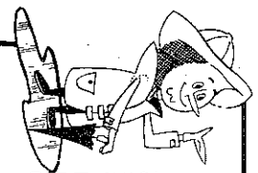
ACKNOWLEDGEMENTS

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
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation was noticeably below normal throughout the state. Streamflow, reservoir storage and ground-water storage declined but remained favorable for water supplies. Lake Erie declined slightly but set a new record high for January.

NOTES AND COMMENTS

FOCUS ON THE ISSUE SERIES

The Ohio Alliance for the Environment has recently published two excellent papers through their "FOCUS on the Issue" series. The September, 1986 FOCUS subject titled "Understanding Ohio's Solid Waste Crisis" deals with the growing problem of what to do with Ohio's solid waste. The paper is written in an easy-to-understand format and is very informative and enlightening.

The November, 1986 FOCUS subject titled "Ohio's Groundwater Management Program" explains Ohio's ground-water quality and quantity programs, outlines deficiencies in state programs and targets future goals for effectively managing Ohio's ground-water.

Both of these FOCUS issues provide an informative, balanced view of two of Ohio's environmental issues as well as suggestions for their solutions.

If you would like copies of these FOCUS issues, write to The Ohio Alliance for the Environment, 445 King Ave, Columbus, OH 43201 or call 614/421-7819.

LAKE AND RESERVOIR MANAGEMENT SYMPOSIUM

The Ohio Lake Management Society (OLMS) and the North American Lake Management Society (NALMS) will co-sponsor a 2-day Symposium on Lake and Reservoir Management on May 4-5, 1987. The Symposium, to be held at the Holiday Inn, Worthington, Ohio, will consist of a one-day NALMS Regional Workshop designed to introduce participants to the basics of lake ecology and lake management techniques. The workshop will provide the groundwork for the second day's agenda, which includes a series of presentations and case histories dealing with lake and reservoir water quality problems.

The program is designed for lake managers, agency personnel, consultants, researchers, and all persons interested in lake management and restoration. The Symposium will provide an opportunity for lake managers to exchange information with researchers and agencies. Also, commercial exhibits will be on display to inform participants of services and products available to aid in managing and restoring lakes and reservoirs.

To receive a registration packet and program agenda, write to: Ohio Lake Management Society - 1987 Symposium, P.O. Box 14, Struthers, Ohio 44417.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

JANUARY 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

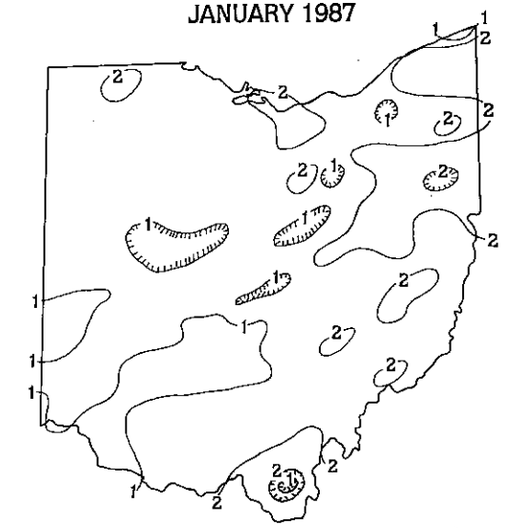
PRECIPITATION for January was noticeably below normal throughout the state. The average for the state as a whole was 1.59 inches, 1.17 inches below normal. Regional averages ranged from 2.05 inches, 0.78 inch below normal for the Northeast Hills region to 0.99 inch, 2.24 inches below normal, for the Southwest region. Chardon, Geauga County, reported the greatest amount of precipitation for the month, 2.72 inches and Milford, Clermont County, reported the least amount, 0.55 inch.

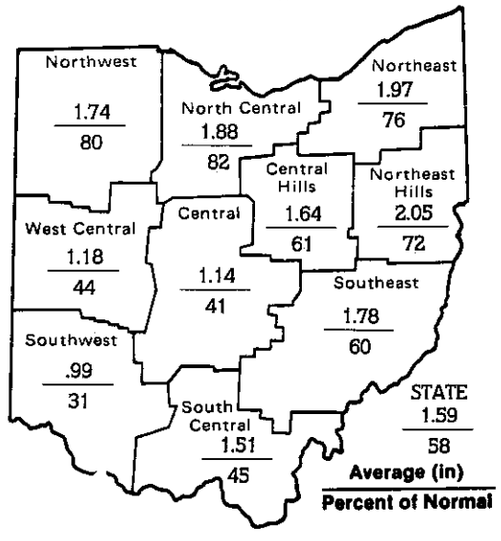
Precipitation was distributed fairly uniform throughout the state. Generally, amounts ranged between 1.5 and 2.5 inches, being lightest in the west, increasing toward the east where a few stations reported more than 2.5 inches. Minimal amounts of rain or snow were observed throughout the state during every week of the month. The only exception was in the northeast when amounts exceeded 1.0 inch on the 2nd and on the 19th when most areas of the state received 0.50 inch or more. As was the case for the past two months, the southeastern portion of the state which experienced drought conditions last year has received the greatest amount of precipitation for the month. Chardon, Geauga County, which reported the greatest amount of precipitation for the month, received 17.5 inches of snow, 6.5 inches below normal. This brings Chardon's snowfall for the 1987 season to 34.0 inches, only 55 percent of normal.

Although January's precipitation appears to be low, it was 0.24 inch more than was received in January 1986. Also, January's precipitation has been lower in 13 of the past 47 years, of which three years reported less than 1.0 inch. Although the deficient precipitation this January has not had a serious effect on the overall water supply situation thus far, it remains to be seen just what will develop during the remaining three months of the 1987 recharge season. It would be wise for those involved in water supplies to monitor their situations closely in the ensuing months and plan accordingly.

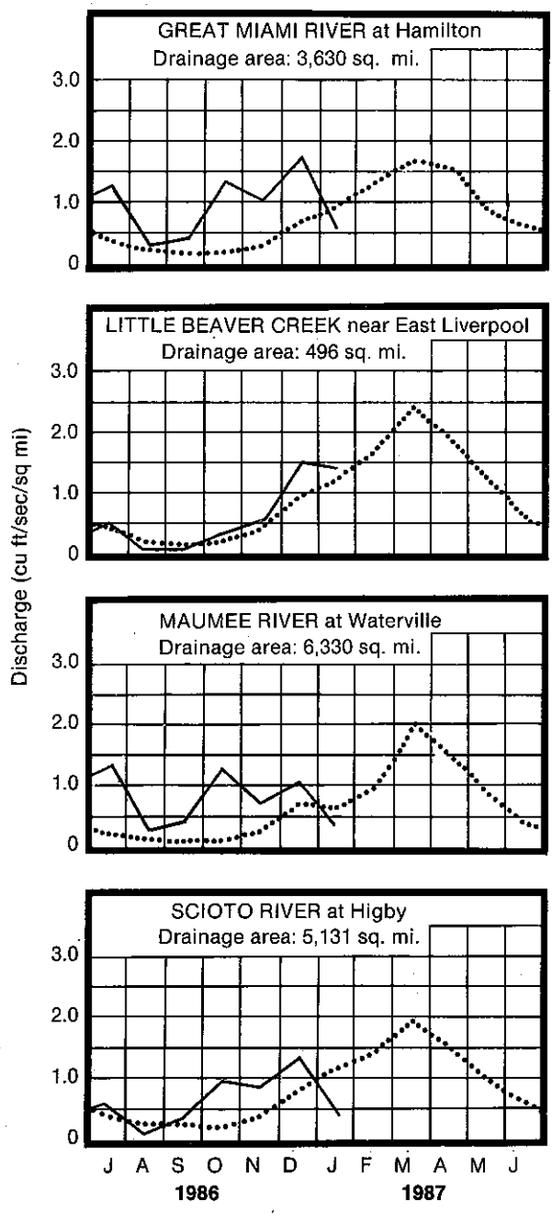
Cumulative precipitation for the first four months of the 1987 water year continues to be above normal throughout the state. The average for the state as a whole is 12.16 inches, 1.83 inches above normal. Regional averages range from 13.62 inches, 2.96 inches above normal, for the Southeast region to 9.43 inches, 0.22 inch above normal, for the Northwest region.

PRECIPITATION
JANUARY 1987





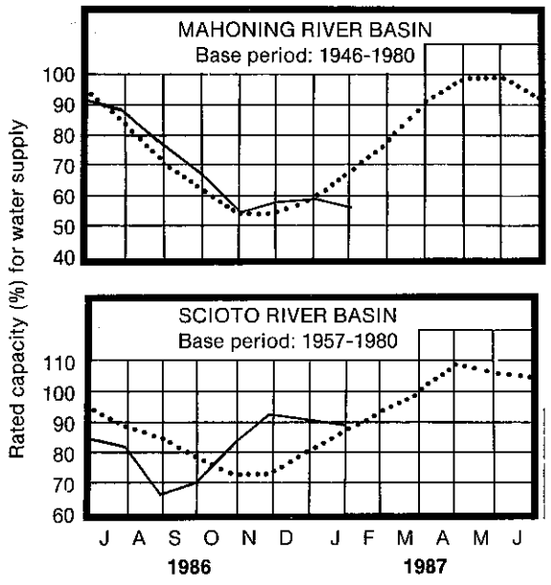
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

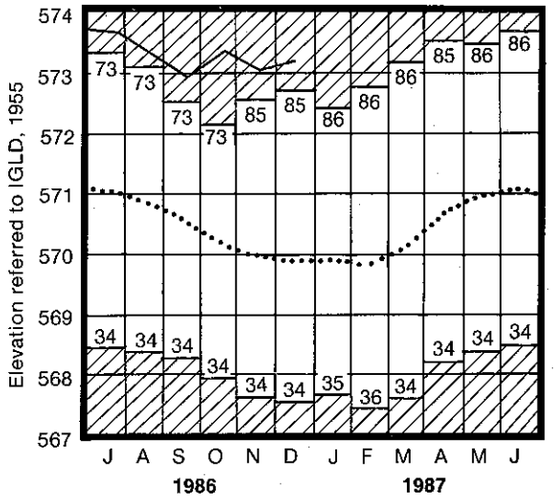
RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for January decreased slightly in both the Mahoning River and the Scioto River basins as a result of the noticeably below normal runoff. Reservoir storage was below normal in the Mahoning River basin while it remained slightly above normal in the Scioto River basin. Storage in the Mahoning River basin continues to be affected by the draining of Lake Milton for repairs to the dam. Reservoir storage for water supply remains favorable thus far in most areas of the state. Reservoir storage at the month's end for the Mahoning basin index reservoirs was 56 percent of rated capacity for water supply compared to 59 percent for last month and 62 percent for January 1986. Storage at the month's end for the Scioto basin index reservoirs was 89 percent of rated capacity for water supply compared to 91 percent for last month and 91 percent for January 1986.

STREAMFLOW for January was generally below normal for most of the state, except in the Little Beaver Creek basin where the flow was slightly above normal and in the Scioto River basin where it was deficient. Runoff for most areas of the state was only about 30 to 50 percent of normal as a result of the below normal precipitation. Flow for the Little Beaver Creek basin showed a significant rise during the last week of the month in response to snow melt from the usual January thaw. Mean discharge and percent of normal for the index gaging stations were: Great Miami River, 2,055 cfs, 63 percent; Little Beaver Creek, 710 cfs, 114 percent; Maumee River, 2,370 cfs, 61 percent; and Scioto River, 2,143 cfs, 38 percent.

LAKE ERIE LEVELS

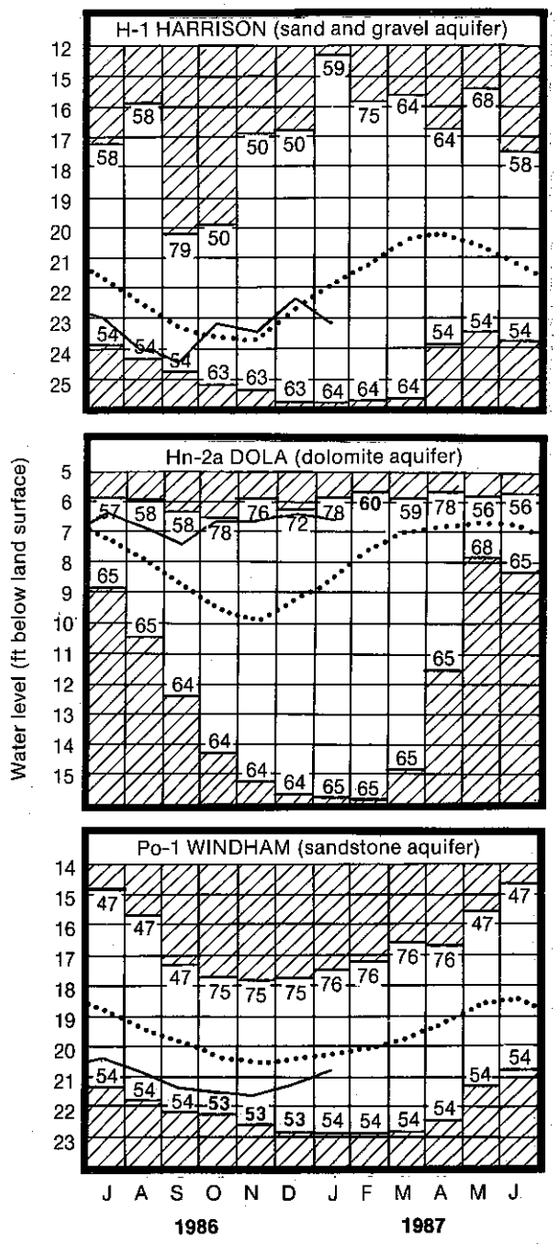


LAKE ERIE level for January declined slightly during the month and set a new record high for the month. The mean level for January was 573.09 feet (IGLD-1955), 0.63 foot above the previous high for January set in 1986 and 0.61 foot below the all time high set in June 1986. The lake level is 3.27 feet above normal and 4.49 feet above Low Water Datum. Strong winds on January 17 produced rises in the lake levels at Toledo which were over 3 feet above the January 1987 mean level.

GROUND-WATER LEVELS for January generally declined in unconsolidated aquifers and rose in consolidated aquifers in response to delayed recharge from above normal precipitation in the previous three months. However, there was evidence near the end of the month that consolidated aquifers were dropping off due to lack of recharge since the middle of December 1986. Ground-water levels in consolidated aquifers showed greater than usual rises from last month's mean levels while in unconsolidated aquifers they showed net declines from last month's levels. Ground-water levels are generally slightly below normal throughout the state; exceptions are in wells in the northern portion of the state where precipitation has generally been above normal for the past year. The ground-water storage situation remains favorable thus far for the 1987 water year.

(continued on back)

GROUND-WATER LEVELS



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

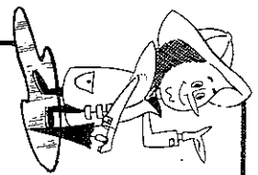
ACKNOWLEDGEMENTS

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
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation was noticeably below normal throughout the state for the second consecutive month. Lake Erie levels declined but still set a new monthly record high for February. Streamflows, groundwater storage and reservoir storage were generally below normal.

NOTES AND COMMENTS

Legislative leadership seminar on ground water

State senators and representatives heard the story of ground water in Ohio at a legislative leadership seminar on February 26 in Columbus. The seminar, sponsored by the Council of State Governments and the Ohio River Basin Commission, informed legislators about ground water's unique properties, and its importance to Ohio's cities and industries, farms and private homeowners. The legislators discussed the state ground water protection and management strategy, its legislative implications and funding needs. The strategy outlines needed actions to assure Ohio's ground water future.

News note from the Ground-Water Resources Section

The Ground-Water Resources Section has just published a prototype map using the DRASTIC system of mapping. The new map, "Ground-Water Pollution Potential of Madison County," by Michael Hallfrisch, can be used as a guide in locating areas within the county that are sensitive to ground-water pollution. The maps are available at a cost of $6.50 plus $1.61 tax, postage, and handling charge from the ODNR-Publication Center, Fountain Square, B-1, Columbus, OH 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!

FEBRUARY 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

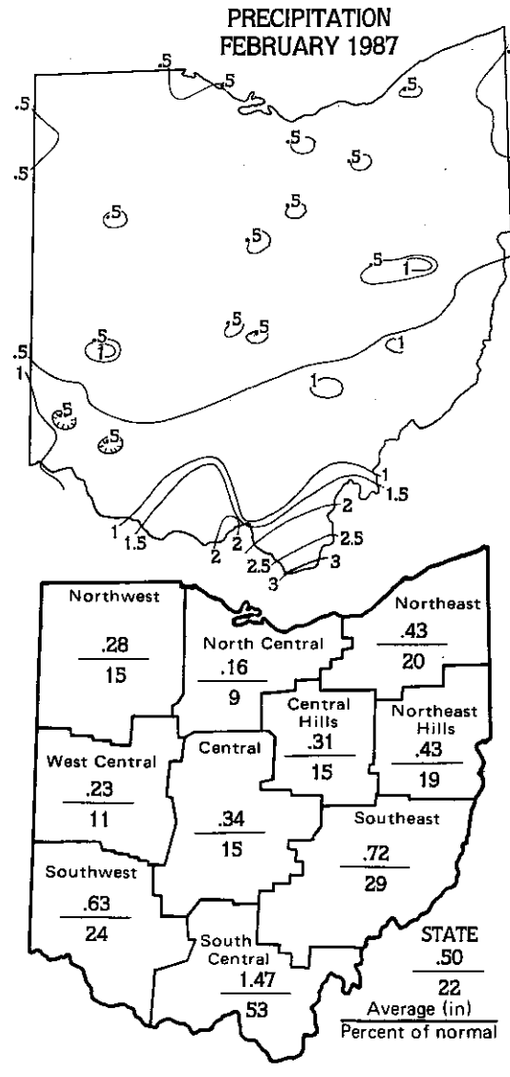
PRECIPITATION for February was noticeably below normal throughout the state. The average for the state as a whole was 0.50 inch, 1.74 inches below normal. Regional averages ranged from 1.47 inches, 1.31 inches below normal for the South Central region to 0.16 inch, 1.71 inches below normal for the North Central region. Departures from normal ranged from 1.31 inches below normal for the South Central region to 1.99 inches below normal for the Southwest region. Waterloo, Lawrence County, reported the greatest amount of precipitation for the month, 2.29 inches, and Grover Hill, Paulding County, reported the least amount—NONE! Also, St. Mary's, Auglaize County, and Montpelier, Williams County, reported only a trace. Note: an area in the extreme southern portion of the state probably received in excess of 3 inches as indicated by the 3.32 inches reported at Huntington Airport NOAA, West Virginia. Chardon, Geauga County, reported 7.3 inches of snow for the month, 36 percent of normal.

Precipitation was light during every week of the month. Stations in extreme south central Ohio and a few isolated stations reported more than 1 inch for the month. Only during storms on the 2nd, 12th, 18th and 28th did stations report more than .02 inch. Much of the precipitation at stations that reported in excess of 1 inch fell on the 28th of the month. Snowfall was extremely light throughout the state during the entire month with only stations in northeastern Ohio receiving significant amounts. This was the second driest February for the state as a whole in 105 years, with only .043 inch in February 1978 being lower. Many stations in northern Ohio reported record low amounts of precipitation for the month.

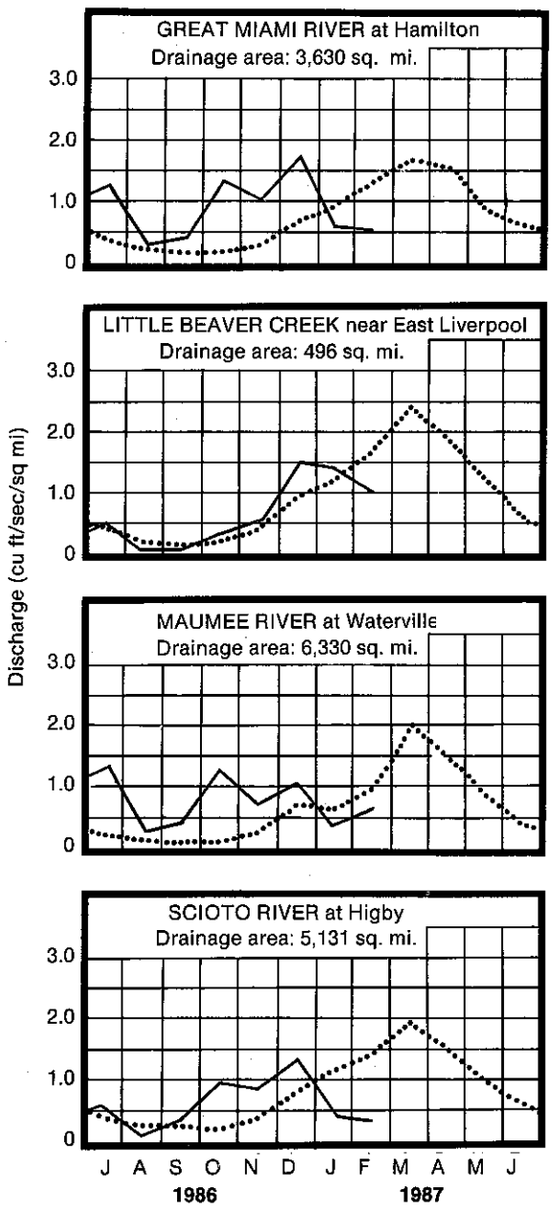
Cumulative precipitation for the 1987 calendar year thus far for the state as a whole is 2.09 inches, 2.91 inches below normal. Regional averages range from 1.41 inches, 3.37 inches below normal for the West Central region to 2.98 inches, 3.17 inches below normal for the South Central region. Departures from normal range from 2.00 inches below normal for the Northwest region to 4.23 inches below normal for the Southwest region.

Cumulative precipitation for the first five months of the 1987 water year for the state as a whole is 12.66 inches, 0.09 inch above normal. Regional averages range from 9.71 inches, 1.34 inches below normal for the Northwest region to 14.88 inches, 0.76 inch above normal for the South Central region.

Precipitation has been very light since the middle of December 1986. Rainfall during this period is very important for replenishment of ground-water and upground reservoir supplies. It is hoped that current conditions will not persist. Those involved in managing water supplies should monitor their situations closely and plan accordingly.



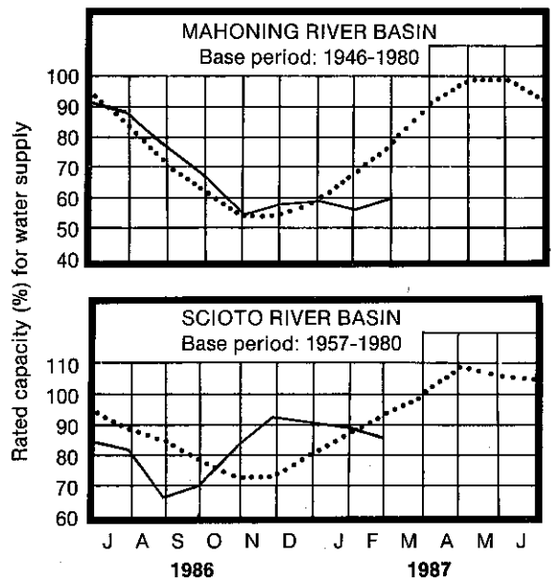
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

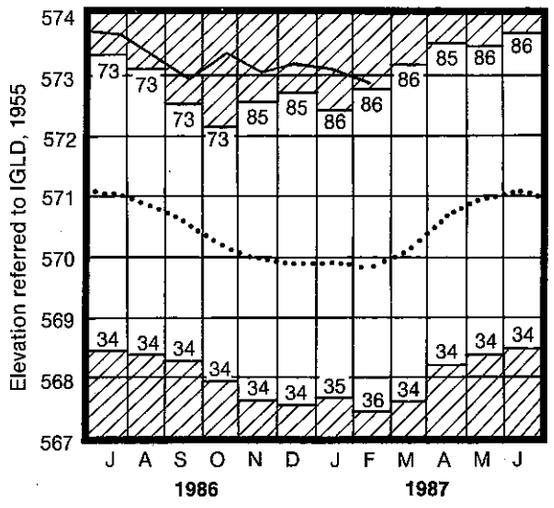
RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for February increased slightly the Mahoning River basin and decreased slightly in the Scioto River basin. Reservoir storage remained below normal in the Mahoning River basin and dropped to below normal in the Scioto River basin in response to the below normal rainfall and runoff for the past two months. Storage in the Mahoning River basin continues to be affected by the draining of Lake Milton for repairs to the dam. Storage at the month's end for the Mahoning basin index reservoirs was 59 percent of rated capacity for water supply compared to 56 percent for last month and 78 percent for February 1986. Storage at the month's end for the Scioto basin index reservoirs was 85 percent of rated capacity for water supply compared to 89 percent for last month and 100 percent for February 1986.

STREAMFLOW for February was in the lower range of normal throughout the state except in the south central and southwestern portions where it was deficient. In general, flows decreased steadily throughout the month in response to the below normal precipitation. Runoff for the southern portion of the state was only 24 to 39 percent of normal; in the northern portion runoff was 60 to 70 percent of normal. Mean discharge and percent of normal for the index gaging stations were: Great Miami River, 1,876 cfs, 39 percent; Little Beaver Creek, 501 cfs, 61 percent; Maumee River, 4,259 cfs, 70 percent; and Scioto River, 1,716 cfs, 24 percent.

LAKE ERIE LEVELS

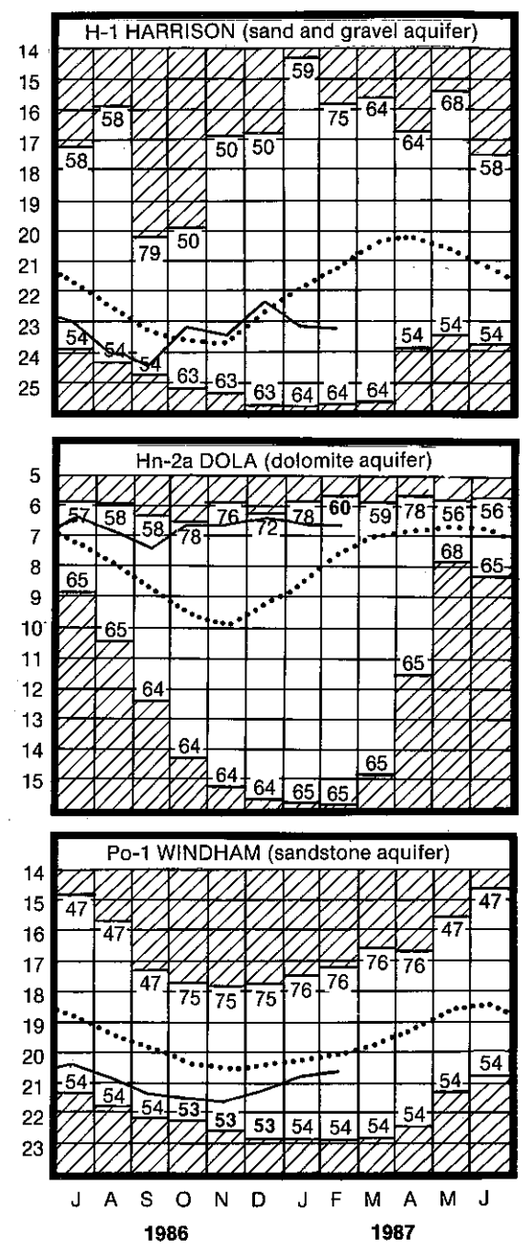


LAKE ERIE level for February declined during the month but still set a new record high for February. The mean level for February was 572.84 (IGLD-1955), 0.05 foot above the previous high for February set in 1986. The lake level is 0.25 foot below the January 1986 level, 3.04 feet above normal and 4.24 feet above Low Water Datum.

GROUND-WATER LEVELS for February declined steadily during the month from last month's levels in response to the below normal precipitation; an exception is observation well Po-1, in Windham, Portage County, representing a sandstone aquifer, which showed a net rise due to delayed recharge from above normal precipitation in northeastern Ohio during the fall months. Ground-water levels are generally from 0.50 to 2.00 feet below normal; exceptions are observation wells Fr-10, OSU farms, Columbus and Hn-2A, Dola, Hardin County, which have been consistently above normal for the past several years.

The below normal precipitation for the past two months has generally caused ground-water levels to decline whereas they normally rise. As the end of the nominal recharge season approaches, usually in May, conditions do not augur well for much improvement. It is hoped that precipitation will be above normal in the next few months. Although the outlook for ground-water storage is still optimistic, those who depend on ground-water for supplies should monitor their situations closely and plan accordingly.

GROUND-WATER LEVELS



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

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

MARCH 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

SUMMARY

Precipitation was below normal for the third consecutive month. Lake Erie's level declined and did not set a record high for the first time since April 1986. Streamflow was deficient statewide. Groundwater and reservoir storage were generally below normal.

NOTES AND COMMENTS

ODNR-DIVISION OF WATER PUBLISHES OHIO'S FIRST GROUND-WATER POLLUTION POTENTIAL MAP

To help identify those areas which may be particularly vulnerable to ground-water pollution, the Ohio Department of Natural Resources (ODNR), Division of Water has published a prototype map titled "Ground-Water Pollution Potential of Madison County", by Michael Hallfrisch.

Ground-Water Pollution Potential Maps are designed to determine an area's relative potential for ground-water pollution. They do not pinpoint specific locations of contamination and should not be used as a substitute for detailed hydrogeologic site investigations.

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.

Mapping an area's potential for ground-water pollution is a relatively new idea. This map uses the DRASTIC system as developed in 1985 for the U.S. Environmental Protection Agency by the National Water Well Association. Ohio is one of the first states to propose a statewide DRASTIC mapping program.

DRASTIC values, as shown on the map, indicate an area's potential to pollute ground water. A low DRASTIC index value indicates a lower potential for ground-water pollution while a high DRASTIC index value indicates a higher pollution potential. Areas of similar DRASTIC values are color coded on the Madison County map for ease of reading.

Copies of "Ground-Water Pollution Potential of Madison County" may be obtained from the ODNR Publications Center, Fountain Square, Bldg. B-1, Columbus, Ohio 43224. The cost is $6.50 plus $1.61 tax, postage and handling. Make checks payable to ODNR Publications Center.

ERRATA: In precipitation last month "storms on the 2nd, 12th, 18th and 28th did stations report more than 0.20 inch", not .02 inch. Also, precipitation in February 1978 was 0.43 inch, not .043 inch.

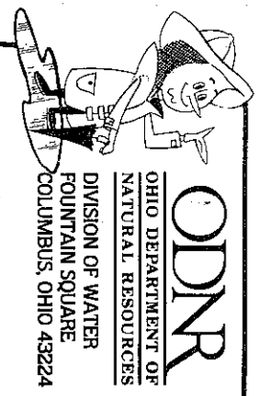
ACKNOWLEDGEMENTS

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
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

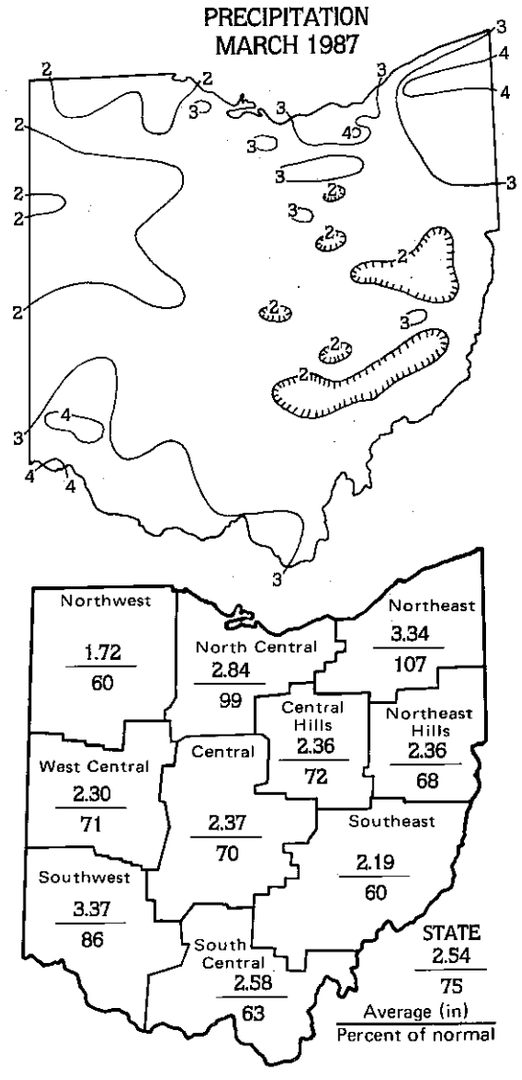
PRECIPITATION for March was below normal throughout the state except in the Northeast region where it was slightly above normal. The average for the state as a whole was 2.54 inches, 0.84 inch below normal. Regional averages ranged from 3.37 inches, 0.55 inch below normal for the Southwest region to 1.72 inches, 1.15 inches below normal for the Northwest region. Departures from normal ranged from 1.51 inches below normal for the South Central region to 0.23 inch above normal for the Northeast region. Kings Mills, Warren County, reported the greatest amount of precipitation for the month, 4.61 inches, and New Straitsville, Perry County, reported the least amount, 1.11 inches. Chardon, Geauga County, reported 4.60 inches for the month including 22.8 inches of snow which is 121 percent of normal snowfall. For the season, Chardon's total snowfall is 64.2 inches, 64 percent of normal.

The bulk of the month's precipitation occurred during storm periods on the 1st and 30th-31st. The rest of the month was very dry with amounts of less than 0.50 inch reported on the 14th-15th, 18th-19th, and 24th-25th. The storm on the 30th-31st was the most significant with stations generally reporting from 1 to 2 inches of precipitation. This storm also produced more snow than any other storm this winter for many stations. Most of the state received between 2 and 3 inches of precipitation. Areas in the northeast and southwest portions received more than 3 inches and a few stations more than 4 inches. Stations in the northwest and east central portions received less than 2 inches.

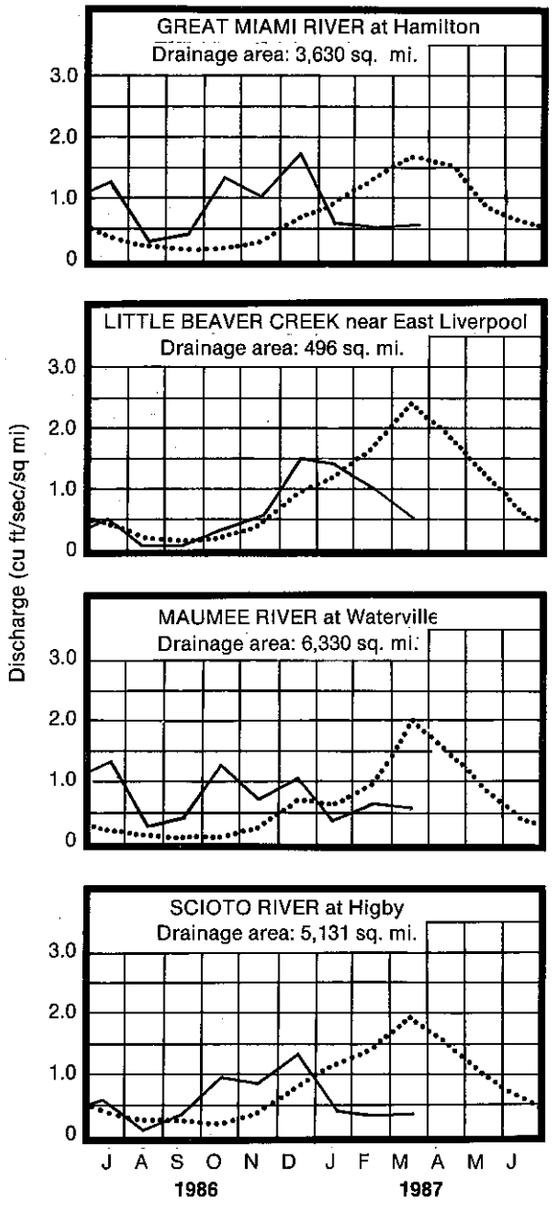
Cumulative precipitation for the 1987 calendar year thus far for the state as a whole is 4.63 inches, 3.75 inches below normal. Regional averages range from 5.74 inches, 2.13 inches below normal for the Northeast region to 3.71 inches, 4.33 inches below normal for the West Central region. Cumulative departures from normal are below normal for all regions ranging from 4.78 inches below normal for the Southwest region to 2.13 inches below normal for the Northeast region. It is significant to note that this was the 4th driest January, February and March for the state as whole in 105 years with only 1941, 1958 and 1983 being drier.

Cumulative precipitation for the first 6 months of the 1987 water year for the state as a whole is 15.20 inches, 0.75 inch below normal. Regional averages range from 17.46 inches, 0.75 inch below normal for the South Central region to 11.43 inches, 2.49 inches below normal for the Northwest region.

This is the third consecutive month that precipitation has been below normal. Although not critical at this time, we urge those involved in managing water supplies to monitor their situations closely and plan accordingly.



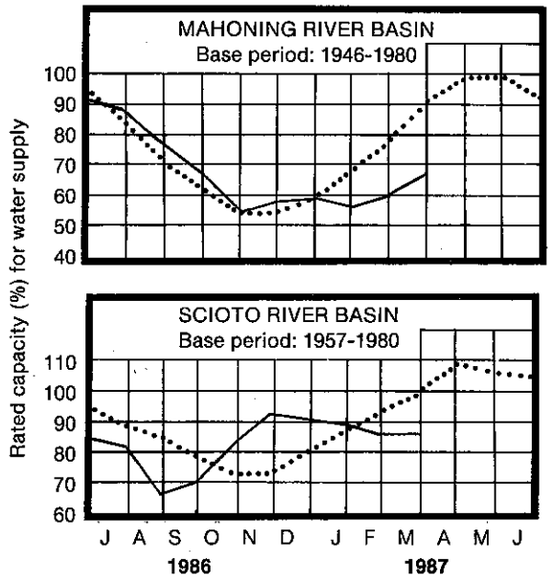
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



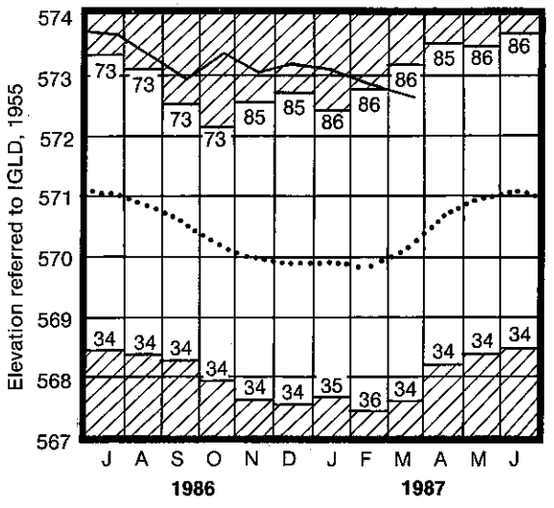
RESERVOIR STORAGE for water supply increased in the Mahoning River basin and was unchanged in the Scioto River basin. Reservoir storage remained below normal in both basins in response to below normal precipitation and runoff for the last three months. Storage has been below normal in the Mahoning River basin for the past three months and in the Scioto River basin for the past two months. Storage in the Mahoning River basin continues to be affected by the draining of Lake Milton for repairs to the dam.

Storage at the month's end for the Mahoning basin index reservoirs was 67 percent of rated capacity for water supply compared to 59 percent for last month and 83 percent for March 1986. Storage at the month's end for the Scioto basin index reservoirs was 85 percent of rated capacity for water supply compared to 85 percent for last month and 101 percent for March 1986.

STREAMFLOW for March was deficient statewide. In general, flows decreased steadily throughout the month after increasing for the first few days in response to the storm on February 28 and March 1. Flows began to increase rapidly on the 30th and 31st in response to the storm of the same dates. Little Beaver Creek recorded the third lowest mean monthly flow for the period of record for March.

Runoff continues to be noticeably below normal throughout the state with amounts ranging from 21 to 37 percent of normal for March. Cumulative runoff for the 1987 calendar year is also noticeably below normal. Cumulative runoff in inches per square mile and percent of normal for the first three months of the 1987 calendar year are: Great Miami River, 1.71 inches, 45 percent; Little Beaver Creek, 2.99 inches, 62 percent; Maumee River, 1.64 inches, 46 percent; and Scioto River, 1.11 inches, 28 percent.

LAKE ERIE LEVELS



Mean discharge and percent of normal for the index gaging stations for March were: Great Miami River, 2,264 cfs, 37 percent; Little Beaver Creek, 274 cfs, 23 percent; Maumee River, 3,781 cfs, 30 percent; and Scioto River, 1,863 cfs, 19 percent.

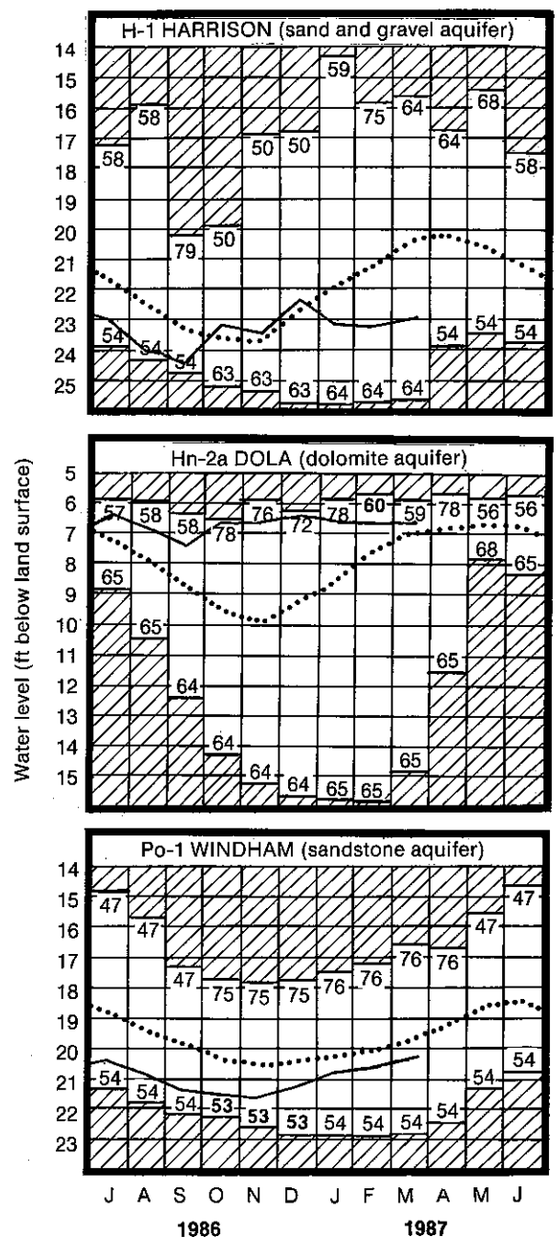
LAKE ERIE level for March declined during the month and did not set a new record high level for the first time since April 1986. Record high levels have been established repeatedly in 17 of the past 23 months. The below normal precipitation for the past three months has resulted in declining lake levels whereas they normally have begun to rise in March.

The mean level for March was 572.69 feet (IGLD-1955), 0.47 foot below the March record high set in 1986, 4.09 feet above Low Water Datum, and 2.64 feet above normal.

GROUND-WATER LEVELS for March in general remained stable throughout the month in response to limited recharge. Ground-water levels range from 0.58 foot below to 0.41 foot above last month's levels. Although precipitation was below normal for March, amounts were enough to have a positive effect on the ground-water storage situation. In general, ground-water levels are from 0.50 to 3.50 feet below normal; exceptions are observation wells Fr-10, OSU Farms, Columbus and Hn-2A, Dola, Hardin County, which have been consistently above normal for the past several years.

The below normal precipitation for the past three months has had a noticeable effect on ground-water supplies. Ground-water levels should normally be rising rapidly in March. The storm on March 30 and 31 was beneficial; however, the full effect will not be determined until the end of April. Although the situation is not critical at this time, those who depend on ground-water for supplies should monitor their situations closely and plan accordingly.

GROUND-WATER LEVELS



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

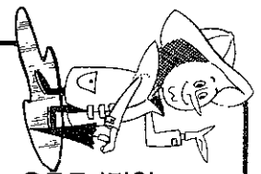
ACKNOWLEDGEMENTS

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

FOUNTAIN SQUARE

COLUMBUS, OHIO 43224

(continued from front page)

normal, for the Northwest region. Departures from normal range from 0.01 inch above normal for the North Central region to 4.26 inches below normal for the Northwest region. Thus the 1987 water supply recharge season began with good promise but ended up somewhat on the short side in total precipitation.

NOTES AND COMMENTS

GROUND-WATER PIONEER PASSES

Fred H. Klaer, Jr., one of Ohio's first and most well known consulting geologists and hydrologists passed away on April 20, 1987. Mr. Klaer, outstanding for his expertise in ground-water development and hydrology in Ohio, served many municipalities and industries as owner of Fred H. Klaer, Jr. and Associates of Columbus, Ohio for over twenty-five years. Prior to going into consulting he was director of surveys and research, Ranney Method Water Supplies of Columbus, Ohio. He began his career in ground water in Ohio with the Ground-Water Division, U.S. Geological Survey, in 1941 and was with the USGS in Indiana from 1943 to 1951. He was a Certified Professional Geologist, Fellow of the Geological Society of America, member of the American Water Works Association, International Association of Hydrogeologists and contributor to professional water journals. Mr. Klaer received his B.S. from Amherst College and M.S. from Northwestern University.

Mr. Klaer made many friends throughout his career in ground water and was renown for his work in the development of ground-water resources in Ohio. One of his first outstanding achievements was the development of the Federal Works Well Field in the Fairfield area of Hamilton County to supply water to the Mill Creek Valley during the Second World War. His works are referred to today in many publications and are regarded outstanding among hydrogeologists. He was also associated with the 4-H Horse Clubs and a popular Horse Show announcer. He resided with his family on a farm near New Albany, Ohio

WILL THE SUPER-CONDUCTOR SUPERCOLLIDER (SSC) COME TO OHIO?

Nearly everyone has heard that Ohio wants the SSC to be built here, and Ohio has been trying to prove to the Department of Energy (DOE) that Ohio is indeed a good site. Through the OSU-Department of Physics, the Ohio Department of Natural Resources has been busy collecting information for a report, which will tell DOE just that.

Although the exact site has not been selected, a proposed area is being considered and closely examined. The general area includes parts of Marion, Union and Delaware counties.

The SSC, when complete, will consist of a small diameter tunnel (about 10 ft. in diameter), 150 to 200 feet underground and 52 miles in circumference. The SSC will be a one-of-a-kind, high energy experimental laboratory, employing 2000 to 3000 technicians and scientists.

The Division of Water has been assisting MK Ferguson Company, the siting projects consultant, in collecting water resource data for the proposed project. Three aquifer tests are planned to collect detailed information about the site's ground-water resources.

Once testing is complete, a final report will be submitted to DOE, outlining the details and reasons why Ohio's proposed site is a superior site. If all goes well, another high-tech industry will soon move to Ohio.

ODNR

OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

APRIL 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

PRECIPITATION for April was generally below normal throughout most of the state for the fourth consecutive month; exceptions were in the eastern and southeastern portions of the state where it was slightly above normal. The average for the state as a whole was 2.92 inches, 0.59 inch below normal. Regional averages ranged from 4.05 inches, 0.31 inch above normal, for the South Central region to 1.54 inches, 1.77 inches below normal, for the Northwest region. Middlebourne, Guernsey County, reported the greatest amount of precipitation for the month, 5.87 inches and Bowling Green, Wood County, reported the least amount, 1.17 inches.

There was precipitation in most areas of the state during every week of the month. The bulk of the month's precipitation fell during the period April 3rd to 5th. During this period a large portion of the state experienced a severe snowstorm which produced record-breaking amounts of snow for a 24 hour period for many stations in the central and eastern areas of the state, and in many cases it was an all-time record 24 hour snowfall. Columbus reported 12.6 inches; Akron-Canton Airport, 20.6 inches; Chardon, 18 inches; New Philadelphia, 17 inches; Dillon Reservoir at Zanesville, 18 inches; these were all time records for a 24 hour period for these stations. The moisture from this storm along with precipitation throughout the month was beneficial to our water supplies.

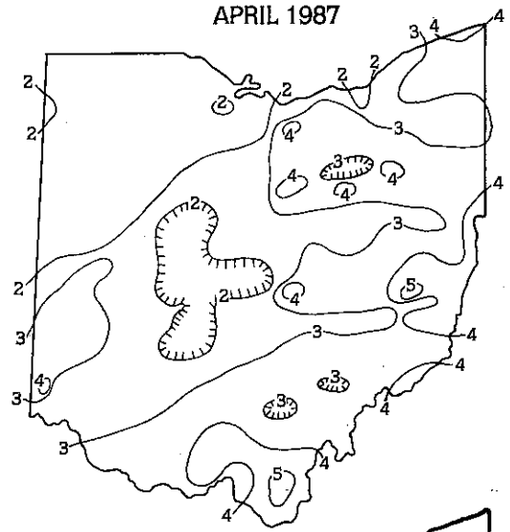
Most of the state west of a line from Cincinnati to Cleveland received between 1.5 and 2.5 inches of precipitation for the month while east of ths line precipitation amounts ranged from 2.5 to 3.5 inches, with a few stations reporting in excess of 4 inches and only one station reporting more than 5 inches. Generally, snowfall this winter was much below normal; Chardon, the snow capital of Ohio, reported 82.6 inches, 78 percent of normal.

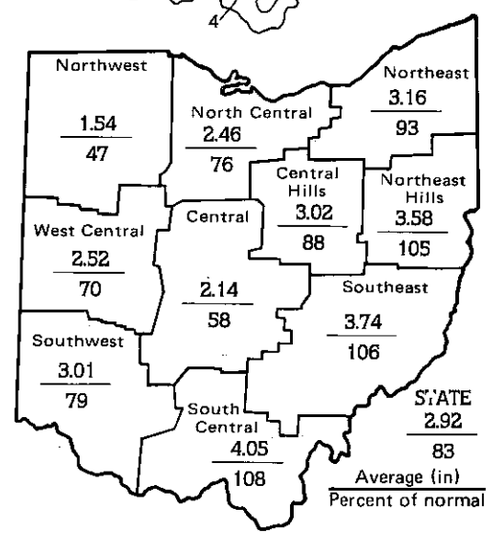
Cumulative precipitation for the 1987 calendar year remains markedly below normal throughout the state. For most regions, precipitation has been below normal for every month in this calendar year. The average for the state as a whole is 7.55 inches, 4.34 inches below normal. Regional averages range from 9.61 inches, 4.37 inches below normal, for the South Central region to 5.28 inches, 4.92 inches below normal, for the Northwest region. Departures from normal range from 6.06 inches below normal, for the Central region to 2.36 inches below normal for the Northeast region.

Cumulative precipitation for the first 7 months of the 1987 water year remains below normal throughout most of the state; one exception is the North Central region where it is normal. The average for the state as a whole is 18.12 inches, 1.34 inches below normal. Regional averages range from 21.51 inches, 0.44 inch below normal, for the South Central region to 12.97 inches, 4.26 inches below

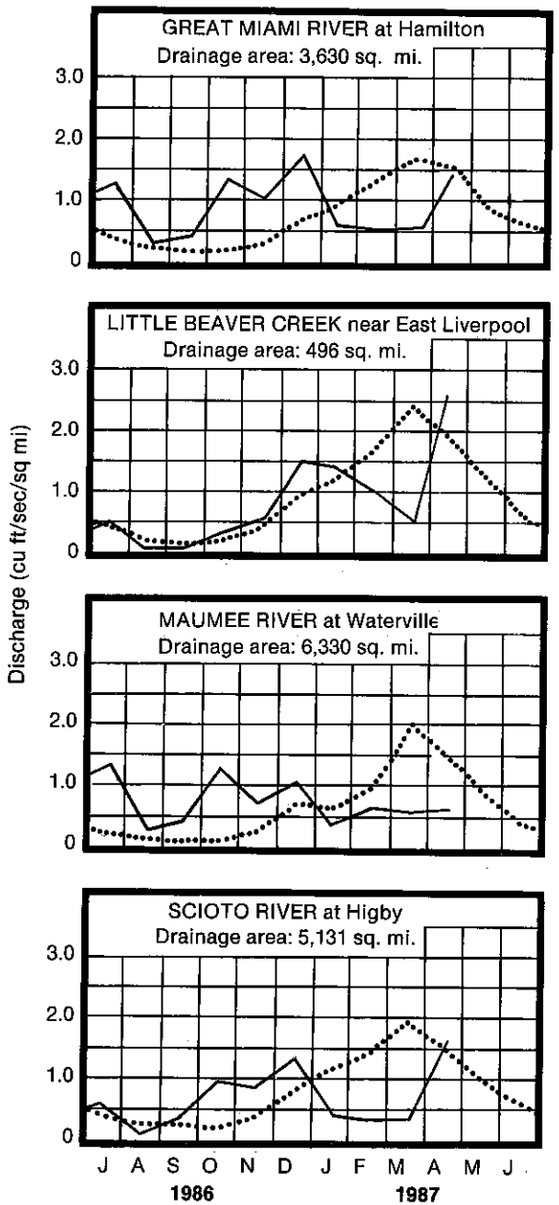
(continued on back)

PRECIPITATION
APRIL 1987





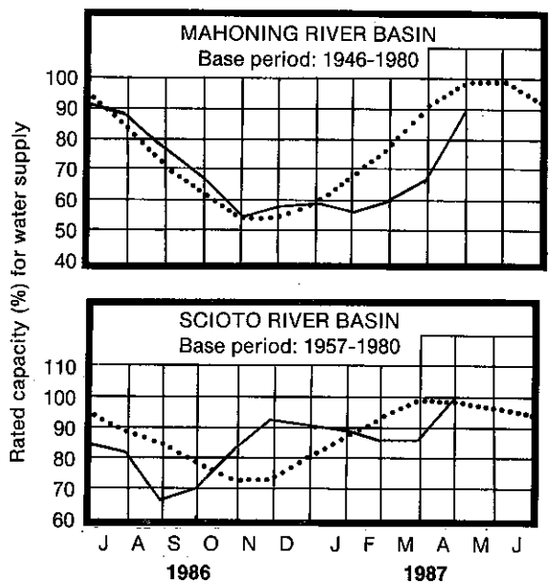
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



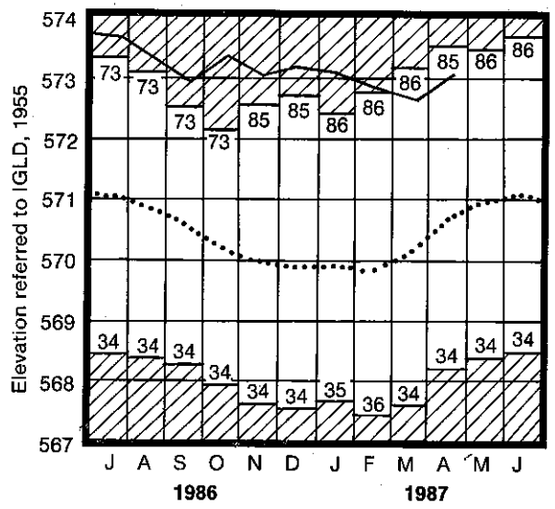
RESERVOIR STORAGE for water supply increased significantly in both the Mahoning River and the Scioto River basins. Storage remained slightly below normal in the Mahoning River basin while it was slightly above normal in the Scioto River basin. Storage at the month's end for the Mahoning basin index reservoirs was 89 percent of rated capacity for water supply compared to 67 percent for last month and 84 percent for April 1986. Storage at the month's end for the Scioto basin index reservoirs was 99 percent of rated capacity for water supply compared to 85 percent for last month and 96 percent for April 1986.

STREAMFLOW for April was generally normal throughout the state; the only exception was in the northwest where it continues to be deficient. Flows increased significantly in most areas of the state during the first half of the month in response to the increased runoff from snow melt and rain during the last two days of March and the first few days of April. An exception to this was in the northwest where streamflow continued to be noticeably deficient in response to below normal precipitation. Flows at the month's end were generally deficient for most areas of the state. Although there was some precipitation throughout the state during the second half of the month, most of it was lost to evaporation, evapotranspiration and soil moisture.

Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 5,205 cfs, 93 percent; Little Beaver Creek, 1,291 cfs, 141 percent; Maumee River, 4,080 cfs, 43 percent; Scioto River, 7,883 cfs, 106 percent.

LAKE ERIE level at Cleveland for April rose during the month following a declining trend in both February and March. This is the second consecutive month the lake level has not set a new record high. The mean level for April was 573.01 feet (IGLD-1955), 0.32 foot above last month's mean level, 0.35 foot below the level observed for April 1986 and 4.41 feet above Low Water Datum.

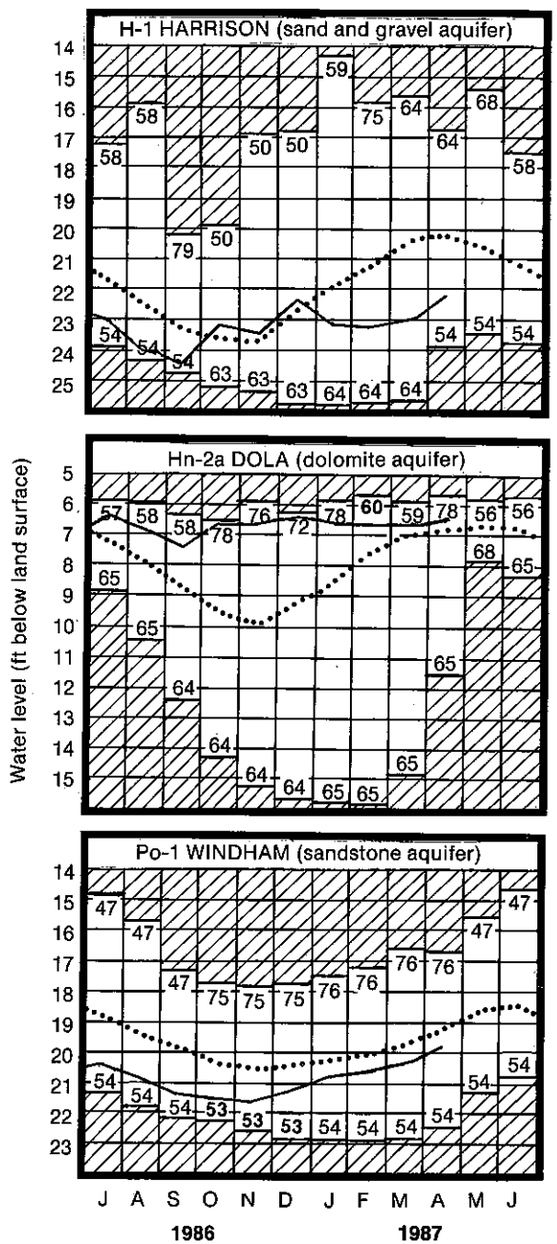
LAKE ERIE LEVELS



GROUND-WATER LEVELS for April generally showed rises in response to recharge from substantial amounts of precipitation during the last days of March and the first week of April. All the index wells showed net rises from last month's levels ranging from 0.1 foot to 0.9 foot. Ground-water levels were below those levels observed last year in most index observation wells; one exception was in northeast Ohio at Windham, where observation well Po-1, representing a consolidated aquifer, was noticeably above the level observed last year. Water levels are noticeably below normal in most areas of the state; the only exception is in consolidated aquifers in the northwest where water levels continue to be above normal in response to above normal precipitation during the past two or three years. Observation well Tu-1 at Strasburg, Tuscarawas County, set a new record low water level for April for the period beginning in 1962.

Ground-water storage showed some improvement over last month, but still continues to be dangerously low as far as water supplies are concerned. Unless we experience substantially greater than normal precipitation in May, the normal recharge season will have ended, and water levels will begin their usual summer declines.

GROUND-WATER LEVELS



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

SUMMARY

Precipitation for April was below normal throughout the state for the fourth consecutive month. Streamflow, reservoir storage and ground-water storage improved slightly in response to precipitation during the first week of the month. Lake Erie level declined slightly and was about 0.5 foot below the record high for April. The water supply situation holds some degree of uncertainty at this time.

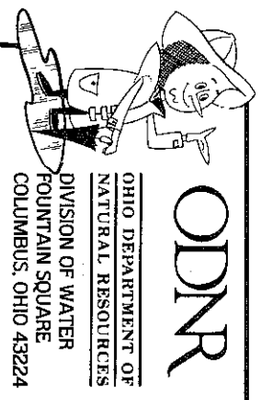
ACKNOWLEDGEMENTS

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
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

(continued from front page)

inches below normal, for the Northwest region. This was not a good recharge season for water supplies. The recharge season was off to a good start during the first three months of the water year when precipitation was generally above normal; however, the below normal precipitation during the last five months has all but erased the gains to water supplies which had been made during the first three months. Thus, we enter the water supply depletion period with much apprehension.

SUMMARY

Precipitation for May was below normal throughout most of the state for the fifth consecutive month. Thus, recharge to water supplies was drastically limited during the 1987 replenishing period. Streamflow, reservoir storage and ground-water storage is noticeably below normal. Lake Erie level declined slightly and did not set a record high for the third consecutive month. The water supply situation holds a very cautious position at the present time and should cause one to have much apprehension during the coming months.

NOTES AND COMMENTS

LAWRENCE COUNTY DESIGNATED A DISASTER AREA

On May 21, 1987, local heavy thunderstorms caused extensive damages to an area east of Ironton in Lawrence County. Over 50 residences and businesses were damaged and a number of roads were closed due to damaged bridges, culverts and roadbed washouts. With total damages estimated at $800,000, Governor Celeste requested that the Federal Government declare Lawrence County a "DISASTER AREA", thereby qualifying its residents for low-interest loans issued through the Small Business Administration (SBA). SBA will set up a temporary office in Lawrence County where flood victims can apply for such loans. The Flood Plain Management Unit of the ODNR-Division of Water, which coordinates the National Flood Insurance Program in Ohio, indicates that even though flood insurance is available to Lawrence County residents, few victims carried such insurance coverage.

USEPA to Issue Wellhead Protection Program (WHPP) Guidance Document

The 1986 Safe Drinking Water Act Amendments (SDWAA) introduced two new ground-water protection programs; the Wellhead Protection Program (WHPP) and the Sole Source Aquifer Program (SSA).

The WHPP defines a Federal framework for the protection of ground water as it pertains to public drinking water systems. A wellhead protection area is defined in the SDWAA as "the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move to and reach such water well or wellfield."

By law, USEPA will issue guidelines by June 19, 1987 for the implementation of the voluntary WHPP. The program will be funded through a matching federal grant program with the Ohio EPA designated as the lead agency and ODNR—Ground Water Resources Section will develop and implement a plan for the delineation of the wellhead protection areas for all public water supply wells.

Contact USEPA Region V, Office of Ground Water, 230 S. Dearborn Street, Chicago, IL 60604 for information on how to obtain a copy of the Wellhead Protection Guidance Document.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

MAY 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

PRECIPITATION for May was noticeably below normal throughout most of the state; exceptions were in the Central and Central Hills regions where it was above normal for the first time this year. This is the fifth consecutive month for which precipitation has been below normal this year. The average for the state as a whole was 3.34 inches, 0.41 inch below normal. Regional averages range from 4.94 inches, 1.13 inches above normal, for the Central region to 2.27 inches, 1.26 inches below normal, for the Northeast region. Marion, Marion County, reported the greatest amount of precipitation for the month, 8.79 inches; West Manchester, Preble County, reported 7.69 inches and Mt. Gilead, Morrow County, reported 7.27 inches; Ashtabula, Ashtabula County, reported the least amount, 1.10 inches.

There were small amounts of precipitation during every week of the month in most areas of the state. However, the bulk of the month's precipitation fell during the last week of the month when heavy thunderstorms passed through the state on the 21st, 28th, 30th and 31st. It was reported that 4 inches fell during a one hour period on the 28th at Glendale, a suburb of Cincinnati. A heavy storm on the 21st resulted in serious local flooding and caused extensive damage in an area east of Ironton in Lawrence County. The area was declared a "Disaster Area" by the Federal Government at the request of Governor Celeste.

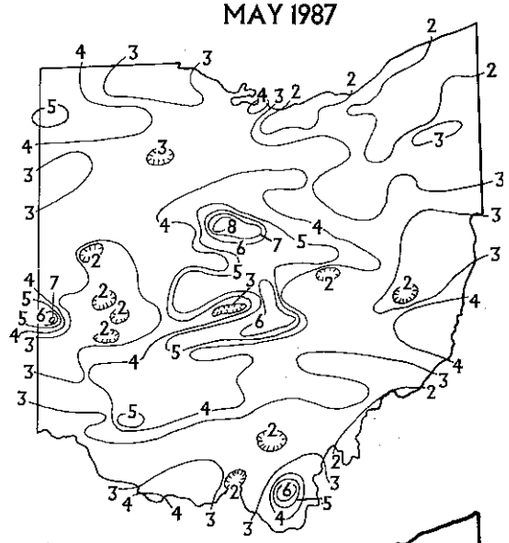
Generally, there was between 3 and 4 inches of precipitation in most areas of the state. Exceptions were in the northeast where from 1 to 3 inches were reported and in the central portion where between 5 and 7.27 inches were reported.

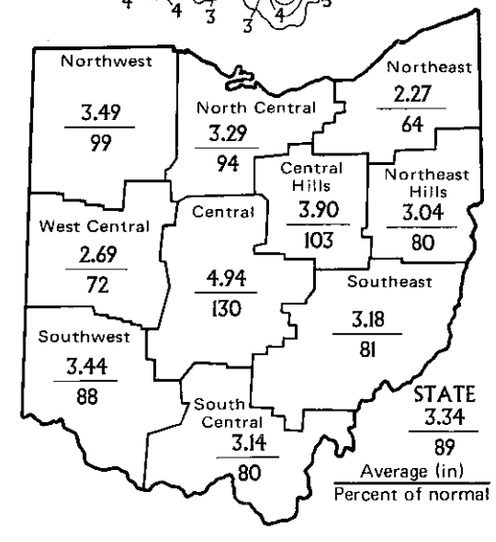
Cumulative precipitation for the first eight months of the 1987 calendar year remains noticeably below normal throughout the state. The average for the state as a whole is 10.89 inches, 4.75 inches below normal. Regional averages range from 12.75 inches, 5.16 inches below normal, for the South Central region to 8.77 inches, 4.97 inches below normal, for the Northwest region. Departures from normal range from 6.42 inches below normal for the West Central region to 3.16 inches below normal for the North Central region. The much below normal precipitation during the first five months of this year is beginning to have a noticeable effect on the state's water supply situation. It would be wise for those in charge of water supplies to monitor their situations closely and plan accordingly.

Cumulative precipitation for the first seven months of this 1987 water year continues to be below normal throughout the state. The average for the state as a whole is 21.46 inches, 1.75 inches below normal. Regional averages range from 24.65 inches, 1.23 inches below normal, for the South Central region to 16.46 inches, 4.31

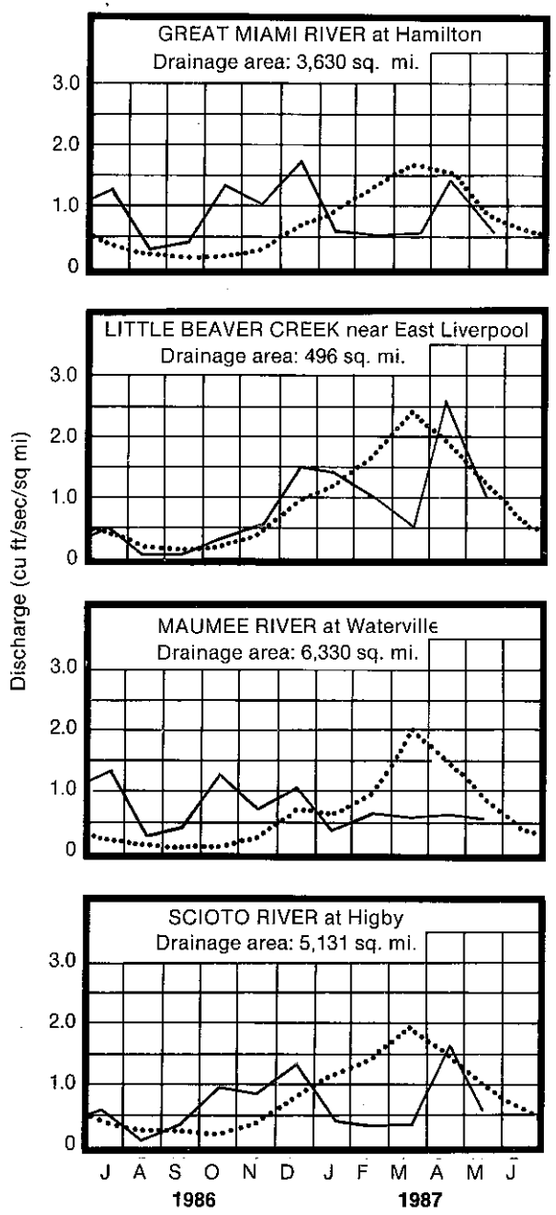
(continued on back)

PRECIPITATION
MAY 1987





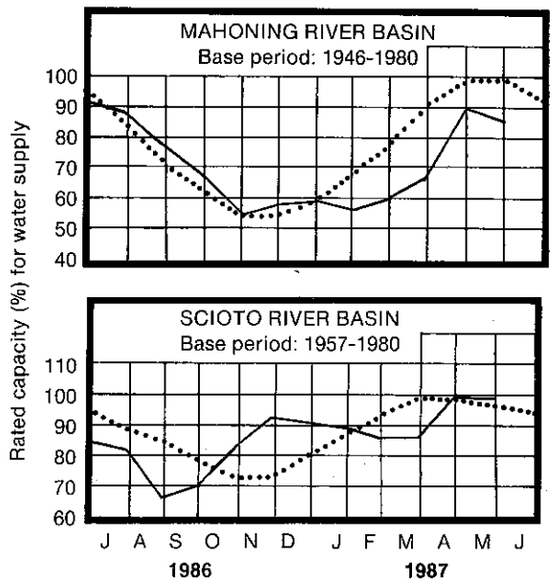
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY

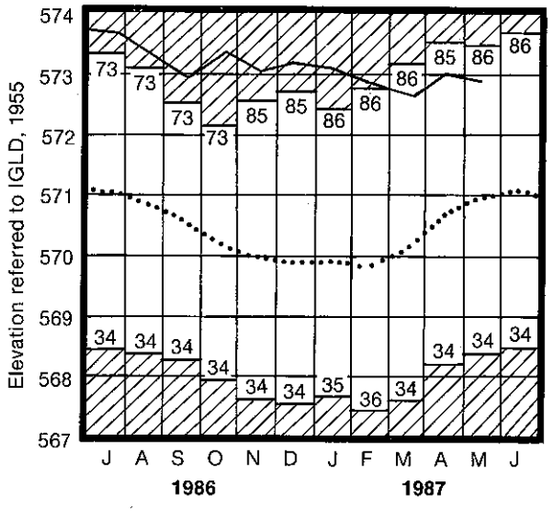


RESERVOIR STORAGE for May declined slightly in the Mahoning River basin and was unchanged in the Scioto River basin. Storage in the Mahoning River basin reservoirs was below normal as has been the case since January; this is due partly to the fact that Milton Reservoir is still drained for repairs. Storage in the Scioto River basin reservoirs is 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 to 89 percent for last month and 90 percent for May 1986. Storage at the month's end for the Scioto basin index reservoirs was 99 percent of rated capacity for water supply compared to the same for last month and 89 percent for May 1986.

STREAMFLOW for May showed noticeable declines in most areas of the state as a result of the much below normal precipitation during the first three weeks. Flows were below normal throughout the state for the month; however, flows increased sharply in the central and southern portion of the state in response to the heavy storms during the last week of the month. Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 2,065 cfs, 67 percent; Little Beaver Creek, 489 cfs, 84 percent; Maumee River, 3,724 cfs, 74 percent and Scioto River, 2,934 cfs, 62 percent. Cumulative runoff and departure from normal is: Great Miami River, 9.44 inches, 0.33 inch below normal; Little Beaver Creek, 9.97 inches, 1.53 inches below normal; Maumee River, 6.54 inches, 2.59 inches below normal, and Scioto River, 7.73 inches, 2.14 inches below normal.

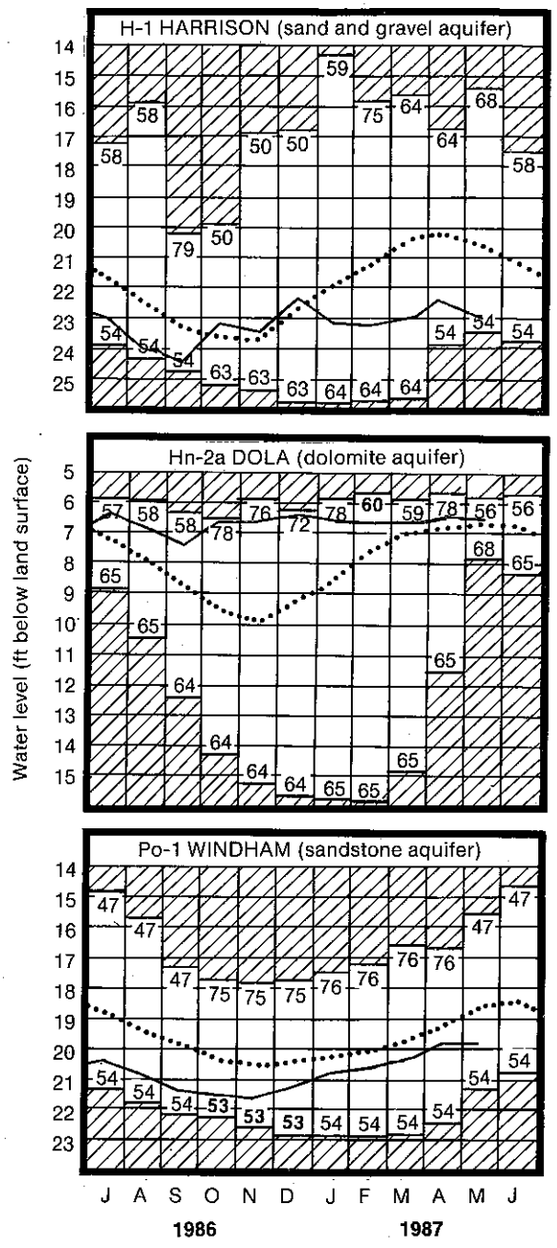
LAKE ERIE LEVELS at Cleveland



LAKE ERIE LEVEL for May at Cleveland declined slightly whereas it usually continues to rise. The mean level for May was 572.87 feet (IGLD-1955), 0.14 foot below last month's mean level, 0.56 foot below the record level observed in May 1986, 1.95 feet above normal and 4.27 feet above Low Water Datum. Note: Lake Erie levels are now reported as the level at Cleveland, Ohio. All means and historical records are based on the long standing record at this location.

GROUND-WATER LEVELS for May generally showed marked declines due to the lack of recharge from the below normal precipitation of the past five months. Wells in the southern portion of the state rose during the last 10 days of the month in response to excess rain from heavy storms in the area. Net declines were generally greater than usual for May; key observation wells representing consolidated aquifers showed net rises in response to delayed recharge. Generally, water levels are noticeably below normal and below those levels observed in May 1986. Some wells in unconsolidated aquifers are near record low levels. These low levels in unconsolidated aquifers pose no immediate threat to water supplies at the present time; however, those depending on ground-water from wells yielding marginal supplies should monitor their wells closely and prepare for alternate supplies.

GROUND-WATER LEVELS



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

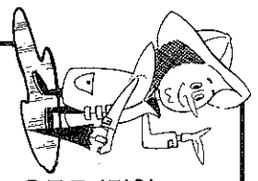
ACKNOWLEDGEMENTS

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
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation for June was generally above normal for the state as a whole for the first time this year. Reservoir storage, streamflow, and ground-water storage retained a favorable position as a result of the above normal precipitation. Lake Erie level declined slightly and was nearly one foot below the record high set in June 1986. The above normal precipitation was most beneficial in maintaining a favorable water supply situation.

NOTES AND COMMENTS

PUBLICATIONS AVAILABLE

Several publications have recently been added to ODNR Division of Water's publication list.

"Ground Water and Consolidated Rock Maps of Cuyahoga County", 2 maps. October 1952. Price $2 plus 11¢ tax and 75¢ handling.

"Alluvial and Glacial Map of Cuyahoga County", 1 map. October 1952. Price $1 plus 6¢ tax and 75¢ handling.

"Ground Water Resources of Dayton, OH", USGS Water Supply Paper 1808, 1966. Price $2 plus 11¢ tax and 75¢ handling.

"Ground Water and Bedrock map of Greene County", 1 map. January 1950. Price $1 plus 6¢ tax and 75¢ handling.

All ODNR publications can be ordered through the ODNR Publications Center, Fountain Square B-1, Columbus, OH 43224. Make checks payable to ODNR Publications Center.

Water Well Log Filing In Ohio Still On The Rise.

Water well log filing in Ohio for the fiscal year ending June 30, 1987 reached 10,664 logs, the highest level since 1978. According to ODNR records a total of 484,222 logs have been filed since the well log filing law was passed in 1945.

Trends in the total number of well logs filed each year show a close correlation with the number of building permits issued in Ohio. Water well log filing in Ohio has shown a steadily increasing trend each year since the 1982 low of 5,510 logs, indicative of a strong and stable economy.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

JUNE 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

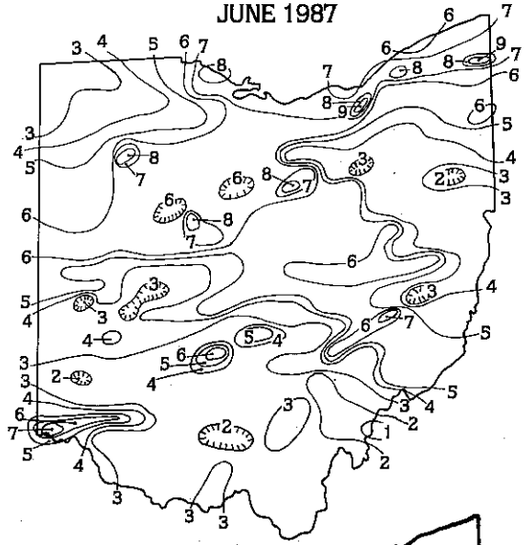
PRECIPITATION for June was above normal for the northern and central portions of the state and below normal for the southern portion. The average for the state as a whole was 4.61 inches, 0.65 inche above normal. This is the first month of the year that precipitation has been above normal for the state as a whole. Regional averages ranged from 6.58 inches, 2.76 inches above normal, for the North Central region to 2.31 inches, 1.57 inches below normal, for the South Central region. Andover, Ashtabula County, reported the greatest amount of precipitation for the month, 9.47 inches; Parma and North Royalton in the Cleveland Metro area also reported 9.31 and 9.23 inches respectively. Belleville Locks and Dam, Meigs County, reported the least amount, 0.76 inch.

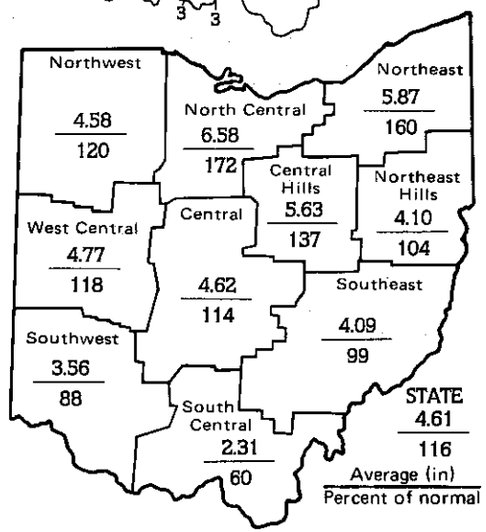
Precipitation for the month was produced by scattered thundershowers throughout the state. Moderate to heavy precipitation fell during every week of the month except for the south central and southeast areas where it was mostly moderate to light rains. Some rather heavy storms occurred during the first three days of the month in the northern portion of the state and during the last days in the southwestern portion. Heavy thunderstorms in the north central portion of the state on the 2nd resulted in considerable flooding in the area. Hardin County was the hardest hit with reports of as much as 6 to 7 inches at some locations. Generally, the northern and central portions of the state received between 4 to 9 inches of precipitation and the southern portion received between 1 to 4 inches. These heavy rains helped to relieve the stress on the overall water supply situation which had developed throughout most of the state.

Cumulative precipitation for the first six months of the 1987 calendar year continues to be noticeably below normal. The average for the state as a whole is 15.50 inches, 4.10 inches below normal. Regional averages range from 17.21 inches, 0.40 inch below normal, for the North Central region to 13.35 inches, 4.22 inches below normal, for the Northwest region. Other regions showing sizeable deficiencies are: South Central, 6.73 inches below normal; Southwest, 6.55 inches below normal and West Central, 5.69 inches below normal.

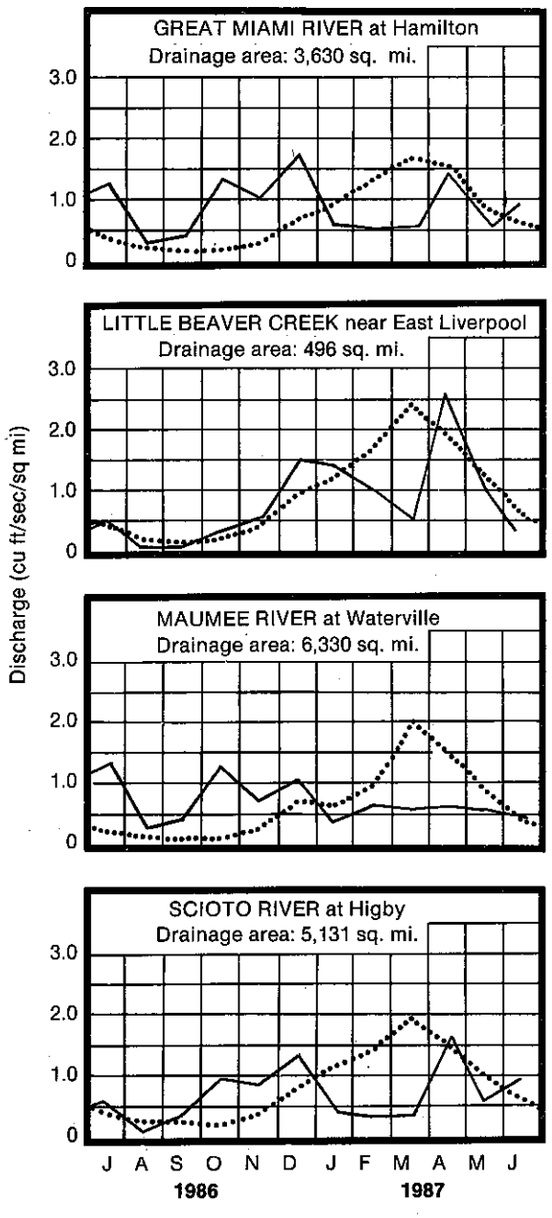
Cumulative precipitation for the 1987 water year remains below normal for most areas of the state; exceptions are in the North Central, Northeast, and Central Hills regions where precipitation is above normal for the first time since January. The average for the state as a whole is 26.07 inches, 1.10 inches below normal. Regional averages range from 27.77 inches, 1.05 inches above normal, for the Central Hills region to 21.04 inches, 3.56 inches below normal, for the Northwest region. Departures from normal range from 2.55 inches above normal for the North Central region to 4.17 inches below normal for the Southwest region.

PRECIPITATION
JUNE 1987





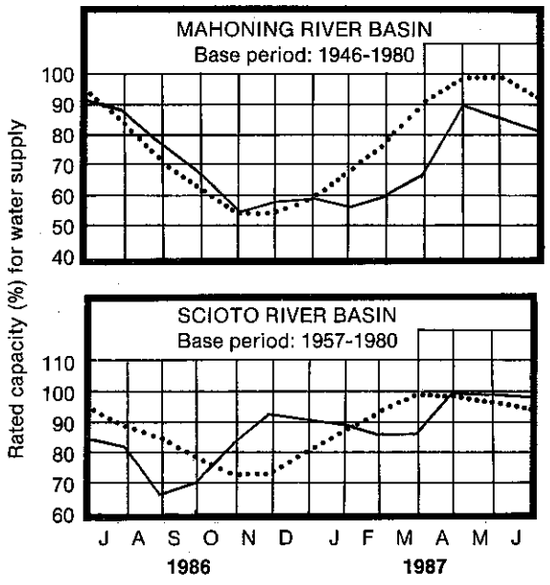
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

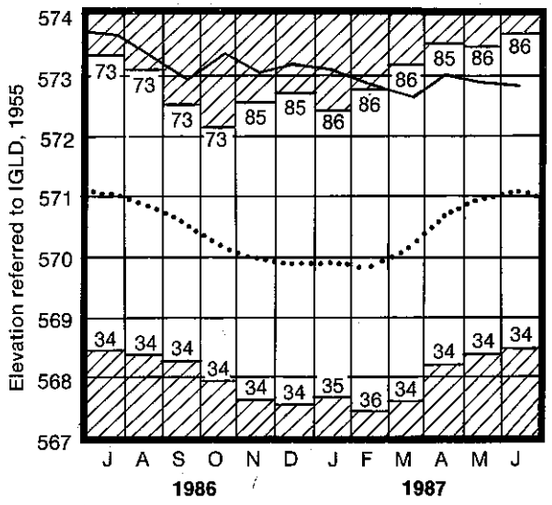
RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for June declined in both the Mahoning River and the Scioto River basins. Storage in the Mahoning River basin continued to be below normal, primarily because Lake Milton is drained for repairs. Storage in the Scioto River basin continues to be slightly above normal. Reservoir storage in general has maintained a good status despite the lack of precipitation during the first few months of this year. Reservoir storage at the month's end for the Mahoning basin index reservoirs was 81 percent of rated capacity for water supply compared to 86 percent for last month and 92 percent for June 1986. Storage at the month's end for the Scioto basin index reservoirs was 98 percent of rated capacity for water supply compared to 99 percent for last month and 84 percent for June 1986.

STREAMFLOW for June was above normal for most of the state; exceptions were in the eastern portion where flows were deficient. A heavy storm on the 2nd, centering on Hardin County, produced severe flooding which caused the loss of one bridge and the temporary closing of many roads. Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 3,341 cfs, 153 percent; Little Beaver Creek, 158 cfs, 53 percent; Maumee River, 3,059 cfs, 139 percent; Scioto River, 4,623 cfs, 153 percent. Streams throughout the state have maintained reasonably good flows despite the fact that runoff has been below normal for every month in this calendar year.

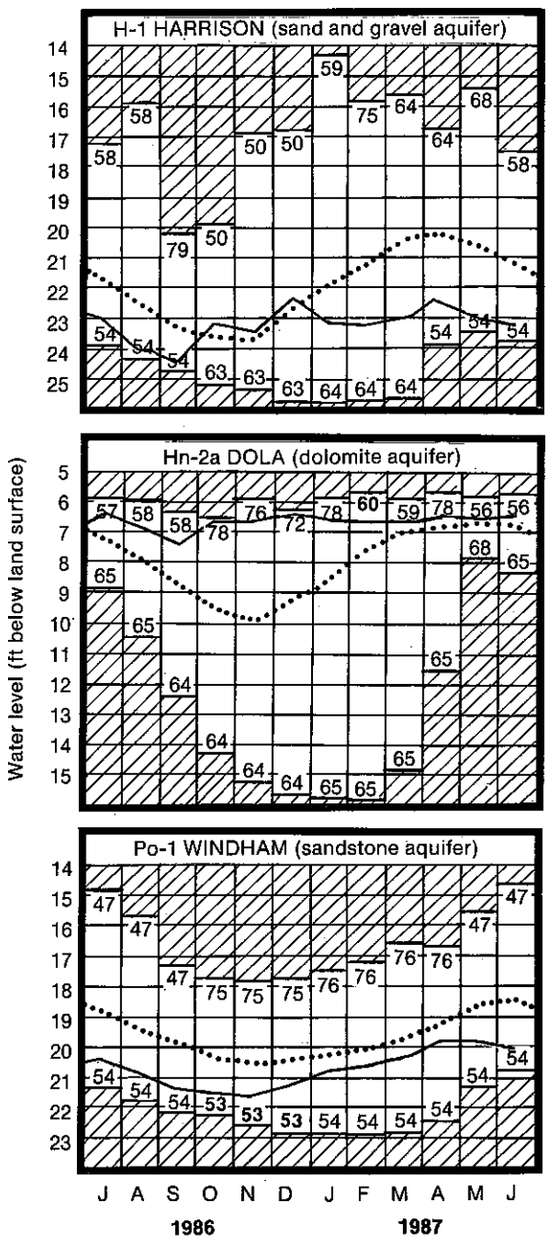
LAKE ERIE LEVELS at Cleveland



LAKE ERIE level for June declined slightly and was nearly one foot below the all time record high set in June 1986. Usually the lake level continues to rise slightly during June. The mean level was 572.78 feet (IGLD 1955), 0.09 foot below last month's mean level, 0.92 foot below the level observed for June 1986, 1.73 feet above normal, and 4.18 feet above Low Water Datum.

GROUND-WATER LEVELS for June showed moderate declines in most areas of the state. Net declines from last month's levels were not nearly as great as usually observed. This indicates that considerable recharge from the above normal precipitation has reached the saturated zone of the aquifers. Generally, water levels were below those levels observed last month in most areas of the state; exceptions were in some consolidated aquifers in the western portion of the state where water levels were slightly higher. Ground-water levels are above those levels observed for June 1986 in consolidated aquifers and below in unconsolidated aquifers. Generally, ground-water levels are noticeably below normal for most areas of the state; exceptions are in consolidated aquifers in the northwestern portion of the state where water levels are slightly above normal. The rains during the last week of May and the first two weeks of June have been most beneficial to water supplies in most areas of the state. At least the water supply situation has not worsened during the first month of the ground-water depletion period. A wet summer would certainly help to alleviate a serious water supply situation for most areas of the state.

GROUND-WATER LEVELS



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

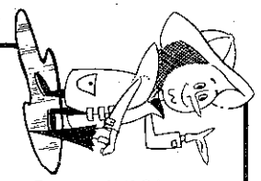
ACKNOWLEDGEMENTS

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.



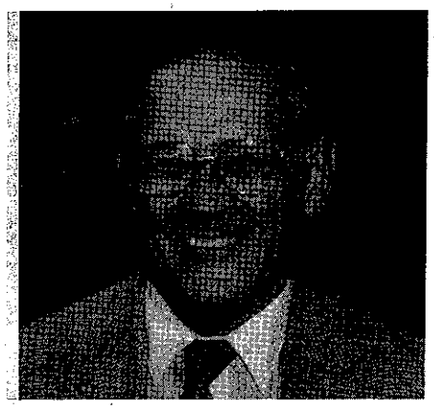
ODNR
OHIO - DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

NOTES AND COMMENTS

FLOOD AREAS RECEIVE MAJOR DISASTER DECLARATION

On July 17, 1987, President Reagan responded to Governor Celeste's request by declaring Crawford, Marion, Morrow, and Richland Counties to be major disaster areas, thereby qualifying its residents for Federal Disaster Aid.

The night of July 1 through the early morning of July 2, up to 6 inches of rain fell on several counties in north central Ohio. This heavy rain, combined with saturated soil from previous week's rain, caused record high flooding in several communities. Clear Fork, a tributary of the Mohican River, recorded a peak stage estimated to be between a 200 and 500 year frequency. This resulted in heavy damage to the small community of Bellville, Richland County. Farther north, the City of Shelby, located along the Black Fork of the Mohican River, experienced its greatest flood since 1913, damaging a large portion of the downtown area. Two other streams which experience flood stages near the 100-year recurrence interval were Whetstone Creek at Mt. Gilead and Sandusky River in Bucyrus. Other communities also hard hit by the rain storms included Galion, Mansfield, Crestline, LaRue, Prospect, Marion and Lexington.



LEONARD HARSTINE HONORED AT ANNUAL ODNR AWARD PROGRAM

Leonard Harstine, a 28 year veteran of ODNR, Division of Water, received the 1987 Daniel Atzenhoefer Distinguished Service Award on August 6, 1987. The awards program was held at the ODNR amphitheater prior to the opening of the Ohio State Fair.

Mr. Harstine received the Distinguished Service award for his unselfish attitude toward his work, helping fellow employees and citizens understand Ohio's valuable water resources. As the supervisor for the Water Inventory Unit, he and his colleagues have developed one of the best historic records and general information sources concerning Ohio's water resources. Almost all water-related projects benefit in some way from the work Mr. Harstine and his staff perform each day.

The Division of Water's staff congratulates Leonard for a job well done and an award well deserved. Ohio looks forward to many more years of exemplary service and wish you and your wife Phyllis the very best.

The Division of Water Staff

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 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

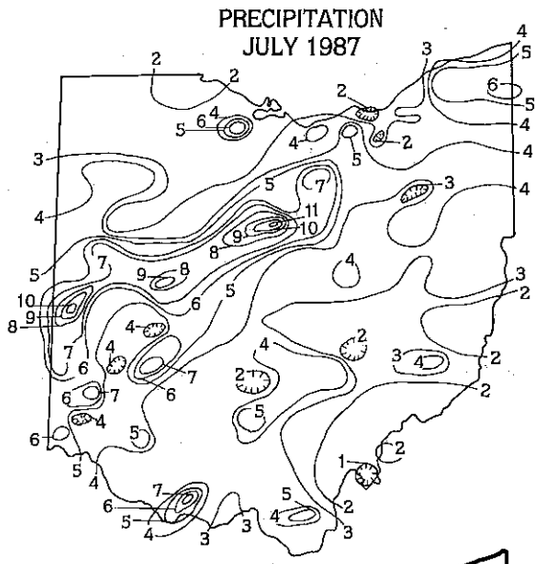
PRECIPITATION for July was above normal for the second consecutive month throughout most of the state: exceptions were the Northwest, Northeast Hills, South Central and Southwest regions where precipitation was below normal. The average for the state as a whole was 4.16 inches, 0.24 inch above normal. Regional averages ranged from 6.23 inches, 2.52 inches above normal, for the West Central region to 2.23 inches, 2.14 inches below normal, for the Southeast region. Galion, Crawford County, reported the greatest amount of precipitation for the month, 11.21 inches of which 5.11 inches fell in the first four days of the month. Racine Locks and Dam, Meigs County, reported the least amount, 0.54 inch.

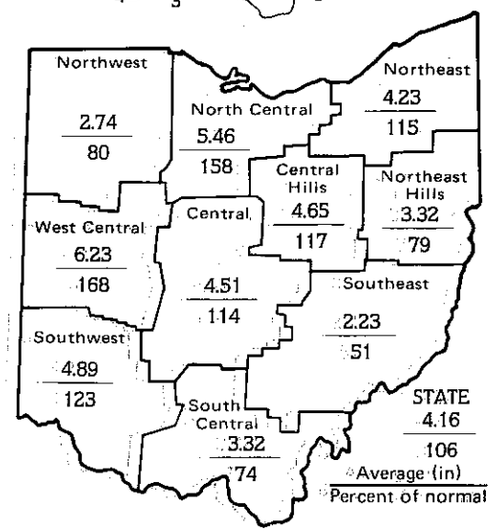
There were substantial amounts of precipitation during every week of the month in most areas of the state; exceptions were in the central and southern portions where very little precipitation was received during the last two weeks. The bulk of the month's precipitation, which was produced by widely scattered heavy thunderstorms, fell during the first two days. The heaviest of these storms occurred in the north central portion of the state on July 1 and 2, causing serious flooding in Crawford, Marion, Morrow and Richland Counties. Excessive precipitation in this area in June contributed to the overall flooding conditions. The extent of this flooding is discussed further under streamflow and on the back page of this report. The above normal precipitation in both June and July has contributed much toward relieving the stress on water supplies which had persisted during the previous months.

Cumulative precipitation for the 1987 calendar year thus far continues to be noticeably below normal for most of the state: the exception is in the North Central region where cumulative precipitation is above normal. The average for the state as a whole is 19.66 inches, 3.86 inches below normal. Regional averages range from 22.67 inches, 1.60 inches above normal, for the North Central region to 16.09 inches, 4.92 inches below normal, for the Northwest region. Regions showing greater deficiencies for the calendar year are: Northeast Hills, 4.98 inches below normal; Southwest, 5.63 inches below normal; South Central, 7.87 inches below normal; and Southeast, 7.14 inches below normal.

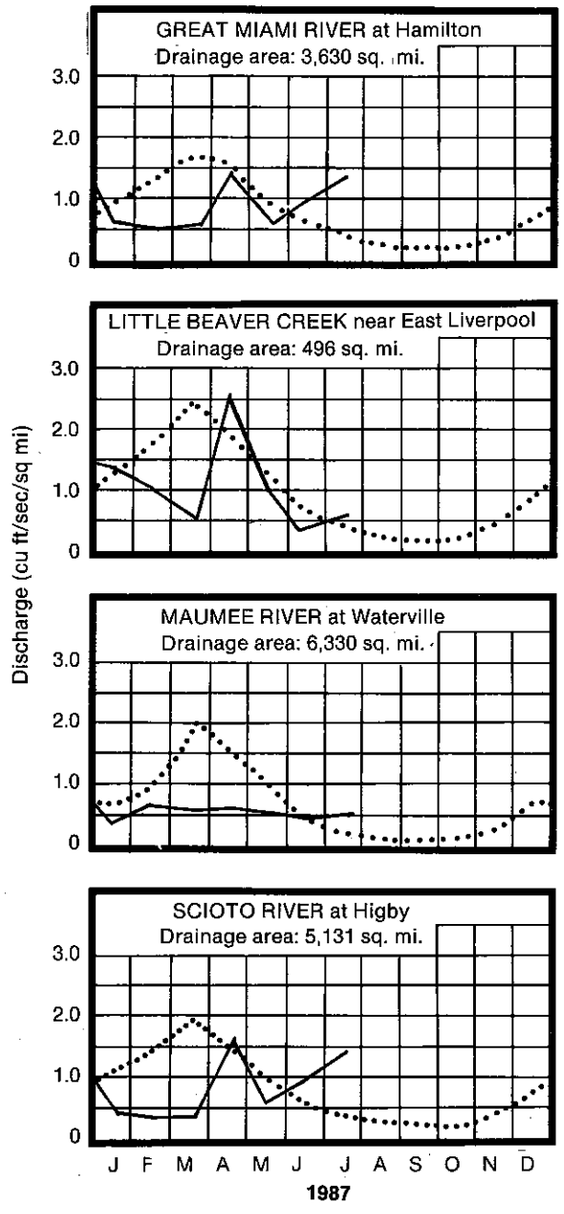
Cumulative precipitation for the 1987 water year is generally above normal for the northern portion of the state and below normal in the southern portion. The average for the state as a whole is 30.22 inches, 0.87 inch below normal. Regional averages range from 32.47 inches, 4.55 inches above normal, for the North Central region to 23.78 inches 4.26 inches below normal, for the Northwest region.

PRECIPITATION
JULY 1987





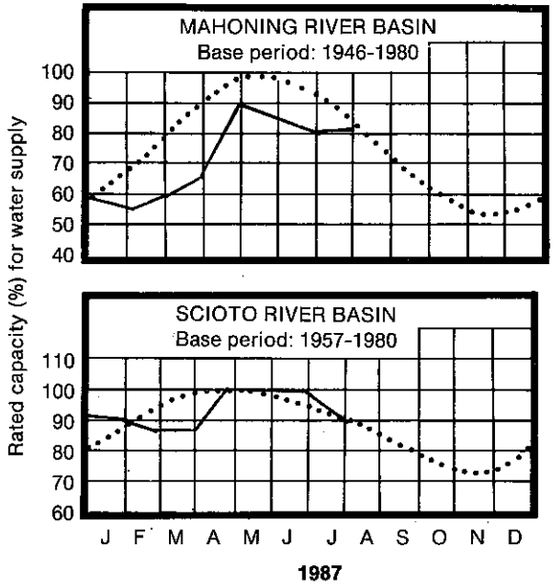
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

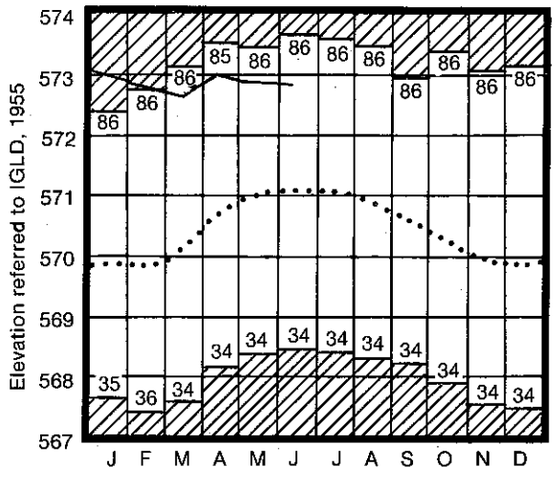
RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for July was stable in the Mahoning River basin and declined slightly in the Scioto River basin. Storage in both basins was near normal for July at the month's end. The above normal precipitation during the past two months has been beneficial in maintaining favorable reservoir storage for water supply for most areas of the state. Reservoir storage at the month's end for the Mahoning basin index reservoirs was 81 percent of rated capacity for water supply compared with the same for last month and 87 percent for July 1986. (Note: Lake Milton is still drained for repairs.) Storage at the month's end for the Scioto basin index reservoirs was 89 percent of rated capacity for water supply compared with 98 percent for last month and 83 percent for July 1986.

STREAMFLOW for July was excessive throughout most of the western and central portions of the state and normal in the eastern portion. Excessive flows were noted during the first 15 days of the month in most areas of the state and in the normal range for the remainder of the month. The excessive flows were the result of the heavy storms on July 1 and 2, following above normal rainfall in June. Serious flooding resulted from this storm in the north central portion of the state including Crawford, Marion, Morrow, and Richland Counties. Generally this flooding was rated as a 2-to-5 year flood frequency. Exceptions which were rated in excess of a 100-year frequency were observed for the Olentangy River at Claridon, 5 miles east of Marion, where a discharge of 13,700 cfs was observed, and for Clear Fork at Butler, Richland County, where a peak record discharge (14,000 cfs) was observed. Greatest flood damages were observed at Bucyrus, Marion, Shelby and Bellville. (See flood disaster story on last page.)

LAKE ERIE LEVELS at Cleveland

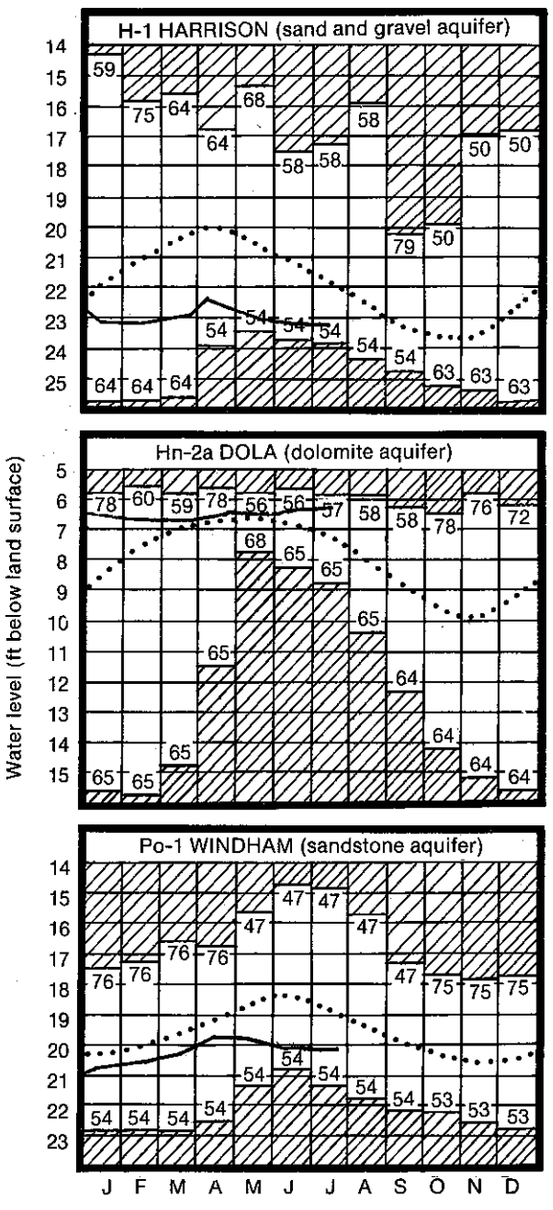


Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 4,995 cfs, 371 percent; Little Beaver Creek, 273 cfs, 129 percent; Maumee River, 3,293 cfs, 245 percent and Scioto River, 7,293 cfs, 433 percent. The mean flow for the Scioto River at Higby was the second highest for July for the period of record beginning in 1930. Flows were generally below normal to deficient at the month's end.

LAKE ERIE level for July rose slightly and remains well above its long-term average. Overall, lake levels this summer have been lower than previously projected because of lower precipitation. However, the threat of flooding and erosion along the shoreline remains. The mean level for July was 572.82 feet (IGLD-1955), 0.04 foot above last month's mean level and 1.82 feet above normal. The lake level is 0.84 foot below the record high set for July in 1986 and 4.22 feet above Low Water Datum.

GROUND-WATER LEVELS for July declined in consolidated aquifers while rising in unconsolidated aquifers. Water levels in unconsolidated aquifers showed notable rises during the early part of the month in response to recharge from excessive rainfall during the last half of June and the first two days of July. Net declines from last month's levels were significant in consolidated aquifers. Water levels in most areas of the state are slightly below those observed for July 1986; exceptions were in observation well F-1 at West Rushville, Fairfield County and PO-1 at Windham, Portage County, which showed levels above those observed for July 1986. Generally, ground-water levels are noticeably below normal throughout the state; however, water levels in unconsolidated aquifers which were at near record low levels during the past two months showed some improvement for July. The above normal precipitation in both June and July has taken some of the stress off the ground-water supply situation which had begun to look rather grim in view of the deficient precipitation and hot, dry weather.

GROUND-WATER LEVELS



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

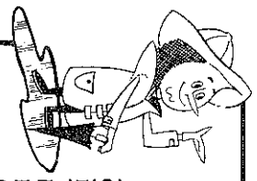
ACKNOWLEDGEMENTS

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
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

NOTES AND COMMENTS

STATE GROUND-WATER GEOLOGIST RESIGNS

The Ohio Department of Natural Resources, Division of Water announced the resignation of John E. Voytek, Jr. as administrator of the Ground-Water Resources Section on September 3, 1987. As administrator, Voytek has directed the management of Ohio's ground-water resources since March 1986. Through his guidance the Division of Water has provided high quality technical advice and information on ground water to Ohio's citizens. Voytek also introduced and implemented the use of the DRASTIC system as developed in 1985 for the U.S. Environmental Protection Agency by the National Water Well Association. DRASTIC evaluates and weighs seven factors to indicate an area's potential for ground-water pollution. Through his direction, Ohio is one of the first states to begin a statewide DRASTIC mapping program. The Division of Water published the first map, "Ground-Water Pollution Potential of Madison County", by Michael Hallfrisch, in March 1987. The Division of Water and the Ground-Water Resources Section has received many valuable benefits from Mr. Voytek's expertise in the field of ground water.

Voytek will join Environmental Resources Management Group (ERM, Inc.) at their new office in Ann Arbor, Michigan. ERM, Inc., with headquarters in West Chester, Pennsylvania, has offices throughout the United States. We congratulate John on his new appointment and wish him well.

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 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

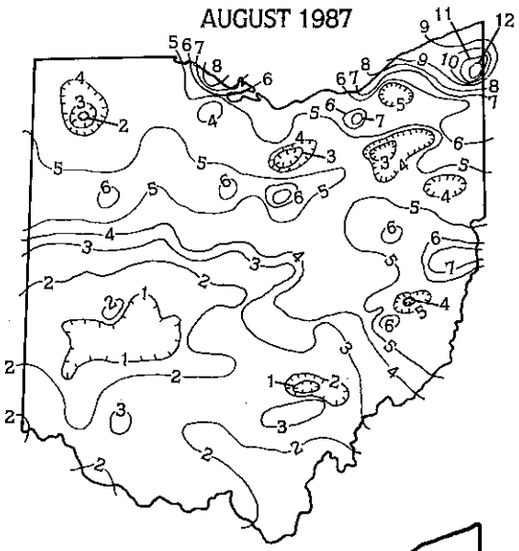
PRECIPITATION for August was above normal for a large portion of the state; exceptions were in the West Central, Central, Southwest and South Central regions where it was below normal. The average for the state as a whole was 3.84 inches, 0.36 inch above normal. Regional averages ranged from 6.00 inches, 2.60 inches above normal, for the Northeast region, to 1.64 inches, 1.83 inches below normal, for the Southwest region. Andover, Ashtabula County, reported the greatest amount of precipitation for the month, 12.00 inches and London, Madison County, reported the least amount, 0.49 inch.

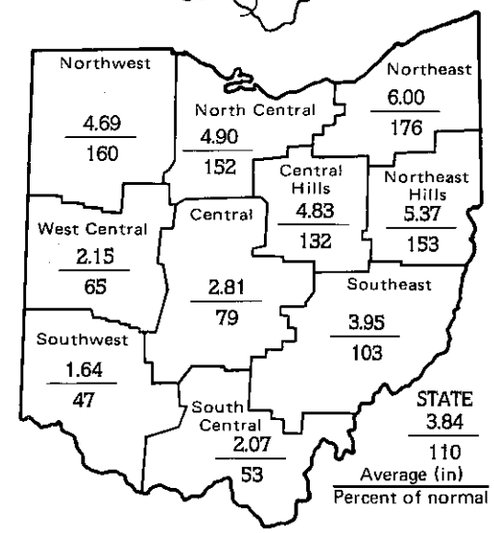
The bulk of the month's precipitation was produced by heavy, isolated thunderstorms, primarily in the northern portion of the state. Storms on August 2-3 and again on the 21-22 produced more than 3.00 inches in northeast Ohio. Generally, there were substantial amounts of precipitation during the first, third and fourth weeks of the month; there were only traces of precipitation in the state during the second week. In general, the northern portion of the state received between 4 and 7 inches of precipitation with a few stations reporting up to 12 inches, while the southern portion of the state received between 0.49 inch to 3.00 inches. Thus, some areas in the southwest and south central areas continue to be very dry. The above normal precipitation in the northern portion of the state helped to improve the water supply situation in that part of the state. However, some areas in the southern portion of the state continue to experience drought conditions.

Cumulative precipitation for the first eight months of the 1987 calendar year continues to be much below normal for most areas of the state; exceptions are in the North Central and Northeast regions where cumulative precipitation is above normal. The average for the state as a whole is 23.46 inches, 3.54 inches below normal. Regional averages range from 27.07 inches, 2.77 inches above normal, for the North Central region to 20.27 inches, 9.87 inches below normal, for the South Central region.

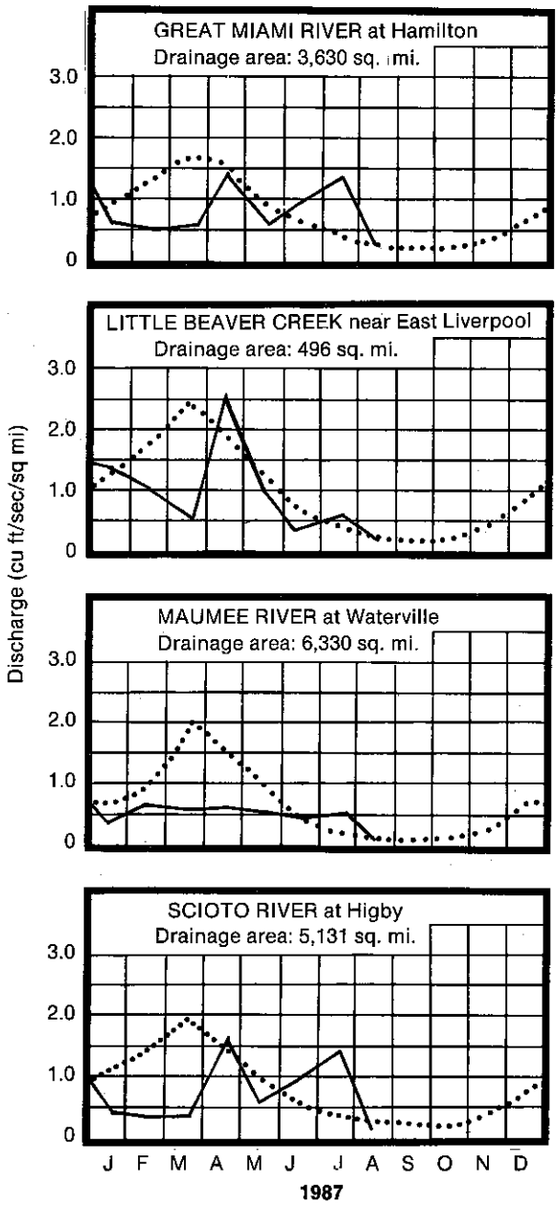
Cumulative precipitation for the 1987 water year thus far is below normal for most of the state; exceptions are in the North Central, Northeast, West Central and Central Hills regions where cumulative precipitation is above normal. The average for the state as a whole is 33.92 inches, 0.65 inch below normal. Regional averages range from 37.36 inches, 3.57 inches above normal, for the Northeast region to 28.31 inches, 2.66 inches below normal, for the Northwest region. Regional departures from normal range from 5.57 inches above normal, for the North Central region to 5.99 inches below normal, for the South Central region.

PRECIPITATION
AUGUST 1987





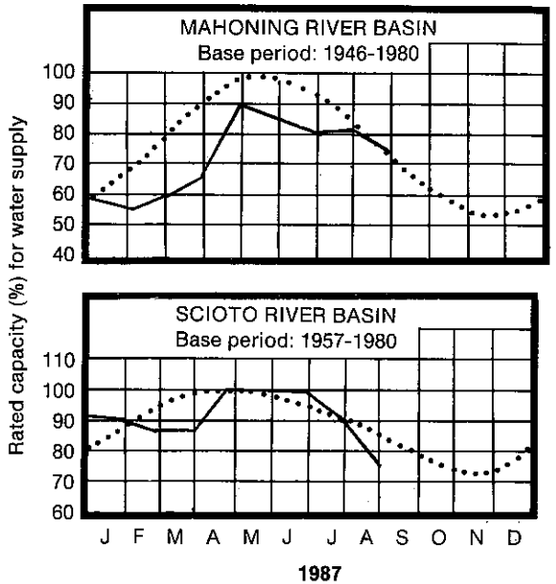
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY



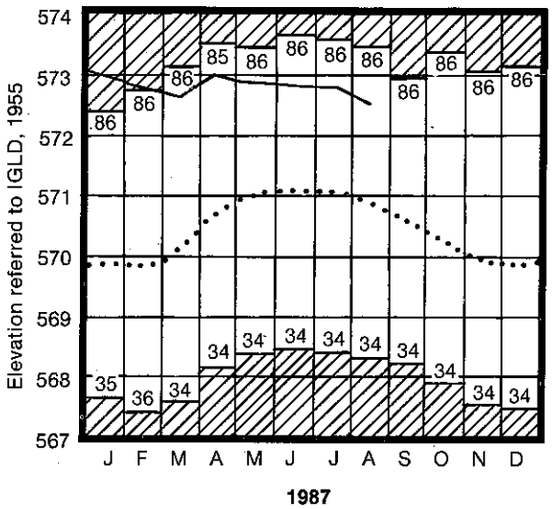
RESERVOIR STORAGE for water supply for August showed marked declines in both the Mahoning River and the Scioto River basins. Storage was slightly above normal for the Mahoning River basin reservoirs despite the fact that Milton Reservoir is still drained for repairs. Storage in the Scioto River basin was below normal as a result of below normal precipitation in the drainage basin and the increased demands on water supply.

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 74 percent of rated capacity for water supply compared with 81 percent for last month and 77 percent for August 1986. Storage at the month's end for the Scioto basin index reservoirs was 76 percent of rated capacity for water supply compared with 89 percent for last month and 67 percent for August 1986.

STREAMFLOW for August was normal for most areas of the state; the exception was the Scioto River where it was noticeably below normal. Flows for the Scioto River and other streams in the southern portion of the state were generally deficient during the month as a result of the continued low precipitation throughout the area. The U.S. Geological Survey reported that flow for the Shade River at Chester, Meigs County, measured 0.4 cfs, a recurrence interval of a 30-40 year drought.

Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 861 cfs, 113 percent; Little Beaver Creek, 106 cfs, 96 percent; Maumee River, 661 cfs, 108 percent; Scioto River, 796 cfs, 65 percent.

LAKE ERIE LEVELS at Cleveland



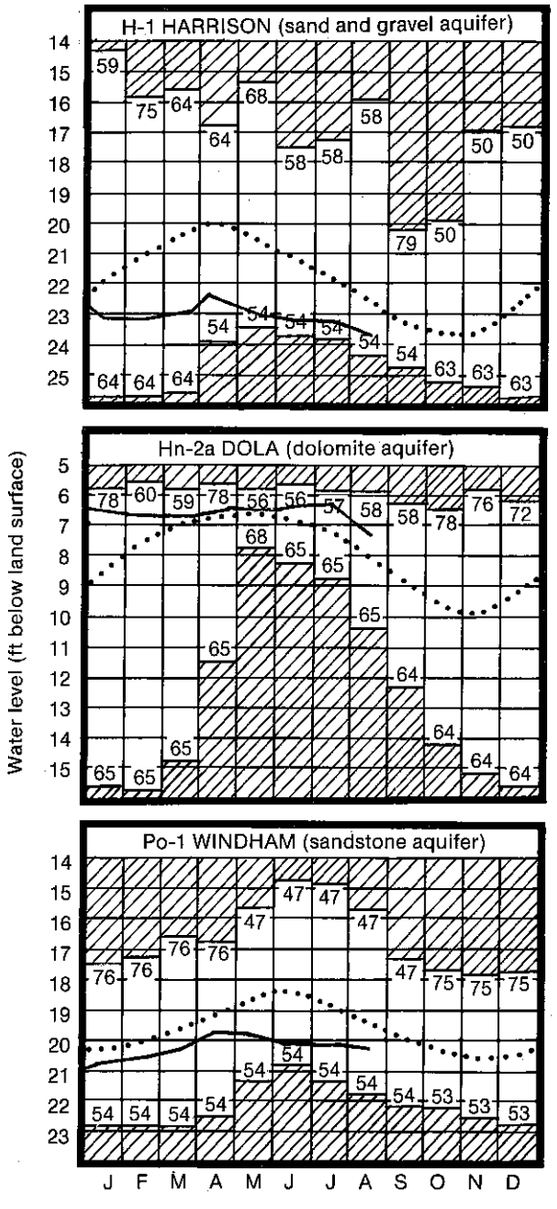
LAKE ERIE level showed a noticeable decline for August but still remains well above the long-term average. The mean level was 572.51 feet (IGLD-1955), 0.31 foot below last month's mean level and 1.70 feet above normal. The lake level is 0.86 foot below the level observed for August 1986 and 3.91 feet above Low Water Datum.

GROUND-WATER levels for August showed noticeable declines throughout the state in response to lack of recharge. Net declines from last month's levels were generally twice that usually observed. There was no distinction between declines in consolidated and unconsolidated aquifers. Ground water levels were noticeably below those levels observed last month throughout the state and generally below those levels observed for August 1986. Water levels throughout the state are much below normal for August; the only exception is observation well Hn-2a at Dola in northwest Ohio where it continues to be above normal in response to above normal precipitation for the past several years. Observation well F-1 at West Rushville, Fairfield County, was a near record low for August. In most cases, ground-water levels are at the level usually observed in October and November. Although ground-water levels are low, the stress on the water supply situation has been lessened by proper planning by water managers in most areas. There are some areas in the southern portion of the state that are experiencing water shortages and have ordered restrictions on sprinkling and washing of cars.

SUMMARY

Precipitation for August was above normal in the northwest, northeast and the southeastern portions of the state and below normal in the southwestern portion. Streamflow and reservoir storage were generally normal for the month while ground-water storage was below normal. Lake Erie level showed a marked decline but remained well above the long-term average.

GROUND-WATER LEVELS



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

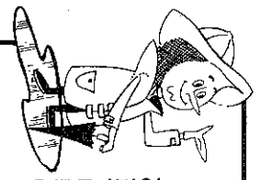
ACKNOWLEDGEMENTS

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
DIVISION OF WATER
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

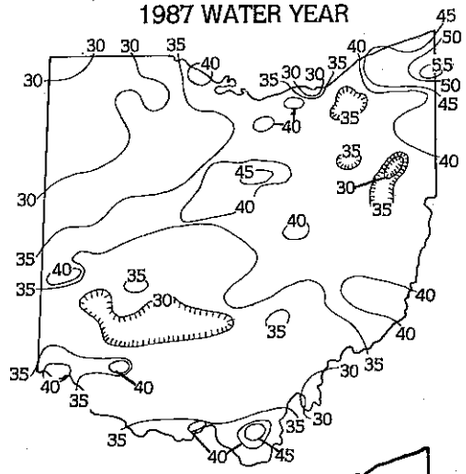
continued from front

The 1987 water year was off to an excellent start with precipitation above normal for the first three months of the recharge period. After that, it was downhill for most areas of the state in so far as recharge to water supplies was concerned. Precipitation was below normal in six of the last nine months of the water year. In general, climatic conditions were a little more favorable for both agriculture and water supplies in the northern portion of the state than in the southern portion. Drought conditions which had persisted in the previous two years worsened in the southern portion of the state. Some areas experienced critical water supply problems by the end of the water year. However, on the whole the water supply situation remained stable due to good management by those in charge of water supplies.

SUMMARY

Precipitation for September was below normal throughout the state. Streamflow was normal; reservoir storage was normal in the northern half of the state and below normal in the southern half; and ground-water storage was noticeably below normal. Lake Erie level declined and was about 1.5 feet below the all-time record set in June 1986.

PRECIPITATION
1987 WATER YEAR



Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

SEPTEMBER 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

PRECIPITATION for September was below normal throughout most of the state; the only exception was for the Northeast region where precipitation was slightly above normal. The average for the state as a whole was 1.90 inches, 1.10 inches below normal. Regional averages ranged from 3.44 inches, 0.26 inch above normal, for the Northeast region to 0.82 inch, 2.11 inches below normal, for the West Central region. Colebrook, Ashtabula County, reported the greatest amount of precipitation for the month, 6.48 inches and Sidney, Shelby County, reported the least amount, 0.21 inch.

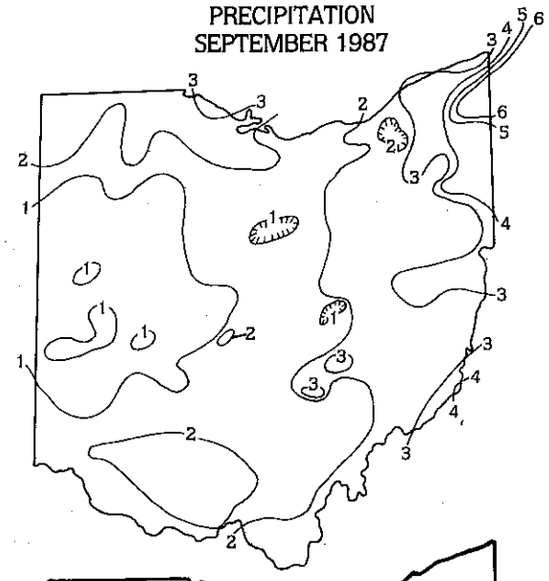
Precipitation fell in most areas of the state during every week of the month although in most cases it was rather sparse. Much of the month's rainfall fell in light showers and amounts were usually less than 0.50 inch. Amounts of 1.0 inch or more were a rare occurrence this month. Generally, most areas of the state received between one and two inches of precipitation for the month. On the whole, it was a dry month. Agriculture and water supplies were definitely affected by the drought conditions, especially in the southern portion of the state.

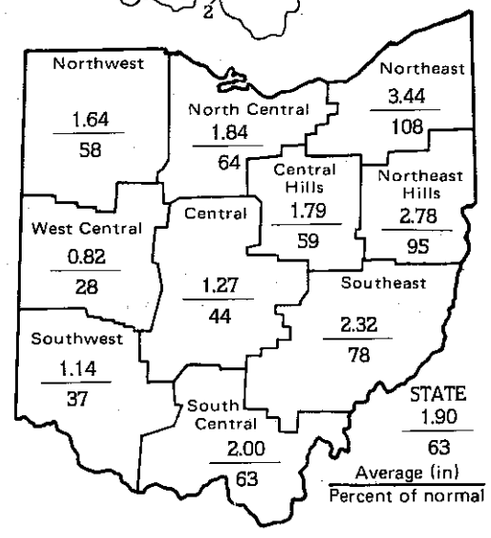
Cumulative precipitation for the 1987 calendar year thus far is noticeably below normal for most of the state; exceptions are in the north central and northeastern portions of the state where it is above normal. The average for the state as a whole is 25.31 inches, 4.70 inches below normal. Regional averages ranged from 30.46 inches, 1.73 inches above normal, for the Northeast region to 22.05 inches, 4.74 inches below normal, for the Northwest region. The West Central, Central, Southwest, South Central and Southeast regions show deficiencies ranging from 6.18 inches below normal, for the Central region to 10.88 inches below normal, for the South Central region. Although 1987 is not the driest year, it can be safely rated among the 10 driest years in this century.

Precipitation for the 1987 water year (October 1, 1986-September 30, 1987) was generally below normal for most of the state; exceptions were in the North Central, Northeast and Central Hills regions where precipitation for the water year was noticeably above normal. The average for the state as a whole was 35.77 inches, 1.80 inches below normal. Regional averages ranged from 40.80 inches, 3.83 inches above normal, for the Northeast region to 29.71 inches, 4.11 inches below normal, for the Northwest region. Departures from normal ranged from 4.37 inches above normal, for the North Central region to 7.00 inches below normal, for the South Central region. Andover, Ashtabula County reported the greatest amount of precipitation for the water year, 58.28 inches and Grover Hill, Paulding County, reported the least amount, 27.63 inches. An isohyetal map and regional averages and departures from normal appear on the back page of this report.

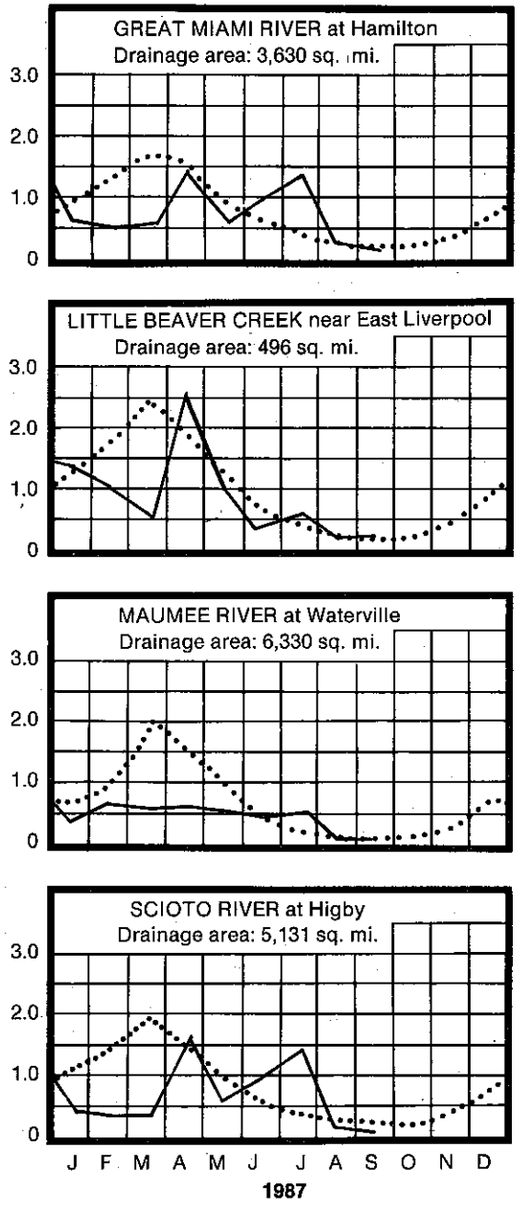
continued on back

PRECIPITATION
SEPTEMBER 1987





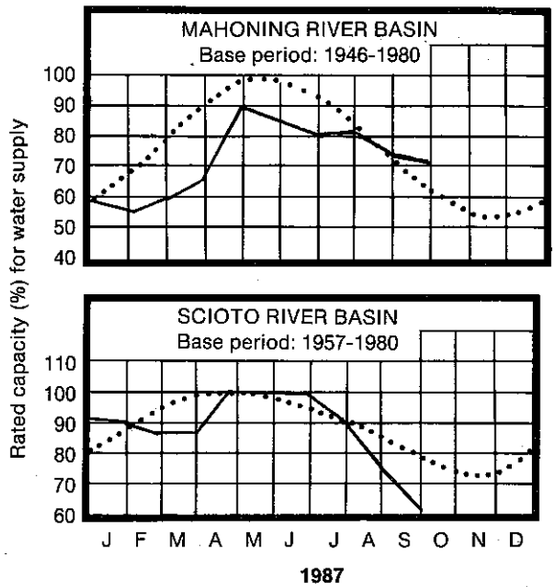
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY

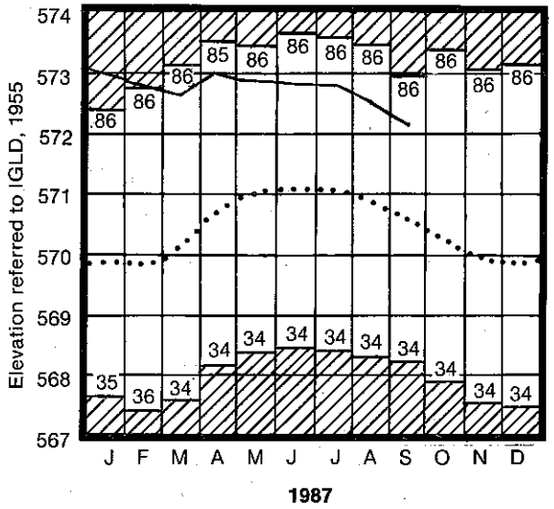


RESERVOIR STORAGE for water supply for September declined slightly in the Mahoning River basin and showed marked declines in the Scioto River basin in response to the lack of precipitation in the drainage areas. Storage continued to be above normal for the second consecutive month in the Mahoning basin while it was noticeably below normal for the Scioto River basin reservoirs. Reservoir storage at the month's end for the Mahoning basin index reservoirs was 69 percent of rated capacity for water supply compared with 74 percent for last month and 68 percent for September 1986. Storage at the month's end for the Scioto basin index reservoirs was 63 percent of rated capacity for water supply compared with 76 percent for last month and 70 percent for September 1986. Reservoir storage was generally below normal in the Mahoning River basin for the water year because Lake Milton was drained for repairs. Storage for the Scioto River basin was about normal for most of the water year except for the last two months when it was noticeably below normal.

STREAMFLOW for September was normal throughout the state for the second consecutive month despite the below normal precipitation. However, flows in some areas of the southern portion of the state continued to be deficient. Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 605 cfs, 91 percent; Little Beaver Creek, 93.5 cfs, 119 percent; Maumee River, 638 cfs, 164 percent; Scioto River, 559 cfs, 53 percent.

Streamflow throughout the state was about normal for the water year. Flows were above normal for the first three months and fell noticeably below normal the last three months of the recharge period. Although flows were noticeably above normal for April, they

LAKE ERIE LEVELS at Cleveland

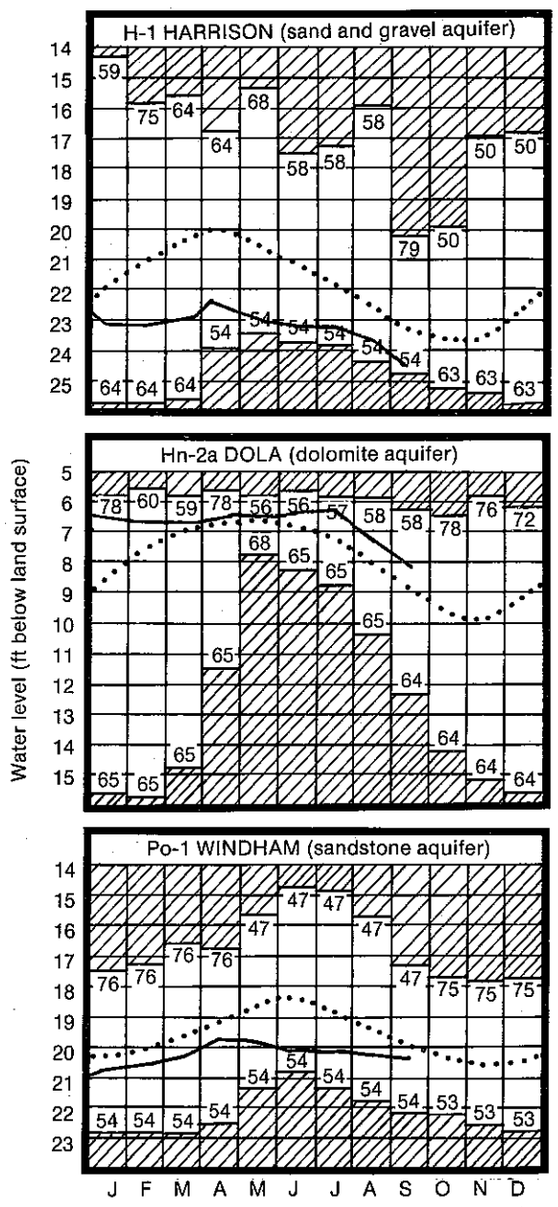


declined and remained about normal for the remainder of the water year. Mean discharge and percent of normal for the index gaging stations were: Great Miami River, 3,355 cfs, 103 percent; Little Beaver Creek, 417 cfs, 75 percent; Maumee River, 3,728 cfs, 73 percent; Scioto River, 4,056 cfs, 88 percent.

LAKE ERIE level at Cleveland declined for September, but continued to be noticeably above normal. The lake level is 0.74 foot below the record high for September and 1.48 feet below the all-time record high set in June 1986. Lake Erie mean level for September was 572.22 feet (IGLD-1955), 0.29 foot below last month's mean level, 0.77 foot below the level observed for September 1986, 1.70 feet above normal and 3.62 feet above Low Water Datum.

GROUND-WATER LEVELS for September showed gradual declines throughout the state in response to the lack of recharge due to the deficient precipitation. Net declines from last month's levels were the same as usually observed. Water levels were generally about 0.5 foot below those levels observed last month and about 0.5 to 1.0 foot below those levels observed in September 1986. Exceptions were in the northeast where water levels are generally above those levels observed a year ago. Ground-water levels continue to be noticeably below normal for most of the state; exceptions are in consolidated aquifers in the north central and northwestern portions of the state where levels remain slightly above normal. Water levels in index observation wells F-1 at West Rushville, Fairfield County, and H-1 near Harrison, Hamilton County, both reached record low levels for September in the southern part of the state for the past three years. For southern Ohio, it can be said that we are experiencing a ground-water drought. Although the drought does not equal that of the 30's or 60's thus far, its effects are being noticed in many areas. The state has provided assistance for some critical situations.

GROUND-WATER LEVELS



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

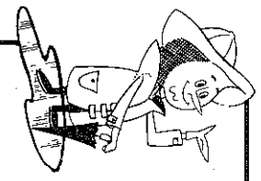
ACKNOWLEDGEMENTS

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
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation for October was noticeably below normal for most of the state. Streamflow was normal throughout the state despite the below normal precipitation. Reservoir storage and ground-water storage was near normal in the northern portion of the state while it was markedly below normal in the southern portion where record-low water levels are being observed. Lake Erie level continues to decline and is 2.0 feet below the all-time record high set in June 1986. Many areas in the southern portion of the state are experiencing severe water shortages as a result of the drought conditions which have persisted throughout the area during the past three years.

NOTES AND COMMENTS

NEW STATE GROUND-WATER GEOLOGIST

The Ohio Department of Natural Resources, Division of Water, announces the appointment of Rebecca Petty as administrator of the Ground-Water Resources Section (GWRS). As the new administrator, Petty will direct the development of Ohio's ground-water resources through her staff of hydrologists and hydrogeologists. Through her guidance, the Division of Water will continue to provide high quality technical information and advice on ground water in Ohio, and will strive to develop further ground-water programs for the state.

Petty is a member of the Association of Ground Water Scientists and Engineers, an affiliate of the National Water Well Association. She received her B.S. and M.S. degrees in Geological Sciences from Ohio University. Prior to joining ODNR, Petty was Research Hydrogeologist for the National Water Well Association. She has authored numerous technical publications, taught many seminars and courses on the technical aspects of ground water and associated subjects. Most recently she was the co-author of a publication, "DRASTIC: A Standard System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings", Environmental Protection Agency Publication Number EPA/600/2-87/035.

ODNR 1988 CALENDAR AVAILABLE

The Ohio Department of Natural Resources has printed a distinctive wall calendar that should be of interest to all conservation minded citizens. The calendar features scenes from Ohio's natural areas and scenic rivers. The 1988 issue marks the first time in several years the department has featured full color photos in its calendars.

Ten nature preserves and two scenic rivers are the subjects in this calendar. Many of these photos were provided from the personal slide library of Phil Zito, manager of Lake Katharine Nature Preserve, as well as from other Division of Natural Areas and Preserves staff including Dick Moseley, division chief, Stu Lewis and Steve Goodwin. It also features a listing and location for state forests, nature preserves open to the public, state parks, public boating areas and public hunting and fishing areas and district or area offices for all ODNR Divisions.

Single copies of the calendar can be obtained for $3.39, including tax, shipping and handling from the ODNR Publications Center, Building B-1, Fountain Square, Columbus, Ohio 43224. Proceeds from the sale of the calendar will benefit the Natural Areas Tax Checkoff Program.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

OCTOBER 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

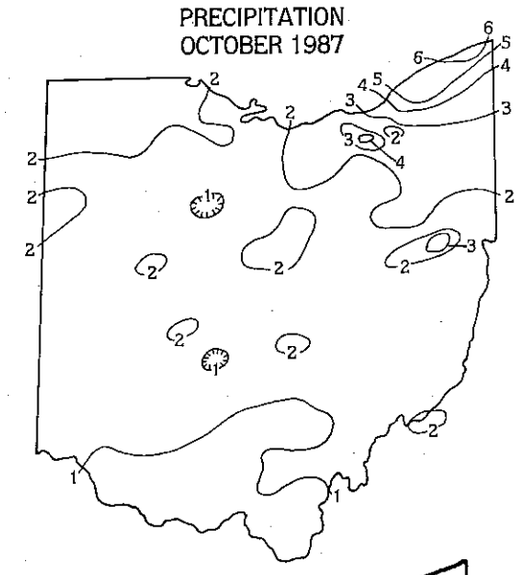
Compiled by Leonard J. Harstine and David H. Cashell

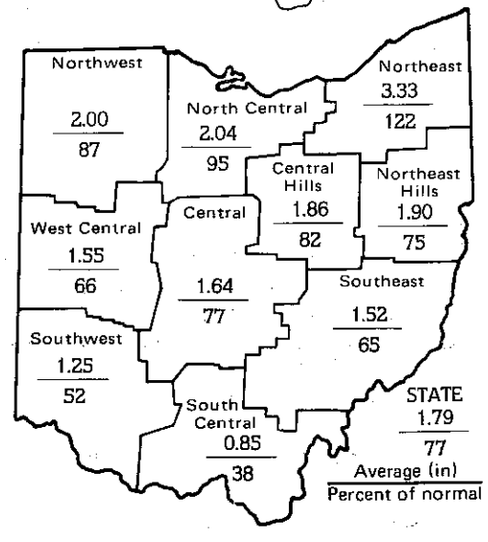
PRECIPITATION for October was below normal throughout the state; an exception was the Northeast region where it was slightly above normal. The average for the state as a whole was 1.79 inches, 0.55 inch below normal. This is the third consecutive month for which precipitation has been below normal for the state as a whole. Regional averages ranged from 3.33 inches, 0.61 inch above normal, for the Northeast region to 0.85 inch, 1.39 inches below normal, for the South Central region. Ashtabula, Ashtabula County, reported the greatest amount of precipitation for the month, 6.39 inches, and Anthony Meldahl Locks and Dam, Clermont County, reported the least amount, 0.37 inch.

There were small amounts of precipitation during every week of the month. The precipitation generally fell in the form of light showers. Nearly half of the state received less than 1.5 inches of precipitation for the month. Only a few isolated areas received more than 2.0 inches except for the snowbelt east of Cleveland where precipitation ranged from 3.0 to 6.39 inches. For the most part it was a dry month. The lack of precipitation was most noticeable in both reservoir storage and ground-water storage for water supplies. Farmers received the most benefit from the continued dry weather which allowed for early harvest and low moisture content for grains.

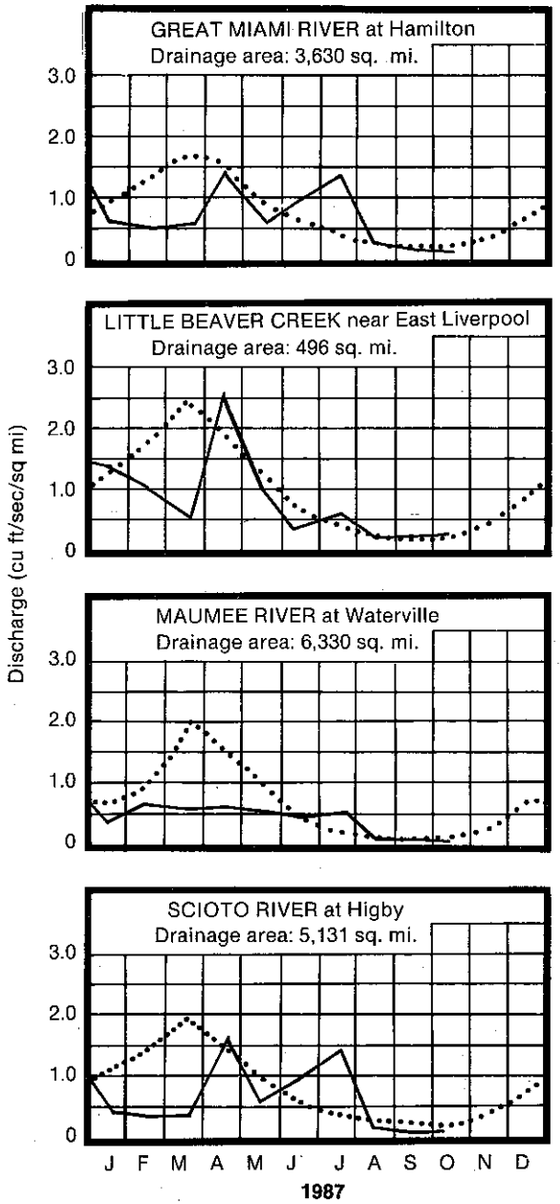
Cumulative precipitation for the 1987 calendar year thus far is noticeably below normal throughout most of the state; exceptions are in the North Central and Northeast regions where it is slightly above normal. The average for the state as a whole is 27.10 inches, 5.24 inches below normal. Regional averages range from 33.79 inches, 2.34 inches above normal, for the Northeast region to 23.29 inches, 12.27 inches below normal, for the South Central region. The southern portion of the state is experiencing severe drought conditions that are affecting the water supply situation. In many cases supplemental water supplies have had to be provided. However, the precipitation deficiencies have not reached the severity of the 1953-54 or the 1963-64 droughts. The outlook for the last two months of this year does not augur well for much encouragement toward improving the water supply situation.

The new 1988 water year begins October 1, 1987 and ends September 30, 1988. The water year is a common reference period for both surface and ground-water supplies and October is generally considered the beginning of the new recharge season for water supplies. The new water year is off to a slow start since precipitation was below normal in both September and October.





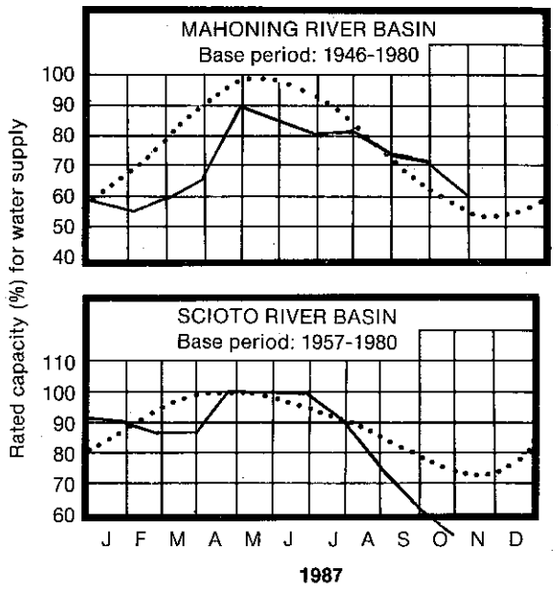
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

RESERVOIR STORAGE FOR WATER SUPPLY

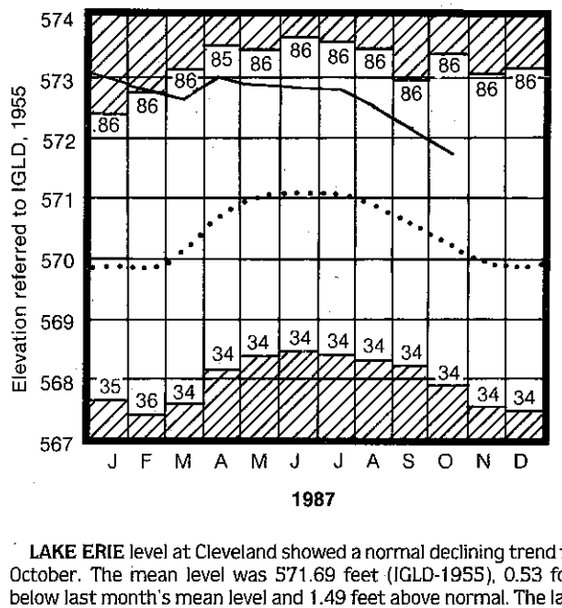


RESERVOIR STORAGE for water supply during October showed normal declines in the Mahoning River basin and sharp declines in the Scioto River basin. Storage was above normal in the Mahoning River basin for the third consecutive month while it was noticeably below normal in the Scioto River basin. Although reservoir storage for water supply is noticeably below normal in the Scioto River basin it poses no threat to the water supply situation at this time.

Reservoir storage at the month's end for the Mahoning basin index reservoirs was 61 percent of rated capacity for water supply compared with 69 percent for last month and 55 percent for October 1986. Storage at the month's end for the Scioto basin index reservoirs was 54 percent of rated capacity for water supply compared with 63 percent for last month and 83 percent for October 1986. For comparison, reservoir storage for the Scioto basin was 47 percent of rated capacity for water supply in October 1982.

STREAMFLOW for October was normal throughout the state. Streams have continued to show good sustained flows in most areas despite the deficient precipitation during the past two months. Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 580 cfs, 86 percent; Little Beaver Creek, 124 cfs, 114 percent; Maumee River, 451 cfs, 81 percent; Scioto River, 781 cfs, 103 percent.

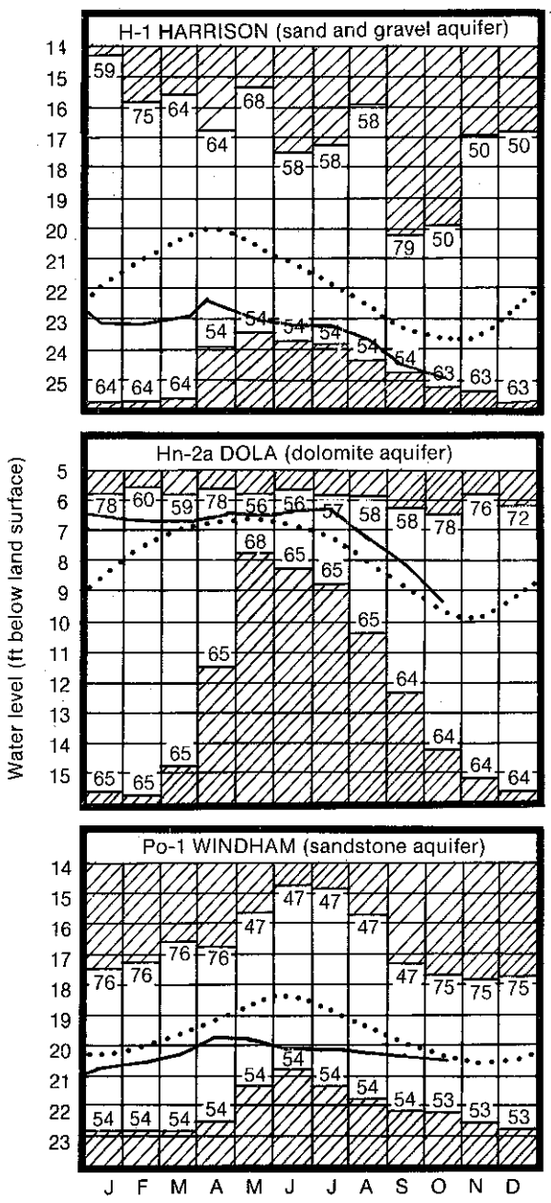
LAKE ERIE LEVELS at Cleveland



LAKE ERIE level at Cleveland showed a normal declining trend for October. The mean level was 571.69 feet (IGLD-1955), 0.53 foot below last month's mean level and 1.49 feet above normal. The lake level is 1.62 feet below the level observed for October 1986 and 3.09 feet above Low Water Datum. The lake level is now 2.01 feet below the all-time record high level set in June 1986.

GROUND-WATER LEVELS for October showed steady declines in most areas of the state due to lack of recharge. Net declines from last month's levels were about normal for October. Ground-water levels in unconsolidated aquifers throughout the state are markedly below those levels observed for October 1986 and noticeably below normal. Water levels in consolidated aquifers are generally about the same as observed last year in the northern half of the state and near normal while levels in the southern half are markedly below those levels observed last year and much below normal. In fact, both index observation wells F-1 at West Rushville, Fairfield County, and Fa-1 near Washington C.H., Fayette County, representing a sandstone and a limestone aquifer respectively, recorded new record low levels for October. In general, the ground-water supply situation has not been critical in most areas of the state. However, some serious problems have been observed in the southern portion of the state where the drought conditions have persisted for the past three years. In some cases where the situation has become critical, water from state-owned reservoirs has been used to supplement water supplies. Also, many domestic supplies have been supplemented by hauling water from municipal water supplies.

GROUND-WATER LEVELS



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

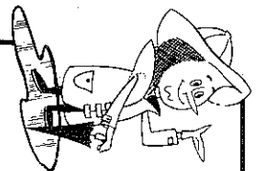
ACKNOWLEDGEMENTS

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.



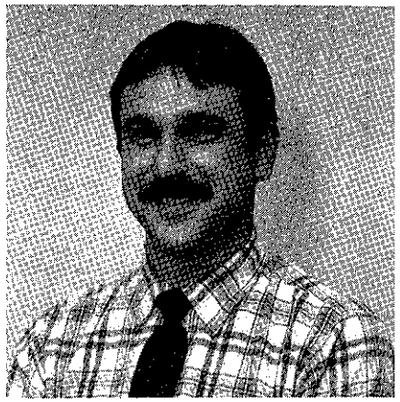
ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

SUMMARY

Precipitation was noticeably below normal throughout the state for the third consecutive month. Reservoir storage, streamflow, and ground-water storage continue to be much below normal for most areas of the state. Lake Erie level declined for the fourth consecutive month and is now only 1.49 feet above normal.

NOTES AND COMMENTS

NEW SUPERVISOR FOR WATER INVENTORY UNIT



The Ohio Department of Natural Resources, Division of Water, announces the appointment of David H. Cashell as hydrologist and supervisor of the Water Inventory Unit of the Ground-Water Resources Section. Cashell replaces Leonard J. Harstine who has served in this position for more than 25 years and will now concentrate on special projects. Cashell has served as an environmental scientist in the Water Inventory Unit for the past nine years. As supervisor of the Water Inventory Unit, he will direct the ground-water level monitoring program which includes over 120 observation wells throughout the state, author the Monthly Water Inventory Report for Ohio, conduct special investigations involving ground-water levels in Ohio and disseminate climatological data information. He will provide technical advice on the water supply situation in Ohio as related to climatological conditions and strive to develop further the Water Inventory Unit's programs for the state.

Cashell is a member of the Association of Ground Water Scientists and Engineers, an affiliate of the National Water Well Association, and the American Water Works Association. He received his BS degree in Natural Resources Development from The Ohio State University where he did graduate work in Natural Resources Development. Prior to joining the Ohio Department of Natural Resources, Division of Water in 1979, he was an engineering assistant for N.A.S.A.—Lewis Research Center in Cleveland, Ohio. Cashell has been very active in ground-water research projects since joining the Water Inventory Unit. He has been co-author of the Monthly Water Inventory Report for Ohio for the past several years.

Dave resides in Hilliard, Ohio with his wife Barbara and two children. His hobbies include growing cacti and other succulent and rare house plants, gardening and outdoor sports activities.

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

DIVISION OF WATER

NOVEMBER 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

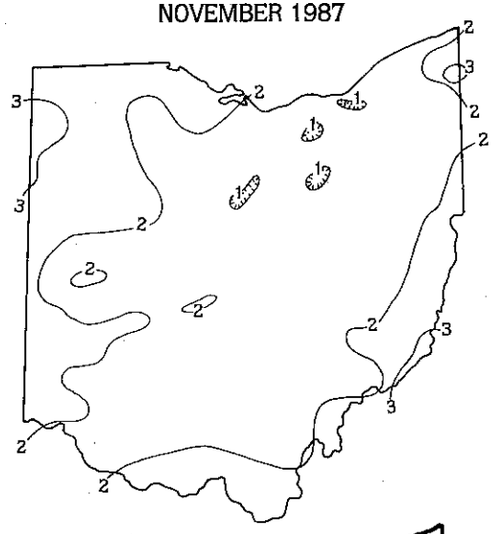
PRECIPITATION for November was below normal throughout the state; an exception was the Northeast region where precipitation was normal. This is the third consecutive month for which precipitation has been below normal for the state. The average for the state as a whole was 1.77 inches, 0.88 inch below normal. Regional averages ranged from 2.43 inches, which is normal for the Northwest region to 1.29 inches, 1.32 inches below normal, for the Central Hills region. Andover, Ashtabula County, reported the greatest amount of precipitation for the month, 3.76 inches and Lagrange, Lorain County, reported the least amount, 0.80 inch.

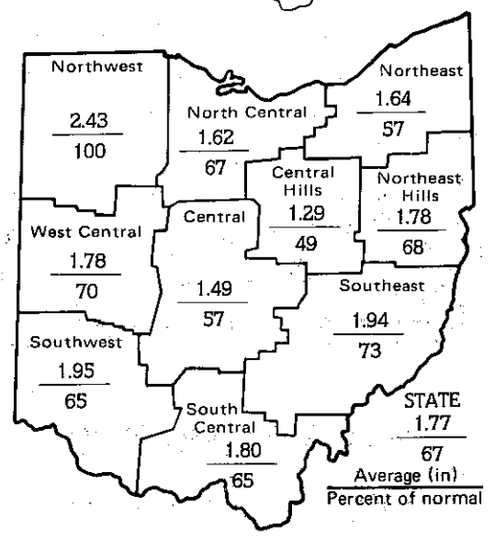
November's precipitation was very scarce during the first three weeks of the month. Generally, there was no precipitation during the first week and only small amounts of less than 1.0 inch during the second and third weeks. The bulk of the month's precipitation fell during the last week in the form of light rain and snow. About three-fourths of the state received less than 2.0 inches of precipitation for the month, while about one-fourth of the state along the western border and the Ohio River Valley received between 2.0 and 3.5 inches. Snowfall for the month was also light; Chardon, Geauga County, which normally receives 12.5 inches for November, reported only 1.5 inches for the month. It is hard to estimate the effects of the below normal precipitation on the water supply situation at this time. One can only say that water supplies are being stressed considerably throughout the state as a result of the below normal precipitation during the past three months.

Cumulative precipitation for the 1987 calendar year thus far is below normal for most of the state; exceptions are in the North Central and Northwest regions where it is slightly above normal. The average for the state as a whole is 28.87 inches, 6.12 inches below normal. Regional averages range from 35.43 inches, 1.10 inches above normal, for the Northeast region to 25.09 inches, 13.24 inches below normal, for the South Central region.

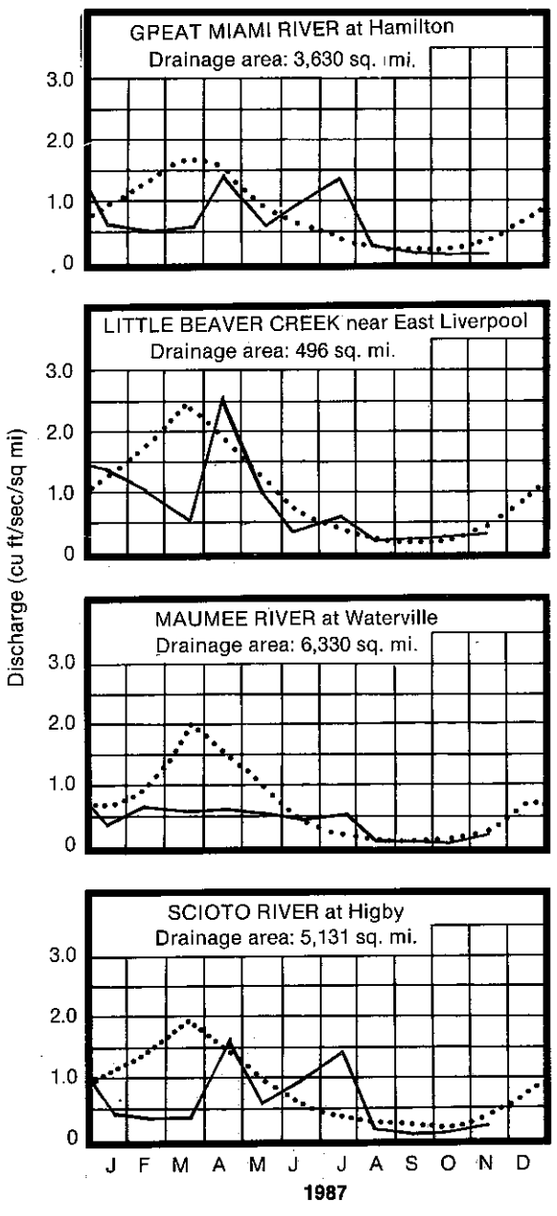
Cumulative precipitation for the first two months of the 1988 water year is below normal throughout the state. The average for the state as a whole is 3.57 inches, 1.42 inches below normal. Regional averages range from 4.97 inches, 0.63 inch below normal, for the Northeast region to 2.65 inches, 2.36 inches below normal, for the South Central region. Thus, the 1988 water year is off to a very poor start in so far as precipitation is concerned.

PRECIPITATION
NOVEMBER 1987





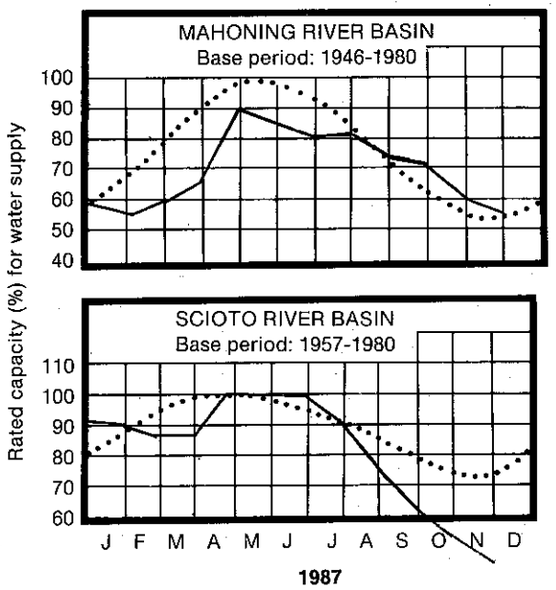
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current _____

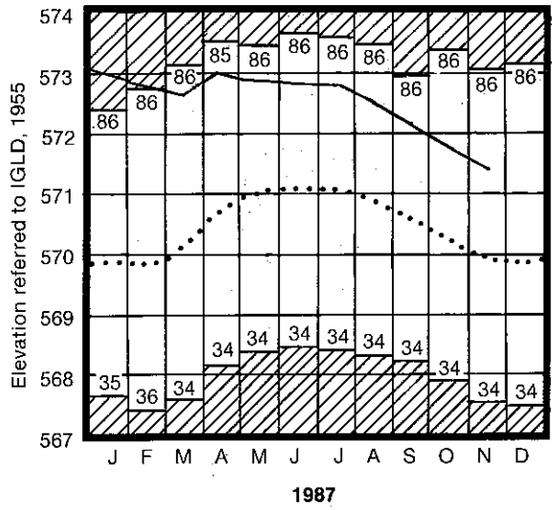
RESERVOIR STORAGE FOR WATER SUPPLY



RESERVOIR STORAGE for water supply for November declined in both the Mahoning River basin and Scioto River basin, whereas storage usually remains stable. Storage was normal in the Mahoning River basin and noticeably below normal in the Scioto River basin. Reservoir storage throughout the state is noticeably low due to the lack of runoff from the below normal precipitation during the past three months. Reservoir storage at the month's end for the Mahoning basin index reservoirs was 55 percent of rated capacity for water supply compared with 61 percent for last month and 58 percent for November 1987. Storage at the month's end for the Scioto basin index reservoirs was 46 percent of rated capacity for water supply compared with 54 percent for last month and 93 percent for November 1987. The last time reservoir storage was noticeably low in the Scioto basin reservoirs was November 1982 when it reached 52 percent of rated capacity for water supply.

STREAMFLOW for November was below normal throughout the state as a result of the below normal precipitation, the only exception was in the northeast where it was normal. Mean discharge and percent of normal at the index gauging stations were: Great Miami River, 702 cfs, 64 percent; Little Beaver Creek, 162 cfs, 80 percent; Maumee River, 1,275 cfs, 79 percent; Scioto River, 875 cfs, 54 percent. Runoff for most areas of the state during the first two months of the 1988 water year was only about 60 percent of normal;

LAKE ERIE LEVELS at Cleveland

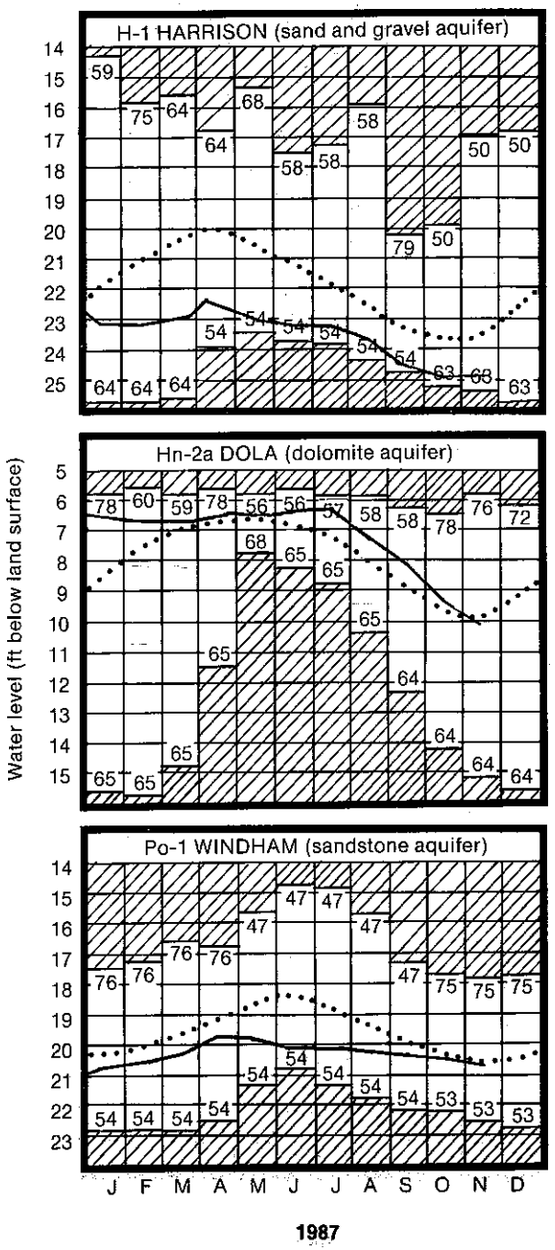


an exception is in the Little Beaver Creek basin in the northeast where runoff was 90 percent of normal.

LAKE ERIE level for November declined for the fourth consecutive month. The mean level for November was 571.41 feet (IGLD-1955), 0.28 foot below last month's mean level and 1.60 feet below the level observed for November 1986. The lake level is 2.30 feet below the all-time record high set in June 1986, 1.49 feet above normal and 2.81 feet above Low Water Datum.

GROUND-WATER LEVELS for November showed slight declines in most areas of the state; in some cases the declines were nearly twice that usually observed. Net declines ranged from 0.25 to 0.75 foot below the levels observed last month; exceptions were observaiton wells Fr-10 at OSU Farms in Columbus and H-1 near Harrison, Hamilton County which showed net rises for the month. Generally, water levels are noticeably below those levels observed for November 1986. Water levels are markedly below normal in most areas of the state; exceptions are in consolidated aquifers in the northern portion of the state where water levels are only slightly below normal. Observation well F-1 at West Rushville, representing a consolidated aquifer, recorded an all-time record low for the period of record beginning in 1947. Ground-water levels in the southern portion of the state continue to be near record lows in many area in both consolidated and unconsolidated aquifers. Although ground-water storage has been under considerable stress throughout the southern portion of the state, no new water supply problems have been reported.

GROUND-WATER LEVELS



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

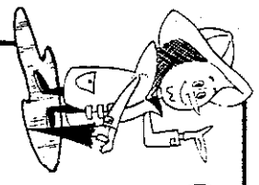
ACKNOWLEDGEMENTS

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.



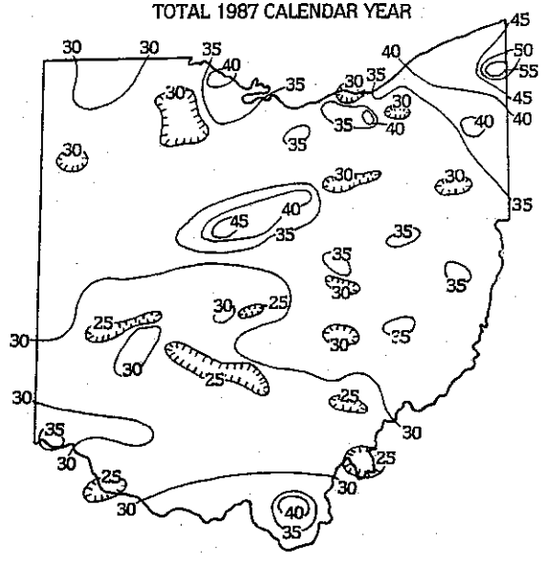
ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
FOUNTAIN SQUARE
COLUMBUS, OHIO 43224

continued from front

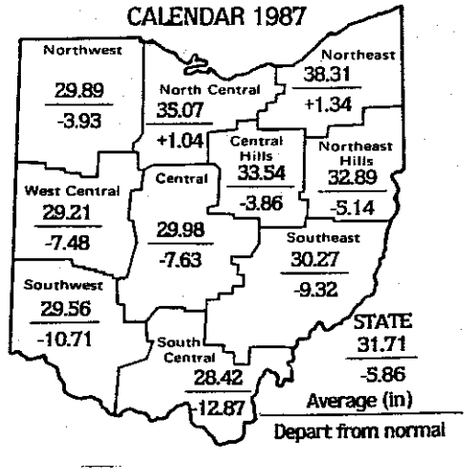
and August were the wettest months which corresponds with the growing season. Thus, it was a good year for agriculture. The effects of the dry weather was felt most by water supply wells and reservoirs. The first four dry months occurred during the 1987 recharge season and the last four months is the beginning of the 1988 water supply recharge season. The deficient precipitation had its greatest effect on water supplies in the southern portion of the state. Many wells went dry and some water supply reservoirs reached critically low levels. Supplemental supplies were provided for several communities in the southern half of the state.

Cumulative precipitation for the first three months of the 1988 water year was below normal for most of the state; the exception was the Northwest region which was above normal. The average for the state as a whole is 6.45 inches, 1.12 inches below normal. Regional averages ranged from 7.91 inches, 0.88 inch above normal, for the Northwest region to 5.40 inches, 1.94 inches below normal, for the Central Hills region.

PRECIPITATION
TOTAL 1987 CALENDAR YEAR



PRECIPITATION
CALENDAR 1987



ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

Richard F. Celeste
Governor

Joseph J. Sommer
Director

Naturally OHIO the heart of it all!

DECEMBER 1987

MONTHLY WATER INVENTORY REPORT FOR OHIO

Compiled by Leonard J. Harstine and David H. Cashell

PRECIPITATION for December was above normal for most of the state, except in the Central Hills and Northeast Hills regions where it was slightly below normal. This is the first time in four months that precipitation has been above normal for the state as a whole. The average for the state as a whole was 2.89 inches, 0.31 inch above normal. Regional averages ranged from 3.44 inches, 1.13 inches above normal, for the Northwest region to 2.29 inches, 0.18 inch below normal, for the Central Hills region. Andover, Ashtabula County, reported the greatest amount of precipitation for the month, 4.58 inches and Senecaville Lake, Guernsey County, reported the least amount, 1.25 inches.

Moderate amounts of precipitation fell in the form of rain or snow during every week of the month. About half of the state, primarily the central area and the northeast received between 2.25 to 3 inches while the remainder received from 3 to 4 inches. A few stations in the southwest, south central and northeast reported more than 4 inches. Snowfall for December was about normal for most areas of the state. Chardon, Geauga County, received 23.4 inches of snow which is normal for that station. The normal precipitation benefited both agriculture and water supplies.

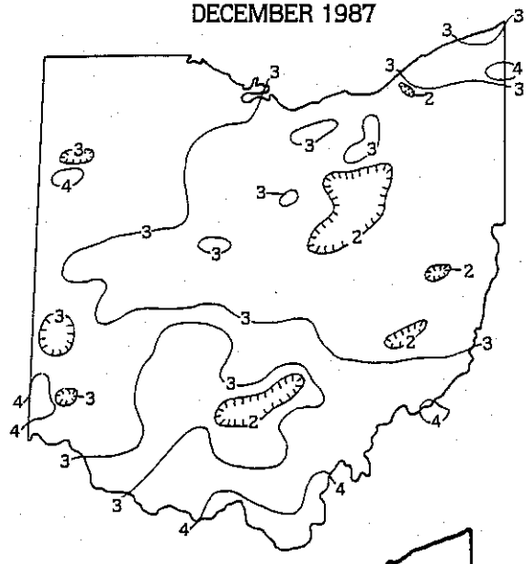
Precipitation for the 1987 calendar year was noticeably below normal for most of the state; exceptions were the North Central and Northeast regions where precipitation was 1.04 and 1.34 inches above normal respectively. The average for the state as a whole was 31.71 inches, 5.86 inches below normal. Regional averages ranged from 4.29 inches, 12.87 inches below normal, for the South Central region to 33.82 inches, 3.93 inches below normal, for the Northwest region. Andover, Ashtabula County, reported the greatest amount of precipitation for the year, 58.31 inches, and Laurelville, Hocking County, reported the least amount, 22.28 inches.

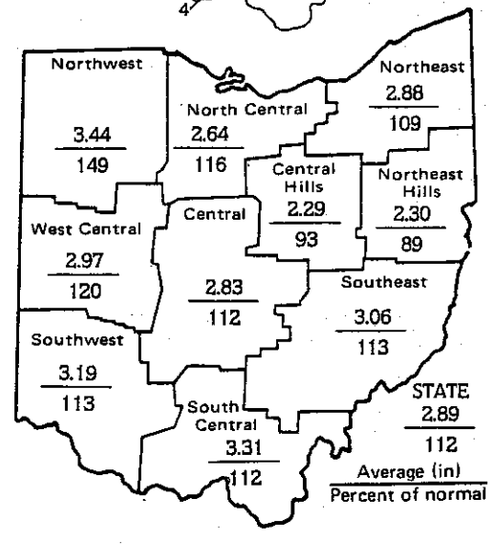
The 1987 calendar year was the seventh driest thus far in this century for the state as a whole. The 1930 calendar year was the driest with 25.02 inches, other driest years in sequence were: 1963, 1934, 1960, 1953 and 1941. However, the southern portion of the state was considerably drier than the northern portion. Regional averages for the three most southerly regions were Southwest, 29.56 inches; South Central, 28.42 inches; and Southeast, 30.27 inches. This was the second driest year for the South Central region; the driest was 1930 with 24.31 inches. An isohyetal map and departures from normal appear on the last page of this report.

Precipitation was below normal in eight of 12 months this year for the state as a whole. It was below normal in 10 months for the Southwest and South Central regions. The driest months were the first four months and the last four months of the year. May, June, July

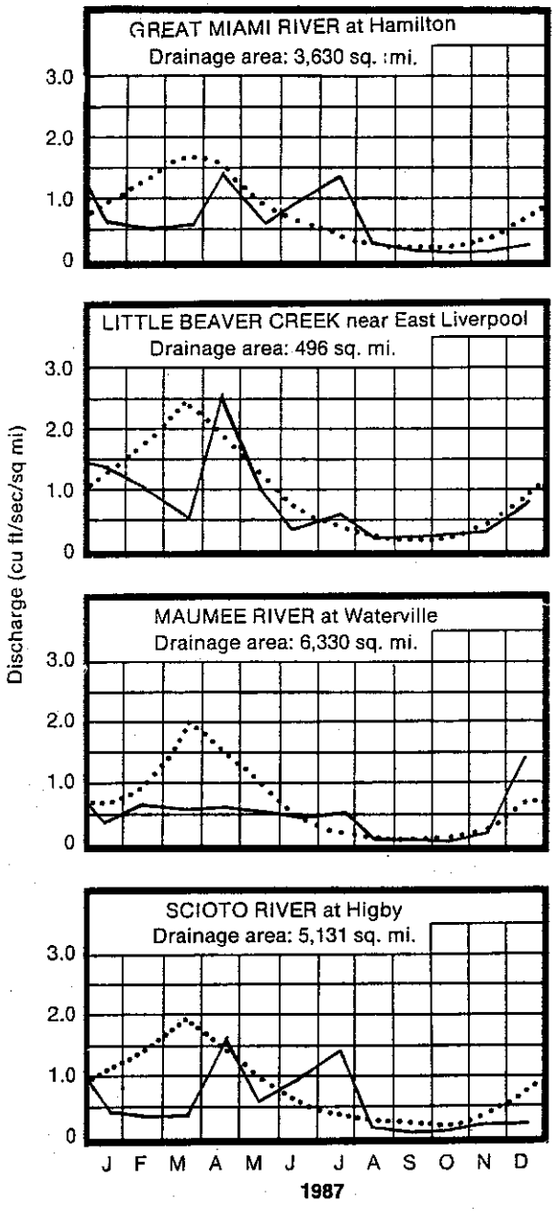
continued on back

PRECIPITATION
DECEMBER 1987





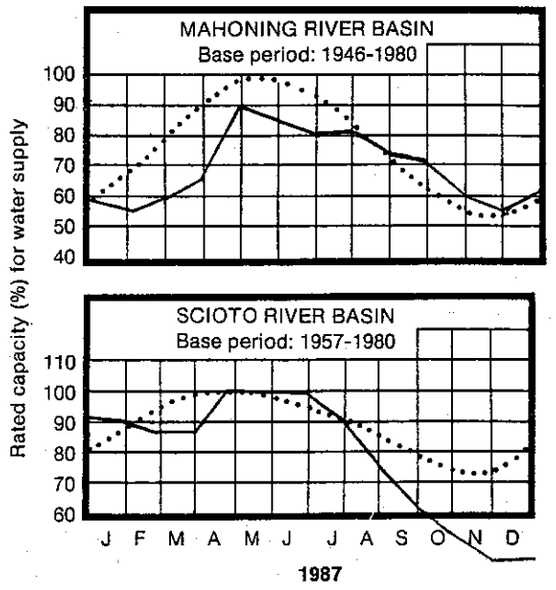
MEAN STREAM DISCHARGE



Base period for all stream: 1951-1980

Normal . . . . . current ———

RESERVOIR STORAGE FOR WATER SUPPLY

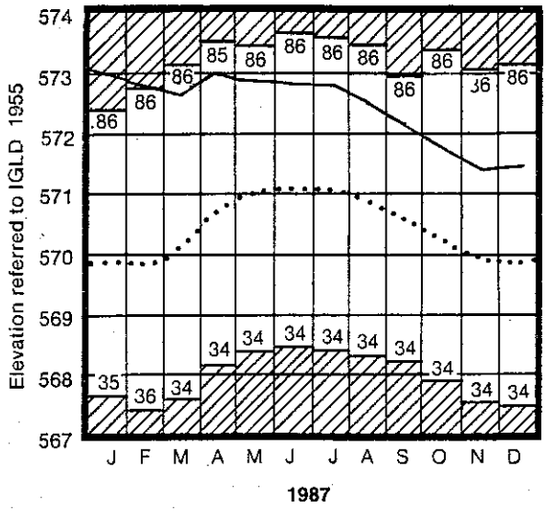


RESERVOIR STORAGE for water supply for December increased in the Mahoning River basin and remained above normal while in the Scioto River basin storage remained the same as last month and was noticeably below normal. Storage in the Scioto River basin reflects the fact that the area is experiencing its seventh driest period of this century. Reservoir storage at the month's end for the Mahoning basin index reservoirs was 63 percent of rated capacity for water supply compared with 55 percent for last month and 59 percent for December 1986. Storage at the month's end for the Scioto basin index reservoirs was 46 percent of rated capacity for water supply compared to the same for last month and 91 percent for December 1986.

STREAMFLOW for December was normal in the northern portion of the state and below normal in the southern portion. Mean discharge and percent of normal at the index gaging stations were: Great Miami River, 985 cfs, 41 percent; Little Beaver Creek, 388 cfs, 83 percent; Maumee River, 8,618 cfs, 194 percent; and Scioto River, 1,031 cfs, 25 percent.

LAKE ERIE level for December rose slightly and remained noticeably above normal. The mean level for December was 571.43 feet (IGLD 1955), 0.02 foot above last month's mean level and 1.58 feet above normal. The lake level is 1.68 feet below the level observed for December 1986 and 2.83 feet above Low Water Datum.

LAKE ERIE LEVELS at Cleveland

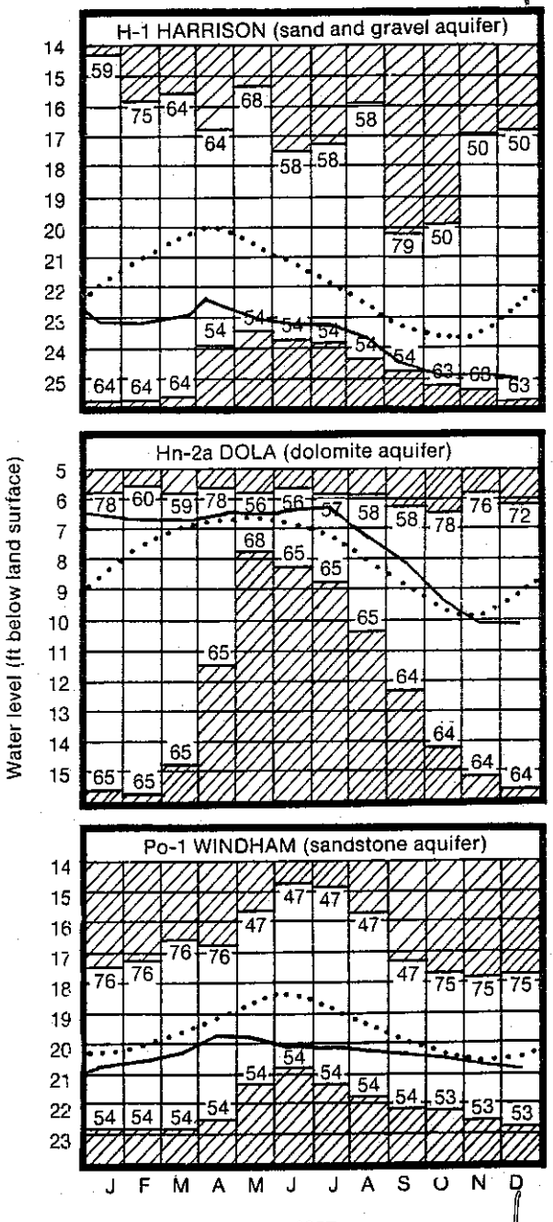


GROUND-WATER LEVELS for December showed slight declines in consolidated aquifers while levels in unconsolidated aquifers declined during the first half of the month and rose slightly in the last half. Consolidated aquifers showed net declines from last month's mean levels, whereas they usually show net rises in December. Unconsolidated aquifers showed slight net rises for the month, but not as great as usually observed. Generally, water levels throughout the state are noticeably below those levels observed for December 1986. Groundwater levels are below normalthroughout the state for December. Observation wells F-l at West Rushville, Fairfield County and Fa-1 near Washington Court House, Fayette County, representing consolidated aquifers in souther Ohio and Tu-1 near Strasburg, Tuscarawas County, representing an unconsolidated aquifer in the northeast all recorded record low levels for December. Well F-1 also set an all-time record low level for the third consecutive month for the period of record beginning in 1947. These low water levels have not caused serious problems for water supplies thus far.

SUMMARY

Precipitation for December was above normal for most of the state. Streamflow and reservoir storage were above normal in the northern portion of the state and below normal in the southern portion. Ground-water storage continues to be noticeably below normal in most areas of the state. Lake Erie level rose slightly and continues to be about 1.5 feet above normal. Precipitation for 1987 averaged 31.71 inches and was the seventh driest year in this century.

GROUND-WATER LEVELS



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