DRAFT

Harney Community-Based Water Planning Collaborative
Integrated Water Resources Plan

March 6, 2025

List of Figures

Definitions

CBWP	Community Based Water Planning
GDE	Groundwater Dependent Ecosystem
MNWR	Malheur National Wildlife Refuge
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OWRD	Oregon Water Resources Department
PBP	Place-Based Planning
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service

About This Document

The Harney Basin Integrated Water Resource Plan is composed of four parts; 1) Background Information developed by Working Groups, 2) a Groundwater Plan approved by consensus in April 2023 by the Collaborative and as modified from review comments from the Interagency Review Team, 3) the Surface Water Plan approved by the Collaborative in December 2024, and 4) an Implementation Approach adopted by the Collaborative on DATE. The following document was prepared to make the detailed information in those official documents available in summary fashion to a broad audience.

The significance of the water resources to the people in Harney County, Oregon, and beyond, and to fish and wildlife cannot be ignored. In many ways the critical nature of water resource issues and how they are approached and addressed in the Harney Basin will be either instructive or a caution to the rest of the state. We wish to tell the unique story of the Harney Basin as simply as possible yet make sure it is tied to the detailed and difficult work done by many people over a long time.

This summary incorporates information developed since consensus approval of the CBWP Groundwater Plan, involving application of the groundwater model developed by USGS and OWRD and a description of the nature of Malheur Lake, Mud Lake, and Harney Lake as a wetland complex. The place names will be used throughout the document but the National Wetlands Inventory identifies Malheur Lake as a Lacustrine,littoral, unconsolidated bottom, permanently flooded wetland fringed by Palustrine, emergent, persistent, seasonally flooded wetlands. Mud Lake and Harney Lake are similarly identified as complexes of different wetland types. While there will always be improved knowledge, the underlying stresses on the water resources of the basin remain and the hopes and dreams of residents of the basin continue.

Introduction

The Harney Basin Integrated Water Resource Plan (Plan) was developed as one of the pilot projects selected to use place-based integrated water resources planning guidelines developed by the Oregon Water Resources Department in 2015. The Harney Community-Based Water Planning (CBWP) Collaborative chose to develop a groundwater management plan to address acute issues identified at the time and to follow later with surface water management planning. This summary integrates the more detailed information in the appended plans.

The Department published Draft Planning Guidelines in 2015 that provide a framework for place-based integrated water resources planning (“place-based water planning") - a voluntary, locally initiated and led effort, involving a balanced representation of water interests who work in partnership with the state to understand and meet their instream and out-of-stream water supply needs. This Plan is focused on achieving a balance of competing water needs through collaborative management of water resources. The Plan identifies the critical water issues facing all who live, work, and recreate in the Harney Basin and proposes strategies to address those issues.

The Basin has a long history of successful collaborative efforts focused on addressing the challenges that face the community. The Basin has experienced:

- Significant over allocation of both surface and groundwater
- Localized significant declines in groundwater level and domestic well impacts
- Lack of a diverse economy and economic challenges from changes in natural resource uses
- Accommodation to highly variable surface water availability
- Aging surface water irrigation infrastructure
- Conflict over water distribution
- Landscape scale fire and overstocked forest conditions

This Plan is intended as a framework to guide future decision making and to address water resource issues with a balanced, collaborative, and solutions-oriented approach. Working within these challenges will require cooperation of the entire community.

This Integrated Summary provides an overview of the major components detailed in the Groundwater Plan and Surface Water Plan, including Basin water needs, issues, and strategies that support efforts to meet the water resources challenges ahead. The Integrated Summary provides a discussion of the components and is supported by the in-depth Groundwater Plan and Surface Water Plan (Appendices X and Y).

The CBWP Collaborative and the Planning Process

There are several processes that will affect water resources in the Harney Basin. The Oregon Water Resources Department is proposing to amend OAR-690-512 (Malheur Lake Basin Program Rules) to designate a Critical Groundwater Management Area and a Serious Water Management Problem Area in a regulatory rulemaking process. The resulting designations and following actions could result in significant reduction in groundwater irrigation in the basin and other changes to groundwater irrigation practices. Additionally, measures identified in the planning process are being implemented such as the Harney Valley Groundwater Conservation Reserve Enhancement Program and Harney Basin Domestic Well Fund to provide voluntary relief to declining groundwater conditions. The 2025 Oregon Legislature is also considering measures that could affect the Harney Basin.

The Place-Based Planning program is separate from regulatory and legislative activities and is an effort to look at the conditions and future of all water resources in the Harney Basin.The Integrated Plan synthesizes the efforts of the Groundwater Plan and Surface Water Plan into a cohesive framework for informing future action.

The planning process involved several key steps:

- Stakeholder Collaboration: A wide range of stakeholder groups actively participated in identifying challenges, providing input, and shaping strategies. These included:
    - o Local Landowners and Agricultural Producers: Representing irrigation needs.
    - o Tribal Representatives: Ensuring cultural and ecological values were integrated into the planning process.
    - o Environmental Organizations: Advocating for the protection of aquatic ecosystems and wildlife habitats.
    - o Municipal and Industrial Water Users: Addressing the needs of towns such as Burns, Hines, and Seneca, along with local businesses.
    - o State and Federal Agencies: Providing technical support, regulatory guidance, jurisdictional land management, and funding opportunities.
    - o Community Members: Offering local knowledge and emphasizing the importance of balancing water needs across all sectors.

- Data-Driven Decision Making: Comprehensive research on groundwater and surface water conditions, usage, and availability were conducted to inform the planning process.

- Strategy Development: Using the information gathered, the Collaborative worked to identify critical water resource issues and design strategies that promote sustainable and equitable management.

This inclusive and iterative process has been instrumental in addressing the complex and often competing demands for water in the Harney Basin. By ensuring that diverse perspectives were represented, the Plan reflects a shared commitment to achieving a balanced water future for all who live, work, and recreate in the Basin.

Harney Basin Overview

The Harney Basin, located in southeastern Oregon, is a closed surface basin where all the snowmelt and other precipitation drains to the center of the basin into Malheur Lake and Harney Lake, the lowest part of the basin (Figure 1). The basin is some 5,240 square miles in area, composed of four subbasins; Silver Creek, Silvies River, Donner and Blitzen River, and the immediate drainages toHarney and Malheur Lakes. The basin is bordered on the north by the Blue Mountains, on the east by the Stinkingwater Mountains and on the south by Steens Mountain. The Harney Basin is the northernmost extension of the Great Basin.

The climate of the Harney Basin is semi-arid with mild summers and cool winters. Precipitation, dominantly snow, in the upper elevations of the Blue Mountains and Steens Mountain Snowmelt ranges from 30 to 45 inches/year. Snowmelt runoff is the main contributor to stream flow in each of the streams that enter the broad lake basin. At around 4,150 feet in elevation, the Harney basin is subject to regular freezing events and has annual precipitation of less than 10 inches per year.

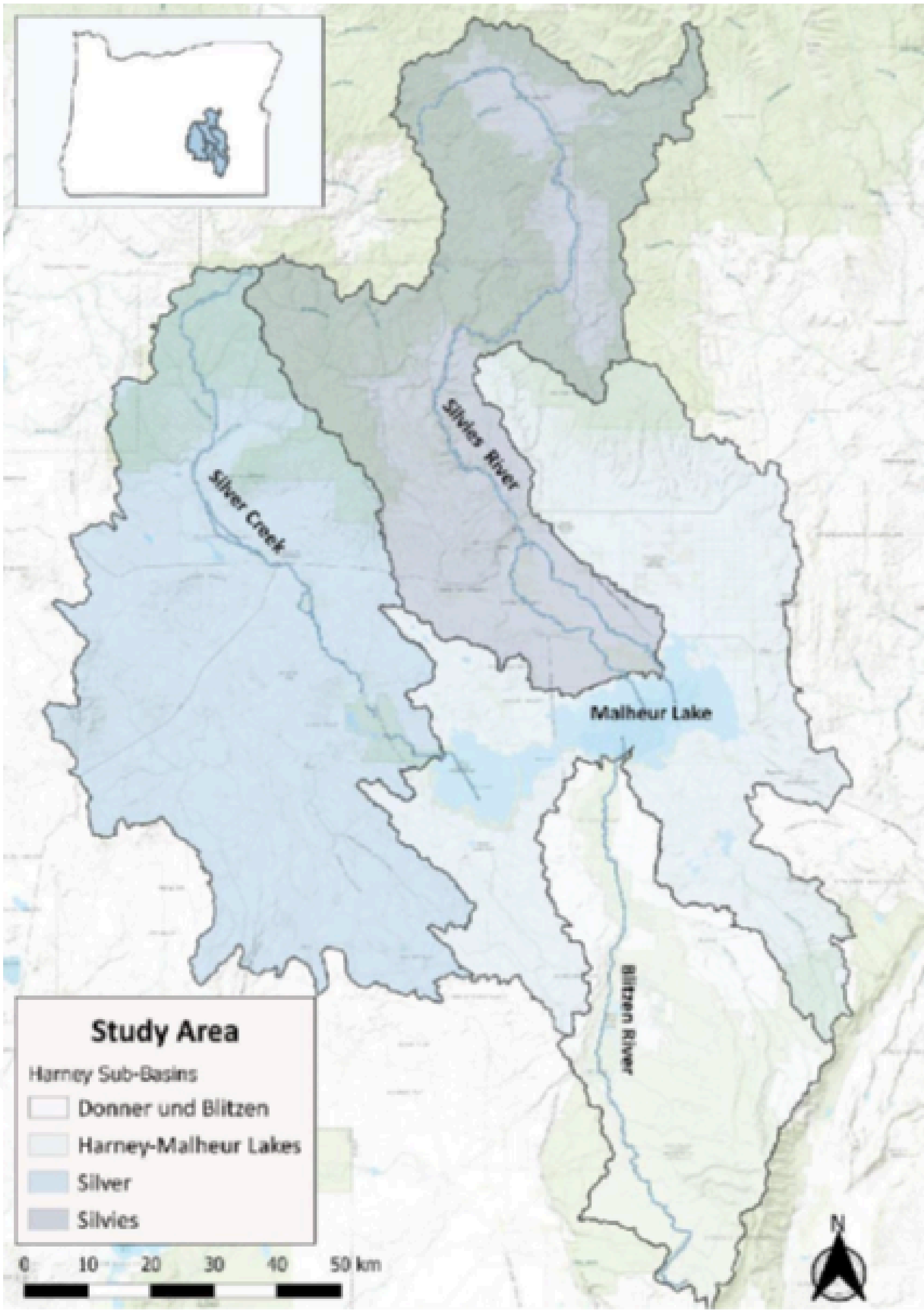

Figure 1: Harney Basin Study Area showing surface water subbasins

Surface Water Hydrology

Streams, rivers, and lakes are fed primarily by snowmelt runoff. While the basin has few stream gauges, the Silvies River gauge near Burns provides a good idea of the flows from the uplands to the Harney Valley. Similarly, the stream gauge on the Donner und Blitzen River at Page Springs provides a good measure of the upland runoff from Steens Mountain. The Basin experiences highly variable seasonal and year-to-year fluctuations in streamflow.

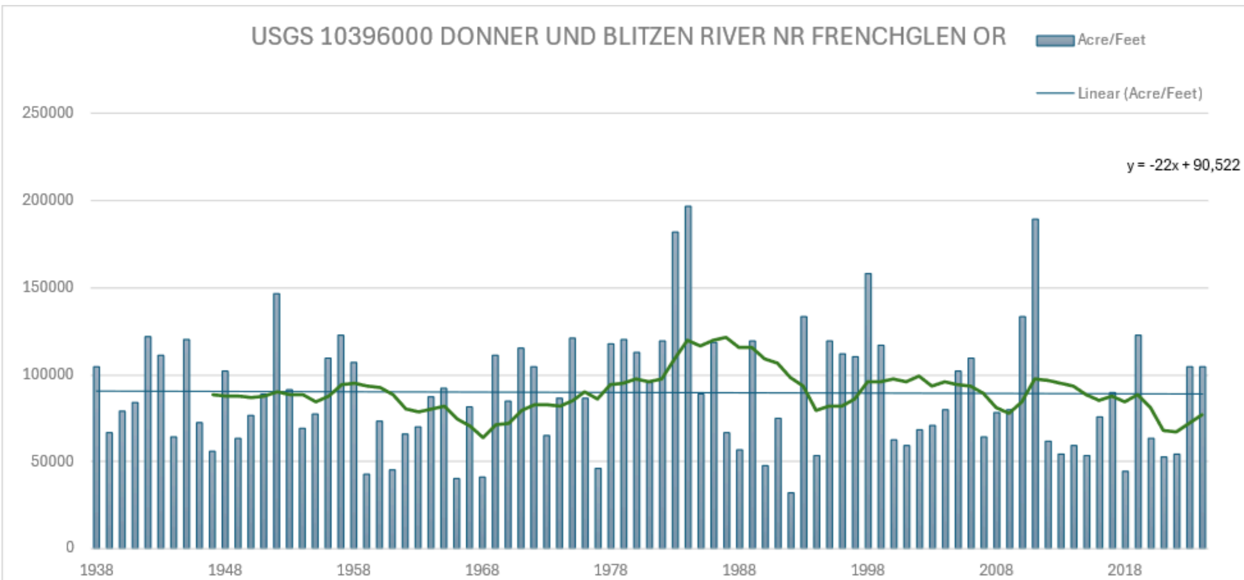

Figure 2: Annual Discharge variability, Average Annual Discharge and 10-year running average Donner und Blitzen, Silvies River and Silver Creek)

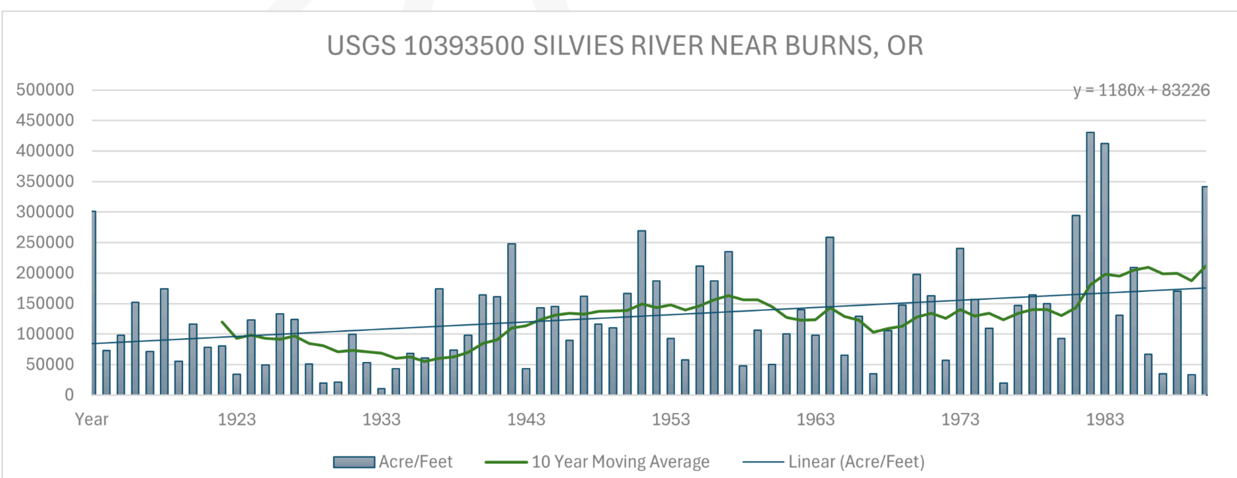

Figure 3: Annual Discharge variability, Average Annual Discharge and 10-year running average Donner und Blitzen, Silvies River and Silver Creek)

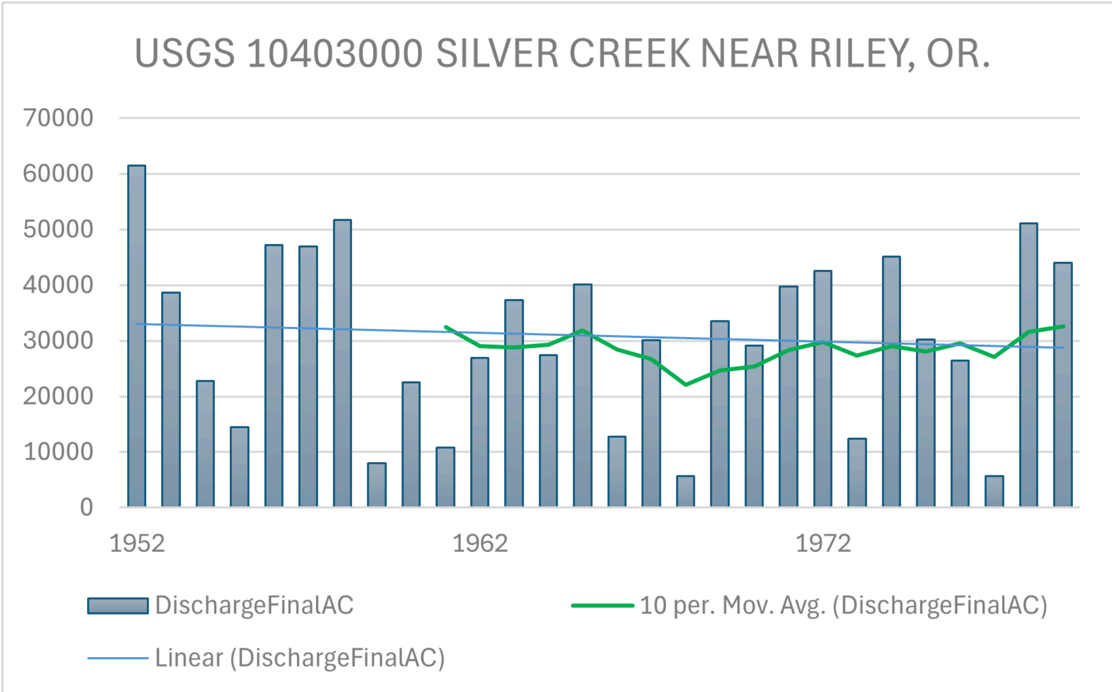

Figure 4: Annual Discharge variability, Average Annual Discharge and 10-year running average Donner und Blitzen, Silvies River and Silver Creek)

Runoff timing varies among the three major contributing catchments. Flows from Silver Creek typically peak earliest, with Silvies River peaking shortly thereafter and Donner und Blitzen having peak flows nearly a month later. While Silver Creek has the largest catchment, it has the least flow into the Harney Basin lowlands. Silvies River has significantly greater flows both in total volume and peak flows. Flows off Steens Mountain have a more protracted flow duration during high flows.

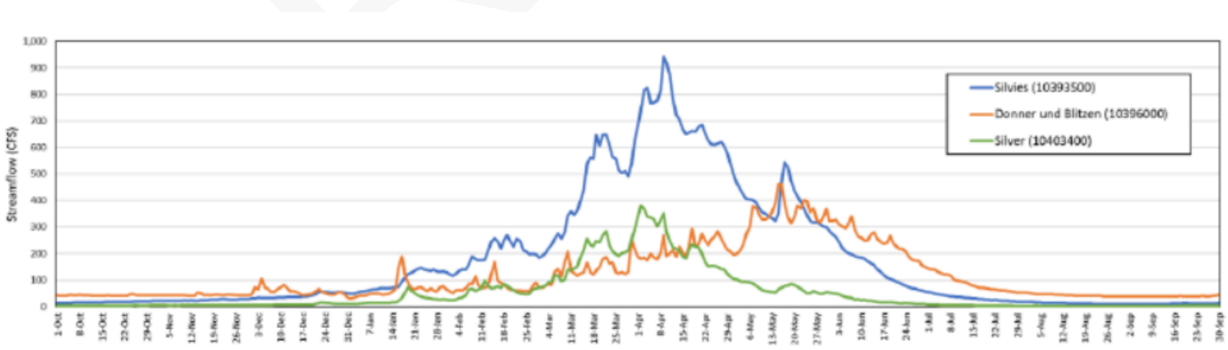

Figure 5: Comparison of mean daily streamflows at Donner und Blitzen River, Silvies Rivers, and Silver Creek for Water Years 2011-2019

The surface water hydrology of the Harney Basin is quite variable both year to year and month to month. This variability is known from only a limited number of measurement locations with many surface water streams not measured, however, these locations reflect the general hydrologic pattern in the Basin. Stream runoff is dominated by spring snowmelt. The terminus of the basin hydrology is Malheur and Harney Lakes. There is no major storage affecting flows in the basin but significant irrigation diversions occur in areas of low gradient suitable for flood irrigation.

During very wet years, Malheur Lake can overflow into Mud Lake, creating a surface water connection to Harney Lake. However, it typically takes several consecutive wet years for this connection to occur. In most years, both Malheur and Harney Lakes remain terminal, with no surface water outflows, even during periods of high water.The surface area of Malheur Lake varies with annual runoff from the Blitzen River. Neither the West Fork Silvies River nor the East Fork Silvies River are gaged near their connection with Malheur Lake making their contributions difficult to monitor.

Occasionally, the West Fork Silvies River connects with Malheur Lake while the East Fork Silvies River is not connected, such as in water year 2020 (Smith and Wood, 2023); however, this connection is often short-lived and results in a relatively small amount of flow. For example, the flow from the West Fork Silvies River in 2020 was 3 percent of the combined flow from both forks of the river in 2019 (Smith and Wood, 2023). The surface area and elevation of Malheur Lake varies significantly year to year. The annual variation in the surface area of the marsh can be quite significant (Figure 6). Historic records of peak elevation (Figure 7) show the year-to-year variability.

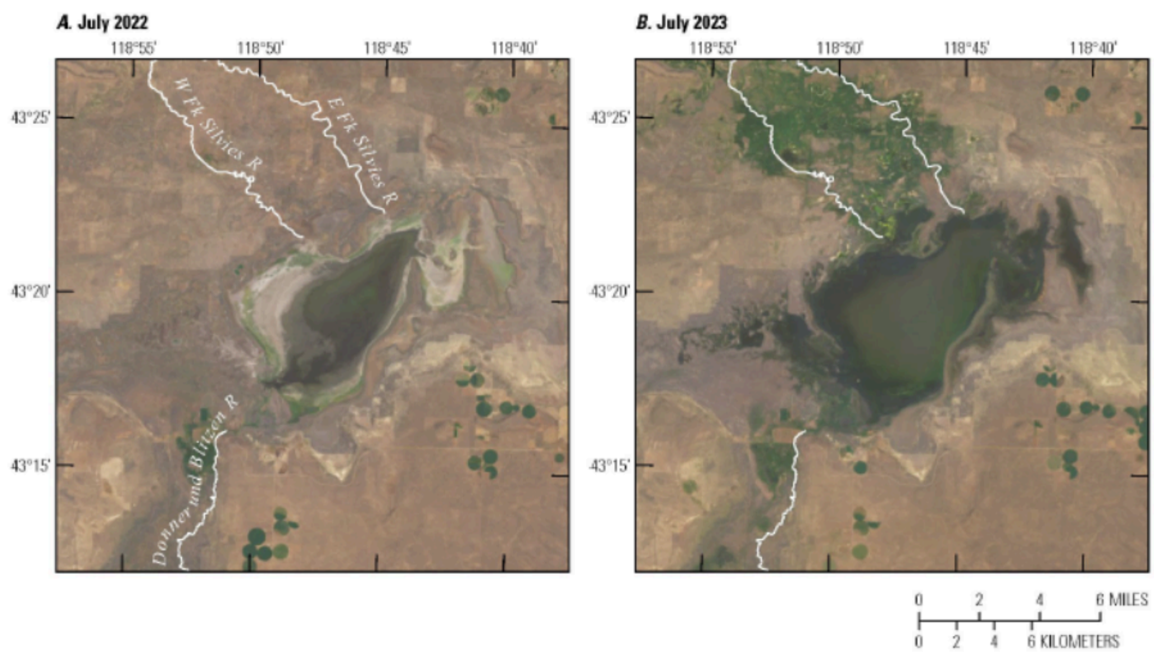

Figure 6: Malheur Lake under varying stream flow conditions A 2022, B 2023 (from Smith, 2024)

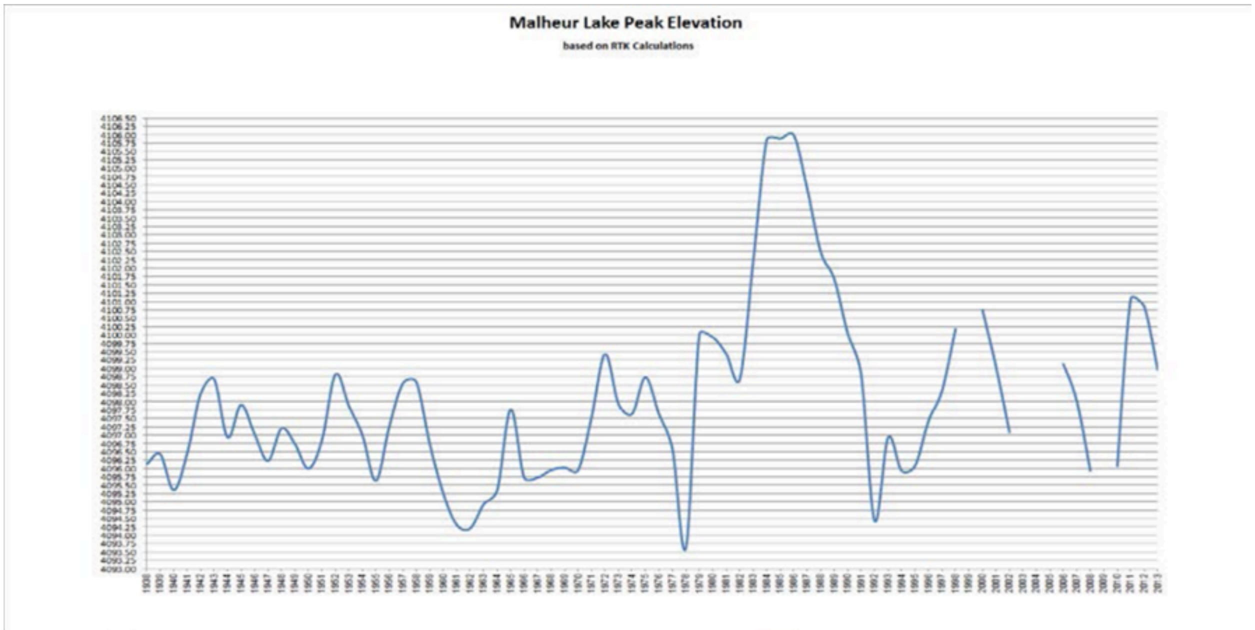

Figure 7: Malheur Lake Peak water level

Groundwater of the Harney Basin

A detailed groundwater resource study (Gingerich et al., 2022) and groundwater budget (Garcia et al., 2022) have been prepared for the Harney Basin. The study identified three regions (North, South and West) and distinguished uplands from lowlands (Figure 8).

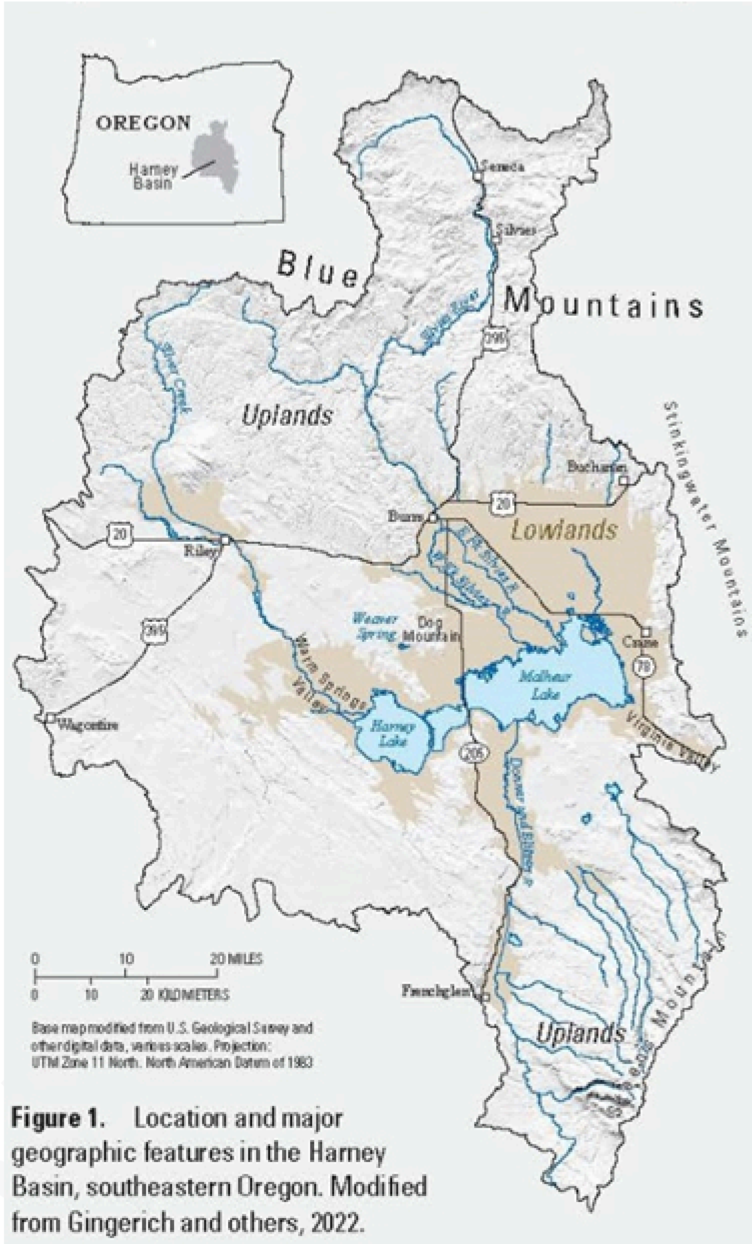

Figure 1. Location and major geographic features in the Harney Basin, southeastern Oregon. Modified from Gingerich and others, 2022.

Figure 8: Groundwater study areas showing uplands v. lowlands and the three groundwater evaluation areas

While the entire basin is considered a single groundwater unit, different locations in the basin respond differently to groundwater flow and pumping due to relatively complex geology.Different rock layers have significantly different transmissivity values affecting groundwater flow. In general, the uplands have very low transmissivity geology and short flow paths for groundwater between recharge and springs or streams.

The studies show that groundwater in the Harney basin is recharged at a relatively low rate from the uplands. Groundwater recharge from the uplands rapidly returns to the streams draining the uplands. The shallow levels of the groundwater are recharged from spring flooding and irrigation as well as recharge from the uplands. Discharge is to springs, streams and evaporation under natural conditions. Groundwater pumping constitutes a significant amount of groundwater discharge at this time (Figure 9).

There is a significant amount of stored groundwater dating from the Pleistocene Lake era (2.58 million to 11,700 years ago) . Deeper wells show that they are pumping this older stored water.

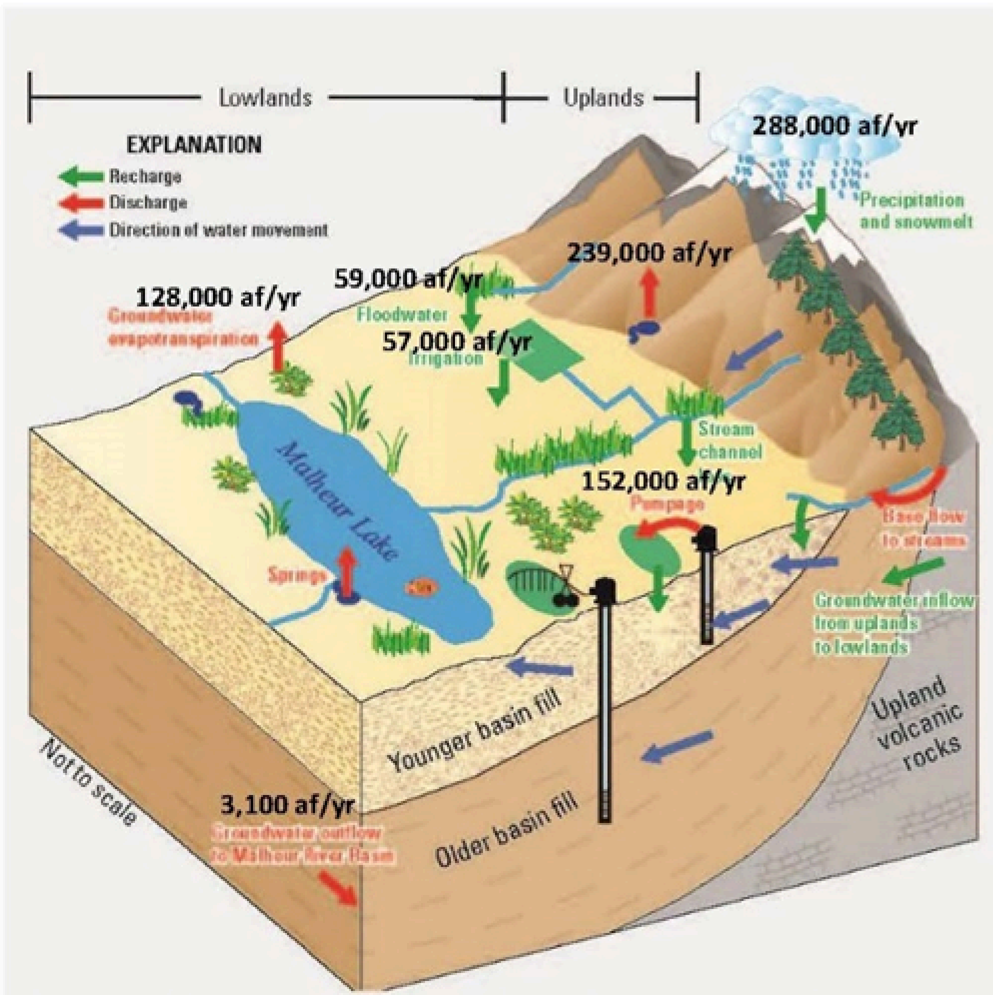

Figure 2. Groundwater recharge and discharge and direction of water movement, Harney Basin, southeastern Oregon. Modified from Garcia and others, 2022.

Figure 9: Block diagram of groundwater recharge and discharge

Recent groundwater budget estimates show an imbalance of discharge over recharge by some 110,000 acre- feet per year (Garcia et al, 2023). Groundwater is pumped for agricultural irrigation, domestic, municipal, and stock watering purposes. However the dominant use of groundwater is for irrigation. Current use patterns have resulted in locally severe groundwater declines and larger areas of less severe but more large-scale declines. The groundwater budget (Figure 10) indicates the need to reduce withdrawal, primarily a reduction in agricultural pumping. OWRD is currently conducting a rulemaking process (Division 512) to designate a Critical Groundwater Area and a Serious Water Management Problem Area in the Harney Basin. A Rules Advisory Committee began meeting in April, 2023 and is expected to meet through April 2025. Designating an area as a Critical Groundwater Area allows OWRD to implement corrective control provisions through a contested case process to reduce existing groundwater use in the area to a sustainable level. This rulemaking and the expected related contested case process(es) are outside the Harney County community-based planning program.

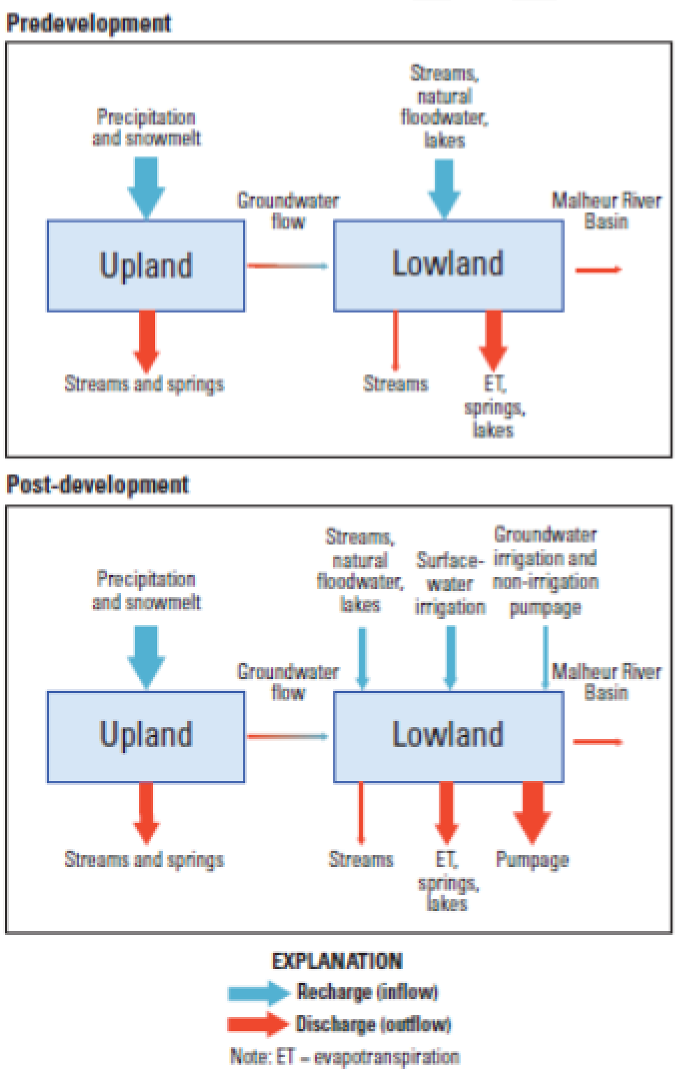

Figure 10: Harney Basin Groundwater Budget

Ecological Resources of the Harney Basin

The upper watershed of the Silvies and Silver Creek is dominantly Malheur National Forest lands (Figure 11). This forest land is used for timber harvest and summer range for cattle ranchers who have allotments.

A significant portion of the western and southern portion of the basin is sagebrush steppe. Meadow vegetation dominates the lowland portions of the Bear Valley, Silvies Valley, Harney Valley, Blitzen Valley, and Silver Creek Valley

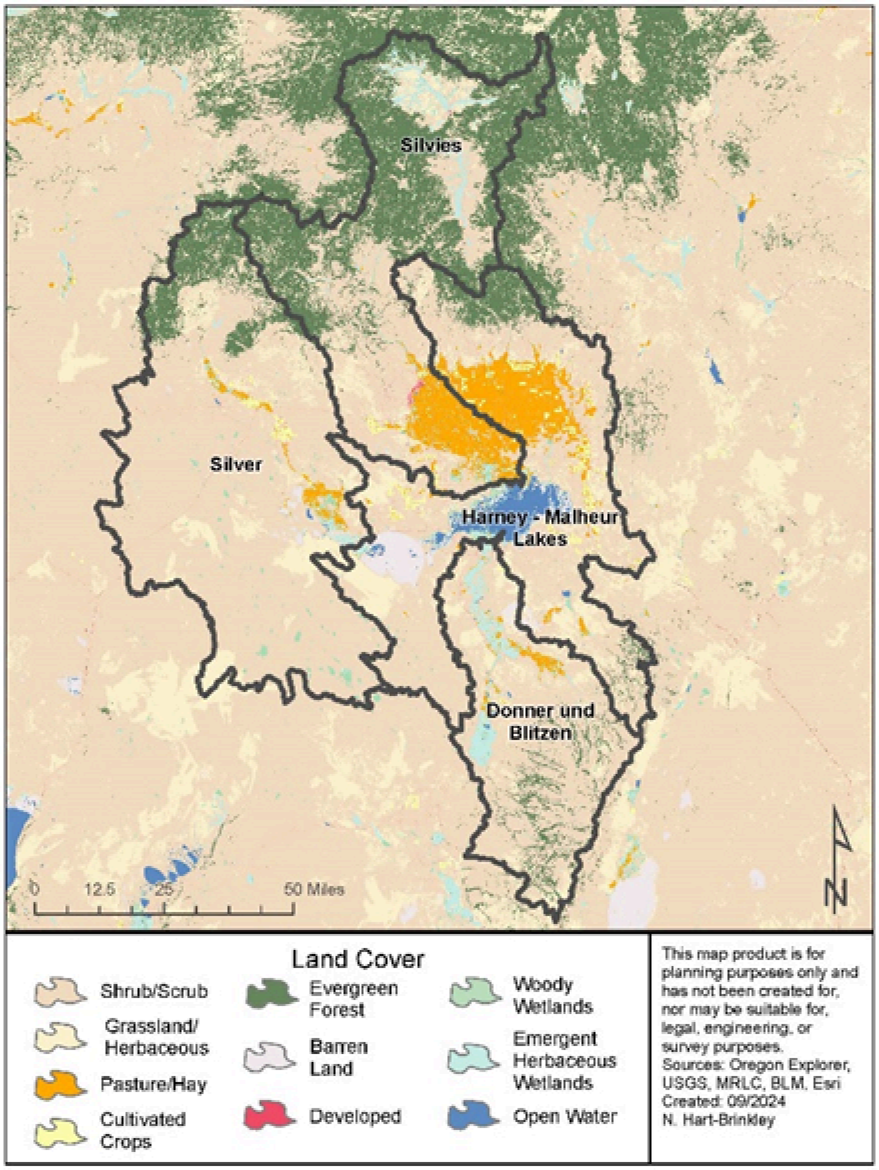

Figure 11: Land Cover of Harney Basin

The upper watersheds of the Silvies and Silver Creek are forested and the cold-water streams support redband trout and other native aquatic species. Conservation of redband trout is a priority for the Oregon Department of Fish and Wildlife. The lower reach of each river may contain habitat for western ridged mussel (which has been petitioned for listing under the federal Endangered Species Act).

Flooded meadows of the Silvies River, Donner und Blitzen River, and Silver Creek floodplains are used by hundreds of thousands of migratory and numerous resident birds. While best known for supporting tens of thousands of migratory waterbirds, flood irrigated wetlands are also important to migratory Bobolinks, Greater Sandhill Cranes, and Cinnamon teal which serve as indicator species for wet meadow habitat. Other species that use this habitat type include nesting Long-billed curlew, Wilson's snipe, and other shorebirds; and foraging waterfowl, White-faced ibis, mule deer, pronghorn, and the occasional Rocky Mountain elk. Small mammals that live in these meadows are an important food source for raptors (USFWS 2013).

Groundwater-dependent ecosystems in the Harney Basin include springs, spring-fed lakes, wetlands, and phreatophyte vegetation. Sod House Springs, located near the Malheur National Wildlife Refuge headquarters, has historically provided critical water to support the refuge's wetlands and the diverse wildlife they sustain. However, the spring has gone dry recently, likely due to declining groundwater levels in the region. The loss of Sod House Springs has significantly impacted nearby wetland habitats that support migratory and resident bird species, including waterfowl and shorebirds that depend on these wetlands for feeding and nesting. The drying of the spring also affects the hydrological balance of the Refuge, which relies on consistent spring flows to maintain its ecological functions. Limited monitoring of groundwater-dependent ecosystems, including Sod House Springs, underscores the need to better understand how groundwater level declines—and any potential recovery—affect these vital resources. Addressing these impacts is a key focus of the Critical Groundwater Area Designation and the related measures and controls being developed. Ongoing monitoring and further study will be essential to inform water resource management decisions and to help preserve these ecosystems into the future.

Economic Values of Surface Water and Groundwater in the Harney Basin

As of 2022 there was a total of $99.4 million in sales for crops and livestock in Harney County (Census of Agriculture, 2022). On average, a farm in Harney County has a market value of agricultural products sold of $208,252 and a net cash farm income of $48,832 (a 30% increase since 2017).There are some 965 producers in the basin, mostly family farms. There are a number of larger farm ownerships with nearly one third of the farms over 1,000 acres. Annual gross revenue received per farm varies significantly with approximately one-third receiving less than $2,500 per year and one-third receiving more than $100,000 per year.

Estimated Value of Surface Water (taken from Blair et al., 2021)

Harney County is a rural county in southeast Oregon and, like many rural counties, one of the main economic sectors is agriculture. Agricultural production in the county is primarily cattle, including cow/calf operations, and hay crops. Surface water diversions from rivers and creeks in the Harney Basin are used to inundate flood plains for irrigated pasture production. Forage produced from irrigated pasture is used to supplement winter feed for cow-calf operations. Without the production on flood-irrigated pasture, cow-calf operations would have to rely on off-ranch sources of forage on the open market. There are approximately 106,530 acres of flood-irrigated pasture in the basin in an average water year, or at the 50-percent exceedance level.

Given this relationship, grazing of flood-irrigated pasture in the Harney Basin supports 718 jobs, $11.6 million in labor income, $40.1 million in economic output, and $22.1 million in value added in the State of Oregon, including both inside and outside the basin (Blair et al., 2021).

In addition to flood-irrigated pasture, bird viewing and fishing are two important outdoor recreation activities that rely on surface water flows in the Harney Basin. For example, each spring, the region hosts the Harney County Migratory Bird Festival to celebrate migratory birds that rely on the Malheur National Wildlife Refuge (MNWR) and surrounding private flood-irrigated pasture for stopover and nesting habitat. Recreational fishing for native redband trout (*Oncorhynchus mykiss spp*.) is popular throughout the region as well.

The Harney Basin supports an estimated 54,889 bird viewing days and 8,000 fishing days annually. Bird viewing contributes approximately $2.9 million in economic benefits each year, while recreational fishing generates an additional $526,800. These figures represent the total economic value that bird viewers and anglers derive from their experiences in the basin, beyond the costs of their trips. It is important to note that groundwater plays a critical role in sustaining groundwater-dependent ecosystems—such as springs, rivers, streams, and lakes—that contribute to these recreational opportunities and their associated economic benefits.

Employment and business activities are supported by local and non-local recreation visitor expenditures related to bird viewing and fishing in the Harney Basin. Combined spending from local and non-local bird viewers and anglers in the basin supports 85 jobs, $2.8 million in labor income, $7.2 million in economic output, and $4.1 million in value added in the State of Oregon, including both inside and outside the basin with most in Harney County.

Flood-irrigated pasture in the basin may provide ecosystem services that are indirectly used and benefit society, such as carbon sequestration, nutrient cycling, and pollination. Individuals that view or hunt migratory birds outside of the basin along the migratory route are also indirectly benefiting from the habitat provided within the basin. Passive-use values include existence values (the value in maintaining a resource regardless of actual or intended direct use) and bequest values (the value in maintaining a resource for the enjoyment of future generations). For example, people may place an economic value on maintaining migratory birds along the flyway regardless of whether they visit the basin. Research has shown that the economic benefit for the preservation of wildlife can be large when aggregating across households in a region or the United States. Other research has demonstrated that there is also individual and collective amenity and lifestyle value associated with working landscapes. Although we do not attempt to quantify the value of indirect or passive use, the evidence suggests that the total economic benefit for the production of ecosystem services provided by the management of surface water in the basin may be large.

Estimated Value of Groundwater

Groundwater irrigated agriculture in Harney County is used to grow primarily alfalfa (USDA Census of Agriculture, 2022). A portion of alfalfa is used regionally for dairy fodder in western Oregon and other locations in the Western U.S. Some of the high-quality alfalfa is exported internationally to be used as feed for dairy cows primarily in Asia, with most of the rest of the high quality Alfalfa used as a supplemental winter feed for livestock in the basin. In contrast, meadow hay is generally used as cattle feed locally and not exported out of the county. Meadow hay is less water intensive annually than alfalfa mainly because it is limited to one cutting opposed to three to four cuttings for alfalfa (depending on weather conditions). Every six to ten years alfalfa land needs to be rotated, and annual barley, triticale, or oats are often grown in those rotation years as forage crops.

The estimated gross revenue from lands irrigated with groundwater is approximately $51.6 million. The estimated net cash farm income on these lands is $12.6 million. The estimated property tax payment from these lands is $1.7 million. The total property tax revenue in Harney County collected for 2019-2020 was $2.6 million – meaning that property tax revenues from these properties is approximately 65 percent of total annual property tax collections. The total employment on these lands is 720 jobs based on the proportion of groundwater irrigated agriculture (108,760 acres) compared to total agricultural area (173,533). This level of employment is approximately 16 percent of total employment (4,353 jobs) in Harney County.

Groundwater dependent ecosystems (GDEs) play a critical role in maintaining the health and stability of the Harney Basin's natural environment. By sustaining springs, rivers, streams, and lakes, GDEs contribute to the basin's biodiversity, support aquatic habitats, and ensure the availability of water for both ecological and human use. These ecosystems provide essential services, such as water filtration, nutrient cycling, and habitat connectivity, which are vital for maintaining the region's environmental resilience. Groundwater dependent ecosystems also support fish and wildlife, including birds and other wildlife that utilize the Malheur National Wildlife Refuge, and game, providing an economic benefit that can be hard to quantify. The preservation and understanding of GDEs are integral to protecting the overall ecological health and economic vitality of the Harney Basin.

History of Water Use in the Harney Basin

The Wadatika people have used the resources of the basin for millenia to sustain their lives and culture. The seasonal round of the Wadatika includes redband trout in the Blitzen River and Malheur Lake in December and January, waterfowl February through April, Indian Potato (*Sagittaria Latifolia*) in May, camas (*Camassia quamash*) in June in the Cow Creek area, and wada (*Suaeda depressa*) harvest in August from Malheur Lake. Seeds traditionally harvested, including wada (*Suaeda depressa*), Indian rice grass (*Oryzopsis hymenoides*), and Great Basin wild rye (*Elymus cinereus*), are still available in the area. The fall takes the people to the mountains for huckleberry and choke cherry harvest. The Burns Paiute Tribe adopted a resolution in 2016 as Formal Recognition of Malheur Lake and its shoreline as Sacred Places and Traditional Cultural Properties of the Burns Paiute Tribe (RESOLUTION NO: 2016-01). Previously, in 2006, the Burns Paiute Tribal Council adopted an Aboriginal Territorial Protection Policy (RESOLUTION NO. 2006-12). The water resources and associated ecological resources of the Harney Basin have been and remain of cultural value for the Burns Paiute people.

The Collaborative and the Burns Paiute Tribe worked together to create Resolution 2023-25 (Appendix X). It was adopted by the Burns Paiute Tribe to renew and affirm their commitment to protecting, conserving, and restoring water resources (referred to as "Paa") in their traditional homelands. The resolution highlights the deep historical and ongoing cultural connection the Burns Paiute people have with local rivers, lakes, streams, wetlands, and groundwater, emphasizing the Tribe's inherent right to protect these resources.

It notes that the Tribe's water rights, guaranteed by historical treaties and recognized as federally reserved rights, remain unresolved, leading to ongoing challenges in managing water sustainably. The resolution addresses concerns over the continued misuse and mismanagement of water resources, including overuse, water quality degradation, habitat destruction, and inadequate regulatory frameworks.

To address these issues, the Tribe calls for cooperative, government-to-government discussions with the State of Oregon and federal agencies. The goal is to develop inclusive and meaningful co-management agreements for jointly managing water resources and fisheries, thereby ensuring water sustainability, ecosystem health, and cultural well-being for future generations. The resolution strongly supports establishing balanced water-use practices and policies that promote ecological resilience, public health, and community needs alongside traditional and cultural priorities. This resolution reaffirms the Tribe's inherent rights and underscores the importance of collaboration to safeguard water resources for current and future generations.

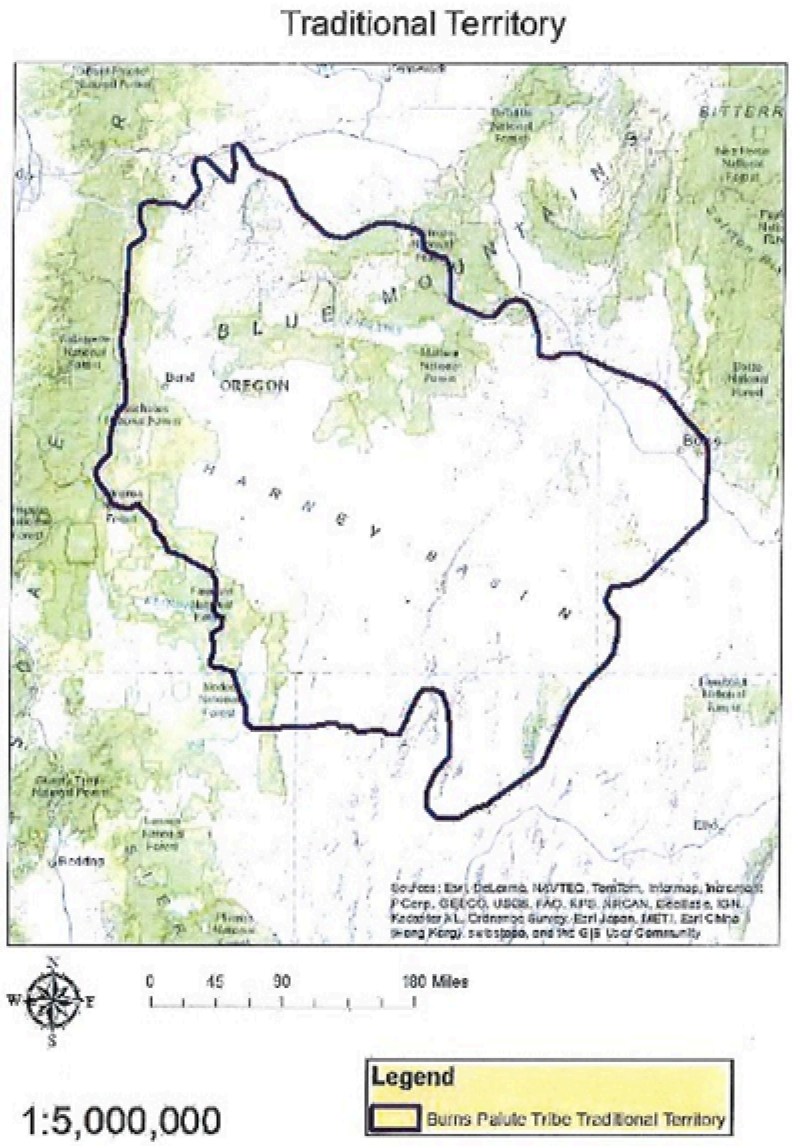

Figure 12: Burns Paiute Tribe Traditional Territory

Fur trappers and explorers traveled through the Harney Basin in the early 1800’s naming streams and taking beaver from the area. A number of military outposts were established in the basin to protect travelers to gold fields and other areas further west. The Harney Valley was seen as an excellent cattle producing area and early Swamp Land Act land acquisitions in the Diamond and Blitzen Valley area were as stated by Lo Piccolo (1962) “Water and its distribution became a determining factor in the range cattle industry. The rancher who controlled the source of the water supply ruled the range and in an area of short creeks and springs complete control became plausible.” Early ranchers built dams and ditches draining “swamp lands” and flooding sagebrush land creating forage meadows. In the Blitzen, Pete French “laid out a plan for the drainage of the swamp by a main canal and the irrigation of all lands between the foothills and the canal, putting the water on the land along the highest lines using the canal itself as a final drain ditch for the irrigation system.” (Langston, 2003). The method was utilized in the Silvies drainage of the Harney Valley by Miller and Lux (Langston, 2003).

Shortly after the turn of the century the Harney Valley was evaluated for irrigation and drainage (Whistler and Lewis, 1916). The report identified that 20,000 to 25,000 acres of tule swamp had been drained with 25 miles of main canal and 10 miles of tributary canals in the Blitzen Valley. The report identified three reservoir sites on the Silvies River, the Krumbo reservoir site and a P Ranch site on the Blitzen River, and a Silver Creek Reservoir site. One feature of the report was a proposal to drain Malheur Lake to the South Fork of the Malheur River. Only the Krumbo Reservoir has been constructed. The proposal to construct a reservoir on Silvies River was raised in 1950’s with a report from the U.S. Army Corps of Engineers in 1957 that concluded “It is recommended that the Silvies River Project not be constructed because of the irreparable damage it would cause to waterfowl resources on Malheur National Wildlife Refuge and in Harney Valley.”

As a result, surface water use has been relatively consistent for multiple decades, relying on spring freshets for flood irrigation of wet meadow vegetation.

Groundwater use in the Harney Basin developed much later than surface water development. The first estimate of groundwater pumpage was in the 1930’s of approximately 1,000 acre-feet/year (Piper et al., 1939) from wells less than 100 feet deep. Leonard (1970) estimated that groundwater pumpage for irrigation was between 7,900 and 10,700 acre-feet/year and was from wells less than 300 feet in depth. Schibel and Grondin (2023) developed estimates for groundwater pumpage from 1930 to 2018 using Beamer and Hoskinson, 2021 estimates for 1991-2018. There has been significant development of groundwater for irrigation purposes since the 1930’s. Significant groundwater development occurred in the late 1970’s and early 1980’s with a surge in the 2000’s (Figure X) leading to a closure of the basin to new groundwater permitting in 2015 (with limited exceptions).

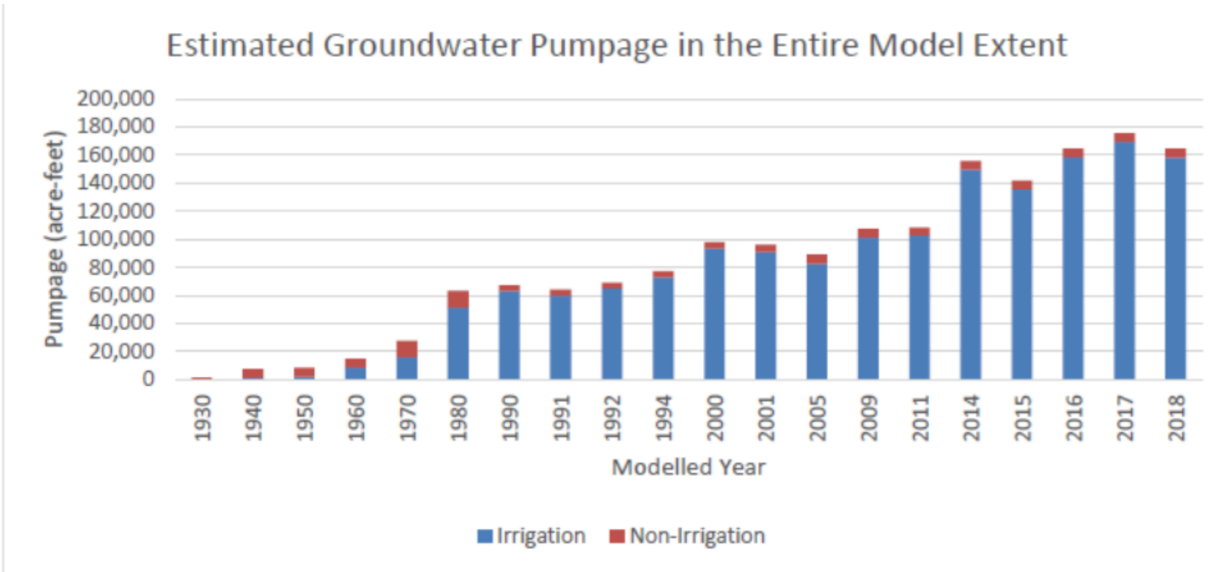

Figure 13: Total groundwater pumpage for irrigation and non-irrigation uses for the Harney Basin (from Schibel and Grondin, 2023)

The most recent estimate of groundwater pumping from the Harney Basin (Beamer and Hoskinson, 2021) provides pumping estimates for the period of 1991 through 2018. The 2018 estimate is used in developing the groundwater budget for the basin (Garcia et al., 2022).

Water Resource Management in the Harney Basin

Since the early cattle ranching days of the 1870s, surface water in the Harney Basin has been managed through diversions to flood meadows in the spring, supporting both traditional agricultural practices and the region's natural ecosystem. While many of these meadows and marshes existed naturally and provided critical habitat for migratory and resident birds, flood irrigation has continued to enhance these functions by stimulating meadow growth and supporting pasture and hay production for nearly 150 years. Additionally, surface water diversions have contributed to maintaining water levels in Malheur Lake, which supports aquatic vegetation, though the lake historically received natural inflows as part of the basin's hydrology.

Most of the surface water has been adjudicated and over allocated. As a result, irrigation users may be regulated to allow the seasonal spring flows to reach senior users, relying on what has been described as an antiquated and decaying irrigation infrastructure system. Regulation of water distribution by the OWRD Water Master and change in infrastructure has been limited since the early 1900's. Recent efforts to upgrade irrigation infrastructure has been started by replacing certain failing diversion structures with structures with fish passage and screening. It is important to note, some ranches have recently completed engineered, full-scale upgrades to their landscape wide irrigation system.

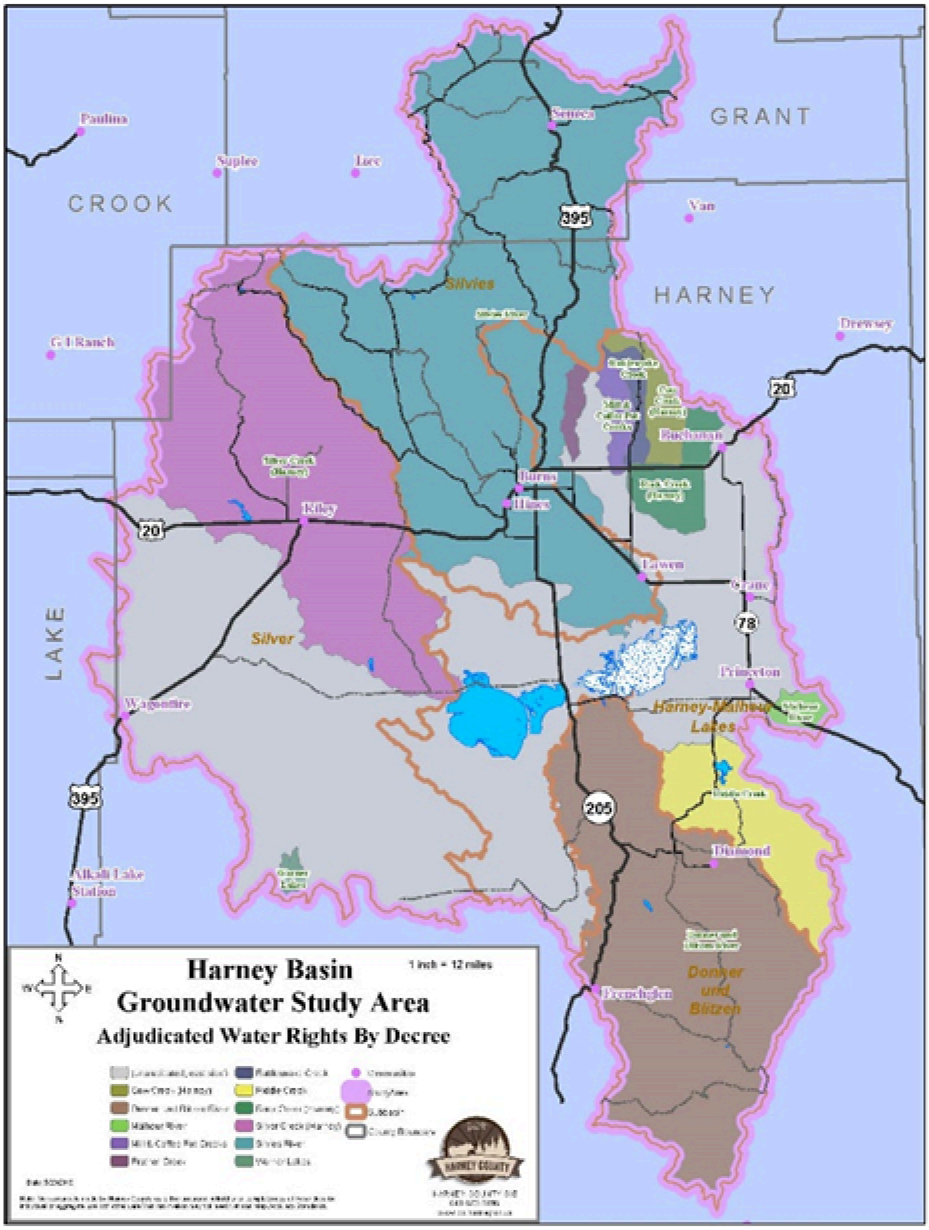

Figure 14: Areas and streams with Surface Water Adjudication by Court Decree

Groundwater management in the basin primarily relied on permitting until 2016, when a moratorium was placed on new groundwater right applications by OWRD. That year, concerns about groundwater over-allocation prompted community discussions, the initiation of a groundwater study, and a rulemaking process. As a result, the basin was effectively closed to new groundwater permits (with limited exceptions) through a basin classification, accompanied by a requirement to evaluate and update the rules within one year of publishing the groundwater study. However, significant groundwater transfers continued to occur during this time, highlighting the need for comprehensive management beyond just restricting new permits. Following the basin classification and limiting new permits transfers of groundwater permits were allowed. During the study period (2015–2023), significant data and insights were gathered about the groundwater resource. In 2024, the Oregon Water Resources Commission adopted new administrative rules to ensure that groundwater availability is confirmed before granting permits. Currently, the Oregon Water Resources Department is conducting a rulemaking process to address basin classification and to establish a Serious Water Management Problem Area and a Critical Groundwater Area in the Harney Basin.

Water Resource Issues and Future Water Needs

The surface water supply in the Harney Basin is limited and exhibits significant annual variability.While the groundwater reserves are significant, They are being withdrawn at a rate beyond their ability to recharge. The economy of Harney Basin is deeply intertwined with the availability of surface and groundwater. Identifying the collaborative efforts necessary to maximize benefits, minimize impacts and protect and restore the aquatic ecosystems and groundwater dependent ecosystems are challenges of the planning effort.

Consumptive water use in the Harney Basin, both surface and groundwater, is primarily driven by agricultural irrigation, which is the backbone of the local economy. Ensuring water availability to support a thriving agricultural community remains a high priority. However, water also plays a vital role in meeting the needs of residents, including those in rural areas who rely on domestic wells, as well as small towns like Burns, Hines, and Seneca, and local industries—all of which require significantly less water than agriculture. Equally important is the role of water in sustaining the Harney Basin's diverse aquatic systems, which provide critical habitats for fish and wildlife. The upland streams and lowland wetlands, particularly the marshes and wetlands of the Harney Valley, are of continental importance, offering essential stopover and breeding grounds for migratory and resident waterbirds, while supporting the broader ecological health of the region and the Pacific Flyway.

Agricultural Use & Needs

The challenge for agriculture is not how to develop more water resources, but rather how to effectively use the surface water that is available in any given year. Both surface and groundwater are significantly over appropriated. The challenge for agricultural groundwater use is finding a way to maintain a stable agricultural base, despite the need for significant reductions in groundwater pumping and the already substantial declines in groundwater levels in some areas.

Surface Water Issues and Needs For Irrigation

In the Harney Basin, irrigation demand for water often exceeds the available supply, and water can also naturally occur at times when it cannot be fully utilized for irrigation. Early-season high flows, for instance, may coincide with frozen lowland fields, preventing both senior and junior water users from utilizing the water. Additionally, the relatively short runoff season can lead to situations where flows exceed the needs of senior water right holders but only for brief periods, during which the excess water may not always be effectively distributed to junior users.

Surface irrigation has been conducted, almost exclusively, by flood irrigation for nearly a century and a half. For the last century it has been recognized that the surface water is over appropriated. Irrigators recognize that they are subject to the availability of springtime flows to spread water to wet meadow fields for hay production.

Since water management with highly variable runoff conditions means different regulatory actions may be necessary (which junior appropriator is cut off), effective communication of water availability and potential use/non-use decisions is very important to irrigators. Creating ways to ensure water is available only to legal users and users have as much information as possible about the difficult management decisions being made to regulate water use is a critical issue for effective management of surface water.

It is critically important that illegal use of surface water in all its forms be eliminated for both ecological and economic reasons.

As the climate changes, there is a high likelihood of altered springtime runoff by changing from a snowmelt dominated to a rainfall dominated pattern from the Silvies River and Silver Creek. While there likely will be less dramatic change to runoff from Steens Mountain, more subtle shifts could occur. Evidence of these patterns appears visible already in the streamflow gaging records (cite to Rivers and Streams figures).

The sparse distribution of flow measurement locations in the basin make it difficult to accurately determine the amount of flow in unmeasured tributaries and at locations along the three streams where there are not measurement devices. A need for improved streamflow monitoring and water use measurement exists throughout the basin.

There is a need to improve aging and poorly functioning agricultural diversions and headgates along the streams that enter the basin. The outdated infrastructure can negatively impact sensitive fish species and other aquatic species, as well as reduce delivery efficiency. Carefully designed projects to upgrade agricultural infrastructure, with consideration for a broad range of interests addressed, can enhance habitat for aquatic species, support waterbird population, and facilitate more efficient flood irrigation management.

Groundwater Issues and Needs For Irrigation

Groundwater is dominantly used for growing alfalfa in the Harney basin. Significant over appropriation has led to the need to reduce groundwater consumptive uses. The estimated overuse by some 110,000 acre-feet/year is more acute in localized cones of depression and generalized lowering of the static groundwater level. A portion of the basin was closed to new permits in 2015 by classification of the basin as the Greater Harney Valley Groundwater Area of Concern. The collaborative supported the development of a voluntary program (Harney Valley Groundwater Conservation Reserve Enhancement Program) to reduce groundwater use on up to 20,000 acres and the exploration of voluntary agreements as identified in state statute among other approaches to reduce groundwater pumping.

While stockwater use has been estimated (Grondin, 2021), there is no current inventory or accurate measurement of groundwater use for stockwater. Conducting such an inventory and assessment would help us better understand the impacts of declining groundwater levels on stockwater wells.This information could inform future water management decisions and help assess the resilience of stockwater supplies amid changing groundwater conditions.

As noted above, Oregon Water Resources Department initiated a rulemaking process in 2023 (set to conclude in 2025) to 1) update the classification, 2) designate and implement a Serious Water Management Problem Area, 3) designate a Critical Groundwater Area. Following the designation of a Critical Groundwater Area, OWRD has the authority to propose control measures in the designated Critical Groundwater Area through a contested case process.

Non-Agricultural Uses and Needs

Domestic and Municipal Water Use and Needs

Nearly all domestic water use is from groundwater. The interference of typically shallow domestic wells by a lowering groundwater table due to irrigation pumping has led to domestic well users experiencing problems accessing adequate water from their wells. The planning collaborative obtained funding for a survey of some 1,200 individuals that have domestic wells in the County. Based on the returned surveys (some 47%) nearly one third of the surveyed population had an issue with their domestic well. The survey also indicated that most of the domestic well users addressed the situation by themselves by either recasing the well, deepening the well, or some other remedial measures.

Due to serious concerns regarding impacts to domestic well users, the planning collaborative sought assistance from the Oregon Legislature, which responded by establishing a funding program to assist Harney Basin domestic well users in remediating or replacing wells affected by declining groundwater levels. The Harney Basin Domestic Well Fund (HDWF) was approved by the 2021 Legislature and allocated $500,000. In 2024, the Oregon Water Resources Department (OWRD) solicited applications for the first time, receiving seven applications that were all approved for funding, totaling $71,649.63. Of these, four grants have been completed and closed, with reimbursements totaling $34,634.63. The funded projects included repairs to three wells, replacements for four wells, and the abandonment of three wells. Additionally, Harney Basin well owners have benefited from a statewide program addressing similar issues, which funded seven additional well replacements in the region. In total, 14 domestic wells have been replaced in the Harney Basin—seven through the statewide program and seven via the HDWF—at an average cost of around $20,000 per well. The towns of Seneca, Hines, and Burns provide water to municipal customers from city wells. Each community has indicated that they have sufficient supplies for the future and have not been affected by groundwater declines. Projected growth in population is not expected to be significant and each community indicated they have supplies for the foreseeable future. Population projections from Portland State University indicates Harney County will experience a “decline at a slow rate in both the near-term (2018 to 2043) and long-term (2043-2068)” (PSU Center for Population Research, 2018). The only concern expressed has been whether additional groundwater could be available for a future industrial user. All non-agricultural uses amount to a small fraction of the groundwater use (less than 5%).

Instream Uses and Needs

Watershed Health and Ecosystem Function

The Harney Basin's water resources are deeply interconnected with the uplands of the Blue Mountains, Stinkingwater Mountain, and Steens Mountain, which serve as the primary sources of water supply through snowpack accumulation. Snowmelt runoff feeds streams, springs, and groundwater systems, supporting both instream and out-of-stream uses in the Harney Valley. These uplands have experienced significant disturbances, including wildfires and changes in forest structure due to timber harvests. Enhancing the resiliency of forest stands through sustainable management practices is essential to protect this critical source of water supply.

The interaction between surface water and groundwater plays a pivotal role in maintaining watershed health. Groundwater recharge from snowmelt and surface water infiltration sustains springs, wetlands, and lowland streams, which are vital for ecological balance and water availability during dry periods. Effective management of these interconnected systems is necessary to support the Basin’s diverse water needs.

Instream Needs

Human activities have changed the flow of water in the Harney Basin. While we can't fully restore past conditions, understanding historical flow patterns helps us make informed water management decisions that benefit both people and nature.

Understanding Instream Flow Needs

Healthy rivers and streams need enough water to support fish, wildlife, and ecosystems. The Oregon Department of Fish and Wildlife (ODFW) has developed guidelines to help communities assess these needs (ODFW, 2018b; ODFW, 2022).

How Much Water is Needed?

A general rule derived from case studies, called the "Presumptive Standard," is that rivers and streams need 80-90% of their natural flow to remain healthy. (Richter et al. 2011). In the Harney Basin, many streams fall below this level from May to September.

Because there are only three long-term streamflow gauges in the Harney Basin, experts analyzed different datasets to determine water availability. The Surface Water Availability

Reporting Systems (SWARS) dataset was first chosen to evaluate streamflows relative to the Presumptive Standard and instream water rights because it closely tracked the gauge data and because it is used by the Oregon Water Resources Department (OWRD) in water management.Similar analysis was also conducted using the median of all available datasets (NHD, VIC StreamStats, WAB).

Instream Water Rights

In Oregon, public uses of water such as conservation of aquatic and fish life, wildlife and wildlife habitat, and recreation are beneficial uses of water. Instream water rights are water rights issued for the purpose of protecting a public use. The Harney Basin has ten certified instream water rights, with three more applications that were protested and remain pending. As in many other parts of the state, instream water rights in the Harney Basin are very junior to other water rights.The collaborative review found that, after accounting for diversions made under other water rights, streamflows are often too low to meet the basin's instream water rights, particularly in late summer and early fall.

Restoring Streamflow

In 2001, state agencies identified priority areas for restoring streamflows and the Surface Water Plan further developed analysis in this area., No recorded instream water leases or transfers have occurred since 2001 to address these priority streamflow restoration reaches. Experts recognize that rivers need a natural mix of high and low flows to stay healthy. Oregon's Conservation Strategy recommends keeping flows as close to natural patterns as possible (ODFW, 2016).

Summary

Finding ways to balance water use and address streamflows and ecosystem health is an ongoing challenge, especially during dry months. Using SWARS data and the Presumptive Standard helps guide decisions, but more data and community collaboration are needed to prioritize and find long-term solutions.

Aquatic Life Uses and Needs

The Harney Basin is home to a range of aquatic species that depend on the connectivity and health of its waterways. Streamflow connectivity between the three major watersheds and Malheur Lake is critical for species such as the adfluvial life forms of fish that migrate between these areas to grow, mature, and spawn.

Recent studies (Laramie et al., 2023) highlight the potential impact of altered hydrology and land use on native fish species, including Tui Chub, Chiselmouth, Largescale Sucker, Northern Pikeminnow, and Redside Shiner. These warm-adapted fish, particularly those occupying lower-elevation streams, are vulnerable to changes in stream connectivity, land use, and water availability. Efforts to enhance fish passage and conserve streamflow will be crucial to supporting these species.

Additionally, the potential listing of the Western Ridged Mussel (Gonidea angulata) under the Endangered Species Act emphasizes the need for targeted conservation efforts. Recent relocation of approximately 8,000 mussels during the replacement of Dunn Dam on the Donner und Blitzen River underscores the importance of understanding and protecting the species' distribution and habitat within the Basin.

Riparian Habitat Needs

Riparian habitats throughout the Harney Basin are essential for maintaining stream health, providing shade, reducing water temperatures, and improving dissolved oxygen levels. However, limited data on the condition of riparian habitats suggests degradation in some areas, leading to elevated stream temperatures and reduced water quality. Restoration of riparian areas is necessary to enhance critical ecosystem functions as these efforts may lead to improvements in water temperature and dissolved oxygen levels, supporting both aquatic and terrestrial species. Comprehensive evaluation and targeted restoration efforts are key priorities for the Basin.

Wetland Uses and Needs

The wetlands of the Harney Basin, including those surrounding Malheur Lake, provide vital habitat for resident and migratory waterbirds. Flows into these wetlands, particularly from the Donner und BlitzenRiver and the Silvies River, support emergent and submergent vegetation critical for waterfowl. However, shifts in hydrology, such as reduced contributions from the Silvies River and vegetation changes in Malheur Lake due to several consecutive years of high water flooding, have negatively impacted habitat quality. The decline in resident waterfowl populations since the late 1980s (Figure 15) reflects these changes. Targeted efforts to manage flow patterns, improve habitat conditions, and enhance wetland connectivity are essential for supporting waterbird populations and maintaining the ecological integrity of the Basin's wetlands.

Groundwater-Dependent Ecosystems (GDEs)

Groundwater supports a range of ecosystems in the Basin, including springs, wetlands, and phreatophyte vegetation. These groundwater-dependent ecosystems are critical indicators of groundwater conditions and provide habitat for numerous species. Stinking Lake, a groundwater-dependent lake designated as a research natural area, exemplifies the unique ecological value of these systems. However, reductions in groundwater flow to some springs have been linked to groundwater pumping, highlighting the impacts of groundwater pumping on these ecological resources Efforts to study, monitor, and protect GDEs will help ensure their continued function as sentinels of groundwater sustainability.

Integration of Groundwater and Surface Water

The intricate relationship between groundwater and surface water in the Harney Basin requires integrated management to address competing water needs effectively. Groundwater recharge relies on surface water infiltration, while streams and springs depend on groundwater discharge to maintain flow during dry periods. Coordinating the management of these interconnected systems will enhance the resilience of aquatic habitats, support instream flows, and balance ecological and economic demands across the Basin.

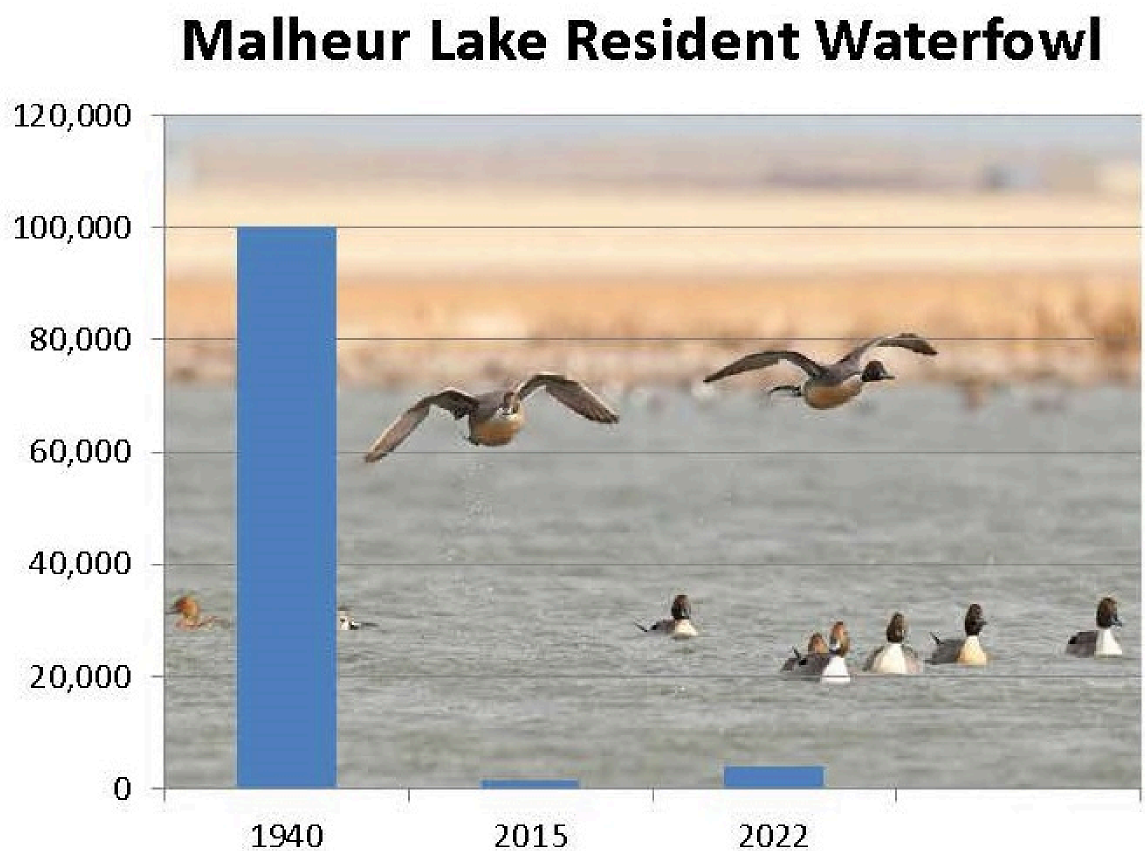

Figure 15: Change in abundance of resident waterfowl in Malheur Lake (USFS)

Challenges

Water users in the Harney Basin have long faced significant challenges in managing water resources, which are expected to intensify in the coming decades. Addressing these issues requires a clear understanding of the interconnected surface water and groundwater systems and the ecological and economic demands they support. Below is a summary of the key challenges organized by surface water and groundwater issues:

Surface Water Challenges

- **Overallocation:** Surface water resources have been significantly over allocated for over a century, creating competition among users and limiting availability during dry years.
- **Illegal Use:** Persistent illegal surface water use further strains resources, undermines the rights of legal users, and complicates water management efforts.
- **High Variability:** The highly variable surface water supply, driven by snowmelt and seasonal flows, complicates resource management and long-term planning.
- **Aging Infrastructure:** Flood irrigation infrastructure is outdated and inefficient, resulting in water loss, reduced delivery reliability, and challenges in meeting both agricultural and ecological needs.
- **Ecological Impacts:** Surface water shortages and flow interruptions adversely affect streamflows needed to maintain aquatic habitats and marsh ecosystems in the Harney Basin, including Malheur National Wildlife Refuge. These shortages disrupt critical habitats for marsh-dwelling species, migratory birds, and aquatic species like redband trout.
- **Riparian Habitat Degradation:** Degraded riparian areas contribute to elevated stream temperatures, reduced dissolved oxygen, and poor water quality, threatening both aquatic and terrestrial ecosystems.
- **Invasive Species:** The spread of invasive species, including hybrid cattail, common carp, reed canary grass, and pepperweed, further degrades wetland habitats and disrupts ecosystem functions.
- **Climate Change Impacts:** Drought, shifting precipitation patterns, and reduced snowpack are altering runoff timing and volume, further stressing the already over allocated surface water resources.

Groundwater Challenges

- **Over allocation and Overuse:** Groundwater pumping exceeds recharge by an estimated 110,000 acre-feet per year, leading to declining water levels and localized cones of depression.

- **Impacts on Springs, Wetlands, and Riparian Areas:** Declining groundwater levels threaten groundwater-dependent ecosystems such as springs, wetlands, and riparian areas, which are vital habitats for fish, wildlife, and vegetation.
- **Interference with Domestic Wells:** Groundwater pumping for agricultural irrigation has reduced water availability for domestic wells, creating challenges for rural residents to access reliable water supplies.
- **Economic Consequences:** Reducing groundwater use to sustainable levels will likely result in significant economic impacts for agricultural operations reliant on irrigation.
- **Impacts on Rivers and Streams:** Groundwater decline reduces spring flow contributions to streams and rivers, exacerbating streamflow interruptions that impact aquatic species like redband trout and other native fish.
- **Insufficient Data:** Limited information on groundwater use, recharge rates, and ecosystem interactions hinders effective groundwater management.
- **Climate and Land Use Impacts:** Wildfires, changes in forest structure, and shifting land use patterns affect groundwater recharge rates and hydrology, further compounding resource challenges.

Major Issues

The following are major issues identified during the planning process (Table 1 & Table 2). As time goes on, future, unforeseen issues will emerge that influence the implementation of strategies to address the issues identified; however, the following challenges will be important for addressing issues.

Over Appropriation of Surface and Groundwater

It has been clear for nearly a century that surface water has been over allocated. Curtailment of junior users has been necessary for dry years for many decades. Flood irrigators have been coping with the situation for decades and have adapted operations to accommodate dry years.

On the other hand, groundwater over appropriation has been a more recent revelation to groundwater irrigators. The curtailment of new permit applications in 2016 through basin classification (Greater Harney Valley Groundwater Area of Concern) was the first step to stop further degradation of the groundwater resource. Ongoing discussions of designation of a critical groundwater area with management controls to reduce groundwater pumping were started in 2023.

Given the status of water resource allocation, nearly all future water right transactions will be either to transfer, or voluntarily cancellation of water rights. The integrated water resource plan identifies the necessity to enforce forfeiture of rights that are not put to beneficial uses to ensure "paper rights" are limited to actual uses.

Factors Affecting Surface Hydrology

There are a multitude of factors that affect the hydrology in the Harney Basin. The main driver of both surface and groundwater recharge is precipitation. The amount of snowpack and timing of snow melt drive streamflow characteristics that are important both ecologically and economically. With highly variable precipitation and increasing temperatures, the future could have less snowpack and earlier runoff, especially from the Blue Mountains into the Silvies River and Silver Creek.

Forest vegetation and forest fire could affect the water yield from the Blue Mountains as well. Recent large-scale fires will have a near term impact on runoff. For example, loss of canopy cover could change snowpack accumulation and rate of melt, increase infiltration, and reduce evapotranspiration. It is unknown how these changes will impact the overall amount and timing of inputs to the local water budget. Forest thinning to improve forest health could have a small impact on runoff and water infiltration. Wildfires have several impacts upon hydrology and water quality. As has been documented in other post-wildfire landscapes, snowpack, spring runoff levels, and timing of flows will likely be altered by a lack of overstory vegetation to gather and shade ground snowpack, and by the black, charred backdrop that increases solar intensity and melting. On the other hand, lack of overstory reduces evapotranspiration, which results in greater infiltration.

Basin hydrology is driven predominately by precipitation and temperature. Over many decades, decision making and policy for water management have been based upon existing hydrology. Climate change has the potential to alter the timing and amount of runoff from the uplands. With the changes already observed and climate change science suggesting even greater change, current operations will be affected. For example, surface irrigators will use drought regimes more frequently, requiring tighter regulation of water distribution.

Factors Affecting Aquifer Sustainability

The recent USGS/OWRD groundwater study (Garcia et al., 2022) documented an estimate of over pumping of the aquifer by 110,000 acre-feet per year. The dominant pumping from the aquifer is for agricultural irrigation. Localized irrigation pumping results in the loss of domestic wells and possible stockwater wells from static groundwater level declines, as well as impacts to groundwater dependent ecosystems and springs (such as evidenced by the drying up of Sod House Spring next to the Malheur Wildlife Refuge headquarters). A number of areas of significant localized declines have been documented and larger areas of general decline in static groundwater levels have been documented. Limited data on actual use has required the use of remote sensing coupled with what documentation of actual use records are available to develop an estimate of use (Beamer and Hoskinson, 2021). Deeper wells are pumping from aquifer storage that dates from many centuries ago. Meeting the sustainability requirement will be a very difficult challenge for the Basin and will require significant reductions in pumping.

Factors Affecting Stream Habitats

Out of stream diversions and changing climate affect the stream flow of upland and lowland portions of the basin affecting redband trout habitat. Coupled with altered riparian habitats and historic elimination of beaver, stream habitats have been altered significantly resulting in increased thermal loads and reduced oxygen levels in the water column. Fish access throughout stream systems in the basin is interrupted by culvert, diversion structure, barriers, and low flows. Fish screens on diversions are needed to keep fish out of field ditches where conditions allow entrainment of fish into diversions and to prevent carp from entering through diversions where ditches can serve as refugia. With warming streams, non-native fish have become more prevalent over the last 50 years even with the retention of the relatively widespread distribution of native species. Non-native species dominate the lowland streams where stream temperatures are more elevated (Figure Z taken from Laramie et al., 2023).

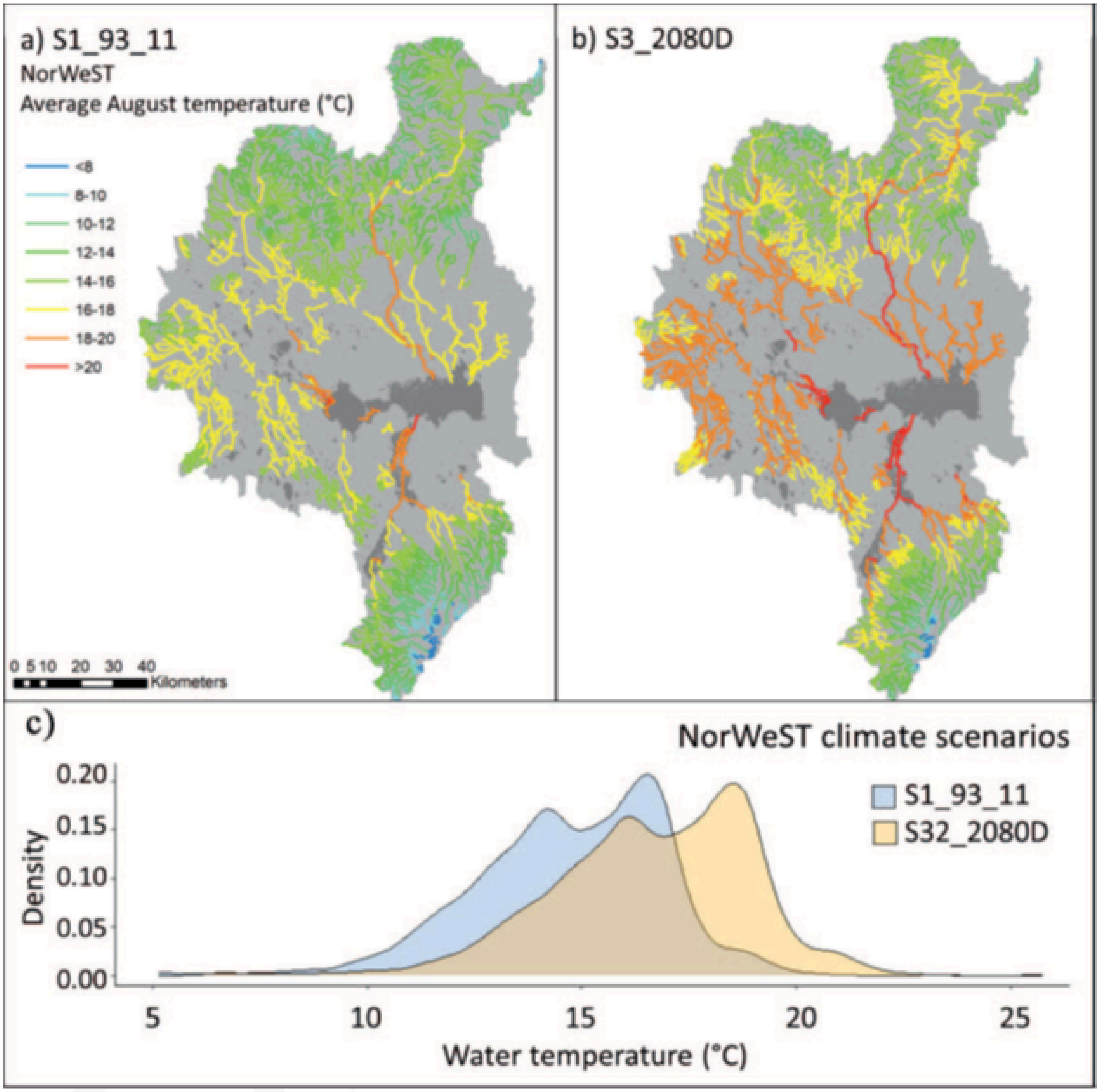

Figure 16: Contemporary and future stream temperature models for Harney Basin

Stream temperatures in the Harney Basin (Figure X from Laramie et al., 2023) are shown for both current and future climate scenarios. The first model (a) represents the average stream temperatures in August from 1993 to 2011. The second model (b) predicts how August stream temperatures might change by the 2080s (2070–2099) due to rising air temperatures and changes in water flow. The bottom graph (c) compares the range of stream temperatures for both scenarios, giving a clearer picture of how climate change could impact the basin's streams.

Factors Affecting Basin Wetland Habitats

Most wetlands are supplied by surface water. Spring flooding and flood irrigation maintain wet meadow conditions in the Harney Valley, Bear Valley, Blitzen Valley, Silver Creek, and Silvies Valley. The terminal ponding of water from all streams in the basin create the playa of Harney Lake (from Silver Creek) and the marshes of Malheur Lake and Diamond Valley. Spring discharges into the Malheur marshlands, Stinking Lake and Harney Lake playa also support important bird habitats.

Groundwater declines have affected some spring flow and further declines have the potential to further affect spring flow. Increased temperatures could affect the amount of surface water getting to the Refuge wetlands, thereby reducing the surface area. Drought and flood cycles have led to a resurgence of emergent vegetation and with low populations of common carp, a short term resurgence of submergent vegetation.

Wetlands of the Malheur Refuge contain invasive common carp that helps to maintain turbid conditions of Malheur Lake. Another invasive species in the marsh is hybrid cattail that has only recently become predominant in areas previously dominated by bullrush. Reed canary grass and pepper weed have expanded in the flood irrigated meadows with the potential to diminish the value of both the bird habitat and cattle forage.Smooth brome (Bromus inermis) is a recent invader of the meadows that also reduces value for birds and cattle forage.

Factors Affecting Domestic and Municipal Water Supplies

Nearly all residents of the Harney Basin rely on groundwater for drinking water. Many of the domestic wells are relatively shallow and in some cases are affected by groundwater declines from irrigation pumping. The communities of Burns, Hines, and Seneca have groundwater wells to supply municipal, commercial and industrial water supplies. Each community has indicated that they have sufficient supplies for the future.

Strategies

Both the Groundwater Plan and Surface Water Plan have detailed compilation of strategies and actions proposed to address water resource conditions in the Harney Basin. The lists below show each strategy identified as well as their current statuses.

Groundwater Plan Strategies

1. Implement irrigation conservation measures to help slow the rate of decline and assist in achieving reasonably stable groundwater levels.
2. Research policy or planning mechanisms to ensure that conserved water remains in the ground.
3. Increase the use of efficient irrigation technology.
4. Support, as a Collaborative, the CREP program described in the application to FSA and encourage voluntary enrollment by water users.
5. Recommend to OWRD that it take actions in the short term to reduce the amount of groundwater being pumped for irrigation, including permit compliance.
6. Work with OWRD to enact improvements in its enforcement of water rights and well construction standards in a publicly transparent manner.
7. Analyze the provisions for VAs (in Oregon Groundwater Law (ORS 537.745)) to explore whether using VAs could be useful in the Harney Basin.
8. Provide financial and technical solutions to domestic well users experiencing declines in groundwater quantity/quality due to declining groundwater levels.
9. Implement actions that protect and conserve groundwater-dependent ecosystems (GDEs).
10. Implement a monitoring program for GDEs and priority plants and animals that depend on them.
11. Integrate water availability into land use planning.
12. Explore how OpenET or other remote-sensing applications could be used as a tool to assess water use.
13. Advocate for additional information, with an early focus on groundwater-dependent ecosystems and economic effects of changing groundwater uses. When the USGS/OWRD groundwater study is available, identify other information needs.
14. Explore and consider a voluntary groundwater market approach; review the feasibility study. Upon review, the Collaborative should make a recommendation to implement or not.
15. Develop a plan to help mitigate and respond to the impacts of drought on the basin's groundwater.
16. Install accountable water measurement devices on all non-exempt groundwater points of diversion and develop appropriate reporting procedures for metered non-exempt groundwater points of diversion.
17. OWRD initiate the cancellation of all known expired permits and water rights that haven't been beneficially used in five years in the Harney Basin and develop a plan to systematically identify those permits that may be subject to forfeit.
18. Work with OWRD to ensure that Collaborative members are represented and Collaborative-developed strategies are presented to the RAC when considering groundwater management rulemaking.
19. CBWP Collaborative should work with OWRD to improve opportunities for public comments and to give meaningful consideration to the voice and comments of the

general public regarding OWRD actions on groundwater permit matters and groundwater management.

20. Develop a well clean-up and safe harbor program.
21. Build community understanding of water resource conditions in the Harney Basin.
22. Identify feasible alternative water delivery mechanisms to meet exempt water supply needs of rural residents.
23. Research and explore the idea of assessing fees for groundwater use.
24. Obtain/request state funding for economic feasibility studies/analyses.
25. Evaluate the hydrogeology and potential for adverse effects from groundwater intermingling from new wells and determine appropriate sealing requirements.
26. CBWP Collaborative should work with the Department of Environmental Quality (DEQ) to set up a permissive drinking water quality monitoring program.
27. Address groundwater quality issues.

Surface Water Plan Strategies

1. Prioritize enforcement to diminish and ultimately stop illegal water use.
2. Develop a communications and information program to inform irrigators about surface water conditions (including water availability and current priority date for regulation).
3. Adequately maintain irrigation ditches.
4. Inventory irrigation and other infrastructure that affects distribution of water. Use that inventory to evaluate distribution and efficiencies that consider irrigation water, bird habitat, and aquatic life.
5. In the lower Silvies, explore the feasibility of installing stream gages or other structures to assist with accurate gross division of water.
6. Provide input to federal land management agencies to include and prioritize the location and level of conifer reduction treatments designed to decrease water losses associated with evapotranspiration and promote snow distribution patterns that contribute to improved capture, storage, and safe (slow) release of water and maintenance of wildlife habitat in coordination with ODFW in the Basin.
7. Targeted conifer (ponderosa pine, mixed conifer, and juniper) reduction in snow accumulation (higher elevation) areas of the Silver Creek, Silvies, Malheur-Harney Lakes, and Donner und Blitzen sub-basins receiving over 17.7 inches of annual precipitation to decrease losses associated with evapotranspiration and promote snow distribution patterns that contribute to improved capture, storage, and safe (slow) release of water in the Basin.
8. Conduct a comprehensive assessment of riparian conditions and implement restoration actions in priority areas.
9. Identify and prioritize riparian habitat conditions for restoration or management to improve ecosystem functions.
10. Implement riparian restoration and management actions in priority areas and early opportunity areas throughout the basin.
11. Identify potential opportunities for beaver reintroduction.
12. Increase the efficiency and accuracy of streamflow measurement in the basin for both instream and out-of-stream uses.

13. Measure the quantity of water being diverted out-of-stream at primary diversions, report to OWRD, and make data publicly available.
14. Identify streamflow restoration needs and develop a program to address them.
15. Achieve more complete streamflow gaging in the Harney Basin.
16. Establish appropriate volitional fish passage throughout the basin, recognizing that the prevention of expansion of common carp is an important consideration.
17. Install screens to encourage healthy populations of native fishes.
18. Take appropriate actions to improve factors affecting degraded water quality.
19. Continue investigations of sediment sources to Malheur Lake.
20. Continue investigations of water quantity and flow influences on Malheur Lake conditions.
21. Manage surface water resources during climate change/drought events in a way that helps meet the short-term and long-term needs of the Harney Basin's people, ecosystems, and economy.
22. Conduct an evaluation on the local-scale effects on springs and river baseflow that are near concentrated groundwater withdrawal areas.
23. Expand the Open Range Consulting (ORC) mapping off refuge to allow for a fuller understanding of on-the-ground conditions.
24. Install appropriate measuring devices to understand how much water is needed to irrigate specific wet meadows and associated seasonal and semi-permanent wetlands.
25. Reintroduce beavers to the watershed where habitat exists and landowners and public land managers are willing.
26. Identify stream restoration actions that reintroduce meanders and floodplain reconnection where appropriate and feasible.

Data Gaps

The detailed Groundwater Plan lists data needs that were identified throughout the CBWP Phase 1 planning process and suggestions for how they could be addressed. The needs include:

Groundwater Use and Management:
- Amount of groundwater pumpage.
- Number of unused/uncapped wells.
- Number of more efficient irrigation systems currently installed and where they are located.
- Status of livestock wells.
- Use of supplemental groundwater, including amount and timing.
- Groundwater permit compliance.
- Actual water use versus permitted use information.
- Location of unpermitted uses.
- Distribution of groundwater contaminants.

Groundwater Movement and Recharge:
- Distribution and rates of groundwater recharge in the Silvies floodplain.
- Contributions of intermittent streams to groundwater recharge.
- Groundwater movement in the Silver Creek area.
- The role of faults in groundwater flows.

Monitoring and Baseline Data:
- More monitoring to determine the relationship between shallow and deep groundwater flow systems.
- Better surface water flow information.
- Consistent and long-term time-series measurement of spring flow.
- Better geological information.
- Additional monitoring wells throughout the Harney Basin to enable adaptive water management strategies.
- Projected impacts of future climate conditions on groundwater recharge and discharge.
- Lack of information regarding riparian habitats.

Groundwater Dependent Ecosystems (GDEs):
- Volume and rate of groundwater needed to support GDEs.
- Short- and long-term impacts of groundwater withdrawal on Harney Basin GDEs.
- Comprehensive understanding of the distribution of Harney Basin GDEs.
- Consistent and long-term time-series monitoring data on GDE locations and status.
- Application of the Framework for Ecological Responses to Groundwater Regime Alteration.

Modeling and Scenario Planning:
- Scenarios model to estimate the impact of different water management strategies on groundwater levels (groundwater model availability provided by OWRD in the Division 512 RAC meetings).

The detailed Surface Water Plan also identifies a number of data gaps, many around the lack of detailed stream gauge monitoring in the basin. The data gaps identified are:

Water Quality and Streamflow Monitoring:

- Lack of uniform information on water quality.
- Continuous data from streamflow gages is patchily distributed in time and space.
- Lack of data for watersheds not included in OWRD's Surface Water Availability Reporting System (SWARS), including key watersheds for redband trout (Coffeepot, Cow, Prater, and Riddle Creeks).
- Lack of data on consumptive uses in the basin.
- Relation between water quality and invasive fish species distribution/spread are unknown.
- Relation between streamflow, stream temperatures, and groundwater depletion are unknown.
- Lack of long-term measurement of stream flow, hindering understanding of surface-groundwater interactions.
- Changing snowpack conditions affecting runoff, flow timing, and flooding, compounded by insufficient monitoring.
- Lack of information on headwater conditions and hillslope water storage.

Species and Habitat Data:

- Improved information on species distribution, including fish and freshwater mussels.
- Information on specific species of host fish for Western Ridged mussels in the Harney Basin.
- Riparian conditions and their spatial relationship to fish and other species populations are not well known.
- Current information about specific species, particularly non-game species outside of the Refuge, is scarce.
- Wetland and woody riparian distribution is largely unmapped in the Harney Basin.
- Lack of information on how declining groundwater levels have affected and will affect wetlands.
- Information about the relationship between hydroperiod, vegetation, and bird communities is needed to understand climate resiliency.
- Accurate measurements of water quantities needed to maintain diverse wetland types across the Harney Basin.
- General need for better understanding of floral and faunal communities and their relationship to surface and groundwater.
- Lack of information on beaver reintroduction and its potential impacts.

Lakes and Wetlands:

- Estimated rather than precise information on historic surface water contributions to lakes.
- Poor understanding of changes in Silver Creek and its contributions to Harney Lake.
- Limited information on lake invertebrates and the relationship between lake-edge habitats and macroinvertebrate communities.
- Uncertainty regarding the lack of emergent vegetation reestablishment in Malheur Lake.
- Lack of information on sources of turbidity in Malheur Lake.
- Data gaps regarding wetland distribution, particularly for wetlands other than flood-irrigated meadows.
- Ongoing efforts through the HBWC aim to address some of these gaps.

Infrastructure and Hydrology:

- Lack of information regarding the potential for managing lowland recharge and identifying opportunities to increase recharge.
- Lack of information on prioritizing vegetation management for water yield purposes.
- Lack of information on future surface and groundwater management needs.

- Spring flooding and flood irrigation account for nearly 70% of Harney Valley groundwater recharge, but the efficiency of recharge areas is unknown.
- Unknown impacts of conifer forest thinning and western juniper clearing on catchment yield and surface-groundwater contributions.
- Lack of information on the current state of Harney County's surface water infrastructure system.
- No complete inventory of river diversion structures, including type, condition, working status, and diversion measurement.
- No headgate on Foley Slough, legally considered a tributary of the Silvies River.
- Dams at the bifurcation of the East and West Forks of the Silvies River lack measurement devices.
- Lack of information on modeling and measuring vegetation's influence on snow accumulation and redistribution in snow zones.

Ecological and Historical Data Gaps:

- Lack of capacity to help the interagency workgroup complete photo-monitoring assessments in the Silvies Subbasin (involving BLM, EOARC, Harney SWCD, and USDA Forest Service).
- Lack of information on historical and current vegetation conditions.
- Insufficient data to evaluate the potential impacts of large-scale forest management practices (e.g., watershed or subbasin level).
- Lack of comprehensive cover class data.

The Path Forward for the Harney Basin

Identifying critical challenges and developing clear strategies for managing water resources is a vital step in the Basin's path forward. The ongoing economic prosperity of this unique region, the health of its environment and fish and wildlife habitat, the sustainability of instream resources, and the development of expanded recreational opportunities for the community all depend on the implementation of the Plan's recommended strategies to protect and optimize the Basin's water resources.

While agricultural irrigation remains the primary water use in the Basin, addressing the needs of instream resources—critical for aquatic habitats, fish populations, and the wetlands that support waterbird species—is also essential. These elements contribute to the broader ecological balance and the recreational and environmental significance of the Harney Basin.

Benefits from successful implementation of this Plan extend beyond the Basin. The environmental and recreational attraction of the Malheur Refuge is of local, national, and international importance. Financial support from the State of Oregon, federal agencies, and private and public sources will be necessary to implement the action items outlined in the Plan.

As the Harney Valley communities address the obstacles to protecting and enhancing the Basin's water values—including agricultural, municipal, industrial, and instream needs—new challenges will arise. For this reason, the Plan is dynamic and will adapt as future opportunities and constraints present themselves. The Plan will be updated periodically as additional information is collected, new focus areas are identified, and emerging issues are addressed. Failure to take action could result in more drastic curtailment of water use and continuing and growing conflict among water users. Responsibilities lie with both water users and the Oregon Department of Water Resources. The Collaborative is currently working on their implementation approach. The primary goal of the CBWP is to create a sustainable water future. The actions identified in this Plan for responsible stewardship of the Basin's water resources will help achieve that future and aim to preserve a balance of water uses and needs that will benefit generations to come.

In the short term, anticipated rules to address groundwater over-allocation may impact the agricultural economy of the Basin. However, in the long term, maintaining a stable groundwater supply, balancing surface water use, and addressing the needs of instream resources alongside agricultural and wet meadow cattle hay production will help ensure a sustainable future for all in the Harney Basin.

How YOU can help

Everyone has a role to play in protecting and conserving our water supply, ensuring a healthy future for people, wildlife, and the local economy. Here are ways you can contribute:

For Community Members

- **Stay Informed & Get Involved** – Learn about the water challenges facing the Harney Basin and participate in local discussions about water management. Attend CBWP Collaborative meetings, public hearings, and workshops to share your perspective and help shape future water policies.
- **Support Responsible Water Use** – Be mindful of your personal water use and adopt conservation practices at home, such as fixing leaks, using water-efficient appliances, and reducing outdoor water consumption.
- **Advocate for Sustainable Water Management** – Engage with local, state, and federal decision-makers to support policies and programs that promote balanced water use and protect groundwater-dependent ecosystems.
- **Help Monitor Local Water Conditions** – Share observations about changes in groundwater levels, surface water flows, or wetland conditions. Community knowledge is invaluable in identifying and addressing emerging water issues.
- **Support Water Conservation Programs** – Encourage voluntary participation in programs like the **Harney Valley Groundwater Conservation Reserve Enhancement Program (CREP)** and the **Harney Basin Domestic Well Fund**, which help reduce water use and provide assistance to those impacted by groundwater declines.
- **Protect Wetlands and Riparian Areas** – If you own or manage land near a river, stream, or wetland, consider restoration projects that enhance habitat for fish and wildlife, reduce erosion, and improve water retention.

For Irrigators & Landowners

- **Implement Irrigation Conservation Measures** – Use efficient irrigation technologies and strategies to reduce groundwater withdrawals and improve water application efficiency.
- **Monitor & Improve Water Infrastructure** – Maintain and upgrade ditches, headgates, and diversion structures to improve water distribution, reduce waste, and ensure compliance with water rights.
- **Participate in Voluntary Water Conservation Programs** – Consider enrolling in **CREP** or similar programs that offer financial incentives for implementing conservation measures on agricultural lands.
- **Support Enforcement of Water Rights** – Work with the Oregon Water Resources Department (OWRD) to ensure legal water use and compliance with existing water rights regulations.
- **Measure & Report Water Use** – Install metering devices on non-exempt groundwater points of diversion and ensure accurate reporting of water use to OWRD.

- **Explore Alternative Water Management Strategies** – Engage in discussions about voluntary groundwater markets, storage options, and alternative cropping practices that reduce overall water demand.
- **Enhance Riparian and Wetland Areas** – Implement land management practices that protect and restore riparian buffers, increase floodplain connectivity, and improve water retention.
- **Support Beaver Reintroduction Where Feasible** – In areas where habitat conditions allow, work with local organizations to explore beaver reintroduction efforts that can enhance natural water storage and riparian habitat.

For Local Businesses & Organizations

- **Promote Water Conservation Practices** – Encourage sustainable water use among employees and customers.
- **Support Research & Monitoring Efforts** – Partner with universities, government agencies, and conservation groups to contribute to data collection and research on water availability and use.
- **Invest in Water-Efficient Infrastructure** – If your business relies on water-intensive processes, consider upgrading to more efficient technologies.
- **Support Funding for Water Conservation Initiatives** – Advocate for state and federal funding to help implement conservation strategies, improve infrastructure, and support local water users.

For Tribal Partners, Conservation Groups, and State/Federal Agencies

- **Collaborate on Habitat Restoration & Water Conservation Efforts** – Continue working together to implement projects that benefit both water users and ecological resources in the Harney Basin.
- **Engage in Policy Discussions & Planning Processes** – Provide technical expertise, funding, and policy support for sustainable water management efforts.
- **Expand Monitoring & Research Initiatives** – Help fill critical data gaps by supporting additional streamflow monitoring, groundwater studies, and ecological assessments.

Everyone Has a Role

The future of water in the Harney Basin depends on collaboration and shared responsibility. Whether you are a landowner, irrigator, business owner, or community member, your actions can contribute to improved water management and a more resilient future.

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Appendices

CBWP Groundwater Plan

Groundwater Implementation Framework

CBWP Surface Water Plan

Surface Water Plan Implementation Framework

Burns Paiute Tribe Resolution