

# Aquifer Storage and Recovery

A Faster, Less Expensive, and Far Less Damaging  
Water Storage Alternative

Larimer County NISP 1041 Hearing  
August 31, 2020

**Courtney Hemenway, PE**

Hemenway Groundwater Engineering (since 1996)

Parker, Colorado

CSU BS and MS in Civil Engineering

# Subsurface Water Storage



- 98-99% of fresh water on the planet is in the ground
- In arid lands almost all fresh water is in the ground

# The available subsurface space for storing water is vast and present almost everywhere in Colorado

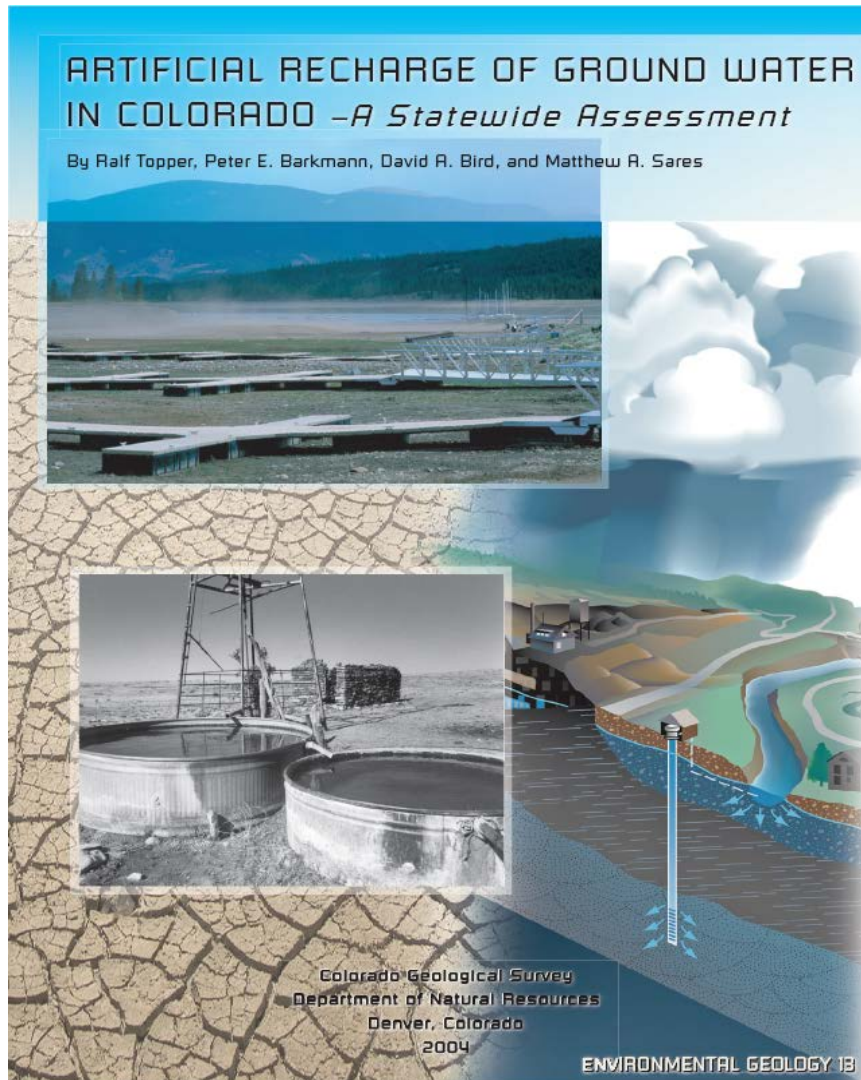


TABLE VIII-2.  
SUMMARY RANKING OF CONSOLIDATED BEDROCK AQUIFERS

Basin or Area	Aquifer	Ranking Value	Quality Value	Storage (ac-ft) *	
				Per Acre	Available (thousands)
High Plains Aquifer	High Plains – East	169	19	15.0	95,290
High Plains Aquifer	High Plains – Southeast	162	20	15.0	28,530
High Plains Aquifer	High Plains – North	143	19	4.0	4,570
Denver Basin	Dawson	109	19	6.0	5,010
SE Colorado	Dakota-Cheyenne Group	105	19	0.3	1,280
Sand Wash Basin	Wasatch-Fort Union	94	15	0.3	320
Denver Basin	Laramie-Fox Hills	92	20	0.3	1,285
Denver Basin	Arapahoe	92	19	0.2	590
Middle Park	Troublesome Formation	91	16	7.5	1,025
Raton Basin	Cuchara-Poison Canyon	77	18	1.0	465
Sand Wash Basin	Mesa Verde	70	16	2.0	1,885
Greater Denver Basin	Laramie-Fox Hills	67	15	4.5	5,045
Piceance Basin	Mesa Verde	66	14	2.0	2,865
Eagle Basin & Vicinity	Weber-Maroon-Minturn	62	14	1.0	730
Piceance Basin	Uinta Formation	60	14	7.5	5,015
Denver Basin	Denver	55	19	0.1	155
SW Colorado	Morrison-Summerville-Entrada	55	14	0.8	735
Raton Basin	Raton-Vermejo-Trinidad	54	18	5.0	4,035
South Park	Antero-Wagontongue	51	13	3.8	370
SW Colorado	Wingate	50	12	3.8	1,810
SW Colorado	Dakota-Burro Canyon	48	14	0.8	1,340
North Park	Coalmont	46	18	0.0	20
North Park	North Park Formation	45	13	1.3	85
San Juan Basin	Mesa Verde	45	13	0.5	600
Huerfano Park	Huerfano Formation	40	13	2.0	160
San Juan Basin	Animas Formation	40	13	0.5	265
Huerfano Park	Cuchara-Poison Canyon	38	12	7.5	720
San Juan Basin	Pictured Cliffs	35	12	0.5	350
Piceance Basin	Wasatch-Fort Union	33	13	0.1	310

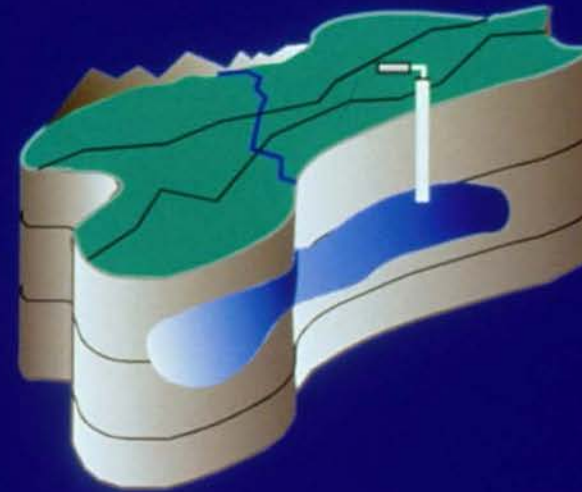
\* Total storage capacity was not calculated due to variable storage coefficients (confined vs. unconfined).

# Aquifer Storage And Recovery (ASR) May Provide Alternative Storage

---

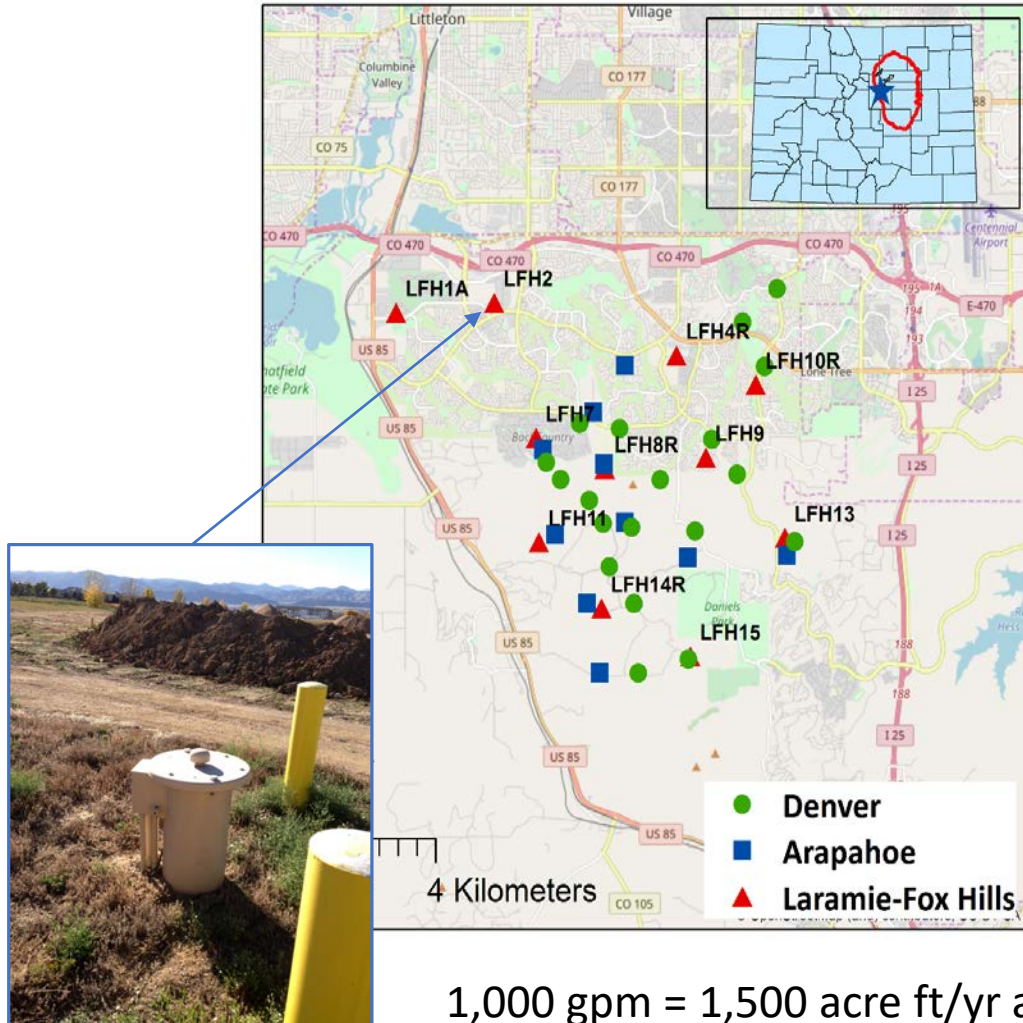


**Traditional**



**ASR**

# Aquifer Storage and Recovery Since 1991 In Colorado



- Highlands Ranch
- Sustained conjunctive use of surface and groundwater for **more than a quarter century** (not a new technology)
- Over **14,000 AF** of Water in Storage
- 25+ wells permitted for ASR
- A synergetic complement to surface water
  - In wet years
  - In dry years
  - No issues with drought

1,000 gpm = 1,500 acre ft/yr at peak capacity... @ \$1M/well... scale to demand

# Northern's Position on ASR in the NISP EIS

## Basis for rejection

- Not enough underground space (Incorrect)
- Not in the Denver Basin (Incorrect and Not Relevant )

## Missed benefits

- 10 to 50% of surface water storage cost
- Minimal permitting required (fast under 1 year)
- Almost no land-use impacts
- An ideal complement to existing storage

## Missed benefits (continued)

- Water conservation
  - Little if any losses
  - Save water for other priorities
  - Lowers costs
- Builds resiliency needed to meet drought and climate change
- No public safety issues
- In time delivery and expansion as required
  - Reduces financial risk
  - Well-suited to economic cycles including pandemic
- Low carbon footprint
  - Construction
  - Power generation during recharge
- AND MORE

# All the while Northern has dismissed ASR, it has risen to the forefront in Colorado

Table ES-2 Overview of Existing and Planned ASR Systems in SMWSA

Member	Status	Source Water	Number of ASR Wells
CWSD	existing system	South Platte River	33
East Cherry Creek Valley Water and Sanitation District (W&SD)	existing pilot system and planned expansion	Northern Water Supply Project	1 (pilot)
Rangeview	existing pilot system and planned expansion	WISE	1 (pilot)
Town of Castle Rock	existing pilot system and planned expansion	WISE, Plum Creek surface water and alluvial water, treated reuse water	2 (pilot)
Cottonwood W&SD	Permitting for ASR	Cherry Creek, WISE, and Denver Basin groundwater	3
Dominion W&SD	Planning for ASR and partnering with Castle Rock	WISE	Currently unknown
Inverness W&SD	Permitting for ASR	Denver Water, Denver Basin groundwater, WISE, and Cherry Creek (when developed)	4
Meridian Metropolitan District	Permitting for ASR	Denver Basin groundwater and WISE	1 to 2
Pinery Water and Wastewater District	Planning for ASR	WISE and Cherry Creek alluvial well water	Up to 9

## Additional ASR Projects in CO:

- The Consolidated Mutual Water District
- Colorado Springs
- Stonegate Village
- **3 ASR Projects Studied in Northern CO**

ASR is a solution considered in most of the CO Water Roundtables

Citizens Guide to Colorado Groundwater

**Criteria 2** – The applicant has not presented reasonable siting and design alternatives nor explained why no reasonable alternatives are available.

**The applicant failed to objectively consider ASR and has ignored public comment on flawed statements regarding ASR for six years.**

**All the while that ASR:**

- **Is faster, lower cost, and far less harmful**
- **Would save 1,000's of AF of evaporative losses**
- **Has risen to the forefront in Colorado for water storage**

**Recommend Denial of 1041 Based on Criteria 2**