US Army Corps of Engineers®
Portland District

**SEDIMENT QUALITY REPORT**

**DWORSHAK RESERVOIR**
**COLUMBIA RIVER BASIN**
**CLEARWATER RIVER, IDAHO**

# Dworshak Reservoir

## Sediment Quality Report
## August 2020

# EXECUTIVE SUMMARY

The Dworshak Dam and Reservoir project is located in central Idaho on the North Fork Clearwater River, 1.9 miles (3.1 kilometers) above the confluence with the Clearwater River. The dam is a U.S. Army Corps of Engineers (Corps) project; the lower portion of the project is within the Nez Perce Indian Reservation; and the entire project is located in Clearwater County, Idaho (Figure 1-1).

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# ACRONYMS

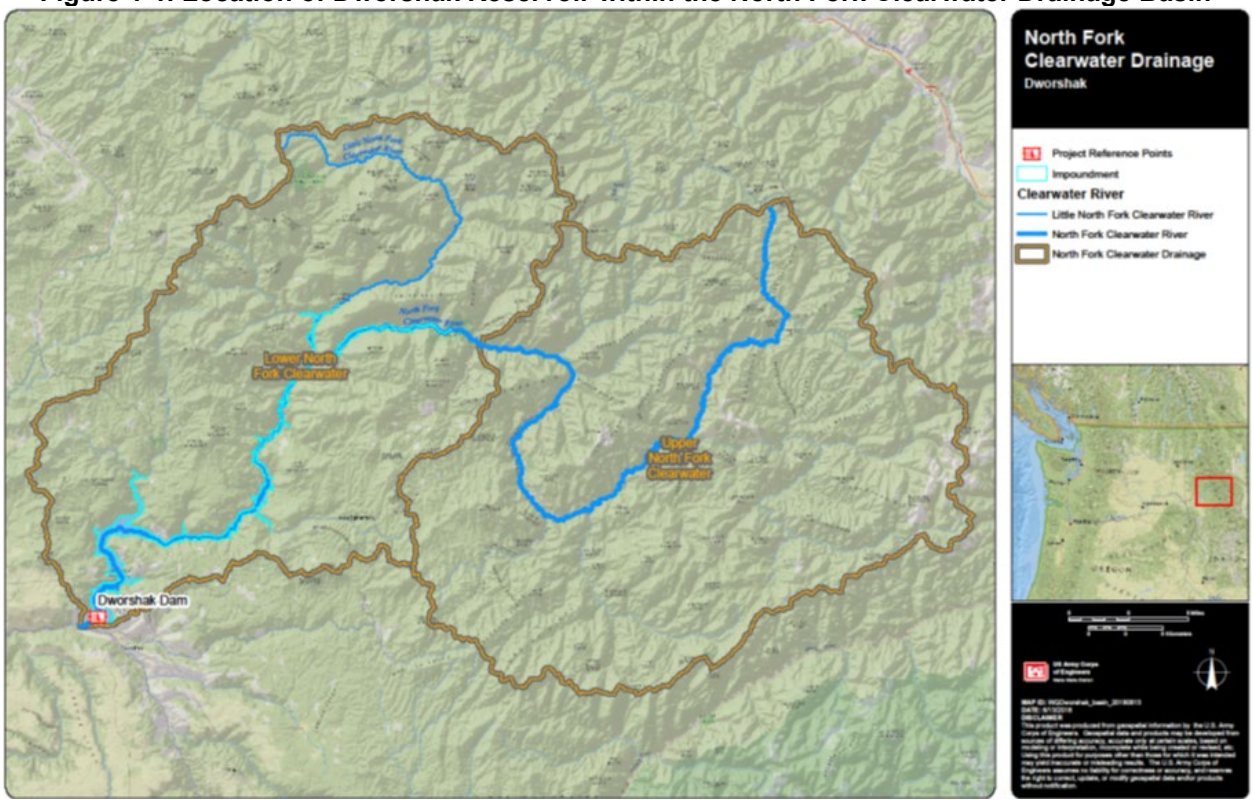
| Acronym | Description |
|---|---|
| Corps | U.S. Army Corps of Engineers |
| msl | Mean Sea Level |

# SECTION 1 - INTRODUCTION

## 1.1 STUDY AREA

The Dworshak Dam and Reservoir project is located in central Idaho on the North Fork Clearwater River, 1.9 miles (3.1 kilometers) above the confluence with the Clearwater River. The dam is a U.S. Army Corps of Engineers (Corps) project; the lower portion of the project is within the Nez Perce Indian Reservation; and the entire project is located in Clearwater County, Idaho (Figure 1-1).

**Figure 1-1. Location of Dworshak Reservoir within the North Fork Clearwater Drainage Basin**




The drainage basin covers an area of approximately 2,440 square miles (6,320 square kilometers). Dworshak Reservoir is long and narrow with a maximum width of 9,000 feet (2,743 meters) and an average width of only 1,800 feet (547 meters). At full pool, it extends 53.6 miles (86.3 kilometers) up the North Fork Clearwater River and covers 16,417 acres (6,644 hectares) at an elevation of 1,600 feet (487.7 meters) above mean sea level (msl). When the reservoir is full, the shoreline measures 175 miles (282 kilometers). The maximum pool elevation is 1,605 feet (489 meters) above msl, which represents 5 feet (1.5 meters) of surcharge storage over normal full pool elevation. At minimum pool elevation, 1,445 feet (440 meters) above msl, the lake covers 9,050 acres (3,663 hectares). The 155-foot (47-meter) vertical zone between full pool and minimum pool provides $2 \times 10^6$ acre-feet ($2.47 \times 10^9$ cubic meters) of storage for power production and flood storage (Corps 1986).

## 1.2 CLIMATE

The climate within the watershed is characterized by relatively long cold winters and mild summers. Climatic conditions are governed by marine air masses from the Pacific Ocean pushed into the area by the prevailing westerly winds. Although these air masses lose much of their moisture as they pass over the Coast and Cascade Ranges to the west, the precipitation rate in the study area is high. Mean annual precipitation ranges from 24 inches (62 centimeters) per year near the mouth of the North Fork Clearwater River to 80 in (203 cm) near the extreme headwaters in the Bitterroot Mountains. Average precipitation over the entire watershed is 51 in (130 cm). About 40 percent of the precipitation occurs between November and January, and rainfall is lowest during July and August (Sport Fishing Institute 1981).

Polar air masses that replace Pacific maritime air masses result in subfreezing temperatures from October to May. Mean January temperatures of 32˚F (0˚C), with lows of 19°F (-7˚C) are not unusual at the mouth of the North Fork Clearwater River. Mean July temperatures of 74°F (23˚C) are recorded at the same locality, with highs exceeding 80˚F (27˚C) common in July and August (Pacific Northwest River Basins Commission 1969; Corps 1975).

## 1.3 GEOLOGY

The Dworshak Reservoir drainage is etched into three major rock types. From oldest to youngest are the metamorphosed sedimentary rocks of the Belt Supergroup, the quartz diorites and tonalites of the Idaho Batholith, and the plateau-forming Columbia River Basalt Group.

Metamorphosed sedimentary rocks underlie most of Dworshak Reservoir and most of the Little North Fork Clearwater River drainage area to the north of the reservoir. Most of these rocks were derived from the Precambrian Belt Supergroup, which underwent extensive structural and mineralogical changes during the emplacement of the nearby Idaho Batholith. High temperatures, pressure, and mineral-rich fluids combined to form folded and faulted schists and gneisses, rich in quartz, amphibole, biotite, and plagioclase. The metasedimentary rocks outcropping in the southwestern end of the reservoir near Dworshak Dam have been recrystallized and deformed to the point where correlation with known sequences of Belt Supergroup rocks is difficult.

The Idaho Batholith is an extensive body of roughly granitic composition that forms much of Central Idaho. It was emplaced approximately 100 million years ago, near the beginning of the Cretaceous period. The Idaho Batholith border zone underlies much of the area east of Headquarters, Idaho, and a large portion of the upper part of the North Fork Clearwater River. Many smaller plutonic bodies associated with the border zone of the Idaho Batholith outcrop in the metasediments within the reservoir canyon and in the area surrounding the Little North Fork Clearwater River. The rocks of the border zone and its satellites are mostly quartz diorites and tonalites which are generally medium to course grained, gray to light gray, and are composed of varying amounts of plagioclase, quartz, amphibole, and biotite, with a distinct lack of potassium feldspar.

The Columbia River Basalt Group is a series of horizontally layered, dark gray, fine-grained volcanic rocks representing Miocene-aged lava flows. It is composed of approximately 50 percent quartz, with lesser amounts of plagioclase, pyroxene, and olivene. These basalt flows include an upper and lower formation referred to as the Clearwater Embankment. Although the upper flow extends approximately 35 miles (56 kilometers) up the North Fork Clearwater River drainage, the lower formation extends only 15 miles (24 kilometers) (Bond 1963). These flows form distinct plateaus immediately adjacent to the canyon walls in the southwestern half of the reservoir and are generally covered by loess. The low relief and the rich soil of these plateaus make them excellent croplands.

The landscape remained generally undeformed until the late Pliocene or early Pleistocene when a major period of faulting and folding occurred. Additional extrusions of local lava flows added to the structural relief of the terrain to elevations exceeding 4,000 feet (1,219 meters). As noted by Bond (1963), the subsequent erosional cycle is relatively new with the parent bedrock, clastic sedimentary layer, and basalt exposed in the canyons of the North Fork Clearwater River.

Although the Clearwater area was not affected by the Wisconsin age ice sheets, most of the higher peaks in the Bitterroot and Clearwater Mountains were covered with montane glaciers (Dort 1965). In those areas, glaciers occasionally descended into the valleys to elevations as low as 3,000 feet (914 meters) above msl. In most instances, however, montane glaciers remained higher than 5,000 feet (1,524 meters) above msl (Anderson 1935). The western flanks of the Bitterroot Mountains are characterized by deeply incised (glaciated) U-shaped valleys that meld into the V-shaped valleys and canyons of the lower Clearwater Mountains.

By about 12,000 years ago, the montane glaciers retreated. Mattson (1983) reports that Late Pleistocene Missoula floodwater deposits in the Clearwater area may have occurred at an elevation of 1,260 feet (384 meters) above msl. Therefore, it is possible that the lower portions of the North Fork Clearwater River were inundated by glacial melt waters during the late Wisconsin era prior to 13,000 years ago.

## 1.4 SOILS

Ross and Savage (1967) describe the soils of the North Fork Clearwater River drainage area as brown Podozolic soils comprised of light to dark brown humid and subhumid soils.

Because of the character of geological formations in the drainage area, the relative scarcity of topsoil, and the nature of runoff, the suspended sediment in the Clearwater River is relatively low. Physical evidence indicates there is significant movement of coarser bed load material during high flows but, in general, the stream is one of the lesser sediment transporting streams in the region. Based on measurements of other streams in the region, it is estimated that the average annual sediment load from the North Fork Clearwater River to Dworshak Reservoir is on the order of 300 acre-feet (370,047 cubic meters) per year (Corps 1975). Because this is very low and no

problems are expected to result from sediment accumulation. The Corps is currently in the process of updating the estimated annual sediment load to the reservoir.

# SECTION 2 - SEDIMENT QUALITY

## 2.1 SEDIMENT DATA

No data was located that described the physical or chemical properties of the sediments in Dworshak Reservoir.

# SECTION 3 - REFERENCES

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