



MONTHLY WATER INVENTORY REPORT FOR OHIO

January 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTES AND COMMENTS

NEW DIRECTOR AT DNR

Frances Seiberling Buchholzer was appointed by Governor George V. Voinovich recently as Director of the Ohio Department of Natural Resources (ODNR). Mrs. Buchholzer replaces former Director Joseph J. Sommer who served for the past five and one-half years.

Director Buchholzer was born on a farm in Northfield, Ohio, a small community located in northern Summit County near Akron. She received a bachelor's degree in English and Education from the University of Akron and a master's degree in geomorphology from the University of Iowa. Geomorphology is the study of landforms and the natural and environmental forces that shape the earth.

The new director moved to Columbus in 1970 where she worked on numerous environmental issues. She was a member of the Water Management Association of Ohio, and chaired two annual meetings. Buchholzer also served on an Advisory Committee to the Director of the Ohio Environmental Protection Agency (EPA) from 1975 to 1979.

Mrs. Buchholzer serves on the National Park System Advisory Board, and is a past member of the Ohio Air Quality Development Authority, and the National Advisory Council on Adult Education. She also served as Director of State Government Relations for the B.F. Goodrich Company, and Director of Environmental Affairs for the Ohio Petroleum Council.

Director Buchholzer is married to developer Richard Buchholzer of Akron, and has two children, Elizabeth and Rick, and one grandson. Mrs. Buchholzer is an avid outdoors person who counts among her favorite pursuits fly fishing, hunting, camping and boating.

In her newest role as ODNR Director, Mrs. Buchholzer is anxious to assist Governor Voinovich in providing an efficient, effective delivery of services to the people of Ohio. She is eager to meet firsthand and work with the people who form the foundation of the ODNR, both at the central office level and with the field personnel who represent the Division of Water and its activities.

Over the years, the Division of Water has been proud to count among its accomplishments for the people of Ohio such projects and programs as the creation of regional water plans, dam safety, ground-water resource mapping, flood damage reduction, and the collection and distribution of hydrologic and water resource data. Director Buchholzer recognizes the tremendous efforts of the Division, and looks forward to the achievements of the future.

NEW PUBLICATION

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

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

This map is one in a series of county ground-water resources maps which have been completed for 72 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.

This new map can be ordered from: ODNR-Publications Center, 4383 Fountain Square Court, Building B-1, Columbus, Ohio 43224-1362. The cost for this map is \$6.53 (includes postage, handling and tax). Make checks payable to ODNR-Publications Center.

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 Con-
servancy District: U.S. Army Corps of Engi-
neers, 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.

ODNR

OHIO DEPARTMENT OF
NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

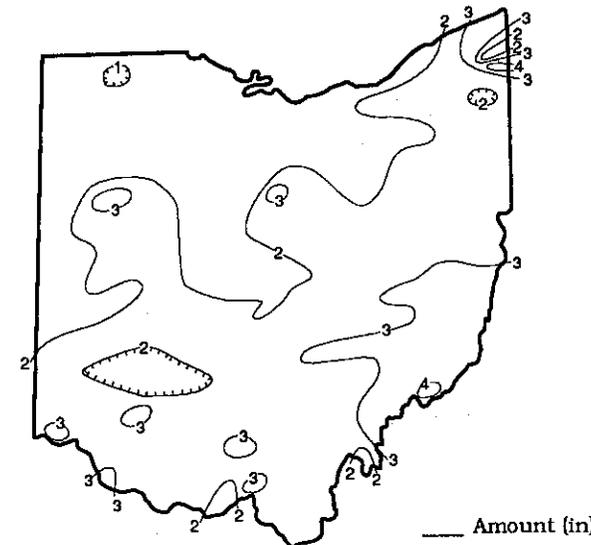
George V. Voinovich
Governor
Frances S. Buchholzer
Director
Robert L. Goettmoeller
Chief

PRECIPITATION for January was below normal throughout most of the state with only the Southeast Region receiving above normal precipitation. The state average was 2.28 inches, 0.48 inch below normal. Regional averages ranged from 3.21 inches, 0.24 inch above normal, for the Southeast Region to 1.62 inches, 0.56 inch below normal, for the Northwest Region. Andover (Ashtabula County) reported the greatest amount of precipitation for the month, 4.85 inches. Wauseon (Fulton County) reported the least amount, 0.88 inch.

Precipitation fell during every week of the month in a somewhat typical pattern with the greatest amounts falling in the southern portion of the state and decreasing to the north and west. Several days of each week had measurable amounts of precipitation but daily totals seldom exceeded 0.25 inch. Slightly greater daily amounts of up to 0.75 inch were recorded at various locations on January 5, 10-11, 16-17, 21, and 28-29. The bulk of the month's precipitation fell in the form of rain, but snow fell on several days during the second half of the month. Snow totals for the month and for the season are below normal throughout the state.

Precipitation for the 1991 water year is above normal throughout the state. The state average is 16.65 inches, 6.32 inches above normal. Regional averages range from 18.25 inches, 6.83 inches above normal, for the Southwest Region to 14.00 inches, 4.79 inches above normal, for the Northwest Region. The Southeast Region has the greatest departure from normal for the 1991 water year so far, 7.16 inches above normal. The above normal precipitation during the first four months of the 1991 water year has been beneficial in recharging ground-water supplies.

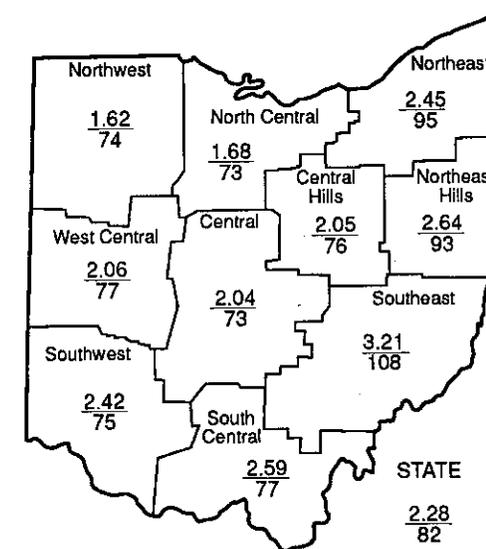
PRECIPITATION JANUARY 1991



PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.56	+3.18	+5.69	+11.45	+10.11	+4.1
North Central	-0.62	+4.01	+7.92	+11.91	+12.98	+5.3
Northeast	-0.14	+4.12	+11.50	+16.18	+21.70	+5.8
West Central	-0.61	+4.68	+8.15	+15.74	+20.96	+5.4
Central	-0.77	+4.31	+7.08	+14.76	+20.37	+4.9
Central Hills	-0.65	+3.88	+8.38	+16.02	+18.40	+5.5
Northeast Hills	-0.19	+4.41	+9.09	+15.56	+17.85	+4.5
Southwest	-0.81	+3.72	+9.06	+16.22	+22.72	+5.4
South Central	-0.78	+3.89	+5.98	+7.15	+16.76	+4.0
Southeast	+0.24	+5.26	+8.90	+13.87	+27.23	+4.6
State	-0.48	+4.16	+8.18	+13.90	+18.92	

*Above +4 = Extreme Moist Spell
3.0 To 3.9 = Very Moist Spell
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-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	1,772	192	153	164	141
Great Miami River at Hamilton	3,630	10,042	310	269	287	179
Huron River at Milan	371	823	262	332	328	170
Killbuck Creek at Killbuck	464	1,350	370	434	484	208
Little Beaver Creek near East Liverpool	496	1,275	205	263	322	167
Maumee River at Waterville	6,330	17,922	463	267	267	159
Muskingum River at McConnelsville	7,422	27,300	350	349	368	180
Scioto River near Prospect	567	1,600	461	388	428	235
Scioto River at Higby	5,131	15,001	265	297	318	193
Stillwater River at Pleasant Hill	503	1,068	236	309	335	201

STREAMFLOW for January was noticeably above normal throughout the state. Flows were high enough to be considered excessive. The Maumee River at Waterville gauging station recorded a record daily maximum mean flow for January of 88,900 cfs on New Year's Day.

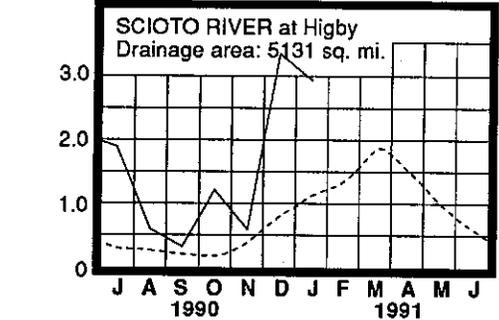
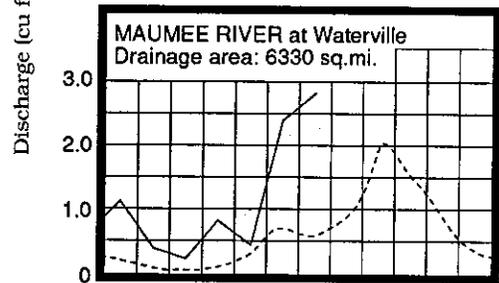
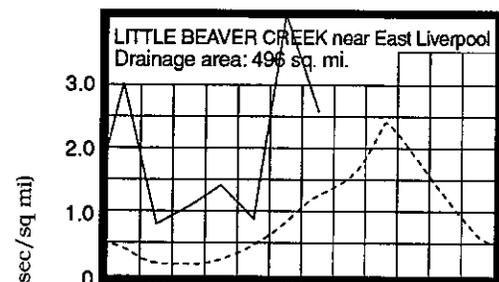
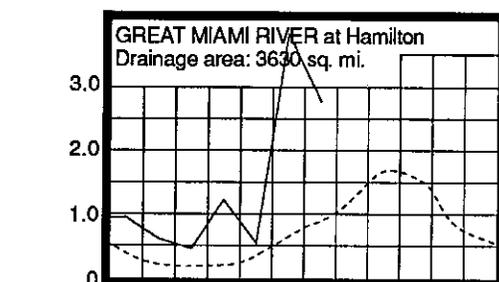
Flows at the beginning of the month were excessive statewide after peaking from flooding conditions in late December. Highest flows for the month occurred on January 1 for most areas of the state. Flows declined during the month with increases noted just before and after mid-month in response to precipitation. Lowest flows for the month occurred just before the month's end for most areas of the state. Flows were still noticeably above normal in the southern two-thirds of the state at the month's end, but slightly below normal in the northern portion.

the southern two-thirds of the state at the month's end, but slightly below normal in the northern portion.

RESERVOIR STORAGE for water supply decreased in both the Mahoning and Scioto river basins. Storage remained above normal in both basins.

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 76 percent of rated capacity for water supply compared with 103 percent for last month and 70 percent for January 1990. Month-end storage in the Scioto basin index reservoirs was 92 percent of rated capacity for water supply compared with 104 percent for last month and 80 percent for January 1990.

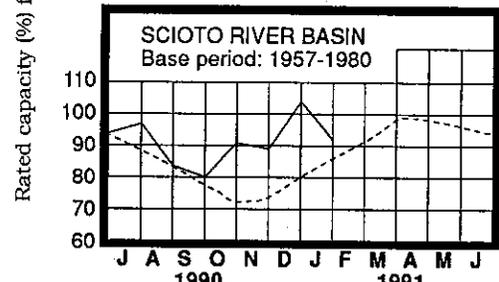
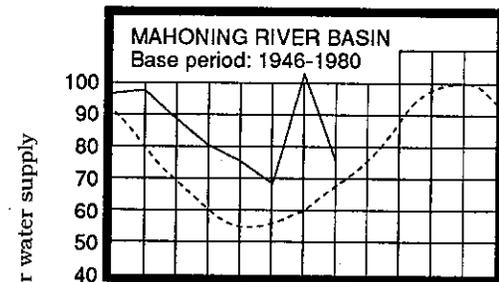
MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

Normal

RESERVOIR STORAGE FOR WATER SUPPLY



Current

GROUND-WATER LEVELS

Ground-water levels during January showed positive net changes from last month's levels statewide. Net changes were greater than usually observed in most aquifers. Ground-water levels in shallow, unconsolidated aquifers rose early in the month, still responding to the widespread precipitation at the end of December, and then declined throughout the remainder of the month. Levels in consolidated and deeper unconsolidated aquifers rose throughout most of the month in response to delayed recharge from December's above normal precipitation with some leveling off or slight declines noted near the month's end.

Ground-water levels are above normal statewide and also noticeably above those of January 1990. Levels in some aquifers are at or near record high January levels. Index observation well Fr-10 (OSU Farms, Franklin County), representing a sand and gravel aquifer, set a record high level in January.

LAKE ERIE level rose noticeably during January. The mean level for January was 571.57 feet (IGLD-1955), 0.59 foot above last month's mean level and 1.75 feet above normal. This month's level is 1.47 feet above the January 1990 level and 2.97 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that the 1990 precipitation for the Lake Erie basin was an apparent record 47.4 inches, 13 inches above normal. Precipitation for the entire Great Lakes basin averaged 38 inches, 6 inches above normal.

Also, the U.S. National Ocean Service and the Canadian Hydrographic Service are in the process of updating the standard reference datum for the Great Lakes. The new reference will be called International Great Lakes Datum (IGLD) 1985. These changes are periodically necessary to maintain the accuracy of the reference system used to measure lake levels.

SUMMARY

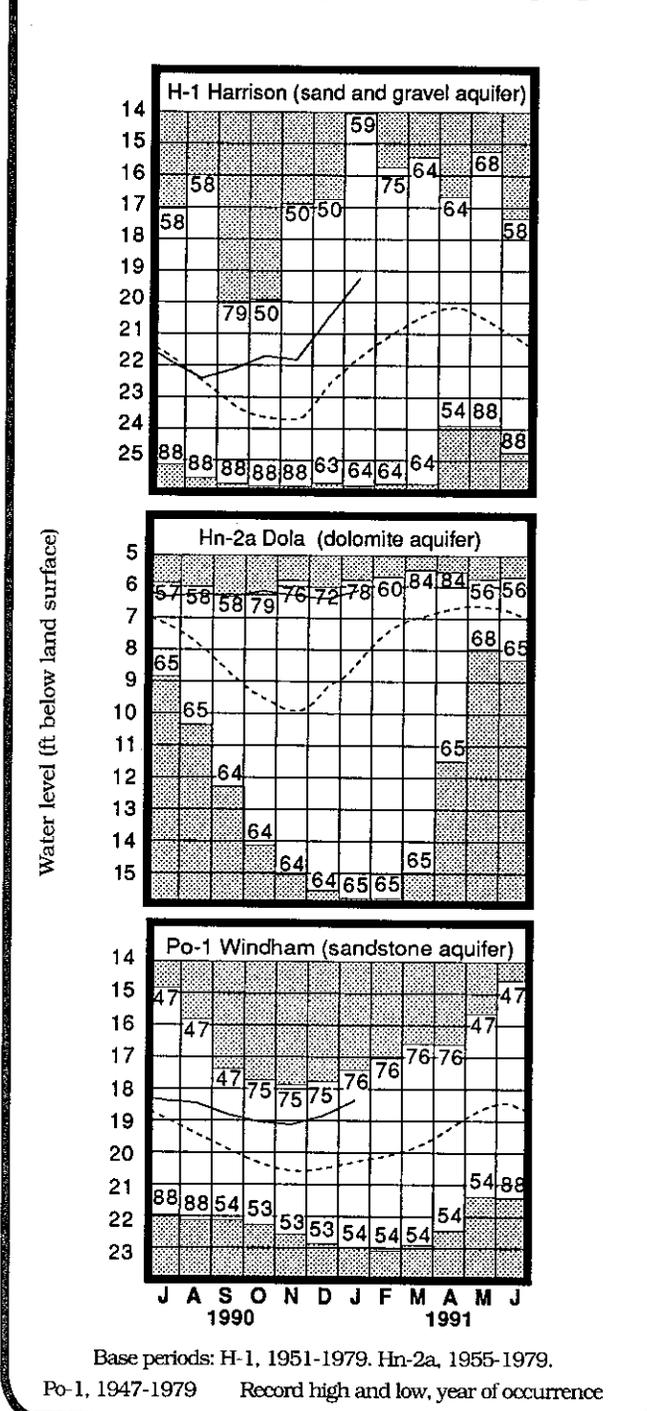
Precipitation was slightly below normal throughout most of the state with only the Southeast Region having above normal precipitation. Streamflow was excessive statewide. Reservoir storage decreased but remained above normal. Ground-water storage showed net improvement and is above normal throughout the state. Lake Erie level increased noticeably and was 1.75 feet above normal.

GROUND-WATER LEVELS

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	12.26	+2.98	+2.77	+3.67
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.82	+0.66	+0.36	+0.93
Fr-10	Columbus, Franklin Co.	Gravel	40.68	+3.67	+0.91	+1.58
H-1	Harrison, Hamilton Co.	Gravel	19.24	+2.61	+1.26	+3.90
Hn-2a	Dola, Hardin Co.	Dolomite	6.13	+2.41	+0.28	+2.41
Po-1	Windham, Portage Co.	Sandstone	18.36	+1.99	+0.48	+1.78
Tu-1	Strasburg, Tuscarawas Co.	Gravel	9.73	+2.88	+2.39	+4.49

GROUND-WATER LEVELS

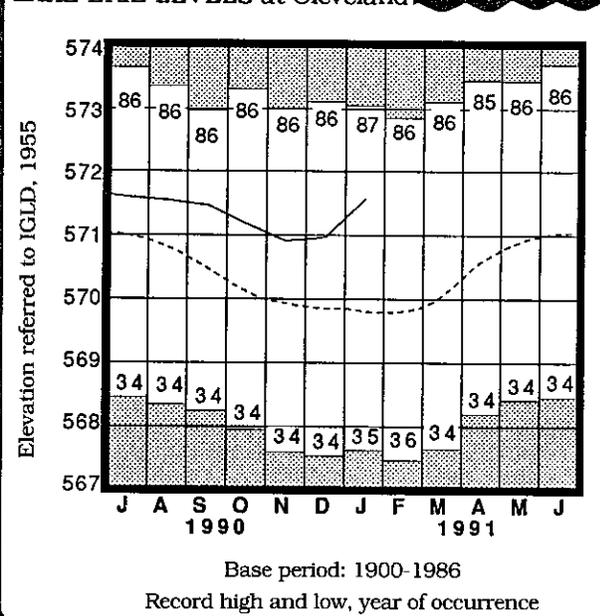


Base periods: H-1, 1951-1979. Hn-2a, 1955-1979. Po-1, 1947-1979. Record high and low, year of occurrence

Normal

Current

LAKE ERIE LEVELS at Cleveland



Base period: 1900-1986. Record high and low, year of occurrence

Normal

Current



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February 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTE AND COMMENTS

NEW PUBLICATIONS

The Division of Water announces the availability of the following new publications by Alfred C. Walker:

- The Ground Water Resources of Belmont County,
- The Ground Water Resources of Fulton County,
- The Ground Water Resources of Monroe County,
- The Ground Water Resources of Noble County.

These maps are four in a series of county ground-water resources maps which have been completed for 76 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.

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A LEGACY OF STEWARDSHIP:

THE OHIO DEPARTMENT OF NATURAL RESOURCES, 1949-1989.

This new publication chronicles the birth, growth and history of the Department of Natural Resources. The book contains information about the creation, growth and responsibilities of each division, past department officials, and provides insight into the changing environmental issues that affect our state. Many historical photos are included.

This book was jointly produced by ODNR and the Ohio Parklands Foundation with contributions from foundations, corporate sponsors, conservation organizations and individuals. It is the result of years of exhaustive research and editing by a large group of former and present employees and other dedicated people. A special thanks is due to Dr. Charles King, Executive Director of the Ohio Biological Survey of The Ohio State University, for editing the book, and to Dan Atzenhoefer, a 54-year employee of ODNR, for organizing the gathering of information. Schools, advocacy groups, conservation professionals, and other organizations will find the book invaluable.

The new publication costs \$18.11 (includes postage, handling, and tax) and can be ordered from the address listed above.

NEW EMPLOYEE JOINS GWRS STAFF

Mary Jo Boland recently joined the Ground-Water Resources Section (GWRS) staff as a data entry technician. Her duties will include scanning well logs into an optical disk computer system and entering well log data into a data base. In addition to her duties in the GWRS, half of her working day is spent as a clerk/typist for the Division of Water's permits and hydraulics section.

Away from work, Mary Jo is an avid OSU sports fan and coaches a fifth and sixth-grade girls basketball team.

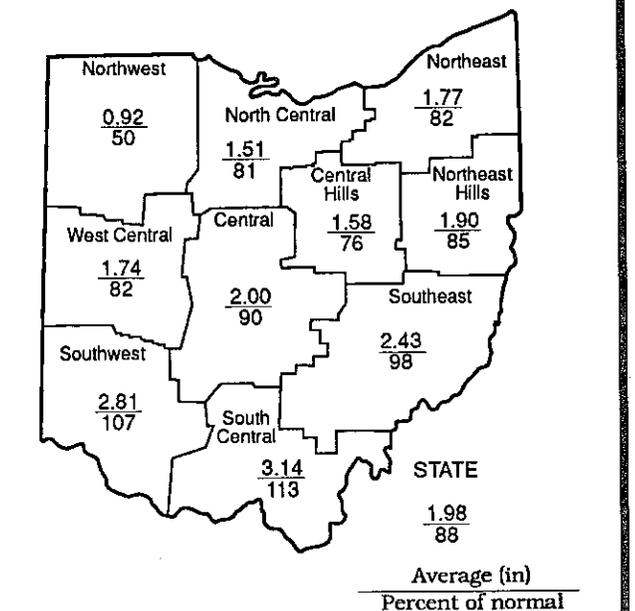
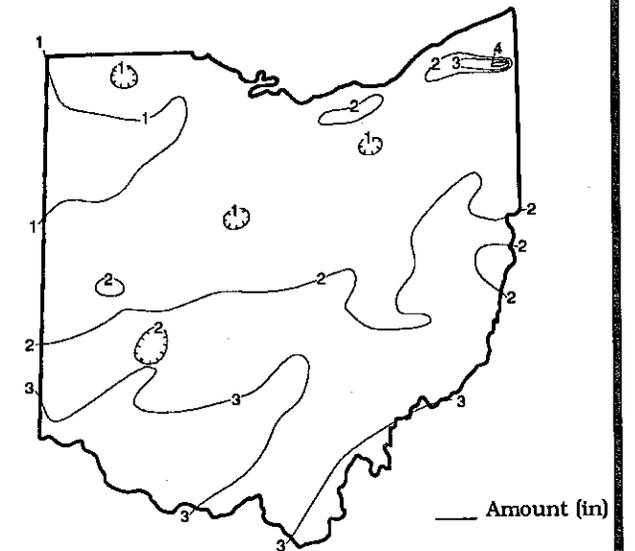
PRECIPITATION for February was below normal throughout most of the state with only the Southwest and South Central regions having above normal precipitation. The state average was 1.98 inches, 0.26 inch below normal. Regional averages ranged from 3.14 inches, 0.36 inch above normal, for the South Central Region to 0.92 inch, 0.92 inch below normal, for the Northwest Region. Andover (Ashtabula County) reported the greatest amount of precipitation for the month, 4.03 inches. Grover Hill (Paulding County) reported the least amount, 0.62 inch. Several areas in the northwestern portion of the state reported less than 1 inch of precipitation for the month.

The bulk of the month's precipitation fell during the first three weeks of the month. Daily totals were seldom over 0.5 inch especially in the northern half of the state. Storms during February 5-7 resulted in weekly precipitation amounts of up to 0.5 inch in the northern portion of the state and to slightly over 2 inches in the extreme southwestern portion. Storms returned during February 13-15 and 17-19 with the bulk of the month's precipitation for most locations occurring during this period. Most areas received between 1 and 2 inches of precipitation during this period with the exception being the northwestern portion of the state which received noticeably less. The rain changed to snow on early February 15 with blizzard-like conditions reported in many areas of the state. The last week of the month was rather dry with a few light showers and flurries near the end.

Precipitation for the 1991 water year is above normal throughout the state. The state average is 18.63 inches, 6.06 inches above normal. Regional averages range from 21.06 inches, 7.02 inches above normal, for the Southwest Region to 14.92 inches, 3.87 inches above normal, for the Northwest Region.

Precipitation for the 1991 calendar year is below normal throughout most of the state with only the Southeast Region having slightly above normal precipitation. The state average is 4.26 inches, 0.74 inch below normal. Regional averages range from 5.73 inches, 0.42 inch below normal, for the South Central Region to 2.54 inches, 1.48 inches below normal, for the Northwest Region. Precipitation has been below normal for the past two months in most areas of the state, but water supplies remain in favorable positions at this time as a result of the above normal precipitation during the last half of 1990.

PRECIPITATION FEBRUARY 1991



PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.92	+2.43	+3.78	+7.09	+10.16	+3.3
North Central	-0.36	+4.20	+7.10	+9.02	+13.21	+4.3
Northeast	-0.40	+4.16	+9.87	+13.26	+21.48	+4.8
West Central	-0.37	+4.98	+6.96	+12.75	+21.03	+4.5
Central	-0.21	+4.86	+7.54	+12.50	+19.66	+4.1
Central Hills	-0.51	+4.16	+7.38	+13.25	+17.64	+4.5
Northeast Hills	-0.33	+4.67	+8.33	+13.36	+17.04	+3.6
Southwest	+0.19	+4.68	+7.47	+14.29	+21.70	+5.0
South Central	+0.36	+4.88	+5.98	+6.66	+13.46	+3.4
Southeast	-0.06	+5.98	+8.70	+13.06	+24.97	+3.9
State	-0.26	+4.46	+7.32	+11.53	+18.04	

*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
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- Streamflow and reservoir storage data: U.S. Geological Survey, Water Resources Division.
- Lake Erie level data: U.S. Army Corps of Engineers, Detroit District.
- Palmer Drought Severity Index: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service.

ODNR

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NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

George V. Vohnovich
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Chief

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	1,734	82	151	157	128
Great Miami River at Hamilton	3,630	7,538	156	271	238	169
Huron River at Milan	371	800	181	258	289	162
Killbuck Creek at Killbuck	464	895	141	276	337	196
Little Beaver Creek near East Liverpool	496	1,014	123	237	245	162
Maumee River at Waterville	6,330	7,683	126	230	221	142
Muskingum River at McConnelsville	7,422	16,770	144	260	286	174
Scioto River near Prospect	567	1,055	164	316	301	215
Scioto River at Higby	5,131	11,485	160	255	245	185
Stillwater River at Pleasant Hill	503	983	185	270	255	186

STREAMFLOW for February was above normal throughout most of the state with only the extreme northeast portion having below normal flows. Flows in the southern half of the state were high enough to be considered excessive. February flows were less than last month's flows.

Flows at the beginning of the month were above normal in the south central and southeastern portions of the state but below normal elsewhere. Lowest flows for the month in most areas of the state occurred during the first few days of the month, but in a few scattered basins, lowest flows occurred at the month's end. Flows during the month increased following periods of precipitation with the highest flows for the month occurring on February 20-

21 for most areas of the state except in the southwestern and south central areas where the highest flows occurred on February 7. Flows declined the last week of the month and were below normal throughout the state at the month's end.

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

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 78 percent of rated capacity for water supply compared with 76 percent for last month and 80 percent for February 1990. Month-end storage in the Scioto basin index reservoirs was 93 percent of rated capacity for water supply compared with 92 percent for last month and 100 percent for February 1990. Surface water supplies are in a favorable position throughout the state.

GROUND-WATER LEVELS during February showed mixed responses. Levels in most consolidated aquifers and deeper unconsolidated aquifers rose during the month still responding to delayed recharge. Levels in most shallow unconsolidated aquifers declined in response to the below normal precipitation of the past two months. Net changes from last month's levels were less than usually observed and in some cases, negative net changes were noted.

Ground-water levels continue to remain above those of a year ago. Levels also continue to remain above normal statewide. Ground-water storage is in a favorable position throughout the state.

LAKE ERIE level declined during February. The mean level for February was 571.42 feet (IGLD-1955), 0.15 foot below last month's mean level and 1.62 feet above normal. This month's level is 0.62 foot above the February 1990 level and 2.82 feet above Low Water Datum.

SUMMARY

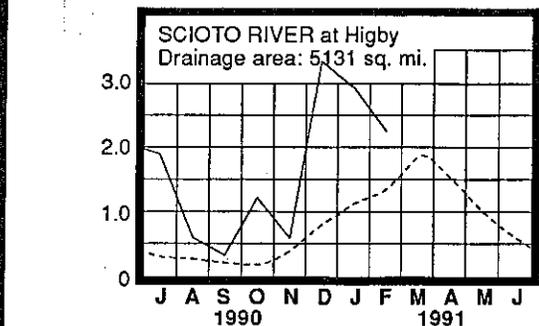
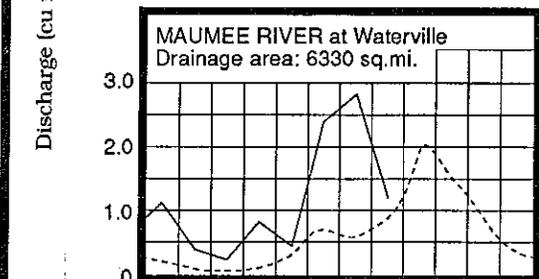
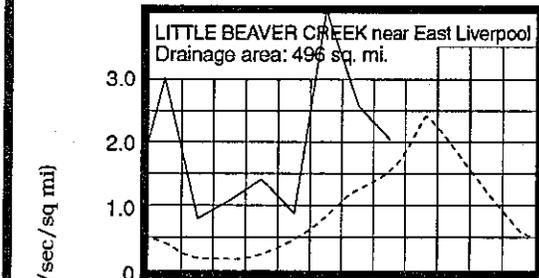
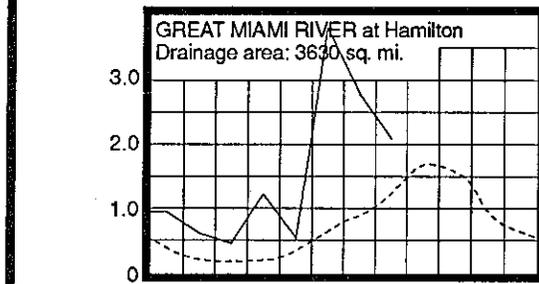
Precipitation was below normal throughout most of the state with only the southwestern and south central portions having above normal precipitation. Streamflow was above normal throughout most of the state. Reservoir storage increased slightly and remained above normal. Ground-water levels showed mixed responses but remained above normal throughout the state. Lake Erie level declined and was 1.62 feet above the long-term February average. Water supplies are in favorable positions throughout the state.

GROUND-WATER LEVELS

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	12.65	+1.45	-0.39	+0.34
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.67	+0.31	+0.15	+0.26
Fr-10	Columbus, Franklin Co.	Gravel	40.28	+3.75	+0.40	+1.41
H-1	Harrison, Hamilton Co.	Gravel	20.19	+1.00	-0.95	+1.03
Hn-2a	Dola, Hardin Co.	Dolomite	6.26	+1.26	-0.13	+0.67
Po-1	Windham, Portage Co.	Sandstone	18.08	+1.98	+0.28	+1.45
Tu-1	Strasburg, Tuscarawas Co.	Gravel	10.58	+1.23	-0.85	+1.77

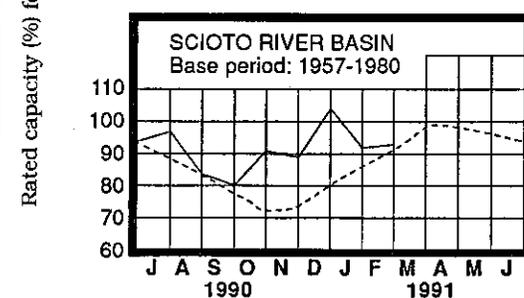
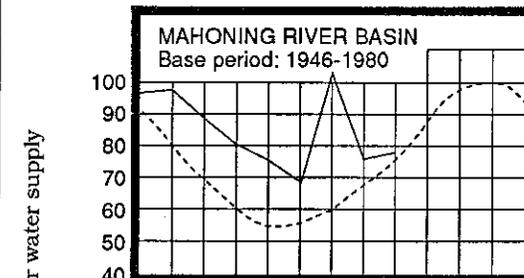
MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

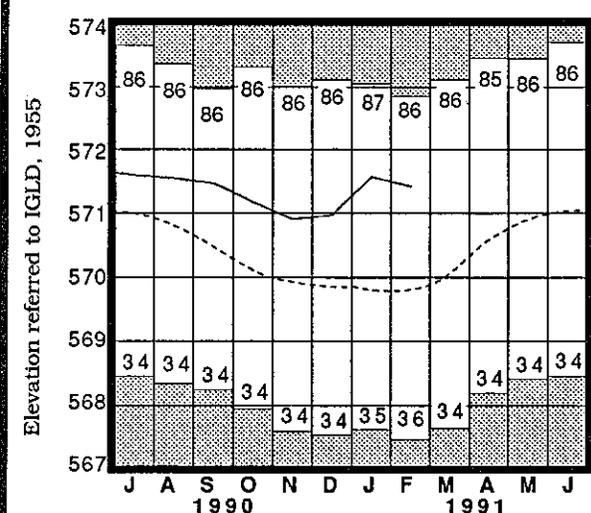
Normal

RESERVOIR STORAGE FOR WATER SUPPLY



Current

LAKE ERIE LEVELS at Cleveland

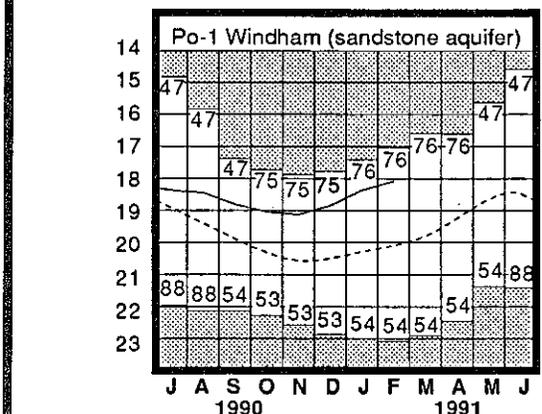
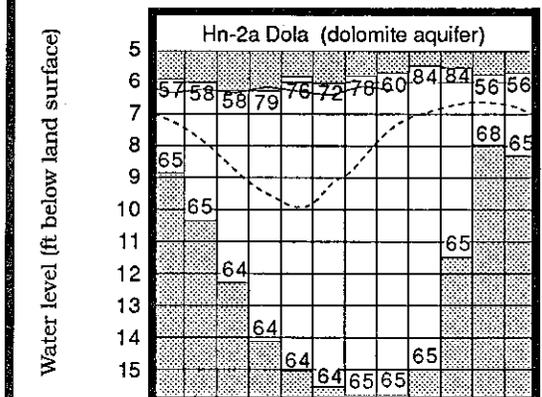
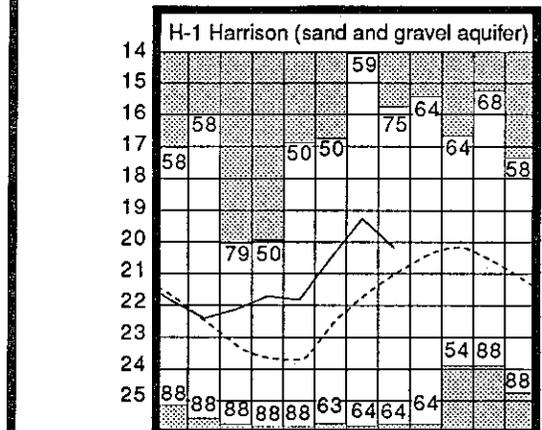


Base period: 1900-1986

Record high and low, year of occurrence

Normal

GROUND-WATER LEVELS



Base periods: H-1, 1951-1979. Hn-2a, 1955-1979.

Po-1, 1947-1979. Record high and low, year of occurrence

Current



MONTHLY WATER INVENTORY REPORT FOR OHIO

March 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

having above normal precipitation. The state average is 7.76 inches, 0.62 inch below normal. Regional averages range from 12.26 inches, 2.02 inches above normal, for the South Central Region to 4.02 inches, 2.87 inches below normal, for the Northwest Region (see precipitation departure from normal table-past 3 months column, on front page). Water supplies remain at favorable levels even though precipitation has been below normal in the northern two-thirds of the state since the start of the year.

NOTES AND COMMENTS NEW PUBLICATIONS

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

The Ground Water Resources of Carroll County
By Alfred C. Walker

This map is one in a series of county ground-water resources maps which have been completed for 77 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.

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

Ground Water Pollution Potential of Knox County, Ohio

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

This report was completed as part of a non-point source pollution grant awarded to the Division of Water to prepare both a general and pesticide pollution potential map for four counties across the state with varying land use conditions. Ground water pollution potential maps (general) are designed to determine an area's relative vulnerability to contaminants that have the mobility of water that are flushed into the subsurface. Pesticide pollution potential maps evaluate an area's susceptibility to contamination from pesticide application at the surface. This map places higher emphasis on those factors that affect attenuation and movement of pesticides into the subsurface.

The maps can be used as a planning and management tool for administrators, commissioners, zoning boards and others to assist 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.

In addition to Knox County, general and pesticide ground-water pollution potential maps that are being produced for the non-point source grant include Sandusky, Portage, and Ross counties. Each map costs \$12.30 (includes postage and tax). Copies of this publication may be obtained from the ODNR-Publications Center at the address listed above.

1991 OHIO DIRECTORY OF DRILLING CONTRACTORS

By Katherine M. Storts

This publication contains a listing by county of active drilling contractors, their capabilities and services offered, as well as other information about the Ground Water Resources Section (GWRS) and other state agencies involved in the protection and management of Ohio's water resources.

This free publication is available upon request while supplies last. To receive a copy, contact the GWRS at the address on this report or call (614) 265-6740

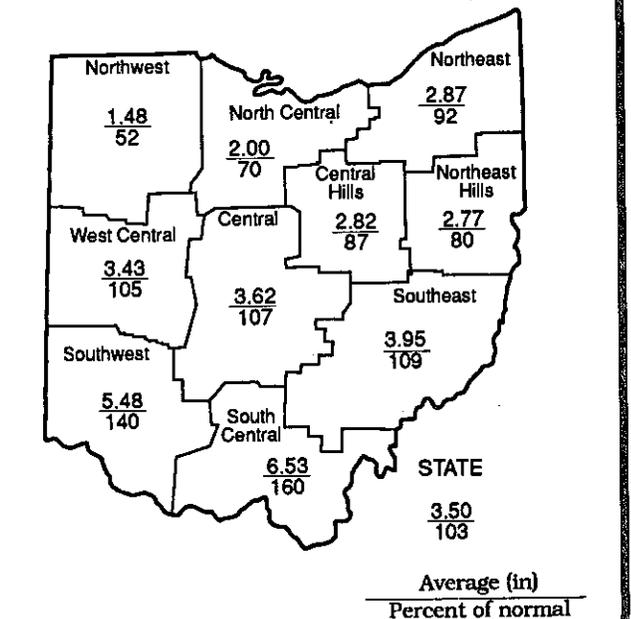
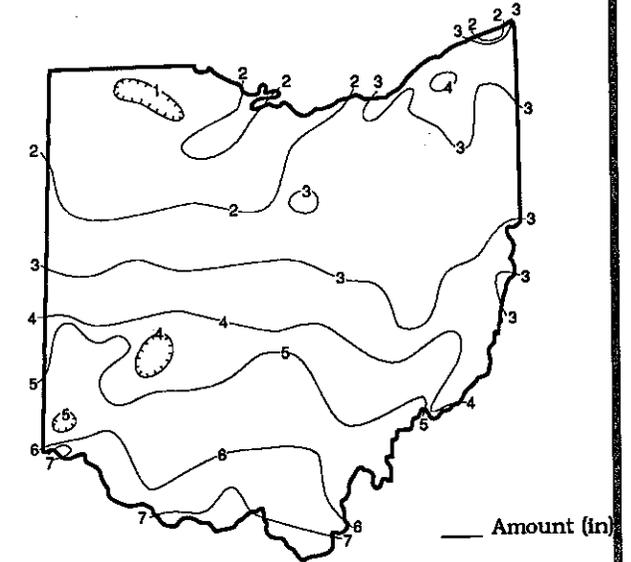
PRECIPITATION for March was above normal in the southern half of the state and below normal in the northern half. The state average was 3.50 inches, 0.12 inch above normal. Regional averages ranged from 6.53 inches, 2.44 inches above normal, for the South Central Region to 1.48 inches, 1.39 inches below normal, for the Northwest Region. Shawnee State Forest (Scioto County) reported the greatest amount of precipitation for the month, 7.74 inches. Bowling Green (Wood County) reported the least amount, 0.68 inch.

Precipitation varied across the state during the month. There were several days of precipitation each week in the southern two-thirds of the state up through the northeastern portion. The northwestern portion of the state was rather dry the first half of the month and received the bulk of its precipitation during the second half. Although there were quite a few days with precipitation, daily totals seldom exceeded 1 inch at most locations except as noted below. During the first ten days of the month, the eastern half of the state received between 1 and 2 inches of precipitation with 0.5 to 1 inch falling elsewhere except in the northwestern portion where totals were near zero. During the next week, storms produced between 1 and 2 inches in the southern portion, up to 1 inch in the central third of the state and again, nominal amounts in the northern portion. Storms on March 12-13 produced daily totals of over an inch in the southwestern portion of the state. For most locations the next week was the wettest. The northern portion of the state received 0.25 to 1 inch of precipitation, the central portion between 1 and 2 inches, and the southern portion 2 to over 3 inches with the greatest daily totals of over an inch falling on March 22. Precipitation during the last week of the month was more uniform throughout the state; most locations received between 0.25 and 0.75 inch except in the extreme southern portion where 1 to 2 inches were recorded with amounts of over an inch falling on March 26. A tornado touched down on March 27 in the Nettle Lake area (Williams County) damaging over 200 homes.

Precipitation for the first half of the 1991 water year is above normal throughout the state. The state average is 22.14 inches, 6.19 inches above normal. Regional averages range from 26.54 inches, 8.58 inches above normal, for the Southwest Region to 16.40 inches, 2.48 inches above normal, for the Northwest Region (see precipitation departure from normal table-past 6 months column, on this page).

Precipitation for the 1991 calendar year is below normal throughout most of the state with only the southern one-third of the state (continued on back)

PRECIPITATION MARCH 1991



PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-1.39	-2.87	+2.48	+6.13	+9.57	+2.0
North Central	-0.86	-1.84	+4.62	+9.68	+12.73	+3.7
Northeast	-0.24	-0.78	+5.94	+15.37	+21.06	+4.1
West Central	+0.17	-0.81	+6.52	+13.40	+20.25	+4.9
Central	+0.25	-0.73	+6.94	+14.26	+19.16	+4.1
Central Hills	-0.44	-1.60	+5.66	+15.07	+16.76	+3.7
Northeast Hills	-0.68	-1.18	+5.23	+15.00	+15.62	+2.5
Southwest	+1.56	+0.94	+8.58	+16.58	+21.73	+5.4
South Central	+2.44	+2.02	+8.30	+11.32	+14.83	+4.4
Southeast	+0.33	+0.51	+7.43	+15.15	+23.78	+4.0
State	+0.12	-0.62	+6.19	+13.21	+17.56	

*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 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.

ODNR

OHIO DEPARTMENT OF
NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

George V. Voinovich
Governor

Frances S. Buchholzer
Director

Robert L. Goettmoeller
Chief

MEAN STREAM DISCHARGE

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
				This Month		
Grand River near Painesville	685	1,773	75	96	127	137
Great Miami River at Hamilton	3,630	7,606	125	165	230	178
Huron River at Milan	371	344	46	112	205	166
Killbuck Creek at Killbuck	464	872	88	167	273	206
Little Beaver Creek near East Liverpool	496	964	80	122	177	171
Maumee River at Waterville	6,330	3,787	30	116	149	138
Muskingum River at McConnelsville	7,422	14,450	87	163	209	182
Scioto River near Prospect	567	622	62	132	218	218
Scioto River at Higby	5,131	10,862	112	151	210	196
Stillwater River at Pleasant Hill	503	934	122	131	211	191

STREAMFLOW for March was below normal throughout most of the state with only the southwestern and south-central areas having above normal flows. Flows were low enough to be considered deficient in the northwestern and north-central portions of the state. In most areas, March flows were less than last month's flows.

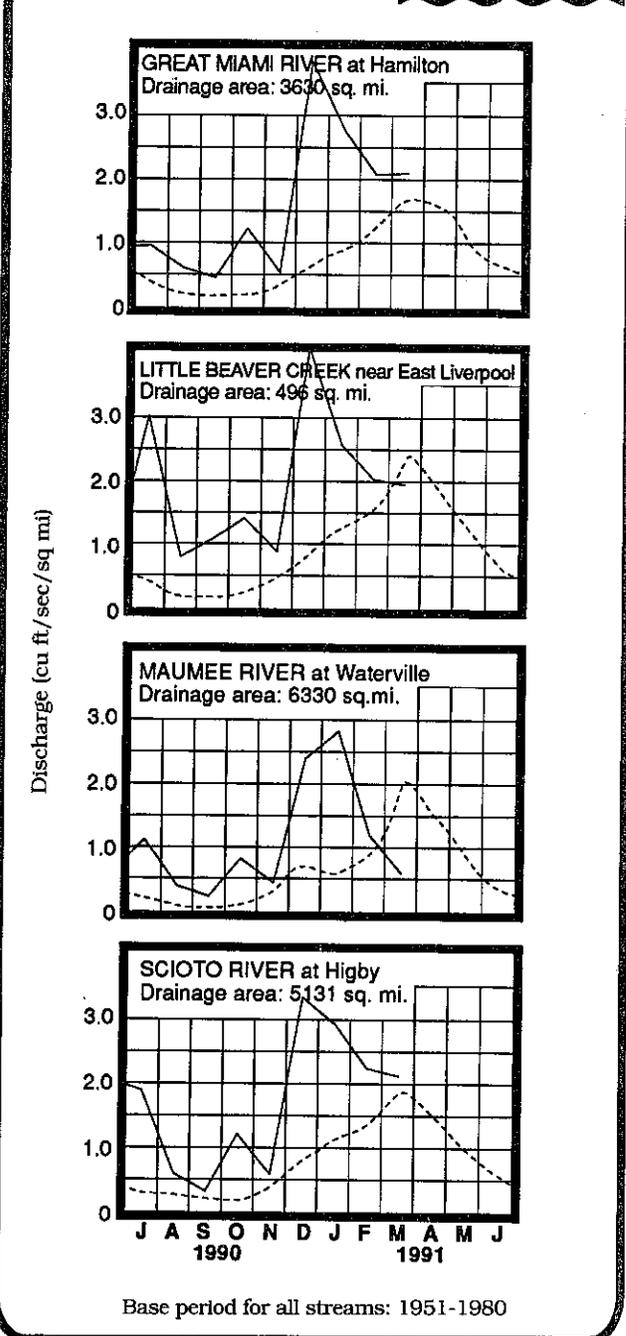
Flows at the beginning of the month were below normal throughout the state. In the northern portion of the state, highest flows for the month occurred during the first week; in the southern portion they occurred on or about March 23. Lowest flows for the month occurred at variable times but were generally: early in the month in the central and south-central areas; just before mid-month in the western

portion; and at the month's end in the northern portion. Flows were below normal at the end of the month and were low enough to be considered deficient in many areas of the state.

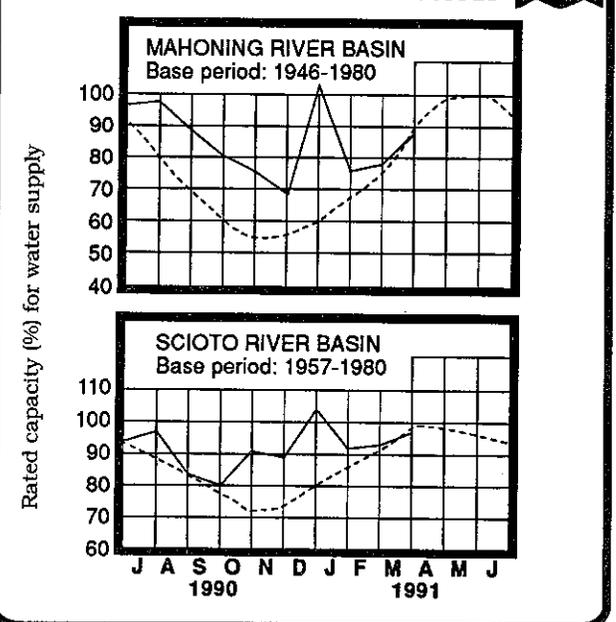
RESERVOIR STORAGE for water supply during March increased in both the Mahoning and Scioto river basins. Month-end storage was slightly below normal in both basins.

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 88 percent of rated capacity for water supply compared with 78 percent for last month and 79 percent for March 1990. Month-end storage in the Scioto basin index reservoirs was 97 percent of rated capacity for water supply compared with 93 percent for last month and 95 percent for March 1990.

MEAN STREAM DISCHARGE



RESERVOIR STORAGE FOR WATER SUPPLY



GROUND-WATER LEVELS during March showed mixed responses. Generally, positive net changes from last month's levels occurred in the southern portion of the state where precipitation has been above normal while net declines were observed in the northern portion where precipitation has been below normal. Ground-water levels declined statewide during the early part of the month in most aquifers. During the second half of the month, levels in the southern portion of the state rose while levels in the northern portion stabilized or continued to decline slowly. Net changes from last month's levels were less than usually observed where net rises occurred and, as noted in some cases, anomalous declines occurred.

Ground-water levels continue to remain at or above normal throughout the state despite the below normal precipitation the past few months in many areas. Levels also continue to remain at or above those levels of a year ago.

LAKE ERIE level rose during March. The mean level for March was 571.66 feet (IGLD-1955), 0.24 foot above last month's level and 1.61 feet above normal. March's level was 0.41 foot above the March 1990 level and 3.06 feet above Low Water Datum.

SUMMARY

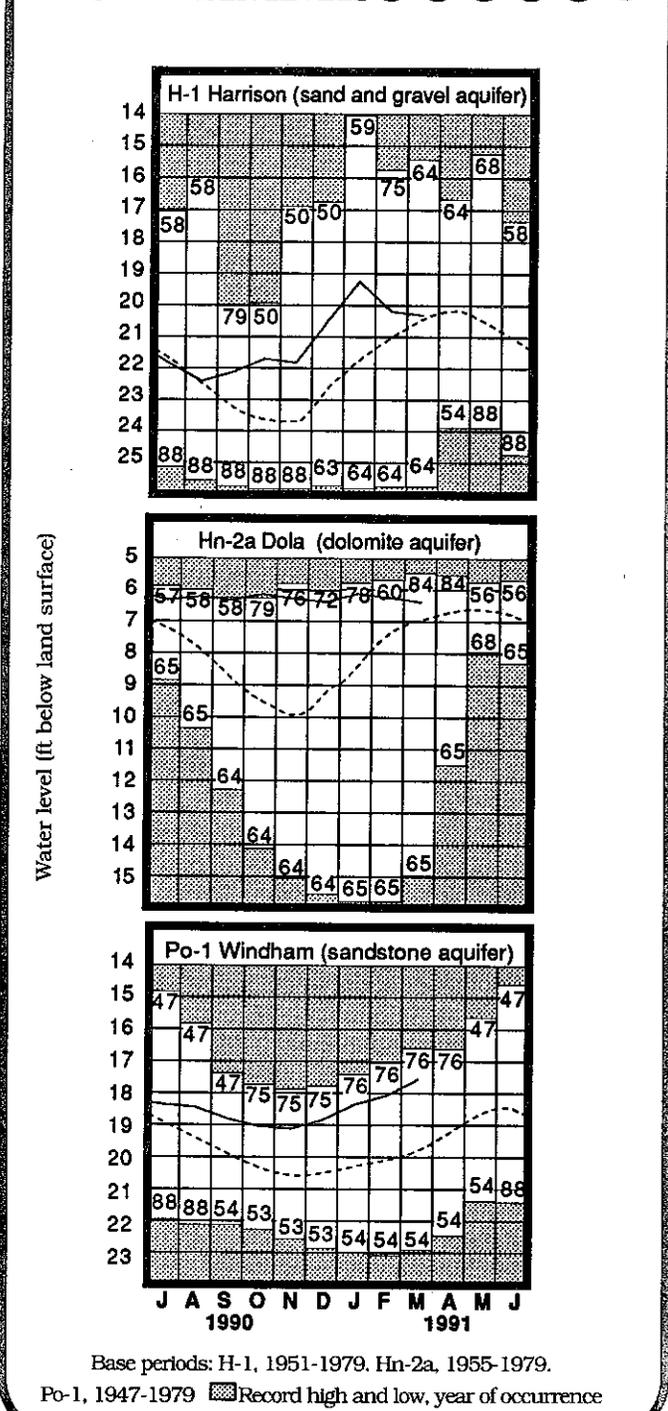
Precipitation was below normal in the northern half of the state and above normal in the southern half. Streamflow was below normal throughout most of the state except in the southern portion which had above normal flows. Reservoir storage increased but was slightly below normal. Ground-water levels had mixed responses and remain at or above normal throughout the state. Lake Erie level rose 0.24 foot and was 1.61 feet above normal.

GROUND-WATER LEVELS

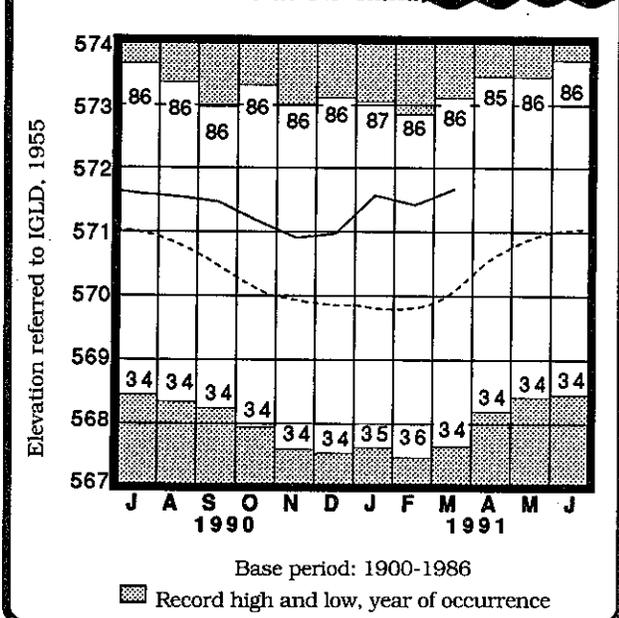
Based on daily lowest level in feet below land-surface datum

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	12.37	+0.58	+0.28	+1.50
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.53	+0.23	+0.14	+0.61
Fr-10	Columbus, Franklin Co.	Gravel	39.90	+3.43	+0.38	+1.23
H-1	Harrison, Hamilton Co.	Gravel	20.30	+0.12	-0.11	+1.14
Hn-2a	Dola, Hardin Co.	Dolomite	6.39	+0.59	-0.13	-0.04
Po-1	Windham, Portage Co.	Sandstone	17.57	+2.19	+0.51	+1.37
Tu-1	Strasburg, Tuscarawas Co.	Gravel	11.00	-0.03	-0.42	+1.31

GROUND-WATER LEVELS



LAKE ERIE LEVELS at Cleveland



Normal - - - - Current - - - -

Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

April 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTES AND COMMENTS

REBECCA PETTY RECEIVES EOM AWARD

Rebecca Petty, Administrator of the Division of Water's Ground Water Resources Section (GWRS), was the recipient of the ODNR Employee of the Month (EOM) Award for May.

Since joining ODNR in 1987, Rebecca has led her section to new heights of accomplishment. She successfully applied for two outside grants to conduct studies in Seneca and Licking counties on subjects of vital importance to Ohio's non-point source pollution program. Under Rebecca's administration, the section will soon finish the county ground-water availability mapping for the state and is moving ahead aggressively on the pollution potential mapping program. Her work on the Interagency Ground Water Advisory Council has led to a recent update of the state's Ground Water Protection and Management Strategy.

During her tenure, the section has received a record number of requests for information. To help process the requests, Rebecca implemented a computerized well log storage and retrieval program, making Ohio a leader in the field.

An industrious and hard working employee, Rebecca has encouraged her staff to develop professionally. Congratulations from the GWRS staff. Keep up the good work.

COSTA RICA EARTHQUAKE MAKES ITS MARK IN OHIO

An earthquake on April 22 in Costa Rica, measuring 7.4 on the Richter scale, left its mark on the ground-water levels of Ohio. The quake occurred at 5:58 pm EDT; the epicenter was located about 70 miles southeast of the capital city of San Jose.

Shock waves radiating out from the earthquake's epicenter pass through the earth's crust and, if strong enough, may cause an alternate compression and expansion of some aquifers. This results in an instantaneous fluctuation in ground-water levels. Several wells in the state's observation well network have shown responses to Western Hemisphere earthquakes over the years. The most sensitive observation well is Vw-1 (Van Wert, Van Wert County) which showed a fluctuation of 0.5 foot in response to this quake. This compares to a 5.8 feet fluctuation in response to the March 27, 1964 Anchorage, Alaska earthquake which had a Richter magnitude of 8.4. Other observation wells showing a response to the Costa Rican earthquake include Bu-16 (Trenton, Butler County), DL-3 (Delaware Dam, Delaware County), and St-5a (Canton, Stark County).

YOUTHS EXCEL ON STATE SCIENCE DAY

At the Ohio Academy of Science's State Science Day on April 20, 1991, three students were recognized during the competition for the Governor's Award for Excellence in Water Resources Research sponsored by the Division of Water.

Judging the event were (from the Division of Water) coordinator Leonard Black, Kim Baker, Dan Halterman, Rebecca Petty, Joel Reed, Kathy Storts, and Ralph Bernhagen (retired); other judges were Gary Schaal, Division of Soil and Water Conservation, Dr. Robert Stiefel, Water Resources Center at OSU and Ohio Water Advisory Council, and Richard Swisshelm, U.S. Geological Survey.

Results were:

- 1st Place**
Sean M. Shipley, 8th grade, Champion M.S., Columbus-
"Metal or Polymer: Which Works Best in Coagulation"
- 2nd Place**
Kurt A. Leeper, 8th grade, Marietta M.S., Marietta-
"Comparison of Wastewater Treatments"
- 3rd Place**
Sara E. White, 8th grade, Eber Baker M.S., Marion-
"Get the Lead Out!"

WELL CONSTRUCTION CONFERENCE

The Ohio Water Well Association (OWWA), The Ohio Department of Natural Resources (ODNR) and the Ohio Department of Health (ODH) are co-sponsoring a well construction conference to be held on June 14-15 at the F.E. Meyers plant in Ashland, Ohio. Several demonstrations of drilling and well abandonment methods as well as educational lectures are scheduled. Experts from manufacturers and suppliers of well drilling and water supply equipment, as well as state government and consultant representatives will be present to answer technical questions.

For more information, contact OWWA at (419) 845-2023, or ODNR at (614) 265-6740.

PRECIPITATION for April was slightly above normal throughout most of the state except in some central, north-central and northwestern areas where it was slightly below normal. The state average was 3.72 inches, 0.21 inch above normal. Regional averages ranged from 4.10 inches, 0.56 inch above normal, for the Southeast Region to 3.14 inches, 0.11 inch below normal, for the North Central Region. Rockbridge (Hocking County) reported the greatest amount of precipitation for the month, 5.60 inches. Bucyrus (Crawford County) reported the least amount, 2.19 inches.

Precipitation fell during every week of the month; however, the bulk of the month's precipitation fell during the middle two weeks as totals averaged around 0.5 inch or less at most locations during the first and last weeks. Thunderstorms with hail and strong winds rumbled across the state on April 8-9 with precipitation totals generally less than 1 inch at most locations. Notable storm periods during the month were April 13-15 in the southern portion of the state and April 19-21 in the northern portion. During April 13-15 many areas in the southern portion of the state received over 2 inches of precipitation with up to 3 inches falling locally during thunderstorm activity which also produced high winds. Minor flooding resulted in the southeastern portion of the state. Precipitation totals in the northern portion of the state during this period ranged from about 0.5 inch to slightly over 1 inch. During April 19-21, the northern portion of the state received between 1 and 2.5 inches of rain with the greatest amounts falling in extreme northwestern Ohio, Indiana and Michigan which resulted in moderate flooding of the Maumee River and its tributaries. The central and southern portions of the state recorded about 0.5 to 1 inch during this time period.

Precipitation for the 1991 water year is above normal throughout the state. The state average is 25.84 inches, 6.38 inches above normal. Regional averages range from 30.47 inches, 8.70 inches above normal, for the Southwest Region to 20.33 inches, 3.10 inches above normal, for the Northwest Region. The 1991 recharge season has been favorable for water supplies despite the slightly below normal precipitation in many areas of the state during the past few months.

Precipitation for the 1991 calendar year is below normal in the northern two-thirds of the state and above normal in the southern one-third. The state average is 11.47 inches, 0.42 inch below normal. Regional averages range from 16.17 inches, 2.19 inches above normal, for the South Central Region to 7.95 inches, 2.25 inches below normal, for the Northwest Region.

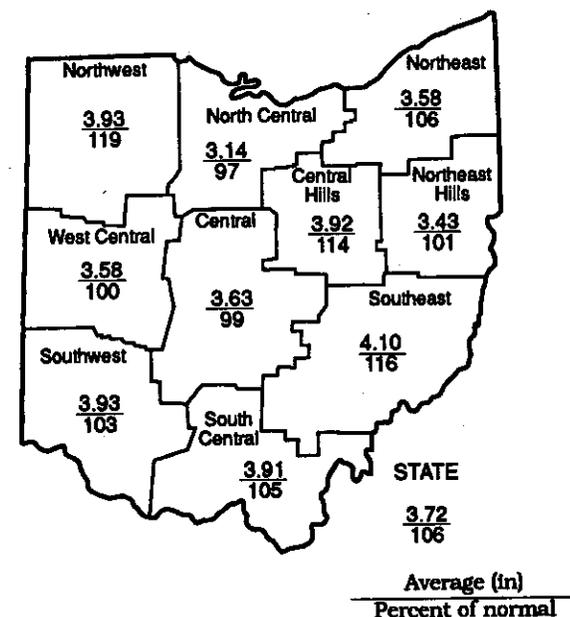
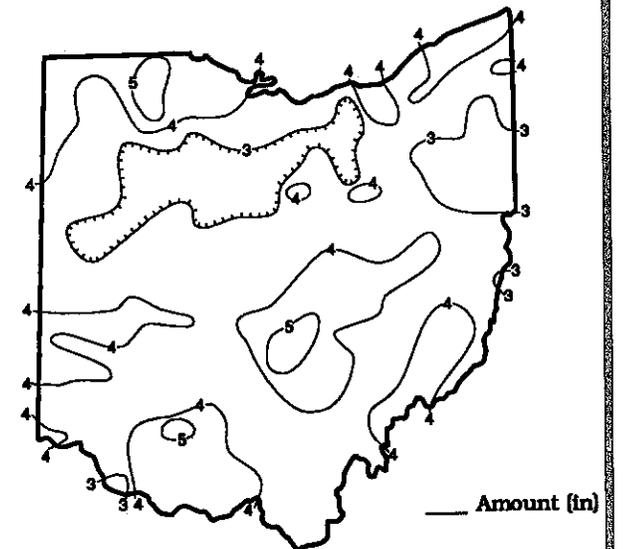
PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.62	-1.69	+1.49	+7.92	+10.29	+1.3
North Central	-0.11	-1.33	+2.68	+9.63	+12.58	+3.4
Northeast	+0.19	-0.45	+3.67	+15.02	+21.99	+3.5
West Central	0	-0.20	+4.48	+14.30	+18.60	+4.5
Central	-0.03	+0.01	+4.32	+14.96	+18.28	+3.4
Central Hills	+0.47	-0.48	+3.40	+15.58	+17.28	+3.0
Northeast Hills	+0.03	-0.98	+3.45	+14.78	+16.40	+1.6
Southwest	+0.12	+1.87	+5.59	+17.38	+19.50	+4.7
South Central	+0.17	+2.97	+6.86	+11.98	+13.52	+3.4
Southeast	+0.56	+0.83	+6.09	+16.36	+22.21	+3.7
State	+0.21	+0.07	+4.23	+13.81	+17.08	

*Above +4 = Extreme Moist Spell
3.0 To 3.9 = Very Moist Spell
2.0 To 2.9 = Unusual Moist Spell
1.0 To 1.9 = Moist Spell
0.5 To 0.9 = Incipient Moist Spell
0.4 To 0.4 = Near Normal

-0.5 To -0.9 = Incipient Drought
-1.0 To -1.9 = Mild Drought
-2.0 To -2.9 = Moderate Drought
-3.0 To -3.9 = Severe Drought
Below -4.0 = Extreme Drought

PRECIPITATION APRIL 1991



ACKNOWLEDGEMENTS

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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.

ODNR

OHIO DEPARTMENT OF
NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

George V. Voinovich
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Director

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Chief

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	1,305	96	88	117	134
Great Miami River at Hamilton	3,830	6,178	110	114	183	182
Huron River at Milan	371	415	84	82	163	163
Killbuck Creek at Killbuck	464	695	97	103	185	206
Little Beaver Creek near East Liverpool	496	558	61	82	147	185
Maumee River at Waterville	6,330	10,892	116	73	139	147
Muskingum River at McConnelsville	7,422	14,491	111	103	178	186
Scioto River near Prospect	567	625	88	72	165	210
Scioto River at Higby	5,131	8,621	116	108	168	201
Stillwater River at Pleasant Hill	503	617	87	95	171	181

STREAMFLOW for April ranged from slightly below to slightly above normal throughout the state. Generally, the below normal flows occurred in the northeastern quadrant of the state. April flows were less than last month's flows except in the northwestern quadrant of the state where they were greater.

Flows at the beginning of the month were below normal statewide and low enough to be considered deficient in much of the northern half of the state. Lowest flows for the month occurred between April 5-12 with most areas recording their lowest flows on April 8. Flows increased noticeably after mid-month following several days of widespread precipitation. Greatest flows for the southern two-thirds of the state

were recorded on or just before April 16. Minor low-level flooding occurred during this period in the southeastern portion of the state. Greatest flows for the northern portion of the state occurred during April 20-21. There was moderate flooding in the northwestern portion of the state during this period as heavy precipitation also fell in the Maumee River drainage basin in portions of Indiana and Michigan. Flows declined after this date and were noticeably below normal at the month's end.

RESERVOIR STORAGE for water supply during April increased in both the Mahoning and Scioto river basins. Month-end storage was normal in the Scioto basin and slightly below normal in the Mahoning basin.

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 97 percent of rated capacity for water supply compared with 88 percent for last month and 92 percent for April 1990. Month-end storage in the Scioto basin index reservoirs was 98 percent of rated capacity for water supply compared with 97 percent for last month and 100 percent for April 1990.

GROUND-WATER LEVELS during April generally declined in shallow unconsolidated aquifers and rose in consolidated and deeper unconsolidated aquifers. Net positive changes from last month's levels were noticeably less than usually observed. In the northern portion of the state, net declines occurred.

Ground-water levels during the early part of the month declined in most aquifers. Levels in shallow unconsolidated aquifers rose sharply after mid-month in response to widespread precipitation and then declined until the month's end. Levels in consolidated and deeper unconsolidated aquifers continued to decline past mid-month and then showed slight rises through the rest of April.

In most areas of the state, ground-water levels continue to remain above normal but have fallen to slightly below normal in other areas. Levels are still above those of a year ago in most of the state. As the end of the recharge season draws near, ground-water storage is favorable as far as water supplies are concerned.

LAKE ERIE level rose during April. The mean level was 571.81 feet (IGLD-1955), 0.15 foot above last month's level and 1.20 feet above normal. April's level was 0.39 foot above the April 1990 level and 3.21 feet above Low Water Datum.

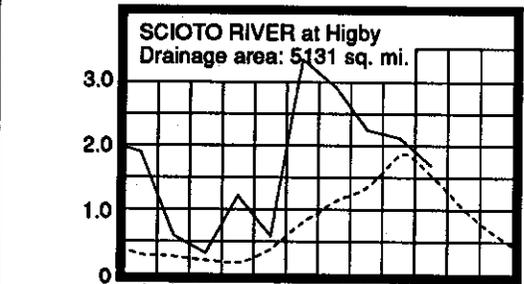
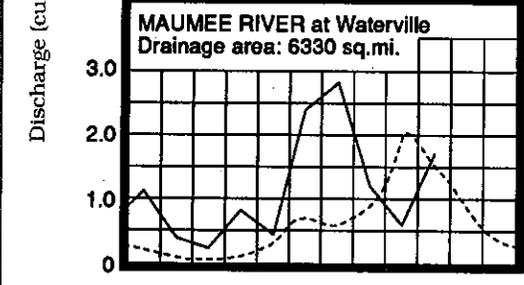
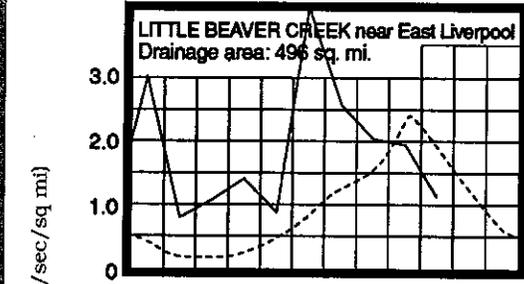
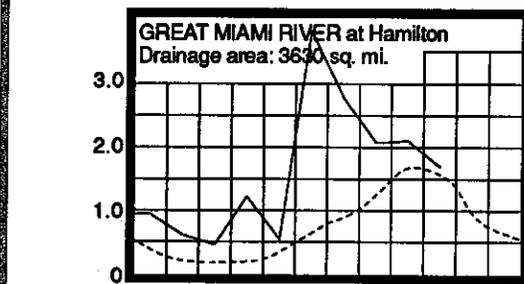
SUMMARY
Precipitation was slightly above normal in most areas of the state but slightly below normal in some central, north-central, and northwestern areas. Streamflow also ranged from slightly above to slightly below normal. Reservoir storage increased and was at or near normal. Ground-water levels generally declined in unconsolidated aquifers and rose in consolidated aquifers. Lake Erie level rose and was 1.20 feet above normal.

GROUND-WATER LEVELS

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
					This Month	
F-1	W. Rushville, Fairfield Co.	Sandstone	12.09	-0.08	+0.34	+2.52
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.42	+0.25	+0.11	+0.70
Fr-10	Columbus, Franklin Co.	Gravel	39.72	+3.35	+0.18	+1.24
H-1	Harrison, Hamilton Co.	Gravel	20.25	-0.08	+0.05	+1.46
Hn-2a	Dola, Hardin Co.	Dolomite	6.42	+0.32	-0.03	-0.22
Po-1	Windham, Portage Co.	Sandstone	17.59	+1.63	-0.02	+0.97
Tu-1	Strasburg, Tuscarawas Co.	Gravel	11.79	-1.27	-0.79	+1.13

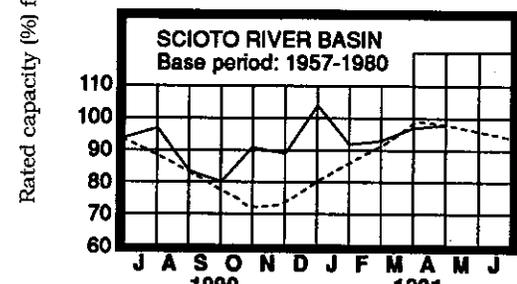
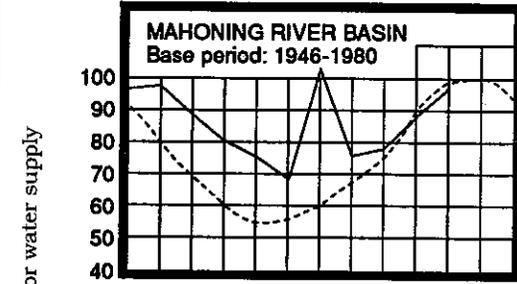
MEAN STREAM DISCHARGE



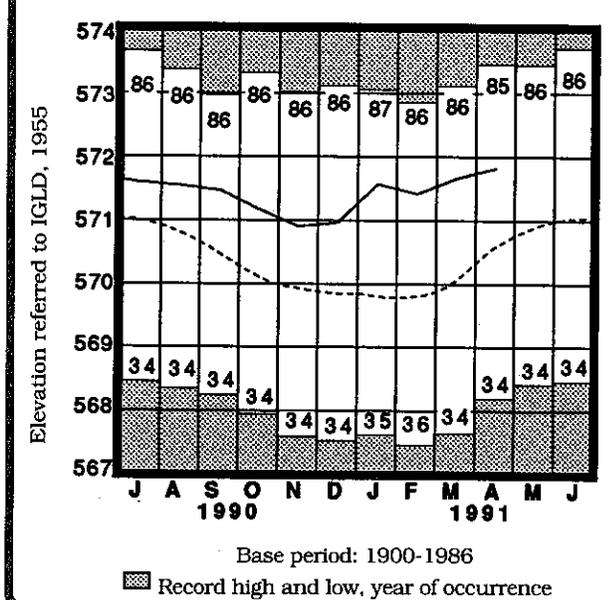
Base period for all streams: 1951-1980

Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



LAKE ERIE LEVELS at Cleveland

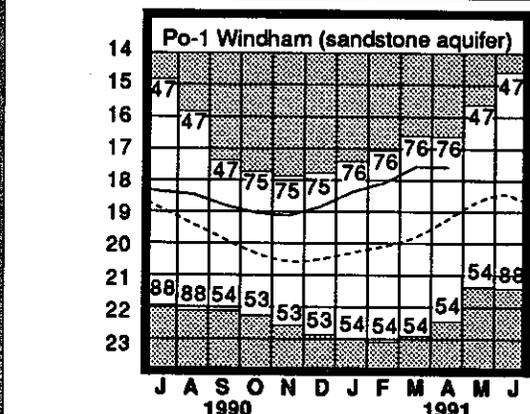
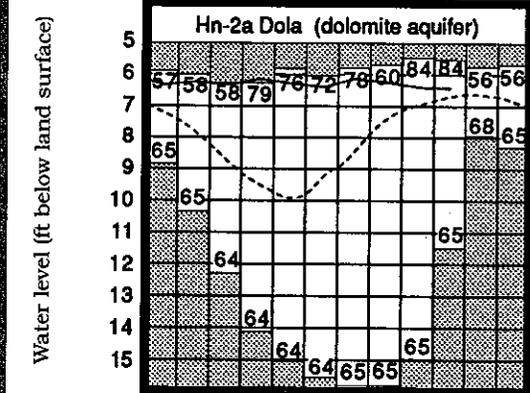
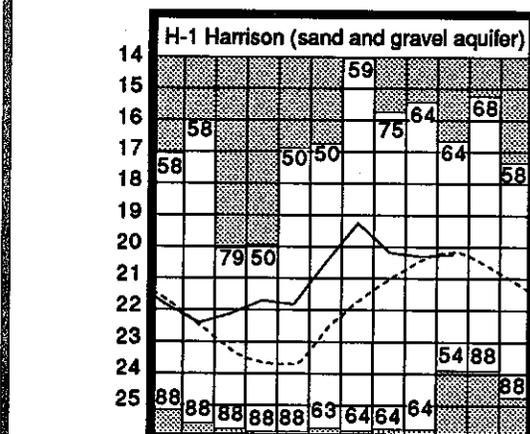


Base period: 1900-1986

Record high and low, year of occurrence

Normal - - - - Current - - - -

GROUND-WATER LEVELS



Base periods: H-1, 1951-1979. Hn-2a, 1955-1979.

Po-1, 1947-1979 Record high and low, year of occurrence

Water level (ft below land surface)

Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

May 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTES & COMMENTS

NEW PUBLICATIONS

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

The Ground Water Resources of Highland County
By James J. Schmidt

This map is one in a series of county ground-water resources maps which have been completed for 78 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.

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

Ground-Water Pollution Potential of Sandusky County, Ohio.
By Michael P. Angle

This report was completed as part of a non-point source pollution grant awarded to the Division of Water by the U.S. Environmental Protection Agency through Ohio's Nonpoint Source Pollution Program to prepare both a general and pesticide pollution potential map for four counties across the state with varying land use conditions. Ground water pollution potential maps (general) are designed to determine an area's relative vulnerability to contaminants with the mobility of water that are flushed into the subsurface. Pesticide pollution potential maps evaluate an area's susceptibility to contamination from pesticide application at the surface. This map places higher emphasis on those factors that affect the concentration and movement of pesticides into the subsurface.

The maps can be used as a planning and management tool for administrators, commissioners, zoning boards and others to assist 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.

In addition to Sandusky County, general and pesticide ground-water pollution potential maps that are being produced for the non-point source grant include Knox (completed), Portage, and Ross counties. Each map costs \$12.30 (includes postage and tax). Copies of this publication may be obtained from the ODNR-Publications Center at the address listed above.

ADDITIONAL ACKNOWLEDGEMENTS

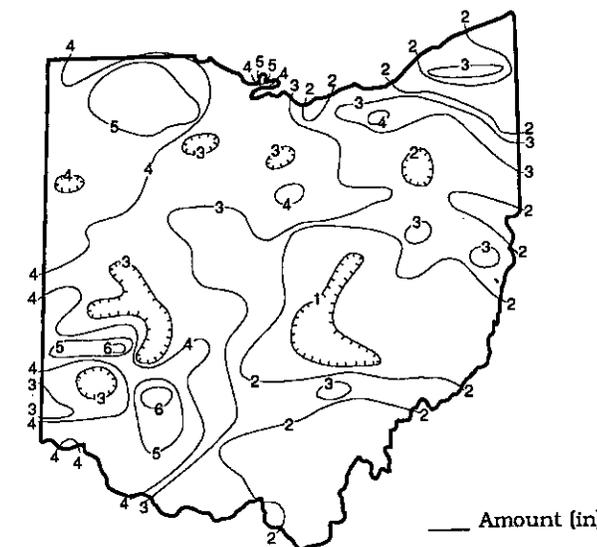
The monthly publication of this report is the result of the dedicated effort of many individuals. Without their assistance, the publication of this report would not be possible. The author wishes to acknowledge their effort. They are: editing, William Mattox and Heidi Hetzel-Evans; data collection and processing, Scott Kirk; typesetting, Linda Fair; and lay-out, Xiaoning (Ning) Jiang.

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.
U.S. Geological Survey, Water Resources Division,
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.

PRECIPITATION MAY 1991



PRECIPITATION for May was below normal throughout most of the state with only the Northwest and Southwest regions having above normal precipitation. The state average was 2.75 inches, 1.00 inch below normal. Regional averages ranged from 4.55 inches, 1.01 inches above normal, for the Northwest Region to 1.54 inches, 2.40 inches below normal, for the Southeast Region. This was the sixth and eighth driest May in 97 years of records for the Southeast and South Central regions respectively. Dayton (Montgomery County) reported the greatest amount of precipitation for the month, 6.25 inches. New Lexington (Perry County) reported the least amount, 0.61 inch.

Precipitation during the month fell in a pattern more typical of mid-summer than mid-spring as weather systems were stalled. Temperatures averaged noticeably above normal throughout the state. Widely scattered showers and thunderstorms brought precipitation during every week of the month. During the first half of the month, most areas of the state received between 0.5 and 1 inch of precipitation. An exception was in the northwestern portion of the state and a few areas along the Ohio River which received up to 2 inches. The third week of the month was rather dry in most locations, but some areas in the western and southwestern portions of the state received up to 2.5 inches. During the last week of the month, storms were a little more widespread especially in the western half of the state. Many stations received the bulk of their monthly total precipitation during the last six days of the month.

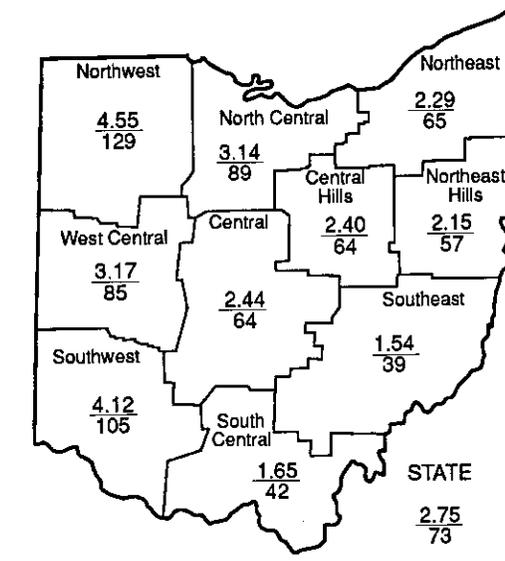
Precipitation for the 1991 water year is above normal throughout the state. The state average is 28.59 inches, 5.38 inches above normal. Regional averages range from 34.59 inches, 8.90 inches above normal, for the Southwest Region to 24.78 inches, 4.14 inches above normal, for the North Central Region.

Precipitation for the 1991 calendar year is below normal throughout most of the state with only the Southwest Region having above normal precipitation. The state average is 14.21 inches, 1.43 inches below normal. Regional averages range from 18.76 inches, 1.26 inches above normal, for the Southwest Region to 11.47 inches, 2.32 inches below normal, for the North Central Region.

PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+1.01	+0.24	+2.67	+6.99	+9.99	+0.3
North Central	-0.37	-1.34	+2.86	+7.75	+9.31	+1.4
Northeast	-1.24	-1.29	+2.87	+11.59	+17.25	-1.1
West Central	-0.55	-0.38	+4.60	+10.61	+15.10	+0.9
Central	-1.37	-1.15	+3.71	+9.71	+14.29	-0.9
Central Hills	-1.37	-1.34	+2.82	+10.61	+13.64	-0.8
Northeast Hills	-1.63	-2.28	+2.41	+10.77	+12.66	-2.4
Southwest	+0.20	+1.88	+6.66	+11.73	+17.39	+2.2
South Central	-2.28	+0.33	+5.21	+5.71	+10.73	-0.5
Southeast	-2.40	-1.51	+3.87	+9.50	+17.37	-0.6
State	-1.00	-0.67	+3.79	+9.52	+13.78	

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



Average (in)
Percent of normal

ODNR

OHIO DEPARTMENT OF
NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

George V. Voinovich
Governor

Frances S. Buchholz
Director

Robert L. Goettscheller
Chief

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	160	47	68	110	123
Great Miami River at Hamilton	3,630	3,018	98	101	168	166
Huron River at Milan	371	123	56	52	140	156
Killbuck Creek at Killbuck	464	299	60	86	158	196
Little Beaver Creek near East Liverpool	496	257	44	62	133	158
Maumee River at Waterville	6,330	2,991	59	58	131	137
Muskingum River at McConnelsville	7,422	4,762	49	84	154	175
Scioto River near Prospect	567	159	46	64	148	189
Scioto River at Higby	5,131	2,957	63	91	156	177
Stillwater River at Pleasant Hill	503	265	81	82	164	173

STREAMFLOW for May was below normal throughout the state. May flows were noticeably less than last month's flows. Flows in the northeastern portion of the state were low enough to be considered deficient.

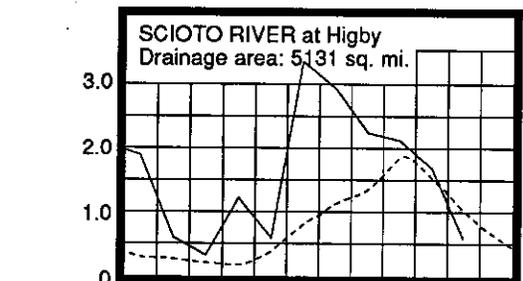
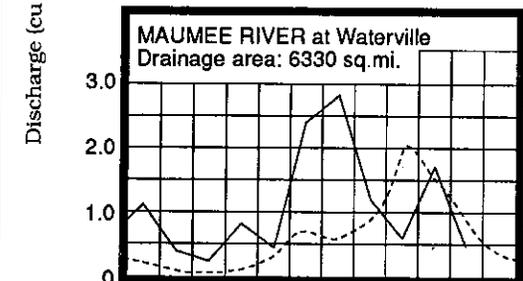
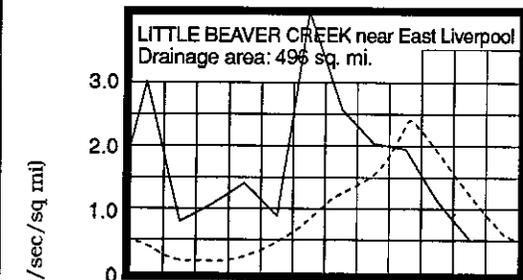
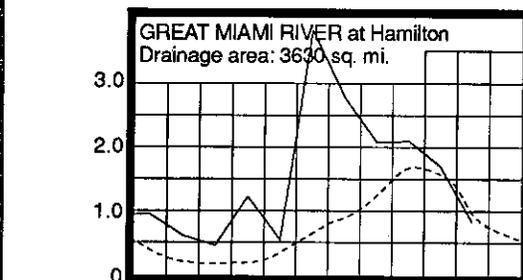
Flows at the beginning of the month were below normal throughout most of the state. Generally, flows declined throughout the month with rises noted following local precipitation. Greatest flows May occurred randomly during the month following the greatest local precipitation. Highest flows occurred during the second half of the month in most areas of the state, but in the northeastern portion they occurred early in the month. Lowest flows for the month occurred during May 24-25 for most areas of the state. Flows at

the end of the month were noticeably below normal in most areas, but slightly above normal in the northwestern and central portions of the state.

RESERVOIR STORAGE for water supply during May decreased in both the Mahoning and Scioto river basins. Month-end storage was slightly below normal in both basins.

Reservoir storage at the end of the month in the Mahoning basin index reservoirs was 94 percent of rated capacity for water supply compared with 97 percent for last month and 99 percent for May 1990. Month-end storage in the Scioto basin index reservoirs was 93 percent of rated capacity for water supply compared with 98 percent for last month and 99 percent for May 1990. Surface water supplies remain in favorable positions throughout the state.

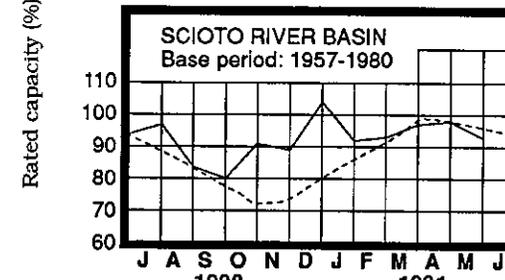
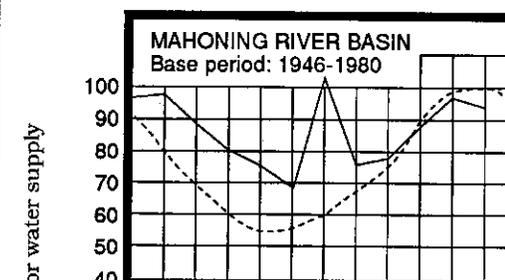
MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

Normal - - - - Current _____

RESERVOIR STORAGE FOR WATER SUPPLY



GROUND-WATER LEVELS during May declined throughout the state. Net declines from April's levels were noticeably greater than usually observed.

Ground-water levels declined throughout the month statewide. A few exceptions were noted in shallow, unconsolidated aquifers in the southwestern portion of the state where moderate rises occurred just after mid-month in response to localized heavy precipitation, but this only temporarily reversed the downward trend. Also, stabilized or slightly rising ground-water levels were noted in several aquifers near the end of the month.

Ground-water levels currently range from slightly above to slightly below normal. Generally, the below normal levels are in unconsolidated aquifers. Ground-water levels also range from slightly above to slightly below those of a year ago. The effect of the below normal precipitation during the past several months is evident in ground-water storage. However, ground-water supplies remain in a very satisfactory condition throughout the state.

LAKE ERIE level rose during May. The mean level was 572.01 feet (IGLD-1955), 0.20 foot above last month's level and 1.09 feet above normal. May's level was 0.39 foot above the May 1990 level and 3.41 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that through April, precipitation in the Lake Erie basin has averaged 10.6 inches, 0.4 inch above normal. For the entire Great Lakes basin, precipitation has averaged 9.6 inches, 1 inch above normal.

SUMMARY

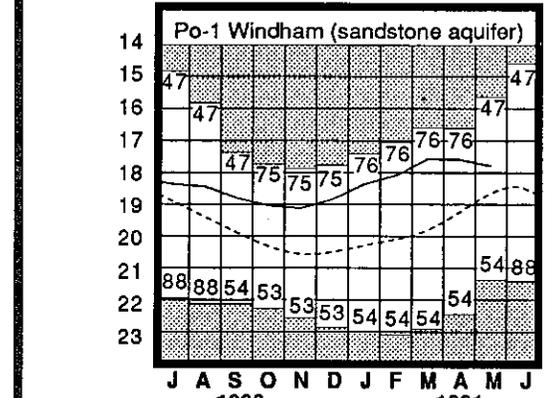
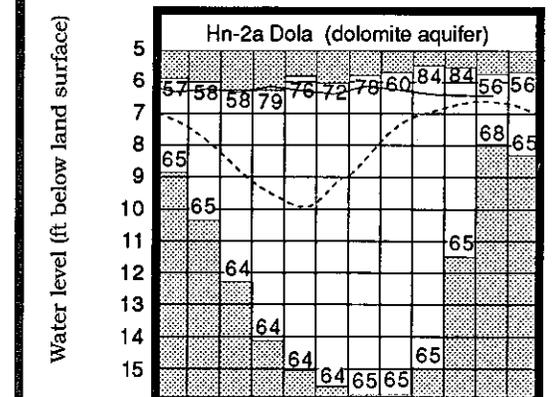
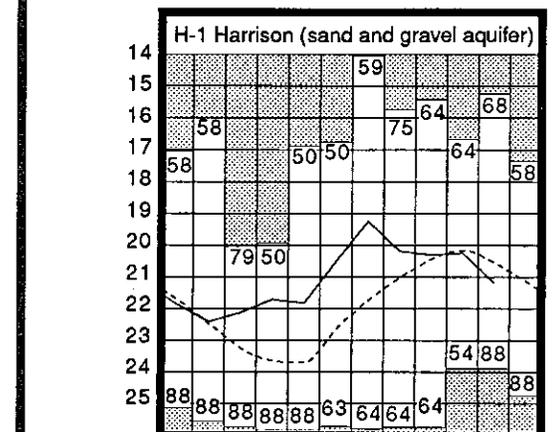
Precipitation was below normal throughout most of the state. Streamflow was below normal statewide. Reservoir storage declined and was slightly below normal. Ground-water levels declined and now range from slightly below to slightly above normal. Lake Erie level rose and was 1.09 feet above normal. Despite below normal precipitation during the past several months, water supplies remain in a satisfactory condition statewide.

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	14.62	-2.51	-2.59	-0.18
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.59	+0.43	-0.17	+0.26
Fr-10	Columbus, Franklin Co.	Gravel	40.22	+3.06	-0.50	+0.65
H-1	Harrison, Hamilton Co.	Gravel	21.22	-0.71	-0.97	-1.17
Hn-2a	Dola, Hardin Co.	Dolomite	6.47	+0.16	-0.05	-0.32
Po-1	Windham, Portage Co.	Sandstone	17.80	+0.79	-0.21	+0.52
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.56	-1.69	-0.77	+0.21

GROUND-WATER LEVELS

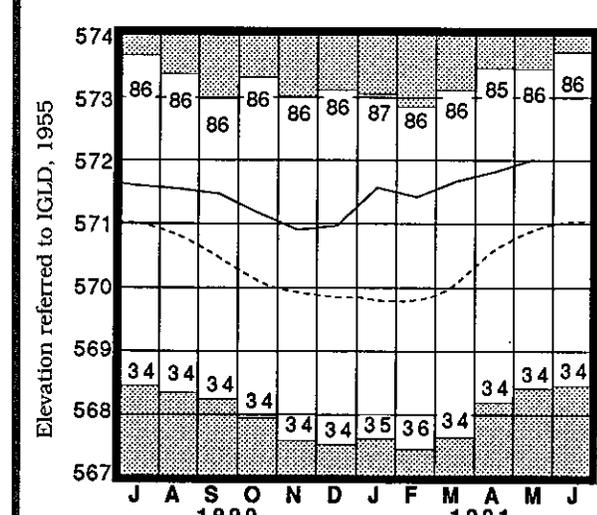


Base periods: H-1, 1951-1979. Hn-2a, 1955-1979.

Po-1, 1947-1979

Normal - - - - Current _____

LAKE ERIE LEVELS at Cleveland



Base period: 1900-1986

Record high and low, year of occurrence



MONTHLY WATER INVENTORY REPORT FOR OHIO

June 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

Precipitation for the 1991 water year remains above normal throughout the state. The state average is 30.26 inches, 3.09 inches above normal. Regional averages range from 36.40 inches, 6.66 inches above normal, for the Southwest Region to 25.97 inches, 1.37 inches above normal, for the Northwest Region.

NOTES AND COMMENTS

NEW PUBLICATIONS

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

Ground-Water Pollution Potential of Stark County, Ohio.
by Steven Williams

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, commissions, zoning boards and others to help them make 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.

Ground-Water Pollution Potential of Portage County, Ohio.
by Michael P. Angle

This report was completed as part of a nonpoint source pollution grant awarded to the Division of Water by the U.S. Environmental Protection Agency through Ohio's Nonpoint Source Pollution Program to prepare both a general and pesticide pollution potential map for four counties with varying land use conditions. Ground-water pollution potential maps (general) are designed to determine an area's relative vulnerability to contaminants with the mobility of water that are flushed into the subsurface. Pesticide pollution potential maps evaluate an area's susceptibility to contamination from pesticide application at the surface. This map places higher emphasis on those factors that affect the concentration and movement of pesticides into the subsurface.

In addition to Portage County, general and pesticide ground-water pollution potential maps that are being produced for the nonpoint source grant include Knox (completed), Sandusky (completed) and Ross counties

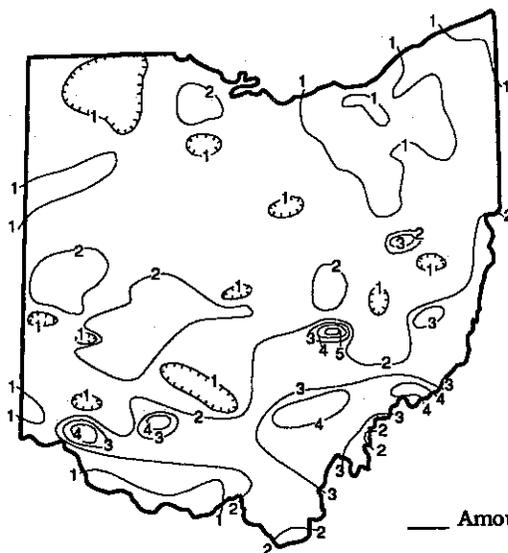
The cost for these new maps is \$12.30 (includes postage and tax). They can be ordered from: ODNR-Publications Center, 4383 Fountain Square Court, Building B-1, Columbus, OH 43224-1362. Make checks payable to ODNR-Publications Center.

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.

PRECIPITATION JUNE 1991



PRECIPITATION for June was noticeably below normal throughout the state with only a few scattered locations in the southern and southeastern areas of the state having slightly above normal precipitation. The state average was 1.67 inches, 2.29 inches below normal. June 1991 ranks as the second driest June in 109 years of record. June 1988 was the driest (0.87 inch) and June 1936 was the third driest (1.74 inches). Regional averages ranged from 2.83 inches, 1.31 inches below normal, for the Southeast Region to 1.06 inches, 2.62 inches below normal, for the Northeast Region. Roseville (Muskingum County) reported the greatest amount of precipitation for the month, 5.24 inches. Van Wert (Van Wert County) reported the least amount, a scant 0.12 inch. Several areas in the northern one-third of the state, as well as other scattered locations, reported less than 1 inch of precipitation for the month.

Precipitation during the month came in the form of widely scattered showers and thunderstorms typical of the season in kind, but not in extent. Hit or miss storms were common during June 1-3. Most areas of the state received small amounts of precipitation, but a few locations, generally in the southern portion of the state, received between 1 and 2 inches. June 4-10 was very dry throughout the state with generally no precipitation occurring. Scattered storms on June 11-12 and 15-16 produced needed precipitation of 1 to 2 inches at some locations throughout the state. The greatest amounts for these two storm periods fell on June 16 in the southeastern portion of the state where up to 3 inches was reported at some locations. Minor flooding occurred in Monroe and Washington counties. Storms again rumbled across the southern half of the state during June 22-23 with amounts of 1 to 2 inches falling at scattered locations with isolated unofficial reports of 2 to 4 inches in a few areas along the Ohio River. The remainder of the month was rather dry with a few light showers around at the end of the month.

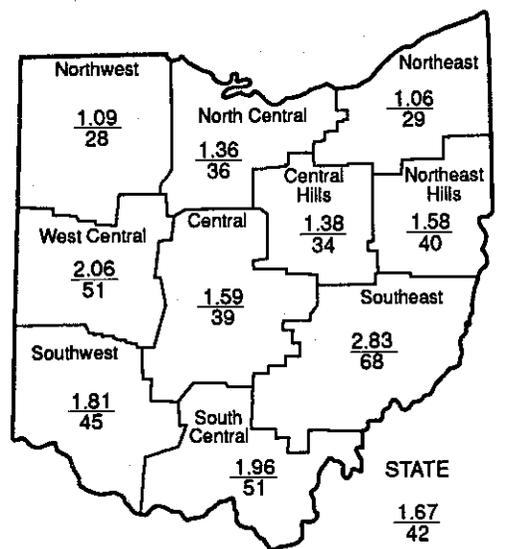
Precipitation for the first half of the 1991 calendar year is below normal throughout the state. The state average is 15.90 inches, 3.70 inches below normal. Regional averages range from 20.57 inches, 0.98 inch below normal, for the Southwest Region to 12.83 inches, 4.78 inches below normal, for the North Central Region. The Central Hills Region has the greatest departure from normal for the 1991 calendar year thus far, 5.23 inches below normal (see precipitation departure from normal table, past six months column).

(continued on back)

PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
	3 Mos.	6 Mos.	12 Mos.	24 Mos.		
Northwest	-2.74	-1.11	-3.98	+4.04	+7.00	-2.0
North Central	-2.46	-2.94	-4.78	+5.87	+5.74	-1.3
Northeast	-2.62	-3.67	-4.45	+9.73	+10.92	-4.0
West Central	-1.98	-2.53	-3.34	+8.25	+12.17	-2.1
Central	-2.47	-3.87	-4.60	+6.89	+10.37	-3.1
Central Hills	-2.73	-3.63	-5.23	+7.65	+7.75	-3.0
Northeast Hills	-2.38	-3.98	-5.16	+7.93	+6.25	-4.0
Southwest	-2.24	-1.92	-0.98	+9.93	+15.07	+0.1
South Central	-1.92	-4.03	-2.01	+5.09	+7.35	-1.9
Southeast	-1.31	-3.15	-2.64	+7.86	+14.13	-2.3
State	-2.29	-3.08	-3.70	+7.34	+9.69	

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



Average (in)
Percent of normal

ODNR

OHIO DEPARTMENT OF
NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

George V. Voinovich
Governor
Frances S. Buchholzer
Director
Robert L. Goettmoeiler
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	45	17	68	85	122
Great Miami River at Hamilton	3,630	1,457	67	87	121	161
Huron River at Milan	371	131	81	67	93	157
Killbuck Creek at Killbuck	464	177	82	73	118	181
Little Beaver Creek near East Liverpool	496	102	34	44	93	153
Maumee River at Waterville	6,330	5,233	238	94	107	139
Muskingum River at McConneville	7,422	2,537	52	78	124	159
Scioto River near Prospect	567	112	62	64	92	176
Scioto River at Higby	5,131	1,623	54	74	112	162
Stillwater River at Pleasant Hill	503	118	49	64	98	168

STREAMFLOW for May was below normal throughout most of the state with only the northwestern portion having above normal flows. Flows in the Maumee River were exceptionally high at the start of the month (33,100 cfs at Waterville), thus noticeably raising the monthly mean flow. At the end of the month, the flow at Waterville was only 439 cfs. Flows in the north-eastern portion of the state were low enough to be considered deficient. Flows in all but the northwestern portion of the state were noticeably less than last month's flows.

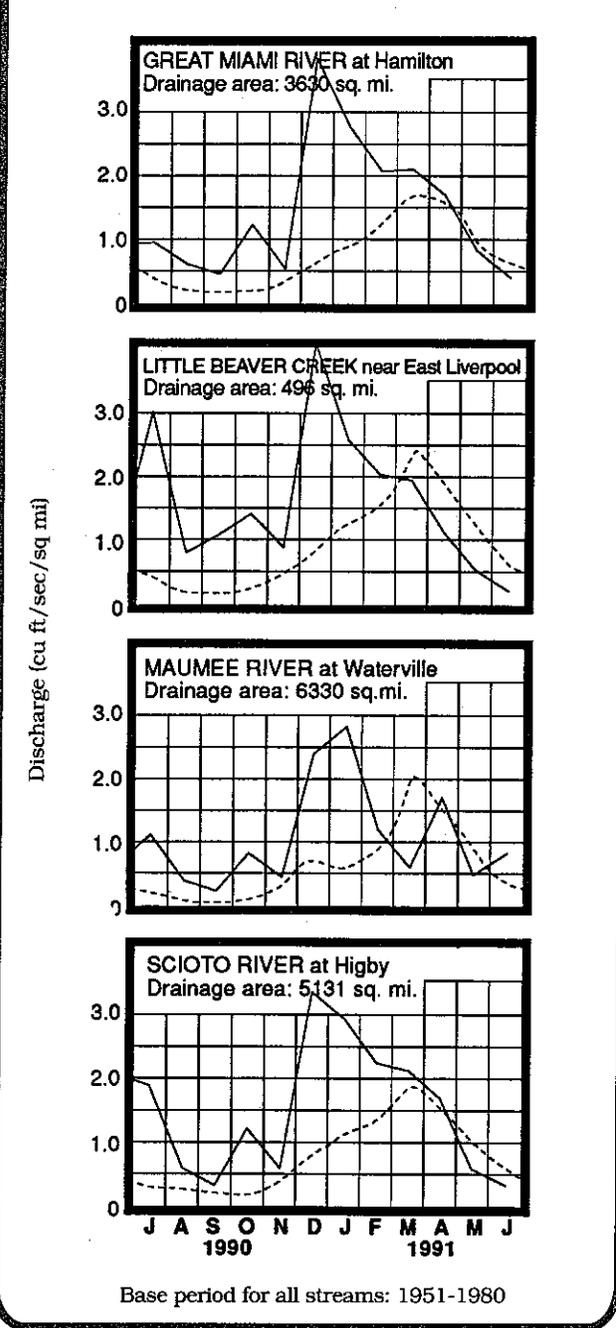
Flows at the beginning of the month were above normal in the western half of the state but below normal in the eastern half. Greatest flows for the month occurred during the first few days. Flows declined noticeably during the month with only slight increases noted following local thunderstorms. Lowest flows for the month occurred near the month's end and were noticeably deficient. Localized minor flooding was reported in Monroe and Washington counties during the evening of June 16 following thunderstorms which produced up to 3 inches of rain.

RESERVOIR STORAGE for water supply during June decreased in both the Mahoning and Scioto river basins. Month-end storage was below normal in both basins.

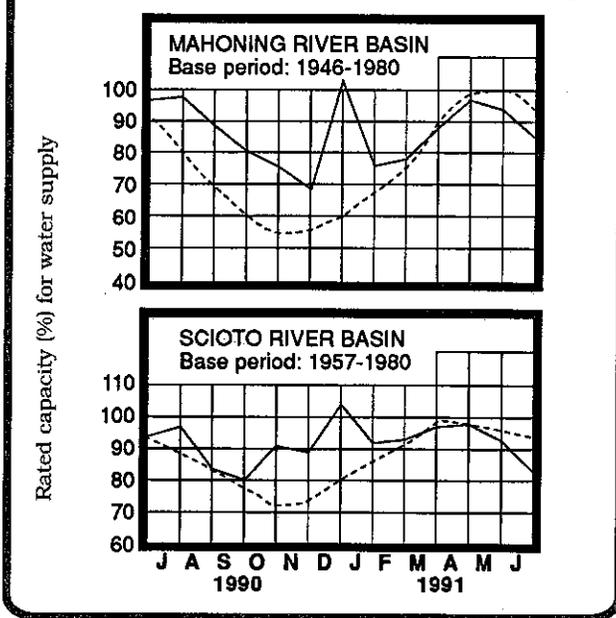
Reservoir storage at the end of the month in the Mahoning basin index reservoirs was 85 percent of rated capacity for water supply compared with 94 percent for last month and 97 percent for June 1990. Month-end storage in the Scioto basin index reservoirs was 83 percent of rated capacity for water supply compared with 93 percent for last month and 94 percent for June 1991.

Surface water supplies remain adequate statewide despite the below normal precipitation and reduced streamflows during the past two months. Increased evaporation and consumptive use, coupled with reduced replenishment, have reduced storage in both on and off-stream reservoirs to below normal levels. Local water supply managers with surface water supplies should monitor their respective situations and plan accordingly.

MEAN STREAM DISCHARGE



RESERVOIR STORAGE FOR WATER SUPPLY



GROUND-WATER LEVELS during June declined throughout the state. Net declines from May's levels averaged over twice that usually observed.

Ground-water levels declined throughout the month in all aquifers statewide responding to the below normal precipitation and resulting lack of recharge. Declines were generally more pronounced in unconsolidated aquifers. Ground-water levels are lower than last year's levels. Levels are noticeably below normal in unconsolidated aquifers but remain near normal in consolidated aquifers.

Ground-water supplies remain in a satisfactory position throughout the state. The above normal precipitation during 1990 resulted in unusually high recharge to ground-water storage and this has helped ground-water levels maintain satisfactory positions. However, water supply managers that depend on ground water as their source should monitor their respective situations.

LAKE ERIE level rose slightly during June. The mean level was 572.06 feet (IGLD-1955), 0.05 foot above last month's level and 1.01 feet above normal. This month's level is 0.37 foot above the June 1990 level and 3.46 feet above Low Water Datum.

SUMMARY

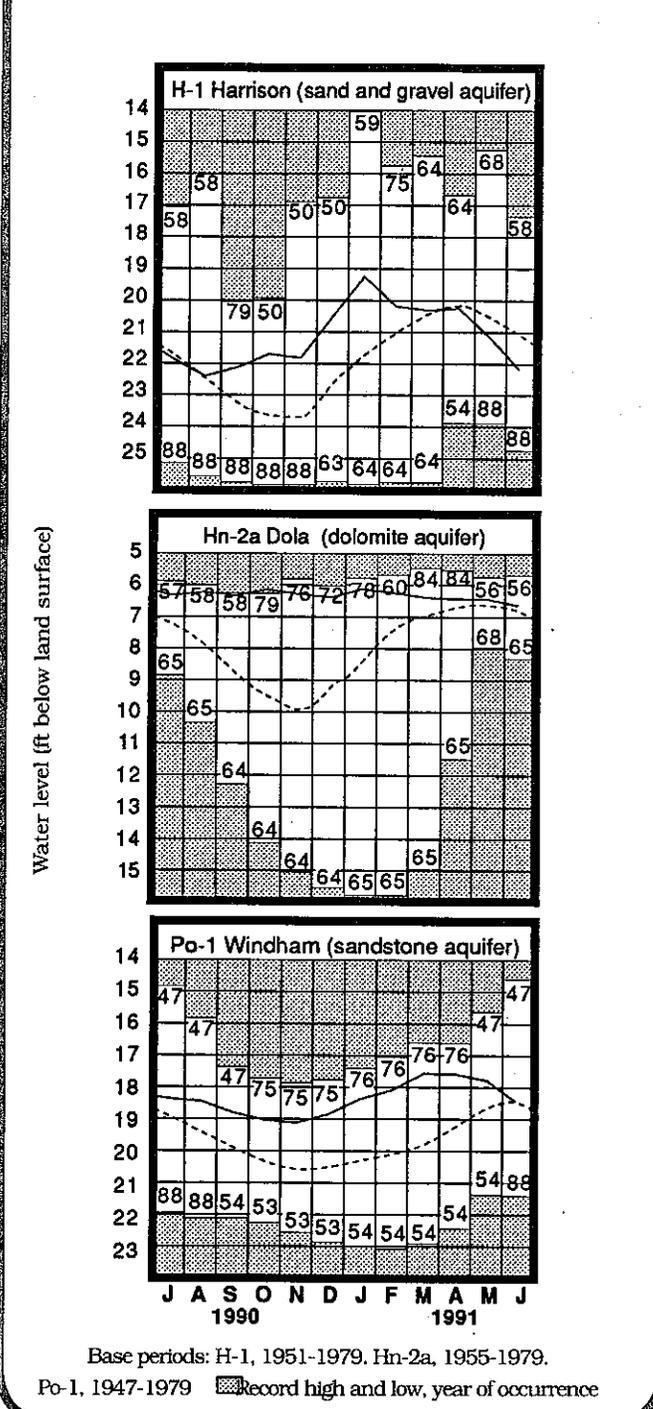
Precipitation was noticeably below normal throughout the state. This month was the second driest June in 109 years of record. Streamflow was noticeably below normal in all but the northwestern portion of the state. Flows were deficient statewide at the end of the month. Reservoir storage declined and was below normal. Ground-water levels declined sharply and are below normal in unconsolidated aquifers and near normal in consolidated aquifers. Lake Erie level rose slightly and was 1.01 feet above normal. Drought conditions plagued the state during the month but water supplies remain adequate.

GROUND-WATER LEVELS

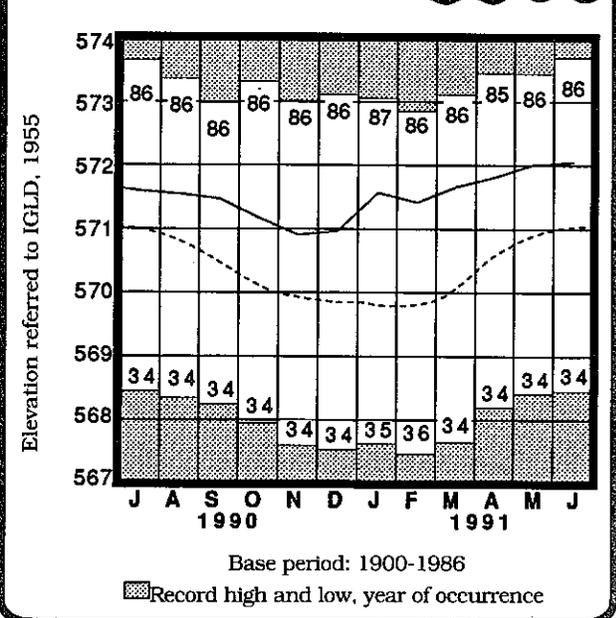
Based on daily lowest level in feet below land-surface datum

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	17.26	-3.53	-2.64	-4.61
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.20	+0.15	-0.61	-0.23
Fr-10	Columbus, Franklin Co.	Gravel	41.43	+2.00	-1.21	-0.92
H-1	Harrison, Hamilton Co.	Gravel	22.18	-1.06	-0.96	-0.94
Hn-2a	Dola, Hardin Co.	Dolomite	6.61	+0.16	-0.14	-0.49
Po-1	Windham, Portage Co.	Sandstone	18.41	+0.02	-0.61	-0.24
Tu-1	Strasburg, Tuscarawas Co.	Gravel	13.68	-1.90	-1.12	-1.93

GROUND-WATER LEVELS



LAKE ERIE LEVELS at Cleveland



Normal - - - - Current - - - -

Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

July 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

Precipitation for the 1991 water year is above normal throughout most of the state but has fallen to slightly below normal in the North Central, Central Hills and Northeast Hills regions. The state average is 32.83 inches, 1.74 inches above normal. Regional averages range from 39.76 inches, 6.05 inches above normal, for the Southwest Region to 27.87 inches, 0.05 inch below normal, for the North Central Region.

NOTES AND COMMENTS

GOVERNOR VOINOVICH DECLARES DROUGHT ALERT

Governor George V. Voinovich declared a drought alert for 78 of Ohio's 88 counties on July 26. The Southwest Region (10 counties) was not included in this declaration. On August 2, the Governor also declared 12 counties agricultural disasters. Those counties are: Coshocton, Crawford, Guernsey, Holmes, Huron, Jefferson, Knox, Licking, Medina, Sandusky, Stark and Wayne. Additional counties are expected to be added as county officials complete and submit disaster assessment reports.

The declaration of a drought alert is a result of specific steps established in the Ohio Drought Response Plan which was completed in 1989. This plan, in part, establishes different phases for the state's response in relation to the increasing severity of drought conditions; identifies specific responsibilities of all pertinent state agencies; and identifies guidelines and recommendations that local governments may consider following during the various phases of a worsening drought. During a drought alert, public awareness, education, and increased monitoring activities are stressed. A Drought Assessment Committee is activated to assess the situation and make recommendations to policy and decision makers.

Currently, the agricultural sector of Ohio has been the most severely impacted by drought conditions. The unusually wet conditions in 1989 and 1990 provided ample recharge to water supplies which has somewhat dampened the impact of the below normal precipitation during much of 1991. Water supplies, both surface and ground, are at below normal levels throughout the state but remain in satisfactory positions.

NEW PUBLICATION

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

Hydrologic Atlas for Ohio (WIR No. 28) by Leonard J. Harstine. This long-awaited publication has been developed as a reference for the basic parameters of the hydrologic cycle. The parameters include precipitation, temperature, streamflow, and water loss. The data in this report, based on 50 years of record for each parameter, includes average annual precipitation, temperature, streamflow, and water loss for the record period of 1931-80. Information on average annual lake evaporation and snowfall is included as supplemental data. This publication includes four maps, one for each parameter, as well as an explanatory report. The new atlas expands the base period of previous hydrologic assessments (WIR No. 13, 1962 and WB No. 15, 1950).

This atlas is designed to be a source of hydrologic data for environmental assessments and investigations. The information should be valuable to ground-water scientists, water-supply engineers, dam construction and design engineers, and other environmental consultants and planners.

This new publication can be ordered from: ODNR-Publications Center, 4383 Fountain Square, Building B-1, Columbus, Ohio, 43224-1362. The cost for the new atlas is \$6.54 (includes postage, handling and tax). Make checks payable to ODNR-Publications Center.

DIRECTOR BUCHHOLZER NAMES CHIEF ENGINEER

Ohio Department of Natural Resources Director Frances S. Buchholzer recently announced the appointment of J. Bruce Pickens as Chief Engineer. Mr. Pickens has worked for the department for nearly 22 years in the Division of Water with his most recent position being Deputy Chief for Engineering.

The Division of Water staff extends its congratulations to Bruce for a well deserved promotion and professional challenge.

PRECIPITATION for July was below normal throughout the state with a few local exceptions at scattered locations. The state average was 2.57 inches, 1.35 inches below normal. July 1991 ranks as the 14th driest July in 109 years of record. Regional averages ranged from 3.49 inches, 0.88 inch below normal, for the Southeast Region to 1.71 inches, 2.28 inches below normal for the Central Hills Region. This was the third driest July for the Central Hills Region and the seventh driest for the Central and North Central regions. Celina (Mercer County) reported the greatest amount of precipitation for the month, 6.02 inches. Toledo Express Airport (Lucas County) reported the least amount, 0.52 inch.

Precipitation during the month came in the form of widely scattered showers and thunderstorms. The bulk of precipitation for most areas of the state fell during the first half of the month, and in some areas, during the first week. During the first week of the month, most areas of the state received around an inch of rain with lower amounts falling in the north-central area. Some areas, including Celina (Mercer County), Corning (Perry County), and scattered locations in the east-northeastern area (e.g. Canfield, Mahoning County), received from 2 to nearly 4 inches of rain during this period. Most of the precipitation during the second week of the month fell in the southwestern and extreme eastern portions of the state. While most areas received light amounts of rain, some locations in these areas received from 2 to over 3 inches. The second half of the month was noticeably dry in most locations. Most areas of the state received about 0.5 inch during the second half of the month, while scattered locations in the southeastern and extreme eastern portions of the state received from 1 to over 2.5 inches.

Precipitation for the 1991 calendar year is below normal throughout the state. The state average is 18.46 inches, 5.06 inches below normal. For Ohio, this is the eighth driest January through July on record. Statewide precipitation has been below normal in five of the seven months so far in 1991 with only March and April having slightly above normal precipitation. Regional averages range from 23.93 inches, 1.59 inches below normal, for the Southwest Region to 14.56 inches, 6.51 inches below normal, for the North Central Region. The Central Hills Region has the greatest departure from normal for the 1991 calendar year thus far, 7.51 inches below normal.

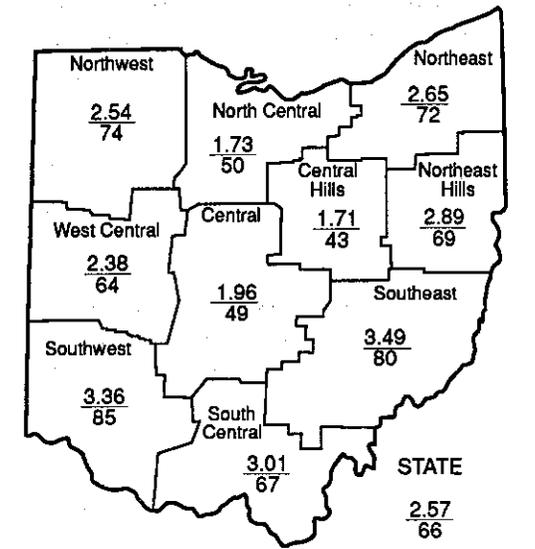
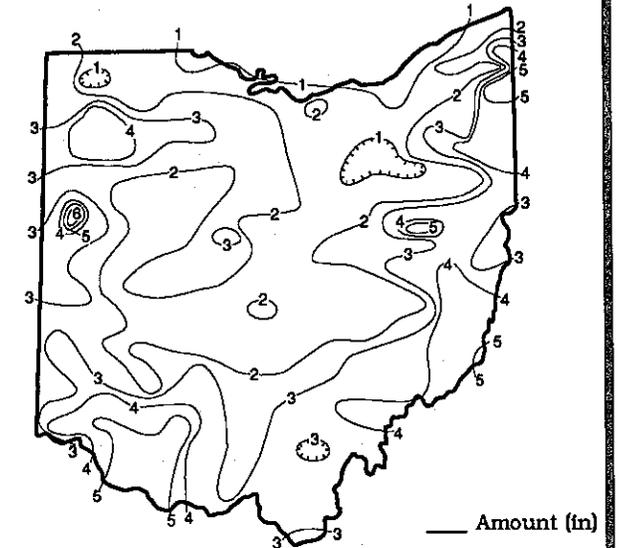
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Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.90	-2.63	-4.32	+1.37	+4.97	-3.3
North Central	-1.73	-4.56	-5.89	+2.03	+4.13	-3.4
Northeast	-1.03	-4.89	-5.34	+6.16	+10.77	-5.5
West Central	-1.33	-3.86	-4.06	+4.09	+10.14	-4.0
Central	-2.00	-5.84	-5.83	+1.25	+8.21	-4.3
Central Hills	-2.28	-6.38	-6.86	+1.52	+6.88	-4.4
Northeast Hills	-1.32	-5.33	-6.31	+2.80	+6.69	-5.1
Southwest	-0.61	-2.65	-0.78	+8.28	+14.10	-1.4
South Central	-1.45	-5.65	-2.68	+3.30	+6.53	-3.1
Southeast	-0.88	-4.59	-3.76	+5.14	+13.91	-4.2
State	-1.35	-4.64	-4.57	+3.61	+8.85	

*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 1991



Average (in)
Percent of normal

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

Robert L. Goettmoeller
Chief

An Equal Opportunity Employer-M/F/H

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	28	10	21	75	121
Great Miami River at Hamilton	3,630	803	60	71	96	154
Huron River at Milan	371	37	43	59	75	149
Killbuck Creek at Killbuck	464	85	54	65	86	166
Little Beaver Creek near East Liverpool	496	122	58	39	70	130
Maumee River at Waterville	6,330	678	51	84	72	128
Muskingum River at McConnelsville	7,422	1,335	38	45	86	146
Scioto River near Prospect	567	31	41	47	65	156
Scioto River at Higby	5,131	973	58	55	87	146
Stillwater River at Pleasant Hill	503	65	57	59	87	155

STREAMFLOW for July was noticeably below normal throughout the state. Flows in most areas of the state were low enough to be considered deficient. July flows were less than June's flows in most basins. The mean flow of 28 cfs for the Grand River near Painesville gauge was the lowest for July for its period of record (only 17 years).

Flows at the beginning of the month were noticeably below normal in most areas of the state. Greatest flows for the month occurred at various times during the first 10 days of the month. Flows declined throughout the remainder of the month with only a few slight increases noted following local precipitation. Lowest flows for the month occurred at or just before the month's end. Flows at the end of the month were deficient statewide.

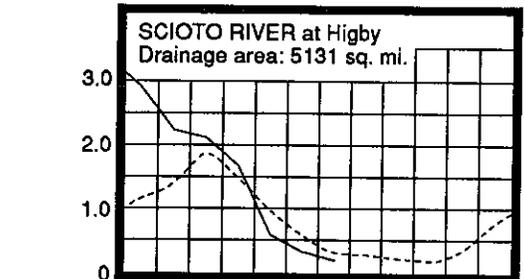
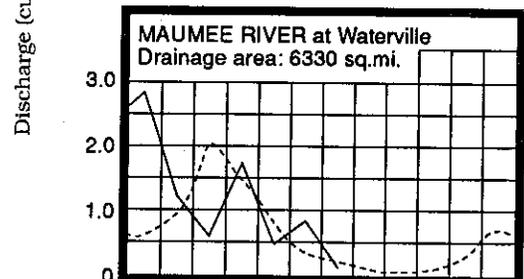
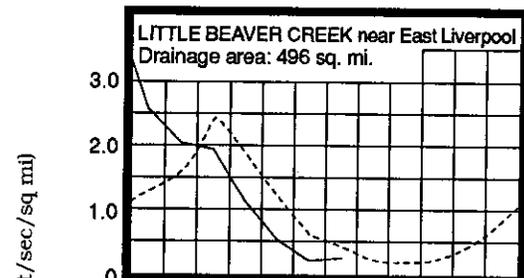
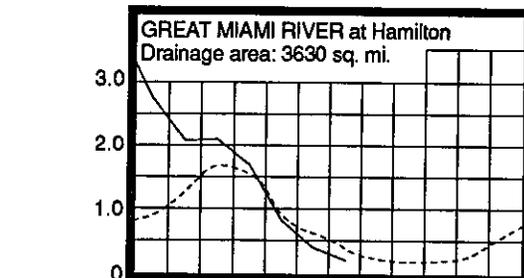
On the evening of July 7, an estimated 3 inches of rain fell in one-half hour over the Sunday Creek basin. A flash flood resulted in Corning (Perry County) with several residents forced to evacuate their homes. No injuries were reported.

RESERVOIR STORAGE for water supply during July decreased in both the Mahoning and Scioto river basins. Month-end storage was below normal in both basins.

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 75 percent of rated capacity for water supply compared with 85 percent for last month and 98 percent for July 1990. End of the month storage in the Scioto basin index reservoirs was 74 percent of rated capacity for water supply compared with 83 percent for last month and 97 percent for July 1990.

Surface water supplies remain satisfactory throughout the state. The below normal precipitation and resulting reduced streamflows during the past several months, coupled with increased evaporation and consumptive use, has lowered storage in both on and off-stream reservoirs. Several public water supply systems have instituted limited water use restrictions including lawn watering, car washing and other non-essential uses. Generally, these restrictions were introduced to curb potential distribution problems, with possible restrictions added should the current drought conditions continue for several more months. Local water supply managers should closely monitor their respective situations and plan accordingly.

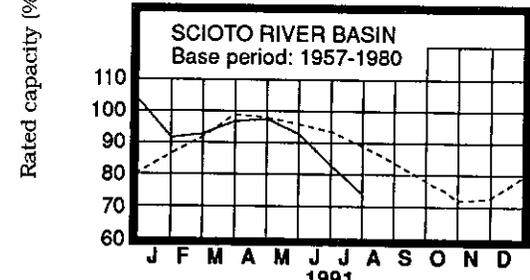
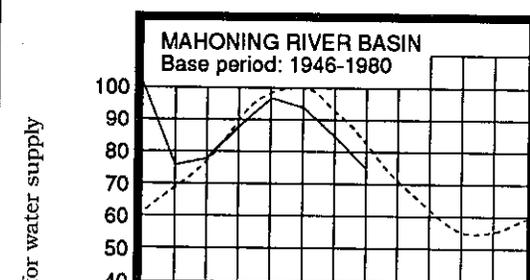
MEAN STREAM DISCHARGE



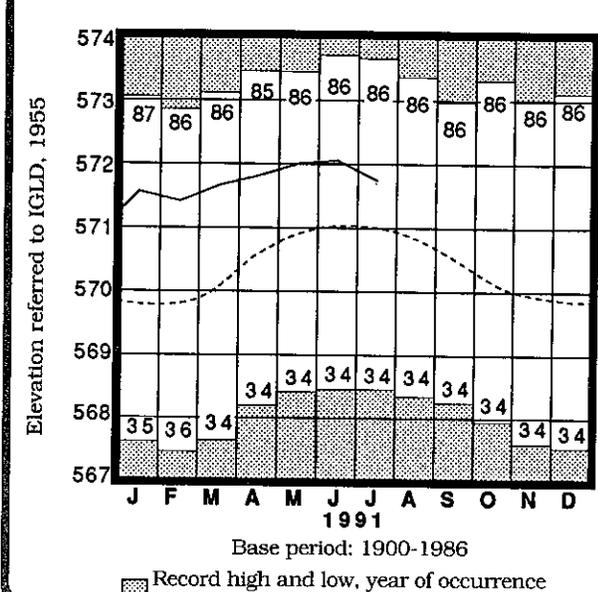
Base period for all streams: 1951-1980

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

RESERVOIR STORAGE FOR WATER SUPPLY



LAKE ERIE LEVELS at Cleveland



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	18.63	-3.72	-1.37	-4.67
Fa-1	Jasper Mill, Fayette Co.	Limestone	8.35	-0.55	-1.15	-0.96
Fr-10	Columbus, Franklin Co.	Gravel	42.44	+1.58	-1.01	-1.27
H-1	Harrison, Hamilton Co.	Gravel	22.97	-1.28	-0.79	-1.08
Hn-2a	Dola, Hardin Co.	Dolomite	7.39	-0.17	-0.78	-1.06
Po-1	Windham, Portage Co.	Sandstone	19.15	-0.18	-0.74	-0.78
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.45	-2.02	-0.77	-2.38

GROUND-WATER LEVELS during July declined throughout the state in response to the below normal precipitation during the past several months. Net declines from June's levels averaged about twice those usually observed.

Ground-water levels declined throughout July in all aquifers statewide. A few exceptions were noted in shallow unconsolidated aquifers which showed slight rises or leveling following local precipitation, but only temporarily halting the downward trend. Ground-water levels range from around 1 to over 4 feet below the moderately above normal levels of a year ago.

Ground-water supplies remain adequate throughout the state despite water levels ranging from slightly below to about 3.5 feet below normal. For comparison, July 1991 ground-water levels range from about 0.5 foot to over 2 feet above the July 1988 levels. However, greater than usual declines have been noted during the past several months. Water supply managers should closely monitor their respective situations.

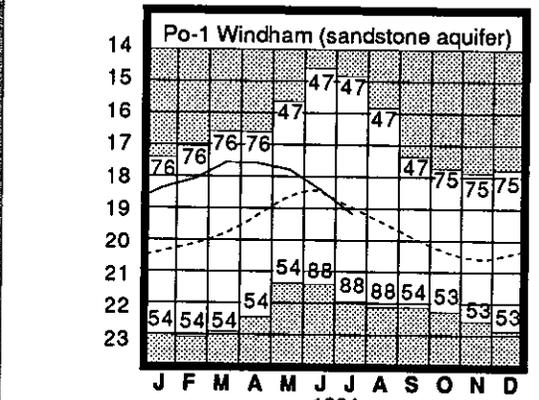
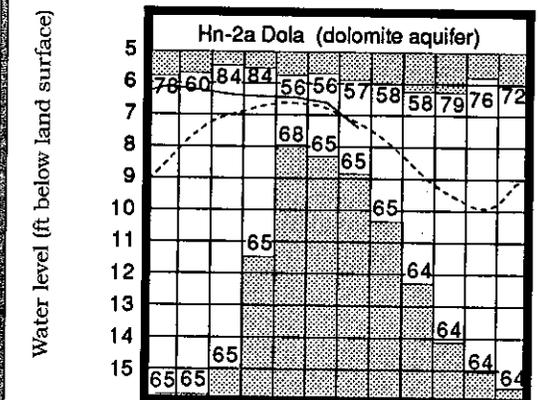
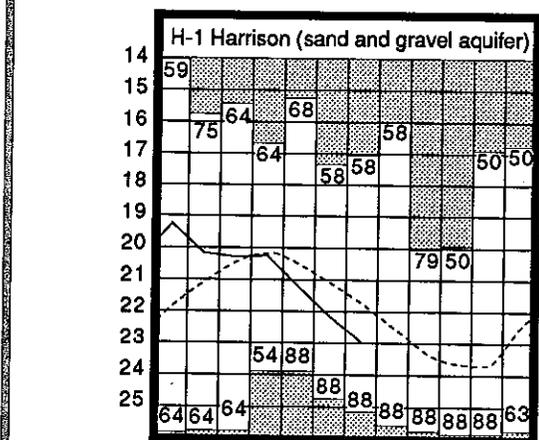
LAKE ERIE level declined moderately during July. The mean level was 571.74 feet (IGLD-1955), 0.32 foot below last month's mean level and 0.74 foot above normal. This month's level is 0.14 foot above the July 1990 level and 3.14 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that, through July, precipitation in the Lake Erie basin has averaged 18.7 inches, 1.7 inches below normal. For the entire Great Lakes basin, precipitation has averaged 18.7 inches, 0.9 inch above normal.

SUMMARY

Precipitation was noticeably below normal throughout most of the state. The state average of 2.57 inches ranks as the 14th driest July on record. Streamflow was deficient throughout the state. Reservoir levels declined and are below normal. Ground-water levels declined and range from slightly below to over 3 feet below normal. Lake Erie level declined 0.32 foot and was 0.74 foot above normal. The drought conditions during the past few months have had severe impacts on agriculture, but water supplies generally remain satisfactory.

GROUND-WATER LEVELS



Base periods: H-1, 1951-1979. Hn-2a, 1955-1979. Po-1, 1947-1979

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



MONTHLY WATER INVENTORY REPORT FOR OHIO

August 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

below normal, for the Southwest Region to 17.77 inches, 6.53 inches below normal, for the North Central Region.

Precipitation for the soon-to-end 1991 water year October 1, 1990 to September 30, 1991 is above normal throughout most of the state. Exceptions are the North Central, Central Hills and Northeast Hills regions where precipitation is slightly below normal. Precipitation is exactly normal in the Central Region. The state average is 35.90 inches, 1.33 inches above normal. Regional averages range from 43.46 inches, 6.28 inches above normal, for the Southwest Region to 31.08 inches, 0.07 inch below normal, for the North Central Region.

NOTES AND COMMENTS

GOVERNOR APPOINTS NEW OWAC MEMBERS

Governor George V. Voinovich has appointed two new members to the Ohio Water Advisory Council (OWAC): Alice Godsey and Byron Nolte.

Alice H. Godsey, P.E., is sanitary engineer for the City of Lima. Ms. Godsey is responsible for industrial waste monitoring and pretreatment, construction coordination for water and wastewater system projects, combined sewer overflow abatement, and interpretation of federal and state regulations affecting water and wastewater systems. She is a registered professional engineer in Ohio and is past president of the Ohio Council, American Society of Civil Engineers.

Byron H. Nolte holds a Ph.D. in agricultural engineering from The Ohio State University, and serves as Professor (Emeritus) of Agricultural Engineering, and Extension Agricultural Engineer, Cooperative Extension Service at OSU. He has been involved in statewide educational programs in soil and water resource engineering. His special interests include watershed development, drainage, erosion control, flood prevention and water planning.

Governor Voinovich also re-appointed James L. Rozelle (Centerville) to the council. Mr. Rozelle was elected Chair at the last OWAC meeting. He has been a council member since its establishment in 1984.

Other council members are: Joan Brasaemle (Stow), Gaybrielle Gordon (Columbus) and Dr. Robert C. Stiefel (Columbus). The seven-member council has one vacant seat with an appointment expected in the near future.

The council consists of persons who have a demonstrated interest in water management and expertise in the various responsibilities of the Division of Water. The council's mission includes: 1) advising the chief of the Division of Water in carrying out the duties under state law; 2) recommending policy and legislation about water management and conservation to promote the economic, industrial and social development of the state, while minimizing threats to the environment; 3) reviewing and recommending the development of plans and programs for long-term, comprehensive water management; and 4) recommending ways to enhance cooperation among governmental agencies with an interest in water to encourage wise use and protection of the state's ground and surface waters. Those interested in the council's activities may obtain a brochure from the Division of Water.

EDITORIAL

The purpose of this report is to disseminate current hydrologic data in a timely and brief form. Observation points have been selected which are considered to be sufficiently representative of hydrologic conditions in the state to permit an evaluation of the current water-supply situation. These key observation stations offer the best available data on the basis of accuracy and length of record, minimal artificial effects on data, and availability of records. Data from these stations are collected by various agencies at the end of each month and processed immediately. Because of the time limitations involved, all data must be considered preliminary and may be subject to revision before publication in regular form by the agencies involved. The remarks in this report include the writer's opinions of the cause and significance of the phenomena reported. The author is indebted to the various agencies and individuals who make this data available.

More complete and detailed information can be obtained by writing to the Ohio Department of Natural Resources, Division of Water, 1939 Fountain Square, Building E-1, Columbus, Ohio 43224.

PRECIPITATION for August was above normal in the northwest and southern portions of the state but below normal elsewhere. The state average was 3.11 inches, 0.37 inch below normal. Regional averages ranged from 4.02 inches, 0.13 inch above normal, for the South Central Region to 2.10 inches, 1.42 inches below normal, for the Northeast Hills Region. Crane Creek State Park (Ottawa County) reported the greatest amount of precipitation for the month, 8.37 inches, of which 7.56 inches fell during August 19-20. Port Clinton, also in Ottawa County, reportedly received in excess of 11 inches for the month; an official total was not available. Mosquito Creek Lake (at the dam, Trumbull County) reported the least amount of precipitation for the month, 0.79 inch. Other stations reporting less than 1 inch for the month were: Delaware (Delaware County), Marysville (Union County), and Youngstown Airport (Trumbull County).

Precipitation during the month fell in the summer, typical form of widely scattered showers and thunderstorms. Generally, rain showers were more widespread than during the previous two months. Weekly passages of cold fronts through the state brought temporary relief from the above normal temperatures as well as much needed precipitation. The month started with scattered showers during August 3-4. Totals were generally less than 0.5 inch but ranged up to over 1 inch in the southern portion of the state. Heavier showers fell during August 8-9. Most of the central, eastern and northeastern portions of the state received about 0.5 inch, but many areas in the western and southern portions received between 1 and 2 inches with isolated amounts of 2 to 4 inches reported. There were several days with precipitation recorded at most locations during August 18-22. Totals for the whole period ranged from less than 1 inch in the southwestern and central portions of the state to over 2 inches at many locations. On August 19-20, an isolated, slow-moving storm dumped nearly 11 inches of rain on Port Clinton (Ottawa County) during a 24-hour period. It was reported that over 7 inches fell in about three hours. Surprisingly, only moderate flooding was reported. The remainder of August was rather dry with a few scattered showers returning just before the month's end.

Precipitation for the 1991 calendar year is below normal throughout the state. The state average is 21.53 inches, 5.47 inches below normal. For Ohio, this is the ninth driest January through August on record. Regional averages range from 27.63 inches, 1.36 inches

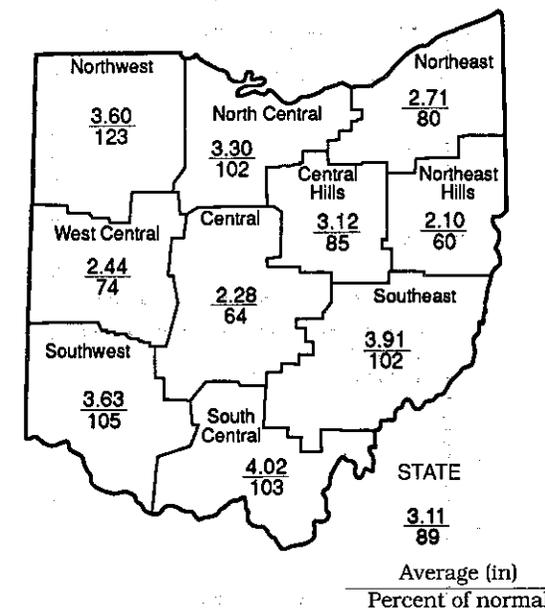
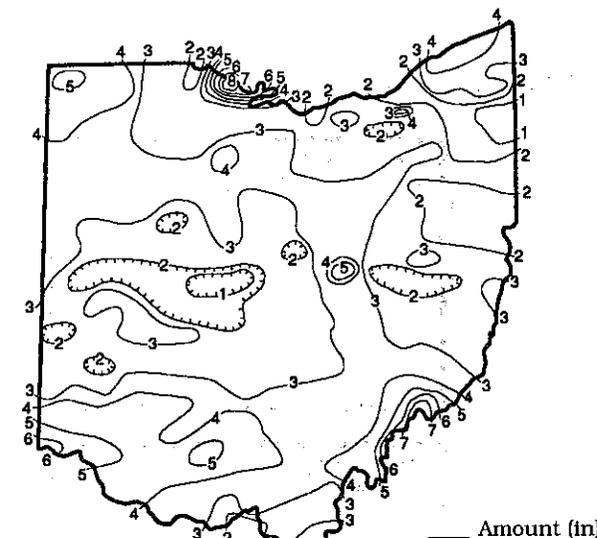
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PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.67	-2.97	-2.73	+1.05	+6.06	-3.9
North Central	+0.07	-4.12	-5.46	+1.64	+6.08	-3.4
Northeast	-0.69	-4.34	-5.63	+4.24	+11.55	-5.7
West Central	-0.86	-4.17	-4.55	+2.41	+8.82	-4.4
Central	-1.27	-5.74	-6.89	+0.65	+6.54	-4.8
Northeast Hills	-1.42	-5.12	-7.40	+0.95	+7.36	-5.8
Southwest	+0.16	-2.69	-0.81	+6.66	+14.12	-1.3
South Central	+0.13	-3.24	-2.91	+3.07	+5.78	-2.2
Southeast	+0.07	-2.12	-3.63	+5.07	+12.17	-4.1
State	-0.37	-4.01	-4.68	+2.64	+8.72	

*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 1991



Average (in)
Percent of normal

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

Francois S. Buchholzer
Director

Robert L. Goettmoeiler
Chief

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MEAN STREAM DISCHARGE

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				This Month		
				3 Mos.	6 Mos.	12 Mos.
Grand River near Painesville	685	24	20	14	55	118
Great Miami River at Hamilton	3,630	635	83	68	87	150
Huron River at Milan	371	33	83	64	54	143
Killbuck Creek at Killbuck	464	66	54	59	77	157
Little Beaver Creek near East Liverpool	496	50	45	44	57	125
Maumee River at Waterville	6,330	657	107	129	69	125
Muskingum River at McConnelsville	7,422	945	37	39	69	139
Scioto River near Prospect	567	24	60	45	58	147
Scioto River at Higby	5,131	734	60	50	81	142
Stillwater River at Pleasant Hill	503	49	99	52	74	147

STREAMFLOW during August was below normal throughout most of the state with only the northwestern portion having slightly above normal flows. Flows were low enough to be considered deficient in the northeastern, eastern and central portions of the state. August flows were less than July flows statewide. The preliminary figure of 24 cfs for the Grand River near Painesville gauge is the lowest monthly mean flow for its period of record (only 17 years), just below the August 1988 flow.

Flows at the beginning of the month were deficient in most areas of the state. Most basins in the northern portion of the state recorded their lowest flows during the first few days of the month. Lowest flows for the remainder of the state were just before

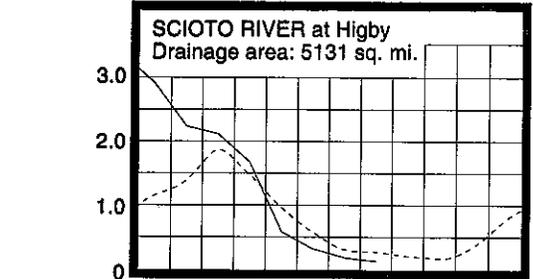
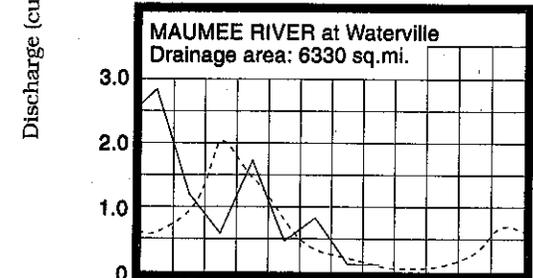
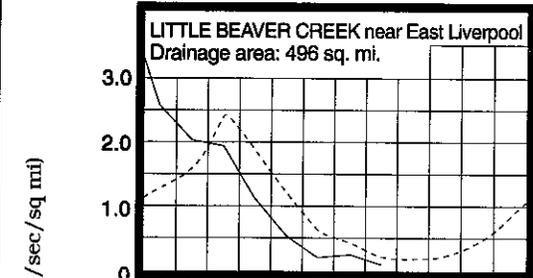
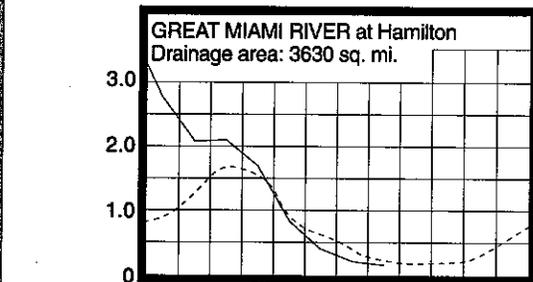
the end of the month with a few basins having similar flows at mid-month. Flows were relatively stable throughout the month with increases noted following local precipitation. Greatest flows occurred on August 20-21 for most areas of the state except in the southwestern and south central portions, when they occurred during August 9-11. At the end of the month, flows were deficient in most areas of the state.

RESERVOIR STORAGE for water supply during August decreased in both the Mahoning and Scioto river basins. Month-end storage was below normal in both basins.

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 66 percent of rated capacity for water supply compared with 75 percent for last month and 89 percent for August 1990. Month-end storage in the Scioto basin index reservoirs was 64 percent of rated capacity for water supply compared with 74 percent for last month and 84 percent for August 1990.

Surface water supplies remain adequate in most areas of the state in spite of below normal levels. Following the drought of 1988, public water supply managers formulated specific contingency plans to deal with drought conditions. In most instances during the current drought, these actions have had positive effects in reducing consumption and/or augmenting existing supplies. Water supply managers should continue to closely monitor their respective situations.

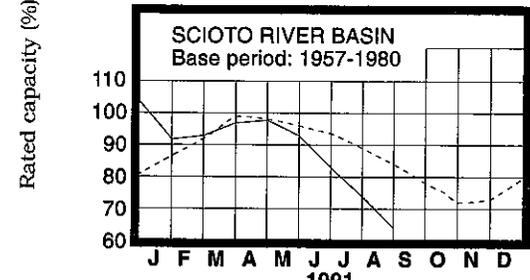
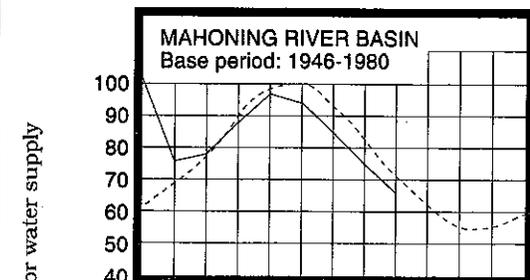
MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

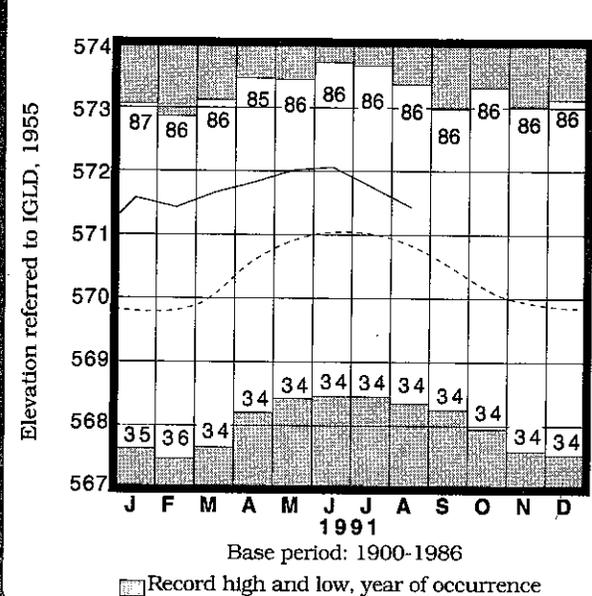
Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



Base period: 1946-1980 (Mahoning), 1957-1980 (Scioto)

LAKE ERIE LEVELS at Cleveland



Base period: 1900-1986. 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	19.32	-3.80	-0.69	-4.09
Fa-1	Jasper Mill, Fayette Co.	Limestone	9.43	-1.15	-1.08	-1.57
Fr-10	Columbus, Franklin Co.	Gravel	42.89	+1.59	-0.45	-1.29
H-1	Harrison, Hamilton Co.	Gravel	23.61	-1.08	-0.64	-1.20
Hn-2a	Dola, Hardin Co.	Dolomite	8.84	-0.95	-1.45	-2.60
Po-1	Windham, Portage Co.	Sandstone	20.20	-0.69	-1.05	-1.77
Tu-1	Strasburg, Tuscarawas Co.	Gravel	15.10	-2.18	-0.65	-2.69

GROUND-WATER LEVELS during August declined throughout the state. Net declines from July's levels ranged from near normal to three times those usually observed. The greatest declines were recorded in consolidated aquifers.

Ground-water levels declined throughout August in all aquifers statewide. A few exceptions were noted in shallow unconsolidated aquifers where localized thunderstorms may have resulted in a temporary rise in water levels. Ground-water levels range from over 1 to 4 feet below the levels of August 1990. Current levels in many aquifers are approaching the levels of 1988 and in a few cases, especially in unconsolidated aquifers, are slightly lower than the August 1988 levels. Generally, August 1991 levels range from about 0.2 foot to over 2 feet above the August 1988 levels.

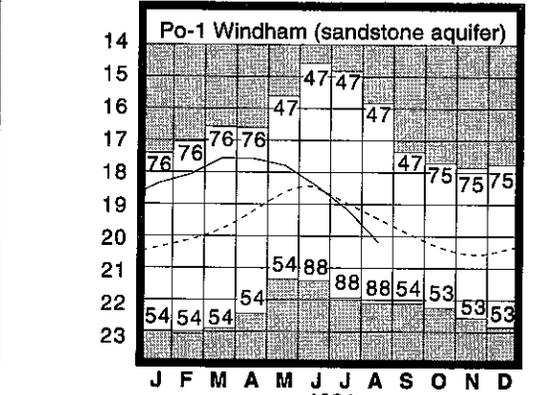
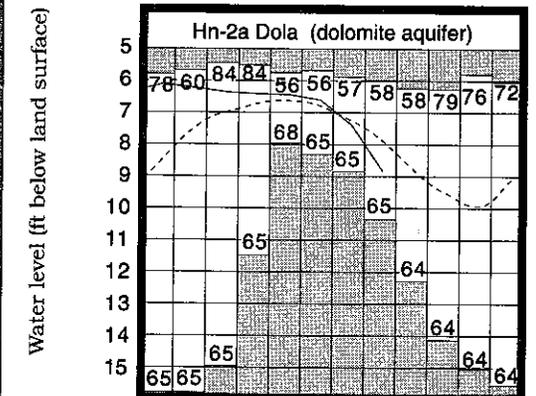
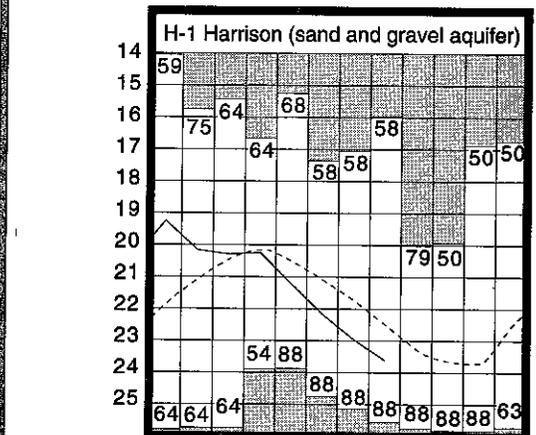
Ground-water levels range from around 0.5 foot to nearly 4 feet below normal throughout most of the state. Ground-water supplies remain adequate in most areas of the state. However, there have been reports of supply deficiencies in domestic wells developed in shallow and/or low-yield aquifers and also in large ground-water withdrawal areas. Ground-water levels are expected to continue to decline for the next couple of months barring any radical change in precipitation accumulation. Water supply managers who depend on ground water as their source should closely monitor their respective situations.

LAKE ERIE level declined seasonally during August. The mean level was 571.42 feet (IGLD-1955), 0.32 foot below last month's mean level and 0.61 foot above normal. This month's level is 0.13 foot below the August 1990 level and 2.82 feet above Low Water Datum.

SUMMARY

Precipitation was slightly above normal in the northwestern and southern portions of the state but below normal elsewhere. Streamflow was above normal in the northwestern portion of the state while noticeably below normal in most other areas. Reservoir storage decreased and was below normal. Ground-water levels declined throughout the month and are below normal statewide. Lake Erie level declined seasonally and was 0.61 foot above normal. Water supplies remain adequate throughout the state in spite of the drought conditions which have caused below normal storage levels.

GROUND-WATER LEVELS



Base periods: H-1, 1951-1979. Hn-2a, 1955-1979. Po-1, 1947-1979. Record high and low, year of occurrence

Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

September 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

departure from normal, past 12 months column). Fernbank (Hamilton County) reported the greatest amount of precipitation for the 1991 water year, 54.85 inches. Other locations reporting more than 54 inches were Hillsboro (Highland County) and Willow Island Lock and Dam (Washington County). Toledo Express Airport (Lucas County) reported the least amount of precipitation for the water year, 28.65 inches. Other locations reporting less than 30 inches were North Georgetown (Columbiana County) and Sandusky (Erie County). An isohyetal map and regional averages with percentages of normal for the 1991 water year precipitation appear below.

Precipitation was noticeably above normal early in the 1991 water year, but noticeably below normal during the last nine months. October precipitation was noticeably above normal, ranking as the ninth wettest October on record. November's precipitation was below normal, but December's was noticeably above normal ranking as the wettest December on record, a fitting end to the wettest calendar year on record. Conditions have changed dramatically during the past nine months. Statewide precipitation was only slightly above normal in March and April and below normal the remaining months. June was the second driest on record and July the fourteenth driest. Most of the state has been in a severe or extreme drought classification since June. For example, Toledo has had only 38 percent of normal rainfall during the past four months. For the water year, statewide precipitation averaged slightly above normal, but precipitation was below normal in eight of 12 months. Water supplies benefited greatly from the precipitation during the 1991 water year recharge period, but have been adversely affected during the 1991 water year depletion period. Adequate precipitation during the upcoming 1992 water year recharge period will be needed to improve the below normal storage conditions that exist currently.

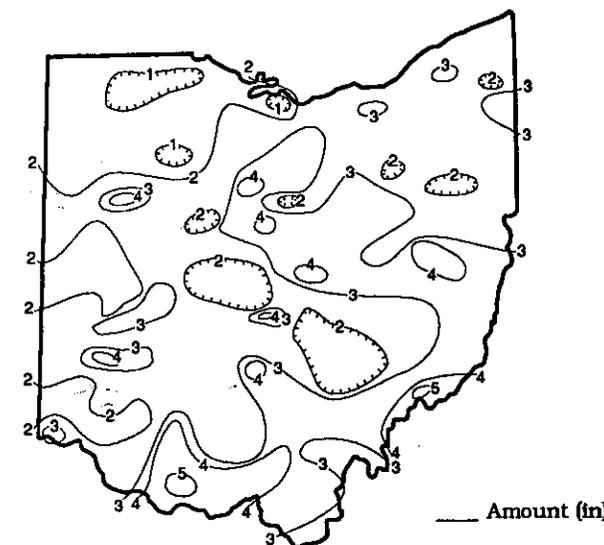
PRECIPITATION for September was below normal throughout most of the state; exceptions were in the Central Hills, Northeast Hills, South Central and Southwest regions where precipitation was slightly above normal. The state average was 2.71 inches, 0.29 inch below normal. Regional averages ranged from 3.82 inches, 0.64 inch above normal, for the South Central Region to 1.63 inches, 1.22 inches below normal, for the Northwest Region. West Union (Adams County) reported the greatest amount of precipitation for the month, 5.36 inches. Marietta (Washington County) reported 5.27 inches. Napoleon (Henry County) reported the least amount of precipitation for the month, 0.48 inch. Other stations reporting less than 1 inch were: Findlay (Hancock County); Sandusky (Erie County); Toledo Express Airport (Lucas County); and Wauseon (Fulton County).

Precipitation during September was rather spotty across the state. Precipitation fell every week, but not in all portions of the state. Storms during September 3-4 were heaviest in the north-central portion of the state where more than 2 inches of precipitation was recorded at isolated locations. Several other locations statewide received more than 1 inch, but the northwestern and southeastern portions of the state received much less. There were several days of light precipitation during the second week of the month. Only the southeastern area received more than 1 inch while the remainder of the state averaged around 0.5 inch. The third week was rather dry in the western half of the state while the central and eastern portions received 0.5 inch to 1.5 inches during September 17-19. The last 10 days of the month were rather dry for most of the state. A few scattered showers produced light amounts of precipitation during September 23-25 with only the southeastern portion of the state receiving more than 1 inch.

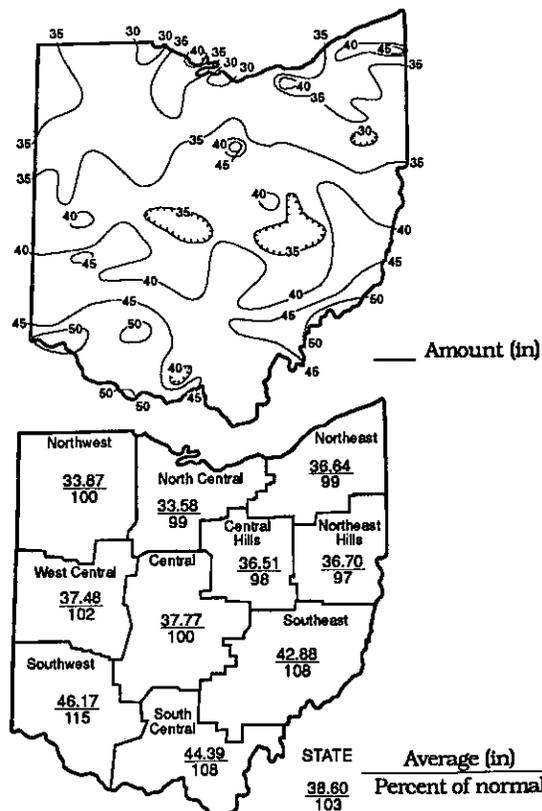
Precipitation for the 1991 calendar year is below normal throughout the state. The state average is 24.24 inches, 5.76 inches below normal. Regional averages range from 30.32 inches, 3.00 inches below normal, for the South Central Region to 20.28 inches, 6.90 inches below normal, for the North Central Region. The Central Hills Region has the greatest departure from normal for the calendar year thus far, 8.17 inches below normal. The Southwest Region has the least departure, 1.78 inches below normal.

Precipitation for the 1991 water year (October 1, 1990-September 30, 1991) was above normal throughout most of the state but slightly below normal in the northeastern quadrant. The state average was 38.60 inches, 1.03 inches above normal. Regional averages ranged from 46.17 inches, 5.90 inches above normal, for the Southwest Region to 33.82 inches, 0.05 inch above normal, for the Northwest Region (see Precipitation Table, (continued on back))

PRECIPITATION SEPTEMBER 1991



PRECIPITATION - 1991 WATER YEAR



SUMMARY

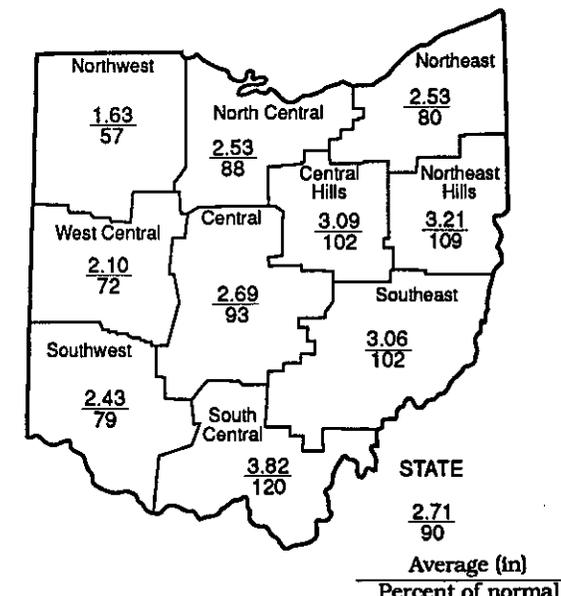
Precipitation was below normal throughout most of the state but slightly above normal in the Central Hills, Northeast Hills, South Central and Southwest regions. Streamflow was below normal throughout most of the state with only the northwestern and north-central portions having above normal flows. Reservoir storage declined and was below normal. Ground-water levels declined and range from about 1 foot to 4 feet below normal. Lake Erie level declined and was 0.54 foot above the long term average. Most of the state remains in a severe or extreme drought classification.

Precipitation for the 1991 water year was above normal throughout most of the state but below normal in the northeastern quadrant. Both surface and ground water supplies were at below normal levels at the water year's end.

PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-1.22	-1.54	-2.51	+0.05	+4.08	-4.3
North Central	-0.35	-1.96	-4.97	-0.45	+5.17	-3.9
Northeast	-0.65	-2.35	-6.14	-0.33	+8.97	-5.0
West Central	-0.83	-3.11	-5.64	+0.79	+6.71	-4.0
Central	-0.20	-3.15	-6.98	+0.16	+7.06	-4.7
Central Hills	+0.06	-2.76	-6.38	-0.89	+7.62	-5.1
Northeast Hills	+0.27	-2.47	-6.61	-1.33	+6.57	-5.6
Southwest	-0.66	-0.84	-2.72	+5.90	+13.30	-1.4
South Central	+0.64	-0.67	-4.54	+3.10	+4.45	-1.9
Southeast	+0.07	-1.02	-4.32	+3.29	+10.66	-3.8
State	-0.29	-1.99	-5.08	+1.03	+7.47	

*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
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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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An Equal Opportunity Employer-M/F/H

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	22	9	12	42	105
Great Miami River at Hamilton	3,630	509	76	73	80	149
Huron River at Milan	371	43	183	66	63	136
Killbuck Creek at Killbuck	464	77	88	56	67	147
Little Beaver Creek near East Liverpool	496	49	62	54	45	113
Maumee River at Waterville	6,330	413	106	51	87	120
Muskingum River at McConnelsville	7,422	987	63	39	62	134
Scioto River near Prospect	567	25	86	42	64	143
Scioto River at Higby	5,131	601	57	49	67	143
Stillwater River at Pleasant Hill	503	35	78	58	63	143

STREAMFLOW for September was below normal throughout most of the state except in the northwestern and north-central areas where it was above normal. Flows in the northeastern and southwestern portions of the state were low enough to be considered deficient. September flows in the north-central and in some of the central portions of the state were slightly greater than the August flows but were still less than last month's flows elsewhere. The preliminary figure of 22 cfs for the Grand River near Painesville gauge is the lowest monthly mean flow for its period of record.

Flows at the beginning of the month were below normal throughout the state and low enough to be considered deficient in many areas. Flows were relatively stable during the month with increases noted following local precipitation. Lowest flows for the month occurred during the first few days for most areas in the eastern half of the state and near the month's end for the western half. Greatest flows occurred around the September 5 for most basins, while some basins recorded their greatest flows during September 11-15. Flows at the end of the month were deficient in most areas of the state with only the north-central area having slightly above normal flows.

Streamflow for the 1991 water year was above normal throughout the state (see Mean Stream Discharge table, past 12 months column). Flows during the first six months were noticeably above normal with many locations establishing record high flows for December with widespread flooding at the month's end. Flows declined sharply during the second half of the water year responding to the noticeably below normal precipitation. Flows were deficient in most basins at the end of the water year.

Reservoir storage for water supply decreased in both the Mahoning and Scioto river basins. Month-end storage was below normal in both basins. Reservoir storage at the month's end for the Mahoning basin index reservoirs was 56 percent of rated capacity for water supply compared with 66 percent for last month and 81 percent for September 1990. Month-end storage in the Scioto basin index reservoirs was 59 percent of rated capacity for water supply compared with 64 percent for last month and 80 percent for September 1990.

Surface water supplies were adequate in most locations during the 1991 water year. The above normal precipitation and resulting streamflows resulted in on-stream reservoirs maintaining above normal levels through the early spring months. Off-stream reservoirs were able to fill and maintain capacity. However, by late spring and throughout the summer months, precipitation was below normal resulting in noticeably below normal streamflows. Increased consumptive use, coupled with high evaporation rates, lowered reservoir storage to below normal levels. By

the end of the water year reservoir storage was noticeably below normal. Water supply managers with surface supplies should continue to monitor their respective situations.

GROUND-WATER LEVELS during September declined throughout the state. Net declines from August's levels ranged from about one-half to over two times those usually observed. The greatest declines were recorded in consolidated aquifers.

Ground-water levels declined throughout the month in most aquifers. A few exceptions were noted in shallow, unconsolidated aquifers, especially those adjacent to streams, where levels were rather stable, and in a few limited cases were slightly higher at the month's end. Ground-water levels generally range from slightly less than 1 foot to nearly 4 feet below normal. Index observation well TU-1 (Strasburg, Tuscarawas County), representing a sand and gravel aquifer, reached a record low level for September.

Ground-water levels during the 1991 water year varied greatly between the first half and the second half of the year. Levels at the start of the 1991 water year were above normal throughout most of the state. Ground-water levels remained above normal during the first half of the water year responding to the noticeably above normal precipitation during 1990. Record and near-record high monthly levels occurred in a few observation wells. Ground-water levels began to decline seasonally in the early spring, but as the drought conditions strengthened through the early summer, levels began to decline sharply. At the end of the 1991 water year, ground-water levels ranged from around 1 foot to 4 feet below normal. Generally, these levels are between 2 and 4 feet below the September 1990 levels. For comparison, the current levels range from about 0.3 foot below to 2 feet above the September 1988 levels. Water supply managers who depend on ground water as their source should closely monitor their respective situations throughout the upcoming recharge season.

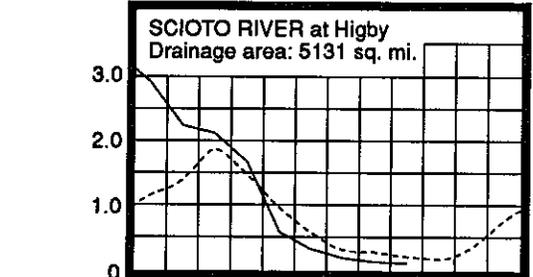
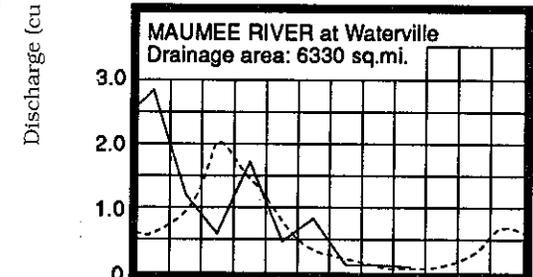
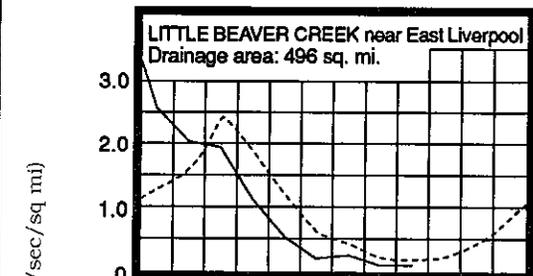
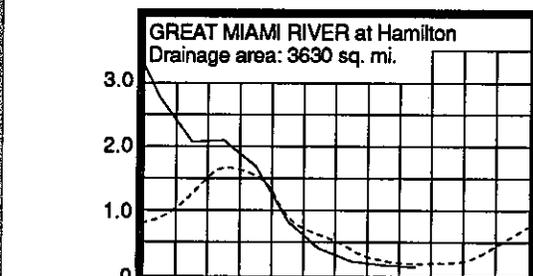
LAKE ERIE level declined during September. The mean level was 571.06 feet (IGLD-1955), 0.36 foot below last month's mean level and 0.54 foot above normal. This month's level is 0.42 foot below the September 1990 level and 2.46 feet above Low Water Datum. Lake Erie's level was above the long term average throughout the 1991 water year. The U.S. Army Corps of Engineers reports that the preliminary precipitation total for the 1991 water year for the Lake Erie basin was 36.1 inches, 1.7 inches above normal. For the entire Great Lakes basin, the 1991 water year precipitation was 35.5 inches, 3.5 inches above normal.

GROUND-WATER LEVELS

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	19.87	-3.95	-0.55	-2.85
Fa-1	Jasper Mill, Fayette Co.	Limestone	10.40	-1.79	-0.97	-1.96
Fr-10	Columbus, Franklin Co.	Gravel	43.08	+2.00	-0.19	-0.96
H-1	Harrison, Hamilton Co.	Gravel	23.92	-0.70	-0.31	-1.78
Hn-2a	Dola, Hardin Co.	Dolomite	10.49	-1.62	-1.65	-4.16
Po-1	Windham, Portage Co.	Sandstone	21.03	-1.05	-0.83	-2.23
Tu-1	Strasburg, Tuscarawas Co.	Gravel	15.46	-2.18	-0.36	-2.40

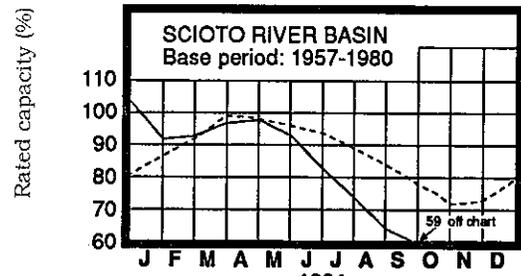
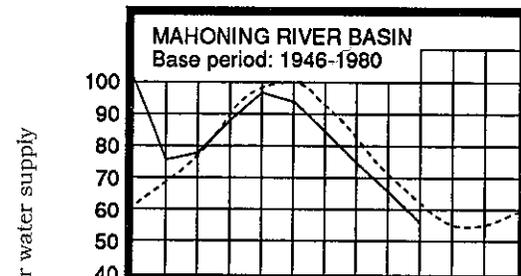
MEAN STREAM DISCHARGE



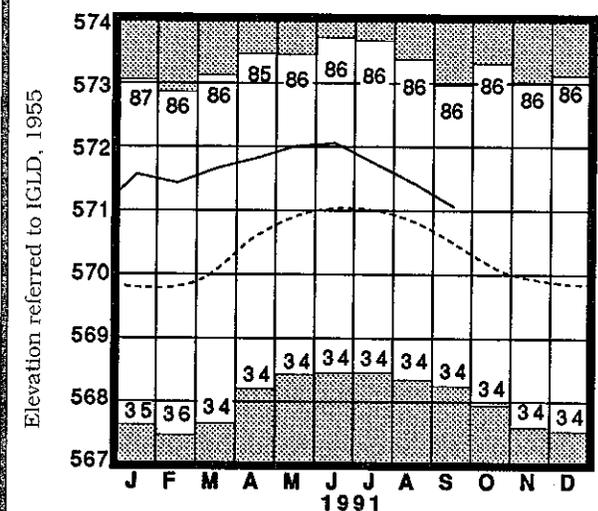
Base period for all streams: 1951-1980

Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



LAKE ERIE LEVELS at Cleveland

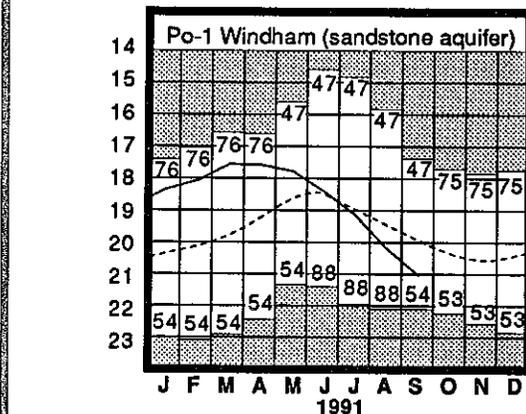
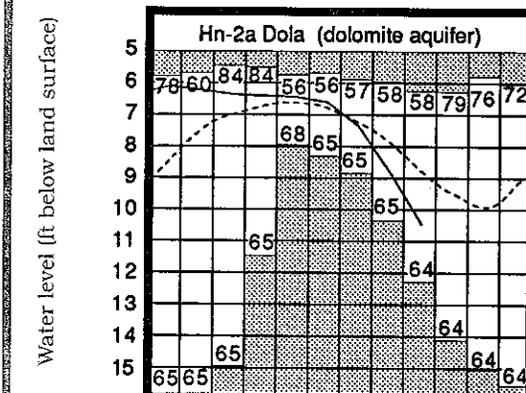
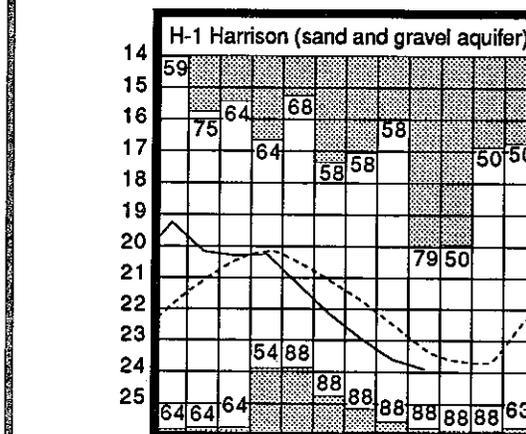


Base period: 1900-1986

Record high and low, year of occurrence

Normal - - - - Current - - - -

GROUND-WATER LEVELS



Base periods: H-1, 1951-1979. Hn-2a, 1955-1979.

Po-1, 1947-1979 Record high and low, year of occurrence

Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

October 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTES AND COMMENTS NEW PUBLICATIONS

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

Ground-Water Pollution Potential of Lake County, Ohio.

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

Ground-water pollution potential maps are designed to determine an area's relative vulnerability to ground-water pollution. The maps can be used as a planning and management tool for administrators, commissioners, zoning boards and others to aid 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.

Ground-Water Pollution Potential of Ross County, Ohio

By Carrie L. Frederick

This report was completed as part of a nonpoint source pollution grant awarded to the Division of Water by the U.S. Environmental Protection Agency through Ohio's Nonpoint Source Pollution Program to prepare both a general and pesticide pollution potential map for four counties with varying land use conditions. General ground-water pollution potential maps are designed to determine an area's relative vulnerability to contaminants with the mobility of water that are flushed into the subsurface. Pesticide pollution potential maps evaluate an area's susceptibility to contamination from pesticide application at the surface. This map places higher emphasis on those factors that affect the concentration and movement of pesticides into the subsurface.

In addition to Ross County, general and pesticide ground-water pollution potential maps that have been produced for the nonpoint source grant include Knox, Portage and Sandusky counties.

The cost for these new maps is \$12.30 (includes postage 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.

The Ground Water Resources of Greene County

By James J. Schmidt

This map is one in a series of county ground-water resources maps which have been completed for 79 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.

The cost for this map is \$6.53 (includes postage, handling and tax) and can be ordered from the Publications Center at the address listed above.

TWO DIVISION OF WATER COLLEAGUES HONORED

Two long-time colleagues of the Division of Water were recently honored at an annual ODNR awards ceremony by Director Frances S. Buchholzer.

Stanley E. Norris, a hydrogeologist retired from the U.S. Geological Survey, was inducted into the Ohio Conservation Hall of Fame. Mr. Norris is considered one of Ohio's premier ground-water scientists. Stan has authored numerous reports and articles chronicling his extensive research on Ohio's ground-water resources. His career has produced fundamental concepts that have formed the foundation of ground-water protection and management techniques used throughout Ohio. His countless contributions to the field of water resources will be used by resource professionals for years to come.

Bayliss L. "Rock" Prater, former chair of the Ohio Water Advisory Council, and his wife Kathleen McNeal accepted, as managers, a Conservation Achievement Award for their 80-acre former farm turned wilderness area, The Last Resort Wilderness Area. Located in Huron County, it contains five wetlands, bluebird trails, sorghum plots and other restoration projects. The Last Resort utilizes modern techniques designed to protect the environment and conserve natural resources. It also illustrates how private landowners can use assistance from state and federal government agencies and turn environmental concerns into active conservation and land management practices.

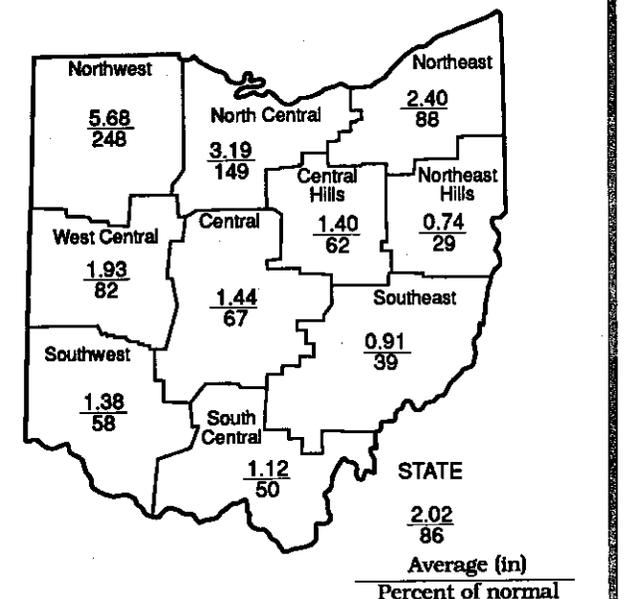
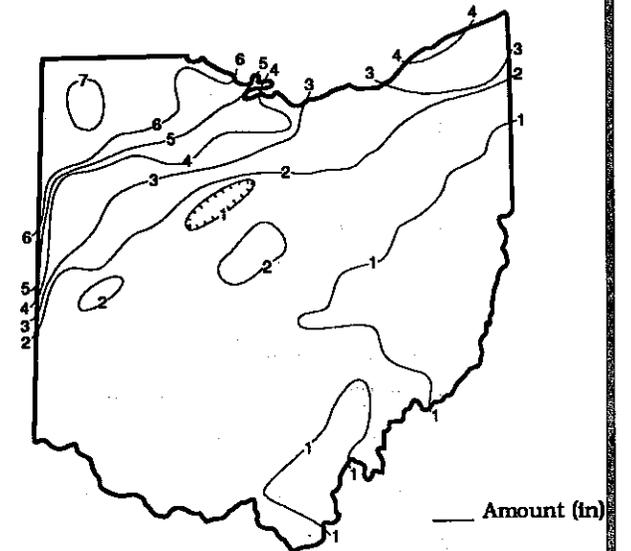
PRECIPITATION for October was noticeably below normal throughout most of the state; exceptions were in the Northwest and North Central regions and the extreme northeastern portion of the state where precipitation was above normal. This was the third wettest October for the Northwest Region in 97 years of records. The state average was 2.02 inches, 0.32 inch below normal. Regional averages ranged from 5.68 inches, 3.39 inches above normal, for the Northwest Region to 0.74 inch, 1.79 inches below normal, for the Northeast Hills Region. Stryker (Williams County) reported the greatest amount of precipitation for the month, 7.29 inches. Defiance (Defiance County) reported the least amount of precipitation for the month, 0.20 inch. Other stations reporting less than 0.5 inch of precipitation for the month were Cadiz and Hopedale (both in Harrison County) and Hannibal Locks and Dam (Monroe County).

Precipitation for the state during October fell in an atypical pattern. The greatest amounts fell in the northwestern portion while precipitation totals decreased to the south and east. Daily totals were light, seldom exceeding 0.5 inch except in the northwestern portion of the state. During the first week of the month, several locations in the northern portion of the state received more than 1 inch of rain during October 4-6. During the second week, most of the state received precipitation during October 10-12 with the greatest amounts of 0.5 to nearly 1 inch falling in the central portion of the state. The remainder of the month was rather dry except in the northwestern portion of the state where, during October 25-27, 2 to 4 inches of rain fell at many locations with 5 to 6 inches reported in isolated spots. These rainfall amounts were also reported in northwestern Indiana and southern Michigan and a flood watch was issued for the Maumee River basin. No significant flooding was reported.

Precipitation for the 1991 calendar year is below normal throughout the state. The state average is 26.26 inches, 6.08 inches below normal. For the entire state, this has been the ninth driest January through October in 109 years of record. Regional averages for the calendar year thus far range from 31.68 inches, 2.79 inches below normal, for the Southwest Region to 23.29 inches, 9.03 inches below normal, for the Central Hills Region. The Northeast Hills Region has the greatest departure from normal precipitation for the calendar year, 9.53 inches below normal.

The 1992 water year is off to a slow start as far as precipitation is concerned except in the northwestern and far northern portions of the state. Several inches of precipitation is needed to fulfill soil moisture requirements before adequate recharge to ground-water storage can begin.

PRECIPITATION OCTOBER 1991



PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+3.39	+2.84	+0.18	+1.83	+8.33	-2.0
North Central	+1.05	+0.75	-3.79	-1.23	+5.72	-3.3
Northeast	-0.32	-1.66	-6.65	-3.11	+8.13	-4.4
West Central	-0.41	-2.17	-6.07	-1.66	+7.41	-3.4
Central	-0.70	-1.98	-7.68	-3.07	+6.41	-4.5
Central Hills	-0.86	-1.34	-7.72	-4.48	+6.50	-5.2
Northeast Hills	-1.79	-2.94	-8.43	-4.93	+5.10	-5.4
Southwest	-1.01	-1.41	-3.83	+1.78	+12.64	-1.6
South Central	-1.12	-0.33	-5.87	+0.37	+1.55	-2.6
Southeast	-1.42	-1.41	-6.27	-0.03	+7.94	-4.1
State	-0.32	-0.97	-5.82	-1.44	+6.98	

*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 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
Robert L. Goettmoeller
Chief
An Equal Opportunity Employer—M/F/H

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	35	15	14	18	91
Great Miami River at Hamilton	3,630	500	74	66	69	137
Huron River at Milan	371	50	172	108	58	127
Killbuck Creek at Killbuck	464	64	78	49	63	126
Little Beaver Creek near East Liverpool	496	50	46	42	37	107
Maumee River at Waterville	6,330	3,602	649	198	104	120
Muskingum River at McConelsville	7,422	848	50	41	43	122
Scioto River near Prospect	567	26	86	54	42	129
Scioto River at Higby	5,131	687	90	58	51	130
Stillwater River at Pleasant Hill	503	49	90	71	60	131

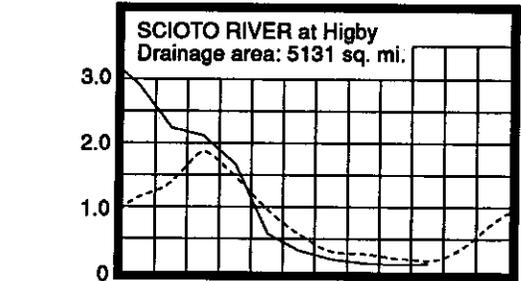
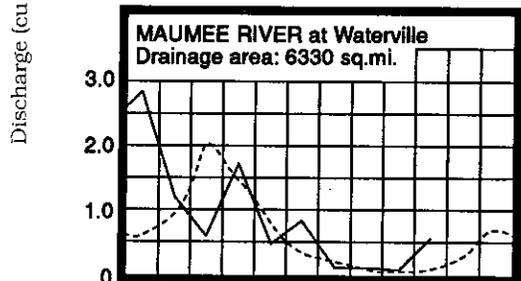
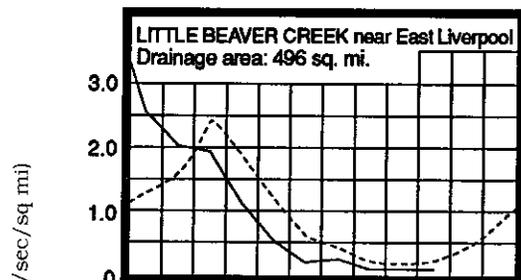
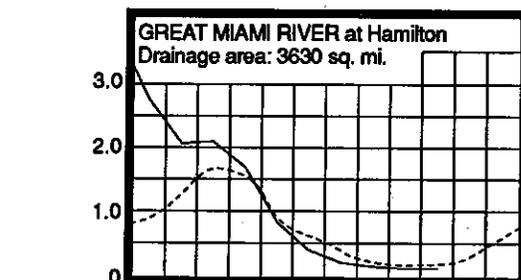
STREAMFLOW for October was below normal throughout most of the state. Exceptions were in the northwest and north-central areas where flows were above normal. Flows in the eastern, northeastern and southwestern areas of the state were low enough to be considered deficient. Flows in the northwestern area were high enough to be considered excessive. October flows in most southeastern and southwestern areas of the state were less than September's flows, while elsewhere this month's flows were greater than September flows. The preliminary figure of 35 cfs for the Grand River near Painesville gauging station is the lowest October mean flow for its period of record.

Flows at the beginning of the month were deficient in most areas of the state with only slightly above normal flows found in the north-central area. Lowest flows for the month occurred randomly during the first several days statewide. Flows increased gradually during October with slight increases noted following local precipitation. The flow in the Maumee River basin, which, after being noticeably below normal for most of the month, increased significantly following the heavy precipitation that fell during October 25-27. Daily mean flows increased from just over 200 cfs on October 23-24 to 27,000 cfs on October 28. Greatest flows for most areas of the state occurred on or after October 26 with a few basins in the southwestern and eastern areas reaching their greatest flows around October 11-12 or October 21-23. Flows at the end of the month were below normal except in the northwestern and north-central areas of the state where flows were still responding to the heavy precipitation that fell several days earlier.

RESERVOIR STORAGE for water supply decreased in both the Mahoning and Scioto River basins. Storage remained below normal in both basins.

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 49 percent of rated capacity for water supply compared with 56 percent for last month and 76 percent for October 1990. Month end storage in the Scioto basin index reservoirs was 57 percent of rated capacity for water supply compared with 59 percent for last month and 91 percent for October 1990.

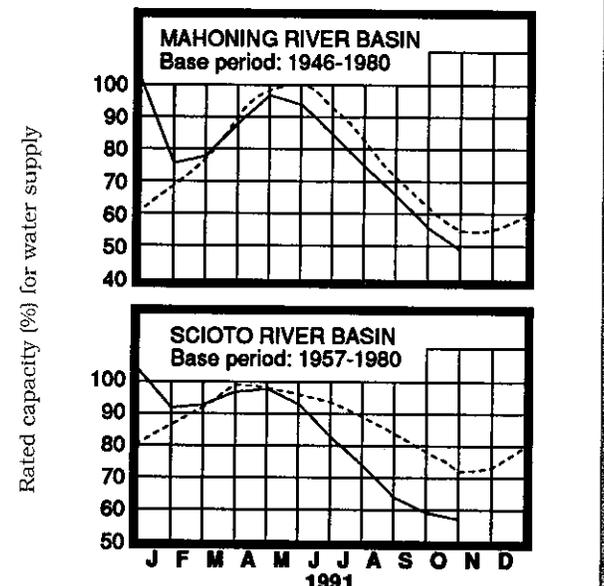
MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



GROUND-WATER LEVELS during October declined throughout most of the state. Net declines from September's levels ranged from nearly equal to about four times those usually observed. The greatest declines were recorded in consolidated aquifers.

Ground-water levels declined steadily throughout the month in most aquifers. A few exceptions were noted in shallow, unconsolidated aquifers, especially those adjacent to streams, where levels were stable during the month. Also, a few unconsolidated aquifers, especially those in the western and northwestern portions of the state, showed some improvement prior to the month's end in response to the substantial precipitation in the northwestern portion of the state during October 25-27.

Ground-water levels generally range from around 1 foot to nearly 4 feet below normal. Current levels are from about 1 foot to over 5 feet below the October 1990 levels. For comparison, the current ground-water levels range from just over 1 foot below to nearly 2 feet above the October 1988 levels.

Several observation wells, especially those in the central and eastern portions of the state, reached record-low levels in October including index observation wells FA-1, low for October and F-1 and TU-1, all-time low levels (see Ground-Water Levels table on this page for aquifer type and location).

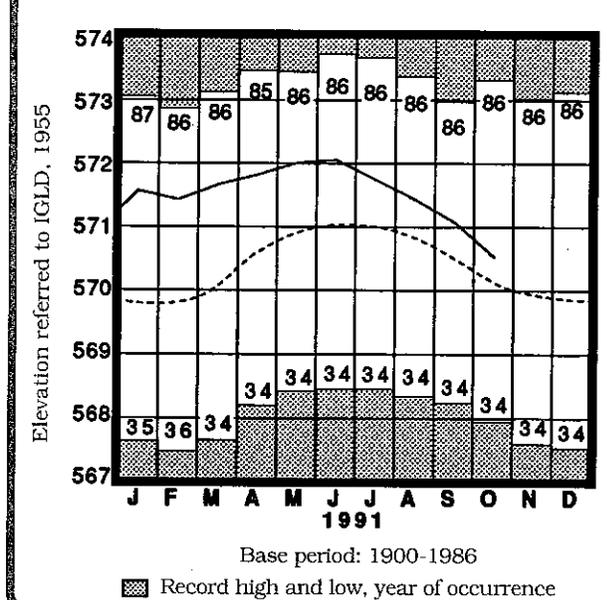
The 1992 water year recharge season is off to a slow start. Ground-water levels are expected to continue to decline until soil moisture requirements are fulfilled. Although ground-water storage is below normal throughout the state, and in some instances at record-low levels, ground-water supplies remain adequate in most areas. However, water supply managers with ground-water sources should closely monitor their respective situations throughout the upcoming recharge season.

LAKE ERIE level declined during October. The mean level was 570.52 feet (IGLD-1955), 0.54 foot below last month's mean level and 0.32 foot above normal. This month's level is 0.66 foot below the October 1990 level and 1.92 feet above Low Water Datum.

SUMMARY

Precipitation was below normal throughout most of the state with only the Northwest and North Central regions having above normal precipitation. Streamflow was below normal statewide except in the northwestern and north-central areas. Reservoir storage declined and was below normal. Ground-water levels declined and are noticeably below normal. Many observation wells reached record-low levels. Lake Erie level declined but remains slightly above the long-term average.

LAKE ERIE LEVELS at Cleveland



Base period: 1900-1986

Record high and low, year of occurrence

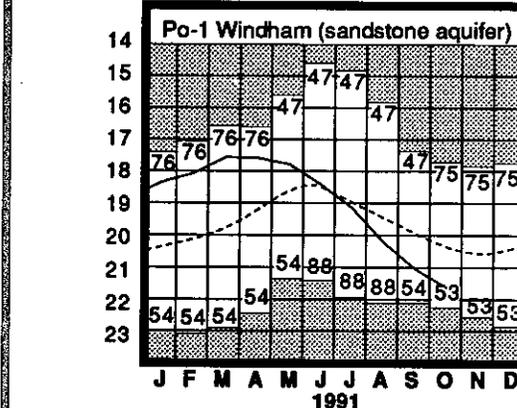
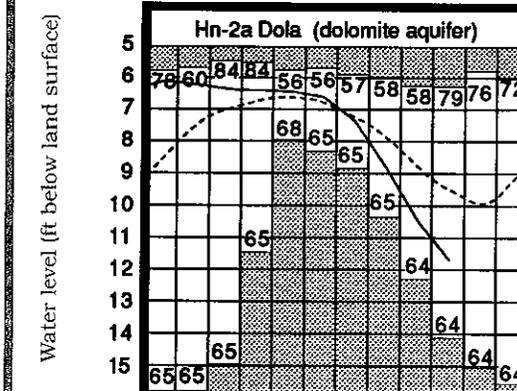
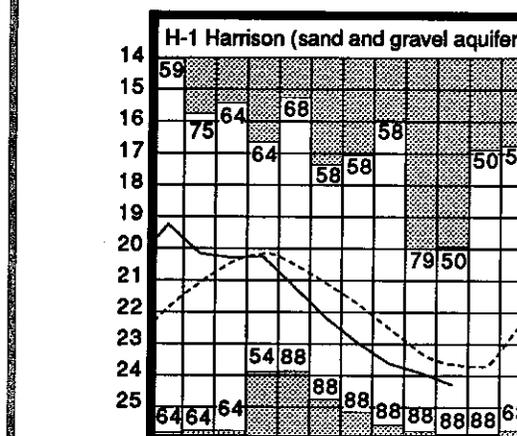
Normal - - - - Current - - - -

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	11.39	-2.47	-0.99	-3.34
Fr-10	Columbus, Franklin Co.	Gravel	43.01	+2.07	+0.07	-0.65
H-1	Harrison, Hamilton Co.	Gravel	24.31	-0.67	-0.39	-2.61
Hn-2a	Dola, Hardin Co.	Dolomite	11.72	-2.19	-1.23	-5.56
Po-1	Windham, Portage Co.	Sandstone	21.61	-1.27	-0.58	-2.58
TU-1	Strasburg, Tuscarawas Co.	Gravel	15.75	-2.37	-0.29	-3.10

GROUND-WATER LEVELS



Base periods: H-1, 1951-1979. Hn-2a, 1955-1979.

Po-1, 1947-1979 Record high and low, year of occurrence

Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

November 1991

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

SUMMARY

Precipitation was below normal throughout the state. Streamflow was below normal statewide except in the northwestern portion. Reservoir storage declined and continued to remain at below normal levels. Ground-water storage also declined and was at record low levels in several areas in the central and eastern portions of the state. Lake Erie level declined but remained slightly above the long-term average. Water supplies, although still adequate for most areas, continue to be adversely affected by the drought conditions that have prevailed during the 1991 calendar year.

NOTES AND COMMENTS

VACANCY ON OWAC FILLED

The last position on the seven-member Ohio Water Advisory Council (OWAC) has been filled by Governor Voinovich's appointee, Dr. Harry M. Kaneshige who replaced Bayliss L. "Rock" Prater whose term had expired.

Dr. Harry M. Kaneshige is a professor in Ohio University's Department of Civil Engineering at Athens. Dr. Kaneshige holds a Ph.D. in civil engineering from the University of Wisconsin. He is a member of OEPA's Advisory Board of Examiners for water and wastewater treatment plant operators. Dr. Kaneshige also serves on the Athens City Planning Commission.

NEW PUBLICATION

ODNR 1992 Calendar

The "Discover Ohio . . . 1992" Ohio Department of Natural Resources (ODNR) calendars are still available. These 13-month calendars feature spectacular, full-color photos of some of Ohio's diverse natural areas. The calendar includes charts detailing the facilities at the various state parks, forests, nature preserves, boating sites and wildlife areas. In addition, holidays, ODNR-sponsored events and location directions are listed each month.

Order now, supplies are limited. The cost for the "Discover Ohio . . . 1992" ODNR calendar is \$5.00 (includes postage, handling and tax) and can be ordered from the ODNR Publications Center, 4383 Fountain Square, Building B-1, Columbus, Ohio 43224-1362. Make checks payable to ODNR Publications Center.

ACKNOWLEDGEMENTS

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Streamflow and reservoir storage data:
U.S. Geological Survey, Water Resources Division.
Lake Erie level data:
U.S. Army Corps of Engineers, Detroit District, Palmer Drought Severity Index;
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service.



DIVISION OF WATER
1939 FOUNTAIN SQUARE
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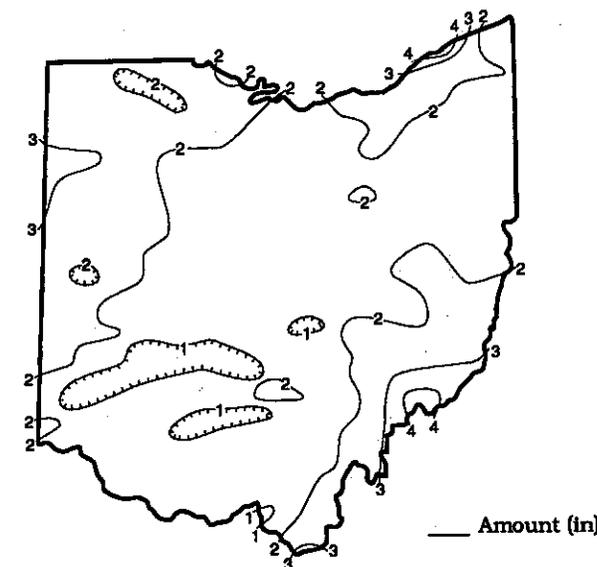
PRECIPITATION for November was below normal throughout the state. The state average was 1.84 inches, 0.81 inch below normal. Regional averages ranged from 2.45 inches, 0.19 inch below normal, for the Southeast Region to 1.22 inches, 1.40 inches below normal, for the Central Region. Marietta Lock (Washington County) reported the greatest amount of precipitation for the month, 4.69 inches. Xenia (Greene County) reported the least amount, 0.24 inch.

Precipitation fell on several days during November in many areas of the state. Daily totals were light, seldom exceeding a few tenths of an inch. The greatest daily precipitation totals were in the extreme southeastern portion of the state along the Ohio River where a storm moving up the eastern seaboard produced rain in Ohio during November 21-23 with over 2 inches reported in a few locations. Several locations throughout the state's northeastern snow belt received the season's first significant snowfall during the last 10 days of the month. Lake and Ashtabula counties received the most snow with unofficial totals of up to 12 inches reported.

Precipitation for the 1991 calendar year is below normal throughout the state. The state average is 28.09 inches, 6.90 inches below normal. Regional averages range from 33.47 inches, 4.86 inches below normal, for the South Central Region to 24.85 inches, 10.08 inches below normal, for the Central Hills Region. So far this year, statewide precipitation has been below normal in nine of the 11 months; it ranks as the eighth driest January through November in 109 years of record. Only March and April had slightly above normal precipitation.

Precipitation for the 1992 water year (October 1, 1991-September 30, 1992) is below normal throughout most of the state; exceptions are in the Northwest and North Central regions where precipitation is above normal. The state average is 3.86 inches, 1.13 inches below normal. Regional averages range from 7.95 inches, 3.23 inches above normal, for the Northwest Region to 2.42 inches, 2.71 inches below normal, for the Northeast Hills Region. The 1992 water year recharge season is off to a slow start. Several inches of precipitation is needed to fulfill soil moisture requirements before adequate recharge to ground-water storage can begin.

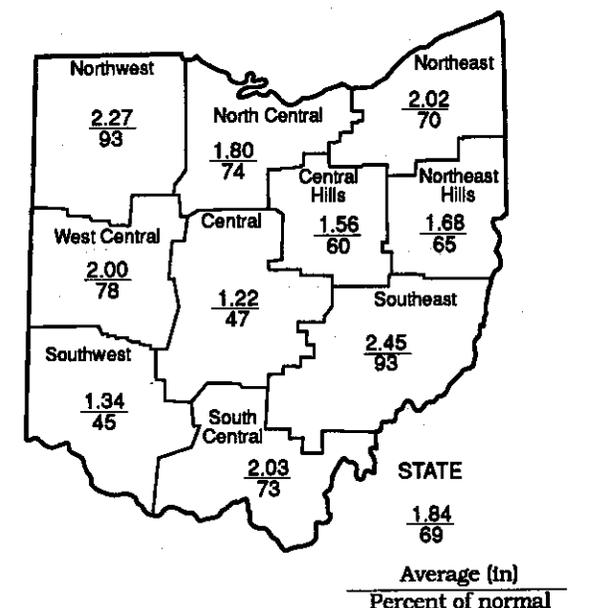
PRECIPITATION NOVEMBER 1991



PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.16	+2.01	-1.04	+1.84	+8.49	-1.5
North Central	-0.63	+0.07	-4.07	-1.31	+4.51	-3.0
Northeast	-0.66	-1.83	-6.20	-3.53	+6.92	-3.9
West Central	-0.56	-1.80	-6.08	-1.55	+6.71	-3.5
Central	-1.40	-2.30	-7.64	-3.71	+4.69	-4.7
Central Hills	-1.05	-1.85	-7.40	-4.74	+5.13	-5.1
Northeast Hills	-0.92	-2.44	-7.64	-5.26	+4.50	-5.4
Southwest	-1.64	-3.31	-5.75	+1.01	+10.78	-2.1
South Central	-0.74	-1.22	-4.37	+0.26	+1.26	-2.0
Southeast	-0.19	-1.54	-4.10	-0.04	+8.02	-3.7
State	-0.81	-1.42	-5.43	-1.69	+6.11	

*Above +4 = Extreme Moist Spell
3.0 To 3.9 = Very Moist Spell
2.0 To 2.9 = Unusual Moist Spell
1.0 To 1.9 = Moist Spell
0.5 To 0.9 = Incipient Moist Spell
0.4 To 0.4 = Near Normal
-0.5 To -0.9 = Incipient Drought
-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		
				3 Mos.	6 Mos.	12 Mos.
Grand River near Painesville	685	58	5	10	12	85
Great Miami River at Hamilton	3,630	501	46	56	58	133
Huron River at Milan	371	31	38	67	55	124
Killbuck Creek at Killbuck	464	93	62	56	50	119
Little Beaver Creek near East Liverpool	496	80	40	37	34	102
Maumee River at Waterville	6,330	3896	241	205	166	122
Muskingum River at McConneville	7,422	1698	46	50	40	116
Scioto River near Prospect	567	32	57	43	37	127
Scioto River at Higby	5,131	716	44	51	46	126
Stillwater River at Pleasant Hill	503	57	68	58	46	128

STREAMFLOW during November was below normal throughout most of the state but exceeded October flows in most drainage basins. The only exception was in the Maumee River basin where the flow was above normal. Flows in most areas of the state were low enough to be considered deficient. The preliminary figure of 58 cfs for the Grand River near Painesville gauging station is the lowest November mean flow for its period of record.

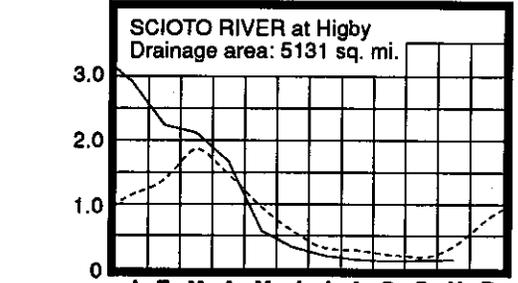
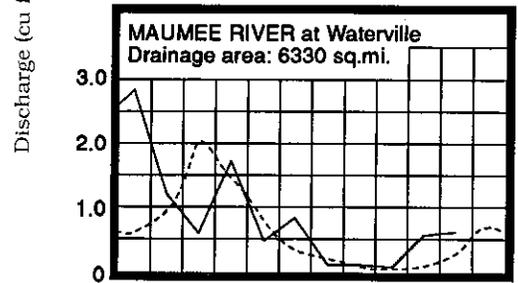
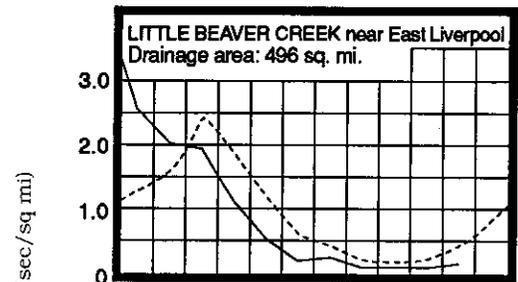
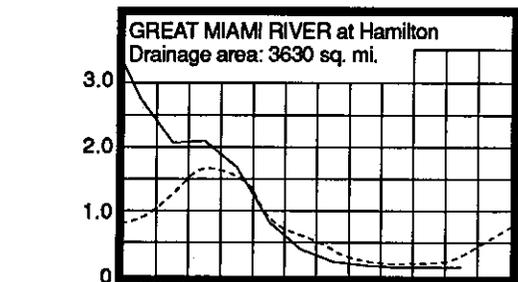
Flows at the beginning of the month were noticeably below normal in most areas of the state with only the northwestern portion having above normal flows. Lowest flows for the month occurred during the first week for most of the state. Flows increased gradually during the month with peak flows for

most areas occurring during November 20-23. An exception was the northwestern portion of the state where flows declined from the above normal flows at the start of the month until several days after mid-month before increasing again. Flows at month's end remained noticeably below normal statewide with the only exception, again, being the northwestern drainage basins where flows continued to be above normal.

RESERVOIR STORAGE for water supply decreased 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 45 percent of rated capacity for water supply compared with 49 percent for last month and 69 percent for November 1990. Month-end storage in the Scioto basin index reservoirs was 55 percent of rated capacity for water supply compared with 57 percent for last month and 89 percent for November 1990.

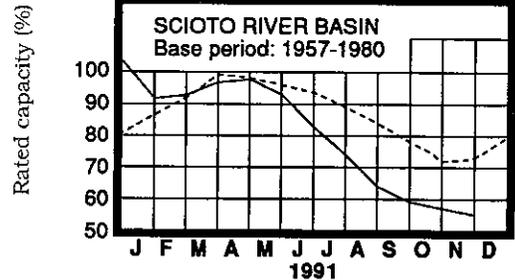
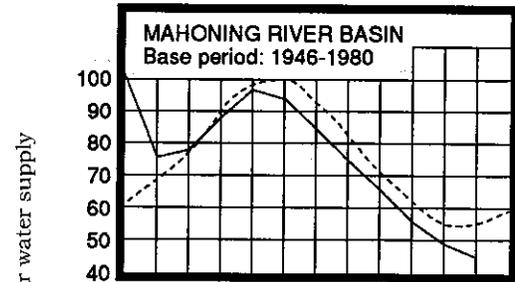
MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

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

RESERVOIR STORAGE FOR WATER SUPPLY



Base period: 1946-1980 (Mahoning), 1957-1980 (Scioto)

GROUND-WATER LEVELS declined steadily during November throughout the state continuing to respond to the below normal precipitation. Net declines from October's levels ranged from nearly equal to over eight times those usually observed. In several cases, declines were noted where slight rises usually occur.

Ground-water levels generally range from around 1 foot to more than 4 feet below normal. Current levels are from about 1 foot to more than 6 feet below the November 1990 levels. Several observation wells, especially in the central and eastern portions of the state, reached record-low levels in November including index wells FA-1, low for November and F-1 and TU-1, all-time low levels (see Ground-Water Levels table on this page for aquifer type and location).

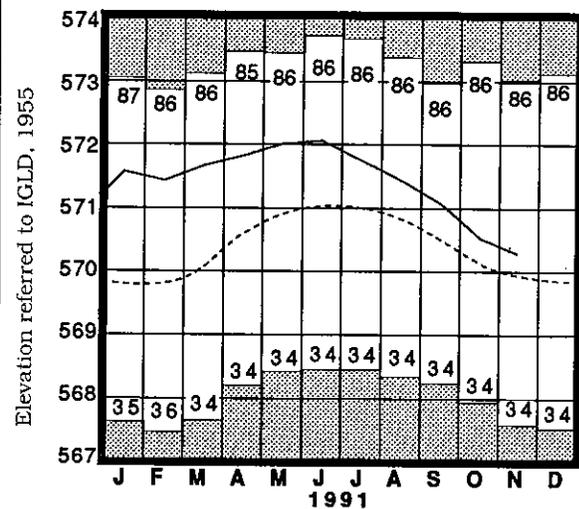
The 1992 water year recharge season continues its slow start. Ground-water storage is below normal throughout the state, and in some instances at record-low levels. Supply deficiencies have been reported in several areas with shallow and/or marginal aquifers. However, ground-water supplies remain adequate in most areas of the state. Water supply managers with ground-water sources should continue to closely monitor their respective situations.

LAKE ERIE level declined during November. The mean level was 570.28 feet (IGLD-1955), 0.24 foot below last month's mean level and 0.36 foot above normal. This month's level is 0.63 foot below the November 1990 level and 1.68 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that, for 1991 through November, precipitation in the Lake Erie basin has averaged 29.8 inches, 2.4 inches below normal. For the entire Great Lakes basin, precipitation has averaged 32.7 inches, 2.9 inches above normal.

The U.S. Army Corps of Engineers also reports that, commencing in January 1992, water levels in the Great Lakes will be referenced to a new chart datum to be known as the International Great Lakes Datum, 1985 (IGLD-1985). The most significant change between IGLD-1955 and IGLD-1985 will be in the elevations assigned to the Great Lakes water levels. More information on the new IGLD-1985 will be provided in this report early next year.

LAKE ERIE LEVELS at Cleveland



Base period: 1900-1986
Record high and low, year of occurrence

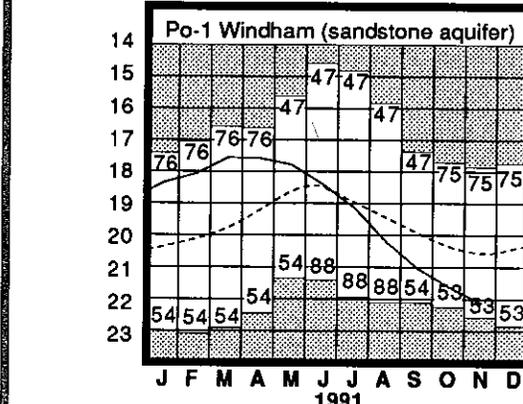
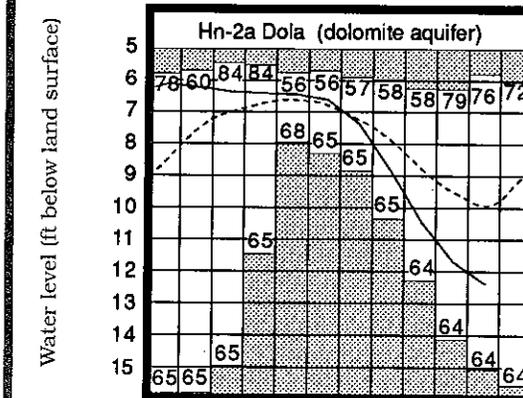
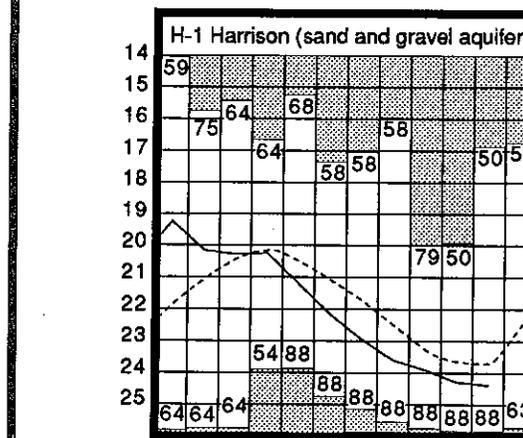
Normal - - - - - Current - - - - -

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	21.04	-4.02	-0.68	-4.47
Fa-1	Jasper Mill, Fayette Co.	Limestone	12.00	-2.96	-0.61	-4.57
Fr-10	Columbus, Franklin Co.	Gravel	42.96	+1.82	+0.05	-1.02
H-1	Harrison, Hamilton Co.	Gravel	24.41	-0.71	-0.10	-2.57
Hn-2a	Dola, Hardin Co.	Dolomite	12.41	-2.49	-0.69	-6.07
Po-1	Windham, Portage Co.	Sandstone	22.13	-1.57	-0.52	-3.00
Tu-1	Strasburg, Tuscarawas Co.	Gravel	15.93	-2.60	-0.18	-3.12

GROUND-WATER LEVELS



Base periods: H-1, 1951-1979; Hn-2a, 1955-1979; Po-1, 1947-1979
Record high and low, year of occurrence

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



MONTHLY WATER INVENTORY REPORT FOR OHIO

December 1991

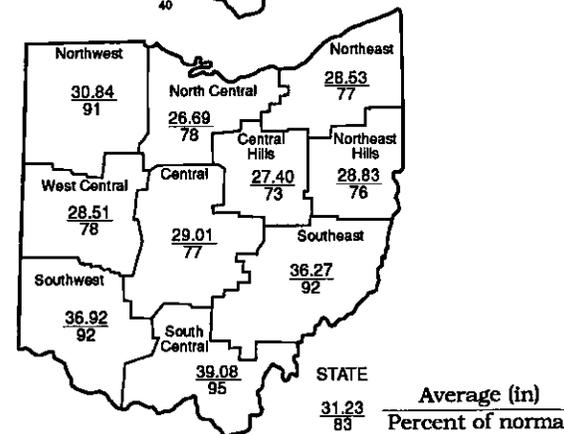
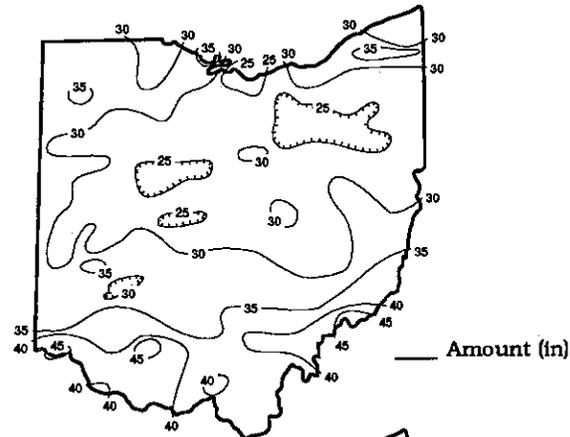
Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

The Central Hills Region had the greatest departure from normal precipitation for the 1991 calendar year, 10.00 inches below normal (See Precipitation table, departure from normal, past 12 months column). This was the second driest year on record for the Central Hills Region; the fourth driest for the Northeast Hills Region; the fifth driest for the Northeast Region; the sixth driest for the North Central Region; and the seventh driest for the Central and West Central regions. Fernbank (Hamilton County) reported the greatest amount of precipitation for the year, 48.49 inches. The Marietta area (Washington County) also reported more than 48 inches of precipitation. North Georgetown (Columbiana County) reported the least amount, 22.83 inches. Several areas in the central and northeastern portions of the state reported less than 25 inches of precipitation for the year. An Isohyetal map and regional averages with percentages of normal precipitation for the 1991 calendar year appear below.

Precipitation during 1991 was below normal except during March, April and December when monthly precipitation was above normal. Water supplies and agriculture were adversely affected by drought conditions. Many public water supplies initiated various types of conservation or use restrictions. Although June was the second driest on record and the May through August period the fourth driest, agricultural crops fared better than expected due to timely rains. Hay crops were the most severely impacted. In addition to 1991 being a dry year, temperatures averaged well above normal ranking it as the third warmest on record.

PRECIPITATION
1991 CALENDAR YEAR



SUMMARY

December's Precipitation was above normal in the eastern and southern portions of the state and below normal in the northern and western portions. Streamflow was noticeably below normal statewide. Reservoir storage remained below normal. Ground-water levels continued to decline in most areas but limited improvement was recorded in a few locations. Lake Erie level rose and was 0.5 foot above normal.

Statewide precipitation for 1991 averaged 31.23 inches, 6.34 inches below normal, ranking it as the eighth driest on record. Streamflow, reservoir and ground-water storage was below normal from mid-spring to the end of the year. Lake Erie remained above its long-term average throughout the year.

PRECIPITATION for December was above normal in the eastern and southern portions of the state and below normal in the northern and western portions. The state average was 3.17 inches, 0.59 inch above normal. Regional averages ranged from 5.61 inches, 2.65 inches above normal, for the South Central Region to 1.40 inches, 0.91 inch below normal, for the Northwest Region. West Union (Adams County) reported the greatest amount of precipitation for the month, 7.00 inches. Van Wert (Van Wert County) reported the least amount, 1.05 inches.

Precipitation during December fell in a typical pattern being greatest in the south and southeast diminishing in amount to the north and west. The most notable precipitation for December fell on December 2-3. The south-central and southeastern portions of the state received 2-3 inches with unofficial amounts of more than 4 inches reported. Flash flooding was reported in Scioto County as well as in Athens, Meigs, Lawrence, Washington and other nearby counties. Precipitation amounts from this storm diminished to the north and west to less than 0.5 inch. The southern half of the state received another 1-2 inches on December 12-13 with up to 0.5 inch falling in the northern portion of the state. The third week of the month was rather dry in most locations with less than 0.5 inch falling in the eastern half of the state. All but the extreme northern portion of the state received precipitation on December 21-23 with the southern portion of the state again recording the greatest amounts of 1-2 inches. Most areas of the state received some precipitation on December 28-29, but generally less than 0.5 inch.

Precipitation for the 1992 water year is below normal throughout most of the state with only the South Central, Southeast and Northwest regions having above normal precipitation. The state average is 6.98 inches, 0.59 inch below normal. Regional averages range from 9.35 inches, 2.32 inches above normal, for the Northwest Region to 5.52 inches, 1.82 inches below normal, for the Central Hills Region.

Precipitation for the 1991 calendar year was below normal throughout the state. The state average was 31.23 inches, 6.34 inches below normal. For the state as a whole, 1991 ranks as the eighth driest in 109 years of record, just ahead of 1901 (31.27 inches), 1987 (31.38 inches) and 1988 (31.51 inches). Regional averages ranged from 39.08 inches, 2.21 inches below normal, for the South Central Region to 26.69 inches, 7.34 inches below normal, for the North Central Region.

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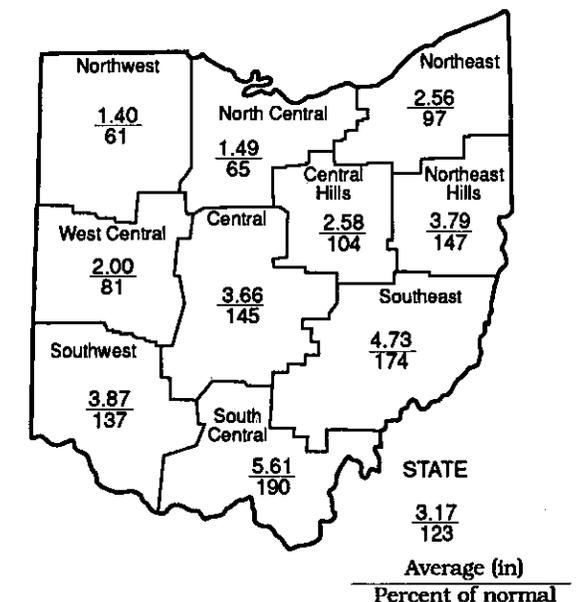
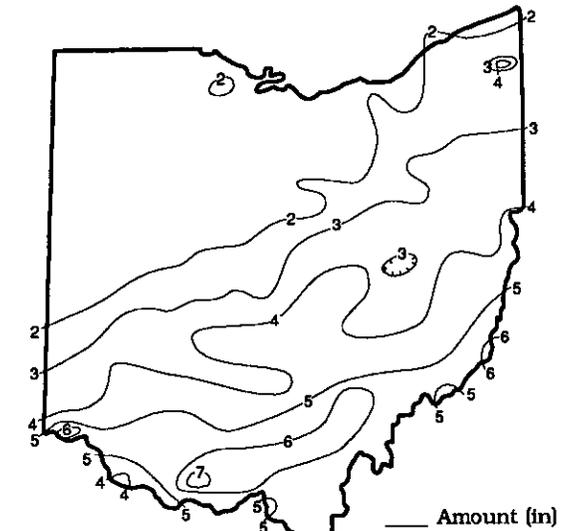
PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.91	+2.32	+0.78	-2.98	+8.65	-1.1
North Central	-0.79	-0.51	-2.40	-7.34	+4.53	-3.3
Northeast	-0.08	-1.39	-3.74	-8.44	+7.33	-4.0
West Central	-0.47	-1.61	-4.76	-8.18	+7.22	-3.0
Central	+1.13	-1.02	-4.20	-8.60	+6.46	-4.3
Central Hills	+0.11	-1.82	-4.59	-10.00	+5.99	-5.1
Northeast Hills	+1.21	-1.46	-3.93	-9.20	+6.41	-4.7
Southwest	+1.05	-1.57	-2.41	-3.35	+12.96	-0.6
South Central	+2.85	+0.79	-0.12	-2.21	+5.39	-0.3
Southeast	+2.01	+0.39	-0.71	-3.32	+10.90	-1.9
State	+0.59	-0.59	-2.58	-6.34	+7.60	

*Above +4 = Extreme Moist Spell
3.0 To 3.9 = Very Moist Spell
2.0 To 2.9 = Unusual Moist Spell
1.0 To 1.9 = Moist Spell
0.5 To 0.9 = Incipient Moist Spell
0.4 To 0.4 = Near Normal

-0.5 To -0.9 = Incipient Drought
-1.0 To -1.9 = Mild Drought
-2.0 To -2.9 = Moderate Drought
-3.0 To -3.9 = Severe Drought
Below -4.0 = Extreme Drought

**PRECIPITATION
DECEMBER 1991**



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
Robert L. Goettmoeller
Chief
An Equal Opportunity Employer-M/F/H

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	259	15	11	12	57
Great Miami River at Hamilton	3,630	763	32	36	43	99
Huron River at Milan	371	33	21	28	30	78
Killbuck Creek at Killbuck	464	138	51	52	43	93
Little Beaver Creek near East Liverpool	496	186	40	43	37	73
Maumee River at Waterville	6,330	3,058	69	120	98	101
Muskingum River at McConnelsville	7,422	2,808	48	45	42	95
Scioto River near Prospect	567	31	13	21	21	80
Scioto River at Higby	5,131	1,344	33	42	45	97
Stillwater River at Pleasant Hill	503	66	20	29	34	81

STREAMFLOW during December was below normal throughout the state. Flows were low enough to be considered deficient in all but the northwestern portion of the state. December's flows increased from November's flows in most areas; an exception was in the Maumee River where this month's flows were less than the noticeably above normal November flows. The preliminary figure of 259 cfs for the Grand River near Painesville gauging station is the lowest for December for its short period of record, only 17 years.

Flows at the beginning of the month were noticeably below normal throughout the state. Most basins in the eastern portion of the state had their lowest flows at the beginning of the month. The remainder of the state's

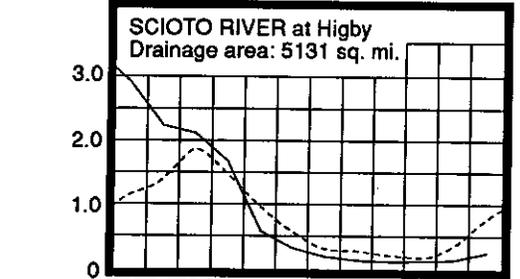
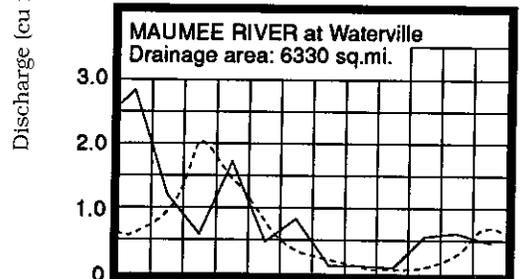
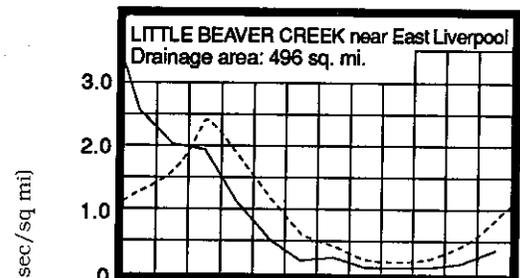
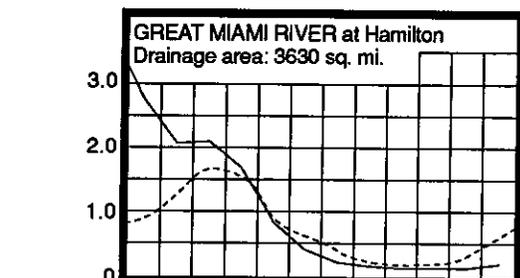
drainage basins had their lowest flows on various days during December 18-23. Flows increased rapidly following the widespread precipitation on December 2-3. Greatest flows for the month followed, generally occurring on December 3-4. Flooding was reported in the southeastern portion of the state with Scioto County the hardest hit. Although flows gradually increased throughout the month with several spikes following local precipitation, flows remained noticeably below normal at the end of the month.

Streamflow for the 1991 calendar year was at or below normal throughout the state. The year started with noticeably above normal flows with flooding on New Year's Day in many areas of the state. However, by mid-spring flows had fallen to below normal where they remained until the end of the year. The only major exception was in the Maumee River basin where flows fluctuated between above and below normal levels. Although very few new record low flows were recorded, the below normal flows did adversely affect surface water supplies in some locations.

RESERVOIR STORAGE for water supply during December decreased in the Mahoning River basin and increased in the Scioto River basin. Storage remained 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 45 percent for last month and 103 percent for December 1990. Month-end storage in the Scioto basin index reservoirs was 57 percent of rated capacity for water supply compared with 55 percent for last month and 104 percent for December 1990.

Surface-water supplies were adequate in most areas of the state during 1991; a few local exceptions were noted in communities with limited storage capacity. Many public water supply managers initiated voluntary or mandatory conservation programs to curb demand. Surface supplies started the year at or above capacity.

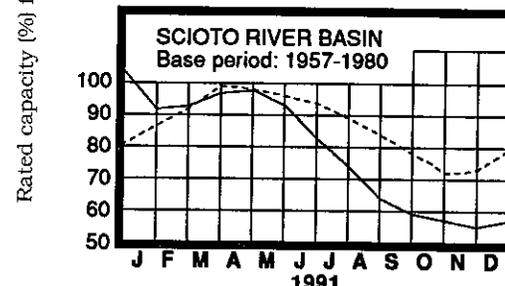
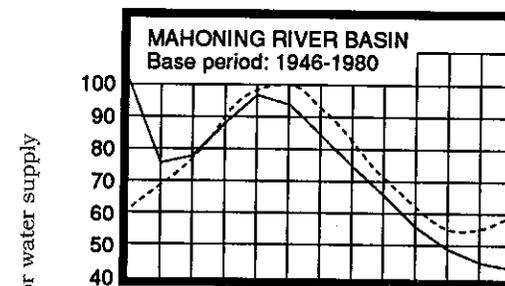
MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



Supplies declined as evaporation and demand increased and inflow diminished during the late spring and summer months and into fall. At the end of the year, surface supplies were noticeably below normal in many areas.

GROUND-WATER LEVELS during December exhibited mixed responses around the state. Water levels in the majority of aquifers continued to decline slightly; many aquifers had somewhat stable water levels and a few aquifers started showing some improvement. Ground-water levels historically are rising throughout the state in December. Current levels continue to respond to the year's drought conditions as precipitation continues to fulfill soil moisture requirements. As soils become saturated, improvement in ground-water storage is expected.

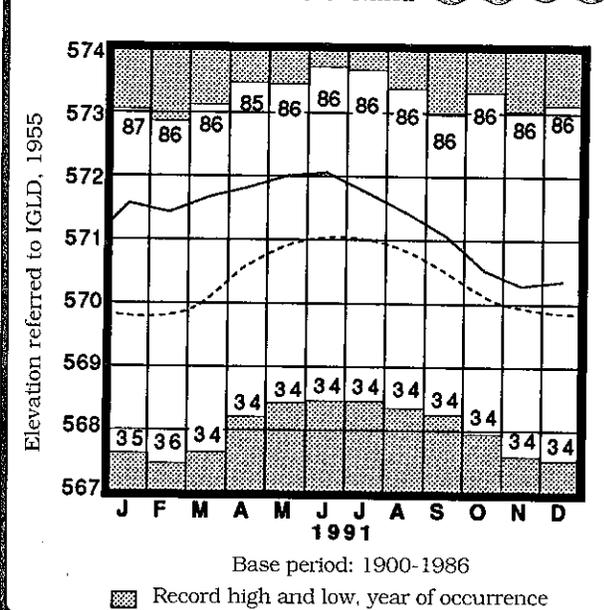
Ground-water levels generally range from nearly 2 feet to more than 4.5 feet below normal. Current levels are from about 1.5 feet to more than 6 feet below the December 1990 levels. Several observation wells in the central and eastern portions of the state reached record-low levels in December including index wells F-1 and Tu-1 (see Ground-Water Levels table on this page for aquifer type and location).

Ground-water storage during 1991 varied greatly between the first and second halves of the year. Calendar year 1991 started with ground-water levels noticeably above normal in response to the record amount of precipitation during 1990. However, as 1991 progressed, drought conditions developed and ground-water levels responded accordingly. By mid-year, levels had fallen to below normal and by the year's end, ground-water storage was at record-low levels for many areas in the central and eastern portions of the state. Supply deficiencies were reported in several areas with shallow and/or marginal aquifers.

LAKE ERIE level rose slightly during December. The mean level was 570.35 feet (IGLD-1955), 0.07 foot above last month's mean level and 0.50 foot above normal. This month's level is 0.63 foot below the December 1990 level and 1.75 feet above Low Water Datum.

Lake Erie level started 1991 at 1.75 feet above normal in January. The lake level rose seasonally through mid-year and then began to decline noticeably, but remained above the long-term average throughout the year. The U.S. Army Corps of Engineers reports that precipitation in the Lake Erie basin for 1991 averaged 31.5 inches, 3.2 inches below normal. For the entire Great Lakes basin, precipitation averaged 35.0 inches, 2.8 inches above normal.

LAKE ERIE LEVELS at Cleveland



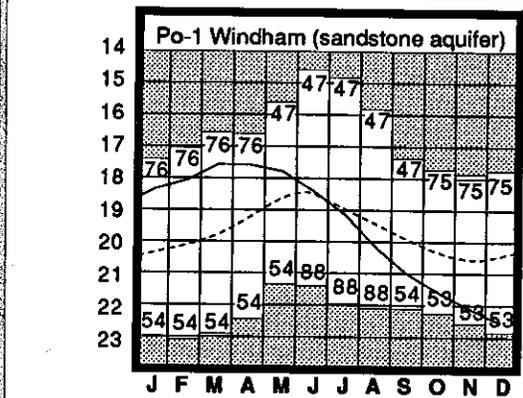
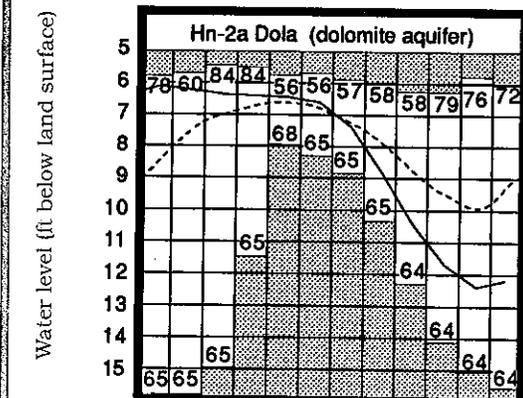
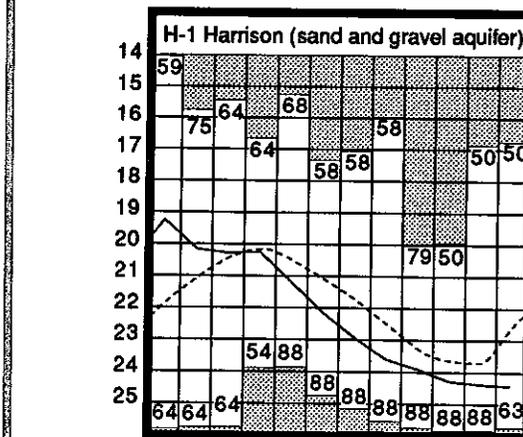
Base period: 1900-1986
Record high and low, year of occurrence

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	21.43	-4.65	-0.39	-6.40
Fa-1	Jasper Mill, Fayette Co.	Limestone	11.64	-3.35	+0.36	-4.46
Fr-10	Columbus, Franklin Co.	Gravel	43.00	+1.41	-0.04	-1.41
H-1	Harrison, Hamilton Co.	Gravel	24.44	-1.78	-0.03	-3.94
Hn-2a	Dola, Hardin Co.	Dolomite	12.22	-2.95	+0.19	-5.81
Po-1	Windham, Portage Co.	Sandstone	22.57	-2.09	-0.44	-3.73
Tu-1	Strasburg, Tuscarawas Co.	Gravel	15.84	-2.74	+0.09	-3.72

GROUND-WATER LEVELS



Base periods: H-1, 1951-1979. Hn-2a, 1955-1979. Po-1, 1947-1979
Record high and low, year of occurrence

Normal - - - - Current - - - -