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SLIDES: Ground Water Resources in Colorado

Matthew A. Sares

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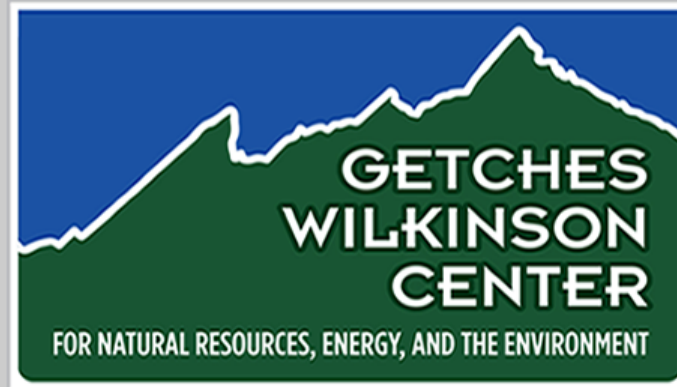
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Ground Water Resources in Colorado

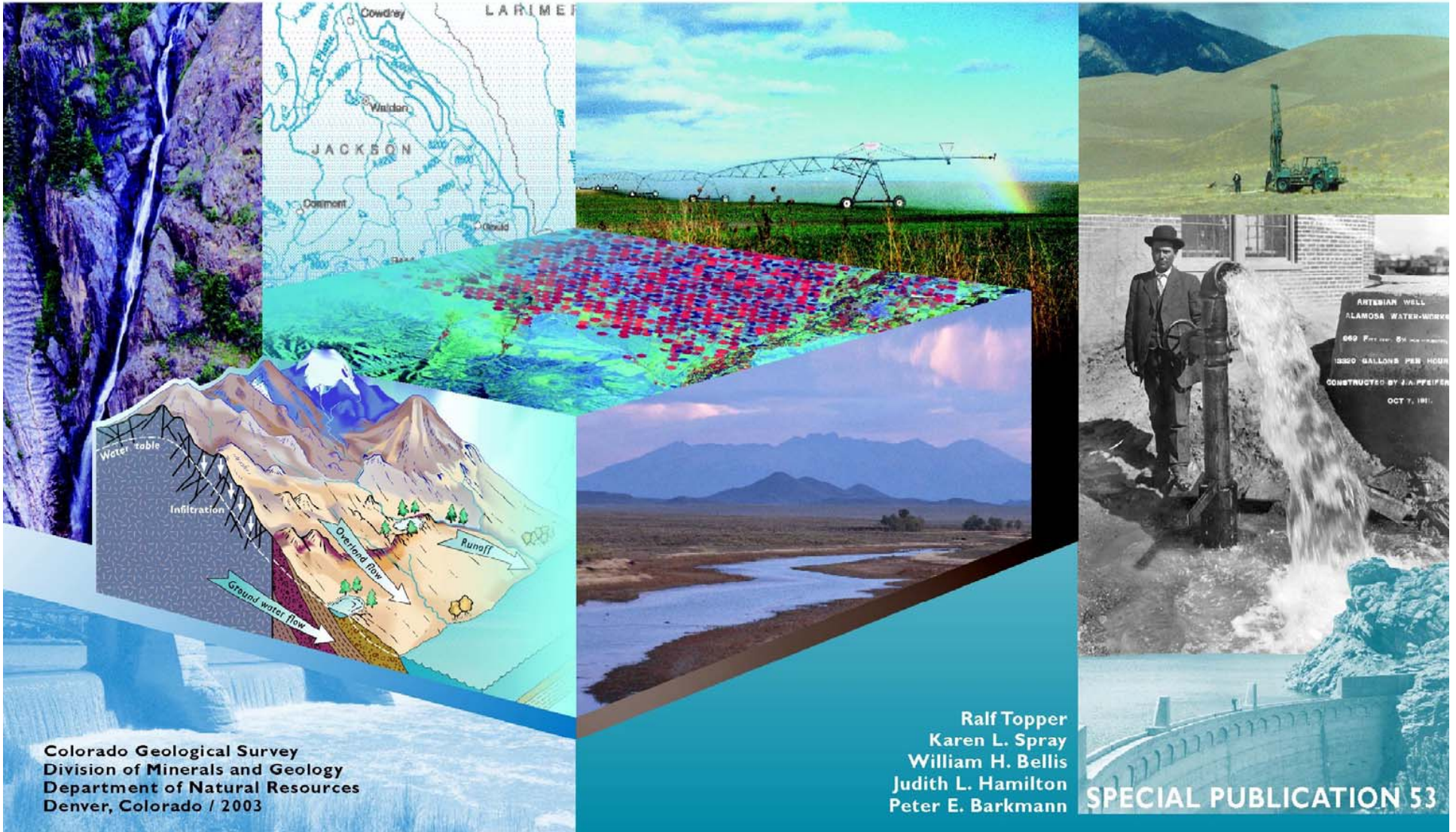


Matthew A. Sares
Colorado Geological Survey
Denver, Colorado

Groundwater in the West
Natural Resources Law Center
Summer Conference, June 2004



GROUND WATER ATLAS OF COLORADO



Colorado Geological Survey
Division of Minerals and Geology
Department of Natural Resources
Denver, Colorado / 2003

Ralf Topper
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Peter E. Barkmann

SPECIAL PUBLICATION 53

ARTIFICIAL RECHARGE OF GROUND WATER IN COLORADO *-A Statewide Assessment*

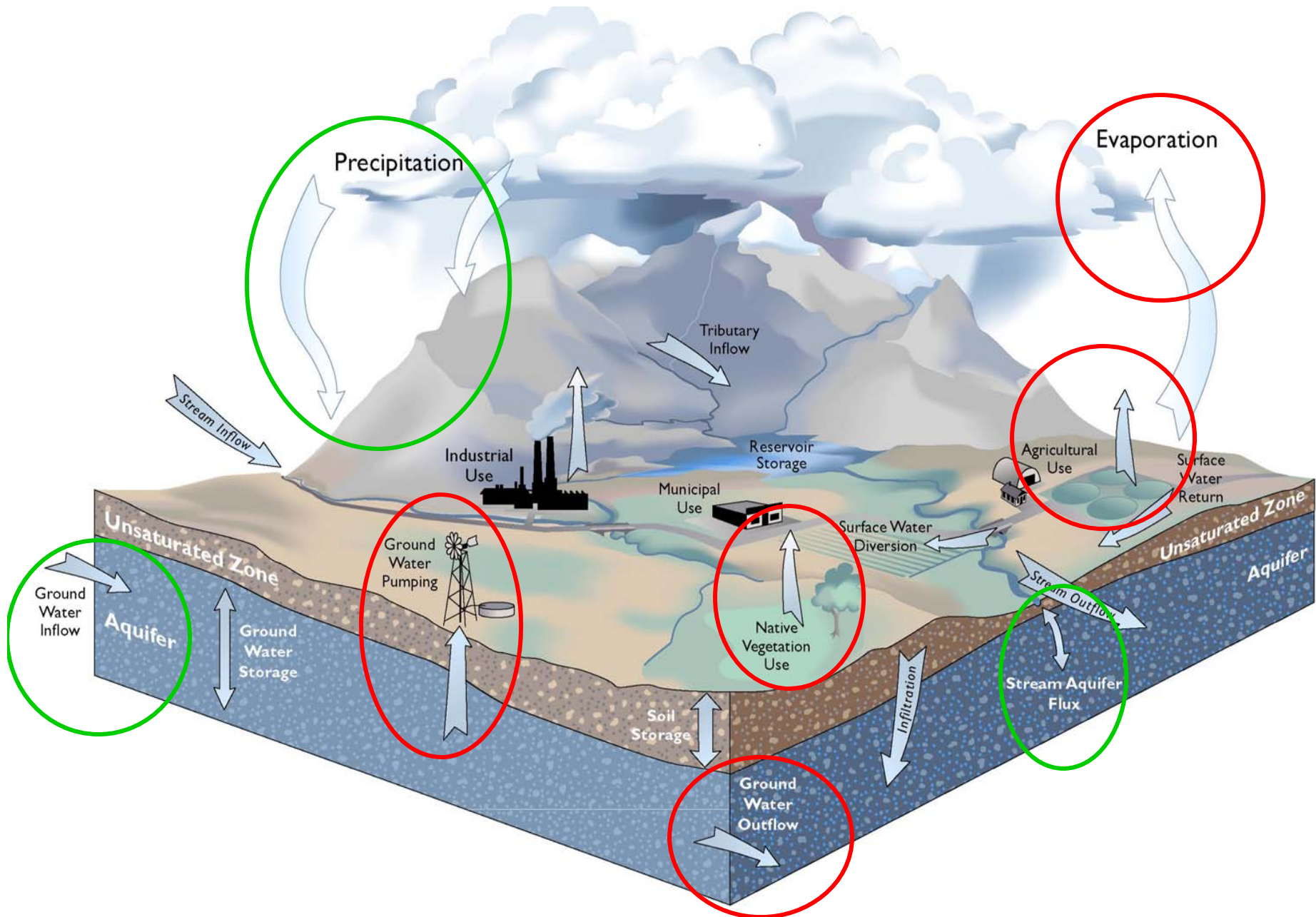
By Ralf Topper, Peter E. Barkman, David A. Bird
and Matthew A. Sares



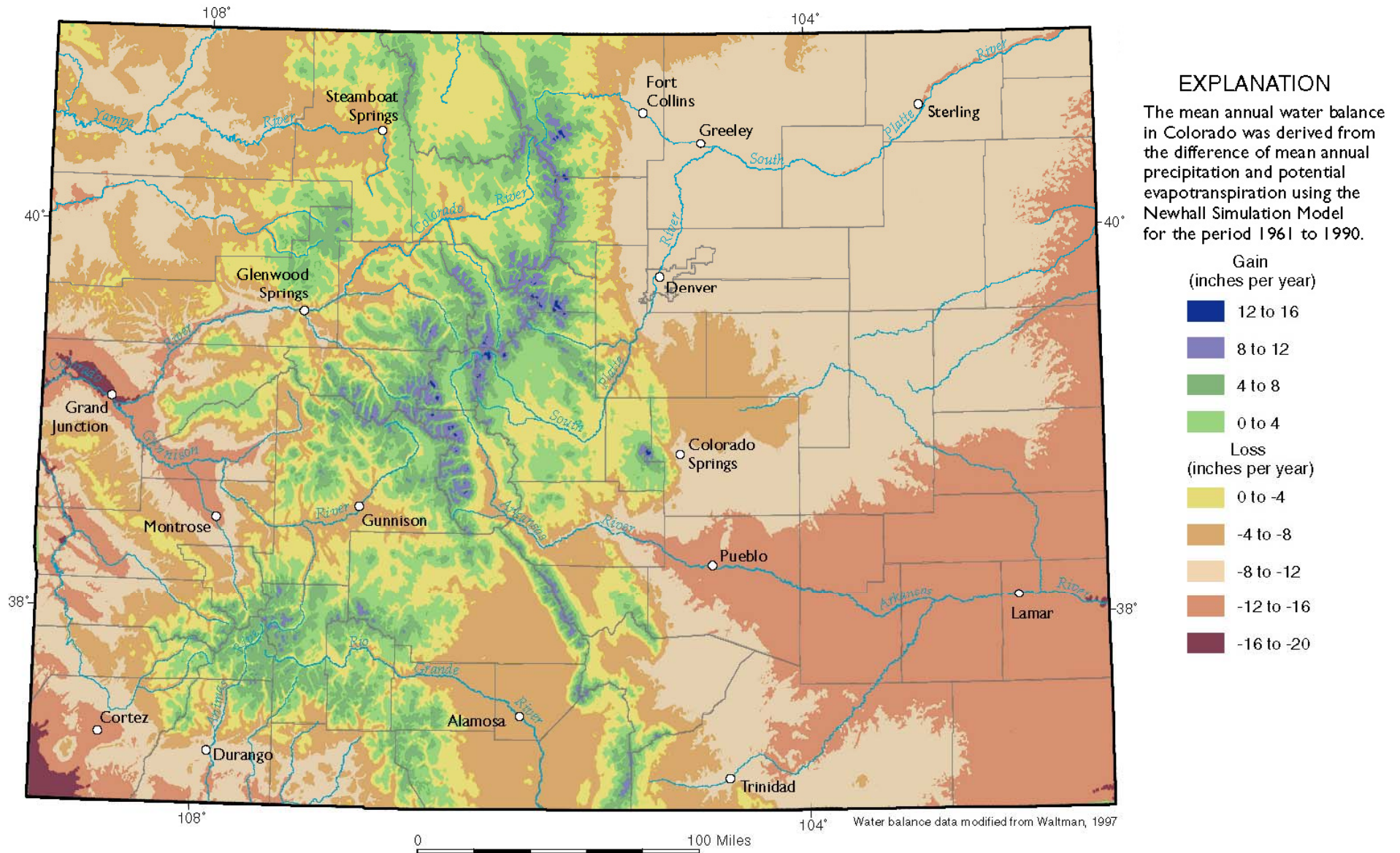
Colorado Geological Survey
Department of Natural Resources
Denver, Colorado
2004

**ENVIRONMENTAL
GEOLOGY 13**

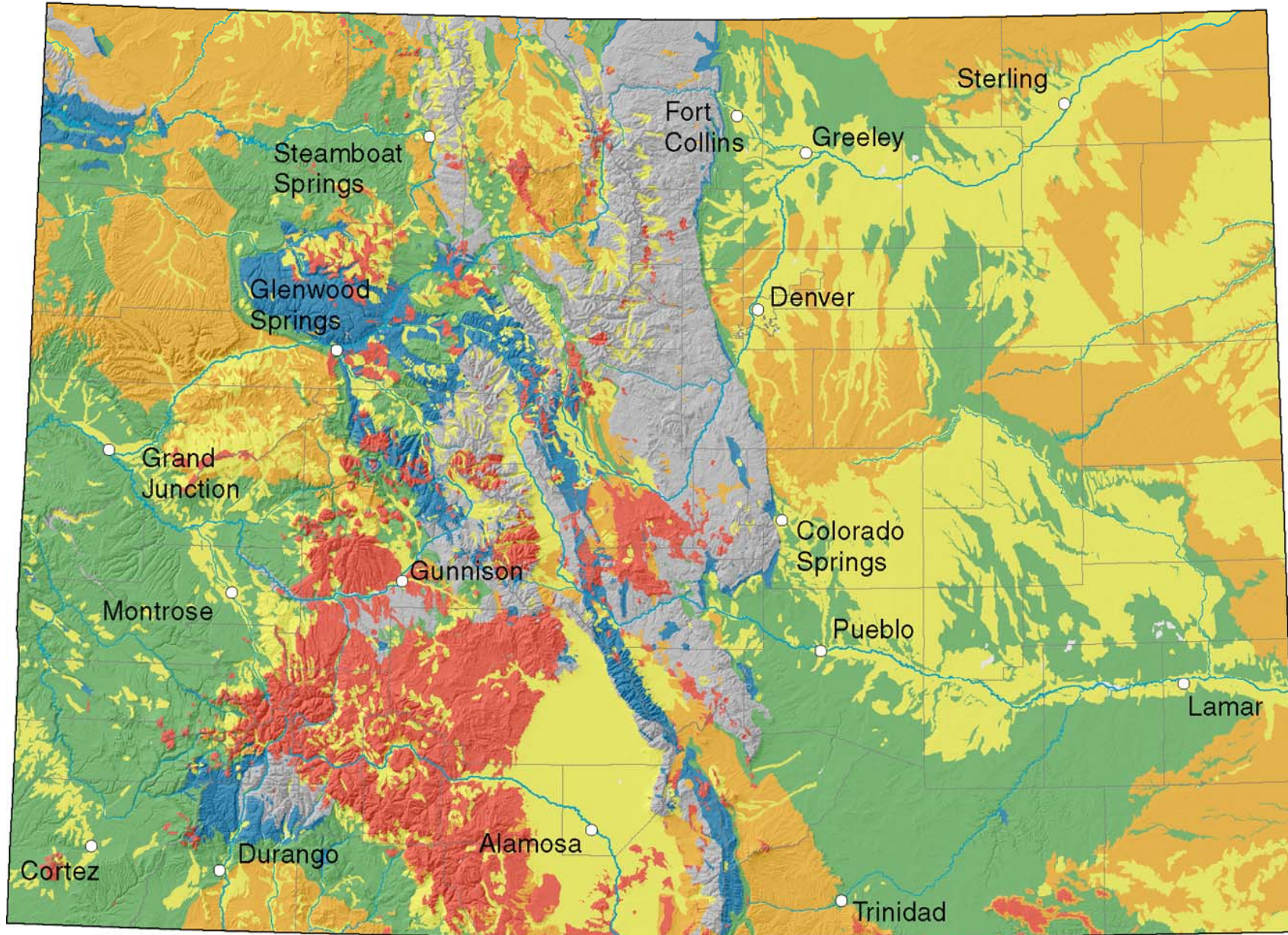
Water Budget Diagram









Annual Water Balance



GENERALIZED GEOLOGY OF COLORADO

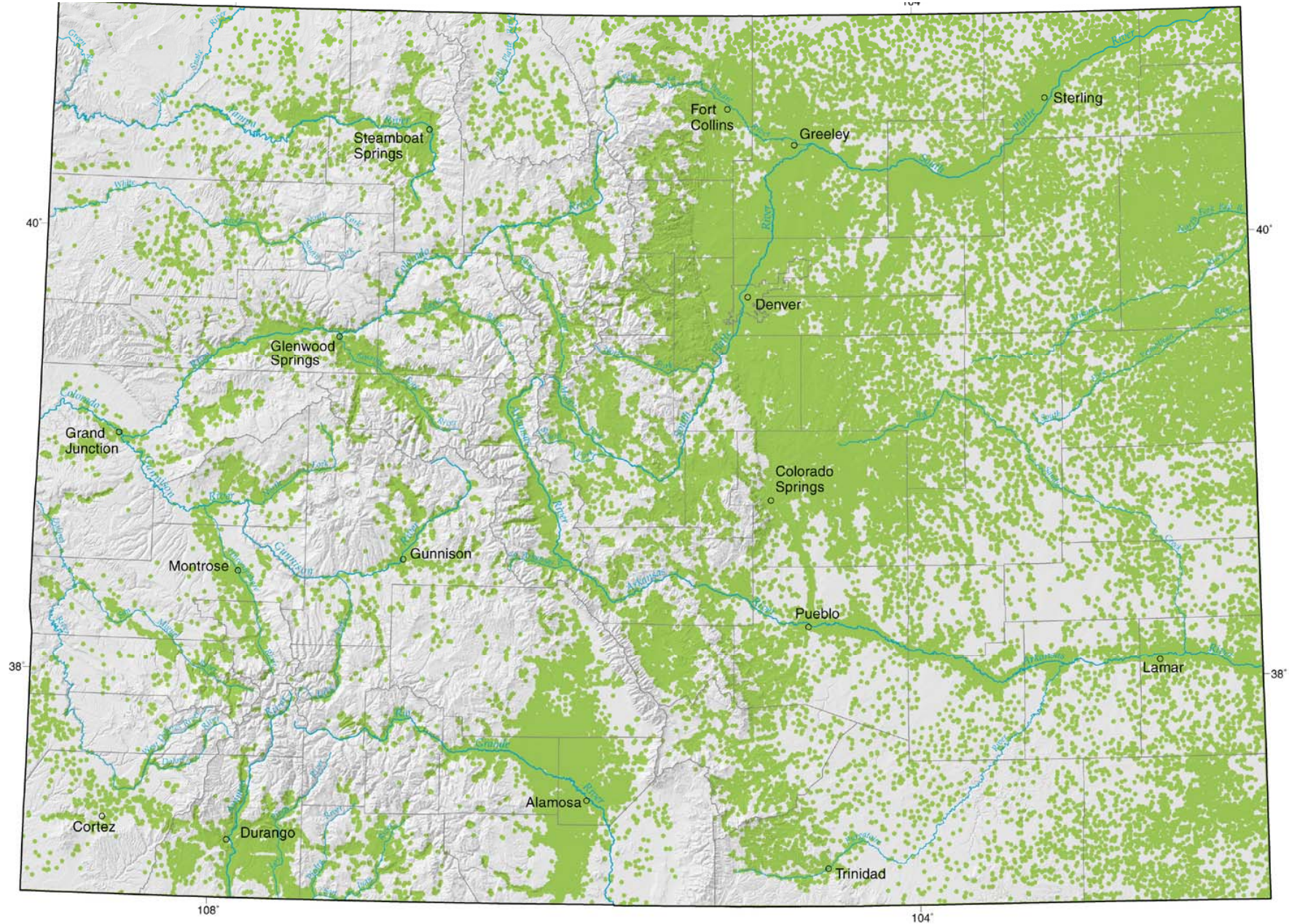


EXPLANATION

-  Unconsolidated Deposits of Quaternary Age
-  Sedimentary Rocks of Tertiary Age
-  Igneous Rocks of Cenozoic Age
-  Sedimentary Rocks of Mesozoic Age
-  Sedimentary Rocks of Paleozoic Age
-  Sedimentary, Metamorphic, and Igneous Rocks of Precambrian Age



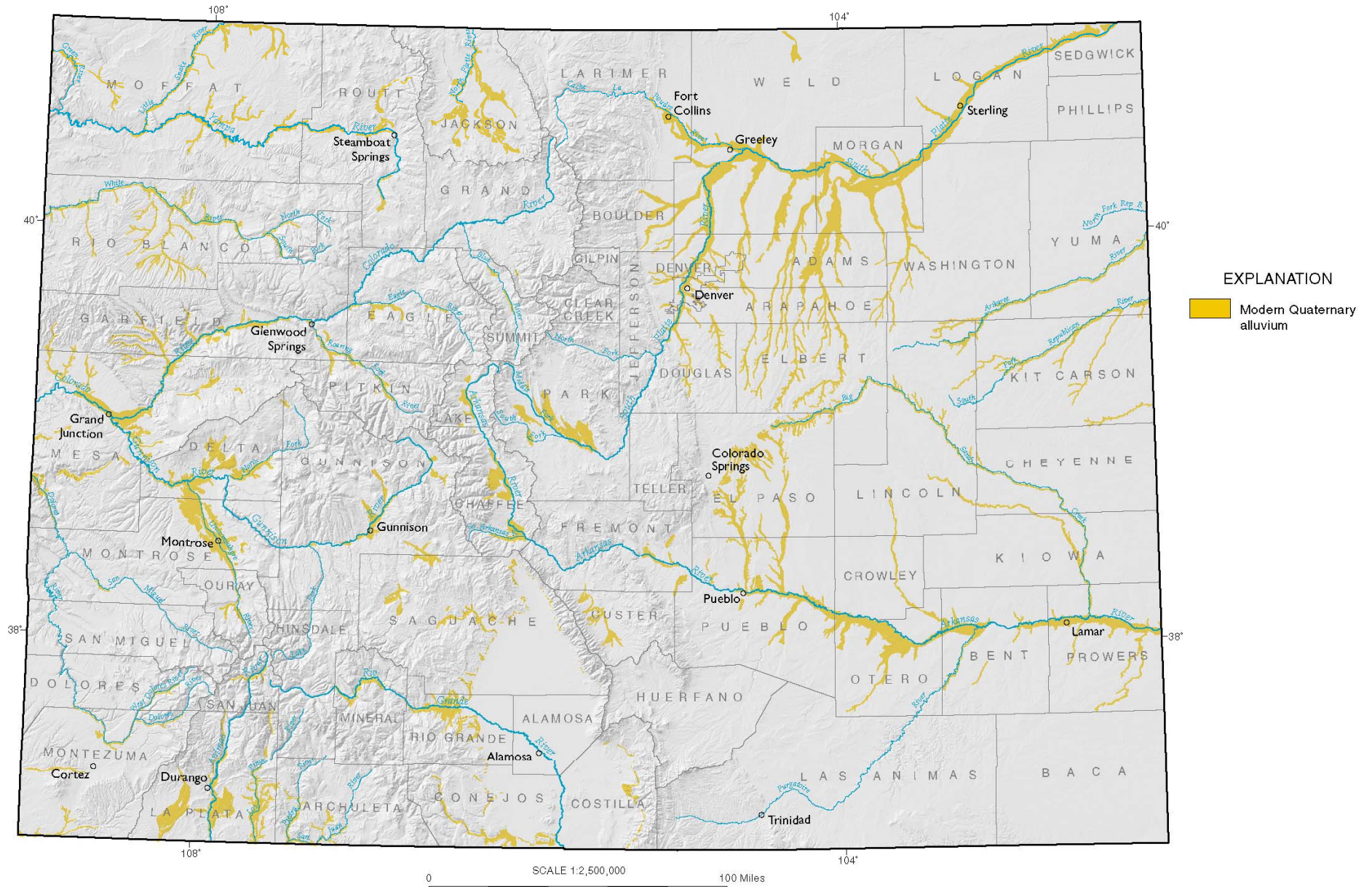
Water Well Distribution in Colorado



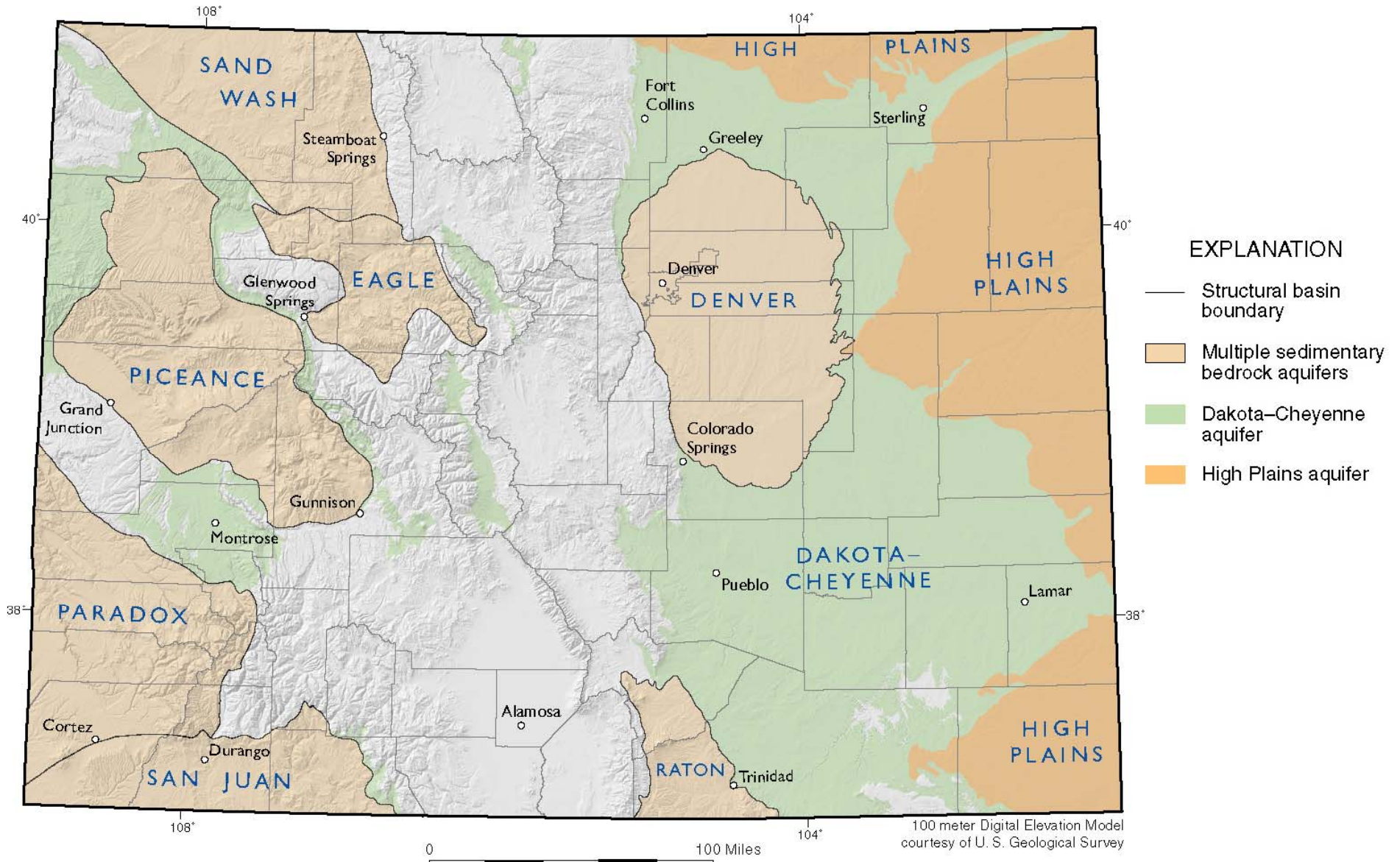
Principal Aquifers in Colorado

1. Unconsolidated stream sand & gravel deposits (Quaternary age alluvial aquifers)
2. Poorly consolidated sediments such as valley-fill deposits
3. Consolidated sedimentary bedrock
4. Volcanic and crystalline rock

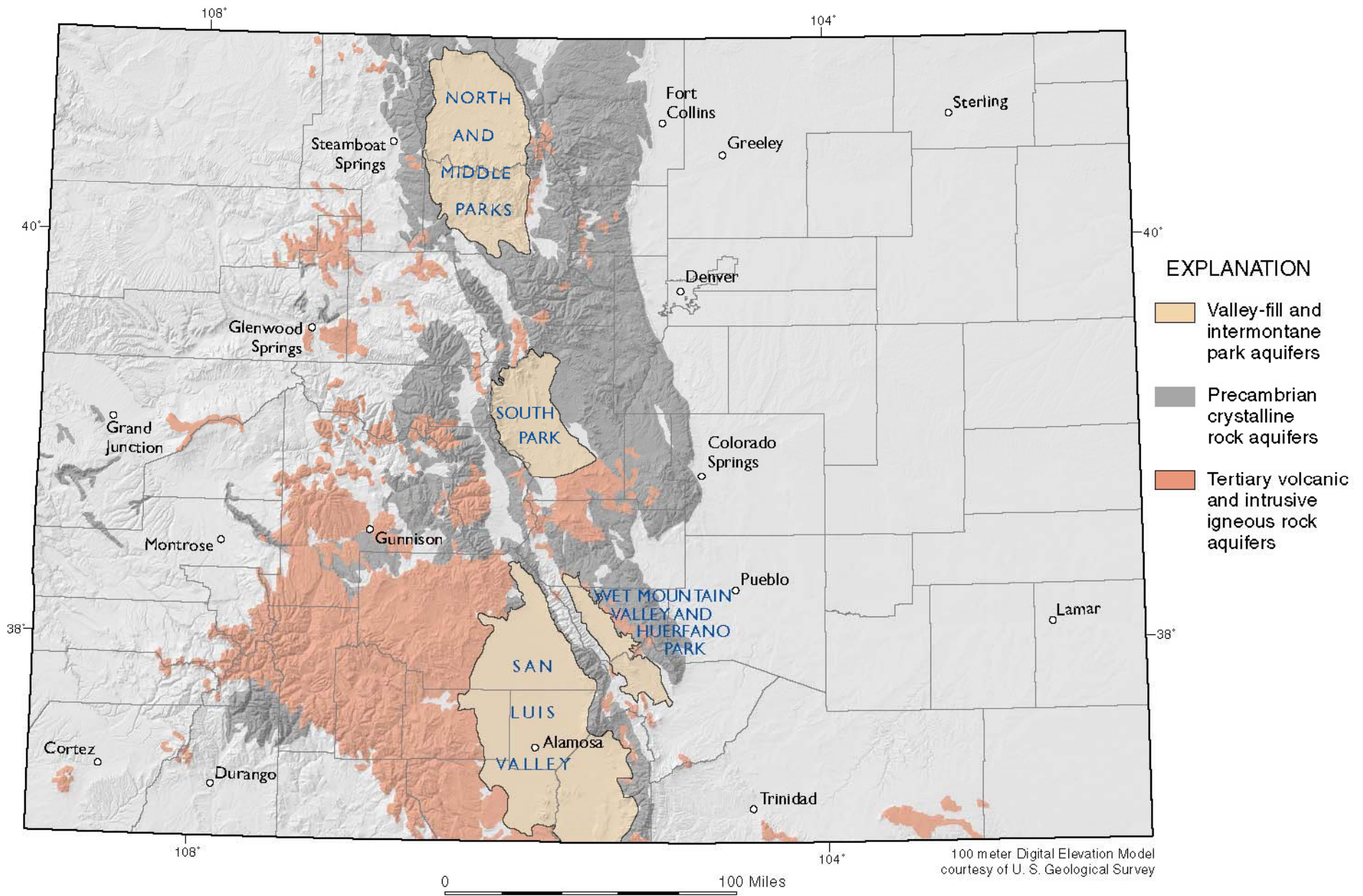
ALLUVIAL DEPOSITS



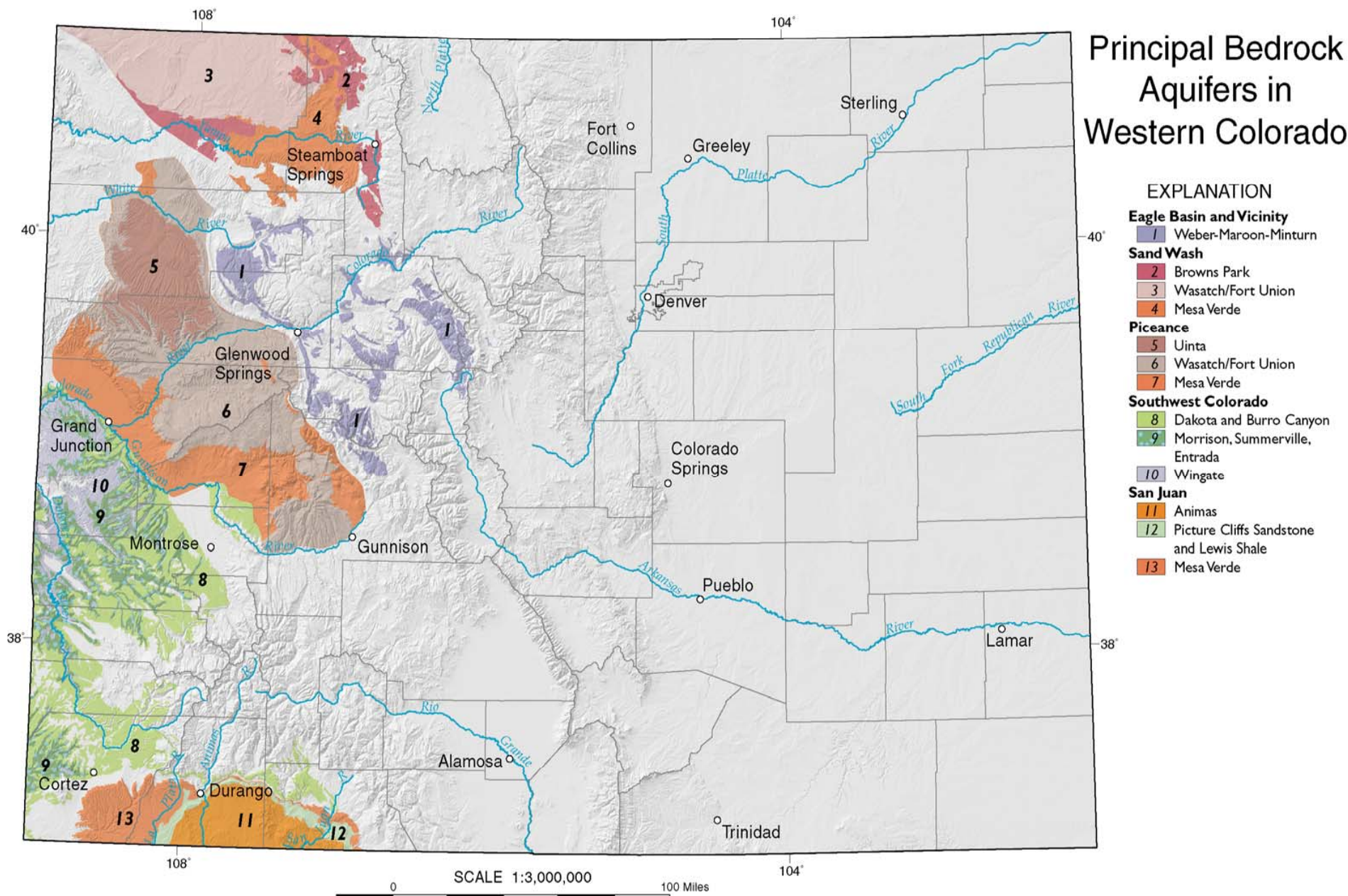
MAJOR SEDIMENTARY ROCK AQUIFERS



MOUNTAINOUS REGION AQUIFERS



Bedrock Aquifers in Western Colorado

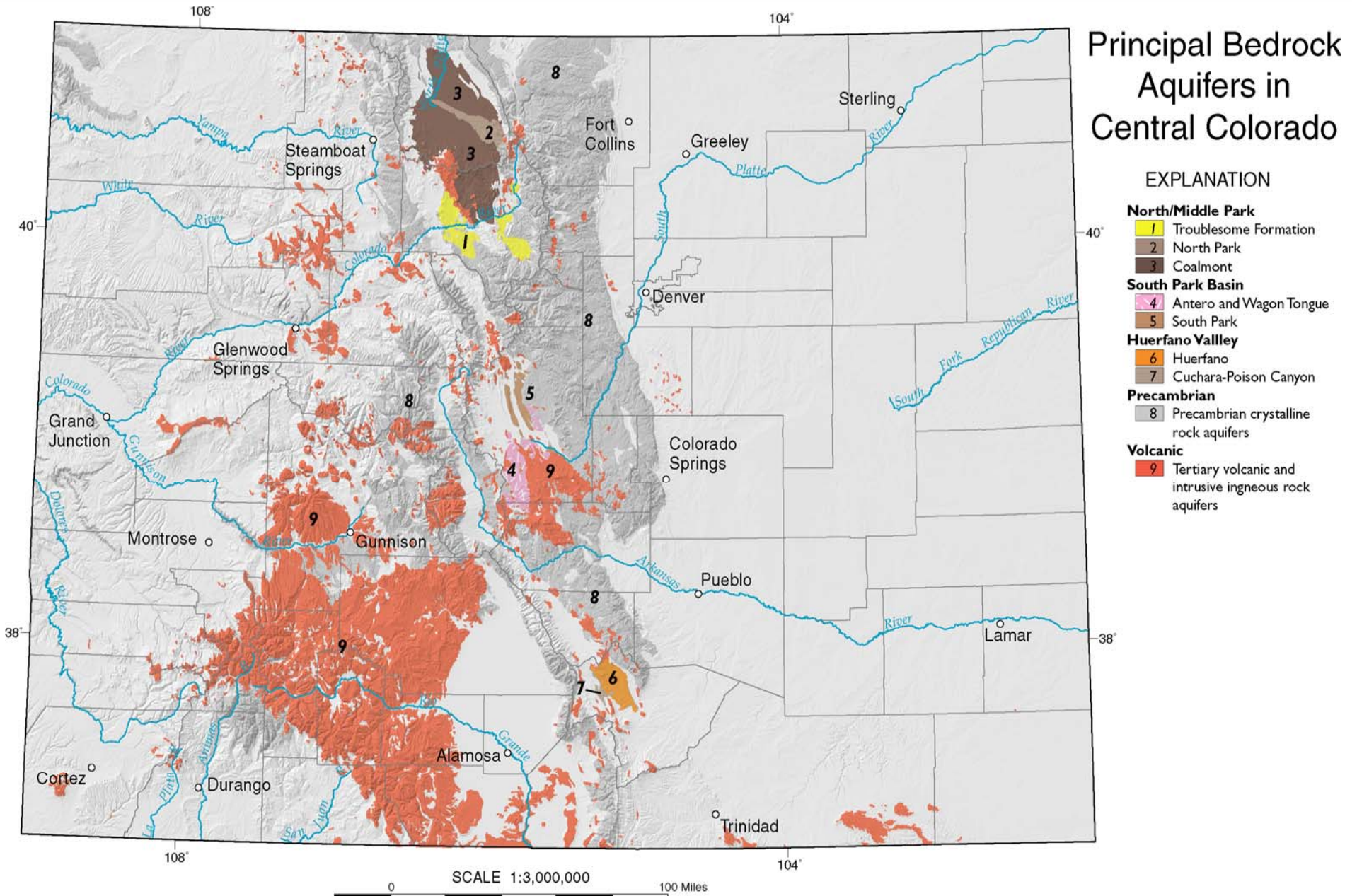


Hydrogeologic Units in Central Colorado

ERA	PERIOD	NORTH AND MIDDLE PARK BASINS		SOUTH PARK BASIN		
CENOZOIC	PLIOCENE	Grouse Mtn Basalt				
		MIOCENE	Troublesome Fm	No Park Fm	Trump Fm	Wagon Tongue Fm
			Unnamed Vol Rocks			
	OLIGOCENE	Rabbit Ears Volc		Antero Fm		
				Thirty-Nine Mile Volc		
	EOCENE			Agate Creek		
				Balfour Fm		
	PALEOCENE	Coalmont Fm				
		Middle Park Fm			South Park Fm	
	MESOZOIC	CRETACEOUS			Laramie Fm	
			Fox Hills Ss			
Pierre Sh			Pierre Sh			
UPPER			Niobrara Fm		Niobrara Fm	Smoky Hill Mbr Ft Hays Ls
			Carlile Sh		Colorado Grp	Codell Ss
			Frontier Ss			Carlile Sh
			Graneros Fm			Greenhorn Ls
			Mowry Sh		Graneros Sh	
Muddy Ss						
LOWER			Dakota Grp	Dakota Lakota Fusion	Dakota Grp	



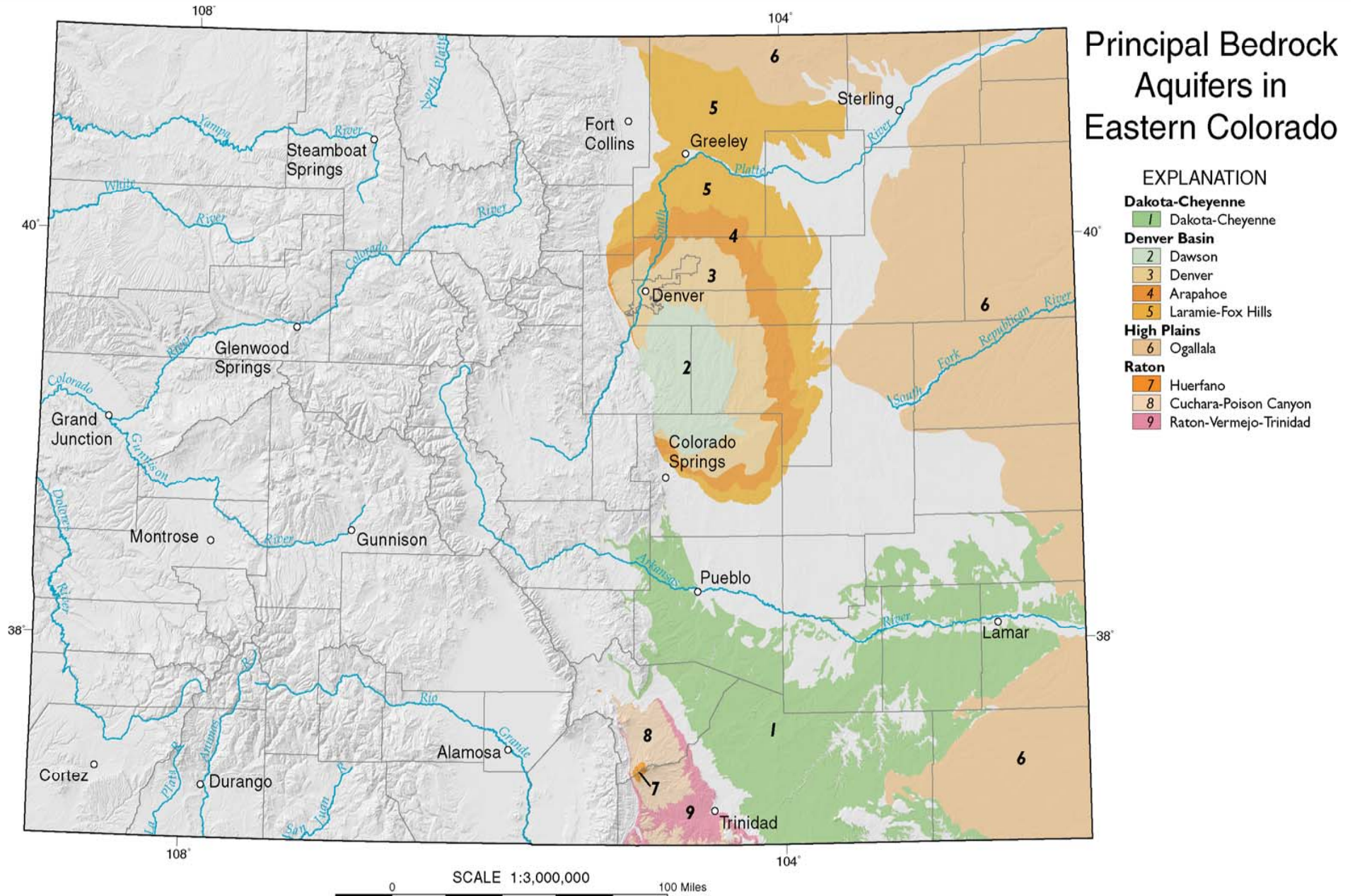
Bedrock Aquifers in Central Colorado



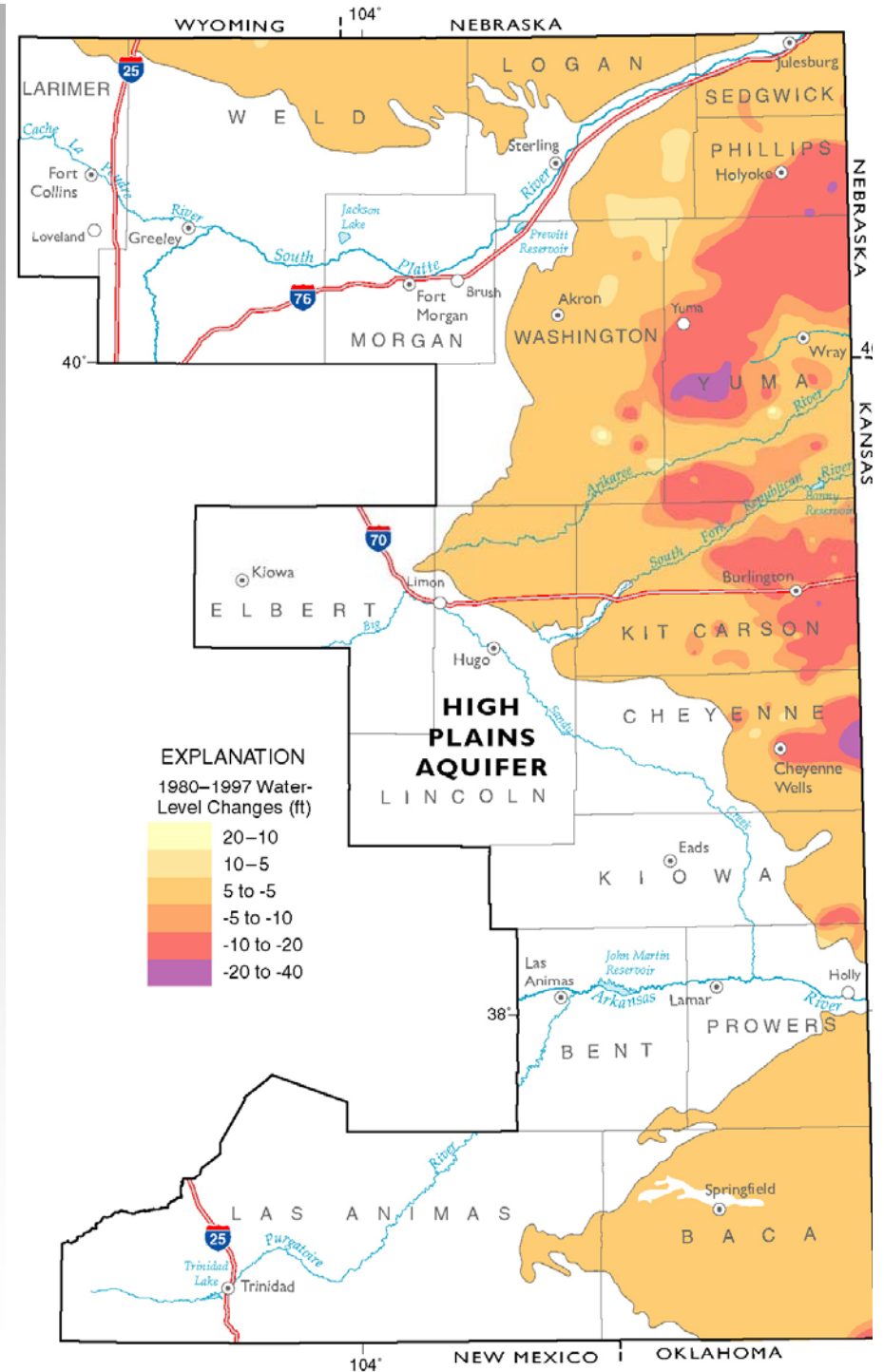
Hydrogeologic Units in Eastern Colorado

ERA	PERIOD	DENVER-JULESBURG BASIN	SOUTHEAST COLORADO AREA	RATON BASIN				
CENOZOIC	PLIOCENE	Ogallala Fm	Ogallala Fm	←				
	MIOCENE	Arikaree Grp	[Grey Area]	[Grey Area]				
		OLIGOCENE			White River Fm			
	EOCENE	[Grey Area]			Devils Hole Fm			
					Farista Fm			
PALEOCENE	Dawson Fm Denver Fm Arapahoe Fm	←			Huerfano-Cuchara			
MESOZOIC	CRETACEOUS	Laramie	[Grey Area]	Poison Canyon Fm				
		Fox Hills Ss		Raton Fm Vermejo Fm Trinidad Fm				
		Richards		Pierre Sh				
		Sussex						
		Pierre Sh						
		Shannon Mbr		Rocky Ford				
		Sharon Spgs		Pierre Sh				
		Niobrara Fm		Smoky Hill Mbr Ft Hays Ls	Niobrara Fm	Smoky Hill Mbr Ft Hays Ls	Niobrara Fm	Smoky Hill Mbr Ft Hays Ls
		Codell Ss		Codell Ss	Codell Ss			
		Colorado Grp		Carlile Sh Greenhorn Ls Graneros Sh	Colorado Grp	Carlile Sh Greenhorn Ls Graneros Sh	Carlile Sh Greenhorn Ls Graneros Sh	
Dakota Grp	So Platte Fm		Dakota Ss	Dakota Ss				
	"D" Ss Huntsman "J" Ss Skull Ck Lytle Fm	Kiowa Sh Cheyenne Ss						
LOWER				←				

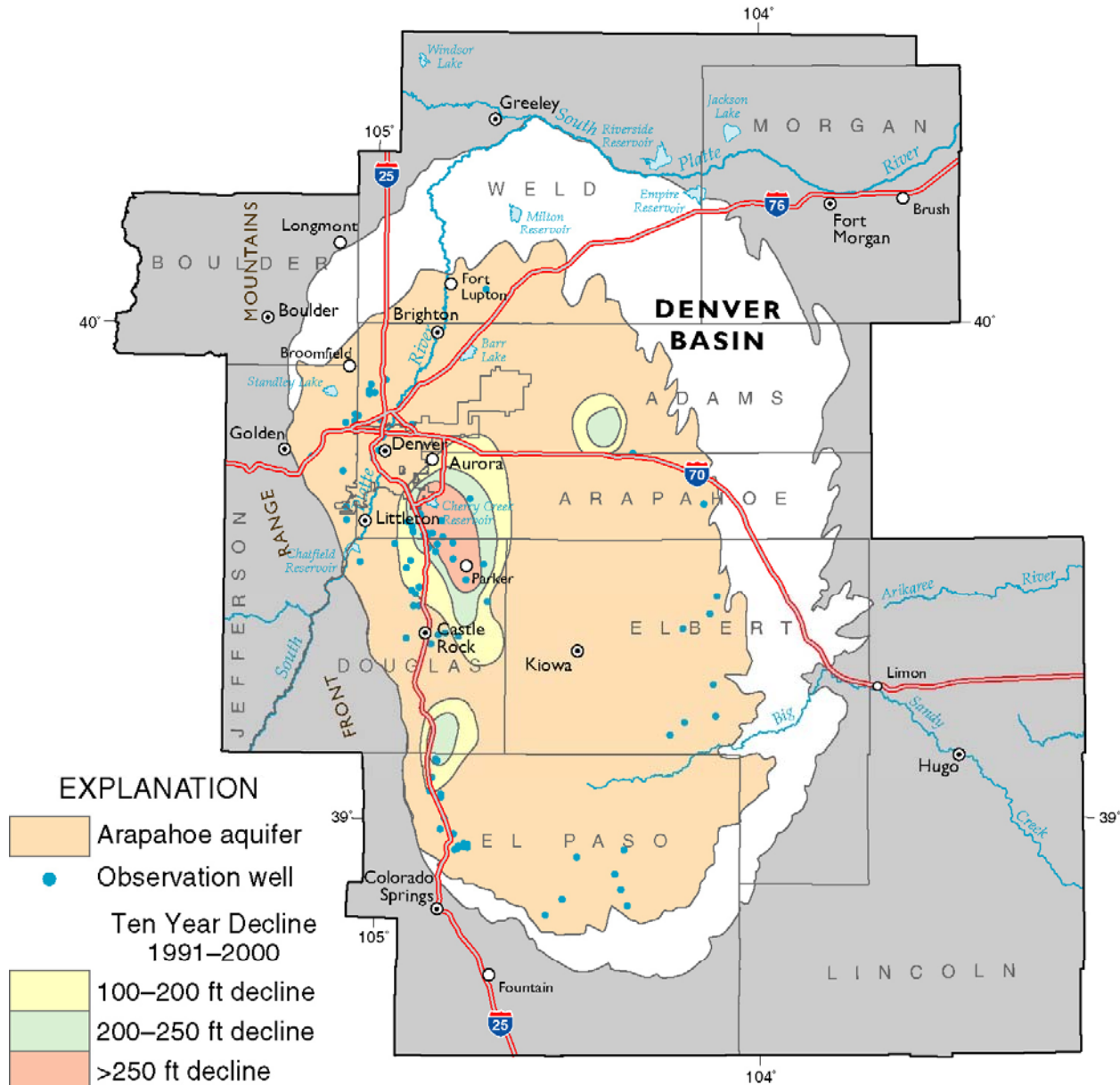
Bedrock Aquifers in Eastern Colorado



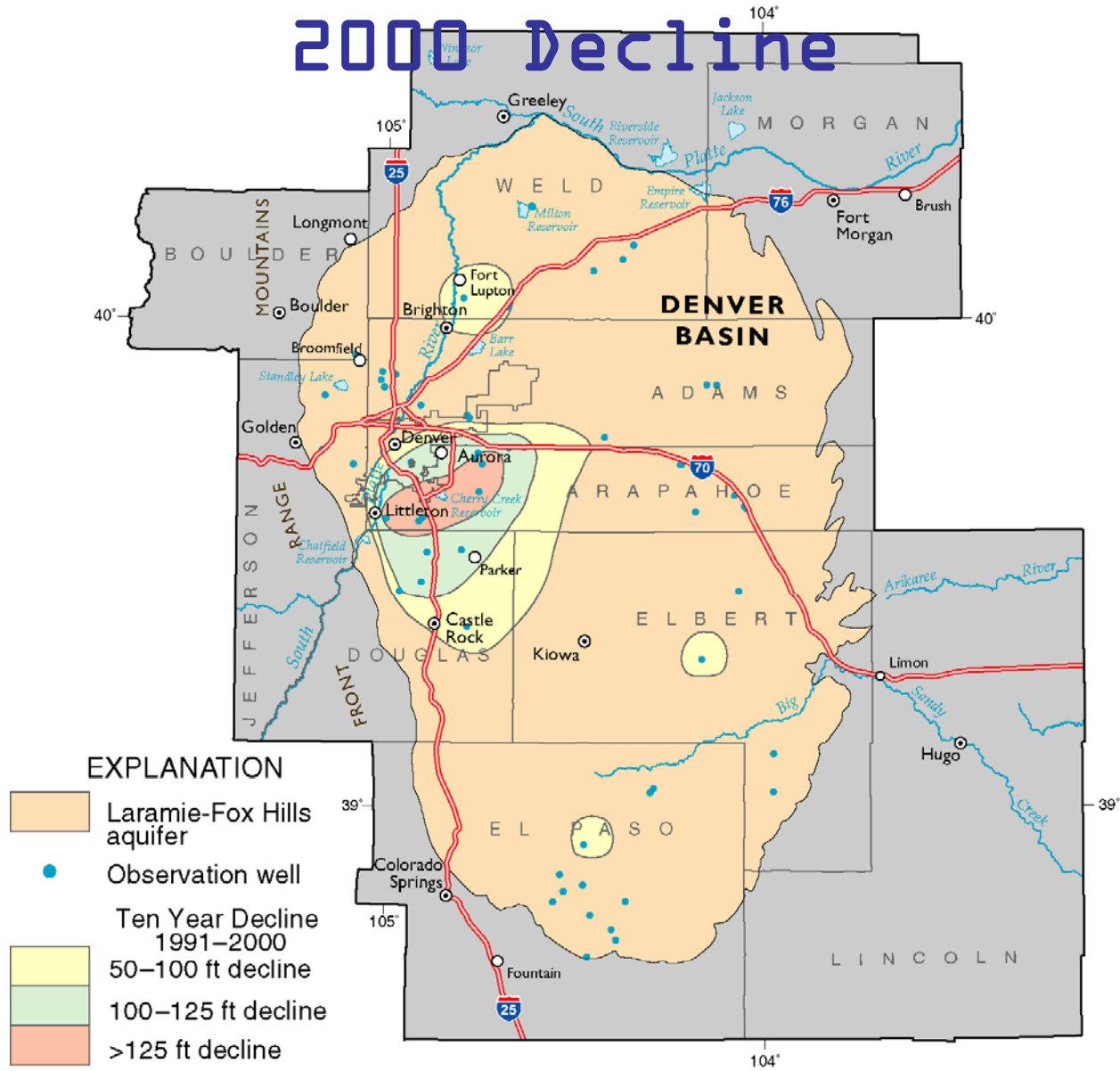
High Plains Aquifer: 1980- 1997 Change



Arapahoe Aquifer: 1991-2000 Decline



Laramie-Fox Hills Aquifer: 1991-2000 Decline



In Conclusion:

- Understanding basic geology is essential to understanding ground water occurrence in Colorado
- Complex geologic history = multitude of aquifers
- High-demand aquifers are experiencing depletion
- Some artificial recharge and conjunctive use projects attempt to slow drawdown.....Will it be enough?
- Other ground water resources do exist that have had little development