Figure 1. Study area and U.S. Geological Survey streamflow-gaging stations in the Mogollon Highlands, Arizona.

Figure 1. Study area and U.S. Geological Survey streamflow-gaging stations in the Mogollon Highlands, Arizona.

Figure 2. U.S. Geological Survey Rural Watershed Initiative study areas.

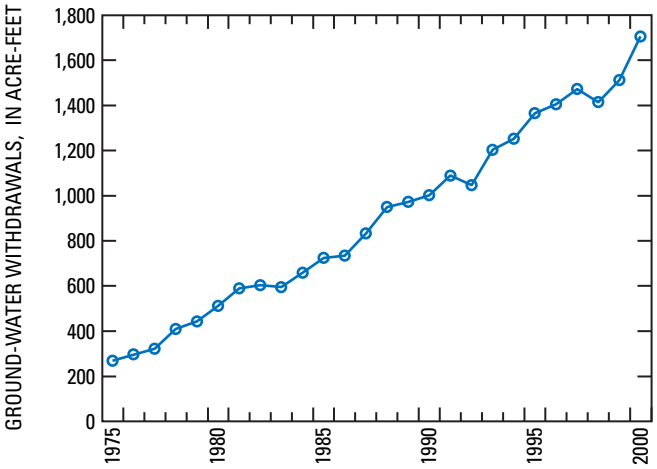


Figure 3. Annual ground-water withdrawals by the town of Payson, Arizona.

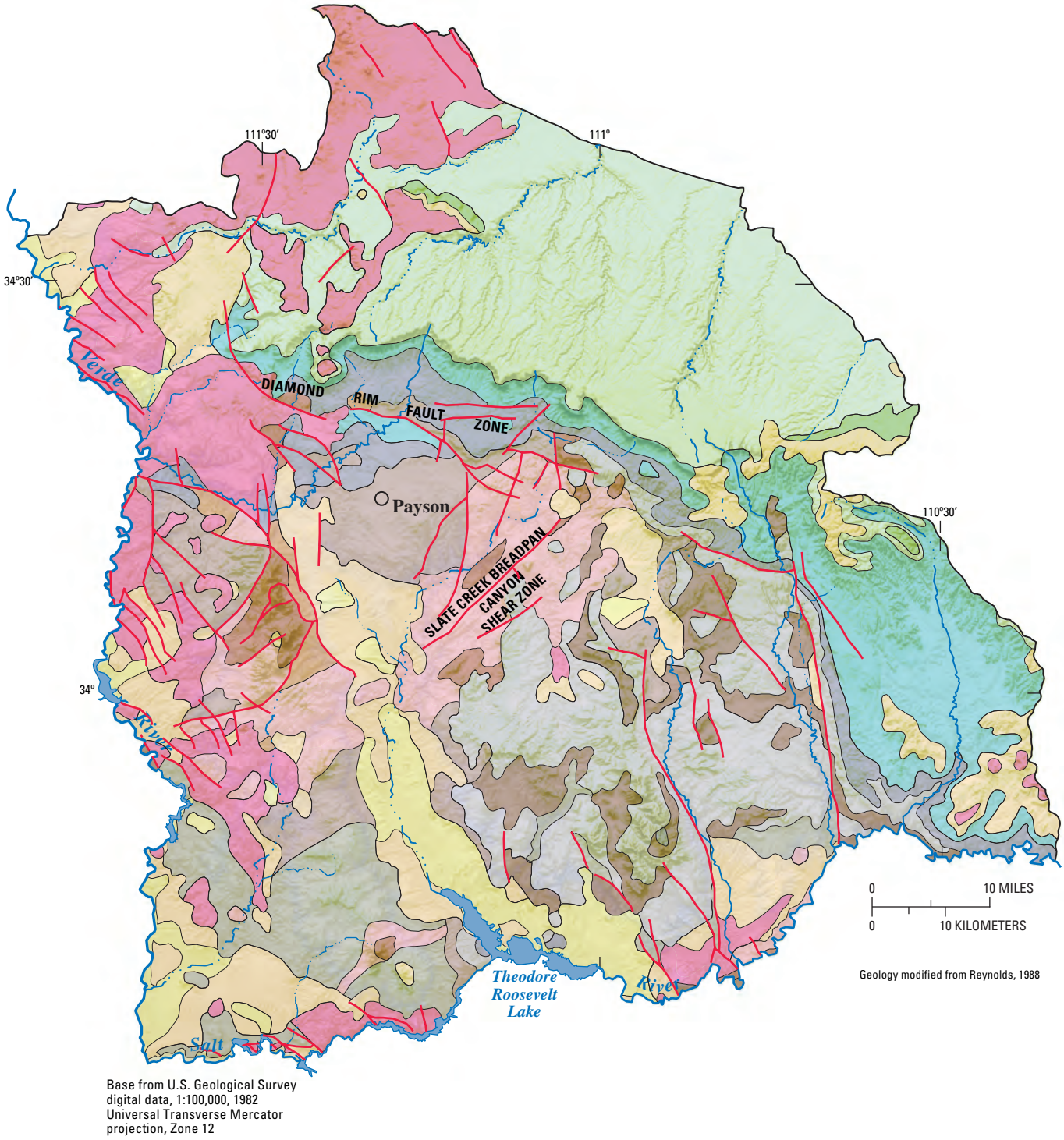


Figure 4. Geology and geologic structure of the Mogollon Highlands, Arizona.

EXPLANATION

- SURFICIAL DEPOSITS, MOSTLY ALLUVIUM—Holocene to Middle Pleistocene
- SEDIMENTARY ROCKS—Pliocene to Middle Miocene
- VOLCANIC ROCKS—Pliocene to Middle Miocene
- SEDIMENTARY ROCKS, UNDIFFERENTIATED—Cretaceous
- SEDIMENTARY ROCKS—Permian (Kaibab Formation and Coconino Sandstone)
- SEDIMENTARY ROCKS—Permian and Pennsylvannian (Schnebly Hill Formation, Supai Formation, and Naco Formation)
- SEDIMENTARY ROCKS—Mississippian to Cambrian (Redwall Limestone, Martin Formation, and Tapeats Sandstone)
- SEDIMENTARY ROCKS—Middle Proterozoic (Apache Group)
- DIABASE—Middle Proterozoic
- GRANITOID ROCKS—Middle Proterozoic
- GRANITOID ROCKS—Early Proterozoic (Payson granite)
- QUARTZITE —Early Proterozoic (Mazatzal Group quartzite of Tonto Supergroup)
- METASEDIMENTARY AND METAVOLCANIC ROCKS, DIFFERENTIATED—Early Proterozoic (Tonto Supergroup: Red Rock Group, Alder Group, East Verde River Formation)
- FAULT

Figure 4. Continued.

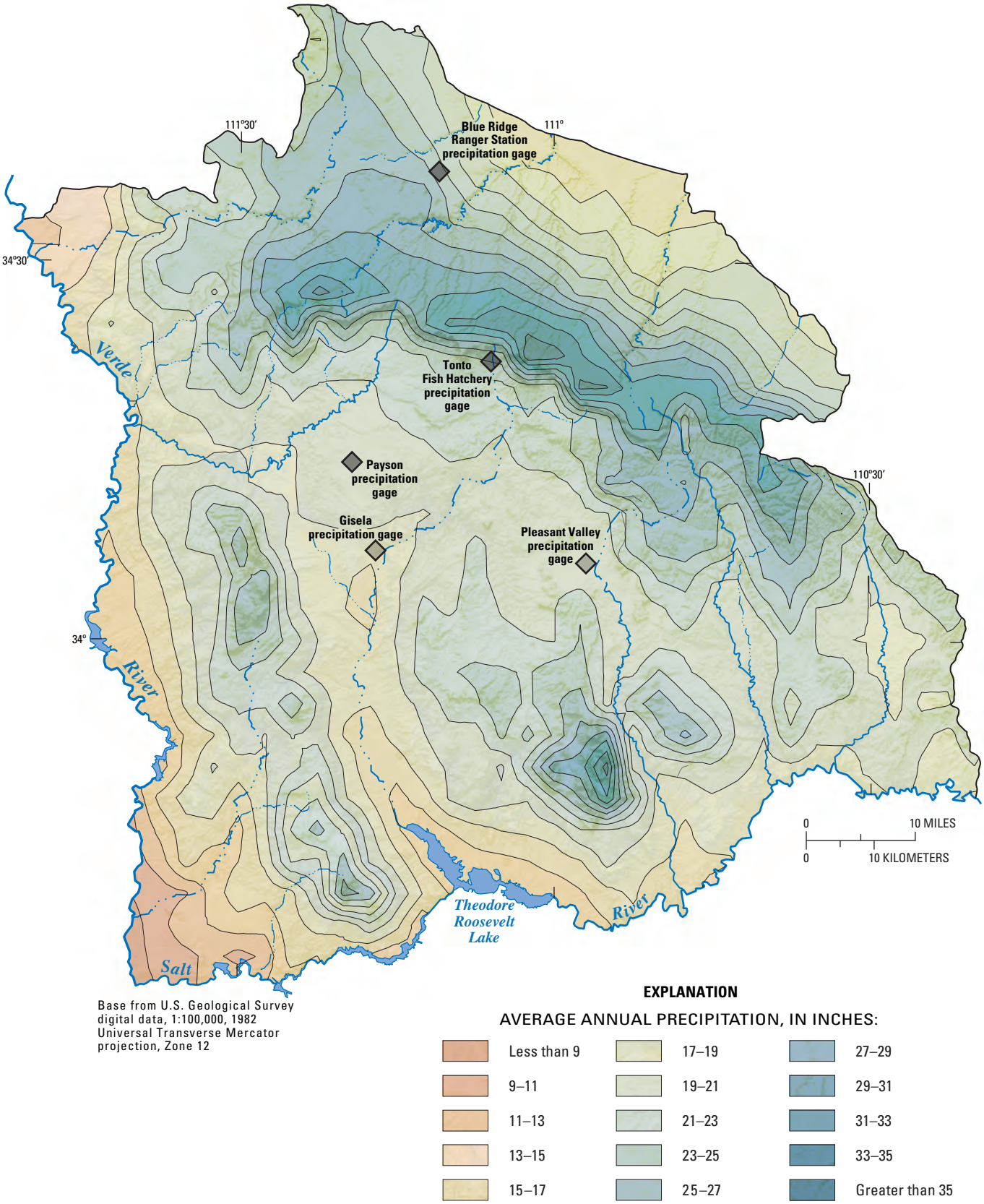


Figure 5. Average annual precipitation and locations of active weather stations in the Mogollon Highlands, Arizona.

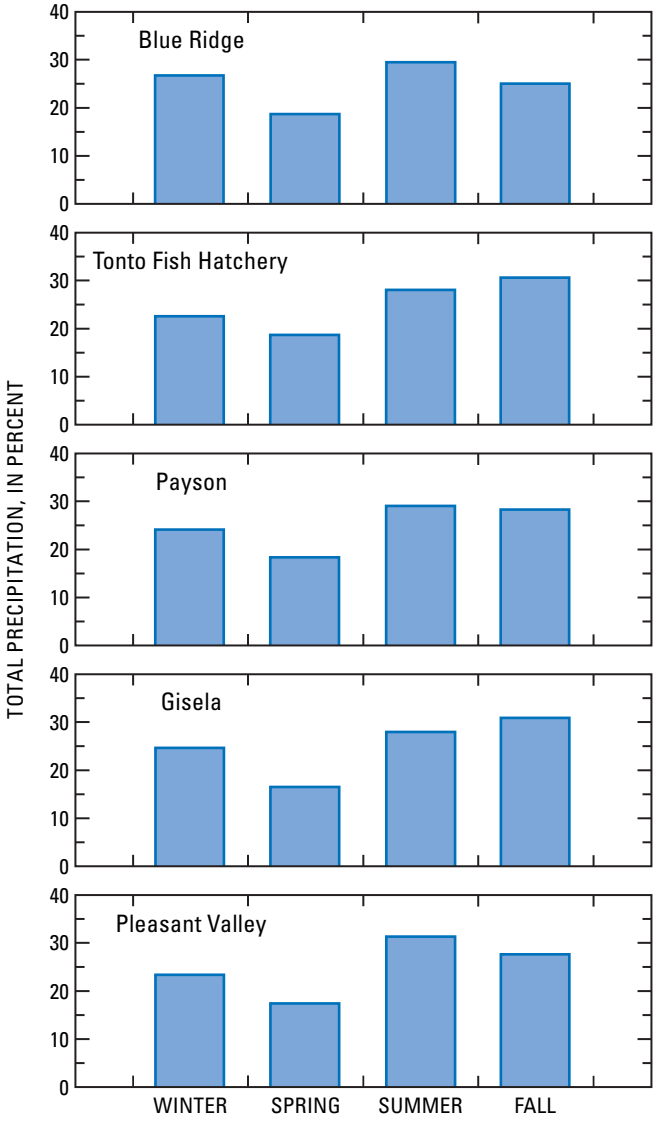
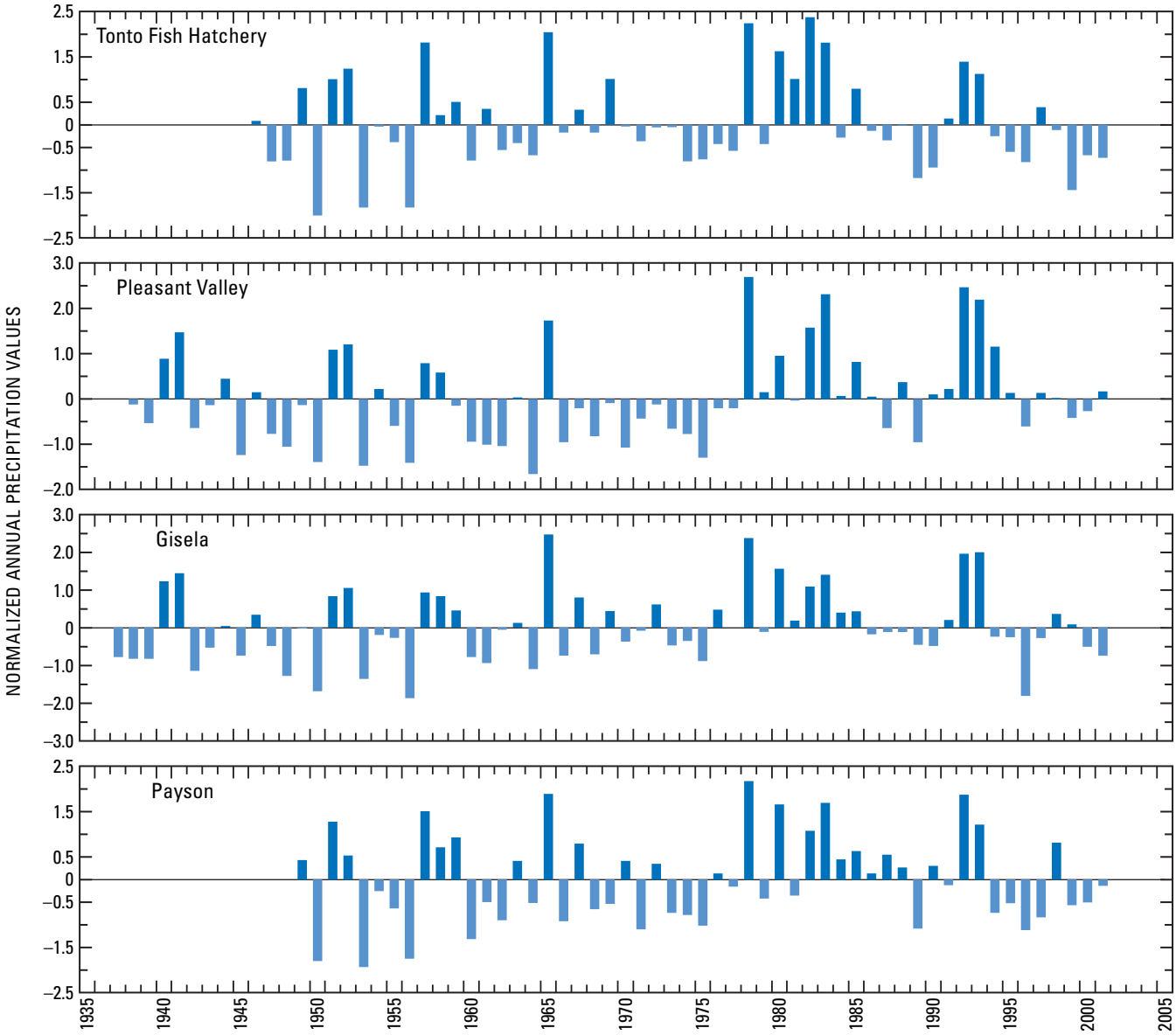


Figure 6. Seasonal distribution of precipitation for selected sites in the Mogollon Highlands, Arizona.

A. Normalized annual average precipitation for Mogollon Highlands



B. Normalized annual average temperature for Payson

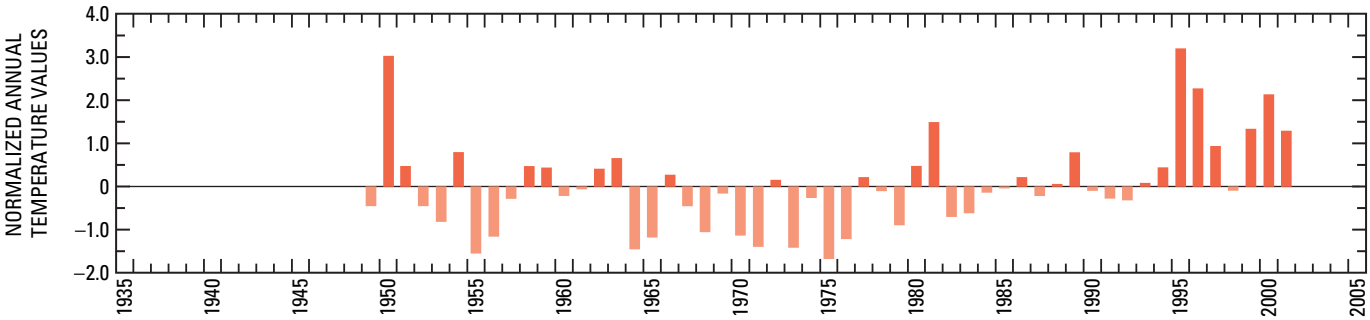


Figure 7. *A*. Normalized annual average precipitation for the Mogollon Highlands, Arizona; *B*. Normalized annual average temperature for Payson, Arizona.

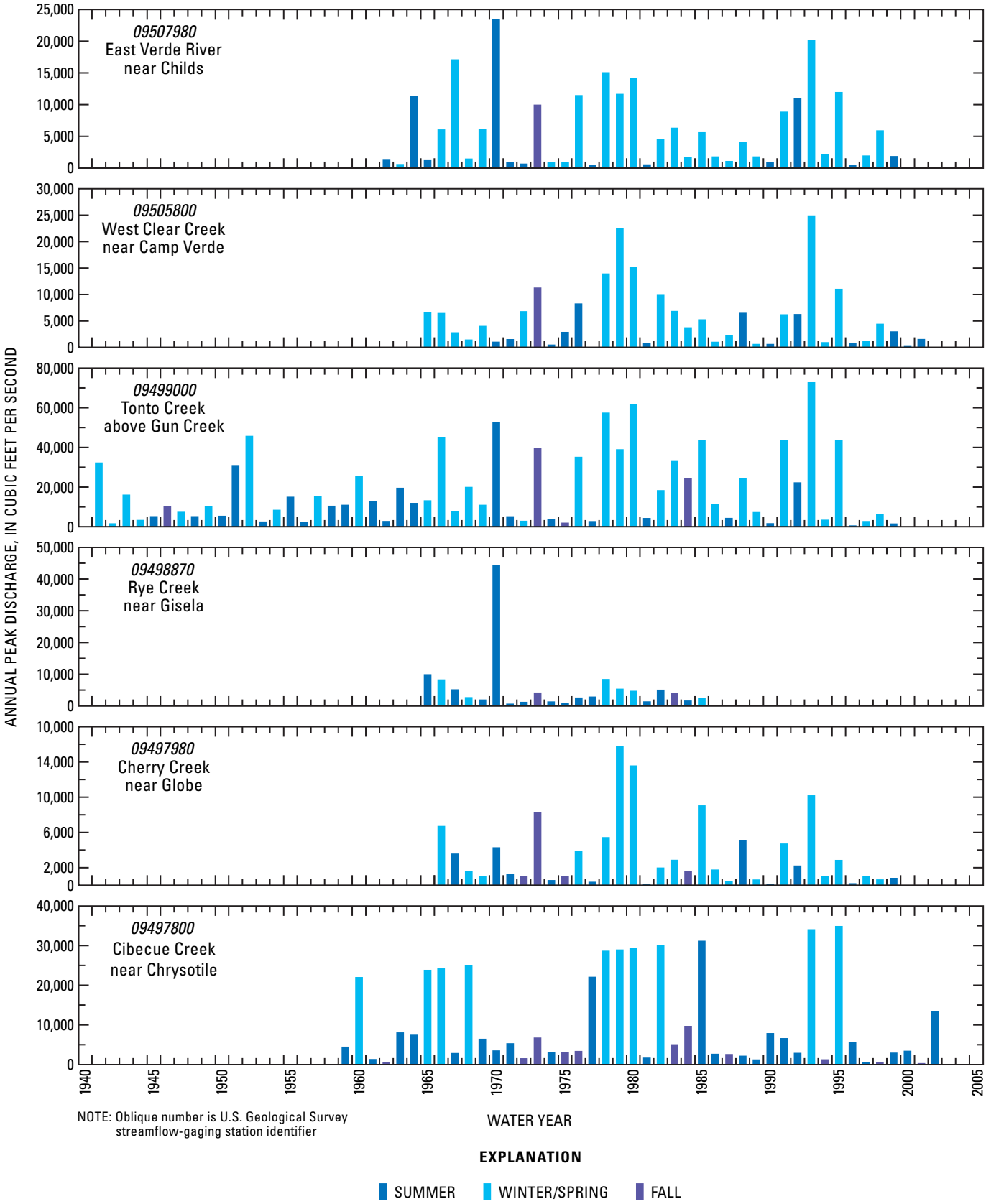


Figure 8. Seasonal distribution of annual peak discharges of selected streams in the Mogollon Highlands, Arizona.

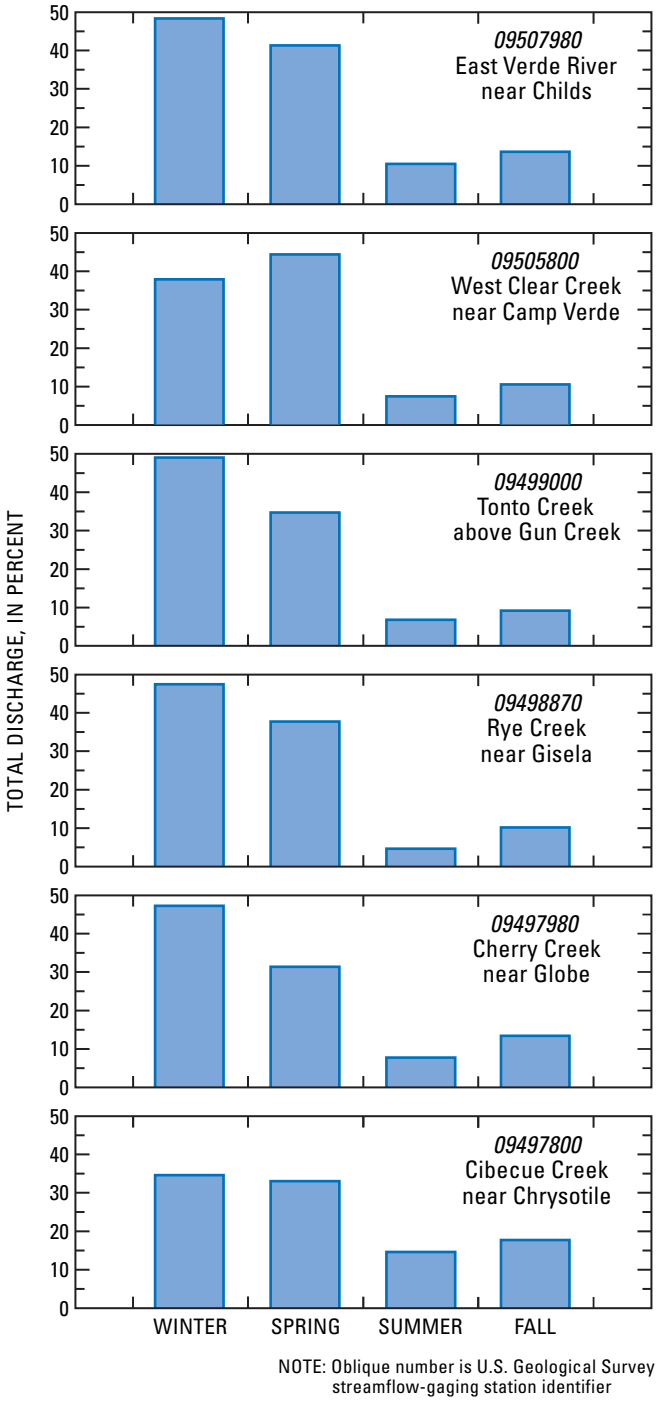


Figure 9. Seasonal distribution of discharge of selected streams in the Mogollon Highlands, Arizona.

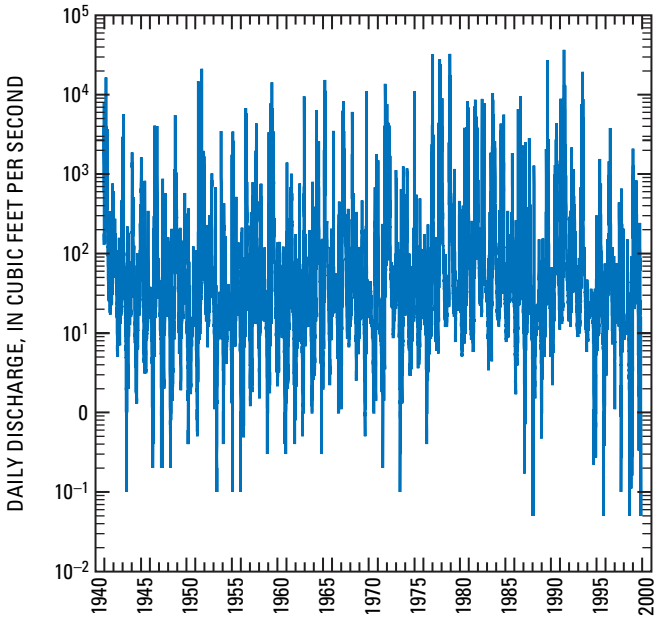


Figure 10. Daily discharge of Tonto Creek above Gun Creek showing typical range of daily discharge for Mogollon Highlands streams.

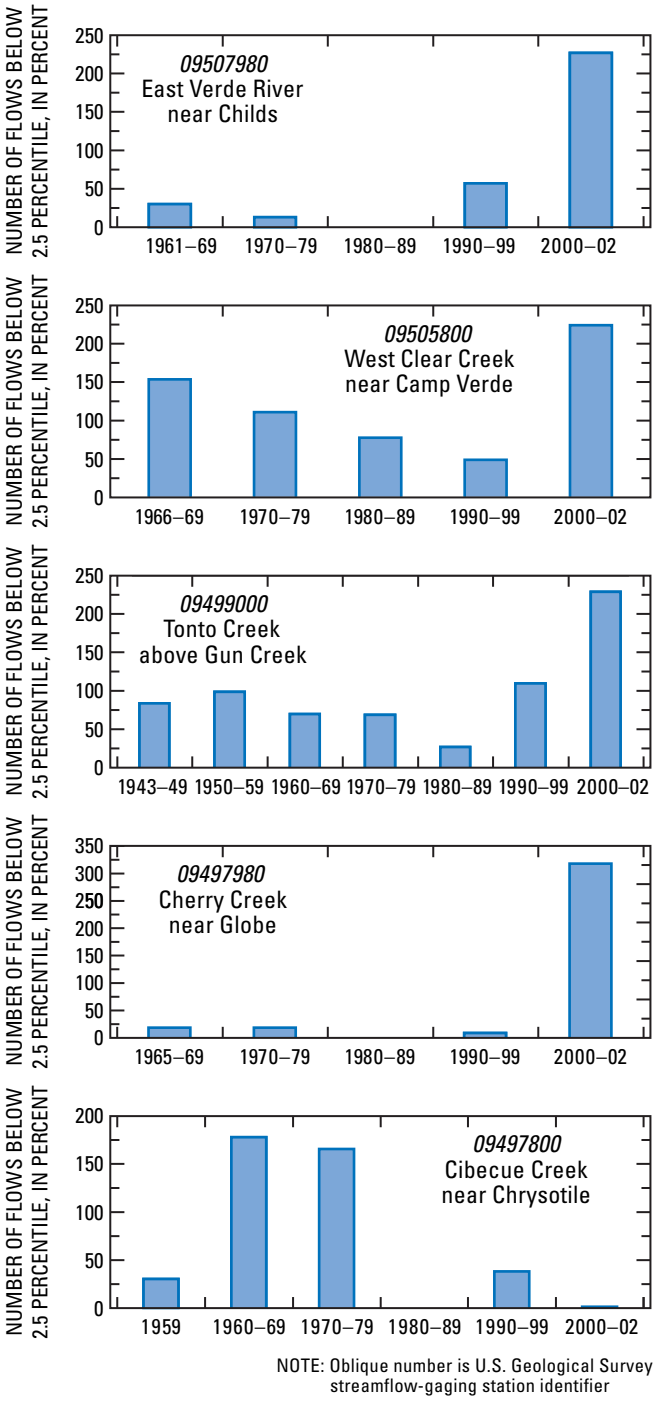


Figure 11. Lowest flows on selected perennial streams in the Mogollon Highlands, Arizona.

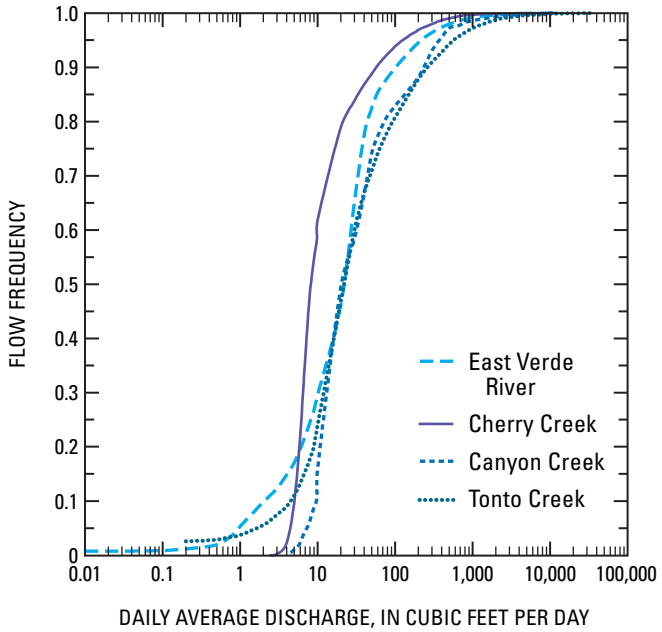


Figure 12. Flow duration curve for selected streams in the Mogollon Highlands, Arizona.

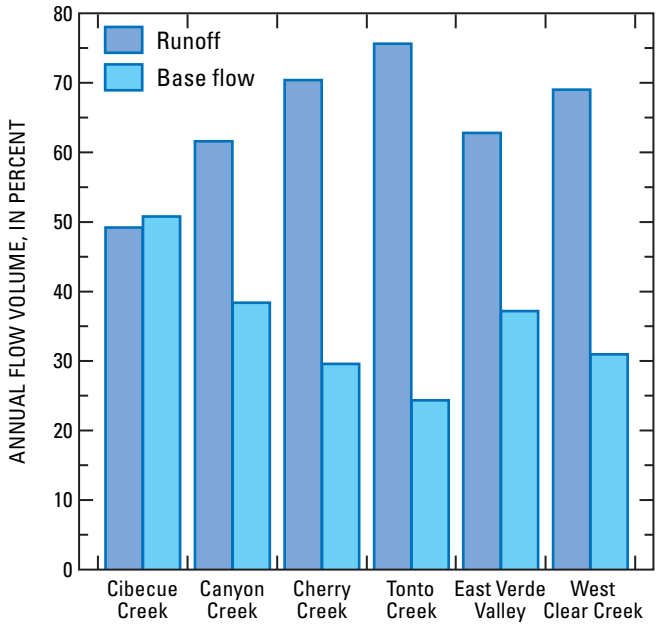
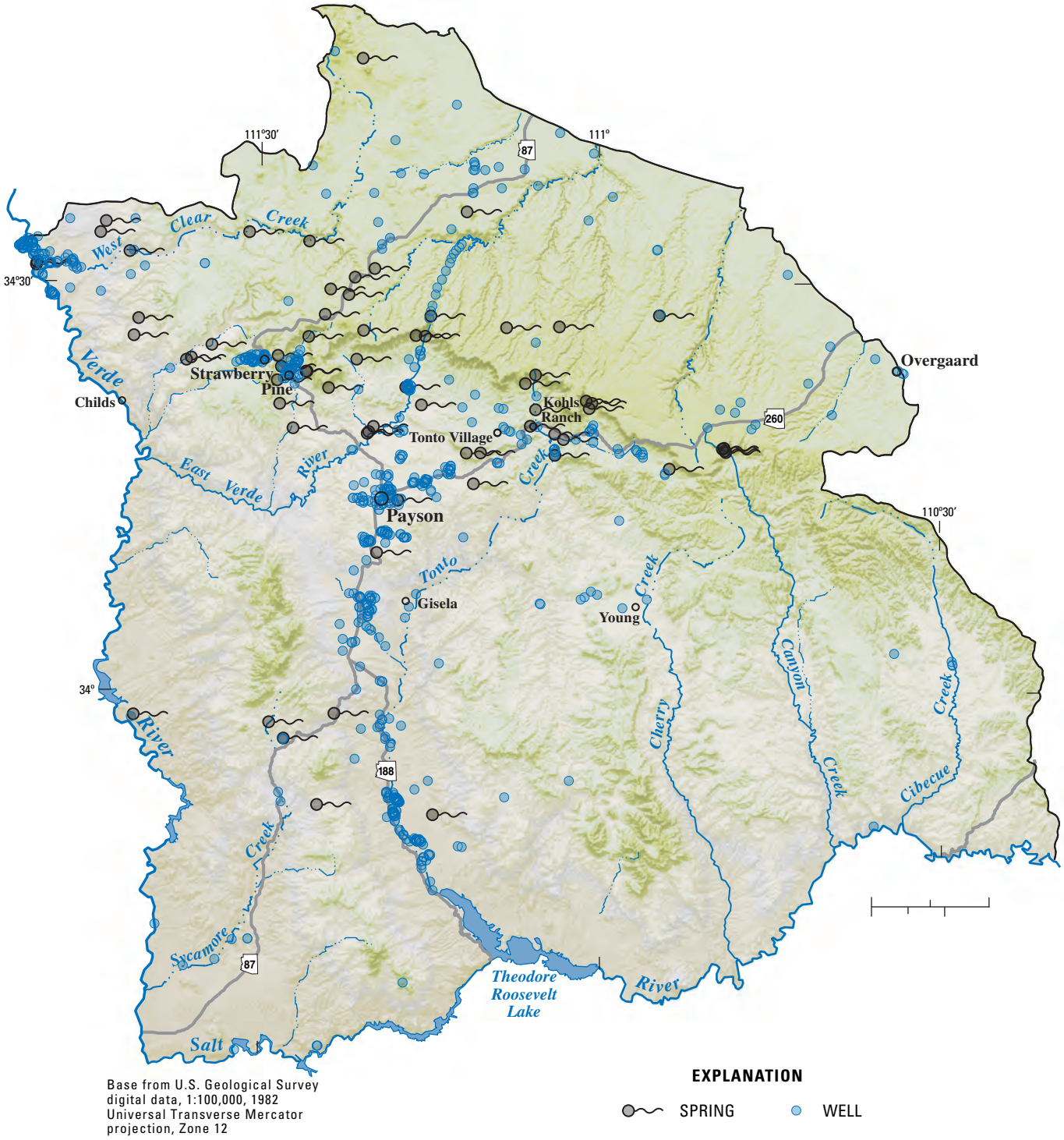


Figure 13. Runoff and base flow components of selected streams in the Mogollon Highlands, Arizona.



Base from U.S. Geological Survey digital data, 1:100,000, 1982 Universal Transverse Mercator projection, Zone 12

Figure.14 Distribution of springs and wells in the Mogollon Highlands, Arizona.

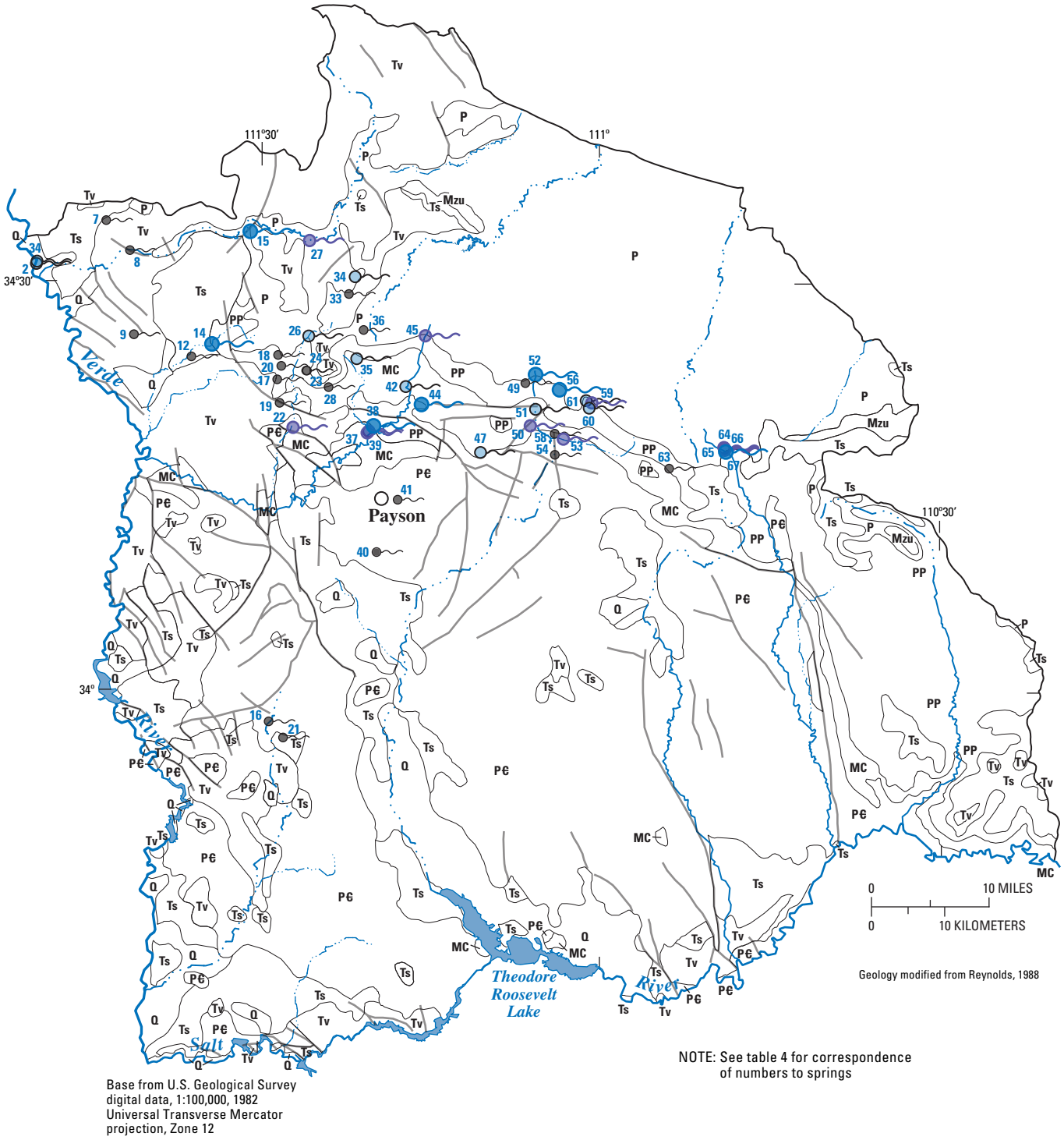


Figure 15. Geology ,geologic structure, and locations of springs for which discharge records are available, Mogollon Highlands, Arizona.

EXPLANATION

Q	SURFICIAL DEPOSITS, MOSTLY ALLUVIUM—Holocene to Middle Pleistocene
Ts	SEDIMENTARY ROCKS—Pliocene to Middle Miocene
Tv	VOLCANIC ROCKS—Pliocene to Middle Miocene
Mzu	SEDIMENTARY ROCKS, UNDIFFERENTIATED—Cretaceous
P	SEDIMENTARY ROCKS—Permian (Kaibab Formation and Coconino Sandstone)
PP	SEDIMENTARY ROCKS—Permian and Pennsylvannian (Schnebly Hill Formation, Supai Formation, and Naco Formation)
MC	SEDIMENTARY ROCKS—Mississippian to Cambrian (Redwall Limestone, Martin Formation, and Tapeats Sandstone)
P€	PROTEROZOIC ROCKS
	FAULT

RANGE OF DISCHARGE, IN GALLONS PER MINUTE:

9	Less than 10	66	100–1,000
61	10–100	49	Greater than 1,000

Figure 15. Continued.

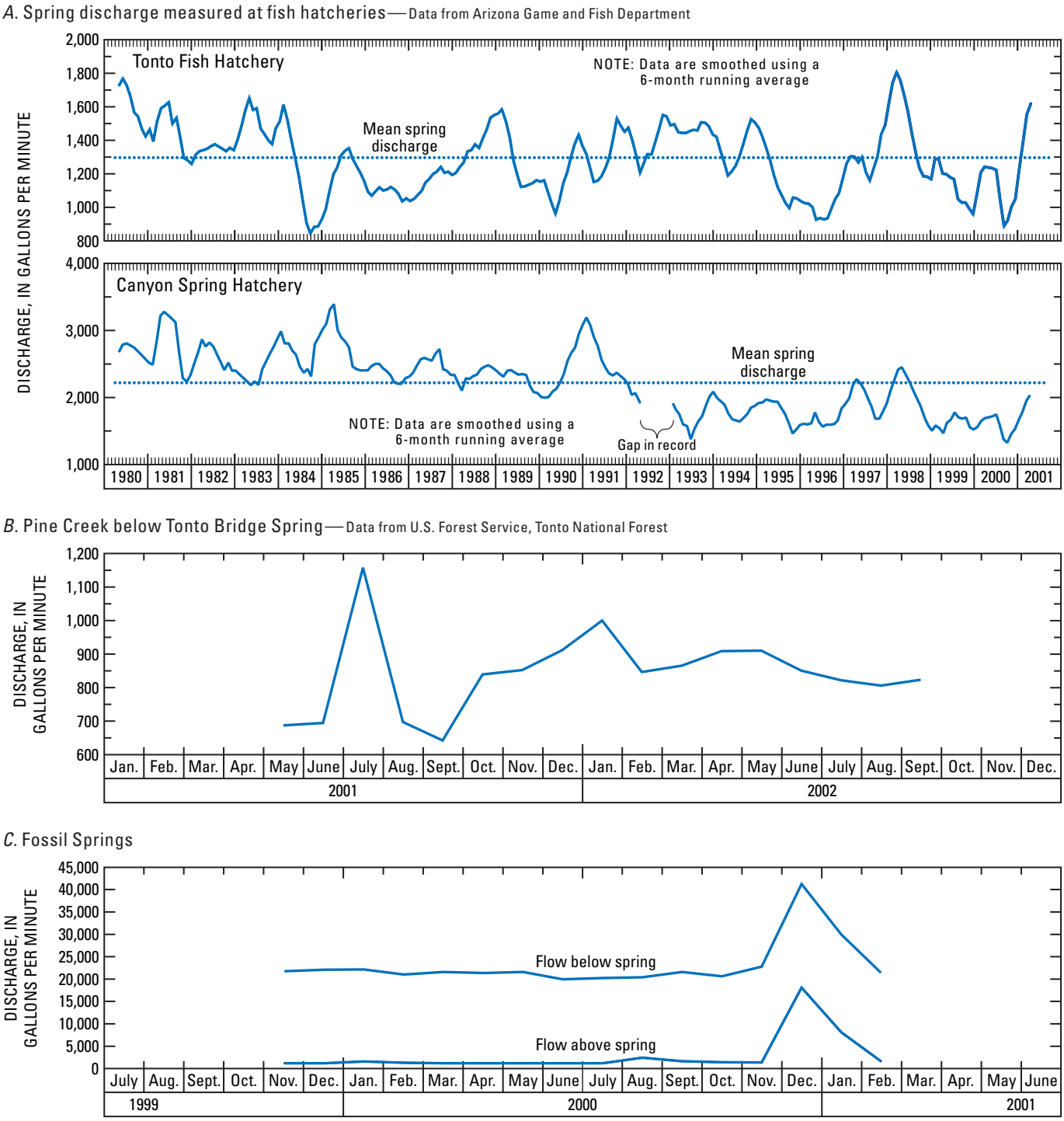
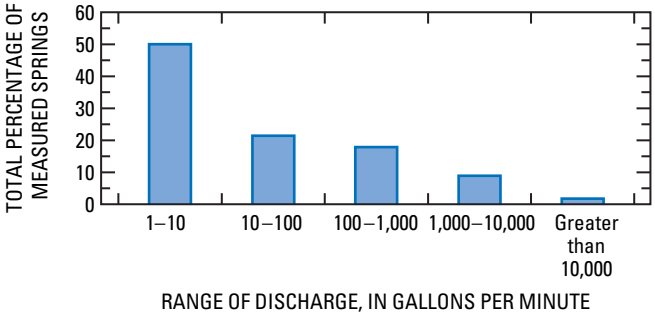


Figure 16. *A*. Spring discharge measured at fish hatcheries once a month; *B*. Discharge measured once daily in Pine Creek below Tonto Natural Bridge Spring; *C*. Intermittent current-meter measurements in Fossil Springs above and below springs.

A. Percentage of springs by range of discharge



B. Percentage of total discharge by range of discharge

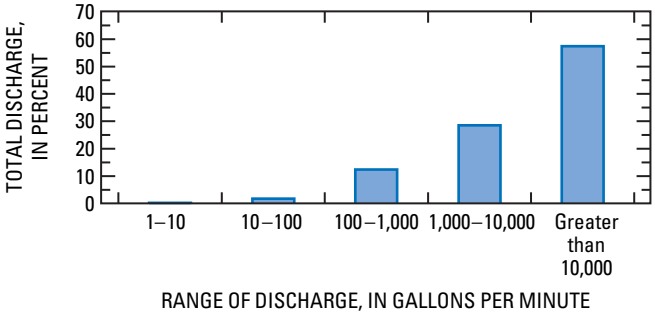


Figure 17. A. Percentage of total springs by range of discharge; B. Percentage of total spring discharge by range of discharge, Mogollon Highlands, Arizona.

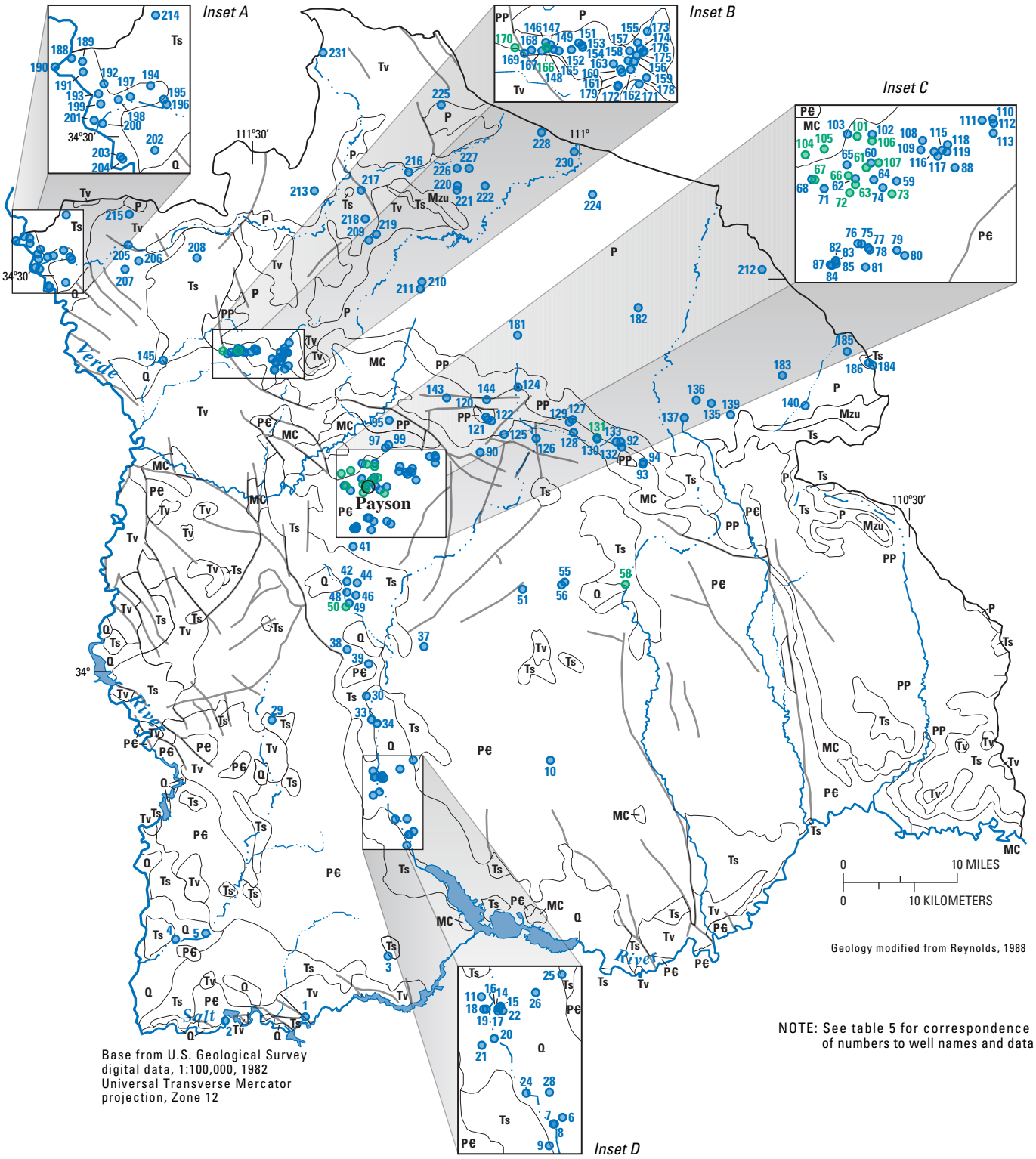


Figure 18. Selected wells for which water-level data are available, Mogollon Highlands, Arizona.

EXPLANATION

Q	SURFICIAL DEPOSITS, MOSTLY ALLUVIUM—Holocene to Middle Pleistocene
Ts	SEDIMENTARY ROCKS—Pliocene to Middle Miocene
Tv	VOLCANIC ROCKS—Pliocene to Middle Miocene
Mzu	SEDIMENTARY ROCKS, UNDIFFERENTIATED—Cretaceous
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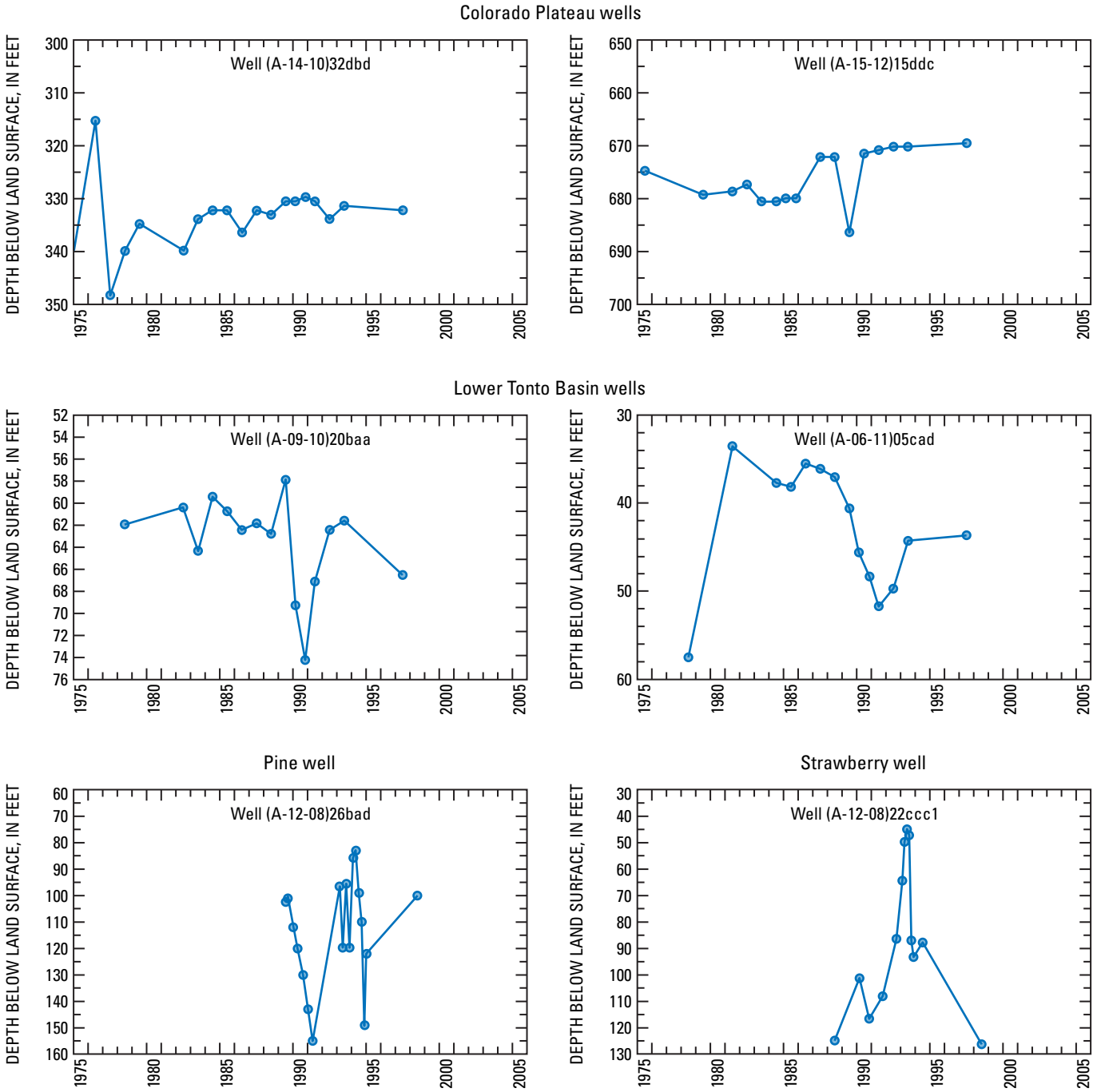
MC	SEDIMENTARY ROCKS—Mississippian to Cambrian (Redwall Limestone, Martin Formation, and Tapeats Sandstone)
P€	PROTEROZOIC ROCKS
———	FAULT
213	WELL AND WELL IDENTIFIER
104	ARIZONA DEPARTMENT OF WATER RESOURCES INDEX WELL AND WELL IDENTIFIER

Figure 18. Continued.



NOTE: See fig. 18 for well location

Figure 19. Time series of water depths in selected wells, Mogollon Highlands, Arizona.

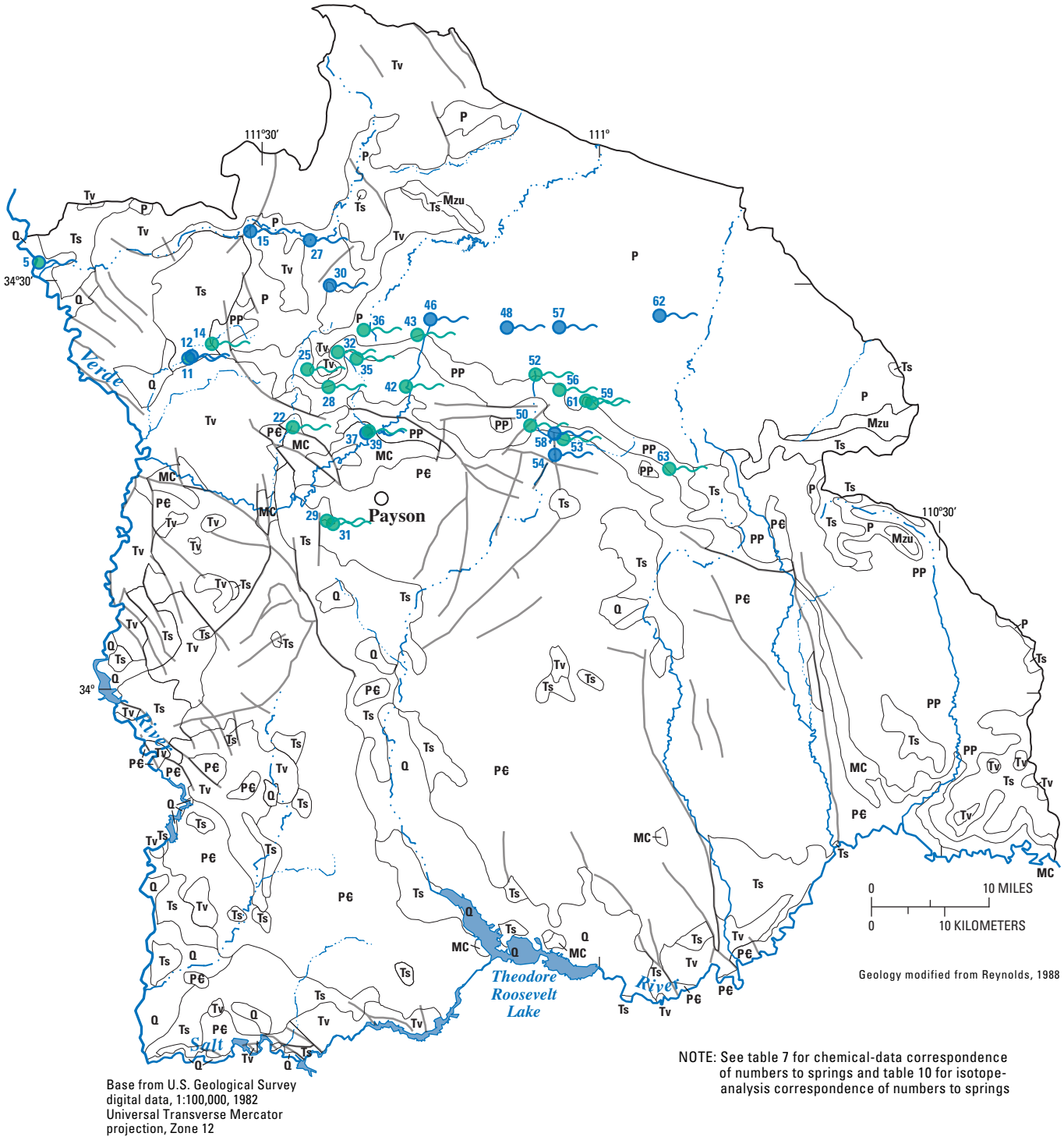


Figure 20. Springs for which chemical data are available and sampling sites for isotope analysis of spring water, Mogollon Highlands, Arizona.

EXPLANATION

Q	SURFICIAL DEPOSITS, MOSTLY ALLUVIUM—Holocene to Middle Pleistocene
Ts	SEDIMENTARY ROCKS—Pliocene to Middle Miocene
Tv	VOLCANIC ROCKS—Pliocene to Middle Miocene
Mzu	SEDIMENTARY ROCKS, UNDIFFERENTIATED—Cretaceous
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MC	SEDIMENTARY ROCKS—Mississippian to Cambrian (Redwall Limestone, Martin Formation, and Tapeats Sandstone)
P€	PROTEROZOIC ROCKS
	FAULT
62	SPRING FOR WHICH CHEMICAL DATA ARE AVAILABLE
42	SPRING SAMPLED FOR ISOTOPE ANALYSIS

Figure 20. Continued.

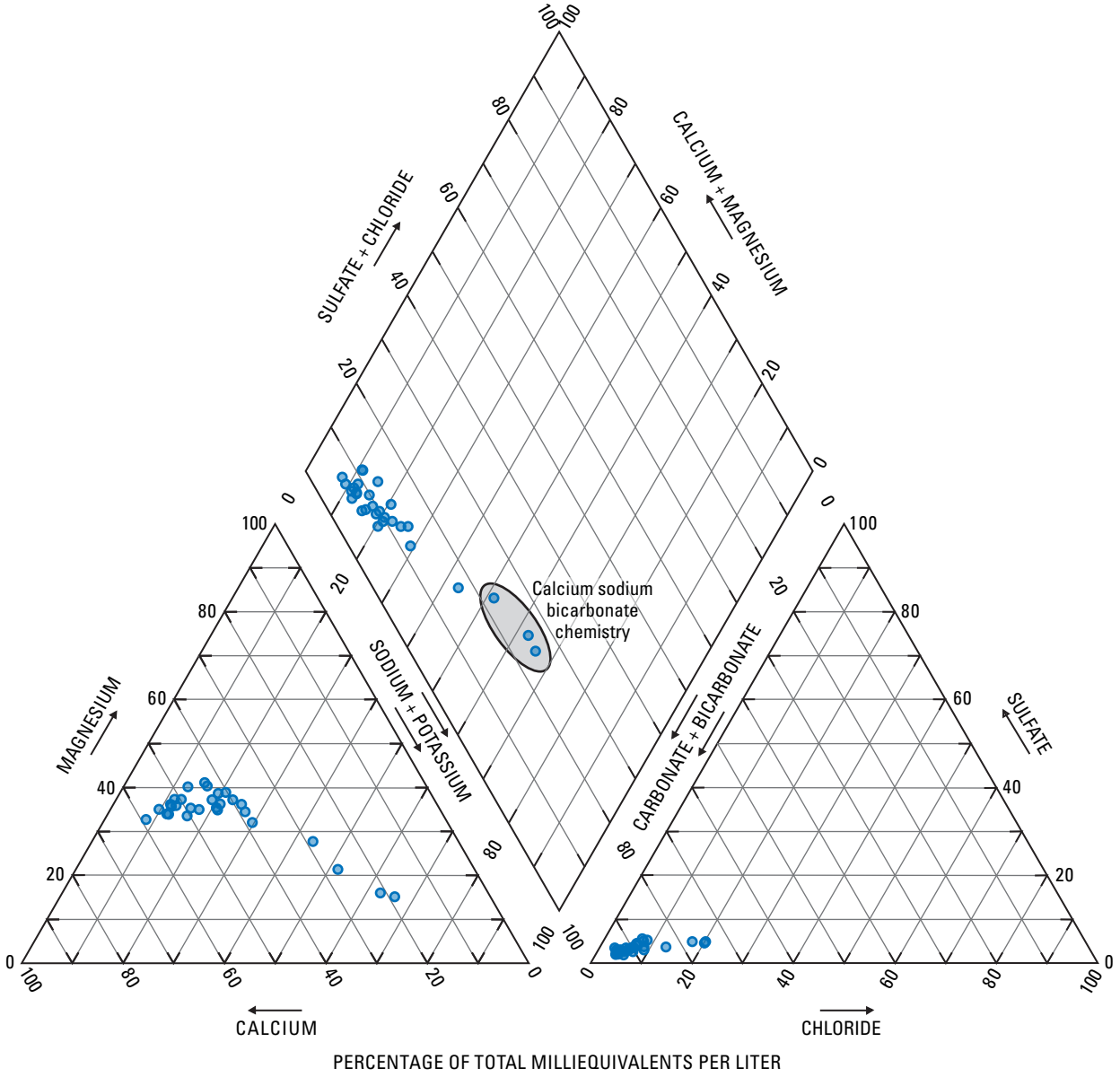
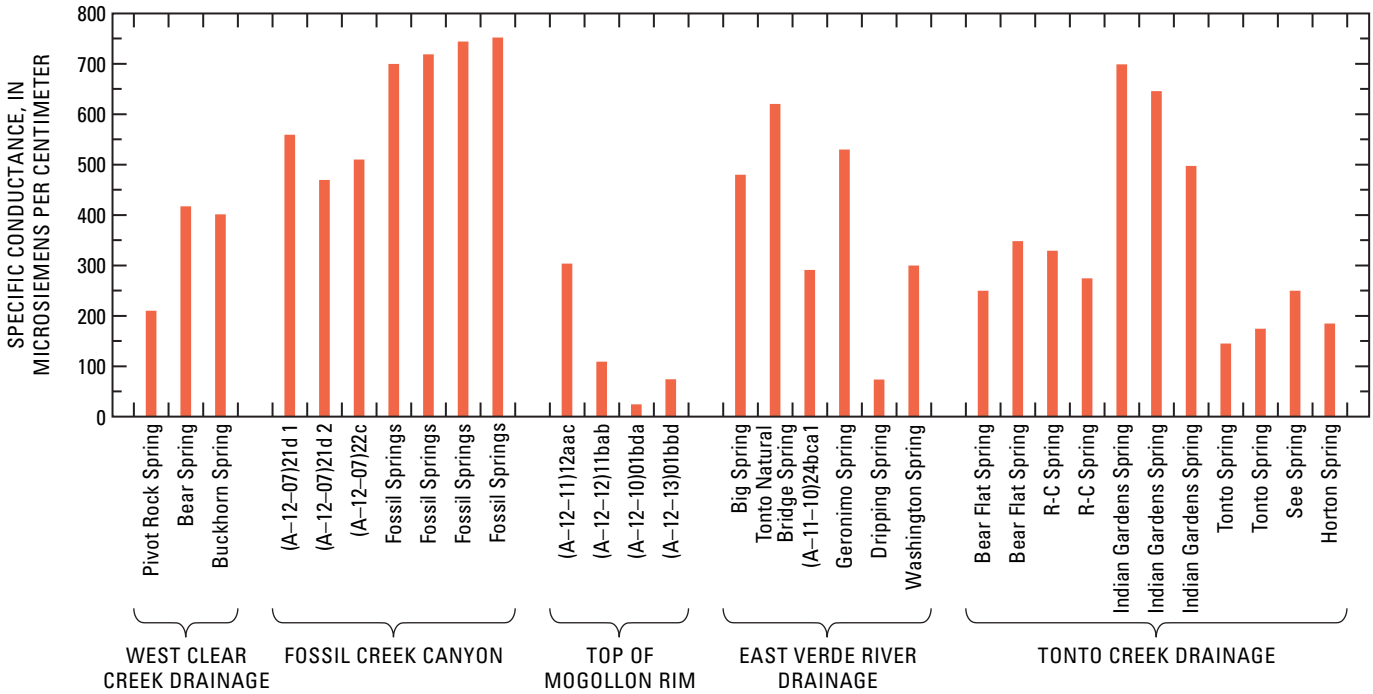


Figure 21. Relative compositions of water from springs in the Mogollon Highlands, Arizona.

A. Specific conductance



B. Concentrations of calcium, magnesium, and sodium

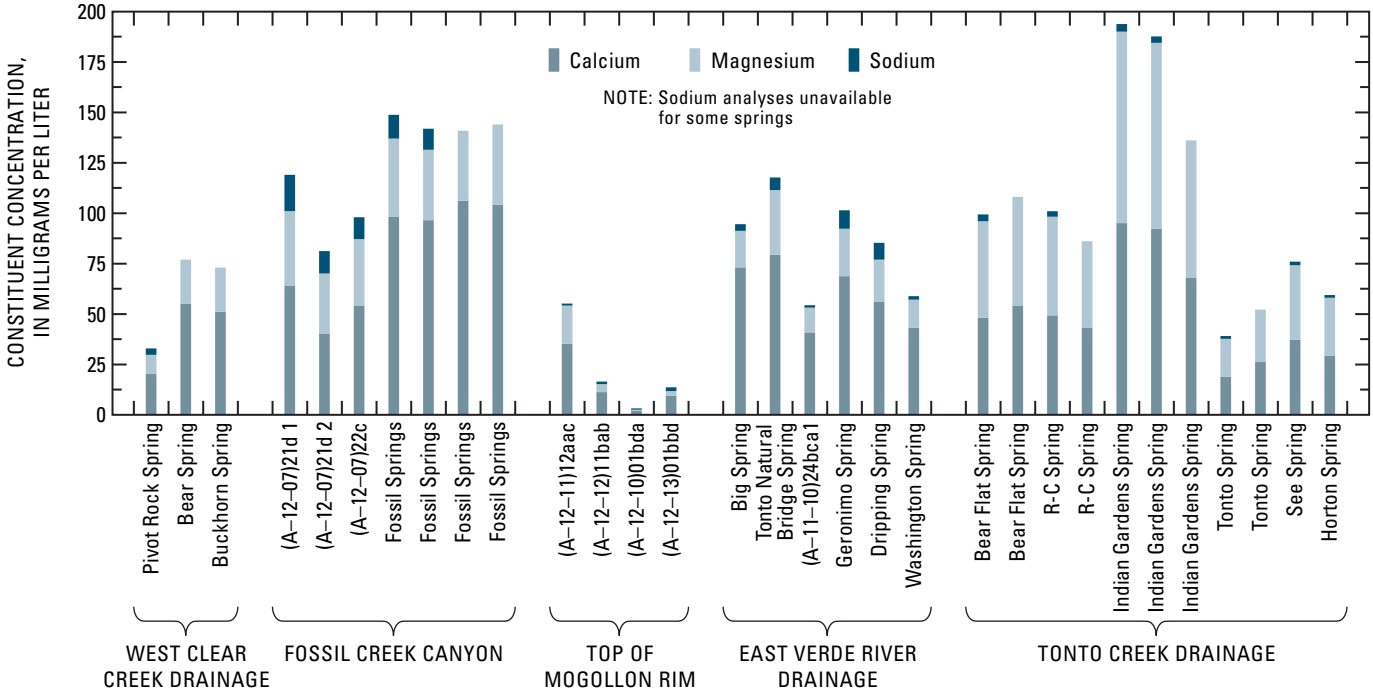
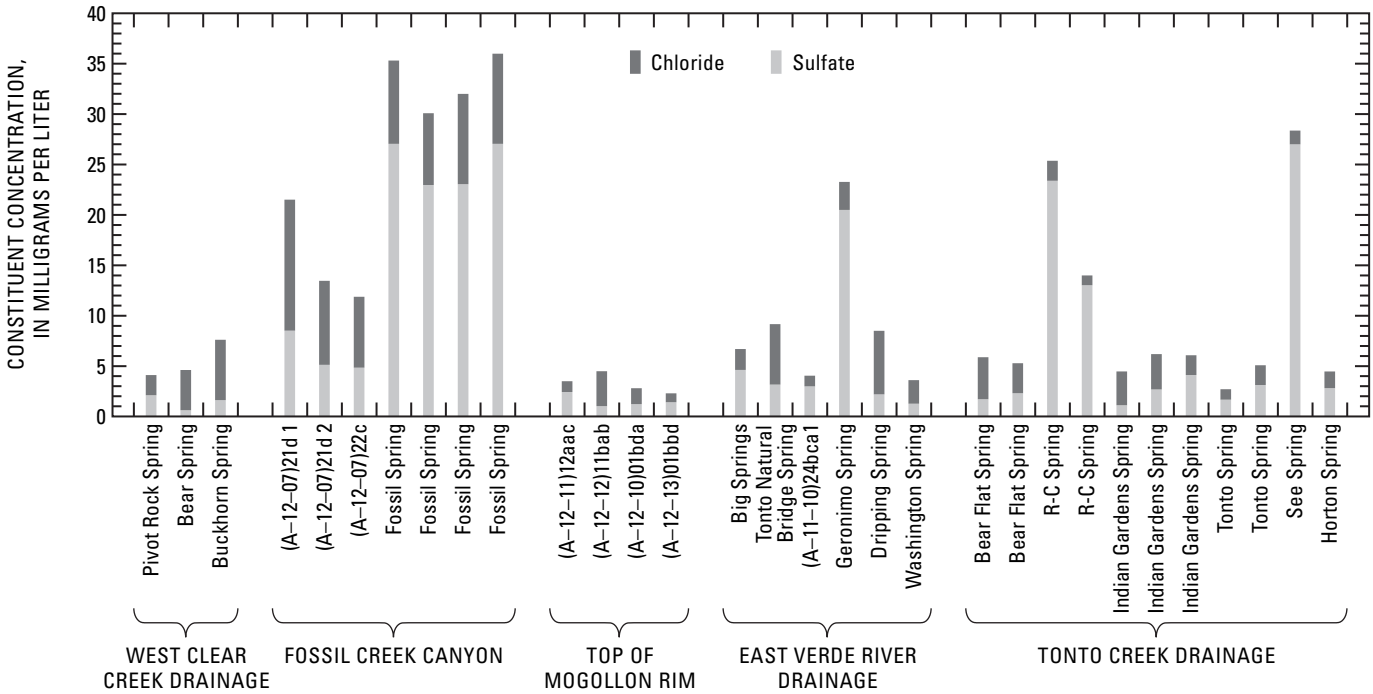
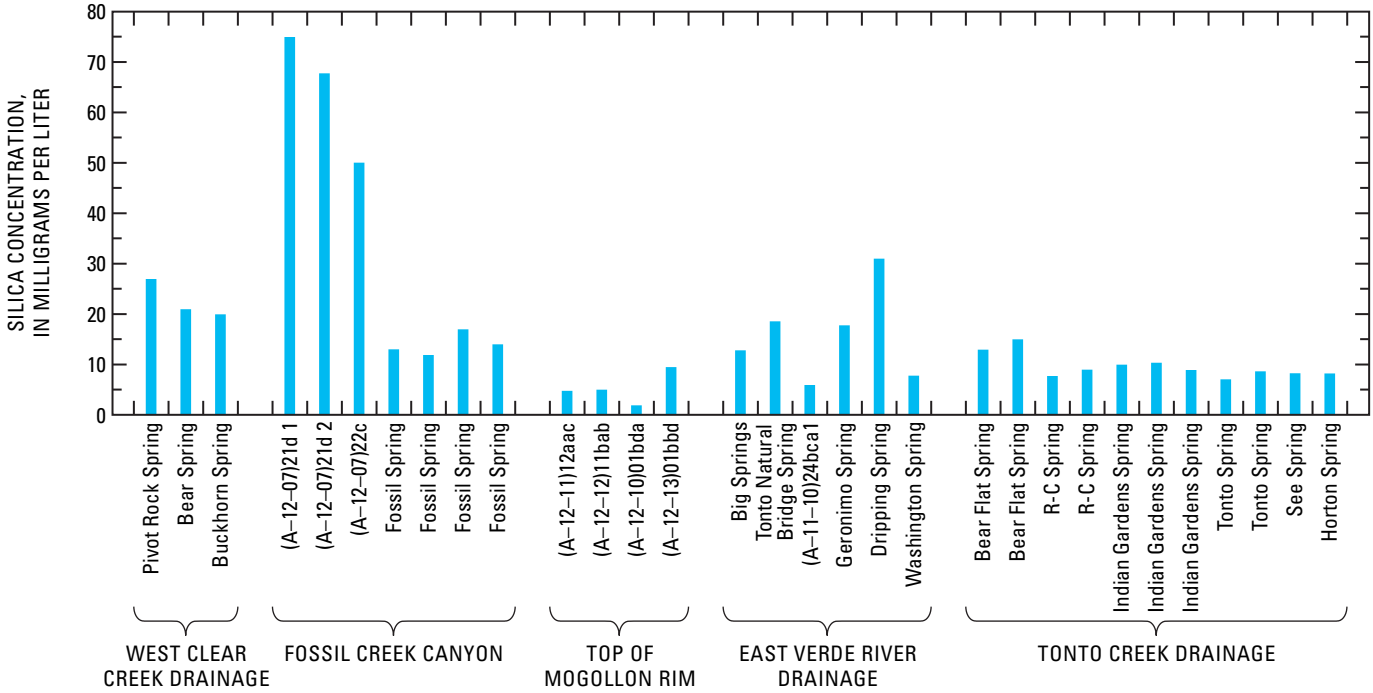


Figure 22. Chemical composition of spring waters within different drainages, Mogollon Highlands, Arizona. *A*. Specific conductance; *B*. Calcium, magnesium, and sodium; *C*. Chloride and sulfate; *D*. Silica.

C. Concentrations of chloride and sulfate



D. Concentration of silica



NOTE: See table 7 for chemical composition values. Repeated locations represent multiple sampling and analyses

Figure 22. Continued

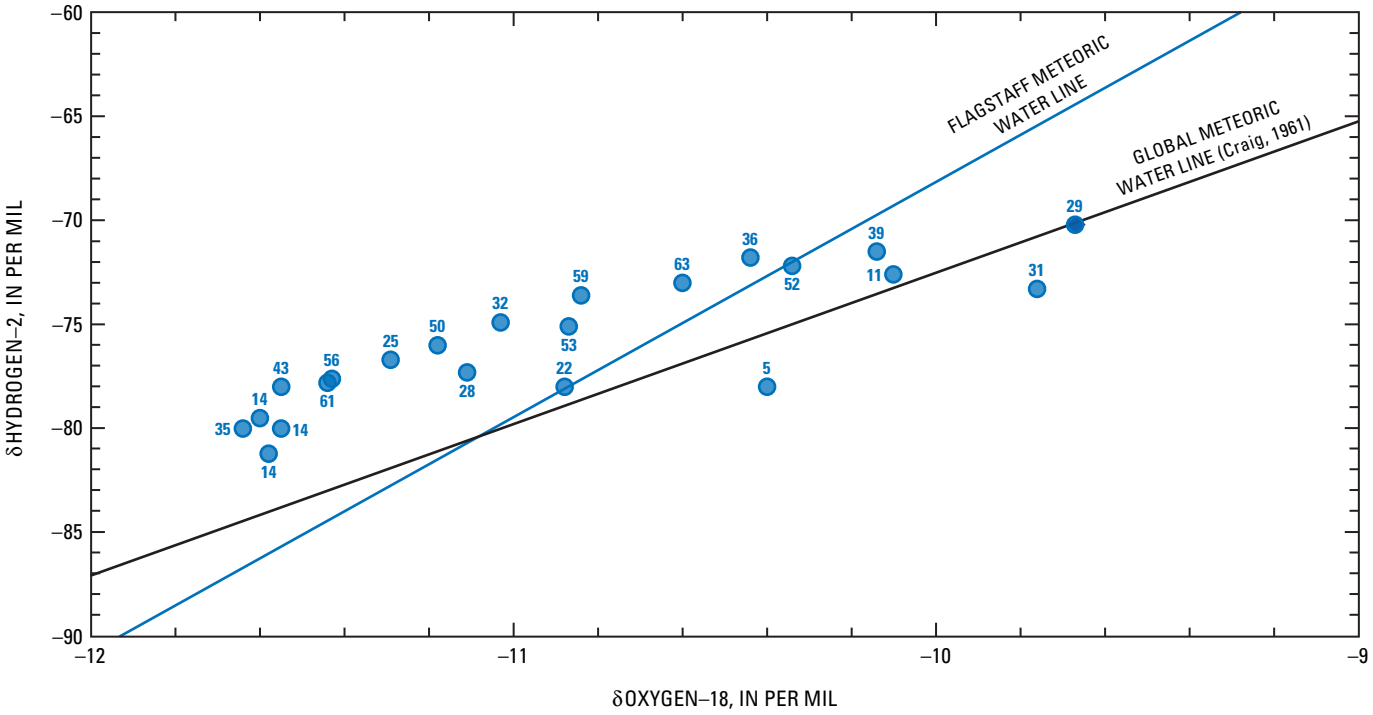


Figure 23. Isotope values for water from springs in the Mogollon Highlands, Arizona.

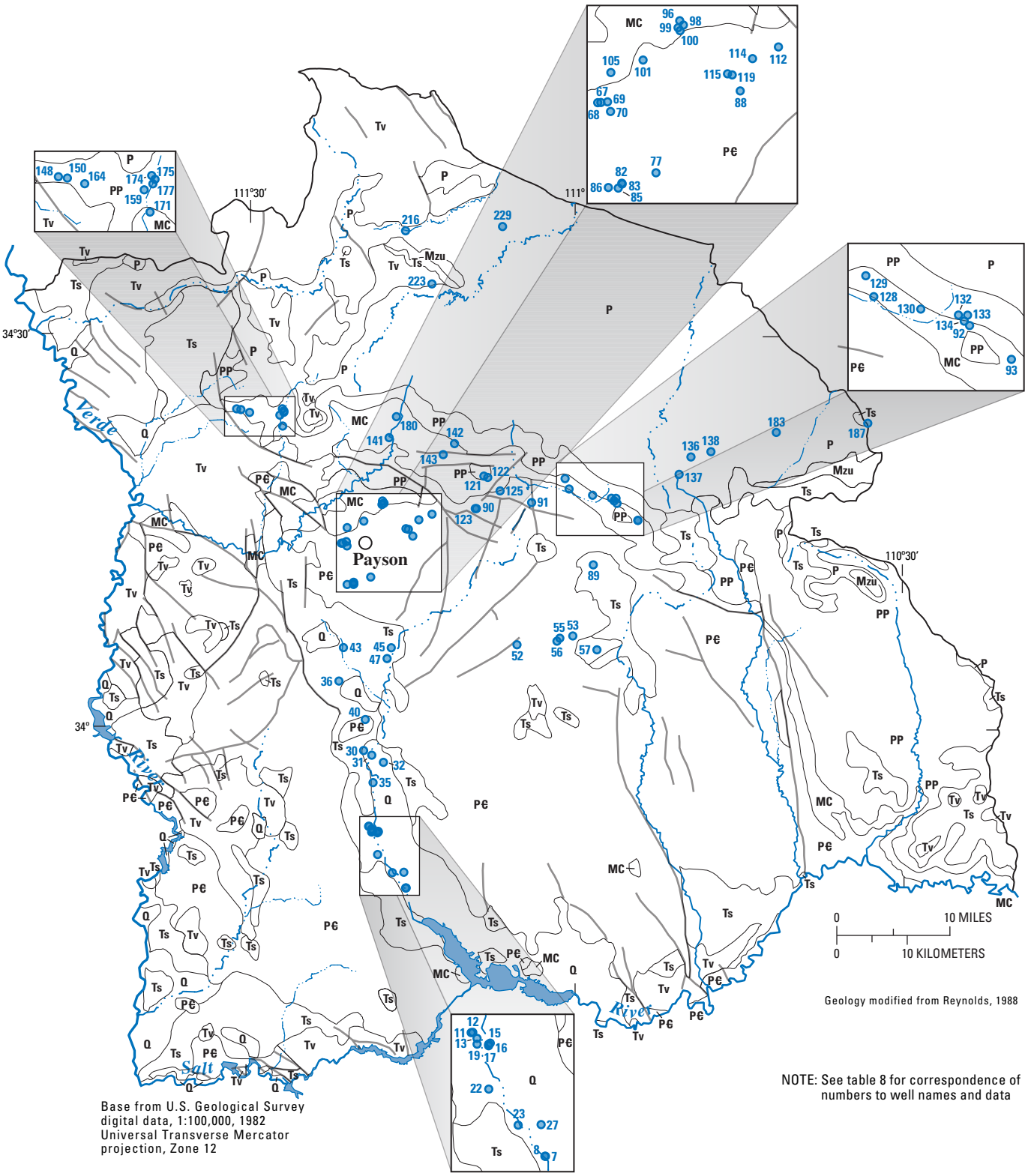


Figure 24. Selected wells for which water-level data are available, Mogollon Highlands, Arizona.

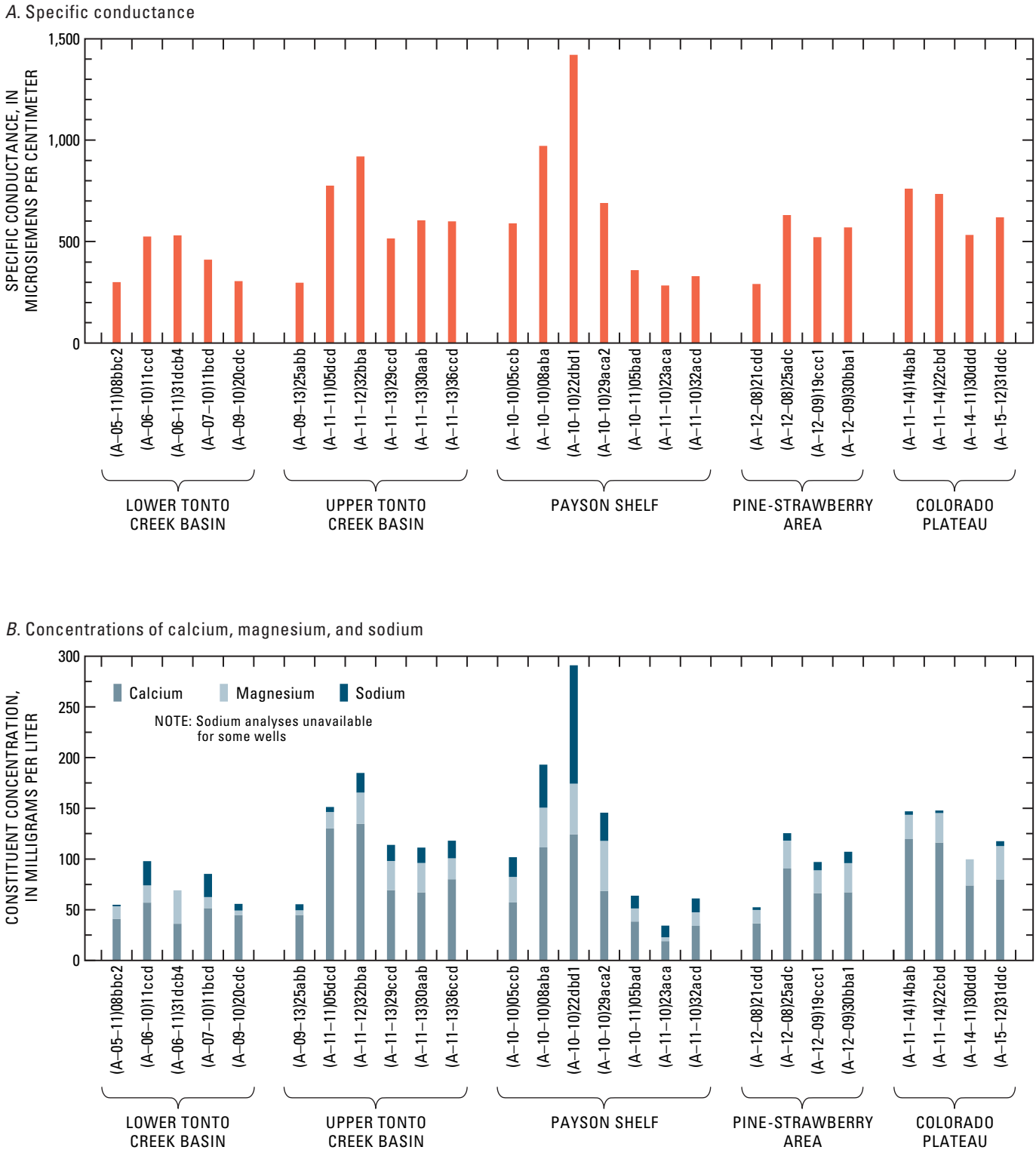
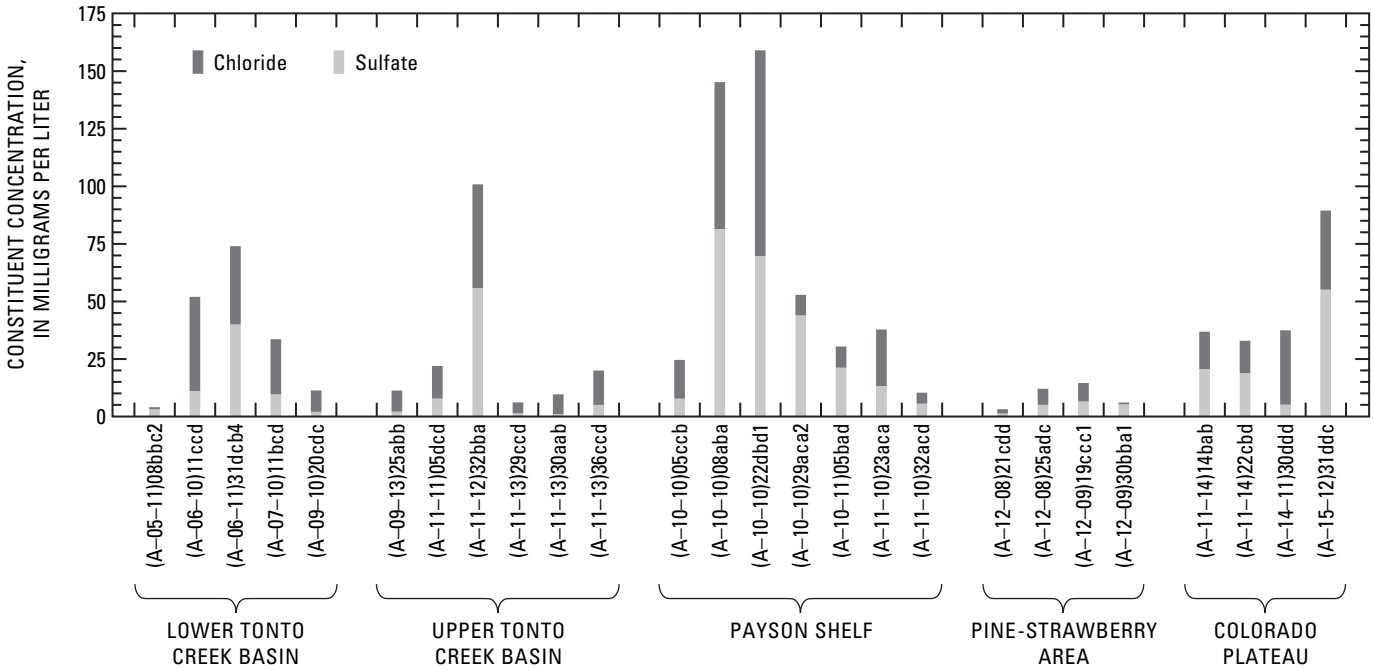


Figure 25. Chemical composition of waters from wells in various locations, Mogollon Highlands, Arizona. *A.* Specific conductance; *B.* Calcium, magnesium, and sodium; *C.* Chloride and sulfate; *D.* Silica.

C. Concentrations of chloride and sulfate



D. Concentration of silica

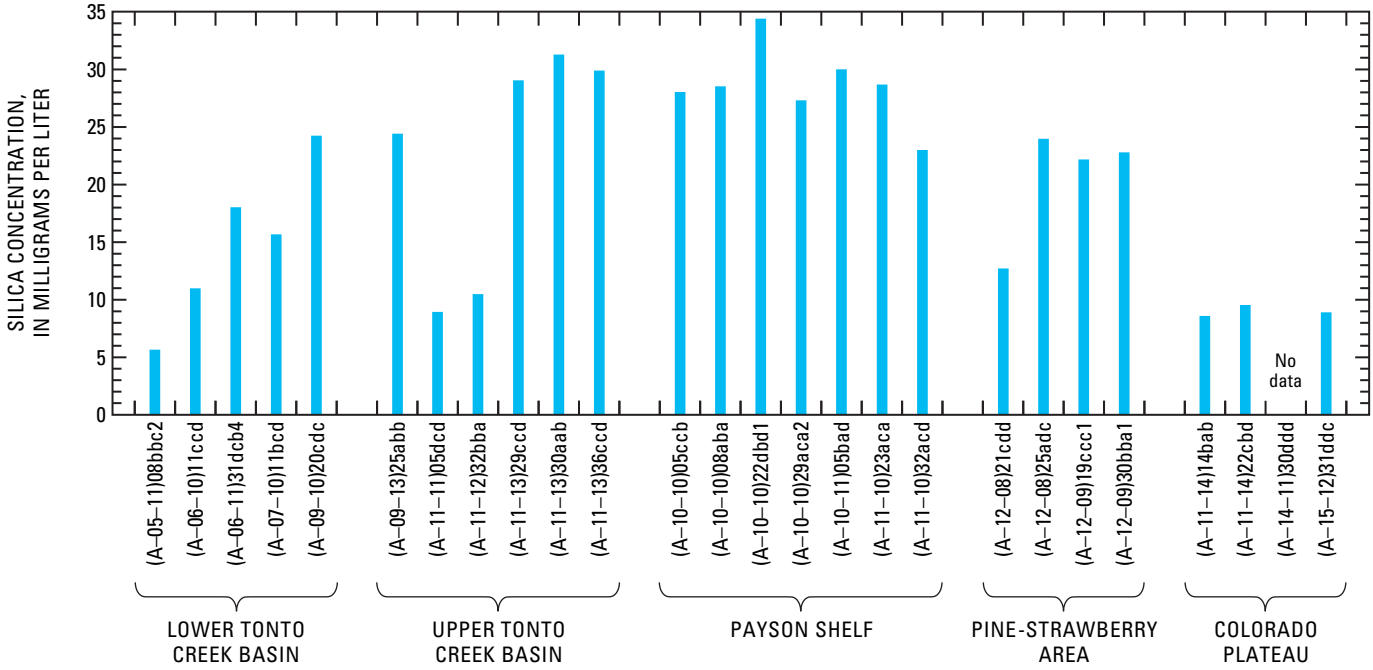
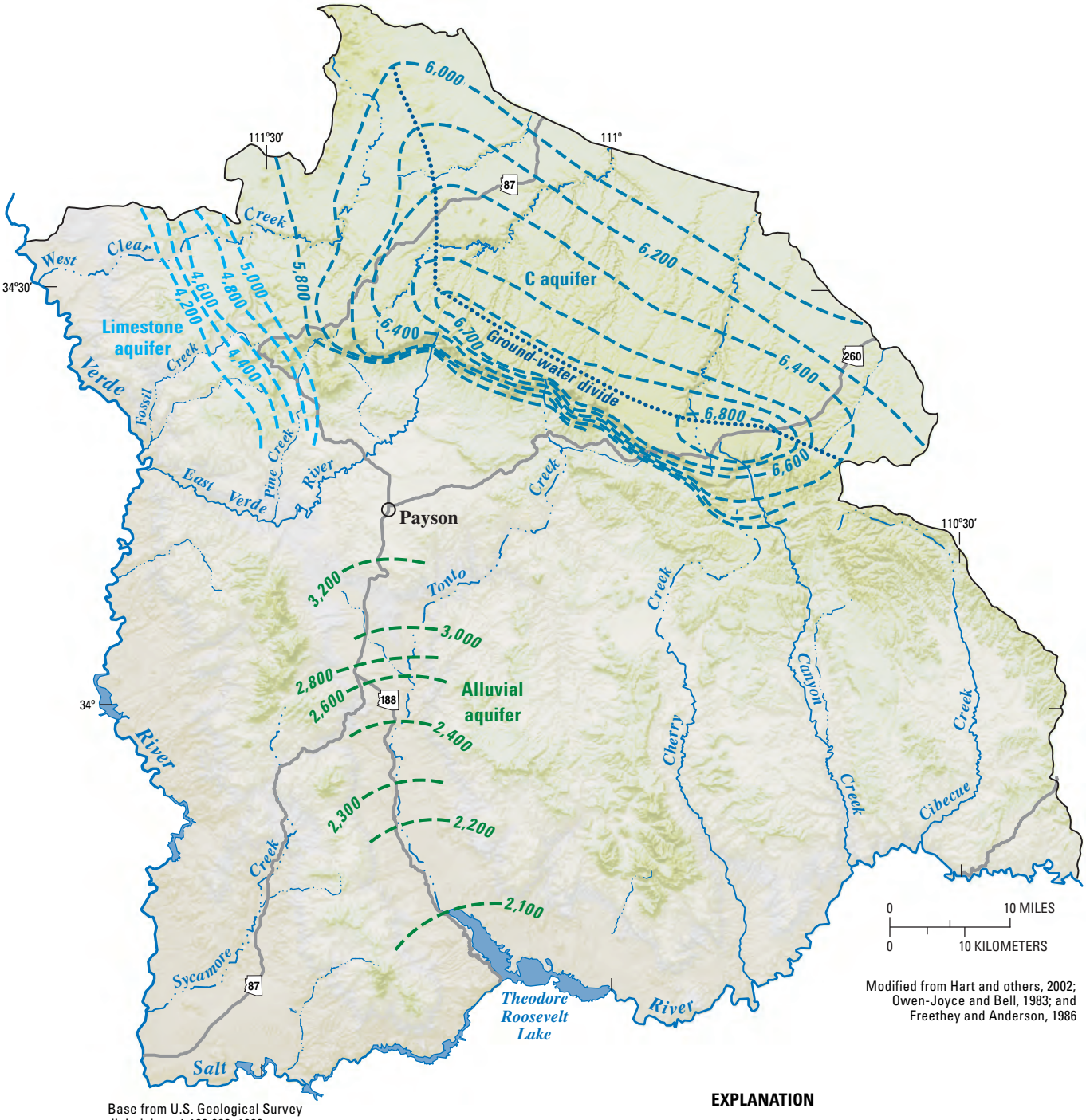


Figure 25. Continued



Modified from Hart and others, 2002; Owen-Joyce and Bell, 1983; and Freethey and Anderson, 1986

Base from U.S. Geological Survey digital data, 1:100,000, 1982 Universal Transverse Mercator projection, Zone 12

EXPLANATION

6,200 POTENTIOMETRIC CONTOUR—Shows altitude at which water level would stand in a tightly cased well on the basis of average values to 2002. Contour interval 100 and 200 feet. Datum is NGVD of 1929

Figure 26. Potentiometric surfaces of the C aquifer, limestone aquifer, and alluvial aquifer in the lower Tonto Creek Basin, Mogollon Highlands, Arizona.

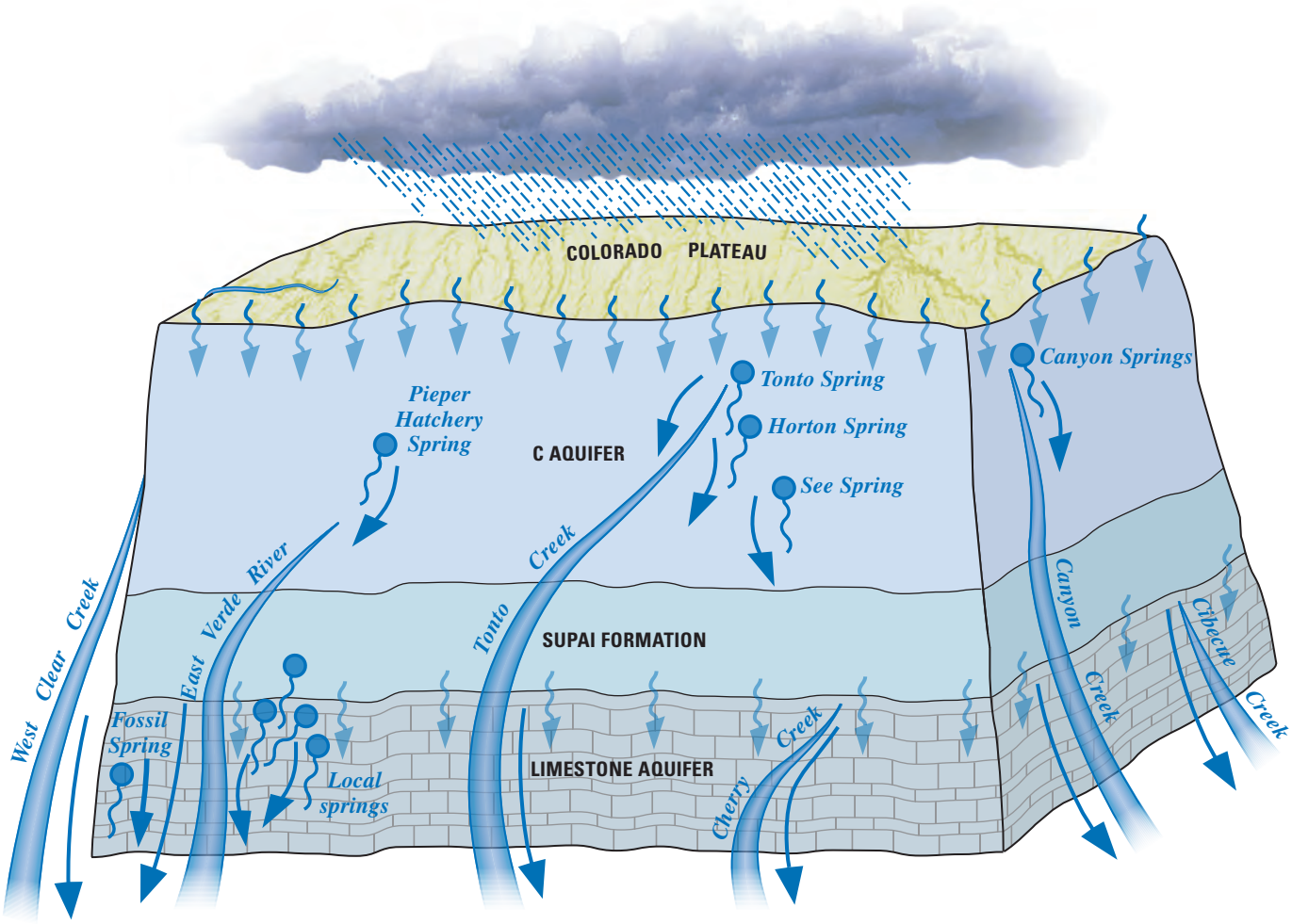


Figure 27. Schematic diagram of the ground-water system in the Mogollon Highlands, Arizona.