

# *Aquifer Storage and Recovery*

## *Administrative Considerations*

*Kevin Rein, P.E.*

*State Engineer, Division of Water Resources*

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# Today's Discussion

## Aquifer Storage and Recovery discussion:

- Purpose
- Hydrogeology
- Administration of the water itself

# Important Background

- Colorado groundwater; *connected to surface streams, “Tributary,”*
- *Law presumes all groundwater is tributary to surface streams,*
- Groundwater is in a *transient* state,
  - Must treat it that way administratively
- Difficult to actually “store” water in aquifers,
- Exceptions: Denver Basin bedrock aquifers, other “nontributary” formations.

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# Purpose

## Aquifer Storage and Recovery <sup>1</sup>

- Solution, Strategy
  - Solution to what?
- Includes:
  - Available water, Infrastructure, Injection/Infiltration, Underground formation, Administration and Accounting, Need, Withdrawal or Accretion,
- Recharge? (To what end?)
- Augmentation or Replacement?

1. Colorado Water Plan, Section 6.5

# Purpose

All can be considered part of Aquifer Storage and Recovery

- Available water,
- Infrastructure,
- Injection/Infiltration,
- Underground formation,
- Administration and Accounting,
- Need,
- Withdrawal or Accretion.

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- Purpose
- **Hydrogeology**
- Administration of the water itself

# What Happens to the Water?

- Store water indefinitely in some formations,
  - relatively static, not moving
- Most formations, transient;
  - groundwater held temporarily,
  - migrates down gradient,
  - usually to a river or stream,
  - More difficult to administer or *regulate*.

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# What Happens to the Water?

- Regulation in tributary formations
  - Accounting
    - Amount of water delivered
    - Losses (evaporation, ET)
  - Migration
    - Time
    - Location
  - Withdrawal/Accretion
    - What if water is not recovered?

# Now Consider All Aspects

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- Purpose
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# Aquifer Storage and Recovery

- Why place water in the ground?
- What is the purpose?
  - If tributary, can't "store" indefinitely,
    - Transient
  - Place water in the ground to meet a known obligation?
  - Place excess water in the ground to avoid losing it?

# *Considerations when using an Aquifer to Hold Water*

What is aquifer storage?

- Use pore space in a geologic formation to hold water,
- Why?

Like 100 years ago, we have water available, but not at the time or place we need it.



# *Perspective on the Use of an Aquifer*

Two different ways to use that pore space :

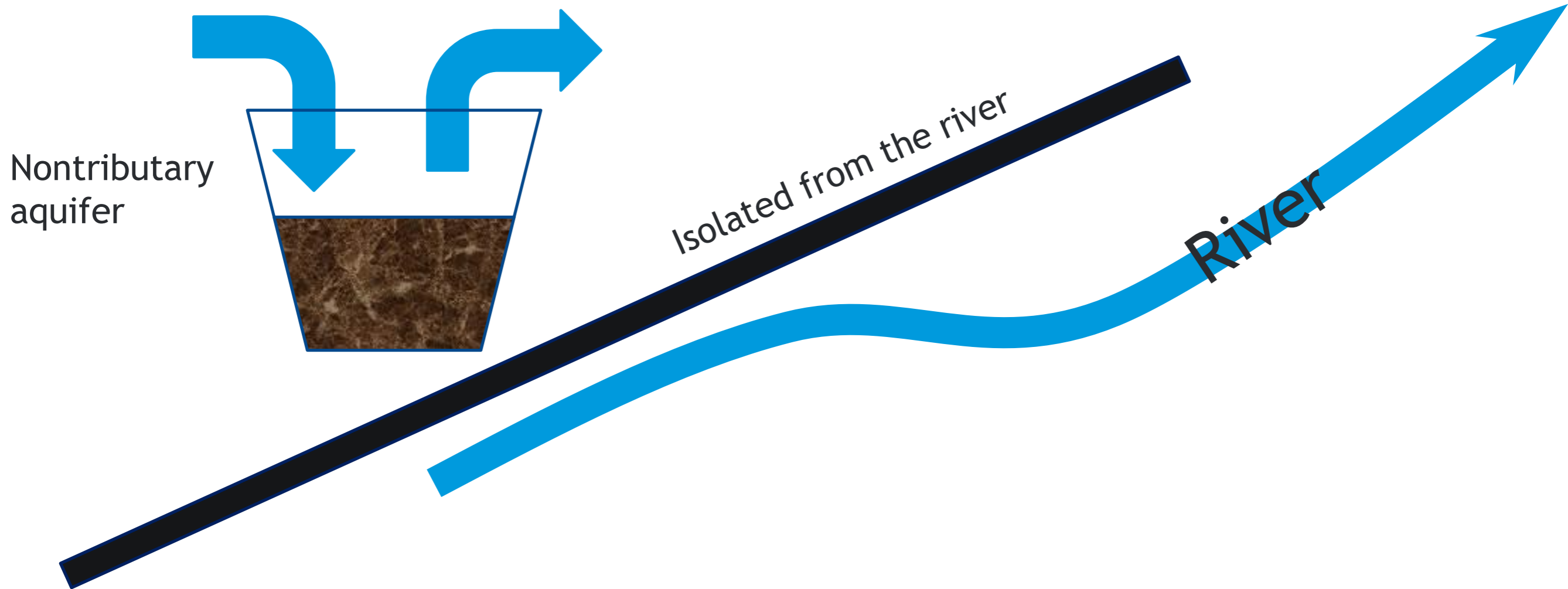
## Static groundwater

1. As a *bank*, to store water indefinitely,

# *Perspective on the Use of an Aquifer*

## Static groundwater

1. As a *bank*, to store water indefinitely,



Nontributary  
aquifer

Isolated from the river

River

# *Perspective on the Use of an Aquifer*

Two different ways we could use that pore space in Colorado:

## Static groundwater

1. As a *bank*, to store water indefinitely,

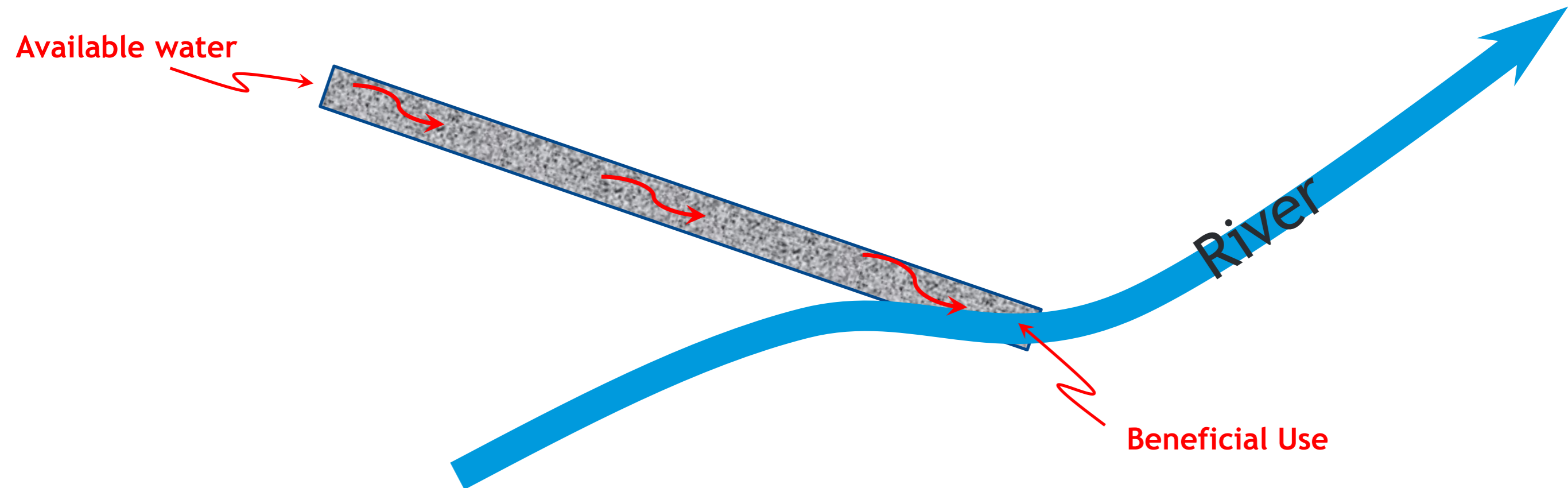
## Transient groundwater

2. As an underground location to *temporarily hold* water; even as the ground acts as a *pipeline* to carry water to the river.

# *Perspective on the Use of an Aquifer*

## Transient groundwater

2. As an underground location to *temporarily hold* water; even as the ground acts as a *pipeline* to carry water to the river.



# *Summary*

## Aquifer Storage and Recovery

- Solution to Water Supply/Infrastructure Needs,
- Several components: water, infrastructure, hydrogeology, engineering, regulation, beneficial use,
- Noted in Colorado Water Plan,
- Noted in South Platte Storage Study (HB16-1256),
- Aquifers can be used different ways,
  - Is each ASR?

# Summary

We can use underground formations to hold or convey water in two different ways:

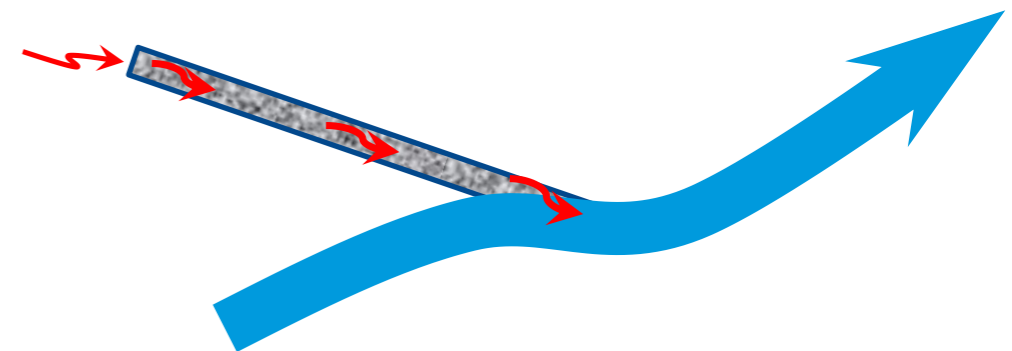
1. Nontributary and lined alluvial storage
  - Objective: store water,
  - Legal and administrative structure is in place,
  - Water users are doing it,
  - Rules do not address non-Denver Basin formations.



# Summary

We can use underground formations to hold or convey water in two different ways:

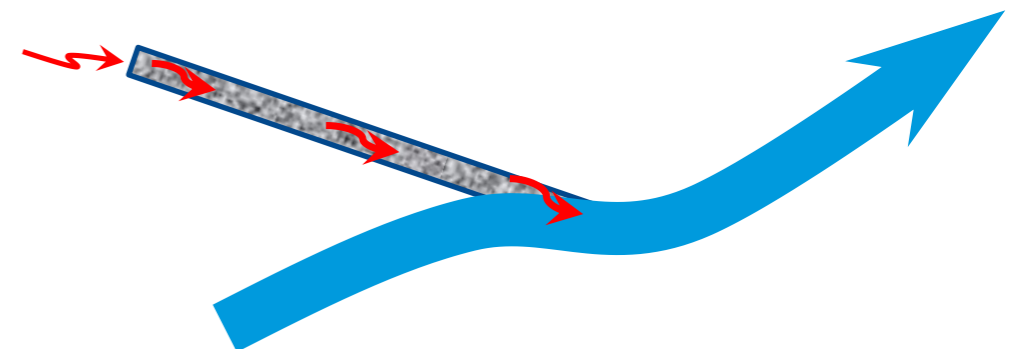
2. Underground location to *temporarily hold* water; ground acts as a *pipeline* to the river,
  - Objective: meet an obligation at the stream
    - Legal, administrative, and engineering framework is in place,
    - Water users are doing it,
  - Objective: capture excess water,
    - Legal and administrative framework is not certain,
    - We are not currently doing it,
    - Speculation concern.



# Summary

We can use underground formations to hold or convey water in two different ways:

2. Underground location to *temporarily hold* water; ground acts as a *pipeline* to the river,
  - Objective: meet an obligation at the stream
    - Legal, administrative, and engineering framework is in place,
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  - Objective: **capture excess water,**
    - Legal and administrative framework is not certain,
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# *Recent*

## Relevant Activity:

- Nontributary Injection Rules
  - HB17-1076
- Upper Arkansas Multi-Use Project
- Designated Basins
  - HB18-1199 (Section 37-90-107.6)