Oregon
Kate Brown, Governor

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MEMORANDUM

TO: Water Resources Commission

FROM: Dwight French, Water Right Services Administrator
Laura Wilke, Flow Restoration Program Coordinator LKW

DATE: Agenda Item C, October 13, 2016
Water Resources Commission Meeting

Deschutes Basin Ground Water Mitigation Program - 2015 Annual Review

I. Introduction

The attached report provides the 2015 annual evaluation of the Deschutes Ground Water Mitigation Rules (OAR Chapter 690, Division 505) and the Deschutes Basin Mitigation Bank and Mitigation Credit Rules (OAR Chapter 690, Division 521). This is an informational report.

II. Background

Much of the mainstem Deschutes River and the Metolius River are designated State Scenic Waterways. Likewise, much of the mainstem Deschutes River and many of its tributaries contain instream water rights. The flows established for the Scenic Waterways and Instream Water Rights are not always met. In addition, surface water in the Deschutes Basin is not available for most of the year due to prior appropriations.

In the late 1990's a U.S. Geological Survey groundwater study was completed in partnership with the Department and others that demonstrated a direct hydraulic connection between groundwater and surface water in the Deschutes Basin Ground Water Study Area (Study Area). Based on the results of the groundwater study, the Department concluded that additional use of groundwater would measurably reduce scenic waterway flows and new uses could not be allowed without mitigation in the Study Area.

The Deschutes Ground Water Mitigation Rules and the Deschutes Basin Mitigation Bank and Mitigation Credit Rules, adopted by the Commission on September 13, 2002, provide for mitigation of impacts to scenic waterway flows and senior water rights while allowing additional appropriations of ground water.

The Department is required to annually report on and evaluate the implementation of the Deschutes Ground Water Mitigation Rules and the Deschutes Basin Mitigation Bank and Mitigation Credit Rules. This annual evaluation is done in coordination with the Oregon Department of Fish and Wildlife (ODFW), Department of Environmental Quality, Division of State Lands and Oregon Department of Parks and Recreation. During the review process, comments were received from ODFW and are included in the attached annual evaluation of the Mitigation Program contained in Attachment 1.

III. Discussion

This annual evaluation includes consideration of new groundwater appropriations, streamflow monitoring, and mitigation activity. The annual evaluation also examines whether scenic waterway flows and instream water right flows in the Deschutes Basin continue to be met on at least an equivalent or more frequent basis (after the mitigation activities) as compared to long-term representative base period flows established by the Department (pre-mitigation activities).

To limit the amount of impact on surface water flows, the Mitigation Program also includes a 200 Cubic Feet per Second (CFS) cap on the amount of new groundwater use that may be allocated to new groundwater use. This allocation cap restriction may be lifted by the Commission only if the Department's evaluation of the mitigation program demonstrates that scenic waterway and instream water right flows continue to be met on at least an equivalent or more frequent basis.

Program Highlights

- 107 active permits and certificates have been issued under the Mitigation Program.
- As of the end of 2015, approximately 138.5 cubic feet per second (cfs) of water had been allocated under new permits and approved final orders. This leaves 61.5 cfs that can still be approved under the 200 cfs allocation cap. At the end of 2015, there was an additional 33.3 cfs in pending applications that, if approved, would leave approximately 28.2 cfs available under the allocation cap.
- The majority of mitigation is from permanent mitigation projects (instream transfers requested to be used to establish mitigation).
- Model results through 2015 indicate that the long-term, net annual effect of the mitigation program on instream flows continues to be nearly zero. On a seasonal basis, flows continue to improve during the irrigation season, while decreasing slightly during the non-irrigation season at almost all of the evaluation sites.

IV. Conclusion

The Department continues to work hard to effectively implement the Deschutes Ground Water Mitigation Program. Groundwater permit applications and mitigation projects are moving through the required processes.

Model results through 2015 suggest that the effects of the mitigation program on instream flows have largely remained minimal compared to base line conditions on an annual basis, with the notable exception of the Deschutes River downstream of Bend at Lower Bridge where the mitigation program has improved irrigation season flows by roughly 40-50 percent in a chronically dewatered reach.

Attachments:

1. 2015 Deschutes Mitigation Program Annual Review

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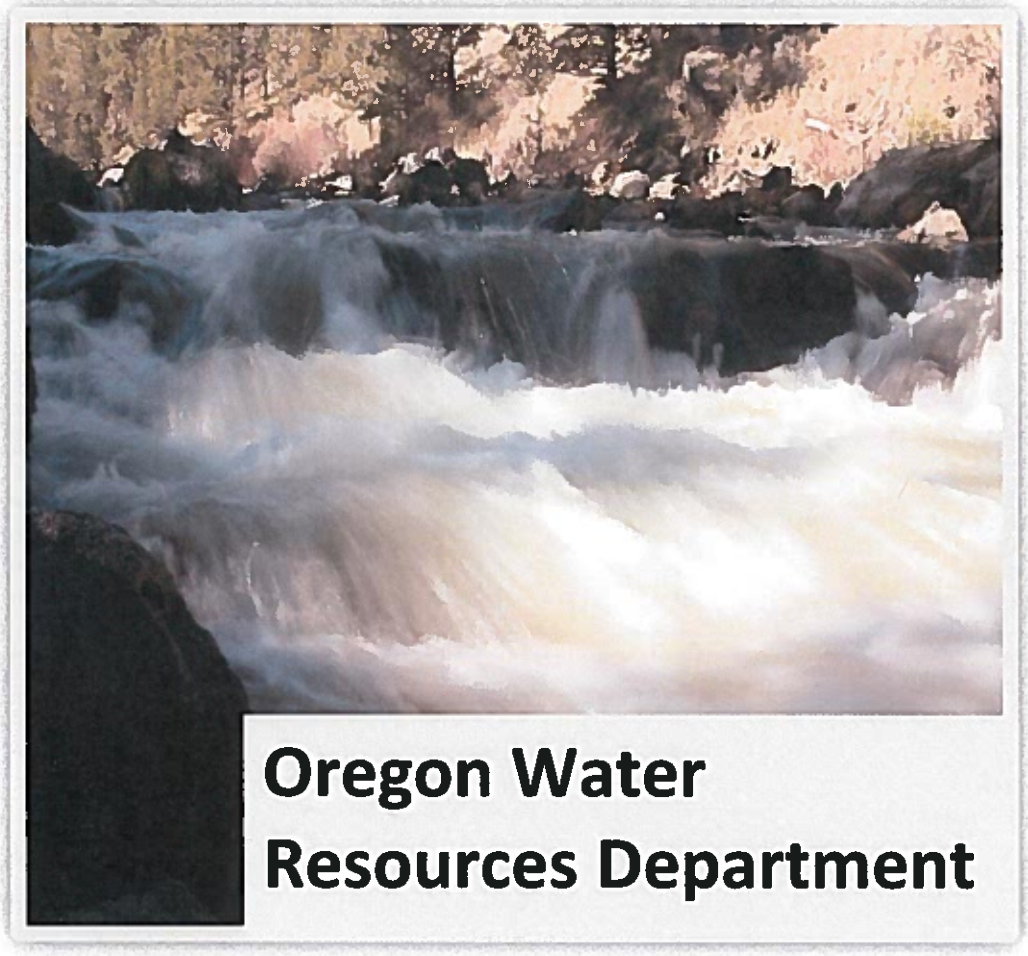
503-986-0819

Laura Wilke
503-986-0884



Oregon Water Resources Department

Deschutes Ground Water Mitigation Program

2015 Annual Review

This report, required by Oregon Administrative Rule (OAR) 690-505-0500(3) and OAR 690-521-0600, provides the 2015 annual evaluation of the Deschutes Ground Water Mitigation Rules (OAR Chapter 690, Division 505) and the Deschutes Basin Mitigation Bank and Mitigation Credit Rules (OAR Chapter 690, Division 521).

Deschutes Basin Ground Water Mitigation Program
2015 Annual Review

Background

On September 13, 2002, the Oregon Water Resources Commission (Commission) adopted the Deschutes Ground Water Mitigation Rules and the Deschutes Basin Mitigation Bank and Mitigation Credit Rules. These rules implement Senate Bill 1033 (codified as ORS 390.835, 1995 Oregon Law), House Bill 2184 (codified as ORS 537.746, 2001 Oregon Laws), House Bill 3494 (Chapter 669, 2005 Oregon Laws), and most recently House Bill 3623 (Chapter 694, 2011 Oregon Laws). HB 3623 replaced HB 3494. The rules provide for mitigation of impacts to scenic waterway flows and senior water rights, while allowing additional appropriations of groundwater in the Deschutes Groundwater Study Area (see Appendix 1).

The Deschutes Ground Water Mitigation Rules allow groundwater users to provide mitigation through an individual mitigation project, a mitigation credit holder, or an approved mitigation bank. The Deschutes Basin Mitigation Bank and Mitigation Credit Rules authorize the establishment of a mitigation credit system and mitigation banks to help facilitate transactions among holders of mitigation credits and persons interested in acquiring mitigation credits.

On June 4, 2010, the Commission adopted the Deschutes Basin Water Management Rules (OAR Chapter 690, Division 522), which operate in conjunction with the Deschutes Ground Water Mitigation Rules and the Deschutes Basin Mitigation Bank and Mitigation Credit Rules. The Deschutes Basin Water Management Rules changed how the Oregon Water Resources Department (Department) counts new groundwater permit applications under the allocation cap and allowed some unused mitigation credits to be reassigned. The rules also clarified how municipal and quasi-municipal permit holders can provide mitigation under incremental development plans, and allowed additional flexibility to use "offsets" and move mitigation credits between permits. These rules were amended by the Commission on June 19, 2015. The rule amendments removed references to cancellation statutes to add additional flexibility to exchange mitigation credits and add water back to the allocation cap when a permit or certificate is cancelled.

During the 2011 Legislative session, House Bill 3623 extended the January 2, 2014 sunset on the mitigation program to January 2, 2029. House Bill 3623 directs the Department to report to the Legislative Assembly every five years on the outcomes of the Department's Mitigation Program for the Deschutes Basin Ground Water Study Area. The first report to the Legislature is due in 2016. A draft of this report was shared with stakeholders during 2015 and with the Water Resource Commission (WRC) as part of the November 19, 2015, WRC meeting. The Department anticipates finalizing that report and submitting it to the Legislative Assembly before the end of 2016.

Discussion

Under the Deschutes Ground Water Mitigation Rules, the Department is required to annually evaluate the Mitigation Program, including the implementation and management of mitigation credits allocated through existing mitigation banks.

As part of the development of the annual evaluation of the Mitigation Program, the Department is required to consult with the Oregon Department of Fish and Wildlife (ODFW), Oregon State Parks and Recreation Department, Oregon Department of Environmental Quality, and Oregon Department of State Lands. The Department also consults with the Oregon Department of Agriculture. The Department provided a draft of the annual evaluation for review by these agencies on September 7, 2016.

Comments were provided by ODFW (Appendix 2). Issues of concern raised by ODFW include:

- The effect of the Mitigation Program on streamflows outside of the irrigation season.
- The presentation of flow data should be modified to a format more relevant to fish.
- That the 200 cubic feet per second (cfs) allocation cap should be maintained until impacts of the Mitigation Program on flows outside of the irrigation season can be resolved.
- Concern over continued use of temporary mitigation for permanent groundwater uses.
- Potential impacts of the Mitigation Program on the Oregon Spotted Frog, which has been recently listed under the Endangered Species Act.
- Concern over impacts of increased groundwater use under the Mitigation Program to local springs, which are an important source of cold water, versus mitigation water that is primarily warmer water from storage.

The comments raised by ODFW are similar to their comments related to issues identified in the development of the House Bill 3623 report. A draft of this report was shared with the Commission at its November 19, 2015, meeting. In response to issues raised by ODFW and other stakeholders, the Department intends to work with stakeholders to explore and evaluate the various issues raised. An update on these issues will be provided to the Commission in a future report.

The Mitigation Program in the Deschutes Groundwater Study Area continues to address new and changing water needs, while protecting scenic waterway flows. Mitigation Program activities are summarized below.

1. <u>New Groundwater Appropriations and Mitigation Activities</u>

   Permits Issued: Since adoption of the mitigation rules in September 2002, a total of 116 groundwater permits with associated mitigation have been issued. Nine of these permits have been cancelled. Seven permits have been issued certificates. Six new permits were issued in 2015 and allow the withdrawal of up to 464.4 Acre-Feet (AF) of groundwater

annually for irrigation and quasi-municipal purposes (not to exceed 3449.1 AF annually at full development). The initial mitigation obligation for these permits, based upon estimated consumptive use, is 197.2 AF and up to 1391.1 AF at full development. No other additional permits were issued in 2015.

Applications with Final Orders: By the end of 2015, 15 groundwater permit applications had been processed to the final order stage. Permits will be issued when the amount of mitigation needed to satisfy their mitigation obligation or any other required information (such as permit recording fees) is provided. Upon issuing a final order approving a new groundwater use, the applicant has five years to provide the required mitigation. Once mitigation obligations are met, the Department issues the groundwater permit and the new permit holder may begin using water. Groundwater use may not begin until a permit is issued. If mitigation is not provided within the five-year timeline, the final order expires. As of year-end 2015, two final orders had expired resulting in 0.124 cfs being added back into the 200 cfs allocation cap.

Pending Applications: There are 29 pending applications for groundwater use in the Deschutes Ground Water Study Area. Figures 1 and 2 provide a breakdown of the pending applications and their status.

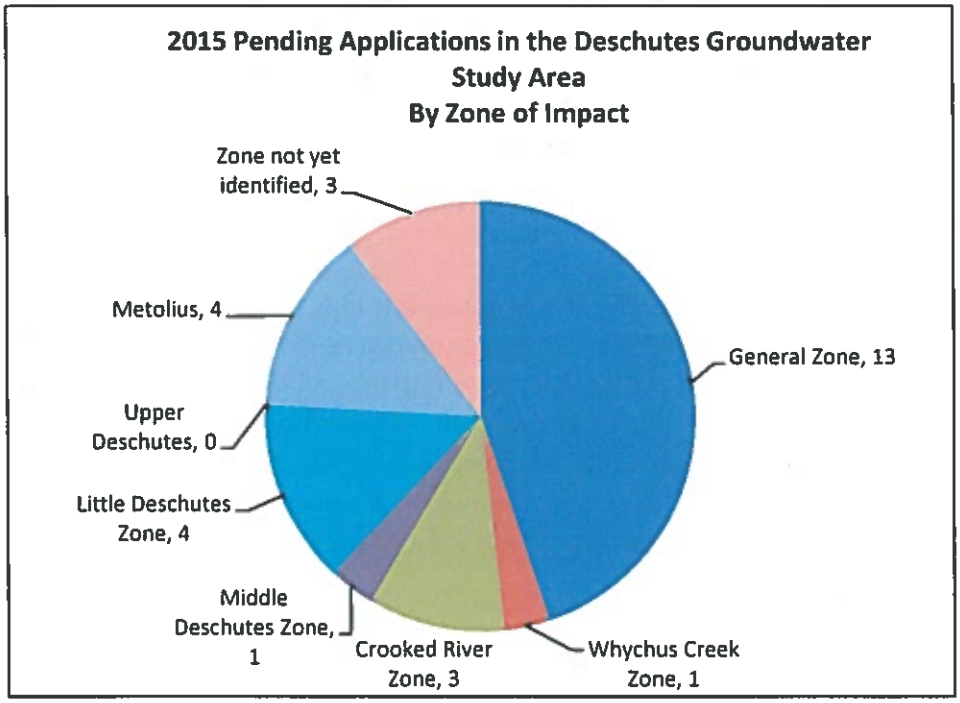


Figure 1: There are 29 pending applications for groundwater use in the Deschutes Ground Water Study Area.

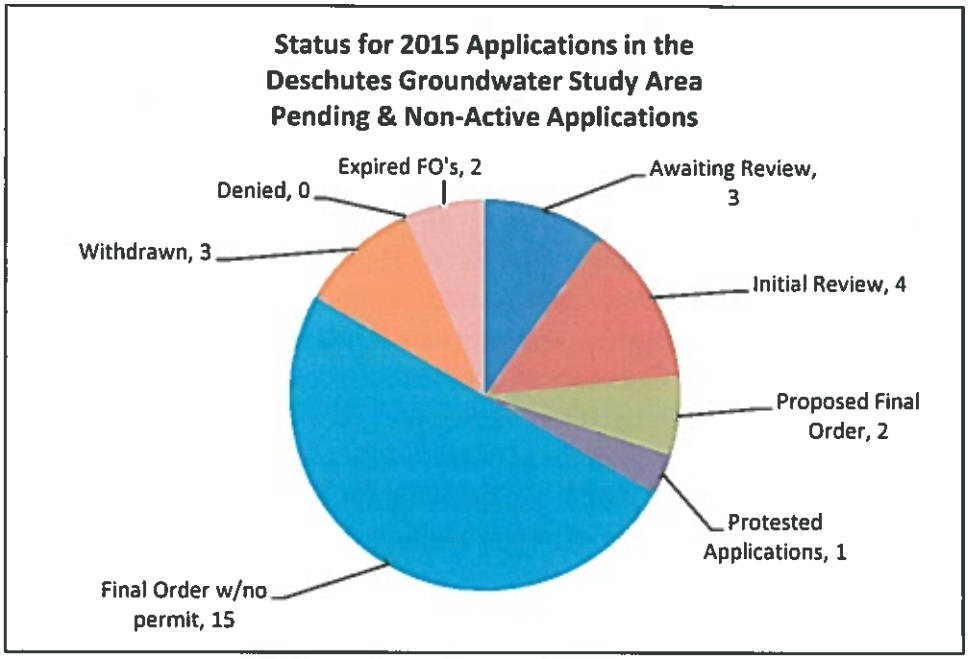


Figure 2: Status of pending and non-active applications.

Allocation Cap Summary: The amount of new groundwater use that can be approved under the Mitigation Program is limited to a total of 200 cfs. Between the beginning of the mitigation program in 2002 and the end of 2015, approximately 138.5 cfs of water was allocated to new permits and approved final orders. This leaves 61.5 cfs that can still be allocated under the 200 cfs allocation cap. At the end of 2015, there was an additional 33.3 cfs in pending applications that, if approved, would leave approximately 28.2 cfs available under the 200 cfs cap.

Incremental Development Plans: By rule, the Department may allow a municipal or quasi-municipal applicant to satisfy their mitigation obligations incrementally, over a period of time, as the water use is developed rather than requiring that all mitigation be provided before the permit is issued. A total of 15 permits with incremental development plans have been approved. The amount of mitigation provided must coincide with the rate of development within each increment. Each permit holder must have an incremental development plan on file with the Department and may amend that plan with prior approval by the Department.

Oregon Administrative Rules Chapter 690, Division 522 clarifies how municipal and quasi-municipal permit holders may grow into each increment. Municipal and quasi-municipal permit holders must include the annual volume of water used and the source of mitigation used as part of their annual reporting requirements. A summary of water use for municipal and quasi-municipal permit holders is provided in Figure 3. This figure is a comparison between the amount that these water users are authorized to use/withdraw

at full development, the amount of water they could use based on how much mitigation they've provided through 2015, and the amount of water they actually used during 2015. Overall, in 2015, more mitigation was provided by entities with incremental development plans than was needed based on reported water use levels (see Figure 3). Total mitigation provided was 2439.3 AF and the amount of mitigation needed to mitigate for consumptive use based on reported use was 1112.7 AF.

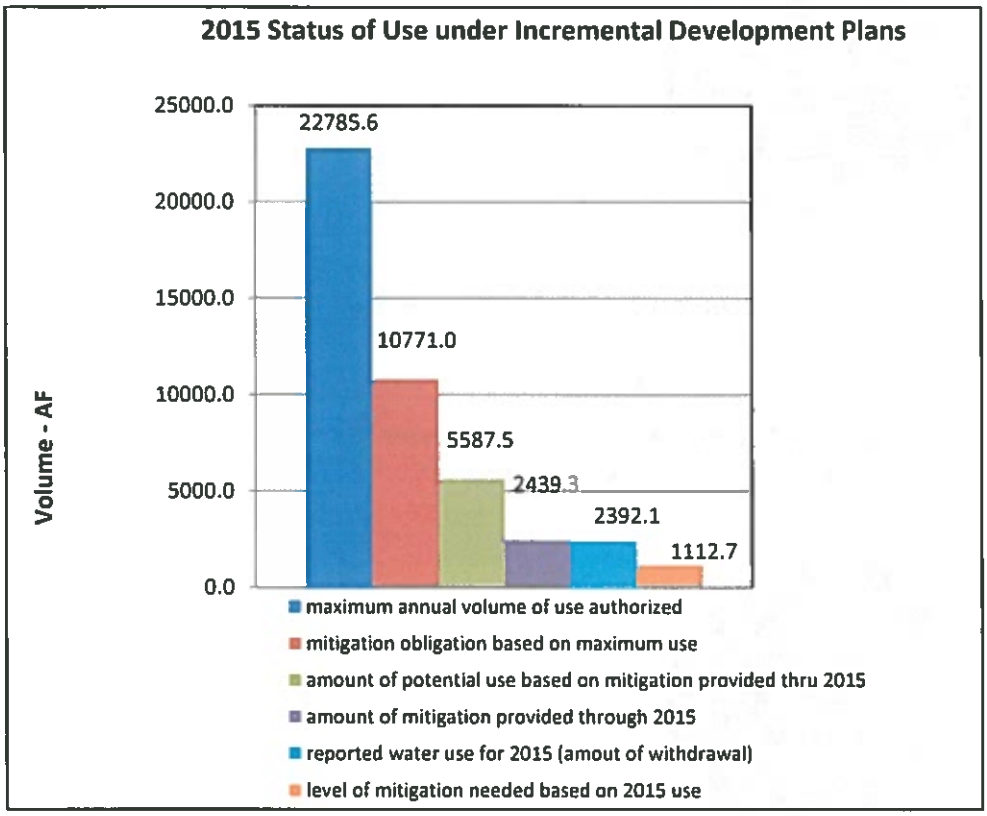


Figure 3: Summary of water use for municipal and quasi-municipal permit holders.

2. Mitigation Activity

Mitigation for active groundwater permits and certificates issued by the Department under the Mitigation Program is being provided through permanent instream transfers and temporary instream leases. When an instream transfer or instream lease is submitted to the Department, the applicants will identify that the project is requested to be used to establish mitigation.

The majority of mitigation water continues to be primarily from instream transfers that are requested to be used to establish mitigation. Mitigation water/credits established by a Mitigation Project are considered used when assigned to a groundwater application or permit. Figures 4 and 5 provide a summary of the amount of permanent and temporary mitigation provided in 2015 and the amount of mitigation used in 2015.

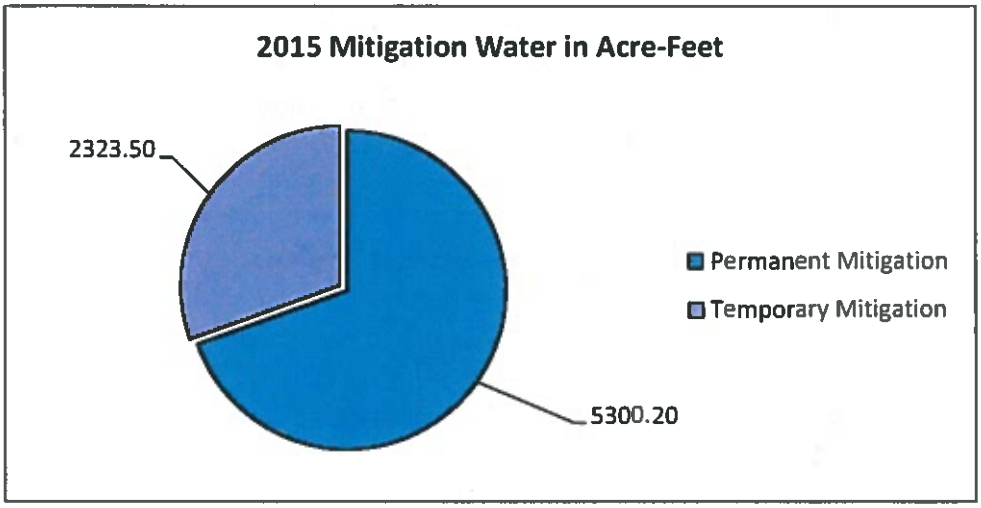


Figure 4: Summary of the amount of permanent and temporary mitigation.

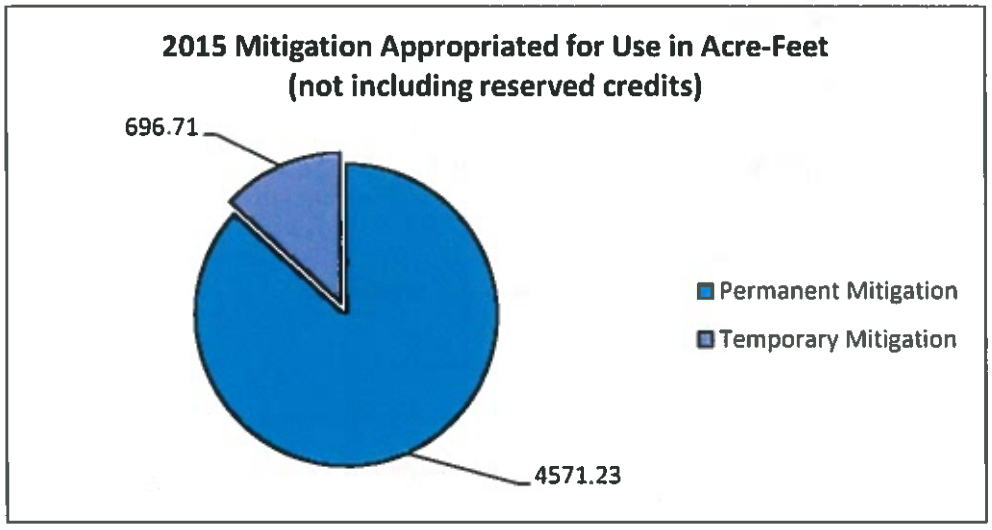


Figure 5: Summary of the amount of mitigation used.

The amount of mitigation water used each year is less than the full amount of the mitigation obligation required for permits and certificates at full development, primarily because municipal and quasi-municipal permit holders can provide mitigation incrementally. In 2015, the full mitigation obligation of all permits/certificates was 13,647.6 AF, of which 12,582.6 AF (92%) was associated with municipal and quasi-municipal permits. However, in 2015, up to 1263 AF of mitigation water was needed to meet consumptive use (mitigation obligation) for municipal and quasi-municipal water users under the Mitigation Program. This amount of mitigation includes consideration of reported water use by those with incremental development plans. The municipal and quasi-municipal permit holders provided 4244.7 AF of mitigation, meaning that these

permit holders are not only meeting their mitigation obligations but also that those with incremental development plans are providing mitigation in advance of actual need.

Figure 6 highlights the amount of mitigation required and the amount of mitigation provided for all permits and certificates. In Figure 6, the amount of "Mitigation Needed" for 2015 water use levels includes consideration of the reported water use by municipal and quasi-municipal water users with incremental development plans. The amount of mitigation provided also includes 546.3 AF of "offsets" established for these water users. An "offset" is the cancellation of an existing groundwater right in favor of a new groundwater permit. Municipal and quasi-municipal water users with incremental development plans may request to provide "offsets" to satisfy their mitigation obligations following permit issuance.

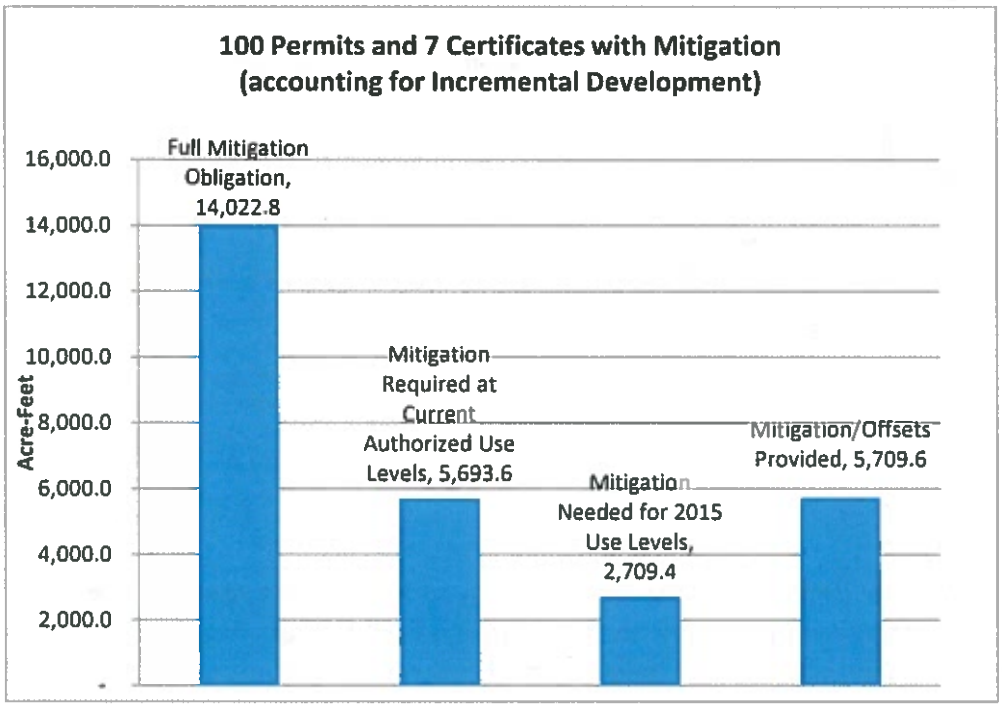


Figure 6: Shows the amount of mitigation required.

Each January, the Deschutes River Conservancy (DRC) Mitigation Bank submits a report detailing all of the credit transactions and activities for the preceding calendar year. Generally, the DRC Mitigation Bank has operated with temporary mitigation credits based on instream leases. In all cases, the DRC Mitigation Bank has maintained sufficient "reserve" credits to cover temporary mitigation credits used by groundwater permit holders in each zone of impact. For each temporary mitigation credit used to satisfy all or part of the mitigation obligation of a groundwater permit, the DRC Mitigation Bank is required to keep a matching credit in reserve. In 2015, the DRC Mitigation Bank completed 43 mitigation credit transactions with groundwater permit holders and permit applicants.

In 2015, there were 56 active mitigation projects. These were comprised of 19 instream leases (submitted by the DRC Mitigation Bank) and 37 permanent instream transfers (submitted by other parties). Figure 7 provides a summary of mitigation activity for 2015 by zone of impact and demonstrates that more mitigation (including unused mitigation) is in place than required in each of the zones of impact. As of year-end 2015, there were 12 permits that completely switched from temporary mitigation credits to permanent credits (up one from 2014). Four other permits have partially switched to permanent mitigation credits.

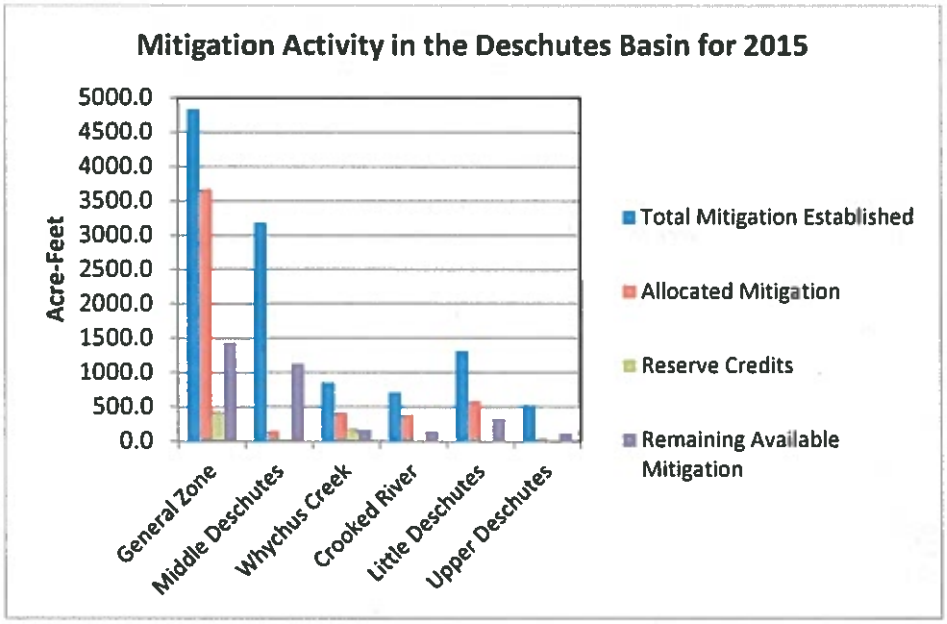


Figure 7: Summary of mitigation activity for 2015.

In previous years, the Department has reported that a few permit holders have not maintained their required mitigation. In 2015, three permit holders did not provide the required mitigation initially. One of these permit holders also had not provided mitigation in previous years. This permit was cancelled by the Department and later reinstated when the permit holder provided the required mitigation. By year-end all three permit holders had provided the required mitigation.

In 2015, the Department cancelled three other permits that had continuously failed to provide the required mitigation on an annual basis. These three permits, issued with a mitigation obligation totaling 19.1 AF, failed to provide the required mitigation, resulting in approximately 31.8 AF of potential water use not being covered with associated mitigation. The source of mitigation for each of these permits had previously been temporary credits from the DRC Mitigation Bank. Each groundwater permit holder is required by rule and by permit condition to provide mitigation for the life of the groundwater permit, and subsequent certificate.

The Department has identified that a more robust and clear process for addressing permits without mitigation is needed and is working with local staff and the DRC Mitigation Bank to develop an active process that will include regulation and compliance actions. In 2016, the Department initiated contact with a few permit holders without mitigation. Others will be receiving a letter reminding them of their mitigation requirements and notifying them that if mitigation is not provided that the Department will likely initiate a cancellation process under ORS 537.720, which allows the Commission to cancel, suspend or further condition a permit when a permit holder is found to be willfully violating any provision of the permit or certificate.

3. Mitigation and Streamflow Monitoring

To monitor the impact of new groundwater permits and mitigation on scenic waterway flows and instream water right flows, the Department developed a streamflow modeling program. The model was constructed using a base-period of flows from 1966 to 1995 at selected gaging stations around the basin. This base-period represents streamflows during a period of time after the dams in the basin were constructed and before the Scenic Waterway Act was amended to include consideration of groundwater impacts. The model then applies the effect of the estimated hydrologic impact of mitigation credits and debits to this historical data. It should be noted that the model is designed only to reflect the theoretical, steady-state response of streamflow to mitigation-related activities. In some cases, the actual hydrologic response to mitigation activities may take years to be reflected as changes in streamflow. In addition, climate variability masks the actual streamflow response in most locations; hence the reason a modeling approach was used. No attempt has been made to reflect other streamflow restoration activities such as other instream transfers or riparian enhancement activities completed for restoration purposes only.

Analysis of the 2015 data demonstrates that, on an annual basis, the change in percent of time the instream flow requirements are met at the evaluation points is predominantly positive, ranging from -0.14% to +0.65% (see Appendix 2). Similarly, the overall annual change in streamflow is positive (maximum of +17.9 cfs) above Lake Billy Chinook to slightly negative below (-0.68 cfs).

Consistent with previous evaluations of the mitigation program, the absolute change in streamflow on a seasonal basis continues to be negative at all evaluation points during the non–irrigation season and positive at all evaluation points during the summer. This is expected given the timing difference between the effects of new groundwater withdrawals and mitigation projects (i.e. instream transfers and leases) on streamflow. New groundwater uses produce a decrease in streamflow that is uniformly distributed over the year, while mitigation projects generally increase streamflow only during the irrigation season (Appendix 2). The one exception to this trend is in the Metolius basin, where no mitigation activities and associated changes to instream flows have occurred.

The seasonal changes in percent of time the instream flow requirements (ISFR) are met at each evaluation site follows the seasonal impacts in terms of absolute streamflow. During the non–irrigation season, the impact to the percent of time the ISFR is met is generally negative while the percent of the impact during the irrigation season is predominantly positive. The relative change in percent of time the ISFR is met varies by month and site, depending on how close the historical flows were to the ISFR prior to the mitigation program. If the historical flows were close to the ISFR for a given evaluation site, then a small change in flows can relate to a relatively large change in percent of time the ISFR is met (see summer flows for the Deschutes River at Lower Bridge, Appendix 2). The opposite is true if the historical flows differed greatly from the ISFR (see summer flows for the Deschutes River at Lake Billy Chinook, Appendix 2).

The Department has also noted small negative changes in streamflow on an annual basis at certain evaluation points (see Appendix 2). For example, for the Deschutes River below Pelton and at the mouth, there appears to have been an annual reduction in streamflows of -0.68 cfs, (0.01 percent of the mean annual streamflow). This is in part due to the resolution of the model.

Another consideration is related to how groundwater permits and mitigation projects are entered into the streamflow model. The model assumes full use by groundwater permit holders. However, not all permit holders are required to provide their full amount of mitigation before the permit is issued. In the case of municipal and quasi-municipal permit holders, they have the option of providing mitigation incrementally to match the development of the permit over time. The amount of mitigation provided and entered into the streamflow model is currently less than what all permits issued under the mitigation program will need at full use levels. However, these users are providing more mitigation than required at current use levels. For example, in the General Zone of Impact, in 2015, the maximum amount of consumptive use allowed by municipal and quasi-municipal permit holders with incremental development plans was 6,992 AF. However, the authorized consumptive use (mitigation obligation) level under incremental development was 1,613 AF. The amount of mitigation provided by these users was 1178 AF and based on reported water use for 2015, these permit holders in the General Zone of Impact appear to have only needed about 778 AF of mitigation (consumptive use). There is a similar situation in each of the zones of impact.

Over time, as municipal and quasi-municipal permits with incremental mitigation plans and their mitigation are developed and added to the streamflow model, the Department anticipates that the annual change will move towards a more accurate reflection of the changes to streamflow. The Department will continue to evaluate streamflow model results on an annual basis to determine whether streamflows continue to be met on an equivalent or more frequent basis.

Summary

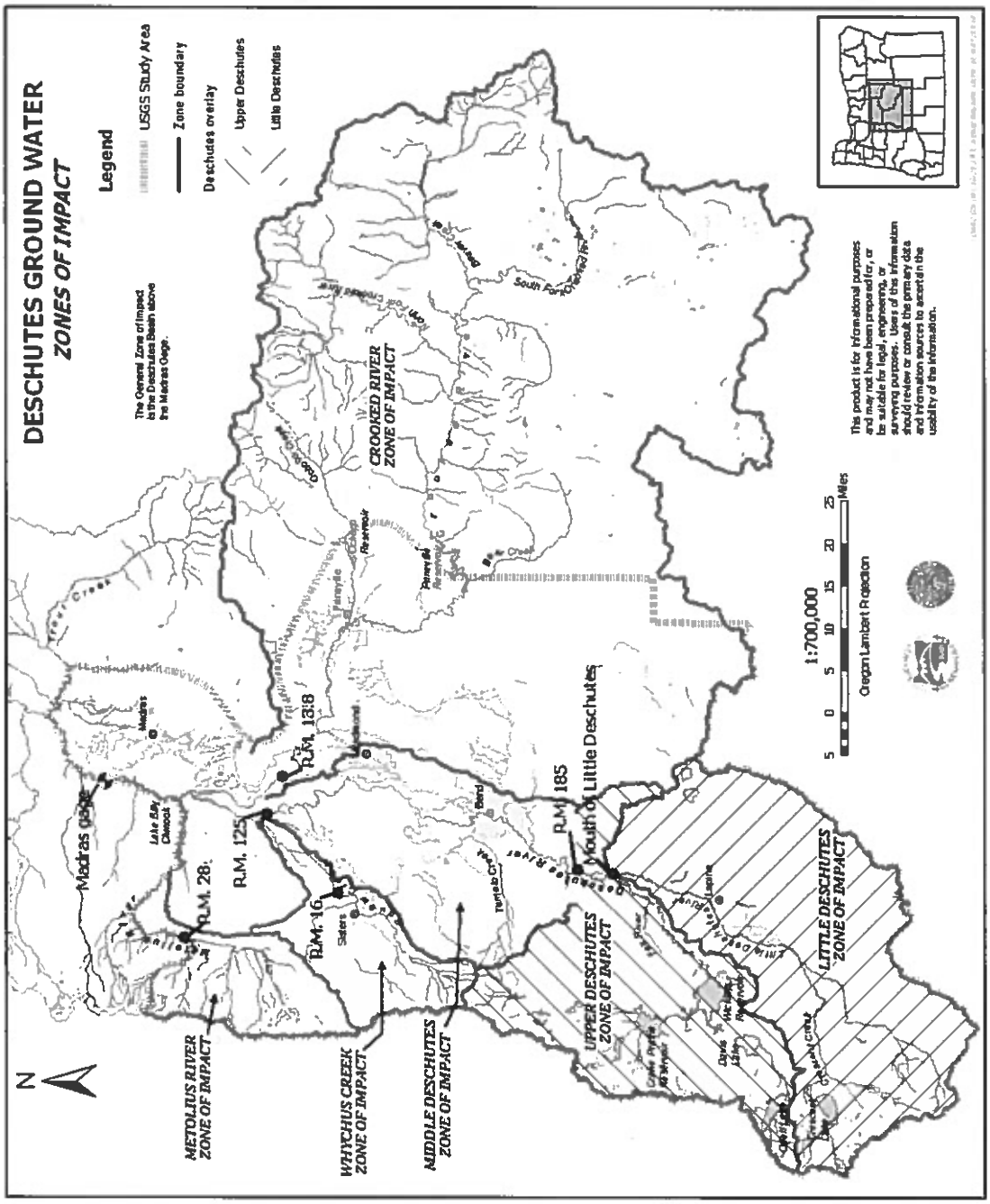
The Department continues to work hard to effectively implement the Deschutes Ground Water Mitigation Program. Groundwater permit applications and mitigation projects are moving through the required processes. The program is producing positive benefits as more mitigation water has been approved and protected instream than required for the 107 active groundwater permits and certificates issued.

Model results through 2015 suggest that the effects of the mitigation program on instream flows have largely remained minimal compared to base line conditions on an annual basis, with the notable exception of the Deschutes River downstream of Bend at Lower Bridge where the mitigation program has improved irrigation season flows by roughly 40-50 percent in a chronically dewatered reach. Seasonally, the mitigation effects on the instream requirements are negative during the non-irrigation season and positive during the irrigation season. These differences in seasonal effects are inherent in the mitigation program and will continue into the future. The relative impact to the percent of time the ISFR are met on a monthly basis depends on how close the ISFR is to the pre–mitigation streamflow and varies by each evaluation site.

Appendices

1. Deschutes Ground Water Study Area Zone of Impact Map
2. Comments from Oregon Department of Fish and Wildlife
3. Summary of Streamflow for Water Year Ending September 2015

Deschutes Groundwater Study Area Zone of Impact Map



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October 9, 2015

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RE: Deschutes Basin Groundwater Mitigation Program 2014 Draft Annual Report

Dear Ms. Wilke,

The Oregon Department of Fish and Wildlife (ODFW) appreciates the opportunity to comment on the Deschutes Basin Ground Water Mitigation Program 2014 Draft Annual Report. ODFW believes the program has been successful in maintaining and improving flows in the Middle and Lower Deschutes River during the irrigation season. Increases in stream flow during the irrigation season in the Middle Deschutes has provided an added benefit to the overall objective of the rules, which are to maintain Scenic Waterway flows in the Lower Deschutes River. ODFW believes the Oregon Water Resources Department (OWRD) has successfully implemented the Deschutes Ground Water Mitigation Rules and Deschutes Basin Mitigation Bank and Mitigation Credit Rules.

However, ODFW does have the following concerns with the Mitigation Program that we have expressed in the past and will reiterate now:

1. As currently designed, the Deschutes Groundwater Mitigation Program mitigates year-round groundwater withdrawals with irrigation season water. This type of mitigation does provide for more instream water during the irrigation season, but also will eventually reduce flows in the lower river during the non-irrigation season. All parties recognized this effect of the Program when the rules were developed. One of the reasons for the 200 cfs cap was to limit flow reduction impacts in the lower river outside of the irrigation season. All stakeholders recognized that non-irrigation flow concerns still needed to be addressed for the Deschutes basin as a whole.

   Stream flows outside the irrigation season are important to fish for a number of reasons, including providing habitat for spawning, rearing habitat throughout the year, and especially for spring outmigrating salmon and steelhead beginning in March and continuing through May.

2. ODFW recommends modifying the presentation of flow data. The annual reports for the Deschutes Ground Water Mitigation Program consistently present flow data on a monthly and annual basis, which demonstrate minor changes in flow. Because fish and other aquatic organisms are very susceptible to acute and chronic events (e.g., dewatered reaches or lower flow rates for extended periods), annual and even seasonal changes do not necessarily reflect true impacts to aquatic life. ODFW recommends presenting flow data in a form that is more relevant to fish needs, such as improvements in low flows, variability in flows throughout the year, and flows during critical time periods for fish.

3. ODFW supports maintaining the 200 cfs allocation cap until such time as the winter flow issues can be resolved. Maintaining the cap will ensure that groundwater reductions due to unmitigated non-irrigation season use is kept to a minimum. Critical fish life history components occur outside of the irrigation season, particularly during "shoulder months" at the beginning and end of the irrigation season (March/April and October/November). ODFW would like OWRD and program partners to work with us to seek options for year-round mitigation to offset year-round impacts. One option would be to forgo some stored water in Wickiup, Crane Prairie, Crescent, and other reservoirs during the non-irrigation season. This would better mitigate for the impacts of groundwater withdrawal on a true 1:1 basis.

4. ODFW is pleased to see that the majority of mitigation is being provided through permanent instream transfers but remains concerned with the number of permanent groundwater rights being mitigated with temporary leased water. This could set up the potential in the future to not have enough mitigation water to cover all the permanent groundwater rights that need mitigated. ODFW proposes that OWRD and program partners work more proactively to provide permanent mitigation water (permanent instream transfers) to offset groundwater pumping. In cases where permanent groundwater pumping certificates have been granted, temporary instream leasing provides no certainty that the mitigation will remain in place for the life of the permit and/or certificate. Annual reports continue to identify permit holders that have allowed temporary credits to expire while continuing to irrigate. ODFW supports WRD's goal of developing a "more robust and clear process for addressing permits without mitigation" and recommends WRD increase compliance monitoring and immediate regulation of non-compliant participants.

5. ODFW would also like to raise awareness of the potential impacts from the Mitigation Program to the recently ESA-listed Oregon Spotted Frog (OSF). The presence of an additional listed species within the Deschutes Ground Water Mitigation Area elevates the concerns ODFW has raised on the Program and our concern for the impact on the recovery of this threatened species. Improving winter flows on the upper Deschutes River below Wickiup Reservoir and on Crescent Creek is essential to the survival of the OSF, and the Program does not currently mitigate for flow impacts during the non-irrigation season. In addition, freshwater spring habitats in the upper Deschutes Basin have been determined to be critical to overwinter survival of the OSF. The Program annual reports

repeatedly state, "New groundwater uses produce a decrease in streamflow that is uniformly distributed over the year while mitigation projects generally increase streamflow only during the irrigation season." This continual detrimental impact to streamflow during the non-irrigation season is now a greater concern for more than just the "shoulder months." Again, ODFW would like OWRD and program partners to proactively seek options for year-round mitigation to offset the year-round impacts. One option would be to forgo some stored water in Wickiup, Crane Prairie, Crescent, and other reservoirs during the non-irrigation season to better mitigate for the impacts of groundwater withdrawal.

6. Although not included in the Mitigation Program but related to the increase in groundwater use in the basin, ODFW continues to have concerns with the localized impacts of groundwater pumping on local springs. Springs provide very important cold water inputs to streams by providing cold water refugia and other habitat benefits for fish and by helping cool stream temperatures during the summer in streams with depleted flows. While the water currently provided through mitigation has improved conditions during the irrigation season for fish and aquatic life in certain reaches relative to pre-mitigation program conditions, it is mostly warmer water from storage and does not yield equitable benefits compared to cool spring water. Over time, ODFW assumes that continued and increased groundwater withdrawal for agricultural, residential, and municipal needs will further affect springs when there is a surface/groundwater connection.

   ODFW requests that OWRD consider implementing a program to monitor key springs/spring complexes in the basin to determine ecological impacts to spring flow, including temperature and nutrient changes resulting from groundwater pumping. Monitoring impacts of groundwater pumping on springs and spring complexes is important in respect to their aquatic habitat, botanical, wildlife, water quality, water quantity, and societal values. This issue was recognized by state and federal agencies several years ago, but work to address the concerns faded due to other priorities. ODFW would like to re-engage on the spring flow concerns and is willing to work with other agencies to seek funding, coordinate efforts for research, and develop and implement a strategy to address spring flow reductions.

Thank you for the chance to comment. If you have any questions, please contact me at (503) 947-6092 or Brett Hodgson at (541) 388-6363.

Sincerely,

Danette L Faucera

Danette Faucera

Water Policy Coordinator

Oregon
Kate Brown, Governor

Department of Fish and Wildlife
Fish Division
4034 Fairview Industrial Drive SE
Salem, OR 97302
(503) 947-6201
FAX (503) 947-6202
www.dfw.state.or.us/

December 2, 2015

Laura Wilke
Flow Restoration Program Coordinator
Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, OR 97301-1271

RE: ODFW's Comments on the draft HB 3623 Report

Dear Ms. Wilke,

The Oregon Department of Fish and Wildlife (ODFW) appreciates the opportunity to provide comments on the November 5, 2015 draft House Bill 3623 Report. ODFW thanks the Oregon Water Resources Department (OWRD) for recognizing our past comments in the draft and for recently presenting those concerns to the Water Resources Commission. Overall, ODFW is pleased that the program has been successful in maintaining and improving flows in the Middle and Lower Deschutes River during the irrigation season. However, as the intent of this review is to improve the Program, ODFW would like to see WRD propose working solutions to our continued concerns beyond recognizing that discussions with stakeholders may be necessary. ODFW has submitted consistent concerns during each annual review, yet solutions have not been integrated into the Program. Specifically, ODFW would like to see tangible improvements to the Program in the following areas:

Impacts During the Non-Irrigation Season

As currently designed, the Deschutes Groundwater Mitigation Program mitigates year-round groundwater withdrawals with irrigation season water. This type of mitigation does provide for more instream water during the irrigation season, but also will eventually reduce flows in the lower river during the non-irrigation season. Critical fish life history components occur outside of the irrigation season, particularly during "shoulder months" at the beginning and end of the irrigation season (March/April and October/November).

In addition, the Mitigation Program poses potential impacts to the recently ESA-listed Oregon Spotted Frog (OSF) outside of the irrigation season. Improving winter flows on the upper Deschutes River below Wickiup Reservoir and on Crescent Creek is essential to the

survival of the OSF, and freshwater spring habitats in the upper Deschutes Basin have been determined to be critical to overwinter survival.

The continual detrimental impact to streamflow during the non-irrigation season is now a greater concern for more than just the "shoulder months." All stakeholders recognize that non-irrigation flow concerns still need to be addressed for the Deschutes basin as a whole. In the draft report, WRD recognizes this concern as well. However, rather than addressing the problem through improvements to the Program, the proposed solution is to rely on other restoration efforts in the basin to provide flow during the non-irrigation season. ODFW would like OWRD and program partners to work with us to seek options for year-round mitigation to offset year-round impacts. One option would be to forgo some stored water in Wickiup, Crane Prairie, Crescent, and other reservoirs during the non-irrigation season. This would better mitigate for the impacts of groundwater withdrawal on a true 1:1 basis.

Impacts to Springs

ODFW continues to have concerns with the localized impacts of groundwater pumping on local springs. Springs provide very important cold water inputs to streams by providing cold water refugia and other habitat benefits for fish and by helping cool stream temperatures during the summer in streams with depleted flows. Over time, ODFW assumes that continued and increased groundwater withdrawal for agricultural, residential, and municipal needs will further affect springs when there is a surface/groundwater connection. Impacts to springs from current and future groundwater withdrawals are exacerbated by the increasing trend to convert area irrigation canals to piped delivery systems. While this is positive in that it generates conserved water that results in improved instream flows in the middle Deschutes River, it also eliminates seepage, which recharges the aquifer and contributes to spring recharge of cold water. The result is an exchange (loss) of cold spring water for warmer water upstream. The fisheries impacts of this inconsistency is likely to become more pronounced in future years as climate change continues to be increasingly more influential. Cold water refugia could likely become critical to long term persistence of many fish species and populations.

ODFW requests that OWRD consider implementing a program to monitor key springs/spring complexes in the basin to determine ecological impacts to spring flow, including temperature and nutrient changes resulting from groundwater pumping. The current update to the groundwater flow model by the U.S. Geological Survey should include information to address this concern, where appropriate.

ODFW Comments 12/2/15

ODFW will participate in seeking solutions and is willing to work with other agencies to seek funding, coordinate efforts for research, and develop and implement a strategy to address these concerns. Thank you for the chance to comment. If you have any questions, please contact me (503-947-6092) or Brett Hodgson (541-388-6363).

Sincerely,

Danette Faucera

Danette Faucera
Water Policy Coordinator

Brett Hodgson
Deschutes District Fish Biologist

Oregon
Kate Brown, Governor

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September 19, 2016

Laura Wilke
Flow Restoration Program Coordinator
Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, OR 97301-1271

RE: Deschutes Basin Groundwater Mitigation Program 2015 Draft Annual Report

Dear Ms. Wilke,

The Oregon Department of Fish and Wildlife (ODFW) appreciates the opportunity to comment on the Deschutes Basin Ground Water Mitigation Program 2015 Draft Annual Report. Overall, ODFW is pleased that the program has been successful in maintaining and improving flows in the Middle and Lower Deschutes River during the irrigation season. However, as the intent of this review is to improve the Program, ODFW would like to see WRD propose working solutions to our continued concerns beyond recognizing that discussions with stakeholders may be necessary. ODFW has submitted consistent concerns during each annual review, yet solutions have not been integrated into the Program. Specifically, ODFW would like to see tangible improvements to the Program in the following areas:

Impacts During the Non-Irrigation Season

As currently designed, the Deschutes Groundwater Mitigation Program mitigates year-round groundwater withdrawals with irrigation season water. This type of mitigation does provide for more instream water during the irrigation season, but also will eventually reduce flows in the lower river during the non-irrigation season. Critical fish life history components occur outside of the irrigation season, particularly during "shoulder months" at the beginning and end of the irrigation season (March/April and October/November).

In addition, the Mitigation Program poses potential impacts to the recently ESA-listed Oregon Spotted Frog (OSF) outside of the irrigation season. Improving winter flows on the upper Deschutes River below Wickiup Reservoir and on Crescent Creek is essential to the

survival of the OSF, and freshwater spring habitats in the upper Deschutes Basin have been determined to be critical to overwinter survival.

The continual detrimental impact to streamflow during the non-irrigation season is now a greater concern for more than just the "shoulder months." All stakeholders recognize that non-irrigation flow concerns still need to be addressed for the Deschutes basin as a whole. In the draft report, WRD recognizes this concern as well. However, rather than addressing the problem through improvements to the Program, the proposed solution is to rely on other restoration efforts in the basin to provide flow during the non-irrigation season. ODFW would like OWRD and program partners to work with us to seek options for year-round mitigation to offset year-round impacts. One option would be to forgo some stored water in Wickiup, Crane Prairie, Crescent, and other reservoirs during the non-irrigation season. This would better mitigate for the impacts of groundwater withdrawal on a true 1:1 basis.

Impacts to Springs

ODFW continues to have concerns with the localized impacts of groundwater pumping on local springs. Springs provide very important cold water inputs to streams by providing cold water refugia and other habitat benefits for fish and by helping cool stream temperatures during the summer in streams with depleted flows. Over time, ODFW assumes that continued and increased groundwater withdrawal for agricultural, residential, and municipal needs will further affect springs when there is a surface/groundwater connection. Impacts to springs from current and future groundwater withdrawals are exacerbated by the increasing trend to convert area irrigation canals to piped delivery systems. While this is positive in that it generates conserved water that results in improved instream flows in the middle Deschutes River, it also eliminates seepage, which recharges the aquifer and contributes to spring recharge of cold water. The result is an exchange (loss) of cold spring water for warmer water upstream. The fisheries impacts of this inconsistency is likely to become more pronounced in future years as climate change continues to be increasingly more influential. Cold water refugia could likely become critical to long term persistence of many fish species and populations.

ODFW requests that OWRD consider implementing a program to monitor key springs/spring complexes in the basin to determine ecological impacts to spring flow, including temperature and nutrient changes resulting from groundwater pumping. The current update to the groundwater flow model by the U.S. Geological Survey should include information to address this concern, where appropriate.

ODFW Comments 9/19/16

ODFW will participate in seeking solutions and is willing to work with other agencies to seek funding, coordinate efforts for research, and develop and implement a strategy to address these concerns. Thank you for the chance to comment. If you have any questions, please contact me (503-947-6092) or Brett Hodgson (541-388-6363).

Sincerely,

Danette L Faucera

Danette Faucera
Water Policy Coordinator

Brett Hodgson
Deschutes District Fish Biologist

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

Effective Date: 9/30/2015
Deschutes River at Mouth
Time: 10:17 Date: 08/23/2016

Month	Base Line Percentage	Mitigated Percentage	Change in Percent
January	93.20	93.10	-0.11
February	90.80	90.40	-0.35
March	95.30	95.10	-0.22
April	99.90	99.60	-0.33
May	99.10	99.10	0.00
June	98.00	98.70	+0.67
July	91.00	92.70	+1.72
August	100.00	100.00	0.00
September	98.10	98.10	0.00
October	97.40	97.40	0.00
November	99.90	99.90	0.00
December	91.70	91.10	-0.64
Annual	96.20	96.30	+0.06

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

Effective Date: 9/30/2015
Deschutes River at Mouth
Time: 10:18 Date: 08/23/2016

Month	Base Line CFS	Mitigated CFS	Change in CFS	Percent Change
January	6910.00	6890.00	-24.40	-0.35
February	7080.00	7050.00	-24.40	-0.34
March	7250.00	7220.00	-24.40	-0.34
April	6640.00	6630.00	-4.37	-0.07
May	5800.00	5820.00	+13.00	+0.22
June	5200.00	5220.00	+25.60	+0.49
July	4590.00	4620.00	+28.20	+0.61
August	4380.00	4410.00	+26.90	+0.61
September	4430.00	4450.00	+17.70	+0.40
October	4710.00	4710.00	+4.76	+0.10
November	5390.00	5370.00	-24.00	-0.45
December	6190.00	6160.00	-24.40	-0.40
Annual	5710.00	5710.00	-0.68	-0.01

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

Effective Date: 9/30/2015
Deschutes River below Pelton Dam
Time: 09:16 Date: 08/23/2016

Month	Base Line Percentage	Mitigated Percentage	Change in Percent
January	64.70	64.10	-0.64
February	63.00	62.20	-0.83
March	67.80	66.90	-0.97
April	71.40	70.70	-0.78
May	58.80	62.30	+3.44
June	55.60	59.40	+3.89
July	41.00	43.90	+2.90
August	98.20	99.20	+1.08
September	66.80	67.60	+0.78
October	81.10	81.10	0.00
November	97.20	97.20	0.00
December	66.10	65.50	-0.64
Annual	69.30	70.00	+0.69

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

Effective Date: 9/30/2015
Deschutes River below Pelton Dam
Time: 09:16 Date: 08/23/2016

Month	Base Line CFS	Mitigated CFS	Change in CFS	Percent Change
January	5240.00	5220.00	-24.40	-0.47
February	5190.00	5170.00	-24.40	-0.47
March	5520.00	5500.00	-24.40	-0.44
April	5130.00	5130.00	-4.36	-0.09
May	4420.00	4430.00	+13.00	+0.29
June	4230.00	4250.00	+25.60	+0.60
July	4020.00	4050.00	+28.20	+0.70
August	3940.00	3960.00	+26.90	+0.68
September	3980.00	3990.00	+17.70	+0.44
October	4190.00	4200.00	+4.76	+0.11
November	4680.00	4660.00	-24.00	-0.51
December	5030.00	5010.00	-24.40	-0.49
Annual	4630.00	4630.00	-0.68	-0.01

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

Effective Date: 9/30/2015

Metolius River at Lake Billy Chinook

Time: 09:19 Date: 08/23/2016

Month	Base Line Percentage	Mitigated Percentage	Change in Percent
January	97.70	97.70	0.00
February	99.20	99.20	0.00
March	99.80	99.80	0.00
April	100.00	100.00	0.00
May	100.00	100.00	0.00
June	100.00	100.00	0.00
July	100.00	100.00	0.00
August	100.00	100.00	0.00
September	100.00	100.00	0.00
October	100.00	100.00	0.00
November	100.00	100.00	0.00
December	100.00	100.00	0.00
Annual	99.70	99.70	0.00

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

Effective Date: 9/30/2015

Metolius River at Lake Billy Chinook

Time: 09:19 Date: 08/23/2016

Month	Base Line CFS	Mitigated CFS	Change in CFS	Percent Change
January	1510.00	1510.00	0.00	0.00
February	1560.00	1560.00	0.00	0.00
March	1560.00	1560.00	0.00	0.00
April	1520.00	1520.00	0.00	0.00
May	1560.00	1560.00	0.00	0.00
June	1590.00	1590.00	0.00	0.00
July	1490.00	1490.00	0.00	0.00
August	1400.00	1400.00	0.00	0.00
September	1350.00	1350.00	0.00	0.00
October	1330.00	1330.00	0.00	0.00
November	1370.00	1370.00	0.00	0.00
December	1450.00	1450.00	0.00	0.00
Annual	1470.00	1470.00	0.00	0.00

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

Effective Date: 9/30/2015

Deschutes River at Lake Billy Chinook

Time: 09:27 Date: 08/23/2016

Month	Base Line Percentage	Mitigated Percentage	Change in Percent
January	100.00	100.00	0.00
February	100.00	100.00	0.00
March	100.00	100.00	0.00
April	97.10	99.80	+2.67
May	100.00	100.00	0.00
June	100.00	100.00	0.00
July	100.00	100.00	0.00
August	100.00	100.00	0.00
September	100.00	100.00	0.00
October	94.40	99.50	+5.05
November	100.00	100.00	0.00
December	100.00	100.00	0.00
Annual	99.30	99.90	+0.65

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

Effective Date: 9/30/2015

Deschutes River at Lake Billy Chinook

Time: 09:27 Date: 08/23/2016

Month	Base Line CFS	Mitigated CFS	Change in CFS	Percent Change
January	1300.00	1290.00	-8.16	-0.63
February	1320.00	1310.00	-8.16	-0.62
March	1300.00	1290.00	-8.16	-0.63
April	843.00	855.00	+11.80	+1.39
May	552.00	581.00	+28.40	+4.89
June	606.00	645.00	+38.60	+5.99
July	550.00	591.00	+41.00	+6.94
August	519.00	559.00	+39.60	+7.09
September	537.00	568.00	+30.40	+5.36
October	725.00	743.00	+17.70	+2.38
November	1130.00	1120.00	-8.16	-0.73
December	1220.00	1210.00	-8.16	-0.67
Annual	881.00	895.00	+14.00	+1.57

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

Effective Date: 9/30/2015

Deschutes River at Lower Bridge

Time: 09:29 Date: 08/23/2016

Month	Base Line Percentage	Mitigated Percentage	Change in Percent
January	60.50	59.00	-1.51
February	63.80	62.50	-1.30
March	68.30	67.70	-0.54
April	23.60	24.10	+0.56
May	1.29	1.40	+0.11
June	2.11	3.11	+1.00
July	0.11	0.54	+0.43
August	0.86	1.40	+0.54
September	3.67	4.00	+0.33
October	13.00	14.20	+1.18
November	52.20	50.90	-1.33
December	56.30	55.60	-0.75
Annual	28.60	28.50	-0.10

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

Effective Date: 9/30/2015

Deschutes River at Lower Bridge

Time: 09:29 Date: 08/23/2016

Month	Base Line CFS	Mitigated CFS	Change in CFS	Percent Change
January	683.00	681.00	-2.15	-0.32
February	705.00	703.00	-2.15	-0.31
March	714.00	711.00	-2.15	-0.30
April	299.00	313.00	+14.40	+4.61
May	51.20	81.40	+30.20	+37.10
June	50.50	90.20	+39.70	+44.00
July	42.60	85.10	+42.50	+49.90
August	46.20	88.10	+41.90	+47.60
September	61.00	94.10	+33.00	+35.10
October	222.00	244.00	+22.30	+9.13
November	551.00	549.00	-2.15	-0.39
December	614.00	612.00	-2.15	-0.35
Annual	335.00	353.00	+17.90	+5.07

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

Effective Date: 9/30/2015
Deschutes River above Diversion Dam at Bend
Time: 09:31 Date: 08/23/2016

Month	Base Line Percentage	Mitigated Percentage	Change in Percent
January	37.30	37.20	-0.11
February	40.00	39.30	-0.71
March	42.90	42.20	-0.75
April	73.20	73.30	+0.11
May	97.00	97.40	+0.43
June	100.00	100.00	0.00
July	100.00	100.00	0.00
August	100.00	100.00	0.00
September	97.00	97.80	+0.78
October	54.60	56.10	+1.51
November	29.00	28.70	-033
December	35.70	35.50	-0.22
Annual	67.40	67.40	+0.06

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

Effective Date: 9/30/2015
Deschutes River above Diversion Dam at Bend
Time: 09:32 Date: 08/23/2016

Month	Base Line CFS	Mitigated CFS	Change in CFS	Percent Change
January	712.00	710.00	-2.12	-0.30
February	738.00	736.00	-2.12	-0.29
March	781.00	778.00	-2.12	-0.27
April	877.00	881.00	+4.15	+0.47
May	1180.00	1190.00	+10.60	+0.89
June	1360.00	1370.00	+14.50	+1.06
July	1440.00	1450.00	+17.40	+1.20
August	1290.00	1310.00	+16.80	+1.29
September	1090.00	1100.00	+13.60	+1.23
October	721.00	729.00	+8.13	+1.12
November	590.00	588.00	-2.12	-0.36
December	650.00	648.00	-2.12	-0.33
Annual	953.00	959.00	+6.27	+0.65

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

Effective Date: 9/30/2015

Deschutes River at Benham Falls

Time: 09:33 Date: 08/23/2016

Month	Base Line Percentage	Mitigated Percentage	Change in Percent
January	43.40	43.20	-0.22
February	54.50	54.40	-0.12
March	32.50	31.40	-1.08
April	69.60	69.30	-0.22
May	78.10	78.10	0.00
June	92.60	92.60	0.00
July	96.80	96.80	0.00
August	94.50	94.60	+0.11
September	67.80	67.90	+0.11
October	54.00	54.00	0.00
November	35.90	35.70	-0.22
December	44.60	44.60	0.00
Annual	63.70	63.60	-0.14

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

Effective Date: 9/30/2015

Deschutes River at Benham Falls

Time: 09:33 Date: 08/23/2016

Month	Base Line CFS	Mitigated CFS	Change in CFS	Percent Change
January	814.00	812.00	-2.07	-0.25
February	845.00	843.00	-2.07	-0.25
March	901.00	899.00	-2.07	-0.23
April	1240.00	1240.00	-1.21	-0.10
May	1850.00	1850.00	+0.73	+0.04
June	2100.00	2100.00	+2.02	+0.10
July	2200.00	2210.00	+4.95	+0.22
August	2040.00	2040.00	+4.34	+0.21
September	1730.00	1740.00	+3.82	+0.22
October	1000.00	1010.00	+3.25	+0.32
November	685.00	683.00	-2.07	-0.30
December	752.00	750.00	-2.07	-0.28
Annual	1350.00	1350.00	+0.65	+0.05

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

Effective Date: 9/30/2015
Little Deschutes River at mouth
Time: 09:35 Date: 08/23/2016

Month	Base Line Percentage	Mitigated Percentage	Change in Percent
January	22.90	20.80	-2.15
February	37.30	34.60	-2.72
March	27.40	27.10	-0.32
April	45.20	45.00	-0.22
May	55.90	55.90	0.00
June	56.60	57.20	+0.67
July	85.10	88.30	+3.23
August	93.90	94.30	+0.43
September	72.00	73.30	+1.33
October	11.60	12.90	+1.29
November	14.70	14.00	-0.67
December	20.30	19.70	-0.64
Annual	45.30	45.30	-0.04

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

Effective Date: 9/30/2015
Little Deschutes River at mouth
Time: 09:40 Date: 08/23/2016

Month	Base Line CFS	Mitigated CFS	Change in CFS	Percent Change
January	162.00	160.00	-2.07	-1.29
February	183.00	181.00	-2.07	-1.14
March	219.00	217.00	-2.07	-0.95
April	262.00	261.00	-1.14	-0.44
May	329.00	329.00	+0.79	+0.24
June	298.00	300.00	+2.09	+0.70
July	230.00	235.00	+5.02	+2.13
August	200.00	204.00	+4.40	+2.16
September	144.00	147.00	+3.88	+2.63
October	76.70	80.00	+3.31	+4.14
November	108.00	106.00	-2.07	-1.95
December	142.00	140.00	-2.07	-1.48
Annual	196.00	197.00	+0.69	+0.35

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

Effective Date: 9/30/2015

Deschutes River above Little Deschutes River

Time: 09:42 Date: 08/23/2016

Month	Base Line Percentage	Mitigated Percentage	Change in Percent
January	29.70	29.70	0.00
February	30.10	30.10	0.00
March	33.50	33.50	0.00
April	68.40	68.40	0.00
May	97.80	97.80	0.00
June	98.80	98.80	0.00
July	100.00	100.00	0.00
August	100.00	100.00	0.00
September	99.80	99.80	0.00
October	56.80	56.80	0.00
November	20.90	20.90	0.00
December	24.70	24.70	0.00
Annual	63.50	63.50	0.00

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

Effective Date: 9/30/2015

Deschutes River above Little Deschutes River

Time: 09:42 Date: 08/23/2016

Month	Base Line CFS	Mitigated CFS	Change in CFS	Percent Change
January	329.00	329.00	0.00	0.00
February	331.00	331.00	0.00	0.00
March	319.00	319.00	0.00	0.00
April	654.00	654.00	0.00	0.00
May	1220.00	1220.00	0.00	0.00
June	1500.00	1500.00	0.00	0.00
July	1690.00	1690.00	0.00	0.00
August	1530.00	1530.00	0.00	0.00
September	1260.00	1260.00	0.00	0.00
October	561.00	561.00	0.00	0.00
November	246.00	246.00	0.00	0.00
December	280.00	280.00	0.00	0.00
Annual	829.00	829.00	0.00	0.00