

## Final Study Plan, Part 2

# Klamath Hydroelectric Project Interim Measure 11 Study Activities for 2018

July 17, 2018

## Introduction

The Klamath Hydroelectric Settlement Agreement (KHSA; as amended on April 6, 2016) includes Interim Measure 11 (Interim Water Quality Improvements), which is intended to address water quality improvement in the Klamath River during the interim period leading up to potential dam removal. Regarding Interim Measure (IM) 11, the KHSA states “The emphasis of this measure shall be nutrient reduction projects in the watershed to provide water quality improvements in the mainstem Klamath River, while also addressing water quality, algal and public health issues in Project reservoirs and dissolved oxygen in J.C. Boyle Reservoir.” The measure calls for PacifiCorp to spend up to \$250,000 per year<sup>1</sup> for studies or pilot projects in consultation with the Interim Measures Implementation Committee<sup>2</sup> (IMIC). PacifiCorp submitted Part 1 of the IM 11 study plan in February 2018<sup>3</sup>. Part 1 included a discussion of three studies:

1. Development of the Priority List of Projects: Phase 3
2. Support for the Upper Klamath Basin Watershed Action Plan Team
3. Continued Evaluation of Intake Barrier System for Water Quality Improvement of Iron Gate Powerhouse Releases

When Part 1 was completed, costs for this work had not been completely developed, but ultimately were less than the \$250,000 available under IM 11. Because of this, proposals were solicited from the IMIC, reviewed by the IMIC, and two projects selected by PacifiCorp for implementation that essentially utilize the remaining 2018 funding. This document describes the proposed studies to be conducted during 2018 to address the IM 11 objectives as described above. Specifically, proposed 2018 Activities described in this Part 2 of the 2018 Study Plan that are related to IM 11 include:

4. Development of a Water Budget and an Assessment of Nutrient Loading from Two Agricultural Operations
5. Klamath Basin Monitoring Program Funding

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<sup>1</sup> Per year until the date that the Dam Removal Entity (DRE) accepts a Surrender Order issued by the Federal Energy Regulatory Committee (FERC) regarding the Klamath Hydroelectric Project. The KHSA indicates that up to 25 percent of the funding in this measure for pre-surrender-order acceptance studies and post-surrender-order acceptance implementation may be directed towards in-reservoir water quality improvement measures, including but not limited to J.C. Boyle reservoir.

<sup>2</sup> The IMIC is comprised of representatives from PacifiCorp and other parties to the KHSA. The purpose of the IMIC is to collaborate with PacifiCorp on ecological and other issues related to the implementation of the Non-Interim Conservation Plan Interim Measures set forth in Appendix D of the KHSA.

<sup>3</sup> PacifiCorp 2018. Klamath Hydroelectric Project Interim Measure 11 Study Activities for 2018: Final Study Plan, Part 1. February 20, 2018. Available online at: <http://www.pacificorp.com/es/hydro/hl/kr.html#>

## 4: Development of a Water Budget and an Assessment of Nutrient Loading from Two Agricultural Operations

### Purpose and Objectives

Hydrologic modification throughout the Upper Klamath Basin has resulted in pump and pipe systems that convey water to and from Upper Klamath Lake and the Klamath River. The pump systems around Upper Klamath Lake allow for the management of water from drainage areas that are composed of agricultural, natural areas, infrastructure (such as roads, highways, railroads), golf courses, and rural residential properties. Agricultural operations are a large component of the land use in these drainage areas. Anthropogenic nutrient loading is linked to increased algae blooms that exacerbate already low dissolved oxygen conditions throughout the summer months. This hydrologic modification, nutrient loading, algae blooms, and low dissolved oxygen may be key factors impacting federally listed shortnose suckers (*Chasmistes brevirostris*) and Lost River suckers (*Deltistes luxatus*) and contributing to poor water quality in Keno Reservoir and the Klamath River downstream. Emergent wetlands naturally sequester nutrients and were once abundant throughout Upper Klamath Lake; however, dramatic declines in the abundance and distribution of these habitats have resulted in a decreased capacity of the system to sequester nutrients. Existing wetlands have been greatly reduced in area and modified where they remain, which has resulted in limited nutrient sequestration capability. As a result, nutrient inputs often exceed system retention capacity, which allows greater nutrient availability for algae blooms.

Recently, phosphorus concentrations in several outflow locations throughout Upper Klamath Lake have been identified as periodically exceeding Total Maximum Daily Load (TMDL) targets. Several of these monitored sites are located where irrigation flows return to the lake after winter flooding. Winter flooding is a longstanding agricultural practice that is integral to organic farming programs and an important food resource for migratory waterfowl in the fall and spring. Agricultural producers, the U.S. Fish and Wildlife Service (USFWS), and Trout Unlimited believe that properly developed and designed wetlands can play a valuable role in reducing nutrient levels in water returning to the lake, particularly when used in conjunction with vegetation harvest that assists in nutrient export, and on-farm best management water practices. However, an assessment of specific locations, historic and current land use, nutrient budgets, water budgets, and seasonal variation needs to be conducted to ensure investments into water quality improvement projects are targeted and effective.

The purpose of the Activity 4 for 2018 will be to assess hydrologic modification and nutrient loading at two farms on the southwestern shore of Upper Klamath Lake (Figure 1). The work would determine a water budget and temporal and spatial variability of soluble and particulate phosphorus and nitrogen. This assessment will be used to evaluate potential restoration and mitigation measures to facilitate nutrient reductions in discharged water.

At the Running Y Farm (Figure 2) water from Upper Klamath Lake is diverted into a main delivery ditch and gravity flows through about 3,600 acres of mixed row crop, grain, and forage production cropland. Discharged water is pumped back into the Geary Canal which flows into Upper Klamath Lake. Peak irrigation periods include a non-growing season of irrigation from December through February and summer-growing season irrigation from May through October annually. Periods of discharge occur in February, March, and June - September, depending on agriculture needs. Currently, agricultural return flows entering the Geary Canal have periodically exceeded TMDL concentration targets. Current monitoring efforts are limited and do not include an analysis of inflows, water management and movement within the property, existing wetland function, or on-site contributions to nutrient loading. This limited monitoring makes it difficult to accurately target actions to reduce phosphorus loading in discharge water, which ultimately ends up in Upper Klamath Lake.

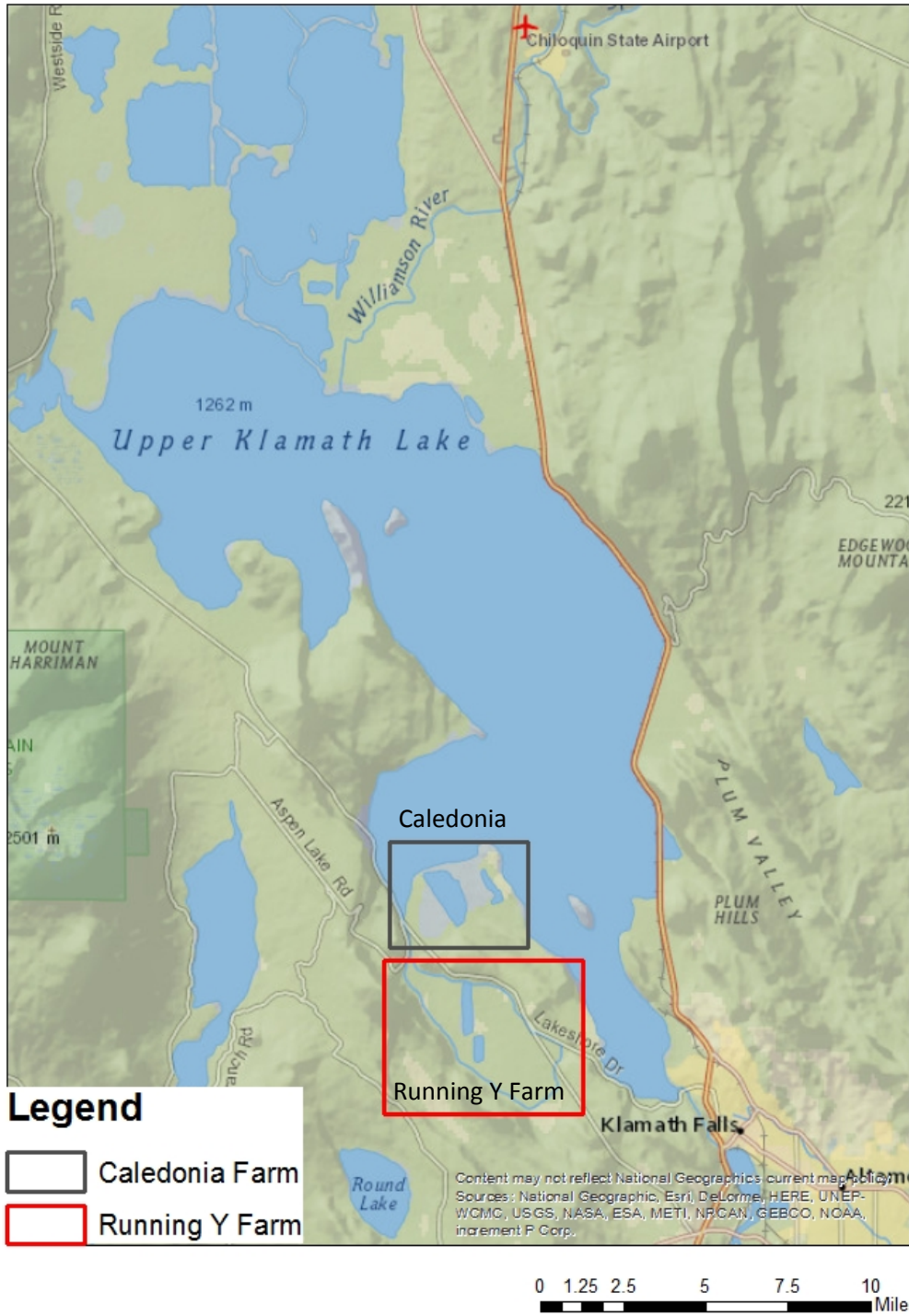


Figure 1. General location of proposed assessment area



Figure 2. Overview of Running Y Farm assessment area

On the Caledonia Farm (Figure 3), water from Upper Klamath Lake moves through a series of long irrigation canals throughout the roughly 2,300 acres of mixed row crop, grain, and forage production cropland (Figure 3). Discharge water can be sent back to Upper Klamath Lake at two pump stations. Similar to the Running Y Farm, the peak irrigation periods include a non-growing season of irrigation from December through February, and summer-growing season irrigation from May through October annually. Periods of agricultural return flows occur in February, March, and June-September, depending on agriculture needs. Water from Caledonia Farm is pumped directly into Geary Canal/Howard Bay and Upper Klamath Lake.

Information derived from this assessment will:

- Support the development of best management practices for agricultural return flows to Upper Klamath Lake and provide data to determine appropriate practices for future implementation.
- Facilitate land management programs including wetland development and agricultural/wetland rotations that can contribute to nutrient sequestration and export.
- Provide data that will help support long term land management plans to ensure sequestration benefits can be achieved for future years.
- Guide development of agricultural management plans that utilize the timing of return flows and water retention in developed wetlands to reduce phosphorus and nitrogen contributions into Upper Klamath Lake.
- Support a sustainable agricultural business model and ensure important migratory bird habitat that is integral to Pacific Flyway management objectives remains available throughout the Klamath basin.

Results from this effort will be applicable throughout the Upper Basin for future return flow management, appropriate non-wetland water quality strategies, future wetland development, and wetland management plans that help reduce discharges below TMDL target compliance concentrations.

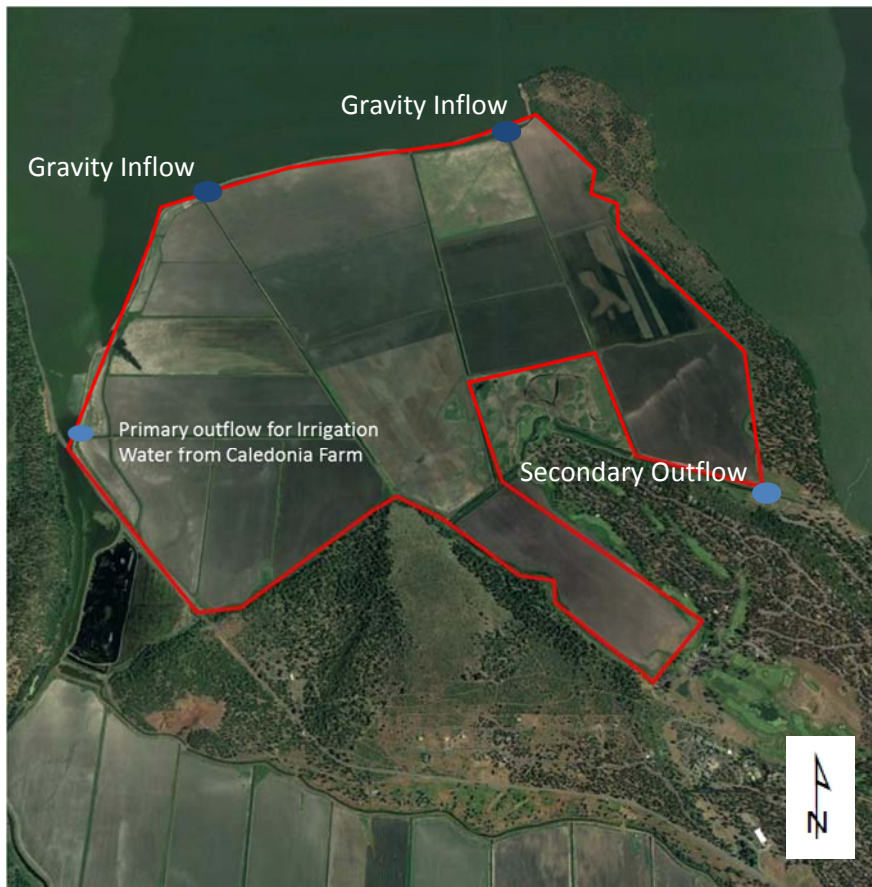


Figure 3. Overview of Caledonia Farm assessment area

Project partners are working in close collaboration with additional agencies, including Oregon Department of Agriculture (ODA), Oregon Department of Environmental Quality (ODEQ), The Klamath Tribes, Natural Resource Conservation Service (NRCS), and U.S. Geological Survey (USGS). Collaboration with all of these partners will continue throughout the assessment process.

## Task and Work Elements

The tasks and work elements associated with this activity (as funded by PacifiCorp) in 2018 will include the following:

- Review of existing data and farm operations
- Development of a detailed monitoring plan
- Data collection
- Data analysis

### Task 1 – Review of existing data and farm operations summary

Review existing water quality data and research regarding nutrient loading will occur including interviews with landowners and managers to fully understand year-round management and water use. A draft summary report will be prepared to document irrigation infrastructure, soil characteristics, existing wetlands, hydrology, and vegetation communities.

## Task 2 – Development of detailed monitoring plan

Project partners and contractors will work closely with ODA and with the landowners to develop a first year monitoring plan. Monitoring locations and timing will complement the monitoring effort underway by ODA and will not duplicate their efforts.

## Task 3 – Water quality and flow data collection

### 3a: 1st Year Monitoring:

Nutrient samples and flow measurements will be collected approximately bi-weekly at approximately eight (8) locations throughout the Caledonia and Running Y properties. Exact locations will be developed during tasks 1 and 2 and will complement the monitoring already underway by ODA. The timing of sample collection may change to capture inflow and pump-off events, as well as irrigation events, but will average 26 sample events per year.

### 3b: 2nd Year Monitoring:

An additional 8 months of sampling will provide data through the 2019 irrigation season as well as the winter 2020 pump-off event. Sample timing and locations may be adjusted slightly depending on results from Task 3a.

## Task 4 – Data analysis and development of nutrient and water budget for each property

Based on data and information collected in Tasks 1 and 3, a water and nutrient budget for the Caledonia and Running Y properties will be developed. This will allow for an evaluation of water quality improvement actions that may be appropriate for each site.

## Schedule and Deliverables

Work will begin in the summer of 2018 and continue through March of 2020. Specific timelines may be adjusted from those presented below based on the final sampling plans.

Task	Tentative Schedule	Deliverable
1. Review of existing data and farm operations summary	July - September 2018	Draft Summary Report
2. Development of detailed monitoring plan	July - August 2018	Monitoring Plan
3. Water quality and flow data collection	July 2018 - June 2019 July 2019 – February 2020	Annual Data Summary
4. Data analysis and development of nutrient and water budget for each property	August 2019 – March 2020	Draft and Final Report

## 5: Klamath Basin Monitoring Program Funding

### Purpose and Objectives

The Klamath Basin Monitoring Program (KBMP) is a voluntary program comprised of organizations that have an interest in improving water quality conditions within the Klamath River Basin. The collaborative efforts by KBMP members is to improve water quality, highlight the collective progress toward water quality and species recovery goals, and to better understand how conservation and restoration contribute to pollution reduction and habitat improvement. With support and funding from PacifiCorp under IM 11, KBMP hopes to advance efforts to achieve nutrient reduction and water quality improvements.

### Task and Work Elements

The work associated with this activity (as funded by PacifiCorp) in 2018 will include support for a water quality restoration session at the Fall 2018 KBMP Meeting.

A dedicated half to full-day session of the next KBMP meeting (Fall 2018) will be focused on water quality restoration topics to help advance the goals of IM 11. To develop the program, KBMP staff will conduct outreach to key restoration partners in the basin. This process will allow development of a final list of presentations and/or activities, and ensure the program is addressing the needs of the basin's water quality restoration community. This session will include water quality restoration-centric presentations, and could include an activity such as a facilitated discussion to help create dialog, share information more broadly, and allow for input and contributions from all attendees. This type of discussion would include lessons learned from water quality restoration projects that would help support an adaptive management approach to water quality improvements. The goal of the discussion would be to share important details about successes and failures in previous water quality restoration projects, inform the attendees of restoration activities that are occurring throughout the watershed, and help provide valuable input on water quality improvement techniques in support of the collaborative restoration efforts in the basin. A dedicated forum at KBMP to assist restoration partners and other attendees will help advance the understanding of water quality related linkages to ongoing restoration activities.

In addition to work necessary to develop this program, this effort will also include coordination tasks needed to host the Fall 2018 KBMP meeting, and develop and distribute pre- and post-meeting restoration-related information. Pre-meeting deliverables could be a survey to inquire about key restoration lessons learned or recommendations to help guide the facilitated discussion. Post-meeting deliverables would include a report highlighting conclusions of the presentations, survey results, and discussions that share key findings and help advance successes and avoid issues in restoration work as it relates to water quality.

### Schedule and Deliverables

The schedule for this work would include pre-meeting activities completed by the end of September 2018, the fall meeting itself in November 2018, and then follow-up reporting completed in December 2018.

Pre-meeting deliverables would include:

- Convene discussion with restoration community to identify key presentations to include and solicit feedback on non-presentation activities and meeting goals that would advance water quality restoration efforts.
- Work with the KBMP Steering Committee and restoration partners to plan a dedicated restoration session at the Fall 2018 KBMP meeting.
- Develop and distribute a survey or other method of soliciting feedback from restoration partners. This could be focused on gathering input on lessons learned from key restoration techniques, identify success, failure, and unexpected results, and gather other insight that would help guide a productive discussion.

Meeting deliverables could include:

- Host a dedicated half to full-day session focused on water quality related restoration topics.
- Facilitate an activity to share survey findings, discuss success, failures, and unexpected results from water quality restoration, and identify how to advance monitoring of restoration projects to help measure project success and provide meaningful data to support broader efforts in the basin.

Post-meeting deliverables would include:

- Share all meeting presentations.
- Summarize key findings of presentations and discussion outcomes to help share information directly with attendees and KBMP members.