DRAFT STRATEGY SCOPING: MONITORING AND METERING

Executive Summary

Three monitoring and metering strategies have been identified as Tier 1 priorities in the Walla Walla Water 2050 Strategic Plan (Strategic Plan) for the Walla Walla watershed. These include efforts to develop an overarching monitoring strategy and adaptive management plan for fish, habitat, and water (Strategy 1.10), to expand and fund streamflow gauges throughout the basin (Strategy 1.15), and to improve agricultural metering and reporting programs by installing telemetry and improving data use by agencies and water users (Strategy 1.20). This memo details existing monitoring and metering infrastructure in the Basin including a network of stream gauges, groundwater wells, and water quality monitoring sites managed by state agencies and other entities in both Oregon and Washington. Both states generally require measuring and reporting of water use for most surface water right holders. However, due to issues with metering technology, agency capacity, and/or water system complexity, not all water use in the Walla Walla watershed is accurately measured. Current habitat and critical species monitoring is also described including adult and juvenile fish counts performed by the fisheries co-managers

The memo provides descriptions of each of the three monitoring and metering strategies and overviews of implementation approaches, including details on entity and partner roles and implementation phases. It also highlights potential barriers to implementation and discusses each strategy's contribution to the Desired Future Conditions outlined in the Strategic Plan. Within each strategy, specific project actions with additional funding needs that have been identified by sponsors within the Basin are described. Finally, the memo summarizes these actions as well as potential funding options from state and federal sources which could be used to support monitoring and metering strategies.

Background

The Strategic Plan was completed in June 2021. This memo is part of Phase 2 of the Walla Walla 2050 Strategic Plan process – an effort to build on the completed Strategic Plan by analyzing and refining implementation details of the Tier 1 strategies. The Strategic Plan identified 60 strategies to manage water resources to meet multiple benefits in the Walla Walla watershed. These strategies were prioritized into three tiers; the highest tier, Tier 1, included 23 strategies. This memo, along with a series of subsequent memos will provide additional detail on these Tier 1 strategies to help move these strategies forward to implementation. This memo is focused on priority strategies related to **monitoring and metering**.

Introduction

An oft-quoted phrase says that what isn't measured can't be managed. Robust monitoring and metering of a diverse set of indicators is foundational to managing water use and ecological and hydrologic indicators in the Walla Walla Basin. Phase 1 of the Walla Walla 2050 Strategic Plan identified three specific Tier 1 priority strategies related to monitoring and metering:

- Strategy 1.10: Develop an overarching monitoring strategy and adaptive management plan for fish, habitat, and water to inform actions and evaluate effectiveness.
- Strategy 1.15: Expand and fund streamflow gauges throughout the basin.
- Strategy 1.20: Improve agricultural irrigation metering and reporting programs in Washington and Oregon by installing telemetry and improving data use by agencies and water users.

This memo more fully explains each of these strategies and their components and provides information on past efforts, next steps and phasing/implementation recommendations, potential barriers, relationships of these and other strategies, and finally, recommendations on adaptively managing the monitoring and metering effort in the basin into the future.

Current Infrastructure for Monitoring and Metering

Significant effort has been expended in the basin to monitor streamflows, groundwater levels, water use, habitat and biological signals. For example, the existing stream gauging and water use monitoring infrastructure in Washington and Oregon, while not perfect, allows for basic water right regulation and water budgeting but has significant gaps in coverage and quality. Likewise, habitat and species monitoring on a project-by-project basis, paired with ongoing basin-wide efforts such as video enumeration at fish ladders and pit-tagging to track anadromous fish population data, have been implemented in the basin over time. This section briefly reviews existing stream gauging infrastructure as well as past efforts to monitor out-of-stream water use and track key habitat and biological parameters.

Streamflow Gauging

Seventeen stream flow gauges operated by USGS, OWRD and Ecology currently measure near real-time streamflow in the basin with data available online. (Table 1).

Table 1: Names and IDs of existing streamflow gauges recording streamflow measurements

	Gauge Name and ID
Oregon	SF WWR Near Milton (14010000)
	NF WWR Near Milton (14010800)
	WW @ Milton (14012000)
	Little WW Near Milton (14012100)
	MF Hudson Bay Ditch Near Freewater
	WWR below Milton (14012500)
Washington	WWR @ Beet Rd. (32A105)
	WWR @ E. Detour Rd. (32A100)
	WWR @ Pepper Bridge (32A120)
	WWR near Touchet (14018500)
	Mill Cr. near Walla Walla (14013000)
	Mill Cr. @ Five Mile Rd Bridge (14013700)
	Mill Cr. at Walla Walla (14015000)
	Touchet R. @ Cummins Rd. (32B075)
	Touchet R. @ Luckenbill Rd. (32B090)
	Touchet R. @ Bolles (32B100)
	NF Touchet R. above Dayton (32E050)

In addition to these gauges, WWBWC monitors approximately 25 river, stream and spring locations in the basin; many of these are listed above in (Table 1); WWBWC monitors five near real-time stream gauges in Oregon not listed above (Table 2).

Table 2: WWBWC Gauge Sites

	Gauge Name and ID
Oregon	SF WWR @ Walla Walla R. Road Bridge (S103)
	NF WWR @ Walla Walla R. Road Bridge (S104)
	WWR below Nursery Bridge (Seasonal)(S106)
	WWR below Tum-A-Lum Bridge (S107)
	Couse Creek @ River Mile 1.1 (S-142)

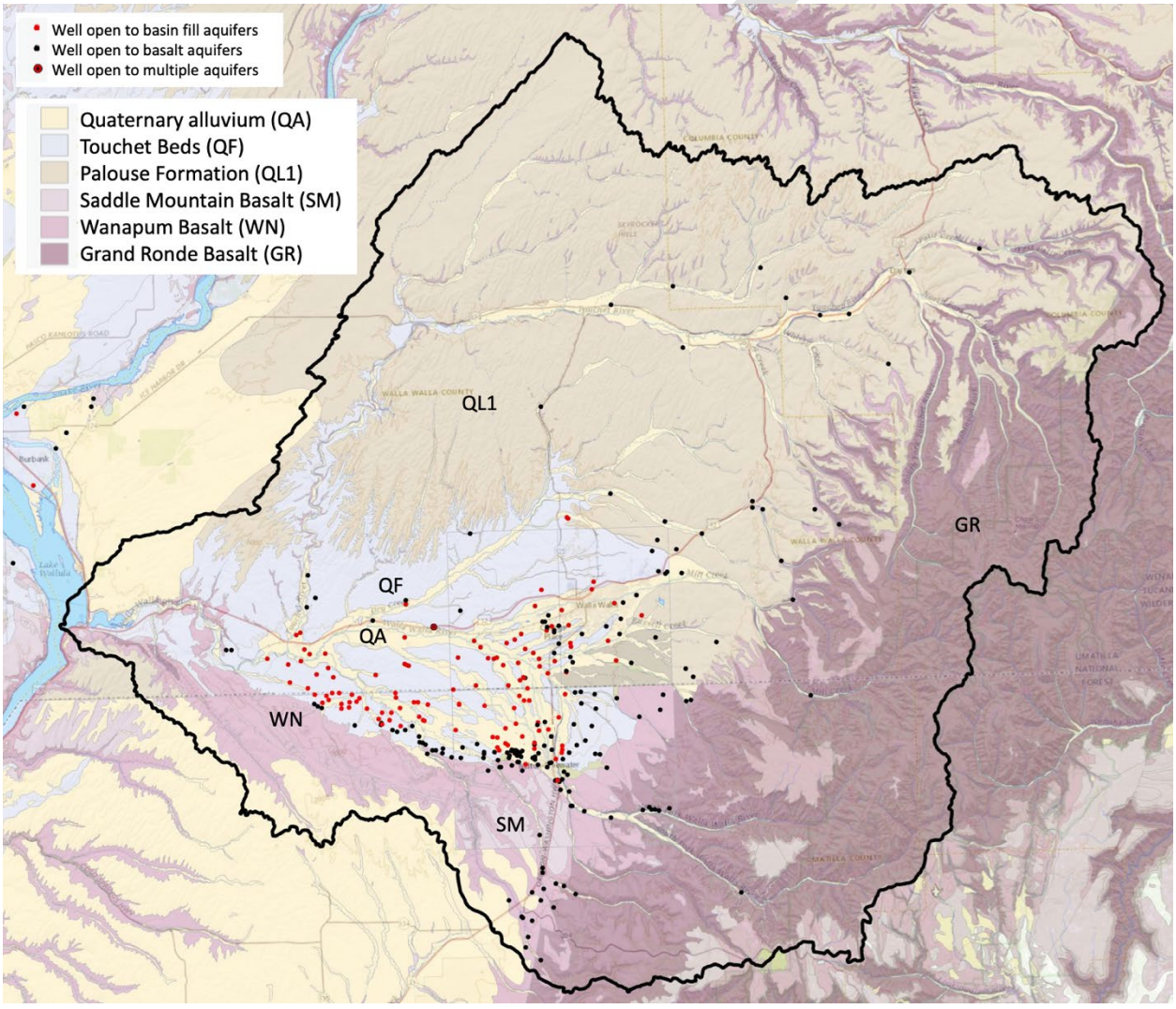
In addition to the online gauging network, some streamflow monitoring has occurred as part of water transactions funded by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the Columbia Basin Water Transactions Program (CBWTP) in both Washington and Oregon. WWBWC also conducts streamflow monitoring at other non-gauged monitoring locations in the basin.

Groundwater Monitoring

Groundwater levels are monitored in Oregon and Washington as part of ongoing water management efforts by WWBWC, CTUIR, OWRD, Ecology and the Walla Walla County

Conservation District. Additionally, the USGS is in conducting a comprehensive groundwater study in cooperation with the states to develop a ". . . three-dimensional quantitative and conceptual understanding of the groundwater-flow system bounded by the areal extent of the Walla Walla River Basin. . . " (Long et al. 2021, 4). In Oregon, OWRD's annually monitored synoptic well network includes 185 wells, 125 in basalt and 60 in the shallow aquifer; quarterly, OWRD measured groundwater levels in 12 total wells in a mix of the shallow and basalt aquifers (Long et al. 2021). In Washington, since 2018, USGS has used an annual synoptic network of 25 basalt wells and visited an additional 53 shallow wells with WWBWC in January of 2020.

Figure 1: Groundwater Monitoring Sites in the Walla Walla Basin (Long et al. 2022)



WWBWC's groundwater monitoring network includes more than 100 groundwater sites in both the Oregon and Washington sides of the basin. These sites are visited approximately four times each year to download data, conduct manual measurements, perform site maintenance and collect other data (Walla Walla Basin Watershed Council 2018).

Another element of groundwater monitoring in the basin is seepage studies that help understand the interaction of streamflow and irrigation diversions and canals with the alluvial groundwater system. Annual seepage runs have been conducted for the Walla Walla River and tributaries seasonally since 2009 by the Walla Walla Basin Watershed Council[1]. USGS and Ecology also conducted a seepage run on the Walla Walla River in August 2020 and included 64 measurement stations in Washington and 22 stations in Oregon (measured by OWRD) along with agricultural diversions and outflows from water treatment plants (Long et al. 2021).

Water Use Metering and Reporting

Metering and reporting for out-of-stream uses is also ongoing across both the Washington and Oregon portions of the basin. Regulatory requirements for measuring and reporting water use for irrigation and municipal uses vary depending upon different factors in both Washington and Oregon. For irrigation uses however, many diversions remain un-metered and/or metered but un-reported. Municipal water users generally keep careful records of water use. It is also important to note that while some irrigation diversions in both Washington and Oregon are metered, actual consumptive use by irrigated crops is rarely, if ever, measured. Consumptive use can be estimated using known irrigation water requirements for specific crops and applying these factors to the number of acres occupied by those crops. Consumptive use can also be field-measured using tools like Eddy Covariance towers or measured remotely with tools like OpenET[2] or other remote-sensing platforms. The Department of Ecology is planning to launch a pilot OpenET project in the Walla Walla Basin in 2023. Irrigation metering requirements for both WA and OR are briefly summarized below.

Washington

The measuring and reporting requirements for water right holders in Washington vary depending on the size of the diversion or withdrawal, priority date, location and whether any recent changes have been made to the water right. All surface water right holders are legally required to measure their water use, however for some older, smaller water rights, Ecology does not to enforce this requirement. Ecology does enforce metering and reporting requirements for the following surface water right holders:

- all new surface water rights after 2003;
- all surface water users greater than 1 cfs;
- all new water right permits (surface and groundwater) issued in 16 fish critical watersheds including the Walla Walla Basin; and
- all water right change application approvals including a metering provision.

Reporting requirements for metering vary depending on the size of the diversion or withdrawal (Table 4 from WAC 173-173-060). For example, small diversions under 10 gallons per minute (gpm) are required to record monthly while diversions greater than 50 gpm must record weekly.

[1] http://www.wwbwc.org/monitoring/monitoring-reports.html#seepage-assessment-reports

[2] https://openetdata.org

Table 3: Metering and Reporting Requirements for WA Water Users

Recording and Reporting Requirements			
Average diversion rate in gallons per minute	<10 gpm	10-49 gpm	>50 gpm
Recording frequency	Monthly	Biweekly	Weekly
Volume or rate to report	Maximum rate of diversion	Maximum rate of diversion	Maximum rate of diversion
	Annual total volume	Annual total volume	Annual total volume
Date data must be reported to department	By Jan. 31 of the following calendar year	By Jan. 31 of the following calendar year	By Jan. 31 of the following calendar year
Monthly means calendar month			
Weekly means Monday 12:01 a.m. to Sunday 12:00 p.m.			
Biweekly means once every two weeks			
Daily means 12:01 a.m. to 12:00 p.m.			
1 gallon per minute is equivalent to .002 cubic feet per second			

Measuring and reporting water use rules can be found under WAC 173-173. Ecology requires the use of online reporting form ECY 070-171 to record and report water use. Ecology also provides technical specification on various meter types for pressurized and open channel water diversions on their website: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Metering

On the ground, Washington historically invested a great deal of time and resources into installing fish screens and meters for surface water irrigation diversions in the Walla Walla Basin. This work was led primarily by the Walla Walla Conservation District (WWCD) and between 2001 to 2018 529 meters were installed in the Washington side of the basin (WWCD factsheet, 2018). However, despite the widespread adoption of surface water meters there were significant mechanical challenges associated with the meters and many of them failed or did not function properly due to the high sediment loads in streams of the Walla Walla Basin (Renee Hadley personal Communication, 2021). The most common water meter type installed was the McCrometer[3] flow meters.

As described above, a subset of water users are required to meter and report their water use in Washington. Data is submitted annually to Ecology. However, Ecology's capacity to review and synthesize water use information has been limited such that summaries of water use data based on submitted water use reports are not readily available.

Oregon

Oregon requires governmental entities including irrigation districts, state or federal agencies, and municipal water providers to measure and report water use (ORS 537.099). However, this requirement only applies to measuring water at the headgate meaning that metering of laterals and on-farm deliveries is not required. Metering and reporting of smaller, individual farm and other diversions is inconsistent across the state. Beginning in the 1990s, Oregon started requiring measurement and/or reporting on new water right permits depending on the size of

[3] https://www.mccrometer.com (last visited November 29, 2022)

the water right. Water rights without these requirements sometimes have a condition stating that water measurement and/or reporting may be required; also, watermasters in Oregon can generally require measurement and reporting of any water right as needed to help with their regulation (ORS 540.310).

In the Walla Walla watershed, the large irrigation district diversions have measurement and reporting at some but not all their primary diversions. However, both Walla Walla River Irrigation District (WWRID) and Hudson Bay District Improvement Company (HBDIC) have complex delivery systems and there is not a general requirement for metering and reporting of water volumes in irrigation laterals and at farm headgates. WWBWC monitors eight different irrigation conveyances in Oregon and in Washington near the Oregon border and this information is available online[4] (Table 4).

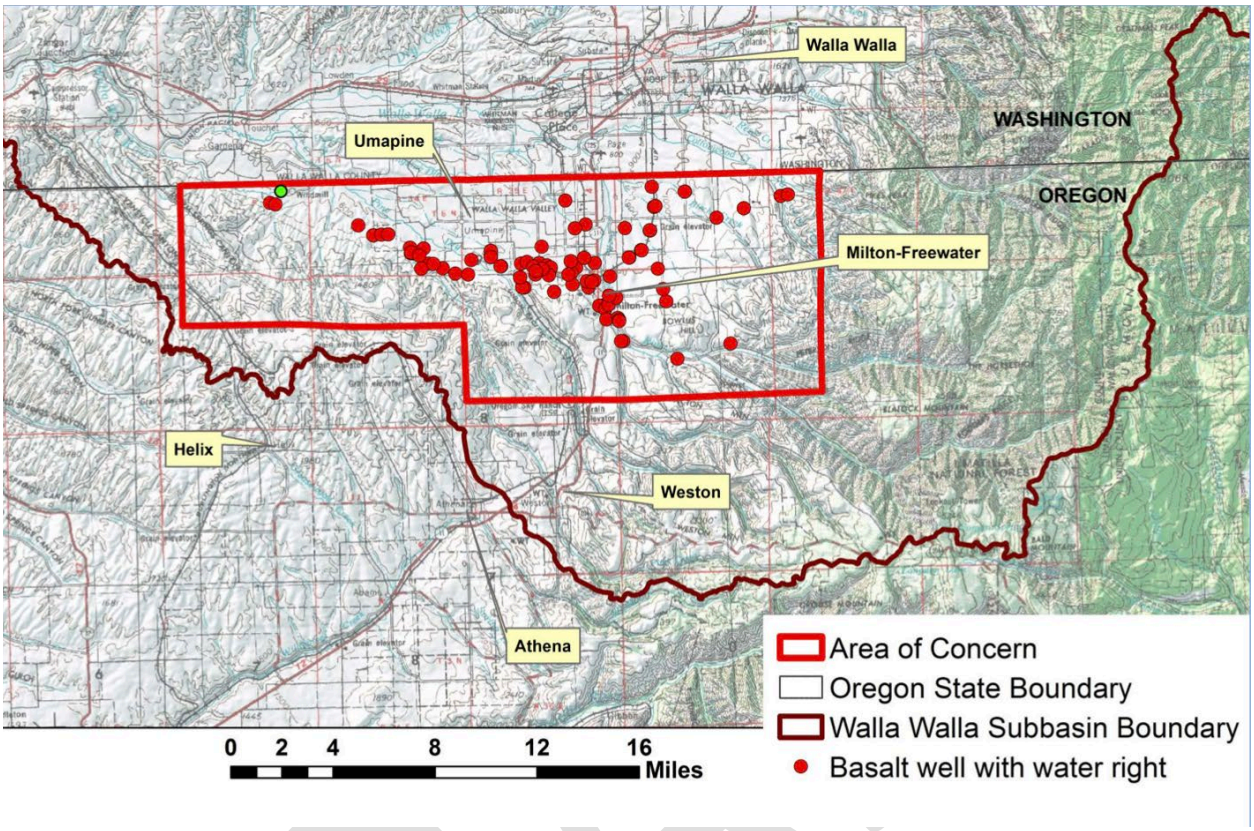
Table 4:WWBWC Irrigation Conveyance Gauges

Gauge Name and ID
Ford Ditch @ Milton Freewater (S203)
HBDIC Canal @ Milton Freewater (S204)
End of Crockett Ditch at Crockett Road (S211)
West Branch of the West Crockett Ditch at Appleton Road (S212)
Ford Ditch at Appleton and Winesap Road (S228)
Fruitvale Irrigation Ditch (S318)
Pine Creek at Schubert Road (S416T)
HBDIC Canal at Schubert Road (@426)

Finally, water users in Oregon's Serious Water Management Problem Areas (SWMPAs) or in critical groundwater areas may also be required to measure and report water use. The Walla Walla subbasin is the one established SWMPA in Oregon, and the SWMPA in the Walla Walla applies to the basalt groundwater aquifer (Figure 2). OWRD reports that all basalt wells that are currently in use are metered and reported (Chris Kowitz, personal communication, 7/19/2022). Water use reports can be found by searching for individual water rights using OWRD's online tools, but aggregated data for the basin is not currently available online.

[4] http://www.wwbwc.org/monitoring/surfacewater.html (last visited November 29, 2022)

Figure 2: Serious Water Management Problem Area Boundary (for Basalt Wells) in Oregon



Water Quality Monitoring

Water quality monitoring occurs at both the project level and the basin wide scale. Data from these efforts is housed in several different data repositories. Projects in Washington funded through grants from the Department of Ecology (Ecology) have water quality monitoring data entered in the Environmental Information Management (EIM) database[5]. The EIM database houses monitoring data of many kinds in addition to water quality, including groundwater levels, physical habitat, and streamflow among others. Also in Washington, the organization Kooskooskie Commons, based in Walla Walla, collects and stores data on water quality in the watershed which is also uploaded to EIM. This includes a network of stream temperature monitoring stations focused on the smaller streams in the Mill Creek subbasin (Figure 3). It is also worth noting that all the streamflow gauges in Washington also collect temperature data.

In the Walla Walla basin in Oregon, water quality data is collected and managed by Department of Environmental Quality (DEQ) and the Walla Walla Basin Watershed Council (WWBWC). OWRD also has temperature loggers installed on some of its gauges and shares but does not publish this temperature data. Relevant DEQ data is primarily available through the Oregon Water Quality Monitoring Data Portal.[6] WWBWC collects water temperature on the mainstem Walla

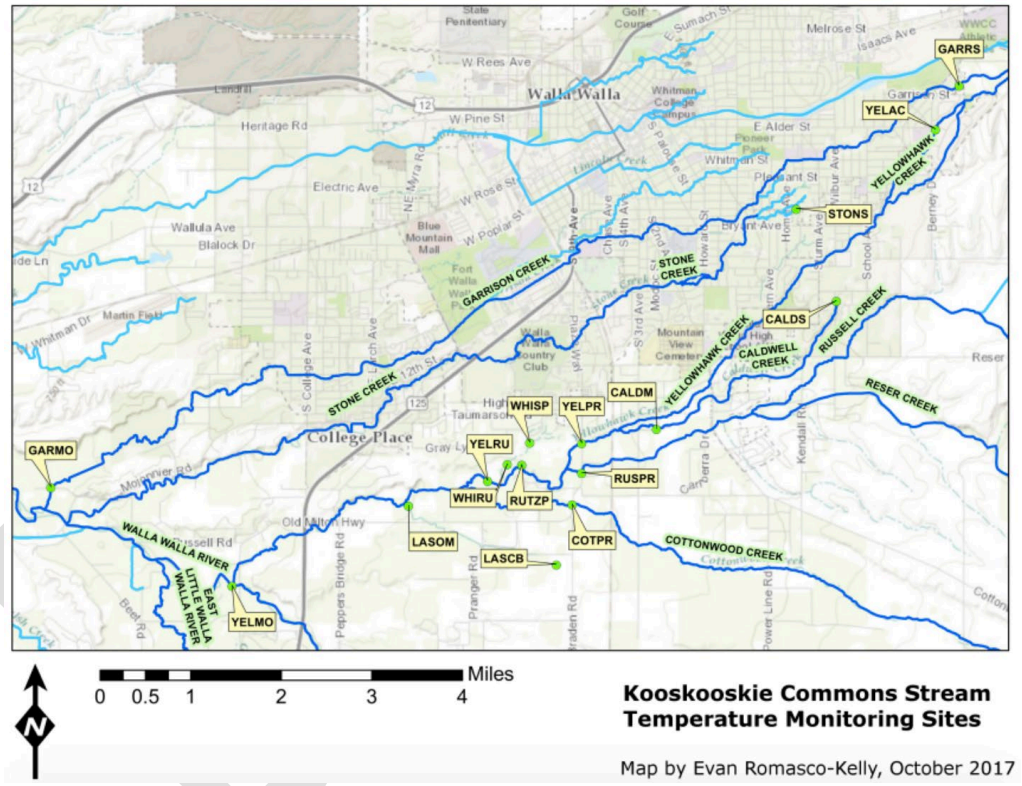
[5] EIM is accessible at https://apps.ecology.wa.gov/eim/search/default.aspx (last visited July 5, 2022).

[6] Accessible at https://orwater.deq.state.or.us/Login.aspx?AspxAutoDetectCookieSupport=1 (last visited July 5, 2022).

Walla, the North Fork and the South Fork of the Walla Walla. WWBWC is also part of the Pesticide Stewardship Partnership Program and conducts water sampling and testing from irrigation ditches for pesticides. The goals of this program are to identify potential concerns and improve water quality where it is affected by pesticide use around Oregon.

Site/project specific habitat and water quality monitoring is typically a component of any habitat restoration grant for implementation, compliance, and effectiveness monitoring at individual sites with funding from the grant source (BPA, Salmon Recovery Funding Board, Ecology, Conservation Commission or other sources). However, this project-specific monitoring does not generally address status/trend or validation of habitat improvements at a reach-scale or tributary level.

Figure 3: Kooskooskie Commons Water Temperature Monitoring Sites (as of 2017)



Habitat and Species Monitoring

The final type of ongoing monitoring in the basin is habitat monitoring – monitoring various aquatic and riparian habitat parameters focused on individual project outcomes as well as reach and basin-wide indicators of species status and river health. Habitat monitoring primarily takes place as part of individual projects. Both pre- and post-project monitoring plans are often part of project design and funding.

Indicators and trends for key species, for example adult returns, juvenile out-migration and survival, redd counts and spawning surveys, are critical parts of the existing monitoring effort in

the basin. This work is primarily coordinated by the tri-sovereigns including CTUIR's Fisheries Program and the fish and wildlife departments of Oregon and Washington.

The Oregon Department of Fish and Wildlife currently conducts fish monitoring including index reach spawning and redd surveys on the South Fork of the Walla Walla for bull trout. CTUIR also conducts extensive biological and habitat monitoring efforts at the basin and project scale. (Fish co-managers please feel free to add detail to this section). The Washington Department of Fish and Wildlife conducts the following fish and habitat monitoring with funding from sources listed for each activity:

Adult Enumeration (and Timing):

- Adult salmon, steelhead, and bull trout are monitored (daily counts) by WDFW at a permanent adult fish trap in Dayton that is funded by the Lower Snake River Compensation Plan (Department of Interior).
- In addition to the permanent fish trap at Dayton, WDFW utilizes a temporary adult trap that is placed in various tributaries on a rotating basis to assess adult utilization and timing of tributaries to the Touchet River with funding from BPA.
- The annual abundance and timing of adult salmon and steelhead, and the status and trend of bull trout abundance, are estimated by WDFW based on detections at a passive induced transponder (PIT tag array) in the Touchet River at Harvey Shaw road. This work is funded by the Lower Snake River Compensation Plan (Department of Interior)
- The abundance of steelhead on the spawning grounds in the Touchet River and tributaries is monitored by WDFW with funding provided by the Lower Snake River Compensation Plan (Department of Interior)
- At this time it is unknown who will conduct spring chinook spawning ground surveys in the Touchet River and its tributaries but as noted above, PIT tagged adults ascending the Touchet River are assessed at the PIT array at Harvey Shaw Road and all adults entering the permanent Trap at Dayton are enumerated and either collected for brood stock or released to spawn in-river.

Juvenile Enumeration (and Timing):

- Migratory (smolts) juvenile salmon and steelhead as well as all age classes of bull trout are monitored daily by WDFW during the migratory season at a Touchet River smolt trap located at Harvey Shaw Road with funding provided by the Lower Snake River Compensation Plan (Department of Interior), State sources, and the Salmon Recovery Funding Board.
- The abundance and timing of migratory juvenile salmon and steelhead as well as all age classes of bull trout that have been PIT tagged at various locations in the Touchet watershed are assessed by WDFW real-time at a Touchet River PIT array located at Harvey Shaw Road. Funding for this PIT array is provided by the Lower Snake River Compensation Plan (Department of Interior).

Detailed Description of Strategies

This section describes the three Tier 1 monitoring and metering strategies identified in the Strategic Plan in detail including the strategy itself, lead entities and their roles in implementing the strategy, and high-level details on implementation phases. Discussion of an overarching monitoring strategy (Strategy 1.10) begins with a description of two other large-scale water and watershed monitoring strategies to help provide context for a Walla Walla strategy.

Strategy 1.10: Develop an overarching monitoring strategy and adaptive management plan for fish, habitat, and water to inform actions and evaluate effectiveness

The Strategic Plan highlighted the need for a holistic strategy to unite the basin's monitoring efforts under a single framework. Such a framework should be designed to take information from reach, project, field and other scales and integrate the data into a real-time picture of the health of the watershed's rivers and aquatic species. In turn, this will allow the basin to adaptively manage water resources; knowing the status of the basin as a whole and how individual parts impact that status, can allow for learning and course correction as the need for adaptation arises.

At the outset, it is critical to recognize that monitoring can be time, labor and budget intensive and that funding monitoring can be difficult. Monitoring efforts need to be carefully tailored and prioritized. Two examples of monitoring frameworks help illustrate this point 1) the Flow Restoration Accounting Framework (FRAF) developed by the Columbia Basin Water Transactions Program (CBWTP), and 2) the Tributary Research, Monitoring and Effectiveness (Tributary RM&E) protocols of Bonneville Power Administration's (BPA) Columbia Basin Fish and Wildlife Program. Each of these are discussed briefly below.

The FRAF involves four tiers of monitoring effort and focus (McCoy and Holmes 2015). Tier 1 requires monitoring only for contractual compliance of flow restoration projects; an example of contractual compliance is using photo documentation to show that landowners are not irrigating a parcel from which they leased a water right for instream use. Tier 2 accounts for additional flow by a transaction by installing specific gauging infrastructure or taking live flow measurements periodically throughout the season when water is supposed to be in a specific stream reach. Tier 3 adds monitoring of flow-related limiting factors such as increased wetted area or decreases in water temperature. Finally, Tier 4 relates flow and flow-related habitat monitoring to broader monitoring efforts throughout the Columbia Basin to evaluate flow changes in the context of broader ecological conditions and, where possible, fish population dynamics.

Importantly, all transactions fall into at least Tier 1, with decreasing numbers of transactions falling into each successive tier. Individual projects are prioritized into tiers based on several factors including size and duration, cost, location and adjacency of other monitoring efforts.

The FRAF example is included here to illustrate a structured, logical approach to maximizing monitoring efforts. The monitoring effort in the Walla Walla will include a more diverse set of projects and indicators than the flow restoration efforts for which the FRAF was designed,

however the FRAF approach is instructive of a framework that offers multiple levels of monitoring intensity tailored to project-level parameters.

Another example of a comprehensive monitoring strategy is the Tributary RM&E protocols of BPA's Columbia Basin Fish and Wildlife Program. The geographic scope of this effort is the entire Columbia River Basin, however the monitoring focus of the program is like what could be implemented in the Walla Walla Basin; in the Columbia River Basin as a whole, as in the Walla Walla, the Tributary RM&E focus is on identifying the full range of limiting factors for anadromous fish species and tracking progress toward addressing them.

More specifically, the BPA Tributary RM&E broadly focuses on four strategies (Northwest Power and Conservation Council 2009):

> "1) Identify priority fish, wildlife, and ecosystem elements of the Program that can be monitored in a cost-effective manner, evaluate the monitoring data and adaptively manage the Program based on results; 2) research and report on key uncertainties; 3) make information from this Program accessible to the public; and 4) to the extent practicable ensure consistency with other processes."

The Tributary RM&E's framing of the purposes of monitoring is also instructive. Monitoring and evaluation can be used to track implementation of measures (like compliance/flow accounting monitoring under the FRAF), to track status and trends of focal species and limiting factors and determining the effectiveness of specific projects. As with the description of the FRAF, highlighting the BPA tributary RM&E provides some useful guideposts for how to design a comprehensive monitoring strategy.

The Pacific Northwest Aquatic Monitoring Partnership (PNAMP) offers guidance for integrating monitoring data across agencies, scales and disciplines through its Stream Habitat Metrics Integration Project. PNAMP suggests that integrating monitoring data requires that individual monitoring programs make their data findable, accessible, interoperable and reusable (FAIR) (Pacific Northwest Aquatic Monitoring Partnership n.d.). Making data FAIR "will allow for reporting status and trends of stream habitat across jurisdictional boundaries, help inform future sampling efforts, and supplement existing data." (Pacific Northwest Aquatic Monitoring Partnership n.d.).

Strategy 1.10 Implementation Overview

The Walla Walla Basin Strategy-Implementation Work Group met in June 2022 to discuss the monitoring strategy described in the Strategic Plan. The work group's overarching goal in implementing this strategy is to avoid developing a new strategy from scratch and instead focus on leveraging existing efforts and collaborations to encourage greater integration of data and communication of results. More specifically, the work group proposed that the goal of the monitoring strategy should be to: ***track resource status, inform future project needs, communicate to the public, and inform adaptive management.***

The group proposed a strategy built around integrating ongoing tracking of status and trends for specific physical and other habitat characteristics. This effort will work to bring together fish and other species data and validate improvements in the watershed. The remainder of this

section discusses the entities who will be involved in implementing this strategy along with their roles, and then discusses a phased approach to implementation.

Lead entities, partners, and roles

Implementing the monitoring strategy is a cooperative effort and therefore will be led by a collaborative group. There are currently several groups working to collaborate on different monitoring efforts in the basin, some formally and some informally. For fish-specific data, CTUIR, OR and WA meet in a forum called Walla Walla Management Monitoring Evaluation and Operations Committee (WWMMEOC). This group disseminates data publicly, but not in a user-friendly, widely accessible way. Habitat monitoring data is primarily managed by CTUIR, WWBWC, and the Snake River Recovery Board. These three entities do not currently collaborate formally as a group but do share information and collaborate at a basic level. As noted above, water quality, water quantity, and groundwater monitoring are conducted by a variety of groups and there is no current effort to bring all the data together in one place.

The first and most critical step implementing Strategy 1.10 will be to select the entities to collaboratively lead the monitoring strategy development. As noted above, this will most likely consist of staff from entities currently involved in monitoring including some or all CTUIR, ODWF, ODEQ, OWRD, WWBWC, WA Ecology, WDFW, Kooskooskie Commons, and/or the Snake River Recovery Board. Once the lead group(s) are identified, their first task will be to develop a blueprint for integrating existing monitoring efforts.

Strategy 1.10 Phasing/Implementation Steps

Phase 1: Develop a Blueprint for an Integrated Monitoring Effort

While monitoring efforts are ongoing in the basin and some of these efforts are coordinated through existing partnerships and committees, the most important task for the monitoring team is to develop a plan to bring all monitoring data under one umbrella to allow the basin to meet its goal to track resource status, inform future project needs, communicate to the public, and inform adaptive management. Developing this plan will start by selecting key physical and other habitat and species characteristics to track based on status and trends. These data should be selected based on how well they represent overall progress implementing a suite of project types and progress toward basin wide goals for limiting factors and habitat/species targets. PNAMP's FAIR (findable, accessible, interoperable and reusable) guidance is also useful in designing the blueprint.

The implementation work group suggested that five or six high-level indicators would likely be sufficient for this strategy. From a high-level perspective, the vision is to develop quantitative indicators to directly measure habitat improvements (flow, temperature, stream habitat, sediment, floodplain connectivity, etc.) and to use fish metrics as a barometer of change but not a direct indicator of habitat improvement. The complicated life history, as well as out-of-basin factors, makes the use of anadromous salmonid abundance, productivity, and survival very challenging as it relates to improvements in habitat conditions, and can be misleading. The monitoring group will make a final decision when designing the blueprint, but high-level indicators could include:

- ***Water and streamflow indicators***: progress toward meeting stream flow targets and water temperature goals (corresponds to CTUIR's Hydrology data).
- ***Fish species indicators***: including adult returns, spawning and redd surveys, harvest and fishery data, hatchery smolt release and adult return data, juvenile survival abundance estimates, Adult to Smolt survival rates (this is the most direct measure of fish response to habitat improvements but does have confounding factors that can influence the results), and smolt smolt) abundance and survival data, and others.
- ***Habitat indicators:*** measures of habitat complexity (i.e., pools/riffles per mile, number of log and other structures), habitat quantity (i.e., weighted linear feet of habitat), substrate/fines, floodplain connectivity, and riparian areas/density miles of riparian area planted (including number of plantings) and with exclusion fencing installed, etc (corresponds to CTUIR's Geomorphology and Riparian Vegetation data) and available spawning and rearing habitat.
- ***Passage/Connectivity indicators:*** this will reflect progress toward addressing, and fixing, all known passage barriers and continually working to identify barriers that are currently unknown (corresponds to CTUIR's Connectivity data).

There is also some discussion about whether the monitoring strategy should include a set of socioeconomic indicators to provide data about how implementing the strategic plan is affecting the communities in the watershed. These data could include information about the number of acres in production, farm incomes, municipal water population/water demand data and other factors at the intersection of the human and aquatic communities of the watershed. However, Strategy 1.10 is specific to "fish, habitat and water" and therefore socioeconomic and economic indicators are not considered in this strategy.

Once the specific high-level indicators are selected, 1) the monitoring team will need to determine what data supports each of them, 2) who currently collects that data and where it is stored, and 3) then develop a plan to acquire that data and host it in a shared database or other platform. The monitoring team could develop a matrix where monitoring practices and ongoing monitoring efforts are grouped by which indicator they inform. This process could help identify specific data gaps and for any indicators that are missing data, the team can either develop a plan to implement the required monitoring, select a different indicator, or figure out a way to track the indicator without the missing data.

Phase 2: Identify Funding Sources

Funding monitoring efforts can be challenging. Coordinating and integrating these may also prove challenging to fund. As part of Phase 2 of the Walla Walla Basin Strategic Plan, a separate funding strategy considers potential funding sources for monitoring and metering. Table 7 below lists the various potential funding sources identified so far as well as who is eligible to apply for funding and what the sources fund specifically. Many of the grant programs in Table 7 may fund components of monitoring and metering as part of other conservation initiatives or projects.

Phase 3: Develop Platform for Housing Monitoring Data and QA/QC Process for Compiling and Entering Monitoring Data

Another critical element of this strategy will be the platform for housing data and disseminating monitoring results and progress on indicators. When the work group met in June 2022, meeting participants suggested a web-based, live map, like the ones currently used in the Tucannon Basin in WA, [7] and produced by Washington Water Trust[8] as an example. A tool like this can serve dual purposes – providing a portal for the public to access information about projects and progress, while also providing a focal point for monitoring data and collaboration. CTUIR's Fisheries Habitat Program currently hosts a web-based map[9] and this provides a foundation on top of which an expanded platform could be developed.

One important step will be determining whether a tool like the Tucannon web map can be used both to house all the monitoring data and provide a public portal, or whether two separate platforms may be needed. It is possible to design a web map like the Tucannon map that has a public facing side connected to a back-end database that is not fully accessible to the public. The back end would house all the monitoring data or connect to databases like Washington's EIM database, while the front-end map would only display selected data that might be more interesting to the public and illustrative of project outcomes and high-level trends. Another option is to have two separate platforms – a web map with the sole purpose of providing information to the public on projects and progress, and a database where monitoring data is housed.

Phase 4: Convene Regular Meetings and Implement Monitoring Strategy

Alongside choosing a platform to host and disseminate data, a critical ongoing need will be facilitating data sharing between existing monitoring efforts and the newly formed collaborative monitoring team. One way to facilitate communication and data sharing would be through regular meetings. The frequency of these meetings could range from quarterly to an annual conference where participants share data and present findings. More regular meetings, for example timed to coincide with Office of Columbia River biennium funding requests, might also be required.

The platform discussed above could also serve as a hub for data sharing. It can connect and bring in data from existing databases like Ecology's EIM database or allow for direct entry of data for projects that are not a fit for the EIM database (for example projects in Oregon). Ongoing database maintenance will also require consistent quality assurance (QA) and quality control (QC).

Adaptive Management

Part of the blueprint for a monitoring framework should include regular check-ins on implementation success – monitoring of the monitoring strategy, in other words. This could be

[7] See https://tucannonriver.org/projects/ (last visited July 6, 2022)

[8] See https://www.washingtonwatertrust.org/rivers-we-restore/ (visited November 29, 2022)

[9] See https://fisherieshabitat.ctuir.org/our-work/ (last visited August 5, 2022)

informal, simply part of the regular meetings undertaken to implement the strategy, or it could be more formal like a checklist or other tool that is used to determine whether implementation is on track.

Strategy 1.15: Expand and fund streamflow gauges throughout the basin

The current network of stream gauges in the Walla Walla Basin is insufficient to precisely monitor and regulate the full range of water rights across the WA and OR sides of the Walla Walla watershed; nor is it sufficient to fully enable accurate bi-state water management.

Regulating instream water rights alongside out-of-stream uses, especially across a border, requires a carefully considered system of gauges that ideally is remotely accessible and provides data in real-time. Gauges must be located strategically in relation to points of diversion and key river reaches for instream water rights. Strategy 1.15 calls for a concerted effort to expand and fund the streamflow gaging network to meet current and future challenges with intra and bi-state water management and water right regulation.

This strategy has two parts: installing new gauges and bringing gauges back online that previously functioned. During Phase I of the Strategic Planning process, the Strategic Plan Advisory Committee (SPAC) members provided input on potential additional gauge sites in Washington. Washington's Office of the Columbia River (OCR) has already proposed funding some of these sites. Table 5 lists new gauge locations identified by the SPAC in the basin.

Table 5: Potential New Gauge Locations

Stream	Location	Notes
Pine Creek	@Sand Pit Road	The site represents the contribution of Pine and Dry Creek (Oregon Dry Creek) to the Walla Walla River.
East Little Walla Walla River	@the mouth with the mainstem WWR	Represents the contribution from the East LWWR and Big Spring. The East LWWR contributes significant summer surface flow with cooler water temperatures to the Walla Walla River.*
Yellowhawk Creek	@Hwy 125	Represents the total flow contribution to the Walla Walla River from not only Yellowhawk Creek, but also Cottonwood, Caldwell, and Russell Creeks.*
Walla Walla River	@McDonald Road	The location is downstream of the last large irrigation diversion on the Walla Walla River.
Walla Walla River	Between Cemetery and Nursery Bridge	Assist OWRD with managing instream water rights on the Walla Walla River.
Touchet River	@Sims Road	Ecology opted for a comparable location to the Touchet River @Luckenbill Rd site (below) due to access and data needs.*

** Indicates site was included in the OCR gauge proposal and has either been funded/installed or is still being considered.*

The SPAC also identified a list of historic gauge sites recommended for reestablishment in Washington. Table 5 lists these sites. Of this list, Ecology funded and installed new gages at WWR at Peppers Bridge Rd and Touchet at Luckenbill Rd for three years (2021-2023). Ecology has also submitted an internal request to fund 3 additional gages for 2023-2025. If successful,

this funding would cover gages on Yellowhawk Creek at Highway 125, WWR at McDonald Road, and Wolf Fork of the Touchet River at Mountain Home Park.

Table 6: Historic Gauge Sites to Reestablish Identified in the Strategic Plan

Stream	Location	Notes
Walla Walla River	Below Lowden	Station ID 32A080
Walla Walla River	Near Lowden	Station ID 32A090
Walla Walla River	@Pepper Bridge Rd	Station ID 32A120*
Touchet River	@Luckenbill Rd	Station ID 32B090*
Touchet River	@ County Walla Walla Columbia County Line	Station ID 32B110
Touchet River	Above Dayton	Station ID 32B140
Yellowhawk Creek	@the Mouth with WWR	Station ID 32D050
Yellowhawk Creek	Near mouth	Station ID 32D060
NF Touchet	Above Jim Creek	Station ID 32E150
Dry Creek	Near mouth	Station ID 32F060
Dry Creek	@Hwy 125	Station ID 32F150
Coppei Creek	Near mouth	Station ID 32G060
Coppei Creek	Near Coppei	Station ID 32G100
East Prong of Little Walla Walla	@Stateline	Station ID 32H090
Robinson Fork	Above Wolf Fork of Touchet Rover	Station ID 32J070
Wolf Fork Touchet R	@ Mountain Home Pk	Station ID 32K070*
S.F. Touchet R.	Near Mouth Above Dayton	Station ID 32L070
Cottonwood Creek	Near Mouth	Station ID 32M060
Cottonwood Creek	@Hood Road	Station ID 32M100
Russell Creek	Near Langdon	Station ID 32N070

** Indicates site was included in the OCR gauge proposal and has either been funded/installed or is still being considered.*

The cooperative USGS groundwater study will also help to expand measurement of streamflow in the basin. USGS will install and operate two additional gauges, one on Mill Creek at Last Chance Road and one on the Walla Walla River at 15th St. Bridge in Milton Freewater (Long et al. 2021). In addition to gauge installation, the groundwater study is considering quarterly discrete streamflow measurements at approximately 30 ungauged sites, installation of continuous gauges that monitor stage but not flow (which are cheaper than flow gauges), installation of cameras to document presence/absence of flow, and using pressure transducers or temperature sensors to document presence/absence of flow (Long et al. 2021).

Finally, as part of the effort to expand streamflow gauging, it is important to recognize that the end use of gauge data can help guide planning for where gauges are installed and what types of gauges and measurement approaches are used. For example, for regulating water rights,

continuous, real-time gauges that are accessible on-line should be the standard. However, as the USGS groundwater plan recognizes, other approaches can supplement streamflow data in the watershed and these can be cheaper and less rigorous than the system of gauges used for water right regulation and specific management actions.

Strategy 1.15 Lead entities, partners, and roles of each

The primary entities involved in stream gauge installation, operation and use are OWRD, Ecology, the Walla Walla Basin Watershed Council and, to a lesser extent, the USGS. As the water regulating agencies, OWRD and Ecology have the most capacity and responsibility to oversee the expansion of the gauging network and to put the data from the network to best use. USGS can play the role of supplementing the states with technical expertise resources.

Strategy 1.15 Phasing/Implementation Steps

Phase 1: Finalize List of New Gauge Sites and Historic Sites to Reestablish

The first step is to prioritize the new and existing gages listed in Table 5 for funding based on water management goals. Phase 2 should focus on securing long-term funding for the prioritized gages.

Phase 2: Secure Funding

While some of the sources identified below in Table 7 may provide funding for stream gauging, funding this strategy will likely need to come from state budgets and perhaps also federal funds for USGS sites. It is important to note that funding for stream gauging needs to include not only funds to purchase and install infrastructure, but also to staff, operate and maintain gauging sites. Based on recent legislative requests and information provided by Ecology staff in Washington, funding required to operate one gauge for one year is approximately $20,000. (new gauges cost around $28,000/yr and $18,000/yr in subsequent years). OWRD staff estimate it takes approximately $15,000 per year to maintain and operate a near real-time station in Oregon, with installation ranging from $10,000 to $25,000. Staffing for expanded streamflow gauging was recommended at 1 full time equivalent (FTE) for each state. The approximate cost of one FTE in Washington is $140000; the cost in Oregon is likely slightly lower but in a similar range.

Adaptive Management

Adaption in implementing this strategy could be required if funding is not available and if technical problems occur. The likely adaptations to lack of funding is to postpone gauge rehabilitation or installation until funding is received, or to look for a different funder or funding partnership. Technical problems with installation or problems with gauges occurring due to flooding or other natural processes can be expected. These simply need to be dealt with as they occur and no special adaptation strategies are required.

Strategy 1.20: Improve agricultural irrigation metering and reporting programs in Washington and Oregon by installing telemetry and improving data use by agencies and water users

Another priority strategy identified in the Strategic Plan is improving data collection and reporting related to agricultural water diversion and use. Improving data on agricultural water

use has two primary purposes: 1) to support agriculture's ability to thrive despite growing scarcity; and 2) to enable precise water management that gets water where it is needed, when it is needed, while balancing competing demands for in and out-of-stream supply.

This strategy could be implemented through one or a combination of several paths. The first is through increased installation and use of meters and other devices to directly measure water as it is diverted from rivers and streams (at headgates), transported to fields (through ditches and/or pipes), and used for irrigation (on sprinklers, laterals, etc.). These measurements are critical for water management but by themselves miss a critical part of the water budget: consumptive use (CU) (or evapotranspiration (ET)) by crops. Measuring CU can provide both growers and water managers with insights into how to best allocate water in time and space.

CU can be estimated using localized climate and crop data and measurements, or it can be measured directly, for example by installing instruments like an Eddy Covariance Flux Tower. More recently, tools, such as OpenET, have been deployed to measure CU remotely.

Strategy 1.20 Phasing/Implementation Steps

Phase 1: Develop a Current Inventory of Irrigation Metering and Reporting on the Ground to Identify Gaps

Metering, especially telemetered, real-time metering, is currently limited. But before trying to expand the basin's metering infrastructure, it is important to have a full inventory of existing metering and reporting. It will be important to understand the meters that have been installed which are functioning properly. Review of existing reporting data that has been submitted to OWRD and Ecology will be one source of information. There may also be meters installed and operating where the water user does not report to either of the state agencies; evidence of these will be more difficult to find, but OWRD and Ecology staff may know of some of these locations.

Phase 2: Develop a Prioritization Strategy for Deploying New Metering Infrastructure

Once the inventory is complete, the next step is to prioritize where to install new meters, fix existing meters, and upgrade technology on existing meters in the basin. In addition to fixing existing meters or installing new meters where needed, consideration should be given to where and when telemetered meters would be informative for water users and managers. For example, the implementation work group may recommend that surface water diversions above a certain volume threshold would benefit from remote read telemetry. Prioritization for future metering work could consider several factors:

- Existing metering regulations
- Location of diversions relative to important river reaches
- Size of diversion (either alone or in comparison to average flows at the headgate)
- Feasibility of installing a meter (i.e. piped systems versus open ditch systems)
- Water user willingness

During this phase, the role of OpenET and/or other tools that can remotely measure and track CU should also be considered. Combined with metering data from key diversions, tracking actual CU could provide an important source of data for water management planning and

decision-making. Ecology is currently pursuing installation of two Eddy Covariance Flux Towers to ground-truth the OpenET data for the Walla Walla watershed.

Phase 3: Improve tracking and utilization of metering data at the state level
Washington and Oregon have different resources available for tracking and synthesizing metering data. Water meter reporting can come in multiple formats and may be inconsistent or missing information (Tracy Band personal communication 2020). Staff time can be limited for following up or processing this information and the state water agencies along with the work group should discuss how to improve the current system to best utilize metering data.

Adaptive Management

The need to adapt this strategy is most likely to come from two places: 1) hesitancy of water users to install new meters or 2) to report on water use, and technical hurdles with installing metering on existing diversion and transmission infrastructure. Both contingencies are likely and therefore the prioritization strategy discussed above should be clear about what to do when they occur. Landowner hesitancy will likely lead to shifting focus to other prioritized locations and continuing outreach to the hesitant landowner. Success installing meters on neighbors' systems and having consistent communication about regulatory requirements and demonstrating how the data are used by both regulatory agencies and water users can help build trust with hesitant landowners.

Possible Barriers and Relationship to Other Strategies

Potential Implementation Barriers

Four high-level barriers and a set of technical hurdles could stand in the way of success implementing the monitoring and metering strategies described in this scoping memo. The first high-level barrier is funding the capacity required for monitoring efforts and for the time and technical support needed for coordinating a basin wide monitoring strategy. As noted in the memo, funding for monitoring, especially consistent, ongoing funding for large-scale (i.e., not related to a single project) monitoring can be difficult to secure. The second potential high-level barrier is continuation of siloing between jurisdictions and disciplines. It can be difficult to coordinate monitoring efforts across agencies due to discrepancies in prioritization, funding, capacity, timing and personal and other differences between personnel. Collaboration across jurisdictions and between disciplines like streamflow gauging and fish habitat will require intention and focus and will need to start at the leadership level of all the coordinating organizations. The third potential high-level barrier is inconsistency in standards. Integrating monitoring data requires shared agreement on structuring monitoring implementation, choosing core indicators and their related collection methodologies, designing statistically valid analytical approaches, and data management practices (Pacific Northwest Aquatic Monitoring Partnership n.d.).

The final potential high level barrier is resistance by the water user community to greater scrutiny of water diversions and use and increased regulation of water rights resulting from a more robust streamflow and groundwater gauging/monitoring network. Water user resistance can impact the uptake of any voluntary effort to expand water use metering and reporting and

can also impact legislative proposals for compulsory measurement or funding for expanding monitoring and measurement. The water user community in the Walla Walla basin generally understand the value of increased measurement in terms of better water management, but some resistance may be present as well.

In addition to these potential high-level barriers, a set of technical hurdles might also hamper success of expanded monitoring and metering strategies. These include:

- accuracy and precision of gauging infrastructure;
- the technical difficulty of monitoring biological responses to physical habitat changes;
- QA/QC of monitoring data as it is collected and entered and over time;
- lack of standardized/shared vocabulary for metrics across and within disciplines/jurisdictions; and
- technological hurdles with integrating/connecting to existing databases (like Ecology's EIM) with a new data platform/hub.

Relationship with other strategies

The monitoring and metering strategies are unique among the Tier 1 strategies because they are related to every other strategy in the Strategic Plan. Monitoring is critical to the success of each strategy because it provides the feedback loop that helps determine success and informs adaptive management and responses to challenges and unforeseen circumstances. As discussed below, monitoring and metering are also key for tracking progress toward Desired Future Conditions (DFC) identified in the Strategic Plan.

Geographic Focal Areas for Strategies

The general focus for all three monitoring and metering strategies is basin wide and, where relevant includes surface water, groundwater (including springs), and tributaries to the region's main rivers and streams. Focal areas for the streamflow gaging strategy (1.15) are listed in Tables 4 and 5. The Implementation Work Group may want to consider other geographic priorities for monitoring (Strategy 1.10) and metering (Strategy 1.20).

Discussion of Contribution to Desired Future Conditions (DFCs)

This section briefly summarizes each of the three strategies contributions to the Desired Future Conditions from the Walla Walla 2050 Strategic Plan.

Strategy 1.10

This strategy contributes to 15 out of the 15 DFCs articulated in the Walla Walla Strategic Plan. By design, an overarching monitoring strategy should allow basin stakeholders to track and report on progress toward each DFC and the specific projects and other actions that make up each DFC.

Strategy 1.15

Expanded streamflow gauging will also support 15 out of the 15 DFCs from the Strategic Plan. Table 7 below provides more detail on how this strategy supports the DFCs.

Table 7: Specific Strategy Contributions to DFCs

Desired Future Condition	Connection with Strategy 1.15 (Expand Streamflow Gauging)
Floodplains, Critical Species, Habitat, & Water Quality	
Achieve healthy, natural floodplain function	Provide accurate, up-to-date streamflow and groundwater data for hydrologic analyses required for designing, implementing and monitoring projects
Increase access to quality habitat	
Increase riparian cover	
Increase river channel complexity and naturalize channelized streams	
Restore a natural sediment transport regime	
Meet TMDL targets	
Increase critical fish species populations and abundance levels necessary to meet delisting criteria, support sustainable natural production, and provide a fishery for Tribes and the general public	
Water Supply, Streamflows, & Groundwater	
Build resiliency and redundancy in the agricultural water supply to meet current and future water demand	Improve water managers' and water users' ability to get water where it is needed, when it is needed and in the right amount
Stabilize aquifer levels to support water resources and water for people and farms	Provide data necessary to support analyses and projects
Enhance instream flows to meet instream flow targets for critical species	Allow both Oregon and Washington to better manage instream water rights
Increased natural infiltration, acreage, and duration of inundation	Provide data necessary to support analyses and projects
Land Use & Flood Control	
Reduce flood risk for people and cities	Provide data necessary to support analyses and projects
Meet TMDL targets	
Create climate resilience for basin water resources	
Quality of Life	
Sustain and improve quality of life in the Walla Walla Valley by supporting community health with clean and reliable domestic water supply as well as opportunities for outdoor recreation and sustainable tourism	Provide data necessary to support analyses and projects

Strategy 1.20

Improved metering and reporting supports 3 out of the 15 DFCs from the Strategic Plan. Table 8 below provides more detail on how this strategy supports the DFCs.

Table 8: Specific Strategy Contributions to DFCs

Desired Future Condition	Strategy 1.20: Improve Metering and Reporting
Water Supply, Streamflows, & Groundwater	
Build resiliency and redundancy in the agricultural water supply to meet current and future water demand	Provide real-time water use data to improve water use efficiency and enable more nimble management of available supplies.
Enhance instream flows to meet instream flow targets for critical species	Metering and reporting will allow OWRD and Ecology to carefully regulate all water rights including instream water rights
Land Use & Flood Control	
Create climate resilience for basin water resources	More and better data on real-time water diversion and use is a foundation of managing water supply in the face of scarcity and other climate impacts

Future Work and Funding Needs

Future Implementation and Budget Needs

The following budget table represents a draft annual budget for all three Monitoring and Metering Strategies this Budget is meant to supplement existing resources that support current monitoring and metering work.

Table 9: Preliminary Draft Additional Annual Budget Needs for Tier 1 Monitoring and Metering Strategies

Strategy	Monitoring & Metering Action	Sponsor	Funding Needed ($)
1.10 (Develop overarching Monitoring Strategy)	Mill Creek PIT Tag Arrays	WDFW	$150,000
1.10 (Develop overarching Monitoring Strategy)	Monitoring (Habitat and Fish)	WDFW, CTUIR, ODFW	$175,000

Strategy	Monitoring & Metering Action	Sponsor	Funding Needed ($)
1.15 (Expand streamflow gauges)	Installation and operation of existing and requested new gages, evaluation of all discontinued ECY gages/locations, staff resources for data synthesis and sharing online	OWRD, Ecology	$210,000
1.20 (Improve metering and reporting)	Field meter checks, installation of telemetered meters, identify operation issues, identify database options, review existing examples and platforms, agency staff needs, meter maintenance, communication and outreach (4 FTE)	WWCCD, Ecology, OWRD	$565,000
1.20 (Improve metering and reporting)	Walla Walla OpenET: Installation of two new Eddy flux stations in the basin. The stations will aid in the validation of ET measurements made using OpenET. WSU AgWeatherNet would be able to install and manage the stations. Locations for the new stations will be determined by Ecology, OWRD, WSU, and landowners.	Ecology, OWRD	$200,000
		Total:	**$1,300,000**

Note: This is a rough estimate of budget and will likely shift as a detailed budget is developed.

General description of funding source(s)

As mentioned previously, monitoring and metering can be labor and resource intensive and a challenge to fund. The table below lists potential funding sources for the three monitoring and metering strategies and in some cases, these may need to be included a part of broader project requests. A more detailed description of funding can be found in the Walla Walla Basin funding strategy.

Table 10: Summary of Potential Funding Options for Monitoring and Metering

Agency	Funding Source Name	Eligibility (who can apply)	Project Types
Oregon Watershed Enhancement Board (OR)	Monitoring Grants	Local or tribal government, non-profit organization, or institution for higher education	Status and trend monitoring, project effectiveness, rapid bio-assessment, and landscape effectiveness
Department of Ecology (WA)	Streamflow Restoration Competitive Grants	Tribal governments with reservation lands or treaty rights within WA, public entities (state & local governments and quasi-governments), and nonprofits	Water right acquisitions, water storage, altered water management or infrastructure, riparian and fish habitat improvements, watershed function, environmental monitoring, and feasibility studies.
Department of Ecology (WA)	Office of Columbia River Grants	Local government, tribes, non-profit organization, etc.	Capital projects and implementation (no general staff time not related to project implementation)
Natural Resources Conservation Service	Regional Conservation Partnership Program (RCPP)	Partners apply for project awards, NRCS works with partners to set aside funding pools, then producers/landowners enter into contracts to carry out agreed-upon activities	Land management, land improvement, restoration practices; land rentals; entity-held easements; US-held easements; public works/watersheds
Bureau of Reclamation	WaterSMART: Applied Science Grants	Eligible applicants include States, tribes, irrigation and water districts, and other organizations with water or power delivery authority located in the Western US and territories. Universities, nonprofit research organizations and nonprofit organizations located in the US are also eligible if they partner with an entity with water delivery authority	Eligible projects include the development of modeling and forecasting tools, hydrologic data platforms, and new data sets
Bureau of Reclamation	WaterSMART: Cooperative Watershed Management Program	State, Tribe, irrigation and water districts (+ partner NGOs)	Outreach, planning, project design
Bureau of Reclamation	WaterSMART: Drought Response Program/Drought Resiliency Projects	State, Tribe, irrigation and water districts (+ partner NGOs)	Infrastructure improvements; groundwater recovery to supplement supplies during drought (including MAR and ASR); decision support tools, modeling, and measurement

Agency	Funding Source Name	Eligibility (who can apply)	Project Types
Bureau of Reclamation	WaterSMART: Small-Scale Water Efficiency Projects	State, Tribe, irrigation and water districts (+ partner NGOs)	Canal lining/piping; municipal metering; irrigation flow measurement; Supervisory Control and Data Acquisition and Automation; landscape irrigation measures; high-efficiency indoor appliances and fixtures; commercial cooling systems
Bureau of Reclamation	WaterSMART: Water and Energy Efficiency Grants (SCADA)	State, Tribe, irrigation and water districts (+ partner NGOs)	Canal lining/piping; municipal metering; irrigation flow measurement; Supervisory Control and Data Acquisition and Automation; landscape irrigation measures; high-efficiency indoor appliances and fixtures; commercial cooling systems; hydropower; solar, wind energy
Bonneville Power Administration	Columbia Basin Water Transactions Program	Ecology, Washington Water Trust, CTUIR	Monitoring related to instream flow restoration projects funded by the program

Next Steps

This final section highlights immediate next steps for moving each of the three Tier 1 monitoring and metering strategies forward:

Strategy 1.10 Develop an overarching monitoring strategy and adaptive management plan for fish, habitat, and water to inform actions and evaluate effectiveness: A key first step in implementing this strategy is selecting high-level indicators that can track progress on the diverse array of projects and outcomes that will be implemented by the Strategic Plan. At a high level, these indicators will include water and stream flow indicators, fish species indicators, habitat indicators and passage/connectivity indicators. This set of indicators is a key to developing a blueprint for the basin's overarching monitoring strategy. Once the indicators are finalized, the monitoring strategy can be more fully designed by matching specific monitoring efforts and other ongoing projects with relevant indicators.

Strategy 1.15 Expand and fund streamflow gauges throughout the basin: The most immediate next step to implement this strategy is finalizing a prioritized list of gauge sites (both new sites to establish and historic sites that have been decommissioned that should be brought back online). Once this list is finalized, new funding can be sought and funding that has been recently approved or will soon be approved can be dedicated based on the final priorized gauge list.

Strategy 1.20 Improve agricultural irrigation metering and reporting programs in Washington and Oregon by installing telemetry and improving data use by agencies and

water users: While there is general knowledge about the extent of current metering and reporting in both Oregon and Washington, a specific, current inventory of diversion and irrigation metering/monitoring infrastructure does not exist. The first step in implementing this strategy is to develop an up-to-date inventory of current infrastructure and, to the extent possible, the status and reporting history of the infrastructure (calibrated and functioning, with regular reporting versus installed but not functioning/reporting for example). Once this list is developed, the next step is to prioritize where to spend available funding to install new meters, fix existing meters and upgrade technology on existing meters in the basing. Concurrent with this effort, Ecology is working to ground-truth the OpenET tool for use in the basin to monitor irrigated crop consumptive use.

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