



# MONTHLY WATER INVENTORY REPORT FOR OHIO

January 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## SUMMARY

Precipitation was above normal throughout most of the state. Streamflow was excessive statewide with extensive flooding along the Ohio River resulting in a federal disaster declaration for thirteen counties. Reservoir storage increased and continues to remain at seasonally above normal levels. Ground water levels rose during the second half of the month and are noticeably higher than they were a year ago. Lake Erie level declined 0.17 foot and was 0.46 foot above the long-term January average.

## NOTES AND COMMENTS

### THIRTEEN OHIO COUNTIES DECLARED DISASTER AREAS

Heavy snow fell throughout the upper Ohio River basin during early January. In some areas more than two feet were on the ground by the middle of the month. Thawing temperatures began to move into the area at mid-month. Within a few days unseasonably warm temperatures were caused rapid snowmelt and moderately heavy rain fell over much of the area. These conditions combined to cause extensive flooding along the Ohio River with ten Ohio counties being severely impacted. At the request of Governor Voinovich, President Clinton declared Adams, Belmont, Brown, Clermont, Columbiana, Gallia, Hamilton, Jefferson, Lawrence, Meigs, Monroe, Scioto and Washington counties to be major disaster areas. This declaration enables affected residents and local governments to apply for various federal disaster relief programs.

Initial damage reports indicate that in Ohio more than 2,000 homes and businesses were affected by the flooding. Early estimates of damage to private and public property total more than \$16 million. The Ohio Department of Natural Resources is one of the state agencies that actively assists the Ohio Emergency Management Agency with emergency response activities and coordination. Staff from the Division of Water provided essential information and advice.

### NEW PUBLICATIONS

The Division of Water announces the availability of the following new publication:

*Ground Water Pollution Potential of Fairfield County*  
by James J. Schmidt

Ground water pollution potential maps are designed to determine an area's relative vulnerability to ground water pollution. The maps can be used as a planning and management tool for administrators, commissioners, zoning boards and others to aid in making educated decisions about local development and siting of land use operations or activities that can affect ground water quality. The system optimizes the use of existing data to rank areas with respect to pollution potential to help direct investigations and resource expenditures and to prioritize protection, monitoring and clean-up efforts.

Mapping an area's potential for ground water pollution is a relatively new idea. These maps use the DRASTIC system as developed for the U.S. Environmental Protection Agency by the National Ground Water Association. DRASTIC values, as shown on the maps, indicate an area's relative vulnerability to contamination through the use of a numerical rating scheme and the mapping of hydrogeologic settings. Low DRASTIC values indicate relatively low potential and high DRASTIC values indicate a high potential for contamination. Areas of similar DRASTIC values are color-coded for ease of interpretation.

Each ground water pollution potential map with its accompanying report costs \$10.00. They can be purchased at or ordered from the address listed below.

ODNR Division of Water  
Water Resources Section  
1939 Fountain Square, Building E-1  
Columbus, Ohio 43224-1336  
Phone (614) 265-6740

Make checks payable to ODNR Division of Water. If publications are ordered through the mail, please be sure to include the correct postage and handling charges as shown below. Payments can also be made with Visa or MasterCard.

### Postage and Handling Charges

Cost of Publications	Add
under \$10.01	\$2.00
\$10.01 - \$20.00	\$3.00
\$20.01 - \$50.00	\$5.00
\$50.01 - \$100.00	\$8.50
\$100.01 and over	\$10.00

**PRECIPITATION** during January was above normal throughout most of the state with only a few areas in north-central and northwestern Ohio having below normal precipitation. The state average was 3.77 inches, 1.01 inches above normal. Regional averages ranged from 5.11 inches, 1.74 inches above normal, for the South Central Region to 2.40 inches, 0.10 inch above normal, for the North Central Region. McArthur (Vinton County) reported the greatest amount of precipitation for the month, 6.47 inches; Enterprise (Hocking County) and Hillsboro (Highland County) also reported more than 6 inches of precipitation during January. Sandusky (Erie County) reported the least amount of January precipitation, only 1.27 inches.

Precipitation during January generally fell as snow during the first half of the month and as rain during the second half. Total snow amounts for most areas of the state were impressive, generally ranging from 12 to 30 inches. There was measurable precipitation on many days during the month, but three or four storms produced most of the precipitation at many locations. The first was during January 2-3 when snow and a rain/snow mix totaled 0.5 to 1 inch in many areas of the state. The next notable storm was during January 6-7 when heavy snow and near blizzard conditions swept across the southern, central and eastern areas of the state. Snow amounts of more than 1 foot were common with drifting causing additional problems. Most of the snow that fell during the first half of January remained on the ground at mid-month.

The "January Thaw" started after the middle of the month with temperatures soaring into the 60's by January 18. Storms arrived with the warmer temperatures. Steady rain during January 18-19 averaged about 1 inch statewide and combined with rapid snowmelt to produce moderate flooding in low-lying areas. Runoff from Ohio and the surrounding states in the upper Ohio River basin caused extensive flooding in eastern and southern counties along the Ohio River. Thirteen counties have been declared major disaster areas (see Notes And Comments, "Thirteen Ohio Counties Declared Disaster Areas"). More heavy rain fell during January 23-24 in many areas of the state with amounts ranging from 0.5 inch in northern Ohio to more than 2 inches at some locations in southern Ohio. The month ended with colder temperatures and light snow returning to the state.

Precipitation for the 1996 water year is above normal throughout Ohio. The state average is 12.92 inches, 2.59 inches above normal. Regional averages range from 14.73 inches, 3.90 inches above normal, for the Northeast Region to 10.39 inches, 1.18 inches above normal, for the Northwest Region. The above normal precipitation so far during the 1996 water year's recharge period has been beneficial for water supplies.

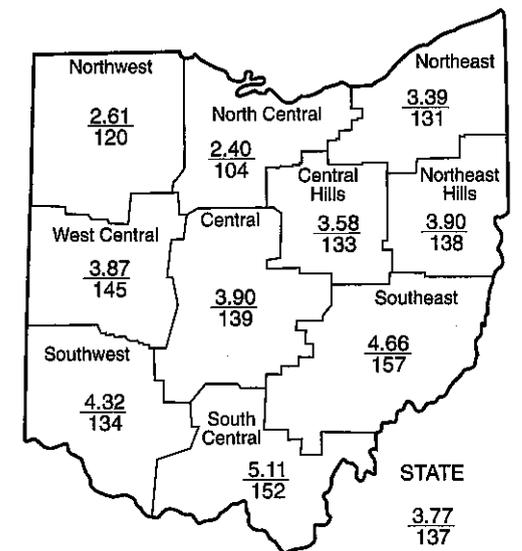
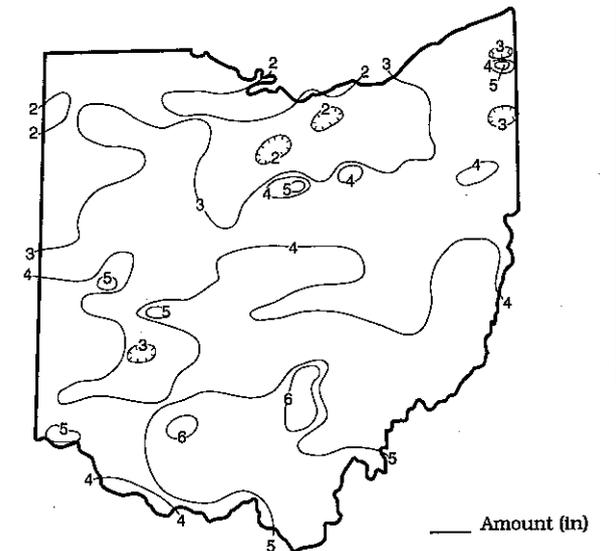
The 1996 calendar year is off to a good start as far as precipitation is concerned. Although favorable for water supplies, the climatic conditions during January caused numerous problems including hazardous driving conditions, travel delays, business and school closings, property damage, and flooding.

## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.43	-0.61	-0.25	-2.82	-7.78	+1.0
North Central	+0.10	+0.03	+0.98	+1.81	+0.33	+1.5
Northeast	+0.80	+1.59	+0.86	+0.07	+1.69	+1.7
West Central	+1.20	+0.74	+3.64	+6.43	-0.94	+2.3
Central	+1.09	+0.32	+2.75	+4.42	+1.02	+2.0
Central Hills	+0.88	+0.32	+2.41	+1.53	+1.99	+1.5
Northeast Hills	+1.07	+0.53	+0.52	-2.31	-1.23	+0.9
Southwest	+1.09	+0.47	+2.83	+4.66	+0.17	+1.5
South Central	+1.74	+0.74	+2.65	+0.04	+2.43	+1.6
Southeast	+1.69	+1.34	+1.90	-0.07	+1.93	+1.5
State	+1.01	+0.55	+1.83	+1.39	-0.01	

\*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 JANUARY 1996



Average (in)  
Percent of normal

## 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.



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

George V. Voinovich  
Governor

Donald C. Anderson  
Director

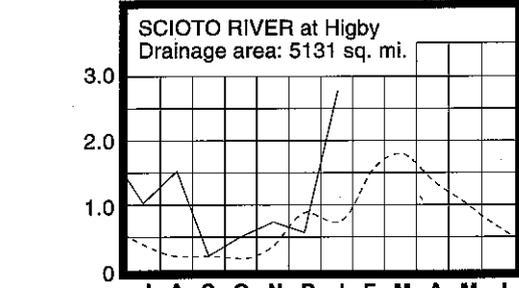
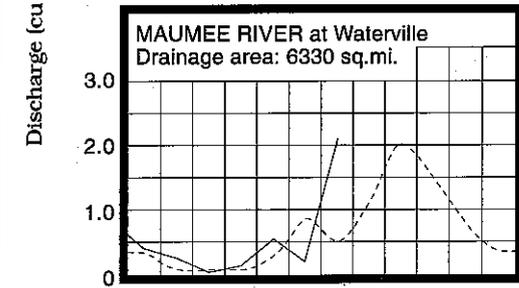
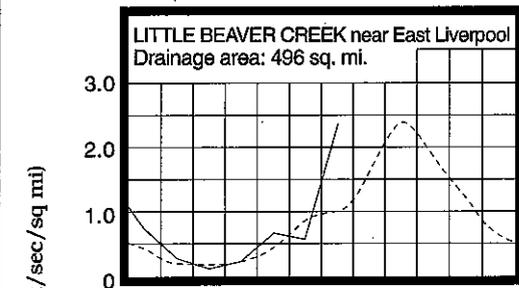
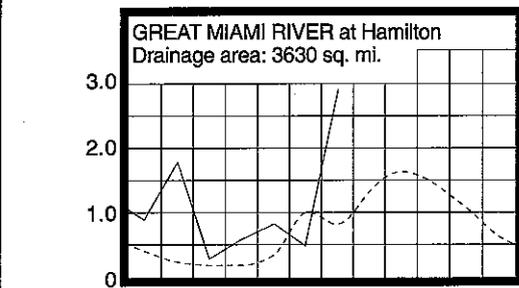
Michael Willis  
Chief

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**MEAN STREAM DISCHARGE**

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				This Month		
				3 Mos.	6 Mos.	12 Mos.
Grand River near Painesville	685	3,358	319	164	135	91
Great Miami River at Hamilton	3,630	10,552	356	138	177	131
Huron River at Milan	371	539	152	113	107	93
Killbuck Creek at Killbuck	484	1,213	322	161	161	96
Little Beaver Creek near East Liverpool	496	1,178	238	139	132	84
Maumee River at Waterville	6,330	13,300	422	133	110	87
Muskingum River at McConnelsville	7,422	15,200	192	122	130	95
Scioto River near Prospect	567	1,831	542	227	262	156
Scioto River at Higby	5,131	14,271	384	174	206	137
Stillwater River at Pleasant Hill	503	1,799	446	437	331	131

**MEAN STREAM DISCHARGE**



Base period for all streams: 1961-1990

Normal - - - - Current - - - -

**STREAMFLOW** during January was noticeably above normal throughout Ohio. Flows were high enough to be considered excessive statewide. January flows were markedly greater than the flows recorded during December.

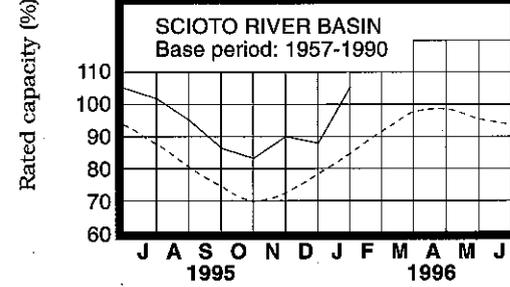
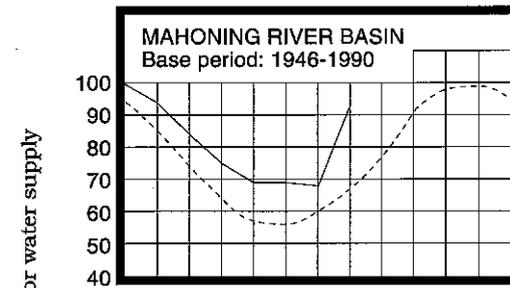
Flows at the beginning of the month were below normal throughout the state and were the lowest observed during January in most areas. Generally, flows increased slightly during the first week of the month and then declined until the middle of the month as most of the precipitation during this period fell as snow and remained frozen on the ground. Flows started to increase after mid-month as the snow started to melt, then increased noticeably after January 18 due to the rain and rapid snowmelt. The greatest flows for the month were observed during January 19-21

throughout the state. Minor flooding of low-lying areas was common; however, areas along the Ohio River were not as fortunate. Snowmelt and precipitation from the upper Ohio River drainage basin contributed significant amounts of runoff and river levels rose well above flood stage (see Notes and Comments, "Thirteen Ohio Counties Declared Disaster Areas"). Flows remained above normal statewide through the end of the month.

**RESERVOIR STORAGE** for water supply during January increased in both the Mahoning and Scioto river basins. Storage remained at above normal seasonal levels in both basins.

Reservoir storage at the end of January in the Mahoning basin index reservoirs was 93 percent of rated capacity for water supply compared with 68 percent for last month and 73 percent for January 1995. Month-end storage in the Scioto basin index reservoirs was 105 percent of rated capacity for water supply compared with 88 percent for last month and 89 percent for January 1995.

**RESERVOIR STORAGE FOR WATER SUPPLY**

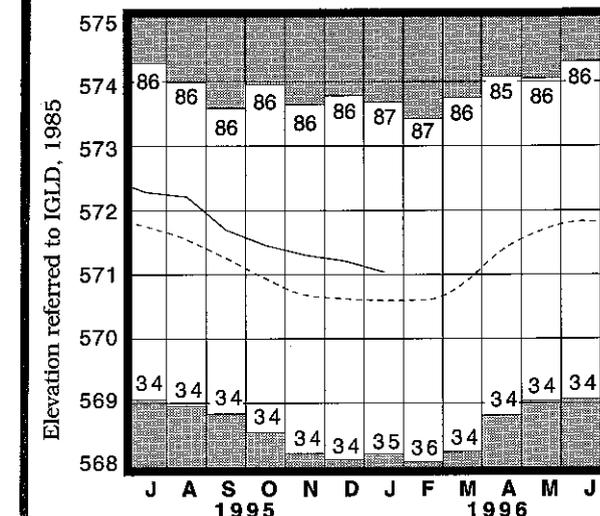


**GROUND WATER LEVELS** during January showed net improvement throughout the state. Net changes during January from December's levels ranged from the same to twice that usually observed. Generally, levels were stable during the first half of the month and then rose during the second half, responding to recharge from precipitation and snowmelt. Levels in shallow aquifers, especially shallow unconsolidated aquifers, rose rapidly after mid-month while levels in deeper aquifers rose steadily during the second half of the month.

Ground water levels continue to remain below normal in many areas in the eastern half of the state, but are in a more favorable position than last year. Hydrologic conditions during the past several months have been positive for the improvement in ground water storage as indicated by the fact that current levels range from about the same to more than three feet higher than the levels observed a year ago. The recharge to ground water storage received during January helps to reinforce an optimistic outlook for adequate ground water supplies throughout the 1996 water year. Continued near normal precipitation and other hydrologic conditions during the next several months will be needed to provide sustained improvement in ground water storage throughout the remainder of the recharge period.

**LAKE ERIE** level declined during January. The mean level was 571.06 feet (IGLD-1985), 0.17 foot below last month's mean level and 0.46 foot above normal. This month's level is 0.66 foot lower than the January 1995 level and 1.86 feet above Low Water Datum.

**LAKE ERIE LEVELS at Fairport**



Base period: 1900-1991  
 ■ Record high and low, year of occurrence

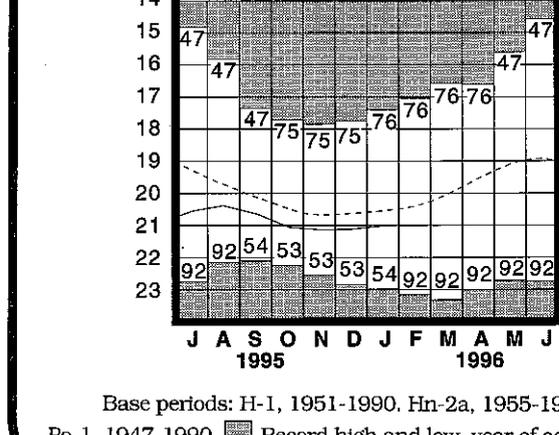
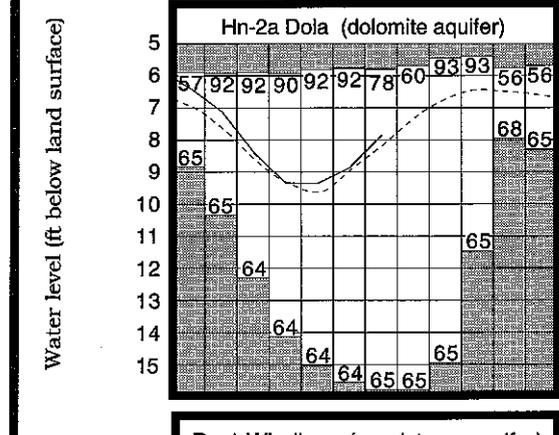
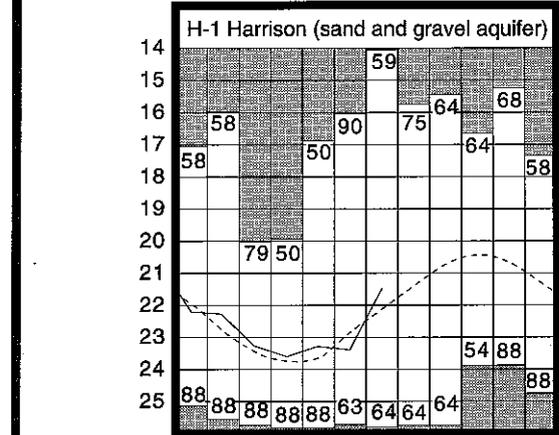
Normal - - - - Current - - - -

**GROUND-WATER LEVELS**

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

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	17.51	-1.96	+1.39	+3.33
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.01	+0.43	+0.57	+1.22
Fr-10	Columbus, Franklin Co.	Gravel	42.41	+1.20	+0.35	+1.61
H-1	Harrison, Hamilton Co.	Gravel	21.51	+0.62	+1.90	+2.42
Hn-2a	Dola, Hardin Co.	Dolomite	7.90	+0.30	+1.00	-0.04
Po-1	Windham, Portage Co.	Sandstone	21.01	-0.46	+0.13	+1.20
Tu-1	Strasburg, Tuscarawas Co.	Gravel	15.34	-2.41	+0.76	+0.39

**GROUND-WATER LEVELS**



Base periods: H-1, 1951-1990. Hn-2a, 1955-1990.  
 Po-1, 1947-1990 ■ Record high and low, year of occurrence

Normal - - - - Current - - - -



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February 1996

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Hydrologist  
Water Inventory Unit

## SUMMARY

Precipitation was generally above normal in the eastern half of the state and below normal in the western half. Streamflow was above normal in most areas of the state, but below normal in some southwestern, northwestern and north-central Ohio drainage basins. Reservoir storage was stable during the month and continued to remain at above normal levels. Ground water levels showed net improvement and were noticeably higher than they were a year ago. Lake Erie level rose 0.07 foot and was 0.53 foot above the long-term February level.

## NOTES AND COMMENTS

### WMAO ANNUAL SPRING MEETING

The Water Management Association of Ohio (WMAO) will hold its annual spring meeting on May 16, 1996 at the Akron Hilton. The meeting is being co-sponsored by the Ohio Section of the American Water Resources Association (AWRA) and the National Aeronautics and Space Administration (NASA). The theme of this conference will be local, regional and state applications of geographic information systems (GIS) in water related issues. The registration cost is \$35. Contact Ralph Haefner with the U. S. Geological Survey, Water Resources Division in Columbus at the address listed below for registration information.

Oral presentations for both the morning and afternoon sessions have been selected; however, space is available for poster presentations. Poster presentations will require submission of a one page abstract by April 15, 1996. Abstracts can be sent to:

Ralph J. Haefner  
U. S. Geological Survey, WRD  
975 West Third Avenue  
Columbus, Ohio 43212  
Phone: (614) 469-5553 ext. 146  
e-mail: rhaefner@usgs.gov

At the WMAO 1995 Annual Fall Conference, two new professional associations focusing on water safety issues in Ohio were organized. They are the Ohio Floodplain Management Association (OFMA) and the Ohio Dam Safety Organization (ODSO). Both have become divisions within WMAO, but each maintains their own organizational structure and procedures. This affiliation with WMAO benefits both OFMA and ODSO by allowing them to draw on WMAO's administrative support.

ODSO's mission is to promote dam safety in the state of Ohio by establishing a partnership between dam owners, operators, engineers and regulators. The organization provides a forum for education and discussion on dam safety related issues. It also provides a voice for all concerned in the formation and implementation of dam safety policy in the state of Ohio. An ODSO spring meeting will be held in conjunction with the WMAO spring meeting. The meeting will address an update of ODSO's activities, funding of small dam repairs, and instrumentation and monitoring of dams with applications to GIS. An ODSO logo contest will also be launched. For more information about ODSO, call Peter Soltys at (513) 631-8300.

OFMA's mission is to promote the common interest in floodplain management, enhance cooperation between various private, local, state and federal agencies, and to encourage and ensure effective, new and innovative approaches to managing Ohio's floodplains. The association provides a forum to facilitate the cooperation and exchange of information among individuals and government entities and to promote public awareness and professional development in floodplain management through educational and professional seminars. The association also will provide an opportunity to discuss research and legislation pertinent to the effective implementation of floodplain management regulations. OFMA will host several group discussions on the use of GIS in floodplain management at the WMAO spring meeting. For additional information about OFMA, call Jerry Brems, OFMA chair at (614) 349-6555.

## ACKNOWLEDGMENTS

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Palmer Drought Severity Index:  
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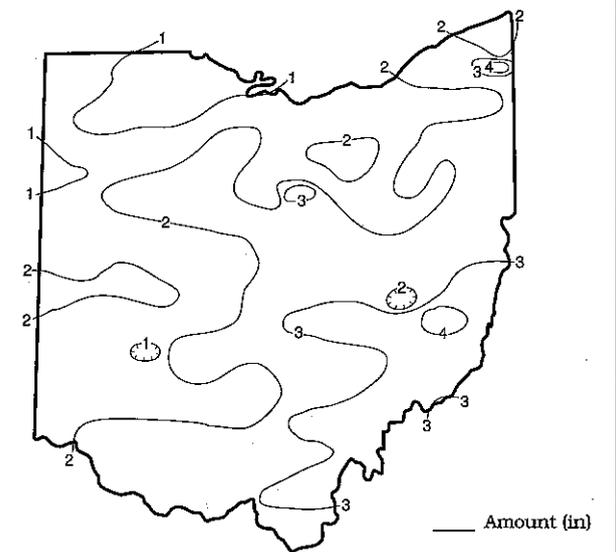
**PRECIPITATION** during February was generally above normal in the eastern half of Ohio and below normal in the western half. The state average was 2.15 inches, 0.09 inch below normal. Regional averages ranged from 3.17 inches, 0.68 inch above normal, for the Southeast Region to 1.18 inches, 0.66 inch below normal, for the Northwest Region. Andover (Ashtabula County) reported the greatest amount of precipitation for the month, 4.96 inches; Barnsville (Belmont County) was the only other location to report more than 4 inches of precipitation during February. Van Wert (Van Wert County) reported the least amount of precipitation in February, only 0.36 inch. Several other locations in the northwestern area of the state also reported less than 1 inch of precipitation.

Most of the precipitation during February fell as rain during the last ten days of the month. Prior to this, the precipitation fell as light snow or scattered rain showers. Most areas of the state had received much less than 0.5 inch of precipitation by the middle of the month with only some areas in southeastern Ohio exceeding this amount. Warmer air moved into the state after February 18 and brought rain showers and thunderstorms with it. Rain during February 19-20 averaged about 0.5 inch in all but the northwestern area of the state. The most widespread precipitation during the month fell during February 26-28 with amounts ranging from 0.5 inch to more than 1.5 inches. Rivers and streams ran at or near bank-full after these rains, but no serious flooding was reported.

Precipitation for the 1996 calendar year is above normal throughout most of Ohio, but slightly below normal in the Northwest and North Central regions. The state average is 5.92 inches, 0.92 inch above normal. Regional averages range from 7.83 inches, 2.37 inches above normal, for the Southeast Region to 3.79 inches, 0.23 inch below normal, for the Northwest Region.

Precipitation for the 1996 water year is above normal throughout the state. The state average is 15.06 inches, 2.49 inches above normal. Regional averages range from 17.26 inches, 4.11 inches above normal, for the Southeast Region to 11.57 inches, 0.52 inch above normal, for the Northwest Region. The excess precipitation during the first five months of the 1996 water year has been beneficial for water supplies, especially ground water supplies. Near normal precipitation and other climatic conditions during the next few months, the remainder of the ground water-supply recharge season, will help to maintain the favorable conditions for continued improvement in ground water storage.

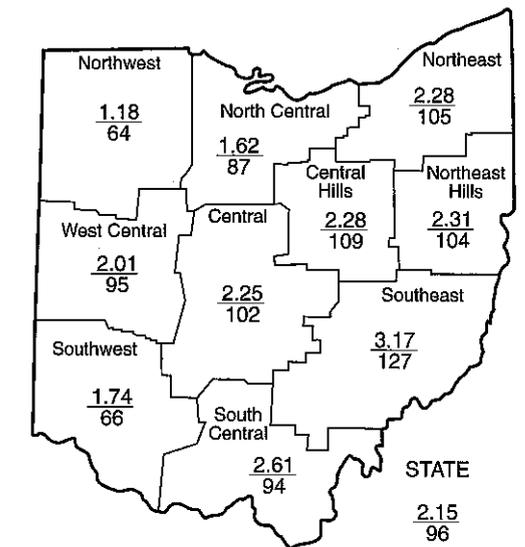
## PRECIPITATION FEBRUARY 1996



## PRECIPITATION

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Northeast	+0.11	+0.83	+2.14	+0.67	+2.61	+2.2
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1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

George V. Vohnovich  
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Donald C. Anderson  
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Michele Willis  
Chief

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**MEAN STREAM DISCHARGE**

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Killbuck Creek at Killbuck	464	665	95	131	124	102
Little Beaver Creek near East Liverpool	496	1,180	140	140	126	95
Maumee River at Waterville	6,330	3,083	44	98	90	88
Muskingum River at McConneville	7,422	14,110	116	119	112	102
Scioto River near Prospect	567	656	98	163	160	162
Scioto River at Higby	5,131	8,473	112	148	143	142
Stillwater River at Pleasant Hill	503	616	111	164	138	137

**STREAMFLOW** during February was above normal throughout most of Ohio but below normal in some drainage basins in the southwestern, northwestern and north-central areas of the state. Streamflow during February was less than the noticeably high flows observed during January in most areas of the state.

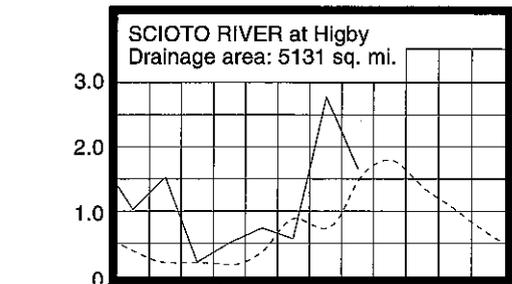
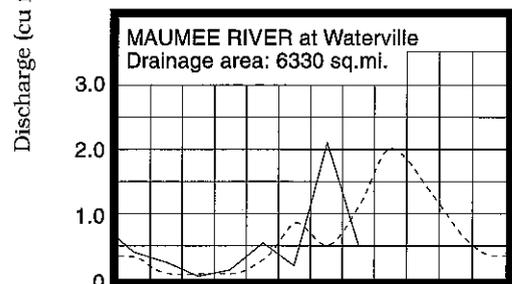
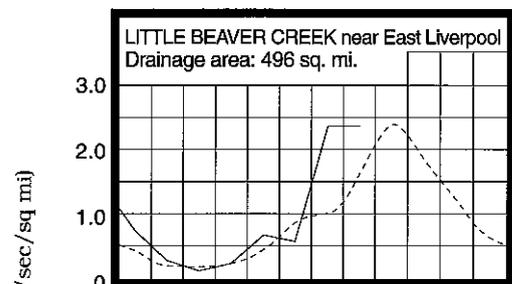
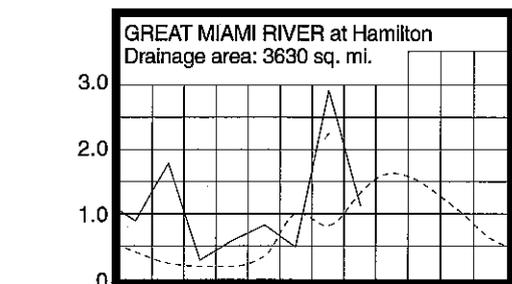
Flows at the beginning of the month were above normal in the eastern half of the state but had fallen to below normal in the western half. Generally, flows slowly declined through mid-month responding to the lack of precipitation and frozen conditions. Lowest flows for the month were recorded on or about February 19 in most drainage basins. Flows increased after this date following scattered rain showers and warmer temperatures.

Flows increased noticeably a few days before the end of February following the month's heaviest and most widespread precipitation. Greatest flows for the month occurred during February 28-29. Flows were noticeably above normal throughout the state at the end of the month.

**RESERVOIR STORAGE** for water supply during February declined slightly in the Mahoning River basin and was unchanged in the Scioto River basin. Storage remained above normal in both basins.

Reservoir storage at the end of February in the Mahoning basin index reservoirs was 92 percent of rated capacity for water supply compared with 93 percent for last month and 77 percent for February 1995. Month-end storage in the Scioto basin index reservoirs was 105 percent of rated capacity for water supply compared with the same for last month and 104 percent for February 1995.

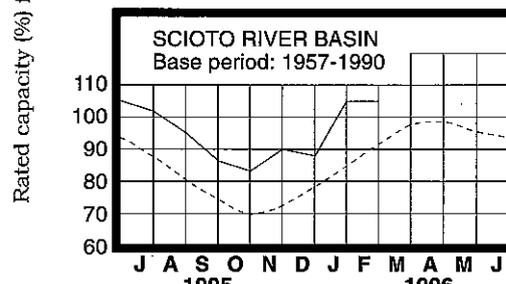
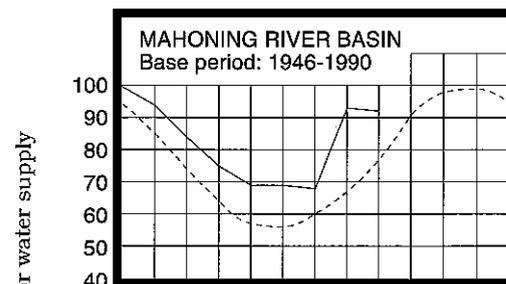
**MEAN STREAM DISCHARGE**



Base period for all streams: 1961-1990

Normal - - - - Current - - - -

**RESERVOIR STORAGE FOR WATER SUPPLY**



Base period: 1946-1990 (Mahoning), 1957-1990 (Scioto)

**GROUND WATER LEVELS** during February showed positive improvement from last month's levels throughout the state. Net changes during February from last month's levels were greater than usually observed in most areas of the state, but less than usually observed in some areas in southern Ohio. Generally, levels in shallow, unconsolidated aquifers declined during the first half of the month and then rose during the second half responding to recharge from precipitation. Levels in most consolidated aquifers and deeper unconsolidated aquifers rose during the early part of February, still receiving delayed recharge from the snowmelt and precipitation during the second half of January, and then were stable or declined slightly during the remainder of the month.

Ground water levels are slightly above normal in the western half of the state, but continue to remain below normal in the eastern half. Even though levels remain below normal in eastern Ohio, the present situation is more optimistic than last year as current levels range from slightly higher to nearly three feet higher than the levels of a year ago. Current conditions favor continued improvement in ground water storage provided precipitation and other hydrologic factors are near normal during the next several months.

**LAKE ERIE LEVEL** rose slightly during February. The mean level was 571.13 feet (IGLD-1985), 0.07 foot above last month's mean level and 0.53 foot above normal. This month's level is 0.65 foot lower than the February 1995 level and 1.93 feet above Low Water Datum.

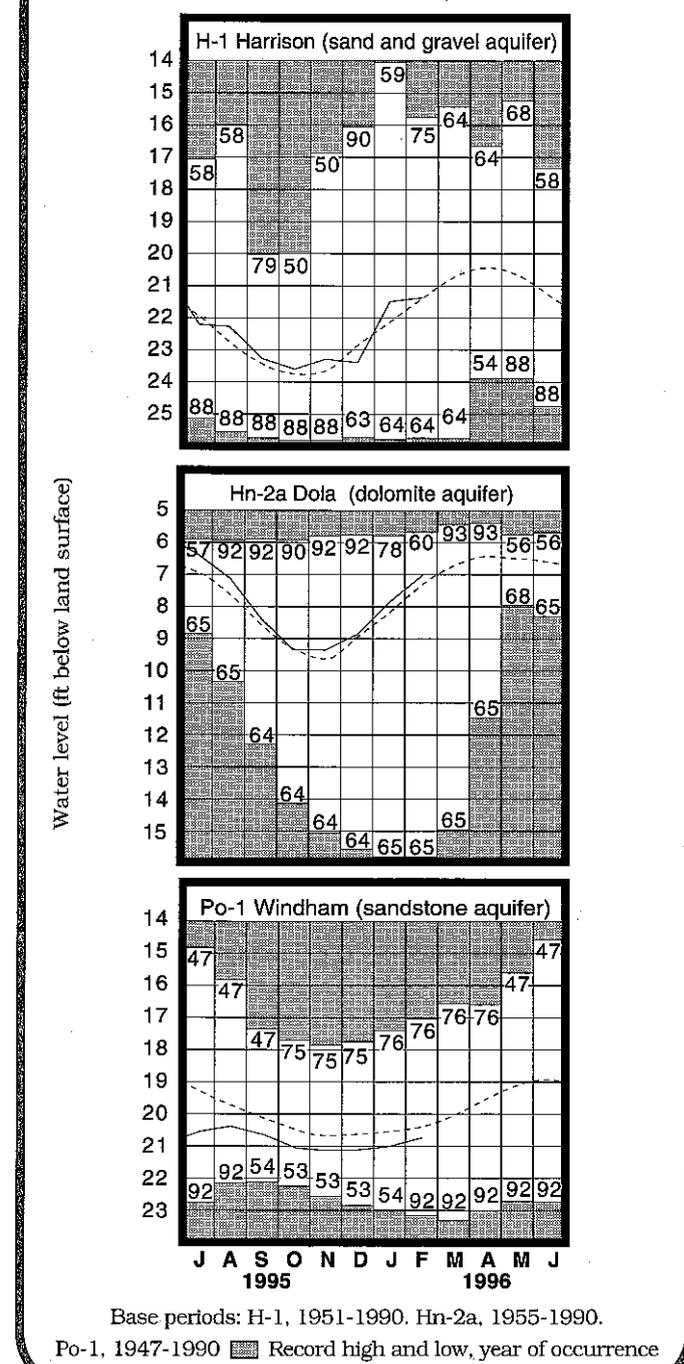
The U. S. Army Corps of Engineers reports that precipitation in the Lake Erie basin during February averaged 1.6 inches, 0.5 inch below normal. The entire Great Lakes basin averaged 2.0 inches of precipitation during February, 0.2 inch above normal. For calendar year 1996 through February, the Lake Erie basin has averaged 4.1 inches of precipitation, 0.4 inch below normal and the entire Great Lakes basin has averaged 5.1 inches, 1.2 inches above normal.

**GROUND-WATER LEVELS**

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

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	14.69	-0.21	+2.82	+2.79
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.95	+0.13	+0.06	+0.56
Fr-10	Columbus, Franklin Co.	Gravel	41.84	+1.25	+0.57	+1.83
H-1	Harrison, Hamilton Co.	Gravel	21.40	0.00	+0.11	+1.95
Hn-2a	Dola, Hardin Co.	Dolomite	7.03	+0.31	+0.87	+0.07
Po-1	Windham, Portage Co.	Sandstone	20.76	-0.36	+0.25	+1.29
Tu-1	Strasburg, Tuscarawas Co.	Gravel	13.59	-1.45	+1.75	+1.44

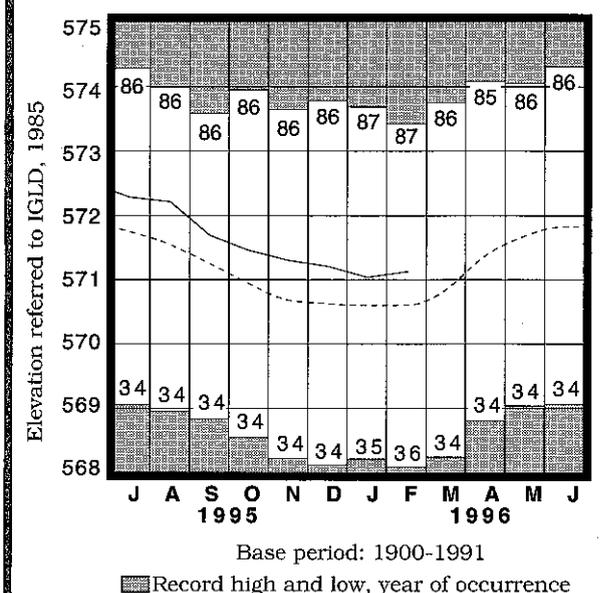
**GROUND-WATER LEVELS**



Base periods: H-1, 1951-1990. Hn-2a, 1955-1990. Po-1, 1947-1990

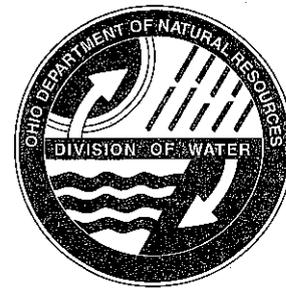
Normal - - - - Current - - - -

**LAKE ERIE LEVELS at Fairport**



Base period: 1900-1991

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

March 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## SUMMARY

Precipitation was generally below normal in the northern two-thirds of Ohio and above normal in the southern one-third. Streamflow was above normal in all but the western and northwestern areas of the state. Reservoir storage increased and continued to remain at above normal levels. Ground water levels showed net improvement during the month and were at noticeably higher levels than a year ago. Lake Erie level rose 0.33 foot and was 0.59 foot above the long-term March level. The first half of the 1996 water year was beneficial for water supplies throughout the state.

## NOTES AND COMMENTS

### OWWA 1996 WELL CONFERENCE

The 1996 Ohio Water Well Association (OWWA) Well Conference will be held on May 18, 10 am - 6 pm, at the Americana Amusement Park near Monroe (Butler County). There will be demonstrations on well cleaning, well rehabilitation, grouting and chemical safety. Three drilling rigs will be working throughout the day. Experts will be on hand to operate a down hole camera, gamma log a well, and inspect pumps pulled from working wells. The 70-acre amusement park will not be open to the general public, but will be open to conference attendees and their families.

The cost to attend the conference is \$25 which also includes lunch and admission to the park. Spouses and children will receive a discount rate of \$15 (children under 12, \$7.50). For more information, contact:

Tom Jenkins, President or Dan Schlosser, Executive Director  
Ohio Water Well Association  
P.O. Box 310  
Caledonia, Ohio 43314  
Phone: (419) 845-2023  
Fax: (419) 845-2026

**PRECIPITATION** during March was generally below normal in the northern two-thirds of Ohio and above normal in the southern one-third. The state average was 3.15 inches, 0.23 inch below normal. Regional averages ranged from 4.53 inches, 0.91 inch above normal, for the Southeast Region to 2.26 inches, 1.00 inch below normal, for the West Central Region. Stonelick State Park (Clermont County) reported the greatest amount of precipitation for the month, 6.30 inches; Fernbank (Hamilton County) reported 6.25 inches, the only other location reporting more than six inches of March precipitation. Ashtabula (Ashtabula County) reported the least amount of precipitation during March, 1.10 inches.

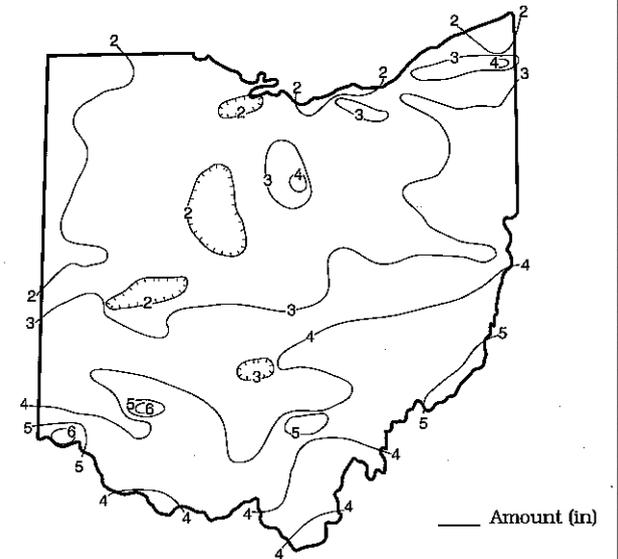
Precipitation during March fell as both rain and snow. Many areas had above normal snowfall for the month. Some areas of the state are approaching record or near-record snow totals for the winter season. Chardon (Geauga County) reported 24.5 inches of snow in March, about 7 inches above normal. Chardon has reported more than 146 inches of snow for the season, about 44 inches above normal, and about 17 inches short of its record established during the winter season of 1959-60.

Precipitation fell during every week of the month. Snow and rain fell during March 5-7 with most areas receiving between 0.5 and 1 inch of precipitation, but some areas reporting in excess of 1.5 inches. Scattered storms crossed the state during March 14-17 with some areas receiving around 0.5 inch of precipitation. The heaviest storms occurred during March 19-22. Many areas of the state received between 1 and 2 inches of rain during March 19-20 and then several inches of snow during March 21-22. Scattered showers remained throughout the state during March 25-31, but were light in most areas of the state.

Precipitation for the 1996 calendar year is above normal throughout most of Ohio, but slightly below normal in the Northwest and North Central regions. The state average is 9.07 inches, 0.69 inch above normal. Regional averages range from 12.36 inches, 3.28 inches above normal, for the Southeast Region to 6.09 inches, 0.80 inch below normal, for the Northwest Region (see Precipitation table, departure from normal, past 3 months column).

Precipitation for the first half of the 1996 water year is above normal throughout most of the state, but slightly below normal in the Northwest Region. The state average is 18.22 inches, 2.27 inches above normal. Regional averages range from 21.79 inches, 5.02 inches above normal, for the Southeast Region to 13.87 inches, 0.05 inch below normal, for the Northwest Region (see Precipitation table, departure from normal, past 6 months column). Precipitation during the 1996 water year recharge season has been beneficial for both surface and ground water supplies.

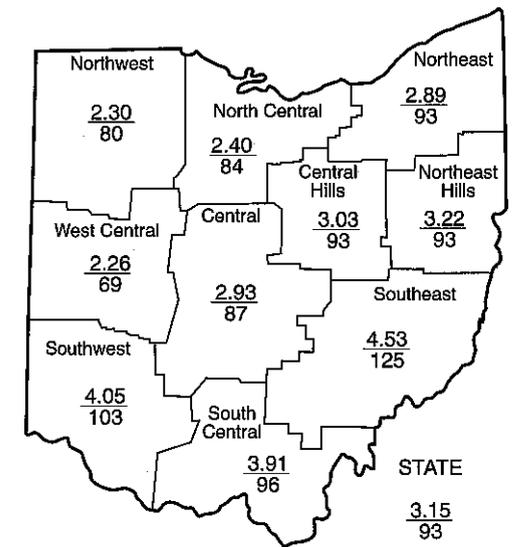
## PRECIPITATION MARCH 1996



## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.57	-0.80	-0.05	-1.80	-6.91	+0.2
North Central	-0.46	-0.61	+1.14	+3.18	+1.63	+1.1
Northeast	-0.22	+0.69	+3.79	+1.92	+2.56	+2.2
West Central	-1.00	+0.10	+1.84	+7.70	+0.69	+2.2
Central	-0.44	+0.69	+1.95	+6.67	+2.50	+2.0
Central Hills	-0.23	+0.84	+2.82	+4.17	+3.31	+1.7
Northeast Hills	-0.23	+0.92	+2.33	0.00	-2.00	+0.9
Southwest	+0.13	+0.34	+1.82	+6.87	+2.02	+1.5
South Central	-0.18	+1.39	+1.93	+2.84	-0.61	+1.8
Southeast	+0.91	+3.28	+5.02	+4.03	+2.78	+2.1
State	-0.23	+0.69	+2.27	+3.57	+0.63	

\*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



Average (in)  
Percent of normal

## 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.



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

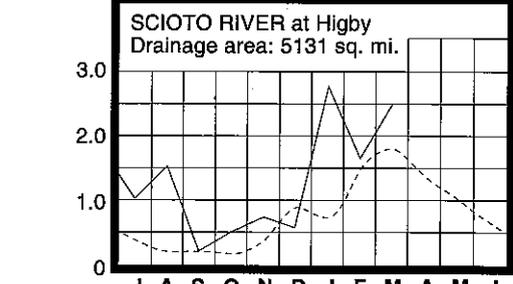
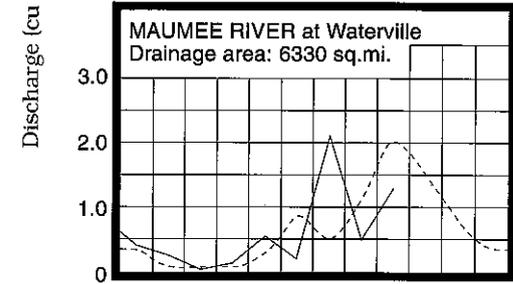
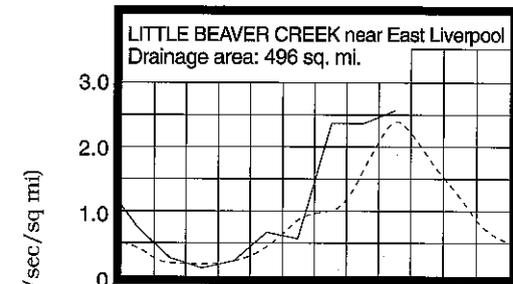
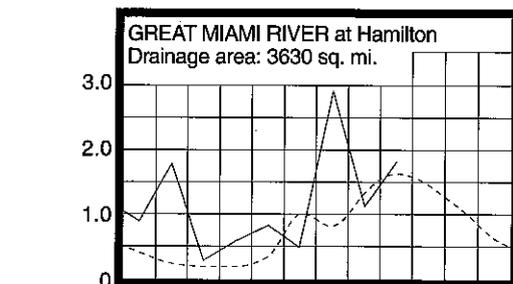
George V. Vohnovich  
Governor  
Donald C. Anderson  
Director  
Michele Willis  
Chief

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**MEAN STREAM DISCHARGE**

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
				This Month		
Grand River near Painesville	685	1,949	102	143	132	104
Great Miami River at Hamilton	3,630	6,655	112	137	123	144
Huron River at Milan	371	900	129	124	123	116
Killbuck Creek at Killbuck	464	1,091	116	159	152	113
Little Beaver Creek near East Liverpool	496	1,276	108	147	139	105
Maumee River at Waterville	6,330	8,152	64	101	93	88
Muskingum River at McConnelsville	7,422	20,200	125	143	129	112
Scioto River near Prospect	567	1,034	106	153	139	165
Scioto River at Higby	5,131	12,792	139	146	140	152
Stillwater River at Pleasant Hill	503	752	91	140	125	142

**MEAN STREAM DISCHARGE**



Base period for all streams: 1961-1990

Normal - - - - Current - - - -

**STREAMFLOW** during March was above normal throughout most of Ohio, but below normal in the western and northwestern areas of the state. Flows during March increased seasonally from the flows observed during February in most drainage basins.

Flows at the beginning of March were noticeably above normal throughout most of the state. Generally, flows declined during the first few days of the month, increased following precipitation during March 5-7, and then declined through the middle of the month. Although a few drainage basins had slightly lower flows at the end of the month, lowest flows for March generally progressed from west to east across the state starting on March 12 in western Ohio and continuing through March 18

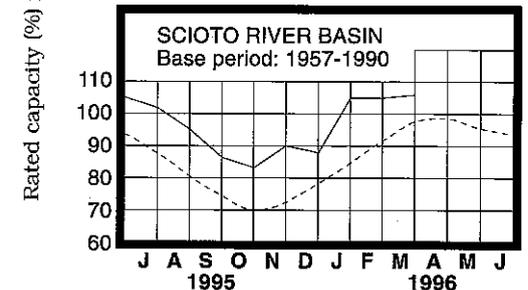
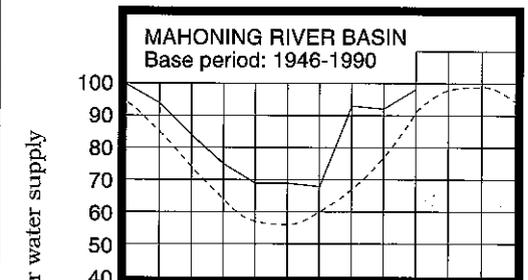
in eastern Ohio. Flows increased noticeably following widespread precipitation during March 19-22. Greatest flows for the month were observed during March 20-25 following this precipitation. Flows declined through the end of the month following these peak flows and were below normal at the month's end.

**RESERVOIR STORAGE** for water supply during March increased in both the Mahoning and Scioto river basins. Storage continued to remain above normal in both basins.

Reservoir storage at the end of March in the Mahoning basin index reservoirs was 98 percent of rated capacity for water supply compared with 92 percent for last month and 85 percent for March 1995. Month-end storage in the Scioto basin index reservoirs was 106 percent of rated capacity for water supply compared with 105 percent for last month and 103 percent for March 1995.

Surface water supplies are in excellent condition throughout the state. Both on- and off-stream water-supply reservoirs are at or near capacity. Recreational reservoirs will soon begin filling to summer pool. The first half of the 1996 water year has been favorable for surface-water resources throughout the state.

**RESERVOIR STORAGE FOR WATER SUPPLY**



Normal - - - - Current - - - -

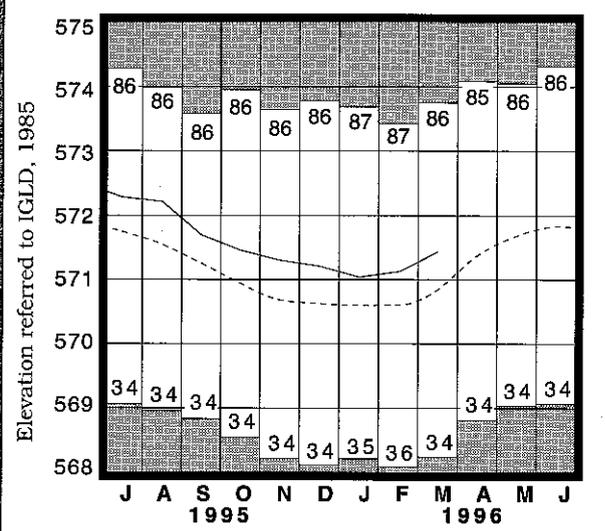
**GROUND WATER LEVELS** during March showed positive improvement from last month's levels throughout the state. Net changes during March from last month's levels were less than usually observed as a result of the below normal precipitation in many areas of the state. Generally, levels were stable during the first half of the month and then rose sharply during the second half following the month's greatest precipitation. All aquifers seemed to respond in a similar fashion, but deeper aquifers showed a much more subdued response.

The first half of the 1996 water year has been beneficial for ground-water supplies as indicated by the fact that current levels are noticeably higher than the levels observed a year ago. Although some aquifers, especially in the eastern half of the state, continue to have below normal levels, current soil and climatic conditions favor continued improvement in ground water recharge. The potential for recharge exists for the next month or two in most aquifers, and with near normal climatic conditions, additional recharge can be expected. The Ohio Agricultural Statistics Service reports that (as of early April) soil moisture was rated as being adequate in 43 percent of the state and as being surplus in 57 percent of the state.

**LAKE ERIE** level rose seasonally during March. The mean level was 571.46 feet (IGLD-1985), 0.33 foot above last month's mean level and 0.59 foot above normal. This month's level is 0.39 foot lower than the March 1995 level and 2.26 feet above Low Water Datum.

The U. S. Army Corps of Engineers reports that precipitation in the Lake Erie basin during March averaged 2.2 inches, 0.6 inch below normal. The entire Great Lakes basin averaged 1.5 inches of precipitation during March, 0.7 inch below normal. For calendar year 1996 through March, the Lake Erie basin has averaged 6.3 inches of precipitation, 1.0 inch below normal, and the entire Great Lakes basin has averaged 6.6 inches, 0.5 inch above normal.

**LAKE ERIE LEVELS at Fairport**



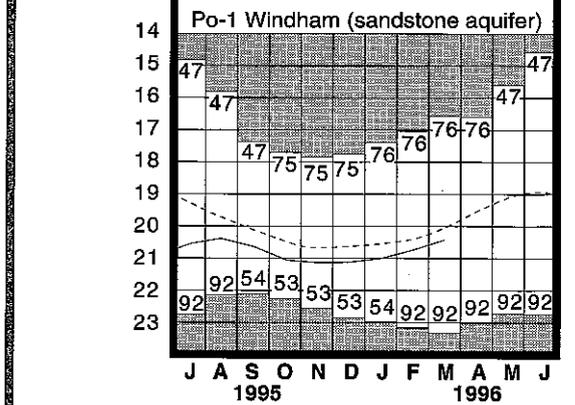
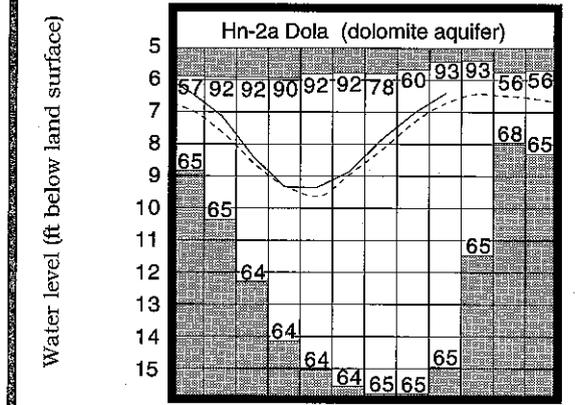
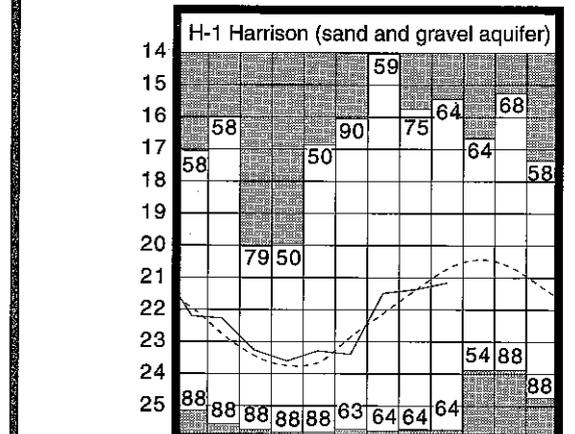
Normal - - - - Current - - - -

**GROUND-WATER LEVELS**

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
					This Month	
F-1	W. Rushville, Fairfield Co.	Sandstone	12.94	+0.37	+1.75	+2.28
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.73	+0.12	+0.22	+0.36
Fr-10	Columbus, Franklin Co.	Gravel	41.45	+1.22	+0.39	+1.79
H-1	Harrison, Hamilton Co.	Gravel	21.20	-0.49	+0.20	+1.78
Hn-2a	Dola, Hardin Co.	Dolomite	6.46	+0.32	+0.57	-0.03
Po-1	Windham, Portage Co.	Sandstone	20.45	-0.42	+0.31	+1.35
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.80	-1.40	+0.79	+1.80

**GROUND-WATER LEVELS**



Base periods: H-1, 1951-1990. Hn-2a, 1955-1990. Po-1, 1947-1990

Record high and low, year of occurrence

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

April 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)

Precipitation for the 1996 calendar year is above normal throughout most of the state; only the Northwest Region has slightly below normal precipitation. The state average is 14.69 inches, 2.80 inches above normal. Regional averages range from 18.69 inches, 5.11 inches above normal, for the Southwest Region to 9.96 inches, 0.24 inch below normal, for the Northwest Region.

Precipitation for the 1996 water year is above normal throughout Ohio. The state average is 23.83 inches, 4.37 inches above normal. Regional averages range from 28.36 inches, 6.59 inches above normal, for the Southwest Region to 17.74 inches, 0.51 inch above normal, for the Northwest Region.

### SUMMARY

Precipitation was above normal throughout the state. Streamflow was above normal except in a few basins in northwestern and eastern Ohio. Moderate flooding of low-lying areas occurred during the last week of the month. Reservoir storage increased and remained above normal. Ground water levels improved in most aquifers and were noticeably higher than they were a year ago, but still remained slightly below normal in some eastern areas of the state. Lake Erie level rose 0.23 foot and was 0.30 foot above the long-term April average.

### NOTES AND COMMENTS

#### NEW PUBLICATION

*The Ground Water Resources of Williams County*  
by William C. Haiker

Ground water resources maps are prepared by staff hydrogeologists. These maps show the regional ground water characteristics based on interpretations of water well drilling records and local geology. These color-coded maps provide well log data for many point locations. Information provided by the maps include typical depths of wells, water-bearing formations and estimated yields for wells in the area.

Ground water resources maps can be used as a guide to locate new or expand existing ground water supplies. The maps are useful to homeowners, ground water consultants, engineers, planners and developers. Ground water resource maps have been completed for 87 of Ohio's 88 counties.

Each ground water resources map costs \$8.00. They can be purchased at or ordered from the address listed below.

ODNR Division of Water  
Water Resources Section  
1939 Fountain Square, Building E-1  
Columbus, Ohio 43224-1336  
Phone (614) 265-6740

Make checks payable to ODNR Division of Water. If publications are ordered through the mail, please be sure to include the correct postage and handling charges as shown below. Payments can also be made with Visa or MasterCard.

#### Postage and Handling Charges

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\$10.01 - \$20.00	\$3.00
\$20.01 - \$50.00	\$5.00
\$50.01 - \$100.00	\$8.50
\$100.01 and over	\$10.00

**PRECIPITATION** during April was above normal throughout Ohio. The state average was 5.61 inches, 2.10 inches above normal. This ranks as the sixth wettest April for the state as a whole during the past 114 years. Regional averages ranged from 8.58 inches, 4.77 inches above normal, for the Southwest Region to 3.87 inches, 0.56 inch above normal, for the Northwest Region. This was the wettest April of record for the Southwest Region and the third wettest for the West Central Region. Milford (Clermont County) reported the greatest amount of precipitation for the month, 9.89 inches. Several other locations in southwestern Ohio also reported more than 9 inches of precipitation for April. Hicksville (Defiance County) reported the least amount of April precipitation, 2.44 inches.

Most of the precipitation during April fell as rain, but snow showers and squalls contributed to the precipitation during the first half of the month. Snow totals for the month were near normal in most locations. This snowfall added enough to the accumulated season total to make this the first or second snowiest winter season for many locations.

Most of the precipitation during April fell as rain during the second half of the month. The greatest amounts fell from southwestern Ohio up through the central part of the state and on into northeastern Ohio. The month started with rain changing to snow from a storm that started during the last days of March. Some locations reported between 1 and 2 inches of precipitation from this storm. Scattered showers and snow squalls continued off and on during the first two weeks of April with most locations reporting 0.5 inch or less of additional precipitation. Heavier and more widespread storms started after the middle of the month. Several storm periods produced between 0.25 and 0.5 inch of precipitation, but two noteworthy periods had much greater precipitation. The first was during April 22-24 when most areas in the state received between 1 and 2 inches of rain. The second was during April 28-30 when once again, most areas of the state reported more than 1 inch of rain. Many places received more than 2 inches of rain during this period and as much as 4 inches was reported at some locations in southwestern Ohio. Moderate flooding of low-lying areas followed these both of these storms. The amount of rain and the number of days during which precipitation fell resulted in soils remaining wet and/or near saturation throughout much of the month. The Ohio Agricultural Statistics Service reports that (as of early May) soil moisture is rated as being adequate in 10 percent of the state and surplus in 90 percent of the state. The above normal precipitation has been beneficial for water supplies but has resulted in moderate flooding and also has greatly delayed agricultural planting activities throughout the state.

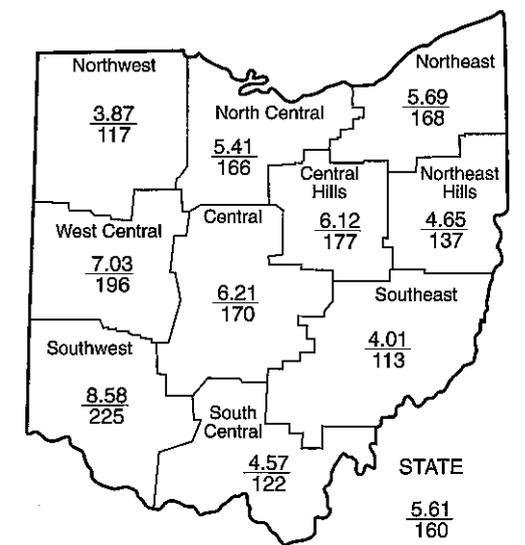
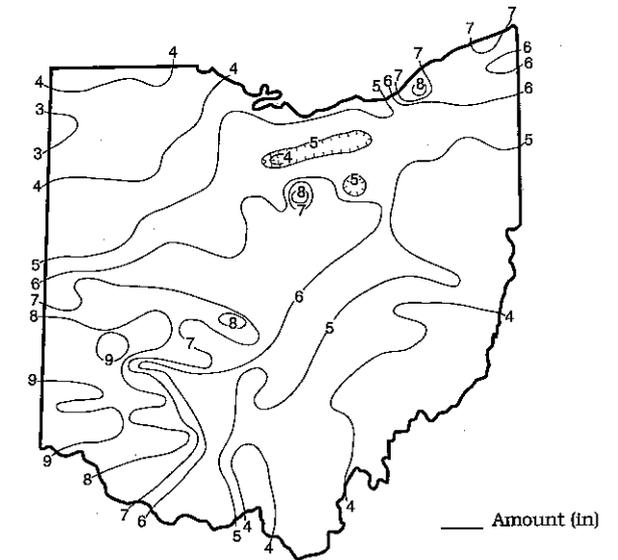
(continued on back)

### PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.56	-0.67	-1.28	-2.38	-7.69	+0.6
North Central	+2.16	+1.45	+1.48	+3.77	+3.06	+2.3
Northeast	+2.30	+2.19	+3.78	+4.33	+2.88	+3.5
West Central	+3.45	+2.35	+3.09	+10.47	+4.09	+4.0
Central	+2.55	+2.15	+2.47	+9.20	+4.59	+3.4
Central Hills	+2.67	+2.63	+2.95	+6.45	+4.57	+3.5
Northeast Hills	+1.25	+1.10	+1.63	+1.87	-1.41	+2.0
Southwest	+4.77	+4.02	+4.49	+11.43	+4.26	+3.6
South Central	+0.83	+0.48	+1.22	+5.06	-1.03	+2.3
Southeast	+0.47	+2.06	+3.40	+5.50	+1.94	+3.0
State	+2.10	+1.78	+2.33	+5.58	+1.65	+3.0

\*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 APRIL 1996



Average (in)  
Percent of normal

### 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.



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

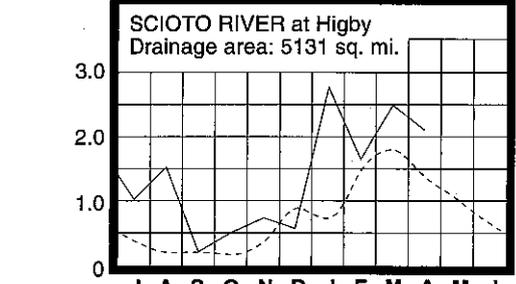
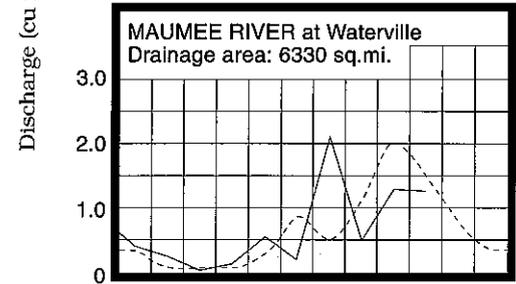
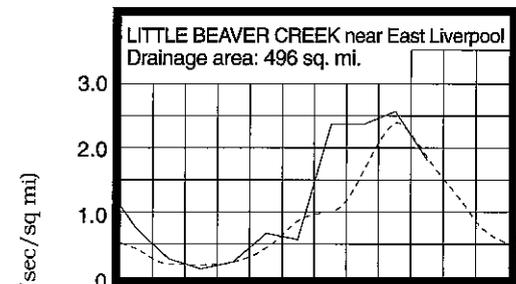
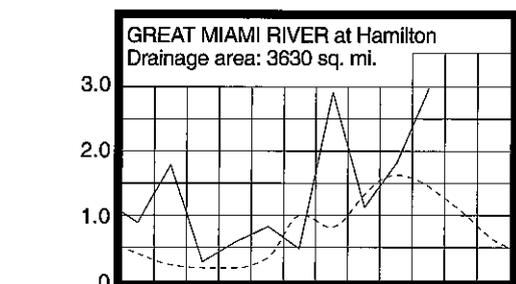
George V. Vohnovich  
Governor  
Donald C. Anderson  
Director  
Michele Willis  
Chief

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**MEAN STREAM DISCHARGE**

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				This Month		
				3 Mos.	6 Mos.	12 Mos.
Grand River near Painesville	685	2,223	155	118	138	112
Great Miami River at Hamilton	3,630	10,799	203	116	137	160
Huron River at Milan	371	877	170	137	126	120
Killbuck Creek at Killbuck	464	793	105	108	133	120
Little Beaver Creek near East Liverpool	496	896	99	119	127	113
Maumee River at Waterville	6,330	7,956	83	64	88	82
Muskingum River at McConnelsville	7,422	12,470	82	111	119	117
Scioto River near Prospect	567	1,049	129	93	130	160
Scioto River at Higby	5,131	10,800	153	117	132	161
Stillwater River at Pleasant Hill	503	1,497	209	105	140	159

**MEAN STREAM DISCHARGE**



Base period for all streams: 1961-1990

Normal - - - - Current - - - -

**STREAMFLOW** during April was above normal throughout most of Ohio, but slightly below normal in the northwestern and eastern areas of the state. Flows in southwestern and extreme northeastern Ohio were high enough to be considered excessive. April flows were seasonally less than the flows for March in most areas of the state except in southwestern and extreme northeastern Ohio where they were greater.

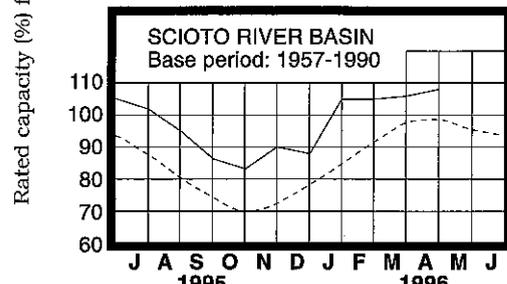
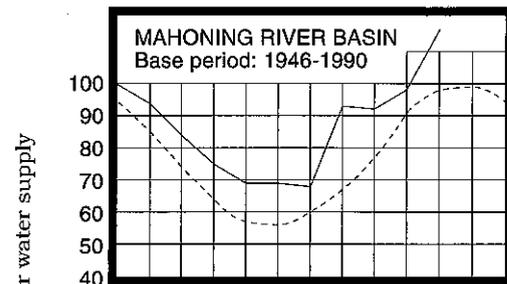
Flows at the beginning of the month were below normal in many areas of the state, but above normal in southwestern, south-central, and north-central Ohio where they were responding to precipitation that fell on March 31. Generally, flows declined through mid-month with most areas recording the month's lowest flows during April 14-15, but day or two earlier in northeastern Ohio. Flows during the second half of April were significantly greater than during the first half following several periods of widespread precipitation. The two most notable periods were April 22-24 and 28-30. Drainage basins in northern Ohio recorded their greatest April flows following the storms during April 22-24. Southern Ohio drainage basins had their greatest flows on the last day of the month following these and then more storms during April 28-30. Moderate flooding of low-lying areas, especially in central and southwestern Ohio, occurred during both of these periods. Some small stream and urban flooding was also reported at the end of the month. Flows were noticeably above normal statewide as April ended.

**RESERVOIR STORAGE** for water supply during April increased in both the Mahoning and Scioto river basins. Storage continued to remain noticeably above normal in both basins.

Reservoir storage at the end of April in the Mahoning basin index reservoirs was 117 percent of rated capacity for water supply compared with 98 percent for last month and 97 percent for April 1995. Month-end storage in the Scioto basin index reservoirs was 108 percent of rated capacity for water supply compared with 106 percent for last month and 104 percent for April 1995.

Surface-water supplies continue to remain in excellent condition throughout the state. Water-supply reservoirs, both on- and off-stream, are at or near capacity and recreational reservoirs are at or above summer pool levels.

**RESERVOIR STORAGE FOR WATER SUPPLY**



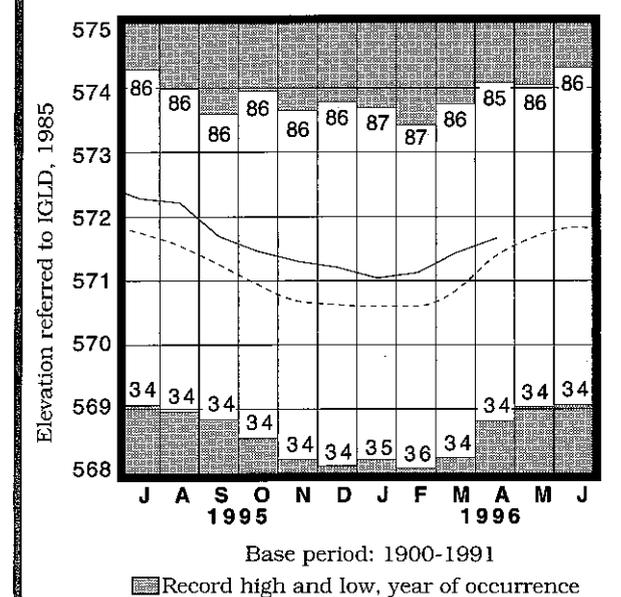
**GROUND WATER LEVELS** during April showed mixed responses around the state with most aquifers showing positive improvement. A few aquifers showed slight declines during the month responding to the slightly below normal precipitation during March. Generally, ground water levels declined during the first half of the month and rose during the second half in response to the widespread, heavy precipitation. A few aquifers, especially deep consolidated aquifers, were stable or slowly rose throughout the month.

Ground water levels continue to remain noticeably higher than they were a year ago due to the above normal precipitation and resulting excellent recharge so far during the 1996 water year. Although some aquifers, especially in the eastern half of the state, continue to remain at below-normal levels, current soil and climatic conditions favor continued recharge to ground water supplies. There is the potential for delayed recharge to deep, consolidated aquifers to continue into June. Ground water supplies are in a favorable position as the summer season of higher use, natural discharge and increased evapotranspiration approaches.

**LAKE ERIE** level rose during April. The mean level was 571.69 feet (IGLD-1985), 0.23 foot above last month's mean level and 0.30 foot above normal. This month's level is 0.42 foot lower than the April 1995 level and 2.49 feet above Low Water Datum.

The U. S. Army Corps of Engineers predicts that, based on the current condition of the Great Lakes basin and anticipated future weather conditions, the level of Lake Erie is expected to remain slightly above its long-term average for the next several months. The U. S. Army Corps of Engineers also reports that precipitation in the Lake Erie basin during April averaged 4.9 inches, 1.8 inches above normal. The entire Great Lakes basin averaged 3.7 inches of precipitation during April, 1.2 inches above normal. For calendar year 1996 through April, the Lake Erie basin averages 11.2 inches of precipitation, 0.8 inch above normal and the entire Great Lakes basin averages 10.2 inches, 1.6 inches above normal.

**LAKE ERIE LEVELS at Fairport**

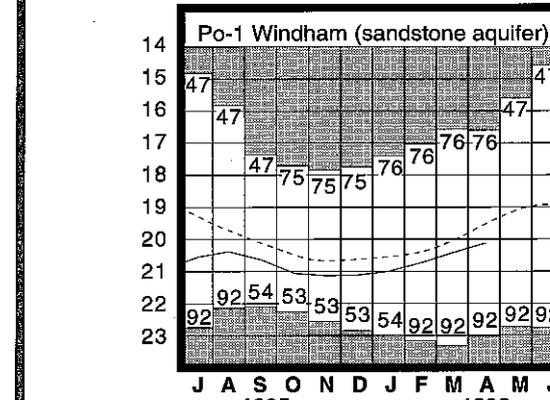
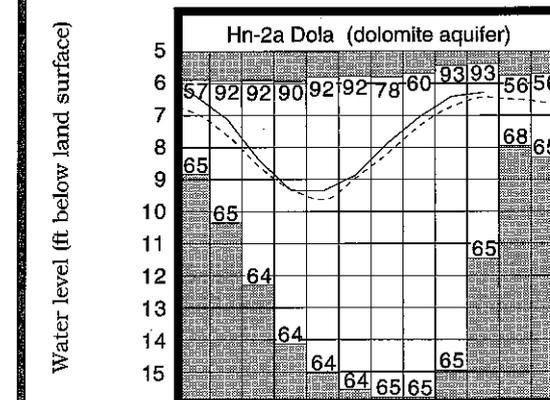
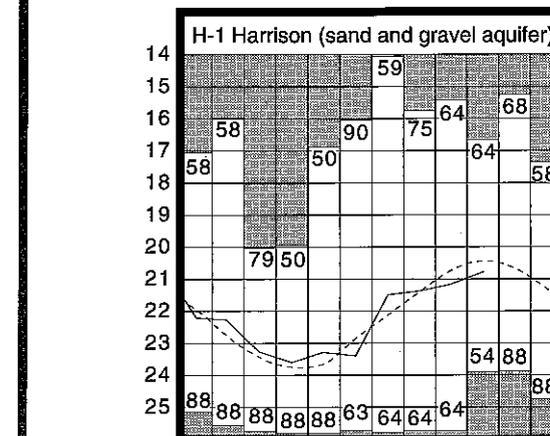


**GROUND-WATER LEVELS**

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

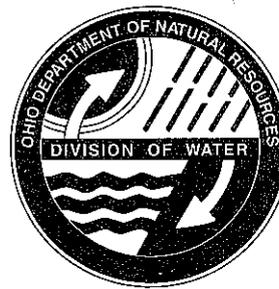
Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	13.21	-0.78	-0.27	+2.54
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.73	+0.01	0.00	+0.60
Fr-10	Columbus, Franklin Co.	Gravel	40.85	+1.55	+0.60	+1.94
H-1	Harrison, Hamilton Co.	Gravel	20.80	-0.37	+0.40	+1.97
Hn-2a	Dola, Hardin Co.	Dolomite	6.35	+0.12	+0.11	-0.16
Po-1	Windham, Portage Co.	Sandstone	20.16	-0.64	+0.29	+1.27
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.84	-2.04	-0.04	+1.94

**GROUND-WATER LEVELS**



Base periods: H-1, 1951-1990. Hn-2a, 1955-1990. Po-1, 1947-1990

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

May 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)

Precipitation for the 1996 water year is above normal throughout the state. The state average is 30.19 inches, 6.97 inches above normal. Regional averages range from 38.52 inches, 12.83 inches above normal, for the Southwest Region to 21.99 inches, 1.22 inches above normal, for the Northwest Region. The above normal precipitation during the 1996 water year has been beneficial for water supplies, but has caused delays in agricultural planting activities and flooding problems in many areas of Ohio.

## SUMMARY

Precipitation was noticeably above normal throughout most of Ohio with only a few areas along the Lake Erie shoreline receiving below normal precipitation. For the state as a whole, this was the fifth wettest May during the past 114 years. Streamflow was excessive throughout the state with many locations recording record or near-record high May flows. Governor Voinovich requested a disaster declaration be made for 14 counties which received an estimated \$11 million in flood related damage. Reservoir storage was above normal throughout the state. Ground water levels improved in all aquifers. Lake Erie level rose 0.65 foot and was 0.65 foot above the long-term May average. Water supplies are in excellent condition throughout the state.

## NOTES AND COMMENTS

### NEW PUBLICATIONS

The Division of Water announces the availability of the following new publications:

*The Ground Water Resources of Perry County*  
by Paul N. Spahr

Ground water resources maps are prepared by staff hydrogeologists. These maps show the regional ground water characteristics based on interpretations of water well drilling records and local geology. These color-coded maps provide well log data for many point locations. Information provided by the maps include typical depths of wells, water-bearing formations and estimated yields for wells in the area.

Ground water resources maps can be used as a guide to locate new or expand existing ground water supplies. The maps are useful to homeowners, ground water consultants, engineers, planners and developers.

Ground water resource maps have been completed for all of Ohio's 88 counties. Currently, 10 counties are out of print. Those counties are: Allen, Clark, Hamilton, Knox, Mahoning, Medina, Portage, Richland, Ross, and Warren. These out of print maps will be revised and/or reprinted as funds are available. The Division of Water invites you to an open house on June 28, 1996 from 2-4 pm to celebrate the completion of the county ground water resource mapping program.

Each ground water resources map costs \$8.00. They can be purchased at or ordered from the address listed below.

*State of Ohio Technical Guidance for Sealing Unused Wells*  
by the State Coordinating Committee on Ground Water

This guidance document outlines the materials and methodologies that should be used to properly seal a well. The intent of the guidance is to provide a comprehensive discussion of all elements involved in the well sealing process, including basic ground water principles and an introduction to well drilling and construction methods. While not a regulatory document itself, the guidance also covers existing regulations concerning well sealing and the agencies that administer them. The guidance was developed by a work group consisting of representatives from several state agencies and the drilling industry.

The guidance document is free upon request. Call or write the Ohio Department of Natural Resources, Division of Water at the address listed below to obtain a copy.

ODNR Division of Water  
Water Resources Section  
1939 Fountain Square, Building E-1  
Columbus, Ohio 43224-1336  
Phone (614) 265-6740

Make checks payable to ODNR Division of Water. If publications are ordered through the mail, please be sure to include the correct postage and handling charges as shown below. Payments can also be made with Visa or MasterCard.

### Postage and Handling Charges

Cost of Publications	Add
under \$10.01	\$2.00
\$10.01 - \$20.00	\$3.00
\$20.01 - \$50.00	\$5.00
\$50.01 - \$100.00	\$8.50
\$100.01 and over	\$10.00

**PRECIPITATION** during May was markedly above normal throughout most of the state with only a few areas along the Lake Erie coastline having below normal precipitation. The state average was 6.35 inches, 2.60 inches above normal. This ranks as the fifth wettest May during the past 114 years. Regional averages ranged from 10.08 inches, 6.16 inches above normal, for the Southwest Region to 3.84 inches, 0.33 inch above normal, for the North Central Region. This was the second wettest May of record for the South Central, Southeast, and Southwest regions, the fourth wettest May for the Central Region, and tied for the fifth wettest May in the West Central Region. Perintown (Clermont County) reported the greatest amount of precipitation during May, 13.08 inches. Several other locations in southwestern Ohio reported more than 10 inches of rain for May. Parma (Cuyahoga County) reported the least amount of May precipitation, 1.98 inches.

Ask anyone. It was wet during May. In many places, it rained on more than 20 days of the month. Showers and thunderstorms continually crossed the state. Locally heavy downpours were common. The rains fell on soils already at or near saturation as the result of the noticeably above normal precipitation during April. Flooding was a problem throughout much of the month. Some drying after the middle of the month allowed farmers a few days of field work, but planting activities are way behind schedule. At the end May, the Ohio Agricultural Statistics Service reported that soil moisture was rated as being adequate in 42 percent of the state and surplus in 58 percent of the state.

The first half of May was very wet in most areas of Ohio with rain falling on nearly every day. Storms periods of note which produced heavy rain occurred during May 3-4 in southwestern and southern Ohio, May 8-9 and May 10-11 statewide, May 15 in southern Ohio, and May 16-17 in extreme northwestern Ohio where more than 4 inches of rain was officially reported and unofficial sources reported amounts of more than 7 inches. Some areas in the northern and northeastern areas of the state started to dry out during the last week or two of the month, but in the southern half of the state it kept raining. Additional heavy storms occurred during May 24 and May 27-29 in the southern half of the state.

Precipitation for the 1996 calendar year is above normal throughout the state. The state average is 21.04 inches, 5.40 inches above normal. Regional averages range from 28.85 inches, 11.35 inches above normal, for the Southwest Region to 14.21 inches, 0.47 inch above normal, for the Northwest Region. Precipitation has been noticeably above normal the past two months throughout most of the southern two-thirds of the state. For the state as a whole, this was the wettest April-May during the past 114 years. Many locations have received between one-third and one-half of their normal annual precipitation during April and May.

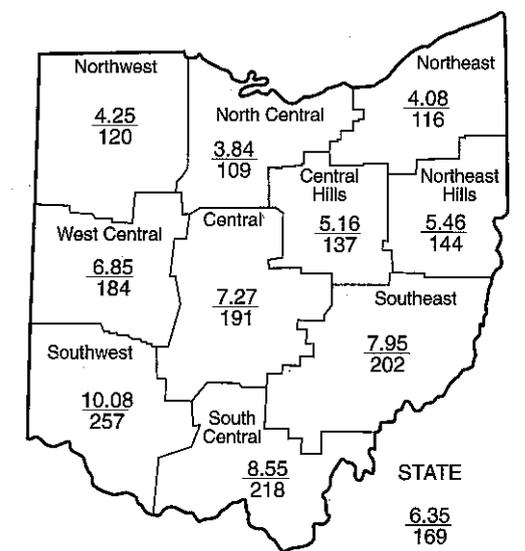
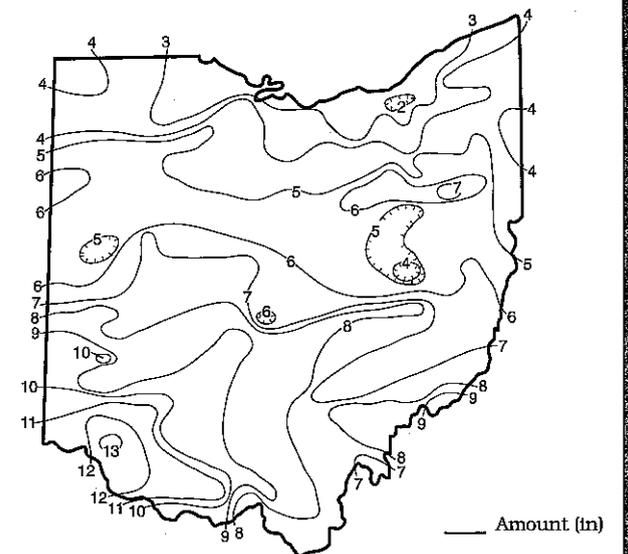
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## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.71	+0.70	-0.82	-1.87	-4.95	+1.1
North Central	+0.33	+2.03	+1.11	+2.71	+4.92	+1.1
Northeast	+0.55	+2.63	+3.46	+4.04	+4.84	+2.1
West Central	+3.13	+5.58	+5.98	+10.51	+8.44	+4.4
Central	+3.46	+5.57	+6.17	+10.18	+9.53	+3.8
Central Hills	+1.39	+3.83	+4.18	+6.06	+7.41	+3.1
Northeast Hills	+1.68	+2.70	+3.22	+2.15	+0.92	+2.0
Southwest	+6.16	+11.06	+11.32	+12.52	+11.43	+4.3
South Central	+4.62	+5.27	+6.68	+6.28	+4.16	+2.8
Southeast	+4.01	+5.39	+7.48	+6.55	+6.68	+3.4
State	+2.60	+4.47	+4.88	+5.92	+5.36	

\*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 MAY 1996



## 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.



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

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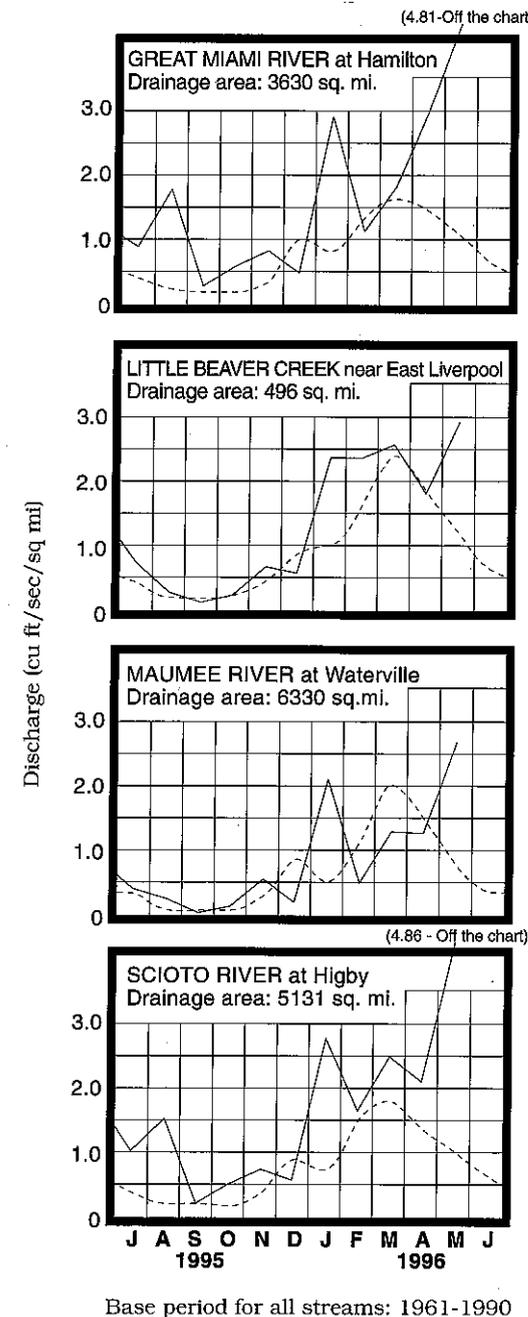
Michèle Willis  
Chief

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**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	1,786	289	143	140	122
Great Miami River at Hamilton	3,630	17,465	446	188	167	181
Huron River at Milan	371	856	319	162	134	135
Killbuck Creek at Killbuck	464	1,710	345	169	154	142
Little Beaver Creek near East Liverpool	496	1,448	250	128	144	126
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Muskingum River at McConnellsville	7,422	28,470	291	146	138	135
Scioto River near Prospect	567	1,888	448	169	150	176
Scioto River at Higby	5,131	24,916	471	196	174	183
Stillwater River at Pleasant Hill	503	1,695	439	169	157	165

**MEAN STREAM DISCHARGE**



**STREAMFLOW** during May was noticeably above normal throughout Ohio. Flows were high enough to be considered excessive statewide. Many gauging stations recorded record or near-record May flows. Record May flows were recorded at the following gauging stations used in this report: Great Miami River at Hamilton; Killbuck Creek at Killbuck; Muskingum River at McConnellsville; Scioto River at Higby; Scioto River at Prospect; and Stillwater River at Pleasant Hill. The gauging station for the Grand River near Painesville recorded its second greatest May flow and for the Maumee River at Waterville, its third greatest May flow. May flows were greater than the flows for April in most areas of the state, but slightly less in some extreme north-central and northeastern Ohio drainage basins.

Flows at the beginning of May were noticeably above normal throughout the state. Many drainage basins in the western, southwestern, and central areas of the state recorded their greatest flows for May on the first or second day of the month following widespread storms at the end of April. Flooding occurred in many areas of the state and also along the Ohio River during this period. Additional flooding was reported during May 7-9 and 11-12 following additional storms. Drainage basins in the northern and eastern areas of the state recorded their greatest flows for May during these periods. On May 17, locally severe thunderstorms in the extreme northwestern Ohio counties caused small stream and urban flooding. Rain amounts of more than 7 inches were reported. Additional small stream flooding was reported in the eastern area of the state during May 24-25 following yet additional storms.

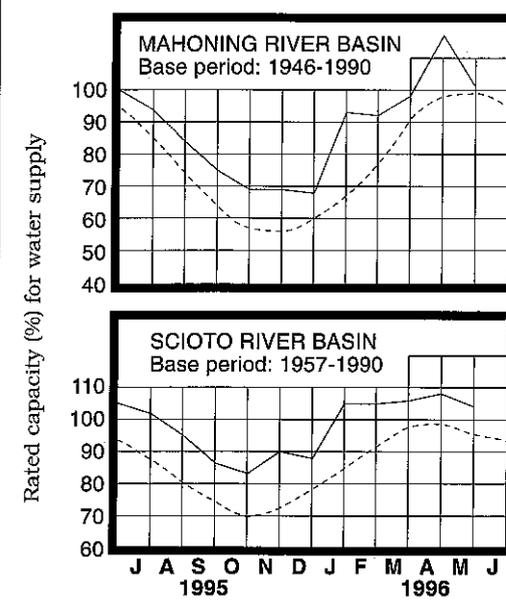
Governor Voinovich requested President Clinton to declare 14 Ohio counties disaster areas as a result of flooding during the month. Officials estimated that more than \$11 million in damage occurred in the following counties: Adams, Belmont, Brown, Butler, Clermont, Columbiana, DeFiance, Gallia, Hamilton, Jefferson, Meigs, Paulding, Scioto, and Williams. Additional information on this request will be available in next month's report.

Lowest flows for the month occurred during the Memorial Day weekend in the western half of the state and at the end of the month in the eastern half. At the end of the month, flows remained above normal in the western half of the state, but had fallen to slightly below normal in many eastern Ohio drainage basins.

**RESERVOIR STORAGE** for water supply during May declined in both the Mahoning and Scioto river basin index reservoirs. Storage continued to remain above normal in both basins.

Reservoir storage at the end of May in the Mahoning basin index reservoirs was 101 percent of rated capacity for water supply compared with 117 percent for last month and 105 percent for May 1995. Month-end storage in the Scioto basin index reservoirs was 104 percent of rated capacity for water supply compared with 108 percent for last month and 105 percent for May 1995.

**RESERVOIR STORAGE FOR WATER SUPPLY**



Surface-water supplies are in excellent condition throughout the state. Water-supply reservoirs, both on- and off-stream, are at or near capacity and recreational reservoirs are at or above summer pool levels. Reservoirs utilized designed flood storage capacity throughout much of the month. Some reservoirs in the lower Scioto River basin were at record or near-record levels during the month.

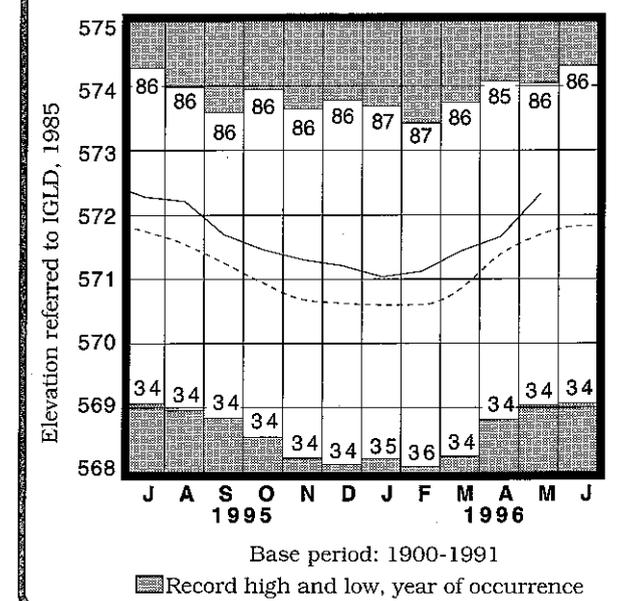
**GROUND WATER LEVELS** during May rose throughout the state in response to recharge from above normal precipitation during the past two months. Net changes during May from last month's levels were noticeably greater than usually observed. Generally, shallow unconsolidated aquifers rose during the first three weeks of the month and then declined during the last week. Deeper unconsolidated aquifers and most consolidated aquifers showed a gradual upward trend throughout the month. Additional delayed recharge to deeper aquifers can be expected in many areas of the state especially where May precipitation was noticeably above normal.

Ground water levels are noticeably higher than they were a year ago in most aquifers. Current levels range from slightly above to more than three feet higher than the May 1995 levels. Ground water levels in most aquifers throughout the state are above normal. An exception is in eastern Ohio where levels in some aquifers continue to remain slightly below normal. Levels in these aquifers have shown significant improvement during the past several months with additional improvement possible. Typically, sustained recharge to most aquifers is nearing an end by this time of the year. However, current soil and climatic conditions may provide an extension to the recharge season. The above normal precipitation during the past few months has been beneficial for ground water supplies, but has delayed field activities for many of Ohio's farmers. Ground water supplies are in a favorable position as the summer season of higher use, natural discharge, and increased evapotranspiration approaches.

**LAKE ERIE** level rose during May. The mean level was 572.34 feet (IGLD-1985), 0.65 foot above last month's mean level and 0.65 foot above normal. This month's level is 0.03 foot above the May 1995 level and 3.14 feet above Low Water Datum.

The U. S. Army Corps of Engineers reports that precipitation in the Lake Erie basin during May averaged 3.2 inches, 0.1 inch below normal. The entire Great Lakes basin averaged 2.1 inches of precipitation during May, 0.9 inch below normal. For calendar year 1996 through May, the Lake Erie basin has averaged 14.4 inches of precipitation, 0.7 inch above normal and the entire Great Lakes basin has averaged 12.4 inches, 0.8 inch above normal.

**LAKE ERIE LEVELS at Fairport**

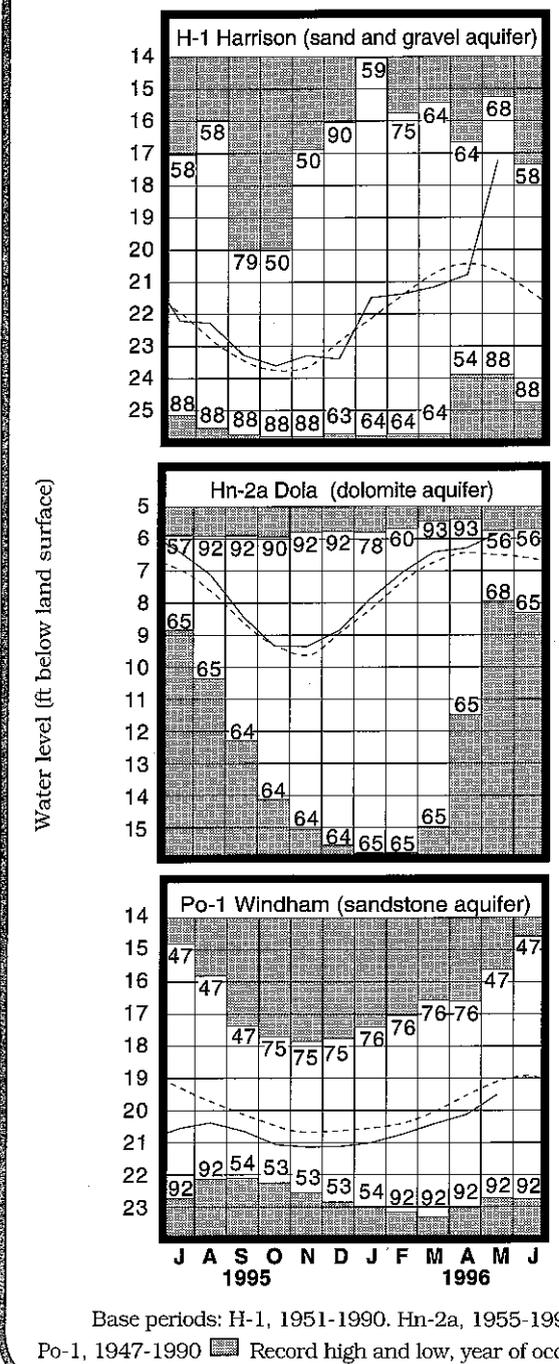


**GROUND-WATER LEVELS**

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
					F-1	W. Rushville, Fairfield Co.
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.35	+0.67	+0.38	+0.71
Fr-10	Columbus, Franklin Co.	Gravel	40.02	+2.61	+0.83	+2.41
H-1	Harrison, Hamilton Co.	Gravel	17.26	+3.42	+3.54	+3.50
Hn-2a	Dola, Hardin Co.	Dolomite	5.86	+0.67	+0.49	+0.23
Po-1	Windham, Portage Co.	Sandstone	19.54	-0.45	+0.62	+1.57
Tu-1	Strasburg, Tuscarawas Co.	Gravel	11.42	-0.29	+1.42	+3.19

**GROUND-WATER LEVELS**



Normal - - - - Current - - - -

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

June 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## SUMMARY

Precipitation was above normal throughout most of the state with only a few areas, especially in west-central Ohio, having below normal precipitation. Streamflow was excessive statewide. Water supply storage reservoirs were near capacity and remained at above-normal seasonal levels. Ground water levels continued to improve in some aquifers but declined slightly in others. Lake Erie level rose 0.43 foot and was 0.95 foot above the long-term June average. Both surface and ground water supplies are in good condition throughout the state.

## NOTES AND COMMENTS

### NEW PUBLICATION

1996 Ohio Directory of Drilling Contractors  
compiled by Katherine M. Sprowls

The latest version of this directory (last published in 1991) contains updated information on water well and environmental drilling contractors operating in the state of Ohio. The contractors included in the directory responded to a letter from the Department of Natural Resources, Division of Water requesting updates on the information currently found in the Division of Water's database. Information available from the directory includes the state and county in which each contractor is based, current addresses and phone numbers, and a listing of the drilling and service capabilities of each company. New to this version is a separate listing of environmental drilling contractors. Also included in the directory are addresses and phone numbers for each county health department, the district offices and central office of the Ohio Department of Health, and the district offices and central office of the Ohio Environmental Protection Agency.

The directory is free upon request while supplies last. Call or write the Division of Water at the address below to obtain a copy.

ODNR Division of Water  
Water Resources Section  
1939 Fountain Square, Building E-1  
Columbus, Ohio 43224-1336  
Phone (614) 265-6740

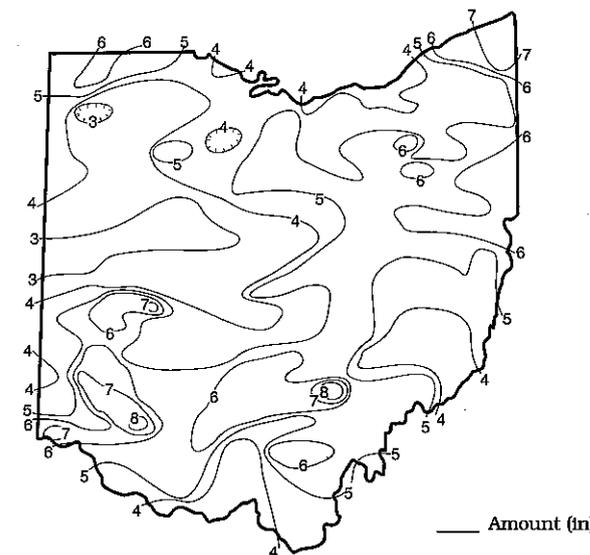
**PRECIPITATION** during June was above normal throughout most of Ohio with only a few scattered locations, especially in the west-central area of the state, having below normal precipitation. The state average was 4.88 inches, 0.92 inch above normal. Regional averages ranged from 5.77 inches, 1.72 inches above normal, for the Southwest Region to 4.09 inches, 0.03 inch above normal, for the Central Region. Fayetteville (Brown County) reported the greatest amount of precipitation during June, 8.66 inches. Nelsonville (Athens County) reported 8.22 inches of rain for the month, the only other reporting location exceeding 8 inches of June precipitation. Kenton (Hardin County) reported the least amount of June precipitation, 2.25 inches.

Most of the precipitation in June fell during the first half of the month. Many locations reported rain on more than 10 of the first 15 days of June, continuing the trend that started in the middle of April. Generally, daily amounts were between 0.1 and 0.5 inch, but most stations had from 1 to 3 days on which 0.5 to more than 1 inch was recorded. Most of these larger storms occurred during June 6-7, 9-10, and 14. Conditions more typical of summer finally arrived in Ohio during the second half of June which allowed fields to dry and farmers to work around the clock to complete planting. Scattered storms, some locally severe with more than 1 inch of rain, were the norm for the second half of June. Many areas reported storms during June 18-19 and again during June 21-24. An especially strong storm hit Gallia and Lawrence counties during June 22-23. As much as 3 inches of rain which fell quickly was reported. Small stream flooding was especially severe in Gallia County where many roads and bridges sustained damage.

Precipitation for the 1996 calendar year is above normal throughout the state. The state average is 25.92 inches, 6.32 inches above normal. Regional averages range from 34.62 inches, 13.07 inches above normal, for the Southwest Region to 18.72 inches, 1.15 inches above normal, for the Northwest Region (see Precipitation table, departure from normal, past 6 months column). The above normal precipitation during the past few months has caused considerable delays in many agricultural planting activities and several areas have had standing water and other flooding problems.

Precipitation for the 1996 water year is above normal throughout Ohio. The state average is 35.07 inches, 7.90 inches above normal. Regional averages range from 44.29 inches, 14.55 inches above normal, for the Southwest Region to 26.50 inches, 1.90 inches above normal, for the Northwest Region. The above normal precipitation during the 1996 water year recharge period has been beneficial for water supplies throughout the state. Ground water supplies have improved to near or above normal levels statewide.

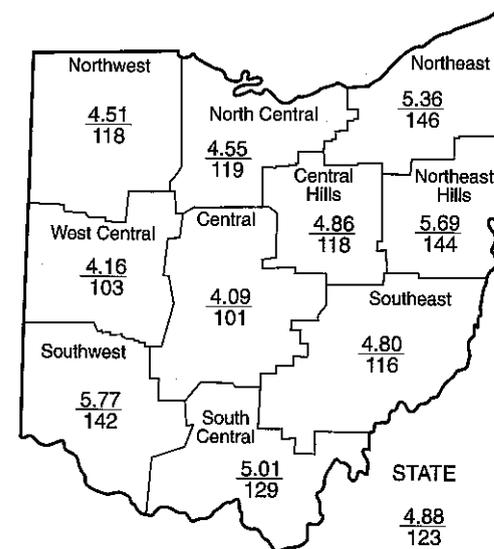
## PRECIPITATION JUNE 1996



## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.68	+1.95	+1.15	-1.18	-4.22	+0.1
North Central	+0.73	+3.22	+2.61	+4.06	+4.57	+1.0
Northeast	+1.68	+4.53	+5.22	+5.83	+6.53	+3.1
West Central	+0.12	+6.70	+6.80	+10.32	+7.99	+3.4
Central	+0.03	+6.04	+6.73	+8.58	+9.40	+2.6
Central Hills	+0.75	+4.81	+5.65	+6.66	+7.20	+3.0
Northeast Hills	+1.73	+4.66	+5.58	+3.28	+2.50	+1.9
Southwest	+1.72	+12.65	+13.07	+14.01	+13.37	+4.1
South Central	+1.13	+6.58	+7.97	+7.37	+5.89	+1.8
Southeast	+0.66	+5.14	+8.42	+6.79	+7.95	+2.9
State	+0.92	+5.62	+6.32	+6.58	+6.11	

\*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  
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-2.0 To -2.9 = Moderate Drought  
-3.0 To -3.9 = Severe Drought  
Below -4.0 = Extreme Drought



Average (in)  
Percent of normal

## 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.



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

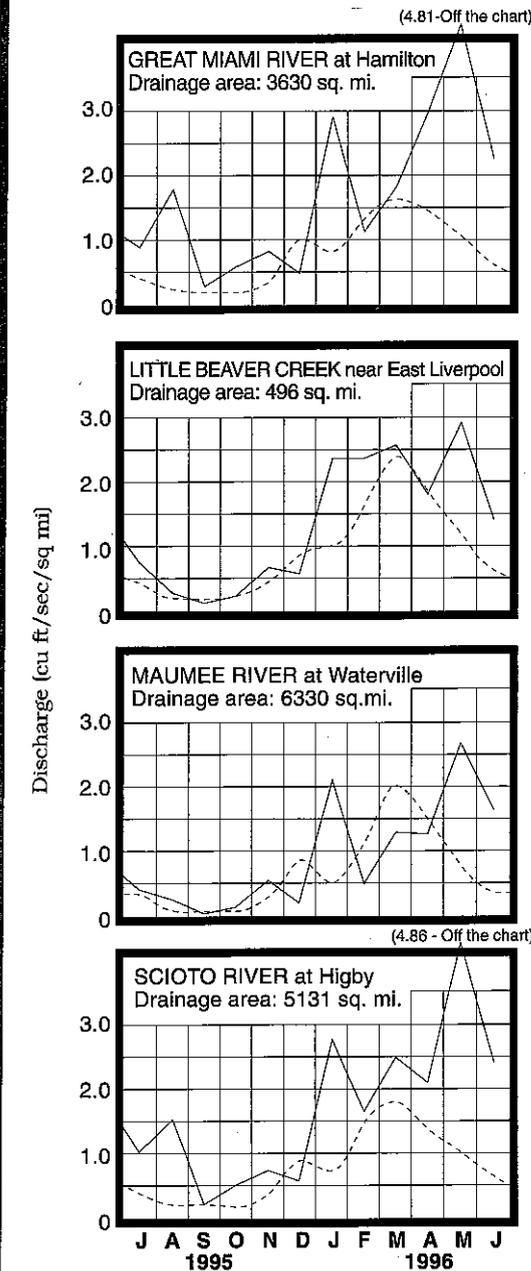
George V. Vohnovich  
Governor  
Donald C. Anderson  
Director  
Michele Willis  
Chief

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**MEAN STREAM DISCHARGE**

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
				This Month		
Grand River near Painesville	685	982	378	194	148	128
Great Miami River at Hamilton	3,630	8,209	352	263	198	191
Huron River at Milan	371	408	236	209	152	135
Killbuck Creek at Killbuck	464	886	337	199	168	150
Little Beaver Creek near East Liverpool	496	692	221	150	156	127
Maumee River at Waterville	6,330	10,301	453	171	135	112
Muskingum River at McConnelsville	7,422	16,100	271	172	158	143
Scioto River near Prospect	567	588	221	195	156	171
Scioto River at Higby	5,131	12,371	354	244	187	191
Stillwater River at Pleasant Hill	503	602	225	220	178	170

**MEAN STREAM DISCHARGE**



(4.81-Off the chart)

(4.86 - Off the chart)

**STREAMFLOW** during June was noticeably above normal throughout the state. Flows were high enough to be considered excessive statewide. Although the June flows were excessive, they were noticeably less than the flows in May, averaging about half of those record or near-record May flows. The Scioto River at Higby gauging station recorded its second highest June flow for its period of record.

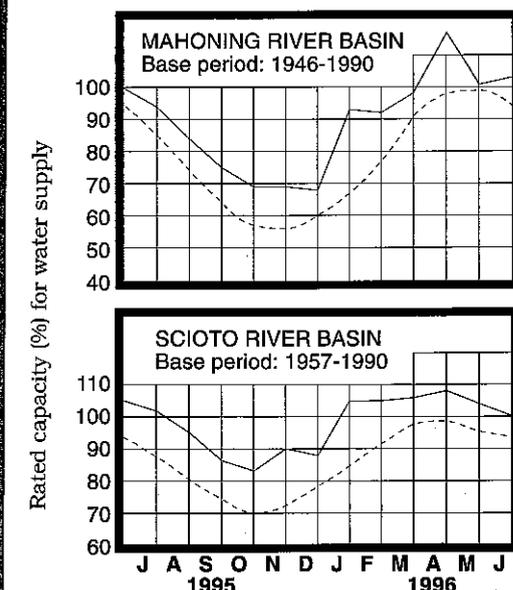
Flows at the beginning of the month were above normal throughout most of Ohio, but slightly below normal in the north-central and northeastern areas of the state. Flows returned to or remained at above normal levels for most of the month responding to many days with precipitation during the first half of the month. Greatest flows during June occurred during the second week of the month following nearly daily precipitation through June 14. High water continued to be a problem during this period, but only minor flooding was reported. Flows began to decline after mid-month as more typical summer conditions finally arrived in the state. Scattered thunderstorms during the second half of the month had only a local effect on streamflow. An isolated severe storm in Gallia and Lawrence counties during June 22-23 caused severe small stream flooding which damaged several roads and bridges. Lowest flows for June occurred at the end of the month in all drainage basins. Month-end flows were above normal in the southern and eastern areas of Ohio but below normal in the western and northern areas of the state.

President Clinton responded favorably to Governor Voinovich's request to have 14 Ohio counties designated as major disaster areas as a result of severe flooding in May and June. Those counties are: Adams, Belmont, Brown, Butler, Clermont, Gallia, Hamilton, Jefferson, Lawrence, Meigs, Monroe, Paulding, Scioto, and Williams. The declaration makes these counties eligible to receive federal disaster assistance.

**RESERVOIR STORAGE** during June increased slightly in the Mahoning basin reservoirs and declined slightly in the Scioto basin reservoirs. Storage remained above normal in both basins. Storage has been above normal for more than a year in both basins.

Reservoir storage in the Mahoning basin index reservoirs was 103 percent of rated capacity for water supply compared with 101 percent for last month and 100 percent for June 1995. Month-end storage in the Scioto basin index reservoirs was 100 percent of rated capacity for water supply compared with 104 percent for last month and 105 percent for June 1995. Surface water supplies continue to remain in excellent condition throughout the state.

**RESERVOIR STORAGE FOR WATER SUPPLY**



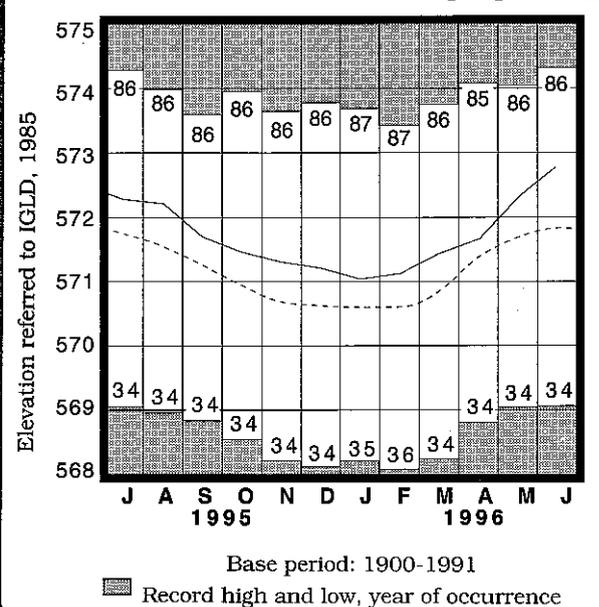
**GROUND WATER LEVELS** during June rose slightly in some aquifers and declined slightly in others. Generally, levels rose during the first half of the month and declined during the second half. Some consolidated aquifers gradually rose throughout the month.

This has been an excellent recharge season for ground water supplies. Ground water levels throughout most of the state are above normal with only a few areas having slightly below normal levels. Observation wells H-1 (Hamilton County), representing sand and gravel aquifers in southwestern Ohio, and Hn-2a (Hardin County), representing the carbonate aquifer of northwestern Ohio, both reached a record-high June level during the month. Current levels are noticeably higher than they were a year ago in most aquifers ranging from slightly above to more than three feet higher than the June 1995 levels. As a result of the return to more typical summer conditions during the second half of June, little additional recharge can be expected in many aquifers, but some deeper consolidated aquifers might receive a little more delayed recharge. Ground water supplies are in excellent condition throughout the state.

**LAKE ERIE** level rose noticeably during June. The mean level was 572.77 feet (IGLD-1985), 0.43 foot above last month's mean level and 0.95 foot above normal. This month's level is 0.36 foot above the June 1995 level and 3.57 feet above Low Water Datum.

The U. S. Army Corps of Engineers reports that precipitation in the Lake Erie basin during June averaged 4.6 inches, 1.2 inches above normal. The entire Great Lakes basin averaged 4.1 inches of precipitation during June, 0.9 inch above normal. For calendar year 1996 through June, the Lake Erie basin has averaged 19.4 inches of precipitation, 2.3 inches above normal and the entire Great Lakes basin has averaged 16.9 inches, 2.1 inches above normal.

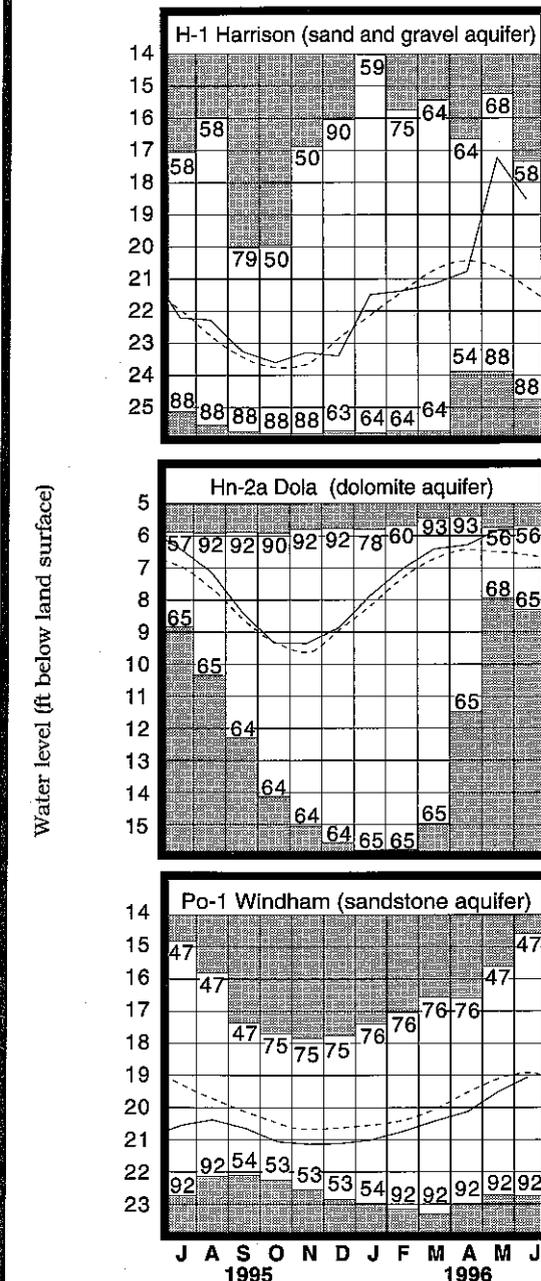
**LAKE ERIE LEVELS at Fairport**



**GROUND WATER LEVELS**  
Based on daily lowest level in feet below land-surface datum

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	12.07	+1.84	-0.28	+1.34
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.41	+0.96	-0.06	+0.64
Fr-10	Columbus, Franklin Co.	Gravel	39.98	+3.07	+0.04	+2.18
H-1	Harrison, Hamilton Co.	Gravel	18.52	+2.78	-1.26	+2.60
Hn-2a	Dola, Hardin Co.	Dolomite	5.80	+0.83	+0.06	+0.29
Po-1	Windham, Portage Co.	Sandstone	19.08	-0.16	+0.46	+1.70
Tu-1	Strasburg, Tuscarawas Co.	Gravel	11.40	+0.49	+0.02	+2.53

**GROUND-WATER LEVELS**



Base periods: H-1, 1951-1990. Hn-2a, 1955-1990. Po-1, 1947-1990

Record high and low, year of occurrence

Normal - - - - Current - - - -

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

July 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## SUMMARY

Precipitation was above normal in most areas of the state, but below normal in scattered areas across northern and south-central Ohio. Streamflow was above normal throughout most of Ohio, but below normal in the north-central and northeastern areas of the state. Reservoir storage declined but remained at above normal levels. Ground water levels declined in most aquifers. Lake Erie level rose 0.2 foot and was 1.22 feet above the long-term July average. Water supplies are in good condition throughout the state.

## NOTES AND COMMENTS NEW PUBLICATIONS

Identification of the Hydrologic System and Nonpoint Source Impacts in the Mad River Watershed  
by Wayne Jones, Mike Schiefer, and Eric B. Sainey

The Division of Water has recently completed a study of the ground and surface water within the Upper Mad River watershed. The two and a half year project was funded in part by a nonpoint source implementation grant from the U.S. Environmental Protection Agency. The project assessed the effects of nonpoint source pollution in the Mad River watershed by defining the hydrologic system and investigating water quality variation within the watershed. The study focused on interpreting the interaction between ground water and surface water. To determine this interaction, extensive water quality samples, streamflow discharge measurements, and ground water level measurements were collected. A surface water model was designed and prepared for the basin to determine the ground water contribution to the surface water flow. In addition, maps of the ground water pollution potential using the DRASTIC method were prepared for Logan and Champaign counties.

The report includes the raw data collected, analysis of the data, results and discussion of the findings, and recommendations for management activities and future studies. In addition, the methodology used for this report will serve as a model for characterizing the hydrology of other similar outwash aquifer settings across the state of Ohio.

This 306 page report (including appendices) is available on a limited basis. Each report costs \$9.00 and can be purchased at or ordered from: The Ohio Department of Natural Resources, Division of Water, Water Resources Section, 1939 Fountain Square Court, Building E-1, Columbus, Ohio 43224-1336, Phone: (614) 265-6739.

Make checks payable to the ODNR-Division of Water. If publications are ordered through the mail, please be sure to include the correct postage and handling charges shown below. Payments can also be made with Visa or MasterCard.

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\$10.01 - \$20.00	\$3.00
\$20.01 - \$50.00	\$5.00
\$50.01 - \$100.00	\$8.50
\$100.01 and over	\$10.00

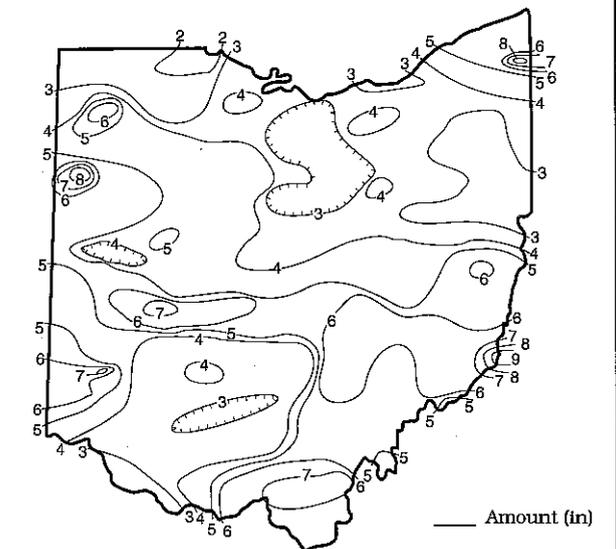
**PRECIPITATION** during July was above normal in western, central, south-eastern and extreme northeastern Ohio, but below normal in north-central, northeastern, extreme northwestern, and in a few south-central areas of the state. The state average was 4.41 inches, 0.49 inch above normal. Regional averages ranged from 5.92 inches, 1.55 inches above normal, for the Southeast Region to 3.49 inches, 0.03 inch above normal, for the North Central Region. Hannibal Locks and Dam (Monroe County) reported the greatest amount of precipitation during July, 9.75 inches; Andover (Trumbull County) reported 8.93 inches. Maumee State Forest (Fulton County) reported the least amount of July precipitation, only 1.79 inches; Toledo Express Airport (Lucas County) reported 1.81 inches.

Most of the precipitation during July fell in the second half of the month as showers and thunderstorms. There were a few widely scattered storms around the state during the first few days of the month and on July 8, but many areas of the state received no rain during the first half of the month. Storms started to become more widespread after July 13 and continued to persist through July 19. Some areas in the northern and northeastern areas of the state received more than 1 inch of rain on July 14 and some areas in south-central Ohio received more than 2 inches of rain on July 15. During July 17-18, storms crossed through the mid-section of the state and continued down through southeastern Ohio with some locations receiving more than 3 inches of rain. Showers and thunderstorms were again widespread during July 21-24 with some areas in southern Ohio reporting more than 1 inch of rain on July 24. The month ended much wetter than it started with storms during July 29-31. The greatest amounts during this period fell in the northeastern area of the state and in south-central Ohio where small stream flooding was reported. The Ohio Agricultural Statistics Service reports that at the end of July, soil moisture was reported as being short in 12 percent of the state, adequate in 78 percent of the state, and surplus in 10 percent of the state.

Precipitation for the 1996 calendar year is above normal throughout Ohio. The state average is 30.33 inches, 6.81 inches above normal. Regional averages range from 38.81 inches, 13.29 inches above normal, for the Southwest Region to 22.81 inches, 1.80 inches above normal, for the Northwest Region.

Precipitation for the 1996 water year is above normal throughout Ohio. The state average is 39.47 inches, 8.38 inches above normal. Regional averages range from 48.48 inches, 14.77 inches above normal, for the Southwest Region to 30.59 inches, 2.55 inches above normal, for the Northwest Region.

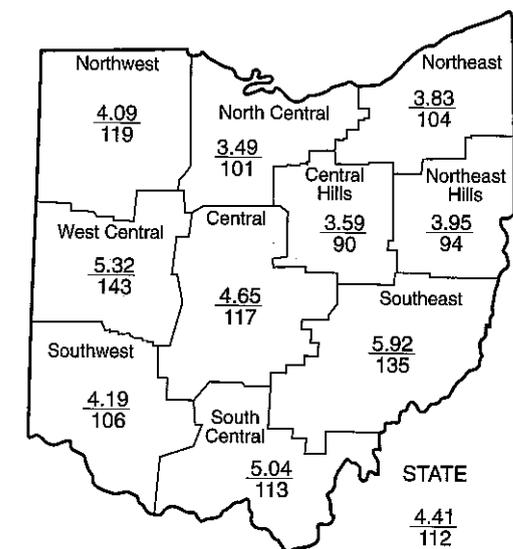
## PRECIPITATION JULY 1996



## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.65	+2.04	+1.37	+1.12	-2.91	+0.9
North Central	+0.03	+1.09	+2.54	+3.52	+5.59	+0.4
Northeast	+0.15	+2.38	+4.57	+5.43	+6.81	+1.8
West Central	+1.61	+4.86	+7.21	+10.85	+10.28	+4.3
Central	+0.69	+4.18	+6.33	+9.08	+10.32	+2.2
Central Hills	-0.40	+1.74	+4.37	+6.78	+7.35	+3.3
Northeast Hills	-0.26	+3.15	+4.25	+4.77	+2.92	+2.1
Southwest	+0.22	+8.10	+12.20	+15.03	+13.70	+3.2
South Central	+0.58	+6.33	+6.81	+9.46	+6.27	+2.4
Southeast	+1.55	+6.22	+8.28	+10.18	+8.49	+3.3
State	+0.49	+4.01	+5.80	+7.63	+6.91	

\*Above +4 = Extreme Moist Spell  
3.0 To 3.9 = Very Moist Spell  
2.0 To 2.9 = Unusual Moist Spell  
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Average (in)  
Percent of normal

## ACKNOWLEDGMENTS

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Precipitation data:  
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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.



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

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Director  
Michele Willis  
Chief

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**MEAN STREAM DISCHARGE**

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	This Month % of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
				Grand River near Painesville	685	178
Great Miami River at Hamilton	3,630	2,917	199	345	184	190
Huron River at Milan	371	46	63	223	154	132
Killbuck Creek at Killbuck	464	178	98	251	142	149
Little Beaver Creek near East Liverpool	496	194	92	169	132	124
Maumee River at Waterville	6,330	2,525	112	280	115	112
Muskingum River at McConneville	7,422	4,330	100	236	149	144
Scioto River near Prospect	567	229	225	273	124	168
Scioto River at Higby	5,131	3,891	195	373	175	188
Stillwater River at Pleasant Hill	503	281	204	286	161	171

**STREAMFLOW** during July was above normal throughout most of Ohio but below normal in the north-central and northeastern areas of the state. Flows in the south-central drainage basins were high enough to be considered excessive. Flows for July were noticeably less than the flows in June.

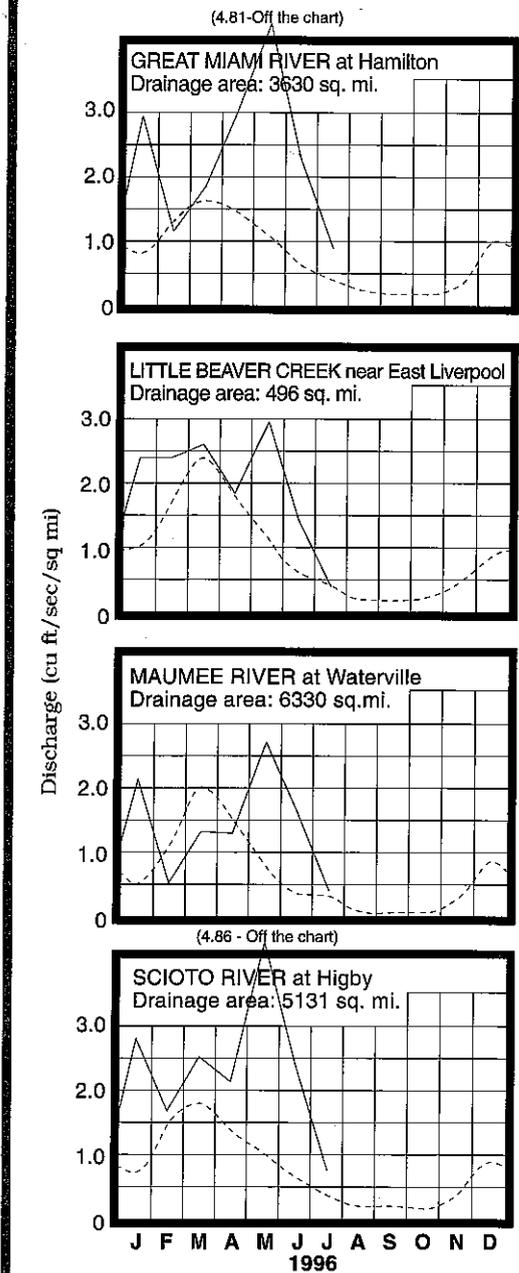
Flows at the beginning of the month were above normal in most areas of Ohio, but below normal across the northern third of the state. Generally, flows declined until just before mid-month responding to the lack of precipitation throughout much of the state. Most drainage basins had their lowest flows for the month on or just prior to July 14 except in some northeast and north-central Ohio drainage basins where flows

were lowest on July 29. Flows increased rapidly after mid-month following widespread precipitation throughout much of the state on July 17-18. Greatest flows for the month occurred during July 18-20 in most areas of the state following these storms. A few drainage basins in north-central Ohio had their greatest flows at the end of the month following storms in that area. Flows at the end of the month were slightly above normal throughout most of the state, but below normal in northeastern Ohio.

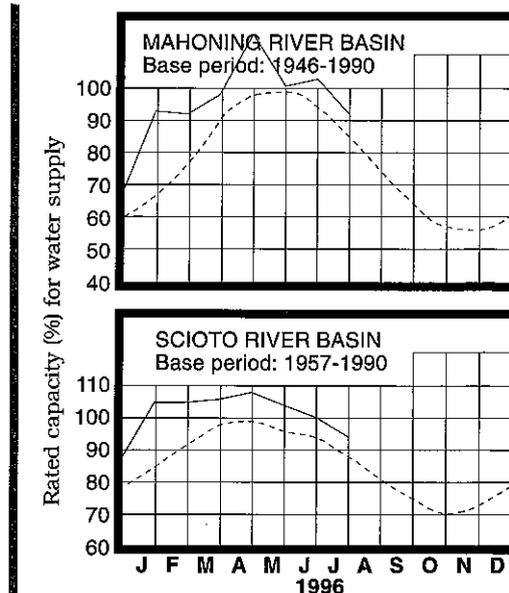
**RESERVOIR STORAGE** during July decreased in both the Mahoning and Scioto river basins. Storage remained above normal in both basins.

Reservoir storage at the end of July in the Mahoning basin index reservoirs was 92 percent of rated capacity for water supply compared with 103 percent for last month and 94 percent for July 1995. Month-end storage in the Scioto basin index reservoirs was 94 percent of rated capacity for water supply compared with 100 percent for last month and 102 percent for July 1995. Surface water supplies continue to remain in excellent condition throughout the state.

**MEAN STREAM DISCHARGE**



**RESERVOIR STORAGE FOR WATER SUPPLY**



**GROUND WATER LEVELS**

during July declined in most aquifers throughout the state. A few exceptions were noted in some shallow aquifers, especially those adjacent to streams and rivers where levels rose noticeably after mid-month. Generally, levels declined throughout the first half of the month in all aquifers. During the second half, levels rose in some aquifers, especially shallow aquifers adjacent to streams, and stabilized in other aquifers. Aquifer levels in areas that received below normal precipitation during July continued to decline through the end of the month.

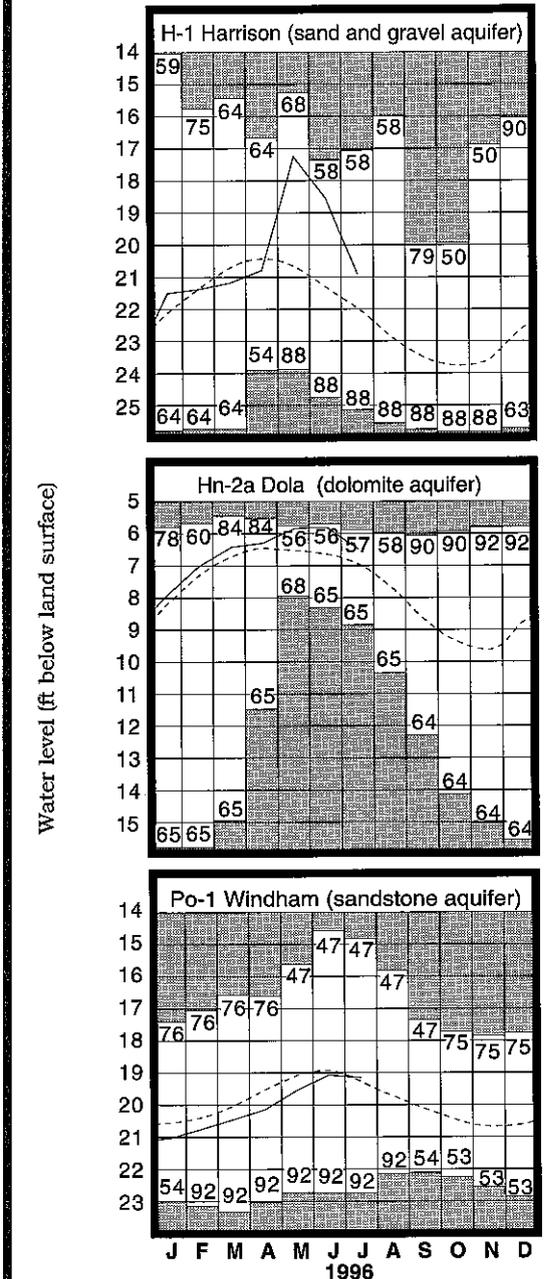
Ground water supplies continue to remain in good condition throughout the state. Current levels range from about the same to nearly 2 feet higher than the levels of a year ago. Levels in most aquifers are above normal with only a few exceptions in some eastern areas of the state where levels are slightly below normal.

**LAKE ERIE** level rose during July. The mean level was 572.97 feet (IGLD-1985), 0.20 foot above last month's mean level and 1.22 feet above normal. This month's level is 0.66 foot above the July 1995 level and 3.77 feet above Low Water Datum.

**GROUND-WATER LEVELS**  
Based on daily lowest level in feet below land-surface datum

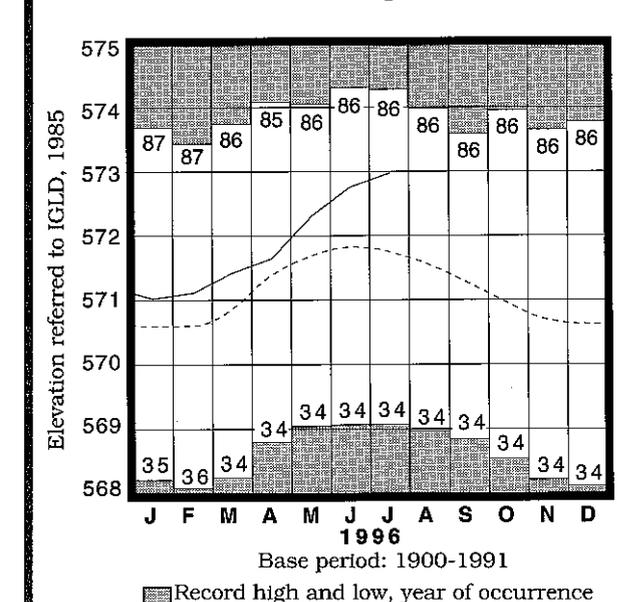
Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	14.68	+0.44	-2.61	+0.93
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.27	+0.53	-0.86	+0.36
Fr-10	Columbus, Franklin Co.	Gravel	41.37	+2.09	-1.39	+1.10
H-1	Harrison, Hamilton Co.	Gravel	20.90	+1.06	-2.38	+1.33
Hn-2a	Dola, Hardin Co.	Dolomite	6.50	+0.45	-0.70	-0.06
Po-1	Windham, Portage Co.	Sandstone	19.16	+0.13	-0.08	+1.42
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.75	-0.23	-1.35	+1.69

**GROUND-WATER LEVELS**



Base periods: H-1, 1951-1990. Hn-2a, 1955-1990. Po-1, 1947-1990

**LAKE ERIE LEVELS at Fairport**



Normal - - - - Current \_\_\_\_\_

Normal - - - - Current \_\_\_\_\_

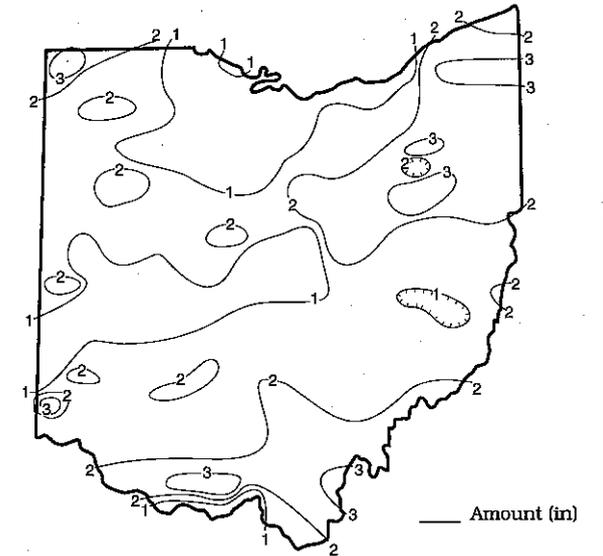


# MONTHLY WATER INVENTORY REPORT FOR OHIO

August 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## PRECIPITATION AUGUST 1996

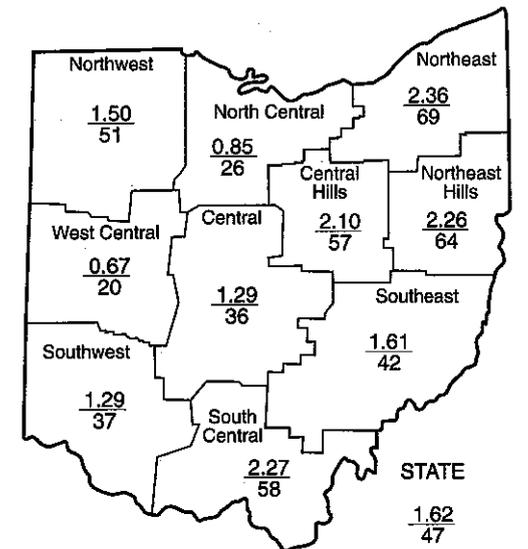


**PRECIPITATION** during August was below normal throughout most of the state with only a few scattered locations having above normal precipitation. The state average was 1.62 inches, 1.86 inches below normal. Regional averages ranged from 2.36 inches, 1.04 inches below normal, for the Northeast Region to 0.67 inch, 2.63 inches below normal, for the West Central Region. This was the driest August on record for the West Central Region and the second driest for the North Central Region. Shawnee State Forest (Scioto County) and Wingfoot Lake (Portage County) both reported the greatest amount of precipitation for the month, 3.72 inches. Dayton Municipal Airport (Montgomery County) reported the least amount of August precipitation, only 0.03 inch, its driest month on record. Other locations reporting less than 0.2 inch of precipitation in August were: New Carlisle and Springfield (Clark County); Troy and Tipp City (Miami County); Urbana (Champaign County); Fostoria and Tiffin (Seneca County); and Vermillion (Erie County).

Precipitation during August fell as scattered light showers and thunderstorms. The first week of the month was rather dry in most locations. During the second week, many locations received some rain during August 8-9 and also on August 12, especially in northeastern Ohio. Scattered storms moved across southern Ohio during August 15-16 and northern Ohio on August 20. Scattered showers continued throughout the August 22-26 period with some areas receiving much needed rain, but most areas missing the storms. The remainder of the month was rather dry in most locations.

Precipitation for the 1996 calendar year is above normal throughout the state. The state average is 31.95 inches, 4.95 inches above normal. Regional averages range from 40.10 inches, 11.11 inches above normal, for the Southwest Region to 24.31 inches, 0.37 inch above normal, for the Northwest Region.

Precipitation for the 1996 water year is above normal throughout the state. The state average is 41.09 inches, 6.52 inches above normal. Regional averages range from 49.77 inches, 12.59 inches above normal, for the Southwest Region to 32.09 inches, 1.12 inches above normal, for the Northwest Region.



Average (in)  
Percent of normal

## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-1.43	-0.10	+0.60	-0.66	-4.46	-0.4
North Central	-2.38	-1.62	+0.41	+0.25	+2.03	-1.9
Northeast	-1.04	+0.79	+3.42	+5.56	+3.50	+0.5
West Central	-2.63	-0.90	+4.68	+5.82	+7.57	+1.4
Central	-2.26	-1.54	+4.03	+4.73	+7.59	+0.6
Central Hills	-1.56	-1.21	+2.62	+3.71	+4.20	+1.7
Northeast Hills	-1.26	+0.21	+2.91	+3.95	+0.10	+1.1
Southwest	-2.18	-0.24	+10.88	+11.10	+11.24	+1.6
South Central	-1.62	+0.09	+5.36	+6.25	+4.84	+1.5
Southeast	-2.23	-0.02	+5.37	+8.35	+5.49	+1.3
State	-1.86	-0.45	+4.03	+4.91	+4.24	

\*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

## SUMMARY

Precipitation was below normal throughout most of Ohio and exceptly below normal in some west-central and north-central areas of the sta. This was the driest August on record for the West Central Region and the second driest for the North Central Region. Streamflow was above normal i all but northeastern Ohio as the result of noticeably above normal flows at the beginning of the month. Reservoir storage declined and remained at or above normal seasonal levels. Ground water levels in all aquifers declined throughout the month. Lake Erie level declined 0.17 foot and was 1.24 feet above the long-term August average.

## NOTES AND COMMENTS

### OWWA ANNUAL CONVENTION

The Ohio Water Well Association (OWWA) will hold its 1996 annual convention November 21-22 at the Columbus Marriott North. Presentations during the two-day event will cover various topics including equipment maintenance, changes in PUCO and worker's compensation rules, and small business management.

Many other activities are also planned for both the convention attendees and their spouses. A silent auction will be held with all proceeds going to support the OWWA scholarship fund. For more information, contact: Dan Schlosser, OWWA Executive Director, P.O. Box 310, Caledonia, Ohio 43314, phone: (419) 845-2023, fax: (419) 845-2026.

### WMAO ANNUAL CONFERENCE

The Water Management Association of Ohio (WMAO) will hold its 25th annual conference November 13-14 at the Columbus Clarion Hotel. Attendees will be updated on many legislative changes and current activities of each of the divisions within WMAO. Additional presentations will cover flood warning, control, protection, and mitigation activities, and water quality, ground water, and watershed management and characterization projects.

At the conference, the Ohio Floodplain Management Association and the Ohio Dam Safety Organization will also hold concurrent meetings. An awards ceremony will recognize WMAO members who have made significant contributions to the water field during the past year and/or throughout their careers and also to high school students who were presented the Water Management Award at the State Science Day competition in April.

For more information, contact: Helen Sedoris at (614) 728-8575 or write to WMAO, 262 Agricultural Engineering Building, 590 Woody Hayes Drive, Columbus, Ohio 43210.

### WATER WITHDRAWAL 1995 ANNUAL REPORT AVAILABLE

The "Ohio Water Withdrawal Facility Registration Program: 1995" annual report pamphlet is now available. This four-page report depicts on a statewide basis the amount of water withdrawn by registered facilities in 1995. It also details on a county basis the water withdrawals for each of the five reporting categories. Those categories are: power; public water supply; industrial; agriculture/irrigation (includes golf courses); and miscellaneous.

Owners of all facilities (surface and/or ground water) with the capacity to withdraw 100,000 gallons of water or more per day are required to register that facility with the ODNR Division of Water and submit annual reports of actual withdrawals pursuant to Section 1521.16 of the Ohio Revised Code. Copies of the 1995 annual report are available from the Ohio Department of Natural Resources, Division of Water, Water Resources Section, 1939 Fountain Square, Building E-1, Columbus, Ohio 43224-1336, phone: (614) 265-6735.

## 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 Conserancy 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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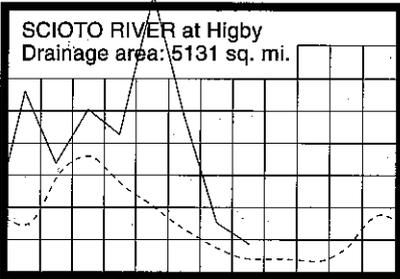
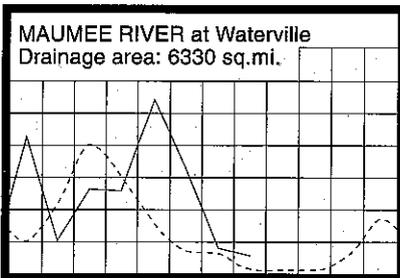
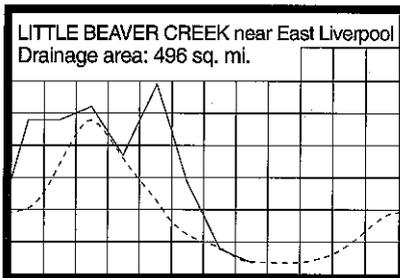
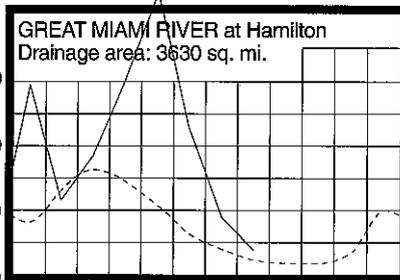
George V. Voinovich  
Governor  
Donald C. Anderson  
Director  
Michele Willis  
Chief  
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**MEAN STREAM DISCHARGE**

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
Grand River near Painesville	685	84	75	110	121	128
Great Miami River at Hamilton	3,630	1,388	150	237	193	177
Huron River at Milan	371	35	73	139	154	130
Killbuck Creek at Killbuck	464	186	145	185	163	148
Little Beaver Creek near East Liverpool	496	84	81	145	121	123
Maumee River at Waterville	6,330	1,770	265	262	137	112
Muskingum River at McConnelsville	7,422	2,723	103	174	148	140
Scioto River near Prospect	567	50	123	155	137	153
Scioto River at Higby	5,131	2,183	186	264	192	178
Stillwater River at Pleasant Hill	503	64	109	184	155	156

**MEAN STREAM DISCHARGE**

(4.81 - Off the chart)



Base period for all streams: 1961-1990

Discharge (cu ft/sec/sq mi)

Normal - - - - Current - - - -

**STREAMFLOW** during August was above normal throughout most of the state, but below normal in north-central and north-eastern Ohio. Flows in some basins in northwestern Ohio were high enough to be considered excessive. Flows during August were seasonally less than the flows during July.

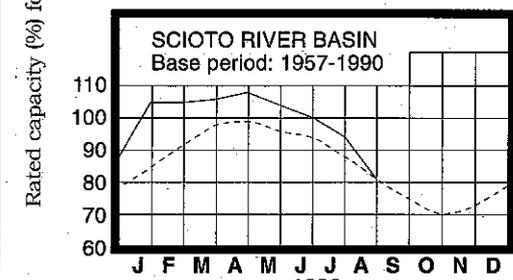
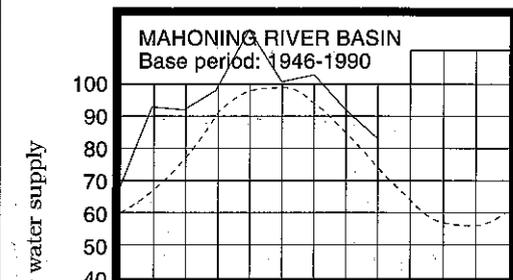
Flows at the beginning of the month were noticeably above normal throughout the state, a significant contributing factor for flows being above normal during August. Generally, flows declined throughout the month with only small rises noted following local precipitation. Nearly all basins had their greatest flows for August on the first day of the month. Exceptions were in some basins in northeastern Ohio where the month's greatest flows occurred during August 9-11

following precipitation that fell during August 8-9. Lowest flows for August occurred at the end of the month in nearly all drainage basins and were noticeably below normal statewide at this time.

**RESERVOIR STORAGE** during August declined in both the Mahoning and Scioto river basins. Storage remained above normal in the Mahoning basin reservoirs but fell to the seasonal normal in the Scioto basin reservoirs.

Reservoir storage at the end of August in the Mahoning basin index reservoirs was 83 percent of rated capacity for water supply compared with 92 percent for last month and 84 percent for August 1995. Month-end storage in the Scioto basin index reservoirs was 81 percent of rated capacity for water supply compared with 94 percent for last month and 95 percent for August 1995. Surface water supplies continue to remain adequate throughout the state.

**RESERVOIR STORAGE FOR WATER SUPPLY**



Base period: 1946-1990 (Mahoning), 1957-1990 (Scioto)

Rated capacity (%) for water supply

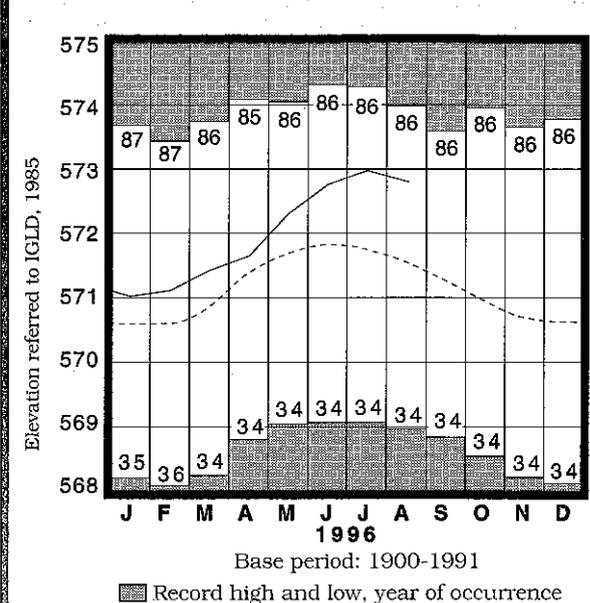
**GROUND WATER LEVELS** during August declined seasonally in all aquifers statewide. Net changes during August from last month's levels ranged from about the same to twice that usually observed with the greatest net changes occurring in unconsolidated aquifers. Generally, ground water levels declined steadily throughout the month in all aquifers.

Ground water supplies continue to remain adequate throughout the state. Current levels range from about the same to nearly one foot higher than they were a year ago. Levels in most aquifers are above normal, but a few aquifers in some eastern areas of the state have slightly below normal levels. Ground water levels can be expected to continue to decline during the next few months, typically the driest period of the year, unless precipitation is notably above normal. The below normal precipitation during August in many areas of Ohio resulted in soil moisture being reduced considerably as compared to a month ago. The Ohio Agricultural Statistics Service reports that at the end of August, soil moisture was rated as being short or very short in 69 percent of the state and adequate in 31 percent of the state.

**LAKE ERIE** level declined during August. The mean level was 572.80 feet (IGLD-1985), 0.17 foot below last month's mean level and 1.24 feet above normal. This month's level is 0.56 foot above the August 1995 level and 3.60 feet above Low Water Datum

The U. S. Army Corps of Engineers reports that precipitation in the Lake Erie basin during August averaged 1.1 inches, 2.1 inches below normal. The entire Great Lakes basin averaged 2.0 inches of precipitation during August, 1.1 inches below normal. For calendar year 1996 through August, the Lake Erie basin has averaged 24.2 inches of precipitation, 0.6 inch above normal and the entire Great Lakes basin has averaged 22.9 inches, 1.9 inches above normal.

**LAKE ERIE LEVELS at Fairport**



Base period: 1900-1991

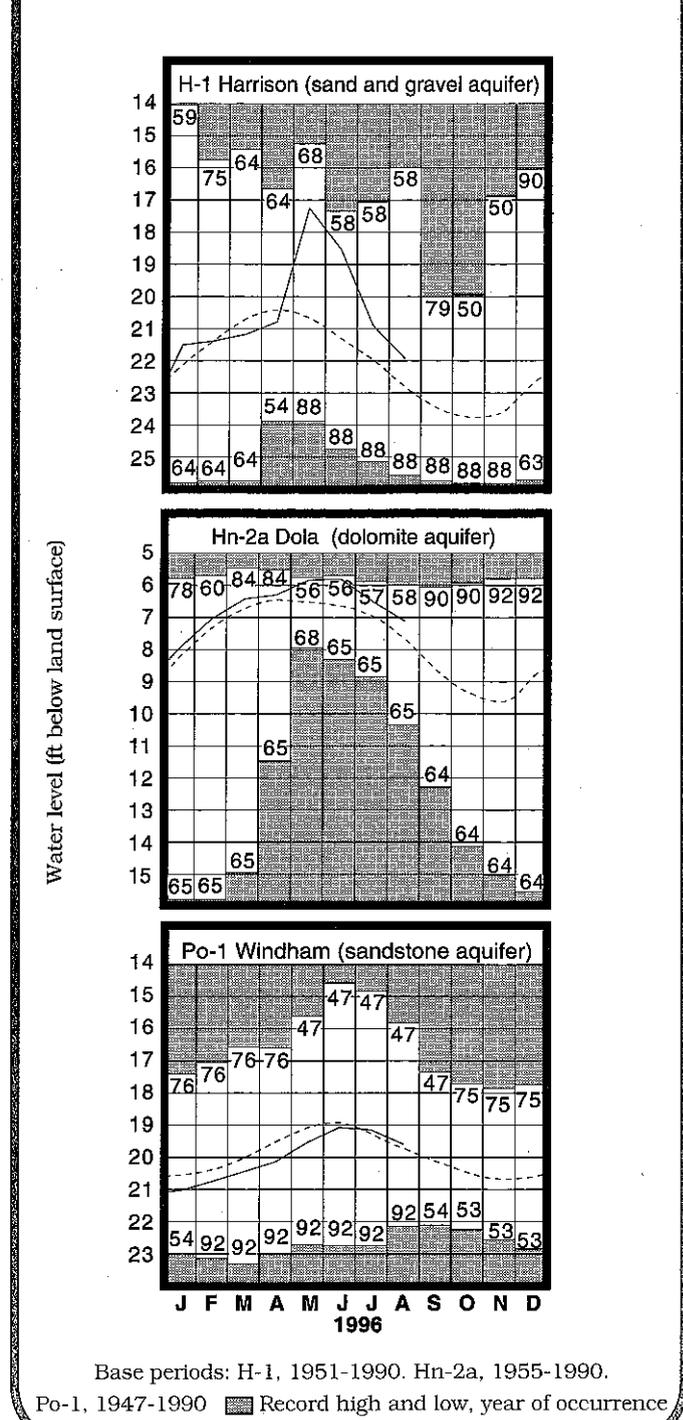
Record high and low, year of occurrence

Elevation referred to IGLD, 1985

**GROUND-WATER LEVELS**  
Based on daily lowest level in feet below land-surface datum

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	15.09	+0.07	-0.41	+0.34
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.99	+0.29	-0.72	-0.01
Fr-10	Columbus, Franklin Co.	Gravel	42.29	+1.73	-0.92	+0.56
H-1	Harrison, Hamilton Co.	Gravel	21.95	+0.86	-1.05	+0.35
Hn-2a	Dola, Hardin Co.	Dolomite	7.11	+0.55	-0.61	+0.03
Po-1	Windham, Portage Co.	Sandstone	19.60	+0.12	-0.44	+0.80
Tu-1	Strasburg, Tuscarawas Co.	Gravel	13.89	-0.80	-1.14	+0.90

**GROUND-WATER LEVELS**



Base periods: H-1, 1951-1990. Hn-2a, 1955-1990. Po-1, 1947-1990

Water level (ft below land surface)

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

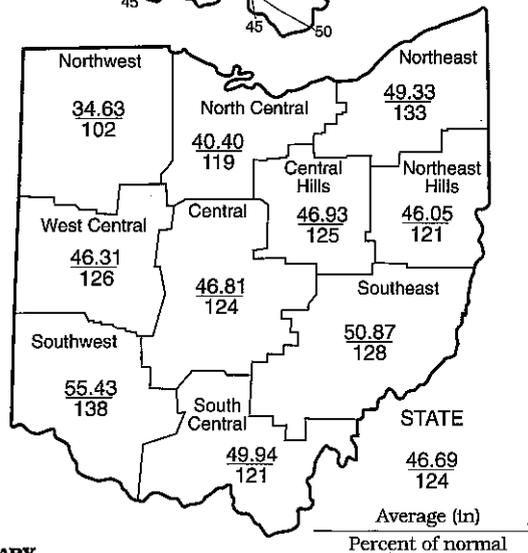
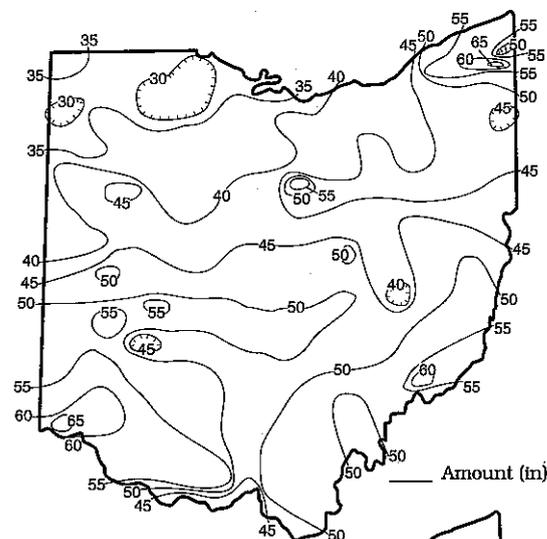
September 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)

The 1996 water year was good for water supplies across Ohio, but unfortunately also included serious flooding events and considerable delays in many spring agricultural activities. The water year started off with above normal precipitation statewide with heavy rains early in October closely followed by the passage of Hurricane Opal's remnants. Precipitation during November continued to be above normal in the northern half of the state, but was below normal in the southern half. Precipitation was below normal statewide during December. Much of Ohio had noticeably above normal snow during the first half of January which melted quickly after mid-month as temperatures warmed and rain fell throughout the state. Flooding of low-lying areas occurred statewide with counties bordering the Ohio River severely impacted. February precipitation was above normal in eastern Ohio, but below normal in western Ohio. March precipitation was below normal throughout the state except in a small area of southwestern Ohio. Then the rains began. April was the sixth wettest on record, May was the fifth wettest, June precipitation was noticeably above normal throughout much of the state and July precipitation was above normal except in a few areas of northeastern Ohio. Conditions started to change during the second half of July and quickly did an about face as August was unusually dry. The west-central and north-central areas of the state experienced record or near-record dryness in August. September precipitation returned to the earlier pattern being the second wettest on record.

Total Precipitation 1996 Water Year



**SUMMARY**

Precipitation for September was noticeably above normal throughout most of the state with only the Northwest Region having slightly below normal precipitation. This was the second wettest September on record for the state as a whole. Streamflow was above normal except in northwestern Ohio drainage basins. Reservoir storage was about the same as last month and remained above normal. Ground water levels declined and are above normal in most areas of the state, but slightly below normal in some eastern Ohio aquifers. Lake Erie level declined and was 1.41 feet above the long-term September average.

Precipitation for the 1996 water year was noticeably above normal throughout most of the state. Streamflow was above normal statewide and at or near record levels in south-central and southwestern Ohio. Reservoir storage was above normal throughout the water year. Ground water levels improved considerably during the water year. Lake Erie remained above the long-term average throughout the water year. The 1996 water year was good for water supplies, but also included serious flooding and considerable delays in spring agricultural activities.

**PRECIPITATION** during September was above normal throughout most of the state with only the Northwest Region having slightly below normal precipitation. The state average was 5.68 inches, 2.68 inches above normal, which ranks as the second wettest September during the past 114 years. Regional averages ranged from 8.23 inches, 5.05 inches above normal, for the Northeast Region to 2.81 inches, 0.04 inch below normal, for the Northwest region. This was the wettest September on record for the Northeast and North Central regions and the second wettest for the Central Hills Region. Painesville (Lake County) reported the greatest amount of precipitation for the month, 12.26 inches. Other locations in Ashtabula, Cuyahoga, and Lorain counties reported more than 11 inches of precipitation during September. Paulding (Paulding County) reported the least amount of September precipitation, 1.86 inches; Defiance (Defiance County) reported 1.88 inches, the only other location reporting less than 2 inches of precipitation during September.

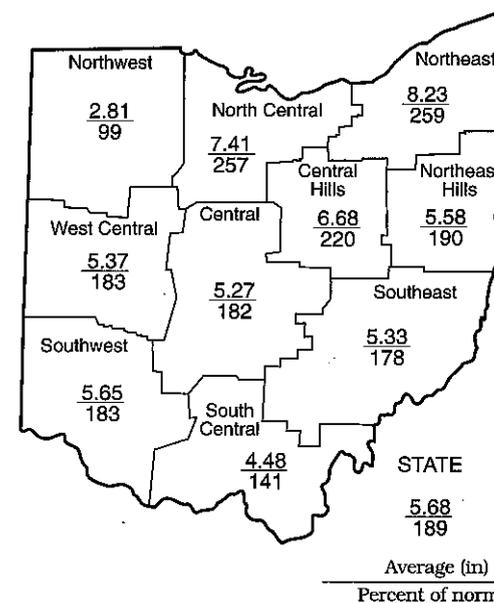
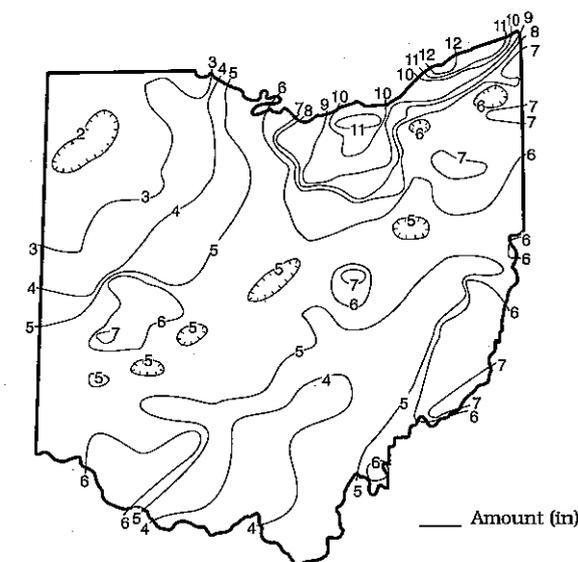
Precipitation fell during every week of September. The dry conditions of August continued during the first several days of September, but by the end of the first week rains returned to many areas of the state. The remnants of Hurricane Fran passed through the eastern half of the state during September 6-7 dropping about 0.5 inch of rain in most locations; however, some areas received more than 1 inch, and in northeastern Ohio, amounts of more than 5 inches were reported. Widely scattered, light showers continued off and on during the second week of the month with most areas receiving up to 0.5 inch of rain during the period, but in northeastern Ohio amounts of more than 1 inch were reported during September 11-13. Heavier storms crossed the state during September 16-17 during which time many areas in the southern half of the state received nearly 2 inches of rain. Scattered showers with 0.5 inch rain totals fell throughout the state during September 21-22. Widespread, soaking rains fell statewide during September 27-28 with amounts of 1 to more than 2 inches of rain reported in most areas.

Precipitation for the 1996 calendar year is above normal throughout the state. The state average is 37.51 inches, 7.51 inches above normal. Regional averages range from 45.76 inches, 13.68 inches above normal, for the Southwest Region to 26.84 inches, 0.05 inch above normal, for the Northwest Region.

Precipitation for the 1996 water year was noticeably above normal throughout the state with only a few locations in northwestern Ohio having below normal precipitation. The state average was 46.69 inches, 9.12 inches above normal. Regional averages ranged from 55.43 inches, 15.16 inches above normal, for the Southwest Region to 34.63 inches, 0.81 inch above normal, for the Northwest Region (see Precipitation table, departure from normal, past 12 months column). Andover (Ashtabula County) reported the greatest amount of precipitation for the water year, 67.93 inches; Cincinnati-Fernbank (Hamilton County) reported the second greatest amount, 65.83 inches. Hicksville (Defiance County) reported the least amount of water year precipitation, 28.95 inches; Bowling Green (Wood County) and Toledo Express Airport (Lucas County) also reported less than 30 inches of precipitation for the water year. An isohyetal map and regional averages with percentages of normal precipitation for the 1996 water year appear on the back page.

(continued on back)

PRECIPITATION  
SEPTEMBER 1996



PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.04	-1.00	+0.85	+0.81	-2.85	+0.4
North Central	+4.53	+2.16	+5.17	+6.37	+7.51	+2.6
Northeast	+5.05	+4.09	+8.62	+12.36	+9.07	+4.1
West Central	+2.44	+1.41	+7.89	+9.62	+11.32	+2.7
Central	+2.38	+0.84	+7.26	+9.20	+11.55	+3.2
Central Hills	+3.65	+1.60	+6.67	+9.53	+9.37	+4.3
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South Central	+1.30	+0.18	+6.72	+8.65	+6.66	+2.7
Southeast	+2.34	+1.49	+6.40	+11.28	+8.00	+3.2
State	+2.68	+1.26	+8.86	+9.12	+8.00	

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3.0 To 3.9 = Very Moist Spell  
2.0 To 2.9 = Unusual Moist Spell  
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0.4 To 0.4 = Near Normal

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ACKNOWLEDGMENTS

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- 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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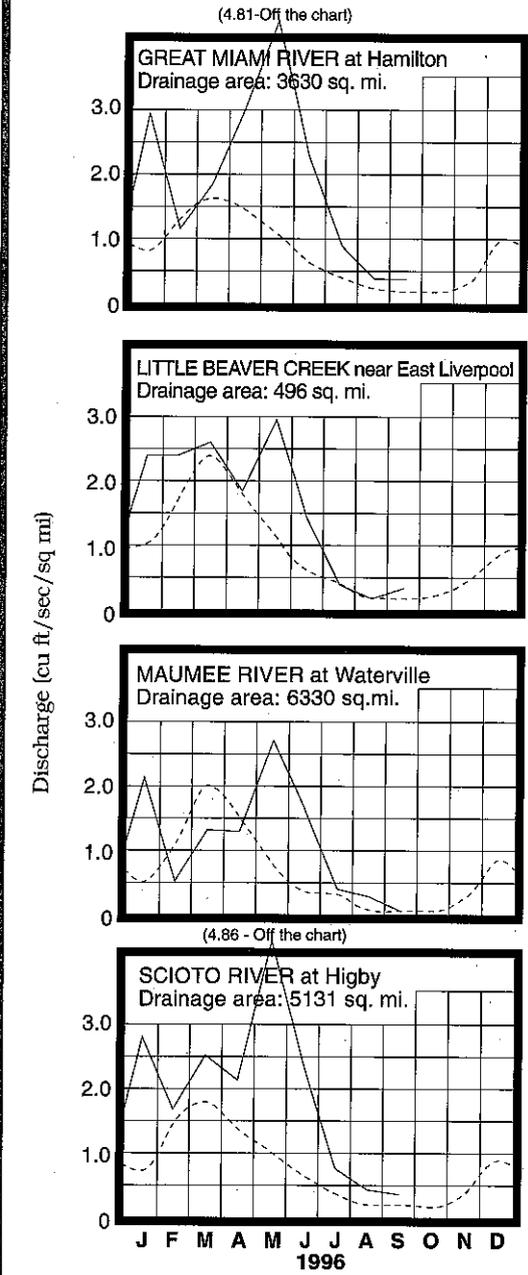
- George V. Voinovich, Governor
- Donald C. Anderson, Director
- Michele Willis, Chief

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MEAN STREAM DISCHARGE

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
				This Month		
Grand River near Painesville	685	753	338	102	146	134
Great Miami River at Hamilton	3,630	1,336	174	166	227	178
Huron River at Milan	371	124	337	98	176	133
Killbuck Creek at Killbuck	464	291	288	152	179	152
Little Beaver Creek near East Liverpool	496	169	184	94	129	125
Maumee River at Waterville	6,330	466	73	125	145	113
Muskingum River at McConnelsville	7,422	2,833	144	98	151	141
Scioto River near Prospect	567	56	182	152	190	153
Scioto River at Higby	5,131	1,829	150	151	226	179
Stillwater River at Pleasant Hill	503	57	115	136	193	156

MEAN STREAM DISCHARGE



Normal - - - - Current - - - -

**STREAMFLOW** during September was above normal throughout most of Ohio, but below normal in the northwestern area of the state. Flows in the northeastern, north-central, southwestern and south-central areas of the state were high enough to be considered excessive. Streamflows during September in the eastern and north-central areas of the state were greater than the flows during August while elsewhere, September flows were seasonally less than the August flows.

Flows at the beginning of the month were below normal in most drainage basins across the state, but slightly above normal in some southwestern and northwestern Ohio drainage basins. Most basins recorded their lowest flows for September during the first week of the month. Flows in the eastern half of the state increased following some locally heavy showers after the remnants of Hurricane Fran clipped the state during September 6-7. A few drainage basins in northeastern Ohio had their highest flows for the month on September 7 following this rain. The remaining drainage basins had their greatest flows for September just before the end of the month following widespread showers and soaking rains during September 27-29. Flows at the end of the month were noticeably above normal throughout the state.

Streamflow for the 1996 water year was noticeably above normal throughout the state (see Mean Stream Discharge table, percent of normal, past 12 months column). The preliminary annual mean daily discharge of 8,415 cfs for the Scioto River at Higby gauging station was the highest for its period of record, and for the Great Miami River at Hamilton gauging station, 5,865 cfs was its second highest annual mean daily flow, trailing only the annual flow for 1913, the year of the Great Flood.

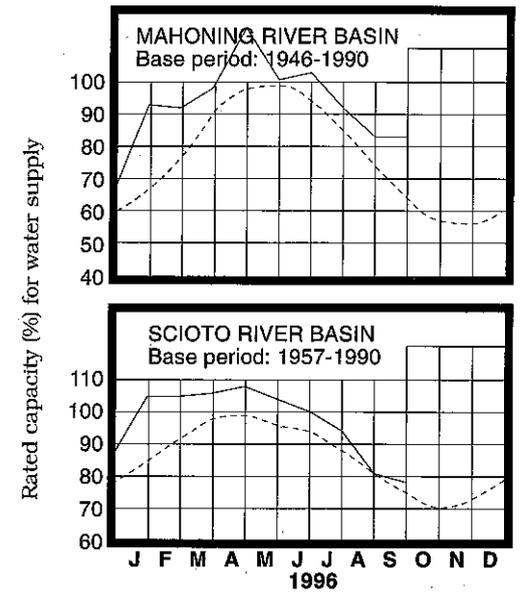
Streamflow during the 1996 water year was generally above normal during nearly every month with only December 1995 having below normal flows statewide. Flooding occurred during January and during the late spring and early summer months. The January flooding was caused by rapid snowmelt and rain falling on frozen ground. The counties that border the Ohio River were the most severely impacted. Much of the runoff came from the drainage area of the Ohio River in Pennsylvania. The flooding during April, May, and June was caused by heavy rain showers and locally severe thunderstorms throughout the period. Soils were at or near moisture retention capacities thus resulting in increased runoff. Many locations had record or near-record May flows.

**RESERVOIR STORAGE** in September was unchanged in the Mahoning, and declined slightly in the Scioto basin reservoirs. Storage was above normal in both basins.

Reservoir storage at the end of September in the Mahoning basin index reservoirs was 83 percent of rated capacity for water supply compared with the same for last month and 75 percent for September 1995. Month-end storage in the Scioto basin index reservoirs was 78 percent of rated capacity for water supply compared with 81 percent for last month and 86 percent for September 1995.

The 1996 water year was very good for surface water supplies. Storage in both on- and off-stream reservoirs was generally above normal throughout the year. Recreational reservoirs easily maintained summer pool levels, but during the winter and spring months high water levels were a nuisance in many areas as flood-control reservoirs often needed to utilize available storage. Some reservoirs in the lower Scioto River basin reached record or near-record levels during May.

RESERVOIR STORAGE FOR WATER SUPPLY



**GROUND WATER LEVELS** during September declined throughout the state. Net changes during September from last month's levels were greater than usually observed. Generally, ground water levels in all aquifers declined steadily throughout the month still responding to the noticeably below normal precipitation during August. Levels in some shallow unconsolidated aquifers began to rise just before the end of the month in response to widespread showers and soaking rains.

Ground water supplies continue to remain adequate throughout the state. Current levels are generally higher than they were a year ago in most areas of the state, but slightly lower in some consolidated aquifers. Most aquifers continue to have above normal seasonal levels, but in some aquifers in the eastern areas of the state levels have fallen to slightly below normal. The above normal precipitation during September improved the soil moisture conditions across the state greatly. The Ohio Agricultural Statistics Service reports that at the end of September, soil moisture was rated as being short in 6 percent of the state, adequate in 83 percent of the state and surplus in 11 percent of the state.

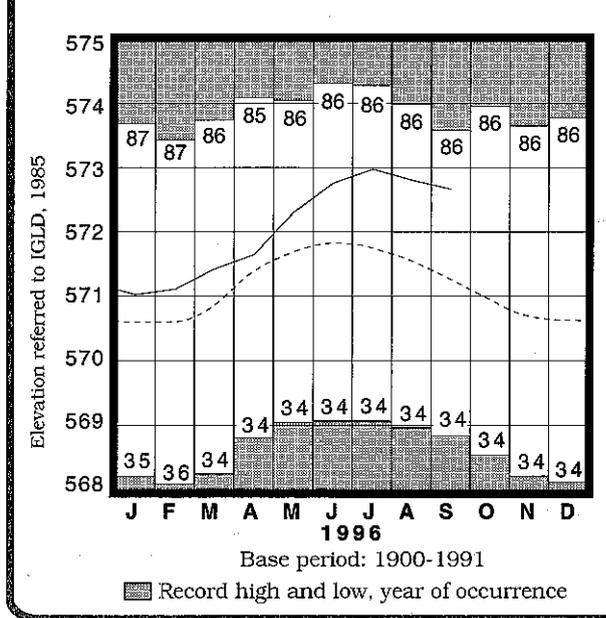
The ground water supply situation improved considerably during the 1996 water year. The water year started off with ground water levels just beginning to recover from unusually dry conditions during late 1994 and early 1995 when below normal precipitation resulted in very little recharge to ground water supplies. Ground water levels in the eastern half of the state were the most severely impacted and remained at below normal levels through the spring of 1996. Significant recharge to ground water supplies started after the January thaw when snowmelt and rain combined to produce high-water conditions in many areas of the state. Although ground water levels in aquifers in the eastern half of Ohio remained below normal, they were well on their way to recovery after this time. Additional recharge continued through the middle of June as the late spring months were unusually wet. By early summer, ground water levels throughout the state had finally recovered to near or above normal levels. Ample precipitation during the summer months reduced demand, and although August was very dry, ground water supplies continued to remain in good condition. Seasonal declines in ground water levels during September, enhanced by the lack of August precipitation, have not had a serious adverse effect on ground water supplies. At the end of the 1996 water year, ground water supplies are in good condition throughout the state. The prognosis appears to be favorable for the upcoming recharge period.

**LAKE ERIE** level declined during September. The mean level was 572.67 feet (IGLD-1985), 0.13 foot below last month's mean level and 1.41 feet above normal. This month's level is 0.95 foot above the September 1995 level and 3.47 feet above Low Water Datum.

The U. S. Army Corps of Engineers reports that precipitation in the Lake Erie basin during September averaged 7.8 inches, 4.7 inches above normal. The entire Great Lakes basin averaged 4.8 inches of precipitation during September, 1.4 inches above normal. For calendar year 1996 through September, the Lake Erie basin has averaged 32.0 inches of precipitation, 5.3 inches above normal and the entire Great Lakes basin has averaged 27.7 inches, 3.3 inches above normal.

Lake Erie remained above the long-term average level throughout the 1996 water year. The U. S. Army Corps of Engineers predicts that, based on the present condition of the lake basin and anticipated future weather conditions, the level of Lake Erie should remain above the long-term average for the next several months.

LAKE ERIE LEVELS at Fairport



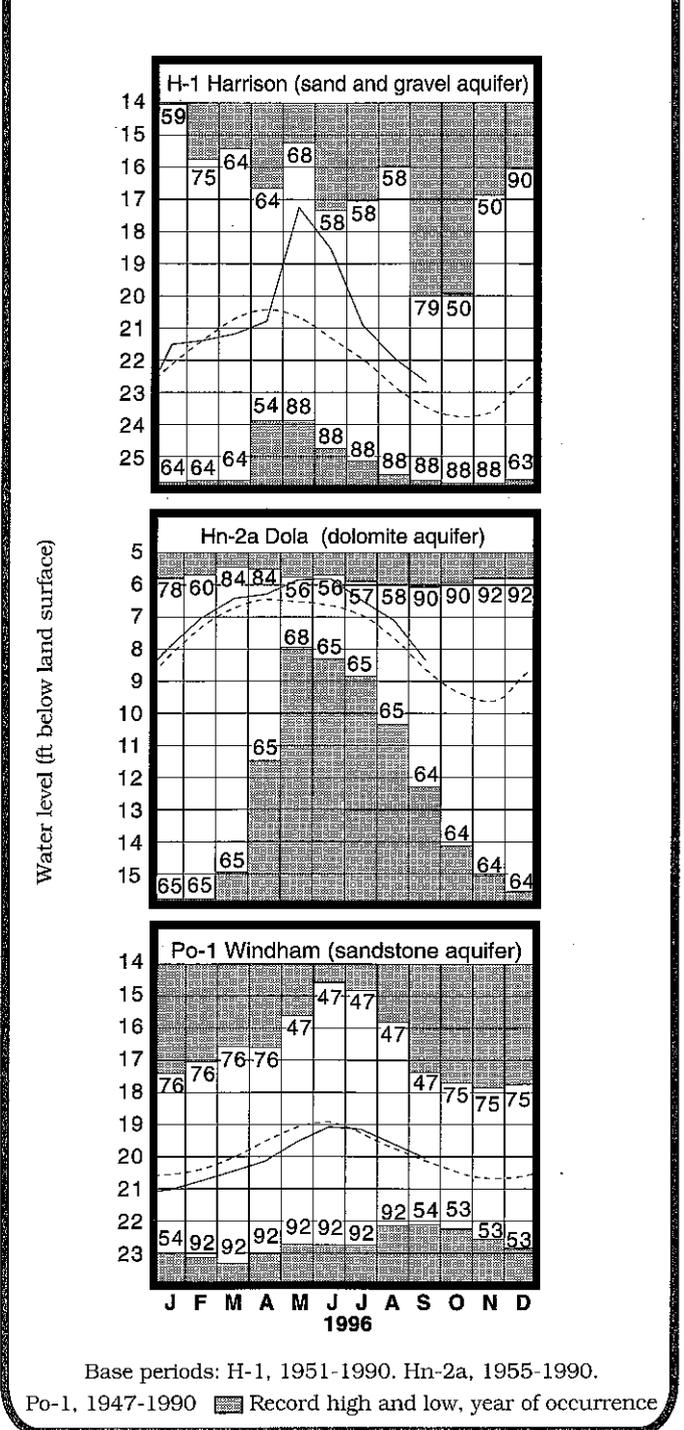
Normal - - - - Current - - - -

GROUND-WATER LEVELS

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

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	16.96	-0.54	-1.87	-0.28
Fa-1	Jasper Mill, Fayette Co.	Limestone	8.84	-0.17	-0.85	-0.37
Fr-10	Columbus, Franklin Co.	Gravel	42.89	+1.61	-0.60	+0.64
H-1	Harrison, Hamilton Co.	Gravel	22.68	+0.79	-0.73	+0.61
Hn-2a	Dola, Hardin Co.	Dolomite	8.35	+0.26	-1.24	+0.08
Po-1	Windham, Portage Co.	Sandstone	20.03	+0.09	-0.43	+0.64
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.55	-1.04	-0.66	+0.98

GROUND-WATER LEVELS





# MONTHLY WATER INVENTORY REPORT FOR OHIO

October 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## SUMMARY

Precipitation was below normal in southern and western Ohio, but above normal in the northeastern area of the state. Streamflow was noticeably above normal throughout most of the state. Reservoir storage was unchanged in the Mahoning basin reservoirs and declined in the Scioto basin reservoirs. Reservoir storage was near or above the normal seasonal levels. Ground water levels declined throughout the state. Lake Erie level declined 0.13 foot and was 1.58 feet above the long-term October average.

## NOTES AND COMMENTS

### NEW PUBLICATION

The Division of Water announces the availability of the following new publication:

Ground Water Pollution Potential of Clermont County, Ohio

by The Center for Ground Water Management, Wright State University, in cooperation with the Ohio Department of Natural Resources, Division of Water

Ground water pollution potential maps are designed to determine an area's relative vulnerability to ground water pollution. The maps can be used as a planning and management tool for administrators, commissioners, zoning boards and others to aid in making educated decisions about local development and siting of land use operations or activities that can affect ground water quality. The system optimizes the use of existing data to rank areas with respect to pollution potential to help direct investigations and resource expenditures and to prioritize protection, monitoring and clean-up efforts.

Mapping an area's potential for ground water pollution is a relatively new idea. These maps use the DRASTIC system as developed for the U.S. Environmental Protection Agency by the National Ground Water Association. DRASTIC values, as shown on the maps, indicate an area's relative vulnerability to contamination through the use of a numerical rating scheme and the mapping of hydrogeologic settings. Low DRASTIC values indicate relatively low potential and high DRASTIC values indicate a high potential for contamination. Areas of similar DRASTIC values are color-coded for ease of interpretation.

Each ground water pollution potential map with its accompanying report costs \$10.00. They can be purchased at or ordered from the address listed below.

ODNR Division of Water  
Water Resources Section  
1939 Fountain Square, Building E-1  
Columbus, Ohio 43224-1336  
Phone (614) 265-6740

Make checks payable to ODNR Division of Water. If publications are ordered through the mail, please be sure to include the correct postage and handling charges as shown below. Payments can also be made with Visa or MasterCard.

### Postage and Handling Charges

Cost of Publications	Add
under \$10.01	\$2.50
\$10.01 - \$20.00	\$3.75
\$20.01 - \$50.00	\$6.00
\$50.01 - \$100.00	\$8.50
\$100.01 and over	\$10.00

## ORIGINATOR OF "MONTHLY WATER INVENTORY REPORT" PASSES

It is with sad contemplation that we report the passing of Paul Kaser on October 29, 1996. Paul began working as a hydrologist in the Division of Water after its creation within ODNR in 1949. Prior to that, he worked for the Ohio Water Resources Board. Paul was instrumental in developing and managing the observation well/ground water level monitoring program in Ohio for many years. He authored several reports that presented and analyzed the data from this statewide network.

In 1954, Paul conceived the idea to publish a monthly report that presented in brief form hydrologic data from across the state that were sufficiently representative of current water conditions to permit an evaluation of the statewide water supply situation. This idea became the "Monthly Water Inventory Report for Ohio" which has been published by the Division of Water for more than 42 years. Paul was the author of this report for more than 22 years.

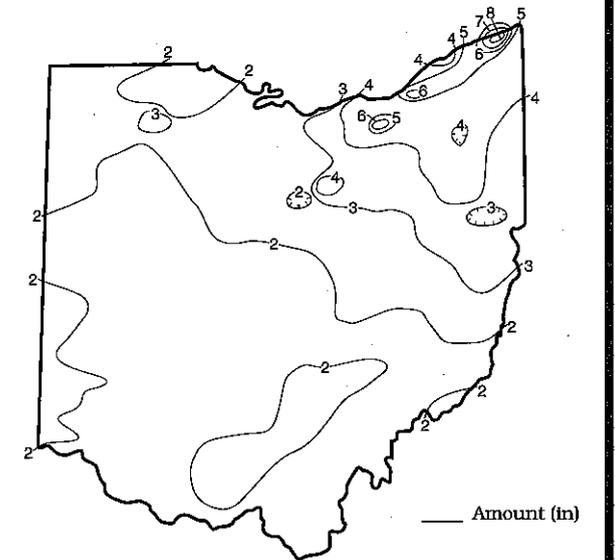
Paul retired from the Division of Water in the early 1970s. He was especially proud of his fellowship with the Ohio Academy of Science. He resided in Scottsdale, Arizona during most of his retirement before moving to Tucson for the past few years. He was laid to rest near his hometown of Killbuck, Ohio.

## 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 Consergency District: U.S. Army Corps of Engineers, Muskingum Area.  
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.

## PRECIPITATION OCTOBER



**PRECIPITATION** during October was below normal throughout most of Ohio, but above normal in the northeastern area of the state. The state average was 2.42 inches, 0.08 inch above normal. Regional averages ranged from 4.41 inches, 1.69 inches above normal, for the Northeast Region to 1.52 inches, 0.82 inch below normal, for the West Central Region. Ashtabula (Ashtabula County) reported the greatest amount of precipitation for the month, 8.17 inches. On October 19, 20, and 21, Ashtabula reported 1.82 inches, 1.70 inches, and 1.37 inches of precipitation, respectively. Ripley (Brown County) reported the least amount of October precipitation, only 1.00 inch.

Precipitation during October fell entirely as rain with most falling during the second half of the month. The only notable precipitation during the first half of October fell during October 9-10. Amounts approaching 1 inch were recorded in northeastern Ohio, tapering off to less than 0.25 inch in the southwestern and south-central areas of the state during this period. The greatest precipitation for the month fell during October 17-19. The western half of the state received less than 1 inch of rain during this period, but some areas in northeastern Ohio reported more than 2 inches. Scattered, light showers crossed the state throughout the last 10 days of the month. Most areas received around 0.5 inch of rain during this period. The exception was once again in northeastern Ohio where around 1 inch was received during this period with 0.5 inch falling on October 29 alone.

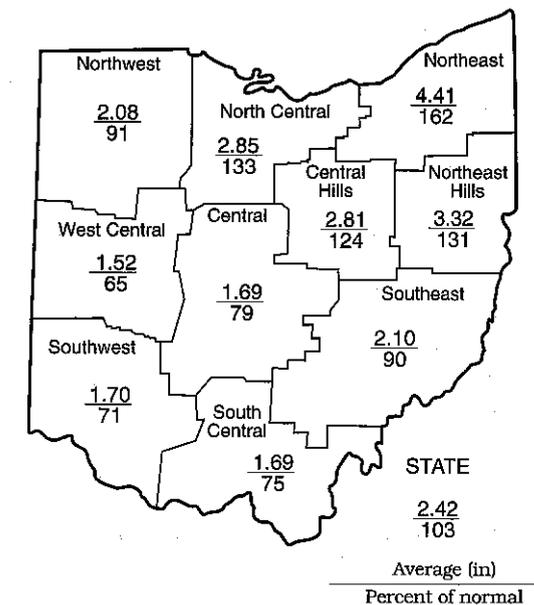
Precipitation for the 1996 calendar year is above normal throughout most of the state with only the Northwest Region having slightly below normal precipitation. The state average is 39.93 inches, 7.59 inches above normal. Regional averages range from 47.46 inches, 12.99 inches above normal, for the Southwest Region to 28.92 inches, 0.16 inch below normal, for the Northwest Region. Most areas of the state have already received more than their average annual precipitation.

The 1997 water year (October 1, 1996 to September 30, 1997) is not off to an exceptionally good start as far as precipitation is concerned. Even with the below normal precipitation during October, conditions favor a good recharge period provided climatic conditions are near normal during the next several months.

## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.21	-1.68	+0.07	-1.19	-1.66	-0.4
North Central	+0.71	+2.85	+3.78	+5.26	+9.68	+3.2
Northeast	+1.69	+5.70	+8.01	+11.74	+12.01	+4.9
West Central	-0.82	-1.03	+3.81	+6.60	+12.14	+1.6
Central	-0.45	-0.30	+4.28	+6.72	+12.48	+2.9
Central Hills	+0.55	+2.55	+4.48	+7.52	+11.43	+4.2
Northeast Hills	+0.79	+2.17	+5.30	+6.86	+5.86	+2.9
Southwest	-0.69	-0.30	+7.76	+12.37	+16.41	+4.2
South Central	-0.55	-0.74	+5.41	+6.56	+7.39	+1.5
Southeast	-0.23	-0.21	+5.58	+8.99	+9.24	+3.2
State	+0.08	+0.90	+4.85	+7.17	+9.54	

\*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



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

George V. Voinovich  
GOVERNOR  
Donald C. Anderson  
DIRECTOR  
Michele Willis  
Chief  
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MEAN STREAM DISCHARGE

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
				This Month		
Grand River near Painesville	685	1,222	349	158	162	143
Great Miami River at Hamilton	3,630	1,079	142	129	259	175
Huron River at Milan	371	96	285	160	207	134
Killbuck Creek at Killbuck	464	328	329	231	246	155
Little Beaver Creek near East Liverpool	496	286	238	154	167	128
Maumee River at Waterville	6,330	602	99	108	205	112
Muskingum River at McConnelsville	7,422	4,082	217	141	188	143
Scioto River near Prospect	567	46	166	86	228	151
Scioto River at Higby	5,131	2,181	236	148	285	178
Stillwater River at Pleasant Hill	503	60	101	89	226	152

**STREAMFLOW** during October was above normal throughout most of Ohio with only the northwestern area of the state having slightly below normal flows. Flows in eastern, north-central, and south-central Ohio were high enough to be considered excessive. Flows during October were greater than the flows during September in many areas of the state, but less in north-central and south-western Ohio.

Flows at the beginning of the month were noticeably above normal throughout the state. Some drainage basins in the southern half of the state had their greatest flows for October at the beginning of the month with these flows still responding to widespread showers and soaking rains just prior to the end of September. Generally, flows declined through mid-month with a few days of slight in-

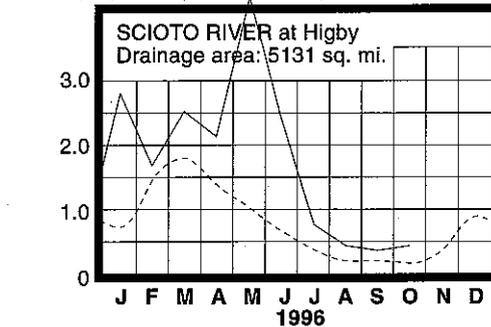
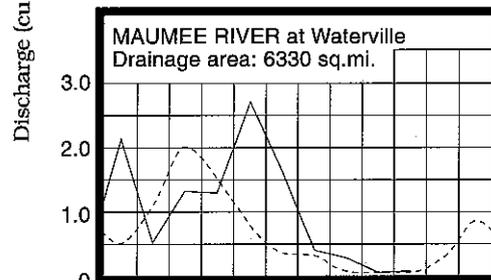
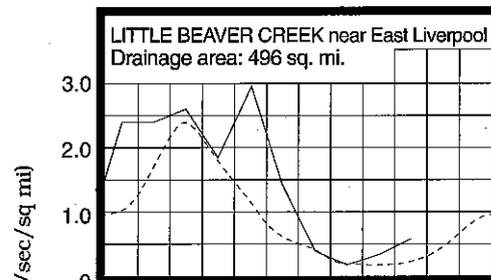
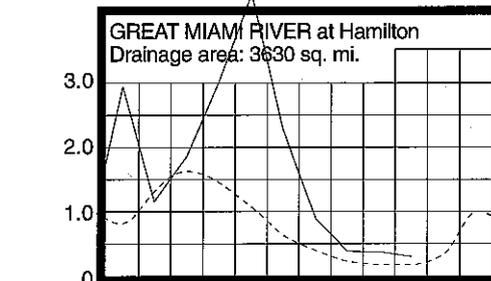
creases noted after October 9. A few drainage basins in extreme north-central and northeastern Ohio had their lowest October flows during October 8-9, but most other basins recorded their lowest flows just after the middle of the month. Flows increased rapidly following the month's greatest precipitation on October 17-18. The greatest flows for the month in most basins occurred during October 19-20 following these rains. Flows at the end of the month remained noticeably above normal throughout the state.

**RESERVOIR STORAGE** for water supply during October was unchanged in the Mahoning basin reservoirs and declined in the Scioto basin reservoirs. Month-end storage was noticeably above normal in the Mahoning basin and slightly below normal in the Scioto basin.

Reservoir storage at the end of October in the Mahoning basin index reservoirs was 83 percent of rated capacity for water supply compared with the same for last month and 69 percent for October 1995. Month-end storage in the Scioto basin index reservoirs was 69 percent of rated capacity for water supply compared with 78 percent for last month and 83 percent for October 1995. Surface water supplies remain in good condition throughout the state.

MEAN STREAM DISCHARGE

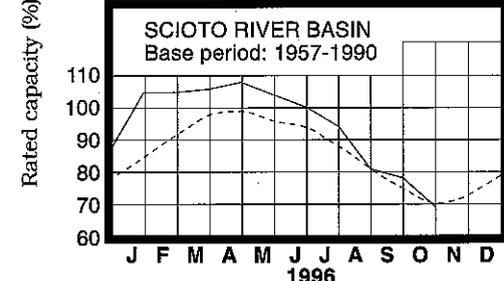
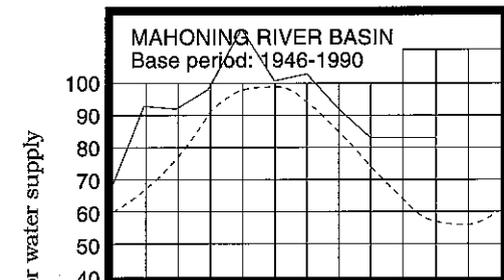
(4.81 - Off the chart)



Base period for all streams: 1961-1990

Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



Base period: 1946-1990 (Mahoning), 1957-1990 (Scioto)

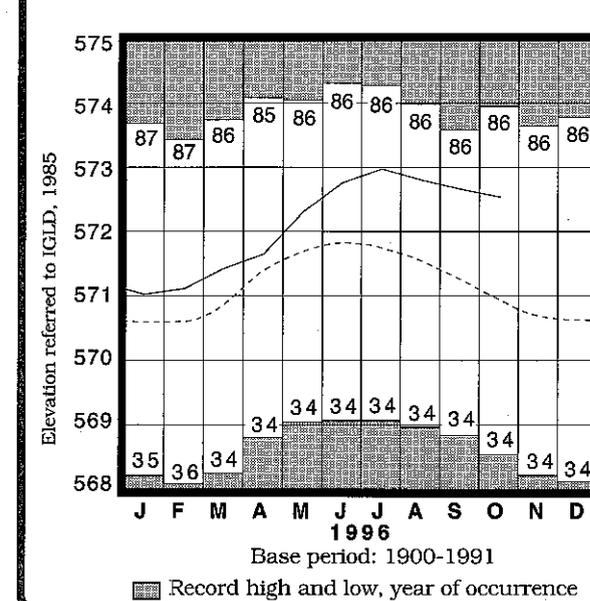
**GROUND WATER LEVELS** during October declined seasonally in all aquifers throughout the state. Generally, net changes during October from last month's levels were greater than usually observed in consolidated aquifers and less than usually observed in unconsolidated aquifers. Levels in most aquifers declined steadily throughout the month, but in some aquifers, especially shallow unconsolidated aquifers, levels rose for a week or so after October 17 responding to the month's greatest precipitation.

Ground water supplies continue to remain adequate throughout the state. Current levels are generally higher than they were a year ago in most aquifers, but slightly lower in some consolidated aquifers in the western half of the state. Ground water levels range from about 1 foot below to 1.5 feet above normal across the state. Generally, levels in consolidated aquifers are below normal and levels in unconsolidated aquifers are above normal. Ground water supplies are in a favorable position as the 1997 water year recharge season approaches. The Ohio Agricultural Statistics Service reports that at the end of October, soil moisture was rated as being adequate in 81 percent of the state, surplus in 14 percent of the state, and short in 5 percent of the state. These conditions favor improvement in ground water storage provided climatic conditions are near normal during the next several months.

**LAKE ERIE** level declined during October. The mean level was 572.54 feet (IGLD-1985), 0.13 foot below last month's mean level and 1.58 feet above normal. This month's level is 1.05 feet above the October, 1995 level and 3.34 feet above Low Water Datum.

The U. S. Army Corps of Engineers reports that precipitation in the Lake Erie basin during October averaged 3.3 inches, 0.5 inch above normal. The entire Great Lakes basin averaged 3.4 inches of precipitation during October, 0.6 inch above normal. For calendar year 1996 through October, the Lake Erie basin has averaged 35.4 inches of precipitation, 5.9 inches above normal, and the entire Great Lakes basin has averaged 31.1 inches, 3.9 inches above normal.

LAKE ERIE LEVELS at Fairport



Base period: 1900-1991

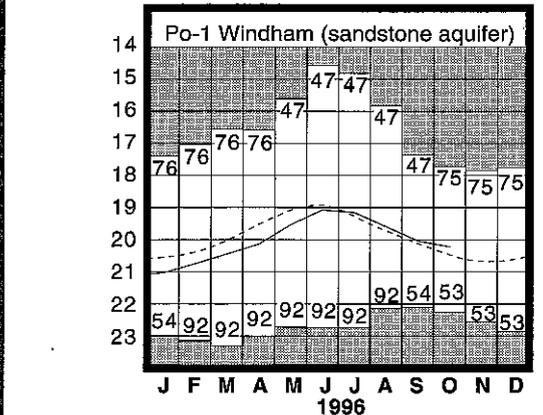
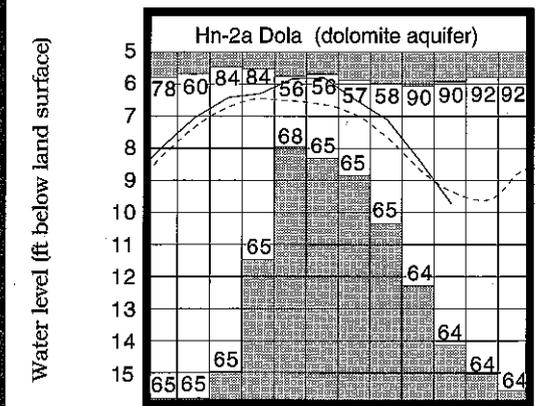
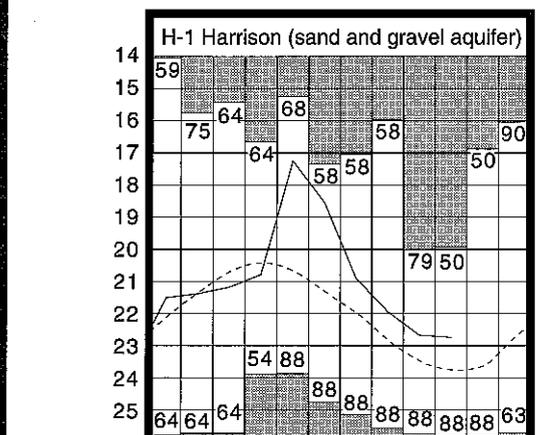
Normal - - - - Current - - - -

GROUND-WATER LEVELS

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
					This Month	
F-1	W. Rushville, Fairfield Co.	Sandstone	17.89	-1.00	-0.93	+0.10
Fa-1	Jasper Mill, Fayette Co.	Limestone	9.57	-0.56	-0.73	-1.24
Fr-10	Columbus, Franklin Co.	Gravel	42.97	+1.47	-0.08	+0.39
H-1	Harrison, Hamilton Co.	Gravel	22.74	+1.02	-0.06	+0.87
Hn-2a	Dola, Hardin Co.	Dolomite	9.72	-0.39	-1.37	-0.34
Po-1	Windham, Portage Co.	Sandstone	20.22	+0.25	-0.19	+0.85
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.65	-1.04	-0.10	+1.27

GROUND-WATER LEVELS



Base periods: H-1, 1951-1990. Hn-2a, 1955-1990. Po-1, 1947-1990

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

November 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)

1996 calendar year precipitation totals in most areas of the state have already exceeded the annual average with the only exception being in northwestern Ohio. The Northeast and Southwest regions have the potential to reach record or near-record annual precipitation amounts.

Precipitation for the first two months of the 1997 water year is above normal throughout most of the state, but slightly below normal in the Southwest and West Central regions. The state average is 5.85 inches, 0.86 inch above normal. Regional averages range from 8.71 inches, 3.11 inches above normal, for the Northeast Region to 4.89 inches for both the Central and West Central regions, 0.13 inch above normal and 0.01 inch below normal, respectively.

## SUMMARY

Precipitation was above normal throughout the state. Near-record snow fell in portions of northeastern Ohio. Streamflow was noticeably above normal throughout the state. Reservoir storage was unchanged in the Mahoning basin reservoirs and increased in the Scioto basin reservoirs. Storage was above normal in both basins. Ground water storage increased in unconsolidated aquifers, but declined in consolidated aquifers. Lake Erie level declined 0.20 foot and was 1.64 feet above the long-term November average.

## NOTES AND COMMENTS

### NEW ADMINISTRATOR FOR OHIO'S DAM SAFETY PROGRAM

Division of Water Chief Michele Willis recently announced the appointment of Mark Ogden as administrator of the division's Water Engineering Group. Mark will fill the vacancy created after George Mills, administrator for more than seven years, retired at the end of September.

As administrator of the Water Engineering Group, Mark will direct Ohio's dam safety program including inspections of existing dams and issuing permits for new dams, dikes and levies, the hydraulic operations and maintenance of Ohio's historic canal systems, and other water engineering projects for the ODNR owned facilities.

Mark, a graduate of The Ohio State University, has worked for the Division of Water for more than eleven years. He is a registered professional engineer in Ohio and has been active in the Water Management Association of Ohio for many years.

**PRECIPITATION** during November was above normal throughout Ohio. The state average was 3.43 inches, 0.78 inch above normal. Regional averages ranged from 4.30 inches, 1.42 inches above normal, for the Northeast Region to 2.97 inches, 0.54 inch above normal, for the North Central Region. Andover (Ashtabula County) reported the greatest amount of precipitation for the month, 7.58 inches; Chardon (Geauga County) reported 7.36 inches. Sandusky (Erie County) reported the least amount of November precipitation, 1.94 inches, the only location reporting less than two inches for the month.

Precipitation during November fell as both rain and snow with temperatures averaging well below normal throughout the state. The first week of the month was rather dry with only a few scattered sprinkles falling around the state. Conditions began to change after November 7 as a slow moving storm system brought rain showers to most of the state. Most areas of the state received around 1 inch of rain with amounts of 1.5 inches reported in portions of northwestern and southeastern Ohio. As this storm system moved northeastward, colder air moved into the state. By November 9 significant lake-effect snows were falling in northeastern Ohio. Snow squalls continued on and off for the next several days. By the time the storm ended, near-record snow accumulations were reported in Cleveland's eastern suburbs and the snow-belt portions of Ashtabula, Lake, and Geauga counties. Snow amounts of 1.5 to 3 feet were common with some areas reporting from 4 to more than 5 feet of snow. The greatest amount reported was 68.9 inches in Geauga County, Hambden Township, which is several miles east of Chardon. Chardon reported 53.6 inches of snow for the month, about 42 inches above normal. The snowiest month of record for Chardon was December 1962 when 69.5 inches of snow fell. The heavy, wet snow caused considerable damage to power distribution lines and many of the hardest hit areas were without electricity for several days. Fortunately, the melt was slow enough to not cause any significant flooding problems.

The middle of the month was rather dry with most locations reporting up to only a 0.5 inch or so of total precipitation which fell during November 17-18 and 21. The most widespread precipitation for the month fell during November 24-26. Most areas of the state received around 1.5 inches of rain with lesser amounts falling in northwestern Ohio. The month ended with light showers falling during the last two days with amounts of up to 0.5 inch reported at most locations; however, some areas in southern Ohio received nearly 1 inch or slightly more during this period.

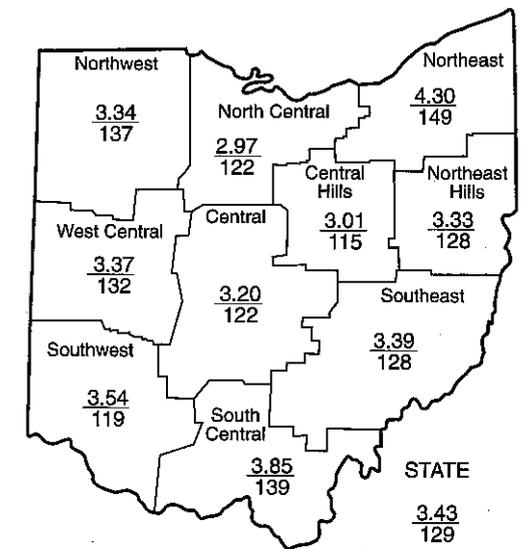
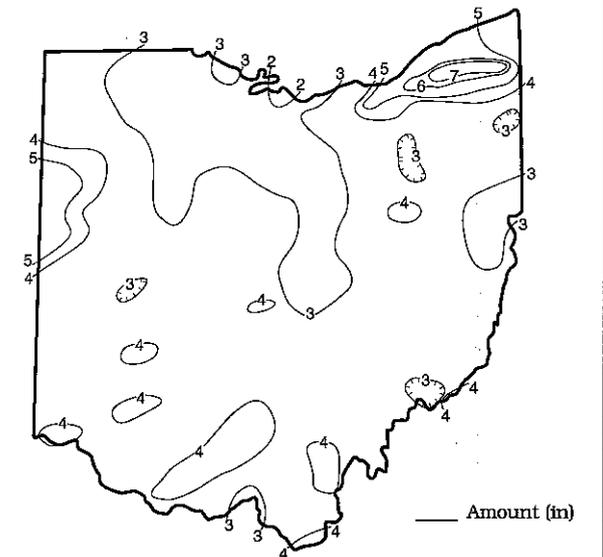
Precipitation for the 1996 calendar year is above normal throughout Ohio. The state average is 43.36 inches, 8.37 inches above normal. Regional averages range from 51.00 inches, 13.55 inches above normal, for the Southwest Region, to 32.26 inches, 0.75 inch above normal, for the Northwest Region. (continued on back)

## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.91	+0.66	+0.37	-0.53	-1.61	+1.0
North Central	+0.54	+5.78	+4.04	+5.10	+9.95	+4.2
Northeast	+1.42	+8.16	+8.88	+12.29	+13.27	+6.0
West Central	+0.81	+2.43	+1.52	+7.17	+12.56	+3.3
Central	+0.58	+2.51	+1.17	+7.54	+12.71	+3.7
Central Hills	+0.40	+4.60	+3.44	+7.76	+11.63	+4.6
Northeast Hills	+0.73	+4.16	+4.37	+7.55	+5.24	+3.5
Southwest	+0.56	+2.43	+2.25	+13.60	+16.55	+5.0
South Central	+1.08	+1.83	+1.95	+8.48	+8.39	+3.3
Southeast	+0.75	+2.86	+2.55	+9.81	+9.63	+4.4
State	+0.78	+3.54	+3.06	+7.90	+9.87	

\*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 NOVEMBER



## 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.



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

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**MEAN STREAM DISCHARGE**

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
				This Month		
Grand River near Painesville	685	2,731	240	228	191	151
Great Miami River at Hamilton	3,630	2,427	186	140	188	174
Huron River at Milan	371	192	221	175	152	134
Killbuck Creek at Killbuck	464	484	235	238	200	158
Little Beaver Creek near East Liverpool	496	473	207	169	128	130
Maumee River at Waterville	6,330	3,420	192	111	160	112
Muskingum River at McConnelsville	7,422	7,082	151	148	151	145
Scioto River near Prospect	567	320	330	186	154	148
Scioto River at Higby	5,131	3,460	183	154	208	178
Stillwater River at Pleasant Hill	503	255	277	128	155	149

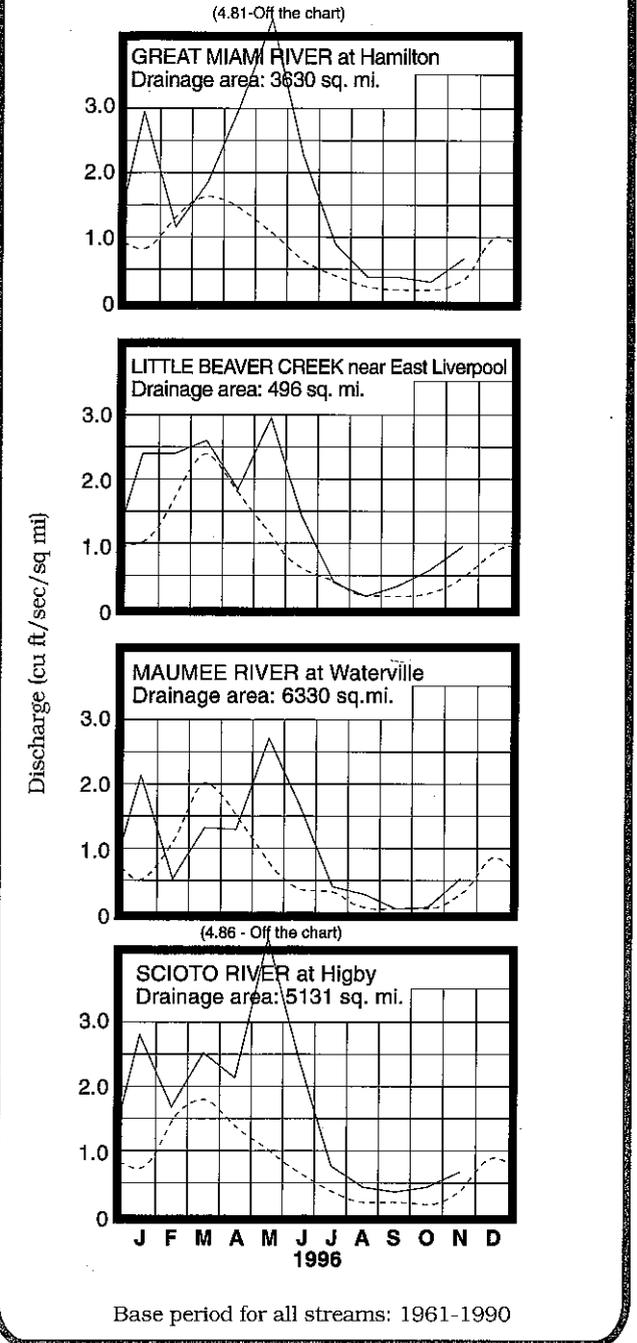
**STREAMFLOW** during November was noticeably above normal throughout the state. Flows in north-central, northeastern and eastern Ohio were high enough to be considered excessive. Flows during November were greater than the flows during October statewide.

Flows at the beginning of the month were above normal throughout most of the state but had fallen to below normal in western Ohio. Flows steadily declined during the first week of the month with nearly all locations recording the month's lowest flows during November 5-7. Flows increased following the precipitation of November 7-10 with some basins in northeastern and northwestern Ohio recording their greatest flows for the month during November 9-10. Basins in the remaining areas of the state had their greatest flows during November 26-28 following the month's most widespread precipitation of November 24-26. Flows at the end of the month were noticeably above normal throughout most of the state.

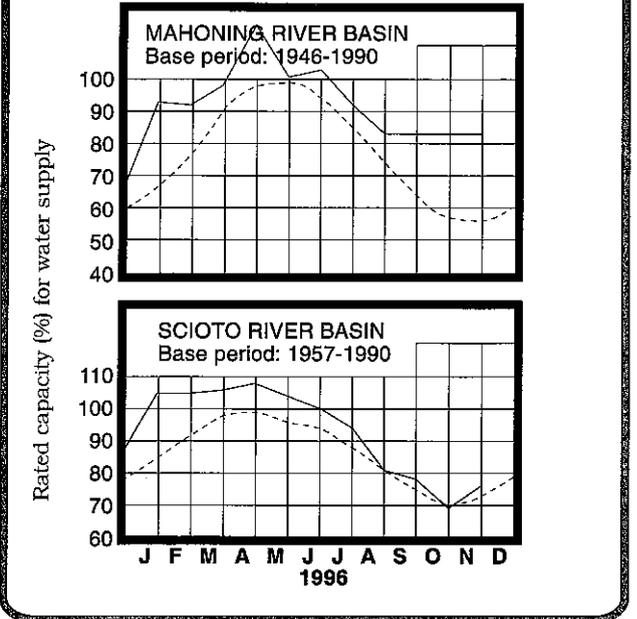
**RESERVOIR STORAGE** for water supply during November was unchanged in the Mahoning basin reservoirs and increased in the Scioto basin reservoirs. Storage remained at noticeably above normal levels in the Mahoning basin and increased to above normal levels in the Scioto basin.

Reservoir storage at the end of November in the Mahoning basin index reservoirs was 83 percent of rated capacity for water supply compared with the same for last month and 69 percent for November 1995. Storage has been stable in the Mahoning basin for the past several months. Month-end storage in the Scioto basin index reservoirs was 76 percent of rated capacity for water supply compared with 69 percent for last month and 90 percent for November 1995. Surface water supplies remain in good condition throughout the state.

**MEAN STREAM DISCHARGE**



**RESERVOIR STORAGE FOR WATER SUPPLY**



**GROUND WATER LEVELS**

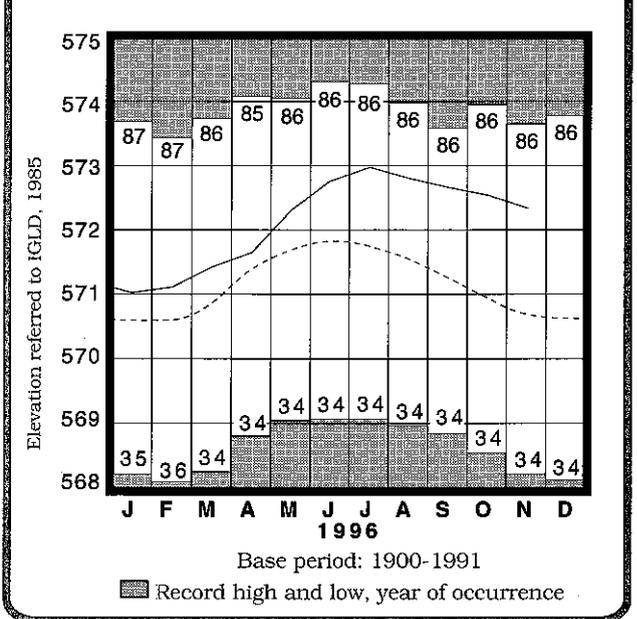
November showed mixed responses across the state. Generally, levels rose in unconsolidated aquifers and declined in consolidated aquifers. An exception was in northeastern Ohio where levels rose in all aquifers. Precipitation in northeastern Ohio was above normal in both October and November while the remainder of the state had below normal precipitation during October which would delay recharge to deeper aquifers. Generally, ground water levels declined or were stable during the first three weeks of November and then rose during the last week in response to the month's most widespread precipitation.

Although ground water levels have fallen to below normal in some consolidated aquifers, ground water supplies continue to remain adequate throughout the state. Levels in most aquifers are higher than they were a year ago except in some consolidated aquifers in the western half of the state where they are lower. Conditions are favorable for improvement in ground water storage during the 1997 water year recharge period.

**LAKE ERIE** level declined during November. The mean level was 572.34 feet (IGLD-1985), 0.20 foot below last month's mean level and 1.64 feet above normal. This month's level is 1.01 feet above the November 1995 level and 3.14 feet above Low Water Datum.

The U. S. Army Corps of Engineers predicts that, based on the present condition of the Great Lakes basin and anticipated future weather conditions, the level of Lake Erie will continue to remain above the long-term average for the next several months.

**LAKE ERIE LEVELS at Fairport**

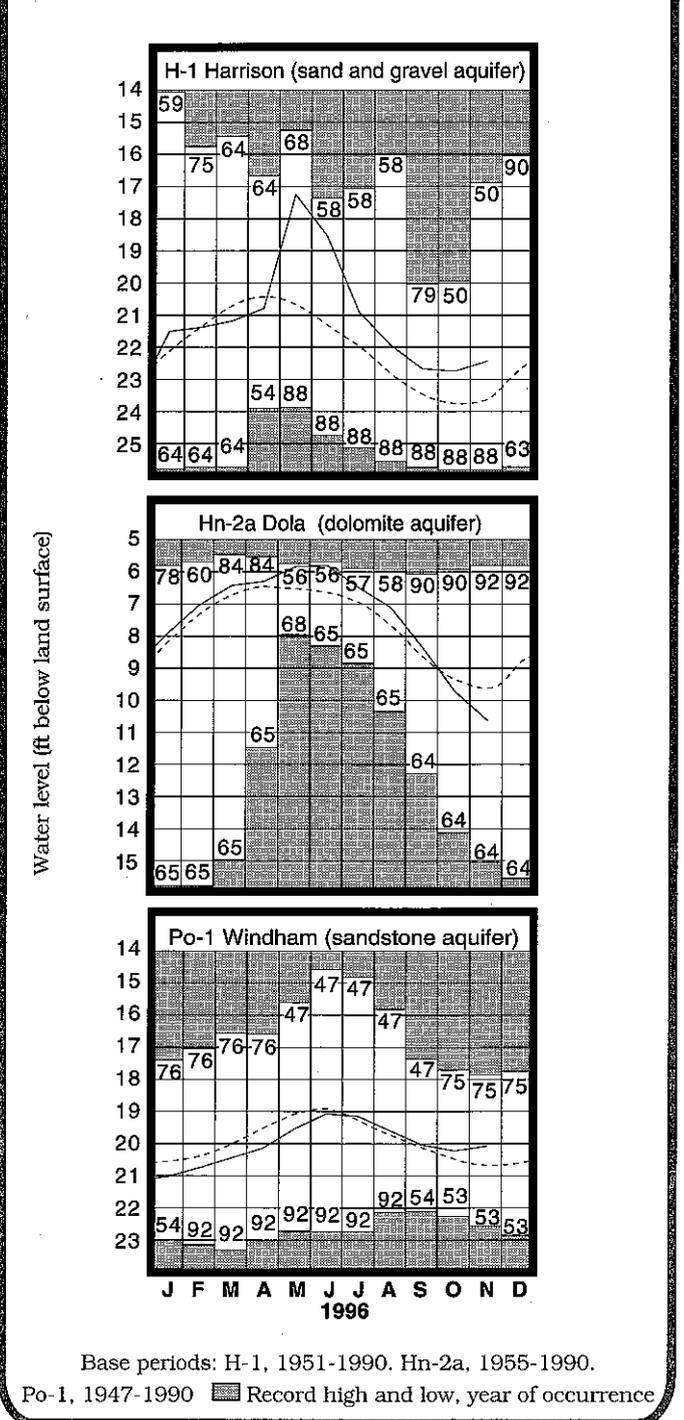


**GROUND-WATER LEVELS**

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

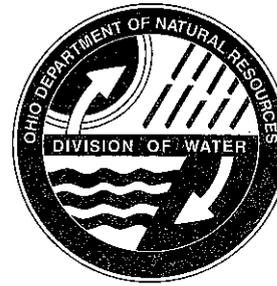
Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	18.38	-1.12	-0.49	+0.32
Fa-1	Jasper Mill, Fayette Co.	Limestone	9.79	-0.84	-0.22	-1.96
Fr-10	Columbus, Franklin Co.	Gravel	42.89	+1.40	+0.08	+0.06
H-1	Harrison, Hamilton Co.	Gravel	22.42	+1.24	+0.32	+0.90
Hn-2a	Dola, Hardin Co.	Dolomite	10.64	-1.01	-0.92	-1.25
Po-1	Windham, Portage Co.	Sandstone	20.09	+0.59	+0.13	+1.08
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.41	-0.85	+0.24	+1.57

**GROUND-WATER LEVELS**



Normal - - - - Current - - - -

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

December 1996

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)

precipitation during 1996, 69.54 inches. Bowling Green (Wood County) reported the least amount of precipitation during 1996, 28.41 inches, the only location reporting less than 30 inches for the year. An isohyetal map and regional averages with percentages of normal precipitation for the 1996 calendar year appear on the last page of this report.

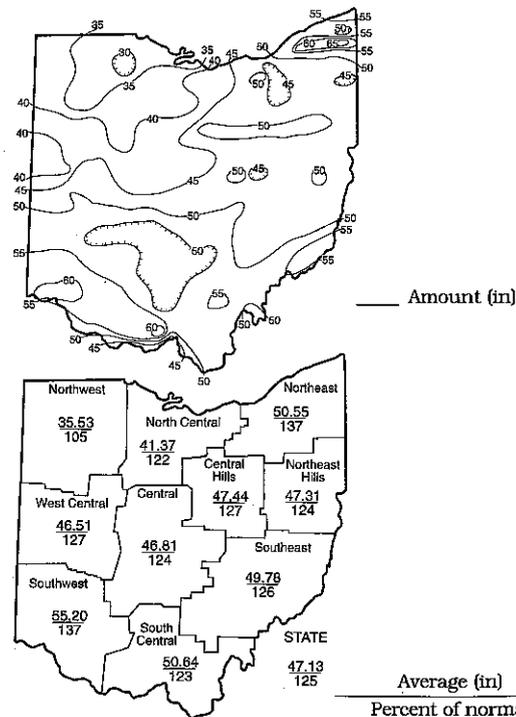
The 1996 calendar year was good for water supplies, but also included serious flooding events and delays in many spring agricultural activities. Much of Ohio had noticeably above normal snow during the first half of January which melted quickly after mid-month as temperatures warmed and rain fell throughout the state. Flooding of low-lying areas occurred statewide with counties bordering the Ohio River severely impacted. February precipitation was above normal in eastern Ohio, but below normal in western Ohio. March precipitation was below normal throughout the state except in a small area of southwestern Ohio. Then the rains began. April was the sixth wettest on record and May was the fifth wettest. June precipitation was noticeably above normal throughout much of the state and July precipitation was above normal except in a few areas of northeastern Ohio. Conditions started to change during the second half of July and quickly did an about face as August was unusually dry. The west-central and north-central areas of the state experienced record or near-record dryness in August, and for the state as a whole, it was the sixth driest August. September precipitation returned to the earlier pattern, being the second wettest on record for the state as a whole and regionally, the wettest September for the Northeast and North Central regions and the second wettest for the Central Hills Region. Northeastern Ohio continued to be unusually wet during October, but the remainder of the state had below normal precipitation. Precipitation was above normal throughout the state during both November and December with significant lake-effect snow falling in the snowbelt areas of northeastern Ohio during the second week of November.

### SUMMARY

Precipitation for December was above normal throughout the state. Streamflow was notably above normal throughout the state. Reservoir storage increased in the Scioto basin and declined slightly in the Mahoning basin. Storage remained above normal in both basins. Ground water levels rose in all aquifers across the state and were above normal statewide. Lake Erie level rose 0.13 foot and was 1.84 feet above the long-term December average.

Precipitation for the 1996 calendar year was above normal throughout the state. The state average was 47.13 inches which ranks as the fourth wettest year during the past 114 years. This was the wettest year on record for the Northeast Region. Streamflow was noticeably above normal for the year. Reservoirs and surface water supplies were in good condition throughout the year. Ground water supplies improved considerably during the year. Lake Erie level was above the long-term average throughout the year. The 1996 calendar year was good for water supplies but also included serious flooding and delays in spring agricultural activities.

### PRECIPITATION 1996 CALENDAR YEAR



**PRECIPITATION** during December was above normal throughout most of the state with only a few locations in southeastern Ohio receiving below normal precipitation. The state average was 3.82 inches, 1.24 inches above normal. Regional averages ranged from 4.37 inches, 1.90 inches above normal, for the West Central Region to 2.95 inches, 0.23 inch above normal, for the Southeast Region. Lakeview (Logan County) reported the greatest amount of precipitation for the month, 5.76 inches. Philo (Muskingum County) reported the least amount, 1.90 inches.

Precipitation during December fell as both rain and snow, but generally, snow amounts were below normal throughout the state. December started with some scattered rain showers during the first week which changed to snow showers early in the second week. Precipitation amounts were generally 0.5 inch during this period, but some areas reported up to 1 inch of precipitation. Stronger storms crossed the state during December 11-12. The greatest amounts reported were more than 1 inch which fell across northern and south-central Ohio. The month's greatest precipitation for much of the state fell during December 16-17. Most areas received about 1 inch of rain, but some areas reported nearly 2 inches. More rain showers fell during December 22-23 with amounts generally around 0.5 inch, but more than 1 inch was reported at some locations. Light rain and snow showers persisted during the last week of the month producing only small amounts of precipitation.

Precipitation for the 1997 water year is above normal throughout the state. The state average is 9.63 inches, 2.06 inches above normal. Regional averages range from 12.56 inches, 4.32 inches above normal, for the Northeast Region to 8.42 inches, 0.73 inch above normal, for the Southeast Region (see Precipitation table, departure from normal, past 3 months column). Precipitation and other climatic conditions have been favorable for recharge to water supplies so far during the 1997 water year.

Precipitation for the 1996 calendar year was above normal throughout the state except for a small area in northwestern Ohio where it was below normal. The state average was 47.13 inches, 9.56 inches above normal. This ranks 1996 as the fourth wettest year in the past 114 years for the state as a whole. Regional averages ranged from 55.20 inches, 14.93 inches above normal, for the Southwest Region to 35.53 inches, 1.71 inches above normal, for the Northwest Region (see Precipitation table, departure from normal, past 12 months column). This was the wettest year of record for the Northeast Region, the second wettest for the Central Hills and Southwest regions, the third wettest for the Northeast Hills and Southeast regions, the fourth wettest for the Central and West Central regions, the fifth wettest for the South Central Region, and the eighth wettest for the North Central Region. Andover (Ashtabula County) reported the greatest amount of

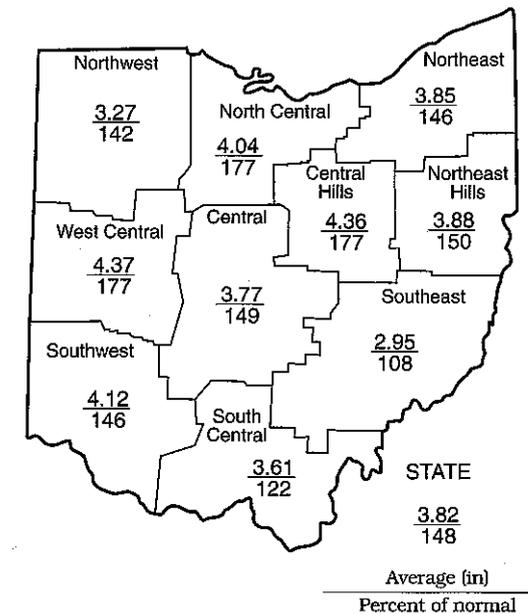
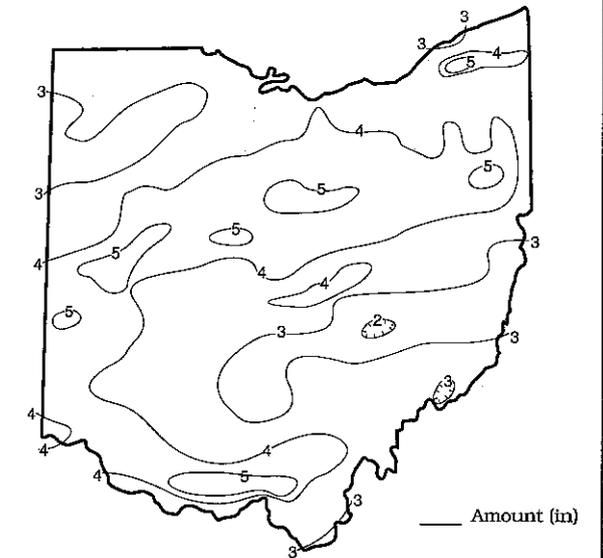
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### PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.96	+1.66	+0.66	+1.71	-0.89	+1.9
North Central	+1.76	+2.98	+4.88	+7.34	+11.09	+4.5
Northeast	+1.21	+4.32	+8.41	+13.58	+14.38	+6.1
West Central	+1.90	+1.95	+3.36	+9.82	+14.85	+4.6
Central	+1.24	+1.31	+2.15	+9.20	+14.01	+3.9
Central Hills	+1.89	+2.66	+4.13	+10.04	+13.07	+5.0
Northeast Hills	+1.30	+2.62	+3.74	+9.28	+6.36	+4.2
Southwest	+1.30	+1.17	+1.83	+14.93	+18.23	+5.1
South Central	+0.65	+1.24	+1.42	+9.35	+9.06	+3.3
Southeast	+0.23	+0.73	+2.22	+10.19	+9.83	+3.9
State	+1.24	+2.06	+3.28	+9.56	+11.03	

\*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

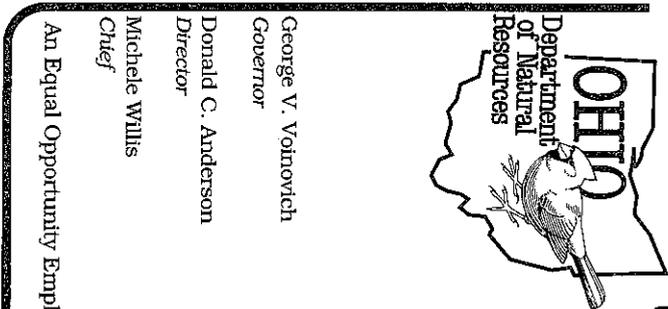
### PRECIPITATION DECEMBER 1996



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

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	This Month % of Normal	% of Normal Past		
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Maumee River at Waterville	6,330	13,495	249	191	166	132
Muskingum River at McConnelsville	7,422	16,120	226	208	151	159
Scioto River near Prospect	567	1,969	752	564	293	182
Scioto River at Higby	5,131	11,886	259	235	189	194
Stillwater River at Pleasant Hill	503	1,419	352	301	195	173

**STREAMFLOW** during December was noticeably above normal throughout the state. Flows were high enough to be considered excessive in all drainage basins statewide. Flows in north-central, western and south-western Ohio were the second or third highest of record for December with flows in the other areas of the state easily ranking in the top ten highest for December.

Flows at the beginning of the month were noticeably above normal throughout the state. Generally, flows declined during the first ten days of the month with all drainage basins having their month's lowest flows during December 10-11. The greatest flows for the month occurred regionally at different times following the passage of storm systems generally during December 12-13 in northern Ohio, during December 18-19 in central, eastern, and southern Ohio, and during December 24-25 in western and northwestern Ohio. Flows at the end of the month remained noticeably above normal throughout the state.

Streamflow during the 1996 calendar year was notably above normal throughout the state (see Mean Stream Discharge table, departure from normal, past 12 months column). Flooding occurred during January and during the late spring and early summer months. The January flooding was caused by rapid snowmelt and rain falling on frozen ground. The counties that border the Ohio River were the most severely impacted. Much of the runoff came from the drainage area of the Ohio River in Pennsylvania. Flooding that occurred during April, May, and June was caused by heavy rain showers and locally severe thunderstorms throughout the period. Soils were at or near moisture retention capacities thus resulting in increased runoff. Many locations had record or near-record May flows. December flows were also near-record in north-central, western, and southwestern Ohio.

**RESERVOIR STORAGE** for water supply during December increased sharply in the Scioto basin reservoirs and declined slightly in the Mahoning basin reservoirs. Storage remained noticeably above normal in both basins.

Reservoir storage at the end of December in the Mahoning basin index reservoirs was 81 percent of rated capacity for water supply compared with 83 percent for last month and 68 percent for December 1995. Month-end storage in the Scioto basin index reservoirs was 97 percent of rated capacity for water supply compared with 76 percent for last month and 88 percent for December 1995.

Surface water supplies were adequate throughout the 1996 calendar year. Storage in both on- and off-stream reservoirs was near or above normal throughout the year. High water levels were a nuisance during the winter and spring months as flood-control reservoirs often needed to utilize available storage. Some reservoirs in the lower Scioto River basin reached record or near-record levels during May. Recreational reservoirs easily maintained summer pool levels during most of the season. At the end of the year, surface water supplies are in excellent condition.

**GROUND WATER LEVELS** during December rose throughout the state. Net changes during December from last month's levels were noticeably greater than usually observed. Generally, levels rose steadily throughout the month in consolidated and most deep, unconsolidated aquifers while levels in shallow, unconsolidated aquifers responded quickly to precipitation, rising sharply after mid-month.

The 1997 water year recharge season is off to a good start as far as ground water supplies are concerned. Current ground water levels are near or slightly above normal in consolidated aquifers and favorably above normal in most unconsolidated aquifers. This year's levels are also notably above last year's levels in most aquifers, especially in the eastern half of the state where levels have been slowly recovering from deficient recharge during the past few years.

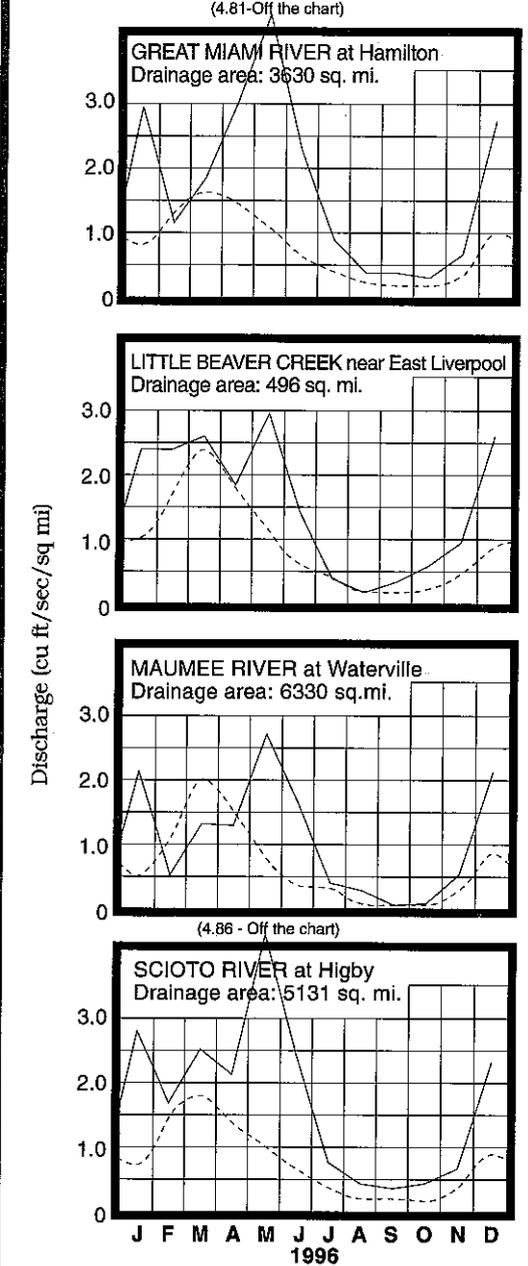
The 1996 calendar year was good for ground water supplies. As the year began, levels were just beginning to recover from dry conditions in 1994 and 1995. The year roared off to a good start as significant recharge occurred after the January thaw when snowmelt and rain combined to produce high-water conditions in many areas of the state. Although ground water levels in aquifers in the eastern half of Ohio remained below normal, they were well on their way to recovery after January. Additional recharge continued through the middle of June as the late spring months were unusually wet. By early summer, ground water levels throughout the state had finally recovered to near or above normal levels. Ample precipitation during the summer months reduced demand, and although August was very dry, ground water supplies continued to remain in good condition. Seasonal declines in ground water levels during September and October, enhanced by the lack of August precipitation, did not have a serious adverse effect on ground water supplies. Favorable climatic and soil moisture conditions during the late autumn months resulted in recharge starting in November and continuing steadily through the end of the year. Ground water supplies are in good condition at the end of 1996.

**LAKE ERIE** level rose during December. The mean level was 572.47 feet (IGLD-1985), 0.13 foot above last month's mean level and 1.84 feet above normal. This month's level is 1.24 feet above the December 1995 level and 3.27 feet above Low Water Datum.

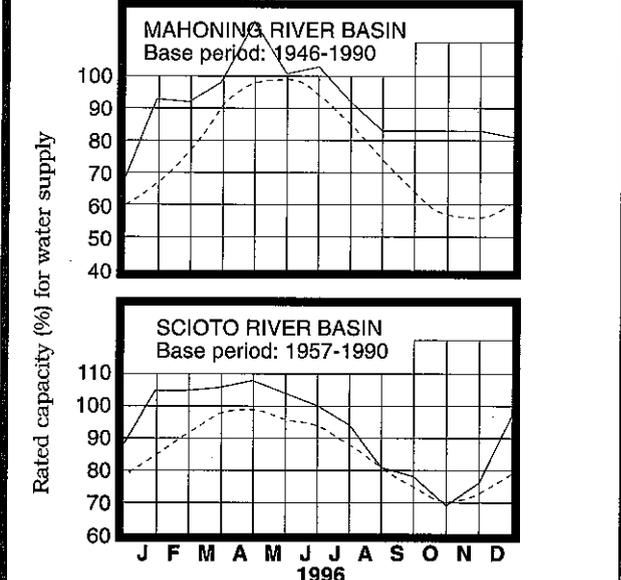
The U. S. Army Corps of Engineers reports that precipitation in the Lake Erie basin during December averaged 3.1 inches, 0.5 inch above normal. The entire Great Lakes basin also averaged 3.1 inches of precipitation during December, 0.8 inch above normal. For calendar year 1996, the Lake Erie basin averaged 41.2 inches of precipitation, 6.3 inches above normal, and the entire Great Lakes basin averaged 36.8 inches, 4.5 inches above normal.

Lake Erie remained above the long-term average level throughout the 1996 calendar year. The U. S. Army Corps of Engineers predicts that, based on the present condition of the lake basin and anticipated future weather conditions, the level of Lake Erie should remain above the long-term average for the next several months.

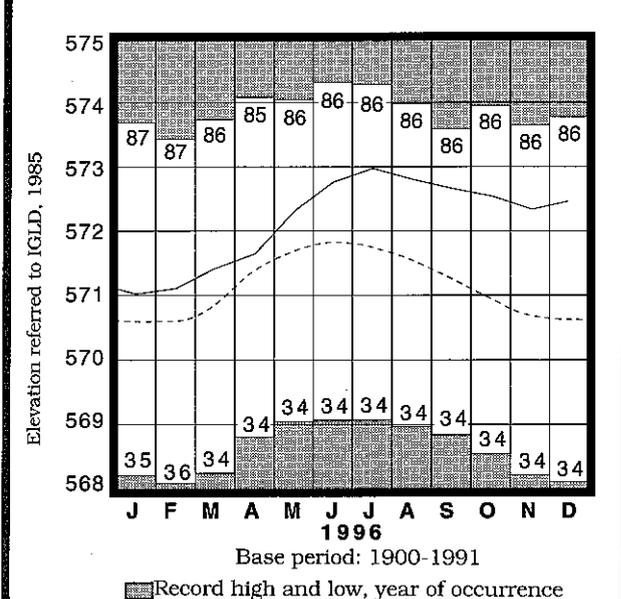
MEAN STREAM DISCHARGE



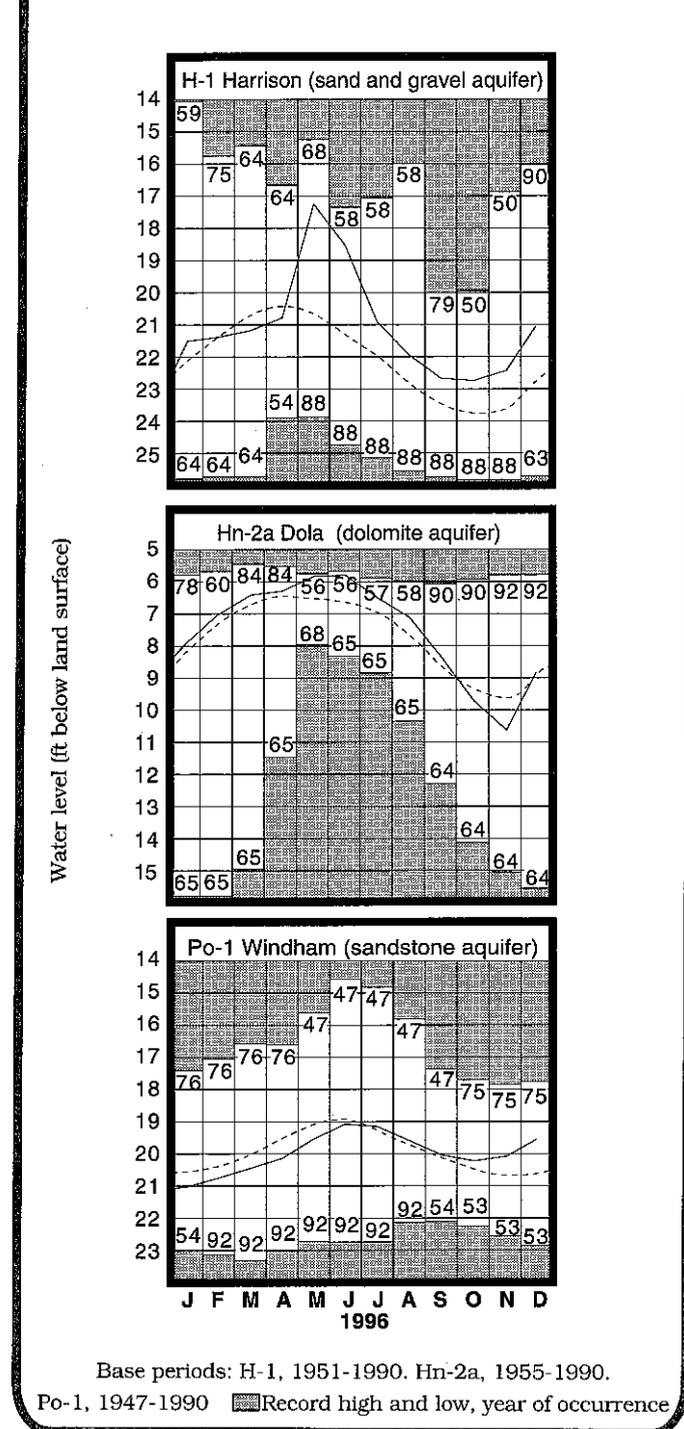
RESERVOIR STORAGE FOR WATER SUPPLY



LAKE ERIE LEVELS at Fairport



GROUND-WATER LEVELS



Normal - - - - Current

Normal - - - - Current