November 2019

Columbia River System Operations Update

Ice Harbor Dam, Washington

This newsletter is part of an ongoing effort to inform the public about the progress made in developing the CRSO EIS, which will provide documentation under the National Environmental Policy Act for long-term system operations, configuration, and maintenance of the 14 federal dam and reservoir projects in Idaho, Montana, Oregon and Washington. Please visit the www.crso.info for project information and earlier project newsletters.

INSIDE:

- **Introducing the affected environment**
- **Resources evaluated for this EIS**
- **Defining the environment under NEPA**
- **Operating the dams to support fish passage**
- **Project features: Hungry Horse and Dworshak**

US Army Corps of Engineers.

BUREAU OF RECLAMATION

Bonneville POWER ADMINISTRATION

Introducing the affected environment

The U.S. Army Corps of Engineers, Bureau of Reclamation and Bonneville Power Administration have made significant progress on development of the Columbia River System Operations Environmental Impact Statement (CRSO EIS). Essential to the National Environmental Policy Act process and the comparison of the alternatives under consideration is the development of the Affected Environment and Environmental Consequences sections of the environmental impact statement. These sections define current conditions of the resources in the area or region in which an alternative would be implemented.

Comparing alternatives, both their potential to achieve project objectives and their impacts, requires detailed information about the existing conditions of a resource. The affected environment is made up of any areas or resources potentially impacted by the implementation of an alternative under consideration. These areas are introduced in this CRSO EIS Update and will be detailed in the draft EIS.

The EIS documents the expected impacts — the environmental consequences — of implementing an alternative. The Environmental Consequences section also includes the significance of these effects and documents how agencies evaluated these impacts. This section will be introduced in more detail in the next update.

Resources evaluated for this EIS

The NEPA analysis considers the impacts of the five alternatives across a spectrum of resource categories. The five alternatives are outlined in the September 2019 Update and presented in a webcast. Both are available on www.crso.info.

The analyses for many of these resource categories are introduced in this document.

Navigation

The Affected Environment section will document conditions of the navigation and transportation system and associated shipping movements and costs. Analysis includes the location of the navigable waterway and the shippers and producers that use the waterway and the navigation locks and reservoirs at eight of the 14 federal Columbia River System projects: Bonneville, The Dalles, John Day, McNary, Ice Harbor, Lower Monumental, Little Goose and Lower Granite. The analysis also considers the road and rail transportation systems within the region that would serve as alternate shipping modes if portions of the waterway were unavailable.

The Environmental Consequences section will document, for example, if an alternative would change river flow and timing, potentially reducing the depth of the navigation channel and altering barge configurations or capacities and impacting the transportation costs associated with river movements.

Flood Risk Management

The Affected Environment section will document flood risk conditions relative to the six Columbia River System storage reservoirs that provide water storage to regulate flood hazards downstream and the flood risk management provided by system operations and associated infrastructure, such as levee systems. The six projects are Libby, Hungry Horse, Albeni Falls, Grand Coulee, Dworshak and John Day. The area of analysis includes all urban and rural areas and populations potentially affected by changes in exposure to flood hazards. The areas are either downstream of one of the six storage projects or upstream within the reservoir of a project.

The Environmental Consequences section will document flood hazard conditions for the alternatives. Flood hazard conditions will be evaluated by assessing defined annual exceedance probabilities or, in simpler terms, the likelihood that specific water conditions measured by water elevations or flows, or both, would occur.

Power Generation and Transmission

The Affected Environment section will describe the elements of the power and transmission systems that could be affected by alternatives and the factors influencing regional electricity rates.

The Environmental Consequences section will document impacts of the alternatives to generation and transmission of power across the larger context of Pacific Northwest regional power resources of which the 14 federal Columbia River System projects are a subset. For example, this evaluation will determine if an alternative modifies the operations of hydroelectric or other generation facilities and any impacts on the Bonneville Power Administration's ability to meet its power supply obligations.

Cultural Resources

The Affected Environment section will group cultural resources into three property-based categories: archaeological sites, traditional cultural properties, and historic built resources and objects within the study area that are more than 50 years old. The general area of analysis includes the 14 project locations and the area extending one mile in all directions from the reservoirs' full pool elevations.

The Environmental Consequences section will document, for example, the impact to archaeological sites from water erosion based on the changes in reservoir water levels as defined in the different alternatives. It also will document any proposed long-term or permanent changes to historic built resources proposed in the different alternatives.

Recreation

The Affected Environment section will describe reservoir and river conditions relative to the recreation opportunities provided. It will detail water-based recreation activities such as boating, fishing and paddling, along with adjacent park and public space recreation conditions. The general study area is the Columbia and Snake river systems, including reservoir and river reaches. The recreation analysis also focuses on recreational lands and activities located adjacent to mainstem rivers, because these lands and activities may be impacted by the EIS alternatives. The analysis also includes impacts associated with potential changes to visitation to other areas that may result from the alternatives.

The Environmental Consequences section will document, for example, how recreation conditions may change under alternatives that would affect reservoir water elevations and the accessibility of recreational boat ramps.

Water Supply

The Affected Environment section will document the physical aspects of existing conditions. This includes the quantification of water needed for irrigation, municipal and industrial supply; the locations where water is diverted from surface water and from groundwater wells within one-mile of the river; and the lands that use that water for irrigation. The area of analysis for the physical and socioeconomic aspects of water supply will be detailed in this section.

The Environmental Consequences section will document, for example, if an alternative that results in a change in reservoir elevation impacts the capacity of irrigation and municipal pumps to remain in service.

Environmental Justice

An environmental justice analysis under NEPA generally evaluates how each alternative is expected to impact the unique conditions of identified environmental justice populations, which include minority populations, low-income populations and Indian tribes. The U.S. Environmental Protection Agency defines a community with potential environmental justice populations as one that has a greater percentage of minority and/or low-income populations than does an identified reference area. For additional information, visit www.epa.gov/environmentaljustice.

The Affected Environment section will document the locations of environmental justice populations using information from U.S. Census Bureau.

The Environmental Consequences section will document, for example, if alternatives heighten these populations' vulnerability and whether any adverse impacts fall disproportionately on and adversely affect environmental justice populations in these communities compared to the larger community and, if so, whether they meet the threshold of "disproportionately high and adverse."

Anadromous and Resident Fish

The Affected Environment section will document existing conditions including water quantity and water quality (including temperature, total dissolved gas and turbidity) and habitat connectivity. Survival of juvenile fish, return rates of adult salmon and mortality from gas bubble trauma are metrics or measurements, used to track conditions.

The area of analysis includes the Columbia River from the United States-Canada border to the lower Columbia River estuary downstream of Bonneville Dam and portions of the Columbia's major tributaries, as well as tributaries to the Libby and Hungry Horse projects. Other rivers in the study area may be included as appropriate and the EIS will document the study area in further detail.

The Environmental Consequences section will document, for example, if an alternative that result in changes in flow from a project impacts downstream survival of juvenile salmon.

Vegetation, Wetlands and Wildlife

The NEPA evaluation will determine how each alternative is expected to impact the aquatic, wetland and riparian vegetation that provides habitat for wildlife. Wildlife species are grouped into the broad categories of birds, mammals, reptiles and amphibians, and invertebrates. The Affected Environment section will describe the existing vegetation and wildlife that may be affected by the alternatives. The area of analysis consists of vegetation communities and habitats of the Columbia River Basin currently influenced by the operations of the 14 federal Columbia River System projects. Wildlife and plant species listed under the Endangered Species Act and their designated critical habitat will also be described and the EIS will further detail vegetation and wildlife communities.

The Environmental Consequences section will document, for example, if changes in flow from operational changes or dam breaching could hinder the establishment or change the composition of wetland vegetation and its role as feeding, sheltering and breeding habitat for wildlife.

Hydrology and Hydraulics

The NEPA evaluation will determine how each alternative is expected to change reservoir elevations, water releases from the dams, including spill, flow and stages (water levels) in the river channel downstream of the 14 federal Columbia River System projects. The Affected Environment section will describe the climate and hydrology of the Columbia River and its sub-basins, within the United States to downstream of Bonneville Dam, the reservoirs and reservoir operations of the basin (focusing on these 14 dams) and summary descriptions of the river reaches between dams.

The Environmental Consequences section will document, for example, the daily simulated effect of changed operations on reservoir elevation, discharge and spill, and any hydrologically connected reservoir or river downstream.

Geomorphology and Sediment Transport

The Affected Environment section will describe the baseline geology, geomorphology and sediment transport characteristics within Columbia River System reservoirs, and the downstream river reaches within the United States.

The Environmental Consequences section will document, for example, where operational changes to river flow and stage could alter a river's capacity to move sediment.

Water Quality

The NEPA evaluation will determine how each alternative is expected to impact:

- water temperature,
- total dissolved gas and other physical, chemical and biological conditions, and
- sediment quality.

The Affected Environment section will describe existing water and sediment quality conditions in order to compare them to state, tribal and federal standards. The general area of analysis includes the Columbia River and tributaries from the United States-Canada border, including the tributaries to the Libby and Hungry Horse projects and the Snake and Clearwater rivers, to just downstream of Bonneville Dam.

The Environmental Consequences section will document, for example, results from simulations of water temperature and total dissolved gas conditions under various weather, flow and dam operations of each alternative.

Air Quality

The NEPA evaluation will determine how each alternative is expected to impact regional air quality and greenhouse gas emissions in the Columbia River Basin region. The analysis will relate the effects of the alternatives on power generation, navigation and transportation, and construction activities to the consequent effects on air pollutant and greenhouse gas emissions. The analysis will measure the effects of the emissions changes in terms of the potential for adverse effects on regional air quality (and associated health and ecological effects) and the social cost of carbon in the atmosphere.

The Affected Environment section will describe air pollutant and greenhouse gas emissions sources across the region and the current management of air quality and greenhouse gas emissions. The area of analysis for air quality and greenhouse gas emissions reflects the area over which air pollutant and emissions are generated from power generation, navigation and transportation, and construction activities and other emissions sources. Generally, this area is within the project area although some potentially affected point sources occur outside of the regions (e.g., power plants in eastern Montana and Wyoming).

The Environmental Consequences section will document, for example, how shifts in power generation (e.g., from hydropower to fossil fuels or renewable resources) would affect energy-sector greenhouse gas emissions by modeling the total volume of carbon dioxide emissions for each action alternative relative to No Action.

The role of scoping input

Public input received during the scoping phase, early in the NEPA process, contributes to identifying 1) significant resources in the affected environment, 2) potential impacts to those resources, and 3) appropriate mitigation measures. This input also helps agencies set appropriate boundaries for the analysis of potential effects. For example, if the boundaries are defined too broadly, the analysis becomes unwieldy; if they are defined too narrowly, significant issues may be missed. A Scoping Summary Report that summarizes the comments received during this phase is available on the project website at http://www.crso.info/1017_report.html.

Defining the environment under NEPA

The National Environmental Policy Act requires federal agencies to evaluate each of the alternatives thoroughly to support comparisons about their implementation and their impacts on resources in natural and physical environments. Alternatives also are evaluated and compared in terms of their social and economic impacts. Under NEPA, "effects" and "impacts" may be used interchangeably and mean the same thing.

"Environment" under NEPA is defined as the natural and physical environment and the relationship of people with that environment. This means the environment considered in a NEPA process includes land, water, air, structures, living organisms, environmental values at the site or sites, and the social, cultural and economic aspects of the action.

The list of potentially impacted resources evaluated under NEPA is not identical for each study. Rather, resources are defined early in a specific NEPA study that considers conditions specific to the study area. Resources also are determined based on input from an interdisciplinary project team, stakeholders and the public.

Hungry Horse Dam, Montana

Featured project

The Columbia River System is large and complex. This educational feature introduces you to a project in Montana that plays an important role for flood risk management and meeting power needs in the Pacific Northwest. It also contributes to other uses including irrigation, navigation and recreation opportunities.

Hungry Horse Dam and Reservoir

On the south fork of the Flathead River, 15 miles from Glacier National Park in Montana, stands the 564-foot Hungry Horse Dam. The Bureau of Reclamation operates and maintains the concrete arch structure as part of the Hungry Horse Project. In 1953, at the time of completion, the dam was the third highest and the fourth largest concrete dam in the United States. The project includes the dam and reservoir, associated spillway, outlet works and penstocks, as well as a power plant and switchyard.

From January through June, Reclamation adjusts the reservoir level to make water storage space to help prevent flooding in the lower Columbia River and locally in the mainstem Flathead River near Columbia Falls, Montana. The amount of space depends on estimates of the amount of runoff that will occur that year, or inflow forecasts, that reflect current and projected snowpack and weather.

Reclamation also releases stored water from the project to maintain streamflow for fisheries. From April to June, flows aid spring anadromous fish migrating in the lower Columbia River. From July through September, reservoir storage is balanced to meet the needs of local and downstream fish. Releases supplement flows for juvenile anadromous fish migration in the lower Columbia River, but timing and limits to drafts also benefit resident fish. To preserve fish habitat in the river below the dam, flows from the reservoir are maintained year-round.

The project plays an important role in meeting the growing power needs in the Pacific Northwest. The reservoir stores almost 3.5 million acre-feet of water for later release to produce clean, renewable hydropower. In the 1990s, Reclamation modernized the Hungry Horse generators to produce up to 428,000 kilowatts of electricity — enough to power almost 270,000 homes.

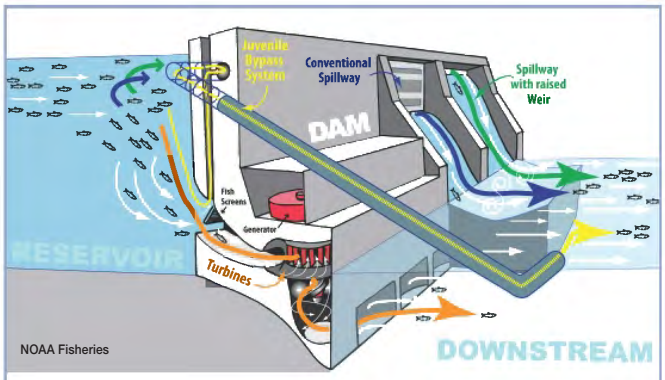
The Hungry Horse project also provides water storage for hydroelectric dams farther downstream on the Columbia River and generates electrical power for the immediate area. Reclamation operates the project in close coordination with the 13 other federal projects that make up the Columbia River System. The area around Hungry Horse Dam and Reservoir offers excellent recreation opportunities. The four-season recreation area allows visitors to take part in fishing, boating, camping, waterskiing, snowmobiling and hunting. To learn more about Hungry Horse, visit www.usbr.gov/pn/hungryhorse/index.html.

Operating dams to support fish passage

Flow augmentation

The Corps and Reclamation operate Hungry Horse, Libby, Albeni Falls, Grand Coulee and Dworshak dams to store water to reduce flood damages downstream and deliver water for irrigation, among other purposes. However, storing water can interrupt the seasonal river flow patterns. To aid migrating juvenile salmon, the Corps and Reclamation operate these dams to provide seasonal releases to improve flows. This is called flow augmentation.

Flow augmentation can impact operations for the dams' other congressionally authorized purposes, including flood risk management, irrigation, hydropower generation and recreation. To balance these purposes, augmentation in spring and summer months is coordinated through a technical group of regional federal agencies, states and tribes to provide recommendations on dam and reservoir operations throughout the region. This Technical Management Team meets weekly during the juvenile fish migration season to discuss flows and spill for juvenile fish passage and plan operations that support fish conservation. To learn more about this team, visit http://pweb.crohms.org/tmt.



In addition to several fish passage systems in place at the lower Columbia River and lower Snake River dams, spillway deflectors produce a more horizontal spill flow and limit the plunge depth of water over the dam spillway. This reduces the amount of entrained nitrogen that creates total dissolved gas, or TDG.

Spill

Water is spilled over a dam's spillway when it cannot be stored in a reservoir behind a dam or passed through turbines to generate electricity, such as during maintenance activities, periods of low energy demand or periods of high river flow. Spill for these reasons is generally characterized as involuntary. Involuntary spill is most common in the spring.

In the early 1980s, the Corps began spilling water at several of its projects as one way to divert ESA-listed juvenile salmon and steelhead away from the turbines to aid downstream juvenile fish passage survival. Over many years of testing, the Corps, Reclamation and BPA, with input from the National Marine Fisheries Service, (NOAA Fisheries) and other federal, tribal and state fish managers, developed a comprehensive spill program tailored to the unique configuration of each of the four lower Snake River dams and four lower Columbia River dams. This program keeps water moving over spillways for fish, generally from April through August each year.

This program has increased downstream migration survival and the overall migration speed of ESA-listed juvenile salmon and steelhead over the years.

Total dissolved gas

Increased pressure from high levels of spill can result in elevated levels of total dissolved gas in the pool below the dam. This causes air bubbles to dissolve in the water, which supersaturates the water with gases, primarily nitrogen. TDG is a measure of this air dissolved into water. A buildup of elevated TDG concentrations in the bloodstream and tissue of fish and other aquatic species can cause a condition called gas bubble trauma. Symptoms range from minor injuries to death, depending on concentrations and the duration of exposure.

The Corps and BPA implement a water quality program to monitor TDG during annual fish passage spill operations. The team at the Corps' Reservoir Control Center, in coordination with the Technical Management Team, adjusts spill operations in real-time to maintain TDG within state water quality standards to minimize impacts on fish and comply with the National Marine Fisheries Service's and U.S. Fish and Wildlife Service's Biological Opinions on the operation and maintenance of the Columbia River System.

Building on the foundation of the spill program and its benefits to juvenile fish passage, federal, state and tribal partners aligned on a flexible spring spill operation for 2019 and 2020 with the goal of improving juvenile salmon survival while managing costs of hydropower generation (diverting water for spill reduces power generation). For more information on this agreement, a key component of operating federal dams on the Columbia River in 2019 and 2020, visit https://www.bpa.gov/news/newsroom/Pages/Flexible-spill-agreement-aims-to-benefit-salmon-and-hydropower.aspx.

For highlights of eight years of accomplishments to protect and conserve ESA-listed salmon and steelhead in the Columbia River Basin, read the 2016 Citizen's Guide.* The guide describes efforts to expand the distribution and abundance of Columbia River and Snake River salmon and steelhead by making multipurpose federal dams safer for fish, removing barriers to fish migration in tributaries, reducing the time it takes juvenile fish to travel downstream, managing predators, and restoring tributary and estuary habitat.

*The 2016 Citizen's Guide is available at https://www.salmonrecovery.gov/doc/default-source/default-document-library/2016-citizen's-guidee56923bab16b6cf0b057ff00002e0fb7.pdf?sfvrsn=0.

McNary Dam spillway. Spill through two raised spillway weirs (right) and conventional spillways at McNary Dam on the lower Columbia River improves downstream passage survival for juvenile salmon and steelhead.

By 2018, the Corps' operation of Dworshak Dam in Idaho had prevented more than $4.4 million in potential local flood damages. From October 2014 through September 2018, the dam prevented approximately $216 million in potential flood damages on the Columbia River.

Featured project

The Columbia River System is large and complex. This educational feature introduces you to a project in Idaho that plays an important role for flood risk management and meeting the power needs in the Pacific Northwest.

Dworshak Dam

The U.S. Army Corps of Engineers operates and maintains Dworshak Dam on the North Fork Clearwater River in Idaho. At 717 feet, Dworshak is the third tallest dam in the United States. It began operating in 1972 to provide 2 million acre-feet of water storage space to reduce local and regional flood risks. It began generating hydropower in 1973. The project's 220-megawatt turbine unit is the largest hydroelectric generator in the Corps' inventory. Combined with two other units that each produce 90,000 kilowatts of power, Dworshak can generate enough to power roughly 300,000 homes.

The height of Dworshak Dam made it impractical to install fish ladders for upstream fish passage. Instead, the Corps constructed the Dworshak National Fish Hatchery below the dam in 1969 to mitigate for lost fisheries resulting from dam construction and operation. The U.S. Fish and Wildlife Service and the Nez Perce Tribe operate and maintain the hatchery that raises Clearwater River steelhead and spring chinook and coho salmon.

Releasing cool water from various depths in the reservoir during the warm summer months helps to promote the continuance of existing fish runs. Operators adjust downstream water temperatures through water releases from a multi-level intake structure on the dam's upstream face that is used for power generation. Wildlife mitigation lands are managed to offset habitat losses that occurred when the reservoir filled. About 9,000 acres are managed specifically for Rocky Mountain elk habitat.

Approximately 30,000 acres of the Corps' land surrounding the reservoir provide recreation, wildlife habitat and timber facilities. Popular recreation activities include boating, swimming, fishing, hunting, camping, picnicking, geocaching and hiking.

The Corps operates the Dworshak project in close coordination with the 13 other federal projects that make up the Columbia River System and serve a wide range of purposes.

To learn more about Dworshak Dam, visit www.nww.usace.army.mil/Locations/District-Locks-and-Dams/Dworshak-Dam-and-Reservoir.