GROUND-WATER LEVEL DATA FOR NORTH CAROLINA, 1988-90

By A.G. Strickland, R.W. Coble, L.A. Edwards, and B.F. Pope

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PREFACE

This report presents ground-water level data collected in the joint U.S. Geological Survey and North Carolina Department of Environment, Health, and Natural Resources 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 ensuring that the information contained herein is accurate and complete, the following personnel contributed significantly to the collection, processing, and tabulation of the data:

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GROUND-WATER LEVEL DATA FOR NORTH CAROLINA, 1988-90

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ABSTRACT

Continuous and periodic water-level measurements were made in 59 key wells throughout North Carolina. Additional measurements were made in 112 supplementary wells emplaced in Coastal Plain aquifers of the State. Changes in ground-water levels are shown in 3- and 10-year hydrographs of selected wells in the State.

The water table in the shallow aquifers was higher throughout most of 1989 and early 1990 than in 1988, indicating that these aquifers were sufficiently recharged by precipitation to replenish the late 1987-88 deficit in ground-water storage. Water levels in the heavily pumped Coastal Plain aquifers declined as a result of ground water being withdrawn from aquifer storage. Record low water levels were measured in 8 of 13 wells in the Castle Hayne aquifer and in 6 of 8 wells in the Peedee aquifer; the maximum annual declines during 1988-90 averaged 3.3 and 1.6 feet per year for these two aquifers, respectively. All wells in the Black Creek, upper Cape Fear, and lower Cape Fear aquifers had record low water levels during 1988-90, with maximum annual declines averaging 9.0, 2.2, and 2.6 feet per year, respectively. Water levels in two of three wells in the Yorktown aquifer did not show a general downward trend during 1988-90, although water levels declined in the third well, reaching a record low in 1990.

The effects of major centers of pumping in the North Carolina Coastal Plain are shown in potentiometric-surface maps of the Black Creek and lower Cape Fear aquifers. Measurements were made in the wells tapping the Black Creek aquifer in the southern Coastal Plain during November and December 1988 and in the lower Cape Fear aquifer in the northern Coastal Plain in December 1989.

INTRODUCTION

Ground water is a vital natural resource in North Carolina and is the source of water for more than 3.6 million people, or about 58 percent of the State's total population. In 1985, ground water was withdrawn at the rate of 435 Mgal/d (Treece and Bales, 1990). The economic significance of ground water is substantial, particularly in the Coastal Plain Province where high-yielding aquifers supply water for most domestic, commercial, industrial, and agricultural uses. 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.

Knowledge of the status of ground-water storage is necessary in order to manage this valuable resource effectively. The amount of water stored within the ground-water system remains constant over the long term under natural conditions because the water moving through and discharging from the system is replaced 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. The potentiometric surface of an aquifer is the imaginary surface that represents the altitude to which the water level would rise in a tightly cased well. 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. Withdrawals of water from wells, combined with natural discharge, commonly exceed recharge. As a result, as water is withdrawn from aquifer storage, the potentiometric surface of that aquifer declines. Water-level declines of as much as 160 ft have been documented in the central Coastal Plain, where ground-water withdrawals have increased from less than 0.10 Mgal/d before 1900 to 30 Mgal/d in 1986 (Lyke, 1990, and Lyke and Brockman, 1990).

History of the Observation-Well Program in North Carolina

Water levels have been measured in wells in North Carolina by U.S. Geological Survey (USGS) 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 USGS and the predecessor agencies of the North Carolina Department of Environment, Health, and Natural Resources (DEHNR) each developed separate statewide observation-well programs for monitoring ground-water levels. By 1978 the USGS operated 50 observation wells, and the DEHNR 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 separate observation-well programs and of 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 USGS began a national program of ground-water studies known as the 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, 1989). 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 USGS and the Groundwater Section of DEHNR regarding a joint observation-well program resumed. The major goals were to take advantage of the observation wells in the DEHNR's ground-water research-station program and to use the USGS's capabilities in data collection, processing, and publishing. By early 1987, the joint program was in operation. The USGS and DEHNR evaluate and update the program on a continuous basis to ensure effective monitoring of ground-water conditions throughout the State. Records of all wells were evaluated in 1990 to make data collection more efficient without greatly reducing the effectiveness of the program. As a result of this evaluation, continuous data recorders were removed from 21 wells, thus saving costs in equipment rental and manpower in data collection and processing.

Purpose and Scope

The purpose of this report is to present water-level data collected from the joint USGS/DEHNR ground-water level observation-well program in North Carolina during 1988-90. Water levels for 1988-90 are included; also included are hydrographs for all or part of the period 1981 through 1990 from 59 key wells measured on a continuous or periodic basis by USGS and DEHNR personnel. This information is grouped by major aquifer. North Carolina counties are shown in figure 1, and the wells are listed by county in table 1. Synoptic water-level measurements were made at 112 other wells in the falls of 1988 and 1989 to construct potentiometric-surface maps for two areas of the Coastal Plain of North Carolina.

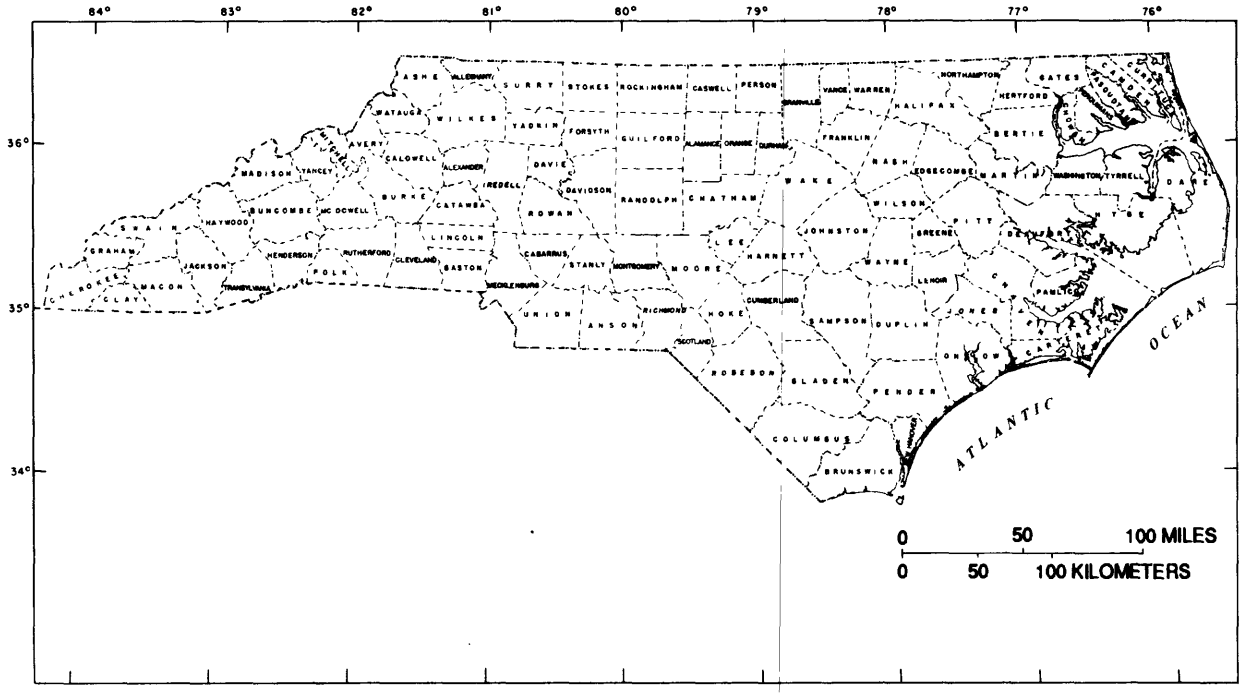


Figure 1.--North Carolina counties.

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

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

County	Aquifer	Well number	Well name	Page
Beaufort	Castle Hayne	NC-13	Texasgulf well near Aurora	72
Beaufort	Castle Hayne	NC-137	DEHNR Creeping Swamp RS well O21q1	80
Beaufort	Castle Hayne	NC-145	DEHNR Bonnerton RS well P18v5	84
Beaufort	Yorktown	NC-162	DEHNR Bonnerton RS well P18v6	66
Beaufort	Castle Hayne	NC-163	DEHNR Coxs Crossroads RS well P19m3	92
Beaufort	Peedee	NC-164	DEHNR Wilmar RS well P21k7	100
Beaufort	Black Creek	NC-165	DEHNR Wilmar RS well P21k9	128
Bertie	Upper Cape Fear	NC-153	DEHNR Cremo RS well G19b6	126
Bertie	Surficial	NC-154	DEHNR Roxobel RS well F22b7	40
Bladen	Peedee	NC-178	DEHNR Bladenboro RS well Z41u3	104
Brunswick	Peedee	NC-180	DEHNR Bolivia RS well FF33d2	106
Brunswick	Castle Hayne	NC-181	DEHNR Sunset Harbor RS well GG34s6	96
Carteret	Castle Hayne	NC-139	DEHNR Camp Glenn RS well X17j5	82
Cherokee	Regolith	NC-191	DEHNR well R102p1 near Marble	52
Cherokee	Regolith	NC-192	DEHNR well R102p2 near Marble	54
Columbus	Lower Cape Fear	NC-179	DEHNR Carver Moore RS well AA39v2	156
Craven	Black Creek and upper Cape Fear	NC-44	City of New Bern well near Cove City	120
Craven	Lower Cape Fear	NC-167	DEHNR Cove City RS well R23x3	154
Craven	Black Creek	NC-170	DEHNR Clarks RS well S22j10	130
Davie	Regolith	NC-142	USGS well near Mocksville	28
Duplin	Peedee	NC-174	DEHNR Rose Hill RS well V32v1	102
Duplin	Black Creek	NC-176	DEHNR Chinquapin RS well W29d6	134
Gates	Upper Cape Fear	NC-149	DEHNR Sunbury RS well C15s5	124
Haywood	Regolith	NC-40	Champion well near Cruso	24
Hertford	Lower Cape Fear	NC-55	Deloatch well near Como	148
Hertford	Lower Cape Fear	NC-155	DEHNR Como RS well B20u6	152
Hyde	Castle Hayne	NC-159	DEHNR Hydeland RS well O10w3	90
Jones	Black Creek	NC-172	DEHNR Comfort RS well U26j4	132
Jones	Surficial	NC-173	DEHNR Comfort RS well U26j8	50
Jones	Peedee	NC-187	DEHNR Comfort RS well U26j5	112
Lenoir	Black Creek	NC-128	City of Kinston well at Kinston	122
Lenoir	Peedee	NC-185	DEHNR Graingers RS well Q25d12	110
Lenoir	Upper Cape Fear	NC-186	DEHNR Kinston Yard RS well Q27r5	140
Mecklenburg	Regolith	NC-146	USGS well near Huntersville	34
New Hanover	Castle Hayne	NC-20	Hodder well near Wilmington	74
Onslow	Castle Hayne	NC-52	USMC Camp Geiger well	76
Onslow	Castle Hayne	NC-85	CP&L well at Jacksonville	78
Onslow	Peedee	NC-188	DEHNR Dixon Tower RS well Y25q4	114
Onslow	Black Creek	NC-189	DEHNR Jacksonville Hwy 258 Well Field RS well W25f7	142
Orange	Regolith	NC-126	Chi Psi Fraternity well at Chapel Hill	26

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

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

County	Aquifer	Well number	Well name	Page
Pamlico	Castle Hayne	NC-169	DEHNR Whortonsville RS well S15y6	94
Pasquotank	Surficial	NC-143	USGS well near Elizabeth City	30
Pasquotank	Yorktown	NC-150	DEHNR Elizabeth City Forest Service RS well D11v5	62
Perquimans	Lower Cape Fear	NC-151	DEHNR Parkville RS well E13m2	150
Perquimans	Castle Hayne	NC-152	DEHNR Parkville RS well E13m3	86
Pitt	Surficial	NC-160	USGS well near Simpson	44
Pitt	Upper Cape Fear	NC-183	DEHNR Bethel RS well L24b4	138
Pitt	Peedee	NC-184	DEHNR Conley RS well N23p3	108
Richmond	Surficial	NC-171	DEHNR Hoffman RS well T50r6	48
Robeson	Upper Cape Fear	NC-177	DEHNR Littlefield School RS well Y42f9	136
Rowan	Regolith	NC-193	DEHNR well L63t1 near Barber	56
Sampson	Surficial	NC-168	DEHNR Mingo RS well R38p11	46
Scotland	Surficial	NC-194	USGS well near Silver Hill	58
Transylvania	Regolith	NC-144	USGS well at Blantyre	32
Transylvania	Regolith	NC-147	USGS well near Brevard	36
Washington	Castle Hayne	NC-156	DEHNR Lake Phelps RS well L13i1	88
Washington	Yorktown	NC-157	DEHNR Lake Phelps RS well L13i2	64
Washington	Surficial	NC-158	USGS well near Hoke	42
Wayne	Surficial	NC-148	USGS well near Grantham	38

OBJECTIVE CONCEPT

The joint USGS/DEHNR observation-well program is based on the concept that observation wells should be selected so that each well provides data to meet specific objectives. This concept was first proposed by Heath (1976) and later adapted to a proposed program for North Carolina (Winner, 1981a). Winner's adaptation and terminology were applied to the joint USGS/DEHNR program described in this report.

This program is designed to measure effects of natural and human-induced stresses on ground-water storage that are reflected by fluctuations

in water levels (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

During 1988-90, the ground-water observation-well program consisted of 59 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. In 1988 and 1989, 112 supplementary wells were measured and the water-level data were used to construct potentiometric-surface maps for two areas in the Coastal Plain.

Well Selection

One of the approaches in establishing the joint program was to take advantage of the availability of observation wells that resulted from the DEHNR 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 DEHNR. 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-level data, and drill-stem water-quality data are collected. Permanent observation wells that tap each

Table 2.--*Type, objective, and use of data from the North Carolina 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	Maps showing potentiometric-surface depressions
		Hydrographs showing changes in water levels with time
	To define the hydraulic characteristics of aquifers	Graphs showing water levels during pumping conditions as a function of pumping rates
	To define effectiveness of confining beds in separating aquifers	
Areal effects	To determine status of storage over the entire areal extent of the aquifer	Regional water-level maps
		Maps showing net change in storage over a specific time period
	To define regional continuity of aquifers	Define recharge and discharge areas for areal extensive aquifers

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 (PVC) casing. About one hundred of these stations have been constructed to date, and data from all of the stations were considered when the joint observation-well program was planned. Of the 59 key wells measured on a continuous or periodic basis, 38 are research-station wells; nearly all of the remaining research-station wells are supplementary wells often used for synoptic measurements.

Fourteen of the 21 remaining wells were either constructed especially for the program or were constructed specifically for studies conducted by the USGS; each of those 14 was designed to tap a specific aquifer. The other seven wells were constructed for production or test purposes by private individuals or local governments and have been made available to the USGS or DEHNR. 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 that 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 well that was dug and left uncased but lined with rock; at one time the well probably served as a household-supply well.

Water-Level Measurements

Water-level measurements are made periodically in all 59 key wells by steel tape or by 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 public-, industrial-, or irrigation-supply wells that are currently operating and 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 59 key wells in the program are measured and serviced periodically by USGS personnel. The supplementary wells are measured by personnel from the USGS and DEHNR. In some cases personnel from public water-supply systems measure the water levels in supplementary wells and report them to the USGS.

MAJOR AQUIFERS

With respect to ground-water hydrology, North Carolina is divided into two zones that 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 it is 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 1988-90 tapped the regolith.

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). During the RASA study (table 3), the Coastal Plain sediments were divided by Winner and Coble (1989) into 10 aquifers separated by confining units.

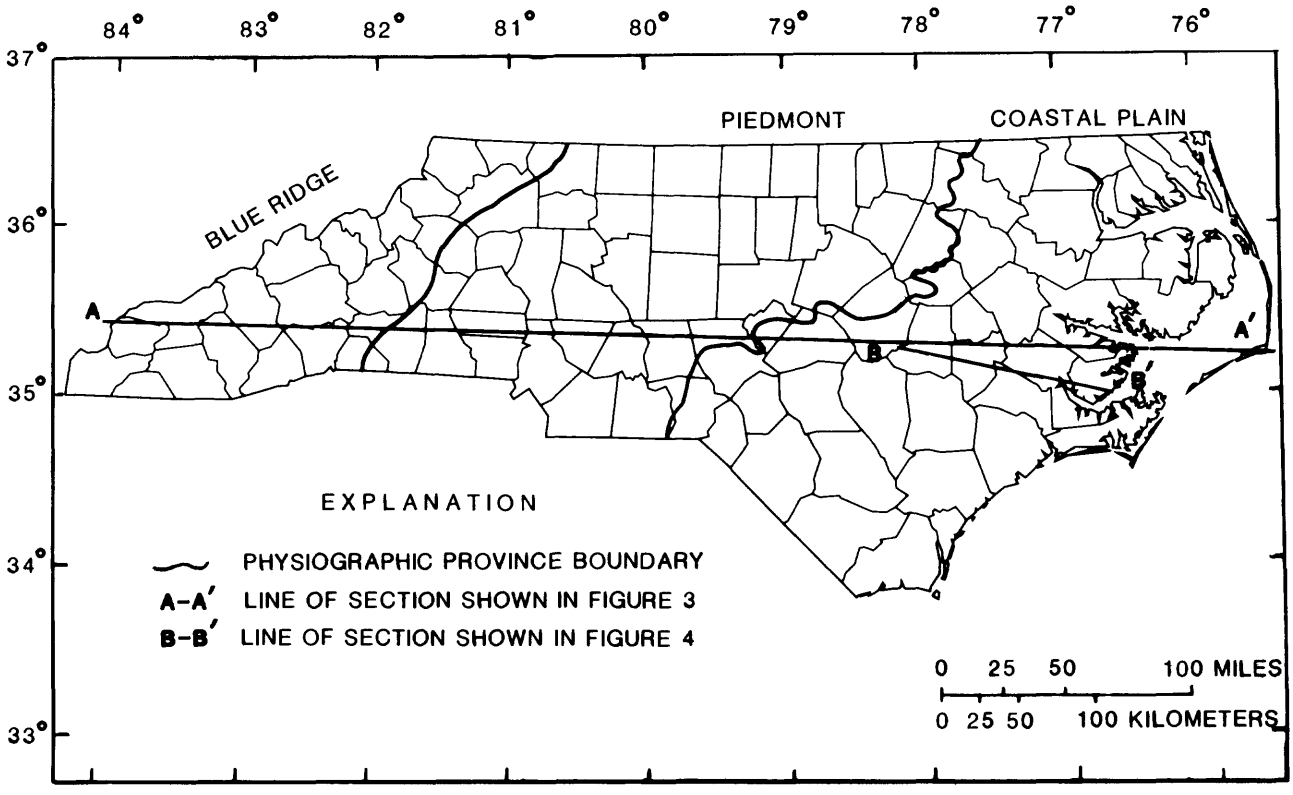


Figure 2.--Physiographic provinces of North Carolina.

The surficial aquifer is a near-surface deposit of fine sand, silt, clay, and peat beds. Deposits of coarser-grained sediments in the unit are scattered in relict beach ridges or in alluvium. The surficial aquifer is considered present throughout the 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 Formation is largely composed of fine sand, silty and clayey sand, and sand with shell and shell beds; some limestone and coarse sand beds also are present.

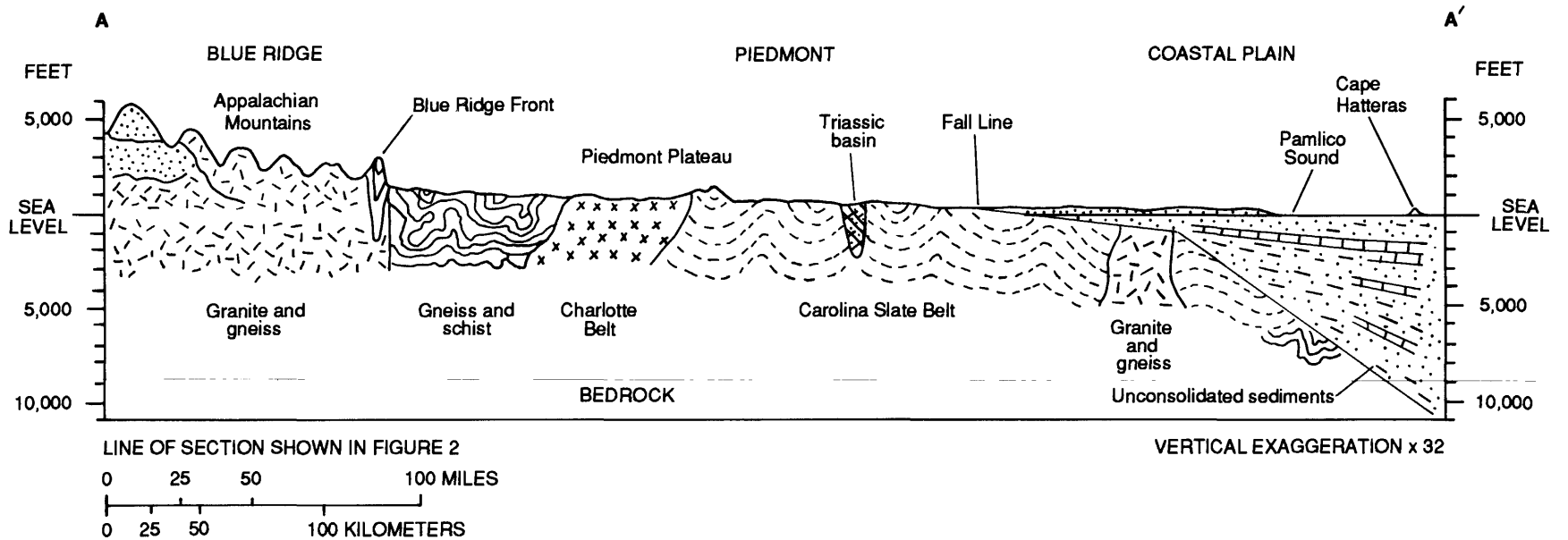


Figure 3.--Geologic section across North Carolina (from Heath, 1980).

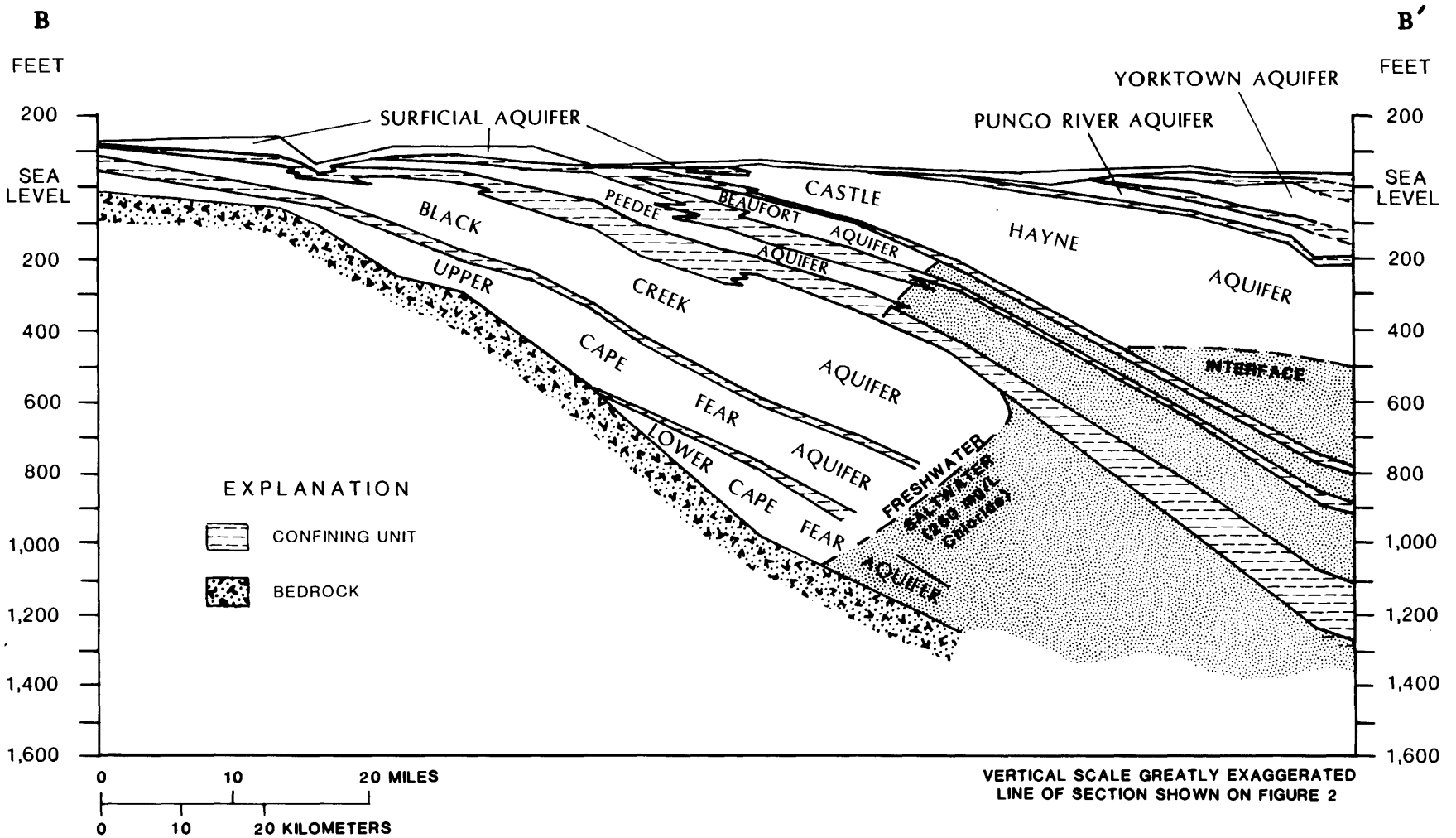


Figure 4.--Hydrogeologic section of the Coastal Plain of North Carolina (from Coble and others, 1987).

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

[Adapted from Winner and Coble, 1989]

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 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 aquifer is a minor one, and water levels in this aquifer are not measured for the joint USGS/DEHNR program.

The Castle Hayne aquifer in the Eocene Castle Hayne Formation and in some sediments of Oligocene age is composed of limestone, sand, and minor amounts of clay. Limestone may be present as shell limestone, dolomitic limestone, and sandy limestone varying 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 ft thick. The Beaufort aquifer is a minor aquifer and often is tapped by wells that are also open to and produce most of their water from the overlying Castle Hayne or underlying Peedee aquifers. 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 Formation is mainly thinly laminated gray to black clay, interbedded with gray to tan sands in the eastern part of its areal extent; whereas in the western part, it is mainly fine to medium sand, interbedded with silty clay, coarser channel sand, and thinly laminated sand and clay.

Below the Black Creek aquifer 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 rocks of Lower Cretaceous age in the updip (western) extent is composed of nonmarine shales, sands, and sand and gravel; whereas in the downdip (eastern) area, this aquifer becomes progressively more marine and is composed of sand and shells with marine beds of 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; however, the aquifer is heavily pumped in southeastern Virginia by industrial and municipal systems that withdraw water from it and the lower Cape Fear aquifer. Water levels in the Lower Cretaceous aquifer are not measured in the joint program.

GROUND-WATER LEVEL DATA

Records of ground-water levels measured continuously or periodically are presented in the following section. Information about each well, including the well-identification number, latitude and longitude, location, aquifer, and well characteristics, and other data, such as period of record and water-level extremes, are listed. Also presented for each well are tables showing values of daily mean water levels for every fifth day derived from the continuous records or tables containing the periodic water-level measurements for 1988-90, a 3-year hydrograph of those data, and a 10-year hydrograph (1981 to 1990). In this report, water-level extremes refer to the instantaneous highest or lowest water level measured during the period of record in a particular well. Thus, the mean value on a given day may be higher or lower than the record extreme. Continuous water-level records on 3-year hydrographs are based on daily mean values and are shown by a solid line; no line is shown for times when record is missing. The 10-year hydrographs of continuous water-level records are based on mean values for every fifth day and the last day of the month; again, no line is shown for missing record. Data on 3-year and 10-year hydrographs from 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.

Hydrographs for several DEHNR research station wells show water-level record adjusted from an adjacent well. Some of the research stations have pairs of wells constructed so that both wells are screened in the same zone in an aquifer. These paired wells were constructed to perform aquifer tests. Several of these wells were selected for the joint observation-well program. Usually, water levels were measured periodically in only one of the paired wells, and that well was selected for the joint program. When the selected well could not be used, it was replaced by its paired well, which became the key well in the program. In such cases, the water-level record from the replaced well was also included in the 10-year hydrograph after adjusting the water levels by the difference in land-surface altitudes of the two wells. The adjusted water-level record is noted in the descriptive heading under REMARKS and on the 10-year hydrograph of the key well.

Synoptic measurements were made in 112 wells tapping the Black Creek aquifer in the southern Coastal Plain during November and December 1988, and in the lower Cape Fear aquifer in the northern Coastal Plain in December 1989. These water-level measurements, along with data from key wells, were used to construct the potentiometric-surface maps presented in this report.

Natural-Stress Network

Ground water in the shallower parts of the surficial aquifer in the Coastal Plain and in the regolith in the Piedmont and Blue Ridge Provinces is generally present under unconfined conditions. Fluctuations of water levels in the unconfined aquifers indicate changes in ground-water storage that result from continual discharge to streams and periodic recharge from precipitation, especially during the nongrowing season. Climatic-effects and terrane-effects wells are constructed in these near-surface materials because the upper part of the ground-water system generally is most sensitive to these natural stresses. The 18 climatic- and terrane-effects wells in the natural-stress network during all or part of the 1988-90 period are shown in figure 5.

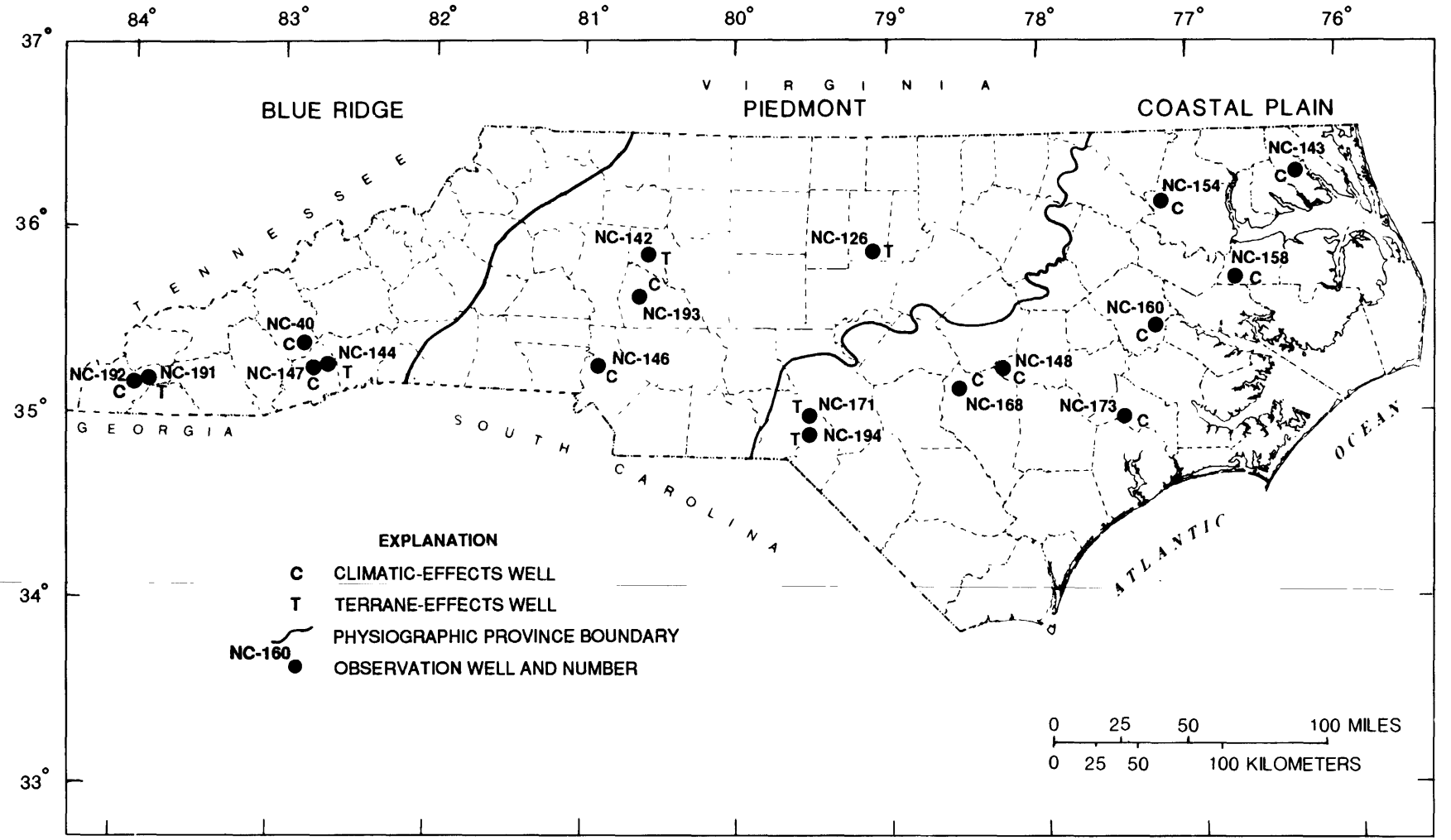


Figure 5.--Locations of climatic- and terrane-effects wells.

Precipitation was below normal throughout most of North Carolina in 1988 (fig. 6). It was driest in the Blue Ridge Province where precipitation was less than 60 percent of normal over large areas; precipitation was near normal in most of the Piedmont and Coastal Plain Provinces, but still was just above normal in only small areas of the southern Coastal Plain.

In contrast, 1989 was a wet year; precipitation was above normal everywhere in the State except a small area in the southern Coastal Plain. Precipitation exceeded 140 percent of normal in several places.

In 1990 precipitation was generally below normal in the Coastal Plain Province and above normal in the Piedmont and Blue Ridge Provinces. The southern Coastal Plain was driest with less than 80 percent of normal precipitation over significant areas; several scattered areas in the Piedmont and Blue Ridge Provinces were wettest with annual precipitation amounts exceeding 120 percent of normal.

The pattern of precipitation departures from normal over the 5-year period 1986-90 is shown in figure 7. Significant departures occurred in the Blue Ridge Province where precipitation was below normal during most of 1987, all of 1988, and early 1989. By May 1989, it was above normal and remained above normal until the spring of 1990. Precipitation was below normal throughout the summer of 1990, but it then increased to above normal for the rest of the year.

Precipitation departure patterns in the Piedmont Province were similar to those in the Blue Ridge, but the departures in 1989 and early 1990 were generally less than those in the Blue Ridge. Throughout the Coastal Plain, precipitation departures were not so much below normal in 1988 as in the other two provinces, nor were departures as much above normal in late 1990; they were, however, farther above normal in the northern Coastal Plain than in the rest of the State in early 1989.

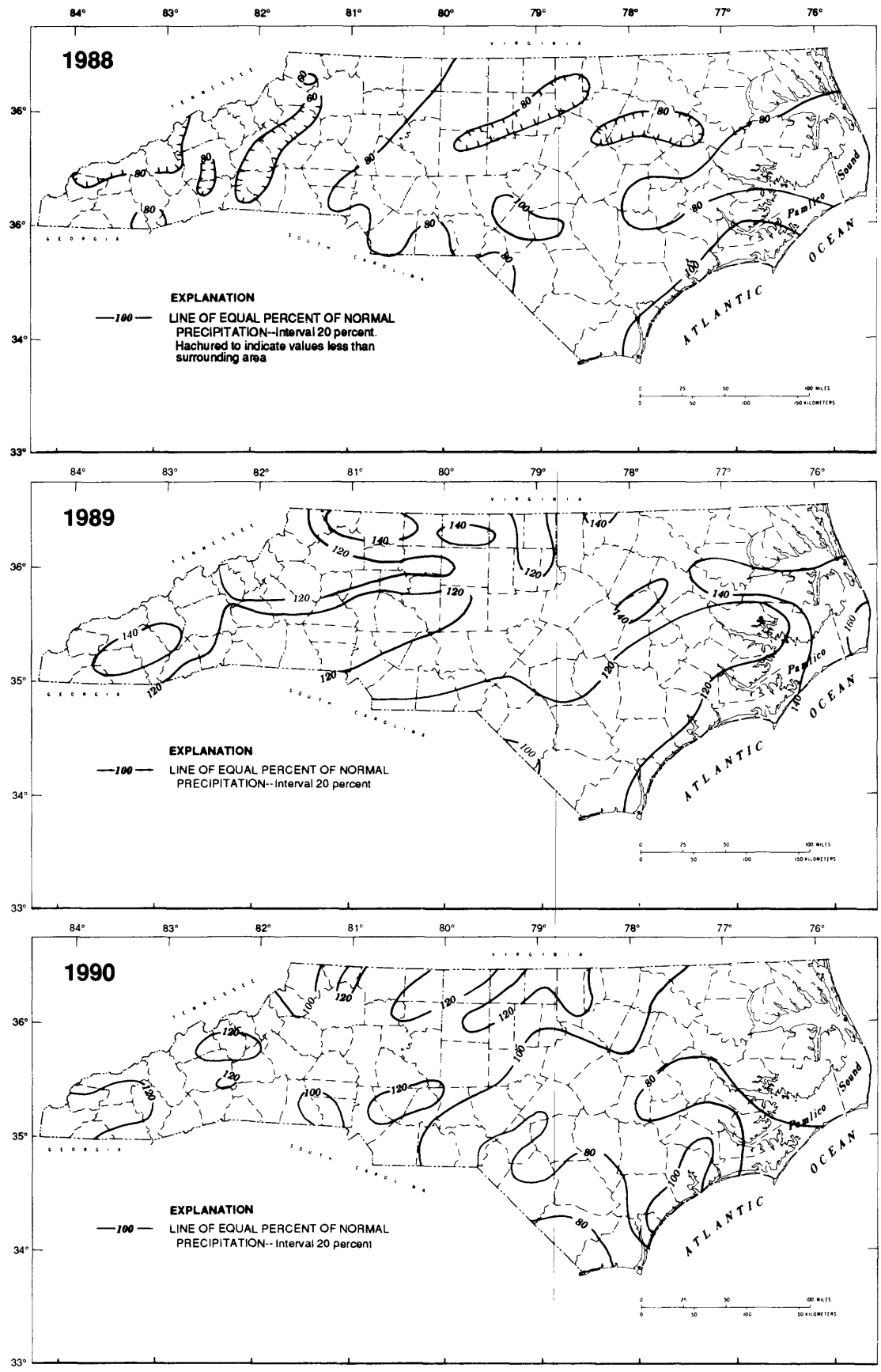


Figure 6.--Percent of normal precipitation in North Carolina, 1988, 1989, and 1990 (from National Oceanic and Atmospheric Administration, 1989, 1990, 1991).

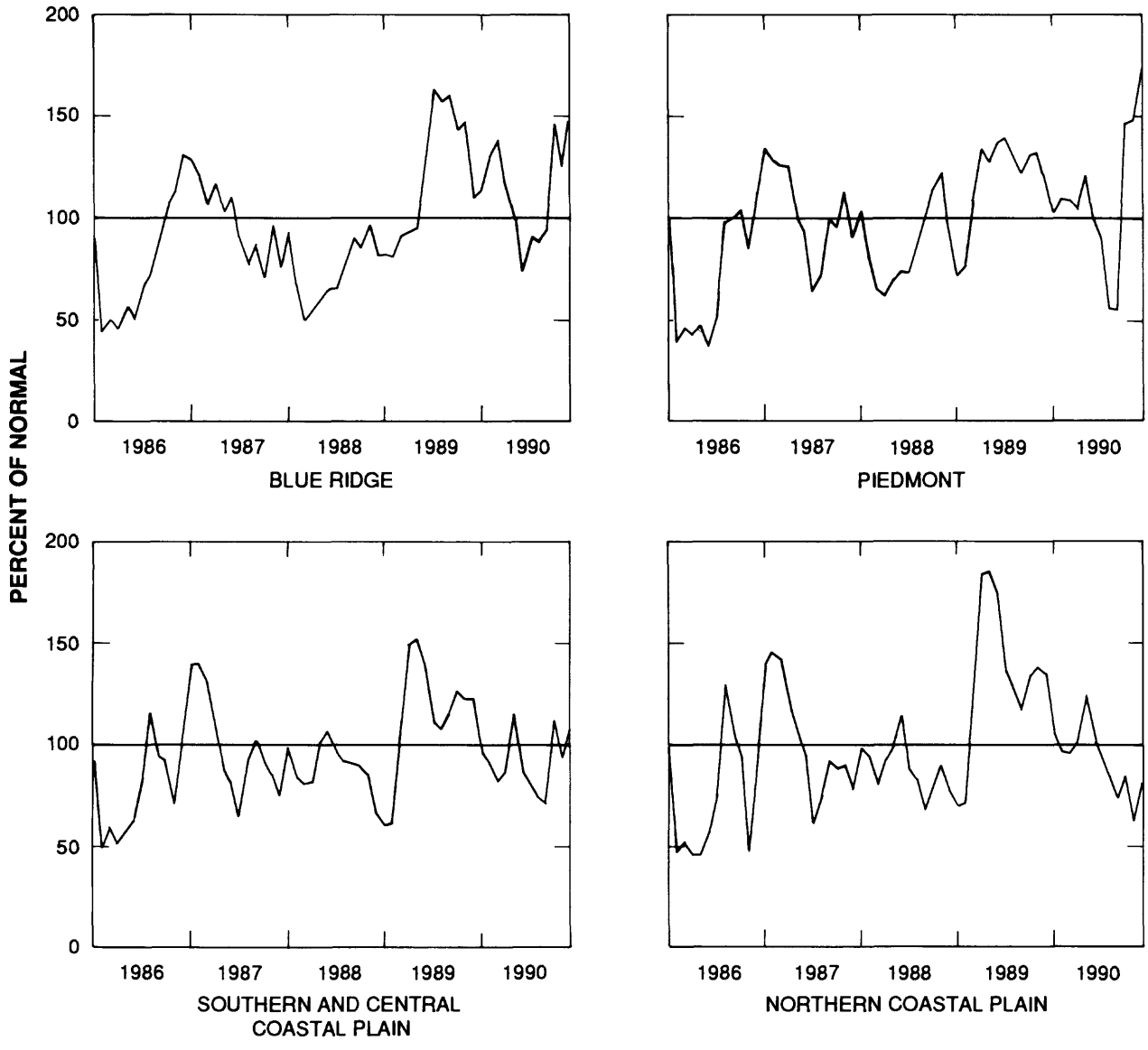


Figure 7.--Precipitation departures from normal (1951-1980) for 1986-1990 (from National Oceanic and Atmospheric Administration, 1991).

Three-year hydrographs for the climatic-effects wells generally show the seasonal pattern of high water levels in the winter and early spring and water-level decline once the growing season begins. This pattern was modified by periods of low and high precipitation as described in preceding paragraphs.

In late 1988 and early 1989, water levels in most natural-effects wells were lower than usual in the Blue Ridge and Piedmont. Data from nearly all climatic- and terrane-effects wells in these two provinces indicated fluctuations that followed the departure patterns of precipitation shown in figure 7. Blue Ridge and Piedmont climatic-effects wells showing this pattern are NC-40, NC-146, NC-147, NC-192, and NC-193 (figs. 8, 13, 14, 23, and 24). The latter two wells, however, have little more than a year of record for the reporting period. Hydrographs for the terrane-effects wells in these two provinces show the same general 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 in the terrane-effects wells, and considerable time is required for precipitation to infiltrate the thick unsaturated zone to the water table. Blue Ridge and Piedmont terrane-effects wells NC-126, NC-142, NC-144, and NC-191 (figs. 9, 10, 12, and 22) show fluctuations similar to, but delayed from, the precipitation departure patterns; water levels in all four wells were lowest in late 1988 and highest in early 1990. Terrane- and climatic-effects pairs NC-144 and NC-147 (figs. 12 and 14) and NC-191 and NC-192 (figs. 22 and 23) show the attenuation effect. Between September 1988 and January 1989, record lows were measured in two terrane-effects wells with long-term records (period of record longer than 5 years). Well NC-126 (fig. 9) went dry for the first time since 1940, and the water level in well NC-191 (fig. 22) dropped to a record low.

Water-level fluctuations in the climatic-effects wells in the Coastal Plain Province followed the expected pattern of rising and remaining high during the nongrowing season, which lasts generally from late fall and early winter to April when recharge exceeds discharge and ground-water storage increases. Water levels gradually decline as ground-water discharge to streams exceeds recharge during the growing season, which generally lasts from April to the first killing frost. Because water levels are near land surface and because most Coastal Plain soils are sandy, ground-water levels in the climatic-effects wells often rise in response to individual storms even during the growing season. Frequently occurring peaks are seen in the following wells: NC-143, NC-148, NC-154, NC-158, NC-160, NC-168, and NC-173 (figs. 11, 15-19, and 21). However, the general pattern of low water levels in 1988, high levels in 1989 and early 1990, and typical decline throughout

the 1990 growing season is common in all of those wells. The above-normal precipitation in the Coastal Plain throughout most of 1989 (fig. 7) is reflected in frequent recharge events during that year; water levels and, thus, ground-water storage remain high even during the growing season. Terrane-effects wells in the southwestern Coastal Plain, NC-171 and NC-194 (figs. 20 and 25), show a similar, but dampened and delayed, response to recharge events as compared to the climatic-effects wells.

Many of the wells in the natural-effects network had record high or low water levels during 1988-90. Of those wells with 5 years or more of record, climatic-effects wells NC-146 and NC-147 and terrane-effects wells NC-142, NC-144, and NC-191 had record high water levels sometime during the period October 1989 through April 1990. As discussed earlier, terrane-effects wells NC-126 and NC-191 had record low water levels in late 1988, and well NC-126 went dry from October 1988 through January 1989.

NC-40 NEAR CRUSO, HAYWOOD COUNTY

WELL-IDENTIFICATION NUMBER.--352315082484401.

LOCATION.--Lat 35°23'15", long 82°48'44", Hydrologic Unit 06010106, 2 miles 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 feet, diameter 12 inches, cased to 18.5 feet, open end, backfilled with gravel from 4 to 18.5 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 3,148.26 feet above National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 1.0 foot above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--December 1955 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.24 feet below land-surface datum, March 12, 1977; lowest, 6.90 feet below land-surface datum, October 7, 8, and 9, 1986.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	6.07	5.76	5.89	5.52	5.81	5.85	6.16	6.33	6.78	6.12	5.45	6.40
10	6.14	5.84	5.89	5.72	5.83	6.00	6.26	6.40	6.81	6.38	5.99	6.59
15	6.20	5.88	5.85	5.43	5.85	6.14	6.31	6.61	6.60	6.55	6.38	6.70
20	4.17	5.81	5.89	5.64	5.84	6.17	6.32	6.66	6.35	6.48	6.20	6.78
25	5.35	5.84	5.90	5.73	5.94	6.25	6.32	6.73	6.52	6.57	6.14	6.84
EOM	5.78	5.86	5.88	5.79	5.97	6.27	6.52	6.82	6.68	6.67	6.00	6.72

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	6.42	6.74	5.54	5.16	4.46	4.59	3.52	4.04	4.91	3.64	4.11	4.67
10	6.58	6.64	5.33	5.03	4.55	4.49	3.96	4.32	4.98	3.37	4.20	4.48
15	6.11	6.73	5.51	5.14	4.65	4.60	3.67	4.38	4.72	3.31	4.36	4.47
20	6.35	6.45	5.48	5.17	4.50	4.41	3.57	4.54	4.98	3.24	4.39	4.65
25	6.58	6.07	4.99	5.18	4.32	4.53	3.63	4.68	4.44	3.63	4.42	4.71
EOM	6.70	4.70	5.22	4.97	4.49	4.74	3.62	4.83	3.54	3.90	4.60	4.60

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	4.51	4.33	2.97	3.49	3.60	4.68	5.07	5.55	5.82	6.11	---	5.29
10	4.44	4.00	3.22	3.70	3.72	4.74	5.19	5.53	5.94	6.10	---	5.63
15	4.61	4.32	3.49	3.89	3.94	4.94	4.81	5.67	5.83	---	5.63	5.77
20	4.64	3.54	3.01	4.09	4.42	4.87	4.90	5.76	5.97	---	5.78	5.72
25	4.42	3.00	3.10	4.29	4.47	4.95	5.32	5.25	6.05	---	5.83	4.73
EOM	4.43	3.00	3.25	4.23	4.54	4.91	5.49	5.58	6.10	---	5.87	5.18

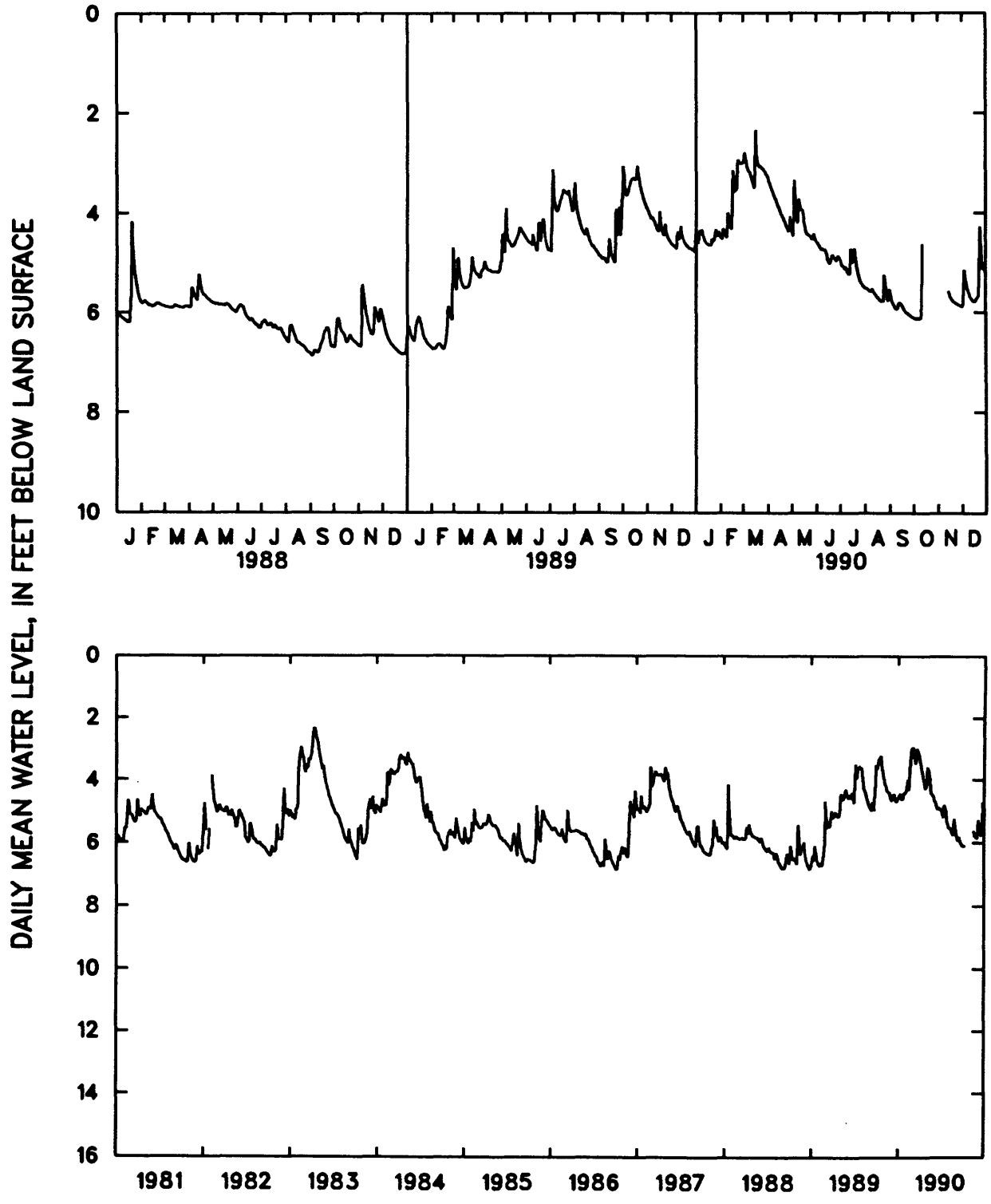


Figure 8.--Water level in observation well NC-40 (regolith), Haywood County.

NC-126 AT CHAPEL HILL, ORANGE COUNTY

WELL-IDENTIFICATION NUMBER.--355522079043001.

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 feet, diameter 36 inches, lined with rock; measur depth 46.2 feet, August 1986.

INSTRUMENTATION.--Measured periodically with steel tape.

DATUM.--Land-surface datum is 511.5 feet above National Geodetic Vertical Datum of 1929.
Measuring point: Top of shelf, 3.27 feet 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 feet below land-surface datum, May 14, 1984; lowest, dry, October 11 to December 31, 1940, October 13 and November 30, 1988, and January 24, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 8	45.77	JUNE 2	44.90	JULY 13	45.35	AUG 18	46.15	OCT 13	DRY	NOV 30	DRY
APR 21	45.09	JUNE 27	44.72								

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 24	DRY	JULY 19	41.91	AUG 16	42.07	SEPT 5	42.04	NOV 1	43.35

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 8	41.79	APR 5	40.52	JUNE 4	39.41	AUG 29	40.85	OCT 3	41.9	NOV 15	42.54
MAR 8	41.14	APR 23	40.16	JULY 20	39.90						

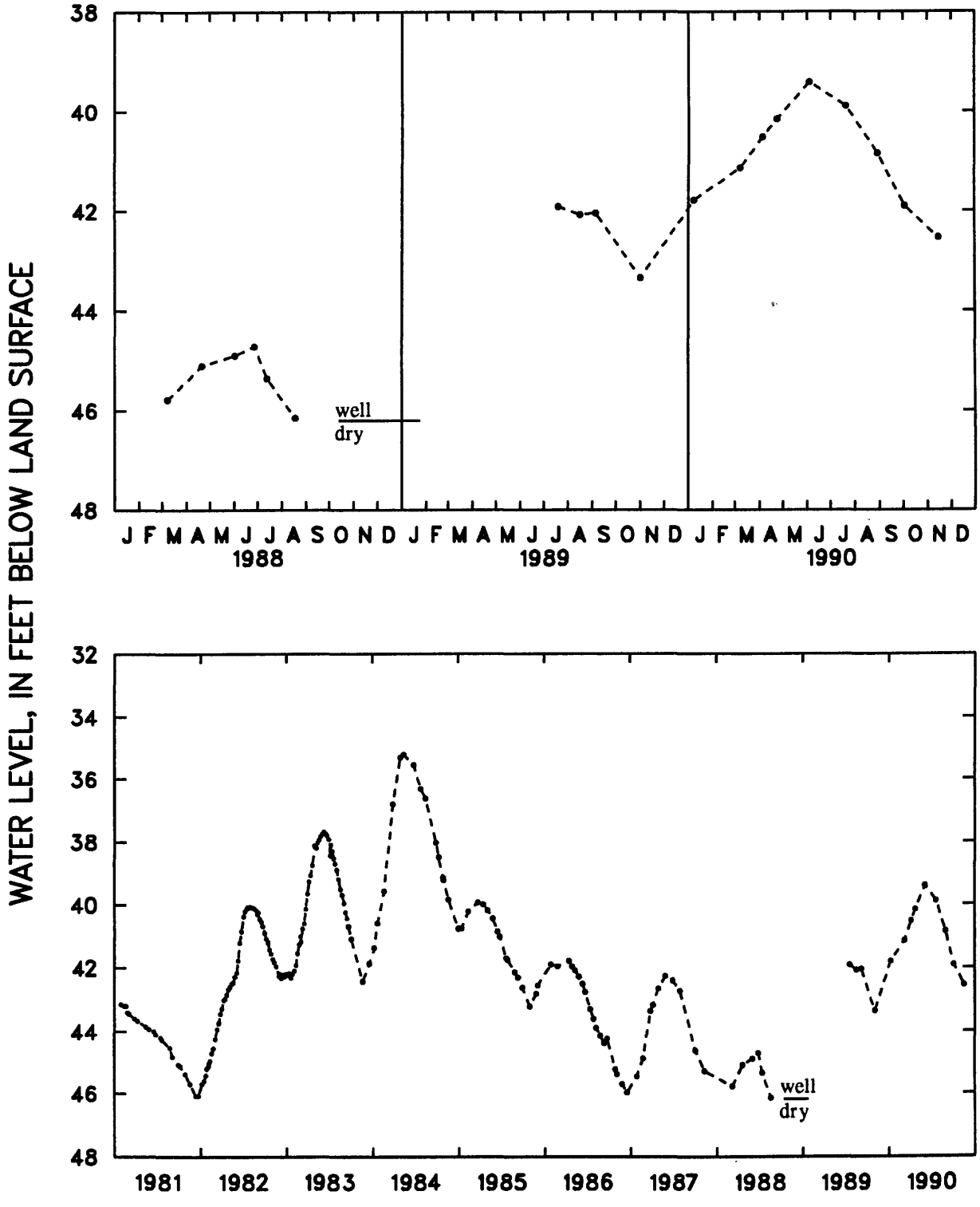


Figure 9.--Water level in observation well NC-126 (regolith), Orange County.

NC-142 NEAR MOCKSVILLE, DAVIE COUNTY

WELL-IDENTIFICATION NUMBER.--355359080331701.

LOCATION.--Lat 35°53'59", long 80°33'17", Hydrologic Unit 03040102, 0.5 mile 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 feet, diameter 6 inches, cased to 30.8 feet, open end, backfilled with gravel from 20 to 30.8 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 835 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of casing, 1.0 foot above land-surface datum.

REMARKS.--Terrane-effects well. In October 1982, well replaced nearby NC-110; EOM, end of the month.

PERIOD OF RECORD.--October 1981 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 13.46 feet below land-surface datum, February 23, 1990; lowest, 20.98 feet below land-surface datum, October 24, 25, and 26, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	18.19	17.42	17.76	17.61	17.91	18.24	19.05	19.76	19.12	17.79	18.24	18.18
10	18.07	17.33	17.73	17.64	17.99	18.35	19.17	19.82	18.72	17.70	18.39	18.25
15	18.01	17.31	17.83	17.66	18.08	18.46	19.28	19.72	18.61	17.86	18.52	18.35
20	17.73	17.39	17.81	17.69	17.79	18.59	19.43	19.86	18.37	18.03	18.53	18.50
25	17.50	17.58	17.81	17.74	17.86	18.64	19.53	19.56	18.32	18.14	18.65	18.60
EOM	17.54	17.63	17.60	17.85	18.08	18.84	19.66	19.45	18.29	18.33	18.19	18.65

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	18.33	18.32	16.58	15.96	15.78	16.46	16.18	16.51	17.26	16.17	16.33	16.42
10	18.34	18.35	16.19	15.88	15.56	16.33	16.24	16.70	17.33	16.28	16.42	16.37
15	18.04	18.44	16.30	15.80	15.68	16.36	16.42	16.67	17.46	16.43	16.50	15.67
20	17.98	18.19	16.40	15.98	15.88	16.38	16.49	16.86	17.55	15.97	16.44	15.68
25	18.07	17.49	15.78	16.11	16.11	15.95	16.59	17.01	17.48	15.97	16.39	15.75
EOM	18.16	16.98	15.72	16.24	16.36	15.99	16.64	17.12	17.18	16.13	16.39	15.82

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	15.71	14.59	13.90	14.59	14.32	13.90	15.35	16.41	17.14	17.81	15.70	15.95
10	15.27	14.27	14.07	14.59	14.25	14.18	15.60	16.45	17.28	17.89	15.67	15.95
15	15.28	14.23	14.28	14.55	14.43	14.44	15.71	16.55	17.31	16.64	15.55	16.05
20	15.34	13.85	14.38	14.53	14.60	14.70	15.84	16.71	17.45	16.69	15.63	16.17
25	15.02	13.76	14.49	14.63	14.74	14.95	16.05	16.85	17.58	15.83	15.72	15.96
EOM	14.84	13.67	14.49	14.73	13.59	15.14	16.22	17.00	17.71	15.64	16.00	15.62

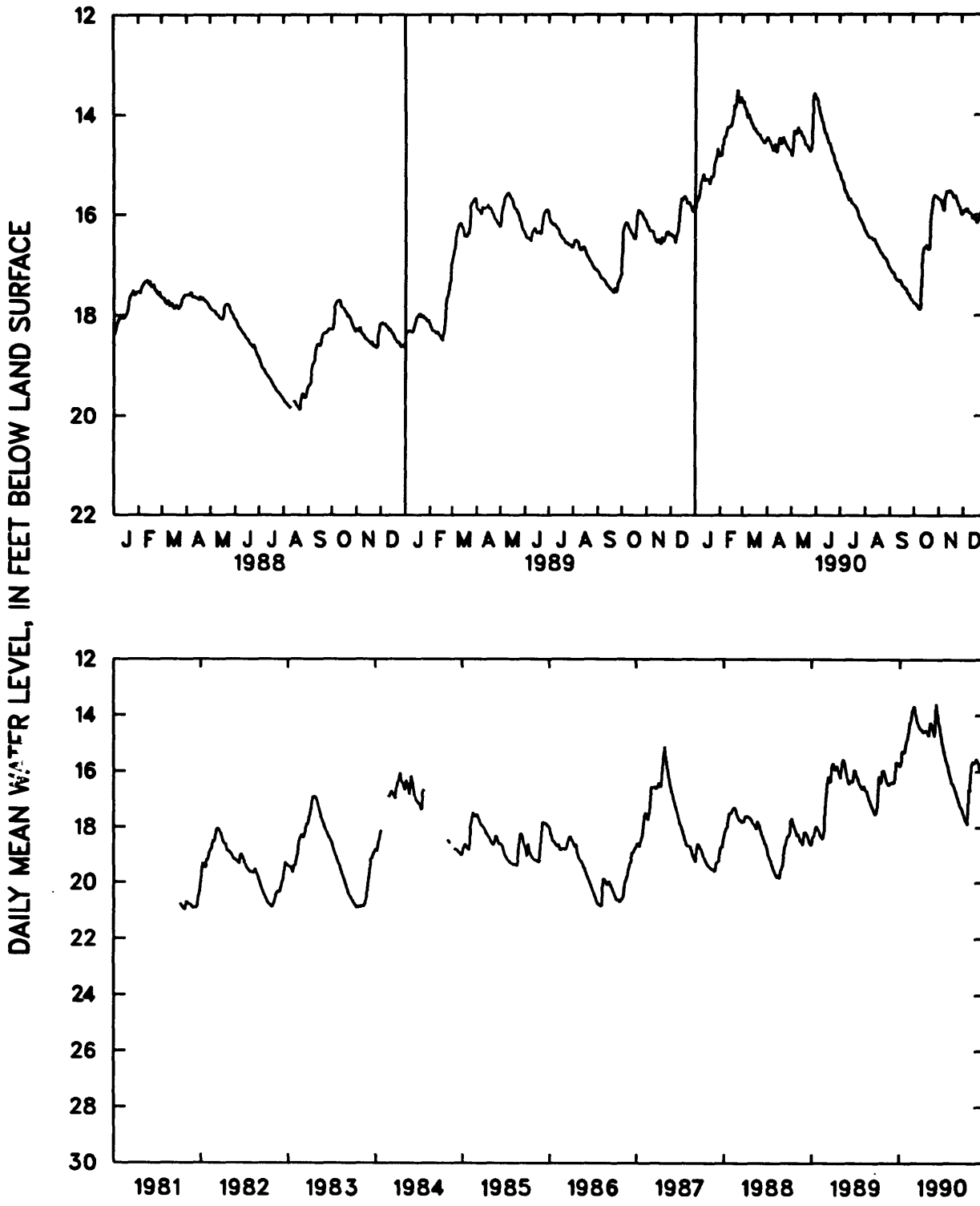


Figure 10.--Water level in observation well NC-142 (regolith), Davie County.

NC-143 NEAR ELIZABETH CITY, PASQUOTANK COUNTY

WELL-IDENTIFICATION NUMBER.--361828076163401.

LOCATION.--Lat 36°18'28", long 76°16'34", Hydrologic Unit 03010205, northwest of Elizabeth City, 1 mile 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 feet, diameter 3 inches, cased to 5 feet, screened interval from 5 to 10.2 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 13 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of casing, 2.35 feet above land-surface datum.

REMARKS.--Climatic-effects well. In May 1984, well replaced nearby NC-86; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--November 1981 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.01 foot below land-surface datum, January 22, 1987; lowest, 6.00 feet below land-surface datum, October 10, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	1.55	1.06	2.55	2.47	2.04	1.44	2.77	2.59	4.19	4.99	3.95	3.44
10	1.40	1.84	2.09	2.11	1.67	1.26	2.93	3.18	2.53	4.99	3.91	3.62
15	2.02	1.69	2.15	1.00	2.04	2.02	2.66	4.04	3.82	5.20	4.20	3.83
20	1.85	1.05	2.02	.80	.66	1.84	2.15	4.27	4.30	4.89	3.98	4.22
25	1.93	1.94	2.29	1.69	1.58	2.45	---	4.03	4.69	4.33	4.34	---
EOM	2.21	2.23	2.44	2.12	1.98	1.98	---	4.04	4.97	4.72	2.81	---

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	---	.57	1.50	1.23	2.57	1.90	2.93	2.89	1.39	---	1.83
10	---	---	.67	1.15	1.02	1.33	2.00	3.28	3.12	1.99	---	.44
15	---	2.48	.64	.86	1.60	1.98	1.94	.31	3.37	2.30	---	.96
20	---	.66	1.38	1.60	2.04	2.38	.97	.67	1.96	1.34	---	.96
25	---	.86	.46	1.91	2.17	2.32	1.98	1.80	2.43	---	---	1.66
EOM	---	.40	.68	1.43	2.71	1.55	2.57	2.42	1.63	---	---	1.19

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	1.11	1.63	1.25	1.53	1.61	1.79	3.76	4.75	---	5.01	4.23	4.27
10	.62	1.35	1.69	1.82	1.87	2.26	4.20	4.15	---	5.09	2.75	3.19
15	1.58	1.77	1.94	1.97	2.20	2.77	4.35	---	---	5.20	3.28	3.62
20	1.68	1.22	1.36	2.32	2.57	3.21	4.49	---	---	5.33	3.75	4.10
25	1.46	1.20	1.93	2.20	1.65	3.43	4.45	---	---	4.90	4.02	4.13
EOM	1.53	1.46	.97	2.32	1.20	3.66	4.42	---	4.94	3.89	4.35	3.96

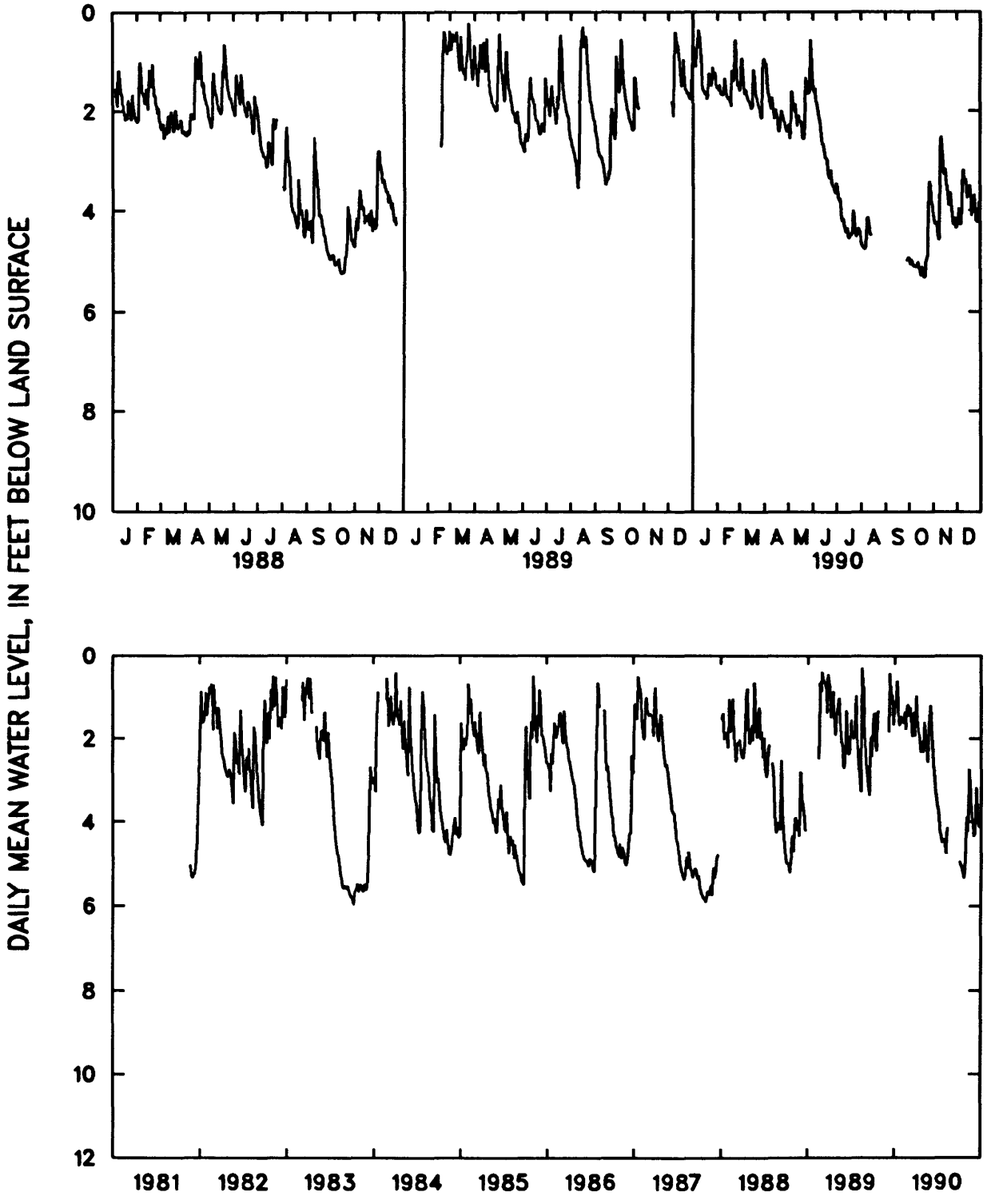


Figure 11.--Water level in observation well NC-143 (surficial aquifer), Pasquotank County.

NC-144 AT BLANTYRE, TRANSYLVANIA COUNTY

WELL-IDENTIFICATION NUMBER.--351808082374302.

LOCATION.--Lat 35°18'08", long 82°37'43", Hydrologic Unit 06010105, at Blantyre, 0.25 mile 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 feet, diameter 4 inches, cased to 58 feet, casing perforated from 15 to 58 feet, gravel filter pack from 5 to 58 feet, backfilled with gravel and saprolite from 58 to 70 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 2,147.11 feet above National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 1.3 feet above land-surface datum.

REMARKS.--Terrane-effects well. In September 1984, well replaced nearby NC-127; EOM, end of the month.

PERIOD OF RECORD.--October 1981 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 22.66 feet below land-surface datum, April 10, 1990; lowest, 37.95 feet below land-surface datum, December 23 and 24, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	30.36	29.19	28.99	29.78	30.04	31.06	32.33	33.75	34.93	35.75	36.08	36.48
10	30.22	29.07	28.90	29.89	30.13	31.27	32.52	33.98	35.09	35.75	36.17	36.43
15	30.12	28.76	29.20	29.94	30.27	31.38	32.77	34.16	35.25	35.86	36.29	36.45
20	29.51	28.71	29.41	30.03	30.48	31.59	33.02	34.33	35.37	35.94	36.27	36.45
25	29.48	28.89	29.45	30.00	30.62	31.81	33.25	34.56	35.50	36.05	36.39	36.41
EOM	29.39	28.89	29.66	30.07	30.85	32.00	33.50	34.77	35.65	36.06	36.43	36.35

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	36.32	34.95	33.90	32.13	30.76	30.12	29.16	27.21	28.18	28.96	27.69	27.46
10	36.18	34.90	33.69	31.92	30.63	30.16	28.87	27.31	28.36	28.82	27.64	27.39
15	35.92	34.67	33.39	31.54	30.53	30.02	28.47	27.25	28.61	28.45	27.48	27.28
20	35.74	34.52	33.10	31.37	30.42	29.80	27.98	27.42	28.94	28.17	27.51	27.32
25	35.53	34.45	32.75	31.13	30.33	29.67	27.69	27.57	29.17	27.98	27.60	27.18
EOM	35.19	34.16	32.39	30.98	30.25	29.53	27.35	27.87	29.11	27.60	27.58	26.93

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	26.96	26.39	24.62	22.78	23.91	25.71	27.68	29.56	30.87	31.91	31.93	31.48
10	26.87	25.78	24.16	22.81	24.15	25.97	28.04	29.79	31.06	31.96	31.78	31.49
15	26.92	25.90	23.82	22.92	24.59	26.24	28.38	30.03	31.15	32.10	31.74	31.56
20	26.66	25.58	23.39	23.35	24.70	26.63	28.66	30.29	31.36	32.23	31.61	31.79
25	26.44	25.56	23.16	23.53	25.08	27.10	29.01	30.50	31.57	32.09	31.50	31.76
EOM	26.56	25.00	22.75	23.74	25.50	27.34	29.30	30.74	31.70	32.17	31.51	31.74

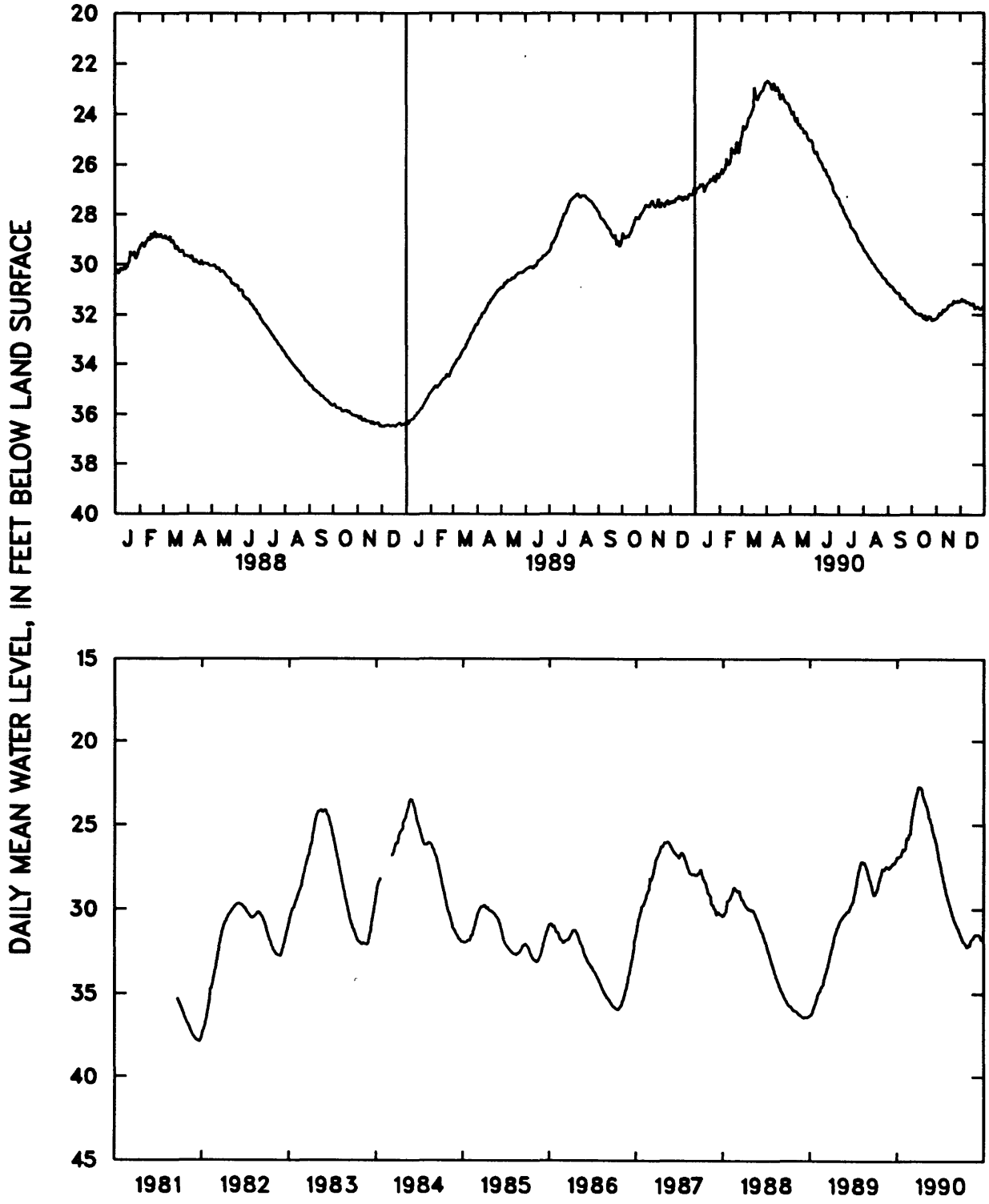


Figure 12.--Water level in observation well NC-144 (regolith), Transylvania County.

NC-146 NEAR HUNTERSVILLE, MECKLENBURG COUNTY

WELL-IDENTIFICATION NUMBER.--351730080524203.

LOCATION.--Lat 35°19'16", long 80°52'39", Hydrologic Unit 03050101, 6 miles 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 feet, diameter 4 inches, cased to 12.1 feet, screened interval from 12.1 to 17.1 feet, sand filter pack from 12.1 to 17.1 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 730 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of casing, 1.9 feet above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month.

PERIOD OF RECORD.--November 1984 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.40 feet below land-surface datum, February 16, 1990; lowest, 7.91 feet below land-surface datum, September 2 and 3, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	3.70	3.60	4.31	4.07	4.62	5.73	6.61	6.43	5.85	5.67	4.89	4.82
10	4.03	3.82	4.00	4.05	4.84	5.94	6.83	6.77	5.09	5.83	5.05	4.92
15	3.88	3.95	3.95	3.92	5.06	6.16	6.77	6.98	5.69	5.98	5.20	5.01
20	3.16	3.86	3.74	3.98	5.16	6.28	7.05	7.25	5.38	5.69	5.20	5.11
25	3.69	4.09	3.97	4.25	5.15	6.54	6.13	7.27	5.78	5.46	5.22	5.14
EOM	3.90	4.18	3.89	4.49	5.50	6.65	6.23	6.19	5.96	5.56	4.49	4.66

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	4.52	4.74	3.47	3.92	3.78	5.15	4.78	6.04	6.72	4.39	4.96	4.56
10	4.54	4.74	3.73	3.58	3.22	5.12	4.95	6.39	6.78	4.75	4.96	3.86
15	4.09	4.81	3.94	3.72	3.75	5.40	5.45	6.29	6.71	4.90	4.97	3.81
20	4.33	4.05	4.08	3.85	4.06	5.19	5.16	6.31	6.63	4.52	4.45	4.10
25	4.54	3.78	3.18	4.04	4.43	4.85	5.51	6.48	5.24	4.74	4.21	4.21
EOM	4.65	3.19	3.70	4.34	4.83	5.35	5.75	6.48	4.77	4.86	4.46	4.22

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	3.93	3.69	3.05	3.44	3.38	4.28	6.00	7.01	7.57	7.29	4.84	4.09
10	3.50	3.11	3.35	3.62	3.63	4.70	6.26	7.10	7.35	7.22	3.92	4.31
15	3.89	3.51	3.53	3.54	4.10	5.00	6.17	7.27	7.06	5.12	4.49	4.46
20	3.98	2.96	3.33	3.80	4.41	5.15	6.21	7.33	7.16	5.28	4.76	4.33
25	3.21	3.27	3.60	3.99	4.59	5.46	6.51	7.24	7.26	4.25	4.83	3.96
EOM	3.51	3.34	3.21	3.92	3.77	5.72	6.80	7.48	7.42	4.64	4.52	3.87

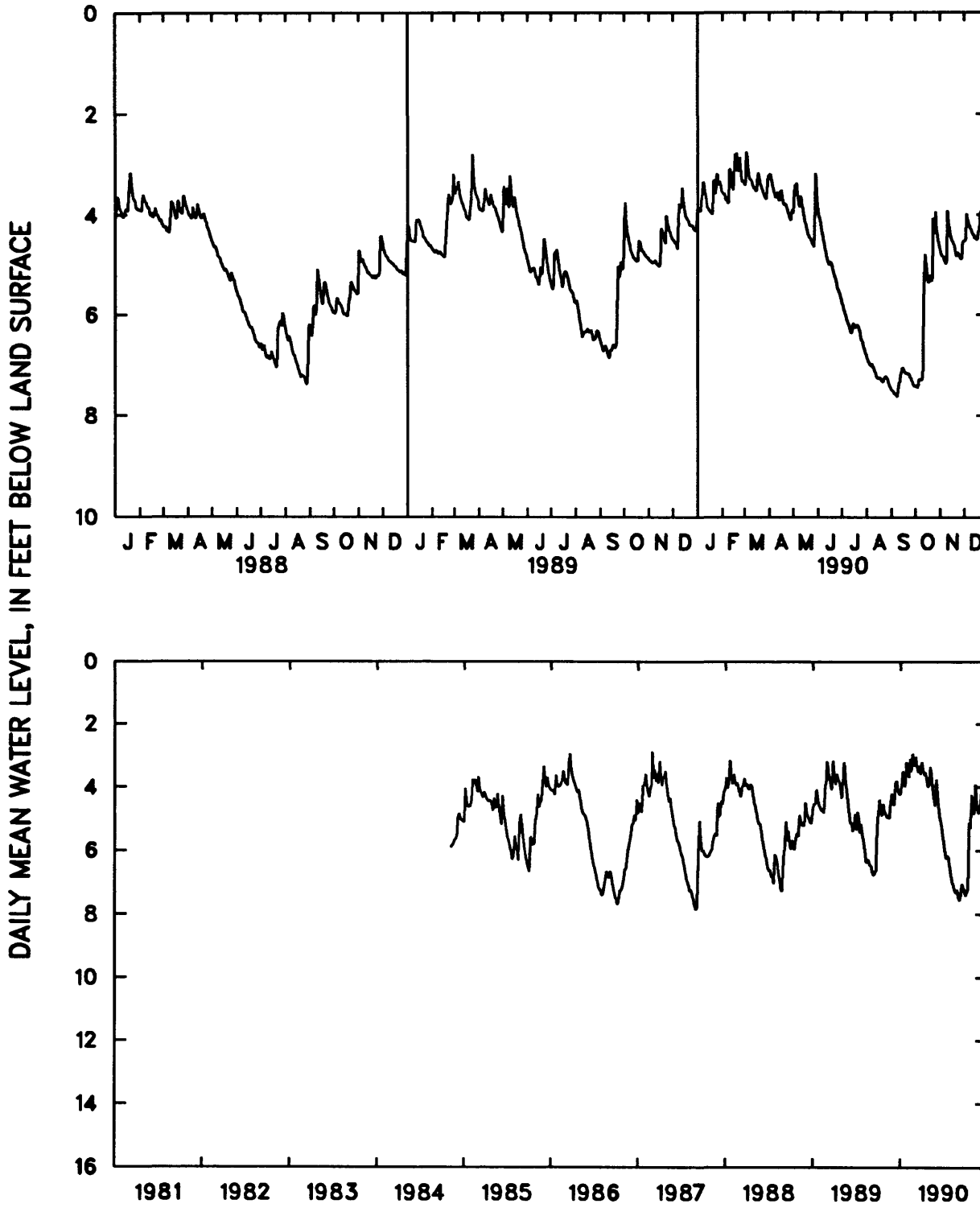


Figure 13.--Water level in observation well NC-146 (regolith), Mecklenburg County.

NC-147 NEAR BREVARD, TRANSYLVANIA COUNTY

WELL-IDENTIFICATION NUMBER.--351709082434101.

LOCATION.--Lat 35°17'09", long 82°43'41", Hydrologic Unit 06010105, 3.5 miles north of Brevard on U.S. Highway 276, 700 feet 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 feet, diameter 4 inches, cased to 11.6 feet, screened interval from 11.6 to 21.6 feet; measured depth 22.9 feet, June 1985.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 2,176.70 feet above National Geodetic Vertical Datum of 1929.
Measuring point: Top of casing, 2.24 feet above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month.

PERIOD OF RECORD.--June 1985 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.43 feet below land-surface datum, October 2, 1989; lowest, 17.66 feet below land-surface datum, October 8 and 9, 1986.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	14.46	13.52	14.23	14.03	14.52	15.88	16.56	16.94	17.13	16.95	17.09	16.04
10	14.61	13.63	14.32	14.05	14.76	16.05	16.71	16.95	17.00	16.87	16.97	16.29
15	14.71	13.80	14.27	13.49	14.96	16.22	16.75	17.06	17.04	16.99	16.96	16.45
20	11.99	13.73	14.31	13.85	15.14	16.38	16.82	17.18	16.93	17.07	16.90	16.56
25	12.71	13.94	14.48	14.06	15.34	16.51	16.73	17.22	17.06	17.09	16.53	16.61
EOM	13.46	14.07	14.53	14.32	15.66	16.61	16.79	17.29	17.23	17.12	15.92	16.42

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	15.41	16.00	13.71	14.16	13.43	14.35	7.91	11.15	12.88	9.10	12.47	12.06
10	15.56	16.02	13.15	13.57	12.79	12.96	9.43	11.98	13.03	10.87	12.48	11.87
15	14.77	16.07	14.02	13.78	13.25	13.09	10.58	12.30	12.58	11.62	12.61	11.51
20	14.99	15.74	14.43	14.02	13.54	9.97	11.23	12.13	12.96	11.28	11.00	12.03
25	15.47	14.59	13.59	14.23	13.77	9.12	11.12	12.58	12.79	11.83	11.21	12.31
EOM	15.81	14.07	13.86	14.35	14.22	10.45	11.81	12.38	11.00	12.21	11.77	12.55

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	12.20	11.49	9.94	11.12	11.43	13.37	15.29	15.67	15.34	16.39	14.67	15.19
10	11.68	11.22	10.61	11.57	11.88	13.73	15.52	15.75	15.68	16.30	14.65	15.18
15	12.25	11.24	10.99	11.78	12.32	14.07	15.33	15.62	15.69	14.50	14.42	15.34
20	12.49	8.65	8.60	12.13	12.74	14.38	15.29	15.82	15.95	13.83	14.75	15.36
25	12.19	9.25	10.00	12.39	12.99	14.74	15.35	15.82	16.13	13.27	15.02	13.43
EOM	11.75	9.96	10.71	12.40	13.11	14.93	15.61	15.54	16.30	14.24	15.21	13.93

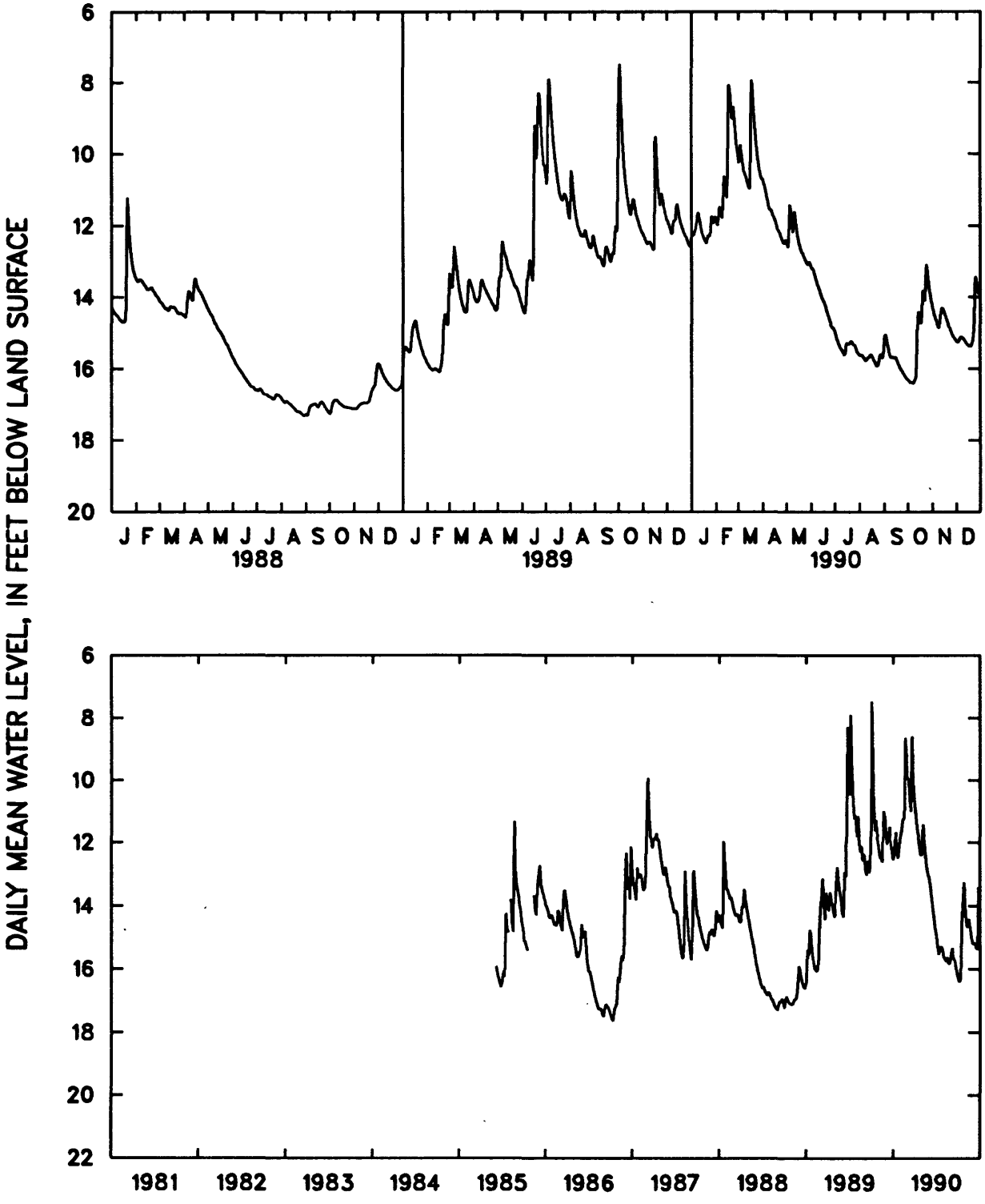


Figure 14.--Water level in observation well NC-147 (regolith), Transylvania County.

NC-148 NEAR GRANTHAM, WAYNE COUNTY

WELL-IDENTIFICATION NUMBER.--351849078163901.

LOCATION.--Lat 35°18'49", long 78°16'39", Hydrologic Unit 03020201, 6 miles west of Grantham, 0.5 mile south of Johnston County line on Secondary Road 1009.

OWNER.--U.S. Geological Survey.

AQUIFER.--Surficial aquifer of post-Miocene age.

WELL CHARACTERISTICS.--Bored observation well, augered to 10.4 feet, diameter 3 inches, cased to 5.4 feet, screened interval from 5.4 to 10.4 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 190 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: File cut on top of casing, 1.8 feet above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--February 1980 to current year. Records for June 17 to September 30, 1987, published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, are unreliable and should not be used.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.12 foot above land-surface datum, March 1, 1987; lowest, 8.40 feet below land-surface datum, September 19 and 20, 1983.

REVISED RECORD.--See PERIOD OF RECORD.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	5.82	1.86	2.14	1.68	2.19	1.87	3.06	3.43	.93	.85	---	1.52
10	4.84	1.86	1.92	1.91	1.83	.92	3.56	3.61	.64	1.56	---	1.60
15	4.44	1.38	1.25	1.56	2.43	1.82	3.96	3.98	1.61	1.98	---	1.65
20	3.40	1.55	.94	.80	.38	2.05	4.40	4.61	1.17	1.81	---	1.91
25	2.63	1.86	1.45	1.58	.55	2.65	2.59	3.86	1.49	---	---	1.99
EOM	2.35	1.98	1.32	2.09	1.46	2.75	2.99	2.35	1.95	---	1.19	1.90

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	1.74	.31	1.10	.50	---	2.67	2.05	3.74	2.11	---	1.86
10	---	1.70	.35	.37	.34	---	2.99	2.47	4.12	2.50	---	.66
15	.76	1.88	.43	.52	---	---	3.27	2.56	4.56	2.84	---	.65
20	1.14	1.22	.65	.64	---	---	1.07	2.25	4.39	2.17	---	1.03
25	1.42	.52	.21	1.16	---	---	1.02	2.82	4.40	2.45	1.31	1.23
EOM	1.58	.18	.88	.25	---	---	2.09	3.30	3.38	---	1.64	1.22

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	1.10	1.49	.98	.83	---	---	4.89	6.78	5.12	6.55	3.14	2.98
10	.54	1.62	1.38	1.33	---	---	5.35	6.81	5.48	6.79	3.00	2.65
15	1.14	1.82	1.69	1.67	---	---	5.66	6.35	5.56	5.83	2.65	2.69
20	1.38	1.07	.91	2.04	---	---	5.85	5.63	5.80	5.51	2.81	2.70
25	1.50	1.22	1.45	2.42	---	3.87	6.05	4.72	6.02	4.92	2.96	2.25
EOM	1.57	1.41	.36	---	---	4.35	6.51	4.73	6.28	2.90	2.97	2.08

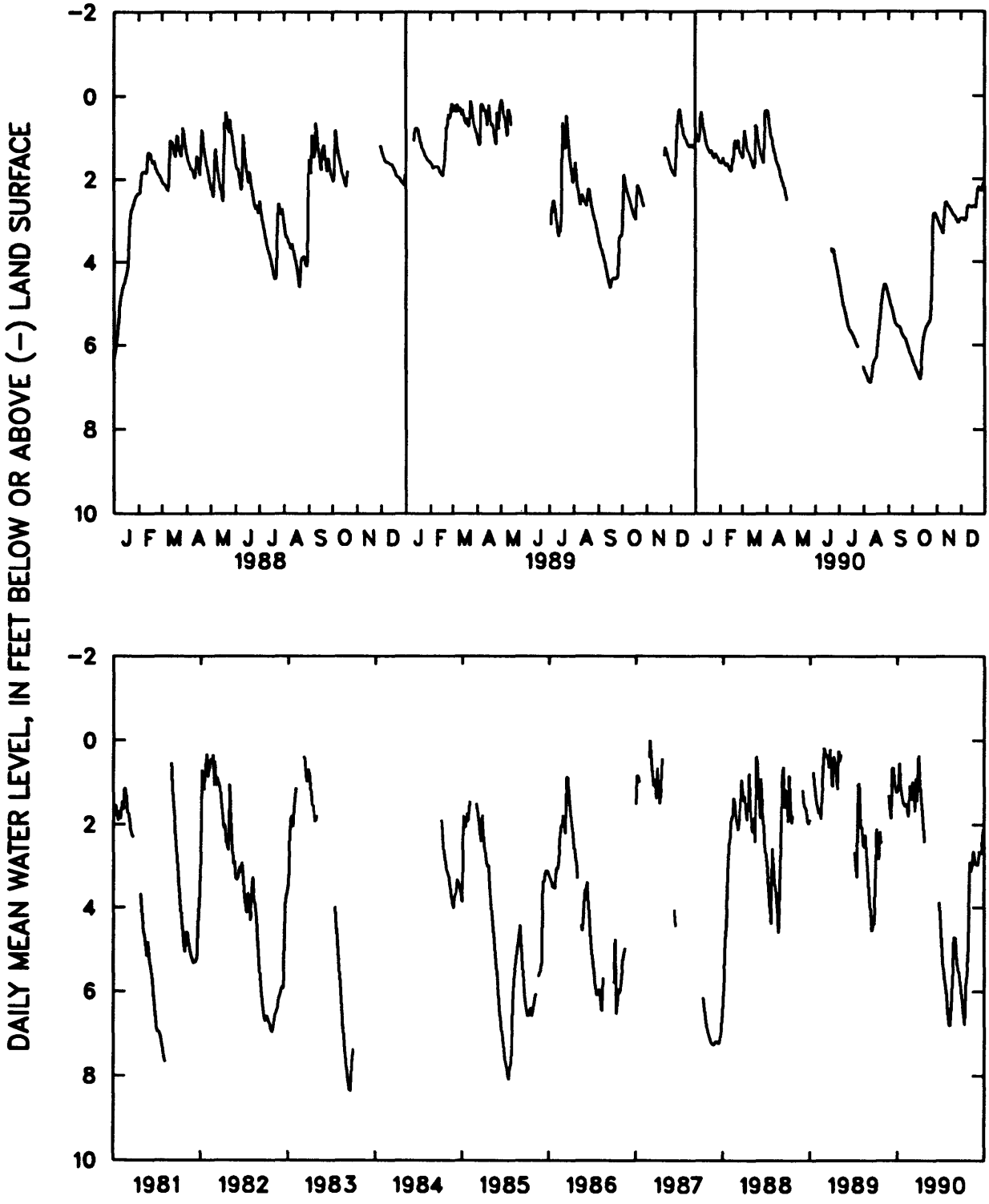


Figure 15.--Water level in observation well NC-148 (surficial aquifer), Wayne County.

NC-154 NEAR ROXOBEL, BERTIE COUNTY

WELL-IDENTIFICATION NUMBER.--361420077111407; DEHNR Roxobel Research Station well F22b7.

LOCATION.--Lat 36°14'20", long 77°11'14", Hydrologic Unit 03010203, 3.8 miles northeast of Roxobel on Secondary Road 1249.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Surficial aquifer of post-Miocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 12 feet, diameter 4 inches, cased to 7 feet, screened interval from 7 to 12 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 74 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 3.05 feet above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--November 1986 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.80 foot below land-surface datum, October 20, 1989; lowest, 9.31 feet below land-surface datum, September 5, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	1.77	1.37	2.30	2.22	---	3.73	3.57	5.47	6.79	6.40	---	---
10	1.84	1.64	2.29	---	---	3.99	4.25	6.00	6.79	6.37	---	---
15	1.92	1.43	2.44	---	---	4.23	4.78	6.39	6.43	6.92	---	---
20	1.54	1.41	2.24	---	---	2.14	5.42	6.75	6.58	7.16	---	5.85
25	1.60	2.07	2.66	---	3.15	2.81	4.79	6.29	6.86	6.03	---	5.87
EOM	1.81	2.40	2.30	---	3.77	2.39	4.83	6.56	7.20	6.57	---	5.94

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	3.76	3.14	1.04	1.82	1.40	3.98	3.67	3.85	4.53	1.37	1.69	2.12
10	2.15	1.62	1.07	1.16	1.40	2.59	3.29	4.42	---	2.78	1.54	1.10
15	1.66	2.00	1.09	1.43	1.81	2.72	3.55	4.50	---	3.40	1.87	1.04
20	2.02	1.36	1.22	1.71	2.54	3.55	1.72	1.87	---	.86	1.62	1.33
25	2.52	1.10	.98	2.46	2.50	1.39	2.87	2.94	---	1.93	1.26	1.74
EOM	2.88	.98	1.47	1.34	3.53	2.78	3.84	3.85	---	2.57	1.59	1.68

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	1.37	1.79	1.21	1.18	2.68	2.14	5.53	6.30	4.71	7.20	6.15	6.34
10	1.01	1.65	1.71	1.91	2.97	3.07	5.09	5.88	5.12	7.43	6.39	4.28
15	1.67	1.49	2.24	2.49	2.56	3.80	4.98	5.00	5.60	7.56	6.29	4.61
20	1.93	1.07	1.45	2.73	3.34	4.20	4.08	5.47	6.19	7.77	6.51	4.72
25	1.38	1.14	2.17	2.86	1.82	4.64	4.82	3.78	6.54	7.41	6.71	3.55
EOM	1.53	1.48	1.25	3.19	1.60	5.07	5.72	3.95	6.91	5.59	6.62	3.10

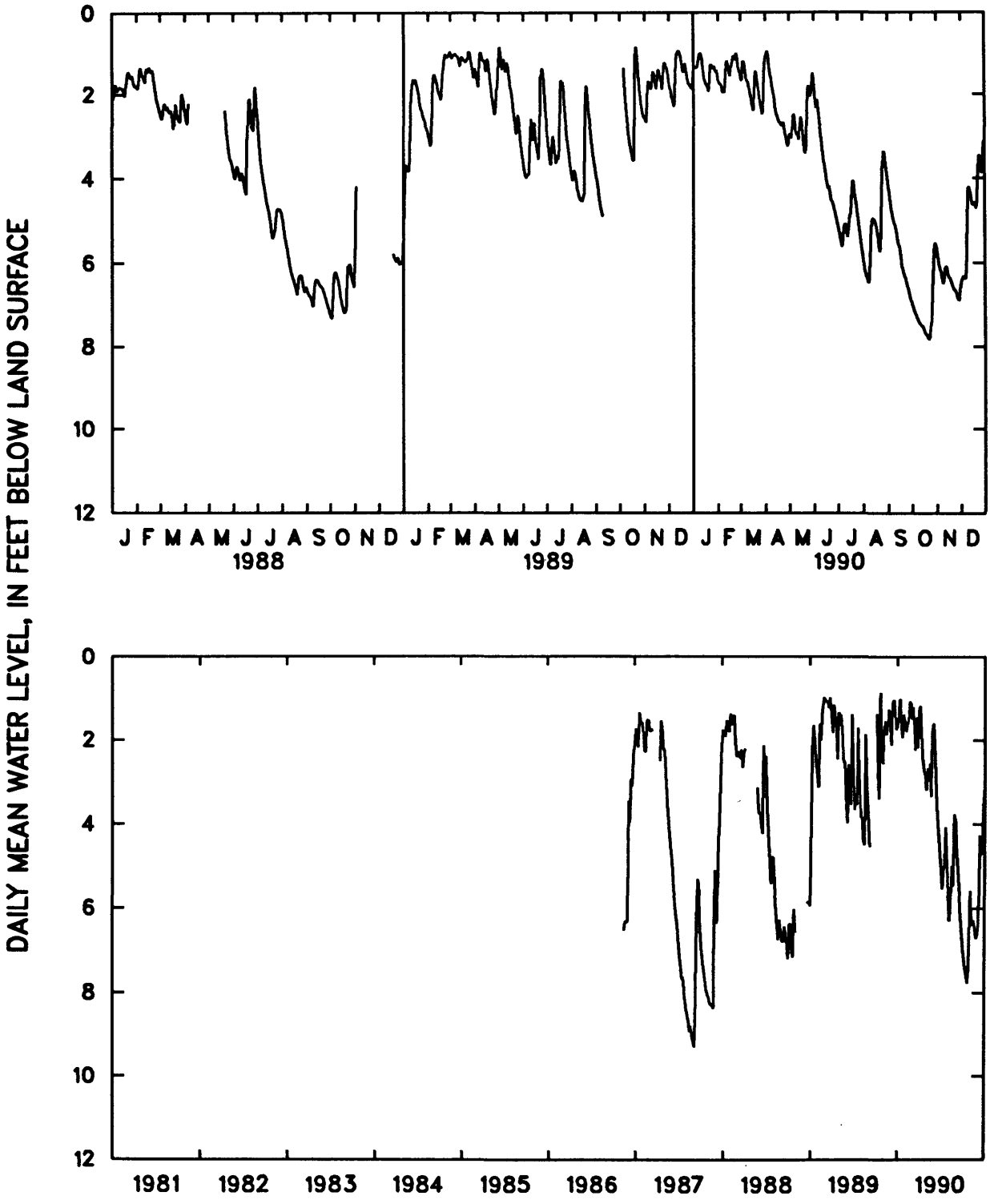


Figure 16.--Water level in observation well NC-154 (surficial aquifer), Bertie County.

NC-158 NEAR HOKE, WASHINGTON COUNTY

WELL-IDENTIFICATION NUMBER.--354418076463601.

LOCATION.--Lat 35°44'18", long 76°46'36", Hydrologic Unit 03020104, 2.4 miles west of N.C. Highway 32 on Secondary Road 1101.

OWNER.--U.S. Geological Survey.

AQUIFER.--Surficial aquifer of post-Miocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 15 feet, diameter 4 inches, cased to 10 feet, screened interval from 10 to 15 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 35 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 2.49 feet above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--December 1986 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.72 foot below land-surface datum, December 9 and 10, 1989; lowest, 5.60 feet below land-surface datum, October 18 and 19, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	1.14	1.18	1.63	1.47	1.68	2.21	3.34	4.61	5.53	5.38	5.48	4.28
10	1.08	1.39	1.59	1.50	1.81	2.40	3.71	4.75	5.34	5.37	5.43	4.31
15	1.28	1.37	1.36	1.01	1.84	2.65	3.98	4.96	5.09	5.51	5.42	4.34
20	1.30	1.21	1.29	.89	1.69	2.84	4.22	5.17	5.00	5.54	4.61	4.39
25	1.33	1.36	1.48	1.18	1.87	3.27	4.05	5.32	5.15	5.43	4.38	4.43
EOM	1.39	1.52	1.42	1.48	2.17	3.07	4.40	5.44	5.35	5.46	4.28	4.50

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	4.24	3.53	1.46	1.38	---	2.29	3.38	1.13	2.24	.97	1.10	1.19
10	3.98	3.14	1.30	1.15	---	1.97	2.02	1.27	2.62	1.15	.89	.74
15	3.33	3.22	1.22	1.17	1.10	2.43	1.34	.85	2.98	1.46	1.11	.91
20	3.24	2.40	1.31	1.03	1.12	2.85	1.00	1.14	1.81	1.05	1.25	1.03
25	3.29	2.06	.98	1.04	1.06	2.55	1.23	1.12	1.47	1.35	.99	1.01
EOM	3.40	1.72	1.38	1.15	1.79	3.01	1.54	1.66	1.30	1.40	1.01	1.06

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	.89	1.23	1.06	1.04	1.07	1.41	3.65	4.64	2.29	4.30	3.92	3.25
10	.95	1.34	1.22	1.17	1.32	2.12	3.99	3.90	2.75	4.53	3.69	2.72
15	1.09	1.49	1.42	1.16	1.39	2.65	4.14	3.69	3.08	4.57	2.99	2.77
20	1.21	1.31	1.07	1.39	1.91	2.76	4.18	2.43	3.45	4.73	3.09	2.86
25	1.26	1.08	1.27	1.54	1.29	2.82	4.43	2.12	3.77	4.54	3.21	2.85
EOM	1.16	1.19	.86	1.48	.96	3.29	4.33	1.75	4.06	3.82	3.24	2.94

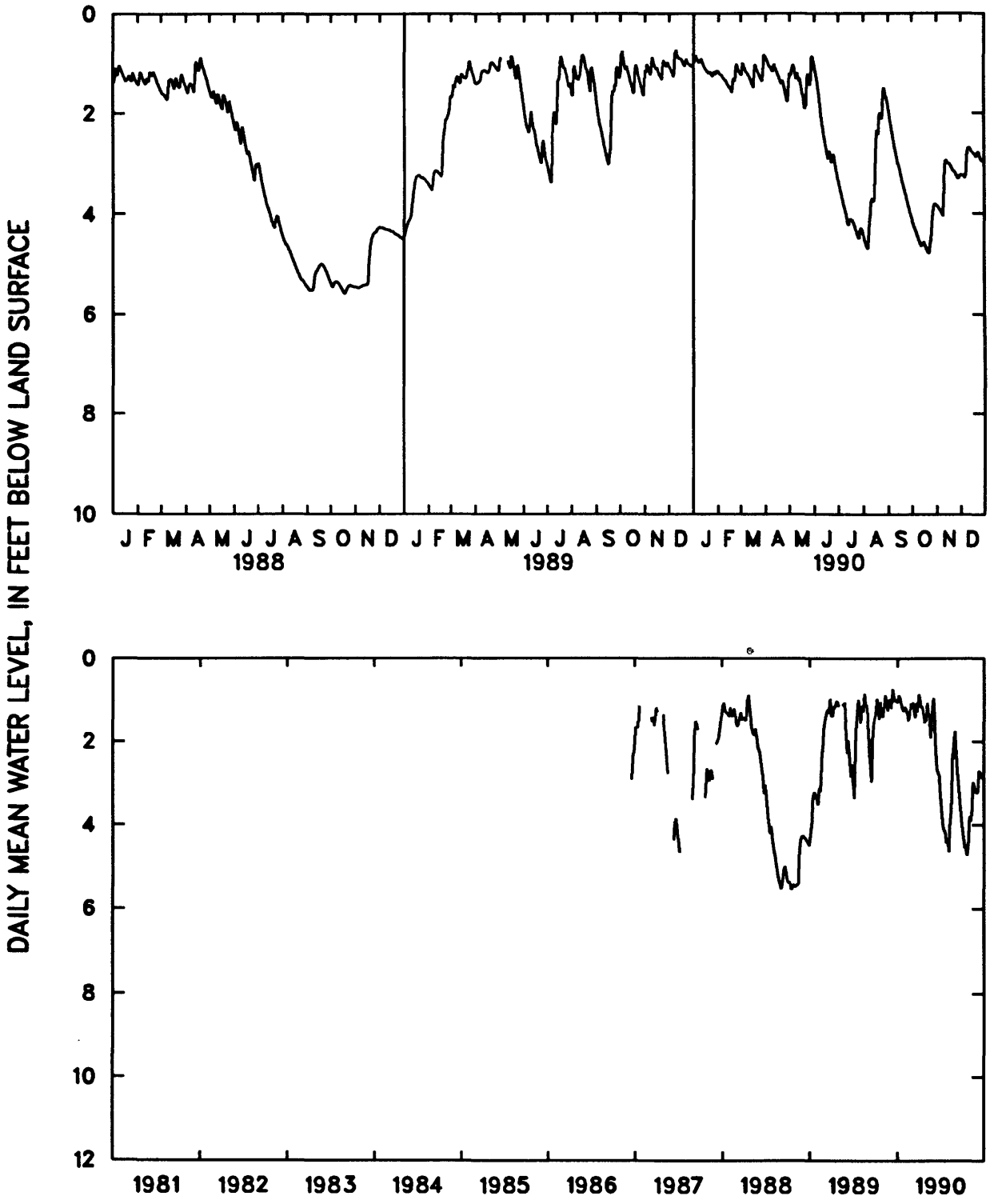


Figure 17.--Water level in observation well NC-158 (surficial aquifer), Washington County.

NC-160 NEAR SIMPSON, PITT COUNTY

WELL-IDENTIFICATION NUMBER.--353219077153801.

LOCATION.--Lat 35°32'19", long 77°15'38", Hydrologic Unit 03020103, 2.7 miles southeast 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 feet, diameter 6 inches, cased to 5.9 feet, screened interval from 5.9 to 10.9 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 56.27 feet above National Geodetic Vertical Datum of 1929 (levels by Soil Conservation Service). Measuring point: Top of instrument shelf, 3.72 feet above land surface datum (since August 1990).

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; EOM, end of the month; ---, missing record.

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, 1.05 feet. below land surface datum September 14, 1984; lowest, 8.84 feet below land surface datum, November 6, 7, and 8, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	2.97	2.79	3.95	3.95	3.69	---	4.99	6.50	6.83	3.74	5.56	5.60
10	2.52	3.24	3.82	4.33	3.90	---	5.53	6.09	5.16	4.34	5.70	5.70
15	2.74	3.31	3.43	2.83	4.30	---	6.04	7.01	5.92	5.03	5.86	5.93
20	2.52	3.04	3.28	2.27	3.66	---	6.46	7.43	6.52	5.06	5.06	6.15
25	2.79	3.44	3.64	3.06	3.94	---	5.66	7.34	5.13	5.34	5.34	6.18
EOM	3.12	3.70	3.59	3.61	---	---	6.23	6.89	5.92	5.69	5.29	6.32

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	6.31	5.58	2.26	2.84	2.60	4.32	4.66	4.69	4.98	2.82	3.86	4.00
10	5.92	5.77	2.22	2.51	2.29	4.30	5.06	4.97	5.53	3.26	3.86	2.07
15	5.04	5.82	2.28	2.10	2.80	4.64	3.76	5.19	5.92	3.68	4.07	2.62
20	5.11	3.54	2.58	2.75	3.21	4.35	2.75	5.66	5.06	3.79	4.33	2.67
25	5.36	2.67	1.97	3.24	2.88	3.46	3.43	3.55	4.87	4.13	3.71	3.06
EOM	5.46	2.01	2.21	1.84	3.79	4.15	4.17	4.47	3.53	4.28	3.61	2.52

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	2.58	2.52	3.13	2.97	3.39	3.41	6.23	7.78	5.21	7.29	5.05	5.07
10	2.28	2.97	3.48	3.36	3.84	4.16	6.15	5.05	5.72	7.66	3.68	4.82
15	2.90	3.34	3.83	3.56	4.40	4.67	6.49	5.79	5.75	7.80	3.68	5.08
20	3.06	3.11	3.31	4.06	4.88	5.11	6.90	4.23	6.24	7.95	4.12	5.27
25	3.23	3.08	3.82	4.44	4.44	5.16	7.28	3.98	6.74	5.72	4.48	5.14
EOM	2.65	3.26	2.43	4.31	2.61	5.72	7.52	4.72	7.04	4.62	4.74	5.04

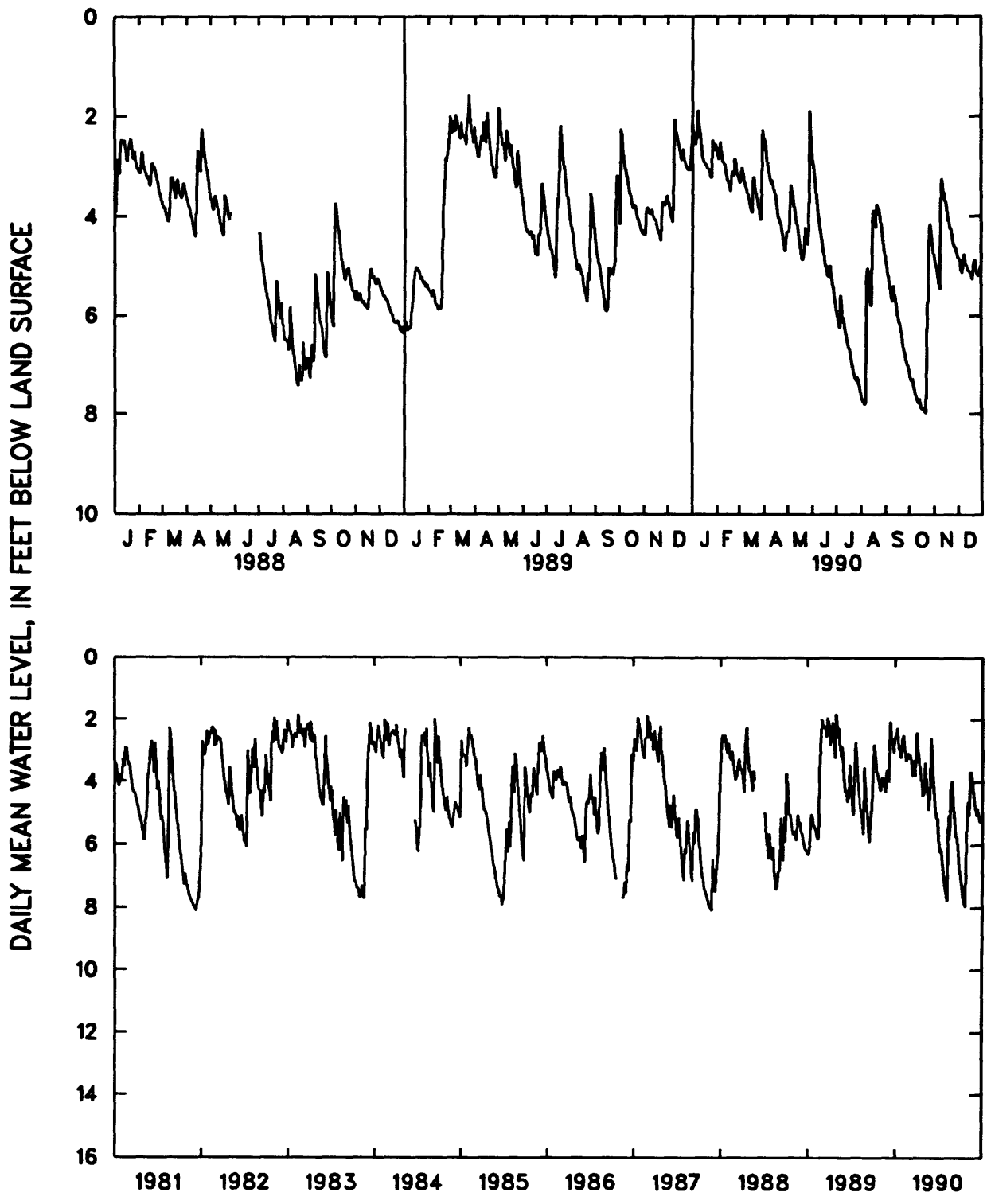


Figure 18.--Water level in observation well NC-160 (surficial aquifer), Pitt County.

NC-168 AT MINGO, SAMPSON COUNTY

WELL-IDENTIFICATION NUMBER.--351121078340411; DEHNR 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.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Surficial aquifer of post-Miocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 20 feet, diameter 4 inches, cased to 5 feet, screened interval from 5 to 20 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 192 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 2.79 feet above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--December 1986 to January 1990 (discontinued).

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.40 feet below land-surface datum, May 11 and 12, 1989; lowest, 17.94 feet below land-surface datum, December 24 and 25, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	17.01	8.03	7.64	7.42	8.17	7.67	8.47	6.76	7.73	6.44	7.62	7.84
10	9.32	7.70	7.74	7.58	8.36	7.77	8.67	7.00	6.31	6.60	7.68	7.90
15	9.26	7.55	7.72	7.75	8.61	7.97	8.84	7.24	6.11	6.83	7.64	8.00
20	9.25	7.38	7.45	7.94	8.82	8.12	8.94	7.52	6.18	7.03	7.66	8.17
25	8.11	7.38	7.39	8.04	8.35	8.24	7.63	7.75	6.10	7.24	7.72	8.32
EOM	8.02	7.43	7.38	8.09	7.83	8.31	6.62	8.03	6.26	7.51	7.74	8.53

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	8.72	8.43	7.38	5.03	3.54	4.63	5.16	3.89	4.59	4.41	4.65	5.26
10	8.73	8.66	6.22	4.39	3.54	4.80	5.34	4.18	4.81	4.57	4.79	4.87
15	8.50	8.85	5.90	4.12	3.61	4.65	5.15	4.07	5.04	4.76	4.87	4.61
20	8.23	9.01	5.93	3.77	3.89	4.62	3.93	3.82	5.22	4.42	5.00	4.73
25	8.18	9.15	5.12	3.83	4.11	4.74	4.16	4.08	5.45	4.49	5.10	4.90
EOM	8.21	8.69	4.91	4.01	4.40	4.98	4.42	4.36	5.53	4.68	5.16	5.01

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	5.09	---	---	---	---	---	---	---	---	---	---	---
10	4.79	---	---	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---	---	---	---
EOM	---	---	---	---	---	---	---	---	---	---	---	---

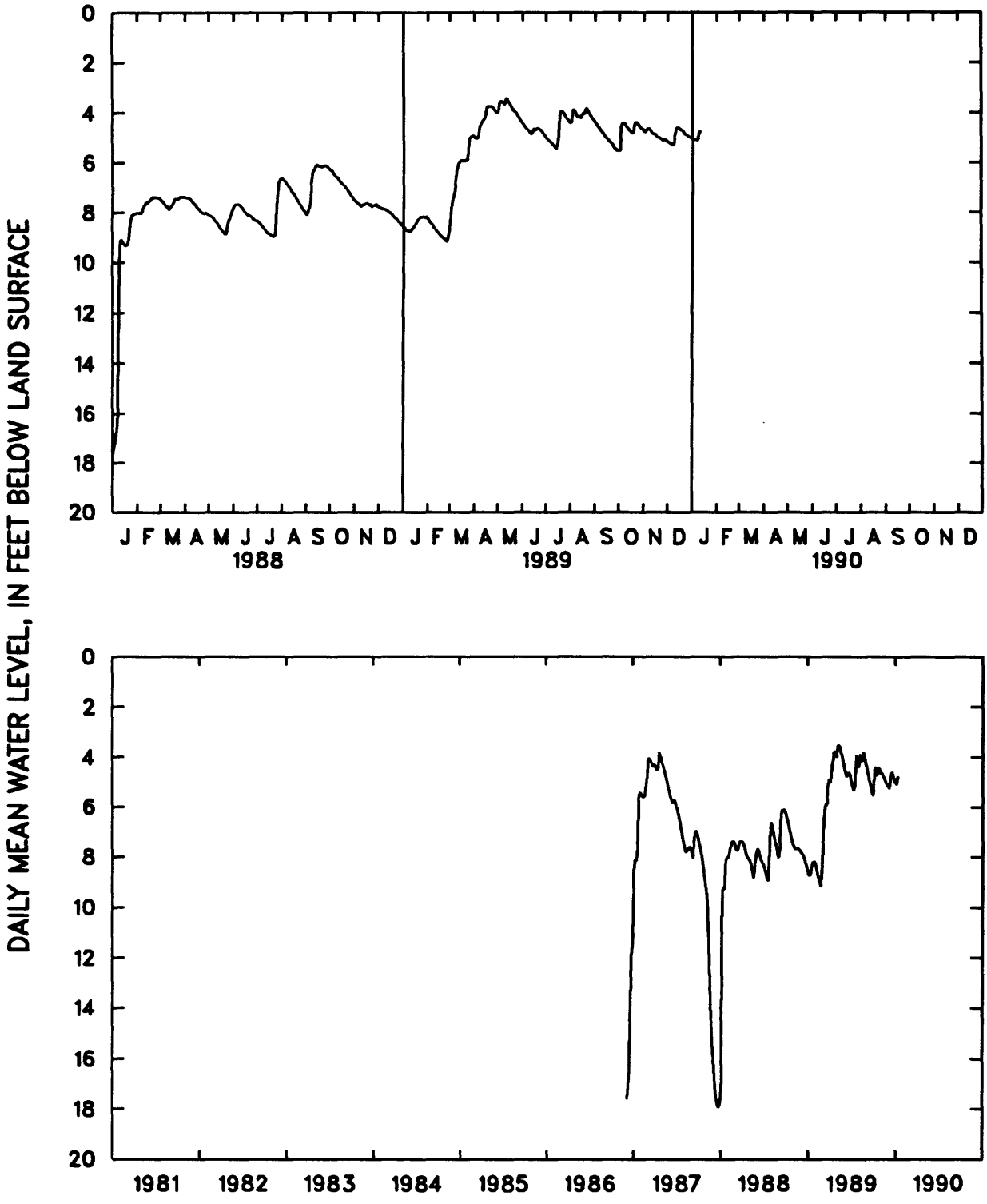


Figure 19.--Water level in observation well NC-168 (surficial aquifer), Sampson County.

NC-171 NEAR HOFFMAN, RICHMOND COUNTY

WELL-IDENTIFICATION NUMBER.--350122079325006; DEHNR Hoffman Research Station well T50r6.

LOCATION.--Lat 35°01'22", long 79°32'50", Hydrologic Unit 03040203, 0.6 mile south of Hoffman on Secondary Road 1474.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Unconfined surficial sands.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 60 feet, diameter 4 inches, cased to 45 feet, screened interval from 45 to 60 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, January 1987 to November 1988; measured periodically with steel tape since November 1988.

DATUM.--Land-surface datum is 413 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of collar on casing, 1.8 feet above land-surface datum (since January 1989).

REMARKS.--Terrane-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--January 1987 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 38.55 feet below land-surface datum, April 8, 9, and 10, 1987; lowest, 45.00 feet below land-surface datum, January 24, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	44.10	44.32	43.96	43.55	43.28	43.38	43.76	44.21	44.65	44.92	---	---
10	44.15	44.31	43.92	43.48	43.27	43.42	43.83	44.26	44.71	44.92	---	---
15	44.21	44.24	43.84	43.42	43.27	43.52	43.91	44.33	44.76	44.94	---	---
20	44.24	44.17	43.78	43.36	43.27	43.57	43.99	44.45	44.80	44.93	---	---
25	44.28	44.11	43.73	43.33	43.29	43.63	44.06	44.52	44.84	44.92	---	---
EOM	44.33	44.04	43.63	43.31	43.35	43.68	44.14	44.59	44.89	44.93	---	---

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 24	45.00	MAR 10	44.95	APR 27	42.63	JULY 6	40.14	SEPT 21	40.73	NOV 15	41.96

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 17	42.54	MAR 21	42.33	MAY 16	42.03	SEPT 5	43.74	NOV 6	44.31	DEC 13	43.41

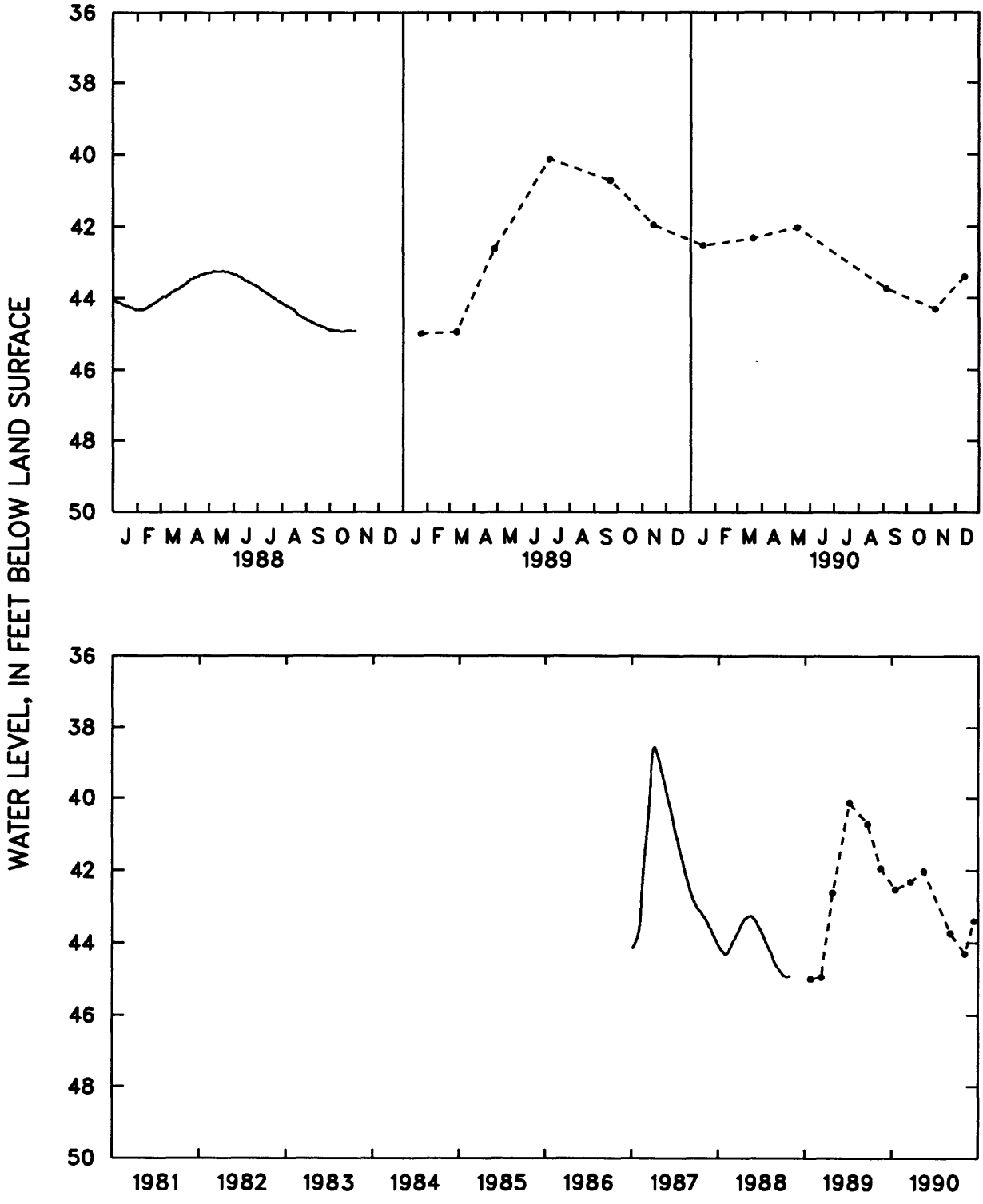


Figure 20.--Water level in observation well NC-171 (surficial aquifer), Richmond County.

NC-173 NEAR COMFORT, JONES COUNTY

WELL-IDENTIFICATION NUMBER.--345809077301408; DEHNR Comfort Research Station well U26j8.

LOCATION.--Lat 34°58'09", long 77°30'14", Hydrologic Unit 03020204, 2.5 miles south of Comfort at North Carolina Division of Forest Resources Fire Tower on Secondary Road 1003.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Surficial aquifer of post-Miocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 15 feet, diameter 4 inches, cased to 5 feet, screened interval from 5 to 15 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 68 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of collar on casing, 2.35 feet above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month.

PERIOD OF RECORD.--January 1987 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.40 foot below land-surface datum, March 1, 1987; lowest, 9.72 feet below land-surface datum, November 27 and 28, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	4.98	3.63	4.49	4.28	4.73	5.93	8.35	4.61	6.69	7.49	8.17	7.75
10	3.69	3.90	4.45	4.69	3.90	6.31	8.46	5.10	6.16	7.64	8.47	7.60
15	3.32	3.96	3.83	2.66	4.32	6.10	8.10	5.54	6.52	8.09	8.50	7.61
20	3.25	3.98	3.55	2.95	4.51	6.94	8.13	6.58	6.73	8.23	8.37	7.73
25	3.31	3.90	3.58	3.71	4.93	7.74	5.63	6.58	7.20	8.39	8.47	7.72
EOM	3.46	4.16	3.87	4.40	5.38	7.76	5.86	6.78	7.37	8.50	8.01	7.63

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	7.03	5.92	3.75	2.81	2.48	5.07	5.69	6.99	5.61	3.05	5.78	6.15
10	6.66	5.81	2.86	2.16	2.71	2.80	6.06	7.02	6.16	3.78	5.92	2.26
15	6.16	6.08	3.17	1.99	3.05	4.06	6.58	6.23	6.47	4.43	6.06	2.72
20	5.76	5.32	2.65	2.00	3.47	3.83	5.63	5.33	6.21	4.85	6.20	2.93
25	5.85	4.27	1.12	2.73	3.97	4.19	5.97	5.82	4.66	5.35	6.19	3.14
EOM	5.83	4.05	2.17	2.02	4.99	5.14	6.70	6.20	3.58	5.69	6.11	2.37

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	2.63	3.86	3.51	2.26	4.96	5.00	8.89	9.33	6.84	8.99	6.98	6.39
10	2.27	3.98	3.93	3.06	5.48	5.94	8.87	9.15	7.40	9.08	6.37	6.22
15	3.03	4.38	4.40	3.56	5.68	6.76	9.07	9.23	7.76	9.18	5.67	6.16
20	3.45	4.29	3.76	4.16	6.15	7.60	9.12	9.02	8.40	9.30	5.86	6.33
25	3.77	3.37	4.23	4.86	5.05	8.23	9.23	6.46	8.65	9.10	6.12	6.15
EOM	3.74	3.46	1.73	5.35	4.12	8.58	9.27	6.41	8.83	7.33	6.28	5.91

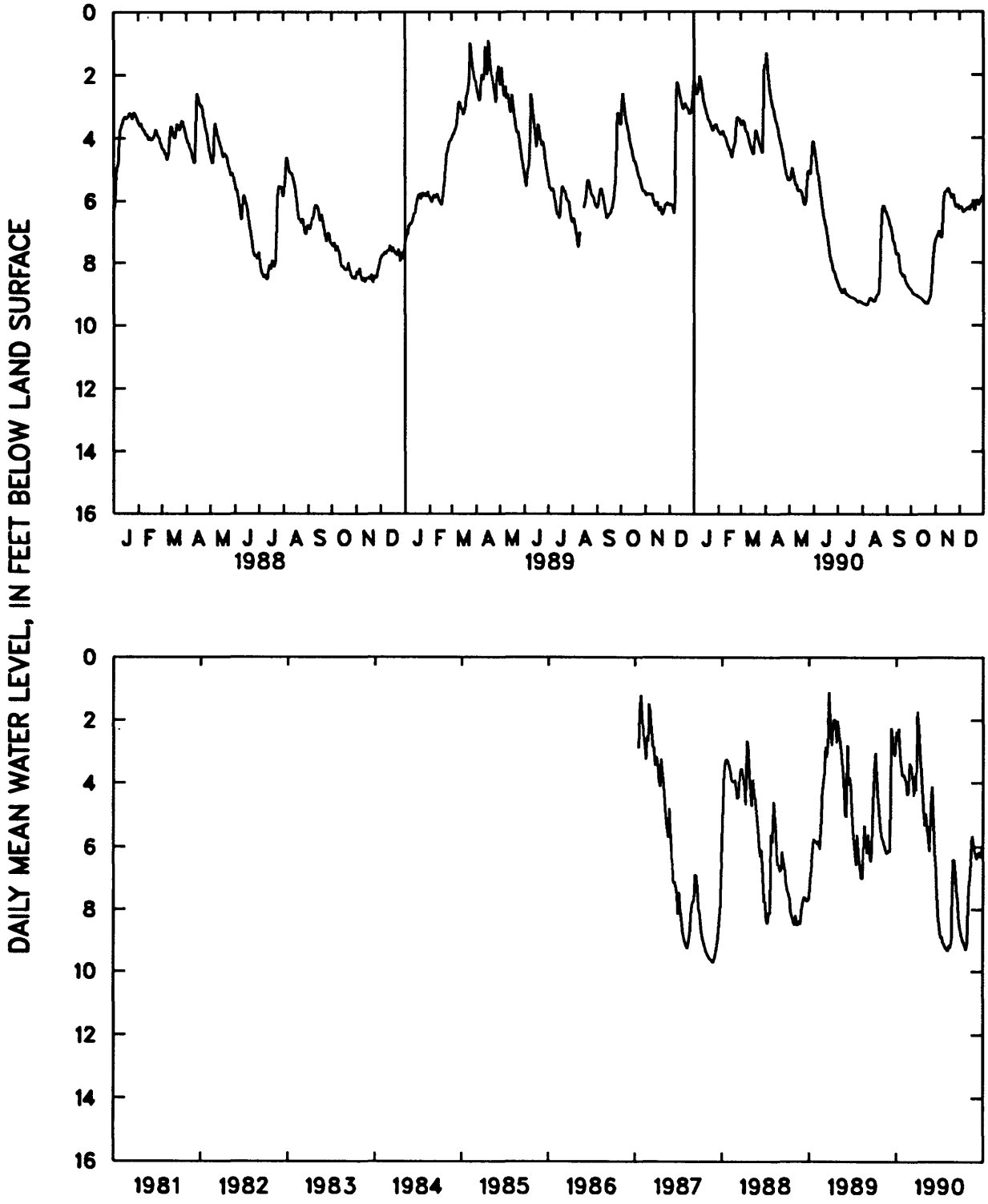


Figure 21.--Water level in observation well NC-173 (surficial aquifer), Jones County.

NC-191 NEAR MARBLE, CHEROKEE COUNTY

WELL-IDENTIFICATION NUMBER.--351117083545001; DEHNR well R102p1.

LOCATION.--Lat 35°11'17", long 83°54'50", Hydrologic Unit 06020002, northeast of Marble at American Thread Company, 0.3 mile north of Secondary Road 1428 on Secondary Road 1377.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Saprolite derived from schist of Precambrian age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 108.5 feet, diameter 4 inches, cased to 53 feet, screened interval from 53 to 83 feet, backfilled with saprolite from 83 to 108.5 feet, sand filter pack from 40 to 83 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 1,720 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 1.15 feet above land-surface datum.

REMARKS.--Terrane-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Water-level data prior to October 1989 were provided by DEHNR.

PERIOD OF RECORD.--September 1985 to current year. Records from September 1985 to September 1989 are unpublished and available in the files of the Groundwater Section, DEHNR. U.S. Geological Survey continuous record began October 1989.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 19.78 feet below land-surface datum, February 17, 1990; lowest, 40.10 feet below land-surface datum, October 8, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, OCTOBER TO DECEMBER 1989
DAILY MEAN VALUES

DAY	OCT	NOV	DEC
5	23.59	27.80	25.70
10	24.88	28.00	25.93
15	25.60	28.07	25.14
20	26.17	26.08	25.10
25	26.73	25.43	25.29
EOM	27.27	25.46	25.70

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	24.86	22.89	23.36	24.59	---	30.09	32.03	33.40	34.77	35.81	35.03	35.28
10	23.67	22.61	23.60	25.18	---	30.45	32.34	33.55	34.98	35.87	34.97	35.27
15	23.95	22.32	23.69	25.80	---	30.74	32.45	33.79	35.10	35.86	35.07	35.28
20	24.47	20.64	20.90	26.53	---	31.08	32.71	34.02	35.30	35.74	35.12	34.88
25	23.71	22.31	22.70	27.03	---	31.42	32.92	34.26	35.45	35.37	35.20	31.15
EOM	22.84	22.85	23.84	27.42	29.87	31.73	33.20	34.54	35.66	35.17	35.35	28.93

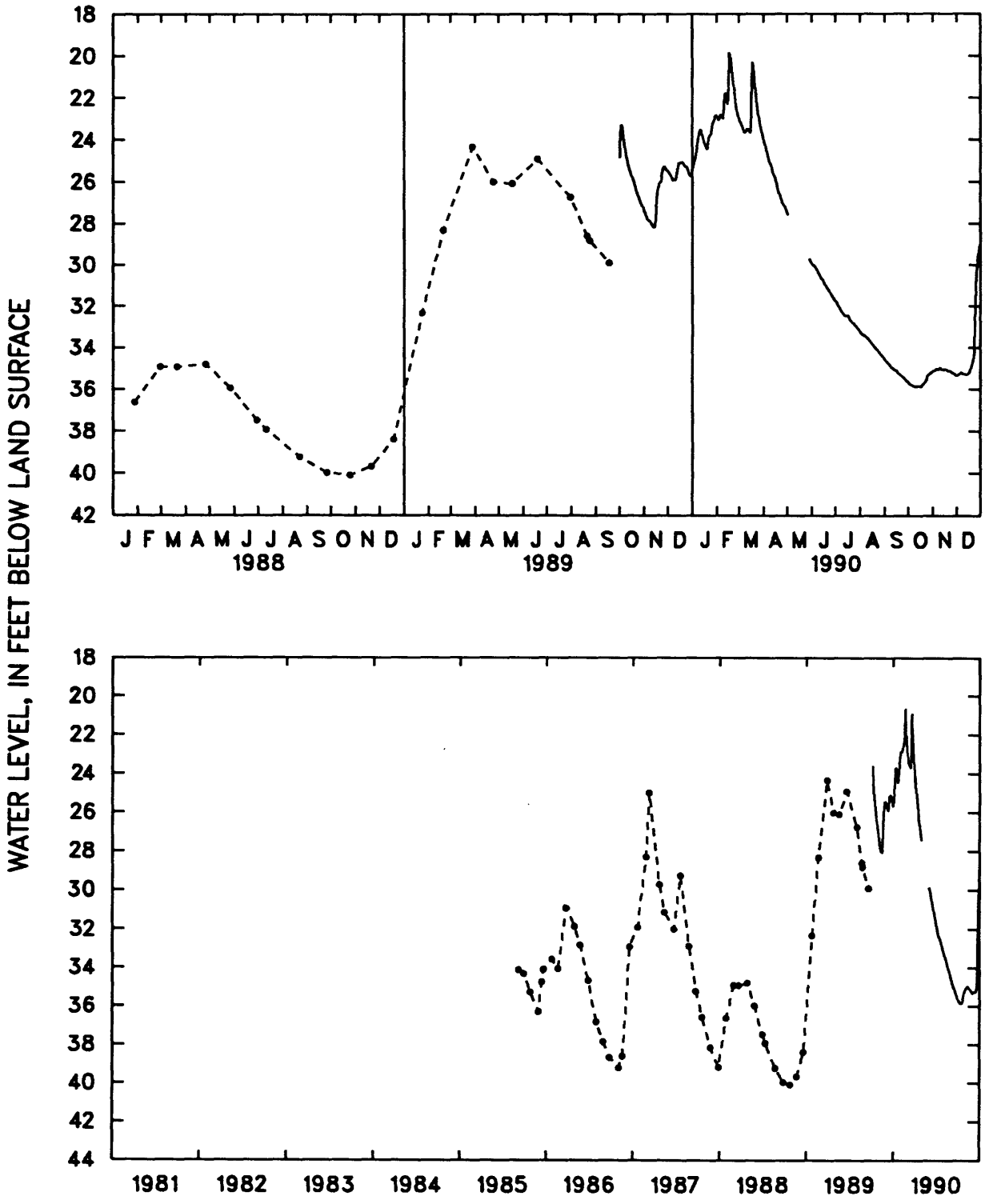


Figure 22.--Water level in observation well NC-191 (regolith), Cherokee County.

NC-192 NEAR MARBLE, CHEROKEE COUNTY

WELL-IDENTIFICATION NUMBER.--351121083545002; DEHNR well R102p2.

LOCATION.--Lat 35°11'21", long 83°54'50", Hydrologic Unit 06020002, northeast of Marble at American Thread Company, 0.45 mile north of Secondary Road 1428 on Secondary Road 1377.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Saprolite derived from schist of Precambrian age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 24 feet, diameter 4 inches, cased to 14 feet, screened interval from 14 to 24 feet, sand filter pack from 6 to 24 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 1,710 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Three saw cuts in top of casing, 3.35 feet above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month.

PERIOD OF RECORD.--October 1989 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.83 foot below land-surface datum, February 16, 1990; lowest, 11.69 feet below land-surface datum, October 8, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, OCTOBER TO DECEMBER 1989
DAILY MEAN VALUES

DAY	OCT	NOV	DEC
5	2.24	6.07	4.19
10	3.92	5.42	3.43
15	4.62	4.40	2.00
20	4.77	2.54	3.33
25	5.31	2.15	4.22
EOM	5.74	3.35	3.33

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	1.57	1.46	3.14	4.62	6.03	6.42	7.83	9.05	10.90	11.59	7.29	7.33
10	1.49	1.06	2.64	5.09	5.91	6.71	8.51	9.34	11.20	11.67	7.62	7.27
15	3.08	1.94	3.29	5.36	6.14	6.91	8.88	9.70	11.30	11.32	7.97	7.34
20	3.45	1.33	1.83	5.58	6.26	7.13	8.00	10.01	11.44	8.58	8.14	4.53
25	1.17	2.56	3.15	5.73	6.30	7.37	7.66	10.29	11.33	6.60	8.25	1.24
EOM	1.49	3.34	4.13	5.87	6.30	7.62	8.27	10.61	11.38	7.15	8.76	1.80

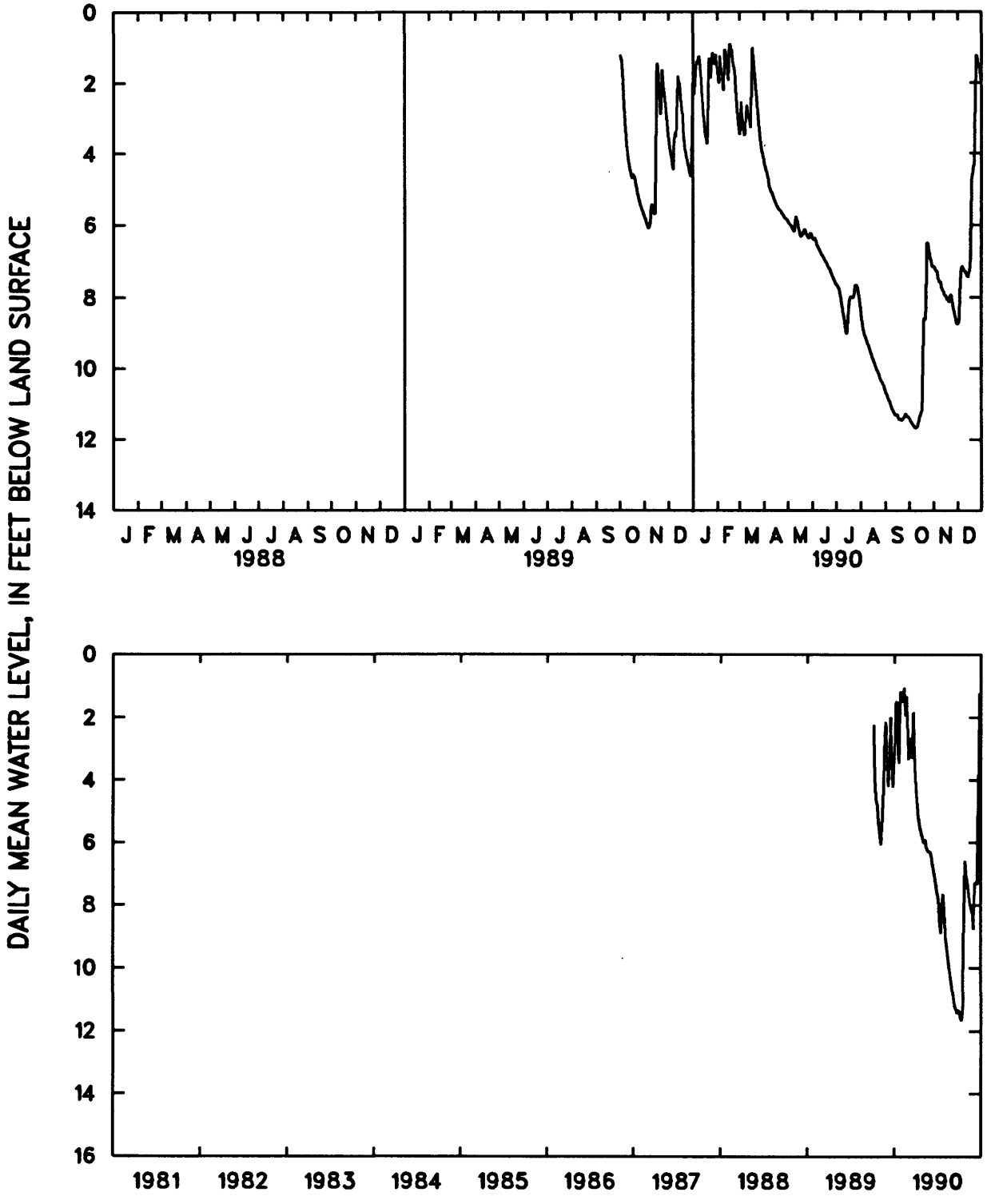


Figure 23.--Water level in observation well NC-192 (regolith), Cherokee County.

NC-193 NEAR BARBER, ROWAN COUNTY

WELL-IDENTIFICATION NUMBER.--354057080362601; DEHNR well L63t1.

LOCATION.--Lat 35°40'57", long 80°36'26", Hydrologic Unit 03040102, 2.75 miles southeast of Barber at North Carolina Department of Agriculture Piedmont Research Station, 0.75 mile south of Secondary Road 1526 on farm road.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Unconfined alluvial silt.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 24 feet, diameter 4 inches, cased to 9 feet, screened interval from 9 to 19 feet, sand filter pack from 7 to 24 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 678 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Two saw cuts in top of casing, 3.3 feet above land-surface datum.

REMARKS.--Climatic-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--November 1989 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.24 feet below land-surface datum, May 5, 1990; lowest, 8.01 feet below land-surface datum, October 9 and 10, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, NOVEMBER AND DECEMBER 1989
DAILY MEAN VALUES

DAY	NOV	DEC
5	6.80	6.65
10	6.80	6.16
15	6.79	5.97
20	6.56	6.34
25	6.38	6.46
EOM	6.60	6.43

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	6.22	5.61	5.57	5.89	5.27	5.98	6.53	7.13	7.64	7.97	---	6.31
10	5.85	5.56	5.81	5.90	5.52	6.10	6.66	7.13	7.73	7.95	---	6.47
15	6.23	5.85	5.89	5.48	5.79	6.17	6.67	7.24	7.72	6.67	---	6.51
20	6.31	5.42	5.85	5.79	5.90	6.21	6.75	7.32	7.83	6.84	---	6.52
25	5.58	5.67	5.95	5.89	6.02	6.34	6.84	7.38	7.90	6.16	---	6.06
EOM	5.89	5.76	5.73	5.94	5.77	6.43	6.99	7.52	7.97	---	---	5.88

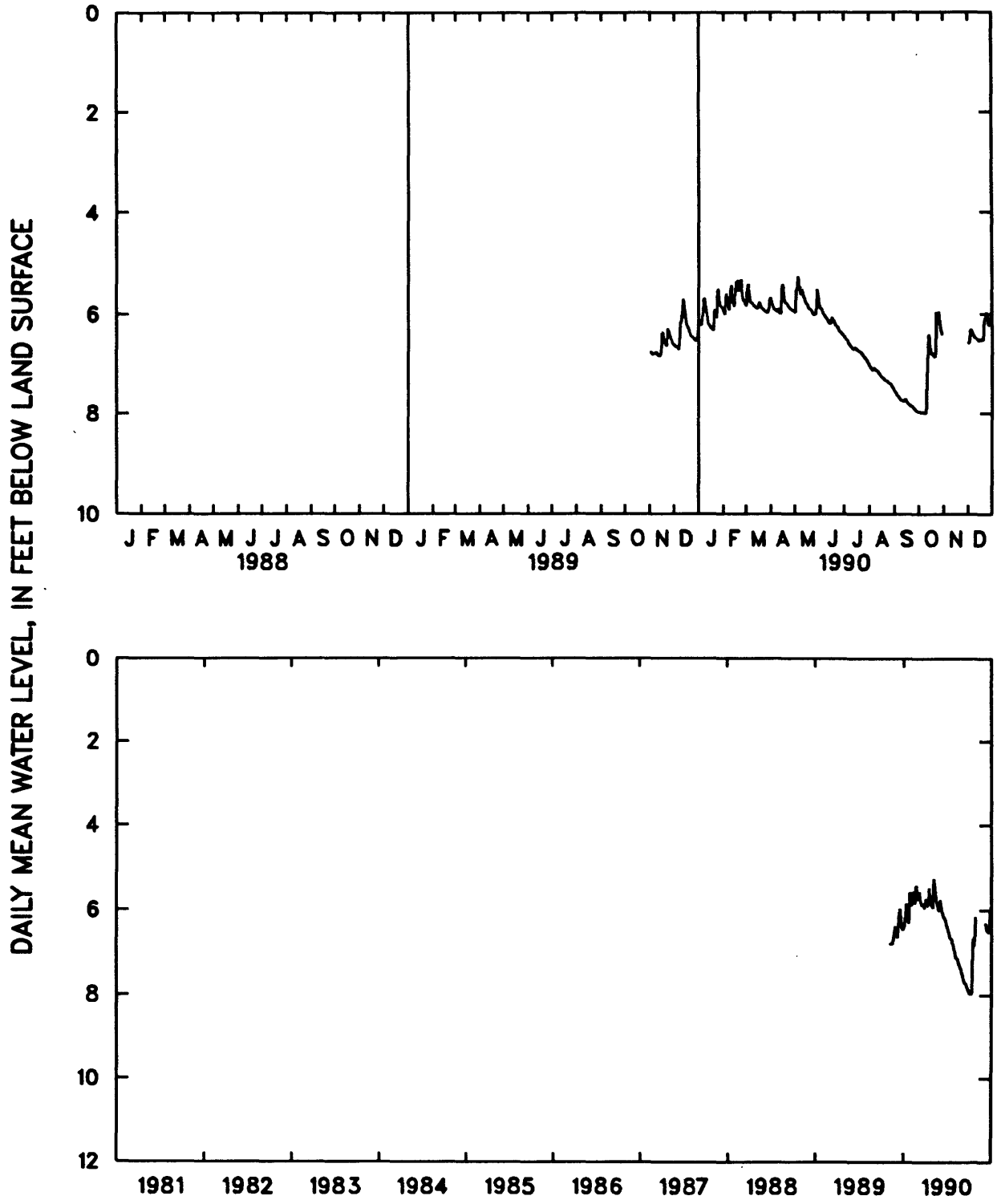


Figure 24.--Water level in observation well NC-193 (regolith), Rowan County.

NC-194 NEAR SILVER HILL, SCOTLAND COUNTY

WELL-IDENTIFICATION NUMBER.--345812079313401.

LOCATION.--Lat 34°58'17", long 79°31'41", Hydrologic Unit 03040204, in Sandhills Game Land Management Area, 6 miles southwest of Silver Hill on Secondary Road 1328.

OWNER.--U.S. Geological Survey.

AQUIFER.--Unconfined surficial sand.

WELL CHARACTERISTICS.--Drilled observation well, depth 35.6 feet, diameter 4 inches, cased to 30.5 feet, screened interval from 30.6 to 35.6 feet. Annular space filled with native clayey sand from 0 to 30 feet below land surface.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 433 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of casing, 2.93 feet above land-surface datum.

REMARKS.--Well is part of Jordan Creek Acid Precipitation Study site, and serves as a terrane-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--September 1987 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.63 feet below land-surface datum, August 23, 1989; lowest, 32.63 feet below land-surface datum, September 7, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	31.66	31.83	31.52	31.55	---	---	32.13	32.34	32.58	32.07	31.81	32.17
10	31.72	31.85	31.46	31.60	---	---	32.16	32.37	32.55	31.97	31.89	32.15
15	31.77	31.70	31.59	31.62	---	---	32.18	32.41	32.51	31.92	31.99	32.13
20	31.74	31.61	31.55	31.66	---	---	32.21	32.48	32.40	31.85	31.94	32.17
25	31.77	31.62	31.51	31.71	---	32.05	32.25	32.51	32.25	31.84	32.07	32.12
EOM	31.85	31.59	31.54	31.76	---	32.08	32.30	32.55	32.15	31.88	32.09	32.12

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	32.14	32.21	32.39	31.89	30.60	30.20	30.49	29.99	29.86	30.33	30.43	30.63
10	32.10	32.31	32.43	31.58	30.34	30.23	30.52	29.82	29.95	30.38	30.42	30.62
15	32.05	32.30	32.41	31.28	30.25	30.29	30.49	29.68	30.04	30.37	30.38	30.63
20	32.08	32.34	32.40	31.11	30.20	30.35	30.41	29.65	30.13	30.40	30.49	30.65
25	32.11	32.43	32.30	30.99	30.18	30.41	30.35	29.65	30.22	30.45	30.58	30.70
EOM	32.13	32.39	32.08	30.85	30.19	30.47	30.22	29.73	30.25	30.35	30.59	30.68

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	30.70	30.76	30.85	30.82	30.68	30.89	31.19	31.52	31.84	32.17	31.90	31.37
10	30.70	30.71	30.82	30.78	30.67	30.92	31.26	31.55	31.87	32.17	31.71	31.41
15	30.74	30.77	30.82	30.74	30.71	30.97	31.30	31.61	31.93	32.22	31.60	31.44
20	30.69	30.83	30.84	30.78	30.73	31.03	---	31.66	32.01	32.29	31.48	31.53
25	30.69	30.89	30.86	30.76	30.78	31.10	---	31.71	32.12	32.18	31.40	31.68
EOM	30.75	30.85	30.78	30.73	30.86	31.13	31.46	31.79	32.11	32.13	31.41	31.66

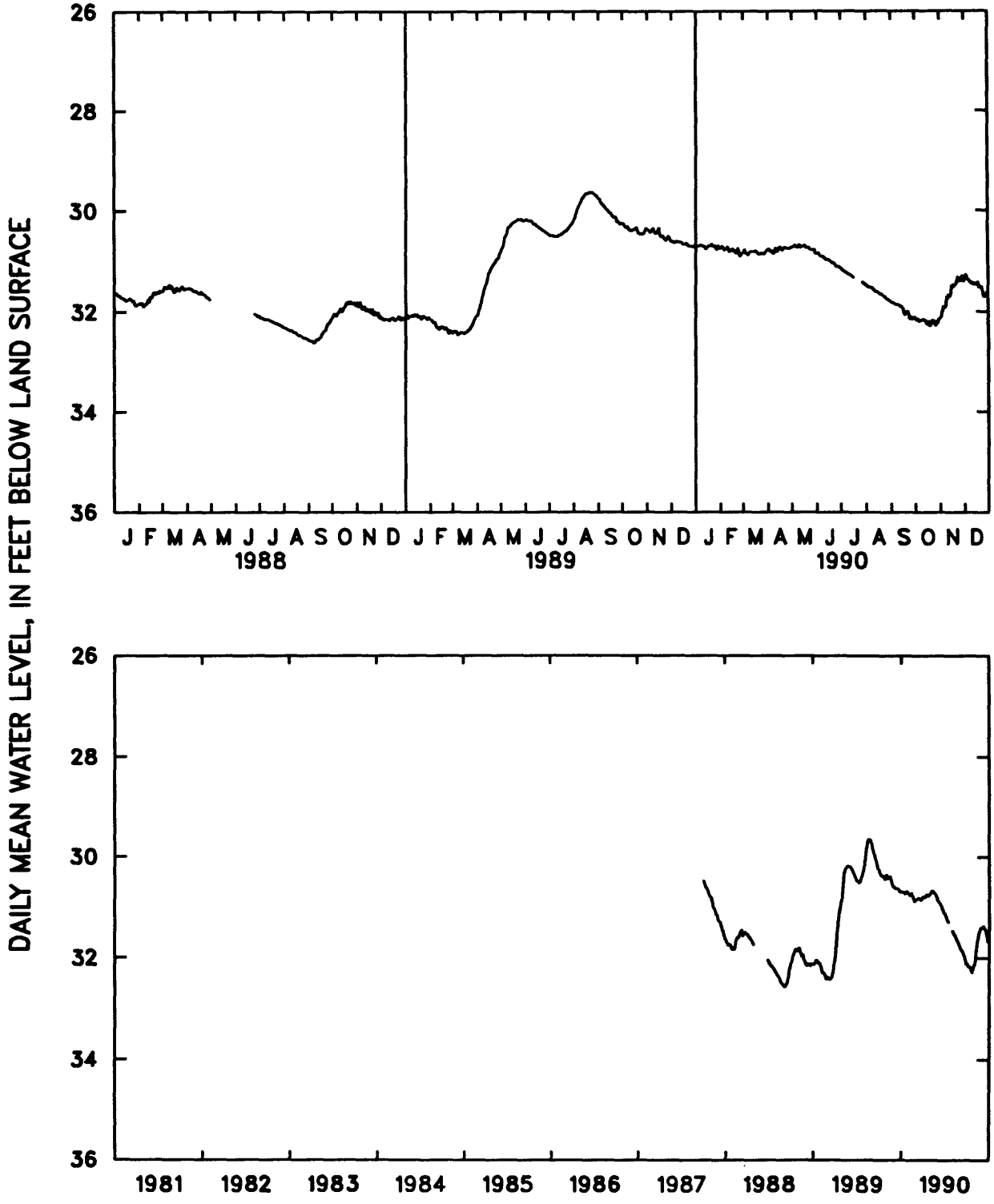


Figure 25.--Water level in observation well NC-194 (surficial aquifer), Scotland County.

Induced-Stress Network

Yorktown Aquifer

Three areal-effects wells tap the Yorktown aquifer in the northeastern and eastern Coastal Plain Province (fig. 26). The hydrograph for well NC-150 (fig. 27) in Pasquotank County shows seasonal fluctuation; although water levels are generally lowest in fall and early winter, this pattern was not repeated in late 1989 when water levels were near a record high. This well is about 2.7 mi north of public-supply wells that withdraw water from this aquifer. The hydrograph for NC-150 may show seasonal pumping. The water level in this well is often below sea level at the end of the growing season, as it was in 1988 and 1990. The decline in water levels observed in the early and mid-1980's has not continued since 1987.

Water levels in well NC-157 (fig. 28) in Washington County have shown a pattern similar to those in NC-150. The pattern in NC-157 indicates that the water level remained high throughout 1989 and did not decline during the summer and fall. The slight downward trend of the early and mid-1980's did not continue in 1988-90.

Well NC-162 (fig. 29) is at the western edge of a phosphate mining area in Beaufort County. The aquifer below the Yorktown, the Castle Hayne, is heavily pumped in order to depressurize that aquifer locally and to allow open-pit mining of ore beds in the Pungo River Formation, which lies below the Yorktown and above the Castle Hayne. This pumping has induced leakage of ground water from the Yorktown and Pungo River aquifers into the Castle Hayne aquifer. This leakage has caused the lowering of the hydraulic head in the Yorktown and Pungo River aquifers, and water levels in well NC-162 have fallen in response to pumping. Comparison of the hydrograph of well NC-162 with that of adjacent well NC-145 (fig. 37), which taps the Castle Hayne aquifer, shows the effects of this pumping.

Water levels in well NC-162 (fig. 29) showed a decline in 1988, and even though the decline decreased and water levels remained generally constant in the latter part of 1988 and through 1990, a record low was reached in July 1990. Water levels in NC-162 declined about 2 ft in 1988 and remained fairly steady at that level through 1990. The long-term trend from mid-1982 through 1990 has been a decline of about 0.3 ft per year.

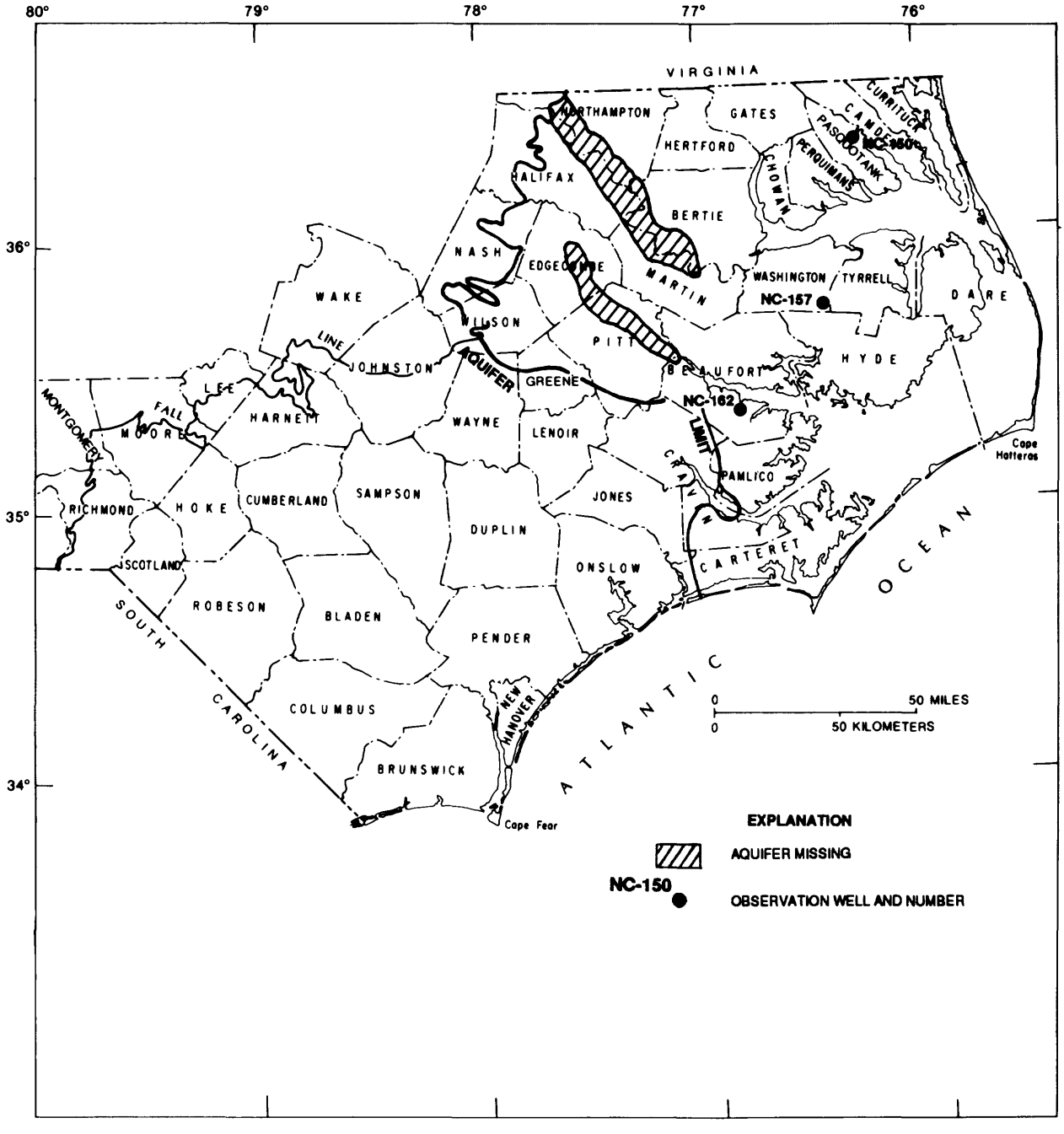


Figure 26.--Locations of observation wells completed in the Yorktown aquifer.

NC-150 NEAR ELIZABETH CITY, PASQUOTANK COUNTY

WELL-IDENTIFICATION NUMBER.--362050076163705; DEHNR Elizabeth City Forest Service Research Station well D11v5.

LOCATION.--Lat 36°20'50", long 76°16'37", Hydrologic Unit 03010205, 4 miles 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.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Yorktown aquifer of Pliocene and Miocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 500 feet, diameter 4 inches, cased to 120 feet, screened interval from 120 to 130 feet, cemented from 130 to 500 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 7.14 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 3.48 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to December 1986 were provided by DEHNR.

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, DEHNR. U.S. Geological Survey continuous record began November 1986.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.22 feet below land-surface datum, June 26, 1979; lowest, 8.32 feet below land-surface datum, August 15, 1986.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by -0.35 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	7.15	6.47	6.13	6.00	5.49	5.22	5.56	6.10	6.78	6.99	7.15	---
10	7.02	6.42	5.97	5.92	5.42	5.24	5.54	6.26	6.77	7.04	---	---
15	6.96	6.28	6.00	5.83	5.37	5.31	5.62	6.44	6.83	7.20	---	---
20	---	6.13	6.05	5.73	5.20	5.32	5.74	6.63	6.82	7.19	---	7.37
25	---	6.14	6.14	5.65	5.19	5.46	5.79	6.65	6.89	7.17	---	7.31
EOM	6.67	6.11	6.10	5.59	5.20	5.42	5.90	6.81	6.99	7.24	---	7.27

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	7.30	6.54	5.95	5.05	4.53	4.68	4.87	4.83	4.48	4.49	4.18	4.17
10	7.27	6.45	5.82	4.96	4.38	4.72	4.94	4.95	4.48	4.43	4.06	4.16
15	7.02	6.48	5.63	4.78	4.39	4.81	5.04	4.54	4.61	4.39	4.04	4.29
20	6.86	6.31	5.56	4.76	4.40	4.88	4.84	4.43	4.67	4.27	3.98	4.35
25	6.80	6.23	5.30	4.69	4.42	4.83	4.86	4.39	4.75	4.24	4.10	4.45
EOM	6.64	6.08	5.11	4.65	4.58	4.84	4.81	4.38	4.67	4.13	4.14	4.58

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	4.58	4.30	4.38	4.38	4.50	4.53	5.65	6.87	6.94	7.52	7.67	7.35
10	4.44	4.20	4.41	4.43	4.54	4.60	5.93	6.84	7.03	7.62	7.50	7.32
15	4.51	4.30	4.44	4.43	4.62	4.76	6.15	6.92	7.10	7.77	7.58	7.30
20	4.45	4.29	4.33	4.54	4.69	4.94	6.33	6.90	7.25	7.92	7.49	7.30
25	4.35	4.33	4.40	4.53	4.64	5.19	6.52	6.78	7.35	7.79	7.45	7.20
EOM	4.36	4.33	4.35	4.56	4.57	5.44	6.67	6.88	7.40	7.78	7.41	7.16

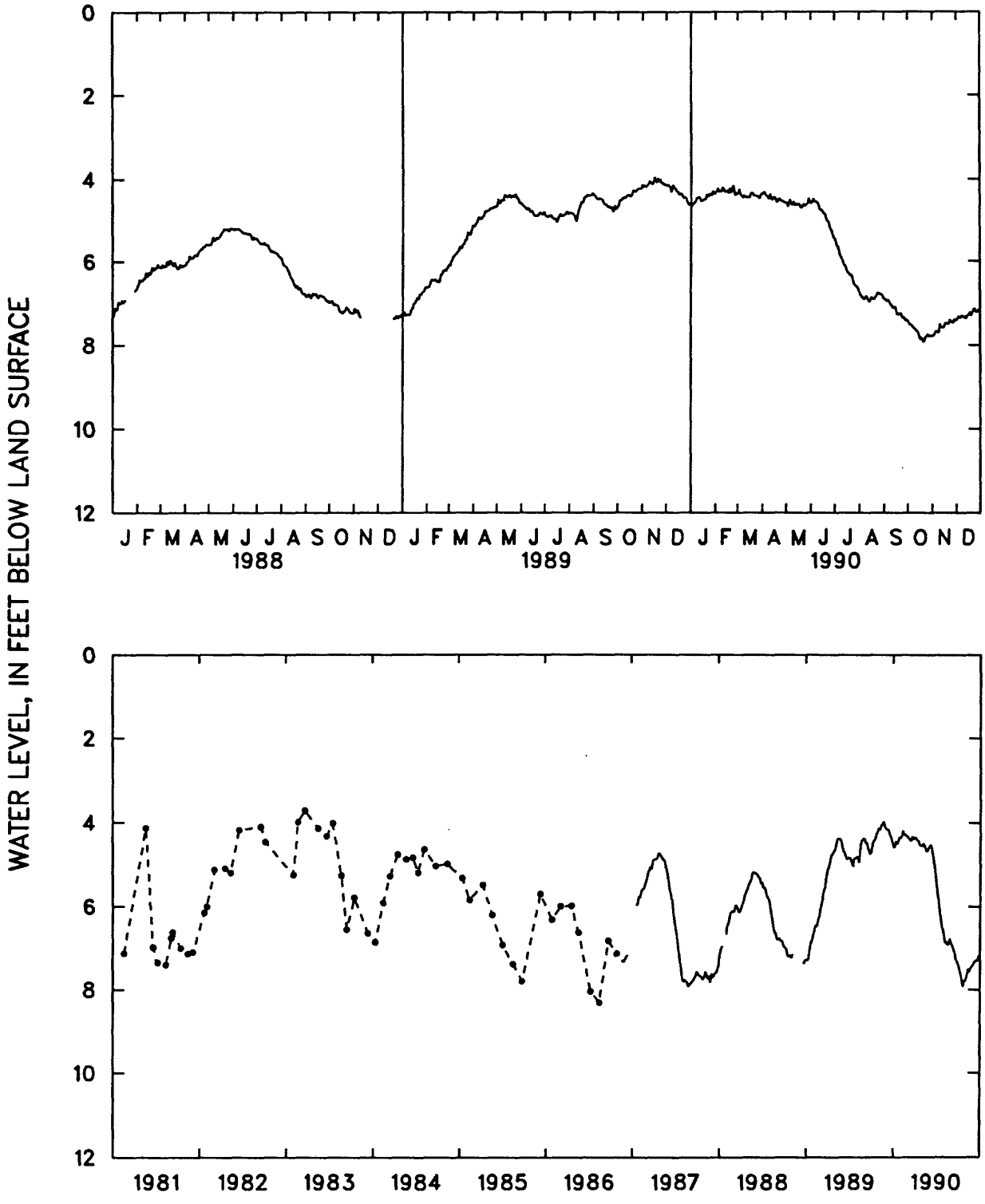


Figure 27.--Water level in observation well NC-150 (Yorktown aquifer), Pasquotank County.

NC-157 AT LAKE PHELPS, WASHINGTON COUNTY

WELL-IDENTIFICATION NUMBER.--354351076260502; DEHNR 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.--DEHNR (North Carolina Department of Environment, Health, and Natural Resouces).

AQUIFER.--Yorktown aquifer of Pliocene and Miocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 130 feet, diameter 4 inches, cased to 110 feet, screened interval from 110 to 120 feet; measured depth 120.2 feet, October 1986.

INSTRUMENTATION.--Digital recorder, 60-minute punch, November 1986 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 16.35 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.84 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.36 feet below land-surface datum, February 20, 1984; lowest, 9.35 feet below land-surface datum, February 24, 1981.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources-North Carolina NC-87-1, should be adjusted by +0.36 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	6.53	6.56	6.64	6.40	6.84	7.20	7.55	7.70	7.98	7.83	7.79
10	---	6.56	6.46	6.66	6.45	6.90	7.16	7.59	7.75	8.00	7.90	7.71
15	---	6.47	6.53	6.41	6.50	7.06	7.18	7.68	7.76	8.12	7.89	7.72
20	---	6.38	6.55	6.27	6.55	7.12	7.32	7.75	7.76	8.08	7.73	7.78
25	6.48	6.49	6.62	6.29	6.59	7.17	7.34	7.76	7.82	8.04	7.75	7.72
EOM	6.60	6.51	6.66	6.38	6.76	7.07	7.47	7.78	7.97	8.09	7.69	7.72

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	7.71	7.38	6.69	6.24	6.04	6.40	6.61	6.41	6.45	6.15	6.38	6.30
10	7.65	7.39	6.59	6.27	5.88	6.43	6.62	6.57	6.57	6.16	6.28	6.11
15	7.47	7.40	6.44	6.13	5.95	6.53	6.68	6.19	6.61	6.19	6.29	6.05
20	7.38	7.18	6.46	6.19	6.05	6.66	6.33	6.10	6.44	6.20	6.32	6.02
25	7.40	6.96	6.15	6.23	6.13	6.57	6.34	6.10	6.38	6.37	6.34	6.01
EOM	7.33	6.80	6.10	6.20	6.35	6.59	6.36	6.27	6.26	6.31	6.32	6.04

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	6.01	6.05	6.19	5.96	6.00	5.85	6.41	7.06	6.21	6.81	6.84	---
10	5.89	6.01	6.15	6.04	6.01	5.92	6.55	6.88	6.28	6.90	6.64	---
15	6.01	6.16	6.19	5.93	6.11	6.10	6.68	6.82	6.29	6.99	6.75	---
20	6.02	6.20	6.09	6.09	6.17	6.25	6.72	6.55	6.48	7.16	---	---
25	6.04	6.21	6.18	6.09	6.14	6.28	6.79	6.28	6.62	7.03	---	---
EOM	6.07	6.22	6.00	6.07	5.88	6.33	6.87	6.15	6.70	7.00	---	---

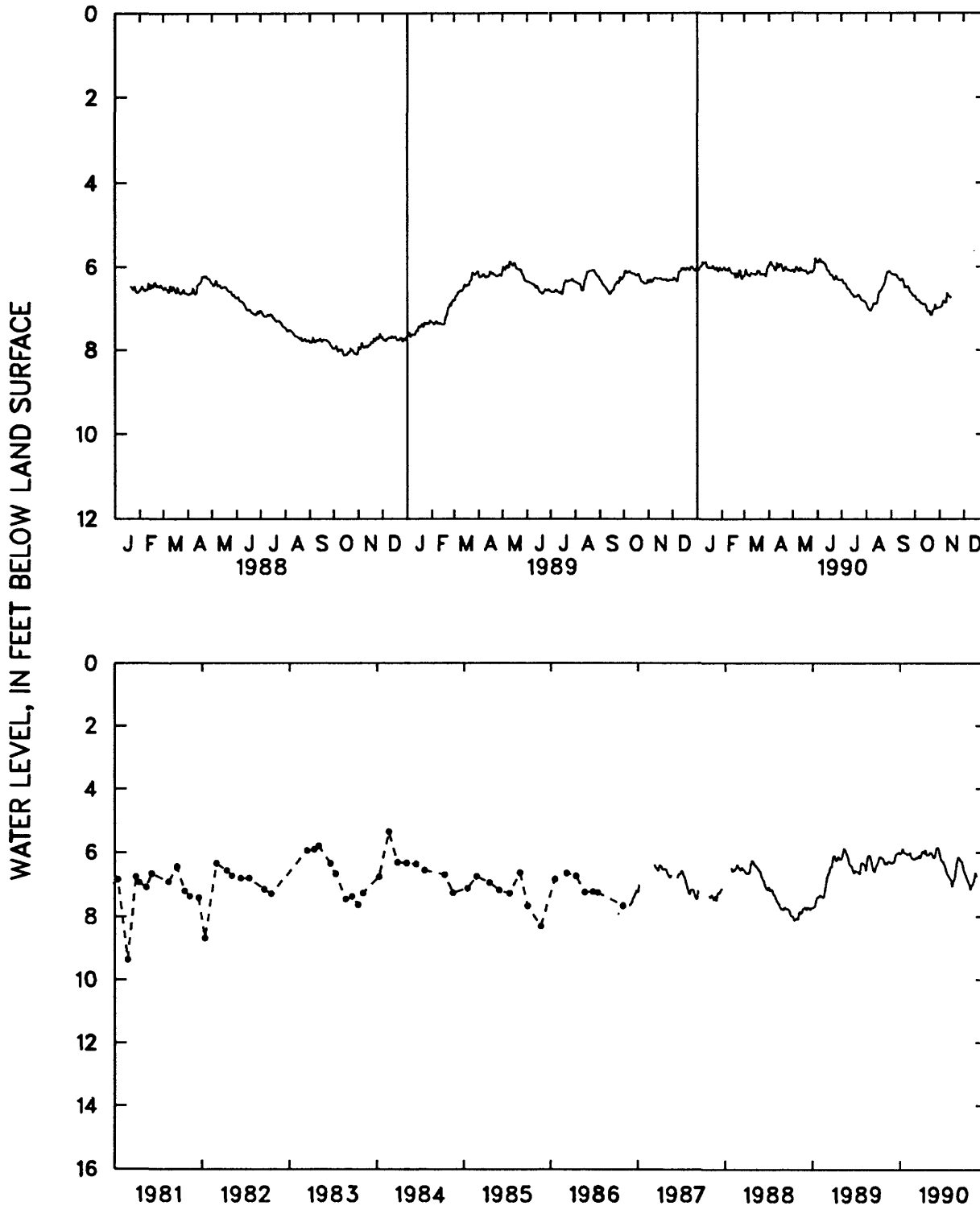


Figure 28.--Water level in observation well NC-157 (Yorktown aquifer), Washington County.

NC-162 NEAR BONNERTON, BEAUFORT COUNTY

WELL-IDENTIFICATION NUMBER.--352037076514106; DEHNR Bonnerton Research Station well P18v6.

LOCATION.--Lat 35°20'37", long 76°51'41", Hydrologic Unit 03020104, 1 mile south of Bonnerton on Secondary Road 1936.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Yorktown aquifer of Pliocene and Miocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 86 feet, diameter 2.5 inches, cased to 76 feet, screened interval from 76 to 86 feet; measured depth 83.4 feet, October 1986.

INSTRUMENTATION.--Digital recorder, 60-minute punch, December 1986 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 37.09 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 3.07 feet above land-surface datum.

REMARKS.--Local-effects well. Water levels affected by nearby pumping associated with mining operations; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 36.68 feet below land-surface datum, March 8, 1983; lowest, 40.58 feet below land-surface datum, July 21, 1990.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by -0.35 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	37.79	37.88	37.98	38.33	38.16	38.14	38.66	38.80	39.31	---	---	39.86
10	37.63	37.94	37.93	37.99	38.17	38.03	39.15	39.01	39.14	39.17	---	39.86
15	37.76	37.92	38.00	37.17	38.27	38.47	39.46	39.34	39.19	---	---	39.67
20	37.76	37.78	37.98	37.46	38.19	38.73	39.99	39.70	---	---	39.74	---
25	37.69	38.01	38.14	37.60	38.47	38.78	39.64	39.17	---	---	39.71	---
EOM	37.99	37.97	38.29	38.07	38.47	38.71	39.73	39.16	---	---	39.70	---

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	40.24	39.60	39.48	39.12	40.01	39.92	39.96	39.33	39.33	39.31	40.12
10	---	40.23	38.80	39.38	39.27	40.02	40.10	39.52	39.69	39.62	39.56	38.99
15	39.49	40.43	39.27	39.09	39.25	40.18	40.02	39.50	39.78	39.78	39.59	39.25
20	39.82	39.83	39.27	38.94	39.24	40.23	39.68	39.59	39.19	39.76	39.90	39.52
25	39.86	39.75	38.65	39.19	39.41	39.97	39.68	39.56	39.11	39.65	39.80	39.65
EOM	40.38	39.58	39.34	39.25	39.71	39.93	39.97	39.90	39.42	39.50	39.83	39.74

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	39.83	39.79	39.59	39.38	39.78	39.65	40.18	39.92	38.77	39.57	39.22	---
10	39.72	39.79	39.79	39.55	39.91	40.02	40.21	39.63	38.87	39.61	38.81	---
15	39.89	39.85	39.89	39.60	39.64	39.63	40.36	39.60	39.01	39.39	---	---
20	39.89	39.65	39.70	39.67	40.12	39.76	40.42	39.36	39.22	39.37	---	---
25	39.87	40.03	39.57	39.97	39.61	39.75	40.21	38.83	39.37	39.01	---	---
EOM	39.80	39.85	38.89	39.77	39.25	40.08	39.72	38.83	39.45	39.20	---	---

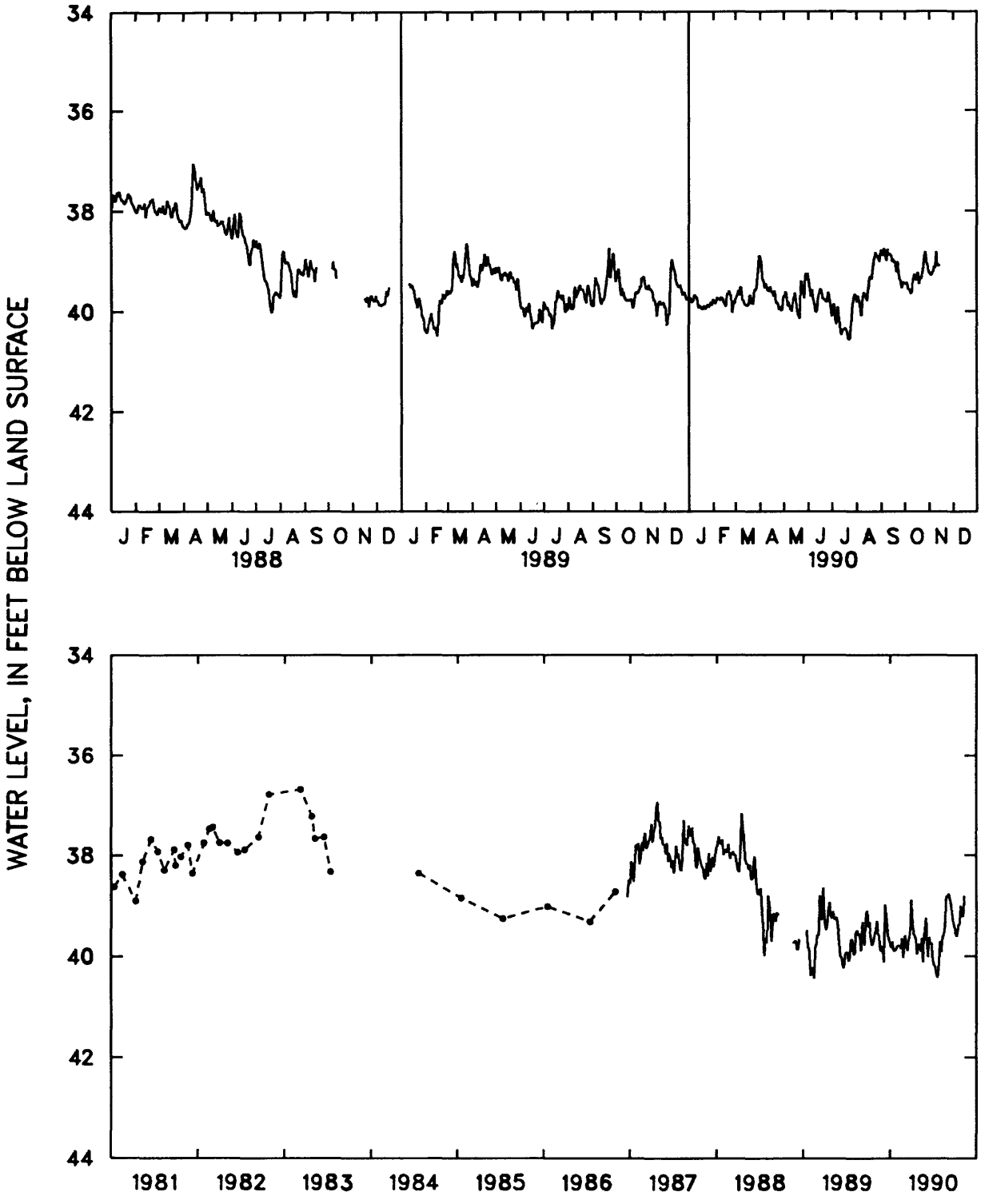


Figure 29.--Water level in observation well NC-162 (Yorktown aquifer), Beaufort County.

Analog-to-digital recorder used to measure water levels in observation well NC-152 near Parkville, North Carolina.
(Photograph by A.G. Strickland, U.S. Geological Survey, Raleigh, North Carolina)

Castle Hayne Aquifer

Thirteen wells monitor water-level fluctuations in the Castle Hayne aquifer (fig. 30). Record low water levels were recorded in eight wells (NC-13, NC-139, NC-145, NC-152, NC-156, NC-163, NC-169, and NC-181; figs. 31, 36-39 and 41-43) during 1988-90.

The Castle Hayne aquifer is the most productive aquifer in North Carolina with respect to the amount of water withdrawn from it and its yields to individual wells. The largest single withdrawal from the aquifer results from a phosphate-mining operation and chemical plant in eastern Beaufort County. Reported 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 low as 96 ft below land surface at well NC-13 (fig. 31), and the altitude of the potentiometric surface at the mining site near the center of the cone has been about 180 ft below sea level since at least February 1974 (North Carolina Department of Natural and Economic Resources, 1974). The effects of these withdrawals are seen in the regional cone of depression, which covers more than 3,000 mi^2 (Coble and others, 1989).

The mining area is north and northwest of NC-13 (fig. 31) and northeast of NC-145 (fig. 37); the water level in the well closer to the mining operation is lower than that in the well farther from it. Throughout the 1981-90 period, the water level in one of these wells declined while that in the other rose; which one declined or rose depended on the geographic position of the major mining operation at any particular time. 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. 37, 41, and 35). Water-level fluctuation patterns in NC-145 and NC-163 are similar, but water-level depth and range of fluctuation are much greater in NC-145 than in NC-163. Fluctuations in NC-137, which is farthest from the center of pumping, show seasonal patterns similar to those of many terrane-effects wells. This well is west of the limit of the extensive confining unit for the Castle Hayne aquifer and shows no apparent influence of the withdrawals at the mine.

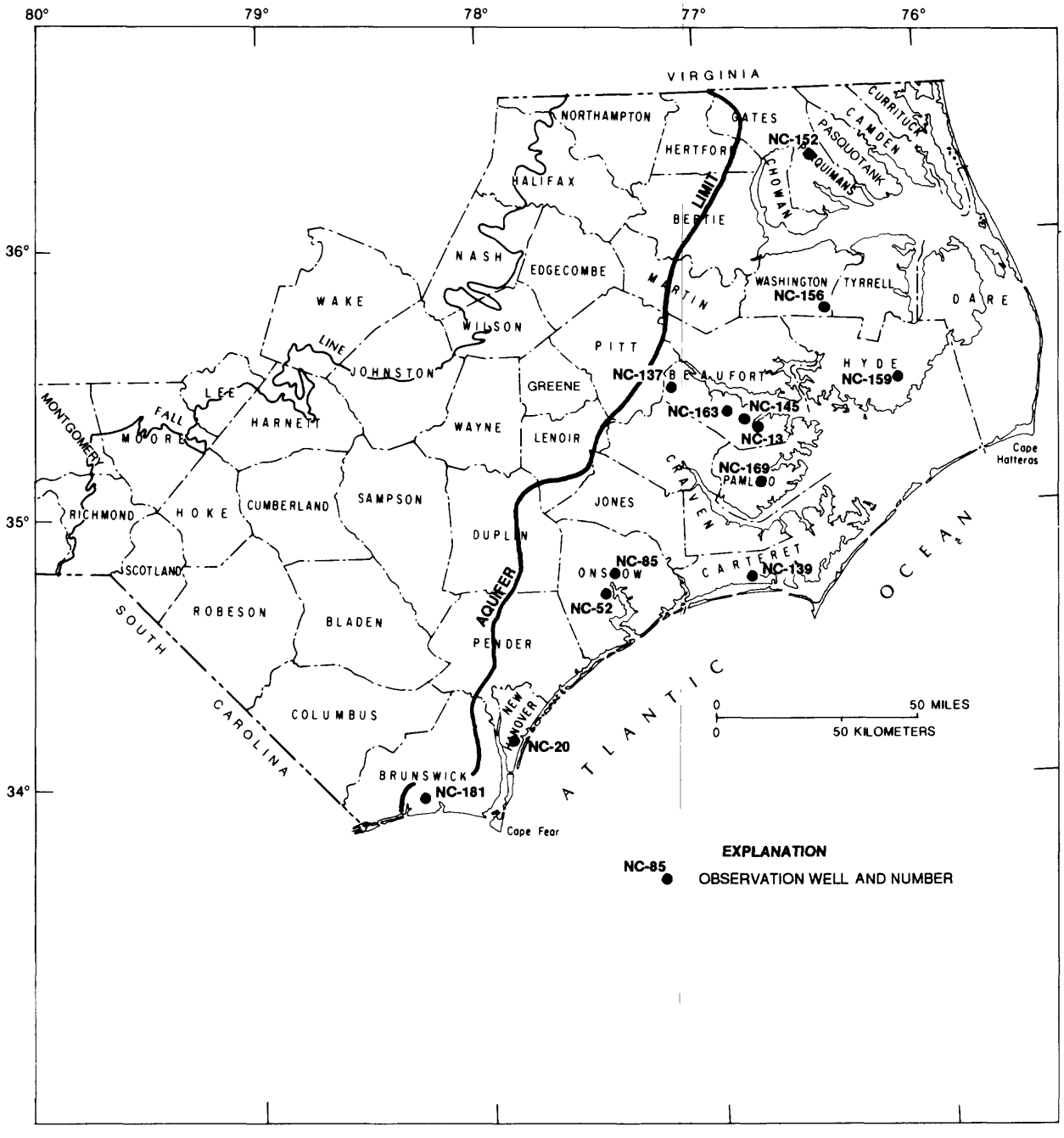


Figure 30.--Locations of observation wells completed in the Castle Hayne aquifer.

Well NC-169 (fig. 42) in Pamlico County is about 20 mi southeast of the center of pumping, and its hydrograph shows a roughly seasonal pattern of fluctuation with no definite upward or downward water-level trend. Well NC-159 (fig. 40) in Hyde County is 35 mi east-northeast of the center of pumping. Here the water level has a limited range of fluctuation, from 0.79 ft above to 1.14 ft below land surface since records began in April 1975, and, although water levels rose slightly during 1988-90, no long-term water-level decline is seen in this water-level record.

Water levels in the coastal areas of New Hanover County (NC-20), Carteret County (NC-139), and Brunswick County (NC-181) (figs. 32, 36, and 43) respond to withdrawals for water supply in these resort areas. Seasonal fluctuations and downward trends are apparent in the hydrographs for these three wells. In Onslow County, water levels in NC-85 (fig. 34) show seasonal fluctuations, which may indicate ground-water withdrawals near that observation well.

Water levels in the Castle Hayne aquifer show definite climatic effects in well NC-52 (fig. 33) where the record is similar to that in climatic-effects well NC-173 (fig. 21) located 14 mi north of NC-52. Even though NC-52 is near water-supply wells at U.S. Marine Corps Camp Geiger, no effects of withdrawals are seen in the long-term record.

In the northern Coastal Plain, two wells (NC-152 and NC-156, figs. 38 and 39) have similar records. The hydrographs for these wells indicate slight seasonal fluctuations and long-term downward trends of 0.15 ft per year or less. The cause of these declines has not been identified.

NC-13 NEAR AURORA, BEAUFORT COUNTY

WELL-IDENTIFICATION NUMBER.--351932076480001.

LOCATION.--Lat 35°19'32", long 76°48'00", Hydrologic Unit 03020104, 1.5 miles north of Aurora, east of intersection of N.C. Highway 306 and Secondary Road 1942.

OWNER.--Texasgulf Inc.

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 168 feet, diameter 4 inches, cased to 156 feet, open hole to 168 feet; measured depth 165.5 feet, September 1981.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 10 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of casing, 0.36 foot below land-surface datum (since February 16, 1984).

REMARKS.--Local-effects well. Since 1965 water levels affected by nearby pumping associated with mining operations; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--June 1964 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.38 feet below land-surface datum, April 9, 1965; lowest, 96.19 feet below land-surface datum, October 28 and November 2, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	87.46	86.94	85.96	84.12	88.99	88.39	90.02	89.20	---	---	91.15	89.76
10	86.39	87.01	84.58	85.56	89.05	85.10	90.63	92.89	---	92.37	91.46	88.93
15	86.43	86.84	84.20	84.37	89.60	85.18	91.01	92.10	---	92.36	91.64	88.73
20	85.92	86.02	82.82	83.89	88.96	87.08	91.66	91.07	---	92.27	91.84	88.81
25	87.05	87.10	85.06	83.79	89.89	86.40	91.40	91.57	---	91.56	91.79	89.56
EOM	87.44	86.61	85.47	87.93	89.43	87.65	89.69	92.23	---	91.27	91.45	86.47

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	89.61	84.83	81.59	80.39	78.93	78.28	78.20	77.87	77.80	76.33	73.02	71.50
10	89.12	84.07	81.59	80.31	78.73	78.08	78.34	77.95	77.41	76.48	72.86	72.20
15	88.77	83.64	81.57	79.81	78.89	78.36	78.05	77.73	78.12	75.79	73.23	73.38
20	86.86	83.35	81.55	79.89	80.14	78.23	77.45	77.72	77.87	75.30	72.48	73.36
25	86.37	83.58	80.73	79.46	79.80	78.67	78.05	77.52	77.41	75.21	71.81	74.13
EOM	86.01	83.34	79.25	78.60	78.35	77.49	78.18	77.70	76.69	74.07	71.89	75.32

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	75.48	76.38	76.81	77.36	81.41	83.11	89.49	89.87	95.41	93.22	95.37	---
10	75.53	76.45	77.08	78.55	80.76	80.72	90.11	94.45	95.30	92.06	94.90	---
15	75.58	76.02	74.78	78.68	81.72	82.96	91.08	93.43	93.93	---	95.20	---
20	75.40	75.90	76.45	78.91	82.04	83.74	90.64	93.62	92.69	---	93.91	---
25	76.47	76.92	75.68	79.62	82.66	83.92	89.49	93.18	92.87	94.96	94.97	---
EOM	76.61	77.26	76.66	79.55	83.15	84.01	92.80	95.13	92.58	---	96.17	---

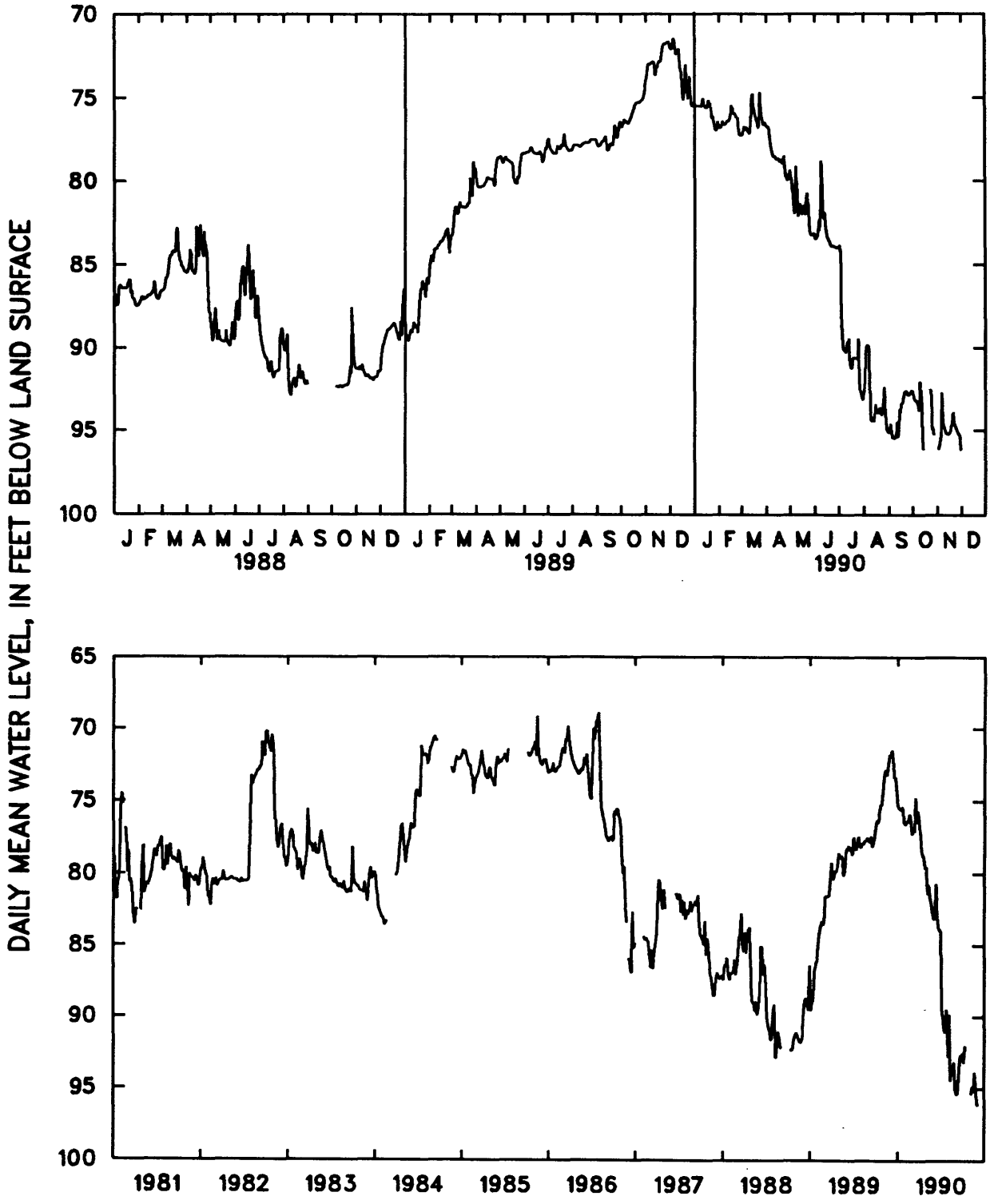


Figure 31.--Water level in observation well NC-13 (Castle Hayne aquifer), Beaufort County.

NC-20 NEAR WILMINGTON, NEW HANOVER COUNTY

WELL-IDENTIFICATION NUMBER.--341000077524201.

LOCATION.--Lat 34°09'53", long 77°52'48", Hydrologic Unit 03030001, southeast of Wilmington, 1 mile 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 feet, diameter 3 inches, cased and screened intervals unknown; measured depth 169 feet, September 1973.

INSTRUMENTATION.--Measured periodically with steel tape.

DATUM.--Land-surface datum is 21 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 1.85 feet 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 feet below land-surface datum, June 10, 1966; lowest, 23.89 feet below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 14	18.25	APR 20	18.13	JUNE 7	18.95	AUG 12	16.81	OCT 27	17.98	NOV 30	18.17
MAR 1	18.02	MAY 10	18.94	JUNE 28	21.32						

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 25	18.79	MAY 17	18.39	JULY 13	21.87	AUG 17	19.92	OCT 5	16.57	NOV 30	18.25

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 23	17.87	APR 25	20.55	JULY 12	22.48	AUG 28	19.86	OCT 3	21.19	NOV 14	17.71
MAR 8	18.35	JUNE 6	21.30								

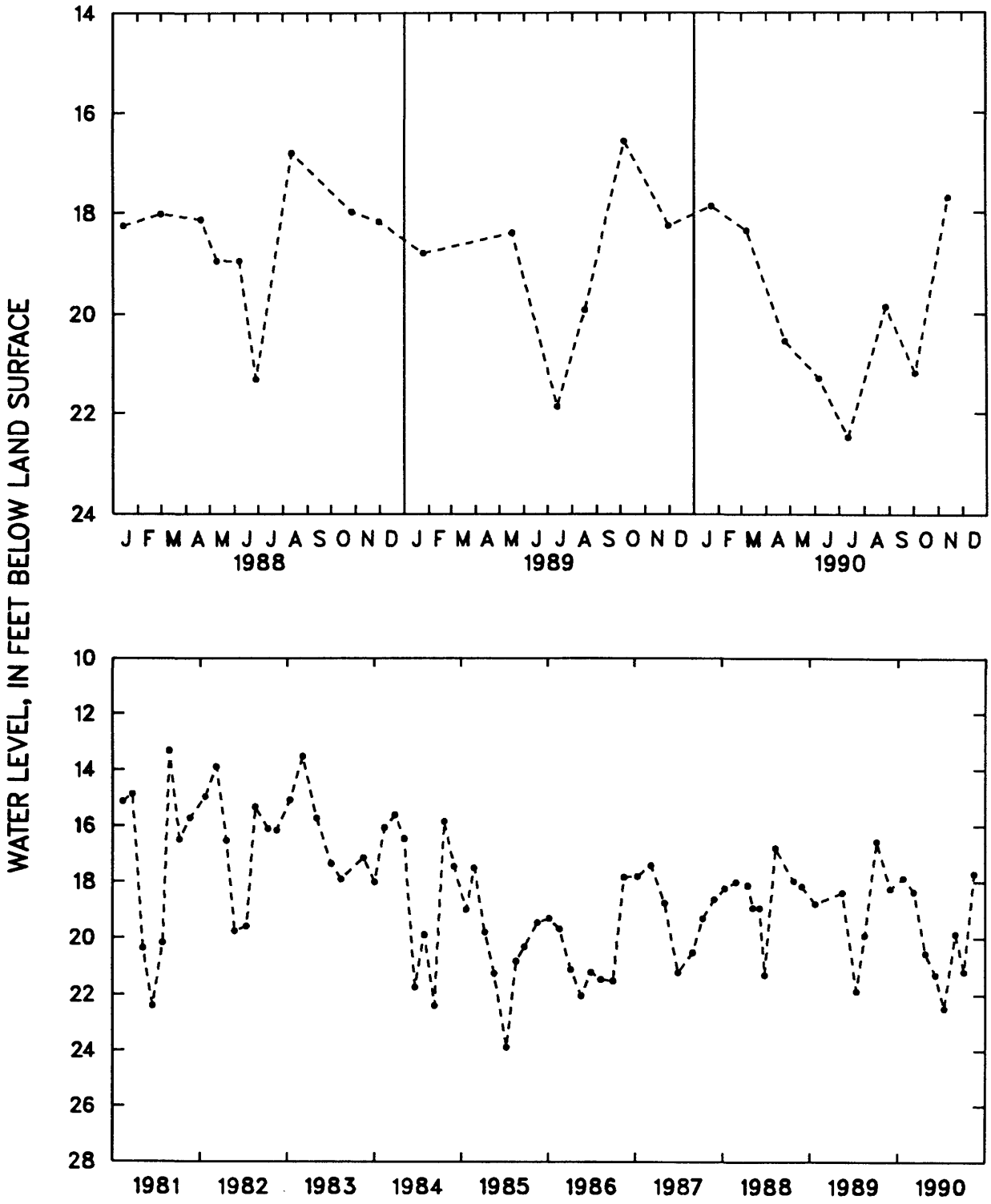


Figure 32.--Water level in observation well NC-20 (Castle Hayne aquifer), New Hanover County.

NC-52 NEAR JACKSONVILLE, ONSLOW COUNTY

WELL-IDENTIFICATION NUMBER.--344425077272501.

LOCATION.--Lat 34°44'18", long 77°27'29", Hydrologic Unit 03030001, southwest of Jacksonville, 2 miles south of U.S. Highway 258, 0.25 mile 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 feet, diameter 18 inches, cased to 23 feet, open hole to 70 feet; measured depth 68 feet, January 1974.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 17 feet above National Geodetic Vertical Datum of 1929 (NGVD of 1929) (from topographic map) - revised from 24.45 feet above NGVD of 1929, October 1988.
Measuring point: Top of instrument shelf, 1.9 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month.

PERIOD OF RECORD.--January 1963 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.67 feet below land-surface datum, September 14, 1984; lowest, 10.44 feet below land-surface datum, January 3, 1966.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	5.27	4.70	5.11	5.39	5.64	4.80	6.29	5.58	5.28	6.37	6.82	5.94
10	4.56	5.05	4.92	5.65	5.43	5.05	6.54	5.05	4.93	6.53	6.56	6.20
15	4.51	4.99	4.65	4.56	5.44	5.14	6.17	4.72	5.21	6.80	6.78	6.51
20	4.59	4.51	4.56	4.73	5.40	5.60	6.55	5.30	5.54	7.02	6.89	6.79
25	4.34	4.58	4.90	5.08	5.62	5.99	5.02	4.94	5.82	7.01	6.89	6.96
EOM	4.52	4.90	5.13	5.45	4.61	6.02	5.51	5.44	6.10	7.02	5.77	7.10

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	6.95	6.59	5.74	4.83	4.06	5.56	6.06	4.95	5.91	4.26	5.81	6.84
10	6.89	6.82	4.93	4.26	4.12	5.49	6.35	4.84	6.18	4.60	5.91	4.69
15	6.77	7.07	5.23	3.10	4.34	5.87	6.68	4.97	6.46	5.08	6.05	4.57
20	6.47	6.96	5.41	3.74	4.21	5.72	5.61	4.40	6.57	5.45	6.19	4.60
25	6.33	5.87	3.63	4.28	4.84	5.20	4.77	5.00	5.90	5.79	6.49	4.84
EOM	6.35	5.84	4.23	3.52	5.34	5.71	5.37	5.60	4.86	6.03	6.71	3.79

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	4.07	5.67	6.29	4.65	6.27	6.23	7.20	8.21	7.94	8.94	8.18	8.34
10	3.50	5.72	6.37	5.06	6.45	6.49	7.40	7.88	8.23	9.01	7.48	8.35
15	4.37	6.00	6.52	5.24	6.63	6.81	7.59	8.16	8.36	9.17	7.27	8.45
20	4.85	6.10	6.31	5.67	6.77	7.06	7.73	8.27	8.54	9.30	7.62	8.68
25	5.18	6.21	6.53	5.96	6.56	6.81	7.92	8.22	8.68	8.91	7.88	8.69
EOM	5.48	6.12	5.14	6.18	6.00	7.00	8.02	8.19	8.80	8.04	8.20	8.71

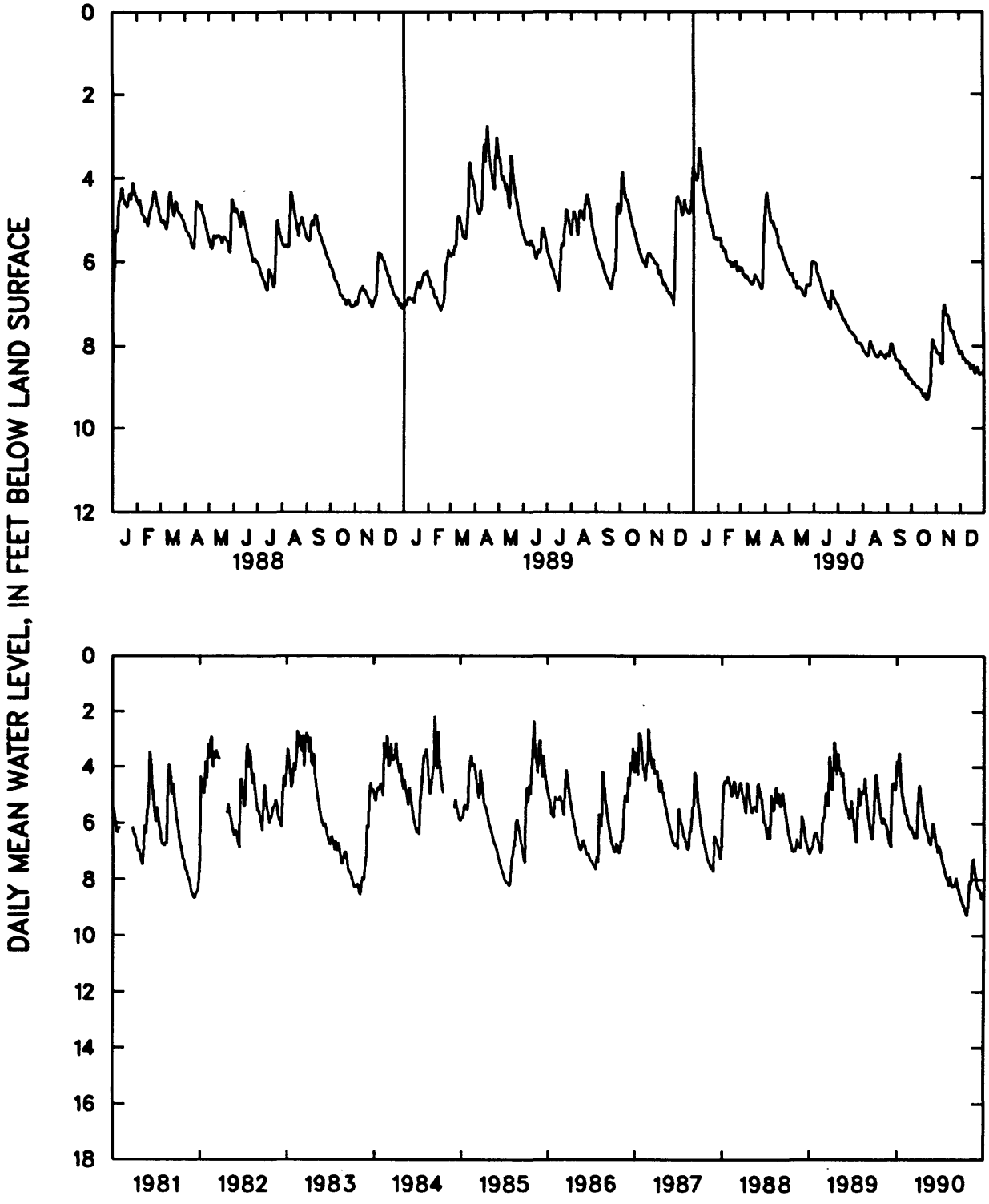


Figure 33.--Water level in observation well NC-52 (Castle Hayne aquifer), Onslow County.

NC-85 AT JACKSONVILLE, ONSLOW COUNTY

WELL-IDENTIFICATION NUMBER.--344525077254501.

LOCATION.--Lat 34°45'25", long 77°25'45", Hydrologic Unit 03030001, in Jacksonville at electrical transformer substation, 0.15 mile north of U.S. Highway 17 and 0.4 mile 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 feet (reported), diameter 8 inches, cased and screened intervals unknown; measured depth 103 feet, January 1974.

DATUM.--Land-surface datum is 20 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 3.2 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--January 1963 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.86 feet below land-surface datum, June 10, 1964; lowest, 24.19 feet below land-surface datum, July 3, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	18.03	18.68	18.12	15.42	14.62	15.26	18.09	21.51	19.83	---	16.61	17.77
10	19.61	19.50	17.15	15.62	14.41	16.37	19.36	21.29	---	---	16.48	18.18
15	20.50	19.70	17.72	15.57	14.49	16.69	20.15	21.39	---	---	16.24	19.32
20	19.20	18.45	18.33	15.26	14.44	---	21.18	22.32	---	---	15.67	20.01
25	19.09	18.97	17.47	14.99	15.22	---	20.65	21.28	---	---	16.20	18.46
EOM	19.76	19.21	16.36	15.10	15.08	18.44	21.40	20.90	---	16.85	---	---

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	17.53	---	14.79	14.74	18.17	19.64	20.99	19.28	16.99	14.83	17.83
10	19.01	18.90	---	15.31	14.59	18.35	20.14	---	19.17	16.57	14.35	18.43
15	18.21	18.17	17.56	15.36	14.54	19.30	20.57	---	19.39	15.92	14.26	19.15
20	18.27	18.85	16.96	14.83	14.50	19.25	19.59	19.68	18.55	15.74	15.82	20.22
25	18.42	19.06	16.63	14.54	15.34	19.23	19.80	20.37	17.97	15.64	17.15	---
EOM	17.37	18.49	15.05	15.09	16.45	19.62	20.80	20.20	17.36	14.74	16.66	---

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	16.52	16.57	14.98	16.06	16.71	21.39	22.56	22.67	21.00	19.43	19.19
10	---	15.89	16.37	15.16	15.43	18.13	22.29	22.03	23.15	20.93	18.83	20.10
15	---	15.78	15.56	14.73	15.64	17.96	23.02	22.88	22.87	21.24	19.81	20.12
20	---	15.60	15.20	14.84	16.38	19.08	22.46	22.97	21.88	20.72	20.00	19.50
25	17.32	16.24	15.31	14.65	15.98	20.45	22.95	22.57	21.23	19.77	19.35	18.84
EOM	17.57	17.11	15.07	15.44	15.93	21.17	22.75	23.16	20.99	20.29	19.10	18.82

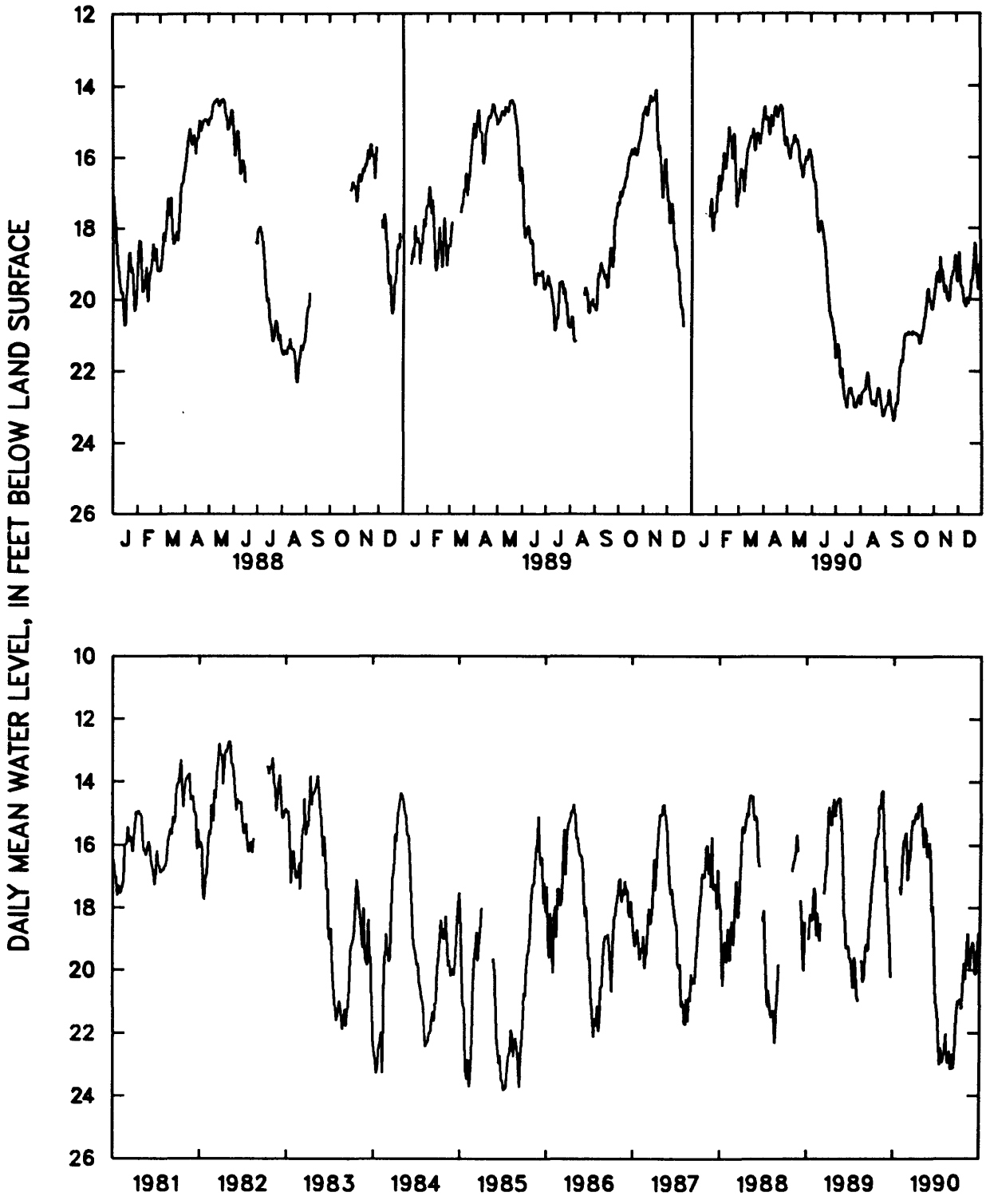


Figure 34.--Water level in observation well NC-85 (Castle Hayne aquifer), Onslow County.

WELL-IDENTIFICATION NUMBER.--352615077083401; DEHNR Creeping Swamp Research Station well O21q1.

LOCATION.--Lat 35°26'15", long 77°08'38", Hydrologic Unit 03020202, 3 miles north of Wilmar, 1 mile west of U.S. Highway 17 on N.C. Highway 102.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 143 feet, diameter 4 inches, cased to 72 feet, open hole to 143 feet; measured depth 141.6 feet, September 1981.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 56.84 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of collar on casing, 0.8 foot above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month, ---, missing record.

PERIOD OF RECORD.--January 1972 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 19.90 feet below land-surface datum, February 3, 1972; lowest, 26.34 feet below land-surface datum, December 5, 6, 7, 13, and 14, 1986.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	23.90	22.32	22.02	22.03	21.94	22.25	22.91	24.31	24.86	25.30	25.25	25.20
10	23.56	22.26	21.91	22.09	22.04	22.19	23.09	24.38	24.96	25.36	25.35	25.13
15	23.29	22.09	22.04	22.03	22.14	22.30	23.35	24.54	25.05	25.49	25.33	25.12
20	22.85	21.97	22.03	22.02	22.15	22.33	23.74	24.67	25.07	25.42	25.18	25.19
25	22.61	22.03	22.08	22.01	22.18	22.51	23.91	24.71	25.13	25.40	25.25	25.11
EOM	22.53	21.99	22.06	21.99	22.25	22.59	24.13	24.89	25.27	25.45	25.20	25.15

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	25.21	24.90	24.14	22.46	21.83	21.98	22.68	22.39	22.82	23.17	22.67	22.55
10	25.19	24.93	23.87	22.33	21.66	22.10	22.73	22.48	22.94	23.01	22.62	22.37
15	25.08	24.87	23.47	22.12	21.65	22.29	22.79	22.47	23.12	22.81	22.63	22.30
20	25.03	24.77	23.25	22.08	21.70	22.43	22.69	22.54	23.25	22.65	22.64	22.16
25	25.02	24.58	22.88	21.99	21.71	22.47	22.66	22.58	23.35	22.68	22.68	21.99
EOM	24.88	24.38	22.56	21.86	21.92	22.64	22.54	22.71	23.33	22.57	22.63	21.79

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	21.68	21.29	21.40	21.25	21.41	21.78	23.04	24.90	24.46	25.11	25.55	24.70
10	21.47	21.23	21.37	21.25	21.48	21.80	23.33	25.00	24.44	25.32	25.27	24.56
15	21.47	21.37	21.39	21.15	21.65	21.95	23.65	25.07	24.47	25.54	---	24.52
20	21.33	21.41	21.33	21.29	21.74	22.14	23.90	25.01	24.68	25.83	25.10	24.50
25	21.27	21.49	21.42	21.31	21.81	22.44	24.22	24.77	24.91	25.71	24.90	24.50
EOM	21.26	21.46	21.26	21.34	21.80	22.72	24.55	24.53	---	25.77	24.84	24.39

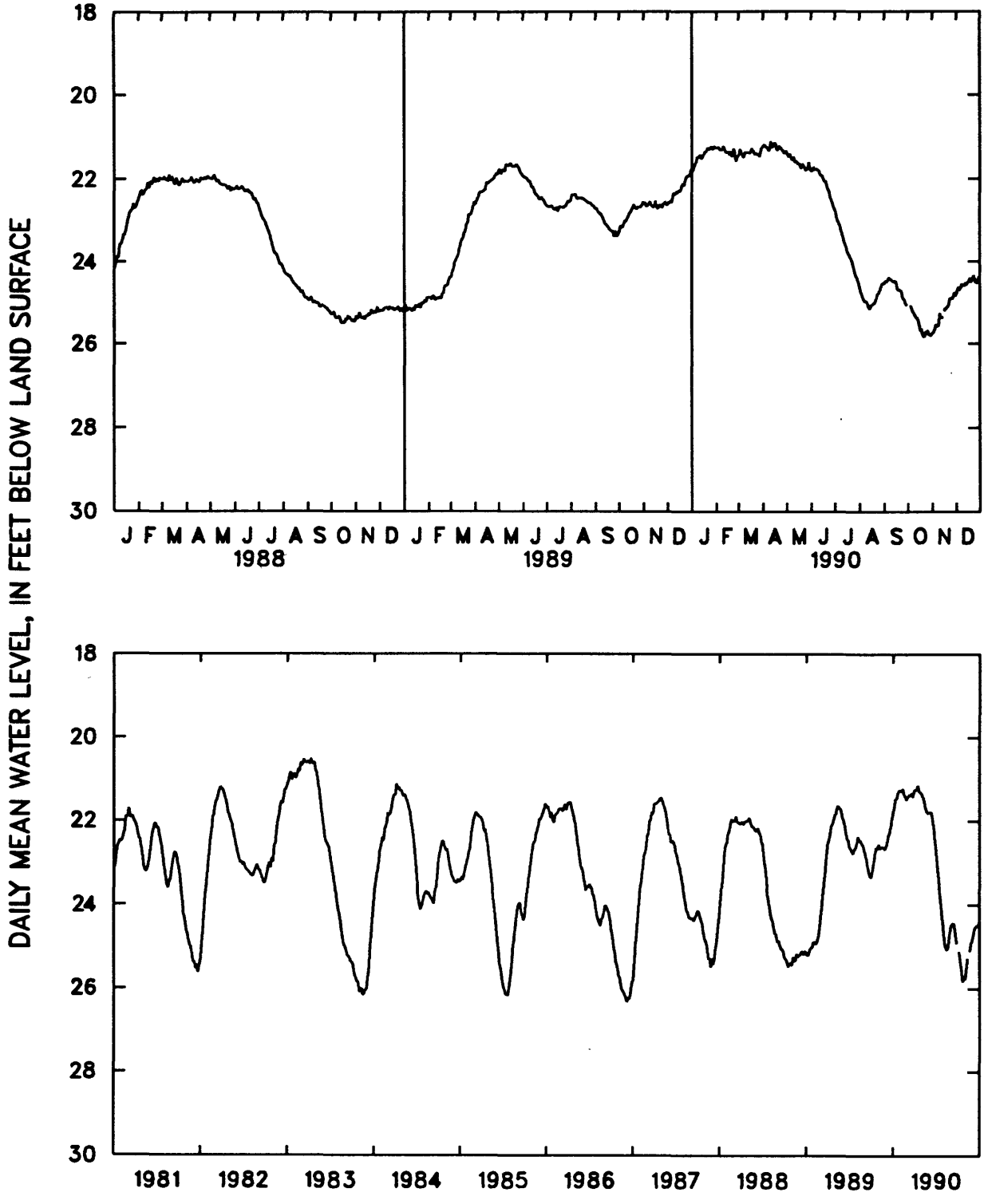


Figure 35.--Water level in observation well NC-137 (Castle Hayne aquifer), Beaufort County.

NC-139 AT MOREHEAD CITY, CARTERET COUNTY

WELL-IDENTIFICATION NUMBER.--344323076451301; DEHNR 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 DEHNR Marine Fisheries Facility on north shore of Bogue Sound.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 238 feet, diameter 4 inches, cased to 180 feet, open hole to 191 feet, hole collapsed from 191 to 238 feet.

INSTRUMENTATION.--Digital recorder, 30-minute punch.

DATUM.--Land-surface datum is 8.72 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of collar on casing, 1.73 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--January 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.23 feet below land-surface datum, December 7, 1976; lowest, 13.20 feet below land-surface datum, August 21, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	9.00	8.99	8.88	8.56	8.36	9.45	11.17	---	---	10.04	8.90	9.34
10	9.27	9.27	8.36	8.03	8.54	9.43	---	---	---	9.58	9.23	8.90
15	9.37	9.08	8.59	8.17	8.86	9.90	---	---	---	10.20	9.23	9.20
20	9.17	8.58	8.81	8.38	8.87	---	---	---	---	9.37	8.91	9.46
25	8.93	8.92	8.98	8.40	9.46	---	---	---	---	9.41	8.91	8.90
EOM	9.48	8.80	8.48	8.62	9.49	10.91	---	---	---	9.42	9.04	9.19

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	8.94	8.73	8.75	8.47	8.66	10.51	11.65	11.83	11.63	9.66	9.11	8.94
10	8.84	9.19	8.70	8.66	8.59	10.40	12.12	11.34	11.08	9.49	8.76	8.71
15	9.01	9.07	8.71	8.32	8.65	10.64	11.77	11.18	11.27	9.77	8.80	8.97
20	9.10	8.97	8.76	8.47	8.80	11.00	11.57	11.25	10.56	9.67	8.84	9.47
25	9.14	9.01	8.71	8.47	9.34	11.22	11.99	11.50	10.08	9.56	8.94	9.23
EOM	8.82	8.84	8.47	8.62	10.01	11.38	12.22	11.63	9.99	8.96	8.84	10.05

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	9.78	8.62	8.48	7.80	8.61	9.67	12.00	12.23	11.95	11.48	10.06	9.63
10	9.29	8.41	8.39	8.23	8.48	10.24	12.44	11.77	11.83	11.39	9.51	9.42
15	9.71	8.49	8.23	8.19	8.95	10.30	12.26	12.12	11.61	11.40	10.15	9.49
20	9.30	8.56	8.13	8.52	9.28	10.69	12.32	12.25	11.32	11.40	9.80	9.34
25	8.83	8.71	8.16	8.75	9.08	11.52	12.23	11.79	11.40	10.39	9.86	9.24
EOM	8.93	8.67	8.06	8.65	9.08	11.92	11.98	12.02	11.40	10.33	9.75	9.04

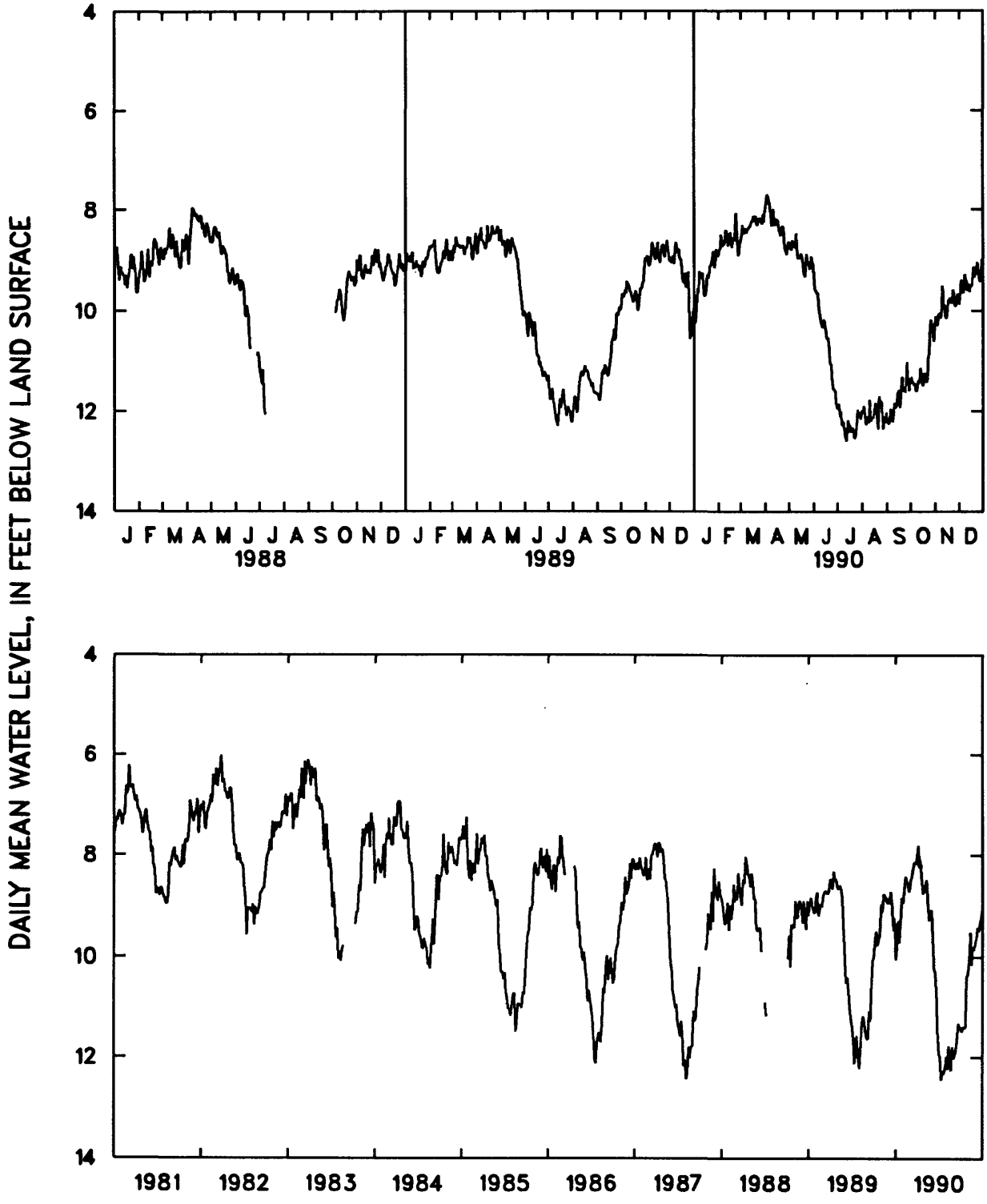


Figure 36.--Water level in observation well NC-139 (Castle Hayne aquifer), Carteret County.

NC-145 NEAR BONNERTON, BEAUFORT COUNTY

WELL-IDENTIFICATION NUMBER.--352037076514101; DEHNR Bonnerton Research Station well P18v5.

LOCATION.--Lat 35°20'37", long 76°51'41", Hydrologic Unit 03020104, 1 mile south of Bonnerton on Secondary Road 1936.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 280 feet, diameter 4 inches, cased to 169 feet, open hole to 280 feet; measured depth 278 feet, September 1981.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 36.41 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.70 feet above land-surface datum.

REMARKS.--Local-effects well. Water levels affected by nearby pumping associated with mining operations. Periods of missing continuous record are supplemented with periodic water-level measurements; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to July 1984 were provided by DEHNR.

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, DEHNR. U.S. Geological Survey continuous record began July 1984.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 68.18 feet below land-surface datum, October 26, 1982; lowest, 100.32 feet below land-surface datum, October 9 and 10, 1989.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual reports, Water Resources Data-North Carolina NC-85-1, NC-86-1, and NC-87-1, should be adjusted by -0.23 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	77.44	78.96	78.96	---	81.50	---	---	87.47	88.85	---	---
10	---	77.58	78.41	---	82.28	81.00	---	---	87.67	---	---	---
15	---	77.57	78.22	---	82.26	81.37	---	---	88.35	---	---	---
20	76.57	77.60	77.94	---	82.27	81.45	---	86.20	88.58	---	88.95*	---
25	77.16	78.11	79.43	---	82.33	81.43	---	86.58	88.58	---	---	---
EOM	77.67	78.91	79.83	---	82.23	---	---	87.26	88.78	---	---	89.68

* Periodic water-level measurement made on November 22.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	90.21	94.68	93.39	92.31	93.41	95.23	97.31*	---	---	100.04	96.85	---
10	90.19	94.47	93.36	92.42	93.24	96.42	---	---	---	100.25	---	---
15	90.54	94.32	93.23	92.09	---	96.85	---	96.82*	---	99.09	---	---
20	91.01	94.16	93.28	92.17	---	96.95	---	---	---	98.53	---	---
25	93.52	93.73	92.91	93.41	---	---	---	---	---	98.58	96.36*	---
EOM	94.86	94.08	91.58	93.27	94.68	---	---	---	---	97.42	---	---

* Periodic water-level measurements made on July 6, August 15, and November 28, respectively.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	---	95.44*	---	---	---	94.55	---	89.74	91.14	91.52	88.98
10	---	---	---	---	---	92.48	92.10	---	90.24	91.46	89.96	88.64
15	---	---	---	---	---	94.15	93.61	---	90.19	90.19	89.56	87.34
20	95.36*	---	---	---	---	94.14	---	---	91.03	89.22	89.11	86.97
25	---	---	---	94.44*	---	94.02	---	---	91.27	90.78	89.32	92.11
EOM	---	---	---	---	---	94.00	---	89.46	91.09	92.85	89.60	92.64

* Periodic water-level measurements made on January 23, March 6, and April 25, respectively.

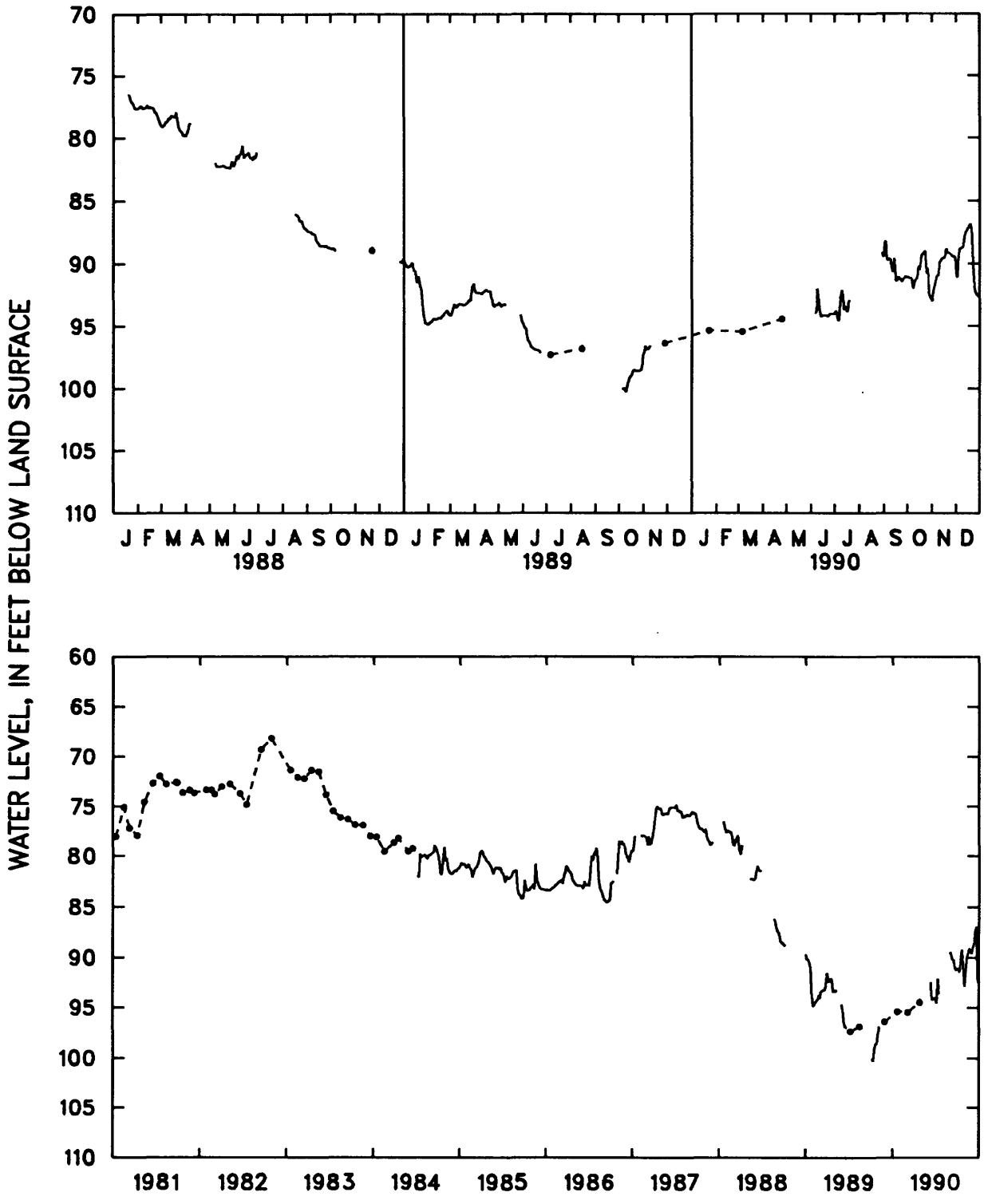


Figure 37.--Water level in observation well NC-145 (Castle Hayne aquifer), Beaufort County.

NC-152 NEAR PARKVILLE, PERQUIMANS COUNTY

WELL-IDENTIFICATION NUMBER.--361744076274403; DEHNR Parkville Research Station well E13m3.

LOCATION.--Lat 36°17'44", long 76°27'44", Hydrologic Unit 03010205, 3.5 miles west of Parkville, west of Secondary Road 1223 on logging road.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 351 feet, diameter 4 inches, cased to 336 feet, open hole to 351 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, November 1986 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 16.73 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 3.0 feet above land-surface datum.

COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by DEHNR.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.46 feet below land-surface datum, December 20, 1978; lowest, 9.85 feet below land-surface datum, October 16, 17, 20, and 21, 1990.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.49 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	9.29	9.18	9.27	9.30	9.28	9.33	9.48	9.49	9.55	9.65	9.41	9.58
10	9.23	9.22	9.10	9.31	9.31	9.31	9.38	9.49	9.52	9.63	9.56	9.53
15	9.26	9.10	9.19	9.21	9.35	9.43	9.35	9.53	9.60	9.74	9.59	9.53
20	9.11	9.03	9.20	9.19	9.24	9.30	9.61	9.53	9.60	9.64	9.53	9.59
25	9.11	9.20	9.29	9.26	9.25	9.36	9.48	9.52	9.62	9.56	9.57	9.52
EOM	9.30	9.21	9.36	9.31	9.35	9.30	9.53	9.61	9.73	9.65	9.54	9.51

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	9.50	9.44	9.08	9.15	9.18	9.29	9.36	9.41	9.50	9.31	9.34	9.28
10	9.48	9.42	9.11	9.16	9.10	9.23	9.41	9.42	9.49	9.36	9.25	9.16
15	9.32	9.43	9.05	9.07	9.20	9.30	9.39	9.18	9.52	9.37	---	9.22
20	9.33	9.26	9.18	9.18	9.30	9.38	9.23	9.25	9.31	9.25	---	9.25
25	9.43	9.18	9.01	9.21	9.30	9.28	9.40	9.32	9.38	9.38	---	9.25
EOM	9.38	9.05	9.03	9.19	9.44	9.36	9.41	9.40	9.34	9.26	---	9.21

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	9.25	9.32	9.37	9.28	9.31	9.46	9.64	9.75	9.60	9.71	9.62	---
10	9.17	9.22	9.37	9.40	9.37	9.49	9.71	9.55	9.62	9.74	9.47	---
15	9.32	9.35	9.41	9.36	9.46	9.56	9.59	9.59	9.43	9.74	---	---
20	9.30	9.36	9.30	9.49	9.49	9.60	9.61	9.50	9.57	9.84	---	---
25	9.24	9.40	9.40	9.45	9.47	9.66	9.69	9.44	9.62	9.56	---	---
EOM	9.31	9.37	9.26	9.42	9.44	9.69	9.64	9.51	9.64	9.66	---	---

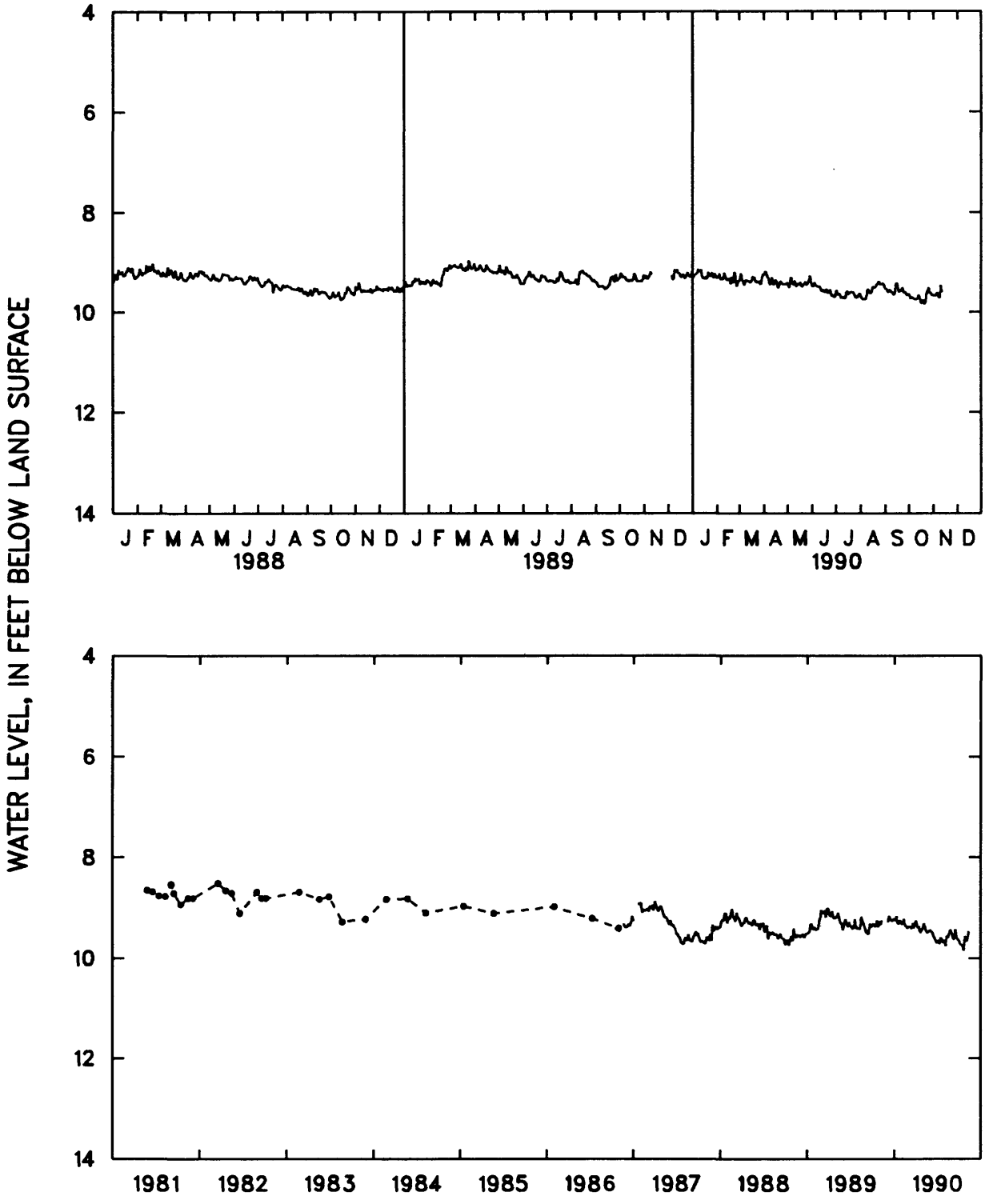


Figure 38.--Water level in observation well NC-152 (Castle Hayne aquifer), Perquimans County.

NC-156 AT LAKE PHELPS, WASHINGTON COUNTY

WELL-IDENTIFICATION NUMBER.--354351076260501; DEHNR Lake Phelps Research Station well L1311.

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.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 510 feet, diameter 6 inches, cased to 390 feet, open hole to 510 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, November 1986 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 16.15 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.47 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing data.

COOPERATION.--Periodic water-level measurements prior to October 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 13.14 feet below land-surface datum, May 16, 1978; lowest, 16.29 feet below land-surface datum, October 14, 1988.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.13 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	15.30	15.12	15.07	14.81	14.63	14.74	15.23	15.75	15.88	16.15	15.68	15.98
10	15.27	15.13	14.71	14.80	14.67	14.75	15.17	15.81	16.09	16.05	15.95	15.90
15	15.29	14.91	14.82	14.65	14.66	14.92	15.23	15.86	16.14	16.19	16.02	15.88
20	15.01	14.78	14.86	14.64	14.64	14.95	15.46	15.84	16.11	16.10	15.83	16.02
25	14.96	15.02	15.01	14.69	14.60	14.98	15.49	15.86	16.09	15.96	15.94	15.86
EOM	15.25	15.00	14.98	14.73	14.70	14.88	15.62	16.04	16.25	16.09	15.91	15.88

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	15.91	15.82	15.48	15.29	15.03	15.03	15.14	15.01	15.27	15.09	15.08	14.76
10	15.97	15.83	15.55	15.34	14.85	15.00	15.12	15.20	15.19	15.17	14.89	14.71
15	15.75	15.83	15.34	15.10	14.95	15.08	15.16	14.93	15.18	15.12	14.92	14.75
20	15.68	15.65	15.51	15.20	15.02	15.18	14.90	15.05	15.12	15.01	14.84	14.79
25	15.84	15.59	15.27	15.14	15.01	15.06	15.12	15.06	15.18	15.19	15.01	14.71
EOM	15.68	15.43	15.08	15.13	15.13	15.15	15.08	15.14	15.19	14.94	14.90	14.63

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	14.69	14.68	14.66	14.32	14.29	14.44	14.97	15.87	15.95	15.95	15.59	---
10	14.54	14.44	14.59	14.52	14.34	14.46	15.15	15.78	15.95	15.89	15.35	---
15	14.81	14.68	14.58	14.36	14.58	14.58	15.29	15.87	15.81	15.85	15.73	---
20	14.71	14.75	14.45	14.63	14.50	14.67	15.39	15.83	15.98	16.01	---	---
25	14.59	14.76	14.60	14.46	14.56	14.77	15.54	15.81	16.00	15.65	---	---
EOM	14.70	14.69	14.36	14.40	14.45	14.85	15.60	15.86	15.94	15.81	---	---

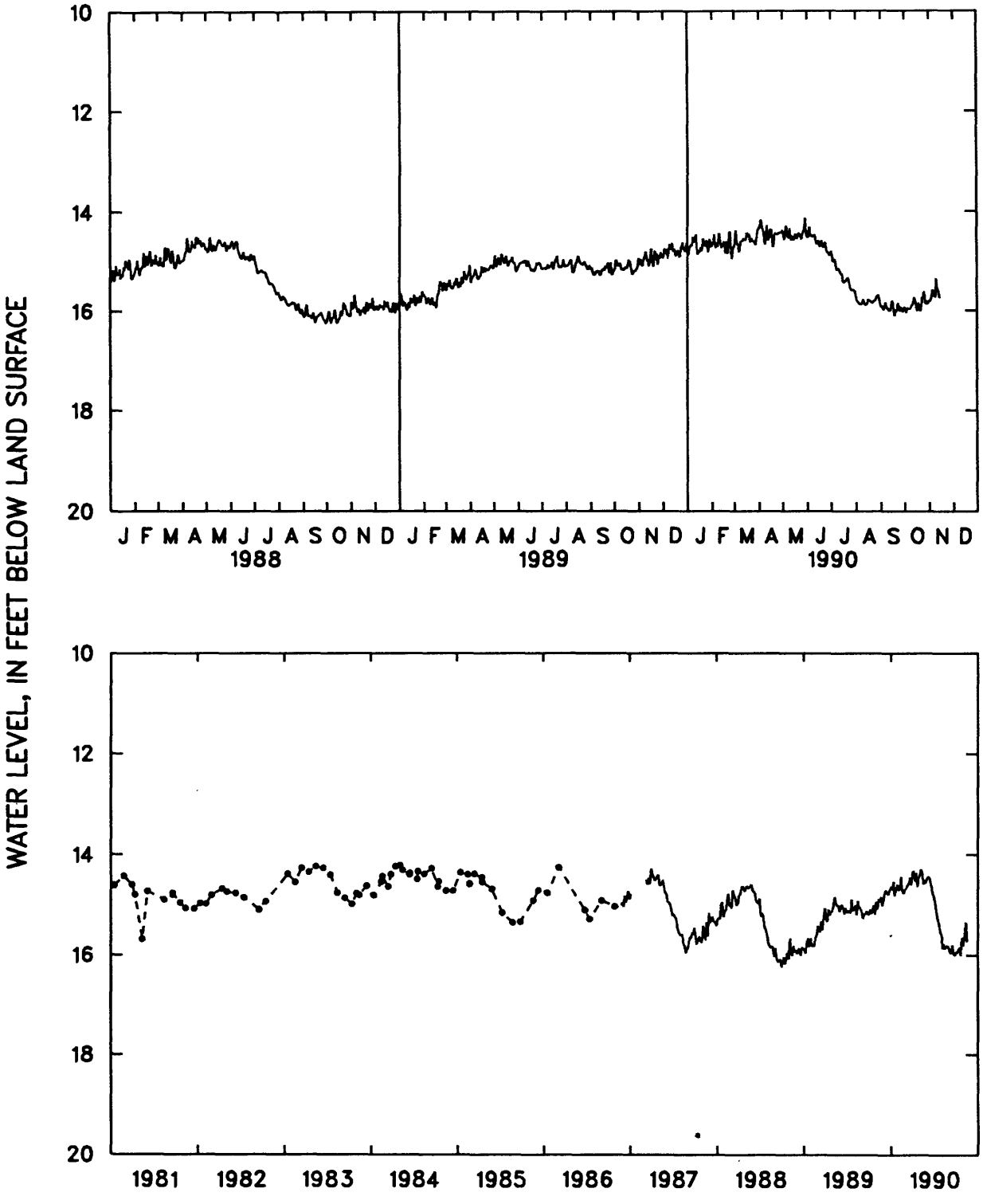


Figure 39.--Water level in observation well NC-156 (Castle Hayne aquifer), Washington County.

NC-159 AT HYDELAND, HYDE COUNTY

WELL-IDENTIFICATION NUMBER.--352527076123103; DEHNR Hydeland Research Station well O10w3.

LOCATION.--Lat 35°25'27", long 76°12'31", Hydrologic Unit 03020105, 0.7 mile east of Secondary Road 1121 on Secondary Road 1122.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 700 feet, diameter 6 inches, cased to 640 feet, open hole to 700 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, November 1986 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 3.17 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 1.58 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.79 foot above land-surface datum, July 17, 1975; lowest, 1.14 feet below land-surface datum, September 14, 1982.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.25 foot.

WATER LEVEL, IN FEET BELOW OR ABOVE (-) LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	.57	---	.62	.56	.31	.36	.53	.52	.32	.55	.27	.72
10	.57	---	.27	.51	.35	.36	.43	.51	.49	.42	.55	.68
15	.61	---	.43	.29	.33	.45	.48	.53	.57	.61	.66	.68
20	.39	---	.47	.29	.32	.47	.65	.49	.55	.60	.53	.81
25	.32	---	.66	.33	.29	.49	.57	.42	.52	.50	.62	.69
EOM	---	---	.69	.39	.39	.30	.57	.50	.64	.62	.61	.72

WATER LEVEL, IN FEET BELOW OR ABOVE (-) LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	.75	.74	.51	.36	.32	.47	.49	.30	.35	.09	.21	.18
10	.81	.77	.47	.50	.21	.42	.47	.37	.25	.20	.08	---
15	.59	.84	.33	.29	.31	.48	.52	.21	.28	.19	.14	---
20	.55	.68	.37	.39	.39	.56	.35	.29	.16	.08	.13	---
25	.72	.62	.38	.33	.40	.43	.49	.26	.15	.30	.36	---
EOM	.62	.46	.34	.39	.54	.53	.44	.31	.14	.02	.31	---

WATER LEVEL, IN FEET BELOW OR ABOVE (-) LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	.29	.33	-.11	-.11	-.07	.00	.13	.01	.17	-.06	---
10	---	.07	.25	.08	-.07	-.07	.09	-.14	.00	.17	-.25	---
15	---	.30	.25	-.04	.11	-.06	.15	-.02	-.17	.14	.23	---
20	---	.37	.13	.24	.04	-.07	.17	-.01	-.02	.28	---	---
25	.20	.43	.26	.12	.06	.03	.16	-.07	.06	-.09	---	---
EOM	.31	.37	-.04	.03	-.01	.02	.02	-.06	.09	.08	---	---

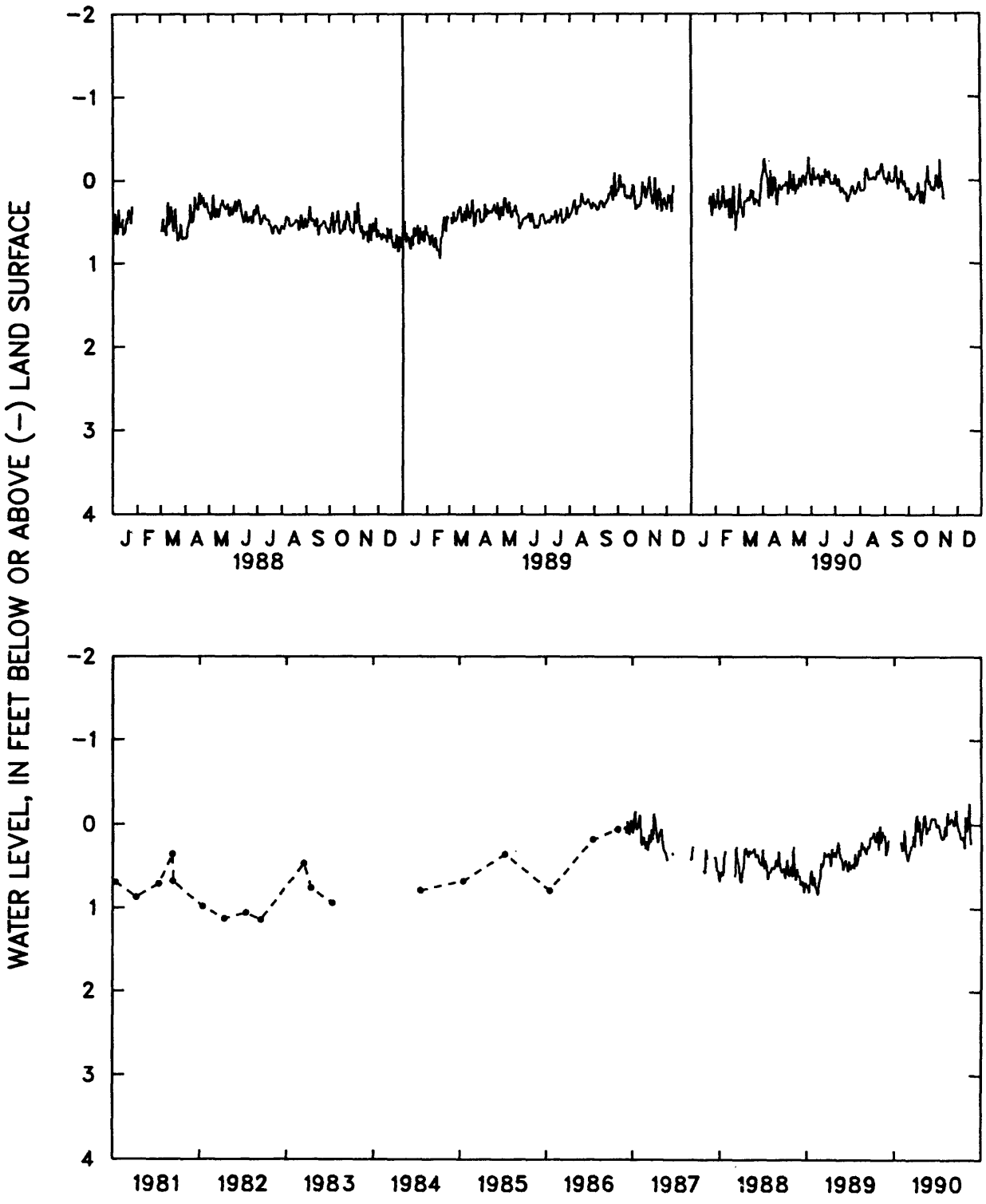


Figure 40.--Water level in observation well NC-159 (Castle Hayne aquifer), Hyde County.

NC-163 NEAR COXS CROSSROADS, BEAUFORT COUNTY

WELL-IDENTIFICATION NUMBER.--352224076570403; DEHNR 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 mile north of N.C. Highway 32 on Secondary Road 1100.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 250 feet, diameter 4 inches, cased to 81 feet, open hole to 250 feet, measured depth 236.5 feet, September 1981.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 25.38 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of plastic sleeve on instrument shelf, 2.07 feet above land-surface datum (since July 1990).

REMARKS.--Areal-effects well. Periods of missing continuous record are supplemented with periodic water-level measurements; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to December 1986 were provided by DEHNR.

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, DEHNR. U.S. Geological Survey continuous record began November 1986.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 21.14 feet below land-surface datum, February 23, 1972; lowest, 31.36 feet below land-surface datum, February 4 and 5, 1989.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by -0.1 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	26.97	26.27	26.19	---	26.08	26.92	---	---	---	30.30*	30.20	30.66
10	26.90	26.29	---	26.24	26.42	---	---	---	---	---	30.46	30.50
15	26.81	26.12	---	25.96	26.62	---	---	28.98*	---	---	30.48	30.42
20	26.43	25.91	---	25.74	26.60	---	---	---	---	---	30.34	30.46
25	26.33	26.13	---	25.60	26.73	---	---	---	---	---	30.47	30.64
EOM	26.54	26.18	---	25.76	26.89	27.29*	---	---	---	30.55	30.53	30.67

* Periodic water-level measurements made on June 30, August 17, and October 6, respectively.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	30.77	31.28	30.41	---	---	---	---	---	---	29.84*	---	29.06
10	30.92	31.29	30.18	---	28.91*	---	---	---	---	---	---	28.58
15	30.73	31.18	29.81	---	---	---	---	29.94*	---	---	---	28.59
20	30.78	30.88	29.77	---	---	---	---	---	---	---	---	28.56
25	30.90	30.68	---	---	---	---	---	---	---	---	---	28.49
EOM	31.07	30.49	---	---	---	---	---	---	---	---	29.15	28.40

* Periodic water-level measurements made on May 10, August 15, and October 5, respectively.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	28.45	---	27.91	---	---	---	---	29.41	28.00	28.80	29.08	28.88
10	28.28	---	---	---	---	---	---	29.39	28.02	28.93	28.81	28.66
15	28.52	27.92	---	---	---	---	---	29.21	28.04	29.00	28.95	28.51
20	28.39	27.90	---	---	---	---	29.25	28.75	28.33	29.11	28.79	28.41
25	---	27.95	---	27.74*	---	---	29.25	28.36	28.55	28.77	28.63	28.58
EOM	28.06*	28.01	---	---	---	---	29.28	28.03	28.63	29.10	28.85	28.90

* Periodic water-level measurements made on January 30 and April 25, respectively.

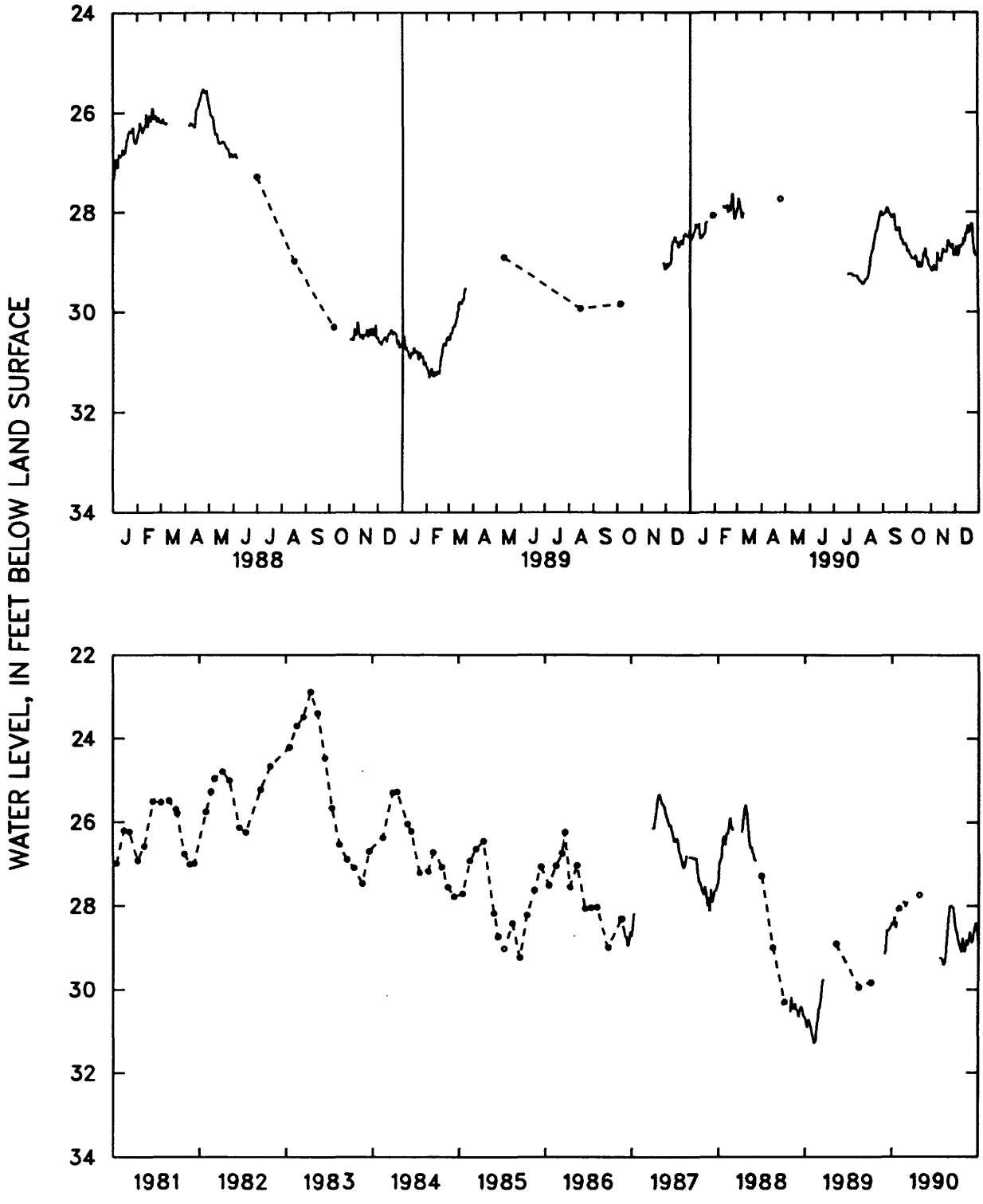


Figure 41.--Water level in observation well NC-163 (Castle Hayne aquifer), Beaufort County.

NC-169 NEAR MERRITT, PAMLICO COUNTY

WELL-IDENTIFICATION NUMBER.--350523076392206; DEHNR Whortonsville Research Station well S15y6.

LOCATION.--Lat 35°05'23", long 76°39'22", Hydrologic Unit 03020204, 3.4 miles east of Merritt on Secondary Road 1321, 0.5 mile northeast of intersection of Secondary Roads 1321 and 1322.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 290 feet, diameter 4 inches, cased to 223 feet and from 228 to 270 feet, screened intervals from 223 to 228 and 270 to 275 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, December 1986 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 7.54 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.53 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to December 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.00 feet below land-surface datum, May 10, 1978; lowest, 7.69 feet below land-surface datum, October 20, 21, 22, and 23, 1990.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.11 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	5.60	5.07	4.88	4.92	4.87	5.13	5.99	7.12	7.12	7.03	7.15	7.12
10	5.48	5.04	4.77	4.88	4.93	5.13	6.21	7.08	7.07	7.02	7.29	7.04
15	5.35	4.94	4.83	4.65	4.99	5.33	6.41	---	7.09	7.14	7.32	6.96
20	5.20	4.89	4.81	4.74	4.97	5.49	6.69	7.30	7.05	7.20	7.25	6.94
25	5.06	4.93	4.87	4.79	5.06	5.67	6.80	7.23	7.04	7.22	7.16	6.92
EOM	5.13	4.89	4.91	4.83	5.09	5.74	7.04	7.15	7.04	7.28	7.13	6.89

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	6.83	6.21	5.71	5.07	4.85	5.54	6.35	6.90	6.73	6.24	5.45	5.31
10	6.78	6.14	5.42	4.99	4.87	5.65	6.44	6.94	6.74	6.05	5.39	5.06
15	6.61	6.15	5.34	4.81	4.91	5.90	6.59	6.82	6.74	5.90	5.37	5.09
20	6.53	6.00	5.32	4.85	5.05	6.11	6.61	6.82	6.63	5.71	5.34	5.01
25	6.41	5.87	5.09	4.81	5.15	6.12	6.73	6.85	6.56	5.68	5.32	4.86
EOM	6.28	5.80	5.06	4.81	5.35	6.28	6.86	6.85	6.43	5.47	5.33	4.87

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	4.91	4.84	4.86	4.71	4.85	5.25	6.19	7.28	7.30	7.47	7.51	---
10	4.80	4.79	4.84	4.74	4.98	5.37	6.39	7.28	7.30	7.51	7.29	---
15	4.83	4.85	4.89	4.69	5.06	5.44	6.64	7.43	7.25	7.57	---	---
20	4.83	4.85	4.83	4.75	5.15	5.56	6.80	7.46	7.29	7.69	---	---
25	4.81	4.91	4.90	4.80	5.17	5.75	6.98	7.37	7.34	7.56	---	---
EOM	4.81	4.92	4.67	4.80	5.18	5.93	7.10	7.37	7.41	7.51	---	---

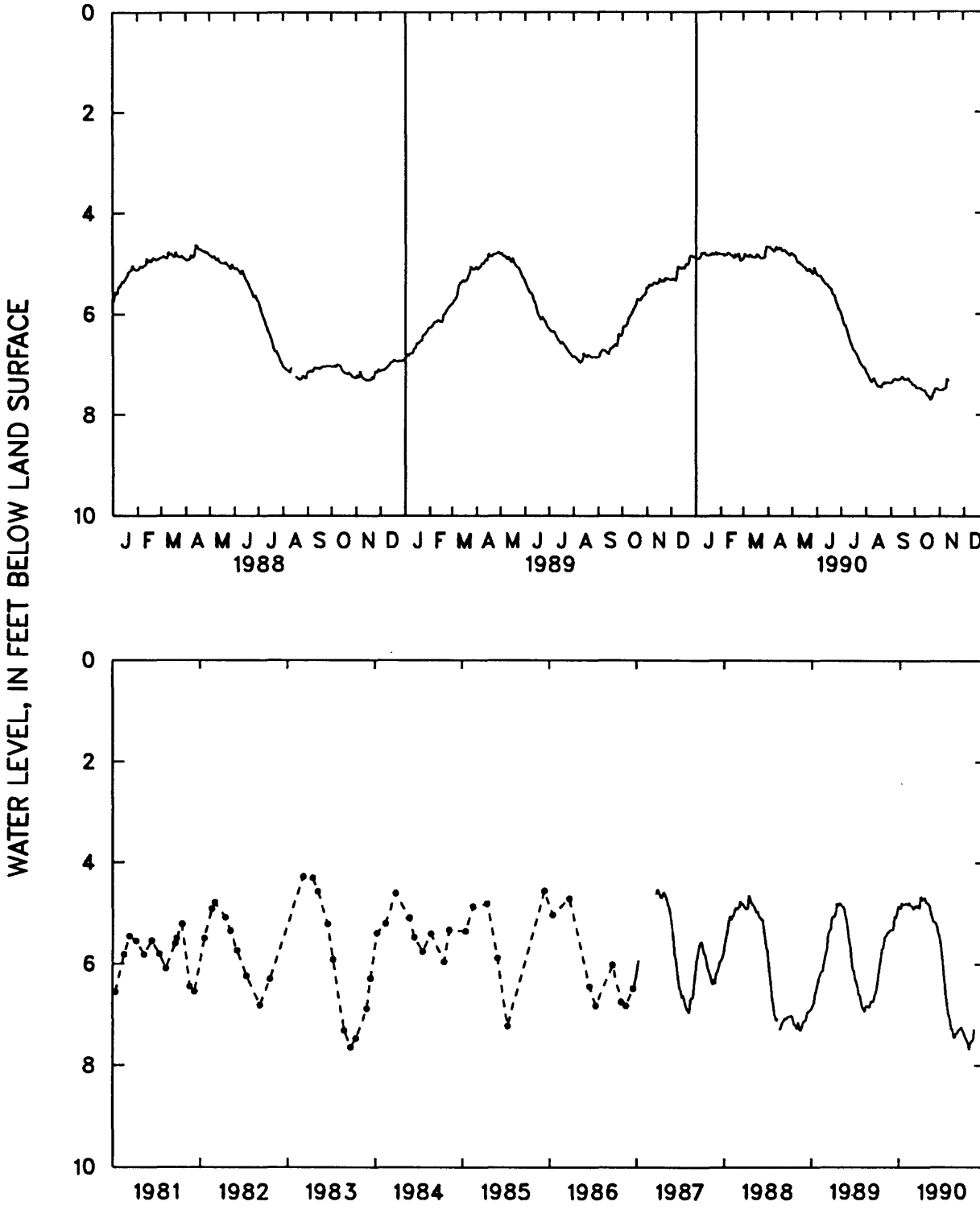


Figure 42.--Water level in observation well NC-169 (Castle Hayne aquifer), Pamlico County.

NC-181 NEAR SUNSET HARBOR, BRUNSWICK COUNTY

WELL-IDENTIFICATION NUMBER.--335629078115406; DEHNR Sunset Harbor Research Station well GG34s6.

LOCATION.--Lat 33°56'29", long 78°11'54", Hydrologic Unit 03040207, 1 mile north of Sunset Harbor, 4.3 miles south of N.C. Highway 211 on Secondary Road 1112.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Castle Hayne aquifer of Oligocene and Eocene age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 102 feet, diameter 6 inches, cased to 84 feet, open hole to 102 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 28.06 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.02 feet 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; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to April 1986 were provided by DEHNR.

PERIOD OF RECORD.--September 1974 to current year. Records for well GG34s5 from September 1974 to March 1986 are unpublished and available in the files of the Groundwater Section, DEHNR. 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, 13.53 ft below land-surface datum, August 1, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	9.55	10.00	10.49	---	9.82	10.32	11.07	11.30	9.57	9.98	10.35	10.78
10	9.47	10.09	10.54	---	9.98	10.50	11.26	11.07	9.55	9.99	10.48	10.84
15	9.48	10.14	10.38	---	10.04	11.18	11.05	10.34	9.62	10.16	10.61	10.92
20	9.56	10.29	10.40	9.84	10.11	10.69	11.22	10.37	9.61	10.23	10.63	11.00
25	9.69	10.46	10.24	9.78	10.25	10.79	11.32	10.21	9.71	10.33	10.71	11.05
EOM	9.89	10.57	---	9.90	10.15	10.80	11.34	10.00	9.82	10.39	10.66	11.12

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	11.21	11.60	11.76	11.37	10.89	11.50	11.81	11.91	11.99	11.42	11.56	12.00
10	11.26	11.68	11.76	11.32	10.87	11.42	11.64	11.96	12.06	11.38	11.66	11.84
15	11.30	11.73	11.74	11.01	10.95	11.69	11.64	12.00	12.12	11.38	11.68	11.61
20	11.40	11.75	11.74	10.96	11.13	11.41	11.69	11.89	12.27	11.48	11.76	11.63
25	11.49	11.79	11.62	10.87	11.27	11.45	11.82	11.84	12.09	11.54	11.88	11.60
EOM	11.55	11.79	11.41	10.95	11.37	11.59	11.98	11.96	11.57	11.48	11.95	11.52

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	11.50	11.51	11.68	11.45	11.36	12.06	12.64	12.93	12.37	12.87	12.80	13.19
10	11.42	11.41	11.69	11.29	11.43	12.84	12.67	12.79	12.42	12.90	12.81	13.14
15	11.42	11.54	11.77	11.25	11.63	12.46	12.67	12.87	12.41	13.06	12.96	13.16
20	11.38	11.59	11.83	11.32	11.70	12.36	12.66	12.81	12.60	13.18	13.04	13.23
25	11.38	11.71	11.87	11.57	11.83	12.71	12.78	12.66	12.66	12.69	13.09	13.26
EOM	11.46	11.57	11.79	11.43	11.92	12.52	13.12	12.40	12.77	12.78	13.15	13.28

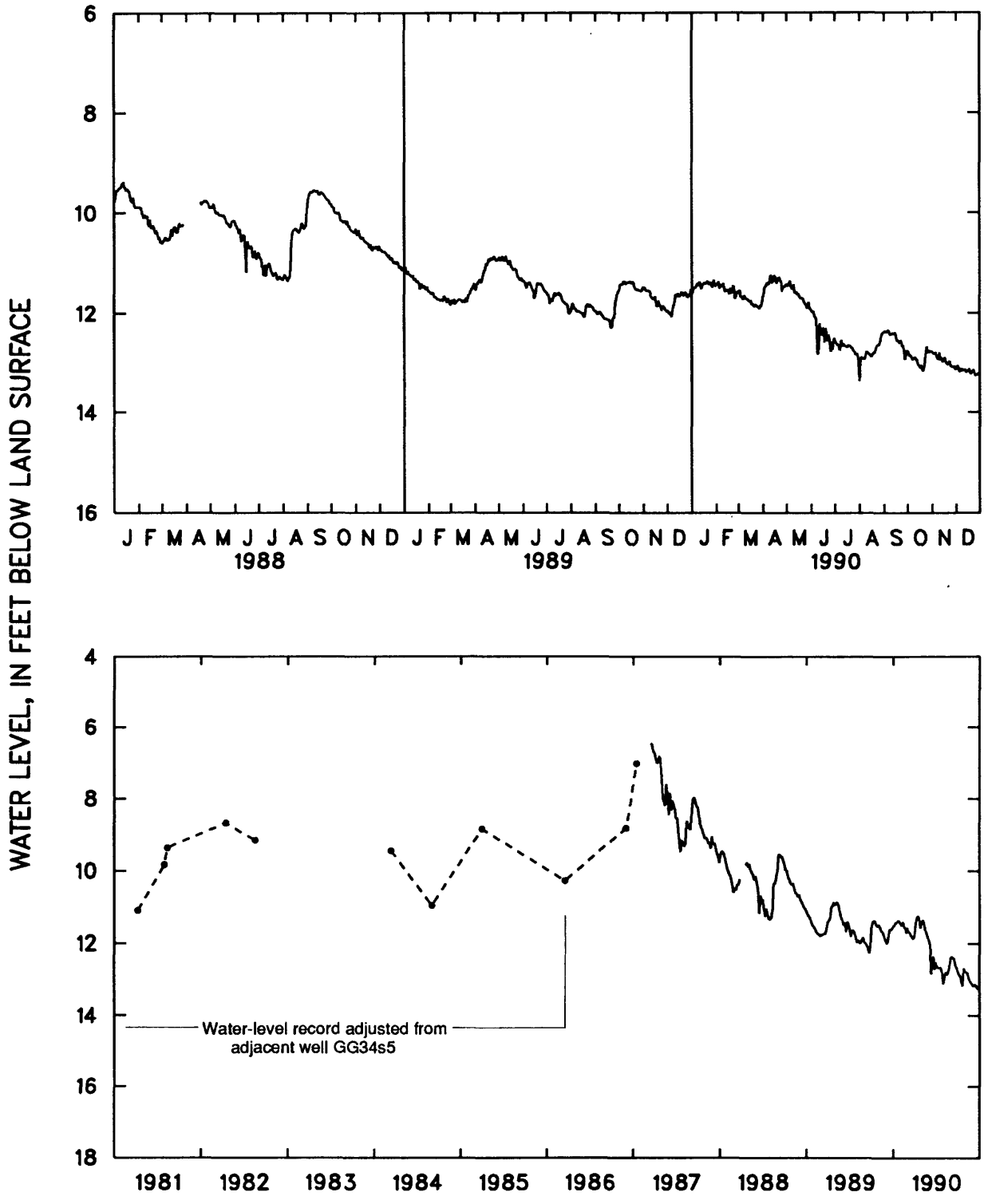


Figure 43.--Water level in observation well NC-181 (Castle Hayne aquifer), Brunswick County.

Peedee Aquifer

Eight wells monitor water levels in the Peedee aquifer (fig. 44). Six of these (NC-164, NC-174, NC-178, NC-180, NC-187, and NC-188; figs. 45-48, 51, and 52) had record low water levels during 1988-90, and NC-184 (fig. 49) reached a record high level in 1989. Six wells (NC-164, NC-174, NC-178, NC-180, NC-184, and NC-185; figs. 45-50) show fairly uniform water-level fluctuations throughout most of the areal extent of the aquifer. All six show seasonal water-level fluctuations, and water levels were generally lower during the summer through early winter in 1988 and 1990 than in 1989. No strong long-term trend of water-level rise or decline is evident in the hydrographs for any of these six wells.

Well NC-187 (fig. 51) shows a steady downward water-level trend of 1.6 ft per year. This well is in southern Jones County and is within 12 mi of several public-supply wells in northwest Onslow County, from which water is withdrawn from both the Peedee and Black Creek aquifers (Eimers and others, 1990). 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) in their potentiometric-surface map of the Peedee aquifer in the central Coastal Plain. Well NC-188 is in southern Onslow County and is nearly 14 mi from the nearest well withdrawing water from the Peedee. Water levels in NC-188 (fig. 52) showed almost no change from 1988 through mid-1990, but then they declined nearly a foot by the end of 1990. The average decline through the 1988-90 period was about 0.2 ft per year, identical to the 1982-90 trend.

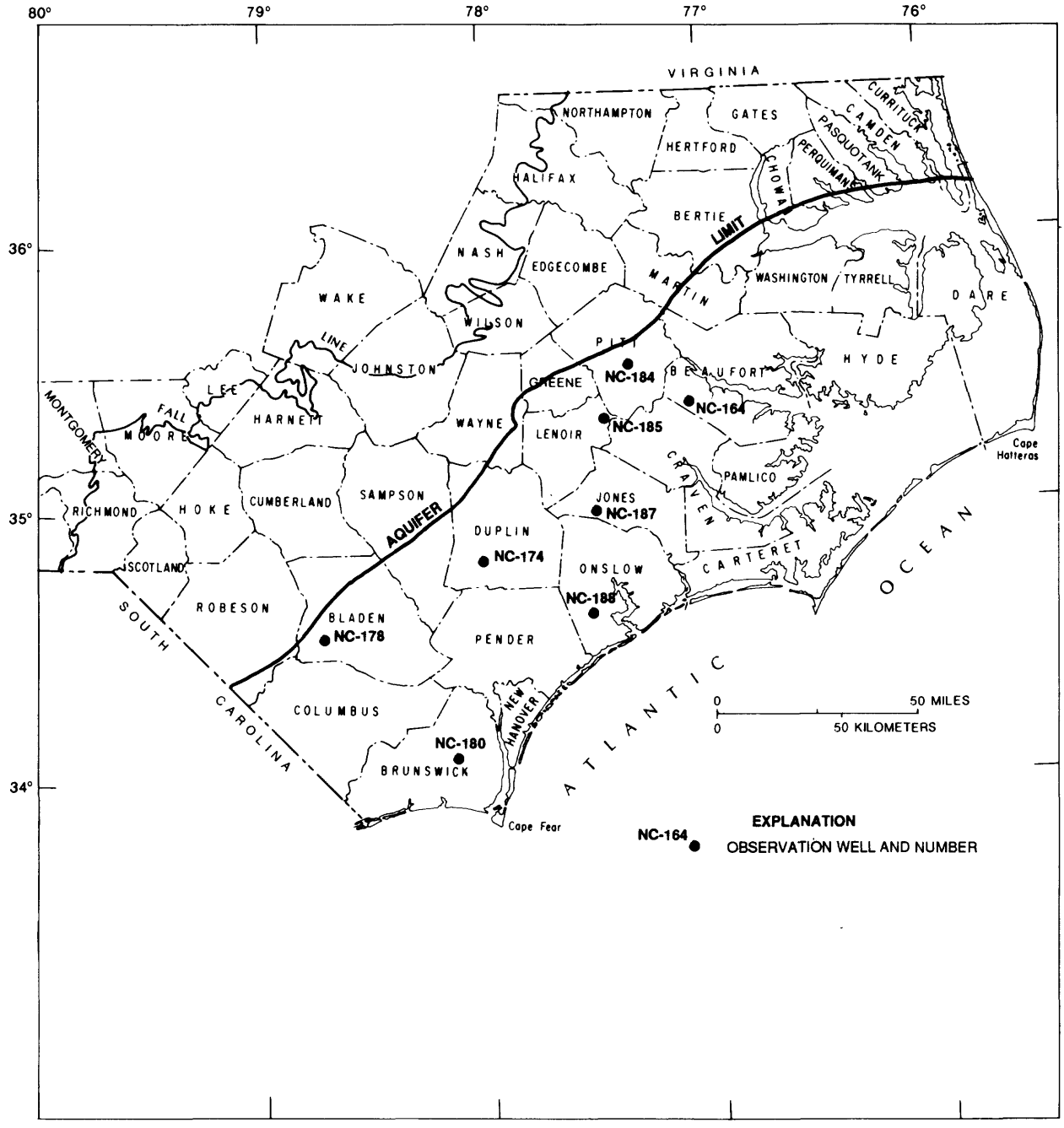


Figure 44.--Locations of observation wells completed in the Peedee aquifer.

NC-164 NEAR WILMAR, BEAUFORT COUNTY

WELL-IDENTIFICATION NUMBER.--352252077050707; DEHNR Wilmar Research Station well P21k7.

LOCATION.--Lat 35°22'53", long 77°05'17", Hydrologic Unit 03020202, 3.5 miles southeast of Wilmar, 0.5 mile east of intersection of Secondary Roads 1129 and 1130 on logging road.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Peedee aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 320 feet, diameter 6 inches, cased to 290 feet, screened interval from 290 to 310 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, December 1986 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 40.56 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.94 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.03 feet below land-surface datum, April 27, 1973; lowest, 19.40 feet below land-surface datum, January 11 and 14, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	17.35	15.97	15.39	15.16	14.92	15.14	---	16.99	17.80	---	18.73	19.17
10	17.10	15.85	15.16	15.19	14.95	15.12	---	17.15	18.01	18.51	18.93	19.16
15	16.90	15.62	15.21	15.11	14.97	15.32	---	17.30	18.17	18.66	19.02	19.18
20	16.50	15.46	15.19	15.06	14.97	15.41	---	17.43	---	18.74	18.96	19.29
25	16.26	15.51	15.26	15.05	14.96	15.55	---	17.52	---	18.73	19.08	19.25
EOM	16.20	15.43	15.22	15.01	15.09	15.57	16.81	17.79	---	18.88	19.10	19.29

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	19.31	19.28	18.73	17.15	15.99	15.60	16.01	15.66	15.91	16.07	15.67	15.54
10	19.38	19.29	18.55	16.96	15.75	15.64	16.02	15.75	15.96	15.98	15.59	15.41
15	19.27	19.28	18.22	16.62	15.66	15.81	16.05	15.66	16.08	15.83	15.62	15.40
20	19.24	19.14	18.07	16.52	15.62	15.90	15.91	15.73	16.12	15.67	15.59	15.29
25	19.30	18.99	17.66	16.33	15.52	15.87	15.94	15.71	16.20	15.74	15.66	15.10
EOM	19.22	18.84	17.28	16.16	15.62	16.02	15.81	15.79	16.21	15.60	15.63	14.89

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	14.82	14.33	14.26	13.94	13.92	14.30	15.20	16.81	16.32	16.81	17.51	---
10	14.61	14.20	14.23	14.00	13.99	14.33	15.46	16.85	16.25	16.98	17.38	---
15	14.63	14.32	14.21	13.88	14.16	14.44	15.72	16.89	16.18	17.15	17.63	---
20	14.49	14.35	14.11	14.01	14.19	14.55	15.98	16.80	16.34	17.42	---	---
25	14.36	14.34	14.19	13.94	14.27	14.74	16.26	16.65	16.47	17.33	---	---
EOM	14.37	14.31	13.98	13.92	14.27	14.97	16.48	16.43	16.62	17.56	---	---

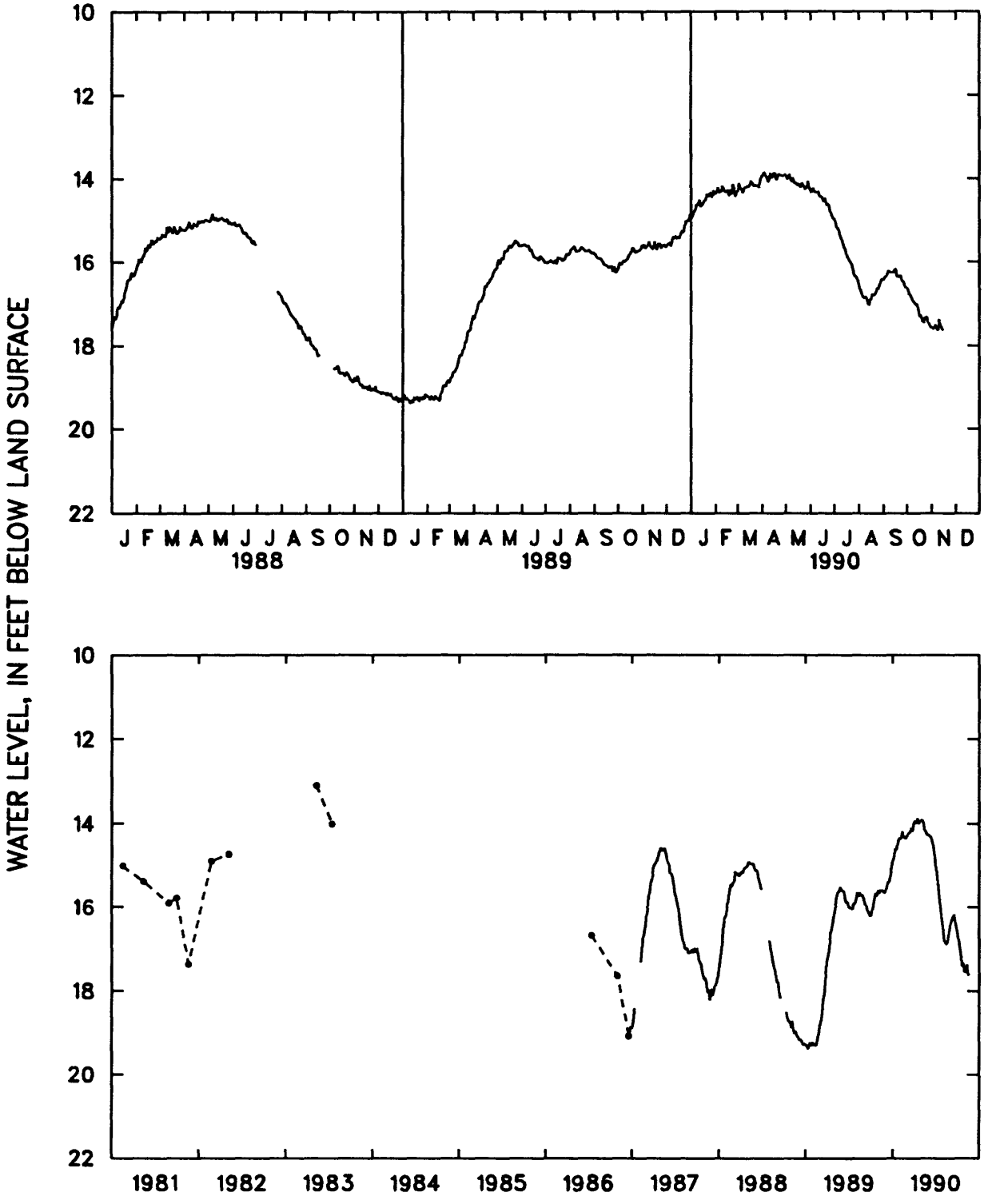


Figure 45.--Water level in observation well NC-164 (Peedee aquifer), Beaufort County.

NC-174 NEAR ROSE HILL, DUPLIN COUNTY

WELL-IDENTIFICATION NUMBER.--345051078012101; DEHNR Rose Hill Research Station well V32v1.

LOCATION.--Lat 34°50'51", long 78°01'21", Hydrologic Unit 03030007, 1.5 miles north of Rose Hill at Rose Hill-Magnolia Elementary School, east of U.S. Highway 117 on Secondary Road 1911.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Peedee aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 98 feet, diameter 4 inches, cased to 83 feet, screened interval from 83 to 98 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 85.89 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 1.75 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to January 1987 were provided by DEHNR.

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, DEHNR. U.S. Geological Survey continuous record began January 1987.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 14.30 feet below land-surface datum, March 31, 1987; lowest, 19.93 feet below land-surface datum, August 4 and 5, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	16.21	15.79	16.00	15.88	16.17	16.92	18.46	18.84	19.53	19.65	19.65	19.43
10	16.04	15.75	15.87	16.10	16.05	---	18.92	18.80	19.47	19.73	19.51	19.54
15	16.06	15.84	15.77	15.58	16.07	---	19.14	19.05	19.57	19.78	19.57	19.48
20	15.77	15.82	15.59	15.55	15.94	---	19.33	19.30	19.43	19.75	19.66	19.54
25	15.63	15.78	15.63	15.78	16.02	---	18.53	19.40	19.56	19.64	19.66	19.53
EOM	15.80	15.86	15.79	15.94	16.39	18.18	18.85	19.61	19.72	19.64	19.39	19.68

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	19.53	19.21	17.08	16.34	---	---	---	---	16.54	15.69	16.05	15.93
10	19.42	19.10	16.73	16.07	---	---	---	15.87	16.86	15.86	15.99	15.33
15	19.17	19.00	16.71	15.76	16.13	---	---	15.58	16.89	16.02	16.18	15.45
20	19.06	18.60	16.53	15.78	16.46	---	---	15.52	17.00	16.11	16.18	15.78
25	19.20	17.81	16.17	15.87	16.57	---	---	15.87	16.39	16.26	15.86	15.67
EOM	19.15	17.38	16.28	15.82	---	---	---	16.40	16.18	16.43	15.83	15.82

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	15.62	15.37	15.21	15.07	16.09	16.36	18.83	19.92	17.59	18.49	16.81	16.94
10	15.32	15.41	15.38	15.22	16.36	17.07	18.99	19.13	17.89	18.61	16.60	16.49
15	15.59	15.55	15.53	15.31	16.10	17.41	19.30	19.57	18.05	18.31	16.40	16.84
20	15.71	15.38	15.30	15.57	16.45	17.54	19.34	19.35	18.19	18.49	16.58	16.90
25	15.63	15.08	15.54	15.74	16.40	18.11	19.47	17.16	18.27	17.87	16.95	16.65
EOM	15.63	15.16	15.20	15.98	16.01	18.36	19.66	17.25	18.42	16.77	16.96	16.51

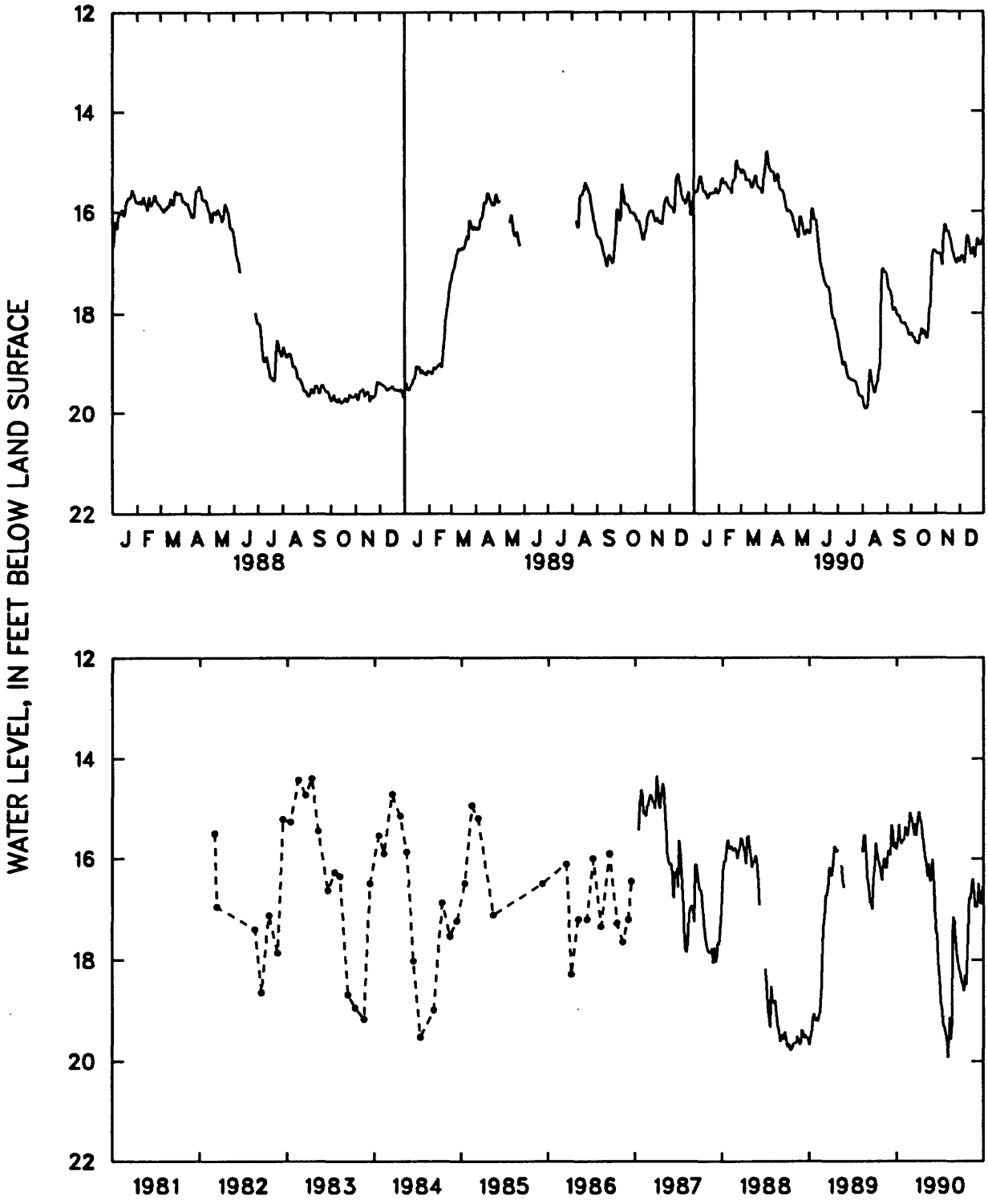


Figure 46.--Water level in observation well NC-174 (Peedee aquifer), Duplin County.

NC-178 NEAR BLADENBORO, BLADEN COUNTY

WELL-IDENTIFICATION NUMBER.--343027078451903; DEHNR Bladenboro Research Station well Z41u3.

LOCATION.--Lat 34°30'27", long 78°45'19", Hydrologic Unit 03040206, 3 miles southeast of Bladenboro, south of N.C. Highway 211 on Secondary Road 1172.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Peedee aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 110 feet, diameter 6 inches, cased to 100 feet, screened interval from 100 to 110 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 116.45 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.78 feet above land-surface datum.

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; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to January 1987 were provided by DEHNR.

PERIOD OF RECORD.--March 1976 to current year. Records for well Z41u4 from March 1976 to December 1986 are unpublished and available in the files of the Groundwater Section, DEHNR. U.S. Geological Survey continuous record for well NC-178 began January 1987.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.73 feet below land-surface datum, April 19, 1978; lowest, 7.84 feet below land-surface datum, October 10, 1990.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.11 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	3.67	3.68	3.80	3.83	4.28	5.40	6.11	5.83	4.72	5.00	5.36
10	---	3.65	3.64	3.90	3.89	4.37	5.63	6.11	5.60	4.72	5.11	5.42
15	4.19	3.60	3.68	3.81	3.91	4.48	5.86	6.09	5.41	4.84	5.20	5.48
20	3.98	3.58	3.67	3.78	3.93	4.64	6.13	6.19	5.14	4.89	5.19	5.56
25	3.79	3.60	3.70	3.77	3.98	4.92	6.11	6.28	4.87	4.94	5.21	5.60
EOM	3.73	3.62	3.74	3.85	4.10	5.02	6.19	6.11	4.78	5.05	5.27	5.70

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	5.69	5.23	4.58	3.73	3.57	4.32	---	4.17	3.98	4.10	4.08	3.84
10	5.65	5.23	4.30	3.62	3.47	4.53	---	4.14	4.09	3.93	3.95	3.60
15	5.50	5.26	4.12	3.42	3.49	4.75	5.27	4.00	4.28	3.95	3.96	3.38
20	5.34	5.24	4.04	3.42	3.56	---	4.82	3.93	4.45	3.99	3.96	3.31
25	5.27	5.00	3.79	3.49	3.71	---	4.38	3.88	4.47	4.10	3.92	3.18
EOM	5.20	4.84	3.66	3.63	4.06	---	4.28	3.88	4.48	4.17	3.86	3.15

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	3.18	3.46	3.52	3.80	4.39	4.98	6.17	6.95	7.07	7.75	6.74	6.05
10	3.07	3.49	3.58	3.86	4.50	5.13	6.28	6.82	7.18	7.83	6.47	5.95
15	3.13	3.59	3.68	3.92	4.65	5.28	6.42	6.85	7.27	7.43	6.31	5.89
20	3.20	3.62	3.76	4.03	4.80	5.50	6.41	6.93	7.40	7.33	6.11	5.82
25	3.27	3.54	3.89	4.14	4.93	5.75	6.53	6.91	7.51	7.09	6.01	5.65
EOM	3.36	3.49	3.86	4.30	4.92	6.00	6.74	6.98	7.63	6.89	6.07	5.48

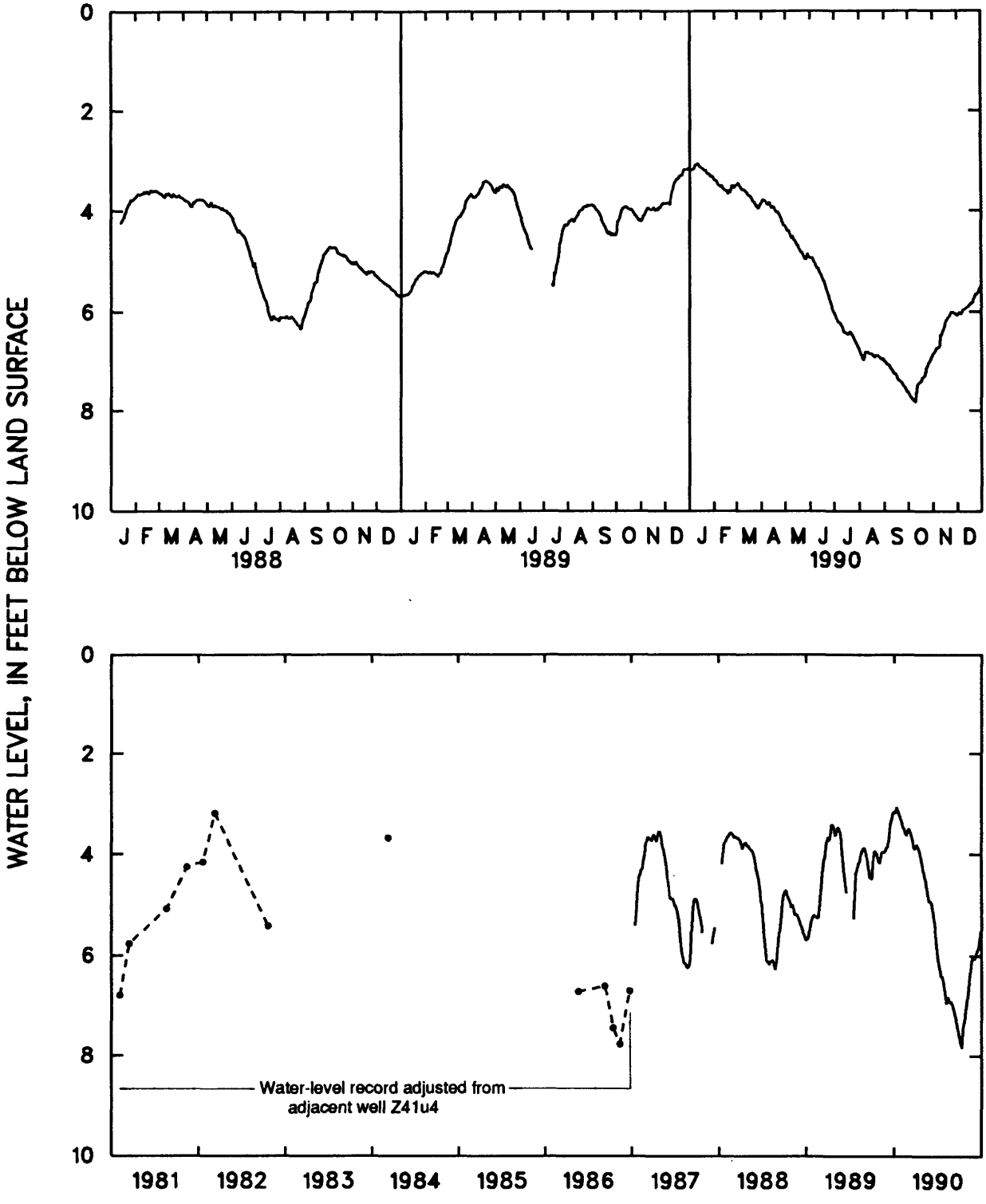


Figure 47.--Water level in observation well NC-178 (Peedee aquifer), Bladen County.

NC-180 AT BOLIVIA, BRUNSWICK COUNTY

WELL-IDENTIFICATION NUMBER.--340416078084202; DEHNR 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.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Peedee aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 140 feet, diameter 4 inches, cased to 92 feet, open hole to 140 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 40.97 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.7 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month.

COOPERATION.--Periodic water-level measurements prior to April 1987 were provided by DEHNR.

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, DEHNR. U.S. Geological Survey continuous record began May 1987.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.52 feet below land-surface datum, August 14, 1973; lowest, 14.54 feet below land-surface datum, October 22, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	10.80	9.08	9.21	9.10	9.05	10.05	10.52	10.03	9.07	9.75	9.59	10.13
10	10.67	9.55	8.73	8.94	9.19	9.94	10.56	10.11	9.11	9.37	10.17	10.29
15	10.32	9.70	8.93	9.40	9.06	9.99	10.97	9.26	9.09	9.41	10.25	10.68
20	9.68	9.37	8.87	9.07	9.44	9.74	11.64	9.23	8.88	9.71	9.85	10.57
25	9.17	9.59	9.25	8.69	9.91	10.01	11.06	9.54	8.98	9.70	10.01	9.91
EOM	9.22	8.96	8.98	8.94	9.87	10.32	10.11	9.87	9.58	9.56	10.15	10.10

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	10.45	9.90	9.57	8.94	8.92	9.85	10.18	9.83	8.85	9.66	8.84	9.26
10	10.36	10.51	9.74	8.67	8.64	9.98	10.19	9.65	8.78	9.62	8.90	8.84
15	10.02	10.39	9.61	8.53	8.90	10.44	10.11	9.26	10.02	9.48	8.79	9.36
20	10.14	10.12	9.27	8.52	9.01	10.28	9.99	9.12	9.94	9.77	8.87	8.84
25	10.38	10.01	8.77	8.98	9.43	10.13	9.70	9.13	9.75	9.31	9.25	9.18
EOM	9.86	9.93	8.73	8.55	9.46	10.37	9.60	9.19	9.66	9.04	9.26	9.44

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	9.18	8.84	8.88	9.05	9.28	10.80	12.55	13.20	12.36	13.31	13.17	13.43
10	8.79	8.49	8.85	8.89	9.57	10.81	12.98	13.05	12.27	13.64	12.99	13.34
15	8.73	8.96	9.07	8.63	9.94	11.53	12.78	12.76	12.62	13.27	13.42	13.08
20	9.36	9.00	8.90	9.06	10.02	11.72	13.10	12.56	12.89	13.59	13.36	13.17
25	8.80	8.99	8.89	9.26	10.48	11.74	13.17	12.55	13.07	13.33	12.88	12.64
EOM	9.05	9.00	8.91	9.41	10.60	12.19	13.36	12.37	12.90	13.47	13.50	12.22

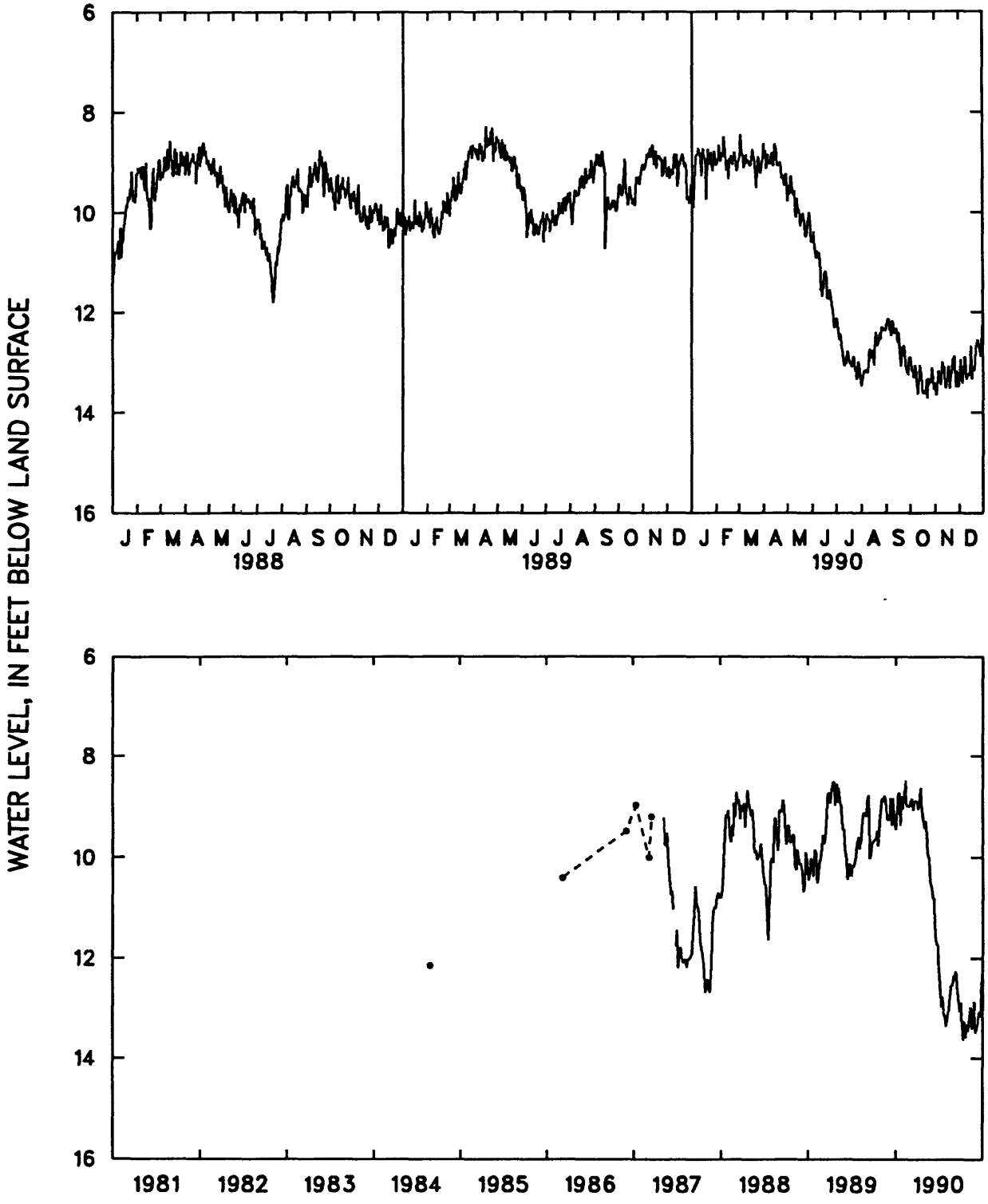


Figure 48.--Water level in observation well NC-180 (Peedee aquifer), Brunswick County.

NC-184 NEAR GREENVILLE, PITT COUNTY

WELL-IDENTIFICATION NUMBER.--353146077193403; DEHNR Conley Research Station well N23p3.

LOCATION.--Lat 35°31'46", long 77°19'34", Hydrologic Unit 03020203, 6 miles southeast of Greenville, 0.2 mile west of N.C. Highway 43 on Secondary Road 1711 at Conley High School.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Peedee aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 132 feet, diameter 4 inches, cased to 122 feet, screened interval from 122 to 132 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 69 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 3.63 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--June 1984 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.84 feet below land-surface datum, May 24, 1989; lowest, 22.39 feet below land-surface datum, December 18 and 19, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	21.88	20.57	19.74	19.09	18.84	18.88	19.16	20.28	21.22	21.00	19.92	19.81
10	21.64	20.52	19.45	19.12	18.87	18.86	19.35	20.46	21.27	20.88	19.97	19.75
15	21.40	20.16	19.42	19.03	18.94	18.95	19.52	20.71	21.29	20.79	19.92	19.77
20	20.92	19.89	19.29	18.95	18.90	18.89	19.74	20.98	21.26	20.53	19.74	19.88
25	20.67	19.94	19.24	18.92	18.82	18.99	19.82	21.07	21.20	20.38	19.78	19.85
EOM	20.76	19.90	19.16	18.91	18.89	18.93	20.06	21.18	21.27	20.27	19.76	19.96

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	20.03	19.81	19.27	---	---	18.25	19.26	---	19.85	19.70	---	19.18
10	20.04	19.85	19.09	---	17.87	18.35	---	---	19.99	19.51	---	19.07
15	19.88	19.85	18.75	---	17.91	18.55	---	19.20	20.12	19.35	---	18.99
20	19.83	19.75	---	---	17.96	18.80	---	19.40	20.13	19.21	---	18.89
25	19.85	19.60	---	---	17.95	18.99	---	19.46	20.12	---	---	18.77
EOM	19.75	19.45	---	---	18.15	19.26	---	19.66	19.98	---	19.23	18.68

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	18.64	18.35	18.40	18.45	18.57	18.89	19.78	21.33	21.11	21.70	21.62	20.86
10	18.47	18.24	18.41	18.46	18.65	18.92	20.06	21.32	21.15	21.83	21.33	20.77
15	18.55	18.35	18.47	18.37	18.79	18.96	20.25	21.41	21.14	21.94	21.39	20.77
20	18.46	18.36	18.47	18.52	18.92	19.06	20.46	21.27	21.32	22.11	21.17	20.79
25	18.41	18.42	18.58	18.56	18.96	19.29	20.76	21.16	21.48	21.91	20.99	20.79
EOM	18.41	18.40	18.47	18.58	18.92	19.49	20.98	21.08	21.57	21.87	20.95	20.61

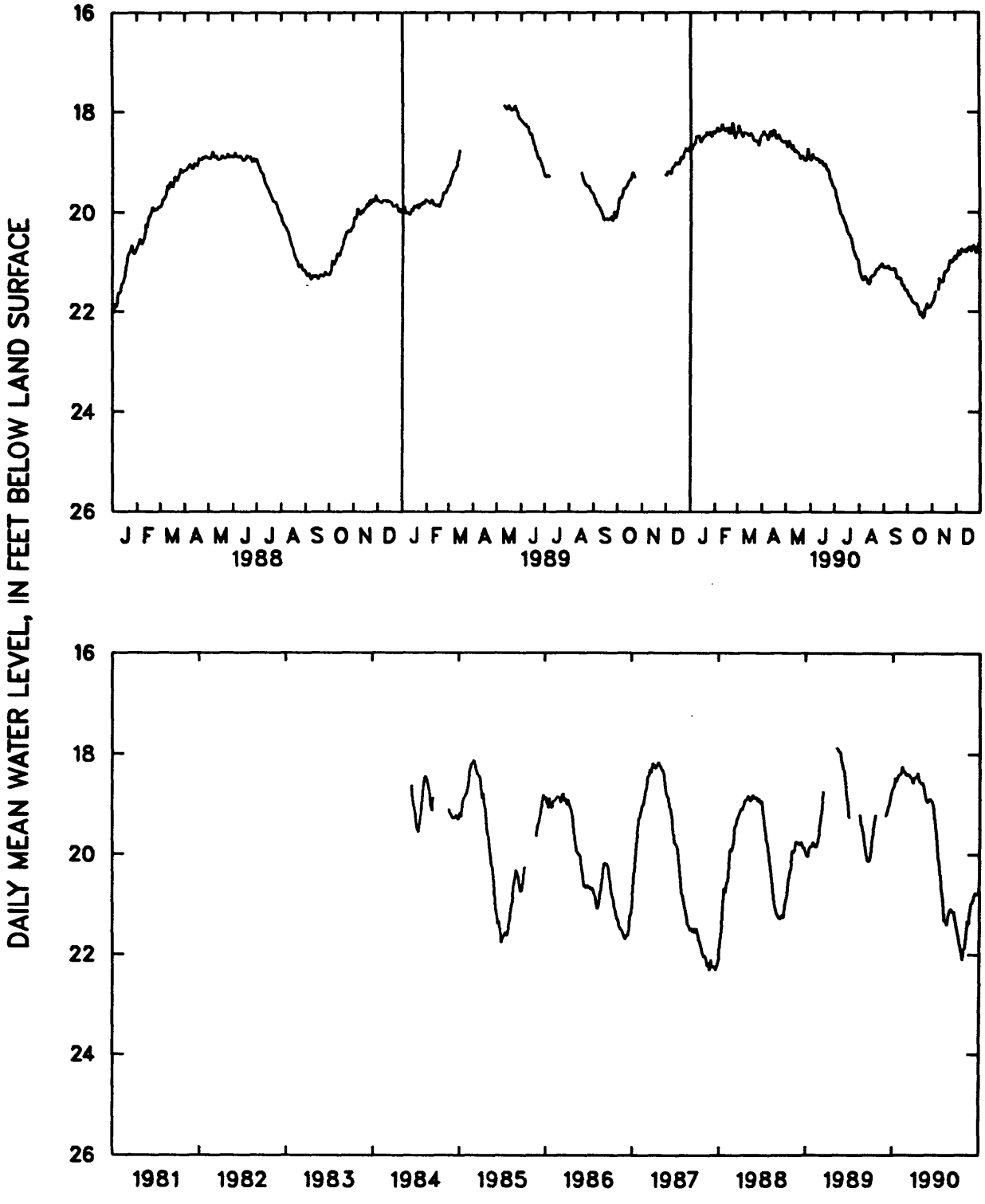


Figure 49.--Water level in observation well NC-184 (Peedee aquifer), Pitt County.

NC-185 NEAR GRAINGERS, LENOIR COUNTY

WELL-IDENTIFICATION NUMBER.--351937077284201; DEHNR Graingers Research Station well Q25d12.

LOCATION.--Lat 35°19'37", long 77°28'42", Hydrologic Unit 03020202, 1.6 miles northeast of Graingers on N.C. Highway 11 at E.I. du Pont de Nemours and Company Inc., Kinston Plant.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Peedee aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 134 feet, diameter 4 inches, cased to 124 feet, screened interval from 124 to 134 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch.

DATUM.--Land-surface datum is 66 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 3.1 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--December 1985 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 54.09 feet below land-surface datum, December 18, 1985; lowest, 60.61 feet below land-surface datum, July 31, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	57.88	57.25	56.71	57.21	56.72	56.85	58.26	58.92	58.70	58.33	58.27	57.64
10	57.65	57.17	56.63	57.23	56.80	57.03	58.41	58.88	58.54	58.20	58.31	57.66
15	57.71	56.78	56.69	57.14	56.87	57.09	58.75	58.94	58.49	58.42	58.11	57.84
20	57.49	56.64	56.71	56.84	56.78	57.33	59.12	59.21	58.48	58.43	57.71	58.02
25	57.38	56.76	56.90	56.58	56.83	57.90	59.12	58.97	58.56	58.36	57.47	58.06
EOM	57.38	56.69	57.16	56.67	56.73	57.92	58.94	58.90	58.55	58.40	57.58	58.07

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	57.94	57.42	55.74	54.36	54.62	56.61	56.76	57.33	57.68	57.67	56.78	56.46
10	57.70	57.75	55.12	54.71	54.39	56.66	57.17	57.42	58.18	57.17	56.55	56.27
15	57.41	57.62	54.50	54.32	54.28	56.53	57.39	57.49	58.69	57.33	56.62	55.59
20	57.27	57.44	54.75	54.40	54.52	56.69	56.79	57.42	58.37	57.41	56.60	55.14
25	57.24	56.86	54.55	54.87	55.47	56.35	56.04	57.12	58.25	57.19	56.56	55.15
EOM	57.18	56.38	54.30	55.39	56.23	56.42	56.39	57.05	58.06	56.76	56.41	55.65

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	55.65	55.87	55.19	54.97	55.65	55.17	57.83	58.98	58.21	58.40	58.08	57.42
10	55.34	56.07	55.09	54.62	55.65	55.66	58.22	58.70	58.18	58.44	57.95	57.30
15	55.30	56.31	55.71	54.68	55.59	56.05	58.42	58.59	58.32	58.36	---	57.50
20	55.54	56.17	55.83	55.14	55.67	56.76	58.51	58.35	58.43	58.53	57.39	57.61
25	55.74	55.66	55.67	55.38	56.12	57.19	58.61	58.31	58.52	58.23	57.36	57.20
EOM	55.62	55.43	55.57	55.65	55.46	57.59	58.69	58.17	58.34	58.09	57.41	57.50

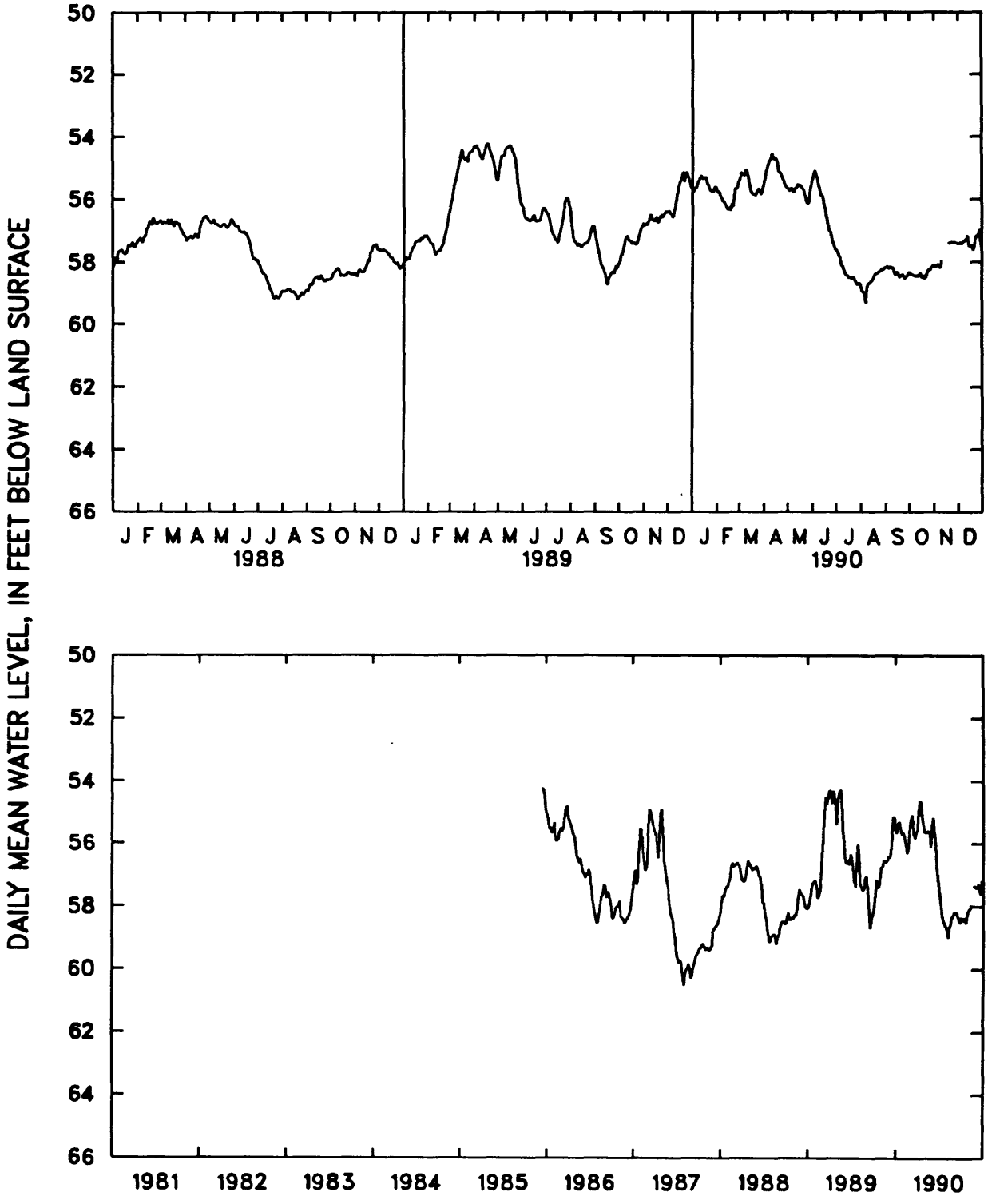


Figure 50.--Water level in observation well NC-185 (Peedee aquifer), Lenoir County.

NC-187 NEAR COMFORT, JONES COUNTY

WELL-IDENTIFICATION NUMBER.--345809077301405; DEHNR Comfort Research Station well U26j5.

LOCATION.--Lat 34°58'09", long 77°30'14", Hydrologic Unit 03020204, 2.5 miles south of Comfort at North Carolina Division of Forest Resources Fire Tower on Secondary Road 1003.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Peedee aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 284 feet, diameter 4 inches, cased to 274 feet, screened interval from 274 to 284 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, July 1986 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 68 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 1.3 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to July 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 21.53 feet below land-surface datum, October 29, 1980; lowest, 37.15 feet below land-surface datum, October 21, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	32.46	32.49	32.62	32.71	32.75	32.94	33.27	33.14	33.21	33.55	33.55	33.87
10	32.40	32.55	32.46	32.75	32.80	32.85	33.23	33.17	33.33	33.55	33.76	33.84
15	32.48	32.48	32.59	32.67	32.80	33.00	33.20	33.21	33.41	33.68	33.79	33.85
20	32.31	32.41	32.62	32.71	32.77	33.01	33.28	33.24	33.44	33.66	33.74	33.94
25	32.32	32.57	32.71	32.77	32.78	33.07	33.13	33.23	33.44	33.63	33.82	33.84
EOM	32.55	32.60	32.75	32.83	32.86	33.08	33.17	33.31	33.56	33.76	33.79	33.87

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	33.89	33.92	33.82	33.90	33.94	34.26	34.44	34.56	34.76	34.82	35.02	35.02
10	33.92	34.01	33.89	33.91	33.92	34.20	34.49	34.66	34.79	34.90	34.94	34.90
15	33.80	33.99	33.81	33.83	34.02	34.32	34.53	34.58	34.84	34.90	34.98	34.98
20	33.80	33.91	33.91	33.91	34.13	34.33	34.47	34.62	34.83	34.87	35.02	35.03
25	33.88	33.87	33.82	33.94	34.16	34.31	34.57	34.62	34.82	35.02	35.10	35.04
EOM	33.82	33.79	33.76	33.94	34.35	34.45	34.60	34.68	34.83	34.93	35.06	35.01

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	35.09	35.36	35.60	35.59	35.78	35.95	36.36	36.53	36.56	36.92	36.86	---
10	35.04	35.30	35.62	35.77	35.83	36.01	36.31	36.43	36.62	36.93	36.72	---
15	35.29	35.47	35.64	35.73	35.94	36.08	36.36	36.52	36.61	36.96	37.00	---
20	35.26	35.52	35.60	35.92	35.95	36.13	36.40	36.51	36.78	37.13	---	---
25	35.22	35.58	35.72	35.88	35.94	36.20	36.46	36.38	36.89	36.79	---	---
EOM	35.33	35.60	35.58	35.82	35.92	36.28	36.40	36.43	36.93	36.94	---	---

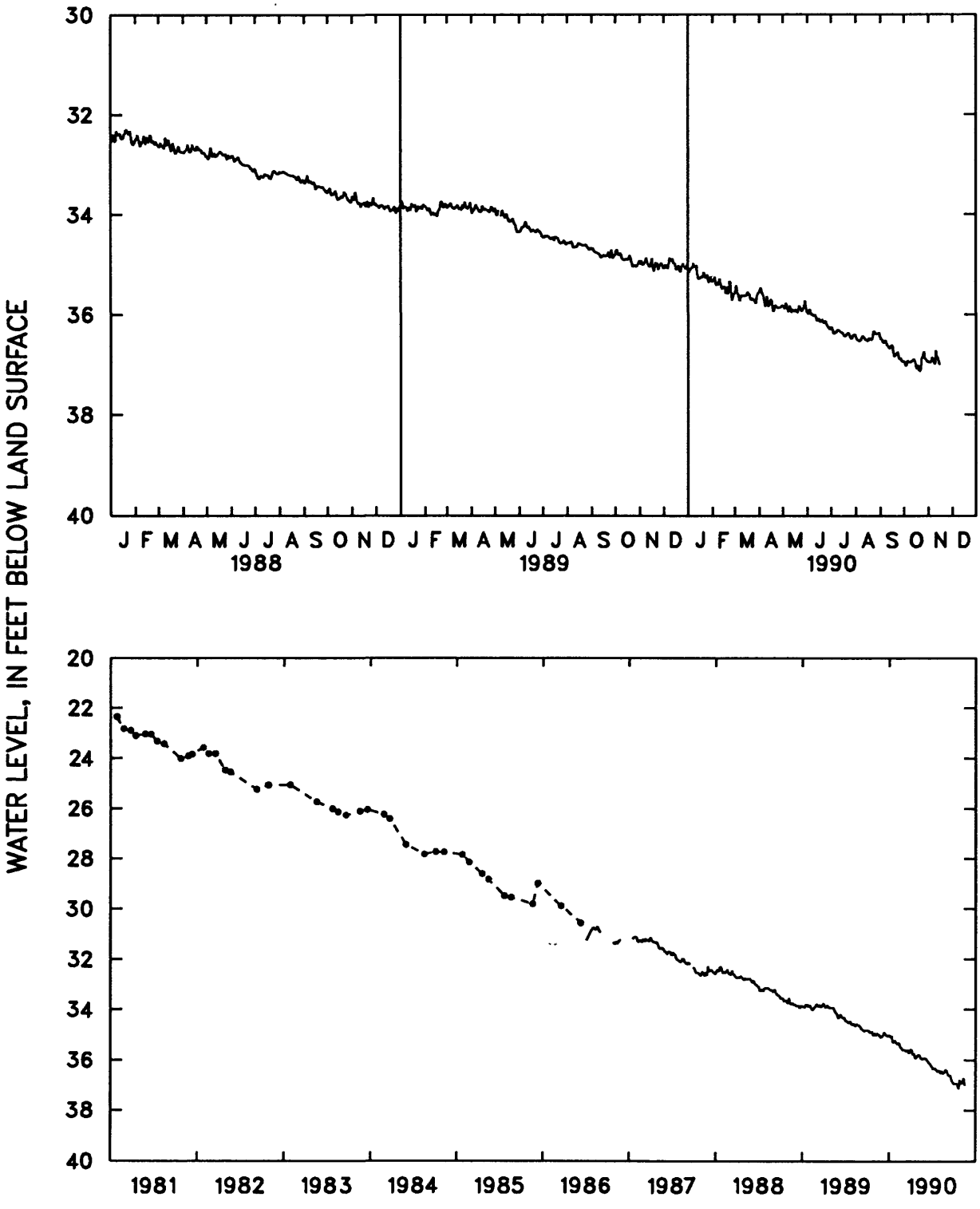


Figure 51.--Water level in observation well NC-187 (Peedee aquifer), Jones County.

NC-188 NEAR DIXON, ONSLOW COUNTY

WELL-IDENTIFICATION NUMBER.--343641077290104; DEHNR Dixon Tower Research Station well Y25q4.

LOCATION.--Lat 34°36'41", long 77°29'01", Hydrologic Unit 03030001, 1.5 miles north of Dixon at North Carolina Division of Forest Resources Fire Tower on U.S. Highway 17.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Peedee aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 550 feet, diameter 4 inches, cased to 524 feet, screened interval from 524 to 534 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, August 1986 to November 1990; measured periodically with steel tape beginning November 1990.

DATUM.--Land-surface datum is 67.44 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.53 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 38.86 feet below land-surface datum, May 12, 1983; lowest, 40.55 feet below land-surface datum, October 20 and 21, 1990.

REVISIONS.--The aquifer designation published in previous reports has been changed from Black Creek to Peedee aquifer.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	40.00	39.93	39.92	39.88	39.87	39.79	39.88	39.70	39.63	39.84	39.71	39.96
10	39.98	39.97	39.73	39.92	39.88	39.69	39.87	39.62	39.73	39.88	39.87	39.93
15	40.03	39.88	39.87	39.83	39.84	39.85	39.81	39.69	39.80	40.02	39.93	39.99
20	39.81	39.77	39.89	39.84	39.80	39.88	39.93	39.73	39.80	39.95	39.87	40.07
25	39.82	39.94	39.96	39.85	39.79	39.93	39.74	39.73	39.81	39.90	39.89	39.98
EOM	40.03	39.94	39.95	39.93	39.76	39.72	39.75	39.78	39.92	39.95	39.86	40.03

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	40.05	40.03	39.88	39.82	39.77	39.96	40.06	39.79	40.07	39.92	40.01	40.08
10	40.06	40.11	39.91	39.78	39.72	39.88	39.97	39.89	40.07	39.96	39.97	39.87
15	39.94	40.11	39.83	39.67	39.72	39.96	40.01	39.85	40.07	39.96	39.97	39.95
20	39.98	40.00	39.90	39.75	39.83	39.96	39.77	39.92	40.04	39.94	40.02	39.96
25	40.06	39.97	39.76	39.76	39.87	39.91	39.83	39.93	39.99	40.09	40.14	39.93
EOM	39.98	39.87	39.69	39.73	39.98	40.03	39.87	40.00	39.91	39.92	40.09	39.87

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	39.92	39.91	39.95	39.74	39.78	39.87	40.13	40.23	40.11	40.40	40.31	---
10	39.83	39.81	39.95	39.88	39.81	39.91	40.01	40.13	40.15	40.39	40.16	---
15	40.01	39.95	39.94	39.79	39.91	39.96	40.04	40.23	40.15	40.41	40.42	---
20	39.94	39.94	39.86	39.97	39.93	40.01	40.08	40.21	40.29	40.53	---	---
25	39.87	40.02	39.97	39.92	39.95	40.11	40.14	40.13	40.38	40.25	---	---
EOM	39.93	40.01	39.71	39.84	39.84	40.13	40.16	40.03	40.39	40.41	---	---

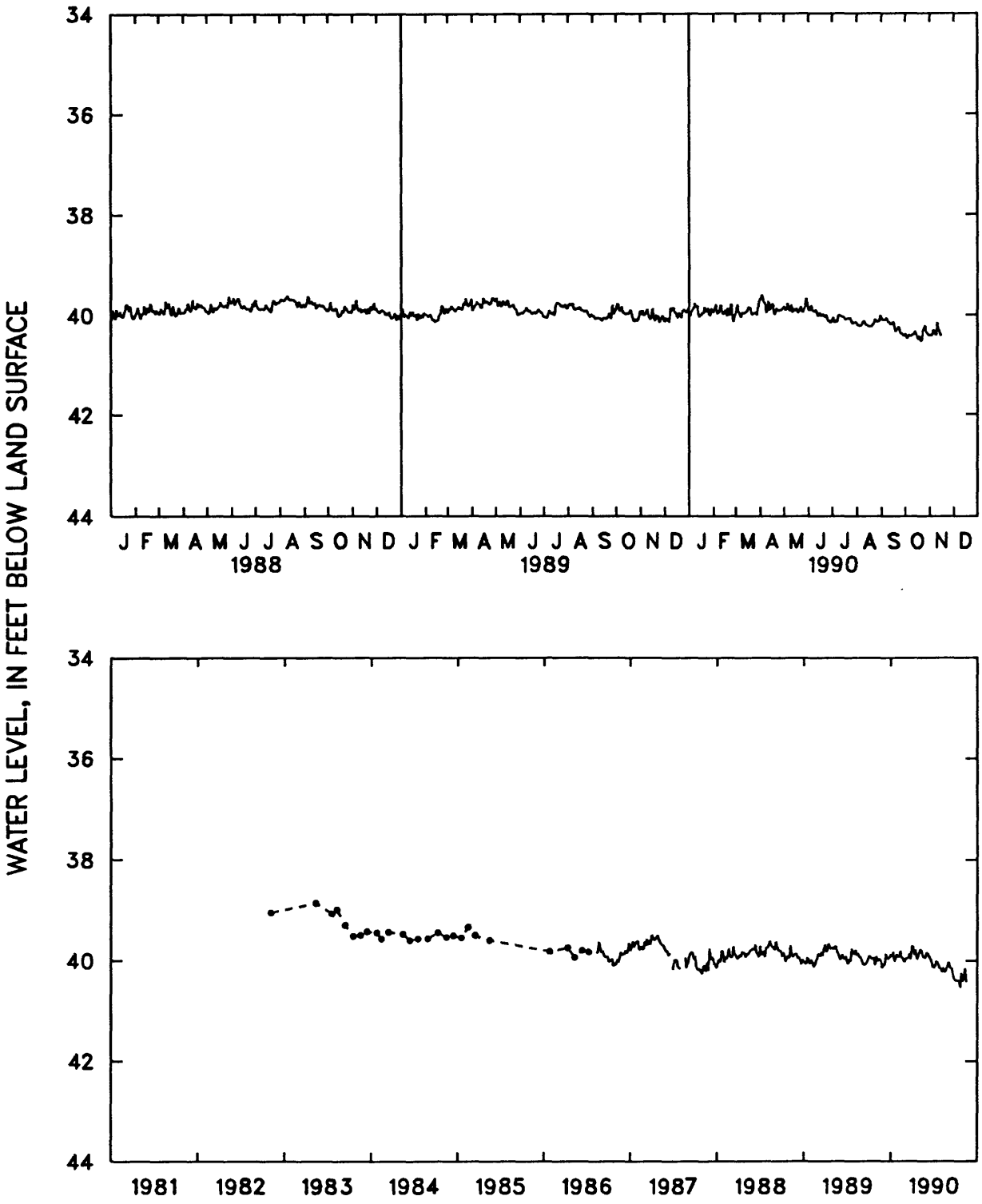


Figure 52.--Water level in observation well NC-188 (Peedee aquifer), Onslow County.

Black Creek and Upper Cape Fear Aquifers

Water-level fluctuations in the Black Creek and upper Cape Fear aquifers are measured at 12 wells (fig. 53). Water levels in all of the wells except one reached record lows in 1990; the exception is well NC-153 (fig. 58), which had the same record low in both 1988 and 1989. These wells show 3-year water-level declines ranging from 0.2 to 9 ft per year. These declines are a continuation of long-term declines and 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 (Giese and others, 1991). Ground water was withdrawn by more than 40 public-supply and industrial users in 1980 in the central Coastal Plain, the general area lying between Pitt and Onslow Counties (Winner and Lyke, 1986); the areas of greatest withdrawal are easily identified by prominent cones of depression (Coble and others, 1989). The greatest rates of water-level declines are associated with withdrawals in Onslow County, where withdrawal rates from the Black Creek aquifer nearly tripled, from 2.1 to 6.1 Mgal/d, from 1980 to 1986 (Lyke and Brockman, 1990). Observation wells NC-172 in Jones County and NC-189 in Onslow County show water-level declines of 7 and 9 ft per year, respectively, during 1988-90 (figs. 61 and 66). Declines in other areas in the central Coastal Plain ranged from 0.9 to slightly more than 6.7 ft per year during 1988-90; these declines are shown in the records for wells NC-44, NC-128, NC-165, NC-170, NC-176, NC-183, and NC-186 (figs. 55, 56, 59, 60, 62, 64, and 65).

Water-level declines in the upper Cape Fear aquifer in the northern Coastal Plain (NC-149 and NC-153, figs. 57 and 58) reflect regional withdrawals by several users in North Carolina and possibly in Virginia. Water-level declines in the upper Cape Fear aquifer in the southern Coastal Plain result from withdrawals for public supply and industry in Robeson and Bladen Counties. Well NC-177 (fig. 63) showed a decline of 2.2 ft per year during 1988-90, an increase over the steady decline of 1.5 ft per year prior to 1988.

The effects of ground-water withdrawals on the potentiometric surface of the Black Creek aquifer in the southern Coastal Plain were determined in the fall of 1988 for an area including Robeson County and parts of adjacent counties in North Carolina (fig. 54). Major withdrawals from the Black

(continued on page 144)

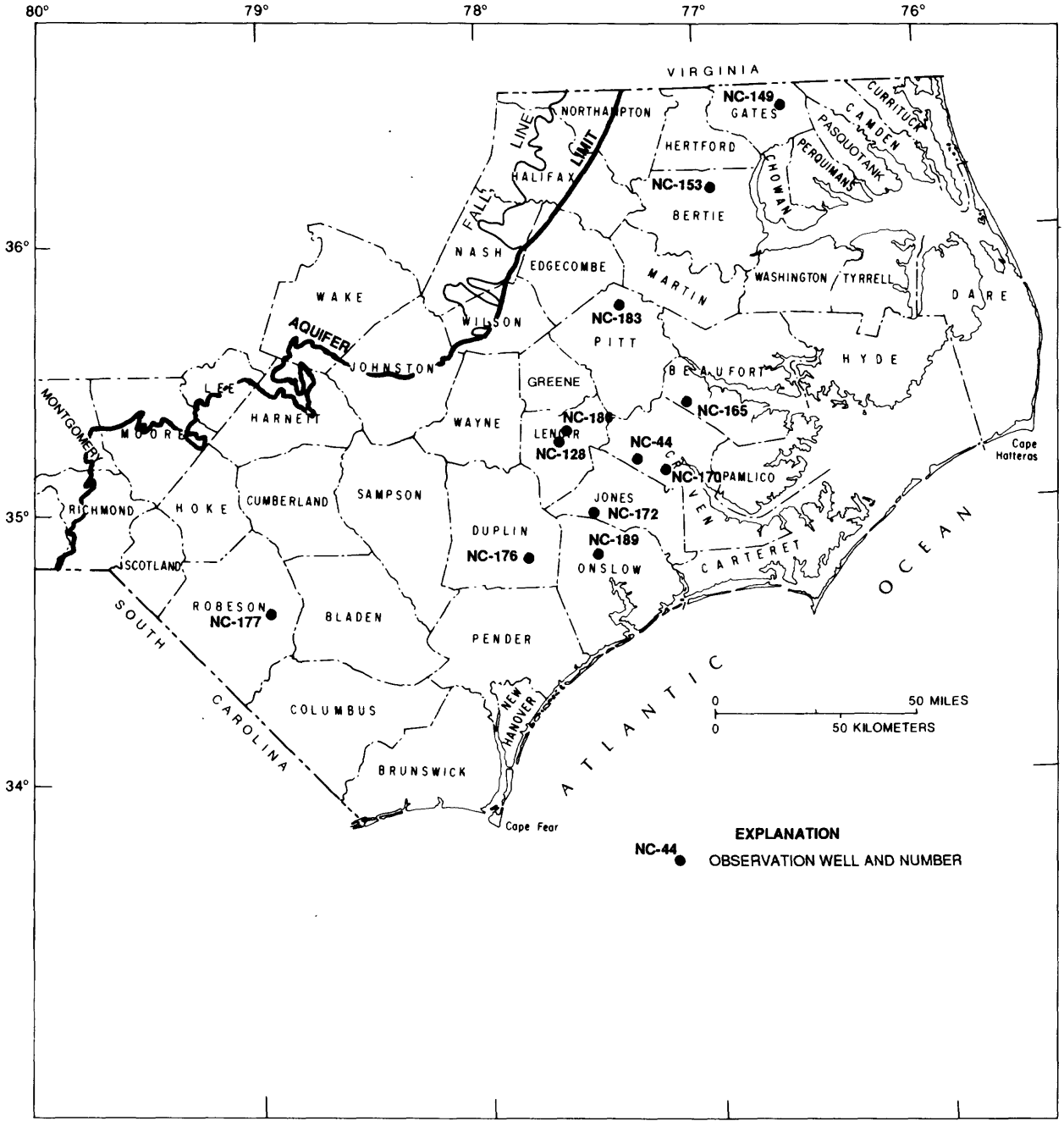


Figure 53.--Locations of observation wells completed in the Black Creek and upper Cape Fear aquifers.

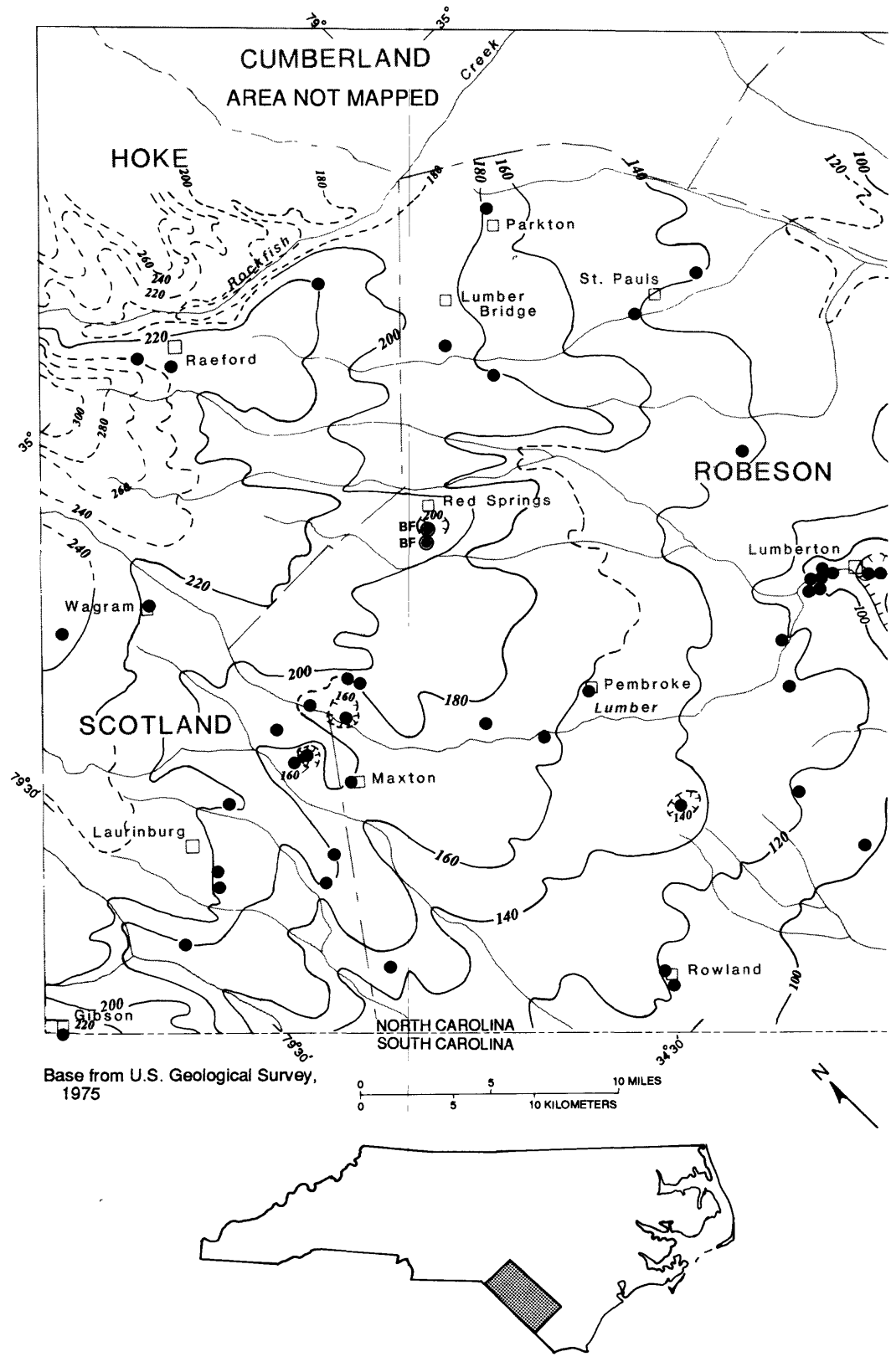
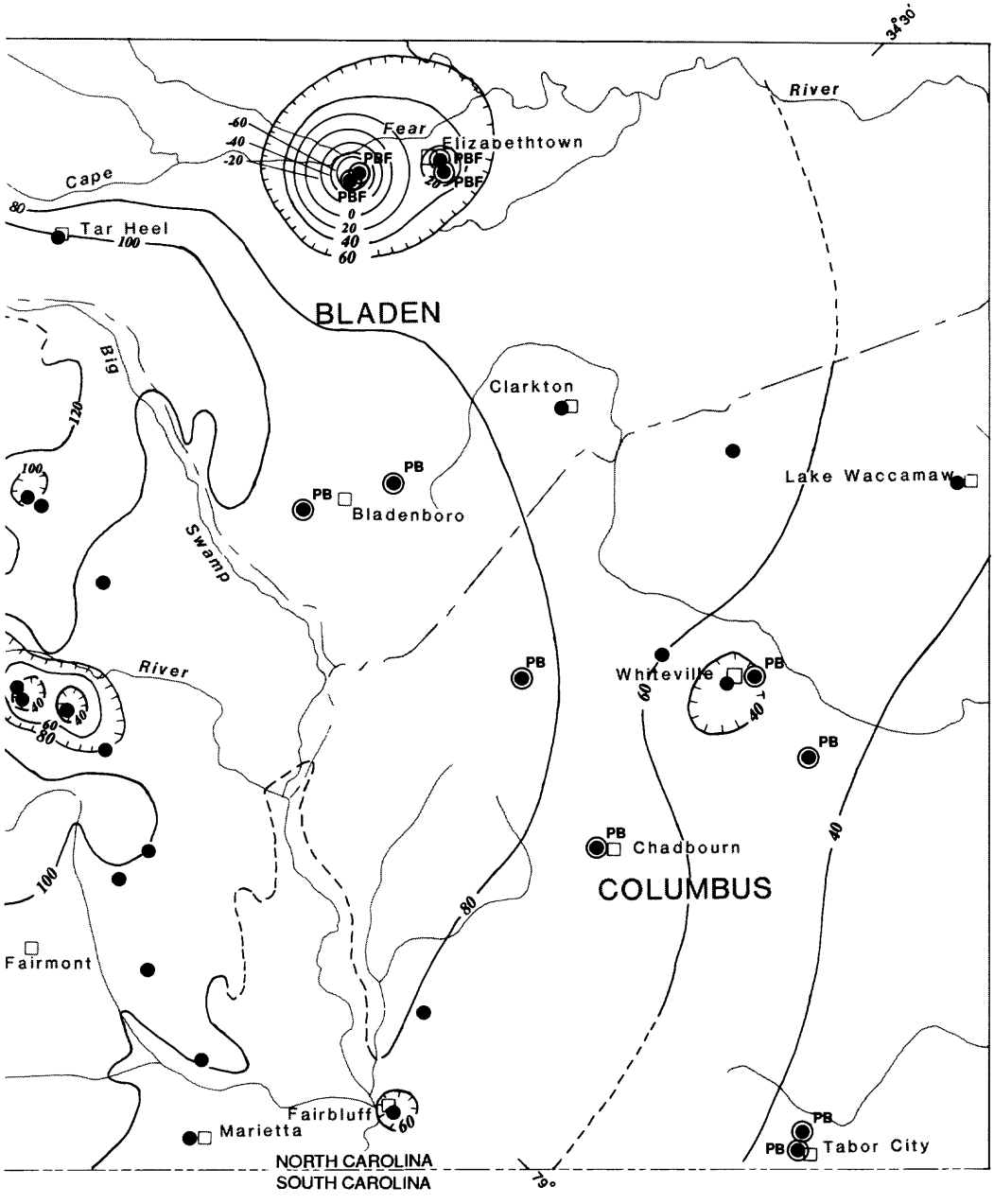


Figure 54.--Potentiometric surface of the Black Creek aquifer



EXPLANATION

—140-- POTENTIOMETRIC CONTOUR--Shows altitude at which water level would have stood in tightly cased wells. Dashed where approximately located. Contour interval 20 feet. Hachured to indicate depressions. Datum is sea level

● WELL IN BLACK CREEK AQUIFER

◉PB WELL IN PEEDEE AND BLACK CREEK AQUIFERS

◉BF WELL IN BLACK CREEK AND UPPER CAPE FEAR AQUIFERS

◉PBF WELL IN PEEDEE, BLACK CREEK, AND UPPER CAPE FEAR AQUIFERS

in the southern Coastal Plain, November-December 1988.

NC-44 NEAR COVE CITY, CRAVEN COUNTY

WELL-IDENTIFICATION NUMBER.--351049077175501.

LOCATION.--Lat 35°10'49", long 77°17'55", Hydrologic Unit 03020202, 1.4 miles 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 feet, diameter 2 inches, cased to 705 feet and from 715 to 781 and 786 to 828 feet, screened intervals from 705 to 715, 781 to 786, and 828 to 833 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, March 1965 to June 1988; measured periodically with steel tape beginning July 1988.

DATUM.--Land-surface datum is 36.73 feet above National Geodetic Vertical Datum of 1929.
Measuring point: Top of instrument shelf, 2.06 feet 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 feet below land-surface datum, August 25 and 26, 1965; lowest, 128.10 feet below land-surface datum, October 3, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 5	106.92	JAN 31	109.72	FEB 25	107.97	MAR 20	107.68	MAY 25	109.24	OCT 5	114.64
JAN 10	107.53	FEB 5	106.14	FEB 28	108.00	MAR 25	106.30	MAY 30	109.65	NOV 21	116.30
JAN 15	109.35	FEB 10	109.03	MAR 5	109.12	MAR 31	106.80	JUNE 10	108.81		
JAN 20	108.69	FEB 15	109.13	MAR 10	108.22	APR 3	108.86	JULY 28	116.87		
JAN 25	107.69	FEB 20	108.49	MAR 15	108.39	MAY 20	108.67	AUG 16	113.49		

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 9	113.91	MAY 8	115.88	JULY 11	121.69	AUG 14	122.10	OCT 2	123.54	NOV 27	119.86
MAR 13	115.36										

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 22	121.32	APR 24	119.03	JULY 17	125.52	AUG 29	126.24	OCT 3	128.10	NOV 16	125.89
MAR 5	119.84	JUNE 6	121.90								

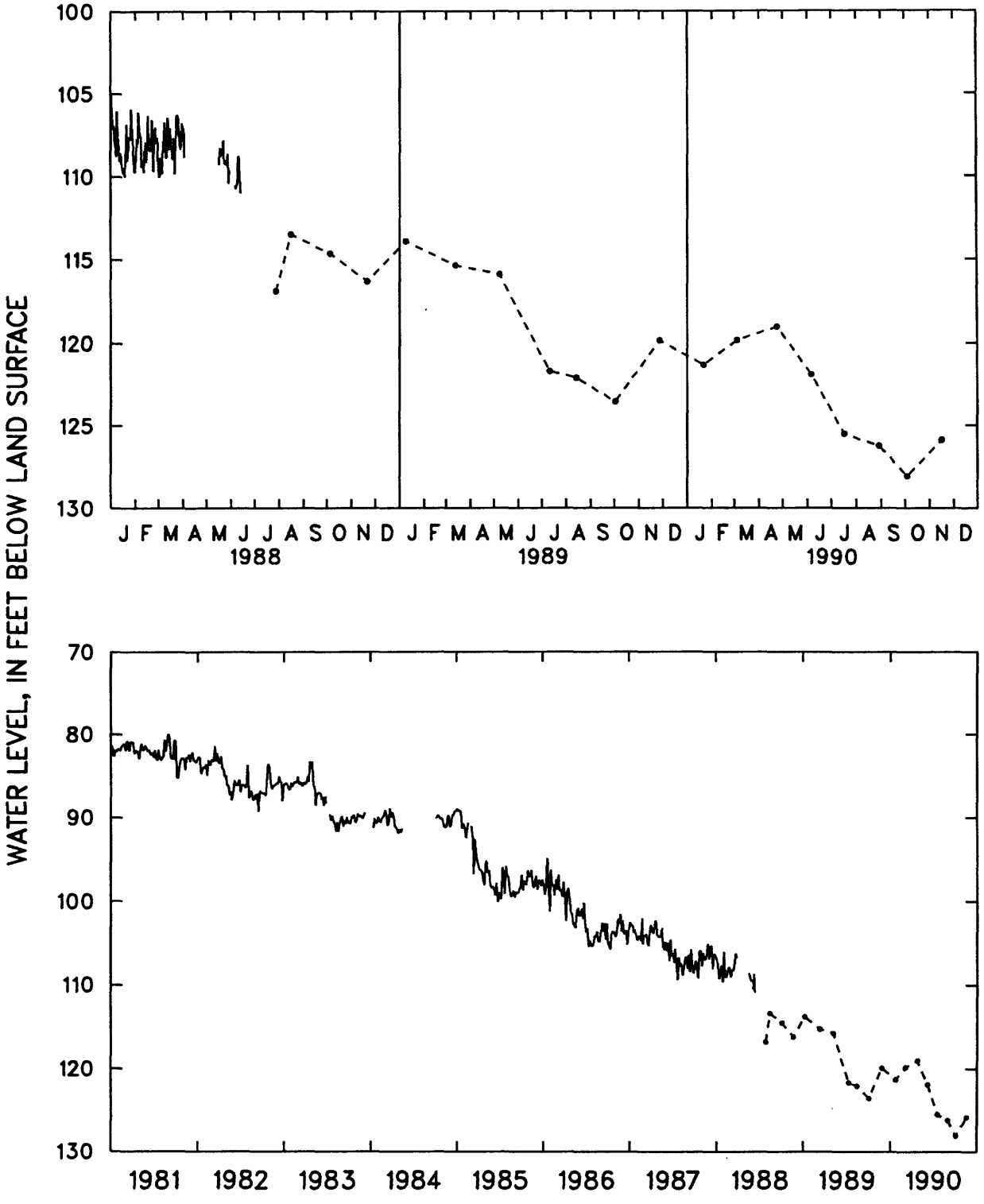


Figure 55.--Water level in observation well NC-44 (Black Creek and upper Cape Fear aquifers), Craven County.

NC-128 AT KINSTON, LENOIR COUNTY

WELL-IDENTIFICATION NUMBER.--351600077381001.

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 feet, diameter 10 inches, cased to 160 feet, screened intervals unknown.

INSTRUMENTATION.--Digital recorder, 30-minute punch.

DATUM.--Land-surface datum is 33.5 feet above National Geodetic Vertical Datum of 1929.
Measuring point: Top of instrument shelf, 2.1 feet above land-surface datum.

REMARKS.--Local-effects well. Water levels affected by pumping of nearby municipal and industrial wells; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--September 1968 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 34.83 feet below land-surface datum, December 30, 1968; lowest, 93.61 feet below land-surface datum, October 30, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	83.22	81.18	81.89	82.04	82.95	83.85	86.41	87.05	87.76	89.45	89.45
10	---	83.34	82.34	81.77	81.81	84.01	85.06	86.32	87.60	87.34	89.96	88.65
15	83.27	82.07	82.20	82.45	81.87	83.74	86.28	---	88.01	88.20	89.14	87.30
20	83.92	82.32	82.29	82.13	82.78	83.52	86.38	---	87.59	90.14	88.65	86.56
25	83.05	82.02	82.45	81.54	83.00	84.44	85.67	---	87.42	88.91	88.16	85.93
EOM	83.19	82.66	82.47	81.74	82.59	85.11	85.69	87.51	88.05	89.58	89.05	86.27

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	86.18	85.33	---	83.95	---	---	---	84.69	---	---	---	88.88
10	86.15	85.12	---	84.04	83.01	---	---	84.73	---	---	---	87.61
15	86.04	---	---	---	82.79	---	85.45	83.97	---	---	---	86.94
20	86.30	---	83.05	---	---	---	84.16	---	---	---	---	87.06
25	86.08	---	83.36	---	---	---	83.77	---	---	---	88.33	86.31
EOM	85.39	---	83.40	---	---	---	84.40	---	---	---	89.04	88.76

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	89.19	87.52	88.67	86.66	87.42	86.43	89.33	---	88.44	92.35	91.86	91.77
10	88.84	88.53	88.20	85.71	86.78	87.16	90.41	---	88.47	92.83	91.22	91.11
15	88.21	88.23	88.82	85.76	86.49	89.05	---	---	89.94	91.54	91.51	90.87
20	89.16	87.14	88.41	86.84	86.46	89.01	91.13	---	90.57	92.14	91.13	90.85
25	89.01	86.63	86.61	87.13	88.12	88.32	91.11	---	90.53	93.22	90.53	90.11
EOM	88.72	87.78	86.07	86.70	85.95	89.13	---	89.48	90.62	93.32	91.07	90.24

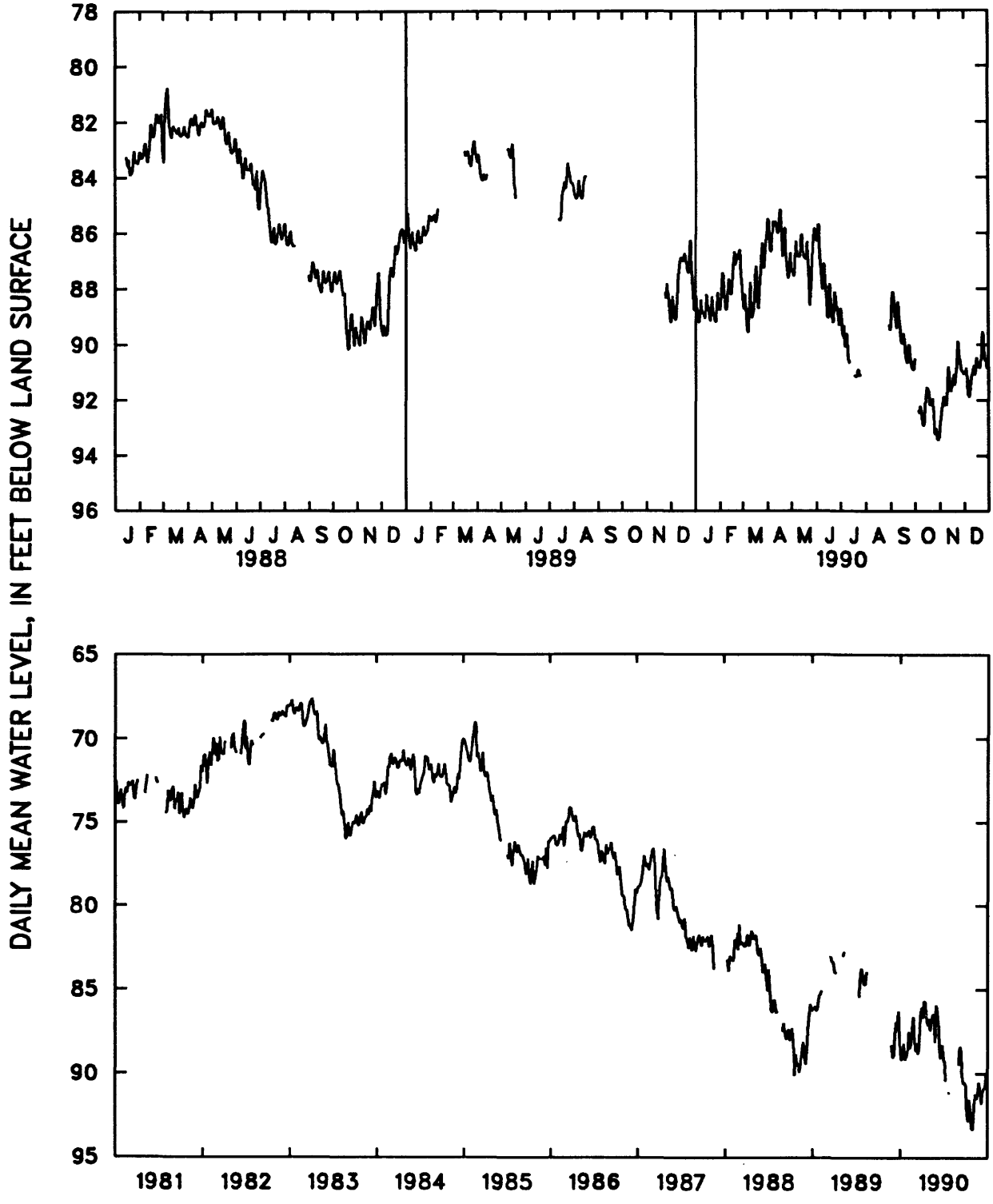


Figure 56.--Water level in observation well NC-128 (Black Creek aquifer), Lenoir County.

NC-149 AT SUNBURY, GATES COUNTY

WELL-IDENTIFICATION NUMBER.--362646076361405; DEHNR 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.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 570 feet, diameter 4 inches, cased to 555 feet, screened interval from 555 to 565 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, November 1986 to November 1990; measured periodically with steel tape beginning November 1990.

DATUM.--Land-surface datum is 37.44 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 3.58 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to October 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 13.37 feet below land-surface datum, December 30, 1968; lowest, 27.83 feet below land-surface datum, October 16 and 17, 1990.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by -0.54 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	25.45	25.38	25.44	25.41	25.42	25.52	---	25.98	26.15	---	---	---
10	25.47	25.44	25.27	25.42	25.45	25.57	---	26.01	26.18	---	---	---
15	25.52	25.35	25.35	25.40	25.49	25.68	---	26.11	26.27	---	---	---
20	25.36	25.29	25.38	25.35	25.39	25.69	---	26.17	26.33	---	---	---
25	25.37	25.41	25.50	25.43	25.44	---	---	26.07	26.31	---	---	26.43
EOM	25.52	25.42	25.46	25.47	25.53	---	---	26.22	26.35	---	---	26.45

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	26.42	26.33	26.04	25.98	25.94	26.20	26.37	26.57	26.66	26.59	26.66	26.52
10	26.40	26.32	26.04	25.97	25.88	26.17	26.38	26.63	26.67	26.66	26.55	26.42
15	26.32	26.32	25.96	25.91	25.99	26.22	26.44	26.43	26.71	26.69	26.58	26.45
20	26.26	26.17	26.05	25.99	26.07	26.31	26.30	26.37	26.63	26.58	26.55	26.52
25	26.36	26.07	25.89	26.01	26.05	26.25	26.50	26.46	26.66	26.70	26.56	26.54
EOM	26.31	25.99	25.88	25.99	26.20	26.36	26.54	26.54	26.64	26.61	26.55	26.53

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	26.56	26.61	26.65	26.51	26.60	26.75	27.14	27.53	27.50	27.65	27.65	---
10	26.46	26.48	26.68	26.63	26.64	26.83	27.25	27.41	27.54	27.71	27.62	---
15	26.62	26.59	26.68	26.62	26.78	26.96	27.28	27.43	27.46	27.73	---	---
20	26.60	26.62	26.57	26.75	26.79	27.05	27.35	27.46	27.55	27.78	---	---
25	26.54	26.64	26.66	26.67	26.74	27.08	27.48	27.37	27.58	27.56	---	---
EOM	26.62	26.64	26.55	26.67	26.70	27.17	27.49	27.39	27.62	27.65	---	---

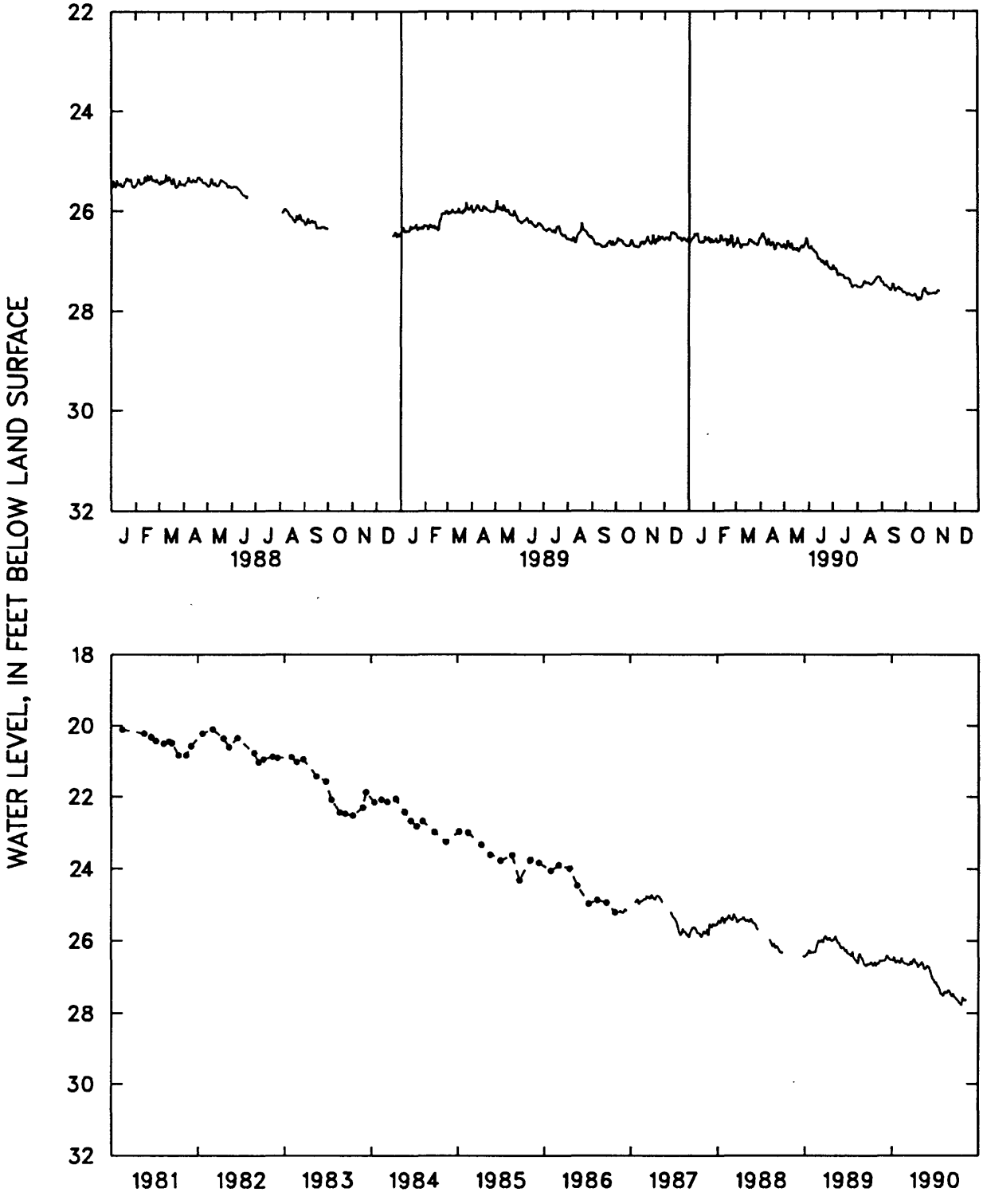


Figure 57.--Water level in observation well NC-149 (upper Cape Fear aquifer), Gates County.

NC-153 NEAR CREMO, BERTIE COUNTY

WELL-IDENTIFICATION NUMBER.--361002076562106; DEHNR Cremo Research Station well G19b6.

LOCATION.--Lat 36°10'02", long 76°56'21", Hydrologic Unit 03010203, 0.75 mile south of Cremo, south of Secondary Road 1313 on logging road.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 431 feet, diameter 6 inches, cased to 400 feet, screened interval from 400 to 410 feet; measured depth 412 feet, October 1986.

INSTRUMENTATION.--Digital recorder, 60-minute punch, November 1986 to November 1990; measured periodically with steel tape beginning November 1990.

DATUM.--Land-surface datum is 64.49 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 3.01 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM; end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to September 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.51 feet below land-surface datum, July 30, 1975; lowest, 39.89 feet below land-surface datum, December 26 and 27, 1988, and February 17, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	39.01	38.99	39.07	39.06	39.05	39.14	39.34	39.41	39.47	39.62	39.54	39.78
10	38.98	39.02	38.95	39.07	39.09	39.15	39.33	39.44	39.48	39.65	39.66	39.75
15	39.03	38.93	39.00	39.04	39.14	39.25	39.34	39.50	39.51	39.75	39.71	39.76
20	38.92	38.90	39.01	39.01	39.05	39.20	39.34	39.53	39.54	39.69	39.67	39.83
25	38.93	39.02	39.10	39.06	39.09	39.26	39.29	39.51	39.60	39.63	39.73	39.80
EOM	39.05	39.03	39.10	39.10	39.17	39.19	39.35	39.51	39.70	39.73	39.73	39.82

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	39.80	39.80	39.51	39.60	39.58	39.76	39.76	39.76	39.83	39.56	39.62	39.53
10	39.80	39.78	39.52	39.59	39.52	39.69	39.78	39.82	39.82	39.65	---	39.42
15	39.68	39.81	39.48	39.54	39.61	39.75	39.84	39.66	39.86	39.65	---	39.46
20	39.68	39.67	39.60	39.63	39.69	39.78	39.60	39.58	39.75	39.54	---	39.49
25	39.77	39.56	39.52	39.66	39.71	39.71	---	39.65	39.77	39.65	---	39.49
EOM	39.74	39.46	39.49	39.59	39.83	39.73	---	39.73	39.73	39.59	---	39.46

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	39.48	39.45	39.42	39.28	39.28	39.26	39.54	39.74	39.50	39.64	39.51	---
10	39.39	39.34	39.42	39.38	39.29	39.31	39.61	39.57	39.46	39.67	39.42	---
15	39.51	39.44	39.44	39.36	39.37	39.37	39.58	39.61	39.44	39.64	---	---
20	39.49	39.44	39.36	39.44	39.39	39.39	39.56	39.48	39.52	39.73	---	---
25	39.41	39.44	39.43	39.39	39.30	39.45	39.63	39.39	39.57	39.46	---	---
EOM	39.45	39.44	39.30	39.36	39.27	39.50	39.65	39.41	39.61	39.53	---	---

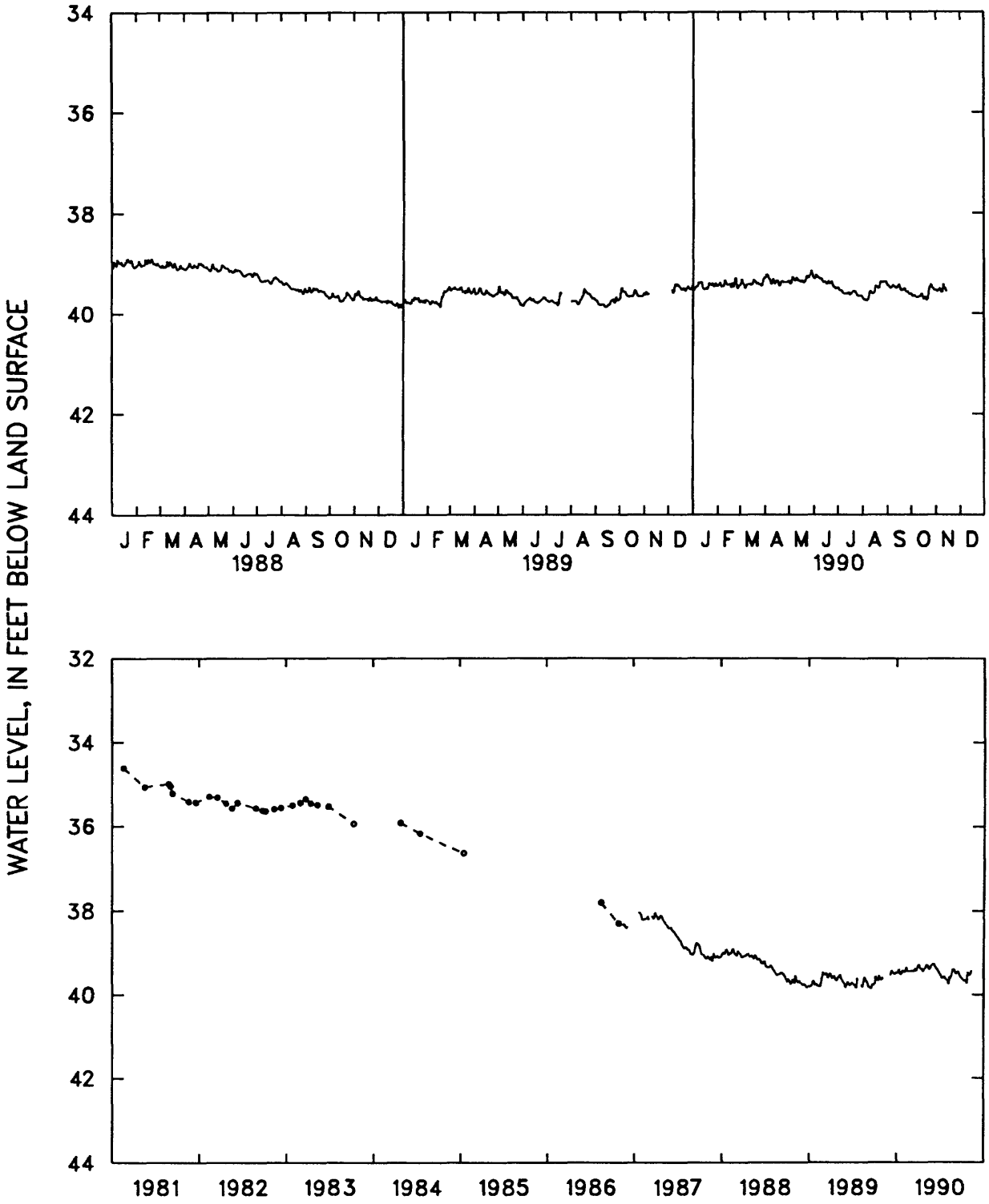


Figure 58.--Water level in observation well NC-153 (upper Cape Fear aquifer), Bertie County.

NC-165 NEAR WILMAR, BEAUFORT COUNTY

WELL-IDENTIFICATION NUMBER.--352252077050709; DEHNR Wilmar Research Station well P21k9.

LOCATION.--Lat 35°22'53", long 77°05'17", Hydrologic Unit 03020202, 3.5 miles southeast of Wilmar, 0.5 mile east of intersection of Secondary Roads 1129 and 1130 on logging road.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Black Creek aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 712 feet, diameter 4 inches, cased to 695 feet, screened interval from 695 to 705 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, December 1986 to August 1989; measured periodically with steel tape since August 1989.

DATUM.--Land-surface datum is 41.63 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.74 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.94 feet below land-surface datum, March 11, 1969; lowest, 55.85 feet below land-surface datum, October 4, 1990.

REVISIONS.--Water-level mean values and extremes for period of record published in U.S. Geological Survey annual report, Water Resources Data-North Carolina NC-87-1, should be adjusted by +0.17 foot.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	50.88	50.85	50.86	50.95	50.96	51.09	51.34	51.40	51.50	51.66	51.77	52.06
10	50.85	50.92	50.74	51.03	50.99	51.01	51.33	51.42	51.59	51.72	51.93	52.05
15	50.94	50.87	50.85	50.94	51.00	51.15	51.33	51.48	51.65	51.85	51.96	52.08
20	50.77	50.74	50.89	50.91	50.96	51.20	51.45	51.51	51.65	51.78	51.90	52.17
25	50.77	50.86	50.97	50.94	50.89	51.27	51.36	51.49	51.69	51.78	51.92	52.09
EOM	50.96	50.89	50.97	50.99	51.03	51.18	51.33	51.56	51.82	51.92	51.98	52.15

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	52.13	52.31	52.20	52.18	52.26	52.67	52.93	53.07	---	53.43*	---	---
10	52.15	52.39	52.26	52.22	52.28	52.66	52.92	53.22	---	---	---	---
15	52.12	52.41	52.11	52.23	52.34	52.74	52.92	53.16	---	---	---	---
20	52.14	52.34	52.12	52.21	52.46	52.80	52.86	---	---	---	---	---
25	52.21	52.25	51.97	52.30	52.48	52.69	53.00	---	---	---	54.04*	---
EOM	52.20	52.18	51.99	52.30	52.69	52.81	53.10	---	---	---	---	---

* Periodic water-level measurements made on October 4 and November 28, respectively.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 23	54.42	APR 25	55.67	JULY 19	55.63	AUG 29	55.36	OCT 4	55.85	NOV 15	55.74
MAR 6	55.72	JUNE 6	55.50								

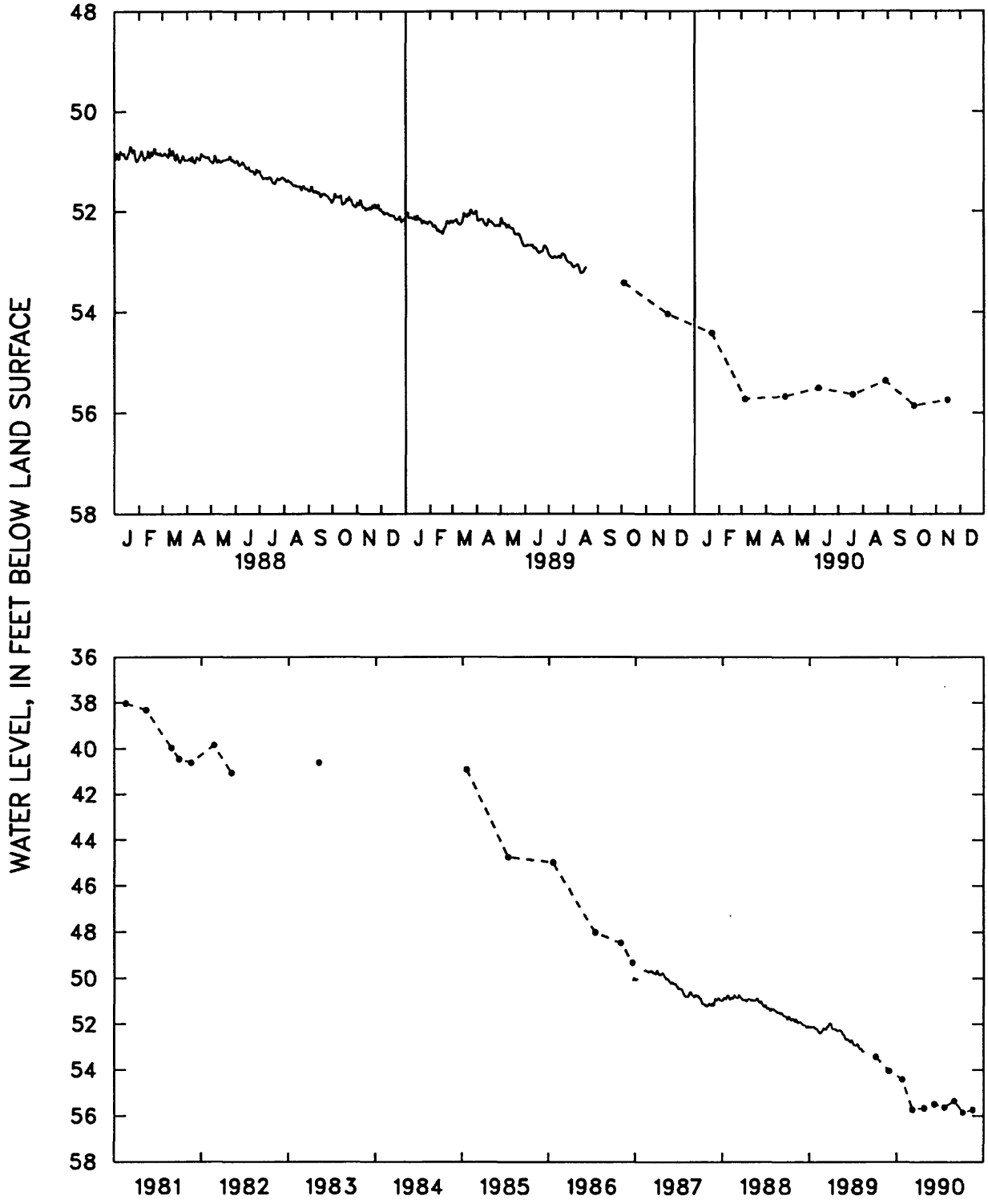


Figure 59.--Water level in observation well NC-165 (Black Creek aquifer), Beaufort County.

NC-170 NEAR CLARKS, CRAVEN COUNTY

WELL-IDENTIFICATION NUMBER.--350816077101810; DEHNR Clarks Research Station well S22j10.

LOCATION.--Lat 35°08'16", long 77°10'18", Hydrologic Unit 03020202, 0.8 mile southwest of Clarks, south of U.S. Highway 70 on Secondary Road 1225 at North Carolina Department of Transportation Rest Area.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Black Creek aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 730 feet, diameter 4 inches, cased to 716 feet, screened interval from 716 to 726 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, April 1984 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 28.64 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 1.7 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to December 1983 were provided by DEHNR.

PERIOD OF RECORD.--July 1979 to current year. Records from July 1979 to November 1983 are unpublished and available in the files of the Groundwater Section, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 25.14 feet below land-surface datum, July 18, 1979; lowest, 51.50 feet below land-surface datum, November 15, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	42.87	42.96	43.11	43.32	43.59	43.88	44.20	44.40	44.62	45.07	45.15	45.69
10	42.86	43.06	42.96	43.44	43.66	43.82	44.21	44.42	44.73	45.11	45.37	45.69
15	42.98	42.98	43.17	43.40	43.64	44.00	44.23	44.51	44.83	45.26	45.45	45.75
20	42.75	42.89	43.24	43.43	43.60	44.04	44.37	44.53	44.87	45.22	45.40	45.86
25	42.80	43.11	43.39	43.50	43.65	44.13	44.30	44.50	44.90	45.20	45.51	45.78
EOM	43.04	43.08	43.44	43.62	43.77	43.98	44.38	44.67	45.04	45.36	45.55	45.83

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	46.06	46.03	46.18	---	46.58	47.17	47.33	47.66	47.82	48.09	48.32
10	45.87	46.18	46.15	---	46.46	46.63	47.30	47.45	47.69	47.93	48.00	48.18
15	45.81	46.17	46.01	---	46.47	46.74	47.31	47.40	47.74	47.94	48.09	48.30
20	45.85	46.09	46.18	---	46.57	46.86	47.13	47.45	47.71	47.88	48.19	48.34
25	45.97	46.07	46.03	---	46.59	46.90	47.29	47.51	47.81	48.08	48.29	48.36
EOM	45.93	45.98	46.00	---	46.61	47.06	47.35	47.65	47.83	47.97	48.27	48.36

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	48.42	48.68	48.94	49.08	49.33	49.68	50.28	50.71	50.72	51.21	51.30	---
10	48.37	48.63	49.00	49.30	49.40	49.78	50.34	50.55	50.76	51.25	51.17	---
15	48.63	48.84	49.02	49.26	49.48	49.90	50.38	50.65	50.79	51.29	---	---
20	48.60	48.89	48.95	49.49	49.55	49.98	50.40	50.71	50.97	51.44	---	---
25	48.54	48.86	49.15	49.37	49.53	50.11	50.49	50.43	51.09	51.20	---	---
EOM	48.66	48.96	48.98	49.35	49.58	50.21	50.53	50.59	51.14	51.37	---	---

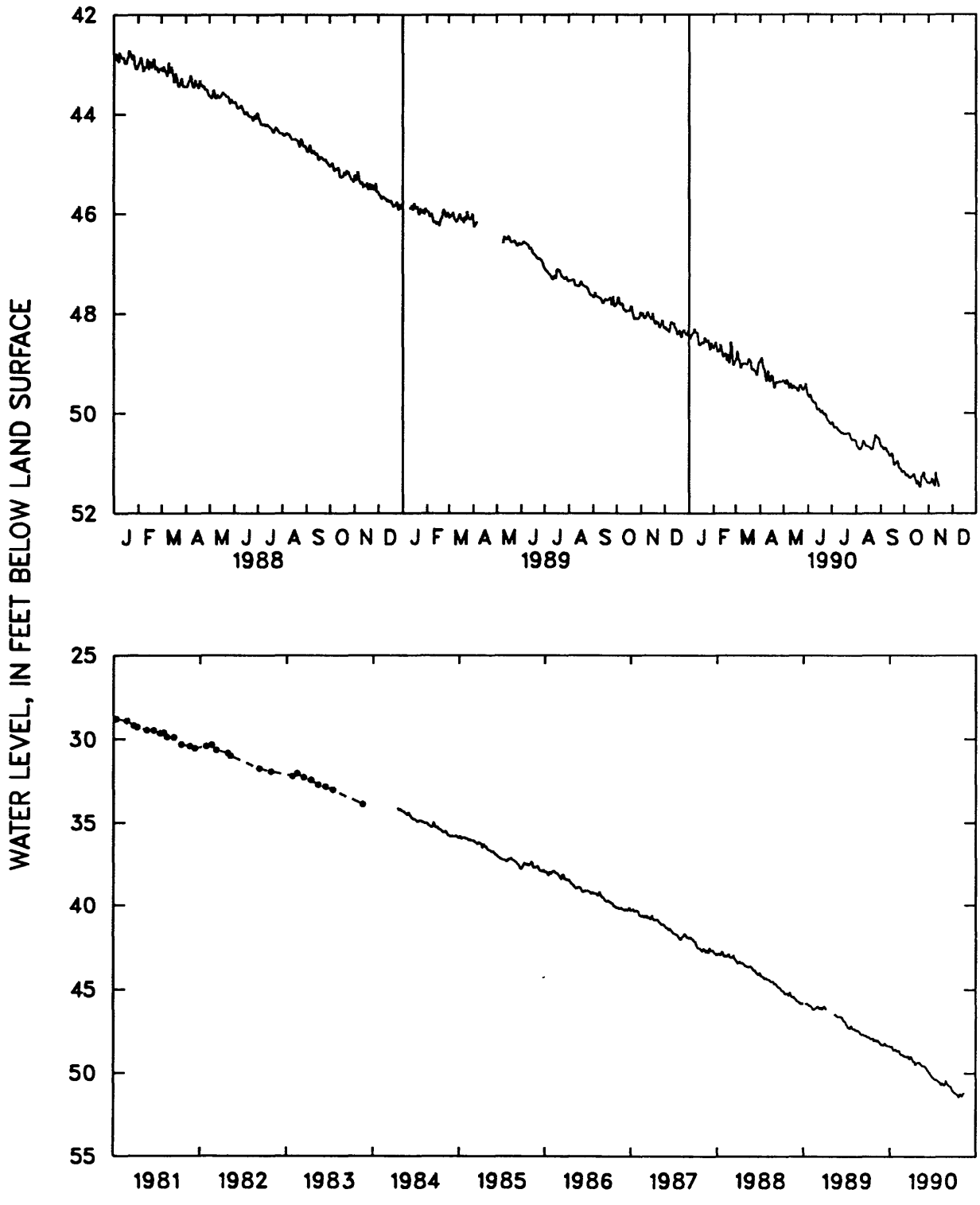


Figure 60.--Water level in observation well NC-170 (Black Creek aquifer), Craven County.

NC-172 NEAR COMFORT, JONES COUNTY

WELL-IDENTIFICATION NUMBER.--345809077301404; DEHNR Comfort Research Station well U26j4.

LOCATION.--Lat 34°58'09", long 77°30'14", Hydrologic Unit 03020204, 2.5 miles south of Comfort at North Carolina Division of Forest Resources Fire Tower on Secondary Road 1003.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Black Creek aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 545 feet, diameter 6 inches, cased to 506 feet and from 516 to 535 feet, screened intervals from 506 to 516 and 535 to 545 feet.

INSTRUMENTATION.--Measured periodically with steel tape (since December 1987).

DATUM.--Land-surface datum is 68 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 1.4 feet above land-surface datum.

REMARKS.--Areal-effects well.

COOPERATION.--Periodic water-level measurements prior to October 1983 were provided by DEHNR.

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, DEHNR. U.S. Geological Survey continuous record from October 1983 to December 1987.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 67.56 feet below land-surface datum, March 18, 1980; lowest, 149.14 feet below land-surface datum, November 15, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 21	130.03	MAR 9	131.04	JUNE 27	133.32	AUG 11	133.12	OCT 4	133.57	NOV 29	134.17

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 10	135.62	MAY 9	136.98	JULY 11	139.14	AUG 15	139.62	OCT 2	140.70	NOV 30	142.29
MAR 14	135.49										

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 24	143.50	APR 27	143.94	JULY 17	147.34	AUG 29	147.86	OCT 3	148.52	NOV 15	149.14
MAR 13	143.57	JUNE 6	144.97								

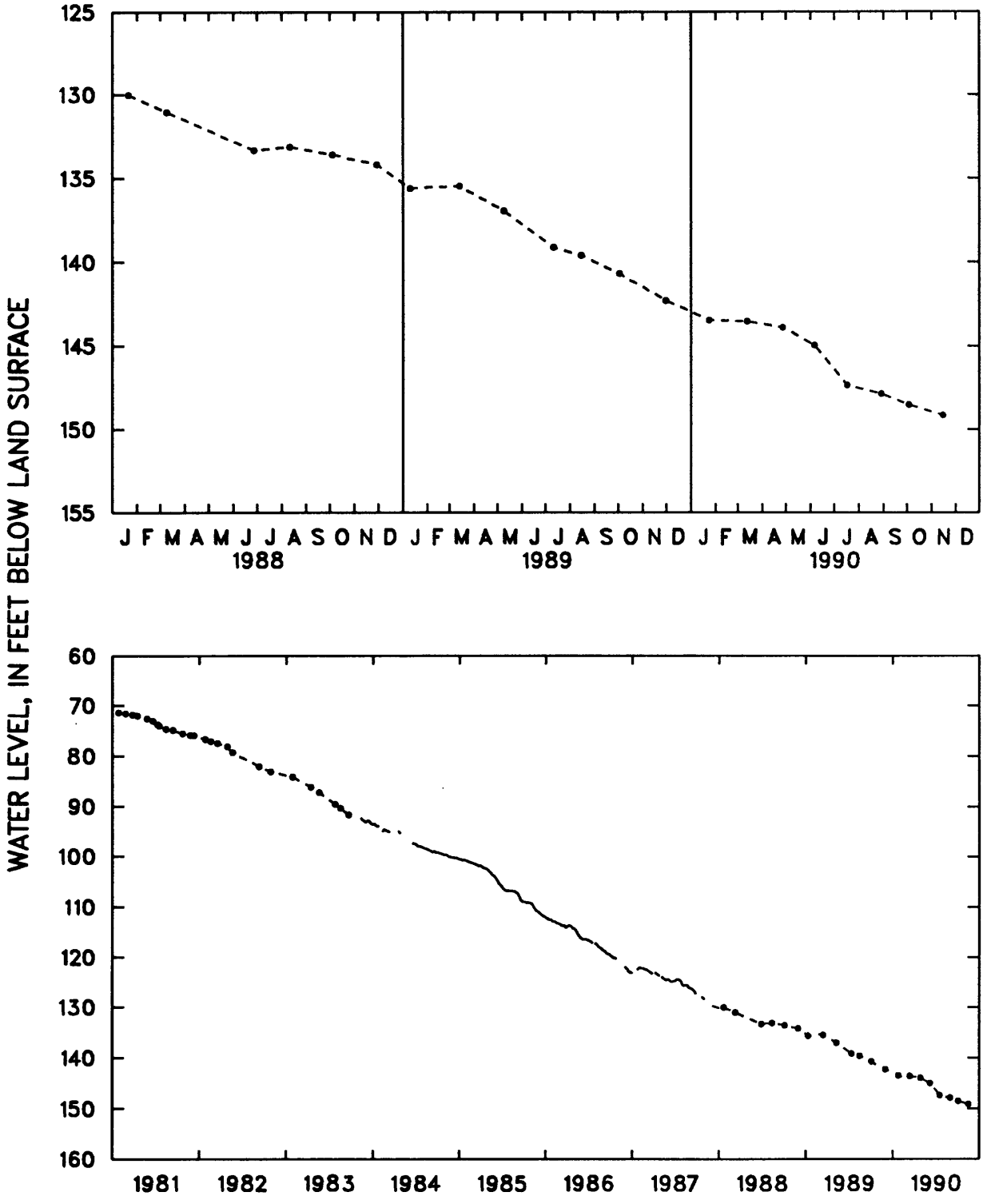


Figure 61.--Water level in observation well NC-172 (Black Creek aquifer), Jones County.

NC-176 NEAR CHINQUAPIN, DUPLIN COUNTY

WELL-IDENTIFICATION NUMBER.--344922077484706; DEHNR Chinquapin Research Station well W29d6.

LOCATION.--Lat 34°49'22", long 77°48'47", Hydrologic Unit 03030007, 0.3 mile south of Chinquapin on N.C. Highway 50 at Chinquapin Elementary School.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Black Creek aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 822 feet, diameter 6 inches, cased to 460 feet, screened interval from 460 to 470 feet, cemented from 486 to 822 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, July 1986 to November 1990; measured periodically with steel tape beginning November 1990.

DATUM.--Land-surface datum is 42.6 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 5.3 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.76 feet above land-surface datum, July 17, 1980; lowest, 20.52 feet below land-surface datum, October 20, 21, and 22, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	---	10.77	11.03	11.31	11.46	11.63	11.82	12.35	12.87	---	---	---
10	---	10.86	10.98	11.35	11.52	11.51	11.82	12.50	---	---	---	14.20
15	10.63	---	11.06	11.24	11.53	11.70	11.99	12.58	---	---	---	14.29
20	10.57	---	11.09	11.27	11.46	11.75	12.12	12.67	---	---	---	14.38
25	10.62	---	11.20	11.35	11.50	11.85	12.15	12.74	---	---	---	14.43
EOM	10.79	---	11.29	11.43	11.56	11.78	12.24	12.82	---	---	---	14.53

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	14.53	14.84	14.84	15.02	15.31	15.69	16.06	16.44	16.80	17.01	---	17.61
10	14.62	14.87	14.89	15.02	15.35	15.63	16.15	16.45	16.90	17.03	17.32	17.40
15	14.57	14.92	14.94	15.07	15.40	15.79	16.16	16.40	17.00	---	17.43	17.42
20	14.61	14.89	15.00	15.10	15.53	15.81	16.20	16.45	17.05	---	---	17.49
25	14.67	14.79	14.89	15.20	15.54	15.80	16.31	16.54	17.02	---	---	17.52
EOM	14.72	14.77	14.91	15.21	15.73	15.94	16.44	16.67	17.06	---	17.55	17.59

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	17.67	18.05	18.20	18.31	---	---	---	19.77	19.80	20.31	20.36	---
10	17.65	---	18.28	18.46	---	---	---	19.63	19.88	20.36	20.24	---
15	17.85	---	18.35	18.49	---	---	19.49	19.72	19.96	20.41	---	---
20	17.89	---	18.32	18.64	---	---	19.54	19.71	20.11	20.51	---	---
25	17.97	---	18.43	18.66	---	---	19.64	19.68	20.18	20.34	---	---
EOM	18.01	---	18.33	---	---	---	19.70	19.72	20.25	20.36	---	---

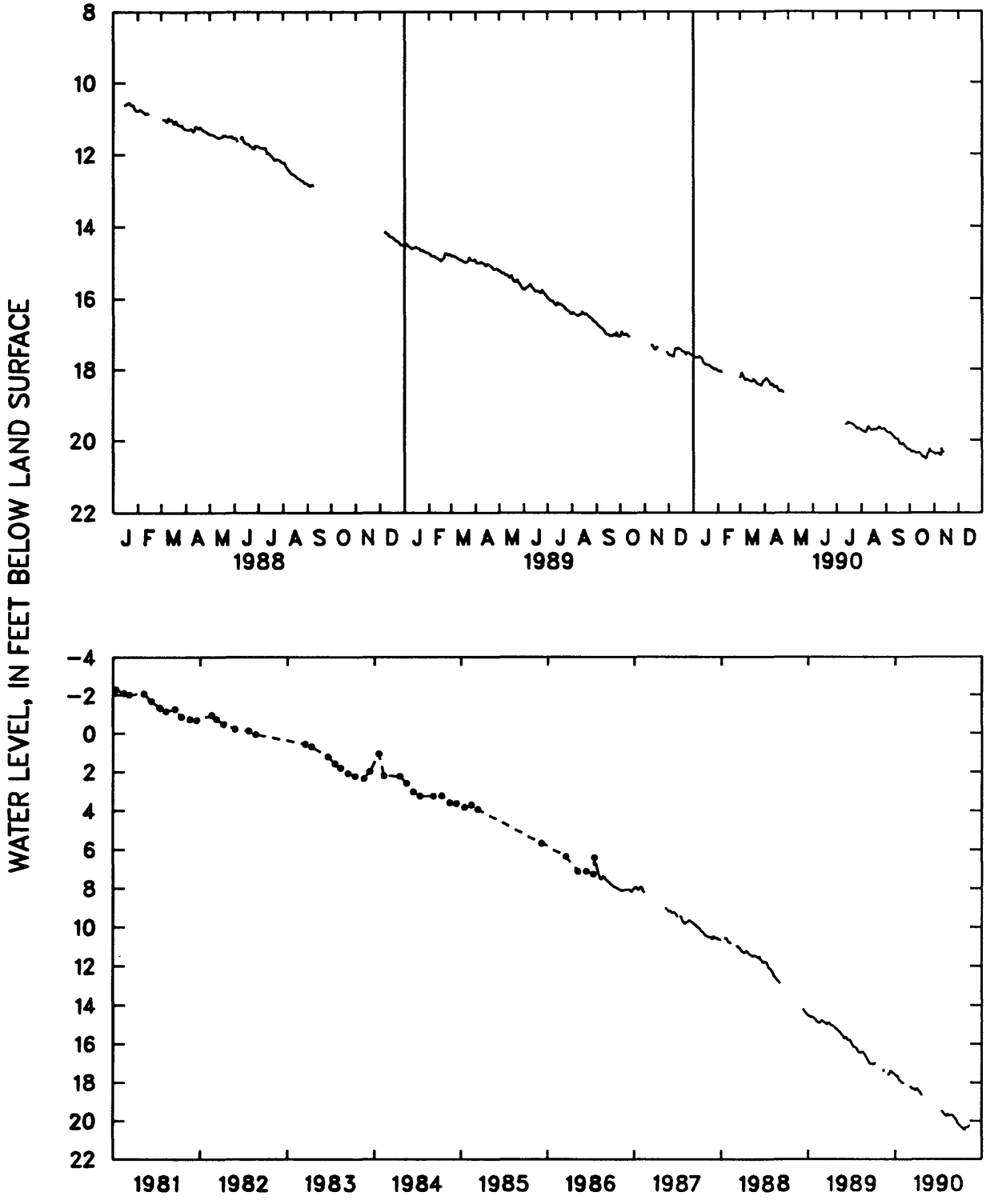


Figure 62.--Water level in observation well NC-176 (Black Creek aquifer), Duplin County.

NC-177 NEAR LUMBERTON, ROBESON COUNTY

WELL-IDENTIFICATION NUMBER.--343840078550009; DEHNR Littlefield School Research Station well Y42f9.

LOCATION.--Lat 34°38'40", long 78°55'00", Hydrologic Unit 03040203, 6 miles east of Lumberton on N.C. Highway 41 at Littlefield School.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 468 feet, diameter 6 inches, cased to 390 feet and from 395 to 429 and 434 to 444 feet, screened intervals from 390 to 395, 429 to 434, and 444 to 449 feet; measured depth 462 feet, December 1987.

INSTRUMENTATION.--Measured periodically with steel tape.

DATUM.--Land-surface datum is 142 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 1.4 feet 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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 76.40 feet below land-surface datum, January 5, 1971; lowest, 106.83 feet below land-surface datum, October 2, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
FEB 29	101.11	JUNE 6	101.94	JULY 6	102.19	AUG 10	102.42	OCT 20	102.68	NOV 21	103.07
APR 18	101.32										

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR 14	103.70	MAY 9	104.17	JUNE 27	104.59	AUG 15	104.93	OCT 2	105.04	NOV 29	105.36

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 22	105.38	APR 23	105.64	JULY 16	106.18	AUG 27	106.41	OCT 2	106.83	NOV 13	106.57
MAR 13	105.44	JUNE 4	105.81								

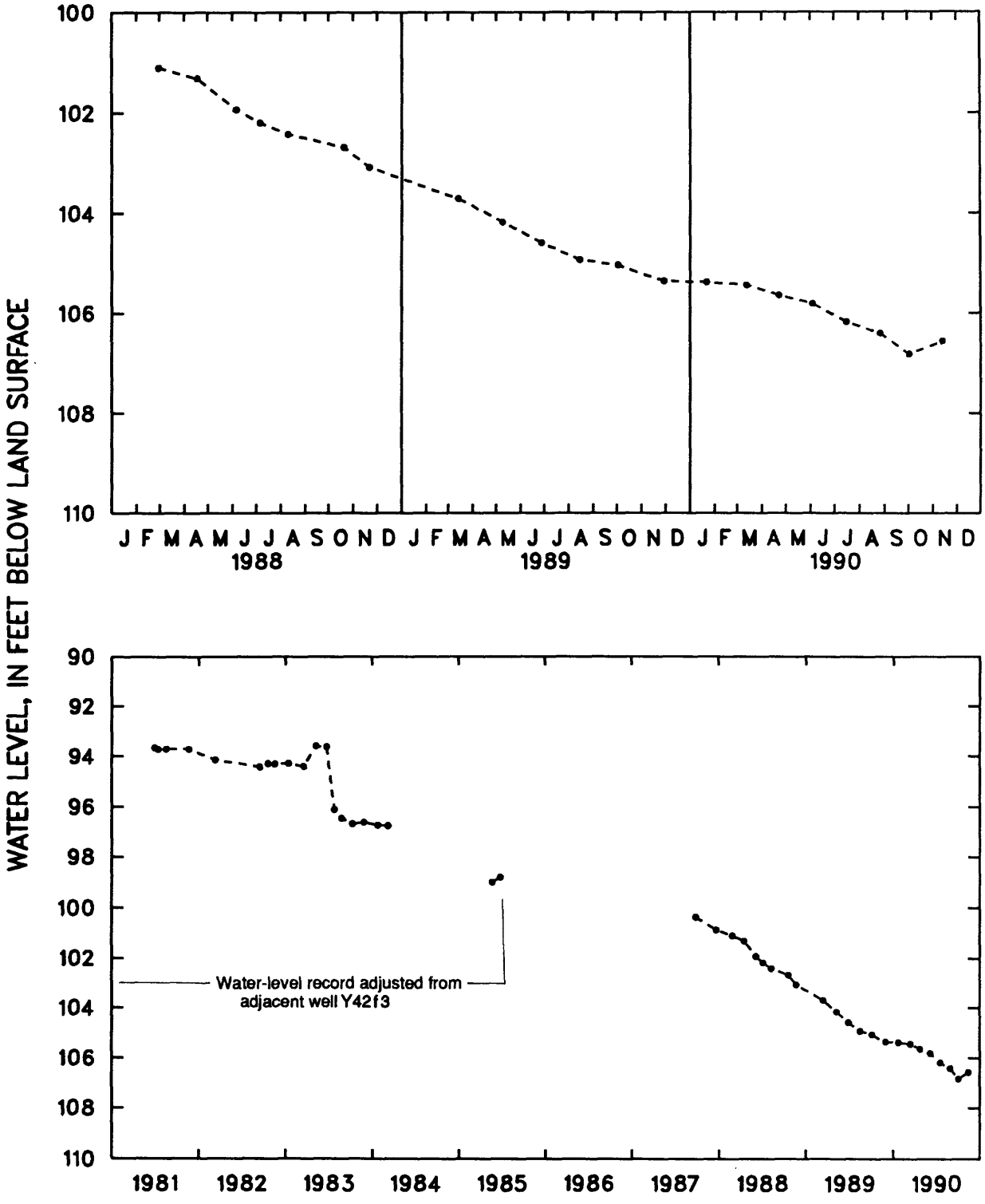


Figure 63.--Water level in observation well NC-177 (upper Cape Fear aquifer), Robeson County.

NC-183 NEAR BETHEL, PITT COUNTY

WELL-IDENTIFICATION NUMBER.--354457077215504; DEHNR Bethel Research Station well L24b4.

LOCATION.--Lat 35°44'57", long 77°21'55", Hydrologic Unit 03020103, 4.2 miles south of Bethel on U.S. Highway 13 and N.C. Highway 11 at North Pitt High School.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 370 feet, diameter 4 inches, cased to 360 feet, screened interval from 360 to 370 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, October 1983 to November 1988; measured periodically with steel tape beginning November 1988.

DATUM.--Land-surface datum is 55.31 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 1.87 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to October 1983 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 56.33 feet below land-surface datum, April 17, 1980; lowest, 70.68 feet below land-surface datum, November 14, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	67.70	67.68	67.82	67.90	67.95	68.08	68.44	68.71	68.78	68.89	---	---
10	67.69	67.79	67.70	67.91	68.03	68.05	68.47	68.73	68.80	68.94	---	---
15	67.77	67.69	67.77	67.85	68.08	68.18	68.48	68.80	68.85	69.02	---	---
20	67.65	67.67	67.81	67.82	67.92	68.21	68.57	68.80	68.89	68.91	---	---
25	67.66	67.74	67.90	67.88	67.93	68.28	68.57	68.84	68.89	68.90	68.73*	---
EOM	67.80	67.78	67.91	67.95	68.05	68.25	68.64	68.83	68.95	68.92	---	---

* Periodic water-level measurement made on November 22.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 9	68.60	MAY 9	68.18	AUG 14	68.45	OCT 16	68.69	NOV 27	68.55	DEC 4	68.54
MAR 14	68.27	JULY 5	68.37								

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 22	68.50	APR 24	68.78	JULY 18	69.47	AUG 28	69.65	OCT 3	70.41	NOV 14	70.68
MAR 5	68.60	JUNE 5	68.90								

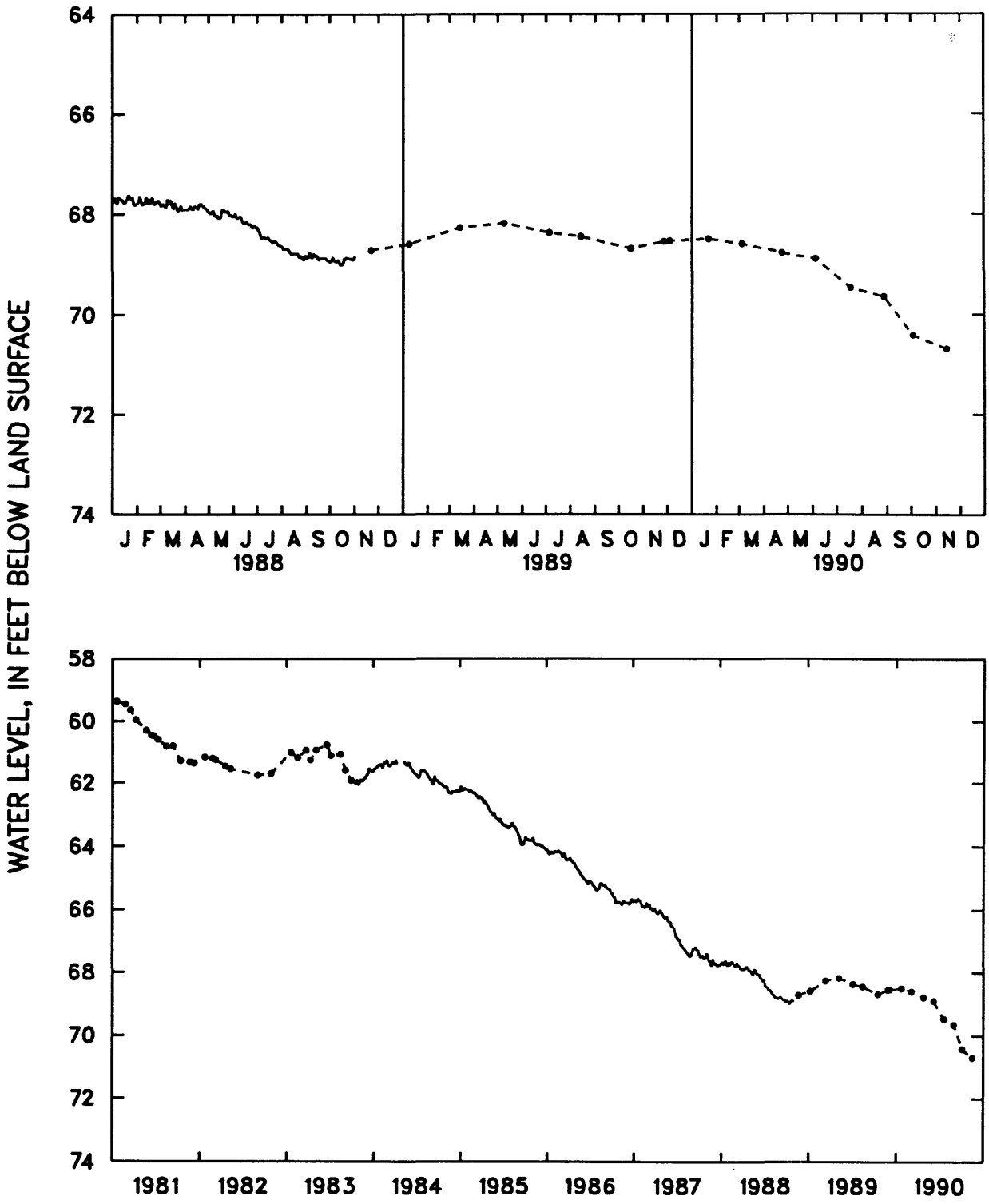


Figure 64.--Water level in observation well NC-183 (upper Cape Fear aquifer), Pitt County.

NC-186 AT KINSTON, LENOIR COUNTY

WELL-IDENTIFICATION NUMBER.--351609077370605; DEHNR 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 DEHNR Supply Yard.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Upper Cape Fear aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 520 feet, diameter 6 inches, cased to 480 feet, screened interval from 480 to 490 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, August 1983 to November 1990; measured periodically with steel tape beginning November 1990.

DATUM.--Land-surface datum is 44.03 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 1.85 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to August 1983 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 68.78 feet below land-surface datum, August 12, 1974; lowest, 103.43 feet below land-surface datum, August 7, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	97.01	---	95.89	96.00	95.81	96.53	97.64	99.01	99.86	99.97	---	100.73
10	96.99	---	95.70	96.00	95.90	96.55	97.60	98.85	99.92	100.18	---	100.90
15	97.00	---	96.21	95.90	95.93	96.88	98.16	99.10	100.03	100.75	---	100.58
20	96.75	---	96.27	95.99	95.92	97.08	98.69	99.32	99.95	---	---	100.54
25	---	96.12	96.25	95.91	95.95	97.46	98.85	99.32	99.79	---	---	100.02
EOM	---	95.97	96.15	95.95	96.17	97.62	98.94	100.01	99.95	---	100.40	99.86

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	99.79	99.39	97.61	97.95	97.55	97.95	---	98.29	98.64	98.91	99.97	100.68
10	99.69	99.39	97.21	98.33	97.00	98.19	---	98.28	98.66	98.83	99.98	100.07
15	99.62	98.91	97.11	97.89	97.03	98.33	98.53	98.13	98.75	99.22	99.78	99.90
20	99.69	98.37	97.56	97.90	97.26	98.26	97.96	98.04	98.74	99.36	100.01	99.83
25	99.69	98.22	97.36	98.18	97.59	98.51	97.67	97.92	98.87	99.50	100.26	---
EOM	99.37	97.72	97.33	98.05	97.68	98.45	98.19	98.52	98.91	99.67	100.35	100.65

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	100.96	100.91	100.26	99.64	100.57	99.66	101.58	103.34	101.77	103.01	102.84	---
10	101.05	100.86	100.32	99.73	100.30	100.08	101.87	103.05	101.83	103.01	102.68	---
15	101.38	100.69	100.32	99.99	100.24	100.44	102.28	102.72	101.95	102.82	103.19	---
20	101.39	100.41	99.97	100.40	100.23	100.72	102.43	102.64	102.36	102.86	---	---
25	101.30	100.03	100.21	100.29	100.46	101.03	102.65	102.35	102.68	102.68	---	---
EOM	101.33	100.09	99.71	100.55	99.69	101.25	102.81	101.93	102.72	103.11	---	---

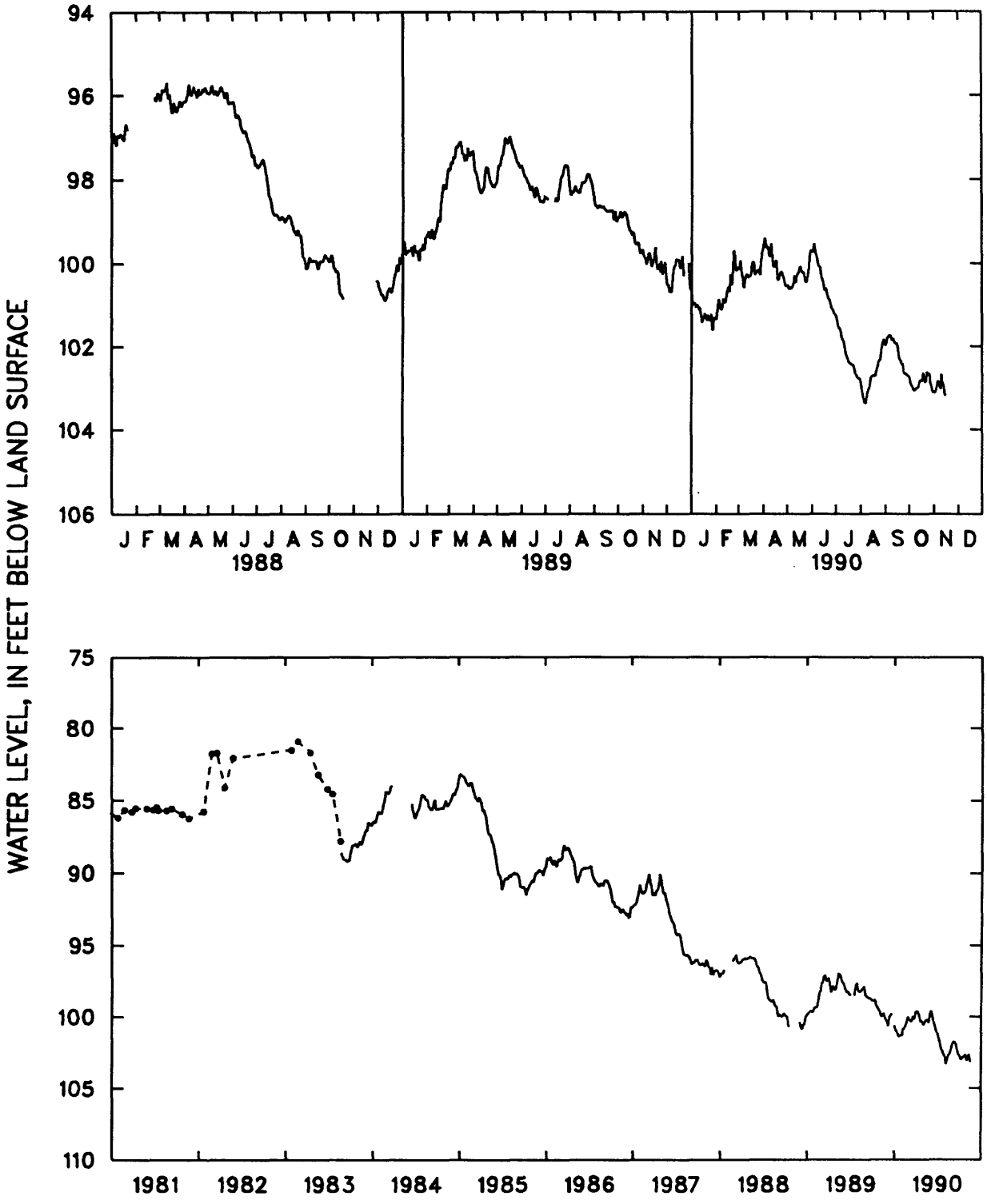


Figure 65.--Water level in observation well NC-186 (upper Cape Fear aquifer), Lenoir County.

NC-189 NEAR JACKSONVILLE, ONSLOW COUNTY

WELL-IDENTIFICATION NUMBER.--344837077291607; DEHNR Jacksonville Hwy 258 Well Field Research Station well W25f7.

LOCATION.--Lat 34°48'37", long 77°29'16", Hydrologic Unit 03030001, 1.4 miles northeast of U.S. Highway 258 and N.C. Highway 24 on Wells Road.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Black Creek aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 834 feet, diameter 4 inches, cased to 824 feet, screened interval from 824 to 834 feet.

INSTRUMENTATION.--Measured periodically with steel tape.

DATUM.--Land-surface datum is 26.62 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 3.78 feet 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 feet below land-surface datum, October 15, 1986; lowest, 135.82 feet below land-surface datum, November 15, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 19	110.01	APR 20	110.97	JUNE 8	112.20	JULY 12	113.03	AUG 9	113.98	OCT 26	117.77
FEB 9	110.32	MAY 11	111.32	JUNE 27	112.35	JULY 19	113.27	SEPT 7	115.29	DEC 6	119.45
MAR 10	110.35	JUNE 6	111.79								

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 10	120.58	MAY 18	122.62	JULY 12	123.64	AUG 18	124.43	OCT 3	125.54	NOV 28	127.03
MAR 15	121.77										

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 24	127.77	APR 25	129.34	JULY 11	131.11	AUG 30	132.77	OCT 4	134.49	NOV 15	135.82
MAR 8	128.52	JUNE 5	130.04								

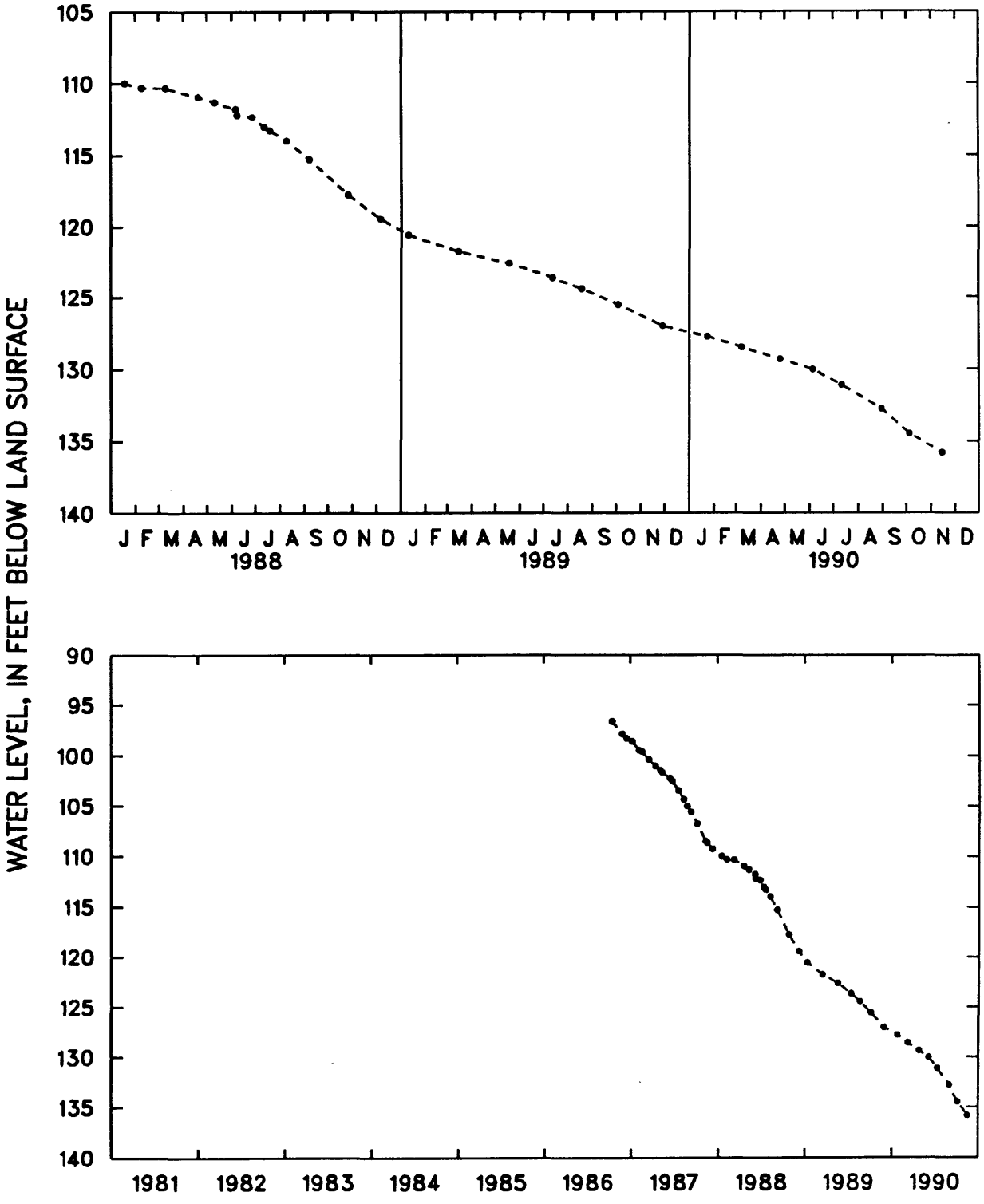


Figure 66.--Water level in observation well NC-189 (Black Creek aquifer), Onslow County.

(continued from page 116)

Creek aquifer are for public supplies in the Maxton area and for public-supply and self-supplied industrial use in the Lumberton and Elizabethtown areas. The wells at Elizabethtown tap the Peedee and upper Cape Fear aquifers in addition to the Black Creek.

Ground-water flow in the Black Creek aquifer throughout Robeson County and the mapped area to the northwest is characterized by recharge in the local uplands and discharge either to the nearby local streams or to wells. Cones of depression that developed around pumping centers, such as those near Maxton and around Lumberton, were not extensive in 1988. In the mapped parts of Bladen and Columbus Counties, where the Black Creek aquifer is overlain by the Peedee aquifer and the Black Creek confining unit, water in the Black Creek does not discharge to the local streams but flows southeastward toward the coast or is discharged from pumping wells at pumping centers, such as those at Elizabethtown and Whiteville.

Lower Cape Fear Aquifer

Water levels in the five observation wells completed in the lower Cape Fear aquifer reached record lows in 1990 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 the wells monitoring this aquifer are located (fig. 67). Significant withdrawals in North Carolina are for small municipal systems in Northampton and Hertford Counties, for the county water system in Northampton County, and for industrial use in northwestern Bertie County.

Ground-water withdrawals from the lower Cape Fear and Lower Cretaceous aquifers in the Franklin, Va., area are approximately 30 Mgal/d (J.D. Larson, U.S. Geological Survey, oral commun., 1991). 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. 68). Withdrawals of about 0.3 Mgal/d from this aquifer at the Caledonia Correction Center ceased in 1988, and the cone of depression that existed in late 1987 (Coble and others, 1989) had nearly disappeared as water levels at the center of the cone recovered about 80 ft by late 1989.

Well NC-55 near the State line has been used to monitor the drawdown in the cone since 1965. The water level in this well declined, on average, slightly more than 0.8 ft per year from 1981 to 1987; it showed a marked increase in decline in October-November 1987 and has shown a steady decline of 1.8 ft per year from 1988 to 1990 (fig. 69). Well NC-155 (fig. 71) also shows a somewhat similar pattern of decline, and its water level has dropped more than 1.7 ft per year during 1987-90. Well NC-151 (fig. 70), 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 1.3 ft per year during the last decade.

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 is more than 2.6 ft per year (fig. 72) and 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 also have occurred in the lower Cape Fear aquifer in the southern Coastal Plain. The cause of the decline, averaging a little more than 0.2 ft per year in well NC-179 (fig. 73), has not been identified.

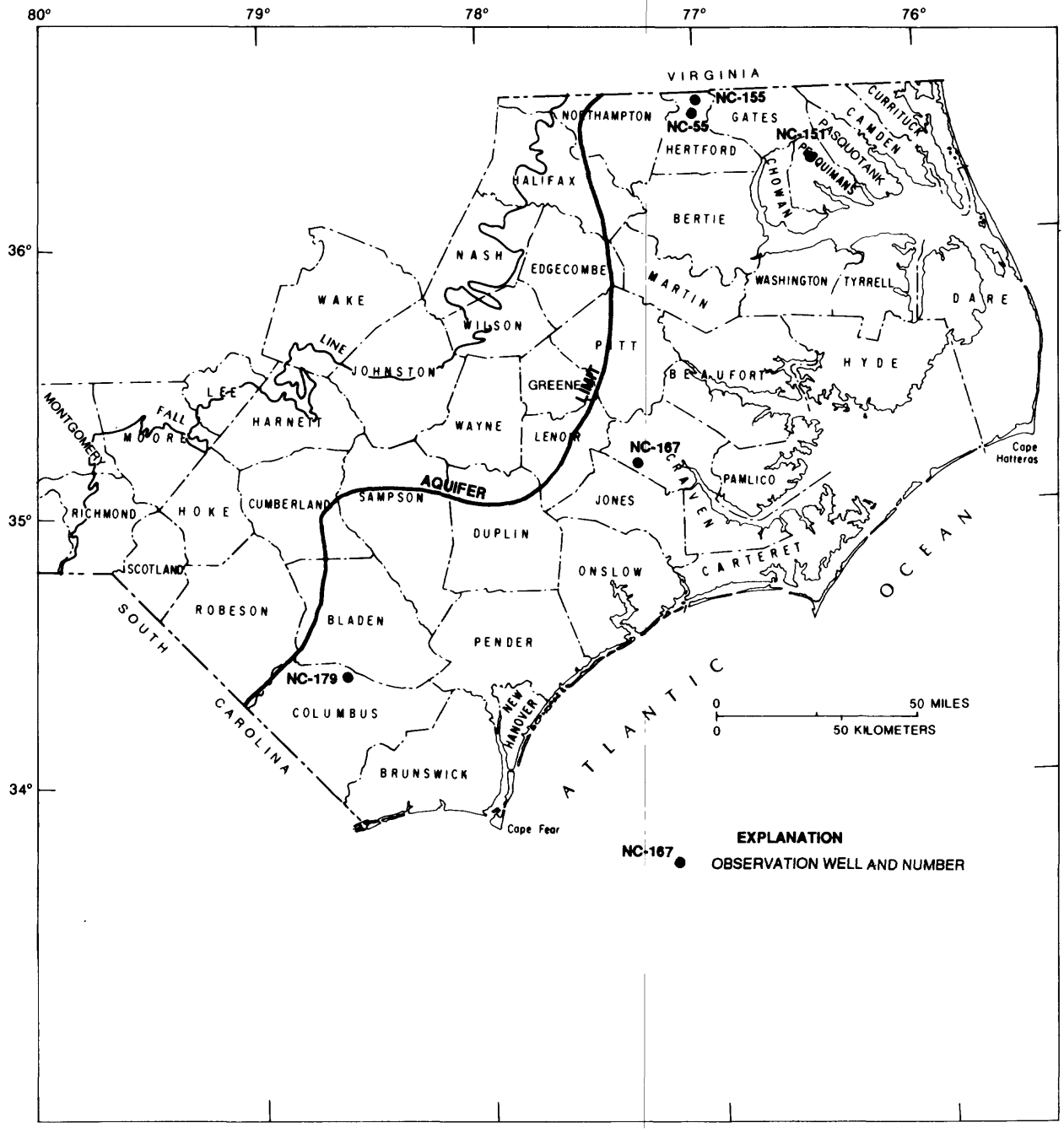


Figure 67.--Locations of observation wells completed in the lower Cape Fear aquifer.

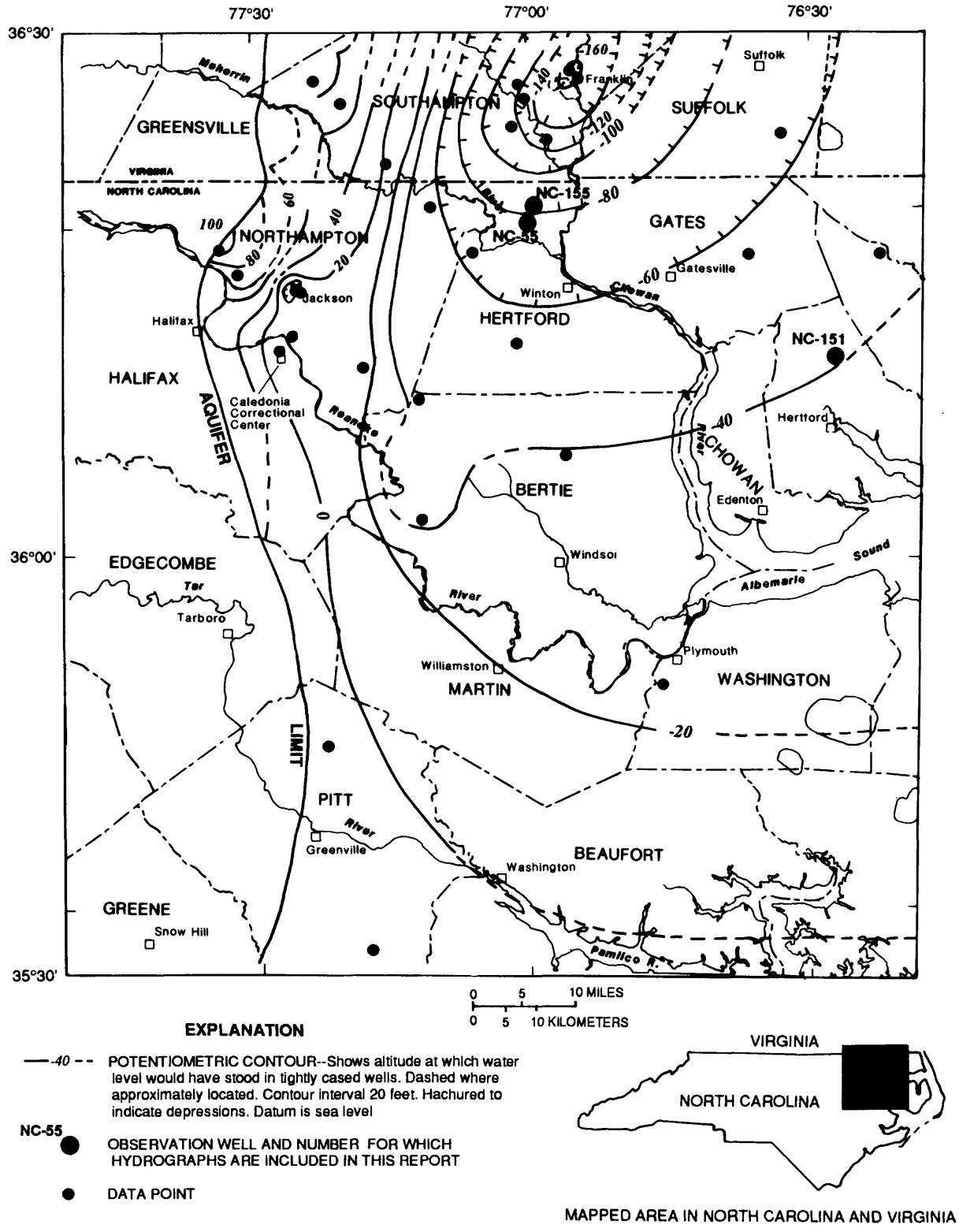


Figure 68.--Potentiometric surface of the lower Cape Fear aquifer of the Coastal Plain of northeastern North Carolina and southeastern Virginia, December 1989.

NC-55 NEAR COMO, HERTFORD COUNTY

WELL-IDENTIFICATION NUMBER.--362845077005501.

LOCATION.--Lat 36°28'45", long 77°00'55", Hydrologic Unit 03010203, 1.7 miles 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 feet, diameter 2 inches, screen depth unknown.

INSTRUMENTATION.--Measured periodically with steel tape.

DATUM.--Land-surface datum is 28.40 feet above National Geodetic Vertical Datum of 1929.
Measuring point: Top of instrument shelf, 2.79 feet 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 feet below land-surface datum, May 30 and 31, 1966; lowest, 106.59 feet below land-surface datum, October 2, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 29	101.64	MAY 11	102.12	AUG 3	102.88	SEPT 14	103.78	OCT 27	104.07	DEC 20	104.15
MAR 29	102.11	JUNE 21	102.71								

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
FEB 15	104.18	APR 14	104.09	JUNE 8	104.47	JULY 31	104.83	OCT 3	104.66	DEC 7	104.79

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 30	104.90	MAR 28	105.45	MAY 16	105.64	JUNE 27	105.92	AUG 14	106.24	OCT 2	106.59

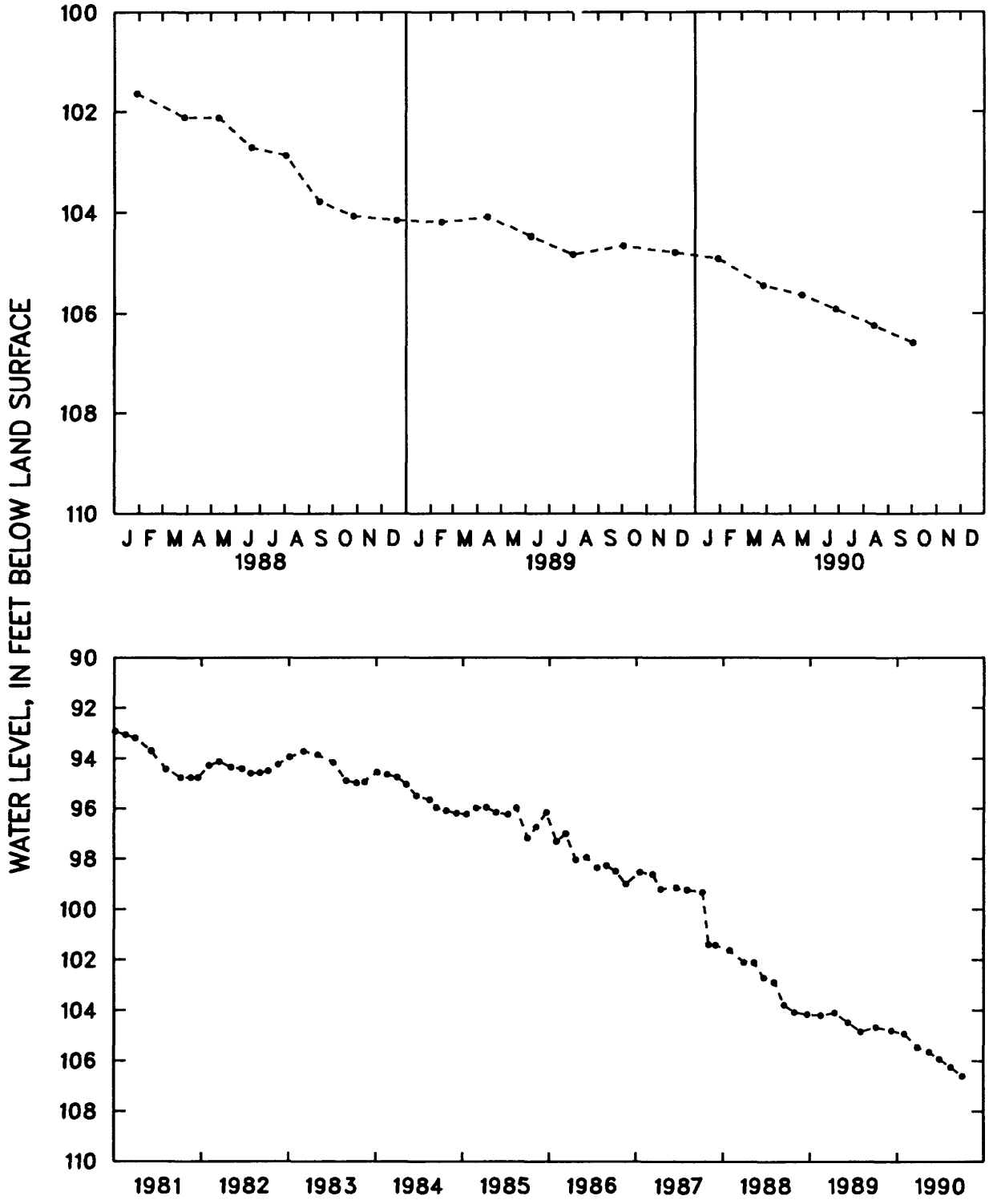


Figure 69.--Water level in observation well NC-55 (lower Cape Fear aquifer), Hertford County.

NC-151 NEAR PARKVILLE, PERQUIMANS COUNTY

WELL-IDENTIFICATION NUMBER.--361744076274402; DEHNR Parkville Research Station well E13m2.

LOCATION.--Lat 36°17'44", long 76°27'44", Hydrologic Unit 03010205, 3.5 miles west of Parkville, west of Secondary Road 1223 on logging road.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Lower Cape Fear aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 1,019 feet, diameter 4 inches, cased to 1,009 feet, screened interval from 1,009 to 1,019 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, November 1986 to September 1990; measured periodically with steel tape since September 1990.

DATUM.--Land-surface datum is 16.82 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 3.02 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to August 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 40.17 feet below land-surface datum, December 7, 1977; lowest, 59.19 feet below land-surface datum, November 13, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	55.26	55.34	55.52	55.59	55.79	55.87	56.11	56.29	56.41	56.60	56.62	---
10	55.26	55.44	55.35	55.62	55.86	55.86	56.09	56.28	56.47	56.64	---	---
15	55.37	55.34	55.45	55.62	55.85	56.00	56.08	56.34	56.50	56.73	---	---
20	55.15	55.23	55.51	55.62	55.76	---	56.14	56.34	56.51	56.68	---	---
25	55.19	55.46	55.69	55.69	55.76	55.99	56.17	56.36	56.54	56.62	---	56.89
EOM	55.47	55.49	55.67	55.76	55.89	55.95	56.27	56.48	56.65	56.79	---	56.94

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	56.96	57.05	56.88	56.96	57.09	57.23	57.42	57.52	57.70	57.64	57.85	---
10	56.98	57.06	56.94	56.98	56.99	57.18	57.45	57.62	57.68	57.75	57.70	57.68
15	56.85	57.08	56.85	56.95	57.11	57.27	57.45	57.41	57.72	57.75	57.74	57.78
20	56.86	56.94	57.02	57.03	57.22	57.37	57.31	57.45	57.57	57.63	57.78	57.84
25	56.98	56.91	56.87	57.07	57.19	57.28	57.49	57.50	57.68	57.85	---	57.89
EOM	56.92	56.80	56.82	57.06	57.36	57.40	57.54	57.58	57.64	57.73	---	57.87

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	57.91	58.01	58.23	58.11	58.22	58.44	58.68	58.97	58.90	---	---	---
10	57.82	57.90	58.23	58.33	58.30	58.48	58.75	58.83	58.90	---	---	---
15	58.05	58.10	58.24	58.30	58.44	58.57	58.70	58.84	58.72	---	59.19*	---
20	58.02	58.13	58.15	58.49	58.44	58.62	58.76	58.77	58.89	---	---	---
25	57.93	58.19	58.28	58.37	58.45	58.71	58.84	58.75	---	---	---	---
EOM	58.00	58.23	58.13	58.36	58.41	58.72	58.82	58.79	---	---	---	---

* Periodic water-level measurement made on November 13.

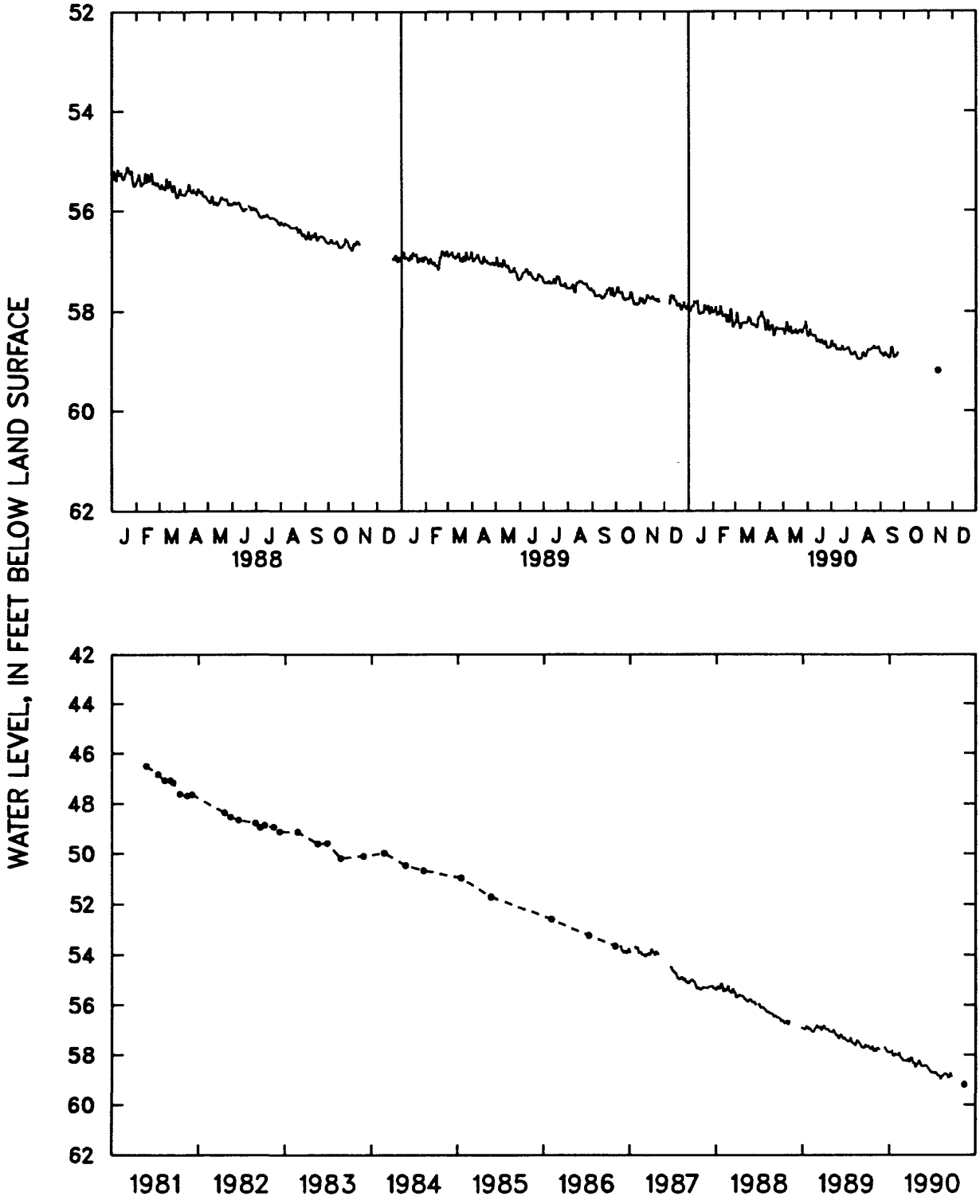


Figure 70.--Water level in observation well NC-151 (lower Cape Fear aquifer), Perquimans County.

NC-155 NEAR COMO, HERTFORD COUNTY

WELL-IDENTIFICATION NUMBER.--363026077001906; DEHNR Como Research Station well B20u6.

LOCATION.--Lat 36°30'26", long 77°00'19", Hydrologic Unit 03010203, 0.5 mile northeast of Como, northwest of U.S. Highway 258 on Secondary Road 1316.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Lower Cape Fear aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 818 feet, diameter 4 inches, cased to 560 feet, screened interval from 560 to 570 feet, cemented from 575 to 818 feet.

INSTRUMENTATION.--Measured periodically with steel tape.

DATUM.--Land-surface datum is 68.83 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 3.0 feet above land-surface datum.

REMARKS.--Areal-effects well.

COOPERATION.--Periodic water-level measurements prior to October 1986 were provided by DEHNR.

PERIOD OF RECORD.--September 1981 to current year. Records from September 1981 to October 1986 are unpublished and available in the files of the Groundwater Section, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 143.04 feet below land-surface datum, February 9, 1983; lowest, 156.05 feet below land-surface datum, November 13, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 29	151.02	APR 29	151.63	MAY 20	151.78	AUG 3	153.07	OCT 27	153.58	DEC 20	153.53
MAR 29	151.54	MAY 11	151.74	JUNE 21	152.32	SEPT 14	153.33				

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
FEB 15	153.55	APR 14	153.48	JUNE 8	153.84	JULY 31	154.09	OCT 3	153.78	DEC 7	154.05

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 30	154.18	MAY 16	154.98	JUNE 27	155.23	AUG 14	155.53	OCT 2	155.87	NOV 13	156.05
MAR 28	154.87										

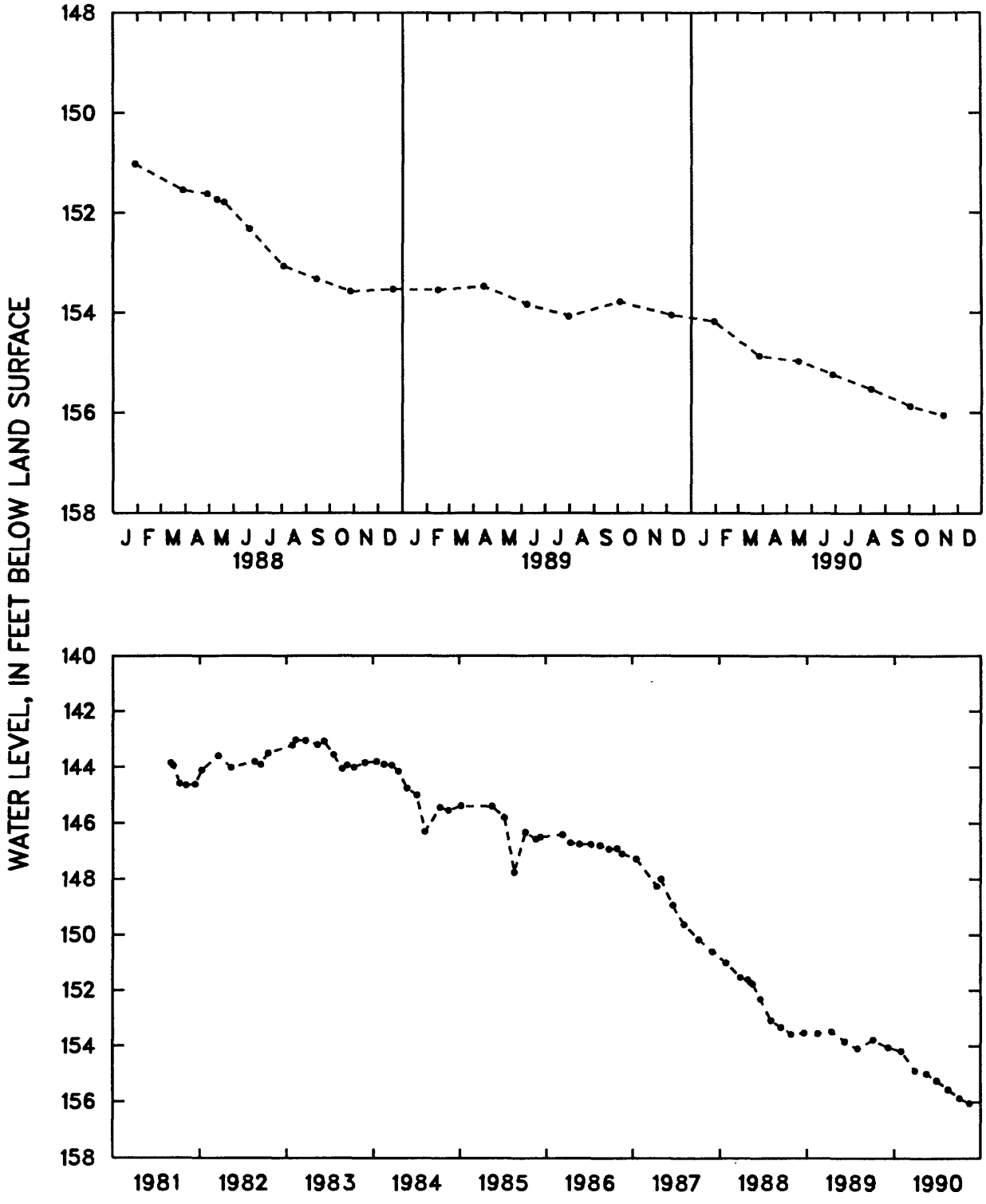


Figure 71.--Water level in observation well NC-155 (lower Cape Fear aquifer), Hertford County.

NC-167 NEAR COVE CITY, CRAVEN COUNTY

WELL-IDENTIFICATION NUMBER.--351019077184103; DEHNR Cove City Research Station well R23x3.

LOCATION.--Lat 35°10'19", long 77°18'41", Hydrologic Unit 03020202, 1 mile southeast of Cove City, 0.6 mile east of Secondary Road 1001 on Secondary Road 1232.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Lower Cape Fear aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 1,000 feet, diameter 4 inches, cased to 990 feet, screened interval from 990 to 1,000 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, July 1985 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 46 feet above National Geodetic Vertical Datum of 1929 (from topographic map). Measuring point: Top of instrument shelf, 2.24 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

PERIOD OF RECORD.--July 1985 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 50.29 feet below land-surface datum, September 27, 1985; lowest, 64.27 feet below land-surface datum, November 15 and 16, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	56.29	56.42	56.62	56.79	57.05	57.34	57.63	57.76	57.97	58.39	58.59	59.07
10	56.30	56.53	56.47	56.87	57.15	57.22	57.64	57.78	58.13	58.55	58.79	59.03
15	56.47	56.47	56.66	56.87	57.13	57.45	57.63	57.89	58.21	58.71	58.83	59.12
20	56.23	56.34	56.73	56.87	57.08	57.48	57.75	57.89	58.28	58.62	58.82	59.26
25	56.28	56.58	56.90	56.94	57.12	57.54	57.69	57.84	58.27	58.61	58.89	59.24
EOM	56.55	56.55	56.92	57.07	57.27	57.42	57.73	57.99	58.42	58.78	58.93	59.15

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	59.19	59.49	59.40	59.68	59.85	60.06	60.41	60.49	60.90	60.99	---	61.40
10	59.20	59.61	59.48	59.73	59.74	60.10	60.48	60.64	60.93	61.07	---	61.26
15	59.33	59.60	59.35	59.74	59.83	60.21	60.15	60.68	60.98	---	---	61.39
20	59.34	59.49	59.58	59.77	59.91	60.26	60.12	60.70	60.98	---	---	61.48
25	59.39	59.40	59.50	59.82	59.92	60.23	60.35	60.71	61.01	---	61.32	61.53
EOM	59.31	59.30	59.50	59.77	60.12	60.37	60.47	60.82	61.01	---	61.34	61.56

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	61.62	61.78	62.06	62.05	62.42	62.73	63.22	63.56	63.64	64.05	64.16	---
10	61.55	61.81	62.13	62.40	62.49	62.81	63.25	63.56	63.68	64.08	64.04	---
15	61.77	61.98	62.13	62.36	62.59	62.89	63.27	63.56	63.69	64.04	64.26	---
20	61.77	62.00	62.08	62.55	62.64	62.92	63.44	63.56	63.85	64.16	---	---
25	61.69	62.00	62.22	62.43	62.63	63.03	63.45	63.55	63.91	64.05	---	---
EOM	61.78	62.20	62.13	62.43	62.65	63.15	63.43	63.49	63.98	64.17	---	---

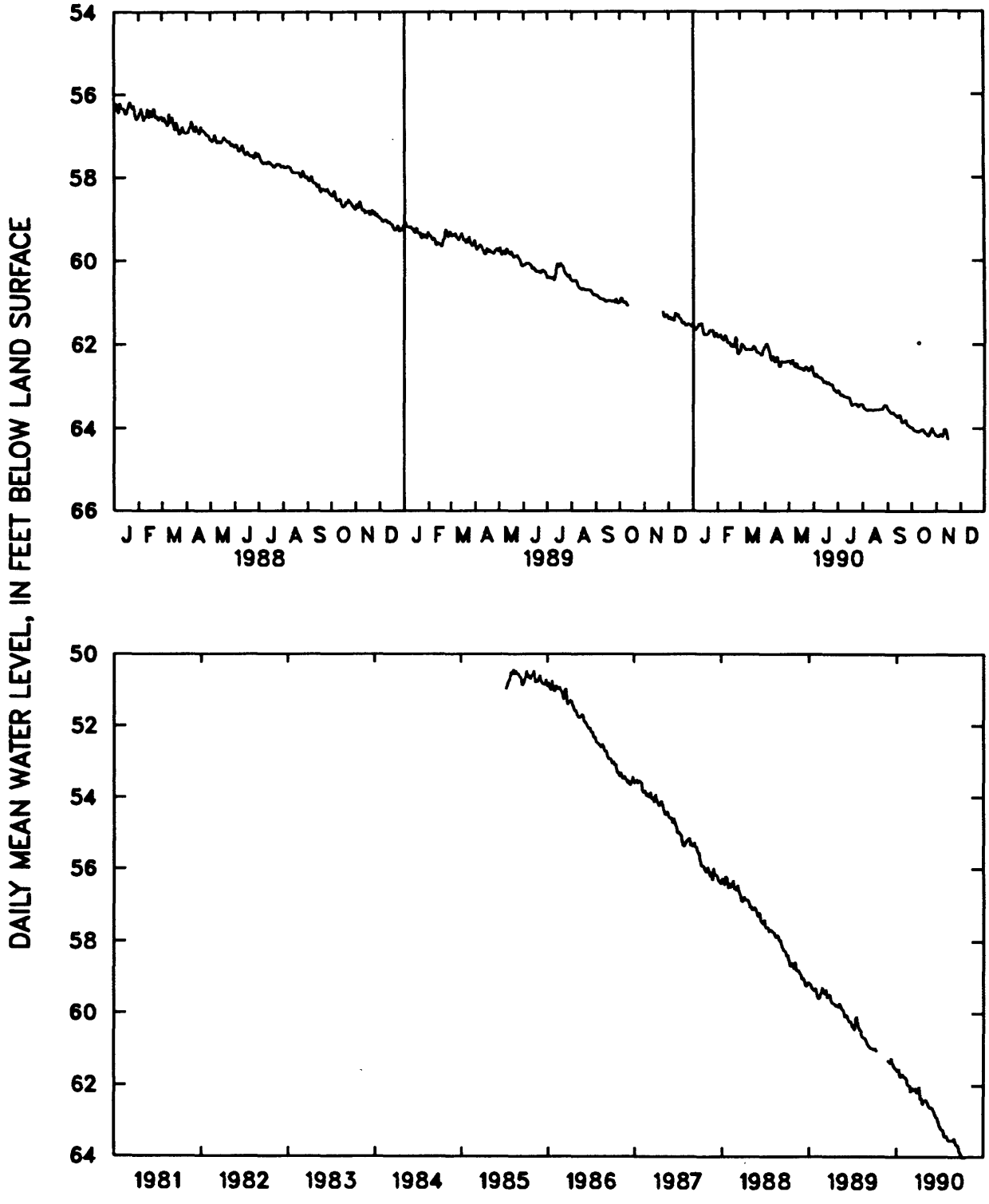


Figure 72.--Water level in observation well NC-167 (lower Cape Fear aquifer), Craven County.

NC-179 NEAR HALLSBORO, COLUMBUS COUNTY

WELL-IDENTIFICATION NUMBER.--342508078360802; DEHNR Carver Moore Research Station well AA39v2.

LOCATION.--Lat 34°25'08", long 78°36'08", Hydrologic Unit 03040206, 6.7 miles north of Hallsboro, east of Secondary Road 1001 at abandoned school on Secondary Road 1724.

OWNER.--DEHNR (North Carolina Department of Environment, Health, and Natural Resources).

AQUIFER.--Lower Cape Fear aquifer of Late Cretaceous age.

WELL CHARACTERISTICS.--Drilled observation well, drilled to 506 feet, diameter 4 inches, cased to 496 feet, screened interval from 496 to 506 feet.

INSTRUMENTATION.--Digital recorder, 60-minute punch, January 1987 to November 1990; measured periodically with steel tape since November 1990.

DATUM.--Land-surface datum is 105.53 feet above National Geodetic Vertical Datum of 1929 (levels by DEHNR). Measuring point: Top of instrument shelf, 2.1 feet above land-surface datum.

REMARKS.--Areal-effects well; EOM, end of the month; ---, missing record.

COOPERATION.--Periodic water-level measurements prior to May 1986 were provided by DEHNR.

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, DEHNR.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 39.11 feet below land-surface datum, July 20, 1976; lowest, 44.53 feet below land-surface datum, October 7 and 8, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1988
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	43.47	43.41	43.42	43.43	43.25	43.44	43.59	43.53	43.50	43.59	43.65	43.91
10	43.36	43.47	43.26	43.46	43.34	43.37	43.63	43.60	43.48	43.68	43.77	43.89
15	43.44	43.39	43.38	43.35	43.37	43.50	43.64	43.61	43.56	43.79	43.82	43.93
20	43.29	43.30	43.41	43.35	43.34	43.48	43.74	43.65	43.47	43.75	43.76	43.96
25	43.30	43.44	43.47	43.34	43.31	43.52	43.60	43.68	43.49	43.74	43.82	43.88
EOM	43.46	43.44	43.48	43.44	43.38	43.49	43.62	43.64	43.60	43.78	43.82	43.91

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1989
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	43.90	43.89	43.72	43.81	43.79	43.93	43.95	---	43.80	43.77	43.82	43.86
10	43.88	43.96	43.71	43.78	43.73	43.88	43.95	---	43.81	43.84	43.77	43.70
15	43.82	43.94	43.73	43.77	43.73	43.95	43.87	---	43.85	43.82	43.77	43.77
20	43.82	43.89	43.75	43.79	43.78	43.86	43.84	43.75	43.81	43.83	43.84	43.78
25	43.89	43.81	43.71	43.79	43.81	43.83	43.75	43.76	43.78	43.92	43.88	43.77
EOM	43.85	43.74	43.71	43.83	43.94	43.93	---	43.80	43.79	43.80	43.85	43.73

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, JANUARY TO DECEMBER 1990
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
5	43.75	43.75	43.77	43.62	43.69	43.69	44.03	44.29	44.18	44.46	44.22	---
10	43.66	43.67	43.75	43.73	43.69	43.73	44.01	44.07	44.21	44.48	44.14	---
15	43.81	43.77	43.73	43.70	43.78	43.78	44.05	44.08	44.17	44.16	---	---
20	43.73	43.75	43.68	43.82	43.78	43.85	44.11	44.11	44.31	44.28	---	---
25	43.69	43.79	43.76	43.77	43.83	43.95	44.17	44.04	44.41	44.09	---	---
EOM	43.75	43.80	43.56	43.73	43.64	43.98	44.21	44.09	44.42	44.27	---	---

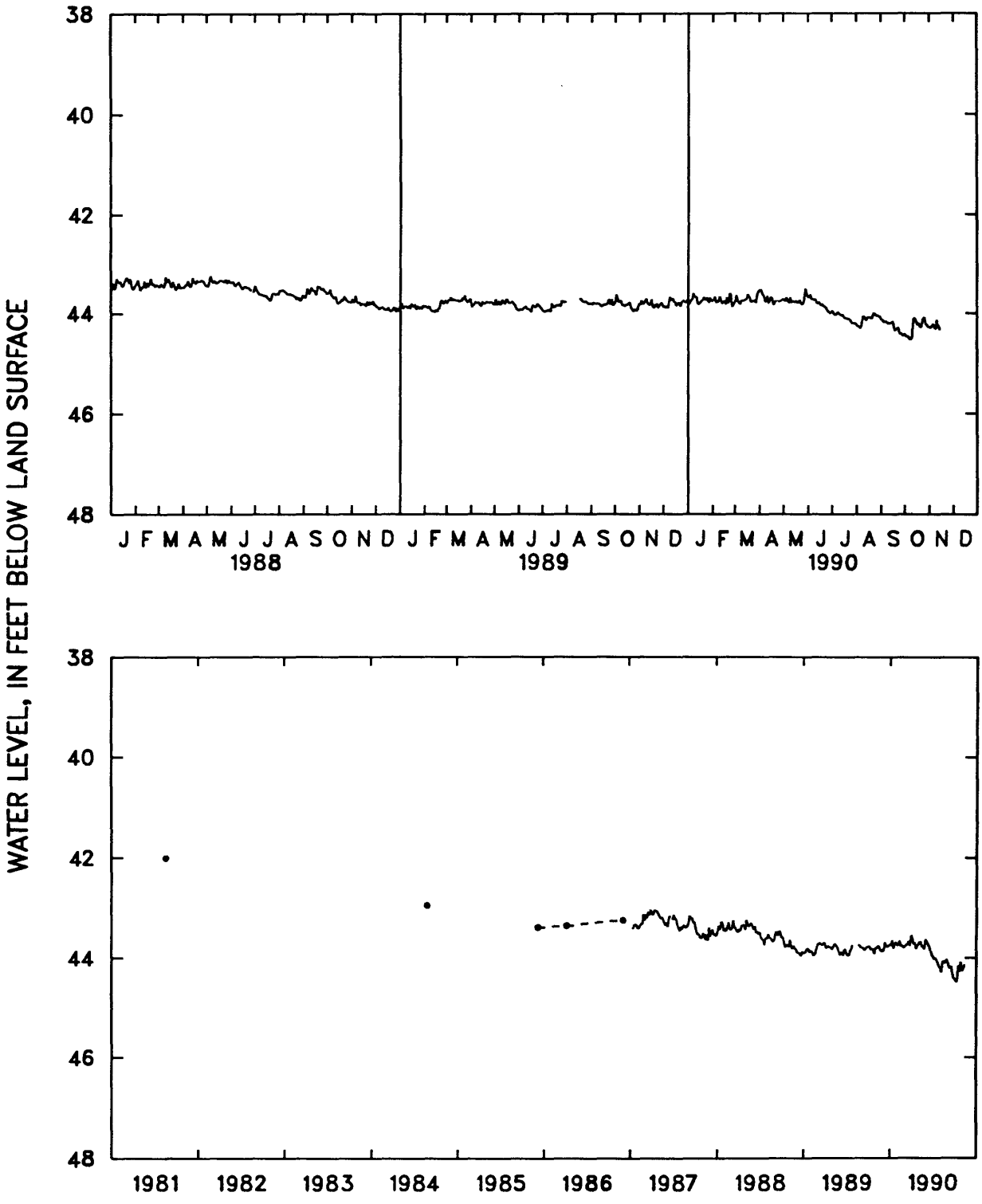


Figure 73.--Water level in observation well NC-179 (lower Cape Fear aquifer), Columbus County.

SELECTED REFERENCES

Data Reports

Prior to 1975, ground-water levels and artesian pressures in observation wells were published in the U.S. Geological Survey Water-Supply Papers (WSP) listed in the following table. Since 1975, publication has been in the annual water-data report series which are distributed each year by the District office in Raleigh.

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
1939	886	1946	1072	1953	1266		
1940	907	1947	1097	1954	1322		
1941	937	1948	1127	1955	1405		

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
	Length	
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
	Area	
square mile (mi^2)	2.590	square kilometer
	Flow	
gallon per minute (gal/min)	0.06309	cubic decimeter per second
million gallons per day (Mgal/d)	0.04381	cubic meter per second

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.