

DESCHUTES BASIN GROUNDWATER MITIGATION PROGRAM



OREGON



WATER RESOURCES
DEPARTMENT

DESCHUTES BASIN GROUNDWATER MITIGATION PROGRAM

2022 ANNUAL REVIEW

OREGON WATER RESOURCES DEPARTMENT



Contents

Introduction.....	1
Background.....	1
Evaluation Requirements	1
Report Contents.....	2
Agency Comments	2
Allocation Cap.....	2
2022 Mitigation Activity.....	4
Mitigation Effects on Streamflow	8
Summary.....	8
Appendices.....	9
Figure 1: Total CFS & Number of Applications Submitted by end of 2022	3
Figure 2: Allocation Cap Status	4
Figure 3: Incremental Development	5
Figure 4: Mitigation Water.....	5
Figure 5: Mitigation by Zone	6
Figure 6: DRCMB Mitigation Credit Activity in Acre Feet	7
Figure 7: Delinquent Number of Permits by Year.....	7

Introduction

The attached report provides the 2022 Annual Evaluation of the Deschutes Basin Groundwater Mitigation Rules (Oregon Administrative Rules (OAR) Chapter 690, Division 505) and the Deschutes Basin Mitigation Bank and Mitigation Credit Rules (OAR Chapter 690, Division 521).

Background

A groundwater study of the Deschutes Basin above Lake Billy Chinook was conducted in the late 1990's by the U.S. Geological Survey (USGS) in cooperation with the Oregon Water Resources Department (OWRD); the City of Bend; City of Redmond; City of Sisters; Deschutes and Jefferson counties; the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS); and the U.S. Environmental Protection Agency and the Bureau of Reclamation.

The CTWS (Boundary shown in Appendix 1), along with the United States of America and the State of Oregon, is a party to the Confederated Tribes of the Warm Springs Reservation Water Rights Settlement Agreement, dated November 17, 1997 and amended effective May 16, 2002 (WRSA). The WRSA recognizes CTWS tribal reserved water right interests on the Deschutes River and tributaries for on and off Reservation uses. In addition, the parties to the WRSA have agreed to pursue long-term, cooperative management of the waters that affect their interests.

On September 13, 2002, the Commission adopted the Deschutes Basin Groundwater Mitigation Rules and the Deschutes Basin Mitigation Bank and Mitigation Credit Rules. The rules provide for mitigation of impacts to

scenic waterway flows and senior water rights including instream water rights, while allowing additional appropriations of groundwater in the Deschutes Basin Groundwater Study Area (Appendix 2). The mitigation program, by rule, allows an additional 200 cubic feet per second (CFS) of new groundwater use, referred to as the allocation cap.

Evaluation Requirements

Under OAR 690-505-0500(3) and OAR 690-521-0600 of the Deschutes Basin Groundwater Mitigation Rules, the Department is required to annually evaluate and report on the Deschutes Basin Groundwater Mitigation Program, including the implementation and management of mitigation credits allocated through existing mitigation banks. This annual evaluation report is to include information on new groundwater appropriations, streamflow impacts, and mitigation activity to determine whether scenic waterway flows and instream water right flows in the Deschutes Basin continue to be met on at least an equivalent or more frequent basis as compared to long-term, representative base-period flows (1966 to 1995).

The annual review must address the following topics:

- New groundwater appropriations
- Mitigation activity
- Mitigation bank activity
- Streamflow impacts
- Consultation with the Oregon Department of Fish and Wildlife (ODFW), Oregon Parks and Recreation Department, Oregon Department of Environmental Quality (ODEQ), and Oregon Department of State Lands

- Determination of whether the scenic waterway and instream water right flows in the Deschutes Basin continue to be met on at least an equivalent or more frequent basis.

Report Contents

This report incorporates all the elements required for the annual report, as outlined in OAR 690-505-0500(3) and OAR 690-521-0600.

Agency Comments

The Department provided a draft of the report for review by the agencies listed above on November 7, 2024. Comments were provided by ODFW and ODEQ (see Appendix 3) and are summarized below.

Issues and concerns raised by ODFW include:

- Improvements to the Program must be made prior to the allocation cap being lifted.
- Water accounting and monitoring should be improved to ensure mitigation is providing a true offset for impacts and remains available as “wet water” in perpetuity. Such improvements may require additional gages, flow measurement, and modeling beyond what is currently in place.
- Mitigation under the Program should directly offset the impact by being located upstream of the impacted reach, not within a larger “Zone of Impact.”
- Impacts of increased groundwater use under the Mitigation Program to local springs, which are an important source of cold-water inputs to streams by providing cold-water refugia and other habitat benefits for fish.

- The effect of the Mitigation Program on streamflows outside of the irrigation season.
- Continue working with other state agencies to seek funding for research, development and implementation of these concerns.

Issues and concerns raised by ODEQ include:

- The issues raised in previous Annual Report reviews are still relevant to the current report and are included below:
 - Allocation cap should not be lifted at this time.
 - The model should consider actual streamflows, actual frequency of instream water right being met, groundwater level declines, water quality, and aquatic habitat.
 - Time lag of impacts from groundwater withdrawals.
 - Spatial consideration of impacts, recommendation for mitigation projects to be sited upstream from groundwater withdrawals. Currently, mitigation credits may come from anywhere within the Zone of impact.
 - Accuracy of accounting, consumptive use coefficients used to determine mitigation requirements and credits.

Allocation Cap

To limit the amount of impact on surface water flows, the mitigation program established a 200 CFS cap on the amount of water that may be allocated to new groundwater use. At the end of 2022 the amount of water use approved under the cap was 155.54 CFS. The allocation cap restriction may only be lifted or modified by the Commission if the Department’s evaluation determines that scenic waterway and

instream water right flows are being met on at least an equivalent or more frequent basis as compared to long-term, representative base-period flows (1966 to 1995) and meets the Department’s mission to sustainably protect and manage the resource.

The CFS amount deducted from the 200 CFS cap is the amount of water (in CFS) allowed in the Department’s final order approving an application requesting the use of groundwater located within the Deschutes Groundwater Study Area (DGWSA). Final orders set a five-year limit for the applicant to provide the required mitigation (i.e., the mitigation obligation). Once the applicant meets their mitigation obligation, the Department issues the groundwater permit. If the mitigation is not provided by the deadline, the final order expires and the CFS is added back into the cap.

All actions that allow CFS to be added back into the cap are:

1. Rates associated with offsets pursuant to 690-505-0610(8);
2. Rates associated with applications withdrawn after final order issuance pursuant to 690-505-0620;
3. Portions of rates approved by a final order issued under 690-505-0620, but not included in a water right permit that is issued following satisfaction of the mitigation requirement;
4. Rates associated with expired final orders pursuant to 690-505-0620(2);
5. Portions of rates associated with permits issued pursuant to 690-505-0620 and subsequently cancelled;
6. Rates associated with certificates issued pursuant to 690-505-0620 and subsequently canceled; and
7. Rates associated with the portion of use originally authorized under a permit

issued pursuant to 690-505-0620, but not included in a subsequent certificate.

Since the adoption of the rules in September 2002 through the end of 2022, approximately 292 groundwater applications have been submitted to the Department within the DGWSA totaling approximately 352.36 CFS; however, approximately 162.42 CFS has been added back to the cap for various reasons (outlined above). Therefore, as of the end of 2022, the total allocated CFS remains under the 200 CFS cap.

Figure 1 shows the status of all the applications received and the total amount of CFS associated with each action category. These action categories include the active and pending applications, as well as the cancelled, expired, withdrawn, rejected, misfiled, and denied applications.

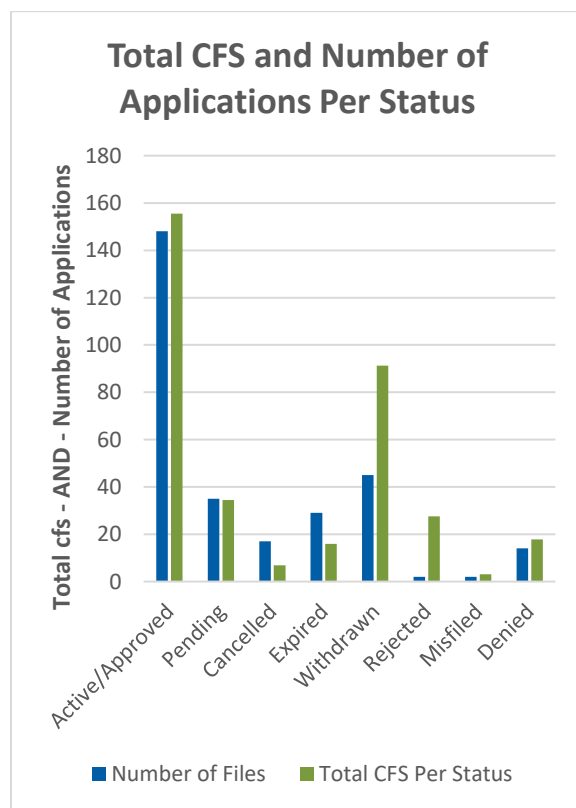


Figure 1: Total CFS & Number of Applications Submitted by end of 2022

2022 Mitigation Activity

For each groundwater permit application submitted, the Department reviews the application and notifies the applicant of their “mitigation obligation.” The “mitigation obligation” is expressed as a volume of water in acre feet and is equivalent to the consumptive portion of the use proposed in the permit application. Groundwater applicants mitigate for this consumptive portion of their proposed use. Consumptive use is calculated using average consumptive use data for different types of use (i.e., irrigation, municipal, etc.) obtained from the U.S. Geological Survey and OWRD’s own information on consumptive use.

Mitigation must be provided in the amount (mitigation water) and in the location (zone of impact) specified by the Department. Each applicant has five years from the date the final order is issued to provide the required mitigation. Applicants must provide mitigation before a new permit may be issued.

New Groundwater appropriations and Mitigation Activities as of end of 2022

A. Active Permits Issued:

- 145 permits issued
- 44 of which are certificated

B. Active Final Orders Issued:

- 12 final orders

C. Applications Pending with No Final Order:

- 35 applications

D. Allocation cap summary (Figure 2):

- 155.54 CFS – total CFS allocated under cap (permits and final orders)
- 34.40 CFS – pending applications not yet deducted from 200 CFS cap
- 10.06 CFS – remaining CFS if all pending applications were approved

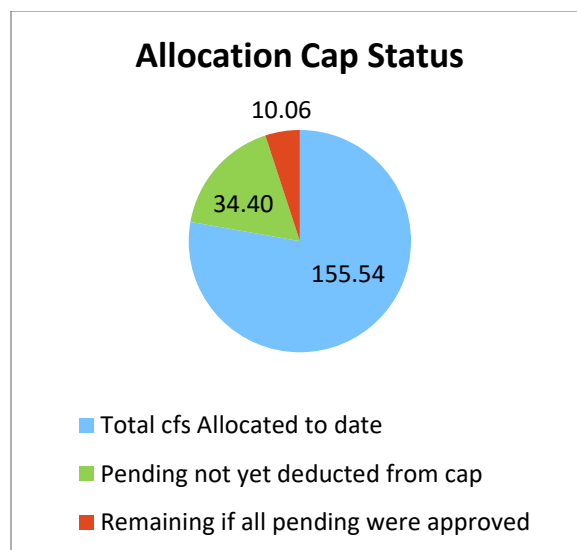


Figure 2: Allocation Cap Status

E. **Incremental Development Plans:** By rule, the Department may allow a municipal or quasi-municipal applicant to satisfy their mitigation obligation incrementally as the water use is developed, rather than requiring mitigation to be provided before the permit is issued. These applicants must report annually to the Department on the volume of water used and the source of mitigation. There are 22 permits that have incremental development plans.

A summary of water use for municipal and quasi-municipal permit holders with incremental development plans is provided in Figure 3. This figure is a comparison between the amount that these water users are authorized to use at full development, the amount of water they could use based on how much mitigation they have provided through 2022, and the amount of water they actually used during 2022. Overall, in 2022, more mitigation was provided by entities with incremental development plans than was needed to mitigate for their actual use.

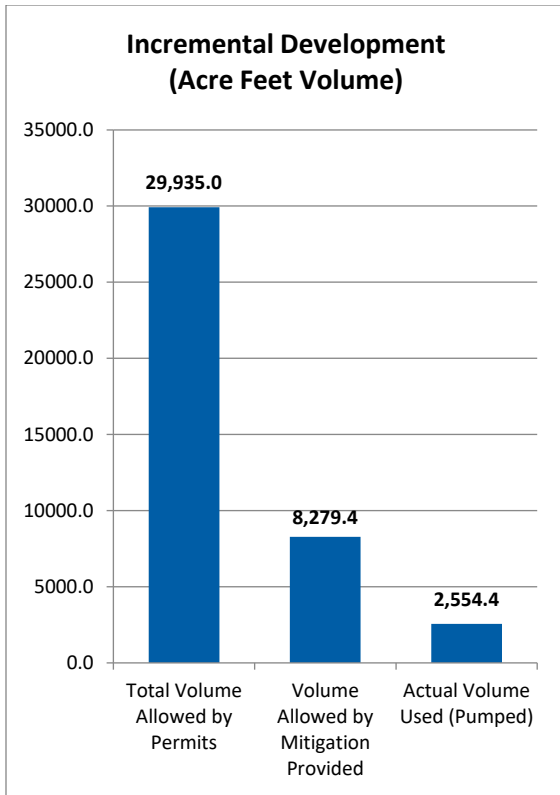


Figure 3: Incremental Development

- F. **Mitigation Activity:** For each mitigation project submitted, the Department identifies the amount of water resulting from the project that can be used for mitigation purposes. The resulting protectable water, expressed in acre feet, is also referred to as “mitigation water” or “mitigation credits.” One acre foot of mitigation water is equal to one mitigation credit. For each project submitted, the Department also identifies the zone or zones of impact in which the mitigation water provides instream benefits and may be used for mitigation purposes. Mitigation for active groundwater permits and certificates issued by the Department under the Mitigation Program is provided through permanent instream transfers and temporary instream leases (Figure 4). Mitigation credits established by a

Mitigation Project are considered used when assigned to a groundwater application or permit.

- As of the end of 2022 there are 73 total active mitigation projects, consisting of:
 - 52 permanent instream transfer projects;
 - 20 temporary instream lease projects; and
 - 1 permanent reservoir release for City of Prineville.

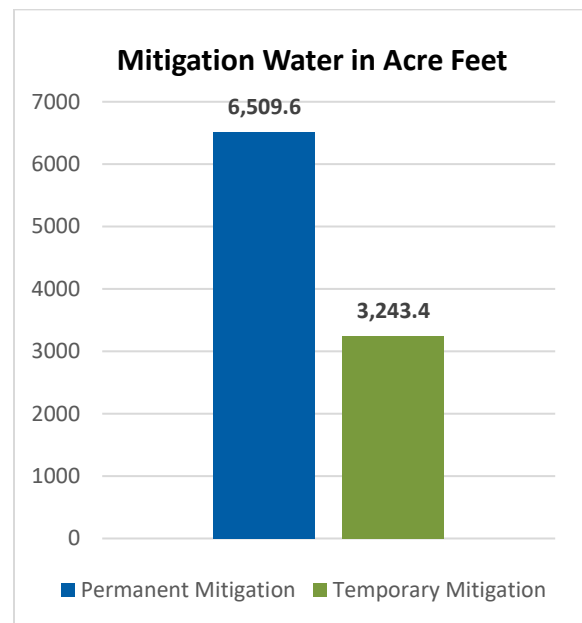


Figure 4: Mitigation Water

- Figure 5 shows the established mitigation broken out by zone of impact. The reason these amounts are more than the established amounts is because mitigation is sometimes established in multiple zones (i.e., 10 credits established in the middle and general zones, but only a maximum total of 10 credits can be used in either the middle or general zones, or a combination thereof).

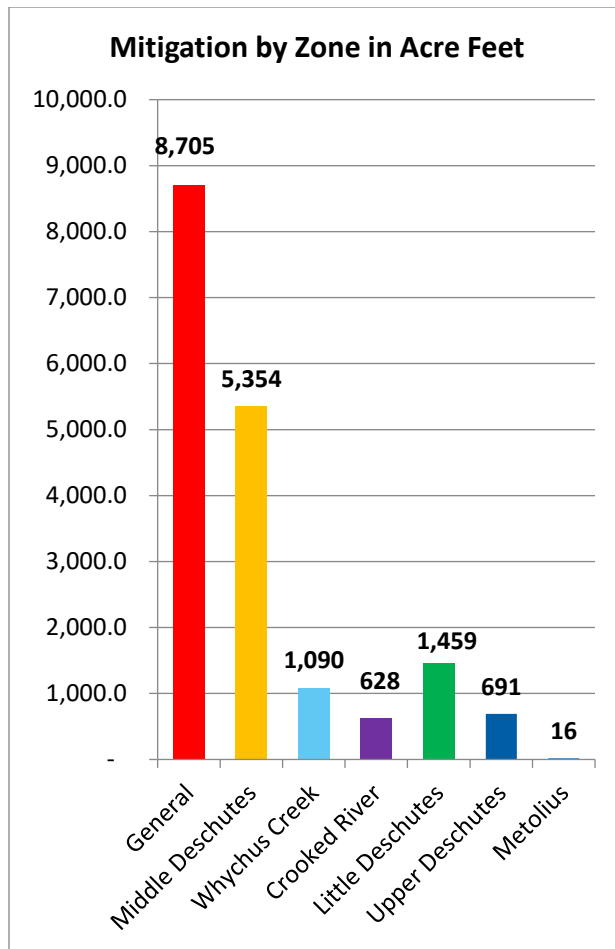


Figure 5: Mitigation by Zone

The above Figures 4 and 5 do not include the 5,100.0 AF of permanent mitigation credits issued to the City of Prineville as identified in Water Right Certificate 94149. These mitigation credits may be used to satisfy the mitigation obligation of a groundwater use found to impact surface water flows in the General and/or Crooked River Zones of Impact and are reported and managed on a water year schedule (Oct. 1 – Sept. 30). These mitigation credits may only be used by the City of Prineville and cannot be conveyed to any other person or mitigation bank. As of the writing of this report, 972.0 AF of these mitigation credits have been assigned to City of Prineville incremental groundwater permits.

G. **Mitigation Banks:** Mitigation banks must submit an annual report detailing all credit transactions and activities for the preceding calendar year. As of the end of the 2022 year, there are three mitigation banks:

- Deschutes River Conservancy Mitigation Bank (DRC Mitigation Bank);
- Deschutes Irrigation, LLC; and
- Arnold Irrigation District Mitigation Bank.

H. **Mitigation Bank Activity:**

DRCMB

- Filed the required annual report
- Submitted 20 instream leases in 2022
- Maintained sufficient “reserve” credits to cover temporary mitigation credits used by groundwater permit holders in each zone of impact. (For each temporary mitigation credit used to satisfy all or part of the mitigation obligation of a groundwater permit, a mitigation bank is required to keep a matching credit in reserve.)
- Figure 6 shows the amount of temporary mitigation credits generated by the DRCMB, the credits allocated to a groundwater permit, and the reserve credits DRCMB is required to keep.

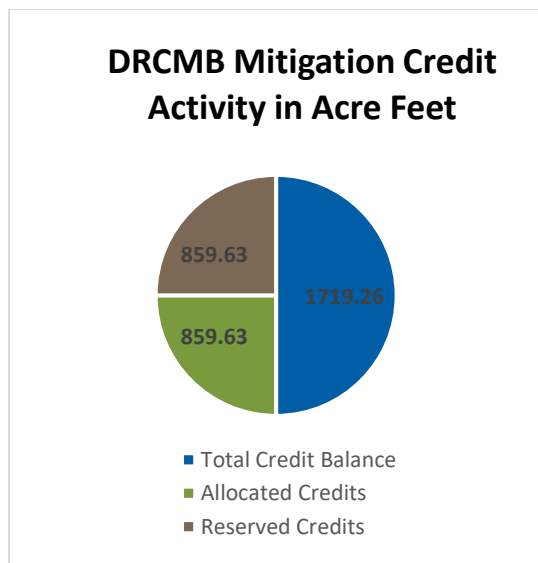


Figure 6: DRCMB Mitigation Credit Activity in Acre Feet

As of the end of the 2022 year, the following mitigation banks had not yet undertaken any mitigation activity. The mitigation program rules do not require a mitigation bank to be active to remain in place.

Deschutes Irrigation, LLC

Arnold Irrigation District Mitigation Bank

Delinquent Permits:

Instream leases are one of the identified sources of mitigation under OAR 690-521-0300(1)(b); however, this temporary mitigation (instream lease-based mitigation) may only be established through a Mitigation Bank chartered by the Oregon Water Resources Commission. To date, temporary mitigation has been available from the DRC Mitigation Bank, which primarily brokers temporary mitigation credits available through final orders issued by OWRD approving instream lease applications. Some permit holders who have used temporary mitigation in the past failed to continue providing that mitigation. Every year, the Department and DRC Mitigation Bank each

notify permit holders who have failed to provide mitigation.

By rule and by permit condition, every groundwater user with a permit issued under the Deschutes Basin Groundwater Mitigation Program is required to maintain mitigation for the life of the groundwater use. Ultimately, the permit holder is responsible for maintaining any temporary mitigation being used annually with the DRC Mitigation Bank.

Since groundwater permit holders using temporary mitigation credits need to obtain mitigation credits on an annual basis, there is the risk of groundwater users failing to maintain the required mitigation. Under the Mitigation Program, when a permit holder fails to maintain their source of mitigation, OWRD is required, under OAR 690-505-0620, to regulate the use, propose denial of any permit extension request, and propose cancellation of the permit.

Figure 7 below shows the number of confirmed delinquent permits each year during a five-year period from 2018 through 2022. During the 2022 year, after being notified, all five delinquent permit holders rectified the situation by providing the required annual mitigation.

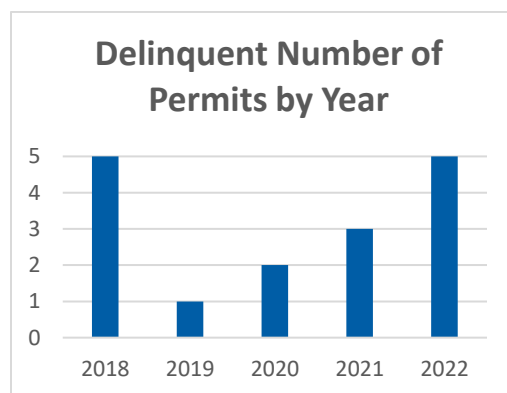


Figure 7: Delinquent Number of Permits by Year

Mitigation Effects on Streamflow

To evaluate the impact of the mitigation program on scenic waterway flows and instream water right flows, the Department developed a streamflow modeling program based on gaging records from the 1966-1995 base period, a pre-mitigation program time frame. The model simulates the long term (i.e., steady-state) estimated hydrologic effects of mitigation credits and debits on the historical records at the gaged locations across the basin, and then evaluates how often the instream flow requirements (ISFR) are met based on this adjusted streamflow data compared to the original flow records (Cooper, 2008). A modeling approach was used because the steady-state, long-term impact of streamflow to mitigation-related activities may take years or even decades to be reflected as actual changes in streamflow (Gannett and Lite, 2004), plus climate variability generally masks the streamflow response to mitigation activities at most locations (Cooper, 2008). The simulations do not reflect activities affecting streamflow outside of the mitigation program, such as canal piping/lining.

Analysis of the 2022 data demonstrates that, on an annual basis, the simulated change in percent of time instream flow requirements (% ISFR) are met at the evaluation points ranges from -0.17% to +1.29%. Similarly, the overall annual change in mean streamflow ranges from -0.006 CFS to +27.4 CFS (Appendix 4).

Consistent with previous annual reports, the seasonal change in the quantity of streamflow (CFS) continues to be negative at all evaluation points during the non-irrigation season and positive at all evaluation points during the irrigation season, reflecting the

general timing difference between the hydrologic impacts to streamflow of credits (irrigation season) and debits (year-around).

Similarly, the changes in % ISFR met generally follows this same seasonality as changes in streamflow quantity. The magnitude of change in % ISFR met varies by month and site, reflecting how close historical flows were to the ISFR prior to the mitigation program. If the historical flows were close to the ISFR for a given evaluation site, then a small change in flows can result in a large change in % ISFR is met, while the opposite is true if the historical flows differed greatly from the ISFR.

Again, this difference in seasonal results is expected due to the inherent timing difference between when the hydrologic effects of debits and credits reach the stream network. Debits (new groundwater withdrawals) produce a decrease in streamflow year-round due to the pumping effects on groundwater being attenuated in time (Gannett and Lite, 2004). Credit (instream leases and instream transfers of surface water rights) effects are immediate and occur primarily during the irrigation season.

Summary

The Department continues working to effectively implement the Deschutes Basin Groundwater Mitigation Program. Groundwater permit applications and mitigation projects are moving through the required processes. Overall, the program continues to produce positive benefits as more mitigation water has been approved and protected instream than is required for active groundwater permits and certificates.

In response to comments and questions received from sister agencies (as outlined in

“Agency Comments” above and provided in Appendix 3 attached to this report), the Department understands the concerns brought forth regarding impacts to cold-water springs, the zonal mitigation impacts, model accounting and climate change, and impacts during the non-irrigation season. From the beginning of the Deschutes Mitigation Program, however, it was determined that the program should be structured in such a way so that it was a manageable system for OWRD to track and maintain long-term. OWRD considered the goals of the Mitigation Program, the Deschutes Groundwater Mitigation Flow Model, and the base period flows (1966-1995) and created sub-zones and consumptive use coefficients to keep the Deschutes Mitigation Program manageable. Seasonal uses were allowed to generate credits that could then be purchased to mitigate for year-round uses.

OWRD is continuing to work with ODFW, ODEQ, and interested parties to address these challenging issues. Other concerns may need to be addressed through other venues and initiatives to develop and implement a basin-wide water management plan.

The Deschutes Groundwater Mitigation Program is a performance based, adaptive approach to managing new groundwater permits in the Deschutes Groundwater Study Area. As part of this adaptive approach, the program included a cap on how much new groundwater use could be approved. The Department may issue final orders approving groundwater permit applications for a cumulative total of up to 200 CFS. This limitation is one of the elements of the program that is to be reviewed as part of the program evaluation. The 200 CFS cap represents the rate up to which water may be withdrawn from the groundwater resource. It

is important to note that this rate-based limitation is different from the consumptive use portion (in acre feet) for which groundwater permit applicants must provide mitigation.

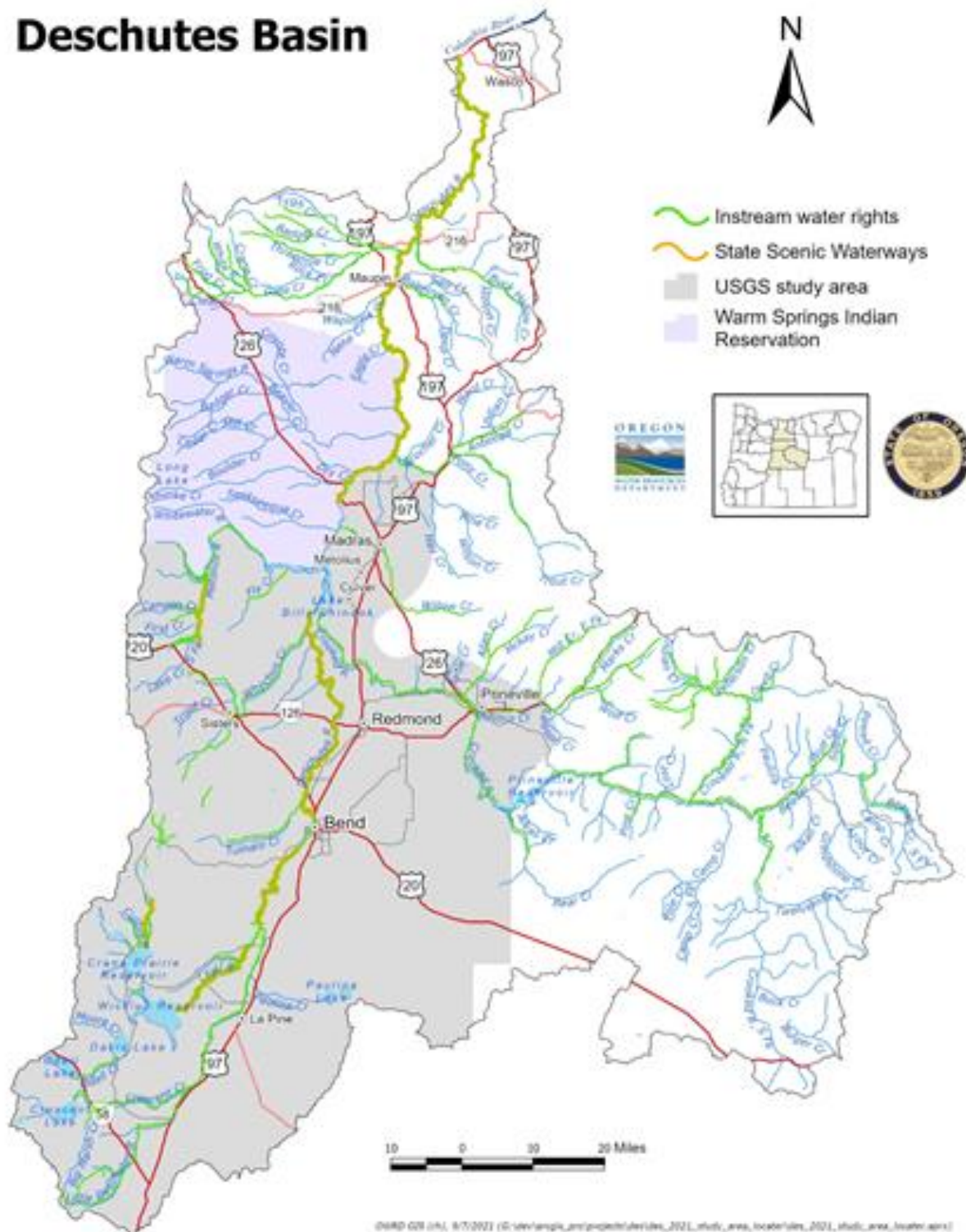
As discussed in the “Allocation Cap” section of this report, the quantity of water (CFS) allocated under the cap fluctuates up and down from year to year as a result of various administrative actions (i.e., denial, cancellation, expiration, withdrawal, etc.) which add back previously deducted CFS to the cap. As of the end of 2022, 155.54 CFS was allocated under the cap.

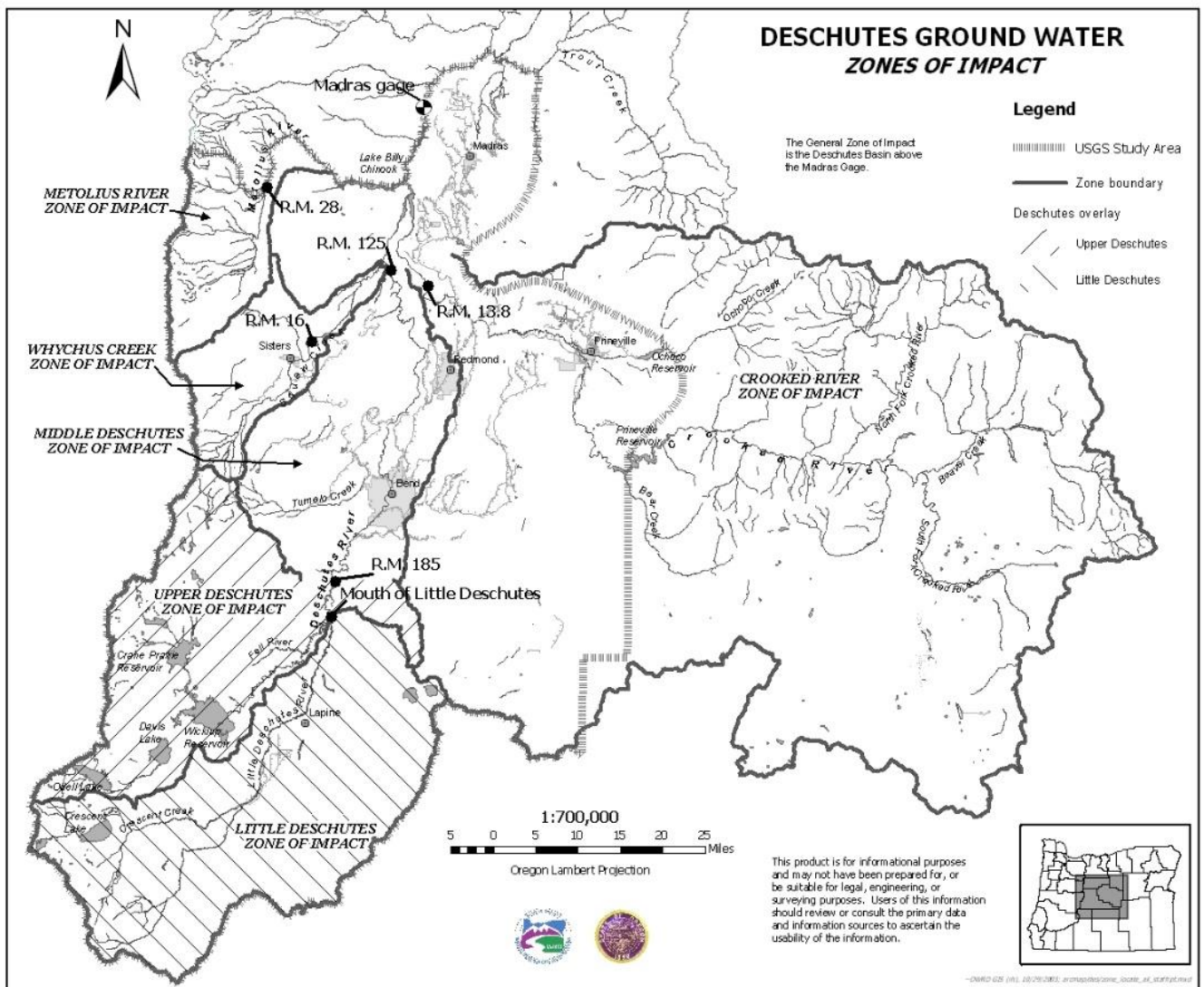
Given the status of the 200 CFS allocation cap, the Department understands there is much interest and diverse opinion in how the future of the Deschutes Basin Groundwater Mitigation Program should unfold. The Department has prioritized working through the many complex issues related to the Program. Both sister-agencies and interested parties have been invited to engage in the OWRD process to evaluate modifications to the existing Deschutes Basin Groundwater Mitigation Program.

Appendices

1. Deschutes Basin Groundwater Study Area Map
2. Deschutes Basin Groundwater Study Area Zone of Impact Map
3. Comments from ODFW and ODEQ
4. Summary of Modeled Streamflow for Water Year Ending September 2022

Deschutes Basin







Oregon

Tina Kotek, Governor

Department of Fish and Wildlife

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Salem, OR 97302-1142
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December 20, 2024

Sarah Henderson
Flow Restoration Program Coordinator, Transfer and
Conservation Division
Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, OR 97301-1271



RE: ODFW Comments on the DRAFT 2022 Annual Review of the Deschutes Basin Groundwater Mitigation Program

Dear Ms. Henderson,

The Oregon Department of Fish and Wildlife (ODFW) appreciates the opportunity to provide comments on the DRAFT 2022 Annual Review of the Deschutes Basin Groundwater Mitigation Program (Program). Overall, ODFW agrees that the Program has been successful in maintaining and improving flows for State Scenic Waterways and senior water rights, particularly instream water rights, during the irrigation season. However, as we acquire more information about the additional detrimental impacts to fish and wildlife expected in the future from a changing climate, we have increasing concerns about water accounting, the impacts to springs, and decreases in flow during the non-irrigation season.

Since inception of the Program, ODFW has repeatedly submitted comments that address our ongoing concerns and have discussed potential solutions with the Oregon Water Resources Department (OWRD) many times. As our concerns are already on record, please refer to past comment letters for details (e.g., ODFW Comments on the DRAFT 2021 Annual Review of the Deschutes Basin Groundwater Mitigation Program, January 6, 2023). We are pleased to currently be engaged in thorough discussions with OWRD for Program improvements as we get closer to the allocation cap being reached and the Program sunset in 2029. ODFW looks forward to continuing conversations and advising the agency on ways to strengthen the efficacy of the Program to improve and protect instream flow for fish, wildlife, and their habitats.

As in the past, ODFW will review our primary concerns here for the record. In general, and as currently being discussed with OWRD, ODFW recommends these tangible improvements to the

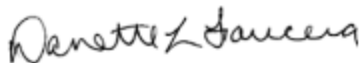
*To protect and enhance Oregon's fish and wildlife and their habitats
for use and enjoyment by present and future generations.*

Program be addressed before the 200 cfs cap on the Program is lifted and/or the Program is reauthorized:

- **Water Accounting and Impacts of Climate Change:** ODFW would like to see a comparison of the streamflow model reporting and current, measured improvements/declines in streamflow. The draft identifies success because 6,509.6 AF of instream flow has been permanently restored to the Deschutes River and its tributaries. A comparison showing how this amount truly offsets the impacts from new groundwater use and information on the reliability of the mitigation water in regard to its physical and regulatory availability would tell a more complete story.
- **Zonal Mitigation:** ODFW recommends mitigation under the Program directly offset the impact by being located upstream of the impacted reach.
- **Impacts to Springs:** ODFW would like to discuss the proposed path forward regarding combined efforts to obtain funding for a study aimed at identifying impacts to the springs within the Study Area and to understand whether any impacts are the direct result of the mitigation program.
- **Impacts During the Non-Irrigation Season:** ODFW recommends providing a more complete picture when communicating the efficacy of the Program at meeting key goals by looking at benefits/impacts to flow during the non-irrigation season as well as the irrigation season. Concluding that the Program has been successful in meeting key goals by relying on assessments on an annual/yearly basis is misleading given the Program allows declines in flow (and potential impacts to the Scenic Waterway and senior water rights) during the non-irrigation season.

Thank you for the chance to comment. We look forward to revisiting Program goals and rule language and pursuing solutions to our concerns in upcoming discussions as OWRD plans for Program updates. In the meantime, ODFW recommends the 200 cfs cap not be lifted until these issues are resolved, and the Commission can determine that scenic waterway flows and instream water right flows in the Deschutes Basin continue to be met year round (including during the non-irrigation season) on at least an equivalent or more frequent basis as compared to long-term, representative base period flows established by the Department per OAR [690-505-0500\(4\)](#). In the meantime, the 200 cfs cap should not be modified or the Program reauthorized until these concerns are resolved. If you have any questions, please contact me at 971-280-3773.

Sincerely,



Danette Faucera, Water Policy Coordinator

HENDERSON Sarah A * WRD

From: HENDRICKSON Cole * DEQ
Sent: Monday, December 9, 2024 1:29 PM
To: HENDERSON Sarah A * WRD
Subject: RE: ACTION NEEDED: Review / Comments requested: DRAFT Deschutes GW Mitigation Program 2022 Annual Review

Hi Sarah,

Due to a lack of staff time, DEQ will not have the capacity to review the Draft Deschutes GW Mitigation Program Annual Report for 2022. The issues DEQ has raised in previous Annual Report reviews are still relevant to the current report. We plan to support the program through collaboration surrounding the update being led by Emelie McKain.

Thank you,

Cole Hendrickson
he/him
Integrated Water Resources Program Coordinator
Integrated Water Resources Specialist
Eastern Region (Bend Office)
Cole.Hendrickson@DEQ.Oregon.Gov
Cell: 458-256-9155



Streamflow Model Data

The data presented in the following tables are from the Department's Deschutes Mitigation model. The "before mitigation" or baseline condition of streams in the Deschutes Basin has been determined from streamflows measured during water years 1966 to 1995. The model has been developed to mathematically estimate the change in streamflow expected due to mitigation (credits) and groundwater allocation (debits). The model is designed to reflect the theoretical, steady-state response of streamflow to mitigation-related activities only. In some cases, the actual hydrologic response to mitigation activities, such as new groundwater pumping, may take years or decades to be reflected as changes in streamflow.

CHANGE IN PERCENT OF TIME INSTREAM REQUIREMENTS ARE MET IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River at Mouth

Time: 13:34

Date: 10/03/2024

Month	Base Line	Mitigated	Change in	Percent
	%	%	Percentage	Change
			%	%
JAN	93.20	92.90	-0.32	-0.35
FEB	90.80	90.20	-0.59	-0.65
MAR	95.30	95.10	-0.22	-0.23
APR	99.90	99.90	0.00	0.00
MAY	99.10	99.50	0.32	0.32
JUN	98.00	98.80	0.78	0.79
JUL	91.00	93.40	2.47	2.65
AUG	100.00	100.00	0.00	0.00
SEP	98.10	98.20	0.11	0.11
OCT	97.40	97.50	0.11	0.11
NOV	99.90	99.80	-0.11	-0.11
DEC	91.70	91.10	-0.64	-0.71
ANNUAL	96.20	96.40	0.16	0.17

CHANGE IN MEAN STREAM FLOW (CFS) IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River at Mouth

Time: 13:34

Date: 10/03/2024

Month	Base Line	Mitigated	Change	Percent
	cfs	cfs	in cfs	Change
			cfs	%
JAN	6910.0	6880.0	-28.7	-0.42
FEB	7080.0	7050.0	-28.7	-0.41
MAR	7250.0	7220.0	-28.6	-0.40
APR	6640.0	6640.0	-1.10	-0.02
MAY	5800.0	5830.0	25.4	0.44
JUN	5200.0	5240.0	44.8	0.85
JUL	4590.0	4640.0	51.1	1.10
AUG	4380.0	4430.0	49.2	1.11
SEP	4430.0	4470.0	34.3	0.77
OCT	4710.0	4710.0	4.16	0.09
NOV	5390.0	5360.0	-28.4	-0.53
DEC	6190.0	6160.0	-28.7	-0.47
ANNUAL	5710.0	5710.0	5.57	0.10

CHANGE IN PERCENT OF TIME INSTREAM REQUIREMENTS ARE MET
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River below Pelton Dam
Time: 13:35 Date: 10/03/2024

Month	Base Line	Mitigated	Change in Percentage	Percent Change
	%	%	%	%
JAN	64.70	63.90	-0.86	-1.35
FEB	63.00	61.50	-1.53	-2.50
MAR	67.80	66.70	-1.18	-1.77
APR	71.40	71.40	0.00	0.00
MAY	58.80	64.10	5.27	8.22
JUN	55.60	60.80	5.22	8.59
JUL	41.00	46.10	5.16	11.20
AUG	98.20	99.50	1.29	1.30
SEP	66.80	69.40	2.67	3.84
OCT	81.10	81.10	0.00	0.00
NOV	97.20	97.20	0.00	0.00
DEC	66.10	65.40	-0.75	-1.15
ANNUAL	69.30	70.60	1.29	1.82

CHANGE IN MEAN STREAM FLOW (CFS)
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River below Pelton Dam
Time: 13:36 Date: 10/03/2024

Month	Base Line	Mitigated	Change in cfs	Percent Change
	cfs	cfs	cfs	%
JAN	5240.0	5210.0	-28.7	-0.55
FEB	5190.0	5160.0	-28.7	-0.56
MAR	5520.0	5490.0	-28.6	-0.52
APR	5130.0	5130.0	-1.10	-0.02
MAY	4420.0	4450.0	25.4	0.57
JUN	4230.0	4270.0	44.8	1.05
JUL	4020.0	4070.0	51.1	1.25
AUG	3940.0	3990.0	49.2	1.24
SEP	3980.0	4010.0	34.3	0.86
OCT	4190.0	4190.0	4.16	0.10
NOV	4680.0	4650.0	-28.4	-0.61
DEC	5030.0	5000.0	-28.7	-0.57
ANNUAL	4630.0	4630.0	5.57	0.12

CHANGE IN PERCENT OF TIME INSTREAM REQUIREMENTS ARE MET
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Metolius River at Lake Billy Chinook

Time: 13:36

Date: 10/03/2024

Month	Base Line	Mitigated	Change in Percentage	Percent Change
	%	%	%	%
JAN	97.70	97.70	0.00	0.00
FEB	99.20	99.20	0.00	0.00
MAR	99.80	99.80	0.00	0.00
APR	100.00	100.00	0.00	0.00
MAY	100.00	100.00	0.00	0.00
JUN	100.00	100.00	0.00	0.00
JUL	100.00	100.00	0.00	0.00
AUG	100.00	100.00	0.00	0.00
SEP	100.00	100.00	0.00	0.00
OCT	100.00	100.00	0.00	0.00
NOV	100.00	100.00	0.00	0.00
DEC	100.00	100.00	0.00	0.00
ANNUAL	99.70	99.70	0.00	0.00

CHANGE IN MEAN STREAM FLOW (CFS)
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Metolius River at Lake Billy Chinook

Time: 13:36

Date: 10/03/2024

Month	Base Line	Mitigated	Change in cfs	Percent Change
	cfs	cfs	cfs	%
JAN	1510.0	1510.0	-0.044	0.00
FEB	1560.0	1560.0	-0.044	0.00
MAR	1560.0	1560.0	-0.044	0.00
APR	1520.0	1520.0	-0.044	0.00
MAY	1560.0	1560.0	0.056	0.00
JUN	1590.0	1590.0	0.056	0.00
JUL	1490.0	1490.0	0.056	0.00
AUG	1400.0	1400.0	0.056	0.00
SEP	1350.0	1350.0	0.006	0.00
OCT	1330.0	1330.0	-0.044	0.00
NOV	1370.0	1370.0	-0.044	0.00
DEC	1450.0	1450.0	-0.044	0.00
ANNUAL	1470.0	1470.0	-0.006	0.00

CHANGE IN PERCENT OF TIME INSTREAM REQUIREMENTS ARE MET
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River at Lake Billy Chinook
Time: 13:37 Date: 10/03/2024

Month	Base Line	Mitigated	Change in Percentage	Percent Change
	%	%	%	%
JAN	100.00	100.00	0.00	0.00
FEB	100.00	100.00	0.00	0.00
MAR	100.00	100.00	0.00	0.00
APR	97.10	100.00	2.89	2.89
MAY	100.00	100.00	0.00	0.00
JUN	100.00	100.00	0.00	0.00
JUL	100.00	100.00	0.00	0.00
AUG	100.00	100.00	0.00	0.00
SEP	100.00	100.00	0.00	0.00
OCT	94.40	99.90	5.48	5.49
NOV	100.00	100.00	0.00	0.00
DEC	100.00	100.00	0.00	0.00
ANNUAL	99.30	100.00	0.70	0.70

CHANGE IN MEAN STREAM FLOW (CFS)
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River at Lake Billy Chinook
Time: 13:37 Date: 10/03/2024

Month	Base Line	Mitigated	Change in cfs	Percent Change
	cfs	cfs	cfs	%
JAN	1300.0	1290.0	-9.61	-0.75
FEB	1320.0	1310.0	-9.61	-0.73
MAR	1300.0	1290.0	-9.47	-0.74
APR	843.0	860.0	17.6	2.05
MAY	552.0	595.0	43.1	7.24
JUN	606.0	666.0	59.8	8.98
JUL	550.0	616.0	66.1	10.70
AUG	519.0	584.0	64.3	11.00
SEP	537.0	587.0	49.4	8.41
OCT	725.0	745.0	20.1	2.69
NOV	1130.0	1120.0	-9.61	-0.86
DEC	1220.0	1210.0	-9.61	-0.79
ANNUAL	881.0	904.0	22.9	2.53

CHANGE IN PERCENT OF TIME INSTREAM REQUIREMENTS ARE MET
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River at Lower Bridge

Time: 13:37

Date: 10/03/2024

Month	Base Line	Mitigated	Change in Percentage	Percent Change
	%	%	%	%
JAN	60.50	59.00	-1.51	-2.55
FEB	63.80	62.50	-1.30	-2.08
MAR	68.30	67.70	-0.54	-0.79
APR	23.60	25.10	1.56	6.19
MAY	1.29	1.72	0.43	25.00
JUN	2.11	3.67	1.56	42.40
JUL	0.11	0.97	0.86	88.90
AUG	0.86	2.15	1.29	60.00
SEP	3.67	4.89	1.22	25.00
OCT	13.00	14.20	1.18	8.33
NOV	52.20	50.90	-1.33	-2.62
DEC	56.30	55.60	-0.75	-1.35
ANNUAL	28.60	28.90	0.23	0.79

CHANGE IN MEAN STREAM FLOW (CFS)
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River at Lower Bridge

Time: 13:38

Date: 10/03/2024

Month	Base Line	Mitigated	Change in cfs	Percent Change
	cfs	cfs	cfs	%
JAN	683.0	681.0	-2.07	-0.31
FEB	705.0	703.0	-2.07	-0.29
MAR	714.0	712.0	-2.07	-0.29
APR	299.0	323.0	24.3	7.53
MAY	51.2	99.2	48.1	48.40
JUN	50.5	112.0	62.0	55.10
JUL	42.6	107.0	64.6	60.30
AUG	46.2	110.0	63.9	58.00
SEP	61.0	110.0	49.3	44.70
OCT	222.0	247.0	25.8	10.40
NOV	551.0	549.0	-2.07	-0.38
DEC	614.0	612.0	-2.07	-0.34
ANNUAL	335.0	362.0	27.4	7.58

CHANGE IN PERCENT OF TIME INSTREAM REQUIREMENTS ARE MET
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River above Diversion Dam at Bend

Time: 13:38

Date: 10/03/2024

Month	Base Line	Mitigated	Change in Percentage	Percent Change
	%	%	%	%
JAN	37.30	37.20	-0.11	-0.29
FEB	40.00	39.30	-0.71	-1.80
MAR	42.90	42.20	-0.75	-1.79
APR	73.20	73.80	0.56	0.75
MAY	97.00	97.50	0.54	0.55
JUN	100.00	100.00	0.00	0.00
JUL	100.00	100.00	0.00	0.00
AUG	100.00	100.00	0.00	0.00
SEP	97.00	98.20	1.22	1.24
OCT	54.60	56.30	1.72	3.05
NOV	29.00	28.70	-0.33	-1.16
DEC	35.70	35.50	-0.22	-0.61
ANNUAL	67.40	67.50	0.16	0.24

CHANGE IN MEAN STREAM FLOW (CFS)
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River above Diversion Dam at Bend

Time: 13:38

Date: 10/03/2024

Month	Base Line	Mitigated	Change in cfs	Percent Change
	cfs	cfs	cfs	%
JAN	712.0	710.0	-2.04	-0.29
FEB	738.0	736.0	-2.04	-0.28
MAR	781.0	779.0	-2.04	-0.26
APR	877.0	884.0	7.14	0.81
MAY	1180.0	1190.0	15.3	1.28
JUN	1360.0	1380.0	20.1	1.46
JUL	1440.0	1460.0	23.4	1.60
AUG	1290.0	1310.0	22.9	1.75
SEP	1090.0	1110.0	17.6	1.59
OCT	721.0	731.0	9.69	1.33
NOV	590.0	588.0	-2.04	-0.35
DEC	650.0	648.0	-2.04	-0.31
ANNUAL	953.0	962.0	8.89	0.93

CHANGE IN PERCENT OF TIME INSTREAM REQUIREMENTS ARE MET
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River at Benham Falls

Time: 13:38

Date: 10/03/2024

Month	Base Line	Mitigated	Change in Percentage	Percent Change
	%	%	%	%
JAN	43.40	43.20	-0.22	-0.50
FEB	54.50	54.40	-0.12	-0.22
MAR	32.50	31.40	-1.08	-3.42
APR	69.60	69.60	0.00	0.00
MAY	78.10	78.10	0.00	0.00
JUN	92.60	92.60	0.00	0.00
JUL	96.80	96.80	0.00	0.00
AUG	94.50	94.60	0.11	0.11
SEP	67.80	67.90	0.11	0.16
OCT	54.00	54.00	0.00	0.00
NOV	35.90	35.70	-0.22	-0.62
DEC	44.60	44.60	0.00	0.00
ANNUAL	63.70	63.60	-0.12	-0.19

CHANGE IN MEAN STREAM FLOW (CFS)
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River at Benham Falls

Time: 13:39

Date: 10/03/2024

Month	Base Line	Mitigated	Change in cfs	Percent Change
	cfs	cfs	cfs	%
JAN	814.0	812.0	-2.02	-0.25
FEB	845.0	843.0	-2.02	-0.24
MAR	901.0	899.0	-2.02	-0.22
APR	1240.0	1240.0	-0.949	-0.08
MAY	1850.0	1850.0	-0.128	-0.01
JUN	2100.0	2100.0	0.553	0.03
JUL	2200.0	2200.0	3.89	0.18
AUG	2040.0	2040.0	3.42	0.17
SEP	1730.0	1740.0	2.77	0.16
OCT	1000.0	1010.0	2.60	0.26
NOV	685.0	683.0	-2.02	-0.30
DEC	752.0	750.0	-2.02	-0.27
ANNUAL	1350.0	1350.0	0.186	0.01

CHANGE IN PERCENT OF TIME INSTREAM REQUIREMENTS ARE MET
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Little Deschutes River at mouth

Time: 13:39

Date: 10/03/2024

Month	Base Line	Mitigated	Change in Percentage	Percent Change
	%	%	%	%
JAN	22.90	20.80	-2.15	-10.40
FEB	37.30	34.60	-2.72	-7.85
MAR	27.40	27.10	-0.32	-1.19
APR	45.20	45.00	-0.22	-0.49
MAY	55.90	55.80	-0.11	-0.19
JUN	56.60	56.60	0.00	0.00
JUL	85.10	86.90	1.83	2.10
AUG	93.90	94.30	0.43	0.46
SEP	72.00	73.10	1.11	1.52
OCT	11.60	12.80	1.18	9.24
NOV	14.70	14.00	-0.67	-4.76
DEC	20.30	19.70	-0.64	-3.28
ANNUAL	45.30	45.10	-0.17	-0.38

CHANGE IN MEAN STREAM FLOW (CFS)
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Little Deschutes River at mouth

Time: 13:39

Date: 10/03/2024

Month	Base Line	Mitigated	Change in cfs	Percent Change
	cfs	cfs	cfs	%
JAN	162.0	160.0	-1.99	-1.25
FEB	183.0	181.0	-1.99	-1.10
MAR	219.0	217.0	-1.99	-0.92
APR	262.0	261.0	-0.918	-0.35
MAY	329.0	329.0	-0.097	-0.03
JUN	298.0	299.0	0.584	0.19
JUL	230.0	234.0	3.92	1.68
AUG	200.0	203.0	3.45	1.70
SEP	144.0	146.0	2.80	1.91
OCT	76.7	79.3	2.63	3.31
NOV	108.0	106.0	-1.99	-1.88
DEC	142.0	140.0	-1.99	-1.42
ANNUAL	196.0	196.0	0.217	0.11

CHANGE IN PERCENT OF TIME INSTREAM REQUIREMENTS ARE MET
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River above Little Deschutes River
Time: 13:40 Date: 10/03/2024

Month	Base Line	Mitigated	Change in	Percent
	%	%	Percentage	Change
			%	%
JAN	29.70	29.70	0.00	0.00
FEB	30.10	30.10	0.00	0.00
MAR	33.50	33.50	0.00	0.00
APR	68.40	68.40	0.00	0.00
MAY	97.80	97.80	0.00	0.00
JUN	98.80	98.80	0.00	0.00
JUL	100.00	100.00	0.00	0.00
AUG	100.00	100.00	0.00	0.00
SEP	99.80	99.80	0.00	0.00
OCT	56.80	56.80	0.00	0.00
NOV	20.90	20.90	0.00	0.00
DEC	24.70	24.70	0.00	0.00
ANNUAL	63.50	63.50	0.00	0.00

CHANGE IN MEAN STREAM FLOW (CFS)
IN THE DESCHUTES BASIN AS A RESULT OF MITIGATED GROUNDWATER USE

Effective Date: 9/30/2022

Deschutes River above Little Deschutes River
Time: 13:40 Date: 10/03/2024

Month	Base Line	Mitigated	Change	Percent
	cfs	cfs	in cfs	Change
			cfs	%
JAN	329.0	329.0	0.000	0.00
FEB	331.0	331.0	0.000	0.00
MAR	319.0	319.0	0.000	0.00
APR	654.0	654.0	0.000	0.00
MAY	1220.0	1220.0	0.000	0.00
JUN	1500.0	1500.0	0.000	0.00
JUL	1690.0	1690.0	0.000	0.00
AUG	1530.0	1530.0	0.000	0.00
SEP	1260.0	1260.0	0.000	0.00
OCT	561.0	561.0	0.000	0.00
NOV	246.0	246.0	0.000	0.00
DEC	280.0	280.0	0.000	0.00
ANNUAL	829.0	829.0	0.000	0.00