

# **2023 ANNUAL REPORT**

## **Monitoring conducted in compliance with U. S. Fish and Wildlife Service Incidental Take Permit TE89773D-0 and Deschutes Basin Habitat Conservation Plan**

Submitted to:

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## Introduction

U. S. Fish and Wildlife Service (USFWS) issued Incidental Take Permit TE89773D-0 (USFWS Permit) to eight Central Oregon irrigation districts and the City of Prineville, Oregon on December 31, 2020. The USFWS Permit covers the incidental take of Oregon spotted frog (*Rana pretiosa*) and bull trout (*Salvelinus confluentus*) during lawful activities associated with the storage, release, diversion and return of irrigation water by Arnold Irrigation District (AID), Central Oregon Irrigation District (COID), Lone Pine Irrigation District (LPID), North Unit Irrigation District (NUID), Ochoco Irrigation District (OID), Swalley Irrigation District (SID), Three Sisters Irrigation District (TSID) and Tumalo Irrigation District (TID). The USFWS Permit also covers lawful activities associated with the diversion and withdrawal of water for municipal uses and discharge of municipal effluent by the City of Prineville. Collectively, the eight irrigation districts and City of Prineville are referred to hereinafter as the Permittees.

All activities covered by the USFWS Permit are described in detail in the Deschutes Basin Habitat Conservation Plan (DBHCP) (DBBC 2020), which was approved by USFWS simultaneous with permit issuance in December 2020 (USFWS (U.S. Fish and Wildlife Service) 2020). DBHCP Chapter 6 (*Habitat Conservation*) and Chapter 7 (*Monitoring, Reporting and Adaptive Management*) are organized by covered activity (e.g., storage reservoir, diversion structure, etc.), with the conservation measures and monitoring requirements for each covered activity or set of activities described separately.

The DBHCP requires compliance/implementation monitoring (DBHCP Section 7.2) and effectiveness monitoring (DBHCP Section 7.3). The former involves documentation that the Permittees are complying with the requirements of the DBHCP and the USFWS Permit. The latter involves monitoring to support adaptive management provisions of the DBHCP that address minor levels of uncertainty about the effectiveness of the conservation measures. The organization of this report follows the numbered conservation and effectiveness measures associated with the covered activities. Results of monitoring for the reporting period follow. The biologist hours funded by the Permittees to complete required monitoring tasks are summarized in Table 1.

Annual reporting of DBHCP implementation requires numerous datasets and additional documentation that is submitted as part of this report package (Table 2). This includes reporting of hydrological data for the surface waters covered by the DBHCP and the hydrologic parameters used to evaluate compliance. For adaptive management measures, supplemental studies and/or monitoring are required in some years and are submitted as independent reports with this reporting package. Lastly, supplemental attachments also include documentation of correspondence among the Districts and the Services, implementation coordination meeting notes, and leasing and payment information.

Table 1. Hours funded by the Permittees in 2023.

<b>Requirement Description</b>	<b>DBHCP Measure</b>	<b>Maximum Required Hours</b>	<b>Qualified Biologist Hours Requested in WY23</b>
Dead Slough Habitat Assessment	WR-1	80	0
Upper Deschutes River Habitat Suitability Assessment Downstream of Wickiup Dam	WR-1	80	345.50 <sup>a</sup>
Crescent Creek Egg Mass Counts	CC-1	80	49.50
Crescent Creek/Little Deschutes Monitoring for Stranding	CC-1	80	0
Crescent Creek/Little Deschutes Habitat Suitability Analyses	CC-1	80	0
Upper Deschutes River OSF Pre-breeding Assessment	OSF-1, WR-1.1		0
Upper Deschutes River OSF Egg/Larvae Survival Monitoring	OSF-1, WR-1.2	240	5
Crane Prairie OSF Egg Mass Counts	OSF-1, CP-1.1		63.75 <sup>b</sup>
Crane Reservoir Wetland Vegetation Monitoring	CP-1.3	NA	260

<sup>a</sup> District funding allocated for monitoring tasks WR-1 (Dead Slough Monitoring), CC-1, WR-1.1, and WR-1.2 were shifted to conduct an Upper Deschutes habitat suitability analysis, as directed by USFWS.

<sup>b</sup> As per prior agreement with USFWS, a boat was provided for crew access to Crane Prairie Reservoir and the 2-day fee for the boat (\$720.00) was converted to biologist hours using the billing rate of \$136.00 per hour.

Table 2. Supplemental Attachments for Water Year 2023

<b>Attachment</b>	<b>Description of Contents</b>
<b>A</b>	Tables (.xlsx) containing specified hydrologic data, monitoring metrics, reporting of values outside the required ranges and allowable ranges of deviation, and explanation of deviations. All tables have metadata tabs with data dictionaries including calculation methods.
<b>B</b>	Email correspondence, official letters, or other documentation related to DBHCP compliance and implementation.
<b>C</b>	Monthly coordination meeting notes.
<b>D</b>	Effectiveness monitoring reports
<b>E</b>	Payments and leases

## Crane Prairie Reservoir

### Compliance and Implementation Monitoring

Central Oregon Irrigation District (COID) implements, monitors, adaptively manages, and reports on covered activities at Crane Prairie Dam and Reservoir. Monitoring and reporting requirements are described in the Deschutes Basin Habitat Conservation Plan Chapter 7.

#### ***Conservation Measure CP-1 (Crane Prairie Reservoir Operation: Crane Prairie Reservoir)***

The DBHCP Conservation Measure CP-1 specifies required ranges and allowable ranges of deviation for both midnight water surface elevation and daily change in water surface elevation at Crane Prairie Reservoir (provisions A through E). Conservation Measure CP-1 also requires monthly coordination between USFWS and COID on the implementation of this conservation measure (provision G) and coordination on the release of an additional 5,000 acre-feet of stored water (provision H). Lastly, COID is required to report any deviations from provisions A through F to USFWS via email (provision I).

Daily reported values for midnight water surface elevation and daily changes in water surface elevation in Crane Prairie Reservoir from October 1 through September 30 are presented in Figure 1 and Figure 2. All surface elevations for Water Year 2023 were reported in a Microsoft Excel file (CranePrairie\_WY2023.xlsx) and submitted to USFWS as part of this report package. This file also includes daily values that were outside the allowable range of deviation for Conservation Measure CP-1, the rationale or explanation for those deviations, and any remedial actions taken. Email notifications of compliance deviations and other correspondences are included in supplemental materials, Attachment B.

During the previous water year (Water Year 2022), the Permittees did not release the additional 5,000 acre-feet of storage from Crane Prairie Reservoir allowed for under Provision H of Conservation Measure CP-1. Accordingly, COID was not exempt from provisions A, D and E of this conservation measure. Water surface elevations in the reservoir were within the allowable range of deviation throughout the entire 2023 Water Year. Daily changes in water surface elevation at Crane Prairie Reservoir (Provision B) were within the allowable range of deviation except for a single instance on July 23, 2023 when the rate of change in water surface elevation exceeded 0.05 feet per day (Figure 2). COID notified USFWS that the drop on the staff gage was likely due to heavy winds since District personnel had not made operational changes during this period (Attachment B: CP\_notifications20230725).

Monthly coordination between USFWS and the Permittees on the implementation of Conservation Measure CP-1 (Provision G) occurred via Microsoft Teams video conferencing and by email for all 12 months during water year 2023 (Attachment C). Participants in these meetings included representatives of USFWS, Bureau of Reclamation, Oregon Water Resources

Department (OWRD), AID, COID, LPID, and NUID. Notes were provided to the USFWS via email.

***Conservation Measure CP-1 (Crane Prairie Reservoir Operation: Deschutes River Below Crane Prairie Dam)***

Provision F of Conservation Measure CP-1 defines the minimum instream flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir. Releases from the reservoir, monitored by the discharge below Crane Prairie Dam (Hydromet Station CRAO), were within the allowable range of deviation the entire water year (Figure 3). All flows for Water Year 2023 are reported in a Microsoft Excel file (Attachment A: CranePrairie\_WY2023.xlsx) and were submitted to the USFWS as part of this report package. Email notifications regarding compliance (Provision I) and other correspondences are included in the email correspondences submitted with this report (Attachment B).

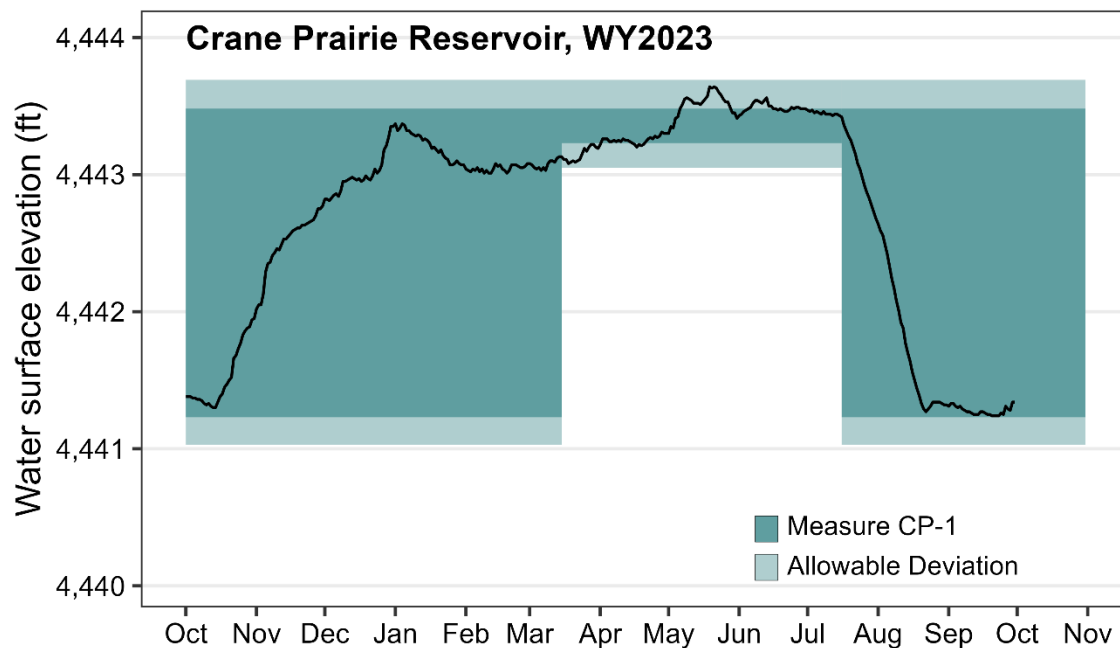


Figure 1: Daily (midnight) water surface elevations (feet) in Crane Prairie Reservoir measured at Hydromet Station CRA (OWRD Gage 14053500) between October 1, 2022, and September 30, 2023. Values outside the colored areas fall outside the required range and allowable deviation for Conservation Measure CP-1.



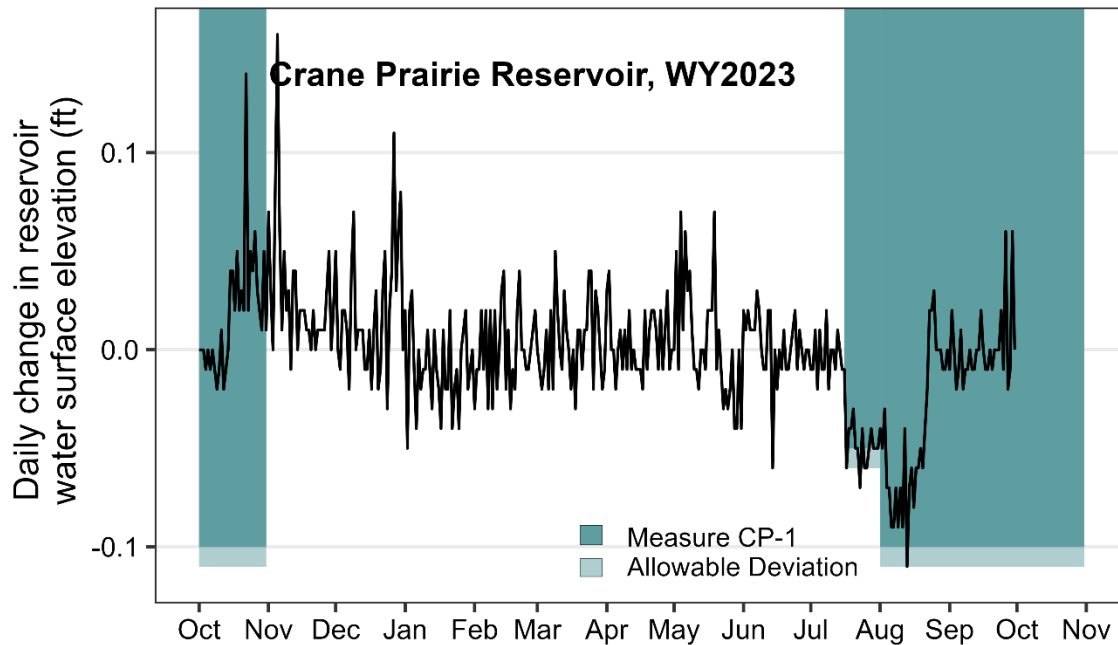


Figure 2: Daily change in reservoir surface elevation (feet) in Crane Prairie Reservoir measured at Hydromet Station CRA (OWRD Gage 14053500) between October 1, 2022, and September 30, 2023. DBHCP requirements apply October 1-31 and July 15-September 30 (shaded blue regions).

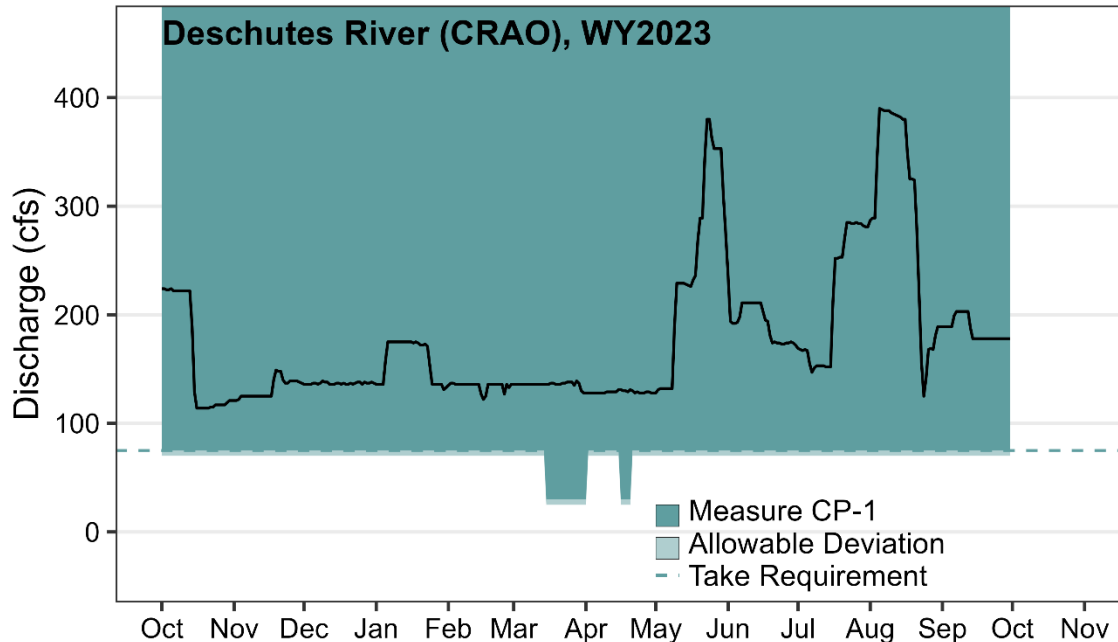


Figure 3: Deschutes River discharge (cfs) below Crane Prairie Reservoir measured at Hydromet Station CRAO (OWRD Gage 14054000) between October 1, 2022, and September 30, 2023. The dashed line indicates the 75 cfs minimum required under the Incidental Take Permit.

## Effectiveness Monitoring

### *Adaptive Management Measure CP-1.1 (Crane Prairie Reservoir Breeding Surveys)*

Permittees provided three qualified biologists to conduct Oregon spotted frog (OSF) egg mass counts at Crane Prairie Reservoir in close coordination with USFWS in 2023. A total of 63.75 hours of qualified biologist time were funded to support Adaptive Management Measures CP-1.1 (Table 1). The hours shown in Table 1 were used for field data collection and data processing under the direction of USFWS. Travel time for biologists to and from the Deschutes Basin, which amounted to another 17.5 hours, is not included in Table 1. Additionally, the Permittees provided a boat for crew access to the breeding habitat.

The Mount Hood Environmental (MHE) team assisted USFWS surveying egg masses at Crane Prairie Reservoir on May 18, 2023. The survey area included the western half of NW Bay, the western half of the Cultus River outlet to Cultus Creek reach, and Goldfish Pond. On May 19, MHE biologists surveyed the eastern half of the NW Bay reach and the pond at Cow Meadow. In total 17 oviposition sites were observed in the emergent wetlands along the reservoir shoreline. Due to the degraded state of the egg masses, complete counts of masses or oviposition sites could not be ascertained. Consequently, the data collected during 2023 can only be used to validate that breeding occurred at the known breeding sites that were visited at Crane Prairie. At one oviposition site in the NW Bay site, an OSF tadpole was captured. Size indicated that hatching likely had occurred 1-3 weeks prior to the survey; this timing was consistent with the observation of remnant, degraded egg masses. On May 19, 2023, count data collected by the Permittee-funded biologists were provided to USFWS for incorporation into their database. These data are also summarized in the annual egg mass survey report (Blackman 2023), submitted in Attachment D.

The schedule for conducting breeding surveys is determined by USFWS and is dependent on environmental conditions that affect accessibility. Although Crane Prairie Reservoir received substantial precipitation and snow during April, the timing of breeding in 2023 was consistent with previous years (based on survey records from 2017 – 2022). To capture peak OSF breeding activity at Crane Prairie, future monitoring will occur during the month of April, regardless of snowpack. The Permittees' biologists will coordinate closely with USFWS to schedule surveys in 2024.

Surface elevations remained within the allowable deviation under Provision A of Conservation Measure CP-1 and were therefore in compliance. However, to prevent overfilling the reservoir with forecasted precipitation, COID held the reservoir water surface elevation slightly below the minimum of 4,443.23 feet from March 15 – April 1, 2023 (Figure 1) required under Provision A. This decision was made in coordination with USFWS to keep the reservoir at a surface elevation that would inundate frog breeding areas but would avoid potential overfilling, which may create unsuitable breeding habitat. As forecasted, spring precipitation continued to intermittently fill the reservoir above Provision A's maximum of 4,443.48 feet in May and June. During this period,

and in coordination with USFWS, COID began managing the rising volume by increasing the outflow (Attachment C).

***Adaptive Management Measure CP-1.2 (Drawdown Monitoring)***

Crane Prairie drawdown was intensively monitored during the first two years of implementation (2021 and 2022) to document any observations of OSF stranding (DBBC 2022, 2023). Monitoring is required for two of ten years thereafter; however, this task was not requested by USFWS in 2023. In part, this decision was the result of observations made during the spring breeding survey which indicated that there was a very low risk for stranding larval frogs (Attachment C: Coord Meeting Notes Final\_20230720).

***Adaptive Management Measure CP-1.3 (Vegetation monitoring)***

In accordance with Adaptive Management Measure CP-1.3, orthophotography and vegetation surveys occurred in 2021 along the northern shoreline of Crane Prairie Reservoir. Vegetation mapping was completed by Mount Hood Environmental and Smayda Consulting during 2023 and early 2024. Mapping incorporated data from vegetation surveys, orthophotography, and existing LiDAR to create a baseline assessment of the area and type of wetland habitats present at Crane Prairie Reservoir. Suitable breeding habitat for the OSF was also mapped and quantified within the operational minimum and maximum surface water elevations that coincide with the OSF breeding and rearing period.

The classification of wetland habitat cover types followed methods adapted from Cowardin (2013) with modifications specific to OSF habitat. Orthomosaic imagery of the study area was visually examined in QGIS software to distinguish cover type boundaries (polygons) with identifiable colors and patterns. The habitats along the north shore, east of the Deschutes River to the Cultus River, where vegetation transects were sampled, were also used to validate the mapped polygons. Further, a 20-foot by 20-foot grid layer was superimposed to the QGIS map to estimate the percent cover values for emergent, shrub, and forest species. The western, southwestern, and eastern shorelines of the reservoir were not surveyed on the ground; therefore, vegetation cover determinations were based on orthophotographic interpretation.

Total area and area below maximum operating elevation for each cover type were calculated (Table 3) using a field calculator tool (QGIS.org 2023) to establish baseline conditions for the future assessment of the temporal change in area and elevation of cover types. Additionally, the average elevation was calculated for each cover type within the defined study area and elevation band 4,440.28 feet – 4,445.00 feet. Lastly, we delineated habitat suitable for OSF breeding as defined in DBBC (2020). The total area of cover types below maximum operating elevation and covered by 6-12 inches of water at maximum operating elevation are shown in Figure 4. Habitat suitable for OSF breeding, defined as PEM cover type, totaled 25.97 acres of this mapping area. Detailed reporting of vegetation mapping is included in Attachment D.

Table 3. Summary of cover type area (acres) and elevation. Minimum and maximum surface water elevations (SWE) are derived from the minimum and maximum operating requirements.

Cover Type	Total Area	Area Below Max SWE	Area 6-12 inch Depth at Max SWE	Area > 9 inches Depth at Min. SWE	Mean Elevation (ft)
PFO	82.44	3.68	0.43	0.0	4,444.66
PSS	128.72	103.92	24.77	0.035	4,441.65
PEM <sub>tall</sub>	1.16	1.16	0.0	0.0	4,440.27
PEM	241.56	210.69	25.97	1.23	4,441.71
RUB	6.75	6.31	0.26	0.85	4,440.91
PUB	7.43	7.39	0.62	0.32	4,441.22
LUB	1.61	1.61	0.007	1.06	4,440.32

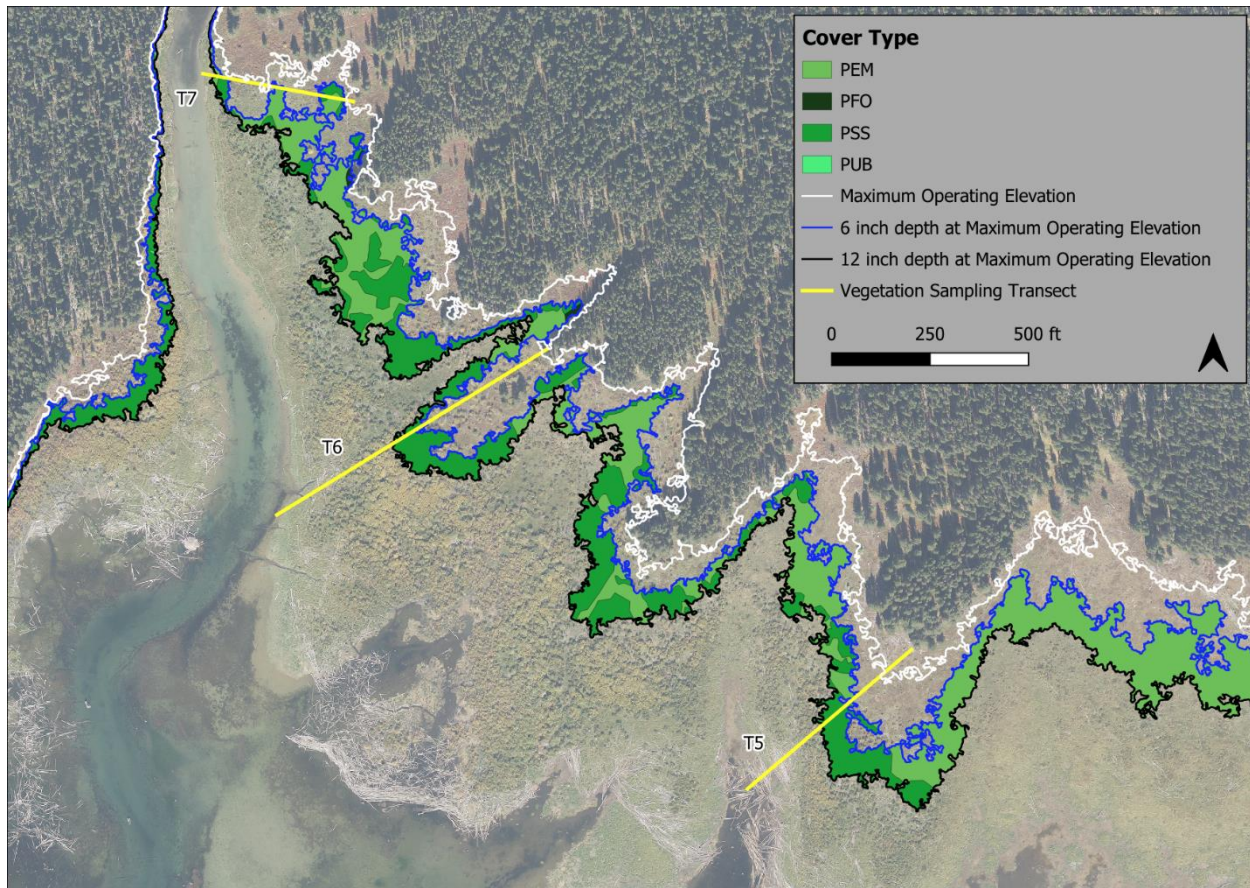


Figure 4. Cover types within 6 –12 inches water depth along the north shore of Crane Prairie Reservoir at maximum operating elevation.

## Wickiup Reservoir

### Compliance and Implementation Monitoring

North Unit Irrigation District (NUID) implements, monitors, adaptively manages, and reports on covered activities at Wickiup Reservoir. Monitoring and reporting requirements are described in the Deschutes Basin Habitat Conservation Plan Chapter 7.

#### *Conservation Measure WR-1 (Wickiup Reservoir Operation)*

DBHCP Conservation Measure WR-1 specifies required ranges and allowable ranges of deviation for the daily average flows in the Deschutes River below Wickiup Dam (Items A through D, F through H, and J) and daily average flows in the Deschutes River at Benham Falls (Item E). Conservation Measure WR-1 also requires monthly coordination between USFWS and NUID on the implementation of this conservation measure (Item L). Lastly, NUID is required to report any deviations from Items A through L to USFWS via email (Item K).

Monthly storage volume for Wickiup Reservoir (Hydromet Station WIC) along with daily average flow and continuous water stage data from the Deschutes River downstream of Wickiup Reservoir (Hydromet Stations WICO and BENO) from October 1, 2022 through September 30, 2023 are submitted to the USFWS in Microsoft Excel files as part of this annual report. Daily values for discharge and the percent change in daily discharge at WICO are shown in Figure 5 and Figure 6, respectively. Deschutes River discharge below Benham Falls (Hydromet station BENO) is presented in Figure 7. Any flow metrics that were outside the allowable range of deviation for Conservation Measure WR-1 are indicated in Attachment A:

Wickiup\_WY2023.xlsx, including the rationale or explanation for those deviations and any remedial actions taken. Email notifications of compliance deviations are included with this annual report (Attachment B).

Compliance with Item J was determined using a rolling average of water surface elevations (measured every 15 minutes at WICO) to calculate the rate of change for 4-hour and 12-hour periods (Attachment A: WickiupItemJ\_WY2023.xlsx). The rate of change in water surface elevation at WICO exceeded the allowable deviations allowed under Item J of WR-1 on five occasions during Water Year 2023. These incidents were reported directly to USFWS via email and during the monthly coordination meetings. Explanations for each deviation are noted in Attachment A: Wickiup\_WY2023.xlsx and are summarized as follows:

- **October 15, 2022:** This deviation was related to the final ramp down adjustment.
- **November 16, 2022:** This deviation resulted from a glitch in the flow measurement during maintenance work.
- **December 16, 2022:** Flows changed precipitously over several hours due to a flow adjustment made in response to an OWRD measurement.

- **May 10, 2023:** The rate of increase was  $> 0.1$  for a few hours in the afternoon after NUID increased flow to 800 cfs per USFWS' email request on 5/10.
- **May 30, 2023:** The adjustment to increase in stage at WICO above 800 exceeded the allowable deviation over a period of 4 hours.

Additionally, Item J requires that during the fall ramp-down (September 15 – October 31), the flow reduction at WICO must be halted for five days when flows at BENO reach 1,200 and 1,100 cfs. It should be noted that this ramp-down period coincides with consecutive water years and ramp down flows in October 2022 are reported in DBBC (2023). In fall 2023, the fall ramp-down schedule was determined in coordination with USFWS (see Attachment C: September and October meeting notes) and is summarized as follows:

- **September 21:** WIC flows were reduced by ~100 cfs
- **September 21 – 26:** Flows at BENO were held between 1,225-1,216 cfs
- **September 27:** WIC flows were reduced by another ~100 cfs
- **September 27 – October 03:** Flows at BENO were held between 1,116-1,113 cfs
- **October 11 - 15:** Flows @ BENO to reduce from ~ 965 to 688 cfs;
- **October 14:** NUID stops diverting water in Bend
- **October 16:** Final ramp down to 105 +/- cfs

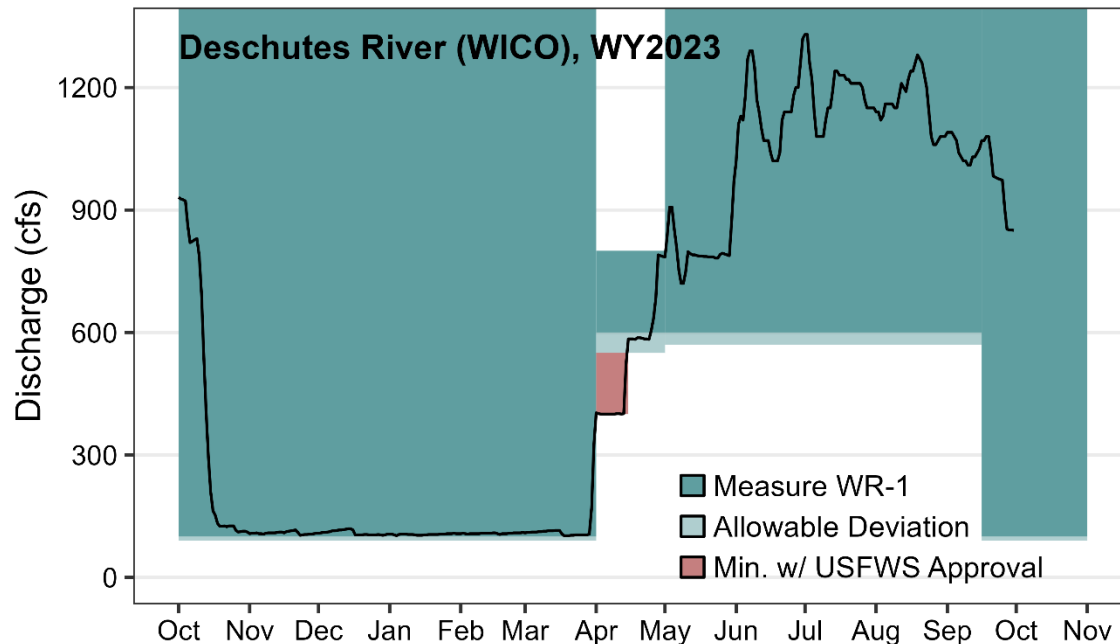


Figure 5. Deschutes River discharge below Wickiup Dam (OWRD Gage 14056500). The minimum flow between April 1 and April 15 can be modified below 600 cfs with USFWS approval.



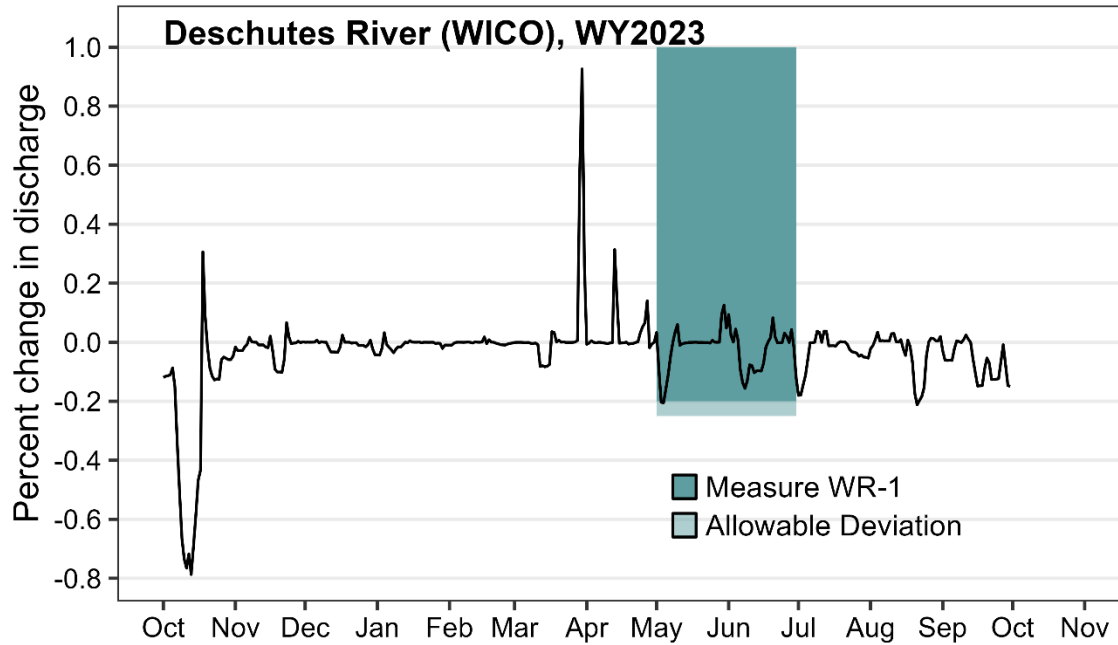


Figure 6. Percent change in Deschutes River discharge below Wickiup Dam (OWRD Gage 14056500).

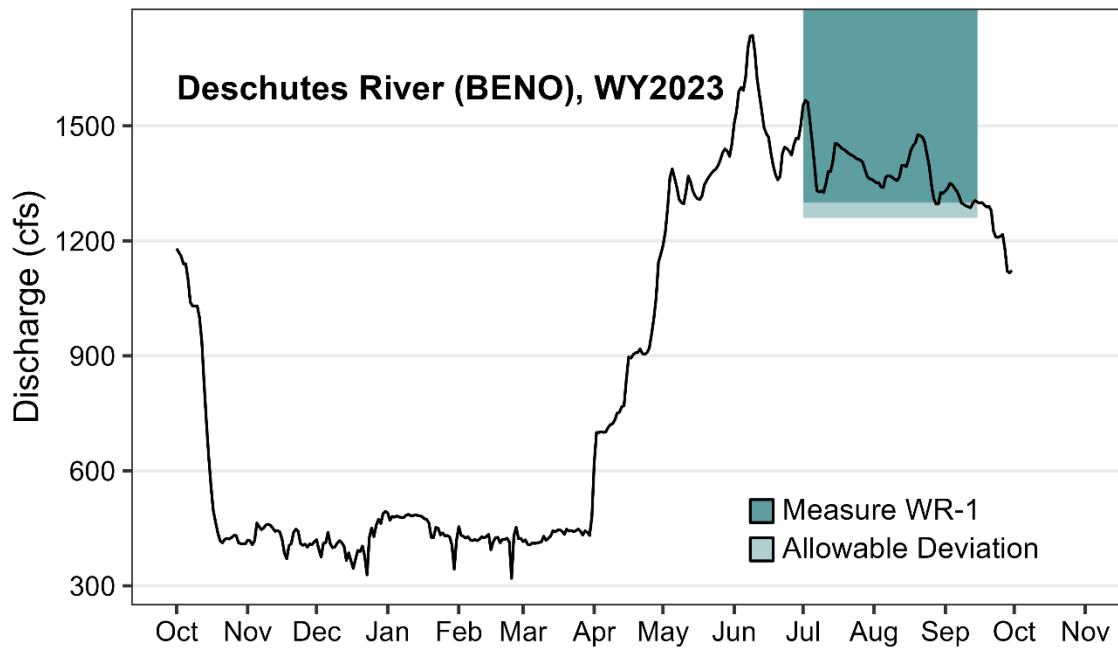


Figure 7. Deschutes River discharge at Benham Falls (OWRD Gage 14064500).

***Conservation Measure WR-1 (Conserved Water)***

COID's conserved water during the 2022 irrigation season amounted to 6,494.80 acre-feet of Wickiup Reservoir storage to be made available for OSF purposes. This stored water was subsequently called on by USFWS and released as instream flows in 2023 between May 10 – 16; May 24 – 29; and from September 15 – October 01 (Attachment B: USFWS Frog Water Tracker\_20230921). USFWS indicated during the August coordination meeting that it intended to release OSF-dedicated stored water through October 15, which would include 15 days into the new water year of 2024. An updated accounting of the remaining OSF-dedicated stored water in the September coordination meeting with USFWS resulted in the decision to release the remaining stored water incrementally during the last week of September to meet the flow requirements for Item J. Lastly, conserved water during the 2023 Water Year amounted to 6,744 acre-feet which will be available to support the OSF during the 2024 Water Year.

***Conservation Measure WR-1 (Dead Slough Monitoring)***

The Permittees will provide up to two qualified biologists for up to 40 hours each per year to assess habitat conditions in Dead Slough if the flow at WICO decreases by 20 percent over any 5-day period between May 1 and June 30. No monitoring requests were made by USFWS during 2023. Observations from 2021 indicated that the downstream end of the slough was not at risk of surface connection with the river until the flow at WICO was between 1,050 and 1,100 cfs and sufficient time had elapsed for this flow to reach Dead Slough (DBBC 2022). On May 03, 2023 and May 04, 2023 the flows at WICO were reduced by 20.4 percent and 20.5 percent (calculated as the rate of change over a rolling five day period), respectively, but remained within the allowable deviation. The flow reductions were reported in the coordination meeting notes (Attachment C: Coord Meeting Notes Final\_20230524) and no requests were made by USFWS to assess the habitat conditions at Dead Slough. During the June 08, 2023 coordination meeting (Attachment C), USFWS requested that NUID notify the District's consultant at least 24 hours before NUID intends to reduce the flow during the period covered in this conservation measure to allow for a site visit to Dead Slough, if needed.

While no monitoring at Dead Slough occurred in 2023, District funding for monitoring tasks WR-1 (Dead Slough Monitoring), CC-1, WR-1.1, and WR-1.2 was reallocated to conduct habitat suitability analyses along the Deschutes River. The reallocation of funding was decided in coordination with USFWS and to fulfill its request to utilize allocated funding for alternate tasks. Habitat suitability analyses in Dead Slough and East Slough are reported in Attachment D.

***Conservation Measure WR-1 (Habitat Suitability Analyses Along the Deschutes River)***

Implementation of the Deschutes Basin Habitat Conservation Plan (DBHCP) necessitates Permittees to provide qualified biologists to fulfill specific conservation and adaptive management measures in cooperation and agreement with USFWS. An analysis of OSF habitat suitability along the upper Deschutes River below Wickiup Dam (HCP 7.2.2.1) is required in year 1 (2021) and every 5 years thereafter for the term of the DBHCP. Habitat suitability requirements were fulfilled in 2022 (Blackman et al. 2022); however, USFWS requested that



Permittees' funding for DBHCP monitoring tasks WR-1, CC-1, WR-1.1, and WR-1.2 be reallocated to conduct an additional habitat suitability analysis. Accordingly, the East Slough and Dead Slough sites, along the Deschutes River, were selected for monitoring by USFWS to meet the requirements.

The goal of the East Slough assessment was to map and delineate baseline vegetation associations, breaks, and relative elevations of off-channel OSF habitats. Additionally, this study aims to monitor shifts in plant composition and area through time. This study is intended to capture the potential effects on vegetation from changes in the Deschutes River flows that are scheduled in year 1, 8, and 13 of the DBHCP. The major components of this study were (1) unmanned aerial vehicle (UAV) remote sensing to capture high-resolution imagery, (2) plant association mapping within selected OSF habitats, and (3) photogrammetric processing and analysis. The results for this assessment are reported and were submitted to the USFWS as part of this annual report package (Attachment D).

The assessment at the Dead Slough site involved mapping the off-channel wetland area used by the OSF, using aerial imagery. The Dead Slough is likely to undergo several restoration actions aimed at improving year-round habitat for OSF (Jennifer O'Reilly USFWS personal communication). These modifications may alter the hydrologic connectivity between the slough and the Deschutes River, thereby affecting the vegetation and inundation area. To collect imagery capable of detecting changes in vegetation extent and composition, a UAV survey was used to build an orthographic and digital terrain model. This assessment is intended to support a multi-year UAV survey effort to be used to construct a time-series of images that measure changes in vegetation and ground elevations. The results for this assessment are reported and were submitted to the USFWS as part of this annual report package (Attachment D).

### **Effectiveness Monitoring**

#### ***Adaptive Management Measure WR-1.1 (Pre-breeding Activity Along the Upper Deschutes)***

Under prior arrangement by USFWS, the field assessment described in Adaptive Management Measure WR-1.1 was completed by biologists employed by the U.S. Geological Survey (USGS). Funding for this measure was shifted to conduct a habitat suitability analysis at East Slough and Dead Slough. Survey coordination notes from the June 08, 2023 meeting (Attachment C) document that this task was completed by USGS in 2023 and that funding was re-allocated.

#### ***Adaptive Management Measure WR-1.2 (Monitoring OSF Egg/Larvae Survival Along the Upper Deschutes River)***

Adaptive Management Measure WR1.2 was developed to be implemented if the Permittees proposed a decrease in flow  $\geq 30$  cfs when the flows at WICO are above 600 cfs during April. While flows were above 600 cfs during the last week in April (Figure 5) there were no proposed or implemented reductions in flow.

The Permittees provided two biologists to assist USFWS with Adaptive Management Measure WR-1.2 in 2023. Biologists assisted Jennifer O'Reilly (USFWS) to relocate two stranded egg masses at the Deschutes River Arm site (ephemeral wetland connected to Wickiup Reservoir) on May 02, 2023. The relocation coordinates were recorded in Survey123 and uploaded directly to USFWS within 24 hours. It should be noted that the Deschutes River Arm site is upstream of WICO and the rationale for this measure is intended to address sites downstream of WICO. The remaining hours allocated for Adaptive Management Measure WR-1.2 were utilized for habitat suitability analyses at East Slough and Dead Slough.

***Adaptive Management Measure WR-1.3 (Variable Flow Tool)***

Development of the variable flow tool is required by year 10 of implementation. This tool is currently under development.

## Upper Deschutes Basin

### Compliance and Implementation Monitoring

Arnold Irrigation District (AID), COID, Lone Pine Irrigation District (LPID), NUID, Tumalo Irrigation District (TID) and Swalley Irrigation District (SID) are jointly responsible for implementation and reporting on Conservation Measure UD-1.

#### *Conservation Measure UD-1 (Upper Deschutes Basin Conservation Fund)*

The DBHCP Permittees' contribution to the Upper Deschutes Basin Conservation Fund was posted on March 14, 2023, in the total amount of \$170,925 (Figure 8) sent to the Oregon Community Foundation. The Conservation Fund payment was adjusted by +13.74% based on the change in the CPI for all west urban consumers between 2020 and 2022. Inflation adjustments are based on the market basket values in December published by the U.S. Bureau of Labor Statistics (USBLS 2022).

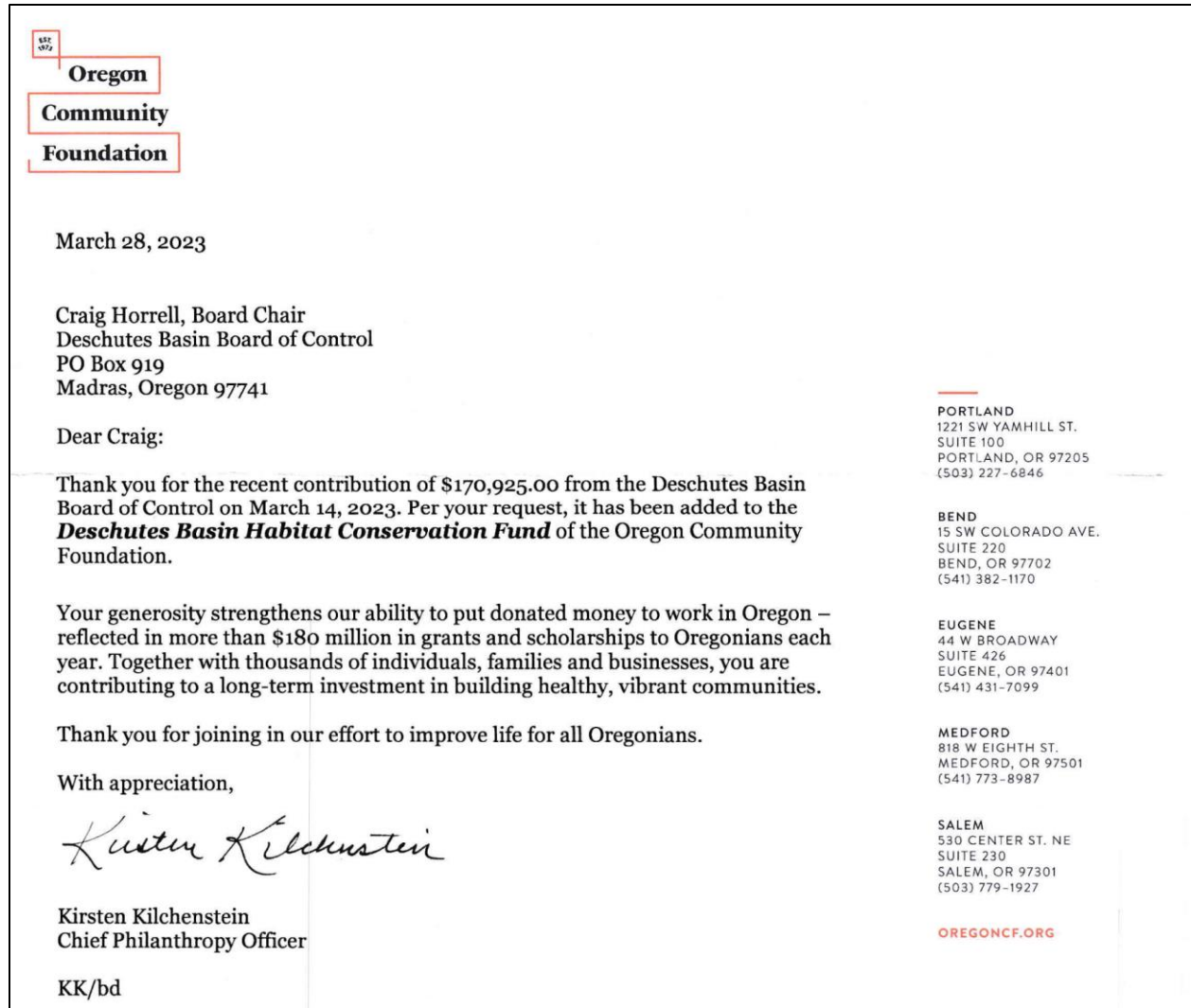


Figure 8. Payments from DBCHCP Permittees to the Upper Deschutes Conservation Fund.

## Middle Deschutes River

### Compliance and Implementation Monitoring

Three DBBC Districts (AID, COID and SID) coordinate stock water diversions and other diversions of live flow from the Deschutes River between November 1 and March 31 to prevent such diversions from resulting in a 1-day average flow of less than 250 cfs ( $\pm 25$  cfs) at Hydromet Station DEBO (OWRD Gage 14070500) below Bend.

#### ***Conservation Measure DR-1 (Middle Deschutes River Flow Outside the Irrigation Season)***

Conservation Measure DR-1 requires reporting on daily average flow data for the preceding November 1 through March 31 at Benham Falls and will identify all daily average flows less than the required 250 cfs and allowable deviation of 225 cfs during stock water runs.

All daily average flows in the Deschutes River below Bend (Hydromet Station DEBO) were within the allowable deviation of 225 cfs from November 1, 2022 through March 31, 2023, including periods when stock water runs were occurring. On February 15 and February 16, 2023, daily average flows were <250 cfs (242 cfs and 249 cfs, respectively) but remained above the threshold for reporting flows to USFWS (235 cfs). Therefore, all stock water runs in Water Year 2023 were in compliance with Conservation Measure DR-1. Flows in the Deschutes River below Bend, above Bend (Hydromet Station BENO), and in the four irrigation district diversions used for winter stock water runs covered by DBHCP Conservation Measure DR-1 (Arnold Diversion, Central Oregon Diversion, North Canal Diversion, and Swalley Diversion) are included in Attachment A: MiddleDeschutes\_WY2023.xlsx of this report.

## Crescent Creek and Little Deschutes River

### Compliance and Implementation Monitoring

Tumalo Irrigation District (TID) implements, monitors, adaptively manages, and reports on covered activities at Crescent Lake Dam and Reservoir.

#### ***Conservation Measure CC-1 (Crescent Creek Flow Management: OSF storage)***

The DBHCP Conservation Measure CC-1 specifies volumes of storage in Crescent Lake Reservoir to be made available for OSF conservation (OSF storage). Reporting for this measure includes the volume of water in Crescent Lake Reservoir available for OSF management (OSF storage) based on the reported storage volume on July 1 of the preceding calendar year and volume of water released from OSF storage during the preceding water year (October 1 – September 30). Daily average flow data for the preceding water year (October 1 through September 30) is reported to the USFWS in a Microsoft Excel file that include flows outside the allowances specified in Measures CC-1, explanations for each deviation, and any remedial actions identified by USFWS and taken by TID.

The total storage volume in Crescent Lake Reservoir on July 1, 2022 was 18,163 acre-feet, resulting in 5,264 acre-feet of Crescent Lake storage to be made available for OSF conservation in Water Year 2023 (DBBC 2023). However, Crescent Lake did not refill appreciably during the Water Year 2023 storage season and was below 9,000 acre-feet when irrigation began on April 15. Therefore, the requirement for storage and release of water for OSF purposes was not triggered due to low volumes of water in Crescent Lake Reservoir. Storage season releases from the reservoir enabled TID to maintain releases of 50 cfs or more from early July through late August, which support OSF habitat in lower Crescent Creek and Little Deschutes River.

The total storage volume in Crescent Lake Reservoir on July 1, 2023 was 17,425 acre-feet, calculated as the three-day average storage volume between June 29 to July 1. In accordance with Conservation Measure CC-1, the July 1 total storage volume results in 5,264 acre-feet of Crescent Lake storage to be made available to USFWS for OSF conservation in Water Year 2023. By September 30, 2023, the storage volume dropped to 6,302 acre-feet with a flow at CREO of 10 cfs. Like Water Year 2023, it is likely that continued drought conditions and low storage volumes in the reservoir will preclude these storage releases in 2024.

#### ***Conservation Measure CC-1 (Crescent Creek Flow Management)***

The DBHCP Conservation Measure CC-1 specifies minimum flows and allowable ranges of deviation for flow in Crescent Creek during both irrigation and storage seasons. The DBHCP requirement for 10 cfs or more during the storage season (October 1 through June 30) with an allowable deviation of 9 cfs was not met during 71 days of Water Year 2023 (Attachment A: CrescentLake\_WY2023.xlsx, Figure 9). During the winter and spring months, flows frequently dropped below 10 cfs. Like previous years, the pumps were set at 10 cfs but the low storage

volume in Crescent Lake resulted in little to no head pressure available to maintain flow at or above 9 cfs. Further, the screens at the outlet are inaccessible for maintenance during winter conditions, allowing debris and ice to accumulate and potentially impact flows. Consequently, there was no action that could be taken by TID to adjust the flows at CREO.

During the irrigation season, as defined in the Conservation Measure CC-1 (July 1 through September 30), flows below Crescent Dam were less than 45 cfs on 30 days. However, TID notified the USFWS that it intended to end the irrigation season on September 08, 2023 (Attachment C: Coord Meeting Notes Final\_20230720) and proceeded with an early ramp down and transition to storage season. The rationale for this was to ensure water would be available for winter releases given the low storage volume. The early transition to storage season accounted for nearly all flows below the allowable deviation except between July 1 and 4 when head pressure dropped due to a screen cleaning issue.

All reported daily average flows in Crescent Creek below Crescent Lake Dam (Hydromet Station CREO) for Water Year 2023 are included in CrescentLake\_WY2023.xlsx with this annual report. This spreadsheet includes a filter for all dates that did not meet the requirements or allowable deviations specified in CC-1 and explanations for such deviations.

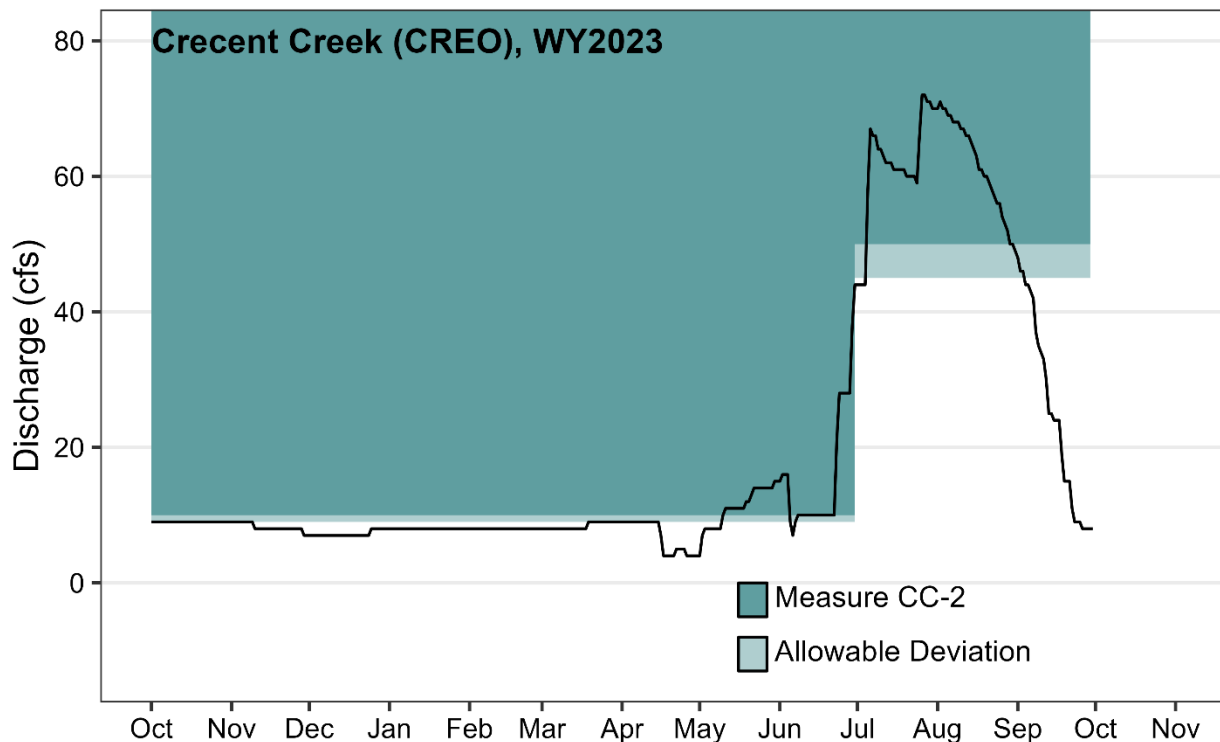


Figure 9. Flow (cfs) in Crescent Creek below Crescent Lake.

***Conservation Measure CC-1 (Maintenance of Gage Downstream of Big Marsh Creek)***

The gage downstream of Big Marsh Creek was not instrumented with the capability to provide real-time data during Water Year 2023. Due to logistical and staffing issues, TID was unable to deliver data to USFWS on two-month intervals. However, continuous flow measurements were recorded during Water Year 2023 and are provided in Attachment A:

CrescentLake\_WY2023.xlsx and summarized in Figure 10.

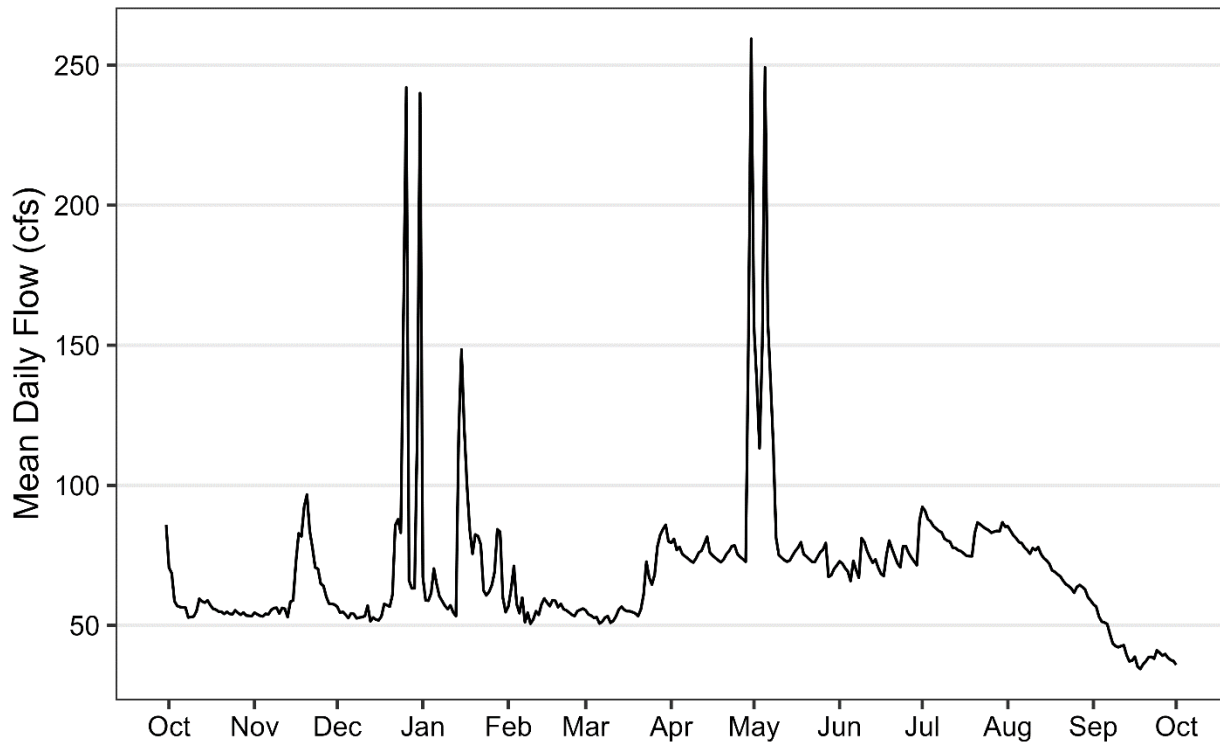


Figure 10. Mean daily flow in Crescent Creek downstream of Big Marsh Creek during Water Year 2023.

***Conservation Measure CC-1 (Breeding Surveys in Crescent Creek)***

Permittees funded two qualified biologists to conduct OSF egg mass counts at Crescent Creek and Little Deschutes River breeding sites during Water Year 2023. A total of 49.5 hours were funded to support field data collection and data processing (Table 1) under the direction of USFWS.

OSF egg masses were surveyed at three long-term monitoring sites on Crescent Creek (RM 1.74, RM 21.9, and RM 22.8) and three sites on the Little Deschutes River (High School Sloughs, Leona Park, and Rosland Park). Count data was collected by the Permittee-funded biologists and uploaded directly to USFWS via Survey123 for incorporation into the USFWS regional database. These data are summarized in detail within the 2023 egg mass survey report (Blackman 2023) submitted to USFWS with this annual report.



***Conservation Measure CC-1 (Stranding Surveys in Crescent Creek)***

USFWS requested that the Permittees' biologist monitor known OSF breeding sites along Crescent Creek and Little Deschutes River where there are specific concerns of stranding. In 2023, Permittee-funded biologists reported that surface water was present and at all egg mass locations in mid-May (Blackman 2023). Surface water depth and the connectivity between egg mass sites and the stream were reported directly to USFWS via Survey123. At all locations, the surface water was deeper than in 2022 due to the high spring precipitation. Consequently, there was no concern that stranding might occur during the early rearing period. OSF monitoring coordination notes from June 08, 2023 (Attachment C) document coordination with USFWS on Conservation Measure CC-1.

***Conservation Measure CC-1 (Habitat Suitability Crescent Creek)***

Starting in Year 1 and repeating every 5 years for the term of the DBHCP, TID will provide funding for two qualified biologists for up to 40 hours each (or up to 80 hours total for one biologist) to conduct OSF habitat suitability analyses at up to three sites along Crescent Creek and/or Little Deschutes River selected by USFWS. The analyses may include, but are not limited to, determining surface water elevations relative to flood plains, monitoring vegetation (including presence of invasive reed canarygrass), monitoring bullfrogs, and conducting drone flights. Methodology will vary by site and will be developed in coordination with USFWS.

Through consultation with USFWS in 2021, the Year 1 analysis was deferred to Year 2 (DBBC 2022). In 2022, the Casey Tract, an 86.5-acre parcel along the Little Deschutes River, was selected for monitoring by USFWS to meet the Permittees' requirements for conducting habitat suitability analyses under both DBHCP Sections 7.2.2.1 (Conservation Measure WR-1) and 7.2.5 (Conservation Measure CC-1). The results from that assessment were reported in DBBC (2023) and Blackman et al. (2022). This Conservation Measure is conducted on 5-year intervals and will be required again in 2025.

***Conservation Measure CC-2 (Crescent Dam Ramping Rates)***

Conservation Measure CC-2 specifies that TID will not increase the flow below Crescent Dam (as measured at OWRD Gage 14060000) more than 30 ( $\pm 2$ ) cfs per 24-hour period or decrease the flow more than 20 ( $\pm 2$ ) cfs per 48-hour period, except under emergency conditions.

The ramping rate below Crescent Dam was within the required ranges of allowable deviation specified in Conservation Measure CC-2 throughout Water Year 2023 (Attachment A: CrescentLake\_WY2022.xlsx).

***Conservation Measure CC-3 (Crescent Lake Reservoir Irrigation Release Season)***

The annual transition from irrigation season flows ( $\geq 50$  cfs) to storage season flows ( $\geq 10$  cfs) at Hydromet Station CREO below Crescent Dam will end no later than October 31 of each year.

TID notified the USFWS that it intended to end the irrigation season on September 08, 2023 (Attachment C: Coord Meeting Notes Final\_20230720) and proceeded with an early ramp down and transition to storage season. The rationale for this was to ensure water would be available for winter releases given the low storage volume. In Water Year 2023, the transition was completed by September 23, 2023.

## Whychus Creek Diversion

### Compliance and Implementation Monitoring

Three Sisters Irrigation District (TSID) implements, monitors, adaptively manages, and reports on covered activities at Whychus Creek Diversion.

#### ***Conservation Measure WC-1 (Whychus Creek Instream Flows: Permanent Instream, Water Rights)***

Conservation Measure WC-1 requires reporting of all permanent instream transfers of TSID irrigation rights completed during the previous calendar year, along with any other senior downstream water right transfers TSID would be required to pass. Instream water rights transfers in Water Year 2023 will be reported under separate cover.

#### ***Conservation Measure WC-1 (Whychus Creek Instream Flows: Whychus Creek and TSID Diversion)***

Conservation Measure WC-1 requires TSID to pass specified amounts of water at its primary diversion that are determined by the proportionality calculator developed by TSID and the Deschutes River Conservancy (DRC). During the first two years of implementation, the DRC provided instream flow minimums using the calculator tool approved by USFWS in 2019. Because that calculator tool required a series of complex manual data inputs to assemble instream protected flows, it was difficult and laborious to replicate the results and could not be easily calculated on a daily timestep. Consequently, the DRC developed an updated calculator during November 2023. The new proportionality calculator tool was approved by USFWS to retrospectively evaluate the 2023 Water Year and for future use (Attachment B: Whychus\_20240104), provided there was concordance with the previous calculations approved during the 2023 Water Year. Figure 11 shows a comparison of the calculations from the 2019 and 2023 tools. The small differences that occur between the two calculations of protected instream flow arise from the new tool calculating flows on a daily timestep over the entire water year compared to a monthly (or longer) timestep for only a selected portion of the water year with the 2019 tool. When compliance with Conservation Measure WC-1 was evaluated with both methods, the two calculators provided almost identical results (99.7% concordance 2023:2019 and 99.0% concordance 2019:2023) for all hours in Water Year 2023. The updated calculator flagged 105 more instances (hours of the year) than the 2019 calculator, however most were within a tenth of 1 cfs of the instream requirement.

As with previous years, TSID was unable to rely on OWRD Gages 14076001 and 14076010 for diversion management in Water Year 2023 due to persistent issues with gage telemetry. No data are available from either gage for Water Year 2023. Instantaneous flow data in Whychus Creek above and below the TSID diversion were available throughout the year from OWRD Gages 14075000 and 14076020, respectively, and were used to guide diversions in compliance with the

DBHCP. Hourly flow data from Gages 14075000 and 14076020 are provided in Attachment A: *WhychusCreek\_WY2023.xlsx* submitted with this report. This table also includes the estimated hourly flow being diverted each day TSID was diverting and the hourly rate of change in diversion (calculated from the difference in flow between upstream and downstream gages). Further, the table indicates hourly flows below the requirements of Conservation Measure WC-1.

Flows below the TSID diversion fell below 23 cfs on 430 instances (hours) during Water Year 2023. Of those instances, 158 occurred in October, 59 occurred in November, 78 in August, and 135 in September. In total, hourly flows below TSID's main diversion were below the instream minimum 4.9% of the total hours in Water Year 2023; many were only a fraction of 1 cfs below the instream minimum. The complete dates TSID was diverting, explanations/reasons for any deviations from Measure WC-1, and any remedial actions identified by the Services and implemented by TSID are to be provided under separate cover.

Per Conservation Measure WC-1, a digital file containing the raw 15-minute data from OWRD Gages 14075000 and 14076020 was also submitted with this report (Attachment A: *WhychusCreekRaw\_WY2023.xlsx*). The processed data for those same days (preliminary, provisional, or published) were not available from OWRD on September 30. We note that both raw 15-minute data and hourly data from these gages are missing flow values between December 20, 2022, and January 19, 2023. For dates with missing hourly data, compliance was evaluated using the mean daily flows published by OWRD.

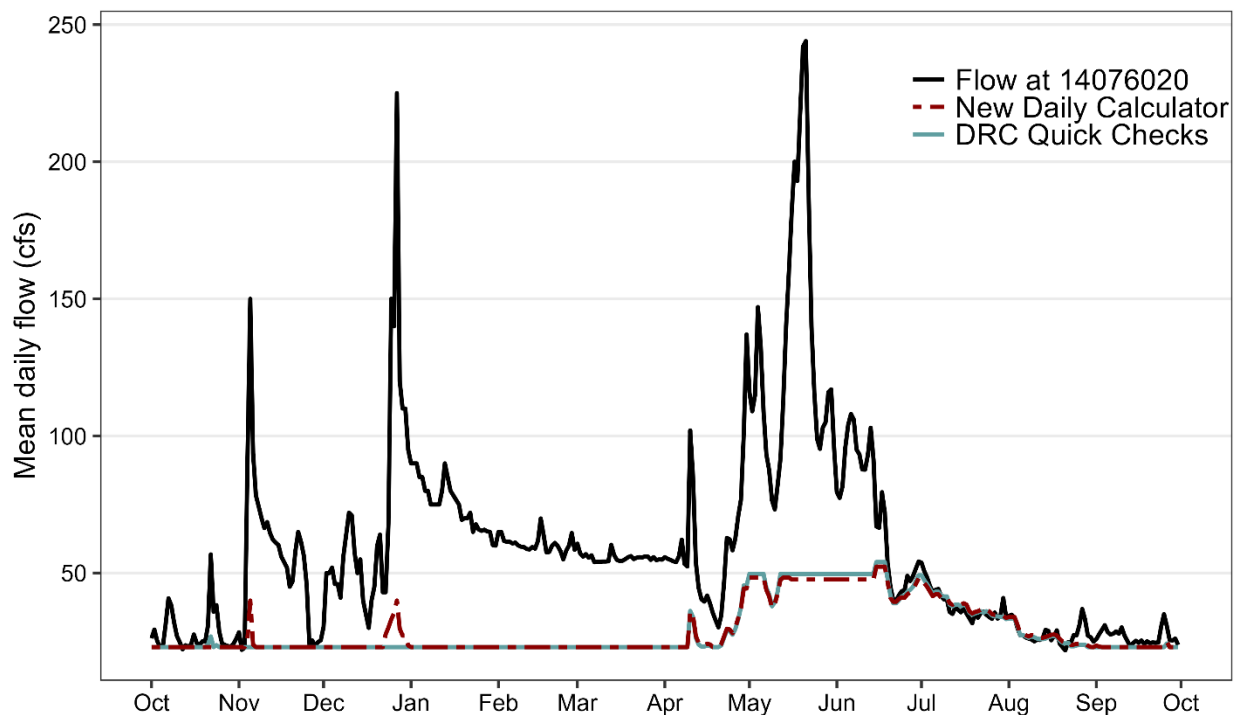


Figure 11. Hydrograph showing calculated instream flow minimums below TSID diversion.

***Conservation Measure WC-1 (Whychus Creek Instream Flows: Flow and Temperature at Camp Polk Road)***

Daily average flow and daily maximum water temperature data in Whychus Creek at Camp Polk Road (OWRD Gage 14076100) are provided in this annual reporting package as digital Microsoft Excel file (Attachment A: WhychusCampPolk\_WY2023.xlsx) for Water Year 2023. The dates that TSID was diverting water at its primary diversion will be provided under separate cover.

***Changed and Unforeseen Circumstances WC-1 (Change in the Status of Whychus Creek DBHCP Section 9.10)***

Water temperature in Whychus Creek is monitored and managed by the Upper Deschutes Watershed Council (UDWC). Hourly water temperatures in Whychus Creek near RM 6.0 for the period April 19 - October 25, 2023, are provided in a Microsoft Excel file (Attachment A: 2023\_ContinuousTempData\_WC\_006-00.xlsx) submitted with this reporting package. This file was created by the UDWC and includes monitoring locations, hourly temperature data, and the DEQ QA/QC audits for the data. The three temperature data loggers that were deployed all met the DEQ criteria and will be added to the water quality monitoring data available on the UDWC's website (Mork 2023). The 7DADM was calculated from all three loggers (Attachment A: WhychusRM6\_Temp\_WY2023.xlsx) and is included with this report.

***Conservation Measure WC-2 (Whychus Creek Temporary Instream Leasing)***

TSID made a financial contribution to the Deschutes River Conservancy on March 01, 2023 in the amount of \$6,824.40 for the Temporary Instream Leasing Fund program. Instream leasing documentation and payment to the Deschutes River Conservancy are provided in Attachment E.

***Conservation Measure WC-3 (Whychus Creek Diversion Fish Screens and Fish Passage)***

TSID is required to schedule one full day each calendar year for the Services to conduct annual inspection of the Whychus Creek diversion and associated fish screens. Every 5 years, beginning in Year 5 (2025) of the DBHCP, TSID will schedule a detailed evaluation of the Whychus Creek diversion and fish screens to be conducted by a qualified professional with appropriate fish screen and fish passage expertise, will include visual examination of the facilities for damage and/or deterioration, as well as measurements of water depths and velocities to verify the facilities are meeting their original design specifications.

No fish screen inspection occurred during calendar year 2023. TSID intends to schedule the inspection early in 2024.

***Conservation Measure WC-4 (Piping of Patron Laterals)***

TSID must report to the Services the miles of patron laterals that were piped and the associated reductions in seepage losses during the preceding calendar year.

TSID piped 3,200 feet along the Runco pipeline in Water Year 2023 resulting in an approximated savings of 0.2 cfs.

***Conservation Measure WC-5 (Whychus Creek Diversion Ramping Rate)***

Conservation Measure WC-5 specifies when the flow in Whychus Creek downstream of TSID's diversion (measured at OWRD Gage 14076020) is 30 cfs or less, the amount of water being diverted will not be increased or decreased more than 5 cfs/hour; when the flow is between 30 and 50 cfs, the amount of water being diverted will not be increased or decreased more than 10 cfs/hour.

As with Conservation Measure WC-1, TSID was unable to rely on OWRD Gages 14076001 and 14076010 for diversion management in 2023 due to persistent issues with gage telemetry. No data are available from either gage for the preceding water year (October 1 through September 30). Instantaneous flow data in Whychus Creek above and below the TSID diversion were available throughout the year from OWRD Gages 14075000 and 14076020, respectively, and were used to guide diversions in compliance with this conservation measure.

Ramping rates were evaluated from average hourly flow data at OWRD Gages 14076020 and 14075000 and reported in Attachment A: WhychusCreek\_WY2023.xlsx, submitted with this report. There were five days during Water Year 2023 when ramping rates exceeded 10 cfs for one hour of the day while flows below the TSID diversion were between 30 and 50 cfs. There were 20 instances (hours) when ramping rates exceeded 5 cfs while flows below TSID diversion were < 30 cfs; almost all instances occurred in October of 2022.

***Conservation Measure WC-6 (Whychus Creek Habitat Conservation Fund)***

TSID in-kind riparian channel restoration activity in 2023 includes the cleanup and restoration of the Plainview project and direct financial contributions to the Whychus Creek Habitat Conservation Fund. The details and receipts for this work will be provided under separate cover.

***Conservation Measure WC-7 (Plainview Dam Removal)***

Removal of the Plainview Dam and restoration of the associated reach of Whychus Creek was completed in October 2021.

## Crooked River Subbasin

### Compliance and Implementation Monitoring

Ochoco Irrigation District (OID), NUID and the City of Prineville implement, monitor and adaptively manage various aspects of the Crooked River diversions including flow conditions in the Crooked River, Ochoco Creek, and McKay Creek; temporary instream flow leasing and permanent water rights transfers; and screening activities that occur at OID patron diversions. Specific compliance and implementation monitoring and reporting to be conducted in the Crooked River basin can be found in Chapter 7 of the DBHCP.

**Table 7-1. DBHCP flow monitoring requirements for the Crooked River subbasin.**

<b>Water Body</b>	<b>Location</b>	<b>Data to be Collected</b>
<i>Crooked River (RM 70.0)</i>	<i>OWRD Gage 14080500 (Hydromet Station PRVO)</i>	<i>Daily average flow</i>
<i>Crooked River (RM 56.5)</i>	<i>Manual staff gage downstream of Crooked River Diversion</i>	<i>Flow at time of change in diversion rate</i>
<i>Crooked River (RM 48.0)</i>	<i>OWRD Gage 14081500 (Hydromet Station CAPO)</i>	<i>Daily average flow</i>
<i>Ochoco Creek (RM 11.2)</i>	<i>OWRD Gage 14085300 (Hydromet Station OCHO)</i>	<i>Hourly average flow</i>
<i>Ochoco Creek (RM 10.2)</i>	<i>Manual staff gage at Red Granary Diversion</i>	<i>Flow at time of change in diversion rate</i>
<i>Ochoco Creek (RM 9.4)</i>	<i>Recording gage with telemetry downstream of Golf Course Dam</i>	<i>Hourly average flow</i>
<i>Ochoco Creek (RM 7.5)</i>	<i>Manual staff gage at Breese Dam</i>	<i>Flow at time of change in diversion rate</i>
<i>Ochoco Creek (RM 5.1)</i>	<i>Recording gage with telemetry at Crooked River Diversion Spill</i>	<i>Hourly average flow</i>
<i>Ochoco Creek (RM 4.7)</i>	<i>Manual staff gage at Ryegrass Diversion</i>	<i>Flow at time of change in diversion rate</i>
<i>McKay Creek (RM 5.8)</i>	<i>Manual staff gage at Jones Dam</i>	<i>Flow at time of change in diversion rate</i>
<i>McKay Creek (RM 3.2)</i>	<i>Manual staff gage at Reynolds Siphon</i>	<i>Flow at time of change in diversion rate</i>
<i>McKay Creek (RM 1.3)</i>	<i>Recording gage with telemetry at Cook Inverted Weir</i>	<i>Daily average flow</i>
<i>McKay Creek (RM 0.6)</i>	<i>Manual staff gage at Smith Inverted Weir</i>	<i>Flow at time of change in diversion rate</i>

***Conservation Measure CR-1 (Crooked River Flow Downstream of Bowman Dam)***

Conservation Measure CR-1 specifies that OID will provide live flow and/or storage from its account, as needed. This will enable Reclamation to maintain a daily average flow of 50 cfs  $\pm 10\%$  allowable deviation at OWRD Gage 14080500 below Bowman Dam (Hydromet Station PRVO) outside the active irrigation season. The typical irrigation season is mid-April to mid-October, but actual dates can vary. From October 1, 2022, until the start of the irrigation season on April 15, 2023, releases from Bowman Dam ranged from 9-56 cfs (Figure 12). Despite reaching storage capacity in the spring of 2023, Prineville Reservoir releases at the beginning of the 2023 water year were less than 50 cfs because Prineville Reservoir's storage only reached 47,331 acre-feet at the end of Water Year 2022, which is approximately 32 percent of the reservoir's 148,633 acre-feet capacity. This was significantly lower than the previous lowest annual fill level of 78,494 acre-feet that occurred in 1992. This led to ending the 2022 irrigation season on September 15, approximately one month earlier than usual. Moreover, in their Annual Flow Recommendation Memo dated September 12, 2022 (USFWS (U.S. Fish and Wildlife Service) and NMFS (National Marine Fisheries Service) 2022), USFWS and NMFS elected not to release uncontracted storage water for fish and wildlife in the fall of 2022 after irrigation releases ended because *"Increasing flows above 10 cfs would likely have limited benefits since flow releases do not have instream protection in these months [September and October] and may be legally diverted for irrigation. In addition, flows from Prineville Reservoir will likely be warmer than normal due to the reservoir's very low storage level, which will limit their instream benefits to fish species that require cold water such as Chinook, steelhead, and bull trout."*

The record low reservoir storage levels in 2022 created unprecedented conditions that required modifications to storage season flows. In anticipation of the inability to fully support storage season flows, the Permittees consulted with USFWS and NMFS midway through the 2022 irrigation season to define a plan for maximizing biological benefits of the limited available stored water. USFWS delivered a letter to OID on September 12, 2022 explaining its preferred approach to fall/winter flow management (USFWS (U.S. Fish and Wildlife Service) 2022). The letter provided the rationale for postponing the increase to 50 cfs until November 1, 2022. Reclamation therefore bypassed a minimum of 9 cfs from October 1 to October 23, 2022. (Figure 12; Attachment A: CrookedRiverCR1\_WY2023.xlsx). Due to natural flow inputs, reservoir releases increased to 18 cfs on October 24 and continued to increase until the 50 cfs threshold was achieved November 1, 2022. There were no dates after October 31, 2022, that fell outside the requirements or allowable deviations for Conservation Measure CR-1.

Due to high snowpack levels at higher elevations during the spring in 2023, the reservoir storage reached capacity, requiring spill at Bowman Dam (Attachment C: Coord Meeting Notes Final\_20230421). This triggered the requirement for BOR to monitor total dissolved gases (TDG) downstream of the dam. Spill events at Bowman Dam are known to increase the amount of TDG, which has been shown to increase the prevalence of gas bubble disease (GBD) in fish. GBD typically occurs when TDG levels exceed 110% saturation for prolonged periods (Pleizier et al. 2020). On the Crooked River, studies conducted by BOR (2008), Nesbit (2010), Sharpe (2012), and MHE (2019) documented TDG levels greater than 110% when flows exceeded



approximately 600 cfs. At 1,200 cfs, Nesbit (2010) measured TDG at or exceeding 120%. Similarly, MHE (2019) found TDG reached 120% between 1200 and 1400 cfs. BOR (2008) observed similar TDG levels at 2,600 cfs. High TDG levels coincident with spill at Bowman Dam also persist downstream of the tailrace through the Wild and Scenic reach of the Crooked River.

The TDG levels observed by BOR in 2023 were high enough to cause GBD in salmonids but were surprisingly low and consistent (111-115%) across all flows, and were the lowest levels reported at flows greater than 1000 cfs (Figure 13). It is unclear why there was a discrepancy between 2023 measurements and previously collected data. USFWS is working with BOR, USGS, and MHE to refine data collection protocols and possibly collect additional data during the next spill event at Bowman Dam.

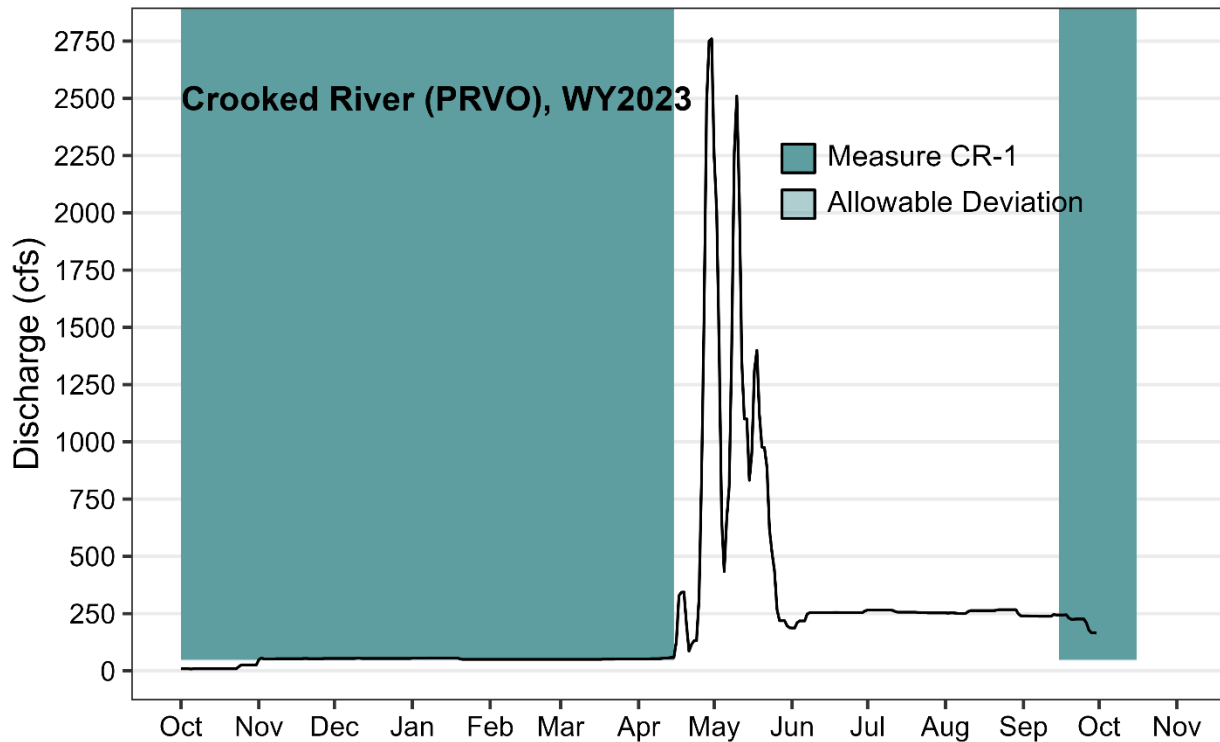


Figure 12. Crooked River discharge below Bowman Dam (OWRD Gage 14080500).

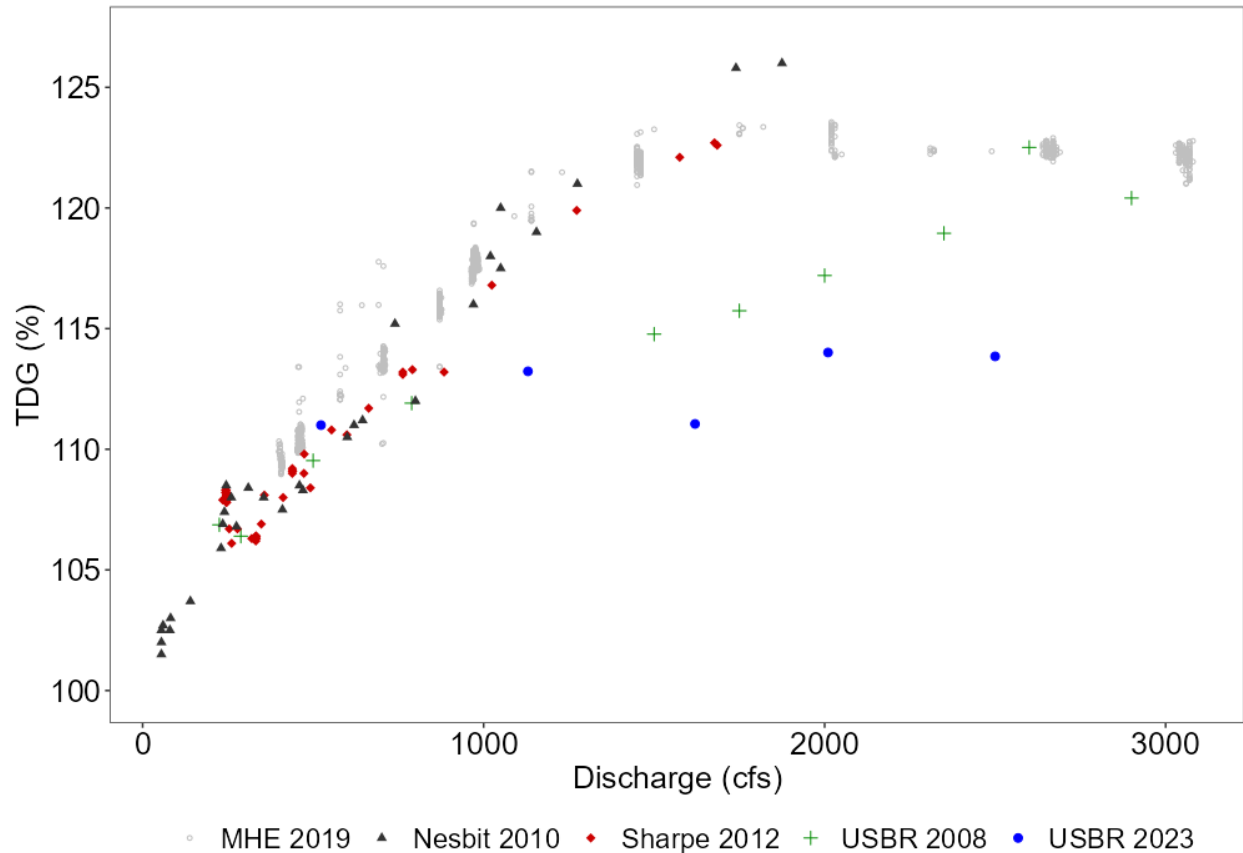


Figure 13. TDG measurements taken downstream of Bowman Dam across five spill monitoring events.

***Conservation Measure CR-2 (Ochoco Creek Flow: OID Contributions to Ochoco Creek Flow)***

Conservation Measure CR-2 specifies OID will contribute to flow in Ochoco Creek by releasing water from the Ochoco Main Canal downstream of Ochoco Reservoir. Seasonal contributions of 3 or 5 cfs as specified in the DBHCP are additive to any permanent instream water right transfers and/or temporary instream leases secured through the Crooked River Conservation Fund (Measure CR-5) on Ochoco Creek. OID contributions are not made if they require pumping from inactive storage in Ochoco Reservoir (below water surface elevation 3,074.94 feet) unless OID is pumping water from inactive storage for irrigation purposes.

During the 2023 water year, sufficient storage was not available in Ochoco Reservoir to contribute flow per measure CR-2 until April 14 because water levels were below the minimum necessary to release water from Ochoco Dam (Figure 14; Attachment A: CrookedRiverCR2\_hourly\_WY2023.xlsx). Moreover, flows were below the allowable deviation from April 14-29 because OID was switching from the bypass to the regulating gates; USFWS was notified. From May-September, reservoir volumes were sufficient and OID was able to comply with Measure CR-2. OID has explored, with the assistance of BOR, options for

monitoring water surface elevation in Ochoco Reservoir when the water level drops below the sensor. The district will take a physical measurement during its routine inspection and provide this information to BOR for tracking and recording purposes.

Lack of flow in Ochoco Creek in 2023 was a lag effect from drought conditions in 2022. These conditions excluded fish downstream of Ochoco Dam such that rearing fish would have had to migrate downstream to avoid desiccation. When stream flow was restored in April 2023, Redband Trout from the Crooked River likely recolonized Ochoco Creek below the Dam. However, steelhead spawning in Ochoco Creek in 2023 was unlikely because peak spawning occurs before April. Similarly, spring Chinook Salmon most likely did not utilize the creek in 2023. Flow was above 5 cfs in Ochoco Creek throughout the fall, but remained insufficient to support spawning adult salmon, which require relatively deep pools and runs because of their large body size.

In accordance with monitoring and reporting requirements for Measure CR-2, average hourly flows are provided in Attachment A (CrookedRiverCR2\_hourly\_WY2023.xlsx) for river miles 9.4 and 5.1. Stream gage measurements at river miles 5.1 and 9.4 did not become available until mid-April and early May, respectively because of lack of flow in Ochoco Creek.

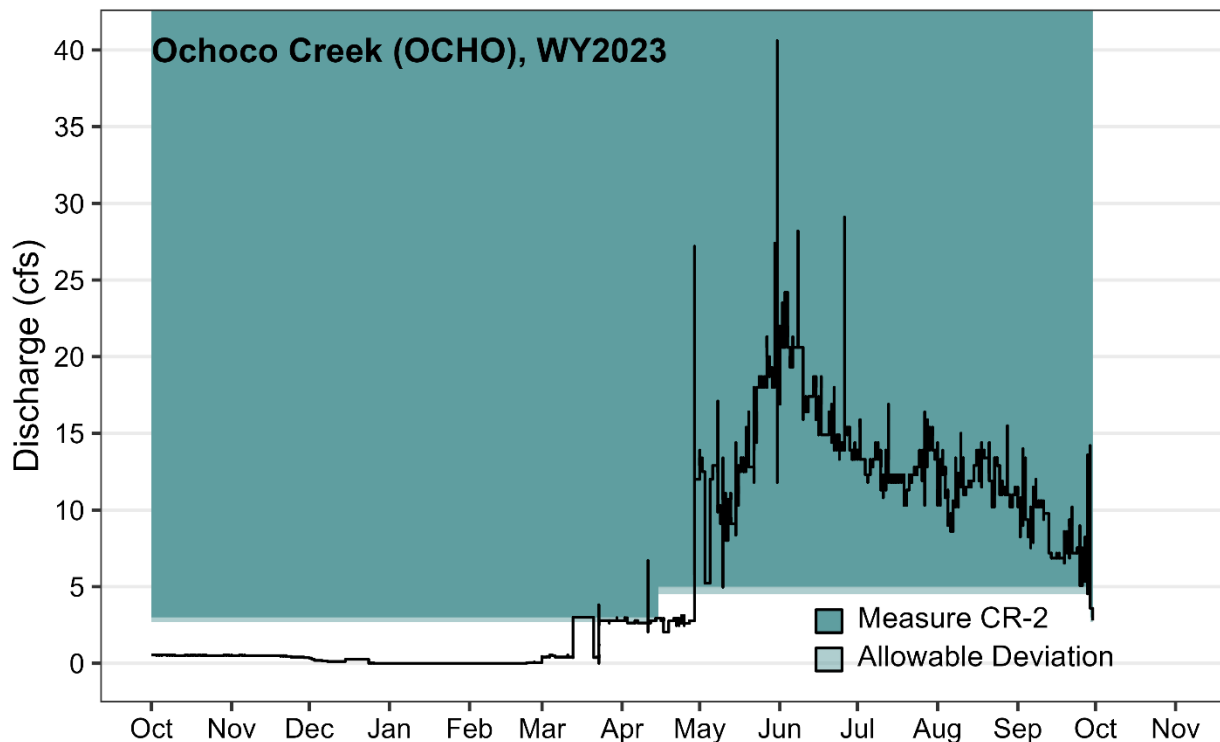


Figure 14. Ochoco Creek hourly discharge below Ochoco Dam (OWRD Gage 14085300).

***Conservation Measure CR-2 (Ochoco Creek Flow: Installation of additional monitoring sites)***

Rating curves for flow gages were developed at additional sites in Ochoco Creek during the 2023 Water Year. OID coordinated with OWRD beginning in January 2021 to determine site feasibility and locations for staff gages required by DBHCP Section 7.2.12. OID visited the sites with OWRD in February 2021 and placed staff gages at the required locations on Ochoco Creek based on the recommendation of OWRD. OID also visited sites requiring telemetry with Reclamation to evaluate specific locations and order materials. Delivery of telemetry materials was delayed significantly due to COVID, but all sites became operational in March or April 2021. OWRD revisited the sites in April and June to collect flow measurements for rating the gages. Additional rating of the gages was anticipated in 2022 but did not occur. The only site that was not successfully installed was the Crooked River staff gage below the OID diversion because the site was determined unsuitable. In 2023, OID hired a contractor to develop rating curves at new gage sites (Attachment D: CrookedRiverGageRating\_WY2023). Using the rating curves, estimated discharge was calculated at RM 7.5 and RM 10.2 (Attachment A: CrookedRiverCR2\_StaffGage\_WY2023). Some sites proved not to be feasible and OID staff are working to identify alternative locations that meet the intent of the measure.

***Conservation Measure CR-2 (Ochoco Creek Flow: Temporary Instream Leasing and Permanent Water Right Transfers)***

CR-2 requires reporting on temporary instream leases and permanent water right transfers of Crooked River and Ochoco Creek irrigation rights during the preceding calendar year. Reporting will identify the quantity of water covered by each temporary or permanent transfer, and the fate of that water (timing and rate of bypass at Bowman Dam or Ochoco Dam). For transfers of OID patron water rights, the report will also identify whether any of the water was temporarily stored by OID.

OID worked with the DRC to implement a dry year lease program and incentivize instream leasing during the exceptional drought of 2022. This program resulted in the temporary instream lease of water rights from 83.9 acres irrigated with Ochoco Creek water, which produced a protected instream flow of 0.746 cfs. This flow was placed instream by OID from June 1 through July 6. The total flow volume was relatively low because Oregon water law sets instream leases at the same priority date as water that is being delivered to farms during the period of the leases. Because 2022 was a poor water year, on-farm deliveries to OID patrons were quite low.

No permanent instream transfers of OID water occurred in 2023. OID and the DRC are surveying a selection of OID patrons to determine a price structure for expanding instream leasing in dry years. The survey results will help guide adjustments to the dry year lease program in 2024.

***Conservation Measure CR-3 (McKay Creek Flow: McKay Switch)***

Conservation Measure CR-3 specifies OID will report on the status of the McKay Creek water switch including the amount of McKay Creek irrigation water that was transferred instream

during the preceding year and the total amount of water transferred to date through the McKay Creek switch. In Water Year 2023, two major milestones were met regarding the McKay switch. First, construction began on the first phase of the OID Infrastructure Modernization Project. This initial phase includes the construction of a new Crooked River Pump Station Number One, the first of three steps for OID to deliver water to the McKay patrons. Second, OID and the Deschutes River Conservancy were awarded a grant from OWRD totaling over \$4 million dollars to help cover the construction costs for the new infrastructure. Additional work is needed to secure project power agreements and final pump station and pipeline design.

***Conservation Measure CR-3 (McKay Creek Flow: Installation of additional monitoring sites)***

Flow monitoring and reporting is required at four locations on McKay Creek (Table 4) and daily minimum instream flows in McKay Creek are required during the active irrigation season at Jones Dam (RM 5.8), Reynolds Siphon (RM 3.2), and Cook Inverted Weir (RM 1.3). The minimum flows will shift after the full implementation of the McKay switch, which is currently in progress. In 2021, staff gages were installed at the required locations on McKay Creek and based on the recommendation of OWRD. However, OWRD did not revisit sites to update rating curves during 2022 or 2023.

In lieu of OWRD rating curves, OID contracted MHE to develop rating curves for staff gages with flow monitoring requirements under Conservation Measure CR-3 during the 2023 water year. In McKay Creek, a rating curve was established for Jones Dam (MHE 2023) to estimate discharge and evaluate compliance. Due to high-flow events during the spring, staff gages were lost on Smith Weir, Norms Weir (*formerly Cook*), and Reynolds Siphon. Consequently, discharge measurements were not possible at those locations.

Measurements of flow at Jones Dam are provided in CrookedRiverCR3\_WY2023.xlsx (Attachment A). In the absence of real-time gage data, it was not always feasible to obtain flow at the time of diversions. In part, this is due to a lack of timely notification from patrons. Between June 19, 2023 and September 28, 2023 the flow below Jones Dam was estimated to be less than 1.8 cfs during all stage height measurements taken in June and July as well as two days in September. It should be noted that there was substantial error associated with the rating curves due to the frequency of measurement and therefore the estimates of flow also reflect that error. Although these rating curves are informative, we caution against using the resulting flows as a metric for compliance without validation by OWRD.

Coordination between OID and OWRD in January 2021 established sites and the expectation that OWRD would collect flow measurements for rating the gages. OWRD has since been unable to monitor those locations. In the 2024 water year, OID will coordinate with OWRD to relocate staff gages that were lost during 2023 high-flow events. If the relocation of any lost staff gage is not feasible, OID intends to develop alternative methods to record and report flows at these sites in coordination with the Services.

Table 4. Minimum instream flows and reporting for McKay Creek during the active irrigation season.

Stream Reach	Before McKay Switch	After McKay Switch	Reporting REQ
Jones Dam (RM 5.8)	2.0 cfs (1.8 cfs)	Equal to flow immediately upstream of Jones Dam, to a maximum of 11.2 cfs	Flow at time of change in diversion rate; deviations from instream minimum
Reynolds Siphon (RM 3.2)	3.0 cfs (1.7 cfs)	Equal to flow immediately upstream of Jones Dam, to a maximum of 12.2 cfs	Flow at time of change in diversion rate; deviations from instream minimum
Inverted Weir (RM 1.3)	5.0 cfs (4.5 cfs)	Equal to flow immediately upstream of Jones Dam, to a maximum of 14.2 cfs	Daily average flow; deviations from instream minimum
Smith Weir (RM 0.6)	NA	NA	Flow at time of change in diversion rate

#### ***Conservation Measure CR-4 (Crooked River Conservation Fund)***

The DBHCP Permittees' payment to the Crooked River Conservation Fund was issued in February 2023. Confirmation of payment to the DRC in the amount of \$9,099.20 was received by the DBBC on February 23, 2023 (Attachment E).

#### ***Conservation Measure CR-5 (Screening of Diversion Structures: District Diversions)***

OID and NUID are required to maintain and operate fish screens to prevent the entrainment of juvenile salmonids on all District-controlled diversions accessible to covered fish species. The DBHCP also specifies that OID will schedule one full day each year for USFWS to inspect the OID's diversions and fish screens. On March 7, 2023, USFWS completed its inspection of OID diversions. No issues were identified during the inspection and no further action was required. As requested by the Services, below is a list of screens to be inspected in 2024:

- the main Crooked River diversion
- Red Granary (Located at RM 10.2) on Ochoco Creek
- Ryegrass (Located at RM 4.7) on Ochoco Creek

#### ***Conservation Measure CR-5 (Screening of Diversion Structures: Patron Diversions)***

OID is required to provide the Services with a report on the screening of patron diversions during the preceding calendar year (for year 2-6 only). The report will identify the screening account balance as of December 31, all account activity (deposits and withdrawals), and all screens funded through the account.

There were no screening projects directly funded in 2023. However, OID worked directly with the Crooked River Watershed Council (CRWC) on landowner outreach and recruitment through the Fin Safe fish screening program. Following the successful installation of two fish screens in the lower Crooked River during the program pilot year in 2022, the 2023 water year focused on actions to connect with and engage landowners that have qualifying irrigation screens. First, the

CRWC and OID developed and sent 19 formal introduction letters to landowners informing them of the funding opportunity and process for installing a screen on their irrigation pump intakes. Additionally, postcards were developed and mailed as a follow-up to the letter. To increase broad community awareness of this opportunity for new fish screens, the CRWC worked with the Central Oregonian newspaper to feature an article about Fin Safe and the need for fish screens. The Fin Safe program letter, postcard, and article are documented in Attachment B: Crooked River WY23.

In the last quarter of 2023, several landowners expressed interest in screens and are now communicating with the project engineer to explore screen options and evaluate the need for a lifting device at their site. Because each site is unique and each pump configuration is different, custom-designed screening solutions are needed to ensure screen performance, longer term durability, minimal impact to the landowner in terms of operations and maintenance, and cost effectiveness. It is anticipated that these efforts will result in OID and the CRWC installing at least three screens in 2024 in the lower Crooked River.

As of December 31, 2023, the account balance for the screening account is \$5,000. This balance will be carried over to the 2024 water year, which will have an additional \$5,000 added to the account, totaling \$10,000.

***Conservation Measure CR-6 (Crooked River Flow Downstream of the Crooked River Pumps)***

Conservation Measure CR-6 requires that NUID report to NMFS and USFWS by email within 48 hours whenever the flow measured at OWRD Gage 14087300 falls below the required level specified in Conservation Measure CR-6 concurrent with NUID pumping of stored water. Additionally, this measure specifies that flow requirements downstream of NUID's pumps are based on the declaration of a "Dry" or "Non-dry" year by OWRD or BOR in March of the current Water Year.

The 2023 Water Year was anomalous with respect to the late and voluminous snowpack in the basin preceded by a relatively dry early winter. As of March 31, 2023, the reservoir levels were very low; however, all parties agreed that there was a significant snowpack yet to melt off. In anticipation of that melt off, the request for a declaration was sent on April 20, 2023. By mid-April, the contracted storage was full, and the basin snowpack remained well above average. The Crook and Jefferson County drought declarations made by the Governor were based on the relatively dry early winter conditions and the extremely low reservoir levels in January and February. The early request for the drought declarations by the county commissioners were based on conditions and reservoir storage levels at the time as well as attempting to address concerns around emergency drought permit processing time frames. An early drought declaration was seen as providing permit applicants time for permit approval prior to the onset of the 2023 irrigation season. Nevertheless, OWRD declared the 2023 Water Year a "Non-dry" year. The rationale for this determination is documented in Attachment B: "Dry\_NonDry\_Determination\_2023.pdf".

CR-6 specifies reporting flows, the number of pumps in operation, and the estimated daily average rate of diversion (cfs) when flows fell below the required level. These metrics are provided in Attachment A: CrookedRiverCR6\_WY2023.xlsx. NUID's installation and troubleshooting of a new network configuration on site resulted in a gap in the pumping data from June 1 – June 19. There was another gap in data from August 4 – September 12 when the controller stopped datalogging due to FTP memory maxing out, and a subsequent failure of the alerting system (Attachment B: CrookedRiver\_20231030). During June there were 26 days when the mean daily flow at CRSO was below the required 86 cfs. During July there were 23 days when the mean daily flow at CRSO was below the required 61 cfs. During August there were 14 days when the mean daily flow at CRSO was below the required 68 cfs. During September there were 8 days when the mean daily flow at CRSO was below the required 68 cfs. Pumping coincides with the hottest summer months when peak air temperatures can significantly warm the surface water in the Crooked River. Because lower flows may travel slower and have more shallow depths than higher flows, they can warm faster when exposed to peak summer air temperatures. The potential biological impacts of flows below the minimum requirements in CR-6 could include the exposure of riverine organisms to warmer water, potentially above their thermal tolerances.

***Conservation Measure CR-7 (Crooked River Downstream Fish Migration Pulse Flows)***

Conservation Measure 7 specifies that OID and NUID will not divert water from the Crooked River if the water at issue is part of a spring fish migration pulse flow from uncontracted Prineville Reservoir as provided for by Reclamation.

Based on the 2022/2023 annual flow recommendation issued by USFWS and NMFS, storage quantities for release as fish and wildlife flows were (1) 0 acre-feet of uncontracted storage, and (2) 1,977 acre-feet of groundwater mitigation storage, for a total storage of 1,977 acre-feet for fish and wildlife. Due to extremely low Prineville Reservoir storage, two additional storage sources were made available to help maintain minimum flows for fish and wildlife: (1) the Bureau of Reclamation reserved a volume of reservoir storage to provide a minimum flow of 10 cfs when no other water was being released from Bowman Dam, pursuant to the provisions of the Crooked River Act of 2014; and, (2) an allocation of 3,000 acre-feet of OID storage was made available for fish and wildlife under the DBHCP. However, due to high snowpack levels at higher elevations during the spring in 2023, the reservoir storage reached capacity, requiring spill at Bowman Dam. Consequently, several pulse flows occurred from mid-April until mid-May (Figure 12), contemporaneous with the timing of downstream migration of steelhead smolts.



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