



Memorandum

To: OWRD Division 512 Rulemaking Team

From: Darrick E. Boschmann, Hydrogeologist, Groundwater Section

Date: DRAFT 02/26/2024

Regarding: Response to RAC request: “sub-basin” PTW for the Harney Basin CGWA

Introduction

The Department has introduced preliminary Permissible Total Withdrawal (PTW) values to the Division 512 Rules Advisory Committee (RAC) based on the Department’s proposed approach of dividing the proposed Harney Basin Critical Groundwater Area (HBCGWA) into fifteen subareas for groundwater management (Figure 1). The 15 subareas are grouped into high priority and lower priority categories based on the severity of groundwater level declines (Table 1). In the high priority subareas PTW is determined using the hydrograph approach to identify the level of pumpage that can occur without resulting in groundwater level declines. In the lower priority subareas, the PTW is based on estimates of groundwater pumpage in 2018. These methods and PTW values were presented to the RAC at meeting 5 on January 24, 2024, and are not described in detail here.

Table 1: Proposed high priority and lower priority subareas.

High Priority Subareas	Lower Priority Subareas
Weaver Springs	Upper Silver Creek
Dog Mountain	Harney Lake
Lawen	Silvies
North Harney	Poison Creek – Rattlesnake Creek
Rock Creek	Crane – Buchanan
Crane	Windy Point
	Lower Blitzen – Voltage
	Upper Blitzen
	Malheur Lake

The Department is proposing the 15 subarea approach to target regulatory action in those areas that are experiencing the greatest rate and magnitude of groundwater level decline (high priority subareas), while limiting the impacts of pumpage reductions in those areas where the declines are not as severe (lower priority subareas). This targeted approach facilitates strategic pumpage reductions, limits the impact of reductions on the overall basin, and will stabilize groundwater levels in the high priority subareas faster than a broad approach to pumpage reductions. The methods and criteria used for delineating the 15 subareas were presented to the RAC at the 2nd RAC meeting on August 29, 2023, and are not described in detail here.

Members of the RAC have requested the Department present PTW values based on three larger “sub-basins”, preferring to have fewer larger areas across which to manage the groundwater level declines. Recommendations from RAC members for delineation of the larger “sub-basins” included using the USGS Watershed Boundary Dataset (WBD) (U.S Geological Survey, 2023) and/or using the three regions from Garcia and others (2022) that were delineated for the purposes of discussion and analysis of the water budget components within the basin.

This memo presents example PTW values based on one possible approach to dividing the HBCGWA into larger “sub-basins”, details the criteria used to delineate these areas, and outlines the criteria required for groundwater management across these larger areas to meet the Department’s management goals. Note that the term “sub-basin” as used in this memo is not used in the traditional hydrologic sense but is used here to describe the larger groundwater management areas delineated based on feedback from the RAC, and as such is framed in quotes.

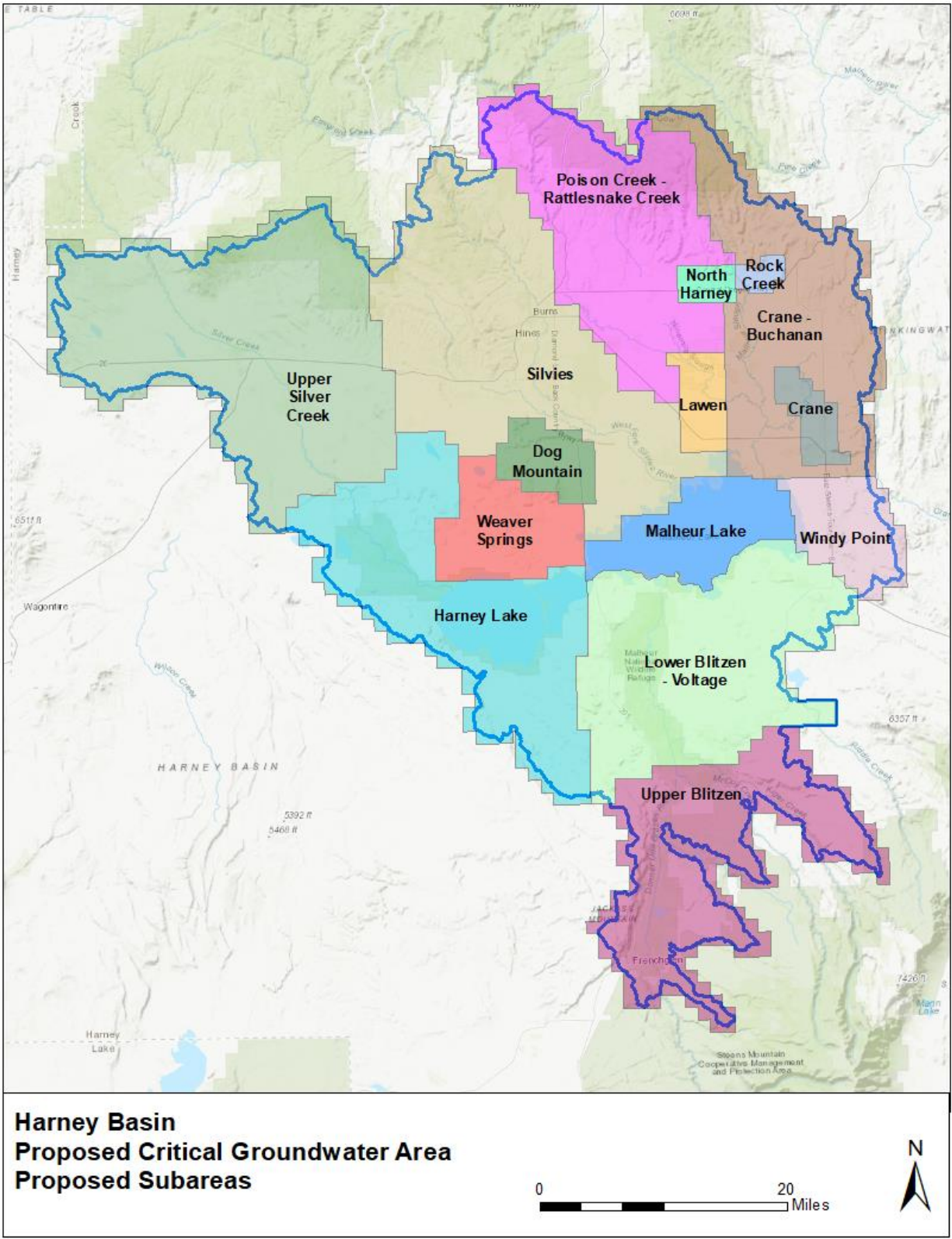


Figure 1: Map showing the 15 proposed subareas. Proposed extent of the Harney Basin Critical Groundwater Area represented by blue line.

“Sub-basin” Delineation

Members of the RAC have proposed the use of the USGS Watershed Boundary Dataset (WBD)(U.S. Geological Survey, 2023) and/or using the three water budget regions from Garcia and others (2022) for delineation of larger “sub-basins” for groundwater management within the HBCGWA. Additionally, there was widespread agreement amongst RAC members that the hydrogeologic characteristics and groundwater conditions in the Weaver Springs subarea were unique from the rest of the HBCGWA and should remain separate from the three larger “sub-basins”. Based on these recommendations, one possible approach to delineating the “sub-basins” is to group together the 15 proposed subareas into larger areas based on the WBD and USGS water budget regions as shown in Figure 2. The groundwater management areas depicted in Figure 2 include a “West sub-basin”, “North sub-basin”, and “South sub-basin”, with the Weaver Springs and Malheur Lake subareas remaining separate for a total of 5 areas. The Malheur Lake subarea remains separate in this example as it represents the area where groundwater flow converges at the center of the basin and is not appropriate to group together with any one of the other larger “sub-basins”. For this example, the 15 subareas are grouped into the five areas as follows:

1. “West sub-basin”
 - Upper Silver Creek
 - Harney Lake
2. “South sub-basin”
 - Upper Blitzen
 - Lower Blitzen – Voltage
3. “North sub-basin”
 - Dog Mountain
 - Silvies
 - Poison Creek – Rattlesnake Creek
 - Lawen
 - North Harney
 - Rock Creek
 - Crane – Buchanan
 - Crane
 - Windy Point
4. Weaver Springs
5. Malheur Lake

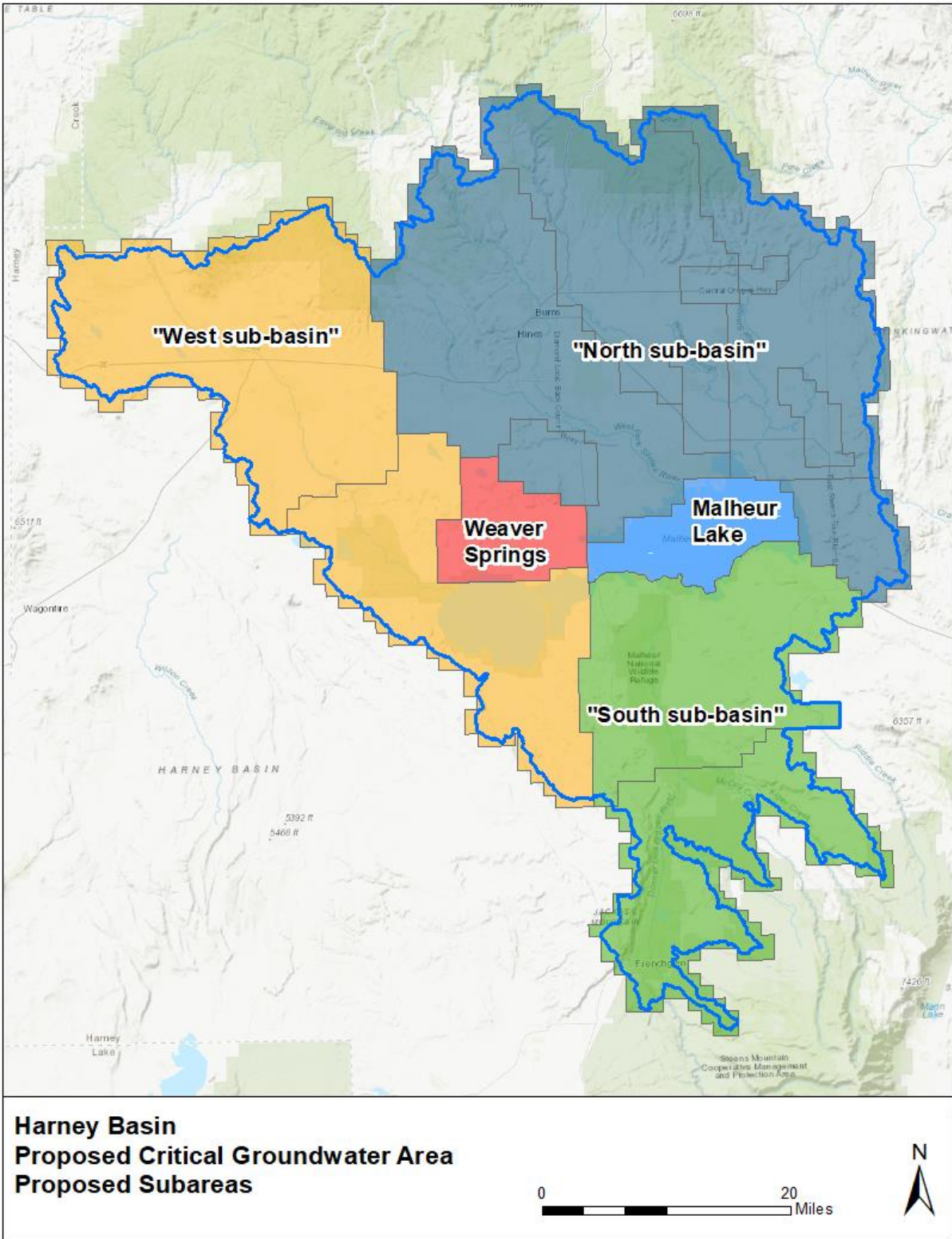


Figure 2: Map showing the 5 areas delineated for the example “sub-basin” approach. Outlines of the original 15 subareas shown in gray. Orange = “West sub-basin”; Dark Blue = “North sub-basin”; Green = “South sub-basin”; Red = Weaver Springs; Light Blue = Malheur Lake. Proposed extent of the Harney Basin Critical Groundwater Area represented by blue line.

Target Water Level Trend

The Department’s position is that the goal of any groundwater management actions in the basin is to stabilize the groundwater level declines, resulting in a target water level trend of no decline. Any proposed framework for facilitating groundwater management in the basin is required to meet this criterion. The Department’s proposed framework of 15 subareas, with targeted curtailment in those areas with the greatest rate and magnitude of decline (high priority subareas) is intended to achieve this goal while limiting the impacts of pumpage reductions in those areas where the declines are not as severe (lower priority subareas).

Grouping together both high priority subareas and lower priority subareas for the “sub-basin” approach and distributing pumpage reductions across these larger areas will require significantly more pumpage reductions in the lower priority subareas to achieve stable groundwater levels in the high priority subareas. The PTW for the entire “sub-basin” will be constrained by the pumpage reductions needed to achieve stable groundwater levels in those area with the most significant declines.

“Sub-basin” Permissible Total Withdrawal

The PTW values for the five areas delineated using the “sub-basin” approach as described above are based on the established PTW estimates presented to the RAC under the framework of the 15 subarea approach (hydrograph approach for the high priority subareas; 2018 pumpage for the lower priority subareas). The “sub-basin” PTW values are listed and compared to the Departments proposed PTW values in Table 2. The PTW values for the “West sub-basin” and “South sub-basin” are equal to the sum of PTW values of the grouped lower priority subareas from the Departments current proposed approach. These PTW values represent the 2018 pumpage across the entire “sub-basin”, and in effect represent no change to the Departments current proposed PTW values. The PTW values for Weaver Springs and Malheur Lake using the “sub-basin” approach are similarly unchanged from the Departments proposed subarea PTW values.

Table 2: Comparison of PTW values using the "sub-basin" approach versus the Departments proposed subarea approach. The PTW subarea summed values represent the sum of PTW values for the grouped subareas in each "sub-basin" using the Departments proposed subarea approach (2018 pumpage for lower priority subareas; direct hydrograph approach for Weaver Springs; median inflection point year for remaining high priority subareas).

Area	PTW sub-basin (ac-ft)	PTW subarea summed (ac-ft)
North sub-basin	43000	69000
West sub-basin	21300	21300
South sub-basin	13700	13700
Weaver Springs	5000	5000
Malheur Lake	0	0

The “sub-basin” approach PTW value for the “North sub-basin” is 26,000 acre-feet lower than the sum of PTW values of the nine grouped subareas from the Departments current proposed approach (Table 2, Figure 3). The pumpage reductions required in the Crane area are the constraining factor – pumpage

reductions necessary to achieve stable groundwater levels in the Crane area require annual pumpage equal to the volume pumped in the Crane area on or around 1987 as identified by the hydrograph approach. Grouping the Crane subarea with the other eight subareas in the “North sub-basin” requires the entire “sub-basin” be held to the ~1987 volume of annual pumpage. Note that for this example pumpage year 1990 was used for the Crane area and applied across the entire “North sub-basin”. This represents a somewhat larger annual pumpage than the Departments current proposed PTW for the Crane subarea and is used here to demonstrate that even with a somewhat larger allowance for the pumpage in the Crane area, the overall “sub-basin” PTW is still significantly lower than what the Department is currently proposing.

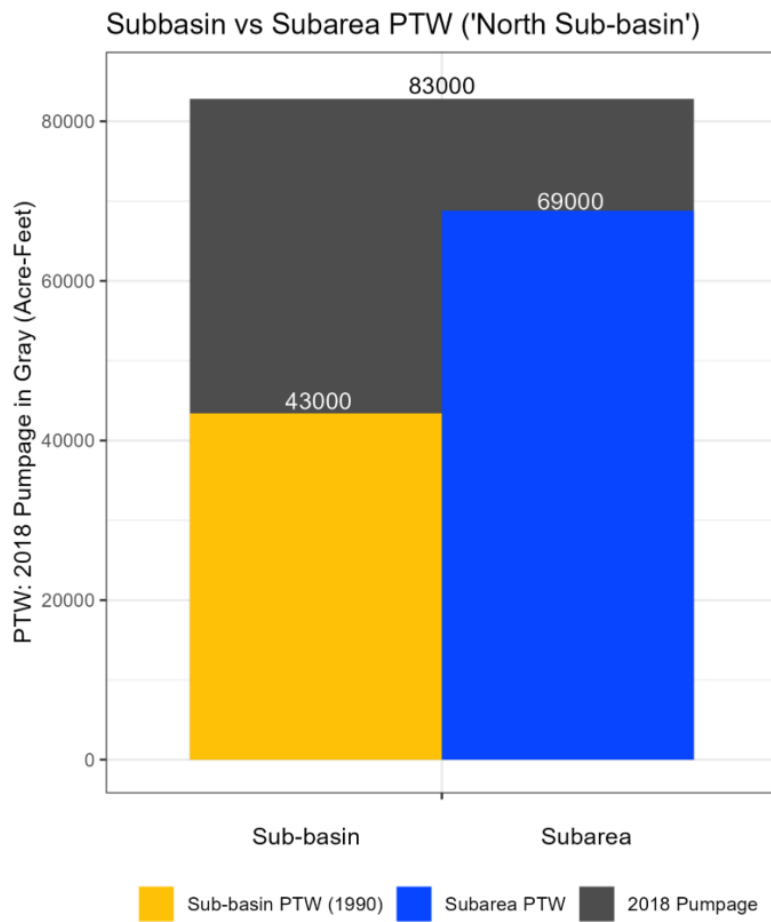


Figure 3: Comparison of PTW values for the "North sub-basin" using the sub-basin approach versus the sum of PTW values for the 9 grouped subareas using the subarea approach. 2018 pumpage in gray.

Figure 4 shows the comparison of PTW values using the "sub-basin" approach versus the subarea approach for the 9 individual subareas grouped into the “North sub-basin”. Note that for the “sub-basin” approach the individual subareas are not limited to the PTW values shown in figure 4, and that the sum of “sub-basin” PTW values (43,000 acre-feet) is instead distributed across the entire “sub-basin. The

values presented in Figure 4 are separated back into the nine component subareas that were grouped to form the “North sub-basin” to allow for a direct comparison between the two approaches in these areas. For the lower priority subareas within the “North sub-basin” (Windy Point; Silvies; Poison Creek – Rattlesnake Creek; Crane-Buchanan) the PTW from the “sub-basin” approach is significantly lower than the Departments current proposal of PTW values set at the 2018 pumpage. For the high priority subareas within the “North sub-basin” the comparison is variable – the PTW for Rock Creek and North Harney are somewhat lower than the Departments current proposed PTW; The PTW for Lawen and Dog Mountain are unchanged; and the PTW for the Crane subarea is higher than the Departments proposed PTW due to the use of the somewhat higher 1990 pumpage year for this particular example.

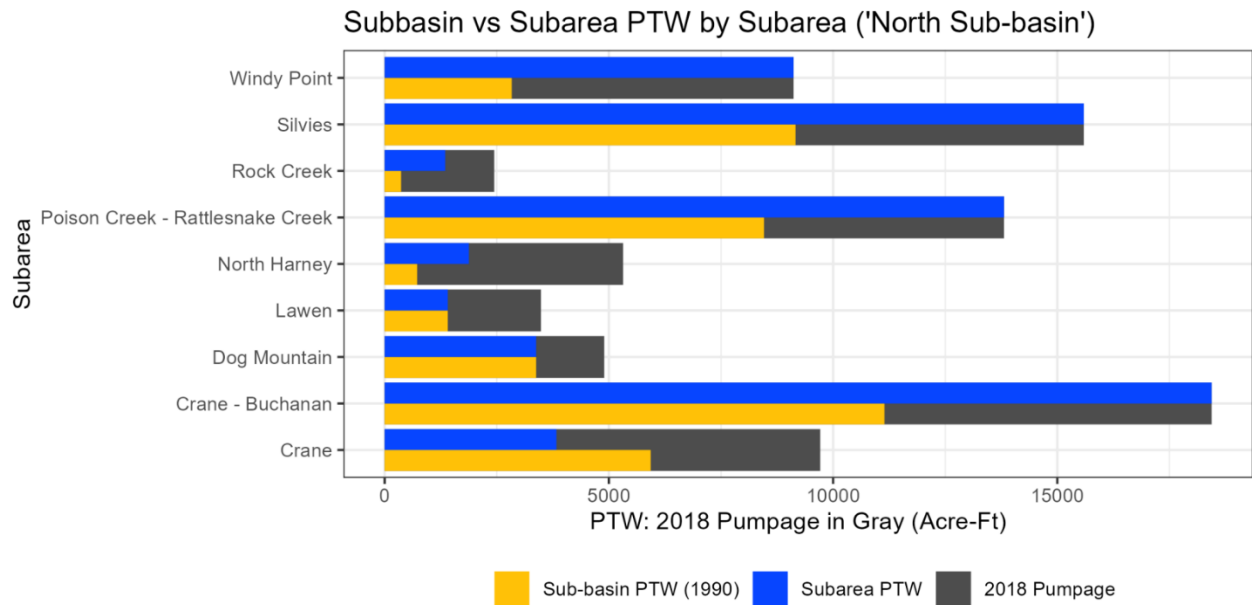


Figure 4: Comparison of PTW values using the “sub-basin” approach versus the subarea approach for the 9 individual subareas grouped into the “North sub-basin”.

Conclusion

To achieve the stated goal of stabilizing groundwater levels across the basin, the “sub-basin” approach for groundwater management in the proposed HBCGWA requires a lower overall PTW for the entire HBCGWA, with the PTW reductions focused on the “North sub-basin”. Under the example described here most of the areas in the “North sub-basin” corresponding to the nine grouped subareas receive a lower PTW than what is proposed under the 15 subarea approach. The “sub-basin” PTW for the Crane subarea is somewhat higher only because of the 1990 pumpage year used in this example. Overall, the PTW for the “North sub-area” is 26,000 acre-feet lower than the sum of PTW values of the nine grouped subareas from the Departments current proposed approach. The total “sub-basin” approach PTW across the rest of the proposed HBCGWA remains equal to the sum of PTW values across those areas proposed by the Department under the subarea management framework.

References

Garcia, C.A., Corson-Dosch, N.T., Beamer, J.P., Gingerich, S.B., Grondin, G.H., Overstreet, B.T., Haynes, J.V. and Hoskinson, M.D., 2022. Hydrologic budget of the Harney Basin groundwater system, southeastern Oregon. US Geological Survey Scientific Investigations Report 2021-5128.

U.S. Geological Survey, National Geospatial Technical Operations Center, 2023, Watershed Boundary Dataset (WBD) - USGS National Map Downloadable Data Collection: U.S. Geological Survey.