

Preliminary water-table elevation map of Columbia County, Wisconsin

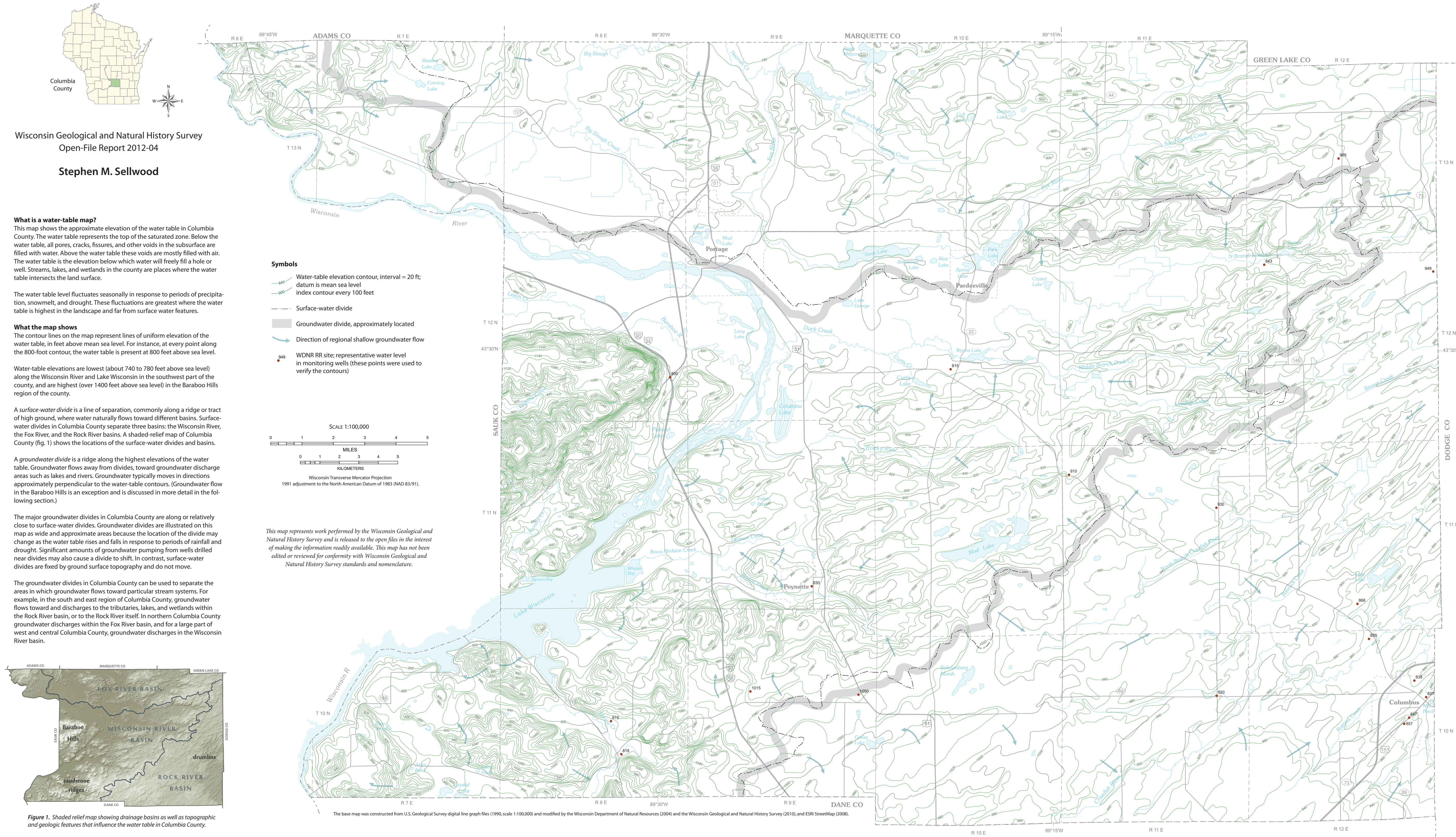


Figure 1. Shaded relief map showing drainage basins as well as topographic and geologic features that influence the water table in Columbia County.

Construction of the map

Groundwater elevations were estimated from the elevations of surface-water features such as streams, lakes, and wetlands. Water-table elevation contours for this map are interpolated from the elevations of surface water features and inferred from ground surface topography.

Mapped water-table elevations were verified at several locations throughout the county using water-table elevation data obtained from the Wisconsin Department of Natural Resources online database of closed remediation sites. These data consist of water level elevations measured in monitoring wells installed at contamination investigation sites. Monitoring wells are excellent indicators of water-table elevation because they are often screened across or just below the water table, and water levels are often repeatedly measured. The locations and approximate water-table elevations of these data are indicated as red points on the map.

The accuracy of the map varies throughout the study area, increasing where surface-water bodies are more prevalent. Water-table elevation contours are less accurate in areas of steeper topographic relief, such as in the Baraboo Hills and south of Lake Wisconsin (fig. 1). The water-table elevations are also subject to seasonal fluctuations in recharge or as a result of large-volume pumping from wells. However, the groundwater flow directions are not typically affected by seasonal variations in recharge.

The water table is heavily influenced by surface topography. The general surface topography of Columbia County is shown in the shaded-relief map (fig. 1). The following paragraphs discuss some of the topographic and geologic features in the county and their influence on the mapped water table.

Baraboo Hills

The Baraboo Hills form a topographic high in western Columbia County beginning west of the Wisconsin River and extending well into Sauk County to the west. The Baraboo Hills consist of Precambrian quartzite and Cambrian sandstone covered in many places by a thin layer of glacially deposited sediment. The Baraboo Hills are the highest and steepest landscape in Columbia County, and as a result, the water table within the Baraboo Hills is also higher and steeper than elsewhere in the county.

The quartzite bedrock of the Baraboo Hills is relatively impermeable; ground-water flows primarily through fractures in the rock. Although the water table is mapped as a continuous surface across this area, groundwater flow directions in fractured rock aquifers can be more complex than in porous aquifers. Flow directions in the quartzite may not be predicted accurately from the mapped water-elevation contours; flow-direction arrows are not shown for this area. In addition, wells installed into the quartzite bedrock may not produce significant amounts of water, and these wells will likely not produce water levels consistent with the mapped water table unless they intersect near-surface fractures.

Sandstone ridges

The water table in the southwest corner of Columbia County contains notable areas of raised relief where the water-table elevation rises above nearby surface water features. These areas coincide with bedrock ridges that consist predominantly of sandstone. In these areas the mapped water table is also mapped as a raised feature, but it is more subdued than the surface topography.

Drumlins

Along the eastern boundary of Columbia County, the water table takes on a linearity trending generally northeast–southwest. This linearity is due to the presence of drumlins on the land surface in this part of the county. The drumlins influence the shapes of surface water features and the shape of the water table.

Uses of the map

This water-table elevation map has a wide variety of uses. The map can be used to identify where a spill will move or to trace a contaminant back to its source by looking at the approximate direction of groundwater flow. Knowing the direction of groundwater flow can also be used to help protect both the quantity and quality of water that feeds lakes and streams. Another use for the map is to calculate depth to the water table, a key component in estimating groundwater susceptibility. Depth to water table data is important for construction activities such as excavations, foundation design, and highway planning.