Chapter 1: Introduction

1.1 Overview

The proposed Lincoln County Passive Rehydration Project is a multi-phase project that would help recharge aquifer systems, revitalize dry streams, and refill dry lakes using available water pumped from Lake Roosevelt on the Columbia River. The proposed project—located in Lincoln County in eastern Washington (see Figure 1)—addresses the declining availability of groundwater for irrigation purposes and the reduced surface water volumes in streams and lakes that provide wildlife habitat and recreational opportunities. The project would benefit and has the support of agricultural users, local government entities, and local watershed management organizations.

Funding for the initial phase of the project (the "prefeasibility" phase) was provided by the Washington State Department of Ecology (Ecology). Acting on a 2006 directive from the Washington State Legislature (RCW 90.90[1]), Ecology is "aggressively pursuing development of water supplies to benefit both instream and out-of-stream uses" in the Columbia River Basin (Ecology n.d.). The Columbia River Basin includes the Odessa Groundwater Management Subarea (see Figure 2). The Lincoln County Passive Rehydration Project's focus is on the eastern and northern part of this subarea.

What is rehydration?

In eastern Washington and other arid regions, groundwater is heavily relied upon for agricultural, municipal, and other uses. Because of the demand for water, groundwater may be withdrawn from aquifers faster than it is naturally replenished. To help avoid aquifer depletion, hydrogeologists have looked for ways to use excess water to "rehydrate" aquifers. This process can involve diverting water to lakes and streams, allowing it to infiltrate and recharge the aquifer, and storing water in the aquifer for later recovery. Though the process presents technical challenges, its feasibility has been demonstrated under the right circumstances (Scott 2008).

Passive rehydration occurs when water enters an aquifer through natural processes like infiltration from lakes and streams. This contrasts with an active process where water is mechanically pumped into an aquifer.

This report describes the prefeasibility assessment conducted by the Lincoln County Conservation District (LCCD), the lead agency for the project. The report describes the geology, hydrogeology, and climate in the study area; water availability and governance; drainage and routing of water; and land access. Based on the positive results of the prefeasibility assessment, it concludes with a recommendation that the project proceed to the next phase—a feasibility evaluation and design of a pilot project.

[1] http://apps.leg.wa.gov/rcw/default.aspx?cite=90.90

1.2 Background

Odessa Groundwater Management Subarea

The Odessa Groundwater Management Subarea, defined in Chapter 173-128A WAC as "the segment of the Columbia basin groundwater system centered around the community of Odessa"[2] in Lincoln County (see Figure 2), has experienced a steady decline in groundwater levels since 1967[2]. Groundwater is the primary, and commonly the only, source of water for domestic wells, municipal and public water systems, and irrigated agriculture in Lincoln County and adjacent portions of Grant, Adams, and Franklin counties. In addition, groundwater from stock wells and springs is very important to stock raisers throughout this area. Concurrent with declining groundwater levels, surface water systems (lakes and streams) in the same area have been drying up.

Ecology and the U.S. Bureau of Reclamation (Reclamation) prepared an environmental impact statement (EIS) that describes alternatives for delivering surface water from the Columbia Basin to irrigated lands in the western portion of the Odessa Groundwater Management Area (Ecology and Reclamation 2010). In this western portion of the Odessa Groundwater Management Area, identified in the EIS as the Special Study Area, irrigated agriculture places the largest demand on the groundwater system, with approximately 102,000 acres of irrigated ground supplied by groundwater pumping. Adding the groundwater-irrigated acres outside the Special Study Area, but within the larger Odessa Groundwater Management Subarea, probably at least doubles the number of groundwater-supplied irrigated acres in the region. At least a quarter (more than 50,000 acres of 200,000-plus acres) of groundwater-supplied irrigated ground is located in the focus area of the Lincoln County Passive Rehydration Project.

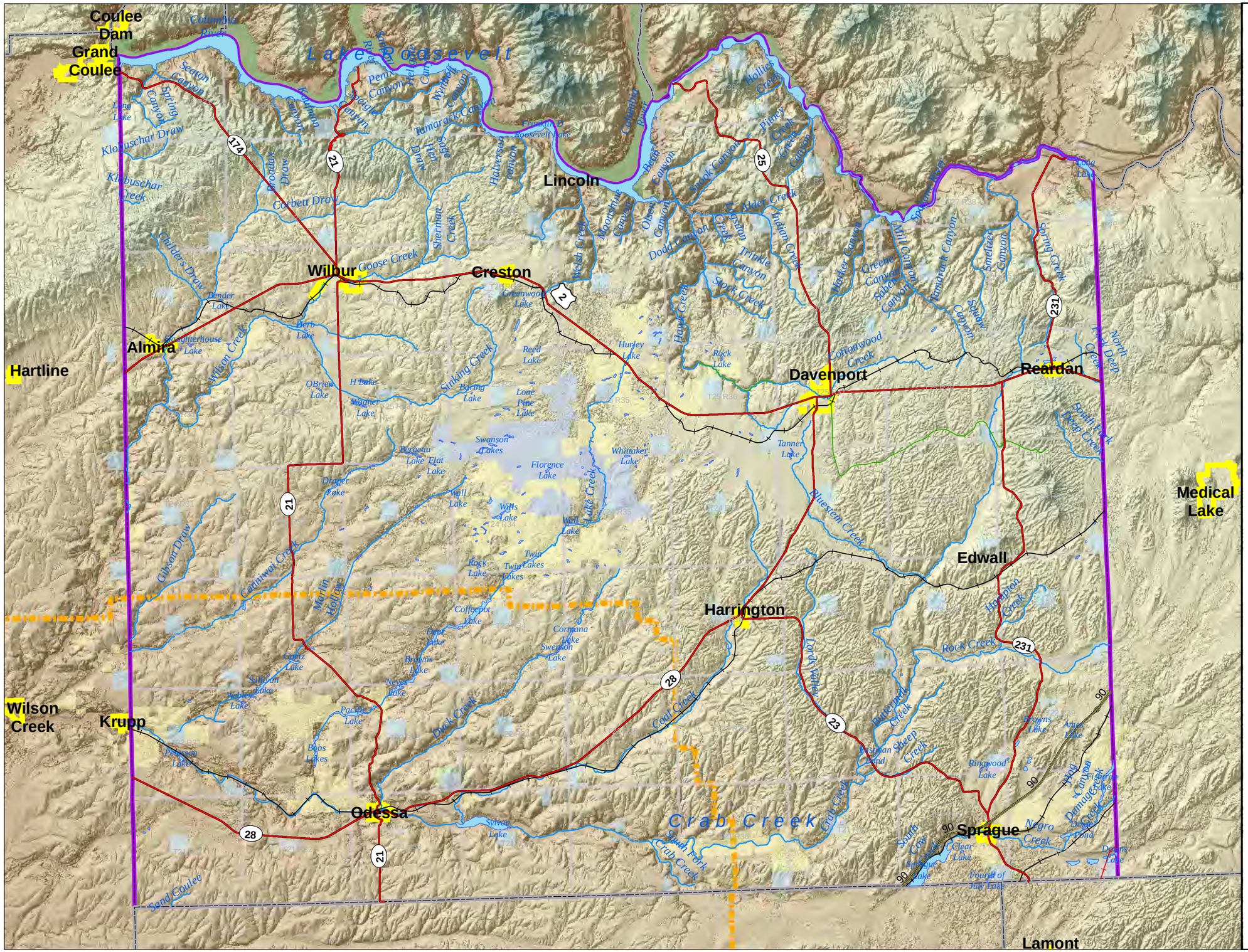
Pacific Lake

One prominent example of the drastic declines in stream flows and lake volumes that have occurred in much of Lincoln County and adjacent counties is Pacific Lake (Figure 3), located a few miles north of Odessa. In the mid 1980s, Pacific Lake went dry. It has held water only periodically since that time. Previously, the lake was approximately 130 acres in area, ranged up to 30 feet deep, and had an approximate storage volume of 2,400 acre-feet (Dion et al. 1976). Pacific Lake had historically seen high levels of recreational use including fishing, boating, and water skiing.

Based on conversations with area residents and farmers, wildlife professionals, and field observations, it seems plausible that surface water declines in the region since the 1980s are related to the large groundwater withdrawals and accompanying declines in the Columbia River Basalt (CRB) aquifer system in the surrounding area. Pacific Lake, and several others in the nearby area that have gone dry, are located in coulees cut deep into the CRB.

[2] http://apps.leg.wa.gov/wac/default.aspx?cite=173-128A&full=true

Figure 1
Location Map for Lincoln County



Legend

- US
- State
- Active RR
- Abandoned RR
- Rails to Trails
- Lakes
- Rivers & Streams
- County Boundary
- Study Area - Lincoln County
- Incorporated Area
- Township
- Odessa Sub-Area
- Dept of Natural Resources
- Dept of Fish and Wildlife
- Bureau of Land Mgmt
- National Park Service

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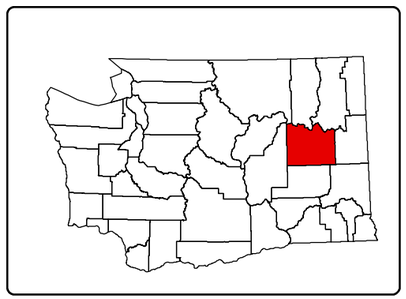


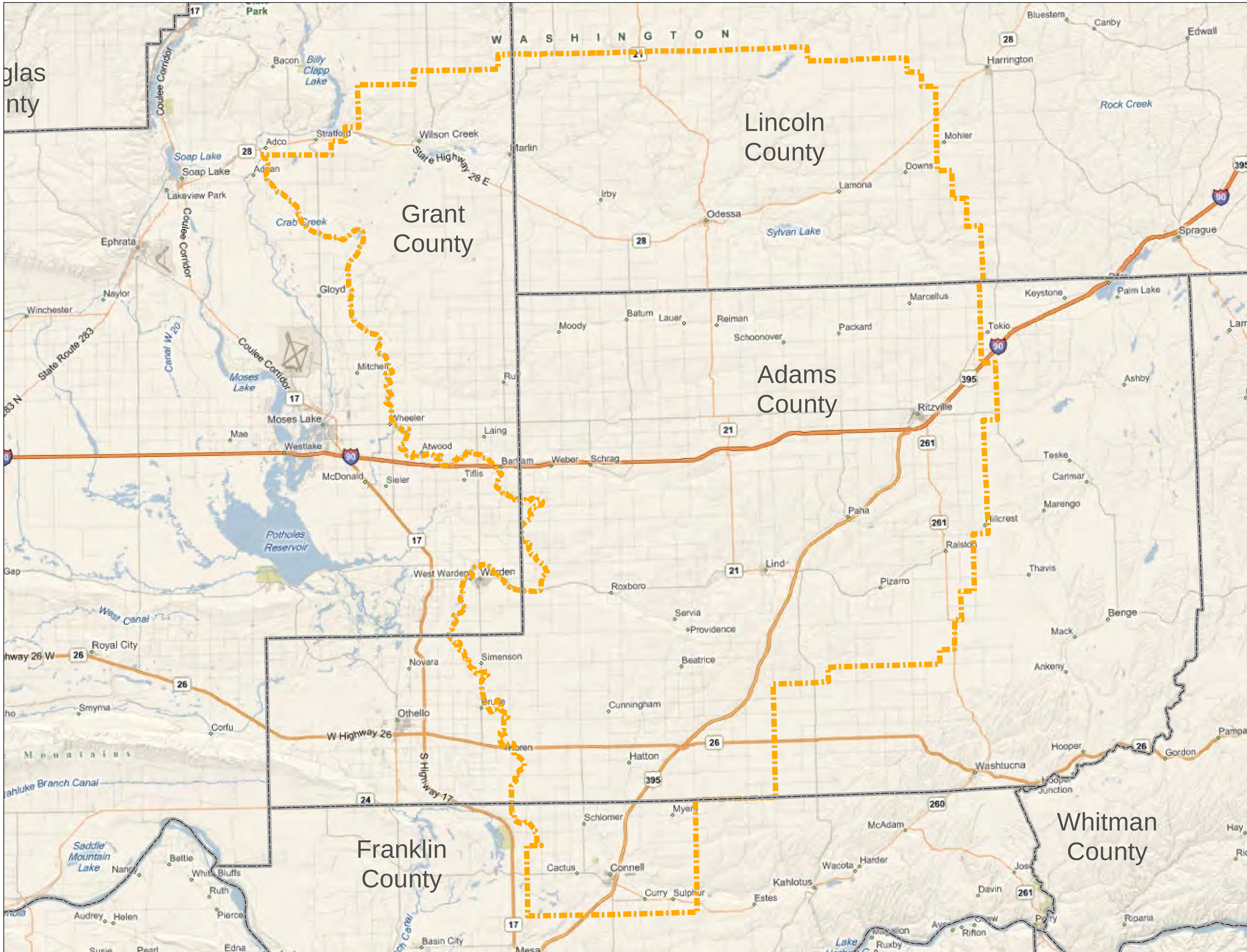
Lincoln County, WA

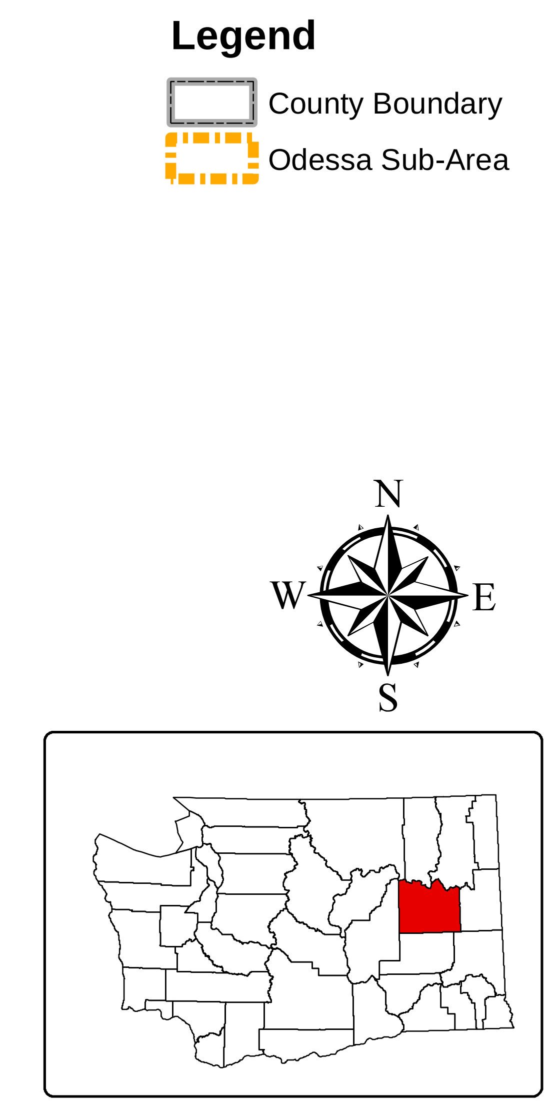
0 2.5 5 10 15 20 25 30 35 40

Miles

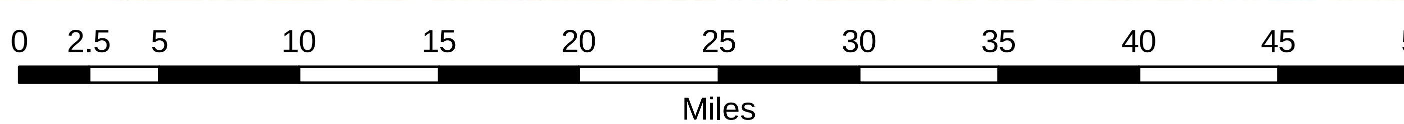
This is not a survey. Actual relationships and distances between features may be different from those depicted on this map. Accurate measurements are required in order to verify these relationships and distances.

Figure 2
Map showing the boundaries of the Odessa Groundwater Management Subarea





Lincoln County, WA



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Accurate measurements are required in order to verify these relationships and distances.

Figure 3. Photograph of the Dry Bed of Pacific Lake (lower Lake Creek) at the Allington Bay Boat Launch

1.3 Project Phases and Goals

Overall Project

As noted above, water diverted from Lake Roosevelt would revitalize dry streams, refill dry lakes, and help recharge the underlying aquifer system in the eastern and northern portions of the Odessa Groundwater Management Subarea. The overall goal of the project is to deliver between 50,000 and 100,000 acre-feet of water into multiple streams in the upper Crab Creek watershed (see Figures 1 and 2). One of the few perennial streams in the Columbia Basin, Crab Creek and its tributaries, some of which are now dry, flow generally south and southwest and drain most of Lincoln County.

Because this project requires careful consideration of feasibility issues—ranging from water sources, to stream capacity, to aquifer recharge potential—implementation is planned in phases or steps. The goals and objectives of each phase are contingent on the results of the previous phase, including whether or not to move the project from one phase to the next. The project phases are planned as follows:

- Phase 1 – Prefeasibility Assessment (the subject of this report)
- Phase 2 – Feasibility Evaluation and Design of a 10- to 20-cfs Pilot Project
- Phase 3 – Environmental Evaluation and Implementation of a 10- to 20-cfs Pilot Project Supplying a Single Drainage
- Phase 4 – Implementation of 5- to 20-cfs Pilot Projects Supplying Multiple Drainages
- Phase 5 – Construction of a Full-Scale, 50- to 250-cfs Rehydration Project in Multiple Drainages

The objectives of Phase 1, the Prefeasibility Assessment are summarized below. For additional details on the potential scope of Phases 2 through 5, see Chapter 6.

Phase 1 – Prefeasibility Assessment Goals

When the project was first proposed in 2008/2009, project proponents envisioned moving directly to construction of a pilot project that would test project concepts, operations, and impacts by operating a small project that delivered water into a target drainage and included observing the impacts of this water on streams, lakes, and groundwater. However, after consulting with Ecology staff, Phase 1 of the project was scaled-back to a prefeasibility assessment having the following goals:

- Determine if water is available from Lake Roosevelt for a rehydration project, both a single stream pilot-scale rehydration project and a potential full-scale rehydration project.
- Propose how much water is needed for each phase of a rehydration project.
- Identify drainages where water might be applied in a subsequent pilot-scale and larger rehydration project.
- Propose primary and secondary streams for a pilot-scale rehydration project.
- Describe the flow capacities of target drainages.
- Describe potential governance structures for the management, operation, permitting, and funding of a rehydration project.

In addition to addressing these goals, Phase 1 also addresses preliminary engineering, hydrologic, hydrogeologic, and land access issues. Based on the results of the Prefeasibility Assessment, a decision will be made about whether or not to proceed to Phase 2.

1.4 Elements Addressed in the Report

During the prefeasibility phase, the project team evaluated potential "fatal flaws" in the passive rehydration concept. Fatal flaws can involve conditions that are physical in nature (e.g., geology, hydrogeology, water routing and delivery pathways, and channel conditions), or regulatory or societal in nature (e.g., rules and regulations that would govern a project, or whether or not the community wants the project). The prefeasibility phase did not include a cost–benefit evaluation.

Physical Elements

The prefeasibility assessment addressed whether or not there is a reasonable potential for surface water to provide a recharge source for portions of the CRB aquifer system. The project team identified streams that would be more or less suitable for aquifer recharge, and for streams where recharge seems plausible, made an initial, qualitative evaluation of the potential aquifer area influenced by such recharge.

With respect to constraints on routing and delivery of the water, the prefeasibility assessment identified extreme physical conditions that, in the project team's qualitative judgment, argued against a specific route. Qualitative judgments included such things as whether or not it is practical to establish a pump station and/or pipeline at a particular location because of physical access, what other types of infrastructure might be present along a particular water transportation route that might require extensive (or excessive) modification, and/or is any single drainage too small to accommodate stream flows that would provide viable recharge options.

The project team obtained information on physical elements from studies, reports, plans, maps, and other materials. A limited field reconnaissance was undertaken to become familiar with these physical elements. If the project moves beyond the prefeasibility phase, additional fieldwork and data analysis will be needed.

Regulatory and Societal Elements

This report outlines regulatory and societal issues that may be encountered if a rehydration project moves forward. As part of the prefeasibility phase, the project team has not proposed specific solutions to potential issues, but does make recommendations about possible courses of action.

Regulatory issues that will need to be resolved relate to federal and state permits required to implement a project, and to regulations, particularly those set forth in the National Environmental Policy Act (NEPA), State Environmental Policy Act (SEPA), and the Clean Water Act (CWA).

Chapter 3 includes a discussion of authorization in the form of a water right to use water from Lake Roosevelt. Regulatory issues were identified in an initial review of potentially relevant rules and regulations, and/or in the course of interviews and conversations with agencies that may have an interest in the project, or the land the project would be situated on.

The societal issues discussed in this report focus on whether or not the public would support a rehydration project, and whether or not landowners along a project route would agree to implementing a project on their land, especially if it had the potential to impose limitations on how they might use their property. These societal issues were largely identified from direct conversations with landowners in the drainages evaluated for the project.

1.5 Report Structure

This chapter of the report (Chapter 1) provides general information about the project including its intent, goals, location, funding source, phases, and background, and identifies the individuals and firms that contributed to completion of Phase 1. Chapters 2 through 4 provide in-depth technical information specific to Phase 1. Chapter 5 discusses the conclusions and recommendations resulting from the prefeasibility analysis, and Chapter 6 describes potential next steps (future phases) of the project. Chapter 7 lists the references cited in the text.

1.6 Project Team

LCCD, as the lead agency, grant recipient, and grant manager, led the project team. Table 1 identifies the project team members.

Table 1. Prefeasibility Assessment Team Members

Affiliation	Team Members	Role
LCCD	David Lundgren Elsa Coffman	Grant management, technical support.
GSI Water Solutions (GSI)	Kevin Lindsey, L.Hg Molly Reid Jon Travis Travis Hammond John Porcello Terry Tolan	Worked under contract to LCCD to provide hydrogeologic and geologic assessment, evaluate land ownership issues, manage the consulting team working on the project, and coordinate preparation of this report.
HDR Engineering, Inc. (HDR)	Steve Thurin, P.E. Emily Flanagan, P.E. Brian Bartle, P.E. Rona Spellecacy, AICP Aaron Meilleur, P.E. Barb Whiton	Worked under contract to GSI to evaluate RCW 90.90 issues, routing and infrastructure needs, surface water drainage and habitat issues, governance required for the project, and report editing and formatting.
Water and Natural Resources Group (WNR)	Gene St. Godard, P.G., L.Hg	Worked under contract to GSI; he led the public outreach effort, evaluated water rights issues, and provided general technical support.
Lincoln County Planning Department	Courtney Thompson	Worked under contract to LCCD to provide GIS support.

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