RECLAMATION

Managing Water in the West

2018 Annual Report

Bureau of Reclamation Report on Monitoring and Implementation Activities Associated with the USFWS 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
Pacific Northwest Region
Snake River Area Office
Boise, Idaho

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MISSION OF THE BUREAU OF RECLAMATION

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.

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Acronyms and Abbreviations

Acronym or Abbreviation	Description
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

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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 Reservoir[1] 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 2013b). 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. 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,

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

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 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) 2018 (October 1, 2017, to September 30, 2018).

1.1 Bull Trout

This section summarizes annual water operations at bull trout projects, 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.

The Monitoring and Implementation Plan (Reclamation 2006) identifies how Reclamation will monitor bull trout throughout the duration of the 2005 Opinion. Monitoring elements include evaluating operational indicators and tracking population trends. To monitor compliance with the operational thresholds defined in the ITS, operations for WY18 were monitored, evaluated, and summarized using 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

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

in the 2013 Biological Assessment and 2014 Opinion. These facilities are shown in Figure 1.

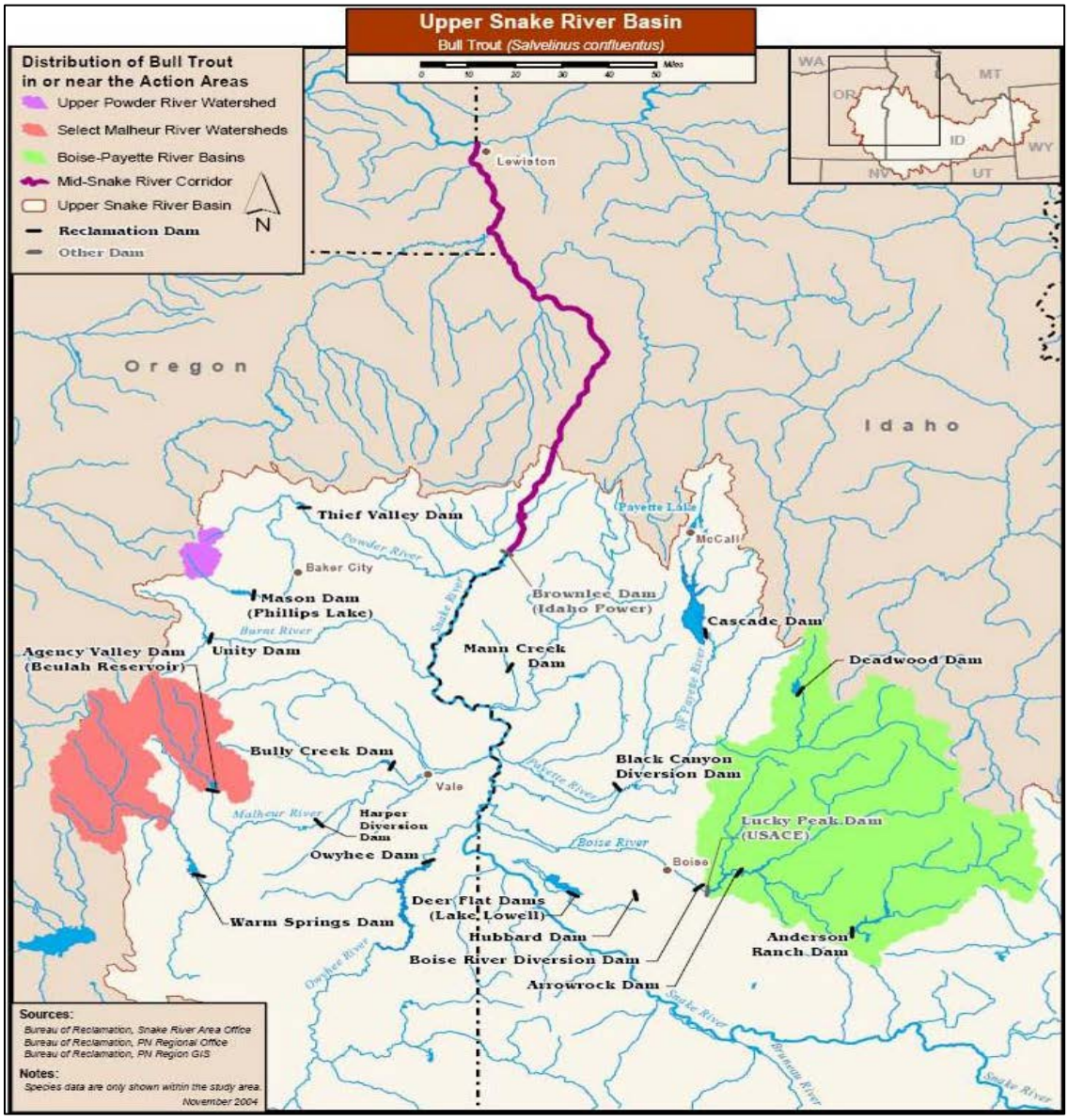

Figure 1. Known distribution of bull trout populations (shaded areas on map) associated with Reclamation facilities in the upper Snake River basin (Reclamation 2004).

1.2 Snake River Snails

Previous annual reports to USFWS documented two species of snails in the Snake River basin: Utah valvata (*Valvata utahensis*) 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; construction 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.

Reclamation's physa monitoring requirements under the 2015 Opinion ended in 2017. Reclamation assisted USFWS with sampling at the old Jackson Bridge site in 2018 for their long-term monitoring. In 2017, environmental DNA (eDNA) sampling was experimentally incorporated into surveys; this sampling method is known to reliably produce species presence/absence results for other species, but its utility to also produce meaningful spatial results for physa is still being assessed for potential incorporation into future study design. Reclamation used eDNA sampling to test for the presence of physa at fixed distances below the lowest positive previous detection of physa at the Jackson Bridge site. Reclamation also took eDNA samples in the Minidoka spillway in August and November 2018.

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 that Reclamation operations are not likely to adversely affect the species, which fulfills Section 7 coverage for this species under the ESA.

2. Summary of 2018 Operations

The following information summarizing 2018 operations was included in Reclamation's 2018 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 2018, water supply conditions were near average to below average in the Snake River basin above Brownlee Reservoir. In the Payette, Boise, and upper Snake

basins, November carryover storage from 2017 was 117, 142, and 176 percent of average, respectively.

In the early winter and through February, below-normal precipitation fell in the Payette and Boise basins, while the upper Snake Basin above Milner Dam experienced normal precipitation. Snowpack at the beginning of March was well below average in the Payette and Boise basins, but the upper Snake basin was at 109 percent of average. During the month of March, precipitation totals in all three basins were average to above average, with the Boise basin receiving 136 percent of average precipitation. During March, the snowpack increased, and by April 1, snowpack was 114 percent of average in the upper Snake but still below average in the Boise and Payette basins, which were 82 and 86 percent of average, respectively.

Below-average precipitation in central and eastern Oregon resulted in drought conditions for 2018. Most of the reservoirs in eastern Oregon did not achieve refill.

Observed unregulated runoff in the Boise and Payette basins for the April-through-July period was below average, with natural flows being 94 percent of average for the Payette River at Horseshoe Bend and 90 percent of average for the Boise River near Boise. Due to above-average snowpack in the upper Snake basin and late-season storms, natural runoff in the upper Snake basin was 131 percent of average for the Snake River at Heise. Even though the Payette and Boise basins had below-average runoff during the spring and early summer, flood control releases were required in those basins during the late winter and early spring of 2018.

Refill in all three of the basins was either achieved (upper Snake) or deliberately missed (Payette and Boise) to provide flow-augmentation water as early as possible. The upper Snake reservoir system essentially filled and reached a maximum combined physical storage content of 4,179,456 acre-feet, approximately 6,239 acre-feet below full capacity (4,185,695 acre-feet). The Boise reservoir system nearly filled, reaching a maximum storage content of 935,434 acre-feet, and would have filled but for early flow-augmentation releases. The Boise reservoir system maximum storage content peaked at approximately 14,266 acre-feet below its full capacity of 949,700 acre-feet. The Payette reservoir system also nearly filled, reaching a maximum storage content of 791,226 acre-feet, and also would have filled but for early flow-augmentation releases. The Payette reservoir system maximum storage content peaked at approximately 9,226 acre-feet below its full capacity of 800,452 acre-feet.

2.1 Idaho

2.1.1 Boise River Basin Operational Indicators

The term i*ncidental take* is defined as death, harm, sub-lethal harassment, injury, or displacement of an individual organism. 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 listed in the USFWS 2005 Opinion. These operations or conditions are summarized as operational indicators for each dam in Table 1 and Table 2.

Two operational indicators were exceeded during the 2018 reporting period in the Boise River basin:

- 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.
- Anderson Ranch Dam released water over the spillway as part of a discretionary powerplant outage for scheduled maintenance operations between March 19 and March 23, for a total of 5 days of spill[3] during the reporting period. The 2005 Opinion granted Reclamation an exemption for this action for 6 out of the 30 years for which that 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 2018 reporting period.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2017 Operations (October 2016 to September 2017)	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 used during the reporting period.	**4 of 6 years** 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 WY18 are shown in Figure 2.	**13 of 30 years** Exceeds annually
Up to 4 percent of bull trout in the reservoir experience degraded water quality	Reservoir storage volume falls below 62,000 acre-feet (Figure 3).	Summer	2 of 30 years	Reservoir storage volume was maintained above 62,000 acre-feet (Figure 3).	**0 of 2 years**

[3] Reclamation completed a formal Section 7 consultation with USFWS for the effects to bull trout (*Salvelinus confluentus*) from spillway use as required for reoccurring scheduled maintenance activities. USFWS issued a Biological Opinion (2018 Opinion) on March 16, 2018, which included Terms and Conditions, Reasonable and Prudent Measures, and Conservation Measures associated with the Incidental Take Statement issued for this action. The Biological Assessment completed by Reclamation (Reclamation 2018a) and the Biological Opinion (USFWS 2018) from this consultation are publicly available; Reclamation's monitoring report to USFWS is provided in a Technical Memorandum, which is pending publication at the time of this annual report.

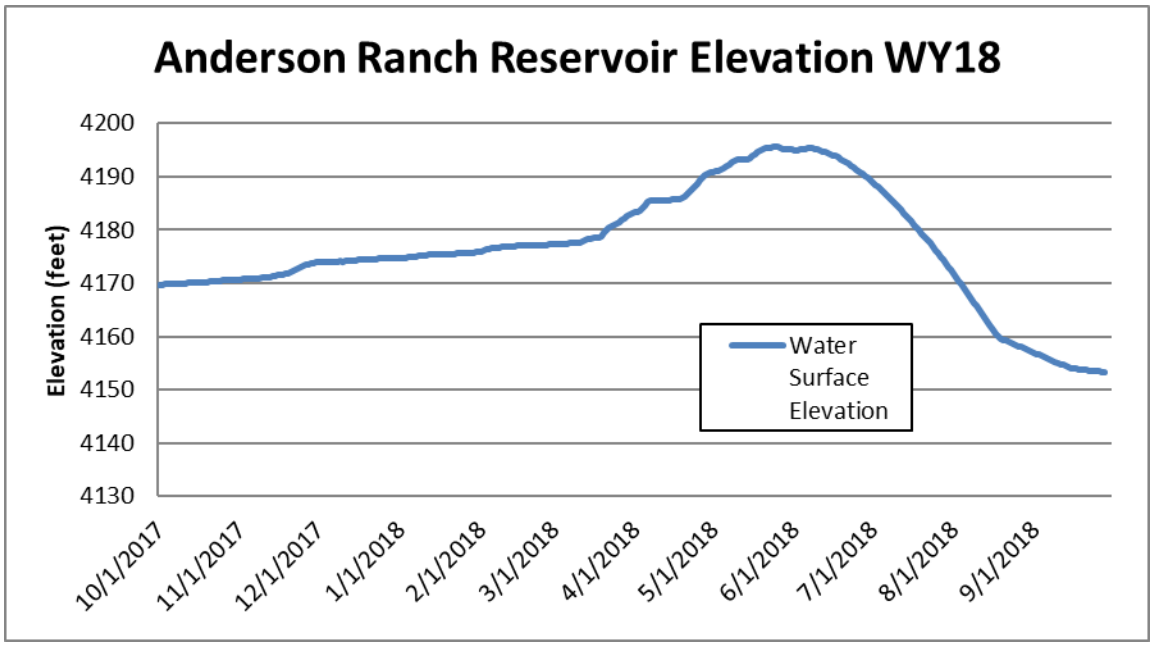

Figure 2. Anderson Ranch Reservoir elevation (feet above sea level) for WY18

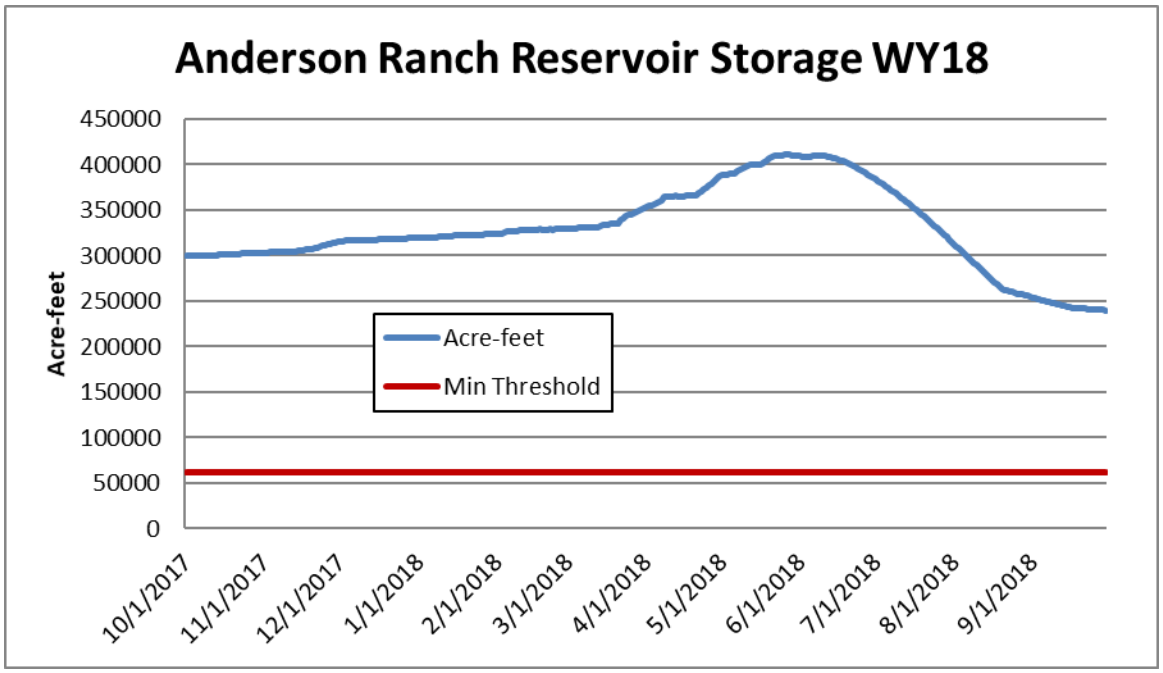

Figure 3. Anderson Ranch Reservoir storage volume (acre-feet) for WY18. The straight line represents Reclamation's Operational Indicator minimum threshold of 62,000 acre-feet of storage.

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 2018 reporting period.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2018 Operations (October 2017 to September 2018)	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 acre-feet at the end of June	30 Jun	3 of 30 years	Reservoir volume was 200,080 acre-feet on June 30, 2018. It dropped below 200,000 acre-feet until July 1, 2018 (Figure 4).	**4 of 3 years** 2007: yes (6/15) 2013: yes (4/24) 2015: yes (6/25) 2016: yes (6/23)
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.	**2 of 15 years** 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	Discharge exceeded 695 cfs regularly from Jan 6-Sep 30, 2018. Reservoir surface elevation dropped below 3,111 feet on Aug 24, and rose above 3,111 feet again on Sep 5. (Figure 5).	**14 of 30 years** Presumed to exceed annually
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 3100 feet during the critical season in WY 2018 (Figure 5).	**0 of 18 years**
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 3111 feet (Figure 5)[4]	Winter	20 of 30 years	Reservoir elevations did not drop below 3,111 feet during the critical season in WY 2018 (Figure 5).	**0 of 20 years**

[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. Future annual reports will list these indicators as "No Longer Applicable."

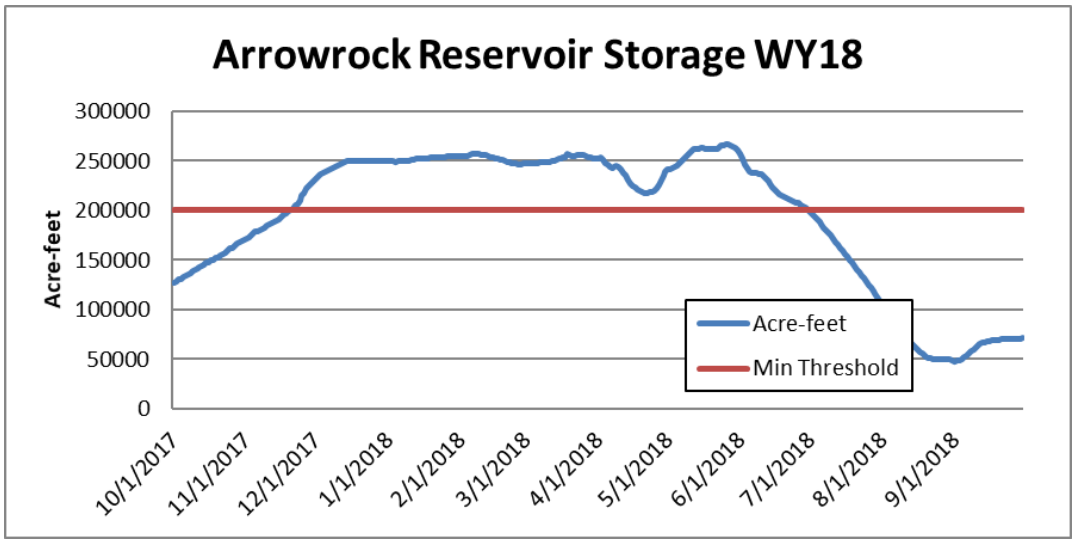

Figure 4. Arrowrock Reservoir storage volume (acre-feet) for WY18. The straight red line represents Reclamation's Operational Indicator of reservoir volume of 200,000 acre-feet; reservoir volume should exceed this minimum at the end of June. On June 30, 2018, Arrowrock Reservoir storage volume was 200,080 acre-feet.

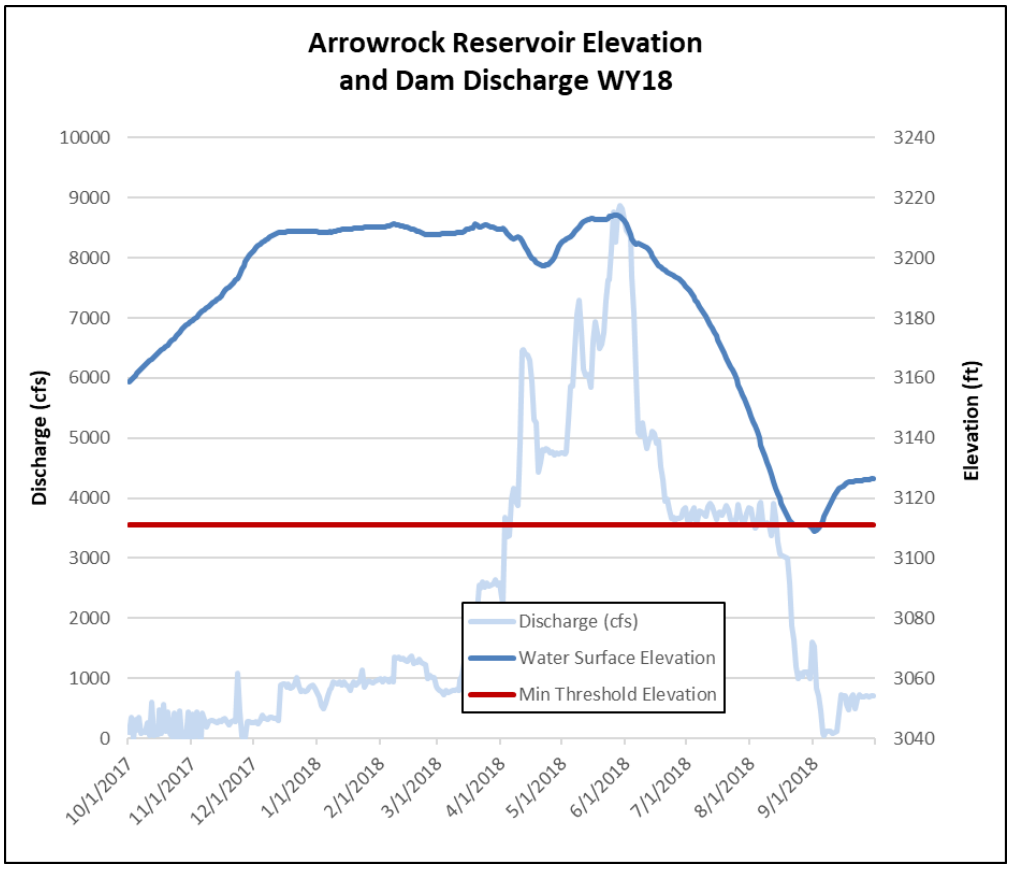

Figure 5. Arrowrock Reservoir surface elevation (feet above sea level) for WY18 and discharge (cfs). The straight red line represents Reclamation's Operational Indicator minimum elevation threshold (during discharges exceeding 695 cfs) of 3111 feet. Reclamation's fall minimum elevation threshold (Sep 15-Oct 31) is 3100 feet.

2.1.2 Payette River Basin Operational Indicators

The term i*ncidental 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 WY18.

One operational indicator was exceeded during the 2018 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 2018 reporting period.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2018 Operations (October 2017 to September 2018)	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 ft.)	Spring	11 of 30 years	Water was not discharged over the spillway during the reporting period in WY18.	**6 of 11 years** 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 acre-feet	August through October	2 of 30 years	Reservoir storage volumes did not drop below 50,000 acre-feet during the reporting period in WY18 (Figure 6).	**0 of 2 years**

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2018 Operations (October 2017 to September 2018)	Quick Reference: Number of times threshold has been exceeded
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 WY18.	**6 of 11 years** 2006: 32 days 2007: 33 days 2008: 33 day 2010: 15 days 2014: 69 days 2015: 50 days
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	**14 of 30 years** Exceeds annually

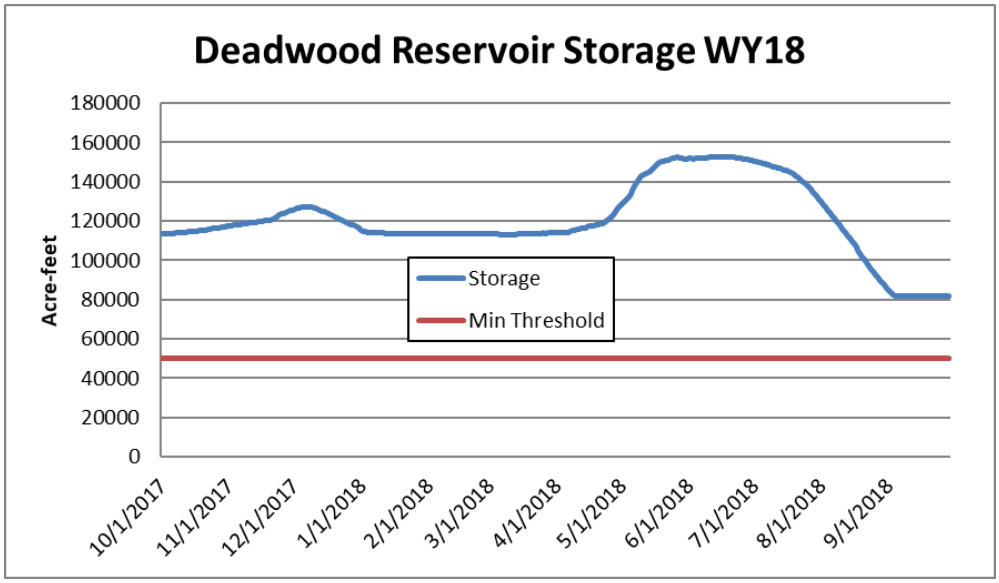

Figure 6. Deadwood Reservoir storage volume (acre-feet) for WY18. The straight red line represents Reclamation's Operational Indicator minimum threshold of 50,000 acre-feet of storage.

2.2 Oregon

Carryover storage volume in Beulah Reservoir for WY18 was 10,003 acre-feet on October 1, 2017, approximately 17 percent of full capacity and well above the conservation pool target of 2,000 acre-feet established in Reclamation (2018d). Beulah Reservoir filled to its peak WY18 capacity of 41,086 acre-feet (69 percent of full capacity) in late April 2018, and subsequently drafted to a low of 2,373 acre-feet (4 percent of full capacity) by the end of the reporting period. Beulah Reservoir did not fall below the 2,000-acre-foot conservation pool threshold at any point in WY18.7

Phillips Reservoir began WY18 with a carryover storage volume of 32,113 acre-feet on October 1, 2017 (44 percent of full capacity) and refilled to a peak of 46,465 acre-feet (64 percent of full capacity) by the end of May 2018. Phillips Reservoir was subsequently drafted to a low of 6,358 acre-feet (9 percent of full capacity) by the end of the reporting period.

Information on flows discharged from the dams during WY18 (October 1, 2017, to September 30, 2018) can be found on Reclamation's Hydromet website. Reservoir water operations, including daily average reservoir elevations, contents in acre-feet, storage, and outflow for Reclamation facilities are discussed in detail later in this report.

2.2.1 Malheur River Basin Operational Indicators

The term i*ncidental 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.

No operational indicators were exceeded during the 2018 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 2018 reporting period.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2018 Operations (October 2017 to September 2018)	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 the dam	Water is discharged over the spillway	May through June	3 of 30 years	The spillway was not used during the WY18 reporting period.	1 of 3 years 2006: yes (non-discretionary spill in 2011, 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 acre-feet	August through October	10 of 30 years	Reservoir storage volume did not fall below 2,000 acre-feet in the WY18 reporting period (Figure 7).	8 of 10 years 2007: 60 days 2008: 34 days 2009: 53 day 2010: 28 days 2013: 45 days 2014: 56 days 2015: 35 days 2016: 15 days
Reduced prey based caused by competition from non-native fish	Run of river operations	October through May	3 of remaining 15 years of Incidental Take Statement	Measure to be implemented in 2019	3 of 15 years (Reclamation 2018c)

[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 was therefore not discretionary. In past reports the spill in 2011 was erroneously counted as one of the three excepted years; this has been corrected and the number adjusted in this report.

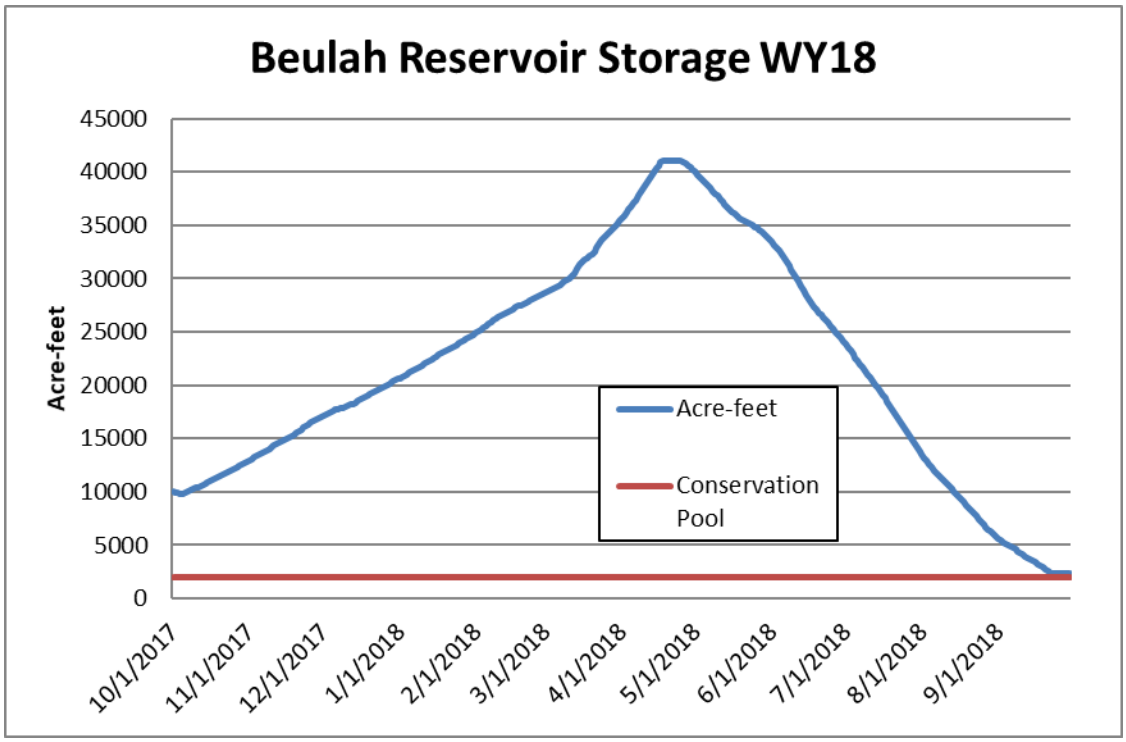

Figure 7. Beulah Reservoir storage volume (acre-feet) for WY18. The straight red line represents Reclamation's Operational Indicator minimum threshold of 2,000 acre-feet of storage.

2.2.2 Powder River Basin Operational Indicators

Bull trout were sampled in Phillips Reservoir in 2011 by an Oregon Department of Fish and Wildlife crew, triggering a requirement that Reclamation consult with USFWS for bull trout and bull trout critical habitat in this area (Reclamation 2013b). 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. Anticipated take and operational indicators as identified in this monitoring plan are shown in Table 5. A summary of operations for WY18 are included in this report. Figures 8, 9, and 10 illustrate the water storage volume in acre-feet and reservoir elevation, respectively, and Powder River inflows into Phillips Reservoir during WY18.

One operational indicator was exceeded during the 2018 reporting period in the Powder River basin:

- Mean daily reservoir storage elevation at Phillips Reservoir was below 4,048 feet throughout the WY 2018 reporting period (Figure 9); however, 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.

Table 5. Summary of amount or extent of anticipated take of bull trout associated with Mason Dam and Phillips Reservoir facility operations during the 2018 reporting period, as included in the monitoring and reporting plan finalized in 2016.

Anticipated Take	Operational Indicators	Critical Season	Frequency of Exemptions	2018 Operations (October 2017 to September 2018)	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 flows exceeding 856 cfs (from 2014 Opinion)	Spring through summer	27 percent (6 of 21 years)	Powder River flows did not exceed this threshold in the WY18 reporting period (Figure 10).	**0 of 6 years**
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 (from 2016 Monitoring and Reporting Plan)	Spring through summer	100 percent (21 of 21 years)	Reservoir surface elevation was below 4,048 feet during the entire WY18 reporting period (Figure 9).	**5 of 21 years** Exceeds annually

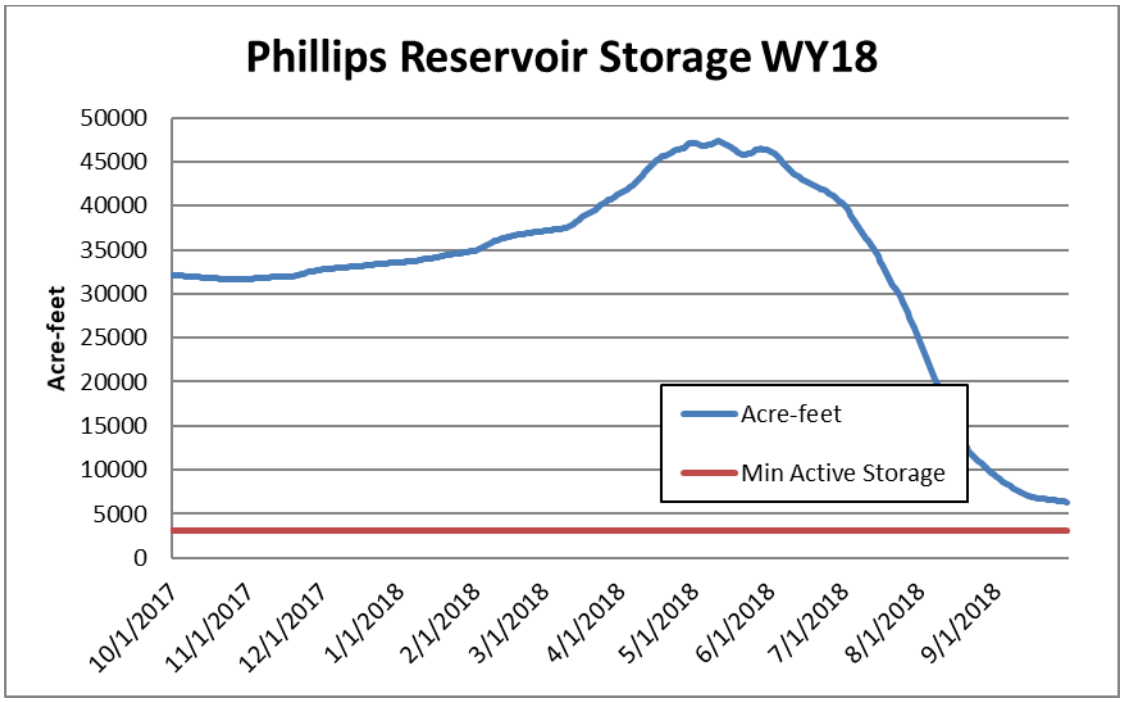

Figure 8. Phillips Reservoir storage volumes (acre-feet) for WY18. Minimum active storage occurs when pool elevation reaches 4009 feet above sea level (3,100 acre-feet of storage), corresponding to the point of inactive storage, indicated by the red line.

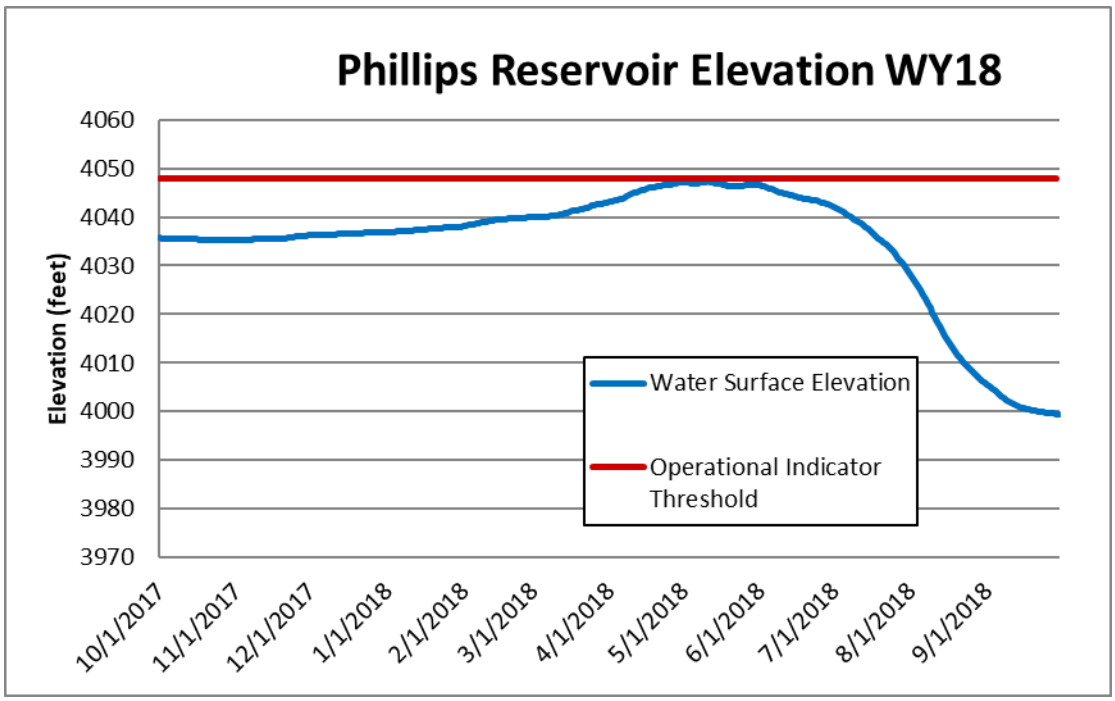

Figure 9. Phillips Reservoir surface elevation (feet above sea level) for WY18. The operational indicator spring/summer minimum for mean daily reservoir elevation of 4048 is indicated by the red line.

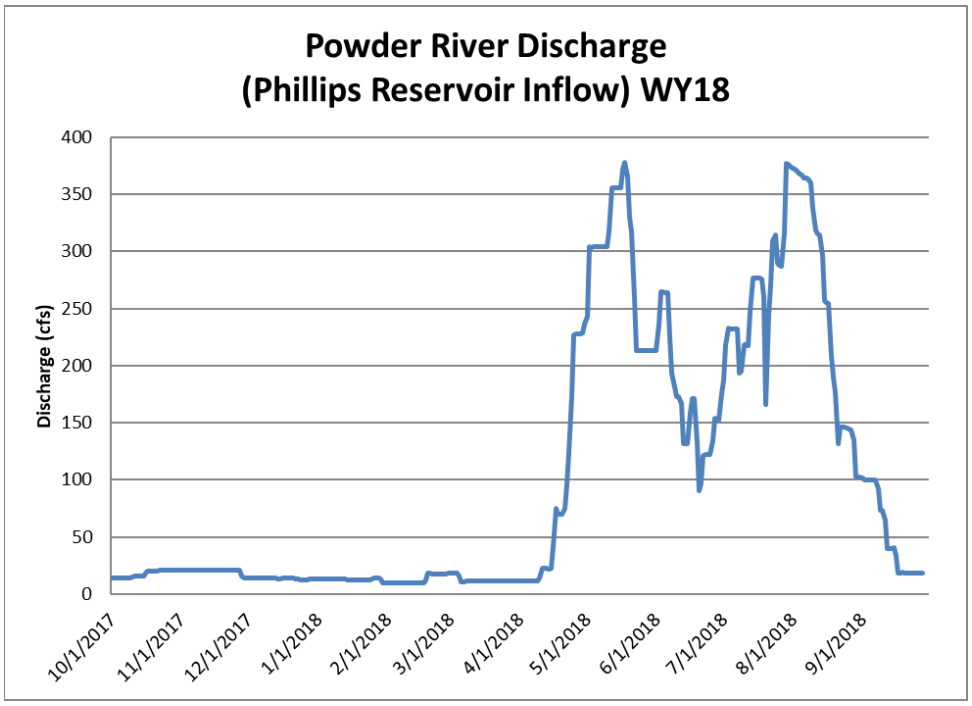

Figure 10. Powder River inflows to Phillips Reservoir in WY18, measured in cfs and recorded at USGS Gage #13275105, Powder River at Husdpeth Lane near Sumpter, Oregon.

3. Bull Trout

This chapter describes the bull trout ITS and RPMs, including monitoring efforts during WY18. The ITSs include 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 help monitor population trends. In 2018, Reclamation was involved with RPM activities and/or monitoring at Arrowrock, Anderson Ranch, 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 2018, 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 will continue into 2019.

Reclamation completed a Technical Memorandum in June 2018 titled *Two-Dimensional Water Quality Modeling of Arrowrock Reservoir, 2013-2014*. This report can be found at: https://www.usbr.gov/pn/programs/esa/uppersnake/2004ba/pdf/arrowrockwaterqual.pdf (Reclamation 2018d).

Reclamation completed data collection in 2018 for the development of a water quality model for Anderson Ranch Reservoir. This model will be similar to the one developed for Arrowrock Reservoir. The Anderson Ranch Reservoir Water Quality model will focus on spatial and temporal availability and variation in water temperatures and dissolved oxygen levels suitable for and preferred by bull trout.

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 are scheduled to occur in even-numbered years and any year in which the spillway is used.

3.1.3 Radio Telemetry

Radio transmitters and archival temperature tag technology were used in a study designed to address the T&Cs outlined in the 2005 Opinion. Data collection for that study concluded in WY14 and was summarized by MacCoy et al. (2017). Additionally, those data have been used in the following reports: Benjankar et al. (2018); Benjankar et al. (2017); Maret and Schultz (2013); Reclamation (2018); and are being used in other analyses to address T&Cs from the 2005 Opinion.

No further telemetry tracking occurred during WY18, nor are any telemetry studies currently planned for Arrowrock Reservoir or the Boise River in the near future.

3.1.4 Hydrology and Water Chemistry

Hydrology data were monitored in Arrowrock and Anderson Ranch Reservoirs and select tributaries, and routine water quality data were periodically collected during the reporting period, such as temporary monitoring of total dissolved gases and temperature in the South Fork Boise River below Anderson Ranch Dam during periods of spillway use. These data are being used, in part, to model water quality in the reservoirs to address requirements of the 2005 BiOp.

Arrowrock Reservoir

To facilitate water quality modeling, a semi-permanent water quality monitoring station was in operation during the ice-free seasons from 2012 to 2015 at Arrowrock Reservoir. Limited water profiles, water samples, and phytoplankton and zooplankton samples were collected in 2016 to supplement data with the aim of resolving uncertainties in the Arrowrock Reservoir water quality model. Regular water quality sampling efforts have concluded at Arrowrock Reservoir; however, future water quality sampling may be conducted as needed for model completion and the development of long-term monitoring needs. The Arrowrock Water Quality Model was published in Reclamation 2018d. Future data collection needs will be determined by Reclamation's Regional River and Reservoir Operations Group.

Anderson Ranch Reservoir

In-depth sampling of hydrology and water quality parameters at Anderson Ranch Reservoir, as described in detail in previous years' annual reports, was completed in WY17. The Anderson Ranch Water Quality Model was returned to the model program developer (Portland State University) for further review and calibration of temperatures and is currently undergoing peer review. Potential additional intermittent sampling may be necessary to clear up any uncertainties in the model.

3.1.5 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 are 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; however, a trap-and-haul was conducted in Lucky Peak Reservoir in 2018 because it was an even-numbered year. No other trap-and-haul activities occurred in the Boise River basin during the reporting period.

Lucky Peak trap-and-haul efforts were conducted on 10 separate days between May 15 and June 5, 2018. Fifty-foot gill nets with one of three different experimental mesh sizes (2.5 inches, 3 inches, and 3.5 inches) were used in random deployment throughout the upper arm of the reservoir below the boom line below Arrowrock Dam. Soak times were limited to under 1 hour, when possible, to maximize fish survival.

Surface water temperatures during the sampling period ranged from 8.4 to 17.2° C and varied from day to day and net set location. Operational changes to the amount of water being discharged from Arrowrock Dam during the sampling period seemed to influence both water temperatures and the locations of cooler pockets of water, which were not consistent between days and did not appear to follow any trend over the sampling period.

Three adult bull trout were captured and relocated. Captured bull trout were held in the boat's live well with a recirculating pump drawing intake water directly from the tailrace (all other species captured were immediately released). Scales and DNA samples were collected from each bull trout; each individual was weighed, measured, and PIT tagged, and then transferred to a transport cooler fitted with an aeration system and driven to a release site on the Middle Fork Boise River above its inflow into Arrowrock Reservoir (temperatures at lower locations throughout Arrowrock Reservoir were above 15° C). Care was taken to handle bull trout minimally following established methods.

Water temperature at the release site was measured prior to each release and fish were gradually acclimated as necessary to ensure gradual temperature change between capture/transport and release site water temperatures.

Bull trout detections occurred in three apparently spatially unrelated locations (Figure 11), in 9.1, 14.8, and 15^{o} C water temperatures, and were not grouped in any specific part of the day or associated with particular weather or light conditions that be predictive for gill net efficacy. Two of the bull trout were caught in gill nets that also contained one single largescale sucker (*Catostomus macrocheilus*), and one was the only fish in the gill net. One was sampled with a 2.5-inch mesh size, another in 3-inch mesh size, and the mesh size was not recorded for one bull trout sampled. However, of all the non-bull trout salmonids sampled (15 rainbow trout, four mountain whitefish, two cutthroat trout, and one kokanee), none were caught with the 3.5-inch mesh size nets.

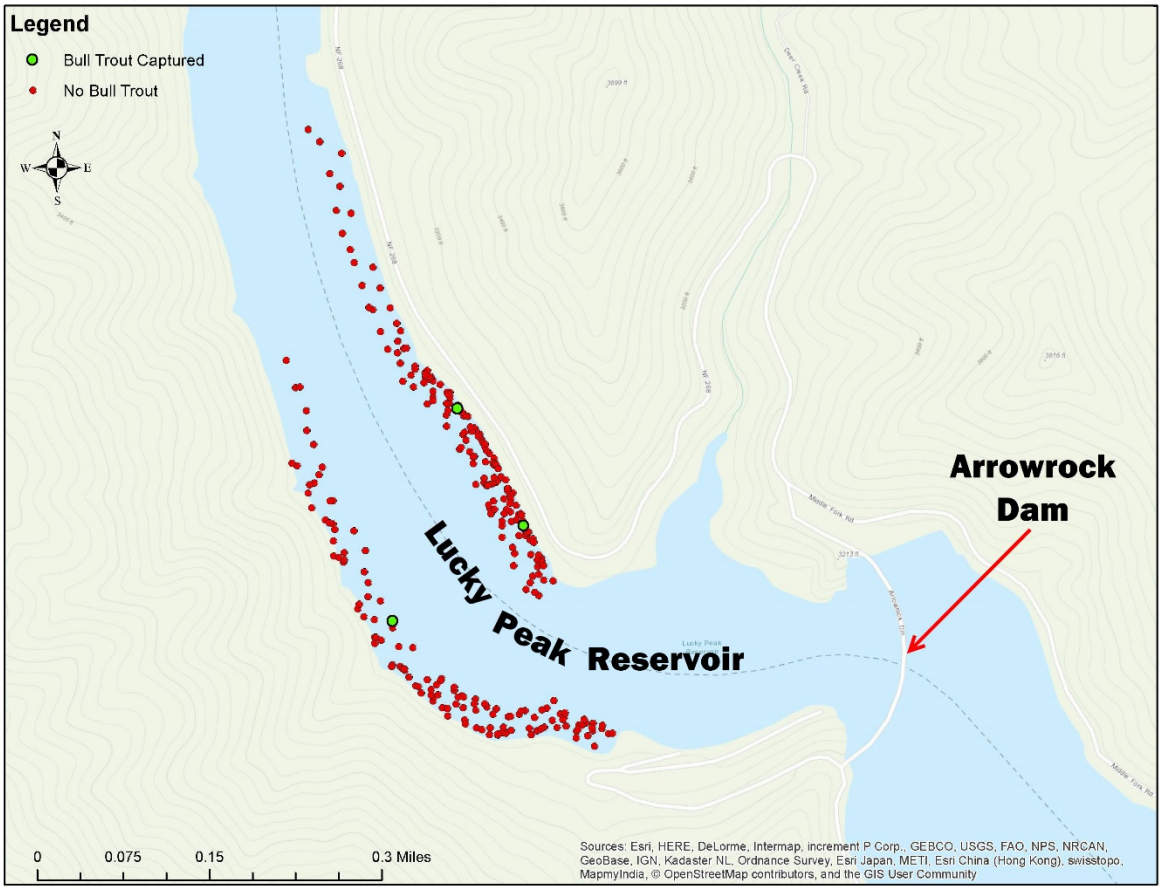

Figure 11. Location map of sampling efforts on Lucky Peak reservoir during 2018 trap-and-haul efforts. Gill net deployment locations are indicated by red dots; the three nets resulting in positive bull trout detections are indicated by green dots. Access to the area immediately below Arrowrock Dam is restricted by a safety boom line; gill netting took place below and up to the safety boom line.

A total of 657 fish, including nine species, were captured via gill net and subsequently released, during a total of 212.5 effort hours, with a total catch per unit effort (CPUE) of 3.09. The unit of effort measured is 1 hour with each species CPUE rounded up to one tenth of a decimal for each species. Largescale sucker *(Catostomus macrocheilus)*, bridgelip sucker *(Catostomus columbianus)*, and northern pikeminnow *(Ptychocheilus oregonensis)* comprised 95 percent of the total catch. A by-species breakdown of total catch is provided in Table 6.

Table 6. WY 2018 catch data for trap-and-haul effort on Lucky Peak Reservoir. Sampling periods included May and June. The unit of effort for CPUE is one hour.

Number caught	Total Soak Time (hours): 212.5		
	Totals	CPUE	Percent of total catch
Largescale Sucker *(Catostomus macrocheilus)*	392	1.84	59.6
Bridge Lip Sucker *(Catostomus columbianus)*	209	0.98	31.8
Rainbow Trout *(Oncorhynchus mykiss)*	15	0.07	2.3
Mountain Whitefish *(Prosopium williamsoni)*	4	0.02	0.6
Smallmouth Bass (*Micropterus dolomieui)*	7	0.03	1.1
Northern Pikeminnow *(Ptychocheilus oregonensis)*	24	0.11	3.7
Cutthroat Trout *(Oncorhynchus clarkii)*	2	0.01	0.3
Sockeye Salmon/Kokanee (*Oncorynchus nerka)*	1	0.00	0.2
Bull Trout *(Salvelinus confluentus)*	3	0.01	0.5
Total:	**657**	**3.09**	**100**

Table 7 presents the weight, measurements, and tag information associated with each bull trout captured during the 2018 effort.

Table 7. Capture date, water temperature at capture (degrees C), total length, and PIT tag number of bull trout sampled during WY18 trap-and-haul effort.

Capture date	Water Temp. (C)	Total length (mm)	PIT tag #
May 29, 2018	9.1	439	457962307D
May 29, 2018	15	415	4579361546
May 31, 2018	14.8	418	4578112319

Observed Trends in Lucky Peak Trap-and-Haul Efforts

In 2004, Reclamation replaced the lower ensign release valves at Arrowrock Dam with clamshell valves capable of handling higher discharge volumes. Following that replacement, the upper release valves referred to in T&C 1.c were taken offline in 2005 (they remain operable but are used only for emergency release purposes and are exercised twice a year). The result is that surface or near-surface water releases, with the exception of uncontrolled spill, have been eliminated from Arrowrock Dam operations.

Since 2004, trap-and-haul efforts had shown a corresponding consistent decline in bull trout catch, with no bull trout captured after 2010, suggesting that entrainment was not occurring at a detectable level if spill did not occur. The renewed detection of bull trout in Lucky Peak following spillway use in 2017 appears to further support this theory, indicating that bull trout entrainment is likely associated with surface water releases such as those that formerly occurred with the use of the upper release valves, and which still occur during spillway use at Arrowrock Dam.

Current-year catch data and historic trends in trap-and-haul data are shown in Figure 12.

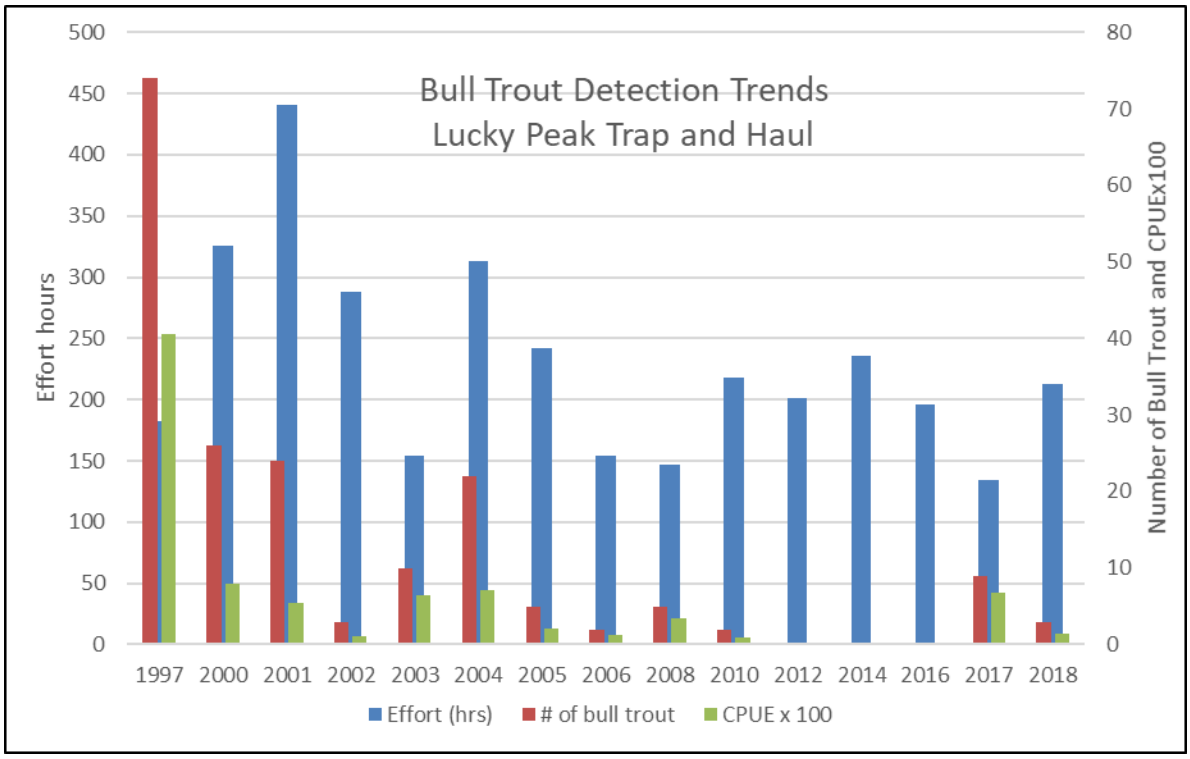

Figure 12. Lucky Peak trap-and-haul bull trout detection trends, from 1997–2018 data. Sampling frequency was reduced from yearly efforts to every other year (and years the spillway is used) following 2006 sampling. Since valve reconfiguration in 2004, the spillway at Arrowrock Dam has been used only twice, in 2006 and 2017. No bull trout were sampled in 2012, 2014, or 2016 sampling efforts. Following spillway usage in 2017, nine bull trout were sampled in 2017 and three were sampled in 2018.

3.1.6 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 scheduled for 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 for foraging, migration, and

overwintering habitat, to support upstream migration and spawning. 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 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.

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 stocking[6] for all fish types that occurred at Arrowrock and Anderson Ranch Reservoirs and in the South Fork Boise River in WY 2018 is shown in Table 8.

Table 8. Fish stocking by IDFG in WY 2018 in the Boise River basin for all fish types

Date Stocked	Species Type	Size	Number Stocked
Anderson Ranch Reservoir			
5/31/2018	Fall Chinook	Less than 6 in.	10,253
6/12/2018	Kokanee	Less than 6 in.	173,760
Arrowrock Reservoir			
10/02/2017	Rainbow trout	Catchable (6 in. +)	14,508
6/13/2018	Kokanee	Less than 6 in.	98,580
9/24/2018	Rainbow trout	Catchable (6 in. +)	13,231
South Fork Boise River (Above Anderson Ranch Reservoir)			

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

Date Stocked	Species Type	Size	Number Stocked
6/18/2018	Rainbow trout	Catchable (6+ in.)	480
6/19/2018	Rainbow trout	Catchable (6+ in.)	1,920
7/05/2018	Rainbow trout	Catchable (6+ in.)	1,939
7/19/2018	Rainbow trout	Catchable (6+ in.)	1,950
7/25/2018	Rainbow trout	Catchable (6+ in.)	346
7/30/2018	Rainbow trout	Catchable (6+ in.)	1,576
8/30/2018	Rainbow trout	Catchable (6+ in.)	484

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 operational recommendations 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, *Operational Recommendations for Deadwood Dam,* is expected to be finalized in 2019.

3.2.1 Data Collection in the Deadwood River Basin

Physical, hydrologic, and water quality data were collected in Deadwood Reservoir, the Deadwood River below the dam, and selected tributaries, as shown in Figure 13. Due to the proximity of the 2017 Bearskin Fire, the only data obtained in 2016 were from the flow and temperature loggers associated with Reclamation's Hydromet system. TidbiT

temperature loggers were still logging data, but access for downloads was not possible during 2017. Access to the lower Deadwood River (Julie Creek Trail) was closed in 2017 due to unstable hillslopes and hazard trees from the Pioneer Fire that occurred in 2016. The Bearskin Fire of 2017 limited access to the reservoir and upper river.

In the fall of 2018, Reclamation biologists attempted to download data from all temperature loggers. Data were retrieved from those temperature loggers in the river and tributaries that were still locatable and operational; however, data were not obtained from several loggers (loggers at Warmsprings Creek and in the Deadwood River inflow to the Reservoir, as well as below the dam, were not found and had likely been buried in debris flows, washed out and displaced, or removed by the public). The temperature logger at Whitehawk Creek was found to have an expired battery. Temperature data are stored at Reclamation's Snake River Area Office and are being used for biological and hydrologic modeling (Reclamation 2013a). At this time Reclamation does not plan to install replacement loggers for these locations.

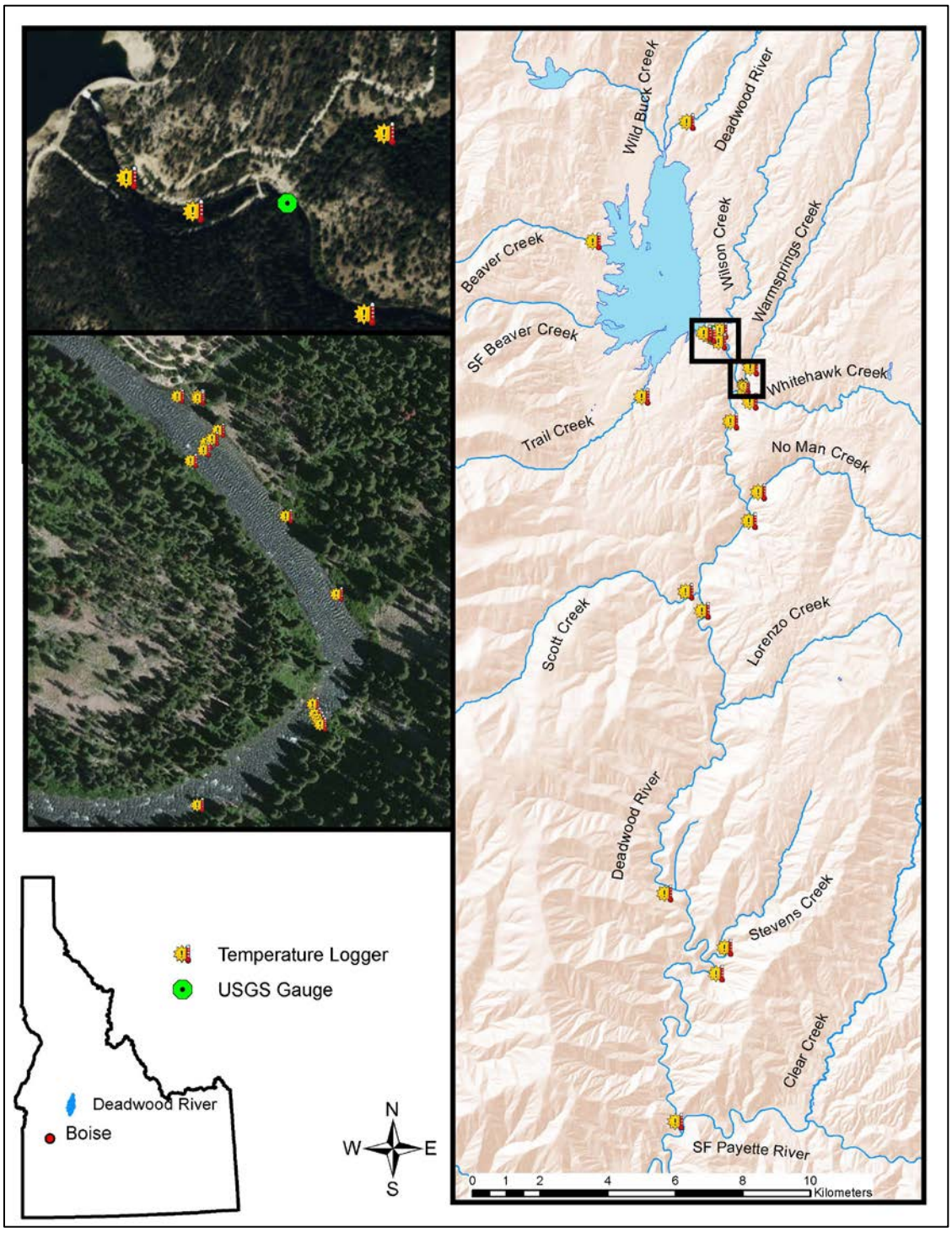

Figure 13. Data logger locations in the Deadwood study area, Idaho, 2018

Other Activities

In 2018, IDFG stocked Chinook, kokanee, and rainbow trout into Deadwood Reservoir as a measure to supplement a sport fishery (Table 9).

Table 9. Fish stocking by IDFG in 2018 in Deadwood Reservoir for all fish types

Date Stocked	Species Type	Size	Number Stocked
6/13/2018	Fall Chinook	Less than 6 in.	547
6/13/2018	Rainbow trout	Less than 6 in.	9,820
6/21/2018	Kokanee	Less than 6 in.	67,440

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. Reclamation finalized implementing measures to assure ESA compliance at Beulah Reservoir (Reclamation 2018c). Reclamation worked with USFWS to finalize seven measures that maintain a prey base for bull trout that overwinter in the reservoir. Implementation of these measures will maintain incidental take coverage through the duration of the 2005 Opinion and update monitoring requirements. Additionally, Reclamation is working with USFWS and the Bureau of Land Management to minimize effects of grazing around the reservoir (R. Jackson, pers. Comm. 2018).

3.3.1 Temporary Water Lease

Reclamation worked collaboratively with the Vale Irrigation District to maintain the required conservation pool volume not requiring a water lease during the 2018 water year. The storage at Beulah Reservoir did not fall below 2,000 acre-feet during WY18 (Figure 7), and carryover into WY19 was 10,082 acre-feet on September 30, 2017.

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 move bull trout entrained through the dam back up into Beulah Reservoir. No spillway use occurred in WY18; therefore, Reclamation did not perform any trap-and-haul efforts during the reporting period.

3.3.3 Other Activities – Redd Counts

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 14 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 tributaries[7].

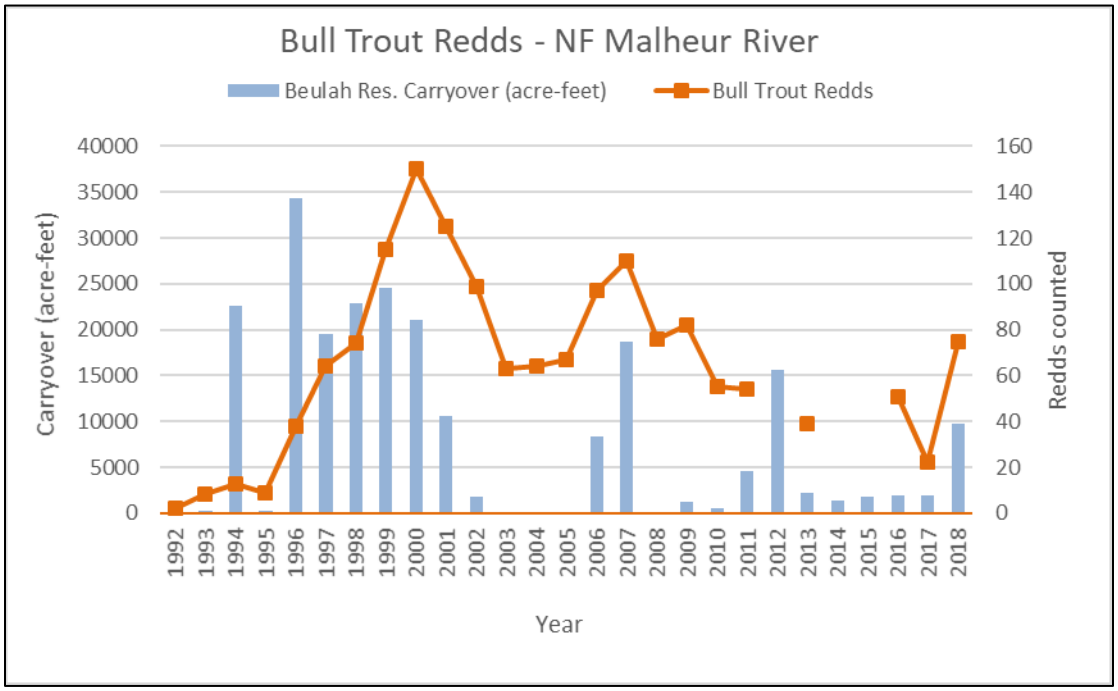

Figure 14. Data on bull trout redd trends observed in the North Fork Malheur River watershed (North Fork Malheur River), and carryover storage at the start of the WY in Beulah Reservoir, WY's 1992–2018. The number of redds observed after 2007 has been adjusted by one, to reflect reduced size of area surveyed. No redd count data exist for 2012, 2014, and 2015. See footnote 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

[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.

accordingly finalized a 5-year Bull Trout Monitoring and Reporting Plan for Phillips Reservoir with USFWS in 2016 (Reclamation 2016b). This plan was developed in collaboration with Oregon Department of Fish and Wildlife in order to fulfill this T&C. Reclamation continued in 2018 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, and recording the frequency of drawdown that seasonally affects access through the Deer Creek varial zone, through continued monitoring of pool elevation. In the 2018 reporting period, inflow measured at the Powder River gage did not exceed 856 cfs, the operational indicator identified in the monitoring plan.

Reclamation conducted 218 hours of fish sampling efforts at Phillips Reservoir between April 25 and May 14, 2018, in an ongoing 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 210 hours of sampling via fyke net, 1 hour of sampling via gill net, and 7 hours of sampling via hook-and-line methods. No bull trout were sampled.

Yellow perch (*Perca favescens*) strongly dominated the field of species sampled, with more than 122,000 young-of-year found in trap nets (compared to approximately 500 in 2017 and approximately 1,300 in 2016). Other fish species sampled include rainbow trout (*Oncorhyncus mykiss*), black crappie (*Pomoxis nigromaculatus*), redside shiner (*Richardsonius balteatus*), northern pikeminnow (*Ptychocheilus oregonensis*), largescale sucker (*Catostomus macrocheilus*), speckled dace (*Rhinichthys osculus*), and longnose dace (*Rhinichthys cataractae*). 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. However, due to the bulk, rather than individual, counting techniques necessary to process the high numbers of yellow perch sampled, they would likely have gone undetected.

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 on December 15, 2017. The full 2018 report for sampling permit *OR STP#20271: 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 in February 2019.

Table 10. Phillips Reservoir fish sampling data from 2018 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	Sampling Method: Hook and Line	Catch Total (by species)
Largescale sucker *(Catostomus macrocheilus)*	1	1	0	2
Yellow perch *(Perca flavescens)*	0	122,738	0	122,738
Northern pikeminnow *(Ptychocheilus oregonensis)*	0	43	0	43
Bridgelip sucker *(Catostomus columbianus)*	0	1	0	1
Redside shiner *(Richardsonius balteatus)*	0	66	0	66
Smallmouth bass (*Micropterus dolomieui)*	0	1	0	1
Rainbow trout *(Oncorhynchus mykiss)*	0	4	1	5
Speckled dace *(Rhinichthys osculus)*	0	1	0	1
Longnose dace *(Rhinichthys cataractae)*	0	2	0	2
Black crappie *(Pomoxis nigromaculatus)*	0	1	0	1
Total sampling hours	**1**	**210**	**7**	**218**
Catch total (by method)	**1**	**122,858**	**1**	**122,860**
CPUE (by method)	**1**	**585**	**0.14**	**564**

3.4.2 Other Activities

In 2016, Reclamation implemented experimental 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, 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 at the conclusion of the sampling period.

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 2018, Reclamation assisted USFWS with their trend monitoring of the snail population at the Jackson Bridge site. A summary of the long-term flow recommendations will be available in this report next year.

5. Literature Cited

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