



MONTHLY WATER INVENTORY REPORT FOR OHIO

January 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTES AND COMMENTS

RECORD NUMBER OF WELL LOGS RECEIVED BY GWRS

The Ground-Water Resources Section (GWRS) received a record 14,170 well logs during 1989. Pursuant to Section 1521.05 of the Ohio Revised Code, whoever drills a well in Ohio is required to file a well log with the Division of Water. Nearly 700,000 well logs are currently on file. Information from the well logs is used for many purposes including answering over 7,000 requests for information annually, aquifer mapping and site evaluations. Douglas J. Barber, hydrogeologist with the GWRS, coordinates the collection of well logs and is the division's liaison with the water-well drilling industry. Doug is also editor of "The Down Hole View," a technical newsletter dealing with ground-water and well drilling issues. This newsletter is available at no cost upon request.

GWRS MOVES TO NEW LOCATION

The Ground-Water Resources Section (GWRS) has moved from the third floor to the first floor of the Fountain Square Complex, Building E, with the rest of the Division of Water remaining on the third floor. The new area is much larger and will provide additional accommodations for the public to use the information, materials and well logs kept on file. All telephone numbers remain the same; the new address is: ODNR Division of Water, Ground-Water Resources Section, 1939 Fountain Square, Building E-1, Columbus, OH 43224-1336.

NEW EMPLOYEE JOINS GWRS STAFF

The ODNR Division of Water, Ground-Water Resources Section (GWRS) has added a new employee to its staff. Paul Spahr has joined the GWRS mapping unit as a hydrogeologist. He will be mapping the state's ground-water resources and using the DRASTIC system to produce pollution potential maps. Paul worked as a college intern locating well logs with the GWRS while earning a bachelor's degree in geology from The Ohio State University. Paul, a native Cincinnati, now resides near Sunbury.

NEW PUBLICATION

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

Drilling Contractors in Ohio by Douglas J. Barber

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

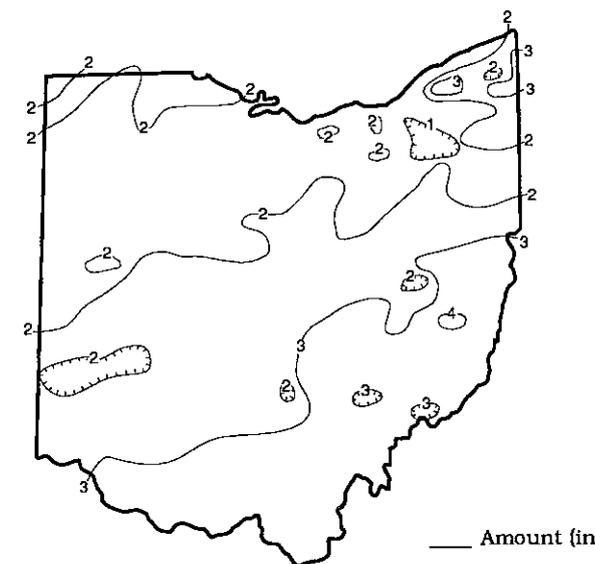
This free publication is available upon request while supplies last. To receive a copy, contact the GWRS at the new address listed above or call 614/265-6739.

PRECIPITATION for January was below normal throughout most of the state with only the Southeast Region receiving slightly above normal precipitation. The average for the state as a whole was 2.32 inches, 0.44 inch below normal. Regional averages ranged from 3.41 inches, 0.60 inch below normal, for the Southeast Region to 1.70 inches, 0.60 inch below normal, for the North Central Region. Barnesville (Belmont County) reported the greatest amount of precipitation for the month, 4.11 inches. Akron (Summit County) reported the least amount, 0.76 inch.

Most of the precipitation during January, in contrast to last month, fell in the form of rain. Precipitation totals during the first week of the month averaged about 0.4 inch with slightly greater amounts in the southeast and slightly lesser amounts in the northwest. Totals during the second week were generally less than 0.25 inch with slightly greater amounts in the north-eastern portion of the state. The bulk of the month's precipitation for most of the state fell during the third week of the month with the northern portion receiving between 0.5 and 1 inch and the southern portion 1 to slightly over 2 inches. The most notable storm period was during January 19-21 when the bulk of the third week's precipitation was received at most locations. No serious flooding was observed. Precipitation totals during the last 10 days of the month averaged about 0.5 inch with amounts of over 1 inch falling in the southern portion of the state.

Precipitation for the 1990 water year (October 1, 1989 to September 30, 1990) is below normal throughout most of the state with only the Southeast Region being slightly above normal. The average for the state as a whole is 9.16 inches, 1.17 inches below normal. Regional averages range from 11.23 inches, 0.11 inch below normal, for the South Central Region to 6.59 inches, 2.62 inches below normal, for the Northwest Region. The Southeast Region average is 10.96 inches, 0.30 inch above normal.

PRECIPITATION JANUARY 1990

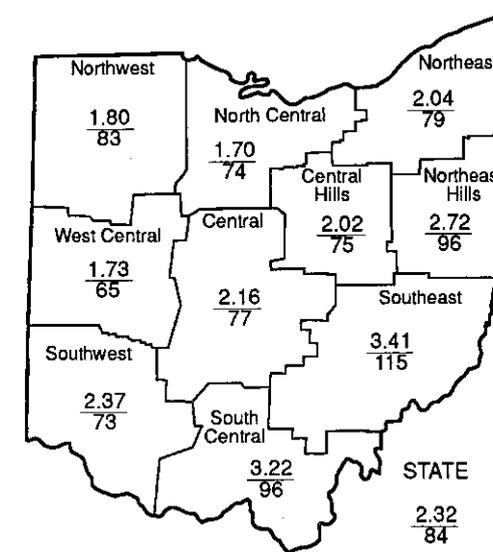


PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.38	-1.76	-2.15	-1.33	-5.92	+0.7
North Central	-0.60	-0.90	-1.84	+1.12	-6.10	+1.3
Northeast	-0.55	-0.82	-0.07	+5.52	+2.66	+2.6
West Central	-0.94	-1.99	-1.54	+5.22	-0.92	+2.6
Central	-0.65	-1.09	-0.90	+5.43	+3.69	+2.6
Central Hills	-0.68	-1.14	-2.26	+2.40	+0.20	+1.1
Northeast Hills	-0.11	-1.09	-2.55	+2.32	-3.65	+0.6
Southwest	-0.86	-1.76	-1.46	+6.38	+3.01	+2.4
South Central	-0.15	-1.89	+2.25	+9.80	+1.89	+2.8
Southeast	+0.44	-1.00	+3.44	+13.00	+10.04	+3.3
State	-0.44	-1.33	-0.70	+4.99	+0.68	

*Above +4 = Extreme Moist Spell
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-0.5 To -0.9 = Incipient Drought
-1.0 To -1.9 = Mild Drought
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-3.0 To -3.9 = Severe Drought
Below -4.0 = Extreme Drought



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.

ODNR

OHIO DEPARTMENT OF
NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Robert L. Goettemoeller
Chief



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 Palmsville	685	2,256	244	115	90	127
Great Miami River at Hamilton	3,630	3,306	102	71	106	138
Huron River at Milan	371	504	161	88	69	93
Killbuck Creek at Killbuck	464	619	170	139	125	115
Little Beaver Creek near East Liverpool	496	497	80	55	66	103
Maumee River at Waterville	6,330	7,372	191	80	85	82
Muskingum River at McConnelsville	7,422	11,750	151	119	122	121
Scioto River near Prospect	567	746	215	92	91	134
Scioto River at Higby	5,131	6,963	123	98	121	137
Stillwater River at Pleasant Hill	503	376	83	65	122	160

STREAMFLOW for January was above normal in most areas of the state; only the western portion and a small area of the eastern portion had below normal streamflows. Flows throughout the state were greater than last month's flows.

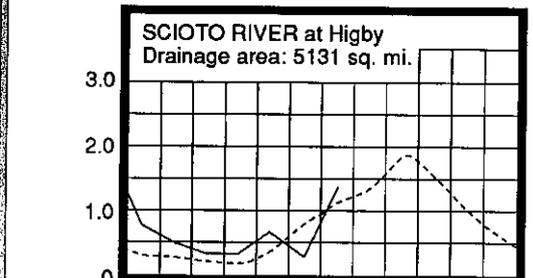
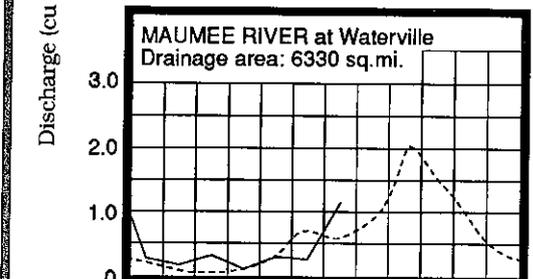
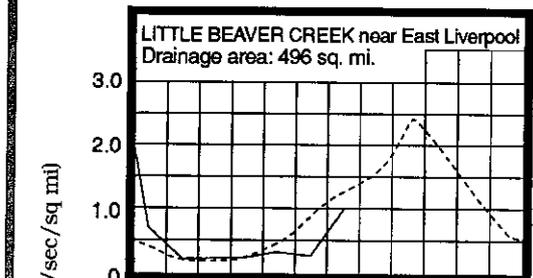
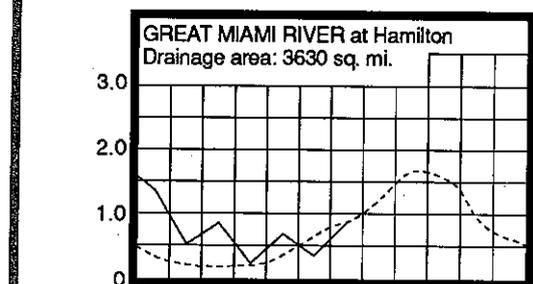
Flows at the beginning of the month were noticeably above normal throughout most of the state in response to the precipitation and snowmelt at the end of December, with only the western portion having below normal flows. Generally, flows statewide decreased from the start of the month until the middle of the third week

with slight increases noted following local precipitation. Lowest flows for the month occurred during the January 14-18 period for most areas of the state except in the northwest and extreme northeast areas where the lowest flows occurred the last day of the month. Greatest flows for the month occurred during January 19-23 for most areas of the state following several days of widespread precipitation, except in the northeast quadrant where the greatest flows were at the beginning of the month. Flows at the month's end were decreasing throughout the state except in the south-eastern portion where they were beginning to rise. Month-end flows were below normal in the northern and western portions of the state and above normal elsewhere.

RESERVOIR STORAGE for water supply increased in both the Mahoning and Scioto river basins. Storage increased to slightly above normal in the Mahoning basin index reservoirs while storage remained below normal in the Scioto basin index reservoirs.

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 70 percent of rated capacity for water supply compared with 58 percent for last month and 74 percent for January 1989. Month-end storage in the Scioto basin index reservoirs was 80 percent of rated capacity for water supply compared with 64 percent for last month and 102 percent for January 1989.

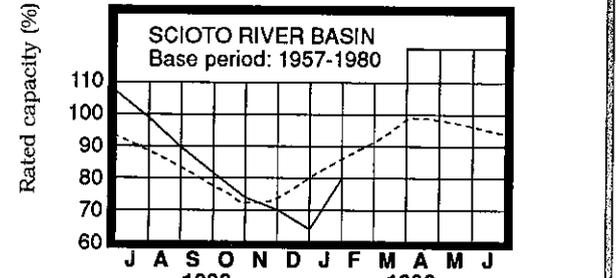
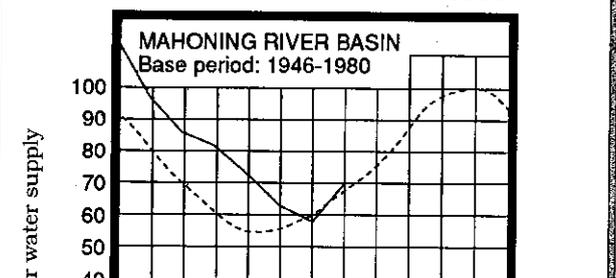
MEAN STREAM DISCHARGE



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 during January rose throughout the state. January mean levels were higher than the December mean levels, but net rises from December's levels were less than usually observed.

Ground-water levels have fallen to slightly below normal throughout most of the state as a result of the slightly below normal precipitation during the late fall and early winter months. However, levels remain noticeably above levels of a year ago in most areas of the state, ranging up to 3.5 feet above the January 1989 levels.

The next few months represent the remainder of the water-supply recharge period. Although ground-water storage is in a favorable position at this time, water-supply managers should monitor their respective situations closely during this period to be prepared should the climatic situation change dramatically.

LAKE ERIE level declined slightly during January. The mean level for January was 570.10 feet (IGLD-1955), 0.08 foot below last month's mean level and 0.28 foot above normal. This month's mean level is 0.27 foot below the January 1989 level and 1.50 feet above Low Water Datum. This month's mean level is the lowest monthly mean level since March 1967.

SUMMARY

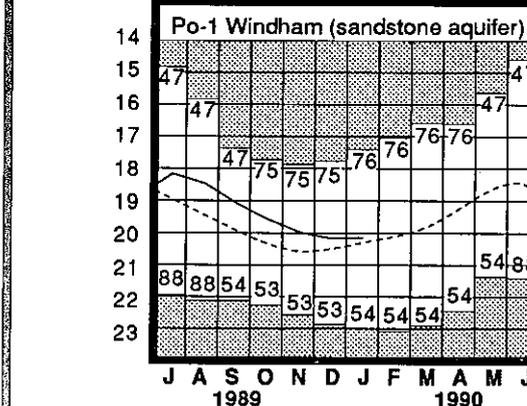
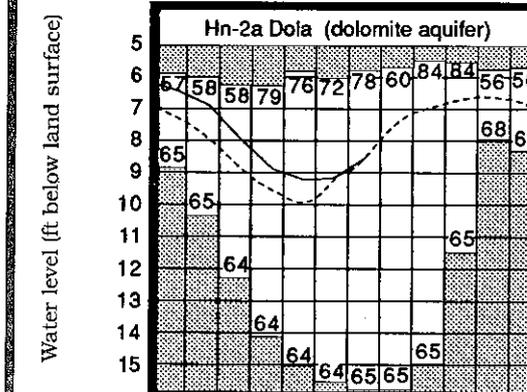
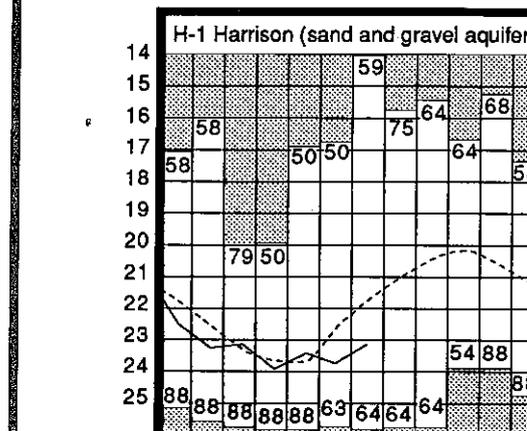
Precipitation was below normal throughout most of the state. Streamflow was above normal in most areas, but below normal in the western portion. Reservoir storage increased and ranged from slightly below to slightly above normal. Ground-water levels rose less than usual, and are below normal in many areas. Lake Erie level declined slightly and, although slightly above normal, was at its lowest monthly level since March 1967.

GROUND-WATER LEVELS

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	15.93	-0.69	+0.89	+2.10
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.75	-0.27	+0.40	-0.64
Fr-10	Columbus, Franklin Co.	Gravel	42.26	+2.09	+0.07	+1.74
H-1	Harrison, Hamilton Co.	Gravel	23.14	-1.29	+0.61	+0.23
Hn-2a	Dola, Hardin Co.	Dolomite	8.54	0.00	+0.64	+3.44
Po-1	Windham, Portage Co.	Sandstone	20.14	+0.21	+0.03	+1.54
Tu-1	Strasburg, Tuscarawas Co.	Gravel	14.22	-1.61	+0.62	+0.40

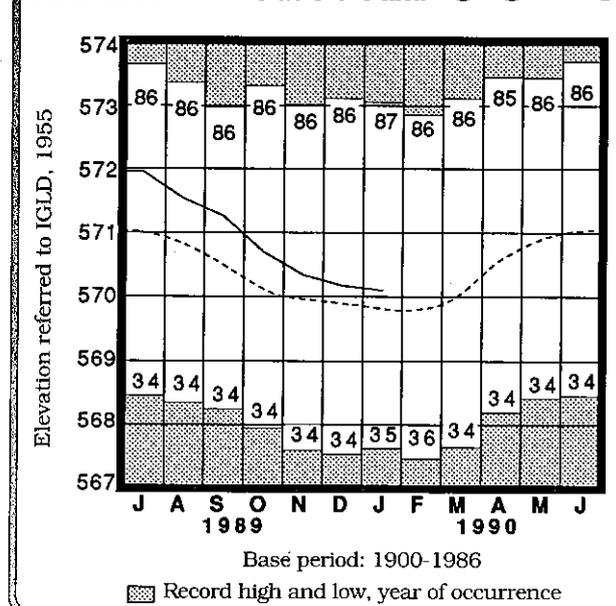
GROUND-WATER LEVELS



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



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(continued from front page)
normal throughout most of the state; the West Central and Southwest regions are slightly below normal. The average for the state as a whole is 13.48 inches, 0.91 inch above normal. Regional averages range from 15.22 inches, 2.22 inches above normal, for the Northeast Region to 11.55 inches, 0.60 inch below normal, for the West Central Region.

Precipitation for the 1990 calendar year is above normal throughout the state. The average for the state as a whole is 6.66 inches, 1.66 inches above normal. Regional averages range from 7.08 inches, 1.23 inches above normal, for the Southwest Region to 6.03 inches, 1.86 inches above normal, for the North Central Region.

NOTES AND COMMENTS

NEW PUBLICATION

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

The Northeast Ohio Water Plan - Public Water Supply, 1988

This new publication is an update to the original Northeast Ohio Water Plan published in 1972. Published in cooperation with the Ohio Environmental Protection Agency, this update evaluates the water supply situation for 108 community water systems in the region by assessing current system capabilities, identifying projected treatment and supply needs, formulating alternatives for meeting those needs and making recommendations from among the alternatives. The Northeast Ohio Region includes the Mahoning River and Little Beaver Creek watersheds and the Lake Erie tributaries east of the Vermillion River basin.

Copies of the 167-page update have been distributed to the communities and counties in the region. Copies may be ordered from:

ODNR - Publications Center
4383 Fountain Square Court, Building B-1
Columbus, OH 43224-1362

The cost is \$8.25 (includes postage and tax). Make checks payable to ODNR Publications Center.

NEW UP-GROUND RESERVOIR FOR FOSTORIA

Ground-breaking ceremonies were held on January 16, 1990 in Fostoria for the construction of a new water-supply reservoir for that city. When completed, the new Fostoria Reservoir No. 6 will have a surface area of approximately 165 acres and will store 1 billion gallons of water. This will nearly double Fostoria's raw water storage capacity.

The ceremony was hosted by Mayor Kenneth Befer. Representing the Ohio Department of Natural Resources (ODNR) were Director Joseph J. Sommer and Division of Water Chief Robert L. Goettemoeller. Each praised Fostoria city officials for recognizing the importance of an adequate water supply to attract growth and industry to the area.

Total costs for the reservoir are estimated at \$7.56 million. The project is being financed jointly by ODNR and the City of Fostoria. This new facility will also provide additional recreational benefits to the area including boating and fishing.

1990 CENSUS - THE NATURAL THING TO DO

Every 10 years, the federal government (Census Bureau) conducts a census of the population as required by the U.S. Constitution. The 1990 Census is the full count of every person living in the United States and a count of every housing unit in the country on Census Day, April 1, 1990.

This count determines congressional representation and the redistricting of state and local election district boundaries as well as the allocation of billions of dollars of federal, state and local funds for many programs. The Ohio Department of Natural Resources (ODNR) administers several programs, such as the Land and Water Conservation Fund, the Sport Fish Restoration Program (Dingell-Johnson), and the Wildlife Restoration Program (Pittman-Robertson), that rely on the census data. If Ohioans are not fully counted, ODNR stands to lose significant amounts of dollars for these programs.

When your census questionnaire arrives in the mail around March 23-25, please fill it out and return it to the Census Bureau. What you tell the census gives a better picture of what is needed in Ohio in terms of jobs, housing, schools, family aid and natural resources. The Census Bureau pledges complete confidentiality concerning your individual and household information.

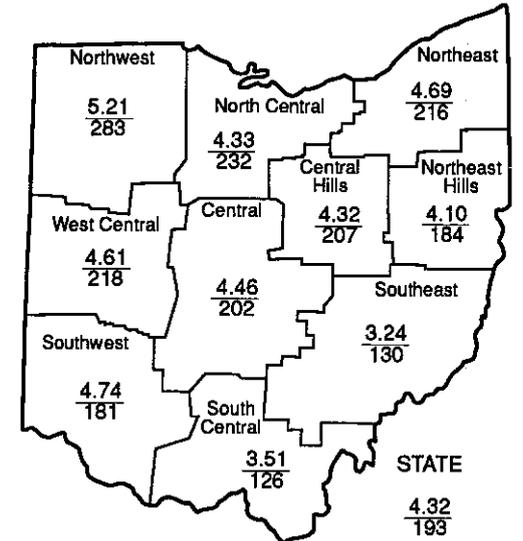
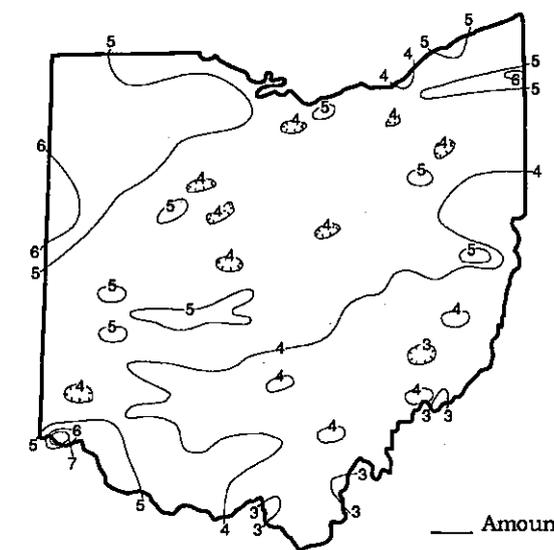
Stand up and be counted. Please respond to the census.

PRECIPITATION for February was noticeably above normal throughout the state. The average for the state as a whole was 4.32 inches, 2.08 inches above normal. This ranks February 1990 as the 10th wettest February in 108 years of record keeping. Regional averages ranged from 5.21 inches, 3.37 inches above normal, for the Northwest Region to 3.24 inches, 0.75 inch above normal, for the Southeast Region. This was the wettest February on record for the Northwest, North Central and Northeast regions and the second wettest for the West Central Region. Also, it was the third wettest for the Central Region, the fifth wettest for the Central Hills Region, the seventh wettest for the Northeast Hills Region and the eleventh wettest for the Southwest Region. Fernbank (Hamilton County) reported the greatest amount of precipitation for the month, 7.38 inches. Lloyd Greenup Locks and Dam (Scioto County) reported the least, 2.77 inches.

Precipitation fell during every week of the month. Total precipitation for the month was in a somewhat atypical pattern with the greatest amounts in the northwest portion of the state and decreasing in amount to the southeast. During the first week of the month precipitation occurred on nearly every day. Weekly totals were generally less than 1 inch in the southeastern portion of the state and 1 to 2 inches elsewhere. Some locations received over 2 inches. During the second week of the month, totals were from .5 to 1 inch at most locations but less than .5 inch in the northwestern portion. During the third week, storms on February 14-16 produced 1 to 2 inches in most areas and over 2 inches at some locations. Again, the southeastern portion received less than .5 inch. The last week of the month was the most notable for weather related events. Although the southeastern portion of the state again received less than .5 inch, most areas received .5 to 1 inch and in the northwestern portion from 1 to around 3 inches. The bulk of this precipitation fell on February 22. The eastern portion of Indiana also received these larger amounts resulting in moderate flooding in the Maumee River and other nearby river basins. On February 24 blizzard conditions engulfed most of the state. Although the northeastern portion of the state was the hardest hit, conditions throughout the state were treacherous with high winds and blowing snow causing whiteout conditions. Several tragic multi-car accidents occurred and many counties declared a snow emergency to restrict unnecessary travel.

Cumulative precipitation for the 1990 water year thus far is above normal (continued on back)

PRECIPITATION FEBRUARY 1990



Average (in)
Percent of normal

PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+3.37	+1.93	+1.64	+3.01	-2.51	+2.0
North Central	+2.46	+0.98	+2.50	+4.17	-4.20	+2.1
Northeast	+2.52	+1.35	+3.92	+8.22	+4.57	+3.3
West Central	+2.50	+0.37	+0.50	+8.16	+0.19	+3.3
Central	+2.25	+0.84	+0.95	+7.18	+4.37	+3.1
Central Hills	+2.23	+0.77	+2.19	+4.38	+0.58	+1.9
Northeast Hills	+1.87	+1.10	+1.41	+3.71	-3.02	+1.2
Southwest	+2.12	+0.14	+0.52	+7.29	+3.31	+2.5
South Central	+0.73	-0.71	+2.10	+6.87	+2.24	+2.3
Southeast	+0.75	+0.16	+2.38	+11.55	+9.24	+3.5
State	+2.08	+0.70	+1.82	+6.46	+1.69	

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Palmer Drought Severity Index:
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Scioto River near Prospect	567	2,180	339	177	150	167
Scioto River at Higby	5,131	16,473	229	139	137	151
Stillwater River at Pleasant Hill	503	1,846	347	131	156	167

STREAMFLOW for February was excessive statewide. February streamflows were noticeably greater than January's flows. The monthly mean flow of 16,473 cfs for the Scioto River at Higby index gauging station was the third highest for February for the period of record. Moderate flooding occurred in the northwestern and north central portions of the state on February 21-24 following heavy precipitation of February 21-22 in eastern Indiana, southern Michigan and portions of northwestern Ohio.

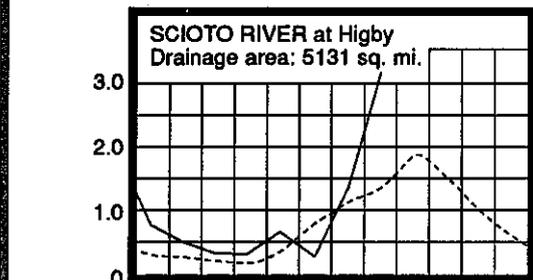
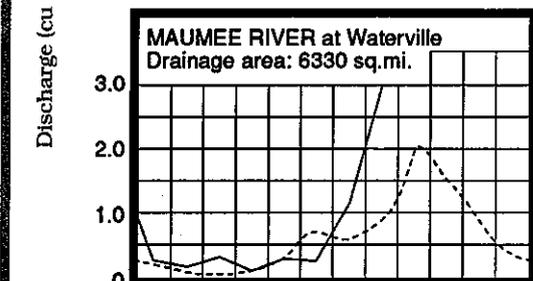
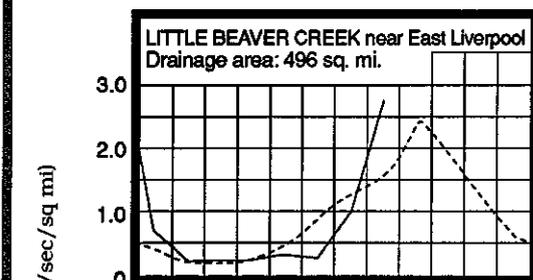
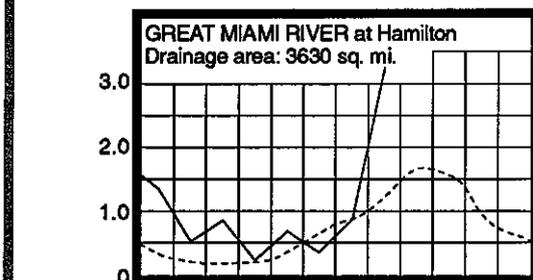
Flows at the beginning of the month were below normal throughout most of the state with only the south central and southeastern portions starting the month with above normal flows. Lowest flows for the western and northern portions of the state occurred on February 1; lowest flows elsewhere occurred at or near the month's end. Generally, streamflows increased rapidly after the start of the month until February 4-6 and then declined until the middle of the month. Widespread precipitation on February 14-16 resulted in rapid increases of streamflows with the greatest flows for the month for most areas occurring soon after this. Streamflows then declined until the month's end in the southern and eastern portions of the state, but in the northern and western portions only until February 21 after which they increased. Highest flows for the month in the northwestern portion of the state occurred during the period of moderate flooding mentioned above. Flows at the month's end were above normal statewide except in the northeastern and southern portions where they were below normal.

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

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 80 percent of rated capacity for water supply compared with 70 percent for last month and 77 percent for February 1989. Month-end storage in the Scioto basin index reservoirs was 100 percent of rated capacity for water supply compared with 80 percent for last month and 104 percent for February 1989.

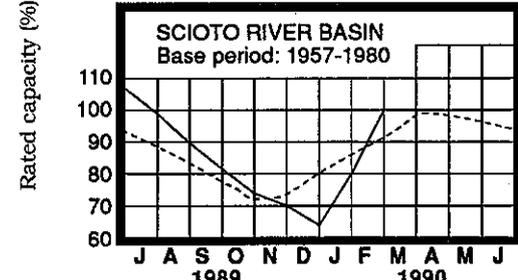
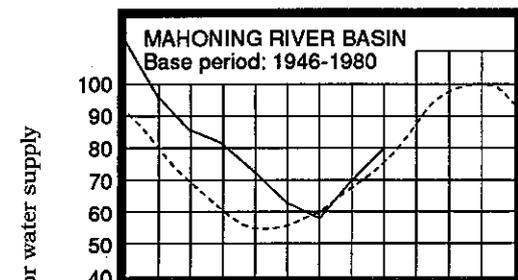
MEAN STREAM DISCHARGE



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 rose noticeably throughout the state during February. Levels in consolidated aquifers rose throughout the month; levels in unconsolidated aquifers rose during the first three weeks but were declining at the month's end. Net rises from last month's levels were markedly greater than usually observed, ranging up to four times greater than the normal rises.

Ground-water levels have risen to above normal throughout most of the state in response to the noticeably above normal precipitation during February. The only exceptions are in some unconsolidated aquifers which remain slightly below normal. Levels remain noticeably above those levels of a year ago, ranging up to 3 feet higher than the February 1989 levels. The above normal precipitation during February has helped to eliminate the slight deficits that have been accumulating throughout the state during the current recharge season. As a result, the ground-water storage situation has improved and is in a favorable position at this time.

LAKE ERIE level rose noticeably during February. Levels normally decline through February before starting their seasonal rise. The mean level for February was 570.80 feet (IGLD-1955), 0.7 foot above last month's mean level and 1 foot above normal. This month's mean level is 0.35 foot above the February 1989 level and 2.2 feet above Low Water Datum.

SUMMARY

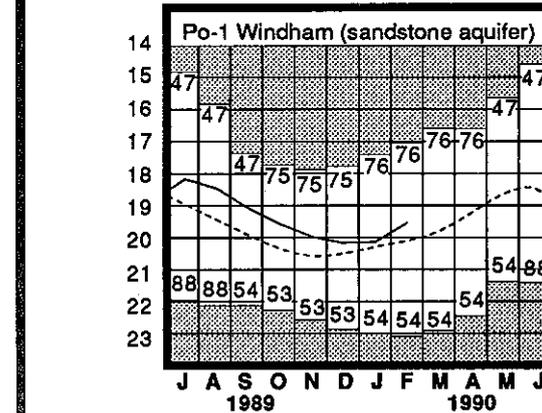
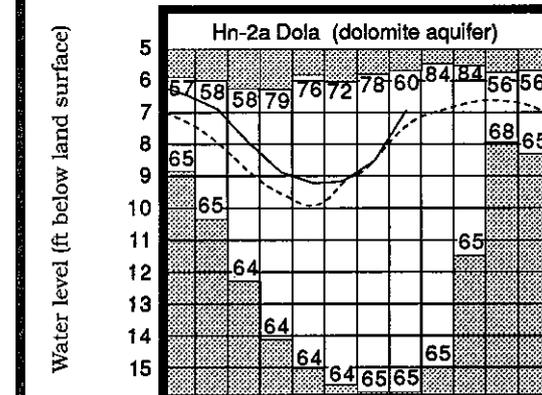
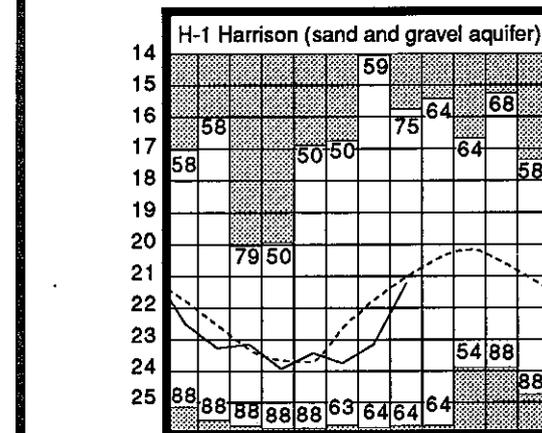
Precipitation was noticeably above normal throughout the state with the northern and western regions having their wettest or second wettest February on record. Streamflow was excessive statewide. Reservoir storage increased and was above normal. Ground-water levels rose markedly and are above normal throughout most of the state. Lake Erie level rose noticeably and was 1 foot 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	12.99	+1.11	+2.94	+2.94
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.93	+0.05	+0.82	-0.06
Fr-10	Columbus, Franklin Co.	Gravel	41.69	+2.34	+0.57	+1.86
H-1	Harrison, Hamilton Co.	Gravel	21.22	-0.03	+1.92	+1.90
Hn-2a	Dola, Hardin Co.	Dolomite	6.93	+0.59	+1.61	+2.61
Po-1	Windham, Portage Co.	Sandstone	19.53	+0.53	+0.61	+1.76
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.95	-0.54	+1.87	+2.21

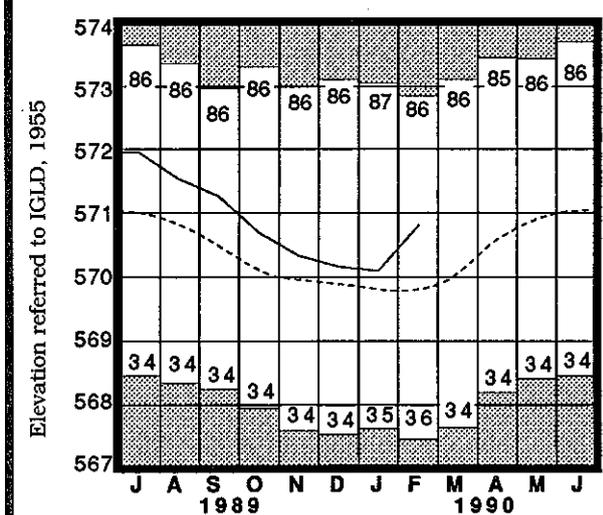
GROUND-WATER LEVELS



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

Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

March 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTES AND COMMENTS

NEW GROUND-WATER LEGISLATION

New ground-water legislation was recently passed by the Ohio General Assembly without a dissenting vote. Substitute House Bill 476, introduced by Representative David Hartley (Clark County), evolved through considerable work by many individuals, agencies and organizations. This bill addresses certain ground-water quantity initiatives of the state's Ground-Water Protection and Management Strategy and resolves a conflict between previous legislation (Sub. H.B. 662, 1988) and the Ohio Supreme Court decision in *Cline vs. American Aggregates* (1984) regarding the "reasonable use" of ground water. Sub. H.B. 476 makes the current state statute consistent with the definition of "reasonable use" contained in Section 858 of the Second Restatement of Torts and referred to for resolving ground-water use conflicts in the *Cline* case.

Sub. H.B. 476 also enhances the capability of the Division of Water to assist ground-water users in resolving conflicts. Meetings or hearings could be held with public entities or as deemed necessary by the chief whereby many problems could be resolved with the technical information and expertise available in the Division of Water. The bill also gives the division authority to designate a ground-water stress area for the purpose of gathering additional information. Water use registration can be required of all users within a designated ground-water stress area. This, too, is for the purpose of resolving conflicts where ground water is, or projected to be, utilized to a greater extent than is naturally replenished annually.

Additionally, the bill authorizes the chief of the Division of Water to perform ground-water measurements and redefines a "well" to require the filing of well logs with the division for monitoring and geothermal wells. Well logs are the main source of information for ground-water resource and geologic mapping and are vital in managing the state's ground-water resources.

DIVISION OF WATER HAS NEW DEPUTY CHIEF FOR ENGINEERING

Robert L. Goettmoeller, chief of the Division of Water, recently announced the appointment of J. Bruce Pickens as deputy chief for engineering. Mr. Pickens started working with the division in 1969 as an engineering intern. Through the years he has held several positions, most recently as administrator of the division's Dam Safety and Water Engineering Section. Bruce, a registered professional engineer, is an alumnus of The Ohio State University where he earned a bachelor's degree in agricultural engineering and master's degree in civil engineering. Bruce is a member of numerous professional organizations including the U.S. Committee on Large Dams, the American Society of Civil Engineers, and the American Society of Agricultural Engineers. He was one of the organizers of the Association of State Dam Safety Officials where he served as its president in 1987-88. Currently, he serves on the board of directors of the Water Management Association of Ohio. Bruce, with his wife Marjic, resides in Columbus.

OWAC MEMBERS RE-APPOINTED

The Ohio Water Advisory Council (OWAC) held its 21st quarterly meeting on March 5 in Columbus. The seven-member council, established by state law in 1984 (Am. Sub. S.B. 360), recently had three of its members re-appointed by Governor Celeste for two-year terms. They are: Joan E. Brasaemle (Stow), ground water; Gaybrielle E. Gordon (Columbus), public member; and Dr. Robert C. Stiefel (Columbus), surface water.

At the meeting, the council re-elected Bayliss L. (Rock) Prater (Willard) as chair and Marquita McLean (Cincinnati) as vice-chair, positions they have held since the establishment of the council. The two remaining council members are James L. Rozelle (Center-ville), dam safety and Lloyd E. Overly (Chillicothe), floodplain management.

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.

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.

ACKNOWLEDGEMENTS

ODNR

OHIO DEPARTMENT OF
NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Robert L. Goettmoeller
Chief



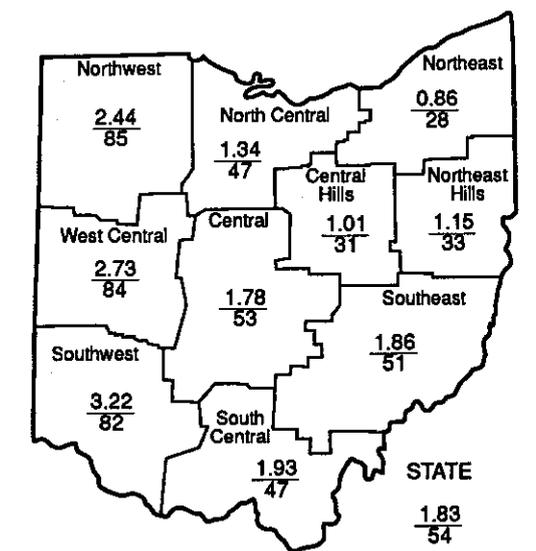
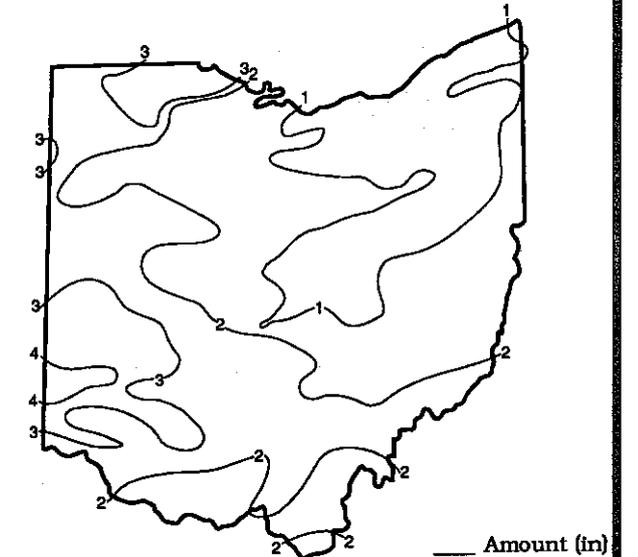
PRECIPITATION for March was below normal throughout the state. The average for the state as a whole was 1.83 inches, 1.55 inches below normal. This ranks March 1990 as the 16th driest March in 108 years of record-keeping. Regional averages ranged from 3.22 inches, 0.70 inch below normal, for the Southwest Region to 0.86 inch, 2.25 inches below normal, for the Northeast Region. March 1990 was the second driest March on record for the Northeast, Northeast Hills and Central Hills regions. The Northeast Hills Region had the greatest departure from normal for the month, 2.30 inches below normal. Oxford (Butler County) reported the greatest amount of precipitation for the month, 4.57 inches. Dorset (Ashtabula County) reported the least, 0.33 inch.

Precipitation was noticeably light in the northeastern quadrant of the state during the month. The entire state received very little precipitation during the first week. During the second week, the extreme northwestern portion of the state received around 1 inch of precipitation on March 10-11 and the southwestern portion from 1 to over 2.5 inches, the greatest daily totals for the month throughout the state. During the third week, many areas in the southwestern portion of the state again received over 1 inch on March 15-16 with most other areas in the southern and northwestern portions receiving around .5 inch. The fourth week of the month was similar to the first week, being rather dry. Precipitation returned the last few days of the month with amounts of around .5 inch common in all but the northeastern portion of the state.

Cumulative precipitation for the first half of the 1990 water year is below normal throughout most of the state with only the Northwest and North Central regions having slightly above normal precipitation. The average for the state as a whole is 15.32 inches, 0.63 inch below normal. Regional averages range from 17.09 inches, 0.87 inch below normal, for the Southwest Region to 14.24 inches, 0.32 inch above normal, for the Northwest Region. The Northeast Hills Region has the greatest departure for the water year thus far, 1.84 inches below normal (see precipitation departure from normal table, past six months column).

Precipitation for the 1990 calendar year is above normal in the western half of the state and below normal in the eastern half. The average for the state as a whole is 8.49 inches, 0.11 inch above normal. Regional averages range from 10.30 inches, 0.53 inch above normal, for the Southwest Region to 7.35 inches, 0.70 inch below normal, for the Central Hills Region (see precipitation departure from normal table, past three months column).

PRECIPITATION MARCH 1990



PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.43	+2.56	+0.32	+3.38	-1.95	+0.5
North Central	-1.52	+0.34	+0.54	+3.03	-4.68	+0.8
Northeast	-2.25	-0.28	-0.03	+5.79	+3.31	+1.1
West Central	-0.53	+1.03	-1.13	+6.68	+0.89	+2.5
Central	-1.59	+0.23	-0.26	+5.06	+4.07	+1.3
Central Hills	-2.25	-0.70	-0.90	+1.69	-0.78	-0.4
Northeast Hills	-2.30	-0.54	-1.84	+0.65	-4.30	-1.0
Southwest	-0.70	+0.59	-0.67	+4.88	+3.08	+2.2
South Central	-2.16	-1.58	-1.54	+3.64	+1.48	+0.9
Southeast	-1.76	-0.57	-0.71	+8.27	+7.70	+1.8
State	-1.55	+0.11	-0.63	+4.31	+1.01	

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

Average (in)
Percent of normal

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	660	26	113	100	139
Great Miami River at Hamilton	3,630	4,142	68	122	116	158
Huron River at Milan	371	194	26	100	96	109
Killbuck Creek at Killbuck	464	394	40	134	134	132
Little Beaver Creek near East Liverpool	496	393	33	82	71	108
Maumee River at Waterville	6,330	5,881	46	123	99	111
Muskingum River at McConnelsville	7,422	6,450	39	113	106	128
Scioto River near Prospect	567	473	47	133	116	167
Scioto River at Higby	5,131	4,593	47	110	110	143
Stillwater River at Pleasant Hill	503	674	88	123	109	187

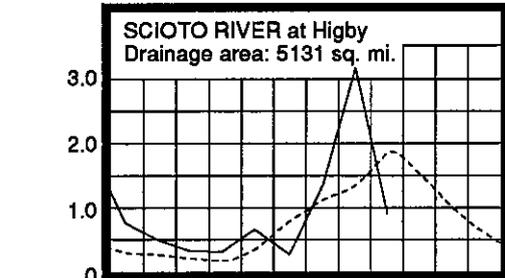
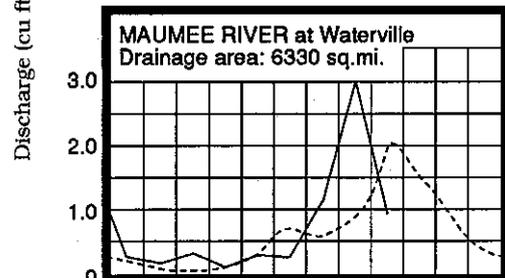
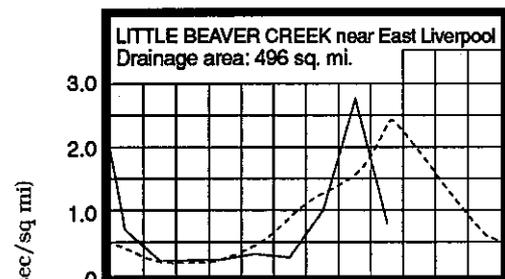
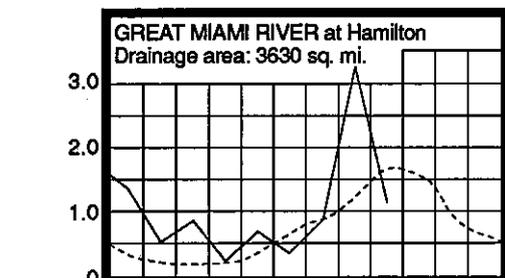
STREAMFLOW for March was below normal throughout the state. Flows in all but the western and southwestern portions of the state were low enough to be considered deficient. March flows decreased noticeably from the above normal flows in February.

Flows at the beginning of the month were below normal throughout most of the state. Greatest flows for the month for most of the northern and eastern portions of the state occurred on March 1 as flows statewide began to decline. Greatest flows for the western portion of the state occurred on March 11-12 after moderate precipitation fell locally in that area. Generally, flows declined until the end of the month with slight increases noted following local precipitation. Lowest flows for the month statewide occurred at or near the month's end. Flows were below normal at the end of the month throughout most of the state.

RESERVOIR STORAGE for water supply during March decreased in both the Mahoning and Scioto river basins. Storage fell to below normal in both basins.

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 79 percent of rated capacity for water supply compared with 80 percent for last month and 88 percent for March 1989. Storage at the month's end in the Scioto basin index reservoirs was 95 percent of rated capacity for water supply compared with 100 percent for last month and 110 percent for March 1989.

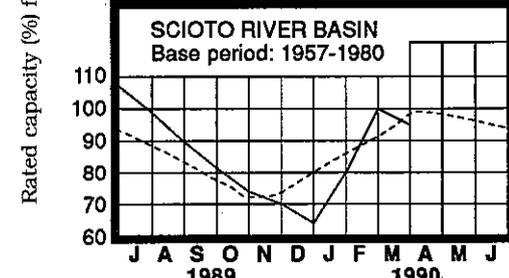
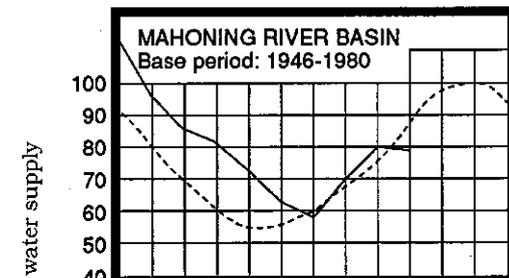
MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



GROUND-WATER LEVELS during March showed mixed responses throughout the state. Generally, water levels in shallow unconsolidated aquifers declined during the month in response to the lack of recharge; levels in consolidated aquifers and deeper unconsolidated aquifers rose or remained static during the month in response to delayed recharge from the noticeably above normal precipitation in February. Only wells developed in consolidated aquifers in the northern portion of the state had net rises from last month's levels greater than usually observed.

Ground-water levels have fallen, in response to below normal precipitation in three of the past four months, to below normal in many areas of the state. Exceptions are in consolidated aquifers where levels are slightly above normal. Ground-water levels remain above those of a year ago except in the southeastern portion of the state where they are lower than last year's levels. Levels one year ago in most areas of the state were just beginning to show substantial recovery from the lingering effects of the drought conditions during 1988. An exception to this delayed recovery was in the southeastern portion of the state where precipitation was noticeably above normal starting in January 1989 and continuing throughout most of the spring recharge months. Variations in this year's levels compared to last year's can, most likely, be attributed to the variable precipitation conditions during this time period.

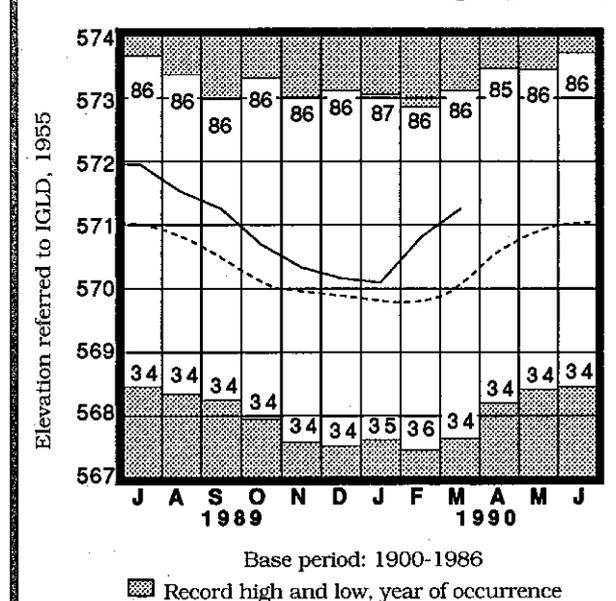
The ground-water storage situation remains in a favorable position at this time. Adequate precipitation during the remainder of the current recharge season will be needed to maintain this position.

LAKE ERIE level rose during March. The mean level for March was 571.25 feet (IGLD-1955), 0.45 foot above last month's mean level and 1.20 feet above normal. This month's level is 0.66 foot above the March 1989 level and 2.65 feet above Low Water Datum.

SUMMARY

Precipitation was below normal throughout the state with the Northeast, Northeast Hills and Central Hills regions having their second driest March on record. Streamflow was deficient throughout most of the state. Reservoir storage declined and was below normal in many areas. Ground-water levels declined in unconsolidated aquifers but rose in consolidated aquifers still recharging from February's above normal precipitation. Lake Erie level rose seasonally and is 1.2 feet above normal.

LAKE ERIE LEVELS at Cleveland



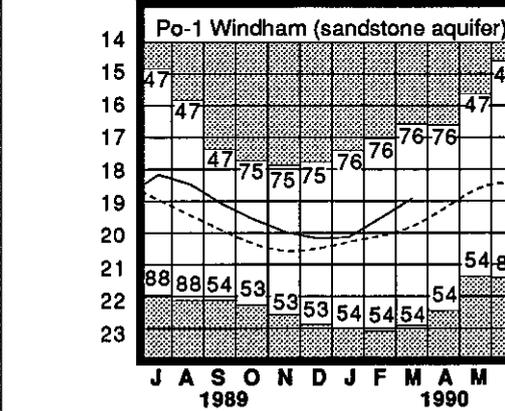
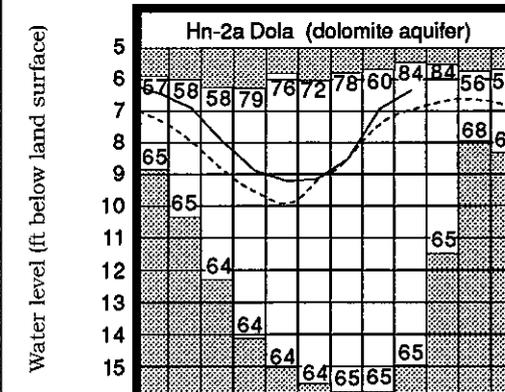
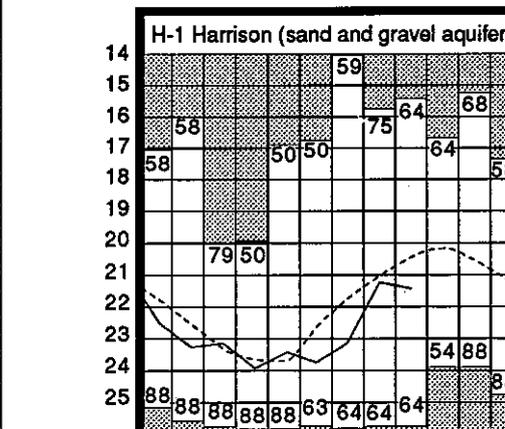
Base period: 1900-1986
Record high and low, year of occurrence

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	13.87	-0.92	-0.88	-0.35
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.14	-0.38	-0.21	-0.51
Fr-10	Columbus, Franklin Co.	Gravel	41.13	+2.20	+0.56	+2.13
H-1	Harrison, Hamilton Co.	Gravel	21.44	-1.02	-0.22	+0.69
Hn-2a	Dola, Hardin Co.	Dolomite	6.35	+0.63	+0.58	+1.79
Po-1	Windham, Portage Co.	Sandstone	18.94	+0.82	+0.59	+1.96
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.31	-1.34	+0.04	+1.68

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

April 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTES AND COMMENTS

NEW EMPLOYEE JOINS GWRS STAFF

The ODNR, Division of Water, Ground-Water Resources Section (GWRS) has added a new employee to its staff. Carrie Frederick has joined the GWRS Mapping Unit as a hydrogeologist. She will be using the DRASTIC system to map the pollution potential of ground water in Ohio. In addition, Carrie will assist in conducting hydrogeologic field investigations and detailed aquifer studies. Carrie worked as an intern with the GWRS while earning a degree in geology from The Ohio State University. Away from work, Carrie enjoys her free time at home in Sunbury with her dogs, guinea pig, and increasing number of cats.

THE MIAMI CONSERVANCY DISTRICT CELEBRATES 75 YEARS

During 1990, The Miami Conservancy District (MCD) will celebrate the 75th anniversary of its formation. The district was formed June 28, 1915 following the adoption of the Ohio Conservancy Act by the Ohio General Assembly in February 1914. The articles of incorporation for MCD define the district's purposes as preventing floods, regulating stream channels, reclaiming or filling wet and overflowed lands, providing needed irrigation, regulating the flow of streams, and diverting or eliminating water courses. The district provides flood protection to areas along the Great Miami River and its major tributaries in southwest Ohio.

The official plan of MCD, adopted in 1916, called for protection against a flood 40 percent larger than the 1913 flood, the largest flood of record. The plan called for the construction of five earthen, dry-detention dams with a total storage capacity of 274 billion gallons, utilized only during flood periods. In addition, 44 miles of levee and 31 miles of improved channel were built. Construction was completed in 1922. In 68 years since completion of the system, the five dams have stored water a total of 1,109 times.

Until the mid-1950s, the work of the district involved primarily the maintenance of the structures and lands. However, starting in the 1950s, the district assumed other water-related functions provided for in the act. These functions include streamflow regulation and conservation, wastewater treatment, ground-water quantity and quality, and recreation.

During its 75 years, the district has attempted to address the water resource needs of the Great Miami River basin. Today, with a staff of 60, MCD is involved in all facets of water resource programs. MCD, which is considered to be the "Grandfather" of flood control in the United States, will continue to meet the future water resource needs of the region.

Note: A detailed history of this project is available in the pictorial history, *Keeping the Promise*, published by MCD in 1988. For details, contact Donald C. Holtvoigt, The Miami Conservancy District, 38 East Monument Avenue, Dayton, Ohio 45402-1210, (513)223-1271.

CONSERV 90

CONSERV 90, the National Conference and Exposition Focusing on Water Supply Solutions for the 1990s, will be held August 12-16, 1990, in Phoenix. CONSERV 90 will be the largest, most important water conservation meeting ever held in the United States. This unprecedented event of technology and information sharing will bring together the best minds, and best solutions, for the nation's agricultural, municipal, industrial and residential water supply challenges. Over 350 presentations on drought management, water resource management, water transfer, water reuse, long-term planning, public education programs and related topics will be offered. Technological advances to conserve water in all walks of life will be on display.

The ODNR Division of Water is a CONSERV 90 promotional partner. For attendee and/or exhibit information, contact Sharron Travis, 6375 Riverside Drive, Dublin, OH 43017, phone: (614)761-1711.

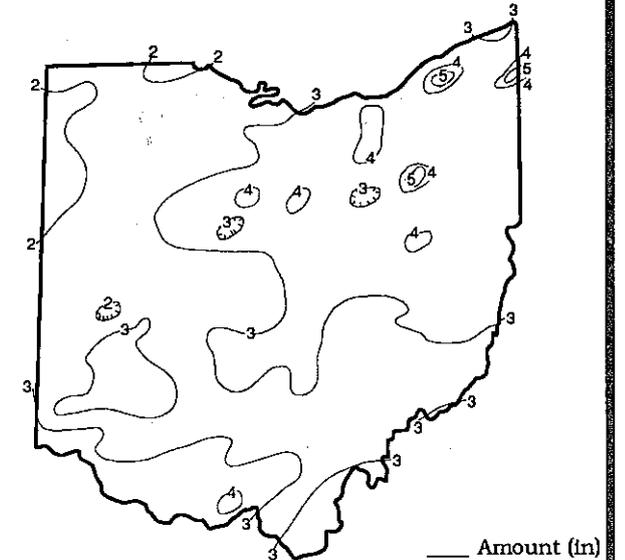
PRECIPITATION for April was below normal throughout most of the state with only the Northeast and Northeast Hills regions having above normal precipitation. The average for the state as a whole was 3.13 inches, 0.38 inch below normal. Regional averages ranged from 3.97 inches, 0.58 inch above normal, for the Northeast Region to 2.14 inches, 1.17 inches below normal, for the Northwest Region. Andover (Ashtabula County) reported the greatest amount of precipitation for the month, 5.82 inches. Stryker (Williams County) reported the least amount, 1.87 inches.

April started with several days of precipitation during the first week, but the weekly totals were generally less than 0.5 inch in the southern portion of the state increasing to around 1 inch in the northeastern portion. The heaviest precipitation for the month fell during the second week on April 10-11. Most areas received in excess of 1 inch with several areas from Mansfield northeastward receiving over 2 inches. Scattered storms at the end of the third week on April 20-21 produced slightly over 0.5 inch of precipitation at most locations, but some areas along the Ohio River in the south and also in the northeastern portion of the state recorded over 1 inch. The remainder of the month was rather dry with the year's warmest temperatures thus far being recorded. Scattered showers on April 28-29 in the southern portion of the state resulted in 0.5 inch or less of precipitation at most locations.

Cumulative precipitation for the 1990 calendar year thus far is above normal in the northern portion of the state and below normal in the southern portion. The average for the state as a whole is 11.62 inches, 0.27 inch below normal. Regional averages range from 13.47 inches, 0.11 inch below normal, for the Southwest Region to 10.56 inches, 0.28 inch above normal, for the North Central Region.

Precipitation for the first seven months of the 1990 water year is below normal throughout most of the state, with only the Northeast and North Central regions having slightly above normal precipitation. The average for the state as a whole is 18.44 inches, 1.02 inches below normal. Regional averages range from 20.26 inches, 1.51 inches below normal, for the Southwest Region to 16.38 inches, 0.85 inch below normal, for the Northwest Region.

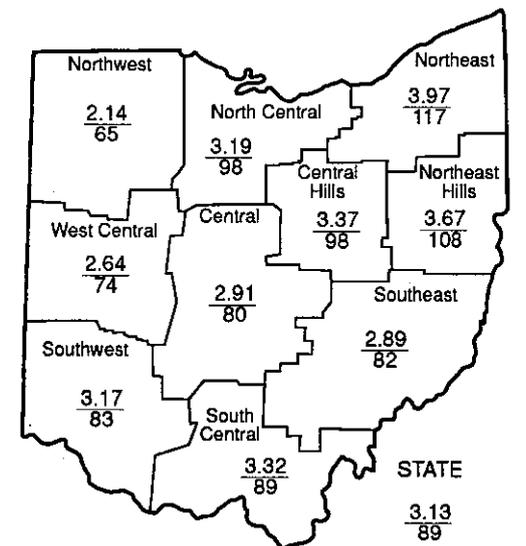
PRECIPITATION APRIL 1990



PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-1.17	+1.77	+0.01	+2.31	-1.72	-0.8
North Central	-0.06	+0.88	-0.02	+2.93	-3.53	-0.5
Northeast	+0.58	+0.85	+0.03	+7.11	+4.50	+1.2
West Central	-0.94	+1.03	-0.96	+4.09	+1.85	+0.6
Central	-0.75	-0.09	-0.96	+3.46	+4.55	+0.4
Central Hills	-0.08	-0.10	-1.24	+1.66	-0.27	-0.4
Northeast Hills	+0.27	-0.16	-1.25	+1.67	-2.55	-2.4
Southwest	-0.64	+0.78	-1.01	+1.89	+3.02	+1.3
South Central	-0.42	-1.85	-3.74	+1.74	+1.90	+0.7
Southeast	-0.65	-1.86	-2.66	+5.49	+8.08	+0.7
State	-0.38	+0.15	-1.16	+3.24	+1.88	

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



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.

ODNR

OHIO DEPARTMENT OF
NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Robert L. Goettnoeller
Chief

Natural Resources
OHIO
the heart of it all!

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	1,799	132	103	110	139
Great Miami River at Hamilton	3,630	4,489	80	107	103	139
Huron River at Milan	371	526	107	94	95	109
Killbuck Creek at Killbuck	464	673	94	107	115	125
Little Beaver Creek near East Liverpool	496	953	104	86	79	109
Maumee River at Waterville	6,330	5,382	57	97	95	105
Muskingum River at McConnelsville	7,422	11,330	87	91	103	120
Scioto River near Prospect	567	1,090	154	116	116	165
Scioto River at Higby	5,131	5,948	80	92	95	127
Stillwater River at Pleasant Hill	503	607	85	115	103	153

STREAMFLOW for April was below normal throughout most of the state; exceptions were in the northeastern and north central portions of the state where flows were slightly above normal. April flows were greater than the noticeably below normal March flows in most areas of the state; only the western and northwestern portions of the state had lower flows.

Flows at the beginning of the month were below normal throughout most of the state; only the western portion of the state started the month with above normal flows. Greatest flows for the month occurred during April 11-13 following widespread moderate precipitation on April 10. Flows declined during the remainder of the month with moderate increases noted during

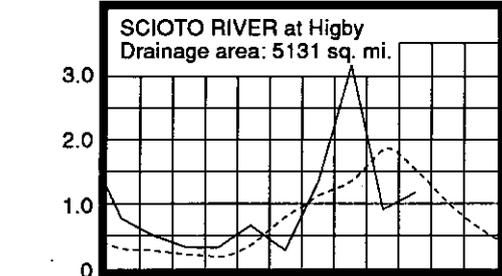
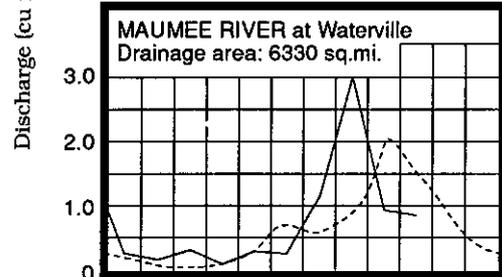
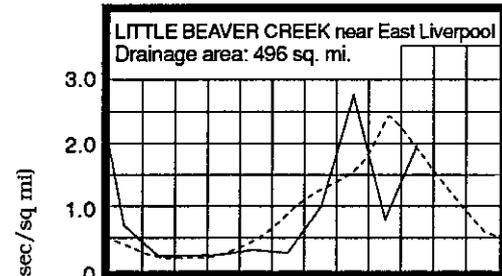
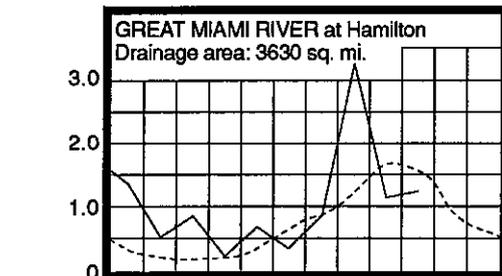
April 21-22. Lowest flows for the month for most areas of the state occurred at the month's end except in the eastern portion where lowest flows were recorded at the start of the month. Flows at the month's end were noticeably below normal statewide and in many areas were low enough to be considered deficient.

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

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 92 percent of rated capacity for water supply compared with 79 percent for last month and 100 percent for April 1989. Month end storage in the Scioto basin index reservoirs was 100 percent of rated capacity for water supply compared with 95 percent for last month and 107 percent for April 1989.

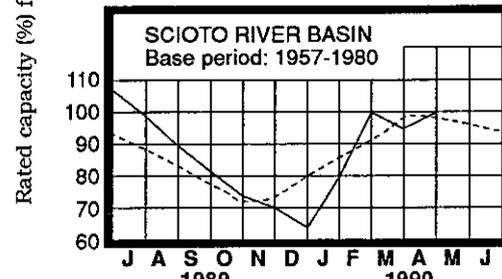
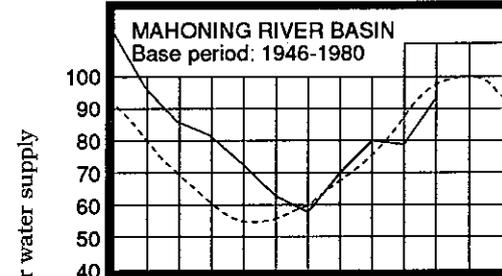
Reservoir storage is in a favorable position at this time. Most in-stream and off-stream reservoirs are at or near their normal summer pool elevation.

MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

RESERVOIR STORAGE FOR WATER SUPPLY



GROUND-WATER LEVELS during April showed mixed responses throughout the state. Generally, water levels declined until mid-month and then began to show some improvement. Water levels in all aquifers statewide normally show net rises during April. This month, however, net rises from last month's levels were noticeably less than usually observed and, in fact, net declines were recorded in many unconsolidated aquifers.

Ground-water levels range from noticeably below to slightly above normal around the state. The greatest departures below normal are in the eastern and southern portions of the state and are more pronounced in unconsolidated aquifers. Water levels are noticeably below last year's levels in the southern portion of the state and above last year's levels in the northern portion.

As the recharge season draws to a close, the ground-water storage situation remains in a favorable position, although storage is below normal in many areas. Water supply managers who depend on ground water as their source should closely monitor their respective situations.

LAKE ERIE level rose during April. The mean level for April was 571.42 feet (IGLD-1955), 0.17 foot above last month's mean level and 0.81 foot above normal. This month's level is 0.38 foot above the April 1989 level and 2.82 feet above Low Water Datum.

SUMMARY

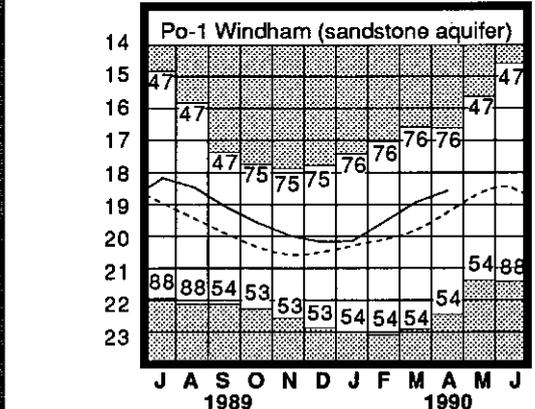
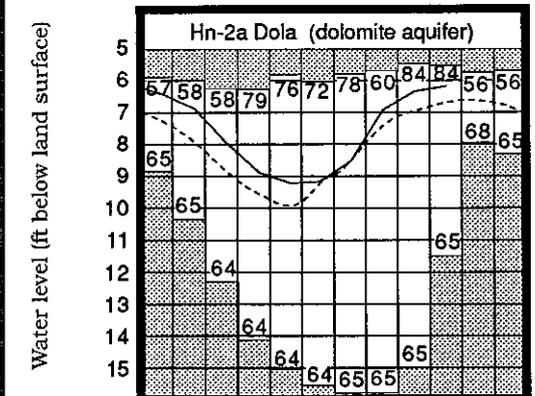
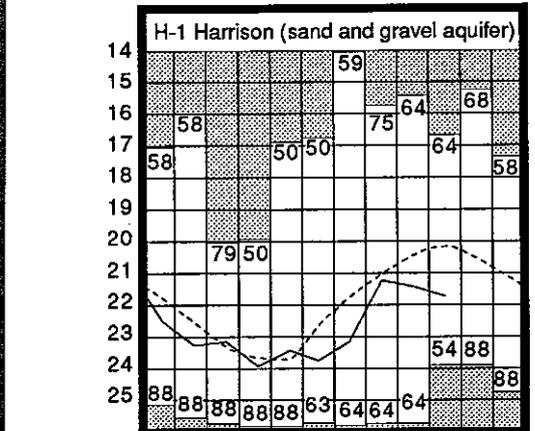
Precipitation was below normal throughout most of the state with only the northeastern portion having above normal precipitation. Streamflow was below normal throughout most of the state except in the northeastern portion where flows were above normal. Reservoir storage increased and is near normal in most locations. Ground-water levels showed mixed responses during the month and are below normal in the eastern and southern portions of the state. Lake Erie level rose 0.17 foot and is 0.81 foot above normal.

GROUND-WATER LEVELS

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

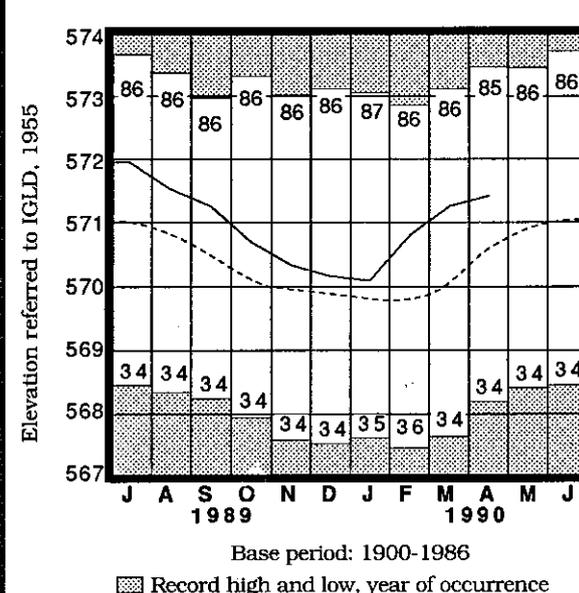
Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	14.55	-2.60	-0.68	-2.05
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.12	-0.45	+0.02	-0.78
Fr-10	Columbus, Franklin Co.	Gravel	40.96	+2.11	+0.17	+1.61
H-1	Harrison, Hamilton Co.	Gravel	21.71	-1.54	-0.17	-1.36
Hn-2a	Dola, Hardin Co.	Dolomite	6.20	+0.54	+0.15	+0.48
Po-1	Windham, Portage Co.	Sandstone	18.56	+0.66	+0.38	+1.67
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.92	-2.40	-0.61	-0.41

GROUND-WATER LEVELS



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

LAKE ERIE LEVELS at Cleveland



Normal - - - - Current - - - -

Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

May 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

Precipitation for the 1990 water year is above normal throughout the state. The average for the state as a whole is 25.50 inches, 2.29 inches above normal. Regional averages range from 30.10 inches, 4.41 inches above normal, for the Southwest Region to 21.98 inches, 1.21 inches above normal, for the Northwest Region.

NOTES AND COMMENTS

NEW PUBLICATION

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

DIVISION OF WATER INFORMATION AND PUBLICATIONS compiled by Margo Fulmer and Leonard P. Black, 55 pages.

This publication is a thorough, up-dated listing of in-print, out-of-print and unpublished documents prepared by Division of Water staff over the years. This free publication is available from: ODNR Publications Center, 4383 Fountain Square Court, Building B-1, Columbus, OH 43224-1362.

GOVERNOR CELESTE REQUESTS FEDERAL FLOOD DISASTER AID

Governor Celeste requested and received from the federal government a flood disaster area declaration for four counties in Ohio. Those counties are Athens, Hocking, Lawrence and Perry. Over 400 residences and businesses were affected, with damages expected to exceed several million dollars. The following additional counties may be added to the disaster declaration: Jackson, Pike, Ross and Vinton.

The locally severe flooding followed widespread precipitation in the southern half of the state during May 25-29. The heaviest precipitation occurred on May 28-29 with amounts of 2 to over 3.5 inches reported at many locations. The most severe flooding occurred on the Hocking River and its tributaries and those of the Ohio River, as well as the Scioto River and its tributaries. Several lives were lost in the flood waters.

Flows on the main rivers were in the 10-year recurrence interval range and probably higher on the tributaries.

WILMINGTON OBTAINS ADDITIONAL WATER SUPPLY

On May 25, 1990 the City of Wilmington broke ground for a new 12-mile water-supply pipeline and signed an agreement with ODNR to purchase raw water from Caesar Creek Reservoir. The agreement with ODNR allows the city to withdraw up to seven million gallons of water per day from the reservoir. This multi-purpose reservoir was constructed in the 1970s. ODNR Director Joseph J. Sommer said ODNR is proud to be a part of the economic development of the area. Several local dignitaries as well as ODNR Division of Water Chief Robert L. Goettemoeller were on hand for the ceremony.

YOUTHS EXCEL ON STATE SCIENCE DAY

State Science Day, sponsored by the Ohio Academy of Science, is the culmination of many local and district science fairs throughout the state. The ODNR Division of Water has coordinated the special award in water since Governor Celeste established the Youth Science Award series in October 1984.

Winners of the "Governor's Award for Excellence in Water Resources Research" at the State Science Day on April 21 were:

First—Rob S. Crawford, grade 10, Stow-Monroe Falls H.S., Stow, A Stream Study of Benthic Macroinvertebrates."

Second—Adam T. Hayes, grade 8, Seven Hills M.S., Cincinnati, "Desalination: Is the Freeze Concentration Method Effective?"

Third—Randall A. Wulker, grade 8, St. Veronica E.S., Cincinnati, "The Effects Rain Solutions Have On Soil When It Passes Through It."

Also, receiving Honorable Mention were:

Steve L. Flandro, grade 7, St. Barnabas E.S., Northfield;

Mark A. Hudson, grade 8, Riverside H.S., Degraff;

Kristen A. Lewis, grade 10, Harding H.S., Marion.

PRECIPITATION for May was noticeably above normal throughout the state. The average for the state as a whole was 7.06 inches, 3.31 inches above normal. This ranks May 1990 as the second wettest May in 108 years of record keeping. Regional averages ranged from 9.84 inches, 5.92 inches above normal, for the Southwest Region to 4.88 inches, 1.37 inches above normal, for the North Central Region. This was the second wettest May on record for the Central Hills, Southwest, South Central and Southeast regions, the third wettest for the Central Region and the fourth wettest for the Northwest and West Central regions. Fayetteville (Brown County) reported the greatest amount of precipitation for the month, 12.20 inches. Other stations reporting over 11 inches for the month were: Perintown (Clermont County); Chillicothe (Ross County); Spring Valley Wildlife Area (Greene County); Hillsboro (Highland County); and Rockbridge (Hocking County). Sandusky (Eric County) reported the least amount of precipitation for the month, 4.12 inches.

Precipitation fell during every week of the month. Several days of precipitation each week, often over the weekends, kept soil moisture in the adequate to surplus range throughout the month. Total precipitation each week was seldom less than 1 inch at any location and usually between 1 and 2 inches; however, several locations, especially in the southern portion of the state, received in excess of 2 inches. On May 3-4, over 2 inches fell at many locations from the southwestern portion of the state up through the north-central area. Storms during May 13-17 dumped 2 to 3 inches of precipitation at many locations in the southern two-thirds of the state and up to 4 inches in the southwestern portion. Minor flooding occurred in the western half of the state following the May 16-17 precipitation. Many locations in the southeastern portion of the state received around 2 inches of precipitation on May 25-26 and then, on May 28, the southern half of the state received an additional 2 to nearly 4 inches. The greatest amounts fell in the south-central area of the state. Moderate to locally severe flooding occurred along the Hocking and Scioto rivers and their tributaries following the Memorial Day precipitation.

Precipitation for the 1990 calendar year thus far is above normal throughout the state. The average for the state as a whole is 18.68 inches, 3.04 inches above normal. Regional averages range from 23.31 inches, 5.81 inches above normal, for the Southwest Region to 15.44 inches, 1.65 inches above normal, for the North Central Region.

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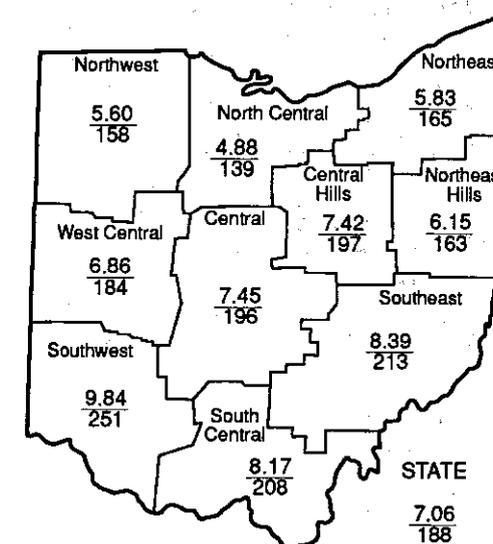
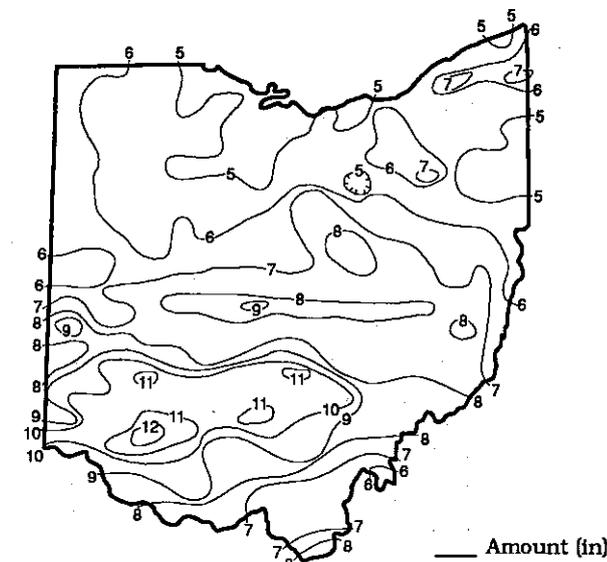
PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+2.06	+0.46	+2.39	+2.96	+2.86	+0.2
North Central	+1.37	-0.21	+0.77	+1.40	+0.64	+1.6
Northeast	+2.30	+0.63	+1.98	+5.91	+8.18	+2.2
West Central	+3.14	+1.67	+2.04	+4.28	+7.37	+2.5
Central	+3.64	+1.30	+2.36	+4.48	+10.31	+1.2
Central Hills	+3.65	+1.32	+2.09	+3.04	+5.05	+1.9
Northeast Hills	+2.37	+0.34	+1.44	+1.93	+1.74	-0.6
Southwest	+5.92	+4.58	+4.69	+5.50	+11.47	+3.5
South Central	+4.24	+1.66	+0.95	+5.47	+7.65	+3.2
Southeast	+4.45	+2.04	+2.20	+7.50	+13.86	+2.7
State	+3.31	+1.38	+2.10	+4.25	+7.13	

*Above +4 = Extreme Moist Spell
3.0 To 3.9 = Very Moist Spell
2.0 To 2.9 = Unusual Moist Spell
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PRECIPITATION MAY 1990



Average (in)
Percent of normal

ACKNOWLEDGEMENTS

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Precipitation data:
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Palmer Drought Severity Index:
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ODNR

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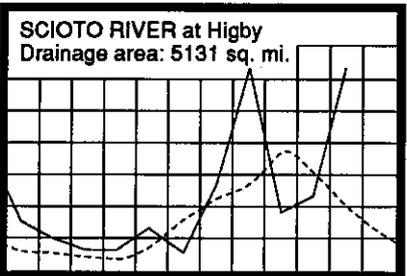
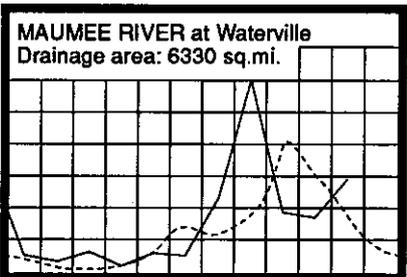
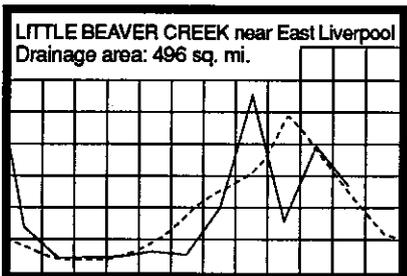
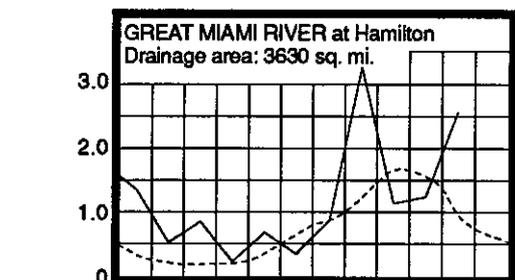
Robert L. Goettemoeller
Chief



MEAN STREAM DISCHARGE

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
Grand River near Palmsville	685	1,431	423	82	112	125
Great Miami River at Hamilton	3,630	9,317	303	108	117	135
Huron River at Milan	371	393	179	66	91	98
Killbuck Creek at Killbuck	464	845	171	89	118	126
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Scioto River near Prospect	567	1,253	363	129	129	133
Scioto River at Higby	5,131	16,272	345	110	120	130
Stillwater River at Pleasant Hill	503	1,240	380	115	122	137

MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

Discharge (cu ft./sec./sq mi)

STREAMFLOW for May was above normal throughout the state. Flows were high enough to be considered excessive in all but a part of the eastern portion of the state. May flows were greater than the April flows in all but the northeastern portion of the state. The mean flow of 16,272 cfs for the Scioto River at Higby gauging station was the third highest for May for the period of record.

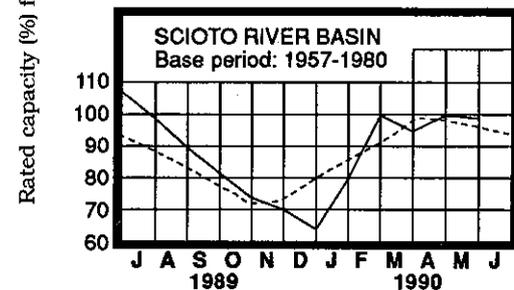
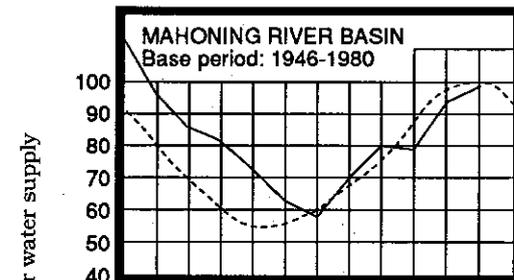
Flows at the beginning of the month were below normal throughout the state. Lowest flows for the month for most areas of the state occurred during the middle of the first week. Two noticeably high flow periods occurred during the month. The first was during May 16-18. Most areas in the northern and western portions of the

state had their highest flows during this period. Minor flooding occurred in the western and northwestern portions of the state. The second high flow event occurred during May 28-30. Most areas in the south-central and southeastern portions of the state had their highest flows during this period. Moderate to locally severe flooding occurred in several areas along the Scioto and Hocking rivers and their tributaries (see Governor Celeste Requests Federal Flood Disaster Aid on the last page of this report). Flows were declining at the month's end and were generally below normal in the northern portion of the state, but still noticeably above normal in the southern portion.

RESERVOIR STORAGE for water supply during May increased in the Mahoning River basin and declined slightly in the Scioto River basin. Storage remained slightly below normal in the Mahoning basin index reservoirs. Storage remained slightly above normal in the Scioto basin index reservoirs even though O'Shaughnessy Reservoir has been drawn down since early 1990 for replacement of the bridge over the dam.

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 99 percent of rated capacity for water supply compared with 92 percent for last month and 108 percent for May 1989. Month end storage in the Scioto basin index reservoirs was 99 percent of rated capacity for water supply compared with 100 percent for last month and 107 percent for May 1989.

RESERVOIR STORAGE FOR WATER SUPPLY



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

Rated capacity (%) for water supply

GROUND-WATER LEVELS during May showed net rises throughout the state in response to the above normal precipitation during the month. Water levels in shallow unconsolidated aquifers in the southern portion of the state rose early in the month following precipitation events and continued to respond favorably as precipitation occurred during the month. Ground-water levels statewide in consolidated aquifers and deeper unconsolidated aquifers declined or remained stable until mid-month and then rose until the month's end. Water levels in consolidated aquifers usually continue to show net rises through May in response to delayed recharge while levels in unconsolidated aquifers usually show net declines during May. Although the net rises this month from last month's levels were not large, it will be beneficial in maintaining a favorable ground-water storage situation.

Ground-water levels are slightly above normal throughout most of the state with only some aquifers in the eastern portion being below normal. This month's levels are above those of a year ago in the northern and western portions of the state, but below last year's levels in the south-central and eastern portions.

The recharge season is drawing to a close in a positive way. Ground-water storage improved during May and is in a favorable position as the summer discharge season begins.

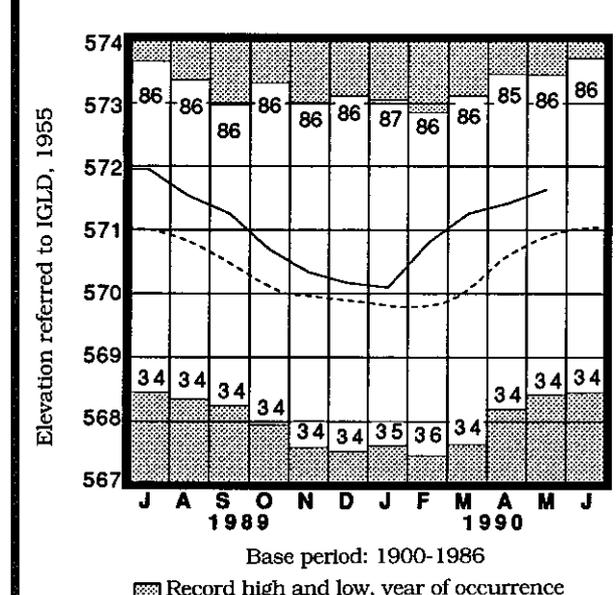
LAKE ERIE level rose during May. The mean level for May was 571.62 feet (IGLD-1955), 0.20 foot above last month's mean level and 0.70 foot above normal. This month's level is 0.31 foot above the May 1989 level and 3.02 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that precipitation in the Lake Erie basin for the past 12 months ending in April 1990 was 5.1 inches above normal. Precipitation for the entire Great Lakes basin has near normal for the same period.

SUMMARY

Precipitation was above normal throughout the state. Many areas in the southern half of the state had the second wettest May on record. Streamflow was excessive statewide with moderate to locally severe flooding in the southern half of the state near the month's end. Reservoir storage increased. Ground-water levels rose and are near normal throughout most of the state. Lake Erie level rose 0.2 foot and is approaching its seasonal high level.

LAKE ERIE LEVELS at Cleveland



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

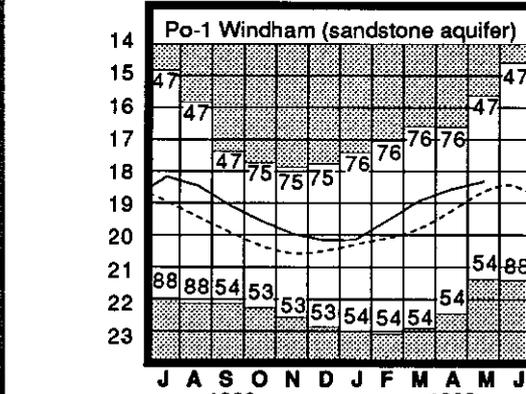
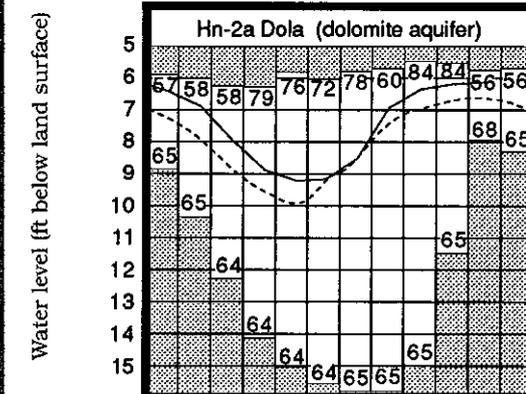
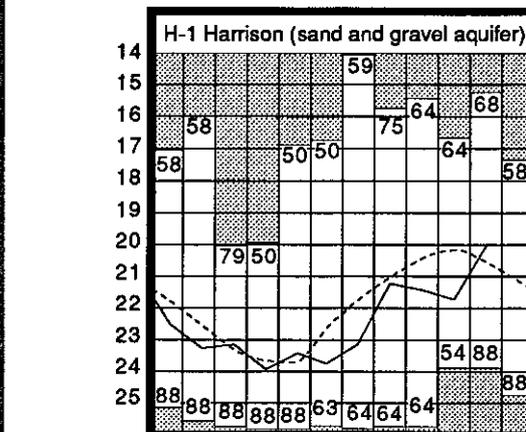
Elevation referred to IGLD, 1955

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	14.44	-2.33	+0.11	-2.98
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.85	+0.17	+0.27	-0.56
Fr-10	Columbus, Franklin Co.	Gravel	40.87	+2.41	+0.09	+1.24
H-1	Harrison, Hamilton Co.	Gravel	20.05	+0.46	+1.66	+0.16
Hn-2a	Dola, Hardin Co.	Dolomite	6.15	+0.48	+0.05	+0.20
Po-1	Windham, Portage Co.	Sandstone	18.32	+0.27	+0.24	+1.43
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.77	-1.90	+0.15	-0.03

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 - - - -

Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

June 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

The second half of the month was much drier statewide than the first half. Scattered precipitation during several of the last 10 days of the month totaled 0.5 to 1 inch at most locations, but isolated areas, especially in the northwestern, north-central and southwestern portions of the state, received from 1 to over 2 inches. Tornadoes swept through portions of Morrow and Richland counties on June 22 resulting in a disaster declaration for those counties.

Precipitation for the first half of the 1990 calendar year is above normal throughout the state (see precipitation table, past 6 month departure column, on this page). The average for the state as a whole is 22.57 inches, 2.97 inches above normal. Regional averages range from 26.93 inches, 5.38 inches above normal, for the Southwest Region to 18.59 inches, 0.98 inch above normal, for the North Central Region.

Precipitation for the 1990 water year is above normal throughout the state. The average for the state as a whole is 29.38 inches, 2.21 inches above normal. Regional averages range from 33.72 inches, 3.98 inches above normal, for the Southwest Region to 25.64 inches, 1.18 inches above normal, for the North Central Region.

NOTES AND COMMENTS TRAGIC FLASH FLOODS HIT OHIO

During the evening of June 14, thunderstorms rumbled across the midsection of the state. Small stream and urban flooding was common from Franklin County east through Fairfield and Licking counties. Farther east, over portions of Belmont, Harrison, Jefferson and Monroe counties, an intense storm cell inundated several small, steep drainage basins with an estimated 5.5 inches of precipitation falling in less than three hours, the bulk of which fell in less than one hour. These conditions, coupled with already high streamflows, resulted in a flash flood that produced a powerful wall of water up to 20 feet high. The National Weather Service estimated the storm to be in excess of a 500-year recurrence interval. Several of the steep drainage basins in the four-county area, as well as in West Virginia's Ohio County, had flooding conditions. Hardest hit were Pipe and Wegee creeks near Shadyside in Belmont County. Nearly 350 homes and businesses were destroyed or damaged by the floodwaters in these basins alone. Flows in these creeks were estimated by the U.S. Geological Survey to be well in excess of a 100-year recurrence interval. Tragically, 26 people lost their lives, and several may still be missing. Nearly 2,000 homes and businesses were damaged or destroyed in the six-county area in Ohio that had flooding conditions following the June 14 storms.

Flooding conditions have plagued Ohio the past two months. At least 29 people have lost their lives and damages to property have been extensive. All or portions of 17 counties have been declared flood disaster areas. Those counties are: Athens, Belmont, Fairfield, Franklin, Harrison, Hocking, Jackson, Jefferson, Lawrence, Licking, Madison, Monroe, Muskingum, Perry, Pike, Ross and Vinton. In addition, five counties have been declared disaster areas due to tornadoes. Those counties are: Butler, Clermont, Hamilton, Morrow and Richland. A total of 22 of Ohio's 88 counties have had disaster declarations this year.

BUCKEYE LAKE DAM REPAIRS NEARLY UNDERWAY

The Ohio Department of Natural Resources (ODNR) currently has an engineering consultant under contract to prepare plans to upgrade the dam at Buckeye Lake to modern safety standards. The major items of the plan are to construct a new, much larger spillway at Seller's Point; raise the low points of the embankment crest 6 to 18 inches in some areas; and replace the existing outlet works. Construction of the new spillway and outlet works is expected to begin this year and be completed in 1993. Plans are to request funding for the embankment crest work in the next capital budget.

Recent storms and resultant flooding at Buckeye Lake demonstrated the urgency of these needed improvements and rehabilitation. The lake level came within 9 inches of overtopping the dam and as a precaution, nearly 3000 residents and campers were evacuated. Buckeye Lake dam has been and will continue to be ODNR's number one priority for dam rehabilitation.

Since 1963, the ODNR Division of Water has been charged with the responsibility for administration and enforcement of Ohio's dam safety laws. The division's Dam Safety and Water Engineering Sections permit the construction of new dams, dikes and levees and have the responsibility to periodically inspect 1,700 existing dams. Neglecting the proper and safe operation and maintenance of dams and their reservoirs poses threats to persons and properties located downstream. The well-being and health of the public dependent on the stored water is also threatened.

PRECIPITATION for June was below normal in the northeastern and southwestern portions of the state and above normal in the northwestern, central and eastern portions. The average for the state as a whole was 3.89 inches, 0.07 inch below normal. Regional averages ranged from 4.67 inches, 0.61 inch above normal, for the Central Region to 2.55 inches, 1.33 inches below normal, for the South Central Region. Cadiz (Harrison County) reported the greatest amount of precipitation for the month, 8.79 inches, 5 inches of which fell during the evening of June 14. Cleveland Hopkins International Airport (Cuyahoga County) reported the least amount of precipitation for the month, 1.72 inches.

Precipitation fell during every week of the month, mostly in the form of summer-type showers and thunderstorms. The most notable events during the month occurred during the first two weeks. Scattered storms during June 2-3 resulted in precipitation amounts of generally less than 0.5 inch in many areas, but destructive tornadoes touched down in Hamilton, Butler and Clermont counties causing much damage and resulting in a disaster declaration for those counties. Scattered thunderstorms during June 6-9 produced a total of 0.5 to over 4 inches of rain throughout the state with the greatest amounts falling in the central portion. On June 8-9, isolated storms dumped over 3 inches of rain in the Buckeye Lake area and over 4 inches in the New Lexington (Perry County) area. Flooding occurred in Fairfield, Licking, Muskingum and Perry counties. Buckeye Lake came within 9 inches of overtopping the levees and forced the evacuation of nearly 3,000 residents and campers. Potential tragedy was averted, but within a week the same could not be said. On June 14, slow-moving thunderstorms rumbled across the midsection of the state with isolated storm cells dumping 1 to 3 inches of rain in many locations. Small stream and urban flooding occurred in Franklin and Licking counties, especially in Columbus and surrounding suburbs, as well as in Newark and Marne. Farther east, over portions of Belmont, Jefferson, Harrison and Monroe counties, an intense thunderstorm inundated several small, steep drainage basins with 5.5 inches of rain in less than three hours with the bulk of the total falling in less than one hour. These conditions, coupled with already high streamflows, resulted in flash floods producing a powerful wall of water 20 feet high at times. Pipe and Wegee creeks near Shadyside (Belmont County) were hardest hit (see *Tragic Flash Floods Hit Ohio* on back page of this report).

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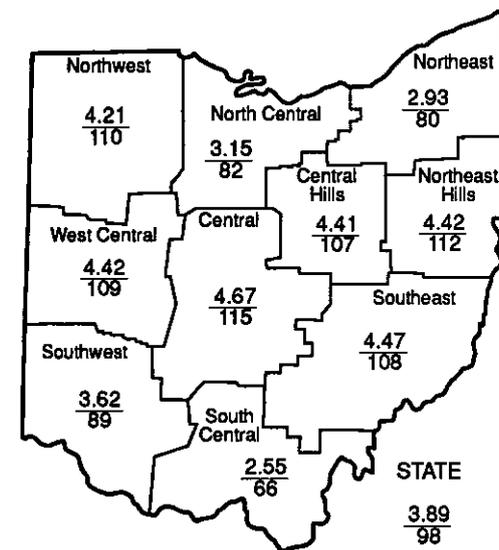
PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+0.38	+1.27	+3.83	+3.19	+6.64	-0.7
North Central	-0.67	+0.64	+0.98	-0.38	+3.18	+0.4
Northeast	-0.75	+2.13	+1.85	+1.45	+10.19	+1.0
West Central	+0.38	+2.58	+3.61	+3.71	+10.65	+1.1
Central	+0.61	+3.50	+3.73	+3.64	+13.80	+1.0
Central Hills	+0.30	+3.87	+3.17	+0.18	+8.72	+0.8
Northeast Hills	+0.46	+3.10	+2.56	-1.64	+5.07	-0.7
Southwest	-0.43	+4.85	+5.38	+4.99	+14.17	+2.5
South Central	-1.33	+2.49	+0.91	+2.68	+9.60	+1.5
Southeast	+0.33	+4.13	+3.56	+5.90	+17.28	+1.9
State	-0.07	+2.86	+2.97	+2.38	10.17	

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

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

PRECIPITATION JUNE 1990



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 nears, 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

Richard F. Celeste
Governor

Joseph J. Sommer
Director

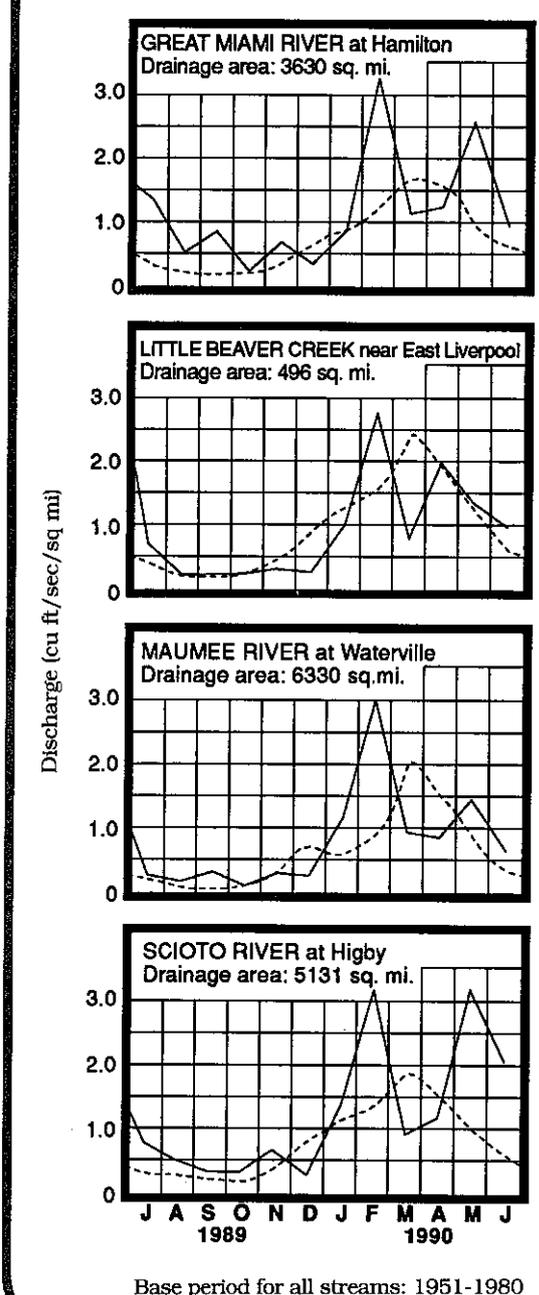
Robert L. Goettmoeiller
Chief



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	181	69	155	122	104
Great Miami River at Hamilton	3,630	3,415	157	141	122	127
Huron River at Milan	371	94	59	102	99	85
Killbuck Creek at Killbuck	464	920	428	152	136	118
Little Beaver Creek near East Liverpool	496	470	158	100	95	81
Maumee River at Waterville	6,330	4,055	184	92	111	98
Muskingum River at McConnelsville	7,422	17,380	358	157	130	114
Scioto River near Prospect	567	821	456	227	142	136
Scioto River at Higby	5,131	10,504	348	185	134	132
Stillwater River at Pleasant Hill	503	367	154	144	125	137

MEAN STREAM DISCHARGE



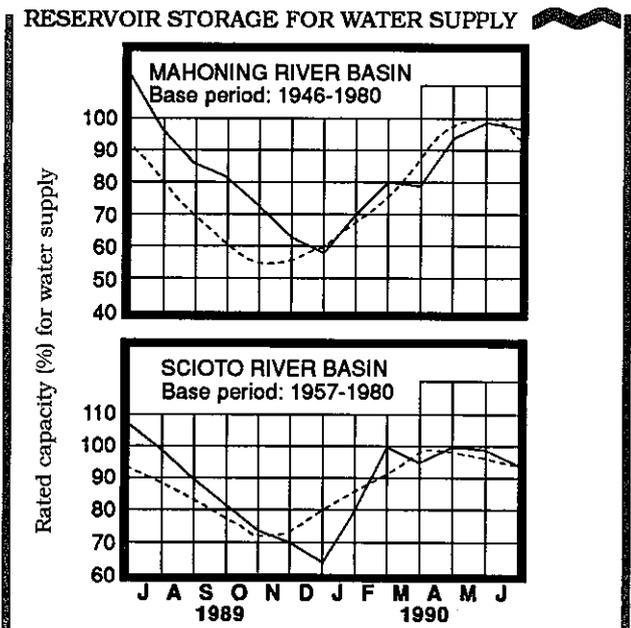
Normal - - - - Current - - - -

STREAMFLOW for June was above normal throughout most of the state with only the north-central and extreme northeast portions having below normal flows. June flows in the eastern part of the state were greater than May flows, but elsewhere June flows were less than last month's flows. The mean flow of 17,380 cfs and 10,504 cfs for the Muskingum River at McConnelsville and Scioto River at Higby gauging stations respectively were the fourth highest for June for the period of record.

Flows at the beginning of the month were above normal throughout most of the state except in the north-central portion where they were below normal. Flows generally declined the first week of the month and then increased after widespread precipitation on June 8. Highest flows for most areas of the state occurred shortly after this date. Flooding occurred in portions of Fairfield, Licking, Perry and Muskingum counties on June 8-9. Buckeye Lake rose to near record levels and forced the evacuation of nearly 3,000 residents. Flows in most areas of the state declined until the month's end with slight increases noted following local precipitation; however, an exception was in the eastern portion of the state where several small drainage basins had flash floods following localized intense rainfall on June 14. Portions of Jefferson and Belmont counties were the hardest hit. The most notable flash flooding occurred on Pipe and Wegee creeks with Short and McMahon creeks also having serious flooding (see *Tragic Flash Floods Hit Ohio* on the last page of this report). Lowest flows for the month for most areas of the state were at or near the month's end. Flows in most portions of the state were below normal at the month's end.

RESERVOIR STORAGE for water supply decreased in both the Mahoning and Scioto river basins. Month-end storage was above normal in the Mahoning basin index reservoirs for the first time since February. Storage was normal in the Scioto 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 99 percent for last month and 115 percent for June 1989. Month-end storage in the Scioto basin index reservoirs was 94 percent of rated capacity for water supply compared with 99 percent for last month and 107 percent for June 1989.



GROUND-WATER LEVELS during June showed net rises from last month's levels throughout most of the state. The only exceptions were in the southwestern and extreme northern portions where net declines were noted. Greatest positive changes from May levels occurred in the eastern portion of the state.

Ground-water levels during the month were rather stable in consolidated aquifers with slight rises noted early, mainly in response to delayed recharge from the above-normal May precipitation. Unconsolidated aquifers responded in accordance to the local precipitation conditions. In areas where precipitation was near normal, levels were stable or declined slowly during the month. In areas where precipitation was noticeably above normal, moderate rises were noted during the first half of the month. Ground-water levels throughout the state were declining during the last week or so of the month.

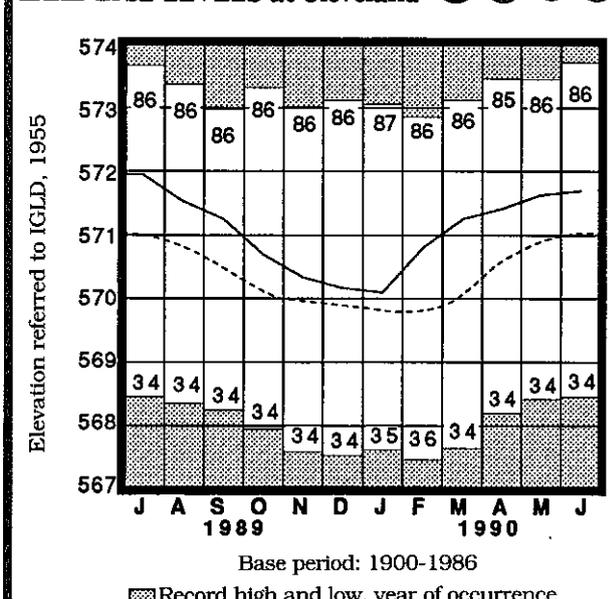
Ground-water levels are slightly above normal throughout most of the state. Levels are above those of a year ago in the northern portion of the state but below last year's levels in the southern portion. Above normal precipitation during the past two months in many areas of the state has benefited ground-water storage. Ground-water supplies are in a favorable position at this time.

LAKE ERIE level rose during June. The mean level was 571.69 feet (IGLD-1955), 0.07 foot above last month's mean level and 0.64 foot above normal. This month's level is 0.28 foot below the June 1989 level and 3.09 feet above Low Water Datum.

SUMMARY

Precipitation was above normal in the northwestern, central and eastern portions of the state, but below normal in the northeastern and southwestern portions. Streamflow was above normal in all but the north-central and extreme northeastern portions of the state. Flash flooding in Belmont County on June 14 resulted in the loss of at least 26 lives. Reservoir storage decreased but remained above normal. Ground-water levels showed net rises in most areas of the state. Lake Erie level was 571.69 feet (IGLD-1955), 0.64 foot above normal. The water supply situation is favorable throughout the state.

LAKE ERIE LEVELS at Cleveland

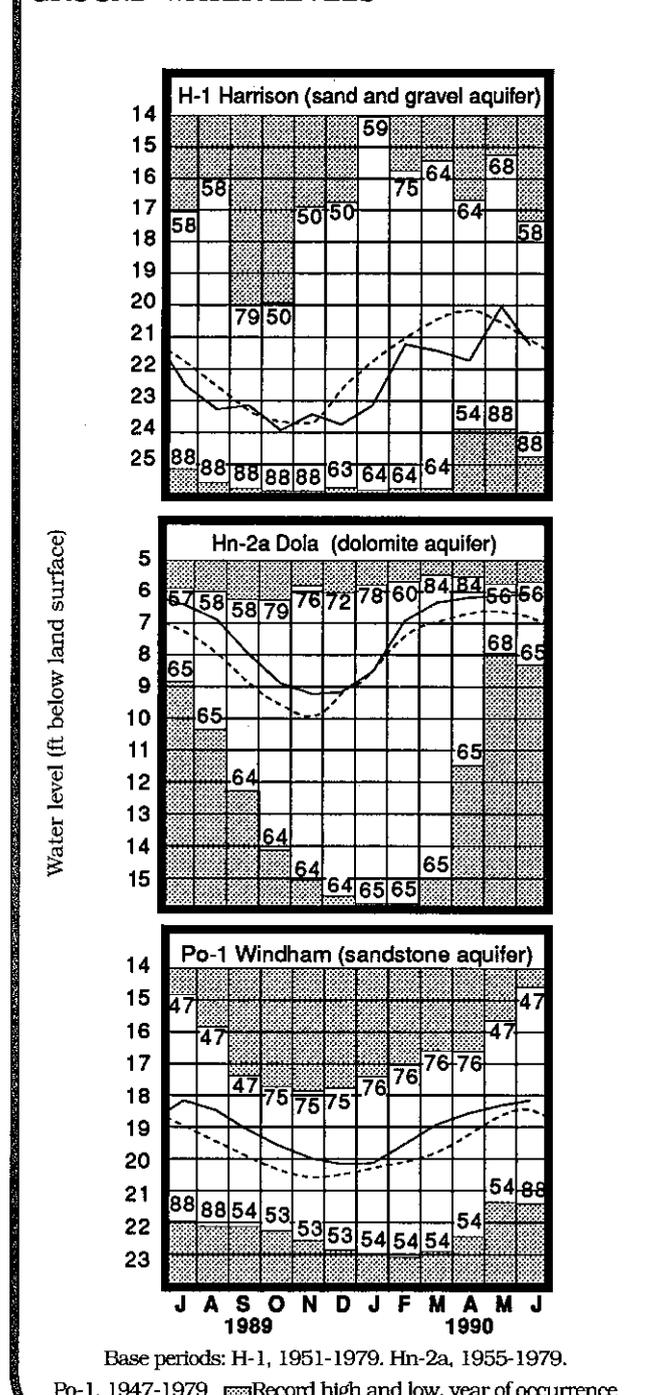


GROUND-WATER LEVELS

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	+1.08	+1.79	-0.42
Fa-1	Jasper Mill, Fayette Co.	Limestone	6.97	+0.38	-0.12	-0.26
Fr-10	Columbus, Franklin Co.	Gravel	40.51	+2.92	+0.36	+1.06
H-1	Harrison, Hamilton Co.	Gravel	21.24	-0.12	-1.19	-0.32
Hn-2a	Dola, Hardin Co.	Dolomite	6.12	+0.65	+0.03	+0.02
Po-1	Windham, Portage Co.	Sandstone	18.17	+0.26	+0.15	+0.61
Tu-1	Strasburg, Tuscarawas Co.	Gravel	11.75	+0.03	+1.02	+0.48

GROUND-WATER LEVELS



Normal - - - - Current - - - -



MONTHLY WATER INVENTORY REPORT FOR OHIO

JULY 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

falling in the central portion. Small stream and urban flooding was again common in the central portion of the state on July 21-22 and in the northwestern portion on July 22-23. A cloudburst in the Akron-Canton area on July 24 also resulted in urban flooding conditions. The remainder of the month was rather dry in most areas with scattered showers near the month's end.

Precipitation for the 1990 calendar year is above normal throughout the state. The average for the state as a whole is 28.90 inches, 5.38 inches above normal. Regional averages range from 32.05 inches, 6.53 inches above normal, for the Southwest Region to 24.44 inches, 3.37 inches above normal, for the North Central Region. The Central Region's total of 31.43 inches is the greatest departure above normal, 7.55 inches. The past few months have been wet in many locations. In fact, the state average for May through July 1990 is 17.29 inches, 5.66 inches above normal. This ranks May-July 1990 as the second wettest on record for this period with only the total of 17.87 inches in 1958 being greater. This above normal precipitation has been favorable for water supplies but has resulted in considerable damage to property and the loss of several lives.

Precipitation for the 1990 water year is above normal throughout the state. The average for the state as a whole is 35.73 inches, 4.64 inches above normal. Regional averages range from 38.84 inches, 5.13 inches above normal, for the Southwest Region to 31.40 inches, 3.36 inches above normal, for the Northwest Region.

NOTES AND COMMENTS

NEW PUBLICATION

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

Ground Water Pollution Potential of Pickaway County by David J. Sugar

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 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.

In addition to Pickaway County, ground-water pollution potential maps are available for Hamilton, Lorain, Madison and Mercer counties. Each map costs \$12.30 (includes postage and tax). Copies of these publications may be obtained from:

ODNR-PUBLICATIONS CENTER

4383 Fountain Square Court, Building B-1
Columbus, OH 43224-1362

Make checks payable to ODNR PUBLICATIONS CENTER.

THREE NEW EMPLOYEES JOIN GWRS STAFF

The ODNR, Division of Water, Ground-Water Resources Section (GWRS) has added three new employees to its staff.

Bill Haiker and Julie Piskura have joined the GWRS Technical Services Unit as hydrogeologists. Bill and Julie will answer requests regarding well log information and assist in collecting field data for special investigations and detailed aquifer studies.

Bill received his bachelor's degree in geology from Michigan State University. His outside interests include volleyball, running, fishing and astronomy.

Julie earned her bachelor's degree in geology from Cleveland State University. Julie began working for the GWRS this past April as a college intern while completing her master's degree in geology from The Ohio State University. Away from work Julie enjoys gardening, hiking and reading.

Xiaoning (Ning) Jiang has joined the GWRS Mapping Unit as a cartographer. Ning will be producing ground-water resource and ground-water pollution potential maps. Ning arrived in this country from China last year. While living in China, she received a bachelor's degree in cartography and a master's degree in computer cartography from the Nanjing University.

PRECIPITATION for July was noticeably above normal throughout the state with only small areas in the extreme northern portion and southern portion along the Ohio River having below normal precipitation. The average for the state as a whole was 6.34 inches, 2.42 inches above normal. This ranks July 1990 as the third wettest July in 108 years of record keeping. Regional averages ranged from 8.02 inches, 3.81 inches above normal, for the Northeast Hills Region to 4.77 inches, 0.31 inch above normal, for the South Central Region. For the period of record, this was the second wettest July for the Central Region; the third wettest for the Central Hills Region; the fourth wettest for the Northeast Region; the fifth wettest for the Northeast Hills and West Central regions; the sixth wettest for the Southeast Region; and the seventh wettest for the North Central Region. The Columbus Hap Cremean Water Plant (Franklin County) reported the greatest official amount of precipitation for the month, 10.40 inches. Several unofficial precipitation gauging stations in the Columbus area reported over 11 inches. Other stations reporting over 10 inches for the month were Akron-Canton Airport (Summit County), 10.03 inches and Celina (Mercer County), 10.05 inches. Toledo Express Airport (Lucas County) reported the least amount of precipitation for the month, a scant 1.89 inches.

The month started with a typical summer weather pattern with dry conditions throughout most of the state and a few scattered thunderstorms. Most areas received little or no rain during the first week; however, a few locations in the eastern and southeastern portions received 1 to over 2 inches on July 5 with the greatest amounts falling in Vinton and Muskingum counties. A slow moving weather system remained in the state for several days and produced substantial precipitation throughout most of the state from July 9-15. Most areas of the state received between 2.5 and 5 inches of rain during this period, but several areas in the Columbus, Dayton and Mansfield vicinities received nearly 8 inches. Some daily precipitation totals were more than 4 inches. Only the extreme northwestern portion received less than 1 inch of rain during this period. Several areas experienced small stream and urban flooding on several days throughout this period. On July 19 an isolated storm dumped more than 3 inches of rain in a short period in several Cleveland suburbs causing urban flooding. During July 20-24 the state again received widespread precipitation. Most areas in the northern two-thirds of the state received from 2 to 4 inches of rain with the greatest amounts

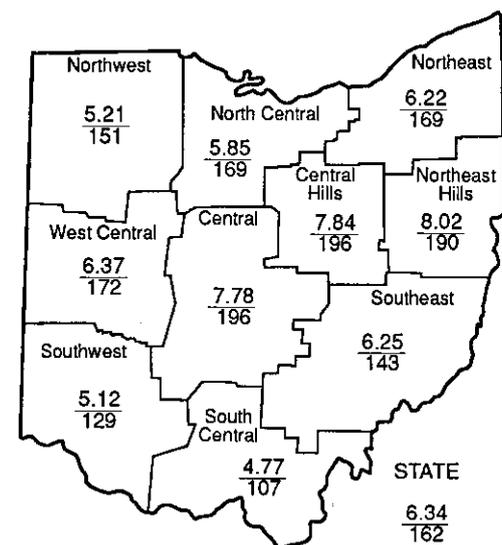
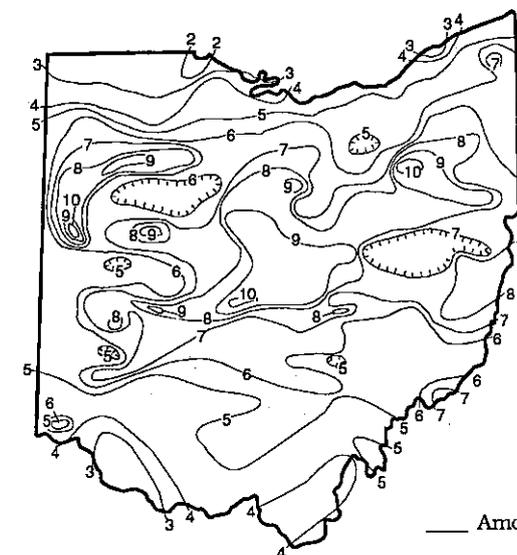
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PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+1.77	+4.21	+5.98	+3.83	+8.42	+1.7
North Central	+2.39	+3.09	+3.97	+2.13	+5.95	+1.9
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West Central	+2.66	+6.18	+7.21	+5.67	+13.01	+2.8
Central	+3.82	+8.07	+7.98	+7.30	+15.89	+1.9
Central Hills	+3.85	+7.80	+7.70	+5.44	+10.52	+2.4
Northeast Hills	+3.81	+6.64	+6.48	+3.93	+9.01	+1.7
Southwest	+1.15	+6.64	+7.42	+5.78	+14.54	+3.2
South Central	+0.31	+3.22	+1.37	+3.62	+11.19	+1.4
Southeast	+1.88	+6.66	+5.00	+8.44	+18.80	+2.7
State	+2.42	+5.66	+5.81	+5.11	+12.03	

*Above +4 = Extreme Moist Spell
3.0 To 3.9 = Very Moist Spell
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PRECIPITATION JULY 1990



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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.

ODNR

OHIO DEPARTMENT OF
NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Robert L. Goettmoeller
Chief



MEAN STREAM DISCHARGE

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
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				This Month		
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Little Beaver Creek near East Liverpool	496	1,538	729	216	127	100
Maumee River at Waterville	6,330	7,096	529	195	117	107
Muskingum River at McConnelville	7,422	13,647	386	238	138	121
Scioto River near Prospect	567	1,091	1,457	492	175	150
Scioto River at Higby	5,131	9,718	577	362	153	142
Stillwater River at Pleasant Hill	503	728	633	308	160	138

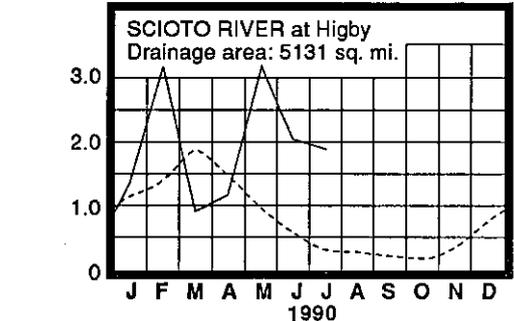
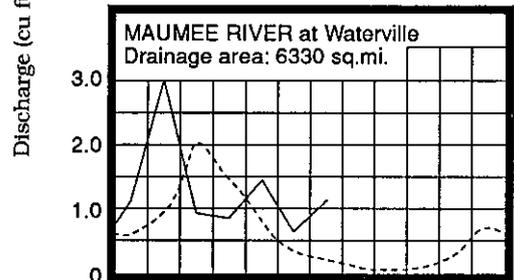
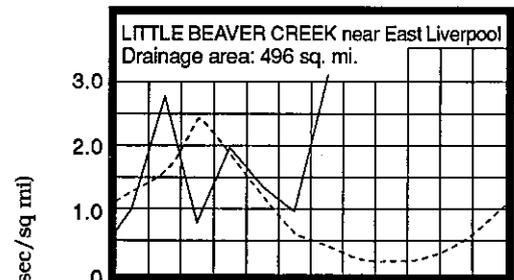
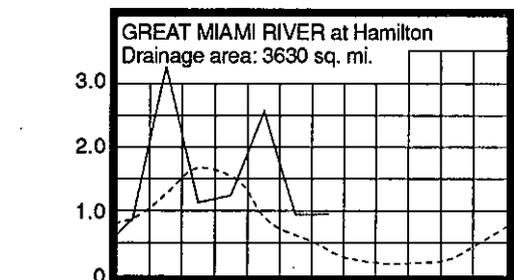
STREAMFLOW for July was noticeably above normal throughout most of the state with only the extreme north-eastern area along Lake Erie having below normal flows. Flows were high enough to be considered excessive statewide except in the afore mentioned northeastern portion. July flows were greater than the June flows throughout most of the state with only the southeast quadrant having lower flows. Several record or near record July flows occurred during the month. The most notable were: Little Beaver Creek near East Liverpool, mean flow of 1,538 cfs, greatest for July; Killbuck Creek at Killbuck, mean flow of 842 cfs, Muskingum River at McConnelville, mean flow of 13,647 cfs, Scioto River at Higby, mean flow of 9,718, and Scioto River near Prospect, mean flow of 1,091 cfs, each the second greatest for July; and Maumee River at Waterville, July 24 daily mean flow of 34,200 cfs, greatest for July.

Flows at the beginning of the month were above normal in most areas of the state but below normal in the southwestern and extreme northeastern portions. Flows statewide declined during the first week of the month with the lowest flows for the month occurring on July 8-9. Flows increased rapidly after this period following several days of widespread precipitation during July 9-15. Greatest flows for the month occurred during or shortly after this period except in the northwestern portion of the state where the greatest flows occurred during July 22-24. Flows declined until the month's end but were still above normal throughout most of the state with only the southwestern portion having below normal flows.

Small stream and urban flooding was once again common this month. Several notable events were: July 5 in Vinton County; July 12-15 in Columbiana, Jefferson, Mahoning and Trumbull counties as well as in Licking County and the Scioto River valley; July 19 in several Cleveland suburbs, July 21-22 in Columbus and other central Ohio locations; July 22 in Allen County and several surrounding areas; and July 24 in the Akron-Canton area. This list is not totally comprehensive as other areas may also have had high water following local thunderstorms. As a result of this month's flooding, Columbiana, Mahoning and Trumbull counties were added to the previous list of 22 Ohio counties already receiving disaster declarations this year.

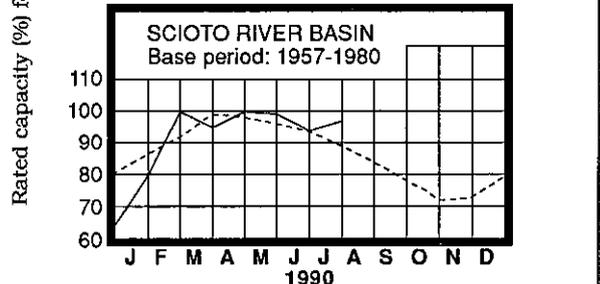
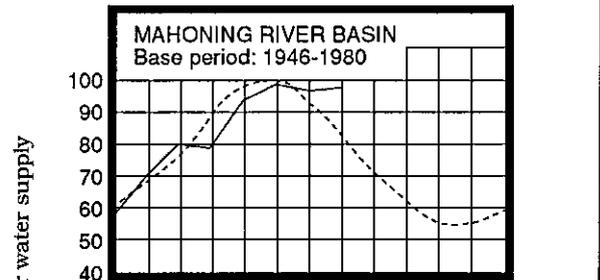
RESERVOIR STORAGE for water supply increased in both the Mahoning and Scioto river basins. Month-end storage was above normal in both basins.

MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

RESERVOIR STORAGE FOR WATER SUPPLY



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	13.96	+0.95	-1.31	-0.05
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.39	+0.41	-0.42	-0.22
Fr-10	Columbus, Franklin Co.	Gravel	41.17	+2.85	-0.66	+0.13
H-1	Harrison, Hamilton Co.	Gravel	21.89	-0.20	-0.65	+0.59
Hn-2a	Dola, Hardin Co.	Dolomite	6.33	+0.89	-0.21	+0.11
Po-1	Windham, Portage Co.	Sandstone	18.37	+0.60	-0.20	-0.23
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.07	+0.36	-0.32	+0.37

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 98 percent of rated capacity for water supply compared with 97 percent for both last month and July 1989. Storage at the month's end in the Scioto basin index reservoirs was 97 percent of rated capacity for water supply compared with 94 percent for last month and 99 percent for July 1989.

GROUND-WATER LEVELS during July showed net declines from last month's levels throughout most of the state. Net changes were less than or nearly equal to those usually expected.

Ground-water levels during the month responded favorably to the above normal precipitation that fell in many areas. Water levels in all aquifers declined during the first 10 days of the month. Shallow unconsolidated aquifers showed substantial rises following several days of widespread precipitation during July 9-15. Consolidated aquifers and deeper unconsolidated aquifers stabilized after this period of precipitation and then showed some rises later in the month in response to delayed recharge. Water levels in most aquifers throughout the state were declining at the month's end although some consolidated aquifers were still rather stable.

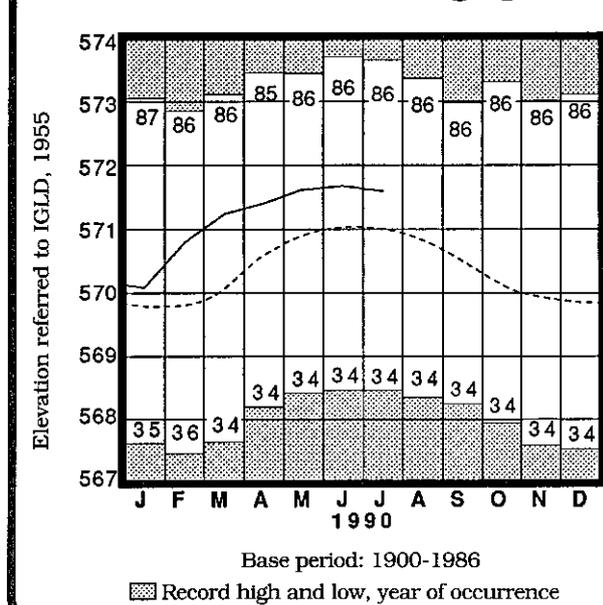
Ground-water levels remain slightly above normal throughout most of the state. Generally, water levels are above those of a year ago in the northern portion of the state and below last year's levels in the southern portion. The above normal precipitation during the past several months in most areas of the state has continued to maintain ground-water storage in a favorable position.

LAKE ERIE level declined during July. The mean level was 571.60 feet (IGLD-1955), 0.09 foot below last month's level and 0.60 foot above normal. This month's level is 0.36 foot below the July 1989 level and 3.00 feet above Low Water Datum.

SUMMARY

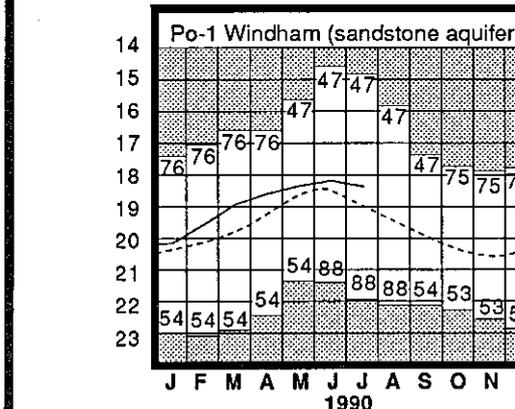
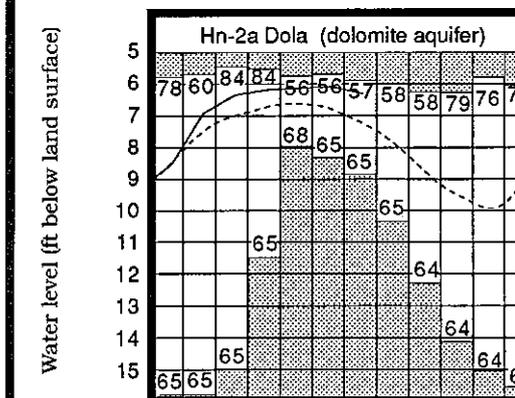
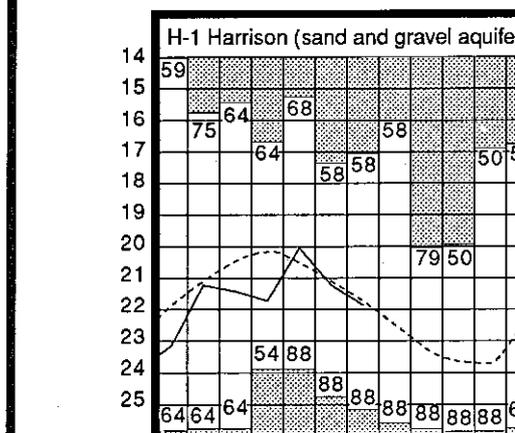
Precipitation was noticeably above normal throughout most of the state with the state average of 6.34 inches making this month the third wettest July on record. Streamflow was excessive throughout most of the state with many areas having small stream and urban flooding on several days. New July streamflow records were established at several gauging sites. Reservoir storage increased and was above normal. Ground-water levels showed slight net declines from last month's levels but remain above normal throughout most of the state. Lake Erie level declined 0.09 foot and was 0.60 foot above normal.

LAKE ERIE LEVELS at Cleveland



Record high and low, year of occurrence

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 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

Precipitation for the soon-to-be ending 1990 year water is above normal throughout the state. The average for the state as a whole is 39.59 inches, 5.02 inches above normal. Regional averages range from 43.96 inches, 6.78 inches above normal, for the Southwest Region to 35.18 inches, 4.03 inches above normal, for the North Central Region.

NOTES AND COMMENTS

LAKE WHITE DAM OVERTOPPED

A near failure incident occurred August 22 at Lake White dam when heavy rain caused the embankment to be overtopped to a maximum depth of 6 to 8 inches for two and one-half hours. Unofficial reports of nearly 6 inches of rain were reported in the Peepee Creek drainage basin which supplies Lake White. Small stream flooding also occurred in the Paint and Sunfish creek watersheds as well as in other nearby watersheds. At Lake White, the state park personnel had opened all spillway gates four hours prior to the overtopping. Erosion of the downstream slope of the earthen dam had, as a result of the overtopping flows, progressed to the crest of the dam at two different locations. This damage and other areas of downstream slope erosion were subsequently repaired by the Ohio Department of Transportation. Lake White, near Waverly (Pike County), is a recreational lake built in 1935 as a result of the Bridge Dam Law. The dam impounds 5,287 acre-feet of water.

As a result of this local heavy precipitation and resulting small steam flooding, Pike and contiguous counties were declared limited disaster areas. Over 200 homes and businesses were damaged. A limited disaster declaration means disaster assistance is limited to low interest loans made available through the Small Business Administration.

GWRs STAFF MEMBER EARNS PE LICENSE

Michael Hallfrisch, supervisor for the Ground-Water Resources Section (GWRs) Mapping Unit, recently became a Registered Professional Engineer. Mike, also a Certified Professional Geologist, has been with the GWRs as a hydrogeologist for nearly six years. He earned his bachelor's degree in geological engineering from Michigan Technological University and a master's degree in geology (with emphasis on hydrogeology) from the University of Toledo. Mike has authored several ground-water resource and pollution potential, maps as well as participated in numerous special studies and investigations.

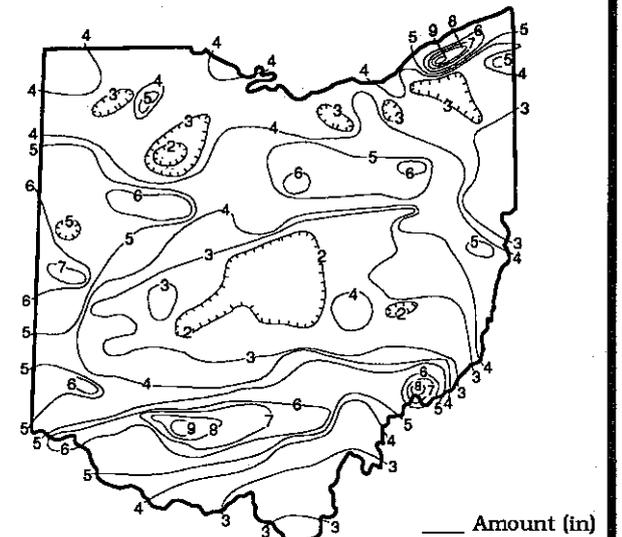
Congratulations from the GWRs staff Mike.

PRECIPITATION for August was above normal throughout most of the state with only the Central and Central Hills regions having below normal precipitation. The average for the state as a whole was 4.00 inches, 0.52 inch above normal. Regional averages ranged from 5.25 inches, 1.78 inches above normal, for the Southwest Region to 2.77 inches, 0.78 inch below normal, for the Central Region. Chardon (Geauga County) reported the greatest amount of precipitation for the month, 9.20 inches. Hillsboro (Highland County) reported 9.13 inches of precipitation for the month. London State Fish Hatchery (Madison County) reported the least amount of precipitation for the month, 1.55 inches. Several locations throughout the central portion of the state reported less than 2 inches of precipitation for the month.

Precipitation during the month fell in a typical summer pattern of scattered showers and thunderstorms. Precipitation fell during every week of the month, but only on a few days were notable amounts received. During the first two weeks of the month, scattered showers brought light-to-moderate precipitation to most areas of the state. On August 4-5 several locations in the northern and southern portions of the state received over 2 inches of rain, but the bulk of the state received less than 1 inch. On August 12-14 similar conditions again produced 1 to over 2 inches of precipitation at scattered locations with the greatest amounts falling in the northern, north-eastern and western portions of the state. August 18-22 was the wettest period of the month for most locations. Storms on August 18-19 again were widely scattered, with local amounts ranging up to nearly 2 inches. The most notable precipitation for the month fell during August 21-22 when amounts of over 4 inches fell in the south-central portion of the state with unofficial amounts of nearly 6 inches being reported. Small stream flooding occurred in Pike and surrounding counties (see *Lake White Dam Overtopped* on the last page of this report). The remainder of the month was rather dry in most locations with light precipitation on August 28-29 except in the western portion of the state where amounts of 1 to 2 inches were reported.

Precipitation for the 1990 calendar year is above normal throughout the state. The average for the state as a whole is 32.77 inches, 5.77 inches above normal. Regional averages range from 37.17 inches, 8.18 inches above normal, for the Southwest Region to 28.13 inches, 3.83 inches above normal, for the North Central Region.

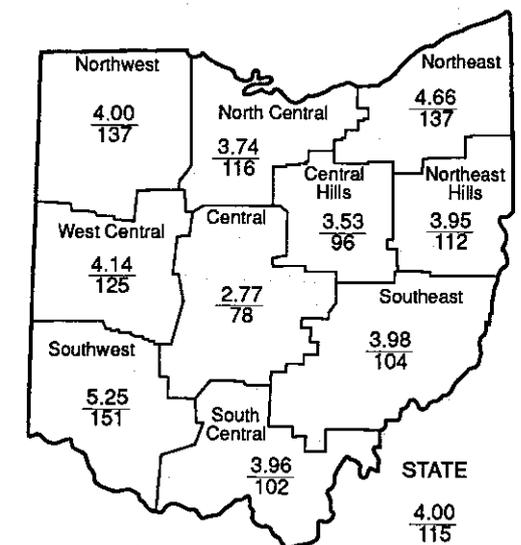
PRECIPITATION AUGUST 1990



PRECIPITATION (continued on back)

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+1.07	+3.10	+3.45	+5.16	+8.06	+1.4
North Central	+0.51	+2.04	+1.97	+4.47	+5.60	+1.7
Northeast	+1.26	+3.04	+3.42	+7.34	+12.78	+3.3
West Central	+0.84	+3.83	+5.42	+5.67	+13.99	+2.1
Central	-0.78	+3.39	+5.03	+5.92	+15.29	+0.4
Central Hills	-0.13	+3.95	+5.25	+7.45	+10.74	+2.6
Northeast Hills	+0.43	+4.70	+5.03	+6.41	+8.74	+1.5
Southwest	+1.78	+2.38	+6.82	+7.29	+16.88	+3.8
South Central	+0.07	-0.92	+0.36	+2.58	+11.71	+1.9
Southeast	+0.14	+2.35	+4.40	+6.93	+19.59	+2.3
State	+0.52	+2.79	+4.12	+5.93	+12.34	

*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

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

Richard F. Celeste
Governor

Joseph J. Sommer
Director

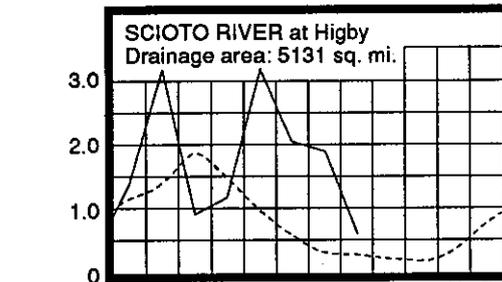
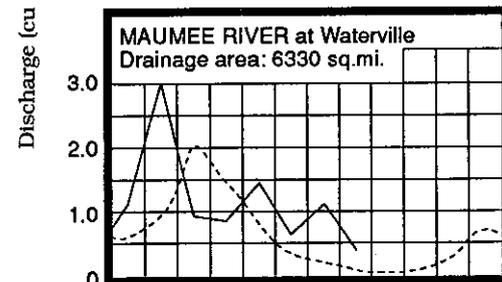
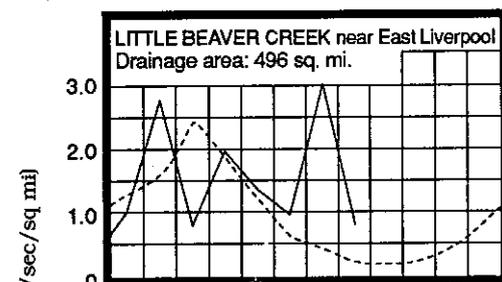
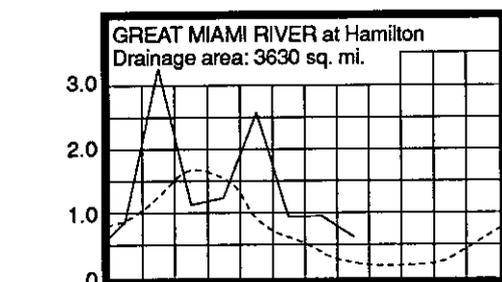
Robert L. Goettmoecker
Chief

Natural Resources
OHIO
The Heart of It All!

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 Palmsville	685	301	253	86	75	106
Great Miami River at Hamilton	3,630	2,218	291	214	120	124
Huron River at Milan	371	260	655	214	89	98
Killbuck Creek at Killbuck	464	563	458	418	148	137
Little Beaver Creek near East Liverpool	496	398	362	387	123	105
Maumee River at Waterville	6,330	2,434	397	272	99	110
Muskingum River at McConnellsville	7,422	6,592	257	304	126	126
Scioto River near Prospect	587	495	1,228	657	195	157
Scioto River at Higby	5,131	3,047	247	350	159	143
Stillwater River at Pleasant Hill	503	450	907	351	146	144

MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

Normal - - - - Current - - - -

STREAMFLOW for August was noticeably above normal throughout the state. Flows were high enough to be considered excessive in all but the extreme northeastern portion of the state. August flows were less than the July flows in most areas, but greater in several basins in the northeastern portion of the state. The mean flow of 260 cfs for the Huron River at Milan gauging station was the second greatest for August; 495 cfs for the Scioto River near Prospect, the third greatest for August; and 450 cfs for the Stillwater River at Pleasant Hill, the fourth greatest for August.

Flows at the beginning of the month were above normal throughout the state. Streamflows fluctuated during the month in response to local precipitation.

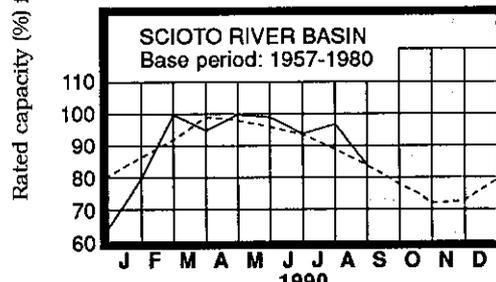
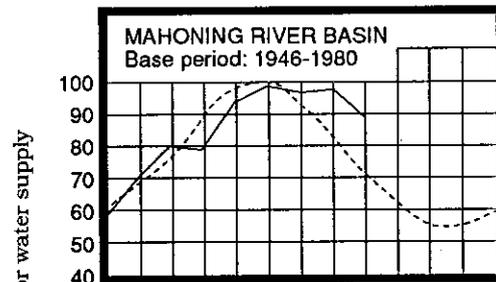
Lowest flows for the western portion of the state occurred on or about August 12; in the central portion during August 18-20; and in the northern portion near the month's end. Greatest flows for the month for most areas of the state occurred during August 22-24 after several days of widespread precipitation. Greatest flows in the northeastern portion of the state occurred on August 13-14. Flows throughout most of the state were still noticeably above normal at the month's end.

Small stream and urban flooding occurred again this month following local thunderstorms, although not as widespread as in the past few months. The most notable flooding occurred in the south-central portion of the state in Pike and surrounding counties. The Peepee Creek drainage basin as well as Paint and Sunfish creeks all had flooding conditions (see *Lake White Dam Overtopped* on the last page of this report).

RESERVOIR STORAGE for water supply decreased in both the Mahoning and Scioto river basins. Month-end storage was above normal in the Mahoning basin index reservoirs; storage in the Scioto basin index reservoirs was normal despite O'Shaughnessy Reservoir still being drawn down for replacement of the bridge over the dam.

Reservoir storage at the month's end in the Mahoning basin index reservoirs was 89 percent of rated capacity for water supply compared with 98 percent for last month and 86 percent for August 1989. Month-end storage in the Scioto basin index reservoirs was 84 percent of rated capacity compared with 97 percent for last month and 90 percent for August 1989.

RESERVOIR STORAGE FOR WATER SUPPLY



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

GROUND-WATER LEVELS during August showed net declines from last month's levels throughout most of the state. Declines were greater than usually observed in the southeastern portion of the state, but less than usually observed elsewhere.

Ground-water levels in most aquifers statewide declined throughout the month except in consolidated aquifers in the northern portion of the state where levels were rather stable throughout the month.

Ground-water levels have responded favorably to the above normal precipitation during the past several months and are above normal throughout the state. Levels are above those of a year ago in all but the southeastern portion of the state. Ground-water storage continues to maintain a favorable position as the end of the 1990 water year draws near.

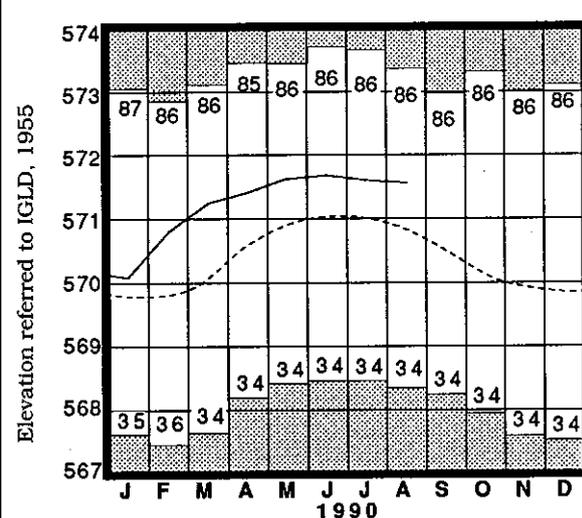
LAKE ERIE level declined slightly during August. The mean level for August was 571.55 feet (IGLD-1955), 0.05 foot below last month's mean level and 0.74 foot above normal. This month's level is the same as the August 1989 level and 2.95 feet above Low Water Datum.

The U.S. Army Corps of Engineers reports that precipitation for the Lake Erie basin for 1990 through July has been 5.5 inches above normal and for the entire Great Lakes basin, 3.5 inches above normal.

SUMMARY

Precipitation was above normal except in the central portion of the state. Streamflow was excessive statewide. Reservoir storage decreased but remained above normal. Ground-water levels declined but are above normal throughout the state. Lake Erie level declined slightly and was 0.74 foot above normal.

LAKE ERIE LEVELS at Cleveland



Base period: 1900-1986

Record high and low, year of occurrence

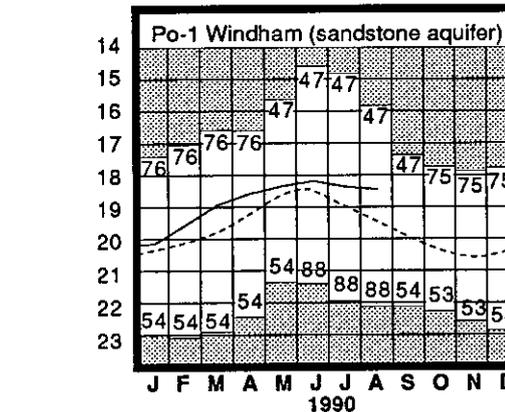
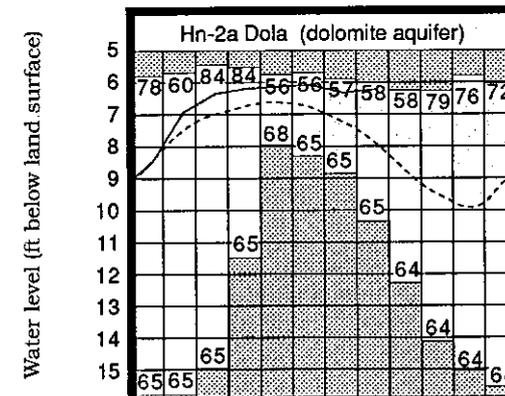
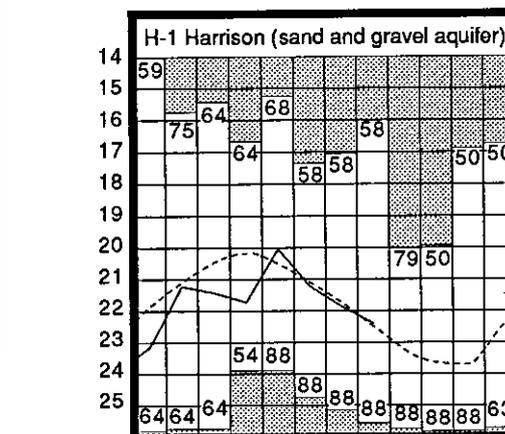
Normal - - - - Current - - - -

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	15.23	+0.29	-1.27	-0.04
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.86	+0.42	-0.47	-0.62
Fr-10	Columbus, Franklin Co.	Gravel	41.60	+2.88	-0.43	+0.46
H-1	Harrison, Hamilton Co.	Gravel	22.41	+0.12	-0.52	+0.88
Hn-2a	Dola, Hardin Co.	Dolomite	6.24	+1.65	+0.09	+0.65
Po-1	Windham, Portage Co.	Sandstone	18.43	+1.08	-0.06	+0.03
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.41	+0.51	-0.34	+1.36

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 - - - -



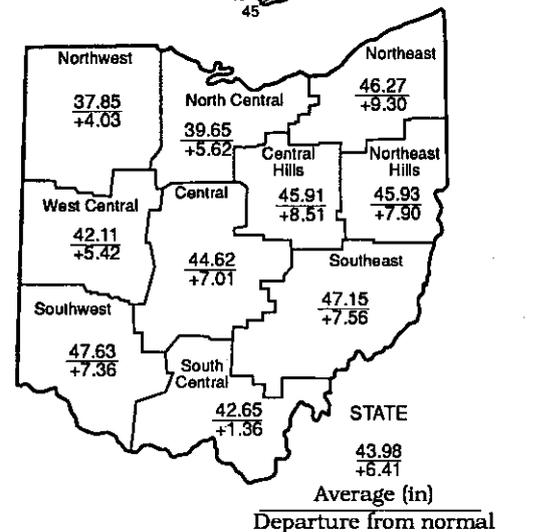
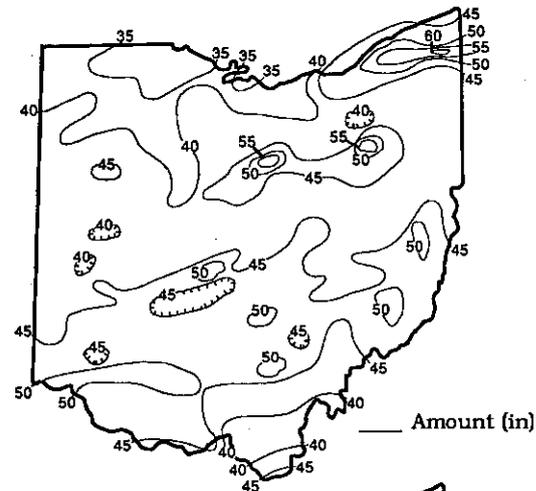
MONTHLY WATER INVENTORY REPORT FOR OHIO

September 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)
8.59 inches above normal, for the Southwest Region to 32.60 inches, 5.42 inches above normal, for the North Central Region (see Precipitation table, departure from normal, past twelve months column).

Precipitation for the 1990 water year, which ended September 30, was above normal throughout the state. The average for the state as a whole was 43.98 inches, 6.41 inches above normal. The 1990 water year ranks as the seventh wettest in 107 years of record keeping. Regional averages ranged from 47.63 inches, 7.36 inches above normal, for the Southwest Region to 37.85 inches, 4.03 inches above normal, for the Northwest Region. Andover (Ashtabula County) reported the greatest amount of precipitation for the water year, 64.91 inches. Toledo Express Airport (Lucas County) reported the least, 32.36 inches. An isohyetal map and regional averages and departures from normal for the 1990 water year precipitation appear below.



Generally, conditions during the 1990 water year were dry during the first half and wet in the second half of the year. The western portion of the state had below normal precipitation in October, the eastern and southeastern portions in November, and the entire state in December and January. Conditions reversed in February with the northern portion of the state having record February precipitation and near record precipitation elsewhere. The dry conditions returned in March and April with the northeastern portion of the state having near record breaking dryness for March. May brought a dramatic change from these dry conditions. From May through September precipitation was noticeably above normal throughout the state. Several storm events from the end of May through June resulted in tragic flooding with substantial property damage and the loss of several lives. Small stream and urban flooding continued intermittently through September following locally heavy thunderstorms. The above normal precipitation has been beneficial for water supplies. Both surface and ground-water supplies are in a favorable position as the 1991 water year begins.

PRECIPITATION for September was above normal throughout most of the state with only the Northwest Region having below normal precipitation. Some areas in the south-central and western portions of the state also had below normal precipitation. The average for the state as a whole was 4.29 inches, 1.29 inches above normal. Regional averages ranged from 6.87 inches, 3.69 inches above normal, for the Northeast Region to 2.76 inches, 0.09 inch below normal, for the Northwest Region. The 6.87 inches for the Northeast Region ties with September 1972 for being the wettest September on record. Ashtabula (Ashtabula County) reported the greatest amount of precipitation for the month, 9.80 inches. Other stations reporting more than 9 inches for the month were: Andover (Ashtabula County), 9.42 inches; and Akron-Canton Airport (Summit County), 9.02 inches. Toledo Express Airport (Lucas County), reported the least amount of precipitation for the month, 1.72 inches. Findlay (Hancock County), Grover Hill (Paulding County), and West Manchester (Preble County) also reported less than 2 inches of precipitation for the month.

Precipitation during the month varied greatly throughout the state. During the first week, the eastern and northeastern portions of the state received substantial precipitation on September 6-7 with amounts of 2 to 3 inches common and over 4 inches reported at some locations. Small stream and urban flooding occurred in several locations. Amounts decreased to the south and west with some areas reporting less than 1 inch. During the second week, most of the state received around 1 inch, but from the central portion up through the northeastern portion, 1.5 to over 2 inches was common. Storms occurred on September 9, 12 and 14 during the second week of the month. A similar precipitation pattern continued during the third week with the north-central, northeastern and eastern portions of the state receiving 1 to 2 inches, but less than 1 inch elsewhere. Several periods of rain occurred during September 16-24. The remainder of the month was rather dry with most areas receiving less than 0.5 inch of rain, but several locations in the east-central and southeastern portions of the state received 1 to 2 inches on September 29. The Ohio State University football game with the University of Southern California was stopped because of a severe thunderstorm on this date.

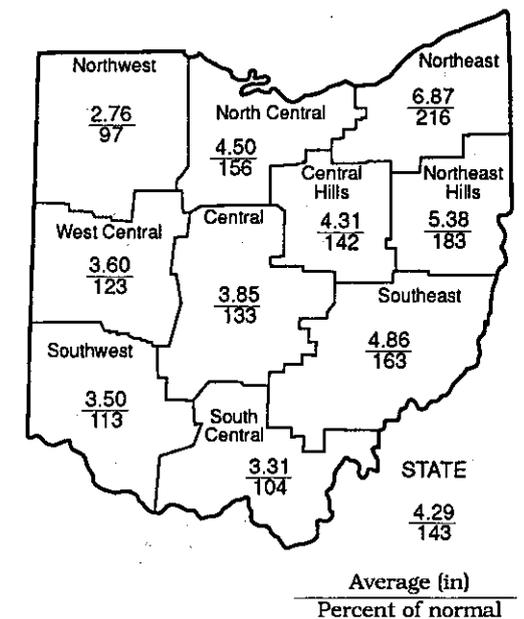
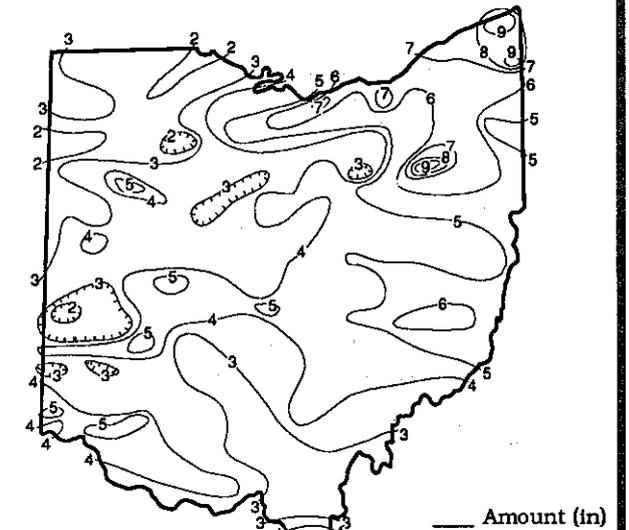
Precipitation for the 1990 calendar year is above normal throughout the state. The average for the state as a whole is 37.13 inches, 7.13 inches above normal. Regional averages range from 40.67 inches, (continued on back)

PRECIPITATION

Region	This Month	DEPARTURE FROM NORMAL (IN.)				Palmer Drought Severity Index*
		Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	-0.09	+2.67	+3.65	+4.03	+8.23	+1.7
North Central	+1.62	+4.19	+5.06	+5.62	+8.30	+2.5
Northeast	+3.69	+7.46	+9.43	+9.30	+16.33	+5.2
West Central	+0.87	+4.31	+6.88	+5.42	+14.50	+2.6
Central	+0.96	+3.93	+7.43	+7.01	+14.38	+1.6
Central Hills	+1.28	+5.62	+9.41	+8.51	+12.05	+3.5
Northeast Hills	+2.44	+6.68	+9.77	+7.90	+11.05	+3.1
Southwest	+0.41	+3.23	+7.96	+7.36	+16.68	+4.2
South Central	+0.13	+0.83	+3.03	+1.36	+12.56	+2.4
Southeast	+1.87	+3.77	+7.91	+7.56	+21.23	+2.8
State	+1.29	+4.26	+7.05	+6.41	+13.53	

*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 SEPTEMBER 1990



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

Richard F. Celeste
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Robert L. Goettemoeller
Chief



MEAN STREAM DISCHARGE

This Month

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
Grand River near Painesville	685	1,688	686	145	151	118
Great Miami River at Hamilton	3,630	1,721	258	275	157	122
Huron River at Milan	371	286	1,217	496	151	105
Killbuck Creek at Killbuck	464	552	615	484	213	145
Little Beaver Creek near East Liverpool	496	538	683	604	183	107
Maumee River at Waterville	6,330	1,611	413	327	126	106
Muskingum River at McConnelsville	7,422	6,350	404	315	175	130
Scioto River near Prospect	567	220	759	862	329	160
Scioto River at Higby	5,131	1,664	159	306	207	146
Stillwater River at Pleasant Hill	503	257	570	559	202	133

STREAMFLOW for September was noticeably above normal throughout the state. Flows were high enough to be considered excessive. September flows were less than August flows in most areas of the state, but greater in the northeastern quadrant. The mean flow of 1,688 cfs for the Grand River near Painesville gauging station was the greatest for September for the period of record; mean flows of 552 cfs for the Killbuck Creek at Killbuck and 286 cfs for the Huron River at Milan gauging stations, each the second greatest for September; and the mean flow of 538 cfs for the Little Beaver Creek near East Liverpool gauging station, the third greatest for September.

Flows at the beginning of the month were above normal throughout most of the state. Generally, flows declined during the first part of the month with most areas of the state having their lowest flows near the middle or end of the first week. Lowest flows for the month for the western and northwestern portions of the state occurred near the month's end. Flows increased and fluctuated throughout the middle two weeks of the month in response to local precipitation. Greatest flows for the month generally occurred during September 9-11 in the northern portion of the state and during September 15-17 in the southern portion. Flows were declining at most locations at the month's end but remained noticeably above normal.

Small stream and urban flooding occurred again this month following locally heavy thunderstorms. The most notable flooding occurred in the eastern and northeastern portions of the state following locally heavy thunderstorms on September 6-7. Amounts of up to 4 inches of precipitation were reported. Steubenville (Jefferson County) as well as several other locations throughout the northeastern portion of the state were affected.

Streamflow was above normal throughout the state for the 1990 water year as a whole. Flows were below normal in the late fall months, increasing noticeably during the winter months, but falling back to below normal in March responding to March's noticeably below normal precipitation. Since May, flows have been excessive throughout the state with several occurrences of local flooding conditions. The most notable was the flash floods of June 14 in the Shadyside (Belmont County) and surrounding area. All or portions of at least 20 of Ohio's 88 counties had flood disaster declarations during the year. Several new streamflow records were established.

RESERVOIR STORAGE for water supply during September decreased in both the Mahoning and Scioto river basins. Month-end storage was above normal in both basins. Reservoir storage at the month's end in the Mahoning basin index reservoirs was 81 percent of rated capacity for water supply compared

with 89 percent for last month and 82 percent in September 1989. Month-end storage in the Scioto basin index reservoirs was 80 percent of rated capacity for water supply compared with 84 percent for last month and 82 percent for September 1989.

Surface water supplies were generally in a favorable position throughout the 1990 water year. Storage was above normal at the start of the water year, but declined throughout the fall months, and fell below normal by the end of December. Storage increased noticeably during January and February and was near normal during the spring months. Storage was above normal throughout the summer months responding to the noticeably above normal precipitation and resulting streamflows in most areas of the state.

GROUND-WATER LEVELS during September declined throughout the month in most areas of the state. Exceptions were noted in some unconsolidated aquifers in areas where precipitation was noticeably above normal. Declines greater than usual were observed in some central and eastern portions of the state, but less than usual declines were observed elsewhere.

Ground-water levels are above normal throughout most of the state. Levels are above those of a year ago in most areas but below last year's levels in the southeastern portion of the state.

The 1990 water year was favorable for ground-water supplies. Although levels were near or below normal during the late fall and early winter months, the above normal precipitation the past several months helped ground-water storage return to and maintain a favorable position during the summer discharge season.

LAKE ERIE level declined during September. The mean level for September was 571.48 feet (IGLD-1955), 0.07 foot below last month's mean level and 0.96 foot above normal. This month's level is 0.22 foot above the September 1989 level and 2.88 feet above Low Water Datum.

SUMMARY

Precipitation was above normal throughout most of the state. Streamflow was excessive statewide. Reservoir storage decreased but remained above normal. Ground-water levels declined but remained above normal throughout most of the state. Lake Erie level declined slightly and was 0.96 foot above normal.

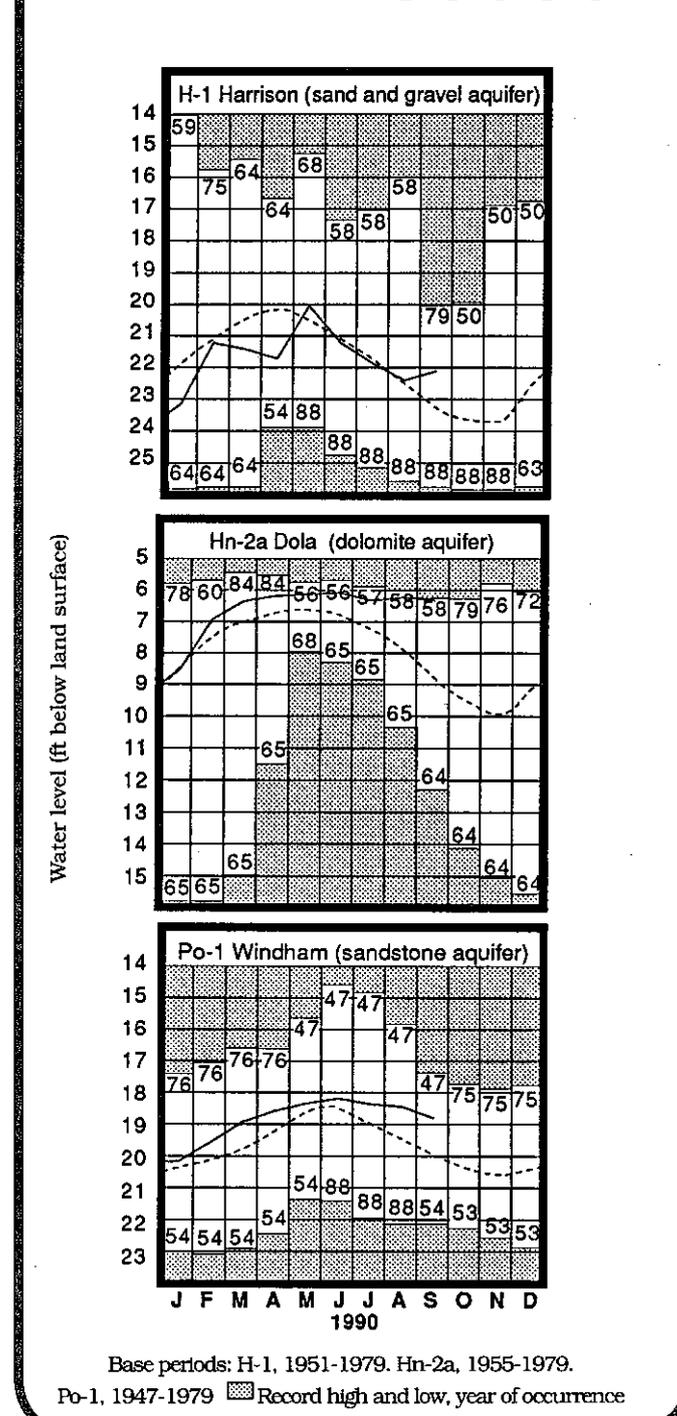
The 1990 water year was favorable for both surface and ground-water supplies. Precipitation was above normal statewide. Streamflow was excessive during May through September with several flooding occurrences. Reservoir and ground-water storage were above normal at the end of the water year. Lake Erie level was above normal throughout the water year.

GROUND-WATER LEVELS

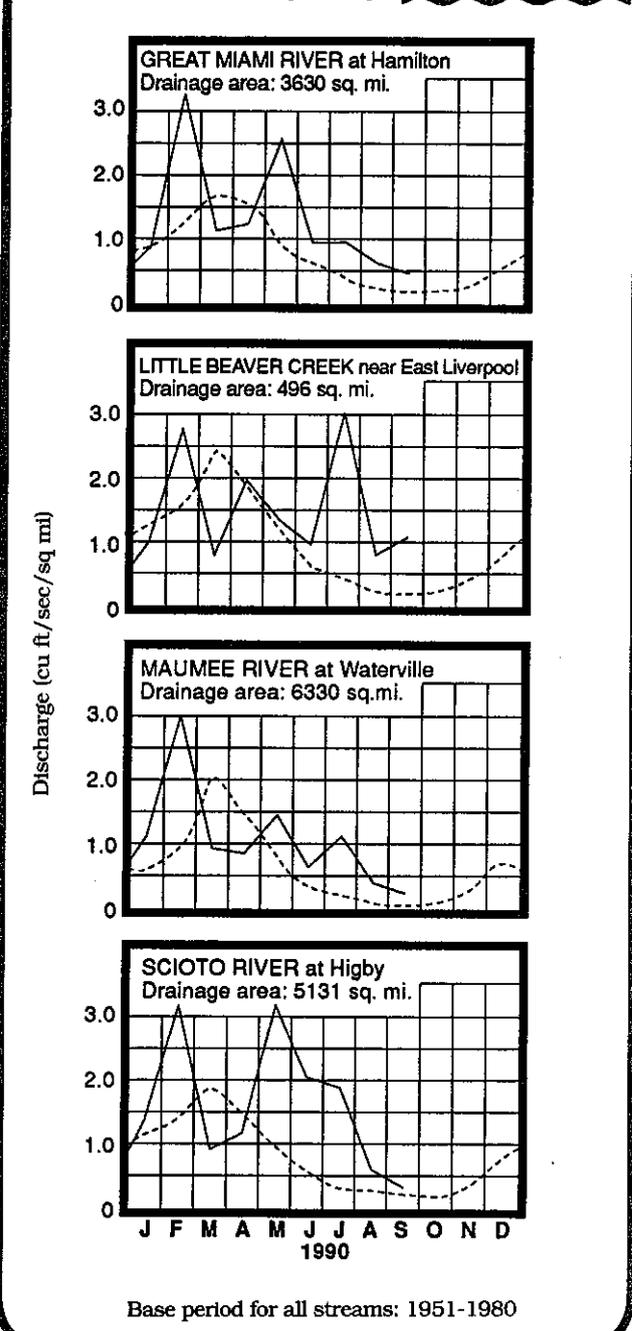
Based on daily lowest level in feet below land-surface datum

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	17.02	-1.10	-1.79	-1.21
Fa-1	Jasper Mill, Fayette Co.	Limestone	8.44	+0.17	-0.55	-0.58
Fr-10	Columbus, Franklin Co.	Gravel	42.12	+2.96	-0.52	+0.46
H-1	Harrison, Hamilton Co.	Gravel	22.14	+1.08	+0.27	+1.00
Hn-2a	Dola, Hardin Co.	Dolomite	6.33	+2.54	-0.09	+1.62
Po-1	Windham, Portage Co.	Sandstone	18.80	+1.18	-0.37	+0.27
Tu-1	Strasburg, Tuscarawas Co.	Gravel	13.06	+0.22	-0.65	+1.44

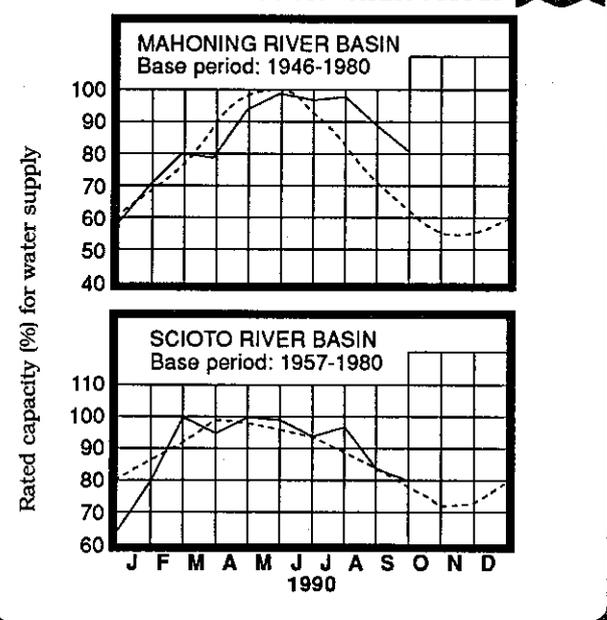
GROUND-WATER LEVELS



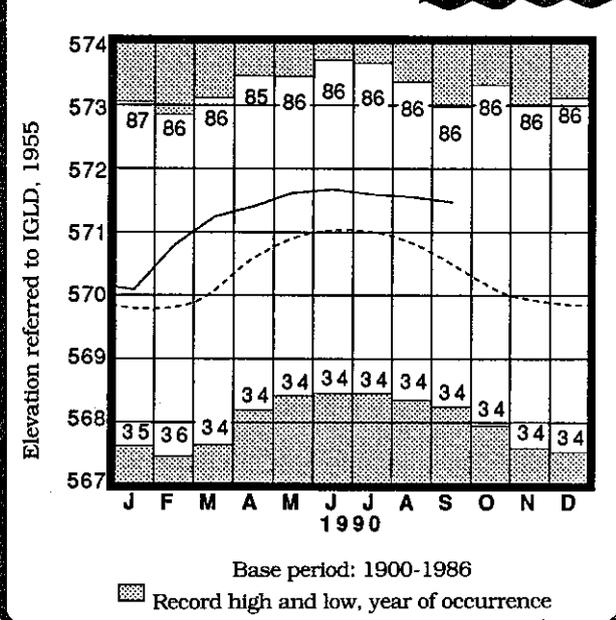
MEAN STREAM DISCHARGE



RESERVOIR STORAGE FOR WATER SUPPLY



LAKE ERIE LEVELS at Cleveland



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

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



MONTHLY WATER INVENTORY REPORT FOR OHIO

October 1990

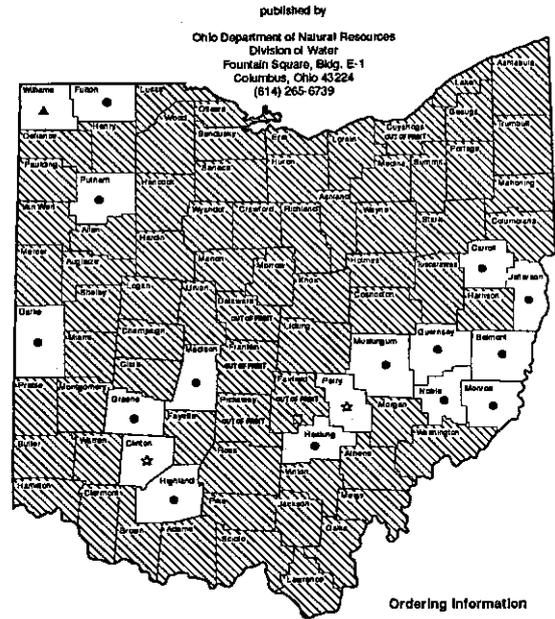
Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTES AND COMMENTS
NEW PUBLICATIONS
The Division of Water announces the availability of the following new publication:
THE GROUND-WATER RESOURCES OF FAYETTE COUNTY
by James J. Schmidt

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. They are useful to homeowners, ground-water consultants, engineers, planners and developers.

Available County Ground-Water Resources Maps



- Published
- Revision in Progress
- Field Work In Progress
- Field Work Scheduled for 1991
- In Production

Ordering Information
Ground-Water Resources Maps are available for \$6.53 (includes postage, handling and tax), from ODNR Publications, Fountain Square, Bldg. B-1, Columbus, Ohio 43224

ODNR 1991 CALENDAR

The 1991 Ohio Department of Natural Resources (ODNR) calendars are available now. These 13-month calendars feature a spectacular, full-color photo of some of Ohio's lesser-known scenic getaways each month. 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 also listed. The cost for the 1991 ODNR calendar is \$4.00 (includes postage, handling and tax) and can be ordered from the ODNR Publication Center at the address listed above.

WATER WITHDRAWAL FACILITY REGISTRATION DEADLINE NEAR

The Ohio Department of Natural Resources Division of Water reminds all owners of water withdrawal facilities having a total withdrawal capacity exceeding 100,000 gallons of water per day that the deadline to register their facilities is December 31, 1990.

Section 1521.16 of the Ohio Revised Code established the registration program to improve water planning, assist in resolving water availability conflicts, and manage inter-basin water transfers.

Facilities existing as of January 1, 1990 are required to be registered in 1990. New facilities are required to be registered within 90 days after completion.

Registration forms and other information are available from the Division of Water at 614/265-6750.

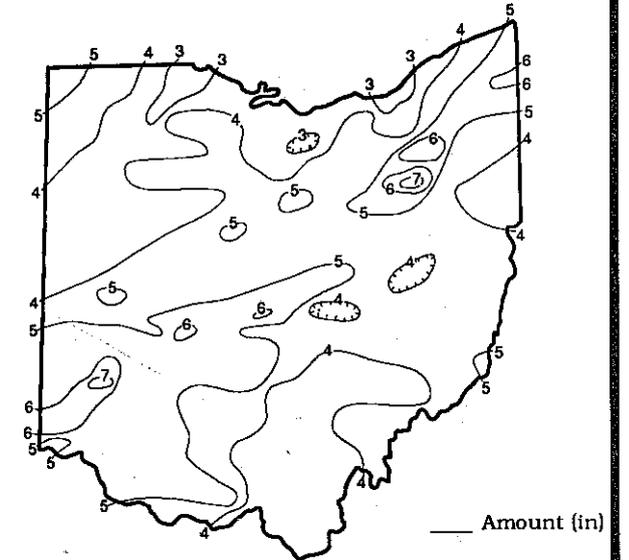
PRECIPITATION for October was above normal throughout the state. The average for the state as a whole was 4.55 inches, 2.21 inches above normal. This ranks as the ninth wettest October in 108 years of record keeping. Regional averages ranged from 5.54 inches, 3.15 inches above normal, for the Southwest Region to 3.90 inches, 1.61 inches above normal, for the Northwest Region. Franklin (Warren County) reported the greatest amount of precipitation for the month, 7.27 inches. Akron-Canton Airport (Summit County) reported 7.10 inches for the month. Toledo Express Airport (Lucas County) reported the least amount of precipitation for the month, 2.63 inches.

Several periods of precipitation during the first three weeks of the month produced the monthly total for all locations. During the first week, storms on October 3-4 produced 1 to 2 inches of precipitation throughout most of the state with slightly lesser amounts in the northwestern portion and slightly greater amounts in the southwest. The second week precipitation fell on nearly every day. Heaviest precipitation occurred on October 9-10 and 12-14. Weekly totals of slightly over 2 inches were common with up to 4 inches falling in isolated areas in the northeastern portion of the state. Some areas in the northwestern and southeastern portions of the state had less than 2 inches for the week. The next ten days brought the remainder of the month's precipitation. Storms on October 17-18 and 21-22 produced a total of 1 to 2 inches of precipitation at most locations with only the northwestern portion of the state receiving less than 1 inch. The remainder of the month was rather dry with only a few scattered sprinkles as the entire state enjoyed "Indian summer".

Precipitation for the 1990 calendar year is above normal throughout the state. The average for the state as a whole is 41.68 inches, 9.34 inches above normal. Regional averages range from 46.21 inches, 11.74 inches above normal, for the Southwest Region to 36.59 inches, 7.27 inches above normal, for the North Central Region.

The 1991 water year is off to a good start as far as water supplies are concerned. The above normal precipitation statewide during October, coupled with the above normal precipitation during the past several months, has resulted in recharge beginning in many aquifers and above normal streamflows.

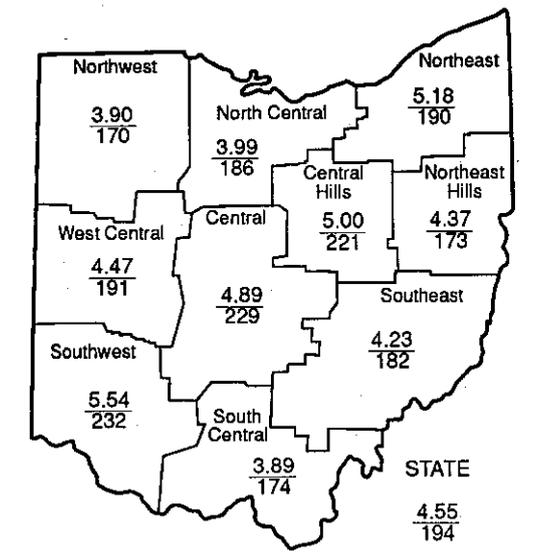
PRECIPITATION OCTOBER 1990



PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+1.61	+2.51	+6.43	+6.50	+8.14	+2.7
North Central	+1.85	+3.93	+6.97	+6.97	+9.86	+3.8
Northeast	+2.46	+7.38	+11.35	+11.24	+17.86	+6.3
West Central	+2.13	+3.61	+9.91	+8.66	+17.10	+3.8
Central	+2.75	+3.04	+10.91	+9.81	+17.45	+3.3
Central Hills	+2.74	+4.51	+12.19	+10.99	+15.11	+4.6
Northeast Hills	+1.84	+4.71	+11.34	+10.06	+13.49	+4.2
Southwest	+3.15	+5.34	+11.79	+10.86	+19.67	+5.4
South Central	+1.65	+2.14	+5.17	+1.23	+14.30	+3.4
Southeast	+1.90	+3.91	+10.46	+8.16	+23.25	+3.6
State	+2.21	+4.10	+9.65	+8.46	+15.63	

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



Average (in)
Percent of normal

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.

ODNR

OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

- Richard F. Celeste
Governor
- Joseph J. Sommer
Director
- Robert L. Goettmoeller
Chief



MEAN STREAM DISCHARGE

This Month

River and Location	Drainage Area (Sq. Mi.)	Mean Discharge (CFS)	% of Normal	% of Normal Past		
				3 Mos.	6 Mos.	12 Mos.
Grand River near Painesville	685	1,765	735	256	195	128
Great Miami River at Hamilton	3,630	4,505	664	339	246	130
Huron River at Milan	371	361	1,241	776	237	115
Killbuck Creek at Killbuck	464	1,136	1,392	537	401	164
Little Beaver Creek near East Liverpool	496	701	643	463	251	120
Maumee River at Waterville	6,330	5,262	948	394	229	117
Muskingum River at McConnelsville	7,422	11,740	696	369	263	140
Scioto River near Prospect	567	738	2,452	1,059	518	173
Scioto River at Higby	5,131	6,324	831	320	319	151
Stillwater River at Pleasant Hill	503	662	1,212	728	385	144

STREAMFLOW for October was noticeably above normal throughout the state. Flows were high enough to be considered excessive statewide. October flows were greater than last month's flows in all drainage basins. Several of the gauging stations cited in this report set record or near record flows for October: Grand River near Painesville, Huron River at Milan, Killbuck Creek at Killbuck, and Scioto River at Higby had the greatest October flows for their respective periods of record; Great Miami River at Hamilton and Muskingum River at McConnelsville had the second greatest flows for October; Scioto River near Prospect and Stillwater River at Pleasant Hill, the third greatest flows for October; Little Beaver Creek near East Liverpool, the fourth greatest for October; and Maumee River at Waterville, the sixth greatest for October.

Flows at the beginning of the month were above normal statewide. Flows declined the first few days of the month with the lowest flows for the month occurring during this period. Flows fluctuated during the next three weeks of the month in response to several periods of precipitation. Greatest flows for the month occurred on or about October 13 for most areas of the eastern portion of the state and a few days earlier in the western portion. Flows decreased statewide during the last week of the month but remained noticeably above normal at the month's end.

RESERVOIR STORAGE for water supply decreased in the Mahoning River basin reservoirs and increased in the Scioto River basin reservoirs. Month-end storage was 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 81 percent for last month and 73 percent for October 1989. Month-end storage in the Scioto basin index reservoirs was 91 percent of rated capacity for water supply compared with 80 percent for last month and 74 percent for October 1989.

GROUND-WATER LEVELS during October were stable or rose throughout most of the state responding to recharge from the above normal precipitation and a reduction in evapotranspiration. Positive net changes from last month's levels were noted in many aquifers and are an exception to the norm in October. In aquifers where net declines were noted, declines were near those usually observed.

Ground-water levels are above normal throughout most of the state. Levels are above those of a year ago except in the southeastern portion of the state. The above normal precipitation received in past months has been beneficial for ground-water supplies. Ground-water storage is in a favorable position as the 1991 water year recharge season begins.

During October, index observation well Hn-2a (Dola, Hardin County), representing a dolomite aquifer, set a new record high level for the month.

LAKE ERIE level declined seasonally during October. The mean level for October was 571.18 feet (IGLD-1955), 0.30 foot below last month's mean level and 0.98 foot above normal. This month's level is 0.42 foot above the October 1989 level and 2.58 feet above Low Water Datum.

SUMMARY

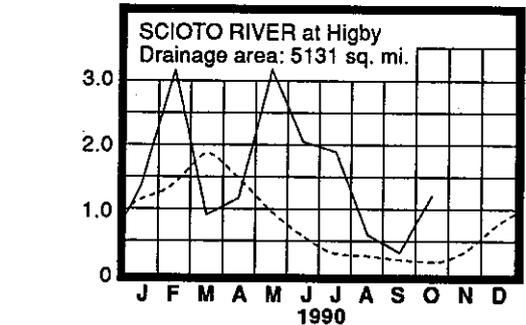
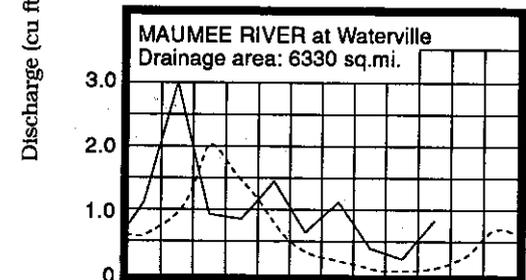
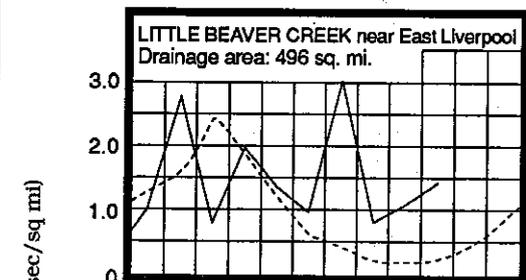
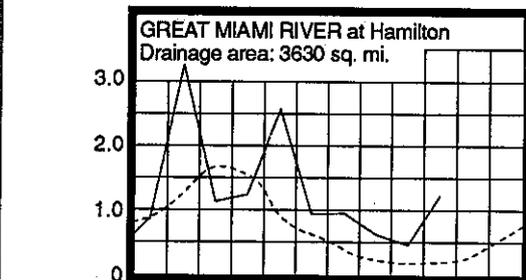
Precipitation was above normal throughout the state and the statewide average of 4.55 inches is the ninth greatest in 108 years of records. Streamflow was excessive throughout the state. Reservoir storage decreased in the Mahoning River basin reservoirs and increased in the Scioto River basin reservoirs. Reservoir storage remained above normal at the month's end. Ground-water levels were stable or rose and are above normal throughout most of the state. Lake Erie level declined seasonally and was 0.98 foot above normal. The water supply situation is favorable 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	17.25	-0.65	-0.23	-1.35
Fa-1	Jasper Mill, Fayette Co.	Limestone	8.05	+0.87	+0.39	+0.34
Fr-10	Columbus, Franklin Co.	Gravel	42.36	+2.72	-0.24	+0.08
H-1	Harrison, Hamilton Co.	Gravel	21.70	+1.94	+0.44	+2.23
Hn-2a	Dola, Hardin Co.	Dolomite	6.16	+3.37	+0.17	+2.75
Po-1	Windham, Portage Co.	Sandstone	19.03	+1.31	-0.23	+0.55
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.65	+0.73	+0.41	+2.15

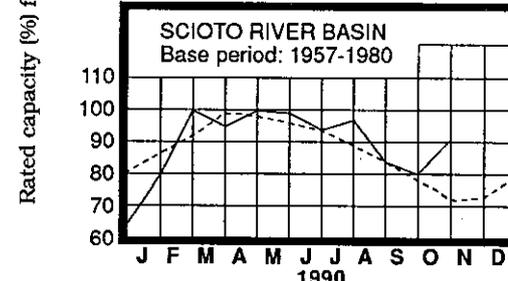
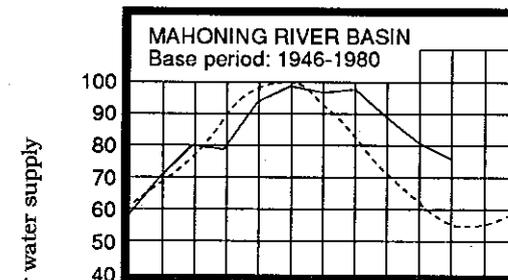
MEAN STREAM DISCHARGE



Base period for all streams: 1951-1980

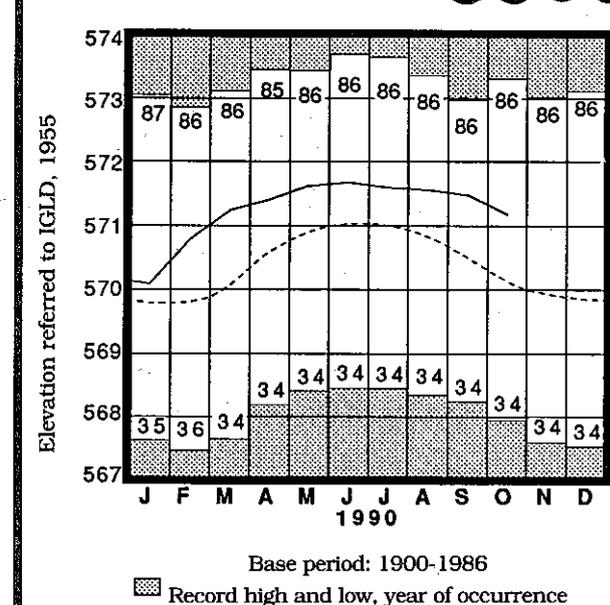
Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



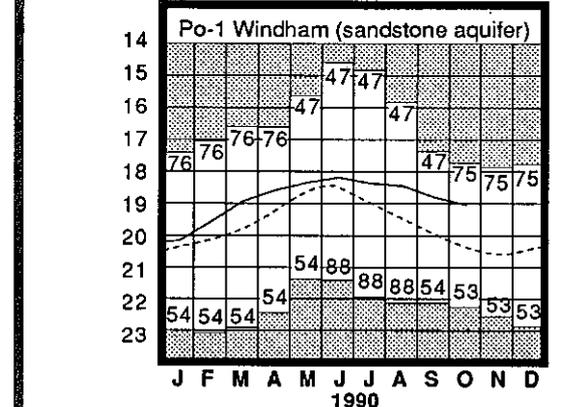
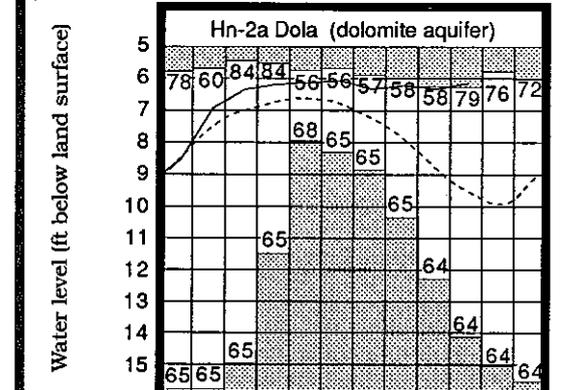
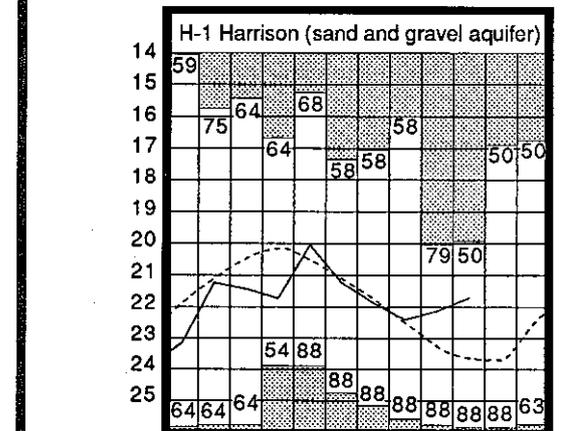
Normal - - - - Current - - - -

LAKE ERIE LEVELS at Cleveland



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

November 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

NOTES AND COMMENTS

A MESSAGE FROM DIRECTOR SOMMER

In the five and one-half years since I became director of ODNR I have recognized what an important role water plays in our departmental programs and in all natural resources management. I have seen that we can have too little water and too much water. The severe drought of 1988 taxed our resources to the utmost and showed how cooperation at all levels of government could be effective. The catastrophic floods of 1990 reminded us that flooding is a natural phenomenon which we can expect to experience from time to time. In dealing with both the drought and floods, I found ODNR's Division of Water to have many dedicated and effective career professionals. Chief Bob Goettemoeller has led the effort to provide water data needed in periods of water shortage, and has worked with the legislature to try to reduce losses from flooding.

I was privileged to work with the division on several key pieces of legislation to assist in managing Ohio's water: funding for the dam safety program, water withdrawal facility registration, a law giving the division authority to designate ground-water stress areas and to assist in conflict resolution, and the canal lands transfer to ODNR.

I have also been pleased to see the Division of Water working with local communities to plan for plentiful supplies of water, as in our cooperative effort in building the Fostoria Reservoir. Dam safety must continue to be a high priority for the protection of our citizens. The division has a big task since ODNR took over the canal system last year. We all know it will take additional financial support to manage the canals properly, but what a recreation potential!

I was glad to be at ODNR when the division completed mapping each county's ground water availability, and I look forward to publication of the composite map of ground water availability for the entire state next year. I am also very supportive of the new project mapping the county-by-county vulnerability of ground water to contamination. As we address various threats of pollution, I see this project as making a very positive contribution.

As I retire from public service, I pledge to continue my interest in water-related matters, and I will work in support of the Division of Water when searching for more solid funding of Ohio's natural resources programs. Keep up the good work!

Joseph J. Sommer
Director

WATER WITHDRAWAL FACILITY ANNUAL REPORTS DUE

The Ohio Department of Natural Resources Division of Water recently sent annual report forms to all facilities that registered under the Water Withdrawal Facility Registration Program in 1990. Section 1521.16 of the Ohio Revised Code requires the owner of a facility that has the capacity to withdraw more than 100,000 gallons per day to register that facility and submit an annual report to the Division of Water. Annual report forms for registered facilities are due by March 1, 1991. Additional information is available from the Division of Water at 614/265-6750.

VILLAGE OF SHELBY PLANS NEW RESERVOIR

The Ohio Department of Natural Resources Division of Water and the Village of Shelby recently entered into a cooperative agreement which paved the way for the construction of a new water supply reservoir. The Division of Water presented the village a check for half of the \$400,000 appropriated by the Ohio General Assembly to help fund the new reservoir. The agreement also assures the construction of certain recreational facilities. Activities will include boating and fishing. Fish concentration structures will be placed in the reservoir.

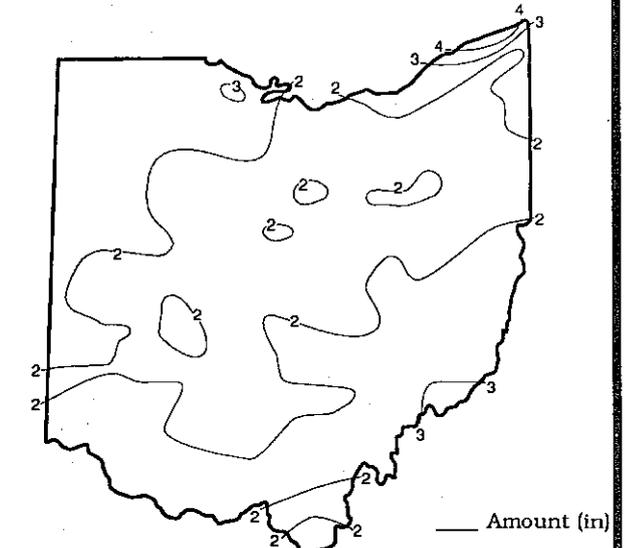
The new reservoir will enable the village to better meet its water supply needs in the future. Shelby's water supply was seriously impacted during the 1988 drought.

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.

PRECIPITATION NOVEMBER 1990



PRECIPITATION for November was below normal throughout the state. The average for the state as a whole was 2.10 inches, 0.55 inch below normal. November was the first month since June in which the state average was below normal and the first month since March in which precipitation was below normal in all regions. Regional averages ranged from 2.48 inches, 0.40 inch below normal, for the Northeast Region to 1.79 inches, 0.82 inch below normal, for the Central Hills Region. Ashtabula (Ashtabula County) reported the greatest amount of precipitation for the month, 4.50 inches. Congress (Wayne County) reported the least amount, 1.35 inches.

Precipitation during the month fell in the form of rain with only a slight amount of snow reported in the northeastern portion of the state. Although precipitation fell during every week of the month, the showers were light, with daily or weekly totals seldom exceeding 0.75 inch. Periods of precipitation included November 4-5, 9-11, 16-17, 22-23, and 26-28. Perhaps the most widespread precipitation occurred on Thanksgiving Day, November 22.

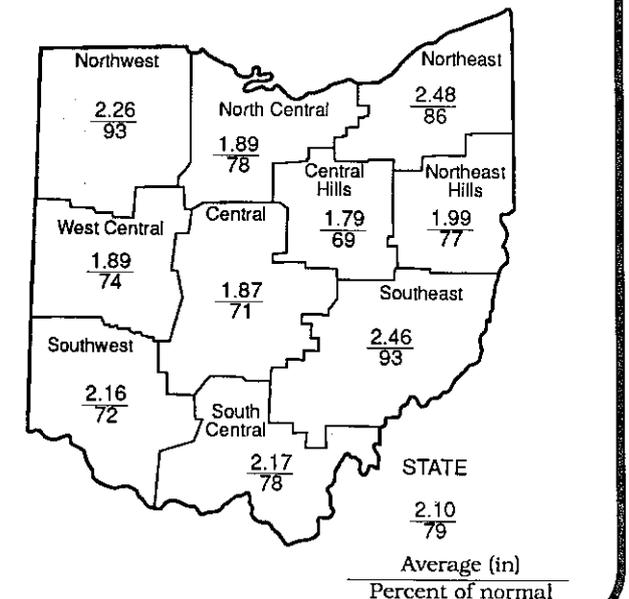
Precipitation for the 1990 calendar year is above normal throughout the state. The average for the state as a whole is 43.78 inches, 8.79 inches above normal. Regional averages range from 48.37 inches, 10.92 inches above normal, for the Southwest Region to 38.48 inches, 6.73 inches above normal, for the North Central Region.

Precipitation for the 1991 water year is above normal throughout the state. The average for the state as a whole is 6.64 inches, 1.65 inches above normal. Regional averages range from 7.70 inches, 2.33 inches above normal, for the Southwest Region to 5.88 inches, 1.31 inches above 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	-0.17	+1.35	+4.32	+6.65	+6.25	+2.9
North Central	-0.54	+2.93	+4.92	+5.85	+7.71	+3.2
Northeast	-0.40	+5.75	+8.76	+10.49	+16.63	+4.9
West Central	-0.67	+2.13	+6.10	+7.85	+14.32	+3.8
Central	-0.75	+2.96	+6.28	+8.74	+15.03	+3.7
Central Hills	-0.82	+3.20	+7.77	+9.85	+12.71	+4.7
Northeast Hills	-0.61	+3.67	+8.37	+9.77	+11.62	+3.7
Southwest	-0.82	+2.74	+5.12	+9.82	+17.41	+4.6
South Central	-0.60	+1.18	+0.58	+1.08	+11.90	+3.2
Southeast	-0.18	+3.59	+5.90	+8.33	+21.59	+3.4
State	-0.55	+2.95	+5.81	+7.85	+13.52	

*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



ODNR
OHIO DEPARTMENT OF
NATURAL RESOURCES
DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Robert L. Goettemoeller
Chief

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	898	81	203	175	125
Great Miami River at Hamilton	3,630	2,012	183	305	229	129
Huron River at Milan	371	166	204	439	251	116
Killbuck Creek at Killbuck	464	455	305	521	397	168
Little Beaver Creek near East Liverpool	496	435	215	350	309	125
Maumee River at Waterville	6,330	2,707	168	249	268	118
Muskingum River at McConnelsville	7,422	6,691	181	356	303	142
Scioto River near Prospect	567	180	323	599	530	173
Scioto River at Higby	5,131	3,026	186	284	299	150
Stillwater River at Pleasant Hill	503	216	257	471	335	142

STREAMFLOW for November was above normal throughout most of the state with only the extreme northeastern portion having below normal flows. Flows were high enough to be considered excessive in the eastern and southern portions of the state. November flows were less than the markedly high flows of October.

Flows at the beginning of the month were noticeably above normal throughout most of the state with only some basins in the northwestern and extreme northeastern portions starting the month with slightly below normal flows. Flows decreased during the early part of the month with the northern and eastern portions of the state having their lowest November flows during this period. Lowest flows for the remainder of the state occurred on or about November 21. Flows fluctuated during the month in response to local precipitation. Generally, the greatest flows for the month occurred during the November 23-30 period. Flows remained noticeably above normal at the month's end except in the extreme northeastern portion where they were slightly below normal.

RESERVOIR STORAGE for water supply during November decreased in both the Mahoning and Scioto river basin reservoirs. Month-end storage was above normal in both basins. Reservoir storage at the month's end in the Mahoning basin index reservoirs was 69 percent of rated capacity for water supply compared with 76 percent for last month and 63 percent for November 1989. Month-end storage in the Scioto basin index reservoirs was 89 percent of rated capacity for water supply compared with 91 percent for last month and 70 percent for November 1989.

GROUND-WATER LEVELS

Ground-water levels during November showed mixed responses throughout the state. The general trend for ground-water levels during the month was down for most aquifers, but some aquifers (especially some confined and/or consolidated aquifers) did show some improvement in response to delayed recharge from October's noticeably above normal precipitation. Positive net changes from last month's levels were noted in many aquifers with less than normal declines noted elsewhere.

Ground-water levels are above normal throughout the state. Levels are also above those of a year ago. The 1991 water year recharge season is off to a good start even though precipitation was below normal in November. Ground-water storage is in a favorable position and, with normal climatic conditions, continued improvement can be expected.

LAKE ERIE level declined seasonally during November. The mean level for November was 570.91 feet (IGLD-1955), 0.27 foot below last month's mean level and 0.99 foot above normal. This month's level is 0.54 foot above the November 1989 level and 2.31 feet above Low Water Datum.

SUMMARY

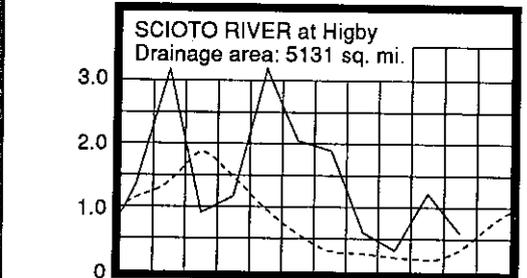
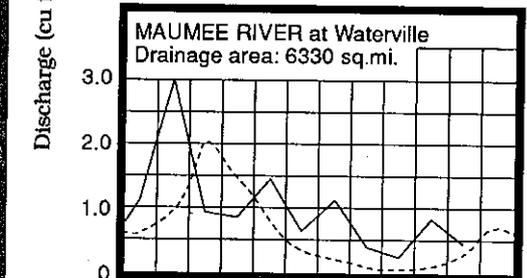
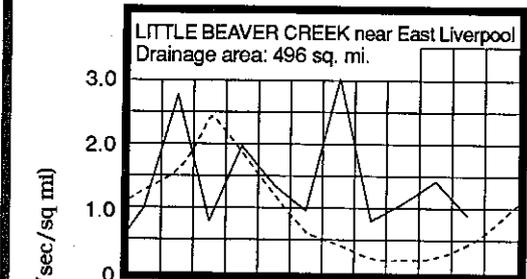
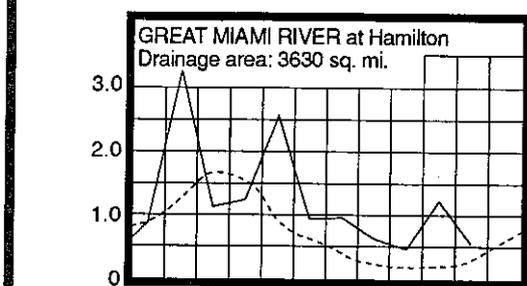
Precipitation was below normal statewide. Streamflow was above normal throughout most of the state. Reservoir storage declined but remained above normal. Ground-water levels showed mixed responses but remained above normal in all aquifers. Lake Erie level declined seasonally and was 0.99 foot above the long-term average November level.

GROUND-WATER LEVELS

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	16.57	+0.45	+0.68	+0.09
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.43	+1.61	+0.62	+0.74
Fr-10	Columbus, Franklin Co.	Gravel	41.94	+2.84	+0.42	+0.32
H-1	Harrison, Hamilton Co.	Gravel	21.84	+1.86	-0.14	+1.59
Hn-2a	Dola, Hardin Co.	Dolomite	6.34	+3.58	-0.18	+2.89
Po-1	Windham, Portage Co.	Sandstone	19.13	+1.43	-0.10	+0.86
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.81	+0.53	-0.16	+2.00

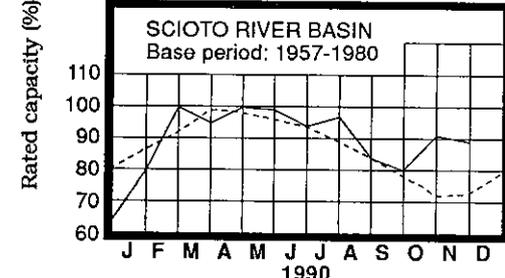
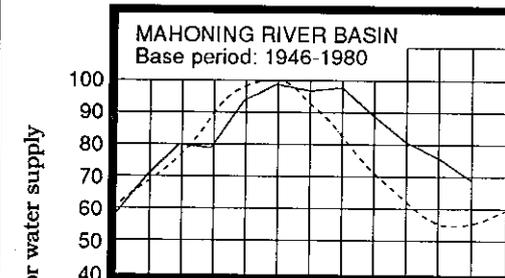
MEAN STREAM DISCHARGE



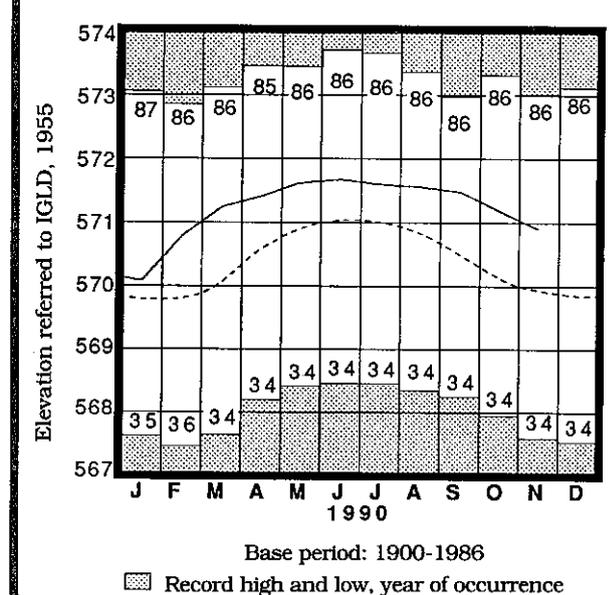
Base period for all streams: 1951-1980

Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY

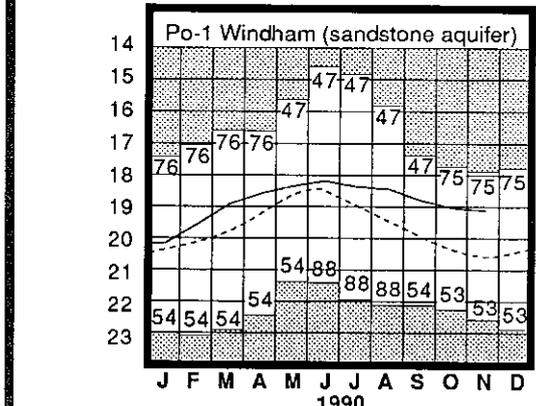
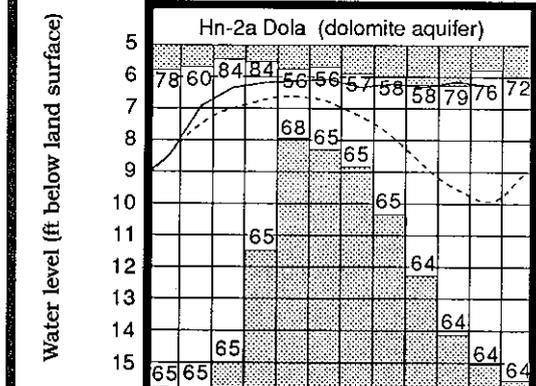
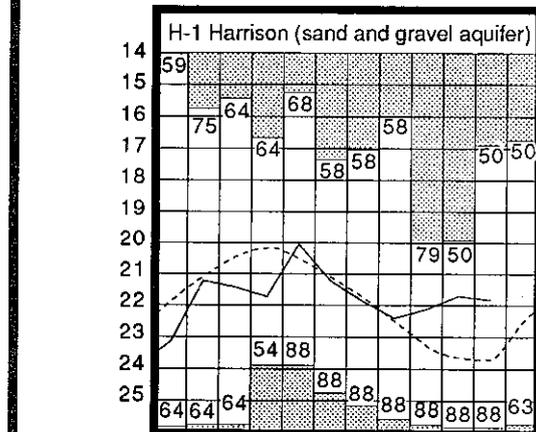


LAKE ERIE LEVELS at Cleveland



Normal - - - - Current - - - -

GROUND-WATER LEVELS



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



MONTHLY WATER INVENTORY REPORT FOR OHIO

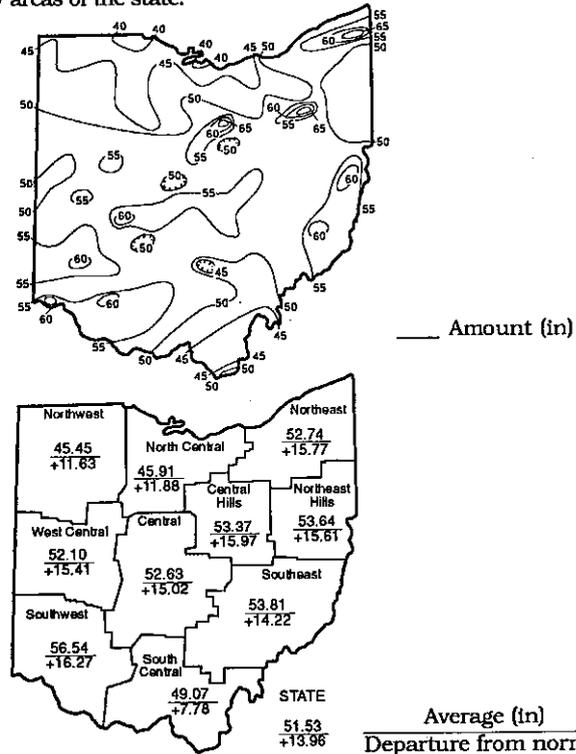
December 1990

Compiled By David H. Cashell
Hydrologist
Water Inventory Unit

(continued from front page)

greatest amount of precipitation for the year, 67.22 inches. Other areas reporting more than 60 inches of precipitation for the year were: Akron-Canton Airport, Andover, Barnesville, Cadiz, Fayetteville, Fernbank, Franklin and Springfield. Toledo Express Airport (Lucas County) reported the least amount of precipitation for the year, 38.41 inches. Sandusky reported 39.28 inches, the only other area with less than 40 inches for the year. An isohyetal map and regional averages and departures from normal for the 1990 calendar year appear on the last page of this report.

Precipitation conditions during 1990 varied greatly between the first and second halves. Precipitation was below normal in January. Record precipitation fell in the northern portion of the state in February with near record precipitation elsewhere. March and April were dry with the northeastern portion of the state having near record dryness in March. May precipitation was noticeably above normal, while in June, above normal precipitation fell causing tragic flooding in some areas; in other areas dry conditions prevailed. Precipitation during July through September was noticeably above normal. The state dried out slightly in November with below normal precipitation only to be followed by the wettest December on record. The above normal precipitation benefited water supplies, but also resulted in numerous episodes of flooding in many areas of the state.



NOTES AND COMMENTS

OHIO ENACTS STATE FLOODPLAIN MANAGEMENT LEGISLATION

On the last day of the legislative session in December 1990, the Ohio General Assembly enacted for the first time a state floodplain management program. Co-sponsored by Senators Burch, Hobson and Suhadolnik, the legislation (Substitute Senate Bill 396) authorizes the Ohio Department of Natural Resources (ODNR), Division of Water, to establish flood damage reduction standards for developments within 100-year floodplains. State agencies that undertake, fund or finance developments within floodplains must comply with these standards. The standards would also apply to those licensed or permitted activities for which the state has sole jurisdiction over siting.

The bill also requires the Division of Water to maintain a listing of floodprone communities that comply with the floodplain management standards of the National Flood Insurance Program. State flood disaster assistance may not be provided by state agencies to a community that is listed as noncomplying.

The bill culminates a lengthy legislative effort by ODNR to draw attention to Ohio's increasingly serious flooding problems. The tragic June 14, 1990 flood in eastern Ohio sent a strong message about the need for such legislation. Likewise, the Federal Emergency Management Agency had notified the governor that future flood disaster assistance may be in jeopardy if the state failed to address flood damage reduction issues.

PRECIPITATION for December was noticeably above normal throughout the state. The state average was 7.78 inches, 5.20 inches above normal. This was the wettest December in 108 years of record-keeping. Regional averages ranged from 8.43 inches, 5.96 inches above normal, for the West Central Region to 6.22 inches, 3.91 inches above normal, for the Northwest Region. Mansfield-Lahm Airport (Richland County) reported the greatest amount of precipitation for the month, 11.19 inches. Wauseon (Fulton County) reported the least amount, 4.39 inches.

Precipitation during the month fell mostly in the form of rain and was distributed fairly evenly across the state. During December 2-4, most of the state received 1-2 inches of precipitation with amounts of over 3 inches reported from the west-central up through the north-central portion. The second week of the month was the driest. Most areas received less than 1 inch toward the end of the week, but a strip from west to east across the central portion of the state received 1 to 2 inches with the most falling on December 14-15. Heavy rains ranging from 1.5 to over 3 inches statewide on December 17-18 resulted in flooding conditions mainly in the southern half of the state. During December 21-23 another 1 inch or more of rain fell statewide and changed to snow, providing a white Christmas for much of the northern two-thirds of the state. Calendar year 1990 ended with statewide flooding resulting from snow melt and 2 to 3 inches of precipitation on December 28-30. For the season so far, Chardon (Geauga County), Ohio's snow capital, has had 15.5 inches of snow which is 41 percent of normal.

Precipitation for the first three months of the 1991 water year is above normal throughout the state. The average for the state is 14.37 inches, 6.80 inches above normal. Regional averages range from 15.83 inches, 7.64 inches above normal, for the Southwest Region to 12.38 inches, 5.35 inches above normal, for the Northwest Region. The above normal precipitation received during the early part of the recharge season has benefited both surface and ground water supplies.

Precipitation for the 1990 calendar year was markedly above normal throughout the state. The average for the state was 51.53 inches, 13.96 inches above normal. This ranks 1990 as the wettest year in 108 years of records, easily surpassing the previous record of 50.37 inches set in 1890. Regional averages ranged from 56.54 inches, 16.27 inches above normal, for the Southwest Region to 45.45 inches, 11.63 inches above normal, for the Northwest Region (see precipitation table, past 12 months column below). Mansfield-Lahm Airport (Richland County) reported the

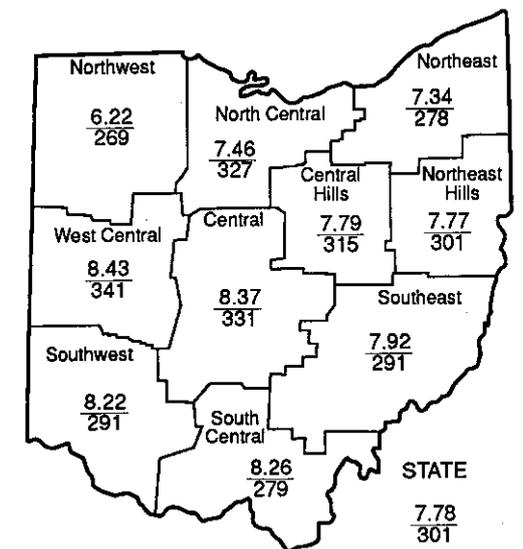
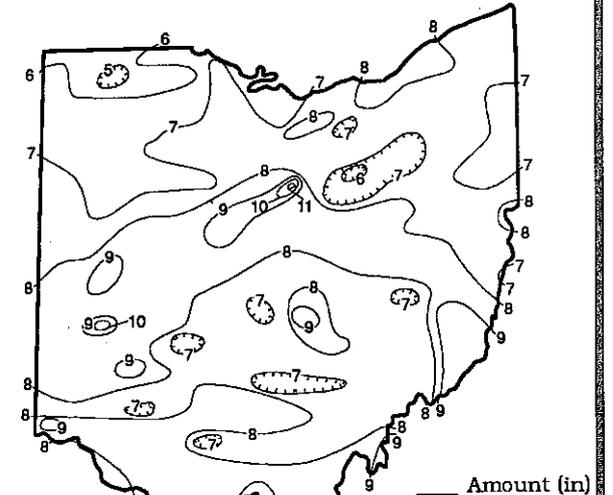
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PRECIPITATION

Region	DEPARTURE FROM NORMAL (IN.)					Palmer Drought Severity Index*
	This Month	Past				
		3 Mos.	6 Mos.	12 Mos.	24 Mos.	
Northwest	+3.91	+5.35	+8.02	+11.63	+10.54	+4.7
North Central	+5.18	+6.46	+10.65	+11.88	+13.12	+5.8
North East	+4.70	+6.72	+14.18	+15.77	+21.46	+6.5
West Central	+5.96	+7.33	+11.59	+15.41	+20.75	+6.1
Central	+5.84	+7.67	+11.49	+15.02	+20.69	+5.6
Central Hills	+5.32	+7.26	+12.88	+15.97	+18.46	+6.4
Northeast Hills	+5.19	+6.41	+13.09	+15.61	+17.26	+5.1
Southwest	+5.40	+7.64	+10.91	+16.27	+23.00	+6.2
South Central	+5.30	+6.28	+7.10	+7.78	+17.46	+4.8
Southeast	+5.20	+6.92	+10.50	+14.22	+26.84	+5.2
State	+5.20	+6.81	+11.04	+13.96	+16.64	

*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 1990



Average (in)
Percent of normal

ACKNOWLEDGEMENTS

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Precipitation data:
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service; The Miami Consergency District; U.S. Army Corps of Engineers, Muskingum Area.
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. Goettemoeller
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	3,669	206	201	183	145
Great Miami River at Hamilton	3,630	13,982	588	425	321	182
Huron River at Milan	371	1,666	1,054	583	405	161
Killbuck Creek at Killbuck	464	1,491	554	541	420	194
Little Beaver Creek near East Liverpool	496	2,015	433	430	385	155
Maumee River at Waterville	6,330	15,166	341	265	274	141
Muskingum River at McConnelsville	7,422	22,460	384	343	332	163
Scioto River near Prospect	567	2,450	1,012	815	664	219
Scioto River at Higby	5,131	17,244	426	406	369	179
Stillwater River at Pleasant Hill	503	2,473	752	569	515	188

STREAMFLOW for December was markedly above normal throughout the state. Flows were excessive with new record high December mean flows established at the following gauging stations listed in this report: Great Miami River at Hamilton, Huron River at Milan, Killbuck Creek at Killbuck, Little Beaver Creek near East Liverpool, Scioto River near Prospect, Scioto River at Higby, and Stillwater River at Pleasant Hill. The Grand River near Painesville and Muskingum River at McConnelsville had the second highest mean flow for December, the Maumee River at Waterville had the fifth greatest mean flow for December.

Flows at the beginning of the month were near normal throughout the state. The lowest flows for the month for most locations occurred on December 2, although some areas in the western and northwestern portions of the state had their lowest flows on or about December 14. Flows increased considerably after mid-month and remained noticeably high until the month's end. The two most notable periods of high flows occurred during the December 18-20 and 28-31 periods. During the December 18-20 period, small stream and low-level flooding occurred throughout the southern half of the state. The most severe and widespread flooding occurred at the month's end following snow melt and 2-3 inches of rain on December 29-30. Flow recurrence intervals were generally in the 25-year range in the northern portion of the state, but ranged up to a 100-year recurrence measured at the Portage River at Woodville gauging station. Recurrence intervals decreased from north to south to generally less than a 5-year recurrence interval in the southern portion of the state.

Streamflow was noticeably above normal throughout the state for the 1990 calendar year as a whole. Several daily and monthly maximum flow records were set. Although streamflow was slightly below normal at the start of the year and during the middle of the spring, the second half of the year saw excessive flows with flooding a recurring problem in many areas of the state. This resulted in the tragic loss of life as well substantial property damage. Nearly one-fourth of Ohio's 88 counties received some sort of disaster declaration. The year ended on a fitting note with flooding throughout many areas of the state.

RESERVOIR STORAGE for water supply during December increased in both the Mahoning and Scioto river basins. Month-end storage was noticeably above normal in both basins. Reservoir storage at the month's end in the Mahoning basin index reservoirs was 103 percent of rated capacity for water supply compared with 69 percent for last month and 58 percent for December 1989. Month-end storage in the Scioto basin index reservoirs was 104 percent of rated capacity for water supply compared with 89 percent for last month and 64 percent for December 1989.

Surface water supplies were in a favorable position throughout most of the 1990 calendar year. Storage was below normal at the start of the year and slightly below normal during the spring months. However, storage was above normal during the second half of the year and noticeably above normal at the year's end.

GROUND-WATER LEVELS during December rose throughout the state. Net changes from last month's levels were greater than usually expected in most aquifers. Ground-water levels in shallow, unconsolidated aquifers rose sharply during the second half of the month in response to heavy precipitation.

Ground-water levels are above normal throughout the state and noticeably above levels of a year ago. Index observation well H-1 (Harrison, Hamilton County), representing a sand and gravel aquifer, set a record-high level for December at the month's end.

Ground-water supplies were in a favorable position throughout most of the 1990 calendar year. Ground-water storage was near or slightly below normal during the early part of the year. However, the noticeably above normal precipitation during the summer and fall months helped ground-water storage return to and maintain a favorable position through the year's end. Several new record high ground-water levels were set during the last few months of 1990.

LAKE ERIE level rose during December. The mean level for December was 570.98 feet (IGLD-1955), 0.07 foot above last month's mean level and 1.13 feet above normal. This month's level is 0.80 foot above the December 1989 level and 2.38 feet above Low Water Datum.

Lake Erie's level was above the long-term average throughout 1990. The U.S. Army Corps of Engineers reports that through November precipitation has been 9.2 inches above normal in the Lake Erie basin and 5.1 inches above normal in the entire Great Lakes basin.

SUMMARY

Precipitation was noticeably above normal with the state average of 7.78 inches making December 1990 the wettest December on record. Streamflow was excessive with many river basins having record-high flows. Flooding occurred on December 18-20 and 28-31. Reservoir storage and ground-water levels are above normal. Lake Erie level rose 0.07 foot and is 1.13 feet above normal.

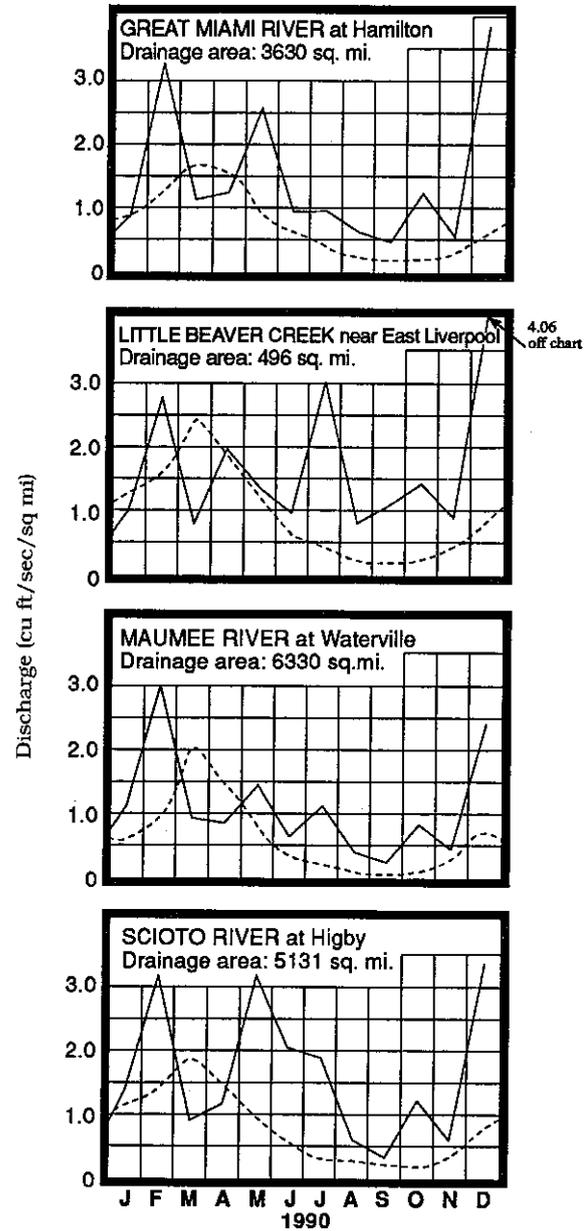
The 1990 calendar year was the wettest on record. The state average of 51.53 inches easily surpassed the previous record of 50.37 inches dating back to 1890. Both surface and ground-water supplies were in a favorable position throughout most of the year. Flooding was a recurring problem during the second half of the year. Lake Erie's level was above the long-term average throughout the year.

GROUND-WATER LEVELS

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

Index Well	Location	Aquifer	Mean This Month	Departure From Normal	Change in feet from:	
					Last Month	Year Ago
F-1	W. Rushville, Fairfield Co.	Sandstone	15.03	+1.75	+1.54	+1.79
Fa-1	Jasper Mill, Fayette Co.	Limestone	7.18	+1.11	+0.25	+0.97
Fr-10	Columbus, Franklin Co.	Gravel	41.59	+2.82	+0.35	+0.74
H-1	Harrison, Hamilton Co.	Gravel	20.50	+2.16	+1.34	+3.25
Hn-2a	Dola, Hardin Co.	Dolomite	6.41	+2.86	-0.07	+2.77
Po-1	Windham, Portage Co.	Sandstone	18.84	+1.64	+0.29	+1.33
Tu-1	Strasburg, Tuscarawas Co.	Gravel	12.12	+0.98	+0.69	+2.72

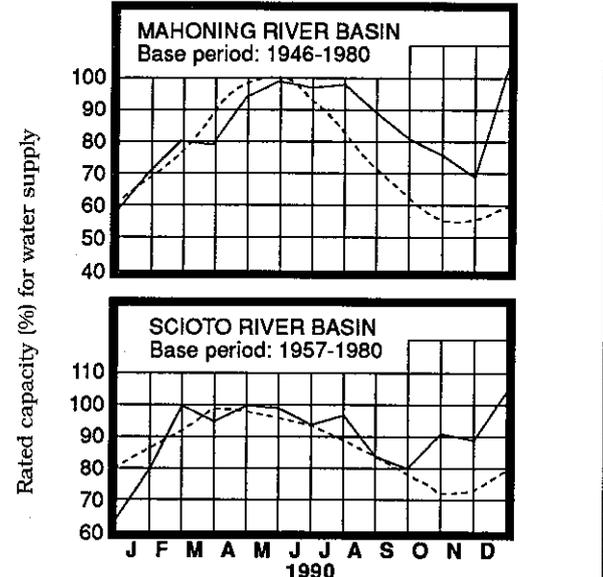
MEAN STREAM DISCHARGE



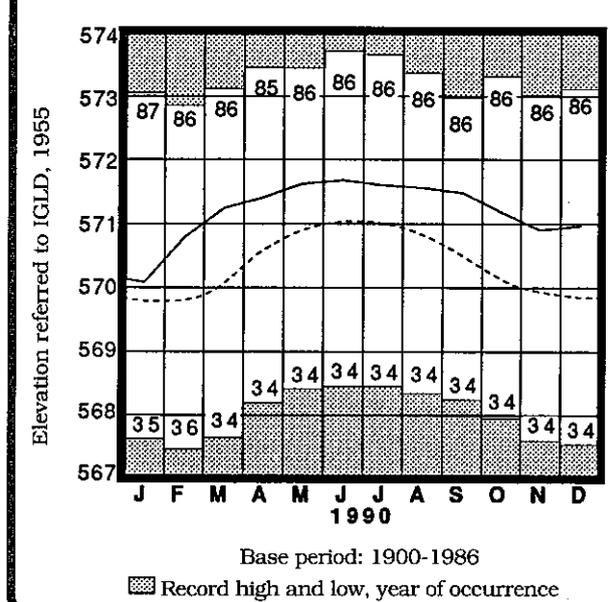
Base period for all streams: 1951-1980

Normal - - - - Current - - - -

RESERVOIR STORAGE FOR WATER SUPPLY



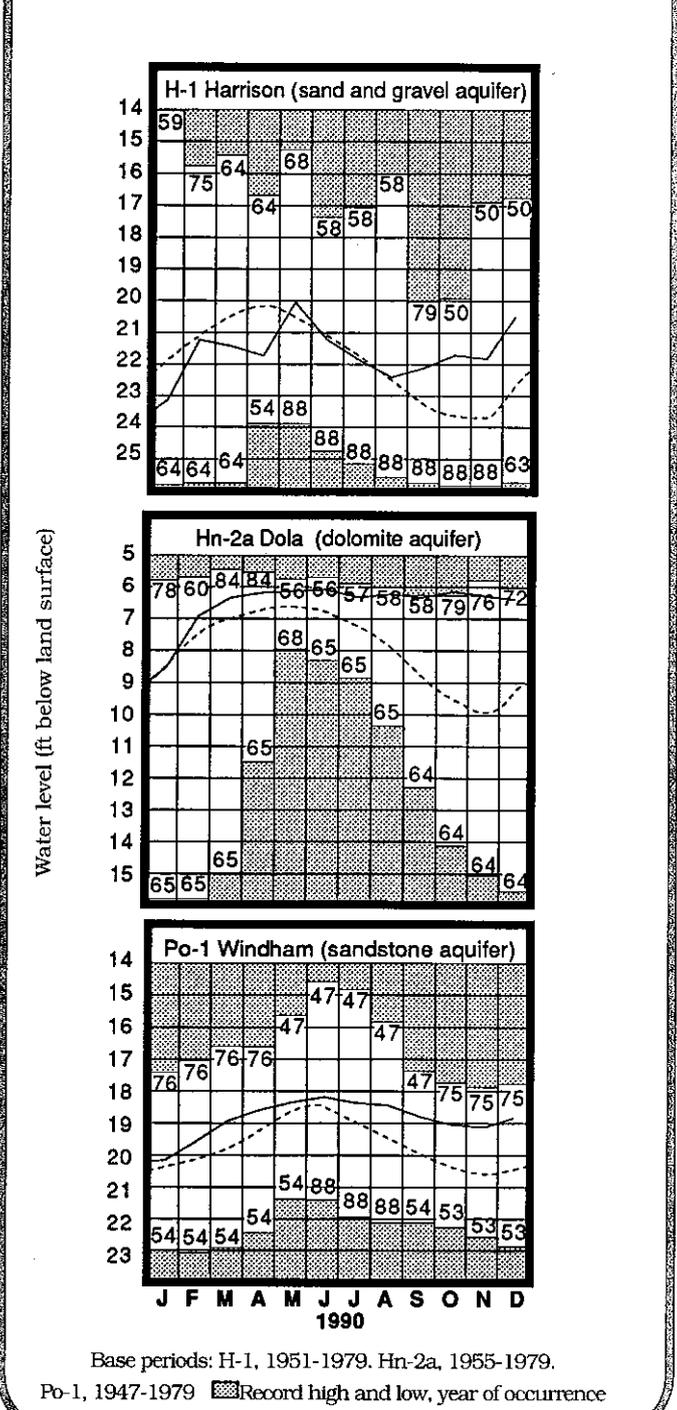
LAKE ERIE LEVELS at Cleveland



Base period: 1900-1986

Record high and low, year of occurrence

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 - - - -