Harney County Community-Based Water Planning

*Quarterly Full Collaborative **Summary Notes***

July 19, 2017 meeting

***Meeting Convened by*:**
Harney County Watershed Council (HCWC)
Harney County Court

***Presenters*:**
Hank Johnson, hydrologist, Oregon Water Science Center, USGS
Michael Campana, hydrogeologist, OSU

Overall Process Purpose: *The overall purpose of this planning process is to engage a broad, representative group of stakeholders and other interested members of the public to begin the process of developing a long-term integrated water resources strategy that will meet the needs of Harney County. In the near term, the process will fulfill the requirements of the **Community-Based Water Planning** grant awarded to Harney County Watershed Council by the Oregon Water Resources Department.*

Meeting Purposes:

1) *The Declaration of Cooperation will be reviewed and participants will be invited an to sign on;*
2) *Updates on water planning-related projects in the County will be provided;*
3) *USGS will give a presentation on the hydrology of Harney Basin as a closed basin drainage;*
4) *OSU hydrogeologist will lead a discussion to help identify areas of the greatest potential influence;*

Peter Harkema, facilitator with Oregon Consensus opened the meeting and welcomed participants. He outlined the evening's objectives, touched on the discussion protocols, and then turned the meeting over to Mark Owens.

Declaration of Cooperation: *Mark Owens/Peter Harkema*

Mark Owens, County Commissioner, outlined the *Declaration of Cooperation* document and the reasons for the cooperative agreement. Mark said that the goals of this process are to be open, transparent and inclusive, with balanced representation from a diverse group of stakeholders. Community backing and dedication to the process is important.

He explained that as we've gotten further into the planning process, it's become clearer that funding is needed outside of the original grant from OWRD.[1] The OWRD grant will provide seed money for the later planning stages and the implementation phases. As we begin to look for this additional funding, the Declaration of Cooperation will serve to show funders that we have the broad base of community support crucial to long-term success.

Peter Harkema stated that this *Declaration* illustrates that the community backing the process has a shared vision and shared goals for Community-Based Water Planning. In addition, as a call-back to the

[1] The OWRD grant provides funds on a year-by-year basis, with the final disbursement in 2019.

Collaborative's Working Agreements, "it is your commitment to each other, on how you'll work cooperatively together, and on consensus decision making protocols, etcetera."

Vision of the Harney County Community Based Water Planning Collaborative: ***A sustainably managed supply of quality water for people, the economy, and the environment.***

Through collaborative, community based planning, a diverse group of partners will work together to:

- More effectively balance water uses between many different water needs.
- Promote conservation and efficiencies in water use.
- Maximize the value of each unit of water that is put to use.
- Ensure adequate, clean water supplies for people, the economy, and the environment.

The *Declaration of Cooperation* itself is a simple declaration that by signing indicates you support and would plan to participate in the process. It includes a brief description of the need for CBWP as well as an organizational chart. The last page provides space for signatures. The Declaration was circulated around the room for participants to review and sign.

Updates on Water-Related Projects in Harney County:

There are several water-related projects in the County which are directly or tangentially related to Community-Based Water Planning. The Water Availability Work Group is a committee of CBWP. The monitoring project by the Crane students is being funded by CBWP. The USGS/OWRD Groundwater Study is separate from CBWP but data from the study will be used to help develop the integrated water resources plan.

1) **Water Availability Work Group *Research Team* Update**- *Morgan Corrigan*

During the June 28th Water Availability Work Group meeting, a subcommittee was formed to begin looking into the issues/questions raised during the meeting's discussion session. Morgan Corrigan, an OSU student who has taken classes from OSU hydrogeologist Michael Campana and who is interning with the Harney County SWCD, volunteered to lead the subcommittee. Eight other participants volunteered to participate.

The first Research Team meeting was held on Tuesday, July 11th. Morgan reported that during the first meeting, the subcommittee:

- Discussed the importance of assurances that irrigators who do conserve water wouldn't lose that portion of their water right, and also talked about the idea of a "safe harbor" for conserved water.
- Considered the possibility of having the issue of assurances addressed by OWRD at an upcoming subcommittee meeting or Water Availability Work Group meeting.
- Discussed the issues surrounding a groundwater irrigation district, acknowledging the need to thoroughly investigate the pros and cons, along with the barriers to and the difficulties of the formation of such a district. It was suggested that the manager of the Three Sisters Irrigation District might be willing to speak to the subcommittee via conference call. The subcommittee will also be looking at possibility of talking to a groundwater irrigation district in Idaho, since there are no groundwater irrigation districts in Oregon.

- Talked about the importance of promoting of the Community-Based Water Planning, possibility through newspaper articles, a fair booth, and a billboard, with the understanding that the Coordinating Committee would need to weigh-in on these ideas.

2) **Monitoring Crane Student interns**: *Rhett Landon and Levi Roath*

As part of CBWP, some of the OWRD grant money is supporting a groundwater monitoring project being undertaken by Crane students Rhett Landon and Levi Roath, and a Portland State University graduate student.[2] The graduate student is conducting an isotopic study on springs in the Harney Basin along with some area wells.

Rhett Landon gave an update on their activities. Rhett said that their project started in the fall of 2015. This summer they have been testing wells all across the basin, testing for total dissolved solids and taking temperature readings. They also collect water for isotope testing. The isotope data can paint part of a picture on where the water may have been.

Rhett related that one of the findings that their biology teacher found interesting is this year there has been a loss of water from a hot artisan well in the basin. It was a well drilled in the 1930s and always has had hot water flowing. (The depth is 1300 ft). This finding may be something that will be investigated further by OWRD.

He also gave credit to Crane, Diamond, Frenchglen, Suntex Elementary schools and Silvies River charter school for their help in collecting water samples

3) **USGS/OWRD Groundwater Study Update:** *Mark Owens*

Background: *In response to concerns over groundwater development and declining groundwater measurements, Oregon Water Resources Department announced a moratorium on further development in June 2015 in an area of greatest concern in Harney County (denoted as Greater Harney Valley Groundwater Area of Concern). The moratorium will be in effect until a study of groundwater conditions in the Harney Basin is completed to better understand area groundwater resources.*

This Ground Water Study (GWS) is jointly conducted by the OWRD and the United States Geological Survey (USGS). The study is being planned and conducted in coordination with an advisory committee of local landowners, well drillers, and conservation group representatives, along with members the scientific community. The advisory committee referred to as the GroundWater Study Advisory Committee (GWSAC). Public meetings are held in Burns every quarter to promote an open exchange of information, data and ideas, as well as to keep the public informed. The quarterly meetings are held a day prior the quarterly Community-Based Water Planning (CBWP) Collaborative meetings.

Update from Mark Owens:

Mark Owens, County Commissioner and alfalfa producer, is the Chair of the advisory committee. He gave a brief update on the July 18th GWSAC meeting. Mark said that the USGS presented an overview of existing studies and data. They also gave a summary of how data and information from the existing studies is being

[2] Funding is only going towards the efforts by Crane Union High School.

used in the current study. The most recent comprehensive study was completed in 1970, with other past studies in 1939 and in 1901.

Mark stressed that the groundwater study is now only in the data gathering stages. So, no answers or results are yet available. A quantitative conceptual model report will be released in 2019, with a numerical (computer simulation) report in 2021-2022.

Currently, USGS/OWRD can tell us how they will be collecting data and how they may be interpreting the data. It's important to also note that although the final outputs of the scientific investigation will be helpful for water resource management decisions, the USGS does not make management recommendations nor does it take any regulatory actions.

Data from the Groundwater Study will be used in the Community-Based Water Planning process to help develop our long-term integrated water resources plan for a sustainable water future in Harney County.

Link: http://www.oregon.gov/owrd/Pages/Place/Malheur_Lake_Basin.aspx#Groundwater_Study

Making a Water Cycle Conceptual Model Relevant to Harney County

Hydrology of Closed Basin Drainages: *Hank Johnson, hydrologist, Oregon Water Sciences Center, USGS*

Hank started his presentation by giving an overview of patterns in the Northwest and in the Great Basin. The Great Basin covers areas in across sections of Oregon, Idaho, Utah, Wyoming, Nevada and California. The watersheds in the Great Basin are all closed basin watersheds.

The Great Basin is arid with islands of moisture:

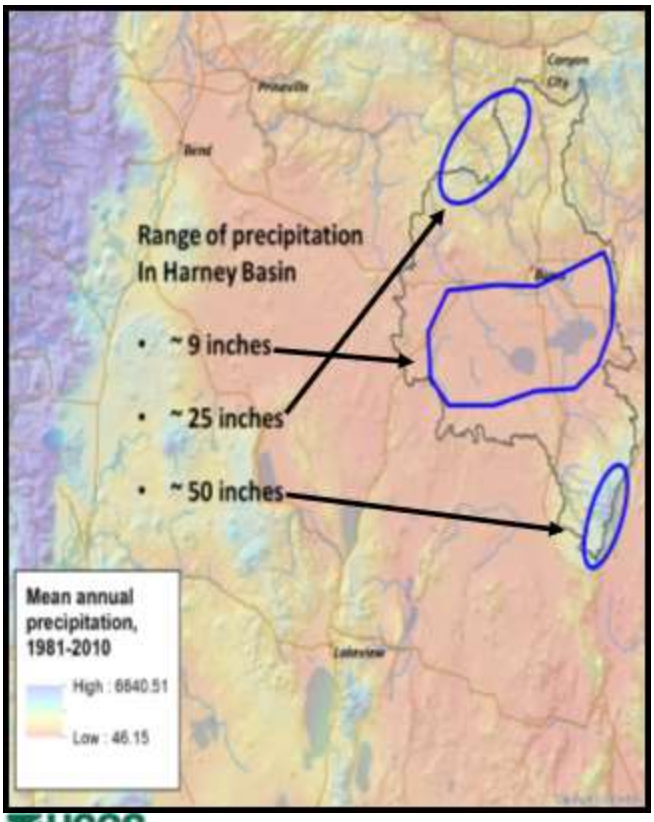
The Great Basin shown as the darker shaded area. The areas of evaporative lakes are circled in yellow.

In Oregon, crest of the Cascades, precipitation (snow and rain combined) is about 150", Blue Mountains, about 45", Steens, about 50".

Evaporative lakes or playas form adjacent to well watered uplands. These playas are seasonal lakes experience extensive evaporation by mid-summer. This lakes tend to be higher have high salinity.

Closed basin evaporative lakes in Eastern Oregon include: Summer, Abert, and Goose, along with Harney and Malheur.

Variability of Precipitation in the Harney Basin:



Portions of Eastern Oregon, shown with precipitation legend. The boundaries of the Harney Basin are illustrated by the grey border line.

In the Harney Basin, precipitation varies greatly between the upland areas and the valley floor. Upland areas regularly receive three to five times as much as the valley floor.

Greater precipitation and greater recharge often occur in upland areas such as the Blue Mountains and the Steens. Infiltration in upland areas often emerge as springs closer to the valley bottom.

Other areas of recharge may include stream alluvial fans at the base of uplands where streams leave the uplands and enter adjacent valleys.

The Silvies alluvial fan, where the Silvies River leaves the uplands and enters the valley floor is likely a recharge zone as there are coarser sediments that allow the water to travel downward. There might be other areas that contribute to recharge.

Water movement in a "basin and range" geologic system:

Harney Basin has a "basin and range" geologic setting.

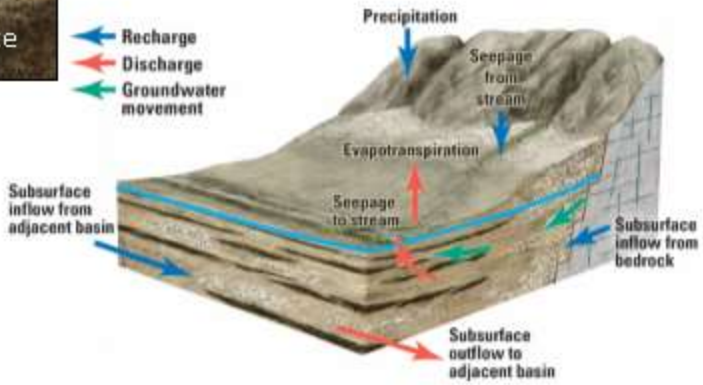
The slide below illustrates the primary pathways by which water moves through a "basin and range" system.

Winter Ridge and Summer Lake provide a good example of the topography.

Blue arrows depict water moving into or through the system.

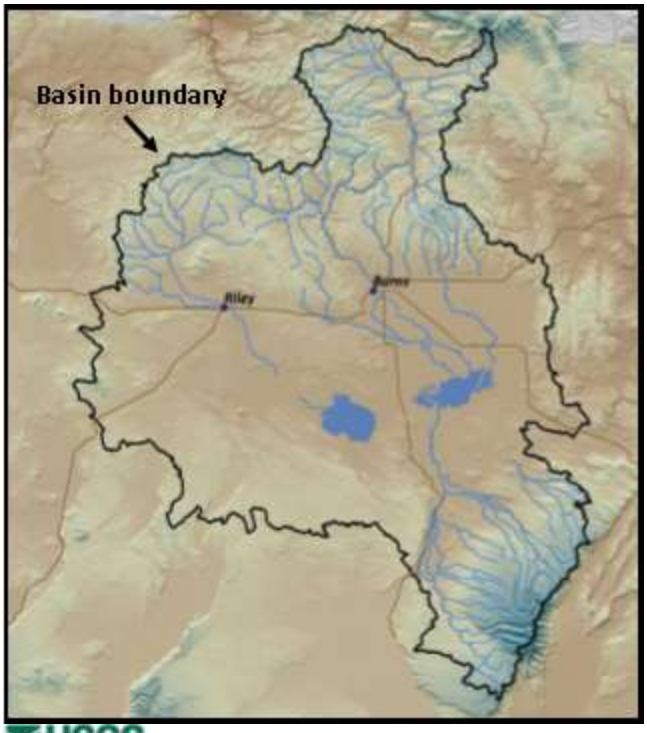
Red arrows depict water moving out of the system.

Green arrows show the direction of ground-water flow.



USGS

Harney Basin as a closed system:



Harney Basin, with rivers, streams and the lakes shown.

As a closed basin, Harney Basin is topographically contained. Surface water outside the basin boundary flows in another direction. Water settling at the bottom of the basin can be visualized as draining a bathtub. In the basin, water drains towards the lakes, as the valley bottom.

The only major outlet for water from a closed basin system is evapotransporation.

In a closed basin, there being no surface water outlet for water, the closed lake system tends to be subject to higher salinity, due to the evaporative effects. Malheur Lake is a freshwater lake, while Harney Lake contains more saline-alkaline.

* Harney Basin wasn't always a closed basin, approximately 30,000 years ago lava flows closed it off in the east.

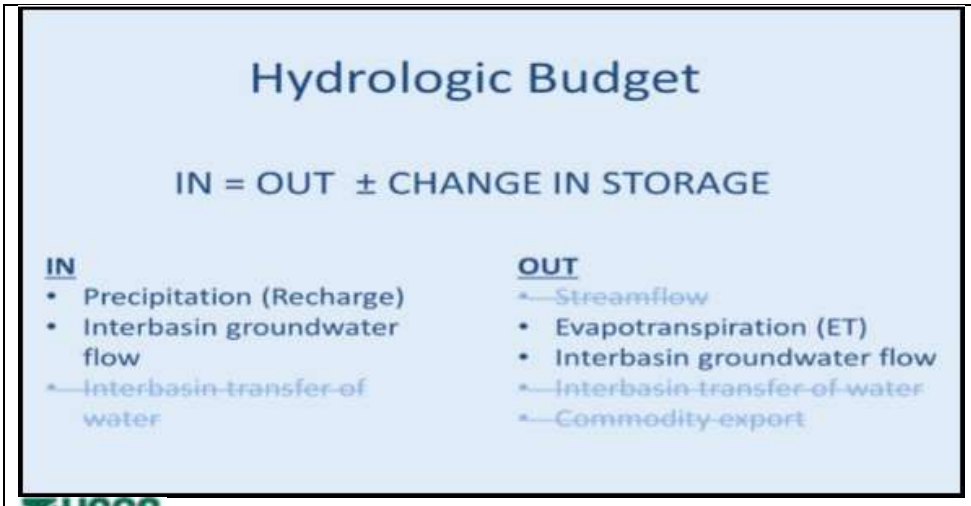
Hydrologic Budget: Water Accounting

In the next section of Hank's presentation he reviewed the hydrologic budget and its importance to potential water planning and resource management decisions. He said that the USGS is looking to capture detailed information on the IN/OUT accounting of water in the basin. This data will help us to determine which areas we can affect and to what degree management actions would be successful. Hank reiterated that USGS does not make management recommendations nor does it take any regulatory actions.

The hydrologic budget can be compared to a checking account:

Water **IN** – Water **OUT** = **the change in Storage.**

The components that affect Storage:



This slide shows the Hydrologic budget in a closed basin versus a basin that is not closed. The flows in light blue which are stricken out are those flows that do **not** occur in a closed basin. Water IN in a closed basin only includes Precipitation (as recharge) and inter-basin groundwater flow. There is no inter-basin transfer of *surface* water- no water is coming in from any adjacent basins. Similarly, water is only removed (Water OUT) from our basin by (ET) and inter-basin groundwater flow. Commodity export is not a significant component of water leaving our basin.

What is left are the components that affect the balance of storage.

Hydrologic Quasi-Equilibrium:

Change in the System introduced by development. Pre-Development, prior to the population growth in Harney County, and related groundwater development, there was tremendous variability in components of the water budget: annually, decadal, and even in centuries of inflow and outflow. However on average the water budget was balanced. This was called a Quasi-Equilibrium, a concept put forth by the 1909 Waring study. As water resources development increased, it started to impact the water budget:

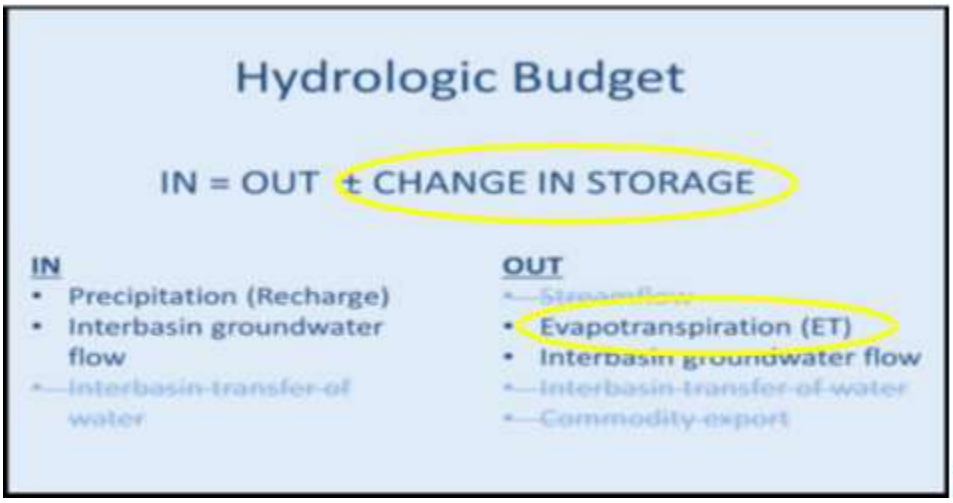
Surface Water diversion and irrigation:

- *Some* effect on evapotranspiration (ET)

Groundwater development:

- *Large* increase in ET
- Depletion of storage = declining groundwater (GW) levels

Groundwater development and surface water diversion/irrigation has increased the impact of ET on the hydrologic budget, to such a degree that the change in Storage is largely driven by ET.



Other impacts driving increases in ET are the recent, higher temperatures in the summers. Higher temperatures cause there to be greater ET from both natural vegetation and crops grown on irrigated land.

Toward a New Quasi-Equilibrium in the Harney Basin Hydrologic Budget:

Development of water resources and warmer summers are driving the system to a **New Quasi-Equilibrium**. The main characteristics of a new-quasi equilibrium may be:

- Lower water levels in aquifers
- Reduction or loss of streamflow
- Reduction or loss of spring flow
- Decreasing qroundwater quality
- Lower lake levels and smaller areal extent

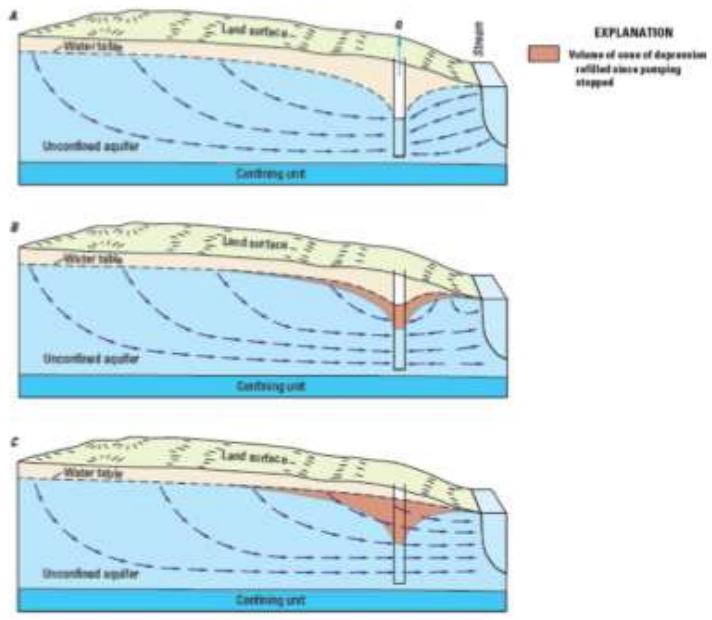
Hank mentioned that until development stops, the system won't get to a new equilibrium, as each new pivot can change the water balance.

Groundwater development: Effects vary with time and distance:

- We may not see the full effects of the current levels of groundwater pumping until far into the future.
- It takes time (years to decades) for the effects of groundwater development to be realized.
- Proximity to recharge sources will buffer the impact of development – INTERCEPTION.
- Magnitude of impact generally decreases with distance from pumping. Geology and proximity to recharge matter.

Pumping and the Cone of Depression: Volume of depression refilled after pumping stops:

It takes time for a system to recover to pre-pumping condition after pumping is halted. The effects of pumping can be reversible. These images show how a cession in pumping affects springs and streamflow:



USGS

Residual effects of streamflow depletion after pumping stops.
A: During pumping, the pumping rate at the well is balanced by decreases in aquifer storage and by streamflow depletion, which consists of captured groundwater discharge and induced infiltration of streamflow.

B: After pumping stops, groundwater levels begin to recover, and water flows into aquifer storage to refill the cone of depression created by the previous pumping stress.

C: Eventually, the system may return to its pre-pumping condition with no additional changes in aquifer storage or streamflow depletion. [Q, pumping rate at well]

Barlow, P.M., and Leake, S.A., 2012, Streamflow depletion by wells--Understanding and managing the effects of groundwater pumping on streamflow: U.S. Geological Survey Circular 1376.

Discussion following Hank's presentation:

Do we know the sub-basin IN/OUT?

No, not yet. This will be something that the Groundwater Study will examine in Phase II of the numerical model, when we have a better understanding of water movement.

Will water budgets be developed for areas other than the major recharge zones?

Yes. Budgets will be developed for the entire basin, using different identified hydrologic sub-areas. The data will show us how the water flows laterally and vertically, and what is connected and what is not.

Do we know how Phreatophytes like greasewood and rabbitbrush affect the system?

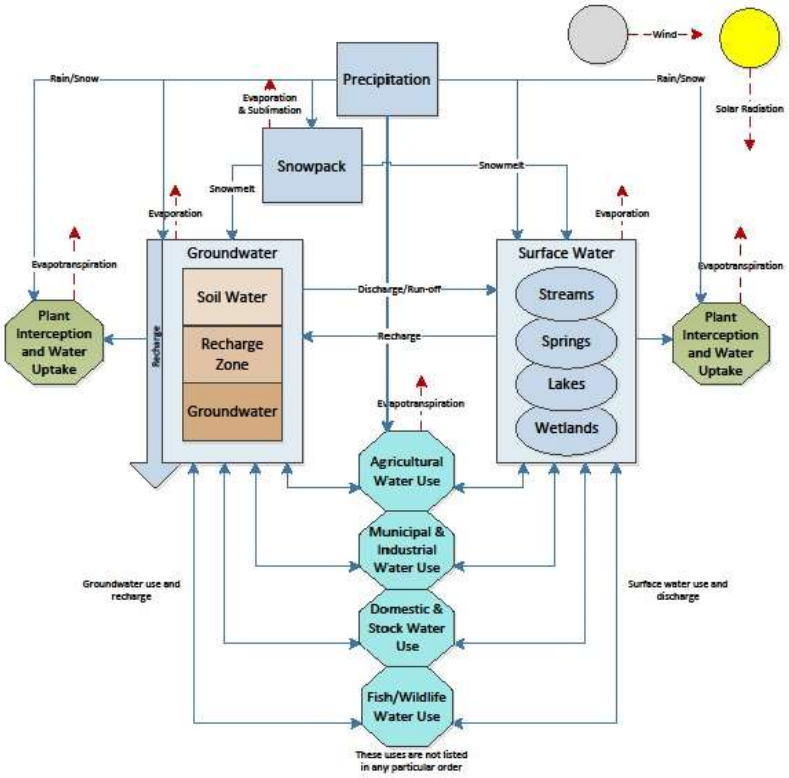
This is something that is being investigated. OWRD is trying to get some Agrimet stations into the basin, which will help us understand what groundwater fed plants need and how that might affect the lakes.

Does alfalfa represent a significant amount of water being exported? No.

Making a Water Cycle Conceptual Model Relevant to Harney County

Harney Basin Water Cycle Conceptual Model Review: *Allison Aldous*

Allison Aldous, a member of the Coordinating Committee, and a senior freshwater scientist with The Nature Conservancy gave a brief overview of the Conceptual Model, which she had previously presented to participants at the April quarterly meeting. A comprehensive understanding of the water cycle in the area is crucial to our ability to determine which components of the water cycle could be influenced by management actions.



This is an updated version of the conceptual model. The original conceptual model was developed by a subcommittee in April. It was modified based upon suggestions from participants of the April and May meetings.

In this model, water is represented three ways:

1) "Pools" of Water: where water accumulates: in aquifers, lakes, ponds, plants, snow-pack, and atmosphere. These pools are represented by boxes/rectangles in the diagram.
2) "Fluxes" of Water: arrows in the diagram indicate movement of water from one *pool* of water to another.
3) The octagons show water uses, including use by plants, people, livestock, fish and wildlife.

Referring to the conceptual model, you can see that there is no outlet of water from our basin using surface water mechanisms. As Hank showed, this is because the Harney Basin is a closed basin or an endoreic basin. The vertical red arrows upwards on the conceptual model represent evaporation and

evapotranspiration, the only above ground mechanisms for water to leave a closed basin. In a basin that is not closed, there is an outlet for water to leave the basin via surface water: streams, rivers, etc.

The conceptual model will continue to be refined as our understanding of the system continues to develop.

For example, we hope to be able to determine the relative importance of the different *fluxes* of water between *pools* of water. This could be represented on the conceptual model by the relative size of the arrows from one *pool* to another *pool*. An understanding of the relative importance is another factor that will inform the potential of different possible management solutions.

Making a Water Cycle Conceptual Model Relevant to Harney County

Determining the Areas of the Greatest Impact: *Michael Campana, OSU Hydrogeologist*

Michael Campana has been working with the Water Availability Work Group, and assisted in the development of the Harney Conceptual Model. He gave a Hydrology 101 presentation at the April WAWG meeting. Today Michael lead a discussion on what areas we could have the most impact on water availability.

Michael first spoke about his work in the Reno area examining the groundwater situation in the 1970s. That area of Great Basin is a huge carbonate aquifer beneath silt and sand. There was no incentive to drill through the carbonate rock, because the drilling would need to be quite deep. Water was being added from Nevada to discharge to Death Valley. After developing water budgets, they found that precipitation was the biggest input and evaporation was the biggest output. However, due the level of technology at the time, ET estimation was not advanced and anything that could not be specifically accounted for in the water budget was considered to be ET.

Hank mentioned that today the technology is extremely advanced. NASA uses satellite and infrared imaging to measured ET remotely.

Discussion: This discussion relates back to the Conceptual Model.

During the discussion, Michael made the following points and suggestions:

- Solar and Radiation is not a huge deal.
- Are all uses of water going to be estimated?
- If Burns and Hines use groundwater, that would be an area for infrastructure improvement and very probable impact.
- Agricultural water use is the largest component. Reduce pumping 25%.
    - What happens to conserved water?
        - If an irrigator conserve water will they lose part of their water right
        - Will people voluntarily conserve water
        - Will conserved water be used elsewhere
- Let's look at what we can't change
    - Precipitation
    - Snowpack

    - Plant Interception and uptake
    - Fish and Wildlife use?
- Potential for artificial recharge to replenish aquifer and Storage opportunities:
    - Storage underground, like Umatilla Basin is doing
    - Off-season discharge that is not allocated might be able to be captured temporarily and be used to recharge the basin.
- Domestic wells: we really can't address because of a lack of data

Relevant to water use, Hank said every five years, going back to the 1950s, the USGS puts out a water demand survey. The 2015 survey is about to be updated.

There was significant discussion on plant interception and uptake. The point was made that that locally the thinking is that the upland areas are important to the water cycle, and that management of juniper and vegetation can impact water availability. Michael stated that this is all lumped into evaporation and transpiration. Another participant suggested that this upland management can have an effect because juniper trees can be cut or burned.

Other concerns included the impact of agricultural water use on domestic wells and stock wells.

There was some discussion about sub-surface water transfers due to elevational gradient. Hank said that there might be a very small amount, referencing the small amount that transfers from the Deshutes to the Klamath and the approximately 5% that crosses the Cascade divide.

Conclusions: What are the areas of the greatest impact?

The areas of the greatest potential impact, *not* in specific order *after* agricultural use, are:

1. Agricultural Water Use: conservation and efficiencies
2. Artificial Recharge
3. Municipal and Industrial Water Use efficiencies
4. Vegetation Management (*invasive grasses and juniper*)
5. Flood plain/stream restoration – due to the link between surface water & groundwater recharge
6. Policy

Next Steps: The Water Availability Work Group and the Coordinating Committee will look at how to prioritize the areas of greatest impact. This would include feasibility and the magnitude of impact to water availability.

Next Meetings:

September 5, 2017: Research Team, 5pm, EOARC
September 20, 2017: Water Availability Work Group, 2pm, Harney ESD
October 18, 2017: Quarterly Collaborative, 5pm, Harney County Community Center

Contact person:

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(website information on the following page)

Watershed Council Website: www.hcwatershedcouncil.com
CBWP page: http://hcwatershedcouncil.com/community-based-water-planning/
Meeting Materials and Schedule: http://hcwatershedcouncil.com/cbwp-meeting-materials/

Facebook: “Harney County Watershed Council” @hcwatershed