ACKNOWLEDGEMENTS

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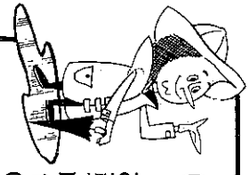
Lake Erie level data:
U.S. Corps of Engineers, Detroit District.



ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation for January was noticeably below normal throughout the state. Reservoir storage and ground-water storage continues to be below normal statewide while streamflow was below normal in the north and deficient in the south. Lake Erie level declined but still remains 1.45 feet above normal. Water supplies have seen little replenishment during the current recharge season.

NOTES AND COMMENTS

Supervisor named for Mapping Unit

The Ohio Department of Natural Resources, Division of Water announces the appointment of Michael Hallfrisch, hydrogeologist, as supervisor of the newly formed Mapping Unit of the Ground-Water Resources Section. Hallfrisch will direct the production of all the ground-water resources maps and the new pollution potential maps which are based on the "DRASTIC" system developed by the National Water Well Association for the U. S. Environmental Protection Agency. These maps are a valuable asset as a planning and management tool for administrators, commissioners, zoning boards, consulting engineers, ground-water consultants and others to help them make informed decisions about local development problems.

Mike is a member of the Association of Ground-Water Scientists and Engineers (an affiliate of the National Water Well Association), and the Water Management Association of Ohio. He received his Bachelor of Science degree in geological engineering from Michigan Technological University at Houghton, Michigan and his Masters of Science degree in geology with emphasis in hydrogeology from the University of Toledo. Mike has been very active in ground-water research projects since joining the Ground-Water Resources Section in October, 1984. He has authored several county ground-water resources maps and the first pollution potential map produced in the state of Ohio.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

JANUARY 1988

DIVISION OF WATER

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

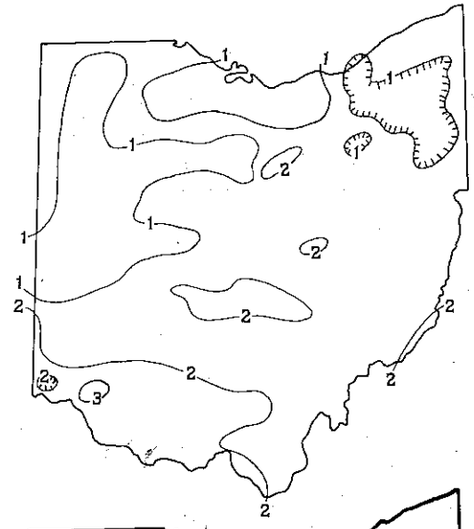
PRECIPITATION for January was noticeably below normal throughout the state. The average for the state as a whole was 1.40 inches, 1.36 inches below normal. Regional averages ranged from 2.05 inches, 1.32 inches below normal, for the South Central region to 0.83 inch, 1.47 inches below normal, for the North Central region. Milford, Clermont county, reported the greatest amount of precipitation for the month, 3.19 inches and Sandusky, Erie County, reported the least amount, 0.42 inch.

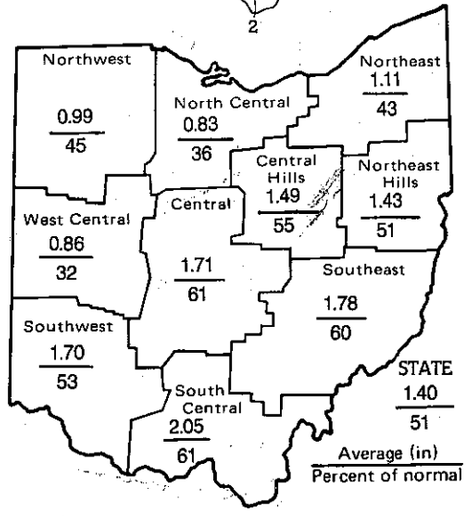
The bulk of the month's precipitation fell during the last two weeks mostly in the form of rain. Precipitation amounts generally ranged between 1 and 2 inches for most of the state with amounts of less than 1 inch reported from the west-central up through the northern portions of the state. Generally, only stations in the extreme south reported more than 2.0 inches. Storms during January 18-20 produced as much as 1.80 inches of rain in the southern portion of the state with amounts decreasing to about 0.25 inch in the northern portion. Snowfall was generally below normal throughout the state with very little accumulation on the ground when the "January Thaw" arrived.

Precipitation for the 1988 calendar year is off to a slow start. Hopefully these dry conditions will not continue and the state will not have a re-run of 1987.

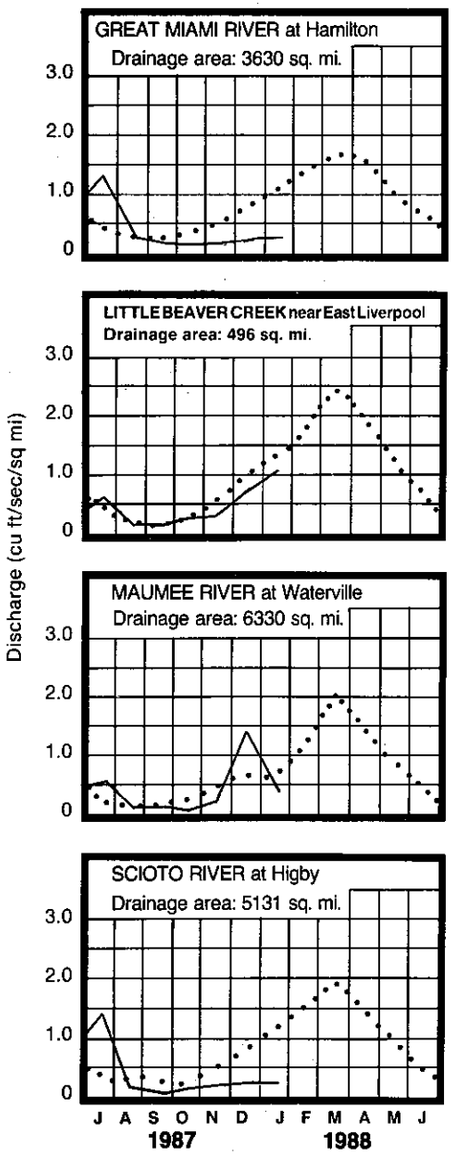
Precipitation for the first four months of the 1988 water year was below normal throughout the state. Precipitation statewide has been below normal in three of the four months. The average for the state as a whole is 7.85 inches, 2.48 inches below normal. Regional averages ranged from 8.96 inches, 1.87 inches below normal, for the Northeast region to 6.89 inches, 3.15 inches below normal, for the Central Hills region. Replenishment to water supplies has been very limited during the current recharge season. It is hoped that there will be some improvement during the coming months.

PRECIPITATION
JANUARY 1988





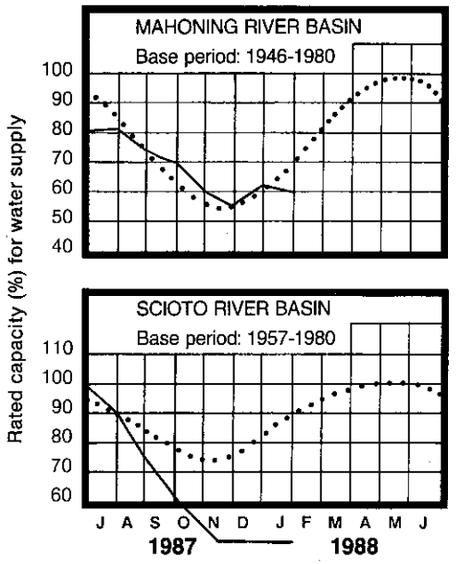
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



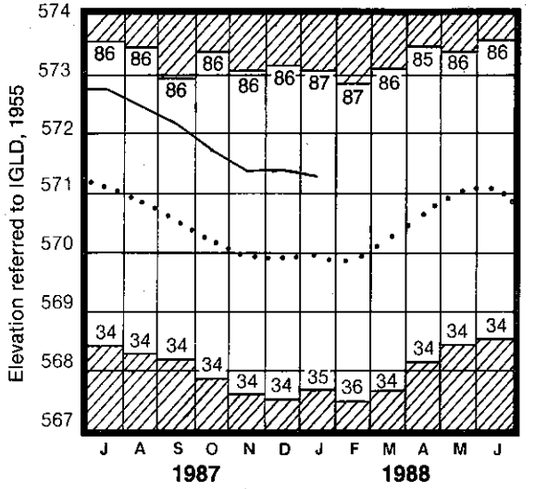
RESERVOIR STORAGE for water supply for January decreased slightly in the Mahoning River basin and increased slightly in the Scioto River basin. Storage in the Mahoning River basin fell to below normal for the first time since July 1987. Storage in the Mahoning River basin continues to be affected by the draining of Lake Milton for repairs to the dam. Storage in the Scioto River basin remains noticeably below normal.

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 61 percent of rated capacity for water supply compared with 63 percent for last month and 56 percent for January 1987. Storage at the month's end for the Scioto basin index reservoirs was 47 percent of rated capacity for water supply compared with 46 percent for last month and 89 percent for January 1987.

STREAMFLOW for January was below normal in the northern portion of the state and deficient in the southern portion. Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 936 cfs, 29 percent; Little Beaver Creek, 524 cfs, 84 percent; Maumee River, 2,704 cfs, 70 percent; and Scioto River, 1,329 cfs, 24 percent.

Cumulative runoff and percent of normal for the first four months of the 1988 water year at the index gaging stations is: Great Miami River, 1.00 inch, 29 percent; Little Beaver Creek, 2.77 inches, 80 percent; Maumee River, 2.32 inches, 86 percent; and Scioto River, 0.89 inch, 31 percent.

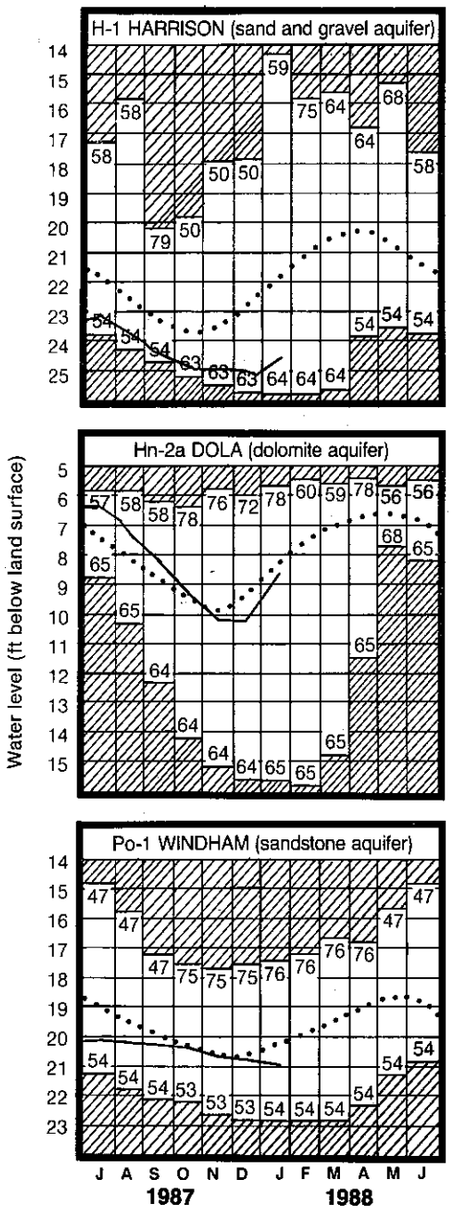
LAKE ERIE LEVELS at Cleveland



LAKE ERIE level for January declined, yet still remains above normal. The mean level for January was 571.27 feet (IGLD- 1955), 0.16 foot below last month's mean level and 1.45 feet above normal. This month's mean level is 1.82 feet below the record high level observed for January in 1987 and 2.67 feet above Low Water Datum.

GROUND-WATER LEVELS for January showed slight improvements but still remain noticeably below normal throughout the state. Ground-water levels in general remained stable during the first half of the month and rose slightly during the second half in response to recharge from precipitation, some delayed recharge from December's precipitation and the "January Thaw". Net rises from last month's levels were on the average about half of that usually observed for January. Generally, ground-water levels ranged from 0.25 foot to nearly 5.0 feet below the January 1987 levels and 0.5 foot to over 5.0 feet below normal. The greatest departures were in the southern and eastern portions of the state where precipitation was most deficient during 1987. Observation well F-1 at West Rushville, Fairfield County, representing a sandstone aquifer, recorded an all-time record low level for fourth consecutive month. The noticeably low ground-water levels have cause supply problems with many domestic wells in some areas of the state.

GROUND-WATER LEVELS



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

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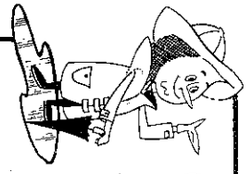

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY Precipitation was above normal throughout most of the state. Streamflow was above normal while reservoir storage and ground-water storage increased noticeably yet still remain below normal. Lake Erie level rose slightly and remains noticeably above normal.

NOTES AND COMMENTS

TWO HYDROGEOLOGISTS ADDED TO GWRS STAFF

The ODNR Division of Water, Ground-Water Resources Section has added two new hydrogeologists to its staff. Jack A. Leow, a native of Toledo, has joined the GWRS Technical Service Unit and will be assisting in answering requests for ground-water resource information and working on special projects and investigations. Jack received his Bachelor of Science degree in geology from Bowling Green State University and worked with the ODNR Division of Geological Survey from 1984 until present.

Katherine M. Peterson, of Ravenna, has joined the GWRS Mapping Unit. Kathy will locate well logs which provide the basic data for the ground-water resource and pollution potential maps. Kathy received her Bachelor of Science degree in geology from Kent State University and was employed with the ODNR Division of Geological Survey from 1985 until present.

NEW MEMBERS APPOINTED TO THE OHIO WATER ADVISORY COUNCIL

Governor Richard F. Celeste has appointed two new members to the Ohio Water Advisory Council. They are: Joan E. Brasaemle, Stow, representing ground water and Chris Carlson, Yellow Springs, a public member. Ms. Brasaemle and Ms. Carlson both have been active in Ohio environmental and water resource matters. In addition, Dr. Robert Stiefel, Columbus, representing surface water, was reappointed to the council.

Other members of the seven-person council are: Bayliss (Rock) L. Prater, Willard, public member; Marquita McLean, Cincinnati, public member; Lloyd E. Overly, Chillicothe, flood plains and James L. Rozelle, Centerville, dam safety.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER

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FEBRUARY 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

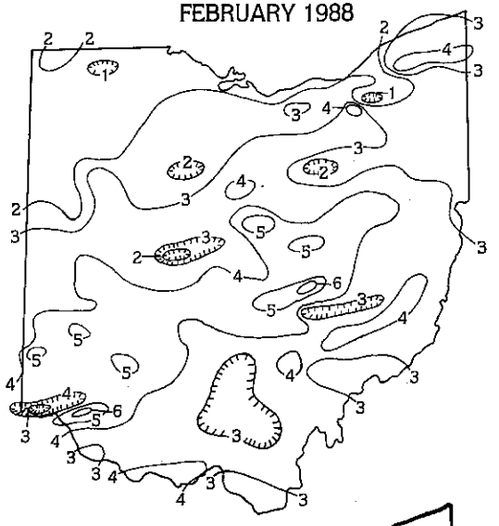
PRECIPITATION for February was above normal throughout the state, except in the Northwest Region where precipitation was slightly below normal. The average for the state as a whole was 3.31 inches, 1.07 inches above normal. Regional averages ranged from 4.15 inches, 1.53 inches above normal, for the Southwest Region to 1.81 inches, 0.03 inch below normal, for the Northwest Region. Perintown, Clermont County, reported the greatest amount of precipitation for the month, 6.63 inches; Wauseon, Fulton County, reported the least amount, 0.76 inch.

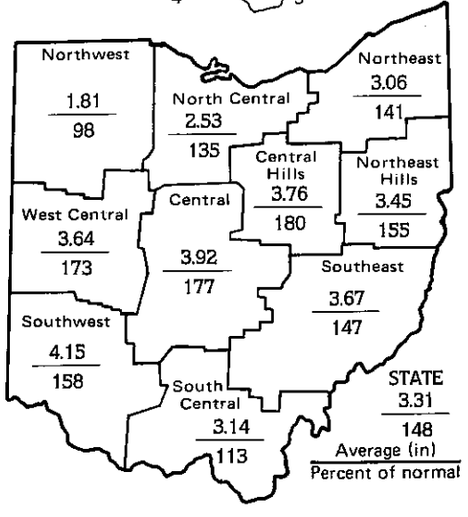
The southwestern and central portions of the state received the greatest amounts of precipitation for the month ranging from 4 to 6.63 inches. Amounts decreased to the southeast and north, diminishing to less than 2 inches in the northwest. Measurable amounts of precipitation fell during every week of the month. The bulk of the month's precipitation for the southern two-thirds of the state fell during February 1-3. Many stations in the southwest and central portions reported 2 to 4 inches during this period. Snowfall was generally normal to above normal statewide. The northeast snowbelt area received excessive amounts; Chardon, Geauga County, reported a record 47.8 inches, 27.3 inches above normal, for the month. For the snow season, Chardon has received 97.4 inches, 15.4 inches above normal.

Precipitation for the 1988 calendar year is generally below normal statewide, except in the Central and Central Hills regions where precipitation is above normal and the Southwest Region where it is exactly normal. The average for the state as a whole is 4.71 inches, 0.29 inch below normal. Regional averages range from 5.85 inches which is normal for the Southwest Region to 2.80 inches, 1.22 inches below normal, for the Northwest Region.

Precipitation for the 1988 water year is below normal throughout the state. The average for the state as a whole is 11.16 inches, 1.41 inches below normal. Regional averages range from 12.27 inches, 1.77 inches below normal, for the Southwest Region to 9.68 inches, 1.34 inches below normal, for the North Central Region.

PRECIPITATION
FEBRUARY 1988





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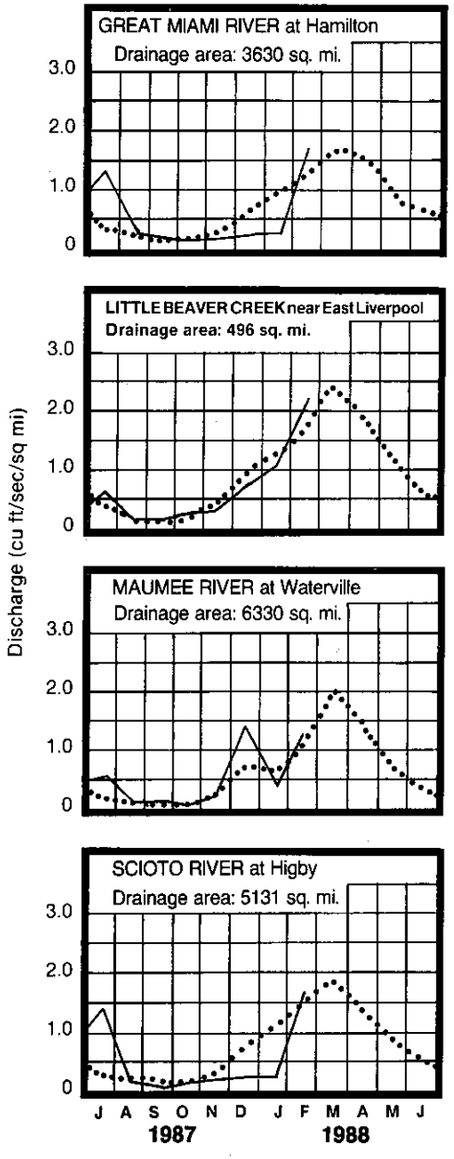
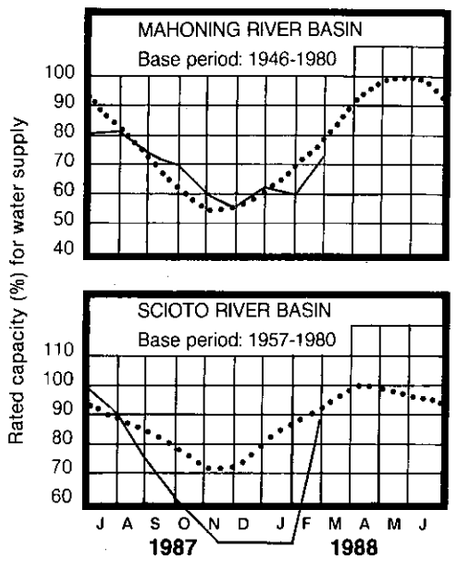


Base period for all stream: 1951-1980

Normal . . . . . current ———

RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for February increased in both the Mahoning River and the Scioto River basins. Storage in the Mahoning River basin remained below normal and is still affected by the draining of Lake Milton for repairs to the dam. Storage increased significantly in the Scioto River basin, yet still remains below normal.

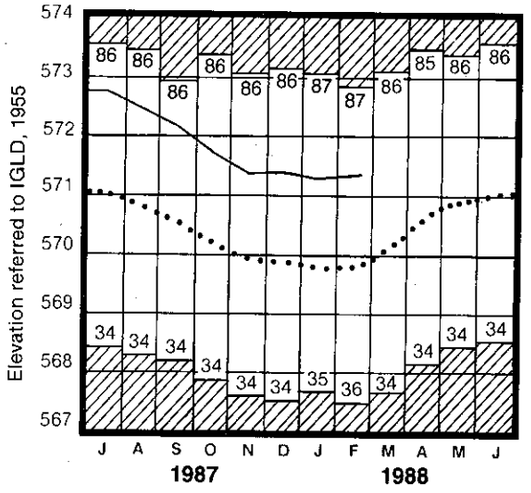
Reservoir storage at the month's end for the Mahoning basin index reservoirs was 73 percent of rated capacity for water supply compared with 61 percent for last month and 59 percent for February 1987. Storage at the month's end for the Scioto basin index reservoirs was 88 percent of rated capacity for water supply compared with 47 percent for last month and 85 percent for February 1987.

STREAMFLOW for February increased seasonally and was above normal statewide. Flows increased sharply the first week of the month in response to the heavy precipitation on February 1-2. Flows decreased during the rest of the month and were below normal at the month's end.

Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 6,017 cfs, 124 percent; Little Beaver Creek, 1,090 cfs, 133 percent; Maumee River, 7,107 cfs, 116 percent; and Scioto River, 8,215 cfs, 114 percent.

Cumulative runoff for the 1988 water year is still noticeably below normal for the southern half of the state. Cumulative runoff for the Great Miami River at Hamilton is 2.78 inches, 57 percent of normal and for the Scioto River at Higby is 1.72 inches, 55 percent of normal.

LAKE ERIE LEVELS at Cleveland

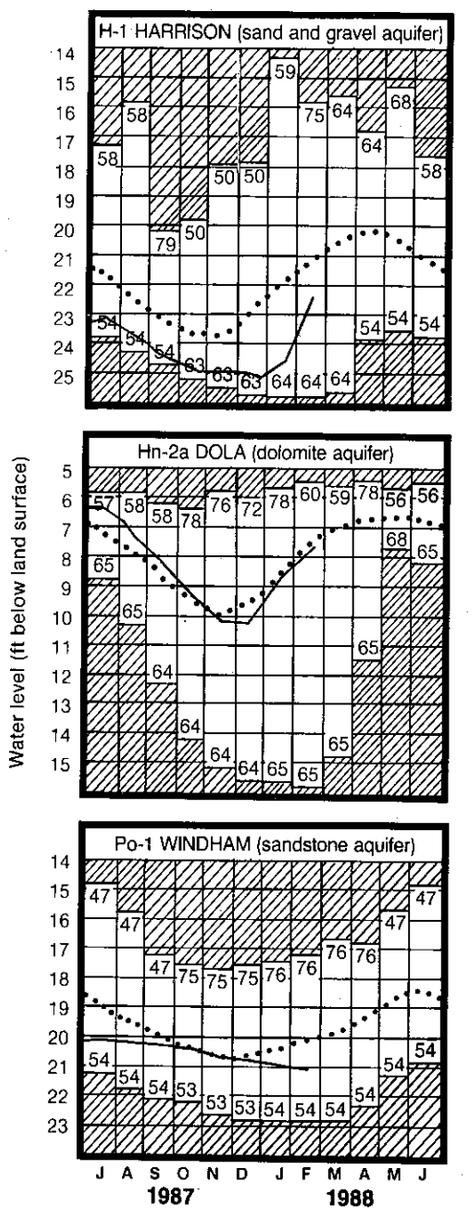


LAKE ERIE level for February increased slightly whereas lake levels are usually still declining. The mean level for February was 571.32 feet (IGLD-1955), 0.05 foot above last month's mean level and 1.52 feet above normal. This month's mean level is 1.52 feet below the record high level for February set in 1987 and 2.72 feet above Low Water Datum. The lake level is 2.38 feet below the all-time record high set in June 1986 as it appears to be starting its seasonal rise.

GROUND-WATER LEVELS for February showed significant rises in most areas of the state. Exceptions were in the consolidated aquifers in the northeastern portion of the state. Water levels rose sharply the first week of the month in response to the heavy rains in many areas of the state. Water levels continued to rise throughout the month in consolidated aquifers and leveled off in unconsolidated aquifers during the last two weeks of the month. Net rises from last month's levels were generally over twice that usually observed. Even with these significant rises, ground-water levels are generally from 0.5 to 2.5 feet below those levels observed in February 1987 and from 0.5 to 4 feet below normal.

Observation well F-1 at West Rushville, Fairfield County, representing a sandstone aquifer, recorded a record low for February on the first day of the month, before water levels began to rise. Although not an all-time low level, this is the fifth consecutive month for which record lows were established for this well.

GROUND-WATER LEVELS



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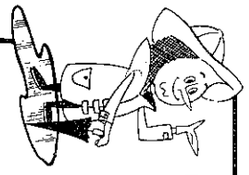

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation for March was below normal throughout the state. Streamflow decreased contra-seasonally and was below normal. Reservoir storage and ground-water storage increased but still remain below normal. Lake Erie rose slightly and continues to be noticeably above normal.

NOTE AND COMMENTS

LAKE MILTON DAM REPAIRS COMPLETED

Lake Milton, after being drained for repairs to the dam since early 1986, has begun to refill. The gates were officially closed on March 29, 1988. One or two gates will remain partially open during the filling process to maintain downstream flow. With normal precipitation, the lake should fill by early summer.

Approximately $4.5 million was spent to rehabilitate the dam which was found unsafe by studies and inspections made in the late 1970s and early 1980s by the ODNR Division of Water. By agreement between the City of Youngstown and the Ohio Department of Natural Resources, Lake Milton is to become the state's 72nd state park.

OHIO LAKE MANAGEMENT SOCIETY PLANS ANNUAL CONFERENCE

The Ohio Lake Management Society will hold its Second Annual Conference on May 2, 1988, at the Radisson Hotel and Conference Center (Port Columbus Airport) in Columbus, Ohio. The theme of the one day symposium is "Tools For Lake & Reservoir Management." The registration fee is $40 ($50 at the door). Write or call Janis Markusic, OLMS President, P. O. Box 14, Struthers, Ohio 44471, (216) 757-3051 for registration materials. In the Columbus area, contact Jerry Wager, ODNR Division of Soil and Water Conservation, at (614) 265-6619. Information about commercial exhibits can be obtained from Donna Myers, OLMS Secretary, P. O. Box 14, Struthers, Ohio 44471 (614) 363-2982 or (614) 469-5553.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

Richard F. Celeste
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MARCH 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

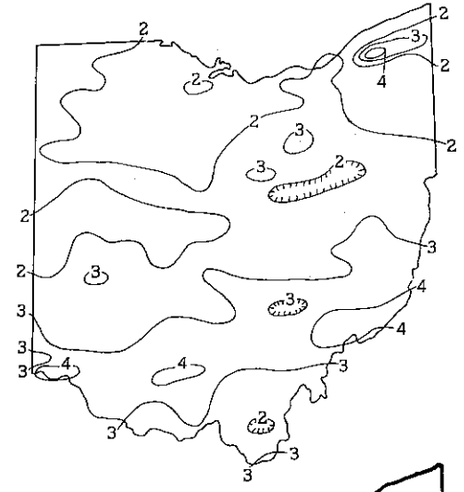
PRECIPITATION for March was below normal throughout the state. The average for the state as a whole was 2.38 inches, 1.00 inch below normal. Regional averages ranged from 3.30 inches, 0.32 inch below normal, for the Southeast Region to 1.83 inches, 1.03 inches below normal, for the North Central Region. Fernbank, Hamilton County, reported the greatest amount of precipitation for the month, 4.87 inches; Crane Creek State Park, Ottawa County, reported the least amount, 1.05 inches.

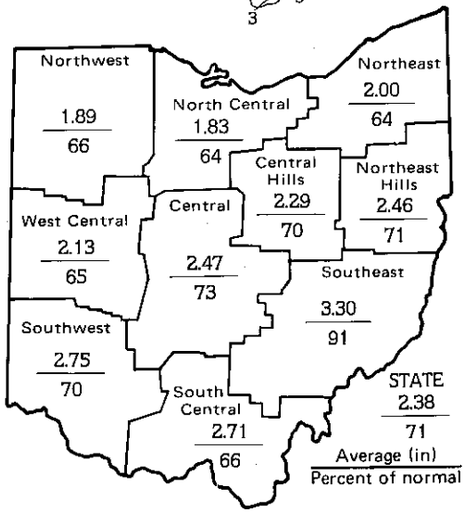
There were moderate amounts of precipitation during every week of the month. Most areas of the state received 2 to 4 inches. Amounts were greatest in a band across the southern and southeastern portions of the state with a few stations reporting more than 4 inches. Generally, precipitation amounts decreased to the north and west with most stations in these areas reporting less than 2 inches. The bulk of the month's precipitation for the southern half of the state was produced during March 2-5 with many stations reporting up to 2 inches. Storms during March 24-26 produced amounts of 0.5 to 1 inch statewide. Snowfall was generally below normal statewide except in the northeast portion of the state where it was above normal. Chardon, Geauga County, reported 26 inches for the month, 7 inches above normal. Chardon's snow total for the season is 123.5 inches, 22.6 inches above normal.

Precipitation for the 1988 calendar year is below normal throughout the state. The average for the state as a whole is 7.08 inches, 1.30 inches below normal. Regional averages range from 8.75 inches, 0.33 inch below normal, for the Southeast Region to 4.69 inches, 2.20 inches below normal, for the Northwest Region.

Precipitation for the first half of the 1988 water year (Oct. 1, 1987-Sept. 30, 1988) is below normal throughout the state. The average for the state as a whole is 13.54 inches, 2.41 inches below normal. Regional averages range from 15.22 inches, 1.55 inches below normal, for the Southeast Region to 11.51 inches, 2.37 inches below normal, for the North Central Region. Precipitation has been below normal in four of the six months in the 1988 water year. This period includes much of the water supply recharge period.

PRECIPITATION
MARCH 1988





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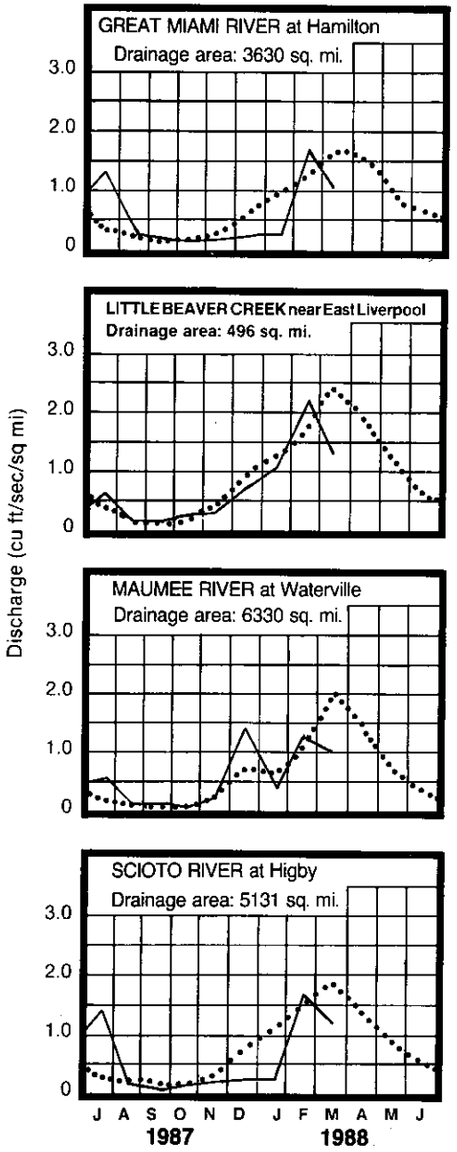

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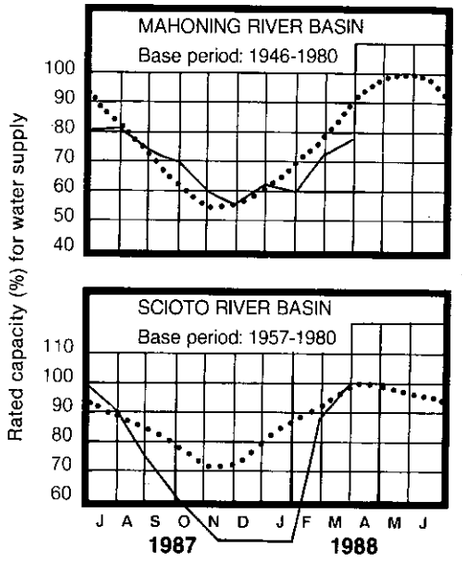
Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



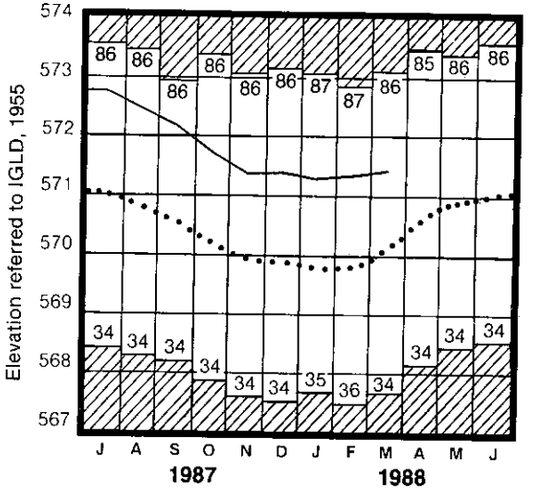
RESERVOIR STORAGE for water supply for March increased in both the Mahoning and Scioto river basins. Storage in the Mahoning River basin remained below normal and is still affected by the draining of Lake Milton for repairs to the dam. As of March 29, 1988, refilling of Lake Milton has begun (see note on the last page of this report). Storage in the Scioto River basin was above normal for the first time since July 1986. 1

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 78 percent of rated capacity for water supply compared with 73 percent for last month and 67 percent for March 1987. Storage at the month's end for the Scioto basin index reservoirs was 100 percent of rated capacity for water supply compared with 88 percent for last month and 85 percent for March 1987.

STREAMFLOW for March decreased contra-seasonally and was below normal statewide. Flows increased to above the long-term monthly normals on only a few days during the month. Generally, flows were above normal during March 4-10 in the southern portion of the state and March 24-26 in the northern portion. Flows were deficient statewide at the month's end.

Mean discharge and percent of normal at the index gaging stations for March were: Great Miami River, 3,971 cfs, 65 percent; Little Beaver Creek, 672 cfs, 56 percent; Maumee River, 6,480 cfs, 51 percent; and Scioto River 6,359 cfs, 66 percent.

LAKE ERIE LEVELS at Cleveland



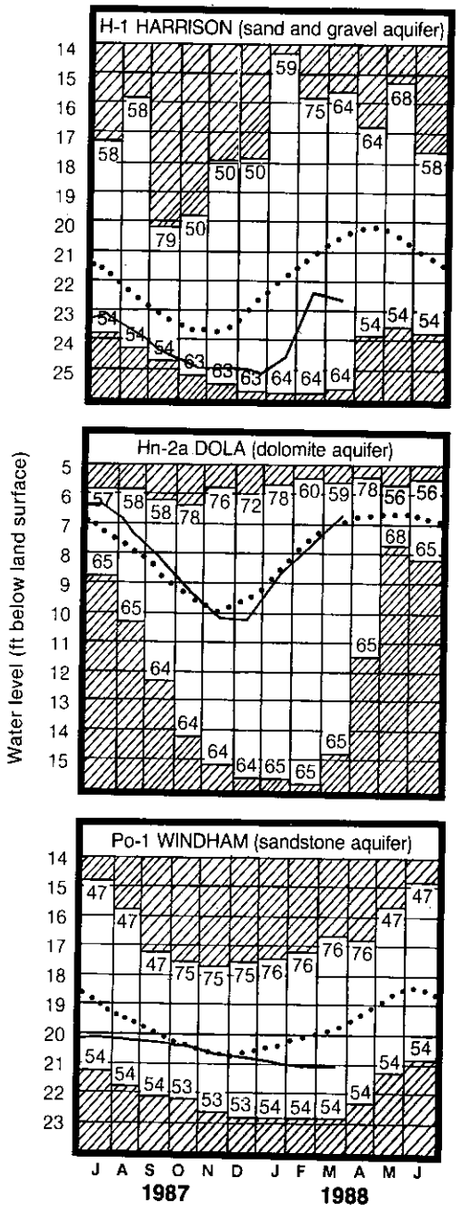
March is normally the month with the highest streamflows. The below normal precipitation during March may help explain why flows were below normal and only two flood warnings were issued in the state. The first flood warning was on March 4 for Brush Creek, Adams County, and the lower Scioto River. The second occurred on March 25 for the St. Joseph and Tiffin rivers. There was very little damage or property loss reported on each occasion. Since many factors are involved, the potential for flooding exists throughout the state all year. Given the proper weather and soil conditions, flooding may occur at any time.

LAKE ERIE level for March rose slightly. The mean level for March was 571.45 feet (IGLD-1955), 0.13 foot above last month's mean level, and 1.40 feet above normal. This month's mean level is 1.22 feet below the February 1987 mean level and 2.85 feet above Low Water Datum.

The U. S. Army Corps of Engineers reports that the Great Lakes levels are down about 2.5 feet from the record high levels set during the summer of 1986. The corps also reports that applications for dredging permits have increased sharply during the past three months.

GROUND-WATER LEVELS for March generally rose throughout the state; the exception was in unconsolidated aquifers in the southwestern portion of the state where water levels declined after showing significant rises last month. Generally, water levels rose during the first half of the month and leveled off during the second half. Net rises from last month's levels were generally equal to that usually observed. Even after two months of net rises, ground-water levels are generally normal to 2 feet below normal. 2

GROUND-WATER LEVELS



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

ACKNOWLEDGEMENTS

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

Precipitation data:
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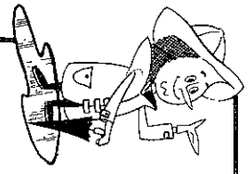

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OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation for April was below normal throughout the state. Streamflow was noticeably below normal. Ground water and reservoir storage increased but generally continue to be below normal. Lake Erie level rose for the third consecutive month and continues to be noticeably above normal but 1.91 feet below the record high level set in June, 1986.

NOTES AND COMMENTS

GOVERNOR CELESTE SIGNS "GREAT LAKES CHARTER INITIATIVES"

The Ohio General Assembly recently passed and Gov. Celeste signed Sub. H.B. 662, effective June 29, 1988. Known as the "Great Lakes Charter Initiatives," this legislation will have far reaching significance in Ohio for water managers and users. The legislation encompasses a wide range of water management issues which were necessitated by concerns of diversions and consumptive uses. This legislation was developed to meet specific legal tests established by the U. S. Supreme Court. Sub. H.B. 662: 1) amends the authority of the Ohio Department of Natural Resources (ODNR) to require permits for water diversions of 100,000 gallons per day (gpd) or more out of the Lake Erie or Ohio River basins; 2) requires ODNR to issue permits for new or increased consumptive uses of more than 2 million gpd of any waters in Ohio; 3) requires the registration and annual reporting to the ODNR Division of Water of all facilities with the capacity to withdraw 100,000 gpd or more of water; 4) requires the ODNR Division of Water to develop a detailed statewide water resource inventory, including consumptive uses and diversions; 5) requires the ODNR Division of Water to cooperate with other Great Lakes states in developing a common data base of water resource information; 6) requires the ODNR Division of Water to prepare a long-range water management plan for the Lake Erie basin; and 7) provides guidelines for the determination of reasonable use and/or prior use of ground or surface waters.

For more information on Sub. H.B. 662, contact Richard Bartz of the ODNR Division of Water at (614) 265-6730.

RETIREMENT BANQUET BEING PLANNED

On July 15, 1988 four longtime Division of Water employees will be honored at a retirement banquet. The future retirees are Chuck Hahn, Leonard Harstine, Andy Spencer and Art Woldorf. The banquet will be held at the Monte Carlo Restaurant, 6333 Cleveland Ave., Columbus. For additional information contact David Cashell at ONDR Division of Water, 1939 Fountain Sq., Bldg. E-3, Columbus, Ohio 43224, or call (614) 265-6743.

ODNR
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APRIL 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

PRECIPITATION for April was below normal throughout the state. The average for the state as a whole was 2.33 inches, 1.18 inches below normal. Regional averages ranged from 3.21 inches, 0.60 inch below normal, for the Southwest Region to 1.67 inches, 1.91 inches below normal, for the West Central Region. Fernbank, Hamilton County, reported the greatest amount of precipitation for the month for the second month in succession, 4.61 inches. The least amount of precipitation for April was reported by Westlake, Cuyahoga County, 0.97 inch.

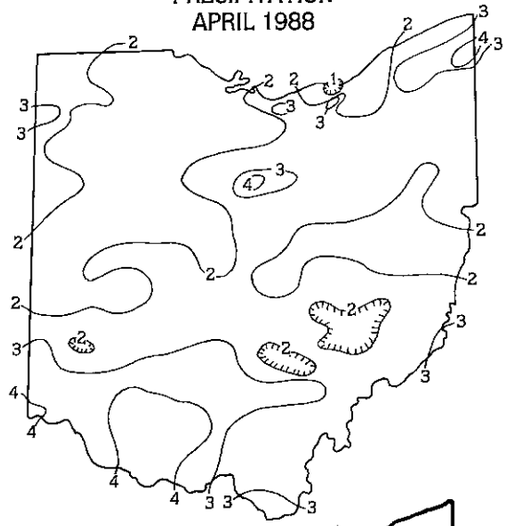
The bulk of the month's precipitation occurred during the first week. Storms on April 3-4 produced between 1 and 2 inches throughout the southern half of the state diminishing to less than 0.5 inch in the north. Another storm on April 6-7 produced amounts of 0.5 to 1 inch throughout most of the state with the greatest amounts again occurring in the southern portion. Generally, the remainder of the month was rather dry. Storms on April 21 produced about 0.5 inch in the southern portion of the state to over 1 inch along the Ohio River. Only the extreme northeastern portion of the state received more than 0.5 inch during the last week.

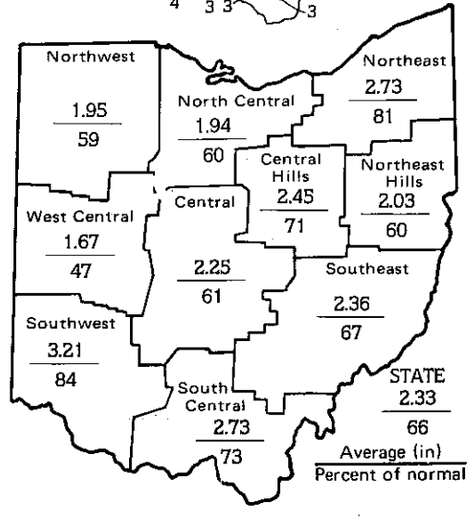
Most of the state received 1.5 to 3 inches of precipitation for the month. Except for Mansfield and a few other isolated locations in the northeast, only stations in the southern third of the state received greater than 3 inches, with amounts exceeding 4 inches along the Ohio River in the southwestern portion of the state.

Cumulative precipitation for the 1988 calendar year is below normal throughout the state. The average for the state as a whole is 9.42 inches, 2.47 inches below normal. Regional averages range from 11.81 inches, 1.77 inches below normal, for the Southwest Region to 6.64 inches, 3.56 inches below normal, for the Northwest Region. Precipitation has been below normal in three of the four months so far in 1988.

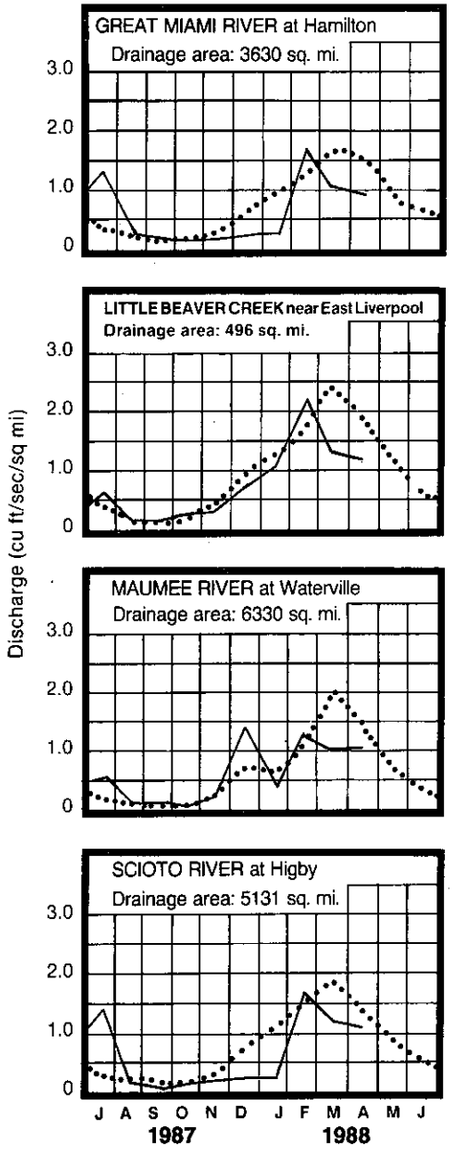
Cumulative precipitation for the 1988 water year (Oct. 1, 1987-Sept. 30, 1988) thus far is below normal throughout the state. The average for the state as a whole is 15.88 inches, 3.58 inches below normal. Regional averages range from 18.23 inches, 3.54 inches below normal, for the Southwest Region to 13.45 inches, 3.68 inches below normal, for the North Central Region. Precipitation during the water supply recharge season has been below normal in five of the seven months in the 1988 water year. As the recharge season draws to a close, we urge those who manage water supplies to closely monitor their respective water resources and plan accordingly.

PRECIPITATION
APRIL 1988





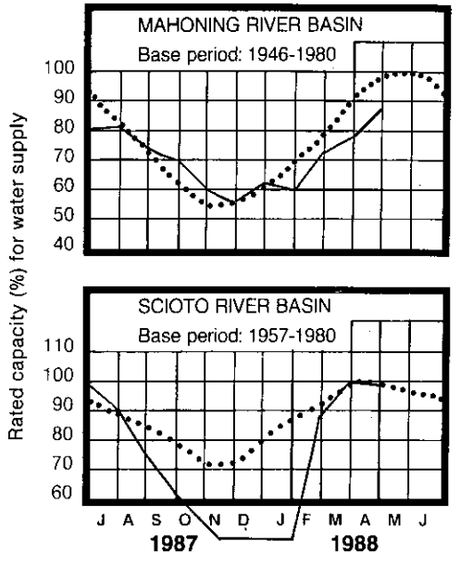
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current ———

RESERVOIR STORAGE FOR WATER SUPPLY



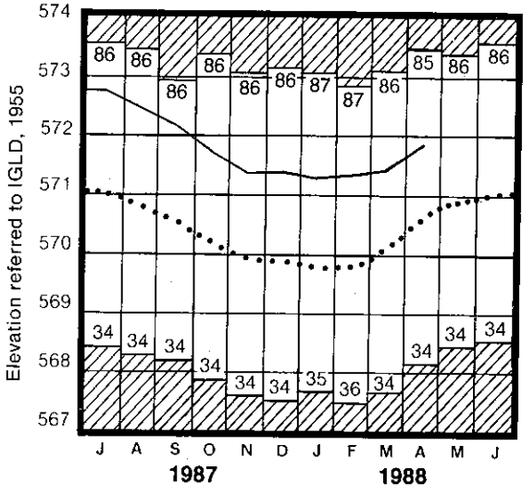
RESERVOIR STORAGE for water supply for April increased in the Mahoning River basin and remained the same in the Scioto River basin. Storage in the Mahoning River basin was below normal for the fourth consecutive month. Lake Milton has begun to fill and had impounded 20 percent of its rated capacity for water supply at the month's end. Storage in the Scioto River basin was slightly above normal.

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 86 percent of rated capacity for water supply compared with 78 percent for last month and 89 percent for April 1987. Storage at the month's end for the Scioto basin index reservoirs was 100 percent of rated capacity for water supply compared with the same for last month and 99 percent for April 1987.

STREAMFLOW for April was below normal throughout the state except in the eastern portion where it was deficient. Flows in most areas increased significantly on April 4 in response to the heavy statewide precipitation on April 3-4. Flows were generally above the monthly mean only during the April 4-10 period. Flows were noticeably deficient statewide at the month's end.

Mean discharge and percent of normal at the index gaging stations for April were: Great Miami River, 3,227 cfs, 58 percent; Little Beaver Creek, 612 cfs, 67 percent; Maumee River, 6,440 cfs, 68 percent; and Scioto River, 5,793 cfs, 78 percent.

LAKE ERIE LEVELS at Cleveland



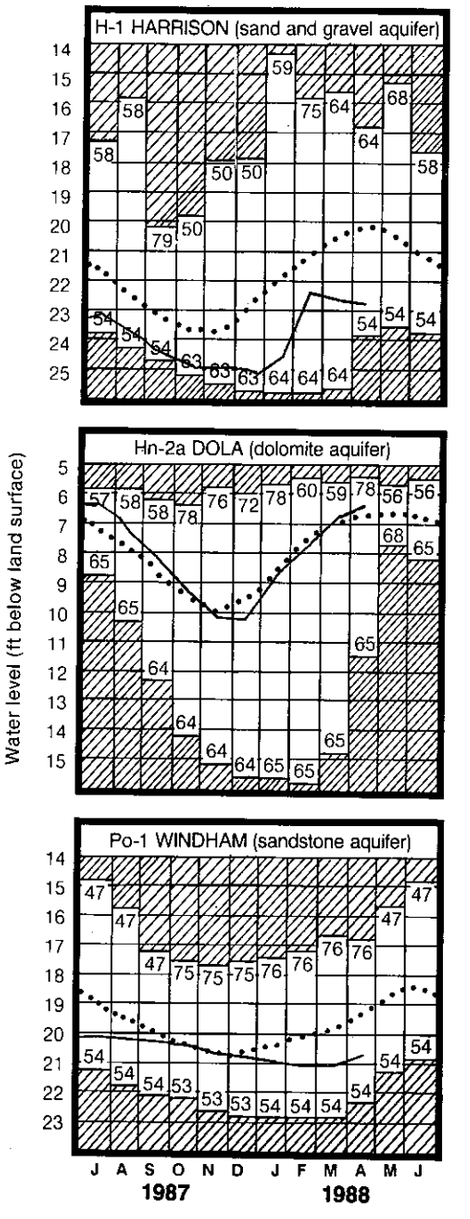
LAKE ERIE level for April rose moderately. The mean level for April was 571.79 feet (IGLD-1955), 0.34 foot above last month's mean level and 1.18 feet above normal. This month's mean level is 1.22 feet below the April 1987 mean level and 3.19 feet above Low Water Datum.

This is the third consecutive month of rising water levels in Lake Erie. Rises during this period were about two-thirds of that usually observed. The U. S. Army Corps of Engineers is projecting Lake Erie's level to remain above the long-term mean but not to set any new record high levels in the near future.

GROUND-WATER LEVELS for April generally declined throughout the state; exceptions were in some consolidated and confined unconsolidated aquifers where water levels continued to rise in response to delayed recharge. Generally, water levels rose during the first half of the month in response to recharge from precipitation and declined during the second half due to the lack of sustained recharge. April mean levels were generally above those of last month, but net rises were about one-half of those usually observed, except in unconsolidated aquifers in the southwestern portion of the state where water levels declined for the second consecutive month. Ground-water levels are generally 0.5 to 2.5 feet below normal statewide with only index well Hn-2a, Dola, Hardin County, representing a dolomite aquifer, being slightly above normal for the second consecutive month.

Ground-water levels in most areas of the state continued to decline throughout the fall of 1987 into early February 1988. Many record low levels were established during this period. Although ground-water levels have recovered, they still remain noticeably below normal. As the end of the recharge season approaches, we urge those who depend on ground water for their supplies to closely monitor their respective situations and plan accordingly.

GROUND-WATER LEVELS



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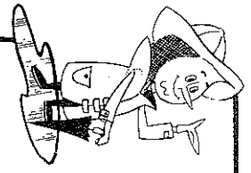

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OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

NOTES AND COMMENTS

CURRENT DROUGHT CONDITIONS IN OHIO

A word frequently heard in recent weeks is drought. Although the word drought is commonly used by everyone, the exact definition is hard to agree on. Ohio is experiencing a drought; but a closer look reveals that these conditions have not happened overnight.

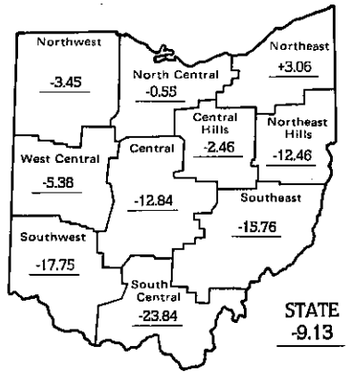
In 1986, severe drought conditions were experienced in the southeastern portion of the United States. During this period, below normal precipitation was experienced in the southern half of Ohio. The South Central Region showed the greatest departure, 3.20 inches below normal. Generally, there were few problems during this period. Agriculture fared well during the growing season and only a few water supply problems were reported.

A different situation occurred in 1987. The drought conditions expanded to include the entire state except for the northeast portion. Precipitation during the water supply recharge period was noticeably below normal with February being the second driest February for the state as a whole in 105 years. March, April and May brought little relief. Water supplies were not fully replenished during the recharge season. June, July and August brought above normal precipitation to the northern portion of the state, but the southern half continued to be dry. Agricultural crops suffered in this area from the below normal precipitation during the growing season. September, October, and November also offered below normal precipitation. Water supplies were declining from already lowered levels and the water supply recharge season got off to a poor start. December offered some relief with above normal precipitation, but it did little to help. For the state as a whole, 1987 ended as the seventh driest in this century. The southern portion of the state was hardest hit again with the South Central Region being the second driest in this century with a departure of 12.87 inches below normal.

These conditions have continued through 1988. Only in February did above normal precipitation occur statewide. Water supplies, especially ground-water supplies, have not recovered. During the past six weeks, agricultural crops have been especially hard hit. Water supply problems have already been reported. As the summer season approaches, water supplies will continue to be affected by these current drought conditions.

Going back to the definition of drought, one must understand what the dry conditions have affected. Precipitation is needed at different times of the year to meet different specific requirements. Agriculture has been adversely affected the past six weeks, but the cumulative effect of three years of dry conditions has had noticeable effects on water supplies, especially ground-water supplies. Shown below is a map of cumulative departures from normal for the past 30 months.

PRECIPITATION
30 MONTH CUMULATIVE DEPARTURE IN INCHES—
DECEMBER 1985 to MAY 1988



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MAY 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

PRECIPITATION for May was noticeably below normal statewide. The average for the state as a whole was 1.78 inches, 1.97 inches below normal. Regional averages ranged from 2.43 inches, 1.51 inches below normal, for the Southeast Region to 0.84 inch, 2.67 inches below normal, for the North Central Region. Andover, Ashtabula County, reported the greatest amount of precipitation for the month, 3.61 inches. Crane Creek State Park, Ottawa County, reported the least amount, 0.37 inch.

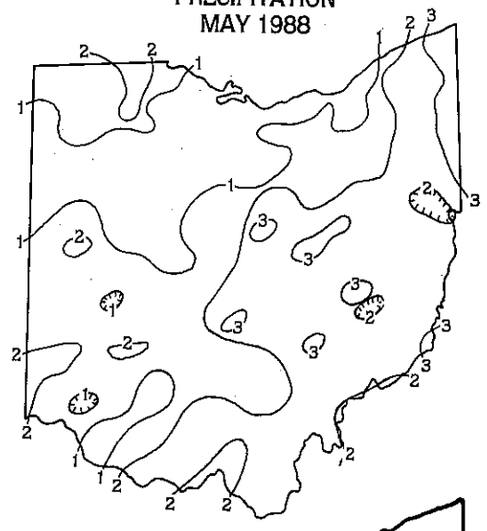
Precipitation was quite variable around the state in May. Most of the precipitation fell in the form of light showers or widely scattered thunderstorms. Generally, the eastern half of the state received 2 to 3 inches and the western half 0.5 to 2 inches of precipitation. A 50-mile wide area in the northwest, bounded by the Maumee River on the north and extending northeast to the Cleveland area received less than 1 inch of precipitation.

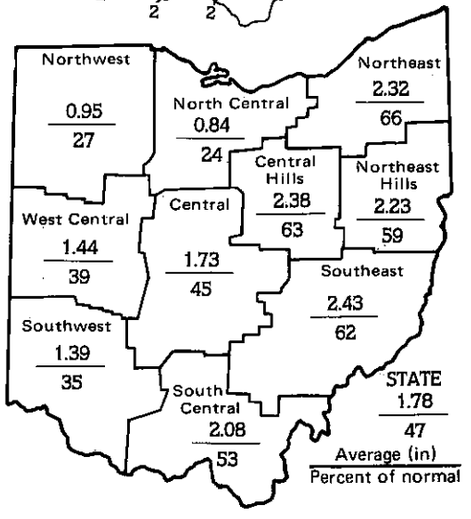
Precipitation fell during every week of the month. Weekly amounts generally ranged from 0.1 to 0.5 inch around the state. Storms on May 5-6 brought amounts of 0.5 to 0.8 inch in the eastern portions. A storm on May 9-10 produced 1.72 inches in Mansfield with amounts of 0.5 to 1 inch elsewhere throughout the north central portion. The remainder of May was rather dry with the only significant precipitation occurring on May 19-20 and 23-24, generally in the eastern and central portions of the state.

Cumulative precipitation for the 1988 calendar year remains below normal statewide. The average for the state as a whole is 11.20 inches, 4.44 inches below normal. Regional averages range from 13.62 inches, 2.94 inches below normal, for the Southeast Region to 7.59 inches, 6.15 inches below normal, for the Northwest Region. Precipitation statewide has been below normal in four of the five months in 1988.

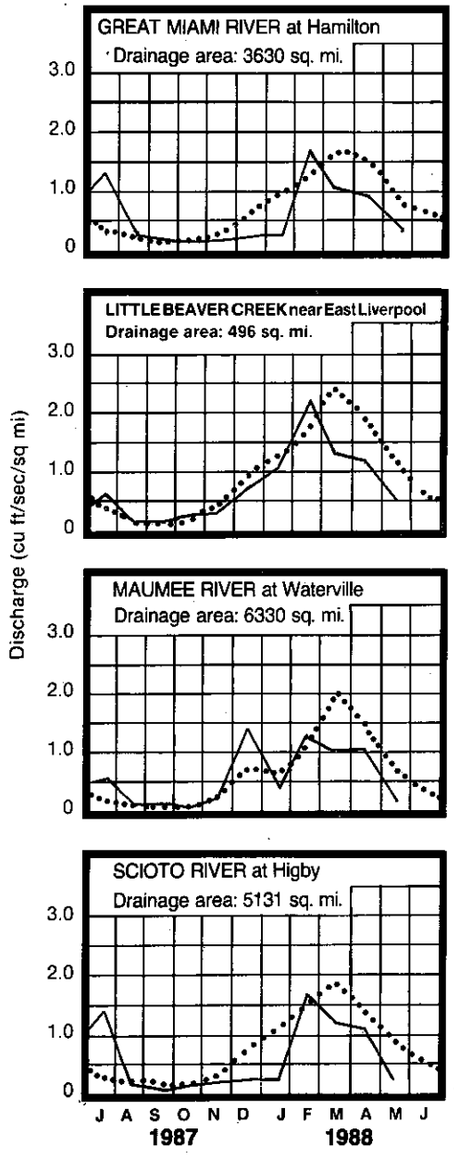
Cumulative precipitation for the 1988 water year is below normal throughout the state. The average for the state as a whole is 17.66 inches, 4.16 inches below. Regional averages range from 20.09 inches, 5.56 inches below normal, for the Southeast Region to 14.29 inches, 6.35 inches below normal, for the North Central Region. Other regions with departures greater than 6 inches are: West Central, -6.66 inches; Southwest, -6.07 inches; and South Central, -7.18 inches. Statewide precipitation was below normal in six of the eight months in the 1988 water year.

PRECIPITATION
MAY 1988





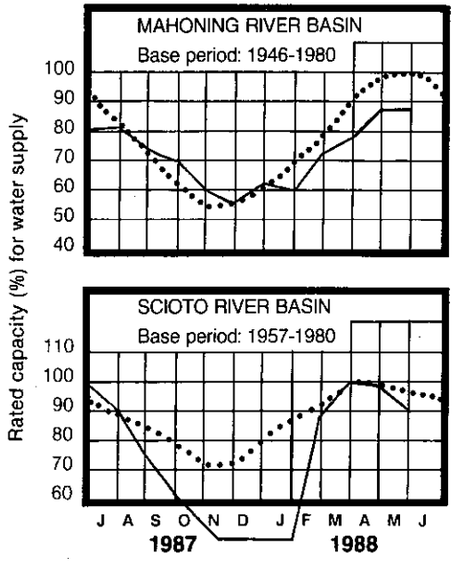
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for May increased slightly in the Mahoning River basin and decreased in the Scioto River basin. Storage was below normal in both basins.

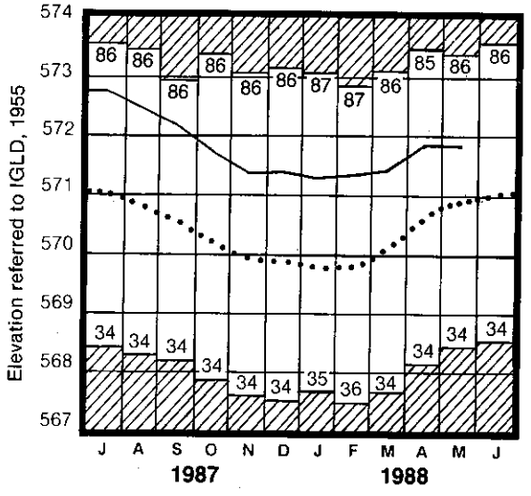
Reservoir storage at the month's end for the Mahoning basin index reservoirs was 87 percent of rated capacity for water supply compared with 86 percent for last month and 86 percent for May 1987. Storage at the month's end for the Scioto basin index reservoirs was 91 percent of rated capacity for water supply compared with 100 percent for last month and 99 percent for May 1987.

STREAMFLOW for May was deficient throughout the state. Generally, flows decreased steadily throughout the month in response to the lack of precipitation. Daily flows were below normal throughout the month and were noticeably deficient at the month's end.

Mean discharge and percent of normal at the index gaging stations for May were: Great Miami River, 1,310 cfs, 43 percent; Little Beaver Creek, 259 cfs, 45 percent; Maumee River, 1,113 cfs, 22 percent; and Scioto River, 1,396 cfs, 30 percent.

Cumulative runoff for the 1988 water year is noticeably below normal throughout the state. Cumulative runoff and departures from normal for the eight months so far in the 1988 water year at the index gaging stations are: Great Miami River, 5.44 inches, 4.33 inches below normal; Little Beaver Creek, 8.67 inches, 2.83 inches below normal; Maumee River, 6.01 inches, 3.12 inches below normal; and Scioto River, 5.59 inches, 4.28 inches below normal.

LAKE ERIE LEVELS at Cleveland



LAKE ERIE level for May decreased slightly. This contra-seasonal decline was in response to below normal precipitation throughout most of the drainage basin. The mean level for May was 571.76 feet (IGLD-1955), 0.03 foot below last month's mean level. This month's mean level is 1.11 feet below the May 1987 level but still 0.84 foot above normal. May's level is 3.16 feet above Low Water Datum.

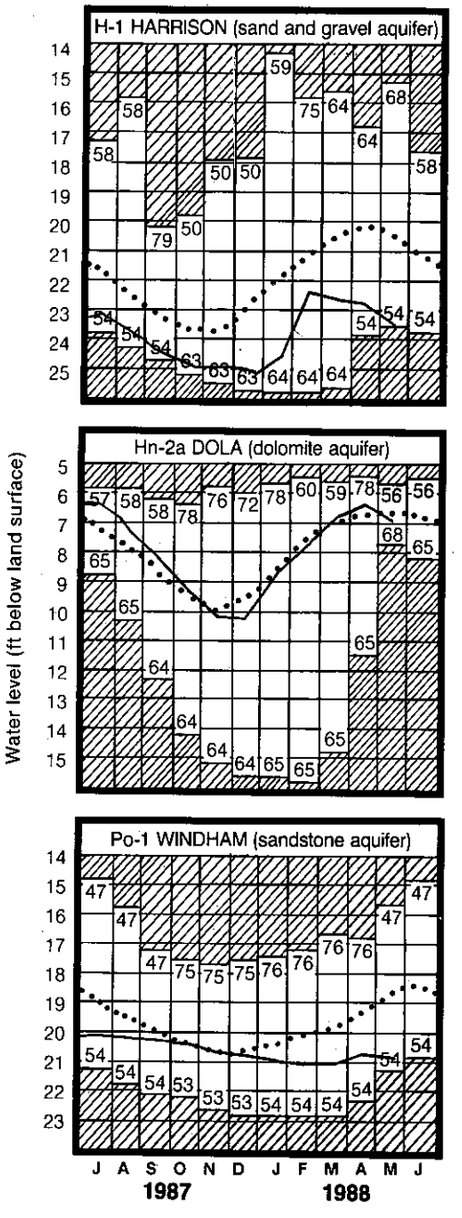
GROUND-WATER LEVELS for May declined throughout the state. Net declines were much greater than that usually observed. Water levels range from 0 to over 1 foot below those levels of May 1987. Ground-water levels are noticeably below normal statewide and range up to 4 feet below normal in some areas. Observation well H-1 near Harrison, Hamilton County, representing a sand and gravel aquifer, set a new record low level for May. Other observation wells were approaching record low levels at the month's end.

The recharge season appears to have ended in April. The lack of precipitation in April and May resulted in steady declines in ground-water levels. Conditions do not augur well for any improvement in the coming months. We urge those who depend on ground water for their supplies to closely monitor their respective situations and plan accordingly.

SUMMARY

Precipitation for May was below normal throughout the state. Streamflow was deficient statewide. Ground-water levels declined and are noticeably below normal. Reservoir storage generally declined and was below normal. Lake Erie level declined slightly contra-seasonally, but remains 0.84 foot above normal.

GROUND-WATER LEVELS



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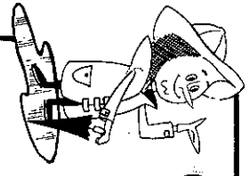

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation for June was noticeably below normal throughout the state. The state average of 0.85 inch made this the driest June in Ohio since records have been kept. Streamflows were noticeably deficient with flows at or near all-time June lows. Ground-water levels declined and many observation wells set new record low levels for June. Reservoir storage declined and was below normal. Lake Erie level declined but still remained 0.54 foot above normal.

NOTES AND COMMENTS

GOVERNOR CELESTE FORMS DROUGHT TASK FORCE

In response to the severe drought conditions in Ohio, Governor Celeste has formed a drought task force. Chaired by Lt. Governor Leonard, the task force consists of representatives from the Departments of Natural Resources, Agriculture, Environmental Protection, Emergency Management, Health and others.

On July 1, 1988 the task force gave Governor Celeste its recommendations. The governor then issued an executive order including: converting the task force into a more permanent cabinet group called the Drought Assistance and Relief Team (DART) under the direction of Lt. Governor Leonard; waiving permits, fees and other restrictions for carriers bringing hay into Ohio; implementing and enforcing a ban on outdoor burning where a danger of brushfires exists; directing state government to take the lead on water conservation; providing public water systems with guidelines for mandatory water use restrictions; and requesting federal relief for Ohio farmers.

ODNR DIVISION OF WATER ENCOURAGES WATER CONSERVATION

Everyone in Ohio can play a part in conserving water during the current drought. Voluntary conservation now can help eliminate the need for mandatory conservation measures later should the current drought conditions continue. Each Ohioan uses about 80 gallons of water every day. There are several simple ways to reduce home water use. Below are some recommendations.

1. **Repair Water Leaks:** Water leaks account for 5-10% of all home water use. Replace worn out faucet washers and faulty tank valves. A single faucet leak can cause you to lose up to 12 gallons of water per day. Toilet leaks can cause water losses of up to 60 gallons per day.
2. **Improve Toilet Efficiency:** Toilet flushing accounts for about 40% of home water use. More efficient flush mechanisms can cut water use from an average of 5.3 gallons per flush to 3.5 gallons. Tank inserts such as a filled one gallon jug can save a gallon or more per flush.
3. **Reduce Use of Garden Hose:** Hosing sidewalks, driveways and gutters is a waste of water—use a broom. Wash cars with a bucket. Never leave a hose running—a standard garden hose at normal pressure runs at a rate of up to 360 gallons per hour.
4. **Reduce Garden Watering and Eliminate Lawn Watering:** We can live without green lawns during this time of extreme drought. Lawns go dormant and can survive during hot, dry weather. Mulch gardens and flower beds and water only if necessary.
5. **Install Conservation Shower Heads:** Bathing accounts for 35% of home water use. Flow restricters and low flow shower heads can reduce this water use by 50%.

By following these simple guidelines we can make substantial strides in water conservation. Please do your part.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER

Richard F. Celeste
Governor

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Director

Naturally OHIO the heart of it all!

JUNE 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

PRECIPITATION for June was markedly below normal throughout the state. The average for the state as a whole was 0.85 inch, 3.11 inches below normal. This was the driest June ever for the state as a whole based on 105 years of record. The previous driest June was in 1936 when the state precipitation averaged 1.68 inches. June 1988 regional averages ranged from 1.26 inches, 2.80 inches below normal, for the Central Region to 0.51 inch, 3.32 inches below normal, for the Northwest Region. Andover, Ashtabula County, and Newark, Licking County, reported the greatest amount of precipitation for the month, 1.93 inches. Wauseon, Fulton County, reported the least amount, 0.15 inch.

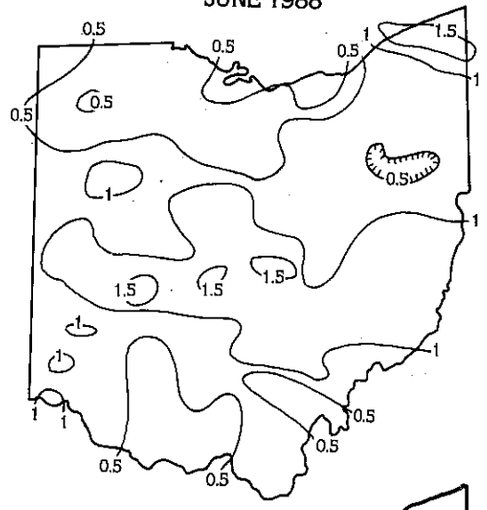
Precipitation fell during every week of the month in most areas of the state. Mid-week passages of cold fronts produced scattered light showers or thunderstorms, but amounts were generally less than .25 inch. The northern half and the southern third of the state received less than 1 inch of precipitation while a band across the central portion and an area in the extreme northeast corner of the state received 1 to 1.93 inches. Generally, only the central portions of the state received weekly amounts in excess of .5 inch. Scattered thunderstorms during the third week also brought some temporary relief to isolated areas in the central portions. The hot and dry weather conditions have had severe adverse effects on agricultural crops throughout the state.

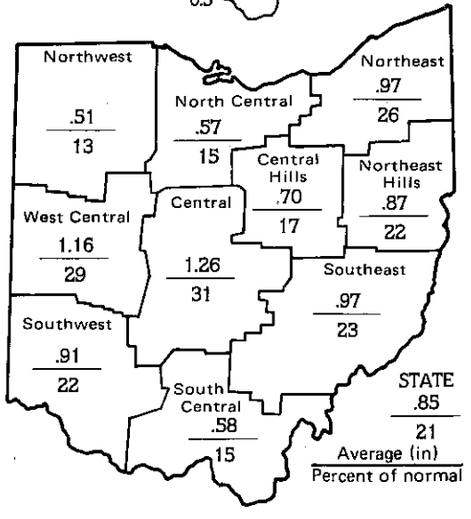
Cumulative precipitation for the 1988 calendar year remains below normal statewide. The average for the state as a whole is 12.05 inches, 7.55 inches below normal. Regional averages range from 14.59 inches, 6.11 inches below normal, for the Southeast Region to 8.10 inches, 9.47 inches below normal, for the Northwest Region. Precipitation has been below normal in five of the six months in 1988.

Cumulative precipitation for the 1988 water year (Oct. 1, 1987 to Sept. 30, 1988) is below normal statewide. The average for the state as a whole is 18.51 inches, 8.67 inches below normal. Regional averages range from 21.06 inches, 7.33 inches below normal, for the Southeast Region to 14.86 inches, 9.60 inches below normal, for the North Central Region. Precipitation has been below normal in seven of the nine months in the 1988 water year with only December 1987 and February 1988 being above normal.

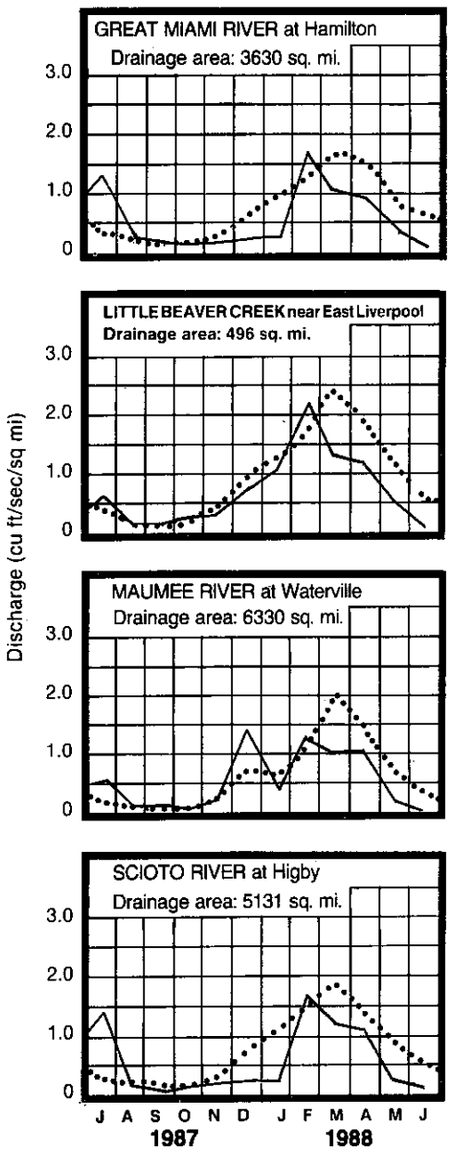
The below normal precipitation has had noticeable effects on all aspects of life in Ohio. Agriculture, water supplies, home gardens and recreation, to name a few, have been affected. The ODNR Division of Water encourages everyone to do his part in using our valuable water resources wisely and efficiently.

PRECIPITATION
JUNE 1988





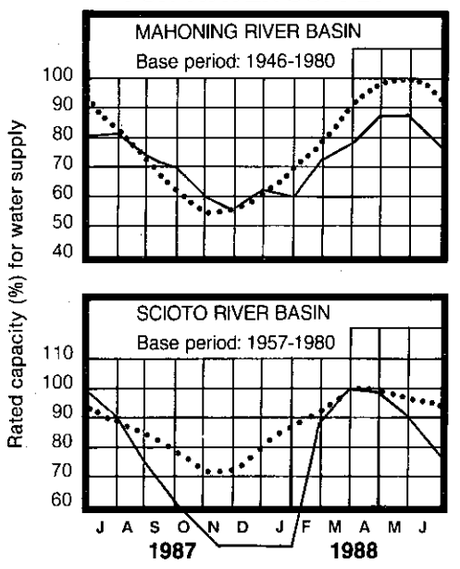
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current ———

RESERVOIR STORAGE FOR WATER SUPPLY



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

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 77 percent of rated capacity for water supply compared with 87 percent for last month and 81 percent for June 1987. Storage at the month's end for the Scioto basin index reservoirs was 78 percent of rated capacity for water supply compared with 91 percent for last month and 98 percent for June 1987.

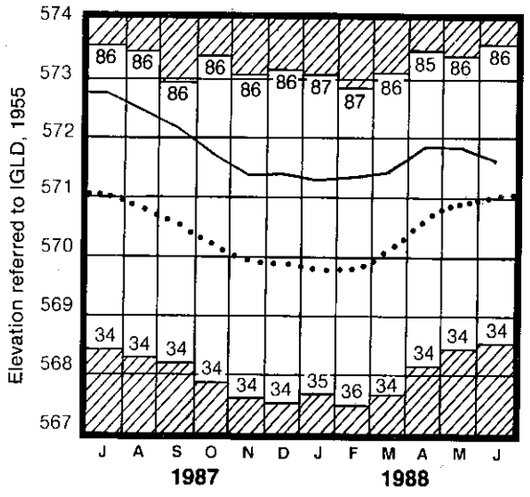
Many communities, including those with smaller capacity reservoirs, have initiated voluntary water conservation programs. Although storage is still adequate at this time, increased consumption has pushed many treatment plants and distribution systems to their limits. We urge those who depend on surface water for their supplies to monitor closely their respective situations and plan accordingly.

STREAMFLOW for June was noticeably deficient statewide. Generally, flows decreased steadily throughout the month and were noticeably below normal. Flows were significantly deficient at the month's end.

Mean discharge and percent of normal at the index gaging stations for June were: Great Miami River, 456 cfs, 21 percent; Little Beaver Creek, 71.5 cfs, 24 percent; Maumee River, 221 cfs, 10 percent; and Scioto River, 682 cfs, 23 percent.

The flow in the Little Beaver Creek was the third lowest for June for the period of record; in the Maumee and Great Miami Rivers it was the second lowest; and in the Scioto River it was the lowest, surpassing the low flow of June 1934. The daily flow of 17 cfs on June 30 in the Maumee River was the lowest ever observed in June. Streamflows throughout the state are in the 80% -98% duration of daily flow ranges with the lowest flow in the northern, western and southern portions of the state. Flows are generally between the 7 day/2 year and 7 day/10 year low flow discharge.

LAKE ERIE LEVELS at Cleveland

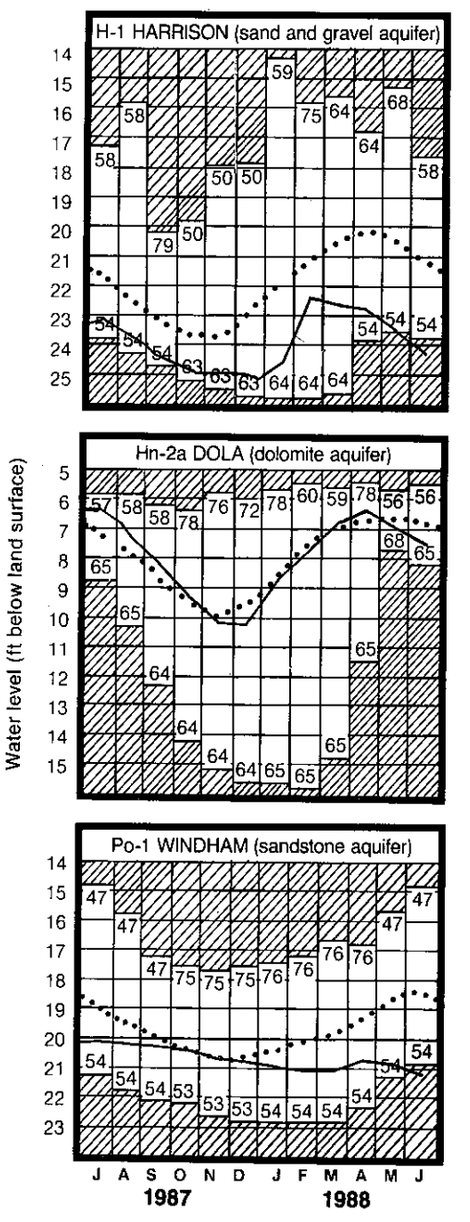


LAKE ERIE level declined contra-seasonally for the second consecutive month. The mean level for June was 571.59 feet(IGLD-1955), 0.17 foot below last month's mean level, but still 0.54 foot above normal. This month's mean level is 1.19 feet below the June 1987 level and 2.99 feet above Low Water Datum. This month's mean level is 2.11 feet below the record high mean level set in June 1986.

GROUND-WATER LEVELS for June showed noticeable declines throughout the state. Generally, declines were nearly twice those usually observed. Ground-water levels are from 1 to over 2 feet below the levels of June 1987 and range from 1 to over 4 feet below normal. The following index observation wells set new record low levels for June: F-1, West Rushville, Fairfield County, sandstone aquifer, 4.12 feet below normal; H-1, near Harrison, Hamilton County, sand and gravel aquifer, 3.23 feet below normal; Po-1, Windham, Portage County, sandstone aquifer, 2.77 feet below normal; and Tu-1, Strasburg, Tuscarawas County, sand and gravel aquifer, 3.00 feet below normal.

The lack of sufficient precipitation during the past several months has resulted in steady declines in ground-water levels. Levels are already at or below the lowest expected annual levels. Conditions do not appear to be favorable for any improvement during the coming months. We urge those who depend on ground water for their supplies to monitor closely their respective situations and plan accordingly.

GROUND-WATER LEVELS



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

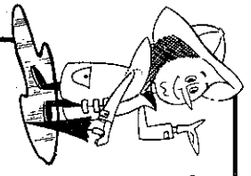
ACKNOWLEDGEMENTS

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. Corps of Engineers, Detroit District.



ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation for July was above normal for most areas of the state. Although streamflows did increase during the month, flows remained deficient. Reservoir storage decreased and remained below normal. Lake Erie level declined and is only 0.34 foot above normal. Most of the precipitation went toward the fulfillment of soil moisture and ground-water levels continued to decline reaching new record lows for the month in many areas of the state.

NOTE AND COMMENTS

OHIO'S TOLL-FREE DROUGHT HOTLINES IN OPERATION

The state of Ohio's Emergency Operations Center (EOC) began operating toll-free drought hotlines on August 3. One phone line is providing taped messages on water conservation and a second line is staffed by operators trained to assist people with drought related questions. The taped message line is 1-800-232-OHIO and the operator assisted line is 1-800-759-RAIN. Operators will be on duty from 7:30 a.m. to 4:30 p.m. Monday through Friday. The taped message line will operate 24 hours a day.

The toll-free lines are designed to enable people to get a quick response from the state when they have a question or concern about the drought. The hotlines are currently scheduled to remain in operation through September 30. The EOC is located at the Ohio Emergency Management Agency in Columbus. AT&T and MCI have donated the 1-800 lines to the state during the drought period.

ODNR DIVISION OF WATER ANNOUNCES FOUR RETIREMENTS

On July 31, 1988 four longtime Division of Water employees retired. With nearly 120 years of combined service and dedication to ODNR and the citizens of Ohio, their expertise, assistance and guidance will be missed by those involved in the continuing process of developing and managing Ohio's water resources.

Charles Hahn retires after 38 years of service in many capacities including dam permitting and water resource engineering. Chuck, a hydraulic engineer in the Dam Safety and Water Engineering Section, served as section head and most recently, special projects coordinator.

Andy Spencer retires after 22 years of service. As section head of the Water Resources Development Section, his duties included assisting communities in the development of water supplies and administering contracts for the sale of state-owned water supplies.

Arthur Woldorf retires after 30 years of service. Art, as supervisor of the Water Planning Unit, was responsible for the development of Ohio's regional water supply plans. His expertise also included water law, small watershed development, and the development of rural water supplies.

Of special interest to the readers of this report is the retirement of *Leonard Harstine.* During Leonard's 29 years of service, his work has involved many special projects and ground-water level investigations, numerous publications, and countless hours of field work maintaining Ohio's ground-water monitoring wells. As the division's hydrologist and supervisor of the Water Inventory Unit, his work included compiling historical records of all aspects of water in Ohio. For 25 years Leonard authored the "Monthly Water Inventory Report for Ohio."

The entire Department of Natural Resources and especially the co-workers in the Division of Water, wish these four a happy retirement. Thanks for all your help, words of wisdom, and dedication. You will each be missed.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

JULY 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

PRECIPITATION for July was above normal for most of the state; the exceptions were in the North Central, Northeast Hills and South Central regions where precipitation was below normal. The average for the state as a whole was 4.47 inches, 0.54 inch above normal. This is the first month since February with above normal precipitation. Regional averages ranged from 6.30 inches, 2.31 inches above normal, for the Central Hills Region to 3.31 inches, 0.15 inch below normal, for the North Central Region. Mohawk Dam, Coshocton County, reported the greatest amount of precipitation for the month, 8.41 inches. Nelsonville, Athens County, reported the least, 1.68 inches. Defiance, Defiance County, reported 1.69 inches.

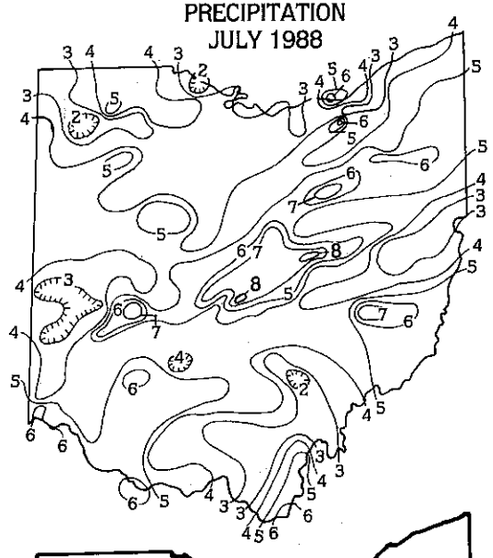
Generally, there was no precipitation during the first nine days of the month. During the second week, widely scattered thunderstorms produced amounts of up to 0.5 inch in many areas of the state. On July 16 a cold front and accompanying thunderstorms moved into northern Ohio. By the 19th this front had became somewhat stationary and storms were reported throughout most of the state. The next seven days brought the bulk of the month's precipitation for most stations. The central and east central areas of the state received the largest amounts during this period. Senecaville Dam, Guernsey County, reported 5.36 inches on July 21. Storms were reported across much of the northern half of the state on the last day of the month.

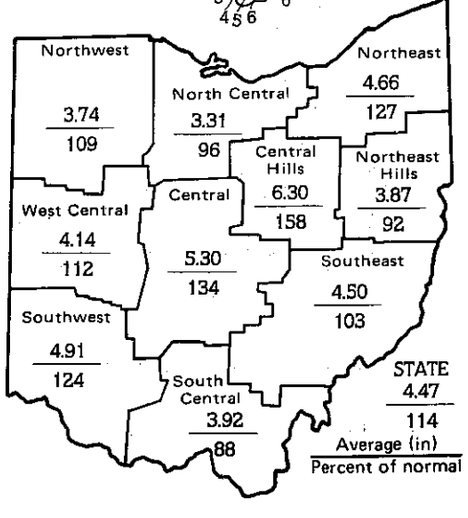
Precipitation for the 1988 calendar year remains below normal throughout the state. The average for the state as a whole is 16.52 inches, 7.00 inches below normal. Regional averages range from 19.37 inches, 4.00 inches below normal, for the Central Hills Region to 11.84 inches, 9.17 inches below normal, for the Northwest Region.

Precipitation for the 1988 water year is below normal throughout the state. The average for the state as a whole is 22.97 inches, 8.12 inches below normal. Regional averages range from 25.56 inches, 7.20 inches below normal, for the Southeast Region to 18.17 inches, 9.75 inches below normal, for the North Central Region.

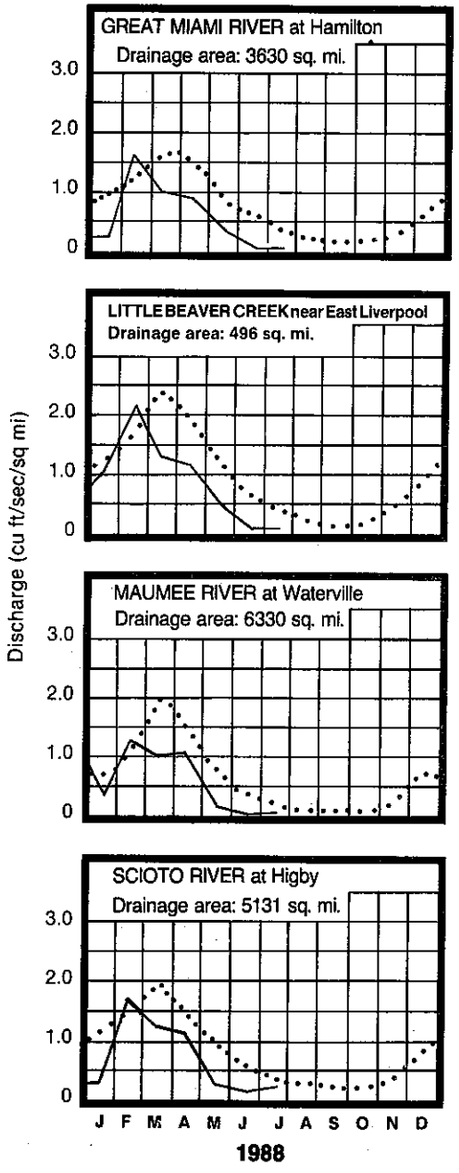
The above normal precipitation in many areas of the state was a welcome relief to the severe drought conditions during the past few months. Unfortunately, not all areas of the state fared as well. The Ohio Agricultural Statistics Service reports that crops are generally rated as very poor to fair. Streamflows remain deficient and ground-water levels are at record low levels. The drought is not over. Many areas of the state are still under voluntary and mandatory lawn sprinkling bans.

PRECIPITATION
JULY 1988





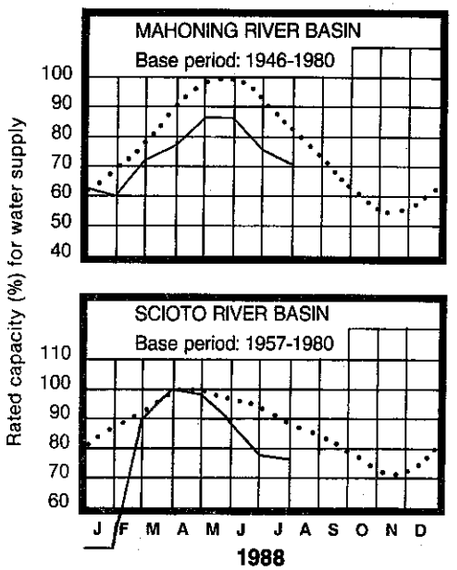
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for July decreased in both the Mahoning and Scioto river basins. Storage remains below normal in both basins.

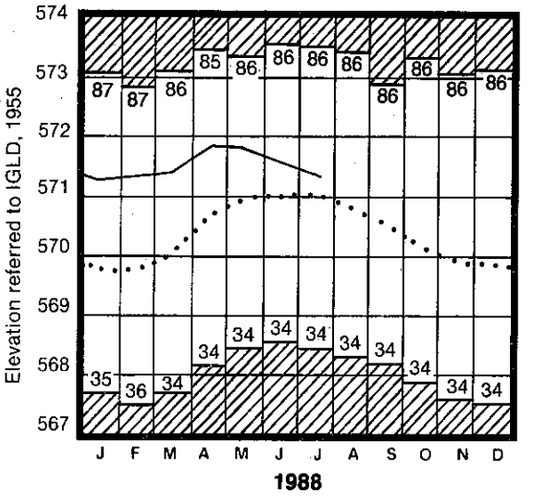
Reservoir storage at the month's end for the Mahoning basin index reservoirs was 72 percent of rated capacity for water supply compared with 77 percent for last month and 81 percent for July 1987. Storage at the month's end for the Scioto basin index reservoirs was 76 percent of rated capacity for water supply compared with 78 percent for last month and 89 percent for July 1987.

STREAMFLOW for July was noticeably deficient throughout the state. Generally, flows decreased steadily through mid-month and increased sharply beginning on the 19th in response to precipitation. Although flows were declining and still deficient at the month's end, these flows were greater than flows at the beginning of the month. A new daily minimum flow for July of 20 cfs was recorded for the Maumee River on July 1.

Mean discharge and percent of normal at the index gauging stations for July were: Great Miami River, 484 cfs, 36 percent; Little Beaver Creek, 66 cfs, 31 percent; Maumee River, 325 cfs, 24 percent; and Scioto River, 1,032 cfs, 61 percent.

Note: Due to construction of a low-head dam and a temporary dike near the Great Miami River at Hamilton gauge, flows have been estimated by hydrographic comparison with data obtained from the next gauge upstream, Great Miami River at Miamisburg.

LAKE ERIE LEVELS at Cleveland



LAKE ERIE level for July declined. The mean level for July was 571.34 feet (IGLD-1955), 0.25 foot below last month's level, and 0.34 foot above normal. This month's mean level is 1.48 feet below the mean level of July 1987 and 2.74 feet above Low Water Datum.

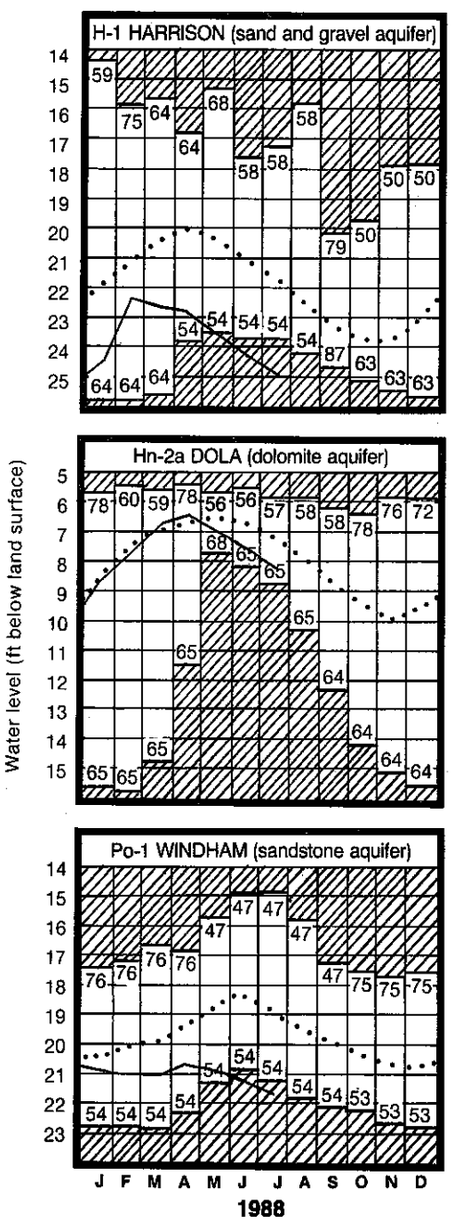
The U. S. Army Corps of Engineers reports that based on preliminary figures, the precipitation last month in the Great Lakes basin was the least amount ever recorded for a June since 1900 when record keeping began. Also, the April-June precipitation was the least amount for that period since 1900.

GROUND-WATER LEVELS for July declined throughout the state. Generally, declines were slightly greater to nearly twice those usually observed. Ground-water levels are from 1 to over 2 feet below the July 1987 levels and from 1 to 4 feet below normal. Levels in some shallow sand and gravel aquifers located in areas that received substantial precipitation did show slight temporary recoveries during the third week of the month. Ground-water levels in all areas of the state were declining at the month's end.

The following index observation wells set new record low levels for July: F-1, West Rushville, Fairfield County, sandstone aquifer; H-1, near Harrison, Hamilton County, sand and gravel aquifer; Po-1, Windham, Portage County, sandstone aquifer; and Tu-1, Strasburg, Tuscarawas County, sand and gravel aquifer.

Although some areas of the state received substantial precipitation during the month, most of the moisture was captured by the dry soils and resulted in little if any improvement in ground-water storage. Ground-water levels are below the lowest expected annual levels. Conditions do not appear to be favorable for any improvement during the next few months. Water supply managers who depend on ground water as their source should closely monitor their respective situations and plan accordingly.

GROUND-WATER LEVELS



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

ACKNOWLEDGEMENTS

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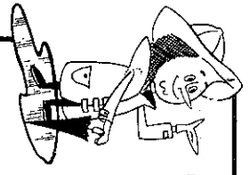
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service; The Miami Conservancy District; U.S. Army Corps of Engineers, Muskingum Area.

Streamflow and reservoir storage data:
U.S. Geological Survey, Water Resources Division.

Lake Erie level data:
U.S. Corps of Engineers, Detroit District.



ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation for August was above normal in the northern portion of the state and below normal in the southern portion. Streamflow and reservoir storage continue to remain below normal. Ground-water levels declined reaching new record low levels for August in many areas of the state. Lake Erie level declined and is at its lowest August level since 1967.

NOTES AND COMMENTS

NEW PUBLICATION

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

THE GROUND-WATER RESOURCES OF COSHOCTON COUNTY by David J. Sugar.

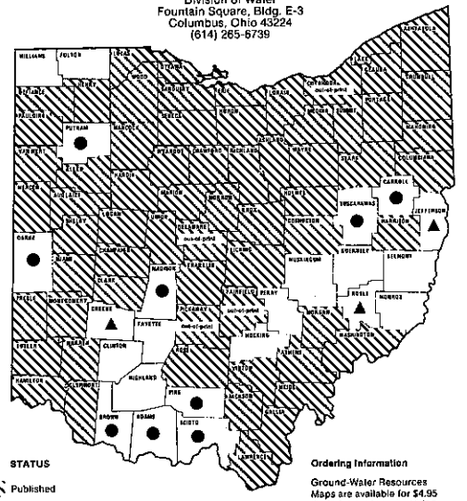
Also, THE GROUND-WATER RESOURCES OF ASHTABULA COUNTY by Glenn W. Hartzell and THE GROUND-WATER RESOURCES OF STARK COUNTY by Alfred C. Walker have been reprinted and are again available.

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 locating new or expanding existing ground-water supplies. They are useful to homeowners, ground-water consultants, engineers, planners and developers.

Available County Ground-Water Resources Maps

published by
Ohio Department of Natural Resources
Division of Water
Fountain Square, Bldg. E-3
Columbus, Ohio 43224
(614) 265-6739



STATUS
- Published
- ▲ Field Work Completed
- ● In Production

Ordering Information

Ground-Water Resources Maps are available for $4.95 (includes postage, handling and tax), from ODNR Publications, Fountain Square, Bldg. B-1, Columbus, Ohio 43224.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

AUGUST 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

PRECIPITATION for August was above normal in the northern portion of the state and below normal in the southern portion. Above normal precipitation fell in the Northwest, North Central, Northeast, Northeast Hills, and Central Hills Regions. The average for the state as a whole was 3.55 inches, 0.07 inch above normal. Regional averages ranged from 4.51 inches, 1.28 above normal, for the North Central Region to 2.66 inches, 0.64 inch below normal, for the West Central Region. Ruggles (Ashland County) reported the greatest amount of precipitation for the month, 7.17 inches. Greenville (Darke County) reported the least, 1.37 inches.

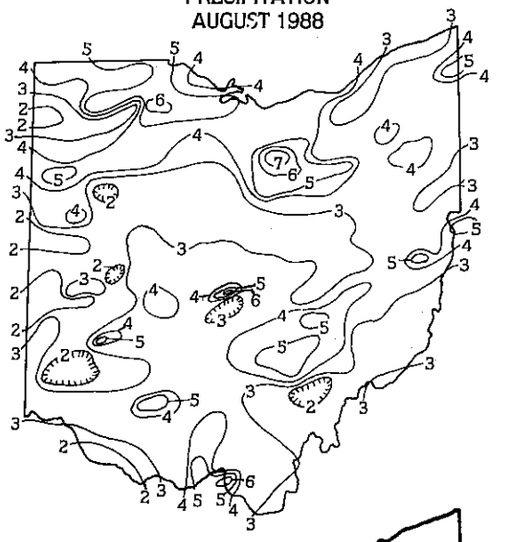
Precipitation fell during every week of the month in the form of widely scattered showers and thunderstorms. Generally, the precipitation that fell during the last week of the month was the most widespread with the greatest amounts occurring during storms on August 23-24 and 28-29. Although not all areas of the state fared as well, a return to more normal climatic conditions has been a welcomed relief to the severe drought conditions which persisted during the past several months.

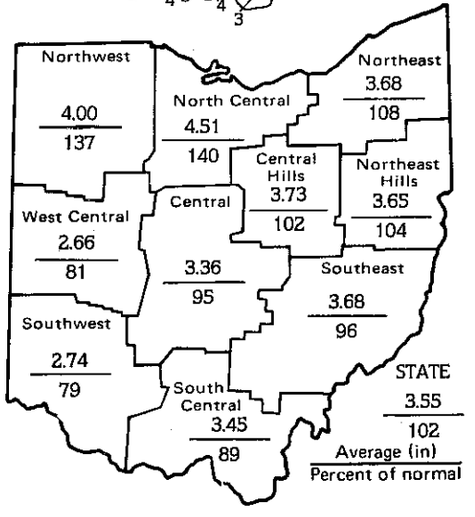
Precipitation for the 1988 calendar year continues to remain noticeably below normal statewide. The average for the state as a whole is 20.06 inches, 6.94 inches below normal. Regional averages range from 23.10 inches, 3.93 inches below normal, for the Central Hills Region to 15.84 inches, 8.10 inches below normal, for the Northwest Region. The South Central Region has the greatest departure from normal for the 1988 calendar year thus far, 9.48 inches below normal.

Precipitation for the 1988 water year continues to remain noticeably below normal statewide. The average for the state as a whole is 26.52 inches, 8.05 inches below normal. Regional averages range from 29.24 inches, 7.36 inches below normal, for the Southeast Region to 22.68 inches, 8.47 inches below normal, for the North Central Region. The South Central Region has the greatest departure from normal for the 1988 water year thus far, 11.46 inches below normal.

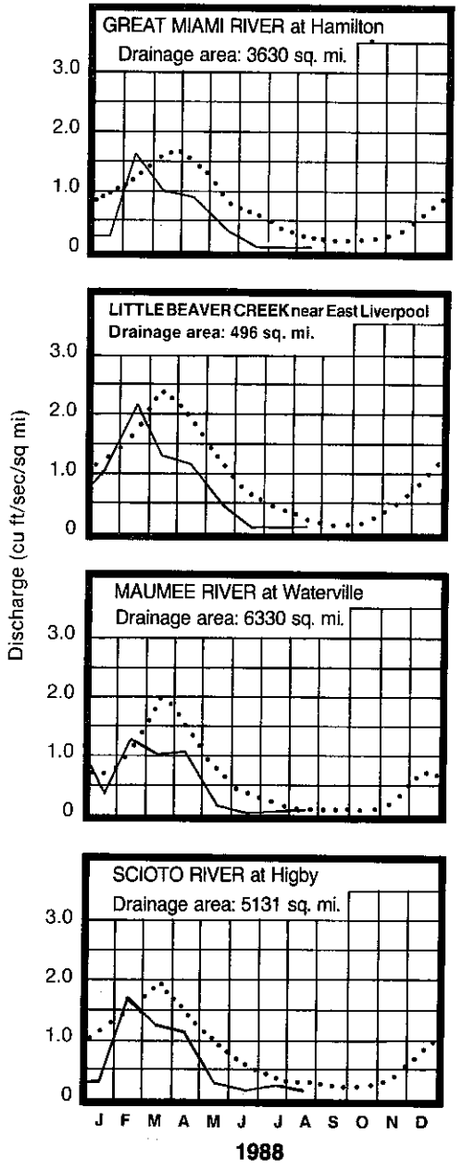
The return to more normal precipitation conditions during the past six weeks has brought some temporary relief from the severe drought conditions of the past several months. Although the general water supply situation has not improved significantly, conditions have not continued to deteriorate. As far as water supplies are concerned, the drought is not over as indicated by continued below normal streamflows, ground-water levels and storage in reservoirs. A continuation of normal precipitation conditions during the upcoming water supply recharge season will be necessary to improve these supplies.

PRECIPITATION
AUGUST 1988





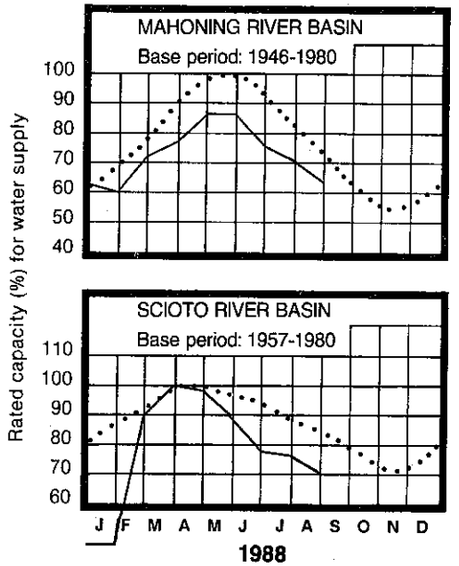
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for August decreased in both the Mahoning and Scioto river basins. Storage remains below normal in both basins.

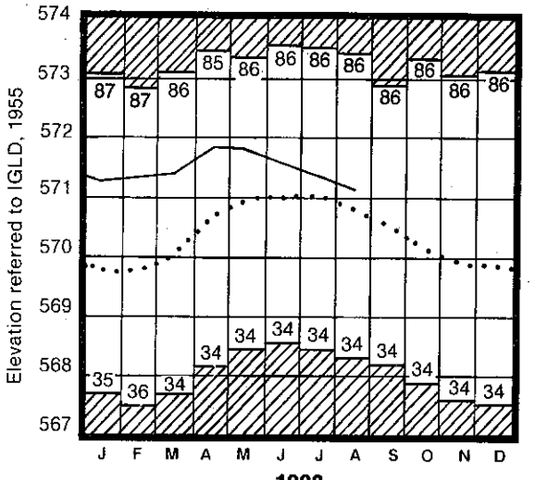
Reservoir storage at the month's end for the Mahoning basin index reservoirs was 63 percent of rated capacity for water supply compared with 72 percent for last month and 74 percent for August 1987. Storage at the month's end for the Scioto basin index reservoirs was 70 percent of rated capacity for water supply compared with 76 percent for last month and 76 percent for August 1987.

Storage in one of the Scioto basin index reservoirs has been augmented since mid-July by an average of 35 million gallons daily. Without this augmentation, storage recently shown in this report for the Scioto basin reservoirs would have been noticeably lower.

STREAMFLOW for August was below normal throughout the state; in the southwest portion it was low enough to be considered deficient. Flows in the northern portion of the state increased contra-seasonally from last month's flows. Flows continued to decline seasonally in the southern portion.

Mean discharge and percent of normal at the index gauging stations for August were: Great Miami River, 408 cfs, 53 percent; Little Beaver Creek, 70.2 cfs, 64 percent; Maumee River, 477 cfs, 78 percent; and Scioto River, 802 cfs, 65 percent.

LAKE ERIE LEVELS at Cleveland



LAKE ERIE level declined during August. The mean level for August was 571.14 feet (IGLD-1955), 0.20 foot below last month's mean level, and 0.33 foot above normal. This month's mean level is 1.37 feet below the August 1987 level and 2.54 feet above Low Water Datum.

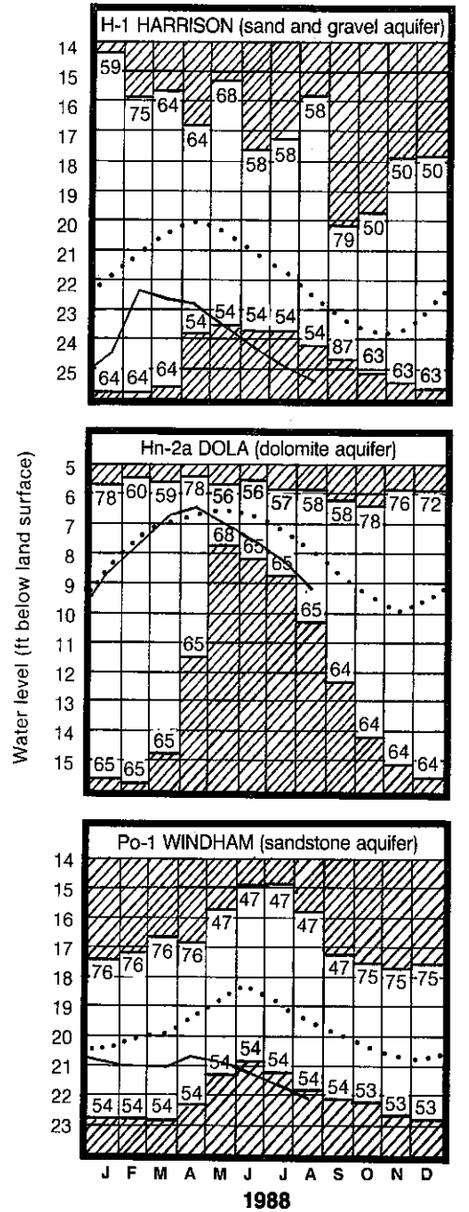
The mean level this month is the lowest observed for August since 1967. Levels in the other Great Lakes have also declined noticeably. The lowest annual precipitation observed for the Great Lakes was 25.7 inches in 1930. The total 1988 precipitation through July was about 2.5 inches less than the amount recorded during the same months in 1930. The U.S. Army Corps of Engineers reports that, if this trend continues, lake levels will continue to drop significantly.

GROUND-WATER LEVELS declined steadily throughout the state during August. Generally, declines were greatest in limestone/dolomite aquifers, about twice that usually observed, and least in sand and gravel aquifers, about one half that usually observed. Ground-water levels range from 1 to over 4 feet below normal statewide. Generally, these current levels are 1 to 2 feet below the levels of August 1987.

Many observation wells continue to set new monthly record low levels and are approaching all-time record low levels. Conditionsdo not appear to be favorable for any improvement during the next couple of months. Water supply managers who depend on ground water for their source should closely monitor their respective situations and plan accordingly.

The following index observation wells set new record low levels for August: F-1, West Rushville (Fairfield County), sandstone aquifer; H-1, near Harrison (Hamilton County), sand and gravel aquifer; Po-1, Windham (Portage County), sandstone aquifer; and Tu-1, Strasburg (Tuscarawas County), sand and gravel aquifer.

GROUND-WATER LEVELS



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

ACKNOWLEDGEMENTS

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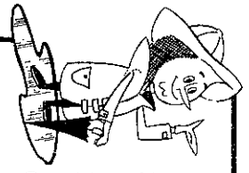

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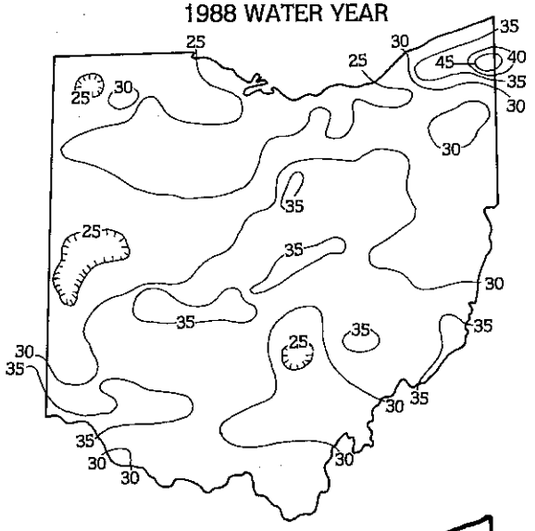
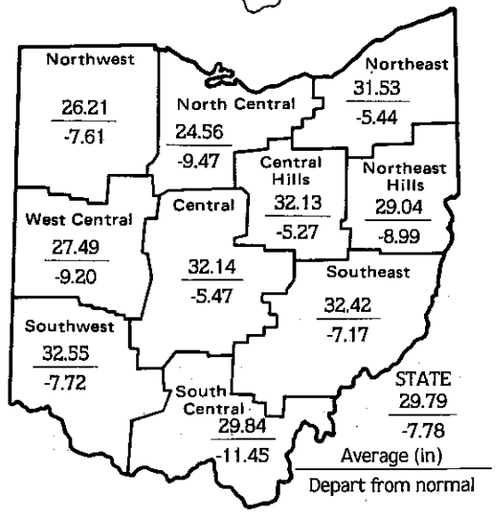
allowed ground-water levels to decline through January 1988. The recharge period was very short lasting only a few months during the spring and ending abruptly as the dry conditions returned. The drought conditions during the summer months resulted in an increase in the rate of decline in ground-water levels. Many new record low levels were observed. Although ground-water levels are still noticeably below normal, conditions appear to be favorable for improvement during the upcoming recharge season.

SUMMARY

Precipitation was above normal for most of the state. Streamflows increased and were generally near normal to above normal. Reservoir and ground-water storage were stable or decreased slightly and remain below normal. Lake Erie level declined and is at its lowest September level since 1967 but still slightly above normal.

PRECIPITATION
1988 WATER YEAR





Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

SEPTEMBER 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

PRECIPITATION for September was above normal for most of the state; exceptions were in the Northwest, North Central and South Central regions where precipitation was below normal. The average for the state as a whole was 3.16 inches, 0.16 inch above normal. Regional averages ranged from 4.57 inches, 1.68 inches above normal, for the Central Region to 1.70 inches, 1.18 inches below normal, for the North Central Region. Derby (Pickaway County) reported the greatest amount of precipitation for the month, 7.17 inches. Bay View (Erie County) reported the least, 0.95 inch.

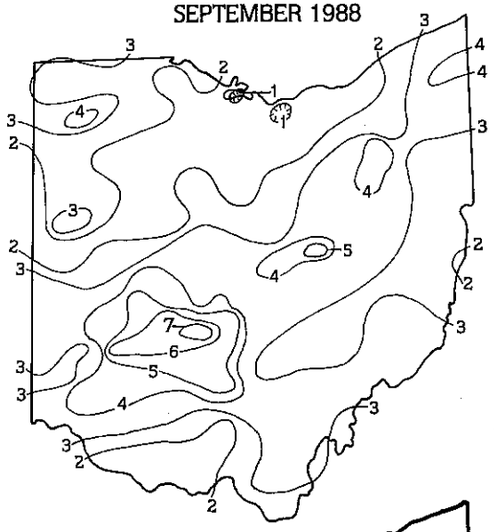
Precipitation fell during every week of the month. The greatest statewide precipitation occurred during September 3-5 with amounts of 1.5 to 3 inches common in all but the northwest and extreme southern portions of the state. Remnants of Hurricane Florence produced locally heavy precipitation on September 12 from the Dayton area east through the south central portion of the state. The following week scattered showers occurred statewide with amounts of 1 inch being common. The last week of the month was dry in most locations with only minimal precipitation recorded.

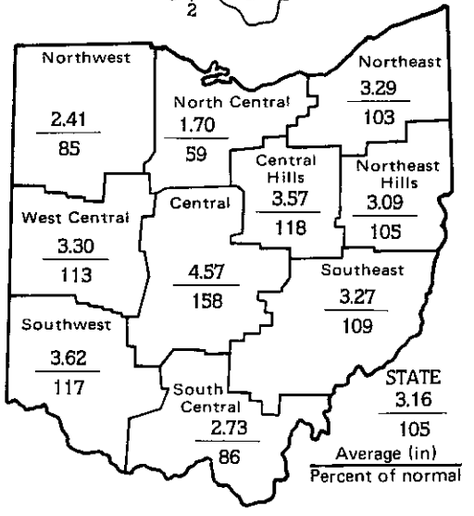
Precipitation for the 1988 calendar year remains noticeably below normal throughout the state. The average for the state as a whole is 23.32 inches, 6.68 inches below normal. Regional averages range from 26.70 inches, 3.36 inches below normal, for the Central Hills Region to 18.19 inches, 8.99 inches below normal, for the North Central Region.

Total precipitation for the 1988 water year which ended September 30, was below normal throughout the state. The average for the state as a whole was 29.79 inches, 7.78 inches below normal. Regional averages ranged from 32.55 inches, 7.72 inches below normal, for the Southwest Region to 24.56 inches, 9.47 inches below normal, for the North Central Region. The South Central Region had the greatest departure for the year, 11.45 inches below normal. The South Central Region also had the greatest departure from normal in the 1987 water year, 7.00 inches below normal. Andover (Ashtabula County) reported the greatest amount of precipitation for the water year, 46.26 inches. Upper Sandusky (Wyandot County) reported the least, 21.54 inches. An isohyetal map with regional averages and departures from normal appear on the back page of this report.

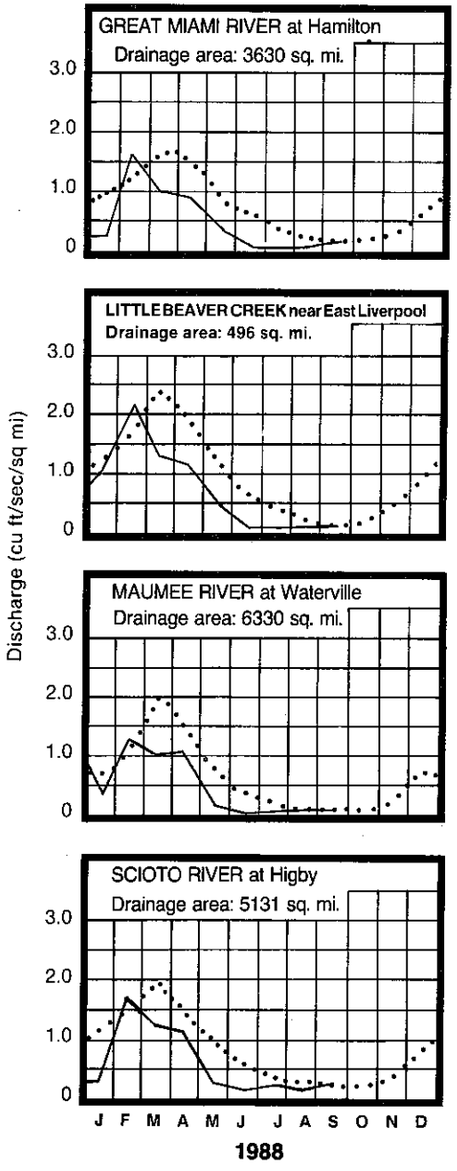
The 1988 water year was most notable for the lack of precipitation. The water supply recharge period was very dry and water supplies, especially ground-water supplies, did not fully replenish. The late spring and early summer months were hot and dry with June being the driest June on record for the state as a whole. Slightly above normal precipitation since mid-July has lessened the drought conditions and restored soil moisture in most areas of the state. As the new recharge season approaches, water supply conditions have improved and continued improvement can be expected with normal precipitation.

PRECIPITATION
SEPTEMBER 1988





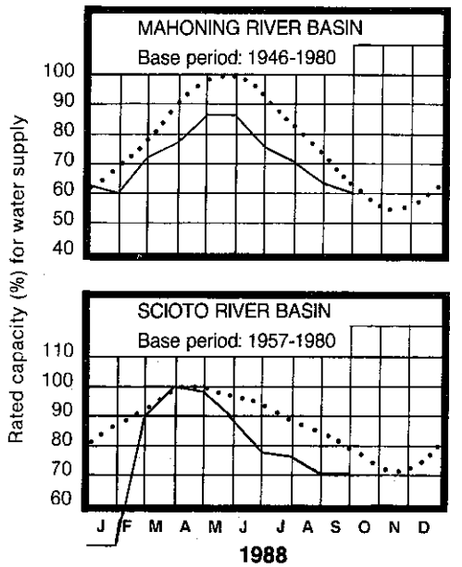
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for September decreased in the Mahoning River basin reservoirs and was unchanged in the Scioto River basin reservoirs. Storage remains below normal in both basins.

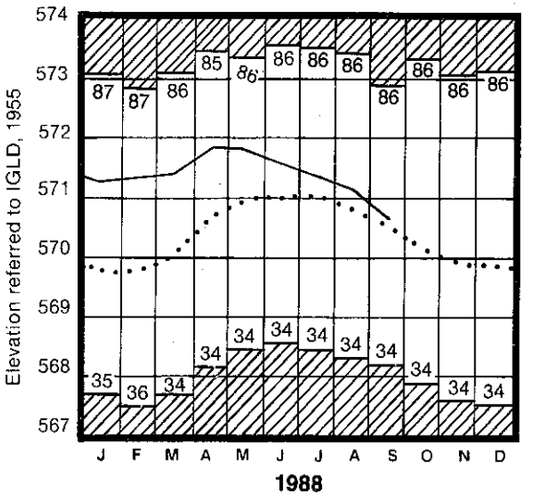
Reservoir storage at the month's end for the Mahoning basin index reservoirs was 60 percent of rated capacity for water supply compared with 63 percent for last month and 69 percent for September 1987. Storage at the month's end for the Scioto basin index reservoirs was 70 percent of rated capacity for water supply compared with the same for last month and 63 percent for September 1987.

Storage in both basins was at or below normal during 10 months in the 1988 water year. Storage in the Mahoning River basin was affected by the draining of Lake Milton for repairs to the dam. Repairs were completed in March, but due to the drought conditions during the spring and summer months, the reservoir did not fill to a normal level. In addition to the drought conditions, storage in both basins was affected by increased water supply demands during the summer months.

STREAMFLOW for September increased from August flows throughout most of the state with only the northeast portion having lower flows. Flows ranged from slightly below normal in the northeast, west, and southwest areas to above normal in the northwest, central, and southern parts of the state. This is the first month since February that streamflows have been above normal for most of the state. Generally, flows were decreasing at the end of the month becoming less than those at the beginning of the month.

Mean discharge and percent of normal at the index gauging stations for September were: Great Miami River, 633 cfs, 95 percent; Little Beaver Creek, 67.6 cfs, 86 percent; Maumee River, 547 cfs, 140 percent; and Scioto River, 1,417 cfs, 135 percent.

LAKE ERIE LEVELS at Cleveland



Annual mean discharge for the 1988 water year was deficient throughout the state. Flows were noticeably deficient during the spring and early summer months with record low flows occurring at some locations. Annual mean discharge and percent of normal at the index gauging stations for the 1988 water year were: Great Miami River, 1,623 cfs, 50 percent; Little Beaver Creek, 339 cfs, 61 percent; Maumee River, 2,967 cfs, 58 percent; and Scioto River, 2,448 cfs, 53 percent.

LAKE ERIE level declined during September. The mean level for September was 570.72 feet (IGLD-1955), 0.42 foot below last month's mean level and 1.50 feet below the September 1987 mean level. This month's mean level is 0.2 foot above normal and 2.12 feet above Low Water Datum.

The mean level this month is the lowest level for September since 1967. Lake Erie's level has fallen 3.32 feet since the record high level of June 1986.

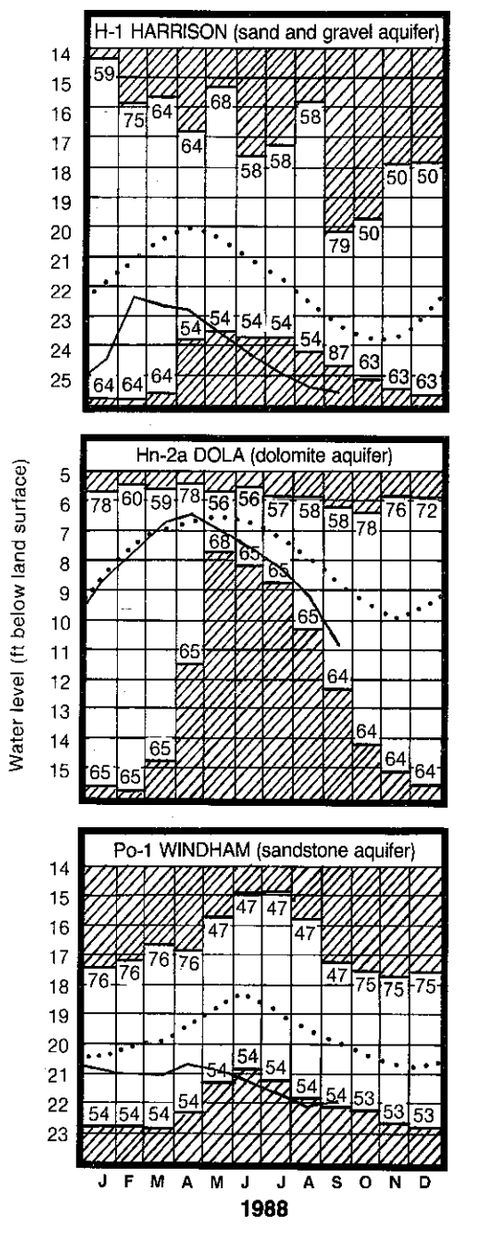
GROUND-WATER LEVELS for September showed mixed responses around the state. Generally, water levels in most areas of the state continued to decline or remained stable during the month. In some locations, unconsolidated aquifers rose during the first half of the month in response to precipitation and declined during the second half. Generally, ground-water levels remain 1.5 to more than 4 feet below normal and are equivalent to more than 2.5 feet below those levels of September 1987. In many areas of the state ground-water levels are approaching all-time record low levels. This continued downward trend may be coming to an end as indicated by the stabilization or even slight rises in some wells.

The following index observation wells set new record low levels for September: F-1, West Rushville (Fairfield County), sandstone aquifer; H-1, near Harrison (Hamilton County), sand and gravel aquifer; and Tu-1, Strasburg (Tuscarawas County), sand and gravel.

The 1988 water year was not a good one in relation to ground-water supplies. The dry conditions during the autumn of 1987

continued on back

GROUND-WATER LEVELS



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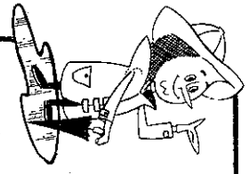

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SUMMARY

Precipitation was below normal for most of the state except in the northern portion where it was above normal. Streamflow was below normal except in the northwestern portion where it was excessive. Reservoir storage declined as did Lake Erie's level. Ground-water levels declined in most areas. All-time low levels were recorded in three index observation wells.

NOTES AND COMMENTS

New Publication

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

GROUND-WATER POLLUTION POTENTIAL OF LORAIN COUNTY by Douglas J. Barber.

Ground-water pollution potential maps are designed to determine an area's relative potential for 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 low potential and high DRASTIC values indicate a high potential for contamination. Areas of similar DRASTIC values are color coded for ease of reading.

Copies may be obtained from:
ODNR-Publications Center
Fountain Square, Bldg. B-1
Columbus, Ohio 43224

The cost is $6.50 plus $2.11 tax, postage, and handling (total $8.61). Make checks payable to ODNR Publications Center.

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Director

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OCTOBER 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

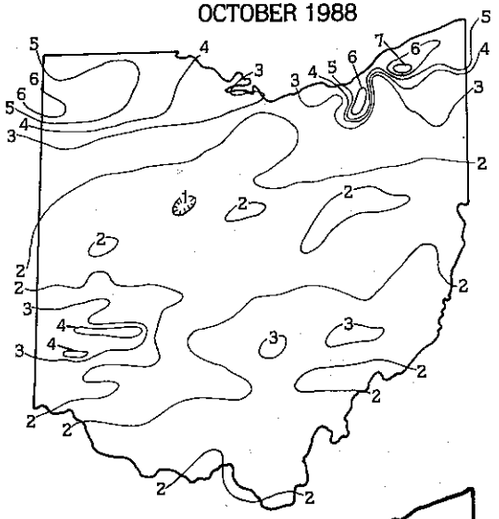
PRECIPITATION for October was below normal for most of the state: exceptions were in the Northwest, North Central, Northeast and Southwest regions where precipitation was above normal. The average for the state as a whole was 2.51 inches, 0.17 inch above normal. Regional averages ranged from 4.06 inches, 1.77 inches above normal, for the Northwest Region to 1.85 inches, 0.29 inch below normal, for the Central Region. Chardon (Geauga County) reported the greatest amount of precipitation for the month, 7.22 inches, including 10 inches of snow. LaRue (Marion County) reported the least, 0.98 inch.

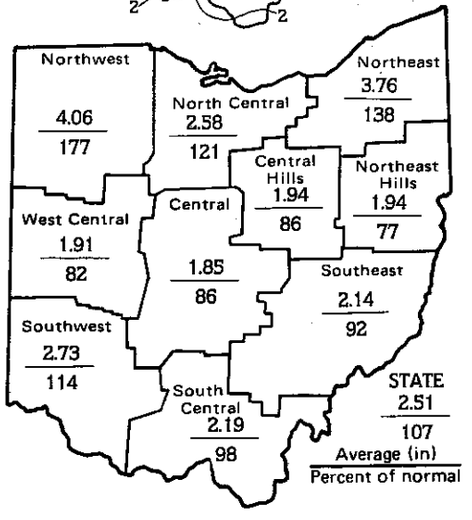
The bulk of the month's precipitation fell during the second and third weeks of the month with nominal amounts occurring during the first and fourth weeks. The most notable storm period was October 17-18 when amounts of more than 2 inches were common in the southwestern portion and amounts of 3 to 4.5 inches common throughout the extreme northwestern portion of the state. The extreme northeast portion also received substantial precipitation during this period. Minor flooding was reported in the northwest portion after these rains.

Precipitation for the 1988 calendar year remains noticeably below normal throughout the state. The average for the state as a whole is 25.83 inches, 6.51 inches below normal. Regional averages range from 28.76 inches, 5.71 inches below normal, for the Southwest Region to 20.77 inches, 8.55 inches below normal, for the North Central Region. The South Central Region has the greatest departure for the year so far, 9.63 inches below normal.

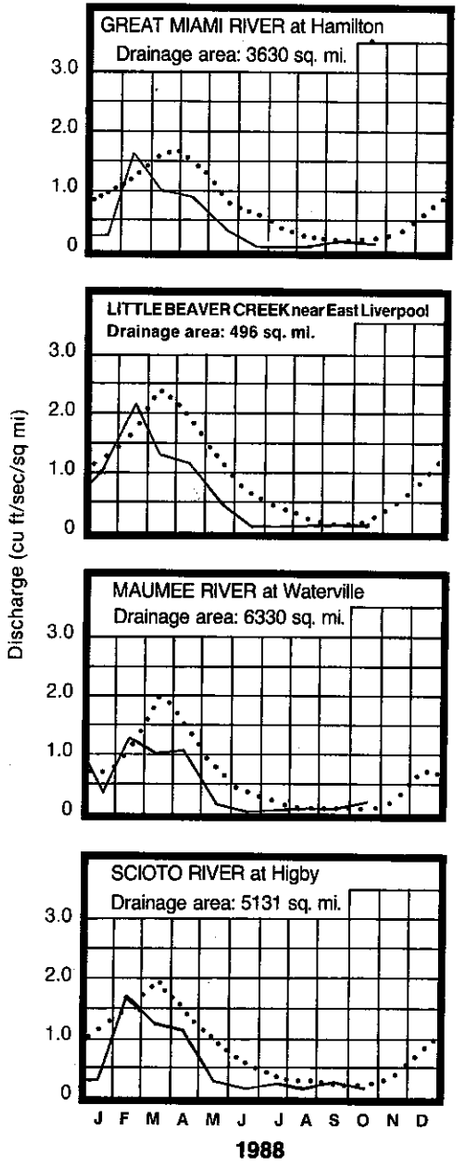
This month starts the 1989 water year. Even though the state average was above normal, most areas of the state received less than normal precipitation. As the water supply recharge season approaches, continued and more widespread normal precipitation would benefit water supplies.

PRECIPITATION
OCTOBER 1988





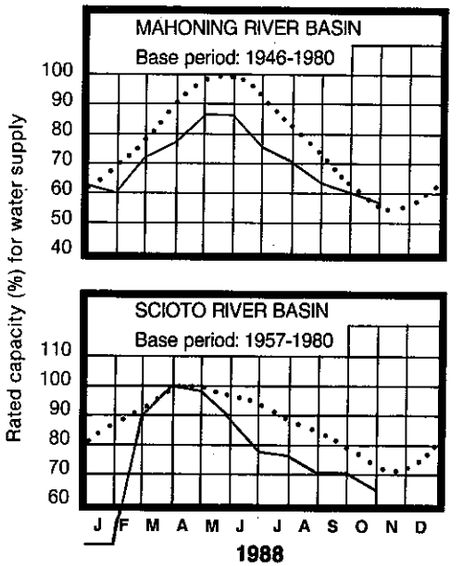
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



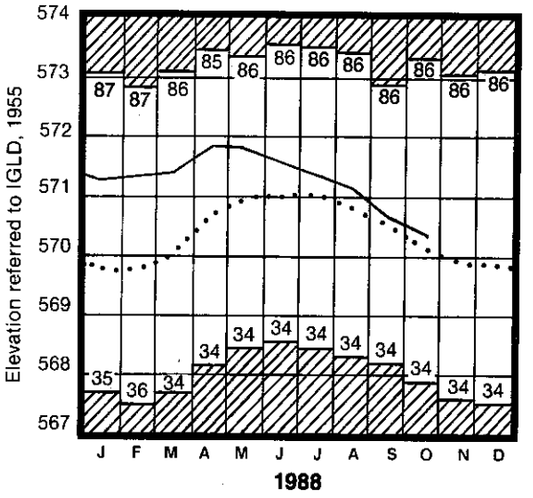
RESERVOIR STORAGE for water supply for October declined in both the Mahoning and Scioto river basin reservoirs. Storage was slightly above normal in the Mahoning River basin and below normal in the Scioto River basin.

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 57 percent of rated capacity for water supply compared with 60 percent for last month and 61 percent for October 1987. Storage at the month's end for the Scioto basin index reservoirs was 65 percent of rated capacity for water supply compared with 70 percent for last month and 54 percent for October 1987.

STREAMFLOW for October was below normal throughout the state except in the northwest portion where it was excessive. Flows in the southwest portion were low enough to be considered deficient. Flows in the northern portion of the state were greater than flows of last month and flows in the southern portion were lower than last month. Minor flooding was reported in the northwest portion of the state during the third week of the month resulting from heavy precipitation on October 17-18.

Mean discharge and percent of normal at the index gauging stations for October were: Great Miami River, 510 cfs, 75 percent; Little Beaver Creek, 75.8 cfs, 70 percent; Maumee River, 1,724 cfs, 311 percent; and Scioto River, 658 cfs, 86 percent.

LAKE ERIE LEVELS at Cleveland

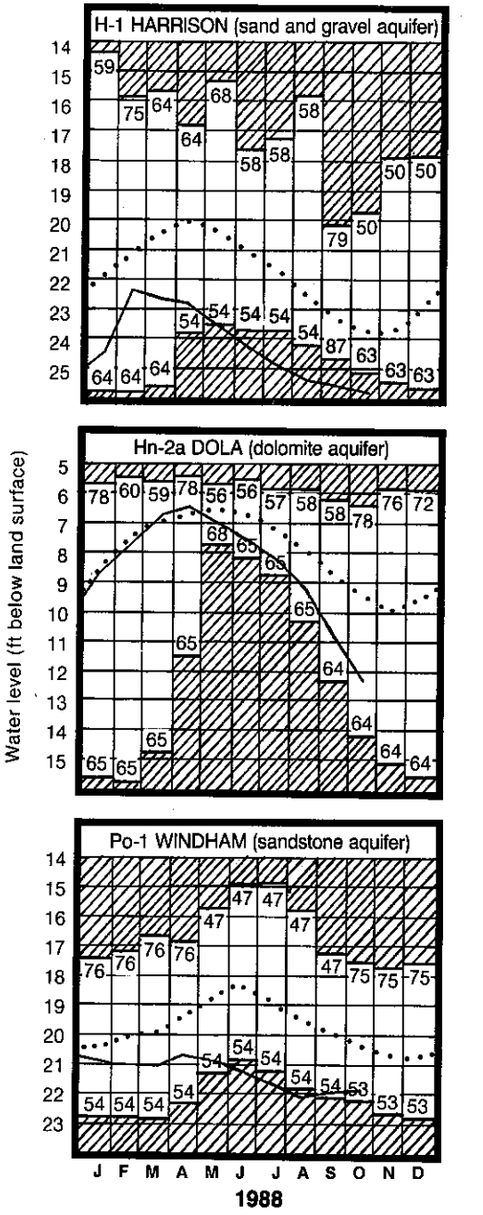


LAKE ERIE level declined seasonally during October. The mean level for October was 570.36 feet (IGLD-1955), 0.36 foot below last month's mean level and 1.33 feet below the October 1987 mean level. This month's mean level is 0.16 foot above normal and 1.76 feet above Low Water Datum. This month's level is the lowest for October since 1967.

GROUND-WATER LEVELS for October showed mixed responses around the state. Levels declined or remained stable in most areas of the state with slight rises occurring at a few locations. Generally, declines were less than those usually observed except in the limestone/dolomite aquifers in the west and northwest portions where declines were over twice that usually observed. Rises in ground-water levels during October are infrequent. Since rises were observed in some locations, this may be an indication the recharge season is starting.

Ground-water levels continue to remain noticeably below normal throughout most of the state. Generally, levels range from 1.5 to 4 feet below normal. This month's levels are equivalent to nearly 3 feet below those levels of October 1987. Three of the seven index observation wells set new all-time record low levels during the month. The new record lows were recorded in observation wells: F-1, West Rushville (Fairfield County), sandstone aquifer; H-1, near Harrison (Hamilton County), sand and gravel aquifer; and Tu-1, Strasburg (Tuscarawas County), sand and gravel aquifer.

GROUND-WATER LEVELS



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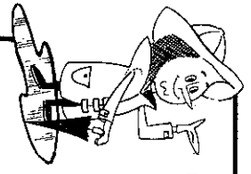

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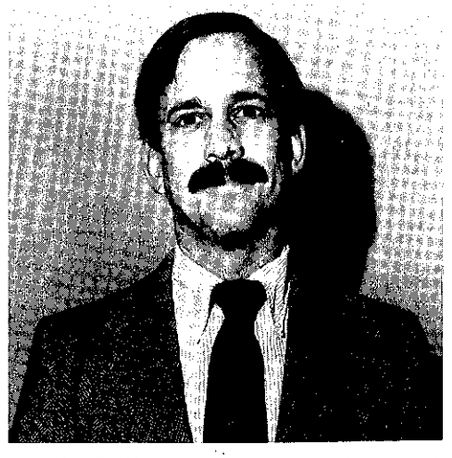
NOTES AND COMMENTS

NEW ADMINISTRATOR FOR WATER RESOURCES DEVELOPMENT SECTION



Chief Robert L. Goettemoeller has announced the appointment of Richard S. Bartz as administrator of the Water Resources Development Section of ODNR's Division of Water. Mr. Bartz has a bachelor's degree and a master of environmental science degree from Miami University, Ohio. He started working for ODNR's Division of Planning in 1974 developing an Ohio coastal management program. In 1976, he worked for Indiana DNR on a natural resource inventory for the Lake Michigan shoreline area. He returned to ODNR Division of Water in 1977 to work on Ohio's coastal management efforts. Most recently, Mr. Bartz has represented Ohio on the International Joint Commissions's study for the Lake Levels Reference, the Water Resources Management Committee to the Council of Great Lakes Governors and the Water Data Task Force to the Great Lakes Commission. Mr. Bartz was instrumental in recent passage of coastal management legislation, Sub. S.B. 70, and H.B. 662, the Great Lakes Charter legislation. His responsibilities now include overseeing water supply planning, automated water data management, community water assistance, floodplain management and coastal management.

REQUESTS FOR COMMENTS AND SUGGESTIONS

Many thanks to those who have written with comments and suggestions about this report's format and contents. I plan to incorporate some new information and other changes into the report next year.

In response to many requests, I would like to clarify the information presented graphically in this report:

1) The solid lines are the actual data during the previous months.
2) The dotted lines are the normal or long term average based on many years of record and are used for comparison with current data.
3) The diagonally shaded areas on the Lake Erie and ground-water level graphs represent historical monthly high and low extremes and the year of occurrence.

—David H. Cashell

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NOVEMBER 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

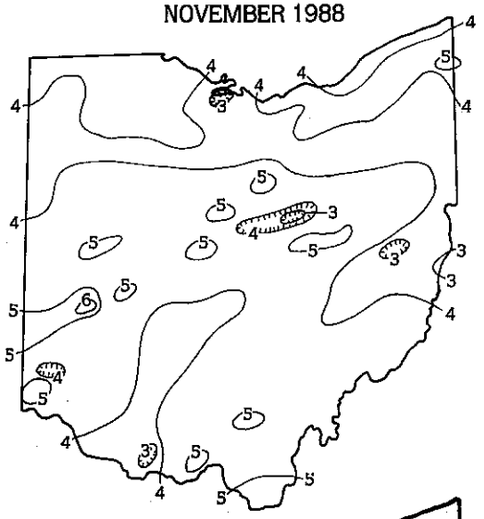
PRECIPITATION for November was above normal throughout the state. This is the first month since October 1986 that precipitation has been above normal in all 10 climatic regions. The state average for this month was 4.27 inches, 1.62 inches above normal. Regional averages ranged from 4.73 inches, 1.96 inches above normal, for the South Central Region to 3.86 inches, 1.26 inches above normal, for the Northeast Hills Region. Dayton International Airport (Montgomery County) reported the greatest amount of precipitation for the month, 6.22 inches. Clendening Dam (Harrison County) reported the least, 2.46 inches.

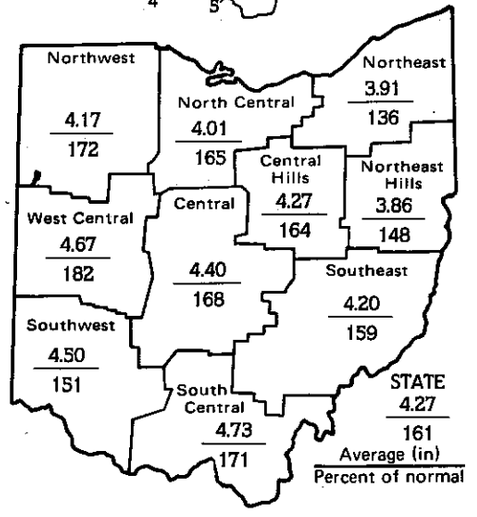
Precipitation fell during every week of the month with the greatest amounts recorded during the first three weeks. Most stations received over one inch per week during this period. Many stations reported some precipitation almost every day during the first 10 days of the month. Greatest amounts were generally reported on November 4-5, 10, and 19-20. Only the southwestern portion of the state received more than .5 inch during the last week.

Precipitation for the 1988 calendar year remains below normal statewide. The average for the state as a whole is 30.11 inches, 4.89 inches below normal. Regional averages range from 33.26 inches, 4.19 inches below normal, for the Southwest Region to 24.78 inches, 6.97 inches below normal, for the North Central Region.

Precipitation for the 1989 water year is above normal statewide. The average for the state as a whole is 6.78 inches, 1.79 inches above normal. Regional averages range from 8.23 inches, 3.51 inches above normal, for the Northwest Region to 5.80 inches, 0.67 inch above normal, for the Northeast Hills Region. The new water year is off to a good start with above normal precipitation during the first two months.

PRECIPITATION
NOVEMBER 1988





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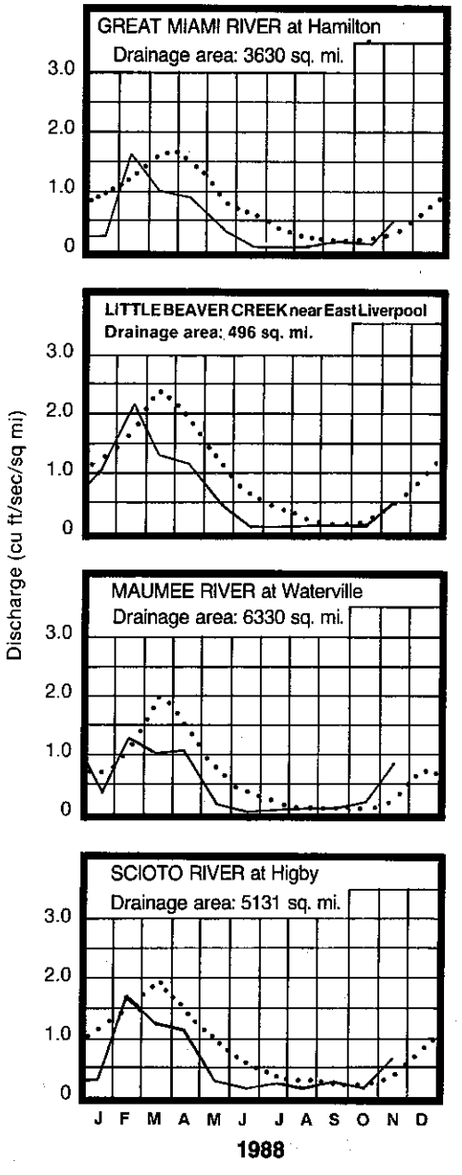

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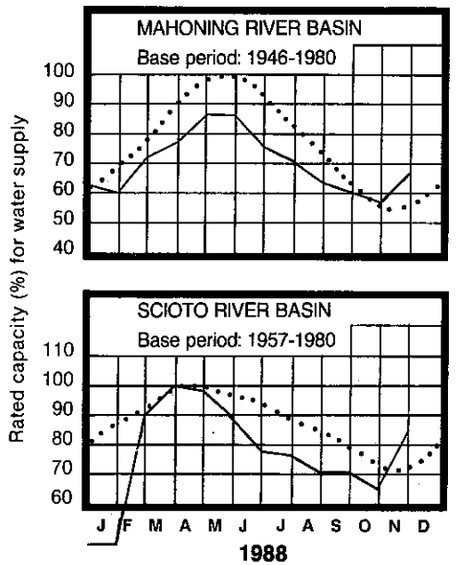
Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for November increased in both the Mahoning and Scioto river basins. Storage was above normal in the Scioto River basin index reservoirs for the first time since April. Storage was above normal in the Mahoning for the second consecutive month. Lake Milton, after seven months of being unable to fill due to the drought conditions, is now at 65 percent of its rated capacity for water supply.

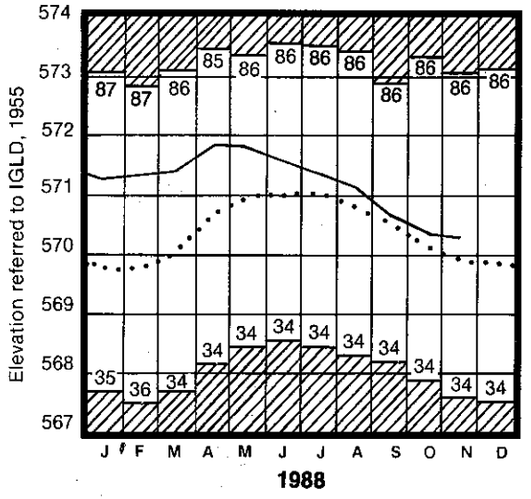
Reservoir storage at the month's end for the Mahoning basin index reservoirs was 66 percent of rated capacity for water supply compared with 57 percent for last month and 55 percent for November 1987. Storage at the month's end for the Scioto basin index reservoirs was 84 percent of rated capacity for water supply compared with 65 percent, for last month and 46 percent for November 1987.

STREAMFLOW for November was above normal throughout the state. Flows in the northwest and south central portions were high enough to be considered excessive. Flows during November were noticeably greater than October flows. Generally, greatest daily flows were observed on November 21-22 in most areas of the state following widespread precipitation on November 19-21. Flows were declining at the month's end.

Mean discharge and percent of normal at the index gauging stations for November were: Great Miami River, 1,803 cfs, 164 percent; Little Beaver Creek, 236 cfs, 117 percent; Maumee River, 5,388 cfs, 333 percent; and Scioto River, 3,143 cfs, 194 percent.

LAKE ERIE level during November declined slightly. The mean level for November was 570.27 feet (IGLD-1955), 0.09 foot below last month's mean level and 1.14 feet below the November 1987 mean level. This month's mean level is 0.35 foot above normal and 1.67 feet above Low Water Datum.

LAKE ERIE LEVELS at Cleveland



Lake Erie's level has dropped 3.43 feet since setting its record high level in June 1986. This month's level is the lowest for November since 1967 and the second lowest for any month during this 21 year period, only being exceeded slightly in February 1977 (570.22 ft.).

GROUND-WATER LEVELS for November showed net rises in most areas of the state. The most notable exception was in the limestone/dolomite aquifers in western and northwestern Ohio where levels continued to decline. Most notable rises were observed in shallower aquifers, especially those along or near rivers and streams. Generally, levels remained stable or declined slightly during the first half of the month and rose during the second half. Rises were in response to above normal precipitation during the month's first three weeks. Although rises were not substantial, it is notable since ground-water levels generally continue to decline in November.

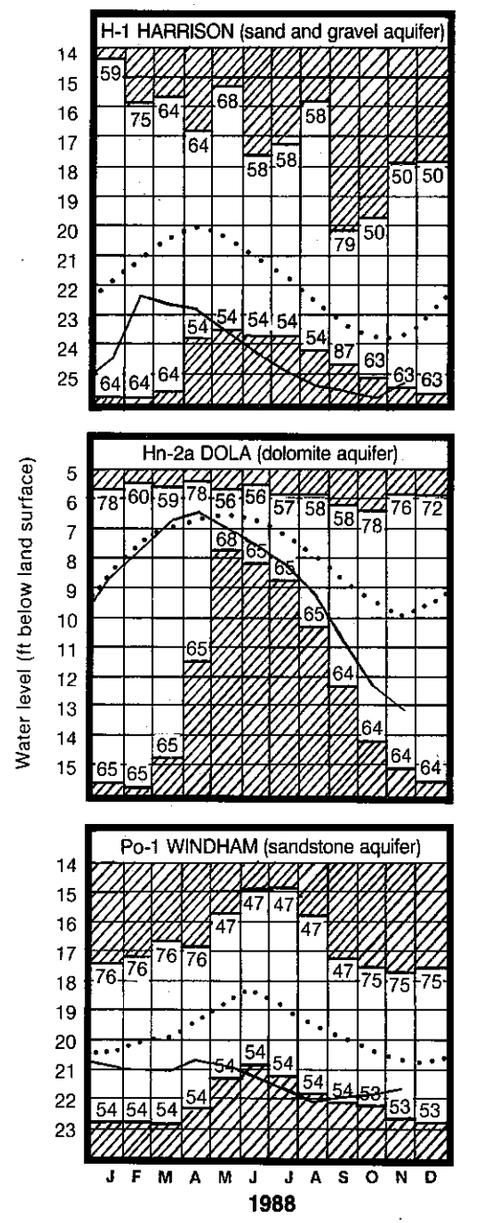
Ground-water levels continue to remain noticeably below normal throughout most of the state. Generally, levels range from 1.5 to 3.5 feet below normal and up to 3 feet below those levels of November 1987. Three of the seven index observation wells reached new record low November levels during the month: for Tu-1, Strasburg (Tuscarawas County), sand and gravel aquifer, this level was an all-time record low; for F-1, West Rushville (Fairfield County), sandstone aquifer, this level equaled the all-time record low set in October 1988; and for H-1, near Harrison (Hamilton County), sand and gravel aquifer, this level was only .01 foot above the all-time record low set in October 1988.

It appears that ground-water levels have bottomed out in most areas of the state with the exceptions noted above. Normal precipitation will be needed throughout the recharge season to continue the improvement noted this month.

SUMMARY

Precipitation was above normal throughout the state. Streamflow was above normal to excessive. Reservoir storage increased. Ground-water levels rose slightly in most areas of the state but generally remain 1.5 to 3.5 feet below normal. Lake Erie level declined slightly and is at its lowest November level since 1967, but still 0.35 foot above normal.

GROUND-WATER LEVELS



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

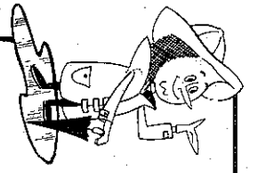
ACKNOWLEDGEMENTS

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. Corps of Engineers, Detroit District.



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DIVISION OF WATER
1939 FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

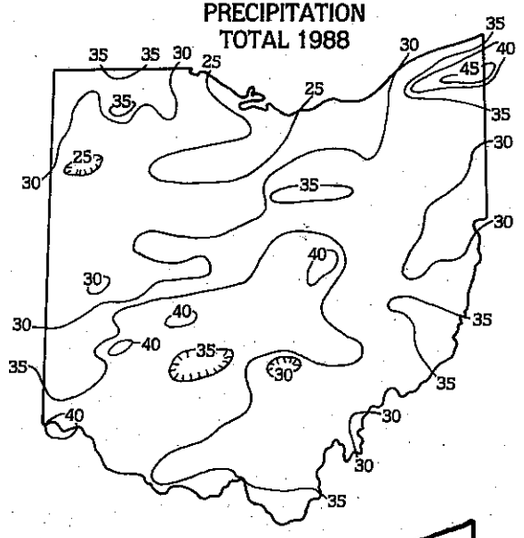
continued from front

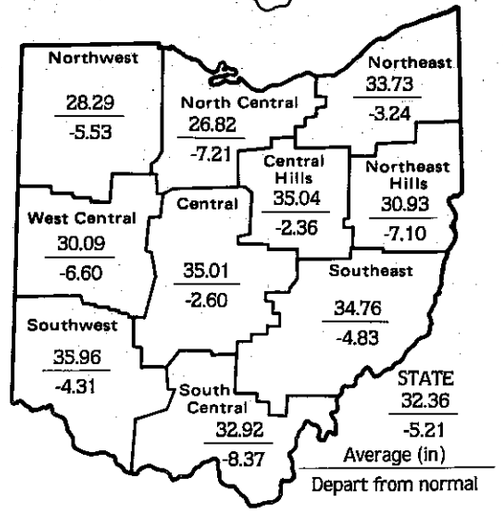
urban landscapes were also stressed. Many municipalities instituted mandatory water conservation and other water use restrictions by the end of June. Although a return to more normal conditions during the last six months of the year lessened the grip of the drought, as far as water supplies are concerned, the drought may not be over. Those who are responsible for managing water supplies, especially ground-water supplies, should continue to monitor their respective situations closely.

SUMMARY

Precipitation was below normal throughout the state. Reservoir storage increased and was slightly above normal. Streamflow was below normal. Ground-water levels were stable and generally remain noticeably below normal. Lake Erie level declined and is at its lowest December level since 1966. Precipitation for 1988 totaled 32.36 inches and ranks 1988 as the 11th driest since records began 106 years ago.

PRECIPITATION
TOTAL 1988





ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

DIVISION OF WATER

DECEMBER 1988

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled By David H. Cashell
Water Inventory Unit

PRECIPITATION for December was below normal throughout the state. The average for the state as a whole was 2.30 inches, 0.28 inch below normal. Regional averages ranged from 2.62 inches, 0.34 inch below normal, for the South Central Region to 1.93 inches, 0.38 inch below normal, for the Northwest Region. Andover (Ashtabula County) reported the greatest amount of precipitation for the month, 4.62 inches. Bowling Green (Wood County) reported the least, 1.37 inches.

Generally, there were only nominal amounts of precipitation throughout the state during the first three weeks of the month. The only exception occurred in the northeastern snow belt counties where greater amounts of precipitation were observed. Chardon (Geauga County) reported 29.4 inches of snow for the month, 6 inches above normal. The bulk of the month's precipitation occurred during the last 10 days. Most notable storm periods were December 22-24 and 27-28. The latter produced amounts of generally 1 inch or more precipitation statewide.

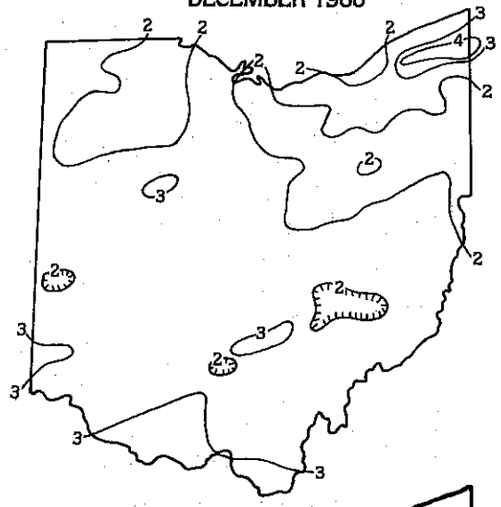
Precipitation for the 1989 water year is above normal throughout the state. The average for the state as a whole is 8.98 inches, 1.41 inches above normal. Regional averages range from 9.98 inches, 2.95 inches above normal, for the Northwest Region to 7.91 inches, 0.20 inch above normal, for the Northeast Hills Region.

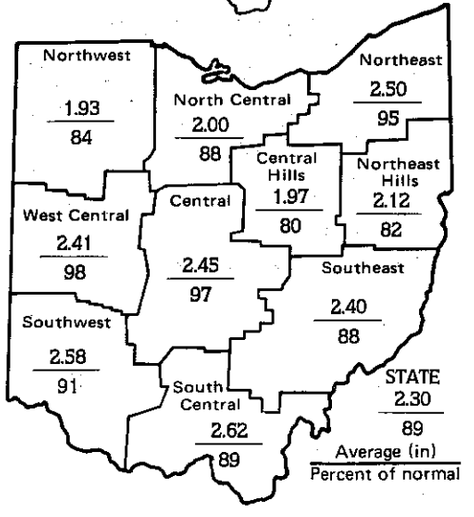
Precipitation for the 1988 calendar year was below normal throughout the state. The average for the state as a whole was 32.36 inches, 5.21 inches below normal. This makes 1988 the 11th driest year since reliable record keeping began 106 years ago and the 9th driest year this century. Regional averages ranged from 35.96 inches, 4.31 inches below normal, for the Southwest Region to 26.82 inches, 7.21 inches below normal, for the North Central Region. The South Central Region had the greatest departure from normal in 1988 as it did in 1987. The departure this year was -8.37 inches and last year -12.87 inches. Andover (Ashtabula County) reported the greatest amount of precipitation for the year, 49.18 inches. Bay View (Erie County) reported the least, 23.14 inches. An isoheytal map and regional averages and departures from normal for 1988 appear on the last page of this report.

1988 will be remembered as a very dry year. Although not as dry as 1987 (which was the 10th driest in 106 years), other significant facts stand out: 1) June 1988 was the driest June ever for the state as a whole, and; 2) April, May and June 1988 were the driest ever for that period for the state as a whole. The dryness during this period is what made "drought" a common household word this year. Not only were agricultural crops adversely affected, but lawns, gardens and other

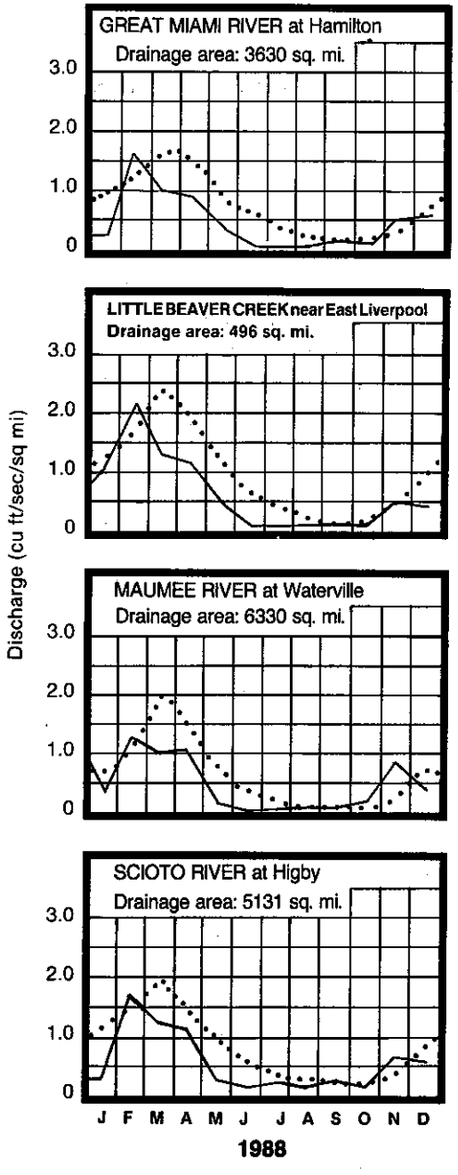
continued on back

PRECIPITATION
DECEMBER 1988





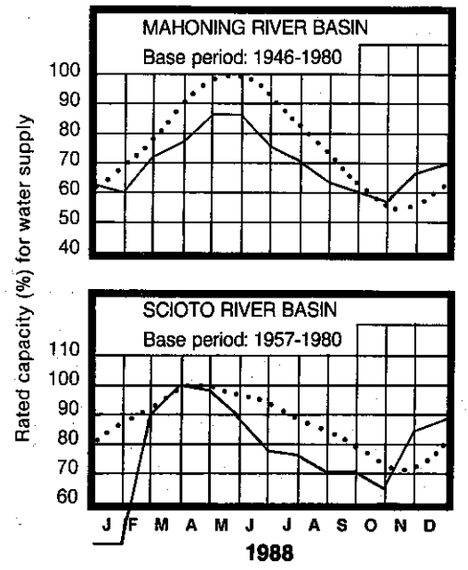
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



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

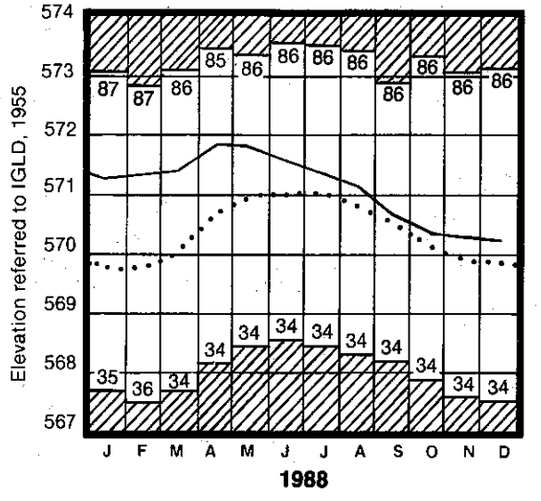
Reservoir storage at the month's end for the Mahoning basin index reservoirs was 69 percent of rated capacity for water supply compared with 66 percent for last month and 63 percent for December 1987. Storage at the month's end for the Scioto basin index reservoirs was 88 percent of rated capacity for water supply compared with 84 percent for last month and 46 percent for December 1987.

Storage during 1988 was at or below normal in both basins during the first 10 months increasing to above normal only during the last two months. Storage in the Mahoning basin was influenced by the low levels in Lake Milton during the year. Lake Milton was drained to repair the dam and was unable to fill after construction was completed in March due to the drought conditions. Storage in the Scioto basin started the year with noticeably low levels, filled to normal in the early spring, but fell to below normal throughout the summer. Storage in both basins was affected by above normal withdrawals for increased demand during the summer months.

STREAMFLOW for December was below normal throughout the state. Flows in the northeastern portion of the state were low enough to be considered deficient. Flows throughout the state were less than November flows except in the southwestern portion where they were slightly higher. Generally, flows declined steadily during the first three weeks of the month and increased rapidly during the last week in response to widespread precipitation. Generally, greatest daily flows were observed on December 29-30.

Mean discharge and percent of normal at the index gauging stations for December were: Great Miami River, 2,205 cfs, 93 percent; Little Beaver Creek, 199 cfs, 43 percent; Maumee River, 2,619 cfs, 59 percent; and Scioto River, 2,940 cfs, 73 percent.

LAKE ERIE LEVELS at Cleveland



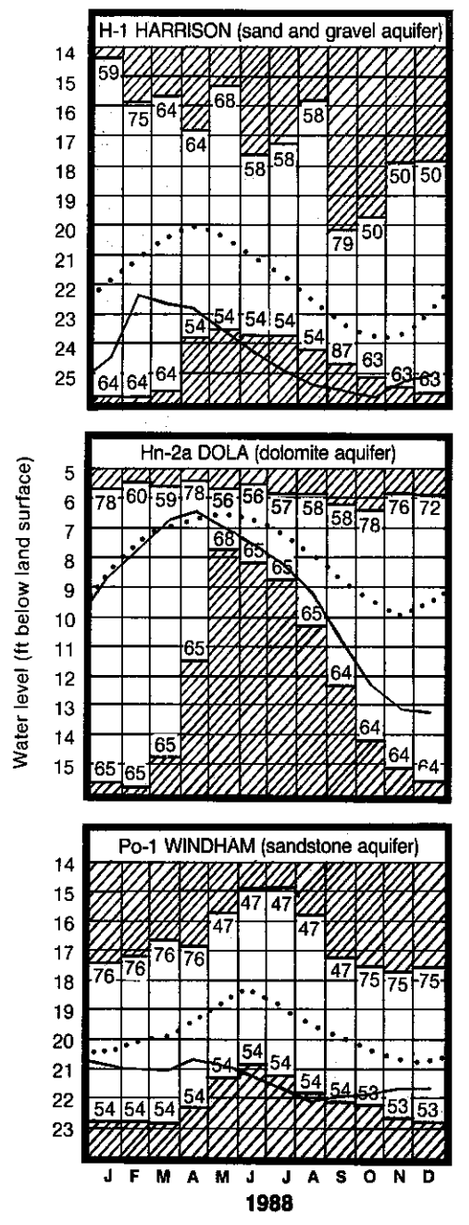
Generally, streamflow in most areas of the state was at or below normal during every month of 1988 except February and November. Record low daily and monthly flows were recorded at some gauging stations during the early summer months.

LAKE ERIE level declined seasonally during December. The mean level for December was 570.21 feet (IGLD-1955), 0.06 foot below last month's level and 1.22 feet below the December 1987 mean level. This month's level is 0.36 foot above normal and 1.61 feet above Low Water Datum. This month's level is the lowest for December since 1966 and the lowest for any month since November 1967.

GROUND-WATER LEVELS for December generally remained stable throughout the state. Consolidated aquifers were stable during the month while unconsolidated aquifers declined during the first three weeks and rose during the last week in response to widespread precipitation. December mean levels were higher than those in November except in the limestone/dolomite aquifers in the western and northern portions of the state where they were slightly lower. Generally, levels in the northern portion of the state are lower than those levels of last year and higher in the southern portion. Levels range from near normal to over 4 feet below normal.

The climatic conditions during the past several years have not been favorable for ground-water supplies. Ground-water supplies have not been fully replenished during the past recharge seasons. This, coupled with the drought conditions of 1988, allowed levels to decline to record low levels in many areas of the state. It appears that levels bottomed out in early November in most areas of the state. Although current water levels are higher, they are still noticeably below normal. Normal precipitation will be needed throughout the entire recharge season to permit a substantial recovery in ground-water supplies.

GROUND-WATER LEVELS



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