GROUND-WATER LEVEL DATA FOR NORTH CAROLINA - 1987

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Resources and Community Development

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PREFACE

This report is the first dealing exclusively with the ground-water level data collected in the joint U.S. Geological Survey and North Carolina Department of Natural Resources and Community Development observation-well program. It is the culmination of a concerted effort by dedicated personnel of both agencies who collected, compiled, analyzed, and verified the data assembled in the report. In addition to the authors, who had primary responsibility for assuring that the information contained herein is accurate, is complete, and adheres to U.S. Geological Survey and North Carolina Department of Natural Resources and Community Development policy and established guidelines, the following personnel contributed significantly to the collection, processing, and tabulation of the data:

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INCH-POUND TO INTERNATIONAL SYSTEM (SI) UNITS

The following factors may be used to convert inch-pound units published herein to the International System of Units (SI).

Multiply	By	To obtain
Length		
inch (in.)	25.4	millimeter (mm)
foot (ft)	.3048	meter (m)
mile (mi)	1.609	kilometer (km)
Area		
square mile (mi^2)	2.590	square kilometer (km^2)
Flow		
gallon per minute (gal/min)	0.06308	liter per second (L/s)
million gallons per day (Mgal/d)	.04381	cubic meter per second (m^3/s)
	43.81	liter per second (L/s)

Sea Level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada, formerly called "Sea Level Datum of 1929."

GROUND-WATER LEVEL DATA FOR NORTH CAROLINA - 1987

By R.W. Coble[1], A.G. Strickland[1], and M. Carl Bailey, Jr.[2]

ABSTRACT

Continuous and periodic measurements in 54 key wells throughout North Carolina and water-level measurements in 193 supplemental wells emplaced in Coastal Plain aquifers of the State are presented in this report. Hydrographs of selected wells show changes in ground-water storage in the State.

The water table in the shallow aquifers was higher throughout most of the State in 1987 than in 1986, indicating that rain had recharged these aquifers sufficiently to replenish the deficit in ground-water storage that accumulated in the western and central parts of the State during 1986.

Water levels in the heavily pumped Coastal Plain aquifers show a general downward trend for the year, indicating ground water is being withdrawn from aquifer storage. Record low water levels were measured in 4 of 13 wells in the Castle Hayne aquifer; the greatest decline measured during 1987 was 3.7 feet. Water levels in wells in the Peedee, Black Creek, upper Cape Fear, and lower Cape Fear aquifers generally show downward trends. Record low water levels were measured in 4 of 8 wells in the Peedee aquifer; the maximum decline measured during 1987 was 1.5 feet. All wells in the Black Creek, upper Cape Fear, and lower Cape Fear aquifers had record low water levels for 1987, with maximum measured declines in 1987 of 8.6, 3.1, and 3.1 feet, respectively. Record high water levels were measured in two wells, one each in the Castle Hayne and Peedee aquifers.

Potentiometric surface maps show the effects of major centers of pumping for the Castle Hayne, Black Creek, and lower Cape Fear aquifers in the east-central, central, and northern Coastal Plain, respectively.

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INTRODUCTION

Ground water is a vital natural resource in North Carolina and is the source of domestic water supply for more than 3.2 million people, or about 55 percent of the State's total population (U.S. Geological Survey, 1985, p. 329). In 1985, ground water was withdrawn at the rate of 435 million gallons per day (Mgal/d) (M.W. Treece and J.D. Bales, U.S. Geological Survey, written commun., 1988). The economic significance of ground water is substantial, particularly in the Coastal Plain province where high-yielding aquifers supply water to most municipalities, industries, rural areas, and livestock. In the Piedmont and Blue Ridge provinces, ground water is the source of supply for domestic use for slightly more than one-half of the 4 million residents (Heath and Giese, 1980). The largest ground-water withdrawals in the State are for public supply, mining and quarrying operations, and process-water for textile and chemical industries. Withdrawals for irrigation represent a small, but increasing, percentage of total ground-water use, particularly in the Coastal Plain (U.S. Geological Survey, 1985).

Knowledge of the status of ground-water storage is necessary in order to manage this valuable resource adequately. The amount of water stored within the ground-water system remains constant over the long term under natural conditions when the ground water moving through and discharging from the system is equaled by recharge to the system. The status of ground-water storage within a particular aquifer is indicated by the position or change in position of the potentiometric surface within that aquifer. If recharge equals discharge, the potentiometric surface remains unchanged. The potentiometric surface rises when recharge is greater than discharge and declines when discharge exceeds recharge. Ground-water withdrawals from wells combined with natural discharge commonly exceed recharge; this causes water to be withdrawn from aquifer storage and results in a decline of the potentiometric surface of that aquifer. Water-level declines of as much as 148 feet have been documented in the central Coastal Plain, where ground-water withdrawals have increased from 0.12 Mgal/d in 1910 to 21 Mgal/d in 1980 (Winner and Lyke, 1986).

History of the Observation-Well Program in North Carolina

Water levels have been measured in wells in North Carolina by U.S. Geological Survey investigators since the early 1900's (Stephenson and Johnson, 1912), and water levels have been measured periodically in a few wells since the late 1920's. In the last few decades, the Geological Survey, North Carolina Department of Natural Resources and Community Development (NRCD), and its predecessor agencies each developed separate statewide observation-well programs for monitoring ground-water levels. By 1978, the Geological Survey operated 50 observation wells and the NRCD operated about 600 observation wells. At that time officials of both agencies decided to combine the two into a single and more effective and efficient program. An analysis of the observation-well programs and potential alternatives for improving and combining the two was completed in 1980 (Winner, 1981a and 1981b), but the combined program was not implemented. At about the same time, the Geological Survey began a national program of ground-water studies termed Regional Aquifer System Analysis (RASA) studies. A product of the RASA program in North Carolina was a further delineation of the Coastal Plain aquifers (Winner and Coble, 1987). This delineation aided considerably in determining the specific aquifers that could be monitored effectively with respect to ground-water level fluctuations in the Coastal Plain (Coble and others, 1987).

In 1985, discussions between the Geological Survey and the Groundwater Section of NRCD regarding a joint observation-well program resumed, with the major goal of taking advantage of the observation wells in the NRCD's ground-water research-station program and the Geological Survey's capabilities in data collection, processing, and publishing. By early 1987, the joint program was in operation. The Geological Survey and NRCD evaluate and update the program on a continuous basis to assure effective monitoring of ground-water conditions throughout the State.

Purpose and Scope

The purpose of this report is to present for each of the major aquifers of North Carolina water-level data collected from the joint Geological

Survey/NRCD ground-water level observation-well program during 1987. This report is the first one of its type for North Carolina, and it represents the first statewide compilation of water-level information for the major aquifers in the State. Water levels for 1987 and hydrographs for all or part of the period 1978 through 1987 from 54 wells measured on a continuous or periodic basis in 1987 by Geological Survey and NRCD personnel are included. This information is grouped by major aquifer. North Carolina counties are shown on figure 1, and the wells are listed by county in table 1.

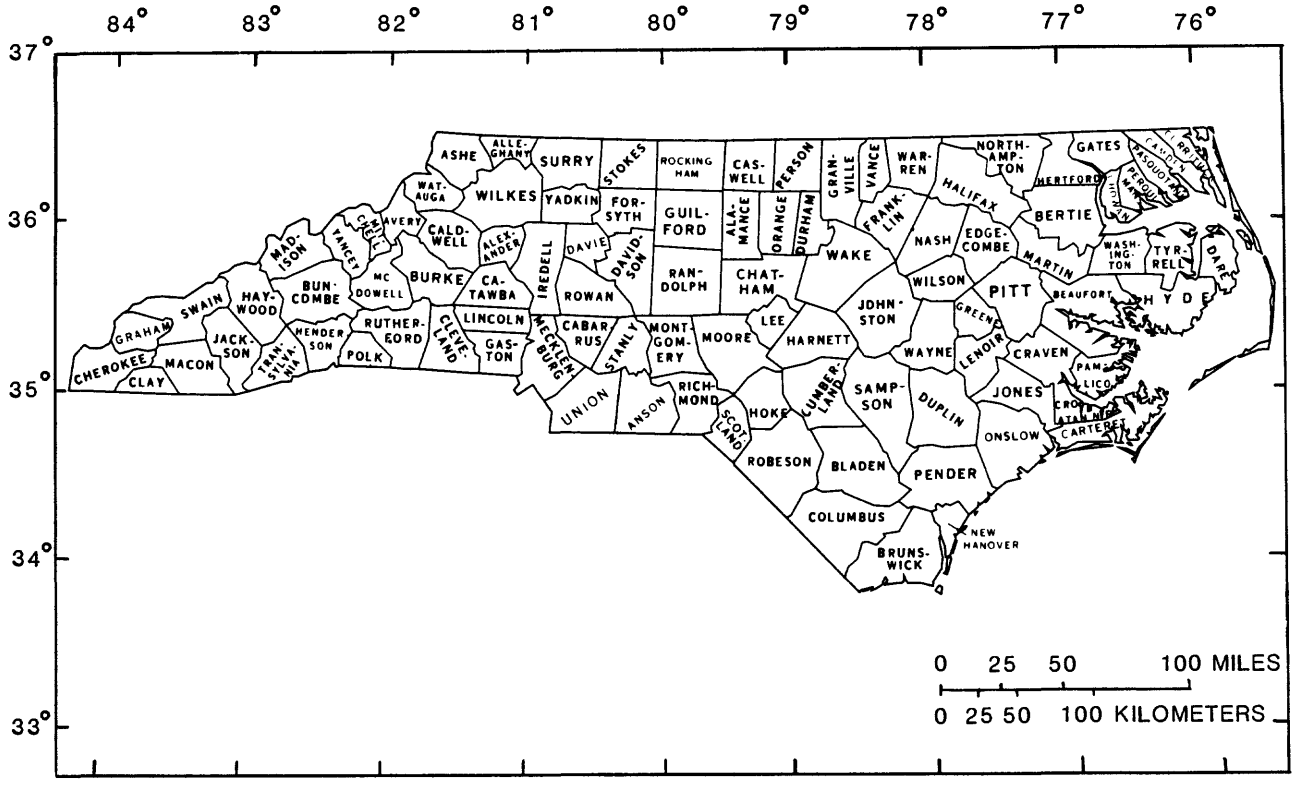


Figure 1.--North Carolina counties.

Synoptic water-level measurements were made at 193 other wells in the fall of 1987 to construct potentiometric-surface maps for three areas of the Coastal Plain of North Carolina.

OBJECTIVE CONCEPT

The joint Geological Survey/NRCD observation-well program is based on the concept that observation wells should be selected so as to provide data

Table 1.--*Observation wells for which hydrographs are included in this report*

[Well name: NRCD, North Carolina Department of Natural Resources and Community Development; RS, Research Station; USGS, U.S. Geological Survey; USMC, U.S. Marine Corps; CP&L, Carolina Power and Light Company]

County	Aquifer	Well number	Well name	Page
Beaufort	Castle Hayne	NC-13	Texasgulf well near Aurora	58
Beaufort	Castle Hayne	NC-137	NRCD Creeping Swamp RS well O21q1	66
Beaufort	Castle Hayne	NC-145	NRCD Bonnerton RS well P18v5	70
Beaufort	Yorktown	NC-162	NRCD Bonnerton RS well P18v6	52
Beaufort	Castle Hayne	NC-163	NRCD Coxs Crossroads RS well P19m3	78
Beaufort	Peedee	NC-164	NRCD Wilmar RS well P21k7	86
Beaufort	Black Creek	NC-165	NRCD Wilmar RS well P21k9	112
Bertie	Upper Cape Fear	NC-153	NRCD Cremo RS well G19b6	110
Bertie	Surficial	NC-154	NRCD Roxobel RS well F22b7	34
Bladen	Peedee	NC-178	NRCD Bladenboro RS well Z41u3	90
Brunswick	Peedee	NC-180	NRCD Bolivia RS well FF33d2	92
Brunswick	Castle Hayne	NC-181	NCRD Sunset Harbor RS well GG34s6	82
Brunswick	Surficial	NC-182	NRCD Sunset Harboro RS well GG34s7	44
Carteret	Castle Hayne	NC-139	NRCD Camp Glenn RS well X17j5	68
Columbus	Lower Cape Fear	NC-179	NRCD Carver Moore RS well AA39v2	142
Craven	Black Creek and upper Cape Fear	NC-44	City of New Bern well near Cove City	104
Craven	Lower Cape Fear	NC-167	NRCD Cove City RS well R23x3	140
Craven	Black Creek	NC-170	NRCD Clarks RS well S22j10	114
Davie	Regolith	NC-142	USGS well near Mocksville	24
Duplin	Peedee	NC-174	NRCD Rose Hill RS well V32v1	88
Duplin	Black Creek	NC-176	NRCD Chinquapin RS well W29d6	118
Gates	Upper Cape Fear	NC-149	NRCD Sunbury RS well C15s5	108
Haywood	Regolith	NC-40	Champion well near Cruso	20
Hertford	Lower Cape Fear	NC-55	Deloatch well near Como	134
Hertford	Lower Cape Fear	NC-155	NRCD Como RS well B20u6	138

Table 1.--*Observation wells for which hydrographs are included in this report*--Continued

[Well name: NRCD, North Carolina Department of Natural Resources and Community Development; RS, Research Station; USGS, U.S. Geological Survey; USMC, U.S. Marine Corps; CP&L, Carolina Power and Light Company]

County	Aquifer	Well number	Well name	Page
Hyde	Castle Hayne	NC-159	NRCD Hydelands RS well 010w3	76
Jones	Black Creek	NC-172	NRCD Comfort RS well U26j4	116
Jones	Surficial	NC-173	NRCD Comfort RS well U26j8	42
Jones	Peedee	NC-187	NRCD Comfort RS well U26j5	98
Lenoir	Black Creek	NC-128	City of Kinston well at Kinston	106
Lenoir	Peedee	NC-185	NRCD Graingers RS well Q25d12	96
Lenoir	Upper Cape Fear	NC-186	NRCD Kinston Yard RS well Q27r5	124
Mecklenburg	Regolith	NC-146	Hornets Nest Park well near Huntersville	30
New Hanover	Castle Hayne	NC-20	Hodder well near Wilmington	60
Onslow	Castle Hayne	NC-52	USMC Camp Gieger well	62
Onslow	Castle Hayne	NC-85	CP&L well at Jacksonville	64
Onslow	Black Creek	NC-188	NRCD Dixon Tower RS well Y25q4	126
Onslow	Black Creek	NC-189	NRCD Jacksonville 258 Well Field RS well W25f7	128
Orange	Regolith	NC-126	Psi Chi Fraternity well at Chapel Hill	22
Pamlico	Castle Hayne	NC-169	NRCD Whortonsville RS well S15y6	80
Pasquotank	Surficial	NC-143	USGS well near Elizabeth City	26
Pasquotank	Yorktown	NC-150	NRCD Elizabeth City Forest Service RS well D11v5	48
Perquimans	Lower Cape Fear	NC-151	NRCD Parkville RS well E13m2	136
Perquimans	Castle Hayne	NC-152	NRCD Parkville RS well E13m3	72
Pitt	Surficial	NC-160	USGS well near Simpson	36
Pitt	Black Creek	NC-183	NRCD Bethel RS well L24b4	122
Pitt	Peedee	NC-184	NRCD Conley RS well N23p3	94
Richmond	Surficial	NC-171	NRCD Hoffman RS well T50r6	40
Robeson	Upper Cape Fear	NC-177	NRCD Littlefield RS well Y42f9	120
Sampson	Surficial	NC-168	NRCD Mingo RS well R38p11	38
Transylvania	Regolith	NC-144	USGS well at Blantyre	28
Transylvania	Regolith	NC-147	USGS well near Brevard	32
Washington	Castle Hayne	NC-156	NRCD Lake Phelps RS well L13i1	74
Washington	Yorktown	NC-157	NRCD Lake Phelps RS well L13i2	50

to meet specific objectives. This concept was first proposed by Heath (1976) and later adapted to a proposed program for North Carolina (Winner, 1981a). This adaptation was applied to the joint Geological Survey/NRCD program described in this report.

The major objective of the program is to measure the effects on ground-water storage, as reflected by fluctuations in water levels, resulting from natural stresses and those stresses induced by man (table 2). Natural stresses are affected by climate, and the effects are often modified by differences in the geologic or topographic terrane in which the well is placed. The climatic- and terrane-effects wells in the natural-stress network are in the shallow aquifers statewide, which include the surficial aquifer in the Coastal Plain and the regolith aquifer in the Piedmont and Blue Ridge provinces. Induced stresses are affected by pumpage. Local effects are seen near pumping centers or points, and areal effects are seen region wide within a particular aquifer. The local- and areal-effects wells in the induced-stress network apply to the Coastal Plain. Maps showing the areal extent of the Yorktown, Castle Hayne, Peedee, Black Creek and upper Cape Fear, and lower Cape Fear aquifers are presented with the separate discussions of the water-level data for these aquifers.

METHODS OF INVESTIGATION

A ground-water observation-well program to observe natural and induced stresses in the major aquifers of North Carolina was established. The primary program consists of 54 key wells committed solely to the monitoring of water-level fluctuations on a continuous or periodic basis. In addition, a few hundred supplementary wells are used to monitor induced stress in areas of major pumpage by collecting synoptic water-level measurements on either an annual or less-frequent basis.

Well Selection

Some wells selected were constructed for the program or for special studies involving particular aquifers. The remainder were existing privately-owned wells and made available to the Geological Survey or NRCD for making water-level measurements.

Table 2.--*Type, objective, and use of data from the observation-well program*

[Adapted from Winner, 1981a]

Type	Objective	Use of data
	Natural stresses	
Climatic effects	To define effects of climate on ground-water storage	Hydrographs showing natural changes in storage
Terrane effects	To define effects of climate on ground-water storage as modified by topography and geology	Hydrographs showing natural changes in storage as modified by topography and geology
	Induced stresses	
Local effects	To define effects of ground-water withdrawals on storage near points of withdrawal To define the hydraulic characteristics of aquifers To define effectiveness of continuing beds in separating aquifers	Maps showing potentiometric-surface depressions Hydrographs showing changes in water levels with time Graphs showing water levels during pumping conditions as a function of pumping rates
Areal effects	To determine status of storage over the entire areal extent of the aquifer To define regional continuity of aquifers	Regional water-level maps Maps showing net change in storage over a specific time period Define recharge and discharge areas for areal extensive aquifers

One of the approaches in establishing the joint program was to take advantage of the availability of observation wells that have resulted from the NRCD ground-water research-station program. A major part of the hydrogeologic data base for the North Carolina Coastal Plain is the result of this program, carried out since the mid 1960's by the Groundwater Section of NRCD. A typical research-station site has a test hole drilled to crystalline basement rock or to about 1,500 ft, whichever is less, from which borehole geophysical logs, drill-stem water levels, and drill-stem water-quality data are collected. Permanent observation wells that tap each of the several aquifers identified from the test-hole data are constructed at each site; nearly all of these observation wells have screened intervals that are only 10 ft long, thus tapping very limited zones within the aquifers. Most of the wells have steel casing, but some newer ones have polyvinyl chloride casing. About 100 of these stations have been constructed to date, and data from all of them were considered when the joint program was planned. Of the 54 key wells measured on a continuous or periodic basis, 39 are research-station wells; nearly all the remaining research-station wells are supplementary wells used for synoptic measurements.

Fifteen of the 54 key wells were retained from the Geological Survey's previous program. Eight of the 15 wells were either constructed especially for the program or were constructed specifically for studies conducted by the Geological Survey. Seven wells were constructed for production or test purposes by private individuals or local governments and have been made available to the Geological Survey or NRCD. Six of these are drilled wells constructed with steel casing. Well NC-20 is an unused privately-owned irrigation well originally measured during a study of the ground-water resources of New Hanover County; well NC-44 is a test well constructed during a feasibility study for a well field for the city of New Bern. Wells NC-52 and NC-128 are unused public-supply wells, and well NC-55 is an unused well which supplied water for domestic purposes at a prison camp. NC-85 is an unused industrial well. The seventh well, NC-126, is an abandoned privately-owned, large-diameter dug well that is uncased but lined with rock. At one time the well probably served as a household-supply well.

A total of 210 wells were measured in the fall of 1987 to construct potentiometric-surface maps of aquifers in three areas of major ground-water pumpage. Seventeen of these are key wells in the joint program, and the other 193 supplementary wells are either NRCD ground-water research-station wells or are unused domestic or industrial wells or public-supply wells. All 210 of these are drilled and constructed with either steel or polyvinyl chloride casing.

Water-Level Measurements

Water-level measurements are made periodically in all 54 key wells by steel tape or electric tape, if the inside of the well casing is covered with water droplets. Water levels in most of these key wells are measured continuously by analog-to-digital recorders (ADR) which record water levels, hourly, by digital punch on paper tape from which daily mean values are computed. Many of the wells used for synoptic measurements are operating public-, industrial-, or irrigation-supply wells that are equipped with air lines and pressure gages. These air lines are used for water-level measurements if direct access is not available for steel-tape or electric-tape measurements.

The 54 key wells in the network are measured and serviced periodically by Geological Survey personnel. The supplementary wells are measured by personnel from the Geological Survey and NRCD. In some cases personnel from public water-supply systems measure the water levels in supplementary wells and report them to the Geological Survey.

MAJOR AQUIFERS

North Carolina is divided into two zones with respect to ground-water hydrology, which are intimately related to the physiographic provinces of the State (Heath, 1980) (fig. 2). The Piedmont and Blue Ridge provinces (fig. 3) extend across the western 60 percent of the State and are, for the most part, underlain by fractured, massive crystalline igneous and metamorphic rocks. These rocks are covered almost everywhere by regolith, which is either a clayey or sandy saprolite consisting of weathered parent

material or sand and clayey sand alluvium. The fractured igneous and metamorphic rocks have low permeability but are, nevertheless, the major aquifers in the Piedmont and Blue Ridge; the regolith, although not a major aquifer, contains most of the ground water in storage and is a source of water to the underlying igneous and metamorphic rock aquifers. All observation wells in the Piedmont and Blue Ridge provinces that were measured in 1987 tapped the regolith.

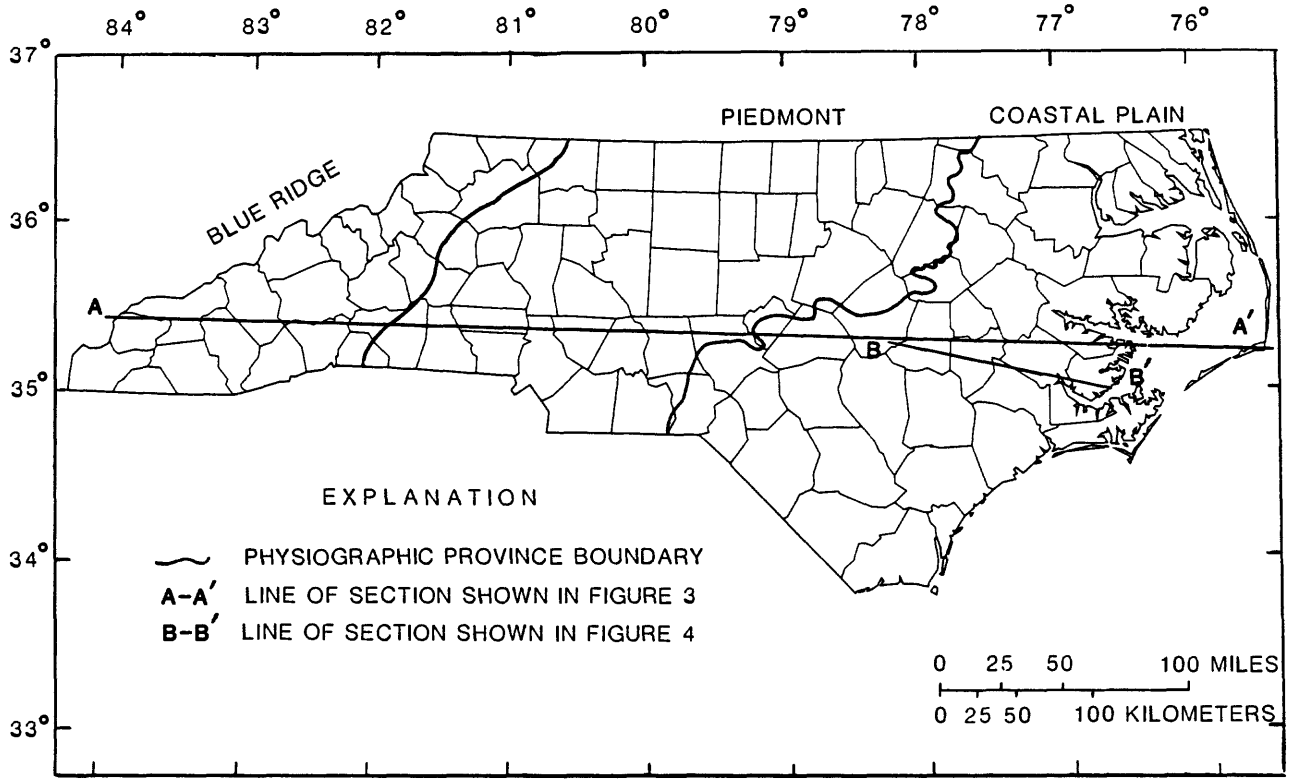


Figure 2.--Physiographic provinces of North Carolina.

The eastern 40 percent of North Carolina is in the Coastal Plain province, where aquifers are within a wedge of sediment layers that dip and thicken to the southeast (fig. 4). The Coastal Plain sediments were divided by Winner and Coble (1987) into 10 aquifers separated by confining units during the RASA study (table 3).

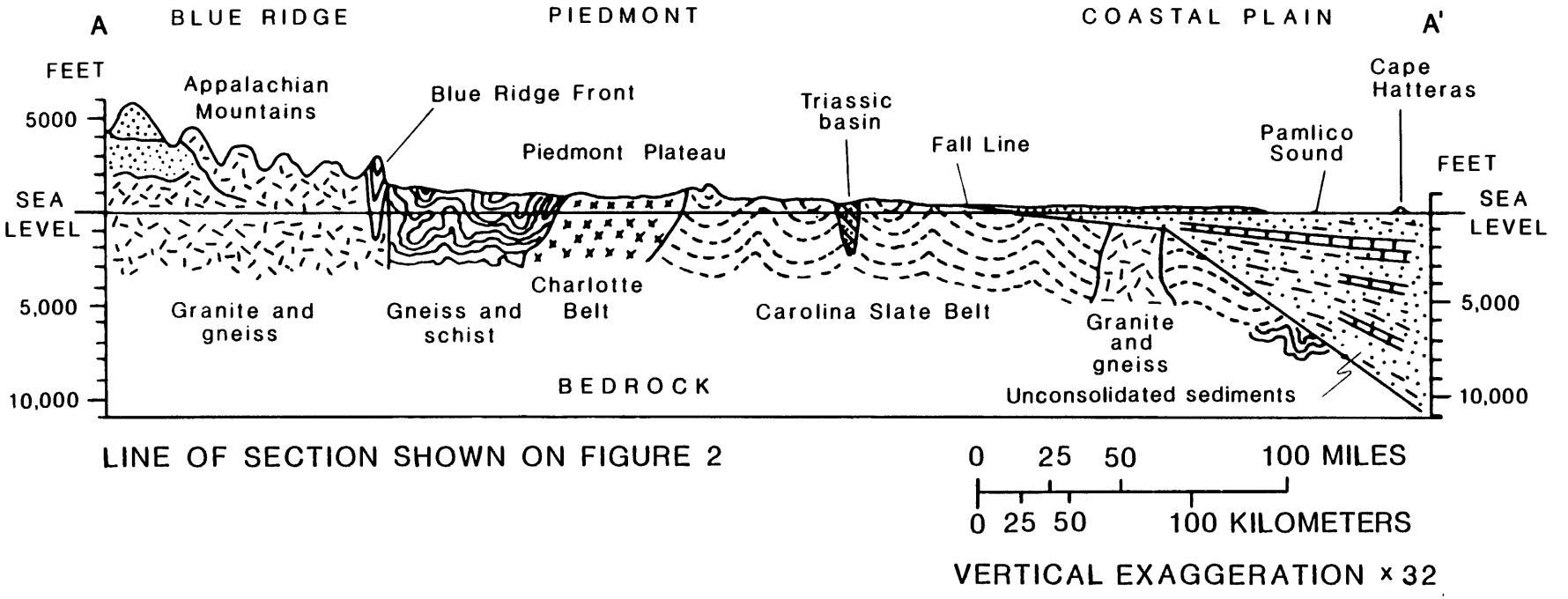


Figure 3.--Geologic section across North Carolina.

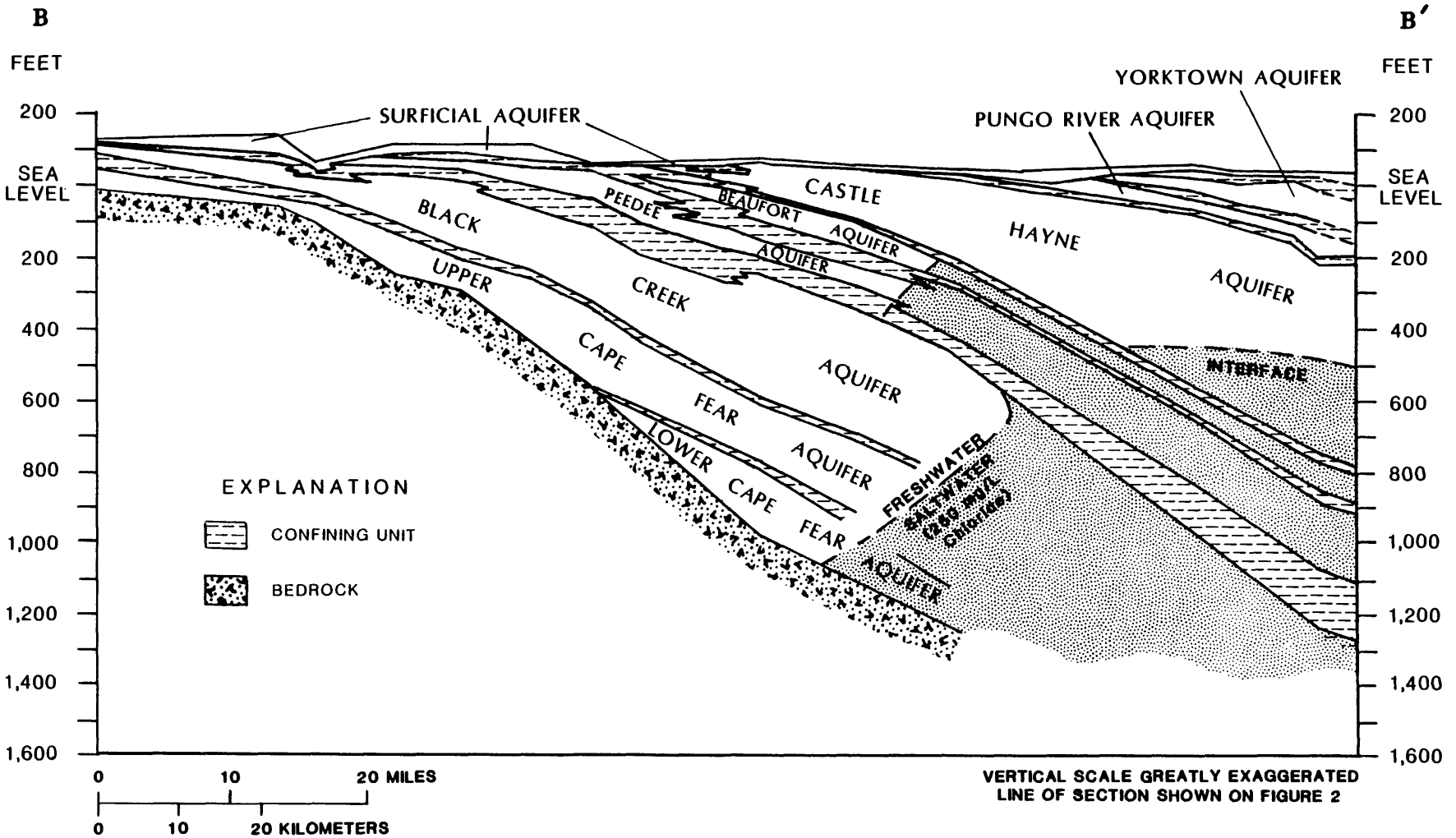


Figure 4.--Hydrogeologic section of the Coastal Plain of North Carolina.

Table 3.--*North Carolina Coastal Plain hydrogeologic units*

Geologic series	RASA[1] aquifers and confining units
Quaternary	Surficial aquifer
Tertiary	Yorktown confining unit Yorktown aquifer Pungo River confining unit Pungo River aquifer Castle Hayne confining unit Castle Hayne aquifer Beaufort confining unit Beaufort aquifer
Upper Cretaceous	Peedee confining unit Peedee aquifer Black Creek confining unit Black Creek aquifer Upper Cape Fear confining unit Upper Cape Fear aquifer Lower Cape Fear confining unit Lower Cape Fear aquifer
Lower Cretaceous	Lower Cretaceous confining unit Lower Cretaceous aquifer

[1]U.S. Geological Survey Regional Aquifer System Analysis.

The surficial aquifer is a near-surface deposit of fine sand, silt, clay, and peat beds. Scattered deposits of coarser-grained sediments in the unit occur in relict beach ridges or in alluvium. The surficial aquifer is considered to be present across the entire Coastal Plain.

The Yorktown aquifer in the Pliocene Yorktown Formation is present at shallow depths throughout the northern part of the Coastal Plain. The Yorktown is largely composed of fine sand, silty and clayey sand, and sand with shell and shell beds, with some limestone and coarse sand beds also present.

The Pungo River aquifer is part of the Miocene Pungo River Formation and is mostly fine to medium marine sands with considerable phosphate content. Shells and other fossils are present throughout the aquifer, and, in some areas, beds of limestone and coarse sand are present. The Pungo River is a minor aquifer, and water-levels in this aquifer are not measured with the joint program.

The Castle Hayne aquifer in the Eocene Castle Hayne Formation and in some Oligocene-aged sediments is composed of limestone, sand, and minor amounts of clay. Limestone may occur as shell limestone, dolomitic limestone, and sandy limestone ranging from loosely consolidated to hard and recrystallized. The Castle Hayne aquifer is the major source of freshwater throughout much of the eastern Coastal Plain.

The Beaufort aquifer is fine to medium glauconitic sands, clayey sands, and clay beds of marine origin of the Paleocene Beaufort Formation. Shell and limestone beds are present but are less than 6 feet thick. The Beaufort aquifer is a minor aquifer and often is tapped by wells that produce most of their water from the overlying Castle Hayne or underlying Peedee aquifer. None of the wells in the joint program are in the Beaufort aquifer.

The Peedee aquifer in the Upper Cretaceous Peedee Formation is composed of fine- to medium-grained sands interbedded with clays and silts. Thin beds of consolidated calcareous sandstone and impure limestone are interlayered in the sands in some places; shells are common throughout the Peedee aquifer. It is present throughout most of the central and eastern Coastal Plain and is the major aquifer in limited areas.

The aquifer most used for water supply in the North Carolina Coastal Plain is the Black Creek aquifer in the Upper Cretaceous Black Creek Formation. The Black Creek is mainly thinly-laminated gray to black clay, interbedded with gray to tan sands in the eastern part of its areal extent, while in the west it is mainly fine to medium sand, interbedded with silty clay, coarser channel sand, and thinly-laminated sand and clay. Below the Black Creek is the upper Cape Fear aquifer in the upper part of the Upper

Cretaceous Cape Fear Formation. This aquifer is composed of alternating beds of sand and clay. The Black Creek and upper Cape Fear aquifers are present and contain freshwater in a wide belt extending from the Virginia border to the South Carolina line. Many public-supply and industrial wells throughout the central part of the Coastal Plain produce water from both of these aquifers.

The lower Cape Fear aquifer in the lower part of the Upper Cretaceous Cape Fear Formation is composed of alternating beds of sand and clay, similar to the upper Cape Fear aquifer. Although the lower Cape Fear aquifer is present throughout most of the Coastal Plain, it is an important source of water supply only in the northwestern part.

The Lower Cretaceous aquifer in Lower Cretaceous-aged rocks in its updip (western) extent is composed of nonmarine shales, sands, and sand and gravel, whereas in the downdip (eastern) area it becomes progressively more marine and consists of sand and shells with marine beds being chiefly sandy or dolomitic limestone. The Lower Cretaceous aquifer contains saltwater throughout most of its limited areal extent in northeastern North Carolina. It is not used for water supply in this State, and water levels in the Lower Cretaceous aquifer are not measured in the joint program. However, the aquifer is heavily pumped in southeastern Virginia by industrial and municipal systems that withdraw water from both it and the lower Cape Fear aquifers causing declines in the potentiometric surfaces of these aquifers in North Carolina.

GROUND-WATER LEVEL DATA

Records of ground-water levels measured continuously or periodically are presented in the following section. Information about each well, including location, aquifer, and well characteristics and other data such as period of record and instantaneous water-level extremes during the period of record are listed. Tables showing either mean values for each day or every fifth day derived from the continuous records or tables containing the periodic water-level measurements for 1987 are included for each well. An annual hydrograph of the 1987 data and a decade hydrograph (1978 to 1987)

also are presented for every well. Potentiometric-surface maps of fall 1987 water levels also are presented for parts of the Castle Hayne, Black Creek, and lower Cape Fear aquifers.

Continuous water-level records on annual hydrographs are based on daily mean values and are shown by a solid line; no line is shown for times when record is missing. Data on annual hydrographs for wells in which periodic measurements are made are shown as individual data points.

Decade hydrographs of continuous water-level records are based on mean values for every fifth day and the last day of the month; no line is shown for missing record. Periodic measurements are shown as individual points connected by dashed lines. When fewer than two measurements were made in a 12-month period, the data points are not connected with dashed lines.

Natural-Stress Network

Ground water in the shallower parts of the surficial aquifer in the Coastal Plain and the regolith in the Piedmont and Blue Ridge provinces generally occurs under unconfined conditions, and the water levels are affected by natural stresses. Climatic-effects and terrane-effects wells are in these near-surface materials because the upper part of the ground-water system generally is most sensitive to these natural stresses. Climatic- and terrane-effects wells in the natural-stress network are shown on figure 5.

Annual hydrographs for the climatic-effects wells show the seasonal pattern of high water levels in the winter and early spring and water-level decline once the growing season begins. In September 1987, above normal rainfall was recorded statewide, and ground-water recharge resulted over most of the State even though this was during the growing season. Rises in water levels occurred in September at wells NC-40, NC-146, NC-147, NC-154, NC-160, NC-168, NC-173, and NC-182 (figs. 6, 11-15, 17, and 18). The only climatic-effects well not showing a definite rise in water level during that time was NC-143 (fig. 9) in the northeastern Coastal Plain.

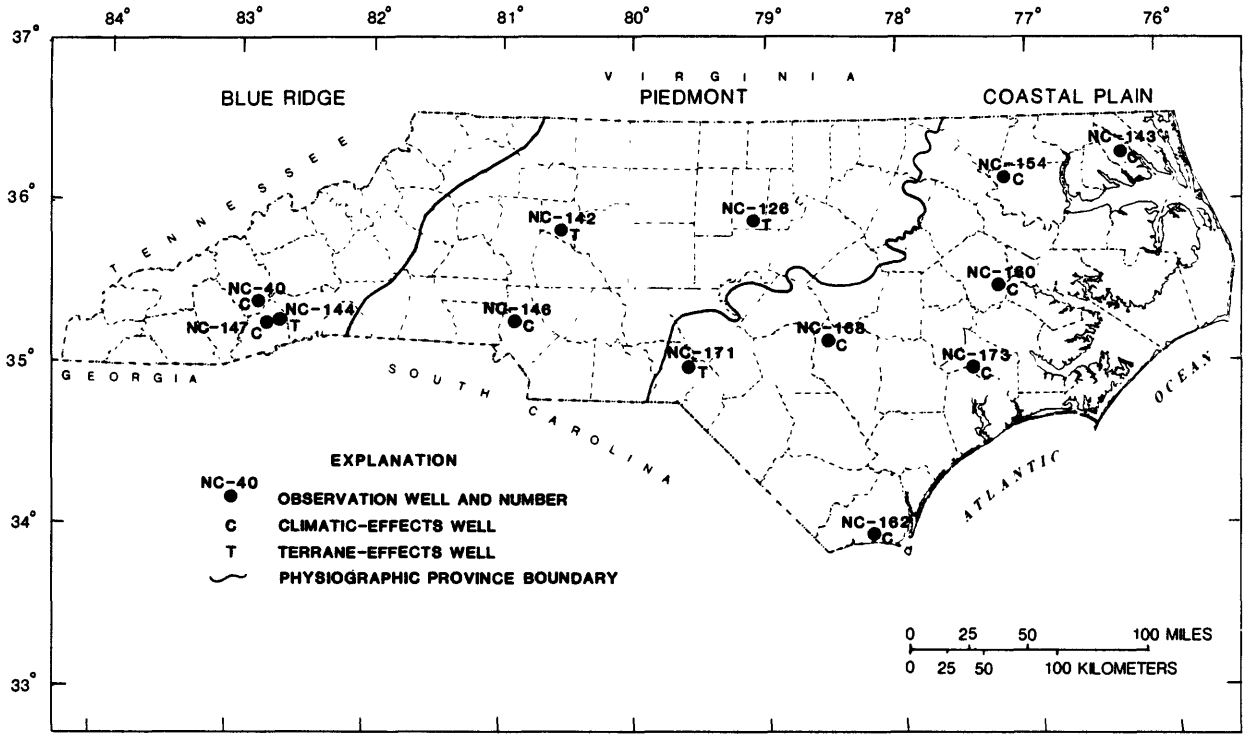


Figure 5.--Location of climatic- and terrane-effects wells.

Annual hydrographs for terrane-effects wells also show the usual seasonal pattern; however, high and low extremes often lag as much as 2 months behind those in the climatic-effects wells because water levels are typically 15 to 45 ft below land surface, and considerable time is required for precipitation to infiltrate through the thick unsaturated zone to the water table. Wells NC-142 and NC-144 show a rise in water levels in September, but NC-126 and NC-171 do not (figs. 8, 10, 7, and 16, respectively).

Water levels in many climatic- and terrane-effects wells declined during the 1981 and 1986 droughts, especially the latter. Lack of the usual amount of recharge during late winter and early spring of 1986 resulted in lower than usual high-water levels before the growing season began and (or) lower than usual water levels during the growing season. The effect of the 1986 drought was greatest in the western and central parts of the State. Several wells that had lower than usual water levels for both 1985 and 1986 recovered during 1987; this is seen at wells NC-40, NC-142, and NC-144 (figs. 6, 8, and 10). The terrane-effects well NC-126 (fig. 7) in Orange County shows these seasonal fluctuations; however, the downward trend in water levels begun in 1985 continued through 1987. Growing-season water levels in climatic-effects well NC-146 (fig. 11) in Mecklenburg County also were progressively lower from 1985 through 1987. The 1986 drought did not substantially affect water levels in the surficial aquifer at wells NC-143 and NC-160 (figs. 9 and 14) in the northeastern part of the State.

NC-40 NEAR CRUSO, HAYWOOD COUNTY

352315082484401. Local number, NC-40.
LOCATION.--Lat 35°23'15", long 82°48'44", Hydrologic Unit 06010106, 2 mi south of Cruso on U.S. Highway 276 at Camp Hope.
Owner: Champion International Corporation.
AQUIFER.--Unconfined saprolite derived from muscovite-biotite gneiss of Precambrian age.
WELL CHARACTERISTICS.--Dug observation well, depth 18.5 ft, diameter 12 in, cased to 18.5 ft, open end, backfilled with gravel from 4 to 18.5 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 3,148.26 ft above National Geodetic Vertical Datum of 1929.
Measuring point: Top of casing, 1.00 ft above land-surface datum.
REMARKS.--Climatic-effects well.
PERIOD OF RECORD.--December 1955 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.24 ft below land-surface datum, March 12, 1977; lowest, 6.90 ft below land-surface datum, October 7, 8, and 9, 1986.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	4.89	4.88	3.22	3.87	3.66	4.72	5.22	5.75	6.08	6.09	6.38	5.55
2	4.90	4.82	3.72	3.88	3.75	4.75	5.24	5.75	6.10	6.13	6.39	5.62
3	4.93	4.78	3.98	3.87	3.78	4.77	5.26	5.72	6.12	6.18	6.39	5.69
4	4.94	4.86	4.14	3.86	3.78	4.78	5.28	5.73	6.14	6.22	6.39	5.76
5	4.96	4.91	4.23	3.87	3.79	4.81	5.31	5.73	6.13	6.23	6.40	5.82
6	4.97	4.95	4.29	3.88	3.79	4.87	5.33	5.67	5.94	6.25	6.41	5.87
7	4.97	4.97	4.30	3.86	3.75	4.92	5.35	5.52	5.48	6.26	6.40	5.90
8	4.98	4.98	4.26	3.82	3.68	4.96	5.35	5.55	5.39	6.27	6.33	5.94
9	4.99	5.01	4.18	3.81	3.70	4.99	5.36	5.60	5.48	6.28	6.26	5.97
10	4.96	5.04	4.12	3.82	3.79	5.02	5.38	5.65	5.53	6.29	6.16	5.98
11	4.97	5.05	4.09	3.82	3.95	4.99	5.40	5.70	5.58	6.30	6.06	6.00
12	4.99	5.03	4.03	3.81	4.11	4.88	5.42	5.73	5.45	6.31	6.04	6.02
13	5.03	4.98	3.97	3.86	4.14	4.90	5.45	5.75	5.31	6.32	6.03	6.05
14	5.05	4.94	3.93	3.86	4.16	4.94	5.46	5.78	5.39	6.32	6.04	6.06
15	5.07	4.96	3.89	3.85	4.20	4.97	5.47	5.81	5.48	6.32	6.07	5.82
16	5.09	4.90	3.87	3.86	4.24	4.99	5.49	5.83	5.57	6.33	6.08	5.65
17	5.11	4.83	3.86	3.87	4.29	4.99	5.51	5.84	5.68	6.34	4.93	5.68
18	4.94	4.85	3.85	3.89	4.32	4.95	5.53	5.86	5.78	6.33	4.90	5.75
19	4.37	4.88	3.72	3.95	4.35	4.77	5.55	5.88	5.86	6.34	5.15	5.81
20	4.52	4.90	3.73	3.96	4.39	4.83	5.56	5.91	5.91	6.35	5.28	5.86
21	4.68	4.89	3.79	3.96	4.43	4.84	5.58	5.93	5.97	6.36	5.40	5.91
22	4.75	4.80	3.84	3.90	4.48	4.82	5.60	5.95	6.02	6.37	5.51	5.95
23	4.83	4.62	3.84	3.74	4.51	4.89	5.62	5.98	6.06	6.37	5.61	5.99
24	4.90	4.71	3.84	3.96	4.54	4.96	5.62	5.99	6.09	6.37	5.69	6.02
25	4.91	4.78	3.84	4.06	4.58	5.00	5.64	6.01	6.12	6.37	5.77	6.04
26	4.82	4.83	3.83	3.98	4.63	5.04	5.65	6.01	6.15	6.37	5.83	6.04
27	4.86	4.61	3.85	3.78	4.49	5.09	5.67	6.03	6.17	6.38	5.81	6.04
28	4.90	3.60	3.87	4.01	4.44	5.13	5.69	6.05	6.18	6.37	5.67	6.01
29	4.96	---	3.88	4.09	4.52	5.17	5.70	6.05	6.17	6.38	5.49	5.98
30	4.91	---	3.87	3.62	4.60	5.20	5.71	6.07	6.11	6.39	5.50	5.97
31	4.84	---	3.86	---	4.68	---	5.73	6.08	---	6.38	---	5.98

CAL YR 1987 HIGHEST DAILY MEAN 3.22 MAR 1 LOWEST DAILY MEAN 6.41 NOV 6

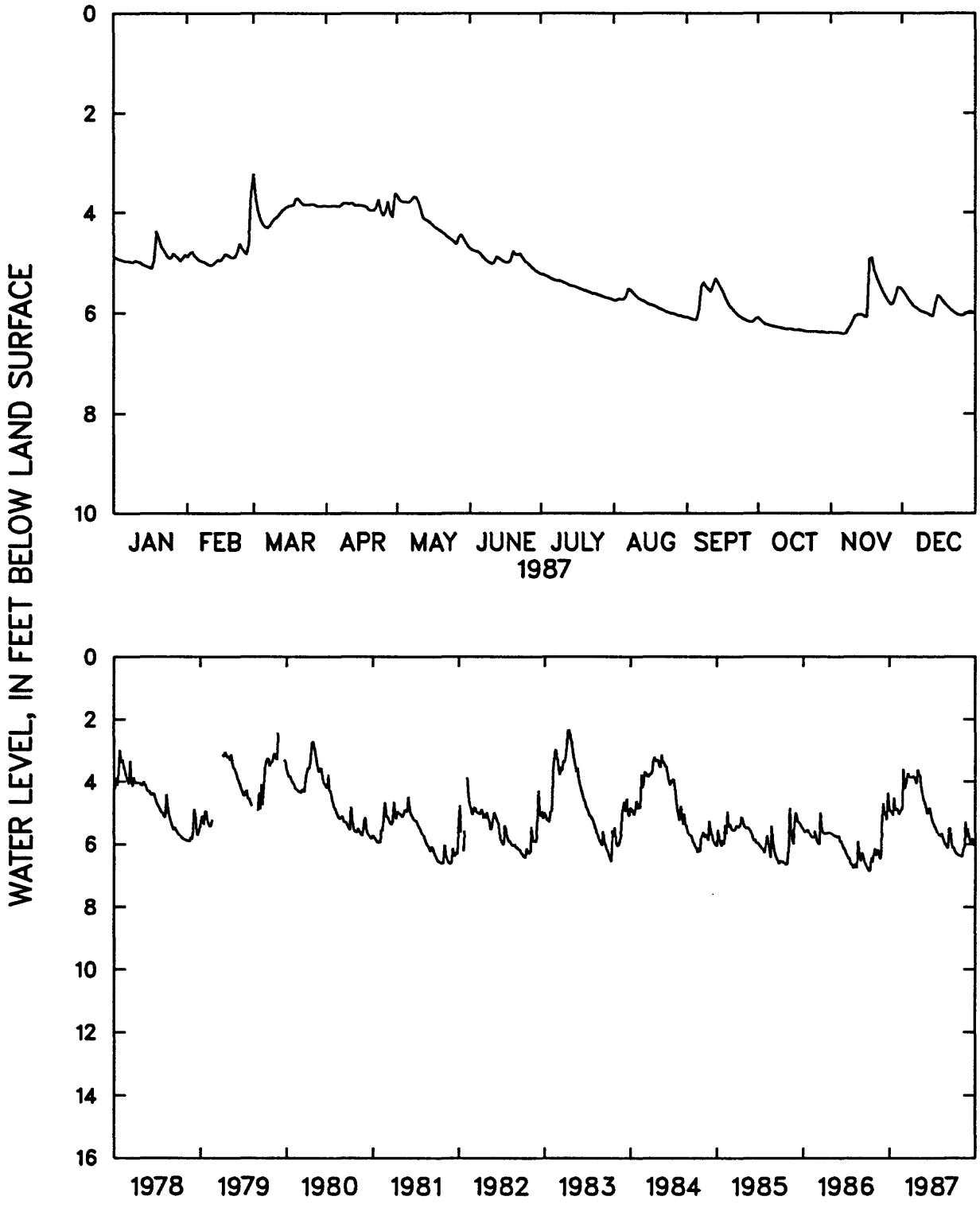


Figure 6.--Water level in observation well NC-40, Haywood County.

NC-126 AT CHAPEL HILL, ORANGE COUNTY

355522079043001. Local number, NC-126.
LOCATION.--Lat 35°55'22", long 79°04'30", Hydrologic Unit 03030002, at Chapel Hill, west of University of North Carolina campus, southeast of intersection of Cameron Avenue and Ransom Street.
Owner: Chi Psi Fraternity.
AQUIFER.--Unconfined saprolite derived from granite of Paleozoic age.
WELL CHARACTERISTICS.--Dug observation well, depth 48 ft, diameter 36 in, lined with rock; measured depth 46.2 ft, August 1986.
INSTRUMENTATION.--Measured every six weeks with chalked tape by USGS personnel.
DATUM.--Land-surface datum is 511.50 ft above National Geodetic Vertical Datum of 1929.
Measuring point: Top of shelf, 3.27 ft above land-surface datum (since July 21, 1981).
REMARKS.--Terrane-effects well.
PERIOD OF RECORD.--August 1938 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 35.22 ft below land-surface datum, May 14, 1984; lowest, dry, October 11 to December 31, 1940.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 28	45.46	MAR 26	43.37	APR 30	42.67	JUN 30	42.41	OCT 5	44.63	NOV 12	45.29
FEB 24	44.89	APR 6	43.18	MAY 29	42.27	JUL 31	42.73				

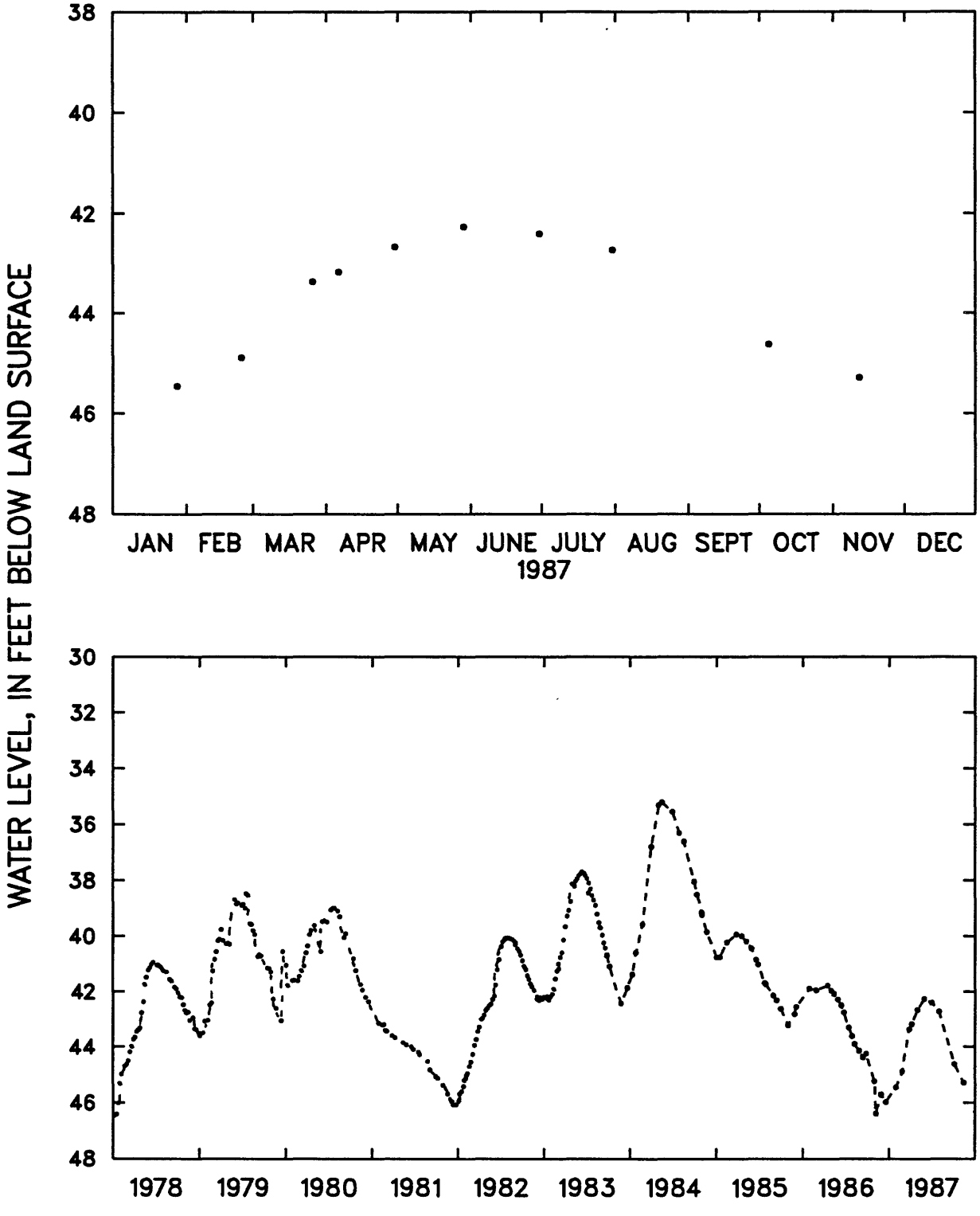


Figure 7.--Water level in observation well NC-126, Orange County.

NC-142 NEAR MOCKSVILLE, DAVIE COUNTY

355359080331701. Local number, NC-142.
LOCATION.--Lat 35°53'59", long 80°33'17", Hydrologic Unit 03040102, 0.5 mi northeast of Mocksville on U.S. Highway 158 at B. C. Brocks Community Center.
Owner: U.S. Geological Survey.
AQUIFER.--Unconfined weathered granite of Paleozoic age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 30.8 ft, diameter 6 in, cased to 30.8 ft, open end, backfilled with gravel from 20 to 30.8 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 835 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of casing, 1.0 ft above land-surface datum.
REMARKS.--Terrane-effects well. In October 1982, well replaced nearby NC-110.
PERIOD OF RECORD.--October 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 15.05 ft below land-surface datum, April 29, 1987; lowest, 20.98 ft below land-surface datum, October 24, 25, and 26, 1981.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	18.70	17.82	16.66	16.52	15.23	16.88	17.81	18.65	19.20	18.88	19.45	19.27
2	18.67	17.70	16.62	16.43	15.29	16.92	17.84	18.66	19.22	18.89	19.46	19.28
3	18.65	17.64	16.58	16.39	15.39	16.96	17.87	18.67	19.25	18.93	19.47	19.25
4	18.62	17.62	16.57	16.39	15.51	16.99	17.89	18.68	19.28	18.95	19.46	19.24
5	18.61	17.57	16.57	16.42	15.58	17.02	17.92	18.69	19.27	18.96	19.48	19.27
6	18.61	17.47	16.57	16.43	15.60	17.05	17.95	18.70	19.26	18.96	19.52	19.30
7	18.59	17.41	16.54	16.44	15.65	17.08	17.98	18.70	19.17	19.00	19.53	19.32
8	18.62	17.38	16.50	16.47	15.76	17.11	18.01	18.69	18.98	19.06	19.53	19.32
9	18.62	17.50	16.52	16.52	15.85	17.13	18.04	18.68	18.92	19.10	19.54	19.30
10	18.60	17.50	16.61	16.56	15.89	17.18	18.07	18.69	18.85	19.10	19.51	19.25
11	18.64	17.49	16.59	16.58	15.95	17.22	18.09	18.73	18.61	19.10	19.51	19.14
12	18.66	17.47	16.55	16.64	16.01	17.24	18.12	18.71	18.61	19.13	19.52	19.06
13	18.70	17.57	16.54	16.72	16.10	17.27	18.14	18.71	18.61	19.17	19.51	19.06
14	18.72	17.58	16.56	16.75	16.15	17.29	18.16	18.72	18.61	19.20	19.53	19.04
15	18.73	17.65	16.58	16.55	16.15	17.33	18.21	18.70	18.61	19.21	19.55	18.94
16	18.78	17.65	16.65	16.04	16.22	17.35	18.25	18.70	18.61	19.22	19.55	18.84
17	18.81	17.69	16.68	15.93	16.26	17.40	18.29	18.72	18.61	19.24	19.51	18.80
18	18.75	17.73	16.69	15.92	16.29	17.44	18.31	18.77	18.62	19.26	19.56	18.77
19	18.61	17.78	16.62	15.91	16.34	17.45	18.33	18.80	18.65	19.28	19.56	18.74
20	18.51	17.75	16.55	15.88	16.41	17.46	18.36	18.85	18.66	19.29	19.53	18.72
21	18.45	17.71	16.53	15.86	16.46	17.49	18.38	18.89	18.68	19.32	19.58	18.74
22	18.37	17.65	16.57	15.88	16.50	17.53	18.41	18.90	18.69	19.35	19.60	18.73
23	18.43	17.61	16.60	15.90	16.53	17.57	18.44	18.95	18.72	19.37	19.61	18.78
24	18.42	17.56	16.63	15.75	16.57	17.61	18.48	19.00	18.73	19.38	19.62	18.78
25	18.35	17.50	16.64	15.49	16.61	17.63	18.51	19.03	18.77	19.39	19.62	18.75
26	18.32	17.50	16.66	15.28	16.67	17.65	18.54	19.05	18.81	19.40	19.63	18.74
27	18.30	17.47	16.67	15.16	16.70	17.68	18.57	19.08	18.84	19.38	19.58	18.74
28	18.27	17.12	16.73	15.10	16.73	17.73	18.60	19.10	18.87	19.41	19.50	18.62
29	18.21	---	16.77	15.11	16.76	17.77	18.64	19.14	18.85	19.41	19.38	18.52
30	18.10	---	16.64	15.13	16.79	17.79	18.66	19.18	18.82	19.42	19.31	18.48
31	17.97	---	16.57	---	16.84	---	18.67	19.19	---	19.44	---	18.42

CAL YR 1987 HIGHEST DAILY MEAN 15.10 APR 28 LOWEST DAILY MEAN 19.63 NOV 26

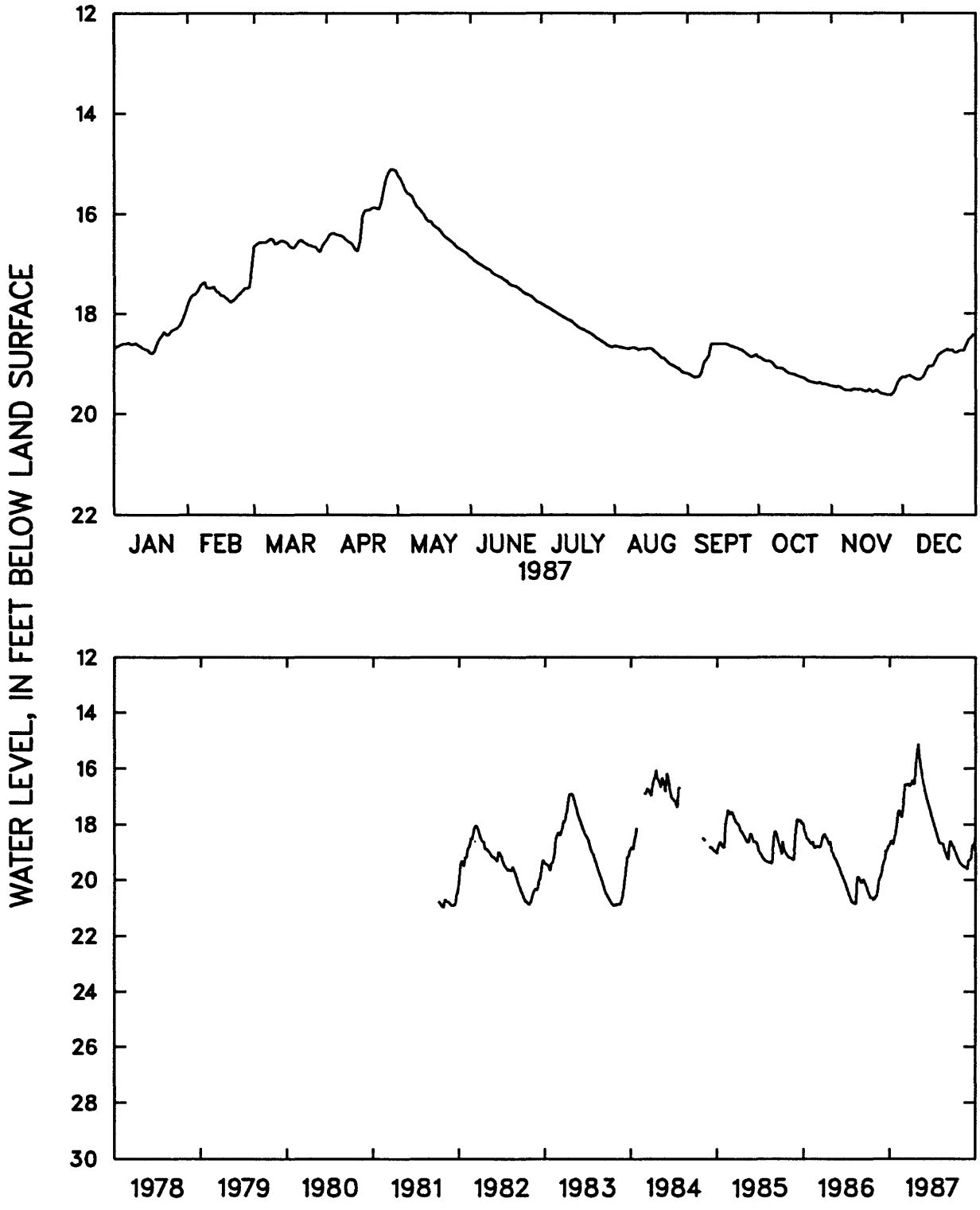


Figure 8.--Water level in observation well NC-142, Davie County.

NC-143 NEAR ELIZABETH CITY, PASQUOTANK COUNTY

361828076163401. Local number, NC-143.
LOCATION.--Lat 36°18'28", long 76°16'34", Hydrologic Unit 03010205, northwest of Elizabeth City, 1 mi west of Secondary Road 1307 on Secondary Road 1309.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial aquifer of post-Miocene age.
WELL CHARACTERISTICS.--Bored observation well, augered to 10.2 ft, diameter 3 in, cased to 5 ft, screened interval from 5.0 ft to 10.2 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 13 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of casing, 2.35 ft above land-surface datum.
REMARKS.--Climatic-effects well. In May 1984, well replaced nearby NC-86.
PERIOD OF RECORD.--November 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.01 ft below land-surface datum, January 22, 1987; lowest, 6.00 ft below land-surface datum, October 10, 1983.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	2.31	1.23	.60	1.30	1.93	3.30	4.43	5.36	5.19	5.41	5.90	5.15
2	.90	1.14	.75	1.43	1.99	3.34	4.46	5.35	5.25	5.53	5.87	5.29
3	.97	1.25	1.03	1.48	2.10	3.43	4.49	5.35	5.30	5.49	5.82	5.26
4	1.07	1.52	1.28	1.22	2.18	3.40	4.48	5.36	5.36	5.57	5.72	5.15
5	1.19	1.68	1.47	1.45	2.22	3.41	4.53	5.24	5.32	5.55	5.66	5.33
6	1.32	1.64	1.57	1.52	2.22	3.50	4.64	4.78	5.23	5.52	5.87	5.42
7	1.33	1.53	1.56	1.59	2.24	3.62	4.63	4.81	5.21	5.53	5.87	5.46
8	1.58	1.58	1.50	1.68	2.31	3.63	4.67	4.82	5.14	5.65	5.84	5.41
9	1.68	1.78	1.43	1.78	2.44	3.63	4.75	4.82	5.20	5.70	5.77	5.29
10	1.18	1.93	1.40	1.87	2.48	3.75	4.81	4.84	5.18	5.66	5.64	5.19
11	.81	1.93	1.38	1.93	2.53	3.87	4.87	4.97	5.20	5.58	5.57	5.03
12	1.04	1.80	1.16	1.98	2.58	3.82	4.90	5.02	5.21	5.59	5.61	5.02
13	1.32	1.99	.99	2.08	2.71	3.79	4.91	5.10	5.04	5.69	5.60	5.19
14	1.47	1.97	1.28	2.16	2.76	3.79	4.93	5.14	5.02	5.75	5.64	5.24
15	1.54	2.03	1.44	2.06	2.68	3.80	5.04	5.11	5.11	5.74	5.73	4.84
16	1.72	1.97	1.53	1.71	2.78	3.87	5.06	5.09	5.13	5.76	5.73	4.68
17	1.63	.97	1.55	1.38	2.84	3.74	5.14	5.12	5.12	5.74	5.64	4.85
18	.98	.63	1.63	1.51	2.84	3.87	5.13	5.15	5.12	5.77	5.59	4.95
19	.32	.89	1.58	1.62	2.88	3.87	5.11	4.92	5.22	5.81	5.63	4.91
20	.52	1.04	1.49	1.69	2.63	3.83	5.16	4.73	5.14	5.81	5.51	4.79
21	.62	1.12	1.57	1.71	2.66	3.90	5.17	4.86	5.16	5.81	5.66	4.82
22	.29	1.11	1.73	1.78	2.75	3.99	5.18	4.84	5.21	5.92	5.76	---
23	.58	.62	1.85	1.86	2.80	4.07	5.21	4.88	5.27	5.91	5.77	---
24	.90	.87	1.91	1.83	2.85	4.17	5.26	5.03	5.30	5.89	5.77	---
25	.74	1.03	1.95	1.43	2.91	4.18	5.26	5.07	5.35	5.83	5.74	---
26	.48	1.23	1.92	1.39	3.01	4.16	5.23	5.06	5.43	5.85	5.69	---
27	.73	1.34	1.72	1.50	3.06	4.05	5.24	5.04	5.46	5.68	5.70	---
28	.91	1.33	.87	1.53	3.10	4.29	5.27	5.07	5.48	5.72	5.53	---
29	.98	---	1.05	1.66	3.11	4.45	5.34	5.11	5.42	5.81	5.21	---
30	.70	---	.94	1.78	3.15	4.45	5.38	5.21	5.28	5.86	5.09	---
31	.98	---	.78	---	3.23	---	5.37	5.18	---	5.90	---	---

CAL YR 1987 HIGHEST DAILY MEAN .29 JAN 22 LOWEST DAILY MEAN 5.92 OCT 22

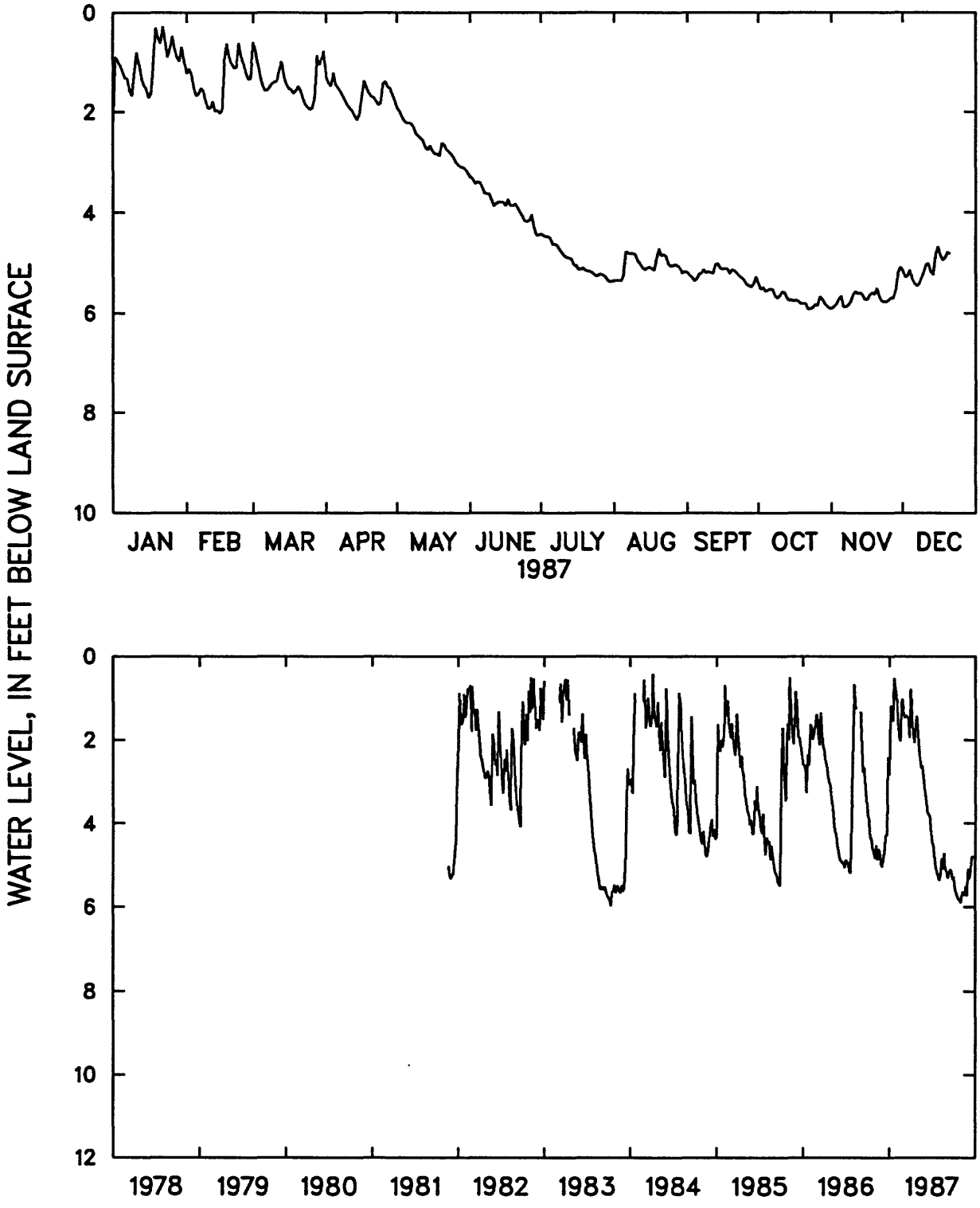


Figure 9.--Water level in observation well NC-143, Pasquotank County.

NC-144 AT BLANTYRE, TRANSYLVANIA COUNTY

351808082374302. Local number, NC-144.
LOCATION.--Lat 35°18'08", long 82°37"43", Hydrologic Unit 06010105, at Blantyre, 0.25 mi northwest of U.S. Highway 64 on King Road (Secondary Road 1502).
Owner: U.S. Geological Survey.
AQUIFER.--Unconfined saprolite derived from gneiss of Paleozoic age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 70 ft, diameter 4 in, cased to 58 ft, casing perforated from 15 to 58 ft, gravel filter pack from 5 to 58 ft, backfilled with gravel and saprolite from 58 to 70 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 2,147.11 ft above National Geodetic Vertical Datum of 1929.
Measuring point: Top of casing, 1.30 ft above land-surface datum.
REMARKS.--Terrane-effects well. In September 1984, well replaced nearby NC-127.
PERIOD OF RECORD.--October 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 23.46 ft below land-surface datum, May 29, 1984; lowest, 37.95 ft below land-surface datum, December 23 and 24, 1981.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	31.36	29.68	27.67	27.02	26.06	26.43	26.94	27.30	27.94	27.83	29.05	30.12
2	31.37	29.52	28.14	26.88	26.03	26.46	26.89	27.36	27.96	27.88	29.05	30.25
3	31.35	29.58	28.24	26.77	26.04	26.50	26.88	27.41	28.00	27.96	29.06	30.15
4	31.23	29.60	28.29	26.79	26.05	26.45	26.84	27.46	28.02	28.01	29.02	30.19
5	31.19	29.58	28.29	26.76	26.10	26.54	26.85	27.52	27.98	27.93	29.11	30.33
6	31.09	29.43	28.26	26.72	26.02	26.62	26.84	27.59	27.96	27.87	29.38	30.36
7	30.99	29.31	28.14	26.66	25.98	26.66	26.80	27.50	27.92	27.97	29.37	30.37
8	30.95	29.27	27.98	26.63	26.03	26.66	26.77	27.60	27.91	28.17	29.37	30.33
9	30.85	29.50	27.94	26.62	26.09	26.63	26.75	27.63	27.97	28.23	29.31	30.21
10	30.69	29.40	28.09	26.60	26.07	26.65	26.69	27.67	28.01	28.19	29.22	30.15
11	30.78	29.27	28.09	26.54	26.04	26.70	26.67	27.75	28.02	28.11	29.46	30.22
12	30.69	29.12	28.03	26.54	26.02	26.68	26.67	27.81	27.96	28.08	29.55	30.29
13	30.68	29.15	27.96	26.56	26.04	26.65	26.63	27.87	27.94	28.25	29.55	30.48
14	30.57	29.06	27.89	26.50	26.07	26.67	26.61	27.91	28.00	28.34	29.64	30.44
15	30.45	29.07	27.81	26.28	26.02	26.72	26.68	27.91	28.00	28.34	29.75	30.17
16	30.40	28.98	27.74	26.24	26.05	26.73	26.76	27.91	27.95	28.35	29.68	30.35
17	30.36	29.00	27.73	26.28	26.07	26.79	26.83	27.92	27.89	28.35	29.52	30.47
18	30.17	29.00	27.59	26.39	26.05	26.86	26.81	27.90	27.86	28.37	29.72	30.47
19	30.06	29.04	27.45	26.40	26.05	26.86	26.80	27.80	27.88	28.41	29.71	30.42
20	30.16	28.97	27.44	26.35	26.10	26.83	26.85	27.91	27.89	28.43	29.72	30.31
21	30.08	28.84	27.37	26.28	26.16	26.86	26.89	27.97	27.93	28.53	29.95	30.33
22	29.91	28.72	27.34	26.23	26.19	26.87	26.89	27.93	27.91	28.69	29.98	30.30
23	30.11	28.82	27.28	26.18	26.18	26.80	26.92	27.92	27.89	28.72	29.99	30.47
24	30.06	28.86	27.18	26.16	26.20	26.86	26.99	27.98	27.85	28.74	29.99	30.43
25	29.82	28.77	27.07	26.22	26.24	26.84	27.04	27.97	27.85	28.68	29.94	30.30
26	29.86	28.72	e27.00	26.24	26.28	26.79	27.05	27.95	27.88	28.67	29.94	30.30
27	29.90	28.57	e26.96	26.17	26.33	26.88	27.07	27.93	27.90	28.64	29.95	30.33
28	29.84	28.17	e26.92	26.12	26.34	27.00	27.12	27.92	27.88	28.85	29.92	30.20
29	29.85	---	e26.87	26.13	26.35	27.03	27.20	27.93	27.75	28.93	29.89	30.40
30	29.67	---	26.83	26.06	26.36	27.01	27.26	27.97	27.66	28.97	29.98	30.52
31	29.76	---	26.91	---	26.40	---	27.27	27.92	---	29.05	---	30.40

CAL YR 1987 HIGHEST DAILY MEAN 25.98 MAY 7 LOWEST DAILY MEAN 31.37 JAN 2

e Estimated

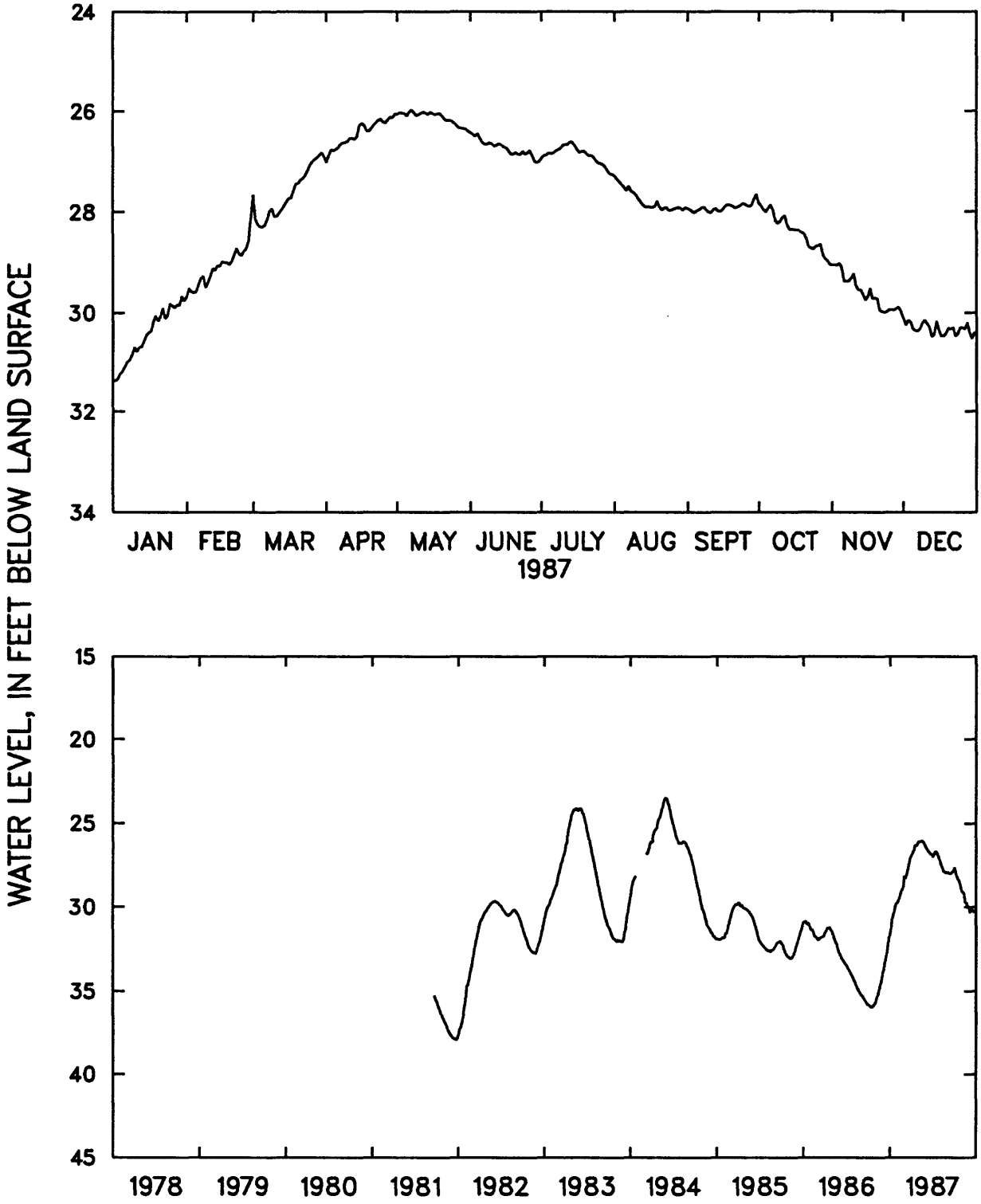


Figure 10.--Water level in observation well NC-144, Transylvania County.

NC-146 NEAR HUNTERSVILLE, MECKLENBURG COUNTY

351730080524203. Local number, NC-146.
LOCATION.--Lat 35°19'16", long 80°52'39", Hydrologic Unit 03050101, 6 mi south of Huntersville in Hornets Nest Park.
Owner: U.S. Geological Survey.
AQUIFER.--Unconfined saprolite derived from metamorphosed quartz diorite.
WELL CHARACTERISTICS.--Drilled observation well, depth 17.1 ft, diameter 4 in, cased to 12.1 ft, screened interval from 12.1 to 17.1 ft, sand filter pack from 12.1 to 17.1 ft.
INSTRUMENTATION.--Digital recorder--60-minute punch.
DATUM.--Land-surface datum is 730 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of casing, 1.90 ft above land-surface datum.
REMARKS.--Climatic-effects well.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.45 ft below land-surface datum, March 1, 1987; lowest, 7.91 ft below land-surface datum, September 2 and 3, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	4.43	3.71	2.65	3.39	4.04	5.24	6.14	7.14	7.82	5.98	6.03	4.63
2	4.08	3.72	3.19	3.46	4.09	5.26	6.16	7.18	7.87	6.03	6.02	4.77
3	4.28	3.74	3.44	3.55	4.13	5.33	6.19	7.20	7.88	6.08	6.00	4.81
4	4.39	3.85	3.60	3.60	4.18	5.32	6.20	7.25	7.83	6.11	5.98	4.86
5	4.49	3.94	3.72	3.68	4.23	5.29	6.20	7.29	7.76	6.10	5.98	4.94
6	4.55	3.95	3.79	3.75	4.24	5.35	6.20	7.33	7.54	6.11	6.03	4.99
7	4.57	3.95	3.81	3.80	4.27	5.41	6.26	7.25	7.17	6.12	6.03	5.03
8	4.64	3.98	3.74	3.85	4.34	5.47	6.28	7.16	5.89	6.17	6.02	5.04
9	4.67	4.12	3.36	3.89	4.42	5.52	6.33	7.17	5.90	6.19	6.00	5.03
10	4.64	4.16	3.46	3.95	4.46	5.58	6.38	7.23	6.04	6.18	5.70	4.86
11	4.71	4.16	3.62	3.97	4.51	5.62	6.41	7.27	5.19	6.16	5.39	4.59
12	4.73	4.15	3.66	4.03	4.54	5.63	6.47	7.26	4.90	6.17	5.42	4.64
13	4.78	4.23	3.71	4.09	4.51	5.67	6.51	7.34	4.62	6.18	5.44	4.75
14	4.80	4.24	3.78	4.12	4.34	5.67	6.52	7.39	4.89	6.20	5.49	4.79
15	4.79	4.29	3.82	3.69	4.35	5.71	6.58	7.40	5.07	6.19	5.54	4.42
16	4.81	4.29	3.88	3.01	4.41	5.72	6.62	7.29	5.22	6.19	5.55	4.19
17	4.83	4.30	3.93	3.29	4.50	5.74	6.67	7.30	5.34	6.19	5.53	4.34
18	4.60	4.27	3.93	3.48	4.56	5.78	6.71	7.41	5.48	6.19	5.49	4.44
19	3.87	4.13	3.69	3.61	4.63	5.77	6.76	7.48	5.60	6.19	5.48	4.49
20	3.96	4.03	3.59	3.70	4.68	5.76	6.81	7.52	5.64	6.20	5.45	4.53
21	4.09	4.00	3.65	3.76	4.71	5.81	6.82	7.57	5.73	6.20	5.49	4.55
22	4.09	3.98	3.75	3.83	4.76	5.88	6.83	7.62	5.83	6.22	5.52	4.17
23	4.10	3.78	3.84	3.89	4.80	5.93	6.89	7.68	5.90	6.20	5.52	4.21
24	4.08	3.87	3.89	3.55	4.85	5.99	6.93	7.72	5.96	6.18	5.53	4.28
25	3.95	3.94	3.88	3.51	4.92	5.93	6.97	7.73	6.02	6.15	5.54	4.16
26	3.76	4.02	3.71	3.62	4.98	5.84	7.01	7.75	6.09	6.15	5.53	4.14
27	3.87	3.65	3.71	3.71	5.02	5.86	7.04	7.79	6.13	6.07	4.76	4.10
28	3.94	2.88	3.66	3.77	5.06	5.98	7.05	7.83	6.17	5.99	4.39	3.84
29	3.98	---	3.71	3.88	5.09	6.05	7.08	7.85	6.18	6.02	4.36	3.81
30	3.76	---	3.45	3.93	5.14	6.11	7.09	7.87	5.99	6.02	4.49	4.00
31	3.60	---	3.20	---	5.20	---	7.09	7.86	---	6.03	---	4.05

CAL YR 1987 HIGHEST DAILY MEAN 2.65 MAR 1 LOWEST DAILY MEAN 7.88 SEP 3

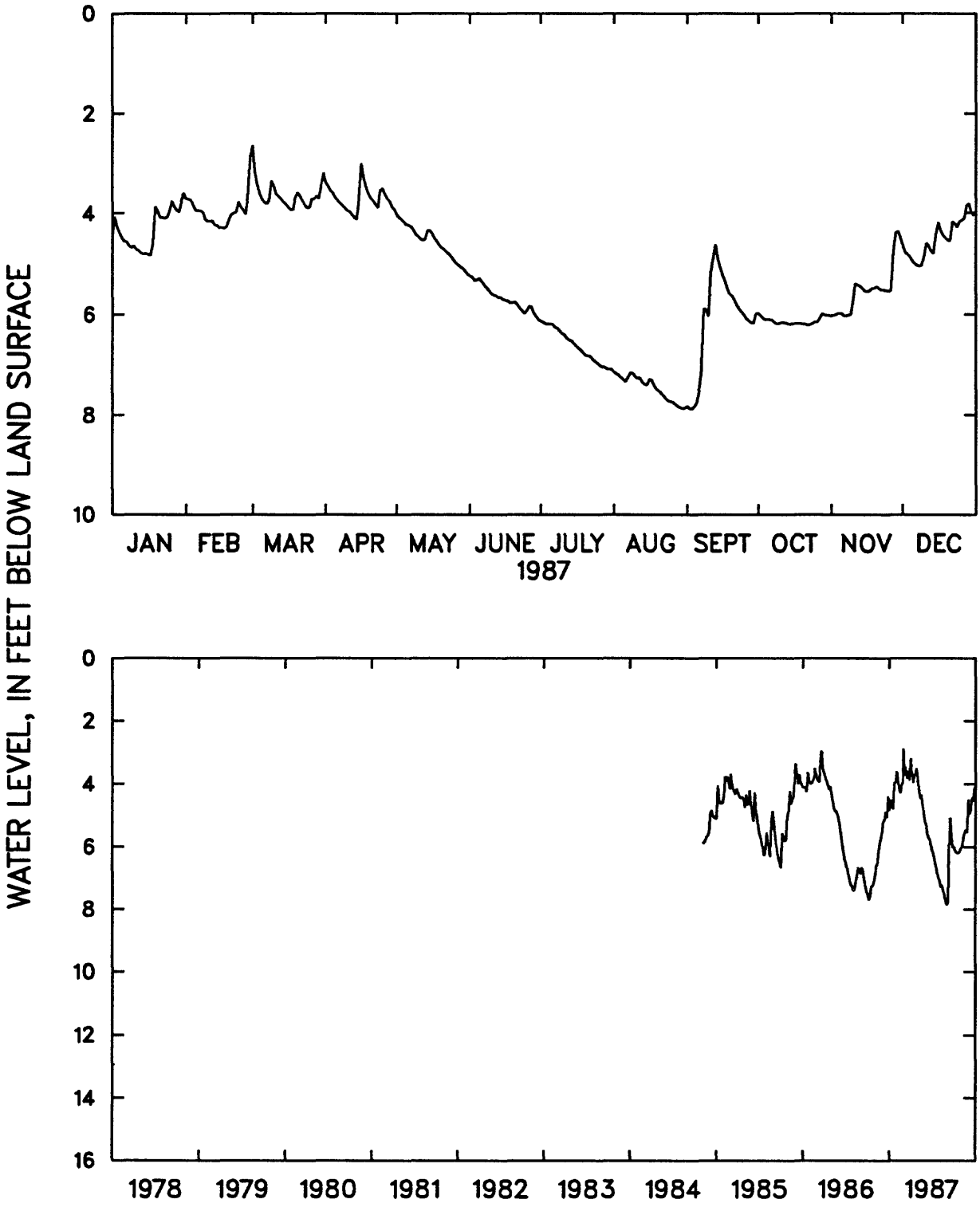


Figure 11.--Water level in observation well NC-146, Mecklenburg County.

NC-147 NEAR BREVARD, TRANSYLVANIA COUNTY

351709082434101. Local number, NC-147
LOCATION.--Lat 35°17'09", long 82°43'41", Hydrologic Unit 06010105, 3.5 mi north of Brevard on U.S. Highway 276, 700 ft northwest of U.S. Forest Service Ranger Station in Pisgah National Forest.
Owner: U.S. Geological Survey.
AQUIFER.--Unconfined alluvial sand.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 25 ft, diameter 4 in, cased to 11.6 ft, screened interval from 11.6 to 21.6 ft; measured depth 22.9 ft, June 1985.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 2,176.70 ft above National Geodetic Vertical Datum of 1929.
Measuring point: Top of casing, 2.24 ft above land-surface datum.
REMARKS.--Climatic-effects well.
PERIOD OF RECORD.--June 1985 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.11 ft below land-surface datum, March 1, 1987; lowest, 17.66 ft below land-surface datum, October 8 and 9, 1986.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	13.09	13.01	8.30	11.77	12.58	13.43	14.23	15.62	15.44	14.27	15.29	14.71
2	13.17	12.98	8.29	11.78	12.64	13.43	14.21	15.60	15.51	14.28	15.30	14.71
3	13.27	12.97	8.86	11.84	12.67	13.45	14.23	15.47	15.60	14.31	15.31	14.72
4	13.32	12.98	9.42	11.86	12.72	13.46	14.24	15.38	15.68	14.35	15.32	14.74
5	13.38	13.04	9.94	11.89	12.78	13.39	14.18	15.28	15.71	14.39	15.35	14.80
6	13.43	13.07	10.36	11.85	12.81	13.43	14.19	15.00	15.61	14.41	15.39	14.86
7	13.45	13.08	10.66	11.64	12.85	13.51	14.24	13.31	15.35	14.45	15.43	14.91
8	13.51	13.12	10.84	11.56	12.91	13.60	14.30	12.99	15.11	14.53	15.45	14.95
9	13.55	13.22	11.00	11.62	12.99	13.68	14.36	12.83	14.95	14.60	15.46	14.97
10	13.56	13.31	11.18	11.73	13.04	13.75	14.46	12.93	14.86	14.64	15.42	14.97
11	13.62	13.35	11.37	11.82	13.08	13.76	14.50	13.19	14.83	14.66	15.30	14.95
12	13.68	13.37	11.50	11.92	13.11	13.74	14.55	13.44	14.38	14.68	15.23	14.94
13	13.75	13.42	11.61	12.03	13.10	13.78	14.62	13.62	12.96	14.72	15.20	14.97
14	13.80	13.46	11.71	12.11	13.05	13.81	14.72	13.78	12.73	14.77	15.19	14.99
15	13.82	13.52	11.80	11.95	12.91	13.87	14.80	13.93	12.90	14.81	15.20	14.75
16	13.86	13.53	11.89	11.65	12.75	13.93	14.87	14.06	13.17	14.84	15.21	14.16
17	13.89	13.50	11.99	11.58	12.67	13.98	14.96	14.17	13.29	14.87	15.16	13.98
18	13.86	13.48	12.06	11.69	12.72	14.01	15.03	14.23	13.21	14.91	15.03	13.98
19	13.24	13.48	12.01	11.82	12.79	14.01	15.09	14.30	13.28	14.94	14.91	14.05
20	12.81	13.45	11.91	11.91	12.79	14.02	15.17	14.42	13.35	14.98	14.83	14.15
21	12.77	13.37	11.89	11.98	12.82	14.04	15.24	14.58	13.48	15.01	14.81	14.24
22	12.80	13.26	11.96	12.05	12.87	14.08	15.30	14.70	13.62	15.05	14.82	14.31
23	12.94	13.13	12.05	12.11	12.94	14.13	15.37	14.82	13.74	15.08	14.85	14.40
24	13.08	13.03	12.14	12.16	12.99	14.18	15.44	14.94	13.84	15.10	14.89	14.47
25	13.13	13.00	12.19	12.24	13.07	14.22	15.51	15.04	13.95	15.12	14.92	14.51
26	13.04	13.07	12.14	12.33	13.14	14.20	15.57	15.11	14.07	15.14	14.96	14.52
27	12.93	12.90	12.11	12.38	13.22	14.04	15.63	15.19	14.15	15.14	14.97	14.52
28	12.90	11.35	12.12	12.41	13.26	14.01	15.68	15.28	14.23	15.16	14.95	14.48
29	12.95	---	12.18	12.47	13.30	14.06	15.74	15.35	14.29	15.20	14.85	14.39
30	12.97	---	12.16	12.52	13.33	14.16	15.76	15.40	14.29	15.23	14.75	14.33
31	13.01	---	11.90	---	13.39	---	15.67	15.44	---	15.26	---	14.29

CAL YR 1987 HIGHEST DAILY MEAN 8.29 MAR 2 LOWEST DAILY MEAN 15.76 JUL 30

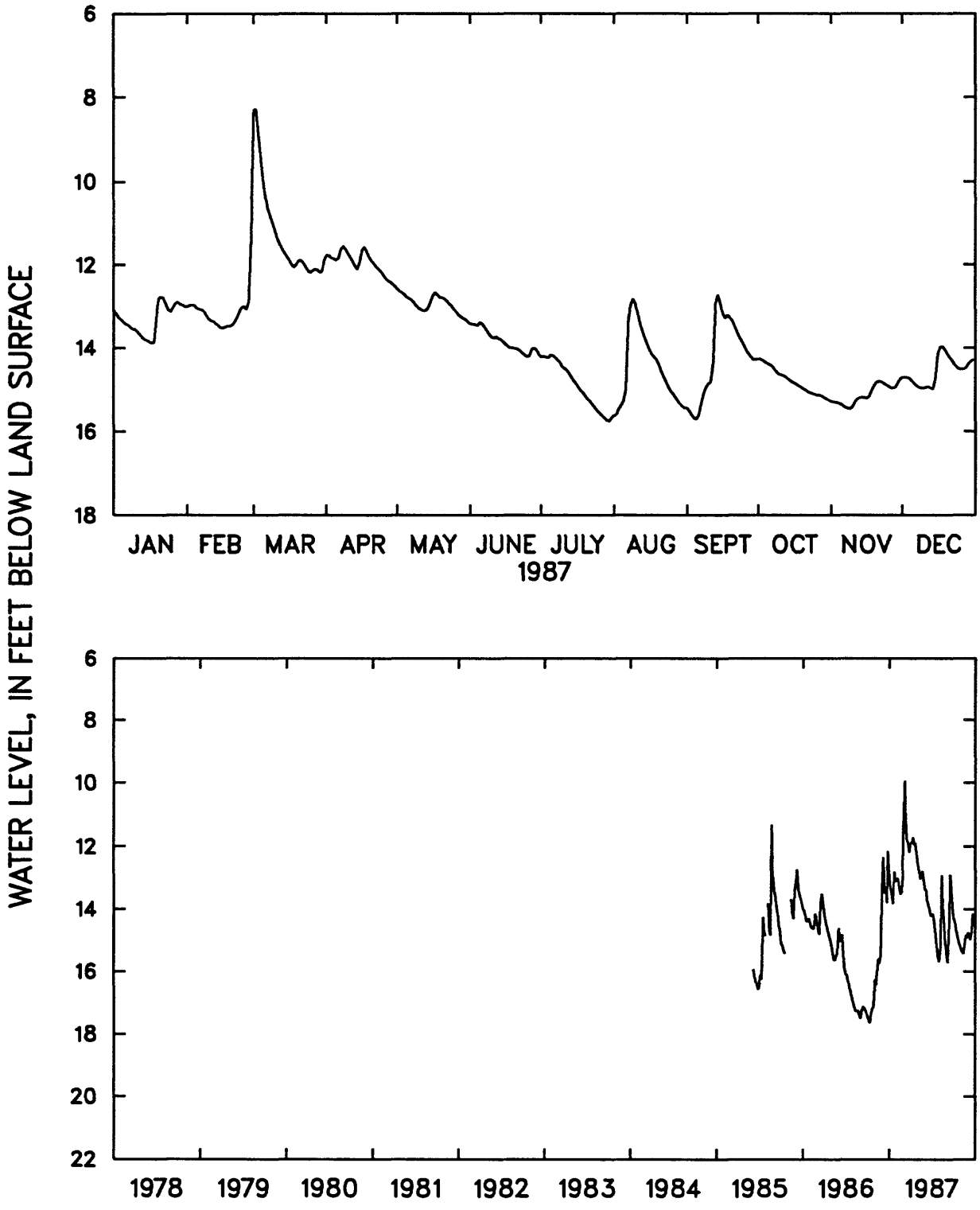


Figure 12.--Water level in observation well NC-147, Transylvania County.

NC-154 NEAR ROXOBEL, BERTIE COUNTY

361420077111407. Local number, NC-154; NRCD Roxobel Research Station well F22b7.
LOCATION.--Lat 36°14'20", long 77°11'14", Hydrologic Unit 03010203, 3.8 mi northeast of Roxobel on Secondary Road 1249.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Surficial aquifer of post-Miocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 12 ft, diameter 4 in, cased to 7 ft, screened interval from 7 to 12 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 74 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 3.05 ft above land-surface datum.
REMARKS.--Climatic-effects well.
PERIOD OF RECORD.--November 1986 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.28 ft below land-surface datum, January 22 and 23 and March 1 and 2, 1987; lowest, 9.31 ft below land-surface datum, September 5, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	2.07	1.69	1.35	---	2.44	4.77	6.80	8.40	9.17	6.45	8.11	4.97
2	1.70	1.71	1.32	---	2.58	4.84	6.88	8.43	9.19	6.57	8.15	5.21
3	1.63	1.67	1.49	---	2.66	4.92	6.95	8.46	9.22	6.68	8.16	5.47
4	1.68	1.74	1.66	---	2.53	4.97	7.02	8.50	9.27	6.79	8.15	5.48
5	1.74	1.83	1.80	---	2.25	4.99	7.07	8.52	9.30	6.89	8.13	5.68
6	1.83	1.88	1.92	---	2.19	5.05	7.11	8.53	9.20	6.95	8.13	5.96
7	1.84	1.87	2.00	---	2.34	5.15	7.15	8.56	8.93	6.97	8.20	6.19
8	1.95	1.92	2.05	---	2.54	5.25	7.21	8.58	8.69	7.02	8.25	6.31
9	2.05	2.07	1.96	---	2.74	5.36	7.28	8.62	8.59	7.12	8.27	6.36
10	2.04	2.28	1.74	---	2.89	5.49	7.36	8.65	8.57	7.21	8.28	6.36
11	1.86	2.24	1.54	---	3.03	5.64	7.44	8.70	8.60	7.25	8.25	5.27
12	1.86	2.21	1.53	---	3.16	5.73	7.52	8.77	8.64	7.26	8.23	4.56
13	1.97	2.25	1.58	---	3.29	5.78	7.58	8.83	7.85	7.29	8.25	4.66
14	2.08	2.32	1.69	---	3.40	5.82	7.62	8.89	6.75	7.36	8.26	4.93
15	2.18	2.28	1.79	2.50	3.44	5.84	7.68	8.93	6.60	7.44	8.29	4.46
16	---	2.25	1.87	1.99	3.51	5.92	7.64	8.82	6.67	7.49	8.32	3.31
17	2.17	2.02	1.77	1.50	3.62	6.00	7.49	8.76	6.79	7.54	8.34	3.45
18	1.91	1.70	---	1.44	3.71	6.09	7.50	8.76	6.90	7.57	8.33	3.75
19	1.49	1.54	---	1.47	3.81	6.18	7.56	8.81	7.02	7.62	8.33	3.87
20	1.35	1.53	---	1.55	3.92	6.15	7.64	8.80	5.33	7.67	8.33	3.94
21	1.42	1.55	---	1.63	3.97	6.15	7.73	8.79	4.36	7.70	8.30	3.96
22	1.37	1.59	---	1.72	4.04	6.21	7.80	8.82	4.61	7.77	8.34	3.35
23	1.36	1.44	---	1.86	4.12	6.27	7.88	8.86	4.88	7.85	8.36	3.07
24	1.54	1.44	---	1.96	4.20	6.33	7.96	8.93	5.13	7.90	8.37	2.98
25	1.59	1.53	---	1.74	4.31	6.36	8.04	9.01	5.45	7.93	8.38	2.87
26	1.50	1.63	---	1.59	4.38	6.38	8.10	9.06	5.80	7.95	8.38	2.74
27	1.53	1.70	---	1.66	4.41	6.42	8.14	9.09	6.06	7.95	8.35	2.69
28	1.57	1.56	---	1.80	4.46	6.50	8.19	9.11	6.26	7.92	8.20	2.45
29	1.63	---	---	2.01	4.51	6.61	8.24	9.10	6.35	7.96	6.83	2.12
30	1.57	---	---	2.23	4.58	6.72	8.31	9.13	6.39	8.02	5.12	2.11
31	1.58	---	---	---	4.67	---	8.36	9.17	---	8.06	---	2.11

CAL YR 1987 HIGHEST DAILY MEAN 1.32 MAR 2 LOWEST DAILY MEAN 9.30 SEP 5

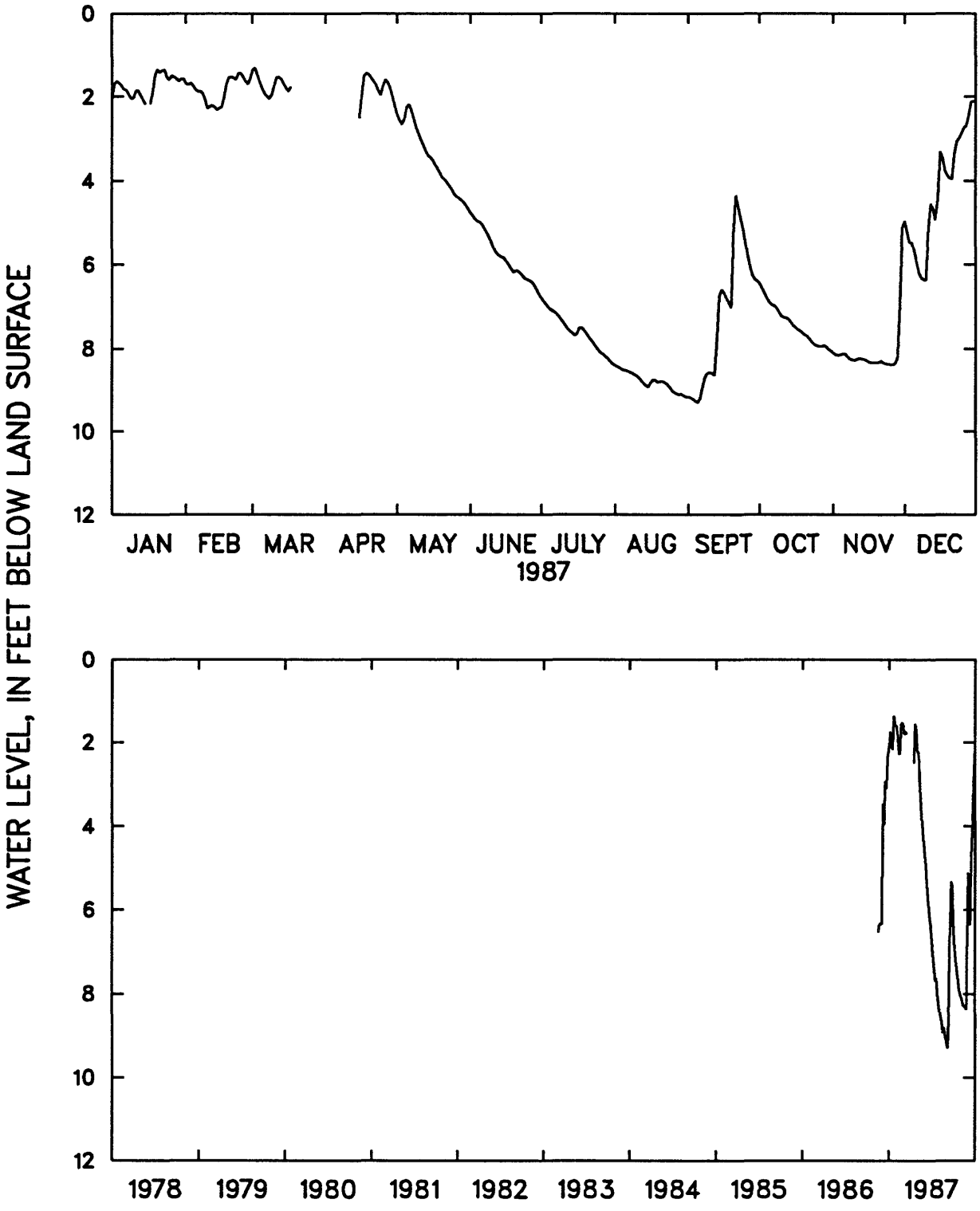


Figure 13.--Water level in observation well NC-154, Bertie County.

NC-160 NEAR SIMPSON, PITT COUNTY

353219077153801. Local number, NC-160.
LOCATION.--Lat 35°32'19", long 77°15'38", Hydrologic Unit 03020103, 2.7 mi southwest of Simpson in southeast corner of intersection of Secondary Roads 1755 and 1769.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial aquifer of post-Miocene age.
WELL CHARACTERISTICS.--Bored observation well, augered to 12 ft, diameter 6 in, cased to 5.9 ft, screened interval from 5.9 ft to 10.9 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Measuring point: Top of casing, 57.31 ft above National Geodetic Vertical Datum of 1929 (levels by Soil Conservation Service).
REMARKS.--Climatic-effects well. From December 1976 to April 1987, well was part of a study of the effects of channelization on hydrology of Chicod Creek watershed.
PERIOD OF RECORD.--December 1976 to current year. Prior to October 1986, published as Local number, PI-532.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 55.22 ft above NGVD, September 14, 1984; lowest, 47.43 ft above NGVD, November 6, 7, and 8, 1978.

WATER LEVEL, IN FEET ABOVE NGVD, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	53.42	53.66	54.64	53.69	53.09	50.82	50.63	49.69	49.24	50.78	48.71	49.48
2	54.13	53.63	54.18	53.58	52.99	51.01	50.66	50.94	49.05	50.61	48.69	49.21
3	53.85	53.58	53.93	53.51	52.92	50.79	50.57	50.51	48.95	50.53	48.66	49.12
4	53.73	53.48	53.76	53.64	52.86	51.63	50.51	50.27	48.88	50.36	48.65	49.07
5	53.61	53.41	53.65	53.55	52.89	51.54	50.47	50.14	49.10	50.27	48.62	48.89
6	53.52	53.40	53.56	53.46	52.83	51.33	50.84	49.92	49.01	50.22	48.51	48.81
7	53.45	53.43	53.52	53.37	52.72	51.17	51.61	50.14	49.20	50.14	48.47	48.76
8	53.38	53.41	53.50	53.28	52.65	51.04	51.37	50.10	49.28	49.95	48.45	48.74
9	53.31	53.24	53.71	53.18	52.53	50.92	51.32	49.84	49.18	49.83	48.46	48.74
10	53.41	53.17	54.17	53.09	52.42	50.79	51.11	49.98	50.65	49.79	48.48	48.77
11	53.56	53.18	53.91	53.03	52.33	50.72	50.99	51.50	50.41	49.79	48.46	48.81
12	53.42	53.16	53.90	52.97	52.26	50.74	50.95	51.26	50.17	49.69	48.42	48.71
13	53.27	53.06	53.80	52.87	52.24	50.70	50.90	50.99	50.30	49.53	48.39	48.63
14	53.23	53.04	53.67	52.80	52.23	51.14	50.72	50.83	50.51	49.42	48.36	48.59
15	53.22	53.00	53.58	52.89	52.14	51.22	50.66	51.02	50.27	49.40	48.31	49.34
16	53.17	53.06	53.54	54.29	52.00	50.97	50.56	51.12	50.05	49.34	48.31	50.44
17	53.38	54.06	53.51	54.23	51.91	50.91	50.44	50.84	49.90	49.32	48.33	50.15
18	53.93	53.98	53.44	53.96	51.82	52.10	50.30	50.64	49.76	49.28	48.32	49.93
19	54.68	53.78	53.52	53.85	51.73	52.02	50.16	50.60	49.63	49.18	48.31	49.83
20	54.30	53.67	53.81	53.74	51.72	51.82	50.03	50.91	51.39	49.14	48.27	49.78
21	54.10	53.60	53.67	53.65	51.66	51.67	49.91	50.64	51.95	49.08	48.20	49.81
22	54.73	53.60	53.52	53.54	51.58	51.55	49.78	50.62	51.81	48.94	48.19	50.38
23	54.27	54.00	53.38	53.46	51.48	51.42	49.69	50.53	51.64	48.89	48.21	50.56
24	53.97	53.78	53.31	53.44	51.40	51.37	49.63	50.35	51.52	48.87	48.18	50.54
25	53.99	53.65	53.25	54.05	51.31	51.27	49.59	50.22	51.36	48.87	48.17	50.56
26	54.22	53.57	53.21	53.89	51.29	51.15	49.51	50.09	51.20	48.78	48.17	50.57
27	53.93	53.81	53.44	53.68	51.20	51.00	49.39	49.88	51.04	48.94	48.19	50.66
28	53.80	54.38	54.07	53.54	51.13	50.80	49.36	49.72	50.92	49.15	48.58	51.25
29	53.73	---	53.85	53.37	51.05	50.71	49.27	49.59	50.84	48.93	49.32	52.31
30	53.89	---	53.84	53.21	50.95	50.61	49.17	49.51	50.89	48.80	49.78	52.37
31	53.81	---	53.91	---	50.82	---	49.12	49.47	---	48.74	---	52.38

CAL YR 1987 HIGHEST DAILY MEAN 54.73 JAN 22 LOWEST DAILY MEAN 48.17 NOV 25, 26

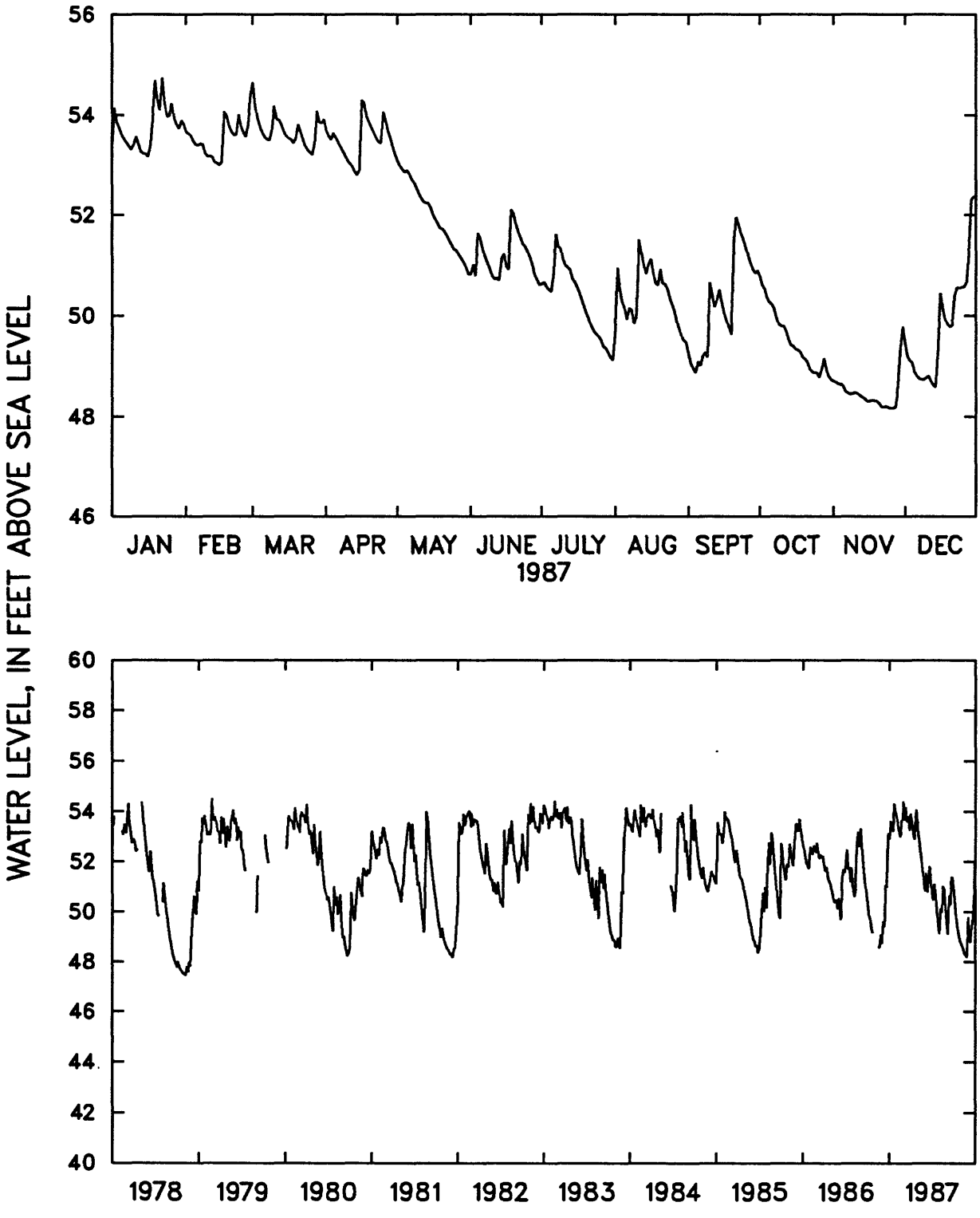


Figure 14.--Water level in observation well NC-160, Pitt County.

NC-168 AT MINGO, SAMPSON COUNTY

351121078340411. Local number, NC-168; NRCD Mingo Research Station well R38p11.
LOCATION.--Lat 35°11'21", long 78°34'04", Hydrologic Unit 03030006, at Mingo in northeast corner of intersection of Secondary Roads 1002 and 1606.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Surficial aquifer of post-Miocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 20 ft, diameter 4 in, cased to 5 ft, screened interval from 5 to 20 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 192 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 2.79 ft above land-surface datum.
REMARKS.--Climatic-effects well.
PERIOD OF RECORD.--December 1986 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.73 ft below land-surface datum, April 17 and 18, 1987; lowest, 17.94 ft below land-surface datum, December 24 and 25, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	10.90	5.44	4.43	4.37	4.21	5.32	5.99	7.41	7.68	7.22	9.07	15.80
2	10.46	5.41	4.10	4.37	4.26	5.36	6.02	7.47	7.75	7.28	9.15	16.00
3	9.69	5.42	4.03	4.37	4.29	5.42	6.03	7.52	7.80	7.32	9.24	16.17
4	8.76	5.48	4.04	4.40	4.29	5.45	6.06	7.58	7.85	7.39	9.28	16.30
5	8.52	5.51	4.05	4.43	4.31	5.49	6.09	7.64	7.88	7.42	9.38	16.44
6	8.36	5.51	4.07	4.44	4.33	5.54	6.13	7.70	7.90	7.44	9.54	16.61
7	8.26	5.49	4.07	4.46	4.37	5.58	6.16	7.75	7.93	7.49	9.63	16.77
8	8.22	5.50	4.04	4.48	4.38	5.62	6.21	7.80	7.97	7.56	9.70	16.95
9	8.18	5.58	4.04	4.50	4.44	5.65	6.25	7.80	8.03	7.62	9.82	17.10
10	8.11	5.60	4.10	4.54	4.49	5.69	6.29	7.81	8.05	7.65	9.98	17.22
11	8.14	5.59	4.13	4.55	4.52	5.75	6.34	7.83	7.88	7.67	10.17	17.33
12	8.14	5.57	4.11	4.59	4.54	5.79	6.39	7.86	7.64	7.73	10.41	17.43
13	8.18	5.60	4.12	4.62	4.57	5.81	6.43	7.87	7.50	7.81	10.69	17.50
14	8.18	5.59	4.15	4.65	4.60	5.84	6.46	7.81	7.42	7.86	11.03	17.58
15	8.16	5.61	4.17	4.47	4.64	5.87	6.51	7.74	7.33	7.91	11.38	17.62
16	8.17	5.62	4.18	3.96	4.69	5.91	6.56	7.71	7.22	7.96	11.73	17.67
17	8.17	5.62	4.23	3.76	4.73	5.96	6.63	7.68	7.13	8.00	12.08	17.73
18	8.13	5.64	4.24	3.74	4.77	5.98	6.67	7.67	7.07	8.07	12.38	17.78
19	8.10	5.67	4.23	3.77	4.81	5.88	6.72	7.66	7.02	8.13	12.72	17.82
20	7.60	5.56	4.28	3.81	4.83	5.77	6.78	7.67	6.98	8.20	13.12	17.84
21	7.04	5.40	4.31	3.83	4.87	5.70	6.82	7.67	6.98	8.28	13.46	17.85
22	6.72	5.29	4.34	3.88	4.91	5.68	6.86	7.65	6.98	8.39	13.88	17.87
23	5.94	5.26	4.36	3.91	4.95	5.69	6.92	7.62	6.98	8.43	14.27	17.91
24	5.69	5.18	4.39	3.92	4.99	5.71	6.97	7.62	6.98	8.49	14.55	17.93
25	5.56	5.11	4.40	3.97	5.03	5.75	7.03	7.59	6.99	8.54	14.80	17.94
26	5.48	5.07	4.41	4.04	5.06	5.77	7.08	7.56	7.04	8.63	14.98	17.93
27	5.47	5.04	4.42	4.08	5.10	5.79	7.14	7.54	7.09	8.67	15.13	17.92
28	5.45	4.93	4.44	4.10	5.14	5.88	7.20	7.54	7.13	8.76	15.29	17.92
29	5.43	---	4.37	4.15	5.19	5.94	7.25	7.57	7.15	8.85	15.46	17.86
30	5.40	---	4.27	4.19	5.24	5.96	7.31	7.60	7.14	8.93	15.62	17.82
31	5.43	---	4.30	---	5.28	---	7.36	7.63	---	9.00	---	17.75

CAL YR 1987 HIGHEST DAILY MEAN 3.74 APR 18 LOWEST DAILY MEAN 17.94 DEC 25

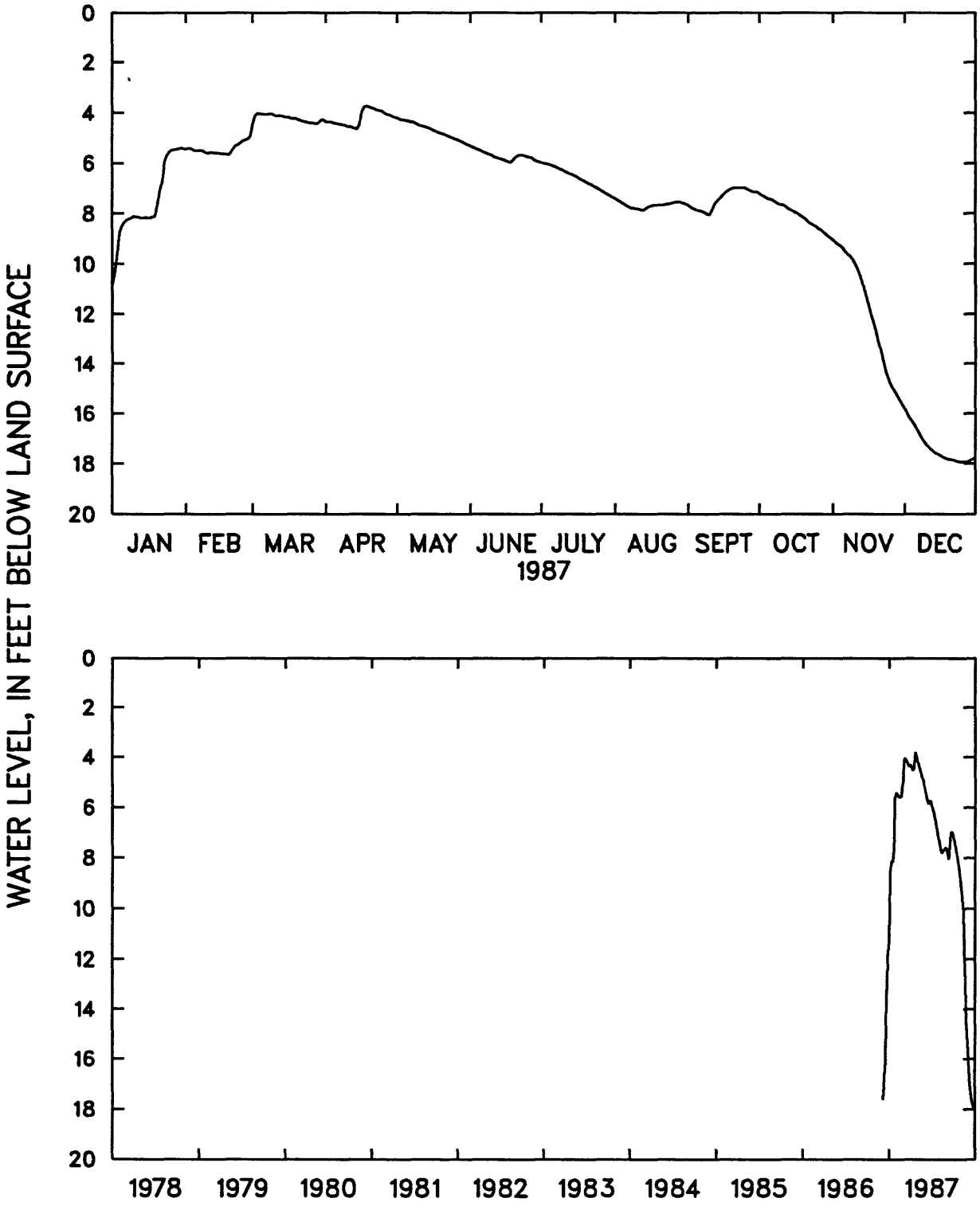


Figure 15.--Water level in observation well NC-168, Sampson County.

NC-171 NEAR HOFFMAN, RICHMOND COUNTY

350122079325006. Local number, NC-171; NRCD Hoffman Research Station well T50r6.
LOCATION.--Lat 35°01'22", long 79°32'50", Hydrologic Unit 03040203, 0.6 mi south of Hoffman on Secondary Road 1474.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Surficial aquifer of post-Miocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 60 feet, diameter 4 in, cased to 45 ft, screened interval from 45 to 60 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 413 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 3.0 ft above land-surface datum.
REMARKS.--Terrane-effects well.
PERIOD OF RECORD.--January to December 1987.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 38.55 ft below land-surface datum, April 8, 9, and 10, 1987; lowest, 44.20 ft below land-surface datum, January 1, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	44.19	43.63	41.20	38.71	39.02	39.96	40.84	41.68	42.45	42.98	43.29	43.62
2	44.18	43.58	41.14	38.70	39.05	39.98	40.86	41.70	42.48	43.00	43.29	43.65
3	44.18	43.51	41.11	38.66	39.09	40.01	40.89	41.73	42.50	43.01	43.30	43.67
4	44.18	43.45	41.08	38.60	39.13	40.04	40.91	41.75	42.53	43.04	43.30	43.67
5	44.16	43.40	41.04	38.58	39.19	40.07	40.94	41.77	42.55	43.05	43.30	43.69
6	44.16	43.33	41.00	38.57	39.22	40.10	40.97	41.80	42.57	43.05	43.31	43.72
7	44.14	43.23	40.94	38.56	39.24	40.15	41.00	41.84	42.58	43.04	43.34	43.74
8	44.12	43.12	40.86	38.55	39.25	40.18	41.03	41.87	42.59	43.06	43.35	43.75
9	44.11	43.01	40.76	38.55	39.29	40.20	41.06	41.90	42.62	43.09	43.36	43.76
10	44.09	42.94	40.70	38.56	39.33	40.22	41.09	41.92	42.64	43.10	43.36	43.76
11	44.06	42.85	40.66	38.58	39.36	40.25	41.11	41.95	42.66	43.10	43.36	43.76
12	44.06	42.74	40.58	38.59	39.38	40.27	41.14	41.97	42.69	43.10	43.38	43.77
13	44.04	42.62	40.49	38.62	39.42	40.28	41.16	42.01	42.70	43.10	43.40	43.79
14	44.04	42.51	40.39	38.68	39.46	40.29	41.18	42.04	42.72	43.12	43.41	43.82
15	44.02	42.40	40.28	38.68	39.48	40.32	41.21	42.06	42.74	43.13	43.43	43.83
16	44.01	42.30	40.16	38.63	39.49	40.35	41.24	42.08	42.76	43.14	43.45	43.83
17	43.99	42.19	40.06	38.61	39.52	40.39	41.28	42.10	42.78	43.14	43.46	43.85
18	43.98	42.09	39.93	38.65	39.54	40.43	41.32	42.12	42.78	43.15	43.46	43.88
19	43.95	42.00	39.79	38.71	39.56	40.46	41.35	42.14	42.80	43.15	43.48	43.89
20	43.93	41.92	39.65	38.77	39.59	40.49	41.38	42.17	42.82	43.16	43.48	43.90
21	43.93	41.84	39.52	38.81	39.64	40.51	41.41	42.21	42.84	43.16	43.49	43.91
22	43.90	41.74	39.40	38.84	39.68	40.53	41.44	42.23	42.86	43.19	43.51	43.92
23	43.87	41.64	39.31	38.87	39.71	40.56	41.46	42.25	42.88	43.20	43.54	43.94
24	43.87	41.56	39.22	38.88	39.74	40.59	41.48	42.27	42.89	43.22	43.57	43.96
25	43.86	41.50	39.13	38.89	39.76	40.62	41.51	42.30	42.90	43.22	43.58	43.96
26	43.82	41.44	39.04	38.95	39.79	40.65	41.54	42.33	42.93	43.22	43.59	43.97
27	43.80	41.37	38.96	38.99	39.83	40.67	41.55	42.35	42.96	43.22	43.60	43.99
28	43.78	41.29	38.88	39.00	39.86	40.71	41.57	42.36	42.98	43.22	43.61	44.00
29	43.76	---	38.85	39.01	39.89	40.77	41.60	42.38	42.98	43.24	43.61	44.00
30	43.72	---	38.78	39.00	39.92	40.81	41.63	42.41	42.98	43.26	43.61	44.03
31	43.67	---	38.69	---	39.94	---	41.66	42.43	---	43.27	---	44.05

CAL YR 1987 HIGHEST DAILY MEAN 38.55 APR 8, 9 LOWEST DAILY MEAN 44.19 JAN 1

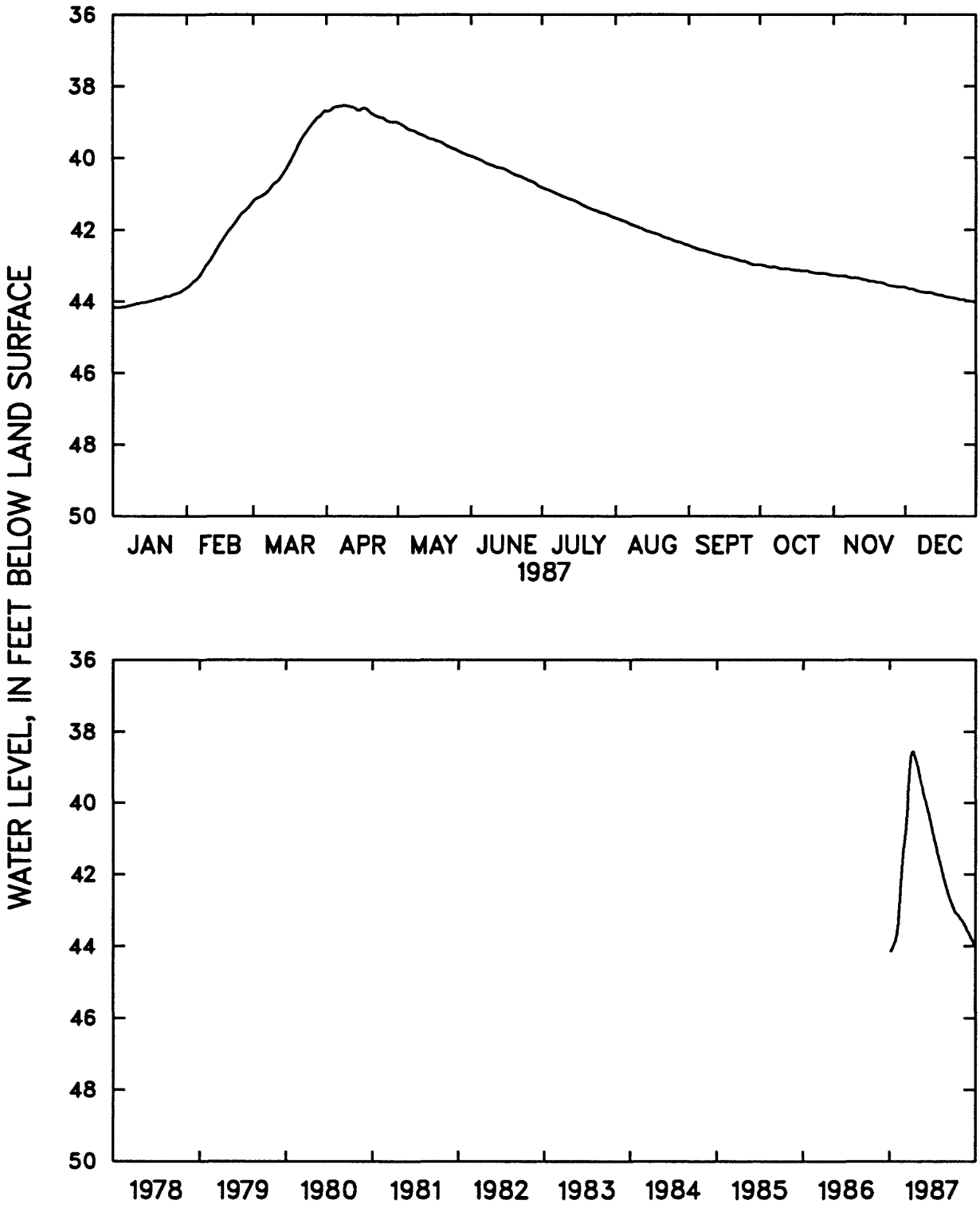


Figure 16.--Water level in observation well NC-171, Richmond County.

NC-173 NEAR COMFORT, JONES COUNTY

345809077301408. Local number, NC-173; NRCD Comfort Research Station well U26j8.
LOCATION.--Lat 34°58'09", long 77°30'12", Hydrologic Unit 03020204, 2.5 mi south of Comfort at North Carolina Division of Forest Resources Fire Tower on Secondary Road 1003.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Surficial aquifer of post-Miocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 15 ft, diameter 4 in, cased to 5 ft, screened interval from 5 to 15 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 68 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of collar on casing, 2.35 ft above land-surface datum.
REMARKS.--Climatic-effects well.
PERIOD OF RECORD.--January to December 1987.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.40 ft below land-surface datum, March 1, 1987; lowest, 9.72 ft below land-surface datum, November 27 and 28, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	---	2.11	.64	3.15	4.12	5.95	8.09	9.09	7.69	8.22	9.44	9.58
2	---	2.16	.95	3.22	4.26	6.11	8.04	9.11	7.78	8.44	9.45	9.56
3	---	2.31	1.23	3.30	4.40	6.29	8.05	9.15	7.88	8.45	9.46	9.52
4	---	2.46	1.51	3.30	4.51	6.31	7.48	9.18	7.89	8.55	9.47	9.46
5	---	2.57	1.73	3.36	4.57	6.34	7.44	9.20	7.75	8.60	9.50	9.43
6	---	2.62	1.89	3.46	4.66	6.54	7.50	9.23	7.63	8.63	9.54	9.40
7	---	2.55	2.01	3.57	4.79	6.70	7.56	9.23	7.54	8.68	9.55	9.35
8	---	2.57	2.07	3.67	4.85	6.84	7.66	9.20	7.22	8.77	9.55	9.30
9	---	2.77	2.12	3.78	4.98	6.99	7.85	9.22	7.00	8.84	9.56	9.26
10	---	2.86	2.33	3.89	5.10	7.17	7.98	9.25	6.89	8.87	9.57	9.23
11	---	2.93	2.44	3.97	5.22	7.32	8.10	9.24	6.85	8.88	9.58	9.19
12	---	2.98	2.50	4.06	5.32	7.40	8.13	9.15	6.84	8.90	9.59	9.14
13	---	3.11	2.60	4.17	5.43	7.51	8.20	9.11	6.80	8.95	9.59	9.10
14	---	3.16	2.72	4.24	5.42	7.26	8.30	9.11	6.86	8.99	9.60	9.04
15	2.88	3.25	2.82	4.11	5.46	7.10	8.29	9.02	6.94	9.02	9.61	8.95
16	2.94	3.23	2.92	3.26	5.61	7.24	8.30	8.90	7.03	9.05	9.62	8.86
17	2.56	2.37	3.01	3.07	5.72	7.47	8.48	8.83	7.05	9.08	9.63	8.77
18	2.10	2.24	3.10	3.10	5.84	7.49	8.55	8.79	7.12	9.10	9.64	8.68
19	1.60	2.37	3.07	3.16	5.97	7.43	8.62	8.77	7.23	9.13	9.64	8.56
20	1.69	2.49	2.89	3.24	5.71	7.25	8.69	8.70	7.28	9.17	9.65	8.44
21	1.85	2.58	2.98	3.35	5.15	7.20	8.74	8.51	7.42	9.19	9.67	8.35
22	.78	2.60	3.12	3.51	4.85	7.26	8.79	8.31	7.57	9.24	9.68	8.25
23	.92	2.41	3.26	3.61	4.72	7.33	8.84	8.15	7.72	9.28	9.70	8.19
24	1.21	2.56	3.36	3.66	4.72	7.38	8.88	8.09	7.82	9.29	9.70	8.11
25	1.21	2.67	3.45	3.64	4.82	7.47	8.92	8.00	7.97	9.31	9.70	7.98
26	1.04	2.78	3.52	3.55	4.95	7.58	8.95	7.89	8.12	9.34	9.70	7.87
27	1.40	2.56	3.55	3.58	5.09	7.70	8.99	7.85	8.21	9.36	9.72	7.80
28	1.60	1.49	3.40	3.70	5.25	7.97	9.00	7.88	8.23	9.37	9.72	7.50
29	1.75	---	3.31	3.86	5.40	8.10	9.03	7.94	8.21	9.39	9.67	6.94
30	1.77	---	3.26	4.01	5.60	8.16	9.05	7.88	8.12	9.41	9.62	6.58
31	1.96	---	3.16	---	5.78	---	9.08	7.74	---	9.42	---	6.33

CAL YR 1987 HIGHEST DAILY MEAN .64 MAR 1 LOWEST DAILY MEAN 9.72 NOV 27, 28

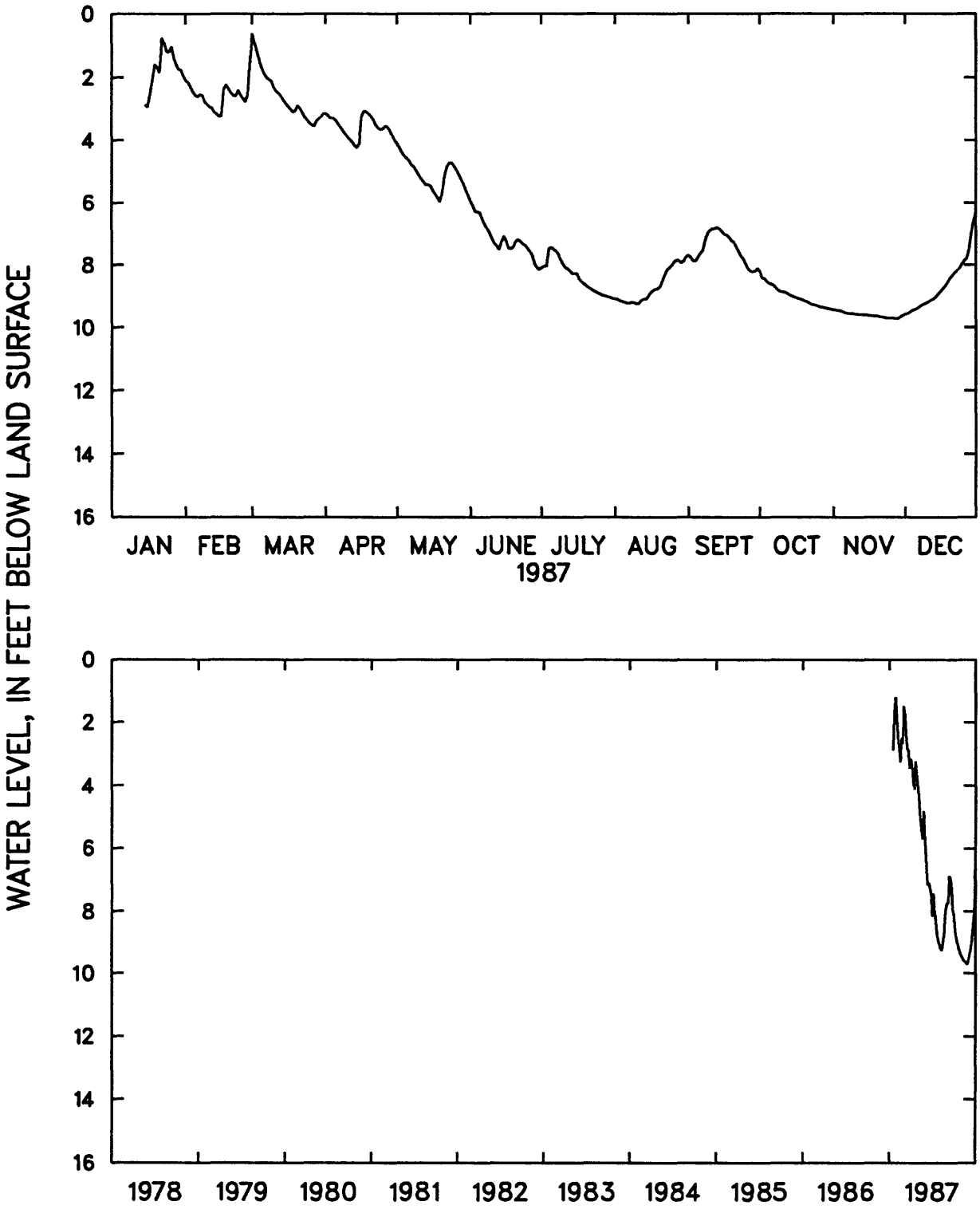


Figure 17.--Water level in observation well NC-173, Jones County.

NC-182 NEAR SUNSET HARBOR, BRUNSWICK COUNTY

335629078115407. Local number, NC-182; NRCD Sunset Harbor Research Station well GG34s7.
LOCATION.--Lat 33°56'29", long 78°11'54", Hydrologic Unit 03040207, 1 mi north of Sunset Harbor, 4.3 mi south of N.C. Highway 211 on Secondary Road 1112.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Surficial aquifer of post-Miocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 15 ft, diameter 4 in, cased to 10 ft, screened interval from 10 to 15 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 25 ft above National Geodetic Vertical Datum of 1929 (hand level by USGS).
Measuring point: Top of collar on casing, 2.65 ft above land-surface datum.
REMARKS.--Climatic-effects well.
PERIOD OF RECORD.--January to December 1987.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.65 ft below land-surface datum, April 15, 1987; lowest, 4.68 ft below land-surface datum, December 31, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	---	1.68	.81	1.57	1.95	2.81	3.33	4.12	3.06	3.18	3.94	3.53
2	---	1.69	.90	1.66	1.98	2.83	3.35	4.14	3.09	3.23	3.96	3.60
3	---	1.73	1.01	1.68	2.02	2.86	3.37	4.16	3.14	3.26	3.98	3.66
4	---	1.80	1.09	1.70	2.04	2.72	3.39	4.19	3.00	3.29	3.99	3.72
5	---	1.85	1.17	1.76	2.01	2.62	3.43	4.21	2.35	3.32	3.99	3.79
6	---	1.86	1.22	1.79	2.07	2.76	3.47	4.24	2.33	3.34	4.02	3.85
7	---	1.23	1.25	1.82	2.10	2.86	3.50	4.22	2.40	3.37	4.04	3.89
8	---	1.38	1.21	1.85	2.12	2.90	3.54	4.23	2.46	3.41	4.06	3.93
9	---	1.54	1.25	1.87	2.16	2.93	3.57	4.26	2.54	3.44	4.07	3.96
10	---	1.65	1.34	1.90	2.19	2.96	3.60	4.28	2.59	3.47	3.95	3.98
11	---	1.71	1.41	1.93	2.22	2.99	3.65	3.96	2.64	3.48	3.63	4.01
12	---	1.74	1.42	1.95	2.24	3.02	3.67	2.93	2.69	3.50	3.66	4.04
13	---	1.81	1.41	1.98	2.27	3.04	3.69	3.03	2.52	3.53	3.72	4.08
14	1.81	1.84	1.42	2.01	2.30	2.98	3.71	3.15	2.57	3.56	3.80	4.12
15	1.83	1.89	1.43	1.45	2.32	2.89	3.71	2.94	2.66	3.59	3.88	4.13
16	1.79	1.64	1.45	1.13	2.34	2.78	3.62	3.01	2.72	3.62	3.94	4.14
17	1.71	1.61	1.48	1.32	2.38	2.87	3.69	3.14	2.76	3.64	3.99	4.17
18	1.63	1.76	1.50	1.40	2.41	2.96	3.74	3.23	2.80	3.67	4.02	4.22
19	1.55	1.86	1.21	1.41	2.43	3.01	3.77	3.31	2.84	3.70	4.05	4.25
20	1.63	1.92	1.30	1.52	2.44	3.04	3.81	3.36	2.88	3.72	4.07	4.29
21	1.71	1.90	1.41	1.57	2.46	3.07	3.84	3.42	2.92	3.74	4.10	4.32
22	1.21	1.81	1.50	1.62	2.49	3.10	3.86	3.48	2.96	3.78	4.13	4.35
23	1.36	1.73	1.55	1.66	2.52	3.12	3.90	3.54	3.00	3.80	4.15	4.40
24	1.48	1.88	1.59	1.67	2.55	3.15	3.93	3.58	3.03	3.83	4.17	4.45
25	1.37	1.94	1.61	1.71	2.58	3.17	3.95	3.47	3.07	3.85	4.20	4.48
26	1.28	1.98	1.62	1.76	2.62	3.11	3.98	3.39	3.11	3.87	4.21	4.51
27	1.42	1.55	1.48	1.81	2.65	3.15	4.01	3.48	3.14	3.83	4.22	4.55
28	1.50	1.09	1.59	1.84	2.69	3.21	4.03	3.57	3.15	3.80	3.82	4.57
29	1.56	---	1.67	1.90	2.72	3.25	4.05	3.63	3.17	3.86	3.60	4.60
30	1.56	---	1.50	1.92	2.75	3.29	4.07	3.66	3.17	3.89	3.49	4.64
31	1.62	---	1.39	---	2.78	---	4.09	3.53	---	3.92	---	4.66

CAL YR 1987 HIGHEST DAILY MEAN .81 MAR 1 LOWEST DAILY MEAN 4.66 DEC 31

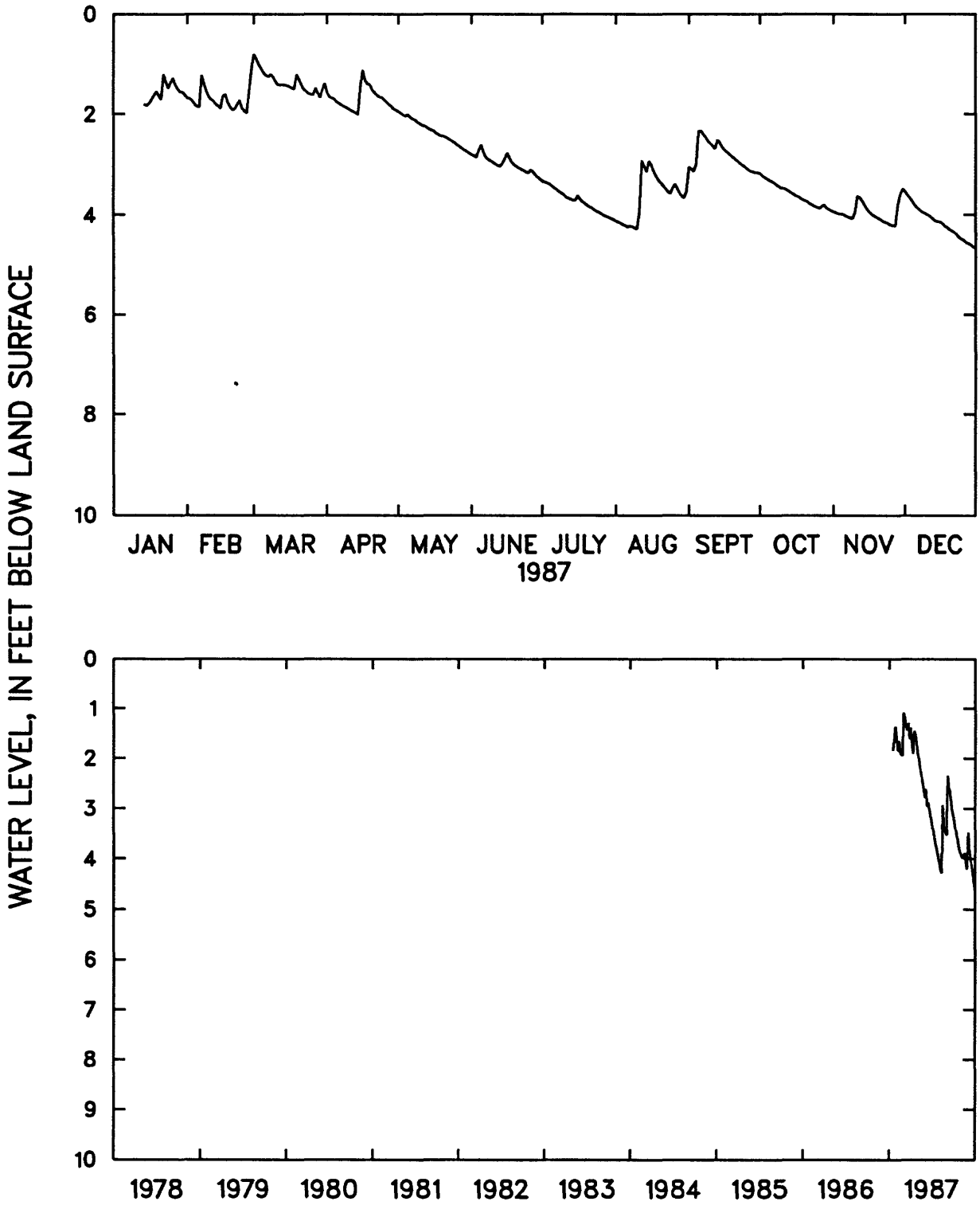


Figure 18.--Water level in observation well NC-182, Brunswick County.

Induced-Stress Network

Yorktown Aquifer

Three areal-effects wells tap the Yorktown aquifer in the northeastern and eastern Coastal Plain (fig. 19). Well NC-150 (fig. 20) in Pasquotank County is about 2.7 miles north of public-supply wells that withdraw water from this aquifer. The hydrograph for that well shows either a subdued response to climate and (or) seasonal pumping. The water level in this well was below sea level at the end of the growing season in 1985, 1986, and 1987 and has declined between 1 to 2 feet during the last decade.

Water levels in well NC-157 (fig. 21) in Washington County have shown a slight downward trend in the last decade. The cause of the trend has not been identified.

Well NC-162 (fig. 22) is at the western edge of a phosphate mining area in Beaufort County. The aquifer below the Yorktown aquifer, the Castle Hayne aquifer, is heavily pumped in order to depressurize that aquifer locally and to allow open-pit mining of ore beds in the Pungo River Formation. This pumping has induced leakage of ground water from the Yorktown and Pungo River aquifers into the Castle Hayne aquifer. This has caused the lowering of the hydraulic head in the Yorktown and Pungo River aquifers with the result that the water levels in well NC-162 have been consistently below sea level since 1980. Comparison of the hydrograph of well NC-162 to that of adjacent well NC-145 (fig. 32), which taps the Castle Hayne aquifer, shows the effects of this pumping.

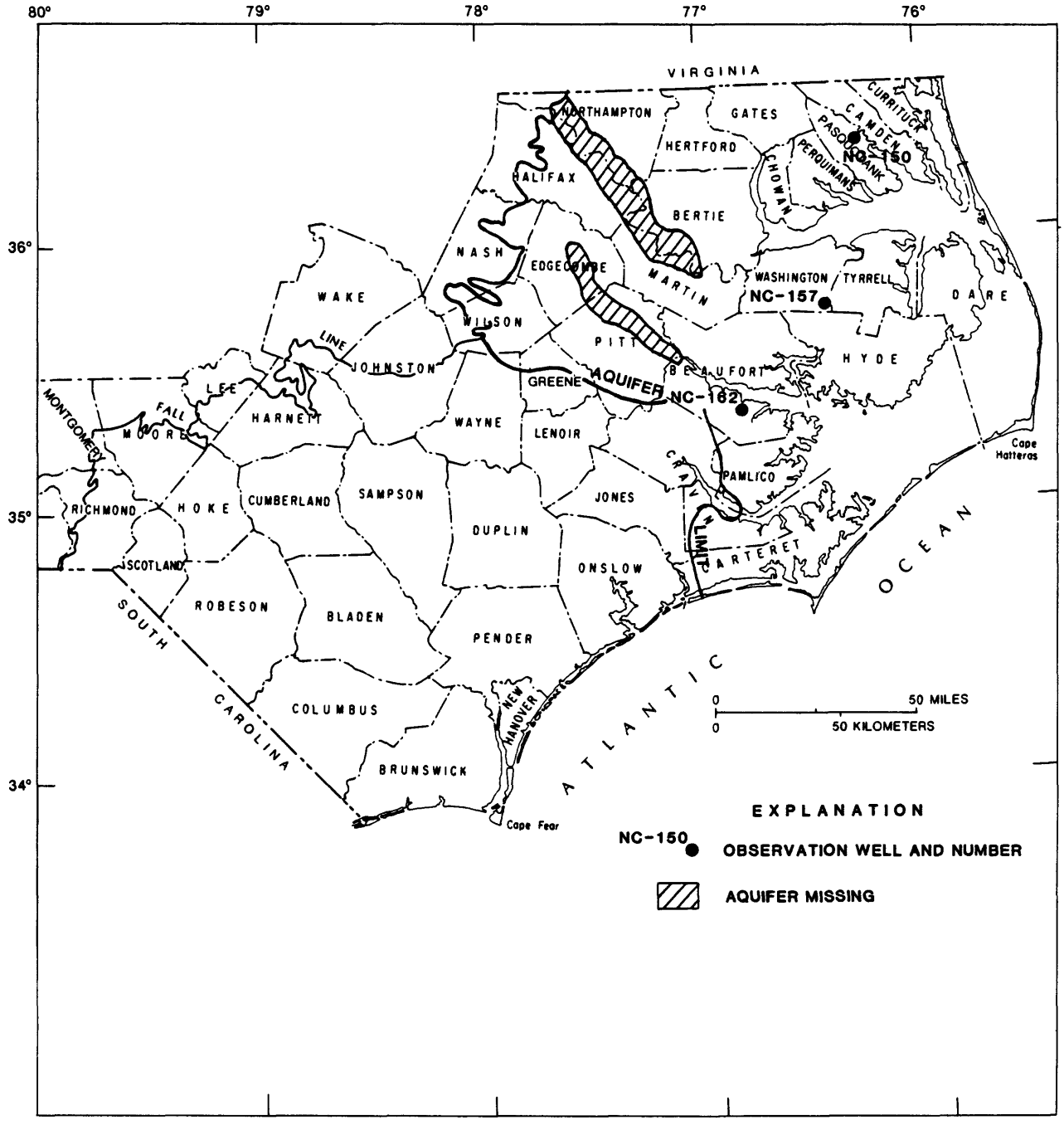


Figure 19.--Location of observation wells in the Yorktown aquifer.

NC-150 NEAR ELIZABETH CITY, PASQUOTANK COUNTY

362050076163705. Local number, NC-150; NRCD Elizabeth City Forest Service Research Station well D11v5.
LOCATION.--Lat 36°20'50", long 76°16'37", Hydrologic Unit 03010205, 4 mi northwest of Elizabeth City at North Carolina Division of Forest Resources Maintenance Yard, west of U.S. Highways 17 and 158 on Secondary Road 1338.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Yorktown aquifer of Pliocene and Miocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 500 ft, diameter 4 in, cased to 120 ft, screened interval from 120 to 130 ft, cemented from 130 to 500 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 7.14 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 3.48 ft above land-surface datum - revised from 3.13 ft above land-surface datum, October 1987.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to December 1986 were provided by NRCD.
PERIOD OF RECORD.--July 1975 to current year. Records from July 1975 to November 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began November 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.22 ft below land-surface datum, June 26, 1979; lowest, 8.32 ft below land-surface datum, August 15, 1986.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by -0.35 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	5.79	5.34	4.89	4.81	5.41	6.54	7.82	7.86	7.62	7.57	7.72
10	---	5.65	5.18	4.88	4.86	5.62	6.79	7.76	7.81	7.66	7.64	7.68
15	---	5.59	5.14	4.88	4.89	5.71	7.02	7.81	7.79	7.68	7.74	7.60
20	5.98	5.59	5.06	4.81	4.91	5.89	7.21	7.81	7.72	7.71	7.66	7.61
25	5.92	5.49	5.11	4.74	5.07	6.17	7.46	7.93	7.68	7.76	7.83	7.52
EOM	5.77	5.42	4.91	4.76	5.24	6.36	7.75	7.88	7.57	7.70	7.62	7.38

CAL YR 1987 HIGHEST DAILY MEAN 4.74 APR 25, 28 LOWEST DAILY MEAN 7.93 AUG 25

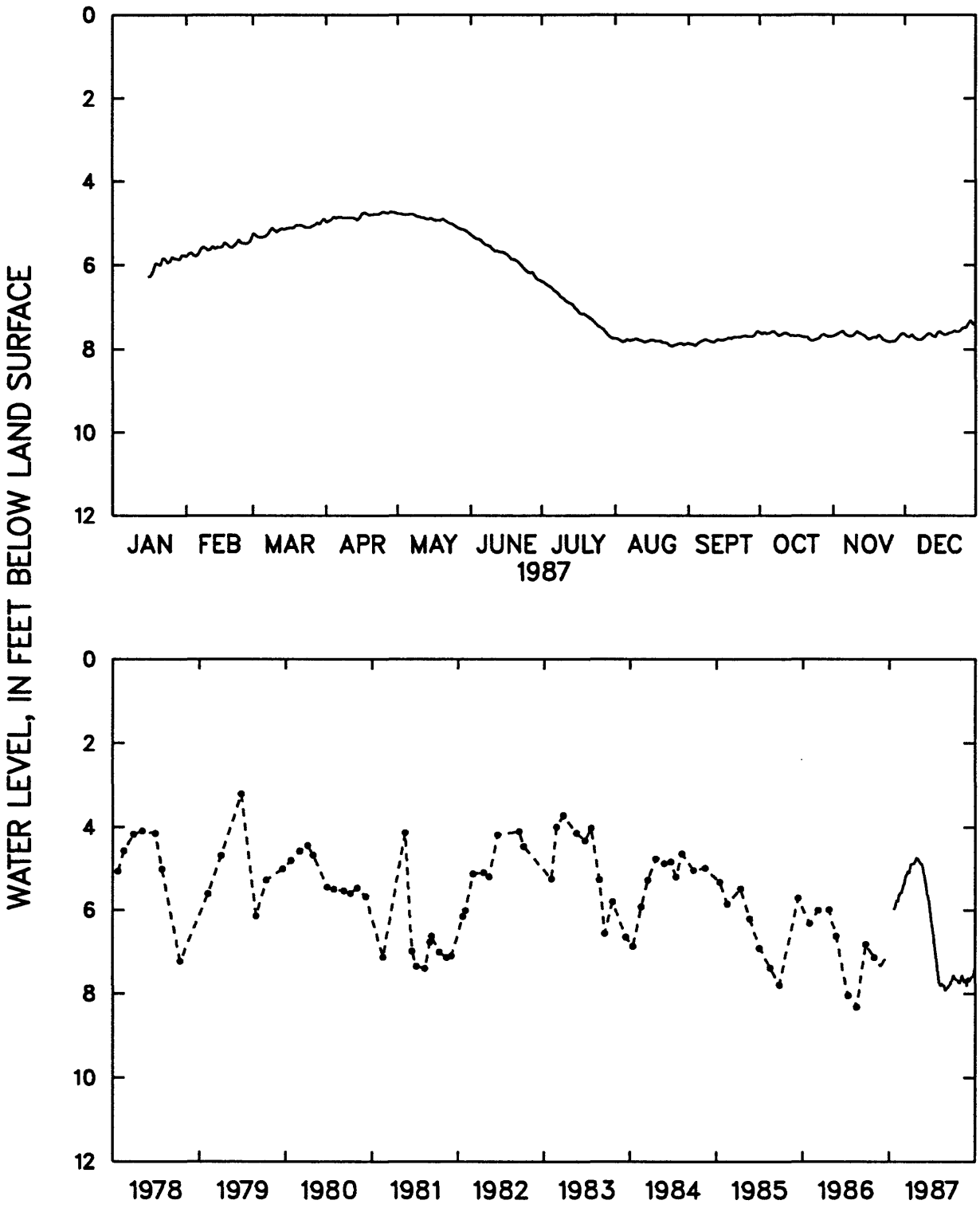


Figure 20.--Water level in observation well NC-150, Pasquotank County.

NC-157 AT LAKE PHELPS, WASHINGTON COUNTY

354351076260502. Local number, NC-157; NRCD Lake Phelps Research Station well L13i2.
LOCATION.--Lat 35°43'51", long 76°26'05", Hydrologic Unit 03010205, on south shore of Lake Phelps, south of Secondary Road 1126 on Secondary Road 1183.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Yorktown aquifer of Pliocene and Miocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 130 ft, diameter 4 in, cased to 110 ft, screened interval from 110 to 120 ft; measured depth 120.2 ft, October 1986.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 16.35 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD). Measuring point: Top of instrument shelf, 2.84 ft above land-surface datum - revised from 3.20 ft above land-surface datum, October 1987.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by NRCD.
PERIOD OF RECORD.--October 1977 to current year. Records from October 1977 to July 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began November 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.36 ft below land-surface datum, February 20, 1984; lowest, 9.35 ft below land-surface datum, February 24, 1981.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources-North Carolina NC-87-1, should be adjusted by +0.36 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	7.01	---	---	6.42	6.67	---	6.58	7.30	7.46	---	7.32	7.29
10	---	---	6.38	6.47	6.74	---	6.71	7.15	7.19	---	7.41	7.23
15	---	---	6.49	6.54	6.79	6.79	6.78	7.15	---	---	7.49	7.15
20	---	---	6.47	6.52	6.71	6.66	6.92	7.16	---	---	7.35	7.13
25	---	---	6.58	6.51	---	6.69	7.06	7.30	---	7.35	7.50	---
EOM	---	---	6.39	6.55	---	6.59	7.23	7.41	---	7.42	7.25	---

CAL YR 1987 HIGHEST DAILY MEAN 6.38 MAR 10 & APR 4 LOWEST DAILY MEAN 7.54 SEP 4

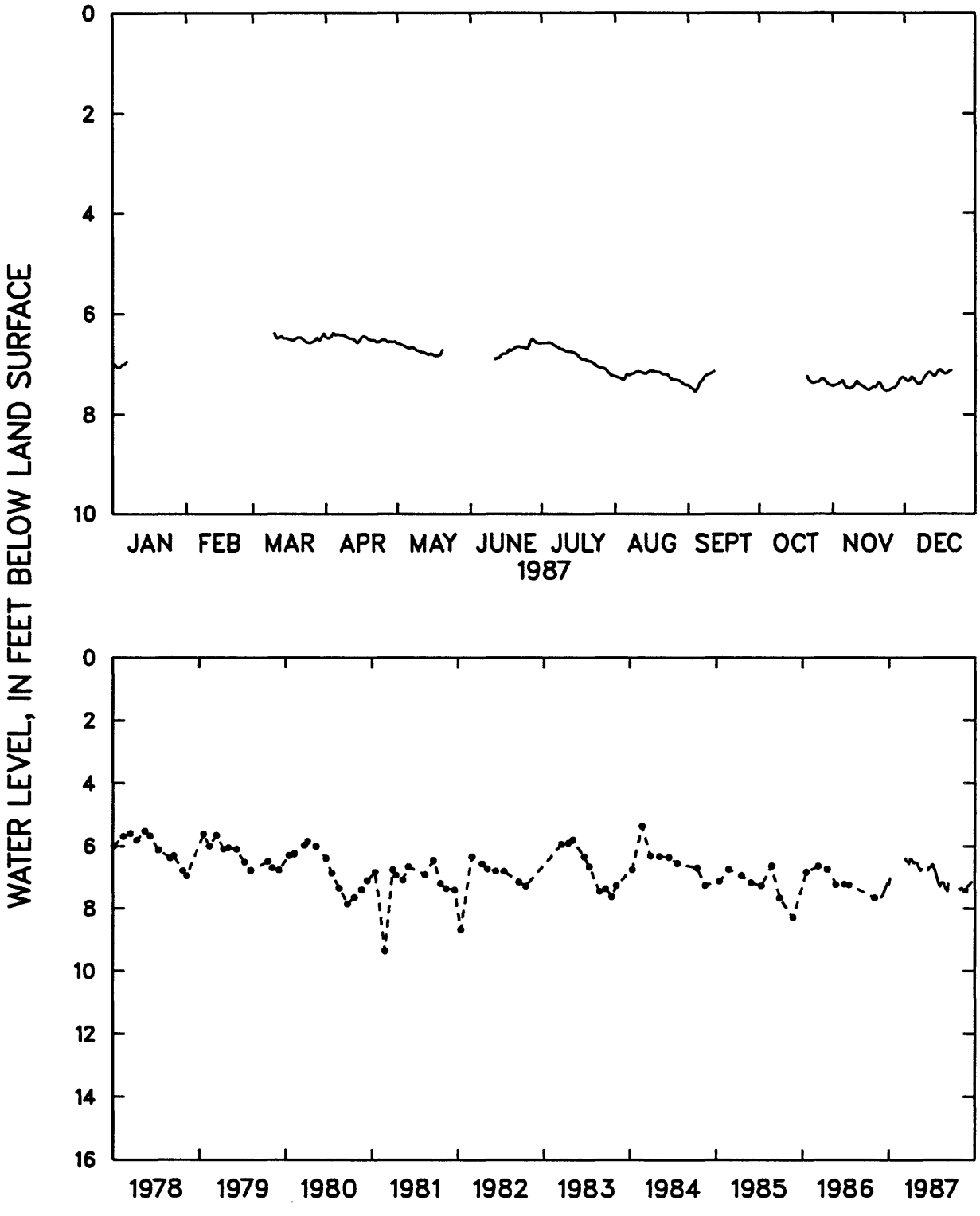


Figure 21.--Water level in observation well NC-157, Washington County.

NC-162 NEAR BONNERTON, BEAUFORT COUNTY

352037076514106. Local number, NC-162; NRCD Bonnerton Research Station well P18v6.
LOCATION.--Lat 35°20'37", long 76°51'41", Hydrologic Unit 03020104, 1 mi south of Bonnerton on Secondary Road 1936.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Yorktown aquifer of Pliocene and Miocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 86 ft, diameter 2.5 in, cased to 76 ft, screened interval from 76 to 86 ft; measured depth 83.4 ft, October 1986.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 37.09 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 3.07 ft above land-surface datum - revised from 2.72 ft above land-surface datum, October 1987.
REMARKS.--Local-effects well. Water levels affected by nearby pumping associated with mining operations.
COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by NRCD.
PERIOD OF RECORD.--June 1980 to current year. Records from June 1980 to July 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began December 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 36.68 ft below land-surface datum, March 8, 1983; lowest, 39.31 ft below land-surface datum, July 14, 1986.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by -0.35 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	38.12	37.76	37.56	37.74	37.34	37.76	38.35	38.30	37.42	38.18	38.26	38.32
10	38.27	38.17	37.86	37.60	37.67	38.12	38.14	38.09	37.59	38.25	38.44	38.25
15	38.52	38.01	37.81	37.42	37.64	37.96	37.81	37.30	37.61	37.85	38.47	38.03
20	38.18	37.74	37.72	37.07	37.79	38.02	38.04	37.65	37.46	37.99	38.15	38.23
25	37.79	37.91	37.66	36.94	37.78	38.24	37.96	37.75	37.73	38.11	38.42	38.05
EOM	37.83	37.70	37.38	37.33	37.97	38.09	38.26	37.80	37.78	38.22	37.96	37.86

CAL YR 1987 HIGHEST DAILY MEAN 36.94 APR 25, 27 LOWEST DAILY MEAN 38.61 NOV 12

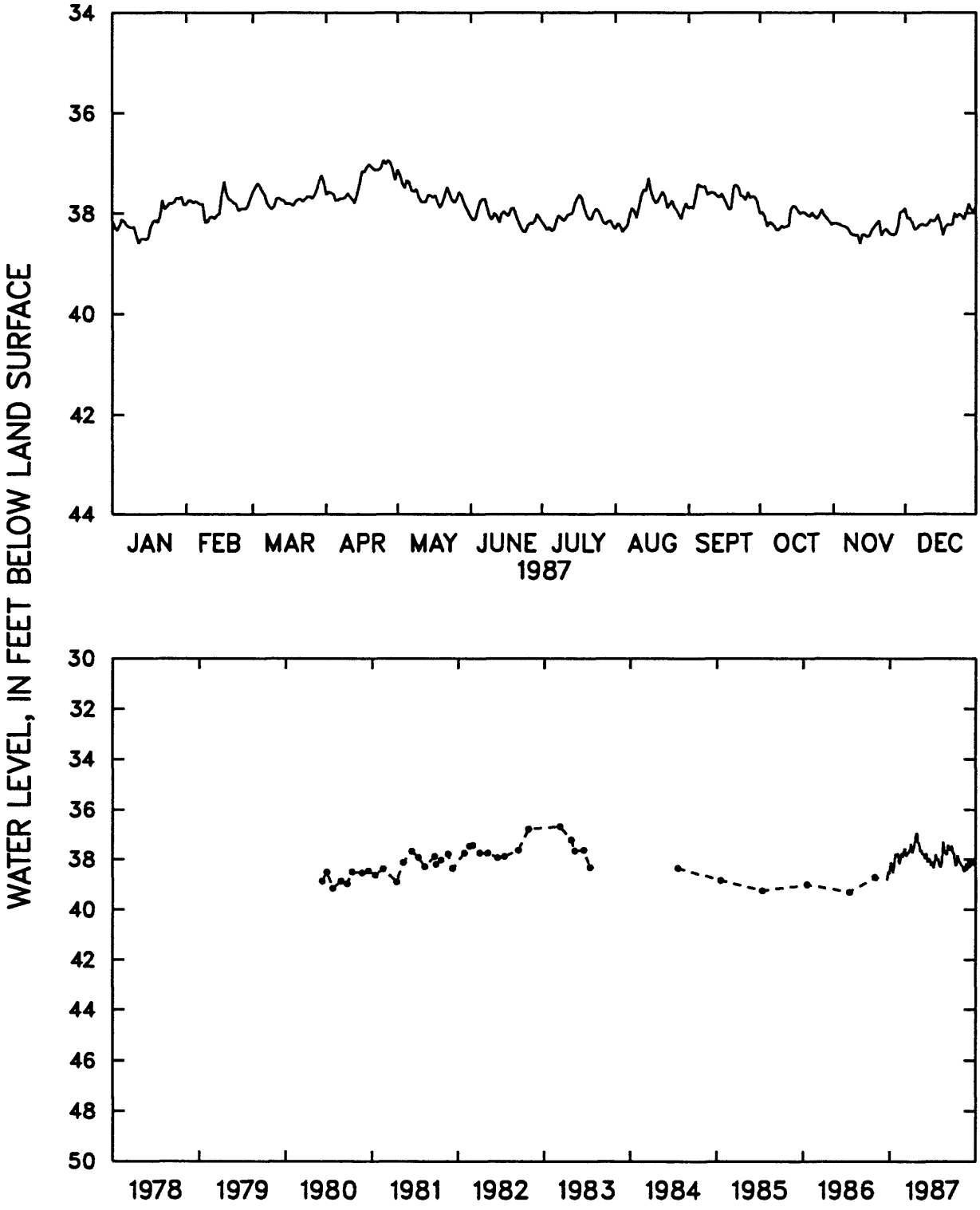


Figure 22.--Water level in observation well NC-162, Beaufort County.

Castle Hayne Aquifer

Thirteen wells monitor water-level fluctuations in the Castle Hayne aquifer (fig. 23). Record low water levels were recorded in four wells (NC-13, NC-139, NC-152, and NC-156) (figs. 26, 31, 33, and 34), and a record high was measured in NC-181 (fig. 38) in 1987.

The Castle Hayne aquifer is the most productive aquifer in North Carolina with respect to both the amount of water withdrawn from it and yields to individual wells. The largest single withdrawal from the aquifer is at a phosphate-mining operation and chemical plant near Aurora in eastern Beaufort County. Withdrawals of from 55 to 65 Mgal/d since 1965 have resulted in a cone of depression in the potentiometric surface with water levels as deep as 77 ft below sea level at well NC-13 (figs. 24 and 25) and probably as deep as 180 ft or more below sea level in the center of the cone. The altitude of the potentiometric surface at the mining site has been about 180 ft below sea level since at least February 1974 (North Carolina Groundwater Section, 1974). The effects of these withdrawals are seen in the regional cone of depression which covers more than 3,000 mi^2 (square miles) over the eastern two-thirds of the map area (fig. 24). A small amount of drawdown also has resulted from withdrawals from the Pamlico County water-system wells north of Arapahoe.

Well NC-169 (fig. 37) in Pamlico County is about 20 miles southeast of the center of pumping, and its hydrograph shows a roughly seasonal pattern of fluctuation with no definite trend of water-level decline from the time water-level records began in 1978 through 1987. Well NC-159 (fig. 35) in Hyde County is 35 miles east-northeast of the center of pumping. Here the water level has ranged from 0.79 ft above sea level to 1.14 ft below sea level since records began in April 1975. Although water levels generally declined from 1975 through 1983, they had risen to near 1975 levels in 1986-87. No long-term water-level decline is seen in this water-level record.

Evidence of this regional cone of depression is not seen west of the approximate limit of the extensive clay confining units associated with the Yorktown, Pungo River, and Castle Hayne aquifers. West of this line, the ground-water flow system is related only to the local flow system where ground water moves from the ground-water recharge areas in the interstream areas to the ground-water discharge areas at the major streams and in their flood plains.

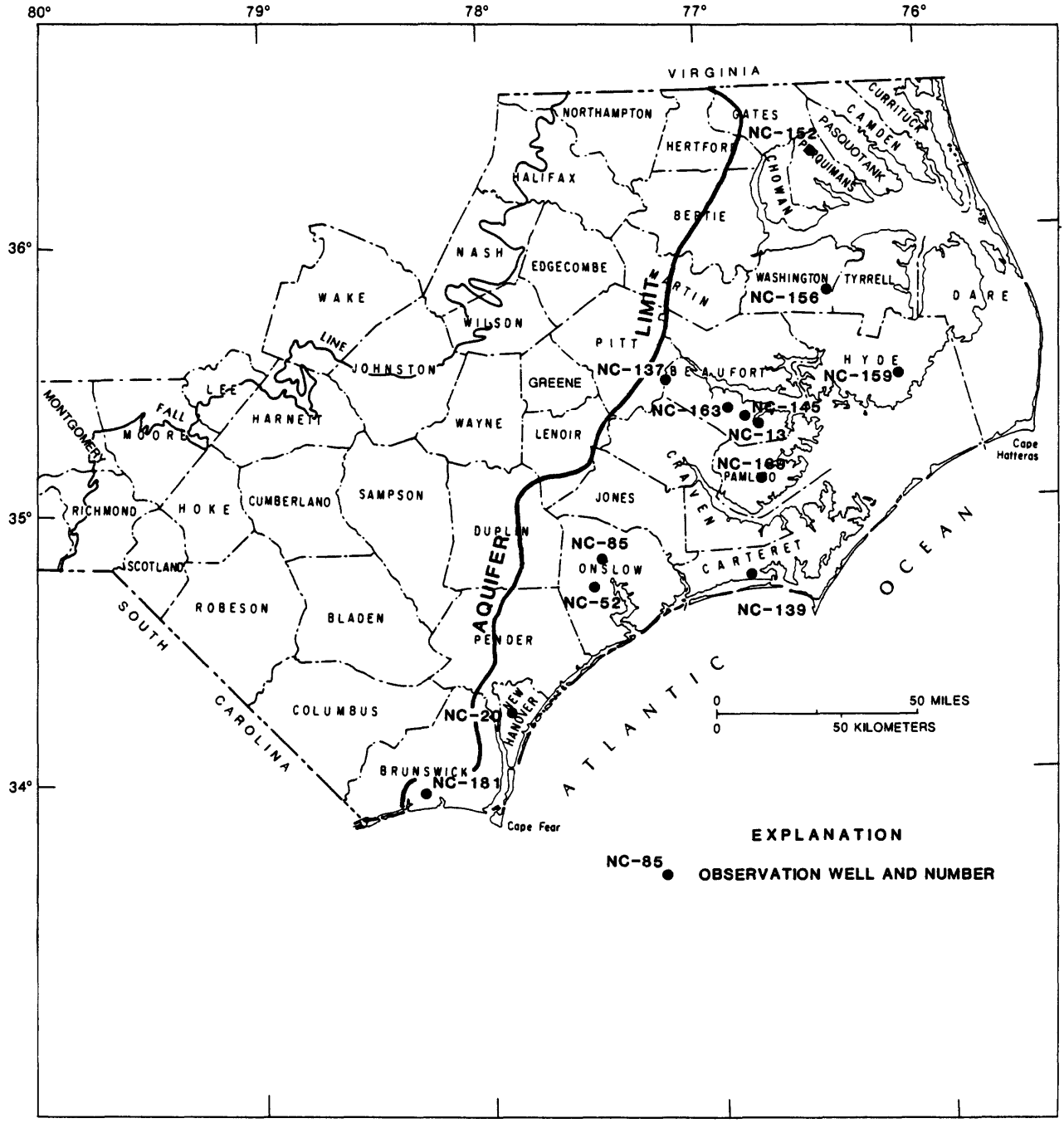


Figure 23.--Location of observation wells in the Castle Hayne aquifer.

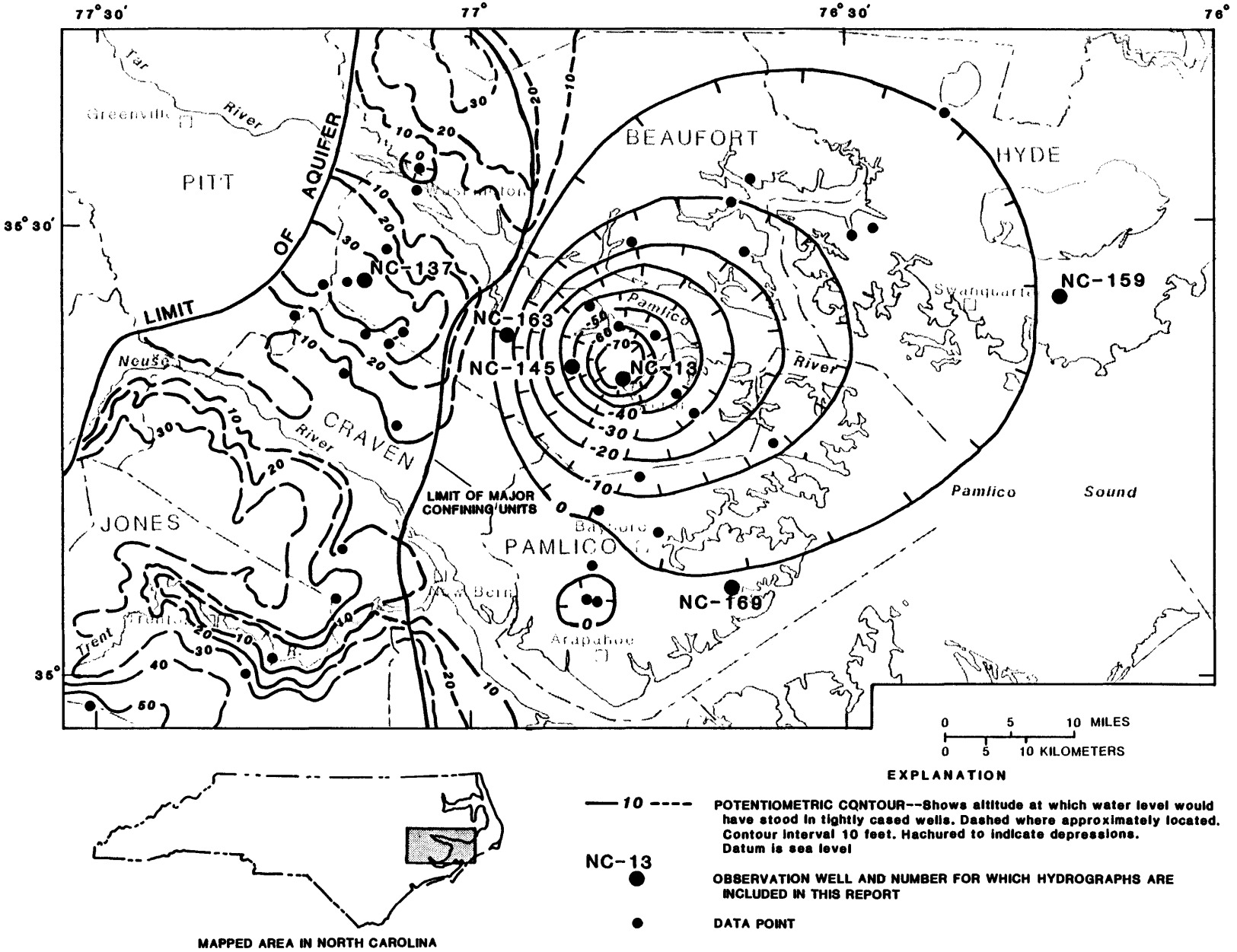


Figure 24.--Potentiometric surface of the Castle Hayne aquifer in the east-central Coastal Plain, November 1987.

The response of the ground-water level to the withdrawals at the mine and plant area is shown by the 1964-87 hydrograph for well NC-13 (fig. 25). The initial response was a rapid decline in water level, and from 1966 to 1987, the water level was influenced not only by the large withdrawals but also by the changing distance between the center of pumping and the observation well.

The mining area is north and northwest of NC-13 and northeast of NC-145 (fig. 32). Fluctuations of water levels in wells spaced at increasing distances from the center of pumping are seen in hydrographs for wells NC-145, NC-163, and NC-137 (figs. 32, 36, and 30, respectively). Water-level fluctuations in NC-145 and NC-163 are similar, but water-level depth is much greater and range of fluctuations is more than twice as much in NC-145 as in NC-163. Fluctuations in NC-137, which is farthest from the center of pumping, show seasonal patterns similar to that of many terrane-effects wells. This well is west of the limit of extensive confining units and shows no apparent influence of the withdrawals near Aurora.

Water levels in the coastal areas of New Hanover County (NC-20) and Carteret County (NC-139) (figs. 27 and 31, respectively) respond to withdrawals for water supply in these resort areas, with annual fluctuations, apparently related to the tourist season, beginning at Easter, peaking in July, and ending around Labor Day. In Jacksonville, Onslow County, the trend has been downward (NC-85, fig. 29) over the last decade suggesting ground-water withdrawals near that observation well.

Water levels in the Castle Hayne aquifer exhibit climatic effects in wells NC-52 and NC-181 (figs. 28 and 38) with no apparent long-term trends. Even though NC-52 is near water-supply wells at the U.S. Marine Corps Camp Geiger, no effects of those withdrawals are seen in the long-term record. Short-term and minor pumping effects are seen at NC-181; however, long-term data show no downward trend.

In the northern Coastal Plain, two wells (NC-152 and NC-156, figs. 33 and 34) have similar records. They show little seasonal fluctuation and downward trends of 0.2 ft per year or less. The cause of the declines has not been identified.

NC-13 NEAR AURORA, BEAUFORT COUNTY

351932076480001. Local number, NC-13.
LOCATION.--Lat 35°19'32", long 76°48'00", Hydrologic Unit 03020104, 1.5 mi north of Aurora, east of intersection of N.C. Highway 306 and Secondary Road 1942.
Owner: Texasgulf Chemicals Company.
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 168 ft, diameter 4 in, cased to 156 ft, open hole to 168 ft; measured depth 165.5 ft, September 1981.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 10 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of casing, 0.36 ft below land-surface datum (since February 16, 1984).
REMARKS.--Local-effects well. Since 1965 water levels affected by nearby pumping associated with mining operations.
PERIOD OF RECORD.--June 1964 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.38 ft below land-surface datum, April 9, 1965; lowest, 88.59 ft below land-surface datum, November 28 and 29, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	84.42	86.64	81.38	82.45	---	81.45	82.54	82.18	84.43	85.27	87.32
10	---	84.67	85.37	80.46	---	---	82.71	82.86	81.92	84.63	86.96	86.97
15	---	84.51	86.68	80.76	---	---	81.85	82.59	82.23	84.96	87.34	87.17
20	---	84.69	85.80	82.03	---	81.41	82.91	81.94	81.53	83.33	88.00	87.40
25	---	84.83	85.06	82.47	---	81.75	81.97	82.67	83.26	85.70	88.56	87.25
EOM	---	85.67	84.28	81.15	---	81.74	83.18	82.17	84.22	84.53	88.51	87.12

CAL YR 1987 HIGHEST DAILY MEAN 80.46 APR 10, 17 LOWEST DAILY MEAN 88.59 NOV 28

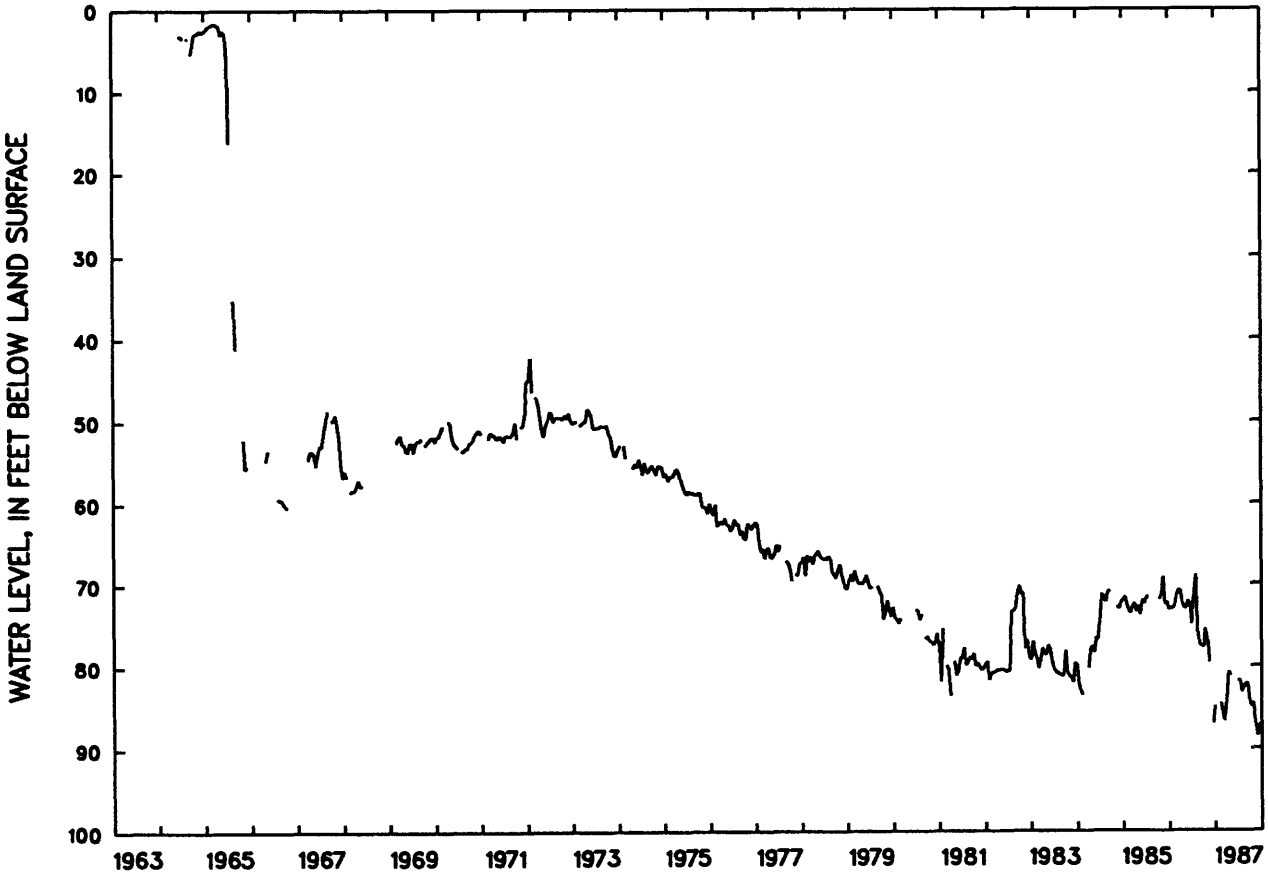


Figure 25.--Water level in observation well NC-13, Beaufort County, 1964 to 1987.

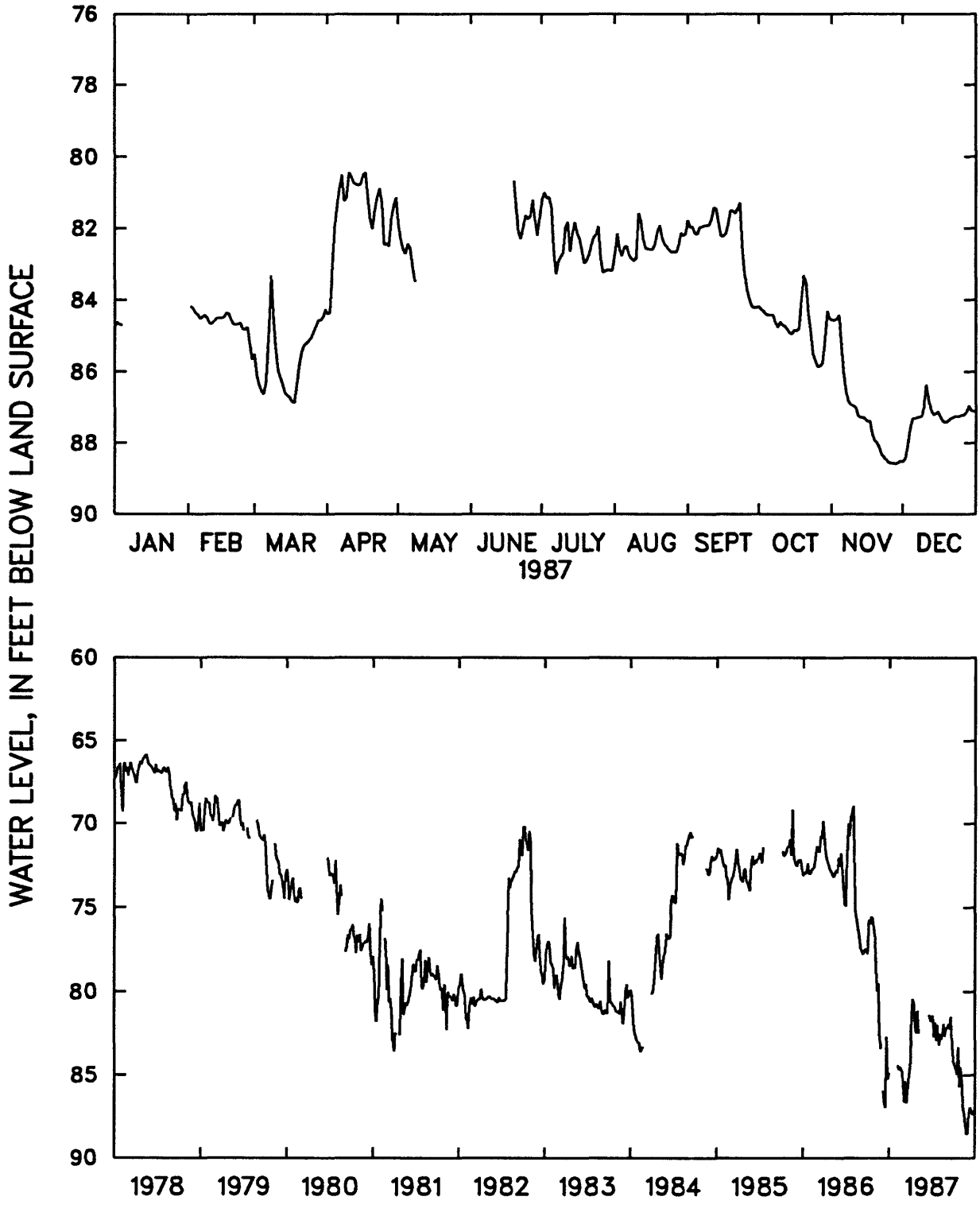


Figure 26.--Water level in observation well NC-13, Beaufort County.

NC-20 NEAR WILMINGTON, NEW HANOVER COUNTY

341000077524201. Local number, NC-20.
LOCATION.--Lat 34°09'53", long 77°52'48", Hydrologic Unit 03030001, southeast of Wilmington, 1 mi west of Secondary Road 1492 on Secondary Road 1516.
Owner: Walter J. Hodder.
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 173 ft, diameter 3 in, cased and screened intervals unknown; measured depth 169 ft, September 1973.
INSTRUMENTATION.--Measured every six weeks with chalked tape by USGS personnel.
DATUM.--Land-surface datum is 21 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 1.85 ft above land-surface datum (since March 11, 1976).
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--November 1963 to current year. U.S. Geological Survey continuous record from December 1964 to November 1980.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 9.42 ft below land-surface datum, June 10, 1966; lowest, 23.89 ft below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 13	17.82	MAY 6	18.77	JUL 1	21.24	SEP 1	20.54	OCT 14	19.32	DEC 1	18.64
MAR 11	17.44										

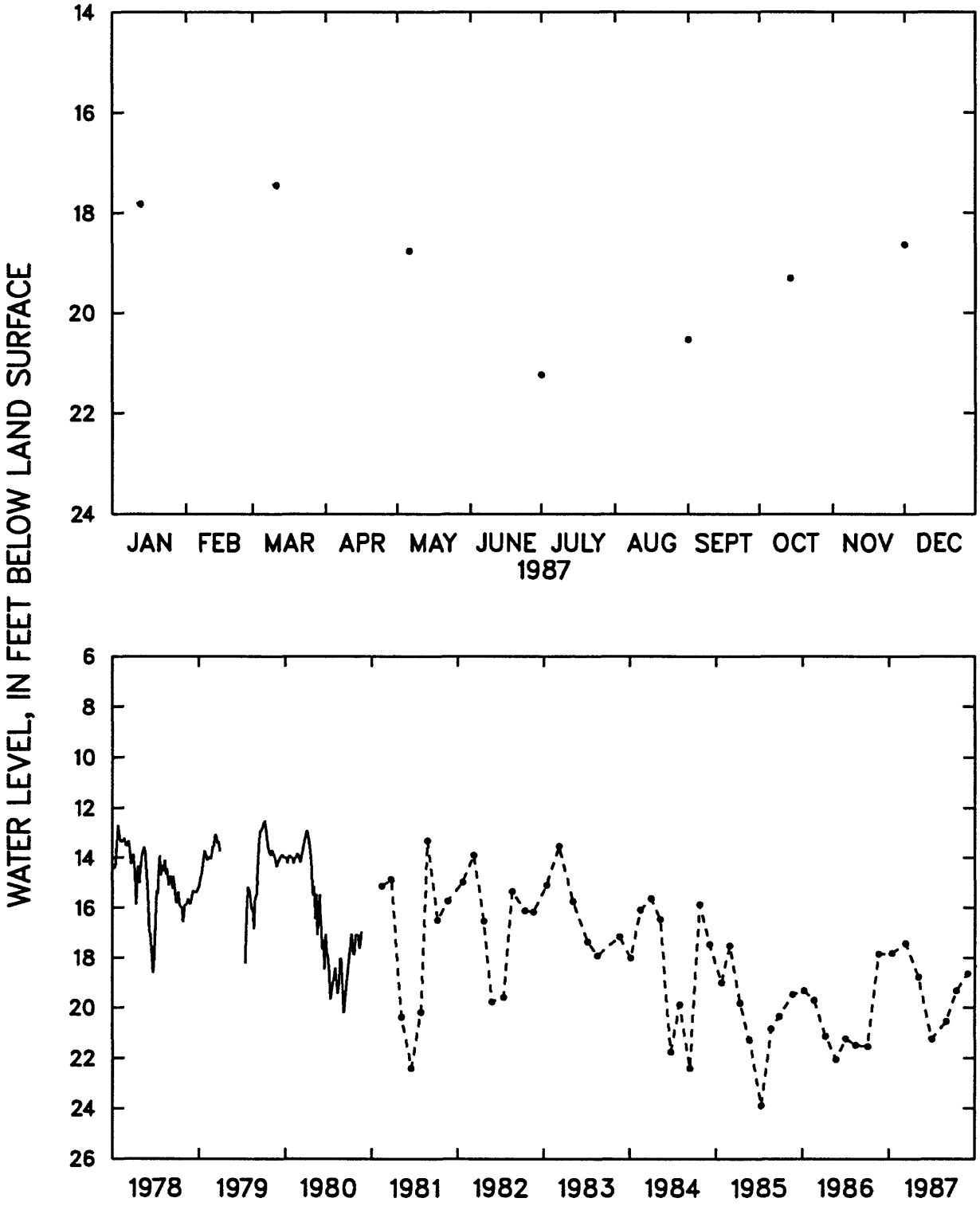


Figure 27.--Water level in observation well NC-20, New Hanover County.

NC-52 NEAR JACKSONVILLE, ONSLOW COUNTY

344425077272501. Local number, NC-52.
LOCATION.--Lat 34°44'18", long 77°27'29", Hydrologic Unit 03030001, southwest of Jacksonville, 2 mi south of U.S. Highway 258, 0.25 mi east of U.S. Highway 17 at U.S. Marine Corps Camp Geiger.
Owner: U.S. Marine Corps.
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled abandoned supply well, drilled to 70 ft, diameter 18 in, cased to 23 ft, open hole to 70 ft; measured depth 68 ft, January 1974.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 24.45 ft above National Geodetic Vertical Datum of 1929.
Measuring point: Top of instrument shelf, 1.90 ft above land-surface datum.
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--January 1963 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.67 ft below land-surface datum, September 14, 1984; lowest, 10.44 ft below land-surface datum, January 3, 1966.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	3.49	4.09	3.40	4.15	5.24	6.49	5.50	6.78	5.38	6.04	7.37	6.54
10	3.86	4.15	3.71	4.67	5.46	6.69	5.73	6.95	4.20	6.34	7.45	6.64
15	4.31	4.50	4.06	4.90	5.66	6.80	6.02	6.87	4.41	6.59	7.64	6.84
20	2.78	3.90	3.70	4.48	5.91	6.75	6.15	6.27	4.95	6.80	7.53	7.12
25	2.88	3.92	4.24	4.84	6.09	6.70	6.45	6.31	5.44	7.00	7.73	7.28
EOM	3.45	2.63	4.15	4.95	6.32	6.92	6.54	5.47	5.68	7.29	6.44	6.69

CAL YR 1987 HIGHEST DAILY MEAN 1.98 MAR 1 LOWEST DAILY MEAN 7.78 NOV 27

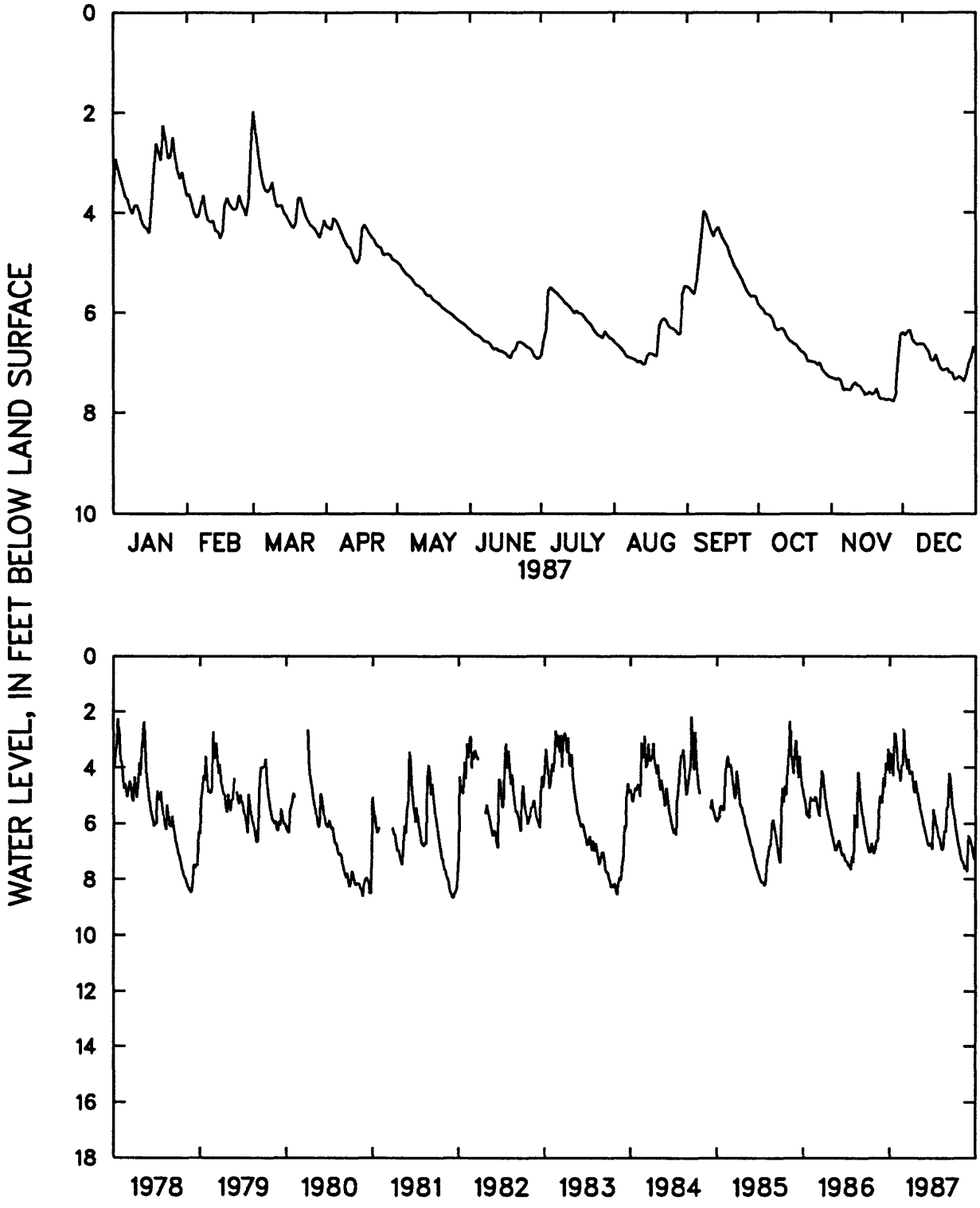


Figure 28.--Water level in observation well NC-52, Onslow County.

NC-85 AT JACKSONVILLE, ONSLOW COUNTY

344525077254501. Local number, NC-85
LOCATION.--Lat 34°45'25", long 77°25'45", Hydrologic Unit 03030001, in Jacksonville at electrical transformer substation, 0.15 mi north of U.S. Highway 17 and 0.4 mi east of New River.
Owner: Carolina Power and Light Company.
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
INSTRUMENTATION.--Digital recorder --60-minute punch.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 240 ft (reported), diameter 8 in, cased and screened intervals unknown; measured depth 103 ft, January 1974.
DATUM.--Land-surface datum is 20 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 3.20 ft above land-surface datum.
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--January 1963 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.86 ft below land-surface datum, June 10, 1964; lowest, 24.19 ft below land-surface datum, July 3, 1985.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	18.98	19.30	18.83	17.45	15.07	17.22	18.56	21.69	20.14	18.50	16.12	17.42
10	19.26	19.44	18.04	16.79	14.76	17.59	19.84	21.74	20.45	17.99	16.01	17.36
15	19.01	18.92	18.54	16.03	14.72	17.41	19.92	20.92	20.31	17.61	16.93	17.24
20	18.70	19.95	18.44	15.52	15.13	17.90	19.81	21.64	20.44	16.93	16.27	18.04
25	19.13	19.54	17.93	15.05	15.42	18.18	21.18	20.88	19.66	17.05	17.35	16.79
EOM	19.68	19.54	16.47	15.07	16.52	18.49	21.00	21.01	19.20	17.02	15.76	17.81

CAL YR 1987 HIGHEST DAILY MEAN 14.72 MAY 15 LOWEST DAILY MEAN 21.87 AUG 6

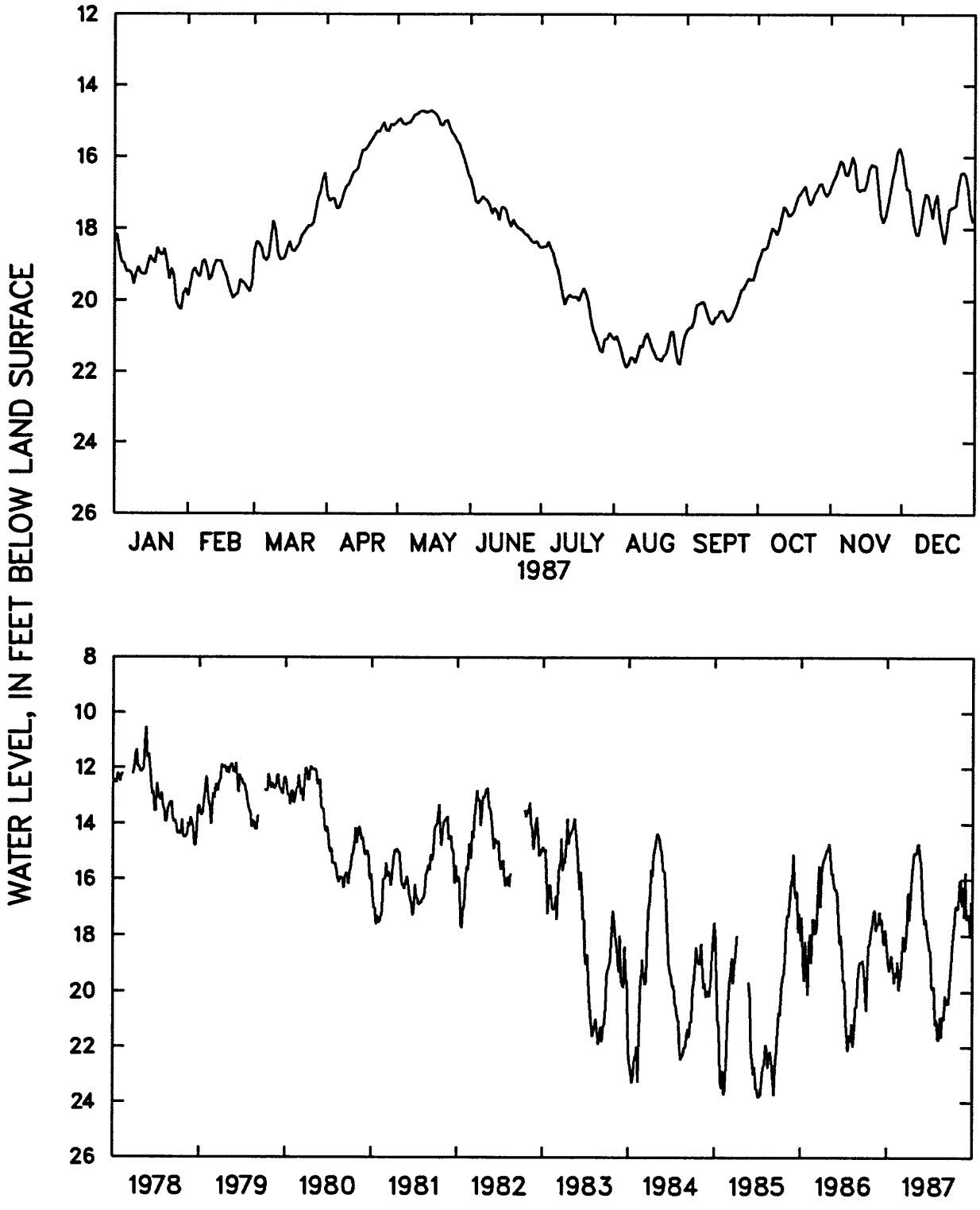


Figure 29.--Water level in observation well NC-85, Onslow County.

NC-137 NEAR WILMAR, BEAUFORT COUNTY

352615077083401. Local number, NC-137; NRCD Creeping Swamp Research Station well O21q1.
LOCATION.--Lat 35°26'15", long 77°08'38", Hydrologic Unit 03020202, 3 mi north of Wilmar, 1 mi west of U.S. Highway 17 on N.C. Highway 102.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 143 ft, diameter 4 in, cased to 72 ft, open hole to 143 ft; measured depth 141.6 ft, September 1981.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Measuring point: Top of collar on casing, 0.8 ft above land-surface datum and 57.64 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--January 1972 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 36.94 ft above NGVD, February 3, 1972; lowest, 30.50 ft above NGVD, December 5, 6, 7, 13, and 14, 1986.

WATER LEVEL, IN FEET ABOVE NGVD, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	31.39	33.47	34.51	35.24	35.28	34.50	34.00	33.06	32.49	32.67	31.96	31.42
10	31.85	33.73	34.81	35.26	35.19	34.31	33.83	32.88	32.52	32.57	31.80	31.54
15	32.13	34.00	34.86	35.29	35.12	34.35	33.76	32.69	32.45	32.47	31.54	31.79
20	32.49	34.07	35.04	35.32	34.95	34.34	33.59	32.66	32.54	32.37	31.57	31.97
25	32.83	34.24	35.00	35.38	34.74	34.25	33.43	32.53	32.58	32.17	31.35	32.28
EOM	33.28	34.46	35.25	35.37	34.50	34.07	33.24	32.52	32.68	31.99	31.56	32.58

CAL YR 1987 HIGHEST DAILY MEAN 35.43 APR 16 LOWEST DAILY MEAN 31.26 JAN 1

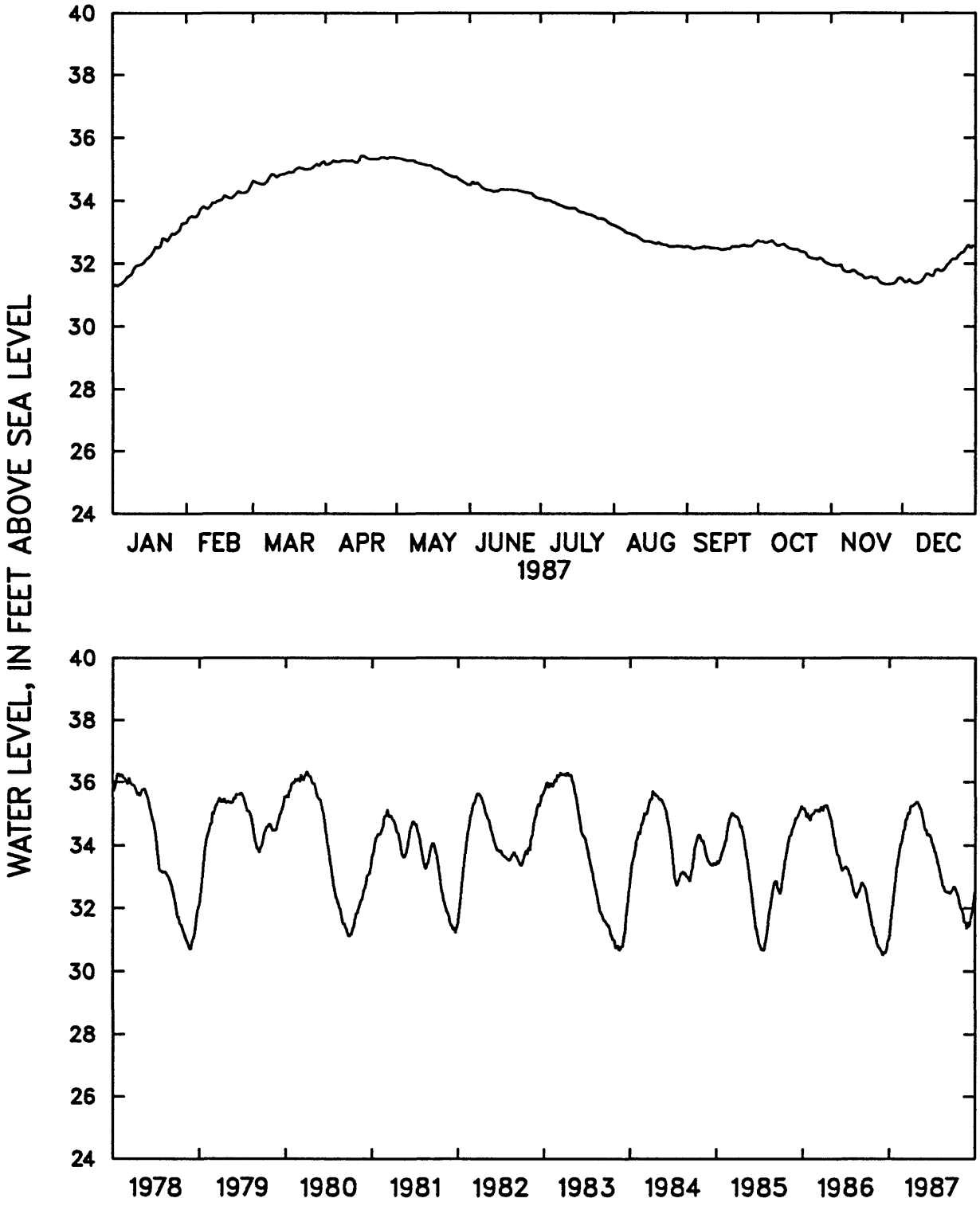


Figure 30.--Water level in observation well NC-137, Beaufort County.

NC-139 AT MOREHEAD CITY, CARTERET COUNTY

344323076451301. Local number, NC-139; NRCD Camp Glenn Research Station well X17j5.
LOCATION.--Lat 34°43'23", long 76°45'13", Hydrologic Unit 03020106, on west edge of Morehead City, south of U.S. Highway 70 at NRCD Marine Fisheries Facility on north shore of Bogue Sound.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 238 ft, diameter 4 in, cased to 180 ft, open hole to 191 ft, hole collapsed from 191 to 238 ft.
INSTRUMENTATION.--Digital recorder --30-minute punch.
DATUM.--Land-surface datum is 8.72 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of collar on casing, 1.73 ft above land-surface datum.
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--January 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.23 ft below land-surface datum, December 7, 1976; lowest, 12.97 ft below land-surface datum, August 6, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	8.29	8.41	8.48	8.04	8.46	10.24	11.44	12.43	11.08	---	9.15	8.70
10	8.16	8.30	7.99	7.75	8.50	10.71	11.59	12.33	11.28	---	9.35	8.77
15	8.29	8.05	7.99	7.78	8.74	10.82	11.29	11.80	11.20	---	9.47	8.89
20	8.06	8.50	7.85	7.95	8.97	11.02	11.55	12.02	10.69	---	8.72	8.52
25	8.21	8.36	7.76	7.87	9.57	10.95	12.18	11.80	10.50	9.87	9.31	8.77
EOM	8.34	8.27	7.83	8.03	10.14	11.33	12.06	11.78	10.21	9.72	8.27	8.85

CAL YR 1987 HIGHEST DAILY MEAN 7.52 APR 16 LOWEST DAILY MEAN 12.46 AUG 6

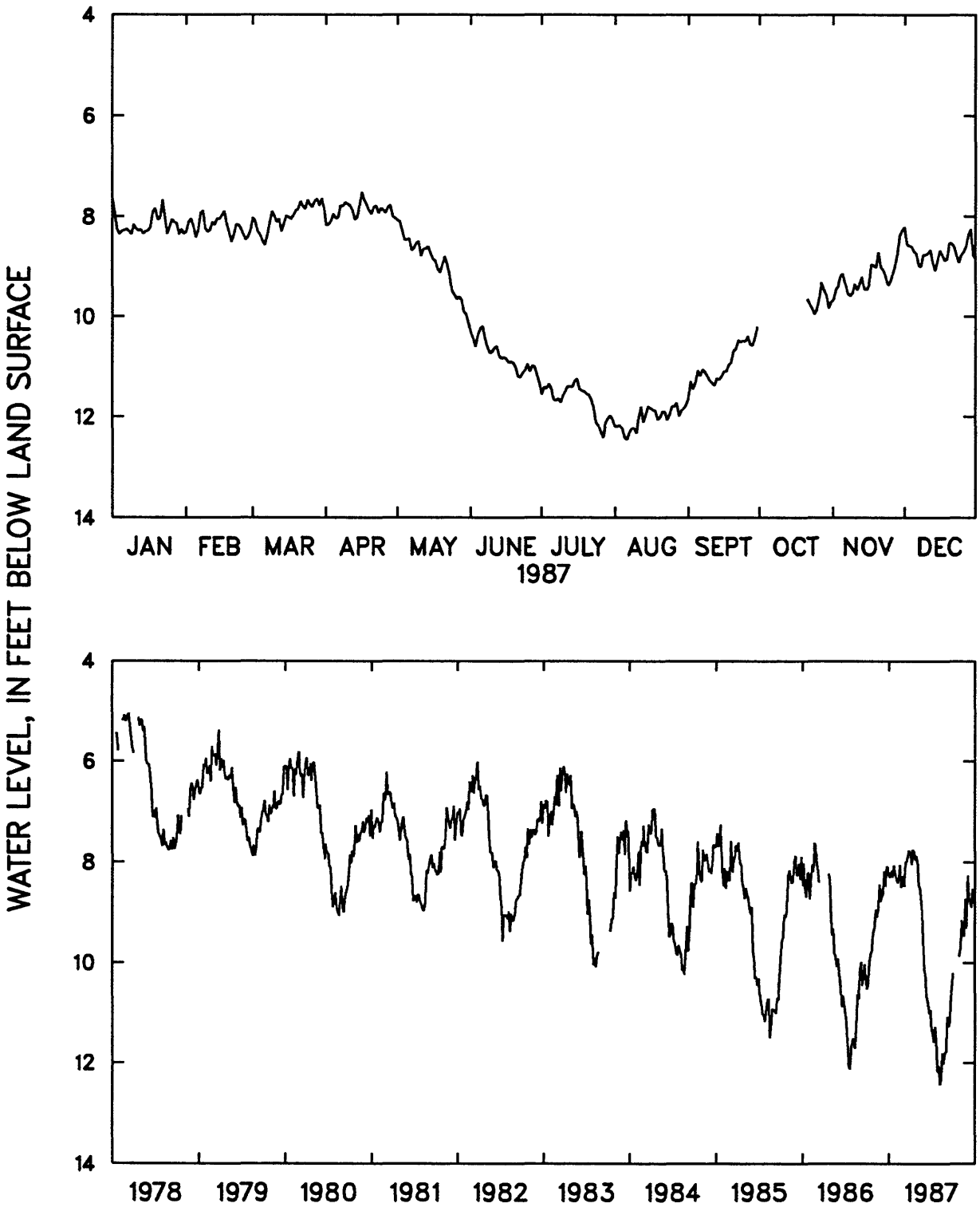


Figure 31.--Water level in observation well NC-139, Carteret County.

NC-145 NEAR BONNERTON, BEAUFORT COUNTY

352037076514101. Local Number, NC-145; NRCD Bonnerton Research Station well P18v5.
LOCATION.--Lat 35°20'37", long 76°51'41", Hydrologic Unit 03020104, 1 mi south of Bonnerton on Secondary Road 1936.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 280 ft, diameter 4 in, cased to 169 ft, open hole to 280 ft; measured depth 278 ft, September 1981.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 36.41 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD) - revised from 36.64 ft above NGVD, October 1987.
Measuring point: Top of instrument shelf, 2.70 ft above land-surface datum - revised from 2.47 ft above land-surface datum, October 1987.
REMARKS.--Local-effects well. Water levels affected by nearby pumping associated with mining operations.
COOPERATION.--Periodic water-level measurements prior to July 1984 were provided by NRCD.
PERIOD OF RECORD.--June 1980 to current year. Records from June 1980 to June 1984 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began July 1984.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 68.18 ft below land-surface datum, October 26, 1982; lowest, 84.56 ft below land-surface datum, September 14 and 15, 1986.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual reports, Water Resources Data-North Carolina NC-85-1, NC-86-1, and NC-87-1, should be adjusted by -0.23 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	78.94	77.95	78.91	76.21	75.78	75.19	74.87	75.98	75.74	76.95	77.29	78.61
10	78.02	77.99	78.05	75.32	75.86	75.23	75.51	76.09	75.54	77.23	78.05	---
15	---	77.96	78.85	75.05	75.75	75.11	75.36	75.90	75.74	77.30	78.43	---
20	---	78.01	78.69	75.29	75.74	75.13	75.62	75.82	75.69	77.27	78.56	---
25	---	78.08	78.14	75.23	75.74	75.12	75.50	75.99	75.83	77.45	78.92	---
EOM	---	78.20	77.28	75.22	75.80	75.18	76.15	75.92	76.52	77.61	78.79	---

CAL YR 1987 HIGHEST DAILY MEAN 74.68 APR 17 LOWEST DAILY MEAN 79.35 JAN 1

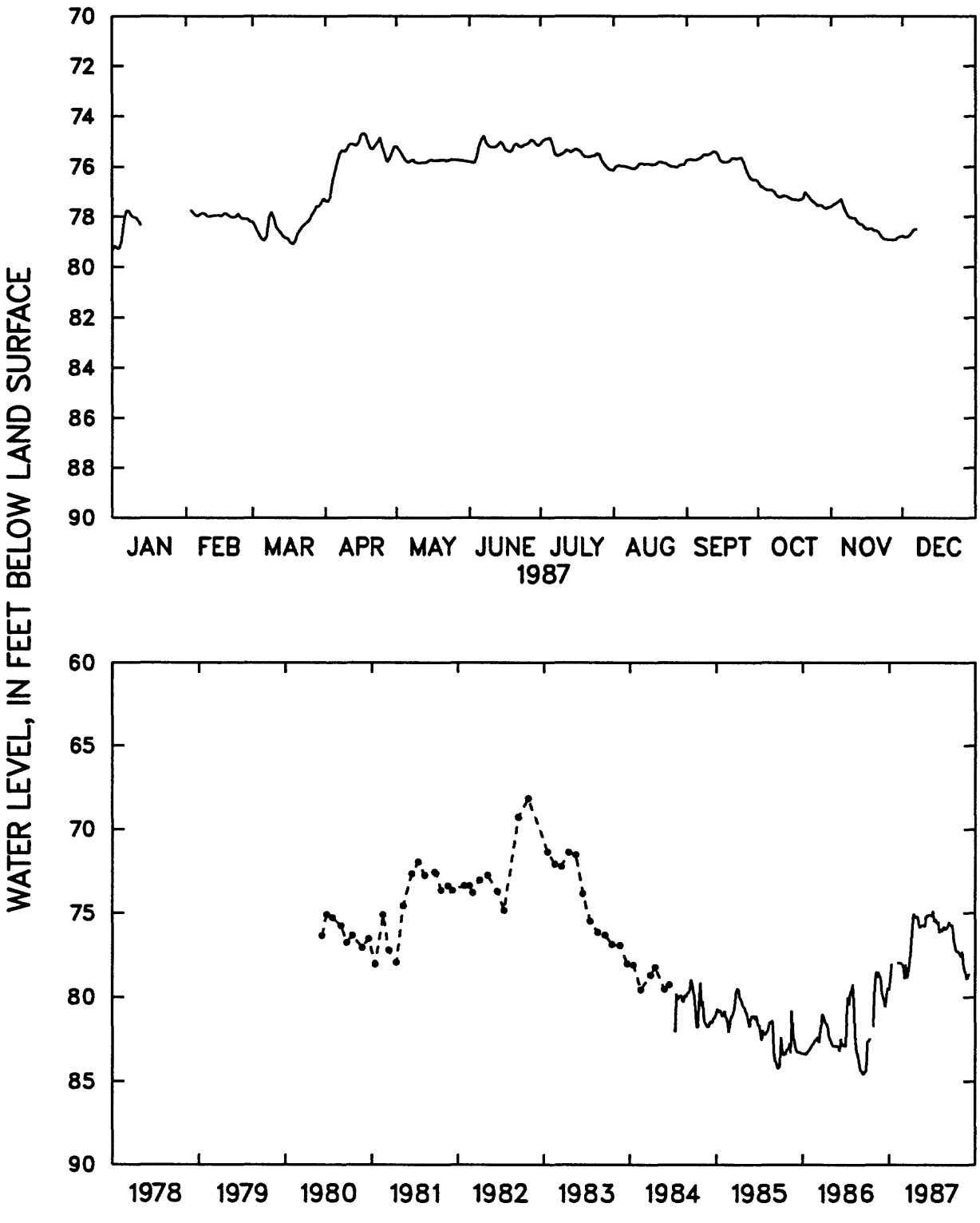


Figure 32.--Water level in observation well NC-145, Beaufort County.

NC-152 NEAR PARKVILLE, PERQUIMANS COUNTY

361744076274403. Local number, NC-152; NRCD Parkville Research Station well E13m3.
LOCATION.--Lat 36°17'44", long 76°27'44", Hydrologic Unit 03010205, 3.5 mi west of Parkville, west of Secondary Road 1223 on logging road.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 351 ft, diameter 4 in, cased to 336 ft, open hole to 351 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 16.73 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 3.00 ft above land-surface datum - revised from 3.49 ft above land-surface datum, October 1987.
COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by NRCD.
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--December 1977 to current year. Records from December 1977 to July 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began November 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.46 ft below land-surface datum, December 20, 1978; lowest, 9.76 ft below land-surface datum, October 22, 23, and 24, 1987.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.49 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	9.09	9.07	8.95	9.12	9.25	9.52	9.61	9.67	9.60	9.58	9.46
10	---	9.06	8.97	9.03	9.18	9.36	9.57	9.59	9.58	9.68	9.60	9.42
15	---	9.04	9.01	9.07	9.19	9.34	9.59	9.65	9.54	9.67	9.65	9.37
20	8.93	9.06	8.95	8.99	9.20	9.38	9.69	9.53	9.48	9.66	9.52	9.43
25	8.92	9.03	9.05	8.97	9.28	9.41	9.71	9.65	9.55	9.70	9.65	9.38
EOM	8.91	9.02	8.88	9.03	9.33	9.52	9.72	9.64	9.51	9.71	9.34	9.40

CAL YR 1987 HIGHEST DAILY MEAN 8.75 JAN 22 LOWEST DAILY MEAN 9.75 OCT 23

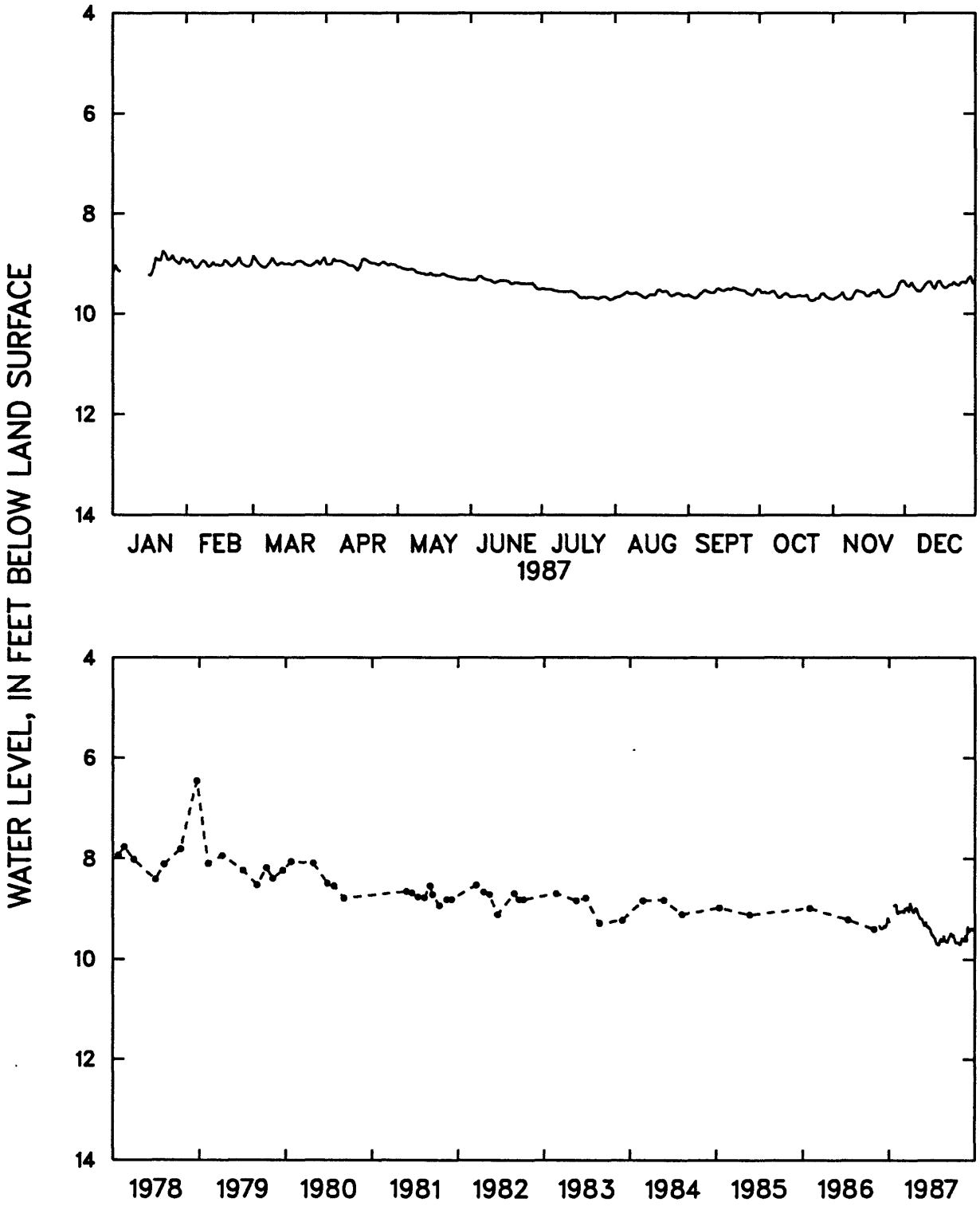


Figure 33.--Water level in observation well NC-152, Perquimans County.

NC-156 AT LAKE PHELPS, WASHINGTON COUNTY

354351076260501. Local number, NC-156; NRCD Lake Phelps Research Station well L13i1.
LOCATION.--Lat 35°43'51", long 76°26'05", Hydrologic Unit 03010205, on south shore of Lake Phelps, south of Secondary Road 1126 on Secondary Road 1183.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 510 ft, diameter 6 in, cased to 390 ft, open hole to 510 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 16.15 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.47 ft above land-surface datum - revised from 2.60 ft above land-surface datum, October 1987.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to October 1986 were provided by NRCD.
PERIOD OF RECORD.--August 1977 to current year. Records from August 1977 to September 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began November 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 13.14 ft below land-surface datum, May 16, 1978; lowest, 16.00 ft below land-surface datum, September 4, 1987.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.13 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	14.79	---	---	14.39	14.62	14.79	15.19	15.59	15.85	15.65	15.43	15.37
10	---	---	14.51	14.46	14.59	14.95	15.25	15.61	15.66	15.79	15.50	15.29
15	---	---	14.60	14.52	14.57	14.95	15.27	15.77	15.67	15.72	15.71	15.24
20	---	---	14.47	14.48	14.51	14.99	15.46	15.82	15.56	15.64	15.36	15.35
25	---	---	14.59	14.43	14.67	15.10	15.54	15.96	15.59	15.71	15.63	15.34
EOM	---	---	14.29	14.41	14.76	15.22	15.61	15.89	15.47	15.76	15.17	15.43

CAL YR 1987 HIGHEST DAILY MEAN 14.29 MAR 31 LOWEST DAILY MEAN 15.96 AUG 25

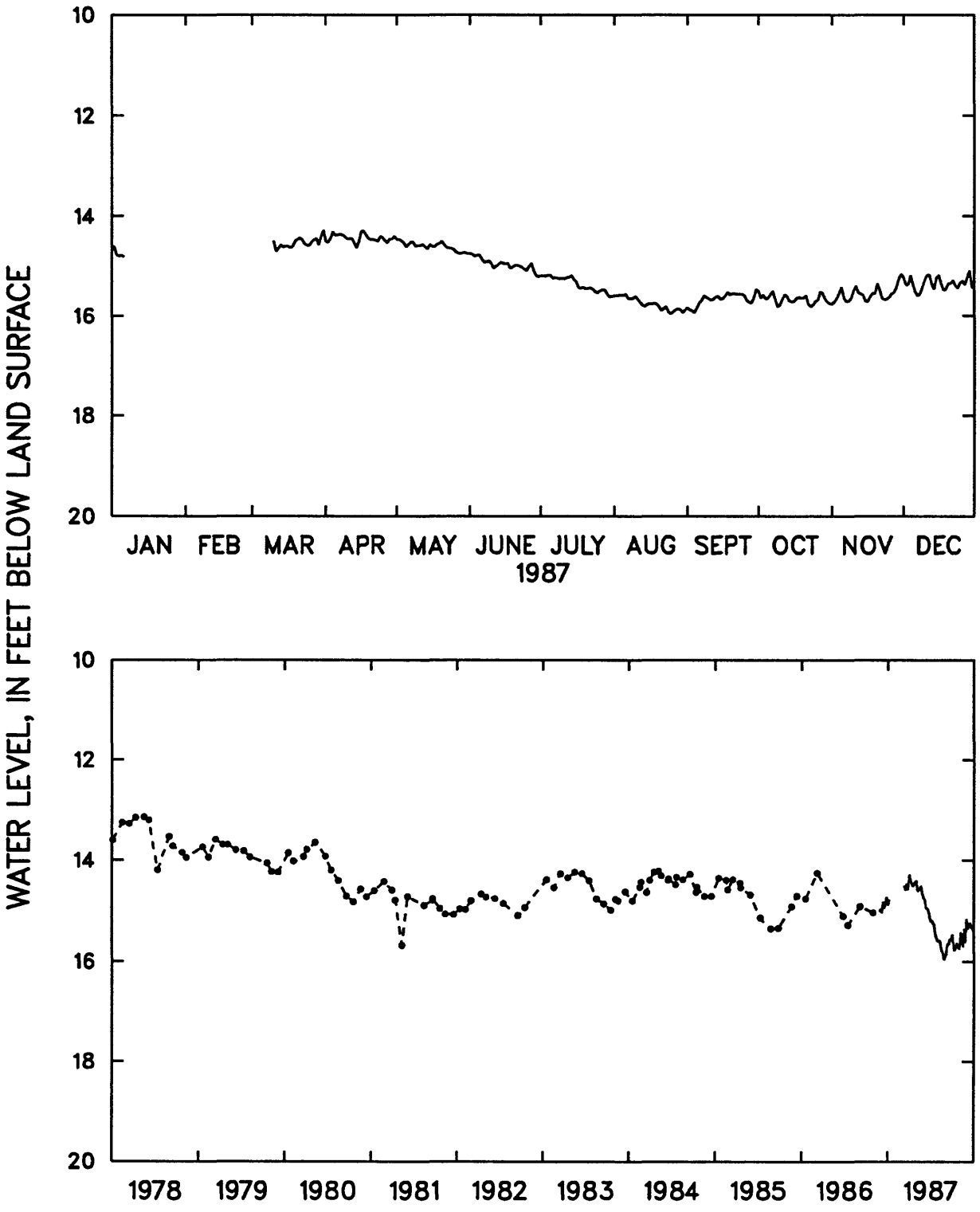


Figure 34.--Water level in observation well NC-156, Washington County.

NC-159 AT HYDELAND, HYDE COUNTY

352527076123103. Local number, NC-159; NRCD Hydeland Research Station well O10w3.
LOCATION.--Lat 35°25'27", long 76°12'31", Hydrologic Unit 03020105, 0.7 mi east of Secondary Road 1121 on Secondary Road 1122.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 700 ft, diameter 6 in, cased to 640 ft, open hole to 700 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 3.17 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 1.58 ft above land-surface datum - revised from 1.83 ft above land-surface datum, October 1987.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by NRCD.
PERIOD OF RECORD.--April 1975 to current year. Records from April 1975 to July 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began November 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.79 ft above land-surface datum, July 17, 1975; lowest, 1.14 ft below land-surface datum, September 14, 1982.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.25 ft.

WATER LEVEL, IN FEET BELOW OR ABOVE (-) LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	.00	.25	.31	.00	.23	---	---	---	.42	---	.30	---
10	-.15	.19	.12	.12	.30	---	---	---	.27	---	.41	.40
15	.06	.15	.22	.22	.32	.34	---	---	---	---	---	.39
20	.04	.25	.06	.14	.35	.36	---	---	---	---	---	.55
25	-.02	.29	.18	.09	.43	---	---	---	---	.55	---	.56
EOM	-.11	.20	-.12	.06	---	---	---	.41	---	.58	---	.68

CAL YR 1987 HIGHEST DAILY MEAN -.28 JAN 22 LOWEST DAILY MEAN .69 DEC 30

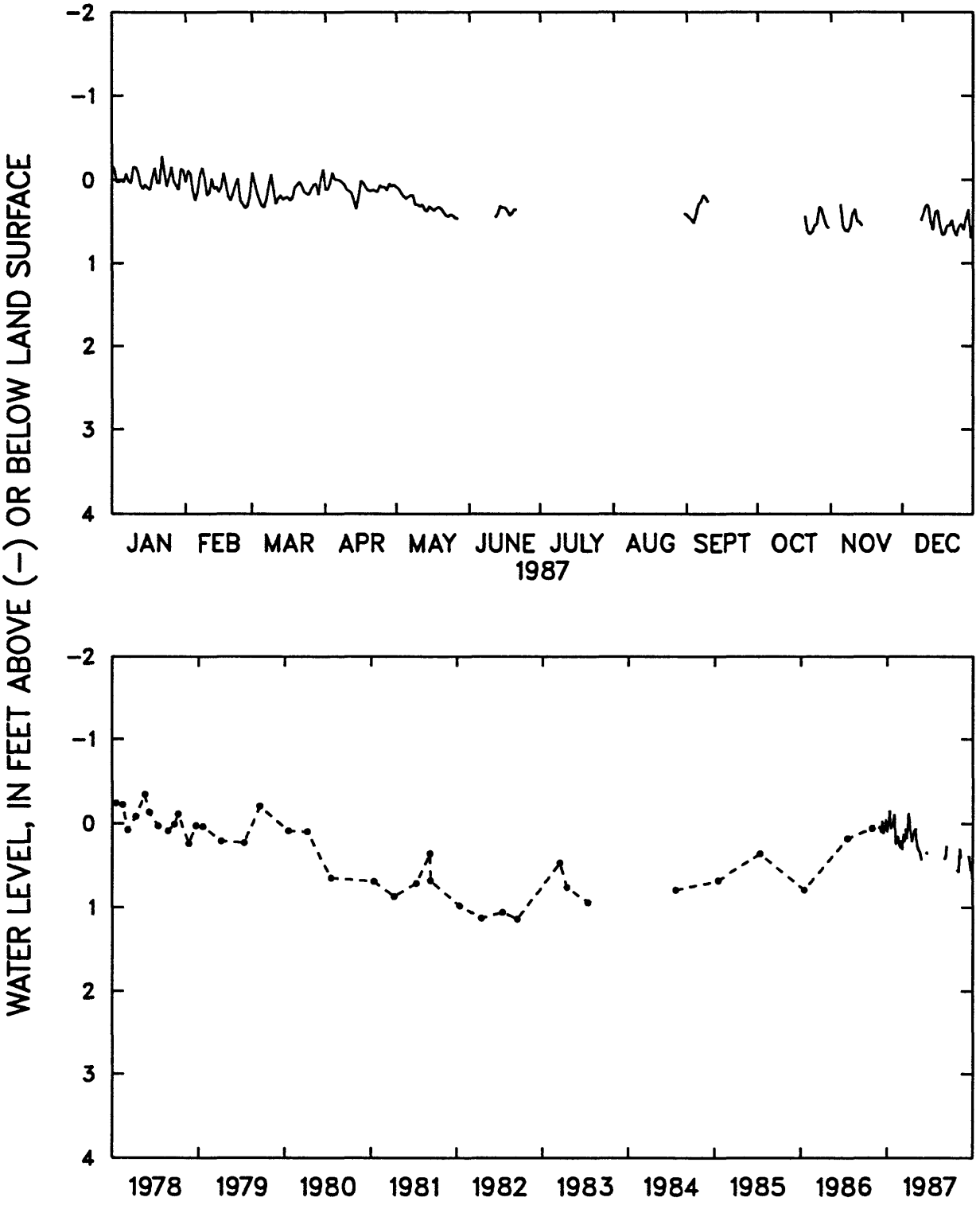


Figure 35.--Water level in observation well NC–159, Hyde County.

NC-163 NEAR COXS CROSSROADS, BEAUFORT COUNTY

352224076570403. Local number, NC-163; NRCD Coxs Crossroads Research Station well P19m3.
LOCATION.--Lat 35°22'24", long 76°57'04", Hydrologic Unit 03020104, at North Carolina Department of Transportation Maintenance Yard near Coxs Crossroads, 0.25 mi north of N.C. Highway 32 on Secondary Road 1100.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 250 ft, diameter 4 in, cased to 81 ft, open hole to 250 ft, measured depth 236.5 ft, September 1981.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 25.38 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.0 ft above land-surface datum - revised from 1.9 ft above land-surface datum, October 1987.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to December 1986 were provided by NRCD.
PERIOD OF RECORD.--June 1967 to current year. Records from June 1967 to November 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began November 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 21.14 ft below land-surface datum, February 23, 1972; lowest, 29.24 ft below land-surface datum, September 15, 1985.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by -0.1 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	28.52	---	---	26.17	25.49	26.00	26.46	27.08	26.85	27.17	27.54	27.92
10	28.19	---	---	25.96	25.57	26.11	26.39	27.09	26.84	27.41	27.68	27.81
15	---	---	---	25.77	25.60	26.07	26.44	26.96	26.87	27.45	28.01	27.64
20	---	---	---	25.50	25.65	26.21	26.67	26.80	26.85	27.53	27.80	27.65
25	---	---	---	25.37	25.80	26.32	26.81	---	26.89	27.66	28.13	27.55
EOM	---	---	26.14	25.36	25.91	26.47	26.94	26.85	26.87	27.74	27.61	27.43

CAL YR 1987 HIGHEST DAILY MEAN 25.36 APR 30 LOWEST DAILY MEAN 28.56 JAN 4

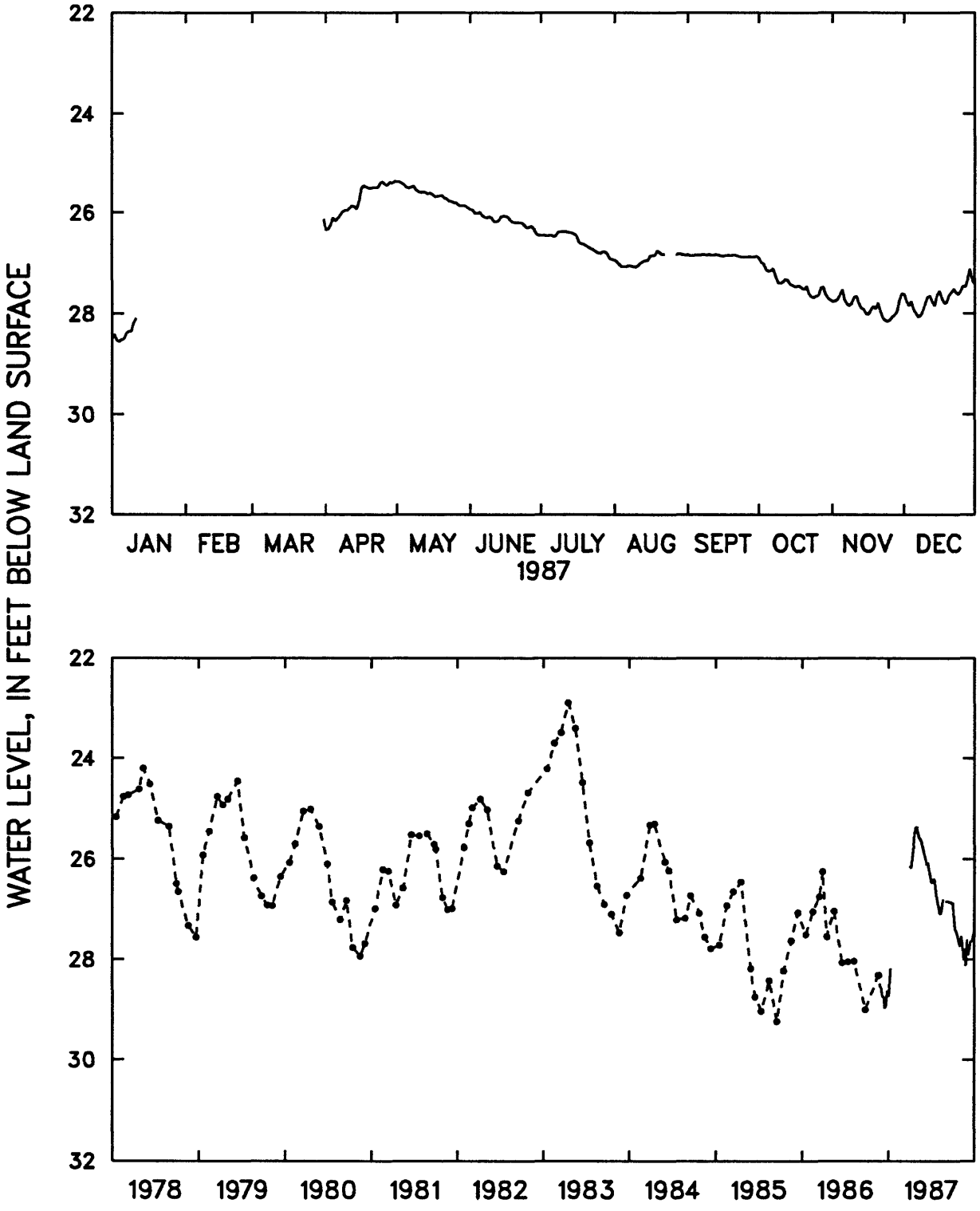


Figure 36.--Water level in observation well NC-163, Beaufort County.

NC-169 NEAR MERRITT, PAMLICO COUNTY

350523076392206. Local number, NC-169; NRCD Whortonsville Research Station well S15y6.
LOCATION.--Lat 35°05'23", long 76°39'22", Hydrologic Unit 03020204, 3.4 mi east of Merritt on Secondary Road 1321, 0.5 mi northeast of intersection of Secondary Roads 1321 and 1322.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 290 ft, diameter 4 in, cased to 223 ft and from 228 to 270 ft, screened intervals from 223 to 228 ft and 270 to 275 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 7.54 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.53 ft above land-surface datum - revised from 2.64 ft above land-surface datum, October 1987.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to December 1986 were provided by NRCD.
PERIOD OF RECORD.--February 1978 to current year. Records from February 1978 to November 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began December 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.00 ft below land-surface datum, May 10, 1978; lowest, 7.65 ft below land-surface datum, September 21, 1983.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.11 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	6.07	---	---	4.60	4.69	5.52	6.53	6.93	6.17	5.67	6.22	6.15
10	5.94	---	---	4.66	4.78	5.82	6.67	6.97	5.94	5.79	6.32	6.07
15	---	---	---	4.71	4.88	5.91	6.62	6.72	5.81	5.82	6.41	5.96
20	---	---	---	4.66	4.98	6.12	6.72	6.67	5.67	5.92	6.30	5.94
25	---	---	4.63	4.59	5.12	6.31	6.81	6.68	5.59	6.07	6.39	5.88
EOM	---	---	4.53	4.64	5.34	6.48	6.90	6.38	5.57	6.15	6.19	5.78

CAL YR 1987 HIGHEST DAILY MEAN 4.53 MAR 31 LOWEST DAILY MEAN 6.97 AUG 10

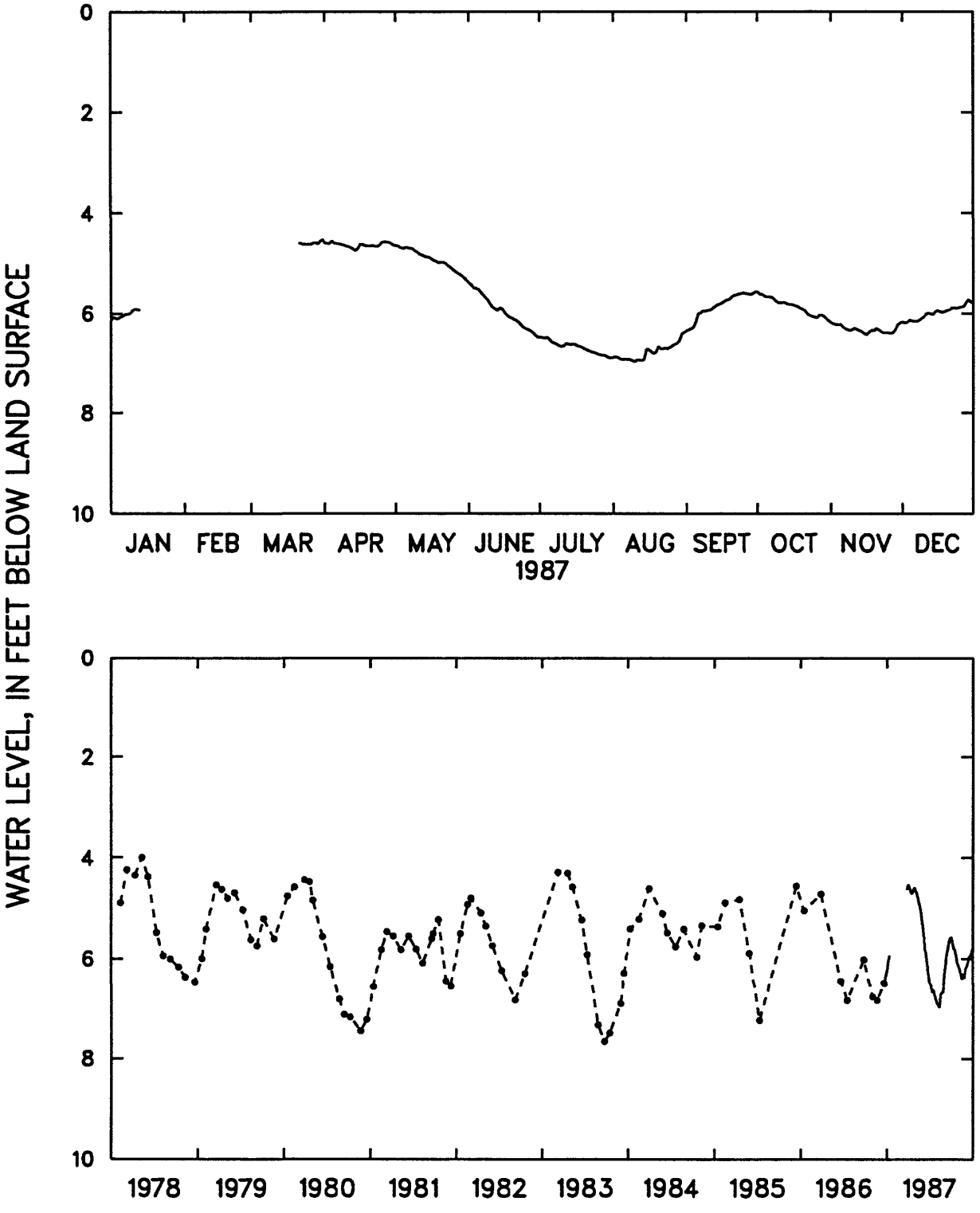


Figure 37.--Water level in observation well NC-169, Pamlico County.

NC-181 NEAR SUNSET HARBOR, BRUNSWICK COUNTY

335629078115406. Local number, NC-181; NRCD Sunset Harbor Research Station well GG34s6.
LOCATION.--Lat 33°56'29", long 78°11'54", Hydrologic Unit 03040207, 1 mi north of Sunset Harbor, 4.3 mi south of N.C. Highway 211 on Secondary Road 1112.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 102 ft, diameter 6 in, cased to 84 ft, open hole to 102 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 28.06 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.02 ft above land-surface datum.
REMARKS.--Areal-effects well. Records from December 1978 to March 1986 are from Sunset Harbor Research Station well GG34s5 which was adjacent to and of similar construction to well NC-181.
COOPERATION.--Periodic water-level measurements prior to April 1986 were provided by NRCD.
PERIOD OF RECORD.--September 1974 to current year. Records from September 1974 to March 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey periodic water-level measurements for well NC-181 began December 1986 and continuous record began March 1987.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.37 ft below land-surface datum, March 13, 1987; lowest, 11.10 ft below land-surface datum, April 10, 1981.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	---	---	6.91	7.99	7.85	8.54	9.32	8.36	8.49	9.08	9.27
10	---	---	---	7.02	8.09	8.32	8.79	9.26	8.01	8.67	9.13	9.24
15	---	---	6.47	6.97	8.20	8.06	9.18	8.63	7.98	8.79	9.25	9.33
20	---	---	6.49	6.83	7.61	8.16	9.48	8.76	8.09	8.86	9.23	9.51
25	---	---	6.68	6.92	7.87	8.28	9.15	8.80	8.21	8.97	9.38	9.60
EOM	---	---	6.74	7.36	8.45	8.57	9.28	8.86	8.25	9.11	9.05	9.78

CAL YR 1987 HIGHEST DAILY MEAN 6.43 MAR 13 LOWEST DAILY MEAN 9.82 DEC 30

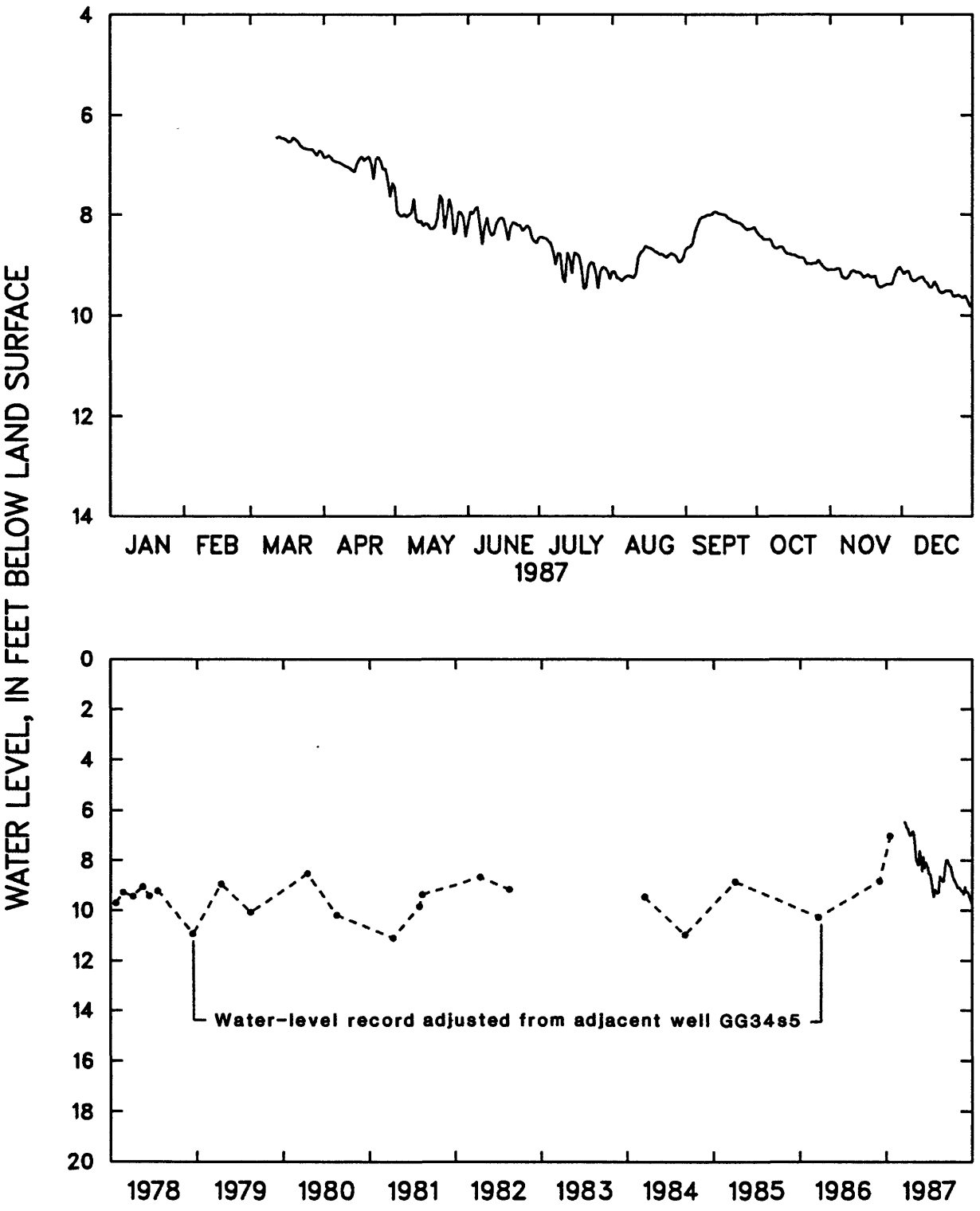


Figure 38.--Water level in observation well NC-181, Brunswick County.

Peedee Aquifer

Seven wells monitor water levels in the Peedee aquifer (fig. 39). Four of these (NC-180, NC-184, NC-185, and NC-187; figs. 43-46) had record low water levels in 1987; however, NC-174 (fig. 41) reached a record high level. Six of these wells exhibit uniform water-level fluctuations throughout most of the aquifer's areal extent. All six show seasonal water-level fluctuations; three (NC-164, NC-174, and NC-180; figs. 40, 41, and 43) show no long-term trend of rise or decline, and the other three (NC-178, NC-184, and NC-185; figs. 42, 44, and 45) do not have water-level records of sufficient length to determine a trend. The seventh well (NC-187, fig. 46) reveals almost no seasonal fluctuations and a steady downward trend of 1.5 ft per year. This well is in southern Jones County and about 12 miles north of a public-supply well field in Onslow County where water is withdrawn from both the Peedee and Black Creek aquifers. These withdrawals have resulted in cones of depression in both aquifers; the one in the Peedee aquifer was delineated for December 1986 by Brockman and others (1989) on their potentiometric map of the Peedee aquifer in the central Coastal Plain.

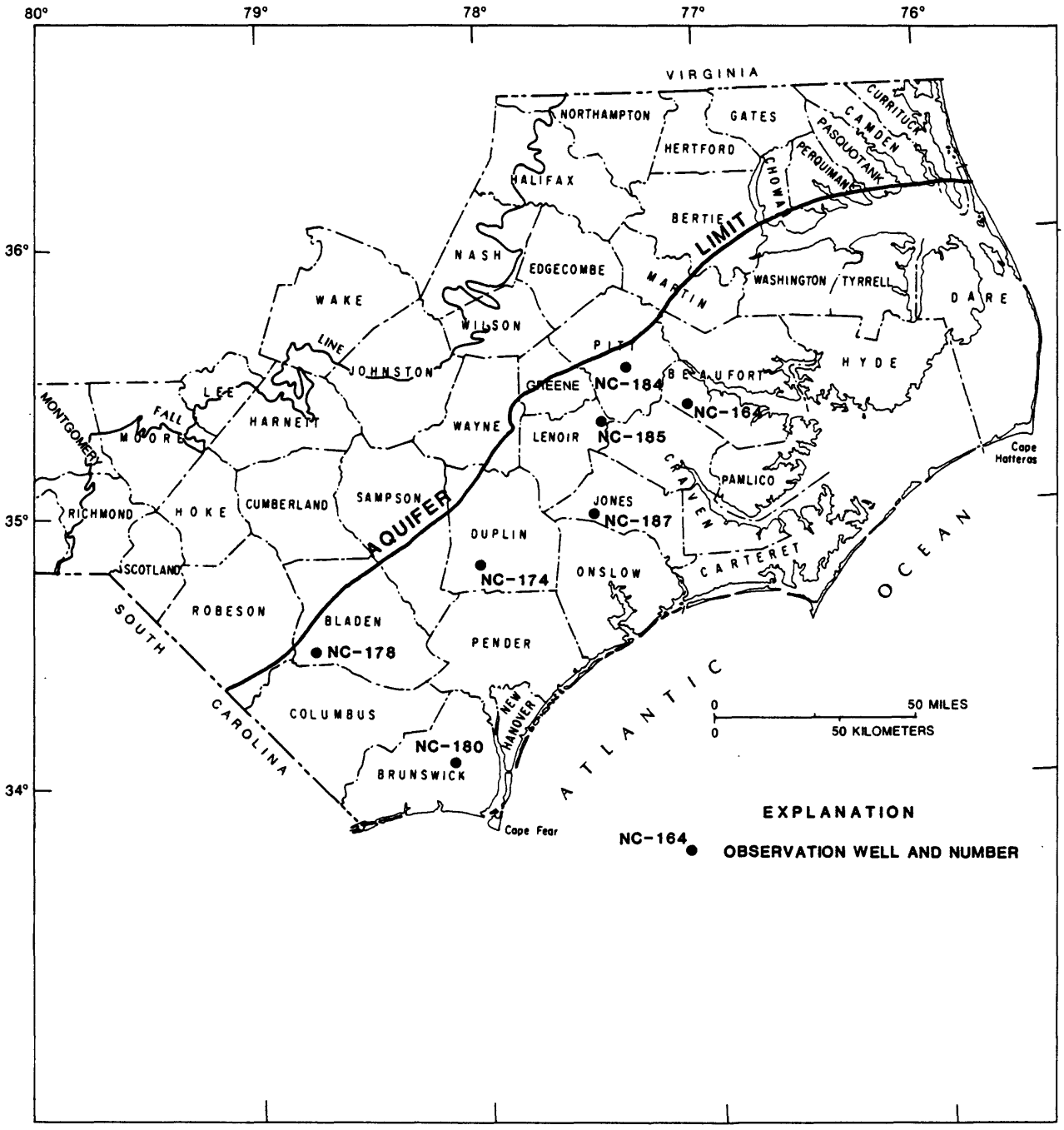


Figure 39.--Location of observation wells in the Peedee aquifer.

NC-164 NEAR WILMAR, BEAUFORT COUNTY

352252077050707. Local number, NC-164; NRCD Wilmar Research Station well P21k7.
LOCATION.--Lat 35°22'53", long 77°05'17", Hydrologic Unit 03020202, 3.5 mi southeast of Wilmar, 0.5 mi east of intersection of Secondary Roads 1129 and 1130 on logging road.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Peedee aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 320 ft, diameter 6 in, cased to 290 ft, screened interval from 290 to 310 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 40.56 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.94 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by NRCD.
PERIOD OF RECORD.--March 1969 to current year. Records from March 1969 to July 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began December 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.03 ft below land-surface datum, April 27, 1973; lowest, 19.11 ft below land-surface datum, December 22, 1986.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	18.70	17.32	16.10	14.99	14.65	14.98	15.78	16.85	17.10	17.11	17.70	18.12
10	18.43	17.00	15.77	14.94	14.65	15.20	15.91	16.99	17.02	17.28	17.84	18.04
15	---	16.76	15.64	14.88	14.60	15.20	16.06	17.01	17.09	17.33	18.05	17.89
20	---	16.62	15.39	14.78	14.68	15.32	16.32	17.00	17.00	17.41	17.98	17.86
25	---	16.44	15.34	14.67	14.82	15.48	16.53	17.11	17.08	17.58	18.22	17.73
EOM	---	16.23	15.03	14.59	14.95	15.69	16.74	17.08	17.00	17.74	17.96	17.60

CAL YR 1987 HIGHEST DAILY MEAN 14.59 APR 30 LOWEST DAILY MEAN 18.74 JAN 3, 4

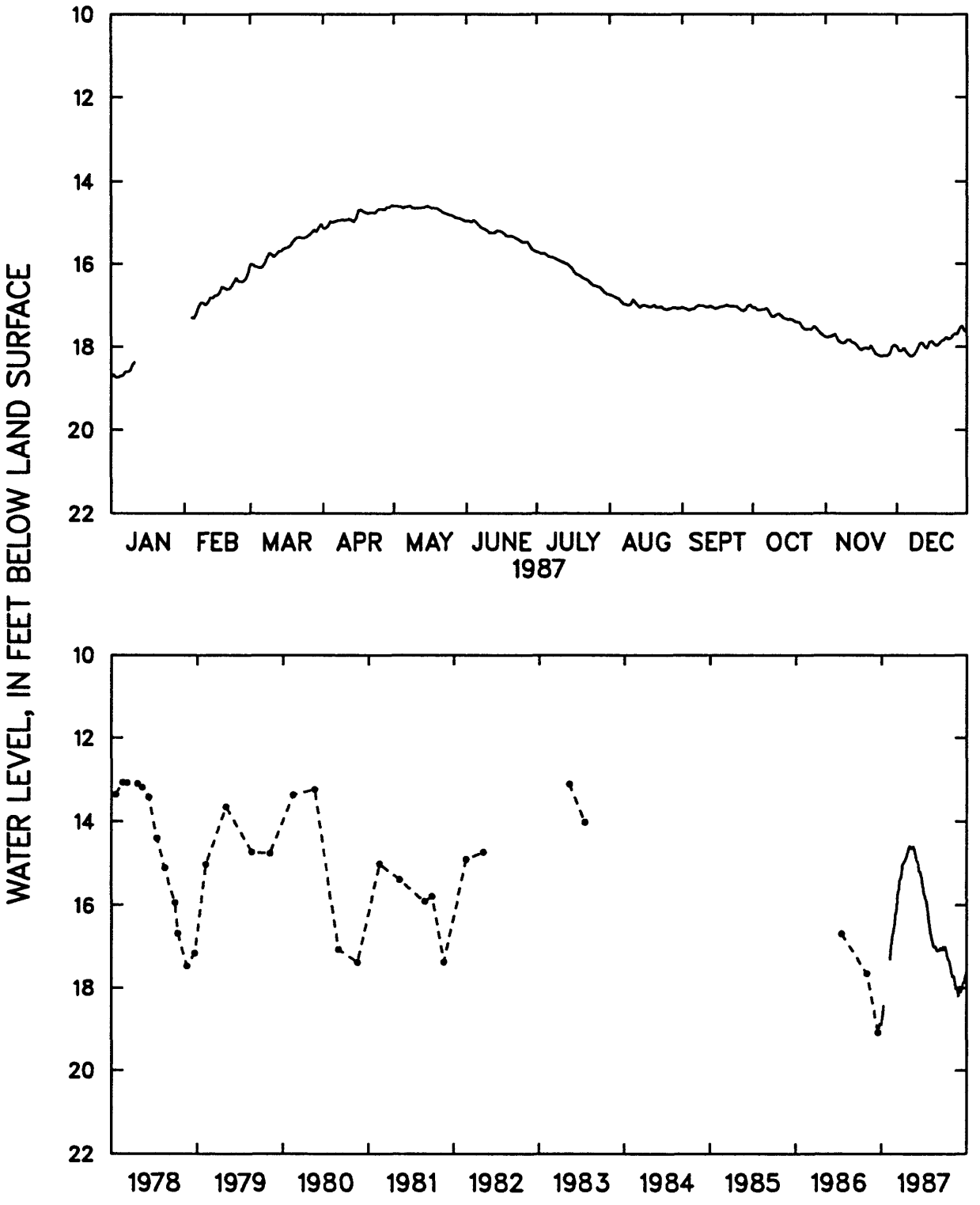


Figure 40.--Water level in observation well NC-164, Beaufort County.

NC-174 NEAR ROSE HILL, DUPLIN COUNTY

345051078012101. Local number, NC-174; NRCD Rose Hill Research Station well V32v1.
LOCATION.--Lat 34°50'51", long 78°01'21", Hydrologic Unit 03030007, 1.5 mi north of Rose Hill at Rose Hill-Magnolia Elementary School, east of U.S. Highway 117 on Secondary Road 1911.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Peedee aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 98 ft, diameter 4 in, cased to 83 ft, screened interval from 83 to 98 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 85.89 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 1.75 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to January 1987 were provided by NRCD.
PERIOD OF RECORD.--March 1982 to current year. Records from March 1982 to December 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began January 1987.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 14.30 ft below land-surface datum, March 31, 1987; lowest, 19.53 ft below land-surface datum, July 11, 1984.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	15.11	14.73	14.61	14.99	16.29	15.64	17.85	17.26	16.63	17.85	18.05
10	---	15.07	14.78	14.92	15.38	16.78	15.92	17.70	16.12	16.94	17.86	17.98
15	15.43	15.16	14.87	15.00	15.92	16.27	16.25	17.09	16.13	17.22	17.87	17.66
20	14.89	14.95	14.88	14.67	16.05	16.38	16.77	16.98	16.29	17.41	17.78	17.70
25	14.63	14.94	15.01	14.50	16.12	16.20	17.30	16.94	16.54	17.62	18.07	17.38
EOM	14.80	14.78	14.35	14.65	16.09	16.57	17.79	16.96	16.63	17.78	17.77	16.75

CAL YR 1987 HIGHEST DAILY MEAN 14.35 MAR 31 LOWEST DAILY MEAN 18.08 DEC 6, 8

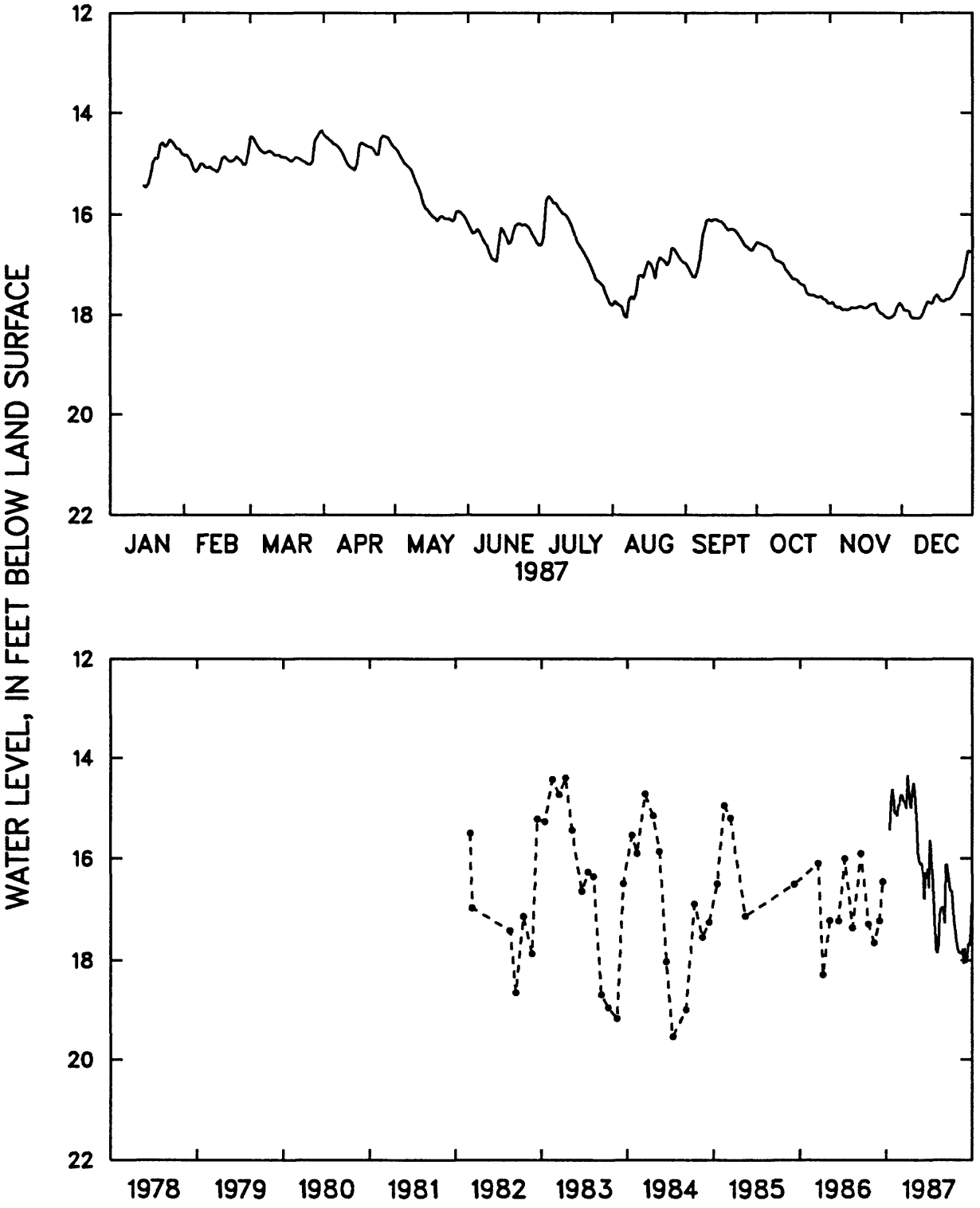


Figure 41.--Water level in observation well NC-174, Duplin County.

NC-178 NEAR BLADENBORO, BLADEN COUNTY

343027078451903. Local number, NC-178; NRCD Bladenboro Research Station well Z41u3.
LOCATION.--Lat 34°30'27", long 78°45'19", Hydrologic Unit 03040206, 3 mi southeast of Bladenboro, south of N.C. Highway 211 on Secondary Road 1172.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Peedee aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 110 ft, diameter 6 in, cased to 100 ft, screened interval from 100 to 110 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 116.45 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.78 ft above land-surface datum - revised from 2.89 ft above land-surface datum, October 1987.
REMARKS.--Areal-effects well. Records prior to January 1987 are from Bladenboro Research Station well Z41u4 which was adjacent to and of similar construction to well NC-178.
COOPERATION.--Periodic water-level measurements prior to January 1987 were provided by NRCD.
PERIOD OF RECORD.--March 1976 to current year. Records for well Z42u4 from March 1976 to December 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record for well NC-178 began January 1987.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.73 ft below land-surface datum, April 19, 1978; lowest, 7.77 ft below land-surface datum, November 13, 1986.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.11 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	4.41	3.73	3.62	3.70	4.61	5.03	6.04	6.09	4.99	---	5.77
10	---	4.31	3.66	3.70	3.84	4.85	5.11	6.17	5.58	5.14	---	5.64
15	5.41	4.30	3.70	3.75	3.92	4.88	5.22	6.15	5.11	5.24	---	5.46
20	5.15	4.11	3.69	3.62	4.05	4.88	5.41	6.23	4.90	5.37	---	---
25	4.73	4.02	3.74	3.55	4.20	4.90	5.64	6.25	4.89	5.55	---	---
EOM	4.46	3.83	3.63	3.59	4.45	5.01	5.93	6.21	4.90	---	---	---

CAL YR 1987 HIGHEST DAILY MEAN 3.55 APR 25 LOWEST DAILY MEAN 6.30 AUG 23

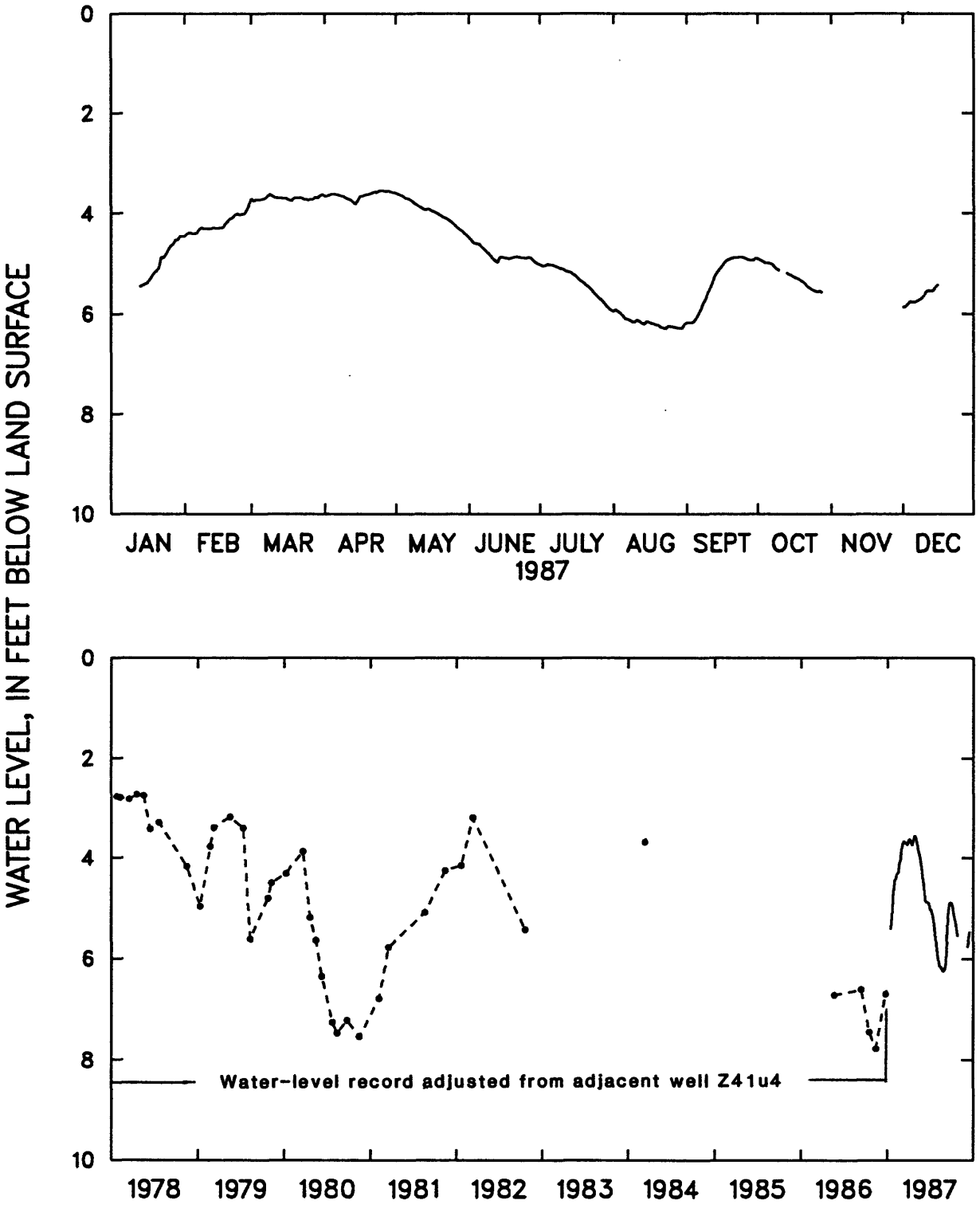


Figure 42.--Water level in observation well NC-178, Bladen County.

NC-180 AT BOLIVIA, BRUNSWICK COUNTY

340416078084202. Local number, NC-180; NRCD Bolivia Research Station well FF33d2.
LOCATION.--Lat 34°04'16", long 78°08'42", Hydrologic Unit 03040207, in Bolivia at Town Hall on U.S. Highway 17.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Peedee aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 140 ft, diameter 4 in, cased to 92 ft, open hole to 140 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 40.97 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.70 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to April 1987 were provided by NRCD.
PERIOD OF RECORD.--April 1971 to current year. Records from April 1971 to March 1987 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began May 1987.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.52 ft below land-surface datum, August 14, 1973; lowest, 13.47 ft below land-surface datum, November 19, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	---	---	---	---	10.46	11.45	12.07	11.93	11.08	12.46	11.07
10	---	---	---	---	9.23	10.75	12.21	12.03	11.51	11.68	12.45	10.99
15	---	---	---	---	9.77	10.67	11.93	12.20	11.20	11.84	12.64	11.01
20	---	---	---	---	9.74	11.03	11.80	12.03	10.58	11.94	12.70	10.77
25	---	---	---	---	9.53	---	11.98	12.04	10.89	12.14	12.25	10.71
EOM	---	---	---	---	10.15	11.77	12.11	11.99	10.99	12.71	11.37	10.80

CAL YR 1987 HIGHEST DAILY MEAN 9.12 MAY 6 LOWEST DAILY MEAN 12.82 NOV 19

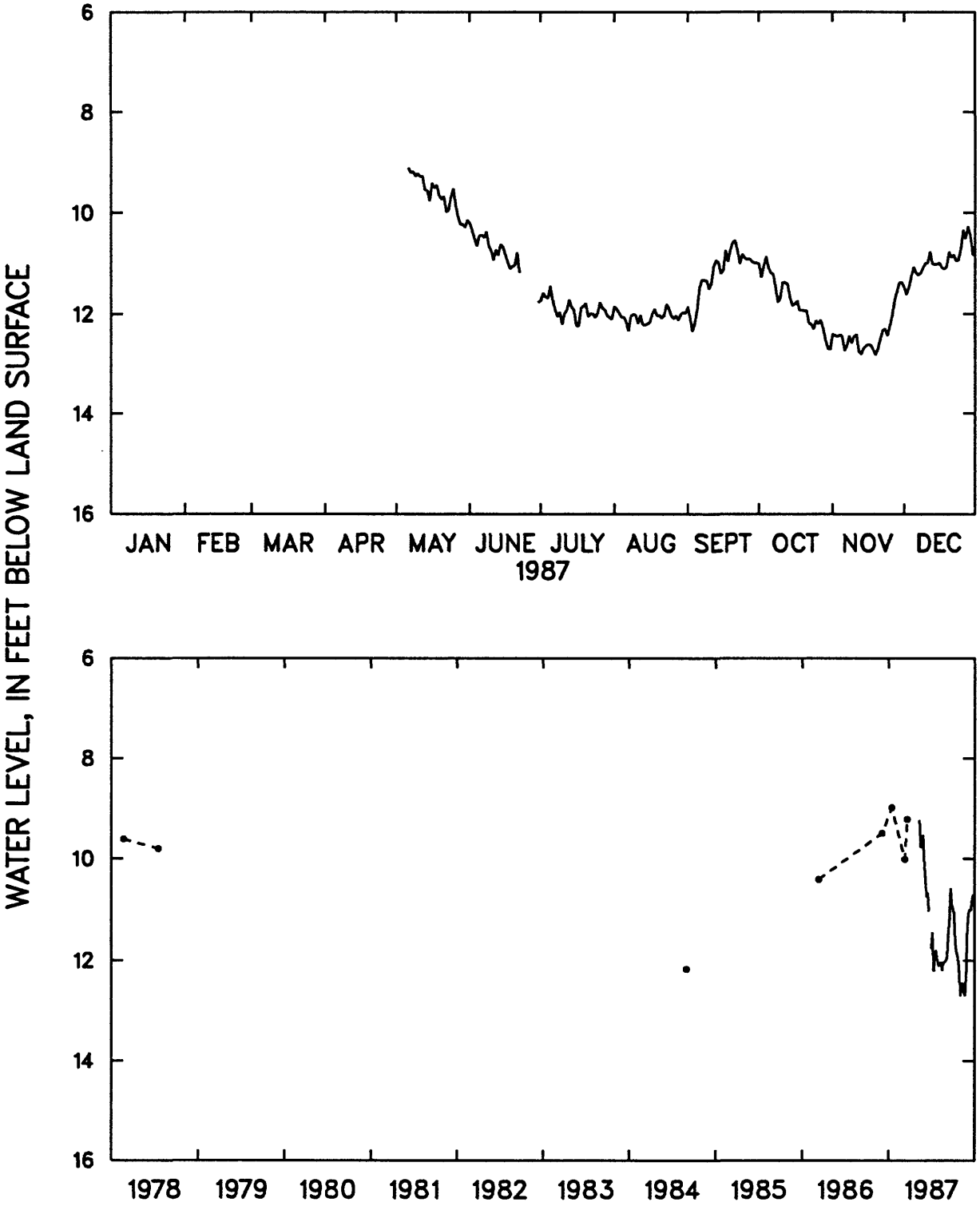


Figure 43.--Water level in observation well NC-180, Brunswick County.

NC-184 NEAR GREENVILLE, PITT COUNTY

353146077193403. Local number, NC-184; NRCD Conley Research Station well N23p3.
LOCATION.--Lat 35°31'46", long 77°19'34", Hydrologic Unit 03020203, 6 mi southeast of Greenville, 0.2 mi west of N.C. Highway 43 on Secondary Road 1711 at Conley High School.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Peedee aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 132 ft, diameter 4 in, cased to 122 ft, screened interval from 122 to 132 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 69 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 3.63 ft above land-surface datum.
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--June 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.07 ft below land-surface datum, March 11, 1985; lowest, 22.39 ft below land-surface datum, December 18 and 19, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	20.80	19.26	18.70	18.21	18.25	18.86	19.80	20.88	21.53	21.58	22.02	22.26
10	20.42	19.14	18.44	18.28	18.32	19.06	19.83	21.02	21.48	21.70	22.11	22.24
15	20.24	19.02	18.44	18.28	18.34	19.11	19.92	21.12	21.56	21.76	22.24	22.25
20	19.91	19.01	18.31	18.22	18.49	19.26	20.19	21.23	21.48	21.84	22.17	22.32
25	19.65	18.91	18.38	18.16	18.72	19.52	20.46	21.40	21.57	21.95	22.32	22.24
EOM	19.30	18.76	18.19	18.23	18.85	19.76	20.77	21.47	21.48	22.06	22.11	22.15

CAL YR 1987 HIGHEST DAILY MEAN 18.12 APR 16 LOWEST DAILY MEAN 22.38 DEC 14, 19

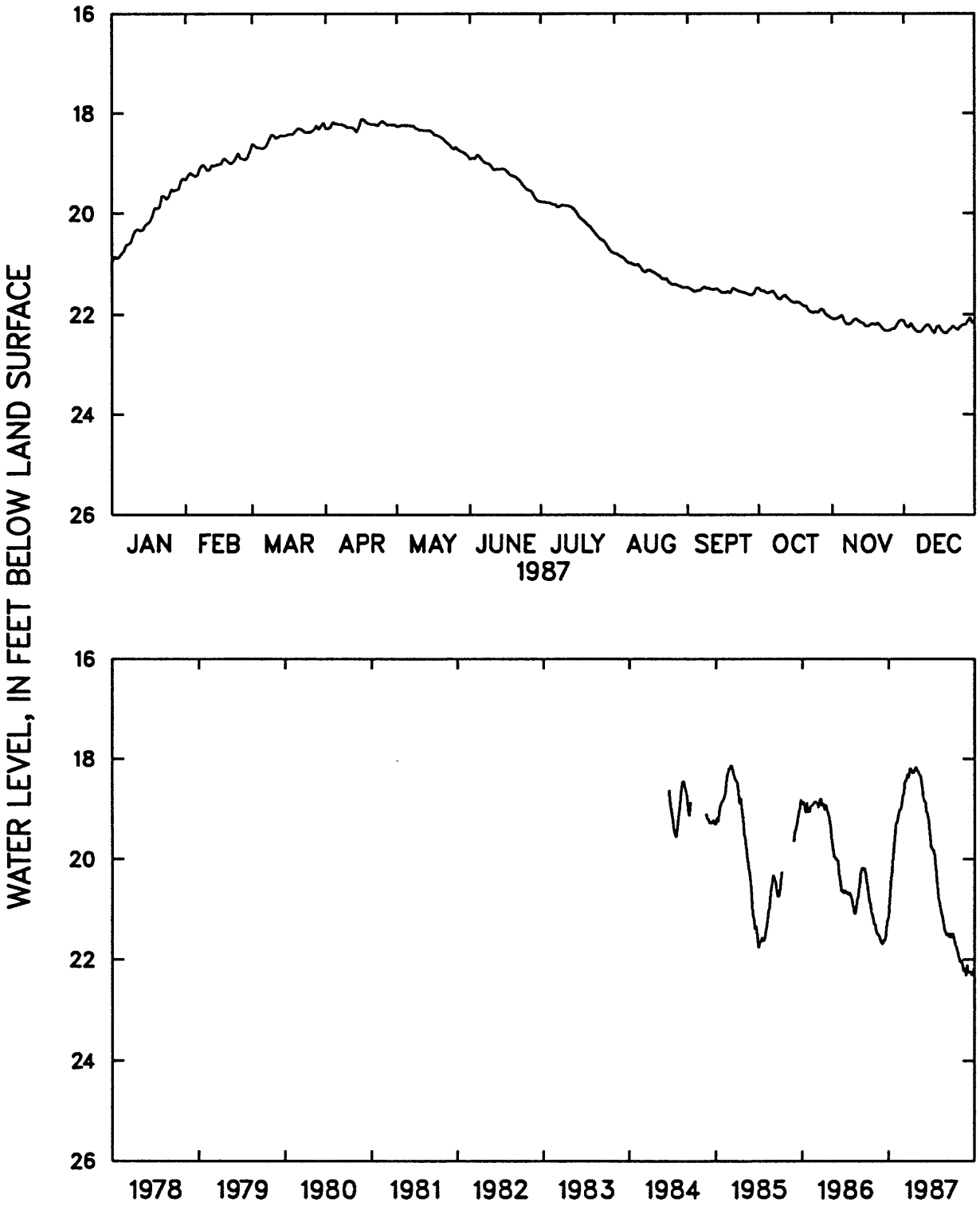


Figure 44.--Water level in observation well NC-184, Pitt County.

NC-185 NEAR GRAINGERS, LENOIR COUNTY

351937077284201. Local number, NC-185; NRCD Graingers Research Station well Q25d12.
LOCATION.--Lat 35°19'37", long 77°28'42", Hydrologic Unit 03020202, 1.6 mi northeast of Graingers on N.C. Highway 11 at E. I. du Pont de Nemours and Company's Kinston Plant.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Peedee aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 134 ft, diameter 4 in, cased to 124 ft, screened interval from 124 to 134 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 66 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 3.1 ft above land-surface datum.
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--December 1985 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 54.09 ft below land-surface datum, December 18, 1985; lowest, 60.61 ft below land-surface datum, July 31, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	57.13	55.58	55.62	55.65	55.61	58.17	59.66	60.23	60.15	59.31	59.30	58.75
10	56.87	56.26	54.92	56.18	56.61	58.33	59.79	60.02	59.91	59.34	59.33	58.67
15	57.33	56.60	55.00	56.48	56.86	58.39	59.71	59.96	59.75	59.22	59.41	58.61
20	57.22	56.88	55.18	55.84	57.14	58.83	59.78	59.83	59.58	59.20	59.35	58.58
25	56.16	56.83	55.38	55.08	57.39	59.08	60.11	59.98	59.51	59.30	59.25	58.42
EOM	55.56	56.73	55.62	54.91	57.91	59.50	60.52	60.29	59.44	59.40	58.75	58.24

CAL YR 1987 HIGHEST DAILY MEAN 54.77 APR 28 LOWEST DAILY MEAN 60.52 JUL 31

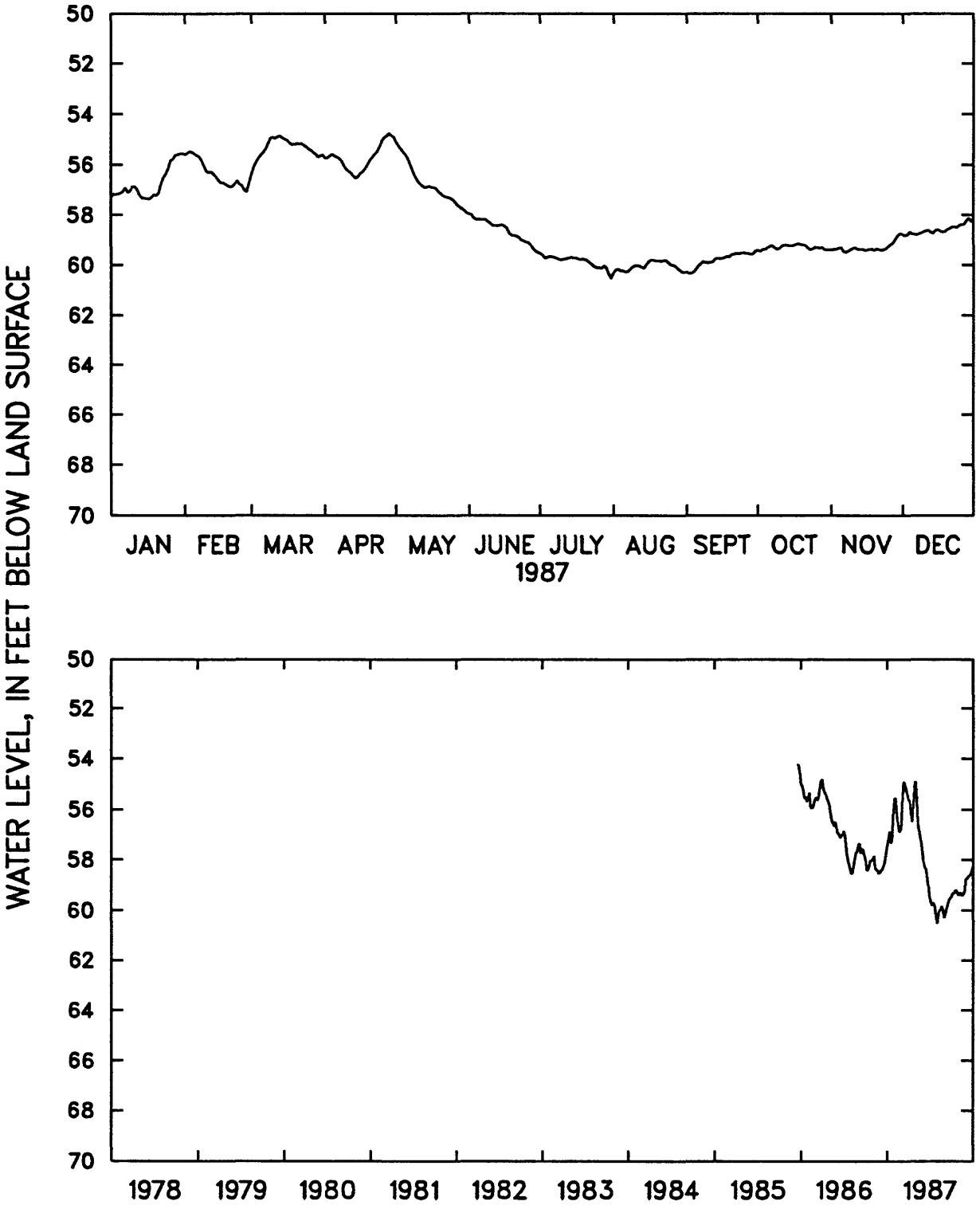


Figure 45.--Water level in observation well NC-185, Lenoir County.

NC-187 NEAR COMFORT, JONES COUNTY

345809077301405. Local number, NC-187; NRCD Comfort Research Station well U26j5.
LOCATION.--Lat 34°58'09", long 77°30'14", Hydrologic Unit 03020204, 2.5 mi south of Comfort at North Carolina Division of Forest Resources Fire Tower on Secondary Road 1003.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Peedee aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 284 ft, diameter 4 in, cased to 274 ft, screened interval from 274 to 284 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 68 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 1.3 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to July 1986 were provided by NRCD.
PERIOD OF RECORD.--July 1980 to current year. Records from July 1980 to June 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began July 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 21.53 ft below land-surface datum, October 29, 1980; lowest, 32.70 ft below land-surface datum, November 23, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	31.29	31.29	31.23	31.52	31.71	31.72	32.10	32.19	32.41	32.49	32.48
10	---	31.29	31.17	31.29	31.57	31.80	31.81	32.09	32.13	32.53	32.53	32.45
15	31.18	31.23	31.27	31.32	31.58	31.71	31.83	31.97	32.20	32.54	32.65	32.41
20	31.13	31.30	31.20	31.33	31.54	31.70	31.99	32.01	---	32.54	32.51	32.51
25	31.12	31.29	31.29	31.32	31.61	31.72	32.03	32.13	---	32.61	32.65	32.53
EOM	31.11	31.19	31.14	31.37	31.69	31.84	32.05	32.15	32.32	32.65	32.29	32.59

CAL YR 1987 HIGHEST DAILY MEAN 30.93 JAN 22 LOWEST DAILY MEAN 32.69 NOV 23

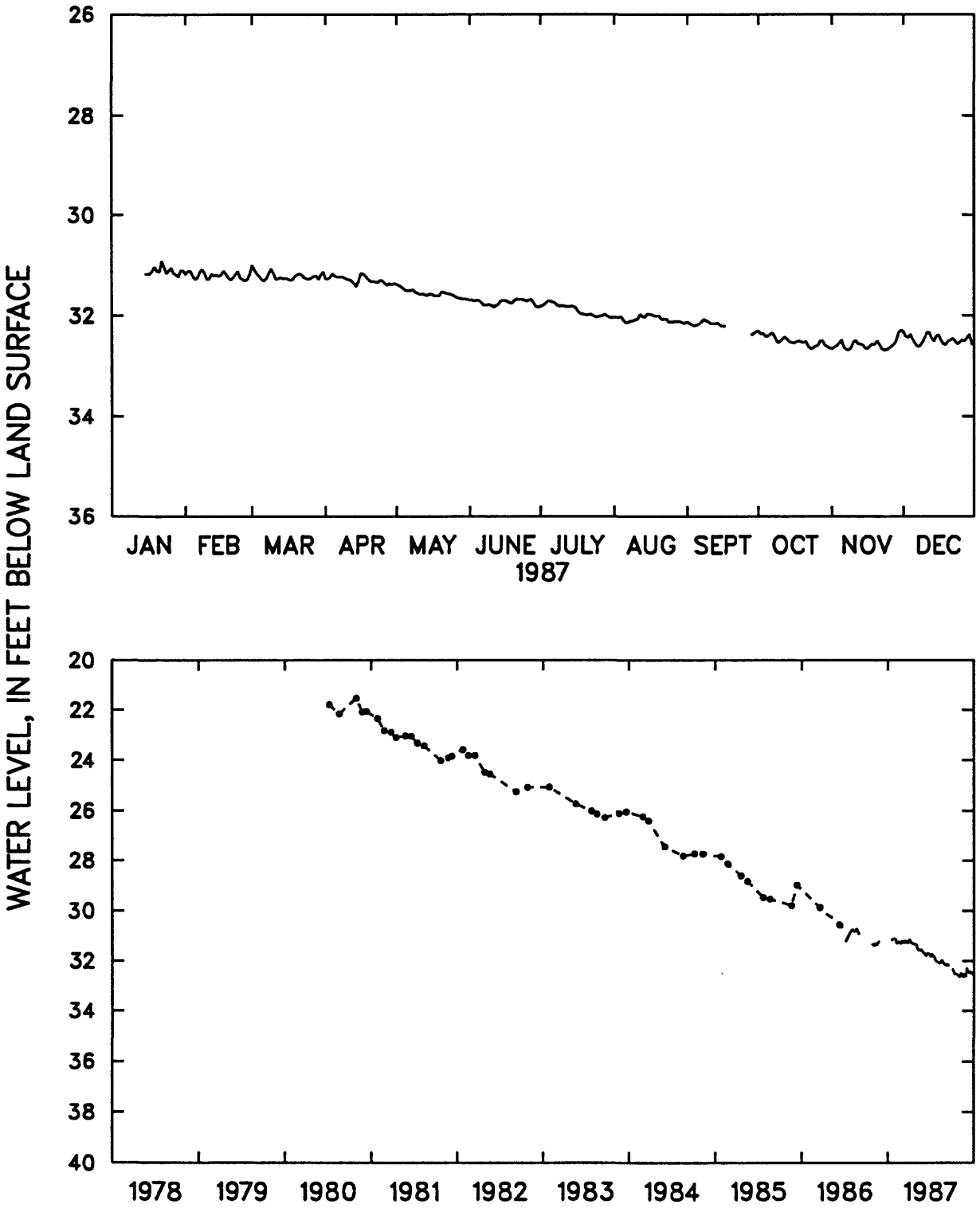


Figure 46.--Water level in observation well NC-187, Jones County.

Black Creek and Upper Cape Fear Aquifers

Water-level fluctuations in the Black Creek and upper Cape Fear aquifers are recorded at 13 wells (fig. 47). Water levels in all the wells reached record lows in 1987, and all show long-term trends of water-level decline ranging from 0.2 to 11 ft per year. These declines are the result of pumpage over most of the areal extent of the aquifers. In 1980, total pumpage from these aquifers was nearly 49 Mgal/d (G.L. Giese, U.S. Geological Survey, written commun., 1987). Ground water was withdrawn by more than 40 public-supply and industrial users in the central Coastal Plain area in 1980 (Winner and Lyke, 1986), and the areas of greatest withdrawal are easily identified by the prominent cones of depression shown on figure 48 in and around Greenville, the Kinston-Graingers area, Cove City, and northern Onslow County. The greatest rate of water-level declines are associated with withdrawals in Onslow County, where withdrawal rates have more than tripled from 2.5 Mgal/d to 8.0 Mgal/d from 1980 to 1986 (William Lyke, U.S. Geological Survey, oral commun., 1988). Observation wells NC-172, in Jones County, and NC-189, in Onslow County, show water-level declines of 9 and 11 ft per year, respectively (figs. 56 and 63). Declines in the other areas in the central Coastal Plain where major withdrawals are taking place range from 2 to slightly more than 4 ft per year. Water-level declines in the northern Coastal Plain (NC-149 and NC-153, figs. 52 and 53) reflect regional withdrawals by several users in North Carolina and possibly Virginia.

Water-level records for this aquifer in the southern Coastal Plain in Robeson County (NC-177, fig. 59) have shown a steady decline of about 1.5 ft per year since records began in 1970. The decline results from withdrawals for public supply and industry in Robeson and Bladen Counties.

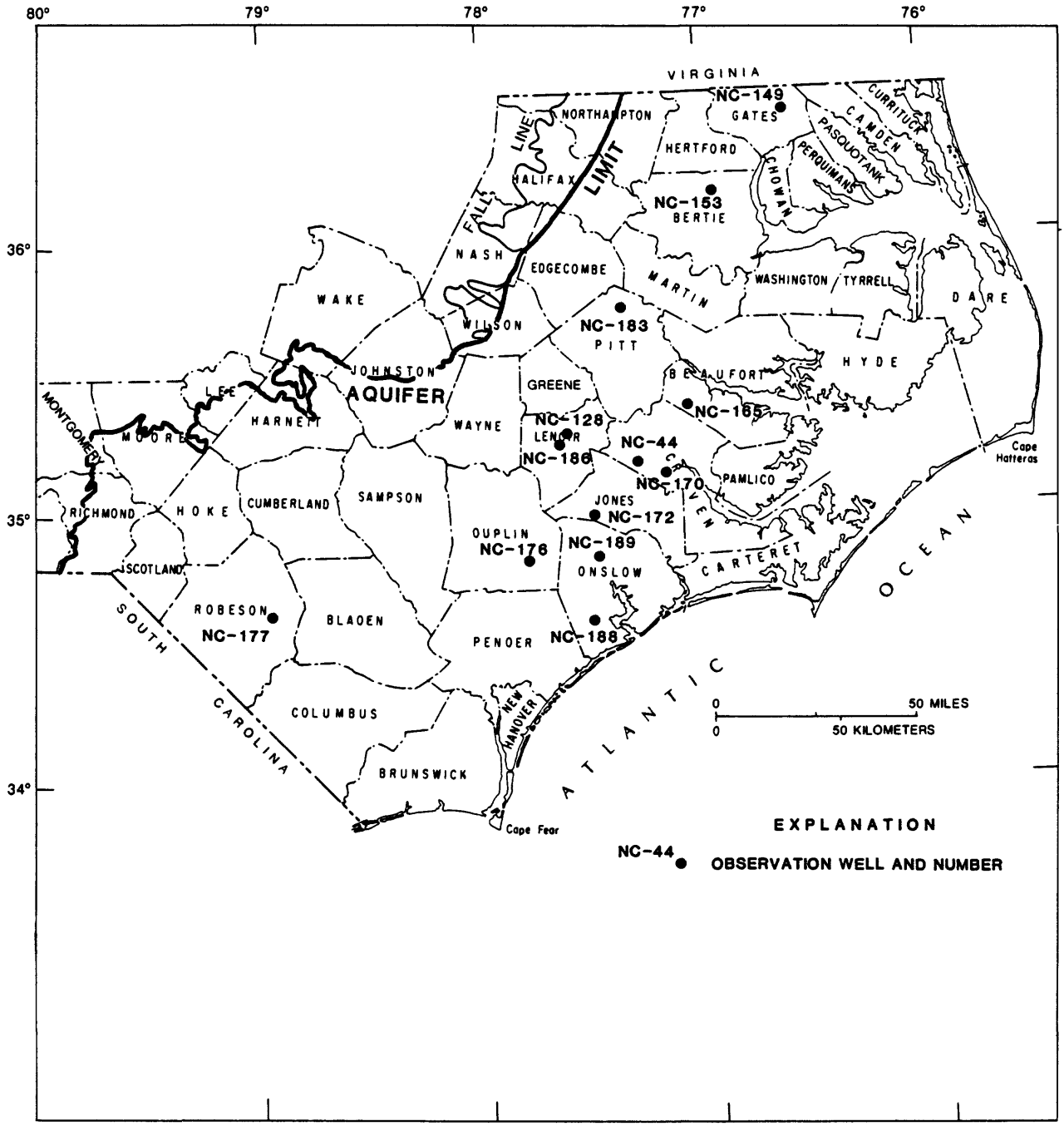
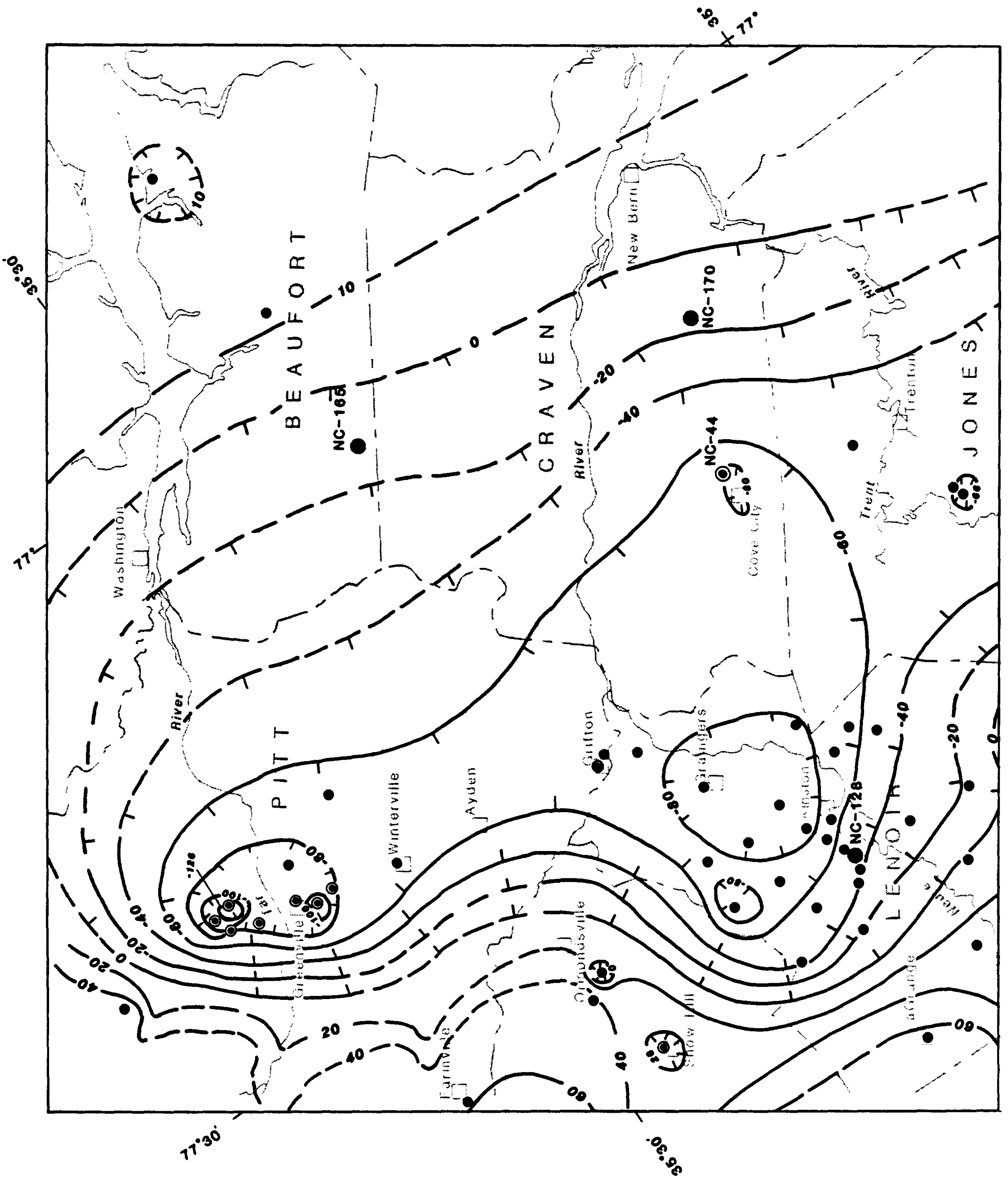


Figure 47.--Location of observation wells in the Black Creek and upper Cape Fear aquifers.



36°
77°
35°30'
77°
77°30'
35°30'
BEAUFORT
CRAVEN
PITT
JONES
LENOIR
NC-165
NC-170
NC-44
NC-128
Washington
New Bern
Greenville
Winterville
Ayden
Grifton
Cove City
Trenton
Snow Hill
Farmville
River
Trent

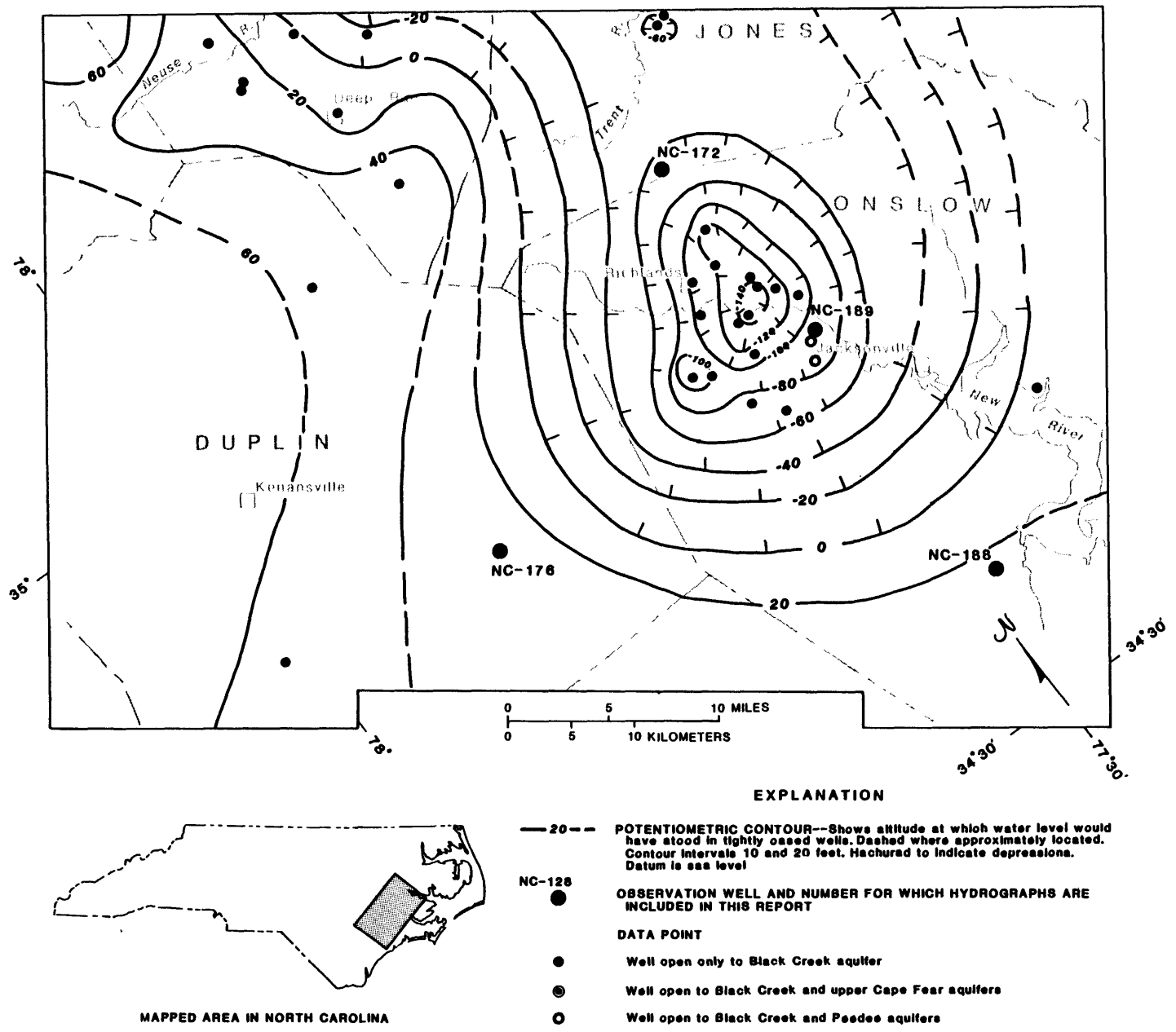


Figure 48.--Potentiometric surface of the Black Creek aquifer in the central Coastal Plain, November 1987.

NC-44 NEAR COVE CITY, CRAVEN COUNTY

351049077175501. Local number, NC-44.
LOCATION.--Lat 35°10'49", long 77°17'55", Hydrologic Unit 03020202, 1.4 mi southeast of Cove City on Secondary Road 1005.
Owner: City of New Bern.
AQUIFER.--Black Creek and upper Cape Fear aquifers of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 854 ft, diameter 2 in, cased to 705 ft and from 715 to 781 ft and 786 to 828 ft, screened intervals from 705 to 715 ft, 781 to 786 ft, and 828 to 833 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 36.73 ft above National Geodetic Vertical Datum of 1929.
Measuring point: Top of instrument shelf, 2.06 ft above land-surface datum.
REMARKS.--Local-effects well. Water levels affected by pumping at nearby City of New Bern well field.
PERIOD OF RECORD.--March 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.01 ft below land-surface datum, August 25 and 26, 1965; lowest, 109.70 ft below land-surface datum, October 20 and 21, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	102.60	104.72	104.15	103.00	104.25	104.93	106.27	107.83	108.12	107.65	107.78	106.95
10	102.91	104.28	104.22	103.71	104.33	106.01	107.35	107.44	106.50	107.18	106.25	105.47
15	102.90	104.17	103.96	103.88	104.23	105.04	105.77	108.92	108.48	108.25	106.83	105.39
20	103.81	104.77	104.96	102.41	103.24	107.11	107.16	108.16	105.80	109.25	107.03	108.10
25	103.48	102.10	105.38	102.62	105.52	104.67	109.43	106.90	107.69	106.12	106.35	106.33
EOM	104.15	105.16	102.94	104.11	105.87	106.59	106.71	106.69	108.63	105.97	105.16	106.48

CAL YR 1987 HIGHEST DAILY MEAN 101.15 MAY 23 LOWEST DAILY MEAN 109.43 JUL 25

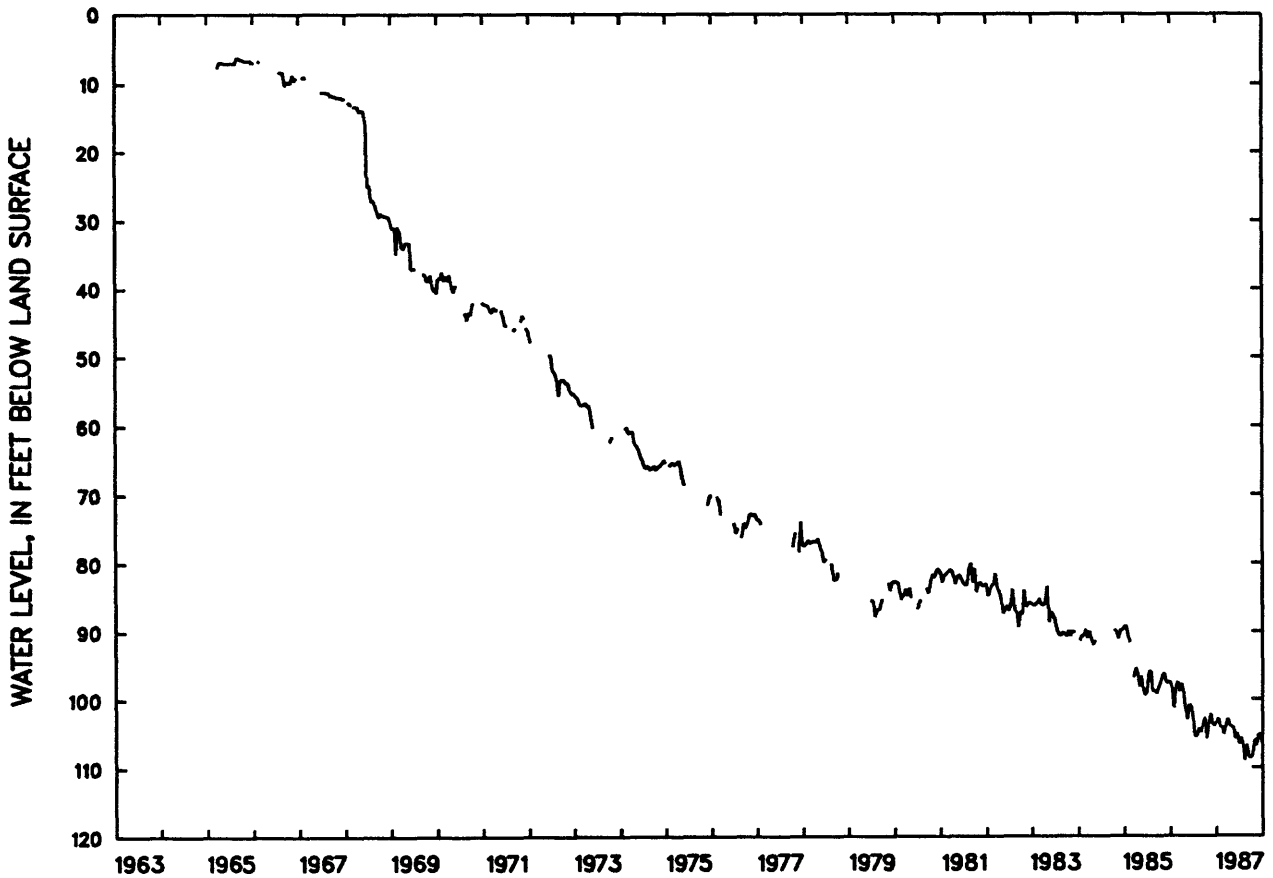


Figure 49.--Water level in observation well NC-44, Craven County, 1965 to 1987.

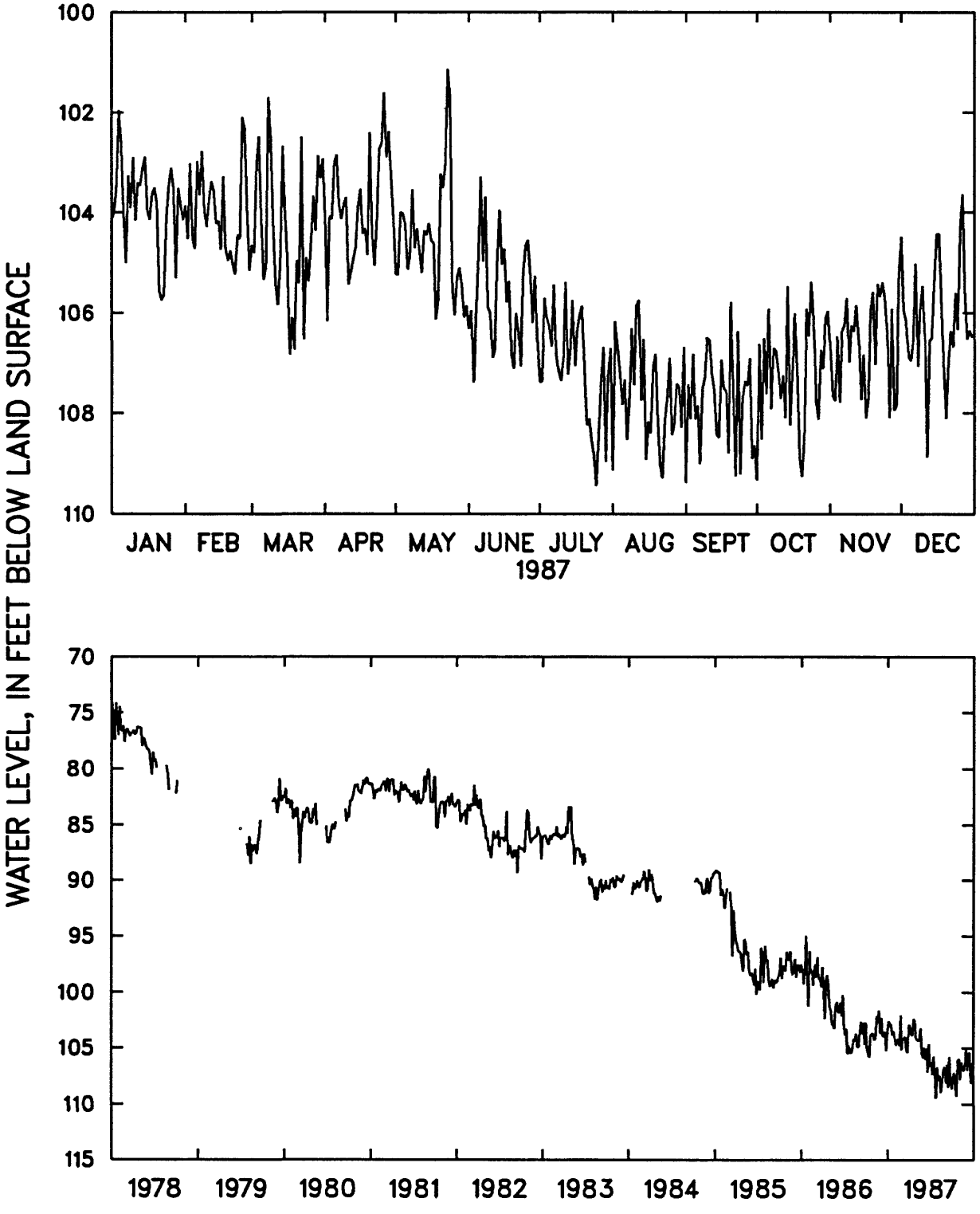


Figure 50.--Water level in observation well NC-44, Craven County.

NC-128 AT KINSTON, LENOIR COUNTY

351600077381001. Local number, NC-128.
LOCATION.--Lat 35°15'59", long 77°37'52", Hydrologic Unit 03020202, on west edge of Kinston at intersection of U.S. Highways 70 and 258 Bypass and U.S. Highways 70 and 258 Business.
Owner: City of Kinston.
AQUIFER.--Black Creek aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, depth 300 ft, diameter 10 in, cased to 160 ft, screened intervals unknown.
INSTRUMENTATION.--Digitial recorder --30-minute punch.
DATUM.--Land-surface datum is 33.5 ft above National Geodetic Vertical Datum of 1929.
Measuring point: Top of instrument shelf, 2.10 ft above land-surface datum.
REMARKS.--Local-effects well. Water levels affected by pumping of nearby municipal and industrial wells.
PERIOD OF RECORD.--September 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 34.83 ft below land-surface datum, December 30, 1968; lowest, 84.43 ft below land-surface datum, November 23, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	78.92	77.48	76.81	78.99	78.60	80.26	80.86	82.58	82.76	81.89	82.05	---
10	78.93	77.74	76.63	78.40	78.32	80.33	81.30	81.95	82.42	82.13	81.82	---
15	78.78	77.53	77.31	78.32	78.70	80.08	81.41	82.33	82.00	82.17	82.46	---
20	78.48	77.92	79.18	77.29	79.11	80.49	80.82	82.73	81.80	82.07	83.82	---
25	77.94	77.55	80.21	76.65	78.98	80.77	81.89	81.88	82.17	81.88	---	---
EOM	77.07	77.22	80.86	77.71	79.72	81.06	82.18	82.21	82.45	82.49	---	---

CAL YR 1987 HIGHEST DAILY MEAN 76.18 MAR 9 LOWEST DAILY MEAN 84.07 NOV 23

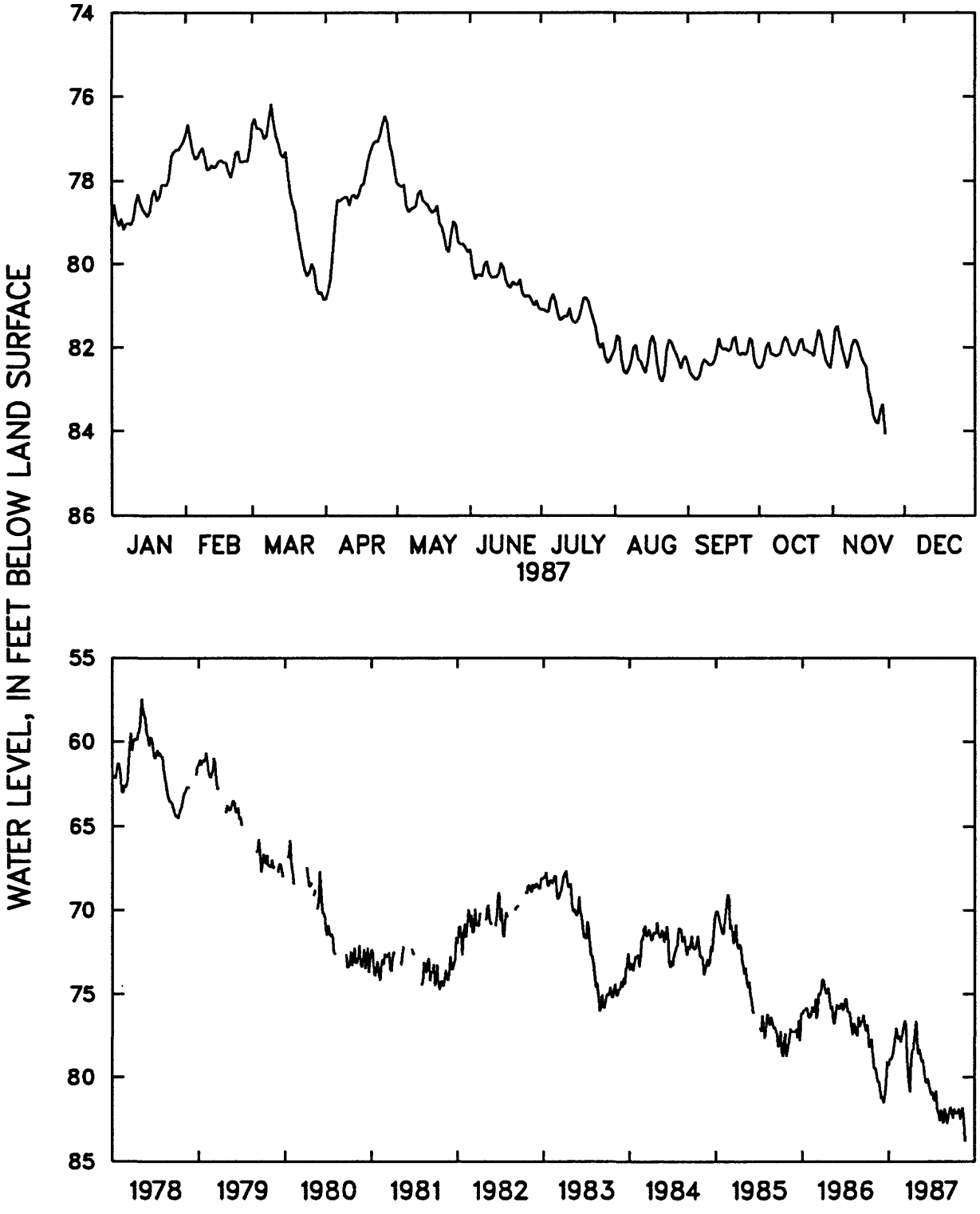


Figure 51.--Water level in observation well NC-128, Lenoir County.

NC-149 AT SUNBURY, GATES COUNTY

362646076361405. Local number, NC-149; NRCD Sunbury Research Station well C15s5.
LOCATION.--Lat 36°26'46", long 76°36'14", Hydrologic Unit 03010203, in northeast section of Sunbury, east of N.C. Highway 32 on Secondary Road 1338.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 570 ft, diameter 4 in, cased to 555 ft, screened interval from 555 to 565 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 37.44 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 3.58 ft above land-surface datum - revised from 3.04 ft above land-surface datum, October 1987.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to October 1986 were provided by NRCD.
PERIOD OF RECORD.--October 1967 to current year. Records from October 1967 to September 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began November 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 13.37 ft below land-surface datum, December 30, 1968; lowest, 25.96 ft below land-surface datum, September 4, 1987.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by -0.54 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	24.99	24.87	24.80	24.82	---	25.37	25.80	25.91	25.71	25.73	25.63
10	---	24.94	24.76	24.84	24.87	---	25.43	25.66	25.78	25.79	25.78	25.61
15	---	24.91	24.82	24.87	24.94	---	25.50	25.77	25.71	25.80	25.80	25.53
20	24.95	24.90	24.78	24.77	---	25.21	25.62	25.75	25.63	25.80	25.68	25.58
25	24.90	24.87	24.85	24.76	---	25.27	25.77	25.82	25.65	25.90	25.86	25.55
EOM	24.85	24.84	24.73	24.77	---	25.36	25.85	25.86	25.64	25.85	25.54	25.57

CAL YR 1987 HIGHEST DAILY MEAN 24.67 MAR 1 LOWEST DAILY MEAN 25.95 SEP 4

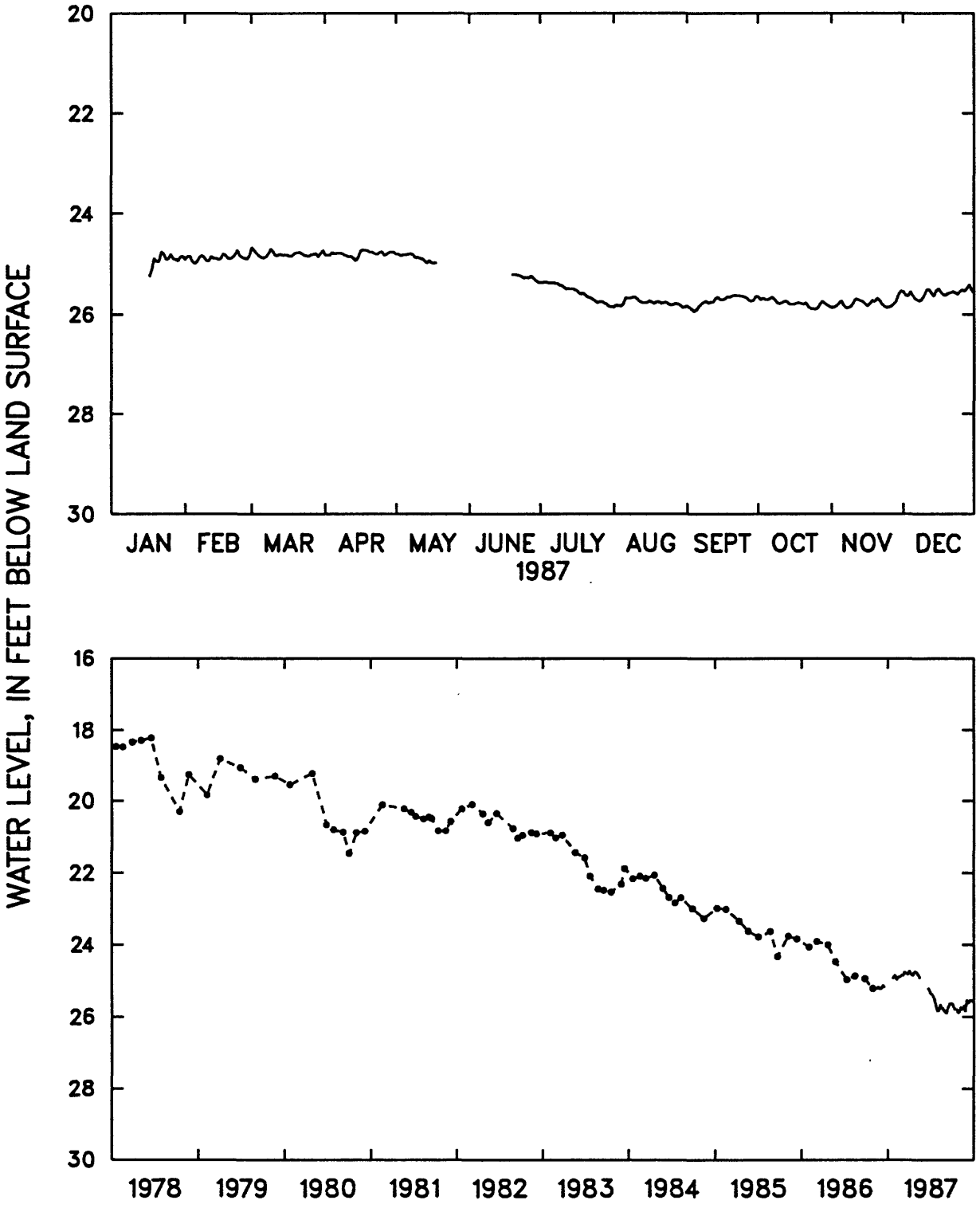


Figure 52.--Water level in observation well NC-149, Gates County.

NC-153 NEAR CREMO, BERTIE COUNTY

361002076562106. Local number, NC-153; NRCD Cremo Research Station well G19b6.
LOCATION.--Lat 36°10'02", long 76°56'21", Hydrologic Unit 03010203, 0.75 mi south of Cremo, south of Secondary Road 1313 on logging road.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 431 ft, diameter 6 in, cased to 400 ft, screened interval from 400 to 410 ft; measured depth 412 ft, October 1986.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 64.49 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 3.01 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to September 1986 were provided by NRCD.
PERIOD OF RECORD.--August 1974 to current year. Records from August 1974 to August 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began November 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.51 ft below land-surface datum, July 30, 1975; lowest, 39.21 ft below land-surface datum, November 25 and December 7 and 8, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	38.22	38.22	38.12	38.25	38.39	38.63	38.85	39.04	38.91	39.07	39.11
10	---	38.21	---	38.17	38.29	38.47	38.70	38.88	38.99	39.02	39.11	39.10
15	---	38.21	38.15	38.21	38.33	38.48	38.70	38.93	38.85	39.04	39.17	39.06
20	38.05	38.19	38.13	38.13	38.36	38.52	38.79	38.92	38.76	39.05	39.08	39.12
25	38.05	38.20	38.20	38.12	38.40	38.56	38.85	39.02	38.79	39.11	39.20	39.09
EOM	38.10	38.13	38.05	38.17	38.42	38.61	38.89	39.03	38.81	39.14	39.01	39.09

CAL YR 1987 HIGHEST DAILY MEAN 37.92 JAN 22 LOWEST DAILY MEAN 39.20 NOV 24, 25 & DEC 7, 8

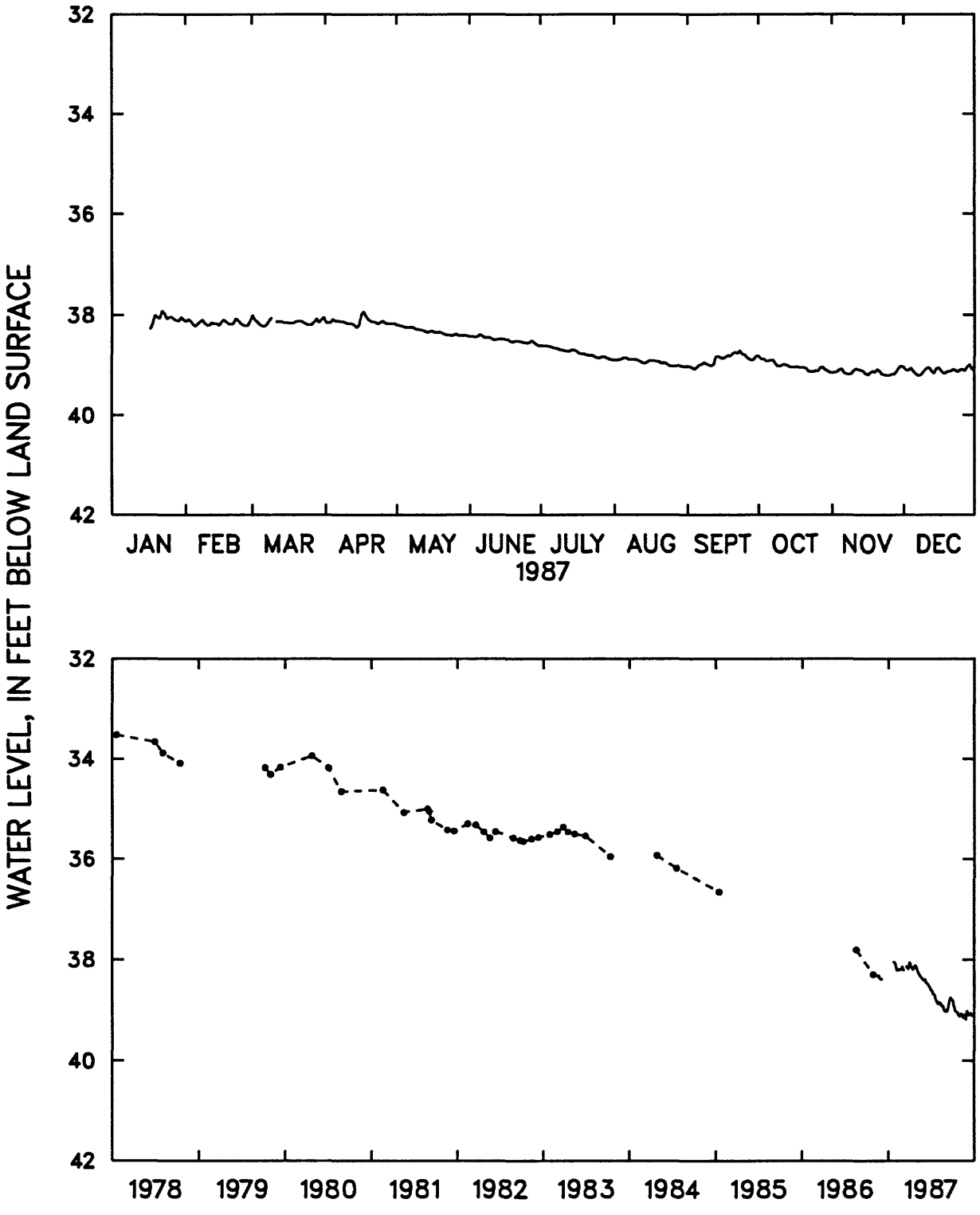


Figure 53.--Water level in observation well NC-153, Bertie County.

NC-165 NEAR WILMAR, BEAUFORT COUNTY

352252077050709. Local number, NC-165; NRCD Wilmar Research Station well P21k9.
LOCATION.--Lat 35°22'53", long 77°05'17", Hydrologic Unit 03020202, 3.5 mi southeast of Wilmar, 0.5 mi east of intersection of Secondary Roads 1129 and 1130 on logging road.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Black Creek aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 712 ft, diameter 4 in, cased to 695 ft, screened interval from 695 to 705 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 41.63 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.74 ft above land-surface datum - revised from 2.91 ft above land-surface datum, October 1987.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by NRCD.
PERIOD OF RECORD.--March 1969 to current year. Records from March 1969 to July 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began December 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.94 ft below land-surface datum, March 11, 1969; lowest, 51.27 ft below land-surface datum, October 23, 1987.
REVISIONS.--Water-level mean values and extremes for period of record published in U.S.G.S. annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.17 ft.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	50.05	49.69	49.74	49.80	49.98	50.18	50.47	50.82	50.84	51.04	51.11	51.00
10	50.06	49.68	49.69	49.87	50.06	50.29	50.49	50.81	50.73	51.15	51.12	50.95
15	---	49.69	49.81	49.87	50.03	50.24	50.51	50.65	50.80	51.15	51.22	50.87
20	---	49.74	49.76	49.82	50.10	50.32	50.67	50.61	50.77	51.16	51.08	50.97
25	---	49.77	49.86	49.80	50.20	50.39	50.76	50.74	50.87	51.22	51.22	50.98
EOM	---	49.69	49.68	49.89	50.27	50.49	50.82	50.78	50.88	51.24	50.89	51.00

CAL YR 1987 HIGHEST DAILY MEAN 49.53 MAR 1 LOWEST DAILY MEAN 51.26 OCT 23

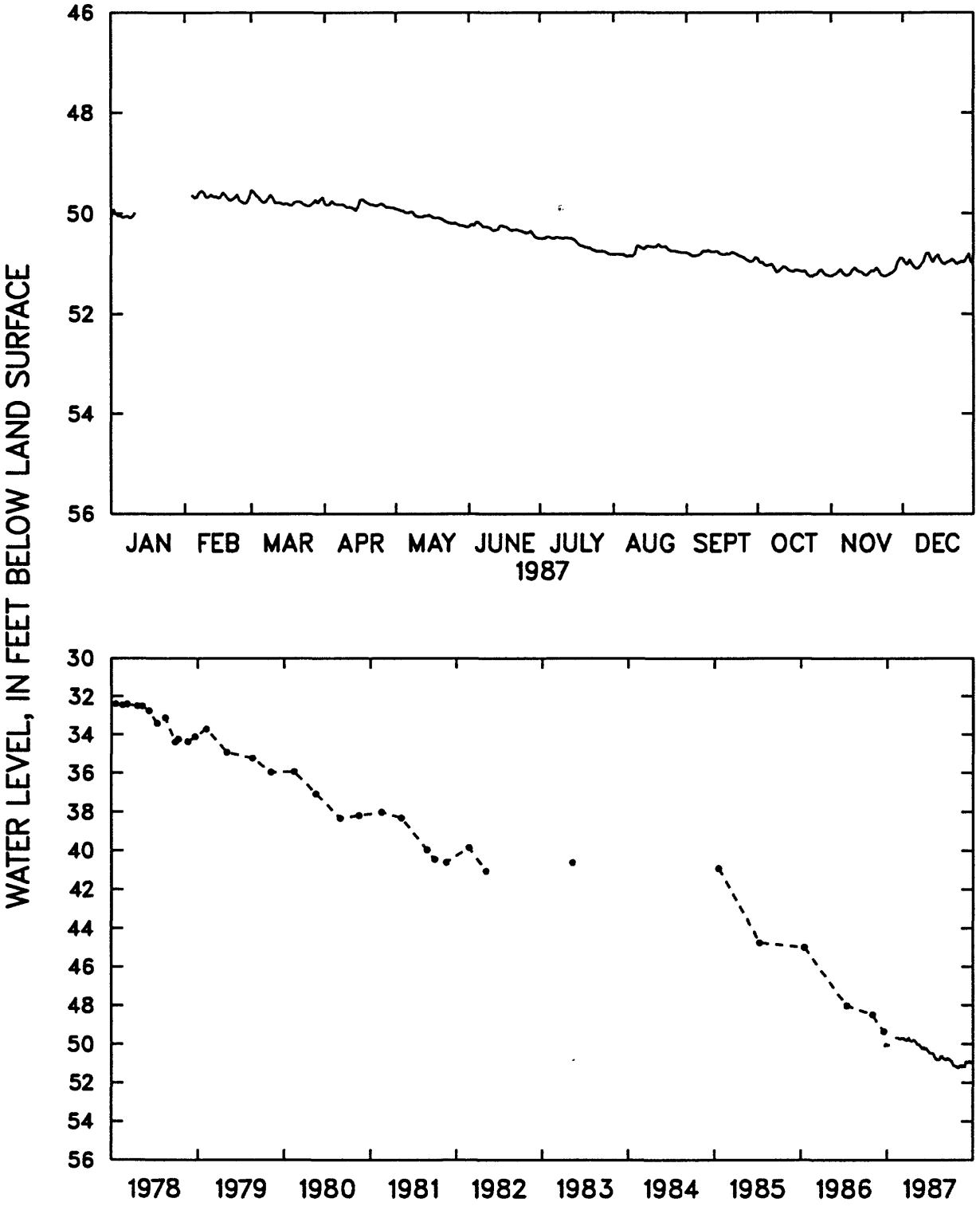


Figure 54.--Water level in observation well NC-165, Beaufort County.

NC-170 NEAR CLARKS, CRAVEN COUNTY

350816077101810. Local number, NC-170; NRCD Clarks Research Station well S22j10.
LOCATION.--Lat 35°08'16", long 77°10'18", Hydrologic Unit 03020202, 0.8 mi southwest of Clarks, south of U.S. Highway 70 on Secondary Road 1225 at North Carolina Department of Transportation Rest Area.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Black Creek aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 730 ft, diameter 4 in, cased to 716 ft, screened interval from 716 to 726 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 28.64 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 1.70 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to December 1983 were provided by NRCD.
PERIOD OF RECORD.--July 1979 to current year. Records July 1979 to November 1983 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began April 1984.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 25.14 ft below land-surface datum, July 18, 1979; lowest, 42.96 ft below land-surface datum, December 30 and 31, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	40.27	40.61	40.75	40.81	41.05	41.34	41.66	41.89	41.97	42.37	42.56	42.72
10	40.23	40.63	40.62	40.89	41.15	41.48	41.76	41.85	41.91	42.52	42.65	42.68
15	40.38	40.60	40.78	40.89	41.14	41.37	41.73	41.71	42.01	42.55	42.81	42.69
20	40.31	40.69	40.71	40.85	41.12	41.47	41.87	41.75	42.01	42.56	42.63	42.83
25	40.33	40.72	40.86	40.85	41.23	41.55	41.97	41.93	42.16	42.67	42.83	42.86
EOM	40.35	40.60	40.62	40.97	41.34	41.69	42.05	41.92	42.16	42.73	42.52	42.96

CAL YR 1987 HIGHEST DAILY MEAN 40.11 JAN 2 LOWEST DAILY MEAN 42.96 DEC 31

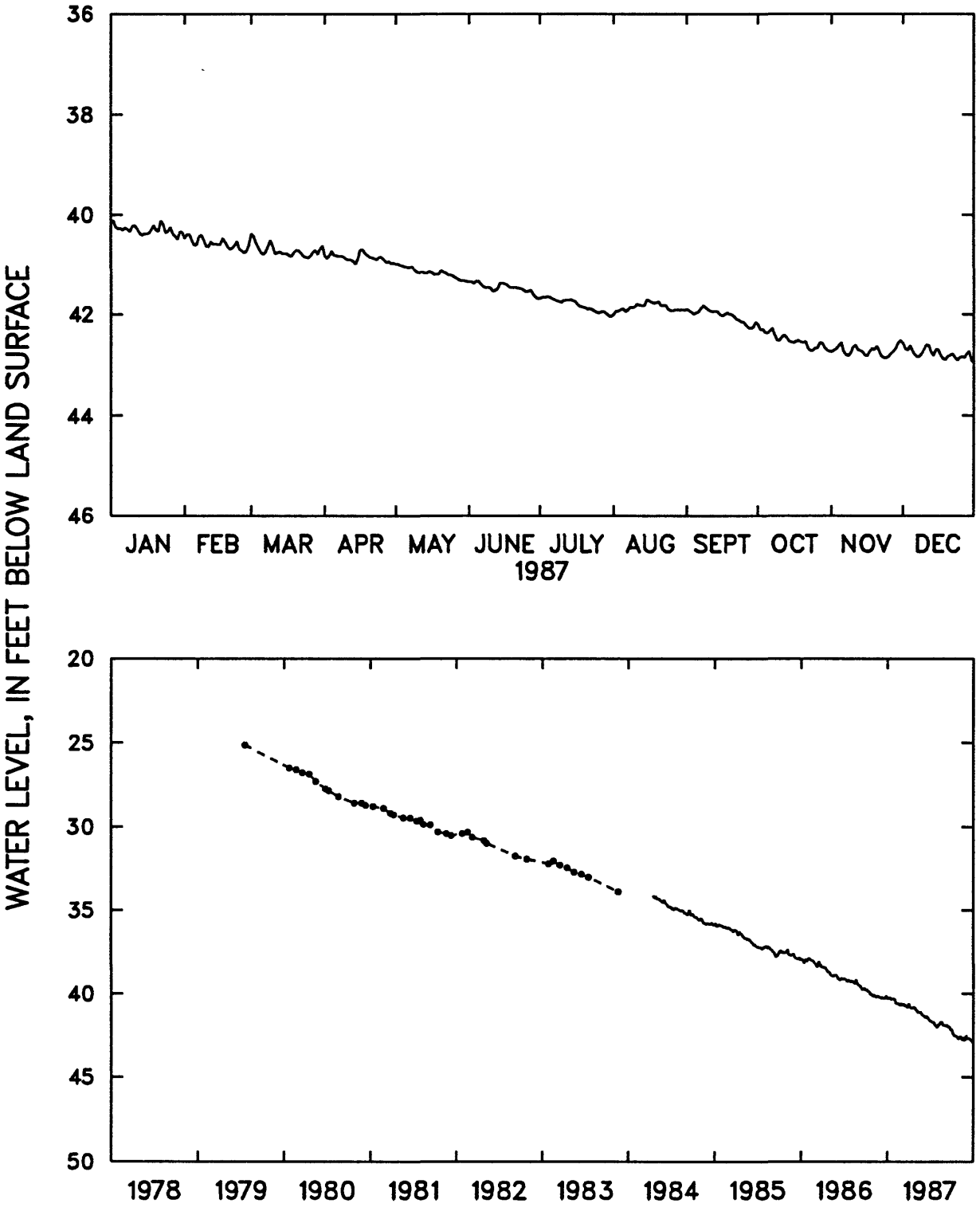


Figure 55.--Water level in observation well NC-170, Craven County.

NC-172 NEAR COMFORT, JONES COUNTY

345809077301404. Local number, NC-172; NRCD Comfort Research Station well U26j4.
LOCATION.--Lat 34°58'09", long 77°30'14", Hydrologic Unit 03020204, 2.5 mi south of Comfort at North Carolina Division of Forest Resources Fire Tower on Secondary Road 1003.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Black Creek aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 545 ft, diameter 6 in, cased to 506 ft and from 516 to 535 ft, screened intervals from 506 to 516 ft and 535 to 545 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 68 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 1.40 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to October 1983 were provided by NRCD.
PERIOD OF RECORD.--March 1980 to current year. Records from March 1980 to September 1983 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began October 1983.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 67.56 ft below land-surface datum, March 18, 1980; lowest, 130.18 ft below land-surface datum, December 31, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	122.22	122.71	123.17	123.95	124.54	124.53	125.71	126.26	---	---	129.81
10	---	122.22	122.82	123.28	124.22	124.86	124.48	125.66	126.38	---	---	129.74
15	---	122.26	123.09	123.46	124.34	124.87	124.44	125.61	126.66	---	---	129.82
20	122.58	122.46	123.12	123.61	124.48	124.86	124.61	125.60	126.83	127.99	---	130.01
25	122.31	122.55	123.39	123.73	124.58	124.74	124.81	125.99	127.32	128.04	---	130.09
EOM	122.09	122.45	---	---	124.43	124.80	125.55	126.26	---	128.45	---	130.15

CAL YR 1987 HIGHEST DAILY MEAN 121.92 FEB 8 LOWEST DAILY MEAN 130.15 DEC 31

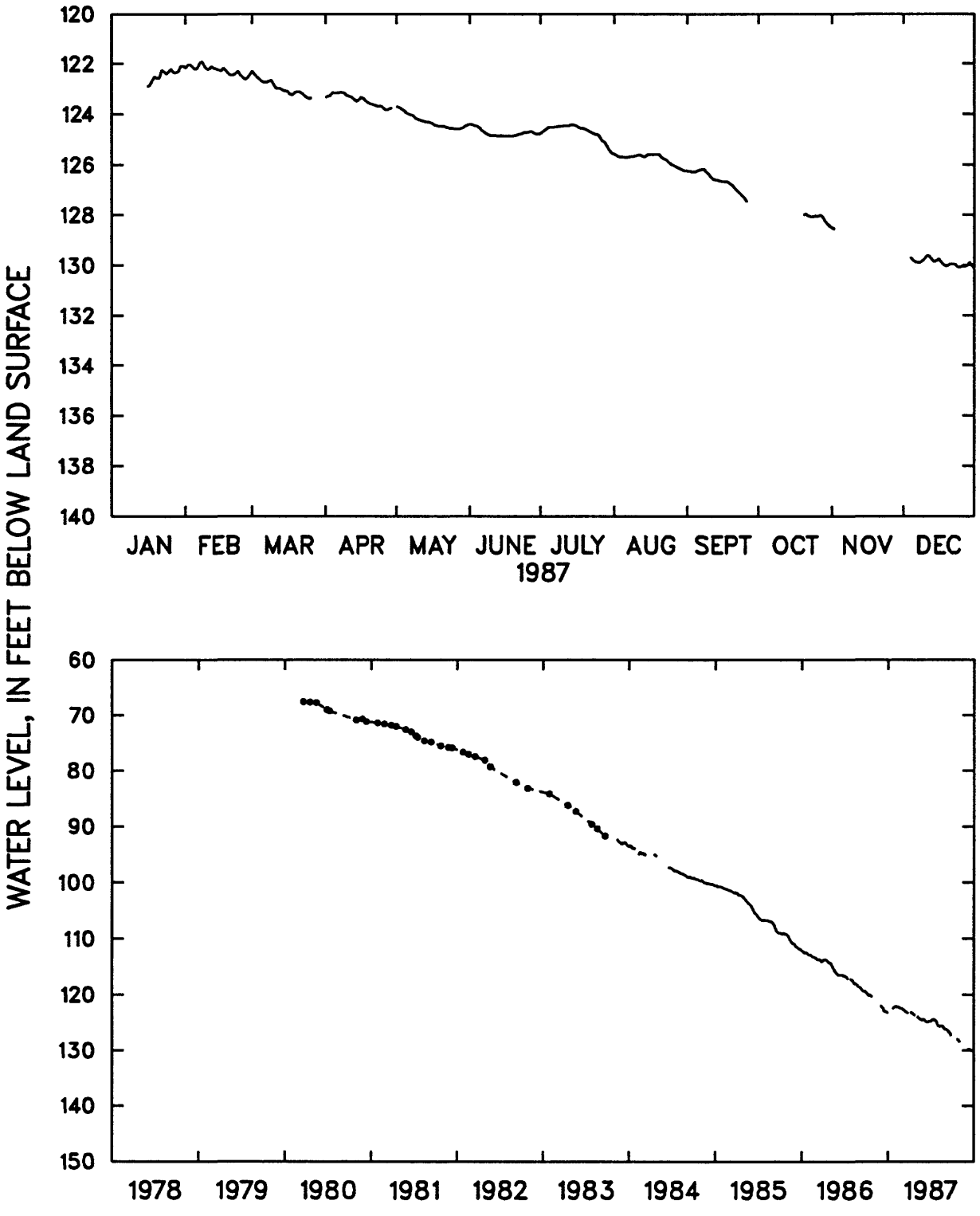


Figure 56.--Water level in observation well NC-172, Jones County.

NC-176 NEAR CHINQUAPIN, DUPLIN COUNTY

344922077484706. Local number, NC-176; NRCD Chinquapin Research Station well W29d6.
LOCATION.--Lat 34°49'22", long 77°48'47", Hydrologic Unit 03030007, 0.3 mi south of Chinquapin on N.C. Highway 50 at Chinquapin Elementary School.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Black Creek aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 822 ft, diameter 6 in, cased to 460 ft, screened interval from 460 to 470 ft, cemented from 486 to 822 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 42.60 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 5.30 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by NRCD.
PERIOD OF RECORD.--July 1980 to current year. Records from July 1980 to July 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began July 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.76 ft above land-surface datum, July 17, 1980; lowest, 10.67 ft below land-surface datum, December 8, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	7.92	8.16	---	---	---	9.24	---	9.78	9.84	10.12	10.48	10.56
10	8.00	8.23	---	---	9.03	9.31	9.47	9.77	9.85	10.24	10.55	10.59
15	8.10	---	---	---	9.09	9.24	9.46	9.71	9.91	10.27	10.53	10.56
20	8.06	---	---	---	9.15	9.29	9.64	9.67	9.97	10.33	10.53	10.64
25	7.95	---	---	---	9.21	9.33	9.76	9.73	10.03	10.43	10.65	10.65
EOM	7.96	---	---	---	9.17	9.49	9.85	9.76	10.07	10.47	10.48	10.65

CAL YR 1987 HIGHEST DAILY MEAN 7.85 JAN 26 LOWEST DAILY MEAN 10.67 DEC 8

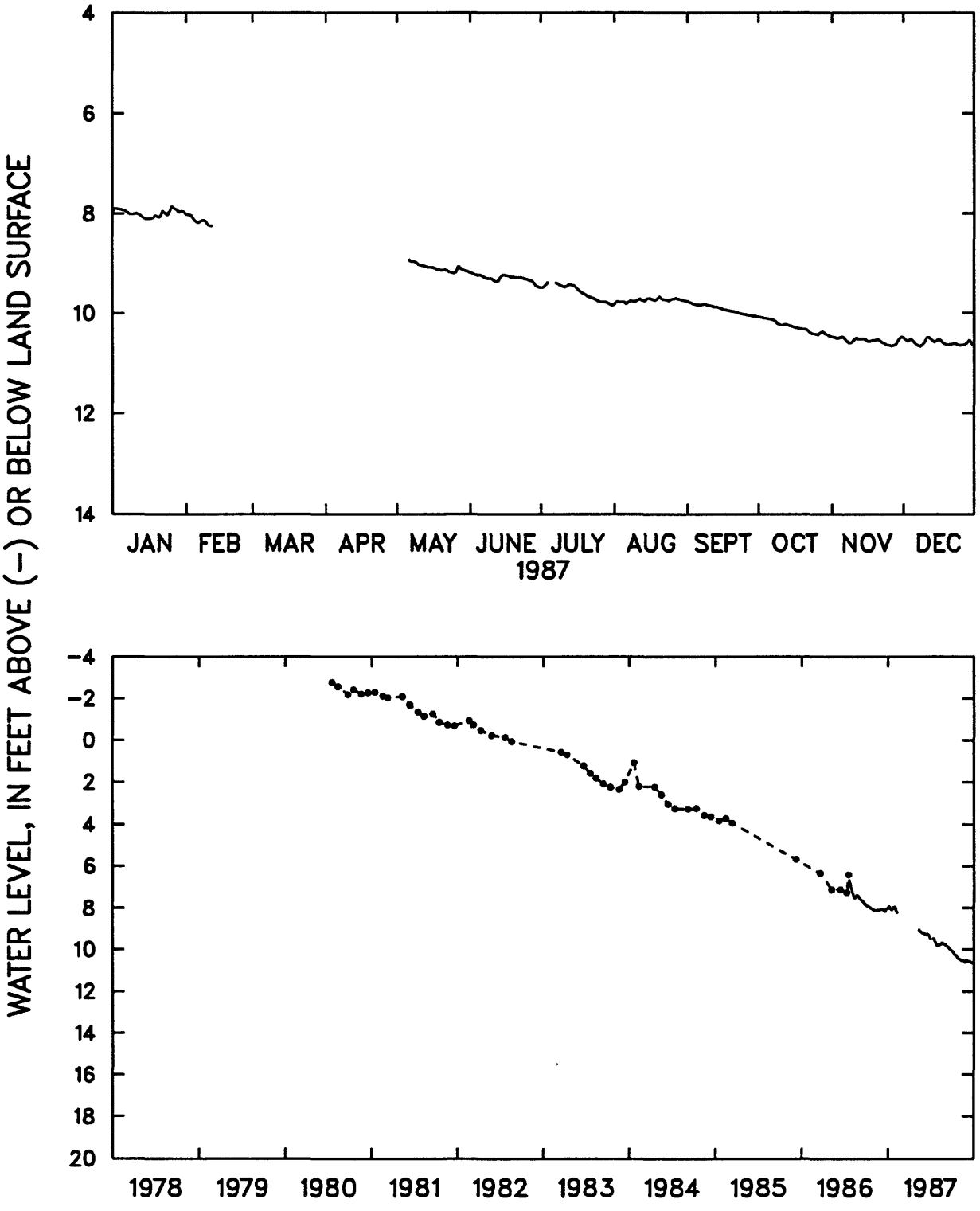


Figure 57.--Water level in observation well NC-176, Duplin County.

NC-177 NEAR LUMBERTON, ROBESON COUNTY

343840078550009. Local number, NC-177; NRCD Littlefield School Research Station well Y42f9.
LOCATION.--Lat 34°38'40", long 78°55'00", Hydrologic Unit 03040203, 6 mi east of Lumberton on N.C. Highway 41 at Littlefield School.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 468 ft, diameter 6 in, cased to 390 ft and from 395 to 429 ft and 434 to 444 ft, screened intervals from 390 to 395 ft, 429 to 434 ft, and 444 to 449 ft; measured depth 462 ft, December 1987.
INSTRUMENTATION.--Measured periodically with chalked tape by USGS and NRCD personnel.
DATUM.--Land-surface datum is 142 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 1.4 ft above land-surface datum.
REMARKS.--Areal-effects well. Records prior to July 1985 are from Littlefield School Research Station well Y42f3 which was adjacent to and of similar construction to well NC-177. Well Y42f3 was destroyed in September 1987.
PERIOD OF RECORD.--October 1970 to current year. Records for well Y42f3 from October 1970 to June 1985 are unpublished and available in the files of the Groundwater Section, NRCD.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 76.40 ft below land-surface datum, January 5, 1971; lowest, 100.88 ft below land-surface datum, December 23, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987

DATE	WATER LEVEL
SEP 28	100.37
DEC 23	100.88

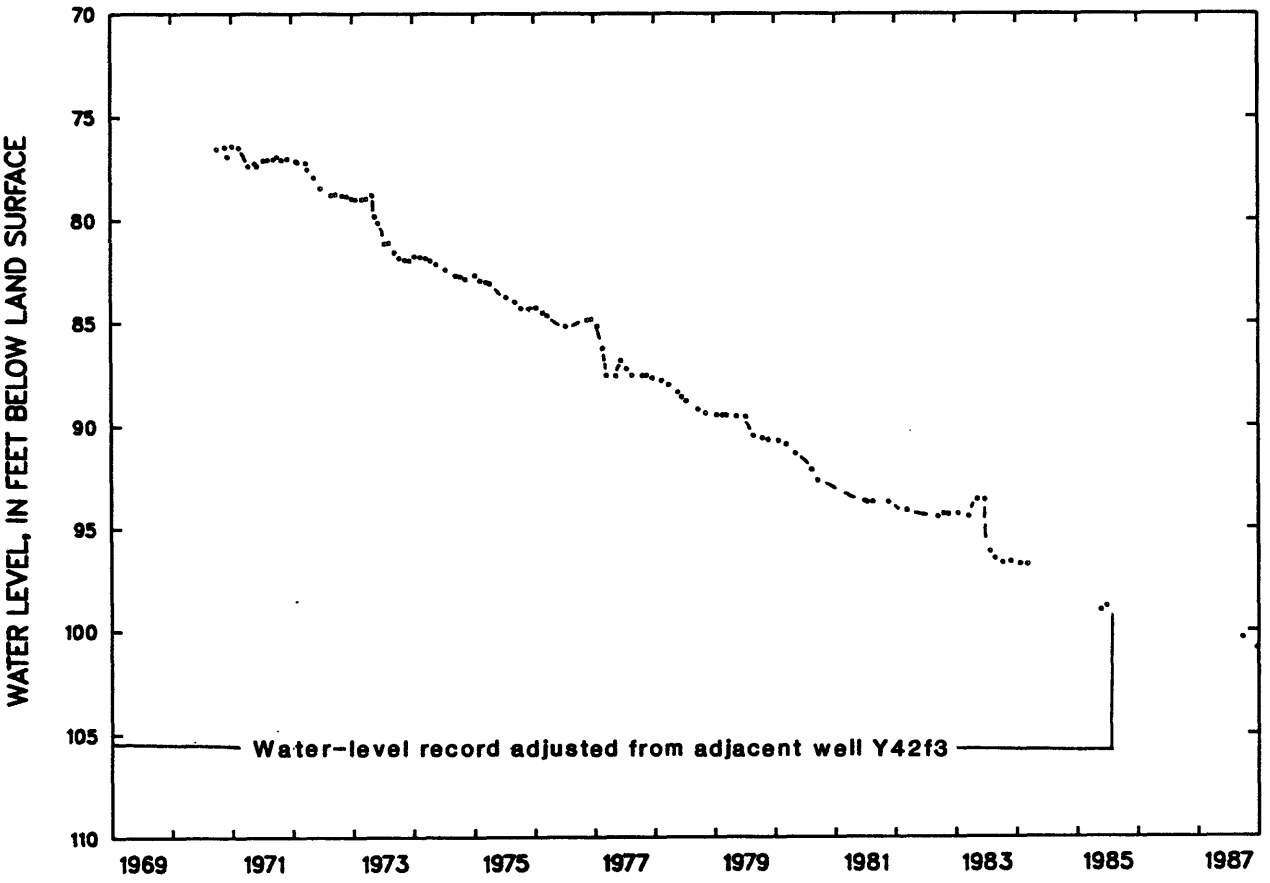


Figure 58.--Water level in observation well NC-177 and nearby well Y42f3, Robeson County, 1970 to 1987.

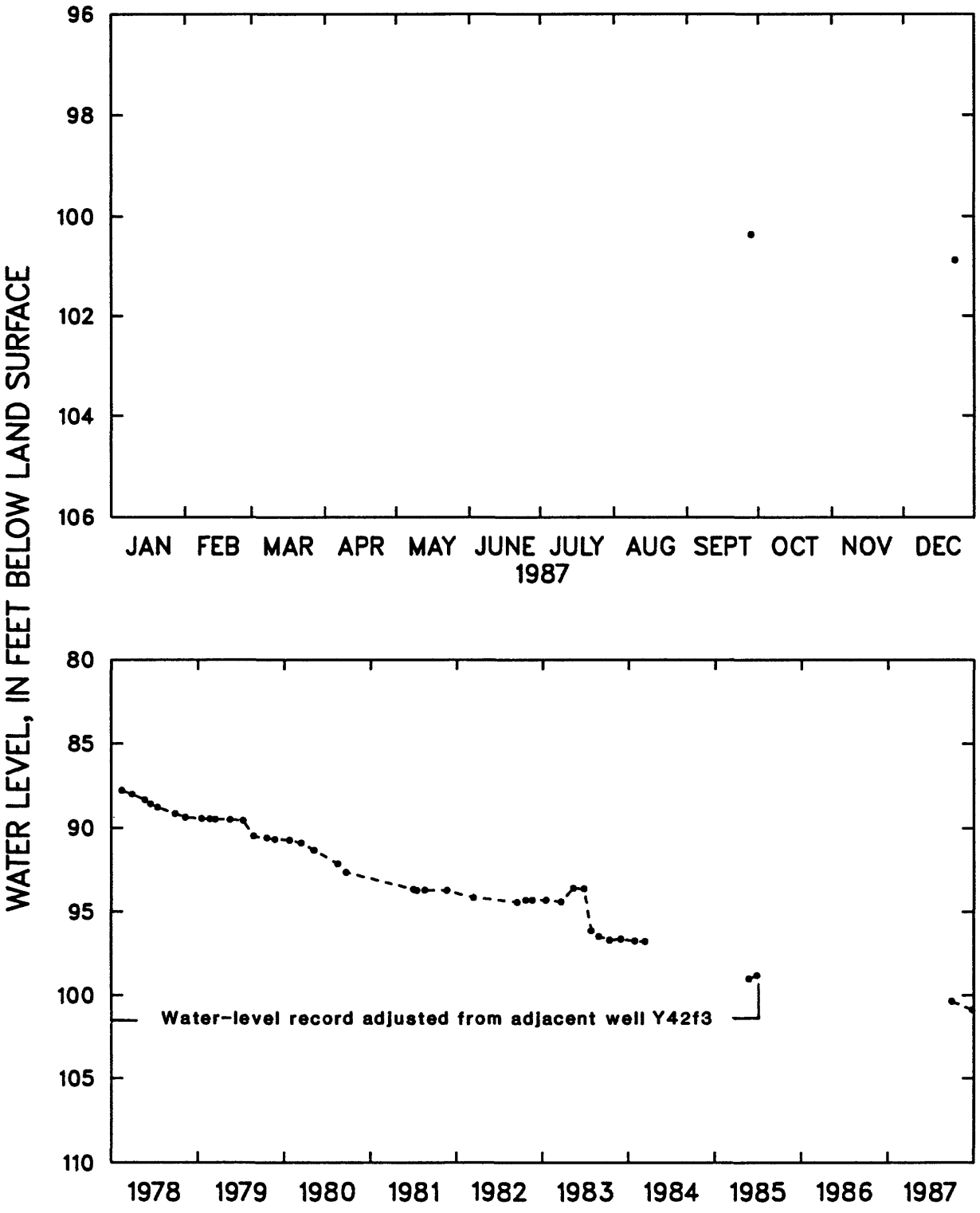


Figure 59.--Water level in observation well NC-177, Robeson County.

NC-183 NEAR BETHEL, PITT COUNTY

354457077215504. Local number, NC-183; NRCD Bethel Research Station well L24b4.
LOCATION.--Lat 35°44'57", long 77°21'55", Hydrologic Unit 03020103, 4.2 mi south of Bethel on U.S. Highway 13 and N.C. Highway 11 at North Pitt High School.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 370 ft, diameter 4 in, cased to 360 ft, screened interval from 360 to 370 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 55.31 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 1.87 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to October 1983 were provided by NRCD.
PERIOD OF RECORD.--April 1980 to current year. Records from April 1980 to September 1983 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began October 1983.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 56.33 ft below land-surface datum, April 17, 1980; lowest, 67.84 ft below land-surface datum, December 7, 8, and 9, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	65.75	65.88	65.92	66.05	66.19	66.40	66.89	67.27	67.36	67.43	67.41	67.69
10	65.69	65.92	65.85	66.13	66.25	66.54	66.99	67.33	67.25	67.52	67.47	67.76
15	65.78	65.92	66.00	66.14	66.30	66.57	66.95	67.38	67.25	67.50	67.66	67.71
20	65.67	65.95	65.95	66.05	66.21	66.58	67.13	67.43	67.20	67.46	67.63	67.81
25	65.73	65.81	66.06	66.03	66.33	66.73	67.17	67.50	67.30	67.56	67.81	67.77
EOM	65.73	65.82	65.96	66.12	66.41	66.88	67.23	67.49	67.30	67.53	67.59	67.78

CAL YR 1987 HIGHEST DAILY MEAN 65.55 JAN 22 LOWEST DAILY MEAN 67.84 DEC 8

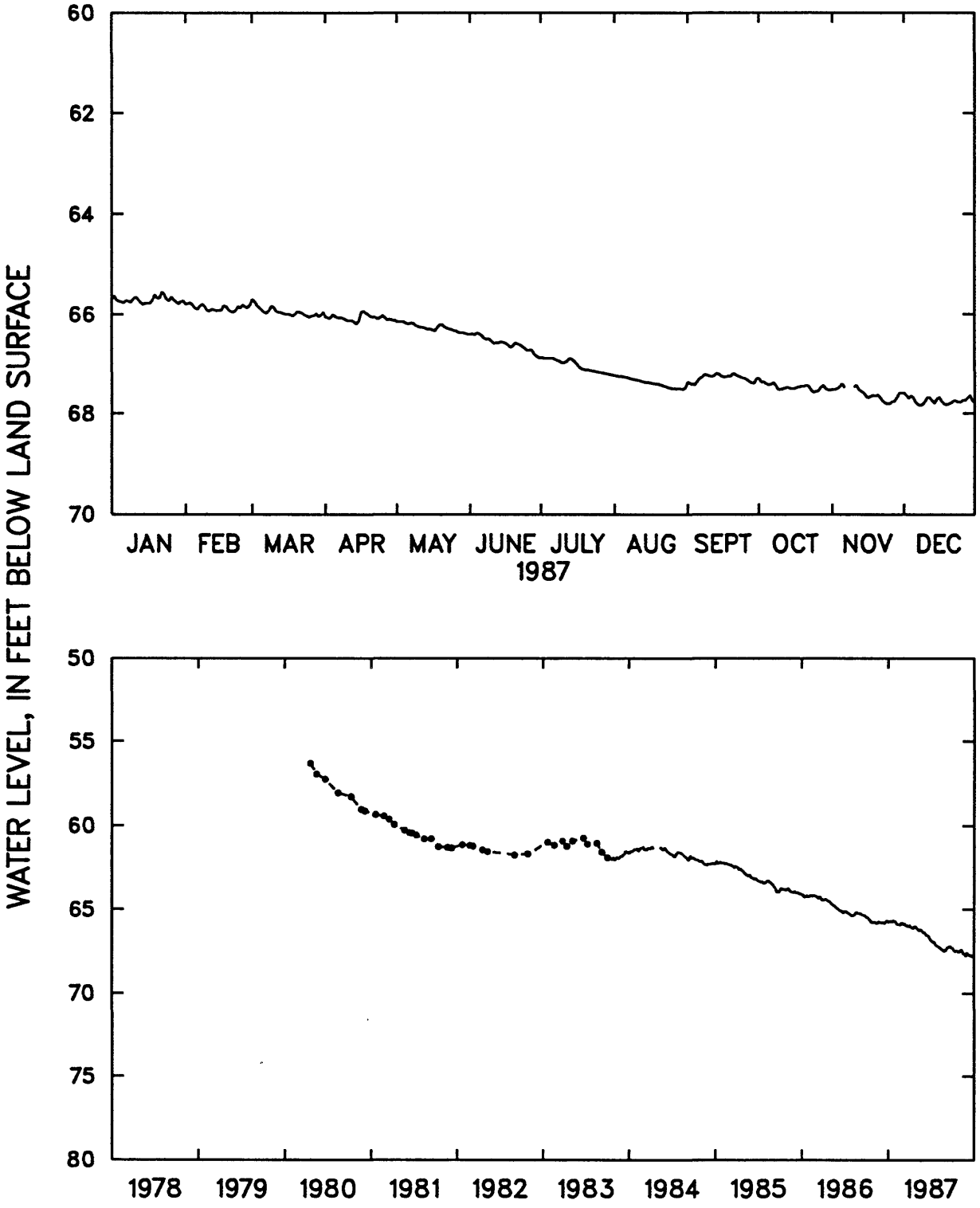


Figure 60.--Water level in observation well NC-183, Pitt County.

NC-186 AT KINSTON, LENOIR COUNTY

351609077370605. Local number, NC-186; NRCD Kinston Yard Research Station well Q27r5.
LOCATION.--Lat 35°16'09", long 77°37'06", Hydrologic Unit 03020202, on west edge of Kinston on U.S. Highways 70 and 258 Business at NRCD Supply Yard.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 520 ft, diameter 6 in, cased to 480 ft, screened interval from 480 to 490 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 44.03 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 1.85 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to August 1983 were provided by NRCD.
PERIOD OF RECORD.--August 1974 to current year. Records from August 1974 to July 1983 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began August 1983.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 68.78 ft below land-surface datum, August 12, 1974; lowest, 97.30 ft below land-surface datum, December 8, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	92.29	91.22	90.56	91.58	91.11	92.85	94.32	95.70	96.34	96.27	96.07	97.10
10	92.23	91.45	90.10	91.25	91.45	93.15	94.24	95.71	96.27	96.41	96.17	96.85
15	92.16	91.41	90.69	91.20	91.39	93.35	94.22	95.71	96.25	96.41	96.54	96.79
20	91.85	91.38	90.91	90.81	91.80	93.45	94.41	95.69	96.11	96.26	96.57	96.76
25	91.45	91.14	91.58	90.12	92.04	93.74	94.89	95.83	96.04	96.36	97.08	96.87
EOM	90.87	90.80	91.41	90.51	92.39	94.14	95.46	96.02	96.04	96.52	96.58	97.25

CAL YR 1987 HIGHEST DAILY MEAN 89.98 MAR 9 LOWEST DAILY MEAN 97.26 DEC 7

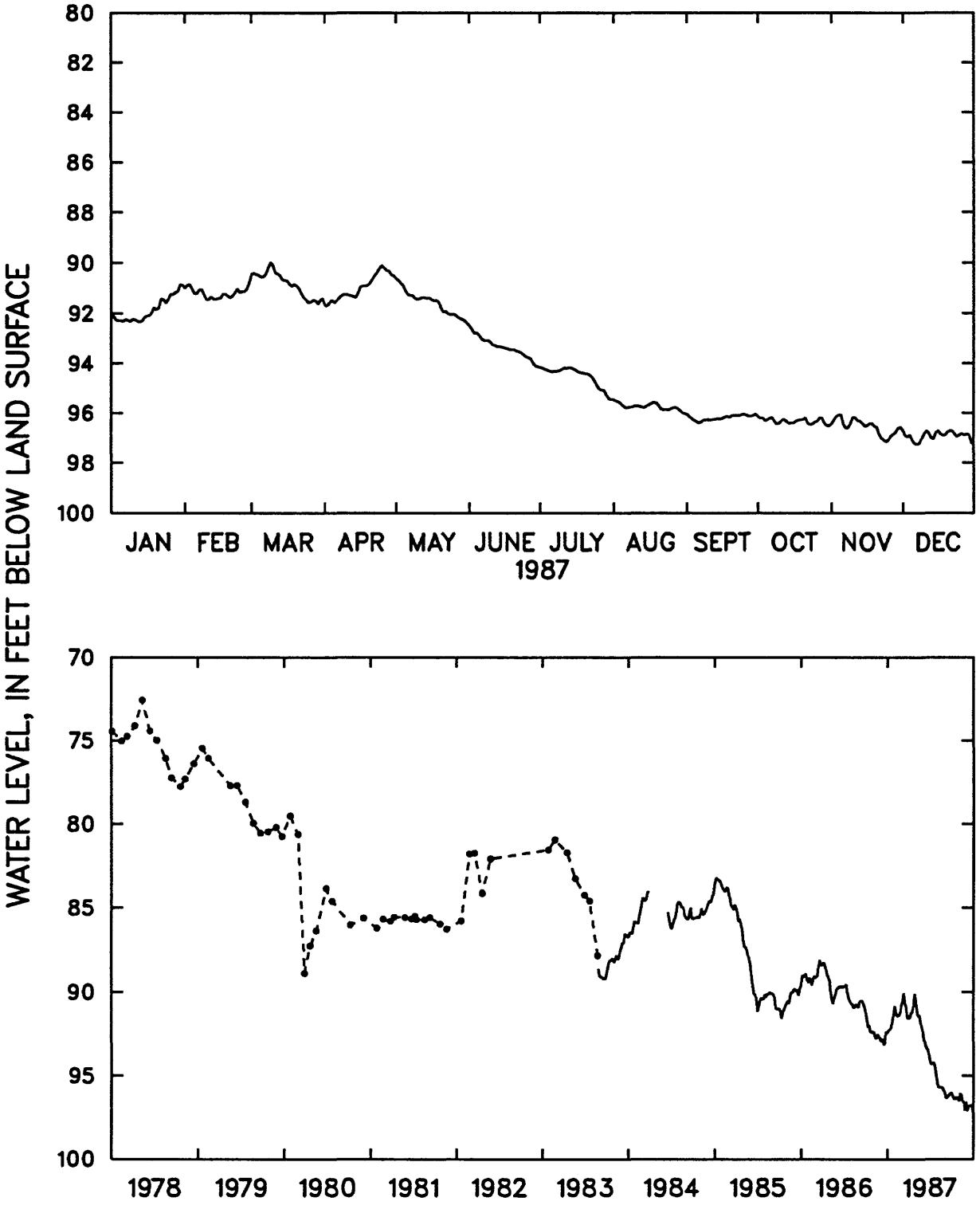


Figure 61.--Water level in observation well NC-186, Lenoir County.

NC-188 NEAR DIXON, ONSLOW COUNTY

343641077290104. Local number, NC-188; NRCD Dixon Tower Research Station well Y25q4.
LOCATION.--Lat 34°36'41", long 77°29'01", Hydrologic Unit 03030001, 1.5 mi north of Dixon at North Carolina Division of Forest Resources Fire Tower on U.S. Highway 17.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Black Creek aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 550 ft, diameter 4 in, cased to 524 ft, screened interval from 524 to 534 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 67.44 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.53 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by NRCD.
PERIOD OF RECORD.--April 1982 to current year. Records from May 1983 to July 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began August 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 38.86 ft below land-surface datum, May 12, 1983; lowest, 40.30 ft below land-surface datum, November 6, 7, and 8, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	39.72	39.78	39.70	39.55	39.64	39.81	39.99	---	39.93	40.10	40.11	39.98
10	39.63	39.77	39.58	39.60	39.68	39.90	40.00	---	39.86	40.18	40.10	39.93
15	39.73	39.72	39.69	39.58	39.69	39.86	39.99	---	39.84	40.19	40.22	39.97
20	39.65	39.77	39.60	39.54	39.70	---	40.11	39.95	39.84	40.16	40.04	40.08
25	39.64	39.77	39.68	39.51	39.76	---	40.15	40.15	39.98	40.23	40.20	40.07
EOM	39.62	39.63	39.50	39.59	39.81	40.18	40.15	40.05	39.92	40.26	39.77	40.15

CAL YR 1987 HIGHEST DAILY MEAN 39.44 APR 16 LOWEST DAILY MEAN 40.29 NOV 7, 8

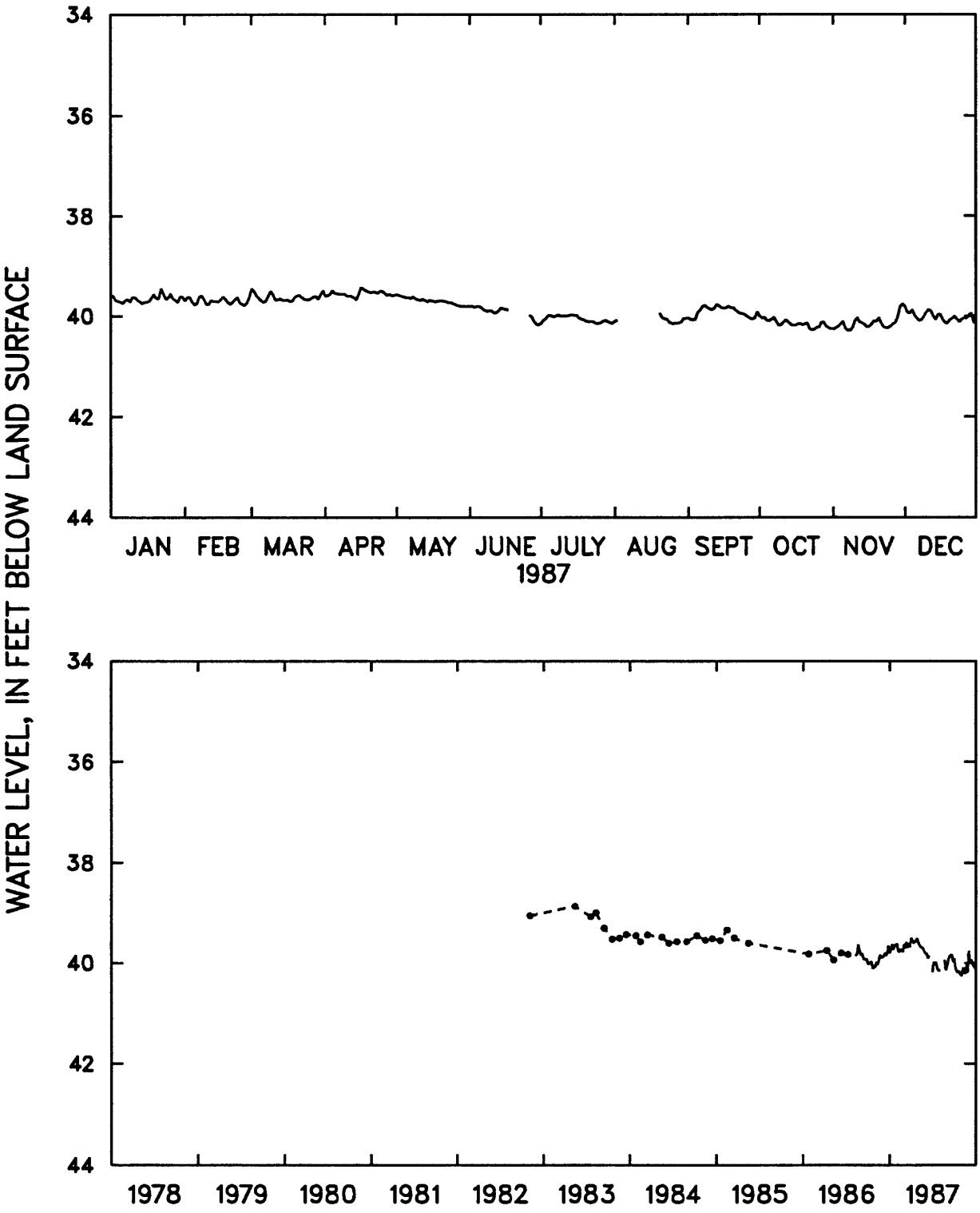


Figure 62.--Water level in observation well NC-188, Onslow County.

NC-189 NEAR JACKSONVILLE, ONSLOW COUNTY

344837077291607. Local number, NC-189; NRCD Jacksonville 258 Well Field Research Station well W25f7.
LOCATION.--Lat 34°48'37", long 77°29'16", Hydrologic Unit 03030001, 1.4 mi northeast of U.S. Highway 258 and N.C. Highway 24 on Wells Road.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Black Creek aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 834 ft, diameter 4 in, cased to 824 ft, screened interval from 824 to 834 ft.
INSTRUMENTATION.--Measured periodically with chalked tape by USGS and NRCD personnel.
DATUM.--Land-surface datum is 26.62 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 3.78 ft above land-surface datum.
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--October 1986 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 96.64 ft below land-surface datum, October 15, 1986; lowest, 109.28 ft below land-surface datum, December 11, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 7	98.61	MAR 17	100.39	MAY 13	101.67	JUL 20	103.49	SEP 11	105.63	NOV 18	108.67
FEB 5	99.49	APR 14	101.06	JUN 15	102.26	AUG 12	104.41	OCT 7	106.81	DEC 11	109.28
FEB 17	99.62	MAY 5	101.47	JUN 25	102.56	AUG 26	105.07	NOV 13	108.54		

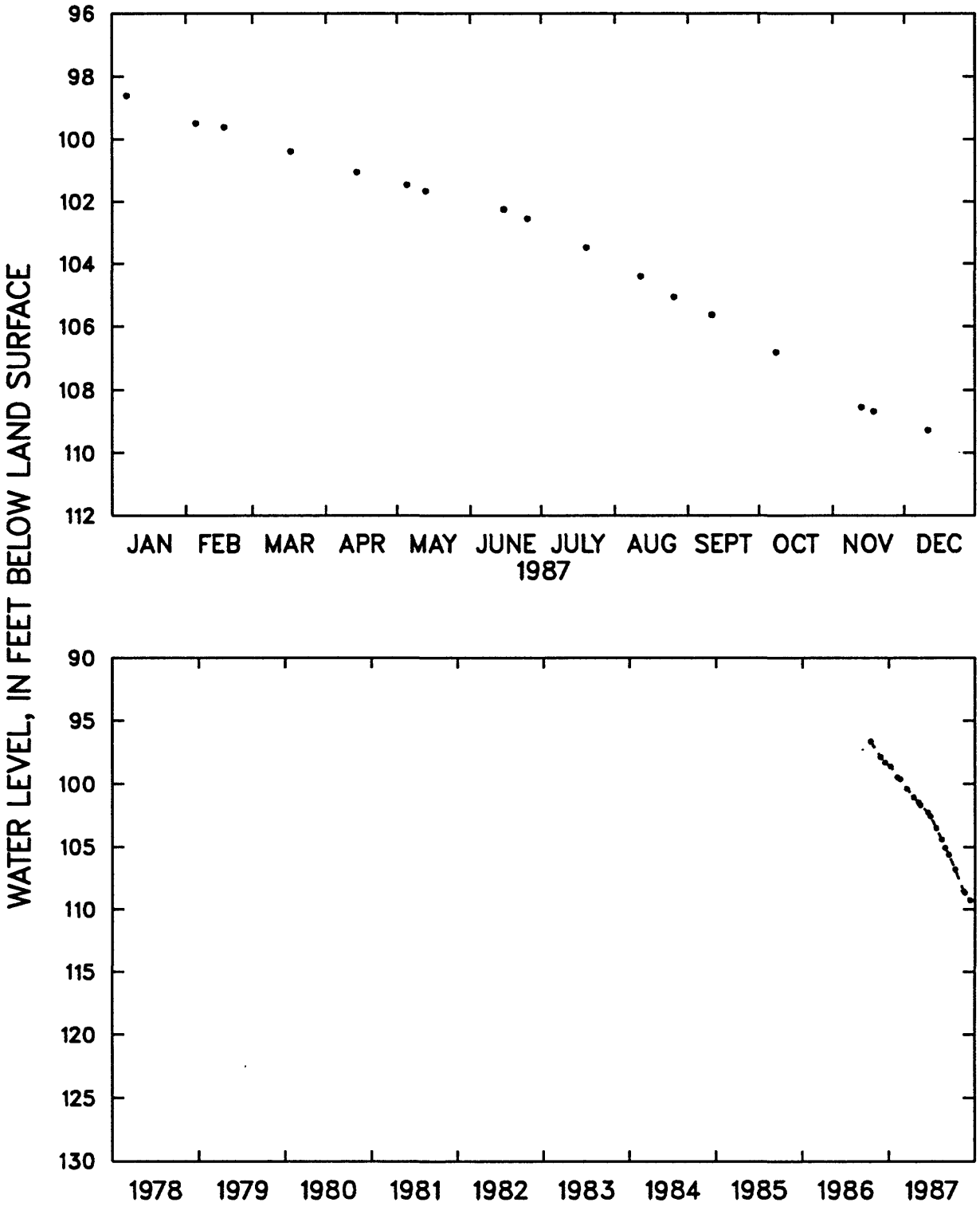


Figure 63.--Water level in observation well NC-189, Onslow County.

Lower Cape Fear Aquifer

Water levels in the five observation wells in the lower Cape Fear aquifer reached record lows in 1987 and followed the long-term trend of water-level decline. Ground-water withdrawals from the lower Cape Fear aquifer in North Carolina generally are limited to the northwestern Coastal Plain, where three of four wells monitoring this aquifer are located (fig. 64). Significant withdrawals in North Carolina are for a municipal system and the county water system in Northampton County, and for industrial and domestic use at Caledonia Correctional Center in eastern Halifax County. The only major cone of depression identified for this aquifer in North Carolina is at the Caledonia Correctional Center, where withdrawals from the aquifer are around 0.3 Mgal/d.

Ground-water withdrawals from the lower Cape Fear and Lower Cretaceous aquifers in the Franklin, Virginia, area are approximately 30 to 34 Mgal/d (North Carolina Division of Water Resources, 1987). These withdrawals in Virginia have caused a regional cone of depression to develop in the lower Cape Fear aquifer which extends several tens of miles into North Carolina (fig. 65).

Well NC-55 (fig. 66) near the State Line has been used to monitor the drawdown in the cone since 1965. The water level in this well declined, on the average, slightly more than 2.3 ft per year from 1966 to 1986. Well NC-55 shows a marked increase in decline rate beginning in October-November 1987 (fig. 67). Well NC-155 (fig. 69) also shows a marked increase in decline to nearly 4 ft per year during 1987. Well NC-151 (fig. 68), which also is in the regional cone but farther from the center of pumping than NC-55 and NC-155, has shown a nearly constant rate of decline of about 1.5 ft per year during the last decade.

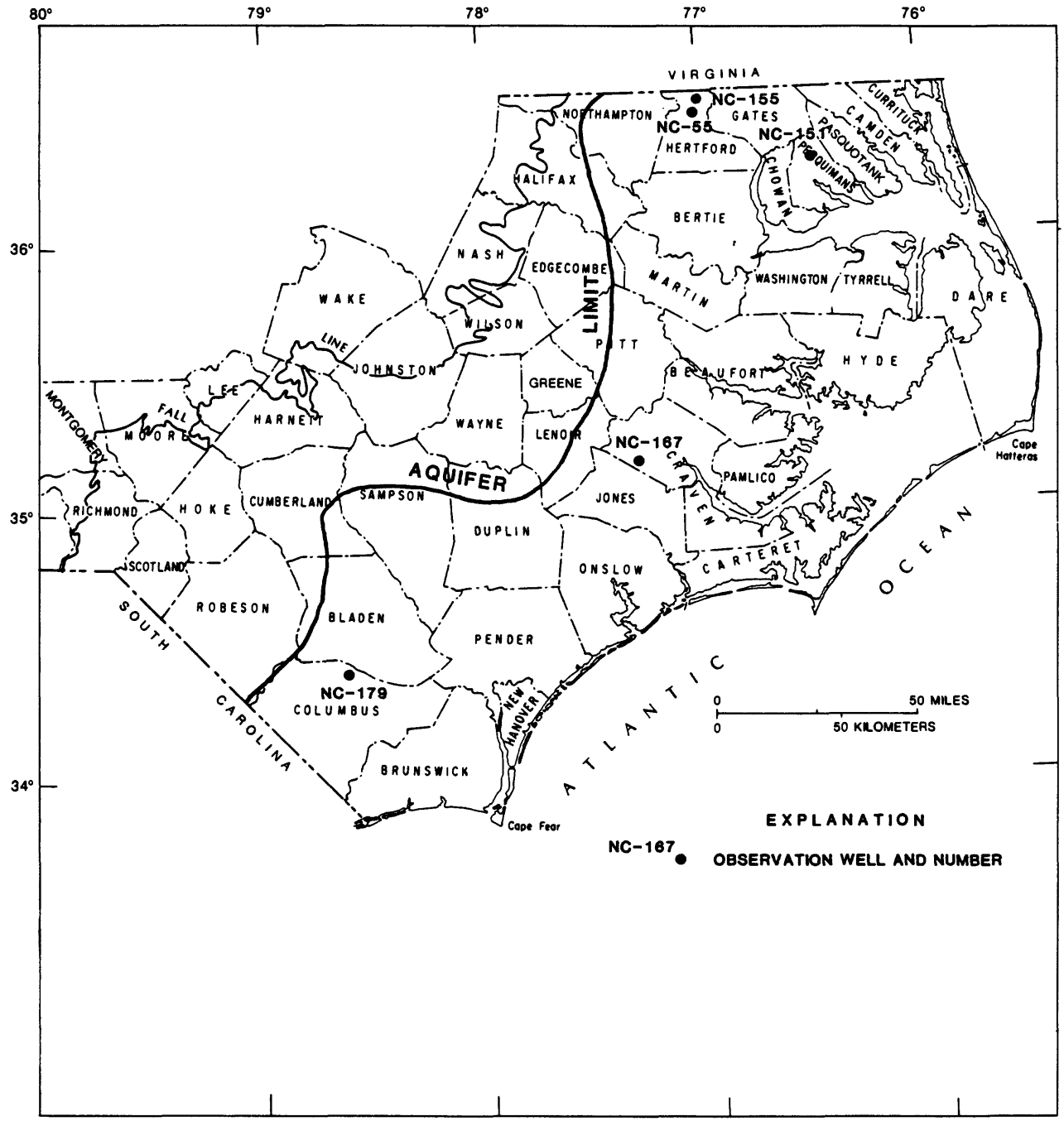


Figure 64.--Location of observation wells in the lower Cape Fear aquifer.

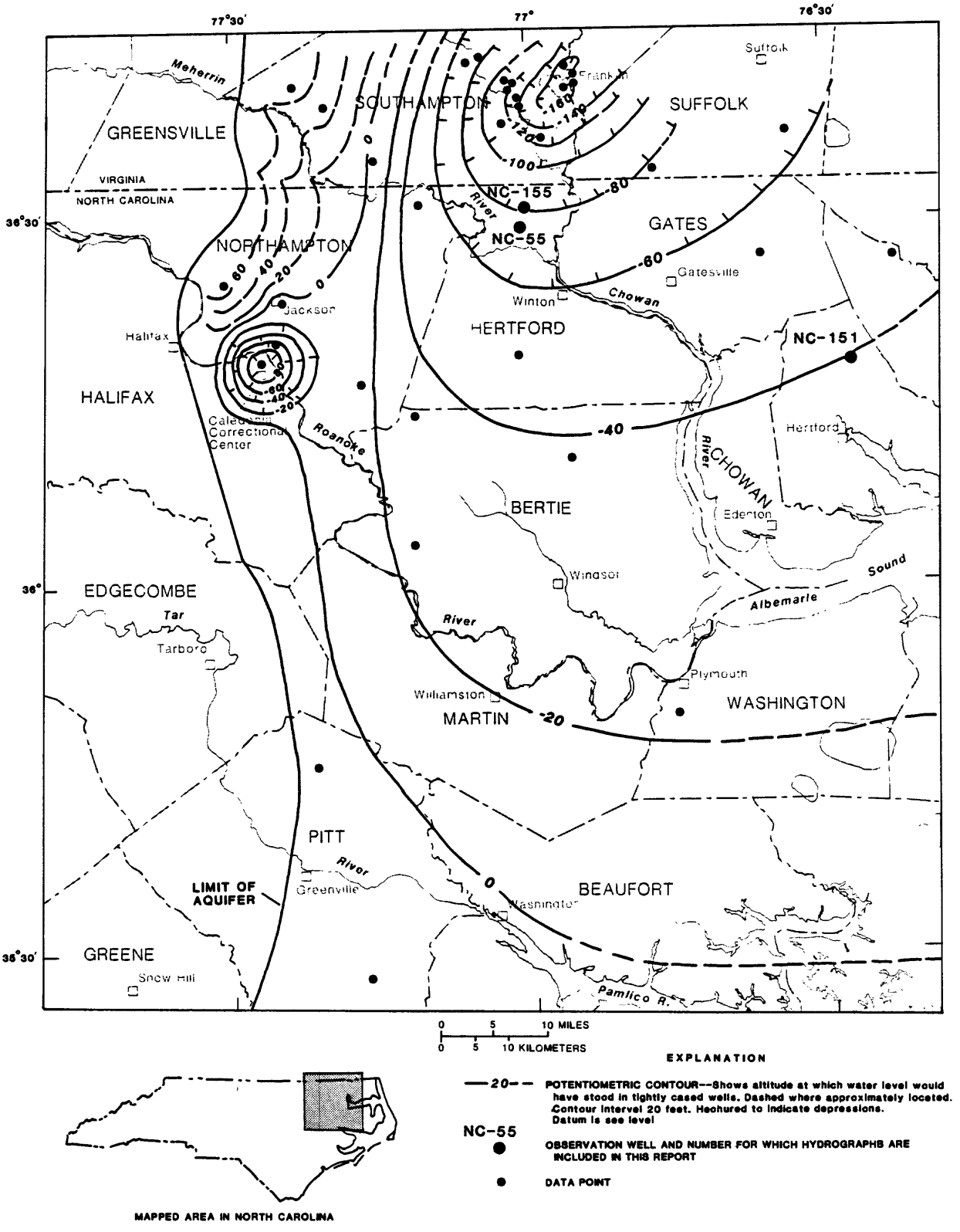


Figure 65.--Potentiometric surface of the lower Cape Fear aquifer of the Coastal Plain of northeastern North Carolina and southeastern Virginia, November 1987.

Well NC-167 is in the central Coastal Plain where the overlying Black Creek and upper Cape Fear aquifers are heavily pumped (Winner and others, 1989a). The water-level decline in this well (fig. 70) is probably the result of leakage of ground water from the lower Cape Fear aquifer upward through confining units into the heavily pumped Black Creek and upper Cape Fear aquifers.

Declines in the lower Cape Fear aquifer in the southern Coastal Plain also are seen. The cause of the decline, averaging about 0.3 ft per year in well NC-179 (fig. 71), has not been identified.

NC-55 NEAR COMO, HERTFORD COUNTY

362845077005501. Local number, NC-55.
LOCATION.--Lat 36°28'45", long 77°00'55", Hydrologic Unit 03010203, 1.7 mi southwest of Como, south of Secondary Road 1306 on Secondary Road 1307.
Owner: Charles Deloatch.
AQUIFER.--Lower Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, depth 340 ft, diameter 2 in, screen depth unknown.
INSTRUMENTATION.--Measured every six weeks with chalked tape by USGS personnel.
DATUM.--Land-surface datum is 28.40 ft above National Geodetic Vertical Datum of 1929.
Measuring point: Top of instrument shelf, 2.79 ft above land-surface datum (since December 1975).
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--December 1965 to current year. U.S. Geological Survey continuous record from December 1965 to December 1968.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 48.36 ft below land-surface datum, May 30 and 31, 1966; lowest, 101.43 ft below land-surface datum, December 2, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 16	98.53	APR 14	99.21	AUG 4	99.24	OCT 7	99.33	NOV 3	101.41	DEC 2	101.43
MAR 11	98.62	JUN 19	99.15								

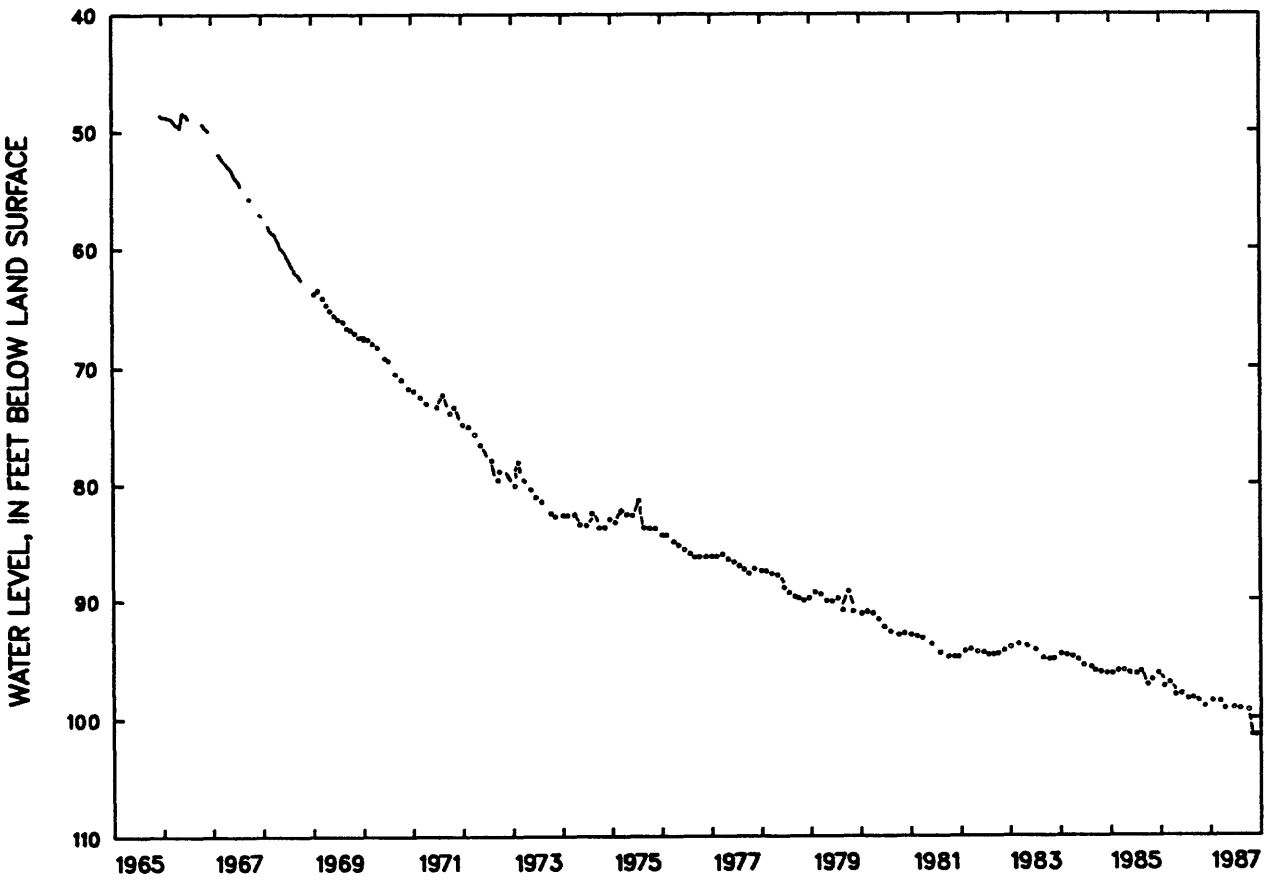


Figure 66.--Water level in observation well NC-55, Hertford County, 1965 to 1987.

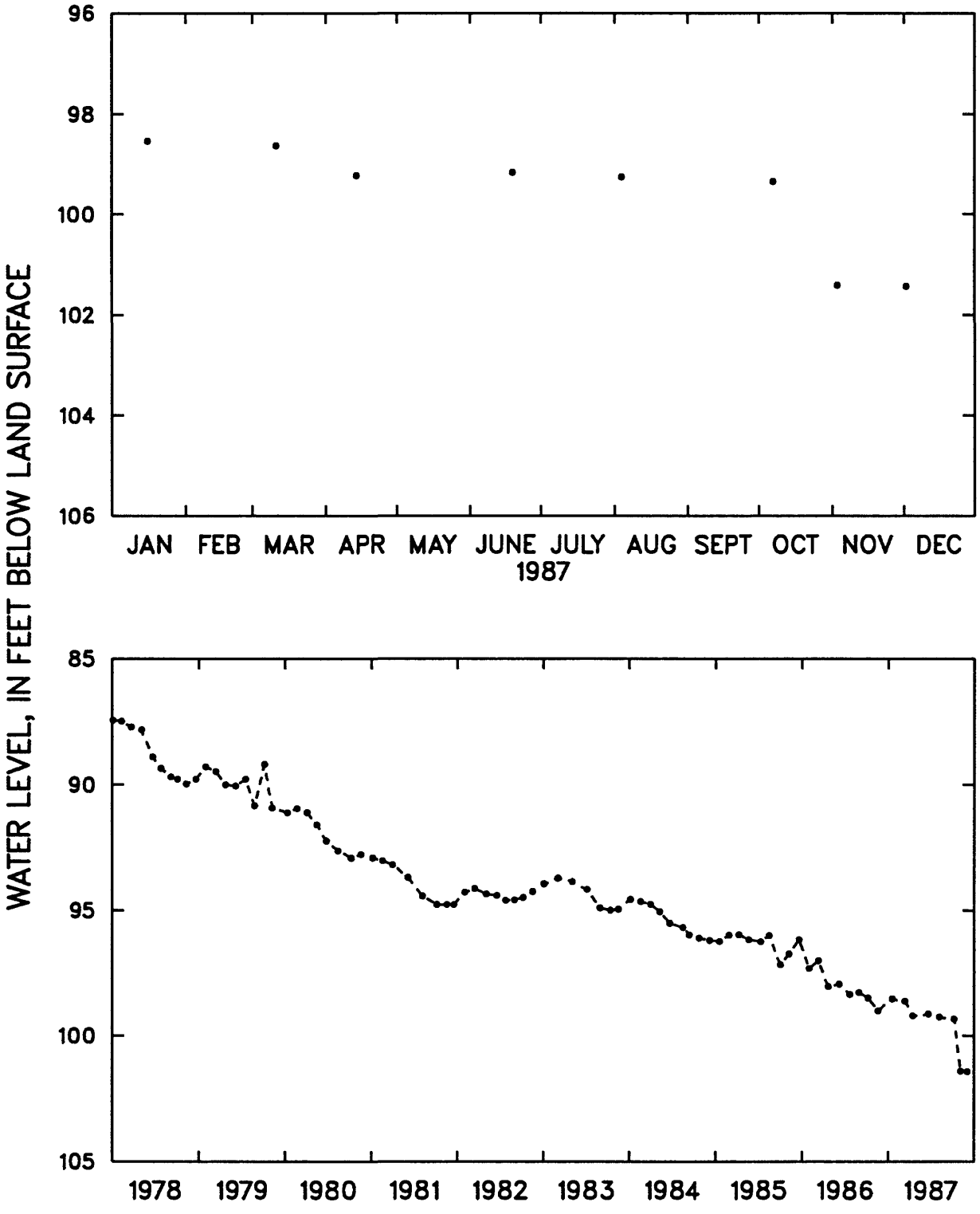


Figure 67.--Water level in observation well NC-55, Hertford County.

NC-151 NEAR PARKVILLE, PERQUIMANS COUNTY

361744076274402. Local number, NC-151; NRCD Parkville Research Station well E13m2.
LOCATION.--Lat 36°17'44", long 76°27'44", Hydrologic Unit 03010205, 3.5 mi west of Parkville, west of Secondary Road 1223 on logging road.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Lower Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 1019 ft, diameter 4 in, cased to 1009 ft, screened interval from 1009 to 1019 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 16.82 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 3.02 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by NRCD.
PERIOD OF RECORD.--December 1977 to current year. Records from December 1977 to July 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began November 1986.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 40.17 ft below land-surface datum, December 7, 1977; lowest, 55.45 ft below land-surface datum, December 8, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	53.94	54.08	53.87	---	---	54.66	54.89	55.14	55.19	55.29	55.26
10	---	53.91	53.97	53.93	---	---	54.73	54.90	55.05	55.34	55.30	55.27
15	---	53.90	54.03	54.03	---	---	54.76	55.01	55.04	55.31	55.31	55.24
20	53.69	54.01	53.93	53.87	---	54.49	54.91	54.93	54.99	55.31	55.31	55.34
25	53.76	54.01	54.03	53.94	---	54.52	54.95	55.09	55.06	55.39	55.32	55.32
EOM	53.71	54.00	53.79	54.00	---	54.66	54.98	55.09	55.05	55.35	55.28	55.40

CAL YR 1987 HIGHEST DAILY MEAN 53.53 JAN 22 LOWEST DAILY MEAN 55.44 DEC 8

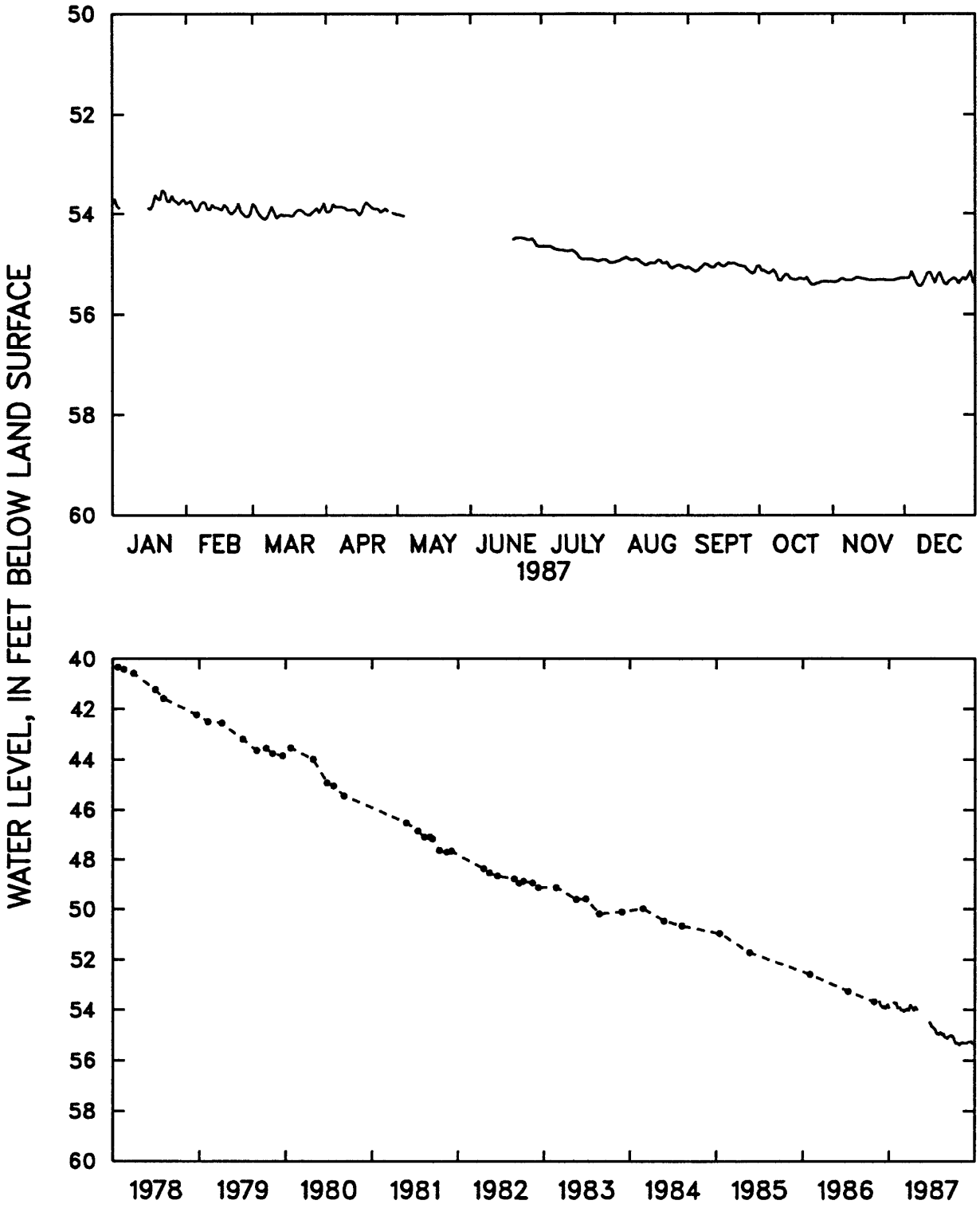


Figure 68.--Water level in observation well NC-151, Perquimans County.

NC-155 NEAR COMO, HERTFORD COUNTY

363026077001906. Local number, NC-155; NRCD Como Research Station well B20u6.
LOCATION.--Lat 36°30'26", long 77°00'19", Hydrologic Unit 03010203, 0.5 mi northeast of Como, northwest of U.S. Highway 258 on Secondary Road 1316.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Lower Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 818 ft, diameter 4 in, cased to 560 ft, screened interval from 560 to 570 ft, cemented from 575 to 818 ft.
INSTRUMENTATION.--Measured every six weeks with chalked tape by USGS personnel.
DATUM.--Land-surface datum is 68.83 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 3.00 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to October 1986 were provided by NRCD.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 143.04 ft below land-surface datum, February 9, 1983; lowest, 150.61 ft below land-surface datum, December 2, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 16	147.29	APR 30	148.00	JUN 19	148.94	AUG 4	149.63	OCT 7	150.17	DEC 2	150.61
APR 14	148.27										

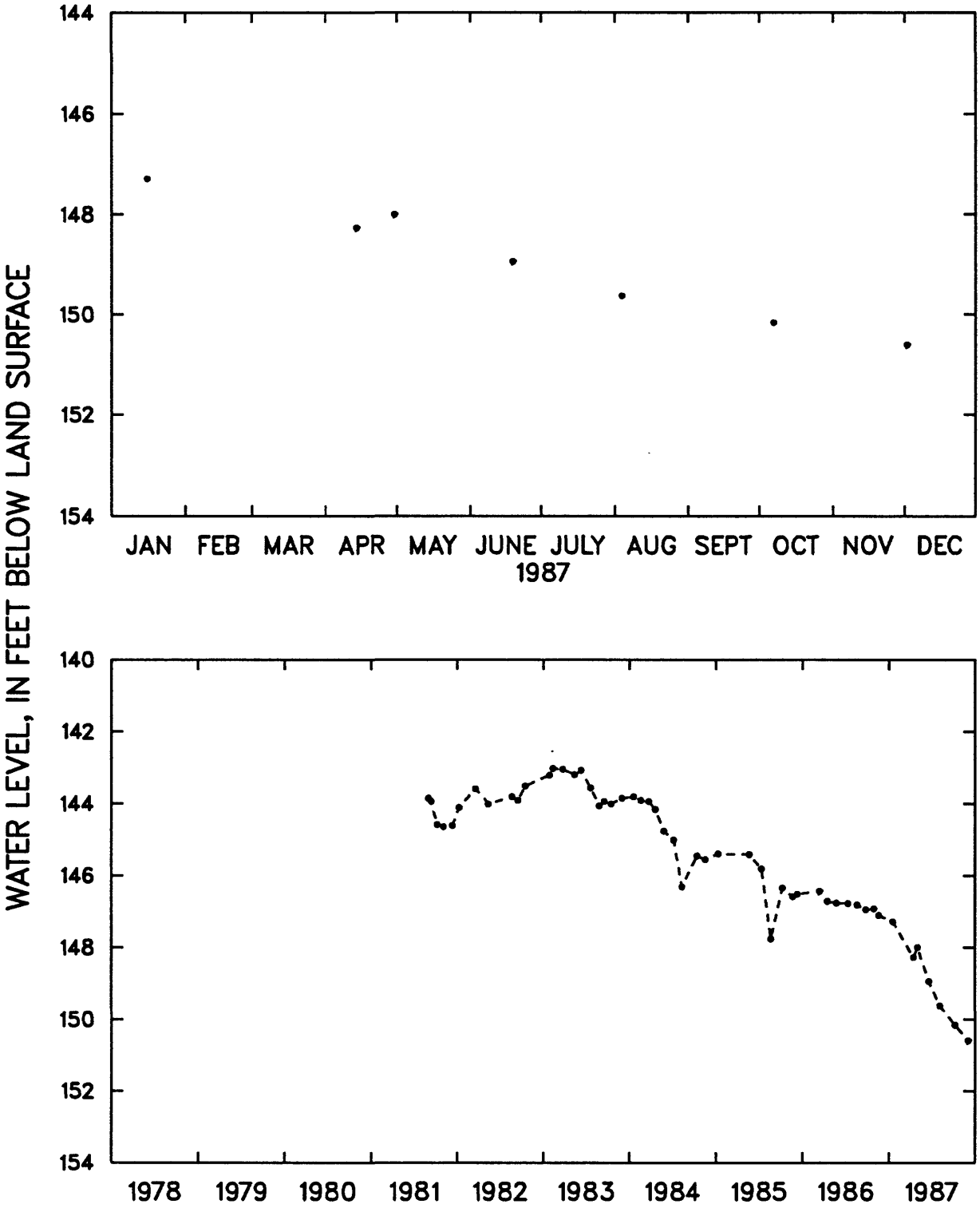


Figure 69.--Water level in observation well NC-155, Hertford County.

NC-167 NEAR COVE CITY, CRAVEN COUNTY

351019077184103. Local number, NC-167; NRCD Cove City Research Station well R23x3.
LOCATION.--Lat 35°10'19", long 77°18'41", Hydrologic Unit 03020202, 1 mi southeast of Cove City, 0.6 mi east of Secondary Road 1001 on Secondary Road 1232.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Lower Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 1000 ft, diameter 4 in, cased to 990 ft, screened interval from 990 to 1000 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 46 ft above National Geodetic Vertical Datum of 1929 (from topographic map).
Measuring point: Top of instrument shelf, 2.24 ft above land-surface datum.
REMARKS.--Areal-effects well.
PERIOD OF RECORD.--July 1985 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 50.29 ft below land-surface datum, September 27, 1985; lowest, 56.45 ft below land-surface datum, December 31, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	53.57	53.85	54.02	54.09	54.40	54.58	54.98	55.26	55.40	55.77	55.97	56.18
10	53.53	53.88	53.87	54.19	54.51	54.74	55.05	55.23	55.28	55.94	56.07	56.19
15	53.62	53.82	54.07	54.26	54.46	54.60	55.05	55.18	55.41	55.94	56.22	56.20
20	53.55	53.96	54.01	54.16	54.41	54.74	55.28	55.17	55.40	55.95	56.11	56.35
25	53.59	53.98	54.16	54.12	54.58	54.82	55.35	55.37	55.56	56.06	56.33	56.36
EOM	53.59	53.91	53.94	54.24	54.60	55.02	55.39	55.32	55.57	56.11	56.00	56.43

CAL YR 1987 HIGHEST DAILY MEAN 53.33 JAN 22 LOWEST DAILY MEAN 56.43 DEC 31

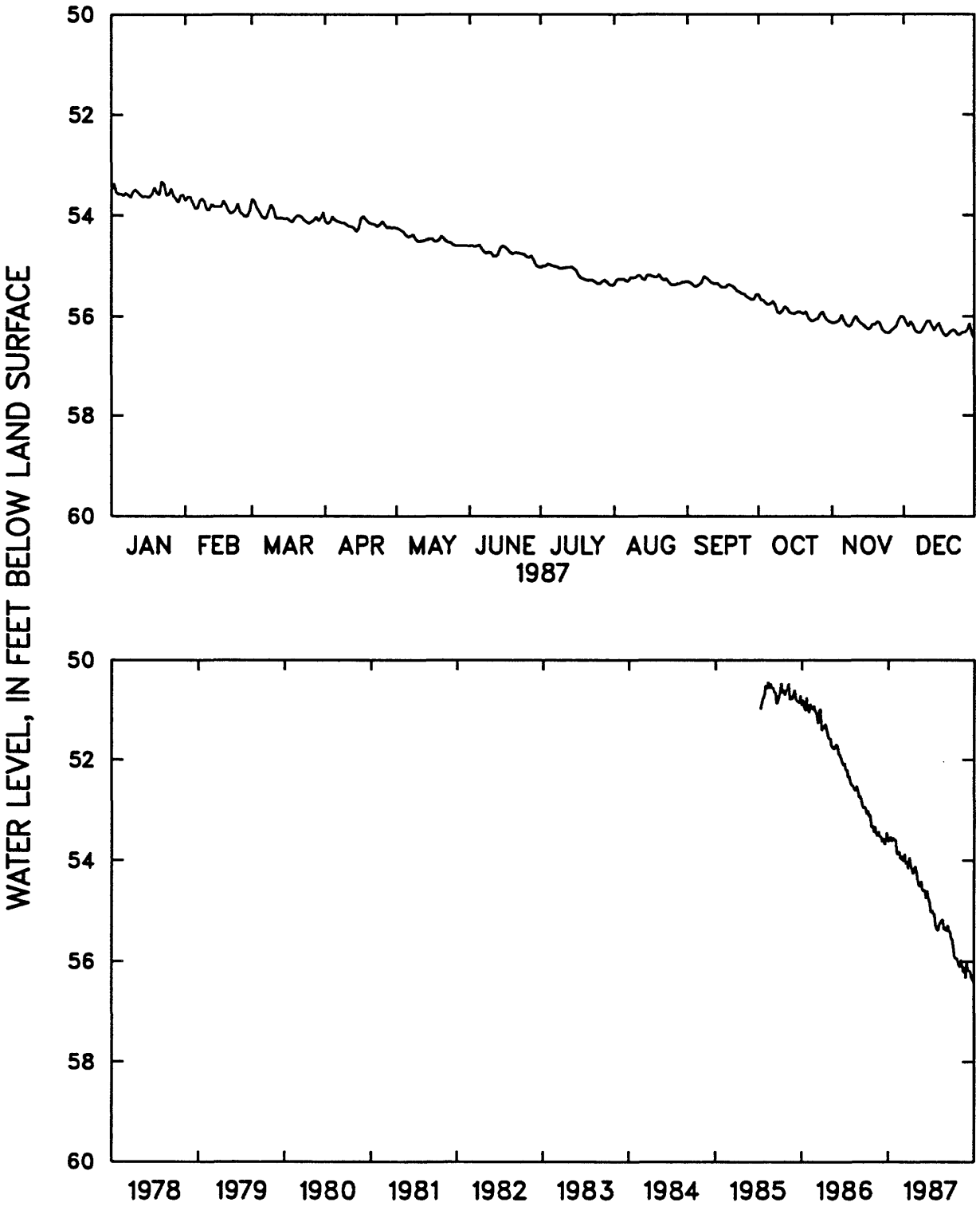


Figure 70.--Water level in observation well NC-167, Craven County.

NC-179 NEAR HALLSBORO, COLUMBUS COUNTY

342508078360802. Local number, NC-179; NRCD Carver Moore Research Station well AA39v2.
LOCATION.--Lat 34°25'08", long 78°36'08", Hydrologic Unit 03040206, 6.7 mi north of Hallsboro, east of Secondary Road 1001 at abandoned Carver Moore School on Secondary Road 1724.
Owner: NRCD (North Carolina Department of Natural Resources and Community Development).
AQUIFER.--Lower Cape Fear aquifer of Late Cretaceous age.
WELL CHARACTERISTICS.--Drilled observation well, drilled to 506 ft, diameter 4 in, cased to 496 ft, screened interval from 496 to 506 ft.
INSTRUMENTATION.--Digital recorder --60-minute punch.
DATUM.--Land-surface datum is 105.53 ft above National Geodetic Vertical Datum of 1929 (levels by NRCD).
Measuring point: Top of instrument shelf, 2.10 ft above land-surface datum.
REMARKS.--Areal-effects well.
COOPERATION.--Periodic water-level measurements prior to May 1986 were provided by NRCD.
PERIOD OF RECORD.--September 1975 to current year. Records from September 1975 to April 1986 are unpublished and available in the files of the Groundwater Section, NRCD. U.S. Geological Survey continuous record began January 1987.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 39.11 ft below land-surface datum, July 20, 1976; lowest, 43.68 ft below land-surface datum, November 6, 7, 8, 22, 23, and 24, 1987.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, CALENDAR YEAR JANUARY TO DECEMBER 1987
MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	---	43.41	43.26	43.13	43.16	43.31	43.15	43.38	43.31	43.41	43.51	43.58
10	---	43.41	43.14	43.14	43.21	43.38	43.22	43.43	43.17	43.51	43.54	43.48
15	43.42	43.35	43.21	43.06	43.20	43.21	43.23	43.35	43.22	43.53	43.64	43.44
20	43.35	43.33	43.09	43.06	43.22	43.17	43.34	43.38	43.21	43.54	43.53	43.54
25	43.34	43.32	43.15	43.07	43.29	---	43.41	43.40	43.31	43.61	43.65	43.53
EOM	43.35	43.14	43.05	43.11	43.35	43.24	43.46	43.38	43.29	43.61	43.40	43.56

CAL YR 1987 HIGHEST DAILY MEAN 42.98 APR 16 LOWEST DAILY MEAN 43.68 NOV 7, 23

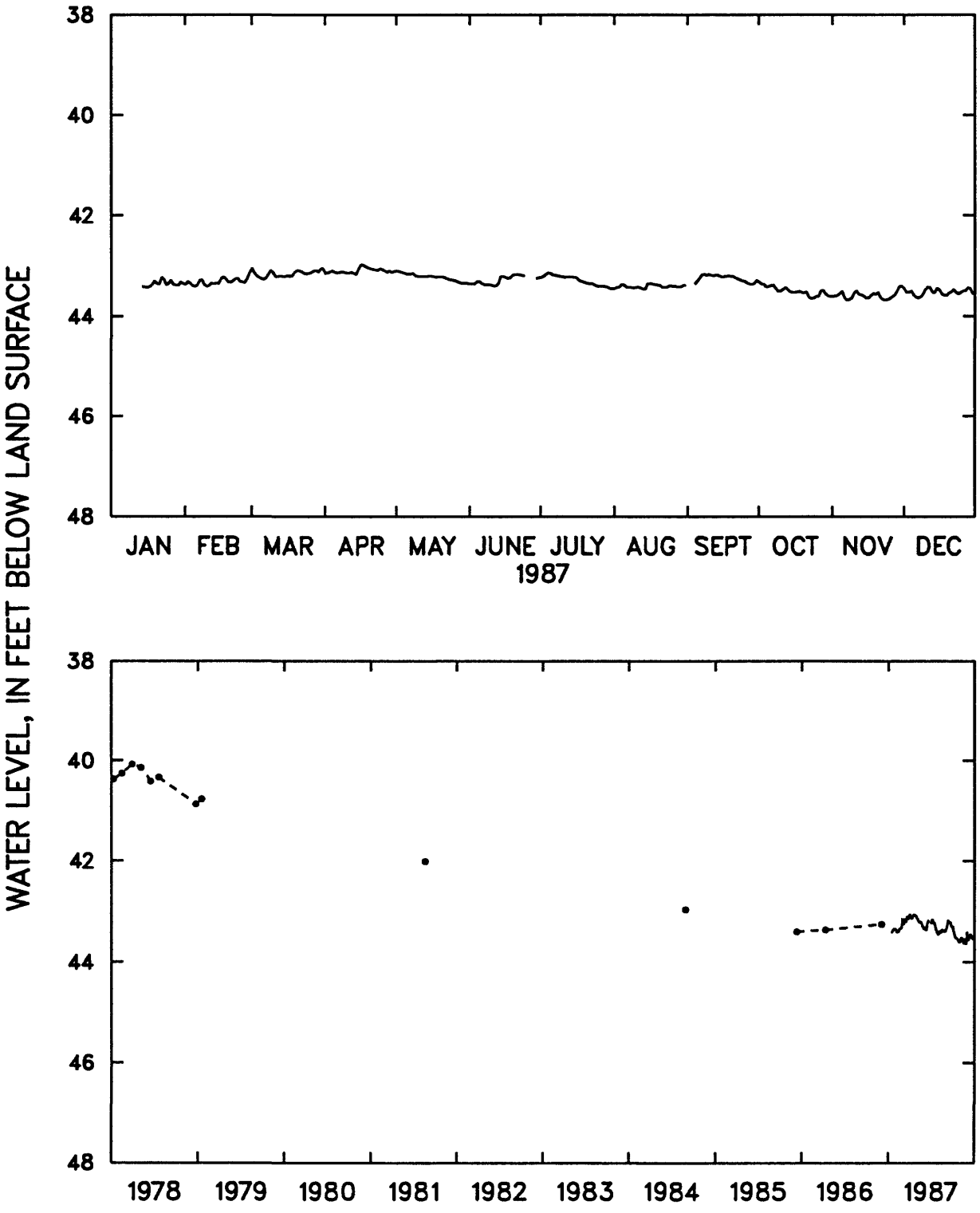


Figure 71.--Water level in observation well NC-179, Columbus County.

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Year	WSP	Year	WSP	Year	WSP	Year	WSP
1935	777	1942	945	1949	1157	1956-58	1538
1936	817	1943	987	1950	1166	1959-63	1803
1937	840	1944	1017	1951	1192	1964-68	1978
1938	845	1945	1024	1952	1222	1969-73	2171
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1940	907	1947	1097	1954	1322		
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