2026
REVIEW OF THE DESCHUTES BASIN GROUNDWATER MITIGATION PROGRAM

Middle Deschutes River
Image credit: Deschutes River Conservancy

OREGON
WATER RESOURCES DEPARTMENT

5-YEAR REPORT (DRAFT)

STATE OF OREGON

2026
REVIEW OF THE DESCHUTES BASIN GROUNDWATER MITIGATION PROGRAM

5-YEAR REPORT (DRAFT FOR PUBLIC COMMENT 9/22/2026)

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Background
Surface water has been fully appropriated in the Deschutes Basin for decades, pushing demand for new water towards groundwater from the regional aquifer system. Significant conservation efforts have led to piping of irrigation canals, freeing up surface water for instream flows and sharing among irrigation districts. Cities in Central Oregon have also implemented conservation practices to help stretch water supplies to meet the demands of growing populations.

Owing to the significant hydraulic connection between groundwater and surface water within the Deschutes Basin, the Oregon Water Resources Department (OWRD or Department) jointly manages groundwater and surface water to ensure that new groundwater uses do not diminish streamflows. Surface water flows in the Deschutes River and many of its tributaries are protected with State Scenic Waterway designations and/or instream water rights. In addition, there are hundreds of existing surface water rights for various out-of-stream uses. These instream and out-of-stream rights include those held by the Confederated Tribes of the Warm Springs Reservation of Oregon (Tribe).

The Deschutes Groundwater Mitigation Program (Mitigation Program) was established in the early 2000s to allow new permitted groundwater use while maintaining flows for scenic waterways and senior surface water rights, including instream water rights. Through the program, water is legally protected instream to offset the impacts to surface water from groundwater use, up to a program limit of 200 cubic feet second (CFS). The Mitigation Program targets surface water flow protection and is complemented by Department programs and policies focused on the sustainable management of groundwater. Groundwater levels in the Deschutes Basin are impacted by a range of factors that include changing climate conditions, canal piping and lining, permitted pumping (both within and external to the Mitigation Program) and exempt well use.

This report satisfies the five-year Mitigation Program evaluation requirements set out in ORS 540.155 and OAR 690-505-0500, covering the period from 2020 through 2025.

Program users and allocations
Approximately 160 CFS of groundwater has been allocated to 155 active permit holders under the Mitigation Program. The primary users of the program are municipal and quasi-municipal water suppliers, who together represent 85% of allocations. As the rate allocated has not changed significantly in the past eight years, the Department does not recommend any changes to the 200 CFS allocation cap at this time.

Program impacts
Mean annual changes to streamflows resulting from Mitigation Program activity were neutral or positive at all analysis locations across the basin, with an impact of +26 CFS in the Middle Deschutes River. The annual change to the percentage of time instream flow requirements were historically met was neutral to positive at most analysis locations and generally on the order of 1%

or less, indicating balance between mitigation debits and credits. There is a seasonality to program impacts that appears to offer benefits to fish and wildlife at some locations (contributing to streamflows during critical low-flow periods) and warrants further investigation at other locations.

Legislative sunset and proposed extension

Authorized under ORS 537.746 and 2005 Oregon Laws Chapter 669, and amended by 2011 Oregon Laws Chapter 694, the Mitigation Program is due to sunset on January 2, 2029. This impending legislative sunset puts many groundwater permit holders at risk. Approximately one in three program users relies on temporary mitigation credits, and a program sunset would leave these permit holders without any means to satisfy their mitigation obligation to continue pumping. Equally at risk are the 21 municipal and quasi-municipal water suppliers who are incrementally developing their groundwater permits. More than half of the total water allocated under the program is still under development by these water suppliers, and a program sunset would leave them without any means to grow into the permits they have already secured to meet projected demand. To address these vulnerabilities, the Legislature will consider legislation to extend the Mitigation Program during the 2027 session.

Strengthening opportunities

The Department plans to take various actions in response to Mitigation Program feedback provided by the Tribe, agency partners and basin interests. Key areas of interest are summarized in the table below alongside planned actions. All actions will be prioritized over the next five years (provided that the Legislature approves a program extension) and will support data-informed program strengthening.

TOPIC / PROBLEM STATEMENT	PLANNED OWRD ACTIONS
WHYCHUS CREEK. OWRD's standard program impact assessment approach cannot be applied to Whychus Creek due to baseline data limitations.	Incorporate alternative analysis of impacts to Whychus Creek in program reports
SEASONAL IMPACTS. Pumping impacts occur year-round, while mitigation projects primarily contribute flows during the irrigation season. This results in seasonal program impacts that are masked by annual accounting.	Continue to assess seasonal impacts at all program analysis locations and review site-specific findings with partners to identify any areas of concern
MITIGATION WATER RELIABILITY. Mitigation water must be sufficiently reliable to generate "wet water" instream to offset groundwater use. The program should account for changes in water availability related to climate and other factors.	Analyze trends in the availability of permanent mitigation water over time to inform decisions on the eligibility of future mitigation projects
PROTECTED FLOW VERIFICATION. Instream flows are confirmed through OWRD's regular monitoring of existing stream gages, periodic auditing and bi-weekly reporting. A new gage at Lower Bridge would further support the verification of protected flows.	Continue to work with partners on a funding strategy to install and operate a new stream gage to verify protected flows

TOPIC / PROBLEM STATEMENT	PLANNED OWRD ACTIONS
CONSUMPTIVE USE FACTORS. Consumptive use (CU) is the basis for the program's system of mitigation debits and credits. The CU factors applied in the program should reflect current conditions and the best available science.	Evaluate CU estimates as part of ongoing updates to the Department's water availability methodology
TEMPORARY CREDIT UNCERTAINTY. Instream leasing is an unstable source of mitigation. Innovative approaches are needed to manage uncertainty and reduce risks to program users.	Work with partners to explore opportunities to manage the risks of temporary credit use, promote permanent mitigation and improve applicant awareness of credit uncertainty
ZONES OF IMPACT. In some zones of impact (ZOI), the potential exists for unmitigated impacts to streams at the subzone level, depending on hydrologic characteristics and the relative locations of wells and mitigation projects.	Assess the likelihood of unmitigated program impacts at the subzone level in the most vulnerable zones to determine if programmatic changes are needed
7J PERMITS. Groundwater permits issued in the basin from 1995-1998 include a condition making them subject to possible regulation barring mitigation. These "7j permits" should be prioritized for review and action.	Initiate the 60-day letter process for 7j permits as appropriate and, where good cause for extensions cannot be shown, start cancellation proceedings as warranted
IMPACTS TO SPRINGS AND WATER QUALITY. Groundwater use in the Deschutes Basin is one factor impacting spring discharge and associated cold water inputs to streams. Understanding the extent of Mitigation Program impacts on springs requires groundwater model refinement.	Work with partners to explore priority technical needs and help address knowledge gaps, including through the ongoing canal leakage investigation and a targeted analysis of changes in spring discharge

1 Background and legal basis

Surface water flows in the Deschutes River and many of its tributaries are protected with State Scenic Waterway designations and/or instream water rights. (See Figure 1.) In addition, there are hundreds of existing surface water rights for various out-of-stream uses.

In the 1990s, a groundwater study of the Deschutes Basin above Lake Billy Chinook was conducted by the U.S. Geological Survey (USGS) in cooperation with the Oregon Water Resources Department (OWRD or Department), the Confederated Tribes of the Warm Springs Reservation of Oregon and various basin partners. The study concluded that there is significant hydraulic connection between groundwater and surface water within the Deschutes Groundwater Study Area (DGWSA, see Figure 1). This connection means that groundwater uses impact streamflows within the DGWSA and that groundwater and surface water must be jointly managed to ensure that new groundwater uses do not diminish surface water flows. Further groundwater appropriations were paused within the DGWSA in 1998, and development of a basin-specific mitigation program began.

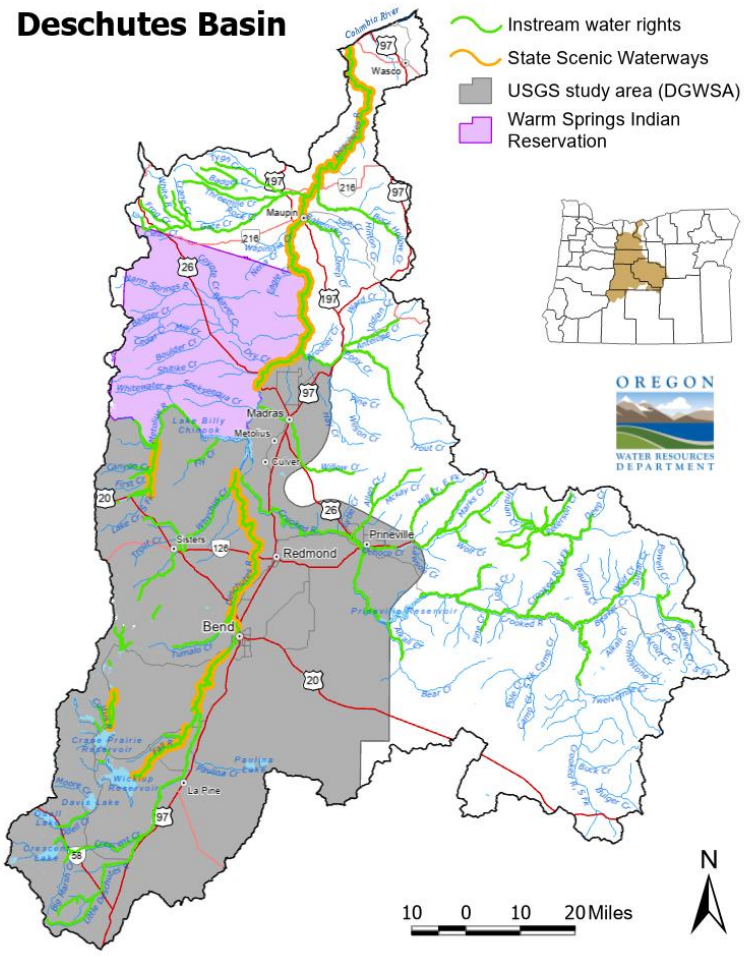

Figure 1: Protected surface water flows in the Deschutes Basin

The Deschutes Groundwater Mitigation Program (Mitigation Program) was established in the early 2000s to allow new permitted groundwater use while maintaining flows for scenic waterways and senior surface water rights, including instream water rights. The Mitigation Program targets surface water flow protection and is complemented by Department programs and policies focused on the sustainable management of groundwater, including OWRD's 2024 Groundwater Allocation Rules.

The Mitigation Program is implemented under Oregon Administrative Rules (OAR) Chapter 690, Divisions 505, 521 and 522. The original rules were adopted in 2002. In 2005, Oregon Laws Chapter

669 affirmed that the primary administrative rules for the program (Divisions 505 and 521) satisfy the requirements relating to mitigation under the Scenic Waterway Act (ORS 390.805 to 390.925), Instream Water Right Act (ORS 537.332 to 537.360) and the groundwater statutes (ORS 537.505 to 537.795), and it authorized the program through January 2, 2014. In 2011, Oregon Laws Chapter 694 extended the program's sunset to January 2, 2029.

Allowing the Mitigation Program to sunset would constrain further groundwater development in the DGWSA and put many existing permit holders at risk. Approximately one in three program users relies on temporary mitigation credits, and a program sunset would leave these permit holders without any means to satisfy their mitigation obligation to continue pumping. Equally at risk are the 21 municipal and quasi-municipal water suppliers who are incrementally developing their groundwater permits. More than half of the total water allocated under the program is still under development by these water suppliers, and a program sunset in 2029 would leave them without any means to grow into the permits already issued to them by the Department. To address these vulnerabilities, the Legislature will consider legislation to extend the Mitigation Program during the 2027 session (see Box 1).

PROPOSED LEGISLATIVE EXTENSION

The Legislature will consider legislation to extend the Mitigation Program during the 2027 session. A program extension will address sunset vulnerabilities and allow time for OWRD to pursue the program evaluation and strengthening opportunities noted throughout this report.

Box 1: Proposed legislative extension of the Mitigation Program

2 Program reporting

Reporting requirements

The Department is required under ORS 537.746 and OAR 690-505-0500 to develop annual reports on Mitigation Program activity and impacts to protected streamflows. The annual reports for 2020 through 2025 can be found on the Deschutes Groundwater Mitigation Program website.

The Department is further required under ORS 540.155 and OAR 690-505-0500 to report to the Legislative Assembly every five years on various aspects and impacts of the Mitigation Program and to assess the allocation cap and certain aspects of program architecture and effectiveness. For reporting efficiency, the Department has elected to address the requirements of these two five-year evaluations in a single combined report. This combined five-year report covers the period from 2020 through 2025. The applicable reporting requirements are outlined in Table 1, which includes cross references to the report sections that address each reporting requirement.

Table 1: Reporting requirements and associated report sections

Required five-year report content (paraphrased)	Report section
Program impacts on other water users of the Deschutes Basin	Chapter 7
Potential timing of mitigation	Section 7.4
Zones of impact identification; zones of impact evaluation	Chapter 10
Review of impacts on the Metolius River system	Sections 7.2-7.4
Potential timing of federal, state and local storage improvements	Section 9.1[1]
Identification of regulatory and statutory changes needed to address injury to existing water rights and spring systems and to offset measurable reductions to scenic waterway flows	Chapter 1[2]
Other issues raised by stakeholders	Chapter 11 and integrated throughout
Evaluation to determine whether the 200 CFS allocation cap should be modified	Section 6.4
Evaluation of the effectiveness of mitigation projects and credits involving time-limited instream transfers, instream leases and allocations of conserved water from canal piping and lining	Chapter 9
Evaluation of whether scenic waterway flows and instream water right flows are met less frequently as compared to base period flows	Section 7.2

[1] There are several existing storage projects in the Deschutes Basin, but there are no developments to report related to the Mitigation Program. Section 9.1 references a 2014 storage project that relates to the program.
[2] The only statutory change proposed is addressed in Chapter 1. Potential programmatic improvements and recommended Department actions are noted throughout the report.

Engagement process

OWRD engaged regularly with the Confederated Tribes of the Warm Springs Reservation of Oregon (Tribe) to develop this report. Between March and August 2026, five bi-lateral consultative meetings were held to discuss the Mitigation Program and opportunities for program improvement. Consistent with those discussions, this report includes a chapter dedicated to describing the Tribe's treaty-reserved water rights and role as a cooperative manager of certain water resources in the Deschutes Basin (see Chapter 3). The report also includes an analysis of Mitigation Program impacts on Whychus Creek (section 7.5), which is a priority river system for the Tribe and had not previously been included in program reporting.

The Department also held a series of meetings with state agency partners. Between May and July 2026, OWRD convened five meetings with the Oregon Department of Fish & Wildlife (ODFW) and the Oregon Department of Environmental Quality (DEQ) to discuss priority questions and feedback, and to identify issues requiring further evaluation and discussion over the months and years ahead.

The Department also prioritized engagement with Mitigation Program users during report development, in particular the Central Oregon Cities Organization and the City of Bend. OWRD had several meetings and conversations with these parties beginning in January 2026 to ensure this report reflects a clear understanding of program user priorities and concerns.

Additionally, the Department engaged with Deschutes Basin interests through a series of public meetings held in April, August and November 2026[3], and through comment solicitation and review. All feedback received was collated and considered in this report. See Appendix A for more details on comments received.

[3] A public meeting in November 2026 is anticipated as of the circulation of this draft report.

3 The Confederated Tribes of Warm Springs: sovereignty, treaty-reserved rights and shared management responsibilities

The Confederated Tribes of the Warm Springs Reservation of Oregon is a sovereign Indian tribe and the legal successor-in-interest to the signatories of the Treaty of June 25, 1855, with the Tribes of Middle Oregon, 12 Stat. 962 (Treaty of 1855). The ancestors of the Tribe have lived on or near the Columbia River since time immemorial. For the Tribe and its members fishing is "not much less necessary to [their] existence * * * than the atmosphere they breathe[]." *See United States v. Winans*, 198 US 371, 381 (1905). The Treaty of 1855 reserved to the Tribe the right to take fish at its usual and accustomed stations, and courts have interpreted this treaty-reserved fishing right to include protection of fish habitat sufficient to sustain harvestable populations, because the treaty fishing right would be "worthless without harvestable fish." *United States v. Washington*, 853 F3d 946, 965 (9th Cir 2017), *aff'd by an equally divided court*, 138 S Ct 1832 (2018). As shown in Figure 2, most of the Deschutes Basin falls within the Tribe's ceded lands.

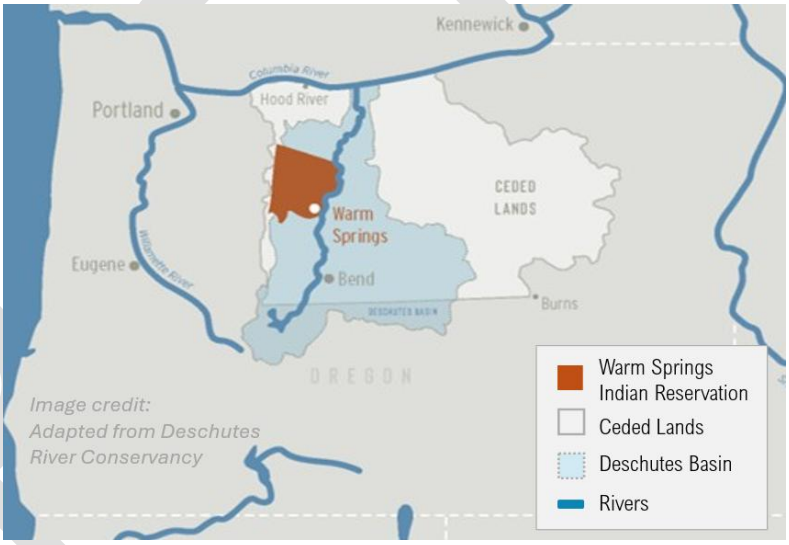

Figure 2: Location of the Deschutes Basin relative to the Tribe's Reservation and ceded lands

Certain of the Tribe's treaty-reserved water rights were determined in the Confederated Tribes of the Warm Springs Water Rights Settlement Agreement, dated November 17, 1997, as amended (Settlement Agreement). The Settlement Agreement establishes an important framework for the management of water resources subject to the Settlement Agreement. That framework includes shared sovereign responsibilities among the Tribe, the United States, and the State regarding the management of water resources subject to the Settlement Agreement. In particular, the Settlement Agreement requires that Deschutes Basin water right transfers (including both surface water and groundwater transfers) do not result in injury to the Tribal Reserved Water Right (as defined and described in the Settlement Agreement).

The Settlement Agreement defines "transfer" to mean "any change in the nature of use, place of use, or point of diversion of a water right." Certain actions taken pursuant to the Mitigation Program may involve transfers subject to the Settlement Agreement's "no injury" standard. Consistent with

their shared sovereign responsibilities under the Settlement Agreement, the Tribe, the State, and the United States are developing a memorandum of understanding intended to establish procedures for evaluating potential injury to the Tribal Reserved Water Right. This process will include the State's administration of elements of the Mitigation Program.

As the State administers the Mitigation Program, continued coordination among the Tribe, the United States, and the State will remain important to ensure that groundwater management decisions are implemented consistently with the Settlement Agreement and the Tribe's reserved water rights. The State will continue to consult with the Tribe in connection with their shared sovereign responsibilities under the Settlement Agreement regarding the Mitigation Program.

4 Program fundamentals

The Mitigation Program provides a set of tools that groundwater permit applicants can use to establish new groundwater uses while mitigating impacts on scenic waterway flows and senior water rights, including instream water rights. The program applies to all groundwater rights issued within the DGWSA (Figure 3) since the program was established.

For each new groundwater permit application in the DGWSA, the Department determines where the groundwater use will impact surface water flows and establishes a mitigation obligation for that zone of impact. Mitigation must be provided in that zone for the life of the permit and subsequent water right certificate.

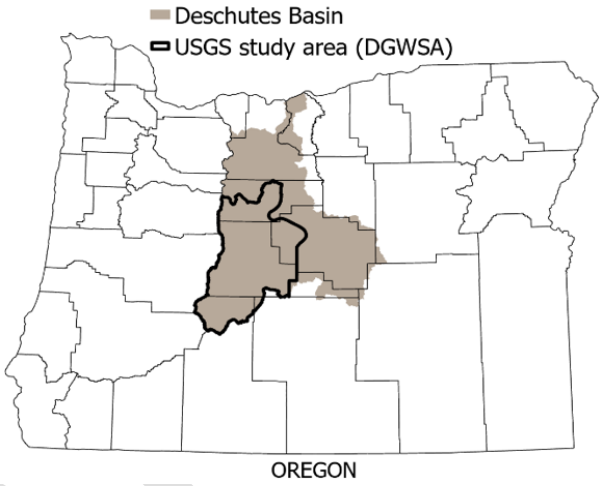

Figure 3: Mitigation Program geographic boundaries

Mitigation is provided through a mitigation project, which generates mitigation credits. To date, most mitigation has come from the conversion of an out-of-stream consumptive use (namely irrigation rights) to an instream non-consumptive use through a temporary lease or permanent transfer. Simply put, a bucket of mitigation water is legally protected instream for every bucket of water consumptively used under a new groundwater permit. (In the case of temporary credits, a 2:1 reserve factor is applied such that twice as much water must be protected instream, as discussed in section 8.1.)

New groundwater uses allowed under the program are limited to a cumulative total of 200 cubic feet per second (CFS), which is referred to as the allocation cap. Once the allocation cap is met, no additional groundwater permits can be issued in the DGWSA without the Water Resources Commission modifying the program rules to adjust the cap.

Refer to subsequent chapters of this report for further discussion of key terms and concepts, including the allocation cap, mitigation projects, temporary versus permanent mitigation, zones of impact and consumptive use.

5 Program users

At the end of 2025, there were 155 active permits under the Mitigation Program, representing various water use types. Permit types are municipal, quasi-municipal, irrigation, and a range of other uses that include nurseries, pond maintenance, storage, commercial, industrial and manufacturing, and group domestic. Figure 4 shows a breakdown of the rate allocated to various use types (in CFS), as well as the number of permits in the respective categories. The primary program users are municipal and quasi-municipal water suppliers, which represented 85% of program use by rate.

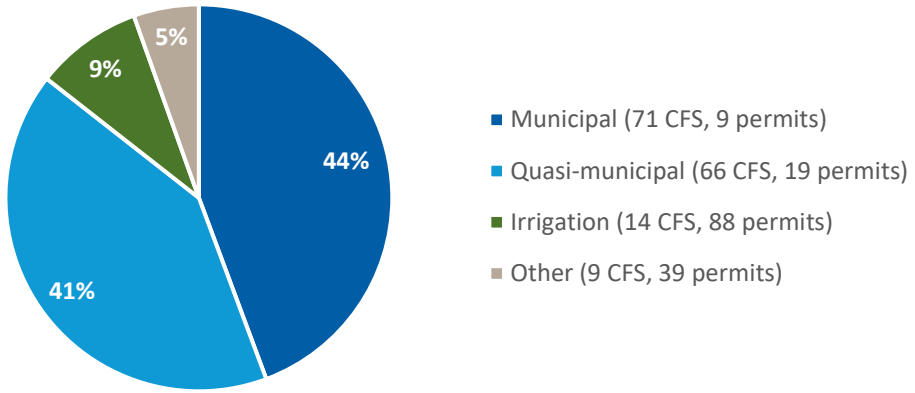

Figure 4: Percentage of total allocated rate by use type, specific rate allocated (CFS) and number of permits

In addition, there were 33 pending applications in the queue for processing at the end of 2025. Municipal and quasi-municipal uses represented 48% and 31% of pending requests by rate, respectively.

6 Allocated rate and volume

This section presents current rate allocations under the Mitigation Program as compared to the 200 CFS allocation cap. It also shows how allocations have changed over time. Allocation data specific to incremental development plans are presented to quantify the room available for further groundwater development under existing allocations. The section also presents information on the volume of water allocated and used under the program, and it concludes with the Department's recommendation to maintain the 200 CFS allocation cap as it continues to evaluate the program with the Tribe, program users, agency partners and basin interests.

6.1 Current rate allocations and pending applications

As noted in Chapter 4, groundwater allocations under the Mitigation Program may not exceed 200 CFS unless the program rules are revised. This allocation cap was established at program inception to limit potential impacts to surface water flows from program activity, particularly during the non-irrigation season (see section 7.4).

Mitigation Program allocations are dynamic, requiring consideration of longer-term trends to contextualize current allocation figures. As shown in Figure 5, 159.7 CFS had been allocated as of the end of 2025, with pending applications totaling an additional 39.7 CFS. The total rate allocated has fluctuated through the years as new groundwater permits have been issued and, conversely, as actions have been taken that reduce the total rate allocated. Circumstances that diminish the allocated rate include expired final orders; applications withdrawn after final order issuance; cancelled permits or certificates; portions of rates approved by a final order but not included in the resulting permit; portions of rates authorized by a permit but not included in the resulting certificate; and rates associated with offsets. The rate associated with pending applications is similarly subject to fluctuations as applications are approved, withdrawn, amended or denied.

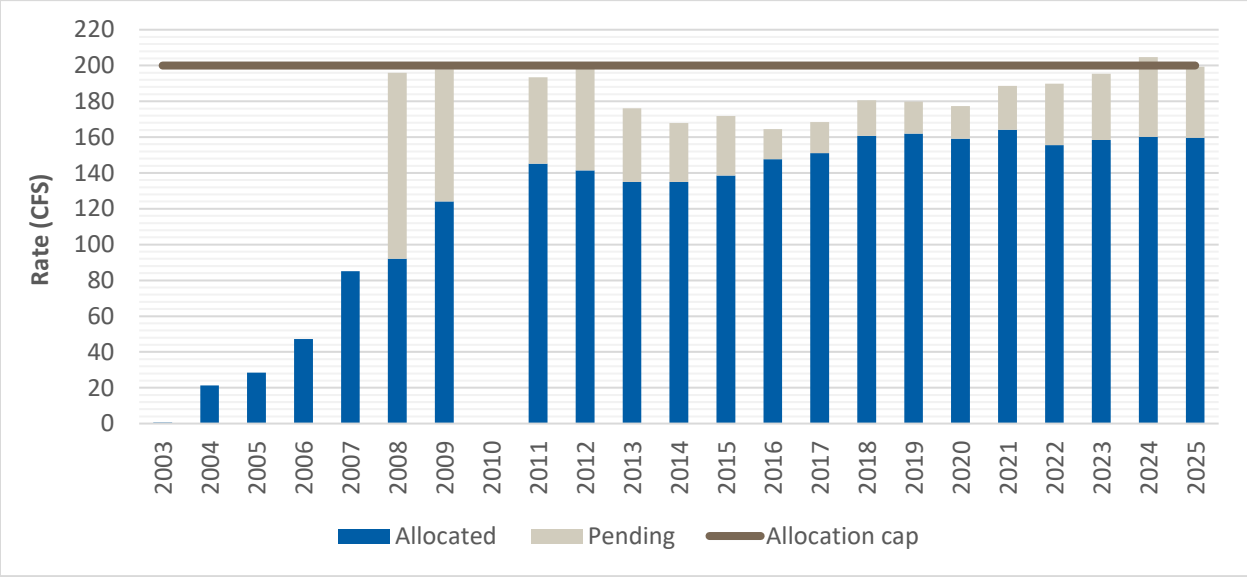

Figure 5: Cumulative rate allocated and pending from 2003 through 2025

6.2 Incremental development plan rate allocations

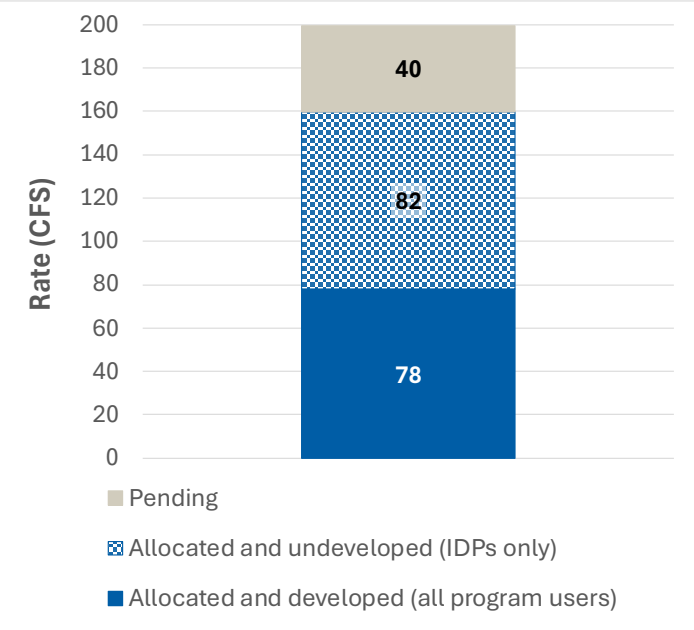

Figure 6: Portion of total program allocation still under development through IDPs in 2025

Contextualizing current program allocation figures also requires consideration of incremental development plans (IDPs). By rule, the Department may allow municipal and quasi-municipal users to satisfy their mitigation obligation incrementally through IDPs to align permit development timelines with the long planning horizons associated with municipal growth. As permits are issued under IDPs, the full authorized rate is added to the program's allocation total, including the undeveloped portion of these permits.

There are presently 21 permits with IDPs, with a combined allocated rate of 105 CFS (approximately two thirds of the total program allocation). By the end of 2025, 23 CFS (22%) had been developed across these permits, with the remaining 82 CFS (78%) not yet developed. When the 2025 cumulative allocation data shown in Figure 5 are isolated and modified to display the undeveloped portion of all IDP permits, the data show that just over half the water allocated under the Mitigation Program has not yet been developed (see Figure 6).

While Figure 6 highlights the potential for further groundwater development under existing IDPs, the room for growth varies widely by individual permit holder. As shown in Figure 7, several permit holders have considerable room for further development, while others have realized their full development potential under existing permits. Further, municipalities are required to secure sufficient water for 20-year planning horizons, necessitating that they maintain room for growth on their permits.

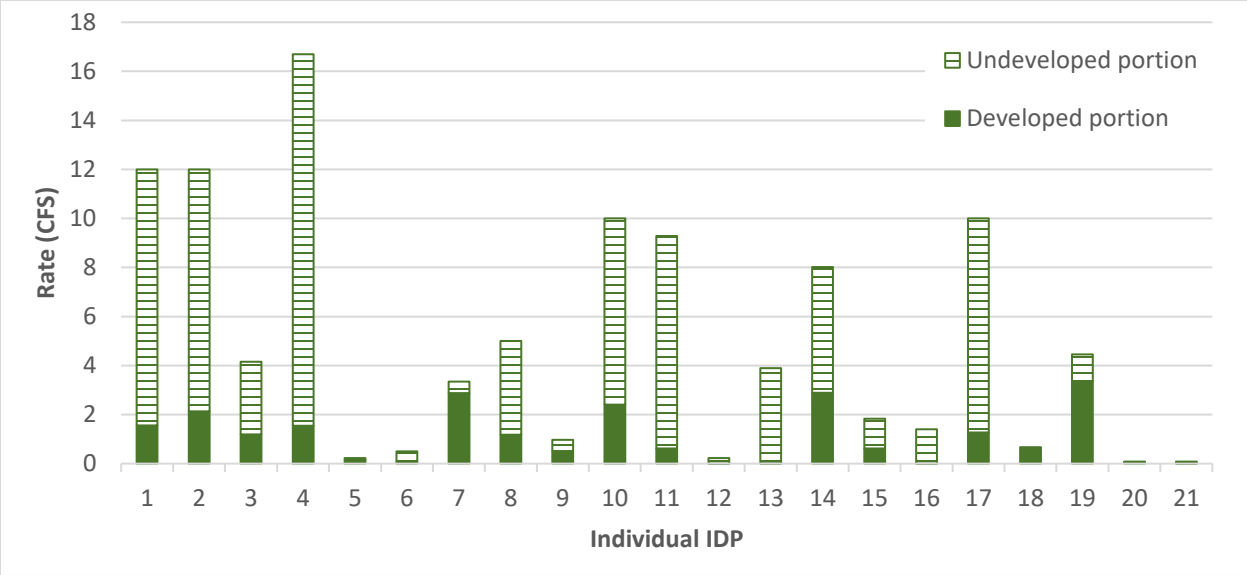

Figure 7: Developed and undeveloped portions of permits in CFS by individual IDP in 2025

6.3 Volume allocated and used

Figure 8 shows that approximately 40,000 acre-feet (AF) of pumping had been allocated under the Mitigation Program by the end of 2025. However, allowed use in 2025 was just over 20,000 AF owing to the status of IDPs. The volume that IDP permit holders are allowed to use is determined by the mitigation they have provided to date. Only when an IDP permit is fully developed and the entire mitigation obligation has been met is the permit holder allowed to use their full allocation.

Water use reporting indicates that IDP permit holders pumped approximately 2400 AF in 2025, or one third of the amount they were allowed to pump based on mitigation provided to date. (The Mitigation Program impact evaluation data presented in Chapter 7 reflects pumping volumes allowed rather than actual use figures.)

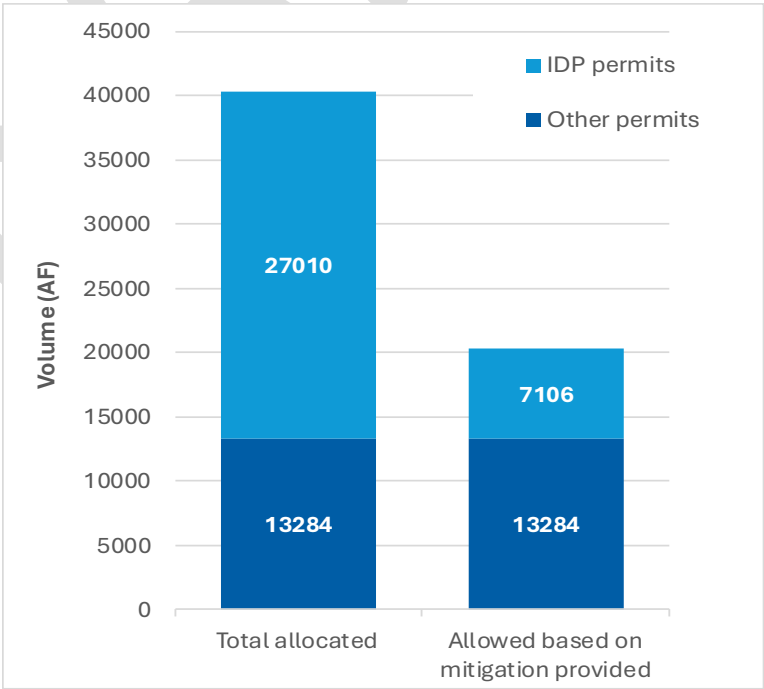

Figure 8: Volume of pumping allocated and allowed based on mitigation provided in 2025

6.4 Maintaining the allocation cap

Agency partners and various basin interests have commented that the allocation cap should not be raised unless and until core Mitigation Program concerns are more fully addressed, including issues related to seasonally reduced surface water flows (see section 7.4); declines in groundwater levels and spring discharge (see section 7.7); and mitigation water reliability (section 9.2). Conversely, municipal suppliers have stressed the need to maintain sufficient room under the cap for regulatory certainty that aligns with State mandates for cities to provide a 20-year supply of water to meet the needs of growing populations. They have also flagged a need for additional clarity on the order in which OWRD processes pending groundwater applications as allocations approach the 200 CFS cap. Another basin interest asked whether, in parallel to discussions related to maintaining or increasing the cap, type-of-use restrictions for the rate remaining under the existing cap should be considered.

The Department agrees that several program concerns warrant further assessment. Until priority issues can be more fully evaluated, maintaining the 200 CFS cap provides important sideboards on potential program impacts. Further, Figure 5 indicates that the total rate allocated has remained near 160 CFS for the past eight years, suggesting there is sufficient time for a measured approach to allocation cap decisions. At the same time, the Department acknowledges municipal and quasi-municipal water supplier concerns. OWRD will prioritize engagement with these primary program users to explore solutions.

7 Evaluation of program impacts

This section presents the Department's assessment of the impact of the Mitigation Program at nine formal analysis locations across the basin based on a mathematical model used to estimate effects of program activities on streamflow. It describes the evaluation methodology and presents annual impact findings for 2020-2025, both as changes to the percentage of time instream flow requirements were historically met and as changes to streamflow rates. This section also provides an analysis of monthly variability in program impacts at multiple locations, and it presents flow impacts on Whychus Creek. Methods of avoiding injury to existing water rights are discussed, as are possible pathways to better understand program impacts on spring flows.

7.1 Evaluation methodology and locations

OAR 690-505-0500(5) establishes that new groundwater appropriations under the Mitigation Program should not cause scenic waterway flows and instream water right flows in the Deschutes Basin to be met less frequently as compared to long term, representative base period flows. The Department has developed a mathematical model to evaluate the impact of Mitigation Program debits and credits on state scenic waterway flows and instream water right flows (Cooper, 2008). (See Box 2 regarding the need for modeling.) This model estimates the change in streamflows resulting from mitigation projects and groundwater withdrawals under the program (i.e., program credits and debits) at 50 discrete locations across the basin. Nine of these locations are associated with long-term stream gaging stations and serve as formal analysis points (see Figure 9). These gaging stations have historic streamflow data to establish base period conditions (1966-1995). The base period captures streamflows after all dams in the basin were constructed and before the Scenic Waterway Act was amended to include consideration of groundwater impacts, providing a suitable baseline for the assessment of Mitigation Program impacts.

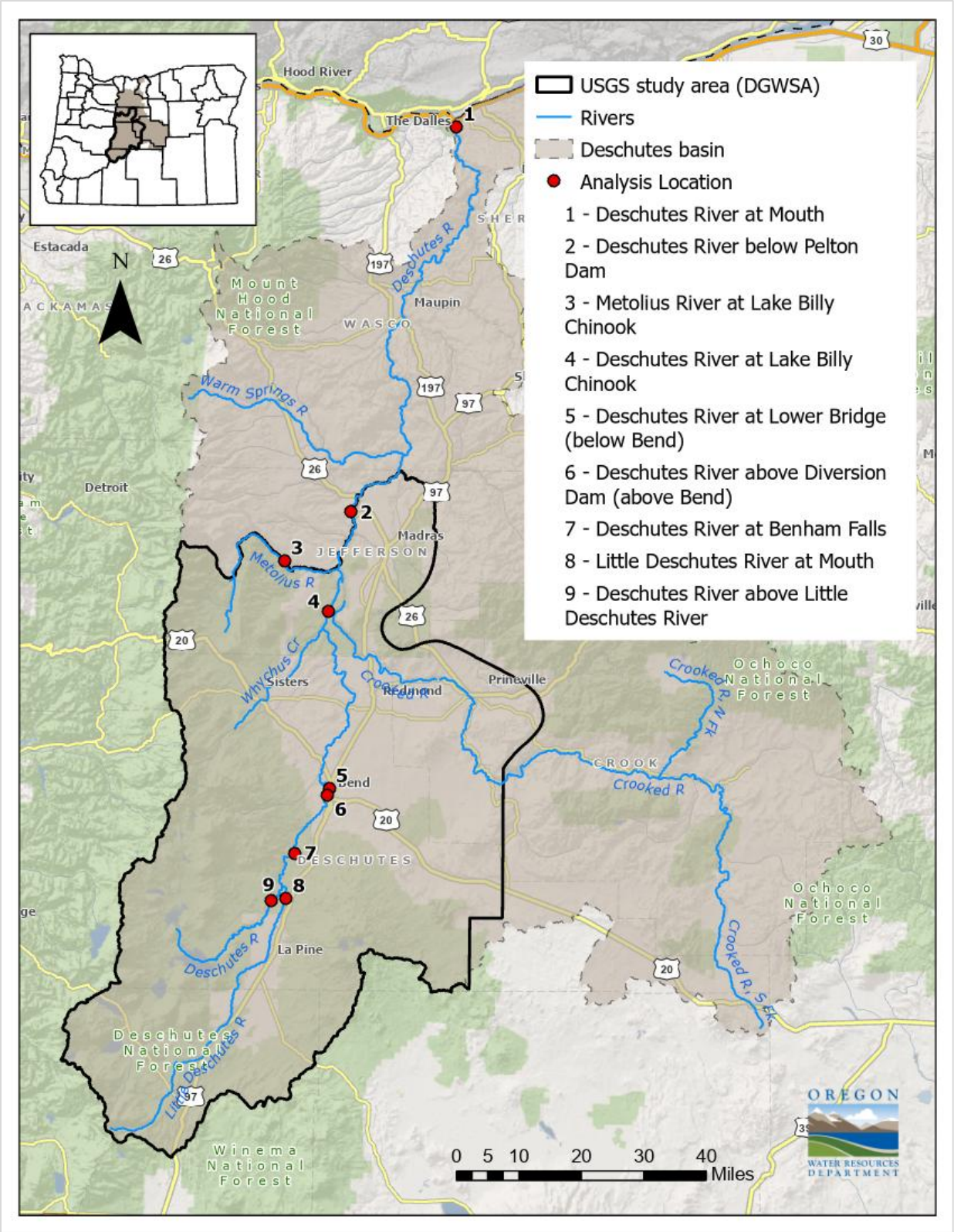

Figure 9: Program impact analysis locations

WHY MODEL PROGRAM IMPACTS?

Why is it necessary to use a mathematical model to assess Mitigation Program impacts rather than relying on real time streamflow monitoring?

1. **Time lag of pumping impacts.** Stream depletion from groundwater use gradually increases until it reaches its maximum after years or even decades. While this is difficult to assess with stream gaging, the model allows pumping effects to be estimated at full realization.
2. **Confounding factors.** Modeling allows program impacts to be estimated in isolation from other factors that affect streamflow. Monitoring will not distinguish flow changes related to program activity from flow changes related to weather, climate, reservoir operations, canal piping, other flow restoration efforts, or groundwater use that is external to the Mitigation Program.

For more information about the Mitigation Program model, refer to Assessing the Impact of Mitigation on Stream Flow in the Deschutes Basin (Cooper 2008).

Box 2: Rationale for modeling (versus measuring) program impacts

7.2 Impacts on frequency instream flow requirements were met

In accordance with OAR 690-505-0500(5), the primary metric for evaluating Mitigation Program impact is the change caused by program activity to the percentage of time (or frequency) instream flow requirements (IFR) were historically met. (IFR refers to scenic waterway flows and instream water right flows.)

Table 2 presents the annual change in frequency of IFR being met compared to the base period at each formal analysis location for years 2020-2025, as estimated by the model. Program impacts on frequency are on the order of approximately 1% or less, indicating that balance is largely achieved between mitigation credits and debits on an annual basis. (See section 7.4 for an assessment of seasonal program impacts.) At most analysis locations, the impact of the program has been neutral to slightly positive. There are also locations where the impact of the program has been slightly negative, most notably at Deschutes River at Benham Falls. At this location, where IFR were met 63.7% of the time during the base period, Mitigation Program activity changed this frequency to a low of 63.4% in 2025, or the equivalent of one additional day where the IFR went unmet.

Table 2: Program impacts on frequency instream flow requirements were historically met

Annual change in frequency IFR were met							
Analysis location	**2020 (%)**	**2021 (%)**	**2022 (%)**	**2023 (%)**	**2024 (%)**	**2025 (%)**	**Mean (%)**
Deschutes River at Mouth	0.13	0.09	0.16	0.15	0.20	0.08	0.14
Deschutes River below Pelton Dam	1.08	0.93	1.29	1.27	1.23	1.10	1.15
Metolius River at Lake Billy Chinook	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Deschutes River at Lake Billy Chinook	0.66	0.67	0.70	0.70	0.70	0.70	0.69
Deschutes River at Lower Bridge (below Bend)	0.03	0.11	0.23	0.20	0.12	-0.14	0.09
Deschutes River above Diversion Dam (above Bend)	-0.06	-0.06	0.16	0.19	0.26	0.15	0.11
Deschutes River at Benham Falls	-0.12	-0.12	-0.12	-0.15	-0.26	-0.36	-0.19
Little Deschutes River at Mouth	-0.17	-0.18	-0.17	-0.08	0.36	0.44	0.03
Deschutes River above Little Deschutes River	0.00	0.00	0.00	0.00	0.00	0.00	0.00

It is also useful to consider the effect of the Mitigation Program as a percent change in average annual streamflow. As shown in Table 3, the mitigation model indicates a net neutral or positive change to annual streamflow during the reporting period (2020-2025) at all analysis locations, including on the Deschutes River at Benham Falls. The reason IFR frequency impacts may be negative at the same time annual streamflow changes are positive can be explained through an analysis of base period flows as compared to IFR. Figure 10 shows that irrigation season (April-October) streamflows during the base period on the Deschutes River at Benham Falls were typically much greater than the IFR. Modeled increases in streamflow from the Mitigation Program during these months therefore do not significantly increase the frequency that IFR were met. In contrast, non-irrigation season (November-March) streamflows during the base period were more similar in magnitude to the IFR. Therefore, the modeled reductions in streamflow during these months result in a negative change in percent of time IFR were met. Although the change in frequency the IFR were met on the Deschutes River at Benham Falls should not be overlooked, the overall effect of the program on annual streamflow at this location indicates balance between program credits and debits.

Table 3: Program impacts as a percent change in average annual streamflow

Percent change in average annual streamflow							
Analysis location	**2020 (%)**	**2021 (%)**	**2022 (%)**	**2023 (%)**	**2024 (%)**	**2025 (%)**	**Mean (%)**
Deschutes River at Mouth	0.06	0.00	0.10	0.07	0.10	0.05	0.06
Deschutes River below Pelton Dam	0.08	0.00	0.12	0.09	0.12	0.06	0.08
Metolius River at Lake Billy Chinook	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Deschutes River at Lake Billy Chinook	1.89	1.99	2.53	2.48	2.75	2.48	2.35
Deschutes River at Lower Bridge (below Bend)	6.18	6.49	7.58	7.40	8.08	7.23	7.16
Deschutes River above Diversion Dam (above Bend)	0.23	0.21	0.93	1.02	1.41	1.08	0.81
Deschutes River at Benham Falls	0.02	0.01	0.01	0.02	0.09	0.09	0.04
Little Deschutes River at Mouth	0.17	0.09	0.11	0.17	0.64	0.65	0.31
Deschutes River above Little Deschutes River	0.00	0.00	0.00	0.00	0.00	0.00	0.00

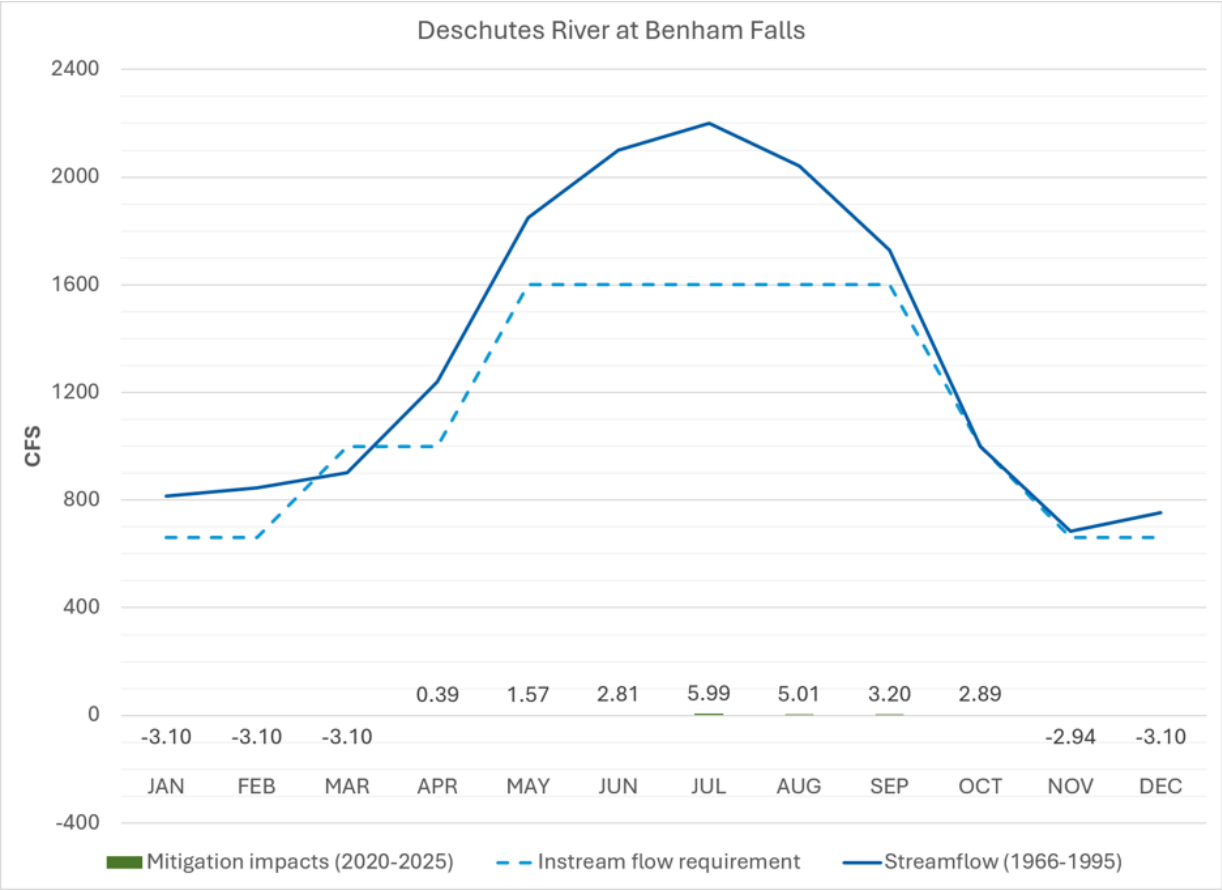

Figure 10: Modeled program impacts to flows on the Deschutes River at Benham Falls from 2020-2025 as compared to IFR and median monthly observed streamflow data from the base period (1966-1995)

7.3 Impacts on flow rates

As noted above, the primary metric for Mitigation Program evaluation is the change to the frequency IFR were historically met. However, it is also valuable to consider the program's impact on flow rates in the Deschutes Basin.

Mean annual changes to streamflow due to program activity are as shown in Table 4. At most locations, the program has resulted in a net increase to mean annual streamflow, while two locations show no net change.

Table 4: Program impacts streamflow rates

Mean annual change to streamflow from program activity (2020-2025)	
Location	**Net change in flow (CFS)**
Deschutes River at Mouth	3.61
Deschutes River below Pelton Dam	3.61
Metolius River at Lake Billy Chinook	0.00
Deschutes River at Lake Billy Chinook	21.23
Deschutes River at Lower Bridge (below Bend)	25.82
Deschutes River above Diversion Dam (above Bend)	7.82
Deschutes River at Benham Falls	0.57
Little Deschutes River at Mouth	0.60
Deschutes River above Little Deschutes River	0.00

7.4 Seasonality analysis

The Department's evaluation of Mitigation Program impacts has been based in part on annual accounting of program debits and credits. There has also been acknowledgment and discussion of the seasonal variations in program impacts, which are shown in the model output tables included in each of the Department's annual program reports. This five-year report presents a more in-depth analysis of these seasonal variations in response to longstanding seasonality concerns expressed by agency partners and some basin interests.

The primary source of mitigation credits has been the transfer of irrigation rights instream (refer to section 9.1 for a discussion of eligible mitigation projects), meaning that the instream benefits of mitigation credits are primarily realized during the irrigation season. Groundwater pumping results in uniform stream depletion throughout the year. The temporal difference between instream benefits from mitigation projects and year-round stream depletion from groundwater use results in increased streamflows during the irrigation season and reduced streamflows outside the irrigation season. Figure 11 through Figure 13 present data from three analysis locations where the seasonal nature of program impacts may be considered more favorable, not significant, and less favorable to streamflows, respectively.

Figure 11 through Figure 13 show the mean monthly modeled flow impacts of the Mitigation Program for 2020-2025 and current IFR at Deschutes River at Lower Bridge (below Bend), Metolius River and Little Deschutes River, respectively. Streamflow data are shown as median monthly flow for 2020-2025 to provide context for the magnitude and timing of program impacts. However, observed changes to streamflow over time cannot be attributed to the Mitigation Program alone, as there are many factors impacting streamflow (see Box 2). Lastly, these hydrographs are based on streamflow data that are in provisional status and subject to change upon final publication.

Figure 11 demonstrates that the program has contributed positively to streamflows in the Middle Deschutes River (Deschutes River at Lower Bridge) from April through October, with water from mitigation projects representing a major share of overall streamflow from May through September. These considerable flow contributions occur during the lowest-flow period for this river reach. Conversely, negative flow impacts occur when streamflows are much higher. Additionally, positive flow impacts during the irrigation season greatly outweigh negative flow impacts outside the irrigation season, resulting in a mean annual change in flow of +25.82 CFS (see Table 4). All considered, the program's overall impact to streamflows in the Middle Deschutes River appears to be favorable for fish and wildlife when seasonal variations are considered. (Refer to the Whychus Creek analysis in Figure 14 for another example of beneficial seasonal impacts.)

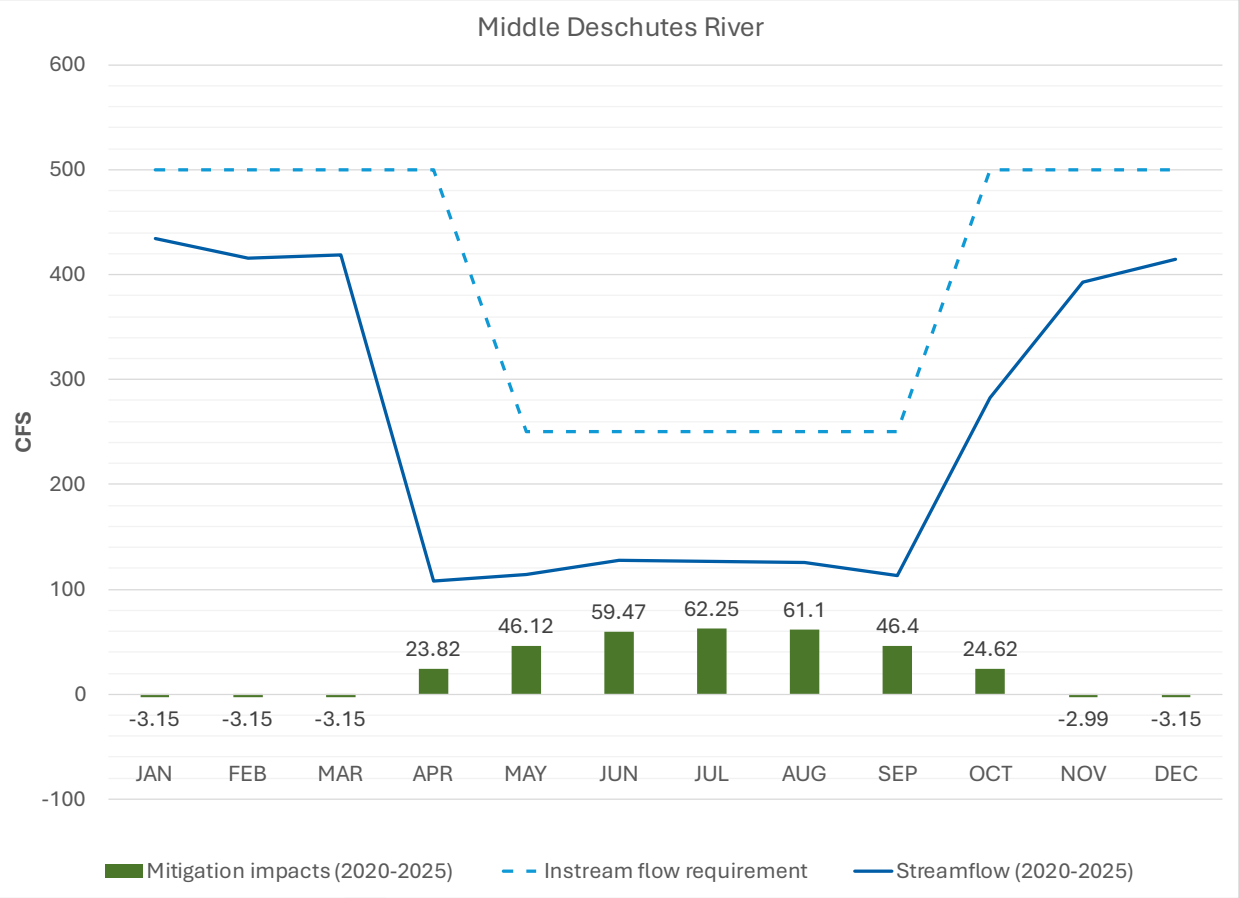

Figure 11: Modeled seasonal program impacts to flows in the Middle Deschutes River from 2020-2025 as compared to IFR and median monthly observed streamflow data from 2020-2025

Figure 12 shows that positive and negative impacts on Metolius River flows are less than a tenth of a CFS, due in part to modest program activity in the Metolius River zone of impact. These flow changes are several orders of magnitude lower than observed streamflows throughout the year, indicating a negligible program impact to Metolius River flows. Further, observed streamflows exceed IFR all year.

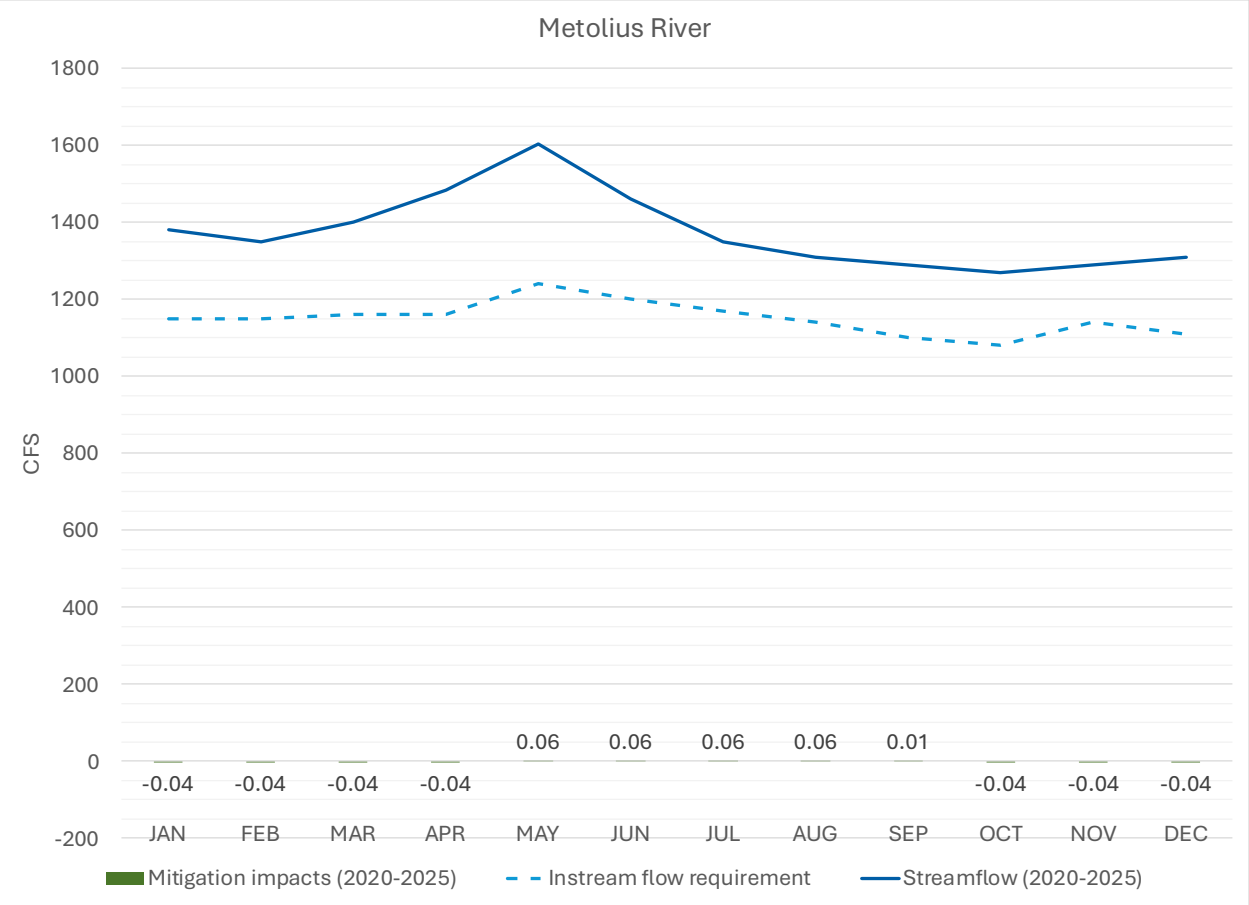

Figure 12: Modeled seasonal program impacts to flows in the Metolius River from 2020-2025 as compared to IFR and median monthly observed streamflow data from 2020-2025

Figure 13 shows that, at the mouth of the Little Deschutes River, the program has contributed positively to streamflows from April through October and negatively from November to March. Positive and negative flow impacts are largely balanced, with a mean annual change in flow of +0.60 CFS (see Table 4). Positive flow impacts occur when streamflows are lowest (October), and when streamflows tend to be below IFR (June, July, October). However, between November and March, the program results in reduced flows when IFR are generally not satisfied.

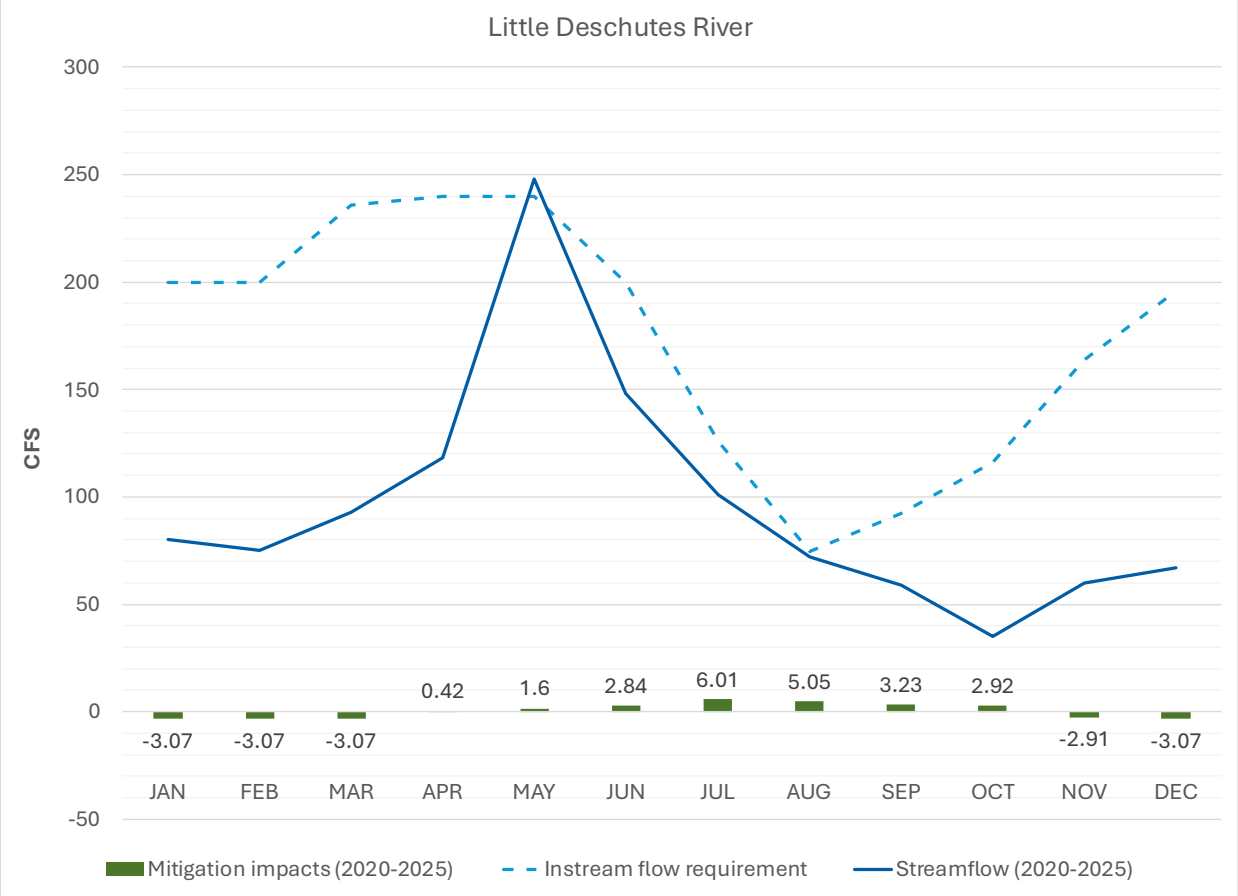

Figure 13: Modeled seasonal program impacts to flows at the mouth of the Little Deschutes River from 2020-2025 as compared to IFR and median monthly observed streamflow data from 2020-2025

In conclusion, the seasonality of program impacts to streamflows – and the implications for fish and wildlife – vary across the basin. At some locations, seasonal variations appear to offer considerable benefits by contributing streamflow during low-flow periods. At other locations, the seasonality of program impacts appears to be exacerbating chronic challenges satisfying IFR. The Department intends to work with agency partners to continue the site-specific analysis of seasonal flow impacts reflected in Figure 11 through Figure 13 to strengthen understanding of the issues. As part of these discussions, the impacts of the Deschutes Basin Habitat Conservation Plan (HCP) will be further considered. While outside the scope of the Mitigation Program, the HCP has driven significant increases in seasonal streamflow in key reaches of the Deschutes River (see Box 3). Further discussion is needed to understand how to consider program impacts in the context of the HCP-related changes to basin hydrology. These discussions will consider the HCP's duration and the portion of HCP releases made permanent through the Deschutes Basin Alternative Pathway for Conserved Water.

HCP-RELATED CHANGES TO BASIN FLOWS

The HCP designates agreed-upon flow requirements. Since 2020, the HCP set a minimum flow goal of 100 CFS out of Wickiup Reservoir during the non-irrigation season. The minimum flow goal is scheduled to increase to 300 CFS in 2028, then to 400-500 CFS in 2033. These flow increases are orders of magnitude higher than the flow reductions that result from the Mitigation Program outside of the irrigation season. Do these significant increases to winter flows serve to establish summer low flows as the more critical threat to fish and wildlife habitat? Does the seasonal nature of streamflow benefits from the Mitigation Program help to address the greatest need from the perspective of habitat health? The answers to these questions likely vary by basin location and require further site-specific analyses.

Box 3: Deschutes Basin flow changes related to the HCP

7.5 Whychus Creek analysis

In response to inputs from the Tribe regarding the Tribe's priority reaches, this section presents an assessment of the impacts of the Mitigation Program on flows in Whychus Creek. As streamflow data are not available for the full base period (1966-1995), there is no formal program analysis location for the Whychus Creek zone (see section 7.1). It is therefore not possible to include the Whychus Creek zone in the section 7.2 evaluation of the program's impact on the percentage of time IFR were historically met. It is, however, possible to use the mitigation model to estimate changes to Whychus Creek flows throughout the year due to program activity. These changes are shown in Figure 14 and Figure 15 for 2025 as an illustrative year. (The period of analysis will be expanded in future reporting.)

Figure 14 shows the monthly flow impacts from program activity for 2025 in Whychus Creek at the mouth. To provide context for the magnitude and timing of these impacts, Figure 14 also shows current IFR and median monthly observed streamflow data from OWRD gage 14076100 (Whychus Creek at Camp Polk Road) for 2020-2025. The data indicate that the program contributed positively to streamflows from May through October, with water from mitigation projects representing a major share of observed streamflow from July through September. These considerable flow contributions occurred during low-flow periods for Whychus Creek, when streamflows were below flow targets and when the creek historically ran dry below the Three Sisters Irrigation District diversion. Conversely, negative flow impacts occurred during periods when streamflows were generally much higher and exceed flow targets. Additionally, positive flow impacts during the irrigation season outweigh negative flow impacts outside the irrigation season, resulting in a mean annual change in flow of 1.53 CFS in 2025. The program's overall impact to Whychus Creek flows appears to be favorable to fish and wildlife.

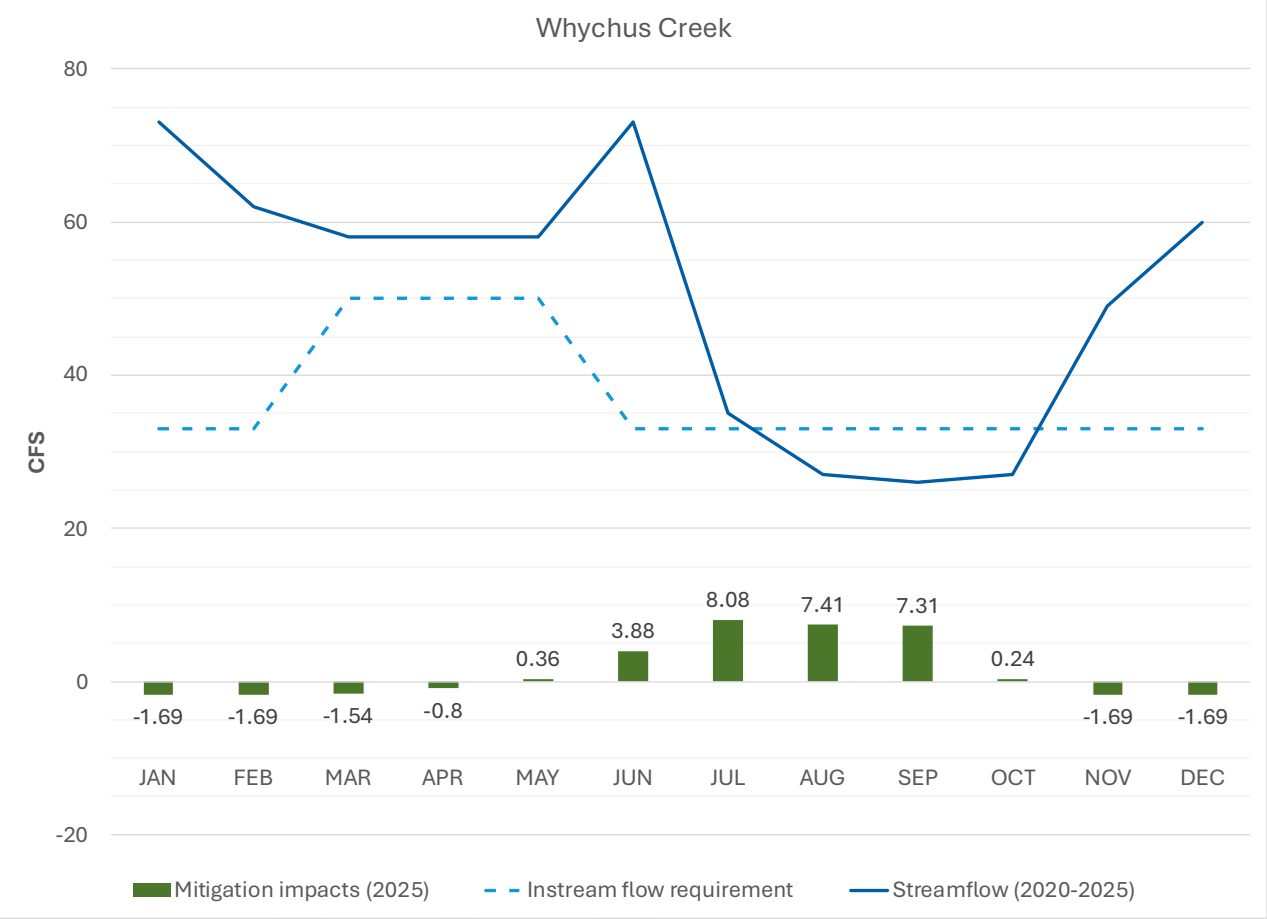

Figure 14: Modeled seasonal program impacts to flows in Whychus Creek in 2025 as compared to IFR and median monthly observed streamflow data from 2020-2025

Figure 15 shows, reach by reach, the amount of mitigation water protected instream in August 2025. The data show that program activity contributed up to 8 CFS to Whychus Creek flows during a critically low-flow period.

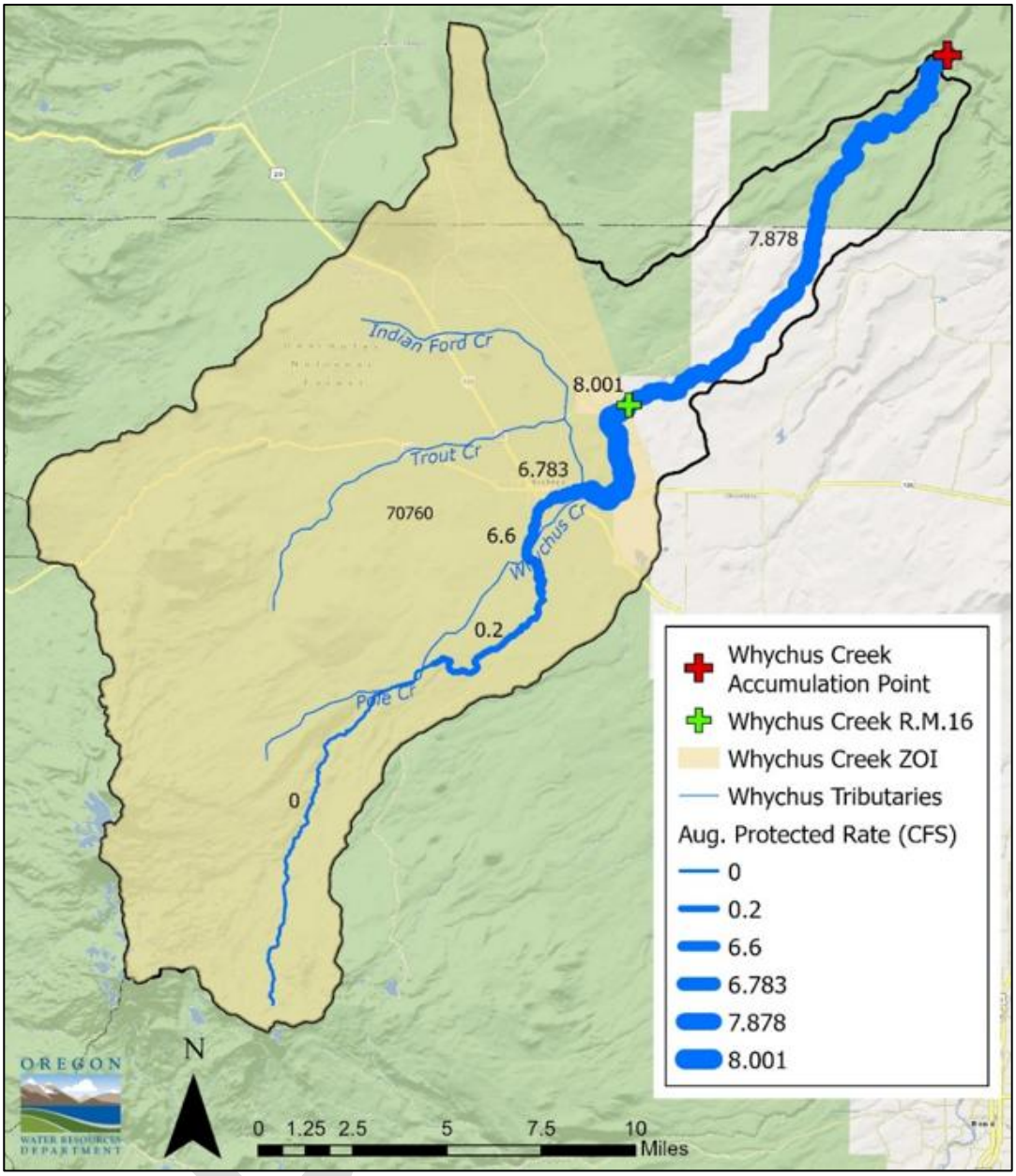

Figure 15: Mitigation water protected instream by reach in Whychus Creek in August 2025

7.6 Injury to existing water rights

Injury occurs when one or more existing water rights, including instream rights, are unable to use the quantity of water to which they are legally entitled as a result of a change in use by another existing water right or a new use. The Department may not approve a new groundwater appropriation or a mitigation project if it results in injury to existing water rights, including the Tribal Reserved Water Right (see Chapter 3). The Mitigation Program rules are intended to ensure that new groundwater uses do not result in a measurable reduction in scenic waterway flows or injury to senior water rights. OAR 690-505-0630 states that if a new groundwater permit applicant satisfies the required mitigation obligations, OWRD may conclude that the proposed use will not substantially interfere with surface water rights, including instream water rights.

As noted in Chapter 3, OWRD is working with the Tribe and the United States to develop a memorandum of understanding intended to establish procedures for evaluating potential injury to the Tribal Reserved Water Right.

7.7 Spring impacts

Groundwater levels in the central part of the Deschutes Basin have declined persistently since the late 1990s. These declines can reduce spring discharge, which translate to a reduction of cold water refugia for aquatic ecosystems. The Tribe, agency partners and some basin interests have highlighted a need to better understand the extent and causes of changes to spring flows.

Multiple factors are contributing to spring flow changes in the basin, primarily changing climate conditions. Large-scale water conservation efforts, including irrigation canal piping and lining, are reducing canal and on-farm water losses to the aquifer (at the same time they are restoring streamflows in the upper basin). Aquifer levels are also impacted by groundwater use, which comprises pumping authorized prior to the establishment of the Mitigation Program and pumping authorized under the program, as well as exempt uses. As shown in Figure 16, pumping authorized under the Mitigation Program amounts to approximately one quarter of all permitted pumping in the basin, with half of the use authorized under the program still undeveloped (see section 6.2).

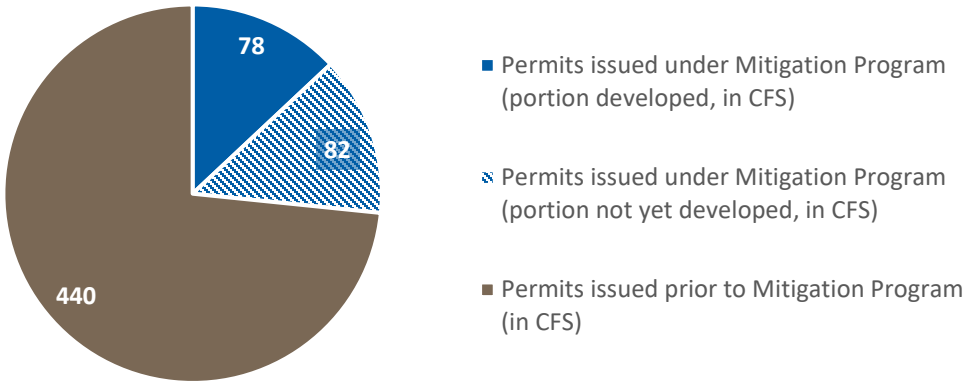

Figure 16: Total permitted pumping rates (CFS) for current groundwater rights in the Deschutes Basin

Because of the wide range of factors impacting groundwater levels and spring flows, modeling would be required to quantify the impacts to springs solely from Mitigation Program activity. (Refer to Box 2 regarding the need for modeling to determine program impacts where there are numerous confounding factors.) However, the published groundwater flow models have relatively coarse resolution for simulating all aspects of the Mitigation Program. Similarly, there is variability in the models' calibration of groundwater-surface interactions across the basin such that modeling program activities would not be uniformly reliable.

As part of the 2023-2025 Agency Request Budget, the Department prepared a Policy Option Package (Package #119) that requested the funds needed for OWRD to engage with ODFW, DEQ, the Tribe and basin interests on a study of springs in the Deschutes Basin. This study would identify high-value springs for ecological needs and assess the magnitude and causes of diminished spring flows, which could support future groundwater flow model improvements. The budget request was unsuccessful, and the current budget climate is not conducive to resubmitting the proposal.

In 2024 and 2025, OWRD supported the Deschutes Basin Water Collaborative (DBWC) Groundwater Subcommittee in identifying basin priorities for further analysis and investment. The collaborative exercise confirmed a common interest in better understanding the impacts of climate, canal piping and lining, and pumping on groundwater levels to inform water management decisions. Recalibration and refinement of the existing groundwater model was identified as a priority action. Actions identified that would support model refinement include a geochemical tracer study to improve understanding of how water moves through the Deschutes regional aquifer, and increased monitoring of spring flows to improve understanding of the relationship between groundwater levels and spring discharge.

OWRD will continue to address data gaps identified by the DBWC Groundwater Subcommittee as resources allow. For example, in 2024 and 2025, OWRD partnered with the USGS to collect geochemical tracer data from approximately 20 wells and springs in the basin with the goal of building the baseline dataset for a larger sampling and analysis effort in the future. Presently, to implement the recent rule changes for groundwater allocation policy, OWRD is leading an investigation to quantify the impacts on groundwater levels from irrigation canal losses. The Department also plans to analyze changes to spring discharge at select basin locations using available stream gage data and targeted streamflow measurements.

Groundwater model refinement and a large-scale geochemical tracer study represent significant efforts that are beyond the capacity of OWRD to undertake within available resources. OWRD will continue to engage with the Tribe and basin partners to confirm the highest priority technical needs and explore partnership opportunities to advance common goals.

8 Temporary and permanent credits

This section explores the use of temporary and permanent mitigation credits across the program. It discusses credit availability by zone of impact and addresses the uncertainty inherent to instream leasing as a source of mitigation. This section also describes the Department's regulatory process to ensure temporary credits are resecured annually. Finally, it presents options to further explore to manage temporary credit uncertainty.

8.1 Credit use and availability

There are two primary pathways for generating mitigation credits under the program: 1) instream leases, which create temporary credits assigned to a mitigation bank; and 2) instream transfers, which create permanent credits assigned to an individual. Permanent mitigation is sourced and purchased by permit holders independently on the open market, whereas temporary credits are made available through the Deschutes River Conservancy (DRC) mitigation bank. The mitigation bank is required to hold one credit in reserve (reserve credit) for every credit assigned to a permit (primary use credit). This means that temporary mitigation provides a 2:1 ratio of instream mitigation to groundwater consumptive use, resulting in a net benefit to streamflows. However, the use of temporary credits creates vulnerabilities related to credit supply instability for program users, which is discussed further below.

Figure 17 shows a breakdown of the number of permits using temporary credits, permanent credits or a combination of to fulfil their mitigation obligation. At the end of 2025, one in three permit holders was relying, in full or in part, on temporary credits.

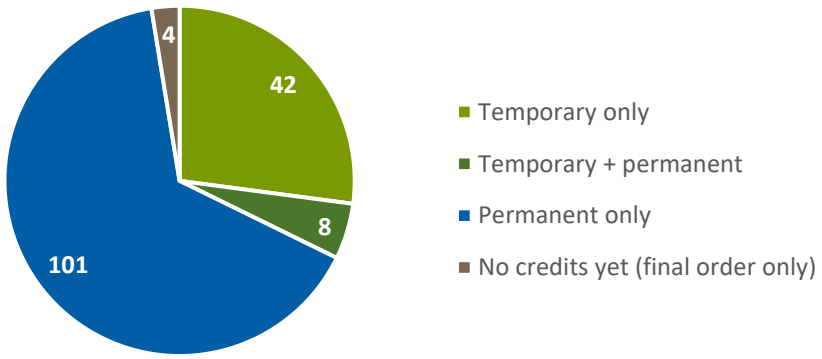

Figure 17: Number of permit holders relying on temporary versus permanent mitigation credits

Figure 18 shows the number of temporary and permanent credits (in AF of mitigation water) used to fulfill mitigation obligations.[4] By volume, approximately 85% of mitigation obligations were satisfied with permanent credits each year. Figure 18 also shows the number of temporary and permanent credits that were available but not used to fulfill mitigation obligations each year. (The reserve credits required when temporary credits are used are not included in Figure 18, as these credits may not be used to satisfy a mitigation obligation. Rather, Figure 18 shows only the primary use credits that are/may be assigned to a groundwater permit.)

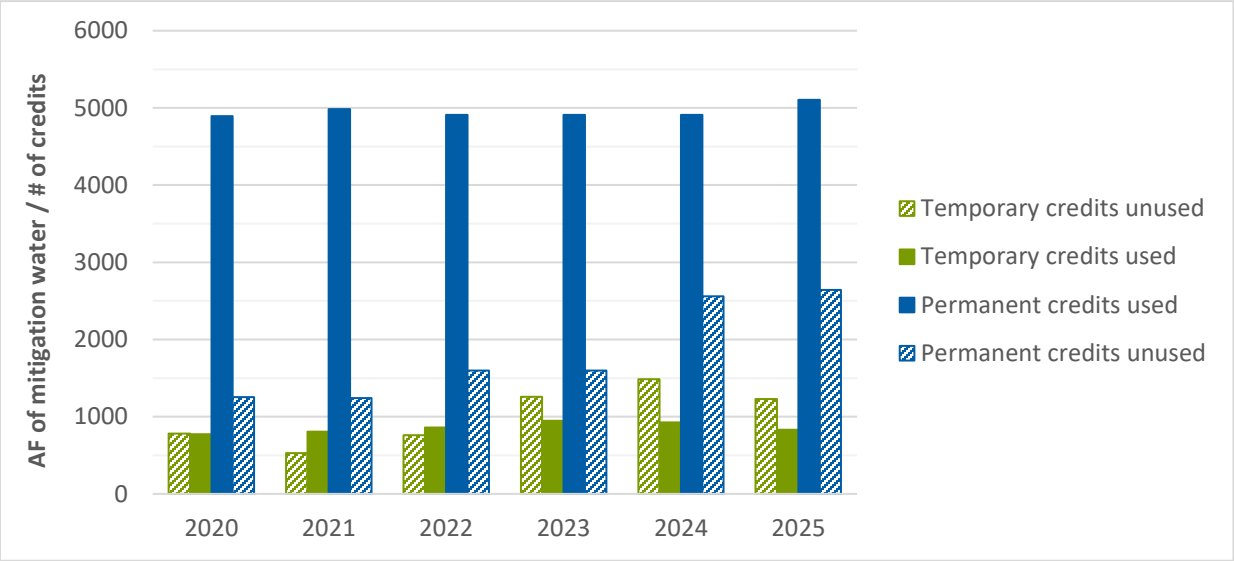

Figure 18: Temporary and permanent credits used and available but unused to satisfy mitigation obligations

The unused credits shown in Figure 18 indicate a credit surplus. However, credit availability is highly localized. As shown in Figure 19, no unassigned permanent credits are available in the Metolius River zone, and the supply in the Whychus Creek and Crooked River zones is modest. Additionally, some credit owners hold their credits for a specific future application rather than making them available on the open market. The high cost of permanent credits is another significant concern for program users.

[4] Figure 18 and Figure 19 do not include the 5,100 permanent mitigation credits issued to the City of Prineville in 2018, as these credits are available only to Prineville and therefore require separate tracking and accounting. By the end of 2025, 972 credits had been assigned, with the remaining 4,128 credits available for future use by the city.

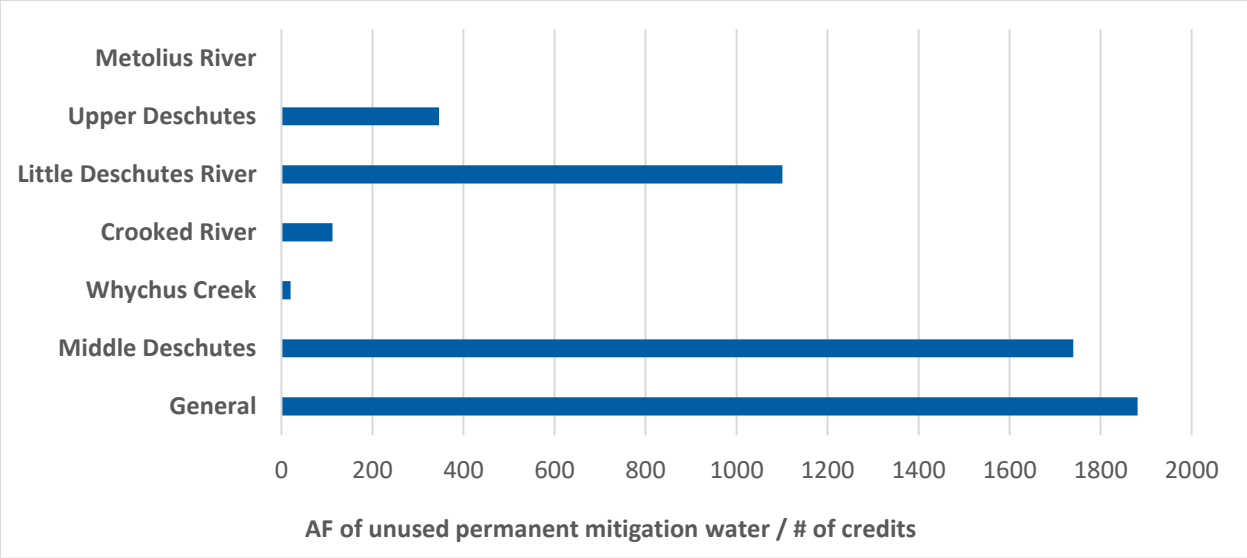

Figure 19: Permanent mitigation water available (not yet assigned) by zone of impact in 2025

Temporary credit availability is similarly localized, with no history of mitigation leasing in the Metolius River zone, for example. The temporary credit supply in the Upper Deschutes and Little Deschutes River zones relies on just a few leases, and credit supply in the Whychus Creek and Crooked River zones tends to be tight in normal years and more restricted in drought years. Further, annual leasing is an insecure source of mitigation, as participation in the leasing program is voluntary and subject to change. Temporary credit users are therefore inherently at risk from an uncertain and unstable supply of credits. To date, sufficient temporary credits have been made available to satisfy annual demand (and associated reserve credit requirements), although 2026 drought conditions nearly resulted in the program's first temporary credit shortfall (in the Whychus Creek zone). This near miss underscores the vulnerability of the temporary credit system.

THE PROGRAM NARROWLY AVOIDED ITS FIRST TEMPORARY CREDIT SHORTFALL IN 2026.

8.2 Enforcing temporary credit acquisition

All Mitigation Program participants are required to maintain mitigation for the life of the permit and subsequent water right certificate, including program participants who rely on temporary credits. Some basin interests have asked how the Department ensures that these permit holders acquire the necessary mitigation annually, and whether more should be done to prevent groundwater use absent mitigation.

The fundamental mechanics of the DRC mitigation bank guard against this scenario. The bank proactively acquires mitigation to meet the demand of temporary credit users each year, resulting in water protected instream. Permit holders then need to purchase this mitigation to reimburse the bank for costs incurred to protect streamflows. If they do not, the streamflows remain protected,

but the bank incurs an operational financial loss and must rely on a grant funding source (if available) to cover the cost of leasing.

Additionally, OWRD and the DRC mitigation bank have established a robust and effective system of tracking, communication and regulatory action to ensure that mitigation is purchased. If a permit holder does not appear to be on track to purchase mitigation, they are contacted by the DRC, which often resolves the situation. If the delay in purchasing mitigation persists, the permit is flagged as delinquent, and OWRD initiates action to regulate the use and/or cancel the permit in accordance with OAR 690-505-0620. The Department sends written notification advising delinquent permit holders that, unless mitigation is purchased by a specified deadline, OWRD will regulate the use and/or cancel the permit under ORS 537.720. If mitigation is not purchased, OWRD conducts site visits to confirm that water is not being used. If water is being used, permit cancellation proceedings are initiated as appropriate. Such cancellations are rare, with most delinquent cases resulting in mitigation being purchased whenever water is used.

Table 5 presents the number of delinquent permits in 2020-2025 and the associated outcomes. The table indicates that most of the 50 permit holders relying in full or in part on temporary mitigation credits (see Figure 17) purchased their mitigation in 2020-2025 without any action required by the Department. If mitigation was not purchased on time, appropriate action was taken by OWRD in all cases. It is the Department's position that no changes to current enforcement processes are necessary.

Table 5: Delinquent temporary credit users and case outcomes

Year	# of delinquent permits	All cases resolved?	Outcome	
			Mitigation purchased	Other
2020	3	✓	3	-
2021	3	✓	3	-
2022	5	✓	5	-
2023	5	✓	5	-
2024	6	✓	5	1 voluntarily cancelled the permit and withdrew from the program (ownership change)
2025	7	✓	7	-

8.3 Proposed credit system improvements

Basin interests have expressed concern over the use of temporary credits to mitigate for permanent groundwater use. OWRD shares this concern, primarily because it puts permit holders at risk of being regulated off due to an unpredictable leasing market that may be unable to satisfy their credit demand. However, a transition away from temporary credit use will require more predictable and affordable sources of permanent mitigation, which is a primary concern for municipal and quasi-municipal water suppliers.

Some agricultural interests have flagged that the practice of selling water rights from viable agricultural land to generate permanent mitigation credits removes farmland from irrigated production, reduces land values and adversely impacts the broader agricultural community. Other basin interests have suggested statutory changes to require the release of water rights for permanent mitigation as rural lands are brought inside the urban growth boundary. Other program users have proposed a Department-led mitigation bank for permanent credits, which would exceed the Department's authorities and capacity and will not be pursued at this time. The Department will continue to support voluntary action for the creation of mitigation credits and will explore opportunities to promote permanent mitigation.

To help manage supply uncertainty for temporary credit users, some basin interests have asked whether available and unassigned permanent credits (see Figure 19) could be assigned temporarily to a permanent groundwater use. This innovative idea would require rule modification and warrants further exploration.

Others have asked whether permanent credits could be temporarily assigned to a limited license for groundwater use and, if so, would it be possible to transfer the credits from a limited license to a groundwater permit if one is acquired. This would require rule change to allow the temporary use of permanent credits (as noted above), as well as statutory change to bring limited licenses into the Mitigation Program. Presently, the Mitigation Program applies only to new groundwater rights within the DGWSA, whereas limited licenses are a water use authorization and not a water right. The Department will continue to assess proposed program changes.

It has also been suggested by basin interests that long-term commitments to instream leases would provide more security for program users. This opportunity will be further explored in partnership with the DRC mitigation bank.

Lastly, the DRC has flagged an opportunity to strengthen communication of Mitigation Program requirements and mitigation supply limitations to groundwater applicants early in the process so that decisions to invest in applications and infrastructure are more fully informed. The Department will consider how to help applicants better navigate the information currently available on the Deschutes Basin Groundwater Mitigation website. OWRD will also identify additional mechanisms for sharing vital information and updates with existing program users and new applicants, such as fact sheets on program fundamentals and the addition of a "dashboard" one-pager to annual program reports to serve as a convenient reference for up-to-date status information.

9 Mitigation projects

This section covers the types of projects that have generated mitigation credits to date, and it summarizes other potential mitigation sources as set out in rule. Key considerations and limitations are noted, including concerns with the use of water saved from canal piping and lining projects as a source of credits. The reliability of mitigation water and the instream verification of these protected flows are also discussed, including strengthening opportunities.

9.1 Sources of mitigation water

OAR 690-505-0610(3) establishes that sources of mitigation water may include instream transfers, allocation of conserved water, stored water releases, artificial recharge and other projects approved by the Department. Potential mitigation projects are discussed below.

Instream transfers

To date, mitigation credits have been generated primarily through the instream transfer of irrigation rights, either permanently or temporarily. (See the Prineville Reservoir exception noted below.) The majority of rights transferred instream for mitigation credits have been held by Deschutes Basin irrigation districts.

Allocation of conserved water

Some program users have encouraged the Department to create mitigation credits from water that is conserved through irrigation canal piping or lining and protected instream. Other basin interests have cautioned that water conserved through piping and lining projects should not be used to offset new groundwater use, as the water conserved through these projects is water that would have otherwise seeped into the aquifer, as shown in Figure 20. (Evaporative losses are a small fraction of transmission losses in Deschutes Basin irrigation canals.) Using water that is conserved by eliminating seepage to mitigate for a new groundwater use would amount to a "double hit" on the aquifer and serve to diminish surface water flows.

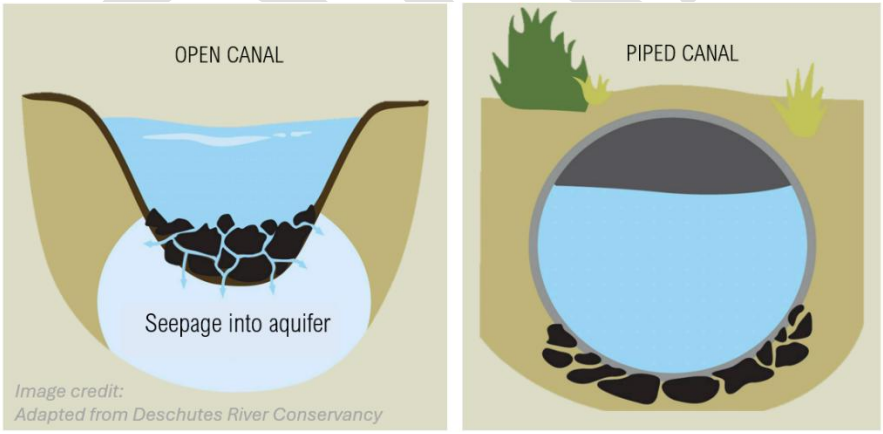

Figure 20: Diagram showing the water conserved by piping canals

OWRD takes the position that mitigation credits are created when a consumptive use (see section 11.1) is converted to an instream water right. When water is conserved through canal piping or lining, there is no consumptive use retired to offset a new consumptive use. Therefore, the Department has not created mitigation credits from canal piping or lining projects. An additional consideration is that OAR 690-505-0610(3)(a) specifies

that only the applicant's portion of conserved water is eligible for credits. In the Deschutes Basin, there often is no applicant portion of the savings (rather, all water is protected instream) due to high levels of public funding for these projects.

Other types of ACW projects will be evaluated by the Department on a case-by-case basis to determine suitability for mitigation.

Stored water releases

Some program users have noted that creating mitigation credits from stored water that is released (and protected) in the winter and shoulder seasons presents an opportunity to enhance the supply of mitigation credits and provide a source of mitigation that is not limited to the irrigation season. (Refer to section 7.4 for a discussion of seasonal streamflow impacts resulting from mitigation water this is limited to the irrigation season.) Other basin interests have advised that any mitigation project related to stored water releases would need to be carefully evaluated to ensure that a consumptive use is retired to offset a new groundwater use. The case of stored water releases originating from canal piping or lining savings (through the Deschutes Alternative Pathway) has been highlighted as requiring additional scrutiny for the reasons noted above.

To date, the Department has not approved any projects involving the release of stored water for mitigation credits. (Credits have been created from water stored in Prineville Reservoir through an exceptional case involving federal law.)[5] Proposed projects will continue to be evaluated on a case-by-case basis to ensure that consumptive use is not increased, which would result in diminished streamflows and enlargement of the originating right.

Aquifer recharge

The potential for aquifer recharge (AR) to address groundwater declines in the Deschutes Basin (see section 7.7) and, possibly, to provide a source of mitigation credits is a subject gaining momentum, with Central Oregon Cities particularly supportive. The concept is to divert winter streamflows that exceed instream flow requirements into infiltration basins to recharge the aquifer. (See Box 3 regarding changing winter flow conditions related to the Habitat Conservation Plan.) Supporters note this would serve to offset reduced aquifer recharge (including from canal piping and lining), slow groundwater declines, and help manage impacts to springs and ecosystems. While other basin interests have acknowledged the potential ecological benefits of AR, they have expressed concerns about the suitability of AR as a source of mitigation credits. Specifically, they have questioned how AR can generate water protected instream, which is foundational to Mitigation Program implementation. The perpetual availability of any excess streamflows for AR is another important consideration where permanent mitigation credits are concerned.

[5] The Crooked River Collaborative Water Security and Jobs Act of 2014, passed by the U.S. Congress, specifies that up to 5,100 AF of water stored in Prineville Reservoir may be used to mitigate for groundwater use by the City of Prineville.

To date, the Department has not approved any mitigation credits from AR projects. Future project proposals will be evaluated on a case-by-case basis. Additionally, the Department will continue to communicate proactively with Central Oregon Cities on this topic.

9.2 Mitigation water reliability

Agency partners and basin interests have inquired about the reliability of mitigation project water. As an instream water right created through a mitigation project has the same priority date as the originating right and is subject to regulation accordingly, the question is how changing basin conditions are impacting the availability of mitigation water. If water becomes less available over time to satisfy an instream water right, there will be less mitigation water instream to offset the associated groundwater use.

Hydrologic changes related to climate and other factors (e.g., see Box 3 regarding the HCP) are impacting water availability in the basin. While the Department's mitigation project review process involves an availability assessment based on historical regulation data, OWRD cannot forecast future water availability. This is an inherent program limitation, and the Department agrees that mitigation water reliability should be prioritized for investigation.

To investigate this topic further, the Department will evaluate trends in mitigation water availability. Water rights that generate permanent credits are of primary interest. While water rights leased for temporary credits undergo availability assessments regularly as leases are renewed, permanent mitigation projects are assessed only once. Findings from the Department's evaluation of permanent mitigation water availability over time will inform decisions on future project eligibility.

9.3 Monitoring mitigation water

Separate from the question of mitigation water reliability (addressed above) is the question of how mitigation water is monitored. Some agency partners and basin interests have asked how OWRD ensures that mitigation project water is truly present instream where and when it should be.

OWRD operates several gaging stations across the Deschutes Basin to verify the presence of protected flows instream, including mitigation water. Instream rights, leased and permanent, are tracked in the Department's primary water accounting tool and included in a bi-weekly "storage report." In addition, field staff periodically audit instream water rights where gage data are not available.

The Department has identified an opportunity to further support monitoring of protected flows in the Middle Deschutes River through the installation of an additional gaging station at Lower Bridge. OWRD is actively engaging with basin partners to identify sources of funding for gage installation and ongoing operational expenses.

10 Zones of impact

This section presents an overview of the concepts of general and local zones of impact, as well as the Department's approach to identifying the zone of impact for each groundwater application. The potential for Mitigation Program activity to impact streamflows at the subzone level is addressed, and next steps are proposed to strengthen understanding of potential vulnerabilities.

10.1 General and local zones of impact

Mitigating for groundwater use under the program requires the Department to determine where the mitigation must be provided to offset the impacts of the groundwater pumping on scenic waterway flows and senior water rights, including instream water rights. This is referred to as the zone of impact (ZOI). The Mitigation Program rules (OAR Chapter 690, Division 505) establish that mitigation should be provided either in a general or a local ZOI, depending on where the surface water impact of the groundwater use is realized. The general and local ZOIs are shown in Figure 21 and further described below.

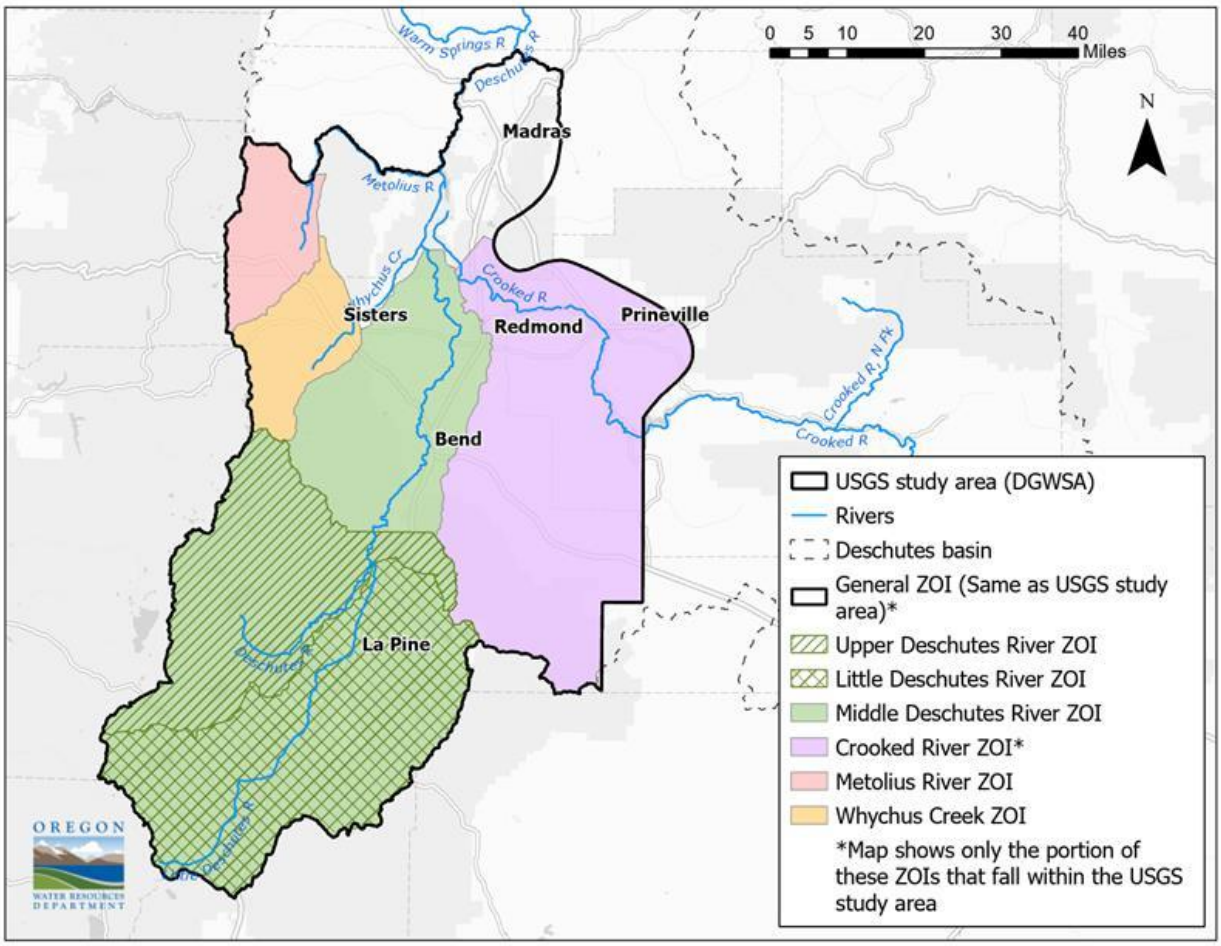

Figure 21: Map of general and local zones of impact

General zone of impact

Essentially, all groundwater in the DGWSA discharges to the major streams upstream of River Mile 100.1 on the Deschutes River where USGS gage 14092500 (Deschutes River near Madras) is located. Most of that groundwater discharge occurs in the confluence area of the Deschutes, Crooked and Metolius Rivers. Wells that impact groundwater discharge in this confluence area are assigned to the General ZOI by OWRD. Groundwater users in the General ZOI may provide mitigation that originates anywhere upstream of the Madras Gage to offset a reduction in spring discharge within this regional discharge area from groundwater pumping.

Local zones of impact

For wells determined by OWRD to have a localized impact on surface water, mitigation must be provided within the relevant local ZOI. The Department has aimed to designate a local ZOI over the General ZOI, when appropriate, to prioritize local mitigation. The six local ZOIs established by OWRD are the Upper Deschutes River, Little Deschutes River, Middle Deschutes River, Crooked River, Metolius River and Whychus Creek. These local ZOIs were established using a set of criteria designed to ensure that mitigation water is provided in stream reaches that are vulnerable to the impacts of groundwater use, and where IFR are not being satisfied and additional flows are needed. Refer to Chapter IX of the 2021 five-year legislative report for a detailed description of each ZOI and the rationale for its delineation.

10.2 Identifying a single zone of impact

OWRD identifies a single ZOI for each groundwater permit using a conceptual approach. Each proposed well is assessed based on its proximity to groundwater discharge areas, which part of the aquifer it will draw water from, hydraulic head, and general groundwater flow direction to determine whether the proposed use will have a localized impact to surface water. If the proposed use will have a localized impact, OWRD finds that all mitigation must occur within the local ZOI.

Some agency partners and basin interests have raised concerns that some groundwater uses may in fact have surface water impacts in more than one ZOI, in which case the practice of identifying a single ZOI could lead to unmitigated impacts in neighboring zones. The Department appreciates this concern. At program inception, OWRD considered taking a numerical approach to ZOI identification – one that would use the groundwater flow model to quantify the impact on specific stream reaches from groundwater development. However, the Department determined that the model had varying degrees of accuracy in simulating groundwater inflow to streams across the basin, and modeling each water right transaction would impose excessive workloads for staff. The conceptual approach to ZOI identification was therefore selected, making use of the best available data and sound hydrologic principles, while also working within the limits of available tools and keeping the program manageable.

The Department has continued to collect data since the program's inception to refine its knowledge of the basin hydrology. Future research investments could build upon that knowledge. (See section 7.7 for a discussion of related research opportunities.)

10.3 Potential impacts at the subzone level

Mitigation Program rules allow for mitigation to be provided anywhere within the ZOI identified for a groundwater permit. This ensures that program credits and debits are net neutral (or better) at the relevant analysis location (see Figure 9).

Some agency partners and basin interests have raised concerns that providing mitigation downstream of a well location (but within the same ZOI) could result in unmitigated impacts to streams at a subzone level. For example, if a well is located near the headwaters and a mitigation project is located closer to the mouth, stream depletion could result within the ZOI.

In many settings in the DGWSA, groundwater discharges to streams via discrete spring complexes in specific locations due to geologic structure and the relationship between groundwater and streambed elevations. The ZOIs were delineated with those boundaries in mind. The Whychus Creek ZOI is a good example of this. As shown in Figure 22, groundwater levels are below streambed elevations from approximately RM 26 to 19. From RM 19-16, where Whychus Creek incises below the water table, spring complexes along McKinney Butte discharge groundwater to the stream. Because of this, RM 16 is designated as the ZOI terminus. Groundwater pumping near RM 25 will impact flows in Whychus Creek, but that interference will not occur until the reach between RM 19 to 16. Because of this relationship, mitigation projects can offset the impacts of an upstream well if the project is located above the reach where pumping impacts the stream. This largely eliminates the risk of unmitigated subzone impacts.

There may be locations within the DGWSA where groundwater-surface water interactions occur more diffusely along a longer section of stream. This creates the potential for unmitigated subzone impacts if a well is located upstream of the associated mitigation project. Further analysis is required to better understand these vulnerabilities. As an initial step, the Department will identify the ZOI(s) that are most vulnerable to impacts at a subzone level (e.g., based on their hydrologic characteristics) and evaluate the likelihood of impacts based in part on the relative locations of wells and mitigation projects. Findings will inform an assessment of whether programmatic changes are recommended to more fully manage this risk.

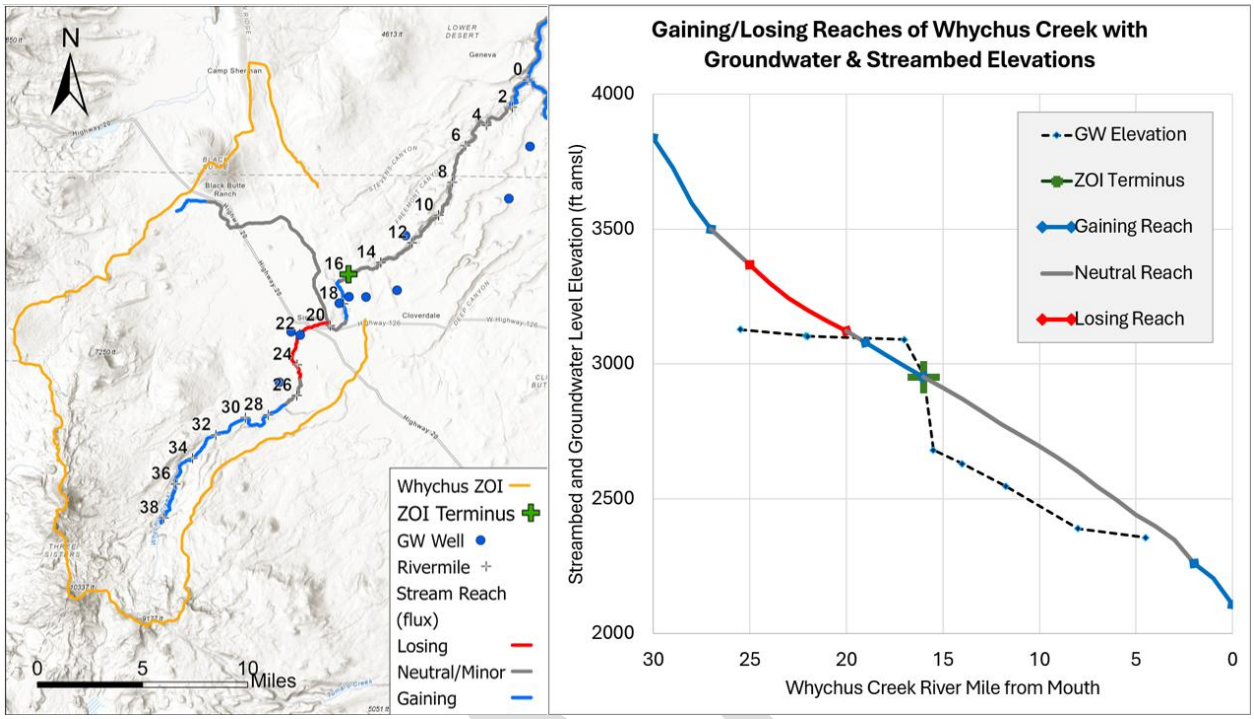

Figure 22: Gaining and losing reaches within the Whychus Creek ZOI.

11 Other issues

This section presents program concerns that are not covered elsewhere in this report, along with the Department's response to each. Issues covered relate to the consumptive use coefficients used in Mitigation Program accounting, the status of groundwater permits with the "7j" condition, and the protection of mitigation water to Lake Billy Chinook. Comments received on these and other topics are summarized in Appendix A.

11.1 Consumptive use coefficients

The Department's determination of the mitigation obligation associated with a new groundwater use and the determination of the mitigation credits generated through a mitigation project are based on the concept of consumptive use. In the context of the Mitigation Program, consumptive use refers to the portion of a water right that does not return to surface water flows in the Deschutes Basin due to transpiration, evaporation or movement to another basin (see OAR 690-505-0605(2)). Figure 23 provides a simple schematic depicting the consumptive use and return flow portions of an irrigation right.

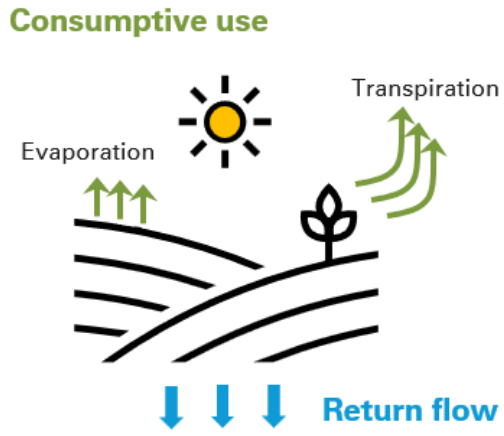

Figure 23: Simple schematic of consumptive use

OWRD uses a standard set of consumptive use coefficients to determine mitigation obligation and mitigation credits. The coefficients cover a range of water uses (e.g., irrigation, municipal use), and they are the same as those used in other OWRD processes, including the Department's water availability methodology. The standard coefficients used are averages, which is necessary to keep the Mitigation Program manageable for staff. However, if an application or other information provided to OWRD indicates that the consumptive use should be higher or lower, the Department evaluates the application using the best information available to establish a case-specific consumptive use coefficient. Further, each groundwater permit issued under the program is conditioned to require additional mitigation should OWRD determine that consumptive use has increased beyond the originally mitigated amount (see OAR 690-505-0620(1)(g)).

Some agency partners and basin interests have noted that consumptive use may change over time, for example as municipalities become increasingly water efficient and as a changing climate alters crop consumptive use. These interests have suggested that consumptive use factors should be reviewed to ensure they are up to date. The Department agrees and is undertaking a review of the standard set of consumptive use estimates as part of an ongoing update to OWRD's water availability methodology, which is targeted for completion in 2030.

11.2 7j permits

In this report, the term "7j permit" refers to a groundwater permit issued in the Deschutes Basin between 1995 and 1998. Beginning in 1995, the amended Scenic Waterway Act authorized the issuance of new groundwater permits provided that these permits included a condition (the 7j condition) stating that these rights may be subject to regulation if it was later determined that the groundwater use would measurably reduce scenic waterway flows. In 1998, a USGS study provided sufficient technical information to demonstrate that new groundwater use in the Deschutes Basin would indeed measurably reduce scenic waterway flows (absent mitigation). As noted in Chapter 1, further groundwater allocations were then paused until the Mitigation Program took effect to allow groundwater users to mitigate for the impacts of use on surface water flows.

Mitigation Program rule OAR 690-505-0600(4) establishes that 7j permit holders who choose to provide mitigation through the program shall not be subject to regulation for scenic waterway flows. Some basin interests have expressed that 7j permit holders should be regulated by OWRD unless they provide mitigation given that the condition of measurable reduction has been triggered.

At the end of 2025, there were 155 active (non-cancelled) permits with the 7j condition in the Deschutes Basin, 90 of which had been certificated. The Department will prioritize the review of permits that are past their designated completion date with no Claim of Beneficial Use (CBU) submitted. For those permits, OWRD will initiate the 60-day letter process under ORS 537.260, encouraging submittal of a CBU and advising that the permit may be canceled if a CBU is not submitted. If an extension of time is needed for a permit holder to complete development of a permit, good cause for the extension must be shown, which typically requires demonstration of progress developing a water right and other criteria defined in OAR 690-315-0040. If good cause cannot be shown, the extension will be denied, and the Department will require submittal of a CBU for portions of the permit developed by the completion date or initiate cancellation proceedings as appropriate. (Cancellation proceedings will also be initiated as appropriate if an extension is needed but a timely extension application is not submitted.)

11.3 Protection to Lake Billy Chinook

Instream water rights that are created through mitigation projects are protected to Lake Billy Chinook (or to the Deschutes River gage near Madras at approximately River Mile 100.1). Some basin interests have suggested that mitigation water should be protected all the way to the mouth of the Deschutes River to avoid adverse impacts to the Lower Deschutes Scenic Waterway from groundwater use under the program. However, protections must be terminated in the Lake Billy Chinook area to avoid injury or enlargement. Further, findings in Table 2 through Table 4 demonstrate that current practices do not serve to reduce flows in the lower river.

To understand how terminating the protections of mitigation water in the Lake Billy Chinook area does not harm the lower Deschutes River, it is useful to consider the distinction between flow restoration projects and mitigation projects. Instream protection of the consumptive use portion of project water must be approached differently in these two scenarios, as described below. Return

flows, on the other hand, are treated the same in both scenarios. Under the originating right, these flows would return to the Deschutes River at or above the Madras Gage, where they become surface water flows available to downstream water rights. Instream protection of these flows below the Madras Gage would therefore result in potential injury to downstream water users in both cases.

Flow restoration projects
When an instream water right is created for flow restoration purposes, the consumptive use portion of the originating right may be protected all the way to the mouth of the Deschutes River. In these cases, there is a net positive impact on the lower river.

Mitigation projects
When an instream water right is created for mitigation purposes, the consumptive use portion of the originating right is protected only to the Lake Billy Chinook area – the region by which all surface water impacts from groundwater use in the upper basin are realized. Water cannot be protected below this region for the benefit of the lower river because the water is instead used to offset groundwater use under the Mitigation Program. Using the water both to increase flows in the lower river and to mitigate for groundwater use would constitute enlargement of the originating right. Protection to Lake Billy Chinook results in a theoretical net neutral impact on the lake area and, by extension, on the lower river (see Figure 24). In practice, the program's modeled impact on the lower river from 2020-2025 was slightly positive (+3.61 CFS), as shown in Table 4.

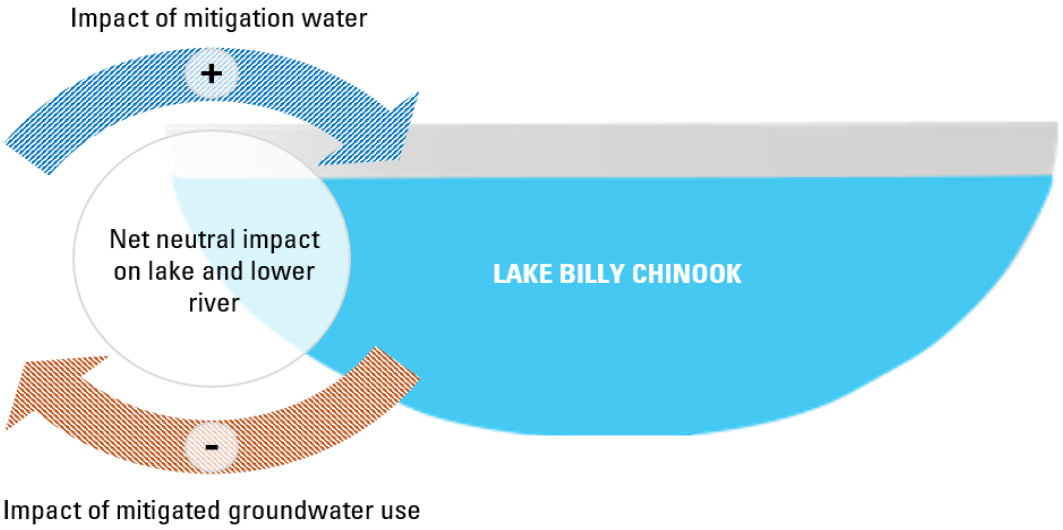

Figure 24: Simplified schematic of mitigation water fluxes at Lake Billy Chinook

As this is a longstanding concern among some basin interests, the Department proposes to meet with concerned parties to try to achieve a shared understanding.

Appendix A: Program feedback received

This appendix provides a summary of Mitigation Program feedback provided through the years by the Confederated Tribes of the Warm Springs Reservation of Oregon, agency partners and various basin interests. Comments captured include these expressed by Central Oregon Cities Organization, Central Oregon LandWatch, Deschutes Basin Water Collaborative, Deschutes River Conservancy, League of Women Voters of Deschutes County, Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife, Oregon Farm Bureau, WaterWatch of Oregon, and multiple engaged citizens. The views expressed do not necessarily represent the Department's position.

The viewpoints summarized in this appendix are primarily those shared with the Department during the development and review of the following Mitigation Program reports:

- 2009 legislative report
- 2016 legislative report
- 2021 legislative report
- 2020 annual report
- 2021 annual report
- 2022 annual report
- 2023 annual report
- 2024 annual report

Much of the program feedback summarized in this appendix can be found in full as attachments to the 2021 five-year legislative report.

Additional feedback provided to the Department during the development of this five-year evaluation report can be found in full on the Deschutes Mitigation Program website.

A. Checks on the program		
A1. 2029 sunset The looming program sunset creates uncertainty for those who rely on groundwater, including cities. A program extension is needed urgently. Conversely, there are calls to address program feedback prior to an extension.	**A2. 200 cfs cap** The allocation cap creates uncertainty for those who rely on groundwater and should be reviewed. Conversely, the cap should remain fixed until program feedback is addressed, including those related to seasonality (see C3).	**A3. GW allocation rules** OWRD should clarify the link between the program and the new groundwater allocation rules, including how the rules address groundwater declines in the basin (both from the program and all other causes of decline).
B. Impact on springs and water quality		
B1. Impact on springs/water quality Groundwater pumping reduces spring discharge and cold-water inputs to surface waters, translating to a loss of cold-water refugia for fish and wildlife. There is a need to identify high-value springs and better understand program impacts on springs and water quality.		
C. Program architecture		
C1. Limited license exclusion Limited licenses are currently not included in the program. OWRD should consider statutory changes to incorporate limited licenses into the program.	**C2. Temp mitigation/perm rights** Using temporary credits to mitigate permanent groundwater rights creates long-term reliability risks for program participants (see G2 regarding stability of temporary credit sources).	**C3. Seasonality of mitigation** The program mitigates year-round groundwater use with irrigation season flows, resulting in reduced flows in winter and shoulder seasons. Annual accounting masks seasonal impacts that are at odds with the Scenic Waterway Act.
C4. Streamflow measurement Groundwater withdrawals may take years to impact streamflows, while mitigation water increases streamflows immediately. This time lag overstates program success. Long-term streamflow monitoring is needed to ensure program goals are met.	**C5. Single zone of impact** The program's single zone of impact approach is too simplistic, as groundwater use may impact multiple zones.	**C6. Localized impacts** Mitigation provided downstream of pumping may cause localized impacts to streams, particularly in the general zone of impact. Mitigation projects should be sited upgradient/ upstream of groundwater use.
C7. Protection to Lake Billy Chinook Protection of mitigation water only to Lake Billy Chinook is at odds with the Scenic Waterway Act, as it may result in reduced flow in the lower Deschutes. Water should be protected to the mouth of the Deschutes.	**C8. Mitigation definition** Program rules define mitigation as "moderating" the effects of groundwater use, which does not meet statutory standards. Mitigation should be defined as "offsetting" the effects of use.	

A. Underpinning science		
D1. Groundwater flow models There is need to recalibrate and refine the existing groundwater-surface water models that underpin the program.	**D2. Streamflow model accounting** Questions exist about the program's streamflow model accounting, its implications for reported impacts, and whether review and revision are needed.	**D3. Consumptive use coefficients** Consumptive use (CU) coefficients used to determine the mitigation obligation should reflect actual use (e.g., frequency and type of use). CU coefficients should be reevaluated.
B. Eligible mitigation projects		
E1. CTWS injury test A memorandum of understanding is needed between OWRD and the Confederated Tribes of Warm Springs to establish the process by which OWRD will assess injury to the Tribal Reserved Water Right from water rights transfers, including transfers processed through the program.	**E2. Sufficiently reliable water** Water rights used for mitigation should meet eligibility criteria to ensure they are sufficiently senior/reliable to generate "wet water" that offsets groundwater use and avoids increased consumptive use and injury to instream water rights. (See related F3.)	**E3. Conserved water** Allocation of Conserved Water (ACW) projects should be considered for mitigation credits as they result in senior water instream. Conversely, using ACW project water to mitigate for new groundwater use would amount to an aquifer "double dip."
E4. Artificial recharge Artificial recharge (AR) is an opportunity to generate needed mitigation credits. Conversely, there is no way to protect recharged water instream, disqualifying AR as a source of mitigation credits.	**E5. Stored water** The release of stored water is an opportunity to generate needed mitigation credits and address seasonality concerns (see C3). Conversely, it is important to consider the source of storage releases (e.g., ACW, see E3) and the impact on consumptive use.	**E6. ODFW inputs** Oregon Department of Fish and Wildlife wishes to provide more input on mitigation projects to ensure offsets to local impacts, limit impacts to streamflows outside the irrigation season, and optimize benefits to fish and wildlife.
C. Oversight/enforcement		
F1. 7j permits Groundwater rights issued after 1995 ("7j permits") include a condition making them subject to regulation if the Scenic Waterway Act's "measurable reduction standard" is triggered. OWRD should regulate or require mitigation.	**F2. Temporary credit enforcement** Groundwater permit holders relying on temporary credits may fail to secure necessary credits annually. OWRD should practice strict compliance monitoring and immediately regulate non-compliant participants.	**F3. Wet water verification** OWRD should establish a monitoring protocol to confirm that mitigation project water generates "wet water" instream to prevent injury to instream water rights. (See related E2.)
F4. Exempt well regulation Exempt wells do not require mitigation under the program. However, exempt wells are subject to regulation if they injure senior surface water rights (including instream water rights) and should therefore be regulated off unless mitigation is provided.		

A. Functionality		
G1. Access to permanent credits A reliable system is needed to access permanent mitigation credits. The current system is inefficient, unpredictable, and costly. A neutral bank for permanent credits would be beneficial. Credits should be created as rural lands are urbanized. Conversely, this practice removes farmland from irrigated production and adversely impacts agricultural communities.	**G2. Stability of temporary credits** Instream leasing is declining and is an unstable source of mitigation credits. Long-term or term-limited instream transfers would provide more stability. A mechanism to allow permanent mitigation credits to be used temporarily could also be considered.	**G3. Zonal credit inequities** Mitigation credit availability is highly limited in some zones of impact, exacerbating difficulties with acquiring credits.
G4. Public awareness There is a need for greater program awareness among groundwater applicants that may not understand program requirements, the allocation cap, or mitigation supply limitations. OWRD should consider fact sheets and outreach efforts.		
B. Assessment and reporting		
H1. Consideration of goals When the program was established, stated goals were to mitigate impacts to scenic waterway flows and instream water rights while allowing qualifying groundwater appropriations. Evaluation reports should consider these goals and avoid "scope creep." Conversely, unintended program consequences also need to be considered.	**H2. Presentation of flow impacts** Reports should highlight seasonally reduced flows (versus annual accounting only), which can impact fish and wildlife. (See C3.) OWRD should present flow data in a way that reflects fish needs. Additionally, reports should aim to better capture the range of instream benefits of program.	**H3. Changed winter flows** Basin changes are occurring that are greatly increasing flows outside the irrigation season. Changes are outside the program scope but should be reported to contextualize program impacts, including seasonality concerns (see C3).
H4. Model assumptions Model assumptions and limitations should be addressed in reports, including whether approaches tend to overstate or understate program impacts.	**H5. Perspective on impacts** Reports should present the volume of groundwater use under the program, ideally as compared to other factors affecting the aquifer (non-program groundwater use, climate, canal piping) to provide perspective on program impacts.	**H6. Allocation cap status** The presentation of information related to groundwater allocation under the cap should be adjusted to provide a fuller picture of program users and cap status.
H7. Available mitigation The presentation of mitigation credit availability should be adjusted to provide a fuller picture of the true credit availability in each zone of impact.	**H8. Rights requiring mitigation** Reports should clarify which types of water rights require mitigation and which are eligible for mitigation under the program.	