

GROUNDWATER LEVELS IN WISCONSIN, ANNUAL SUMMARY 1998

Alexander Zaporozec

Data compilation: Ryan Jakubowski

1999

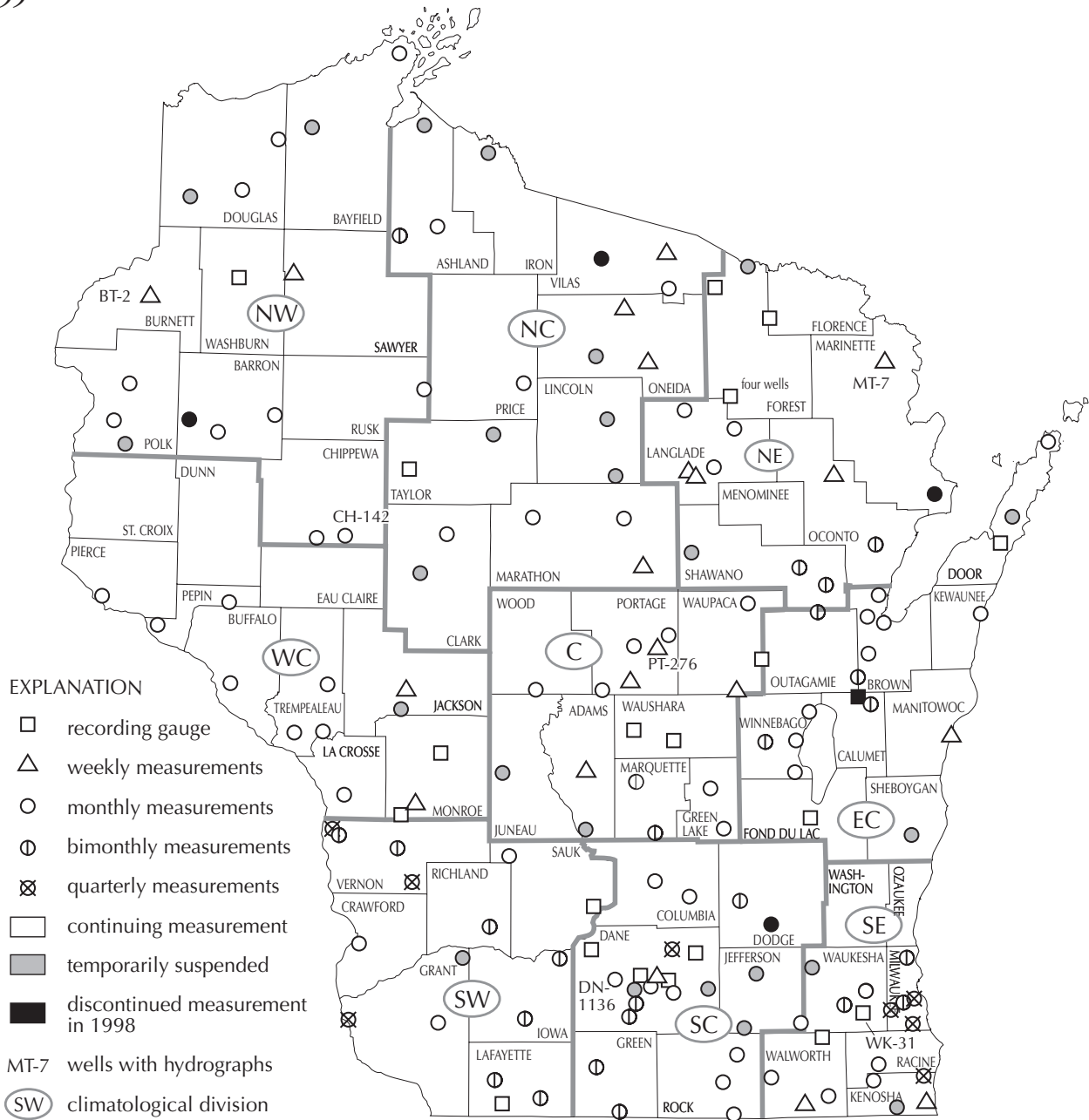


Figure 1. Location of observation wells in Wisconsin, 1998.

In cooperation with

U.S. Department of the Interior, U.S. Geological Survey

Water Resources Division, Madison District Office, 8505 Research Way, Middleton, Wisconsin 53562-3586

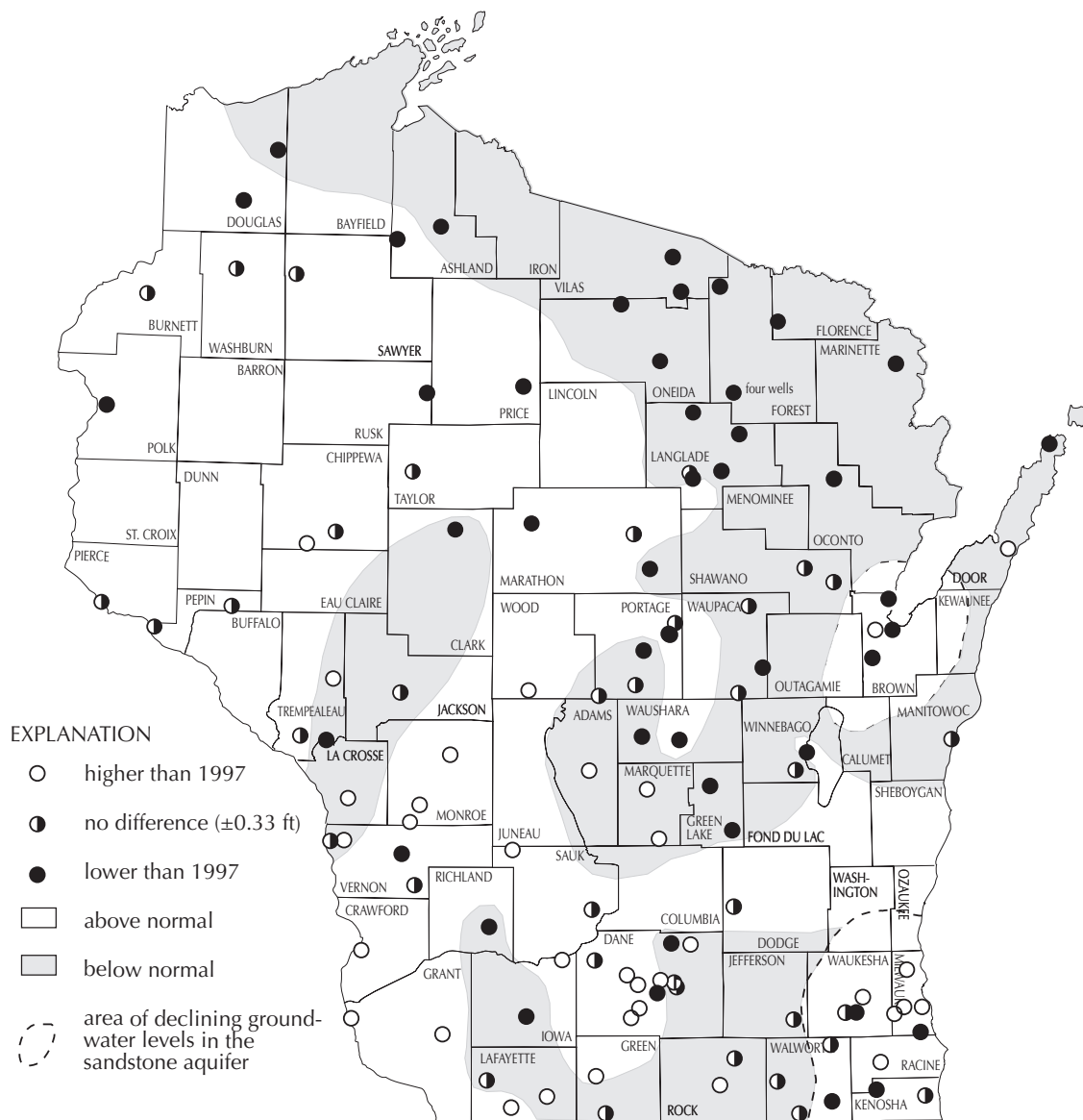


Figure 2. Average water-level changes from 1997 to 1998.

The Wisconsin Geological and Natural History Survey (WGNHS) and the U.S. Geological Survey (USGS) have jointly operated a statewide network of observation wells in Wisconsin since 1946. In 1998 measurements were taken in 137 observation wells in 62 counties. Locations of wells are shown in figure 1. Five wells were discontinued during 1998, and measurements on 24 wells remained suspended for the lack of funds. Frequency of measurements was reduced on an additional 13 wells to meet the limited budget for operating the network. Information about

wells and water-level measurements can be obtained from the USGS (Bernie Ellefson, 608/821.3849) or the WGNHS (Alexander Zaporozec, 608/262.3385).

Fluctuations in groundwater levels are determined to a large degree by the available moisture, which is supplied by precipitation. Average water levels in observation wells did not change significantly between 1997 and 1998, primarily because precipitation amounts, after a relatively dry 1997, were only slightly (104 percent) above normal. This available moisture enabled groundwater lev-

els in 1998 to partly recover from the effects of the previous dry year. Water-level fluctuations were relatively small. Average water levels were within 1 ft of 1997 levels in almost two-thirds of observation wells; levels in more more than one-third of the wells were approximately the same as in 1997 (fig. 2).

Average water levels in 1998 were lower than in 1997 in 55 percent of observation wells, primarily in northern and central Wisconsin (fig. 2). The declines were mostly small, 1 ft or less, and in only a few wells did the water levels decline more than 2 ft (not counting wells in areas affected by heavy pumping). The maximum recorded natural decline for 1998 was -3.27 ft in a well in Green Lake County.

Average water levels in 1998 were higher than in 1997 in 45 percent of observation wells in the southern, west-central, and east-central parts of the state (fig. 2). On the average, water levels in 71 percent of these wells have risen no more than 1 ft. The greatest rises (greater than 2 ft) were recorded in observation wells in Monroe, Grant, Lafayette, Dane, and Rock Counties. The maximum recorded natural rise was almost 7 ft in a well in Lafayette County.

Average water levels for observation wells in the sandstone aquifer in areas affected by heavy pumping around Green Bay and in the southeastern Wisconsin metropolitan centers continued to gradually decline (fig. 2). The maximum recorded decline in the Green Bay area was in well BN-76 (-10.50 ft) and in southeastern Wisconsin in well ML-540 (-3.3 ft). Water levels in the overlying Silurian dolomite aquifer in these two areas are not affected by the heavy pumping because this aquifer is separated from the underlying sandstone aquifer by low permeability layers of a confining formation called the Maquoketa Formation.

In comparison with the 30-year means (so-called normal water levels), the 1998 average wa-

ter levels were, under natural conditions, below normal in 57 percent of observation wells. These wells are mostly located in northeastern Wisconsin and in large parts of north-central, central, and south-central Wisconsin. Above-normal water levels were recorded in 43 percent of observation wells, primarily in the western half of the state (fig. 2). A large proportion of observation wells (22 percent) recorded no significant departures ($\pm 1\%$) from normal levels, and variations were within 4 percent of normal levels in 63 percent of observation wells. If we exclude the wells affected by heavy pumping, in 1998 water levels of only a few wells were less than 85 percent of normal levels. Water levels higher than 115 percent of normal were recorded primarily in observation wells in west-central and southwestern Wisconsin.

The long-term trends in water levels are influenced by precipitation, the principal source of recharge to groundwater. The alternating periods of wet and dry years result in increasing and declining groundwater levels, respectively. The correlation of precipitation cycles and groundwater cycles is best seen by plotting the average monthly water levels along with the cumulative departure from normal monthly precipitation, as shown in figure 3. Seasonal variations that tend to obscure the long-term trends are eliminated by plotting the average values. The hydrographs of selected key wells in figure 3 demonstrate the long-term trends in groundwater levels for the last 13 years and their relation to precipitation trends (top box, fig. 3). Average water levels in observation wells were slowly declining from 1986 until they reached minima in 1990 and early 1991. The subsequent rising trends peaked in 1993, and since then, water levels have generally declined in southern and east-central Wisconsin or remained approximately the same over the rest of the state.

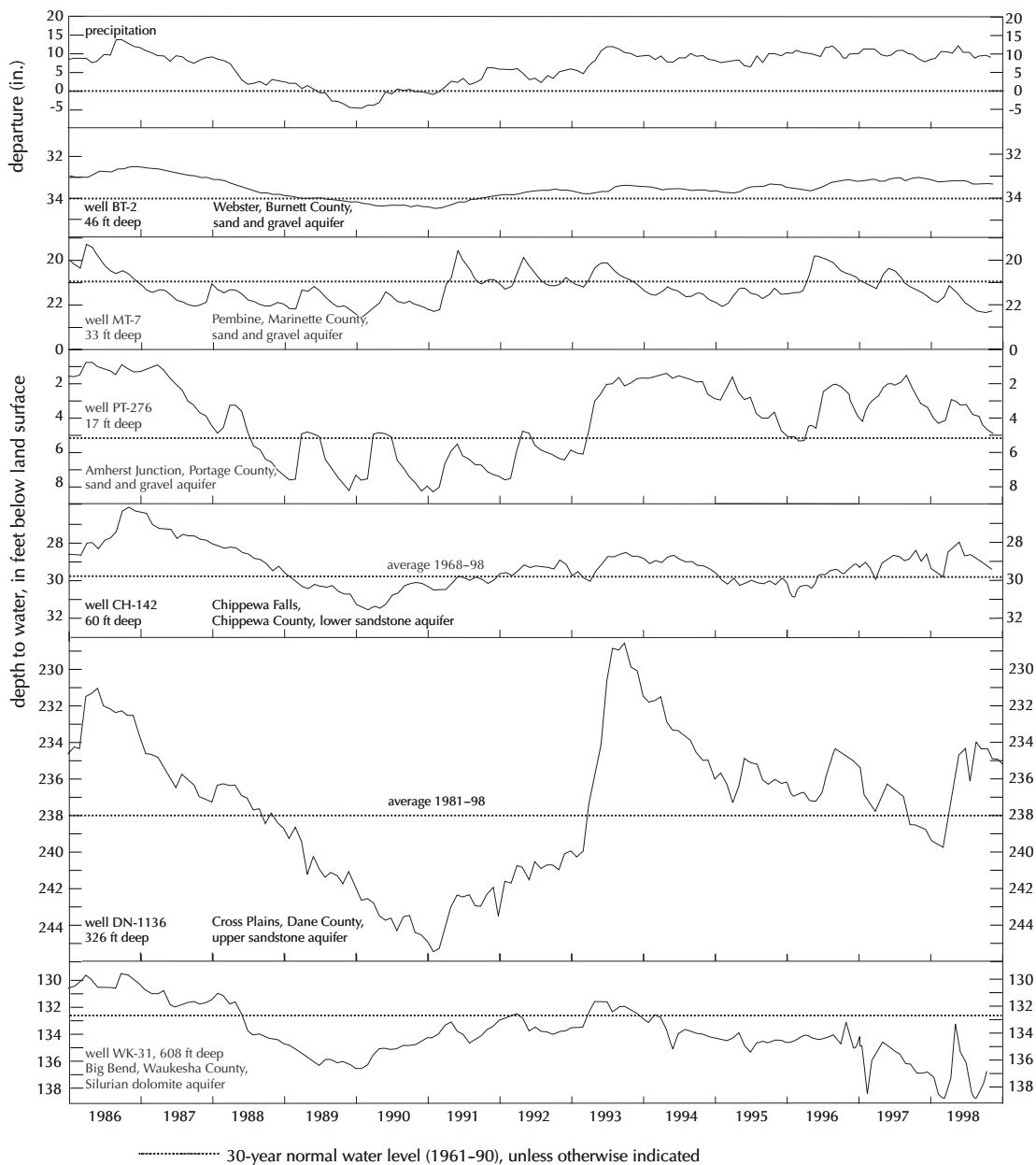


Figure 3. Cumulative departure from normal monthly precipitation in Wisconsin and fluctuations of water levels in selected key wells, 1986–98.

^{UW}Extension

Wisconsin Geological and Natural History Survey

3817 Mineral Point Road, Madison, Wisconsin 53705-5100

☎ 608/263.7389 FAX 608/262.8086 <http://www.uwex.edu/wgnhs/>

James M. Robertson, Director and State Geologist

ISSN: 0375-8265

This report is an interpretation of the data available at the time of preparation. Every reasonable effort has been made to ensure that this interpretation conforms to sound scientific principles; however, the report should not be used to guide site-specific decisions without verification. Proper use of this publication is the sole responsibility of the user.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, University

of Wisconsin–Extension, Cooperative Extension. University of Wisconsin–Extension provides equal opportunities in employment and programming, including Title IX and ADA requirements. If you need this information in an alternative format, contact the Office of Equal Opportunity and Diversity Programs or the Wisconsin Geological and Natural History Survey (☎ 608/262.1705).

Mission of the Wisconsin Geological and Natural History Survey

The Survey conducts earth-science surveys, field studies, and research. We provide objective scientific information about the geology, mineral resources, water resources, soil, climate, and biology of Wisconsin. We collect, interpret, disseminate, and archive natural resource information. We communicate the results of our activities through publications, technical talks, and responses to inquiries from the public. These activities support informed decision-making by government, industry, business, and individual citizens of Wisconsin.