2021 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:

U. S. Fish and Wildlife Service
Bend Fish and Wildlife Office
63095 Deschutes Market Road
Bend, OR 97701

Submitted by:

Arnold Irrigation District, Bend, OR
Central Oregon Irrigation District, Redmond, OR
Lone Pine Irrigation District, Terrebonne, OR
North Unit Irrigation District, Madras, OR
Ochoco Irrigation District, Prineville, OR
Swalley Irrigation District, Bend, OR
Three Sisters Irrigation District, Sisters, OR
Tumalo Irrigation District, Bend, OR
The City of Prineville, OR

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1. INTRODUCTION

1.1 Background

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), which was approved by USFWS simultaneous with permit issuance in December 2020. DBHCP Chapter 7 (*Monitoring, Reporting and Adaptive Management*) describes the Permittees' annual monitoring and reporting requirements. The USFWS Permit also includes additional reporting requirements pertinent to the incidental discovery of covered species remains during the course of DBHCP implementation. As specified in DBHCP Chapter 7, annual reports are to be based on water years, which run from October 1 through September 30. This report contains all information required by DBHCP Chapter 7 and the USFWS Permit for that portion of Water Year 2021 that occurred subsequent to permit issuance (January 1 through September 30, 2021).

1.2 Organization of this Report

The DBHCP requires two general types of monitoring; compliance/implementation monitoring and effectiveness monitoring. 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 a number of adaptive management provisions of the DBHCP that address minor levels of uncertainty about the effectiveness of the conservation measures. This report contains the results of both types of monitoring in 2021.

DBHCP Chapter 6 (Habitat Conservation) and Chapter 7 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. In keeping with this approach, the remainder of this report is organized by covered activities. For each activity or set of activities, the monitoring and reporting requirements of Chapter 7 are provided for reference, followed by the results of the monitoring for the reporting period. If detailed explanation or discussion is warranted for any monitoring element, this is provided immediately after the respective results.

2. CRANE PRAIRIE RESERVOIR

2.1 Compliance and Implementation Monitoring

2.1.1 Crane Prairie Reservoir

2.1.1.1 Monitoring Requirement

Midnight stage (water surface elevation in feet) and storage volume (acre-feet) for Crane Prairie Reservoir will be monitored daily at Hydromet Station CRA (or a comparable replacement) for the term of the DBHCP. COID will use these data to direct day-to-day operation of Crane Prairie Dam in compliance with Measure CP-1. Water surface elevations outside the allowable range of deviation in Table CP-1 will be reported to USFWS via email within 12 hours of occurrence. The report will include an explanation for the deviation and the steps being taken to bring water surface elevation back within the allowable range of deviation. COID will assist USFWS in determining the impact of the water surface deviation on the Oregon spotted frog. USFWS will determine what, if any, remedial actions are necessary to mitigate the impacts, and COID will implement those actions.

No later than January 31 of each year, daily (midnight) water surface elevation and storage volume data for the preceding water year (October 1 through September 30) will be reported to the Services in Microsoft Excel or other format approved by the Services. In addition, annual reports will identify all daily water surface elevations outside the required range specified in Table CP-1 of Measure CP-1, explain the reason for each such deviation, and identify any remedial actions identified by USFWS and taken by COID.

2.1.1.2 Monitoring Results for Water Year 2021

Daily reported values for midnight storage volume and water surface elevation in Crane Prairie Reservoir from January 1 through September 30, 2021 are presented in Appendix A-1. Daily changes in water surface elevation for the same period are also provided in Appendix A-1. 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. These ranges are indicated in Appendix A-1 as well.

In accordance with item H of Conservation Measure CP-1, the minimum allowable water surface elevation starting on July 16 was reduced from 4,441.23 to 4,440.05 feet for 2021 to allow for the release an additional 5,000 acre-feet of storage in late summer. This modification was made in coordination with USFWS, as reported in the notes of the June 16, 2021 implementation coordination meeting between USFWS and the Permittees (see Appendix E-1). Also related to this release of additional storage, the maximum allowable rate of decrease in midnight water surface elevation from July 16 to 31 was increased 0.10 foot per day, which is the DBHCP allowable rate after July 31.

Reported midnight water surface elevation was within the modified DBHCP required range for all but 13 days between January 1 and September 30, and within the original allowable range of deviation for all but two days. The first deviation occurred from July 4 through 15, when a sudden decrease in reservoir inflow caused the water surface elevation to drop prematurely in the weeks

prior to the onset of the annual drawdown. For the first eleven days of the drop, the water surface elevation remained within the allowable range of deviation (i.e., ≥ 4,443.05 feet) and the drop was allowed to continue in anticipation of the upcoming scheduled drawdown. However, at 10:30 PM on July 15, the last day before initiation of the scheduled drawdown, the water surface elevation dropped 0.02 foot (0.24 inch) below the lower limit of the allowable range of deviation (the low on July 15 was 4,443.03 feet). By the time the elevation outside the allowable range of deviation was noted on the morning of July 16, drawdown had begun and the allowable range of deviation had already shifted so that the water surface elevation was again in compliance with the DBHCP. USFWS was not notified of the deviation on July 16 because the water surface elevation was back within the required range by the time it was discovered and no remedial action was warranted. Monitoring for Oregon spotted frog stranding during reservoir drawdown also began on July 16, and the results of this monitoring suggest young frogs had already moved to deeper water prior to the initiation of the drawdown. The results of this monitoring are addressed in Section 2.2.3 and Appendix C-1 of this report.

The second reported water surface elevation outside the allowable range of deviation occurred for a single day on September 9, 2021, several days after completion of the scheduled drawdown. The midnight water surface elevation of the reservoir was reported to be 0.01 foot (0.12 inch) below the required range, but examination of water surface elevations for several days before and after September 9 suggest the low reading was the result of gage error and did not represent actual reservoir conditions at the time. The water surface elevation of the reservoir held relatively steady (± 0.02 feet) for at least five days before and after September 9. On September 9, however, it was reported to drop 0.06 foot before rising again 0.09 feet the following day. This sudden change in water surface elevation during a period of relatively constant water level was more likely the result of hardware malfunction or an environmental factor (e.g., wind) that caused an erroneous gage reading.

The rate of decrease in reservoir water surface elevation was within the DBHCP required range for all but one day in the reporting period. On August 8, mid-way through the annual drawdown, the rate of decrease was 0.11 foot/day (1.3 inches per day). This was 0.01 foot/day above the required range, but within the allowable range of deviation. Monitoring for Oregon spotted frog stranding at the time (see Section 2.2.3) suggest this minor exceedance had no measurable effect on the species.

As required by Item G of Conservation Measure CP-1, the Permittees met monthly via *Teams* video conferencing from January through September 2021 to coordinate implementation of the DBHCP. Participants in these meetings included representatives of USFWS, Bureau of Reclamation (Reclamation), Oregon Water Resources Department (OWRD), AID, COID, LPID and NUID. Notes from the meetings are provided in Appendix E-1.

2.1.2 Deschutes River below Crane Prairie Dam

2.1.2.1 Monitoring Requirement

Daily average flow (cfs) in the Deschutes River below Crane Prairie Dam will be monitored at Hydromet Station CRAO (or a comparable replacement) for the term of the DBHCP. COID will use these data to direct day-to-day operation of Crane Prairie Dam in compliance with Measure CP-1. Daily average flows outside the allowable range of deviation in Table CP-1 will be reported to USFWS via email within 12 hours of occurrence, and will include an explanation for each such deviation. The report will include an explanation for the deviation and the steps

being taken to bring daily average flow back within the allowable range of deviation. COID will assist USFWS in determining the impact of the flow deviation on the Oregon spotted frog. USFWS will determine what, if any, remedial actions are necessary to mitigate the impacts, and COID will implement those actions.

No later than January 31 of each year, daily average flow data for the preceding water year (October 1 through September 30) will be reported to the Services in Microsoft Excel or other format approved by the Services. In addition, annual reports will identify all daily average flows outside the required range specified in Table CP-1 of Measure CP-1, explain the reason for each such deviation, and identify any remedial actions identified by USFWS and taken by COID.

2.1.2.2 Monitoring Results for Water Year 2021

Reported values for daily average flow in the Deschutes River below Crane Prairie Dam from January 1 through September 30, 2021 are presented in Appendix B-1. All daily average flows during the reporting period were in compliance with DBHCP Conservation Measure CP-1. There were no flows outside the required range specified in the conservation measure (≥75 cfs). The minimum flow during the reporting period was 76 cfs, which occurred on multiple days in late winter and early spring 2021, prior to the onset of spring runoff. The maximum daily average flow during the reporting period was 300 cfs, which occurred on multiple days during the annual drawdown of Crane Prairie Reservoir in late July and early August.

2.2 Effectiveness Monitoring

2.2.1 Adaptive Management Measure OSF-1

2.2.1.1 Monitoring Requirement

Adaptive Management Measure OSF-1: *The Permittees will provide funding for up to two biologists qualified to conduct Oregon spotted frog egg mass counts in the Upper Deschutes Basin each year as specified in Adaptive Management Measures CP-1.1, WR-1.1 and WR-1.2. This funding will be provided annually for the term of the DBHCP. Total funding each year will be sufficient to provide 240 hours of professional biologist labor (120 hours each if two biologists are required). The distribution of this funding between Adaptive Management Measures CP-1.1, WR-1.1 and WR-1.2 will be determined each year by USFWS based on need and logistics, but total funding each year will not exceed 240 hours.*

Note: This measure also applies to Wickiup Reservoir operation, as indicated in Section 3.2.1 of this report.

2.2.1.2 Monitoring Results for Water year 2021

Qualified biologists funded by the Permittees conducted Oregon spotted frog egg mass counts and habitat assessments in the Upper Deschutes Basin in close coordination with USFWS in 2021 (Appendix E-2). A total of 139.5 hours of qualified biologist time were funded to support Adaptive Management Measures CP-1.1, WR-1.1 and WR-1.2 in 2021 (Table 1). The results of these activities

are described in Sections 2.2.2.1, 3.2.2.1 and 3.2.3.1 of this report, respectively. 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 28.5 hours, is not included in Table 1.

Table 1. Hours of qualified biologist labor funded by the Permittees for Adaptive Management Measure OSF-1 in 2021.

Qualified Biologist	Hours by Adaptive Management Measure		
	CP-1.1	WR-1.1	WR-1.2
Biota Pacific			
M. E. Vaughn	16.00	-	6.00
Smayda Environmental			
K. W. Smayda	30.50	-	11.00
Mt. Hood Environmental			
T. Blackman	23.00	-	10.50
S. Gibbs	21.75	-	13.50
Boat [1]	7.25	-	-
TOTAL	98.50	-	41.00

[1] 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 for T. Blackman of $98.00 per hour.

Under prior arrangement by USFWS, Adaptive Management Measure WR-1.1 was supported by biologists employed by the U. S. Geological Survey (USGS), and no funding for this measure was needed from the Permittees in 2021. For Adaptive Management Measure CP-1.1 (Oregon spotted frog egg mass counts of Crane Prairie Reservoir) the Permittees also provide a boat for crew access to the breeding habitat when persistent snow in April prevented land access. As per agreement with USFWS in advance of the surveys, the cost of the boat ($720 for two days) was converted to biologist labor at a rate of $98.00 per hour, and the resulting hours (rounded to 7.25) were counted toward the total of biologist hours provided by the Permittees for this measure.

The total of 139.5 hours in 2021 was less than the maximum amount of 240 hours allowed for under Adaptive Management Measure OSF-1, for two reasons. First, it was not necessary for the Permittees to assess Oregon spotted frog activity, weather conditions and habitat conditions along the Upper Deschutes River prior to the onset of breeding (Adaptive Management Measure WR-1.1) because this was accomplished by USGS under the direction of USFWS. Second, while Adaptive Management Measure OSF-1 allows for shifting of hours between other measures, this was not

required in 2021 because the other two adaptive management measures covered by OSF-1 were completed with the labor provided. Adaptive Management Measure CP-1.1 (egg mass surveys at Crane Prairie Reservoir) benefited from participation by additional USFWS staff in 2021, and additional labor was not needed beyond the 98.5 hours funded by the Permittees. As for Adaptive Management Measure WR-1.2 (monitoring of Oregon spotted frog egg/larvae survival at spotted frog habitats along the Upper Deschutes River), the required level of effort in 2021 was less than the maximum anticipated in the DBHCP. This measure was developed to be implemented if the Permittees proposed a decrease in flow at WICO of more than 30 cfs during April. Such a decrease was not proposed, so the associated monitoring was neither warranted nor possible. However, due to unusually low live flow in the Upper Deschutes River in April 2021, the Permittees proposed increasing the flow at WICO above 800 cfs in April. As specified in Item B of Conservation Measure WR-1, the Permittees provided monitoring of Oregon spotted frog breeding and egg deposition in Dead Slough prior to and during the early increase above 800 cfs. The qualified biologists who conducted this monitoring were funded under Adaptive Management Measure WR-1.2, and the results of the monitoring are presented in Section 3.2.3.1 and Appendix G-2 of this report.

2.2.2 Adaptive Management Measure CP-1.1

2.2.2.1 Monitoring Requirement

Adaptive Management Measure CP-1.1: *The Permittees will support USFWS in the performance of Oregon spotted frog egg mass counts at Crane Prairie Reservoir by providing annual funding for qualified biologists as specified in Adaptive Management Measure OSF-1. Egg mass counts will be designed, coordinated and led by USFWS or another entity designated by USFWS.*

If USFWS determines that egg mass counts at Crane Prairie Reservoir indicate Oregon spotted frogs are attempting to lay eggs in the reservoir prior to March 15, USFWS will modify Item A of Conservation Measure CP-1, as needed, to require a water surface elevation of at least 4,443.23 feet (approximate reservoir volume of 46,800 acre-feet) as early as March 1.

Reporting: *The biologists funded by the Permittees in accordance with Adaptive Management Measure OSF-1 will provide the breeding survey data they collect to USFWS and/or the entity leading the spring egg mass counts by June 1 each year. The data will be provided in a format determined by USFWS. The data collected by these biologists will also be included in the DBHCP annual report submitted to the Services by January 31 of each year.*

2.2.2.2 Monitoring Results for Water Year 2021

The Permittees funded four qualified biologists and a boat for a combined total of 98.5 hours to assist USFWS with Oregon spotted frog egg mass counts at Crane Prairie Reservoir in 2021 (Table 1). All data collected by the Permittee-funded biologists was provided to USFWS prior to June 1, 2021, for incorporation into the USFWS database. These data are also summarized briefly in Appendix L. The biologists funded by the Permittees located a total of 265 Oregon spotted frog egg masses in Crane Prairie Reservoir during the two-day count on April 19 and 20. No evidence was found during the egg mass counts of attempted egg laying prior to March 15, and no adjustment was made to the due date of March 15 for reaching the target water surface elevation of 4,443.23.

2.2.3 Adaptive Management Measure CP-1.2

2.2.3.1 Monitoring Requirement

Adaptive Management Measure CP-1.2: *During the first 2 years of DBHCP implementation and for 2 years out of 10 thereafter, the Permittees will provide qualified biologists to monitor Crane Prairie Reservoir during drawdown (July 16 through October 31) for signs of stranding of Oregon spotted frog tadpoles, juveniles and adults. If stranding of tadpoles is observed it will be reported to USFWS within 24 hours. In the event of stranding, USFWS will delay the onset of drawdown to no later than August 15 and/or reduce the rate of drawdown after July 31 to as low as 0.05 foot per day, as needed, to prevent stranding, provided these changes will not prevent a net seasonal reduction in reservoir storage volume of 10,000 acre-feet by September 30. After August 15, USFWS will increase the allowable rate of drawdown to as much as 0.25 foot per day, as needed, if no stranding of tadpoles, juveniles or adults is observed. Funding for biologists to conduct this monitoring will be separate from and in addition to funding specified in Adaptive Management Measure OSF-1.*

Reporting: *Observations of stranding of tadpoles during drawdown of Crane Prairie Reservoir will be reported to USFWS within 24 hours. In years when ramp-down monitoring is conducted, the results for the year will be reported in the DBHCP annual report submitted to the Services by January 31 of the following year.*

2.2.3.2 Monitoring Results for Water Year 2021

Crane Prairie drawdown was monitored on July 15-19 and July 29-30 for signs of stranding of Oregon spotted frogs. The results of drawdown monitoring are provided in Appendix C-1. The monitoring was focused on areas along the north shoreline of the reservoir where Oregon spotted frog egg masses were located during the spring survey. Documented high use oviposition sites and surrounding areas were visited multiple times as the water receded. Biologists searched for larvae and frogs visually, with dip nets and with minnow traps. Water levels at the egg mass sites were recorded at each visit. Portions of the shoreline between egg mass sites were also searched for frogs and tadpoles.

The majority of the monitored high use oviposition sites had surface connections to the rest of the reservoir at the start of drawdown and became disconnected within the first two days. A single Oregon spotted frog in late metamorphosis with four legs and a long tail was observed; this frog was in an area well-connected to the reservoir. No change in the timing or rate of drawdown is warranted as a result of the 2021 surveys, but it is recommended that larval development be monitored periodically during the summer to get a better estimate of timing. The general lack of tadpole observations in the vicinities of the documented high use oviposition sites and surrounding shallows suggests the larvae may have undergone metamorphosis earlier than anticipated. If metamorphosis is completed and young frogs move to deeper water prior to July 15 in future years, it may be possible to begin drawdown of the reservoir before July 15 without adverse effects on the frogs.

2.2.4 Adaptive Management Measure CP-1.3

2.2.4.1 Monitoring Requirement

Adaptive Management Measure CP-1.3: *Within the first 5 years of DBHCP implementation, the Permittees will determine the total area of breeding/rearing/nonbreeding habitat in Crane Prairie Reservoir (as defined in Objective CP-1) through LiDAR or other available digital bathymetry, interpretation of aerial photographs and ground verification. Bathymetry and topographic contours will be overlain on orthographic photos to determine the total area (acres) of vegetation below the maximum reservoir operating elevation of 4,443.48 feet (storage volume of approximately 48,000 acre-feet). Ground verification will be used to determine the species composition of the vegetation and to confirm the slope of the substrate and the extent of vegetation from elevation 4,443.48 feet to elevation 4,439.23 feet (i.e., to a depth of 24 inches below the annual low water elevation of 4,441.23 feet). The interpretation of current aerial imagery and ground verification will be repeated at 5-year intervals for the term of the DBHCP to detect changes in the areal extent or species composition of the vegetation.*

If the total area of vegetation below elevation 4,443.48 decreases or the species composition of the vegetation changes in a way that reduces the total area of Oregon spotted frog breeding/rearing/nonbreeding habitat in the reservoir (as defined in Objective CP-1), USFWS may modify the timing and rate of reservoir drawdown specified in Items B and C of Conservation Measure CP-1, provided the drawdown will never begin prior to July 1, never end later than October 31, never proceed at a rate of more than 0.2 foot/day, and never involve a net reduction in seasonal reservoir storage volume of less than 10,000 acre-feet. In addition, the results of monitoring under Adaptive Management Measure CP-1.2 will be considered to ensure a balance between the long-term effects on vegetation and the short-term effects on Oregon spotted frog tadpoles.

Reporting: *In years when habitat monitoring is conducted in Crane Prairie Reservoir, the results of the monitoring will be reported in the DBHCP annual report submitted to the Services by the following January 31.*

2.2.4.2 Monitoring Results for Water Year 2021

The mapping of Oregon spotted frog habitat in Crane Prairie Reservoir began in 2021. This was the first year of a multi-year effort to establish baseline habitat conditions. Aerial imagery of the reservoir was obtained in early October and an orthographically corrected photograph has been prepared (Figure 1). Vegetation sampling occurred in mid-September along the northern perimeter of the reservoir where Oregon spotted frog breeding and summer rearing have consistently been documented (Appendix D-1). Because of its gentle slope, shallow water during the spring and summer, and well-developed vegetation, this area provides the majority of the Oregon spotted frog habitat within the reservoir. The vegetation data collected in 2021 will be used in conjunction with the aerial imagery to delineate polygons of plant communities within the reservoir in 2022. Once bathymetry of the reservoir becomes available (within the next four years as per Adaptive Management Measure CP-1.3), it will be combined with the vegetation data to prepare a baseline map of Oregon spotted frog habitat for the reservoir.

Figure 1. October 6, 2021 orthophoto image of Crane Prairie Reservoir.

3. WICKIUP RESERVOIR

3.1 Compliance and Implementation Monitoring

3.1.1 Wickiup Reservoir and Deschutes River Downstream of Wickiup Dam

3.1.1.1 Monitoring Requirement

Midnight storage volume (acre-feet) in Wickiup Reservoir (measured at Hydromet Station WIC or a comparable replacement), daily average flow (cfs) in the Deschutes River below Wickiup Dam (measured at Hydromet Station WICO or a comparable replacement) and daily average flow in the Deschutes River at Benham Falls (measured at Hydromet Station BENO or a comparable replacement) will be monitored daily for the term of the DBHCP. Water depth (stage) will also be monitored on a continuous basis at Hydromet Station WICO (or a comparable replacement) whenever flow at WICO is ≤ 800 cfs. NUID will use these data to direct day-to-day operation of Wickiup Dam in compliance with Measure WR-1. Flows and water surface elevations outside the allowable range of deviation in Table WR-1 of Conservation Measure WR-1 will be reported to USFWS via email within 12 hours of occurrence. The report will include an explanation for the deviation and the steps being taken to bring flow and water surface elevation back within the allowable range of deviation. NUID will assist USFWS in determining the impact of the deviation on the Oregon spotted frog. USFWS will determine what, if any, remedial actions are necessary to mitigate the impacts, and NUID will implement those actions.

No later than January 31 of each year, monthly storage volume, daily average flow and continuous water stage data (as required above) for the preceding water year (October 1 through September 30) will be reported to the Services in Microsoft Excel or other format approved by the Services. In addition, annual reports will identify all daily average flows and continuous water surface elevations outside the required range specified in Table WR-1 of Conservation Measure WR-1, explain the reason for each such deviation, and identify any remedial actions identified by USFWS and taken by NUID.

Each year beginning in Year 1 of DBHCP implementation NUID will report on the volume of water NUID has obtained as live flow from COID on a permanent basis in that year, and the volume of Wickiup Reservoir storage NUID has subsequently converted to instream flow or otherwise made available to support winter minimum flows at WICO required under Conservation Measure WR-1. This information will be included in the DBHCP annual report provided to the Services by January 31 of each year.

To assist USFWS with management of Oregon spotted frogs in the Upper Deschutes Basin, the Permittees will provide the following monitoring. The results of this monitoring will be used solely to further the understanding of Oregon spotted frog habitat conditions in the Upper Deschutes River, and will not result in change in the operation of Crane Prairie or Wickiup reservoir or changes in any other requirement of the Permittees under the DBHCP.

- *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. The assessment will be*

done in coordination with USFWS and will include documentation (including photographs) of the level of inundation in the slough. All information gathered by the biologists will be provided to USFWS within 24 hours of collection, as well as in the DBHCP annual report submitted to the Services by January 31 of each year.

- *Starting in Year 1 and repeating every 5 years for the term of the DBHCP, the Permittees will provide funding for two qualified biologists for up to 40 hours each (or up to 80 hours total for one biologist) to conduct Oregon spotted frog habitat suitability analyses at up to three sites along the 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.*

3.1.1.2 Monitoring Results for Water Year 2021

Midnight storage volumes in Wickiup Reservoir (Hydromet Station WIC) from January 1 through September 30, 2021 are reported in Appendix F-1. Daily average flows in the Deschutes River below Wickiup Dam (Hydromet Station WICO) for the same period are reported in Appendix F-2, and daily average flows in the Deschutes River at Benham Falls (Hydromet Station BENO) are provided in Appendix F-3. Continuous (15-minute) water depth data for WICO have been provided to USFWS in Microsoft Excel format, but the data are not included in this report due to the large file size (more than 26,000 data points).

NUID obtained no permanent live flow from COID in Water Year 2021, but NUID managed for a minimum release of 105.54 cfs at WICO (rather than the DBHCP minimum of 100 cfs) to account for 1,605.17 acre-feet of live flow obtained from COID on a temporary basis during the preceding irrigation season. This additional release was covered by a temporary instream lease first approved by OWRD on December 31, 2019, and then renewed on January 21, 2021, with the term of the renewed instream lease ending on March 25, 2021 (Appendix G-1). For consistency, the allowable range of deviation for WICO winter flow in Water Year 2021 was also increased from ≥ 90 cfs to ≥ 95.54 cfs (10 cfs below the new target minimum of 105.54 cfs).

As shown in Appendix F-2, the flow at WICO was less than 105.54 cfs for multiple days during the storage season for Water Year 2021, but it was only below the adjusted DBHCP allowable range of deviation of ≥ 95.54 cfs for one day. This was January 1, when the reported daily average flow at WICO was 95 cfs. These minor deviations from the required range were due to the physical limitations of the outlet structure at Wickiup Dam that complicate efforts to maintain precise flows. In years of abundant inflow, minimum flows can be assured by routinely releasing slightly more water than is required. In years like 2021, however, when reservoir storage was near the record low, every effort was made to release no more than the required minimum and conserve water for fish, wildlife and irrigation use the following summer. In hindsight, this proved to be a beneficial approach because live flow in the Deschutes River during the 2021 irrigation season was also unexpectedly low and mid-summer demands on Wickiup Reservoir storage were unprecedented.

At the beginning of the irrigation season, the adaptive management element of Item A in Conservation Measure WR-1 was utilized and the flows at WICO were briefly held below the allowable range of deviation. Cold temperatures and persistent snowpack in the Upper Deschutes Basin delayed the onset of Oregon spotted frog breeding in 2021. To conserve Wickiup Reservoir storage, NUID in coordination with USFWS, delayed the annual ramp-up of WICO flow slightly. The

ramp-up began on March 30, but the flow was not allowed to reach the required minimum of 600 cfs until April 11. Weather conditions and Oregon spotted frog activity in the Deschutes River downstream of Wickiup Dam were simultaneously monitored to verify the reduced flow did not impact breeding. By the time breeding began, the flow at WICO had reached the required 600 cfs. This slight delay in the ramp-up enabled NUID to conserve an additional increment of Wickiup Reservoir storage to support instream flows and irrigation later in the season.

From April 21 to 30, flows at WICO were above the allowable range of deviation, again in coordination with USFWS. Item B of Conservation Measure WR-1 specifies an upper limit of 800 cfs on WICO flow in April unless USFWS or another qualified biologist verifies that Oregon spotted frog eggs at Dead Slough in La Pine State Park have hatched or are physically situated in a portion of the slough where an increase in flow will not harm them. When live flow in the Upper Deschutes River did not reach predicted levels in April, NUID experienced an unexpectedly high demand for Wickiup Reservoir storage and consulted with USFWS about increasing the WICO flow above 800 cfs prior to May 1. Observation of conditions at Dead Slough on April 19 (WICO flow of 796 cfs) indicated the slough was not connected to the river at the downstream end and consequently there was no surface flow through the slough. Several Oregon spotted frog egg masses were observed near the downstream end of the slough in early stages of development. It was the opinion of the biologists who visited the site that the river would need to rise another six inches before it would connect to the downstream end of the slough, and that Oregon spotted frog eggs were at minimal risk of harm from increased flows as long as the downstream end of the slough was not connected. Based on these observation, NUID and USFWS agreed to increase the flow at WICO while monitoring conditions in Dead Slough. The flow at WICO was gradually increased until it reached 878 cfs on April 30, the last day of the 800-cfs limit. Flow increases and monitoring continued through early May and it was found that the downstream end of the slough did not have a surface connection to the river until the flow at WICO exceeded 1,100 cfs on May 7. Oregon spotted frog egg masses in the downstream end of the slough were monitored during this time, and none showed signs of being disturbed or dislodged by the increasing water level. The results of the Dead Slough monitoring in April and May 2021 are provided in Appendix H-1.

Item E of Conservation Measure WR-1 requires that the flow in the Deschutes River at Benham Falls (Hydromet Station BENO) be no less than 1,300 cfs from July 1 through September 15. Since 1,300 is well above live flow for the Deschutes River at this time of year, it is assumed this provision of the DBHCP will be met by releasing storage from Wickiup Reservoir to supplement live flow. In an average water year, irrigation releases of this magnitude or more are common and the 1,300-cfs requirement can be met with little difficulty. In Water Year 2021, however, Wickiup Reservoir storage and Deschutes River live flow were both unexpectedly low. By May 2021, it became apparent that it would not be possible to sustain 1,300 cfs at BENO until September 15 (see June 16 meeting notes in Appendix G-2). The Permittees and USFWS explored all options in coordination with OWRD and concluded the optimal use of the remaining Wickiup Reservoir storage would be to reduce the flow at WICO to 1,130 cfs and hold it there until the storage was depleted. The flow at WICO was ramped down to 1,130 on June 19 to maintain a target flow of 1,400 cfs at BENO recommended by USFWS to support juvenile Oregon spotted frogs rearing in wetlands downstream of Benham Falls. The flow at WICO was held constant until August 11, except for minor adjustments that were necessary to compensate for changes in hydrostatic head as the reservoir drained. The resulting flow at BENO ranged from 1,368 to 1,447 cfs due largely to fluctuations in live flow and tributary input. Beginning on August 11, ramp-down to live flow at WICO became necessary as storage was depleted. Storage release ceased when there were still about 3,000 acre-feet remaining in Wickiup Reservoir to avoid the discharge of sediment as occurred in 2020 when the reservoir was

drawn further down. The resulting flow at BENO dropped below 1,300 cfs on August 17. By September 15, the flow at BENO was 914 cfs.

Item J of Conservation Measure WR-1 sets limits on the rate of change in flow at WICO when total flow is ≤ 800 cfs. Wickiup Dam was operated within the required rates of change for all but five days in 2021. The rate of increase in flow at WICO exceeded the required rate (≤ 0.10 foot/4-hour period) during seasonal ramp-up on March 30-31 and April 10, 15 and 17 (Table 2). The rate of decrease in flow never exceeded the required rate. Four of the five instances of flow increase above the required rate were within the allowable range of deviation (≤ 0.18 foot/4-hour period) specified in Table WR-1 of the DBHCP. In the fifth instance (April 10), the reported rate of change exceeded the allowable range of deviation by 0.01 foot (the slimmest of margins) for two hours following a flow increase at 3:00 AM. By 5:00 AM the rate of increase was again within the allowable range of deviation, and by 7:00 AM it was within the required rate. This brief exceedance of 0.01 foot (0.12 inch) above the allowable range of deviation would have been largely imperceptible in the Deschutes River downstream of Wickiup Dam, and is not believed to have had any adverse effect on covered species. No remedial action was taken and no further increases of this magnitude occurred in 2021.

Section 7.2.2.1 of the DBHCP requires the monitoring of Oregon spotted frogs and/or their habitat under two sets of circumstances, neither of which occurred in 2021. The first set of circumstances occurs if the flow at WICO decreases 20 percent or more over any five-day period in May or June. This did not occur in 2021, and thus there was no associated monitoring.

In the second set of circumstances, the DBHCP requires the Permittees to provide qualified biologists to conduct Oregon spotted frog habitat suitability analyses at up to three sites along the Deschutes River selected by USFWS. At the suggestion of USFWS, this activity was postponed until 2022 to allow additional time for the identification of specific sites and methods for the monitoring (see Appendix E-2).

Table 2. Increases in flow at Hydromet Station WICO that exceeded the required rate specified in Item J of Conservation Measure WR-1 in 2021.

Date	Time	Reported Flow and Stage at Hydromet Station WICO		
		Flow (cfs)	Stage (feet)	4-Hour Increase in Stage (feet)
3/30/2021	1:00	123	1.42	0.11
	2:00	125	1.43	0.12
	3:00	135	1.49	0.11
	4:00	136	1.5	0.12
	9:00	155	1.62	0.12
	10:00	155	1.62	0.11
	11:00	168	1.7	0.13
	12:00	169	1.71	0.13
	17:00	187	1.82	0.11
	18:00	188	1.83	0.11
	19:00	215	1.94	0.17
	20:00	217	1.95	0.18
	21:00	211	1.93	0.11
3/31/2021	1:00	243	2.04	0.11
	2:00	242	2.04	0.12
	8:00	288	2.19	0.11
	13:00	325	2.31	0.12
	14:00	328	2.32	0.12
	15:00	355	2.4	0.14
	16:00	358	2.41	0.15
	17:00	361	2.42	0.11
	18:00	365	2.43	0.11
4/10/2021	1:00	446	2.66	0.11
	2:00	446	2.66	0.12
	3:00	491	2.78	0.19
	4:00	495	2.79	0.19
	5:00	495	2.79	0.13
	6:00	491	2.78	0.12
	13:00	557	2.95	0.11
	14:00	557	2.95	0.11
	15:00	585	3.02	0.12
	17:00	600	3.06	0.11
	18:00	600	3.06	0.11
4/15/2021	12:00	693	3.3	0.11
4/17/2021	9:00	816	3.61	0.17
	10:00	808	3.59	0.16
	11:00	792	3.55	0.11
	12:00	792	3.55	0.12

3.2 Effectiveness Monitoring

3.2.1 Adaptive Management Measure OSF-1

3.2.1.1 Monitoring Requirement

Adaptive Management Measure OSF-1: *The Permittees will provide funding for up to two biologists qualified to conduct Oregon spotted frog egg mass counts in the Upper Deschutes Basin each year as specified in Adaptive Management Measures CP-1.1, WR-1.1 and WR-1.2. This funding will be provided annually for the term of the DBHCP. Total funding each year will be sufficient to provide 240 hours of professional biologist labor (120 hours each if two biologists are required). The distribution of this funding between Adaptive Management Measures CP-1.1, WR-1.1 and WR-1.2 will be determined each year by USFWS based on need and logistics, but total funding each year will not exceed 240 hours.*

Note: This measure also applies to Crane Prairie Reservoir operation, as indicated in Section 2.2.1 of this report.

3.2.1.2 Monitoring Results for Water year 2021

The results of monitoring under Adaptive Management Measure OSF-1 are described in Section 2.2.1.2 of this report.

3.2.2 Adaptive Management Measure WR-1.1

3.2.2.1 Monitoring Requirement

Adaptive Management Measure WR-1.1: *Each spring, prior to the Oregon spotted frog breeding season, the Permittees will provide funding for qualified biologists as specified in Adaptive Management Measure OSF-1 to assess Oregon spotted frog pre-breeding activity, weather conditions, and habitat conditions at known breeding locations along the Upper Deschutes River. This information will be provided to USFWS to inform its decision on whether breeding season flows at WICO specified in Conservation Measure WR-1, Item A should be less than 600 cfs on April 1. If the April 1 flow is set at less than 600 cfs, this information will also be used by USFWS to determine when within the first two weeks of April the flow should increase to 600 cfs.*

Reporting: *Observations made in accordance with this adaptive management measure will be reported to USFWS daily as they are made (within 24 hours). All observations for the year will be reported in summary fashion in the DBHCP annual report submitted to the Services by January 31 of each year.*

3.2.2.2 Monitoring Results for Water Year 2021

As described in notes from the March 16, 2021 meeting between USFWS and the Permittees (Appendix E-2), this task was completed by USGS in 2021. Results were reported by USGS directly to USFWS.

3.2.3 Adaptive Management Measure WR-1.2

3.2.3.1 Monitoring Requirement

Adaptive Management Measure WR-1.2: *The Permittees will support USFWS in the monitoring of Oregon spotted frog egg/larvae survival at spotted frog habitats along the Upper Deschutes River by providing annual funding for qualified biologists as specified in Adaptive Management Measure OSF-1. Monitoring will be designed, coordinated and led by USFWS or another entity designated by USFWS.*

If USFWS determines through this monitoring that Oregon spotted frog eggs/larvae in Dead Slough can tolerate decreases in water depth of more than 1 inch without being adversely affected, USFWS may modify Item C of Conservation Measure WR-1 to increase the maximum allowable decrease in flow at Hydromet Station WICO in April.

Monitoring of other OSF sites on the Deschutes will inform the shaping and release of winter flows for the life of the permit. The biologists funded by the Permittees in accordance with Adaptive Management Measure OSF-1 will provide the breeding survey data they collect to USFWS and/or the entity leading the spring egg mass counts by June 1 each year. The data will be provided in a format determined by USFWS. The data collected by these biologists will also be included in the DBHCP annual report submitted to the Services by January 31 of each year.

Reporting: *The biologists funded by the Permittees in accordance with Adaptive Management Measure OSF-1 will provide the breeding survey data they collect to USFWS and/or the entity leading the spring egg mass counts by June 1 each year. The data will be provided in a format determined by USFWS. The data collected by these biologists will also be included in the DBHCP annual report submitted to the Services by January 31 of each year.*

3.2.3.2 Monitoring Results for Water Year 2021

Funding provided by the Permittees for Adaptive Management Measure WR-1.2 in 2021 was not needed to assess the effects of WICO flow decreases in April because no decreases of more than 30 cfs occurred (see Item C of Conservation Measure WR-1 for background on this requirement). Instead, the funding was used to monitor Oregon spotted frog habitat and breeding activity in Dead Slough during the ramp-up of WICO flows in late April and early May. The results of this monitoring are reported in Appendix H-1. As noted previously, the flow at WICO was increased above 800 cfs in late April to compensate for unusually low live flow in the Upper Deschutes River. Qualified biologists funded by the Permittees monitored Dead Slough during the flow increase. Observation of conditions at Dead Slough on April 19 (WICO flow of 796 cfs) indicated the slough was not connected to the river at the downstream end and consequently there was no surface flow through the slough. Several Oregon spotted frog egg masses were observed near the downstream end of the slough in early stages of development. Based on these observation, NUID and USFWS agreed to increase the flow at WICO while monitoring conditions in Dead Slough. The flow at WICO was gradually increased until it reached 878 cfs on April 30, the last day of the 800-cfs limit. Flow increases and monitoring continued through early May and it was found that the downstream end of the slough did not have a surface connection to the river until the flow at WICO exceeded 1,100 cfs on May 7. Oregon spotted frog egg masses

in the downstream end of the slough were monitored during this time, and none showed signs of being disturbed or dislodged by the increasing water level.

3.2.4 Adaptive Management Measure WR-1.3

3.2.4.1 Monitoring Requirement

Adaptive Management Measure WR-1.3: *Beginning no later than Year 13 of DBHCP implementation, minimum flow at WICO shall be between 400 cfs and 500 cfs from September 16 through March 31, with actual flow during this period determined according to the variable flow tool described herein. The variable flow tool shall be developed collaboratively by USFWS and the Permittees in consultation with OWRD and Reclamation. USFWS must approve the final tool for usage. A prototype of the variable flow tool shall be developed by the end of Year 10 of DBHCP implementation and tested in Years 11 and 12. The final variable flow tool shall be implemented beginning in Year 13. The variable flow tool shall be used to establish the September 16 to March 31 minimum flow at WICO each year based on available storage in Wickiup Reservoir at the beginning of the storage season and anticipated inflow to the reservoir during the storage season. Monitoring, reporting and adaptive management provisions for the variable tool shall also be developed by the end of Year 10. For purposes of this calculation, target reservoir storage volume at the end of the storage season shall never be less than 92,000 acre-feet.*

Reporting: The reporting requirements for this adaptive management measure will be determined as part of the development of the variable flow tool.

3.2.4.2 Monitoring Results for Water Year 2021

No activity occurred under Adaptive Management Measure WR-1.3 in 2021. The measure calls for the development of a prototype variable flow tool no later than Year 10 of DBHCP implementation. As of September 30, 2021, work on the variable flow tool had not begun.

4. UPPER DESCHUTES BASIN CONSERVATION FUND

4.1 Compliance and Implementation Monitoring

4.1.1 Monitoring Requirement

No later than January 31 of each year, the Permittees will provide USFWS with documentation of their contributions to the Upper Deschutes Basin Conservation Fund for the previous year.

4.1.2 Monitoring Results for Water Year 2021

The DBHCP Permittees' contribution to the Upper Deschutes Basin Conservation Fund was made on May 21, 2021, when $150,000 was sent to Oregon Community Foundation. Receipt of the contribution is documented in a June 14, 2021 letter from Max Williams, President and CEO of Oregon Community Foundation (Appendix I).

4.2 Effectiveness Monitoring

4.2.1 Monitoring Requirement

The DBHCP contains no requirement of the Permittees for effectiveness monitoring or adaptive management related to the Upper Deschutes Basin Conservation Fund. Effectiveness monitoring associated with the use of the fund will be carried out by the parties receiving funding and/or other entities designated by USFWS.

5. MIDDLE DESCHUTES RIVER

5.1 Compliance and Implementation Monitoring

5.1.1 Monitoring Requirement

Daily average flow (cfs) in the Deschutes River below Bend will be monitored at Hydromet Station DEBO (or a comparable replacement) from November 1 through March 31 for the term of the DBHCP. These data will be used by AID, COID and SID to conduct winter stock water runs in compliance with Measure DR-1. These three Districts will report any flows of less than 235 cfs at DEBO during stock water runs to the Services via email within 12 hours of occurrence. The report will include an explanation for the flow below 235 cfs and the steps being taken to bring the flow back to the target minimum of 250 cfs. The three Districts will assist the Services in determining the impact of the deviation on covered species. The Services will determine what, if any, remedial actions are necessary to mitigate the impacts, and the three Districts will implement those actions.

No later than January 31 of each year, daily average flow data for the preceding November 1 through March 31 will be reported to the Services in Microsoft Excel or other format approved by the Services. The report will include all daily average flows less than 250 cfs during stock water runs and any remedial actions identified by the Services and implemented by the Districts for flows less than 235 cfs.

5.1.2 Monitoring Results for Water Year 2021

Reported daily average flows in the Deschutes River below Bend (Hydromet Station DEBO) from January through March 2021 are provided in Appendix J. Also included in the appendix are daily average flows for the same period in the Deschutes River 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). As shown in Appendix J, flow at DEBO remained above 250 cfs at all times between January 1 and March 31, including periods when one or more stock water runs were occurring. The lowest flow reported at DEBO during that period was 276 cfs on February 23. All stock water runs in 2021 were in full compliance with Conservation Measure DR-1.

5.2 Effectiveness Monitoring

5.2.1 Monitoring Requirement

The DBHCP contains no requirement of the Permittees for effectiveness monitoring or adaptive management related to the Middle Deschutes River.

6. CRESCENT CREEK AND LITTLE DESCHUTES RIVER

6.1 Compliance and Implementation Monitoring

6.1.1 Monitoring Requirement

Daily average flow (cfs) in Crescent Creek below Crescent Lake Dam will be monitored at Hydromet Station CREO (or a comparable replacement) for the term of the DBHCP. TID will use these data to direct day-to-day operation of Crescent Lake Dam in compliance with Measures CC-1, CC-2 and CC-3. Flows outside the compliance allowances specified in Conservation Measures CC-1, CC-2 and CC-3 will be reported to USFWS via email within 12 hours of occurrence. The report will include an explanation for the deviation and the steps being taken to bring flows back within the allowances. TID will assist USFWS in determining the impact of the deviation on the Oregon spotted frog. USFWS will determine what, if any, remedial actions are necessary to mitigate the impacts, and TID will implement those actions.

No later than January 31 of each year, daily average flow data for the preceding water year (October 1 through September 30) will be reported to the Services in Microsoft Excel or other format approved by the Services. In addition, annual reports will identify all flows outside the allowances specified in Measures CC-1, CC-2 and CC-3, explain the reason for each such deviation, and identify any remedial actions identified by USFWS and taken by TID. TID will maintain a flow monitoring gage in Crescent Creek downstream of Big Marsh Creek confluence (near the Highway 58 Bridge) and include daily average flows at that gage in the DBHCP annual report delivered to the Services by January 31 of each year. No later than December 31 of Year 1 of DBHCP implementation, TID will instrument the gage to provide USFWS with on-line access to flow information in real time. Until real-time access to flow information is available, TID will report daily average flows to USFWS at two-month intervals, with reports provided to USFWS no later than the last day of the following (third) month. Once real-time access to flow data is available to USFWS, TID will cease reporting at 2-month intervals and will report daily average flows only in the DBHCP annual report.

In the DBHCP annual report, TID will also report the volume of water in Crescent Lake Reservoir available for Oregon spotted frog management (OSF storage) on July 1 of the preceding calendar year according to Conservation Measure CC-1, as well as the volume of water released from OSF storage during the preceding water year (October 1 – September 30).

To support USFWS decisions on the use of OSF storage in Crescent Lake Reservoir as specified in Conservation Measure CC-1, TID will provide the following monitoring. The results of this monitoring will be used solely to assist USFWS with determining the use of OSF storage, and will not result in change in the size or timing of availability of OSF storage, or changes in any other requirement of TID under the DBHCP.

- *TID will support USFWS with the Oregon spotted frog breeding surveys in Crescent Creek by providing annual funding for two qualified biologists for up to 40 hours each for the term of the DBHCP. Breeding surveys will be coordinated and led by USFWS or another entity designated by USFWS.*
- *Starting in Year 1 and repeating every 3 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 check known Oregon spotted frog breeding sites along Crescent Creek and Little*

Deschutes River for rearing Oregon spotted frogs in May/June (early rearing period) to determine if stranding is occurring. USFWS will be notified if there is a situation where stranding is observed. If USFWS determines a change in use of OSF storage is warranted to reduce stranding and improve Oregon spotted frog survival, TID will implement the change within the limits of the OSF storage described in Conservation Measure CC-1.

- *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 Oregon spotted frog 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.*

6.1.2 Monitoring Results for Water Year 2021

Reported daily average flows in Crescent Creek below Crescent Lake Dam (Hydromet Station CREO) for Water Year 2021 are provided in Appendix K-1. As indicated by these data, the DBHCP requirement for 10 cfs or more during the storage season (October 1 through June 30) was met. The minimum reported flow from January 1 through June 30, 2021, was 12 cfs. During the subsequent 2021 irrigation season, the DBHCP required minimum flow of 50 cfs was provided for all but the last two weeks of September. Due to extremely low storage volume in the reservoir, TID was unable to maintain an outflow of 50 cfs past mid-September. Despite TID's efforts, the flow at CREO dropped below 50 cfs on September 16. USFWS was notified of the issue on September 20 (Appendix M). By September 30, the flow at CREO was 35 cfs.

The largest 24-hour increase in flow at CREO was 15 cfs on June 23, and the largest 48-hour decrease in flow was 6 cfs which occurred on multiple days during annual ramp-down in September. All of these rates of change were within the allowable limits of Conservation Measure CC-2.

In anticipation of the requirements of DBHCP Conservation Measure CC-1, a new recording stream gage was installed on Crescent Creek downstream of Big Marsh Creek near the Highway 58 Bridge in late 2020. Rating flows for the new gage were collected on September 28 and October 2, 2020, and on January 13, 2021. Reported daily average flows for the gage in Water Year 2021 are provided in Appendix K-2. These data were also provided to USFWS when they became available late during the water year (Appendix M). Preliminary trends observed at the new gage include:

1. Flows at CREO made up a small percentage (average 21%; range 8 to 36%) of the flows downstream of Big Marsh Creek during most of the storage season. While the flow at CREO was generally constant between 12 and 16 cfs, the flow at Highway 58 was 5 to 10 times higher and it fluctuated widely.
2. During the irrigation season, the opposite was true and the majority of the flow downstream of Big Marsh Creek at Highway 58 was made up of irrigation releases from Crescent Lake Reservoir. From June 17 to September 30, the average contribution of CREO flow to Highway 58 flow was 81 percent (range 44 to 95%).

3. Flows at Highway 58 and flows in the Little Deschutes River at La Pine (Hydromet Station LAPO; Appendix K-3) followed similar patterns throughout the year (Figure 3). The flow at LAPO was generally higher than the flow in Crescent Creek at Highway 58 from January through June due to live flow from the Upper Little Deschutes basin, but lower from July through September due to irrigation diversions downstream of Highway 58 in lower Crescent Creek and lower Little Deschutes River. From July to September, substantial releases of storage from Crescent Lake Reservoir were still not sufficient to keep the flow at LAPO higher than it was upstream in Crescent Creek at Highway 58.

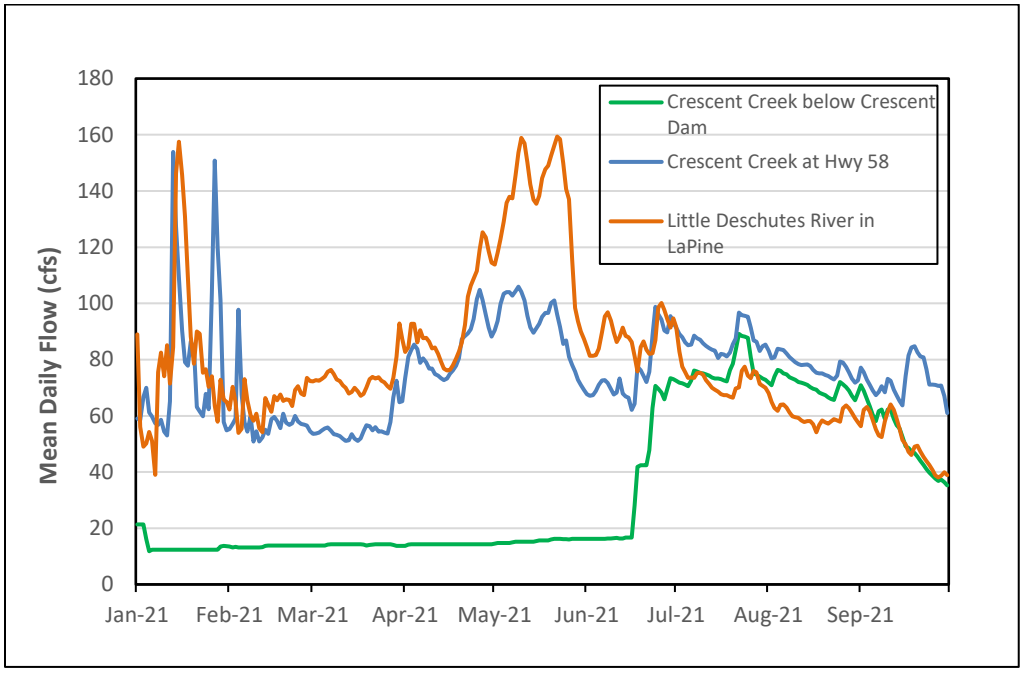

Figure 2. Comparison of daily average flows in Crescent Creek and the Little Deschutes River in Water Year 2021.

The total storage volume in Crescent Lake Reservoir on July 1, 2021 was 28,157 acre-feet. As per DBHCP Conservation Measurer CC-1, this was calculated as the three-day average storage volume for June 29 to July 1. Based on this amount of storage, a total of 5,264 acre-feet of Crescent Lake storage will be made available for Oregon spotted frog conservation in Water Year 2022. Since this was the first year of DBHCP implementation, no Crescent Lake storage was available from Water Year 2020 for Oregon spotted frog conservation in 2021.

The Permittees funded Oregon spotted frog breeding (egg mass) surveys at three sites along Crescent Creek in 2021 as required by DBHCP Section 7.2.5. The results of the 2021 surveys are reported in Appendix L. Oregon spotted frog egg masses were reported in numbers comparable to previous years at two of the historical breeding locations, but lower than in previous years at the third location (River Mile 21.9). Crescent Creek flows were uncharacteristically low during the 2021 Oregon spotted frog breeding season, and this may have caused the low numbers of egg masses observed at one of the three sites. Surveys were also conducted at three sites along the Little Deschutes River, where egg mass numbers were very low due to extremely low water levels in those areas.

6.2 Effectiveness Monitoring

6.2.1 Monitoring Requirement

The DBHCP requires no effectiveness monitoring or adaptive management specifically associated with Crescent Creek and Little Deschutes River.

7. WHYCHUS CREEK

7.1 Compliance and Implementation Monitoring

7.1.1 Whychus Creek Instream Flows

7.1.1.1 Monitoring Requirement

No later than January 31 of each year, TSID will report to the Services 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.

7.1.1.2 Monitoring Results for Water Year 2021

No permanent instream transfers of TSID irrigation rights or senior downstream Whychus Creek water rights were completed in 2021.

7.1.2 Whychus Creek and TSID Diversion

7.1.2.1 Monitoring Requirement

Whenever TSID is diverting water at its primary diversion, flow (cfs) will be monitored hourly at the diversion (OWRD Gages 14076001 and 14076010 or comparable replacements) and in Whychus Creek downstream of the diversion (OWRD Gage 14076020 or a comparable replacement). TSID will use these data to direct day-to-day operation of its diversion in compliance with Measures WC-1 and WC-5. Flows lower than those required by Conservation Measures WC-1 will be reported to the Services via email within 12 hours of occurrence. The report will include an explanation for the deviation and the steps being taken to bring flows back to the required level. TSID will assist the Services in determining the impact of the deviation on covered species. The Services will determine what, if any, remedial actions are necessary to mitigate the impacts, and TSID will implement those actions.

No later than January 31 of each year, flow data at each of the above gages for the preceding water year (October 1 through September 30) will be reported to the Services in Microsoft Excel or other format approved by the Services. The report will include the raw data available each day TSID was diverting, as well as the processed data for those same days (preliminary, provisional or published) available from OWRD on September 30. In addition, annual reports will identify all flows lower than those required by Measure WC-1, explain the reason for each such deviation, and identify any remedial actions identified by the Services and implemented by TSID.

TSID will also provide data on daily average flow and daily maximum water temperature in Whychus Creek at Camp Polk Road available for OWRD Gage 14076100 for all days when TSID is diverting water at its primary diversion. These data will be provided to the Services in Microsoft Excel or other format approved by the Services in the DBHCP annual report no later than January 31 of each year for the preceding water year (October 1 through September 30).

Temperature data will be compiled from existing third-party data sources as long as they continue to be available. Should the data cease to be generated by third parties, TSID will fund and/or conduct temperature monitoring consistent with current protocols and include the results in the DBHCP annual report.

Changed Circumstances Monitoring (DBHCP Section 9.10)

For the term of the DBHCP, water temperature in Whychus Creek will be monitored on an hourly basis for at least the months of April through October at RM 6.0, as specified in DBHCP Chapter 7. Water temperature data collected at this location will be used to calculate the 7-day average of the daily maximum water temperature (7-DADM). Monitoring results will be reviewed annually by the Services and TSID beginning in Year 1 of DBHCP implementation to track overall subbasin progress toward reducing the 7-DADM at RM 6.0. If monitoring results do not indicate incremental reduction in peak summer temperatures or there has been limited progress in implementation of projects to ultimately reduce peak summer temperatures or otherwise offset the effects of high temperatures on steelhead, the Services will identify voluntary measures TSID can implement to advance toward meeting the 10-year target identified in the following paragraph.

7.1.2.1 Monitoring Results for Water Year 2021

TSID was unable to rely on OWRD Gages 14076001 and 14076010 for diversion management in 2021 due to persistent issues with gage telemetry. No data are available from either gage for 2021. TSID is working to make both gages and associated telemetry operational for Water Year 2022.

Instantaneous flow data for OWRD Gage 14076020 in Whychus Creek downstream of the TSID diversion were available throughout the year, and these were used to guide diversions in compliance with the DBHCP. Instantaneous (15-minute) flow data for Gage 14076020 have been provided to USFWS in Microsoft Excel as a digital file, but are not included in this report due to file size (more than 26,000 data points). Daily average flow data for Gage 14076020 are provided in Appendix N-1. These include raw data that were available in real time during the irrigation season, as well as provisional data available on November 30, 2021. As indicated in Appendix N-1, problems with gage telemetry at the diversions resulted in a number of instances of daily minimum flows downstream of the diversions that were slightly below the allowable minimum of 20 cfs. Appendix N-2 provides the required minimum flows at OWRD Gage 14076020 when TSID was diverting water in 2021, as determined by the proportionality calculator developed by TSID and the Deschutes River Conservancy (DRC).

Reported daily average flows and daily maximum water temperatures in Whychus Creek at Camp Polk Road (OWRD Gage 14076100) are provided in Appendix N-3. TSID diverted water for stock runs in January and February 2021, and diverted for irrigation from March 4 through the end of the water year on September 30.

Daily maximum water temperatures and 7-day averages of the daily maximum water temperatures (7-DADM) in Whychus Creek at RM 6.0 are provided in Appendix N-4. Equipment failure at RM 6.0 interrupted data collection from May 15 through August 3. To augment the missing data, Appendix N-4 also includes daily maximum water temperatures and 7-DADM water temperatures upstream at RM 8.5 in Whychus Creek. Hourly water temperature data for both locations have been provided to USFWS in Microsoft Excel format as a digital file, but the hourly data are not included in this report due to file size.

Comparisons for the days with data from both locations on Whychus Creek indicate similar temperatures, although during the warmest month of the year (July) daily maximum water temperatures at RM 6.0 are likely to be higher by roughly 1°C. The 7-DADM at RM 8.5 exceeded 20°C from June 22 through August 18. Data were only available for the last 12 days of that period at RM 6.0, during which time the 7-DADM exceeded 20°C. The 7-DADM at RM 6.0 reached a high of 23.5°C on August 18. The 2021 water temperature data provide a baseline for use according to the changed circumstances provision of DBHCP Section 9.10. They will be used for comparison to temperatures in future years of implementation.

7.1.3 Whychus Creek Temporary Instream Leasing

7.1.3.1 Monitoring Requirement

No later than January 31 of each year, TSID will provide the Services with documentation of its contributions to Whychus Creek Temporary Instream Leasing for the previous year.

7.1.3.1 Monitoring Results for Water Year 2021

TSID contributed $6,000 to the DRC to support Whychus Creek Temporary Instream Leasing in 2021 (Appendix O-1). This funding helped support the instream leasing of irrigation water with priority dates of 1869, 1880 and 1895 and resulted in the instream protection of 4.178 cfs from Whychus Creek RM 24.5 to Lake Billy Chinook from June 30 through October 31 (Appendix O-2).

7.1.4 Whychus Creek Diversion Fish Screens and Fish Passage

7.1.4.1 Monitoring Requirement

TSID will schedule one full day each year for the Services to conduct annual inspection of the Whychus Creek diversion and associated fish screens. TSID personnel will be present for the inspection to provide the Services with full access to the facilities. The date for the annual inspection will be determined by the Services no later than January 31 of each year, and the inspection will occur at least 30 days after TSID has been informed of the date. The Services may also visit the Whychus Creek diversion and fish screens at any time outside the scheduled annual inspection by providing TSID with notice at least 24 hours in advance.

Every 5 years, beginning in Year 5 of the DBHCP, TSID will conduct a detailed evaluation of the Whychus Creek diversion and fish screens. The evaluation, which will 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. The evaluation report will identify any deficiencies or malfunctions, and make recommendations to correct those conditions. The evaluation report, along with an action plan for correcting any deficiencies or malfunctions within 90 days of the evaluation, will be provided to the Services no later than January 31 of the year following the evaluation.

No later than January 31 of each year, TSID will report any difficulties/deviations encountered implementing the TSID Diversion Screen Maintenance Plan during the preceding calendar year.

7.1.4.2 Monitoring Results for Water Year 2021

Annual inspection of the Whychus Creek diversion and fish screens did not occur in 2021 due to COVID restrictions on travel and meetings. If permitted, an annual inspection will occur in 2022. Other than the inability to conduct the annual inspection, TSID encountered no issues with implementation of the Diversion Screen Maintenance Plan in 2021.

7.1.5 Piping of TSID Patron Laterals

7.1.5.1 Monitoring Requirement

No later than January 31 of each year, TSID will report to the Services the miles of patron laterals that were piped and the associated reductions in seepage losses during the preceding calendar year.

7.1.5.2 Monitoring Results for Water Year 2021

Field activities were restricted in 2021 by Fire Level 4 conditions at the Runco Pipeline project site and COVID restrictions on work in general. Consequently, no TSID patron laterals were piped in 2021.

7.1.6 Whychus Creek Habitat Conservation Fund

7.1.6.1 Monitoring Requirement

No later than January 31 of each year, TSID will provide documentation to the Services of the District's direct financial and in-kind contributions to the Whychus Creek Habitat Conservation Fund during the preceding calendar year. The documentation will include the basis for calculating the financial value of the in-kind services.

7.1.6.2 Monitoring Results for Water Year 2021

TSID contributed $23,250 of in-kind services to the Whychus Creek Habitat Conservation Fund in 2021. This included over 250 hours for hauling pipe and backfill, welding, and excavating at $45.00 per hour for the Runco and Cloverdale pipelines. In addition, TSID donated the use of a grizzly rock screen to sort materials for the Plainview pipeline project as well as creating a stockpile of materials for future projects. TSID also donated over 1,200 feet of HDPE ADS pipe (valued at $12,000) for the Plainview ditch removal, which allowed the diversion to be moved upstream. (Note: The Plainview pipeline project is separate from the Plainview Dam removal discussed in Section 7.1.7.)

7.1.7 Plainview Dam Removal

7.1.7.1 Monitoring Requirement

No later than January 31 of the year following the removal of the Plainview Dam, TSID will provide the Services documentation of the removal.

7.1.7.2 Monitoring Results for Water Year 2021

TSID provided an estimated $6,100 of in-kind services (labor and construction management) for the removal of Plainview Dam restoration of the historical diversion channel in 2021. TSID Manager Marc Thalacker spent over 100 hours working and supervising the TSID construction crew. Removal and restoration were completed in October.

7.2 Effectiveness Monitoring

The DBHCP requires no effectiveness monitoring or adaptive management specifically associated with Whychus Creek.

8. CROOKED RIVER SUBBASIN

8.1 Compliance and Implementation Monitoring

8.1.1 Crooked River, Ochoco Creek and McKay Creek Flows

8.1.1.1 Monitoring Requirement

Flow data will be collected within the Crooked River subbasin at the locations and time intervals specified in Table 7-1. These data will be used by OID to manage releases from Ochoco Reservoir and diversions at multiple locations on the Crooked River, Ochoco Creek and McKay Creek in compliance with Measures CR-1, CR-2 and CR-3. The data will also be available to Reclamation to manage releases from Prineville Reservoir. Flows outside the compliance allowances specified in Conservation Measures CR-1, CR-2 and CR-3 will be reported to the Services via email within 12 hours of occurrence. The report will include an explanation for the deviation and the steps being taken to bring flows back within the allowances. OID will assist USFWS in determining the impact of the deviation on covered species. The Services will determine what, if any, remedial actions are necessary to mitigate the impacts, and OID will implement those actions.

No later than January 31 of each year, flow data for the preceding water year (October 1 through September 30) will be reported to the Services in Microsoft Excel or other format approved by the Services. In addition, annual reports will identify all flows outside the allowances specified in Measures CR-1, CR-2 and CR-3, explain the reason for each such deviation, and identify any remedial actions identified by the Services and taken by OID.

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

Water Body	*Location*	*Data to be Collected*
Crooked River (RM 70.0)	*OWRD Gage 14080500 (Hydromet Station PRVO)*	*Daily average flow*
Crooked River (RM 56.5)	*Manual staff gage downstream of Crooked River Diversion*	*Flow at time of change in diversion rate*
Crooked River (RM 48.0)	*OWRD Gage 14081500 (Hydromet Station CAPO)*	*Daily average flow*
Ochoco Creek (RM 11.2)	*OWRD Gage 14085300 (Hydromet Station OCHO)*	*Hourly average flow*
Ochoco Creek (RM 10.2)	*Manual staff gage at Red Granary Diversion*	*Flow at time of change in diversion rate*
Ochoco Creek (RM 9.4)	*Recording gage with telemetry downstream of Golf Course Dam*	*Hourly average flow*
Ochoco Creek (RM 7.5)	*Manual staff gage at Breese Dam*	*Flow at time of change in diversion rate*

Ochoco Creek (RM 5.1)	*Recording gage with telemetry at Crooked River Diversion Spill*	*Hourly average flow*
Ochoco Creek (RM 4.7)	*Manual staff gage at Ryegrass Diversion*	*Flow at time of change in diversion rate*
McKay Creek (RM 5.8)	*Manual staff gage at Jones Dam*	*Flow at time of change in diversion rate*
McKay Creek (RM 3.2)	*Manual staff gage at Reynolds Siphon*	*Flow at time of change in diversion rate*
McKay Creek (RM 1.3)	*Recording gage with telemetry at Cook Inverted Weir*	*Daily average flow*
McKay Creek (RM 0.6)	*Manual staff gage at Smith Inverted Weir*	*Flow at time of change in diversion rate*

8.1.1.1 Monitoring Results for Water Year 2021

Reported daily average flows for the Crooked River below Bowman Dam (Hydromet Station PRVO) and the Crooked River at Prineville (Hydromet Station CAPO) in Water Year 2021 are provided in Appendix P-1. The flow at PRVO remained within the allowable range specified in Conservation Measure CR-1 (≥50 cfs ±10%) at all times between January 1 and the start of the irrigation season; the minimum reported flow at PRVO during that time was 46 cfs. The minimum flow from the start of the irrigation season (April 4) through September 30 was 112 cfs.

Reported hourly average flows for Ochoco Creek below Ochoco Dam (Hydromet Station OCHO) have been provided to USFWS in Microsoft Excel format, but are not included here due to large file size (more than 26,000 data points). Reported daily average flows for OCHO are provided in Appendix P-2, and reported daily storage volumes in Ochoco Reservoir (Hydromet Station OCH) are reported in Appendix P-3. Daily average flows at OCHO fell below the required DBHCP minimum on multiple occasions in 2021 due to a number of factors, including drought conditions that complicated reservoir operation.

From January 1 until the start of the irrigation season on April 19 (the first day of flow in Ochoco Canal) the daily average flow at OCHO was between 1.8 and 2.6 cfs, which is below the allowable range of 3.0 cfs (±10%) specified in Conservation Measure CR-2. From April 19 through June 24, the daily average flow at OCHO remained above 5.0 cfs as required by the conservation measure. It fell below 5.0 cfs briefly from June 25-29, and then remained above 5.0 cfs again through July 20. From July 21 through the end of the irrigation season on August 27 the flow was below 5.0 cfs. From August 28 through September 30 the daily average flow was 0.7 cfs. Of particular note in 2021 was the inability to release water from Ochoco Reservoir by gravity flow in late summer. From July 23 through August 27, OID could only release water from the reservoir by pumping because the remaining storage was in the dead pool below elevation 3,074.94 feet. Pumping stopped on August 27 and the only water flowing below the dam after that time (0.7 cfs) was the result of seepage at the dam.

There were no temporary or permanent instream water right transfers upstream of Ochoco Reservoir that required pass-through by OID in 2021.

Data for the remaining locations specified in Table 7.1 of the DBHCP are unavailable for Water Year 2021 due to unanticipated delays in getting the new gages operational and rated. 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, and placed staff gages at the required locations on Ochoco Creek and McKay Creek based on the recommendation of OWRD. OID also visited sites requiring telemetry with Reclamation in February 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. OWRD revisited the sites in April and June to collect flow measurements for rating the gages (Tables 3 and 4). Additional rating of the gages will be conducted in 2022. The only site that was not successfully identified was the Crooked River staff gage located below the OID diversion. OWRD and OID staff are working to identify a location that meets the intent of the measure and is feasible.

Table 3. Results of OWRD flow measurements in Ochoco Creek and McKay Creek on April 7, 2021.

Water Body	Location	Gage Height (feet)	Flow (cfs)
Ochoco Creek (RM 11.2)	OWRD Gage 14085300 (Hydromet Station OCHO)	0.15	2.63
Ochoco Creek (RM 10.2)	Manual staff gage at Red Granary Diversion	8.41	2.58
Ochoco Creek (RM 9.4)	Recording gage with telemetry downstream of Golf Course Dam	7.43	1.99
Ochoco Creek (RM 7.5)	Manual staff gage at Breese Dam	4.12	1.84
Ochoco Creek (RM 5.1)	Recording gage with telemetry at Crooked River Diversion Spill	4.42	69.50
Ochoco Creek (RM 4.7)	Manual staff gage at Ryegrass Diversion	1.00	66.70
McKay Creek (RM 5.8)	Manual staff gage at Jones Dam	3.67	2.27
McKay Creek (RM 3.2)	Manual staff gage at Reynolds Siphon	7.34	5.97
McKay Creek (RM 1.3)	Recording gage with telemetry at Cook Inverted Weir	3.99	6.54
McKay Creek (RM 0.6)	Manual staff gage at Smith Inverted Weir	0.47	4.86

Table 4. Results of OWRD flow measurements in Ochoco Creek on June 7, 2021.

Water Body	Location	Gage Height (feet)	Flow (cfs)
Ochoco Creek (RM 10.2)	Manual staff gage at Red Granary Diversion	8.43	3.67
Ochoco Creek (RM 9.4)	Recording gage with telemetry downstream of Golf Course Dam	7.56	2.88
Ochoco Creek (RM 7.5)	Manual staff gage at Breese Dam	4.30	3.28
Ochoco Creek (RM 5.1)	Recording gage with telemetry at Crooked River Diversion Spill	4.10 / 0.52*	24.55
Ochoco Creek (RM 4.7)	Manual staff gage at Ryegrass Diversion	0.51	16.69

- During the irrigation season the total flow in Ochoco Creek below the Crooked River Diversion Spill is a determined by measuring flow in the creek above the spill and flow in the spill.

8.1.2 Temporary Instream Leasing and Permanent Water Right Transfers

8.1.2.1 Monitoring Requirement

No later than January 31 of each year, OID will provide the Services a report on temporary instream leases and permanent water right transfers of Crooked River and Ochoco Creek irrigation rights during the preceding calendar year. The report 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.

8.1.2.2 Monitoring Results for Water Year 2021

OID worked with the DRC to implement a dry year lease program and incentivize instream leasing during the exceptional drought of 2021. This program resulted in the temporary instream lease of water rights from 134.4 acres irrigated with Ochoco Creek water, which produced a protected instream flow of 0.4 cfs (Table 5). This flow was placed instream by OID from April 30 through October 15, but the water associated with IL-1877 and IL-1879 did not receive instream protection from OWRD until July 23 due to delays in processing of the leases. This instream flow was relatively low because Oregon water law sets instream leases at the same rate water is being delivered to farms at the time of the lease. Because 2021 was a poor water year, on-farm deliveries to OID patrons were quite low. No permanent instream transfers of OID water occurred in 2021, and none of the water identified in Table 5 was temporarily stored by OID. 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 2022.

Table 5. Ochoco Creek instream leases secured from OID patrons for Water Year 2021.

Instream Lease Number	Ochoco Creek Instream Lease Rate (cfs)		
	April 30 – July 22	July 23 – September 30	October 1 -15
IL-1290	0.258	0.258	0.258
IL-1877 *	0.000	0.079	0.000
IL-1879 *	0.000	0.063	0.000
TOTAL	**0.258**	**0.400**	**0.258**

*IL-1877 and IL-1879 had instream start dates of 4/15 but were not approved until 7/23.

8.1.3 McKay Creek Water Switch

8.1.3.1 Monitoring Requirement

No later than January 31 of each year, OID will provide the Services a report on the status of the McKay Creek water switch. The report will identify the amount of McKay Creek irrigation water that was transferred instream during the preceding year, as well as the total amount of water transferred to date through the McKay Creek switch.

8.1.3.2 Monitoring Results for Water Year 2021

Planning for the McKay Creek water switch continued in 2021. Work was done on the design of structural modifications and improvements that will be necessary to convey Crooked River water to McKay Creek, and on securing project power-related agreements for the new pumping plant that will be needed. It is currently anticipated that the project power-related agreements will be finalized and construction on portions of the new conveyance system will begin in 2022.

8.1.4 Crooked River Conservation Fund

8.1.4.1 Monitoring Requirement

No later than January 31 of each year, NUID, OID and the City will provide the Services with documentation of their contributions to the Crooked River Conservation Fund for the previous year.

8.1.4.2 Monitoring Results for Water Year 2021

The Permittees contributed $8,000 to the Crooked River Conservation Fund in April 2021 (Appendix Q-1).

8.1.5 Screening of District Diversions

8.1.5.1 Monitoring Requirement

OID will schedule one full day each year for the Services to conduct annual inspections of District's diversions and associated fish screens. OID personnel will be present for the inspections to provide the Services with full access to the facilities. The date for the annual inspections will be determined by the Services no later than January 31 of each year, and the inspection will occur at least 30 days after OID has been informed of the date. The Services may also visit OID diversions and fish screens at any time outside the scheduled annual inspection by providing OID with notice at least 24 hours in advance.

Every five years, beginning in Year 5 of DBHCP implementation, OID will conduct detailed evaluations of its diversions and fish screens. The evaluations, which will be conducted by a qualified professional with appropriate fish screen and fish passage expertise, will include visual examinations 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. Evaluation reports will identify any deficiencies or malfunctions, and make recommendations to correct those conditions. Evaluation reports, along with an action plans for correcting any deficiencies or malfunctions within 90 days of the evaluations, will be provided to the Services no later than January 31 of the year following the evaluations.

8.1.5.2 Monitoring Results for Water Year 2021

Annual inspection of OID's diversions and fish screens did not occur in 2021 due to COVID restrictions on travel and meetings. If permitted, an annual inspection will occur in 2022.

8.1.6 Screening of Patron Diversions

8.1.6.1 Monitoring Requirement

No later than January 31 of the second through the sixth year of DBHCP implementation, OID will provide the Services with a report on the screening of patron diversions during the preceding calendar year. 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.

8.1.6.2 Monitoring Results for Water Year 2021

No patron diversion screens were funded by OID in 2021. The $5,000 specified in Conservation Measure CR-5 for the first year of DBHCP implementation will be combined with funding for the second year to provide $10,000 for a pilot program evaluating patron diversion screen options. OID has partnered with the Crooked River Watershed Council to evaluate potential screens that could be successfully used on common patron diversions within the district. A civil engineer hired by OID (Black Rock Consulting) worked with project managers from the Watershed Council to identify irrigators willing to test screens on their Crooked River diversions. Two diversions (one large and one

small) were selected. The team also chose the screens to be used in the trial, and they will be installing those during the 2022 irrigation season. Information from this pilot program will guide future outreach and applications for screening of OID patron diversions in accordance with Conservation Measure CR-5.

8.1.7 Crooked River Flow Downstream of the Crooked River Pumps and Crooked River Downstream Fish Migration Pulse Flow

8.1.7.1 Monitoring Requirement

NUID will report diversions at its Crooked River Pumps to USFWS and NMFS as part of the DBHCP annual report. The accounting for each day of pumping will include the number of pumps in operation each day, the estimated daily average rate of diversion (cfs) for all operating pumps combined, the estimated total volume (acre-feet) of water diverted by all pumps combined during the 24-hour period, and the reported flow (cfs) at OWRD Gage 14087300 (Crooked River near Terrebonne) at 7:00 AM of each day. If, during the term of the DBHCP, a recording stream gage with real-time access (e.g., telemetry) is installed and operational upstream of the Crooked River Pumps in a location that reasonably estimates the flow reaching the pumps, the Services may approve a change in required reporting whereby NUID may cease reporting pump diversions to USFWS and NMFS and simply provide an annual report of daily average flows at OWRD Gage 14087300 and the new gage.

In addition, NUID will 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. The report will specify the flow at Gage 14087300, the number of pumps in operation, and the estimated daily average rate of diversion (cfs) when the flow at Gage 14087300 fell below the required level.

8.1.7.2 Monitoring Results for Water Year 2021

Data for NUID diversions at the Crooked River Pumps are included in Appendix R-1. For each day of diversion at the pumps, the data include the number of pumps in operation, the estimated daily average rate of diversion, the estimated daily total volume of diversion and the reported 7:00 AM flow in the Crooked River at Hydromet Station CRSO (OWRD Gage 14087300). Also included are the minimum flow requirements of Conservation Measure CR-1, which vary by month, and the daily rates and volumes of Prineville Reservoir storage purchased by NUID.

As indicated in Appendix R-1, the flow at CRSO was below the Conservation Measure CR-6 minimums on multiple days in 2021, but these flows were in compliance with Conservation Measure CR-6 because the measure only applies to NUID diversions of live flow. Due to the extremely low flow conditions in the Crooked River in 2021, NUID did not divert live flow. The only water diverted at the Crooked River Pumps during the 2021 irrigation season was Prineville Reservoir storage that NUID purchased from Reclamation. As indicated in Conservation Measure CR-6, diversion of storage at the pumps may continue regardless of the concurrent flow at CRSO. The first occurrence of CRSO flows below the Conservation Measure CR-6 minimum in 2021 occurred on April 14. In correspondence with USFWS (Appendix S-1) NUID documented that it was not diverting live flow.

No water was released from Prineville Reservoir for downstream fish migration pulse flows in 2021. Consequently, there was no need for the Permittees to track the flow and avoid diverting it.

8.2 Effectiveness Monitoring

The DBHCP requires no effectiveness monitoring or adaptive management specifically associated with the Crooked River, Ochoco Creek or McKay Creek.

APPENDIX A
Crane Prairie Reservoir Data

Appendix A-1. Reported daily storage volumes and water surface elevations for Crane Prairie Reservoir in Water Year 2021.

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
1/1/2021	43,763	4,441.23 - 4,443.48	N/A	4,442.56	N/A	N/A	
1/2/2021	43,806	4,441.23 - 4,443.48	N/A	4,442.57	N/A	N/A	-0.01
1/3/2021	43,896	4,441.23 - 4,443.48	N/A	4,442.59	N/A	N/A	-0.02
1/4/2021	44,208	4,441.23 - 4,443.48	N/A	4,442.66	N/A	N/A	-0.07
1/5/2021	44,298	4,441.23 - 4,443.48	N/A	4,442.68	N/A	N/A	-0.02
1/6/2021	44,208	4,441.23 - 4,443.48	N/A	4,442.66	N/A	N/A	0.02
1/7/2021	44,164	4,441.23 - 4,443.48	N/A	4,442.65	N/A	N/A	0.01
1/8/2021	44,388	4,441.23 - 4,443.48	N/A	4,442.70	N/A	N/A	-0.05
1/9/2021	44,434	4,441.23 - 4,443.48	N/A	4,442.71	N/A	N/A	-0.01
1/10/2021	44,298	4,441.23 - 4,443.48	N/A	4,442.68	N/A	N/A	0.03
1/11/2021	44,298	4,441.23 - 4,443.48	N/A	4,442.68	N/A	N/A	0.00
1/12/2021	44,434	4,441.23 - 4,443.48	N/A	4,442.71	N/A	N/A	-0.03
1/13/2021	44,706	4,441.23 - 4,443.48	N/A	4,442.77	N/A	N/A	-0.06
1/14/2021	44,750	4,441.23 - 4,443.48	N/A	4,442.78	N/A	N/A	-0.01

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
1/15/2021	44,841	4,441.23 - 4,443.48	N/A	4,442.80	N/A	N/A	-0.02
1/16/2021	44,659	4,441.23 - 4,443.48	N/A	4,442.76	N/A	N/A	0.04
1/17/2021	44,706	4,441.23 - 4,443.48	N/A	4,442.77	N/A	N/A	-0.01
1/18/2021	44,750	4,441.23 - 4,443.48	N/A	4,442.78	N/A	N/A	-0.01
1/19/2021	44,797	4,441.23 - 4,443.48	N/A	4,442.79	N/A	N/A	-0.01
1/20/2021	44,706	4,441.23 - 4,443.48	N/A	4,442.77	N/A	N/A	0.02
1/21/2021	44,706	4,441.23 - 4,443.48	N/A	4,442.77	N/A	N/A	0.00
1/22/2021	44,797	4,441.23 - 4,443.48	N/A	4,442.79	N/A	N/A	-0.02
1/23/2021	44,797	4,441.23 - 4,443.48	N/A	4,442.79	N/A	N/A	0.00
1/24/2021	44,933	4,441.23 - 4,443.48	N/A	4,442.82	N/A	N/A	-0.03
1/25/2021	44,888	4,441.23 - 4,443.48	N/A	4,442.81	N/A	N/A	0.01
1/26/2021	45,071	4,441.23 - 4,443.48	N/A	4,442.85	N/A	N/A	-0.04
1/27/2021	45,024	4,441.23 - 4,443.48	N/A	4,442.84	N/A	N/A	0.01
1/28/2021	45,116	4,441.23 - 4,443.48	N/A	4,442.86	N/A	N/A	-0.02
1/29/2021	45,116	4,441.23 - 4,443.48	N/A	4,442.86	N/A	N/A	0.00
1/30/2021	45,207	4,441.23 - 4,443.48	N/A	4,442.88	N/A	N/A	-0.02

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
1/31/2021	45,207	4,441.23 - 4,443.48	N/A	4,442.88	N/A	N/A	0.00
2/1/2021	45,299	4,441.23 - 4,443.48	N/A	4,442.90	N/A	N/A	-0.02
2/2/2021	45,391	4,441.23 - 4,443.48	N/A	4,442.92	N/A	N/A	-0.02
2/3/2021	45,622	4,441.23 - 4,443.48	N/A	4,442.97	N/A	N/A	-0.05
2/4/2021	45,529	4,441.23 - 4,443.48	N/A	4,442.95	N/A	N/A	0.02
2/5/2021	45,529	4,441.23 - 4,443.48	N/A	4,442.95	N/A	N/A	0.00
2/6/2021	45,484	4,441.23 - 4,443.48	N/A	4,442.94	N/A	N/A	0.01
2/7/2021	45,484	4,441.23 - 4,443.48	N/A	4,442.94	N/A	N/A	0.00
2/8/2021	45,529	4,441.23 - 4,443.48	N/A	4,442.95	N/A	N/A	-0.01
2/9/2021	45,576	4,441.23 - 4,443.48	N/A	4,442.96	N/A	N/A	-0.01
2/10/2021	45,529	4,441.23 - 4,443.48	N/A	4,442.95	N/A	N/A	0.01
2/11/2021	45,622	4,441.23 - 4,443.48	N/A	4,442.97	N/A	N/A	-0.02
2/12/2021	45,669	4,441.23 - 4,443.48	N/A	4,442.98	N/A	N/A	-0.01
2/13/2021	45,899	4,441.23 - 4,443.48	N/A	4,443.03	N/A	N/A	-0.05
2/14/2021	45,991	4,441.23 - 4,443.48	N/A	4,443.05	N/A	N/A	-0.02
2/15/2021	46,268	4,441.23 - 4,443.48	N/A	4,443.11	N/A	N/A	-0.06

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
2/16/2021	46,408	4,441.23 - 4,443.48	N/A	4,443.14	N/A	N/A	-0.03
2/17/2021	46,453	4,441.23 - 4,443.48	N/A	4,443.15	N/A	N/A	-0.01
2/18/2021	46,592	4,441.23 - 4,443.48	N/A	4,443.18	N/A	N/A	-0.03
2/19/2021	46,685	4,441.23 - 4,443.48	N/A	4,443.20	N/A	N/A	-0.02
2/20/2021	46,827	4,441.23 - 4,443.48	N/A	4,443.23	N/A	N/A	-0.03
2/21/2021	46,779	4,441.23 - 4,443.48	N/A	4,443.22	N/A	N/A	0.01
2/22/2021	46,827	4,441.23 - 4,443.48	N/A	4,443.23	N/A	N/A	-0.01
2/23/2021	46,779	4,441.23 - 4,443.48	N/A	4,443.22	N/A	N/A	0.01
2/24/2021	46,827	4,441.23 - 4,443.48	N/A	4,443.23	N/A	N/A	-0.01
2/25/2021	46,967	4,441.23 - 4,443.48	N/A	4,443.26	N/A	N/A	-0.03
2/26/2021	46,967	4,441.23 - 4,443.48	N/A	4,443.26	N/A	N/A	0.00
2/27/2021	47,109	4,441.23 - 4,443.48	N/A	4,443.29	N/A	N/A	-0.03
2/28/2021	47,015	4,441.23 - 4,443.48	N/A	4,443.27	N/A	N/A	0.02
3/1/2021	47,109	4,441.23 - 4,443.48	N/A	4,443.29	N/A	N/A	-0.02
3/2/2021	47,061	4,441.23 - 4,443.48	N/A	4,443.28	N/A	N/A	0.01
3/3/2021	47,109	4,441.23 - 4,443.48	N/A	4,443.29	N/A	N/A	-0.01

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
3/4/2021	47,015	4,441.23 - 4,443.48	N/A	4,443.27	N/A	N/A	0.02
3/5/2021	47,061	4,441.23 - 4,443.48	N/A	4,443.28	N/A	N/A	-0.01
3/6/2021	47,015	4,441.23 - 4,443.48	N/A	4,443.27	N/A	N/A	0.01
3/7/2021	47,061	4,441.23 - 4,443.48	N/A	4,443.28	N/A	N/A	-0.01
3/8/2021	47,061	4,441.23 - 4,443.48	N/A	4,443.28	N/A	N/A	0.00
3/9/2021	47,109	4,441.23 - 4,443.48	N/A	4,443.29	N/A	N/A	-0.01
3/10/2021	47,155	4,441.23 - 4,443.48	N/A	4,443.30	N/A	N/A	-0.01
3/11/2021	47,109	4,441.23 - 4,443.48	N/A	4,443.29	N/A	N/A	0.01
3/12/2021	47,061	4,441.23 - 4,443.48	N/A	4,443.28	N/A	N/A	0.01
3/13/2021	47,061	4,441.23 - 4,443.48	N/A	4,443.28	N/A	N/A	0.00
3/14/2021	47,155	4,441.23 - 4,443.48	N/A	4,443.30	N/A	N/A	-0.02
3/15/2021	47,155	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.30	N/A	N/A	0.00
3/16/2021	47,061	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.28	N/A	N/A	0.02
3/17/2021	47,109	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.29	N/A	N/A	-0.01
3/18/2021	46,967	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.26	N/A	N/A	0.03
3/19/2021	46,967	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.26	N/A	N/A	0.00

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
3/20/2021	47,061	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.28	N/A	N/A	-0.02
3/21/2021	47,155	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.30	N/A	N/A	-0.02
3/22/2021	47,155	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.30	N/A	N/A	0.00
3/23/2021	47,204	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.31	N/A	N/A	-0.01
3/24/2021	47,155	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.30	N/A	N/A	0.01
3/25/2021	47,250	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.32	N/A	N/A	-0.02
3/26/2021	47,250	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.32	N/A	N/A	0.00
3/27/2021	47,155	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.30	N/A	N/A	0.02
3/28/2021	47,344	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.34	N/A	N/A	-0.04
3/29/2021	47,250	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.32	N/A	N/A	0.02
3/30/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	-0.01
3/31/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	0.00
4/1/2021	47,250	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.32	N/A	N/A	0.01
4/2/2021	47,250	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.32	N/A	N/A	0.00
4/3/2021	47,344	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.34	N/A	N/A	-0.02
4/4/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	0.01

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
4/5/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	0.00
4/6/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	0.00
4/7/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	0.00
4/8/2021	47,393	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.35	N/A	N/A	-0.02
4/9/2021	47,344	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.34	N/A	N/A	0.01
4/10/2021	47,344	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.34	N/A	N/A	0.00
4/11/2021	47,250	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.32	N/A	N/A	0.02
4/12/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	-0.01
4/13/2021	47,439	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.36	N/A	N/A	-0.03
4/14/2021	47,204	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.31	N/A	N/A	0.05
4/15/2021	47,204	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.31	N/A	N/A	0.00
4/16/2021	47,155	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.30	N/A	N/A	0.01
4/17/2021	47,204	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.31	N/A	N/A	-0.01
4/18/2021	47,250	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.32	N/A	N/A	-0.01
4/19/2021	47,204	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.31	N/A	N/A	0.01
4/20/2021	47,250	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.32	N/A	N/A	-0.01

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
4/21/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	-0.01
4/22/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	0.00
4/23/2021	47,155	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.30	N/A	N/A	0.03
4/24/2021	47,204	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.31	N/A	N/A	-0.01
4/25/2021	47,439	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.36	N/A	N/A	-0.05
4/26/2021	47,488	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.37	N/A	N/A	-0.01
4/27/2021	47,439	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.36	N/A	N/A	0.01
4/28/2021	47,439	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.36	N/A	N/A	0.00
4/29/2021	47,534	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.38	N/A	N/A	-0.02
4/30/2021	47,488	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.37	N/A	N/A	0.01
5/1/2021	47,630	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.40	N/A	N/A	-0.03
5/2/2021	47,583	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.39	N/A	N/A	0.01
5/3/2021	47,630	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.40	N/A	N/A	-0.01
5/4/2021	47,676	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.41	N/A	N/A	-0.01
5/5/2021	47,676	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.41	N/A	N/A	0.00
5/6/2021	47,772	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.43	N/A	N/A	-0.02

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
5/7/2021	47,821	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.44	N/A	N/A	-0.01
5/8/2021	47,772	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.43	N/A	N/A	0.01
5/9/2021	47,772	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.43	N/A	N/A	0.00
5/10/2021	47,725	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.42	N/A	N/A	0.01
5/11/2021	47,725	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.42	N/A	N/A	0.00
5/12/2021	47,725	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.42	N/A	N/A	0.00
5/13/2021	47,772	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.43	N/A	N/A	-0.01
5/14/2021	47,821	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.44	N/A	N/A	-0.01
5/15/2021	47,772	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.43	N/A	N/A	0.01
5/16/2021	47,868	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.45	N/A	N/A	-0.02
5/17/2021	47,772	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.43	N/A	N/A	0.02
5/18/2021	47,821	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.44	N/A	N/A	-0.01
5/19/2021	47,917	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.46	N/A	N/A	-0.02
5/20/2021	47,917	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.46	N/A	N/A	0.00
5/21/2021	48,013	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.48	N/A	N/A	-0.02
5/22/2021	47,821	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.44	N/A	N/A	0.04

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
5/23/2021	47,917	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.46	N/A	N/A	-0.02
5/24/2021	47,917	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.46	N/A	N/A	0.00
5/25/2021	47,964	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.47	N/A	N/A	-0.01
5/26/2021	47,917	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.46	N/A	N/A	0.01
5/27/2021	47,964	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.47	N/A	N/A	-0.01
5/28/2021	47,868	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.45	N/A	N/A	0.02
5/29/2021	47,868	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.45	N/A	N/A	0.00
5/30/2021	47,821	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.44	N/A	N/A	0.01
5/31/2021	47,868	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.45	N/A	N/A	-0.01
6/1/2021	47,821	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.44	N/A	N/A	0.01
6/2/2021	47,868	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.45	N/A	N/A	-0.01
6/3/2021	47,772	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.43	N/A	N/A	0.02
6/4/2021	47,725	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.42	N/A	N/A	0.01
6/5/2021	47,534	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.38	N/A	N/A	0.04
6/6/2021	47,488	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.37	N/A	N/A	0.01
6/7/2021	47,488	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.37	N/A	N/A	0.00

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
6/8/2021	47,488	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.37	N/A	N/A	0.00
6/9/2021	47,488	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.37	N/A	N/A	0.00
6/10/2021	47,439	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.36	N/A	N/A	0.01
6/11/2021	47,534	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.38	N/A	N/A	-0.02
6/12/2021	47,583	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.39	N/A	N/A	-0.01
6/13/2021	47,534	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.38	N/A	N/A	0.01
6/14/2021	47,630	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.40	N/A	N/A	-0.02
6/15/2021	47,868	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.45	N/A	N/A	-0.05
6/16/2021	47,676	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.41	N/A	N/A	0.04
6/17/2021	47,725	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.42	N/A	N/A	-0.01
6/18/2021	47,630	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.40	N/A	N/A	0.02
6/19/2021	47,583	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.39	N/A	N/A	0.01
6/20/2021	47,534	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.38	N/A	N/A	0.01
6/21/2021	47,439	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.36	N/A	N/A	0.02
6/22/2021	47,488	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.37	N/A	N/A	-0.01
6/23/2021	47,488	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.37	N/A	N/A	0.00

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
6/24/2021	47,488	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.37	N/A	N/A	0.00
6/25/2021	47,393	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.35	N/A	N/A	0.02
6/26/2021	47,298	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.33	N/A	N/A	0.02
6/27/2021	47,344	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.34	N/A	N/A	-0.01
6/28/2021	47,204	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.31	N/A	N/A	0.03
6/29/2021	47,109	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.29	N/A	N/A	0.02
6/30/2021	47,109	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.29	N/A	N/A	0.00
7/1/2021	46,921	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.25	N/A	N/A	0.04
7/2/2021	46,873	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.24	N/A	N/A	0.01
7/3/2021	46,827	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.23	N/A	N/A	0.01
7/4/2021	46,685	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.20	N/A	N/A	0.03
7/5/2021	46,640	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.19	N/A	N/A	0.01
7/6/2021	46,592	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.18	N/A	N/A	0.01
7/7/2021	46,453	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.15	N/A	N/A	0.03
7/8/2021	46,360	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.13	N/A	N/A	0.02
7/9/2021	46,315	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.12	N/A	N/A	0.01

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
7/10/2021	46,268	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.11	N/A	N/A	0.01
7/11/2021	46,222	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.10	N/A	N/A	0.01
7/12/2021	46,222	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.10	N/A	N/A	0.00
7/13/2021	46,222	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.10	N/A	N/A	0.00
7/14/2021	46,083	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.07	N/A	N/A	0.03
7/15/2021	45,899	4,443.23 - 4,443.48	4,443.05 - 4,443.69	4,443.03	N/A	N/A	0.04
7/16/2021	45,576	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.96	≤ 0.10	≤ 0.11	0.07
7/17/2021	45,163	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.87	≤ 0.10	≤ 0.11	0.09
7/18/2021	44,797	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.79	≤ 0.10	≤ 0.11	0.08
7/19/2021	44,478	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.72	≤ 0.10	≤ 0.11	0.07
7/20/2021	44,031	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.62	≤ 0.10	≤ 0.11	0.10
7/21/2021	43,763	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.56	≤ 0.10	≤ 0.11	0.06
7/22/2021	43,356	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.47	≤ 0.10	≤ 0.11	0.09
7/23/2021	42,989	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.39	≤ 0.10	≤ 0.11	0.08
7/24/2021	42,714	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.33	≤ 0.10	≤ 0.11	0.06
7/25/2021	42,349	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.25	≤ 0.10	≤ 0.11	0.08

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
7/26/2021	42,032	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.18	≤ 0.10	≤ 0.11	0.07
7/27/2021	41,719	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.11	≤ 0.10	≤ 0.11	0.07
7/28/2021	41,364	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,442.03	≤ 0.10	≤ 0.11	0.08
7/29/2021	41,053	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.96	≤ 0.10	≤ 0.11	0.07
7/30/2021	40,742	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.89	≤ 0.10	≤ 0.11	0.07
7/31/2021	40,476	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.83	≤ 0.10	≤ 0.11	0.06
8/1/2021	40,037	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.73	≤ 0.10	≤ 0.11	0.10
8/2/2021	39,776	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.67	≤ 0.10	≤ 0.11	0.06
8/3/2021	39,389	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.58	≤ 0.10	≤ 0.11	0.09
8/4/2021	39,132	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.52	≤ 0.10	≤ 0.11	0.06
8/5/2021	38,778	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.44	≤ 0.10	≤ 0.11	0.08
8/6/2021	38,379	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.35	≤ 0.10	≤ 0.11	0.09
8/7/2021	38,114	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.29	≤ 0.10	≤ 0.11	0.06
8/8/2021	37,633	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.18	≤ 0.10	≤ 0.11	0.11
8/9/2021	37,331	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.11	≤ 0.10	≤ 0.11	0.07
8/10/2021	36,903	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,441.01	≤ 0.10	≤ 0.11	0.10

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
8/11/2021	36,731	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.97	≤ 0.10	≤ 0.11	0.04
8/12/2021	36,345	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.88	≤ 0.10	≤ 0.11	0.09
8/13/2021	36,133	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.83	≤ 0.10	≤ 0.11	0.05
8/14/2021	35,795	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.75	≤ 0.10	≤ 0.11	0.08
8/15/2021	35,501	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.68	≤ 0.10	≤ 0.11	0.07
8/16/2021	35,088	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.58	≤ 0.10	≤ 0.11	0.10
8/17/2021	34,759	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.50	≤ 0.10	≤ 0.11	0.08
8/18/2021	34,586	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.46	≤ 0.10	≤ 0.11	0.04
8/19/2021	34,413	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.42	≤ 0.10	≤ 0.11	0.04
8/20/2021	34,242	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.38	≤ 0.10	≤ 0.11	0.04
8/21/2021	33,986	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.32	≤ 0.10	≤ 0.11	0.06
8/22/2021	33,860	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.29	≤ 0.10	≤ 0.11	0.03
8/23/2021	33,649	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.24	≤ 0.10	≤ 0.11	0.05
8/24/2021	33,524	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.21	≤ 0.10	≤ 0.11	0.03
8/25/2021	33,524	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.21	≤ 0.10	≤ 0.11	0.00
8/26/2021	33,397	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.18	≤ 0.10	≤ 0.11	0.03

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
8/27/2021	33,397	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.18	≤ 0.10	≤ 0.11	0.00
8/28/2021	33,357	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.17	≤ 0.10	≤ 0.11	0.01
8/29/2021	33,440	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.19	≤ 0.10	≤ 0.11	-0.02
8/30/2021	33,397	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.18	≤ 0.10	≤ 0.11	0.01
8/31/2021	33,357	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.17	≤ 0.10	≤ 0.11	0.01
9/1/2021	33,273	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.15	≤ 0.10	≤ 0.11	0.02
9/2/2021	33,190	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.13	≤ 0.10	≤ 0.11	0.02
9/3/2021	33,233	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.14	≤ 0.10	≤ 0.11	-0.01
9/4/2021	33,150	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.12	≤ 0.10	≤ 0.11	0.02
9/5/2021	33,150	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.12	≤ 0.10	≤ 0.11	0.00
9/6/2021	33,108	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.11	≤ 0.10	≤ 0.11	0.01
9/7/2021	33,067	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.10	≤ 0.10	≤ 0.11	0.01
9/8/2021	33,067	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.10	≤ 0.10	≤ 0.11	0.00
9/9/2021	32,821	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.04	≤ 0.10	≤ 0.11	0.06
9/10/2021	33,190	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.13	≤ 0.10	≤ 0.11	-0.09
9/11/2021	33,150	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.12	≤ 0.10	≤ 0.11	0.01

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
9/12/2021	33,190	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.13	≤ 0.10	≤ 0.11	-0.01
9/13/2021	33,150	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.12	≤ 0.10	≤ 0.11	0.01
9/14/2021	33,108	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.11	≤ 0.10	≤ 0.11	0.01
9/15/2021	33,150	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.12	≤ 0.10	≤ 0.11	-0.01
9/16/2021	33,025	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.09	≤ 0.10	≤ 0.11	0.03
9/17/2021	32,985	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.08	≤ 0.10	≤ 0.11	0.01
9/18/2021	33,108	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.11	≤ 0.10	≤ 0.11	-0.03
9/19/2021	33,150	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.12	≤ 0.10	≤ 0.11	-0.01
9/20/2021	33,108	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.11	≤ 0.10	≤ 0.11	0.01
9/21/2021	33,108	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.11	≤ 0.10	≤ 0.11	0.00
9/22/2021	33,150	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.12	≤ 0.10	≤ 0.11	-0.01
9/23/2021	33,067	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.10	≤ 0.10	≤ 0.11	0.02
9/24/2021	33,108	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.11	≤ 0.10	≤ 0.11	-0.01
9/25/2021	33,150	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.12	≤ 0.10	≤ 0.11	-0.01
9/26/2021	32,985	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.08	≤ 0.10	≤ 0.11	0.04
9/27/2021	33,357	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.17	≤ 0.10	≤ 0.11	-0.09

Date	Reported Storage Volume (acre-feet)	Midnight Water Surface Elevation (feet)			Daily Decrease in Water Surface Elevation (feet/day)		
		DBHCP Required Range [1]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]	DBHCP Required Range [3]	DBHCP Allowable Range of Deviation	WY 2021 Reported [2]
9/28/2021	33,357	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.17	≤ 0.10	≤ 0.11	0.00
9/29/2021	33,397	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.18	≤ 0.10	≤ 0.11	-0.01
9/30/2021	33,481	4,440.05 - 4,443.48	4,440.05 - 4,443.69	4,440.20	≤ 0.10	≤ 0.11	-0.02

[1] The minimum allowable water surface elevation in WY 2021 was reduced to 4,440.05 feet to allow for the release of an additional 5,000 acre-feet of storage between July 15 and October 31.

[2] Reported value is within allowable range of deviation. Reported value is outside allowable range of deviation.

[3] The allowable rate of decrease in water surface elevation starting on July 16 was increased to 0.10 foot/day for WY 2021 to facilitate the release of the additional 5,000 acre-feet of storage.

APPENDIX B
Deschutes River
Hydromet Station CRAO Data

Appendix B-1. Reported daily average flows for the Deschutes River below Crane Prairie Dam (Hydromet Station CRAO) in Water Year 2021.

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
1/1/2021	79	2/1/2021	80	3/1/2021	77
1/2/2021	80	2/2/2021	81	3/2/2021	77
1/3/2021	81	2/3/2021	81	3/3/2021	77
1/4/2021	81	2/4/2021	80	3/4/2021	77
1/5/2021	80	2/5/2021	80	3/5/2021	77
1/6/2021	80	2/6/2021	80	3/6/2021	77
1/7/2021	80	2/7/2021	80	3/7/2021	77
1/8/2021	81	2/8/2021	79	3/8/2021	77
1/9/2021	80	2/9/2021	80	3/9/2021	77
1/10/2021	80	2/10/2021	80	3/10/2021	77
1/11/2021	80	2/11/2021	80	3/11/2021	77
1/12/2021	83	2/12/2021	80	3/12/2021	77
1/13/2021	85	2/13/2021	80	3/13/2021	77
1/14/2021	85	2/14/2021	80	3/14/2021	77
1/15/2021	85	2/15/2021	79	3/15/2021	77
1/16/2021	84	2/16/2021	80	3/16/2021	77
1/17/2021	83	2/17/2021	80	3/17/2021	77
1/18/2021	82	2/18/2021	80	3/18/2021	77
1/19/2021	82	2/19/2021	80	3/19/2021	77
1/20/2021	82	2/20/2021	79	3/20/2021	77
1/21/2021	82	2/21/2021	79	3/21/2021	76
1/22/2021	82	2/22/2021	80	3/22/2021	77
1/23/2021	82	2/23/2021	79	3/23/2021	77
1/24/2021	82	2/24/2021	79	3/24/2021	77
1/25/2021	82	2/25/2021	79	3/25/2021	76
1/26/2021	81	2/26/2021	77	3/26/2021	76
1/27/2021	82	2/27/2021	77	3/27/2021	76
1/28/2021	81	2/28/2021	77	3/28/2021	76
1/29/2021	81			3/29/2021	76
1/30/2021	80			3/30/2021	76
1/31/2021	80			3/31/2021	77

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
4/1/2021	77	5/1/2021	79	6/1/2021	120
4/2/2021	77	5/2/2021	79	6/2/2021	120
4/3/2021	77	5/3/2021	81	6/3/2021	120
4/4/2021	77	5/4/2021	80	6/4/2021	120
4/5/2021	77	5/5/2021	78	6/5/2021	120
4/6/2021	77	5/6/2021	78	6/6/2021	120
4/7/2021	76	5/7/2021	92	6/7/2021	119
4/8/2021	77	5/8/2021	101	6/8/2021	115
4/9/2021	76	5/9/2021	104	6/9/2021	112
4/10/2021	77	5/10/2021	104	6/10/2021	112
4/11/2021	77	5/11/2021	105	6/11/2021	113
4/12/2021	77	5/12/2021	105	6/12/2021	113
4/13/2021	77	5/13/2021	105	6/13/2021	113
4/14/2021	77	5/14/2021	104	6/14/2021	113
4/15/2021	77	5/15/2021	105	6/15/2021	113
4/16/2021	77	5/16/2021	105	6/16/2021	113
4/17/2021	80	5/17/2021	105	6/17/2021	113
4/18/2021	80	5/18/2021	103	6/18/2021	113
4/19/2021	80	5/19/2021	101	6/19/2021	113
4/20/2021	80	5/20/2021	101	6/20/2021	113
4/21/2021	80	5/21/2021	109	6/21/2021	113
4/22/2021	80	5/22/2021	115	6/22/2021	113
4/23/2021	80	5/23/2021	115	6/23/2021	113
4/24/2021	79	5/24/2021	118	6/24/2021	113
4/25/2021	78	5/25/2021	121	6/25/2021	113
4/26/2021	78	5/26/2021	121	6/26/2021	113
4/27/2021	79	5/27/2021	124	6/27/2021	113
4/28/2021	79	5/28/2021	128	6/28/2021	114
4/29/2021	79	5/29/2021	124	6/29/2021	113
4/30/2021	79	5/30/2021	122	6/30/2021	114
		5/31/2021	121		

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
7/1/2021	113	8/1/2021	300	9/1/2021	132
7/2/2021	119	8/2/2021	300	9/2/2021	132
7/3/2021	121	8/3/2021	300	9/3/2021	132
7/4/2021	120	8/4/2021	300	9/4/2021	132
7/5/2021	119	8/5/2021	298	9/5/2021	132
7/6/2021	107	8/6/2021	298	9/6/2021	132
7/7/2021	103	8/7/2021	297	9/7/2021	132
7/8/2021	103	8/8/2021	297	9/8/2021	132
7/9/2021	103	8/9/2021	297	9/9/2021	132
7/10/2021	103	8/10/2021	294	9/10/2021	130
7/11/2021	103	8/11/2021	293	9/11/2021	128
7/12/2021	102	8/12/2021	293	9/12/2021	127
7/13/2021	101	8/13/2021	292	9/13/2021	127
7/14/2021	100	8/14/2021	290	9/14/2021	126
7/15/2021	164	8/15/2021	289	9/15/2021	126
7/16/2021	246	8/16/2021	289	9/16/2021	125
7/17/2021	275	8/17/2021	288	9/17/2021	125
7/18/2021	278	8/18/2021	243	9/18/2021	125
7/19/2021	278	8/19/2021	207	9/19/2021	125
7/20/2021	278	8/20/2021	208	9/20/2021	125
7/21/2021	277	8/21/2021	208	9/21/2021	125
7/22/2021	277	8/22/2021	207	9/22/2021	125
7/23/2021	275	8/23/2021	207	9/23/2021	106
7/24/2021	275	8/24/2021	181	9/24/2021	94
7/25/2021	274	8/25/2021	163	9/25/2021	93
7/26/2021	274	8/26/2021	137	9/26/2021	93
7/27/2021	275	8/27/2021	122	9/27/2021	94
7/28/2021	275	8/28/2021	123	9/28/2021	93
7/29/2021	289	8/29/2021	123	9/29/2021	93
7/30/2021	300	8/30/2021	122	9/30/2021	93
7/31/2021	300	8/31/2021	128		

APPENDIX C
Crane Prairie Reservoir
Drawdown Monitoring Report

2021 Report
Crane Prairie Reservoir Drawdown Monitoring

Conducted in Compliance with
ESA Section 10 Incidental Take Permit TE-89773D-0 and
Deschutes Basin Habitat Conservation Plan

Prepared for: Deschutes Basin Board of Control
P. O. Box 919
Madras, Oregon 97741

Prepared by: Biota Pacific Environmental Sciences, Inc.
P. O. Box 158
Bothell, Washington 98041

Smayda Environmental Associates, Inc.
139 NE 61st Street
Seattle, Washington 98115

Mount Hood Environmental
P. O. Box 744
Boring, Oregon 97009

December 2021

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INTRODUCTION

On December 31, 2020, eight Deschutes Basin irrigation districts (Arnold, Central Oregon, Lone Pine, North Unit, Ochoco, Swalley, Three Sisters and Tumalo) and the City of Prineville, Oregon (City) received Endangered Species Act (ESA) Section 10 Incidental Take Permit TE-89773D-0 for two species that occur on lands affected by irrigation district and City activities; bull trout (*Salvelinus confluentus*) and Oregon spotted frog (*Rana pretiosa*). The Deschutes Basin Habitat Conservation Plan (DBHCP), which was prepared to support the application for incidental take permit, requires continued monitoring of Oregon spotted frog (OSF) populations on the lands affected by the covered activities. This report contains the results of a portion of that monitoring.

Adaptive Management Measure CP-1.2 of the DBHCP specifies that, "During the first 2 years of DBHCP implementation and for 2 years out of 10 thereafter, the Permittees will provide qualified biologists to monitor Crane Prairie Reservoir during drawdown (July 16 through October 31) for signs of stranding of Oregon spotted frog tadpoles, juveniles and adults. If stranding of tadpoles is observed it will be reported to USFWS within 24 hours. In the event of stranding, USFWS will delay the onset of drawdown to no later than August 15 and/or reduce the rate of drawdown after July 31 to as low as 0.05 foot per day, as needed, to prevent stranding, provided these changes will not prevent a net seasonal reduction in reservoir storage volume of 10,000 acre-feet by September 30. After August 15, USFWS will increase the allowable rate of drawdown to as much as 0.25 foot per day, as needed, if no stranding of tadpoles, juveniles or adults is observed. Funding for biologists to conduct this monitoring will be separate from and in addition to funding specified in Adaptive Management Measure OSF-1."

In accordance with Adaptive Management Measure CP-1.2 of the DBHCP, surveys for OSF stranding were conducted during the 2021 Crane Prairie Reservoir drawdown. The midnight water surface elevation (stage) of the reservoir on July 15, 2021 at the start of drawdown was 4,443.03 feet and the lowest stage of 4,440.08 feet was reached on September 17, 2021 (OWRD 2021).

METHODS

As indicated by spring egg mass counts conducted in 2021 and previous years, the majority of documented OSF breeding at Crane Prairie Reservoir occurs along the northern shoreline. In order to provide focus to the drawdown survey efforts within this extensive area, 16 oviposition sites with large numbers of egg masses in 2021 were selected as primary survey sites. Table 1 shows the oviposition sites and Figure 1 shows their locations along the north shore.

The survey was conducted on July 15 through July 19, 2021, and July 29 through July 30, 2021. Two qualified biologists conducted each visit. The survey area was divided into two portions: the NE Bay and eastern half of the NW Bay were surveyed on one day and the western half of the NW Bay (west of closed Forest Road 4600635) was surveyed on a second day. During the mid-July survey, two 2-day surveys of the northern shoreline were conducted as well as a single day kayak survey of the NW Bay.

The mid-July survey period coincided with the start of reservoir drawdown. Each of the 16 selected oviposition sites with high numbers of egg masses in 2021 was visited. Oviposition sites had been flagged during the spring breeding survey, and the pin flags were relocated using UTM coordinates. At each oviposition site the following data were recorded:

- water depth

- water temperature
- substrate/habitat notes
- distance to open water of reservoir
- presence of one or more visible surface water connections to reservoir
- observations of OSF in larval, juvenile and adult stages
- a photo of each oviposition site relative to open water at the reservoir shoreline

Table 1. Selected 2021 OSF oviposition sites at Crane Prairie Reservoir with high egg mass counts.

Oviposition Site ID	Subarea	2021 OSF Egg Masses (count)
FWS-09	NE Bay	9
FWS-05	NE Bay	7
S-06	NE Bay	27
FWS-02	NE Bay	6
FWS-10	NW Bay	14
FWS-18	NW Bay	27
FWS-28	NW Bay	21
FWS-35	NW Bay	22
FWS-38	NW Bay	6
FWS-42	NW Bay	7
S-27	NW Bay	12
BP-08	NW Bay	16
S-19	NW Bay	26
S-18	NW Bay	16
BP-03	NW Bay	12
S-15	NW Bay	13

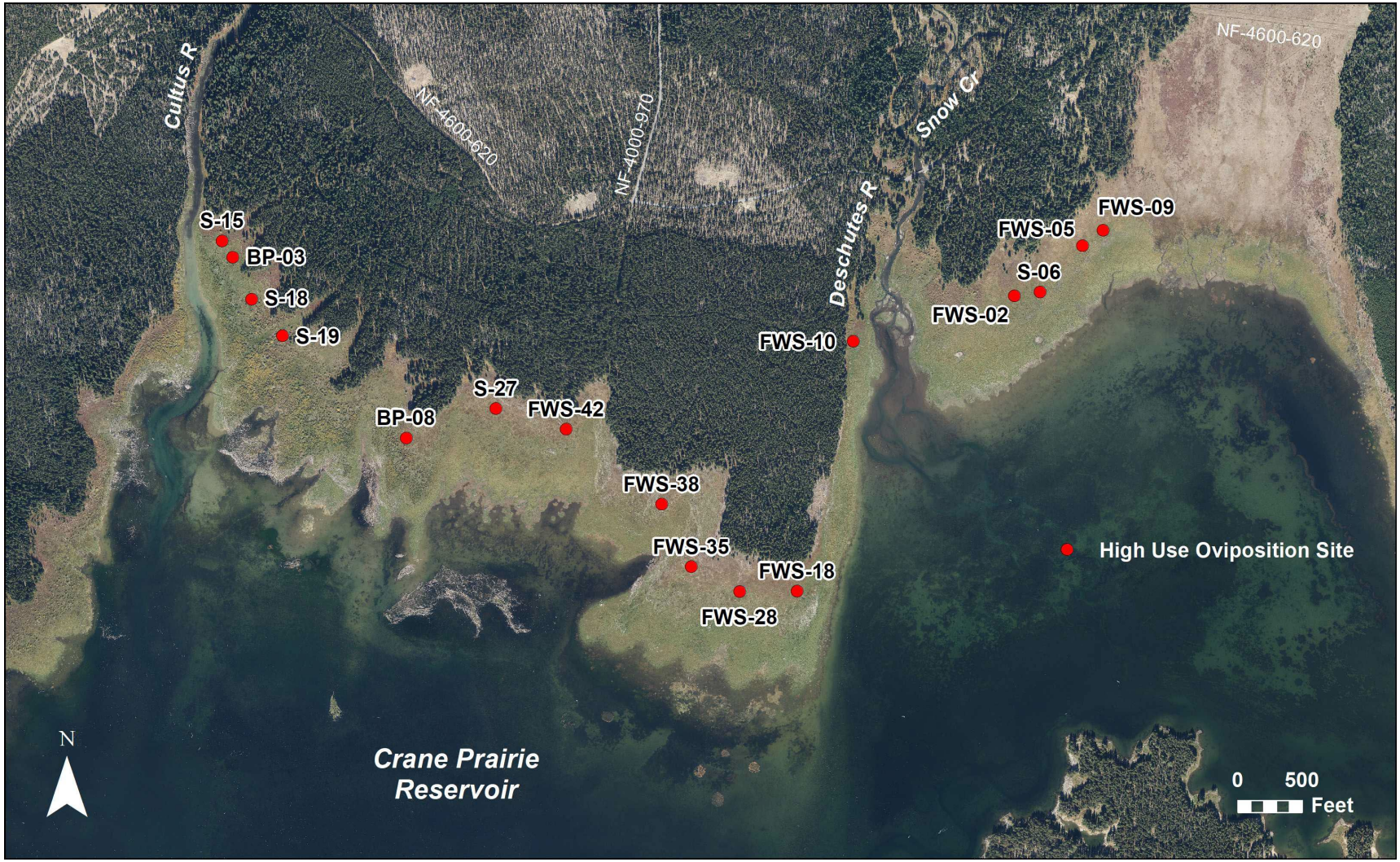

Figure 1. Selected 2021 OSF oviposition sites along the north shore of Crane Prairie Reservoir with high egg mass counts.

In addition to evaluating the connectivity of oviposition sites with the reservoir, the surveyors searched for OSF in various life stages. Areas along the reservoir's northern shoreline that appeared suitable for larval and/or juvenile frogs were visually surveyed and swept with dip nets, including ponded areas, inundated emergent vegetation, and exposed sediments. One day of kayak surveys was conducted along the reservoir margin of the NW Bay. Aquatic funnel traps were deployed near several of the 2021 oviposition sites.

During the July 29-30 visit, the NE Bay and NW Bay were walked and the oviposition sites were revisited. Pools and exposed sediments were swept with dip nets. Aquatic funnel traps were placed in shallow water at selected locations along the reservoir shoreline in the vicinity of the oviposition sites. Other potentially suitable habitat for OSF was surveyed visually and with dip nets, including the pond on the right bank of the Deschutes River near Cow Meadow Campground and an extensive beaver run channel on the right bank of the Deschutes River near its outlet.

RESULTS

Hydrologic Connection of Oviposition Sites

On the first two-day survey of the oviposition sites, 14 of the 16 surveyed sites were hydrologically connected to the reservoir. One or more channels a minimum of 1-2 inches deep connected each oviposition site to open water at the edge of the reservoir. Two sites in the eastern half of NW Bay (FWS-28 and FWS-38) appeared to be disconnected, based on a lack of surface water connection to the reservoir. By the second round of survey on July 17 and 18, receding reservoir water levels had resulted in all but three of the sites becoming disconnected from the reservoir. At some sites, wet mud was still present, but open water channels were absent. Table 2 summarizes the results of the reservoir connection assessment.

At the start of the drawdown, all but two of the surveyed oviposition sites were hydrologically connected to open water of the reservoir. The change in stage of 0.15 feet (1.8 inches) over the initial four days of drawdown resulted in loss of hydrologic connection at all but three oviposition sites.

Photos 1 and 2 show two representative oviposition sites on two different survey dates: the first date with hydrologic connection present, and the second date without hydrologic connection. In each photo, the flag in the foreground marks the oviposition site, and the surveyor is standing where continuous open water is present at the edge of reservoir.

Table 2. Oviposition site surface water connection to reservoir relative to Crane Prairie Reservoir stage.

Oviposition Site ID	Subarea	2021 OSF Egg Masses (count)	Connectivity to Reservoir (Y/N)				
			July 15 4,443.03 ft	July 16 4,442.96 ft	July 17 4,442.88 ft	July 18 4,442.79 ft	July 19 4,442.71 ft
FWS-09	NE Bay	9	Y		N		
FWS-05	NE Bay	7	Y		Y	N	
S-06	NE Bay	27	Y		N		
FWS-02	NE Bay	6	Y		N		
FWS-10	NW Bay	14	Y		Y		N
FWS-18	NW Bay	27	Y		N		
FWS-28	NW Bay	21	N		N		
FWS-35	NW Bay	22	Y		N		
FWS-38	NW Bay	6	N		N		
FWS-42	NW Bay	7		Y	N		
S-27	NW Bay	12		Y		N	
BP-08	NW Bay	16		Y		N	
S-19	NW Bay	26		Y		N	
S-18	NW Bay	16		Y		N	
BP-03	NW Bay	12		Y		Y, marginal	
S-15	NW Bay	13		Y		N	

Photo 1A. Oviposition Site S-06, NE Bay, July 15, 2021.

Photo 1B. Oviposition Site S-06, NE Bay, July 17, 2021.

Photo 2A. Oviposition Site S-18, July 16, 2021.

Photo 2B. Oviposition Site S-18, July 18, 2021.

OSF Observations

Table 3 presents a summary of OSF life stages observed during the survey. During the mid-July survey, a total of six OSF were flushed by the surveyors. All were estimated at between 30 and 35 mm snout-vent length (SVL) and assumed to be juveniles or subadults. Netting and trapping of potentially suitable habitat did not result in the capture of any OSF. Larval Pacific chorus frogs and northwestern salamanders were observed at a few locations.

Table 3. Summary of OSF observations, sizes, and locations at Crane Prairie Reservoir in July 2021.

Subarea	Location Notes	July 15-19	July 29	July 30
NE Bay	S-06	1 JS (35mmE)		
NE Bay	LB D River	1 JS (35mmE)		
NW Bay	Pond west of D River		1 JS (30mmE)	2 JS (35mmE) 1 adult male (40mm, nuptial pads) 1 adult (41mm)
NW Bay	Beaver run RB D River		2 J (tailed, 34 and 26 mm) 4 JS (30mmE) 3 Adult (61mm female, 51mm male, 40mmE)	
NW Bay	FWS-10	1 JS (30mmE)		
NW Bay	E of FWS-38	1 JS (35mmE)		
NW Bay	FWS-42	1 JS (35mmE)		
NW Bay	S-18	1 JS (30mmE)		
NW Bay	Between BP-08, S-19, S-18			2 JS (30mmE) 1 adult (45mmE) 1 Metamorph (24mm)
NW Bay	LB Cultus R Outlet			1 J (tailed, white vest, 34mm) 2 J (light vest, 26mm, 28mm) 1 adult (45mmE) 2 JS (30mm and 32mm) 6 JS (30mmE)

Note: measurements with 'E' indicate frogs not captured, SVL estimated;
J indicates young-of-year; JS indicates a small juvenile/subadult frog of unknown age

A shallow, remnant pool adjacent to the right bank of the Deschutes River was netted on July 17, and two very large tadpoles were captured. Based on their large size (4 inches overall, 38-40 mm SVL), ventral coloration and overall morphology, these were believed to be bull frog (*Lithobates catesbeiana*) tadpoles. The tadpoles were humanely dispatched in accordance with the requirements of ODFW Scientific Taking Permit 041-21. Based on subsequent conversations with USFWS and USGS biologists, it is suspected the euthanized tadpoles may have been atypically large OSF larvae. No other signs of bull frogs were detected in the area. If the euthanized tadpoles were OSF, they would constitute the only two known OSF of any life stage to have been unintentionally destroyed/killed in 2021.

During the late July survey, 30 OSF were observed, including one metamorph, and several tailed juveniles, subadults and adult frogs. All observed individuals were flushed, captured in traps, or captured by net or hand. Three areas supported concentrations of OSF: the pond west of the Deschutes River at Cow Meadow Campground, a beaver run complex on the right bank of the Deschutes River downstream of the outlet, and the left bank of the Cultus River close to the outlet.

At the pond west of the Deschutes River, a presumed adult OSF measuring 41mm SVL was captured in a trap along with numerous northwestern salamander larvae. Two other frogs, estimated at 35mm SVL, were flushed in the pond. An adult male frog with nuptial pads and 40mm SVL was netted (Photo 3).

The beaver run complex along the right bank Deschutes River yielded juvenile through adult stage OSF; frogs were captured by net and by hand. Two juveniles with remnant tails were measured at 26 and 34mm SVL (Photo 4). Four additional small frogs were flushed. Three adult frogs were captured: a 61mm SVL female, and two males with nuptial pads and measuring 51 and 40mm SVL. During the late July survey, the beaver run was inundated 8 to 15 inches deep, included several tributary channels, and was hydrologically connected to the Deschutes River (Photo 5). Water temperatures in the channels ranged from 19°C to 20°C.

Twelve frogs were observed along the left bank of the Cultus River near the outlet. These included one presumed adult, three confirmed juveniles, and eight additional small frogs (Photos 6 and 7). The frogs were located in inundated sedge beds and small willow stands along the shoreline in water ranging from 5 to 10 inches deep and 15°C to 19°C (Photo 8).

A single OSF metamorph was captured by netting. It was located in about 10 inches of water in a large inundated mosaic of open water, sedge, fines, and willow which was connected to the reservoir via inundated willow thickets and beaver channels (Photo 9). Water temperature at the capture site was 20°C. The capture site was about 155 feet south of the closest 2021 oviposition site (S-21) in the western portion of NW Bay. This transforming frog measured 24mm SVL, had four fully formed legs, a tail that was about 1.7 times the length of the body, and was breathing air during examination (Photos 10 and 11).

Photo 3. Adult male OSF, 40mm SVL, with nuptial pads, July 30, 2021.

Photo 4. Tailed juvenile OSF captured at beaver run, July 29, 2021.

Photo 5. Beaver run habitat on right bank of Deschutes River, July 29, 2021.

Photo 6. Juvenile OSF, left bank of Cultus River near outlet, July 30, 2021.

Photo 7. Tailed juvenile OSF at Cultus River, with light chest and lacking red mottling, July 30, 2021.

Photo 8. Habitat supporting juvenile OSF on left bank of Cultus River, July 30, 2021.

Photo 9. Habitat near site of OSF metamorph capture, July 30, 2021.

Photo 10. OSF metamorph, ventral view, July 30, 2021.

Photo 11. OSF metamorph, dorsal view, July 30, 2021.

SUMMARY AND DISCUSSION

Surveys along the north shore of Crane Prairie Reservoir showed that the majority of oviposition sites evaluated were hydrologically connected to the reservoir when drawdown was initiated and became disconnected from the reservoir within two days. Mid-July efforts to trap and net larval and juvenile OSF did not result in capture of any confirmed OSF. Two large tadpoles may have been misidentified as bullfrogs; if these were large OSF larvae, their size suggests that metamorphosis was imminent. Six small OSF were flushed during the surveys; no other OSF were observed despite warm air and water temperatures.

During late July, a total of 30 OSF were captured or observed. Seven adult OSF were observed, including one large female and three adult males with nuptial pads. One of these males measured 40mm SVL, which is somewhat smaller than the adult male size category of 45mm to 75mm SVL described by Leonard and McAllister (2005) as cited in Cushman and Pearl (2007). FRESC (2017) defines adult life stages as 'typically greater than 40mm snout-urostyle length'.

Five juvenile (young-of-year) frogs were captured. These were characterized by white or very light 'vests', lack of ventral mottling, and in some cases presence of tails. Two of the tailed juveniles were measured at 34mm SVL, which is slightly larger than the size range for recently metamorphosed OSF of 20-30mm SVL described by Leonard and McAllister (2005) as cited in Cushman and Pearl (2007). In addition to the five captured juveniles, 17 small frogs of undetermined age were observed.

The large number of small frogs observed in late July, including at least five young-of-year, indicates that many OSF larvae metamorphosed prior to late July. This was further supported by the observation of

only a single metamorphic larva during the surveys. Based on the abundance of young-of-year and other small frogs, and the lack of capture of larval stages, it was concluded that most OSF larvae had likely completed metamorphosis by the early portion of the drawdown period.

The survey resulted in a small amount of information on the specific timing of larval development and metamorphosis and movement of OSF larvae from oviposition sites to other habitats. Consequently, our recommendation for 2022 drawdown surveys includes initiating survey efforts earlier in the season at high use oviposition sites to gain more information on timing of development and dispersal. The surveys would entail systematic dip netting and funnel trapping near oviposition locations identified during the egg mass surveys. Simple temperature monitoring would also occur in tandem with surveys. Surveys should occur up to weekly at each site shortly after the time of hatching until metamorphosis. Adjacent sites that are unimpacted by the drawdown would also be monitored to compare the ontogeny of frogs and distinguish potential drawdown impacts from local climate or other conditions unrelated to the DBHCP activities.

Data would be used to inform future analyses that predict date of OSF metamorphosis and movement from spawning locations, based on local temperature and date of oviposition. This baseline information would 1) define frog ontogeny as it relates to temperature conditions, 2) provide specific date ranges for frog vulnerability to stranding, and 3) provide information as to the reservoir drawdown dates that would minimize or avoid impact to the OSF.

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APPENDIX D
Crane Prairie Reservoir
Habitat Mapping Report

2021 Interim Report
Crane Prairie Reservoir Habitat Mapping

Conducted in Compliance with
ESA Section 10 Incidental Take Permit TE-89773D-0 and
Deschutes Basin Habitat Conservation Plan

Prepared for: Deschutes Basin Board of Control
P. O. Box 919
Madras, Oregon 97741

Prepared by: Biota Pacific Environmental Sciences, Inc.
P. O. Box 158
Bothell, Washington 98041

Smayda Environmental Associates, Inc.
139 NE 61st Street
Seattle, Washington 98115

Mount Hood Environmental
P. O. Box 744
Boring, Oregon 97009

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INTRODUCTION

On December 31, 2020, eight Deschutes Basin irrigation districts (Arnold, Central Oregon, Lone Pine, North Unit, Ochoco, Swalley, Three Sisters and Tumalo) and the City of Prineville, Oregon (City) received Endangered Species Act (ESA) Section 10 Incidental Take Permit TE-89773D-0 for two species that occur on lands affected by irrigation district and City activities; bull trout (*Salvelinus confluentus*) and Oregon spotted frog (*Rana pretiosa*). The Deschutes Basin Habitat Conservation Plan (DBHCP), which was prepared to support the application for incidental take permit, requires continued monitoring of Oregon spotted frog (OSF) habitats and populations on the lands affected by the covered activities. This report contains the results of a portion of that monitoring.

Adaptive Management Measure CP-1.2 of the DBHCP specifies that, "The total area of Oregon spotted frog (OSF) breeding/rearing/nonbreeding habitat in Crane Prairie Reservoir (as defined in Objective CP 1-A) will be determined through LiDAR or other available bathymetry, interpretation of aerial photographs, and ground verification. Ground verification will be used to determine the species composition of the vegetation and to confirm the slope of the substrate and the extent of vegetation from elevation 4,443.48 feet to elevation 4,439.23 feet (i.e., to a depth of 24 inches below the annual low water elevation of 4,441.23 feet)."

In accordance with Adaptive Management Measure CP-1.3, vegetation mapping and sampling was initiated in late summer 2021 along the northern shoreline of Crane Prairie Reservoir. The purpose of the mapping is to provide a baseline assessment of the area and type of wetland habitats present at Crane Prairie Reservoir, and to further categorize the habitats, using LiDAR or other bathymetric data, by suitability as OSF breeding, rearing, and nonbreeding habitats. This report summarizes the methods used and preliminary results obtained during 2021 orthophoto flights and baseline vegetation sampling. The data presented herein is preliminary and will require additional bathymetric data to complete the mapping and calculation of OSF breeding, rearing, and non-breeding habitat. This remaining work is planned for 2022.

METHODS

Orthophotography

Statewide Land Surveying, Inc. of Gresham, Oregon established ground control points at Crane Prairie Reservoir and GeoTerra, Inc. of Eugene, Oregon obtained orthographically corrected aerial imagery of the reservoir using those control points in September 2021. Data provided by Statewide and GeoTerra included:

- 0.50-foot pixel resolution, 3-band, RGB orthophotography in uncompressed GeoTIFF/TFW format
- 20:1 MrSID compressed, 3-band, RGB orthophotography tiles and mosaic in SID/SDW format
- Vector data: Flight index in ACAD DWG format
- Project metadata: in PDF format

Vegetation Sampling

Transect Selection

Potential sites for placement of vegetation transects were evaluated in the office using aerial photographs and OSF observation data from spring 2021 egg mass counts and summer 2021 reservoir drawdown monitoring. Transects were placed roughly perpendicular to the north shoreline of Crane Prairie Reservoir, extending from the edge of forest at approximate elevation 4,443.9 feet (origin) to approximate elevation 4,438.0 feet at the downslope end (end). Vegetation transects were sampled during annual low water between September 14 and 16, 2021. Water surface elevation in the reservoir during the sampling period fluctuated between 4,440.10 and 4,440.12 feet (OWRD 2021), so that the ends of the transects were roughly 2 feet below the water surface. Transects were designed to be placed across the north shore of the reservoir from the Northeast Bay, east of the Deschutes River, to the Cultus River.

Transect locations were selected to sample a variety of plant assemblages supporting OSF breeding and rearing along the north shore. In addition, several high use oviposition sites and/or locations of documented rearing habitat in 2021 were targeted. Figure 1 displays the overall study area for which orthophotography was prepared. Figure 2 shows the locations of the six transects selected for sampling. One transect evaluated in the office was not selected for field sampling (T3), due to its similarity to other selected transects. Table 1 summarizes the Oregon spotted frog breeding and rearing activity observed near the transect locations during spring and summer 2021 surveys.

Table 1. Sampled vegetation transects and Oregon spotted frog activity observed at each in 2021.

Transect Number	2021 Oviposition Site	Number of Egg Masses in 2021	2021 Rearing Observations
T1	S-06	27	-
T2	-	0	2 tailed juveniles, 4 juvenile/subadults, and 3 adult OSF in beaver run approx. 500 ft north of S-06
T4	FWS-35	22	-
T5	BP-08	16	-
T6	S-19	26	Metamorphic OSF, 24mm SVL, captured approx. 275 ft southeast of S-19
T7	S-15	13	3 juvenile, 8 juvenile/subadult, and one adult OSF along Cultus River shoreline near S-15

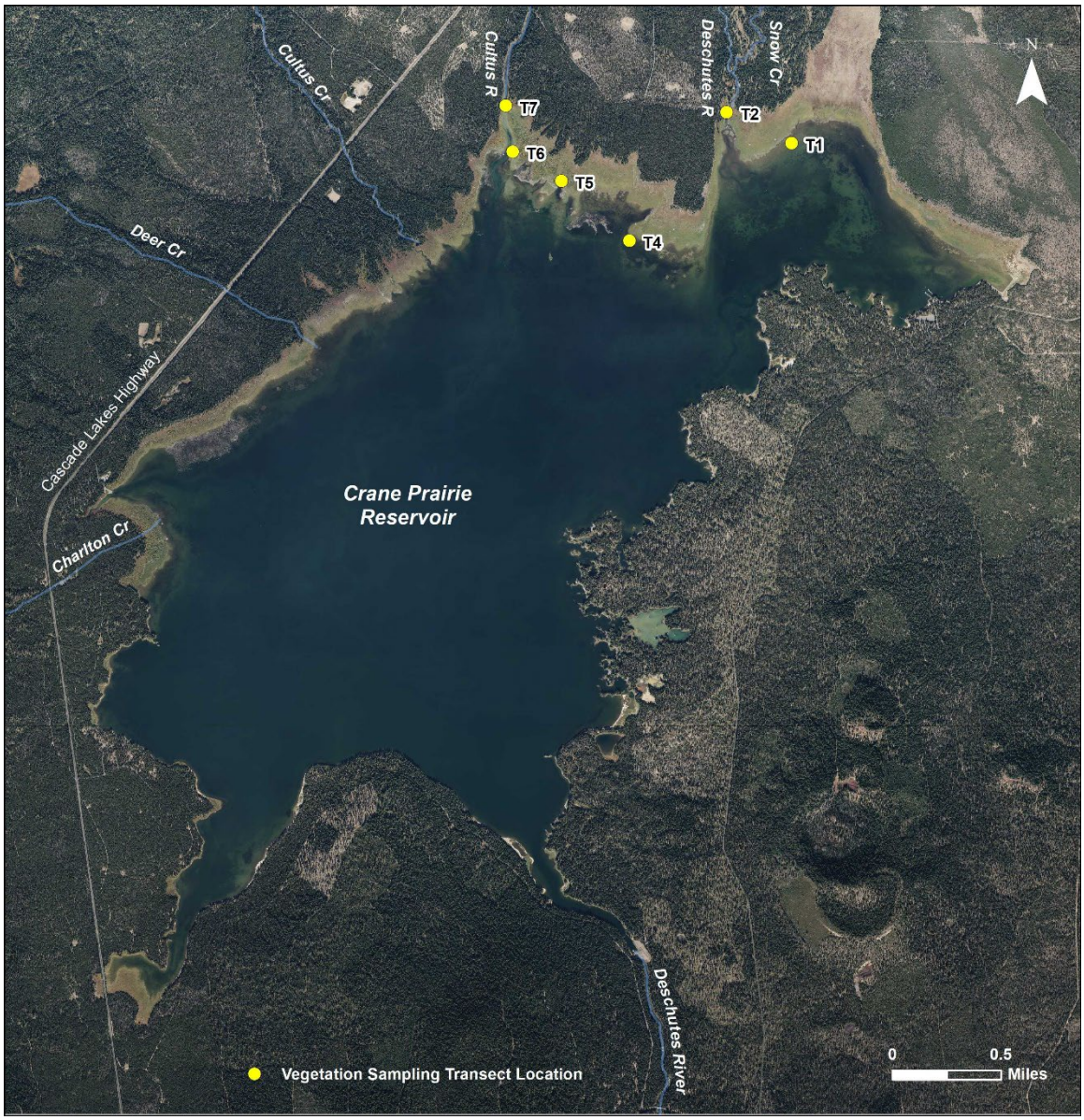

Figure 1. Study area for orthophotography.

Figure 2. Locations of six vegetation transects at Crane Prairie Reservoir sampled in 2021.

Field Sampling Methods

Transects were laid out and sampled using the following procedures:

1. **Lay out transects and mark ends.** Locate the flagged 2021 oviposition site (five of six transects) and then lay out transect perpendicular to shoreline, intersecting the oviposition site.

   A. **Mark origin (upslope end) of transect** with yellow plastic tree tag; record by averaging GPS pts in UTMs, NAD83 using a Garmin GPSmap 62s or equivalent handheld.

   B. **Determine position for end of transect** (downslope end) at water's edge using compass bearing; mark for the duration of fieldwork with a well-flagged pole.

      Compass declination for Crane Prairie Reservoir: 14 ° 26' East [NCEI Geomagnetic Calculators (noaa.gov)].

   C. **Mark lower end of transect** by averaging GPS pts in UTMs, NAD83, using a Garmin GPSmap 62s or equivalent handheld.

2. **Layout tape(s) along transect, using decimal feet.** Stake with tent stakes or similar, beginning at upper end of transect, and using compass and end flagged pole for reference. Depending on length of transect, the entire transect may not be laid out at once; tapes may need to be leapfrogged. Walk and conduct layout from right side of tape (as viewed downslope), leaving left side undisturbed for vegetation sampling.

3. **Photograph transect as laid out**. Overall view from beginning (upslope) to end (downslope); if transect is particularly long, one or more additional photos may be added from intermediate point(s) on transect.

4. **Sample vegetation** along transect using line intercept (trees, water/terrain features, coarse woody debris (CWD)) and systematically placed quadrats (shrubs and herbaceous vegetation). Species were identified using Hitchcock and Cronquist (2018).

   Line Intercept Features:

   A. **Tree canopy cover.** Record canopy cover of each tree species, regardless of size, as distance in decimal feet along line transect (line intercept method), and record on general transect field form. Categories include tree (dbh > 6 inch), sapling (dbh = 1-6 inch), and seedling (diameter < 1 inch).
   B. **Coarse woody debris (CWD).** Record each piece of CWD (≥ 6 in diameter) that intercepts the line transect. For each piece, record length, diameter at narrow end of log, and note if root wad (partial or full) is attached [yes/no].
   C. **Other features along transect**
      - distance to flagged 2021 oviposition site (intersected on five of six transects);
      - start/end distances of beaver runs, drainages, pools; inundated areas;
      - major vegetation breaks affecting OSF habitat: veg cover > 25% woody veg, veg cover < 50%, other as observed.

Quadrat Features:

D. Herbaceous vegetation. Single herbaceous quadrats are nested with extended shrub quadrats. Sample using quadrat measuring 0.5 m (19.68 in) on each side (area = 0.25 sq m / 387.5 sq in / 2.69 sq ft); quadrat is divided into 25 squares, each representing **4 percent** of total quadrat area. Place quadrat on the left side of the tape (as viewed downslope) starting at edge of forest canopy, and at each 50 feet for length of transect. For those transects that intersect a flagged high density oviposition site from 2021, place an additional quadrat immediately downslope of the intersect point. If the quadrat includes surface water, indicate percent of quadrat inundated. Record all herbaceous species rooted in quadrat and percent cover of each species. Record percent cover and type of other substrates, including litter, fines, and gravel. Record on herbaceous quadrat field form. Since CWD is measured elsewhere, and quadrats are used for characterizing herbaceous vegetation, any quadrats that have > 1/3 cover of CWD (8 of 25 squares on quadrat) will be relocated (offset) immediately downslope of CWD, with explanatory note recorded on field form. Offsets for any other reason should be similarly noted.

E. Shrub vegetation. Single herbaceous quadrats are nested with extended shrub quadrats. Sample using 0.5 m quadrat placed on left side of tape (as viewed downslope); place second quadrat immediately below first and then flip it over parallel to tape, to create an extended sampling quadrat equivalent to three of the metal quadrats. The extended quadrat will be 1.5 m long by 0.5 m wide, and will be placed parallel to the transect. The area of the extended quadrat will be 0.75 sq m. The extended quadrat will be comprised of 75 squares, each equivalent to 1.3 percent of the total quadrat area. The first extended quadrat will be placed at the edge of the forest canopy (identical start point to the herbaceous quadrat), and subsequent extended quadrats will start each 50 feet for length of transect. Sample an additional extended shrub quadrat immediately downslope of a flagged 2021 oviposition site. If the quadrat includes surface water, indicate percent of quadrat inundated. Record all live woody species rooted within extended quadrat and percent cover of each species. Record percent cover and type of other substrate, including litter, fines, and gravel.

F. Photograph each station of nested herbaceous and shrub quadrats. Place white board with label along one edge of transect. Photograph from the right side of transect, plan view, with white board visible. White board to include:
Date (YYYY-MM-DD)*;*
Transect No. (TX);
Quadrat Number & Station distance (QXX, STA XXX).
Record photo number on photo log field form.

5. Record total length of transect on general transect field form and herbaceous/shrub field forms.

RESULTS

A compressed version of the ortho-corrected aerial image provided by Statewide and GeoTerra is provided in Figure 1. The full image will be the base for addition of bathymetry and vegetation polygons in 2022 to create the OSF habitat map. Table 2 summarizes the canopy cover data collected on the six transects by lifeform, and indicates the abundance and length of CWD pieces.

All transects exhibited low tree canopy cover, as the transect origins were located at the edge of forest. Seedling and sapling trees were included in the tree canopy measurements, and seedling trees were found on half of the transects (T1, T4, T5). No sapling trees (1-6 inch dbh) were recorded on any transect. All tree canopy was provided by lodgepole pine (*Pinus contorta*).

Shrub canopy cover varied across the transects from less than 1 percent to almost 40 percent. Shrub canopy on transects 1, 2, and 4 was located in the uppermost portion of the transect. The majority of shrub canopy on transects 5 and 6 was located in the middle (T6) and lower (T5) thirds of the transect, and was dominated by Geyer's willow (*Salix geyeriana*) greater than 2 meters tall. Shrub cover on Transect 7 was bimodal, with the upper third of the transect dominated by Douglas spirea (*Spiraea douglasii*) and the lower third dominated by Geyer's willow. The third species of shrub observed on the transects was bog blueberry (*Vaccinium uliginosum*).

Herbaceous canopy cover varied across the transects from 45 to 71 percent. Herbaceous vegetation on all transects was dominated by sedges. The most abundant species included inflated sedge (*Carex vesicaria*), water sedge (*Carex aquatilis var. aquatilis*), Sitka sedge (*Carex aquatilis cf var. dives*), and lakeshore sedge (*Carex kelloggii cf var. kelloggii*). Other dominant herbaceous species included Baltic rush (*Juncus balticus)*, silverweed (*Potentilla anserina ssp. anserina*), thread rush (*Juncus filiformis*), timothy (*Phleum pratense*), and aster (*Symphyotrichum sp*.). Aquatic and semi-aquatic species present at the lower end of the transects included water smartweed (*Persicaria amphibia*), pondweed (*Potamogeton sp.*), creeping buttercup (*Ranunculus flammula*), and common bladderwort (*Utricularia vulgaris*). These species had been exposed to air for several weeks due to the receding reservoir water levels, had decayed substantially, and were likely under-represented in the canopy cover estimates. None of the transects intercepted the tall emergent wetland species common cattail (*Typha latifolia*) or bulrush (*Schoenoplectus sp*.). However, these species were observed on the north shore outside of surveyed locations.

REFERENCES

Hitchcock, C.L. and A. Cronquist. 2018. Flora of the Pacific Northwest, an Illustrated Manual. Second Edition. Giblin, D.E., B.S. Legler, P.F. Zika, and R.G. Olmstead, eds. University of Washington Press, Seattle, WA.

OWRD (Oregon Water Resources Department). 2021. Near real time hydrographic data for Station ID 14053500 Crane Prairie Reservoir, preliminary and raw data for July through September, 2021. Accessed October 25, 2021 at: https://apps.wrd.state.or.us/apps/sw/hydro_near_real_time/

Table 2. Summary of canopy cover and CWD data by transect.

Transect		Trees		Shrubs		Herbaceous Plants		Coarse Woody Debris	
Transect Number	Length (feet)	Percent Canopy Cover	Number of Species	Percent Canopy Cover	Number of Species	Percent Canopy Cover	Number of Species	Number of Pieces CWD	Average Length (feet)
T1	1135	3.8	1	3.3	3	57.2	20	6	26
T2	147	11.5	1	1.0	1	64.5	6	2	48
T4	1419	3.7	1	0.8	2	70.7	15	73	31
T5	562	2.0	1	9.6	3	59.8	12	138	31*
T6	800	0.3	1	39.8	3	45.2	7	27	32
T7	400	0.9	1	25.1	3	60.2	8	6	25

* Note: length, diameter, and root were evaluated based on the first 13 pieces of wood encountered on this transect.

APPENDIX E
Crane Prairie Reservoir
Meeting Notes and Correspondence

Appendix E-1. Notes of monthly coordination meetings between the Permittees and USFWS on implementation of the DBHCP at Crane Prairie Reservoir.

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF CRANE PRAIRIE OPERATIONS

Date/Time: Monday, January 25, 2021, 3:00 PM to 4:00 PM, via Teams video conference

Purpose: This conference call was held to comply with Item G of Conservation Measure CP-1 of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), David Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates:

1. Item E of Conservation Measure CP-1 requires COID to increase the water surface elevation of Crane Prairie Reservoir (measured at Hydromet Station CRA) from 4,441.23 feet (storage volume of about 37,870 acre-feet) to at least 4,443.23 feet (storage volume of about 46,800 acre-feet) between November 1 and March 15. As of January 25, the water surface elevation was 4,442.82 feet (storage volume 44,950 acre-feet) and increasing. OWRD has informed COID it expects the reservoir to reach the target of at least 4,443.23 feet by March 15.
2. Item F of Conservation Measure CP-1 requires the flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir (measured at Hydromet Station CRAO) to be at least 75 cfs at all times. The flow at CRAO was 80 cfs on January 1, and was increased to 85 cfs on January 13 at the request of ODFW to improve habitat conditions for fish. It has not been adjusted since January 13.

Decisions/Action Items:

1. Future monthly Crane Prairie coordination meetings will be held on the third Thursday of the month from 10:00 AM to 11:00 AM. The next meeting will be a Teams video conference on Thursday, February 18 at 10:00 AM.
2. Prior to the next meeting Marty Vaughn will prepare a generic checklist of items to be covered in monthly meetings based on the requirements of the DBHCP and Incidental Take Permits.
3. Marty will invite Kyle Gorman (OWRD) to participate in the February video conference to discuss Crane Prairie Reservoir fill.
4. Conservation Measure CP-1, Item H concerning the potential release of an additional 5,000 acre-feet of storage from Crane Prairie Reservoir will be discussed in the February video conference.
5. USFWS and COID will copy Marty on email correspondence concerning DBHCP compliance at Crane Prairie so that Marty can include the correspondence in the DBHCP annual report to the Services.

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF CRANE PRAIRIE OPERATIONS

Date/Time: Thursday, February 18, 2021, 9:30 AM, via Teams

Purpose: This conference call was held to comply with Item G of Conservation Measure CP-1 of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Craig Horrell (COID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), David Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item E of Conservation Measure CP-1** requires COID to increase the water surface elevation of Crane Prairie Reservoir (measured at Hydromet Station CRA) from 4,441.23 feet (storage volume of about 37,870 acre-feet) to at least 4,443.23 feet (storage volume of about 46,800 acre-feet) between November 1 and March 15. As of February 18, the water surface elevation was 4,443.15 feet (storage volume 46,470 acre-feet) and increasing. OWRD and COID expect the reservoir to reach the target of at least 4,443.23 feet by the end of February.
2. **Item F of Conservation Measure CP-1** requires the flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir (measured at Hydromet Station CRAO) to be at least 75 cfs at all times. The flow at CRAO on February 18 was 79.8 cfs. From January 25 through February 18 the reported flow fluctuated between 79.4 and 81.7 cfs.
3. **Item H of Conservation Measure CP-1** allows for the release of an additional 5,000 acre-feet of storage (for an annual total of 15,000 acre-feet) under specified conditions and with the concurrence of USFWS. Marty and Craig suggested it would be desirable to release the additional 5,000 acre-feet in 2021 to augment what is expected to be a very low amount of storage in Wickiup Reservoir. Bridget noted that USFWS would like to coordinate such releases with reservoir management activities (such as weed control) to optimize associated benefits to OSF. Bridget will discuss the potential release with Jen O'Reilly (USFWS), Jason Gritzner (USFS) and representatives of ODFW, and be prepared to discuss the possibility on future coordination calls.
4. OWRD is considering eliminating some of the gages that measure inflow to Crane Prairie Reservoir to save operating costs. Craig noted that these gages are not necessary for reservoir operation and Marty added they are not necessary for DBHCP compliance.

Action Items:

1. Prior to the March conference call, Bridget will confer with Jen O'Reilly and others on the opportunities and implications for releasing the additional 5,000 acre-feet of storage from Crane Prairie Reservoir in 2021.
2. Marty will send copies of the Final DBHCP conservation measures to Jeremy and Kyle for their reference.
3. The next meeting will be Thursday, March 18, via Teams. It will start immediately following the Wickiup meeting.

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF CRANE PRAIRIE OPERATIONS

Date/Time: Thursday, March 18, 2021, 9:30 AM, via Teams

Purpose: This conference call was held to comply with **Item G of Conservation Measure CP-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Terry Smith (LPID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), David Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure CP-1** requires that the water surface elevation of Crane Prairie Reservoir (measured at Hydromet Station CRA) be at least 4,443.23 feet (storage volume of about 46,800 acre-feet) from March 15 through July 15. On March 15, 2021, the water surface elevation reached 4,443.28 feet (storage volume 47,080 acre-feet), putting it in compliance with the conservation measure. Item A also specifies an upper limit on water surface elevation from March 15 through July 15 of 4,443.48 feet (storage volume of about 48,000 acre-feet). The biological goal during this time is to maintain a relatively constant water surface elevation near the upper limit of the reservoir where Oregon spotted frog (OSF) breeding conditions are believed to be best. In the March 18 meeting, COID and OWRD pointed out the operational difficulties inherent in maintaining a constant water surface elevation during spring runoff (when inflow to the reservoir is high and variable). This will require frequent adjustments to the outflow at Crane Prairie Dam, which will be made by COID. As an added measure of assurance, and to provide a slightly larger storage volume for irrigation release in this unusually dry year, Crane Prairie will be allowed to fill to 48,500 acre-feet in March and held there until July. This will result in a reservoir water surface elevation of 1.6 inches above the normal target of 4,443.48 feet. The OSF habitat conditions provided at this slightly higher water surface elevation will be monitored by Biota Pacific and USFWS in 2021, and the results of the monitoring will be used to inform management under the DBHCP in future years.
2. **Item F of Conservation Measure CP-1** requires that the flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir (measured at Hydromet Station CRAO) be at least 75 cfs at all times. The flow at CRAO on March 18 was 76.6 cfs. From February 18 through March 18 the reported flow fluctuated between 76.5 and 76.8 cfs.
3. **Item H of Conservation Measure CP-1** allows for the release of an additional 5,000 acre-feet of storage (for an annual total of 15,000 acre-feet) under specified conditions and with the concurrence of USFWS. The group in the March 18 meeting briefly discussed the Permittees' previous request that USFWS consider the release of the additional 5,000 acre-feet in 2021 due to ongoing drought conditions. USFWS noted they will be consulting with ODFW to determine whether such a release could be coordinated with habitat enhancement activities in the reservoir. While ODFW approval of the additional release is not a prerequisite, USFWS expressed a desire to

coordinate activities on the reservoir to increase overall benefit to covered species. The topic will be discussed further at the April 15 meeting.

4. **Adaptive Management Measure OSF-1** requires the Permittees to fund biologists for OSF surveys and assessments on the covered lands. This item was covered in a meeting between USFWS and the Permittees on March 16.
5. **Adaptive Management Measure CP-1.1** requires the Permittees' support for OSF egg mass counts on Crane Prairie Reservoir. This item was also addressed in the March 16 meeting, and Biota Pacific will be providing at least two biologists to assist in the egg mass counts.

Action Items:

1. USFWS will continue to consult with ODFW and others on the opportunities and implications for releasing the additional 5,000 acre-feet of storage from Crane Prairie Reservoir in 2021.
2. **The next meeting will be Thursday, April 15, via Teams. It will start immediately following the Wickiup meeting, which will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF CRANE PRAIRIE OPERATIONS

Date/Time: Thursday, April 15, 2021, 9:30 AM, via Teams

Purpose: This conference call was held to comply with **Item G of Conservation Measure CP-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Terry Smith (LPID), Colin Wills (AID), Kyle Gorman (OWRD), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure CP-1** requires that the water surface elevation of Crane Prairie Reservoir (measured at Hydromet Station CRA) be between 4,443.23 and 4,443.48 feet (storage volumes of 46,800 and 48,000 acre-feet, respectively) from March 15 through July 15. Actual water surface elevation from March 18 through April 15 remained between 4,443.26 and 4,443.35 feet (storage volumes of 47,000 and 47,800 acre-feet, respectively), keeping it in compliance with the DBHCP. In the March 18 meeting, it was anticipated it may be necessary to hold the reservoir at a higher storage volume (up to 48,500) to ensure it didn't drop below 46,800 when inflow fluctuates. Inflow was relatively constant in late March and early April, and to date it has not been necessary to increase storage above 47,800 acre-feet. However, the higher volume may still be necessary later in the spring. As noted in the March 18 meeting, OSF habitat conditions will be monitored by Biota Pacific and USFWS in 2021, and the results of the monitoring will be used to inform management under the DBHCP in future years.
2. **Item F of Conservation Measure CP-1** requires that the flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir (measured at Hydromet Station CRAO) be at least 75 cfs at all times. The daily average flow at CRAO from March 18 through April 15 was reported to be between 75.6 and 76.0 cfs.
3. **Item H of Conservation Measure CP-1** allows for the release of an additional 5,000 acre-feet of storage (for an annual total of 15,000 acre-feet) under specified conditions and with the concurrence of USFWS. Detailed discussion on this topic was deferred to the May meeting. As noted in March, USFWS will be consulting with ODFW to determine whether such a release could be coordinated with habitat enhancement activities in the reservoir. While ODFW approval of the additional release is not a prerequisite, USFWS expressed a desire to coordinate activities on the reservoir to increase overall benefit to covered species. Marty will prepare a summary of the proposed additional release that Bridget can share with ODFW.
4. **Adaptive Management Measure OSF-1** requires the Permittees to fund biologists for OSF surveys and habitat assessments on the covered lands. The OSF surveys for 2021 are currently underway, with assistance from the Permittee's consultant (Biota Pacific).
5. **Adaptive Management Measure CP-1.1** requires the Permittees' support for OSF egg mass counts on Crane Prairie Reservoir. The 2021 counts will begin on Monday, April 19, with the participation of

Biota Pacific. Due to persistent snow on roads leading to the south side of the reservoir, it will be necessary to access the OSF breeding habitat by boat. USFWS and the Permittees agreed the Permittees would cover the cost of providing a boat, and the DBHCP requirement to provide qualified biologists would be reduced by an equal amount so that total cost to the Permittees will not increase. Due to efficiencies in some of the earlier OSF survey tasks, it is not anticipated that reducing the number of biologist hours to cover the boat will interfere with accomplishing all required OSF surveys in 2021.

Action Items:

1. Marty will prepare a summary of the proposed release of an additional 5,000 acre-feet from Crane Prairie Reservoir this year.
2. USFWS will consult with ODFW and others on the proposed additional release.
3. **The next meeting will be Thursday, May 20, via Teams. It will start immediately following the Wickiup meeting, which will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF CRANE PRAIRIE OPERATIONS

Date/Time: Thursday, May 20, 2021, 9:30 AM, via Teams

Purpose: This conference call was held to comply with **Item G of Conservation Measure CP-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Terry Smith (LPID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure CP-1** requires that the water surface elevation of Crane Prairie Reservoir (measured at Hydromet Station CRA) be between 4,443.23 and 4,443.48 feet (storage volumes of 46,800 and 48,000 acre-feet, respectively) from March 15 through July 15. Reported water surface elevation from April 15 through May 20 remained between 4,443.29 and 4,443.45 feet (storage volumes of 47,120 and 47,870 acre-feet, respectively), keeping it in compliance with the DBHCP. Crane Prairie outflow was increased by approximately 24 cfs on May 7 to hold the water surface elevation within the allowable range as inflow increased. In anticipation of additional increase in inflow, COID will increase outflow by another 15 cfs on May 20 to keep storage volume between 47,500 and 47,800 acre-feet.
2. **Item F of Conservation Measure CP-1** requires that the flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir (measured at Hydromet Station CRAO) be at least 75 cfs at all times. The daily average flow at CRAO from April 15 to May 7 was reported to be between 74.0 and 79.2 cfs. The low reported flow of 74.0 cfs is within the allowable range of deviation stated in Conservation Measure CP-1, Table CP-1 (≥ 70 cfs). Outflow was not adjusted during this period, and variations in reported flows may be the result of vegetation accumulation at the outlet structure and/or the CRAO gage. After the flow increase on May 7, daily average flow ranged from 101 to 105 cfs.
3. **Item H of Conservation Measure CP-1** allows for the release of an additional 5,000 acre-feet of storage (for an annual total of 15,000 acre-feet) under specified conditions and with the concurrence of USFWS. The Permittees provided a proposal to release the additional 5,000 acre-feet in 2021 (see attached). Marty noted that the release of the additional storage will temporarily reduce the inundated surface area of the reservoir by an estimated 202 acres in the late summer, before the reservoir begins to fill again in September. The proposal will be discussed in further detail in the June meeting.
4. **Adaptive Management Measure OSF-1** requires the Permittees to fund biologists for OSF surveys and habitat assessments on the covered lands. The OSF surveys for 2021 are currently underway, with assistance from the Permittee's consultants (Biota Pacific, Smayda Environmental and Mt Hood Environmental).

5. **Adaptive Management Measure CP-1.1** requires the Permittees' support for OSF egg mass counts on Crane Prairie Reservoir. The 2021 counts were successfully conducted on April 19 and 20, with the participation of the Permittees' consultants. As per prior agreement, Mt Hood Environmental provide a boat for access to the survey area. The costs of the boat were covered as part of the qualified biologist labor required by the conservation measure.

Action Items:

1. **The next meeting will be Wednesday, June 16, via Teams. It will start immediately following the Wickiup meeting, which will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF CRANE PRAIRIE OPERATIONS

Date/Time: Wednesday, June 16, 2021, 9:30 AM, via Teams

Purpose: This conference call was held to comply with **Item G of Conservation Measure CP-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Terry Smith (LPID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure CP-1** requires that the water surface elevation of Crane Prairie Reservoir (measured at Hydromet Station CRA) be between 4,443.23 and 4,443.48 feet (storage volumes of 46,800 and 48,000 acre-feet, respectively) from March 15 through July 15. Reported water surface elevation from May 20 through June 16 remained between 4,443.34 and 4,443.47 feet (storage volumes of 47,358 and 47,969 acre-feet, respectively), keeping it in compliance with the DBHCP. Crane Prairie outflow was adjusted a number of times by small amounts in late May and early June to hold the water surface elevation within the allowable range as inflow varied.
2. **Item B of Conservation Measure CP-1** specifies a maximum rate of 0.05 foot/day for the drawdown of Crane Prairie Reservoir in July, but the DBHCP also includes adaptive management provisions for adjusting this rate with additional monitoring. To provide additional inflow to Wickiup Reservoir in July for management of flows downstream of Wickiup Dam (see Wickiup implementation notes for June 16), all parties agree the maximum rate of Crane Prairie drawdown in July would be 0.10 foot/day. The effects of the drawdown on OSF will be monitored by qualified biologists.
3. **Item D of Conservation Measure CP-**1 requires a water surface elevation in Crane Prairie Reservoir of at least 4,441.23 feet (storage volume about 37,870 acre-feet) from July 16 through October 31, but **Item H of** the same conservation measure allows for the release of an additional 5,000 acre-feet of storage in late summer to support OSF management downstream of Wickiup Dam. The Permittees and USFWS have agreed that the additional 5,000 acre-feet of storage will be released in August to counteract the effects of the current drought and support Deschutes River flows downstream of Wickiup Dam. The effects of the lower water surface elevation in Crane Prairie Reservoir will be monitored by qualified biologists.
4. **Item F of Conservation Measure CP-1** requires that the flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir (measured at Hydromet Station CRAO) be at least 75 cfs at all times. The daily average flow at CRAO from May 20 to June 16 was reported to be between 96 and 123 cfs, keeping it in compliance with the DBHCP.
5. **Item H of Conservation Measure CP-1** allows for the release of an additional 5,000 acre-feet of storage (for an annual total of 15,000 acre-feet) under specified conditions and with the concurrence of USFWS. As noted in Item 3 above, the additional 5,000 acre-feet will be released from Crane Prairie Reservoir in 2021.

6. **Adaptive Management Measure CP-1.2** requires monitoring of Crane Prairie Reservoir for OSF stranding during drawdown in July and August. Qualified biologists will monitor the drawdown, paying particular attention to the effects of the increased rate of drawdown in late July and the lower water surface elevation in late August after release of the additional 5,000 acre-feet.

Action Items:

1. **The next meeting will be Wednesday, July 14, via Teams. It will start immediately following the Wickiup meeting, which will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF CRANE PRAIRIE OPERATIONS

Date/Time: Wednesday, July 14, 2021, 9:30 AM, via Teams

Purpose: This conference call was held to comply with **Item G of Conservation Measure CP-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure CP-1** requires that the water surface elevation of Crane Prairie Reservoir (measured at Hydromet Station CRA) be between 4,443.23 and 4,443.48 feet (storage volumes of 46,800 and 48,000 acre-feet, respectively) from March 15 through July 15. Reported water surface elevation remained above 4,443.23 from June 16 through July 2, but then dropped slowly until it reached 4,443.08 feet on July 14. Reduced inflow to the reservoir made it impossible to maintain 4,443.23 feet without reducing the outflow. In consultation with USFWS, the Permittees kept the outflow constant to support fish and wildlife habitat downstream of Crane Prairie Dam. The resulting 2-inch drop in water surface elevation from 4,443.23 to 4,443.08 was not expected to have an adverse effect on OSF in the reservoir.
2. **Item B of Conservation Measure CP-1** specifies a maximum rate of 0.05 foot/day for the drawdown of Crane Prairie Reservoir in July, but the DBHCP also includes adaptive management provisions for adjusting this rate with additional monitoring. To provide additional inflow to Wickiup Reservoir in July for management of flows downstream of Wickiup Dam (see Wickiup implementation notes for June 16), all parties agree in early June that the maximum rate of Crane Prairie drawdown in July would be 0.10 foot/day. The drawdown is scheduled to begin on July 15. The effects of the drawdown on OSF will be monitored by qualified biologists.
3. **Item D of Conservation Measure CP-**1 requires a water surface elevation in Crane Prairie Reservoir of at least 4,441.23 feet (storage volume about 37,870 acre-feet) from July 16 through October 31, but **Item H of** the same conservation measure allows for the release of an additional 5,000 acre-feet of storage in late summer to support OSF management downstream of Wickiup Dam. The Permittees and USFWS have agreed that the additional 5,000 acre-feet of storage will be released in August to counteract the effects of the current drought and support Deschutes River flows downstream of Wickiup Dam. The target low water surface elevation for 2021 will be 4,440.05 feet (storage volume 32,870 acre-feet). The effects of the lower water surface elevation in Crane Prairie Reservoir will be monitored by qualified biologists.
4. **Item F of Conservation Measure CP-1** requires that the flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir (measured at Hydromet Station CRAO) be at least 75 cfs at all times. The daily average flow at CRAO from June 16 through July 14 was reported to be between 103 and 121 cfs, keeping it in compliance with the DBHCP.

5. **Item H of Conservation Measure CP-1** allows for the release of an additional 5,000 acre-feet of storage (for an annual total of 15,000 acre-feet) under specified conditions and with the concurrence of USFWS. As noted in Item 3 above, the additional 5,000 acre-feet will be released from Crane Prairie Reservoir in 2021.
6. **Adaptive Management Measure CP-1.2** requires monitoring of Crane Prairie Reservoir for OSF stranding during drawdown in July and August. Qualified biologists will monitor the drawdown, paying particular attention to the effects of the increased rate of drawdown in late July and the lower water surface elevation in late August after release of the additional 5,000 acre-feet.

Action Items:

1. **The next meeting will be Thursday, August 19, via Teams. It will start immediately following the Wickiup meeting, which will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF CRANE PRAIRIE OPERATIONS

Date/Time: Thursday, August 19, 2021, 9:30 AM, via Teams

Purpose: This conference call was held to comply with **Item G of Conservation Measure CP-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item B of Conservation Measure CP-1** specifies a maximum rate of 0.05 foot/day for the drawdown of Crane Prairie Reservoir in July, but the DBHCP also includes adaptive management provisions for adjusting this rate with additional monitoring. To provide additional inflow to Wickiup Reservoir in July for management of flows downstream of Wickiup Dam (see Wickiup implementation notes for June 16), all parties agreed that the maximum rate of Crane Prairie drawdown in July would be 0.10 foot/day, which is the maximum allowable rate specified in **Item C of Conservation Measure CP-1** for drawdown in August. The drawdown began on July 15. The reported daily rate of drop in water surface elevation from July 15 through August 19 was less than 0.10 foot/day for all days except August 6, when the reported drop was 0.12 foot/day. This reported rate appears to be the result of gage error, however; because the reported rate the previous days (August 5) was unusually low (0.04 foot/day) even though there had been no change in reservoir inflow or outflow. The daily average drop for August 5 and 6 combined was 0.08 foot/day, which was consistent with the daily drop reported for several days before and after these two days. Based on this, it is assumed the actual rate of drop in water surface elevation was less than 0.10 foot/day the entire period.
2. **Item D of Conservation Measure CP-**1 requires a water surface elevation in Crane Prairie Reservoir of at least 4,441.23 feet (storage volume about 37,870 acre-feet) from July 16 through October 31, but **Item H of** the same conservation measure allows for the release of an additional 5,000 acre-feet of storage in late summer to support OSF management downstream of Wickiup Dam. The Permittees and USFWS previously agreed that the additional 5,000 acre-feet of storage will be released in August to counteract the effects of the current drought and support Deschutes River flows downstream of Wickiup Dam. The target low water surface elevation for 2021 is 4,440.05 feet (storage volume 32,870 acre-feet). As of August 19, the water surface elevation had dropped to 4,440.43 feet.
3. **Item F of Conservation Measure CP-1** requires that the flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir (measured at Hydromet Station CRAO) be at least 75 cfs at all times. The reported daily average flow at CRAO from July 15 through August 19 ranged from 172 to 300 cfs, keeping it in compliance with the DBHCP.
4. **Item H of Conservation Measure CP-1** allows for the release of an additional 5,000 acre-feet of storage (for an annual total of 15,000 acre-feet) under specified conditions and with the

concurrence of USFWS. As noted in Item 2 above, the additional 5,000 acre-feet was released from Crane Prairie Reservoir in August 2021.

5. **Adaptive Management Measure CP-1.2** requires monitoring of Crane Prairie Reservoir for OSF stranding during drawdown in July and August. Qualified biologists monitored the drawdown that began on July 15, paying particular attention to the effects of the increased rate of drawdown. No signs of stranding were observed. Details of the drawdown monitoring will be provided in the DBHCP annual report to USFWS.

Action Items:

1. **The next meeting will be Thursday, September 16, via Teams. It will start immediately following the Wickiup meeting, which will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF CRANE PRAIRIE OPERATIONS

Date/Time: Thursday, September 16, 2021, 9:30 AM, via Teams

Purpose: This conference call was held to comply with **Item G of Conservation Measure CP-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Colin Wills (AID), Steve Johnson (AID), Terry Smith (LPID), Gregg Garnett (BOR), Kyle Gorman (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item C of Conservation Measure CP-1** specifies a maximum rate of 0.10 foot/day for the drawdown of Crane Prairie Reservoir from August 1 through October 31. The reported daily rate of drop in water surface elevation from August 20 through September 15 was 0.07 foot/day or less.
2. **Item D of Conservation Measure CP-1** requires a water surface elevation in Crane Prairie Reservoir of at least 4,441.23 feet (storage volume about 37,870 acre-feet) from July 16 through October 31, but **Item H** of the same conservation measure allows for the release of an additional 5,000 acre-feet of storage in late summer to support OSF management downstream of Wickiup Dam. The Permittees and USFWS previously agreed that the additional 5,000 acre-feet of storage would be released in August to counteract the effects of the current drought and support Deschutes River flows downstream of Wickiup Dam. The target low water surface elevation for 2021 is 4,440.05 feet (storage volume 32,870 acre-feet). As of September 15, the water surface elevation had dropped to 4,440.12 feet. COID does not plan to drop the reservoir further in 2021. The extra water (less than 1 inch above 4,440.05 feet) will be retained as an operational buffer to make sure the water surface elevation remains at or above the required level. On a related note, COID plans to stop diverting water for the year on October 1.
3. **Item F of Conservation Measure CP-1** requires that the flow in the Deschutes River between Crane Prairie Dam and Wickiup Reservoir (measured at Hydromet Station CRAO) be at least 75 cfs at all times. The reported daily average flow at CRAO from August 20 through September 15 ranged from 122 to 208 cfs, keeping it in compliance with the DBHCP.
4. **Item H of Conservation Measure CP-1** allows for the release of an additional 5,000 acre-feet of storage (for an annual total of 15,000 acre-feet) under specified conditions and with the concurrence of USFWS. As noted previously, the additional 5,000 acre-feet was released from Crane Prairie Reservoir by early September 2021.
5. **Adaptive Management Measure CP-1.3** requires monitoring of vegetation in Crane Prairie Reservoir for long-term changes resulting from the new operating regime. Baseline vegetation data are being collected in the reservoir during the week of September 13-17, and baseline aerial photography will be flown in late September. Details of the vegetation sampling will be provided in the DBHCP annual report to USFWS.

Action Items:

1. **The next meeting will be Thursday, October 21, via Teams. It will start immediately following the Wickiup meeting, which will start at 9:00 AM.**

Appendix E-2. Correspondence between the Permittees and USFWS concerning planning for Oregon spotted frog monitoring in 2021.

From: mvaughn@biotapacific.com <mvaughn@biotapacific.com>
Sent: Wednesday, March 17, 2021 1:56 PM
To: Moran, Bridget <bridget_moran@fws.gov>; OReilly, Jennifer <Jennifer_OReilly@fws.gov>; Britton, Mike <mbritton@northunitid.com>; Craig Horrell (chorrell@coid.org) <chorrell@coid.org>; 'Chris Schull' <chris@tumalo.org>; Smayda, Kathy <kwsmayda@aol.com>
Subject: DBHCP - 2021 OSF Surveys

DBHCP OSF Team,

Here are the draft notes from out *Teams* meeting yesterday. If you can get me any comments/edits you have by Friday I'll finalize the notes before the weekend.

Marty

Biota Pacific Environmental Sciences
425-260-1588

Meeting Notes
Deschutes Basin Habitat Conservation Plan
Coordination of Oregon Spotted Frog Surveys

Date/Time: Tuesday, March 16, 2021, 4:00 PM, via *Teams*

Purpose: Planning for 2021 Oregon spotted frog surveys on the covered lands

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Chris Schull (TID), Marty Vaughn (Biota Pacific), Kathy Smayda (Smayda Environmental)

Notes Prepared by: Marty Vaughn and Kathy Smayda

The requirements of the DBHCP for Oregon spotted frog (OSF) survey and habitat assessment have been summarized in 10 tasks. These meeting notes are organized according to those tasks. Not all tasks were discussed in the March 16 meeting (as indicated below), but all are listed herein to provide a framework for future meeting notes. Items requiring further input/guidance from USFWS are underlined for convenience.

TASK 1. Assessment of pre-breeding activity, weather and habitat conditions along the Upper Deschutes River

- This task supports the decision on ramp-up of the flow at Hydromet Station WICO in the spring. Based on habitat conditions and OSF breeding activity, the ramp-up may pause temporarily at 400 cfs on March 31, before proceeding to 600 cfs in early April.
- Marty provided draft ramp-up schedules that were prepared by OWRD. One schedule assumes a goal of 400 cfs on March 31 and the other assumes a goal of 600 cfs. Both schedules assume ramp-up will proceed at the maximum rate allowed under Conservation Measure WR-1.
- Jen suggested it would be appropriate to pause at 400 cfs on March 31 regardless of weather and habitat conditions, and then increase to 600 cfs over the next 1-2 weeks to provide

gradually increasing water depth for breeding OSF. The timing of the increase from 400 to 600 cfs in early April will be determined by observations of OSF activity in Dead Slough and other known breeding locations along the Deschutes River. All parties agreed on this approach.

- Biologists with USGS will be conducting the surveys of OSF along this reach of the Deschutes River in the spring of 2021, and Jen will rely on input from them to determine the timing for the ramp-up to 600 cfs.
- The Permittees will not fund or conduct Task 1 in 2021. As provided in Adaptive Management Measure OSF-1, the funding allocated for Task 1 can be used for other OSF survey requirements of the DBHCP, if necessary.

TASK 2. Monitoring of OSF egg/larvae survival along the Upper Deschutes River

- This task supports adaptive management for provisions in Conservation Measure WR-1, Item C that limit the magnitude of decreases in flow at WICO in April.
- Conservation Measure WC-1 requires that this monitoring include Dead Slough, and may include other sites selected by USFWS.
- The Permittees' consultant (Biota Pacific) will conduct this monitoring.
- USFWS will determine whether other breeding sites along the Upper Deschutes River should be monitored as well.
- The monitoring will begin when OSF egg deposition is first observed at Dead Slough.

TASK 3. Assessment of habitat conditions in Dead Slough if the flow at WICO drops ≥20 percent

- This task only occurs if it becomes necessary to reduce the flow at WICO by 20 percent or more over a 5-day period in May and June.
- This task was not discussed in the March 16 meeting.
- It is assumed Biota Pacific will be available to conduct this assessment, if it is needed.

TASK 4. Habitat suitability analyses along the Upper Deschutes River

- This task provides general support to USFWS in their efforts to characterize and enhance OSF habitat along the Upper Deschutes River.
- This task was not discussed in the March 16 meeting.
- USFWS will identify sites and habitat metrics to be monitored in 2021.

TASK 5. OSF egg mass counts at Crane Prairie Reservoir

- These egg mass counts will be used to track the success of Conservation Measure CP-1 as well as habitat enhancement activities funded under Conservation Measure UD-1.
- Jen noted that it may not be necessary to conduct the egg mass counts every year, but they will occur in 2021. She indicated the 2021 effort could require up to 5 days of field work.
- Biota Pacific will provide at least two biologists to assist in this effort under the direction of USFWS.
- The timing of the egg mass counts will be determined by USFWS.

TASK 6. Crane Prairie Reservoir drawdown monitoring

- This task supports adaptive management of the rate and timing of the annual drawdown of Crane Prairie Reservoir in late summer.
- This task was not discussed in the March 16 meeting.
- Biota Pacific and COID will work with USFWS during early summer to determine the timing, location(s) and methods for this task.

TASK 7. Crane Prairie Reservoir vegetation monitoring

- This task supports adaptive management of the operating regime for Crane Prairie Reservoir in Conservation Measure CP-1.
- This task was not discussed in the March 16 meeting.
- Biota Pacific and COID will work with USFWS during early summer to determine the timing, location(s) and methods for this task.

TASK 8. Crescent Creek OSF egg mass counts

- This task is a continuation of OSF monitoring along Crescent Creek and the Little Deschutes River that began during DBHCP development.
- Biota Pacific will conduct the counts at the known breeding sites at RM 1.7, 21.9 and 22.8 on Crescent Creek; and at Leona Park, Rosland Campground and the oxbows near LaPine High School on the Little Deschutes River.
- The counts will be timed to determine the total number of egg masses present for the year at each location.
- Biota Pacific will coordinate the surveys on BLM lands (Crescent Creek RM 1.7; LaPine High school oxbows) with Larry Ashton, BLM Wildlife Biologist.

TASK 9. Check for OSF stranding in Crescent Creek and the Little Deschutes River

- This task will be conducted to determine whether stranding of developing OSF is occurring in May and June.
- This task was not discussed in the March 16 meeting.
- It is assumed Biota Pacific will be available to conduct this task.
- It is assumed this task will be conducted at the sites listed under Task 8.

TASK 10. Habitat suitability analyses along Crescent Creek and the Little Deschutes River

- This task provides general support to USFWS in their efforts to characterize and enhance OSF habitat along Crescent Creek and the Little Deschutes River.
- This task was not discussed in the March 16 meeting.
- It is assumed Biota Pacific will be available to conduct this task.
- USFWS will identify sites and habitat metrics to be monitored in 2021.

From: mvaughn@biotapacific.com <mvaughn@biotapacific.com>
Sent: Monday, April 5, 2021 11:39 AM
To: OReilly, Jennifer <jennifer_oreilly@fws.gov>
Cc: Smayda, Kathy <kwsmayda@aol.com>; Craig Horrell <chorrell@coid.org>; Britton, Mike <mbritton@northunitid.com>; 'Chris Schull' <chris@tumalo.org>; Moran, Bridget N <bridget_moran@fws.gov>
Subject: [EXTERNAL] DBHCP - 2021 OSF Field Support

Jen,

Just checking in on a few items.

1. What has the USGS crew found at Dead Slough so far? Any indication of what the timing for the ramp-up to 600 cfs will be?
2. Any changes/edits to the March 16 meeting notes? We should get those finalized before we get much further into the season.
3. Kathy and I are going to do the first visit to the Crescent Creek and LaPine sites on Monday and Tuesday of next week (April 12/13). Based on results from previous years and current water temperatures at CREO and LAPO, we anticipate egg deposition will begin no later than this week and peak numbers of egg masses will be present between April 12 and April 25. We're planning to do one visit early next week and another toward the middle or end of the following week to capture the peak.
4. Any thoughts on the specifics (objectives, methods and timing) for Adaptive Management Measure WR-1.2 (Task 2 in the March 16 meeting notes)? We'll be available to do the field work beginning next week.
5. Similarly, and thoughts on the specifics for the habitat suitability analyses along the Upper Deschutes River (Task 4 in the March 16 meeting notes)? The main question at this point is whether you have any work you want done in April. If not, we can wait until later this month to get the specifics.
6. Lastly, any thoughts on the specifics for the habitat suitability analyses along Crescent Creek and the Deschutes River (Task 10 in the March 16 meeting notes). That HCP requirement specifies we need to be available on April 1. Just let us know if there is something you want done this month.

Marty

Biota Pacific Environmental Sciences
425-260-1588

From: OReilly, Jennifer <jennifer_oreilly@fws.gov>
Sent: Monday, April 5, 2021 2:29 PM
To: mvaughn@biotapacific.com
Cc: Smayda, Kathy <kwsmayda@aol.com>; Craig Horrell <chorrell@coid.org>; Britton, Mike <mbritton@northunitid.com>; 'Chris Schull' <chris@tumalo.org>; Moran, Bridget N <bridget_moran@fws.gov>
Subject: Re: [EXTERNAL] DBHCP - 2021 OSF Field Support

Hi Marty-

No action at Dead Slough yet but we suspect it will be this week. I was up at Crescent on Friday. The site below HWY 58 is completely frozen. Above HWY 58 is open. Your timing should work for the upper site. It's very dry compared to past years.

Regarding the habitat monitoring and assessments, I think that we need to get through the breeding season before conducting that level of work. Habitat assessment and comments about habitat suitability are typically part of the breeding surveys. But the adaptive management may involve determining if the habitat water levels are suitable for allowing frogs to complete metamorphosis. For example, given the very dry conditions this year, we may need to conduct some monitoring of egg masses into May to ensure they do not strand.

I'll have to find the March 16 meetings notes for the specifics. I'm working off of the March 18 Final Notes. I will be thinking of these things while I am out in the field and perhaps we can follow up in a week or so?

I'll be in the field most of this week and will let folks know when it's time to release the water as per the HCP agreement. I'm reachable via my cell (below). So please call if you need to get a hold of me.

Thanks,

Jen

Jennifer O'Reilly
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Bend Field Office
63095 Deschutes Market Road
Bend, OR 97701
Direct line: 541-312-6426
Main line: 541-383-7146
Cell: 541-306-1270

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From: mvaughn@biotapacific.com <mvaughn@biotapacific.com>
Sent: Monday, April 5, 2021 2:38 PM
To: 'OReilly, Jennifer' <jennifer_oreilly@fws.gov>
Cc: 'Smayda, Kathy' <kwsmayda@aol.com>; 'Craig Horrell' <chorrell@coid.org>; 'Britton, Mike' <mbritton@northunitid.com>; 'Chris Schull' <chris@tumalo.org>; 'Moran, Bridget N' <bridget_moran@fws.gov>
Subject: RE: [EXTERNAL] DBHCP - 2021 OSF Field Support

Jen,

Thanks. That all sounds good. Kathy and I will plan to check in with you when we're down there next week.

Marty

Biota Pacific Environmental Sciences
425-260-1588

From: mvaughn@biotapacific.com
To: Moran, Bridget <bridget_moran@fws.gov>; OReilly, Jennifer <Jennifer_OReilly@fws.gov>
Cc: Craig Horrell <chorrell@coid.org>; 'David Filippi' <david.filippi@stoel.com>
Sent: Fri, May 14, 2021 12:29 pm
Subject: DBHCP Oregon Spotted Frog Field Activity - May 2021 Status Report

Bridget and Jen,

Attached is our May status report on the Oregon spotted frog monitoring we are conducting in accordance with the DBHCP. I will be providing these reports to you and the Permittees monthly through the summer. This report is just a summary of the work we are doing. Data and detailed reports on the individual tasks will be sent separately to Jen and included in the annual report to USFWS.

You will see in the status report that:

- Task 1 was covered by USGS this year.
- Tasks 2, 5 and 8 have been completed by us.
- Tasks 3, 6 and 7 will occur later this summer, as described in the Final DBHCP.
- Tasks 4, 9 and 10 are on hold pending further direction from USFWS.

With respect to these last three tasks (4, 9 and 10), the specific objectives, methods and timing are not provided in the Final DBHCP. Rather, all three tasks are to be performed under the direction of USFWS. We are available at your convenience to discuss your thoughts on these three tasks and prepare to get in the field.

Thanks,

Marty
Biota Pacific Environmental Sciences
425-260-1588

From: mvaughn@biotapacific.com <mvaughn@biotapacific.com>
Sent: Friday, May 21, 2021 8:31 AM
To: Moran, Bridget N <bridget_moran@fws.gov>; OReilly, Jennifer <jennifer_oreilly@fws.gov>
Subject: [EXTERNAL] DBHCP - 2021 OSF Monitoring

Jen and Bridget,

At this point I'm pretty open next week for a conference call to discuss the details of the OSF monitoring over the next couple months. Go ahead and suggest a day and time that works for the two of you and I'll get it on my schedule.

In the meantime, I've put together a list of questions I have on the three tasks for May and June. If you're able to answer these questions I may have enough to get things moving forward. We may even be able to eliminate the need for a conference call next week.

Marty

Biota Pacific Environmental Sciences
425-260-1588

From: OReilly, Jennifer <jennifer_oreilly@fws.gov>
Sent: Friday, May 21, 2021 8:39:06 AM
To: mvaughn@biotapacific.com <mvaughn@biotapacific.com>; Moran, Bridget N <bridget_moran@fws.gov>
Subject: Re: [EXTERNAL] DBHCP - 2021 OSF Monitoring

Morning Marty-

Thanks for prompting the discussion. I'm going to need some time to think about these questions before responding and I'm pulled off on other tasks today. My next week is pretty full but I'm open Thursday afternoon (5/27) between 1 and 3. In quickly checking Bridget's calendar, I think that she is available, but I'll let her confirm.

-Jen

Jennifer O'Reilly
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Bend Field Office
63095 Deschutes Market Road
Bend, OR 97701
Direct line: 541-312-6426
Main line: 541-383-7146

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From: Moran, Bridget N <bridget_moran@fws.gov>
Sent: Friday, May 21, 2021 8:43 AM
To: OReilly, Jennifer <jennifer_oreilly@fws.gov>; mvaughn@biotapacific.com
Subject: Re: [EXTERNAL] DBHCP - 2021 OSF Monitoring

Thursday the 27th @ 1pm works for me.

Bridget Moran, Field Supervisor
Bend Field Office
U.S. Fish & Wildlife Service

From: mvaughn@biotapacific.com <mvaughn@biotapacific.com>
Sent: Friday, May 21, 2021 8:57 AM
To: 'Moran, Bridget N' <bridget_moran@fws.gov>; 'OReilly, Jennifer' <jennifer_oreilly@fws.gov>
Subject: RE: [EXTERNAL] DBHCP - 2021 OSF Monitoring

Jen and Bridget,

Thursday (5/27) from 1:00 to 3:00 works for me. I'll send out a Teams invitation.

Marty

Biota Pacific Environmental Sciences
425-260-1588

From: mvaughn@biotapacific.com <mvaughn@biotapacific.com>
Sent: Friday, May 21, 2021 9:01 AM
To: 'Moran, Bridget N' <bridget_moran@fws.gov>; 'OReilly, Jennifer' <jennifer_oreilly@fws.gov>
Subject: RE: [EXTERNAL] DBHCP - 2021 OSF Monitoring

Jen and Bridget,

Here's the Teams invitation.

Marty

Biota Pacific Environmental Sciences
425-260-1588

From: mvaughn@biotapacific.com <mvaughn@biotapacific.com>
Sent: Wednesday, June 2, 2021 11:53 AM
To: mvaughn@biotapacific.com <mvaughn@biotapacific.com>; Moran, Bridget N <bridget_moran@fws.gov>; OReilly, Jennifer <jennifer_oreilly@fws.gov>
Cc: Craig Horrell <chorrell@coid.org>; Chris Schull <Chris@tumalo.org>
Subject: RE: [EXTERNAL] DBHCP - 2021 OSF Monitoring

Bridget and Jen,

Just to summarize what we decided on the May 27 call concerning OSF monitoring activities for June:

1. **Monitoring Task 4 (DBHCP Section 7.2.2.1) - Habitat suitability analyses along the Upper Deschutes River**

   We decided to defer this one to next year (2022) to allow time for selection of study sites and development of a detailed study plan. Bridget will confirm with Craig Horrell that the budget for this task can be moved to 2022. Jen will work with the Permittees between now and next March to finalize the details of the study plan. Our assumption is that the extreme drought that is occurring in 2021 would complicate efforts to characterize existing habitat conditions, and that better information can be gained in 2022.

2. **Monitoring Task 9 (DBHCP Section 7.2.5) - Checking for OSF stranding in Crescent Creek and Little Deschutes River**

   We decided to defer this one to next year (2022). Bridget will confirm with Craig Horrell and Chris Schull that the budget for this task can be moved to 2022. Jen will work with the Permittees between now and next March to finalize the details of the study plan. As with Item 1, the extreme drought in 2021 and resulting unavailability of OSF water in Crescent Lake Reservoir would make it difficult to make use of stranding information this year. Marty will make sure the observations of potential stranding made during the March/April egg mass counts this year are included in the annual report to provide additional guidance for 2022.

3. **Monitoring Task 10 (DBHCP Section 7.2.5) - Habitat suitability analyses along Crescent Creek and Little Deschutes River**

   This task will be completed in late summer (July-September) of 2021 and will focus on the three known OSF breeding sites along Crescent Creek that we have been monitoring since 2013. Marty will prepare a draft detailed study plan for Jen's review prior to July. It will include establishing long-term photo-documentation sites and collecting baseline data on vegetation and water depth conditions at the breeding wetlands.

Let me know if you have any comments/additions/revisions.

Thanks,

Marty

Biota Pacific Environmental Sciences
425-260-1588

From: OReilly, Jennifer <jennifer_oreilly@fws.gov>
Sent: Thursday, June 3, 2021 8:36 AM
To: mvaughn@biotapacific.com; Moran, Bridget N <bridget_moran@fws.gov>
Cc: Craig Horrell <chorrell@coid.org>; Chris Schull <Chris@tumalo.org>
Subject: Re: [EXTERNAL] DBHCP - 2021 OSF Monitoring

Thanks Marty. We have some notes from the May 27 meeting that we will share with you after Bridget takes a look. In general, you have captured what we discussed. However, we may need some more discussion around Monitoring Task 4. You were going to discuss options for the aerial photo/drone imagery with Joetta to inform how we would approach this task. So before saying that we are deferring the task, we should know how we are going to approach it. The drought year may be an important one to assess conditions, especially at East Slough.

Thanks,
Jen

Jennifer O'Reilly
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Bend Field Office
63095 Deschutes Market Road
Bend, OR 97701
Direct line: 541-312-6426
Main line: 541-383-7146

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From: Moran, Bridget N <bridget_moran@fws.gov>
Sent: Wednesday, June 16, 2021 2:40 PM
To: Martin E. Vaughn <mvaughn@biotapacific.com>
Cc: OReilly, Jennifer <jennifer_oreilly@fws.gov>; Funari, Claudia A <claudia_funari@fws.gov>
Subject: OSF monitoring follow-up

Hi Marty,

Thanks for the discussion regarding the OSF monitoring elements identified in the DBHCP. I thought our discussion was productive. Attached are our notes from the conversation. Once you've had a chance to review, we should meet again to discuss next steps.

Thank you,

Bridget Moran, Field Supervisor
Bend Field Office
U.S. Fish & Wildlife Service

(541) 480-7914

Deschutes Basin Habitat Conservation Plan
2021 OSF Monitoring
Questions on Monitoring Requirements and Study Design
(USFWS notes in blue italicized font)

Present at Meeting: Jennifer O'Reilly, Martin Vaughn, Bridget Moran, Claudia Funari

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Monitoring Task 4 (DBHCP Section 7.2.2.1) - Habitat suitability analyses along the Upper Deschutes River

Requirement

"Starting in Year 1 and repeating every 5 years for the term of the DBHCP, the Permittees will provide funding for two qualified biologists for up to 40 hours each (or up to 80 hours total for one biologist) to conduct Oregon spotted frog habitat suitability analyses at up to three sites along the 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."

Questions

1. What are the three sites to be monitored?

USFWS Note: *The number of sites to be monitored each year will depend on the type of monitoring to be done. Intensive analysis may lend itself to conducting this task at a single site annually.*

2. What are the habitat metrics to be analyzed at each site?

USFWS Note: *OBJECTIVE: As summer flows in the Deschutes River are reduced over time, we anticipate reduced water depths and increased vegetation encroachment in floodplain habitats. This task is to assess the change in OSF floodplain habitats along the Deschutes over time so that Upper Deschutes Conservation Fund may be used to implement restoration and enhancement activities.*

a. *In general, aerial imagery that is spatially explicit should be gathered and ground-truthed during the early years of the HCP so that there is a habitat baseline. Marty will talk to Joetta about drone imagery, satellite imagery, etc.*

NOTES:

East Slough Camp may be the first site to conduct this monitoring. Marty plans to do a vegetation survey this September on East Slough sites. DBHCP conservation measure -East Slough is inundated with 1,300 CFS until September 15th. So Marty may go out late September to do these surveys.

Monitoring Task 9 (DBHCP Section 7.2.5) - Checking for OSF stranding in Crescent Creek and Little Deschutes River

Requirement

"Starting in Year 1 and repeating every 3 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 check known Oregon spotted frog breeding sites along Crescent Creek and Little Deschutes River for rearing Oregon spotted frogs in May/June (early rearing period) to determine if stranding is occurring. USFWS will be

notified if there is a situation where stranding is observed. If USFWS determines a change in use of OSF storage is warranted to reduce stranding and improve Oregon spotted frog survival, TID will implement the change within the limits of the OSF storage described in Conservation Measure CC-1."

Questions

1. What are the sites to be checked?

   USFWS Note:

   a. *During the 2021 OSF breeding surveys season, surveyors noted at several sites that egg masses were laid in shallow water and in some cases could strand. Jen noted that these observations should be evident in the notes column in the breeding data. Marty says he can use that data to assess stranding for the year. Given the drought year and dry spring, stranding was evident at most sites, even under natural conditions outside of the areas affected by water management. If 2022 is another dry spring or conditions may result in stranding during the breeding or rearing period, then FWS may ask for eggs or tadpoles to be moved within sites. This conservation measure should be fully implemented in 2022. It may be possible to add the 40hrs we would have used this year, to next year's monitoring effort so that we get 80 hrs next year when there might be better precipitation and we might be able to collect better information. Everyone agreed that it would be better to implement this CM next year. OSF breeding data collected in 2021 will be assessed by Marty to inform the approach to this CM next year. Marty will discuss this with the districts and make sure they agree with this plan. Bridget will then write a formal request.*

2. How is stranding defined? A clear and consistent definition of stranding will be important for effective implementation of Measure CC-1. Are tadpoles stranded if their breeding site:

   USFWS Note: *Stranding may occur at all life stages of OSF before they have metamorphosed and have legs that facilitate movement over dry land. Definition of stranding may include all, but not limited to A-D).*

   a. becomes isolated from the creek, regardless of the depth of the water;

   b. becomes isolated from the creek *and* the depth of the water drops below a specified level;

   c. remains connected to the creek, but the depth drops below a certain level;

   d. goes completely dry;

   e. other?

3. When will the known sites be visited? Will they be checked for stranding at specified (regular) intervals, or only after a detected decrease in flow at one of the established stream gages that could cause stranding? **Note:** As of May 21, flows at CREO and LAPO gages have generally remained steady or increased from those during OSF egg deposition in late March and early April.

   a. ***USFWS Note:*** *Everyone agreed that it would be better to move the surveys to next year and rely on the data already collected because the year was so dry.*

4. Who at USFWS will be notified if stranding is detected, and how should they be notified?

   a. ***USFWS Note:*** *This should be in each Section 10 permit. But Jen and/or Bridget should get a phone call so that the FWS can provide guidance and assistance, if needed.*

5. How will the results of this monitoring be used? Conservation Measure CC-1 appears to indicate that Crescent Lake Reservoir storage for OSF management does not become available until October 1, 2021 at the earliest.

   a. ***USFWS Note:*** *Unresolved? No notes on this question.*

Monitoring Task 10 (DBHCP Section 7.2.5) - Habitat suitability analyses along Crescent Creek and Little Deschutes River

Requirement

"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 Oregon spotted frog 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."

Questions

1. What are the three sites to be monitored?

   a. ***USFWS Note:*** *Monitor all three Crescent sites (Above HW 58, Below Hwy 58 and BLM on Lower Crescent)*

2. What are the habitat metrics to be analyzed at each site?

USFWS Note: *OBJECTIVE: To better understand how Big Marsh Creek flows and CREO flows influence inundation of OSF habitat through seasonal irrigation changes so that adaptive management and "OSF water" may be used to improve survival of OSF.*

   a. *Establish 2-3 photo monitoring points at each location prior to irrigation releases from Crescent Lake. These points should be near the OSF breeding areas to capture changed conditions that could affect metamorphosis; located where summer high flows may provide addition rearing habitat; and in an area that can capture the change in habitat condition between high and low flows.*
   b. *Observe, photograph, GPS where water is at low flow, high flow and at 50 cfs at CREO.*
   c. *Record vegetation characteristics at the various inundation flows.*
   d. *Re-visit oviposition sites and re-measure water depth (NOTE: this may be part Monitoring Task 9).*

From: mvaughn@biotapacific.com <mvaughn@biotapacific.com>
Sent: Thursday, June 17, 2021 10:53 AM
To: 'Moran, Bridget N' <bridget_moran@fws.gov>
Cc: 'OReilly, Jennifer' <jennifer_oreilly@fws.gov>; 'Funari, Claudia A' <claudia_funari@fws.gov>; Smayda, Kathy <kwsmayda@aol.com>
Subject: RE: OSF monitoring follow-up

Bridget,

Thanks for the clarification on the OSF monitoring. I have a few comments/questions on the information provided.

Monitoring Task 4 (DBHCP Section 7.2.2.1) – Habitat suitability analyses along the Upper Deschutes River

1. As I noted yesterday in the DBHCP Implementation meeting, I've learned that Oregon law requires that spatially-explicit aerial imagery (drone or otherwise) be collected by a licensed land surveyor. We had previously talked about substituting drone operator time for qualified biologist time to collect imagery for wetlands along the Deschutes River. Given that the work would need to be collected by a licensed surveyor, I suspect the budget allocated for biologists would not be sufficient to cover it. Would you like me to obtain an estimate for collecting aerial imagery of wetlands along the Deschutes River? Is there a funding source for this?
2. If the answer to Item 1 is Yes, which areas would you like covered? Aerial imagery of the entire Deschutes River reach clearly would be cost prohibitive, so we'd need to identify specific wetlands with geographic limits (e.g., lat/long or quarter/quarter section) the surveyors could use to develop a cost estimate.
3. To be clear, we discussed that it would be possible to do vegetation sampling at East Slough this year, but at this point we don't have a specific plan. Based on the agreement we reached in our May 27 conversation I have already confirmed with Craig Horrell that he would be OK moving the funding for this task to 2022. Nevertheless, I don't think Craig would be opposed to having the work done in 2021 as originally anticipated in the conservation measure. We talked on May 27 about the concept of vegetation mapping (this year or next), but as indicated in Item 1 we would first need to obtain spatially-explicit imagery as a base for the mapping and there currently is no source of funding for that. Alternately, we could establish a number of transects in the wetlands to monitor the locations of cover type boundaries (e.g., the boundary between cattails and sedges or the boundary between sedges and unvegetated). We would not be able to calculate the areas of various cover types without the base map, but we could at least document whether the cover type boundaries are moving over time. Would you like us to do this at East Slough? It could be done this September or next year. For the purposes of establishing a long-term baseline condition, I believe either year would work.

Monitoring Task 9 (DBHCP Section 7.2.5) - Checking for OSF stranding in Crescent Creek and Little Deschutes River

1. As indicated, we will note in the OSF egg mass survey report where we saw stranding or potential stranding. I don't know that we can accurately, "assess stranding for the year," from this, but we can at lease indicate where there was potential. We did not do follow-up visits after we documented the egg masses, so for at least some of the sites we can't say with certainty whether stranding actually occurred.

2. DBHCP Section 7.2.5 calls for the funding of monitoring for stranding along Crescent Creek every 3 years. We discussed moving the 2021 funding to 2022, but there isn't already 2022 funding to add this to. So the total budget for 2022 would be 40 hours for two biologists each, not 80 hours each. I've spoken with Chris at TID and he has no problem moving the 2021 funding to 2022. Bridget can go ahead and make the formal request to TID.

Monitoring Task 10 (DBHCP Section 7.2.5) - Habitat suitability analyses along Crescent Creek and Little Deschutes River

1. Do you want to be involved in selection of the photo monitoring points, or shall we select them based on the criteria provided?
2. By "low flow, high flow and 50 cfs at CREO" do you mean these flows as they will occur between now and October (i.e., not flows that might be higher or lower during next winter or spring)?
3. What vegetation characteristics do you want recorded? I wouldn't expect vegetation to change much in response to short-term seasonal flow variations this summer. Are you looking for baseline vegetation for long-term monitoring, which presumably could be collected at any one of the visits this summer, but wouldn't need to be collected at each visit?
4. It may be a challenge to do all the described monitoring with the budget of 40 hours each for two biologists. Once we've clarified items 1-3, we'll put together a detailed scope and let you know what is achievable.

Thanks,

Marty

Biota Pacific Environmental Sciences
425-260-1588

From: mvaughn@biotapacific.com <mvaughn@biotapacific.com>
Sent: Tuesday, June 29, 2021 3:13 PM
To: 'Moran, Bridget N' <bridget_moran@fws.gov>; OReilly, Jennifer <Jennifer_OReilly@fws.gov>
Cc: Smayda, Kathy <kwsmayda@aol.com>; 'Filippi, David' <david.filippi@stoel.com>; Chris Schull <Chris@tumalo.org>
Subject: RE: OSF monitoring follow-up

Bridget and Jen,

I visited Crescent Creek last week and established photo monitoring points as per Task 10 (DBHCP Section 7.2.5) at the RM 22.8 and RM 21.9 OSF breeding sites. I was able to obtain photos for what we expect to be this summer's high flow (70 cfs at CREO). I will revisit the sites in July and August to capture 50 cfs (as measured at CREO) as well as the seasonal low flow.

As for the RM 1.74 (BLM) wetland, I have not yet established photo monitoring sites. I remembered on my way out there that we never obtained legal access to the wetland. As you know, it is necessary to cross private property to reach the BLM site from the public road. We discussed obtaining access a number of times during DBHCP development, but to the best of my knowledge USFWS and ODFW were never successful. At this point I don't think it would be advisable to set up a long-term (30-year) monitoring site without having legal access. I would prefer to have authorization from the landowner

before visiting the site again. Let me know how you want to handle this one. In the meantime I'll stand by.

Thanks,

Marty

Biota Pacific Environmental Sciences
425-260-1588

APPENDIX F

Wickiup Reservoir Data

And

Deschutes River Data for

Hydromet Stations WICO and BENO

Appendix F-1. Reported daily (midnight) storage volume in Wickiup Reservoir (Hydromet Station WIC) in Water Year 2021.

Date	Midnight Storage Volume (acre-feet	Date	Midnight Storage Volume (acre-feet	Date	Midnight Storage Volume (acre-feet
1/1/2021	66,816	2/1/2021	87,192	3/1/2021	102,590
1/2/2021	67,522	2/2/2021	87,703	3/2/2021	103,106
1/3/2021	68,234	2/3/2021	88,259	3/3/2021	103,624
1/4/2021	69,045	2/4/2021	88,732	3/4/2021	104,031
1/5/2021	69,682	2/5/2021	89,208	3/5/2021	104,611
1/6/2021	70,410	2/6/2021	89,689	3/6/2021	105,079
1/7/2021	71,050	2/7/2021	90,212	3/7/2021	105,550
1/8/2021	71,819	2/8/2021	90,698	3/8/2021	106,080
1/9/2021	72,472	2/9/2021	91,185	3/9/2021	106,616
1/10/2021	73,130	2/10/2021	91,678	3/10/2021	107,152
1/11/2021	73,794	2/11/2021	92,315	3/11/2021	107,632
1/12/2021	74,562	2/12/2021	92,855	3/12/2021	108,114
1/13/2021	75,336	2/13/2021	93,550	3/13/2021	108,598
1/14/2021	75,988	2/14/2021	94,146	3/14/2021	109,081
1/15/2021	76,652	2/15/2021	95,101	3/15/2021	109,510
1/16/2021	77,290	2/16/2021	95,405	3/16/2021	110,001
1/17/2021	77,966	2/17/2021	95,966	3/17/2021	110,367
1/18/2021	78,581	2/18/2021	96,681	3/18/2021	111,109
1/19/2021	79,201	2/19/2021	97,300	3/19/2021	111,297
1/20/2021	79,825	2/20/2021	97,819	3/20/2021	111,731
1/21/2021	80,454	2/21/2021	98,287	3/21/2021	112,167
1/22/2021	81,087	2/22/2021	99,022	3/22/2021	112,670
1/23/2021	81,656	2/23/2021	99,390	3/23/2021	112,986
1/24/2021	82,300	2/24/2021	99,920	3/24/2021	113,489
1/25/2021	82,875	2/25/2021	100,398	3/25/2021	113,870
1/26/2021	83,536	2/26/2021	100,989	3/26/2021	114,266
1/27/2021	84,188	2/27/2021	101,472	3/27/2021	114,735
1/28/2021	84,847	2/28/2021	102,019	3/28/2021	115,337
1/29/2021	85,427			3/29/2021	115,538
1/30/2021	85,969			3/30/2021	115,807
1/31/2021	86,599			3/31/2021	115,807

Date	Midnight Storage Volume (acre-feet	Date	Midnight Storage Volume (acre-feet	Date	Midnight Storage Volume (acre-feet
4/1/2021	115,672	5/1/2021	99,920	6/1/2021	65,485
4/2/2021	115,607	5/2/2021	98,863	6/2/2021	64,152
4/3/2021	115,472	5/3/2021	97,819	6/3/2021	62,793
4/4/2021	115,403	5/4/2021	96,837	6/4/2021	61,488
4/5/2021	115,134	5/5/2021	95,812	6/5/2021	60,237
4/6/2021	115,000	5/6/2021	94,749	6/6/2021	59,117
4/7/2021	115,069	5/7/2021	93,698	6/7/2021	58,032
4/8/2021	114,800	5/8/2021	92,608	6/8/2021	56,748
4/9/2021	114,667	5/9/2021	91,584	6/9/2021	55,771
4/10/2021	114,266	5/10/2021	90,565	6/10/2021	54,587
4/11/2021	113,808	5/11/2021	89,427	6/11/2021	53,623
4/12/2021	113,362	5/12/2021	88,259	6/12/2021	52,562
4/13/2021	112,860	5/13/2021	86,937	6/13/2021	51,446
4/14/2021	112,357	5/14/2021	85,551	6/14/2021	50,472
4/15/2021	111,856	5/15/2021	84,106	6/15/2021	49,447
4/16/2021	111,297	5/16/2021	82,768	6/16/2021	48,412
4/17/2021	110,677	5/17/2021	81,513	6/17/2021	47,445
4/18/2021	110,001	5/18/2021	80,278	6/18/2021	46,542
4/19/2021	109,266	5/19/2021	79,097	6/19/2021	45,633
4/20/2021	108,536	5/20/2021	77,865	6/20/2021	44,765
4/21/2021	107,632	5/21/2021	76,652	6/21/2021	43,920
4/22/2021	106,735	5/22/2021	75,564	6/22/2021	43,067
4/23/2021	105,786	5/23/2021	74,498	6/23/2021	42,189
4/24/2021	105,079	5/24/2021	73,604	6/24/2021	41,328
4/25/2021	104,437	5/25/2021	72,722	6/25/2021	40,465
4/26/2021	103,683	5/26/2021	71,819	6/26/2021	39,598
4/27/2021	102,817	5/27/2021	70,959	6/27/2021	38,722
4/28/2021	102,075	5/28/2021	69,987	6/28/2021	37,825
4/29/2021	101,364	5/29/2021	68,924	6/29/2021	36,871
4/30/2021	100,667	5/30/2021	67,818	6/30/2021	35,979
		5/31/2021	66,640		

Date	Midnight Storage Volume (acre-feet	Date	Midnight Storage Volume (acre-feet	Date	Midnight Storage Volume (acre-feet
7/1/2021	35,013	8/1/2021	12,645	9/1/2021	2,952
7/2/2021	34,092	8/2/2021	12,035	9/2/2021	2,996
7/3/2021	33,157	8/3/2021	11,443	9/3/2021	3,029
7/4/2021	32,266	8/4/2021	10,890	9/4/2021	3,068
7/5/2021	31,361	8/5/2021	10,375	9/5/2021	3,097
7/6/2021	30,419	8/6/2021	9,837	9/6/2021	3,120
7/7/2021	29,488	8/7/2021	9,326	9/7/2021	3,143
7/8/2021	28,601	8/8/2021	8,868	9/8/2021	3,160
7/9/2021	27,675	8/9/2021	8,308	9/9/2021	3,184
7/10/2021	26,770	8/10/2021	7,649	9/10/2021	3,225
7/11/2021	25,880	8/11/2021	6,999	9/11/2021	3,237
7/12/2021	24,986	8/12/2021	6,404	9/12/2021	3,237
7/13/2021	24,093	8/13/2021	5,889	9/13/2021	3,237
7/14/2021	23,187	8/14/2021	5,416	9/14/2021	3,231
7/15/2021	22,415	8/15/2021	4,993	9/15/2021	3,225
7/16/2021	21,794	8/16/2021	4,587	9/16/2021	3,213
7/17/2021	21,258	8/17/2021	4,099	9/17/2021	3,201
7/18/2021	20,721	8/18/2021	3,683	9/18/2021	3,219
7/19/2021	20,116	8/19/2021	3,377	9/19/2021	3,219
7/20/2021	19,494	8/20/2021	3,190	9/20/2021	3,213
7/21/2021	18,905	8/21/2021	3,080	9/21/2021	3,219
7/22/2021	18,306	8/22/2021	3,052	9/22/2021	3,231
7/23/2021	17,727	8/23/2021	3,029	9/23/2021	3,213
7/24/2021	17,204	8/24/2021	2,963	9/24/2021	3,190
7/25/2021	16,660	8/25/2021	2,919	9/25/2021	3,190
7/26/2021	16,132	8/26/2021	2,903	9/26/2021	3,178
7/27/2021	15,585	8/27/2021	2,898	9/27/2021	3,201
7/28/2021	15,034	8/28/2021	2,840	9/28/2021	3,207
7/29/2021	14,479	8/29/2021	2,888	9/29/2021	3,207
7/30/2021	13,881	8/30/2021	2,877	9/30/2021	3,207
7/31/2021	13,248	8/31/2021	2,903		

Appendix F-2. Reported daily average flows for the Deschutes River below Wickiup Dam (Hydromet Station WICO) in Water Year 2021.

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
1/1/2021	≥ 105.54	≥ 95.54	95						
1/2/2021	≥ 105.54	≥ 95.54	97						
1/3/2021	≥ 105.54	≥ 95.54	99						
1/4/2021	≥ 105.54	≥ 95.54	99						
1/5/2021	≥ 105.54	≥ 95.54	100						
1/6/2021	≥ 105.54	≥ 95.54	100						
1/7/2021	≥ 105.54	≥ 95.54	101						
1/8/2021	≥ 105.54	≥ 95.54	99						
1/9/2021	≥ 105.54	≥ 95.54	98						
1/10/2021	≥ 105.54	≥ 95.54	98						
1/11/2021	≥ 105.54	≥ 95.54	98						
1/12/2021	≥ 105.54	≥ 95.54	98						
1/13/2021	≥ 105.54	≥ 95.54	98						
1/14/2021	≥ 105.54	≥ 95.54	98						
1/15/2021	≥ 105.54	≥ 95.54	98						
1/16/2021	≥ 105.54	≥ 95.54	100						
1/17/2021	≥ 105.54	≥ 95.54	101						
1/18/2021	≥ 105.54	≥ 95.54	101						
1/19/2021	≥ 105.54	≥ 95.54	101						
1/20/2021	≥ 105.54	≥ 95.54	106						
1/21/2021	≥ 105.54	≥ 95.54	107						

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
1/22/2021	≥ 105.54	≥ 95.54	106						
1/23/2021	≥ 105.54	≥ 95.54	106						
1/24/2021	≥ 105.54	≥ 95.54	106						
1/25/2021	≥ 105.54	≥ 95.54	106						
1/26/2021	≥ 105.54	≥ 95.54	106						
1/27/2021	≥ 105.54	≥ 95.54	105						
1/28/2021	≥ 105.54	≥ 95.54	106						
1/29/2021	≥ 105.54	≥ 95.54	101						
1/30/2021	≥ 105.54	≥ 95.54	102						
1/31/2021	≥ 105.54	≥ 95.54	105						
2/1/2021	≥ 105.54	≥ 95.54	105						
2/2/2021	≥ 105.54	≥ 95.54	104						
2/3/2021	≥ 105.54	≥ 95.54	104						
2/4/2021	≥ 105.54	≥ 95.54	104						
2/5/2021	≥ 105.54	≥ 95.54	105						
2/6/2021	≥ 105.54	≥ 95.54	105						
2/7/2021	≥ 105.54	≥ 95.54	104						
2/8/2021	≥ 105.54	≥ 95.54	104						
2/9/2021	≥ 105.54	≥ 95.54	104						
2/10/2021	≥ 105.54	≥ 95.54	104						
2/11/2021	≥ 105.54	≥ 95.54	105						
2/12/2021	≥ 105.54	≥ 95.54	105						
2/13/2021	≥ 105.54	≥ 95.54	106						
2/14/2021	≥ 105.54	≥ 95.54	106						

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
2/15/2021	≥ 105.54	≥ 95.54	106						
2/16/2021	≥ 105.54	≥ 95.54	106						
2/17/2021	≥ 105.54	≥ 95.54	106						
2/18/2021	≥ 105.54	≥ 95.54	107						
2/19/2021	≥ 105.54	≥ 95.54	107						
2/20/2021	≥ 105.54	≥ 95.54	106						
2/21/2021	≥ 105.54	≥ 95.54	106						
2/22/2021	≥ 105.54	≥ 95.54	106						
2/23/2021	≥ 105.54	≥ 95.54	106						
2/24/2021	≥ 105.54	≥ 95.54	104						
2/25/2021	≥ 105.54	≥ 95.54	104						
2/26/2021	≥ 105.54	≥ 95.54	106						
2/27/2021	≥ 105.54	≥ 95.54	106						
2/28/2021	≥ 105.54	≥ 95.54	106						
3/1/2021	≥ 105.54	≥ 95.54	106						
3/2/2021	≥ 105.54	≥ 95.54	106						
3/3/2021	≥ 105.54	≥ 95.54	106						
3/4/2021	≥ 105.54	≥ 95.54	107						
3/5/2021	≥ 105.54	≥ 95.54	106						
3/6/2021	≥ 105.54	≥ 95.54	106						
3/7/2021	≥ 105.54	≥ 95.54	106						
3/8/2021	≥ 105.54	≥ 95.54	106						
3/9/2021	≥ 105.54	≥ 95.54	106						
3/10/2021	≥ 105.54	≥ 95.54	106						

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
3/11/2021	≥ 105.54	≥ 95.54	107						
3/12/2021	≥ 105.54	≥ 95.54	107						
3/13/2021	≥ 105.54	≥ 95.54	106						
3/14/2021	≥ 105.54	≥ 95.54	106						
3/15/2021	≥ 105.54	≥ 95.54	106						
3/16/2021	≥ 105.54	≥ 95.54	108						
3/17/2021	≥ 105.54	≥ 95.54	107						
3/18/2021	≥ 105.54	≥ 95.54	107						
3/19/2021	≥ 105.54	≥ 95.54	106						
3/20/2021	≥ 105.54	≥ 95.54	107						
3/21/2021	≥ 105.54	≥ 95.54	108						
3/22/2021	≥ 105.54	≥ 95.54	106						
3/23/2021	≥ 105.54	≥ 95.54	105						
3/24/2021	≥ 105.54	≥ 95.54	105						
3/25/2021	≥ 105.54	≥ 95.54	105						
3/26/2021	≥ 105.54	≥ 95.54	105						
3/27/2021	≥ 105.54	≥ 95.54	106						
3/28/2021	≥ 105.54	≥ 95.54	106						
3/29/2021	≥ 105.54	≥ 95.54	106						
3/30/2021	≥ 105.54	≥ 95.54	170						
3/31/2021	≥ 105.54	≥ 95.54	295						
4/1/2021	600 - 800	570 - 830	371						
4/2/2021	600 - 800	570 - 830	372						
4/3/2021	600 - 800	570 - 830	372						

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
4/4/2021	600 - 800	570 - 830	371						
4/5/2021	600 - 800	570 - 830	370						
4/6/2021	600 - 800	570 - 830	388						
4/7/2021	600 - 800	570 - 830	394						
4/8/2021	600 - 800	570 - 830	394						
4/9/2021	600 - 800	570 - 830	394						
4/10/2021	600 - 800	570 - 830	502						
4/11/2021	600 - 800	570 - 830	601	≤ 30	≤ 50	0			
4/12/2021	600 - 800	570 - 830	601	≤ 30	≤ 50	0			
4/13/2021	600 - 800	570 - 830	600	≤ 30	≤ 50	0			
4/14/2021	600 - 800	570 - 830	637	≤ 30	≤ 50	0			
4/15/2021	600 - 800	570 - 830	681	≤ 30	≤ 50	0			
4/16/2021	600 - 800	570 - 830	734	≤ 30	≤ 50	0			
4/17/2021	600 - 800	570 - 830	777	≤ 30	≤ 50	0			
4/18/2021	600 - 800	570 - 830	794	≤ 30	≤ 50	0			
4/19/2021	600 - 800	570 - 830	794	≤ 30	≤ 50	0			
4/20/2021	600 - 800	570 - 830	839	≤ 30	≤ 50	0			
4/21/2021	600 - 800	570 - 830	918	≤ 30	≤ 50	0			
4/22/2021	600 - 800	570 - 830	918	≤ 30	≤ 50	0			
4/23/2021	600 - 800	570 - 830	918	≤ 30	≤ 50	0			
4/24/2021	600 - 800	570 - 830	916	≤ 30	≤ 50	2			
4/25/2021	600 - 800	570 - 830	918	≤ 30	≤ 50	2			
4/26/2021	600 - 800	570 - 830	898	≤ 30	≤ 50	20			
4/27/2021	600 - 800	570 - 830	880	≤ 30	≤ 50	38			

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
4/28/2021	600 - 800	570 - 830	879	≤ 30	≤ 50	39			
4/29/2021	600 - 800	570 - 830	878	≤ 30	≤ 50	40			
4/30/2021	600 - 800	570 - 830	878	≤ 30	≤ 50	40			
5/1/2021	≥ 600	≥ 570	971				≤ 20%	≤ 25%	8.2%
5/2/2021	≥ 600	≥ 570	1,051				≤ 20%	≤ 25%	19.5%
5/3/2021	≥ 600	≥ 570	1,052				≤ 20%	≤ 25%	19.8%
5/4/2021	≥ 600	≥ 570	1,051				≤ 20%	≤ 25%	19.8%
5/5/2021	≥ 600	≥ 570	1,069				≤ 20%	≤ 25%	21.9%
5/6/2021	≥ 600	≥ 570	1,080				≤ 20%	≤ 25%	11.3%
5/7/2021	≥ 600	≥ 570	1,115				≤ 20%	≤ 25%	6.1%
5/8/2021	≥ 600	≥ 570	1,137				≤ 20%	≤ 25%	8.1%
5/9/2021	≥ 600	≥ 570	1,134				≤ 20%	≤ 25%	7.9%
5/10/2021	≥ 600	≥ 570	1,171				≤ 20%	≤ 25%	9.5%
5/11/2021	≥ 600	≥ 570	1,213				≤ 20%	≤ 25%	12.3%
5/12/2021	≥ 600	≥ 570	1,277				≤ 20%	≤ 25%	14.5%
5/13/2021	≥ 600	≥ 570	1,307				≤ 20%	≤ 25%	14.9%
5/14/2021	≥ 600	≥ 570	1,370				≤ 20%	≤ 25%	20.7%
5/15/2021	≥ 600	≥ 570	1,368				≤ 20%	≤ 25%	16.8%
5/16/2021	≥ 600	≥ 570	1,335				≤ 20%	≤ 25%	10.1%
5/17/2021	≥ 600	≥ 570	1,306				≤ 20%	≤ 25%	2.3%
5/18/2021	≥ 600	≥ 570	1,301				≤ 20%	≤ 25%	-0.5%
5/19/2021	≥ 600	≥ 570	1,300				≤ 20%	≤ 25%	-5.1%
5/20/2021	≥ 600	≥ 570	1,304				≤ 20%	≤ 25%	-4.7%
5/21/2021	≥ 600	≥ 570	1,309				≤ 20%	≤ 25%	-2.0%

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
5/22/2021	≥ 600	≥ 570	1,306				≤ 20%	≤ 25%	0.1%
5/23/2021	≥ 600	≥ 570	1,257				≤ 20%	≤ 25%	-3.4%
5/24/2021	≥ 600	≥ 570	1,190				≤ 20%	≤ 25%	-8.5%
5/25/2021	≥ 600	≥ 570	1,190				≤ 20%	≤ 25%	-8.7%
5/26/2021	≥ 600	≥ 570	1,187				≤ 20%	≤ 25%	-9.3%
5/27/2021	≥ 600	≥ 570	1,182				≤ 20%	≤ 25%	-9.5%
5/28/2021	≥ 600	≥ 570	1,211				≤ 20%	≤ 25%	-3.7%
5/29/2021	≥ 600	≥ 570	1,276				≤ 20%	≤ 25%	7.2%
5/30/2021	≥ 600	≥ 570	1,300				≤ 20%	≤ 25%	9.3%
5/31/2021	≥ 600	≥ 570	1,312				≤ 20%	≤ 25%	10.5%
6/1/2021	≥ 600	≥ 570	1,385				≤ 20%	≤ 25%	17.1%
6/2/2021	≥ 600	≥ 570	1,433				≤ 20%	≤ 25%	18.4%
6/3/2021	≥ 600	≥ 570	1,428				≤ 20%	≤ 25%	12.0%
6/4/2021	≥ 600	≥ 570	1,387				≤ 20%	≤ 25%	6.7%
6/5/2021	≥ 600	≥ 570	1,300				≤ 20%	≤ 25%	-0.9%
6/6/2021	≥ 600	≥ 570	1,258				≤ 20%	≤ 25%	-9.2%
6/7/2021	≥ 600	≥ 570	1,259				≤ 20%	≤ 25%	-12.1%
6/8/2021	≥ 600	≥ 570	1,262				≤ 20%	≤ 25%	-11.6%
6/9/2021	≥ 600	≥ 570	1,260				≤ 20%	≤ 25%	-9.1%
6/10/2021	≥ 600	≥ 570	1,254				≤ 20%	≤ 25%	-3.5%
6/11/2021	≥ 600	≥ 570	1,250				≤ 20%	≤ 25%	-0.6%
6/12/2021	≥ 600	≥ 570	1,240				≤ 20%	≤ 25%	-1.5%
6/13/2021	≥ 600	≥ 570	1,239				≤ 20%	≤ 25%	-1.8%
6/14/2021	≥ 600	≥ 570	1,233				≤ 20%	≤ 25%	-2.1%

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
6/15/2021	≥ 600	≥ 570	1,230				≤ 20%	≤ 25%	-1.9%
6/16/2021	≥ 600	≥ 570	1,220				≤ 20%	≤ 25%	-2.4%
6/17/2021	≥ 600	≥ 570	1,183				≤ 20%	≤ 25%	-4.6%
6/18/2021	≥ 600	≥ 570	1,149				≤ 20%	≤ 25%	-7.3%
6/19/2021	≥ 600	≥ 570	1,130				≤ 20%	≤ 25%	-8.4%
6/20/2021	≥ 600	≥ 570	1,130				≤ 20%	≤ 25%	-8.1%
6/21/2021	≥ 600	≥ 570	1,125				≤ 20%	≤ 25%	-7.8%
6/22/2021	≥ 600	≥ 570	1,121				≤ 20%	≤ 25%	-5.3%
6/23/2021	≥ 600	≥ 570	1,127				≤ 20%	≤ 25%	-1.9%
6/24/2021	≥ 600	≥ 570	1,130				≤ 20%	≤ 25%	0.0%
6/25/2021	≥ 600	≥ 570	1,129				≤ 20%	≤ 25%	-0.1%
6/26/2021	≥ 600	≥ 570	1,128				≤ 20%	≤ 25%	0.2%
6/27/2021	≥ 600	≥ 570	1,129				≤ 20%	≤ 25%	0.7%
6/28/2021	≥ 600	≥ 570	1,122				≤ 20%	≤ 25%	-0.5%
6/29/2021	≥ 600	≥ 570	1,128				≤ 20%	≤ 25%	-0.2%
6/30/2021	≥ 600	≥ 570	1,126				≤ 20%	≤ 25%	-0.2%
7/1/2021	≥ 600	≥ 570	1,128						
7/2/2021	≥ 600	≥ 570	1,126						
7/3/2021	≥ 600	≥ 570	1,128						
7/4/2021	≥ 600	≥ 570	1,126						
7/5/2021	≥ 600	≥ 570	1,129						
7/6/2021	≥ 600	≥ 570	1,126						
7/7/2021	≥ 600	≥ 570	1,130						
7/8/2021	≥ 600	≥ 570	1,127						

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
7/9/2021	≥ 600	≥ 570	1,127						
7/10/2021	≥ 600	≥ 570	1,130						
7/11/2021	≥ 600	≥ 570	1,124						
7/12/2021	≥ 600	≥ 570	1,126						
7/13/2021	≥ 600	≥ 570	1,141						
7/14/2021	≥ 600	≥ 570	1,136						
7/15/2021	≥ 600	≥ 570	1,128						
7/16/2021	≥ 600	≥ 570	1,130						
7/17/2021	≥ 600	≥ 570	1,129						
7/18/2021	≥ 600	≥ 570	1,122						
7/19/2021	≥ 600	≥ 570	1,125						
7/20/2021	≥ 600	≥ 570	1,130						
7/21/2021	≥ 600	≥ 570	1,128						
7/22/2021	≥ 600	≥ 570	1,130						
7/23/2021	≥ 600	≥ 570	1,130						
7/24/2021	≥ 600	≥ 570	1,126						
7/25/2021	≥ 600	≥ 570	1,125						
7/26/2021	≥ 600	≥ 570	1,140						
7/27/2021	≥ 600	≥ 570	1,131						
7/28/2021	≥ 600	≥ 570	1,102						
7/29/2021	≥ 600	≥ 570	1,123						
7/30/2021	≥ 600	≥ 570	1,130						
7/31/2021	≥ 600	≥ 570	1,130						
8/1/2021	≥ 600	≥ 570	1,122						

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
8/2/2021	≥ 600	≥ 570	1,128						
8/3/2021	≥ 600	≥ 570	1,132						
8/4/2021	≥ 600	≥ 570	1,128						
8/5/2021	≥ 600	≥ 570	1,119						
8/6/2021	≥ 600	≥ 570	1,123						
8/7/2021	≥ 600	≥ 570	1,129						
8/8/2021	≥ 600	≥ 570	1,119						
8/9/2021	≥ 600	≥ 570	1,120						
8/10/2021	≥ 600	≥ 570	1,137						
8/11/2021	≥ 600	≥ 570	1,128						
8/12/2021	≥ 600	≥ 570	1,110						
8/13/2021	≥ 600	≥ 570	1,091						
8/14/2021	≥ 600	≥ 570	1,072						
8/15/2021	≥ 600	≥ 570	1,054						
8/16/2021	≥ 600	≥ 570	1,038						
8/17/2021	≥ 600	≥ 570	1,018						
8/18/2021	≥ 600	≥ 570	969						
8/19/2021	≥ 600	≥ 570	885						
8/20/2021	≥ 600	≥ 570	821						
8/21/2021	≥ 600	≥ 570	771						
8/22/2021	≥ 600	≥ 570	731						
8/23/2021	≥ 600	≥ 570	728						
8/24/2021	≥ 600	≥ 570	732						
8/25/2021	≥ 600	≥ 570	703						

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
8/26/2021	≥ 600	≥ 570	660						
8/27/2021	≥ 600	≥ 570	639						
8/28/2021	≥ 600	≥ 570	636						
8/29/2021	≥ 600	≥ 570	638						
8/30/2021	≥ 600	≥ 570	641						
8/31/2021	≥ 600	≥ 570	628						
9/1/2021	≥ 600	≥ 570	623						
9/2/2021	≥ 600	≥ 570	627						
9/3/2021	≥ 600	≥ 570	630						
9/4/2021	≥ 600	≥ 570	635						
9/5/2021	≥ 600	≥ 570	639						
9/6/2021	≥ 600	≥ 570	642						
9/7/2021	≥ 600	≥ 570	646						
9/8/2021	≥ 600	≥ 570	650						
9/9/2021	≥ 600	≥ 570	654						
9/10/2021	≥ 600	≥ 570	659						
9/11/2021	≥ 600	≥ 570	662						
9/12/2021	≥ 600	≥ 570	664						
9/13/2021	≥ 600	≥ 570	666						
9/14/2021	≥ 600	≥ 570	668						
9/15/2021	≥ 600	≥ 570	670						
9/16/2021	≥ 105.54	≥ 95	671						
9/17/2021	≥ 105.54	≥ 95	638						
9/18/2021	≥ 105.54	≥ 95	627						

DATE	Daily Average Flow at WICO (cfs)			Cumulative Decrease after Flow Exceeds 600 cfs in April (cfs)			Decrease in Flow over 5-Day Period in May and June (% of initial flow)		
	DBHCP Required Range [1]	DBHCP Allowable Range of Deviation [2]	WY 2021 Reported [3]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]	DBHCP Required Range	DBHCP Allowable Range of Deviation	WY 2021 Reported [1]
9/19/2021	≥ 105.54	≥ 95	628						
9/20/2021	≥ 105.54	≥ 95	628						
9/21/2021	≥ 105.54	≥ 95	621						
9/22/2021	≥ 105.54	≥ 95	617						
9/23/2021	≥ 105.54	≥ 95	618						
9/24/2021	≥ 105.54	≥ 95	607						
9/25/2021	≥ 105.54	≥ 95	596						
9/26/2021	≥ 105.54	≥ 95	598						
9/27/2021	≥ 105.54	≥ 95	600						
9/28/2021	≥ 105.54	≥ 95	602						
9/29/2021	≥ 105.54	≥ 95	600						
9/30/2021	≥ 105.54	≥ 95	600						

[1] DBHCP Required Range includes 100 cfs minimum flow specified in Conservation Measure WR-1 plus 5.54 cfs additional flow resulting from Temporary Instream Lease IL-1770 (see Appendix G-2)

[2] The lower limit of DBHCP Allowable Range of Deviation is increased to 95 cfs to account for additional flow from Temporary Instream Lease IL-1770.

[3] Reported value is within allowable range of deviation. Reported value is outside allowable range of deviation.

Appendix F-3. Reported daily average flows for the Deschutes River at Benham Falls (Hydromet Station BENO) in Water Year 2021.

Date	Daily Average Flow (cfs) [1]	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
1/1/2021	501	2/1/2021	492	3/1/2021	489
1/2/2021	501	2/2/2021	493	3/2/2021	490
1/3/2021	505	2/3/2021	494	3/3/2021	492
1/4/2021	512	2/4/2021	475	3/4/2021	492
1/5/2021	506	2/5/2021	483	3/5/2021	492
1/6/2021	514	2/6/2021	473	3/6/2021	497
1/7/2021	512	2/7/2021	484	3/7/2021	495
1/8/2021	502	2/8/2021	480	3/8/2021	495
1/9/2021	484	2/9/2021	479	3/9/2021	496
1/10/2021	490	2/10/2021	474	3/10/2021	496
1/11/2021	480	2/11/2021	481	3/11/2021	494
1/12/2021	503	2/12/2021	448	3/12/2021	490
1/13/2021	516	2/13/2021	414	3/13/2021	487
1/14/2021	505	2/14/2021	527	3/14/2021	484
1/15/2021	527	2/15/2021	524	3/15/2021	484
1/16/2021	559	2/16/2021	508	3/16/2021	483
1/17/2021	556	2/17/2021	496	3/17/2021	483
1/18/2021	548	2/18/2021	499	3/18/2021	484
1/19/2021	521	2/19/2021	498	3/19/2021	483
1/20/2021	486	2/20/2021	501	3/20/2021	483
1/21/2021	523	2/21/2021	490	3/21/2021	484
1/22/2021	521	2/22/2021	494	3/22/2021	490
1/23/2021	509	2/23/2021	500	3/23/2021	490
1/24/2021	497	2/24/2021	498	3/24/2021	485
1/25/2021	472	2/25/2021	498	3/25/2021	486
1/26/2021	437	2/26/2021	496	3/26/2021	484
1/27/2021	441	2/27/2021	498	3/27/2021	484
1/28/2021	538	2/28/2021	492	3/28/2021	483
1/29/2021	505			3/29/2021	481
1/30/2021	497			3/30/2021	488
1/31/2021	491			3/31/2021	543

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
4/1/2021	681	5/1/2021	1,217	6/1/2021	1,573
4/2/2021	765	5/2/2021	1,290	6/2/2021	1,630
4/3/2021	772	5/3/2021	1,351	6/3/2021	1,674
4/4/2021	778	5/4/2021	1,366	6/4/2021	1,671
4/5/2021	781	5/5/2021	1,369	6/5/2021	1,654
4/6/2021	777	5/6/2021	1,391	6/6/2021	1,607
4/7/2021	777	5/7/2021	1,402	6/7/2021	1,571
4/8/2021	775	5/8/2021	1,433	6/8/2021	1,575
4/9/2021	774	5/9/2021	1,455	6/9/2021	1,587
4/10/2021	775	5/10/2021	1,460	6/10/2021	1,580
4/11/2021	869	5/11/2021	1,494	6/11/2021	1,572
4/12/2021	960	5/12/2021	1,534	6/12/2021	1,577
4/13/2021	966	5/13/2021	1,578	6/13/2021	1,565
4/14/2021	968	5/14/2021	1,612	6/14/2021	1,568
4/15/2021	965	5/15/2021	1,665	6/15/2021	1,570
4/16/2021	989	5/16/2021	1,665	6/16/2021	1,555
4/17/2021	1,038	5/17/2021	1,636	6/17/2021	1,535
4/18/2021	1,077	5/18/2021	1,610	6/18/2021	1,501
4/19/2021	1,094	5/19/2021	1,611	6/19/2021	1,466
4/20/2021	1,098	5/20/2021	1,611	6/20/2021	1,444
4/21/2021	1,142	5/21/2021	1,614	6/21/2021	1,444
4/22/2021	1,206	5/22/2021	1,626	6/22/2021	1,444
4/23/2021	1,219	5/23/2021	1,630	6/23/2021	1,439
4/24/2021	1,227	5/24/2021	1,581	6/24/2021	1,436
4/25/2021	1,231	5/25/2021	1,522	6/25/2021	1,433
4/26/2021	1,246	5/26/2021	1,500	6/26/2021	1,433
4/27/2021	1,225	5/27/2021	1,489	6/27/2021	1,443
4/28/2021	1,214	5/28/2021	1,479	6/28/2021	1,442
4/29/2021	1,214	5/29/2021	1,495	6/29/2021	1,443
4/30/2021	1,209	5/30/2021	1,546	6/30/2021	1,447
		5/31/2021	1,564		

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
7/1/2021	1,444	8/1/2021	1,407	9/1/2021	931
7/2/2021	1,445	8/2/2021	1,396	9/2/2021	910
7/3/2021	1,446	8/3/2021	1,390	9/3/2021	906
7/4/2021	1,441	8/4/2021	1,388	9/4/2021	910
7/5/2021	1,442	8/5/2021	1,378	9/5/2021	911
7/6/2021	1,441	8/6/2021	1,366	9/6/2021	910
7/7/2021	1,437	8/7/2021	1,365	9/7/2021	909
7/8/2021	1,433	8/8/2021	1,362	9/8/2021	906
7/9/2021	1,428	8/9/2021	1,349	9/9/2021	904
7/10/2021	1,427	8/10/2021	1,343	9/10/2021	921
7/11/2021	1,425	8/11/2021	1,368	9/11/2021	925
7/12/2021	1,416	8/12/2021	1,387	9/12/2021	920
7/13/2021	1,414	8/13/2021	1,373	9/13/2021	919
7/14/2021	1,420	8/14/2021	1,355	9/14/2021	917
7/15/2021	1,430	8/15/2021	1,336	9/15/2021	914
7/16/2021	1,424	8/16/2021	1,316	9/16/2021	909
7/17/2021	1,419	8/17/2021	1,296	9/17/2021	908
7/18/2021	1,411	8/18/2021	1,279	9/18/2021	909
7/19/2021	1,406	8/19/2021	1,243	9/19/2021	915
7/20/2021	1,401	8/20/2021	1,178	9/20/2021	910
7/21/2021	1,400	8/21/2021	1,123	9/21/2021	911
7/22/2021	1,396	8/22/2021	1,080	9/22/2021	903
7/23/2021	1,391	8/23/2021	1,044	9/23/2021	895
7/24/2021	1,388	8/24/2021	1,036	9/24/2021	893
7/25/2021	1,365	8/25/2021	1,034	9/25/2021	884
7/26/2021	1,361	8/26/2021	1,015	9/26/2021	869
7/27/2021	1,373	8/27/2021	977	9/27/2021	871
7/28/2021	1,404	8/28/2021	957	9/28/2021	883
7/29/2021	1,397	8/29/2021	948	9/29/2021	881
7/30/2021	1,410	8/30/2021	945	9/30/2021	883
7/31/2021	1,418	8/31/2021	942		

[1] Highlight indicates flow of 1,300 cfs or greater.

APPENDIX G
Wickiup Reservoir
Meeting Notes and Correspondence

Appendix G-1. Oregon Water Resources Department orders approving and renewing Temporary Instream Leasing IL-1770 for the Deschutes River below Wickiup Dam.

BEFORE THE WATER RESOURCES DEPARTMENT
OF THE
STATE OF OREGON

In the Matter of Instream Lease Application IL-1770, Deschutes County	)))	DETERMINATION and FINAL ORDER ON PROPOSED INSTREAM LEASE

Authority
Oregon Revised Statute (ORS) 537.348 establishes the process in which a water right holder may submit a request to lease an existing water right for instream purposes. Oregon Administrative Rule (OAR) Chapter 690, Division 077 implements the statutes and provides the Department's procedures and criteria for evaluating instream lease applications.

Lessor
North Unit Irrigation District
Mike Britton, Manager
2024 NW Beech Street
Madras, Oregon 97741

Findings of Fact

1. On September 19, 2019, North Unit Irrigation District filed an application to lease a portion of Certificate 51229 for instream use. The Department assigned the application number IL-1770.

2. Pursuant to OAR 690-077-0076 (2)(b), the owner of any storage facility which is the source of water for a lease must be a co-lessor. The Bureau of Reclamation (BOR) is the storage facility owner for the water right being leased instream and is not a co-lesser. On December 19, 2019, the Department received an email from the BOR with consent and agreement of the processing of this instream lease application for storage instream out of Wickiup Reservoir.

3. The portion of the right to be leased is as follows:

Certificate: 51229 in the name of North Unit Irrigation District (appropriated under Permit S-23196)
Use: Storage under Reservoir Permit No. R-1677
Priority Date: February 28, 1913
Quantity: **Volume:** 1605.17 Acre-Feet (AF)
Source: Deschutes River, tributary of Columbia River for storage in Wickiup Reservoir

Reservoir Location:

Twp	Rng	Mer	Sec	Q-Q	Measured Distances
22 S	9 E	WM	7	SW NE	1830 FEET SOUTH AND 1950 FEET WEST FROM THE NE CORNER OF SECTION 7

This is a final order in other than contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080 you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

4. The Lessor has requested that stored water from Wickiup Reservoir be leased instream during the period of November 1 through March 25, a 146 day period, with a volume of 1505.17 acre-feet. Given the proposed instream period, up to 5.54 cfs may be leased instream.

5. The lease application includes the information required under OAR 690-077-0076(3). The Department provided notice of the lease application pursuant to OAR 690-077-0077(1). No comments were received.

6. The instream use has been modified from the lease application to prevent injury and enlargement and is as follows:
Deschutes River, tributary of Columbia River for storage in Wickiup Reservoir

Instream Reach: From the OWRD Gauge Station #14056500 (WICO) to Lake Billy Chinook

Certificate	Priority Date	Instream Rate (CFS)	Instream Volume (AF)	Period Protected Instream
51229	February 28, 1913	5.54	1605.17	November 1 through March 25

7. Other conditions to prevent injury and enlargement are:

Within the specified stream reach, the amount of water to which this right is entitled shall not exceed the quantity of water legally available at the original point of diversion. Stream channel losses and gains calculated based on the best available data and the use of water by senior appropriators will determine the amount of water to which this right is entitled downstream from the original points of diversion within the specified stream reach.

The instream use may be conditioned to allow for less water to be protected instream below the gauge based upon instream measurements conducted by Department staff or other approved by the Department, which may show lower or higher levels of loss and allow the instream flows to be adjusted accordingly but may not exceed the instream quantities identified at the reservoir.

8. The amount and timing of the proposed instream flow is allowable within the limits and use of the original water right.

9. The protection of flows within the proposed reach is appropriate, considering:

   a. The instream water use begins at the recorded point of diversion;

   b. The location of confluences with other streams downstream of the point of diversion.

   c. There are known areas of natural loss of streamflow to the river bed downstream from the point of diversion; and

   d. Any return flows resulting from the exercise of the existing water right would re-enter the river downstream of the reach of the instream water right.

10. The total monthly quantities of water to be protected under the existing and proposed instream rights in the reach will provide for a beneficial purpose.

11. The total monthly quantities of water to be protected instream under existing and proposed instream rights in the reach do not exceed the estimated average natural flow.

12. If approved, this instream lease is not reasonably expected to significantly affect land use as prescribed by ORS 197.180, OAR Chapter 660, Divisions 30 and 31, and OAR Chapter 690, Division 5.

13. Based upon review of the application, information provided by the Department's Watermaster, and other available information, the Department finds that the lease will not result in injury or enlargement. The order approving this instream lease may be modified or revoked under OAR 690-077-0077 if the Department later finds that the lease is causing injury to any existing water right or enlargement of the original right.

14. If a right which has been leased is later proposed to be leased again, transferred and/or reviewed under an allocation of conserved water, a new injury review shall be required. For example, instream transfers will be subject to a full and complete review to determine consistency with the requirements of OAR Chapter 690, Division 380 and Division 077. Approval of this lease does not establish a precedent for approval of any future transactions.

15. The Lessor has requested that the lease terminate on March 25, 2020. The lease may commence on the date this final order is signed.

16. The Lessor has not requested there be an option to terminate the lease.

Conclusions of Law

The Department concludes that the lease will not result in injury or enlargement, OAR 690-077-0077. The lease conforms to the applicable provisions of OAR 690-077-0015.

Now, therefore it is ORDERED:

1. The Lease as described herein is APPROVED.

2. During the term of the lease, the former place of use will no longer receive water as part of these rights, any supplemental rights, or any other layered irrigation water rights, including ground water registrations and permits.

3. The term of the lease will commence upon approval of the instream lease and terminate on March 25, 2020.

Dated at ~~Salem~~, Oregon this day DEC 3 1 2019.

Lisa J. Jaramillo, Transfer and Conservation Section Manager, for Thomas M. Byler, Director, Oregon Water Resources Department

This document was prepared by Sarah Henderson. If you have any questions, please call 503-986-0884.

Mailing date: JAN 0 2 2020

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BEFORE THE WATER RESOURCES DEPARTMENT
OF THE
STATE OF OREGON

In the Matter of Instream Lease Application IL-1770, Deschutes County	))	DETERMINATION and FINAL ORDER ON PROPOSED INSTREAM LEASE

Authority
Oregon Revised Statute (ORS) 537.348 establishes the process in which a water right holder may submit a request to lease an existing water right for instream purposes. Oregon Administrative Rule (OAR) Chapter 690, Division 077 implements the statutes and provides the Department's procedures and criteria for evaluating instream lease applications.

Lessor
North Unit Irrigation District
Mike Britton, Manager
2024 NW Beech Street
Madras, Oregon 97741

Findings of Fact

1. On November 23, 2020, North Unit Irrigation District filed an application to renew instream lease IL-1770, involving a portion of Certificate 51229.

2. Pursuant to OAR 690-077-0076 (2)(b), the owner of any storage facility which is the source of water for a lease must be a co-lessor. The Bureau of Reclamation (BOR) is the storage facility owner for the water right being leased instream and is not a co-lesser. On November 25, 2020, the Department received an email from the BOR with consent and agreement of the processing of this instream lease application for storage instream out of Wickiup Reservoir.

3. The portion of the right to be leased is as follows:

Certificate:	51229 in the name of North Unit Irrigation District (appropriated under Permit S-23196)
Use:	Storage under Reservoir Permit No. R-1677
Priority Date:	February 28, 1913
Quantity:	**Volume:** 1605.17 Acre-Feet (AF)
Source:	Deschutes River, tributary of Columbia River for storage in Wickiup Reservoir

This is a final order in other than contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080 you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

Reservoir Location:

Twp	Rng	Mer	Sec	Q-Q	Measured Distances
22 S	9 E	WM	7	SW NE	1830 FEET SOUTH AND 1950 FEET WEST FROM THE NE CORNER OF SECTION 7

4. The Lessor has requested that stored water from Wickiup Reservoir be leased instream during the period of November 1 through March 25, a 146 day period, with a volume of 1605.17 acre-feet. Given the proposed instream period, up to 5.54 cfs may be leased instream.

5. The lease application includes the information required under OAR 690-077-0076(3). The Department provided notice of the lease application pursuant to OAR 690-077-0077(1). No comments were received.

6. The instream use is as follows:
Deschutes River, tributary of Columbia River for storage in Wickiup Reservoir

Instream Reach: From the OWRD Gauge Station #14056500 (WICO) to Lake Billy Chinook

Certificate	Priority Date	Instream Rate (CFS)	Instream Volume (AF)	Period Protected Instream
51229	February 28, 1913	5.54	1605.17	November 1 through March 25

7. Other conditions to prevent injury and enlargement are:

Within the specified stream reach, the amount of water to which this right is entitled shall not exceed the quantity of water legally available at the original point of diversion. Stream channel losses and gains calculated based on the best available data and the use of water by senior appropriators will determine the amount of water to which this right is entitled downstream from the original points of diversion within the specified stream reach.

The instream use may be conditioned to allow for less water to be protected instream below the gauge based upon instream measurements conducted by Department staff or other approved by the Department, which may show lower or higher levels of loss and allow the instream flows to be adjusted accordingly but may not exceed the instream quantities identified at the reservoir.

8. The amount and timing of the proposed instream flow is allowable within the limits and use of the original water right.

9. The protection of flows within the proposed reach is appropriate, considering:

   a. The instream water use begins at the recorded point of diversion;

   b. The location of confluences with other streams downstream of the point of diversion.

   c. There are known areas of natural loss of streamflow to the river bed downstream from the point of diversion; and

d. Any return flows resulting from the exercise of the existing water right would re-enter the river downstream of the reach of the instream water right.

10. The total monthly quantities of water to be protected under the existing and proposed instream rights in the reach will provide for a beneficial purpose.

11. The total monthly quantities of water to be protected instream under existing and proposed instream rights in the reach do not exceed the estimated average natural flow.

12. If approved, this instream lease is not reasonably expected to significantly affect land use as prescribed by ORS 197.180, OAR Chapter 660, Divisions 30 and 31, and OAR Chapter 690, Division 5.

13. Based upon review of the application, information provided by the Department's Watermaster, and other available information, the Department finds that the lease will not result in injury or enlargement. The order approving this instream lease may be modified or revoked under OAR 690-077-0077 if the Department later finds that the lease is causing injury to any existing water right or enlargement of the original right.

14. If a right which has been leased is later proposed to be leased again, transferred and/or reviewed under an allocation of conserved water, a new injury review shall be required. For example, instream transfers will be subject to a full and complete review to determine consistency with the requirements of OAR Chapter 690, Division 380 and Division 077. Approval of this lease does not establish a precedent for approval of any future transactions.

15. The Lessor has requested that the lease terminate on March 25, 2021. The lease may commence on the date this final order is signed.

16. The Lessor has not requested there be an option to terminate the lease.

Conclusions of Law

The Department concludes that the lease will not result in injury or enlargement, OAR 690-077-0077. The lease conforms to the applicable provisions of OAR 690-077-0015.

Now, therefore it is ORDERED:

1. The Lease as described herein is APPROVED.

2. During the term of the lease, the former place of use will no longer receive water as part of these rights, any supplemental rights, or any other layered irrigation water rights, including ground water registrations and permits.

3. The term of the lease will commence upon approval of the instream lease and terminate on March 25, 2021.

Dated at Salem, Oregon this day January 21, 2021.

Lisa J. Jaramillo, Transfer and Conservation Section Manager, for
Thomas M. Byler, Director, Oregon Water Resources Department

This document was prepared by Sarah Henderson. If you have any questions, please call 503-986-0884.

Mailing date: January 22, 2021

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Appendix G-2. Notes of monthly coordination meetings between the Permittees and USFWS on implementation of the DBHCP at Wickiup Reservoir.

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF WICKIUP OPERATIONS

Date/Time: Wednesday, January 20, 2021, 1:00 – 2:00 PM, via conference call

Purpose: This conference call was held to comply with Item L of Conservation Measure WR-1 of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Scott Carlon (NMFS), Mike Britton (NUID), Kyle Gorman (OWRD), David Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates:

1. Item F of Conservation Measure WR-1 requires a minimum daily average flow of 100 cfs at WICO gage, with an allowable deviation of 10 cfs (for a minimum daily average of 90 cfs) to account for operational constraints and gage inaccuracies. As of January 20, 2021, the reported flow at WICO was 106 cfs. The lowest reported flow at WICO in 2021 to date was 94.84 cfs on January 1. Reported flows below 100 cfs are believed to be due to inaccurate gage readings; actual flows are believed to have been above 100 cfs at all times. The flow of 106 cfs on January 20 includes a voluntary increase of 5 cfs above the required minimum of 100 cfs. NUID has opted to voluntarily add 5 cfs to the flow to reflect water it anticipates receiving as live flow from COID during the 2021 irrigation season.

Decisions/Action Items:

1. Future monthly Wickiup coordination calls will be held on the third Thursday of the month from 9:00 AM to 10:00 AM. The next call will be Thursday, February 18 at 9:00 AM.
2. Prior to the next call Marty Vaughn will prepare a generic checklist of items to be covered in monthly calls based on the requirements of the DBHCP and Incidental Take Permits.
3. The Services, OWRD and NUID will copy Marty on email correspondence concerning DBHCP compliance at Wickiup Dam so that Marty can include the correspondence in the DBHCP annual report to the Services.
4. In addition to the items required to be included in the monthly calls, NUID will voluntarily provide the Services with updates on the status of live flow being made available to NUID as a result of canal piping by COID and the other Permittees.

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF WICKIUP OPERATIONS

Date/Time: Thursday, February 18, 2021, 9:00 AM, via Teams

Purpose: This conference call was held to comply with Item L of Conservation Measure WR-1 of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Craig Horrell (COID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), David Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item F of Conservation Measure WR-1** requires a minimum daily average flow of 100 cfs at WICO gage, with an allowable deviation of 10 cfs (for a minimum daily average of 90 cfs) to account for operational constraints and gage inaccuracies. As of February 18, 2021, the reported flow at WICO was 106 cfs. The lowest reported flow at WICO from January 20 to February 18 was 104 cfs on multiple days. The flow of 106 cfs on February 18 includes a voluntary increase of 5 cfs above the required minimum of 100 cfs. NUID has opted to voluntarily add 5 cfs to the flow to reflect water it anticipates receiving as live flow from COID during the 2021 irrigation season. Additional increases in flow at WICO will occur as additional live flow is acquired from COID.
2. **Item J of Conservation Measure WR-1** allows for an increase in the daily average flow at WICO gage above 100 cfs if it is anticipated Wickiup Reservoir will fill by spring and there will be a need to spill water. As of February 18, 2021, the storage volume in Wickiup Reservoir is 95,950 acre-feet (48% of full) and the reservoir is not expected to fill in 2021. Consequently, there will be no associated increase in the minimum follow at WICO.
3. **Adaptive Management Measure WR-1.1** requires assessment of OSF pre-breeding activity and habitat conditions along the Upper Deschutes River in March to determine whether it is necessary to adjust the timing of annual ramp-up to 600 cfs at WICO. Marty will coordinate the timing and location of this assessment with Jen O'Reilly (USFWS), and report to the group on the March 18 conference call.

Action Items:

1. Marty will coordinate the OSF pre-breeding assessment with Jen O'Reilly prior to March 18.
2. The next meeting will be Thursday, March 18, via Teams. It will start at 9:00 AM.

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF WICKIUP OPERATIONS

Date/Time: Thursday, March 18, 2021, 9:00 AM, via Teams

Purpose: This conference call was held to comply with **Item L of Conservation Measure WR-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Terry Smith (LPID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), David Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure WR-1** requires a spring ramp-up of the flow at WICO gage to 600 cfs by March 31, unless a decision is made to stop at 400 cfs on March 31 and proceed to 600 cfs later in April based on weather and habitat conditions and Oregon spotted frog (OSF) breeding activity. In a meeting on March 16 to discuss OSF survey needs and funding for 2021, USFWS and NUID determined the 2021 spring ramp-up will stop at 400 cfs on March 31 and habitat conditions and OSF breeding activity will be monitored by USGS biologists working in coordination with USFWS. Based on the information gathered by USGS and USFWS, the flow at WICO will be gradually increased from 400 cfs to 600 cfs by mid-April. USFWS will notify NUID (Mike Britton) when it is time to make an increase in the flow between 400 cfs and 600 cfs, and Mike will relay that information to OWRD and the dam operator. This approach of increasing water depths in stages (with the flow going to 400 cfs, pausing for a period, and then going to 600 cfs) during OSF breeding is intended to reduce the potential for sudden drops that might occur if a constant flow of 600 cfs were provided at WICO while inflows from unregulated tributaries and springs could be fluctuating. The ramp-up will begin on March 29 and proceed as allowed under Item J of Conservation Measure WR-1 (a copy of the ramp-up scheduled is attached).
2. **Item F of Conservation Measure WR-1** requires a minimum daily average flow of 100 cfs at WICO gage, with an allowable deviation of 10 cfs (for a minimum daily average of 90 cfs) to account for operational constraints and gage inaccuracies. From February 18 to March 18, 2021, the reported flow at WICO was 104 cfs or greater at all times.
3. **Item I of Conservation Measure WR-1** allows for an increase in the daily average flow at WICO gage above 100 cfs if it is anticipated Wickiup Reservoir will fill by spring and there will be a need to spill water. As of March 18, 2021, the storage volume in Wickiup Reservoir was 111,100 acre-feet (56% of full) and the reservoir is not expected to fill in 2021. Consequently, there will be no associated increase in the minimum flow at WICO.
4. **Item J of Conservation Measure WR-1** sets a maximum ramping rate for increasing the flow at WICO gage of 0.1 foot (water depth) per 4-hour period. The 2021 ramp-up schedule (attached) adheres to this requirement.

5. **Adaptive Management Measure OSF-1** requires the Permittees to fund biologists for OSF surveys and assessments on the covered lands. This item was covered in a meeting between USFWS and the Permittees on March 16.
6. **Adaptive Management Measure WR-1.1** requires assessment of OSF pre-breeding activity and habitat conditions along the Upper Deschutes River to determine the timing of annual ramp-up to 600 cfs at WICO. As noted above, USGS will conduct the monitoring of OSF breeding activity in early April in coordination with USFWS.

Action Items:

1. Jen O'Reilly will coordinate with Mike Britton on the timing of flow increases at WICO in early April.
2. **The next meeting will be Thursday, April 15, via Teams. It will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF WICKIUP OPERATIONS

Date/Time: Thursday, April 15, 2021, 9:00 AM, via Teams

Purpose: This conference call was held to comply with **Item L of Conservation Measure WR-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Terry Smith (LPID), Colin Wills (AID), Kyle Gorman (OWRD), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure WR-1** requires a spring ramp-up of the flow at WICO gage to 600 cfs by March 31, unless a decision is made to stop at 400 cfs on March 31 and proceed to 600 cfs later in April based on weather and habitat conditions and Oregon spotted frog (OSF) breeding activity. USFWS and NUID determined in mid-March that the 2021 spring ramp-up would be temporarily halted at 400 cfs on March 31 while USFWS and USGS continued to monitor habitat conditions and OSF breeding activity at Dead Slough. USFWS then notified NUID on April 9 to resume the ramp-up, and 600 cfs was reached on April 11. The flow at WICO has remained above 600 cfs since April 11.
2. **Item B of Conservation Measure WR-1** specifies the flow at WICO cannot exceed 800 cfs during April without USFWS approval. On the morning of April 15 the flow at WICO was 650 cfs. Kyle noted there will be two increases of 50 cfs each on April 15 and 16 to respond to irrigation demand.
3. **Item C of Conservation Measure WR-1** limits the magnitude of decrease in flow at WICO in April to 30 cfs to avoid stranding OSF eggs along the Deschutes River. Kyle and Josh asked for clarification on the meaning and intent of this because they anticipate there may be times when it is necessary to make adjustments (decreases) during ramp-up to account for imprecision in the control structures at Wickiup Dam. Specifically, they foresee the possibility that the dam operator could unavoidably overshoot a flow target and then need to reduce the flow again by a small amount. After discussing the biological rationale for this provision in the DBHCP, the group agreed on the following approach, with the assumption that small adjustments within the first 12 hours of the initial ramp-up will not result in the stranding of OSF eggs.

   If the operator at Wickiup Dam overshoots a flow target of 600 cfs or greater in April, the flow may be reduced within 12 hours to get to the target. If the reduction is 30 cfs or less, NUID need not consult with USFWS and the adjustment will be indicated in the DBHCP annual compliance report. If a larger reduction is needed to reach the target flow, NUID will consult with USFWS before decreasing the flow by more than 30 cfs.

4. **Item D of Conservation Measure WR-1** limits decreases in the flow at WICO during May and June to no more than 20 percent of the total flow over any 5-day period. This requirement was noted in the meeting for reference, since it will be in effect prior to the next meeting.
5. **Item J of Conservation Measure WR-1** sets a maximum ramping rate for increasing the flow at WICO gage of 0.1 foot (water depth) per 4-hour period. The 2021 ramp-up was designed to meet this requirement. The actual rate of ramp-up will be reviewed and reported in the May implementation meeting.
6. **Adaptive Management Measure OSF-1** requires the Permittees to fund biologists for OSF surveys and assessments on the covered lands. The 2021 OSF surveys have begun, and will continue in coordination with USFWS.
7. **Adaptive Management Measure WR-1.1** requires assessment of OSF pre-breeding activity and habitat conditions along the Upper Deschutes River to determine the timing of annual ramp-up to 600 cfs at WICO. As noted above, USGS conducted the monitoring of OSF breeding activity in early April in coordination with USFWS, and the results were used to set the timing for the final ramp-up to 600 cfs in early April.
8. **Adaptive Management Measure WR-1.2** requires monitoring of OSF egg and larvae survival along the Upper Deschutes River. Marty will coordinate with Jen on specific locations for 2021 monitoring.

Action Items:

1. **The next meeting will be Thursday, May 20, via Teams. It will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF WICKIUP OPERATIONS

Date/Time: Thursday, May 20, 2021, 9:00 AM, via Teams

Purpose: This conference call was held to comply with **Item L of Conservation Measure WR-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Terry Smith (LPID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure WR-1** requires a minimum flow of 600 cfs at WICO gage from March 31 through September 15. The flow at WICO remained above 600 cfs at all times between April 15 and May 20 (range 684 to 1,370 cfs).
2. **Item B of Conservation Measure WR-1** specifies the flow at WICO cannot exceed 800 cfs during April unless it is verified that a higher flow will not harm Oregon spotted frogs (OSF) in Dead Slough (LaPine State Park). The flow at WICO exceeded 800 cfs from April 20 through May 20. USFWS was notified prior to April 20 of the Permittees' proposal to exceed 800 cfs, and biologists under contract to the Permittees visited Dead Slough on April 19 to evaluate the potential effects of the higher flow in accordance with Adaptive Management Measure OSF-1. The biologists determined that WICO flows well in excess of 800 cfs would be needed to make a surface connection between the river and the downstream end of Dead Slough. In the absence of this surface connection and the associated potential for flushing flows in the slough, the risk of harm to OSF eggs is minimal. Based on this information, USFWS concurred with the proposal to increase the flow above 800 cfs. The biologists revisited the slough multiple times between April 20 and May 7 to observe the effects of increasing flows on surface water levels and OSF eggs. The surface connection between the river and the downstream end of the slough occurred on May 7 at a WICO flow of about 1,140 cfs. By that time, all eggs detected in the downstream end of the slough had developed into larvae (tadpoles) that moved down into the mud and vegetation on the bottom of the wetland. No flushing of eggs or larvae was observed.
3. **Item C of Conservation Measure WR-1** limits the magnitude of decrease in flow at WICO in April to 30 cfs without the prior approval of USFWS. The purpose of this measure is to avoid stranding OSF eggs along the Deschutes River. The Permittees contacted USFWS on April 26 and proposed a decrease of 40 cfs to save storage after irrigation demand decreased. USFWS concurred with the proposal. The flow at WICO was subsequently decreased by 40 cfs (down to 880 cfs). Monitoring of habitat and OSF egg conditions in Dead Slough during this period (see Item 2 above) detected a drop in water surface elevation between 1 and 2 inches, with no evidence of OSF egg stranding.
4. **Item D of Conservation Measure WR-1** limits decreases in the flow at WICO during May and June to no more than 20 percent of the total flow over any 5-day period. The maximum decrease between

May 1 and May 20 was 70 cfs (beginning on May 15). This represented a decrease of only 5 percent from the WICO flow of 1.370 cfs on May 15.

5. **Item E of Conservation Measure WR-1** requires that the flow at Benham Falls (Hydromet Station BENO) be at least 1,300 cfs from July 1 through September 15. Bridget reminded the group of this requirement. The Permittees noted this may be difficult to meet due to the drought conditions in 2021. The matter will be discussed further in the June coordination meeting.
6. **Item J of Conservation Measure WR-1** sets a maximum rate for increasing the flow at WICO gage of 0.1 foot (water depth) per 4-hour period and a maximum rate for decreasing the flow of 0.2 foot per 12-hour period whenever the total flow is 800 cfs or less. The flow at WICO was less than 800 cfs from April 15 to April 17. It increased from 647 cfs on April 15 to over 800 cfs by the morning of April 17. There were no decreases in flow during this time. The 4-hour rate of increase exceed 0.10 foot on two occasions:
    - it reached 0.12 foot between 11:30 AM and 2:30 PM on April 15
    - it reached 0.11 foot at 10:30 AM on April 16

    Both of these instances were within the allowable range of deviation specified in Conservation Measure WR-1, Table WR-1 (≤ 0.18 foot per 4-hour period), and they are reflective of the inherent difficulties of managing Wickiup Reservoir outflow at that level of precision. Nether instance is considered to represent a significant impact to OSF or other covered species.
7. **Adaptive Management Measure OSF-1** requires the Permittees to fund biologists for OSF surveys and assessments on the covered lands. The Permittee-funded monitoring of OSF habitat conditions and eggs in Dead Slough in late April and early May was done in accordance with this requirement.
8. **Adaptive Management Measure WR-1.2** requires monitoring of OSF egg and larvae survival along the Upper Deschutes River. Monitoring of OSF eggs in Dead Slough in late April (see Item 2 above) supported this adaptive management measure by providing information on the effects of decreases in water surface elevation between 1 and 2 inches when the flow at WICO was decreased by 40 cfs. Coordinate with USFWS will continue in May to determine if additional monitoring will be done under this measure in 2021.

Action Items:

1. **Marty, Jen and Bridget will meet via Teams on May 27 to discuss further OSF monitoring needs for 2021.**
2. **The next meeting of the full group will be Wednesday, June 16, via Teams. It will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF WICKIUP OPERATIONS

Date/Time: Wednesday, June 16, 2021, 9:00 AM, via Teams

Purpose: This conference call was held to comply with **Item L of Conservation Measure WR-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Terry Smith (LPID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure WR-1** requires a minimum flow of 600 cfs at WICO gage from March 31 through September 15. The flow at WICO remained above 600 cfs at all times between May 20 and June 16 (range 1,120 to 1,370 cfs).
2. **Item D of Conservation Measure WR-1** limits decreases in the flow at WICO during May and June to no more than 20 percent of the total flow over any 5-day period. The maximum 5-day decrease between May 20 and June 16 was 120 cfs, beginning on June 2. This represented a decrease of 8.8 percent from the starting WICO flow of 1,370 cfs on June 2.
3. **Item E of Conservation Measure WR-1** requires that the flow at Benham Falls (Hydromet Station BENO) be at least 1,300 cfs from July 1 through September 15. In an average year this flow can be met largely with live flow, with minimal if any contribution from storage. In late May the Permittees became aware that due to the drought in 2021 live flow in the Deschutes River is extremely low and likely will not increase during the summer. Earlier water forecasts did not indicate this, but the effects of the current drought have exceeded all expectations. This lack of live flow, combined with the low storage volume in Wickiup Reservoir at the start of the irrigation season, will make it impossible to maintain 1,300 cfs at BENO until September 15. Due to the extreme and unforeseen nature of the current drought, the Permittees and Service met multiple times in early June to explore water management options. On June 14, the Service asked the Permittees to estimate the maximum flow that could be sustained at BENO until the first or second week of August to allow OSF tadpoles time to mature. Rough estimates provided by the Permittees suggest a flow of 1,230 at WICO could be sustained until August 3, and a flow of 1,130 cfs could be sustained until August 11. These would correspond to roughly 1,530 cfs and 1,430 cfs, respectively, at BENO. A flow of 1,030 cfs at WICO could be sustained until roughly August 25, but this would result in dropping the flow at BENO to roughly 1,320 immediately. Based on these estimates, USFWS recommended reducing the flow at WICO to 1,130 cfs and holding it there as long as possible.
4. **The Incidental Take Permit** requires a flow of at least 900 cfs at WICO gage from June 30 to September 14. As noted in Item 3 above, the current drought will make it impossible to sustain 900 cfs at WICO past mid-August. The approach to addressing this situation is being developed concurrent with addressing the BENO 1,300 cfs target.

5. **DBHCP Section 7.2.2.1** requires an assessment of OSF habitat conditions in Dead Slough if the WICO flow drops 20 percent or more over a 5-day period in May and June. As noted in Item 2 above, no decrease of that magnitude occurred between May 20 and June 16.
6. **DBHCP Section 7.2.2.1** also requires the Permittees to provide qualified biologists to assist USFWS with assessment of OSF habitat suitability along the Deschutes River. Marty met with USFWS via Teams on May 27, and is awaiting further direction from USFWS on 2021 needs for assistance.

Action Items:

1. **The next meeting of the full group will be Wednesday, July 14, via Teams. It will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF WICKIUP OPERATIONS

Date/Time: Wednesday, July 14, 2021, 9:00 AM, via Teams

Purpose: This conference call was held to comply with **Item L of Conservation Measure WR-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure WR-1** requires a minimum flow of 600 cfs at WICO gage from March 31 through September 15. The flow at WICO remained above 1,100 cfs at all times between June 16 and July 14 (range 1,100 to 1,210 cfs).
2. **Item D of Conservation Measure WR-1** limits decreases in the flow at WICO during May and June to no more than 20 percent of the total flow over any 5-day period. The maximum 5-day decrease between June 16 and June 30 was 110 cfs, beginning on June 16. This represented a decrease of 9.0 percent from the starting WICO flow of 1,210 cfs.
3. **Item E of Conservation Measure WR-1** requires that the flow at Benham Falls (Hydromet Station BENO) be at least 1,300 cfs from July 1 through September 15. As noted during the June meeting, the combination of low Wickiup Reservoir storage and low Deschutes River live flow will prevent the Permittees from maintaining 1,300 cfs at BENO through September 15 in 2021. In mid-June, USFWS recommended reducing the flow at WICO to 1,130 cfs and holding it there as long as possible in an attempt to maintain a flow at BENO of about 1,400 cfs. The flow at WICO was ramped down from 1,210 cfs on June 16 to 1,130 cfs on June 19, and then held between 1,100 and 1,130 cfs through July 14. Brief periods of flow below 1,130 cfs at WICO were the result of challenges in maintaining the target flow as Wickiup Reservoir drained and the hydrostatic head on the release gate decreased. During the same period, the flow at BENO was between 1,410 and 1,440 cfs.
4. **The Incidental Take Permit** requires a flow of at least 900 cfs at WICO gage from June 30 to September 14. As noted in Item 3 above, the current drought will make it impossible to sustain 900 cfs at WICO past August. It is currently estimated that Wickiup Reservoir storage will be depleted and the flow at WICO will drop below 900 cfs by the third week of August.
5. **DBHCP Section 7.2.2.1** requires an assessment of OSF habitat conditions in Dead Slough if the WICO flow drops 20 or more over a 5-day period in May and June. As noted in Item 2 above, no decrease of that magnitude occurred in June.

Action Items:

1. **The next meeting of the full group will be Thursday, August 19, via Teams. It will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF WICKIUP OPERATIONS

Date/Time: Thursday, August 19, 2021, 9:00 AM, via Teams

Purpose: This conference call was held to comply with **Item L of Conservation Measure WR-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Colin Wills (AID), Kyle Gorman (OWRD), Jeremy Giffin (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure WR-1** requires a minimum flow of 600 cfs at WICO gage from March 31 through September 15. The flow at WICO remained above 1,000 cfs at all times between July 15 and August 17 (range 1,020 to 1,120 cfs). Annual ramp-down of the flow began on August 18 when the flow was decreased to 965 cfs. This initiation of the ramp-down was earlier than normal due to the drought conditions that were discussed in previous meetings. By August 19 the flow was 921 cfs. It is not anticipated the flow will drop below 600 cfs prior to September 15.
2. **Item E of Conservation Measure WR-1** requires that the flow at Benham Falls (Hydromet Station BENO) be at least 1,300 cfs from July 1 through September 15. As noted in previous meetings, the combination of low Wickiup Reservoir storage and low Deschutes River live flow will prevent the Permittees from maintaining 1,300 cfs at BENO through September 15 in 2021. The flow at BENO remained above 1,300 cfs at all times between July 15 and August 17 (range 1,310 to 1,430 cfs). The flow fell below 1,300 cfs for the first time on August 17, and to 1,260 cfs by August 19 as a result of annual ramp-down of releases from Wickiup Reservoir.
3. **Item J of Conservation Measure WR-1** requires that the ramp-down of Wickiup Reservoir releases be paused for 5 days each when the flow at BENO is 1,200 cfs and 1,100 cfs. As a result of the drought conditions noted in Item 2 above, there will not be sufficient storage in Wickiup Reservoir to support these pauses. The ramp-down will continue without pausing until the flow at WICO meets live flow plus any stored water that is being released from Crane Prairie Reservoir and passing through Wickiup. To minimize the release of suspended sediment from Wickiup Reservoir, the Permittees will stop the ramp-down before total storage in the reservoir drops below 2,500 acre-feet.
4. **The Incidental Take Permit** requires a flow of at least 900 cfs at WICO gage from June 30 to September 14. As noted in Item 2 above, the current drought will make it impossible to sustain 900 cfs at WICO past August. The flow at WICO remained above 900 cfs from July 15 through August 19, but is scheduled to drop below 900 cfs in late August as the ramp-down continues.

Action Items:

1. **The next meeting of the full group will be Thursday, September 16, via Teams. It will start at 9:00 AM.**

MEETING NOTES

DESCHUTES BASIN HABITAT CONSERVATION PLAN

MONTHLY COORDINATION OF WICKIUP OPERATIONS

Date/Time: Thursday, September 16, 2021, 9:00 AM, via Teams

Purpose: This conference call was held to comply with **Item L of Conservation Measure WR-1** of the Final Deschutes Basin Habitat Conservation Plan (DBHCP), which requires monthly coordination on implementation of the conservation measure.

Participants: Bridget Moran (USFWS), Jen O'Reilly (USFWS), Craig Horrell (COID), Mike Britton (NUID), Josh Bailey (NUID), Colin Wills (AID), Steve Johnson (AID), Terry Smith (LPID), Gregg Garnett (BOR), Kyle Gorman (OWRD), Dave Filippi (Stoel Rives), Marty Vaughn (Biota Pacific)

Notes Prepared by: Marty Vaughn

Reports/Updates/Decisions:

1. **Item A of Conservation Measure WR-1** requires a minimum flow of 600 cfs at WICO gage from March 31 through September 15. The flow at WICO remained above 600 cfs at all times between August 19 and September 15 (range 606 to 891 cfs). As noted in the August meeting, annual ramp-down of the flow began on August 18 due to drought conditions.
2. **Item E of Conservation Measure WR-1** requires that the flow at Benham Falls (Hydromet Station BENO) be at least 1,300 cfs from July 1 through September 15. As noted in previous meetings, the combination of low Wickiup Reservoir storage and low Deschutes River live flow prevented the Permittees from maintaining 1,300 cfs at BENO through September 15 in 2021. The flow at BENO dropped below 1,300 cfs on August 17 and reached as low as 904 cfs on September 9 as a result of annual ramp-down of releases from Wickiup Reservoir. This also resulted in the shutting down of the NUID diversion at Bend during the third week of August, roughly six weeks ahead of schedule.
3. **Item F of Conservation Measure WR-1** requires a minimum flow of 100 cfs at WICO gage from September 16 through March 31 during the first 7 years of DBHCP implementation. Due to the ongoing drought conditions, which are not expected to be fully reversed by April 2022, NUID has requested the minimum winter flow at WICO be reduced below 100 cfs to enable more water to be stored over the winter. Bridget noted that winter flows of less than 100 cfs were not evaluated in the NEPA EIS or the Biological Opinion (BiOp) for the DBHCP. Marty suggested the current drought is an unforeseen circumstance, which by definition would not have been analyzed in the EIS or BiOp. Mike suggested we continue to evaluate the need for decreasing the winter flow, and continue the discussion in the October meeting.
4. **Item J of Conservation Measure WR-1** requires that the ramp-down of Wickiup Reservoir releases be paused for 5 days each when the flow at BENO is 1,200 cfs and 1,100 cfs. As a result of the drought conditions noted previously, there was not sufficient storage in Wickiup Reservoir to support these pauses. The ramp-down continued without pausing in September until the flow at WICO reached 904 cfs.
   When the total flow at WICO is less than 800 cfs, **Item J of Conservation Measure WR-1** also limits the rate of increase in flow to no more than 0.1 foot in water surface elevation per 4-hour period and the rate of decrease in flow to no more than 0.2 foot in water surface elevation per 12-hour

period. From August 19 through September 15, the maximum 4-hour increase in water surface elevation at WICO was 0.02 foot and the maximum 12-hour decrease was 0.16 foot.

5. **The Incidental Take Permit** requires a flow of at least 900 cfs at WICO gage from June 30 to September 14. As noted previously, the current drought made it impossible to sustain 900 cfs at WICO past mid-August. The flow at WICO dropped below 900 cfs on August 19 and remained below 900 cfs through September 14.

Action Items:

1. **The next meeting of the full group will be Thursday, October 21, via Teams. It will start at 9:00 AM.**

APPENDIX H
Dead Slough Monitoring Report

Assessment of Oregon Spotted Frog Habitat Conditions in Dead Slough, LaPine State Park, Deschutes County, Oregon April – May 2021

Monitoring Conducted in Support of ESA Section 10 Incidental Take Permit TE-89773D-0 and Deschutes Basin Habitat Conservation Plan

Prepared for: Deschutes Basin Board of Control
P. O. Box 919
Madras, Oregon 97741

Prepared by: Biota Pacific Environmental Sciences, Inc.
P. O. Box 158
Bothell, Washington 98041

Smayda Environmental Associates, Inc.
139 NE 61st Street
Seattle, Washington 98115

Mount Hood Environmental
P. O. Box 744
Boring, Oregon 97009

December 2021

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1. INTRODUCTION

On December 31, 2020, eight Deschutes Basin irrigation districts (Arnold, Central Oregon, Lone Pine, North Unit, Ochoco, Swalley, Three Sisters and Tumalo) and the City of Prineville, Oregon (City) (collectively the Permittees) received Endangered Species Act (ESA) Section 10 Incidental Take Permit TE-89773D-0 for two species that occur on lands affected by irrigation district and City activities; bull trout (*Salvelinus confluentus*) and Oregon spotted frog (*Rana pretiosa*). The Deschutes Basin Habitat Conservation Plan (DBHCP) was prepared by the Permittees and approved by U. S. Fish and Wildlife Service (USFWS) to minimize and mitigate the impacts of the covered activities on the covered species. Item B in Conservation Measure WR-1 of the DBHCP specifies that flow in the Deschutes River below Wickiup Dam (as measured at Hydromet Station WICO) cannot exceed 800 cubic feet per second (cfs) during the month of April without the approval of USFWS. Prior to giving its approval, USFWS must determine, with the assistance of qualified biologists funded by the Permittees, that flows in excess of 800 cfs will not adversely impact Oregon spotted frog (OSF) eggs and larvae in Dead Slough, which is located adjacent to the Deschutes River in LaPine State Park at river mile (RM) 208 (19 miles downstream of Wickiup Dam). The 800-cfs threshold is based on studies conducted during annual fall ramp-down of the flow at WICO in 2014 (USFWS in 2017) that showed the upstream and downstream ends of the slough both had surface connections to the Deschutes River when the flow at WICO reached about 900 cfs. Once the slough is fully connected to the river, OSF eggs and young larvae in the slough are vulnerable to being flushed into the river. High water levels within the slough can also make OSF eggs susceptible to movement by wind, which can increase their vulnerability to predation.

Due to unusually low natural flow in the Upper Deschutes River in 2021, the Permittees requested the release of additional irrigation storage from Wickiup Reservoir on 19 April. The release of this storage would increase the flow at WICO to at least 900 cfs. In response to the request for additional flow, USFWS asked qualified biologists from Biota Pacific, Smayda Environmental and Mt. Hood Environmental to assess the status of OSF eggs and larvae in the lower reaches of the slough and make a recommendation as to the potential impacts of the increased flow. The following report contains the results of that assessment.

2. RESULTS

Dead Slough was visited ten times between 19 April and 7 May 2021 to observe OSF habitat conditions and monitor for surface connection to the Deschutes River (Table 1). The upstream end of the slough was connected to the Deschutes on the first visit, when the flow at WICO was 794 cfs, but no surface connection was found at the downstream end until 7 May, when the flow at WICO was 1,115 cfs. The corresponding flow in the Deschutes River 26 miles downstream of Dead Slough at Benham Falls (Hydromet Station BENO) on 7 May was 1,402 cfs.

The first visit to Dead Slough began at 6:30 PM on 19 April 2021. Reported flow at WICO at 6:30 PM was 796 cfs. Gannett et al. (2001) and Gannett and Lite (2004) have estimated net inflow to the Deschutes River between Wickiup Dam and LaPine State Park to be 4 cfs. The flow at WICO had been relatively stable for at least 24 hours prior to 19 April, so it was estimated the flow past Dead Slough at the time of Visit 1 was approximately 800 cfs.

Twelve OSF egg masses were observed in the lower (downstream) 200 feet of the slough on 19 April. All twelve egg masses were in a narrow portion of the slough with a wetted area of 10 feet or less (Figure 1). All were in water between 2 and 8 inches deep. No signs of egg mortality were observed. The slough had a surface connection to the river at the upstream end, but there was no surface connection at the downstream end (Figure 2). A visual estimate of the natural berm at the downstream end of the slough indicated water level in the river would need to rise at least 6 inches before there would be a surface connection between the river and the slough.

Based on the observations made during the first visit, the biologists recommended that flow at WICO could increase to at least 900 cfs without increasing the risk of flushing or otherwise impacting OSF eggs in lower Dead Slough. This recommendation was conveyed to USFWS, and USFWS approved the increase in flow.

Table 1. Deschutes River flows and status of surface connection with Dead Slough in late April and early May 2021.

Date	Deschutes River Daily Average Flow (cfs)		Dead Slough Habitat Assessment Visit Number	Dead Slough Connected to River at Downstream End
	Hydromet Station WICO	Hydromet Station BENO		
16-Apr	734	989	-	-
17-Apr	777	1,038	-	-
18-Apr	794	1,077	-	-
19-Apr	794	1,094	Visit 1	No
20-Apr	839	1,098	Visit 2	No
21-Apr	918	1,142	Visit 3	No
22-Apr	918	1,206	-	-
23-Apr	918	1,219	-	-
24-Apr	916	1,227	-	-
25-Apr	918	1,231	-	-
26-Apr	898	1,246	-	-
27-Apr	880	1,225	Visit 4	No
28-Apr	879	1,214	-	-
29-Apr	878	1,214	-	-
30-Apr	878	1,209	-	-
1-May	971	1,217	Visits 5 and 6	No
2-May	1,051	1,290	Visit 7	No
3-May	1,052	1,351	Visit 8	No
4-May	1,051	1,366	-	-
5-May	1,069	1,369	-	-
6-May	1,080	1,391	Visit 9	No
7-May	1,115	1,402	Visit 10	Yes

Figure 1. **View of the downstream portion of Dead Slough, facing upstream, at 7:05 PM on 19 April 2021. All 12 Oregon spotted frog egg masses observed on 19 April were upstream of (beyond) the branch that lies across the channel.**

Figure 2. **View of the downstream portion of Dead Slough, facing downstream, at 7:05 PM on 19 April 2021. The two biologists are standing on the berm that separates the downstream end of the slough from the Deschutes River, which lies just beyond them.**

A second visit to Dead Slough was made at 6:30 PM on 20 April. The flow at WICO began to increase at 11:00 AM that day and it reached 916 cfs by 6:00 PM. Nineteen miles downstream at Dead Slough, however, there was still little evidence of increase in flow at 6:30 PM. The depth and aerial extent of inundation in the pond showed no apparent change. The 12 OSF egg masses observed on 19 April were still present and undisturbed, and three additional (newer) egg masses were observed in the same area. Inundation levels at the downstream end of the slough on 20 April are shown in Figures 3 and 4.

Figure 3. View of the downstream portion of Dead Slough, facing upstream, at 6:30 PM on 20 April 2021.

Figure 4. View of the downstream limit of inundation in Dead Slough, facing upstream, at 6:30 PM on 20 April 2021. The photographer is standing on the berm that separates the downstream end of the slough from the Deschutes River at low flows. The Deschutes River is out of sight to the left of the photo.

The third visit to Dead Slough was conducted at 9:45 AM on 21 April. By that time the increase in flow at WICO from the previous day was beginning to appear at BENO, which is 26 miles downstream of Dead Slough. It was therefore assumed the full hydrologic effects of the increase to 916 cfs would be observable at Dead Slough. Measurement of the water depth in the slough indicated it had risen 2.5 inches between 20 April and 21 April (Figure 5). This is the amount of increase in water surface elevation of the river that was predicted based on the rating curve for the WICO gage. The area of inundation in the slough had extended 15 feet closer to the river (Figure 6), but there was still no surface connection (Figure 7). Visual estimates suggested an additional increase in river depth of at least 3 inches would be needed before there would be a surface connection with the lower end of the slough. All 15 OSF egg masses observed on 19 and 20 April were present and undisturbed on 21 April. There was no indication any had moved appreciably from their 19 and 20 April locations.

The fourth visit to Dead Slough occurred at 9:20 AM on 27 April. The flow at WICO had been reduced to 880 cfs over the previous day to conserve storage as irrigation demand decreased slightly. The water level in Dead Slough had not changed appreciably from 21 April and the downstream end remained disconnected from the river. All 15 OSF egg masses observed on 21 April were still present. One of the egg masses had moved (drifted) toward the downstream end of the slough, but it remained intact and within the area isolated from the river.

Figure 5. **View of the downstream end of Dead Slough, facing upstream, at 9:45 AM on 21 April 2021 when the flow at WICO was 916 cfs. Comparison with Figure 1 provides visual reference for the increase in water depth at the branch that lies across the slough. A stick placed vertically at this location on 20 April was used to measure change in water depth.**

Figure 6. **View of the downstream limit of inundation in Dead Slough at 9:45 AM on 21 April 2021 when the flow at WICO was 916 cfs. The stick in the center of the photo was placed at the limit of inundation on 20 April, prior to the increase in flow in the Deschutes River at LaPine State Park. All inundation to the right of the stick resulted from the flow increase of 120 cfs.**

Figure 7. View of the Deschutes River (left side of photo) and downstream limit of inundation in Dead Slough (right side of photo) at 9:45 AM on 21 April 2021 when the flow at WICO was 916 cfs.

Visits 5 and 6 were conducted at 1:30 PM and 6:15 PM, respectively, on 1 May. The flow at WICO had increased during the day and the average for 1 May was 971 cfs. However, the flow increase had not appeared at Dead Slough by 6:15 PM and there was no measurable change in water depth within the slough and no connection between the river and the downstream end of the slough. Nine OSF egg masses remained from the 15 observed on earlier visits. Two of the egg masses were still in early stages of development, but the others had hatched or were hatching and free-swimming larvae were observed.

Observations during Visit 7 on the morning of 2 May were similar to those of the previous day. The flow at WICO continued to increase and this resulted in an increase of about 2 inches in water depth within the slough. However, there was still no connection at the downstream end. No change in the OSF egg masses was noted from the previous day.

Visit 8 was at 8:00 AM on 3 May. By that time the flow at WICO had been 1,051 cfs for more than 24 hours, allowing time for the flow adjacent to Dead Slough to be roughly 1,055 cfs. At this flow the downstream end of Dead Slough still remained disconnected from the river and the biologist on site estimated the river would need to rise at least another 2 inches before a

connection would be made. Portions of nine OSF egg masses were still present in the slough and they showed further evidence of disintegration consistent with hatching.

On 6 May (Visit 9) the flow at WICO was 1,080 cfs and it had been over 1,050 cfs for more than four days. The downstream end of the slough was still not connected.

At 7:30 PM on 7 May (Visit 10) a surface connection between the river and the downstream end of Dead Slough was observed for the first time. The flow at WICO had been 1,050 cfs from 8:45 AM on 5 May until 9:00 AM on 7 May, when it was increased to 1,100 cfs. It had been at 1,100 cfs for 10.5 hours prior to Visit 10 at 7:30 PM. This indicates the WICO flow necessary to make the downstream connection at Dead Slough in 2021 was between 1,050 and 1,100 cfs. Figure 8 is a panoramic view of the connection that existed on 7 May. There was no discernable flow through the slough with this shallow connection. Low light conditions during the visit made examination of the OSF egg masses difficult, but previous visits had already shown that most were hatched.

Figure 8. **Panoramic view of the downstream end of Dead Slough (foreground) and the Deschutes River (background) showing the shallow surface connection between the two on 7 May 2021. Flow in the river at the time of the photo was between 1,050 and 1,100 cfs.**

3. CONCLUSIONS

The increase in flow at WICO from 796 to 916 cfs on 20 April had no observable effect on OSF eggs in the lower reaches of Dead Slough. Water level in the slough rose an estimated 2.5 inches as a result of the 120-cfs flow increase, but there continued to be no surface connection between the downstream end of the slough and the river. There was no discernable current in the slough at the higher flow, and channel width did not change appreciably. The egg masses observed on 19 and 20 April remained within a narrow channel where they were partially shielded from wind. All 15 egg masses were deposited over unvegetated sediments because of the overall low water conditions. The increase in flow to 916 cfs did not raise the water level in the slough enough to inundate the vegetation that borders the unvegetated main channel.

Continued monitoring of the downstream end of the slough indicated there was no surface connection 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. These findings differ from those observed during WICO ramp-down in 2014 (USFWS 2017), when a flow of 900 cfs at WICO was sufficient to create a surface connection at the downstream end of the slough. The difference between 2014 and 2021 could be due to increased height of the natural berm that isolates the downstream end of the slough from the river at low flows. It is also possible that inflow to the Deschutes River between WICO and Dead Slough during fall ramp-down (a descending hydrograph) is different from inflow during the increasing hydrograph of the spring ramp-up. During ramp-down, discharge of shallow groundwater from the banks of the river may temporarily increase the net inflow between WICO and Dead Slough. This would result in higher flow at Dead Slough for a given flow at WICO than would be found during the spring.

4. LITERATURE CITED

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APPENDIX I
Upper Deschutes
Habitat Conservation Fund
Documentation

Oregon Community Foundation

June 14, 2021

Deschutes Basin Board of Control
c/o Craig Horrell
1055 SW Lake Ct
Redmond, OR 97756

chorrell@coid.org
bridget_moran@fws.gov
david.filippi@stoel.com

Dear Craig:

I am pleased to inform you that the ***Deschutes Basin Habitat Conservation Fund*** has been established with the receipt of $150,000.00, from the Deschutes Basin Board of Control on May 21, 2021.

Now that the fund has been established, our donor relations officer, Anne George, will serve as a primary resource for the advisory committee as it recommends grants from the fund. In the coming weeks, she will be contacting the committee to schedule a new fund orientation where she will explain the Foundation's advised fund procedures and answer any questions that you may have.

Community leader Dave Frohnmayer once said, "Citizenship implies duty. It requires looking for and deciding about the common good." We're honored to assist the Deschutes Basin Board of Control in accomplishing its objectives.

With sincere appreciation,

Max Williams
President and CEO

MW/nf
cc: Bridget Moran
David E. Filippi
Anne George
Julie Gregory

NOTE: The IRS requires substantiation of charitable donations. This letter constitutes your receipt and confirms that you received no goods or services from The Foundation because of this donation. This letter also confirms that, as required by federal tax law, The Foundation has exclusive legal control over the assets contributed to The Foundation's donor advised funds. Please keep this letter with your tax records. The Oregon Community Foundation's federal tax ID# is: 23-731 5673.

Craig, just a quick note to say that we are honored to be administering this important fund for Central Oregon. Warm wishes, Max

PORTLAND
1221 SW YAMHILL ST.
SUITE 100
[illegible]

BEND
[illegible]

EUGENE
[illegible]

MEDFORD
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APPENDIX J
Middle Deschutes River
Winter Flow Data

Appendix J-1. Reported daily average flows for the Deschutes River Upstream of Bend (Hydromet Station BENO), Downstream of Bend (Hydromet Station DEBO) and at Arnold, Central Oregon and Swalley Irrigation District Diversions from January through March 2021.

Date	Daily Average Flow (cfs)					
	Deschutes River Upstream of Bend (BENO)	Arnold Diversion (ARNO)	Central Oregon Diversion (CENO)	North Canal Diversion (NCAO)	Swalley Diversion (SWCO)	Deschutes River Downstream of Bend (DEBO)
1/1/2021	501	0	1	0	0	468
1/2/2021	501	0	1	0	0	465
1/3/2021	505	0	1	0	0	473
1/4/2021	512	0	24	0	0	452
1/5/2021	506	0	148	0	0	337
1/6/2021	514	0	186	0	0	294
1/7/2021	512	0	174	0	0	301
1/8/2021	502	0	88	0	0	356
1/9/2021	484	0	1	0	0	453
1/10/2021	490	0	1	0	0	449
1/11/2021	480	0	1	0	0	447
1/12/2021	503	0	1	0	0	459
1/13/2021	516	0	1	0	0	484
1/14/2021	505	0	1	0	0	472
1/15/2021	527	0	1	0	0	477
1/16/2021	559	0	1	0	0	519
1/17/2021	556	0	1	0	0	524
1/18/2021	548	0	1	0	0	517
1/19/2021	521	0	1	0	0	497
1/20/2021	486	0	1	0	0	462
1/21/2021	523	0	1	0	0	471
1/22/2021	521	0	1	0	0	487
1/23/2021	509	0	1	0	0	479
1/24/2021	497	0	1	0	0	464
1/25/2021	472	0	1	0	0	438
1/26/2021	437	0	1	0	0	429
1/27/2021	441	0	1	0	0	384

Date	Daily Average Flow (cfs)					
	Deschutes River Upstream of Bend (BENO)	Arnold Diversion (ARNO)	Central Oregon Diversion (CENO)	North Canal Diversion (NCAO)	Swalley Diversion (SWCO)	Deschutes River Downstream of Bend (DEBO)
1/28/2021	538	0	1	0	0	487
1/29/2021	505	0	1	0	0	477
1/30/2021	497	0	1	0	0	457
1/31/2021	491	0	1	0	0	453
2/1/2021	492	0	1	0	0	452
2/2/2021	493	0	1	0	0	453
2/3/2021	494	0	1	0	0	453
2/4/2021	475	2	1	0	0	445
2/5/2021	483	4	1	0	0	433
2/6/2021	473	0	1	0	0	438
2/7/2021	484	22	1	0	0	421
2/8/2021	480	36	1	0	19	390
2/9/2021	479	38	1	0	18	376
2/10/2021	474	38	1	0	17	380
2/11/2021	481	27	1	0	0	402
2/12/2021	448	0	1	0	0	425
2/13/2021	414	0	0	0	0	402
2/14/2021	527	0	0	0	0	444
2/15/2021	524	0	0	0	0	498
2/16/2021	508	0	0	0	0	473
2/17/2021	496	0	0	0	0	455
2/18/2021	499	0	0	0	0	459
2/19/2021	498	0	0	0	0	461
2/20/2021	501	0	0	0	0	457
2/21/2021	490	0	23	0	0	425
2/22/2021	494	0	144	0	0	315
2/23/2021	500	0	175	0	0	276
2/24/2021	498	0	165	0	0	279
2/25/2021	498	0	94	0	0	337
2/26/2021	496	0	1	0	0	454
2/27/2021	498	0	1	0	0	454
2/28/2021	492	0	1	0	0	451

Date	Daily Average Flow (cfs)					
	Deschutes River Upstream of Bend (BENO)	Arnold Diversion (ARNO)	Central Oregon Diversion (CENO)	North Canal Diversion (NCAO)	Swalley Diversion (SWCO)	Deschutes River Downstream of Bend (DEBO)
3/1/2021	489	0	1	0	0	444
3/2/2021	490	0	0	0	0	451
3/3/2021	492	0	0	0	0	448
3/4/2021	492	0	0	0	0	448
3/5/2021	492	0	0	0	0	443
3/6/2021	497	0	0	0	0	439
3/7/2021	495	0	0	0	0	438
3/8/2021	495	0	0	0	0	436
3/9/2021	496	0	0	0	0	436
3/10/2021	496	0	0	0	0	437
3/11/2021	494	0	0	0	0	437
3/12/2021	490	0	0	0	0	433
3/13/2021	487	0	0	0	0	431
3/14/2021	484	0	0	51	0	405
3/15/2021	484	0	0	120	0	318
3/16/2021	483	0	0	149	0	292
3/17/2021	483	0	0	149	0	285
3/18/2021	484	0	0	0	0	360
3/19/2021	483	0	0	0	0	425
3/20/2021	483	0	0	0	0	423
3/21/2021	484	23	0	0	0	409
3/22/2021	490	42	0	0	0	386
3/23/2021	490	42	0	0	0	388
3/24/2021	485	42	0	0	0	385
3/25/2021	486	41	0	5	16	362
3/26/2021	484	18	0	0	17	371
3/27/2021	484	0	0	0	17	399
3/28/2021	483	0	0	0	17	400
3/29/2021	481	0	0	0	16	395
3/30/2021	488	0	0	0	20	397
3/31/2021	543	0	0	0	23	419

APPENDIX K
Crescent Creek and
Little Deschutes River Flow Data

Appendix K-1. Reported daily average flows for Crescent Creek below Crescent Dam (Hydromet Station CREO) in Water Year 2021.

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
1/1/2021	21	2/1/2021	14	3/1/2021	14
1/2/2021	21	2/2/2021	13	3/2/2021	14
1/3/2021	21	2/3/2021	13	3/3/2021	14
1/4/2021	16	2/4/2021	13	3/4/2021	14
1/5/2021	12	2/5/2021	13	3/5/2021	14
1/6/2021	12	2/6/2021	13	3/6/2021	14
1/7/2021	12	2/7/2021	13	3/7/2021	14
1/8/2021	12	2/8/2021	13	3/8/2021	14
1/9/2021	12	2/9/2021	13	3/9/2021	14
1/10/2021	12	2/10/2021	13	3/10/2021	14
1/11/2021	12	2/11/2021	13	3/11/2021	14
1/12/2021	12	2/12/2021	13	3/12/2021	14
1/13/2021	12	2/13/2021	14	3/13/2021	14
1/14/2021	12	2/14/2021	14	3/14/2021	14
1/15/2021	12	2/15/2021	14	3/15/2021	14
1/16/2021	12	2/16/2021	14	3/16/2021	14
1/17/2021	12	2/17/2021	14	3/17/2021	14
1/18/2021	12	2/18/2021	14	3/18/2021	14
1/19/2021	12	2/19/2021	14	3/19/2021	14
1/20/2021	12	2/20/2021	14	3/20/2021	14
1/21/2021	12	2/21/2021	14	3/21/2021	14
1/22/2021	12	2/22/2021	14	3/22/2021	14
1/23/2021	12	2/23/2021	14	3/23/2021	14
1/24/2021	12	2/24/2021	14	3/24/2021	14
1/25/2021	12	2/25/2021	14	3/25/2021	14
1/26/2021	12	2/26/2021	14	3/26/2021	14
1/27/2021	12	2/27/2021	14	3/27/2021	14
1/28/2021	12	2/28/2021	14	3/28/2021	14
1/29/2021	13			3/29/2021	14
1/30/2021	14			3/30/2021	14
1/31/2021	14			3/31/2021	14

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
4/1/2021	14	5/1/2021	15	6/1/2021	16
4/2/2021	14	5/2/2021	15	6/2/2021	16
4/3/2021	14	5/3/2021	15	6/3/2021	16
4/4/2021	14	5/4/2021	15	6/4/2021	16
4/5/2021	14	5/5/2021	15	6/5/2021	16
4/6/2021	14	5/6/2021	15	6/6/2021	16
4/7/2021	14	5/7/2021	15	6/7/2021	16
4/8/2021	14	5/8/2021	15	6/8/2021	16
4/9/2021	14	5/9/2021	15	6/9/2021	16
4/10/2021	14	5/10/2021	15	6/10/2021	16
4/11/2021	14	5/11/2021	15	6/11/2021	17
4/12/2021	14	5/12/2021	15	6/12/2021	16
4/13/2021	14	5/13/2021	15	6/13/2021	16
4/14/2021	14	5/14/2021	15	6/14/2021	17
4/15/2021	14	5/15/2021	15	6/15/2021	17
4/16/2021	14	5/16/2021	16	6/16/2021	17
4/17/2021	14	5/17/2021	16	6/17/2021	28
4/18/2021	14	5/18/2021	16	6/18/2021	42
4/19/2021	14	5/19/2021	16	6/19/2021	42
4/20/2021	14	5/20/2021	16	6/20/2021	42
4/21/2021	14	5/21/2021	16	6/21/2021	42
4/22/2021	14	5/22/2021	16	6/22/2021	48
4/23/2021	14	5/23/2021	16	6/23/2021	63
4/24/2021	14	5/24/2021	16	6/24/2021	71
4/25/2021	14	5/25/2021	16	6/25/2021	70
4/26/2021	14	5/26/2021	16	6/26/2021	68
4/27/2021	14	5/27/2021	16	6/27/2021	66
4/28/2021	14	5/28/2021	16	6/28/2021	70
4/29/2021	14	5/29/2021	16	6/29/2021	73
4/30/2021	14	5/30/2021	16	6/30/2021	73
		5/31/2021	16		

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
7/1/2021	72	8/1/2021	72	9/1/2021	71
7/2/2021	72	8/2/2021	71	9/2/2021	69
7/3/2021	72	8/3/2021	74	9/3/2021	66
7/4/2021	71	8/4/2021	76	9/4/2021	63
7/5/2021	71	8/5/2021	76	9/5/2021	60
7/6/2021	73	8/6/2021	75	9/6/2021	58
7/7/2021	76	8/7/2021	75	9/7/2021	62
7/8/2021	76	8/8/2021	74	9/8/2021	62
7/9/2021	75	8/9/2021	73	9/9/2021	59
7/10/2021	75	8/10/2021	73	9/10/2021	62
7/11/2021	75	8/11/2021	72	9/11/2021	62
7/12/2021	74	8/12/2021	72	9/12/2021	59
7/13/2021	74	8/13/2021	71	9/13/2021	57
7/14/2021	73	8/14/2021	71	9/14/2021	55
7/15/2021	73	8/15/2021	70	9/15/2021	53
7/16/2021	73	8/16/2021	70	9/16/2021	49
7/17/2021	73	8/17/2021	69	9/17/2021	49
7/18/2021	72	8/18/2021	68	9/18/2021	47
7/19/2021	76	8/19/2021	68	9/19/2021	47
7/20/2021	79	8/20/2021	67	9/20/2021	45
7/21/2021	83	8/21/2021	67	9/21/2021	44
7/22/2021	89	8/22/2021	66	9/22/2021	43
7/23/2021	88	8/23/2021	66	9/23/2021	41
7/24/2021	88	8/24/2021	69	9/24/2021	40
7/25/2021	88	8/25/2021	72	9/25/2021	39
7/26/2021	81	8/26/2021	71	9/26/2021	38
7/27/2021	75	8/27/2021	70	9/27/2021	37
7/28/2021	75	8/28/2021	69	9/28/2021	37
7/29/2021	74	8/29/2021	67	9/29/2021	36
7/30/2021	73	8/30/2021	66	9/30/2021	35
7/31/2021	73	8/31/2021	68		

Appendix K-2. Reported daily average flows for Crescent Creek at Highway 58 in Water Year 2021.

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
1/1/2021	59	2/1/2021	55	3/1/2021	54
1/2/2021	59	2/2/2021	57	3/2/2021	54
1/3/2021	67	2/3/2021	59	3/3/2021	54
1/4/2021	70	2/4/2021	98	3/4/2021	55
1/5/2021	61	2/5/2021	68	3/5/2021	56
1/6/2021	60	2/6/2021	58	3/6/2021	56
1/7/2021	57	2/7/2021	54	3/7/2021	55
1/8/2021	57	2/8/2021	60	3/8/2021	53
1/9/2021	59	2/9/2021	51	3/9/2021	53
1/10/2021	54	2/10/2021	54	3/10/2021	53
1/11/2021	53	2/11/2021	51	3/11/2021	52
1/12/2021	65	2/12/2021	52	3/12/2021	51
1/13/2021	154	2/13/2021	55	3/13/2021	51
1/14/2021	127	2/14/2021	54	3/14/2021	53
1/15/2021	109	2/15/2021	59	3/15/2021	52
1/16/2021	90	2/16/2021	60	3/16/2021	51
1/17/2021	79	2/17/2021	58	3/17/2021	52
1/18/2021	78	2/18/2021	56	3/18/2021	54
1/19/2021	86	2/19/2021	61	3/19/2021	57
1/20/2021	84	2/20/2021	58	3/20/2021	56
1/21/2021	63	2/21/2021	57	3/21/2021	55
1/22/2021	62	2/22/2021	57	3/22/2021	56
1/23/2021	60	2/23/2021	60	3/23/2021	54
1/24/2021	68	2/24/2021	58	3/24/2021	54
1/25/2021	62	2/25/2021	57	3/25/2021	54
1/26/2021	104	2/26/2021	57	3/26/2021	54
1/27/2021	151	2/27/2021	57	3/27/2021	58
1/28/2021	120	2/28/2021	55	3/28/2021	67
1/29/2021	101			3/29/2021	73
1/30/2021	58			3/30/2021	65
1/31/2021	55			3/31/2021	65

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
4/1/2021	73	5/1/2021	90	6/1/2021	68
4/2/2021	81	5/2/2021	94	6/2/2021	67
4/3/2021	83	5/3/2021	100	6/3/2021	67
4/4/2021	85	5/4/2021	103	6/4/2021	69
4/5/2021	84	5/5/2021	104	6/5/2021	71
4/6/2021	79	5/6/2021	104	6/6/2021	73
4/7/2021	80	5/7/2021	103	6/7/2021	73
4/8/2021	79	5/8/2021	104	6/8/2021	72
4/9/2021	77	5/9/2021	106	6/9/2021	70
4/10/2021	77	5/10/2021	104	6/10/2021	68
4/11/2021	75	5/11/2021	101	6/11/2021	68
4/12/2021	74	5/12/2021	96	6/12/2021	73
4/13/2021	73	5/13/2021	91	6/13/2021	68
4/14/2021	73	5/14/2021	90	6/14/2021	67
4/15/2021	73	5/15/2021	91	6/15/2021	66
4/16/2021	75	5/16/2021	93	6/16/2021	62
4/17/2021	76	5/17/2021	95	6/17/2021	64
4/18/2021	78	5/18/2021	97	6/18/2021	77
4/19/2021	80	5/19/2021	97	6/19/2021	76
4/20/2021	87	5/20/2021	100	6/20/2021	74
4/21/2021	88	5/21/2021	101	6/21/2021	72
4/22/2021	89	5/22/2021	96	6/22/2021	76
4/23/2021	91	5/23/2021	92	6/23/2021	89
4/24/2021	95	5/24/2021	86	6/24/2021	99
4/25/2021	101	5/25/2021	87	6/25/2021	96
4/26/2021	105	5/26/2021	81	6/26/2021	94
4/27/2021	101	5/27/2021	78	6/27/2021	90
4/28/2021	96	5/28/2021	76	6/28/2021	90
4/29/2021	91	5/29/2021	73	6/29/2021	96
4/30/2021	88	5/30/2021	71	6/30/2021	93
		5/31/2021	69		

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
7/1/2021	91	8/1/2021	83	9/1/2021	77
7/2/2021	89	8/2/2021	80	9/2/2021	76
7/3/2021	88	8/3/2021	81	9/3/2021	73
7/4/2021	86	8/4/2021	84	9/4/2021	71
7/5/2021	85	8/5/2021	84	9/5/2021	69
7/6/2021	85	8/6/2021	83	9/6/2021	67
7/7/2021	89	8/7/2021	82	9/7/2021	68
7/8/2021	88	8/8/2021	81	9/8/2021	71
7/9/2021	87	8/9/2021	80	9/9/2021	68
7/10/2021	86	8/10/2021	79	9/10/2021	73
7/11/2021	85	8/11/2021	78	9/11/2021	73
7/12/2021	84	8/12/2021	78	9/12/2021	69
7/13/2021	84	8/13/2021	78	9/13/2021	67
7/14/2021	83	8/14/2021	78	9/14/2021	65
7/15/2021	81	8/15/2021	78	9/15/2021	64
7/16/2021	82	8/16/2021	76	9/16/2021	74
7/17/2021	82	8/17/2021	75	9/17/2021	82
7/18/2021	81	8/18/2021	75	9/18/2021	84
7/19/2021	83	8/19/2021	75	9/19/2021	85
7/20/2021	85	8/20/2021	74	9/20/2021	83
7/21/2021	88	8/21/2021	74	9/21/2021	81
7/22/2021	97	8/22/2021	73	9/22/2021	81
7/23/2021	96	8/23/2021	73	9/23/2021	77
7/24/2021	96	8/24/2021	74	9/24/2021	71
7/25/2021	95	8/25/2021	79	9/25/2021	71
7/26/2021	91	8/26/2021	79	9/26/2021	71
7/27/2021	87	8/27/2021	77	9/27/2021	71
7/28/2021	86	8/28/2021	75	9/28/2021	71
7/29/2021	83	8/29/2021	73	9/29/2021	67
7/30/2021	85	8/30/2021	72	9/30/2021	61
7/31/2021	85	8/31/2021	73		

Appendix K-3. Reported daily average flows for the Little Deschutes River at La Pine (Hydromet Station LAPO) in Water Year 2021.

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
1/1/2021	89	2/1/2021	62	3/1/2021	72
1/2/2021	56	2/2/2021	70	3/2/2021	73
1/3/2021	49	2/3/2021	65	3/3/2021	72
1/4/2021	50	2/4/2021	54	3/4/2021	73
1/5/2021	54	2/5/2021	55	3/5/2021	74
1/6/2021	51	2/6/2021	73	3/6/2021	76
1/7/2021	39	2/7/2021	65	3/7/2021	76
1/8/2021	76	2/8/2021	60	3/8/2021	75
1/9/2021	83	2/9/2021	58	3/9/2021	73
1/10/2021	74	2/10/2021	61	3/10/2021	72
1/11/2021	85	2/11/2021	56	3/11/2021	71
1/12/2021	71	2/12/2021	54	3/12/2021	70
1/13/2021	84	2/13/2021	66	3/13/2021	68
1/14/2021	146	2/14/2021	64	3/14/2021	69
1/15/2021	158	2/15/2021	61	3/15/2021	70
1/16/2021	146	2/16/2021	67	3/16/2021	69
1/17/2021	131	2/17/2021	66	3/17/2021	67
1/18/2021	109	2/18/2021	68	3/18/2021	68
1/19/2021	88	2/19/2021	65	3/19/2021	70
1/20/2021	79	2/20/2021	66	3/20/2021	73
1/21/2021	90	2/21/2021	66	3/21/2021	74
1/22/2021	89	2/22/2021	63	3/22/2021	73
1/23/2021	75	2/23/2021	69	3/23/2021	74
1/24/2021	77	2/24/2021	71	3/24/2021	72
1/25/2021	70	2/25/2021	68	3/25/2021	72
1/26/2021	74	2/26/2021	67	3/26/2021	71
1/27/2021	64	2/27/2021	74	3/27/2021	70
1/28/2021	58	2/28/2021	72	3/28/2021	74
1/29/2021	73			3/29/2021	81
1/30/2021	66			3/30/2021	93
1/31/2021	65			3/31/2021	87

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
4/1/2021	83	5/1/2021	114	6/1/2021	84
4/2/2021	84	5/2/2021	118	6/2/2021	81
4/3/2021	93	5/3/2021	123	6/3/2021	81
4/4/2021	93	5/4/2021	129	6/4/2021	82
4/5/2021	86	5/5/2021	136	6/5/2021	84
4/6/2021	91	5/6/2021	138	6/6/2021	90
4/7/2021	88	5/7/2021	137	6/7/2021	95
4/8/2021	88	5/8/2021	146	6/8/2021	97
4/9/2021	86	5/9/2021	154	6/9/2021	94
4/10/2021	84	5/10/2021	159	6/10/2021	90
4/11/2021	84	5/11/2021	157	6/11/2021	86
4/12/2021	82	5/12/2021	150	6/12/2021	88
4/13/2021	79	5/13/2021	142	6/13/2021	91
4/14/2021	77	5/14/2021	137	6/14/2021	88
4/15/2021	76	5/15/2021	135	6/15/2021	88
4/16/2021	76	5/16/2021	138	6/16/2021	86
4/17/2021	78	5/17/2021	145	6/17/2021	81
4/18/2021	80	5/18/2021	148	6/18/2021	76
4/19/2021	83	5/19/2021	149	6/19/2021	84
4/20/2021	86	5/20/2021	153	6/20/2021	86
4/21/2021	92	5/21/2021	156	6/21/2021	84
4/22/2021	102	5/22/2021	159	6/22/2021	82
4/23/2021	106	5/23/2021	158	6/23/2021	82
4/24/2021	109	5/24/2021	150	6/24/2021	87
4/25/2021	112	5/25/2021	141	6/25/2021	99
4/26/2021	119	5/26/2021	137	6/26/2021	100
4/27/2021	125	5/27/2021	115	6/27/2021	98
4/28/2021	123	5/28/2021	98	6/28/2021	94
4/29/2021	119	5/29/2021	94	6/29/2021	91
4/30/2021	114	5/30/2021	90	6/30/2021	95
		5/31/2021	87		

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
7/1/2021	92	8/1/2021	68	9/1/2021	56
7/2/2021	83	8/2/2021	65	9/2/2021	62
7/3/2021	77	8/3/2021	63	9/3/2021	63
7/4/2021	76	8/4/2021	62	9/4/2021	62
7/5/2021	74	8/5/2021	64	9/5/2021	59
7/6/2021	74	8/6/2021	64	9/6/2021	55
7/7/2021	74	8/7/2021	63	9/7/2021	53
7/8/2021	75	8/8/2021	61	9/8/2021	52
7/9/2021	75	8/9/2021	60	9/9/2021	58
7/10/2021	75	8/10/2021	59	9/10/2021	61
7/11/2021	73	8/11/2021	59	9/11/2021	64
7/12/2021	71	8/12/2021	58	9/12/2021	62
7/13/2021	70	8/13/2021	58	9/13/2021	59
7/14/2021	69	8/14/2021	58	9/14/2021	55
7/15/2021	69	8/15/2021	58	9/15/2021	51
7/16/2021	68	8/16/2021	57	9/16/2021	50
7/17/2021	67	8/17/2021	54	9/17/2021	47
7/18/2021	67	8/18/2021	57	9/18/2021	46
7/19/2021	67	8/19/2021	58	9/19/2021	49
7/20/2021	66	8/20/2021	58	9/20/2021	49
7/21/2021	70	8/21/2021	57	9/21/2021	47
7/22/2021	70	8/22/2021	58	9/22/2021	45
7/23/2021	76	8/23/2021	59	9/23/2021	44
7/24/2021	77	8/24/2021	58	9/24/2021	43
7/25/2021	74	8/25/2021	58	9/25/2021	41
7/26/2021	73	8/26/2021	63	9/26/2021	39
7/27/2021	76	8/27/2021	64	9/27/2021	38
7/28/2021	75	8/28/2021	63	9/28/2021	39
7/29/2021	71	8/29/2021	61	9/29/2021	40
7/30/2021	71	8/30/2021	59	9/30/2021	39
7/31/2021	70	8/31/2021	58		

APPENDIX L
Oregon Spotted Frog
Egg Mass Survey Report

2021 Annual Report
Upper Deschutes Basin
Oregon Spotted Frog (*Rana pretiosa*)
Egg Mass Surveys

Monitoring Conducted in Compliance with ESA Section 10 Incidental Take Permit TE-89773D-0 and Deschutes Basin Habitat Conservation Plan

Prepared for: Deschutes Basin Board of Control
P. O. Box 919
Madras, Oregon 97741

Prepared by: Biota Pacific Environmental Sciences, Inc.
P. O. Box 158
Bothell, Washington 98041

Smayda Environmental Associates, Inc.
139 NE 61st Street
Seattle, Washington 98115

Mount Hood Environmental
P. O. Box 744
Boring, Oregon 97009

December 2021

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1.0 Introduction

1.1 Regulatory Background

On December 31, 2020, eight Deschutes Basin irrigation districts (Arnold, Central Oregon, Lone Pine, North Unit, Ochoco, Swalley, Three Sisters and Tumalo) and the City of Prineville, Oregon (City) received Endangered Species Act (ESA) Section 10 Incidental Take Permit TE-89773D-0 for two species that occur on lands affected by irrigation district and City activities; bull trout (*Salvelinus confluentus*) and Oregon spotted frog (*Rana pretiosa*). The Deschutes Basin Habitat Conservation Plan (DBHCP), which was prepared to support the application for incidental take permit, requires continued monitoring of Oregon spotted frog populations on the lands affected by the covered activities. This report contains the results of a portion of that monitoring.

1.2 Biological and Operational Background

Oregon spotted frogs are known to be present in wetlands that are hydrologically influenced by the operation of Crane Prairie, Wickiup and Crescent Lake dams and reservoirs (Figure 1). The species is present within Crane Prairie and Wickiup reservoirs, in the Deschutes River between the reservoirs, and in the Deschutes River downstream of Wickiup Dam as far as the City of Bend. Oregon spotted frogs are also present in Crescent Creek downstream of Crescent Lake Dam, but they are not present upstream of the dam in Crescent Lake Reservoir.

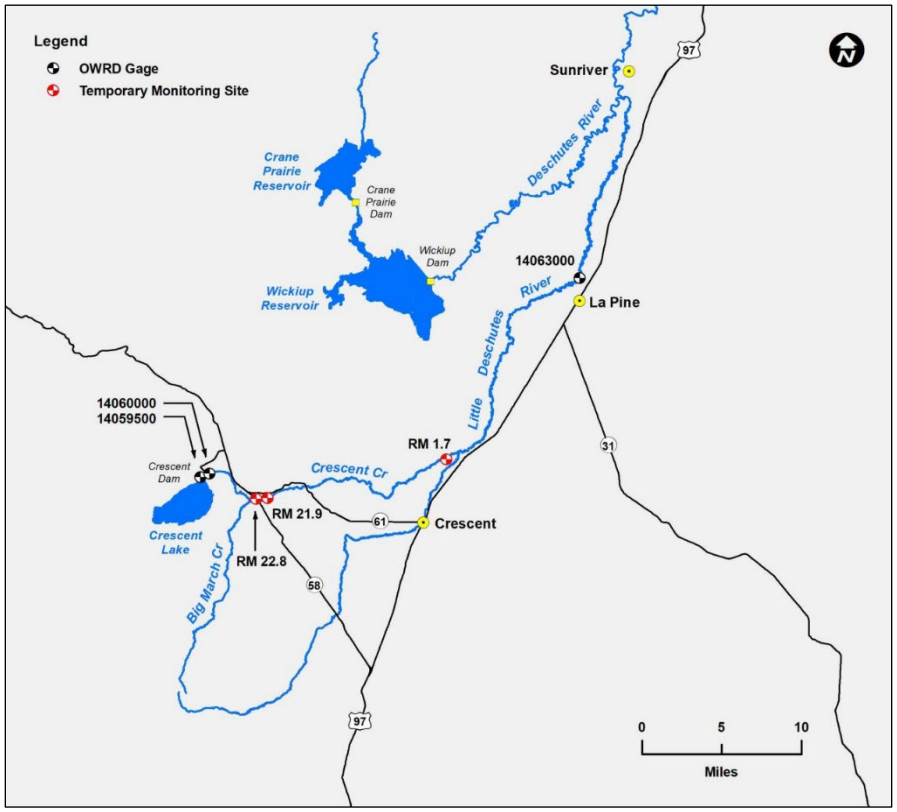


Figure 1. Map of the Upper Deschutes Basin showing Crane Prairie, Wickiup and Crescent Lake reservoirs.

Most of the wetlands that support Oregon spotted frogs are known to experience seasonal fluctuations in water surface elevation. Depending on time of year and location, these fluctuations are the result of natural weather events (such as rain and snowmelt) and/or alterations in streamflow related to the storage and release of irrigation water from Crane Prairie, Wickiup and Crescent Lake reservoirs.

Beginning in late 2016, operations at Crane Prairie Reservoir were modified to protect breeding, rearing and overwintering habitat for the Oregon spotted frog. On January 1, 2021, operation of the reservoir was modified again to comply with Conservation Measure CP-1 of the Final DBHCP and provide additional benefits for the Oregon spotted frog. The current (DBHCP) operating regime for Crane Prairie Reservoir requires storage volumes of at least 37,870 acre-feet at all times (with certain exceptions) and at least 46,800 acre-feet by March 15 of each year. From March 15 through July 15, water surface elevation of the reservoir is held relatively constant to protect breeding habitat for the frog. From July 16 through October 31 irrigation storage is released from the reservoir, with the rate of release limited to specified maximums to avoid the stranding of young frogs.

The operation of Wickiup Reservoir has also been modified by the Final DBHCP. The minimum flow below Wickiup Dam during the storage season (September 16 through March 31) is currently 100 cfs, plus any additional flow resulting from corresponding permanent transfers of live flow from Central Oregon Irrigation District to North Unit Irrigation District during the irrigation season. This minimum storage season flow will increase above 100 cfs beginning in Year 8 of DBHCP implementation. The timing and rate of seasonal ramp-up and ramp-down of irrigation releases from Wickiup Reservoir have also been modified to comply with Conservation Measure WR-1 of the Final DBHCP.

At Crescent Lake Reservoir, Tumalo Irrigation District maintains outflows of at least 10 cfs from October 1 through June 30 and 50 cfs from July 1 through September 30 to support Oregon spotted frog habitat along lower Crescent Creek and the lower Little Deschutes River. Portions of the available storage in Crescent Lake Reservoir are also allocated for use by USFWS to increase these minimum flows, if desired. Like Wickiup Reservoir, the timing and rate of change in outflow from Crescent Lake Reservoir are also regulated to minimize downstream impacts to Oregon spotted frogs.

Chapter 7 of the Final DBHCP requires the eight irrigation districts and the City (collectively called the Permittees) to conduct monitoring of Oregon spotted frogs and their habitat at specified times and places, and to provide qualified biologists to support similar monitoring by USFWS. This report provides data for the egg mass surveys conducted by Biota Pacific, Smayda Environmental and Mt. Hood Environmental (collectively the Biota Pacific team) on behalf of the Permittees, as well as the portions of the egg mass surveys for which the Biota Pacific team assisted USFWS. The results of Oregon spotted frog habitat surveys and other monitoring requirements of the DBHCP are reported elsewhere.

2.0 Survey Locations

Surveys for Oregon spotted frog egg masses were conducted at known breeding locations at three sites along Crescent Creek, three sites along the north shore of Crane Prairie Reservoir, one site east of Crane Prairie Reservoir and three sites along the Little Deschutes River (Table 1).

Table 1. Oregon spotted frog egg mass survey locations in 2021.

Location	Stream Reach Description
Crescent Creek	
RM 1.74	BLM parcel upstream of confluence with Little Deschutes River
RM 21.9	Downstream of Highway 58 crossing
RM 22.8	Large oxbow upstream of Highway 58 crossing
Crane Prairie Reservoir	
NE Bay	East of the Deschutes River outlet
NW Bay	West of the Deschutes River outlet to the Cultus River outlet, including pond at Deschutes River Bridge
Cultus River to Cultus Creek	Cultus River outlet to Cultus Creek outlet
Goldfish Pond	Isolated pond located east of Crane Prairie Reservoir
Little Deschutes River	
Leona Park	Downstream half of oxbow (public lands) connected to Little Deschutes River
Rosland Campground	Series of oxbows adjacent to Little Deschutes River
LaPine High School Sloughs	Two oxbows on BLM lands adjacent to Little Deschutes River and Long Prairie Creek

3.0 Methods

Surveys were conducted by two or more biologists with previous training in the survey methods and experience surveying for Oregon spotted frogs in the Deschutes Basin. Survey activities were conducted by named permittees in accordance with the Special Terms and Conditions of Federal Fish and Wildlife Permit TE-58481B (ESA Section 10(a)(1)(A) recovery permit) issued May 16, 2019 to Biota Pacific Environmental Sciences. Survey methods followed those described by Pearl et al. (2010) for visual encounter surveys. The USGS Amphibian Breeding Survey Form was used to record the results of each survey visit. Additional details on the survey methods can be found in the 2017 Final OSF Breeding Survey Report (Biota Pacific 2017). The surveys were conducted between April 12 and 27, 2021.

4.0 Results

Survey results are summarized below. Detailed results, including dates of observations and UTM coordinates for oviposition sites, have been provided directly to USFWS in digital form as Microsoft Excel spreadsheet format for incorporation into its regional database.

4.1 Crescent Creek 2021

Oregon spotted frog egg masses were documented in 2021 at all three Crescent Creek locations (Table 2). Water levels were low enough at River Mile (RM) 1.74 on April 12 that the left bank was accessible, as well as the right bank. Ten oviposition sites and 20 egg masses total were observed.

No egg masses were observed at RM 21.9 on April 12, but four egg masses were observed at a single oviposition site in the main oxbow on April 27. Water levels were very low at this site, and the majority of both oxbows lacked surface water.

Fifteen egg masses were documented at two oviposition sites in the main oxbow at RM 22.8 on April 12. The 'East Subarea' lacked surface water and was omitted from the survey.

Table 2. Oregon spotted frog egg mass counts on Crescent Creek in 2021.

Crescent Creek Site / Subarea	Number of Oviposition Sites	Number of Egg Masses	Number of Juveniles/Adults
RM 1.74			
Right Bank	3	8	0
Left Bank	7	12	0
RM 1.74 Total	**10**	**20**	**0**
RM 21.9			
Near Subarea (near river)	0	0	0
Far Subarea (main oxbow)	1	4	0
RM 21.9 Total	**1**	**4**	**0**
RM 22.8			
Main Oxbow	2	15	0
Inlet Pond	0	0	0
RM 22.8 Total	**2**	**15**	**0**

4.2 Crescent Creek 2015-2021 Summary

Table 3 presents a summary of the Oregon spotted frog egg masses observed at the Crescent Creek locations from 2015 through 2021, except 2020 when surveys were interrupted by COVID travel restrictions (Biota Pacific 2016, 2017, 2018, 2019).

Table 3. Summary of Oregon spotted frog egg mass counts on Crescent Creek in 2015-2021.

Crescent Creek Site / Subarea		Total Number of Egg Masses Observed					
		2015	2016	2017	2018	2019	2021
RM 1.74	Right bank; west end of pond	20	9	12	7	10	8
RM 1.74	Left Bank	NV	NV	NV	15	NV	12
	RM 1.74 Total	**20**	**9**	**12**	**22**	**10**	**20**
RM 21.9	Near Subarea (near river)	2	1	0	0	0	0
RM 21.9	Far Subarea (main oxbow)	5	5	6	7	12	4
	RM 21.9 Total	**7**	**6**	**6**	**7**	**12**	**4**
RM 22.8	Main oxbow pond	16	13	23	23	12	15
RM 22.8	Inlet pond	0	0	0	0	0	0
RM 22.8	East	1	0	0	0	0	NV
	RM 22.8 Total	**17**	**13**	**23**	**23**	**12**	**15**

NV = Not visited
No surveys conducted in 2020 due to COVID-19 restrictions

4.3 Crane Prairie Reservoir

The Biota Pacific team assisted USFWS during two days of egg mass surveys along the northern shore of Crane Prairie Reservoir on April 19-20, 2021. The survey area included the NE Bay (east of the Deschutes River outlet), NW Bay (Deschutes River outlet to Cultus River outlet including a small pond west of the Deschutes River Bridge), the Cultus River outlet to Cultus Creek, and an isolated pond on the east side of the reservoir locally known as the Goldfish Pond. The results presented here (Table 4) include all oviposition sites and egg masses documented by the Biota Pacific team; oviposition site and egg mass data recorded by USFWS are reported elsewhere.

Nine oviposition sites with 52 egg masses were documented in NE Bay on April 19, 2021 by the Biota Pacific team. A single OSF was also observed during the survey.

Emergent wetlands along the shoreline between the Cultus River outlet and Cultus Creek were surveyed on April 19, 2021. Seven oviposition sites with a total of 67 egg masses were recorded, as well as a single OSF measuring 24 mm SVL.

On April 20, 2021 the reach between the Deschutes River and Cultus River outlets was surveyed; the Biota Pacific team recorded 24 oviposition sites and 140 egg masses. A small pond located on the right bank of the Deschutes River at the Cow Meadow Campground bridge was surveyed on April 19; no egg masses were observed but one adult OSF was spotted in the pond.

The Goldfish Pond was surveyed on April 20; a single oviposition site with six egg masses and one adult frog estimated at approximately 32mm SVL were recorded.

4.4 Little Deschutes River

Egg mass surveys were conducted on the Little Deschutes River sites at Leona Park, Rosland Park and High School Sloughs on April 13, 2021. Water levels at all the sites were low, with many portions of the sedge wetlands and slough channels lacking surface water. The riverward end of the pond at Leona Park supported four oviposition sites with approximately 31 egg masses, several of which were partially out of water.

No oviposition sites were found at Rosland Campground and the area was almost entirely unsuitable for breeding due to low water.

No egg masses were found at the High School Sloughs site on April 13 or on a return visit on April 27. Much of the area lacked surface water and on April 13 many of the wetted areas were covered by ice.

Table 4. Oregon spotted frog egg mass counts at other Upper Deschutes Basin sites in 2021.

Upper Deschutes Basin Site / Subarea	Number of Oviposition Sites	Number of Egg Masses	Number of Juveniles/Adults
Crane Prairie Reservoir			
NE Bay (east of Deschutes River)[1]	9	52	1
NW Bay (Deschutes River to Cultus River)[1]	24	140	1
Cultus River to Cultus Creek	7	67	1
Goldfish Pond	1	6	1
Crane Prairie Reservoir Total	**41**	**265**	**4**
Little Deschutes River			
Leona Park	4	31	0
Rosland Park	0	0	0
High School Sloughs	0	0	0
Little Deschutes River Total	**4**	**31**	**0**

[1] Data collected by Biota Pacific team during the April 19-20 Crane Prairie Reservoir surveys; additional egg mass data collected by USFWS at these sites are summarized elsewhere.

5.0 References

Biota Pacific. 2016. Final Report, 2015 and 2016 Oregon spotted frog (*Rana pretiosa*) Crescent Creek egg mass surveys. Prepared for Deschutes Basin Board of Control and City of Prineville, Oregon by Biota Pacific Environmental Sciences and Smayda Environmental Associates, Inc., October 2016.

Biota Pacific. 2017. Final Report, 2017 Oregon spotted frog (*Rana pretiosa*) Crescent Creek Egg Mass Surveys. Prepared for Deschutes Basin Board of Control and City of Prineville, Oregon by Biota Pacific Environmental Sciences and Smayda Environmental Associates, Inc., December 2017.

Biota Pacific. 2018. 2018 Annual Report. Upper Deschutes Basin Oregon Spotted Frog (*Rana pretiosa*) Egg Mass Surveys. Prepared for Deschutes Basin Board of Control and City of Prineville, Oregon by Biota Pacific Environmental Sciences and Smayda Environmental Associates, Inc., December 2018.

Biota Pacific. 2019. 2019 Annual Report. Upper Deschutes Basin Oregon Spotted Frog (*Rana pretiosa*) Egg Mass Surveys. Prepared for Deschutes Basin Board of Control and City of Prineville, Oregon by Biota Pacific Environmental Sciences and Smayda Environmental Associates, Inc., November 2019.

Pearl, C., D. Clayton, and L. Turner. 2010. Surveys for presence of Oregon spotted frog (*Rana pretiosa*): Background information and field methods. U.S. Geological Survey, Corvallis, OR.

U.S. Fish and Wildlife Service (USFWS). 2014. Endangered and threatened wildlife and plants: threatened status for Oregon spotted frog; final rule. Federal Register 79(168): 51658-51710. August 29, 2014.

APPENDIX M
Crescent Creek Correspondence

From: Moran, Bridget N <bridget_moran@fws.gov>
Sent: Thursday, June 3, 2021 5:25 PM
To: Chris Schull <chris@tumalo.org>
Cc: OReilly, Jennifer <jennifer_oreilly@fws.gov>; Martin E. Vaughn <mvaughn@biotapacific.com>
Subject: May coordination call notes FWS/TID

Hi Chris,
Thanks for reaching out to us last week to coordinate on flows in Crescent Creek. Jennifer O'Reilly and I were glad we could connect; and we appreciate your proactive approach to addressing the drought conditions in this first year implementing the Deschutes Basin Habitat Conservation Plan (DBHCP).

My understanding from your call is given the current level of storage in Crescent Reservoir (~24k AF), and the predicted additional inflows into the reservoir, you are concerned with Tumalo Irrigation District's ability to sustain the DHBCP's minimum flow of 50 cfs from July 1 - Sept. 30th.

We are seeing unprecedented levels of drought throughout the DBHCP's lands in this first year and will need to stay in close contact so we can address the concerns that you raised.

As we discussed, please keep us appraised of your anticipated turn-on date for Crescent, as we are anticipating biological and habitat monitoring ahead of, and throughout this season of use for TID.

We also appreciated your commitment to get us the download from the newly installed gauge on Hwy 58 (thank you).

I hope your recovering from your surgery and that you can be back at full capacity soon; however we understand that might take a bit.

Best,

Bridget Moran, Field Supervisor
Bend Field Office
U.S. Fish & Wildlife Service

(541) 480-7914

From: "Moran, Bridget N" <bridget_moran@fws.gov>
Date: 8/6/21 15:34 (GMT-08:00)
To: Chris Schull <chris@tumalo.org>
Cc: "OReilly, Jennifer" <jennifer_oreilly@fws.gov>
Subject: Big Marsh gauge data?

Hi Chris,
Following up on our last conversation, I'm checking in to see if you have an update on when we'll be able to access or get the download of the data from the recently installed Big Marsh gauge. We understand there were challenges accessing the site earlier, but wanted to see if that data was now available.

Please let us know and we'll follow up on a method to obtain it.

Thanks,

Bridget Moran, Field Supervisor
Bend Field Office
U.S. Fish & Wildlife Service

(541) 480-7914

From: Chris Schull <chris@tumalo.org>
Sent: Friday, August 6, 2021 3:38 PM
To: Moran, Bridget N <bridget_moran@fws.gov>
Cc: OReilly, Jennifer <jennifer_oreilly@fws.gov>
Subject: [EXTERNAL] RE: Big Marsh gauge data?

Hello Bridget,
I am hoping to have time to go download the data next week. I will get that over to you as soon as I get it.

Chris

From: Moran, Bridget N <bridget_moran@fws.gov>
Sent: Monday, September 13, 2021 9:25 AM
To: Chris Schull <chris@tumalo.org>
Cc: OReilly, Jennifer <jennifer_oreilly@fws.gov>
Subject: Re: [EXTERNAL] RE: Big Marsh gauge data?

Hi Chris,
Just checking in to see if you have downloaded the Big Marsh gauge data? Please send if you have it, thanks!

Bridget Moran, Field Supervisor
Bend Field Office
U.S. Fish & Wildlife Service

(541) 480-7914

From: Chris Schull <chris@tumalo.org>
Sent: Wednesday, September 15, 2021 12:20 PM
To: Moran, Bridget N <bridget_moran@fws.gov>
Cc: OReilly, Jennifer <jennifer_oreilly@fws.gov>
Subject: RE: [EXTERNAL] RE: Big Marsh gauge data?

Bridget,
I have been doing QA/QC on the data to make sure it is correct.
There are 3 columns of interest.
Ground Depth is a constant that is measured from the bottom of the instrument to the actual gravel river channel
Target is instrument measured from bottom of instrument to top of water
Depth is instrument measured difference between top of water surface to ground depth.

Also I would like to schedule a time to talk about a proposed Forest Service project that will directly effect Tumalo's ability to meet the flow rates from the HCP. This will directly affect our ability to deliver the agreed upon rates when the lake level is around 45,000 ac ft. and down.

Thank you

Chris Schull
District Manager
Tumalo Irrigation District
64697 Cook Ave.
Bend, Oregon 97703
Office: (541)382-3053
Cell: (541)640-0634

From: Chris Schull <chris@tumalo.org>
Sent: Monday, September 20, 2021 8:50 AM
To: Moran, Bridget N <bridget_moran@fws.gov>
Cc: OReilly, Jennifer <jennifer_oreilly@fws.gov>; Martiin Vaughn <mvaughn@biotapacific.com>
Subject: Crescent outflow

Bridget,
Just an update for you, TID is having a issue keeping the outflow level at 50 CFS. Currently we are cleaning screens 3 times a week and without any head pressure in the lake, the flow level keeps dropping into the 45 to 47 CFS range. We will keep working on keeping it as high as possible until the 30th of September.

Chris Schull
District Manager
Tumalo Irrigation District
64697 Cook Ave.
Bend, Oregon 97703
Office: (541)382-3053
Cell: (541)640-0634

APPENDIX N
Whychus Creek Flow and Temperature Data

Appendix N-1. Raw and provisional flow data for Whychus Creek at OWRD Gage 14076020 in Water Year 2021.

Date	OWRD Provisional Data	OWRD Raw Data		
	Daily Average Flow (cfs)	Daily Average Flow (cfs)	Daily Minimum Flow (cfs)	Flow Less Than 20 cfs for More Than 1 Hour
1/1/2021	72	72	70	no
1/2/2021	44	44	25	no
1/3/2021	35	35	28	no
1/4/2021	37	37	32	no
1/5/2021	28	28	24	no
1/6/2021	24	24	21	no
1/7/2021	24	24	23	no
1/8/2021	27	27	23	no
1/9/2021	58	58	24	no
1/10/2021	66	66	64	no
1/11/2021	63	63	52	no
1/12/2021	170	-	-	no
1/13/2021	380	197	148	no
1/14/2021	197	132	113	no
1/15/2021	132	104	96	no
1/16/2021	104	89	83	no
1/17/2021	89	77	72	no
1/18/2021	77	69	63	no
1/19/2021	69	75	63	no
1/20/2021	75	90	63	no
1/21/2021	91	96	93	no
1/22/2021	96	91	80	no
1/23/2021	91	89	78	no
1/24/2021	89	88	75	no
1/25/2021	88	-	-	no
1/26/2021	85	-	-	no
1/27/2021	85	81	80	no
1/28/2021	81	78	72	no
1/29/2021	78	76	76	no
1/30/2021	76	76	75	no
1/31/2021	76	76	75	no

Date	OWRD Provisional Data	OWRD Raw Data		
	Daily Average Flow (cfs)	Daily Average Flow (cfs)	Daily Minimum Flow (cfs)	Flow Less Than 20 cfs for More Than 1 Hour
2/1/2021	76	76	74	no
2/2/2021	76	76	74	no
2/3/2021	73	73	69	no
2/4/2021	70	-	-	no
2/5/2021	57	57	48	no
2/6/2021	46	46	40	no
2/7/2021	41	41	36	no
2/8/2021	44	44	35	no
2/9/2021	45	45	34	no
2/10/2021	44	44	36	no
2/11/2021	66	66	63	no
2/12/2021	65	65	61	no
2/13/2021	66	66	61	no
2/14/2021	70	70	66	no
2/15/2021	73	73	64	no
2/16/2021	64	64	61	no
2/17/2021	64	64	61	no
2/18/2021	68	68	59	no
2/19/2021	69	69	67	no
2/20/2021	65	65	63	no
2/21/2021	64	64	63	no
2/22/2021	68	68	63	no
2/23/2021	72	72	66	no
2/24/2021	66	66	61	no
2/25/2021	65	65	60	no
2/26/2021	63	63	58	no
2/27/2021	65	65	61	no
2/28/2021	66	66	62	no

Date	OWRD Provisional Data	OWRD Raw Data		
	Daily Average Flow (cfs)	Daily Average Flow (cfs)	Daily Minimum Flow (cfs)	Flow Less Than 20 cfs for More Than 1 Hour
3/1/2021	65	65	63	no
3/2/2021	65	65	63	no
3/3/2021	49	49	37	no
3/4/2021	37	37	36	no
3/5/2021	37	37	36	no
3/6/2021	36	36	35	no
3/7/2021	35	35	34	no
3/8/2021	34	34	34	no
3/9/2021	34	33	33	no
3/10/2021	33	33	28	no
3/11/2021	33	33	31	no
3/12/2021	34	34	26	no
3/13/2021	36	36	30	no
3/14/2021	37	37	36	no
3/15/2021	35	35	35	no
3/16/2021	34	34	29	no
3/17/2021	34	34	31	no
3/18/2021	36	35	34	no
3/19/2021	35	35	34	no
3/20/2021	34	34	34	no
3/21/2021	33	33	33	no
3/22/2021	34	34	34	no
3/23/2021	32	32	25	no
3/24/2021	33	33	31	no
3/25/2021	32	32	31	no
3/26/2021	31	31	25	no
3/27/2021	33	33	31	no
3/28/2021	37	37	34	no
3/29/2021	37	37	32	no
3/30/2021	36	36	24	no
3/31/2021	36	36	30	no

Date	OWRD Provisional Data	OWRD Raw Data		
	Daily Average Flow (cfs)	Daily Average Flow (cfs)	Daily Minimum Flow (cfs)	Flow Less Than 20 cfs for More Than 1 Hour
4/1/2021	38	38	34	no
4/2/2021	38	38	34	no
4/3/2021	38	38	34	no
4/4/2021	38	38	33	no
4/5/2021	31	31	27	no
4/6/2021	33	33	27	no
4/7/2021	36	36	33	no
4/8/2021	37	37	34	no
4/9/2021	34	34	30	no
4/10/2021	36	36	34	no
4/11/2021	34	34	33	no
4/12/2021	32	32	28	no
4/13/2021	29	28	24	no
4/14/2021	34	33	19	no
4/15/2021	37	37	26	no
4/16/2021	39	39	30	no
4/17/2021	41	41	31	no
4/18/2021	46	46	28	no
4/19/2021	46	46	29	no
4/20/2021	39	39	24	no
4/21/2021	38	38	26	no
4/22/2021	46	45	37	no
4/23/2021	47	47	36	no
4/24/2021	48	48	37	no
4/25/2021	40	40	31	no
4/26/2021	35	34	27	no
4/27/2021	36	36	19	no
4/28/2021	39	39	21	no
4/29/2021	45	45	25	no
4/30/2021	50	50	35	no

Date	OWRD Provisional Data	OWRD Raw Data		
	Daily Average Flow (cfs)	Daily Average Flow (cfs)	Daily Minimum Flow (cfs)	Flow Less Than 20 cfs for More Than 1 Hour
5/1/2021	73	72	57	no
5/2/2021	62	62	50	no
5/3/2021	51	51	42	no
5/4/2021	53	53	43	no
5/5/2021	56	56	46	no
5/6/2021	66	66	53	no
5/7/2021	60	60	53	no
5/8/2021	47	47	43	no
5/9/2021	53	53	40	no
5/10/2021	97	97	52	no
5/11/2021	51	51	32	no
5/12/2021	46	46	33	no
5/13/2021	52	52	38	no
5/14/2021	54	54	43	no
5/15/2021	55	55	41	no
5/16/2021	61	61	44	no
5/17/2021	71	71	51	no
5/18/2021	66	67	49	no
5/19/2021	46	46	38	no
5/20/2021	36	36	34	no
5/21/2021	32	32	29	no
5/22/2021	32	32	25	no
5/23/2021	30	30	25	no
5/24/2021	38	38	27	no
5/25/2021	41	41	31	no
5/26/2021	35	35	28	no
5/27/2021	43	43	31	no
5/28/2021	39	39	31	no
5/29/2021	38	38	31	no
5/30/2021	42	42	32	no
5/31/2021	48	48	37	no

Date	OWRD Provisional Data	OWRD Raw Data		
	Daily Average Flow (cfs)	Daily Average Flow (cfs)	Daily Minimum Flow (cfs)	Flow Less Than 20 cfs for More Than 1 Hour
6/1/2021	66	66	44	no
6/2/2021	104	103	68	no
6/3/2021	131	131	89	no
6/4/2021	111	112	83	no
6/5/2021	84	84	69	no
6/6/2021	53	53	44	no
6/7/2021	37	37	33	no
6/8/2021	31	31	27	no
6/9/2021	30	30	24	no
6/10/2021	30	30	23	no
6/11/2021	43	42	25	no
6/12/2021	94	94	59	no
6/13/2021	81	81	60	no
6/14/2021	91	91	72	no
6/15/2021	83	83	67	no
6/16/2021	59	59	47	no
6/17/2021	55	54	42	no
6/18/2021	78	78	49	no
6/19/2021	80	80	66	no
6/20/2021	88	88	71	no
6/21/2021	75	76	50	no
6/22/2021	63	63	48	no
6/23/2021	55	55	44	no
6/24/2021	58	58	45	no
6/25/2021	52	52	43	no
6/26/2021	53	53	42	no
6/27/2021	60	60	43	no
6/28/2021	65	65	48	no
6/29/2021	64	64	51	no
6/30/2021	58	58	47	no

Date	OWRD Provisional Data	OWRD Raw Data		
	Daily Average Flow (cfs)	Daily Average Flow (cfs)	Daily Minimum Flow (cfs)	Flow Less Than 20 cfs for More Than 1 Hour
7/1/2021	51	51	42	no
7/2/2021	43	43	36	no
7/3/2021	36	36	27	no
7/4/2021	32	32	26	no
7/5/2021	29	29	24	no
7/6/2021	27	27	23	no
7/7/2021	27	27	23	no
7/8/2021	30	30	22	no
7/9/2021	34	34	23	no
7/10/2021	37	37	24	no
7/11/2021	38	38	26	no
7/12/2021	35	35	19	no
7/13/2021	35	35	21	no
7/14/2021	36	36	25	no
7/15/2021	32	32	21	no
7/16/2021	30	30	18	**YES**
7/17/2021	27	27	21	no
7/18/2021	31	31	25	no
7/19/2021	34	34	26	no
7/20/2021	32	32	22	no
7/21/2021	28	28	18	**YES**
7/22/2021	20	20	15	**YES**
7/23/2021	26	25	20	no
7/24/2021	33	33	24	no
7/25/2021	42	42	36	no
7/26/2021	33	33	25	no
7/27/2021	34	34	26	no
7/28/2021	28	28	23	no
7/29/2021	31	31	24	no
7/30/2021	29	29	21	no
7/31/2021	27	27	22	no

Date	OWRD Provisional Data	OWRD Raw Data		
	Daily Average Flow (cfs)	Daily Average Flow (cfs)	Daily Minimum Flow (cfs)	Flow Less Than 20 cfs for More Than 1 Hour
8/1/2021	31	30	24	no
8/2/2021	29	29	22	no
8/3/2021	30	29	22	no
8/4/2021	29	29	21	no
8/5/2021	29	29	20	no
8/6/2021	29	29	17	**YES**
8/7/2021	31	31	22	no
8/8/2021	33	33	20	no
8/9/2021	27	27	15	**YES**
8/10/2021	24	24	15	**YES**
8/11/2021	29	29	17	**YES**
8/12/2021	33	33	21	no
8/13/2021	32	32	22	no
8/14/2021	31	31	20	no
8/15/2021	39	39	27	no
8/16/2021	30	30	13	**YES**
8/17/2021	24	24	16	**YES**
8/18/2021	24	24	22	no
8/19/2021	29	29	22	no
8/20/2021	27	27	16	**YES**
8/21/2021	28	28	17	**YES**
8/22/2021	35	35	24	no
8/23/2021	26	27	16	**YES**
8/24/2021	24	24	22	no
8/25/2021	24	24	22	no
8/26/2021	30	30	22	no
8/27/2021	32	32	13	**YES**
8/28/2021	34	34	19	no
8/29/2021	34	34	22	no
8/30/2021	24	24	20	no
8/31/2021	23	23	20	no

Date	OWRD Provisional Data	OWRD Raw Data		
	Daily Average Flow (cfs)	Daily Average Flow (cfs)	Daily Minimum Flow (cfs)	Flow Less Than 20 cfs for More Than 1 Hour
9/1/2021	23	23	20	no
9/2/2021	26	25	20	no
9/3/2021	28	28	18	no
9/4/2021	27	27	19	no
9/5/2021	33	33	23	no
9/6/2021	32	32	17	**YES**
9/7/2021	29	-	-	no
9/8/2021	31	-	-	no
9/9/2021	35	34	21	no
9/10/2021	32	32	16	**YES**
9/11/2021	22	22	17	**YES**
9/12/2021	22	22	19	**YES**
9/13/2021	23	23	17	**YES**
9/14/2021	24	23	20	no
9/15/2021	26	26	24	no
9/16/2021	24	24	22	no
9/17/2021	24	24	22	no
9/18/2021	31	31	17	no
9/19/2021	24	24	20	no
9/20/2021	23	23	20	no
9/21/2021	24	24	21	no
9/22/2021	26	26	25	no
9/23/2021	27	27	23	no
9/24/2021	30	30	22	no
9/25/2021	30	30	22	no
9/26/2021	30	30	22	no
9/27/2021	30	30	21	no
9/28/2021	25	25	20	no
9/29/2021	25	25	19	no
9/30/2021	24	24	18	no

Appendix N-2. Required minimum flows (cfs) in Whychus Creek at OWRD Gage 14076020 during Water Year 2021, as determined with the Deschutes River Conservancy proportionality calculator.

June 15 through August 4 (Stream should get about 30% of flow)			August 5 through September 30 (Stream should get about 29.0 - 29.5% of flow)		
Flow above TSID	Proportional Flow Below TSID[1]	Estimated Flow at Sisters[2]	Flow above TSID	Proportional Flow Below TSID[1]	Estimated Flow at Sisters[2]
140	40.73	30.45	130	37.36	27.08
138	40.20	29.92	128	36.84	26.56
136	39.66	29.38	126	36.32	26.04
134	39.13	28.85	124	35.80	35.52
132	38.60	28.32	122	35.28	25.00
130	38.07	27.79	120	34.76	24.48
128	37.54	27.26	119	34.51	24.23
126	37.00	26.46	118	34.25	23.97
124	36.47	26.19	117	33.99	23.71
122	35.94	21.73	116	33.73	23.45
120	35.41	25.13	115	33.47	23.19
119	35.14	24.86	114	33.21	22.93
118	34.88	24.60	113	32.95	22.67
117	34.61	24.33	112	32.69	22.41
116	34.34	24.06	111	32.43	22.15
115	34.08	23.80	110	32.17	21.89
114	33.81	23.53	109	31.91	21.63
113	33.55	23.27	108	31.65	21.37
112	33.28	23.00	107	31.39	21.11
111	33.01	22.73	106	31.13	20.85
110	32.75	22.47	105	30.87	20.59
109	32.48	22.20	104	30.61	20.33
108	32.22	21.94	103	30.35	20.07
107	31.96	21.68	102	30.09	19.81
106	31.70	21.42	101	29.84	19.56
105	31.44	21.16	100	29.58	19.30
104	31.18	20.90	99	29.32	19.04
103	30.92	20.64	98	29.06	18.78
102	30.66	20.38	97	28.80	18.52
101	30.40	20.12	96	28.54	18.26
100	30.09	19.86	95	28.28	18.00
99	29.82	19.81	94	28.02	17.74

June 15 through August 4 (Stream should get about 30% of flow)			August 5 through September 30 (Stream should get about 29.0 - 29.5% of flow)		
Flow above TSID	Proportional Flow Below TSID[1]	Estimated Flow at Sisters[2]	Flow above TSID	Proportional Flow Below TSID[1]	Estimated Flow at Sisters[2]
98	29.56	19.58	93	27.76	17.48
97	29.29	19.31	92	27.50	17.22
96	29.02	18.74	91	27.24	16.96
95	28.76	18.48	90	26.98	16.70
94	28.49	18.21	89	26.72	16.44
93	28.23	17.95	88	26.46	16.18
92	27.96	17.68	87	26.20	15.92
91	27.70	17.42	86	25.94	15.66
90	27.43	17.15	85	25.68	15.40
89	27.17	16.89	84	25.42	15.14
88	26.90	16.62	83	25.16	14.88
87	26.64	16.36	82	24.90	14.62
86	26.37	16.09	81	24.64	14.36
85	26.11	15.83	80	24.39	14.11
84	25.83	15.55	79	24.13	13.85
83	25.57	15.29	78	23.87	13.59
82	25.30	15.02	77	23.61	13.33
81	25.04	14.76	76	23.35	13.07
80	24.77	14.49	75	23.09	12.81
79	24.51	14.23	74	22.83	12.55
78	24.24	13.96	73	22.57	12.29
77	23.98	13.70	72	22.31	12.03
76	23.71	13.43	71	22.05	11.77
75	23.45	13.17	70	21.79	11.51
74	23.18	12.90	69	21.53	11.25
73	22.92	12.64	68	21.27	10.99
72	22.64	12.36	67	21.01	10.73
71	22.38	12.10	66	20.75	10.47
70	22.11	11.83	65	20.49	10.21
69	21.85	11.57	64	20.24	9.96
68	21.58	11.30	63	20.00	9.82
67	21.32	11.04	62	20.00	9.82
66	21.05	10.77	61	20.00	9.82
65	20.79	10.51	60	20.00	9.82
64	20.52	10.24	59	20.00	9.82
63	20.26	9.97	58	20.00	9.82

June 15 through August 4 (Stream should get about 30% of flow)			August 5 through September 30 (Stream should get about 29.0 - 29.5% of flow)		
Flow above TSID	**Proportional Flow Below TSID[1]**	**Estimated Flow at Sisters[2]**	**Flow above TSID**	**Proportional Flow Below TSID[1]**	**Estimated Flow at Sisters[2]**
62	20.00	9.71			
61	20.00	9.71			
60	20.00	9.71			
59	20.00	9.71			
58	20.00	9.71			

[1] Flow below TSID includes senior protected flow just below diversion and Sokol's water to divert.

[2] Flow at Sisters is an estimate to use in case the gage below TSID is out of order.

Appendix N-3. Reported daily average flows and daily maximum water temperatures for Whychus Creek at OWRD Gage 14076100 in Water Year 2021.

Date	Daily Average Flow (cfs)	Daily Maximum Water Temp (°C)	Date	Daily Average Flow (cfs)	Daily Maximum Water Temp (°C)
1/1/2021	69	3.7	2/1/2021	77	5.3
1/2/2021	49	4.6	2/2/2021	76	4.1
1/3/2021	33	4.8	2/3/2021	73	3.0
1/4/2021	34	5.4	2/4/2021	69	2.2
1/5/2021	28	3.2	2/5/2021	61	4.8
1/6/2021	22	5.0	2/6/2021	47	4.0
1/7/2021	23	4.1	2/7/2021	40	4.2
1/8/2021	24	4.2	2/8/2021	44	2.9
1/9/2021	45	1.9	2/9/2021	43	2.1
1/10/2021	61	1.7	2/10/2021	42	2.8
1/11/2021	59	3.7	2/11/2021	61	1.8
1/12/2021	155	4.6	2/12/2021	67	0.2
1/13/2021	453	4.3	2/13/2021	67	0.1
1/14/2021	204	2.8	2/14/2021	68	0.9
1/15/2021	143	4.8	2/15/2021	71	1.7
1/16/2021	114	3.9	2/16/2021	63	2.8
1/17/2021	96	5.2	2/17/2021	63	3.2
1/18/2021	83	3.0	2/18/2021	64	2.1
1/19/2021	74	1.7	2/19/2021	69	4.2
1/20/2021	77	2.2	2/20/2021	64	4.1
1/21/2021	90	4.3	2/21/2021	63	4.3
1/22/2021	99	3.5	2/22/2021	65	6.1
1/23/2021	91	1.4	2/23/2021	70	4.5
1/24/2021	88	1.0	2/24/2021	64	3.4
1/25/2021	84	1.4	2/25/2021	63	4.4
1/26/2021	83	0.7	2/26/2021	61	3.1
1/27/2021	87	1.6	2/27/2021	61	3.5
1/28/2021	84	1.6	2/28/2021	62	4.7
1/29/2021	79	3.0			
1/30/2021	77	3.7			
1/31/2021	77	4.4			

Date	Daily Average Flow (cfs)	Daily Maximum Water Temp (°C)	Date	Daily Average Flow (cfs)	Daily Maximum Water Temp (°C)
3/1/2021	63	-	4/1/2021	32	-
3/2/2021	63	-	4/2/2021	32	9.5
3/3/2021	46	-	4/3/2021	32	10.1
3/4/2021	32	-	4/4/2021	33	9.1
3/5/2021	31	-	4/5/2021	29	9.7
3/6/2021	31	-	4/6/2021	27	9.9
3/7/2021	30	-	4/7/2021	31	10.4
3/8/2021	29	-	4/8/2021	33	9.5
3/9/2021	28	-	4/9/2021	29	9.7
3/10/2021	28	-	4/10/2021	31	9.1
3/11/2021	27	-	4/11/2021	29	9.8
3/12/2021	28	-	4/12/2021	29	9.2
3/13/2021	30	-	4/13/2021	25	9.5
3/14/2021	32	-	4/14/2021	27	10.0
3/15/2021	30	-	4/15/2021	33	10.7
3/16/2021	29	-	4/16/2021	33	11.3
3/17/2021	29	-	4/17/2021	35	11.7
3/18/2021	30	-	4/18/2021	39	13.1
3/19/2021	31	-	4/19/2021	44	12.0
3/20/2021	30	-	4/20/2021	36	11.1
3/21/2021	29	-	4/21/2021	32	11.7
3/22/2021	30	-	4/22/2021	39	12.1
3/23/2021	28	-	4/23/2021	42	9.6
3/24/2021	29	-	4/24/2021	43	10.5
3/25/2021	29	-	4/25/2021	40	7.6
3/26/2021	28	-	4/26/2021	29	11.7
3/27/2021	29	-	4/27/2021	30	12.4
3/28/2021	31	-	4/28/2021	33	13.3
3/29/2021	33	-	4/29/2021	38	14.8
3/30/2021	31	-	4/30/2021	44	13.4
3/31/2021	31	-			

Date	Daily Average Flow (cfs)	Daily Maximum Water Temp (°C)	Date	Daily Average Flow (cfs)	Daily Maximum Water Temp (°C)
5/1/2021	65	13.0	6/1/2021	51	17.3
5/2/2021	61	12.3	6/2/2021	88	17.1
5/3/2021	46	12.3	6/3/2021	130	15.5
5/4/2021	47	13.8	6/4/2021	116	14.2
5/5/2021	50	13.0	6/5/2021	91	13.6
5/6/2021	58	12.8	6/6/2021	55	11.3
5/7/2021	59	10.9	6/7/2021	33	11.2
5/8/2021	42	10.2	6/8/2021	25	11.2
5/9/2021	39	10.6	6/9/2021	24	10.4
5/10/2021	95	11.0	6/10/2021	24	15.1
5/11/2021	48	13.9	6/11/2021	30	11.3
5/12/2021	40	14.8	6/12/2021	91	13.8
5/13/2021	44	14.7	6/13/2021	78	15.7
5/14/2021	48	13.1	6/14/2021	88	12.9
5/15/2021	45	14.3	6/15/2021	83	14.1
5/16/2021	51	14.8	6/16/2021	57	14.8
5/17/2021	60	14.0	6/17/2021	46	16.4
5/18/2021	63	11.5	6/18/2021	75	16.0
5/19/2021	39	11.0	6/19/2021	75	16.7
5/20/2021	27	9.6	6/20/2021	82	16.8
5/21/2021	24	8.8	6/21/2021	73	17.8
5/22/2021	22	9.9	6/22/2021	62	15.3
5/23/2021	24	12.2	6/23/2021	46	17.9
5/24/2021	24	-	6/24/2021	52	17.7
5/25/2021	33	14.1	6/25/2021	45	18.0
5/26/2021	27	15.3	6/26/2021	42	19.6
5/27/2021	30	15.0	6/27/2021	51	20.0
5/28/2021	32	14.3	6/28/2021	60	20.0
5/29/2021	28	15.4	6/29/2021	58	20.1
5/30/2021	30	15.5	6/30/2021	54	19.1
5/31/2021	36	16.8			

Date	Daily Average Flow (cfs)	Daily Maximum Water Temp (°C)	Date	Daily Average Flow (cfs)	Daily Maximum Water Temp (°C)
7/1/2021	47	19.0	8/1/2021	27	19.4
7/2/2021	37	19.0	8/2/2021	28	17.6
7/3/2021	30	18.9	8/3/2021	27	18.7
7/4/2021	26	19.0	8/4/2021	29	18.7
7/5/2021	23	19.6	8/5/2021	27	16.2
7/6/2021	22	20.4	8/6/2021	29	18.0
7/7/2021	22	19.9	8/7/2021	29	18.8
7/8/2021	23	18.6	8/8/2021	32	17.1
7/9/2021	27	18.7	8/9/2021	27	17.2
7/10/2021	29	19.5	8/10/2021	25	18.1
7/11/2021	32	18.8	8/11/2021	26	19.8
7/12/2021	29	19.1	8/12/2021	31	19.7
7/13/2021	29	18.1	8/13/2021	32	18.6
7/14/2021	30	19.4	8/14/2021	30	18.1
7/15/2021	29	19.2	8/15/2021	37	18.7
7/16/2021	26	18.6	8/16/2021	31	18.8
7/17/2021	25	19.1	8/17/2021	26	15.9
7/18/2021	26	19.8	8/18/2021	24	14.7
7/19/2021	29	19.4	8/19/2021	26	15.9
7/20/2021	29	18.7	8/20/2021	29	16.2
7/21/2021	27	18.1	8/21/2021	25	14.9
7/22/2021	20	18.1	8/22/2021	32	14.5
7/23/2021	21	18.3	8/23/2021	29	14.4
7/24/2021	27	18.4	8/24/2021	23	13.6
7/25/2021	36	18.8	8/25/2021	23	14.2
7/26/2021	30	16.4	8/26/2021	25	15.7
7/27/2021	31	14.9	8/27/2021	31	15.9
7/28/2021	25	18.3	8/28/2021	32	15.2
7/29/2021	28	18.4	8/29/2021	34	14.6
7/30/2021	28	16.3	8/30/2021	25	14.9
7/31/2021	26	15.1	8/31/2021	23	14.0

Date	Daily Average Flow (cfs)	Daily Maximum Water Temp (°C)
9/1/2021	22	13.2
9/2/2021	23	13.3
9/3/2021	27	13.2
9/4/2021	27	13.3
9/5/2021	31	13.6
9/6/2021	32	14.7
9/7/2021	27	15.1
9/8/2021	28	15.6
9/9/2021	31	14.0
9/10/2021	37	12.5
9/11/2021	25	13.9
9/12/2021	24	14.1
9/13/2021	24	13.3
9/14/2021	25	13.1
9/15/2021	26	13.9
9/16/2021	25	11.5
9/17/2021	26	10.0
9/18/2021	30	12.3
9/19/2021	27	12.0
9/20/2021	25	11.4
9/21/2021	25	11.7
9/22/2021	27	12.6
9/23/2021	26	12.1
9/24/2021	29	11.3
9/25/2021	28	12.5
9/26/2021	29	12.4
9/27/2021	31	11.6
9/28/2021	26	10.1
9/29/2021	27	9.2
9/30/2021	25	10.9

Appendix N-4. Daily maximum water temperatures and 7-day averages of daily maximums (7-DADM) in Whychus Creek at River Miles 6.0 and 8.5 in Water Year 2021.

DATE	River Mile 8.5		River Mile 6.0 [1]	
	Daily Maximum (°C)	7-DADM (°C) [2]	Daily Maximum (°C)	7-DADM (°C) [2]
3/29/2021	8.9	-	-	-
3/30/2021	9.0	-	-	-
3/31/2021	10.0	-	-	-
4/1/2021	11.6	10.3	-	-
4/2/2021	10.7	10.6	10.7	-
4/3/2021	10.8	11.0	10.4	-
4/4/2021	10.9	11.0	10.5	-
4/5/2021	10.9	11.0	10.9	10.8
4/6/2021	11.9	11.0	11.9	10.9
4/7/2021	10.4	11.0	10.5	10.9
4/8/2021	11.1	11.0	11.1	11.0
4/9/2021	11.2	11.0	11.2	10.9
4/10/2021	10.7	10.8	10.3	10.7
4/11/2021	11.2	10.8	11.2	10.8
4/12/2021	10.4	11.0	10.1	10.9
4/13/2021	10.4	11.2	10.5	11.2
4/14/2021	10.9	11.7	11.1	11.7
4/15/2021	12.0	12.2	11.9	12.2
4/16/2021	13.1	12.6	13.2	12.7
4/17/2021	13.8	13.0	13.7	13.1
4/18/2021	14.8	13.4	14.6	13.4
4/19/2021	13.5	13.8	13.5	13.8
4/20/2021	13.1	13.5	13.3	13.6
4/21/2021	13.6	13.3	13.7	13.4
4/22/2021	14.4	12.4	14.8	12.6
4/23/2021	11.6	11.9	11.7	12.0
4/24/2021	11.8	12.0	12.2	12.1
4/25/2021	8.9	12.2	9.0	12.4
4/26/2021	9.7	12.6	9.5	12.8
4/27/2021	14.0	13.2	14.1	13.3
4/28/2021	15.3	13.8	15.4	14.0
4/29/2021	17.2	14.4	17.5	14.5
4/30/2021	15.3	15.1	15.7	15.2
5/1/2021	15.9	15.5	16.7	15.6
5/2/2021	13.6	15.4	12.7	15.5
5/3/2021	14.5	15.1	14.5	15.2

DATE	River Mile 8.5		River Mile 6.0 [1]	
	Daily Maximum (°C)	7-DADM (°C) [2]	Daily Maximum (°C)	7-DADM (°C) [2]
5/4/2021	16.3	14.7	16.7	14.8
5/5/2021	14.7	14.3	15.0	14.2
5/6/2021	15.1	14.1	15.0	14.1
5/7/2021	12.9	13.8	12.9	13.8
5/8/2021	13.2	13.8	12.7	13.6
5/9/2021	11.9	14.1	11.7	13.8
5/10/2021	12.8	14.4	12.7	14.2
5/11/2021	15.6	15.0	15.2	14.8
5/12/2021	17.0	15.5	16.6	-
5/13/2021	17.6	16.4	17.6	-
5/14/2021	16.8	16.9	16.8	-
5/15/2021	17.1	16.7	-	-
5/16/2021	17.8	15.9	-	-
5/17/2021	16.7	14.9	-	-
5/18/2021	13.7	14.0	-	-
5/19/2021	11.5	13.2	-	-
5/20/2021	10.6	12.7	-	-
5/21/2021	10.9	12.7	-	-
5/22/2021	11.4	13.2	-	-
5/23/2021	14.3	14.1	-	-
5/24/2021	16.7	14.7	-	-
5/25/2021	17.1	15.7	-	-
5/26/2021	18.0	16.6	-	-
5/27/2021	14.7	17.2	-	-
5/28/2021	17.4	17.7	-	-
5/29/2021	18.3	18.3	-	-
5/30/2021	18.3	18.6	-	-
5/31/2021	20.4	19.1	-	-
6/1/2021	21.2	18.9	-	-
6/2/2021	19.9	18.4	-	-
6/3/2021	17.9	17.6	-	-
6/4/2021	16.5	16.5	-	-
6/5/2021	14.7	15.4	-	-
6/6/2021	12.5	14.4	-	-
6/7/2021	13.0	14.3	-	-
6/8/2021	13.5	13.9	-	-
6/9/2021	13.0	14.0	-	-
6/10/2021	17.2	14.7	-	-
6/11/2021	13.7	15.0	-	-
6/12/2021	15.2	15.4	-	-

DATE	River Mile 8.5		River Mile 6.0 [1]	
	Daily Maximum (°C)	7-DADM (°C) [2]	Daily Maximum (°C)	7-DADM (°C) [2]
6/13/2021	17.5	16.0	-	-
6/14/2021	14.9	16.3	-	-
6/15/2021	16.2	17.0	-	-
6/16/2021	17.2	17.6	-	-
6/17/2021	19.5	17.9	-	-
6/18/2021	18.4	18.7	-	-
6/19/2021	19.6	18.9	-	-
6/20/2021	19.6	19.5	-	-
6/21/2021	20.2	19.8	-	-
6/22/2021	17.9	20.3	-	-
6/23/2021	21.7	20.9	-	-
6/24/2021	21.3	21.6	-	-
6/25/2021	22.0	22.1	-	-
6/26/2021	23.9	23.0	-	-
6/27/2021	24.3	23.2	-	-
6/28/2021	23.8	23.4	-	-
6/29/2021	23.7	23.7	-	-
6/30/2021	23.3	23.5	-	-
7/1/2021	23.2	23.4	-	-
7/2/2021	23.4	23.5	-	-
7/3/2021	23.2	23.7	-	-
7/4/2021	23.4	23.9	-	-
7/5/2021	24.2	23.9	-	-
7/6/2021	25.0	23.8	-	-
7/7/2021	24.6	23.9	-	-
7/8/2021	23.4	23.9	-	-
7/9/2021	22.9	23.6	-	-
7/10/2021	24.0	23.1	-	-
7/11/2021	23.2	23.0	-	-
7/12/2021	22.2	23.0	-	-
7/13/2021	21.7	22.9	-	-
7/14/2021	23.6	22.8	-	-
7/15/2021	23.2	23.0	-	-
7/16/2021	22.7	23.2	-	-
7/17/2021	23.2	23.4	-	-
7/18/2021	24.1	23.2	-	-
7/19/2021	24.1	23.0	-	-
7/20/2021	23.0	23.0	-	-
7/21/2021	21.9	22.8	-	-
7/22/2021	21.8	22.7	-	-

DATE	River Mile 8.5		River Mile 6.0 [1]	
	Daily Maximum (°C)	7-DADM (°C) [2]	Daily Maximum (°C)	7-DADM (°C) [2]
7/23/2021	22.6	22.1	-	-
7/24/2021	22.3	21.4	-	-
7/25/2021	23.0	21.3	-	-
7/26/2021	20.1	21.4	-	-
7/27/2021	17.9	21.1	-	-
7/28/2021	21.3	20.6	-	-
7/29/2021	22.8	20.7	-	-
7/30/2021	20.2	20.8	-	-
7/31/2021	18.8	21.5	-	-
8/1/2021	23.5	21.7	-	-
8/2/2021	20.9	21.2	-	-
8/3/2021	22.8	21.3	-	-
8/4/2021	22.8	21.9	23.6	-
8/5/2021	19.4	21.5	21.0	-
8/6/2021	21.0	21.4	21.5	-
8/7/2021	22.8	21.4	23.8	22.2
8/8/2021	20.9	21.5	22.0	22.4
8/9/2021	20.5	22.2	21.2	23.0
8/10/2021	22.3	22.4	22.6	23.2
8/11/2021	24.0	22.4	24.9	23.1
8/12/2021	24.2	22.6	25.0	23.2
8/13/2021	22.5	22.9	22.9	23.5
8/14/2021	22.3	22.6	22.8	23.2
8/15/2021	22.7	21.9	23.3	22.4
8/16/2021	22.5	21.3	23.2	21.7
8/17/2021	19.9	20.8	20.3	21.1
8/18/2021	19.0	20.2	19.2	20.4
8/19/2021	20.1	19.6	20.0	19.7
8/20/2021	18.8	19.0	18.8	19.0
8/21/2021	18.5	18.7	17.7	18.6
8/22/2021	18.6	18.6	18.9	18.4
8/23/2021	17.8	18.5	17.8	18.4
8/24/2021	17.7	18.7	17.5	18.5
8/25/2021	18.4	18.7	18.1	18.7
8/26/2021	19.9	18.6	19.8	18.6
8/27/2021	19.7	18.8	19.9	18.8
8/28/2021	18.7	18.9	18.8	18.8
8/29/2021	18.1	18.7	18.3	18.6
8/30/2021	19.1	18.3	18.9	18.2
8/31/2021	18.3	17.8	18.0	17.7

DATE	River Mile 8.5		River Mile 6.0 [1]	
	Daily Maximum (°C)	7-DADM (°C) [2]	Daily Maximum (°C)	7-DADM (°C) [2]
9/1/2021	17.1	17.5	16.8	17.4
9/2/2021	17.0	17.3	16.8	17.2
9/3/2021	16.4	17.2	16.6	17.1
9/4/2021	16.3	17.3	16.3	17.3
9/5/2021	17.0	17.7	17.0	17.7
9/6/2021	18.2	17.8	18.4	17.9
9/7/2021	19.2	17.8	19.0	17.9
9/8/2021	19.7	18.0	19.7	18.0
9/9/2021	18.0	18.0	18.1	18.0
9/10/2021	16.0	17.9	16.4	17.9
9/11/2021	17.5	17.6	17.3	17.6
9/12/2021	17.2	17.3	17.2	17.3
9/13/2021	17.6	16.9	17.3	16.8
9/14/2021	16.9	16.6	16.8	16.4
9/15/2021	17.8	16.0	17.7	15.9
9/16/2021	15.0	15.6	14.9	15.4
9/17/2021	14.0	15.2	13.9	15.0
9/18/2021	13.3	14.9	13.4	14.7
9/19/2021	14.6	14.6	14.1	14.4
9/20/2021	14.6	14.6	14.4	14.5
9/21/2021	15.0	14.7	14.8	14.6
9/22/2021	15.5	15.0	15.4	14.8
9/23/2021	15.4	15.1	15.3	15.0
9/24/2021	14.5	15.0	14.6	14.9
9/25/2021	15.3	14.7	15.3	14.6
9/26/2021	15.2	14.2	15.1	14.0
9/27/2021	13.8	13.9	13.6	13.7
9/28/2021	13.4	-	12.6	-
9/29/2021	11.9	-	11.7	-
9/30/2021	13.1	-	13.2	-

[1] The loss of temperature recording equipment at RM 6.0 resulted in the lack of data from May 15 until new equipment was installed on August 4.

[2] Yellow highlights indicate days with 7-DADM in excess of 20 °C.

APPENDIX O
Whychus Creek Correspondence

Appendix O-1. Receipt for payment of $6,000 to Deschutes River Conservancy Whychus Creek Temporary Instream Leasing Program in 2021.

6/29/2021

Deschutes River Conservancy **6,000.00

Six Thousand and 00/100**********

Deschutes River Conservancy
PO Box 1560
Bend, OR 97709-1560

Habitat Conservation Plan Instream Leasing Paymen

Deschutes River Conservancy 6/29/2021 6,000.00

First Int Main Canal (B Habitat Conservation Plan Instream Leasing Pay 6,000.00

Deschutes River Conservancy 6/29/2021 6,000.00

First Int Main Canal (B Habitat Conservation Plan Instream Leasing Pay 6,000.00

Appendix O-2. Oregon Water Resources Department order approving the instream leasing of irrigation water in Whychus Creek for Water Year 2021.

BEFORE THE WATER RESOURCES DEPARTMENT
OF THE
STATE OF OREGON

In the Matter of Instream Lease Application IL-1872 and Preliminary and Final Award of Mitigation Credits for Mitigation Project MP-275, Deschutes County	))))	DETERMINATION and FINAL ORDER ON PROPOSED INSTREAM LEASE and MITIGATION CREDIT PROJECT

Authority
Oregon Revised Statute (ORS) 537.348 establishes the process in which a water right holder may submit a request to lease an existing water right for instream purposes. Oregon Administrative Rule (OAR) Chapter 690, Division 077 implements the statutes and provides the Department's procedures and criteria for evaluating instream lease applications.

OAR 690-521-0100 to 690-521-0600 establishes the process in which anyone may submit a ground water mitigation project to the Department for the purpose of establishing mitigation credits in the Deschutes Ground Water Study Area.

Lessor
Pooled Instream Lease for several water right holders (described in Findings of Fact No. 3 and 6)

Co-Lessor
Three Sisters Irrigation District (TSID)
PO Box 2230
Sisters, OR 97759
manager@tsidweb.org

Lessee
Deschutes River Conservancy Mitigation Bank (DRCMB)
700 NW Hill Street, Suite 1
Bend, Oregon 97703
gen@deschutesriver.org

Findings of Fact

1. On May 14, 2021, the DRCMB and TSID, on behalf of several water right holders, filed an application to lease a portion of Certificates 74135 and 93680 for instream use. The Department assigned the application number IL-1872.

2. Certificates 74135 and 93680 describe the authorized place of use by township, range, section, quarter quarter, and tax lots. Some tax lot configurations have changed and some tax lots have been partitioned or subdivided since this certificate was issued and may no longer match those shown on the map or the water right of record. The portion of the water right to be leased as described in Findings of Fact No. 3 and No. 6 are consistent with the water right of record in so far as possible.

This is a final order in other than contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080 you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

IL-1872.ord.approve.sah (MP-275) Page 1 of 8 Special Order Volume 120 Page 1011

3. The portion of the first right to be leased is as follows:

Certificate: 74135 Squaw Creek Irrigation District (now known as Three Sisters Irrigation District (perfected under the Squaw Creek Decree, of record at Salem, in the Order Record of the Water Resources Director, in Volume 1, at Pages 121, 122, 123, 124, 435, 438, 445, 472, and 473)

Priority Date: 1869 and 1895

Use: Irrigation of 245.47 acres, being 9.68 acres under the 1869 priority date; 235.79 acres under the 1895 priority date;
Pond Maintenance of 1.0 acre equivalent under the 1895 priority date.

Quantity: **Limit:** One-fiftieth of one cubic foot per second (CFS) per acre, or its equivalent for each acre irrigated during the irrigation season of each year.

Source: Whychus Creek (formerly known as Squaw Creek), tributary to the Deschutes River

Authorized Point of Diversion (POD):

Twp	Rng	Mer	Sec	Q-Q	Measured Distances
15 S	10 E	WM	21	SW SW	998 FEET NORTH AND 1211 FEET EAST FROM THE SW CORNER OF SECTION 21

Authorized Place of Use:

Twp	Rng	Mer	Sec	Q-Q	Tax Lot	Priority Date	Acres	Lessor
Irrigation Use – 245.47 acres total (1895 - Mitigation Acres) (1869 - Restoration only)								
15 S	11 E	WM	18	SW NW	700	1869	4.62	Michael & Karen Mansker
15 S	11 E	WM	18	SE NW	700		1.59	
15 S	11 E	WM	18	NE SW	700		2.57	
15 S	11 E	WM	18	NW SW	700		0.90	
						Sub Total:	*9.68*	
14 S	11 E	WM	23	NE SE	800	1895	3.00	Peter & Rebecca Green
14 S	11 E	WM	30	NE SE	4700		13.50	Reece & Lorene Richardson
15 S	10 E	WM	12	NW NE	302/303		7.10	Wayne Cornick
15 S	11 E	WM	4	SW SE	100		27.00	Theodore Eady
15 S	11 E	WM	4	NW NE	101		18.30	Karen Swaner
15 S	11 E	WM	4	SW NE	101		38.70	
15 S	11 E	WM	5	SE SW	400		11.20	Tygh Redfield
15 S	11 E	WM	7	NW SE	600		30.50	John Schaad
15 S	11 E	WM	7	NE SE	600		38.50	
15 S	11 E	WM	7	SW SE	600		32.00	
15 S	11 E	WM	7	SE SE	600		10.40	
15 S	11 E	WM	18	SW NE	800		3.84	Michael & Karen Mansker
15 S	11 E	WM	18	SE NE	800		1.22	
15 S	11 E	WM	18	SW NW	700		0.28	
15 S	11 E	WM	18	SE NW	700		0.05	
15 S	11 E	WM	18	NE SW	700		0.10	
15 S	11 E	WM	18	NW SW	700		0.10	
						Sub Total:	*235.79*	
						Total:	***245.47***	

Twp	Rng	Mer	Sec	Q-Q	Tax Lot	Priority Date	Acres	Lessor
1.0 acre equivalent of Pond Maintenance (Restoration only)								
15 S	11 E	WM	5	SE SW	400	1895	1.00	Tygh Redfield
						Total:	1.00	

4. Certificate 74135 does not specify the irrigation season. Nor is an irrigation season specified by Basin Program or Decree. For the purposes instream leasing, an irrigation season of March 1 through October 31, consistent with OAR 690-250, shall be used to establish when water may be protected instream.

5. Certificate 74135 describes the rate limit per acre as 1/50th cubic foot per second per (cfs) acre. Certificate 74135 has been modified by transfers, cancellation, and allocation of conserved water projects. The rate available per acre or rate per acre equivalent has been reduced as a result of previous transactions.

6. The second right to be leased is as follows:

Certificate: 93680 in the name of City of Sisters (perfected under the Squaw Creek Decree, of record at Salem, in the Order Record of the Water Resources Director, in Volume 1, at Page 120)
Use: Irrigation of 49.1 acres
Priority Date: 1880
Quantity: **Rate:** 0.687 Cubic Foot per Second (CFS)
Volume: 147.3 Acre-Feet (AF)
Source: Whychus Creek, tributary to the Deschutes River

Authorized Point of Diversion (POD):

Twp	Rng	Mer	Sec	Q-Q	Measured Distances
15 S	10 E	WM	21	SW SW	ORIGINAL POD - UNCLE JOHN DITCH – 140 FEET NORTH AND 1190 FEET EAST FROM THE SW CORNER OF SECTION 21
15 S	10 E	WM	21	SW SW	NEW POD – 998 FEET NORTH AND 1211 FEET EAST FROM THE SW CORNER OF SECTION 21

Authorized Place of Use:

Twp	Rng	Mer	Sec	Q-Q	Tax Lot	Acres	Lessor
15 S	10 E	WM	10	NW SW	705	0.3	City of Sisters
15 S	10 E	WM	10	NE SW	705	18.0	
15 S	10 E	WM	10	SW SW	705	1.0	
15 S	10 E	WM	10	SE SW	705	8.0	
15 S	10 E	WM	10	NW SE	705	2.4	
15 S	10 E	WM	10	SW SE	705	15.2	
15 S	10 E	WM	10	SE SE	705	4.2	
					Total Acres	49.1	

7. Certificate 93680 does not specify the irrigation season. Nor is an irrigation season specified by Basin Program or Decree. For the purposes instream leasing, an irrigation season of March 1 through October 31, consistent with OAR 690-250, shall be used to establish when water may be protected instream.

8. There may be supplemental irrigation water rights appurtenant to all or a portion of the lands described in Findings of Fact No. 3 and 6. During the term of the lease, water use under any supplemental or layered irrigation water right will also be suspended.

9. The lease application includes the information required under OAR 690-077-0076(3). The Department provided notice of the lease application pursuant to OAR 690-077-0077(1). No comments were received.

10. The lease application requests to protect water instream from Whychus Creek into the Deschutes River. An instream reach is generally from the point of diversion to the mouth of the source stream (Whychus Creek) but may be protected further if measurable in the receiving stream (the Deschutes River) (OAR 690-077-0015 (8)). The quantity that may be leased instream from Whychus Creek is measurable into the Deschutes River and may be protected instream in the Deschutes River.

11. The instream use will be conditioned to allow less water to be protected instream below TSID's point of diversion based upon instream measurements conducted by Department staff or others approved by the Department, which may show lower or higher levels of loss and allow the instream flows to be adjusted accordingly. The instream quantity may not exceed the instream quantity identified at the point of diversion.

12. The applicant has requested the instream use begin at the authorized point of diversion. The point of diversion is located within a known losing reach on Whychus Creek. The losing reach extends from the point of diversion located at approximately River Mile (RM) 24.5 to the OWRD gaging station 14076050 located in Sisters, at approximately RM 20.7. The Department's study on seepage loss monitoring water would be problematic. Therefore, to prevent enlargement of the water right, the instream use will be conditioned as set forth in Finding of Fact No. 11.

13. The instream use is as follows:
Whychus Creek, tributary to the Deschutes River

Instream Reach: At the POD (as described in Finding of Fact No. 3), located approximately at RM 24.5 to the mouth of Whychus Creek into Deschutes River to Lake Billy Chinook

Certificate	Priority Dates	Use	Instream Rate (CFS)	Instream Volume (AF)	Instream Period
74135	1895*	Irrigation	3.333	707.37	June 16 through September 30
	1869**	Irrigation	0.137	29.04	
	1895**	Pond Use	0.014	3.00	
93680	1880*	Irrigation	0.694	147.30	
		Totals:	**4.178**	**886.71**	

*Instream flows for mitigation purposes
**Instream flows for restoration purposes

14. The amount and timing of the proposed instream flow is allowable within the limits and use of the original water right.

15. The protection of flows within the proposed reach is appropriate, considering:
    a. The instream water use begins at the recorded point of diversion;
    b. The location of confluences with other streams downstream of the point of diversion.
    c. The known areas of natural loss of streamflow to the river bed downstream from the point of diversion; and
    d. Any return flows resulting from the exercise of the existing water right would re-enter the river downstream of the reach of the instream water right.

16. Instream water rights, with a senior priority date, created through an instream lease generally replace portions of other instream water rights, which carry junior priority dates, established through minimum flow conversion or the state agency application process to establish new instream water rights. On Whychus Creek, during the period April 1 through September 30, the total quantities of water to be protected instream under the existing and proposed instream rights within a portion of the reach from approximately T15S, R10E, Section 21 (approximately River Mile (RM) 24.5) to the confluence with Indian Ford Creek (just upstream from RM 20) will exceed the quantities identified as necessary for instream use for various fish life stages under Certificate 73224, which was created under ORS 537.341, an application process for state agencies to establish new instream water rights. During the period June 16 through September 30, the total quantities of water to be protected instream under the existing and proposed instream rights within another portion of the reach from T14S, R10E, Section 26 (approximately RM 16) to the mouth of Whychus Creek will exceed the quantities identified as necessary for instream use for various fish life stages under Certificate 73223, which was also created under ORS 537.341. However, the Department has identified that this instream lease will provide an additional beneficial purpose. The Oregon Department of Fish and Wildlife has identified that Whychus Creek is a high priority for flow restoration. In addition, the original instream flows established under Certificates 73224 and 73223 were based on flow needs for resident redband trout and did not account for flows necessary to support reintroduction of Mid-Columbia summer steelhead trout and spring Chinook salmon.

17. The Department has identified that during the term of this lease, the quantities protected instream may be additive to other existing instream water rights established within the same reach under ORS 537.341, 537.346, 537.348 or 537.470 during the months of April through October for the portion of the reach extending from approximately T15S, R10E, Section 21 (approximately RM 24.5) to the confluence with Indian Ford Creek (just upstream from RM 20)] and during the period June 16 through September 30 for the portion of the reach extending from T14S, R10E, Section 26 (approximately RM 16) to the mouth of Whychus Creek. In other portions of the identified reach, the quantities protected instream may be additive to other existing water rights established under ORS 537.348 and 537.470 and may replace a portion of existing water rights established under ORS 537.341 or 537.346 with an earlier priority date, unless otherwise specified in an order approving a new instream water right under these statues.

18. If approved, this instream lease is not reasonably expected to significantly affect land use as prescribed by ORS 197.180, OAR Chapter 660, Divisions 30 and 31, and OAR Chapter 690, Division 5.

19. Based upon review of the application, information provided by the Department's Watermaster, and other available information, the Department finds that the lease will not result in injury or enlargement. The order approving this instream lease may be modified or revoked under OAR 690-077-0077 if the Department later finds that the lease is causing injury to any existing water right or enlargement of the original right.

20. If a right which has been leased is later proposed to be leased again, transferred and/or reviewed under an allocation of conserved water, a new injury review shall be required. For example, instream transfers will be subject to a full and complete review to determine consistency with the requirements of OAR Chapter 690, Division 380 and Division 077. Approval of this lease does not establish a precedent for approval of any future transactions.

21. The Lessor and Lessee have requested that the lease terminate on October 31, 2021. The lease may commence on the date this final order is signed.

Preliminary Award of Deschutes Basin Mitigation Credits

22. The Lessee, a mitigation bank chartered by the Water Resources Commission, has requested that a portion of the right to be protected instream be used to generate mitigation credits.

23. The Department assigned this mitigation credit project number MP-275.

24. The Department provided notice of the mitigation credit project pursuant to OAR 690-521-0300 (6). The Department also provided notice of the mitigation credit project to the Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality, Oregon Parks and Recreation Department, Oregon Department of State Lands, the Oregon Department of Agriculture, and the Department's Watermaster pursuant to OAR 690-521-0300 (7) and OAR 690-505-0630 (2). No comments were received.

25. The Department finds that **512.8** mitigation credits may be awarded to this mitigation credit project and assigned to the DRC Mitigation Bank. The mitigation credits may be used to mitigate for ground water permit applications and existing conditioned ground water permits and certificates, providing mitigation pursuant to the Deschutes Ground Water Mitigation Rules, OAR Chapter 690, Division 505, within the **Whychus Creek and General** Zones of Impact.

26. The mitigation credits expire on December 31, 2021.

27. The use and maintenance of the mitigation credits is subject to the terms and conditions of the DRC Mitigation Bank Charter.

28. The Department shall award final mitigation credits upon completion of the approved project by the applicant and verification by the Department that the project is complete. The issuance of the Final Order approving the proposed instream lease shall result in completion of the project and verification that the project is complete.

29. No precedent is set by this Final Order as to the amount of mitigation credits that may be generated by a subsequent mitigation credit project.

Conclusions of Law

The Department concludes that the lease will not result in injury or enlargement, OAR 690-077-0077. The lease conforms to the applicable provisions of OAR 690-077-0015.

This mitigation project results in mitigation credits pursuant to ORS 537.746 and OAR 690-521-0300 and 690-521-0400.

Now, therefore it is ORDERED:

1. The Lease as described herein is APPROVED.

2. During the term of the lease, the former place of use will no longer receive water as part of these rights, any supplemental rights, or any other layered irrigation water rights, including ground water registrations and permits.

3. The term of the lease will commence upon approval of the instream lease and terminate on October 31, 2021.

4. **Final Award of Deschutes Basin Mitigation Credits:** Issuance of this Final Order results in completion of the project and verification by the Department that the project is complete. The Department concludes that the mitigation credit project is awarded mitigation credits, as described above, pursuant to OAR 690-521-0400 and ORS 537.746. Mitigation Credits, in the amount of **512.8** credits, as described herein, are awarded to this mitigation project and assigned to the DRC Mitigation Bank. Mitigation Credits may be used to satisfy a mitigation obligation of a ground water permit applicant and/or ground water permit/certificate holder in the **Whychus Creek and General Zones of Impact**.

5. Mitigation credits are valid until used (or until they expire or are terminated) to satisfy a mitigation obligation of a ground water permit applicant and/or ground water permit/certificate holder within the Deschutes Ground Water Study Area pursuant to the Deschutes Ground Water Mitigation Rules. Mitigation credits are used when a person submits to the Department documentary evidence that valid credits have been obtained and assigned to satisfy a mitigation obligation.

6. The mitigation credits shall expire on December 31, 2021.

7. The use and maintenance of the mitigation credits shall be subject to the terms and conditions of the DRC Mitigation Bank Charter.

Dated at Salem, Oregon this day JUN 30 2021.

Lisa J. Jaramillo, Transfer and Conservation Section Manager, for
Thomas M. Byler, Director, Oregon Water Resources Department

This document was prepared by Sarah Henderson. If you have any questions, please call 503-979-9872.

Mailing date: JUL 02 2021

APPENDIX P
Crooked River and
Ochoco Creek Flow Data

Appendix P-1. Reported daily average flows for the Crooked River at OWRD Gage 14080500 (Hydromet Station PRVO) and OWRD Gage 14081500 (Hydromet Station CAPO) in Water Year 2021.

Date	Daily Average Flow (cfs)		Date	Daily Average Flow (cfs)	
	Hydromet Station PRVO	Hydromet Station CAPO		Hydromet Station PRVO	Hydromet Station CAPO
1/1/2021	50	48	2/1/2021	49	48
1/2/2021	50	48	2/2/2021	49	48
1/3/2021	50	48	2/3/2021	49	48
1/4/2021	50	48	2/4/2021	48	48
1/5/2021	50	48	2/5/2021	48	48
1/6/2021	50	48	2/6/2021	48	48
1/7/2021	49	49	2/7/2021	49	48
1/8/2021	49	49	2/8/2021	48	48
1/9/2021	50	49	2/9/2021	48	48
1/10/2021	49	48	2/10/2021	48	48
1/11/2021	50	48	2/11/2021	48	50
1/12/2021	50	48	2/12/2021	48	48
1/13/2021	49	49	2/13/2021	48	48
1/14/2021	49	48	2/14/2021	48	49
1/15/2021	49	48	2/15/2021	48	50
1/16/2021	49	48	2/16/2021	47	49
1/17/2021	49	48	2/17/2021	47	48
1/18/2021	49	48	2/18/2021	47	49
1/19/2021	50	47	2/19/2021	47	49
1/20/2021	50	48	2/20/2021	47	49
1/21/2021	50	49	2/21/2021	47	48
1/22/2021	50	50	2/22/2021	47	48
1/23/2021	50	49	2/23/2021	47	48
1/24/2021	50	47	2/24/2021	46	47
1/25/2021	50	51	2/25/2021	47	47
1/26/2021	50	44	2/26/2021	47	48
1/27/2021	50	53	2/27/2021	47	48
1/28/2021	49	50	2/28/2021	46	48
1/29/2021	49	49			
1/30/2021	49	48			
1/31/2021	49	48			

Date	Daily Average Flow (cfs)		Date	Daily Average Flow (cfs)	
	Hydromet Station PRVO	Hydromet Station CAPO		Hydromet Station PRVO	Hydromet Station CAPO
3/1/2021	47	48	4/1/2021	48	48
3/2/2021	47	48	4/2/2021	48	48
3/3/2021	47	47	4/3/2021	48	49
3/4/2021	46	47	4/4/2021	112	50
3/5/2021	46	47	4/5/2021	162	165
3/6/2021	46	48	4/6/2021	162	97
3/7/2021	46	48	4/7/2021	163	37
3/8/2021	46	48	4/8/2021	163	38
3/9/2021	46	48	4/9/2021	163	38
3/10/2021	46	48	4/10/2021	163	39
3/11/2021	46	48	4/11/2021	164	40
3/12/2021	46	47	4/12/2021	164	40
3/13/2021	46	47	4/13/2021	164	35
3/14/2021	46	47	4/14/2021	165	32
3/15/2021	46	46	4/15/2021	233	40
3/16/2021	46	47	4/16/2021	262	102
3/17/2021	46	47	4/17/2021	253	80
3/18/2021	46	47	4/18/2021	254	79
3/19/2021	46	47	4/19/2021	276	85
3/20/2021	46	47	4/20/2021	285	96
3/21/2021	47	47	4/21/2021	308	104
3/22/2021	47	48	4/22/2021	317	126
3/23/2021	47	48	4/23/2021	317	126
3/24/2021	47	48	4/24/2021	317	132
3/25/2021	47	48	4/25/2021	317	134
3/26/2021	47	48	4/26/2021	239	115
3/27/2021	47	48	4/27/2021	196	36
3/28/2021	47	48	4/28/2021	190	12
3/29/2021	47	47	4/29/2021	190	11
3/30/2021	48	48	4/30/2021	190	10
3/31/2021	48	48			

Date	Daily Average Flow (cfs)		Date	Daily Average Flow (cfs)	
	Hydromet Station PRVO	Hydromet Station CAPO		Hydromet Station PRVO	Hydromet Station CAPO
5/1/2021	190	10	6/1/2021	233	6
5/2/2021	190	10	6/2/2021	266	49
5/3/2021	190	9	6/3/2021	284	103
5/4/2021	232	13	6/4/2021	284	98
5/5/2021	249	57	6/5/2021	283	95
5/6/2021	249	61	6/6/2021	283	96
5/7/2021	249	62	6/7/2021	282	98
5/8/2021	249	63	6/8/2021	282	99
5/9/2021	249	63	6/9/2021	283	99
5/10/2021	248	66	6/10/2021	283	100
5/11/2021	248	63	6/11/2021	283	108
5/12/2021	248	65	6/12/2021	282	117
5/13/2021	248	66	6/13/2021	282	117
5/14/2021	248	63	6/14/2021	220	98
5/15/2021	248	63	6/15/2021	201	39
5/16/2021	248	63	6/16/2021	201	33
5/17/2021	202	58	6/17/2021	186	28
5/18/2021	182	14	6/18/2021	179	11
5/19/2021	182	11	6/19/2021	179	9
5/20/2021	182	9	6/20/2021	179	16
5/21/2021	182	8	6/21/2021	179	23
5/22/2021	182	7	6/22/2021	179	19
5/23/2021	182	7	6/23/2021	241	12
5/24/2021	182	8	6/24/2021	293	76
5/25/2021	182	5	6/25/2021	307	123
5/26/2021	182	5	6/26/2021	305	119
5/27/2021	182	5	6/27/2021	305	120
5/28/2021	182	6	6/28/2021	305	119
5/29/2021	182	6	6/29/2021	305	114
5/30/2021	182	6	6/30/2021	305	112
5/31/2021	182	6			

Date	Daily Average Flow (cfs)		Date	Daily Average Flow (cfs)	
	Hydromet Station PRVO	Hydromet Station CAPO		Hydromet Station PRVO	Hydromet Station CAPO
7/1/2021	304	109	8/1/2021	192	13
7/2/2021	303	104	8/2/2021	191	14
7/3/2021	303	101	8/3/2021	191	25
7/4/2021	304	103	8/4/2021	191	8
7/5/2021	304	104	8/5/2021	191	9
7/6/2021	304	103	8/6/2021	191	11
7/7/2021	303	101	8/7/2021	191	10
7/8/2021	302	102	8/8/2021	191	10
7/9/2021	302	102	8/9/2021	190	9
7/10/2021	302	102	8/10/2021	190	7
7/11/2021	302	104	8/11/2021	190	8
7/12/2021	302	103	8/12/2021	190	10
7/13/2021	301	102	8/13/2021	191	10
7/14/2021	301	101	8/14/2021	191	11
7/15/2021	218	84	8/15/2021	191	12
7/16/2021	196	11	8/16/2021	191	12
7/17/2021	195	6	8/17/2021	192	12
7/18/2021	195	6	8/18/2021	191	17
7/19/2021	195	6	8/19/2021	191	16
7/20/2021	195	6	8/20/2021	191	16
7/21/2021	195	7	8/21/2021	191	14
7/22/2021	195	7	8/22/2021	191	12
7/23/2021	195	6	8/23/2021	191	15
7/24/2021	194	9	8/24/2021	191	13
7/25/2021	193	13	8/25/2021	190	10
7/26/2021	193	13	8/26/2021	190	12
7/27/2021	193	13	8/27/2021	189	11
7/28/2021	193	10	8/28/2021	189	12
7/29/2021	192	10	8/29/2021	189	13
7/30/2021	192	9	8/30/2021	189	13
7/31/2021	192	10	8/31/2021	188	14

Date	Daily Average Flow (cfs)	
	Hydromet Station PRVO	Hydromet Station CAPO
9/1/2021	187	13
9/2/2021	187	7
9/3/2021	187	7
9/4/2021	185	6
9/5/2021	185	7
9/6/2021	185	8
9/7/2021	185	6
9/8/2021	183	4
9/9/2021	183	5
9/10/2021	183	16
9/11/2021	183	17
9/12/2021	182	15
9/13/2021	181	13
9/14/2021	168	10
9/15/2021	161	5
9/16/2021	161	3
9/17/2021	161	4
9/18/2021	161	8
9/19/2021	161	9
9/20/2021	161	10
9/21/2021	160	10
9/22/2021	148	10
9/23/2021	144	8
9/24/2021	144	7
9/25/2021	144	6
9/26/2021	144	6
9/27/2021	144	5
9/28/2021	144	5
9/29/2021	130	5
9/30/2021	122	5

Appendix P-2. Reported daily average flows for Ochoco Creek at OWRD Gage 14085300 (Hydromet Station OCHO) in Water Year 2021.

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
1/1/2021	2.0	2/1/2021	1.8	3/1/2021	1.9
1/2/2021	2.0	2/2/2021	1.8	3/2/2021	1.9
1/3/2021	2.0	2/3/2021	1.8	3/3/2021	1.9
1/4/2021	2.0	2/4/2021	1.8	3/4/2021	1.9
1/5/2021	2.0	2/5/2021	1.8	3/5/2021	1.9
1/6/2021	2.0	2/6/2021	1.8	3/6/2021	1.9
1/7/2021	2.0	2/7/2021	1.8	3/7/2021	1.9
1/8/2021	2.0	2/8/2021	1.8	3/8/2021	1.9
1/9/2021	1.9	2/9/2021	1.8	3/9/2021	2.0
1/10/2021	1.9	2/10/2021	1.8	3/10/2021	2.0
1/11/2021	1.9	2/11/2021	1.8	3/11/2021	2.0
1/12/2021	1.9	2/12/2021	1.8	3/12/2021	2.0
1/13/2021	1.9	2/13/2021	1.8	3/13/2021	2.0
1/14/2021	1.9	2/14/2021	1.8	3/14/2021	2.0
1/15/2021	1.9	2/15/2021	1.8	3/15/2021	2.0
1/16/2021	1.9	2/16/2021	1.8	3/16/2021	2.0
1/17/2021	1.9	2/17/2021	1.8	3/17/2021	2.0
1/18/2021	2.0	2/18/2021	1.9	3/18/2021	2.0
1/19/2021	2.0	2/19/2021	1.9	3/19/2021	2.0
1/20/2021	1.9	2/20/2021	1.9	3/20/2021	2.0
1/21/2021	1.9	2/21/2021	1.9	3/21/2021	2.0
1/22/2021	2.0	2/22/2021	1.9	3/22/2021	2.0
1/23/2021	2.0	2/23/2021	1.9	3/23/2021	2.0
1/24/2021	1.9	2/24/2021	1.9	3/24/2021	2.0
1/25/2021	1.8	2/25/2021	1.9	3/25/2021	2.0
1/26/2021	1.8	2/26/2021	1.9	3/26/2021	2.0
1/27/2021	1.8	2/27/2021	1.9	3/27/2021	2.1
1/28/2021	1.8	2/28/2021	1.9	3/28/2021	2.1
1/29/2021	1.8			3/29/2021	2.2
1/30/2021	1.8			3/30/2021	2.2
1/31/2021	1.8			3/31/2021	2.2

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
4/1/2021	2.2	5/1/2021	9.1	6/1/2021	10.3
4/2/2021	2.3	5/2/2021	9.3	6/2/2021	10.5
4/3/2021	2.4	5/3/2021	8.7	6/3/2021	10.7
4/4/2021	2.6	5/4/2021	9.3	6/4/2021	10.7
4/5/2021	2.6	5/5/2021	9.1	6/5/2021	11.0
4/6/2021	2.6	5/6/2021	9.3	6/6/2021	11.0
4/7/2021	2.6	5/7/2021	10.7	6/7/2021	10.9
4/8/2021	2.6	5/8/2021	10.9	6/8/2021	11.0
4/9/2021	2.6	5/9/2021	10.6	6/9/2021	10.7
4/10/2021	2.6	5/10/2021	10.4	6/10/2021	10.6
4/11/2021	2.6	5/11/2021	11.6	6/11/2021	10.4
4/12/2021	2.6	5/12/2021	11.6	6/12/2021	10.2
4/13/2021	2.6	5/13/2021	10.8	6/13/2021	10.1
4/14/2021	2.6	5/14/2021	10.8	6/14/2021	10.4
4/15/2021	2.6	5/15/2021	10.8	6/15/2021	11.2
4/16/2021	2.6	5/16/2021	10.8	6/16/2021	11.4
4/17/2021	2.6	5/17/2021	10.8	6/17/2021	11.7
4/18/2021	2.6	5/18/2021	9.6	6/18/2021	11.9
4/19/2021	6.4	5/19/2021	11.2	6/19/2021	12.2
4/20/2021	7.1	5/20/2021	11.2	6/20/2021	12.4
4/21/2021	7.3	5/21/2021	11.7	6/21/2021	11.8
4/22/2021	7.6	5/22/2021	13.1	6/22/2021	11.0
4/23/2021	7.5	5/23/2021	13.5	6/23/2021	11.4
4/24/2021	8.0	5/24/2021	13.0	6/24/2021	9.0
4/25/2021	8.2	5/25/2021	12.3	6/25/2021	4.7
4/26/2021	6.8	5/26/2021	11.8	6/26/2021	4.5
4/27/2021	7.9	5/27/2021	11.7	6/27/2021	3.9
4/28/2021	8.6	5/28/2021	11.4	6/28/2021	4.5
4/29/2021	8.1	5/29/2021	11.1	6/29/2021	4.7
4/30/2021	7.6	5/30/2021	11.1	6/30/2021	5.4
		5/31/2021	10.6		

Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)	Date	Daily Average Flow (cfs)
7/1/2021	6.8	8/1/2021	3.0	9/1/2021	0.7
7/2/2021	7.6	8/2/2021	2.8	9/2/2021	0.7
7/3/2021	8.9	8/3/2021	3.0	9/3/2021	0.7
7/4/2021	7.9	8/4/2021	3.2	9/4/2021	0.7
7/5/2021	7.4	8/5/2021	3.1	9/5/2021	0.7
7/6/2021	9.0	8/6/2021	2.7	9/6/2021	0.7
7/7/2021	9.2	8/7/2021	2.8	9/7/2021	0.7
7/8/2021	8.9	8/8/2021	2.8	9/8/2021	0.7
7/9/2021	8.3	8/9/2021	2.8	9/9/2021	0.7
7/10/2021	7.5	8/10/2021	2.8	9/10/2021	0.7
7/11/2021	7.8	8/11/2021	2.9	9/11/2021	0.7
7/12/2021	9.7	8/12/2021	3.2	9/12/2021	0.7
7/13/2021	9.1	8/13/2021	3.4	9/13/2021	0.7
7/14/2021	8.1	8/14/2021	3.4	9/14/2021	0.7
7/15/2021	8.5	8/15/2021	3.4	9/15/2021	0.7
7/16/2021	8.3	8/16/2021	3.5	9/16/2021	0.7
7/17/2021	7.8	8/17/2021	3.4	9/17/2021	0.7
7/18/2021	6.4	8/18/2021	4.1	9/18/2021	0.7
7/19/2021	6.6	8/19/2021	4.3	9/19/2021	0.7
7/20/2021	5.3	8/20/2021	4.3	9/20/2021	0.7
7/21/2021	4.0	8/21/2021	3.2	9/21/2021	0.7
7/22/2021	6.1	8/22/2021	2.6	9/22/2021	0.7
7/23/2021	4.1	8/23/2021	2.8	9/23/2021	0.7
7/24/2021	3.2	8/24/2021	4.9	9/24/2021	0.7
7/25/2021	3.0	8/25/2021	4.1	9/25/2021	0.7
7/26/2021	3.0	8/26/2021	4.4	9/26/2021	0.7
7/27/2021	3.0	8/27/2021	2.3	9/27/2021	0.7
7/28/2021	3.0	8/28/2021	0.8	9/28/2021	0.7
7/29/2021	2.8	8/29/2021	0.8	9/29/2021	0.7
7/30/2021	3.0	8/30/2021	0.7	9/30/2021	0.7
7/31/2021	3.1	8/31/2021	0.7		

Appendix P-3. Reported daily (midnight) storage volume in Ochoco Reservoir (Hydromet Station OCHO) in Water Year 2021.

Date	Midnight Storage Volume (acre-feet)	Date	Midnight Storage Volume (acre-feet)	Date	Midnight Storage Volume (acre-feet)
1/1/2021	5,792	2/1/2021	6,388	3/1/2021	7,534
1/2/2021	5,795	2/2/2021	6,423	3/2/2021	7,604
1/3/2021	5,803	2/3/2021	6,472	3/3/2021	7,683
1/4/2021	5,803	2/4/2021	6,510	3/4/2021	7,776
1/5/2021	5,814	2/5/2021	6,553	3/5/2021	7,864
1/6/2021	5,824	2/6/2021	6,583	3/6/2021	7,975
1/7/2021	5,824	2/7/2021	6,614	3/7/2021	8,078
1/8/2021	5,843	2/8/2021	6,645	3/8/2021	8,177
1/9/2021	5,853	2/9/2021	6,676	3/9/2021	8,264
1/10/2021	5,864	2/10/2021	6,700	3/10/2021	8,347
1/11/2021	5,872	2/11/2021	6,735	3/11/2021	8,422
1/12/2021	5,886	2/12/2021	6,758	3/12/2021	8,492
1/13/2021	5,904	2/13/2021	6,785	3/13/2021	8,568
1/14/2021	5,952	2/14/2021	6,821	3/14/2021	8,630
1/15/2021	5,978	2/15/2021	6,852	3/15/2021	8,706
1/16/2021	6,007	2/16/2021	6,884	3/16/2021	8,782
1/17/2021	6,029	2/17/2021	6,927	3/17/2021	8,859
1/18/2021	6,048	2/18/2021	6,963	3/18/2021	8,932
1/19/2021	6,081	2/19/2021	6,995	3/19/2021	9,018
1/20/2021	6,099	2/20/2021	7,030	3/20/2021	9,105
1/21/2021	6,118	2/21/2021	7,074	3/21/2021	9,183
1/22/2021	6,159	2/22/2021	7,106	3/22/2021	9,262
1/23/2021	6,181	2/23/2021	7,175	3/23/2021	9,351
1/24/2021	6,200	2/24/2021	7,243	3/24/2021	9,425
1/25/2021	6,226	2/25/2021	7,300	3/25/2021	9,505
1/26/2021	6,245	2/26/2021	7,361	3/26/2021	9,581
1/27/2021	6,264	2/27/2021	7,418	3/27/2021	9,652
1/28/2021	6,286	2/28/2021	7,476	3/28/2021	9,709
1/29/2021	6,309			3/29/2021	9,804
1/30/2021	6,328			3/30/2021	9,896
1/31/2021	6,358			3/31/2021	9,978

Date	Midnight Storage Volume (acre-feet)	Date	Midnight Storage Volume (acre-feet)	Date	Midnight Storage Volume (acre-feet)
4/1/2021	10,065	5/1/2021	11,358	6/1/2021	9,623
4/2/2021	10,163	5/2/2021	11,347	6/2/2021	9,543
4/3/2021	10,271	5/3/2021	11,326	6/3/2021	9,458
4/4/2021	10,380	5/4/2021	11,300	6/4/2021	9,369
4/5/2021	10,509	5/5/2021	11,253	6/5/2021	9,276
4/6/2021	10,619	5/6/2021	11,217	6/6/2021	9,193
4/7/2021	10,725	5/7/2021	11,176	6/7/2021	9,110
4/8/2021	10,832	5/8/2021	11,139	6/8/2021	9,032
4/9/2021	10,939	5/9/2021	11,098	6/9/2021	8,963
4/10/2021	11,041	5/10/2021	11,062	6/10/2021	8,891
4/11/2021	11,144	5/11/2021	11,011	6/11/2021	8,832
4/12/2021	11,233	5/12/2021	10,954	6/12/2021	8,760
4/13/2021	11,316	5/13/2021	10,893	6/13/2021	8,688
4/14/2021	11,394	5/14/2021	10,832	6/14/2021	8,621
4/15/2021	11,473	5/15/2021	10,766	6/15/2021	8,550
4/16/2021	11,526	5/16/2021	10,700	6/16/2021	8,470
4/17/2021	11,584	5/17/2021	10,629	6/17/2021	8,386
4/18/2021	11,637	5/18/2021	10,554	6/18/2021	8,303
4/19/2021	11,621	5/19/2021	10,464	6/19/2021	8,225
4/20/2021	11,589	5/20/2021	10,385	6/20/2021	8,151
4/21/2021	11,568	5/21/2021	10,306	6/21/2021	8,078
4/22/2021	11,531	5/22/2021	10,237	6/22/2021	8,005
4/23/2021	11,494	5/23/2021	10,168	6/23/2021	7,932
4/24/2021	11,463	5/24/2021	10,104	6/24/2021	7,847
4/25/2021	11,436	5/25/2021	10,051	6/25/2021	7,776
4/26/2021	11,420	5/26/2021	9,997	6/26/2021	7,692
4/27/2021	11,415	5/27/2021	9,929	6/27/2021	7,608
4/28/2021	11,399	5/28/2021	9,876	6/28/2021	7,534
4/29/2021	11,379	5/29/2021	9,819	6/29/2021	7,435
4/30/2021	11,363	5/30/2021	9,756	6/30/2021	7,353
		5/31/2021	9,694		

Date	Midnight Storage Volume (acre-feet)	Date	Midnight Storage Volume (acre-feet)	Date	Midnight Storage Volume (acre-feet)
7/1/2021	7,251	8/1/2021	4,855	9/1/2021	3,483
7/2/2021	7,154	8/2/2021	4,790	9/2/2021	3,483
7/3/2021	7,030	8/3/2021	4,737	9/3/2021	3,481
7/4/2021	6,915	8/4/2021	4,689	9/4/2021	3,478
7/5/2021	6,809	8/5/2021	4,637	9/5/2021	3,475
7/6/2021	6,711	8/6/2021	4,586	9/6/2021	3,475
7/7/2021	6,630	8/7/2021	4,535	9/7/2021	3,473
7/8/2021	6,549	8/8/2021	4,487	9/8/2021	3,470
7/9/2021	6,476	8/9/2021	4,437	9/9/2021	3,470
7/10/2021	6,400	8/10/2021	4,387	9/10/2021	3,467
7/11/2021	6,328	8/11/2021	4,337	9/11/2021	3,464
7/12/2021	6,245	8/12/2021	4,291	9/12/2021	3,462
7/13/2021	6,163	8/13/2021	4,242	9/13/2021	3,462
7/14/2021	6,077	8/14/2021	4,193	9/14/2021	3,459
7/15/2021	5,985	8/15/2021	4,144	9/15/2021	3,456
7/16/2021	5,886	8/16/2021	4,099	9/16/2021	3,453
7/17/2021	5,795	8/17/2021	4,051	9/17/2021	3,453
7/18/2021	5,716	8/18/2021	3,994	9/18/2021	3,451
7/19/2021	5,641	8/19/2021	3,935	9/19/2021	3,448
7/20/2021	5,577	8/20/2021	3,880	9/20/2021	3,448
7/21/2021	5,523	8/21/2021	3,822	9/21/2021	3,445
7/22/2021	5,470	8/22/2021	3,767	9/22/2021	3,443
7/23/2021	5,416	8/23/2021	3,712	9/23/2021	3,440
7/24/2021	5,363	8/24/2021	3,656	9/24/2021	3,440
7/25/2021	5,309	8/25/2021	3,602	9/25/2021	3,437
7/26/2021	5,256	8/26/2021	3,547	9/26/2021	3,434
7/27/2021	5,202	8/27/2021	3,494	9/27/2021	3,434
7/28/2021	5,116	8/28/2021	3,492	9/28/2021	3,432
7/29/2021	5,048	8/29/2021	3,492	9/29/2021	3,429
7/30/2021	4,985	8/30/2021	3,489	9/30/2021	3,426
7/31/2021	4,918	8/31/2021	3,486		

APPENDIX Q
Crooked River Correspondence

Appendix Q-1. Receipt for payment of $8,000 to the Crooked River Conservation Fund in 2021.

DESCHUTES RIVER CONSERVANCY

PO BOX 1560
Bend, OR 97709

PAID 06/07/2021

Invoice

Date	Invoice #
5/1/2021	2167

Bill To
Deschutes Basin Board of Control PO Box 919 Madras, OR 97741

Description	Qty	Rate	Amount
DBBC HCP Crooked River Conservation Fund		8,000.00	8,000.00

Total	$8,000.00
Balance Due	$0.00

APPENDIX R
NUID Crooked River Pumping Data

Appendix R-1. NUID Crooked River pumping records for Water Year 2021.

Date	7:00 AM Flow at Hydromet Station CRSO (cfs)	Number of Pumps in Operation	Flow at Pumps (cfs)				Daily Volume Pumped (acre-feet)	DBHCP Measure CR-6 Minimum Flow (cfs) [1]		Prineville Storage Ordered	
			Average per Pump at Time of Reading	Total all Pumps at Time of Reading	Total all Pumps per Day (cfs estimated)	Average per Pump per Day (estimated)		Non-Dry Year	Dry Year	CFS	Acre-feet
4/1/2021								180	120	0.00	0.00
4/2/2021								180	120	0.00	0.00
4/3/2021								180	120	0.00	0.00
4/4/2021								180	120	0.00	0.00
4/5/2021								180	120	0.00	0.00
4/6/2021								180	120	0.00	0.00
4/7/2021								180	120	0.00	0.00
4/8/2021	164.00	0						180	120	0.00	0.00
4/9/2021	154.00	0						180	120	0.00	0.00
4/10/2021	158.00	0						180	120	0.00	0.00
4/11/2021	154.00	0						180	120	0.00	0.00
4/12/2021	160.00	0						180	120	0.00	0.00
4/13/2021	124.00	0						180	120	0.00	0.00
4/14/2021	111.00	0						180	120	0.00	0.00
4/15/2021	113.00	0						180	120	0.00	0.00
4/16/2021	80.00	5						180	120	32.00	63.47
4/17/2021	82.60	5	14.80	74.00	55.56	11.11	110.20	180	120	78.00	154.71
4/18/2021	40.30	5	14.60	73.00	73.42	14.68	145.63	180	120	78.00	154.71
4/19/2021	53.10	5	14.60	73.00	73.02	14.60	144.84	180	120	78.00	154.71
4/20/2021	40.30	6	14.60	73.00	72.87	12.15	144.54	180	120	104.00	206.28
4/21/2021	48.90	6	14.83	89.00	78.97	13.16	156.64	180	120	104.00	206.28
4/22/2021	34.10	6	15.00	94.00	90.06	15.01	178.63	180	120	120.00	238.02

Date	7:00 AM Flow at Hydromet Station CRSO (cfs)	Number of Pumps in Operation	Flow at Pumps (cfs)				Daily Volume Pumped (acre-feet)	DBHCP Measure CR-6 Minimum Flow (cfs) [1]		Prineville Storage Ordered	
			Average per Pump at Time of Reading	Total all Pumps at Time of Reading	Total all Pumps per Day (cfs estimated)	Average per Pump per Day (estimated)		Non-Dry Year	Dry Year	CFS	Acre-feet
4/23/2021	26.10	8	15.50	124.00	117.63	14.70	233.32	180	120	120.00	238.02
4/24/2021	28.40	8	15.50	124.00	122.97	15.37	243.91	180	120	120.00	238.02
4/25/2021	40.30	8	15.50	124.00	121.40	15.18	240.80	180	120	120.00	238.02
4/26/2021	48.90	8	15.50	124.00	122.14	15.27	242.26	180	120	120.00	238.02
4/27/2021	55.20	8	15.50	77.00	122.47	15.31	242.92	180	120	0.00	0.00
4/28/2021	92.10	0				0.00	5.93	180	120	0.00	0.00
4/29/2021	68.80	0				0.00	0.00	180	120	0.00	0.00
4/30/2021	54.10	0				0.00	0.00	180	120	0.00	0.00
April Total							**2,089.62**				**2,130.28**
5/1/2021	51.00	0				0.00		95	50	0.00	0.00
5/2/2021	48.90	0				0.00		95	50	0.00	0.00
5/3/2021	56.30	0				0.00		95	50	0.00	0.00
5/4/2021	63.00	0				0.00		95	50	0.00	0.00
5/5/2021	52.00	0				0.00		95	50	60.00	119.01
5/6/2021	41.20	2	14.45	32.00	28.89	14.45	57.31	95	50	60.00	119.01
5/7/2021	30.00	4	14.42	61.00	57.69	14.42	114.42	95	50	60.00	119.01
5/8/2021	24.00	4	15.92	61.00	63.69	15.92	126.34	95	50	60.00	119.01
5/9/2021	27.60	4	15.25	61.00	64.71	16.18	128.35	95	50	60.00	119.01
5/10/2021	36.70	4	15.25	61.00	63.01	15.75	124.98	95	50	60.00	119.01
5/11/2021	56.30	3	15.00	45.00	54.87	18.29	108.84	95	50	60.00	119.01
5/12/2021	30.80	4	15.00	60.00	62.70	15.68	124.36	95	50	60.00	119.01
5/13/2021	36.70	4	15.00	60.00	60.80	15.20	120.60	95	50	60.00	119.01
5/14/2021	33.20	4	15.00	60.00	64.92	16.23	128.77	95	50	60.00	119.01

Date	7:00 AM Flow at Hydromet Station CRSO (cfs)	Number of Pumps in Operation	Flow at Pumps (cfs)				Daily Volume Pumped (acre-feet)	DBHCP Measure CR-6 Minimum Flow (cfs) [1]		Prineville Storage Ordered	
			Average per Pump at Time of Reading	Total all Pumps at Time of Reading	Total all Pumps per Day (cfs estimated)	Average per Pump per Day (estimated)		Non-Dry Year	Dry Year	CFS	Acre-feet
5/15/2021	26.90	4	15.25	60.00	63.25	15.81	125.46	95	50	60.00	119.01
5/16/2021	27.60	4	15.25	61.00	68.40	17.10	135.67	95	50	60.00	119.01
5/17/2021	33.20	4	15.25	61.00	58.71	14.68	116.46	95	50	60.00	119.01
5/18/2021	34.10	3	14.30	43.00	52.47	17.49	104.07	95	50	0.00	0.00
5/19/2021	51.00	0	0.00	51.00	14.87	0.00	29.50	95	50	0.00	0.00
5/20/2021	37.60	0	0.00			0.00		95	50	0.00	0.00
5/21/2021	45.00	0	0.00			0.00		95	50	0.00	0.00
5/22/2021	40.30	0	0.00			0.00		95	50	0.00	0.00
5/23/2021	58.50	0	0.00			0.00		95	50	0.00	0.00
5/24/2021	63.00	0	0.00			0.00		95	50	0.00	0.00
5/25/2021	59.60	0	0.00			0.00		95	50	0.00	0.00
5/26/2021	64.10	0	0.00			0.00		95	50	0.00	0.00
5/27/2021	64.10	1	17.00	17.00	2.79	2.79	5.54	95	50	0.00	0.00
5/28/2021	67.60	1	12.00	N/A	2.63	2.63	5.22	95	50	0.00	0.00
5/29/2021	48.90	1	15.00	7.50	4.90	4.90	9.72	95	50	0.00	0.00
5/30/2021	52.00	1	16.00	15.00	5.01	5.01	9.94	95	50	0.00	0.00
5/31/2021	59.60	2	11.00	15.00	9.29	4.65	18.42	95	50	0.00	0.00
May Total							**1,593.97**				**1,547.13**
6/1/2021	48.90	0				9.91		86	54	0.00	0.00
6/2/2021	44.00	0				0.00		86	54	60.00	119.01
6/3/2021	82.60	5		35.00		0.00		86	54	60.00	119.01
6/4/2021	26.90	4	N/A	65.00	57.19	14.30	113.44	86	54	90.00	178.52
6/5/2021	15.10	6	15.40	90.00	82.02	13.67	162.69	86	54	90.00	178.52

Date	7:00 AM Flow at Hydromet Station CRSO (cfs)	Number of Pumps in Operation	Flow at Pumps (cfs)				Daily Volume Pumped (acre-feet)	DBHCP Measure CR-6 Minimum Flow (cfs) [1]		Prineville Storage Ordered	
			Average per Pump at Time of Reading	Total all Pumps at Time of Reading	Total all Pumps per Day (cfs estimated)	Average per Pump per Day (estimated)		Non-Dry Year	Dry Year	CFS	Acre-feet
6/6/2021	15.10	5	15.40	77.00	82.40	16.48	163.44	86	54	90.00	178.52
6/7/2021	48.90	7	15.10	91.00	82.40	11.77	163.44	86	54	90.00	178.52
6/8/2021	48.90	6	15.10	91.00	90.85	15.14	180.20	86	54	90.00	178.52
6/9/2021	53.10	6	15.30	92.00	90.79	15.13	180.08	86	54	90.00	178.52
6/10/2021	32.40	6	15.00	90.00	95.38	15.90	189.19	86	54	90.00	178.52
6/11/2021	55.20	6	15.17	91.00	82.76	13.79	164.15	86	54	90.00	178.52
6/12/2021	55.10	7	15.00	114.00	98.05	14.01	194.48	86	54	90.00	178.52
6/13/2021	57.30	8	15.00	117.00	58.70	7.34	116.43	86	54	90.00	178.52
6/14/2021	87.90	7	15.00	90.00	161.16	23.02	319.66	86	54	90.00	178.52
6/15/2021	59.50	7	14.80	104.00	107.56	15.37	213.35	86	54	15.00	29.75
6/16/2021	66.40	3	17.30	52.00	58.18	19.39	115.40	86	54	15.00	29.75
6/17/2021	68.80	3	17.30	52.00	49.06	16.35	97.31	86	54	15.00	29.75
6/18/2021	71.20	2	15.50	31.00	21.09	10.55	41.83	86	54	15.00	29.75
6/19/2021	66.40	2	N/A	N/A	13.31	6.66	26.40	86	54	15.00	29.75
6/20/2021	55.20	1	15.00	15.00	2.18	2.18	4.32	86	54	15.00	29.75
6/21/2021	54.10	1	15.00	5.00	1.41	1.41	2.80	86	54	15.00	29.75
6/22/2021	49.90	2	15.50	31.00	0.50	0.25	0.99	86	54	15.00	29.75
6/23/2021	70.00	2	N/A	N/A	12.22	6.11	24.24	86	54	15.00	29.75
6/24/2021	59.60	4	7.00	7.00	5.27	1.32	10.45	86	54	65.00	128.93
6/25/2021	55.20	3	17.00	51.00	29.03	9.68	57.58	86	54	100.00	198.35
6/26/2021	30.80	7	14.20	100.00	100.63	14.38	199.60	86	54	100.00	198.35
6/27/2021	42.10	7	14.20	100.00	110.40	15.77	218.98	86	54	100.00	198.35
6/28/2021	36.70	6	14.50	87.10	93.00	15.50	184.47	86	54	100.00	198.35
6/29/2021	27.60	7	9.45	101.50	106.87	15.27	211.98	86	54	100.00	198.35

Date	7:00 AM Flow at Hydromet Station CRSO (cfs)	Number of Pumps in Operation	Flow at Pumps (cfs)				Daily Volume Pumped (acre-feet)	DBHCP Measure CR-6 Minimum Flow (cfs) [1]		Prineville Storage Ordered	
			Average per Pump at Time of Reading	Total all Pumps at Time of Reading	Total all Pumps per Day (cfs estimated)	Average per Pump per Day (estimated)		Non-Dry Year	Dry Year	CFS	Acre-feet
6/30/2021	21.20	7	14.30	100.00	98.10	14.01	194.58	86	54	100.00	198.35
June Total							**3,551.48**				**3,788.49**
7/1/2021	13.40	7	14.30	100.40	98.09	14.01	194.57	61	51	100.00	198.35
7/2/2021	12.40	7	14.20	100.00	111.16	15.88	220.49	61	51	100.00	198.35
7/3/2021	7.86	7	14.00	100.00	101.34	14.48	201.00	61	51	100.00	198.35
7/4/2021	4.08	7	14.00	100.00	110.77	15.82	219.71	61	51	100.00	198.35
7/5/2021	4.66	7	14.00	99.50	94.02	13.43	186.48	61	51	100.00	198.35
7/6/2021	3.35	7	13.70	96.00	81.98	11.71	162.61	61	51	100.00	198.35
7/7/2021	22.96	6	14.10	84.50	87.62	14.60	173.80	61	51	100.00	198.35
7/8/2021	9.12	6	15.80	94.80	73.00	12.17	144.80	61	51	100.00	198.35
7/9/2021	5.64	6	15.80	95.00	84.34	14.06	167.29	61	51	100.00	198.35
7/10/2021	6.71	6	15.80	95.00	84.95	14.16	168.49	61	51	100.00	198.35
7/11/2021	6.71	6	15.96	95.80	89.82	14.97	178.15	61	51	100.00	198.35
7/12/2021	5.99	6	15.80	95.00	81.05	13.51	160.76	61	51	100.00	198.35
7/13/2021	7.08	6	16.00	96.00	84.58	14.10	167.77	61	51	100.00	198.35
7/14/2021	10.30	6	15.85	95.10	88.46	14.74	175.47	61	51	100.00	198.35
7/15/2021	9.05	6	13.66	82.00	80.67	13.45	160.01	61	51	100.00	198.35
7/16/2021	7.08	6	13.70	82.20	109.12	18.19	216.43	61	51	0.00	0.00
7/17/2021	27.60	0				0.00		61	51	0.00	0.00
7/18/2021	30.80	0				0.00		61	51	0.00	0.00
7/19/2021	31.60	0				0.00		61	51	0.00	0.00
7/20/2021	31.60	0				0.00		61	51	0.00	0.00
7/21/2021	27.60	0				0.00		61	51	0.00	0.00

Date	7:00 AM Flow at Hydromet Station CRSO (cfs)	Number of Pumps in Operation	Flow at Pumps (cfs)				Daily Volume Pumped (acre-feet)	DBHCP Measure CR-6 Minimum Flow (cfs) [1]		Prineville Storage Ordered	
			Average per Pump at Time of Reading	Total all Pumps at Time of Reading	Total all Pumps per Day (cfs estimated)	Average per Pump per Day (estimated)		Non-Dry Year	Dry Year	CFS	Acre-feet
7/22/2021	21.90	0				0.00		61	51	0.00	0.00
7/23/2021	20.50	0				0.00		61	51	0.00	0.00
7/24/2021	28.40	0				0.00		61	51	0.00	0.00
7/25/2021	32.40	0				0.00		61	51	0.00	0.00
7/26/2021	30.80	0				0.00		61	51	0.00	0.00
7/27/2021	32.40	0				0.00		61	51	0.00	0.00
7/28/2021	30.80	0				0.00		61	51	0.00	0.00
7/29/2021	32.40	0				0.00		61	51	0.00	0.00
7/30/2021	32.40	0				0.00		61	51	0.00	0.00
7/31/2021	36.70	0				0.00		61	51	0.00	0.00
July Total							**2,897.83**				**2,975.25**
2021 Total							**10,132.89**				**10,441.14**

[1] Non-Dry Year and Dry Year flows are the minimum instream flows at CRSO required under DBHCP Conservation Measure CR-6 when NUID is diverting live flow at the Crooked River Pumps. These flows are based on the NUID - DRC Agreement for flows in the Crooked River as it existed in December 2020, with the one exception that the Dry Year minimum for May was increased to 50 cfs for the DBHCP. These minimums relate only to NUID diversions of live flow at the Crooked River Pumps. Diversions of NUID Prineville Reservoir storage may continue even if there is insufficient live flow reaching the pumps to support these flows at CRSO. NUID and the DRC may increase the monthly minimum flows over time as a result for Conserved Water Projects, but such increases will remain requirements of the Agreement only and will not become requirements of the DBHCP.

APPENDIX S

Crooked River Pump Correspondence

Appendix S-1. Correspondence between NUID and USFWS Concerning Operation of the Crooked River Pumps in 2021.

From: Mike Britton
Sent: Thursday, April 15, 2021 3:09 PM
To: 'Kate Fitzpatrick' <kate@deschutesriver.org>
Cc: Josh Bailey <jbailey@northunitid.com>; Gary Calhoun <gcalhoun@northunitid.com>; 'GORMAN Kyle G * WRD (Kyle.G.Gorman@oregon.gov)' <Kyle.G.Gorman@oregon.gov>; 'GIFFIN Jeremy T * WRD (Jeremy.T.Giffin@oregon.gov)' <Jeremy.T.Giffin@oregon.gov>
Subject: CR Flows

Kate

Just a heads up that we'll begin pumping CR water tomorrow. We've called on our Prineville stored water as the CR natural flow is currently below the NUID min flow requirement. Just checked and flow in CR is 102 cfs and dropping.

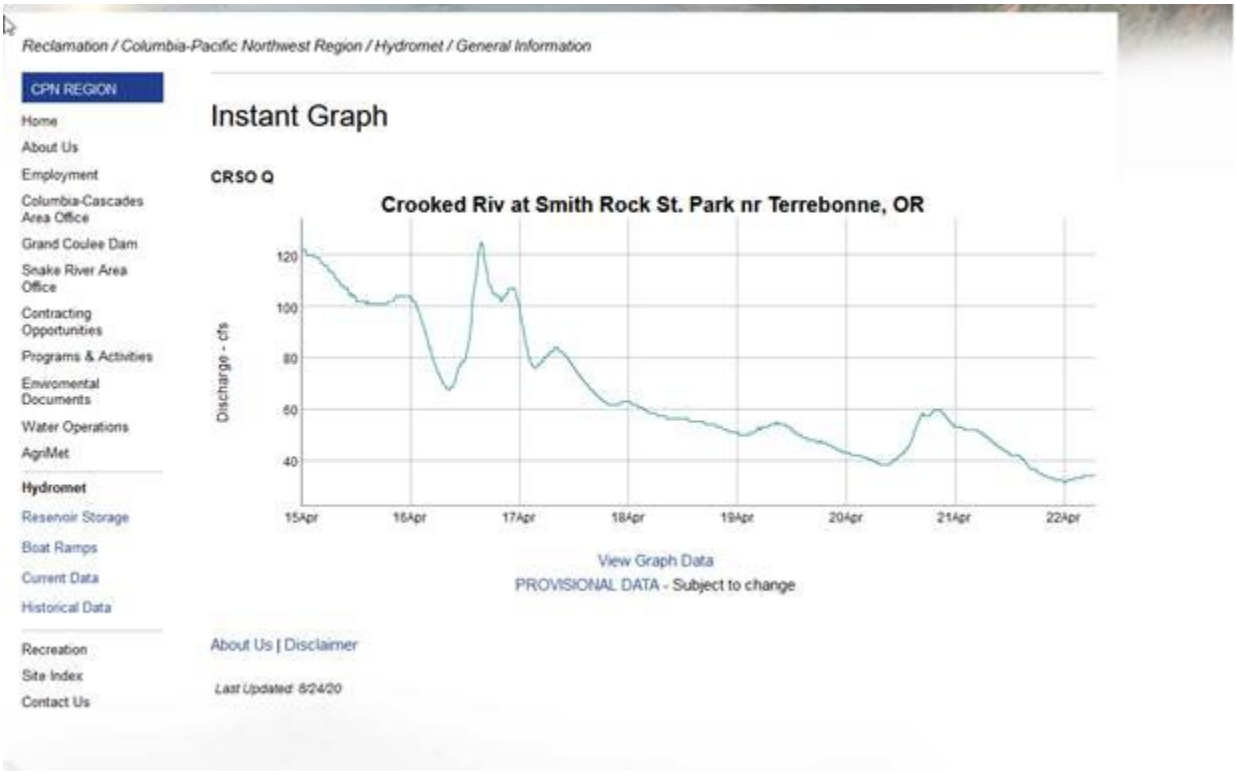
Mike

From: Mike Britton <mbritton@northunitid.com>
Sent: Thursday, April 22, 2021 10:35 AM
To: Moran, Bridget <bridget_moran@fws.gov>
Cc: Martin E. Vaughn <mvaughn@biotapacific.com>; Bruce at Ochoco Irrigation <bruceoid@crestviewcable.com>
Subject: Fwd: CR Flows

Good morning Bridget

Not sure if I need to report on this given the circumstances but thought it best to cover the bases. We currently have 6 pumps running with a 120 cfs request out of Bowman which would equal 8 pumps. We've not been able to pick up all of our stored water as people above us, we believe, are pulling it. Low flows and drops below the pumps is not a result of our pumping but the fact that people above us are taking the water and the lack of natural flow.

Mike



From: Mike Britton <mbritton@northunitid.com>
Sent: Friday, April 23, 2021 11:19 AM
To: Moran, Bridget N <bridget_moran@fws.gov>
Cc: Martin E. Vaughn <mvaughn@biotapacific.com>; bruceoid <bruceoid@crestviewcable.com>
Subject: [EXTERNAL] RE: CR Flows

Sorry – to further clarify – we are only pumping water that has been called for from our Prineville storage account.

Have a good weekend.
Mike

From: Moran, Bridget N <bridget_moran@fws.gov>
Sent: Friday, April 23, 2021 11:26 AM
To: Mike Britton <mbritton@northunitid.com>
Cc: Martin E. Vaughn <mvaughn@biotapacific.com>; bruceoid <bruceoid@crestviewcable.com>; Lickwar, Peter <peter_lickwar@fws.gov>; Soens, Anna H <anna_soens@fws.gov>
Subject: Re: [EXTERNAL] RE: CR Flows

Hi Mike,
Thanks for the clarification, but it was our understanding that you were only pumping what you had called for from your storage account.

Thanks for sending the earlier message too, it helps to clarify whether the low flows beyond the pumps, which may require notification, is an NUID event or not. Reclamation has also been keeping us appraised of the situation as well, and we appreciate NUID's attention and concern.

The DBHCP's annual report will correlate the pumping data with the gauges, so it'll demonstrate that NUID's pumping is not causing the flows to be below the HCP (DRC agreement) levels. We understand OWRD might be working on communicating with other diverters so they are clear regarding the lack of live flow and obligation to not divert water until it arrives (or as per Bruce directs).

It's going to be a challenging water year all around, so let's keep up with these communications, they are helpful.

Best,

Bridget Moran, Field Supervisor
Bend Field Office
U.S. Fish & Wildlife Service

(541) 480-7914