



Harney Groundwater RAC: Discussion Group Materials Examples of Adaptive Management

Prepared for: Harney RAC Discussion Group

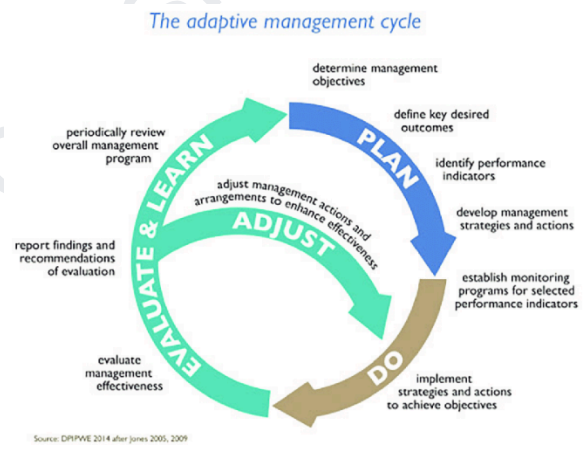
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Prepared for Discussion Purposes Only

This document was developed in response to Discussion Group requests to research adaptive management approaches of other state agencies, the federal government, and in other states. Adaptive management is a cycle and process for adjusting management based on changing information, evaluation and learning. See Figure 1 below.

Since the first meeting of the Division 512 Rulemaking Advisory Committee (RAC), RAC members have encouraged the Oregon Water Resources Department to consider options for adaptive management of groundwater reductions in the Harney Basin. This is the first time that the Oregon Water Resources Department is implementing the updated statute and rules to designate a critical groundwater area in Oregon. This presents both opportunities and challenges. Given the past success of collaborative and adaptive management approaches for other natural resources related challenges in the Harney Basin, members of the RAC have encouraged the Department to use this as an opportunity to try new approaches that might prove successful in the Harney Basin and elsewhere. Adaptive management is also encouraged in the Harney Community-Based Integrated Water Resources Plan (Attachment A).



Examples of Adaptive Management

Table 1 includes a brief overview of several examples of adaptive management employed by Oregon state agencies, the federal government and also agencies in other states. Other examples may be added over time. Review of these adaptive management approaches along with feedback provided by members and the RAC and discussion group resulted in identification of several potential mechanisms for adaptive management:

- **Monitoring and reporting** at regular intervals.

- **Incorporation of a plan or other planning documents by rule**, which could include details not appropriate for rule (e.g., monitoring plan, management plan, implementation plan, adaptive management considerations, etc).
- **Phased approaches to implementation** documented in rule with specific milestones, measures of success or triggers for action considered at key intervals or when certain conditions are met.
- **Creation of an advisory group or committee to advise** on adaptive management or other implementation considerations.
- **Establishment of a formal or informal adaptive management program or process.**

Elements of Adaptive Management

- Indicators of success
- Monitoring, analysis and reporting
- Evaluation of effectiveness
- Adjustment of management actions
- Milestones

Additional Adaptive Management Questions and Considerations

The Department is currently considering whether and how it could support adaptive management. The following questions and considerations might help inform whether and how groundwater can be adaptively managed in the Harney Basin:

- Through a review of other rules that deploy adaptive management in Oregon, there oftentimes is not clear statutory direction for adaptive management but agencies use their broad discretion to employ adaptive management approaches. A mix of mechanisms are used in Oregon and beyond.
- How can the rules be structured to allow for different approaches to allow management approaches to differ in different parts of the basin?
- At what intervals should certain analyses be performed to inform management decisions? What should the communication and public involvement be at those intervals?
- Can rules include criteria or triggers specifying when the Department would initiate a contested case process that would allow for curtailment/regulation?
- What elements of implementation can or should be phased in over time? What are the benefits and drawbacks of a phased approach?
- Is a phased implementation only possible under a voluntary approach or is it also possible under a regulatory approach?
- Once a contested case process is initiated how does that affect opportunities for adaptive management?
- If significant curtailments are needed in a particular area is adaptive management even possible?

- How can the broader community support adaptive management considerations and actions that are beyond the purview of the Water Resources Department (e.g., upland management, additional non-Department led monitoring efforts or actions, etc)?
- Given that we cannot foresee the needs for future community and economic development, is there a way that the rules can create a pathway for future development that would not further deplete the resource, such as an “offset” or “mitigation” approach?
- As groundwater irrigated lands are transitioned back to native or non-irrigated vegetation, how can this best be facilitated to address some of the concerns related to unmanaged or fallow land?
- Is there a process and criteria for lifting a critical groundwater area designation if groundwater management goals are achieved?

Table 1. Examples of Adaptive Management in Oregon and Beyond

Entity	Overview	Statutory Authority	Rule Reference	Rule Language
Oregon Water Resources Department	Creation of a Groundwater Study Advisory Group to advise on the Groundwater Study as it develops. Rulemaking process triggered after one year of publication of the Groundwater Study. Opportunity for voluntary cancellations to support development. Annual reporting to Commission and opportunity to adjust basin program rules based on monitoring results.	ORS 536.300	OAR-690-512-020	(4) Voluntary Cancellations for Groundwater Availability. (9) The Department shall report annually on the implementation of these rules to the Water Resources Commission early each calendar year beginning in 2017. The Commission may amend these rules to adjust the boundaries of the GHVGAC, or amend or repeal these rules. (11) The Department shall plan and conduct the study in coordination with a local Groundwater Study Advisory Committee (SAC) to be jointly appointed by the Department and the Harney County Court. [...] The Department shall provide the SAC a draft of the groundwater study report for review and comment prior to publishing the final report. (12) Within 1 year after the Groundwater Study discussed in subsection 11 has been published by the Department, the Department will convene a Rules Advisory Committee to explore whether there is a need for updates or changes to these rules. Members of the Groundwater Study Advisory Committee will be invited to participate on the Rules Advisory Committee.
Oregon Water Resources Department	Opportunity to adjust sustainable annual yield value over time and adjust subarea boundaries in the Umatilla Basin	ORS 537.515, 537.525, 537.545 & 537.730 - 537.745	OAR 690-507-0650, 690-507-0660, OAR 690-507-0680	(1) Each of the eight subareas in the Butter Creek Critical Groundwater Area shall be managed according to the sustainable annual yield within that subarea. The Department shall refine the sustainable annual yield value over time through

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	critical groundwater areas (rules encourage adaptive management but require rulemaking to make adjustments).		Umatilla Basin Program	the use of pumpage data and the response of groundwater levels. Butter Creek CGWA: Method for Determining the Sustainable Annual Yield Butter Creek (CGWA) Butter Creek CGWA: Distribution of Sustainable Annual Yield Butter Creek CGWA: Process of Periodic Review of Sustainable Annual Yield Butter Creek (CGWA) Annual Reporting Stage Gulch CGWA: Sustainable Annual Yield Stage Gulch CGWA: Method for Determining the Sustainable Annual Yield Stage Gulch CGWA: Distribution of Sustainable Annual Yield Stage Gulch CGWA: Process of Periodic Review of Sustainable Annual Yield Stage Gulch CGWA: Annual Reporting
Oregon Water Resources Department	Rules for the Deschutes Basin mitigation program that allows for additional groundwater development if mitigation credits can be acquired to offset potential impacts to the state scenic waterway.	ORS 537.746 , ORS 540.155	OAR 690-521 and OAR 690-522 and OAR 690-505-0050 – 690-5050630	Set of rules setting up a complex program whereby mitigation projects are completed for the development of credits that are then used to allow additional groundwater development. Requires ongoing monitoring and reporting to determine program adjustments.
Oregon Department of State Lands	Use of leasehold management plans and annual operating plans to	ORS 273.805 to ORS 273.825	OAR 141-110-005	(18) “Leasehold Management Plan” or “LMP” is a multi-year plan to guide the livestock grazing activities on a specific leasehold in relationship to

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	adaptively manage leases in accordance with rules.		(18) and 141-110-0100	other uses and resources, such as recreation uses, cultural resources, watershed resources, vegetation resources, and fish and wildlife habitat. (4) “Annual Operating Plan” or “AOP” is a plan developed every year by the Department following consultation by Department staff with a lessee to guide the grazing of livestock on a particular leasehold for a grazing year to meet the objectives outlined in an approved Leasehold Management Plan (“LMP”).
Oregon Department of State Lands	Adoption of management plans by reference (e.g. Lower Willamette River Management Plan) that is then used for ongoing management.	ORS 273.045	OAR 141-080-0105	The 1992 Lower Willamette River Management Plan as promulgated by the State Land Board and the Division of State Lands is hereby adopted by reference. Part F is the Implementation Plan.
Oregon Department of Environmental Quality	Rules governing the development and implementation of Total Maximum Daily Loads (TMDLs), which includes a Water Quality Management Plan (WMQP) that contains specific standards, strategies and actions, milestones, timelines for attainment of standards	ORS 468B.020	OAR 340-042	(15) “Total Maximum Daily Load (TMDL)” means a written quantitative plan and analysis for attaining and maintaining water quality standards and includes the elements described in OAR 340-042-0040. These elements include a daily load calculation of the maximum amount of a pollutant that a waterbody can receive and still meet state water quality standards, allocations of portions of that amount to the pollutant sources or sectors, and a Water Quality Management Plan to achieve water quality standards.

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	as well as monitoring considerations. TMDLs and their associated plans are adopted by rule.			Establishing Total Maximum Daily Loads (TMDLs) Total Maximum Daily Loads and Water Quality Management Plans
Oregon Department of Fish and Wildlife	The Oregon Wolf Conservation and Management Plan is incorporated by reference as rule. The plan is reviewed at least once every five years to determine revisions. The plan includes multiple phases, Phase I, II, and III that are triggered by different criteria.	ORS 496.012 , ORS 498.012	OAR 690-635-110	The rules specify different actions for different phases. The plan describes in greater detail the different management phases and when the management objectives are achieved for each phase.
Oregon Department of Forestry	Adoption of Adaptive Management Program rules that provide regulatory certainty by establishing a transparent mechanism for scientific testing of rules, and then changing them if needed.	ORS 527.710 36(7), chapter 33, Oregon Laws 2022	OAR 629-603	(1) The purpose of the adaptive management program rules is to provide science-based recommendations and technical information to assist the Board of Forestry in determining when it is necessary or advisable to adjust rules, guidance, and training programs to achieve the biological goals and objectives. Adaptive Management Program Committee
Broad State Policy	State agencies are encouraged to adopt and incorporate adaptive management mechanisms in their programs in order	ORS 468.581 – ORS 468.587	na	na

Entity	Overview	Statutory Authority	Rule Reference	Rule Language
	to support the maintenance, restoration, and enhancement of ecosystem services.			
Oregon Department of Fish and Wildlife	Sets forth rules for implementation of the Greater Sage-Grouse Conservation Assessment and Strategy for Oregon	ORS 498.500 – ORS 498.504	OAR 635-140	These administrative rules establish the policy of the Commission for the protection and enhancement of Greater Sage-Grouse in Oregon. These rules incorporate and supplement portions of the "Greater Sage-Grouse Conservation Assessment and Strategy for Oregon" (2011) ("the Strategy").
Oregon Watershed Enhancement Board	OWEB prepared a guide to inform adaptive management of restoration initiatives.	NA	NA	As a funder, OWEB is interested in helping grantees and other restoration partnerships apply the elements of an adaptive management framework to better understand and improve the impact of their investments. Adaptive management is an encouraged practice for restoration initiatives as detailed in this guide .
Bureau of Land Management	The Approved Resource Management Plan for the Oregon Greater Sage Grouse, including an Adaptive Management Strategy with hard and soft triggers.	Federal Land Policy and Management Act (FLPMA; 43 United States Code [USC], Section 1701 et seq.)	BLM planning regulations (43 Code of Federal Regulations [CFR] Part 1600)	BLM reports annually on Adaptive Management Triggers and pursuant actions in accordance with an Adaptive Management Strategy (first adopted in 2015 and updated in 2020) that outlines the process the BLM Oregon/Washington (OR/WA) used in cooperation with the ODFW and the U.S. Fish and Wildlife Service (FWS) to determine the annual status of sage-grouse adaptive management triggers.

Entity	Overview	Statutory Authority	Rule Reference	Rule Language
Arizona Department of Water Resources	Douglas Active Management Area includes an adopted management goal and the 1 st management plan, which specifies actions for the first 10 years of active management. Active management areas generally follow guidelines for five management periods specified in statute. Active Management Areas also include the creation of a groundwater users advisory council.	ARS 45-420 , ARS 45-421 , ARS 45-569		Statutory Language: B. Not later than two years after the designation of a subsequent active management area, the director shall promulgate an initial management plan for the active management area and may provide for subsequent management plans to be promulgated during the time set for achieving the management goal. The 1st Management Plan for the Douglas AMA includes reductions to be achieved in the first 10 years.

Chapter 10. Adaptive Management (Step 5)

Adaptive management is the process of learning while doing. It is dependent on monitoring outcomes of interventions (implemented strategies) and is based on a planning process that produces strategies that have expected outcomes. As specific strategies are implemented the expected outcome should be identified and the timeframe to accomplish those outcomes should be identified.

Central to any adaptive management program is monitoring the effects of implemented actions (strategies). Only by monitoring and evaluating the outcomes of implemented actions can judgements be made about progress towards goals. Monitoring demonstrates progress or lack thereof during critical milestones and allows for strategies to be adjusted for maximum efficacy. This process requires: 1) a commitment to identifying the expected outcomes in some measurable manner and the timeframe the expected outcome will likely respond, 2) regular monitoring of the indicator of the expected outcome, 3) reporting on the monitoring results, 4) Evaluation of the effectiveness given the expected timeframe for response, and 5) a commitment to adjust strategies based on feedback from monitoring and evaluation.

The adaptive management cycle (Figure 19) involves applying interventions (Tactical Strategies), monitoring outcomes, and adjusting tactics as outcomes indicate is necessary. Strategies to address the elements of the adaptive cycle have been identified by the Collaborative.

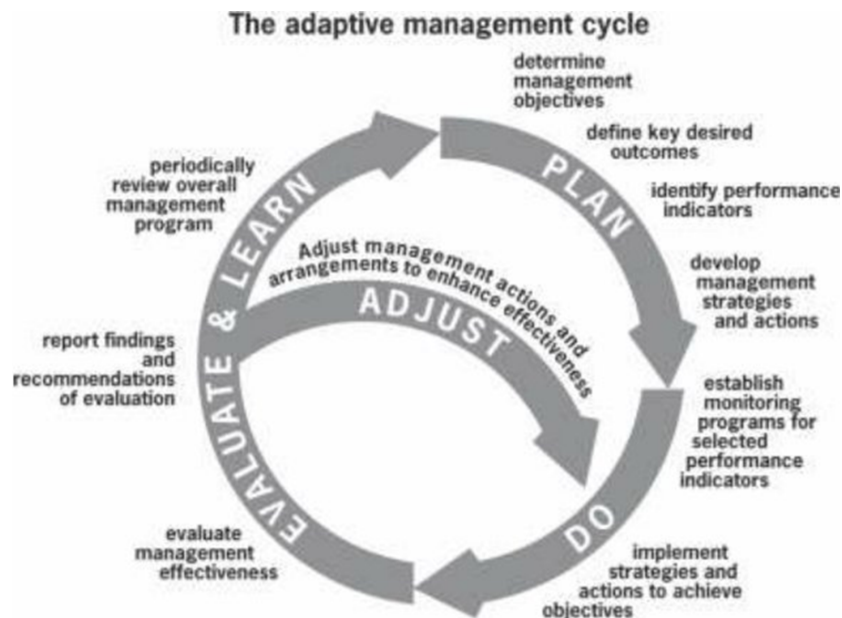


Figure 24. The Adaptive Management Cycle

Since there is no single strategy to address the groundwater declines in the Harney basin, it is important to evaluate the Tactical Strategies as they are implemented, document the goals and identify measurable benchmarks and measure progress against the desired benchmarks and report the results on a regular basis. The commitment to continued monitoring of groundwater levels by OWRD is an important first step, however, developing an effective method of monitoring and reporting groundwater use is critical to evaluate strategies proposing to reduce use. To be accountable, many of the Operational Strategies need to be in place to provide the information needed to evaluate the effects of Tactical Strategies. To make these adjustments in how groundwater use is managed in the basin several Organizational/Infrastructure Strategies need to be in place. Organizational/Infrastructure Strategies are particularly important for accountability.

What the above implies is that there are major changes necessary to reduce groundwater use to sustainable levels and that there is uncertainty about the outcomes of any given strategy. To “learn as we go” there needs to be a thoughtful way to identify the expected outcomes and a commitment of resources and establishment of capacity to measure and evaluate progress.

An additional consideration that is critical in managing groundwater is that the groundwater system does not react to changes uniformly or rapidly. Expectations of rapid change needs to be tempered

by improved sharing of information about groundwater response times and variations throughout the basin. It is hoped that the groundwater model being developed can be used to test scenarios to optimize where strategies can be implemented to have the maximum impact. The model runs should be reiterated over time as strategies are implemented to inform adaptive management.

Gleeson et al. (2012) highlights that “adaptive management to changing conditions (e.g., population growth, cultural or climate change, better theory or understanding, new measurements) allows for more resilient long-term management and potentially provides a bridge within and across generations for addressing the longer-term issues of groundwater sustainability”

A significant number of the Strategies identified by the Collaborative address the consideration of changing conditions and preparing for them (Drought Planning Strategy, Alternative Crops Strategy, GDE resources Strategy, Inventory Unused Wells), Improving understanding of groundwater conditions Strategies, and to determine the value of groundwater in Harney County Strategy). As these strategies are implemented, they can lead to changes that affect tactical approaches to managing groundwater.

Chapter 11. Conclusions

Following more than 5 years of deliberation and study and the formal publication of the Harney Basin Groundwater study (Gingerich et al., 2022; Garcia et al., 2022), the community has wrestled with strategies to reduce groundwater use. The groundwater study documents areas of the basin with groundwater declines, estimates that the groundwater budget is out of balance by more than 110,000 acre-feet/year, and that much of the groundwater used for irrigation is ancient water from storage. The steps necessary to change the amount of groundwater use and address the areas of critical decline remain. The Collaborative has gleaned a significant number of strategies through community input and involvement from organizations interested in the public’s water. Implementation of the strategies will make progress towards reducing the amount of groundwater used to start reducing the rate of decline. The community will focus their efforts on near-term implementation and look for ways to reduce groundwater irrigation use that protects domestic