

COLORADO GEOLOGICAL SURVEY

Colorado School of Mines
1500 Illinois Street
Golden, Colorado 80401
Phone 303.866.2611
Fax 303.866.2461



Karen Berry
Director and State
Geologist

MEMORANDUM

TO: Eric Skeie, Water Resources Engineer
Colorado Water Conservation Board

FROM: Peter Barkmann

DATE: June 5, 2018

SUBJECT: County Groundwater Resource Assessment Project Fiscal Year End Progress Report

The Colorado Geological Survey has made good progress in completing this project within the anticipated timeline and budget. The following is a summary of progress by task:

Task 1 - Compile generalized geology: Compilation of existing geologic data is complete. Draft copies of the generalized geologic map and stratigraphic column relating mapped geologic formations to hydrostratigraphic units.

Task 2 - Compile hydrogeologic data: CGS has delineated 10 hydrostratigraphic units that will have maps and hydrologic characteristics described. These units include, in depth order from surficial units to deeper bedrock units:

1. Alluvial aquifer
2. Eolian sand deposits
3. Nussbaum and High Plains aquifers (treated as one aquifer type)
4. Upper Paleogene confining unit

5. Upper Dawson Aquifer
6. Lower Dawson Aquifer
7. Denver Aquifer
8. Arapahoe Aquifer
9. Laramie-Fox hills Aquifer
10. Upper Pierre aquifer

Maps will be prepared for each showing distribution and distribution of permitted wells. The maps will also show areas where the aquifer intersect the surface to be in connection with water system. These are areas of potential recharge as well as vulnerability. When available, aquifer parameter data will be tabulated for each unit.

Staff met with DWR to discuss differences between new interpretations of the Denver Basin Group strata and Senate Bill 5 aquifer designations. New interpretations made using new data suggest a more systematic stratigraphic architecture for Elbert County and surfaces generated by CGS will aid DWR in permitting and future determinations.

Task 3 - Compile water quality data: Staff has compiled water quality data from a number of sources to be shown on basic water quality and type maps for each aquifer and individual water quality standard exceedance maps. Data sources include:

1. National Water Quality Monitoring Council (NWQMC)
2. US Environmental Protection Agency
3. Colorado Department of Public Health and Environment (CDPHE) Storet and NWIS
4. Colorado Oil and Gas Conservations Commission (COGCC)
5. Miscellaneous publications
6. Colorado Department of Agriculture (CDA)
7. National Uranium Resource Evaluation (NURE)

Task 4 - Preparation of maps: Staff is preparing maps for individual aquifers as plates and other units as figures.

Task 5 - Preparation of GIS and web capable files: This task is being undertaken in conjunction with Task 4. Maps are in preparation in formats to be easily itegrated in a web based platform. A draft text report is in progress.

Task 6 - Preparation of hard-copy information sheet or poster: Not yet underway.

Invoicing and Budget:

The following Table is a breakdown of the expenses by the end of April 2018 allocated by task.

April 2018

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Total
Labor	\$0.00	\$0.00	\$1,430.57	\$3,057.32	\$6,491.52	\$0.00	\$10,979.41
Direct Costs	\$0.00						\$0.00
Total expenses this month	\$0.00	\$0.00	\$1,430.57	\$3,057.32	\$6,491.52	\$0.00	\$10,979.41
Prior Expenses	\$16,101.88	\$14,288.10	\$1,997.87	\$19,009.75	\$2,426.88	\$0.00	\$53,824.47
Expenses to Date	\$16,101.88	\$14,288.10	\$3,428.44	\$22,067.07	\$8,918.40	\$0.00	\$64,803.88
Budget	\$16,450.00	\$15,320.00	\$14,525.00	\$32,390.00	\$26,385.00	\$4,930.00	\$110,000.00
CGS Match: To Date	\$847.00	\$98.66	\$0.00	\$2,878.84	\$0.00	\$0.00	\$3,824.50
CGS Match: Month	\$0.00	\$0.00	\$1,430.57	\$3,057.32	\$6,491.52	\$0.00	\$10,979.41
CGS Match: Total	\$847.00	\$98.66	\$1,430.57	\$5,936.16	\$6,491.52	\$0.00	\$14,803.91
Total Spent	\$16,101.88	\$14,288.10	\$3,428.44	\$22,067.07	\$8,918.40	\$0.00	\$64,803.88
Remaining	\$348.12	\$1,031.91	\$11,096.57	\$10,322.93	\$17,466.60	\$4,930.00	\$45,196.11
CWCB Funds Spent	\$15,254.88	\$14,189.44	\$1,997.87	\$16,130.91	\$2,426.88	\$0.00	\$49,999.98
CWCB Funds Remaining							\$0.02
% Task Cost Billed	98%	93%	24%	68%	34%	0%	

If you have any questions regarding this summary of activities, please don't hesitate to contact me by telephone at (303) 384-2642, or email at barkmann@mines.edu.

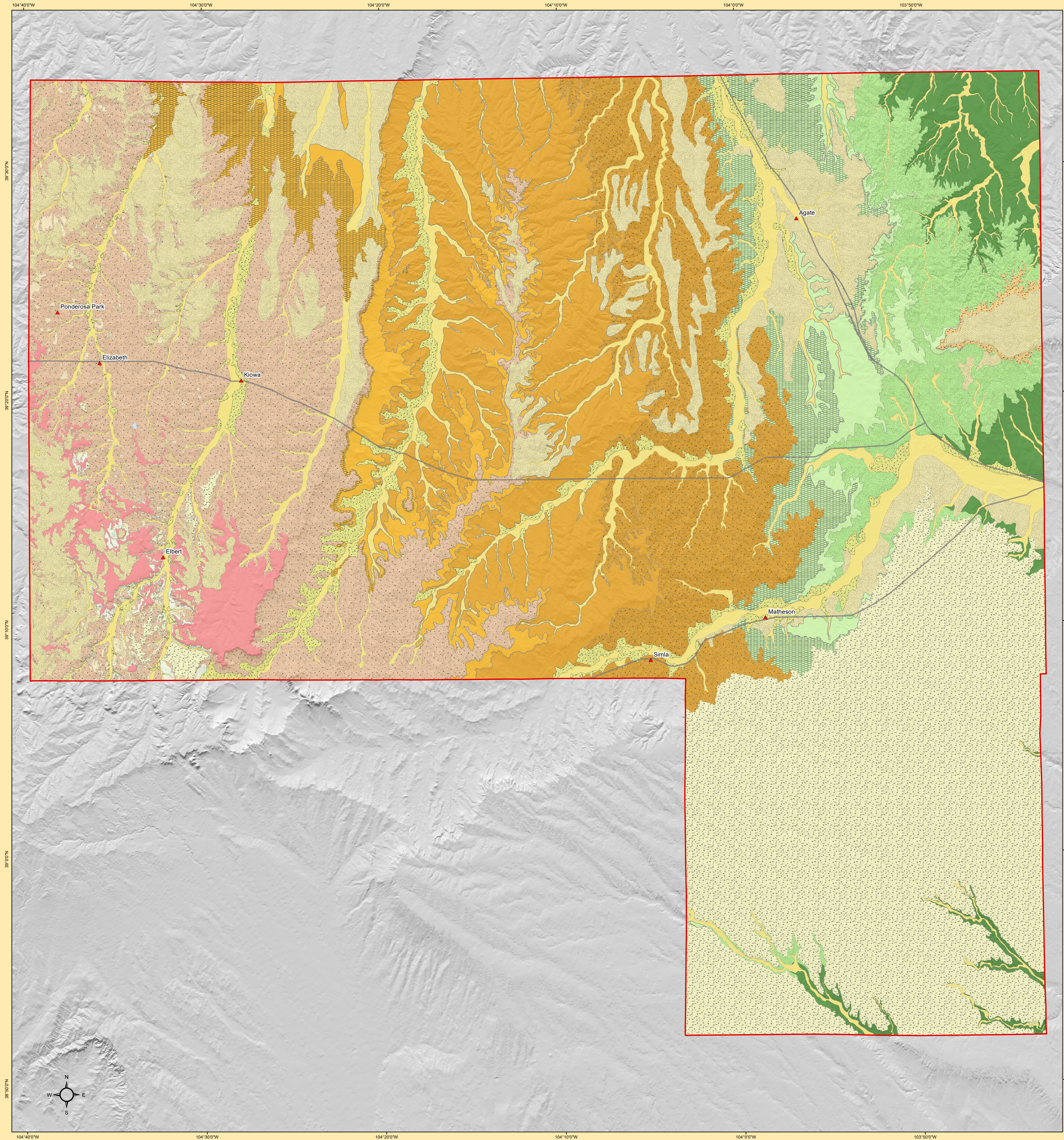
Plate 1

Elbert County Geology and Groundwater Resources

Generalized Geologic Map

COLORADO GEOLOGICAL SURVEY
COLORADO SCHOOL OF MINES
GOLDEN, COLORADO

GEOLOGY AND GROUNDWATER RESOURCES
ELBERT COUNTY, COLORADO
GEOLOGIC MAP
OPEN FILE REPORT 18 - XX



Legend

Elbert County Outline

Cities

Highways

Elbert Geology (merge)

FMT

af

Qc

Qcs

Qls

Qsw

Qaf

Qap

Qes

Qal

Qn

No

Tcr

Tlc

Tlc?

Twm

Tda

TKdum

TKdurf

TKdmf

TKdlf

Klush

Klisst

Kfn

Kpush

Kpsst

Kpm

Common Data

Map Explanation: This map illustrates general surface geology of Mesa County, Colorado and is based on current mapping efforts.

Details: Geologic maps used in the compilation include most recent 1:24,000 scale geologic quadrangle maps or 1:100,000 and 1:250,000 scale maps where the large scale maps have not been prepared.

Hillshade raster base layer produced from 30 meter statewide Digital Elevation Model.

Note: Wells with locations listed as measurements from section lines or global positioning satellite (GPS) in the DWR permit files are considered as *high confidence* locations. Wells with locations listed as quarter-quarter reference alone are considered as *low confidence* locations.

Note: Water Level (WL), in feet, are as reported in the DWR well permit database. Not Listed (nl) indicates no data exists for depth or water level in the database.

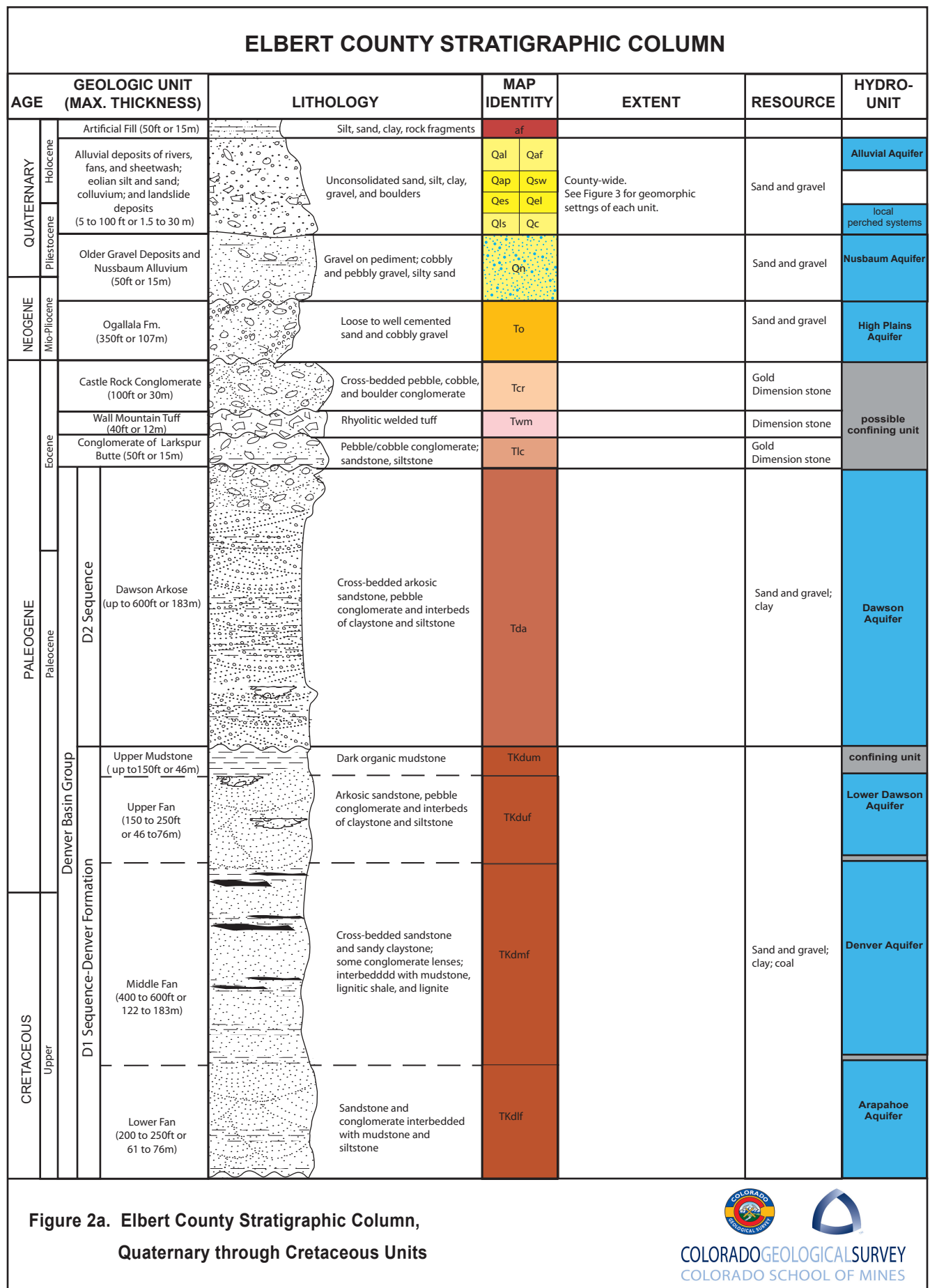


Figure 2a. Elbert County Stratigraphic Column,
Quaternary through Cretaceous Units

ELBERT COUNTY STRATIGRAPHIC COLUMN

AGE	GEOLOGIC UNIT (MAX. THICKNESS)	LITHOLOGY	MAP IDENTITY	EXTENT	RESOURCE	HYDRO- UNIT
CRETACEOUS	Upper Laramie Fm (150 to 200ft or 46 to 61m)	Coaly shale; occasional thick-bedded sandstone				confining unit
	Lower Laramie Fm (50 to 150ft or 15 to 46m)	Coaly or sandy shale; coal; interbedded sandstone			Coal	
	Fox Hills Sandstone (250 to 400ft or 76 to 122m)	Micaceous sandstone	Kfh			Laramie-Fox Hills Aquifer
	Pierre Shale upper unit (150 to 300ft or 46 to 92m)	Gray to dark gray shale				confining unit
	Upper Pierre Sandstone (500 to 700ft or 152 to 213m)	Thin-bedded fine grained sandstone				Upper Pierre Aquifer
	Pierre Shale main unit (5000ft or 1524m)	Gray to dark gray shale	Kp		Oil and gas	predominately a confining unit
	Older Cretaceous Units Undivided	Niobrara Formation, Carlile Shale, Greenhorn Limestone, and Graneros Shale: Shale and limestone;	Ku			confining unit
	Dakota Group Undivided	Dakota Sandstone and Purgatoire Formations: Sandstone, pebble conglomerate and shale	Kd		Oil and gas	Dakota- Cheyenne Aquifer
JURASSIC	Morrison Fm.	Variegated shales and sandstones	Jm			
CAMBRIAN-TRIASSIC	Jurassic to Cambrian Units Undivided	Ralston Creek and Lykins Formations, Lyons Sandstone, Fountain Formation, Williams Canyon Formation and Sawatch Sandstone: Sandstone, siltstone, shale, gypsum and anhydrite, limestone, and quartzite	Jc			
"Great Unconformity": No rocks preserved from this time period.						
PRECAMBRIAN	Precambrian Igneous and Metamorphic Rocks	Igneous plutons, gneisses and migmatites of varying age and composition	pC			

Figure 2b. Elbert County Stratigraphic Column,
Cretaceous through Precambrian Units



COLORADO GEOLOGICAL SURVEY
COLORADO SCHOOL OF MINES