

APPRAISAL STUDY  
Alpine Lake Optimization and Automation  
Prepared for: Chelan County Natural Resources  
Department

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# 1 Introduction

## 1.1 Background and Prior Studies

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### ***Background and Purpose***

The Icicle and Peshastin Irrigation Districts (IPID) and the U.S. Fish and Wildlife Service (USFWS) operate seven alpine lakes (collectively referred to as the Alpine Lakes in this report) in the Icicle Creek Sub-basin. The Alpine Lakes are located in the Icicle Creek sub-basin of WRIA 45 (Wenatchee River Basin) and are used to augment water supply for IPID and the USFWS. IPID operates Klonaqua, Square, Eightmile, and Colchuck Lakes, and the USFWS manages Upper and Lower Snow Lakes and Nada Lake. The lakes are all natural lakes. A small dam with a low-level outlet and control gate was installed at the outlet of each of the lakes in the early part of the 20th Century to allow IPID and the USFWS to capture and store additional runoff during the winter and spring for release during the late summer low flow period. Flows released from Square, Klonaqua, Eightmile, and Colchuck Lakes allow IPID to maintain irrigation diversions and meet instream flow obligations. Flows released from the Snow Lakes and Nada Lake supply water to Leavenworth National Fish Hatchery (operated by the USFWS) and allow the USFWS to meet instream flow obligations. The location of the lakes are shown on Figure 1.

Release gates on the lakes are operated manually and are accessed by hiking in or by helicopter; therefore, they are adjusted infrequently and are not optimized to meet water demands. The purpose of this study is to:

1. Evaluate annual recharge to each lake over a range of historical and future climate scenarios;
2. Evaluate the different lake management scenarios to optimize water releases; and
3. Evaluate the potential to automate the lake discharges so that they can be operated remotely.

There are multiple competing demands for water in the Icicle Creek Sub-basin. These include out-of-stream water supply needed for irrigation, operation of the Leavenworth National Fish Hatchery (LNFH), and municipal use by the City of Leavenworth. Instream flows are also needed to support habitat and passage needs for the endangered species act (ESA) listed fish species. Treaty harvest by the Yakama Nation and the Colville Confederated Tribes, and non-Treaty harvest are important parts of the Icicle fishery. During the late summer and early fall, when natural flows in Icicle Creek are lowest, it is a challenge to supply water for out-of-stream uses, while meeting instream flow targets needed to maintain adequate passage and habitat conditions for ESA-listed fish species. Improvements related to automation and optimization of release from the Alpine Lakes have the potential to provide more reliable instream flows during the late summer and early fall, which would benefit a broad stakeholder group, including IPID, the City of Leavenworth, and local, state, federal, and tribal interests.