



# MONTHLY WATER INVENTORY REPORT FOR OHIO

January 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## NOTES AND COMMENTS

### DIVISION OF WATER CHIEF PLANS RETIREMENT

Robert L. "Buckeye Bob" Goettemoeller, chief of the Division of Water, will retire from state government service on February 29, 1992. Bob joined ODNR in 1969 when the Ohio Soil and Water Conservation Committee staff, on which he served, became ODNR's Division of Soil and Water Conservation. He was a soil and water specialist for that division until his appointment as acting chief of the Division of Water in September 1983. Prior to joining ODNR, Bob spent six years working for the U.S. Soil Conservation Service.

During his career, Bob helped change the direction of soil and water protection and management in Ohio. He was instrumental in the development and enactment of major state legislation for soil conservation, nonpoint source pollution and statewide water management including coastal management, ground-water quantity management and water rights, dam safety and flood damage reduction. While with the Division of Soil and Water Conservation, Bob played an important role in the development of Ohio's agricultural pollution and urban sediment pollution abatement programs and storm water management programs. Under his leadership, major water management issues have been elevated to the pinnacle of attention and support.

Bob was reared in rural Mercer County near Maria Stein. He attended The Ohio State University where he earned a bachelor of science degree in agriculture and a masters degree in agronomy. He has been affiliated with a number of professional organizations and received many awards for his expertise, hard work and dedication.

The Division of Water has been fortunate to have Bob as chief. His positive approach and optimistic outlook, as well as his personal involvement, have benefited all programs in the division. The Division of Water staff says "Thanks and Enjoy your retirement."

Retirement might not be exactly accurate since Bob plans to keep working in the private sector. Additionally, Bob and his wife Bernice will surely find time to play golf, garden, visit family and of course, support The Ohio State Buckeyes.

### NEW PUBLICATIONS

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

The Ground Water Resources of Guernsey County

by Alfred C. Walker

The Ground Water Resources of Hocking County

by Alfred C. Walker

These maps are two in a series of county ground-water resources maps which have been completed for 81 of Ohio's 88 counties. 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.

These new maps cost \$6.53 each (includes postage, handling and tax). They can be ordered from: ODNR-Publications Center, 4383 Fountain Square, Building B-1, Columbus, Ohio, 43224-1362. Make checks payable to ODNR-Publications Center.

Ground Water Pollution Potential of Ashtabula County

by Linda Aller and Karen Ballou, Geodysey, Inc. in cooperation with the Ohio Department of Natural Resources (ODNR), Division of Water

Ground Water Pollution Potential of Butler County

by the Groundwater Research Center, University of Cincinnati in cooperation with the ODNR, Division of Water

Ground Water Pollution Potential of Darke County

by Paul N. Spahr

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 them in making educated decisions about local development and siting of potentially polluting operations or activities. 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.

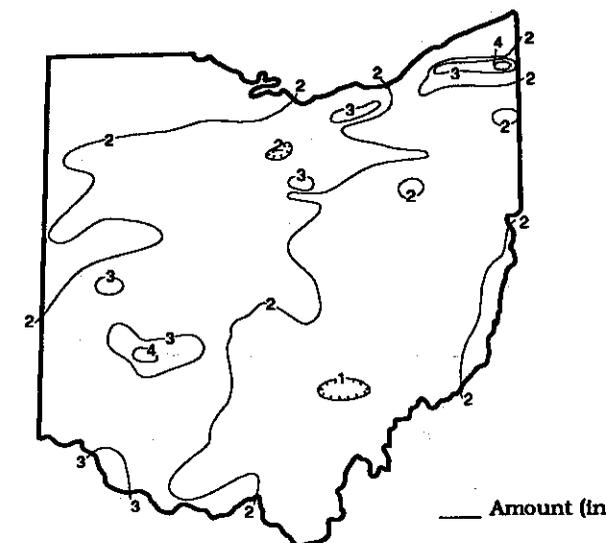
Mapping an area's potential for ground-water pollution is a relatively new idea. This map uses the DRASTIC system as developed for the U.S. Environmental Protection Agency by the National Water Well Association. DRASTIC values, as shown on the map, indicate an area's relative vulnerability to contamination 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. These new maps cost \$12.30 each (includes postage, handling and tax) and can be ordered from the ODNR Publications Center at the address listed above.

**PRECIPITATION** for January was below normal throughout most of the state; only a few areas in the southwestern and north-central portions received above normal precipitation. The state average was 2.10 inches, 0.66 inch below normal. Regional averages ranged from 2.92 inches, 0.31 inch below normal, for the Southwest Region to 1.59 inches, 1.38 inches below normal, for the Southeast Region. The North Central Region was the only region with above normal precipitation averaging 2.38 inches, 0.08 inch above normal. Andover (Ashtabula County) reported the greatest amount of precipitation for the month, 4.52 inches. The only other location reporting more than 4 inches of precipitation for the month was Xenia (Greene County), 4.16 inches. Nelsonville (Athens County) reported the least amount of precipitation for the month, 0.87 inch.

Precipitation during the first half of the month fell mostly in the form of rain, while during the second half it was mostly snow. Scattered showers fell during January 3-4 with the greatest amounts of up to nearly 1 inch falling in the southwestern portion of the state, then diminishing to trace amounts in the northeastern portion. Many locations from the southwestern portion up through the north-central portion of the state received their greatest precipitation during January 13-15. The precipitation started as rain prior to the cold front passage with thunderstorms reported at many locations. Total precipitation ranged from slightly more than 2 inches at some locations to much less in the southeastern portion of the state. Another snowstorm passed through the state during January 23-24 with the greatest amounts falling across the mid-section of the state. Total snowfall for the month was slightly above normal at most locations in the northern two-thirds of the state.

Precipitation for the 1992 water year is below normal throughout the state with the only exception being in the Northwest Region where it is above normal. The state average is 9.05 inches, 1.28 inches below normal. Regional averages range from 11.23 inches, 2.02 inches above normal, for the Northwest Region to 7.49 inches, 2.55 inches below normal, for the Central Hills Region. The below normal precipitation during the current 1992 water year recharge season has not significantly improved the overall water supply situation. Several months with recharge potential remain. Normal precipitation during these months would improve the state's situation considerably.

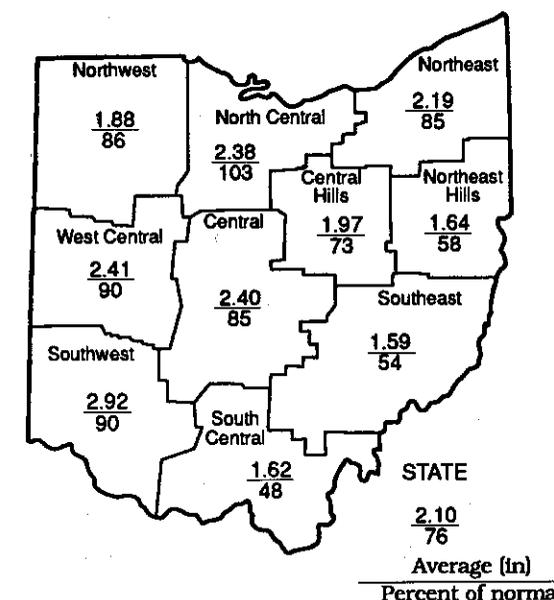
## PRECIPITATION JANUARY 1992



## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.30	-1.37	+1.47	-2.72	+8.73	-1.8
North Central	+0.08	-1.35	-0.68	-6.66	+5.24	-3.2
Northwest Hills	-0.40	-1.47	-3.13	-8.63	+7.48	-3.6
West Central	-0.26	-1.32	-3.67	-7.75	+7.90	-3.0
Central	-0.41	-1.02	-3.06	-8.55	+6.24	-4.5
Central Hills	-0.73	-1.72	-3.08	-10.06	+5.96	-5.1
Northwest Hills	-1.19	-0.90	-3.80	-10.27	+5.36	-5.1
Southwest	-0.31	-0.69	-2.09	-2.67	+13.60	-0.6
South Central	-1.75	+0.16	-0.17	-3.18	+3.79	-1.2
Southeast	-1.38	+0.36	-1.08	-4.85	+8.91	-2.6
State	-0.66	-0.93	-1.93	-6.52	+7.33	

\*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



## ACKNOWLEDGEMENTS

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.



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

George V. Voinovich  
Governor

Frances S. Buchholzer  
Director

Robert L. Goettemoeller  
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	500	54	20	15	47
Great Miami River at Hamilton	3,630	1,269	39	26	35	76
Huron River at Milan	371	210	67	34	37	61
Killbuck Creek at Killbuck	464	142	39	49	50	69
Little Beaver Creek near East Liverpool	496	162	26	30	35	55
Maumee River at Waterville	6,330	3,350	87	76	88	76
Muskingum River at McConnelsville	7,422	2,345	30	42	44	68
Scioto River near Prospect	567	80	23	13	16	51
Scioto River at Higby	5,131	1,851	29	31	39	73
Stillwater River at Pleasant Hill	503	103	23	18	23	63

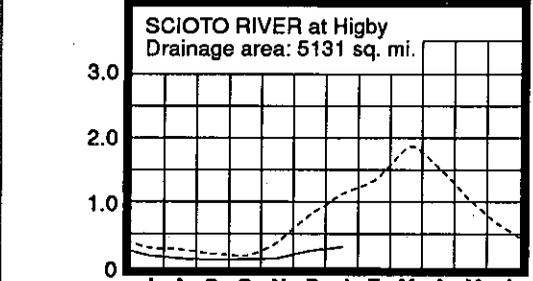
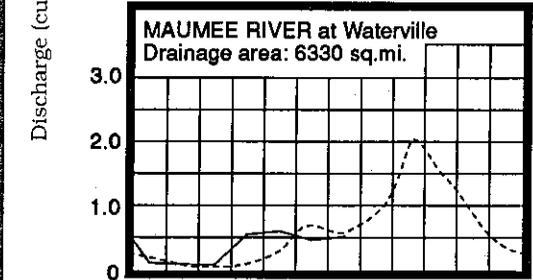
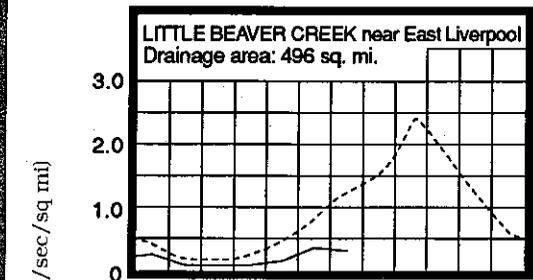
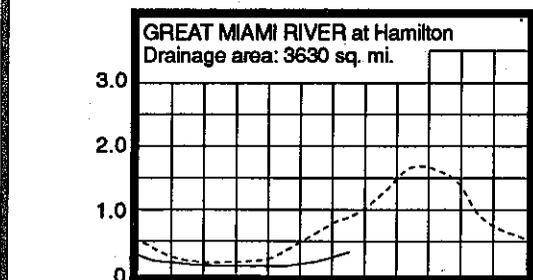
**STREAMFLOW** during January was below normal throughout the state. Flows were low enough to be considered deficient in all but the northwestern and northern portions of the state. Flows in January were greater than in December in most areas.

Flows were noticeably deficient at the beginning of the month statewide. Most drainage basins had their lowest flows for the month early in the first week while several basins in the northeastern portion of the state had their lowest flows a few days prior to mid-month. Greatest flows for the month occurred during January 24-26 for most areas of the state except in the southwestern portion where they occurred around the middle of the month. Flows at the end of the month were greater than flows at the start of the month, but still remained noticeably below normal throughout the state.

**RESERVOIR STORAGE** for water supply during January was unchanged in the Mahoning River basin and increased in the Scioto River basin. Storage remained noticeably below normal in both basins.

Reservoir storage at the month's end in the Mahoning Basin index reservoirs was 43 percent of rated capacity for water supply compared with the same for last month and 76 percent for January 1991. Month-end storage in the Scioto basin index reservoirs was 64 percent of rated capacity for water supply compared with 57 percent for last month and 92 percent for January 1991.

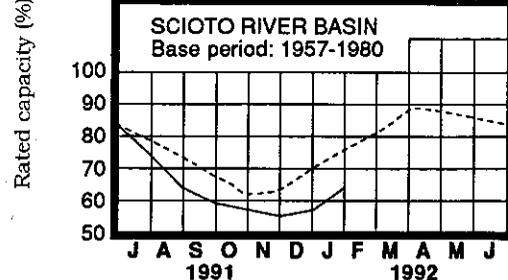
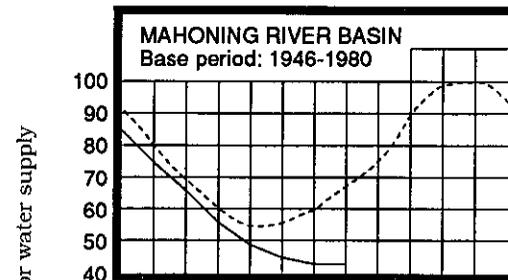
**MEAN STREAM DISCHARGE**



Base period for all streams: 1951-1980

Normal - - - - Current - - - -

**RESERVOIR STORAGE FOR WATER SUPPLY**



**GROUND-WATER LEVELS** during January showed improvement in the western and southern portions of the state but were stable or continued to decline in the eastern and northeastern portions. Ground-water levels continue to remain noticeably below normal throughout the state. Current levels generally range from 2 feet to more than 6 feet below normal. This year's levels differ markedly from the January 1991 levels ranging from 2 feet to more than 9 lower.

Several observation wells in the central and eastern portions of the state reached record-low levels once again in January including index wells F-1 and Tu-1 (see Ground-Water Levels table on this page for aquifer type and location).

The 1992 water year recharge season has resulted in extremely limited improvement in ground-water storage. Although several months with the potential for recharge exist, conditions do not favor significant improvement to normal levels. Water supply managers with ground water sources should monitor closely their respective situations and plan accordingly.

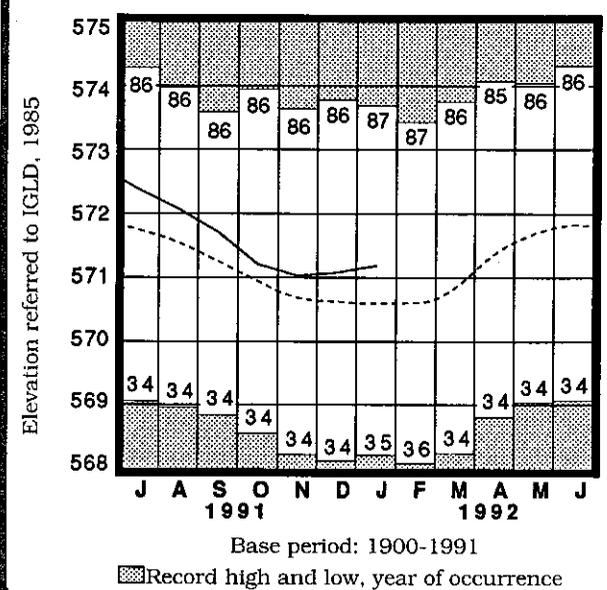
**LAKE ERIE** level rose during January. The mean level was 571.18 feet (IGLD-1985), 0.11 foot above last month's mean level and 0.58 foot above normal. This month's level is 1.11 feet below the January 1991 level and 1.98 feet above Low Water Datum.

Two important changes have been made in the reporting of Lake Erie's level. First, all future Great Lakes' levels will be referenced to a new common datum known as the International Great Lakes Datum, 1985 (IGLD-1985). Secondly, the master gauge for Lake Erie has been changed from Cleveland to Fairport. Both of these changes have been incorporated in the graph provided in this report. Additionally, new long-term monthly averages have been calculated for Fairport for the expanded base period of 1900-1991. More information on IGLD-1985 and the other changes will be provided in this report at a later date.

**SUMMARY**

Precipitation was below normal throughout most of the state. Streamflow was noticeably below normal in most drainage basins. Reservoir storage remained noticeably below normal. Ground-water storage improved slightly in the western and southern portions of the state but continued to reach record-low levels in the central, eastern and northeastern portions. Lake Erie level rose slightly and was 0.58 foot above normal. Much of the state continues to be in a severe or extreme drought classification.

**LAKE ERIE LEVELS at Fairport**



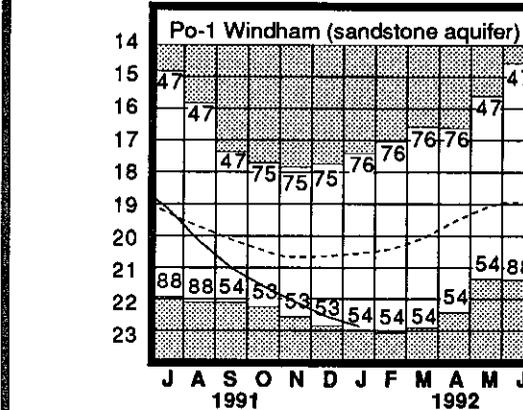
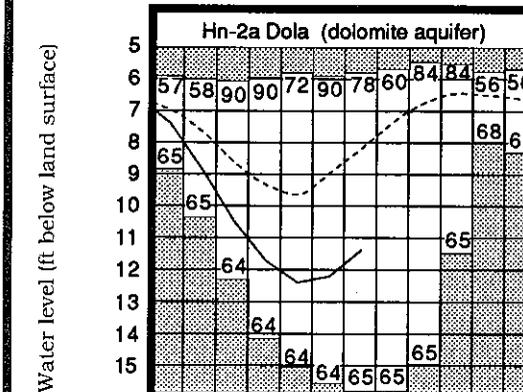
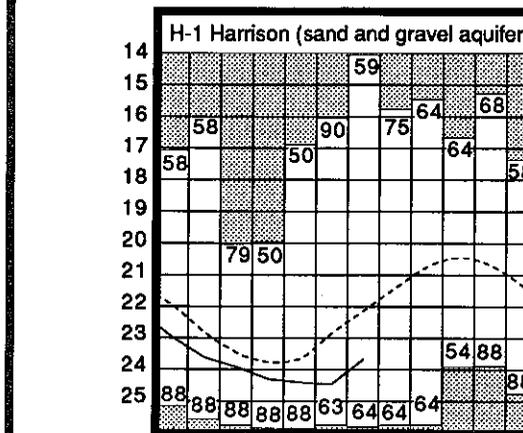
Normal - - - - Current - - - -

**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	21.65	-6.10	-0.22	-9.39
Fa-1	Jasper Mill, Fayette Co.	Limestone	10.15	-3.07	+1.49	-3.33
Fr-10	Columbus, Franklin Co.	Gravel	42.91	+0.70	+0.09	-2.23
H-1	Harrison, Hamilton Co.	Gravel	23.66	-1.53	+0.78	-4.42
Hn-2a	Dola, Hardin Co.	Dolomite	11.39	-3.19	+0.83	-5.26
Po-1	Windham, Portage Co.	Sandstone	22.87	-2.32	-0.30	-4.51
Tu-1	Strasburg, Tuscarawas Co.	Gravel	15.90	-2.97	-0.06	-6.17

**GROUND-WATER LEVELS**



Base periods: H-1, 1951-1990. Hn-2a, 1955-1990. Po-1, 1947-1990. Shaded areas indicate record high and low, year of occurrence

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

February 1992

Compiled By David H. Cashell  
Hydrologist  
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## SUMMARY

Precipitation was below normal throughout the state. Streamflow was noticeably below normal in all but the northwestern portion of the state. Reservoir storage remained virtually unchanged and below normal. Ground-water storage improved slightly in the western and southern portions of the state, but showed little improvement in the central, eastern and northeastern portions. Record-low levels were reached in some areas. Lake Erie level rose slightly and remained above the long-term average. Much of the state continues to be affected by drought conditions. Water supply managers should monitor their specific situations.

## NOTES AND COMMENTS

### BUCKEYE LAKE HAS NEW AUXILIARY SPILLWAY

A new auxiliary spillway for Buckeye Lake has recently been completed. Located at Seller's Point, the new auxiliary spillway will function only during high water situations to help ensure that the earthen dam embankment will never overtop. The Seller's Point spillway project cost approximately \$3 million. Construction included the placement of more than 5,000 cubic yards of concrete for the spillway and a new outlet channel to the South Fork of the Licking River. Also, a new bridge for State Route 360 was built across this channel.

Additional construction for the Buckeye Lake dam project is expected to begin this spring and should be completed this year. This includes replacing the existing (main) spillway and any final work on the outlet channels. When completed, normal and small flood flows will pass through the replacement (main) spillway and then the auxiliary or secondary spillway at Seller's Point as needed when higher water levels occur.

### NEW EMPLOYEES IN THE GWRS

Several new employees have joined the Ground-Water Resources Section (GWRS) staff during the past several months.

Joel Vormelker has joined the GWRS as a hydrogeologist. He has spent the past 23 years working for ODNR's Division of Geological Survey. While with the Geological Survey, he authored several county bedrock and drift thickness maps. Joel's experience will prove invaluable as he answers inquiries for information, assists in special investigation projects and participates in various hydrogeologic mapping projects. Joel has earned bachelor of science and master of science degrees in geology from Allegheny College and the University of Florida respectively. Joel enjoys boating and fishing and is also an avid photographer.

Tim Jackson has also joined the GWRS as a hydrogeologist. Tim will be answering inquiries for information and also serve as the GWRS's driller liaison, working with water well drillers and their local professional organization. In addition, Tim will serve as editor for the Division of Water's "Down Hole View," a technical newsletter addressing issues in the ground water and well drilling industry. Tim earned a bachelor of science degree in geology from The Ohio State University and an associates degree in construction management from Columbus State Community College. Prior to joining ODNR, Tim worked for Gemstar/Wallick Construction. Away from work, Tim enjoys fishing and playing baseball and soccer.

Patsy Cutler is a new clerk/receptionist in the GWRS. Patsy previously worked for ODNR's Division of Oil and Gas where she reviewed permit applications, answered operator questions and collected permit fees. In the GWRS, she will coordinate the dissemination of well log and drilling reports, process well logs as they are received and perform other duties as a receptionist. In her spare time, Patsy enjoys camping and outdoor sports, baking and spending time with her family.

Nikkole Cordell has also joined the GWRS as a clerk/receptionist. Nikkole came to the GWRS from ODNR's Administration EEO/Contract Compliance office where her duties were very similar. At the GWRS, Nikkole is the receptionist in the Technical Services Unit (well logs) where she greets and assists visitors who are using the division's well logs; she also processes invoices and requests for information and performs other clerical duties. Nikkole enjoys shopping, swimming, watching soap operas and visiting with her family.

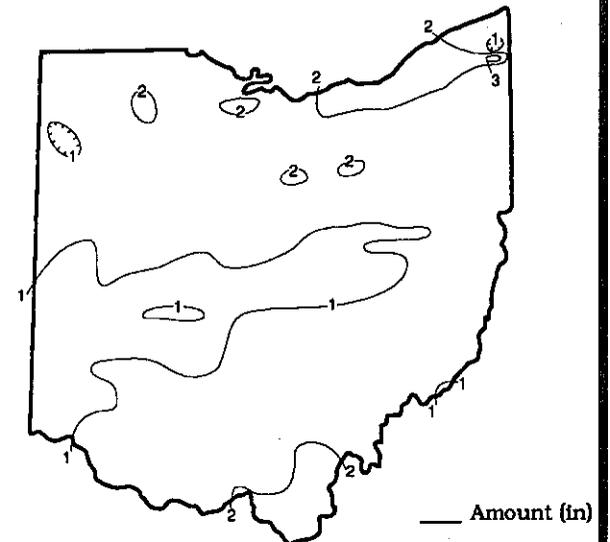
**PRECIPITATION** for February was below normal throughout the state with only a few scattered locations in the northern portion having above normal precipitation. The state average was 1.40 inches, 0.84 inch below normal. Regional averages ranged from 1.99 inches, 0.18 inch below normal, for the Northeast Region to 0.92 inch for both the Southwest and West Central regions, 1.70 inches and 1.19 inches below normal respectively. Andover (Ashtabula County) reported the greatest amount of precipitation for the month, 3.03 inches. Mohawk Dam (Coshocton County) reported the least amount, 0.39 inch.

Precipitation during the first half of the month was sparse and fell mostly in the form of snow. During the second half of the month, precipitation was a little more widespread and fell mostly in the form of rain. At most locations, daily totals seldom exceeded 0.5 inch. The most widespread precipitation fell during February 13-15. During this period, most areas of the state received about half their monthly precipitation totals. There were several days with precipitation during the remainder of the month, especially during February 18-20, 23-24 and 28-29. With the exception of a few locations, daily amounts during these periods ranged up to 0.25 inch. For the month, snowfall was below normal in most areas. For the snow season so far, Chardon (Geauga County), Ohio's snow capital, has only received about 60 inches of snow, 22 inches below normal.

Precipitation for the 1992 calendar year is below normal throughout the state except in the North Central Region where it is slightly above normal. The state average is 3.50 inches, 1.50 inches below normal. Regional averages range from 4.19 inches, 0.02 inch above normal, for the North Central Region to 2.85 inches, 2.61 inches below normal, for the Southeast Region.

Precipitation for the 1992 water year is below normal throughout most of the state; the only exception is the Northwest Region where precipitation is above normal. The state average is 10.44 inches, 2.13 inches below normal. Regional averages range from 12.49 inches, 1.44 inches above normal, for the Northwest Region to 8.82 inches, 3.31 inches below normal, for the Central Hills Region. The below normal precipitation during the current 1992 water year recharge season has not been favorable for water supplies, especially ground-water supplies. Only a couple of months with the potential for significant recharge to ground-water storage remain before evapotranspiration limits infiltration. Normal precipitation during the next two months would improve the situation; however, conditions do not favor a return to normal levels.

PRECIPITATION  
FEBRUARY 1992

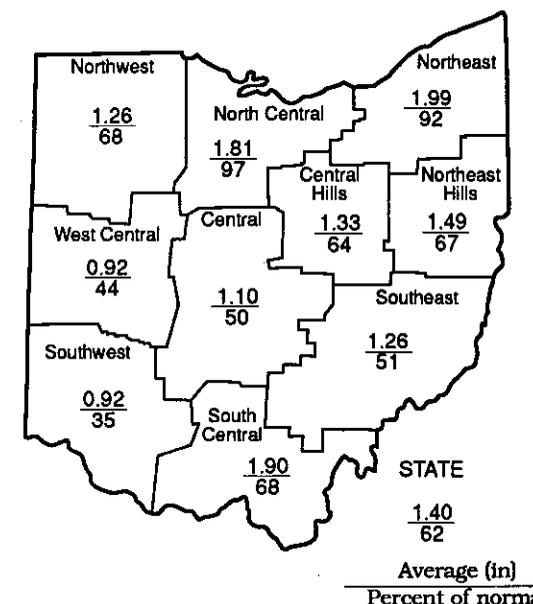


PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
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North Central	-0.06	-0.79	-0.79	-6.32	+2.65	-2.3
Northeast	-0.18	-0.66	-2.62	-8.36	+4.78	-2.8
West Central	-1.19	-1.92	-3.93	-8.57	+4.09	-3.5
Central	-1.11	-0.71	-3.09	-9.45	+3.08	-5.1
Central Hills	-0.76	-1.38	-3.25	-10.20	+2.94	-4.9
Northeast Hills	-0.74	-0.72	-3.12	-10.68	+2.75	-5.2
Southwest	-1.70	-0.77	-4.05	-4.58	+9.78	-1.8
South Central	-0.88	+0.02	-0.94	-4.41	+2.06	-1.6
Southeast	-1.23	-0.62	-2.25	-6.13	+6.93	-3.0
State	-0.84	-0.93	-2.38	-7.10	+4.39	

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Palmer Drought Severity Index:  
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DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
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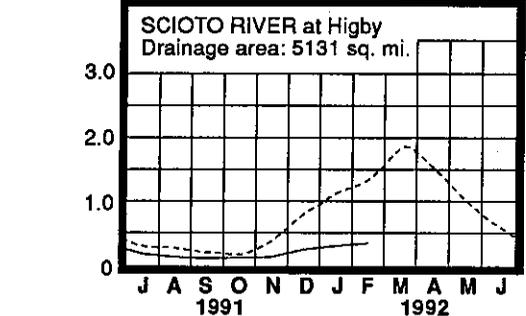
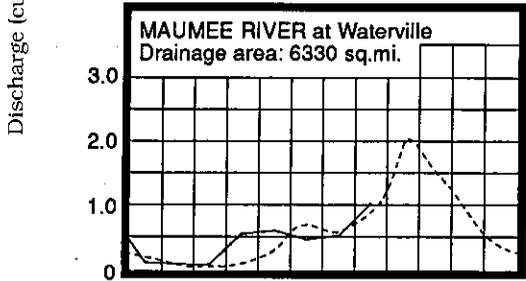
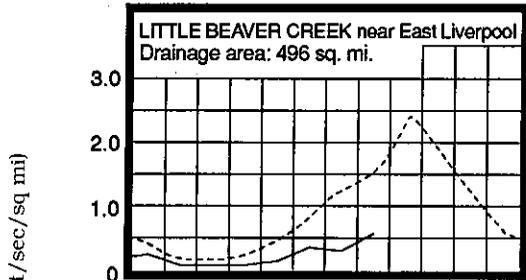
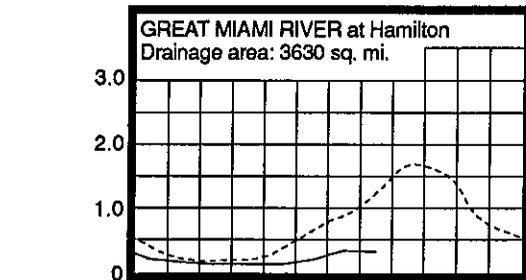
Frances S. Buchholzer  
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**MEAN STREAM DISCHARGE**

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	1,161	55	39	27	42
Great Miami River at Hamilton	3,630	1,159	24	27	28	62
Huron River at Milan	371	406	92	50	53	51
Killbuck Creek at Killbuck	464	226	35	37	42	57
Little Beaver Creek near East Liverpool	496	283	34	34	33	45
Maumee River at Waterville	6,330	6,614	108	72	91	75
Muskingum River at McConnellsville	7,422	3,554	30	34	38	55
Scioto River near Prospect	567	177	27	17	17	36
Scioto River at Higby	5,131	1,843	26	28	30	58
Stillwater River at Pleasant Hill	503	136	26	18	20	48

**MEAN STREAM DISCHARGE**



Base period for all streams: 1951-1980

Normal - - - - Current - - - -

**STREAMFLOW** during February was below normal throughout the state. The only exception was in the northwestern portion of the state where flows were slightly above normal. Flows were low enough to be considered deficient in the southern three-fourths of the state. Mean flows for February were greater than in January in all but the southwestern portion of the state.

At the beginning of the month, flows were noticeably below normal state-wide and in the deficient range for most areas. Generally, flows slowly declined during the first half of the month; drainage basins in the northwestern quadrant of the state had temporary flow increases around the end of the first week of the month. Lowest flows for the month occurred during February 10-

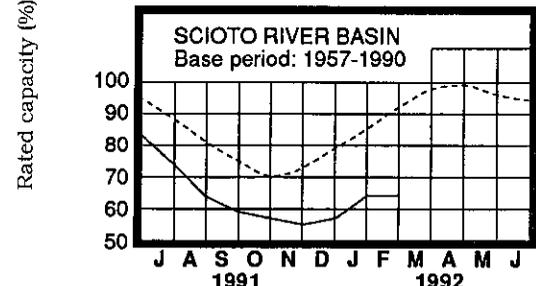
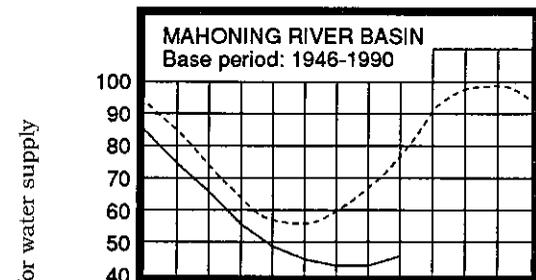
14 in all drainage basins. Flows increased noticeably after mid-month responding to the bulk of the month's precipitation received in most areas. Greatest flows for the month occurred during February 16-21 for the entire state. Flows then declined steadily until the end of the month except in the extreme northeastern portion of the state where flows were increasing on the last day of the month. Flows at the end of the month were generally greater than at the start of the month, but were still noticeably below normal.

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

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 46 percent of rated capacity for water supply compared with 43 percent for last month and 78 percent for February 1991. Month-end storage in the Scioto basin index reservoirs was 64 percent of rated capacity for water supply compared with the same for last month and 93 percent for February 1991.

Several surface water supply reservoirs, both on and off-stream, have had only limited success in filling during the past several months. Several inches of runoff are needed to fill on-stream reservoirs and a week or two of sustained seasonal streamflow is needed to allow off-stream reservoirs to fill. Water supply managers with surface sources should closely monitor their situations and be prepared to capture streamflow when available.

**RESERVOIR STORAGE FOR WATER SUPPLY**



**GROUND-WATER LEVELS** during February showed mixed responses. Ground-water levels showed improvement in the western and southern portions of the state, especially in consolidated aquifers, but remained stable or continued to slowly decline in most aquifers in the central, eastern and northeastern portions of the state. Ground-water levels continue to remain noticeably below normal throughout the state. Current levels range from 2 feet to more than 7 feet below normal. This year's levels are markedly below the February 1991 levels ranging from about 2.5 feet to more than 9 feet lower.

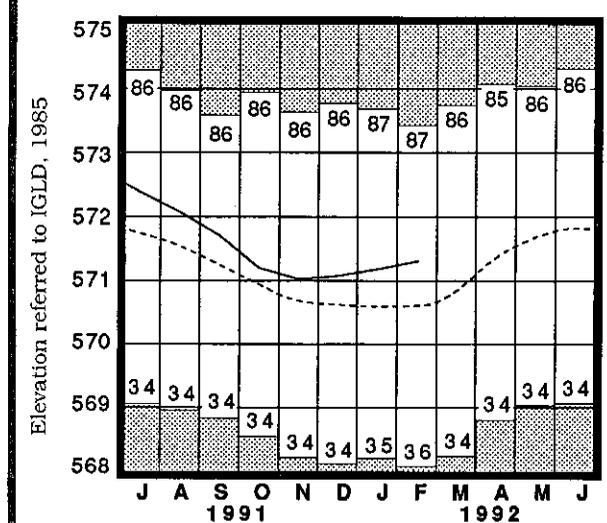
Several observation wells, especially in the central and northeastern portions of the state, continue to reach record-low levels. Index observation wells establishing new record-low levels were F-1 and Po-1. Also, index well Tu-1 reached a new record-low level for December (see the Ground-Water Levels table on this page for aquifer type and location).

The 1992 water year recharge season has not been favorable for ground water. Recharge has been extremely limited in many areas of the state. Only a couple of months with the potential for significant recharge remain before evapotranspiration limits infiltration. Conditions do not favor a return to normal levels. Water supply managers with ground water sources should closely monitor their situations and plan accordingly.

**LAKE ERIE** level rose during February. The mean level was 571.30 feet (IGLD-1985), 0.12 foot above last month's mean level and 0.70 foot above normal. This month's level is 0.81 foot below the February 1991 level and 2.10 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that precipitation in the Lake Erie basin for 1992 through February has averaged 4.6 inches, 0.1 inch above normal. For the entire Great Lakes basin, precipitation has averaged 3.5 inches, 0.4 inch below normal.

**LAKE ERIE LEVELS at Fairport**



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

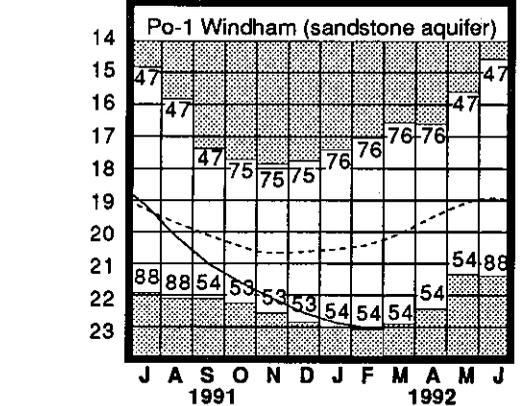
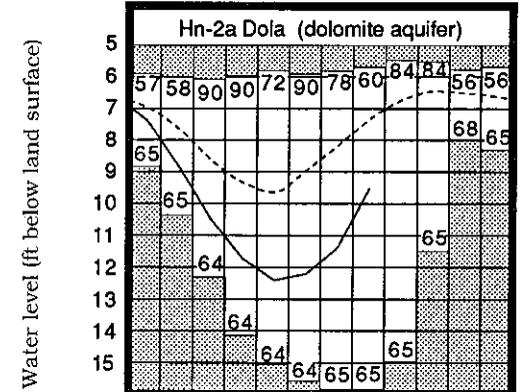
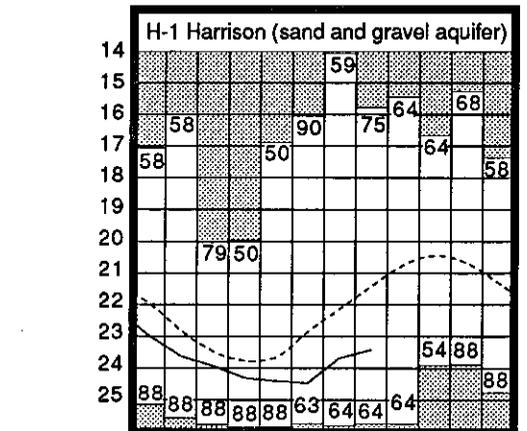
Normal - - - - Current - - - -

**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	21.74	-7.26	-0.09	-9.09
Fa-1	Jasper Mill, Fayette Co.	Limestone	8.96	-1.88	+1.19	-2.29
Fr-10	Columbus, Franklin Co.	Gravel	42.84	+0.25	+0.07	-2.56
H-1	Harrison, Hamilton Co.	Gravel	23.42	-2.02	+0.24	-3.23
Hn-2a	Dola, Hardin Co.	Dolomite	9.52	-2.18	+1.87	-3.26
Po-1	Windham, Portage Co.	Sandstone	23.02	-2.62	-0.15	-4.94
Tu-1	Strasburg, Tuscarawas Co.	Gravel	15.65	-3.51	+0.25	-5.07

**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

March 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)

been favorable for water supplies, especially ground-water supplies. Conditions do not favor a return to normal levels with the greatest deficiencies expected to be from the central to the north-eastern portion of the state.

## NOTES AND COMMENTS

### DIVISION OF WATER HAS NEW CHIEF

The Ohio Department of Natural Resources' Director Frances S. Buchholzer recently announced the appointment of James R. Morris as chief of the Division of Water.

Mr. Morris brings a long and varied professional background to the position. After serving in the U.S. Army as a technical engineering supervisor and chief construction surveyor, he was employed by ODNR's Division of Water from 1978 to 1985. During this time, he held various positions within the Floodplain Management and Dam Safety sections.

In 1985, Mr. Morris joined the Arizona Department of Water Resources as chief of the Flood Management Section where he administered planning, construction and funding of flood control projects and flood warning systems, and coordinated floodplain management activities. He recently graduated from a public executive training program sponsored by the State of Arizona and Arizona State University. In addition, he has instructed various level college math courses at community colleges in both Ohio and Arizona.

"We are extremely fortunate to have an individual with Jim's outstanding professional background and knowledge of the goals and programs of the department for this position," Director Buchholzer said. "Jim's many years of experience combined with his excellent management skills and leadership abilities will prove to be an asset to this vital departmental function."

Mr. Morris is a registered professional engineer in Arizona and Ohio. He has earned both a bachelor's and master's degree in civil engineering from The Ohio State University and is pursuing a doctoral degree. Mr. Morris currently chairs the Mapping and Engineering Standards Committee of the Association of State Floodplain Managers.

### NEW DATUM REVISION COMPLETED FOR GREAT LAKES

A new elevation reference system, or datum, for the Great Lakes is now being used. The new datum, known as the International Great Lakes Datum, 1985 (IGLD-1985), was implemented in January 1992.

The Great Lakes-St. Lawrence River system is the world's greatest fresh water resource. The management of this system requires an internationally coordinated effort. The most basic requirement for this coordinated management is a common vertical elevation reference or datum. This is the purpose of the IGLD.

Because of movement of the earth's crust, or isostatic rebound, the IGLD must be revised every 25 to 35 years. Isostatic rebound is the gradual rising, or bouncing back, of the earth's crust from the weight of the glaciers that covered the Great Lakes region during the last ice age. The rate of rebound is not uniform across the basin. As part of the datum revision, a new reference zero, a location to which all other elevations are referenced, was established at Rimouski, Quebec. From this point, established bench marks are resurveyed and new elevations assigned. IGLD-1985 also established new bench marks throughout the Great Lakes basin.

The most significant change due to the implementation of IGLD-1985 will be in the elevations assigned to water levels resulting from the new elevations surveyed to the new reference zero location. These changes range from 0.2 foot at Lake St. Francis, Summerstown, Ontario to 1.1 feet on Lake Superior. For Lake Erie, the change is 0.6 foot. Elevations referenced to IGLD, for example low water datum, ordinary high water marks, and the range of water levels by which Lake Superior and Lake Ontario outflows are regulated, will change. Levels with elevations referenced to the National Geodetic Vertical Datum, 1929 (NGVD-1929) will not change. These include water levels established for federal flood insurance purposes.

For additional information, contact the U.S. Army Corps of Engineers, Detroit or Buffalo districts, or the National Oceanic and Atmospheric Administration, National Ocean Service in Rockville, Maryland.

## ACKNOWLEDGEMENTS

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. Volnovich  
Governor

Frances S. Buchholzer  
Director

James R. Morris  
Chief

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**PRECIPITATION** for March was near normal throughout most of the state. The state average was 3.37 inches, 0.01 inch below normal. Regional averages ranged from 4.05 inches, 0.43 inch above normal, for the Southeast Region to 2.56 inches, 0.30 inch below normal, for the North Central Region. The West Central Region had the greatest departure from normal precipitation for March, 0.67 inch below normal. West Union (Adams County) reported the greatest amount of precipitation for the month, 5.46 inches. Painesville (Lake County) reported the least amount, 1.57 inches.

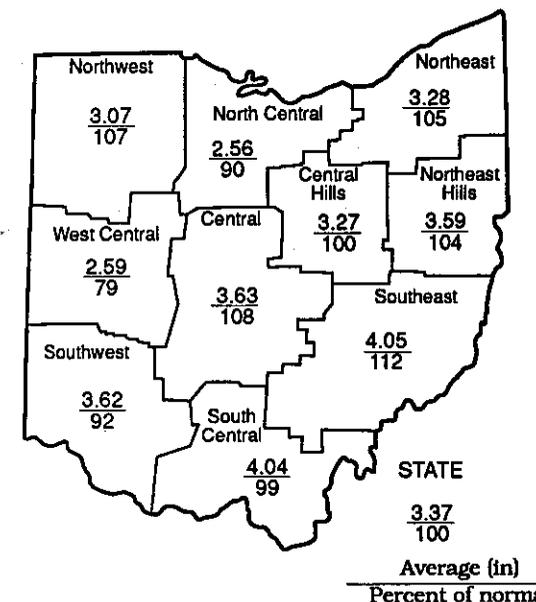
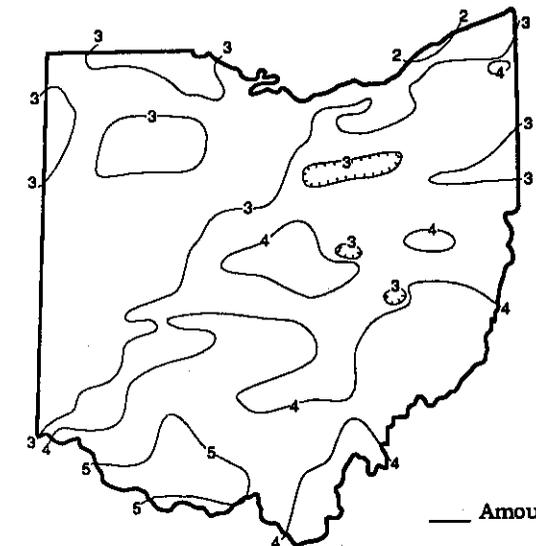
The first week of the month was unseasonably warm and dry. Conditions changed for the remainder of the month to near normal precipitation and below normal temperatures. Most of the state received about 1 inch of rain during March 6-7 with less falling in the western and extreme northeastern portions. Scattered showers and snow showers were common March 9-12, but total precipitation was less than 0.5 inch for most locations. The bulk of the month's precipitation for most of the state fell on March 18 when many areas in the southern two-thirds of the state recorded from 1 to nearly 2.5 inches of rain. Scattered precipitation, mostly in the form of snow, fell during the last 10 days of the month. The greatest amounts were recorded in the northeastern portion of the state. Snowfall for the month was above normal in the northeastern portion of the state with Chardon (Geauga County) reporting 22.7 inches, 3.8 inches above normal. Youngstown Airport (Trumbull County) reported 21.1 inches, its third snowiest March on record.

Precipitation for the 1992 calendar year is below normal throughout the state. The state average is 6.87 inches, 1.51 inches below normal. Regional averages range from 7.56 inches, 2.68 inches below normal, for the South Central Region to 5.92 inches, 2.12 inches below normal, for the West Central Region. Following 1991, the eighth driest year on record, 1992 is not starting off much better.

Precipitation for the first half of the 1992 water year is below normal throughout most of the state, except in the Northwest Region where precipitation is 12 percent above normal. The state average is 13.82 inches, 2.13 inches below normal. Regional averages range from 16.32 inches, 1.89 inches below normal, for the South Central Region to 11.68 inches, 3.73 inches below normal, for the West Central Region (see Precipitation table, departure from normal, past 6 months column, on this page). The below normal precipitation during most of the potential 1992 water year recharge season has not

(continued on back)

## PRECIPITATION MARCH 1992



## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.20	-0.68	+1.64	-0.87	+5.34	+0.2
North Central	-0.30	-0.28	-0.81	-5.71	+3.87	-1.5
Northeast	+0.17	-0.41	-1.80	-7.94	+7.30	-1.7
West Central	-0.67	-2.12	-3.73	-9.41	+3.90	-2.6
Central	+0.26	-1.26	-2.73	-9.74	+4.72	-4.6
Central Hills	+0.01	-1.48	-3.30	-9.69	+5.21	-4.1
Northeast Hills	+0.14	-1.79	-3.25	-9.86	+5.19	-4.1
Southwest	-0.30	-2.31	-3.73	-6.45	+10.17	-1.6
South Central	-0.05	-2.68	-1.89	-6.43	+4.23	-1.6
Southeast	+0.43	-2.18	-1.81	-6.21	+9.12	-2.0
State	-0.01	-1.51	-2.13	-7.21	+5.93	

\*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

**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	1,386	58	55	37	39
Great Miami River at Hamilton	3,630	1,530	25	26	29	46
Huron River at Milan	371	407	55	59	56	53
Killbuck Creek at Killbuck	464	514	52	47	52	50
Little Beaver Creek near East Liverpool	496	641	53	41	39	39
Maumee River at Waterville	6,330	7,381	58	68	78	81
Muskingum River at McConnsville	7,422	8,421	51	40	41	48
Scioto River near Prospect	567	325	33	24	22	31
Scioto River at Higby	5,131	4,916	51	34	37	47
Stillwater River at Pleasant Hill	503	150	20	17	18	32

**STREAMFLOW** during March was below normal throughout the state. Flows were low enough to be considered deficient statewide. Mean flows for all drainage basins in March were greater than in February.

Flows at the beginning of the month were noticeably below normal throughout the state. Flows declined during the first week of the month with all drainage basins recording their lowest monthly flows during March 5-6. Flows increased following precipitation periods several times during the remainder of the month. Greatest flows for the month for most areas of the state occurred during March 19-21; the northwestern portion of the state had its greatest flows during March 10-11 and the extreme northeastern portion

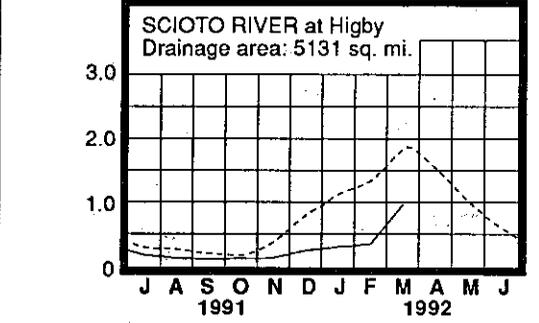
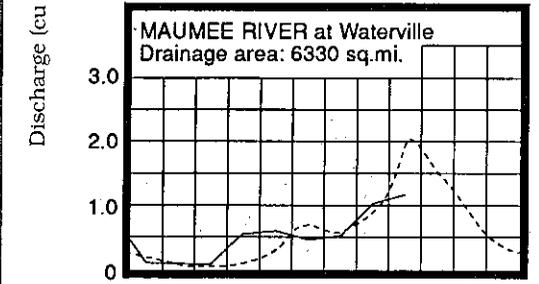
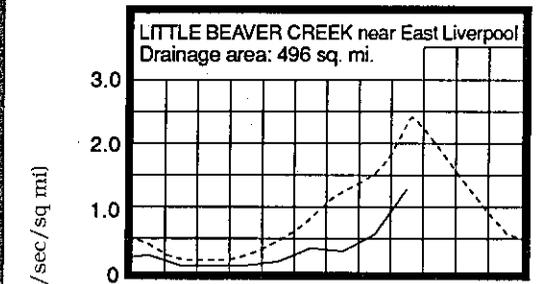
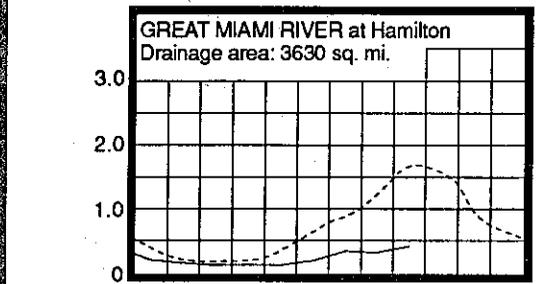
had its greatest flows a few days before the end of the month, partially in response to snow melt. Flows at the end of the month were still noticeably below normal statewide except in the extreme northeastern portion.

**RESERVOIR STORAGE** for water supply increased in both the Mahoning and Scioto river basins. Storage remained below normal in both basins.

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 63 percent of rated capacity for water supply compared with 46 percent for last month and 88 percent for March 1991. Month-end storage in the Scioto basin index reservoirs was 74 percent of rated capacity for water supply compared with 64 percent for last month and 97 percent for March 1991.

The near normal precipitation and resulting increased streamflows have improved both on and off-stream reservoir levels. However, several water supply reservoirs in the central and northeastern portions of the state remain below normal.

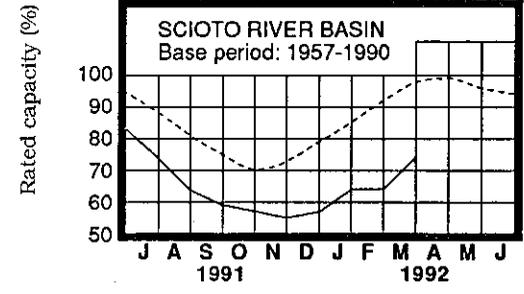
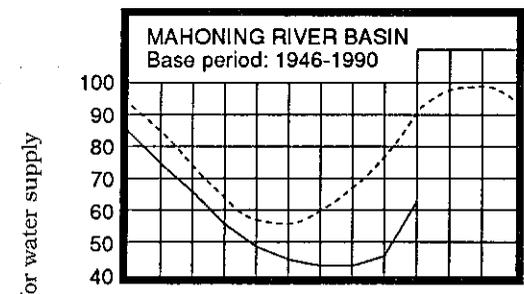
**MEAN STREAM DISCHARGE**



Base period for all streams: 1951-1980

Normal - - - - - Current - - - - -

**RESERVOIR STORAGE FOR WATER SUPPLY**



**GROUND-WATER LEVELS** during March rose in most aquifers throughout the state, exceptions were in the deeper unconsolidated aquifers where levels were stable. Net rises from last month's levels were less than normally observed except in the northwestern portion of the state. Current levels continue to remain noticeably below normal statewide. Generally, this month's levels range from about 1 foot to nearly 8 feet below normal. Current levels also continue to remain much lower than last year's levels ranging from 2 feet to nearly 9 feet below March 1991 levels.

Ground-water levels in many aquifers in the central, eastern and northeastern portions of the state continued to decline during the first two weeks of the month. Ground-water levels then began to rise in response to the month's precipitation. Prior to rising, several observation wells once again reached record-low levels during the month. Index observation well Po-1 recorded a new record-low level; index observation wells F-1 and Tu-1 recorded new record-low levels for March (see Ground-Water Levels table on this page for aquifer type and location).

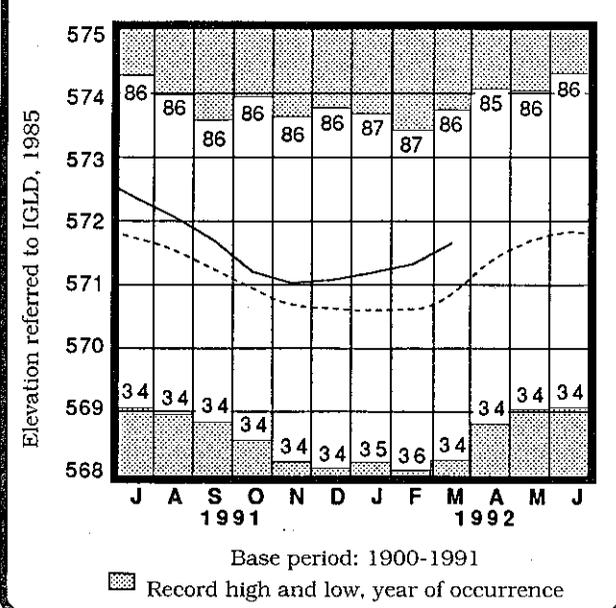
The below normal precipitation during the current 1992 water year recharge season has not been favorable for ground-water storage. The end of the recharge period is approaching with ground-water levels noticeably below normal. Water supply managers with ground-water sources should monitor their situations and plan accordingly.

**LAKE ERIE LEVEL** rose during March. The mean level was 571.65 feet (IGLD-1985), 0.35 foot above last month's mean level and 0.78 foot above normal. This month's level is 0.67 foot below the March 1991 level and 2.45 feet above Low Water Datum.

**SUMMARY**

Precipitation ranged from slightly above to slightly below normal throughout the state. Streamflow was deficient statewide. Reservoir storage increased but remained at below normal levels. Ground-water storage also increased, but new record-low levels for March were still reached early in the month. Lake Erie level rose seasonally and was 0.78 foot above the long-term March average. Various stages of drought conditions remain in most of the state.

**LAKE ERIE LEVELS at Fairport**



Base period: 1900-1991  
 [Shaded Box] Record high and low, year of occurrence

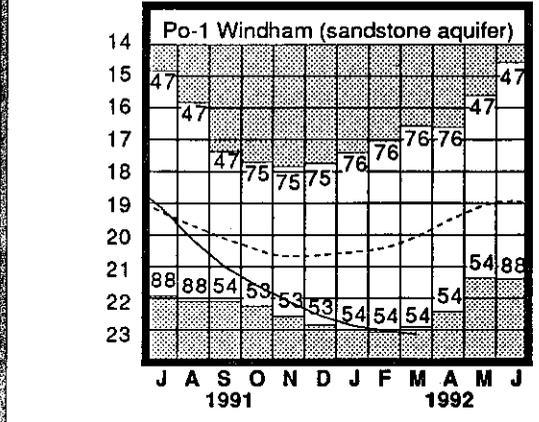
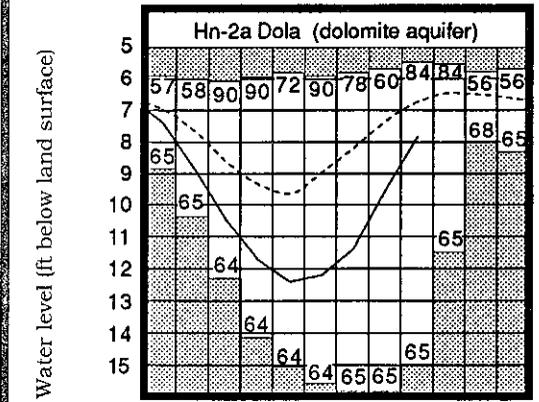
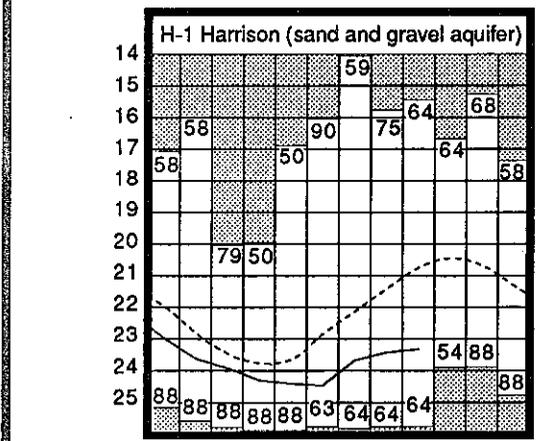
Normal - - - - - Current - - - - -

**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.
Fa-1	Jasper Mill, Fayette Co.	Limestone	8.16	-1.31	+0.80	-1.63
Fr-10	Columbus, Franklin Co.	Gravel	42.73	-0.06	+0.11	-2.83
H-1	Harrison, Hamilton Co.	Gravel	23.31	-2.60	+0.11	-3.01
Hn-2a	Dola, Hardin Co.	Dolomite	7.80	-1.02	+1.72	-1.41
Po-1	Windham, Portage Co.	Sandstone	23.20	-3.17	-0.18	-5.63
Tu-1	Strasburg, Tuscarawas Co.	Gravel	15.14	-3.74	+0.51	-4.14

**GROUND-WATER LEVELS**



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

Normal - - - - - Current - - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

April 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## NOTES AND COMMENTS

### WELL LOG COMPUTERIZATION

The Division of Water currently maintains over 700,000 well log and drilling report forms that have been filed with the State since the turn of the century. The well log data represent the most comprehensive and detailed geologic and hydrogeologic data base in Ohio. Each well log is a legal document filed by drillers and maintained by the Division of Water under Ohio Revised Code Section 1521.05. The Division processes over 10,000 requests for well log data per year from homeowners, realtors, private consultants, and state and local agencies.

The data are used extensively by the Division of Water to prepare ground water resource, pollution potential and detailed aquifer maps, and to assist with various ground water use conflict investigations. Well log data are used within the Department to prepare bedrock topography, drift thickness, glacial and bedrock geologic maps, for coal and industrial minerals permitting, and oil and gas regulatory activities. In addition, well log data are used to provide ground water and well data for a variety of permitted or regulated activities including solid and hazardous waste disposal, underground storage tanks, wellhead protection and public water supply.

A well log computerization system using optical disk storage and retrieval technology has been implemented to facilitate the retrieval and processing of the well logs for these different applications. The system employs the use of the Wang Integrated Imaging System for storage of the well log image, combined with a database developed for easy retrieval and scientific processing of the well log data.

The system configuration includes a Wang VS5300 mini-computer linked to two 325-megabyte hard drives, two optical disk drives, a laser printer, a scanner and three imaging workstations. An alphanumeric terminal is linked directly to the VS5300 for system administration. The entire system operates on a dedicated electrical line through a battery back-up system to ensure the integrity of files during power surges and interruptions.

Well logs are scanned in a batch mode and temporarily stored on a hard drive for data processing. Well log data are interactively entered into the database through the display of the well log image and the database fields in a windows environment. Data entry of each well log requires approximately 3 to 4 minutes depending on the length of the log record. Once data entry for each well log is complete, the image of the log is transferred to optical disk. Well log location maps and data for each township are also scanned and entered into the database to allow retrieval of well logs from topographic maps.

Well logs can be retrieved by directly searching the database on a number of key fields including owner's name, street addresses, drillers, drill dates, location descriptions, and aquifer types. The system also allows the user to search between ranges of street numbers or drill dates. Data retrieved from a search can be downloaded from the VS to a PC in an ASCII format for processing in other types of scientific software such as ground water flow modeling programs and geographical information systems.

The system is designed to allow searches and retrieval of data from remote terminals through local area networking or the use of a fax gateway. An IBM compatible PC computer can be configured through accessory hardware and software to link with the system as a remote terminal once communications links with the VS are established.

Currently, the Division has approximately 25,000 well logs on the system representing all or portions of five counties. Additional funding will be sought in the next budget period to facilitate conversion of the well log data to electronic files, to purchase hardware for storage of all records (current capacity will hold 350,000 records), and enable remote terminal access. The Division has received considerable interest from other state agencies (Ohio EPA and Dept. of Health), county governments and private consultants in networking with the system to provide easy access to the well log data.

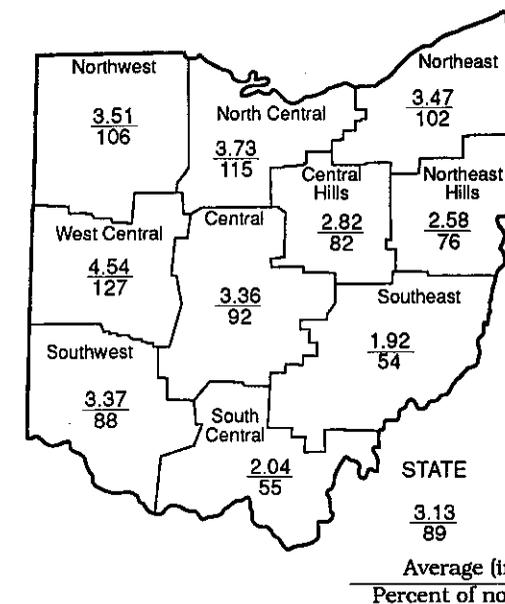
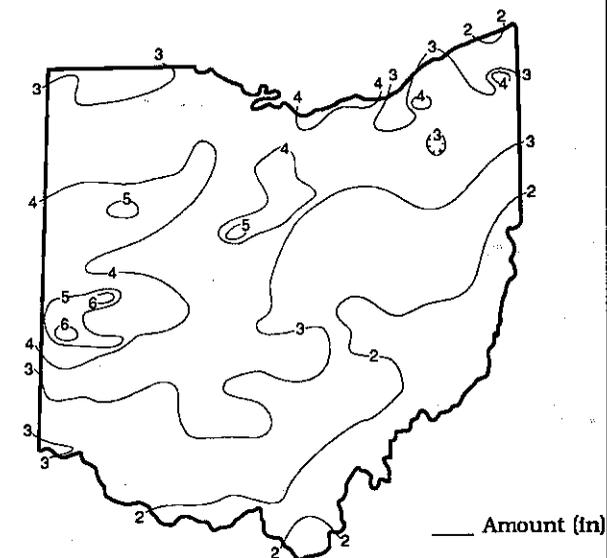
**PRECIPITATION** for April was above normal in the western and northern portions of the state and below normal in the eastern and southern portions. The state average was 3.13 inches, 0.38 inch below normal. Regional averages ranged from 4.54 inches, 0.96 inch above normal, for the West Central Region to 1.92 inches, 1.62 inches below normal, for the Southeast Region. Piqua (Miami County) reported the greatest amount of precipitation for the month, 6.25 inches. West Manchester (Preble County) also reported over 6 inches of precipitation for the month. Greenup Locks and Dam (Scioto County) reported the least amount of precipitation for the month, a scant 1.14 inches.

There were April showers scattered throughout the state on numerous days during the month. Daily precipitation amounts were generally light and varied greatly from one location to another. The first half of the month was drier than the second half for most locations. The wettest period for most areas was from April 16-25 during which time many locations received measurable precipitation on nearly every day. The greatest amounts fell in the western portion of the state with more than 3 inches reported at some locations. Most areas received 1-2 inches from the thunderstorms and showers during this period, but the extreme southern and southeastern portions received only about 0.5 inch or less.

Precipitation for the 1992 calendar year continues to remain below normal throughout most of the state; the exception being the North Central Region where precipitation is slightly above normal. The state average is 10.00 inches, 1.89 inches below normal. Regional averages range from 10.93 inches, 0.33 inch below normal, for the Northeast Region to 8.82 inches, 3.80 inches below normal, for the Southeast Region. The North Central Region averages 10.48 inches, 0.20 inch above normal.

Precipitation for the 1992 water year continues to remain below normal throughout the state; the exception being the Northwest Region where precipitation is slightly above normal. The state average is 16.95 inches, 2.51 inches below normal. Regional averages range from 19.07 inches, 1.84 inches above normal, for the Northwest Region to 14.91 inches, 3.93 inches below normal, for the Central Hills Region.

## PRECIPITATION APRIL 1992



## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.20	-0.18	-1.55	-1.37	+6.71	-0.1
North Central	+0.48	+0.12	-1.23	-5.10	+4.41	-2.3
Northeast	+0.08	+0.07	-1.40	-8.05	+6.84	-2.0
West Central	+0.96	-0.90	-2.22	-8.47	+5.76	-2.6
Central	-0.30	-1.15	-2.26	-10.04	+5.15	-4.4
Central Hills	-0.63	-1.38	-3.10	-10.80	+4.62	-4.1
Northeast Hills	-0.82	-1.42	-2.32	-10.71	+4.10	-3.5
Southwest	-0.44	-2.44	-3.13	-6.99	+10.41	-1.9
South Central	-1.70	-2.63	-2.47	-8.34	+3.02	-2.3
Southeast	-1.62	-2.42	-2.06	-8.36	+8.15	-3.0
State	-0.38	-1.23	-2.16	-7.81	+5.94	

\*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

## ACKNOWLEDGEMENTS

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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  
Frances S. Buchholzer  
Director  
James R. Morris  
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 Palmsville	685	1,097	81	65	46	38
Great Miami River at Hamilton	3,630	4,932	88	41	39	43
Huron River at Milan	371	529	108	71	62	56
Killbuck Creek at Killbuck	464	539	75	54	53	47
Little Beaver Creek near East Liverpool	496	525	57	47	44	39
Maumee River at Waterville	6,330	10,700	114	81	83	81
Muskingum River at McConnelsville	7,422	8,020	82	45	47	41
Scioto River near Prospect	567	624	88	36	32	31
Scioto River at Higby	5,131	5,442	73	43	40	41
Stillwater River at Pleasant Hill	503	1,025	144	49	41	40

**STREAMFLOW** during April was below normal throughout most of the state. Exceptions were in the western and northwestern portions where streamflow was above normal. Flows were low enough to be considered deficient in the eastern portion of the state. This month's flows were greater than March's flows in most basins, but in the eastern drainage basins, they were less.

Flows at the beginning of the month were noticeably below normal in most areas of the state except in the extreme northeastern portion where flows were above normal. Flows steadily declined in most basins during the first half of the month. Lowest flows for the month occurred around mid-month in most areas, a few days earlier in the northwestern portion of the state. Flows increased significantly following the widespread precipitation after mid-month. Maximum flows for the month occurred during April 18-22 following the greatest local precipitation within each basin. Flows then declined until the end of the month, finishing at below normal levels except in the west-central portion of the state where they were above normal.

Cumulative runoff has been noticeably below normal throughout the state during the past seven months (the 1992 water year). Cumulative runoff and percent of normal at the four index gauging stations for the past seven months is: Great Miami River, 3.30 inches, 40 percent; Little Beaver Creek, 4.40 inches, 43 percent; Maumee River, 6.88 inches, 91 percent; and Scioto River, 3.65 inches, 41 percent.

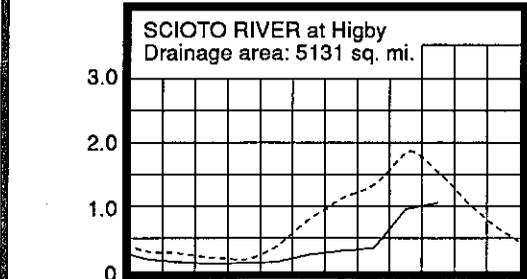
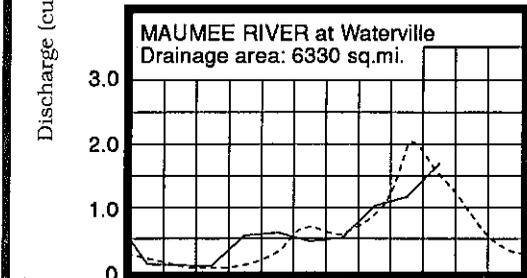
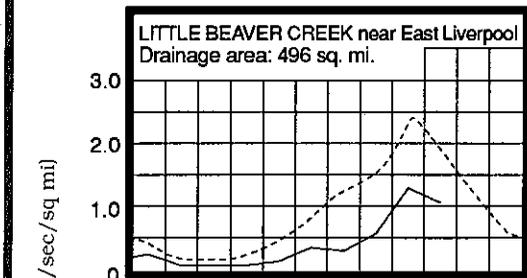
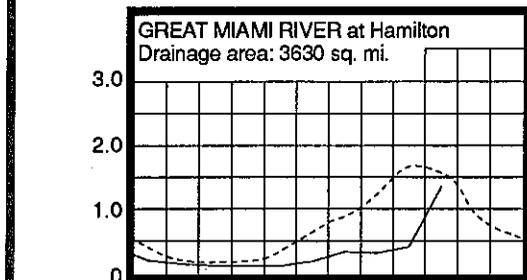
**RESERVOIR STORAGE** for water supply during April increased in both the Mahoning and Scioto river basins. Storage remained below normal in both basins. Reservoir storage at the month's end in the Mahoning basin index reservoirs was 79 percent of rated capacity for water supply compared with 63 percent for last month and 97 percent for April 1991. Month-end storage in the Scioto basin index reservoirs was 84 percent of rated capacity for water supply compared with 74 percent for last month and 98 percent for April 1991.

Surface water supply storage increased in both on and off-stream reservoirs during the past two months. Storage ranges from full, or near normal, to below normal. Surface water supply managers should evaluate their current situation and plan accordingly.

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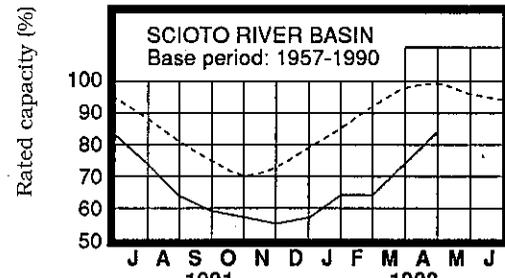
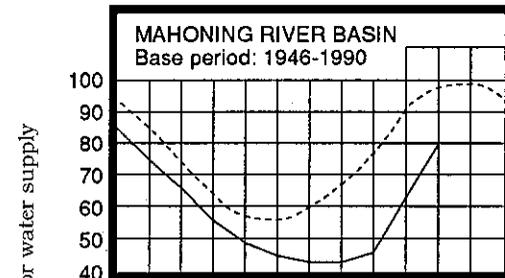
**MEAN STREAM DISCHARGE**



Base period for all streams: 1951-1980

Normal - - - - - Current - - - - -

**RESERVOIR STORAGE FOR WATER SUPPLY**



**GROUND-WATER LEVELS** during April rose in most aquifers throughout the state; levels were stable in some aquifers, especially unconsolidated aquifers in the southeastern portion of the state. Net rises from last month's levels ranged from about one-half to nearly five times that usually observed.

Ground-water storage continues to remain below normal throughout the state. Current levels range from less than 1 foot to nearly 6 feet below normal with the greatest departures from normal levels being in aquifers in the central, eastern and northeastern portions of the state. Current levels also continue to remain noticeably lower than last year's levels ranging from less than 1 foot to more than 6 feet below the April 1991 levels.

The ground-water storage situation has improved slightly during the past two months. However, aquifers in the central, eastern and northeastern portions of the state continue to be at record-low seasonal levels as indicated by index observation wells F-1, Po-1 and Tu-1 that all reached record-low April levels (see Ground-Water Levels table on this page for aquifer type and location).

The 1992 water year recharge season has not been favorable for ground-water supplies. The end of the period for potential recharge to ground-water supplies is near. Little if any improvement in ground-water storage can be expected in the coming months. Water supply managers with ground-water sources should monitor their situations and plan accordingly.

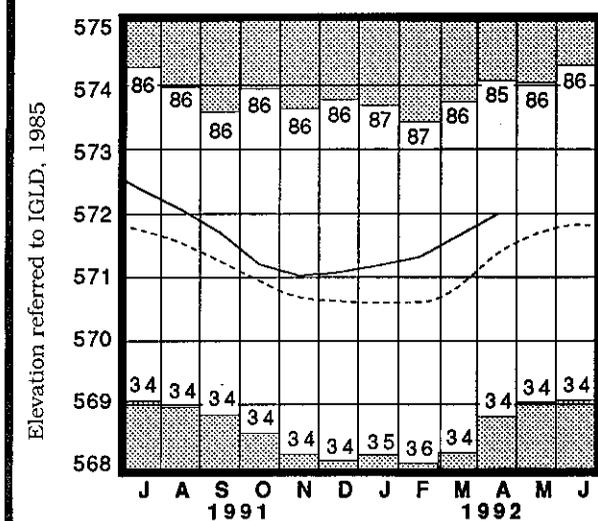
**LAKE ERIE** level rose during April. The mean level was 572.00 feet (IGLD-1985), 0.35 foot above last month's mean level and 0.61 foot above normal. This month's level is 0.47 foot below the April 1991 level and 2.80 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that precipitation in the Lake Erie basin for 1992 through April has averaged 11.2 inches, 0.8 inch above normal. For the entire Great Lakes basin, precipitation has averaged 8.8 inches, 0.2 inch above normal.

**SUMMARY**

Precipitation was above normal in the western and northern portions of the state and below normal elsewhere. Streamflow was below normal in most drainage basins, but above normal in the western and northwestern portions of the state. Reservoir storage increased to near normal levels in many areas, but remained below normal in some reservoirs in the central and northeastern portions of the state. Ground-water storage increased in most aquifers, but remains noticeably below normal and at seasonal record-low levels in the central, eastern and northeastern portions of the state. Lake Erie level rose and was 0.61 foot above its long-term April average.

**LAKE ERIE LEVELS at Fairport**



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

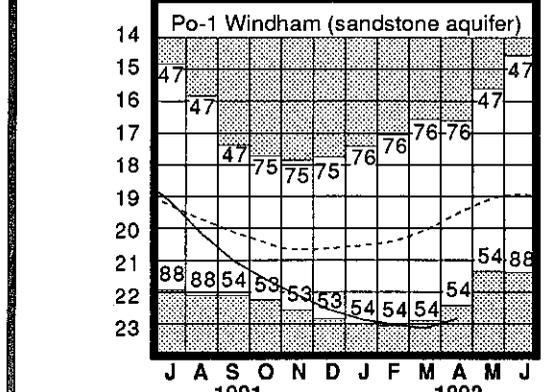
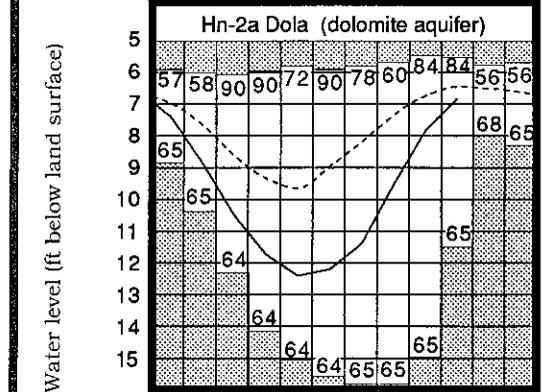
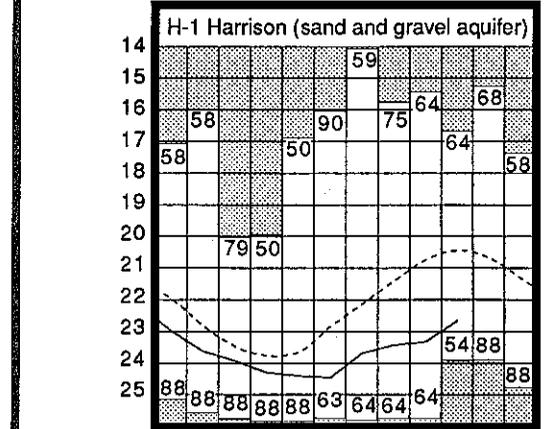
Normal - - - - - Current - - - - -

**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	18.15	-5.72	+2.90	-6.12
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.75	-1.01	+0.41	-1.33
Fr-10	Columbus, Franklin Co.	Gravel	42.53	-0.13	+0.20	-2.81
H-1	Harrison, Hamilton Co.	Gravel	22.66	-2.23	+0.65	-2.41
Hn-2a	Dola, Hardin Co.	Dolomite	6.81	-0.34	+0.99	-0.39
Po-1	Windham, Portage Co.	Sandstone	22.85	-3.33	+0.35	-5.26
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.30	-3.50	+0.84	-2.51

**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

May 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## SUMMARY

Precipitation was below normal throughout most of the state, only the South Central Region had above normal rainfall. Streamflow was below normal throughout the state and in the deficient range in most areas. Reservoir storage declined slightly and remains at below normal levels in many areas. Ground-water levels declined and are below normal. Many aquifers in the central, eastern and northeastern portions of the state continue to reach record-low seasonal levels. Lake Erie level rose 0.29 foot and was 0.60 foot above its long-term May average. Drought conditions continue to plague much of Ohio.

## NOTE AND COMMENTS

### DIVISION OF WATER'S ASSISTANT CHIEF RETIRES

William G. Mattox retired from his position as assistant chief of the Division of Water on May 31 after nearly 20 years of service to the state of Ohio.

Mattox joined ODNR in 1972 as assistant deputy director of the Office of Planning and Research. In 1975 he came to the Division of Water as deputy chief for water planning and policy. He became assistant chief in 1985.

Before joining ODNR, Mattox was a fellow of the Institute of Current World Affairs and worked out of Copenhagen, Denmark studying economic development in Greenland, northern Scandinavia and the Soviet Union. He was director of the McGill University Sub-arctic Research Laboratory in Labrador-Ungava where he led a research program in snow, ice, permafrost and other related fields. He also spent time on Ellesmere Island, Canada (400 kilometers from the North Pole) assisting in glacial hydrology research for the U.S. Air Force.

Since 1972 Mattox has directed a study of peregrine falcons in Greenland where his team has monitored the effects of environmental pollutants on this sensitive species. In 1990, a micro satellite-receiving transmitter was successfully placed on a Greenland falcon, the smallest bird to date to be fitted with such technology. His work in Greenland has compiled the longest and most complete record of this species.

Mattox plans to continue work in Greenland and in the environmental consulting field, particularly in environmental site assessments, the effects of human disturbance on biosystems, and the use of biotelemetry in field research.

The entire Division of Water staff extends its sincere gratitude for the years of dedicated service, and wishes Bill the best in retirement.

### NEW PUBLICATIONS

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

The Ground Water Resources of Putnam County  
by Donald E. Calhoun III

This map is one in a series of county ground-water resources maps which have been completed for 82 of Ohio's 88 counties. 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.

In addition to the new Ground Water Resources of Putnam County map, two other county ground water resources maps that have been out of print have been reprinted and are now available. They are:

The Ground Water Resources of Cuyahoga County  
by Katie Crowell

The Ground Water Resources of Montgomery County  
by James J. Schmidt

These new maps cost \$6.53 each (includes postage, handling and tax). They can be ordered from: ODNR-Publications Center, 4383 Fountain Square, Building B-1, Columbus, Ohio 43224-1362. Make checks payable to ODNR-Publications Center.

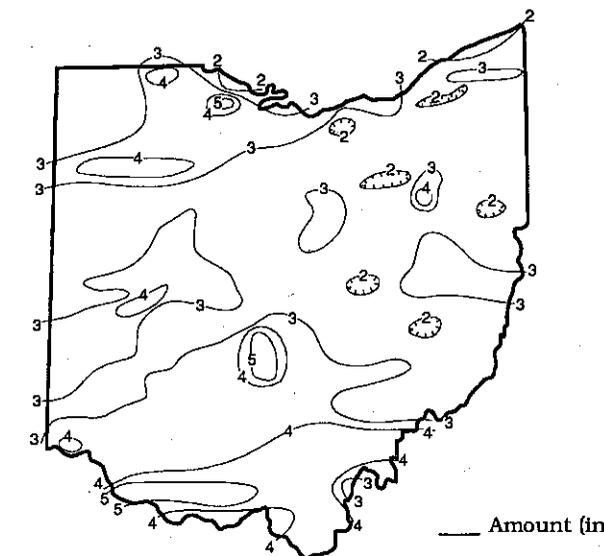
**PRECIPITATION** for May was below normal throughout most of the state, only the South Central Region had above normal precipitation. The state average was 3.08 inches, 0.67 inch below normal. Regional averages ranged from 4.53 inches, 0.60 inch above normal, for the South Central Region to 2.57 inches, 0.96 inch below normal, for the Northeast Region. Circleville (Pickaway County) reported the greatest amount of precipitation for the month, 5.75 inches. Senecaville Dam (Guernsey County) reported the least, 1.58 inches.

During May, precipitation fell every week. At most locations, the first half of the month was drier than the second half. Scattered storms during the first 10 days of the month produced about 0.5 inch of rain for many areas, but storms on May 8-9 dumped from 1 to nearly 2 inches of rain on the south-central portion of the state. Scattered showers and thunderstorms during the next three weekends of the month, although spotty, produced the bulk of the precipitation at most locations. Locally heavy thunderstorms were present in these storms with amounts ranging up to and over 2 inches (unofficial) reported. Most areas received 0.5 to 1 inch of rain on at least two of the three weekends.

Precipitation for the 1992 calendar year remains below normal throughout Ohio. The state average is 12.98 inches, 2.66 inches below normal. Regional averages range from 13.86 inches, 4.05 inches below normal, for the South Central Region to 11.58 inches, 4.98 inches below normal, for the Southeast Region. In each of the five months of the 1992 calendar year, the state has averaged below normal precipitation, only March was near normal. Statewide precipitation has been below normal in 14 of the past 17 months with only December 1991 having widespread above normal precipitation.

Precipitation for the 1992 water year is below normal throughout most of the state with only the Northwest Region having above normal precipitation. The state average is 19.93 inches, 3.28 inches below normal. Regional averages range from 22.62 inches, 3.26 inches below normal, for the South Central Region to 17.50 inches, 5.11 inches below normal, for the Central Hills Region. The Northwest Region's average is 22.10 inches, 1.33 inches above normal.

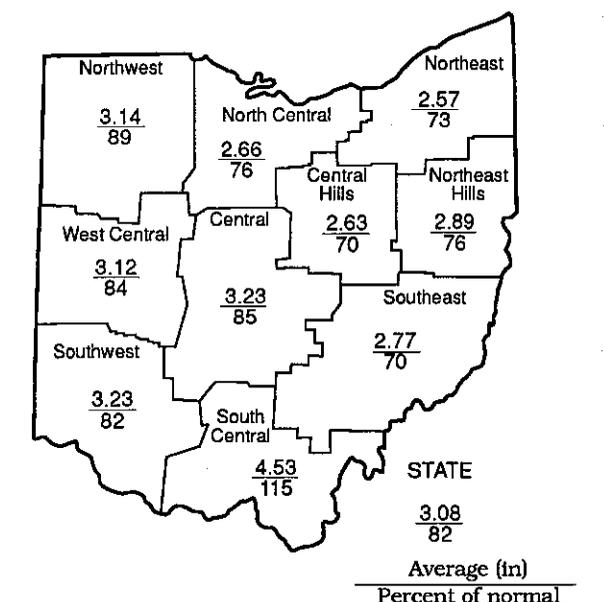
## PRECIPITATION MAY 1992



## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
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North Central	-0.85	-0.48	-1.44	-5.58	+2.07	-2.7
Northeast	-0.96	-0.86	-1.52	-7.85	+3.54	-3.0
West Central	-0.60	-0.40	-2.36	-8.65	+1.89	-3.1
Central	-0.58	-0.63	-1.47	-9.19	+0.68	-4.5
Central Hills	-1.14	-1.74	-3.18	-10.61	-0.16	-4.6
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Southwest	-0.69	-1.65	-2.42	-8.18	+3.65	-1.7
South Central	+0.60	-1.16	-1.40	-5.77	-0.64	-1.6
Southeast	-1.17	-2.37	-2.99	-7.18	+2.51	-3.2
State	-0.67	-1.10	-2.10	-7.58	+1.88	

\*Above +4 = Extreme Moist Spell  
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**MEAN STREAM DISCHARGE**

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				This Month		
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Scioto River at Higby	5,131	3,105	66	55	43	42
Stillwater River at Pleasant Hill	503	156	48	60	42	38

**STREAMFLOW** during May was below normal throughout the state. Flows were low enough to be considered deficient in all but the south-central and extreme northeastern portions of the state. This month's flows were noticeably less than flows during April.

Flows at the beginning of the month were below normal in most areas of the state, exceptions included some drainage basins in the northwestern and extreme northern portions of the state. Greatest flows for the month, for most drainage basins, occurred during the first few days of the month. A few exceptions occurred in some drainage basins where the highest flows were noted following the greatest local precipitation. Flows generally declined during the month with increases noted

following local precipitation. Lowest flows for May occurred just after mid-month in some areas or near the end of the month in other areas. Flows at the end of the month were below normal in most areas but slightly above normal in the west-central and south-central portions of the state.

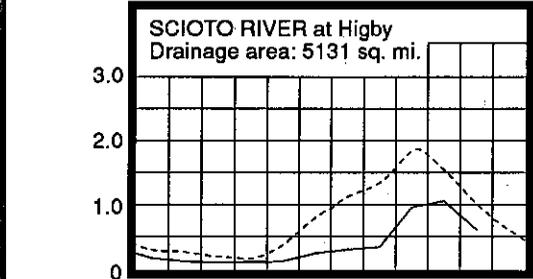
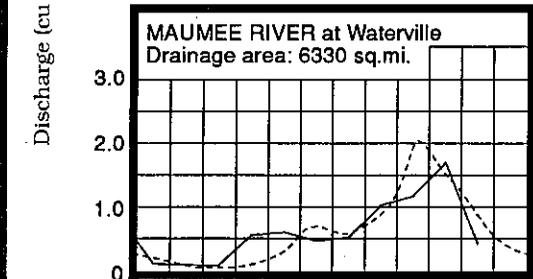
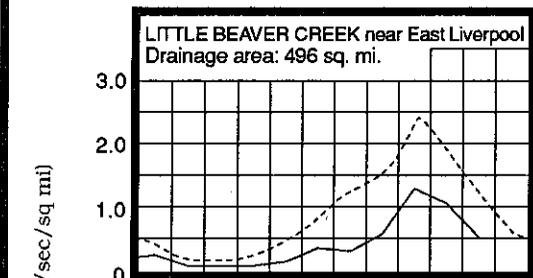
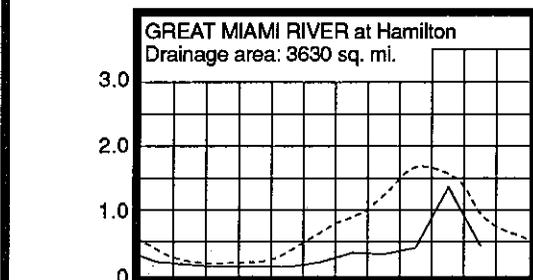
Streamflow continues to remain below normal throughout the state because of the continued below normal precipitation and reduced ground-water base flow contributions. Flows in most drainage basins have been at below normal levels for more than 12 months. In spite of these below normal flows, both on and off-stream surface water supplies currently range from full to seasonally below normal levels.

**RESERVOIR STORAGE** for water supply during May decreased slightly in both the Mahoning and Scioto river basins. Storage remained below normal in both basins.

Reservoir storage at the end of May in the Mahoning basin index reservoirs was 77 percent of rated capacity for water supply compared with 79 percent for last month and 94 percent for May 1991. Month-end storage in the Scioto basin index reservoirs was 82 percent of rated capacity for water supply compared with 84 percent for last month and 93 percent for May 1991.

In most areas of the state, surface water supplies are currently favorable. A few exceptions are noted in the central and eastern portions of the state where storage is at seasonally below normal levels. May's cool temperatures have generally lowered the usual summer-time demand. Water supply managers should continue to monitor their situations.

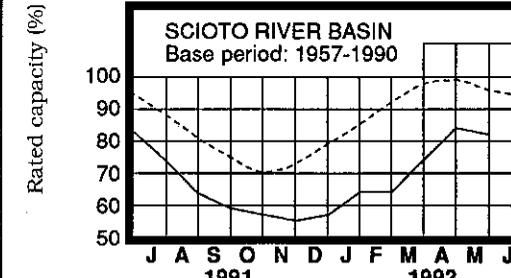
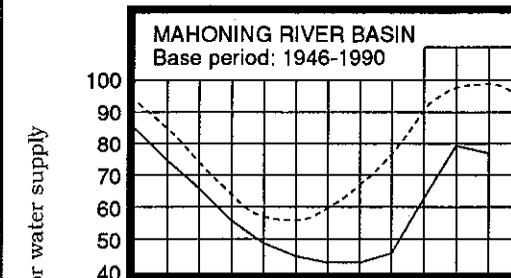
**MEAN STREAM DISCHARGE**



Base period for all streams: 1951-1980

Normal - - - - Current - - - -

**RESERVOIR STORAGE FOR WATER SUPPLY**



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

**GROUND WATER LEVELS** during May declined in most aquifers; exceptions were noted in consolidated aquifers, especially in the northeastern portion of the state, where some delayed recharge occurred. Net changes from last month's mean levels were positive in consolidated aquifers and only slightly negative in unconsolidated aquifers. These declines or rises ranged from near normal to slightly less than usually observed.

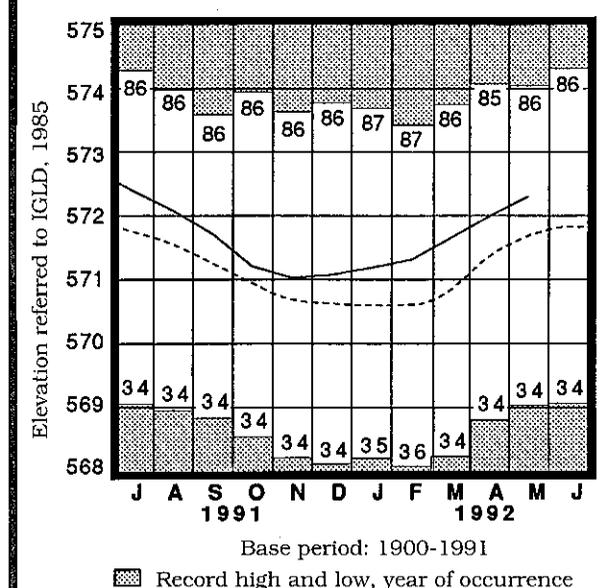
Ground-water storage continues to remain below normal throughout the state. Current levels range from slightly below normal in northwestern Ohio to nearly 5 feet below normal in many areas in central, eastern and northeastern Ohio. Current levels also continue to remain noticeably lower than last year's levels, ranging from slightly less to nearly 5 feet below the May 1991 levels.

The ground-water storage situation has improved slightly during the past two or three months; however, ground-water levels continue to remain at record-low seasonal levels in many aquifers in the central, eastern and northeastern portions of the state. Index observation wells reaching record-low May levels were F-1, Po-1 and Tu-1 (see Ground-Water Levels table on this page for aquifer type and location).

It is unlikely that aquifers will receive any additional significant recharge this water year. Ground-water storage is expected to remain at or near record-low seasonal levels in the central, eastern and northeastern portions of the state. Water supply managers with ground-water sources are encouraged to closely monitor their situations and plan accordingly.

**LAKE ERIE** level rose during May. The mean level was 572.29 feet (IGLD-1985), 0.29 foot above last month's mean level and 0.60 foot above normal. This month's level is 0.38 foot below the May 1991 level and 3.09 feet above Low Water Datum.

**LAKE ERIE LEVELS at Fairport**



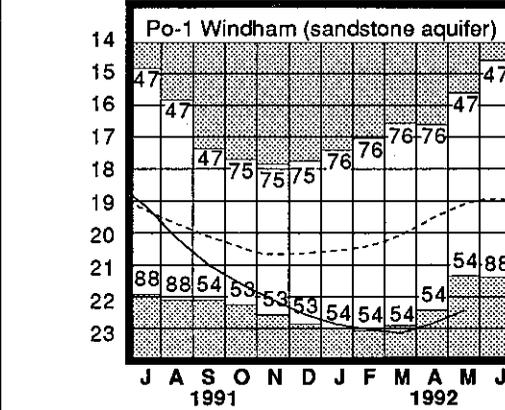
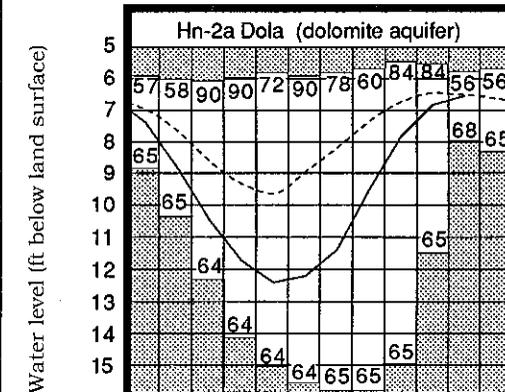
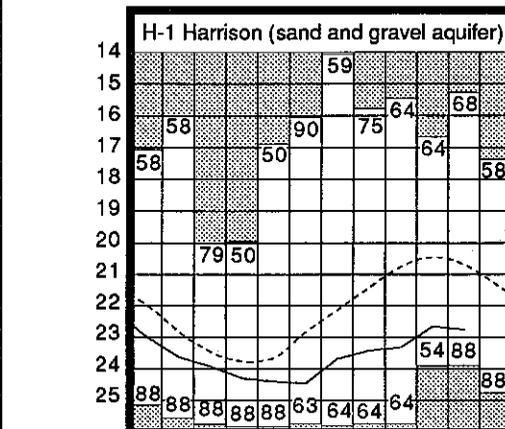
Normal - - - - Current - - - -

**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	17.44	-4.72	+0.71	-2.82
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.73	-0.71	+0.02	-1.14
Fr-10	Columbus, Franklin Co.	Gravel	42.63	0.00	-0.10	-2.41
H-1	Harrison, Hamilton Co.	Gravel	22.77	-2.09	-0.11	-1.55
Hn-2a	Dola, Hardin Co.	Dolomite	6.54	-0.01	+0.27	-0.07
Po-1	Windham, Portage Co.	Sandstone	22.45	-3.36	+0.40	-4.65
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.33	-3.20	-0.03	-1.77

**GROUND-WATER LEVELS**



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

Water level (ft below land surface)

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

June 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## SUMMARY

Precipitation was below normal throughout most of the state, only the West Central Region had above normal rainfall. Streamflow was above normal in the western two-thirds of the state, but noticeably below normal in the eastern one-third. Reservoir storage declined and remains at below normal levels, especially in central and northeastern Ohio. Ground-water levels were stable in the western half of the state, but declined in the eastern half. Most aquifers are at below normal levels and at record-low seasonal levels in many central, eastern and northeastern Ohio aquifers. Lake Erie level declined slightly and was 0.44 foot above its long-term June average. Drought conditions continue to exist throughout most of the state.

## NOTES AND COMMENTS

### NEW PUBLICATIONS

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

Ground Water Pollution Potential of Preble County

by A. Wayne Jones

Ground Water Pollution Potential of Warren County

by The Center for Ground Water Management, Wright State University in cooperation with the ODNR, 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 potentially polluting operations or activities. 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. This map uses the DRASTIC system as developed for the U.S. Environmental Protection Agency by the National Ground Water Association. DRASTIC values, as shown on the map, 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. These new publications cost \$12.30 each (includes postage, handling and tax). They can be ordered from: ODNR-Publications Center, 4383 Fountain Square, Building B-1, Columbus, Ohio, 43224-1362. Make checks payable to ODNR-Publications Center.

### OHIO SUGGESTED DROUGHT RESPONSE ACTIONS

To enhance the Ohio Drought Response Plan, the Drought Assessment Committee has prepared a listing of suggested water conservation actions for use by public water systems when preparing drought response plans. The suggested actions provide general guidance for public water systems regarding when to declare various levels of drought and the types of action that should be taken in each drought level.

Suggestions are given for different types of sources: ground water, unregulated streams, regulated streams and reservoirs. The Ohio Suggested Drought Response Actions, prepared as an appendix to the Ohio Drought Response Plan that is currently being reviewed and updated, should be available in the near future from agencies on the Drought Assessment Committee. Copies will be furnished to interested organizations.

**PRECIPITATION** for June was below normal throughout most of Ohio, only the West Central Region averaged above normal rainfall. The state average was 2.74 inches, 1.22 inches below normal. Regional averages ranged from 4.27 inches, 0.23 inch above normal, for the West Central Region to 1.29 inches, 2.67 inches below normal, for the Northeast Hills Region. Clarksfield (Huron County) reported the greatest amount of precipitation for the month, 7.60 inches; Troy (Miami County) reported the least amount of rainfall for the month, 0.36 inch. Several other locations in northeastern Ohio reported less than 1 inch of rain for the month.

Precipitation during June fell in a typical summer pattern of widely scattered showers and thunderstorms. Spotty showers were common in Ohio during June 5-7. Most areas received 0.5 inch or so of rain with lesser amounts in the eastern portion of the state; however, some areas, especially in the northwestern and south-central portions and The Memorial Golf Tournament, received more than 1 inch during this period. The following week was the driest with little or no rain falling in most locations. The greatest precipitation for the month, for most areas, fell during June 17-19. Most areas received more than 1 inch of rain with lesser amounts falling in northeast Ohio. Amounts of 2 to more than 4 inches of rain were reported at a few isolated locations in the southwestern, extreme western and north-central portions of the state. The last week of June was rather dry at most locations, especially in the southern portion of the state, with spotty showers across the northern portion. Amounts of more than 0.5 inch fell at some locations.

Precipitation for the first half of the 1992 calendar year is below normal throughout the state. The state average is 15.72 inches, 3.88 inches below normal. The state has averaged below normal precipitation during every month in 1992 (March was only 0.01 inch below normal). Regional averages range from 17.72 inches, 1.66 inches below normal, for the West Central Region to 14.04 inches, 6.66 inches below normal, for the Southeast Region (see Precipitation table, departure from normal, past six months column on this page).

Precipitation for the 1992 water year (October 1, 1991 to September 30, 1992) is below normal throughout the state. The state average is 22.66 inches, 4.51 inches below normal. Regional averages range from 26.13 inches, 3.63 inches below normal, for the South Central Region to 19.66 inches, 7.70 inches below normal, for the Northeast Hills Region.

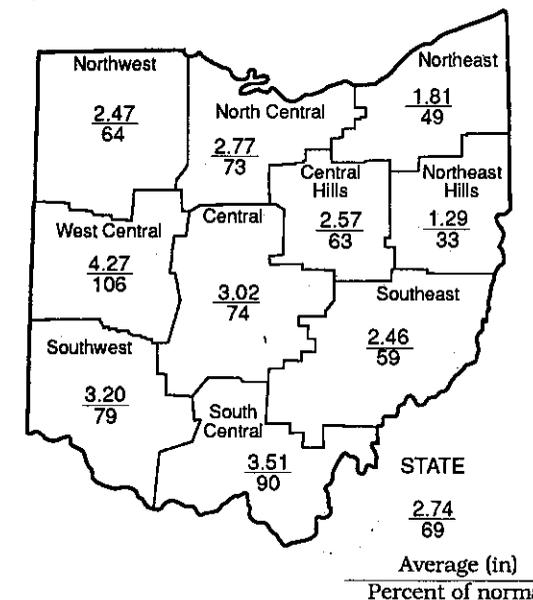
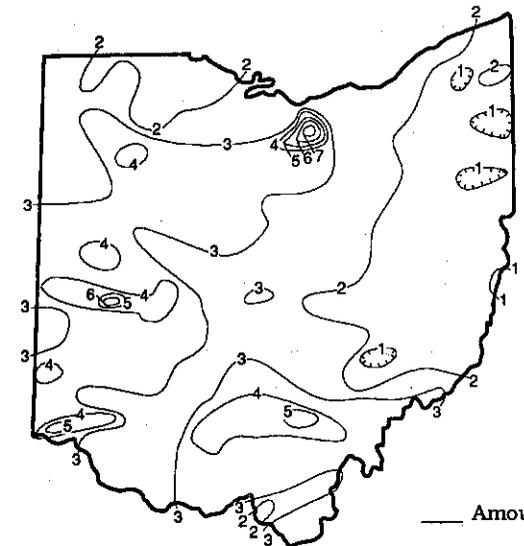
## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-1.36	-1.56	-2.35	-1.57	+2.69	-1.4
North Central	-1.05	-1.46	-1.68	-4.10	+1.60	-2.6
Northeast	-1.87	-2.75	-3.31	-7.05	+2.43	-3.8
West Central	+0.23	+0.50	-1.66	-6.42	+1.74	-3.4
Central	-1.04	-1.95	-3.19	-7.84	-0.71	-4.7
Central Hills	-1.54	-3.29	-4.83	-9.42	-1.93	-4.9
Northeast Hills	-2.67	-4.45	-6.24	-10.17	-2.35	-4.8
Southwest	-0.85	-2.09	-4.51	-6.77	+3.24	-1.5
South Central	-0.37	-1.60	-4.42	-4.30	+0.29	-1.7
Southeast	-1.68	-4.44	-6.66	-7.39	+0.50	-3.7
State	-1.22	-2.31	-3.88	-6.49	+0.77	

\*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 JUNE 1992



## ACKNOWLEDGEMENTS

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  
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George V. Voinovich  
Governor

Frances S. Buchholzer  
Director

James R. Morris  
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	84	32	66	57	39
Great Miami River at Hamilton	3,630	3,224	148	80	46	44
Huron River at Milan	371	224	139	88	68	58
Killbuck Creek at Killbuck	464	202	94	64	53	47
Little Beaver Creek near East Liverpool	496	80	27	41	43	38
Maumee River at Waterville	6,330	3,873	176	84	76	78
Muskingum River at McConnelsville	7,422	2,362	49	53	45	40
Scioto River near Prospect	567	280	156	75	36	34
Scioto River at Higby	5,131	3,167	105	66	45	44
Stillwater River at Pleasant Hill	503	545	228	110	52	46

**STREAMFLOW** during June was above normal in the western two-thirds of Ohio and noticeably below normal in the eastern one-third. Flows in the eastern portion of the state were low enough to be considered deficient. Flows during June in the western half of the state were greater than flows in May, but in the eastern half, they were less.

Flows at the beginning of the month were above normal in the western two-thirds of the state and below normal in the eastern one-third. Generally, flows declined until the middle of the month when most basins recorded their lowest flows for June. Flows increased significantly following widespread rain on June 17-19 after which most basins had their greatest flows. A few basins in the eastern portion of the state had

their greatest flows at the beginning of the month. At the end of the month, flows were below normal throughout the state.

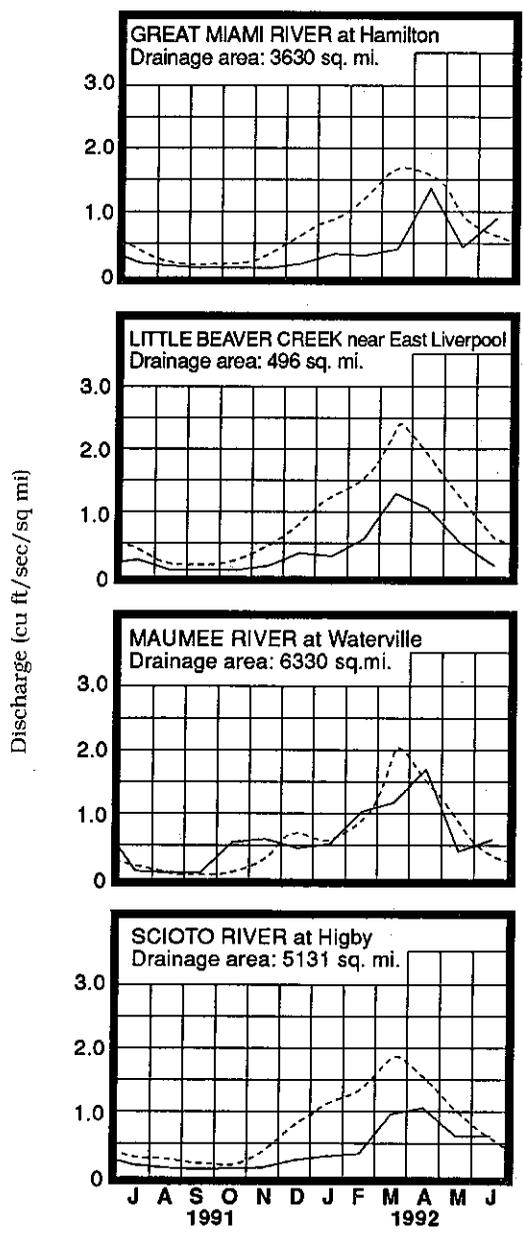
This was the first month in more than a year that many drainage basins have had above normal monthly flows. These flows were beneficial for many areas, but several water supply/flow augmentation reservoirs in central and northeastern Ohio remain at below normal levels.

**RESERVOIR STORAGE** for water supply during June declined in both the Mahoning and Scioto river basins. Storage remained below normal in both basins.

Reservoir storage at the end of June in the Mahoning basin index reservoirs was 69 percent of rated capacity for water supply compared with 77 percent for last month and 85 percent for June 1991. Month-end storage in the Scioto basin index reservoirs was 79 percent of rated capacity for water supply compared with 82 percent for last month and 83 percent for June 1991.

Surface water supplies remain adequate throughout the state; however, many water supply/flow augmentation reservoirs in central and northeastern Ohio are at noticeably below normal seasonal levels, lower than at the same time last year. The below normal temperatures have, fortunately, kept demand from increasing rapidly. Several public water supply systems continue to have mandatory or voluntary water-use restrictions still in effect. Water supply managers should continue to monitor their situations.

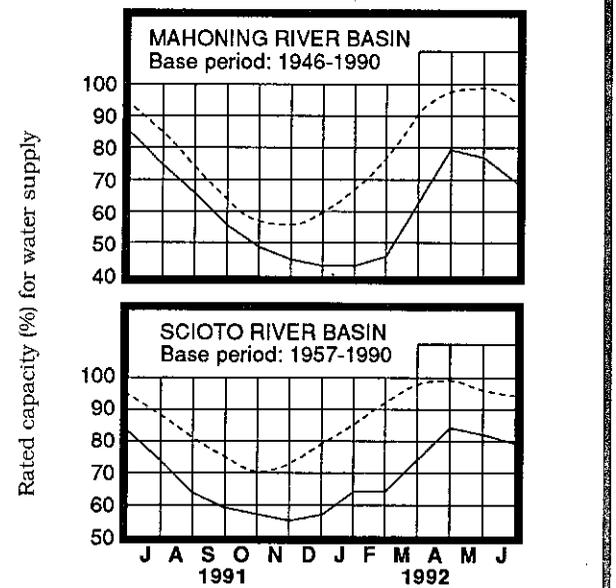
**MEAN STREAM DISCHARGE**



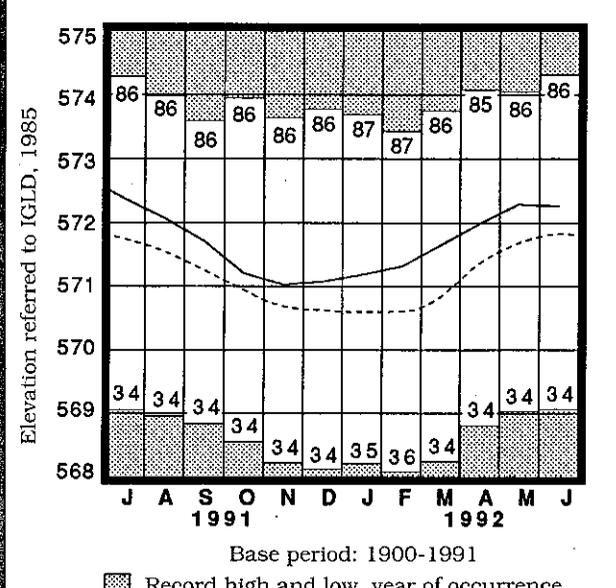
Base period for all streams: 1951-1980

Normal - - - - - Current - - - - -

**RESERVOIR STORAGE FOR WATER SUPPLY**



**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	17.86	-3.95	-0.42	-0.60
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.91	-0.54	-0.18	-0.71
Fr-10	Columbus, Franklin Co.	Gravel	43.21	-0.16	-0.58	-1.78
H-1	Harrison, Hamilton Co.	Gravel	22.66	-1.36	+0.11	-0.48
Hn-2a	Dola, Hardin Co.	Dolomite	6.37	+0.26	+0.17	+0.24
Po-1	Windham, Portage Co.	Sandstone	22.48	-3.56	-0.03	-4.07
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.95	-3.06	-0.62	-1.27

**GROUND-WATER LEVELS** during June declined in most areas of the state. Exceptions were noted in consolidated aquifers in northwestern Ohio and some unconsolidated aquifers in southwestern Ohio where levels were stable or showed slight rises. Net declines from last month's levels were less than usually observed in most aquifers.

Ground-water storage continues to remain noticeably below normal throughout most of Ohio with only consolidated aquifers in the northwestern portion of the state being near normal. Current levels range up to 4 feet below normal with the greatest departures continuing in central, eastern and northeastern Ohio. This year's levels continue to be lower than last year's levels. Current levels range from nearly the same to 4 feet lower than June 1991 levels.

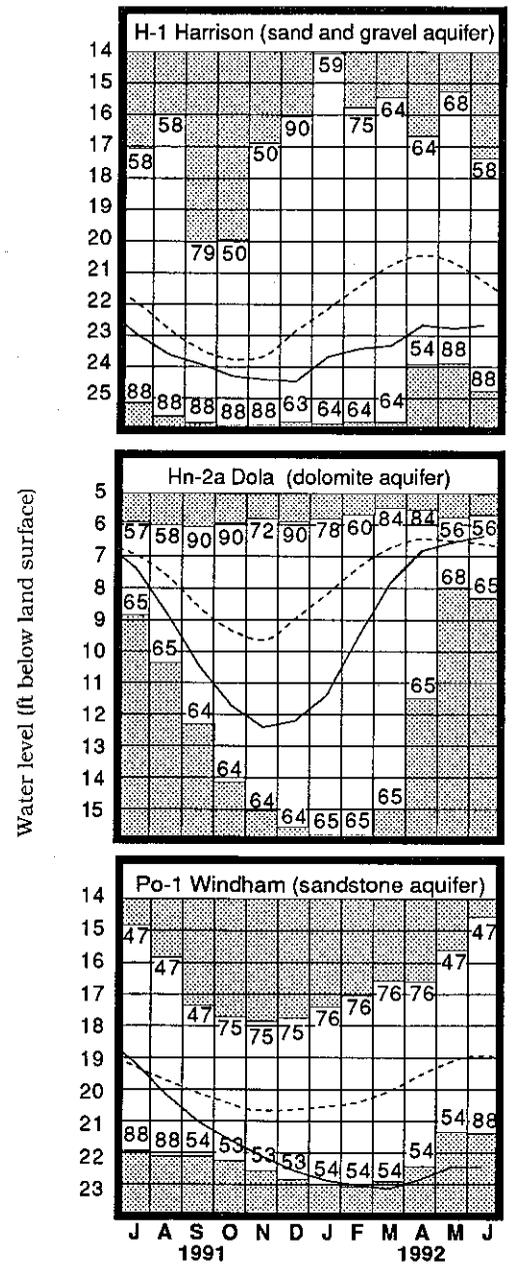
At the end of the month, topsoil moisture was reported to be adequate throughout most of Ohio; the eastern third of the state reporting the most areas with deficiencies. Agricultural crops generally are in good condition, although behind maturing schedules due to the cool temperatures. In contrast to soil moisture conditions (for agricultural purposes), ground-water storage (for water supply) remains at record-low seasonal levels in many central, eastern and northeastern Ohio aquifers. Index observation wells reaching record-low levels for June were Po-1 and Tu-1 (see Ground-Water Levels table on this page for aquifer type and location).

Ground-water storage in much of central, eastern and northeastern Ohio is not in an especially favorable position as the discharge season begins. Ground-water levels are expected to continue to decline through the fall months, possibly reaching record-low levels in the aforementioned areas. Water supply managers with ground-water sources should monitor their situations closely.

**LAKE ERIE** level declined slightly during June. The mean level was 572.26 feet (IGLD-1985), 0.03 foot below last month's mean level and 0.44 foot above normal. The June 1992 mean level is 0.44 foot below the June 1991 level and 3.06 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that precipitation in the Lake Erie basin for 1992 through June has averaged 16.0 inches, 1.1 inches below normal. For the entire Great Lakes basin, precipitation has averaged 13.0 inches, 1.8 inches below normal.

**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

July 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)

Indian Creek watershed (Ross County) causing near flash-flood conditions which resulted in much damage and the loss of life. July's rain was beneficial in helping end the drought, but the result was millions of dollars of damage, loss of life and farmers unable to harvest wheat and complete other field activities.

Precipitation for the 1992 calendar year is now above normal in most of the state, but remains below normal in the southern and eastern portions. The state average is 24.47 inches, 0.95 inch above normal. Regional averages range from 27.56 inches, 4.47 inches above normal, for the West Central Region to 22.10 inches, 1.76 inches below normal, for the Northeast Hills Region.

Precipitation for the 1992 water year is now above normal in the central, western, and northern portions of the state, but remains below normal in the eastern and southern portions. The state average is 31.42 inches, 0.33 inch above normal. Regional averages range from 33.32 inches, 2.86 inches above normal, for the West Central Region to 28.35 inches, 3.22 inches below normal, for the Northeast Hills Region.

## SUMMARY

Precipitation was noticeably above normal statewide. The state averaged 8.76 inches, ranking as the wettest July on record. Streamflow was excessive throughout most of the state. Several record and near-record high flows for July were recorded. Reservoir storage increased and was near normal by the end of the month. Ground-water storage improved slightly and was near normal in the western half of the state, but remained below normal in the eastern half. Lake Erie level rose and was 0.69 foot above the long-term July average. The record setting rainfall during July essentially ended the drought conditions, but the effects are expected to continue to be noticed in the ground water conditions through the spring months of 1993.

## NOTES AND COMMENTS

### RECORD RAINS END DROUGHT, WREAK HAVOC

The drought conditions that have persisted in Ohio for the past year and one-half were essentially ended in July. Only ground-water storage continues to have lingering effects. Unfortunately, severe weather and record rainfall caused substantial damage in many parts of Ohio.

The severe weather started on July 12 when storms across northern Ohio spawned several tornados and high, straight line winds. Heavy damage was reported in Cuyahoga, Erie, Fulton, Geauga, Lorain, Lucas, Medina, Ottawa, Portage, Summit, Van Wert and Wood counties. Later that night (early morning, July 13), heavy rains in central and western Ohio caused moderate to severe small stream and urban flooding. High water conditions were reported in and around Indian Lake. Rainfall amounts of more than 6 inches were reported. Auglaize, Franklin, Logan, Mercer and Shelby counties, as well as portions of some contiguous counties, were hardest hit.

Showers and thunderstorms were common statewide throughout the remainder of the month. Several other storms of note occurred. On July 16-17 heavy rain prompted flood warnings in central, western and northwestern Ohio as well as small stream and urban flood warnings in many other areas of the state. On July 26, an intense, short duration storm caused near flash-flood conditions in the Indian Creek watershed at Massieville (Ross County). A number of mobile homes were destroyed, houses were damaged and two lives were lost. The same day, storms caused some flooding conditions in Belmont, Jefferson and Perry counties. Near the end of the month, storms on July 29-30 in northeastern Ohio caused moderate flooding. Mahoning and Trumbull counties were hardest hit.

Governor Voinovich declared a state of emergency in 24 counties, the first step in seeking a federal disaster declaration. Additional information will be available next month including damage estimates for public and private property, number of homes and businesses affected and status of the request for disaster aid.

### CLINTON COUNTY AREA WATER SUPPLY STUDY UNDERWAY

The U.S. Army Corps of Engineers has initiated a study to assess the long-term water supply situation in the Caesar Creek Reservoir area. The study area includes all of Clinton County and portions of Warren and Greene counties. The ODNR Division of Water is under contract with the Corps to collect information about the public water systems in the study area. Additionally, Division of Water staff will be developing long-range water use projections. A public review period will be scheduled later this year.

**PRECIPITATION** for July was noticeably above normal throughout Ohio; only a few locations in southern Ohio had near normal rainfall. The state average was 8.76 inches, 4.84 inches above normal. This was the wettest July on record for the state as a whole. Also, it was the third wettest month on record ranking behind January 1937, 9.67 inches, and November 1985, 9.16 inches. Regional averages ranged from 10.65 inches, 6.69 inches above normal, for the Central Region to 5.65 inches, 1.19 inches above normal for the South Central Region. Urbana (Champaign County) reported the greatest amount of precipitation for the month, 13.61 inches. Other locations reporting more than 13 inches of rain for the month were: Huntsville (Logan County); Mansfield Airport (Richland County); Marion (Marion County); St. Marys (Auglaize County); and Wingfoot Lake (Summit County). Several unofficial precipitation observers in the Columbus (Franklin County) area reported more than 13 inches of rain for the month and two stations reported more than 15 inches. Salem Center (Meigs County) reported the least amount of rain for the month, 4.08 inches.

When it rains, it pours. That is exactly what happened during July. The month started with a typical summer pattern of widely scattered showers and thunderstorms. Hit or miss storms were common during the first 10 days of the month. A few locations received downpours of more than one inch, but most areas received much less. Total precipitation for the period ranged from less than 1 inch throughout most of Ohio to around 2 inches at some locations. The last three weeks of the month were very wet. Storm systems repeatedly stalled across Ohio resulting in several days with precipitation. On July 12, storms across northern Ohio spawned several tornados. On July 12-13, heavy rain fell in the central and west-central portions of the state. Several locations in and around Franklin, Logan, Mercer, and Shelby counties received from 5 to more than 6 inches of rain. Small stream and urban flooding was common as well as in and around Indian Lake (Logan County). The next major rain producing storm system moved across the state during July 16-17. Once again, moderate flooding in small streams and urban areas was common in central and northern Ohio. By this week's end, most of the northern two-thirds of the state had received more than 4 inches of rain, and in some areas, nearly 9 inches. The last 10 days of the month continued the wet pattern, but the storms tended to shift to the southern and eastern areas of the state. Most of the state received an additional 1-2 inches of rain during this period, but some areas received from 2 to more than 4 inches. The most notable storm was on July 26 when at least 3 inches of rain fell in about 30 minutes over the

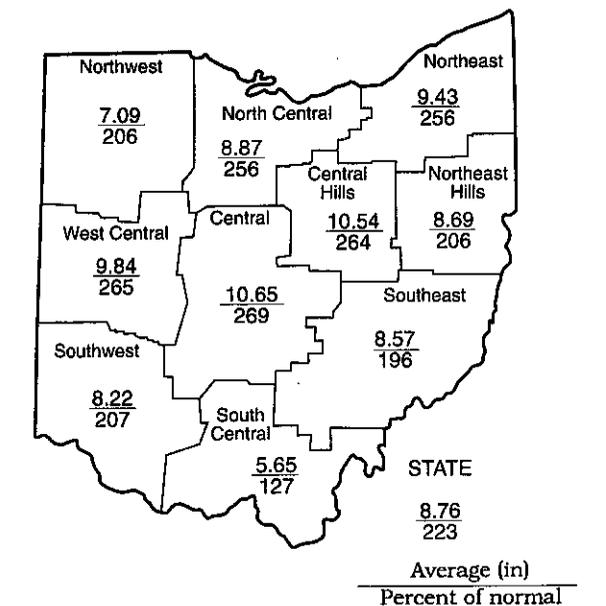
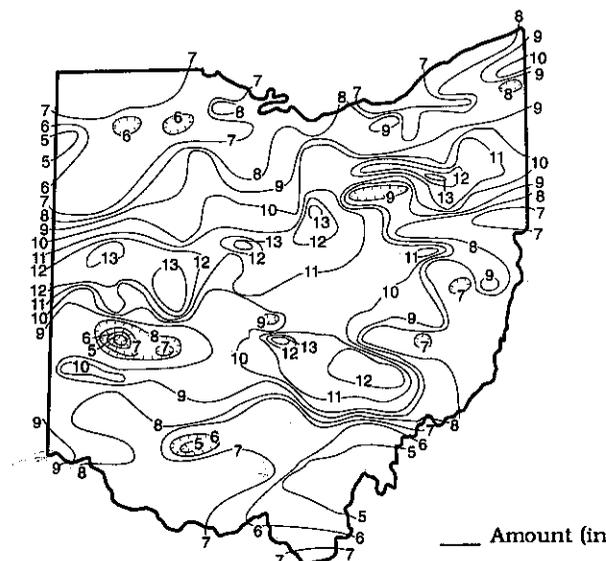
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## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+3.65	+1.89	+1.67	+3.07	+4.57	+2.4
North Central	+5.41	+3.51	+3.79	+2.97	+4.90	+2.3
Northeast	+5.75	+2.92	+2.84	-0.29	+5.64	+1.7
West Central	+6.13	+5.76	+4.76	+1.06	+5.04	+0.9
Central	+6.69	+5.07	+3.93	+0.72	+2.34	+0.1
Central Hills	+6.55	+3.87	+2.45	-0.63	+0.77	+1.4
Northeast Hills	+4.48	+0.92	-0.57	-4.37	-1.68	+1.1
Southwest	+4.25	+2.71	+0.06	-2.08	+6.45	+1.4
South Central	+1.19	+1.42	-1.36	-1.65	+1.14	+1.1
Southeast	+4.20	+1.35	-1.04	-2.16	+2.86	+0.1
State	+4.84	+2.95	+1.66	-0.32	+3.23	

\*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 JULY 1992



## ACKNOWLEDGEMENTS

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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.  
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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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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		
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Great Miami River at Hamilton	3,630	7,557	562	166	74	61
Huron River at Milan	371	879	1,015	251	107	82
Killbuck Creek at Killbuck	464	907	581	183	77	63
Little Beaver Creek near East Liverpool	496	314	149	52	50	41
Maumee River at Waterville	6,330	11,307	843	171	100	96
Muskingum River at McConnelsville	7,422	10,560	298	90	60	50
Scioto River near Prospect	567	2,045	2,730	387	93	72
Scioto River at Higby	5,131	11,448	680	177	73	63
Stillwater River at Pleasant Hill	503	1,195	1,039	249	95	68

**STREAMFLOW** during July was noticeably above normal throughout Ohio. Flows were high enough to be considered excessive in most basins. Several record and near-record July flows occurred. New July high flow records were reached at the Maumee River at Waterville, Scioto River near Prospect and at Higby, and the Stillwater River at Pleasant Hill gauging stations. The Grand River near Painesville, Great Miami River at Hamilton, Huron River at Milan and Killbuck Creek at Killbuck gauging stations each recorded their second highest flows for July; the Muskingum River at McConnelsville recorded its third highest flow for July.

Flows at the beginning of the month were below normal in the eastern half of the state and near or slightly above normal in the western half. Lowest flows for

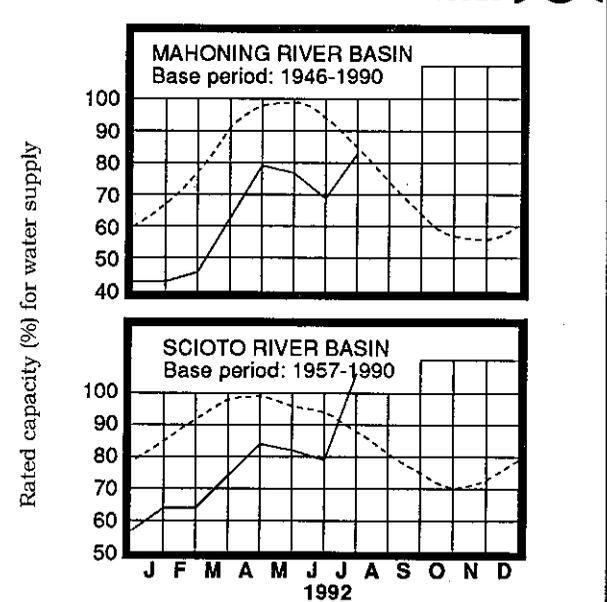
July in most areas of the state occurred between July 7-12. Flows increased rapidly following the widespread, heavy precipitation which began on July 12-13 resulting in small stream and urban flooding in central and west-central Ohio. The next heavy storms followed on July 16-17 resulting in more flooding in northwestern and central Ohio. The most notable flooding occurred on July 26 when at least 3 inches of rain fell in less than 40 minutes over the Indian Creek watershed. Near flash-flood conditions destroyed a number of mobile homes, damaged houses and, tragically, claimed two lives in Massesville (Ross County). More small stream and urban flooding was reported in the eastern and northeastern portions of the state on July 30-31. Several other areas also had some local flooding during all of the month's storm events. Most of the flooding was confined to small streams and urban areas (streets, basements, etc...) following these storms. The peak flows on the larger rivers did not exceed a 5-year recurrence interval. Needless to say, flows at the end of July were excessive throughout the state.

**RESERVOIR STORAGE** for water supply during July increased noticeably in both the Mahoning and Scioto river basins. Storage increased to above normal in the Scioto basin but remained slightly below normal in the Mahoning basin.

Reservoir storage at the end of July in the Mahoning basin index reservoirs was 83 percent of rated capacity for water supply compared with 69 percent for last month and 75 percent for July 1991. Month-end storage in the Scioto basin index reservoirs was 106 percent of rated capacity for water supply compared with 79 percent for last month and 74 percent for July 1991.

The noticeably above normal rainfall and resulting streamflow during July was very beneficial for surface water supplies. Both on and off-stream reservoirs are at or near capacity and/or normal levels for this time of year. Storage in many flood control reservoirs was utilized during the second half of the month.

RESERVOIR STORAGE FOR WATER SUPPLY



**GROUND-WATER LEVELS** during July declined during the first half of the month and then began to rise during the second half. Shallow, unconsolidated aquifers responded rapidly following the widespread precipitation while consolidated and deeper, unconsolidated aquifers showed a delayed response, beginning to rise near the end of the month in most of these type of aquifers. Although most aquifers were rising at the month's end, many aquifers in the central, eastern and northeastern portions of the state still showed net declines in July's average levels from those of last month. In response to the noticeably above normal rainfall, many aquifers had unusual net rises during July.

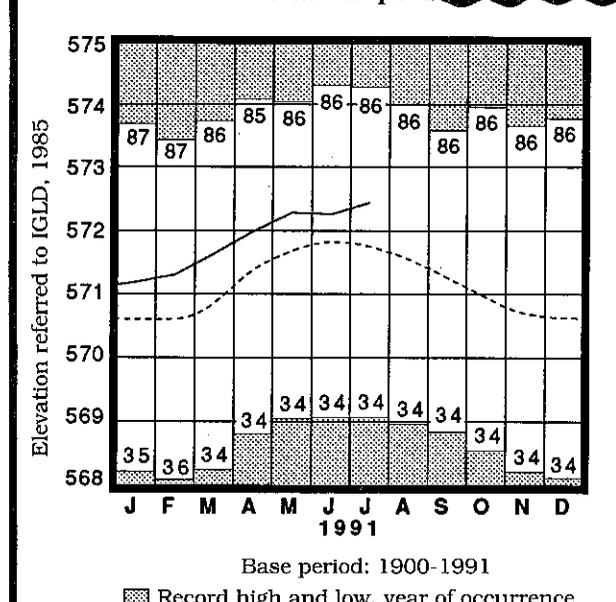
Ground-water storage improved slightly in many areas of the state during July. Shallow, unconsolidated aquifers had the greatest improvement. Most aquifers in the western half of the state are at or near normal seasonal levels; however, most aquifers in the eastern half of the state remain at below normal levels. Levels in eastern Ohio range up to more than 3 feet below normal. Index observation wells reaching record-low levels for July before beginning to rise were Po-1 and Tu-1 (See Ground-Water Levels table on this page for aquifer type and location).

Ground-water storage will be the slowest to fully recover from the drought conditions of the past year and a half. With near normal precipitation, it is expected that many aquifers in central, eastern and northeastern Ohio will not fully recover until after Spring 1993, the end of the next recharge season. Water supply managers with ground-water sources should continue to monitor their situations.

**LAKE ERIE** level rose during July. The mean level was 572.44 feet (IGLD-1985), 0.18 foot above last month's level and 0.69 foot above normal. The July 1992 mean level is 0.05 foot above the July 1991 level and 3.24 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that for July, the Lake Erie basin averaged 7.2 inches of precipitation, 3.9 inches above normal; the entire Great Lakes basin averaged 4.6 inches, 1.5 inches above normal. Precipitation for 1992 through July in the Lake Erie basin has averaged 22.9 inches, 2.5 inches above normal; for the entire Great Lakes basin, 1992 precipitation has averaged 17.7 inches, 0.2 inch below normal.

LAKE ERIE LEVELS at Fairport

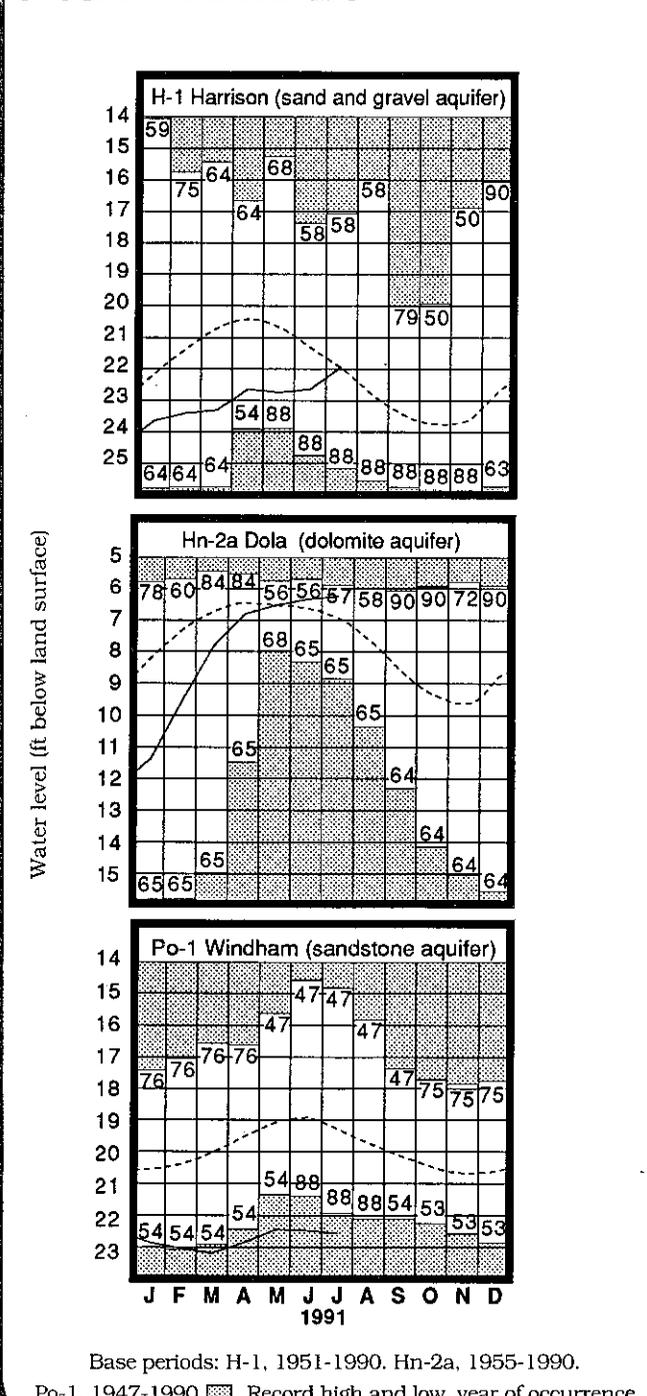


GROUND-WATER LEVELS

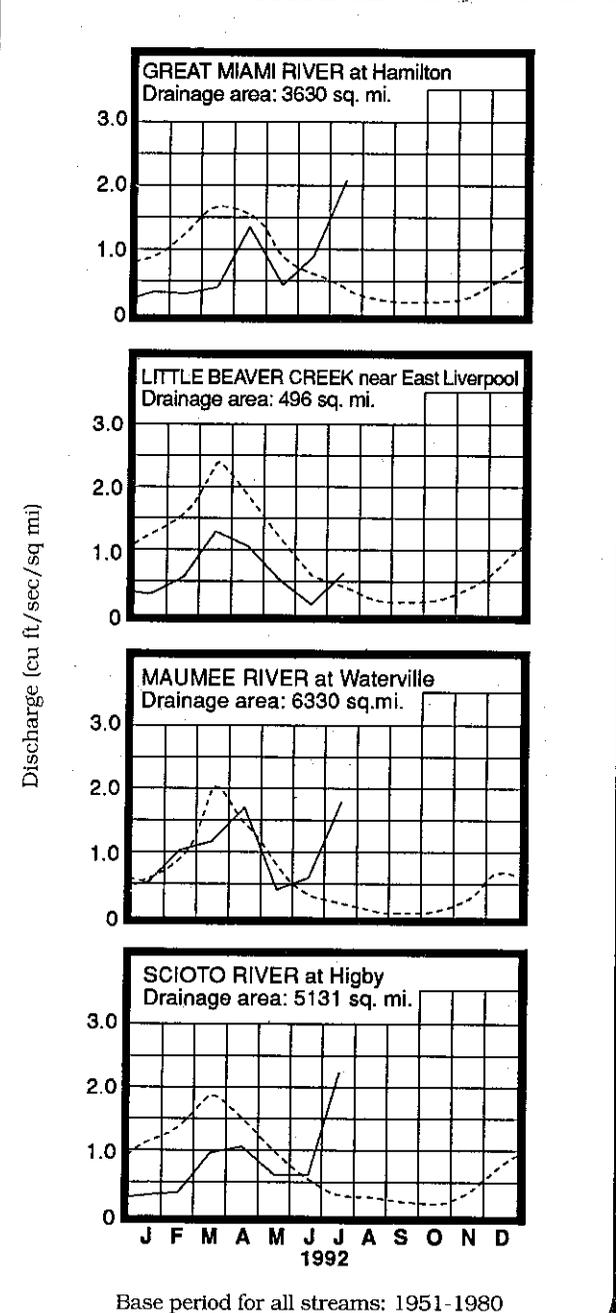
Based on daily lowest level in feet below land-surface datum

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	17.45	-2.33	+0.41	+1.18
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.62	+0.18	+0.29	+0.73
Fr-10	Columbus, Franklin Co.	Gravel	43.51	-0.05	-0.30	-1.07
H-1	Harrison, Hamilton Co.	Gravel	21.90	+0.06	+0.76	+1.07
Hn-2a	Dola, Hardin Co.	Dolomite	6.27	+0.68	+0.10	+1.12
Po-1	Windham, Portage Co.	Sandstone	22.59	-3.30	-0.11	-3.44
Tu-1	Strasburg, Tuscarawas Co.	Gravel	15.16	-2.64	-0.21	-0.71

GROUND-WATER LEVELS



MEAN STREAM DISCHARGE



Normal - - - - Current - - - -

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

August 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)

above normal, for the Central Region to 25.66 inches, 1.72 inches above normal, for the Northwest Region. The South Central Region averages 26.10 inches, 4.04 inches below normal.

Precipitation for the 1992 water year is above normal in the northern and western portions of the state and below normal in the eastern and southern portions. The state average is 35.30 inches, 0.73 inch above normal. Regional averages range from 37.29 inches, 2.57 inches above normal, for the Central Region to 33.03 inches, 2.06 inches below normal, for the Northeast Hills Region.

### SUMMARY

Precipitation for August was above normal throughout much of the state but below normal at scattered locations and throughout most of southeastern Ohio. Streamflow was noticeably above normal statewide. Reservoir storage increased and was above normal seasonal levels. Ground-water levels declined during the month in most areas, but generally are at near or slightly above normal levels. Only northeastern Ohio continues to have substantially below normal ground-water storage. Lake Erie level rose and was 1.04 feet above the long-term August average.

### NOTES AND COMMENTS

### FACT SHEETS AVAILABLE

The Ohio Department of Natural Resources (ODNR), Division of Water is preparing a series of fact sheets concerning wide-ranging topics. Fact sheets are being prepared that will detail services and information available at the Division of Water as well as cover topics and issues of interest to homeowners, scientists and others. These easily reproducible fact sheets would be ideal for distribution to small groups, at information booths, in schools and through local government offices.

Ten fact sheets have been completed and are now available. They are:

- FS92-1 "Water Efficiency at Home"
- FS92-2 "Water Efficiency in Your Own Backyard"
- FS92-3 "Water Efficiency for Private Well Owners"
- FS92-4 "The Ohio Canal System"
- FS92-5 "Well Abandonment, State Health & EPA Standards & Waivers"
- FS92-6 "Properly Sealing Unused Wells"
- FS92-7 "What is a Well Screen"
- FS92-8 "Well Log Computerization"
- FS92-9 "Evaluating Ground Water Pollution Potential in Ohio"
- FS92-10 "Ground Water Resources Mapping in Ohio"

Single copies can be ordered at no cost from the Division of Water, 1939 Fountain Square, Building E-3, Columbus, Ohio 43224, phone (614) 265-6717.

In addition to these fact sheets, the U.S. Geological Survey has prepared two fact sheets that are also available at no cost for single copies. They are:

- OF 92-119 "Advantages and Limitations of Water - Supply Alternatives" by R. J. Veley
- OF 92-152 "Continuous-Record Networks for Collection of Hydrologic Data in Ohio" by S. M. Hindall and Michael Eberle

Copies can be ordered from the U.S. Geological Survey, Water Resources Division, 975 West Third Avenue, Columbus, Ohio 43212-3197, phone (614) 469-5553. Copies are also available at the Division of Water while supplies last.

### WATER WITHDRAWAL ANNUAL REPORTS AVAILABLE

The "Ohio's Water Withdrawal Facility Registration Program 1991" annual report pamphlet will be available at the end of September. This pamphlet summarizes the total registered water withdrawals by county for each of five categories for both surface and ground water. The water withdrawal categories are power, public water supply, industrial, agriculture/irrigation and miscellaneous.

Copies are available from the ODNR, Division of Water, at the address listed above or by calling 614-265-6735.

**PRECIPITATION** for August was above normal throughout much of Ohio; scattered locations in central and western Ohio as well as most of the South Central and Southeast regions had below normal rainfall. The state average was 3.88 inches, 0.40 inch above normal. Regional averages ranged from 5.17 inches, 1.77 inches above normal, for the Northeast Region to 3.08 inches, 0.81 inch below normal, for the South Central Region. Burton (Geauga County) reported the greatest amount of precipitation for the month, 7.80 inches. Other locations reporting more than 7 inches of rain for the month were Ashtabula (Ashtabula County), Chardon (Geauga County) and Oakwood (Cuyahoga County). Ashland (Ashland County) reported the least amount of precipitation for the month, 1.36 inches. Other locations reporting less than 2 inches of rain for the month were Enterprise (Hocking County), Fostoria (Hancock County), Fayetteville and Stonelick Lake State Park (Clermont County).

Precipitation during most of August fell in a typical summer pattern of scattered showers and thunderstorms. The exception was during August 27-28 when the remnants of Hurricane Andrew produced statewide precipitation. The heaviest storms early in the month were generally in the northeastern portion of the state. Some areas reported over 3 inches of rain by August 8 while most central and eastern portions of the state received about 1 inch, and some western and northwestern locations, less than 0.5 inch. The next week of the month had several days with scattered showers, but daily amounts were generally light. Weekly totals were over 1 inch in the northern third and central areas of the state, but only around 0.5 inch elsewhere. The next 10 days of August were rather dry with a few spotty showers in northwestern and north-central Ohio. The bulk of the month's precipitation for many areas of the state fell during August 27-28. A passing cold front, coupled with abundant moisture supplied by the remnants of Hurricane Andrew, produced widespread precipitation over Ohio. Most areas received nearly 2 inches of rain, a few locations 3 inches, but some areas in north-central Ohio, only about 1 inch.

Precipitation for the 1992 calendar year is above normal throughout most of the state; exceptions are the Northeast Hills, South Central, Southeast and Southwest regions where precipitation is below normal. The state average is 28.35 inches, 1.35 inches above normal. Regional averages ranged from 31.47 inches, 4.04 inches

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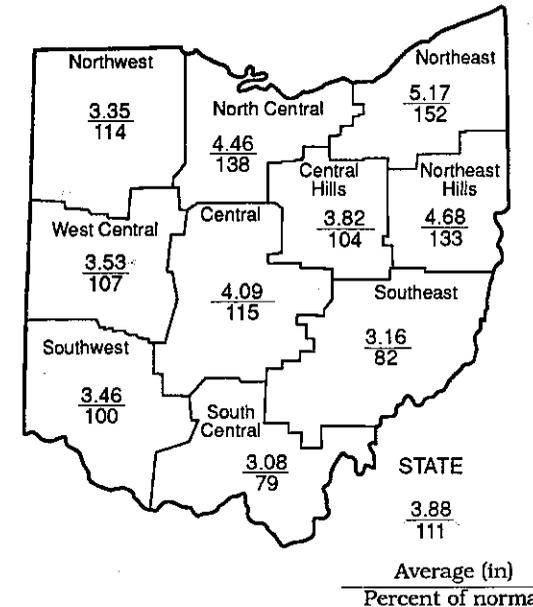
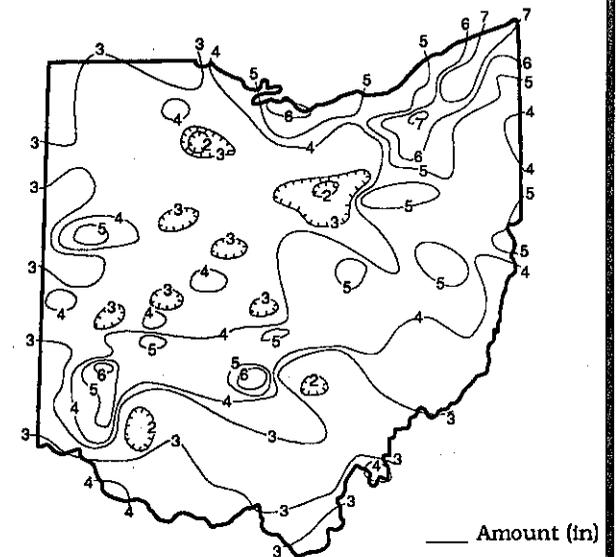
### PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.42	+2.71	+2.66	+2.82	+4.00	+2.7
North Central	+1.23	+5.59	+5.11	+4.15	+5.67	+2.7
North East	+1.77	+5.65	+4.79	+2.17	+6.18	+3.4
West Central	+0.23	+6.59	+6.19	+2.22	+4.45	+1.8
Central	+0.54	+6.19	+5.56	+2.34	+3.55	+0.5
Central Hills	+0.16	+5.17	+3.43	+0.12	+0.44	+1.7
Northeast Hills	+1.16	+2.97	+1.33	-1.79	-0.95	+2.1
Southwest	-0.01	+3.39	+1.74	-2.35	+4.66	+1.6
South Central	-0.81	+0.01	-1.15	-2.35	-0.03	+0.5
Southeast	-0.68	+1.84	-0.53	-2.78	+2.04	+0.5
State	+0.40	+4.02	+2.92	+0.47	+3.03	

\*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 AUGUST 1992



### ACKNOWLEDGEMENTS

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.



DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

George V. Voinovich  
Governor

Frances S. Buchholzer  
Director

James R. Morris  
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	776	652	154	72	51
Great Miami River at Hamilton	3,630	2,604	341	317	95	66
Huron River at Milan	371	399	1,005	489	129	92
Killbuck Creek at Killbuck	464	639	520	317	109	74
Little Beaver Creek near East Liverpool	496	649	590	169	69	51
Maumee River at Waterville	6,330	2,660	434	358	112	99
Muskingum River at McConnellsville	7,422	8,035	314	171	75	58
Scioto River near Prospect	567	555	1,377	793	149	82
Scioto River at Higby	5,131	3,902	316	281	101	69
Stillwater River at Pleasant Hill	503	303	611	464	121	73

**STREAMFLOW** during August was above normal throughout the state. Flows were high enough to be considered excessive statewide. Flows during August were less than the July flows except in northeastern Ohio where the August flows were greater. The mean flow of 399 CFS for the Huron River at Milan and 555 CFS for the Scioto River near Prospect gauging stations was the second highest for August for their respective period of records. The Grand River near Painesville recorded its third highest flow for August. Most other streamflow gauging stations recorded between their fifth and seventh highest flows for August.

Flows at the beginning of the month were excessive throughout the state.

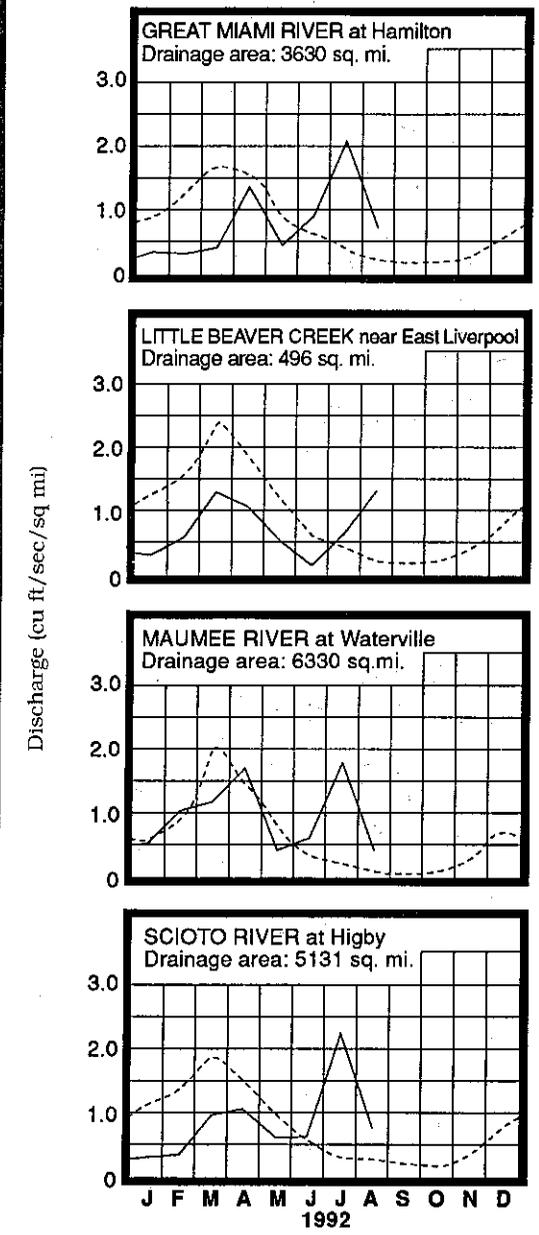
Most areas of the state recorded their greatest flows for August at the start of the month; however, some areas in the eastern portion of the state had slightly higher flows following local precipitation events, especially on August 29. Lowest flows for the month occurred during August 23-26, just prior to the passage of a cold front and the remnants of Hurricane Andrew which produced widespread precipitation. Flows at the end of the month were still excessive throughout the state.

**RESERVOIR STORAGE** for water supply during August increased in both the Mahoning and Scioto river basins. Storage was above normal in both basins. This was the first month since February 1991 that storage has been above normal in the Mahoning basin reservoirs.

Reservoir storage at the end of August in the Mahoning basin index reservoirs was 91 percent of rated capacity for water supply compared with 83 percent for last month and 66 percent for August 1991. Month-end storage in the Scioto basin index reservoirs was 101 percent of rated capacity for water supply compared with 106 percent for last month and 64 percent for August 1991.

The noticeably above normal streamflow during the past two months has been very beneficial for surface water supplies. Both on and off-stream reservoirs are at or near capacity and/or normal levels for this time of year. Surface water supplies are in excellent condition as the end of the water year approaches.

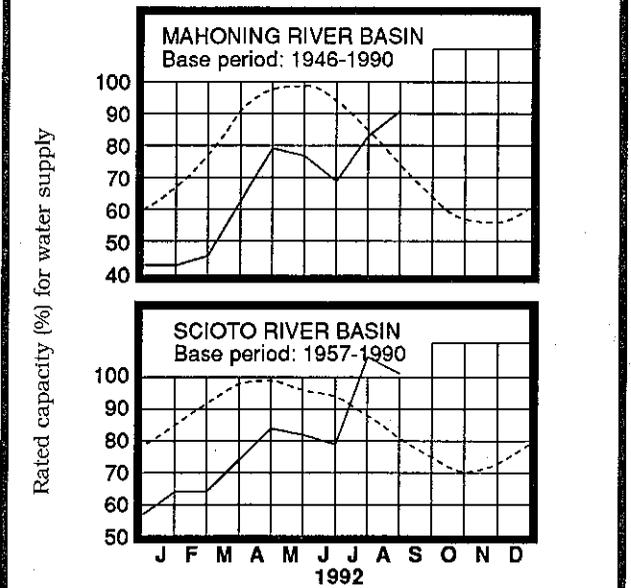
**MEAN STREAM DISCHARGE**



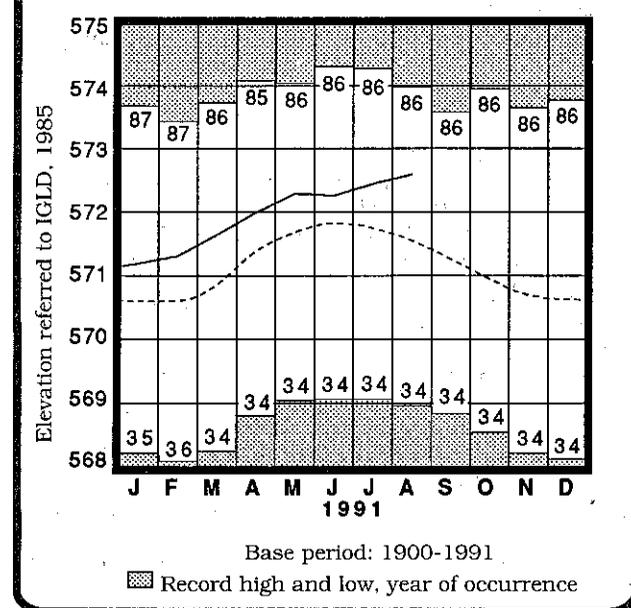
Base period for all streams: 1951-1980

Normal - - - - - Current

**RESERVOIR STORAGE FOR WATER SUPPLY**



**LAKE ERIE LEVELS at Fairport**



Normal - - - - - Current

**GROUND-WATER LEVELS**

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

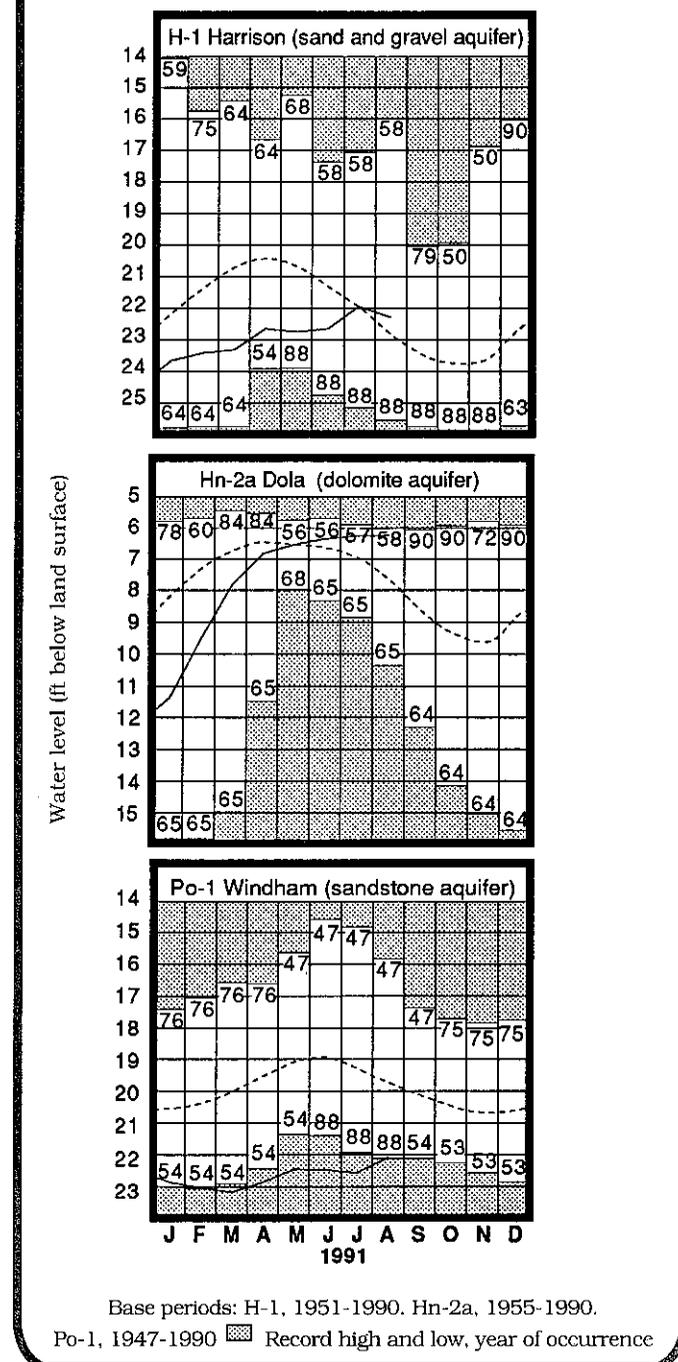
Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	14.58	+1.21	+2.87	+4.74
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.28	+1.00	+0.34	+2.15
Fr-10	Columbus, Franklin Co.	Gravel	43.45	+0.57	+0.06	-0.58
H-1	Harrison, Hamilton Co.	Gravel	22.29	+0.52	-0.39	+1.32
Hn-2a	Dola, Hardin Co.	Dolomite	6.24	+1.42	+0.03	+2.60
Po-1	Windham, Portage Co.	Sandstone	22.04	-2.32	+0.55	-1.84
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.40	-1.31	+0.76	+0.70

Ground-water storage currently is in a much better position than last year as the end of the 1992 water year approaches. Current levels are noticeably above the August 1991 levels in most of Ohio; exceptions are in some deeper aquifers, mainly in the northeastern portion of the state. Index observation well Po-1 (Portage County), representing a sandstone aquifer, reached a record-low level for August early in the month before rising slightly.

Ground-water storage has improved favorably during the past two months in most of Ohio. Normal precipitation conditions during the upcoming recharge season will result in a continuation of this improvement. With near normal climatic conditions, ground-water storage should recover fully from the past drought conditions by the end of spring 1993.

**LAKE ERIE** level rose during August. The mean level was 572.60 feet (IGLD 1985), 0.16 foot above last month's mean level and 1.04 feet above normal. The August 1992 level is 0.53 foot above the August 1991 level and 3.40 feet above Low Water Datum.

**GROUND-WATER LEVELS**



Normal - - - - - Current

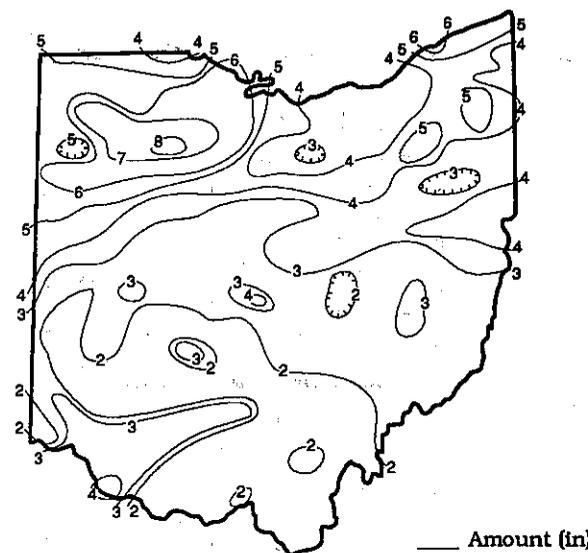


# MONTHLY WATER INVENTORY REPORT FOR OHIO

September 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## PRECIPITATION SEPTEMBER 1992



**PRECIPITATION** for September was above normal in northern Ohio and below normal in most of southern Ohio. The state average was 3.25 inches, 0.25 inch above normal. Regional averages ranged from 5.67 inches, 2.82 inches above normal, for the Northwest Region to 1.92 inches, 1.26 inches below normal, for the South Central Region. Findlay (Hancock County) reported the greatest amount of precipitation for the month, 8.34 inches. Racine Locks and Dam (Meigs County) reported the least amount, 1.01 inches.

Precipitation during September fell in a somewhat atypical pattern being greatest in the north and northwest and least in the south. Locally heavy thunderstorms crossed the northern part of Ohio on several days; rivers were running at near-record September flows and local small stream and urban flooding occurred in northwestern Ohio. The first week of September was rather dry for most of the state with less than 0.5 inch of rain reported at most locations; the exception was in northwestern Ohio where thunderstorms during September 3-5 produced locally heavy precipitation. Most areas received 1-2 inches of rain, but some areas, most notably Findlay, received more than 4 inches, of which 3.33 inches fell during one day. The second week of the month brought a similar pattern. Northwestern Ohio again saw storms that produced from 1 to more than 3 inches of rain locally, with most falling on September 9. Some areas in Allen County reported flooding. Northeastern Ohio also received some 1 inch storms during the second week, but most of the rest of the state could only muster up to 0.5 inch. The third week of September was rather dry with some spotty storms on September 19. Some locations in northeast Ohio reported an inch or so. The bulk of the month's precipitation for all but northwestern Ohio fell during September 21-22. Most of the state received 1-2 inches of rain, less in south-central Ohio, more in some areas in the northeastern part of the state.

Precipitation for the 1992 calendar year is above normal in the northern half of the state and below normal in the southern half. The state average is 31.46 inches, 1.46 inches above normal. Regional averages range from 34.22 inches, 5.49 inches above normal, for the Northeast Region to 28.03 inches, 5.29 inches below normal, for the South Central Region.

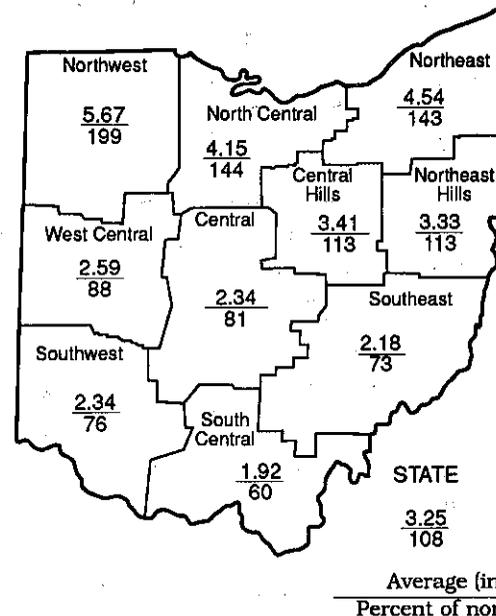
Precipitation for the 1992 water year which ended on September 30 was above normal in northern Ohio and below normal in southern Ohio. The state average was 38.41 inches, 0.84 inch above normal. Regional averages ranged from 41.07 inches, 4.10 inches above normal, for the Northeast Region to 36.19 inches, 3.40 inches below normal, for the Southeast Region (see Precipitation table, departure from normal, past 12 months column, on this page). Andover (Ashtabula County) reported the greatest amount of precipitation for the 1992 water year, 50.33 inches. Senecaville Dam (Guernsey

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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	+2.82	+6.70	+5.21	+6.74	+6.79	+3.6
North Central	+1.27	+7.64	+6.14	+5.39	+5.01	+3.0
Northeast	+1.36	+8.82	+6.05	+4.10	+3.77	+3.8
West Central	-0.34	+6.02	+6.42	+2.65	+3.40	+1.9
Central	-0.55	+6.24	+4.29	+1.58	+1.71	+1.1
Central Hills	+0.38	+6.88	+3.47	+0.11	-0.79	+2.3
Northeast Hills	+0.39	+6.03	+1.58	-1.67	-3.00	+3.1
Southwest	-0.75	+3.23	+1.23	-2.61	+3.29	+1.2
South Central	-1.26	-0.60	-2.47	-4.50	-1.40	+0.1
Southeast	-0.81	+2.89	-1.55	-3.40	-0.19	+0.5
State	+0.25	+5.38	+3.03	+0.84	+1.88	

\*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

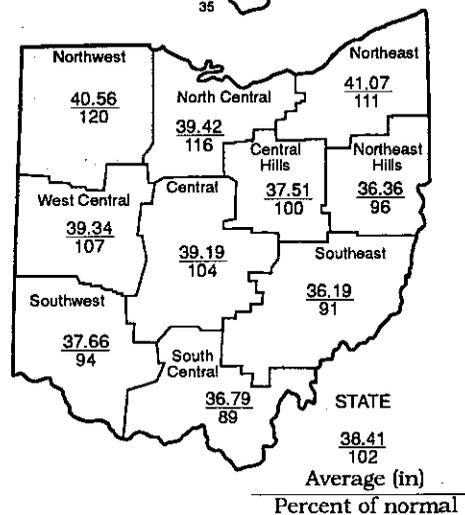
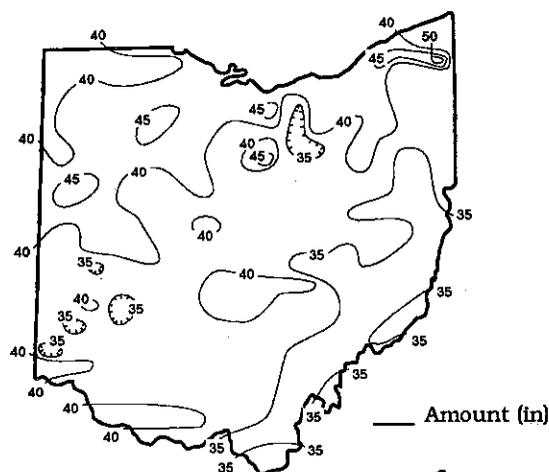


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County) reported the least amount, 31.21 inches. An isohyetal map and regional averages with percentages of normal precipitation for the 1992 water year appear below.

Precipitation during the 1992 water year varied greatly between the beginning and the end. Precipitation during the first nine months continued the trend of being below normal that was established in 1991. Precipitation during October was below normal statewide except in the Northwest Region where it was the third wettest October on record. November precipitation was below normal; December's was above normal in most of the state, but below normal in the northwest and north-central areas. January and February both had noticeably below normal precipitation while March's was near normal. April precipitation was noticeably below normal in southeastern Ohio, but above normal in the West Central Region and at scattered locations in the north. Precipitation during May and June was below normal in most areas, but scattered, locally heavy storms were common. The 1992 January through June period was the eighth driest on record. Recharge to both surface and ground-water supplies was poor. Conditions changed dramatically by mid-summer; July 1992 was the wettest July and the third wettest month on record. Small stream and urban flooding was common. August and September precipitation was above normal in most of the state, but continued to be below normal in the south-central and southeastern areas. Water supplies were in a much better position at the end of the water year than at the start.

## TOTAL PRECIPITATION 1992 WATER YEAR



## SUMMARY

Precipitation during September was above normal in northern Ohio and below normal in southern Ohio. Streamflow was excessive. Reservoir storage declined slightly but remained above normal. Ground-water levels declined and but slightly above normal in all areas except northeastern Ohio. Lake Erie level declined slightly and was 1.32 feet above the long-term September average.

Precipitation for the 1992 water year was above normal in the northern part of the state and below normal in the southern part. Streamflows were below normal except in northwestern Ohio. Surface and ground-water storage was at noticeably low levels, but improved by the end of the water year. Lake Erie levels remained above normal throughout the year.

## ACKNOWLEDGEMENTS

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  
Frances S. Buchholzer  
Director  
James R. Morris  
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	812	330	157	103	57
Great Miami River at Hamilton	3,630	1,231	184	426	135	69
Huron River at Milan	371	496	2,111	1,039	215	104
Killbuck Creek at Killbuck	464	550	613	519	152	84
Little Beaver Creek near East Liverpool	496	590	749	377	96	57
Maumee River at Waterville	6,330	10,345	2,653	708	175	113
Muskingum River at McConneville	7,422	5,391	343	284	97	63
Scioto River near Prospect	567	96	331	1,440	250	83
Scioto River at Higby	5,131	1,313	126	354	125	72
Stillwater River at Pleasant Hill	503	111	246	629	183	74

**STREAMFLOW** during September was above normal throughout the state. Flows were high enough to be considered excessive in all but the south-central drainage basins. Flows during September were greater than the August flows in northern Ohio, but seasonally lower in September elsewhere. The mean flows of 496 cfs for the Huron River at Milan, 550 cfs for the Killbuck Creek at Killbuck and 10,345 cfs for the Maumee River at Waterville gauging stations were the second highest for September for their respective periods of record; the Grand River near Painesville and Little Beaver Creek near East Liverpool recorded their third highest flows for September.

Flows at the beginning of the month were excessive throughout the state. Generally, flows declined in the southern two-thirds of the state until about September 17-18 during

which time most basins recorded their lowest flows. In contrast, flows in the northern one-third of the state increased during the month; their lowest flows occurred on September 2. Also, some basins in central and south-central Ohio had their lowest flows at the end of the month. Greatest flows for the month occurred during September 10-12 in the northern part of the state and September 22-23 in the southern part. Small stream and urban flooding occurred in northwestern Ohio on September 5, 9 and 22, especially in Allen, Hancock and Putnam counties. Flows remained noticeably above normal at the end of the month throughout most of the state with only south-central Ohio having below normal flows.

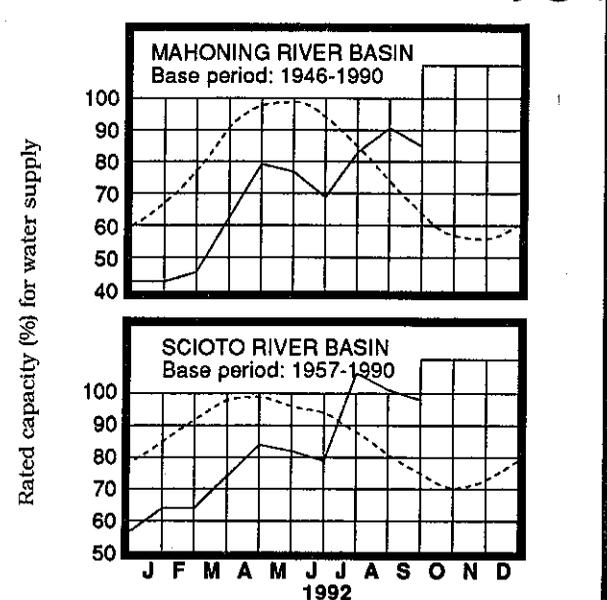
Streamflow during the 1992 water year was below normal throughout most of the state; only northwestern and north-central Ohio had above normal flows (see Mean Stream Discharge table, past 12 months column, on this page). The total annual flow of most of Ohio's drainage basins was low enough to be considered deficient. Flows were noticeably below normal in most drainage basins throughout the fall, winter, spring and early summer months; however, record-breaking rains in July reversed this trend and streamflow was at near-record levels during July, August and September.

Even with the below normal streamflows, flooding still resulted in millions of dollars of damage to both public and private property during the 1992 water year. Local flooding, generally confined to small streams and urban areas, occurred in several months. Some notable events occurred during December 2-3 in south-central and southeastern Ohio, the last three weeks of July throughout Ohio, most notably in Massieville in Ross County, and early to mid-September in northwestern and north-central Ohio.

**RESERVOIR STORAGE** for water supply during September declined in both the Mahoning and Scioto river basins. Storage remained below normal in both basins.

Reservoir storage at the end of September in the Mahoning basin index reservoirs was 85 percent of rated capacity for water supply compared with 91 percent for last month and 56 percent for September 1991. Month-end storage in the Scioto basin index reservoirs was 98 percent of rated capacity

**RESERVOIR STORAGE FOR WATER SUPPLY**



for water supply compared with 101 percent for last month and 59 percent for September 1991.

Surface water storage for water supply varied greatly during the 1992 water year. Storage was noticeably below normal at the start of the water year as a result of the deficient precipitation and increased consumptive use during the spring and summer of 1991. Storage remained below normal throughout the winter, spring and early summer months, increasing slowly from the alarmingly low levels of the fall. Finally, record-breaking rains in July brought surface water storage to above normal levels by the end of the water year. Surfacewater supplies are in good shape as the 1993 water year begins.

**GROUND-WATER LEVELS** during September declined throughout the state in most aquifers; a few exceptions were noted in northern Ohio where levels were stable or increased slightly. Ground-water storage is near or slightly above normal seasonal levels throughout most of the state with only northeastern Ohio continuing to have below normal levels. Ground-water levels are above those levels of a year ago in most areas, but are still lower than last year's in some deeper aquifers, especially in the central and eastern parts of Ohio.

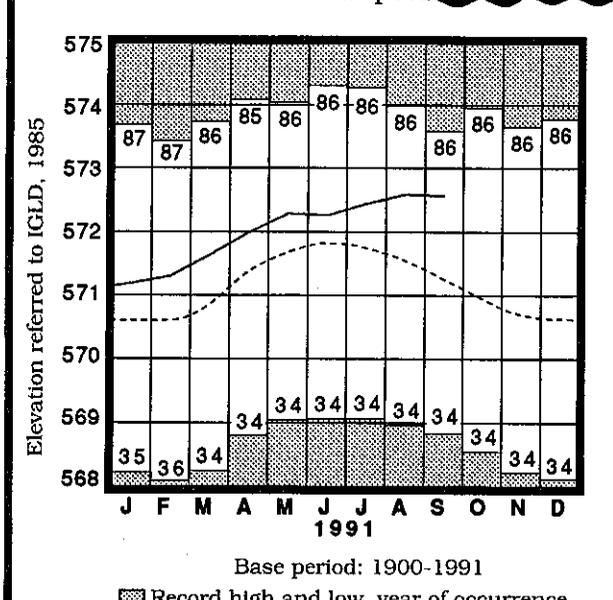
Ground-water storage was at below normal levels during most of the 1992 water year. Most areas of the state had noticeably below normal precipitation during the winter and spring months which resulted in very little recharge to ground-water supplies. Many aquifers, especially in central, eastern and northeastern Ohio, were at record-low levels throughout the recharge season. Record-breaking rains during July, and near normal rain in August and September, helped to improve the situation. At the end of the 1992 water year, ground-water storage was near to slightly above normal seasonal levels in all but northeastern Ohio.

**LAKE ERIE** level declined slightly during September. The mean level was 572.58 feet (IGLD-1985), 0.02 foot below last month's mean level and 1.32 feet above normal. This month's level is 0.88 foot above the September 1991 level and 3.38 feet above Low Water Datum.

The U. S. Army Corps of Engineers reports that precipitation during September in the Lake Erie basin averaged 5.2 inches, 2.1 inches above normal; the entire Great Lakes basin averaged 4.7 inches, 1.3 inches above normal. Precipitation for 1992 through September in the Lake Erie basin has averaged 31.6 inches, 4.9 inches above normal; for the entire Great Lakes basin, 1992 precipitation has averaged 26.0 inches, 1.6 inches above normal.

The level of Lake Erie remained above the long-term average throughout the 1992 water year. Lake Erie levels have remained above the long-term average for more than 20 years during which time precipitation in the Great Lakes basin has also been above normal more often than not.

**LAKE ERIE LEVELS at Fairport**

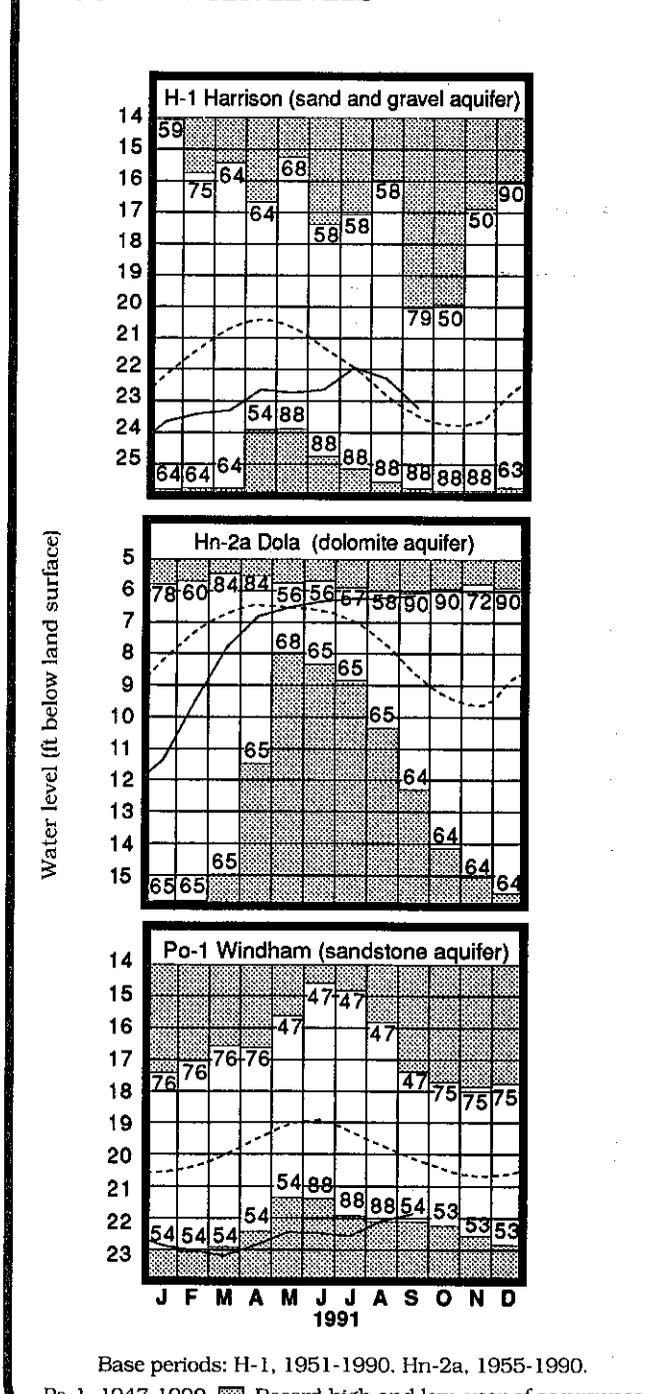


**GROUND-WATER LEVELS**

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
					This Month	
F-1	W. Rushville, Fairfield Co.	Sandstone	16.37	+0.05	-1.79	+3.50
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.99	+0.68	-0.71	+2.41
Fr-10	Columbus, Franklin Co.	Gravel	43.75	+0.75	-0.30	-0.67
H-1	Harrison, Hamilton Co.	Gravel	23.22	+0.25	-0.93	+0.70
Hn-2a	Dola, Hardin Co.	Dolomite	6.19	+2.42	+0.05	+4.30
Po-1	Windham, Portage Co.	Sandstone	21.87	-1.75	+0.17	-0.84
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.48	-0.97	-0.08	+0.98

**GROUND-WATER LEVELS**



Normal - - - - Current - - - -

Normal - - - - Current - - - -



# MONTHLY WATER INVENTORY REPORT FOR OHIO

October 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

## SUMMARY

Precipitation during October was below normal throughout most of Ohio. Streamflow remained at above normal levels. Reservoir storage declined but remained above normal seasonal levels. Ground-water levels declined in most of Ohio's aquifers. Ground-water storage is above normal in the western half of Ohio but below normal in the eastern half. Lake Erie level declined seasonally and was 1.25 feet above the long-term October average.

## NOTES AND COMMENTS

### NEW PUBLICATIONS

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

The Ground Water Resources of Muskingum County  
by Alfred C. Walker

This map is one in a series of county ground-water resources maps which have been completed for 83 of Ohio's 88 counties. 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.

In addition to the new Ground Water Resources of Muskingum County map, two other county ground-water resources maps that have been out of print have been reprinted and are now available. They are:

The Ground Water Resources of Fairfield County

by James J. Schmidt

The Ground Water Resources of Licking County

by Glenn Hartzell

The Ground Water Resources of Fairfield County map has also been revised since its last printing in 1981.

These new maps cost \$6.53 each (includes postage, handling and tax). They can be ordered from: ODNr-Publications Center, 4383 Fountain Square, Building B-1, Columbus, Ohio 43224-1362. Make checks payable to ODNr-Publications Center.

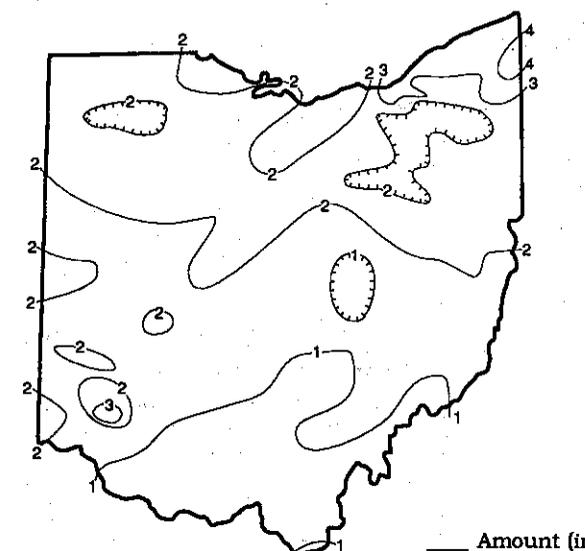
**PRECIPITATION** for October was below normal throughout most of Ohio; only extreme northeastern Ohio and a few other scattered locations had above normal precipitation. The state average was 1.79 inches, 0.55 inch below normal. Regional averages ranged from 2.88 inches, 0.16 inch above normal, for the Northeast Region to 0.62 inch, 1.62 inches below normal, for the South Central Region. Andover (Ashtabula County) reported the greatest amount of precipitation for the month, 4.24 inches. Portsmouth (Scioto County) reported the least amount, only 0.20 inch. Shawnee State Forest (Scioto County), just west of Portsmouth, reported 0.29 inch.

Precipitation during October, as in September, continued to be distributed across Ohio in the somewhat atypical pattern of being greatest in the north and least in the south. Most of the precipitation in October fell during the middle of the month as the first seven and the last 12 days were rather dry, with only a few scattered, light showers near the month's end. Most areas of the state received between 0.3 and 0.7 inch of rain during October 8-10, but the wettest period was during October 13-16. Most of the state received from 1 to nearly 2 inches of rain during this period, with the heaviest storms occurring on October 15. Only south-central and southeastern Ohio missed these storms. Many areas of Ohio observed the season's first snowflakes during October 18-20. Few places had any accumulation, but Dorset (Ashtabula County) reported 5 inches of snow for the month and Youngstown Airport (Trumbull County) reported 4 inches, its second snowiest October on record.

Precipitation for the 1992 calendar year is above normal in northern and western Ohio and below normal in eastern and southern Ohio. The state average is 33.29 inches, 0.95 inch above normal. Regional averages range from 37.11 inches, 5.66 inches above normal, for the Northeast Region to 28.65 inches, 6.91 inches below normal, for the South Central Region.

Precipitation for the new 1993 water year (October 1, 1992 to September 30, 1993) is below normal throughout most of the state and noticeably below normal in south-central and southeastern Ohio. Although not off to a good start, conditions favor a good recharge season if precipitation returns to and remains at near normal amounts.

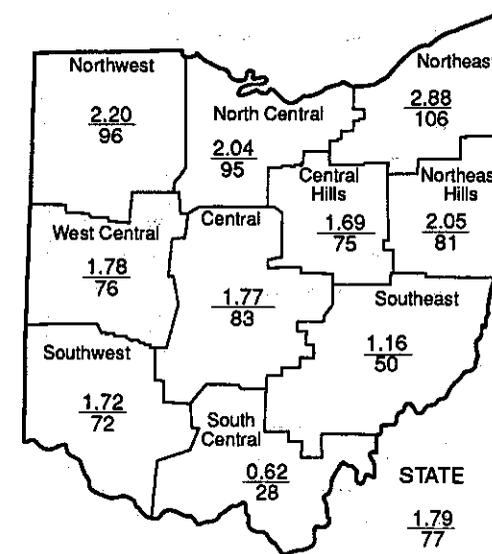
## PRECIPITATION OCTOBER 1992



## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.09	+2.92	+4.92	+3.26	+5.09	+3.5
North Central	-0.10	+2.52	+5.82	+4.61	+3.30	+3.1
Northeast	+0.16	+3.30	+6.14	+4.59	+1.48	+4.4
West Central	-0.56	-0.67	+4.99	+2.64	+0.80	+2.0
Central	-0.37	-0.65	+4.30	+2.03	-1.14	+1.7
Central Hills	-0.57	-0.15	+3.51	+0.37	-4.09	+2.3
Northeast Hills	-0.48	+1.07	+1.99	-0.40	-5.29	+2.9
Southwest	-0.67	-1.36	+1.17	-2.18	-0.43	+1.1
South Central	-1.62	-3.69	-2.30	-5.00	-4.63	-0.6
Southeast	-1.17	-2.66	-1.13	-3.20	-3.26	+0.8
State	-0.55	+0.05	+2.92	+0.67	-0.80	

\*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



## ACKNOWLEDGEMENTS

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Precipitation data:  
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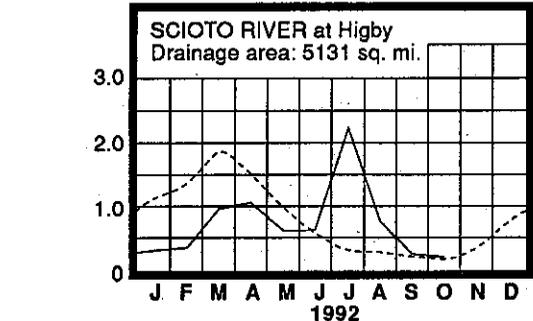
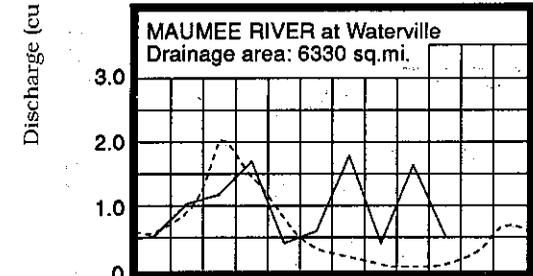
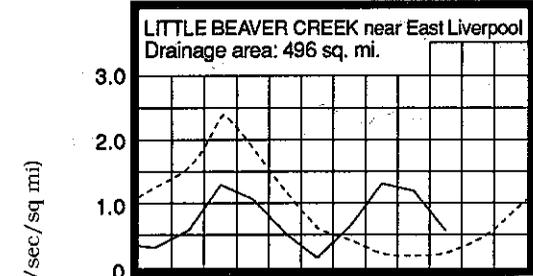
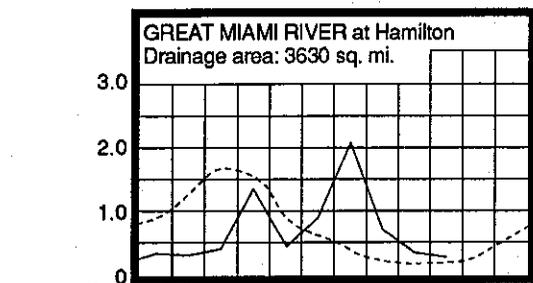
DIVISION OF WATER  
1939 FOUNTAIN SQUARE  
COLUMBUS, OHIO 43224

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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	636	265	152	118	62
Great Miami River at Hamilton	3,630	1,020	150	195	172	69
Huron River at Milan	371	156	536	894	317	107
Killbuck Creek at Killbuck	464	370	453	371	244	90
Little Beaver Creek near East Liverpool	496	293	269	432	126	63
Maumee River at Waterville	6,330	3,215	579	676	262	115
Muskingum River at McConnellsville	7,422	2,747	163	241	125	65
Scioto River near Prospect	567	77	256	531	361	84
Scioto River at Higby	5,131	1,205	158	186	162	71
Stillwater River at Pleasant Hill	503	125	229	286	253	76

**MEAN STREAM DISCHARGE**



Base period for all streams: 1951-1980

Normal

**STREAMFLOW** during October was above normal throughout the state. Flows in the northern half of the state were high enough to be considered excessive. Flows during October declined seasonally from the September flows in most drainage basins.

Flows at the beginning of the month were noticeably above normal throughout most of the state. Flows declined during the first week of the month. Most areas of the state recorded their lowest flows for the month during October 6-8; a few basins in southeastern Ohio had slightly lower flows at the end of the month. Greatest flows for the month occurred during October 17-18 in most basins following several days with precipitation in many areas of the state. Flows declined throughout the

remainder of the month, but remained above normal at the month's end.

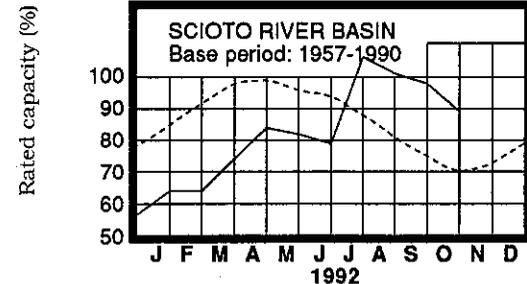
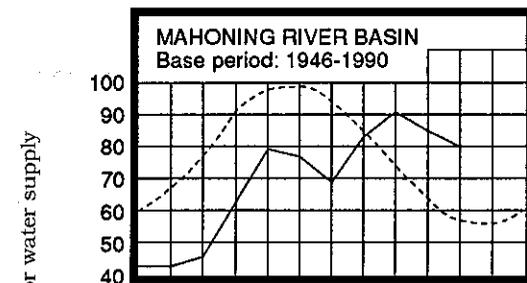
**RESERVOIR STORAGE** for water supply during October declined in both the Mahoning and Scioto river basins. Storage remained above normal in both basins.

Reservoir storage at the end of October in the Mahoning basin index reservoirs was 80 percent of rated capacity for water supply compared with 85 percent for last month and 49 percent for October 1991. Storage at the end of October in the Scioto basin index reservoirs was 89 percent of rated capacity for water supply compared with 98 percent for last month and 57 percent for October 1991.

The above normal streamflow during the past several months has been very beneficial for surface-water supplies. Surface-water storage is in a much better position at the start of the 1993 water year than it was last year.

**ERRATA:** Last month's reservoir storage was mistakenly reported as remaining below normal when in fact storage remained above normal at the end of September.

**RESERVOIR STORAGE FOR WATER SUPPLY**



Current

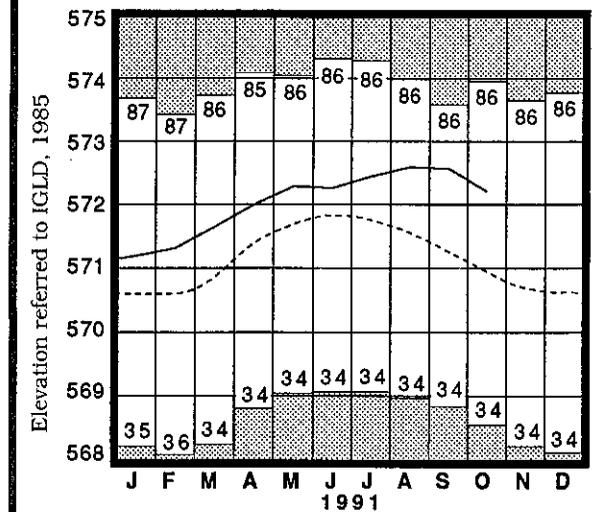
**GROUND-WATER LEVELS** during October declined throughout the state in most aquifers; a few exceptions were noted, especially in consolidated aquifers in north-eastern Ohio, where levels were stable or rose slightly. Ground-water storage remains near or slightly above normal in the western half of the state but has fallen or continues to remain below normal in much of the eastern half of Ohio. This year's levels range from slightly below to noticeably above the October 1991 levels.

Generally, ground-water storage is in a better position at the start of the 1993 water year than it was last year. Long-range forecasts, soil moisture conditions, streamflows, and precipitation during the past several months are all more favorable for improved ground-water storage during the upcoming recharge season than at this time last year.

**LAKE ERIE** level declined seasonally during October. The mean level was 572.21 feet (IGLD-1985), 0.37 foot below last month's mean level and 1.25 feet above normal. This month's level is 1.01 feet above the October 1991 level and 3.01 feet above Low Water Datum.

The U. S. Army Corps of Engineers reports that precipitation during October in the Lake Erie basin averaged 2.6 inches, 0.1 inch below normal; the entire Great Lakes basin averaged 2.2 inches, 0.6 inch below normal. Precipitation for 1992 through October in the Lake Erie basin has averaged 34.0 inches, 4.5 inches above normal; for the entire Great Lakes basin, 1992 precipitation has averaged 28.2 inches, 1.0 inch above normal.

**LAKE ERIE LEVELS at Fairport**



Base period: 1900-1991

Record high and low, year of occurrence

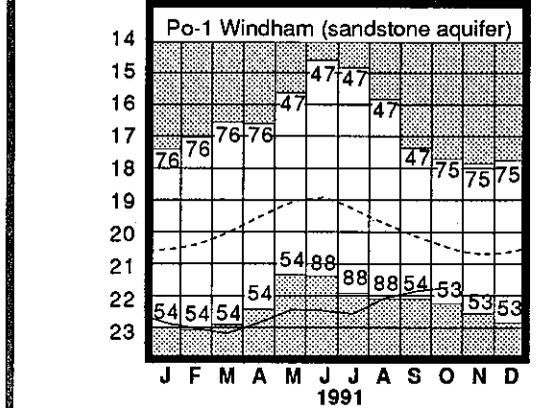
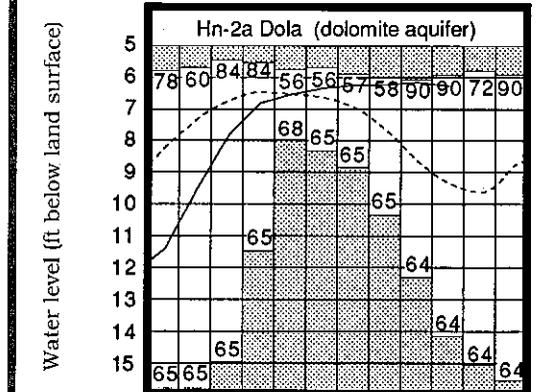
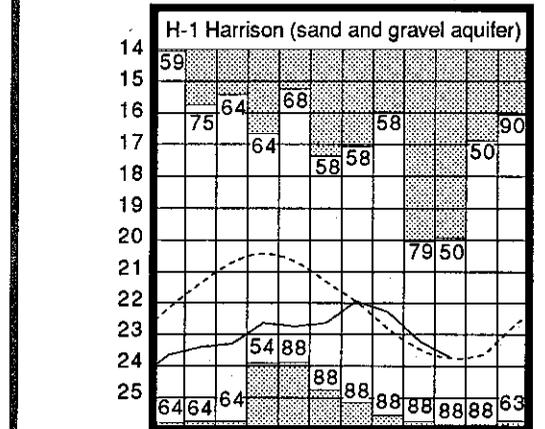
Normal

**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	17.70	-0.81	-1.33	+2.66
Fa-1	Jasper Mill, Fayette Co.	Limestone	8.44	+0.57	-0.45	+2.95
Fr-10	Columbus, Franklin Co.	Gravel	43.78	+0.66	-0.03	-0.77
H-1	Harrison, Hamilton Co.	Gravel	23.75	+0.01	-0.53	-0.56
Hn-2a	Dola, Hardin Co.	Dolomite	6.29	+3.04	-0.10	+5.43
Po-1	Windham, Portage Co.	Sandstone	21.73	-1.26	+0.14	-0.12
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.73	-1.12	-0.25	+1.02

**GROUND-WATER LEVELS**



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

Po-1, 1947-1990

Record high and low, year of occurrence

Current



# MONTHLY WATER INVENTORY REPORT FOR OHIO

November 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)

Central and Southeast regions. The state average is 6.34 inches, 1.34 inches above normal. Regional averages range from 7.92 inches, 2.32 inches above normal, for the Northeast Region to 4.15 inches, 0.86 inch below normal, for the South Central Region. The above normal precipitation during November has helped start the 1993 water year recharge season moving in the right direction.

## NOTES AND COMMENTS

### ODNR BREAKS GROUND FOR OUTDOOR EDUCATION FACILITY-OWWA DONATES WELL

The Ohio Department of Natural Resources (ODNR) recently broke ground for an outdoor environmental education facility. Located on vacant ground at the ODNR Fountain Square complex, the facility is designed to provide an opportunity for urban environmental education. It will include several working demonstrations and educational displays developed by many ODNR divisions. The focal point of the facility will be a wetland area.

A water well was drilled near the wetland. It will be used primarily to supply and maintain water levels within the wetland and within the storm water retention pond at the Fountain Square complex. Materials and funding for the well drilling operation were donated by the Ohio Water Well Association. Beinhower Brothers Drilling, Inc. of Johnstown drilled the well which is 126 feet deep with an estimated yield of 20 gallons per minute. Division of Water staff were on hand during the drilling to provide information about the importance of proper well construction and the role of government and the drilling industry in promoting ground water resource education.

In addition to the well, ODNR has been able to capitalize on several other partnerships to help keep the facility's construction costs relatively low. For example, crews from ODNR's Division of Wildlife transferred vegetation from the wetland Ducks Unlimited and the Division of Wildlife constructed at Ameriflora '92 to the Fountain Square wetland, also created by Wildlife. Other plants from the Ohio Exhibit at Ameriflora '92 also found a new home at the ODNR headquarters.

ODNR Director Frances S. Buchholzer is very happy with the progress that has been made on the outdoor environmental education facility. "We are glad to have the interest and the support of organizations like the Ohio Water Well Association and Ducks Unlimited," she said. "Without their contributions, the Fountain Square environmental education program would not have progressed as much as it has."

### WATER WITHDRAWAL FACILITY ANNUAL REPORTS DUE

The ODNR Division of Water recently sent annual report forms to all facilities that are registered under the Water Withdrawal Facility Registration Program. Section 1521.16 of the Ohio Revised Code requires the owner of a facility that has the capacity to withdraw more than 100,000 gallons of water per day to register that facility and submit an annual report to the Division of Water. The annual withdrawal report for 1992 is due by March 1, 1993. However, if you can submit the report to the Division of Water earlier, it would be appreciated.

If you have any questions or need additional information about the annual report or the Water Withdrawal Facility Registration Program, please contact the Division of Water at (614) 265-6735.

### CITY OF SHELBY BREAKS GROUND FOR NEW RESERVOIR

The Division of Water participated in ground-breaking ceremonies on October 30, 1992 for the City of Shelby's new upground reservoir. When completed, the new Shelby reservoir will have a surface area of just over 51 acres and will store about 370 million gallons of water. The construction of the new reservoir was strongly supported by the local citizenry. Total costs of the reservoir are estimated at \$3.2 million. The Division of Water was able to provide about \$400,000 in financial assistance toward the costs of developing the upground reservoir through a capital grant from the Ohio General Assembly. Such financial assistance is sought in order to help communities develop their water resources in order to protect the public health, provide recreation opportunities and to encourage economic development in the area.

**PRECIPITATION** for November was above normal throughout Ohio. The state average was 4.54 inches, 1.89 inches above normal. This ranks as the eleventh wettest November in 110 years of record. Regional averages ranged from 5.57 inches, 3.14 inches above normal, for the North Central Region to 3.52 inches, 0.88 inch above normal, for the Southeast Region. This was the sixth wettest November during 98 years of record for the North Central Region. Mansfield Airport (Richland County) reported the greatest amount of precipitation for the month, 7.63 inches, its second wettest November on record. Cambridge (Guernsey County) reported the least amount, 2.82 inches.

Precipitation during November, as in September and October, continued to be distributed across Ohio in the somewhat atypical pattern of being greatest in the north and least in the south. Precipitation fell in the form of both rain and snow on numerous days throughout the month. Generally, snow amounts were near normal for the month. The wet conditions continued to delay corn harvesting which is noticeably behind schedule. The first five days of the month were wet statewide with most areas recording more than 1 inch of precipitation, with lesser amounts falling in south-central Ohio. Notable storms occurred during the second week of the month with heavy rains and high winds on November 11-12. Most of the state received more than 1 inch of precipitation during the second week, and some areas in western and northern Ohio received from 2 to more than 3 inches. Snow showers and squalls were common in northern and northeastern Ohio during November 14 and 17-19. A strong frontal system moved through the state during November 21-22 producing moderate amounts of rain and unusual November tornadoes. Arcanum (Darke County) was heavily damaged, but miraculously, no lives were lost. Scattered light showers during the remainder of the month continued to keep farmers out of their fields.

Precipitation for the 1992 calendar year is above normal throughout most of the state, but remains below normal in the South Central and Southeast regions. The state average is 37.83 inches, 2.84 inches above normal. Regional averages range from 42.15 inches, 7.82 inches above normal, for the Northeast Region to 32.18 inches, 6.15 inches below normal, for the South Central Region. The North Central Region averages 40.93 inches, 9.18 inches above normal.

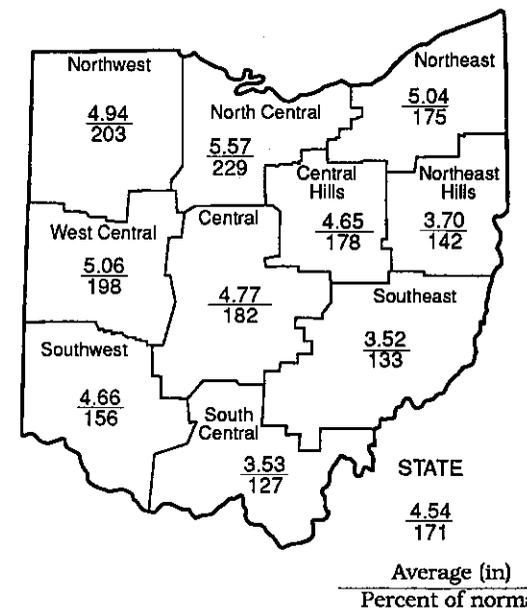
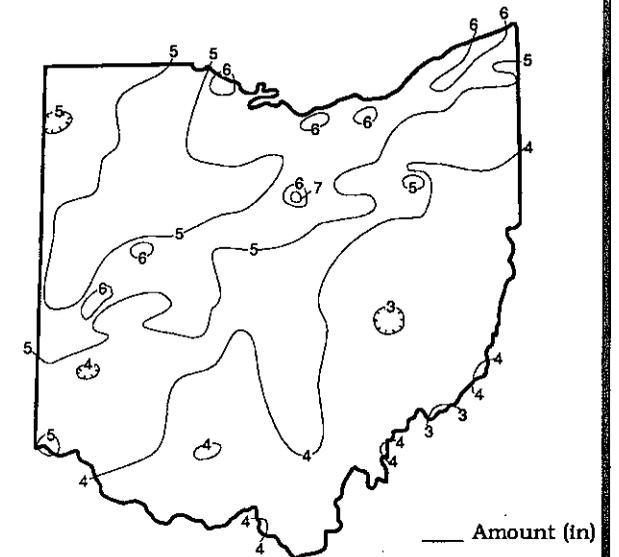
Precipitation for the 1993 water year is above normal throughout most of the state, but remains slightly below normal in the South  
(continued on back)

## PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+2.51	+5.24	+7.76	+5.93	+7.77	+3.7
North Central	+3.14	+4.53	+9.84	+8.37	+6.99	+4.8
Northeast	+2.16	+3.69	+9.26	+7.74	+4.08	+5.4
West Central	+2.50	+1.60	+8.09	+5.73	+3.97	+3.3
Central	+2.15	+1.28	+6.96	+5.56	+1.77	+3.0
Central Hills	+2.04	+1.85	+6.72	+3.51	-1.26	+1.5
Northeast Hills	+1.10	+1.01	+3.98	+1.62	-3.60	+3.3
Southwest	+1.68	+0.32	+3.52	+1.12	+2.12	+2.0
South Central	+0.76	-2.12	-1.89	-3.50	-3.24	+0.5
Southeast	+0.88	-1.10	+0.92	-2.07	-2.20	+1.3
State	+1.89	+1.62	+5.50	+3.39	+1.65	

\*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 1992



## ACKNOWLEDGEMENTS

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 Ceremony 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  
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Director

James R. Morris  
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**MEAN STREAM DISCHARGE**

River and Location	Drainage Area (Sq. Mi.)	This Month Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
				Grand River near Painesville	685	2,603
Great Miami River at Hamilton	3,630	6,281	571	312	289	84
Huron River at Milan	371	1,482	1,821	1,137	616	147
Killbuck Creek at Killbuck	464	953	640	450	321	106
Little Beaver Creek near East Liverpool	496	842	417	357	208	75
Maumee River at Waterville	6,330	17,589	1,088	798	561	138
Muskingum River at McConnelsville	7,422	2,835	77	157	156	66
Scioto River near Prospect	567	1,544	2,767	886	686	112
Scioto River at Higby	5,131	6,779	417	236	243	81
Stillwater River at Pleasant Hill	503	1,300	1,546	627	444	99

**STREAMFLOW** during November was noticeably above normal throughout most of Ohio with only drainage basins in the southeastern part of the state having below normal flows. Flows were high enough to be considered excessive in all but southeastern Ohio. November flows were markedly greater than the flows during October. Preliminary data indicates that many drainage basins had record or near-record high mean flows for November for their respective periods of record. These basins include: Huron River at Milan recording its greatest November mean flow; Grand River near Painesville, Maumee River at Waterville and Scioto River near Prospect, second greatest November mean flows; Killbuck Creek at Killbuck, Scioto River at Higby and Stillwater River at Pleasant Hill, third greatest; Great Miami River at Hamilton, fourth greatest; and Little Beaver Creek near East Liverpool, ninth greatest.

Flows at the beginning of the month were near or slightly below normal throughout most of the state. Lowest flows for the month in all drainage basins occurred on the first day. Flows increased following widespread precipitation during the first half of the month peaking on November 13 or shortly thereafter. Minor flooding during these peak flows was reported in northwestern and north-central Ohio and, to a lesser extent, following the November 22 storms. Flows decreased from these high flows for the remainder of the month, but still remained excessive at the end of November.

**RESERVOIR STORAGE** for water supply during November increased in both the Mahoning and Scioto river basins. Storage remained noticeably above normal in both basins.

Reservoir storage at the end of November in the Mahoning basin index reservoirs was 81 percent of rated capacity for water supply compared with 80 percent for last month and 45 percent for November 1991. Storage at the end of November in the Scioto basin index reservoirs was 105 percent of rated capacity for water supply compared with 89 percent for last month and 55 percent for November 1991.

Surface water supplies are in good shape throughout the state. Both on- and off-stream reservoirs are near or at above normal seasonal levels. Due to the noticeably above normal streamflows during the past several months, many off-stream reservoir managers have been able to make withdrawals from their supply streams to maintain near capacity levels in the reservoirs.

**GROUND-WATER LEVELS** during November showed positive net improvement from last month's levels in most of Ohio's aquifers. A few exceptions were noted in consolidated aquifers in the southeastern portion of the state where levels declined steadily. Generally, in most areas of the state, ground-water levels were stable or declining slightly during the first 10-15 days of November. Ground-water levels then rose throughout the remainder of the month. Ground-water storage continues to remain above normal in the western half of the state, but below normal in the eastern half. Current levels are noticeably above the unusually low levels of November 1991 in most aquifers and at near record-high November levels in portions of northwestern Ohio.

Ground-water storage is in good shape throughout the state. Even though storage is below normal in much of the eastern half of the state, water levels are on the rise and are noticeably above last year's levels. Conditions favor a good recharge season. Water-supply managers with ground-water sources, especially in the eastern half of Ohio, should continue to monitor their situations closely throughout the recharge period.

**LAKE ERIE** level rose slightly during November. The mean level was 572.29 feet (IGLD-1985), 0.08 foot above last month's mean level and 1.59 feet above normal. This month's level is 1.27 feet above the November 1991 level and 3.09 feet above Low Water Datum.

**SUMMARY**

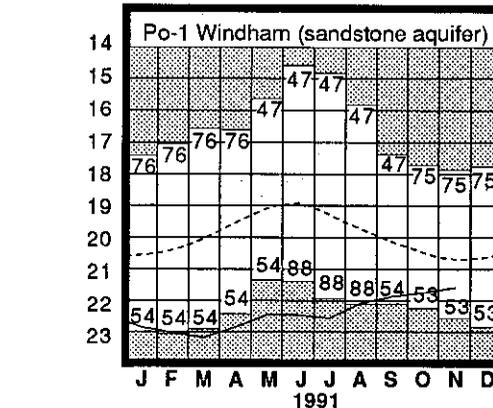
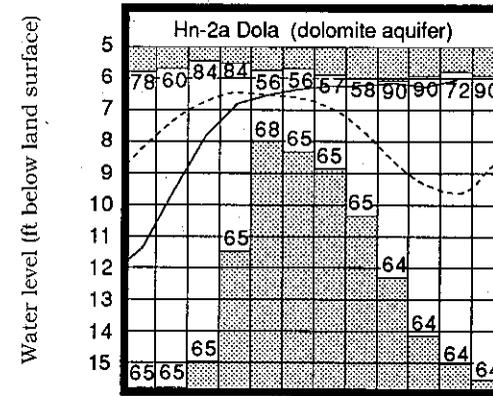
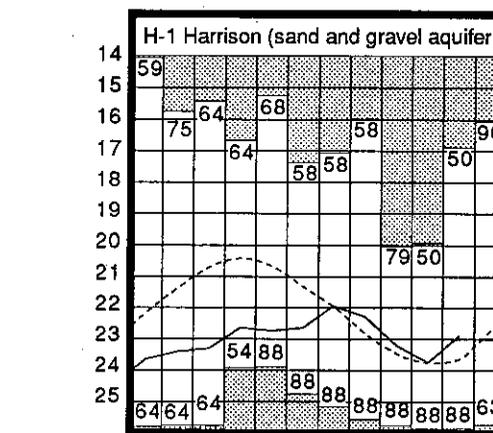
Precipitation during November was above normal throughout the state. Streamflow was noticeably above normal in all but southeast Ohio. Reservoir storage increased and remained above normal seasonal levels. Ground-water storage improved and is above normal in the western half of Ohio but below normal in the eastern half. Lake Erie level rose slightly and was 1.59 feet above the long-term November average.

**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	18.55	-1.29	-0.85	+2.49
Fa-1	Jasper Mill, Fayette Co.	Limestone	8.44	+0.51	0.00	+3.56
Fr-10	Columbus, Franklin Co.	Gravel	43.31	+0.98	+0.47	-0.35
H-1	Harrison, Hamilton Co.	Gravel	22.91	+0.75	+0.84	+1.50
Hn-2a	Dola, Hardin Co.	Dolomite	6.05	+3.58	+0.24	+6.36
Po-1	Windham, Portage Co.	Sandstone	21.59	-0.91	+0.14	+0.54
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.66	-1.10	+0.07	+1.27

**GROUND-WATER LEVELS**

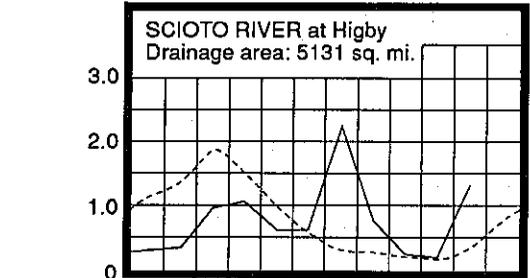
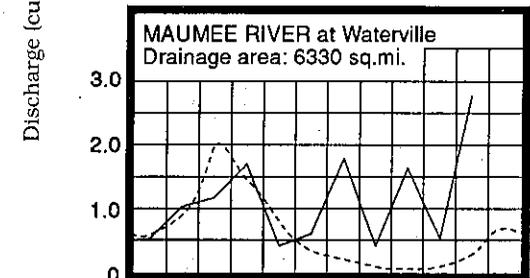
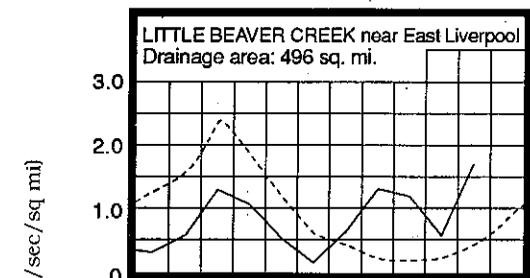
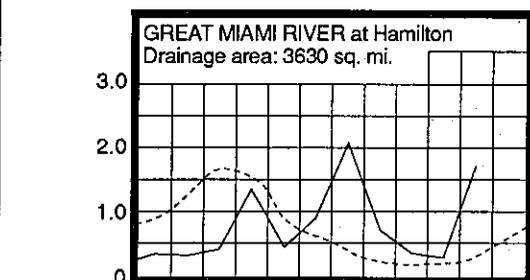


Base periods: H-1, 1951-1990. Hn-2a, 1955-1990.

Po-1, 1947-1990

Normal - - - - Current - - - -

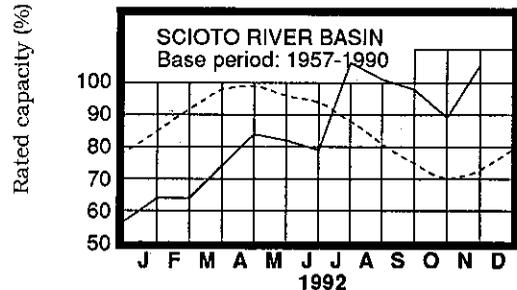
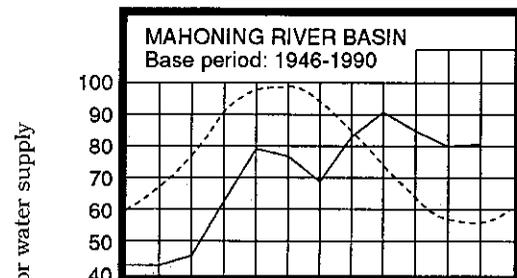
**MEAN STREAM DISCHARGE**



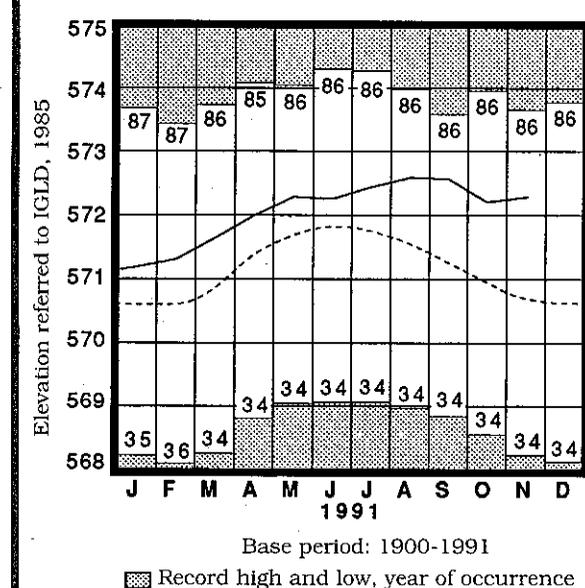
Base period for all streams: 1951-1980

Normal - - - - Current - - - -

**RESERVOIR STORAGE FOR WATER SUPPLY**



**LAKE ERIE LEVELS at Fairport**



Normal - - - - Current - - - -



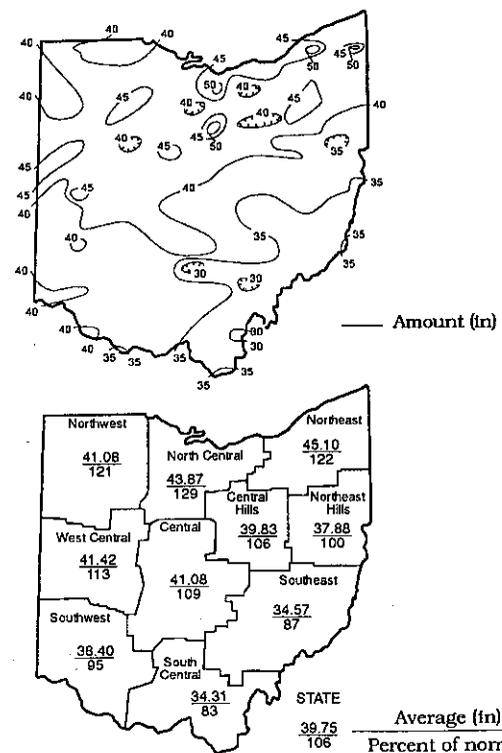
# MONTHLY WATER INVENTORY REPORT FOR OHIO December 1992

Compiled By David H. Cashell  
Hydrologist  
Water Inventory Unit

(continued from front page)  
the year, 29.63 inches. Other areas reporting less than 30 inches of precipitation for 1992 were Athens (Athens County) and Laurelville (Hocking County).

Precipitation during 1992 varied greatly between the first and second halves of the year. January and February both had noticeably below normal precipitation while March's was near normal. April precipitation was noticeably below normal in southeastern Ohio, but above normal in the West Central Region and at scattered locations in the north. Precipitation during May and June was below normal in most areas, but scattered, locally heavy storms were common. The 1992 January through June period was the eighth driest on record. Recharge to both surface and ground-water supplies was poor. Conditions changed dramatically by mid-summer; July 1992 was the wettest July and the third wettest month on record. Small stream and urban flooding was common. August and September precipitation was above normal in most of the state, but continued to be below normal in the south-central and southeastern areas. October was rather dry, especially in southern and southeastern Ohio, but November was wet statewide, delaying harvest in many areas. The year ended with a dry December in the southern two-thirds of the state, but was wet in the northern third. The 1992 July through December period was the sixth wettest on record. All and all, 1992 was a good year for both water supplies and agriculture. An isohyetal map and regional averages with percentages of normal precipitation for the 1992 calendar year appear below.

### 1992 CALENDAR YEAR PRECIPITATION



### SUMMARY

Precipitation during December was below normal in most of Ohio but above normal in the northern counties. Streamflow was above normal in the northern half of the state and below normal in the southern half. Reservoir storage declined slightly but remained above normal. Ground-water levels declined slightly or remained stable and are above normal in western Ohio but below normal in eastern Ohio. Lake Erie level rose 0.07 foot and was 1.73 feet above the long-term December average.

Climatic conditions varied greatly during 1992 between the first 6 months which were noticeably dry, and the last 6 months, which were rather wet. For the year, precipitation was above normal in all but the southern and southeastern sections of the state. Streamflows varied with the precipitation and for the year, were above normal in most of northern Ohio and below normal in southern Ohio. Surface-water storage improved noticeably during the year, rebounding from the worrisome low levels of early 1992. Ground-water storage improved but still has not fully recovered from the drought conditions in the eastern half of the state. Lake Erie remained above normal levels throughout the year.

**PRECIPITATION** for December was below normal throughout most of Ohio with only the extreme northern counties receiving above normal precipitation. The state average was 1.84 inches, 0.74 inch below normal. Regional averages ranged from 3.02 inches, 0.38 inch above normal, for the Northeast Region to 0.94 inch, 1.53 inches below normal, for the West Central Region. This ties December 1930 as being the sixth driest December on record in the West Central Region. Burton (Geauga County) reported the greatest amount of precipitation for the month, 4.60 inches. Mohawk Dam (Coshocton County) reported the least amount, 0.62 inch.

Precipitation during December, as in the past several months, continued to be distributed across Ohio in the somewhat atypical pattern of being greatest in the north and least in the south. Precipitation fell during every week of the month, but in most areas of the state, weekly totals were low. Storms during December 2-3, 9-10, 16-17 and 19-20 produced light amounts of precipitation at most locations, but up to 0.5 inch during one or more of these periods fell at some northern locations and in southeastern Ohio along the Ohio River. The heaviest precipitation for the month fell during December 29-31 across northern Ohio with amounts of 1.5 to nearly 3 inches reported. Minor flooding was common in several northern Ohio drainage basins.

Precipitation for the 1993 water year is above normal in the northern two-thirds of the state and below normal in the southern one-third. The state average is 8.23 inches, 0.66 inch above normal. Regional averages range from 10.87 inches, 2.63 inches above normal, for the Northeast Region to 6.19 inches, 1.78 inches below normal, for the South Central Region.

Precipitation for the 1992 calendar year was above normal in the northern, central and western areas of Ohio, but below normal in the southern and southeastern areas. The state average was 39.75 inches, 2.18 inches above normal. Regional averages ranged from 45.10 inches, 8.13 inches above normal, for the Northeast Region to 34.31 inches, 6.98 inches below normal, for the South Central Region (see Precipitation table, departure from normal, past 12 months column, on this page). The North Central Region averaged 43.87 inches, 9.84 inches above normal. Andover (Ashtabula County) reported the greatest amount of precipitation for 1992, 54.06 inches. Other areas reporting more than 50 inches of precipitation were Chardon (Geauga County), Clarksfield (Huron County) and Mansfield Airport (Richland County). Gallipolis Lock and Dam (Gallia County) reported the least amount of precipitation for

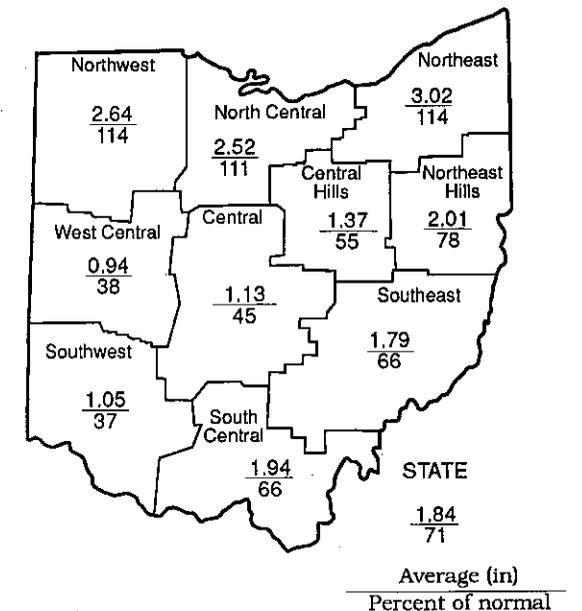
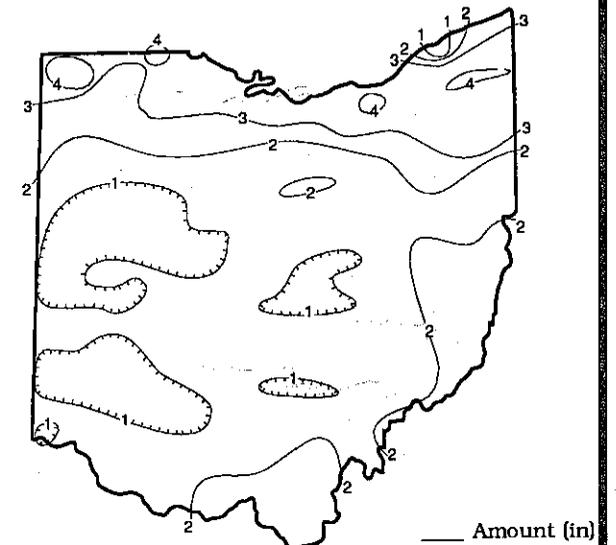
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### PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.33	+2.82	+9.54	+7.26	+4.28	+4.0
North Central	+0.24	+3.70	+11.56	+9.84	+2.48	+5.2
Northeast	+0.38	+2.63	+11.46	+8.13	-0.31	+5.8
West Central	-1.53	+0.47	+6.49	+4.73	-3.45	+3.1
Central	-1.40	+0.37	+6.66	+3.47	-5.58	+2.3
Central Hills	-1.10	+0.37	+7.38	+2.43	-7.57	+1.4
Northeast Hills	-0.57	+0.06	+6.09	-0.15	-9.35	+3.0
Southwest	-1.77	-0.70	+2.55	-1.87	-5.07	+1.2
South Central	-1.02	-1.78	-2.29	-6.98	-9.19	+0.4
Southeast	-0.93	-1.29	+1.64	-5.02	-8.36	+0.7
State	-0.74	+0.66	+6.10	+2.18	-4.19	

\*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

### PRECIPITATION DECEMBER 1992



### ACKNOWLEDGEMENTS

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- 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.
- 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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1939 FOUNTAIN SQUARE  
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**MEAN STREAM DISCHARGE**

River and Location	Drainage Area (Sq. Mi.)	This Month Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
				Grand River near Painesville	685	1,160
Great Miami River at Hamilton	3,630	2,012	85	190	236	87
Huron River at Milan	371	413	261	493	503	157
Killbuck Creek at Killbuck	464	433	161	304	319	112
Little Beaver Creek near East Liverpool	496	734	158	252	232	83
Maumee River at Waterville	6,330	4,645	104	286	393	140
Muskingum River at McConnelsville	7,422	7,103	121	106	180	71
Scioto River near Prospect	567	257	106	443	581	116
Scioto River at Higby	5,131	3,446	85	172	251	85
Stillwater River at Pleasant Hill	503	205	62	270	345	102

**STREAMFLOW** during December was above normal in northern Ohio and below normal in southern Ohio. Flows during December were less than the exceptionally high flows during November in most areas of the state.

Flows at the beginning of the month were above normal throughout the state. Drainage basins in the southern two-thirds of Ohio recorded their greatest flows for December on the first day of the month, the northern one-third, on the last day. Generally, flows declined throughout the month with slight increases noted following local precipitation. Lowest flows for the month in most drainage basins occurred during December 27-29 before flows began to rise in response to the months most widespread precipitation. Flows at the end of the

month were below normal in the southern half of Ohio but noticeably above normal in the northern half with some moderate flooding in some drainage basins.

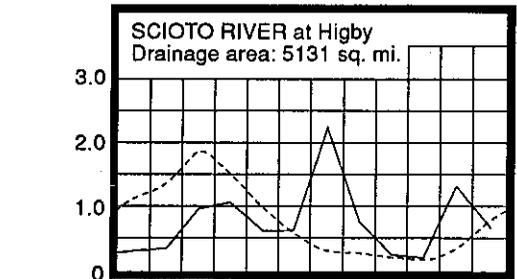
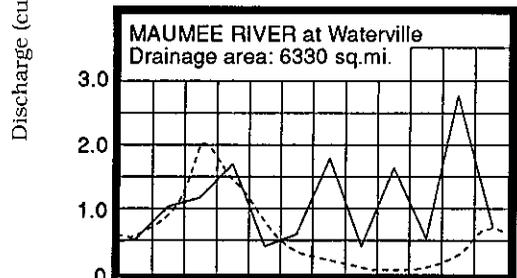
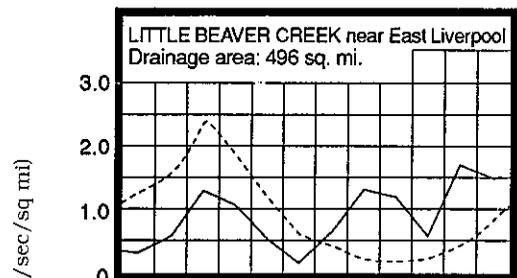
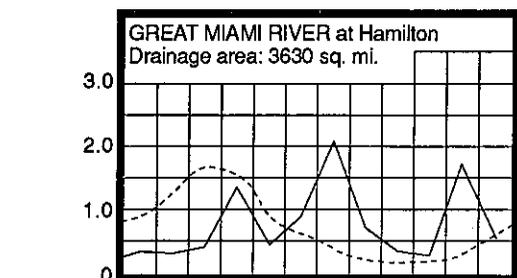
Streamflow during 1992 was above normal in most of the northern half of the state and below normal in the southern half (see Mean Stream Discharge, percent of normal, past 12 months column). Flows were noticeably below normal during the first 6 months of 1992, but markedly above normal, especially in northern Ohio, the last half of the year. Local flooding, generally confined to small streams and urban areas, occurred during July in much of Ohio, most notably in Massieville in Ross County, and at times during September, November and December, mostly in the northern half of the state.

**RESERVOIR STORAGE** for water supply during December declined slightly in both the Mahoning and Scioto river basins. Storage remained above normal in both basins.

Reservoir storage at the end of December in the Mahoning basin index reservoirs was 80 percent of rated capacity for water supply compared with 81 percent for last month and 43 percent for December 1991. Month-end storage in the Scioto basin index reservoirs was 103 percent of rated capacity for water supply compared with 105 percent for last month and 57 percent for December 1991.

Surface-water supplies are currently in good shape throughout the state, a sharp contrast to storage at the beginning of 1992. Surface-water supplies remained noticeably below normal until mid-summer when record-breaking rains during July brought storage up to and above normal levels. Surface-water storage remained at above normal seasonal levels in most of Ohio during the remainder of the year.

**MEAN STREAM DISCHARGE**

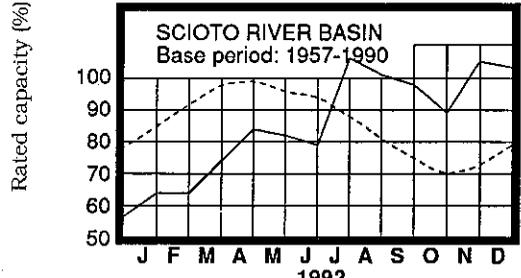
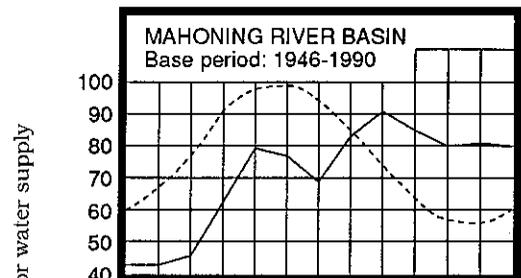


Base period for all streams: 1951-1980

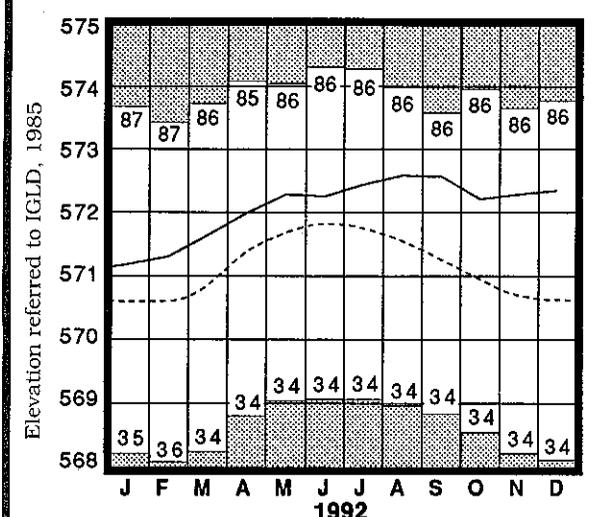
Normal

Current

**RESERVOIR STORAGE FOR WATER SUPPLY**



**LAKE ERIE LEVELS at Fairport**



Base period: 1900-1991

Record high and low, year of occurrence

Normal

**GROUND-WATER LEVELS**

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

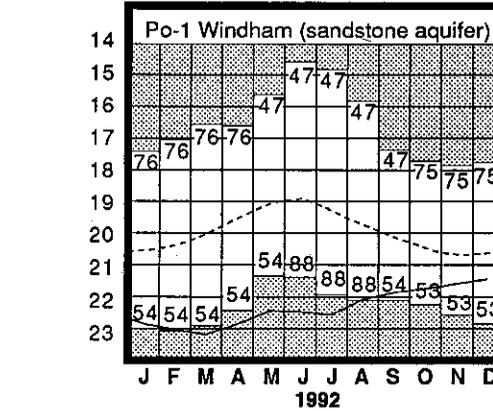
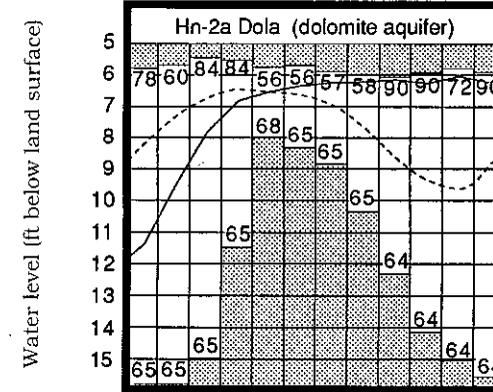
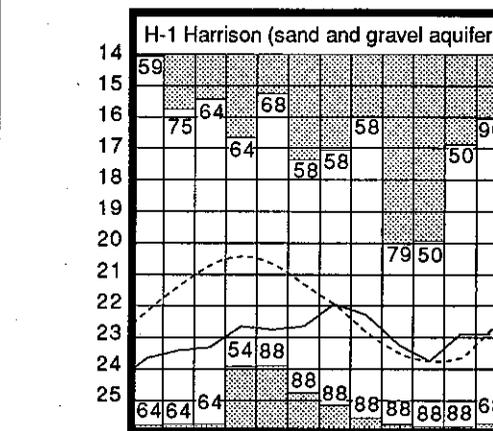
Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	18.37	-1.52	+0.18	+3.06
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.66	+0.50	+0.78	+3.98
Fr-10	Columbus, Franklin Co.	Gravel	42.96	+1.14	+0.35	+0.04
H-1	Harrison, Hamilton Co.	Gravel	22.90	-0.08	+0.01	+1.54
Hn-2a	Dola, Hardin Co.	Dolomite	6.25	+2.69	-0.20	+5.97
Po-1	Windham, Portage Co.	Sandstone	21.44	-0.83	+0.15	+1.13
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.32	-1.04	+0.34	+1.52

Ground-water storage improved during the 1992 calendar year, recovering from the drought conditions of last year and early this year. Record-low levels were reached in 1992 in many aquifers in central, eastern and northeastern Ohio, reflecting the below normal precipitation during the recharge period. Record-breaking rains in July, and near normal precipitation until the end of the year, helped ease the drought situation and also set the stage for a favorable 1993 recharge season. At the end of 1992, ground-water storage was at favorable levels even though many aquifers in the eastern half of the state remained below normal.

**LAKE ERIE** level rose slightly during December. The mean level was 572.36 feet (IGLD-1985), 0.07 foot above last month's mean level and 1.73 feet above normal. This month's level is 1.29 feet above the December 1991 level and 3.16 feet above Low Water Datum.

The U. S. Army Corps of Engineers reports that precipitation for 1992 in the Lake Erie basin averaged 42.5 inches, 7.6 inches above normal. For the entire Great Lakes basin, precipitation for 1992 averaged 34.6 inches, 2.4 inches above normal.

**GROUND-WATER LEVELS**



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

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

Current