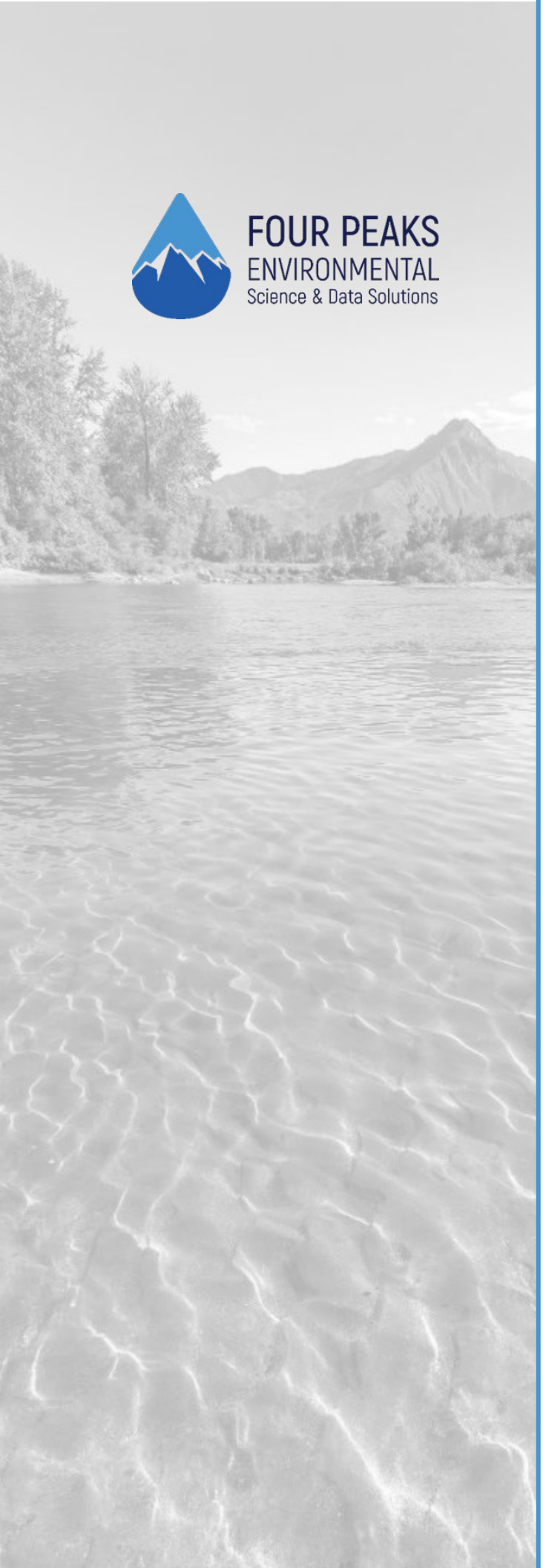

FOUR PEAKS ENVIRONMENTAL
Science & Data Solutions

COLUMBIA BASIN WATER TRANSACTIONS PROGRAM FISCAL YEAR 2024 WORK PLAN

February 2024

Prepared for
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Abbreviations

Abbreviation	Definition
7DADM	7-day average daily maximum
BPA	Bonneville Power Administration
CBWTP	Columbia Basin Water Transactions Program
cfs	cubic feet per second
DO	dissolved oxygen
FRAF	Flow Restoration Accounting Framework
NFWF	National Fish and Wildlife Foundation
NOAA	National Oceanic and Atmospheric Administration
NPCC	Northwest Power and Conservation Council
POD	point of diversion
QLE	Qualified Local Entity
RM	river mile
USFWS	U.S. Fish and Wildlife Service

1 Introduction

This monitoring work plan for the National Fish and Wildlife Foundation (NFWF) Columbia Basin Water Transactions Program (CBWTP) is intended to provide guidance and support to Qualified Local Entities (QLEs) to facilitate the transition to new data collection protocols, a new data management system, and new reporting functions implemented in fiscal year 2023.

1.1 Program Organization

The Bonneville Power Administration (BPA)—in cooperation with the Northwest Power and Conservation Council (NPCC)—funds and oversees the CBWTP, which is administered by NFWF. In addition, a Technical Advisory Committee meets three times a year to review, rank, and make funding decisions for proposed water transactions. The Technical Advisory Committee comprises individuals from NFWF, BPA, NPCC, National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS), and the Confederated Tribes of the Umatilla Indian Reservation. Additionally, NFWF is supported by legal counsel, an economic valuation firm, and an external monitoring consultant. Each of these stakeholders has an interest in understanding the effectiveness of the CBWTP.

1.2 Goals

The goal of the CBWTP is to restore the ecological integrity of streams and associated ecosystem services by increasing instream flow. Execution of the CBWTP is still guided primarily by the Flow Restoration Accounting Framework (FRAF; McCoy and Holmes 2015), and monitoring guidelines outlined in Holmes et al. 2013 and Holmes et al. 2021 remain applicable. However, data collection and management processes were recently updated to increase program accountability and support key programmatic goals.

NFWF identified the following detailed monitoring goals to increase program accountability:

- Identify water transactions with monitoring exemptions, and track justification.
- Confirm contract compliance by verifying non-use of transacted water rights.
- Quantify the net change in instream flow within the beneficial reach.
- Quantify links between instream flow augmentation and physical habitat enhancements.
- Identify links between quantified habitat enhancements and observed improvements to fish population ecology.
- Link instream flow augmentation with upland habitat restoration conducted by external agencies.
- Inform program strategy and adaptations to enable strategic funding of water transactions in basins with the greatest potential benefit to fishes.

1.3 Protected/Beneficial Reaches

The length of stream affected by a water transaction is generally referred to as a protected, target, or beneficial reach. For the purposes of the CBWTP, this length of stream is referred to as the “primary beneficial reach.” The definition of a primary beneficial reach is “a defined stream reach for a specific water right which begins at its associated point of diversion (POD) and extends downstream to an identified location where the flow could be legally diverted or the effects of the additional water (e.g., on discharge volumes, water temperature, or physical habitat characteristics) are no longer measurable, generally whichever occurs first” (Holmes et al. 2013). To decrease ambiguity, NFWF will ask QLEs to provide a description of what defines the downstream endpoint of a primary beneficial reach, how it

was determined, and by whom. Typically, the endpoint is defined for the QLE by the state, a water master agreement, or an irrigator agreement, but circumstances may vary based on the water transaction arrangement.

Certain water transactions are also associated with a defined secondary beneficial reach. The definition and implementation of "secondary beneficial reach" vary considerably across states and water transactions. If there is a secondary beneficial reach associated with a given water transaction, the QLEs will be given an opportunity in the transaction proposal checklist to define it, describe it, and provide context on the potential habitat benefits expected in this stream reach. However, CBWTP does not currently quantitatively track flow augmentation or habitat benefits to secondary beneficial reaches in its effectiveness evaluations.

1.4 Tier Definitions

1.4.1 Compliance (Tier 1)

Tier 1 water transactions require monitoring to verify that the legal terms of the contract are fulfilled and are thus in compliance. Compliance monitoring provides substantiating evidence that transacted water is not diverted and generally occurs at a POD, place of use (e.g., previously irrigated field), or, in some unique circumstances, a flow gauge. All transactions, unless explicitly granted a variance by NFWF, will at a minimum require compliance monitoring.

1.4.2 Water Quantity Objectives (Tier 2)

Tier 2 water transactions require monitoring instream flow within the primary beneficial reach (Section 1.3). Flow is monitored using a variety of available methods determined by the QLE and reported to NFWF (Section 3.2). Of note, program effectiveness metrics reported by CBWTP are those flows and volumes contractually protected in the water transaction and are not derived from observed instream flows. Analyses will be conducted by NFWF or a NFWF-hired external monitoring consultant. The goal of analyses will be to understand the overall success of the program at increasing instream flow and (when applicable) making progress towards flow goals or defined flow targets in each primary beneficial reach (Section 1.4).

Water transactions will qualify for Tier 2 if the following criterion is met:

- The water transaction meets the criteria to be a Tier 1 transaction.
- Flow data are available for the primary beneficial reach and are measured at least biweekly (once every 2 weeks).

1.4.3 Habitat Objectives (Tier 3)

Tier 3 water transactions require monitoring the benefits of transacted water to reach-specific aquatic and riparian habitat objectives within the primary beneficial reach. There are four key habitat objectives tracked by CBWTP to assess overall program effectiveness:

1. Miles of water quality improved
2. Miles of increased habitat access
3. Miles of increased stream complexity
4. Acres of improved riparian habitat

Detailed instructions on monitoring metrics are provided in Section 3.3 to assist the QLEs in converting monitoring activities into miles and acres. The goal of this conversion is to quantify the benefit of transacted flows on reach-specific aquatic and riparian habitat outcomes to better demonstrate the impact of the CBWTP.

Water transactions will qualify for Tier 3 if the following criteria are met:

- The water transaction meets the criteria to be a Tier 2 transaction.
- Increased flow is expected to have measurable effects on key habitat objectives.
- There are sufficiently robust monitoring data available to assess trends in relevant habitat metrics within the primary beneficial reach (Section 3.3). Of note, monitoring may be conducted by entities other than the QLE.

1.4.4 Fish Ecology Objectives (Tier 4)

Tier 4 water transactions require monitoring that identifies links between quantified improvements to instream flow and relevant habitat metrics and observed ecological responses such as improved fish population dynamics within the same stream system. QLEs will be asked to provide information on flow-limiting factors identified for species within the primary beneficial reach, which are generally described in NOAA recovery plans, sub-basin plans, or other state, regional, or watershed-level plans or strategies (e.g., ATLAS).

Water transactions will qualify for Tier 4 if the following criteria are met:

- The water transaction meets the criteria to be a Tier 3 transaction.
- The water transaction occurs in streams where fish data (e.g., smolt trap counts, redd counts, weir counts, carcass counts) are available, either from QLE-conducted surveys or via integration with other regional or local monitoring efforts.

NFWF will ask QLEs to provide data that show trends in fish populations over time in addition to context as to how these trends likely relate to the instream water transactions.

2 Monitoring Data Input Overview

QLEs must use the web-based data management system that track the lifecycle of a water transaction (http://nfwf.fourpeaksenv.com). Using this system, QLEs will initialize a new water transaction by submitting a proposal to the data management system through a web application. The QLEs will then use the same web application to upload and track associated monitoring data. The web application is organized accordingly into two component parts: Transactions and Monitoring. These parts are represented as tabs within the web interface (Figure 1).

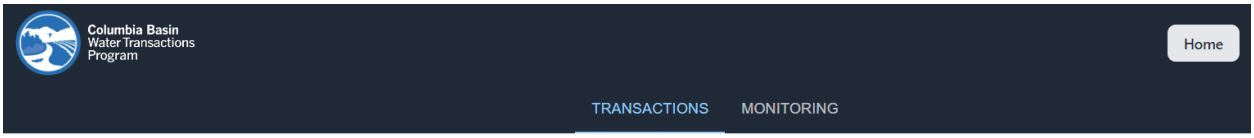

Figure 1. Visual representation of the Transactions and Monitoring tabs on the web interface home page.

The *Transactions* tab is where QLEs submit and track the status of water transaction proposals and track files associated with each water transaction (e.g., legal documents, maps, budget). The water transaction proposal itself provides NFWF and the Technical Advisory Committee with the requisite information to make a funding decision. It will also form the basis for tracking future monitoring requirements of a water transaction. These requirements are based on information entered in the transaction proposal, namely the expected monitoring efforts and associated monitoring locations (i.e., the monitoring plan).

The *Monitoring* tab is divided into *Compliance*, *Flow*, and Habitat & Fish sub-tabs and is designed to enable QLEs to upload and track annual monitoring data to satisfy the monitoring requirements associated with their active (i.e., funded and instream) water transactions.

The following sections provide specifics on how monitoring plans are specified and how monitoring data are to be uploaded in the web application.

2.1 Compliance Monitoring Data Input (Tier 1)

The compliance monitoring plan is specified within the water transaction proposal and the monitoring data uploads are tracked via the compliance monitoring sub-tab.

- Section 2.1.1 documents the information that the QLE will provide in the transaction proposal about how compliance monitoring will be performed.
- Section 2.1.2 documents how the QLE will provide data verifying compliance.

2.1.1 Water Transaction Proposal Compliance Monitoring Plan

Within the water transaction proposal, the QLEs are presented with a yes or no question asking whether the water transaction will be monitored for compliance. If the QLEs select *no*, they will be asked to provide a narrative response explaining why not. If the QLEs answer *yes*, they will be presented with a form requesting the monitoring plan data (Figure 2) for all compliance monitoring locations associated with the water transaction. More information about each data field is provided in Table 1.

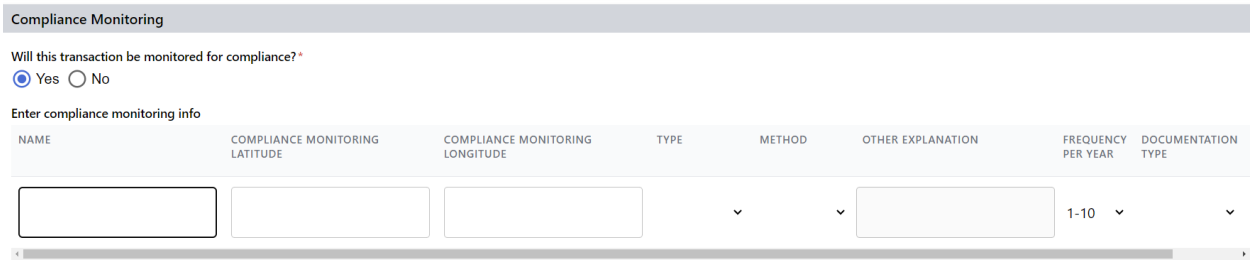

Figure 2. Form presented to Qualified Local Entities to enter compliance monitoring plan.

Table 1. Compliance monitoring data input fields in the water transaction proposal with descriptions and additional guidance.

Data Input	Description		Additional Guidance
Compliance monitoring location name	QLE-assigned name for the monitoring location. This is intended to assist the QLE in identifying the compliance monitoring location during data upload.		The compliance monitoring name must be unique across transactions and flow monitoring locations.
Compliance monitoring latitude and longitude	The coordinates of the monitoring location in decimal degrees latitude/longitude, which will be provided to five decimal places (e.g., 46.97606, -120.64553)		If compliance monitoring occurs at a place of use (e.g., a dry field), QLEs are requested to provide the location where photographs are planned to be taken. If no photographs will be taken (e.g., compliance will be reported via an irrigation district or water master), the QLEs may select a sensible location within the place of use.
Compliance monitoring location type	Select one of: • Diversion • Place of Use	• Flow Gauge • Other	If "Other" is selected, a narrative description of the monitoring location type is required in the "Other Explanation" field. There is a 255 character-limit to the "Other Explanation" field.
Compliance monitoring method	For monitoring at a diversion, select one of the following describing what the QLE will observe to confirm compliance: • Diversion or pump to be permanently removed • Headgate to be closed (no water will be diverted) • Pump to remain in place, but not operating • Flow meter indicating agreed upon flow rate • Weir or staff gauge indicating agreed diversion rate or stage • Other (e.g., stream flow gauge) For monitoring at the place of use, select one of the following describing what the QLE will observe to confirm compliance: • Georeferenced ground-level photographs using Solocator application • Drone or other aerial imagery • Reported by irrigation district • Reported by water master • Other For monitoring at stream flow gauges (primarily used for transaction involving minimum flow agreements or in streams where all water is transacted), the only option available is for the QLE to evaluate the flow data for compliance.		If "Other" is selected, a narrative description of the monitoring location method is required in the "Other Explanation" field. There is a 255 character-limit to the "Other Explanation" field. If there has been a permanent change to the diversion or water source such that it is not feasible for a landowner to be out of compliance with the contract, then only a single verification of compliance is required. Best method includes providing before and after photos with clear explanations such that any person not familiar with the transaction can interpret the verification.

Data Input	Description	Additional Guidance
Frequency per year	The number of times the QLE is expecting to monitor compliance during a year. • 1-10 • 10+	In the case of flow monitoring for compliance, providing daily flow data without context or analysis is not sufficient information to verify compliance. Moving forward, NFWF will require QLEs to analyze submitted flow data to confirm that the transaction is in compliance. The number of times QLEs anticipate doing this analysis will be the compliance monitoring frequency for compliance flow monitoring.

2.1.2 Compliance Monitoring Data Upload

Once the monitoring season is completed, QLEs will upload compliance monitoring data via the compliance monitoring sub-tab found under the monitoring tab (Figure 3).

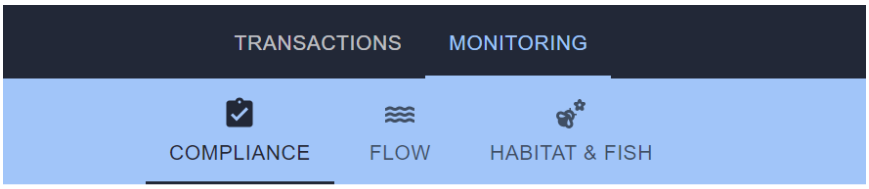

Figure 3. Navigation to the compliance monitoring sub-tab.

On this sub-tab, the QLEs will be presented with a table of all compliance monitoring locations associated with transactions that are in a Funded status.[1] There will be a single row for each transaction-compliance monitoring location combination. For each compliance monitoring location to which QLEs wish to upload data, QLEs will select the upload icon in the *Upload Data* column and will be presented with a form (Figure 4) where the QLE will enter the information specified in Table 2. Once the user selects *Next* in the form, they will be requested to select and upload a monitoring document that demonstrates compliance. As a reminder, there will be entities viewing uploaded monitoring documents that may not be familiar with the water transaction. As such, it is recommended that QLEs provide as much information as possible within the data file uploaded to communicate to a broad audience how to interpret the file. Once the document is uploaded, the user will select *Submit* to finalize the data submission process.

[1] If a QLE wishes to see all transaction compliance monitoring locations, they can select "All" in the upper right corner of the page.

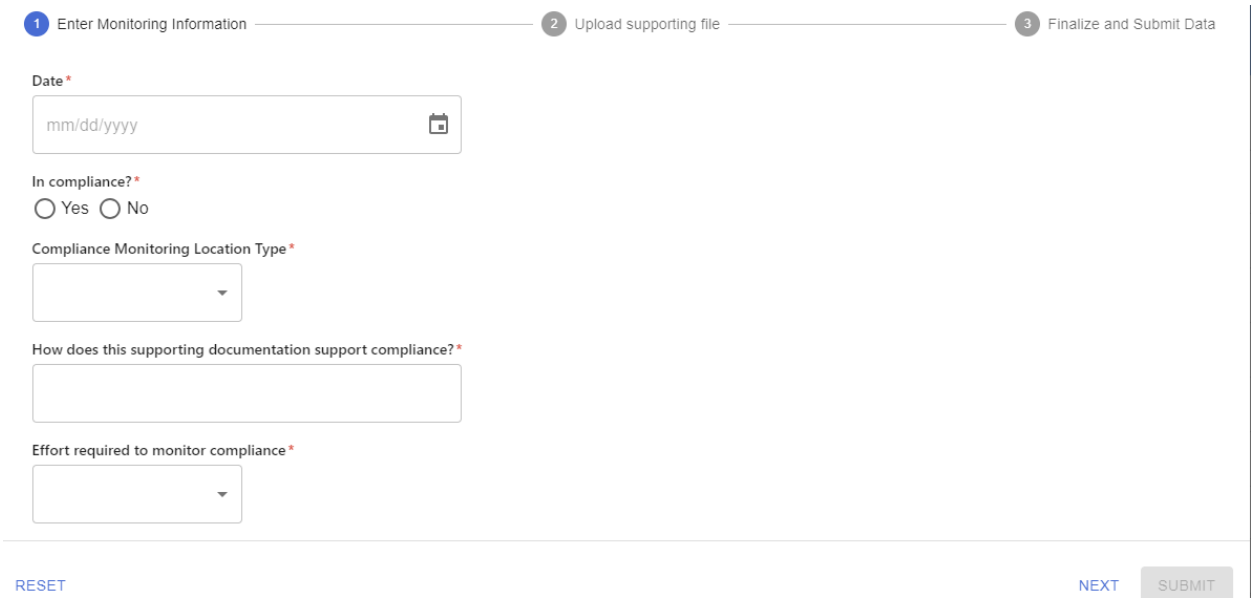

Figure 4. Form presented to Qualified Local Entities to upload compliance monitoring data.

Table 2. Compliance monitoring data input fields presented during data uploads and descriptions.

Data Input	Description
Date	QLEs will enter the date on which compliance monitoring was completed.
In compliance?	QLEs will check a box if the water transaction was in compliance on the date of the compliance monitoring.
Compliance monitoring location type	Select type of compliance monitoring location represented in the data file to be uploaded (i.e., diversion, place of use, flow gauge, or other).
How does this supporting documentation demonstrate compliance?	QLE will enter a narrative of how the uploaded document demonstrates compliance. For instance, “field is dry,” “staff gauge below 3 indicates compliance, picture shows staff gauge at 2.5,” or “stream flow data meets minimum flow agreement flow levels.”
Effort required to monitor compliance	Qualitative assessment (i.e., low, medium, high) from the QLE of the amount of time and energy invested to ensure the water transaction was in compliance on the date compliance was monitored. This field will provide NFWF a sense of how challenging (e.g., remote regions, difficult access, communication issues) certain water transactions are to manage relative to other transactions managed by the QLE.
Select file	QLEs will upload (using a drag-and-drop interface or file selection) the compliance monitoring data file.
Submit	QLEs will be provided a chance to review inputs and associated file name prior to submitting data.

Data upload is confirmed by the green checkmark displayed upon successful submission (Figure 5).

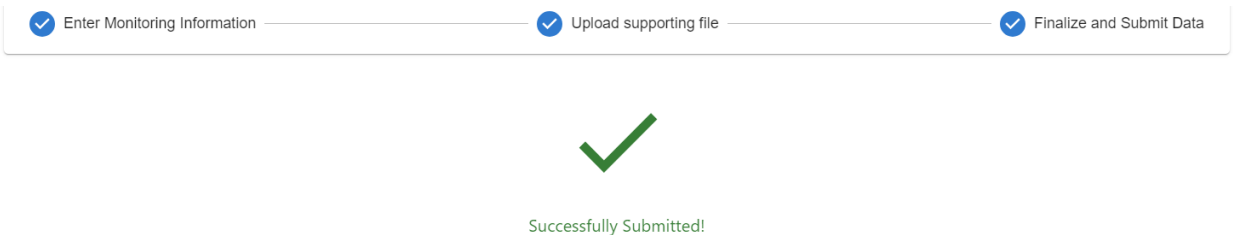

Figure 5. Example of a green checkmark displayed upon successful submission.

2.1.3 Compliance Monitoring Data Confirmation

The monitoring plan associated with the compliance monitoring location and all uploaded files and metadata can be accessed by navigating to the compliance monitoring sub-tab and selecting the hyperlinked name of the compliance monitoring location.

2.2 Flow Monitoring Data Input (Tier 2)

The flow monitoring plan is specified within the water transaction proposal and the monitoring data uploads are tracked via the flow monitoring sub-tab. However, unlike compliance monitoring, prior to specifying the flow monitoring plan in the transaction proposal, flow monitoring locations must first be entered into the flow monitoring sub-tab.

- Section 2.2.1 documents how QLEs create flow monitoring locations and provide associated metadata in the flow monitoring sub-tab.
- Section 2.2.2 provides information on the flow monitoring data requested within the water transaction proposal and how to link a water transaction to a specific flow monitoring location.
- Section 2.2.3 documents how QLEs will upload flow data.

2.2.1 Flow Monitoring Location Data

Data on flow monitoring locations will be entered through interface elements organized in the flow monitoring sub-tab in the web application. QLEs can navigate to the flow monitoring sub-tab by selecting the monitoring tab, then the flow sub-tab (Figure 6). As a reminder, QLEs must create flow monitoring locations prior to attempting to link flow monitoring locations to water transactions.

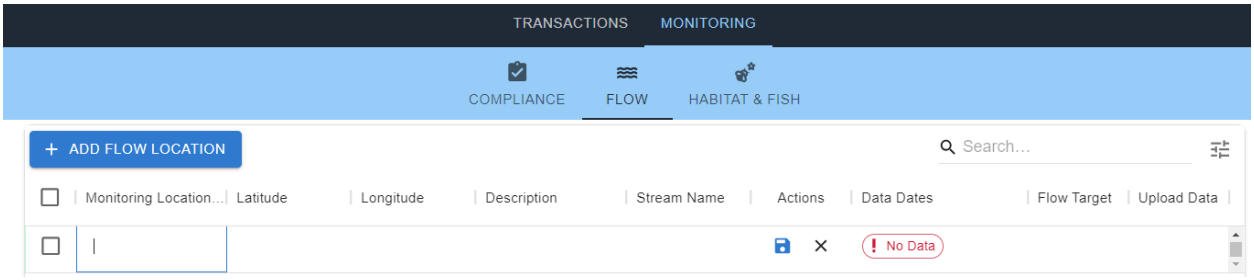

Figure 6. Navigation to the flow monitoring sub-tab and the form presented QLEs when creating a new flow monitoring location.

To add a new flow monitoring location, QLEs will first select *+ Add Flow Location* in the flow monitoring sub-tab. This will add an editable row to the flow monitoring location table (Figure 6) where QLEs will be asked to provide data on the fields specified in Table 3. Once all columns are filled out, the QLE must hit the save icon in the *Actions* column to save the location record.

Table 3. Flow monitoring data input fields in the Flow sub-tab with descriptions and additional guidance.

Data Input	Description	Additional Guidance
Monitoring location name	QLE-assigned name for the monitoring location. This is intended to assist the QLE in identifying the flow monitoring location during data upload.	The monitoring location name must be unique across all the compliance and flow monitoring location names entered by the QLE.

Data Input	Description	Additional Guidance
Flow monitoring location latitude and longitude	The coordinates of the flow monitoring location in decimal degrees latitude/longitude, which will be provided to five decimal places (e.g., 46.97606, -120.64553)	
Description	A general description to help identify the flow monitoring site (e.g., U.S. Geological Survey gauge identifier, information about where a spot flow measurement is taken, other identifying features)	
Stream name	The name of the stream in which the flow monitoring location is located.	The stream name may be different than the stream name associated with the water transactions being monitored at this flow monitoring location. If the monitoring location is in an unnamed stream, use a name deemed most applicable by your organization (i.e., how you reference the stream).

Once the data for flow monitoring locations are saved, QLEs will be presented the option to add a flow objective, flow goal, or established flow target[2] associated with that flow monitoring location. To add flow target information, select *+* in the *Flow Target* column of the associated flow monitoring location. The QLEs will then be presented with a flow target form (Figure 7) where QLEs provide data on the fields specified in (Table 4).

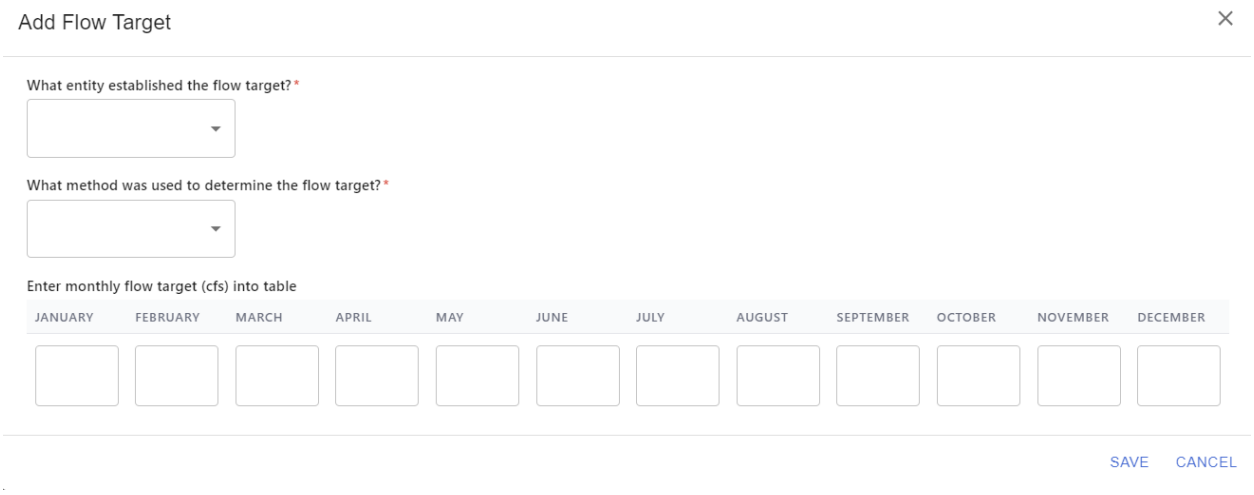

Figure 7. Form presented to QLEs to add a flow target to a flow monitoring location.

[2] For the purposes of the data management system, flow target is used as an inclusive term of flow objectives, goals, or targets.

Table 4. Flow target data input fields associated with a flow monitoring location in the flow monitoring sub-tab with descriptions and additional guidance.

Data Input	Description	Additional Guidance
What entity established the flow target?	Select one of the following: • None • QLE • NOAA • USFWS • Oregon Department of Fish and Wildlife • Washington Department of Fish and Wildlife • Idaho Department of Fish and Game • Montana Department of Fish, Wildlife and Parks • National Marine Fisheries Service • Other	If "Other" is selected, a narrative description of who developed the flow target is required in the "Other Entity" field.
What method was used to determine the flow target?	Select one of the following: • None • Professional Knowledge • Oregon Method • Wetted P Inflection Method • PHABSIM • Instream Flow Incremental Method • Other	If "Other" is selected, a narrative description of what method was used to develop the flow target is required in the "Other Method" field.
Enter monthly flow target (cfs) into table	The flow value (cfs) of the flow target, goal, or objective by month.	

2.2.2 Water Transaction Proposal Flow Monitoring Plan

The water transaction proposal form allows QLEs to link flow monitoring locations within the primary beneficial reach of the water transaction to the water transaction (Figure 8).

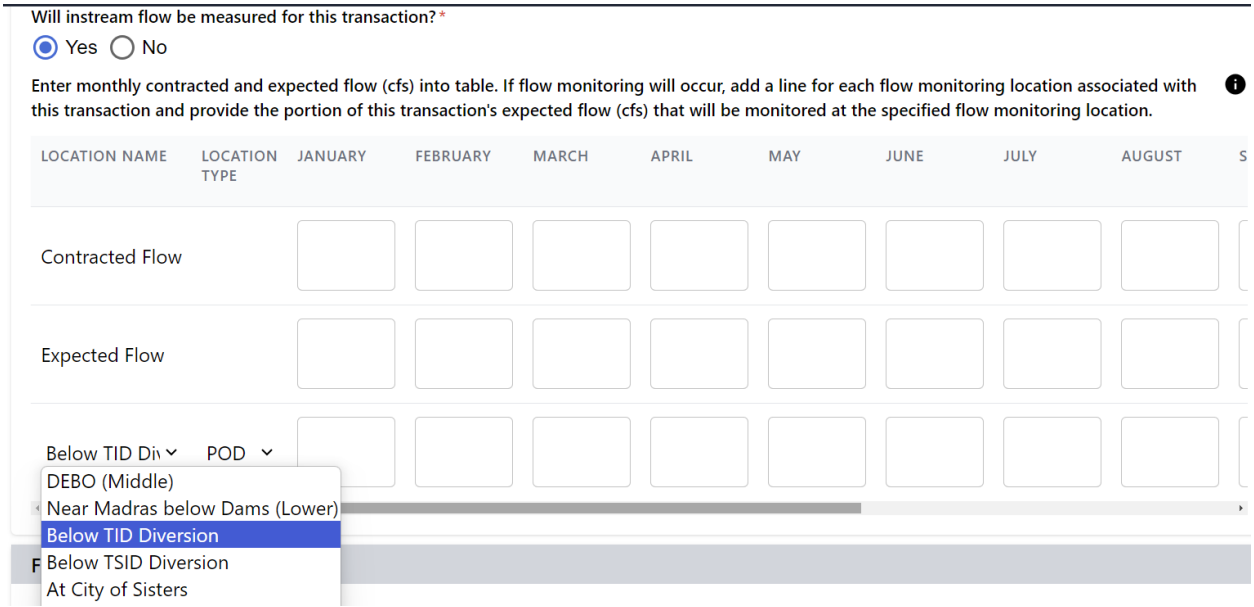

Figure 8. Flow monitoring location data input fields within the water transaction proposal.

In this form, QLEs fill in the cells of the *Contracted Flow* row with the maximum monthly flow rate (cfs) to be protected during the term of the transaction (Figure 8).

If the transaction will also be monitored for flow, QLEs are required to add the applicable flow monitoring locations to the flow data table using the *Add Row* button (not depicted here). Once a new row is added in the flow data table, the QLE is required to enter the following information:

- Monitoring location, which is selected from a dropdown menu containing a list of all flow monitoring locations that have been entered by the QLE (Figure 8).
- Position of the monitoring location relative to the primary beneficial reach.
  - The options include *POD* (point of diversion), *MBR* (middle of beneficial reach), *EBR* (end of beneficial reach), or *Other*.
  - If a QLE selects *Other*, they will be contacted by the monitoring consultant to discuss how the flow monitoring location is able to measure contracted flow when not in the primary beneficial reach.
- The amount of monthly contracted flow (in cfs) that will be monitored at this location.
  - In most cases, these values will match the contracted flow. However, there are instances where transactions have multiple points of diversion and that the selected flow monitoring location is upstream of at least one of those points of diversion. In these cases, enter only that portion of the contracted water that will pass by the flow monitoring gauge.

2.2.3 Flow Monitoring Data Upload

QLEs will upload flow monitoring data through user interface elements organized in the flow monitoring sub-tab on the web application. When a QLE clicks the upload icon in the *Upload Data* column for a given flow monitoring location, the QLE is presented with a file upload form where the flow data file can be uploaded. Flow data must be uploaded as an Excel file (.xlsx) or .csv with the following column headers:

- Datetime: A datetime entry formatted as mm/dd/yyyy HH:MM (e.g., 3/29/2021 17:24)
- Flow (cfs): Measured cfs associated with each datetime entry

A flow data template will be available for download in the file upload form, as needed. The template must be explicitly followed, or the data will not successfully upload. Rigid formatting is required for the data in the files to be ingested into a database (i.e., the file itself is not being saved, only the data). The following are common errors to avoid:

- Column headers that do not exactly match the requirements
- Extra rows or columns
- Blank cells
- Text (e.g., “NA”) in rows that must be either a datetime or numeric format
- Negative values for flow
- Datetime data not in a recognized datetime format

Data upload success can be confirmed by the green checkmark displayed upon successful submission.

2.2.4 Flow Monitoring Data Confirmation

Flow monitoring location metadata and all uploaded flow data can be accessed by navigating to the flow monitoring sub-tab and selecting the hyperlinked name of the flow monitoring location.

2.3 Habitat Monitoring Data Input (Tier 3)

The QLEs indicate that habitat monitoring is planned to occur within the water transaction proposal, but the habitat monitoring plan itself is provided to NFWF via a separate file upload. The separate file upload is to accommodate the wide diversity of habitat monitoring that may occur for any given water transaction throughout the Columbia River Basin. As habitat monitoring data become available, QLEs are provided the opportunity to upload data in the *Habitat & Fish* monitoring sub-tab.

- Section 2.3.1 documents the questions asked within the water transaction proposal.
- Section 2.3.2 documents the information that the QLE will be asked to provide on a habitat monitoring plan upload form.
- Section 2.3.3 documents how the QLE will provide habitat data to the data management system.

2.3.1 Water Transaction Proposal Habitat Monitoring Plan

Within the water transaction proposal, QLEs will be asked two questions for each habitat objective designated by NFWF (i.e., Water Quality, Upstream Habitat Access, Increased Stream Complexity, Riparian Conditions; Figure 9). The first question asks the QLE whether there is an expectation of improvement to the designated habitat objective, independent of whether monitoring will occur. The second question asks whether monitoring of that habitat objective will occur. If monitoring is planned to occur, QLEs must upload a habitat monitoring plan file to the water transaction.

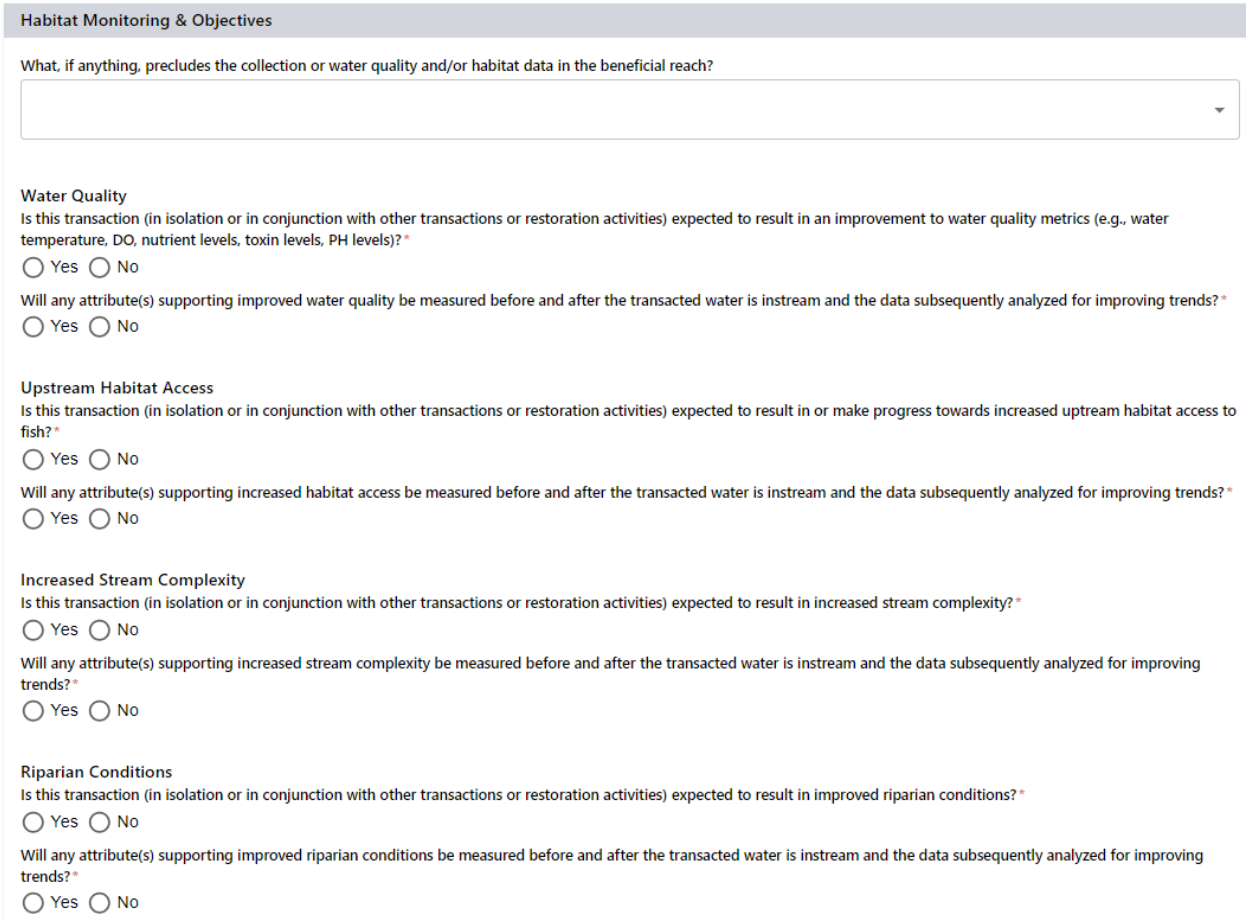

Figure 9. Habitat monitoring notification fields within the water transaction proposal.

2.3.2 Habitat Monitoring Plan Upload Form

QLEs that conduct or liaise with an organization conducting habitat monitoring will fill out a habitat monitoring form (available from NFWF, as needed). This form will solicit the information specified in Table 5 about planned monitoring activities.

Table 5. Habitat monitoring data input fields in the habitat monitoring form and descriptions.

Data Input	Description
What are the habitat objectives?	Select any combination of the following: • Improve water quality • Increase stream complexity • Increase habitat access • Improve riparian habitat
Expected increase	Number of river miles or acres expected to increase/improve with transacted water
Monitoring location	A coordinate, river mile, or general description of the habitat monitoring location(s) associated with this habitat objective
Physical habitat attribute measured	See Section 3.3 for suggestions
Expected improvement	For example, increased pool frequency, temperature to within limits
Monitoring organization	Entity conducting habitat monitoring for this location
Monitoring entity point of contact	First/last name, email, and/or phone number of person in charge of monitoring activities
Analysis organization	Entity assessing the number of acres/miles of improvements/access attained
Analysis entity point of contact	First/last name, email, and/or phone number of person in charge of assessing numbers of acres/miles

2.3.3 Habitat Monitoring Data Upload

QLEs will upload habitat monitoring data through user interface elements organized in the habitat & fish monitoring sub-tab on the web application (Figure 10), found under the monitoring tab.

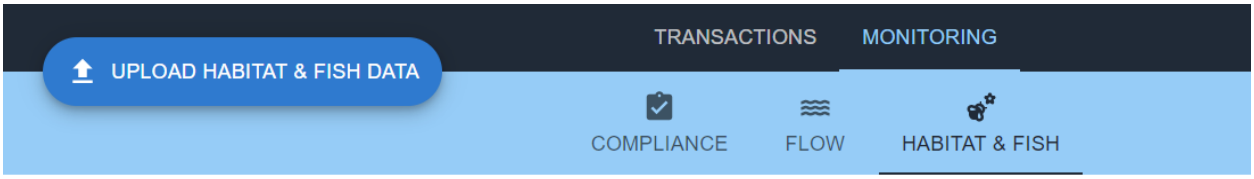

Figure 10. Navigation to the Habitat & Fish Monitoring data upload portal.

To upload habitat data, the QLE will click *Upload Habitat & Fish Data*. The QLE is then presented with a form where information about the data to be uploaded is entered (Figure 11). Unlike compliance and flow monitoring data that are provided annually and are always associated with unique locations, habitat data may be provided at variable frequencies or be associated with more than one water transaction. As such, the QLE must first select the transactions to which the data are related, and during which years the observations were made (Figure 11). The QLE then selects which habitat objectives are substantiated in the document (Figure 11).

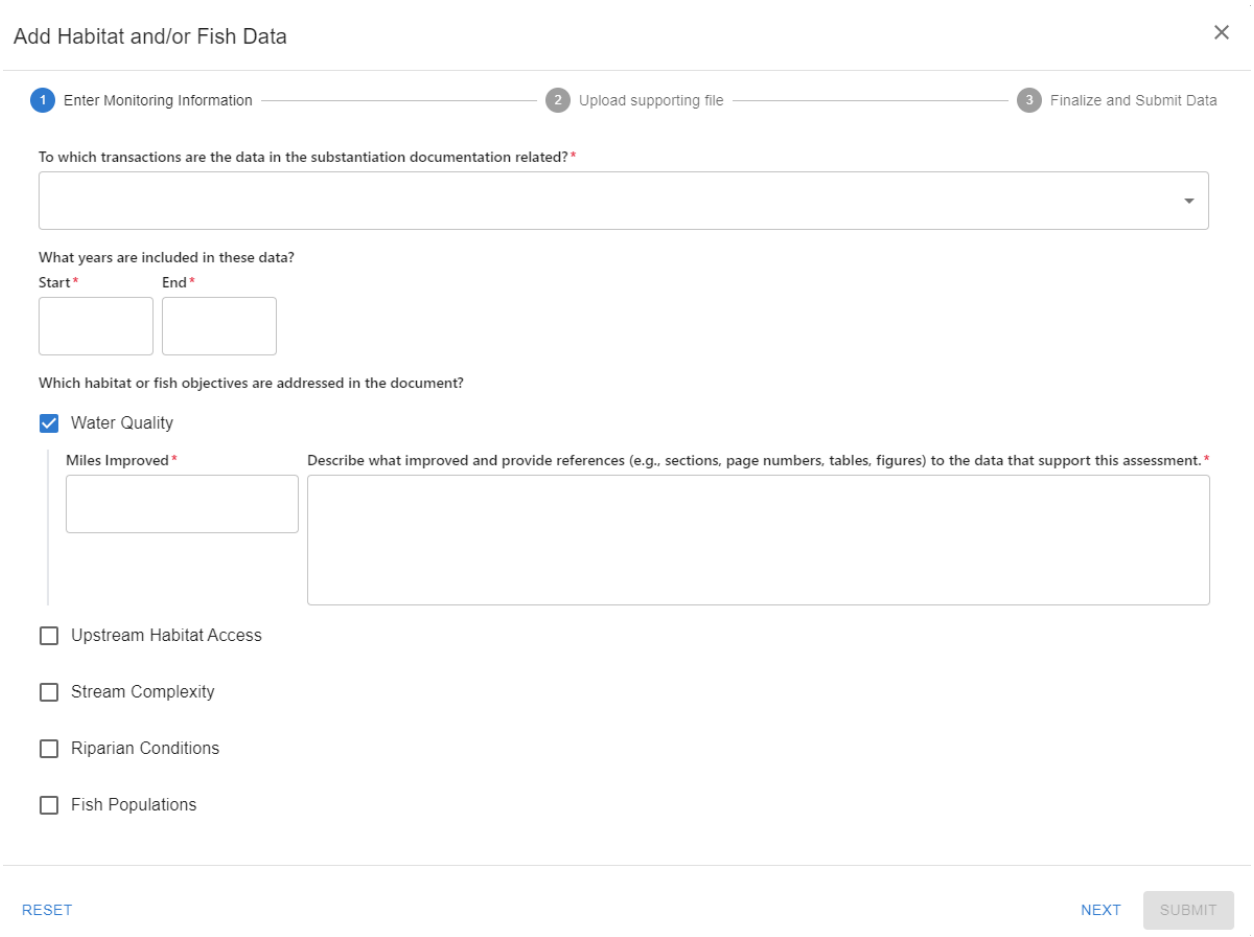

Figure 11. Form presented to QLEs to add a habitat and/or fish data for water transactions.

For each habitat objective selected, the QLE specifies the number of miles (or acres) improved and describes what was measured and how it demonstrates improvement (Figure 11).[3] Guidance on how to specify the number of miles or acres improved is provided in Section 3.3, but generally only habitat benefits that occurred within the primary beneficial reach may be included except for cases where upstream habitat was made accessible because of increased instream flow. Additional benefits from non-flow restoration activities that occurred within the primary beneficial reach may be included in this assessment (e.g., riparian plantings).

Data upload success can be confirmed by the green checkmark displayed upon successful submission.

[3] If the document also includes fish monitoring data, the QLE may provide a single document upload for both habitat and fish monitoring using this same dialogue box. For further details of fish monitoring data, see Section 2.4.2.

2.3.4 Habitat Monitoring Data Confirmation

Habitat monitoring data can be accessed by navigating to the *Transactions* tab, selecting the transaction associated with the habitat data, and selecting *Download Monitoring Data*. Date ranges of the data uploaded will also be associated with the transaction on the *Habitat & Fish* monitoring sub-tab.

2.4 Fish Population Monitoring Data Input (Tier 4)

The QLEs can communicate that fish monitoring is planned to occur within the water transaction proposal. As fish monitoring data become available, QLEs can upload data in the *Habitat & Fish* monitoring sub-tab.

- Section 2.4.1 documents the questions asked within the water transaction proposal.
- Section 2.4.2 documents how the QLE will provide fish monitoring data to the data management system.

2.4.1 Water Transaction Proposal Fish Monitoring Plan

If the QLE has access to data for fish populations that are likely to benefit from instream flow enhancements in the primary beneficial reach, they should select *yes* to the question "Are fish population data (e.g., redd counts, weir counts, snorkel surveys, etc.) available for this population in this stream?" (Figure 12). QLEs are then presented with a form to enter the information about the entity conducting fish population monitoring, as specified in Table 6.

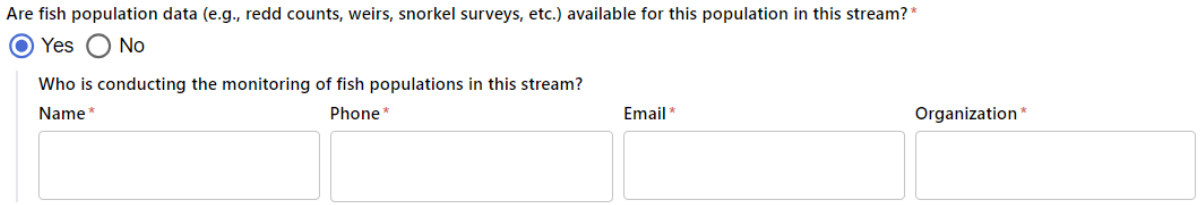

Figure 12. Form presented to QLEs to enter the fish monitoring plan.

Table 6. Fish monitoring data input fields in the water transaction proposal and descriptions.

Data Input	Description
Name	First and last name of the point of contact responsible for fish population data collection
Phone	Phone number of the point of contact
Email	Email of the point of contact
Organization	Entity conducting fish population data collection

2.4.2 Fish Monitoring Data Upload

QLEs upload fish monitoring data through the same user interface elements as presented in Section 2.3.3 in the *Habitat & Fish* monitoring sub-tab on the web application (Figure 10). Identical to uploading habitat data, to upload fish data, the QLE will click *Upload Habitat & Fish Data.* The QLE will then be presented with the form requesting information about the data to be uploaded. Like habitat monitoring data, fish monitoring data may be provided at variable frequencies and be associated with more than one water transaction. As such, the QLE must select the transactions to which the data are

related, and the years during which the observation were made (Figure 11). If *Fish Populations* is checked, QLEs are presented with a form that asks which fish species and life history stages were monitored in the substantiating document and to describe what was measured and how that demonstrates improvement (Figure 13). Further guidance is provided in Section 3.4.

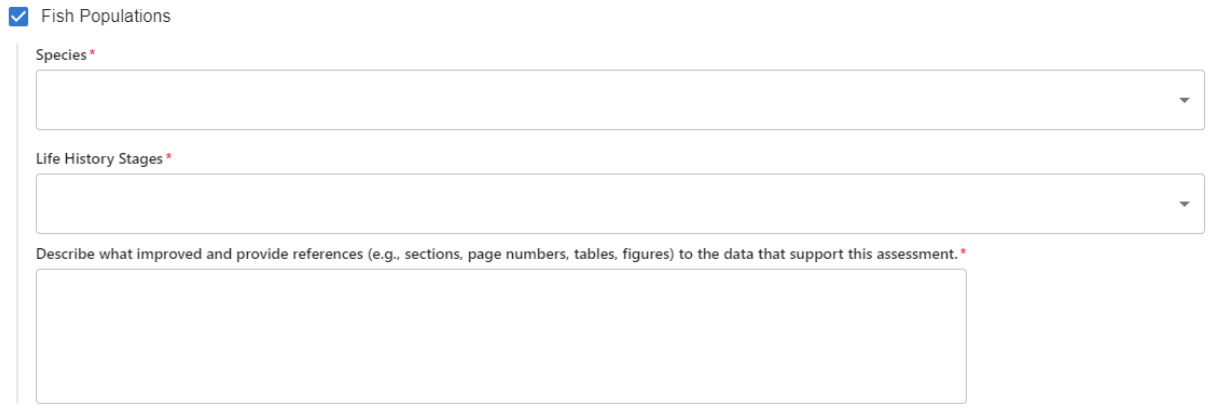

Figure 13. Form presented to QLEs to add fish monitoring data within the Habitat & Fish monitoring data form.

2.4.3 Fish Monitoring Data Confirmation

Fish monitoring data can be accessed by navigating to the transactions dashboard, selecting a transaction associated with fish data, and selecting *Download Monitoring Data*. Date ranges of the data uploaded will also be shown with the transaction on the *Habitat & Fish* monitoring sub-tab.

3 Data Collection Protocols

These data collection protocols build upon the FRAF (McCoy and Holmes 2015), while providing detailed guidelines on how QLEs should structure their data to conform to the CBWTP programmatic changes made in fiscal year 2023.

3.1 Compliance Monitoring (Tier 1)

Compliance monitoring for Tier 1 transactions is designed to verify contract compliance. CBWTP prioritizes electronically recorded flow or meter data at a diversion to verify compliance, followed by photographic evidence obtained by either a site visit or aerial imagery. Signed affidavits by an irrigation district or water master without photographic evidence are also acceptable, but the QLE will be asked to explain why other compliance data are not available. In 2023, NFWF also updated the monitoring requirements for water transactions that are associated with permanent changes to infrastructure such that the landowner is no longer able to divert transacted water. For these permanent changes to diversion infrastructure, QLEs must only provide documentation of these permanent changes once and is thus alleviated from annual compliance monitoring requirements.

Compliance monitoring best practices are as follows:

- **Monitoring location:** Monitoring should occur at a POD, place of use, or a stream flow gauge.
  - POD: POD compliance can be verified by observing one of the following:
    - Diversion or pump was permanently removed.
    - Headgate closed and no water is being diverted.
    - Pump not operating.
    - Flow meter indicates agreed-upon flow rate.
    - Weir or staff gauge indicates agreed-upon diversion rate or stage.
  - Place of Use: Place of use compliance is typically provided by showing photographic evidence of a fallow field, change in crop, or evidence of more efficient irrigation equipment or receiving a signed report or affidavit by the irrigation district or water master that the water was not diverted to the place of use.
    - Provide georeferenced ground-level photographs using Solocator application.
    - Provide drone or other aerial imagery.
    - Provide report or affidavit from irrigation district.
    - Provide report or affidavit from water master.
  - Flow gauge: For minimum flow agreements, flow may be monitored at a single flow gauge downstream of the POD to verify contract compliance. Additionally, flow may be monitored at a single gauge if all instream water has been contracted. If flow gauges are to be used to verify compliance for other transaction types, it is expected that there be an analysis demonstrating flow changes between two gauges, one located upstream of the POD and one located downstream. In this case, it is expected that QLEs conduct these analyses and verify that the analyses indicated compliance.

- **Monitoring frequency:** Depending on the transaction type and associated monitoring criteria, compliance may only need to be demonstrated once (e.g., implementation), annually, or multiple times during the season.
- **Monitoring documentation:** To the maximum extent practicable, it is requested that QLEs attempt to provide as much context within the document uploads as possible, including adding text boxes describing what is being depicted, how the document confirms compliance, circling places of use, or other helpful guiding information. These documents are likely going to be viewed by a broad audience with varying levels of expertise on water transactions.

3.2 Water Quantity Monitoring (Tier 2)

Flow monitoring is designed to quantify and document flow change at the reach-scale (Holmes et al. 2021). Flow data, along with the associated water rights or water management action, are used to evaluate the transaction and to assess the efficacy of project mechanism(s) used to increase water quantity (Table 7).

Table 7. Flow monitoring objectives and the metric to be measured by the monitoring entity.

Objective	Sample Variables	Sample Metrics	Suggested Minimum Frequency	Notes
Increase water quantity	Discharge	Discharge (cfs) Staff gauge level (feet)	Biweekly	Where available, continuous discharge data from long-term gauging sites are preferred. Staff gauge usage requires establishment and use of a rating curve to translate water level (feet) into discharge (cfs).

Flow monitoring best practices are as follows:

- **Primary beneficial reach determination:** QLEs should clearly identify the extent of the primary beneficial reach (Section 1.3).
- **Monitoring location:** Wherever possible, monitor stream discharge downstream of the POD within the primary beneficial reach using existing long-term gauging sites (e.g., U.S. Geological Survey stream gauges). If long-term gauging data are not available, it is acceptable to report stream discharge spot measurements (e.g., using a flow meter or an established rating curve and staff gauge). Where this is the case and when feasible, QLEs should initiate flow monitoring at the POD at least 1 year prior to transaction implementation to establish baseline discharge data.
- **Monitoring frequency:** Wherever possible, obtain and report continuous, year-round stream discharge data.
  - Where long-term gauging data are available, report year-round stream discharge data regardless of whether transacted water is instream on an annual or seasonal basis.
  - Where spot measurements are reported, weekly readings are preferred. At a minimum, discharge levels should be reported on a biweekly (every 2 weeks) basis. Should a minimum of biweekly measurements be infeasible, the QLEs will be asked to provide an explanation of why not to NFWF.
- **Methods:** Refer to Holmes et al. 2013 and Holmes et al. 2021 for more specific monitoring methods and protocols.

  - Refer to this sample instructional video[4] for taking spot flow measurements using a flow meter.

3.2.1 Available Stream Discharge Data Sources

The following are publicly available stream discharge data sources:

- U.S. Geological Survey National Water Dashboard[5]
- U.S. Bureau of Reclamation Hydromet[6]
- Washington Department of Ecology Freshwater DataStream[7]
- Oregon Water Resources Department Near Real Time Hydrographics Data[8]
- Idaho Power IdaStream[9]
- Montana Department of Natural Resources and Conservation Stream and Gauge Explorer[10]

3.3 Aquatic Habitat Response Monitoring (Tier 3)

Analyses of aquatic and riparian habitat responses to flow restoration are focused on changes in flow-limited habitat metrics within the primary beneficial reach of water transactions (Holmes et al. 2021). Specifically, habitat monitoring aims to link transacted water (increased water quantity) to reach-specific aquatic habitat outcomes. Because there can be a diversity of flow restoration benefits to aquatic ecosystems and methods to measure such benefits, NFWF requires that QLEs distill the information into the following habitat objectives:

- Water quality
- Upstream habitat access
- Stream complexity
- Riparian habitat

Furthermore, NFWF requires QLEs to report the miles or acres of benefited habitat within these objectives and has provided the following habitat monitoring best practices to assist in that process:

- **Monitoring metrics:** Wherever possible, QLEs should elect to monitor aquatic habitat metrics that correspond with the stated habitat objective (i.e., the goal of the water transaction). Sections 3.3.1 through 3.3.4 outline CBWTP-tracked habitat objectives and associated potential monitoring metrics. This list is intended as a starting point and is not exhaustive; accordingly, QLEs should select monitoring metrics that are most appropriate for a given primary beneficial reach and habitat objective.

[4] https://www.youtube.com/watch?v=M1Tb7HsEtOM
[5] https://dashboard.waterdata.usgs.gov/app/nwd/?region=lower48&aoi=default
[6] https://www.usbr.gov/pn/hydromet/
[7] https://apps.ecology.wa.gov/continuousflowandwq/
[8] https://apps.wrd.state.or.us/apps/sw/hydro_near_real_time/
[9] https://idastream.idahopower.com/
[10] https://gis.dnrc.mt.gov/apps/stage/

- **Coordination with monitoring entities:** For many QLEs, coordination with local or regional monitoring efforts may be the most efficient means of tracking linkages between transacted water and aquatic habitat outcomes. Key steps include the following:
  - Determining which entities are conducting aquatic habitat monitoring within the primary beneficial reach (e.g., state agencies, tribes, conservation groups)
  - Determining where habitat monitoring is being conducted within the primary beneficial reach (e.g., upstream and downstream river miles)
  - Determining which habitat metrics are being monitored and the frequency of monitoring
    - Do metrics align with the habitat objective?
    - Does the monitoring period align with the period in which the transacted water is instream?
  - For a given metric, conferring with monitoring entities to identify the trend that indicates aquatic habitat improvement (e.g., metric increase, metric decrease, metric within a given range, metric above/below a given threshold)
  - Establishing organizational roles and responsibilities for compiling reach-specific data, analyzing year-over-year trends, and reporting to NFWF; note that while habitat data may be collected and analyzed by entities other than the QLE, the QLE is ultimately responsible for ensuring the quality, accuracy, and relevancy of the data reported to NFWF
- **QLE-led monitoring:** Where sufficient in-house capacity and expertise exists, QLEs may conduct their own aquatic habitat monitoring. This affords the opportunity to tailor monitoring activities to the primary beneficial reach and to select monitoring metrics most appropriate to the habitat objective.
- **Baseline data:** Where possible, baseline aquatic habitat data should be collected to provide a reference for habitat trends. Reporting will require an analysis of whether monitored metrics improved (versus declined or stable). Depending on the habitat metric, this may be best achieved by measuring data in the year(s) prior to the transacted water being instream.
- **Non-flow restoration benefits:** Water transactions that provide water to non-flow restoration activities that occur within the boundaries of the primary beneficial reach (e.g., riparian plantings) can be included as habitat benefits provided by the water transaction. However, if a non-flow restoration activity only partially intersects the primary beneficial reach, only that portion of restoration activity contained within the primary beneficial reach may be included. Confer with the entity responsible for the restoration project to determine the anticipated extent of project benefits.

3.3.1 Water Quality

Potential water quality objectives (Table 8) are as follows:

- **Improve thermal conditions** – Restore instream temperatures to levels suitable for successful migration, spawning, egg incubation, and rearing of target fish species.
- **Improve dissolved oxygen (DO) levels** – Restore instream DO to levels suitable for target adult and juvenile fishes.

For reporting, QLEs should calculate the number of **river miles along which water quality improved,** if applicable, coincident with transacted flows being instream. In most cases, miles of water quality improvement should be calculated in accordance with the length of the monitored reach (e.g., miles along which temperature decreased or DO increased). There are some circumstances where habitat metric improvements may be reasonably extrapolated to include the entirety of the primary beneficial reach (e.g., water temperature measurements at reasonable intervals along the primary beneficial reach). In these cases, QLEs should use their best professional judgment on the number of miles benefited.

> *Example: A beneficial reach extends from river mile (RM) 50.5 to RM 10.0. A partner entity conducts water quality monitoring from RM 35.0 to RM 10.0 and determined that mean instream temperature between June and September was 20°C prior to transaction implementation. Following transaction implementation, mean temperature along the monitored portion of the reach decreased to 17.5°C. In this case, the QLE should report a 25.0-mile improvement in water quality (RM 35.0 - RM 10.0 = 25.0 miles).*

Table 8. Potential water quality objectives, sample variables and metrics, and suggested minimum monitoring frequency.

Objective	Sample Variables	Sample Metrics	Suggested Minimum Frequency	Notes
Improve thermal conditions	Temperature (daily, 7DADM)	Temperature less than specified threshold Temperature within specified range	Monthly	Temperature thresholds/ranges specific to target species or life stage
Improve DO levels	DO	DO greater than specified threshold	Monthly	DO thresholds specific to target species or life stage

3.3.2 Upstream habitat Access

Potential upstream habitat access objectives (Table 9) include the following:

- **Eliminate passage barriers** – Restore longitudinal connectivity by increasing the magnitude or duration of flow.

For reporting, QLEs should calculate the number of **river miles of upstream habitat access made available** coincident with transacted flows being instream. If the water transaction eliminated upstream passage barriers (e.g., increased critical riffle depth), all newly accessible river miles upstream should be included in the total miles of upstream habitat access increased.

> *Example: A beneficial reach extends from RM 50.5 to RM 10.0. A partner entity conducts habitat monitoring from RM 35.0 to RM 32.5 and determined that a passage barrier existed at RM 34.0 prior to transaction implementation, blocking 30 miles of otherwise suitable upstream habitat. Following transaction implementation, the passage barrier in the monitored portion of the reach was removed. In this case, the QLE should report a 30-mile improvement in habitat access (RM 64.0 - RM 34.0 = 30 miles). Note that this includes 13.5 miles upstream of the primary beneficial reach.*

Table 9. Potential habitat access objectives, sample variables and metrics, and suggested minimum monitoring frequency.

Objective	Sample Variables	Sample Metrics	Suggested Minimum Frequency	Notes
Eliminate passage barriers	Tributary reconnect	Surface flows connected longitudinally to next order stream	Monthly	
	Surface water flow	Flow or depth greater than specified threshold	Monthly	Flow/depth thresholds specific to target species or life stage
	Critical riffle flow	Critical riffle flow or depth greater than specified threshold	Monthly	Riffles that are particularly shallow and sensitive to changes in stream flow, whereby low flows could limit hydrologic connectivity and upstream/downstream fish passage Flow/depth thresholds specific to target species or life stage

3.3.3 Stream Complexity

Potential stream complexity objectives (Table 10) include the following:

- **Increase large woody debris** – Increase the frequency and extent of large woody debris and wood complexes, which create complex hydraulics, contribute to pool habitat formation, and are used by various salmonid life stages for holding, shelter, and predator avoidance.
- **Increase pool habitat** – Increase the frequency and extent of pool habitats used by various salmonid life stages for holding, rearing, and thermal refuge.
- **Increase off-channel habitat** – Increase the extent and inundation frequency of off-channel habitats (e.g., sloughs, side channels) used by juvenile salmonids for foraging, over-wintering, and thermal refuge.
- **Increase wetted area** – Increase the habitat area that is regularly, seasonally, or intermittently inundated by river flows.
- **Diversify channel planform** – Increase channel planform complexity to create diverse hydraulics and geomorphic units.
- **Improve channel substrate** – Maintain streambed substrate composition suitable for salmonid spawning and egg incubation.

For reporting, QLEs should calculate the number of **river miles along which stream complexity improved,** if applicable, coincident with transacted flows being instream. In most cases, miles of stream complexity should be calculated in accordance with the length of the monitored reach (e.g., river miles along which large woody debris counts increased, pool density increased). Where habitat improvements are specific to a particular habitat unit (e.g., side channel), improvements in stream complexity should be reported as the number of miles improved within that unit.

Table 10. Potential stream complexity objectives, sample variables and metrics, and suggested minimum monitoring frequency.

Objective	Sample Variables	Sample Metrics	Suggested Minimum Frequency	Notes
Increase large woody debris	Large woody debris frequency (naturally recruited)	Number of large woody debris Number of large woody debris/miles protected reach	Annual	Large woody debris greater than or equal to 1 meter in length and 0.1 meter in diameter is a common threshold for inclusion in count, though numerous methodologies exist.
	Large woody debris projects watered (interaction with a non-flow restoration activity)	Number of large woody debris Number of large woody debris/miles protected reach	Annual	QLEs may include river miles where there is an interaction between a non-flow-restoration activity and a water transaction, such that the water transaction provides water to the restored habitat.
	Wood jam frequency	Number of jams Number of jams/miles protected reach	Annual	
	Beaver dam frequency	Number of dams Number of dams/miles protected reach	Annual	
Increase pool habitat	Pool frequency	Number of pools Number of pools/miles protected reach	Monthly	
	Extent of pool habitat	Mean residual depth (feet) Mean area (square feet) Mean volume (cubic feet)	Monthly	
Increase off-channel habitat	Active off-channel habitat frequency	Number of off-channel habitats Number of off-channel habitats/miles protected reach	Annual	Non-primary channels and habitats (e.g., sloughs, side channels) that contain continuously or periodically flowing water and sediment, including areas inundated by baseflow discharge or subject to frequent deposition and erosion
	Extent of active off-channel habitat	Wetted length (feet, miles) Wetted width (feet, miles) Wetted area (square feet, square miles)	Monthly	
	Seasonal duration of off-channel habitat watering	Days watered	Monthly	
Increase wetted area	Wetted width	Mean width (feet)	Monthly	The horizontal distance between the wetted margins of the stream
	Bankfull width	Mean width (feet)	Annual	The width of the channel that contains most stream flows (*i.e.*, at which flow starts to leave the channel and overtop its banks) Note: the edge of the bankfull channel typically corresponds with the start of the floodplain.
	Active channel area	Mean area (square feet, acres)	Annual	The channel area containing continuously or periodically flowing water and sediment, including areas inundated by baseflow discharge and those subject to frequent deposition and erosion

Objective	Sample Variables	Sample Metrics	Suggested Minimum Frequency	Notes
	Low-flow inundated area	Mean area (square feet, acres)	Annual (during dry season)	The channel area containing flowing water during base flow conditions, i.e., typical low-flow conditions of perennial streams occurring in mid- to late-summer and fall
	Aquatic habitat rating curves		Monthly to establish rating curve, then annual	The relationship between stream discharge and wetted area, channel depth, pool volume, or other aquatic habitat metrics
Diversify channel planform	Active (watered) channels	Number of active (watered) channels	Monthly	All channels (primary + non-primary) that contain continuously or periodically flowing water and sediment, including areas inundated by baseflow discharge and those subject to frequent deposition and erosion
	Confluences and diffluences	Number of confluences and diffluences Number of confluences and diffluences /miles protected reach	Annual	Confluences are areas where two or more channels come together. Diffluences are areas where a single channel splits into two or more channels.
Diversify channel planform	Channel sinuosity	Total channel length (miles) Channel length/valley bottom length	Annual	Channel sinuosity can indicate presence of habitat-forming processes beneficial to fish (e.g., erosion/deposition, pool habitat formation, floodplain activation).
Improve channel substrate	Streambed composition	Percent fine sediment	Annual	

Example 1: A beneficial reach extends from RM 50.5 to RM 10.0. A partner entity conducts pool habitat monitoring from RM 35.0 to RM 32.5 and determined that pool density was 6 pools/mile prior to transaction implementation. Following transaction implementation, pool density along the monitored portion of the reach increased to 12 pools/mile. In this case, the QLE should report a 2.5-mile improvement in stream complexity (RM 35.0 - RM 32.5 = 2.5 miles).

Example 2: A beneficial reach extends from RM 50.5 to RM 10.0. A partner entity conducts off-channel habitat monitoring from RM 35.0 to RM 32.5 and determined that 0.5 mile of wetted side channel existed prior to transaction implementation. Following transaction implementation, wetted side channel length along the monitored portion of the reach increased to 1.25 miles. In this case, the QLE should report a 0.75-mile improvement in stream complexity (1.25 miles – 0.5 miles = 0.75 miles).

3.3.4 Riparian Habitat

Potential riparian improvement objectives (Table 11) include the following:

- **Increase riparian habitat** – Increase the abundance and extent of riparian vegetation by reestablishing hydrologic and sediment regimes, toward reducing stream insolation and bank erosion.
- **Reconnect floodplain** – Restore lateral and vertical connectivity by re-establishing flow between mainstem and off-channel habitats and aggrading incised channels.

Table 11. Potential riparian improvement objectives, sample variables and metrics, and suggested minimum monitoring frequency.

Objective	Sample Variables	Sample Metrics	Suggested Minimum Frequency	Notes
Increase riparian habitat	Canopy cover	Percent coverage	Monthly	
	Extent of riparian vegetation	Total riparian habitat (acres) Percent riparian zone in protected reach	Annual	May pertain to the entire riparian zone or specific classes of riparian habitat (e.g., native vegetation, woody vegetation)
	Extent of riparian restoration project watered (interaction with a non-flow restoration activity)	Total project area benefitted (acres)	Annual	QLEs may include river miles where there is an interaction between a non-flow-restoration activity and a water transaction, such that the water transaction provides water to the restored habitat.
Reconnect floodplain	Extent of active floodplain	Floodplain area (acres)	Annual	The areas adjacent to the active channel that will be inundated during a typical flood event; evidenced by erosion/ deposition, organic debris accumulation, abundance of wetland and riparian vegetation
	Extent of floodplain restoration project watered (interaction with a non-flow restoration activity)	Total project area benefitted (acres)	Annual	QLEs may include river miles where there is an interaction between a non-flow-restoration activity and a water transaction, such that the water transaction provides water to the restored habitat.

For reporting, QLEs should calculate the extent of **riparian acres which improved,** if applicable, coincident with transacted flows being instream. In most cases, acres of habitat should be calculated in accordance with the extent of riparian or floodplain habitat that experience regular, seasonal, or intermittent inundation by increased flows (e.g., acres of planted riparian area watered, acres of floodplain habitat with re-wetted channels).

> *Example 1: A beneficial reach extends from RM 5.0 to RM 1.0. A partner entity conducts floodplain habitat monitoring from RM 3.5 to RM 1.0 and determined that summer flows wetted 200 acres of floodplain habitat prior to transaction implementation. Following transaction implementation, seasonally inundated floodplain extent along the monitored portion of the reach increased to 300 acres. In this case, the QLE should report a 100-acre improvement in riparian habitat (300 acres – 200 acres = 100 acres).*

3.4 Fish Population Monitoring (Tier 4)

Fish population monitoring identifies potential linkages between quantified improvements to instream flow and/or relevant habitat metrics and observed improvements to fish population ecology. Population monitoring should estimate changes in adult abundance, juvenile abundance, life stage-specific survival rates, and fish presence in reaches with increased flows. CBWTP encourages submission of fish population data from streams that have demonstrated habitat enhancements from increased flow. Yet CBWTP acknowledges that detection of population trends may require monitoring efforts that span multiple years and can be influenced by changes in environmental and climate factors at multiple scales. At a minimum, fish population data provide circumstantial evidence that supports logical inference that instream flow enhancements benefit local fish populations. Because fish population monitoring provides only qualitative insights into linkages between habitat and fish populations, only a summary list of potential metrics is offered.

Potential fish population objectives and associated variables that may be measured to support these objectives include the following:

- **Increase adult spawner abundance** – Redd counts, carcass surveys, presence/absence surveys
- **Increase juvenile abundance** – Depletion electrofishing, snorkel surveys, smolt trap catches
- **Increase pre-spawn adult abundance** – Presence/absence surveys, snorkel surveys
- **Increase survival rates** – Egg-to-fry survival, smolt-to-adult survival

When fish population monitoring data are submitted, NFWF requests a summary of the observed trend of fish populations in transacted streams. Should analyses or models be available to quantify the link between instream water transactions and improved fish population ecology, QLEs are asked to provide these data to NFWF. These data will be incorporated into the annual monitoring report produced by NFWF or its hired monitoring consultant.

4 Analysis and Reporting Plan

Compliance and effectiveness monitoring data collected by QLEs will be used to draft an annual CBWTP monitoring report, produced by NFWF or a NFWF-hired monitoring consultant. The report will be provided to the QLEs and other CBWTP stakeholders each year. This report will provide an overview of CBWTP effectiveness based on a series of metrics produced using QLE-provided monitoring data. The following metrics will be evaluated:

- Compliance summary
- Flow data quality summary
- Instream flow analyses for transactions monitored for flow
  - Observed daily average flows (cfs) compared to flows contracted by CBWTP and stream flow targets (where available)
  - Percentage of observed flows that were contracted by the CBWTP
  - Full time series of historical daily average flows (cfs) compared with post-transaction daily average flows and the stream flow target (where available)
  - Progress towards stream flow targets (where available)
- Number of new transactions funded in previous fiscal year
- Total number of active transactions in previous fiscal year
- Newly protected water instream during previous fiscal year (cfs, acre-feet)
- Total protected water instream during previous fiscal year (cfs)
- Cumulative protected instream flows for the life of transactions funded in each fiscal year (acre-feet)
- Total water protected by CBWTP across all years (acre-feet)
- Number of streams benefitted from instream water transaction during previous fiscal year
- Miles of habitat access gained in previous fiscal year
- Miles of increased stream complexity in previous fiscal year
- Miles of water quality improved in previous fiscal year
- Acres of riparian habitat improved in previous fiscal year
- Overview of fish species likely to have benefitted from habitat improvements in previous fiscal year

Additionally, the annual report will highlight transactions that are integrated with other restoration efforts. QLEs will be given the opportunity to provide feedback on this report in its draft form to ensure their programs are accurately represented and to facilitate conversations on ways to improve the program in the future.

References

Holmes, S.R., Tanaka, S.K., Deas, M.L., and McCoy, A. 2021. *Flow restoration accounting framework: A stewardship approach for environmental flows around the western U.S*. Prepared for the National Fish and Wildlife Foundation.

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