



MONTHLY WATER INVENTORY REPORT FOR OHIO

December 1999

<http://www.dnr.state.oh.us/odnr/water/pubs/newsltrs/mwirmain.html>

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PRECIPITATION during December was slightly above normal in the southern one-third of the state and in a few areas of north-central Ohio, but slightly below normal elsewhere. The state average was 2.58 inches which is normal. Regional averages ranged from 3.31 inches, 0.35 inch above normal, for the South Central Region to 2.11 inches, 0.47 inch below normal, for the Northeast Hills Region. Piketon (Pike County) reported the greatest amount of precipitation for December, 4.95 inches. Beach City Dam (Tuscarawas County) reported the least amount for the month, 1.54 inches.

Precipitation during December fell in the form of both rain and snow. Snowfall was generally below normal across the state with the greatest amounts reported in the snowbelt counties of northeastern Ohio. Chardon (Geauga County) received 10.3 inches of snow during the month, about 16 inches below normal. After a dry start during the first 4 days of the month, wet weather prevailed for about the next 12 days. Generally, 0.25-0.50 inch of precipitation fell across the state around December 5-6. Heavier showers on December 10 produced 0.5-1.0 inch amounts of rain across most of the state, but less in northwest Ohio. The most widespread and heaviest precipitation of the month occurred during December 12-15. A slow moving storm system entered the state from the southwest generally producing between 0.75 inch to 1.50 inches of rain with the greatest amounts falling in the southern half of the state. The remainder of the month was rather dry. The only significant precipitation occurred around December 27-28 when 0.25-0.50 inch of precipitation fell across much of the state, most of which was in the form of snow.

Precipitation for the 2000 water year is above normal in the north-central, northeastern, south-central and southeastern areas of the state, but below normal elsewhere. The average for the state as a whole is 7.34 inches, 0.23 inch below normal. Regional averages range from 9.65 inches, 1.68 inches above normal, for the South Central Region to 5.63 inches, 1.40 inches below normal, for the Northwest Region.

Precipitation for the 1999 calendar year was below normal statewide except in a few widely scattered locations in north-central and northeastern Ohio where it was slightly above normal. The state average was 33.47 inches, 4.10 inches below normal. For the state as a whole, 1999 ranks as the 18th driest year in 117 years of record. Regional averages ranged from 37.39 inches, 0.42 inch above normal, for the Northeast Region to 29.98 inches, 10.29 inches below normal, for the Southwest Region (see Precipitation table, departure from normal, past 12 months column). This ranks as the 5th driest year on record for the Southwest Region. Also, it was the 9th driest year of record for the Central Region, the 14th driest for the South Central Region and the 15th driest for the Central Hills Region. Chardon (Geauga County) reported the greatest amount of precipitation for the year, 48.04 inches. Xenia (Greene County) reported the least amount of precipitation, 24.32 inches, which is 15.24 inches below normal. Washington Court House (Fayette County) reported 24.34 inches of precipitation for the year. An isohyetal map and regional averages with percentages of normal precipitation for the 1999 calendar year appear on the last page of this report.

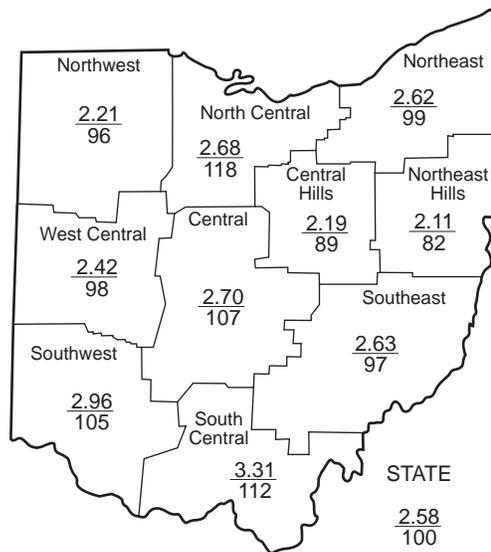
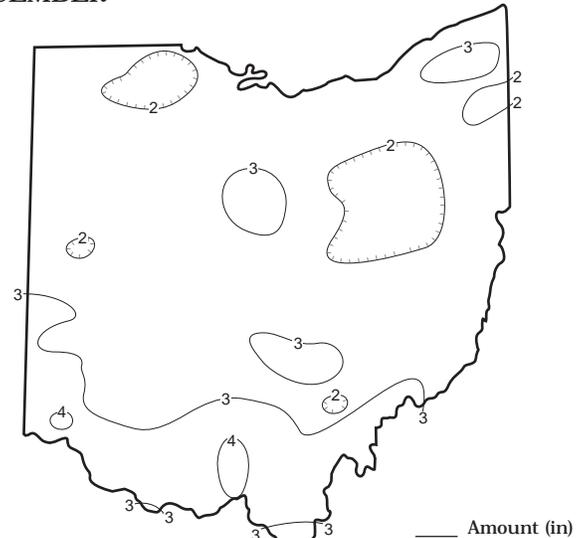
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PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.10	-1.40	-3.03	-2.10	+1.70	-3.4
North Central	+0.40	+0.67	-0.06	-1.48	+2.39	+0.2
Northeast	-0.02	+0.91	+2.29	+0.42	-0.35	+1.2
West Central	-0.05	-1.69	-3.75	-4.96	-2.03	-2.8
Central	+0.17	-0.87	-2.75	-6.94	-6.27	-3.9
Central Hills	-0.28	-0.30	-0.62	-3.89	-1.34	-0.8
Northeast Hills	-0.47	-0.31	-1.24	-2.39	+1.60	-1.6
Southwest	+0.14	-1.87	-6.60	-10.29	-6.63	-3.5
South Central	+0.35	+1.68	-0.70	-5.57	-2.55	+0.4
Southeast	-0.09	+0.93	-0.95	-3.63	+0.19	+0.2
State	0.00	-0.23	-1.75	-4.10	-1.35	

*Above +4 = Extreme Moist Spell
3.0 To 3.9 = Very Moist Spell
2.0 To 2.9 = Unusual Moist Spell
1.0 To 1.9 = Moist Spell
0.5 To 0.9 = Incipient Moist Spell
0.4 To -0.4 = Near Normal
-0.5 To -0.9 = Incipient Drought
-1.0 To -1.9 = Mild Drought
-2.0 To -2.9 = Moderate Drought
-3.0 To -3.9 = Severe Drought
Below -4.0 = Extreme Drought

PRECIPITATION DECEMBER



Average (in)
Percent of normal

MEAN STREAM DISCHARGE

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	This Month		
				% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
Grand River near Painesville	685	1,220	72	64	58	66
Great Miami River at Hamilton	3,630	661	18	28	34	78
Huron River at Milan	371	214	145	101	68	86
Killbuck Creek at Killbuck	464	171	46	60	51	81
Little Beaver Creek near East Liverpool	496	326	73	77	57	83
Maumee River at Waterville	6,330	1,305	24	24	26	90
Muskingum River at McConnelsville	7,422	3,524	49	55	46	85
Scioto River near Prospect	567	77	24	27	22	76
Scioto River at Higby	5,131	1,028	22	34	34	67
Stillwater River at Pleasant Hill	503	63	16	31	29	77

STREAMFLOW during December was below normal throughout most of Ohio. Flows were low enough to be considered deficient across the southern half of the state. The December flows increased seasonally from November's flows statewide.

Streamflow at the beginning of the month was below normal throughout the state. Flows declined slightly during the first few days of the month across most of the state generally reaching their lowest point for December during this period. Streamflow then increased statewide through mid-month in response to runoff from several days of precipitation. Greatest flows for the month occurred around December 14-17 following the widespread precipitation that fell during December 12-15. Flows declined statewide during the second half of the month as drier conditions prevailed. Some streams in southwestern and southeastern Ohio reached their lowest December flows during the last week of the month. Although streamflow was greater at the end of the month

than at the beginning, flows remained below normal statewide.

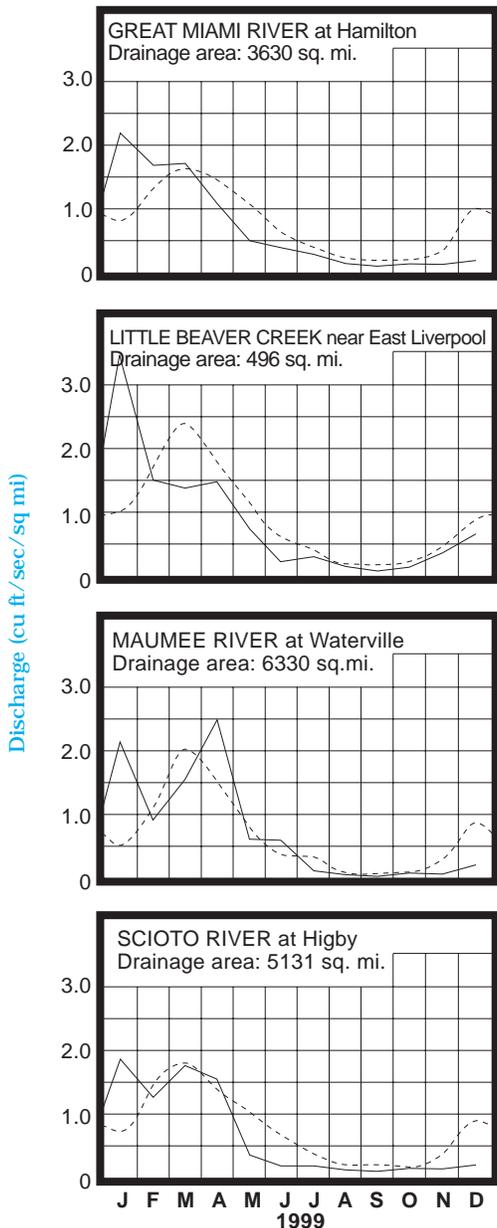
Streamflow for the 1999 calendar year was below normal statewide (see Mean Stream Discharge table, percent of normal, past 12 months column). Flows during January were above normal statewide and were high enough to be considered excessive due in part to melting snow and precipitation from storms with heavy rains around January 21-22. Flows during February fell to below normal across most of the state, but remained above normal in the western and southwestern areas of Ohio. March and April flows were below normal throughout most of the state, but above normal locally in some areas of northern Ohio. Streamflow during the last 8 months of 1999 generally was below normal throughout most of the state. Many flows during this period were low enough to be considered deficient due to the droughty conditions that existed throughout much of 1999.

RESERVOIR STORAGE for water supply during December increased in both the Mahoning and Scioto river basins. Storage remained above normal in the Mahoning basin reservoirs and below normal in the Scioto basin reservoirs.

Reservoir storage at the end of December in the Mahoning basin index reservoirs was 66 percent of rated capacity for water supply compared with 61 percent for last month and 67 percent for December 1998. Month-end storage in the Scioto basin index reservoirs was 64 percent of rated capacity for water supply compared with 54 percent for last month and 71 percent for December 1998.

Although surface-water supplies remained adequate in most areas of the state, drought-like conditions during much of 1999 had an adverse impact, especially in the southern half of Ohio. Reservoir storage in the Mahoning basin reservoirs was generally above normal during much of 1999, but was below normal during the summer high use period. Storage in the Scioto basin reservoirs was above normal from January-April, but fell to below normal during May where it remained throughout the duration of 1999.

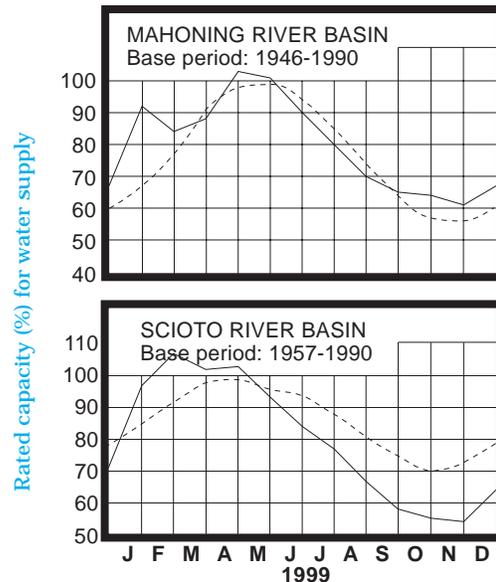
MEAN STREAM DISCHARGE



Base period for all streams: 1961-1990

Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



Rated capacity (%) for water supply

GROUND-WATER LEVELS

Based on daily lowest level in feet below land-surface datum

GROUND WATER levels during December showed mixed responses across the state. Nearly all aquifers showed net declines contra-seasonally from last month's levels during December. Generally, levels were rather stable in most aquifers during the month. However, some aquifers, especially shallow aquifers, showed a temporary rise during the middle of the month following precipitation before stabilizing or slowly declining again.

Ground water levels continue to remain below normal throughout the state. Several index observation wells once again reached new seasonal record-low levels during the month. Those wells were: F-1 near West Rushville (Fairfield County) representing sandstone aquifers in eastern and southeastern Ohio; Fa-1 near Jasper Mill (Fayette County) representing limestone aquifers in south-central and southwestern Ohio; and Tu-1 near Strasburg (Tuscarawas County) representing sand and gravel aquifers in eastern and northeastern Ohio.

The 1999 calendar year was not especially favorable for ground water supplies. Although supplies were adequate throughout the year in most areas of the state, levels in some aquifers fell to record-low or near record-low levels prior to the end of the year. Ground water levels were below normal at the start of 1999 following the on-set of drought-like conditions in the late summer months of 1998. Ground water levels responded favorably to the precipitation that fell during January and February and began to show some improvement. However, an unusually dry March signaled an early end to the recharge season and levels began to decline by mid-spring in most aquifers. Recharge to most aquifers was less than desired and only a few aquifers recovered to the normal-seasonal levels. Persistent droughty conditions throughout most of the summer and the early autumn months contributed to a sharp decline in ground water levels. Continued below normal precipitation through the end of the year in many areas of the state delayed the start of any significant recharge to ground water supplies. At the end of the year, ground water levels ranged from about 2 feet to more than 6 feet below normal, historically low levels in some areas. Year-end levels are also noticeably lower than they were last year ranging from about 1 foot to nearly 4 feet below the December 1998 levels. Water supply managers with ground water sources should monitor closely their situations throughout the recharge season and beyond.

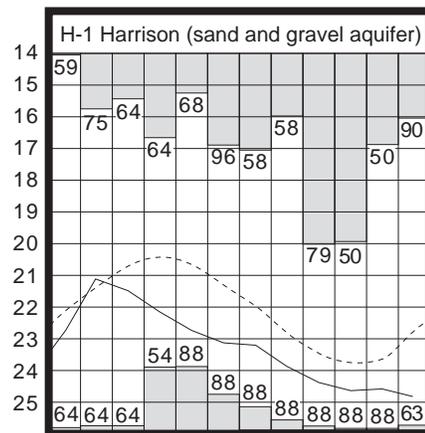
LAKE ERIE level declined during December. The mean level was 570.51 feet (IGLD-1985), 0.16 foot lower than last month's mean level and 0.12 foot below normal. This month's level is 0.52 foot lower than the December 1998 level and 1.31 feet above Low Water Datum.

The U. S. Army Corps of Engineers (USACE) reports that precipitation in the Lake Erie basin during December averaged 2.7 inches which is 0.1 inch above normal. The entire Great Lakes basin averaged 2.2 inches which is 0.1 inch below normal. For calendar year 1999 the Lake Erie basin averaged 31.7 inches of precipitation, 3.2 inches below normal, and the entire Great Lakes basin averaged 32.6 inches, 0.3 inch above normal.

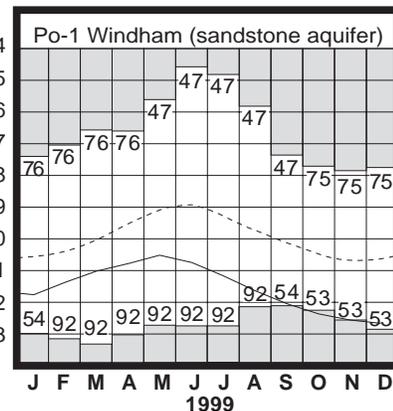
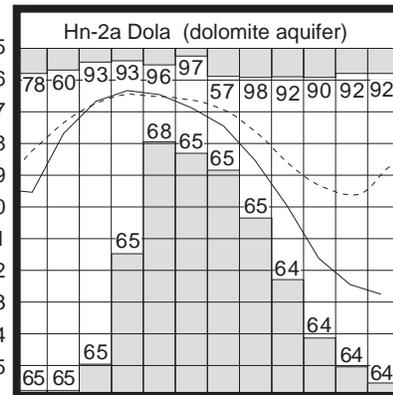
Lake Erie's mean level was above normal during the first 6 months of 1999 and below normal during the last 6 months of the year. The level of the lake fell to below normal during the 1999 summer boating season for the first time in more than 30 years. The USACE predicts that, based on the current condition of the Great Lakes basin and anticipated future weather conditions, the level of Lake Erie should range from near to slightly below the long-term seasonal average for the foreseeable future.

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	22.51	-5.66	-0.61	-3.80
Fa-1	Jasper Mill, Fayette Co.	Limestone	14.70	-6.54	-0.42	-3.77
Fr-10	Columbus, Franklin Co.	Gravel	46.11	-2.01	+0.38	-1.66
H-1	Harrison, Hamilton Co.	Gravel	24.81	-1.99	-0.23	-0.77
Hn-2a	Dola, Hardin Co.	Dolomite	12.75	-3.81	-0.31	-3.29
Po-1	Windham, Portage Co.	Sandstone	22.66	-2.05	-0.09	-0.99
Tu-1	Strasburg, Tuscarawas Co.	Gravel	16.47	-3.19	-0.11	-1.15

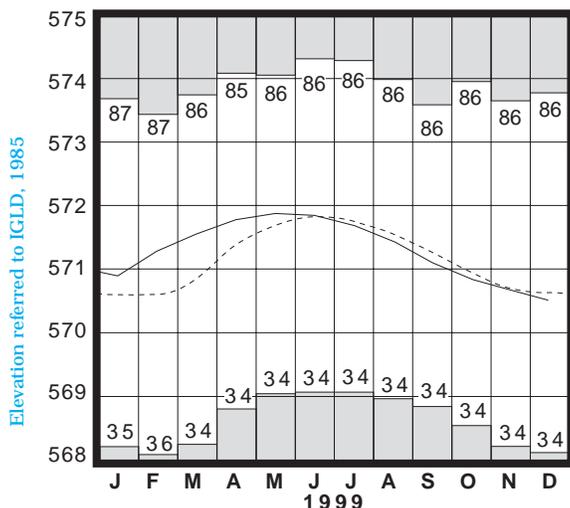
GROUND-WATER LEVELS



Water level (ft below land surface)



LAKE ERIE LEVELS at Fairport



Base period: 1900-1991

■ Record high and low, year of occurrence

Base periods: H-1, 1951-1990. Hn-2a, 1955-1990.

Po-1, 1947-1990 ■ Record high and low, year of occurrence

Normal - - - - Current ———

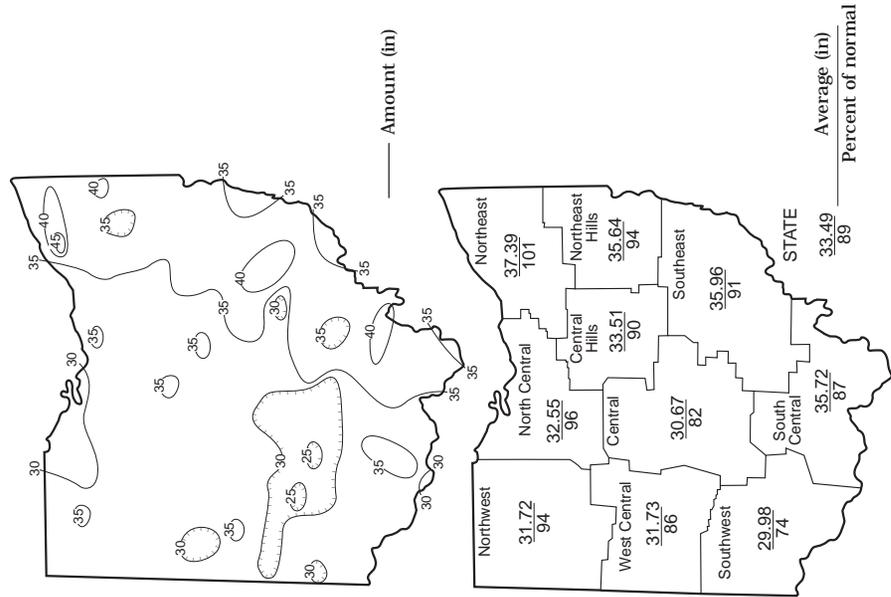
The 1999 calendar year started with above normal precipitation during January and February across most of the state. March precipitation was noticeably below normal statewide and ranked as the 19th driest March of record. April was wet across most of the state, but portions of southern Ohio continued to receive below normal rainfall. Rainfall during May and June was noticeably below normal throughout most of the state. It was the 8th driest May of record for both the Central and Southwest regions. Drought conditions expanded during June ending as the 2nd driest June of record for the Central Hills Region, the 3rd driest for the Central and Northeast Hills regions, the 5th driest for the Southeast and South Central regions and the 9th driest for the Northeast Region. For the state as a whole it was the 18th driest May and the 9th driest June of record. July precipitation was generally above normal in the northern half of the state and below normal in the southern half. It was the 16th driest July of record for the Southwest Region and the 1st driest for the South Central Region. Rainfall during August was below normal in most areas of the state, but above normal in south-central and southeastern Ohio. Ohio continued to receive below normal precipitation during September in most areas of the state where it ranks as the 11th driest September of record for the Southwest and West Central regions and the 12th driest for the South Central Region. For the 1999 May/September growing season, the state averaged 13.24 inches of precipitation, 4.87 inches below normal, ranking it as the 7th driest May/September period during the past 117 years. Regionally, it was the driest May/September of record for the Southwest Region, the 3rd driest for the South Central Region, the 4th driest for the Central Region, the 5th driest for the Southeast Region, the 6th driest for the Central Hills Region, the 8th driest for the West Central Region and the 11th driest for the Northeast Hills Region. Precipitation was above normal in portions of northern and south-central Ohio during October, but below normal elsewhere. November precipitation was generally above normal in the eastern half of the state and below normal in the western half. The year ended with near-normal precipitation during December.

SUMMARY

Precipitation during December was slightly above normal in the southern one-third of the state and in a few areas of north-central Ohio, but slightly below normal elsewhere. Streamflow was below normal throughout most of the state. Reservoir storage increased statewide and remained above normal in the Mahoning basin reservoirs and below normal in the Scioto basin reservoirs. Ground water levels remained rather stable during the month in most aquifers. Lake Erie level declined 0.16 foot and was 0.12 foot below normal.

Precipitation during the 1999 calendar year was below normal statewide except in a few widely scattered locations in north-central and northeastern Ohio where it was slightly above normal. Streamflow was below normal statewide. Reservoir storage was adequate during the year for most areas of the state. Ground water levels were below normal statewide and in many cases reached record-low levels. Lake Erie levels were above normal during the first half of the year and below normal during the second half.

Total Precipitation 1999 Calendar Year



ACKNOWLEDGMENTS

This report has been compiled from Division of Water data and from information supplied by the following:

Precipitation data:

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service: The Miami Conservancy District: U.S. Army Corps of Engineers, Muskingum Area.

Streamflow and reservoir storage data:

U.S. Geological Survey, Water Resources Division.

Lake Erie level data:

U.S. Army Corps of Engineers, Detroit District.

Palmer Drought Severity Index:

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service.



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