

# Subsurface Water Storage Symposium

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## State Permitting and Administration

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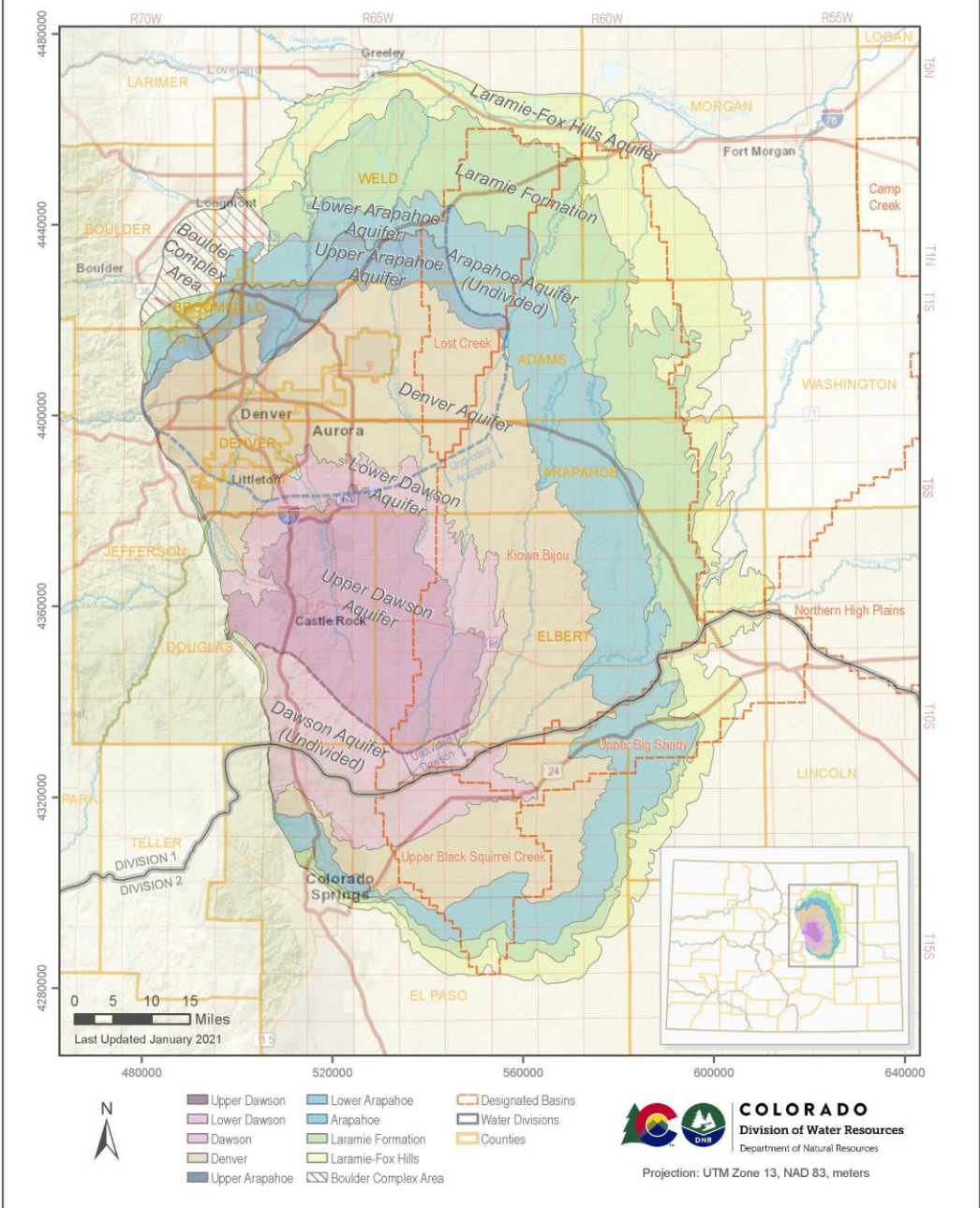
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# Administrative Categories of ASR

- Denver Basin aquifers and Nontributary aquifers outside the boundaries of any designated groundwater basin
- Designated Basin aquifers
- Tributary aquifers (i.e., everywhere else)

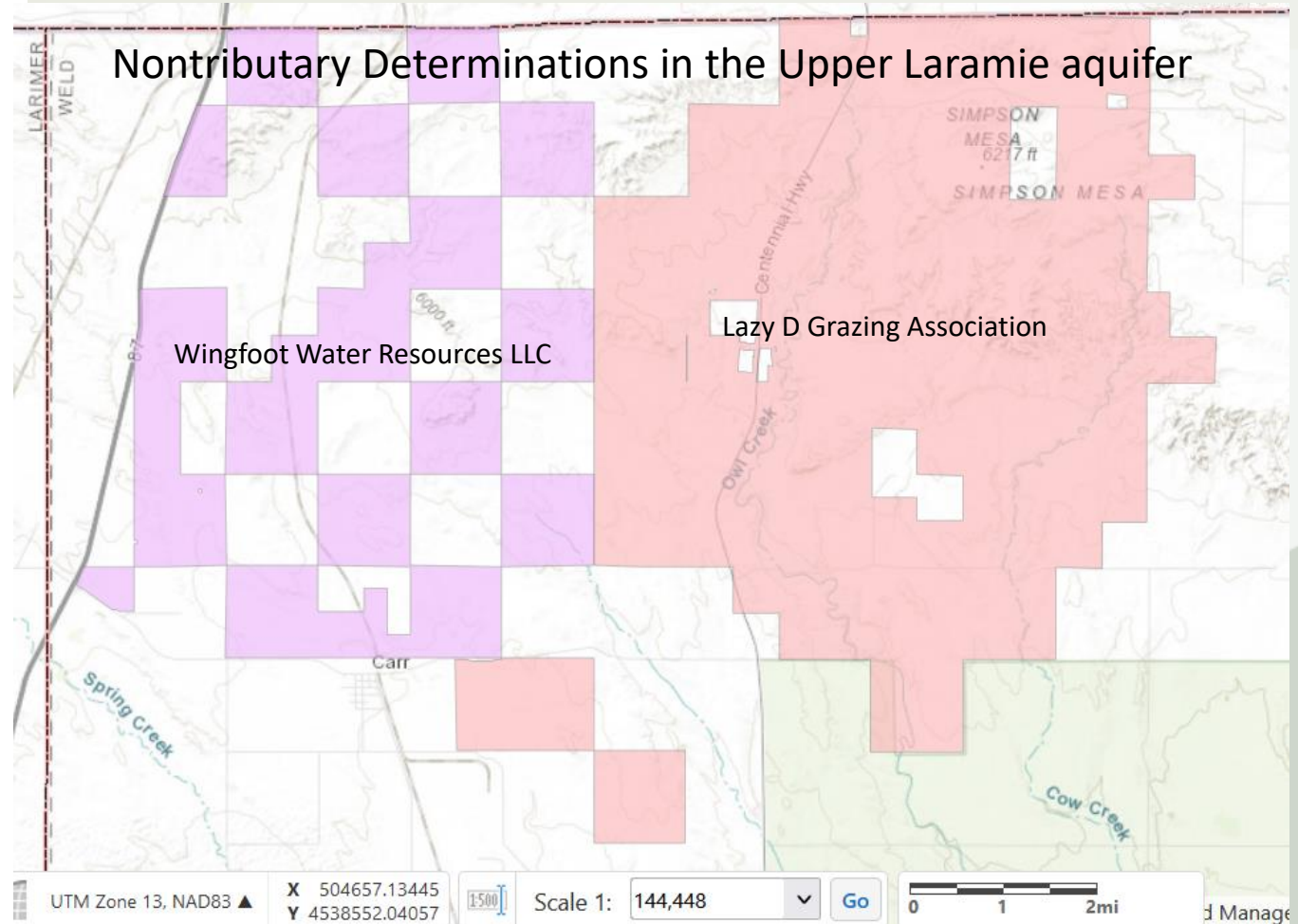


# DENVER BASIN AQUIFER



# Denver Basin aquifers and Nontributary aquifers

## Nontributary Determinations in the Upper Laramie aquifer



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# Denver Basin and Nontributary aquifers

## - General Provisions

- A decree is not required for an ASR project, but can be included as part of a decree.
- Governed by the “Rules and Regulations for the Permitting and Use of Waters Artificially Recharged Into the Denver Basin Aquifers and Nontributary Groundwater Aquifers” (aka Artificial Recharge Extraction Rules).
- Extraction operations must be conducted in a manner that will protect the life and health of the citizens of the State of Colorado, cause no injury to existing users of, and rights to water from the Denver Basin aquifers and Nontributary Groundwater Aquifers, and comply with all applicable federal, state, and local rules.
- Artificially Recharged water must be fully consumable and/or reusable pursuant to decree, statute, or regulation, or decreed for storage by means of Artificial Recharge in the Denver Basin aquifers or Nontributary Groundwater Aquifers (e.g., cannot deliver direct flow irrigation water to artificial recharge without a change of water right).
  - Any augmentation or relinquishment requirements applicable to the water to be injected must be met prior to or at the time of Injection (unless otherwise provided for by decree).





# Denver Basin and Nontributary aquifers - Permitting

- A permit from the State Engineer's Office is required prior to extracting Artificially Recharged Water from a new or existing well.
  - Application must be supplemented with a report summarizing the hydrological conditions at or around the site of the well at the time of permit application including, but not limited to the items listed in Rule 6.2.1 a through p.
  - Notice must be provided to the owners of all decreed rights and permitted or registered wells allowing the withdrawal of water from the same aquifer located within one (1) mile of the proposed Extraction site(s), no less than 35 days prior to the filing of the application.
- The same well may be used for both Injection and Extraction.
- Injection-only wells are typically permitted as Monitoring/Observation Wells. (Injection of water regulated by EPA under a Rule Authorization and may require an Underground Injection Control Permit.)



# Denver Basin and Nontributary aquifers

## - Permit requirements

- Extraction wells must be located within the same Contiguous Extraction Area (area for which applicant has the right to withdraw naturally occurring groundwater) as where water was injected.
  - Not more than 5 miles from the farthest Injection site within a Confined aquifer
  - Not more than 1,000 feet from the farthest injection site within an Unconfined aquifer
- All Injection and/or Extraction Wells must be equipped with a totalizing flow meter or alternative measurement method in compliance with the Division of Water Resources Well Measurement Program Standard.
  - Meters must be verified prior to injection/extraction and reverified every four years
  - No injection or extraction may occur without an operational meter
- Geophysical logs are required for all new wells.



# Denver Basin and Nontributary aquifers - Limitations on Extraction

- The amount of water extracted cannot exceed the total amount of water injected into that aquifer, less any amounts previously extracted.
  - Rules do not consider “leakage” between aquifers
    - Assume that all of the water injected can be extracted from the same aquifer
    - Cannot construct a well into an adjacent aquifer to extract injected water believed to have “leaked” into that aquifer
- The maximum amount of Artificially Recharged Water that may be extracted from an aquifer through any one Extraction Well in any one calendar year cannot exceed five (5) times the maximum amount of water injected into that aquifer in any one calendar year.
- Artificially Recharged Water may be retained in the aquifer indefinitely.



# Denver Basin and Nontributary aquifers - Records and Reporting Requirements

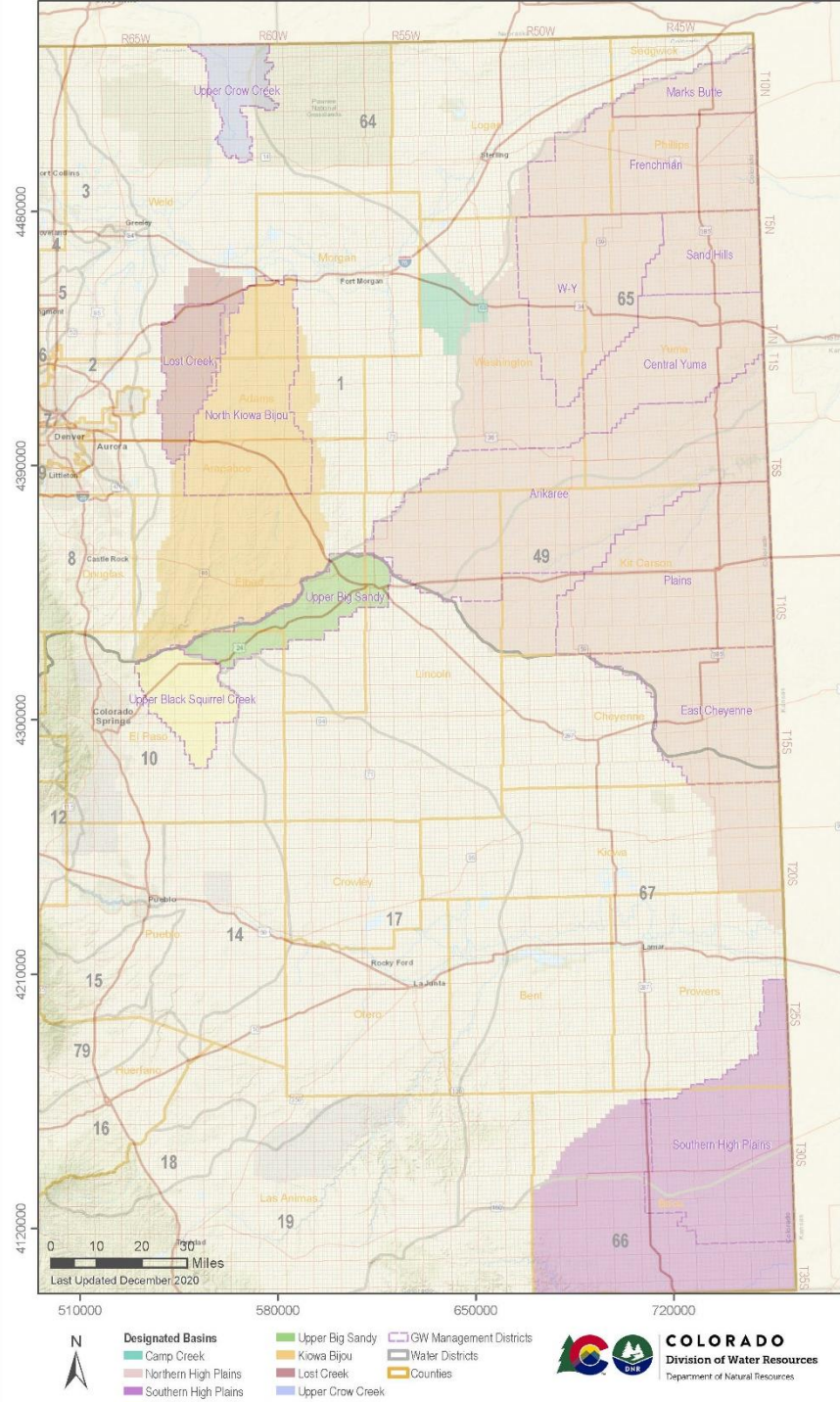
- Prior to Extraction, all available water level data acquired by the Applicant in anticipation of the Extraction of Artificially Recharged Water must be submitted to the State Engineer.
- A Notice of Commencement of Extraction of Recharged Groundwater (currently Form No. GWS-56) must be submitted within 63 days after the first Extraction of Artificially Recharged Water.
- The well owner or operator must maintain permanent records of the timing, types of water pumped through the well (Naturally Occurring water, banked water, or Artificially Recharged Water), location and amounts of water injected and withdrawn, and any other information required by the State Engineer. Records must be collected weekly and submitted to the State Engineer by February 15 of each year for the preceding calendar year, or more frequently if required.
- Upon initiation of Extraction, the Applicant must submit a minimum of one water level measurement per month from each injection well and extraction well or a nearby monitoring well. Water level data must be submitted to the State Engineer by February 15 of each year for the preceding calendar year, or alternatively, provided periodically throughout the year.





# Designated Basin aquifers

## Map of the Designated Ground Water Basins



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# Designated Basin aquifers

## - Application Process

- Governed by Rule 5.8 of the “Rules and Regulations for the Management and Control of Designated Ground Water” (aka Designated Basin Rules).
- Request Ground Water Commission approval of an ASR Plan using the Application for an Aquifer Storage and Recovery Plan (DBB-023)
  - Must be accompanied by a report containing all information required to be submitted for an ASR Plan as required by Designated Basin Rule 5.8.3, including but not limited to the ASR Boundary, ASR Source Water, structures used for recharge and recovery, approximate cost and construction start and end dates, and proposed terms and conditions required to prevent injury to other water rights.
  - A groundwater model *may* be required.
- Applicant must submit a summary of the application to the Commission for publication.
  - Published in newspaper in each of the counties concerned, 30 day objection period, any hearing would be held at the next Commission meeting.



# Designated Basin aquifers

## - General Provisions

- Requirements for ASR Plans in Bedrock Aquifers (Denver Basin and non-Denver Basin) are similar to those in the Artificial Recharge Extraction Rules.
  - One additional requirement is the need to provide evidence that the plan does not cause unreasonable impairment of ground water quality.
- Designated Basin Rules also allow ASR Plans in non-bedrock aquifers
  - Applicant must demonstrate dominion and control over the ASR Source Water by showing the change in the water table and an ability to recover stored water within the ASR Boundary.
    - Can use man-made methods or structures to confine water, but they are not required.
  - An Applicant is not required to own or have a legal right to use all of the land overlying the portions of the aquifer in which water will be stored.



# Designated Basin aquifers

## - Operation and Administration

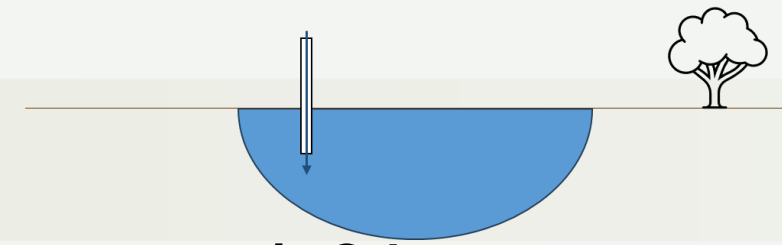
- A well permit from the State Engineer's Office is required for each recovery well and each Artificial Recharge or injection well.
  - Flow or other measurement devices must be installed, operated, and maintained on all wells or other structures artificially recharging water into and recovering water from the aquifer, and any other structure involved in the plan, unless the Commission finds that such devices would be unnecessary or impractical.
- Ongoing water quality sampling and monitoring and monitoring of groundwater levels is required.
  - Water quality sampling and monitoring is required at the point the ASR Source Water is introduced into the aquifer, at any other point of compliance, and at monitoring well(s), as required by the ASR Plan.
- Applicant must record, maintain and submit records of ASR Plan operations on forms acceptable to the Commission on no less than on an annual basis.





# Tributary aquifers

## - “Porosity Reservoirs” / Underground Storage



- Typically alluvial aquifer material surrounded by a man-made impermeable barrier keyed to bedrock.
- Native groundwater within the barrier must be pumped out and discharged to the stream system or aquifer without use, or augmented.
- Wells withdrawing stored water must be located within the impermeable barrier. Well permits and totalizing flow meters are required.
- Out-of-priority inflows (precipitation, seepage) must be released to the stream system or replaced under a substitute water supply plan or plan for augmentation.
- Administered in accordance with the Colorado Division of Water Resources’ General Administration Guidelines for Reservoirs.
- Potential issues: May cause groundwater mounding or shadowing, or interfere with the delivery of recharged water to the stream system.

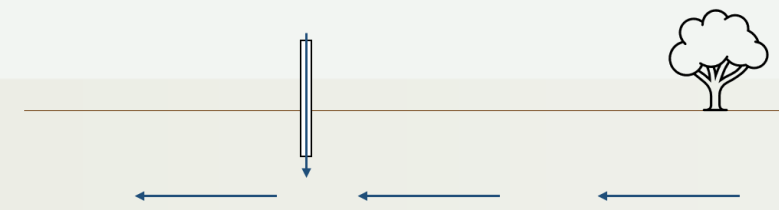




# Tributary aquifers

## - Recharge

- Without construction of an impermeable barrier, water delivered to a tributary aquifer is transient and will follow groundwater flow patterns to the nearest stream or river.
- Delivering water to recharge ponds is a common mechanism to replace depletions to the river from well pumping or meeting return flow obligations associated with a change of water right.
  - Can take advantage of “free river” conditions or junior water rights being in priority.
  - Augmentation wells can be used to re-time depletions to the aquifer. (Satisfies immediate need, but creates a future obligation.)
- A decree is not needed to recharge water into the aquifer, but a decree or substitute water supply plan would be needed to take credit for recharge (generally at the river).
  - Unless the project qualifies as a plan for augmentation or change of water right, would not be able to be approved under a SWSP.
  - Need to have a specific use for water delivered to recharge, otherwise it would be speculative. (Can lease excess credits if they occur and decree allows, but cannot obtain a recharge right based on leasing the credits to others.)
  - Unless decree allows recharge credits to be rediverted from the river, they will become waters of the state if not needed to replace depletions at the time they accrete to the river.



# Tributary aquifers

## - Recharge

- The timing of recharge accretions is determined by modeling (Glover method with site-specific aquifer parameters, MODFLOW, etc.).
- The amount of water recharged to the aquifer is determined through a water balance approach taking into consideration the amount of water delivered to the recharge structure, the amount of water discharged from the structure (if any), the volume of water lost to evaporation, the volume of water consumed by vegetation within the recharge structure, and unmeasured inflows such as from precipitation or runoff.
- No existing rules or legal framework for recharging water into a tributary aquifer and pumping it out at a different location (outside of the Designated Basins – has not been done within the Designated Basins yet either).



# Questions?



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