INTRODUCTION

Hunters Lake is in southwest Hernando County, approximately 2.5 miles from the Gulf of Mexico and immediately north of the Hernando-Pasco County line (figs. 1 and 2). Hunters Lake is the largest lake within Hernando County, with an average size of 360 acres. The lake is surrounded by Spring Hill, an unincorporated residential development, on all but the lake's west side, which is covered by natural scrub oak and palmetto (fig. 3). Although naturally a lake with no natural inflow or outflow streams, development of Spring Hill resulted in a high-water outflow from the southwest corner of the lake, through Dandelion Lake to Caribbean Lake, under U.S. Highway 19, and through coastal swamps to the Gulf of Mexico near the town of Aripeka. Inflow to Hunters Lake from many smaller lakes to the east and north could occur during extremely wet periods. General population growth in Pasco and Hernando Counties, development of Spring Hill in the 1970's, and continuing development along the U.S. Highway 19 corridor have increased demands on the quantity and quality of water in the lake and throughout the area.

The Southwest Florida Water Management District (SWFWMD) is one of five state water management districts and is charged with water-resource management throughout a 10,000 mi^2 area of west-central Florida. The U.S. Geological Survey, in cooperation with SWFWMD, has completed 17 previous investigations of District lakes in a multiyear program to define and evaluate the hydrology of lakes in varying geographic, cultural, and hydrologic settings. Collection and analysis of hydrologic data at Hunters Lake were part of this cooperative study during 1982-84. This report summarizes the hydrologic investigation of Hunters Lake and provides an understanding of the present and potential relationship of the lake to natural and cultural settings.

Lake stages, ground-water levels, and water-quality data within approximately 5 miles of Hunters Lake were considered in this investigation. Stage, discharge, and ground-water level data at Weeki Wachee Springs also were analyzed. Weeki Wachee Springs, about 6 miles north of Hunters Lake (fig. 1), is a spring of first magnitude flow (average discharge greater than 100 ft^3/s). Weeki Wachee Springs discharges ground water from an area of 100 to 150 mi^2 just north and east of Hunters Lake (Sinclair, 1978) and provides a comprehensive long-term summary of areal hydrologic trends. The Deltona Corporation, original developers of Spring Hill, provided historical (1967-81) water-level data for Hunters Lake and other nearby lakes. Water-level data for 1980-84 were collected by Deltona, the Southwest Florida Water Management District, and the U.S. Geological Survey. A network of 20 shallow wells and 14 surface-water gages was installed in 1982 as part of this investigation. Rainfall data for 1965-80 from the National Oceanic and Atmospheric Administration (NOAA) rainfall station at Chinsegut Hill near Brooksville were analyzed in conjunction with water-level data. Rainfall data for 1981-84 were collected by both a lakeside recorder and a resident observer. Lake stages and ground-water levels were analyzed to determine the relationship of Hunters Lake to the ground-water system and to nearby lakes. Water-quality samples from Hunters Lake, deep and shallow wells, and nearby Bob Hill Springs were also analyzed.

There have been several previous investigations of Hunters Lake and the surrounding area. The Deltona Corporation (1981; 1982) evaluated possible effects of connecting Hunters Lake with Dandelion Lake. Wetterhall (1965) reported on springs and sinks in west-central Florida and the geohydrology of Pasco and southern Hernando Counties (1964). The general hydrology of the central Gulf Coast of Florida was described by Cherry and others (1970). Fretwell investigated the ground-water resources of coastal Citrus, Hernando, and Levy Counties (1983) and evaluated the effects of development in Hernando County on water resources (1985). P. D. Ryder (U.S. Geological Survey, written commun., 1985) is investigating saltwater intrusion into the Floridan aquifer system near Hunters Lake. The U.S. Geological Survey reports water-level and water-quality data in annual data reports (1975-84) and also constructs semiannual maps that show the configuration of the potentiometric surface in the Upper Floridan aquifer (Barr and Schiner, 1982). Sinclair (1978) completed a preliminary evaluation of the water-supply potential in the Weeki Wachee area. Healy (1975) compiled the results of several investigations of marine terraces and shorelines of Florida. Mills and Ryder (1977) and Causseaux and Fretwell (1982; 1983) investigated the saltwater-freshwater interface in the Floridan aquifer in the area.

DESCRIPTION OF LAKE AREA

Hunters Lake is near the shoreward side of the Pamlico Marine terrace, a step-like topographical feature that formed as a bottom of the sea when sea levels were higher than in modern times (Cooke, 1945). Sloping upward from the shallow coastal waters of the Gulf of Mexico to an altitude of about 25 feet, the Pamlico terrace in Hernando County is characterized by coastal marshes and swamps, karst features such as springs and sinkholes, and relict beach dunes rising above the terrace to an elevation of approximately 70 feet above sea level (fig. 2). Hunters Lake is bounded by these dunes on the north and east sides, a characteristic common to coastal lakes in west-central Florida (Wetterhall, 1965). Much of the area is internally drained through permeable soils and drainage into depressions and sinkholes into the underlying limestone formations of the Floridan aquifer system. Well-defined surface drainage is generally absent. Rainfall captured by this internal drainage moves westward through the ground-water system and enters the Gulf as discharge from coastal springs and seeps. Wetterhall (1964) describes 19 springs or groups of springs in coastal Hernando County. Bob Hill Springs, southwest of Hunters Lake, is the closest group of springs. Periodic discharge measurements of the spring that is closest to Hunters Lake have ranged from zero flow to 4.4 ft^3/s.

Residential development of Spring Hill surrounds Hunters Lake on all but its west side and extends northeastward for about 8 miles. The water supply for Spring Hill is from a network of widespread wells that are finished in the Upper Floridan aquifer. Average daily pumpage from the wells in 1981 was 2.4 Mgal/d (SWFWMD public water-supply data). Most homes near Hunters Lake are serviced by a central sewage system that transfers sewage away from the lake.

East of the residential areas adjacent to the lake, land use consists of natural cover including scrub oak and palmetto, as well as pasture, agricultural pine, and scattered homes and farms. South of the lake in Pasco County, neglected citrus groves extend southward from the county line. U.S. Highway 19, west of the lake, is a corridor of commercial development throughout the coastal part of the county. Surface features west of U.S. Highway 19 change from hardwood-cypress swamps to coastal marshes as land surface slopes toward the coast. Further development on the west side of the highway will probably be limited to areas above an altitude of 10 feet.

Hernando County's population has increased from less than 20,000 in 1970 to an estimated 50,000 in 1984 (University of Florida, 1983). Population increases are expected to continue in the future and will increase demands on area water supplies. Fretwell (1985) estimated with models of the ground-water system and projected increases in water use that ground-water levels will decrease about 0.2 foot in the Hunters Lake area by the year 2000. Since Hunters Lake is closely tied to the ground-water system, lowered ground-water levels will directly affect the lake. The computer modeling data, however, are for a large area and the actual change in water levels at any specific site is only approximate.

The climate in the Hunters Lake area is characterized by frequent convective thunderstorms during the warm, humid summer months and by relatively dry conditions during the rest of the year. Most winter precipitation is rainfall from areawide frontal storms that bring moisture from the Gulf of Mexico. During 1965-84, the period of record for stage data at Hunters Lake, rainfall averaged 53.02 inches in the area (U.S. Department of Commerce, 1963-84). Long-term annual precipitation at Chinsegut Hill (1915-84) has averaged 56.45 inches. About 55 percent of the annual rainfall occurs during June through September, and August is the wettest month, averaging 8.66 inches. November is the driest month with an average rainfall of 2.02 inches. Annual departures from the 1965-84 average precipitation are shown in figure 4. The average annual temperature at Chinsegut Hill is 71.4°F, and monthly average temperatures range from 59.4°F in January to 81.1°F in August.

HYDROGEOLOGIC SETTING

Hunters Lake is in an area of karst terrain with unconsolidated sands at the land surface underlain by a series of limestone formations. These limestone formations extend several hundred feet below land surface and are collectively known as the Floridan aquifer system. Separating the sand and limestone is a variable layer of clay that is either consistent or intermixed with sand and limestone (fig. 5).

The thickness of the permeable sands above the clay and limestone is about 25 feet close to the lake (wells 3 and 4, section A-A', fig. 5). Closer to the Gulf Coast, the mantle of sand generally decreases in thickness, and exposed limestone is evident in the pool of Bob Hill Springs (fig. 3) at about 5 feet below land surface. Thickness of the sands is greater north and east of the lake in the area of relict beach dunes. Sand occurred to a depth of 130 feet below land surface at well 8 (fig 5). This well is probably located in a sinkhole that is filled with surficial sands.

An areally consistent layer of clay occurred in about one-half the wells shown in figure 5. The remainder of the wells penetrated a layer of clay and sand or clay intermixed with limestone. Erosion, weathering, or disruption of the clay layer due to collapse or subsidence of the underlying limestone prevents the clay from confining water in the Upper Floridan aquifer in the area. This results in a generally nonartesian aquifer system and water levels in wells finished in the surficial sands or in the underlying limestones are the same. Bob Hill Springs, however, only 0.8 mile from the southwest corner of Hunters Lake, has vigorous artesian spring boils as a result of a local confining bed overlying the limestone. The slope of the top of the limestone on both sides of the lake (fig. 5) suggests a bowl-like depression in the limestone beneath the lake.

The uppermost limestone in the area is the Oligocene Suwannee Limestone. In the vicinity of Hunters Lake, the Suwannee Limestone is encountered at an elevation of about 45 feet below sea level and extends to a depth of about 150 feet below land surface. Wetterhall (1964) reported that the Suwannee Limestone is very permeable and most domestic wells in the area are finished in the formation. Underlying the Suwannee Limestone is the Eocene Ocala Limestone. The permeability of the Ocala Limestone is generally less than the Suwannee Limestone and few wells are finished in this zone. The Eocene Avon Park Formation lies beneath the Ocala Limestone at a depth of 275 to 300 feet below land surface and is several hundred feet thick. Production wells for Spring Hill are finished in the upper part of the Avon Park Formation. Wetterhall (1964) states "the dolomitic zone about 100 feet below the top of the formation is highly permeable and yields large quantities of water to wells." Estimates of transmissivity in the Upper Floridan aquifer near Hunters Lake range from 2.5×10^5 ft/d to 8.6×10^5 ft/d (Fretwell, 1985).

Although Hunters Lake is only about 3 miles from the Gulf Coast, saltwater intrusion into the Upper Floridan aquifer near the lake has not been a problem. The saltwater-freshwater interface in the Upper Floridan aquifer is at depths of 450 to 500 feet at well R18-2 (fig. 2).

LAKE DESCRIPTION

Hunters Lake is a relatively shallow, irregularly shaped, natural lake that was formed by subsidence of surficial clay and sand as a result of dissolution and erosion of underlying limestone. It has the same origin as the slightly smaller Citrus Lake (formerly Hog Pond) and Lake Theresa (formerly Weeki Wachee Prairie Lake), both northeast of Hunters Lake (fig. 2), as well as numerous ponds and small lakes throughout the area.

Morphology

Depths to the bottom of Hunters Lake at a stage of 19.07 feet above sea level are shown in figure 3. Soundings were recorded by fathometer on November 30 and December 1, 1983, at the stage noted. The eastern third of the lake and a 25-acre, heavily grassed area in the northern corner of the lake are much shallower than the majority of the lake. Numerous low-lying islands in these areas appear and increase in size with falling lake stages. The bottom slope from the shoreline in these areas is relatively mild but increases distinctly between the 6-foot and 10-foot depth contour lines. The bottom slope again becomes a very mild decline to the deepest part of the lake just west of its center. The deepest spot sounded in the lake was 12.3 feet, or about 6.8 feet above sea level.

With the exception of several closed 6-foot contour lines that were created by excavation near the shoreline, about one- half the lake (165 acres) lies within the large closed contour of the 6-foot depth. The generally regular outline of this contour and the distinct change in bottom slope below this depth suggest a previous shoreline at an elevation of 13 feet above sea level.

Most of the lake shoreline has been altered since residential development began in the late 1960's. Figure 6 compares the lake shoreline as shown on U.S. Geological Survey topographic maps compiled in 1951-54 and the shoreline indicated by aerial photography taken in April 1984. Both shorelines are based on a lake stage of about 19 feet above sea level. The predevelopment area of the lake at this stage was about 300 acres. Some low-lying areas and ponds near the previous shoreline were excavated and made part of the lake or connected to the lake by canals. Other low-lying areas were built up with excavated material. Based on a comparison of the 1954 and 1984 shorelines, approximately 60 acres of marsh or low-lying land adjacent to the lake was excavated. Within the 20-foot contour surrounding the lake, as depicted on the 1954 map, approximately 60 acres was filled to increase land altitudes for residential development. About 20 acres of additional surface area was added to the lake by excavating connecting canals to nearby ponds. The lake has approximately 7 acres of islands at a stage of 19 feet above sea level. This island area increases to almost 50 acres at a lake stage of 17 feet above sea level.

Figure 7 shows how the area and the volume of the lake change with stage. At the average stage of 17.2 feet above sea level, the area of Hunters Lake is 360 acres, the volume is 1,720 acre-feet, and the mean depth (volume divided by area) is about 4.8 feet. The decrease in slope of the area curve above a stage of about 13 feet (fig. 7) reflects the marked decrease in bottom slope above this altitude.

Lake Stage

Stage data for Hunters Lake have been collected since 1965, with the exception of June 1966 to June 1967. The U.S. Geological Survey collected twice-weekly stage readings from January 1965 to June 1966. The Deltona Corporation, as part of its environmental monitoring for Spring Hill, collected monthly stage readings from June 1967 to August 1980. Lake-stage data have been collected since August 1980 by the U.S. Geological Survey, the Deltona Corporation, and the SWFWMD. Data collection frequency for 1980-84 ranges from weekly readings to continuous recording of stage. The average stage for Hunters Lake for 1965-84, based on available data, is 17.2 feet.

Figures 4 and 8 show monthly stage data for the period of record. The maximum stage observed is 20.7 feet and occurred in March 1970. Because this was a discrete monthly reading, it may not have been the maximum stage reached by the lake. Maximum readings for other lakes occurred the same month, however, so the maximum stage for Hunters Lake for 1965-84 probably was in March 1970. The minimum stage recorded is 12.48 feet and occurred July 16, 1981. On the basis of the relationship between Hunters Lake stage and the annual average discharge for Weeki Wachee Springs, this is probably the lowest stage that has occurred at Hunters Lake since at least 1957.

The Deltona Corporation, as part of the overall drainage plan for Spring Hill, had planned to connect Hunters Lake and Dandelion Lake by way of a canal from the southwest corner of Hunters Lake. The SWFWMD, concerned that this connection might lower the stage of Hunters Lake because of water loss to the lower, downgradient Dandelion Lake, requested two tests to evaluate possible impacts of the connection. The first, "dry season," test was conducted from December 1980 through January 1981. The second, "wet season," test was conducted from August through October 1982. In both tests, water was pumped from Hunters Lake to Dandelion Lake until their stages were the same, then a culvert through an earthen dam between the two lakes was opened. After a 2-week stabilization period, a month-long test period of concentrated water-level measurements was conducted before the culvert was closed and the lakes again separated. After reviewing test results presented by Deltona, the SWFWMD in 1984 denied the permit application to remove the earthen dam and permanently connect the lakes on the basis that the stage of Hunters Lake could be significantly decreased by water loss to Dandelion Lake.

Inflow to Hunters Lake from lakes to the northeast did not occur during 1981-83. Because of the permeable soils, the distance of the upgradient lakes, and the close relationship of the lakes to the ground-water system, flow from the upgradient lakes to Hunters Lake would occur only during extremely wet conditions. Outflow from Hunters Lake to Dandelion Lake started in September 1983 as the stage of Hunters Lake rose above 18.9 feet, the altitude of the adjustable weir at the connecting culvert. More than 200 acre-feet of water flowed from Hunters Lake to Dandelion between September and December 1983. The outflow weir was not monitored after December 1983, so outflow conditions are not known after that time.

Figure 9 presents lake-stage and ground-water level data for Hunters Lake and adjacent wells and lakes for the period May 1982 through April 1983. These hydrographs were compiled to show daily lake stage, the relationship of Hunters Lake stage to water levels in nearby lakes and wells, and the second time period when Hunters and Dandelion Lakes were connected. Of particular interest is the period of nearly static stage between September 26, 1982, and January 5, 1983. During this 102-day period, the stage did not vary more than 0.06 foot from the average of 17.54 feet. Fluctuations of stage before and after this period are typical of Hunters Lake. Static levels for long periods are unusual in an ever-changing hydrologic environment. Daily observations of stage were verified by several observers at different sites and by installation of a graphic recorder in early December. Several reconnaissance trips, on land and water, were conducted to determine if unusual sources or withdrawals of water were involved. Nothing unusual was observed. The apparent cause of this lack of stage fluctuation is discussed in the following sections on ground water-surface water relationships and water quality. Because stage readings prior to 1980 are only monthly, it is unknown whether such occurrences have happened in the past.

GROUND WATER-SURFACE WATER RELATIONSHIPS

Hunters Lake is hydraulically connected to water in the surrounding and underlying materials that make up the ground-water system. Hydrologic conditions that may moderate the effects of the ground-water system on the lake--surface inflow, regulated outflow, augmentation, or an underlying artesian aquifer--are generally absent at Hunters Lake. Existing water-level data and data collected as part of this investigation were analyzed to determine how Hunters Lake and the ground-water system interact. Monthly water-level data and discharge data for 1967-83 for Hunters Lake, nearby wells, adjacent lakes, and Weeki Wachee Springs were analyzed to define areal gradients, variations in ground-water and surface-water levels and spring discharge, and how these characteristics relate to Hunters Lake.

The Upper Floridan aquifer in the Hunters Lake area is generally unconfined and water levels in the surficial sands and in the underlying limestone of the Upper Floridan aquifer are generally at the same altitude for a given location. To verify this, shallow well H-17 was installed near Upper Floridan aquifer well SWF-4, west of Dandelion Lake (fig. 3), and shallow well H-20 was installed next to Spring Hill deep well north of the lake. A staff gage was also installed in a pond adjacent to well R97, 2.4 miles east of the lake (fig. 2). Water levels in the Upper Floridan aquifer wells near Caribbean Lake were compared with water levels in Dandelion Lake, Caribbean Lake, and Hunters Lake. There were slight positive and negative differences in the pairs of water-level readings, but in each case, water levels in the Upper Floridan aquifer wells were virtually the same as in shallow wells or lakes. The following discussions of ground-water levels, therefore, will not distinguish between water levels in the Upper Floridan aquifer and in shallow wells or lakes.

Regional maps that present contours of ground-water altitudes for the SWFWMD area show that these contours generally parallel the coast in the Pasco-Hernando County area (Barr and Schiner, 1982). Flow of water in the ground-water system is at right angles to the contours, and regionally, flow is to the west.

Ground-water flow in the vicinity of Hunters Lake is from the northeast to the southwest (fig. 10). Hunters Lake is a "flow-through" lake where water enters the lake from the ground-water system on the northeast side of the lake and water from the lake enters the ground-water system on the southwest side. Ground-water gradients increase toward the southwest due to a steeper drop in land surface, ground-water discharge to springs and swamps, and possibly, due to a decrease in permeability of aquifer materials.

Figure 10 shows contours of water levels in the ground-water system for January 30, 1983. Ground-water flow is toward the west at the north edge of the map and toward the southwest near Hunters Lake. The map, as drawn, indicates that exchange of water with the ground-water system occurs only at the shoreline and that a gradient does not exist in the ground-water system beneath the lake. There is, however, some gradient and exchange of water across the lake bottom. Loss of water from the ground-water system to the lake changes the shape of water-level contours, as indicated by the curves in the 18-foot contour line. Loss of water from the ground-water system to the lake at the inlets on the northeast side of the lake tends to lower heads in the aquifer and causes the contours to bend upgradient, indicating discharge of water from the aquifer. Contour lines southwest of the lake tend to bend downgradient, indicating recharge to the ground-water system from the lake.

The black contour line of figure 10 is the hypothetical location of the 17.56-foot contour line--the equal-head contour line or line of equal ground-water and lake altitudes. It is based primarily on water levels in wells adjacent to the lake. Water in the ground-water system to the right of the contour line is higher than 17.56 feet and is a source of recharge to the lake. The ground-water system to the left of the line has the potential to receive water from the lake. As will be shown later, the location of the equal-head contour line changes with time and is an important factor in maintaining the level of Hunters Lake.

Other lakes in the study area are similarly affected by the ground-water system and are flow-through lakes. Comparative analyses of stage data for Hunters, Citrus, and Holiday Lakes and Lake Theresa have a correlation coefficient of 0.94 or higher. Figure 8 presents water-level data for Citrus Lake and Hunters Lake to show the close stage relationship. Linear regressions were formulated to indicate the stage relationships and are shown in table 1. The equations represent a straight line through a graphical plot of Hunters Lake stage versus water levels at other sites. The regressions show little improvement in standard error of estimate if water-level data for other sites or rainfall data are incorporated into the multiple linear regressions. However, if Citrus Lake stage, the change in Citrus Lake stage from the previous month, and the gradient between Citrus Lake and Hunters Lake from the previous month are used as independent variables in the regression, the standard error of estimate is decreased to 0.23 foot (table 1). Citrus and Holiday Lakes are upgradient from Hunters Lake, whereas gradients at Lake Theresa are probably to the west. Monthly stage data for the period June 1967 through September 1983 show that the lake stages have averaged 19.6 feet (Theresa), 19.3 feet (Holiday), and 19.0 feet (Citrus), with Hunters Lake averaging 16.9 feet for the same period (inclusion of stage data for 1965-66 and 1984 for Hunters Lake results in an average stage of 17.2 feet).

Spring Hill deep well is the closest ground-water monitor site to Hunters Lake that has long-term, continuous water-level records. Figure 4 shows the relationship between water levels in the well and those of Hunters Lake. During the period of coincident record (1972-84), monthly readings show that Hunters Lake stage averaged 16.40 feet above sea level and water levels in Spring Hill deep well averaged 16.23 feet above sea level. The minimum water levels for the lake and well occurred in July 1981 within 1 day of each other and were only 0.05 foot different (lake, 12.48 feet, July 16; well, 12.53 feet, July 15). Regressions of water levels in the lake and well were compiled for historic monthly water levels and for 5-day readings obtained between May 1981 and September 30, 1983 (table 1).

Analyses of Hunters Lake stage data, water-level data for Weeki Wachee well, and stage and discharge data for Weeki Wachee Springs were conducted for monthly data (1964-84) and for 5-day data (1981-83). Although 6 miles from the lake, these sites are the closest that provide monthly data as early as 1967. Stage and discharge at the springs integrate the effects of climate and hydrology throughout the Weeki Wachee Springs ground-water drainage area. Figure 8 compares the annual average discharges at Weeki Wachee Springs--computed from bimonthly discharge measurements--with water levels in Hunters Lake. The scales for lake stage and discharge are aligned so that the average of each is coincident. Regressions that show the relationship of these sites to water levels in Hunters Lake are shown in table 1.

Differences in water levels between sites or over time provide insight into the relationship of other sites with Hunters Lake, to each other, and to ground-water flow in the area. Citrus Lake, upgradient from Hunters Lake, averages about 2.1 feet higher than Hunters Lake. Dandelion Lake, immediately southwest of Hunters Lake, averages 3.4 feet lower than Hunters Lake. The gradient between Citrus and Hunters Lake is about 1.4 ft/mi, whereas the gradient between Hunters and Dandelion Lakes averages about 4.6 ft/mi. Ground-water gradients are even steeper southwest of Dandelion Lake where the gradient between wells SWF-2 and SWF-3 averages about 8 ft/mi. The gradient east of the lake between well R97 and the lake (fig. 2) also averages about 1.4 ft/mi. Analyses of monthly water-level data for Hunters, Citrus, and Holiday Lakes, Spring Hill deep and Weeki Wachee wells, and Weeki Wachee Springs gage height indicate that both water levels and gradients for these sites are higher in November than for any other month. Minimum gradients throughout the area coincide with minimum water levels in May after the dry spring months.

The flat stage of Hunters Lake in the last quarter of 1982 (fig. 9) is a probable result of ground water-surface water interaction. A 3-inch rainfall on September 25 caused water levels at all sites to rise and peak shortly thereafter. Total rainfall for the 102-day period of flat stage (September 26, 1982, to January 5, 1983) was 2.5 inches. This below-average rainfall was fairly evenly distributed throughout the period without any major storms. Lake evaporation, estimated from pan evaporation, would be more than 8 inches for the period. Hunters Lake was connected to Dandelion Lake from September 5 to October 21, and approximately 1.2 ft^3/s was flowing through the connecting culvert to Dandelion Lake. This surface discharge is equivalent to a weekly drop in stage of 0.045 foot over the lake surface of Hunters Lake.

All ground-water levels within a mile of the lake peaked by the first week of October and declined steadily through mid-January (fig. 9). The average decline in water levels between October 8 and January 5, excluding those sites near the induced high water of Dandelion Lake, was about 1.2 feet. Water levels in ground-water sites next to Dandelion Lake had increased in September in reaction to rainfall and the increased stage of the lake but began to decline in early October. Dandelion Lake, however, remained at virtually the same altitude as Hunters Lake. Discharge to Dandelion Lake ceased on October 21 when the culvert was closed. To balance losses to evaporation and surface flow to Dandelion Lake and to maintain the Hunters Lake stage, the ground-water system had to provide more than 200 acre-feet of water to Hunters Lake, an average ground-water flow rate of 1.0 ft^3/s. Net ground-water flow to the lake would have been greatest in late September when ground-water levels were highest. Ground-water flow to the lake would have decreased when surface flow to Dandelion Lake ceased and would have decreased steadily as ground-water levels declined. Loss of water from the lake on the downgradient side would have increased because of these reasons.

Figure 11 shows the location of hypothetical equal-head contour lines for the ground-water system between October 8, 1982, and January 30, 1983. These contour lines represent water levels in the ground-water system at the same elevation as the lake surface on the dates shown. The January 30, 1983, contour line of this figure is the same as the black 17.56-foot contour line of figure 10. The contours represent lines of equal head in the ground-water system and lake with no exchange of water occurring across the lake bottom. There is potential flow to the lake from the ground-water system northeast of an equal-head line and potential flow from the lake to the ground-water system southwest of the contour line.

The primary purpose of figure 11 is to show the relative positions of the equal-head contour lines. On October 8, with relatively high ground-water levels, the majority of the lake and lake shoreline gained water from the ground-water system. This recharge area of the lake and lake shoreline decreased each month during the period of flat stage, although enough ground-water was entering the lake to maintain the same stage. By January 30, when ground-water levels were lowest, the lake had started to decline because net flow to the lake from the ground-water system was insufficient to balance losses to evaporation and to leakage from the lake on the downgradient side. Subsequently, heavy rains recharged both the lake and ground-water system, and lake levels began to rise.

This discussion examines only one period of ground water-surface water relationships at Hunters Lake, but it provides insight into the general relationship of the lake to the ground-water system. Ground-water levels northwest and southeast of the lake determine when the area of exchange of water between the lake and ground-water system increases or decreases. Construction of water-level maps during periods of normal lake stages indicates that the general location of the hypothetical equal-head contour line is near the location of the December 22 contour line (fig. 11). Variations in permeability throughout the lake bottom and beneath it must be known to determine the actual leakage across the lake bottom. Slight changes in the lake stage in relation to ground-water levels cause significant changes in ground-water flow to or from the lake, or the period of near-constant lake stage would not have occurred. For example, the net gain of 1.2 ft^3/s to the lake when the Dandelion Lake culvert was closed on October 21 was quickly balanced by a decrease in net flow from the ground-water system to the lake, and the lake stage did not change. Changes in evaporation rates and precipitation on the lake were similarly balanced by changes in the rate of exchange with the ground-water system.

WATER-QUALITY CHARACTERISTICS

Coincident with development and increased water use in an area is the increased chance of degradation of the quality of water. Surface runoff or ground-water recharge from agricultural, residential, or industrial areas may alter the chemical, biological, and esthetic character of a lake. Water quality can also vary seasonally with changes in temperature, biologic activity, and recharge to the lake.

Water-quality samples were collected by the U.S. Geological Survey at Hunters Lake in 1965-66 and 1981-83. The most frequently sampled parameters were dissolved ions and specific conductance. Vertical profiles of specific conductance, dissolved oxygen, pH, and temperature were recorded at several locations in the lake on the dates of sample collection. Samples collected as part of this investigation (1981-83) were collected at midlake (site S-1), unless otherwise noted, and were integrated from the water column. Water from several nearby ground-water sites and from Bob Hill Springs was sampled on January 25, 1983, for comparison of chemical composition with water from the lake. Specific-conductance surveys of water in Hunters Lake and nearby ground-water and surface-water sites were conducted to determine the variability of chemical composition within the area near the lake.

Table 2 presents results of analyses of major dissolved ions in the lake water for 1965-66 and 1981-83. These data show that the water of Hunters Lake is a calcium carbonate type and has relatively low ionic concentrations. The water is soft, generally having a hardness of less than 60 mg/L (milligrams per liter) as calcium carbonate. The average pH of the water is 7.2. The alkalinity of the lake water averaged 27 mg/L as calcium carbonate. The dissolved ion concentrations are within the range of concentrations for other lakes in the area (Fretwell, 1985).

There has been an apparent increase in ionic concentrations collected in 1981-83 above the values reported for 1965-66. The SWFWMD sampled the lake in 1980 and found dissolved ion concentrations only slightly less than those of the 1981-83 samples. There is insufficient data to determine if this is a continuing trend or a temporary difference. Rainfall for 1964-65 was a total of 24 inches above the average for 1965-84, and the lower concentrations in 1965-66 may reflect dilution below normal concentrations.

Table 3 lists concentrations of nitrogen and phosphorus species, total organic carbon, chlorophyll, and phytoplankton in the lake for 1981-83. Comparable data are not available for lake water prior to 1981. Nitrogen and phosphorus species are referred to as nutrients because they are essential for growth of aquatic plants and algae. Excessive concentrations of nutrients can cause detrimental algal blooms and heavy aquatic plant growth. Total organic carbon is a general indicator of eutrophic conditions in lake waters. Chlorophyll and phytoplankton concentrations help define the mass of algal populations.

Nutrient concentrations in Hunters Lake are typical for surface waters in the area. Of 14 lakes sampled for nutrient concentrations in Hernando County by Fretwell (1985), the average total organic nitrogen concentration was 0.89 mg/L, and the median concentration was 0.74 mg/L. Total organic nitrogen concentrations in Hunters Lake averaged 0.58 mg/L for the seven samples. Other nutrient concentrations are typical for area lakes. The average total organic carbon concentration in Hunters Lake for the four samples was 10 mg/L. The 12 lakes in the District sampled for this constituent in 1982 had concentrations ranging from 1.0 mg/L to 32 mg/L and averaged 13 mg/L.

The concentrations of chlorophyll in water samples is representative of the biomass of all photosynthetic organisms in the water. Concentrations of chlorophyll b are usually much lower than for chlorophyll a. Concentrations of both types of chlorophyll are comparable to values reported for other lakes in west-central Florida. Concentrations of phytoplankton also are within the range reported for noneutrophic lakes in west-central Florida. The relatively high concentration of phytoplankton in May 1981 was during a period of low lake stage (13.8 feet) when the lake volume had decreased to less than half its average volume. Dominant phytoplankton in each of the five samples were blue-green algae, with *Anacystis*, *Agmenellon*, and *Lyngbya* genera that constituted from 50 to 96 percent of the total cells. The Shannon Weaver Diversity Index for phytoplankton at the genus level shown in table 3 is a relative measure of the variety of algal populations. A diversity index of less than 1 indicates an aquatic community with few biologic species.

Surveys of specific conductance were conducted throughout the lake and at nearby surface-water and ground-water sites as part of water-quality sampling in January and August 1983. Specific conductance is a measure of the ability of water to conduct an electrical current, and the greater the specific conductance, the higher the concentration of dissolved minerals. Specific conductance determinations of the January survey are shown in figure 12. Circled readings indicate that water samples were collected for analysis of dissolved constituents. Specific conductance throughout the main body of the lake was consistent and averaged 114 µS/cm. Specific conductance in two inlets at the north end of the lake increased to values of 142 and 164 µS/cm, indicating higher concentrations of dissolved ions. Specific conductance readings in inlets south along the same side of the lake were generally lower than the average for the lake. The higher readings in the northern inlets indicate inflow to the lake, either from ground water with higher ionic concentrations or from cultural sources. Specific conductances determined in August, after heavy summer rainfall, were uniformly lower than in January but showed the same patterns in all of the inlets. Readings averaged 100 µS/cm in the main body of the lake, 133 µS/cm in the northern inlets, and 80 µS/cm in the southeast inlets.

Specific conductance of water from the four shallow wells north of the lake surveyed in January averaged 53 µS/cm. Water from ponds and lakes had specific-conductance readings that ranged from 44 to 114 µS/cm and averaged 71 µS/cm. Specific conductance of water from well SWF-4 and Major Shear Pond, 452 and 463 µS/cm, respectively, were not considered to be representative of naturally occurring waters. Water from the more mineralized limestone of the Floridan aquifer system, as reflected in water from Deltona deep well no. 6, Conner deep well, and Bob Hill Springs (fig. 3), showed higher specific conductances than water from shallow wells or surface-water sites.

Concentrations of major dissolved ions in samples collected from wells and springs in January 1983 are shown graphically in figure 13 and are listed in table 4. Values for Hunters Lake sites are listed in table 2. The Stiff diagrams of figure 13 plot cations along each of four axes left of center and anions along the corresponding right axes. These diagrams portray the differences in composition of water from different sources and, for a given source of water, tend to maintain a characteristic shape as the water is diluted. Water from shallow well H-9, just north of the lake, is very low in dissolved ionic concentration (specific conductance was 25 µS/cm, chloride is the dominant anion, and magnesium the dominant cation). All other Stiff diagrams indicate water of the calcium bicarbonate type.

Water samples were collected from Hunters Lake on August 31, 1983, for determination of concentrations of trace metals, pesticides, and polychlorinated biphenyls. Of the trace metals determined, only zinc, with a concentration of 0.06 mg/L, exceeded limiting criteria established by Florida statutes for State waters used for recreation and fishing (Florida Department of Environmental Regulation, 1983). Similar concentrations of zinc are found in surface waters throughout west-central Florida (U.S. Geological Survey, 1975-84). Of the 25 common pesticides for which analyses were conducted, only 2 were above minimum detection levels--Diazinon and Malathion--and concentrations were well below State limitations.

SUMMARY

The size and shape of Hunters Lake has been significantly altered by development of the surrounding Spring Hill residential community. The lake is the largest in Hernando County, enlarged by lakeshore excavation and connection to nearby ponds to an area of 360 acres at an average stage of 17.2 feet above sea level. Hunters Lake is naturally a closed lake, but development of Spring Hill has resulted in a surface-water outflow from the lake in its southwest corner. Inflow to the lake could occur on the east side during extreme high-water periods.

The karst terrain of the Hunters Lake area is internally drained through permeable soils, depressions, and sinkholes, and natural surface drainage is absent. The underlying Floridan aquifer system is unconfined except locally near coastal springs. Flow in the ground-water system is to the west regionally and to the southwest in the immediate area of Hunters Lake. Water-level gradients in the ground-water system increase from 1.4 ft/mi east of the lake to about 8 ft/mi southwest of the lake. Hunters Lake is hydraulically connected to the ground-water system, receiving ground water on the northeast side and losing water to the ground-water system on the southwest side. This close relationship with the ground-water system is demonstrated by graphical and numerical comparison of Hunters Lake stage with water levels in nearby ground-water sites.

During 1965-84, the stage of Hunters Lake fluctuated between 12.48 and 20.7 feet above sea level. Because area lakes are all directly affected by ground-water levels, they also show a close relationship with water levels in Hunters Lake. This relationship is best demonstrated between the levels of Hunters Lake and Citrus Lake to the northeast. Ground water flow to the lake between September 1982 and January 1983 was estimated to be 1.0 ft^3/s and kept the lake stage unusually static between 17.48 and 17.60 feet for more than three months. The historical occurrence of similar periods of near-constant stage is uncertain.

Analysis of water-quality data for Hunters Lake indicates that the water of the lake is a soft calcium bicarbonate type with ionic concentrations higher than in water from nearby shallow wells and lower than in water from the Upper Floridan aquifer. Samples collected in 1981-83 indicate slightly higher levels of ionic concentration than in 1965-66. Distribution of specific conductance readings throughout the lake and water samples and specific conductance from upgradient sites indicates an inflow of more mineralized water into the northern part of the lake. Concentrations of nutrients, carbon, and phytoplankton in Hunters Lake are typical of lakes in this area of west-central Florida.

REFERENCES

Barr, G. L., and Schiner, G. R., 1982, Potentiometric surface of the Floridan aquifer, Southwest Florida Water Management District, September 1982: U.S. Geological Survey Open-File Report 82-1011, 1 sheet.
Causseaux, K. W., and Fretwell, J. D., 1982, Position of the saltwater-freshwater interface in the upper part of the Floridan aquifer, southwest Florida, 1979: U.S. Geological Survey Water-Resources Investigations Open-File Report 82-90, 1 sheet.
----- 1983, Chloride concentrations in the coastal margin of the Floridan aquifer, southwest Florida: U.S. Geological Survey Water-Resources Investigations 82-4070, 33 p.
Cherry, R. N., Stewart, J. W., and Mann, J. A., 1970, General hydrology of the Middle Gulf area, Florida: Florida Bureau of Geology Report of Investigations 56, 96 p.
Cooke, C. W., 1945, Geology of Florida: Florida Geological Survey Bulletin 29, 342 p.
Deltona Corporation, 1981, Baffin Waterway monitoring program, report on the dry season intense monitoring period: Report to the Southwest Florida Water Management District, 64 p.
----- 1982, Baffin Waterway monitoring program, report on the wet season intense monitoring period: Report to the Southwest Florida Water Management District, 82 p.
Florida Department of Environmental Regulation, 1983, Water quality standards: Chapter 17-3 in Florida Administrative Code.
Fretwell, J. D., 1983, Ground-water resources of coastal Citrus, Hernando, and southwestern Levy Counties, Florida: U.S. Geological Survey Water-Resources Investigations Report 83-4079, 87 p.
----- 1985, Water resources and effects of development in Hernando County, Florida: U.S. Geological Survey Water-Resources Investigations Report 84-4320, 140 p.
Healy, H. G., 1975, Terraces and shorelines of Florida: Florida Bureau of Geology Map Series 71.
Mills, L. R., and Ryder, P. D., 1977, Saltwater intrusion in the Floridan aquifer, coastal Citrus and Hernando Counties, Florida, 1975: U.S. Geological Survey Water-Resources Investigations 77-100, 1 sheet.
Sinclair, W. C., 1978, Preliminary evaluation of the water-supply potential of the spring-river system in the Weeki Wachee area and the lower Withlacoochee River, west-central Florida: U.S. Geological Survey Water-Resources Investigations 78-74, 40 p.
U.S. Department of Commerce, 1963-84, Climatological data for Florida, monthly and annual summaries, 1963-84: Ashville, N.C., National Oceanic and Atmospheric Administration, National Climatic Center.
U.S. Geological Survey, 1975-84, Water resources data for Florida, 1974-83--volume 3: U.S. Geological Survey water-data reports (published annually).
University of Florida, 1983, Population projections: Gainesville, Florida, Bureau of Economic and Business Research, 5 p.
Wetterhall, W. S., 1964, Geohydrologic reconnaissance of Pasco and southern Hernando Counties, Florida: Florida Geological Survey Report of Investigations 34, 28 p.
----- 1965, Reconnaissance of springs and sinks in west-central Florida: Florida Geological Survey Report of Investigations 39, 42 p.

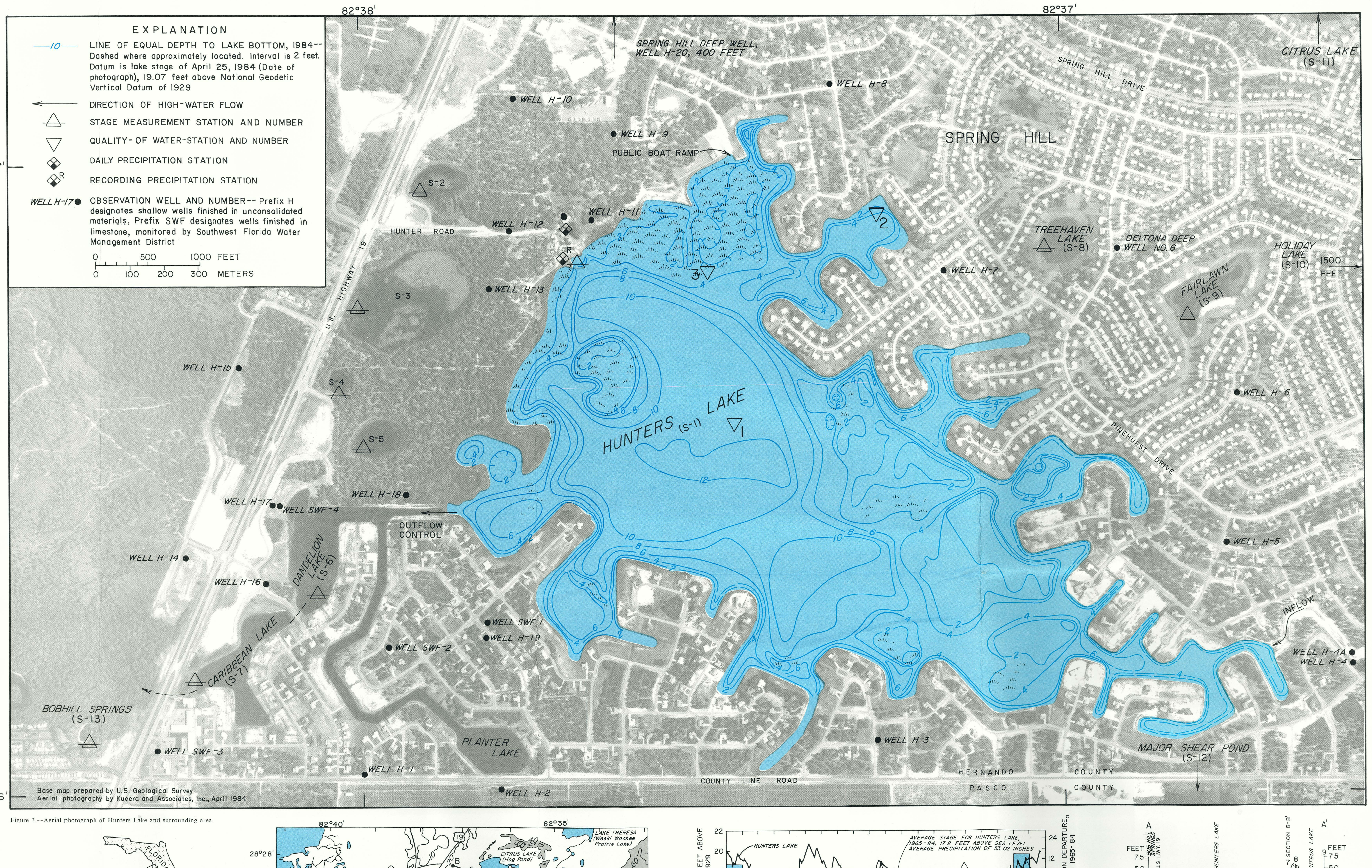

Figure 3.--Aerial photograph of Hunters Lake and surrounding area.

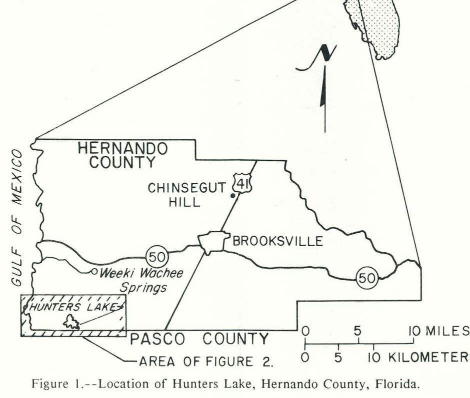

Figure 1.--Location of Hunters Lake, Hernando County, Florida.

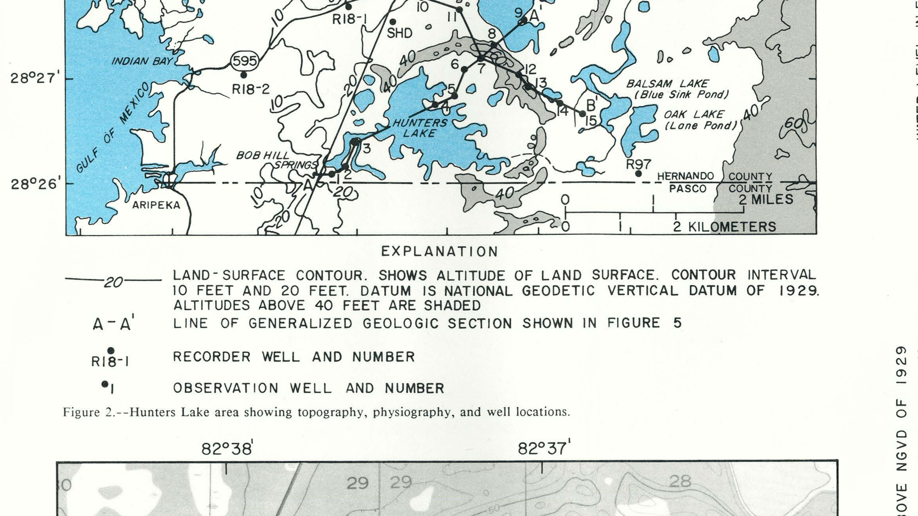

Figure 2.--Hunters Lake area showing topography, physiography, and well locations.

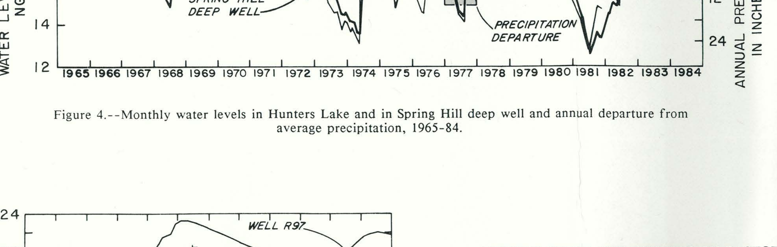

Figure 4.--Monthly water levels in Hunters Lake and in Spring Hill deep well and annual departure from average precipitation, 1965-84.

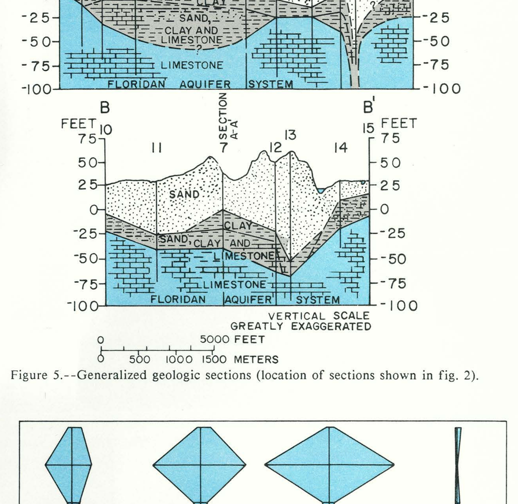

Figure 5.--Generalized geologic sections (location of sections shown in fig. 2).

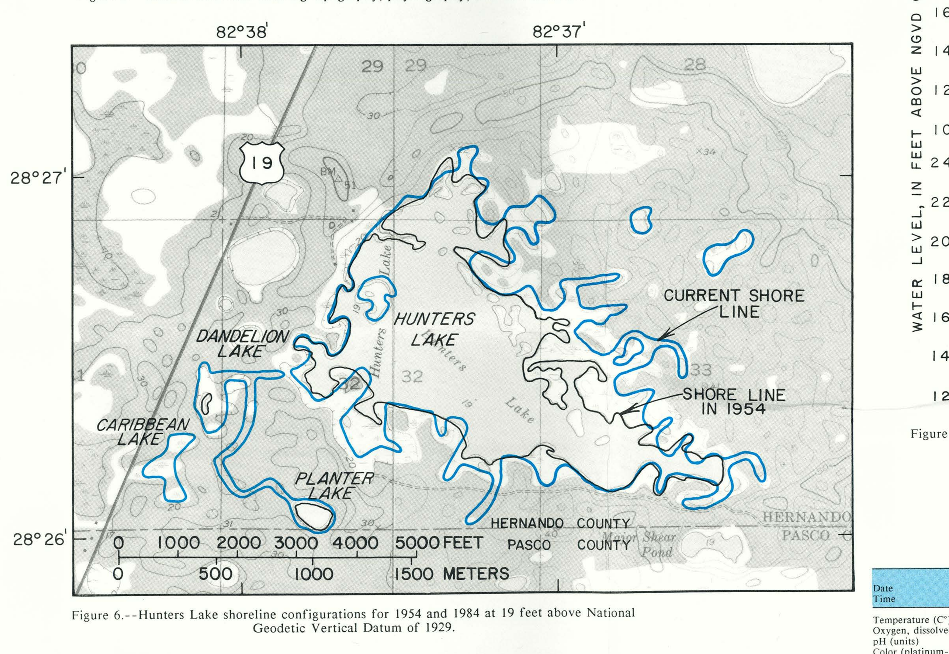

Figure 6.--Hunters Lake shoreline configurations for 1954 and 1984 at 19 feet above National Geodetic Vertical Datum of 1929.

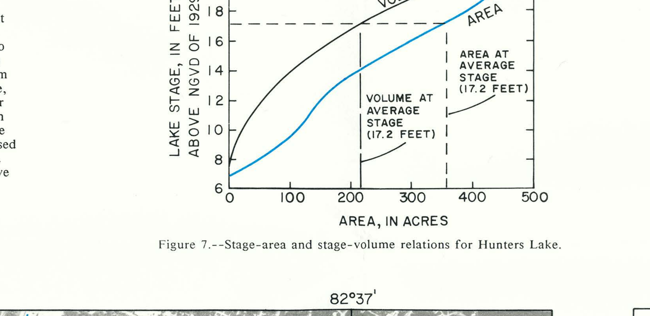

Figure 7.--Stage-area and stage-volume relations for Hunters Lake.

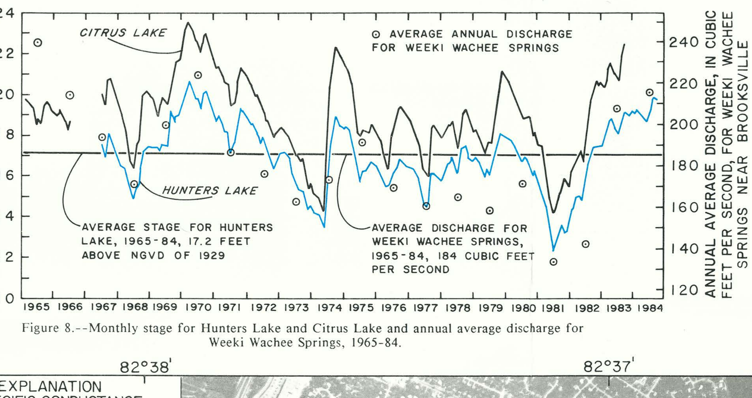

Figure 8.--Monthly stage for Hunters Lake and Citrus Lake and annual average discharge for Weeki Wachee Springs, 1965-84.

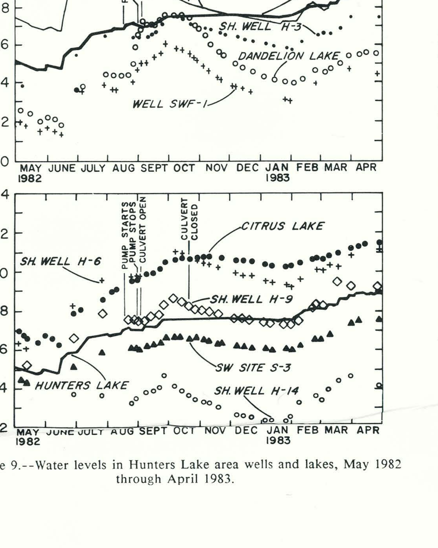

Figure 9.--Water levels in Hunters Lake area wells and lakes, May 1982 through April 1983.

ABBREVIATIONS AND CONVERSION FACTORS

For those readers who may prefer to use metric units (SI) rather than inch-pound units, the conversion factors for the terms used in this report are listed below.

Multiply	By	To obtain
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
foot per mile (ft/mi)	0.189	meter per kilometer (m/km)
acre	0.4047	hectare (ha)
mile (mi)	1.609	kilometer (km)
square foot (ft^2)	0.09294	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
gallon (gal)	0.003785	cubic meter (m^3)
gallon per minute (gal/min)	0.00006309	cubic meter per second (m^3/s)
gallon per day (gal/d)	0.003785	cubic meter per day (m^3/d)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
micromho per centimeter at 25° Celsius (umho/cm at 25°C)	1.000	microsiemens per centimeter at 25° Celsius (µS/cm at 25°C)
acre-feet (acre-ft)	1,233.6	cubic meters (m^3)

Temperature in degrees Fahrenheit (°F) can be converted to degrees Celsius (°C) as follows: °C = (°F-32)/1.8

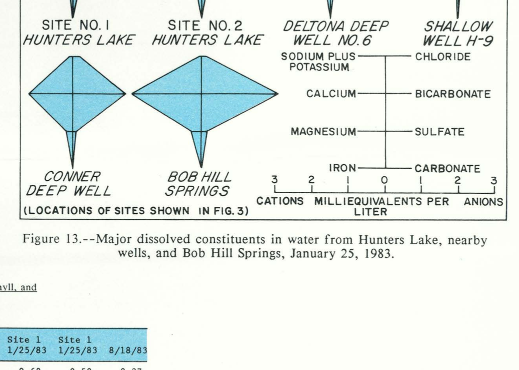

Figure 13.--Major dissolved constituents in water from Hunters Lake, nearby wells, and Bob Hill Springs, January 25, 1983.

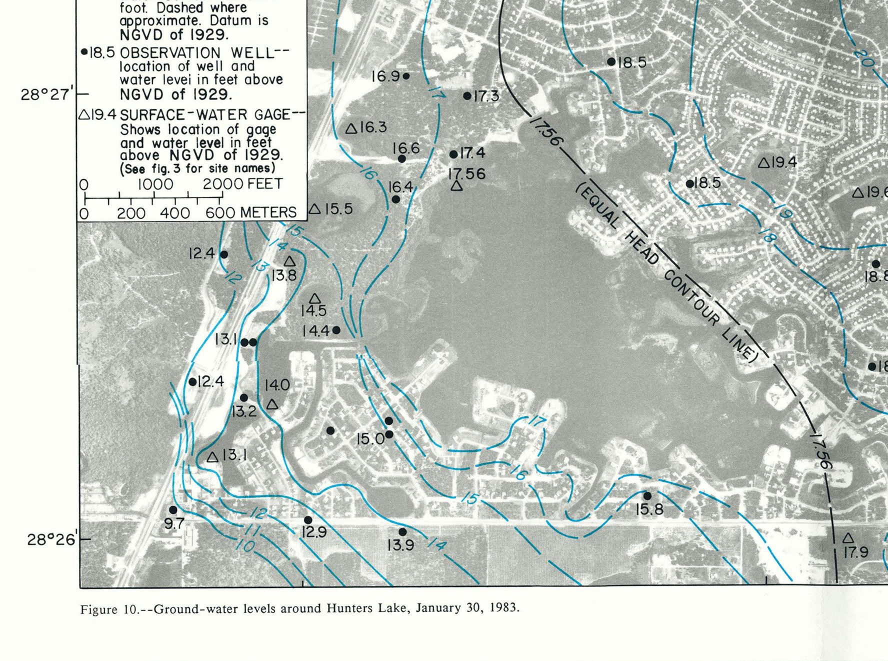

Figure 10.--Ground-water levels around Hunters Lake, January 30, 1983.

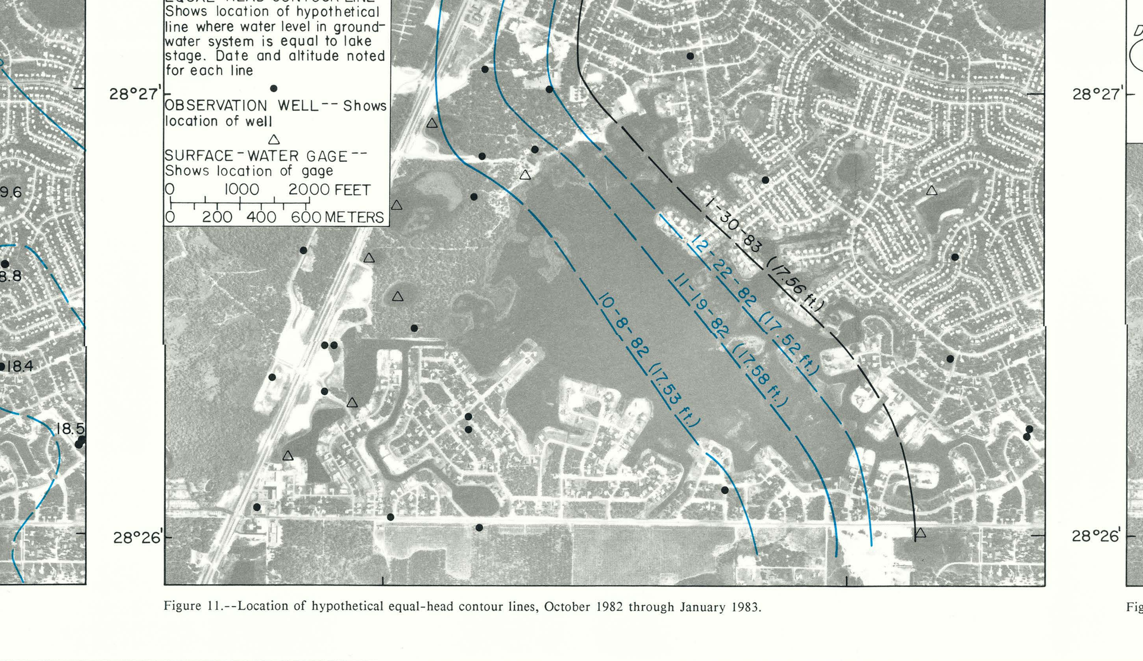

Figure 11.--Location of hypothetical equal-head contour lines, October 1982 through January 1983.

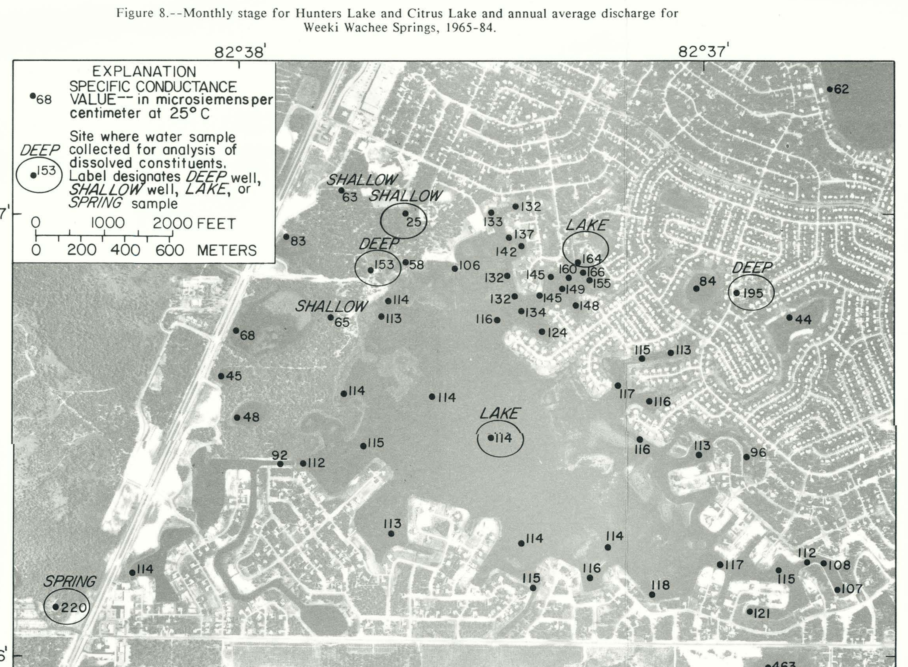

Figure 12.--Specific conductance in water from Hunters Lake and nearby wells, lakes, and springs, January 25, 1983.

Table 1.--Linear regression relationship of Hunters Lake stage to water levels in nearby lakes and wells and to stage and discharge of Weeki Wachee Springs

Regression equation	Data base, frequency/period	Standard error of estimate (feet)	Correlation coefficient	No. of observations
Stage = 0.760*Citrus + 2.176	Weekly/8-80 to 3-83	0.37	0.96	89
Stage = 0.763*Citrus + 2.453	Monthly/6-67 to 9-83	.41	.97	183
Stage = 0.676*Holiday + 4.067	Monthly/6-67 to 9-83	.50	.94	165
Stage = 0.767*Theresa + 1.992	Monthly/5-68 to 6-81	.55	.94	142
Stage = 1.013*Spring.Hill.Dp.Well - 0.298	5-day/10-82 to 9-83	.50	.98	100
Stage = 0.871*Spring.Hill.Dp.Well + 2.385	Monthly/4-72 to 9-83	.53	.92	119
Stage = 0.636*Weeki.Wachee.Well + 4.316	5-day/5-81 to 9-83	.89	.93	169
Stage = 0.582*Weeki.Wachee.Well + 6.409	Monthly/6-67 to 9-83	.99	.80	185
Stage = 0.042*Weeki.Wachee.Discharge + 9.683	Monthly/6-67 to 9-83	1.03	.78	111
Stage = 3.621*Weeki.Wachee.Gage.Ht. + 7.406	5-day/5-81 to 9-83	.90	.91	168
Stage = 3.234*Weeki.Wachee.Gage.Ht. + 9.139	Monthly/6-67 to 9-83	.93	.83	178
Stage = 0.952*Citrus - 0.278*Citrus.change - 0.800*Citrus.gradient + 0.507	Monthly/6-67 to 9-83	.23	.99	178
Stage = 1.057*Shdpwell - 0.457*Shdpwell.change + 0.736*Shdpwell.gradient - 0.844	Monthly/4-72 to 9-83	.16	.99	112

Stage = Hunters Lake stage. Independent variables are water levels except Weeki Wachee discharge.

Citrus.change is change in water level in Citrus Lake from previous month. Citrus.gradient is gradient between Citrus Lake and Hunters Lake from previous month. Shdpwell values for Spring Hill deep well are similar.

Table 2.--Selected physical and chemical characteristics of water from Hunters Lake, 1965-83

Date Time	-- 5/22/65 --	-- 5/27/66 --	Site 1 5/06/81 1200	Site 1 4/20/82 1145	Site 1 8/31/82 1620	Site 1 1/25/83 1406	Site 2 1/25/83 1520	Site 1 8/18/83 1515
Temperature (C°)	--	--	25.0	27.0	29.0	15.0	16.5	31.0
Oxygen, dissolved (mg/L)	--	--	8.3	7.7	7.2	9.0	8.5	5.5
pH (units)	6.4	6.5	6.0	7.8	7.6	7.6	7.7	7.6
Color (platinum-cobalt units)	15	20	10	10	10	10	5	5
pH, lab (units)	--	--	7.0	7.3	6.9	7.0	7.4	7.0
Calcium, dissolved (mg/L as Ca)	7.2	5.6	14	17	14	15	26	14
Magnesium, dissolved (mg/L as Mg)	0.5	1.0	1.4	1.6	1.0	1.4	1.9	1.3
Sodium, dissolved (mg/L as Na)	4.7	5.5	6.9	6.4	5.0	4.8	4.1	4.5
Potassium, dissolved (mg/L as K)	0.4	.5	.8	.9	.7	.8	1.0	.5
Chloride, dissolved (mg/L as Cl)	9.3	10	13	12	10	9.8	9.2	8.4
Sulfate, dissolved (mg/L as SO_4)	4.4	4.4	19	17	13	11	8.4	9.4
Fluoride, dissolved (mg/L as F)	.2	.1	.2	.1	0	.1	.1	.1
Silica, dissolved (mg/L as SiO_2)	.5	.6	.2	0	.5	0	.4	.3
Strontium, dissolved (µg/L as Sr)	--	--	--	70	60	70	80	40
Solids, residue at 180°C, dissolved (mg/L)	--	--	88	104	77	75	96	76
Specific conductance (µS/cm)	65	71	125	111	109	114	165	100
Specific conductance, lab (µS/cm)	--	--	120	136	107	109	158	104
Alkalinity, field (mg/L as $CaCO_3$)	11	11	18	25	25	33	64	25
Alkalinity, lab (mg/L as $CaCO_3$)	--	--	18	28	25	27	61	26
Iron, dissolved (µg/L as Fe)	--	10	--	--	--	20	--	10
Hardness (mg/L as $CaCO_3$)	20	18	41	49	39	43	73	40
Hardness, noncarbonate (mg/L as $CaCO_3$)	9	7	23	21	14	10	9	14

Table 3.--Concentrations of nutrients, carbon, chlorophyll, and phytoplankton in Hunters Lake, 1981-83

Date	5/06/81	Site 1 1/21/82	Site 3 1/21/82	4/20/82	8/31/82	Site 1 1/25/83	Site 1 1/25/83	8/18/83
Nitrogen, total (mg/L as N)	--	0.85	1.0	0.74	0.67	0.68	0.59	0.37
Nitrogen, organic, total (mg/L as N)	--	.69	.63	.71	.64	.66	.41	.34
Nitrogen, ammonia, dissolved (mg/L as N)	--	.02	.30	.03	.02	.01	.02	.02
Nitrogen, ammonia, total (mg/L as N)	--	.05	.30	.03	.02	.01	.02	.02
Nitrogen, nitrite, dissolved (mg/L as N)	--	0	0	0	0	0	0	<.01
Nitrogen, nitrite, total (mg/L as N)	--	0	0	0	0	0	0	<.01
Nitrogen, nitrate, dissolved (mg/L as N)	--	.07	.11	0	0	.01	.16	0
Nitrogen, nitrate, total (mg/L as N)	--	.11	.07	0	.01	.01	.16	0
Nitrogen, ammonia plus organic, dissolved (mg/L as N)	--	.53	.99	.87	.62	.55	.38	.36
Nitrogen, ammonia plus organic, total (mg/L as N)	--	.74	.93	.74	.66	.67	.43	.36
Nitrogen, NO_2+NO_3, total (mg/L as N)	--	.11	.07	0	.01	.01	.16	.01
Nitrogen, NO_2+NO_3, dissolved (mg/L as N)	--	.07	.11	0	0	.01	.16	<.01
Phosphate, ortho, dissolved (mg/L as PO_4)	--	0	.03	0	.03	.03	.03	.03
Phosphorus, total (mg/L as P)	--	.02	.02	.01	.04	.03	.01	.04
Phosphorus, dissolved (mg/L as P)	--	.01	.01	.01	.03	.02	.01	.02
Phosphorus, ortho, dissolved (mg/L as P)	--	0	.01	0	.01	.01	.01	<.01
Phosphorus, ortho, total (mg/L as P)	--	.01	.01	0	.01	.01	.01	<.01
Carbon, organic, total (mg/L as C)	--	--	--	9.7	10	12	--	8.1
Chlorophyll-a, phytoplankton, chromo fluorom (µg/L)	4.41	--	--	--	2.80	1.90	--	--
Chlorophyll-b, phytoplankton, chromo fluorom (µg/L)	0	--	--	--	<.10	<.10	--	--
Phytoplankton, total (cells per mL)	170,000	170	--	2,500	11,000	4,900	--	33,000
Phytoplankton, generic diversified index	0.5	2.1	--	2.5	2.4	.7	--	1.0

Table 4.--Selected physical and chemical characteristics of water from wells near Hunters Lake and from Bob Hill Springs, January 25, 1983

	Deltona deep well no. 6 (282650082363301)	Conner deep well (282654082373801)	Hunters Lake shallow well H-9 (282703082373601)	Bob Hill Springs (02310405)
Time	1725	1640	1800	1835
Temperature (°C)	--	--	--	22.0
Color (platinum-cobalt units)	0	0	0	0
pH, lab (units)	7.9	7.8	5.4	7.9
Calcium, dissolved (mg/L as Ca)	35	25	.5	38
Magnesium, dissolved (mg/L as Mg)	2.0	2.2	.7	3.1
Sodium, dissolved (mg/L as Na)	2.6	3.5	2.2	2.8
Potassium, dissolved (mg/L as K)	.2	.3	0	.2
Chloride, dissolved (mg/L as Cl)	5.2	6.3	3.9	5.0
Sulfate, dissolved (mg/L as SO_4)	6.4	2.4	2.4	6.4
Fluoride, dissolved (mg/L as F)	.1	.1	.1	.1
Silica, dissolved (mg/L as SiO_2)	7.2	7.8	5.4	7.0
Strontium, dissolved (µg/L as Sr)	200	90	20	180
Solids, residue at 180°C, dissolved (mg/L)	112	90	24	135
Specific conductance (µS/cm)	195	153	25	220
Specific conductance, lab (µS/cm)	185	150	25	215
Alkalinity, lab (mg/L as $CaCO_3$)	90	71	0	100
Iron, dissolved (µg/L as Fe)	10	50	10	20
Hardness (mg/L as $CaCO_3$)	96	72	4	110
Hardness, noncarbonate (mg/L as $CaCO_3$)	6	.6	4	8

Copies of this report can be purchased from:

U.S. Geological Survey
Books and Open-File Reports
Federal Center, Bldg. 41
Box 25425
Denver, Colorado 80225
(Telephone: (303) 236-7476)

HYDROLOGY OF HUNTERS LAKE, HERNANDO COUNTY, FLORIDA

By
S. E. Henderson

1986