



— BUREAU OF —
RECLAMATION

2019 Annual Report

**Bureau of Reclamation Report on Monitoring and Implementation
Activities Associated with the U.S. Fish and Wildlife Service 2005
Biological Opinion for Operation and Maintenance of the Bureau of
Reclamation Projects in the Snake River Basin above Brownlee Reservoir**



U.S. Department of the Interior
Bureau of Reclamation
Columbia-Pacific Northwest Region
Snake River Area Office
Boise, Idaho

March 2020

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Cover Photograph: Ute ladies' tresses (*Spiranthes diluvialis*) on the banks of the Snake River below Palisades Dam, Bonneville County, Idaho. (Photograph taken by Amy Goodrich).

Acronyms and Abbreviations

Acronym or Abbreviation	Description
af	acre-feet
cfs	cubic feet per second
CPUE	Catch Per Unit Effort
eDNA	Environmental DNA
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
IDFG	Idaho Department of Fish and Game
ITS	Incidental Take Statement
NOAA	National Oceanic and Atmospheric Administration
O&M	Operations and Maintenance
Opinion	Biological Opinion
Reclamation	Bureau of Reclamation
RPM	Reasonable and Prudent Measure
T&C	Terms and Conditions
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WY	Water Year

This page intentionally left blank.

Table of Contents

1.	Introduction.....	1
1.1	Bull Trout.....	2
1.2	Snake River Snails.....	3
1.3	Yellow-billed Cuckoo	4
2.	Summary of 2019 Operations.....	4
2.1	Idaho.....	5
2.1.1	Boise River Basin Operational Indicators.....	5
2.1.2	Payette River Basin Operational Indicators.....	12
2.2	Oregon.....	15
2.2.1	Malheur River Basin Operational Indicators.....	15
2.2.2	Powder River Basin Operational Indicators.....	18
3.	Bull Trout	21
3.1	Boise River Basin.....	21
3.1.1	Boise River Basin Data Collection.....	22
3.1.2	Fish Sampling.....	22
3.1.3	Trap-and-Haul Efforts.....	22
3.1.4	Other Activities.....	23
3.2	Payette River Basin – Deadwood River System.....	25
3.2.1	Data Collection in the Deadwood River Basin	25
3.3	Malheur River Basin – Beulah Reservoir and the North Fork Malheur River	26
3.3.1	Temporary Water Lease.....	32
3.3.2	Trap-and-Haul Efforts.....	32
3.3.3	Other Activities – Redd Counts	33
3.4	Powder River Basin – Phillips Reservoir.....	34
3.4.1	Bull Trout Monitoring	34
3.4.2	Other Activities.....	36
4.	Snake River Physa	37

5. Literature Cited..... 38

List of Figures

Figure 1. Known distribution of bull trout populations (shaded areas on map) associated with Reclamation facilities in the Upper Snake River basin (Reclamation 2004). 3

Figure 2. Anderson Ranch Reservoir elevation (feet above sea level) for WY19. 8

Figure 3. Anderson Ranch Reservoir storage volume (af) for WY19. The straight line represents Reclamation’s Operational Indicator minimum threshold of 62,000 af of storage. 8

Figure 4. Arrowrock Reservoir storage volume (af) for WY19. The straight red line represents Reclamation's Operational Indicator of reservoir volume of 200,000 af. Reservoir volume should exceed this minimum at the end of June. On June 30, 2019, Arrowrock Reservoir storage volume was 225,101 af. 11

Figure 5. Arrowrock Reservoir surface elevation (feet above sea level) for WY19 and discharge (cfs). The straight red line represents Reclamation’s fall minimum elevation threshold (September 15-October 31) of 3,100 feet. 12

Figure 6. Deadwood Reservoir storage volume (af) for WY19. The straight red line represents Reclamation’s Operational Indicator minimum threshold of 50,000 af of storage. 14

Figure 7. Beulah Reservoir storage volume (af) for WY19. The straight red line represents Reclamation’s Operational Indicator minimum threshold of 2,000 af of storage. Lowest reservoir volume during reporting period occurred October 1, 2018 (2,379 acre feet). 17

Figure 8. Phillips Reservoir storage volumes (af) for WY19. Minimum active storage occurs when pool elevation reaches 4,009 feet above sea level (3,100 af of storage), corresponding to the point of inactive storage indicated by the red line. 20

Figure 9. Phillips Reservoir surface elevation (feet above sea level) for WY19. The operational indicator spring/summer minimum for mean daily reservoir elevation of 4,048 is indicated by the red line. 20

Figure 10. Powder River inflows to Phillips Reservoir in WY19 measured in cfs and recorded at USGS Gage #13275105, Powder River at Husdpth Lane near Sumpter, Oregon..... 21

Figure 11. Locations of experimental gill net and fyke net sets during the 2019 spring prey base sampling in Beulah Reservoir. 28

Figure 12. Length frequency histogram for Redside shiner captured during spring sampling 2011, 2012, 2013 and 2019 using gill nets and fyke traps..... 30

Figure 13. Length frequency histograms for sucker spp. (*Catostomid*) less than 160 millimeters (mm) total length (top) and greater than 160 mm total length (bottom) captured during spring sampling 2011, 2012, 2013 and 2019 using gill nets and fyke traps. 31

Figure 14. Length frequency histogram for Northern pikeminnow captured during spring sampling 2011, 2012, 2013 and 2019 using gill nets and fyke traps..... 32

Figure 15. Length frequency histogram for Rainbow trout captured during spring sampling 2011, 2012, 2013 and 2019 using gill nets and fyke traps..... 32

Figure 16. Data on bull trout redd trends observed in the North Fork Malheur River watershed (North Fork Malheur River) and carryover storage at the start of the Water Year in Beulah Reservoir, Water Years 1992–2018. The number of redds observed after 2007 has been adjusted by one to reflect the reduced size of the area surveyed. No redd count data exist for 2012, 2014, 2015 or 2019. See footnote 7 as this graph has been modified and corrected for previous years..... 34

List of Tables

Table 1. Summary of amount or extent of anticipated take of bull trout associated with Reclamation’s Anderson Ranch Dam and Reservoir facility operations during the 2019 reporting period.....6

Table 2. Summary of amount or extent of incidental take of bull trout associated with Reclamation’s Arrowrock Dam and Reservoir facility operations during the 2019 reporting period.9

Table 3. Summary of amount or extent of anticipated take of bull trout associated with Reclamation’s Deadwood Dam and Reservoir facility operations during the 2019 reporting period. 13

Table 4. Summary of amount or extent of anticipated take of bull trout associated with Reclamation’s Agency Valley Dam and Beulah Reservoir facility operations during the 2019 reporting period..... 16

Table 5. Summary of amount or extent of anticipated take of bull trout associated with Mason Dam and Phillips Reservoir facility operations during the 2019 reporting period, as included in the monitoring and reporting plan finalized in 2016. 19

Table 6. Fish stocking by IDFG in WY 2019 in the Boise River basin for all fish types 24

Table 7. Fish stocking by IDFG in 2019 in Deadwood Reservoir for all fish types 26

Table 8. Catch summaries for all gear types used during the 2019 spring prey base sampling in Beulah Reservoir, May 21 to June 28. 29

Table 9. Catch per unit effort (CPUE) (fish captured per hour) for predominant prey base species during spring sampling 2011, 2012, 2013, and 2019 using gill nets and fyke traps. 29

Table 10. Phillips Reservoir fish sampling data from 2019 effort, including total catch for each species (spp.) by sampling method and catch per unit effort (CPUE) by sampling method. 36

1. Introduction

The Bureau of Reclamation (Reclamation) consulted with the U.S. Fish and Wildlife Service (USFWS) pursuant to Section 7 of the Endangered Species Act (ESA) on 12 proposed actions involving the effects of future operations and routine maintenance at 12 Federal projects in the Upper Snake River basin on six different listed species known to occur in the area at that time (Reclamation 2004). In March 2005, USFWS completed a non-jeopardy Biological Opinion (2005 Opinion) for Reclamation's operations and maintenance (O&M) activities in the Snake River basin above Brownlee Reservoir (USFWS 2005). The 2005 Opinion contained a 30-year incidental take statement (ITS) for bull trout and corresponding reasonable and prudent measures (RPMs) that outlined nondiscretionary actions to minimize take of species listed under the ESA that may be impacted by Reclamation's operations (USFWS 2005). USFWS determined incidental take by correlating frequencies and magnitudes of streamflow and reservoir conditions at specific facilities with an estimate of population effects during critical seasonal time periods in the bull trout's life history. USFWS then described the amount or extent of incidental take at each facility based on operational thresholds.

At the time of the 2005 Opinion, bull trout (*Salvelinus confluentus*) were not known to exist in Phillips Reservoir¹ on the Powder River and, therefore, were not included in the 2005 Opinion or associated documents. In 2011, two bull trout were documented in Phillips Reservoir, necessitating that Reclamation consult with USFWS for bull trout in this area (Reclamation 2013). USFWS completed a non-jeopardy Biological Opinion in June 2014 (2014 Opinion) for Reclamation's O&M activities in the Powder River (USFWS 2014) as a companion document to the 2005 Opinion. The 2014 Opinion contains a 21-year ITS corresponding to the 2005 ITS and RPMs that outlines nondiscretionary actions to minimize take of bull trout in Phillips Reservoir.

The 2014 Opinion also included consultation on bull trout critical habitat for the same area analyzed in the 2005 Opinion. USFWS concluded that Reclamation's O&M of the Upper Snake River projects is not likely to destroy or adversely modify designated critical habitat for bull trout.

In addition to bull trout, the 2005 Opinion also included consultation on the Snake River physa (*Physa [Haitia] natricina*, hereafter physa). Monitoring for physa was reinitiated in 2012 in response to the Minidoka Dam spillway replacement project. Project construction was completed during the summer of 2015. Reclamation consulted on project operations following construction of the spillway. The consultation addressed Reclamation's impact to physa located in the Snake River above Brownlee Reservoir, including the Minidoka Dam spillway. Reclamation received a Biological Opinion (2015 Opinion) on May 8, 2015, finding that Reclamation's proposed operations are likely to adversely affect physa in the Minidoka Dam spillway. An ITS with associated Terms and Conditions (T&Cs) and RPMs was provided. The

¹ Phillips Reservoir was referred to as Phillips Lake in the 2004 Assessment.

consultation was aligned with ongoing actions associated with the long-term O&M of the current 2005 Opinion (USFWS 2005) and is considered a supplement to the 2005 Opinion.

The ITS in the 2005 Opinion has two main components: 1) T&Cs that incorporate a monitoring component to ensure the action agency does not exceed the amount or extent of incidental take described in the ITS, and 2) RPMs to minimize the amount or extent of take without altering the basic design, location, scope, duration, or timing of the action. The 2005 Opinion requires Reclamation to provide an annual report to USFWS by December 31 of each year that documents incidental take monitoring efforts and implementation status of all T&Cs and RPMs. At Reclamation's request (a letter dated November 13, 2007), USFWS agreed to permanently change the submittal date from December 31 to March 31 of the following year.

This document is submitted as Reclamation's annual report for Water Year (WY) 2019 (October 1, 2018, to September 30, 2019).

1.1 Bull Trout

This section summarizes annual water operations at bull trout projects and describes population monitoring and other relevant work associated with projects that address specific RPMs. In addition, this report may discuss other relevant bull trout work that is not managed by Reclamation but is directly relevant to bull trout or bull trout critical habitat within Reclamation's projects.

In its Monitoring and Implementation Plan (Reclamation 2006), Reclamation identified methods to monitor bull trout throughout the duration of the 2005 Opinion. Monitoring elements include evaluating RPMs through operational indicators and tracking population trends. These monitoring methods are continually reassessed and adjusted, as appropriate, to incorporate study findings and new technologies and methodologies as they are developed. To monitor compliance with the operational thresholds defined in the ITS, Reclamation monitored, evaluated, and summarized operations for WY19 in Reclamation's Hydromet system.² Operational thresholds affecting the amount or extent of anticipated take are described in Section 3.

Bull trout have been documented in five of Reclamation's facilities in the Upper Snake River basin. This report covers the four facilities assessed in Reclamation's 2004 Biological Assessment (BA) and 2005 Opinion (Anderson Ranch Dam and Reservoir; Arrowrock Dam and Reservoir; Deadwood Dam and Reservoir; and Agency Valley Dam and Beulah Reservoir), as well as Mason Dam and Phillips Reservoir, which were assessed in the 2013 Biological Assessment and 2014 Opinion. These facilities are shown in Figure 1.

² See Reclamation's Hydromet website at: <http://www.usbr.gov/pn/hydromet/select.html>

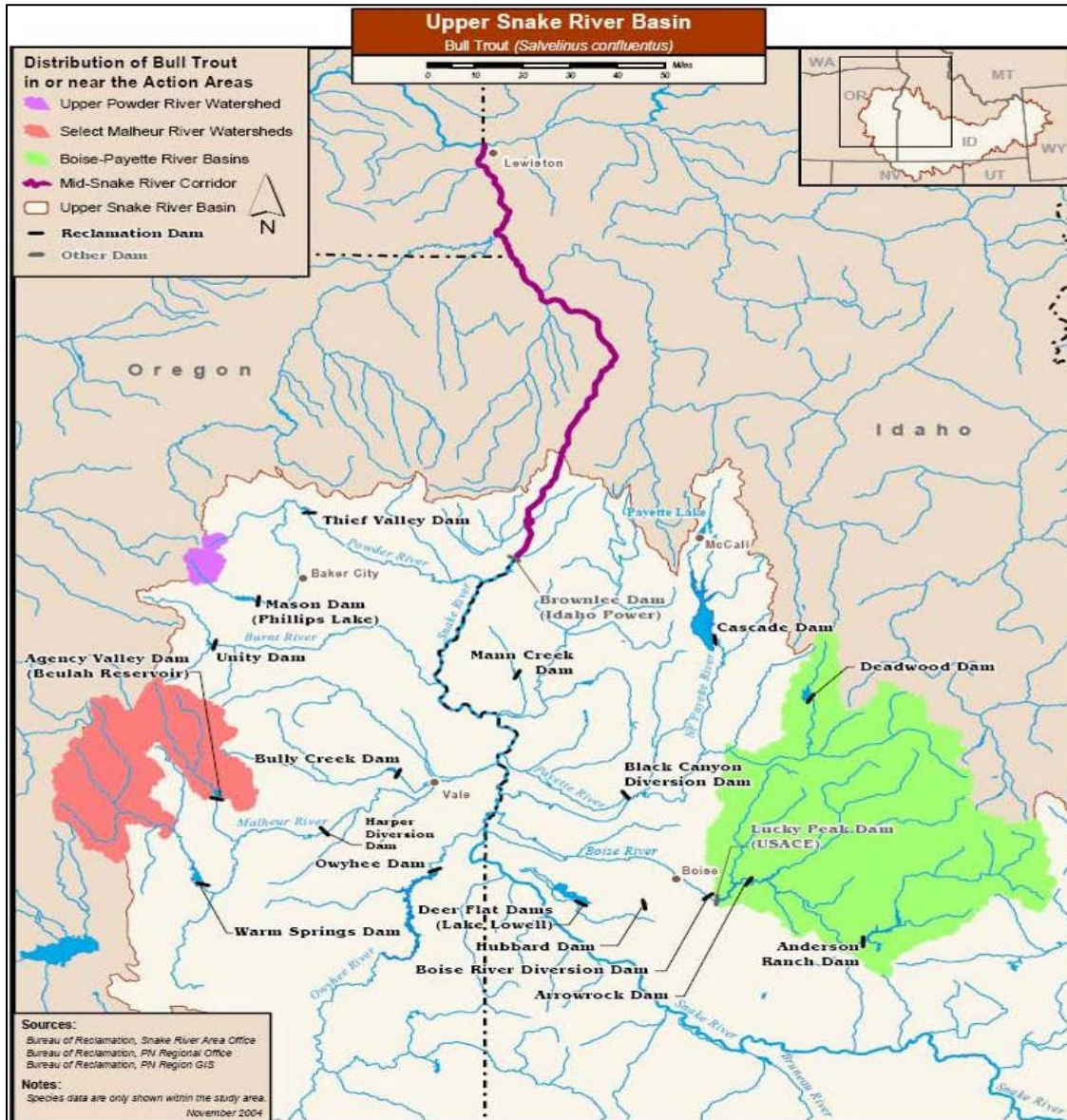


Figure 1. Known distribution of bull trout populations (shaded areas on map) associated with Reclamation facilities in the Upper Snake River basin (Reclamation 2004).

1.2 Snake River Snails

Previous annual reports to USFWS documented two species of snails in the Snake River basin: Utah valvata (*Valvata utabensis*) and Snake River physa. USFWS determined that Utah valvata did not meet the definition of an endangered or threatened species under the ESA. The Utah valvata was removed from the ESA list, thereby removing all protections and subsequent monitoring and reporting requirements provided by the ESA (75 FR 52272). Accordingly, 2010 was the last year Reclamation monitored the Utah valvata.

The physa remains an ESA-listed species; however, the 2005 Opinion did not provide an ITS, monitoring requirements, or T&Cs for physa due to the uncertainty of their presence in the

action area. Subsequent to the 2005 Opinion, physa were confirmed in the action area. A supplemental consultation with USFWS to address possible effects to physa from long-term operation of the newly constructed spillway at Minidoka Dam was completed in 2015. This supplemental consultation was initiated during construction of the spillway, which began in 2011 and was completed in the spring of 2015. The current take coverage for operations is covered under the *Biological Opinion for the Bureau of Reclamation, Operations and Maintenance above Brownlee Reservoir* (2015 Opinion) issued by USFWS in May 2015 (USFWS 2015). Information reported in this document is related to the most recent requirements set forth in this 2015 Opinion.

While Reclamation's physa monitoring requirements under the 2015 Opinion ended in 2017, Reclamation has continued to assist USFWS with ongoing survey efforts as personnel and funding allow. During the 2019 reporting period, Reclamation participated in ongoing USFWS-led suction dredge surveys for physa in the Snake River below Minidoka Dam, near the old Jackson Bridge site. Reclamation has no immediate plans to independently perform surveys in the future.

1.3 Yellow-billed Cuckoo

Reclamation entered into informal ESA Section 7 consultation with USFWS in the fall of 2016 for the western Distinct Population Segment of the yellow-billed cuckoo (*Coccyzus americanus occidentalis*), following the USFWS determination to list this species as threatened in November 2014 (79 FR 67154). A Biological Assessment comprehensively evaluating effects to the yellow-billed cuckoo from Reclamation's operations in the Snake River basin above Brownlee Reservoir was submitted to USFWS in July 2017. In August 2017, USFWS issued a Letter of Concurrence with that BA's findings, stating that Reclamation operations are not likely to adversely affect the species.

2. Summary of 2019 Operations

The following information summarizing 2019 operations was included in Reclamation's 2019 annual progress report to the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service on Reclamation's Salmon Flow Augmentation Program:

Early in water year 2019, the carryover water supply conditions were near average to above average in the Snake River basin above Brownlee Reservoir. In the Payette, Boise, and Upper Snake basins, November carryover storage from 2019 was 96, 102, and 120 percent of average, respectively.

In the early winter and through January, well below normal precipitation fell in the Payette, Boise, and Upper Snake basins. Snowpack at the beginning of February was 81 percent of normal in the Payette, 74 percent of normal in the Boise, and 84 percent of normal in the Upper Snake. During the month of February, precipitation totals in all three basins were well

above average, with the Boise basin receiving 305 percent of average precipitation. This increased the snowpack significantly, and by April 1, the snowpack was 124 percent of normal in the Payette, 120 percent of normal in the Boise, and 108 percent of normal in the Upper Snake.

Above average precipitation in Central and Eastern Oregon, particularly in April and May, resulted in high runoff conditions. All of the eastern Oregon reservoirs filled with the exception of Phillips Lake.

Observed unregulated runoff in the Payette and Boise basins for the April through July period was well above average with the natural flows being 131 percent of average for the Payette River at Horseshoe Bend, and 128 percent of average for the Boise River near Boise. With closer to average snowpack, natural runoff in the Upper Snake basin was near average at 104 percent of average for the Snake River at Heise. Flood control releases were required in all three basins leading up to and during the spring runoff of 2019.

Refill in all three of the basins was either nearly achieved (Upper Snake) or deliberately missed (Payette and Boise) to provide flow augmentation water as early as possible. The Upper Snake reservoir system would have filled but for required flood control releases. It reached a maximum combined physical storage content of 4,048,035 acre-feet (af), approximately 137,660 af below full capacity of 4,185,695 af. The Boise reservoir system nearly filled reaching a maximum storage content of 930,450 af and would have filled but for early flow augmentation releases. The Boise reservoir system maximum storage content peaked at approximately 19,250 af below its full capacity of 949,700 af. The Payette reservoir system also nearly filled reaching a maximum storage content of 773,355 af and also would have filled but for early flow augmentation releases. The Payette reservoir system maximum storage content peaked at approximately 27,097 af below its full capacity of 800,452 af.

2.1 Idaho

2.1.1 Boise River Basin Operational Indicators

The term incidental take is defined as death, harm, sub-lethal harassment, injury, or displacement of an individual organism (USFWS and NMFS 1998). Specific operations or conditions at Anderson Ranch and Arrowrock dams and reservoirs that are expected to result in the incidental take of bull trout were described in the USFWS 2005 Opinion. These operations or conditions are summarized as operational indicators for each dam in Table 1 and Table 2.

Arrowrock Dam and Reservoir

No operational indicators were exceeded during the 2019 reporting for operations at Arrowrock Dam and Reservoir.

Anderson Ranch Dam and Reservoir

One operational indicator was exceeded during the 2019 reporting period for operations at Anderson Ranch Dam:

Anderson Ranch Reservoir stored and released water (Table 1, Figure 2, and Figure 3); however, the 2005 Opinion granted Reclamation an exemption for this action for 30 out of 30 years for which the Opinion is valid.

Table 1. Summary of amount or extent of anticipated take of bull trout associated with Reclamation’s Anderson Ranch Dam and Reservoir facility operations during the 2019 reporting period.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
Up to 50 percent of the Middle and North Fork populations are affected by spillway discharges that disrupt timing of migration and spawning and that alter metabolic rates and up to 10 percent of bull trout in the reservoir are entrained into the South Fork Boise River	Water is discharged over the spillway	Spring	6 of 30 years	The spillway was not used during the reporting period	<u>4 of 6 years</u> 2006: 9 days 2014: 3 days 2017: 20 days 2018: 5 days
Up to 50 percent of the Middle and North Fork populations are affected by the altered flow and temperature regime that disrupts migration and spawning and that increases metabolic rates	Water is stored and released at Anderson Ranch Dam	Spring through fall	30 of 30 years	Anderson Ranch Reservoir elevations for WY19 are shown in Figure 2	<u>15 of 30 years</u> Exceeds annually

2 Summary of 2019 Operations

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
Up to 4 percent of bull trout in the reservoir experience degraded water quality	Reservoir storage volume falls below 62,000 af (Figure 3)	Summer	2 of 30 years	Reservoir storage volume was maintained above 62,000 af (Figure 3)	<u>0 of 2 years</u>

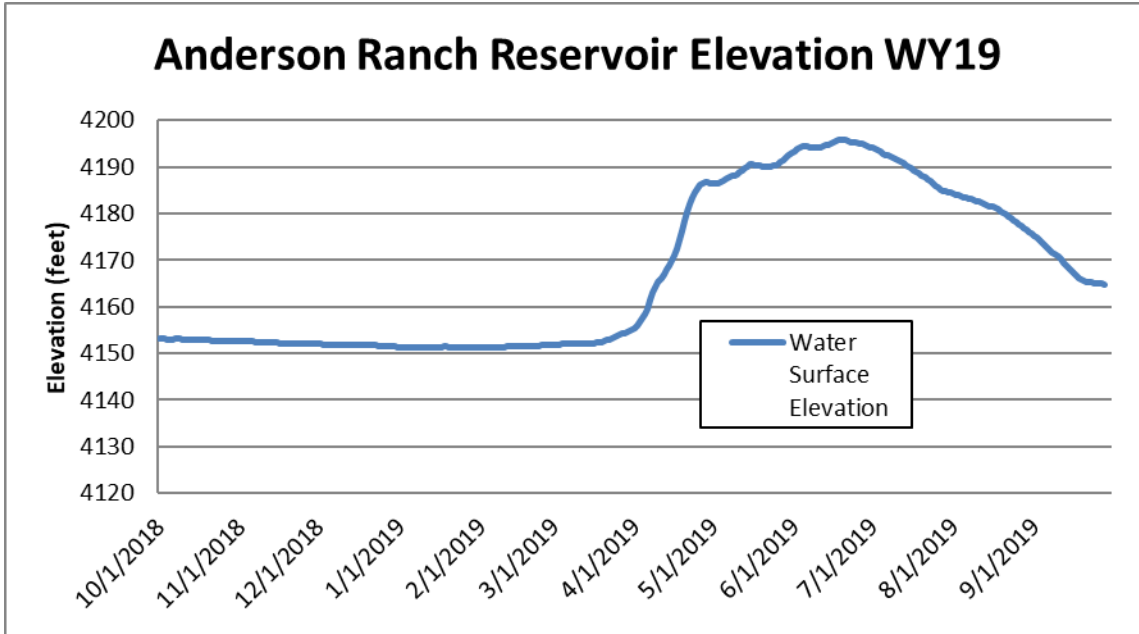


Figure 2. Anderson Ranch Reservoir elevation (feet above sea level) for WY19.

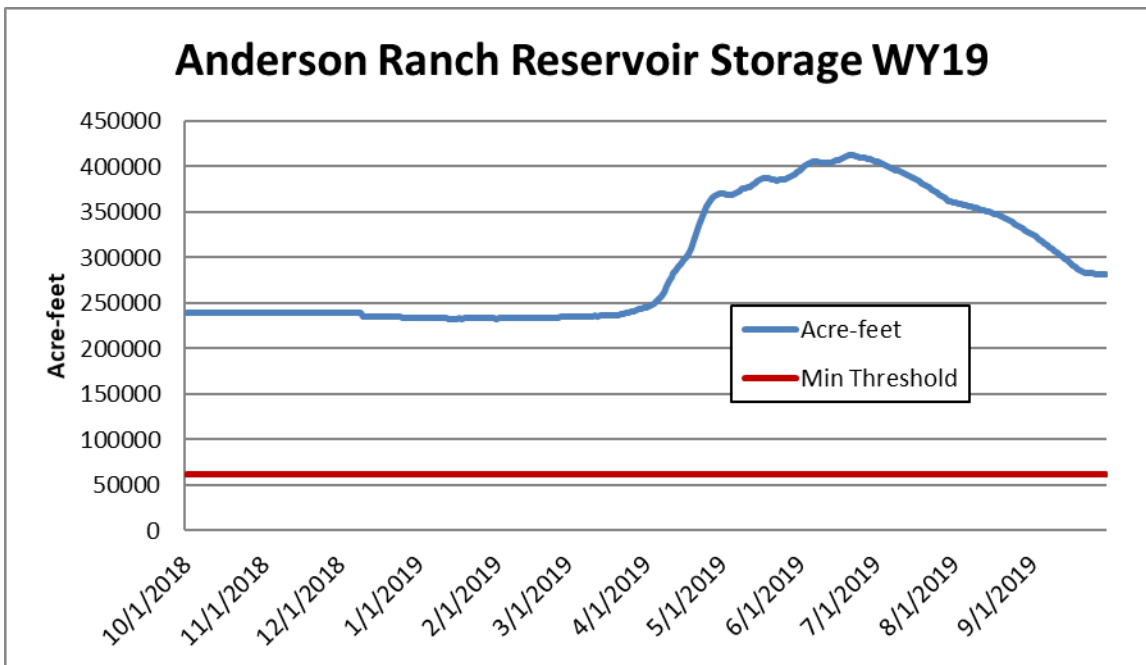


Figure 3. Anderson Ranch Reservoir storage volume (af) for WY19. The straight line represents Reclamation’s Operational Indicator minimum threshold of 62,000 af of storage.

Arrowrock Dam and Reservoir

No operational indicators were exceeded during the 2019 reporting for operations at Arrowrock Dam.

Table 2. Summary of amount or extent of incidental take of bull trout associated with Reclamation's Arrowrock Dam and Reservoir facility operations during the 2019 reporting period.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
Up to 50 percent of the Middle and North Fork populations are affected by low reservoir productivity and decreased prey.	Reservoir volume of less than 200,000 af at the end of June	June 30	3 of 30 years	Reservoir volume was 225,101 af on June 30, 2019. Refill to 200,000 af was achieved on April 21, 2019; reservoir content dipped slightly below this threshold from May 4-May 17 and May 24-May 29, 2019, before rising to a peak of 258,217 af on June 17, 2019. It remained above 200,000 af until July 13, 2019 (Figure 4).	<u>3 of 3 years</u> 2007: yes (6/15) 2013: yes (4/24) 2015: yes (6/25) (Non-discretionary 2016 ³)

³ Only discretionary reservoir operations are applicable to the number of excepted years for this operational indicator. Flood control operations were in place in 2016; therefore, Reclamation did not have the discretion in operations to meet this operational indicator. In past reports, 2016 was erroneously reported as one of the three excepted years. This has been corrected and the number adjusted in this report.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
Up to 8 percent of bull trout in the reservoir are entrained into Lucky Peak Reservoir, as averaged over any consecutive 5-year period.	Water is discharged over the spillway.	March through June	15 of 30 years	The spillway was not used during the reporting period	<u>2³ of 15 years</u> 2006: 9 days 2017: 49 days
Up to 2 percent of bull trout in the reservoir are entrained into Lucky Peak Reservoir	Discharge exceeds 695 cfs while the reservoir water surface elevation is less than 3,111 feet ³	July through September	30 of 30 years	Reservoir surface elevation did not drop below 3,111 feet during the critical season in WY 2019. This operational indicator is no longer applicable due to valve reconfigurations ⁴	<u>10 of 30 years</u>
Up to 20 percent of bull trout in the reservoir, as averaged over any 5 consecutive years, experience habitat degradation and predation	Mean daily reservoir elevation falls below 3,100 feet	September 15 through October 31	18 of 30 years	Reservoir surface elevation did not drop below 3,100 feet during the critical season in WY 2019 (Figure 5).	<u>0 of 18 years</u>

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
Up to 5 percent of bull trout in the reservoir are entrained into Lucky Peak Reservoir, as averaged over any consecutive 5-year period	Discharge exceeds 695 cfs while the reservoir water surface elevation is less than 3,111 feet (Figure 5) ⁴	Winter	20 of 30 years	This operational indicator is no longer applicable due to valve reconfigurations	<u>0 of 20 years</u>

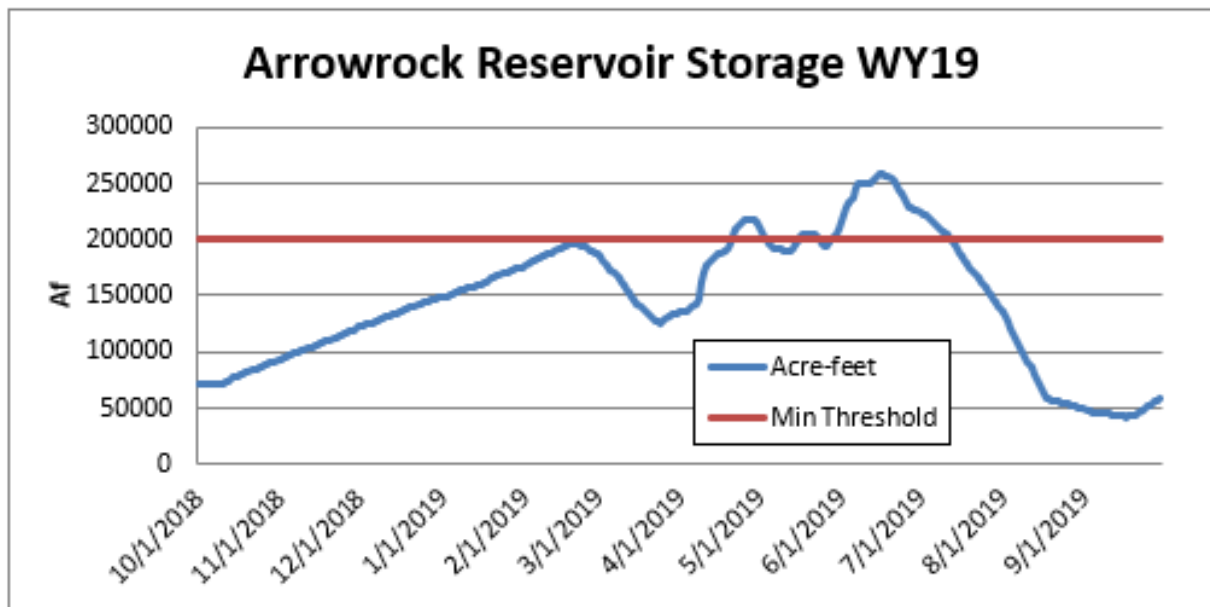


Figure 4. Arrowrock Reservoir storage volume (af) for WY19. The straight red line represents Reclamation’s Operational Indicator of reservoir volume of 200,000 af. Reservoir volume should exceed this minimum at the end of June. On June 30, 2019, Arrowrock Reservoir storage volume was 225,101 af.

⁴ Since the 2005 Opinion was issued, valve reconfigurations at Arrowrock Dam have caused the upper release conduits to no longer be used, making these operational indicators obsolete. This is described in further detail in Reclamation 2018b. This indicator is still listed in annual reporting, but is considered no longer applicable.

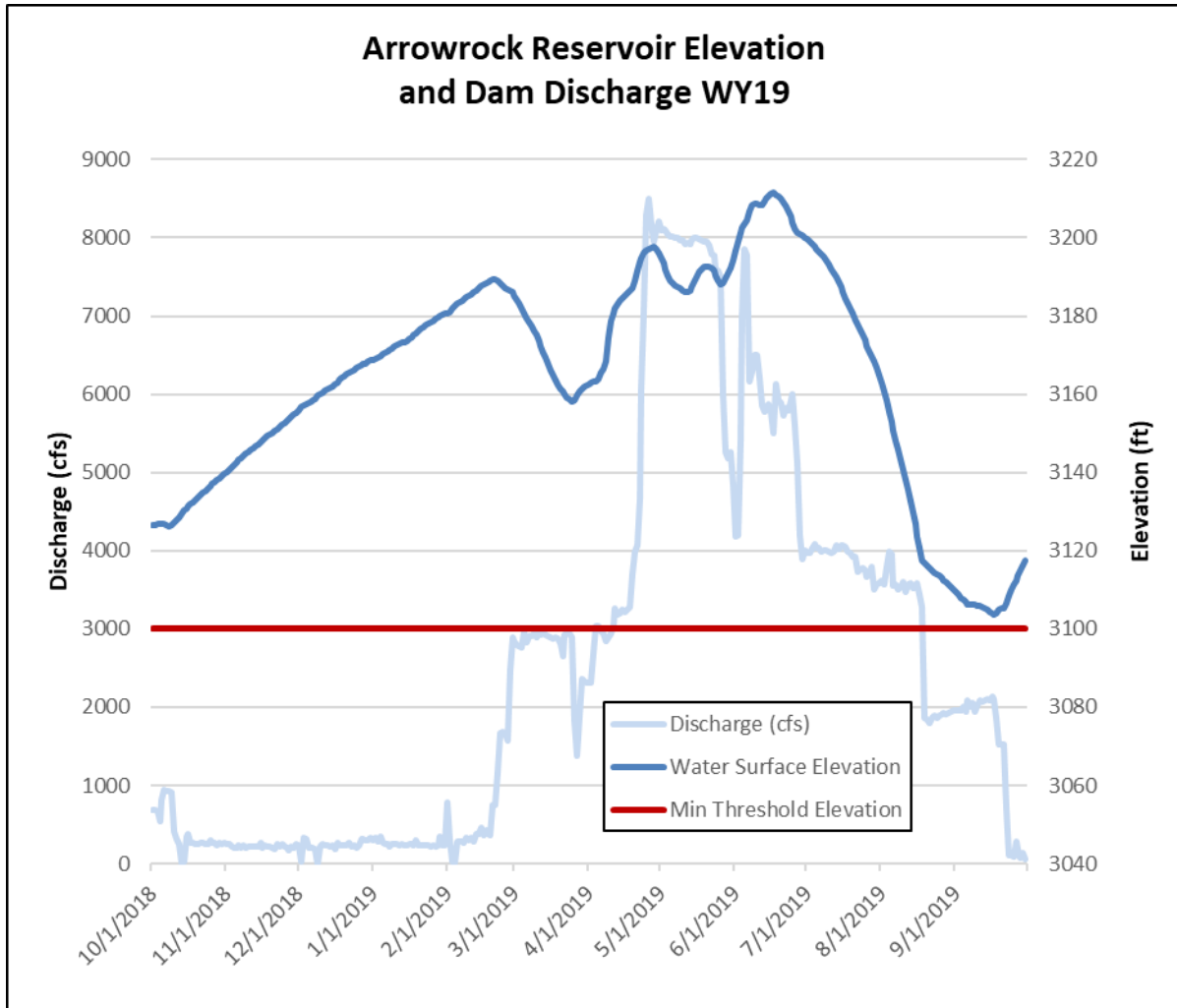


Figure 5. Arrowrock Reservoir surface elevation (feet above sea level) for WY19 and discharge (cfs). The straight red line represents Reclamation’s fall minimum elevation threshold (September 15-October 31) of 3,100 feet.

2.1.2 Payette River Basin Operational Indicators

The term *incidental take* is defined as death, harm, sub-lethal harassment, injury, or displacement of an individual organism. Specific operations or conditions at Deadwood Dam and Reservoir that are expected to result in the incidental take of bull trout were listed in the USFWS 2005 Opinion. These operations or conditions are summarized as operational indicators for Deadwood Dam and Reservoir in Table 3. Figure 6 illustrates Deadwood Reservoir storage volume in WY19.

Deadwood Dam and Reservoir

One operational indicator was exceeded during the 2019 reporting period in the Payette River basin:

Deep water releases occurred throughout the year at Deadwood Dam (Table 3); however, the 2005 Opinion granted Reclamation an exemption for this action for 30 of the 30 years for which the Opinion is valid.

Table 3. Summary of amount or extent of anticipated take of bull trout associated with Reclamation’s Deadwood Dam and Reservoir facility operations during the 2019 reporting period.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
Up to 2 to 4 percent of bull trout in Deadwood Reservoir are entrained into the Deadwood River below the dam	Water is discharged over the spillway (surface elevation exceeds 5,334 feet)	Spring	11 of 30 years	Water was not discharged over the spillway during the reporting period in WY19	<u>6 of 11 years</u> 2006: 32 days 2007: 33 days 2008: 33 day 2010: 15 days 2014: 69 days 2015: 50 days
Up to 2 to 4 percent of bull trout in Deadwood Reservoir are affected by degraded water conditions	Reservoir storage volume falls below 50,000 af	August through October	2 of 30 years	Reservoir storage volumes did not drop below 50,000 af during the reporting period in WY19 (Figure 6)	<u>0 of 2 years</u>
All bull trout in the Deadwood River downstream from the dam are affected by spillway discharges that disrupt timing of migration and spawning and that alter metabolic rates	Water is discharged over the spillway	May through July	11 of 30 years	Water was not discharged over the spillway during the reporting period in WY19	<u>6 of 11 years</u> 2006: 32 days 2007: 33 days 2008: 33 day 2010: 15 days 2014: 69 days 2015: 50 days

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
All bull trout in the Deadwood River downstream from the dam are affected by low winter streamflows and temperatures that affect bull trout movement and growth, and reproduction of bull trout and the prey base	Deep water releases at Deadwood Dam and low flows below the dam	Spring – temperature increases and flow decreases; Summer – temperature decreases and flow increases; Fall – temperature increases and flow reductions; Winter – temperature increases and flow reductions	30 of 30 years	All releases are deep water releases except for water discharged over the spillway	<u>15 of 30 years</u> Exceeds annually

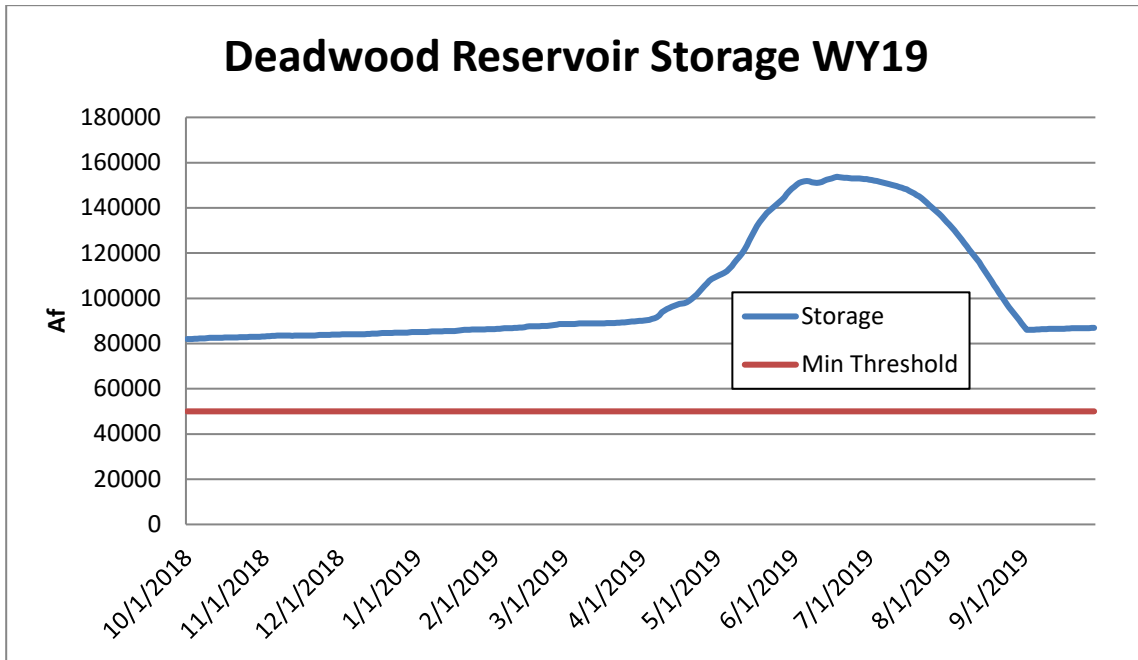


Figure 6. Deadwood Reservoir storage volume (af) for WY19. The straight red line represents Reclamation’s Operational Indicator minimum threshold of 50,000 af of storage.

2.2 Oregon

Carryover storage volume in Beulah Reservoir for WY19 was 2,379 af on October 1, 2018, approximately 4 percent of full capacity and above the conservation pool target of 2,000 af established in Reclamation (2018d). Beulah Reservoir filled to its peak WY19 capacity of 58,887 af (99 percent of full capacity) in late May 2019, and subsequently drafted to a low of 14,218 af (24 percent of full capacity) by the end of the reporting period. Beulah Reservoir did not fall below the 2,000 af conservation pool threshold at any point in WY19.

Phillips Reservoir began WY19 with a carryover storage volume of 6,323 af on October 1, 2018 (6 percent of full capacity), which dropped to a low of 5,720 af by November 5, 2018, and then refilled to a peak of 52,151 af (54 percent of full capacity) by the middle of June 2019. Phillips Reservoir was subsequently drafted to a low of 16,207 af (16 percent of full capacity) by the end of the reporting period.

Information on flows discharged from the dams during WY19 (October 1, 2018, to September 30, 2019) can be found on Reclamation's Hydromet website². Reservoir water operations, including daily average reservoir elevations, contents in af, storage, and outflow for Reclamation facilities, are discussed in detail later in this report.

2.2.1 Malheur River Basin Operational Indicators

The term *incidental take* is defined as death, harm, sub-lethal harassment, injury, or displacement of an individual organism. Specific operations or conditions at Agency Valley Dam and Beulah Reservoir that are expected to result in the incidental take of bull trout were listed in the USFWS 2005 Opinion. These operations or conditions are summarized as operational indicators in Table 4.

Agency Valley Dam/Beulah Reservoir

No operational indicators were exceeded during the 2019 reporting period in the Malheur River basin.

Table 4. Summary of amount or extent of anticipated take of bull trout associated with Reclamation’s Agency Valley Dam and Beulah Reservoir facility operations during the 2019 reporting period.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
Up to 10 percent of bull trout in Beulah Reservoir are entrained into the North Fork Malheur River below Agency Valley Dam	Water is discharged over the spillway	May through June	3 of 30 years	The spillway was not used during the WY19 reporting period	<u>1 of 3 years</u> 2006: Yes Non-discretionary spill in 2011 and 2017 ⁵
All bull trout returning to Beulah Reservoir to over-winter are affected by a reduced prey base	Reservoir storage falls below 2,000 af	August through October	10 of 30 years	Reservoir storage volume did not fall below 2,000 af in the WY19 reporting period (Figure 7)	<u>8 of 10 years</u> 2007: 60 days 2008: 34 days 2009: 53 day 2010: 28 days 2013: 45 days 2014: 56 days 2015: 35 days 2016: 15 days

⁵ Only discretionary spillway use is applicable to the number of excepted years for this operational indicator. Spill in 2011 and 2017 was necessary under flood control operations and, therefore, was non-discretionary. In past reports, the spill in 2011 was erroneously reported as one of the three excepted years. This has been corrected and the number in this report has been adjusted.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
Reduced prey based caused by competition from non-native fish	Run-of-river operations triggered by fish sampling	October through May	3 of 15 years (2019 – 2034)	Following conditions identified in Reclamation 2018c, run-of-river operations were not used in WY19	<u>0 of 3 years</u>

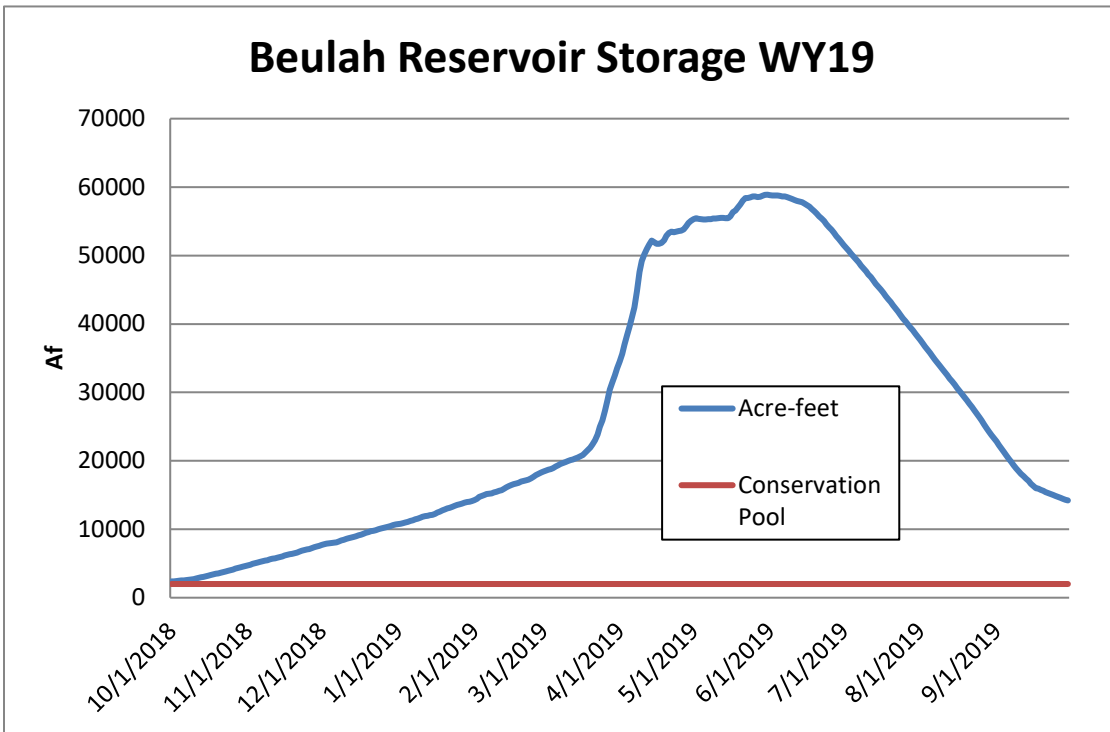


Figure 7. Beulah Reservoir storage volume (af) for WY19. The straight red line represents Reclamation’s Operational Indicator minimum threshold of 2,000 af of storage. Lowest reservoir volume during reporting period occurred October 1, 2018 (2,379 acre feet).

2.2.2 Powder River Basin Operational Indicators

An Oregon Department of Fish and Wildlife (ODFW) crew sampled two bull trout in Phillips Reservoir in 2011, which triggered a requirement that Reclamation consult with USFWS for bull trout and bull trout critical habitat in this area (Reclamation 2013). USFWS completed a non-jeopardy Biological Opinion in June 2014 for Reclamation's O&M activities in the Powder River (USFWS 2014) as a companion document to the 2005 Opinion. The 2014 Opinion contains a 21-year ITS and corresponding RPMs that outline non-discretionary actions for bull trout in Phillips Reservoir. Specific operations or conditions at Mason Dam and Phillips Reservoir that are expected to result in the take of bull trout in the form of death, harm, sub-lethal harassment, injury, or displacement were identified in Reclamation's Bull Trout Monitoring and Reporting Plan for Phillips Reservoir (Reclamation 2016), which was finalized with USFWS in WY16.

The operational indicators developed in that document are intended to minimize incidental take of bull trout resulting from operations of Phillips Reservoir. Low reservoir elevations increase the likelihood of elevated water temperatures (degraded habitat) in the reservoir and contribute to impaired migratory corridors (shallow varial zone habitat). As a result, low reservoir elevations limit the ability of fish to leave the reservoir to seek improved habitat in tributaries above Phillips Reservoir. These operational indicators are shown in Table 5. A summary of operations for WY19 are included in this report. Figures 8, 9, and 10 illustrate the water storage volume in af and reservoir elevation, respectively, and Powder River inflows into Phillips Reservoir during WY19.

Mason Dam/Phillips Reservoir

One operational indicator was exceeded during the 2019 reporting period in the Powder River basin:

Mean daily reservoir storage elevation at Phillips Reservoir was below 4,048 feet until June 1 of the WY 2019 reporting period (Figure 9); it thereafter exceeded the 4,048 threshold until July 9, when the reservoir elevation was drafted below 4,048 feet again. The 2016 Monitoring and Reporting Plan granted Reclamation an exemption for this action for 21 out of the 21 years for which the Opinion is valid. In WY 2019, the persistent low water level can be in part attributed to the residual effects of drawdown in 2018 to a pool level low enough to accommodate concrete work for the installation of a new boat ramp. Low reservoir elevations were then prolonged by below-average snowpack the following winter, which delayed reservoir refill.

Table 5. Summary of amount or extent of anticipated take of bull trout associated with Mason Dam and Phillips Reservoir facility operations during the 2019 reporting period, as included in the monitoring and reporting plan finalized in 2016.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2019 Operations (October 2018 to September 2019)	Quick Reference: Number of times threshold has been exceeded
Up to 12 bull trout from resident headwater populations may be displaced during high flow events and be present in the reservoir	Powder River natural inflows exceeding 856 cfs daily mean (from 2014 Opinion)	Spring through summer	27 percent (6 of 21 years)	Powder River flows did not exceed this threshold in the WY19 reporting period (Figure 10)	<u>0 of 6 years</u>
Up to 12 bull trout from resident headwater populations may be displaced during high flow events and be present in the reservoir	Mean daily reservoir elevation falls below 4,048 feet above sea level (Reclamation 2018)	Spring through summer	100 percent (21 of 21 years; monitoring occurring 2017 – 2034)	Reservoir surface elevation was below 4,048 feet during the entire WY19 reporting period except for June – mid-July 2019 (Figure 9)	<u>5 of 21 years</u> Exceeds annually

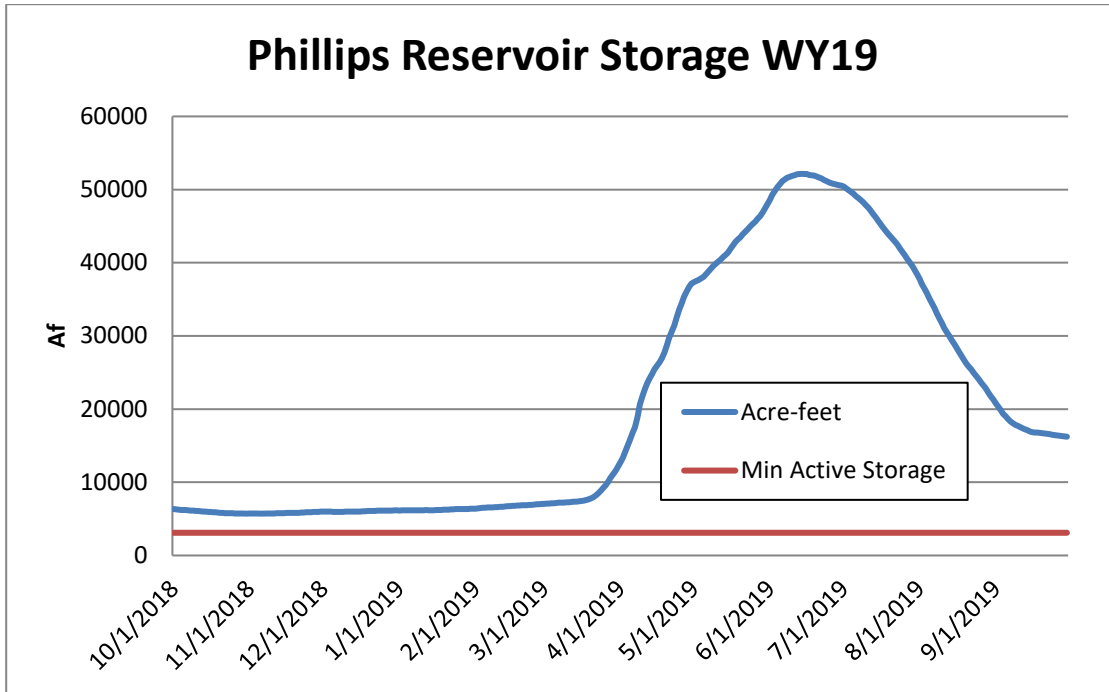


Figure 8. Phillips Reservoir storage volumes (af) for WY19. Minimum active storage occurs when pool elevation reaches 4,009 feet above sea level (3,100 af of storage), corresponding to the point of inactive storage indicated by the red line.

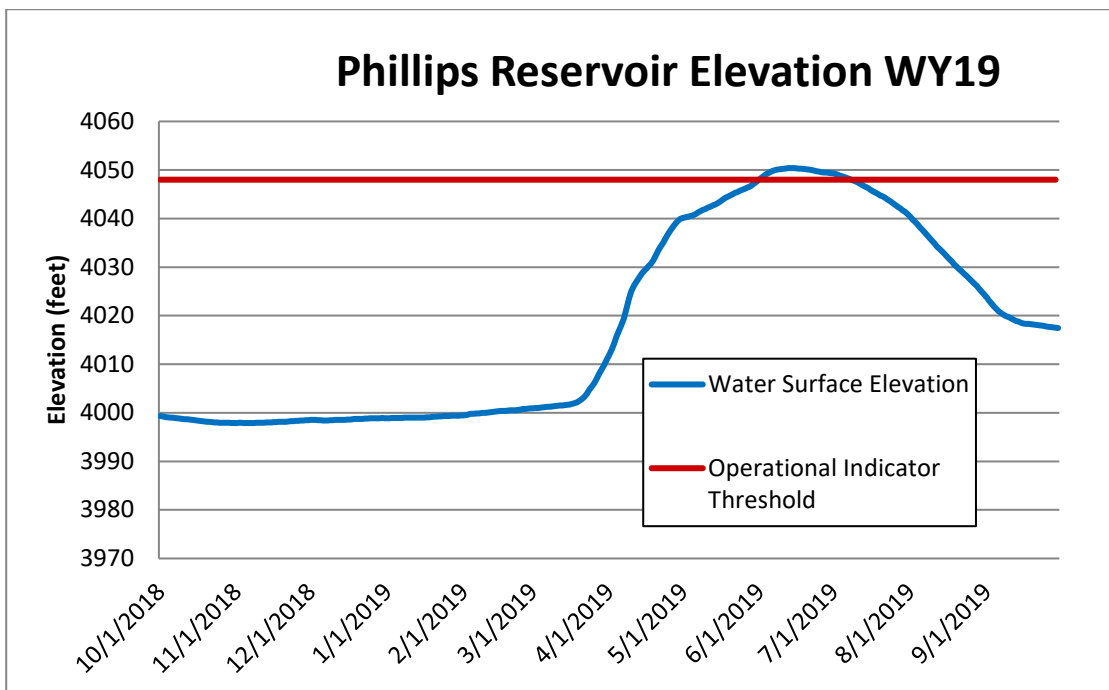


Figure 9. Phillips Reservoir surface elevation (feet above sea level) for WY19. The operational indicator spring/summer minimum for mean daily reservoir elevation of 4,048 is indicated by the red line.

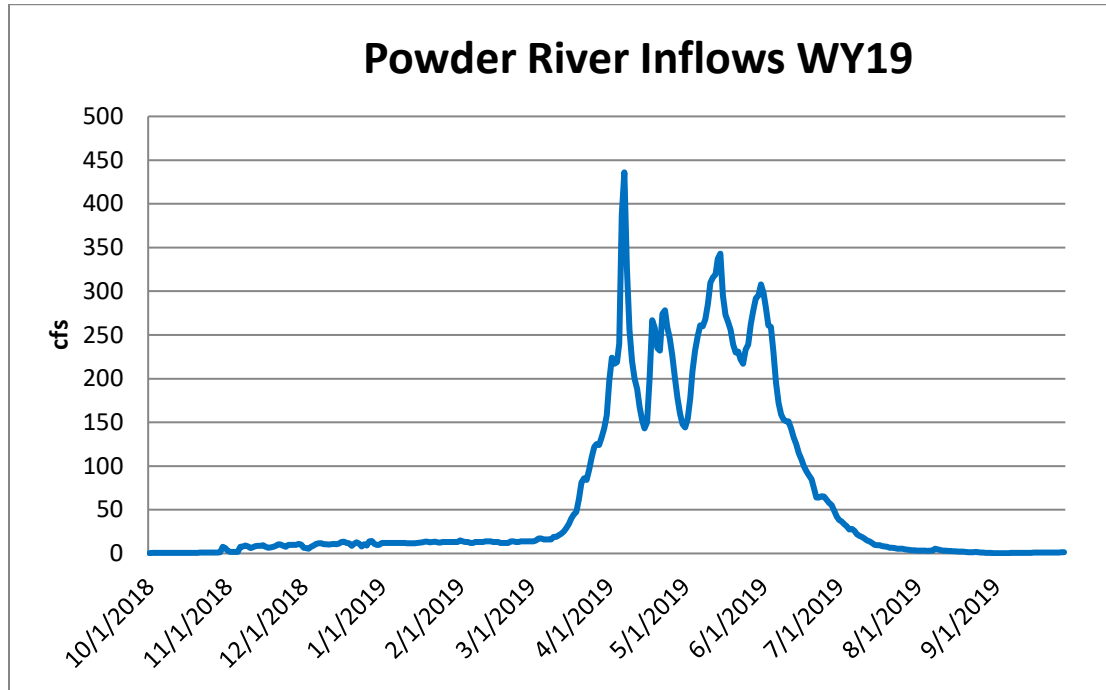


Figure 10. Powder River inflows to Phillips Reservoir in WY19 measured in cfs and recorded at USGS Gage #13275105, Powder River at Husdpath Lane near Sumpter, Oregon.

3. Bull Trout

This chapter describes the bull trout ITS and RPMs, including monitoring efforts during WY19. The ITS includes five RPMs and their associated T&Cs to minimize incidental take of bull trout related to O&M at Reclamation’s facilities in the identified action areas where bull trout are present. Collected data may be used to satisfy the T&Cs and/or monitoring requirements. For example, data collected during a fish sampling activity may be used to monitor population trends and to identify data trends that could be used in the future to address T&Cs or revise existing operational indicators and monitoring. In 2019, Reclamation was involved with RPM activities and/or monitoring at Arrowrock, Anderson Ranch, Beulah and Phillips Reservoirs.

3.1 Boise River Basin

For the purpose of this report, the Boise River basin study area includes Arrowrock Reservoir, Anderson Ranch Reservoir, the South Fork Boise River below Anderson Ranch Dam, portions of the Middle and North Fork Boise Rivers, Lucky Peak Reservoir, and the mouths of Grouse and Cottonwood Creeks, which are tributaries to Arrowrock Reservoir.

The 2005 Opinion identified five T&Cs for Arrowrock Dam and two T&Cs for Anderson Ranch Dam for minimizing the effect and/or amount of take associated with each dam’s operation. Each of the T&Cs addresses a different aspect of the effects of operations on bull

trout or bull trout critical habitat. Most data collection efforts described in the following sections will be used to address T&Cs for both Arrowrock and Anderson Ranch reservoirs because the influences of both facilities overlap.

Summary reports for the Arrowrock Hydroelectric Project (Federal License #4656) can be referenced at <https://www.ferc.gov> and fish stocking performed by the Idaho Department of Fish and Game (IDFG) can be referenced at <https://idfg.idaho.gov/fish/stocking>. An overview of both activities is also included in this report.

3.1.1 Boise River Basin Data Collection

To address T&C 2.b (minimize disruption to biological processes), streamflow and water temperatures were monitored on the South Fork Boise River. In 2019, Reclamation continued funding the U.S. Geological Survey (USGS) to maintain a flow/temperature stream gage at Neal Bridge (USGS Gage No. 13192200) on the South Fork Boise River for the purpose of monitoring tributary flow below Anderson Ranch Dam. Funding is expected to continue into 2020.

Reclamation continued development and review of the water quality model for Anderson Ranch Reservoir in WY19. The Anderson Ranch Reservoir Water Quality model identifies spatial and temporal availability and variation in water temperatures and dissolved oxygen levels suitable for and preferred by bull trout. The data collection effort for this model was completed in 2018; no additional data was collected in 2019.

3.1.2 Fish Sampling

Fish sampling to address T&C 1.c (entrainment) is integrated into trap-and-haul efforts to move potentially displaced (entrained) bull trout from Lucky Peak Reservoir back upstream into Arrowrock Reservoir. Trap-and-haul efforts have historically been scheduled to occur in even-numbered years, and any year (even- or odd-numbered) in which the spillway is used.

3.1.3 Trap-and-Haul Efforts

Trap-and-haul efforts (T&C 1.d) to trap potentially displaced (entrained) bull trout in Lucky Peak Reservoir and relocate them back above Arrowrock Dam have historically been scheduled to occur in even-numbered years, and as additionally necessitated by spillway usage. The spillway at Arrowrock Dam was not used during the reporting period; therefore, a trap-and-haul effort was not conducted in Lucky Peak Reservoir in 2019 because it was not an even-numbered year. No other trap-and-haul activities occurred in the Boise River basin during the reporting period.

3.1.4 Other Activities

Cottonwood Recruitment Modeling – South Fork Boise River

Reclamation is working in collaboration with the University of Idaho and the U.S. Forest Service to validate a cottonwood seedling recruitment model that was developed in 2017 (Benjankar et al. 2017). The authors examined operational effects and assessed critical habitat in the South Fork Boise River as identified in the T&Cs (2005 Opinion). This report discussed the results of using a cottonwood recruitment model to assess recovery of riparian vegetation following wildfire. Data collection from 2018 and 2019 will seek to identify whether natural regeneration is sufficient to maintain critical habitat for bull trout in the watershed and will be used to validate model results.

Bioenergetics Evaluation of Migratory Bull Trout – Arrowrock Reservoir/South Fork Boise River

Reclamation is working in collaboration with the USGS to assess the energetic potential of migratory bull trout, which rely on Arrowrock Reservoir and the South Fork Boise River between Anderson Ranch and Arrowrock reservoirs for foraging, migration, and overwintering habitat. The USGS is using bioenergetics modeling to evaluate whether current reservoir operations provide conditions that are likely to support successful spawning (T&Cs in the 2005 Opinion).

Results from these studies and other available research will be used to identify how operational flexibility can maximize benefits to bull trout and minimize other negative biological impacts system-wide, while still fulfilling Reclamation's non-discretionary flood control and water provision obligations. Identifying environmental responses to operations and operational flexibility will guide the development of modified operational recommendations for Anderson Ranch and Arrowrock reservoirs.

Arrowrock Dam Hydroelectric Project – Boise Project Board of Control

Arrowrock Dam Hydroelectric Project, Federal Energy Regulatory Commission (FERC) licensee No.4656-020, started operations in 2010. Among the requirements of the FERC license, the licensee (Boise Project Board of Control) was obligated to perform water temperature and dissolved oxygen monitoring in the Arrowrock stilling basin for 5 years, culminating in 2015. Future monitoring recommendations will be prepared by the Boise Project Board of Control and presented to FERC after review of the Arrowrock Hydro Team.

Annual meetings of the Arrowrock Hydro Team (IDFG, Reclamation, U.S. Army Corps of Engineers, and USFWS) are expected to continue. The 2019 meeting occurred on March 13, 2019 at the Boise Project Board of Control office.

Fish Stocking within Reclamation Projects – Boise River Basin IDFG

IDFG annually stocks fish in the Boise River basin for recreational angling. Stocking practices are determined solely by IDFG and stocking is not performed to meet Reclamation objectives.

A summary of fish stocking⁶ for all fish types that occurred at Arrowrock and Anderson Ranch Reservoirs and in the South Fork Boise River in WY 2019 is shown in Table 6.

Table 6. Fish stocking by IDFG in WY 2019 in the Boise River basin for all fish types

Date Stocked	Species Type	Size	Number Stocked
Anderson Ranch Reservoir			
5/30/2019	Fall Chinook	Less than 6 in.	2,678
5/30/2019	Fall Chinook	Less than 6 in.	2,879
Arrowrock Reservoir			
10/26/2018	Rainbow trout	Catchable (6+ in.)	10,001
4/3/2019	Rainbow trout	Catchable (6+ in.)	10,614
4/22/2019	Kokanee	Less than 6 in.	129,360
4/22/2019	Kokanee	Less than 6 in.	81,550
6/5/2019	Kokanee	Less than 6 in.	100,644
10/8/2019	Rainbow trout	Catchable (6+ in.)	810
10/9/2019	Rainbow trout	Catchable (6+ in.)	473
10/15/2019	Rainbow trout	Catchable (6+ in.)	9,361
South Fork Boise River (Above Anderson Ranch Reservoir)			
5/22/2019	Rainbow trout	Catchable (6+ in.)	479
5/22/2019	Rainbow trout	Catchable (6+ in.)	958
5/23/2019	Rainbow trout	Catchable (6+ in.)	572
6/20/2019	Rainbow trout	Catchable (6+ in.)	965
6/25/2019	Rainbow trout	Catchable (6+ in.)	460
6/27/2019	Rainbow trout	Catchable (6+ in.)	1,035
7/9/2019	Rainbow trout	Catchable (6+ in.)	950
7/9/2019	Rainbow trout	Catchable (6+ in.)	950
7/10/2019	Rainbow trout	Catchable (6+ in.)	500
7/10/2019	Rainbow trout	Catchable (6+ in.)	2,000
8/20/2019	Rainbow trout	Catchable (6+ in.)	720

⁶ Comprehensive stocking data for the state is provided by IDFG and is available at <https://idfg.idaho.gov/ifwis/fishingPlanner/stocking/?region=4>

3.2 Payette River Basin – Deadwood River System

The 2005 Opinion identified five T&Cs for minimizing the effects to bull trout and the amount of take associated with the operation of Deadwood Dam and Reservoir. Each T&C addresses a different aspect of the effects of operations on bull trout and makes assumptions regarding the effects to bull trout from reservoir operations. Examining the system as a whole allows Reclamation to understand the systemic impacts of individual operational changes. Consequently, Reclamation engaged in the multi-year Deadwood Reservoir Operations Flexibility Evaluation (Deadwood Study) to address T&Cs 3.a through 3.d jointly, which was provided to USFWS in 2018.

Evaluating the flexibility of operations and the effects of varied operational scenarios for Deadwood Dam on water quality conditions and aquatic fauna in both Deadwood Reservoir and the Deadwood River below Deadwood Dam requires an understanding of the potential overall ecosystem response to operational changes over time. Using modeling of physical and biological parameters measured over the course of this project allows for an ecosystem analysis of the T&Cs for Deadwood Reservoir operations and their influence on bull trout populations. These efforts involved collaboration between multiple agencies and include annual activities not detailed in this report.

Conclusions from the Deadwood Study were used to develop Implementation Measures for Deadwood Dam that address T&Cs 3.a through 3.d. These operational recommendations seek to better use existing operational flexibility to maximize benefits to bull trout and minimize biological impacts system-wide, while still fulfilling Reclamation's non-discretionary flood control and water provision obligations. The final report, *Reclamation's Implementation Measures for Operating Deadwood Dam – Addressing Terms and Conditions from U.S. Fish and Wildlife Service 2005 Biological Opinion for Operations and Maintenance of the Bureau of Reclamation Projects in the Snake River Basin above Brownlee Reservoir* was completed in July 2019. Reclamation will consult, as needed, on actions identified in the 2019 report prior to implementation to ensure RPMs from the 2005 Opinion are appropriately updated.

3.2.1 Data Collection in the Deadwood River Basin

Operational indicators were monitored in WY19, and reported in section 2.1.2 of this document. Reclamation did not conduct any field data collection efforts in the Deadwood River Basin during the reporting period.

Other Activities

In 2019, IDFG stocked Chinook, kokanee, and rainbow trout into Deadwood Reservoir as a measure to supplement a sport fishery (Table 7).

Table 7. Fish stocking by IDFG in 2019 in Deadwood Reservoir for all fish types

Date Stocked	Species Type	Size	Number Stocked
6/25/2019	Kokanee	Less than 6 in.	202,872
6/27/2019	Fall Chinook	Less than 6 in.	2,126
6/27/2019	Fall Chinook	Less than 6 in.	1,839
6/27/2019	Rainbow trout	Catchable (6+ in.)	10,124

3.3 Malheur River Basin – Beulah Reservoir and the North Fork Malheur River

The 2005 Opinion identifies four T&Cs for minimizing the effect and amount of take associated with the operation of Agency Valley Dam and Beulah Reservoir. Each of the T&Cs addresses a different aspect of the effects of operations on bull trout and critical habitat. In cooperation with USFWS, Reclamation developed and finalized seven implementation measures in 2018 that target the maintenance of a prey base for bull trout that overwinter in the reservoir. These seven implementation measures help ensure ESA compliance at Beulah Reservoir (Reclamation 2018c). Implementation of these measures began in WY19 and will maintain incidental take coverage through the duration of the 2005 Opinion and updated monitoring requirements. Additionally, Reclamation is working with USFWS and the Bureau of Land Management to minimize effects of grazing around the reservoir (Jackson 2017-2020, pers. comm.).

Prey Base Monitoring

Reclamation analyzed the prey base in Beulah Reservoir from 2010 - 2013 (Reclamation 2015a and 2015b) to determine baseline conditions for the development of an Implementation Plan. Data collected in 2019 was compared to those baseline data to examine population trends and identify biological thresholds that may trigger additional monitoring efforts. Comparisons of trend data does not include electrofishing or crawfish trap catch data because both of those gear types were not used in the previous studies. The sample timing period was selected to avoid bull trout by-catch and allow calculation of the post-winter condition factor (Reclamation 2018a).

Reclamation conducted 1,363 hours of fish sampling efforts at Beulah Reservoir between May 21 and June 28, 2019, to assess fish community composition. Beulah Reservoir ranged between 99 percent full to 96 percent full during the sampling period. Sampling followed guidelines identified in Reclamation 2018e and 2018f and protocols established in Reclamation 2015a and 2015b. Sampling locations were selected following methods described in Reclamation 2018b and included locations in all quadrants of the reservoir (Figure 11). Sampling gear included a fyke net, an electrofishing boat, gill nets and crawfish traps. Fish species sampled included rainbow trout (*Oncorhynchus mykiss*), redbelt shiner (*Richardsonius balteatus*), northern pikeminnow (*Ptychocheilus oregonensis*), largescale sucker (*Catostomus*

macrocheilus), bridgelip sucker (*Catostomus columbianus*) and speckled dace (*Rhinichthys osculus*). The sample also included sculpins (*Cottidae* spp.) and juvenile suckers (*Catostomus* spp.) that were not identified to the species level.

Fifty-three fyke net sets were fished a total of 1,118 hours and 3,049 fish were collected. Fifteen gill net sets were fished a total of 6.3 hours and 2 fish were captured. Five thousand sixty-eight seconds (1.63 hours) of electrofishing yielded 997 fish. Sampling locations of both fyke and gill nets can be viewed in Figure 11. Predominant species included Redside shiner (51 percent), Sucker spp combined (36 percent) and Northern pikeminnow (28 percent). Catch rates for the predominant prey base species varied between species and years (Table 9). Catch statistics used to compare the population health trends between years for predominant prey base species include length frequency histograms; these data show recruitment across all length classes based on 2019 catch data (Figures 12 -15). In addition, Reclamation staff assisted the Oregon Department of Fish and Wildlife with electrofishing surveys that were conducted during the same time (Table 8).

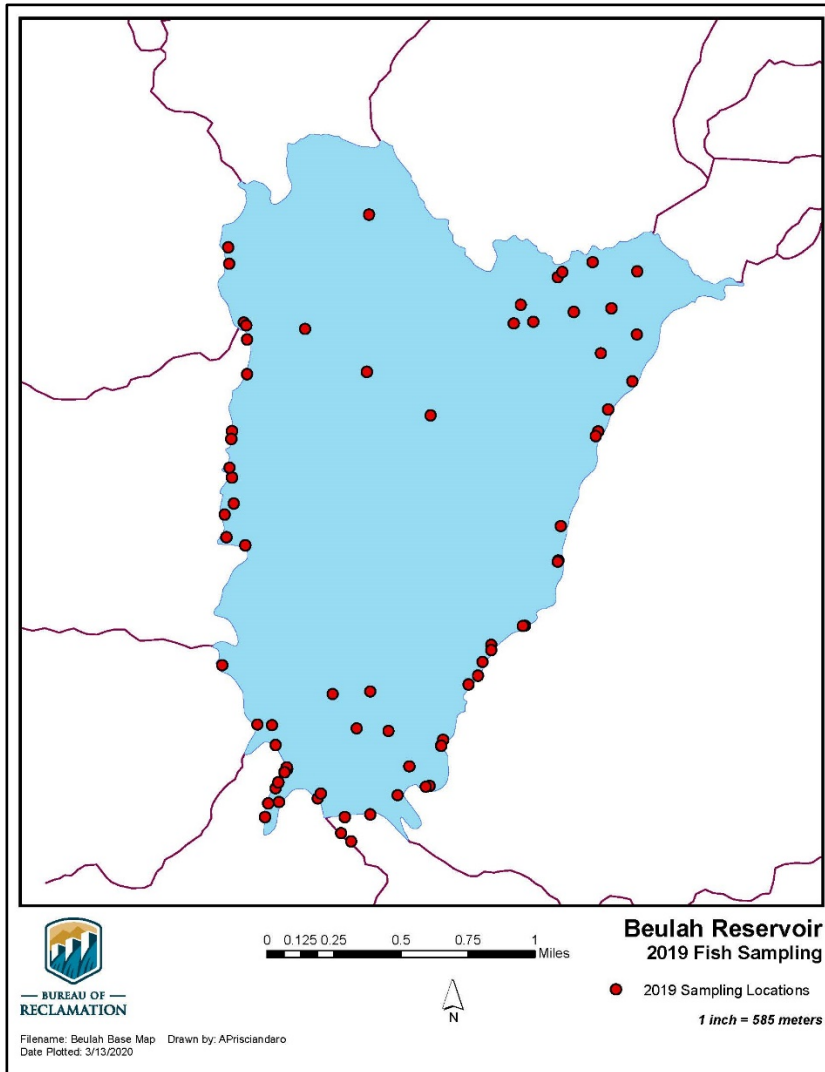


Figure 11. Locations of experimental gill net and fyke net sets during the 2019 spring prey base sampling in Beulah Reservoir.

Table 8. Catch summaries for all gear types used during the 2019 spring prey base sampling in Beulah Reservoir, May 21 to June 28.

Species	Gear types				Catch summary	
	Gill Net	Crawfish trap	Fyke (trap) net	Electro-fish	TOTAL Catch	Relative Abundance (% of total)
Largescale sucker	2	0	61	233	296	7.32%
Bridgelip sucker	0	0	173	308	481	11.89%
Sucker (juvenile, species unk.)	0	0	288	378	666	16.46%
Northern pikeminnow	0	0	869	10	879	21.73%
Chiselmouth	0	0	23	36	59	1.46%
Redside shiner	0	0	1545	12	1557	38.49%
Largemouth bass	0	0	2	5	7	0.17%
Rainbow trout *	0	0	76	13	89	2.20%
Sculpin spp	0	0	1	0	1	0.02%
unknown dace	0	0	1	0	0	0.00%
Speckled dace	0	0	7	0	7	0.17%
Longnose dace	0	0	3	0	3	0.07%
Bull trout	0	0	0	0	0	0.00%
Crawfish spp.	0	0	3	0	3	0.07%
TOTAL SAMPLING HRS	6.31	237.6	1117.83	1.63	1363	
TOTAL FISH CAUGHT	2	0	3049	995	4045	
Catch per unit effort (fish/hour)	0.32	0.00	2.73	610.43	2.97	

*Rainbow trout were not differentiated between fish of hatchery origin or native redband.

Table 9. Catch per unit effort (CPUE) (fish captured per hour) for predominant prey base species during spring sampling 2011, 2012, 2013, and 2019 using gill nets and fyke traps.

Species	Spring 2011	Spring 2012	Spring 2013	Spring 2019
Chiselmouth	0.01	0.00	0.02	0.02
Northern pikeminnow	0.20	0.06	0.09	0.77
All catostomidae	0.04	0.18	0.15	0.47
Dace spp	0.05	0.08	0.01	0.01
Rainbow trout	0.17	0.16	0.36	0.07
Redside shiner	2.75	9.92	13.53	1.37

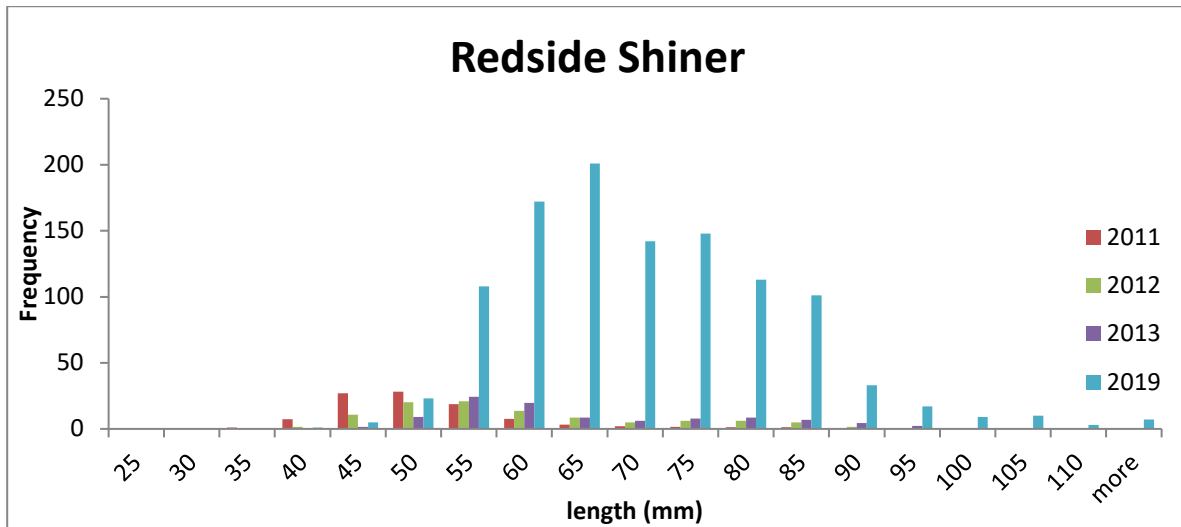


Figure 12. Length frequency histogram for Redside shiner captured during spring sampling 2011, 2012, 2013 and 2019 using gill nets and fyke traps.

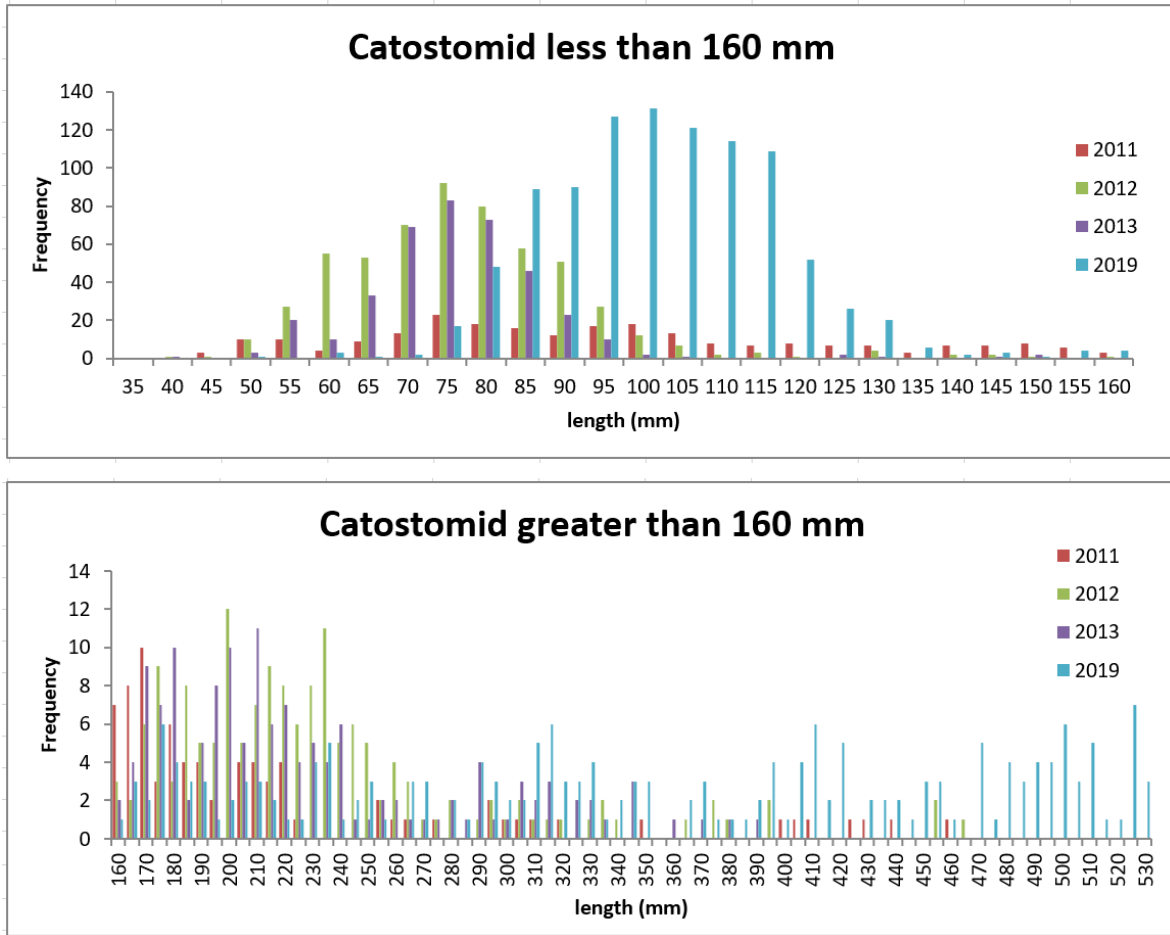


Figure 13. Length frequency histograms for sucker spp. (*Catostomid*) less than 160 millimeters (mm) total length (top) and greater than 160 mm total length (bottom) captured during spring sampling 2011, 2012, 2013 and 2019 using gill nets and fyke traps.

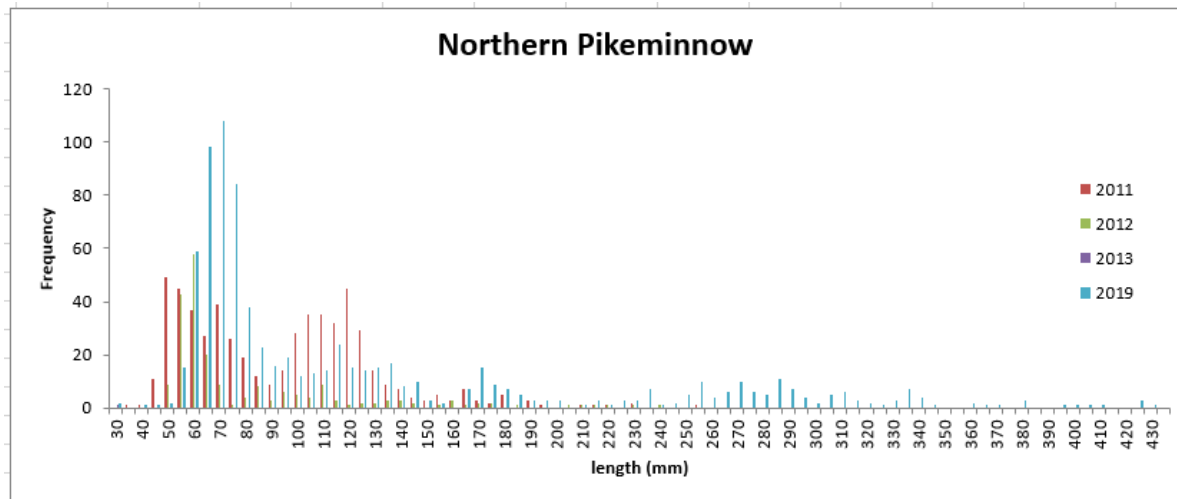


Figure 14. Length frequency histogram for Northern pikeminnow captured during spring sampling 2011, 2012, 2013 and 2019 using gill nets and fyke traps.

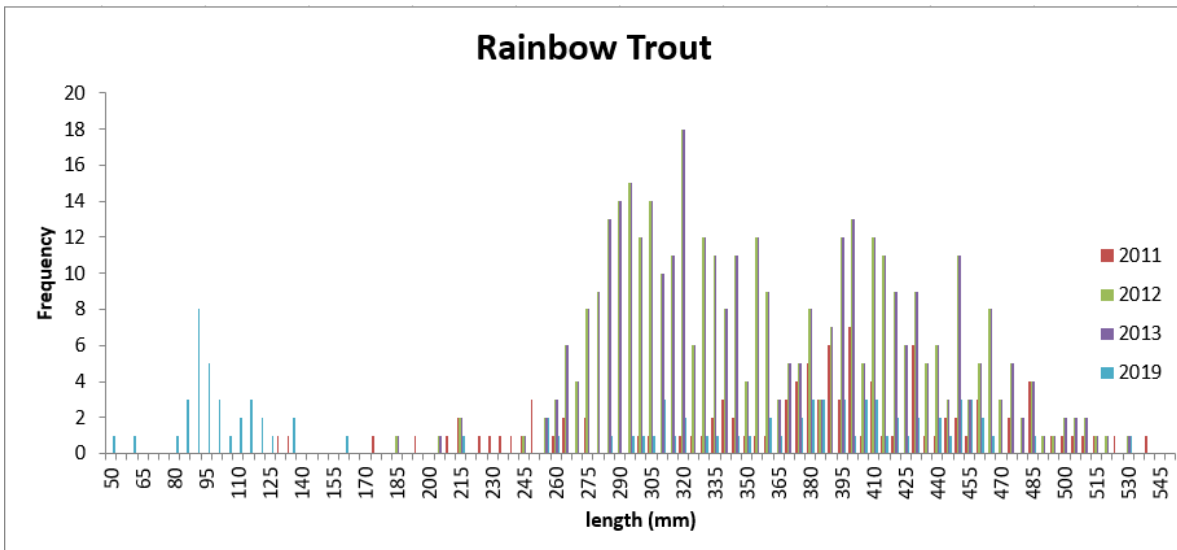


Figure 15. Length frequency histogram for Rainbow trout captured during spring sampling 2011, 2012, 2013 and 2019 using gill nets and fyke traps.

3.3.1 Temporary Water Lease

Reclamation worked collaboratively with the Vale Irrigation District to maintain the required conservation pool volume. As a result, Reclamation avoided using the temporary water lease during the reporting period. Storage at Beulah Reservoir did not fall below 2,000 af during WY19 (Figure 7) and carryover into WY20 was 14,218 af on September 30, 2019.

3.3.2 Trap-and-Haul Efforts

T&C 4.d requires that in years when the spillway is used at Agency Valley Dam (Beulah Reservoir), Reclamation perform trap-and-haul to capture bull trout that have been entrained

through the dam and move them back up into Beulah Reservoir. No spillway use occurred in WY19; therefore, Reclamation did not perform any trap-and-haul efforts during the reporting period.

3.3.3 Other Activities – Redd Counts

In 2019, the annual bull trout redd counts were canceled due to wildfire activity (Cow Fire) causing unsafe conditions in the area. Reclamation participates as a partnering agency in annual survey counts of bull trout redds in the North Fork Malheur River basin to satisfy coordination and basin monitoring requirements set forth in the 2005 Opinion (Reporting Requirements and Conservation Recommendations 2 and 3). Carryover storage in Beulah Reservoir has been shown to affect the bull trout prey base (Rose and Mesa 2009); however, a direct link between carryover pool elevations and bull trout redd counts remains speculative. Figure 16 shows the number of redds observed in the North Fork Malheur River basin, and the carryover of reservoir storage in Beulah Reservoir, from previous reporting years to the present. Following several years in which surveys had been precluded by fire conditions, Reclamation assisted redd counts conducted in the Malheur River basin in 2017 and 2018. In total, 75 redds were observed in surveys throughout the North Fork Malheur River and 10 smaller tributaries⁷.

⁷ Redd count numbers from 2013 and 2016 were misrepresented in previous annual reports. Data shown in those reports erroneously included redd counts for both the Upper Malheur and the North Fork Malheur. The correct counts for the North Fork Malheur were 38 in 2013 and 50 in 2016. This figure reflects those adjustments. The alignment of this figure has also been adjusted to display carryover data by WY rather than calendar year. This was done to simplify interpretation so that the carryover numbers shown correspond to the redd counts observed the following summer.

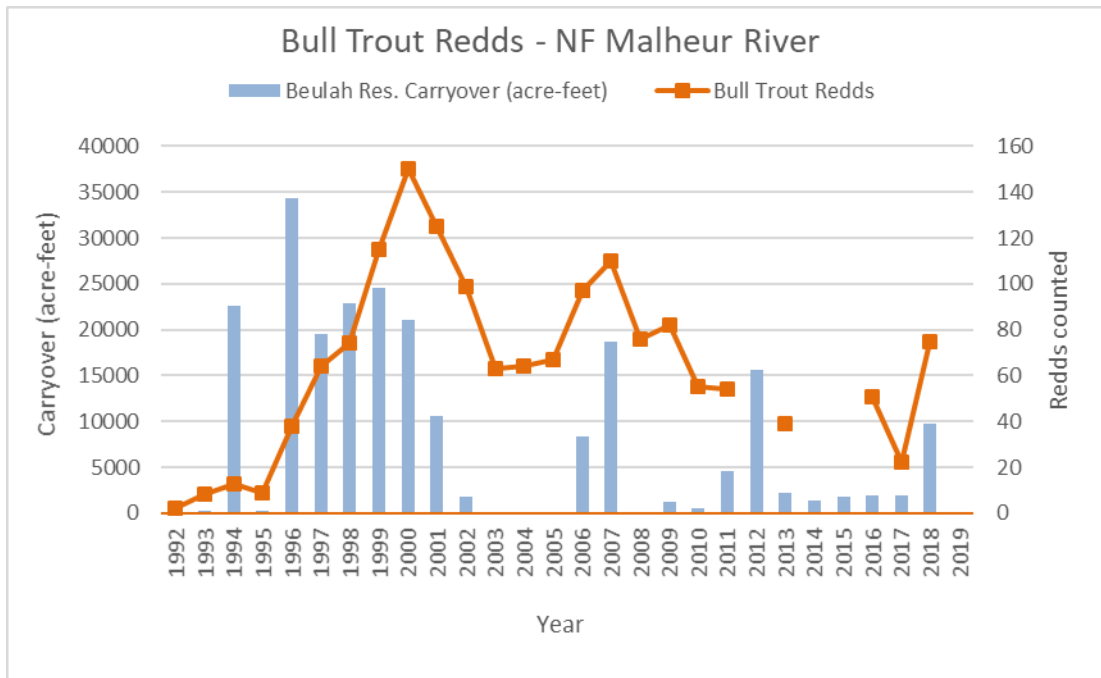


Figure 16. Data on bull trout redd trends observed in the North Fork Malheur River watershed (North Fork Malheur River) and carryover storage at the start of the Water Year in Beulah Reservoir, Water Years 1992–2018. The number of redds observed after 2007 has been adjusted by one to reflect the reduced size of the area surveyed. No redd count data exist for 2012, 2014, 2015 or 2019. See footnote 7 as this graph has been modified and corrected for previous years.

3.4 Powder River Basin – Phillips Reservoir

3.4.1 Bull Trout Monitoring

The 2014 Opinion identifies one T&C associated with minimizing incidental take of bull trout resulting from operations of Phillips Reservoir (decreased water levels and increased temperatures) and from impaired fish migration above Phillips Reservoir. Reclamation accordingly finalized a 5-year Bull Trout Monitoring and Reporting Plan for Phillips Reservoir with USFWS in 2016 (Reclamation 2016). This plan was developed in collaboration with Oregon Department of Fish and Wildlife in order to fulfill this T&C. In 2019, Reclamation continued to work to enhance knowledge of project impacts to bull trout and to better determine bull trout use of Phillips Reservoir through fulfillment of this 5-year plan.

In accordance with this monitoring and reporting plan, Reclamation has continued to conduct monitoring of the Powder River gage (USGS gage 13275105 – Powder River at Hudspeth Lane near Sumpter, Oregon) to record the frequency of high-inflow events that are expected to lead to bull trout migration into/through the reservoir. Also, Reclamation has continued to monitor pool elevation to record the frequency of drawdown that seasonally affects access through tributary varial zones. In the 2019 reporting period, inflow measured at the Powder River gage did not exceed 856 cfs daily average, the operational indicator identified in the monitoring plan.

Reclamation conducted 336 hours of fish sampling efforts at Phillips Reservoir between April 22 and May 15, 2019, in fulfillment of the final year of a 5-year effort to better determine bull trout use of Phillips Reservoir and to assess fish community composition. Sampling took place at locations throughout the reservoir's inlet arm near the mouths of the mainstem Powder River and Deer Creek, and included 329 hours of sampling via fyke net, 7 hours of sampling via gill net, and 0 hours of sampling via hook-and-line methods. No bull trout were sampled.

Yellow perch (*Perca flavescens*) dominated the field of species sampled, with more than 385 found in trap nets (compared to approximately 122,000 in 2018 and approximately 500 in 2017). Other fish species sampled include rainbow trout (*Oncorhynchus mykiss*), black crappie (*Pomoxis nigromaculatus*), redbreast sunfish (*Lepomis gibbosus*), northern pikeminnow (*Ptychocheilus oregonensis*), largescale sucker (*Catostomus macrocheilus*), Bridgelip Sucker, (*Catostomus columbianus*) and Largemouth Bass (*Micropterus salmoides*). Based on the species composition consistently sampled in previous years' efforts, it is possible that sculpins (*Cottidae* spp.) and juvenile suckers (*Catostomus* spp.) unable to be identified to the species level were also present in low numbers in the fyke nets.

Data from this sampling effort are summarized in Table 10 and were entered into the National Marine Fisheries Service online system for Authorizations and Permits for Protected Species in December 2019. The full 2019 report for sampling permit *OR STP#22087: Renew – Phillips Reservoir Bull Trout Monitoring and Agency Valley Trap and Transport* was submitted to the National Marine Fisheries Service online system for Authorizations and Permits for Protected Species on January 7, 2020.

Table 10. Phillips Reservoir fish sampling data from 2019 effort, including total catch for each species (spp.) by sampling method and catch per unit effort (CPUE) by sampling method.

Species	Sampling Method: Gill Net	Sampling Method: Fyke (trap) Net	Catch Total (by species)
Largescale sucker	4	2	6
Yellow perch	3	385	388
Northern pikeminnow	1	66	67
Bridgelip sucker	1	2	3
Redside shiner	0	11	11
Smallmouth bass	7	9	16
Largemouth bass	0	1	1
Rainbow trout	5	11	16
Black crappie	0	23	23
Sucker (juvenile, spp. unknown)	0	3	3
Total sampling hours	7.12	329.16	336.28
Catch total (by method)	21	513	534
CPUE (by method)	0.34	0.64	0.63

3.4.2 Other Activities

In 2016, Reclamation implemented experimental DNA (eDNA) sampling to supplement other sampling methods used at Phillips Reservoir as part of the 5-year sampling plan to better understand bull trout use, if any, of the reservoir. Sampling took place at four locations, including the mouth of the Powder River approximately 20 meters (66 feet) above its inflow into Phillips Reservoir, the mouth of Deer Creek approximately 20 meters (66 feet) above its inflow into Phillips Reservoir, and a sampling location on each bank (north and south) of the Powder River outflow, approximately 50 meters (164 feet) below the outflow from Mason Dam. The same locations were sampled for eDNA repeatedly during multiple sampling event in the spring of 2017 and 2018. Additionally, in the fall of 2018 and 2019, several eDNA samples were taken from locations both within the drawn-down reservoir pool and upstream in the Powder River (at USGS gage 13275105). Complete results of this eDNA sample analysis will be provided in the forthcoming summary report of results of the 5-year Bull Trout Monitoring and Reporting Plan for Phillips Reservoir, expected to be completed in 2020.

4. Snake River Physa

Reclamation is currently working with USFWS to develop long-term spillway flow recommendations for the Minidoka Spillway that will support the physa population. In 2019, Reclamation assisted USFWS with their trend monitoring of the snail population in the spillway pool and at the Jackson Bridge site. Long-term flow recommendations were submitted to USFWS in the spring of 2020. These recommendations will fulfill requirements identified in the 2015 Opinion (USFWS 2015).

5. Literature Cited

Parenthetical Reference	Bibliographic Citation
75 FR 52272	Federal Register. 2010. <i>Endangered and Threatened Wildlife and Plants; Removal of the Utah (Desert) Valvata Snail from the Federal List of Endangered and Threatened Wildlife</i> . Federal Register, August 25, 2010. Vol. 75, Number 164. pp. 52272 - 52282.
79 FR 67154	Federal Register. 2014. <i>Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Western Distinct Population Segment of the Yellow-billed Cuckoo (Coccyzus americanus)</i> . November 12, 2014. Vol. 79, No. 218. pp. 67154-67155.
Benjankar et al. 2017	Benjankar, R., M. M. Sohrabi, D. Tonina. 2017. Investigate measures to minimize the effect of operations of Anderson Ranch Dam on the South Fork Boise River between Anderson Ranch and Arrowrock Reservoirs. Produced for U.S. Bureau of Reclamation under Agreement R12APJ1025.
Jackson 2017-2020	Jackson, R. 2017-2020, personal communication. Telephone conversations between Rich Jackson, Natural Resource Specialist, (US Bureau of Reclamation, Boise, Idaho), Suzanne Anderson, Biologist, (U.S. Fish and Wildlife Service, LaGrande, Oregon), and Michelle McDaniel, Supervisory Range Conservationist (Bureau of Land Management, Vale, Oregon) in Boise, Idaho. Subject: Range use management, challenges of excluding grazing from adjacent (unfenced) Reclamation lands, and potential solutions and grazing use monitoring approaches. March 10, 2020.
Reclamation 2004	U.S. Bureau of Reclamation. 2004. <i>Biological Assessment for the Bureau of Reclamation Operations and Maintenance Activities in the Snake River Basin above Brownlee Reservoir</i> . U.S. Department of the Interior, Bureau of Reclamation, Snake River Area Office, Boise, Idaho.
Reclamation 2006	U.S. Bureau of Reclamation. 2006. <i>Utah Valvata and Bull Trout Monitoring and Implementation Plan, Bureau of Reclamation Operations and Maintenance in the Snake River Basin Above Brownlee Reservoir</i> . U.S. Department of the Interior, Bureau of Reclamation, Snake River Area Office, Boise, Idaho. March 2006.
Reclamation 2013	U.S. Bureau of Reclamation. 2013. <i>2012 Annual Report, Bureau of Reclamation Report on Monitoring and Implementation of Activities Associated with the USFWS 2005 Biological Opinion for Operation and</i>

Parenthetical Reference	Bibliographic Citation
	<i>Maintenance of the Bureau of Reclamation Projects in the Snake River Basin above Brownlee Reservoir.</i> U.S. Department of the Interior, Bureau of Reclamation, Snake River Area Office, Boise, Idaho. March 2013.
Reclamation 2015a	U.S. Bureau of Reclamation. 2015a. <i>Beulah Reservoir Minimum Pool and Prey Base Studies 2010-2013: Part 1 Prey Base.</i> U.S. Department of the Interior, Bureau of Reclamation, Technical Service Center Fisheries and Wildlife Resources Group 86-68290.
Reclamation 2015b	U.S. Bureau of Reclamation. 2015b. <i>Beulah Reservoir Minimum Pool and Prey Base Studies 2010-2013: Part 2 Bioenergetics, Population Sustainability.</i> U.S. Department of the Interior, Bureau of Reclamation, Technical Service Center Fisheries and Wildlife Resources Group 86-68290.
Reclamation 2016	U.S. Bureau of Reclamation. 2016. <i>Bull Trout Monitoring and Reporting Plan – Phillips Reservoir, Oregon.</i> U.S. Department of the Interior, Bureau of Reclamation, Snake River Area Office, Boise, Idaho. August 2016.
Reclamation 2018a	U.S. Bureau of Reclamation. 2018. <i>Biological Assessment for Anderson Ranch Dam Routine Maintenance Activities, Spring 2018, Arrowrock Division, Boise Project, Idaho.</i> Snake River Area Office, Boise, Idaho. March 2018.
Reclamation 2018b	U.S. Bureau of Reclamation. 2018. <i>Memorandum for Record: Changes to Dam Configuration and Applicability of Arrowrock Dam and Reservoir Operational Indicators.</i> Snake River Area Office, Boise, Idaho. Email to file dated March 30, 2018.
Reclamation 2018c	U.S. Bureau of Reclamation. 2018. <i>Addressing Terms and Conditions for Beulah Reservoir Associated with the U.S. Fish and Wildlife Service 2005 Biological Opinion for Operation and Maintenance of the Bureau of Reclamation Projects in the Snake River Basin above Brownlee Reservoir.</i> Snake River Area Office, Boise, Idaho. April 2018.

Parenthetical Reference	Bibliographic Citation
Reclamation 2018d	U.S. Bureau of Reclamation. 2018. <i>Two-Dimensional Water Quality Modeling of Arrowrock Reservoir, 2013-14, Technical Memorandum</i> . U.S. Department of the Interior, Bureau of Reclamation, Pacific Northwest Regional Office. https://www.usbr.gov/pn/programs/esa/uppersnake/2004ba/index.html (last accessed March 30, 2020)
Reclamation 2018e	U.S. Bureau of Reclamation. 2018. <i>Addressing Terms and Conditions for Beulah Reservoir Associated with the U.S. Fish and Wildlife Service 2005 Biological Opinion for Operation and Maintenance of the Bureau of Reclamation Projects in the Snake River Basin above Brownlee Reservoir</i> . U.S. Bureau of Reclamation, Pacific Northwest Region, Snake River Area Office. Boise, Idaho. February 2018.
Reclamation 2018f	U.S. Bureau of Reclamation. 2018. <i>Protocol: Beulah Reservoir – Final Monitoring Requirements for the Conservation Pool Recommendations</i> . U.S. Bureau of Reclamation, Pacific Northwest Region, Snake River Area Office. Boise, Idaho.
Rose and Mesa 2009	Rose, B. and M. Mesa. 2009. <i>Minimum pool and bull trout prey base investigations at Beulah Reservoir</i> . Final Report for 2008. Submitted to: United States Department of the Interior, Bureau of Reclamation, Pacific Northwest Region, Boise, Idaho as Final Report for the Study Agreement #29-RO184. January 2009.
USFWS and NMFS 1998	U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. <i>Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act</i> . U.S. Department of the Interior. March 1998.
USFWS 2005	U.S. Fish and Wildlife Service. 2005. <i>Biological Opinion for Bureau of Reclamation Operations and Maintenance in the Snake River Basin above Brownlee Reservoir</i> . U.S. Department of the Interior, Fish and Wildlife Service, Snake River Field Office, Boise, Idaho. March 31, 2005.
USFWS 2014	U.S. Fish and Wildlife Service. 2014. <i>Biological Opinion for Bureau of Reclamation Operations and Maintenance in the Snake River Basin above Brownlee Reservoir. Effects to Bull Trout in the Powder River, Oregon and Critical Habitat in Idaho and Oregon</i> . U.S. Department of the Interior, Fish and Wildlife Service, Snake River Field Office, Boise Idaho. June 27, 2014.

5 Literature Cited

Parenthetical Reference	Bibliographic Citation
USFWS 2015	U.S. Fish and Wildlife Service. 2015. <i>Biological Opinion for the Bureau of Reclamation, Operations and Maintenance in the Snake River above Brownlee Reservoir</i> . U.S. Department of the Interior, Fish and Wildlife Service, Idaho Fish and Wildlife Office, Boise, Idaho. May 8, 2015.