Reading Guide

to the

2019 Water Quality Study for the Pelton Round Butte Project and the Lower Deschutes River

This reference document is intended to assist your reading of the Water Quality Study. For more in-depth information about the study's design, Pelton Round Butte operations and our next steps, please visit our website or download the water quality FAQ at: Portlandgeneral.com/WaterQuality. See page 8 of this guide for a list of additional resources.

Summary of Study Sections

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Executive Summary

An overview of the entire study, including a description of its components and a summary of major findings.

1 Introduction

Background information on the Pelton Round Butte Project, objectives of the study and existing environmental regulations regarding water quality.

2 Study Area

Description of project operations, as well as topography, geology, land cover, weather and water flows in the Deschutes Basin; includes maps of the region.

3 Water Quality Monitoring Methods

An explanation of monitoring methods used to collect data in the reservoirs, tributaries and Lower Deschutes River; includes a description of the data review process.

4 Reservoir Water Quality Data Results

Results of water quality monitoring in the reservoirs (Lake Billy Chinook and Lake Simtustus) and tributaries (Metolius, Crooked and Upper Deschutes Rivers), including comparisons to other reservoirs in the region. Water quality parameters characterized in this section include: temperature, conductivity, pH, dissolved oxygen, transparency, nutrient composition, chlorophyll, phytoplankton and zooplankton.

5 Water Quality Changes in the Reservoirs

Description of changes that have taken place in the reservoirs, comparing study results to data from the 1990s and 2000s.

6 Water Quality in the Lower Deschutes

Results of water quality monitoring in the Lower Deschutes River and its tributaries, including a comparison to other Oregon rivers. Water quality parameters characterized in this section include: temperature, pH, dissolved oxygen, turbidity, chlorophyll and phycocyanin, periphyton, volatile solids, periphyton chlorophyll, entrained algae, nutrient chemistry and other chemicals.

7 Changes in Water Quality in the Lower Deschutes River

Description of changes that have taken place in the Lower Deschutes River, comparing study results to a 1997 survey and available data from Oregon Department of Environmental Quality's Ambient Water Quality Monitoring Program (AWQMP) from the late 1950s to the present.

8 Discussion

Analysis of results, discussion of limitations and a summary of major findings for the monitoring portion of the Water Quality Study.

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Detailed description of calibration and validation for the project reservoir models.

10 Water Quality Modeling in the Lower Deschutes River

Detailed description of calibration and validation for the Lower Deschutes River model.

11 Scenario Analysis: Integrated Modeling of Project Reservoirs and the Lower Deschutes River

Discussion and evaluation of eleven scenarios that model the potential effects of operational changes, reservoir management options and climate conditions on the reservoirs and Lower Deschutes River.

12 Study Conclusions

Major findings from each section of the study, recommendations for water quality mitigation and future research.

13 Acknowledgments

14 Literature Cited

Recommended Reading

The following sections are recommended for those wishing to read an abbreviated version of the study. This list includes some of the most critical parts of the study as well as sections that summarize, analyze or discuss results.

Glossary of Terms

Definitions provided here reflect the usage within the Water Quality Study.

Attractant Flow
Artificial currents that mimic the natural downstream movement of water, thereby attracting fish to a specific area and enabling their collection.

Benthic
Relating to or occurring in the lowest depths in a body of water. Benthic organisms reside in, on, or just above the river/reservoir substrate.

CE-QUAL-W2
A two-dimensional hydrodynamic water quality model used to generate simulations for the impoundments.

Cladocerans
Small, freshwater crustaceans sometimes referred to as “water fleas.”

Conductivity
A measure of water’s ability to conduct electricity. Used in this study as a conservative tracer to identify water from distinct sources.

Conservative
Conservative water quality parameters remain constant; they do not change as water flows downstream.

Cyanobacteria
Aquatic, photosynthetic bacteria, also known as blue-green algae.

Diatoms
A major group of aquatic, single-celled algae which produce silica cell walls.

Diel
Relating to a 24-hour period; involving regular cycles that include both day and night.

Epilimnion
The uppermost layer of water in a reservoir or lake.

Eukaryote
An organism whose cells contain genetic material housed within a distinct nucleus.

Eutrophic
Overly rich in nutrients, causing abundant plant growth followed by decomposition, leading to oxygen depletion.

Forebay
The portion of a reservoir immediately upstream of a dam.

Frustule
The hard silica wall of a diatom.

Hypolimnion
The deepest layer of water in a reservoir or lake.

Impoundment
A body of water confined within an area; a reservoir.

Labile
Susceptible to change or alteration.

Lysis
The breakdown of a cell membrane, causing cell disintegration.

Metalimnion
The middle layer of water in a reservoir or lake, also known as the thermocline, where temperature decreases rapidly with depth.

Morphometry
The measurement or study of stream shape, including the river’s channel, slope, depth and width.

Nitrogen Fixation
The chemical process that converts atmospheric nitrogen into organic compounds, especially by some microorganisms.

Nonpoint Source
A source of pollution that is widely distributed; emanating from a diffuse, nonspecific area.

Peaking Generation
Power generation facilitates that typically only run when demand for electricity is high.

Periphyton
Algae, cyanobacteria and other freshwater organisms attached to underwater surfaces, such as river rocks.

Phytoplankton
Microscopic algae, forming the base of the aquatic food web.

Point-source
A specific, identifiable source of pollution.

Productive
Having a high rate of generation of biomass in an ecosystem.

Prokaryote
A cellular organism that lacks a nucleus or any other specialized organelles.

QUAL2Kw
A one-dimensional water quality model used to forecast changes in the Lower Deschutes River.

Rotifers
Microscopic aquatic animals common in freshwater.

Seston
Organic and non-organic particles suspended in the water column, as opposed to attached material (periphyton).

Smolt
A young salmon or trout about two years old, when it begins its migration to the ocean.

Sonde
An underwater probe used for gathering water quality information.

Stability
The level of energy required to mix water of different temperatures within the water column, measured as relative thermal resistance (RTR).

Thalweg
The line of lowest elevation along the course of a valley or river.

Thermocline
Also known as the metalimnion; an area in the water column that separates warmer surface waters from colder deep waters.

Tributary
A stream that flows into a larger river or lake.

Trophic
Relating to nutrition or the availability of nutrients.

Turbidity
The level of cloudiness in water, typically caused by sediment.

Water Age
The amount of time that has elapsed since a water molecule entered an impoundment.

Zooplankton
Small aquatic organisms; typically microscopic.

Additional Resources

- **Deschutes water quality webpage**
  Download the study and the raw data, read our answers to common questions, find additional resources.

- **Water Quality Study frequently asked questions**
  Answers to common questions about the Water Quality Study, its design, results and our next steps.

- **Water Quality Study open houses**
  Attend one of our informational open houses in Central Oregon (July 17), Portland (July 23) or Maupin (date TBA).

- **Information on water quality parameters**
  Learn more about pH, temperature, algae, dissolved oxygen, conductivity, turbidity, nutrient composition and more. These resources explain what these water quality parameters measure and why they matter.
    - **Fondriest Environmental Learning Center:** www.fondriest.com/envrionmental-measurements/parameters/water-quality/
    - **Missouri Department of Natural Resources:** https://dnr.mo.gov/env/esp/waterquality-parameters.htm

- **Contact Us**
  Have a question that isn't answered in our other materials? Please send an email to: **deschutes.passage@pgn.com**.