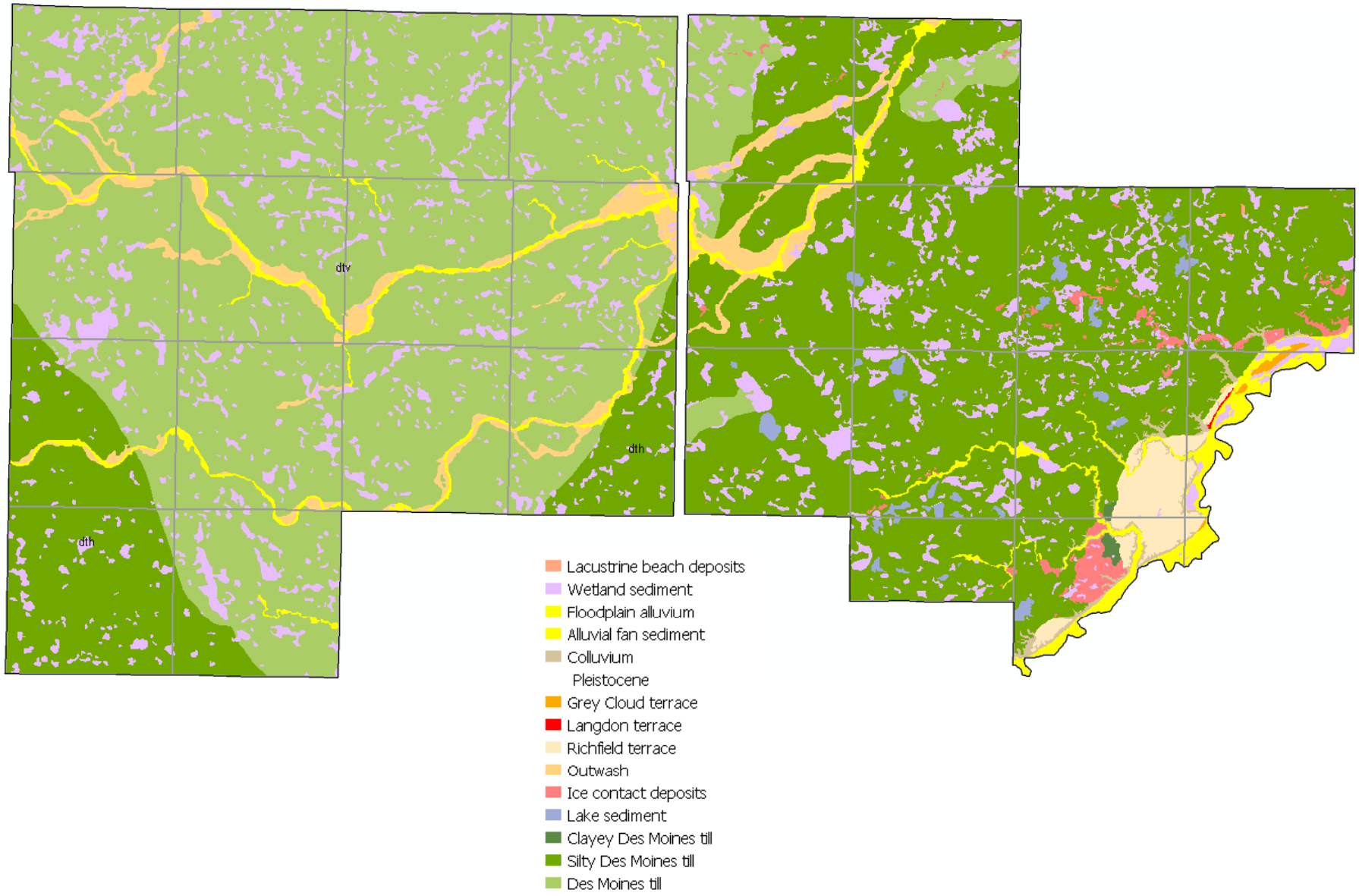
Hydrogeology of McLeod and Carver Counties, Minnesota

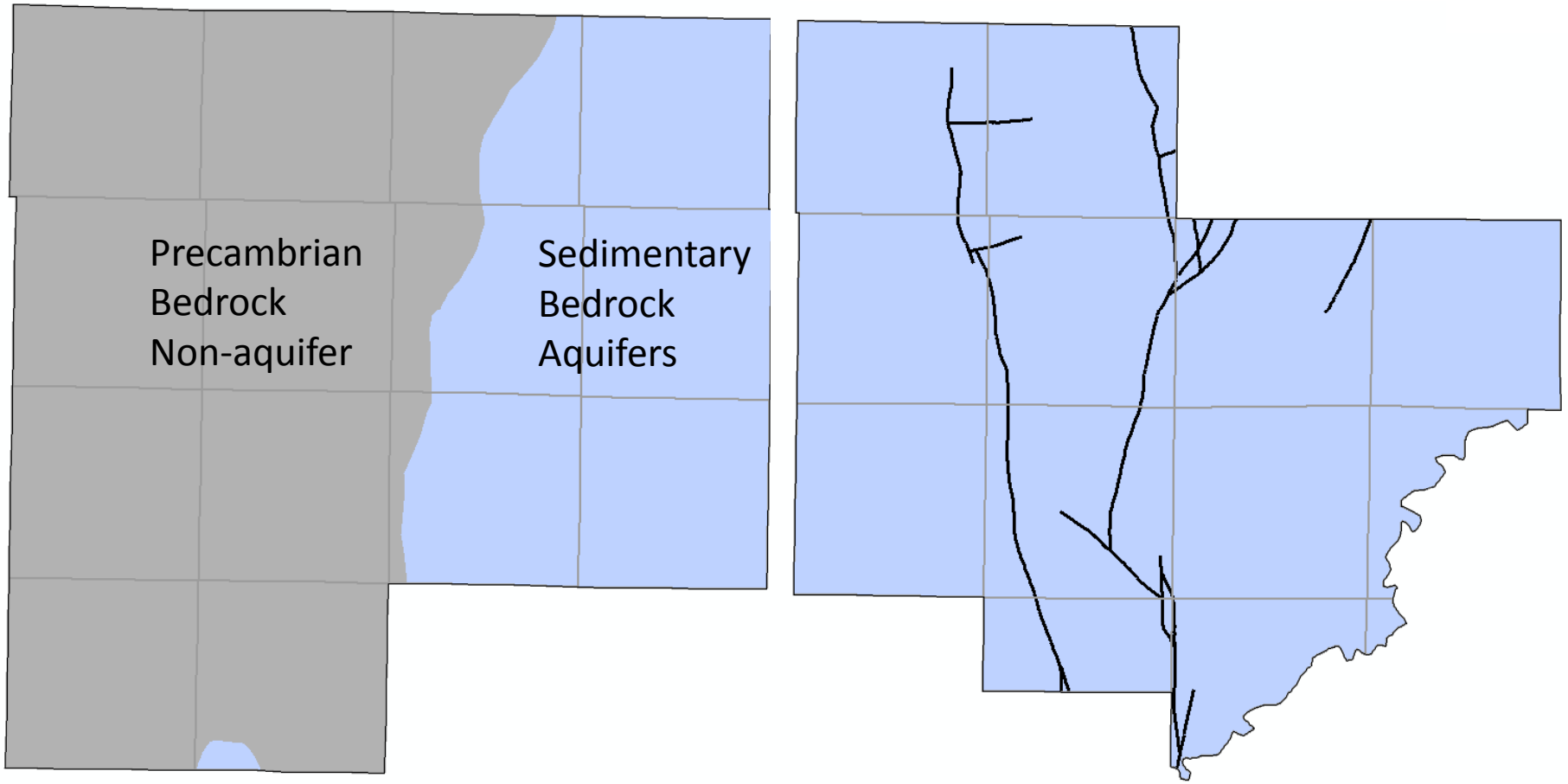
Todd Petersen

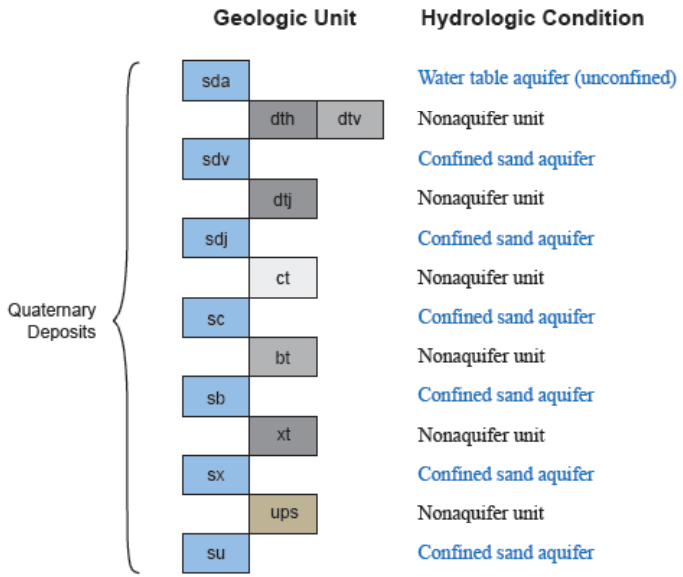
Minnesota Department
of Natural Resources


Minneapolis
McLeod
County
Carver
County

Surficial Geology




Precambrian
Bedrock
Non-aquifer
Sedimentary
Bedrock
Aquifers



Correlation of Quaternary buried sand aquifers and till units in McLeod County.

Aquifer, primarily porous media flow.

Low permeability aquifer. Thin sandstone units interbedded with siltstone and claystone.

Aquifer, primarily fracture flow.

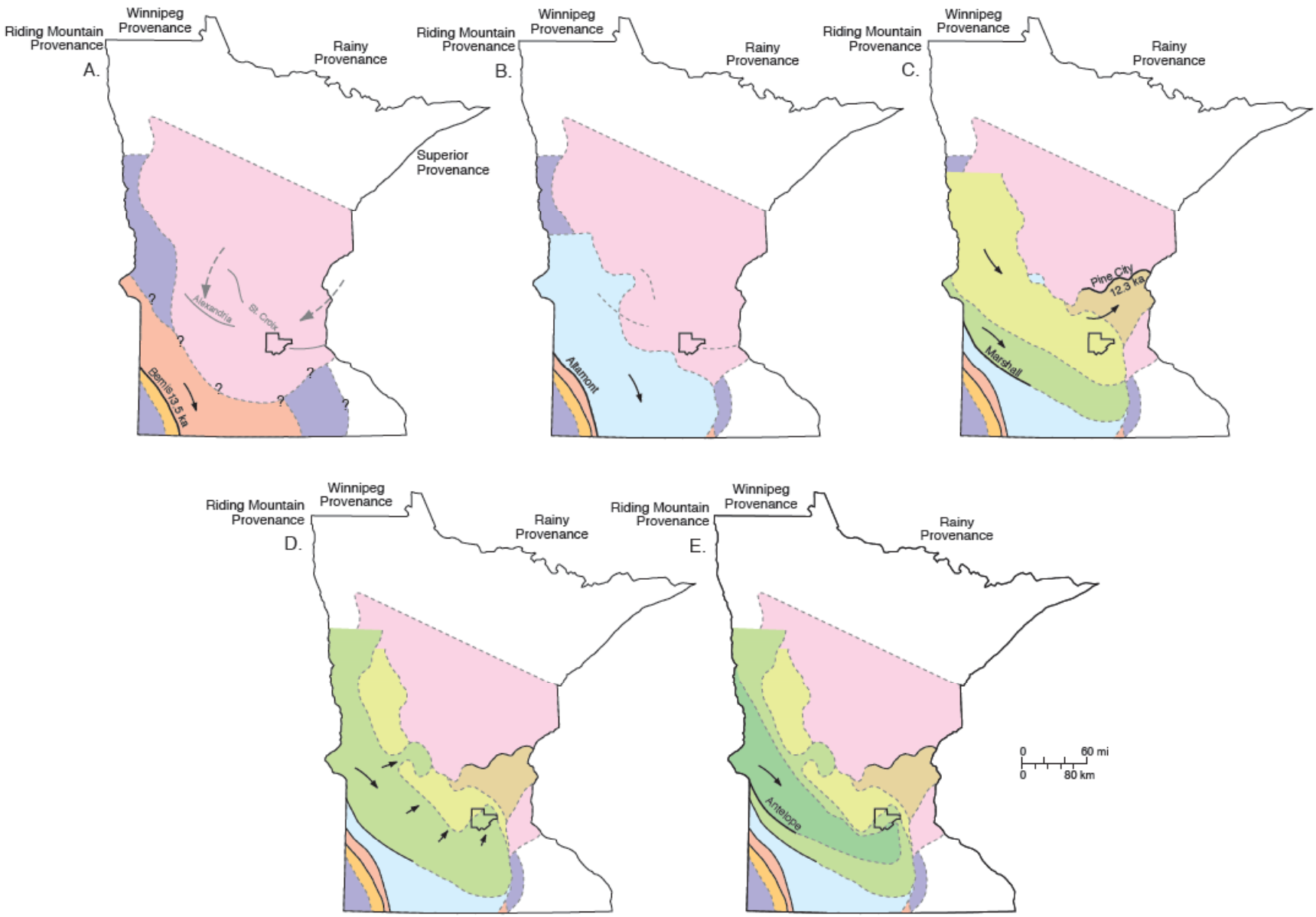
Confining unit, generally low permeability

Boundary between different hydrostratigraphic units

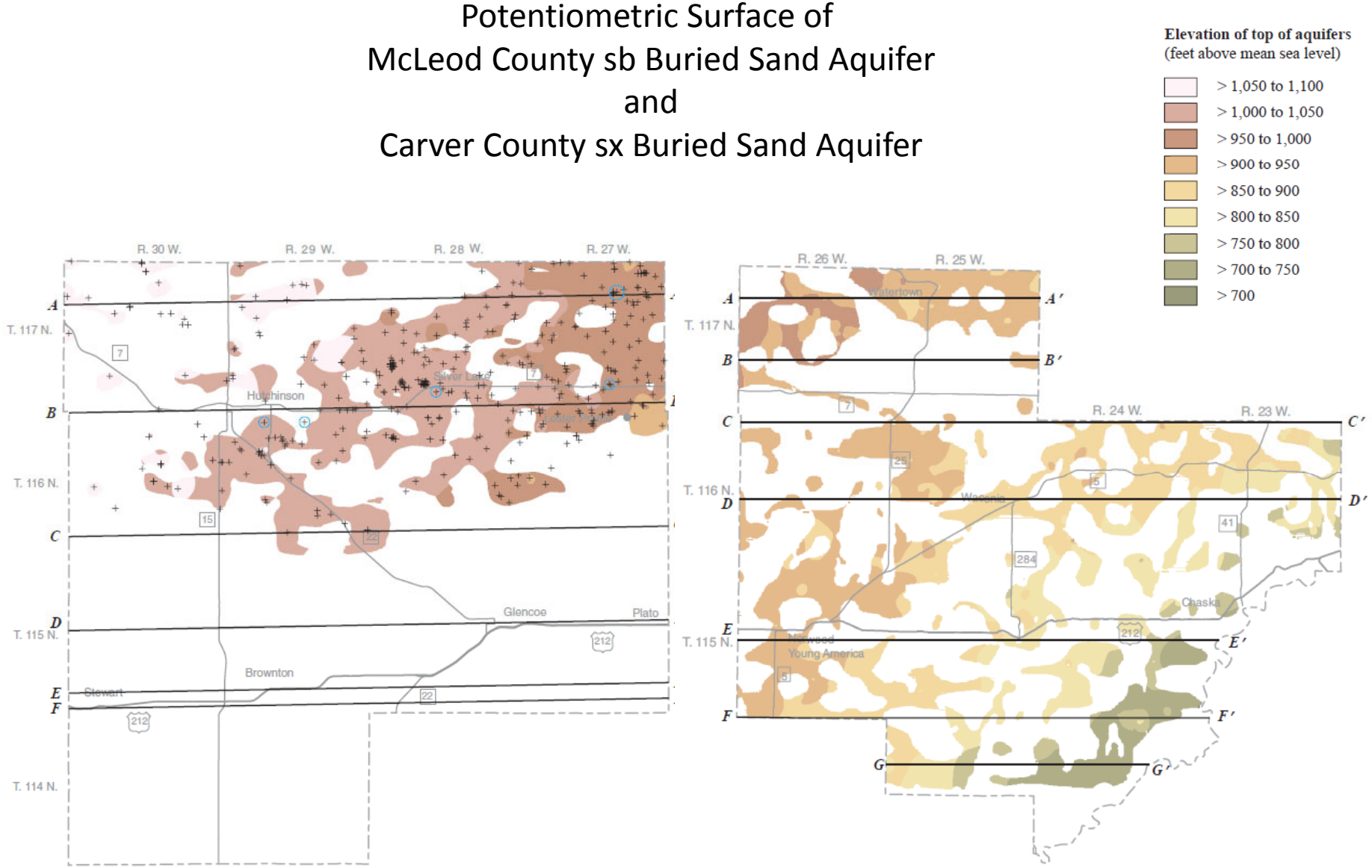
Geologic Unit	Aquifer	Description
Ka*	Ka aquifer	Moderate intergranular permeability due to interlayered clay and sand. Probably low yielding aquifer.
Jordan Sandstone	Jordan aquifer	Relatively high intergranular permeability
St. Lawrence Formation	St. Lawrence - Lone Rock aquifer	Relatively low intergranular permeability with high permeability bedding fractures
Lone Rock Formation		
Lone Rock Formation (lower)		Confining unit Bedding fractures
Wonewoc Sandstone	Wonewoc aquifer	Relatively high intergranular permeability.
Eau Claire Formation		Confining unit.
Mt. Simon Sandstone	Mt. Simon aquifer	Relatively high intergranular permeability
Hinckley Sandstone	Hinckley aquifer	Relatively high intergranular permeability

*Shown on Plate 2, Part A as PMu.

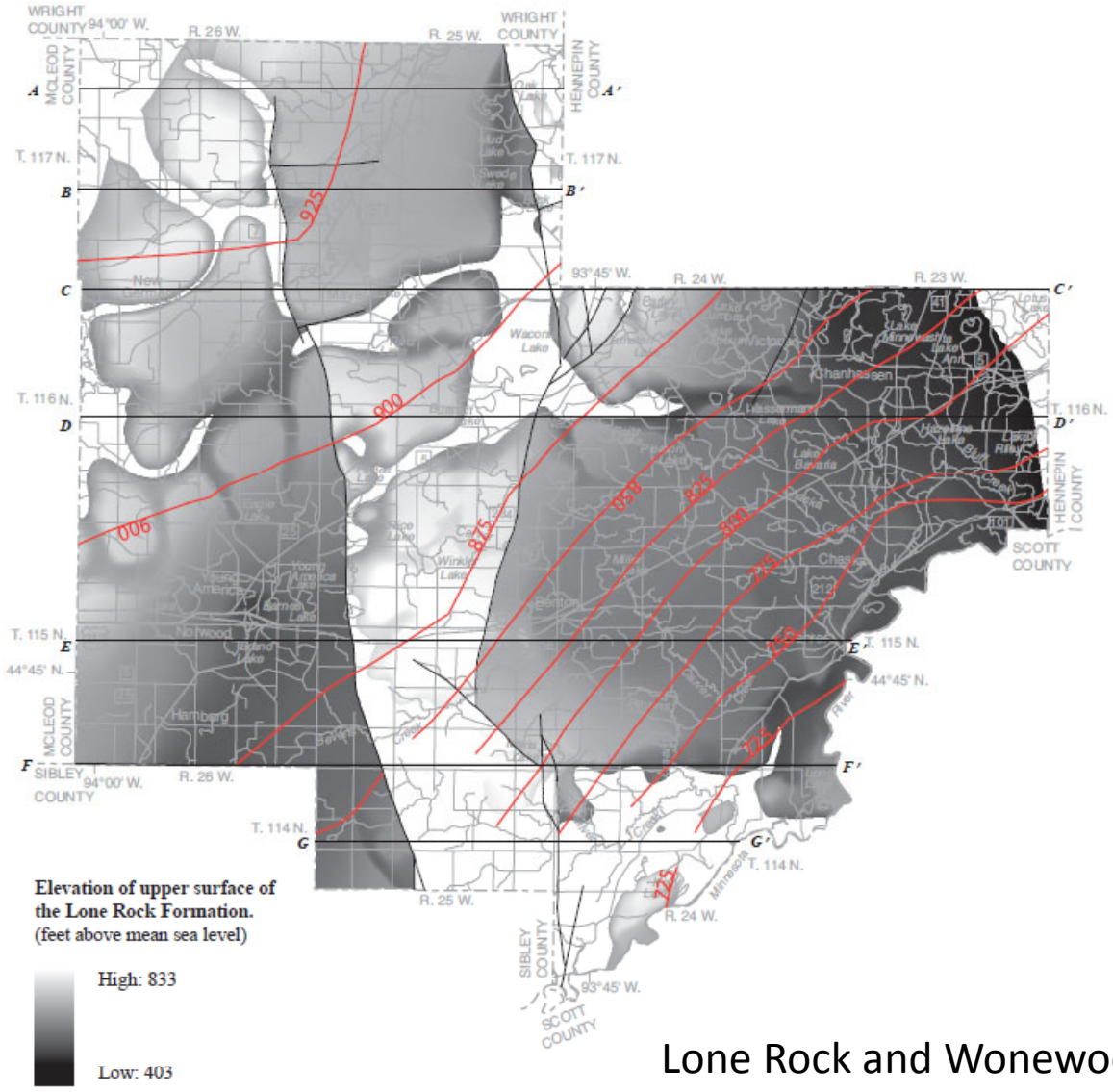
Sequence of bedrock geologic units and aquifers in McLeod County.


A.
Riding Mountain Provenance
Winnipeg Provenance
Rainy Provenance
Superior Provenance
Alexandria
St. Croix
Bemis 13.5 ka
?
B.
Riding Mountain Provenance
Winnipeg Provenance
Rainy Provenance
Altamont
C.
Riding Mountain Provenance
Winnipeg Provenance
Rainy Provenance
Pine City 12.3 ka
Marshall
D.
Riding Mountain Provenance
Winnipeg Provenance
Rainy Provenance
E.
Riding Mountain Provenance
Winnipeg Provenance
Rainy Provenance
Antelope
0 60 mi
0 80 km

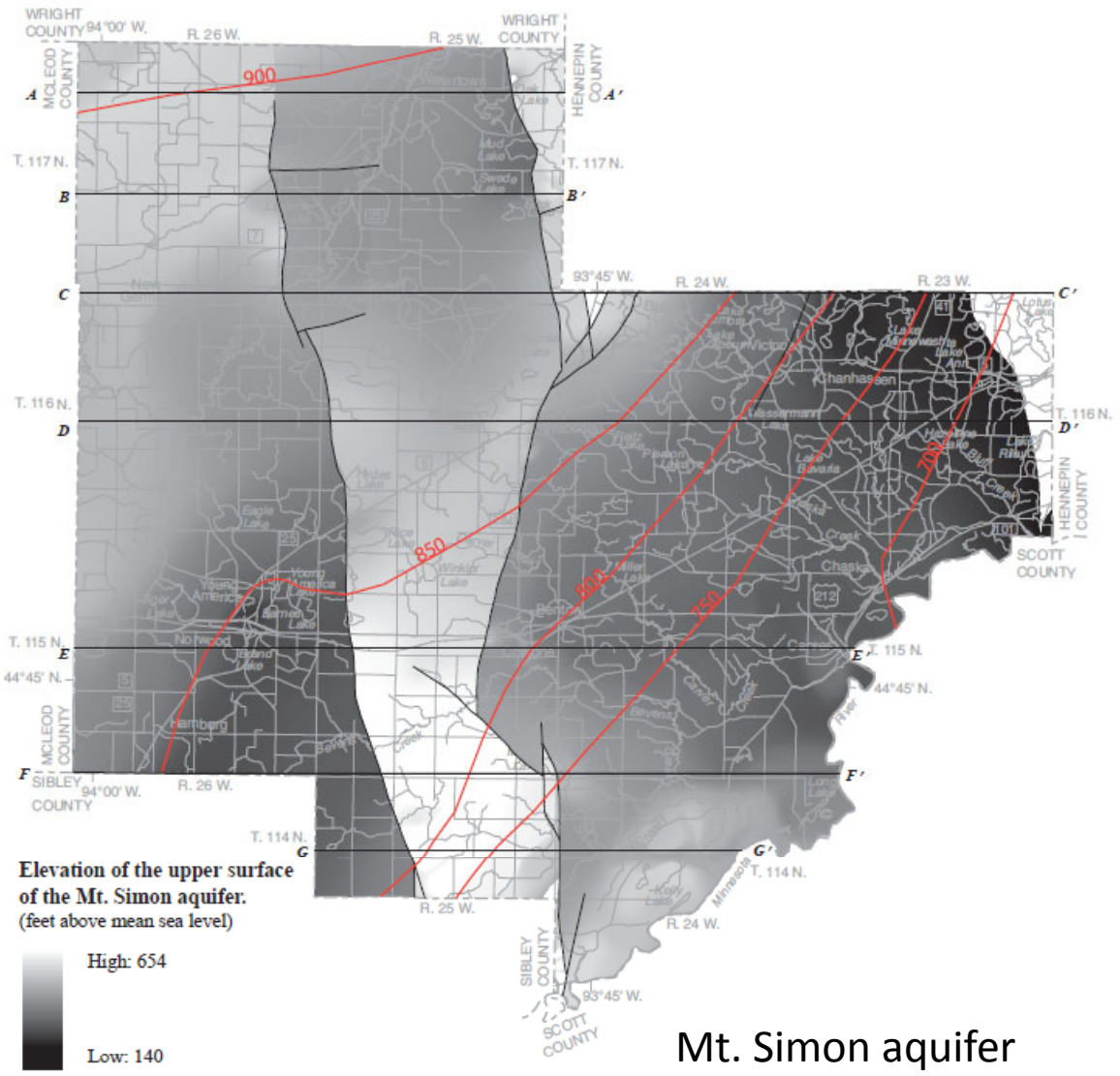
Potentiometric Surface of
McLeod County sb Buried Sand Aquifer
and
Carver County sx Buried Sand Aquifer



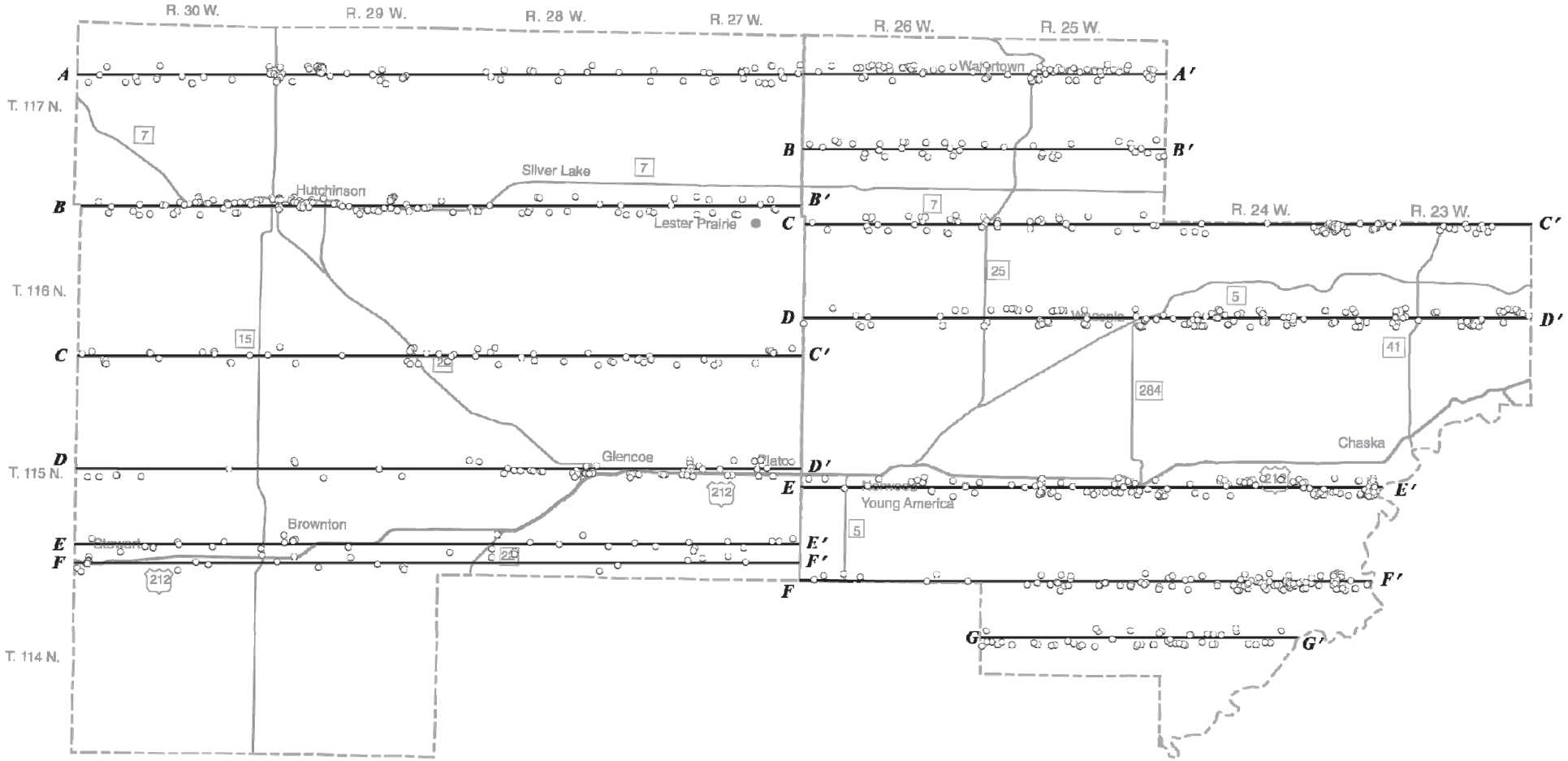
Prairie du Chien and Jordan aquifers

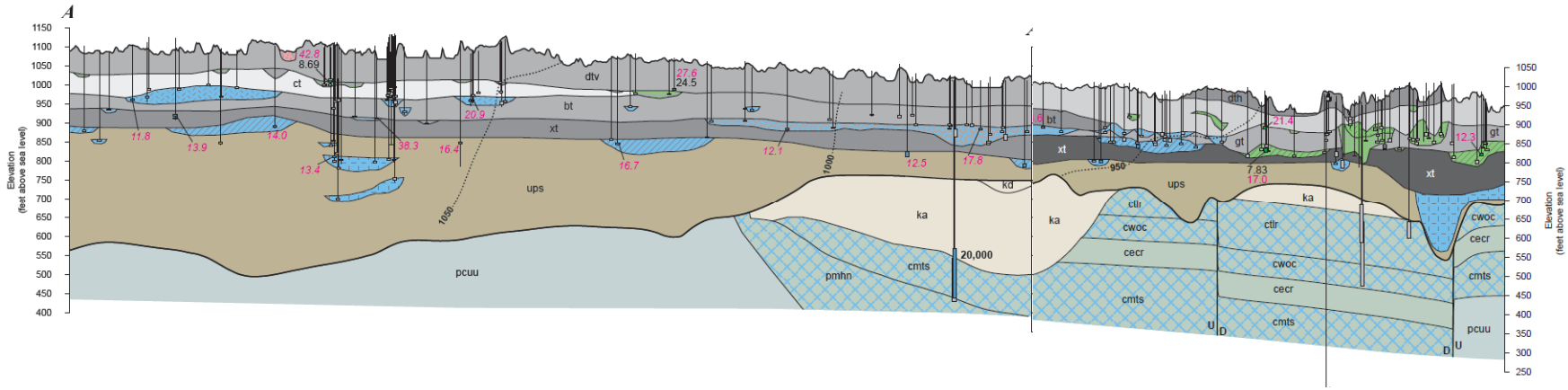


Lone Rock and Wonewoc aquifers



Mt. Simon aquifer


R. 30 W.
R. 29 W.
R. 28 W.
R. 27 W.
R. 26 W.
R. 25 W.
R. 24 W.
R. 23 W.
T. 117 N.
T. 116 N.
T. 115 N.
T. 114 N.
A
A′
B
B′
C
C′
D
D′
E
E′
F
F′
G
G′
Watertown
Silver Lake
Hutchinson
Lester Prairie
Glencoe
Plato
Young America
Chaska
Waconia
Brownton
Stewart
7
15
25
5
41
284
212



Tritium age

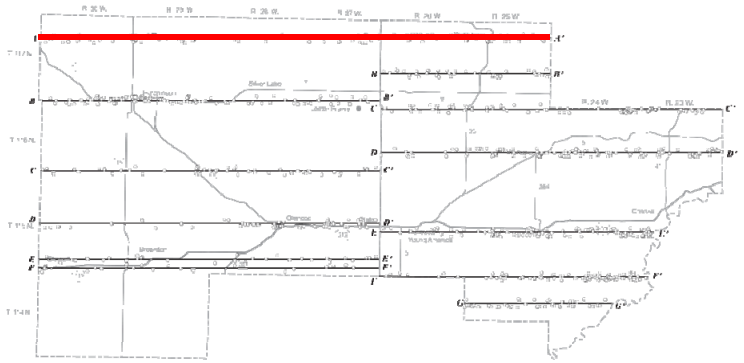
Darker color in small vertical rectangle (well screen symbol) indicates tritium age of water sampled in well. Lighter color indicates interpreted age of water in aquifer.

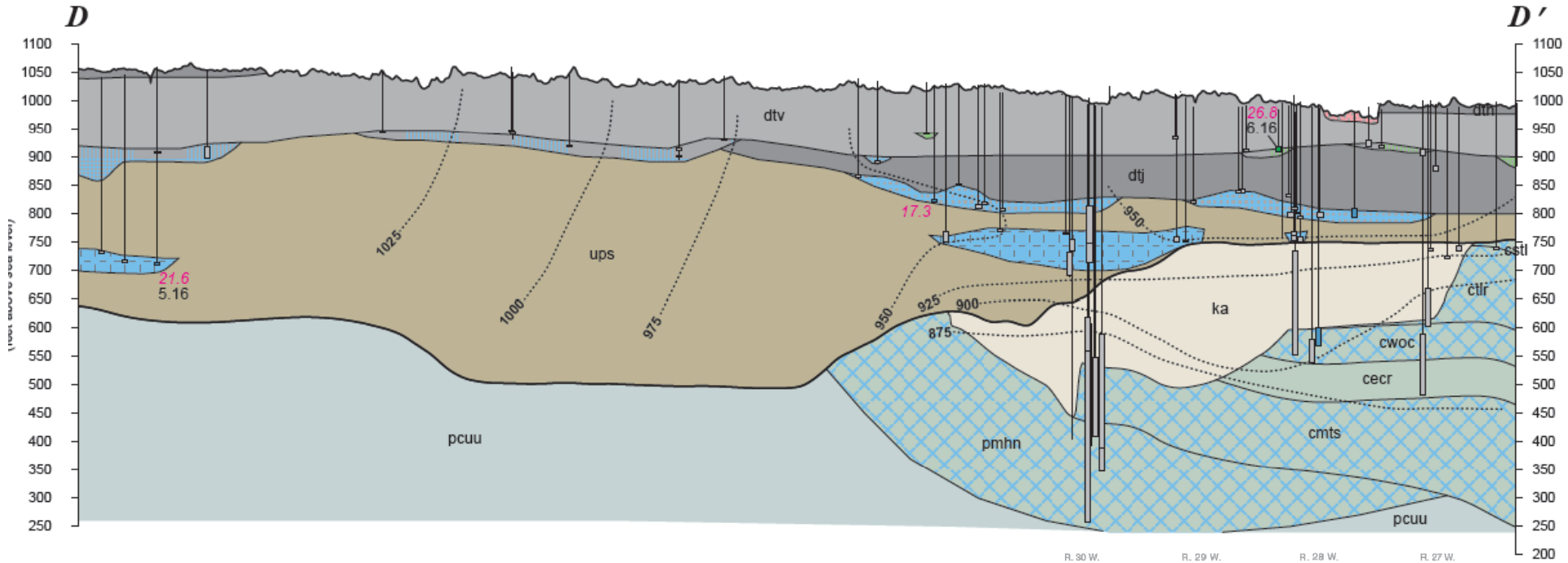
- Recent—Water entered the ground since about 1953 (8 or more tritium units [TU]).
- Mixed—Water is a mixture of recent and vintage waters (greater than 1 TU to less than 8 TU).
- Vintage—Water entered the ground before 1953 (less than or equal to 1 TU).
- Well not sampled for tritium.

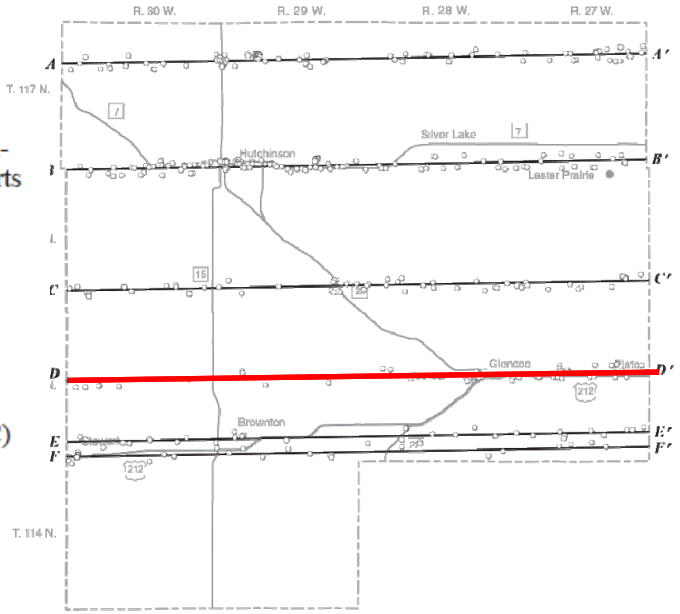
14.0 If shown, arsenic concentration equals or exceeds 5 parts per billion.

11.3 If shown, chloride concentration equals or exceeds 5 parts per million.

4000 If shown, groundwater residence time in years, estimated by carbon-14 (^{14}C) isotope analysis.







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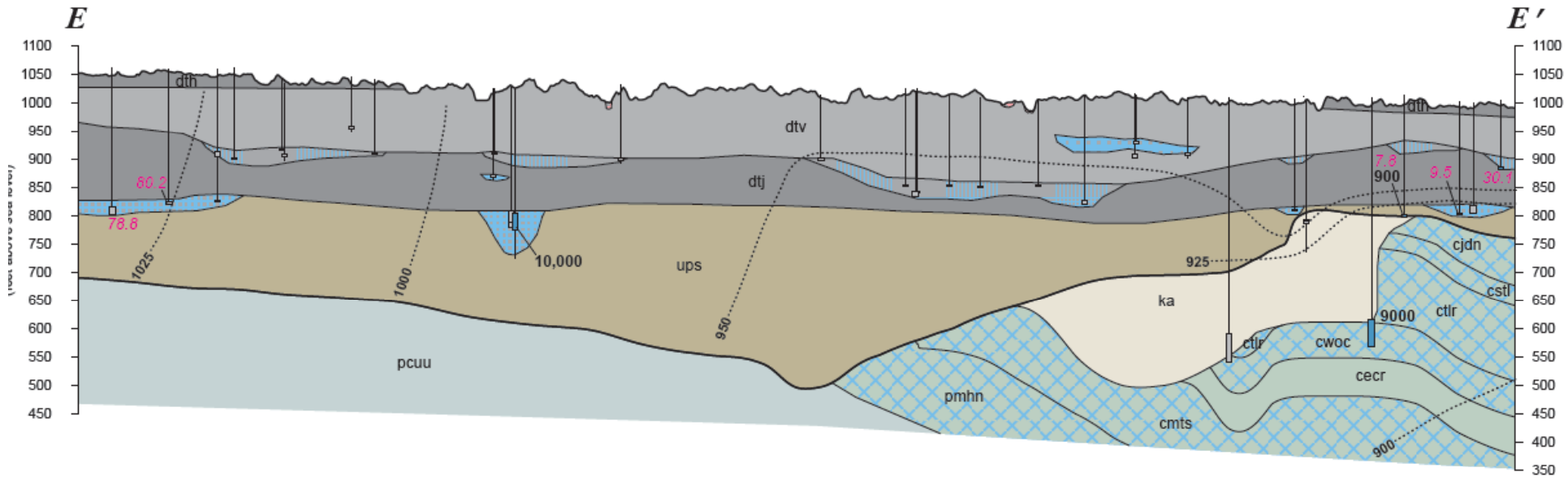

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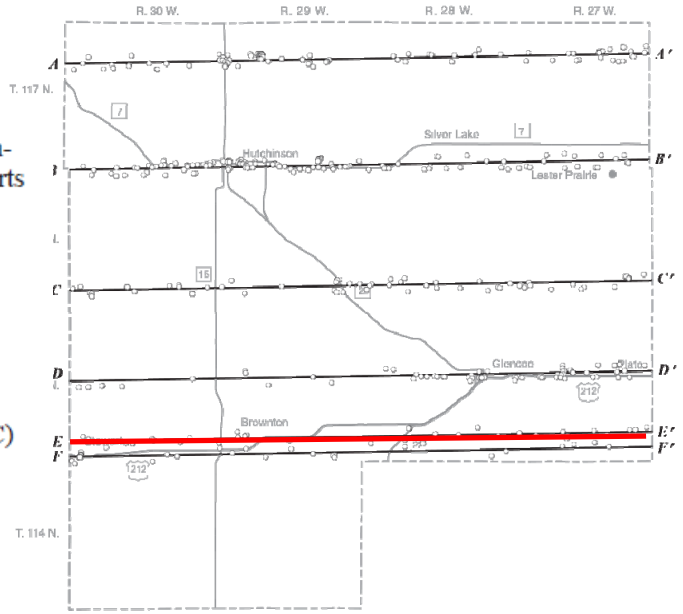

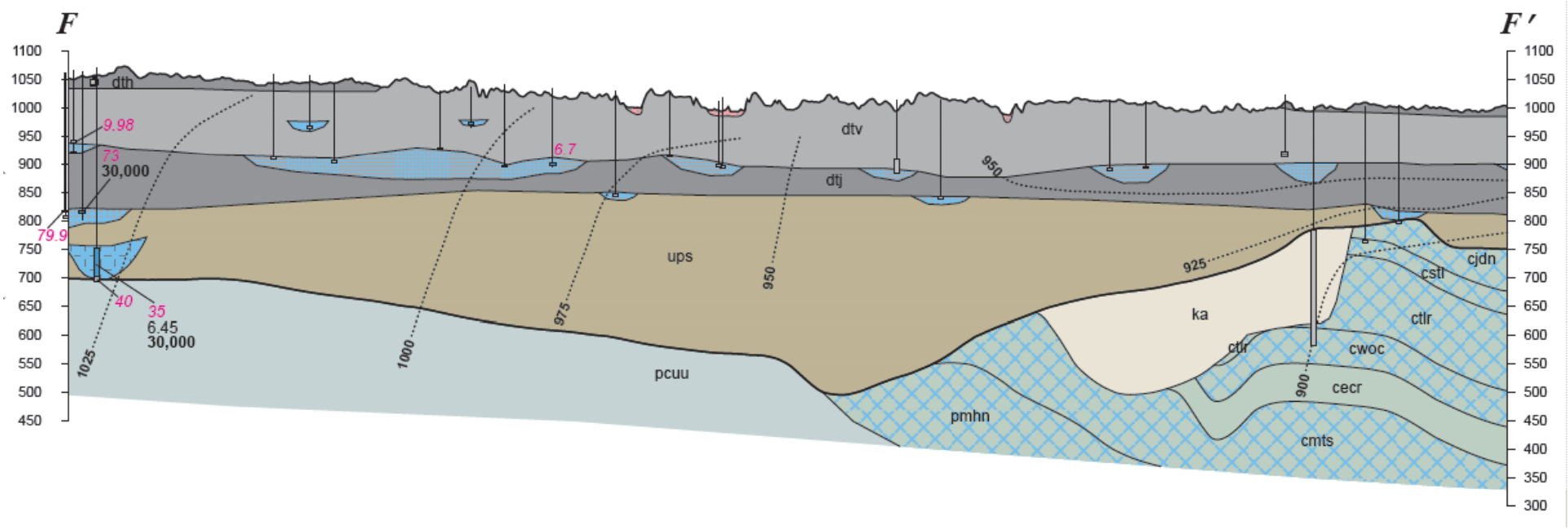

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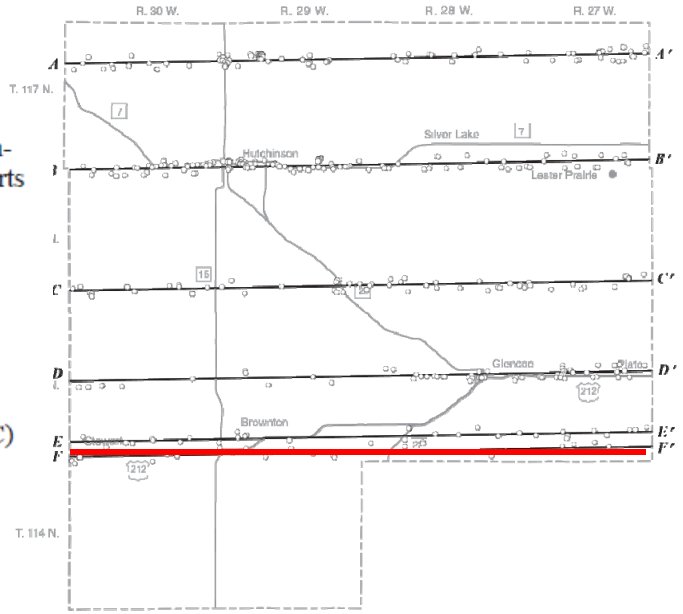

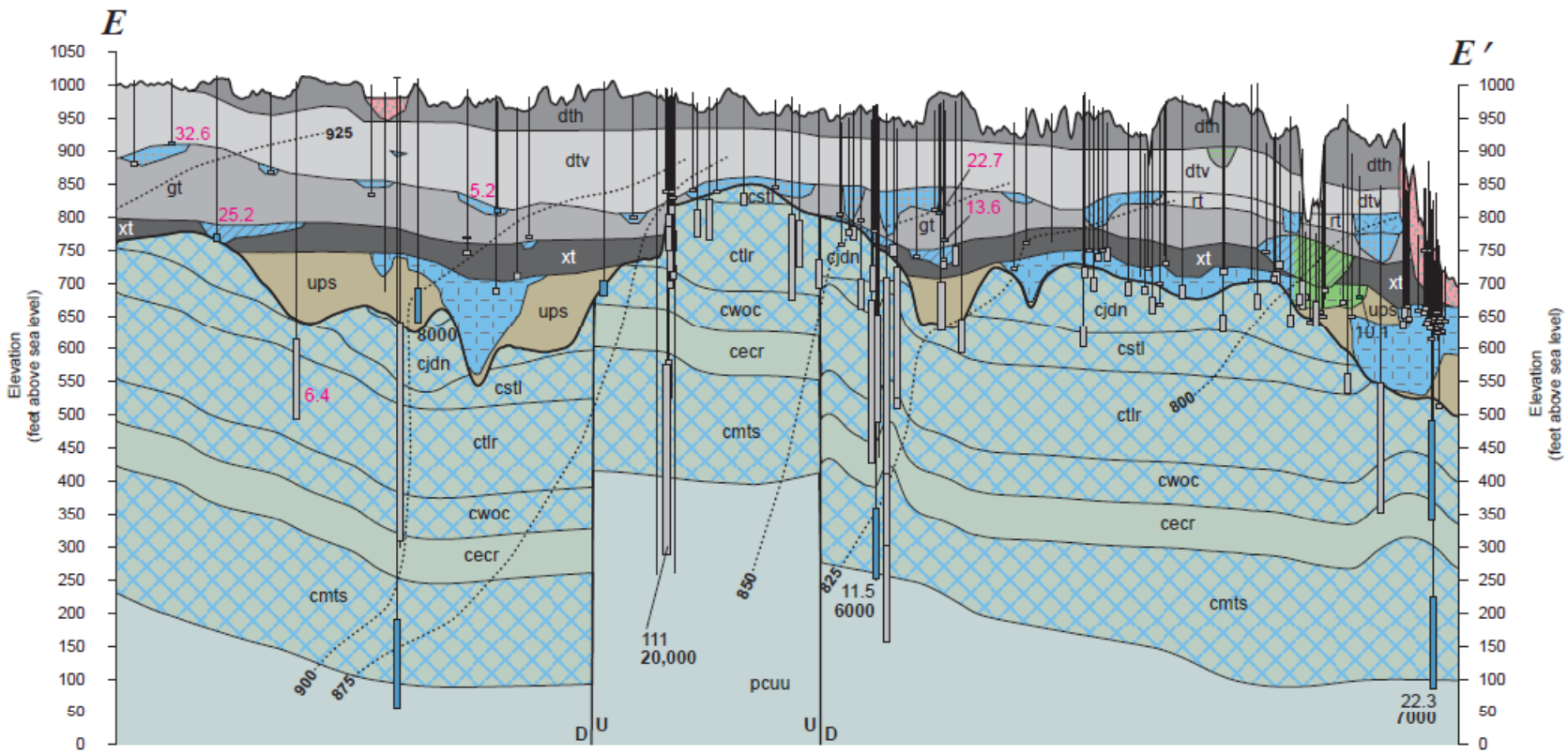

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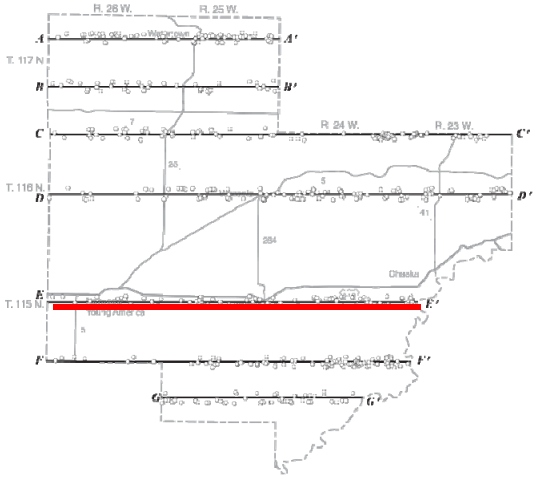

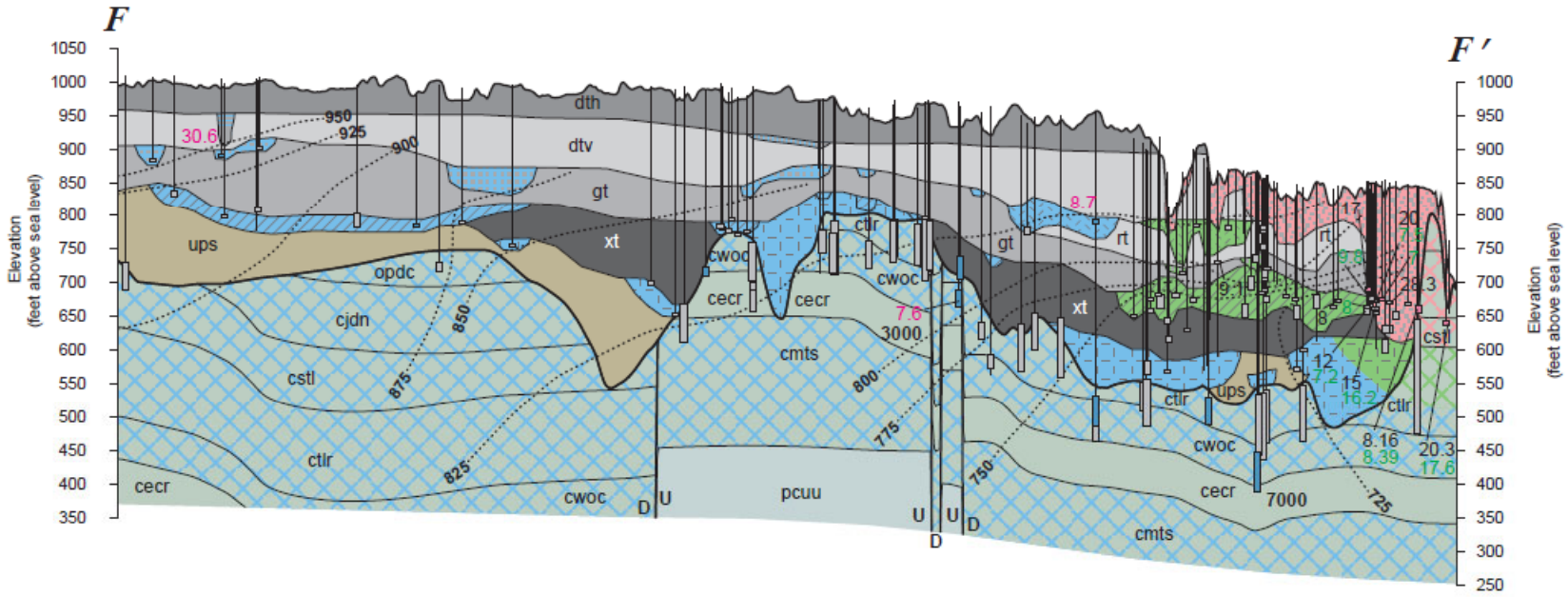

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15.2 If shown, nitrate-nitrogen concentration equals or exceeds 5 parts per million.

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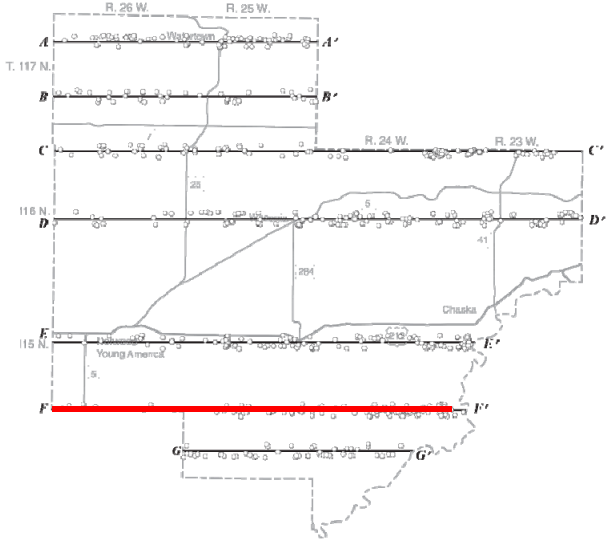
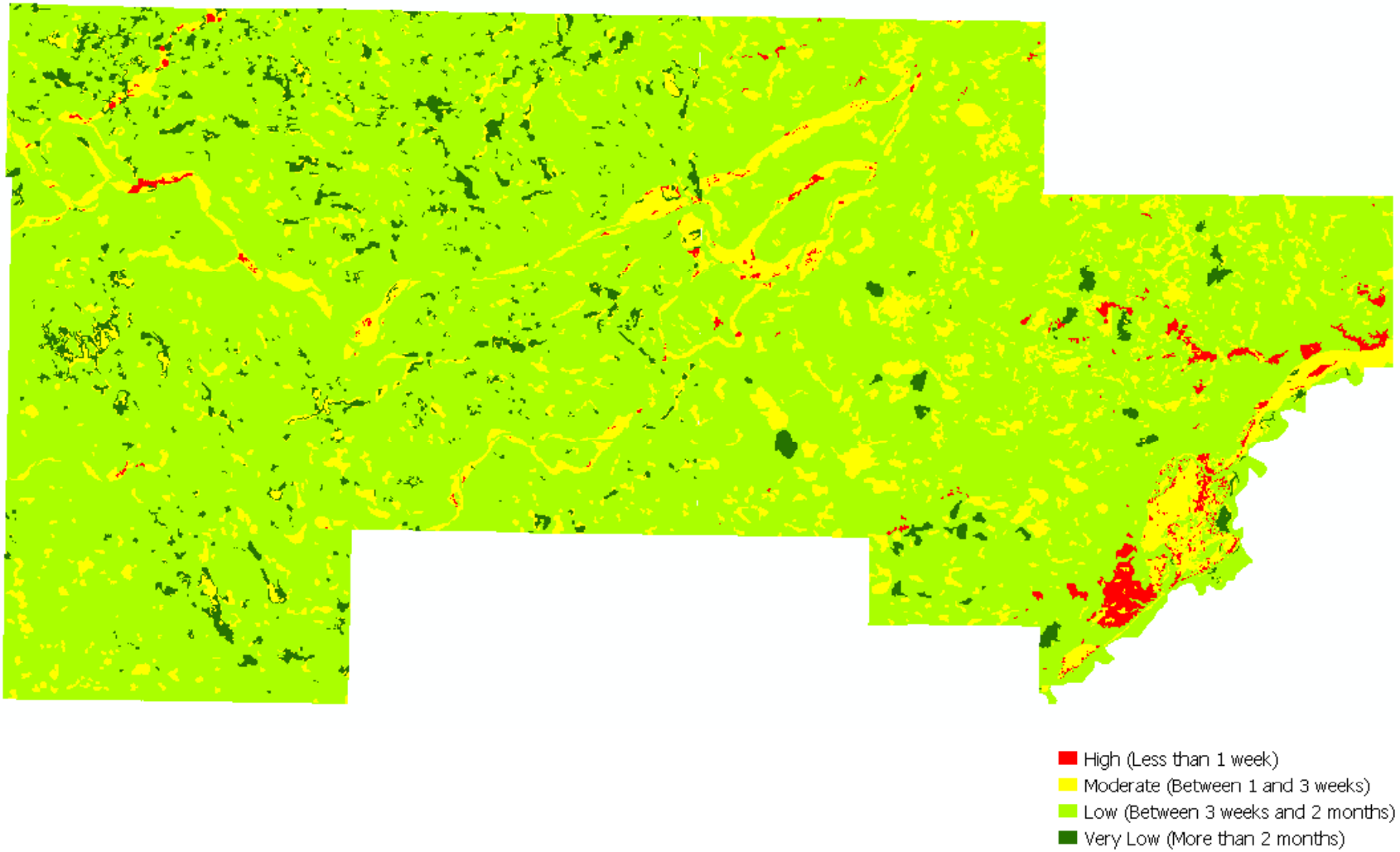
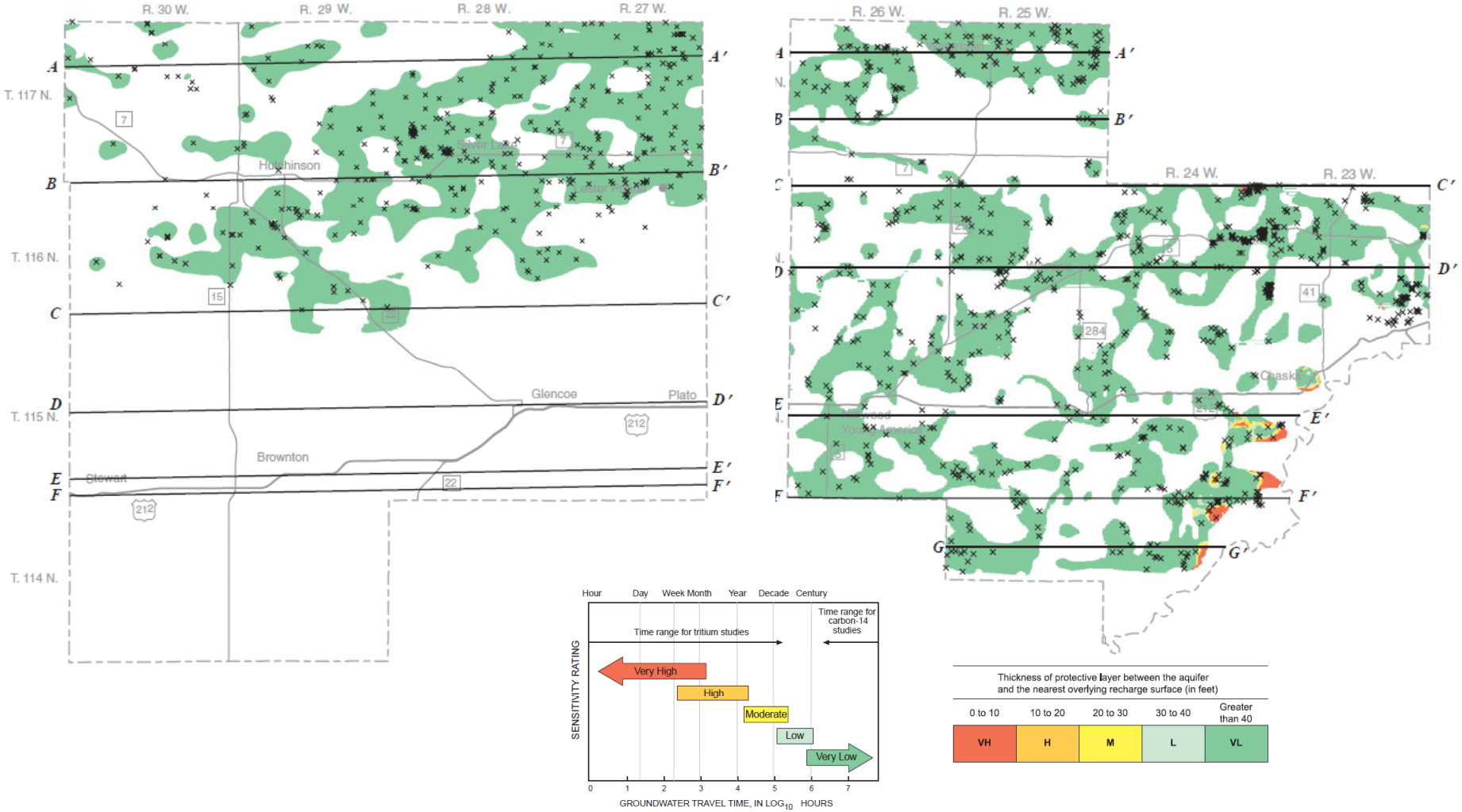


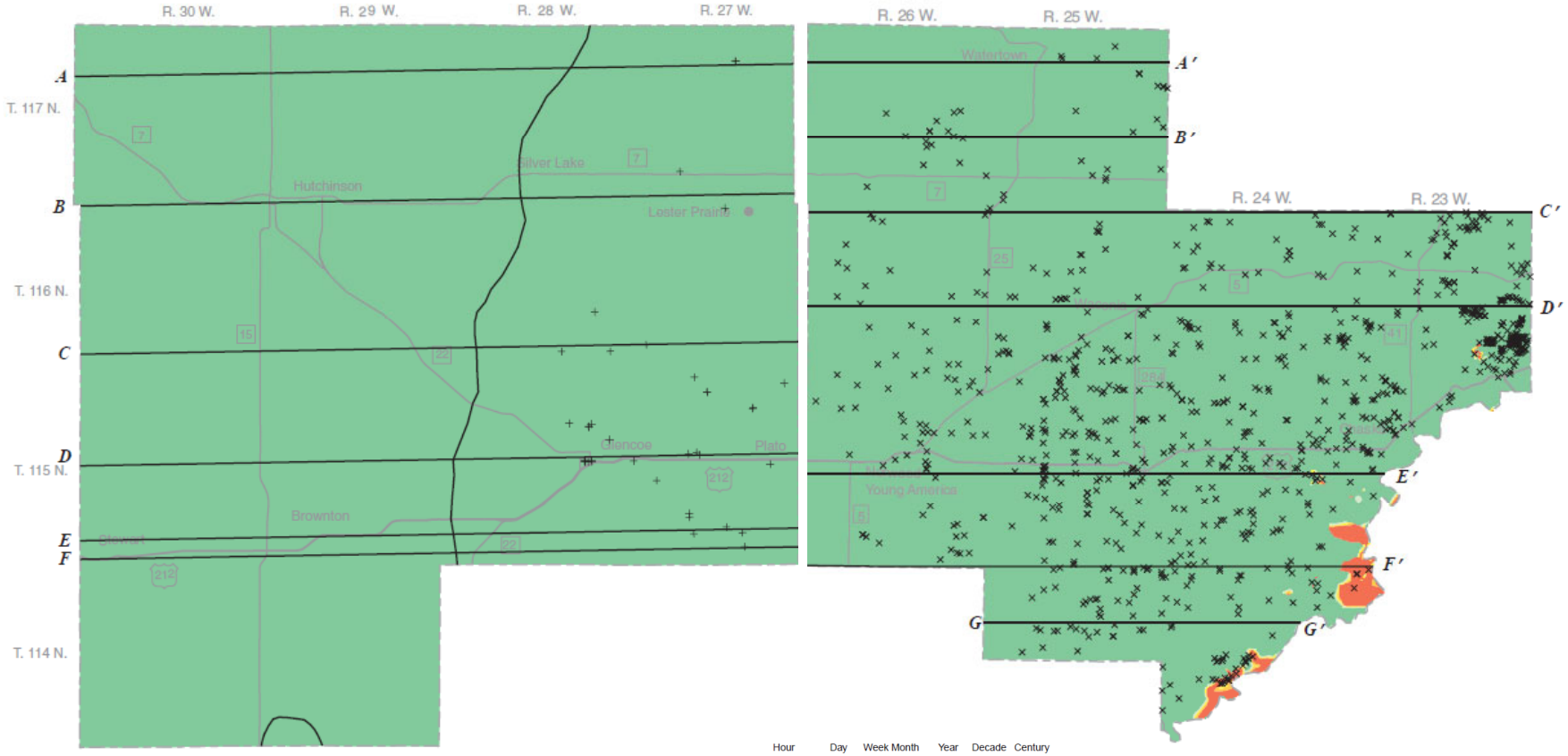
Pollution Sensitivity of the Near-Surface Materials



Pollution Sensitivity of
McLeod County sb Buried Sand Aquifer
and
Carver County sx Buried Sand Aquifer



Pollution Sensitivity of the Top of the Bedrock Service



Conclusions

The aquifer system in McLeod and Carver counties is a complicated sequence of Quaternary sand aquifers overlying a thick sequence of faulted sedimentary bedrock aquifers.

Des Moines lobe till forms the uppermost surficial geology unit over most of both counties. Its low permeability limits infiltration into the deeper Quaternary and bedrock aquifers.

Most groundwater in McLeod and Carver counties has a long residence time greater than 50 years and most aquifers have a low sensitivity to pollution. Deep Quaternary and bedrock aquifers have groundwater residence times up to 30,000 years.

In southeastern Carver County near the Minnesota River, the Des Moines lobe till was eroded by the Glacial River Warren. Alluvial and terrace sands, which form the surficial sediments, allow rapid infiltration from the surface. This area has a high sensitivity to pollution and the groundwater has elevated levels of chloride, nitrate, and tritium.