CHEMICAL CHARACTER OF WATERS OF FLORIDA

By W. D. Collins and C. S. Howard

INTRODUCTION

The chemical character of waters in Florida has been discussed briefly in several publications, but the subject has not been treated comprehensively hitherto. A few field assays and many general statements regarding quality of water are given in United States Geological Survey Water-Supply Paper 319, "Geology and ground waters of Florida," by G. C. Matson and Samuel Sanford, published in 1913. In connection with field work in 1908 samples of ground water were collected for analysis in the water resources laboratory of the Geological Survey. Some of these analyses were published in 1908 in Bulletin 1 of the Florida Geological Survey, "A preliminary report on the underground water supply of central Florida," by E. H. Sellards. Other analyses are given in the third, fourth, and fifth annual reports of the State Survey.

Systematic collection of the samples whose analyses are given in the present report was begun in June, 1923. The collection was made by agents of the State board of health under the direction of George W. Simons, jr., chief sanitary engineer, and the samples were sent to Washington with information in regard to the sources and treatment of the waters. The United States Geological Survey supplied the containers to the State board of health and analyzed the samples. The analyses were made by C. S. Howard, Margaret D. Foster, and H. B. Riffenburg in the water resources laboratory. Some of the analyses that were made in 1908 are also included in this report.

Samples have been obtained especially from the public water supplies of the State. Sources not now used for public supplies but likely to be used in the future are also represented. In each county other samples have been taken to indicate the quality of water available at different depths in the ground. Samples have been taken from lakes and rivers thoughout the State, from large springs and from wells or springs supplying water that is bottled and sold. Thus the analyses give a reasonably complete picture of the chemical character of the waters of Florida.

Correlations of analyses with geologic formations have been made by C. S. Howard on the basis of data given in Water-Supply Paper 319, with modifications from later geologic work referred to in the section on geology.

SURFACE FEATURES

The State of Florida is an area of low relief. A topographic map prepared by Matson, Clapp, and Sanford[1] shows that about two-thirds of the State is less than 50 feet above sea level, and only small areas are more than 200 feet above sea level.

Agassiz, Dall, Vaughan,[2] and others have pointed out that the mainland of Florida is but the top of a larger plateau, most of which is submerged. Sanford[3] says that a depression of 50 feet would submerge all southern Florida but a few ridges. An uplift of 50 feet would extend the shore line only a little on the east but 20 or 30 miles on the west. Such an uplift[4] would add an area equal to about one-third of the present land area of the entire State.

The portion of the State lying west of Aucilla River is part of the main continental mass. Parts of its surface reach higher altitudes and larger areas lie more than 250 feet above sea level than in the peninsula.

The peninsula of Florida consists of an upland or lake region and a lowland region. The upland region extends through the central part of the State from the Georgia line to about the latitude of the north end of Lake Okeechobee. The surface features of this region are similar to those of other areas that are underlain by limestone. Sinks, underground channels, and natural bridges have been formed as a result of the solution of the limestone. There are many springs in this region.

The lowland region consists of the areas along the coast and the southern portion of the peninsula; the Everglades and their environs make up a large part of this region. The lowland region contains many ponds and shallow lakes that have formed in the depressions of the surficial deposits. Ridges, sand dunes, and terraces are found throughout this area.

GEOLOGY

Matson and Sanford summarized previous geologic work in Florida in the paper already cited. Other detailed information is given in the annual reports of the State Geological Survey. A report by

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[1] Matson, G. C., and Sanford, Samuel, Geology and ground waters of Florida: U. S. Geol. Survey Water-Supply Paper 319, pl. 1, 1913.

[2] Agassiz, Alexander, The elevated reef of Florida: Harvard Coll. Mus. Comp. Zoology Bull., vol. 28, No. 2, pp. 29-51, 1896. Dall, W. H., and Harris, G. D., Correlation papers—Neocene: U. S. Geol. Survey Bull. 84, 1892, Vaughan, T. W., A contribution to the geologic history of the Floridian plateau: Carnegie Inst. Washington Pub. 133, pp. 107 et seq., 1910.

[3] Matson, G. C., and Sanford, Samuel, op. cit., p. 44 and pl. 1.

[4] Vaughan, T. W., op. cit., p. 117.

Matson[5] contains geologic information relating to the phosphate deposits of the State. The following discussion is a summary drawn from these publications and from other published and unpublished reports. It has been reviewed and revised by C. Wythe Cooke.

The rocks exposed at the surface or penetrated by wells in Florida are of Tertiary or Quaternary age and include formations of all the series of both those systems.

EOCENE

The Eocene series is represented in Florida by the Ocala limestone, which is exposed in several quarries near Ocala, in phosphate mines throughout north-central Florida, and at many natural outcrops. The Ocala limestone underlies the Vicksburg group in western and peninsular Florida and in large part is identical with the "Peninsular" limestone described by Dall.[6] The Ocala and "Peninsular" limestones were considered by Matson and Sanford [7] parts of the Vicksburg group. Cooke,[8] however, has shown that the Ocala limestone is equivalent in age to the Jackson formation of Mississippi and Alabama. The Ocala limestone in some localities is close grained and compact, but as a rule it is porous and granular and yields large quantities of water.

OLIGOCENE

The Oligocene series in Florida is represented by the Marianna limestone and the Glendon formation of the Vicksburg group. The Byram marl, which forms the upper formation of the Vicksburg group in Alabama, has not been definitely recognized in Florida but may be exposed in the western part of the State. A large part of what was formerly classed as Chattahoochee limestone is now placed in the Glendon formation.[9]

The Eocene and Oligocene formations are the chief sources of water in Florida, supplying nearly all the large springs and many flowing wells and yielding large supplies to nonflowing wells. These formations contain many solution cavities, and their materials are, as a rule, very porous. (See p. 191.)

Water from the Eocene and Oligocene formations is generally hard and may contain hydrogen sulphide. It is moderately mineralized, containing about 250 to 350 parts per million of dissolved solids, except in certain localities where it is highly mineralized and salty.

MIOCENE

The Miocene formations are of less importance as aquifers than the Eocene and Oligocene formations, chiefly because they are less porous and less widely distributed.

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[5] Matson, G. C., The phosphate deposits of Florida: U. S. Geol. Survey Bull. 604, pp. 11–23, 1915.
[6] Dall, W. H., Tertiary fauna of Florida: Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1534, 1903.
[7] Op. cit., pp. 71 et seq.
[8] Cooke, C. W., The age of the Ocala limestone: U. S. Geol. Survey Prof. Paper 95, pp. 107–117, 1915.
[9] Cooke, C. W., The correlation of the Vicksburg group: U. S. Geol. Survey Prof. Paper 133, p. 3, 1923.

The Chattahoochee formation and the contemporaneous Tampa formation yield water to shallow wells in localities where they lie at or close to the surface. The Chattahoochee crops out along Apalachicola and Chipola Rivers and the Tampa along Hillsboro and Manatee Rivers.

The formations of the Alum Bluff group, which overlie the Chattahoochee formation, consist chiefly of sand, clay, and marl but at some places include impure limestone. The formations of this group are thin but are widely spread and are sources of water for many shallow wells in north-central Florida.

The Choctawhatchee marl, which overlies the Alum Bluff group, and the contemporaneous Jacksonville formation yield water to a few shallow wells.

Water from the Miocene formations is usually hard but of moderate mineral content. Shallow wells and springs in these formations may yield soft waters of low mineral content in localities where the water comes from the sandy portions of the formations. The older Miocene formations, the Chattahoochee and some others, may yield water containing hydrogen sulphide.

PLIOCENE

The Pliocene formations in Florida do not yield large quantities of water, and most of the water drawn from them is hard, although in some localities soft water may be obtained from sandy deposits of Pliocene age.

PLEISTOCENE

The Pleistocene deposits are partly of marine and partly of nonmarine origin. These deposits differ in thickness and in value as water-bearing formations. In some localities they yield large supplies of water some of which is soft, but much of it is hard because of the shells and other calcareous materials that are found in the deposits. In lowland areas flowing wells may be obtained from these formations, but the yields are usually small. Some waters from these formations contain hydrogen sulphide.

QUALITY OF WATER

Throughout this report discussions of quality of water relate only to the characteristics due to mineral constituents. Analyses showing the mineral content of waters give little indication of their sanitary condition. Such analyses serve to show the suitability of the waters for industrial use, for use in steam boilers, and for commercial or home laundry work, and they also indicate the few waters of the State that are not suitable for drinking on account of excessive mineral content.

The treatment of a water to make it safer for drinking may affect its chemical character so as to make it decidedly better or worse for industrial use. This phase of the purification of waters is taken up briefly in the present report.

CONSTITUENTS OF NATURAL WATERS

The mineral constituents of natural waters reflect the composition and solubility of the rock materials with which the waters have been in contact. The waters of Florida have a wide range in composition, but all the types of waters encountered here are to be found in greater or less abundance in many other localities. The following notes relate to the different items listed in the table of analyses.

TOTAL DISSOLVED SOLIDS

The residue on evaporation of a water consists mainly of the rock materials listed below. A small quantity of organic material and a little water of crystallization are sometimes included. The range in quantity of dissolved solids in the waters of Florida is from less than 50 parts to several thousand parts per million. Waters with less than 500 parts per million of dissolved solids are generally entirely satisfactory for domestic use, except for the difficulties resulting from their hardness. The waters with more than 1,000 parts per million are likely to contain enough of certain constituents to produce a noticeable taste or to make the water unsuitable in some other respects. Some satisfactory waters contain over 1,000 parts per million of dissolved solids.

SILICA

Silica (SiO_2) is dissolved from practically all rocks. In the waters of Florida the quantity found is generally from 10 to 30 parts per million. The silica in a water may go with the other scale-forming materials when they are deposited as hard scale in a steam boiler. Otherwise it is of no significance as regards the use of the water.

IRON

Iron (Fe) is dissolved from many rock materials. The quantity in the ground water is not so uniform over large areas as the quantity of calcium and other ingredients. Wells near together may differ considerably in the quantity of iron in their waters.

If a water contains much more than 0.1 part per million of iron the excess may separate out and settle as the reddish sediment common in spring and well waters of certain regions. The excess iron may be removed by simple aeration and filtration from most waters, but a few require the addition of lime or some other substance.

CALCIUM

Calcium (Ca) is dissolved in large quantities from limestone, which is essentially calcium carbonate. Corals and shells are also nearly all calcium carbonate. Calcium is therefore found in considerable quantities in the ground waters of Florida.

Calcium carbonate is not very soluble in pure water, but when enough carbon dioxide is available large quantities of the calcium carbonate go into solution as the bicarbonate.

Many of the waters in lakes and rivers of Florida carry less than 10 parts per million of calcium. Some spring waters are also low in calcium. The calcium in potable waters from wells is generally from 40 to 100 parts per million. A few waters have more than 200 parts per million. Calcium is the main cause of the hardness of waters in Florida.

MAGNESIUM

Magnesium (Mg) is dissolved from practically all rocks but mainly from dolomite and dolomitic limestones. As the limestones of Florida contain little magnesium, the waters of the State also generally carry only small quantities. Magnesium is one of the abundant constituents of sea water and therefore will be found in large quantity in ground water contaminated with sea water or with salts embedded in the deposits laid down in the sea ages ago.

Magnesium is the only element besides calcium that causes any appreciable amount of hardness in most natural waters.

SODIUM AND POTASSIUM

Sodium (Na) and potassium (K) are dissolved from practically all rocks, but they make up only a small part of the dissolved mineral matter in most of the waters of Florida. As sea water is essentially a solution of common salt (sodium chloride), considerable quantities of sodium are found in waters contaminated with sea water or with salts inclosed in the older marine deposits. The quantity of sodium may be 5 to 20 parts per million in an ordinary well water or several hundred parts per million in a highly mineralized water. The quantity of potassium is generally comparatively small.

Moderate quantities of sodium have little effect on the suitability of a water for ordinary household use. If the quantity of sodium is much more than 100 parts per million, foaming may occur in steam boilers unless special precautions are taken to prevent it. In some parts of the country natural waters contain so large quantities of sodium salts that crops are injured by application of the waters. The quantity that will be injurious depends on the crop, the composition and condition of the soil, and the drainage, and so no definite limit can be set, but at most places the limit will be in the thousands of parts per million. The only waters in Florida that come in this class are those contaminated with sea water.

CARBONATE AND BICARBONATE

The carbonate (CO_3) and bicarbonate (HCO_3) in natural waters result from the solution of carbonate rocks through the action of carbon dioxide dissolved in the waters. Carbonate is not present in appreciable quantities in many natural waters; it is found in some treated waters. Surface waters and ground waters that have not been in contact with limestone may have less than 10 parts per million of bicarbonate. The ordinary ground waters in Florida have from 100 to 300 parts per million of bicarbonate. The bicarbonate as such has little effect on the use of a water.

SULPHATE

Sulphate (SO_4) is dissolved in large quantities from gypsum (calcium sulphate) in the rocks and soil. It is also formed by the oxidation of sulphides of iron, and sulphate from this source causes serious pollution of streams in parts of the country where the opening of mines has exposed large quantities of iron sulphide to the action of air and water. The waters in Florida that have large quantities of sulphate appear to have obtained it from sea water, from sea salts laid down with sedimentary rocks, or from solution of concentrated deposits of sodium or calcium sulphate.

Sulphate itself has little effect on the general use of a water. Magnesium sulphate and sodium sulphate may be present in sufficient quantity to give a bitter taste. Sulphate in a hard water may increase the cost of softening and will make the scale formed in a steam boiler much more troublesome.

About half the waters analyzed for this report had less than 10 parts per million of sulphate. Less than a quarter had more than 50 parts per million, and only a little more than one-tenth had more than 200 parts per million. On the whole, the sulphate in waters of Florida is of little significance.

CHLORIDE

Chloride (Cl) is an abundant constituent of sea water and is dissolved in small quantities from rock materials throughout the country. The rain water brings down much more chloride near the ocean than in the interior, as the finely divided salt spray from the ocean is carried with dust particles by the wind and precipitated with the rain. This difference is shown in the so-called "normal chlorine" maps that have been prepared for some regions. Such maps are plotted from analyses of normal unpolluted waters and show quantities of chloride ranging from less than 1 part per million far from the ocean up to 5 or 6 parts per million near the coast. As chloride is a characteristic constituent of sewage, the content of chloride in a water when compared with the normal content shown on the normal chlorine map was formerly thought to be an indication of pollution. So many other sources besides sewage supply chloride to natural waters, however, that its presence in more than "normal" quantities is no longer taken as a definite indication of pollution.

Many of the surface waters of Florida have less than 15 parts per million of chloride, but well waters with 100 parts per million or more are not uncommon. Chloride, like sodium, with which it forms sodium chloride (common salt), comes largely from present or ancient sea water. Chloride has little effect on the suitability of water for ordinary use unless there is enough to give the taste of salt. Waters high in chloride may be corrosive when used in steam boilers.

NITRATE

Nitrate (NO_3) in water is considered a final oxidation product of nitrogenous organic material. Most waters in Florida carry less than 1 part per million of nitrate. This small quantity has no effect on the value of the water for ordinary uses.

HARDNESS

Hardness of a water is most commonly recognized by its effects when soap is used with the water in washing. The figures for hardness given in the table of analyses are calculated from the determined quantities of calcium and magnesium, which cause practically all the hardness of ordinary waters. In addition to causing trouble in the use of soap, the constituents that cause hardness are also the active agents in the formation of the greater part of all the scale formed in steam boilers and in other vessels in which water is heated or evaporated.

Water with a hardness of less than 50 parts per million is generally rated as soft, and its treatment for the removal of hardness is rarely justified. Hardness between 50 and 150 parts per million does not seriously interfere with the use of water for most purposes, but it does slightly increase the consumption of soap, and its removal by a softening process is profitable for laundries or other industries that use large quantities of soap. Treatment for the prevention of scale is necessary for the successful operation of steam boilers using water in the upper part of this range of hardness. Hardness above 150 parts per million is noticed by anyone, and where the hardness is 200 or 300 parts per million it is common practice to soften water for household use or to install cisterns to collect rain water. Where municipal water supplies are softened an attempt is generally made to reduce the hardness to about 100 parts per million. The additional improvement from further softening of a whole public supply is not deemed worth the additional cost.

Waters of widely differing hardness are found in Florida. The surface waters are practically all soft; a large proportion of the well waters are decidedly hard. A number of the public supplies from wells are softened.

HYDROGEN SULPHIDE

Hydrogen sulphide (H_2S) was not detected in many samples of water from Florida when they were received in the laboratory, and therefore this constituent is not shown in the tables of analysis. Hydrogen sulphide is a gas which gives the characteristic odor to sulphur waters. It is formed during the decomposition of eggs and other organic materials that contain considerable sulphur. Hydrogen sulphide in ground waters is commonly believed to be formed by the reduction of sulphates.

Many ground waters in Florida carry small quantities of hydrogen sulphide. It usually disappears quickly when the water is allowed to stand in an open vessel. Treatment for the removal of iron will insure the removal of hydrogen sulphide from most of these waters.

COLOR

Ground waters are generally colorless; surface waters are likely to be noticeably colored even when quite free from suspended matter. The color is taken up from decaying leaves and other organic matter. Swamp waters are much more highly colored than waters that have been in contact only with rocks, sand, and gravel or than waters of streams and lakes fed almost entirely by springs from limestone. The waters of a few shallow wells and springs are colored, but these are practically surface waters from swamps. In some parts of the country highly colored waters are obtained from deep wells that penetrate beds of lignite or other deeply buried organic matter.

Color is measured in terms of an arbitrary color standard, which has been used in nearly all studies of natural waters for the last 20 years. The color standard is made from potassium chloroplatinate, cobalt chloride, and hydrochloric acid. The unit color corresponds to 1 milligram of platinum in 1 liter of water.

Color less than 10 according to this standard is not objectionable to those who have not been accustomed to colorless water, but in some communities it is necessary to keep the color of a filtered water well below 10 in order to avoid complaints. The color of some stream waters in Florida is well over 100. The materials that color swamp waters are of themselves harmless, but the removal of color is one of the first considerations in any plant for the purification of water for a public supply. Consumers are generally more concerned over the slight color that they can see than over the invisible bacteria, which may be the cause of disease or death.

SUSPENDED MATTER

Ground water is generally free from suspended matter. Some waters contain enough iron in solution to give on exposure to the air a precipitate, which is usually red or brown but in sulphur waters may be black iron sulphide. Sulphur waters may become turbid from separation of sulphur.

Most of the surface waters of Florida are practically free from suspended matter. The samples analyzed for this report were so clear that no determinations of suspended matter were made. The single sample from Apalachicola River was exceptionally clear, although this river is usually rather muddy. Analyses of water from Chattahoochee and Flint Rivers, published in 1909,[10] gave averages of 136 and 58 parts per million, respectively, for the suspended matter. Some large rivers in the United States carry over 500 parts per million of suspended matter. It has been estimated [11] that from the whole United States the quantity of mineral matter carried to the oceans in suspension in the rivers is nearly twice the quantity carried in solution.

Suspended matter in a water may be harmless, but its removal is necessary to make the water satisfactory as a public supply or suitable for most industrial uses.

METHODS OF ANALYSIS

The methods used in the analyses made for this report are described in detail in another paper.[12]

A suitable volume of the water was evaporated to dryness in platinum and weighed after heating one hour at 180° C. Silica was separated after evaporation with hydrochloric acid. The filtrate from the silica was made to a definite volume and divided into two equal parts, unless the composition of the water made it desirable to divide differently in order to have more suitable quantities for the determination of the several constituents. Iron and aluminum were precipitated in one part of the filtrate. The precipitate was dissolved in hydrochloric acid, and the iron was determined colorimetrically as thiocyanate. Calcium was precipitated as oxalate in the filtrate from the iron and aluminum; the precipitate was filtered out, dissolved in dilute sulphuric acid, and titrated with permanganate. Magnesium was determined as pyrophosphate in the filtrate from the calcium.

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[10] Dole, R. B., The quality of surface waters in the United States: U. S. Geol. Survey Water-Supply Paper 236, pp. 54, 62, 1909.

[11] Dole, R. B., and Stabler, Herman, Denudation: U. S. Geol. Survey Water-Supply Paper 234, pp. 78–93, 1909.

[12] Collins, W. D., Notes on practical water analysis: U. S. Geol. Survey Water-Supply Paper 596, pp. 235–261, 1927.

Sulphate was determined as barium sulphate in the second portion of the filtrate from the silica. Sodium and potassium were weighed together as chlorides after removal of magnesium, barium, and calcium from the sulphate filtrate. Usually the whole weight of mixed chlorides was calculated to sodium. In a few samples potassium was determined in the mixed chlorides by the use of platinic chloride and reduction by magnesium, as described by Hicks.[13] For a number of the samples the determination of sodium was omitted and the sodium necessary to balance the analysis was calculated.

EXPRESSION OF RESULTS

Units.—In accordance with the long-established custom of the United States Geological Survey the radicles determined are reported in parts per million. Results given in parts per million can be converted to grains per United States gallon by dividing by 17.12.

Hypothetical combinations.—A natural water or solution of rock materials is a balanced chemical system and not a mere collection of random quantities of the several radicles. In practically all waters the quantities of the basic radicles calcium, magnesium, sodium, and potassium are together chemically equivalent to the sum of the acid radicles—bicarbonate, sulphate, chloride, and nitrate. It is not possible to set down a list of salts that actually exist in a water, but a number of combinations of salts can be given each of which would make up a solution chemically identical with the water. This is the meaning of the tables of hypothetical combinations in which analyses are sometimes reported.

The outstanding characteristics of many waters can be indicated by the name of a single compound. A water from limestone is likely to be a calcium bicarbonate or calcium carbonate water. Calcium and bicarbonate together may make up 70 to 90 per cent of the dissolved mineral matter. A brine is a sodium chloride water.

Palmer[14] worked out a plan for the classification of waters by their chemical properties without using the names of compounds. He used the term "primary" for sodium and the other alkali metals and "secondary" for the alkaline-earth metals. The weak acid radicles (carbonate and bicarbonate) give "alkalinity," and the strong acid radicles (sulphate, chloride, and nitrate) give "salinity." Thus a limestone water has secondary alkalinity and a brine has primary salinity. This classification with the properties expressed in percentages of the whole, has been used widely in studies of geochemical relations of waters, particularly those found in oil fields.

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[13] Hicks, W. B., A rapid modified chloroplatinate method for the estimation of potassium: Ind. and Eng. Chemistry, vol. 5, pp. 650-653, 1913.

[14] Palmer, Chase, The geochemical interpretation of water analyses: U. S. Geol. Survey Bull. 479, 1911.

Graphic representation of analyses.[15]—For more than 50 years different writers have represented water analyses by diagrams similar to those shown below. The heights of the several sections correspond to the quantities of the radicles, expressed in terms of combining weights rather than in parts per million. One unit of height corresponds to 20 parts per million of calcium, 12 of magnesium, 23 of sodium, 39 of potassium, 61 of bicarbonate, 48 of sulphate, 35.5 of chloride, 62 of nitrate, or 50 of hardness as calcium carbonate. The total hardness is measured to the top of the magnesium; the carbonate hardness is measured to the top of the bicarbonate, if this is lower than the top of the magnesium. If the bicarbonate extends above the magnesium all the hardness is carbonate hardness.

Calculations from analyses.—Stabler[16] gave in 1908 a series of formulas for calculating from water analyses the probable quantities of scale-forming constituents and several other characteristics.

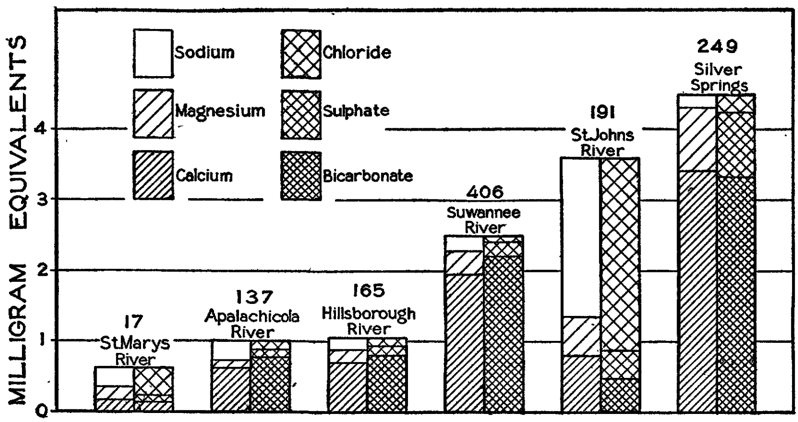

FIGURE 27.—Analyses of river waters in Florida. Numbers refer to analyses in the table

His calculations are based on analyses expressed in terms of combining weights in milligrams per kilogram, to which he gave the name "reacting values."

QUALITY OF SURFACE WATERS

Surface waters of Florida differ widely in composition. In general, however, the rivers and smaller streams carry only small quantities of dissolved mineral matter—not much more than 100 parts per million. Some streams that originate as large springs in limestone have 200 or 300 parts per million of dissolved solids. All the rivers become brackish toward their mouths, where ocean or Gulf water is mixed with the river water by the tide.

[15] Collins, W. D., Graphic representation of water analyses: Ind. and Eng. Chemistry, vol. 15, p. 394, 1923.

[16] Stabler, Herman, The mineral analysis of water for industrial purposes and its interpretations by the engineer: Eng. News, vol. 60, p. 355, 1908; Some stream waters of the western United States, with chapters on sediment carried by the Rio Grande and the industrial application of water analyses: U. S. Geol. Survey Water-Supply Paper 274, pp. 165–181, 1911.

The waters of many small lakes have less than 50 parts per million of dissolved solids; other lake waters have 100 or 200 parts per million. The water of Lake Okeechobee is not the same throughout the lake, but at nearly all points the mineral content ranges from 250 to 300 parts per million. Waters of some small lakes are salty—for example, Salt Lake in Brevard County. Nearly all the surface waters are noticeably colored, and the larger lakes and streams generally have more color than the smaller ones.

The composition of typical lake and river waters is shown graphically in Figures 27 and 28.

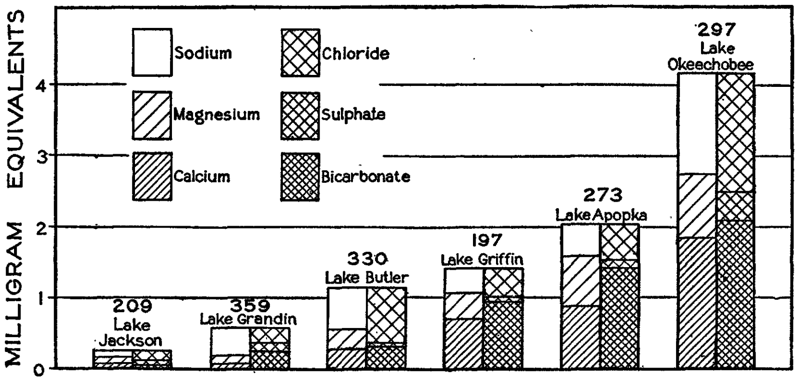

FIGURE 28.—Analyses of lake waters in Florida. Numbers refer to analyses in the table

QUALITY OF GROUND WATERS

The chemical composition of individual ground waters is shown in the accompanying table, in which a brief statement is made regarding the character of the waters of each county. For a more general discussion of ground waters the State is considered in three geographic divisions called western Florida, northern and central Florida, and southern Florida.

WESTERN FLORIDA

As used in this paper, western Florida comprises the counties west of Aucilla River—Jefferson, Leon, Wakulla, Gadsden, Liberty, Franklin, Jackson, Calhoun, Gulf, Holmes, Washington, Bay, Walton, Okaloosa, Santa Rosa, and Escambia. These counties are underlain by the Chattahoochee formation and the limestones of Oligocene and Eocene age. The Marianna and Ocala limestones are at the surface in the northern part of Jackson County. The Chattahoochee formation is at the surface along Aucilla River and in the northern part of Holmes County and southern part of Jackson County. These formations yield large quantities of hard water of moderate mineral content to many wells in this area; in some places they yield sulphur water, and along the coast they yield salty water to many wells. In Walton, Okaloosa, Santa Rosa, and Escambia Counties few wells have been drilled to these older formations.

Along the Gulf coast in the area west of Liberty and Franklin Counties, including all of Escambia and Santa Rosa Counties and the major portion of Okaloosa County, the surface deposits are Miocene to Recent undifferentiated. These deposits yield good quanti-

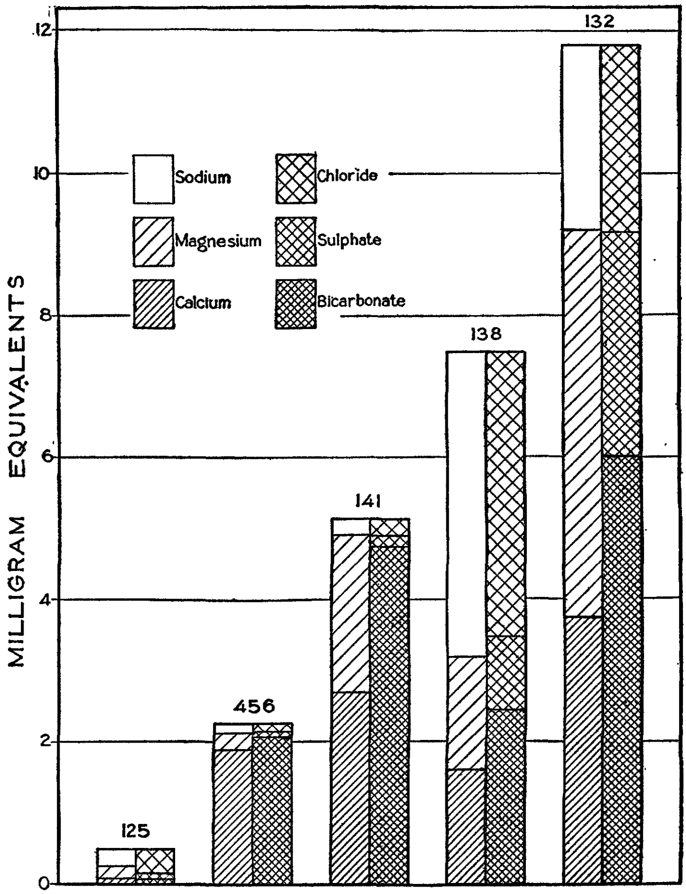

FIGURE 29.—Analyses of ground waters in western Florida. Numbers refer to analyses in the table

ties of soft water to shallow wells. In some localities where a larger supply of water is needed wells have been drilled into the older formations, but the water from these formations is as a rule harder than that obtained from shallow wells.

The Choctawhatchee marl, Jacksonville formation, and formations of the Alum Bluff group underlie the northern part of the coastal area just described and are the surface deposits in the region between the coastal area and the area where the Chattahoochee formation is at the surface. The Choctawhatchee marl and other Miocene formations are the source of water for many shallow wells but do not contain as much water as the older formations. Water from the Miocene formations is as a rule hard, although locally it is reported to be soft.

Soft water with a low mineral content is found in Escambia, Santa Rosa, and Walton Counties in wells as deep as 300 feet. This water probably has its source in the formations that overlie the Oligocene and Eocene limestones and contain practically no limestone or other calcareous material. Analyses of waters of western Florida are shown graphically in Figure 29. No. 125 is typical of the very soft waters found in a small area in Escambia County, No. 456 is a typical limestone water of moderate hardness, and No. 141 is similar except for its greater hardness. Waters like Nos. 456 and 141 are found at many places throughout the State. Nos. 138 and 132 are typical of waters from deep wells in different parts of the State. They contain larger proportions of magnesium than the simple limestone waters; chloride and sulphate make up the greater part of the acid radicles. The constituents other than those found in limestone waters are not in the proportions in which they occur in sea water, and their source is not evident.

NORTHERN AND CENTRAL FLORIDA

Northern and central Florida includes the counties east of Aucilla River and north of Lee, Hendry, and Palm Beach Counties. The Oligocene and Eocene limestones underlie this entire region and crop out in a large portion of the central part of the peninsula. These limestones are very porous and contain large quantities of water, much of it in solution channels in the limestone. Water from these limestones is hard and of moderate mineral content and in many places contains hydrogen sulphide. Wells sunk to these formations yield water under considerable pressure. Flowing wells occur on the east coast near Jacksonville, in central Florida near Sanford, and on the west coast near Bradentown and St. Petersburg. Practically all the large springs of the region flow from these formations, and therefore the spring waters are hard.

The Glendon formation, of Oligocene age, and the formations of the Alum Bluff group, the Jacksonville formation, and the Choctawhatchee marl, all of Miocene age, yield water to many shallow wells but only in moderate quantities. As a rule the water from these formations is of moderate mineral content and hard, although in some places soft water is obtained from them.

The Pliocene deposits consist of marl, clay, and gravel. The marl and clay do not yield much water, and the area where the gravel is most widely distributed has many deep wells sunk to the older

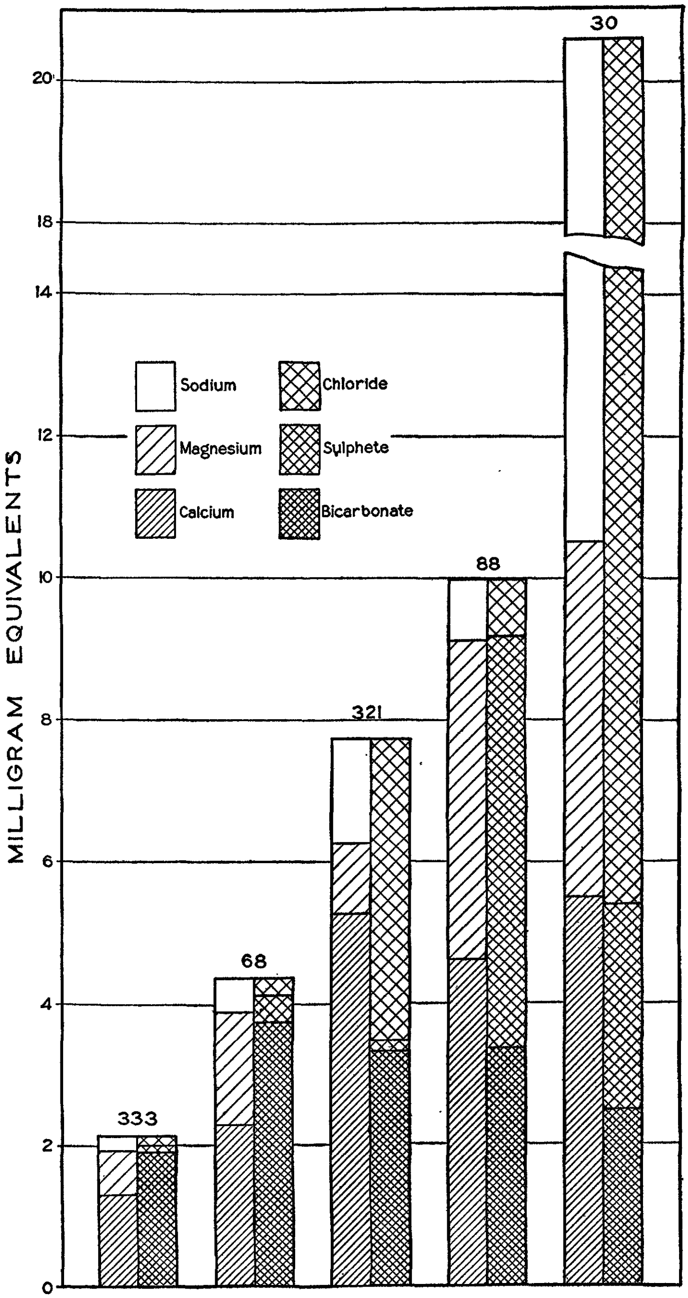

FIGURE 30.—Analyses of ground waters in northern and central Florida. Numbers refer to analyses in the table

formations in order to get large quantities of water under a good head. The gravel yields moderate quantities of water.

The Pleistocene and Recent deposits occur especially along the coast and yield good supplies of water to shallow wells. The waters are usually not so hard as those from the older formations, although coquina and other calcareous materials in the deposits cause some hardness.

More than 60 per cent of the ground waters of northern and central Florida analyzed for this report have a hardness of 150 to 400 parts per million and total solids less than 400 parts per million. The waters having a hardness greater than 400 parts per million and total solids greater than 400 parts per million have considerably more chloride or sulphate or both than the normal ground waters. Analyses of characteristic waters of the region are shown in Figure 30. Nos. 333 and 68 are typical limestone waters such as are found throughout the State. They may be called slightly and moderately hard, respectively. Nos. 321 and 88 are decidedly hard waters, which in addition to constituents dissolved from limestone contain considerable quantities of chloride and sulphate, respectively, with correspondingly larger quantities of sodium or magnesium. No. 30 is primarily a sodium chloride water. It represents in a general way the composition of a ground water contaminated with sea water. In the diagram for No. 30 sodium chloride to the amount of 3 milligram equivalents has been omitted, as indicated by the numbers on the margin.

SOUTHERN FLORIDA

In this report southern Florida comprises Martin, Palm Beach, Broward, Dade, Hendry, Collier, Monroe, and Lee Counties. The Everglades cover a large part of this region.

The Oligocene and older formations are deeply buried in southern Florida. Wells, some flowing, that reach these formations yield large quantities of hard water, which is sulphureted and nearly everywhere salty. The Miocene and Pliocene beds yield a little water; on the west coast some wells obtain flows from these formations. The water is hard, and as large quantities can not be obtained, wells usually are sunk to the older formations. The Pleistocene formations are in some localities 125 feet thick and throughout this region are the chief sources of water. The water is usually hard because it comes from limestone and other calcareous materials. The public supply at Olympia, Martin County (No. 255, fig. 31) is obtained from shallow wells and is the only soft water from the Pleistocene deposits in southern Florida among those analyzed for this report. The Pleistocene formations generally yield the best water in this region, and unless the quantity is insufficient it is unnecessary

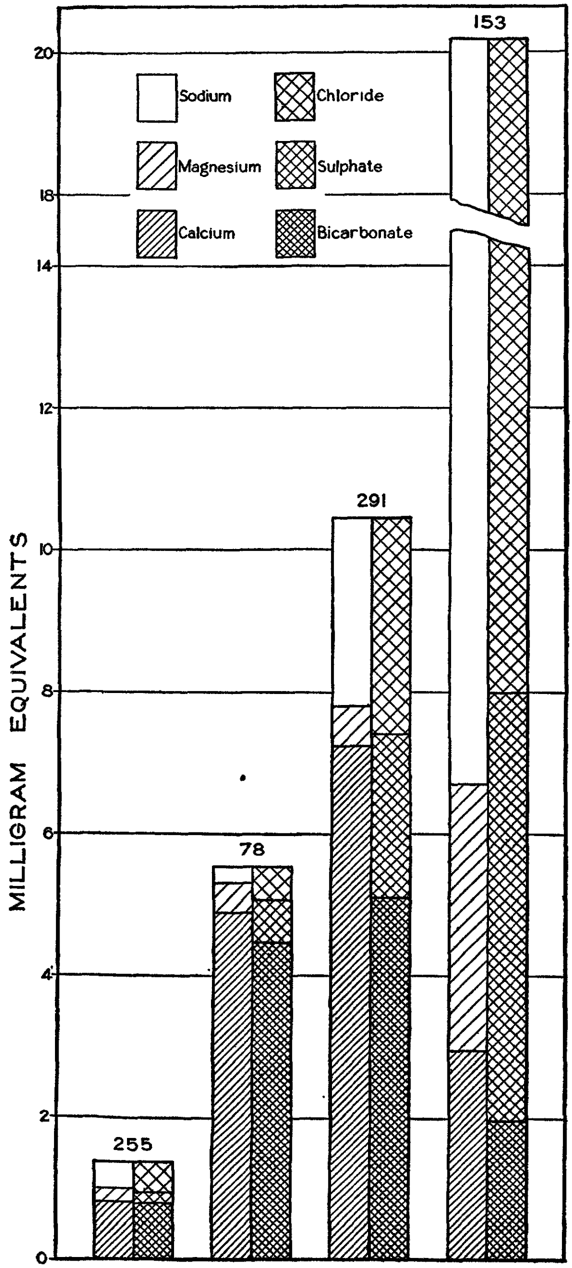

FIGURE 31.—Analyses of ground water in southern Florida. Numbers refer to analyses in the table

to drill to the deeper formations. Some of the ground waters in this area are colored, as the surface waters are.

Typical analyses are shown in Figure 31. Although fairly soft, No. 255 has in general the composition of a limestone water. Calcium and bicarbonate are its chief constituents. No. 78 is a characteristic hard limestone water. A large number of wells in many parts of the State supply water almost identical with that represented by diagram No. 78. Nos. 291 and 153 represent common types of water containing large quantities of chloride and sulphate in addition to the bicarbonate that is characteristic of limestone waters.

UTILIZATION OF WATERS FOR PRIVATE AND PUBLIC SUPPLIES

REQUIREMENTS

The primary requirement for a water for ordinary private or public supply is that it shall be safe to drink. It must come from a source known to be free from possibility of pollution with bacteria that may cause disease, or it must be so treated as to kill any such bacteria that may be in it. For many industrial uses the sanitary condition of a water is of no importance.

The requirement that is second in real importance, though put first in the demands of most customers, is that a water shall have a pleasing appearance and be free from objectionable taste or odor. These qualities are not so important industrially, although clear, colorless water is essential for certain processes.

It is desirable that water for domestic use be soft. Hardness probably has no effect on the value of a water for drinking and certainly is of no consequence for the uses which consume most of the water required by a household. As soon as soap is used with water the ill effects of hardness appear. On the score of economy the softening of hard water may be justified for a single family. The money saving will depend on the quantity of soap used. It does not take a commercial laundry long to save enough in soap to pay for a water softener, but a much larger proportion of the total water used in a laundry is used with soap. In the home the use of a water softener is comparable with the use of a water heater. One can wash, after a fashion, with cold water just as one can wash, also after a fashion, with hard water.

In the industrial use of water freedom from hardness is in general the most important feature. Hardness must be removed for the proper operation of steam boilers to supply power for manufacturing or hot water for industrial processes. In addition to laundry work other textile operations, like bleaching and dyeing, are affected by the hardness of the water used.

Some waters are objectionable because of their corrosive properties. Soft waters that contain large quantities of carbon dioxide often attack iron pipes so vigorously that the water is rendered turbid and red by the dissolved iron, and in time the pipes are almost closed by the accumulation of iron oxide in them. Hard waters are usually less corrosive than naturally soft waters.

SOURCES

Throughout much of the State abundant supplies of potable ground water can be obtained for individual homes or for small communities. Some of the cities, however, have found it difficult to obtain a sufficient supply of ground water, and others have found the quality of the water deteriorating as wells were drawn upon for ever-increasing demands. Moreover, the surface waters at most places are decidedly softer than the ground waters, and hence the utilization of surface waters for public supplies in Florida is likely to increase.

TREATMENT OF GROUND WATER

Some natural ground waters are perfectly satisfactory for all ordinary uses, but many can be decidedly improved by treatment for the removal of iron or hydrogen sulphide or by softening. So many caverns and solution channels have been formed in the limestones of Florida that ground waters there are less safe from pollution than they are in regions where the water-bearing strata consist of sandstone, shale, sand, and gravel. Where the possibility of pollution exists a water that is otherwise acceptable may require chlorination to insure its safety.

REMOVAL OF IRON AND HYDROGEN SULPHIDE

Aeration, with or without filtration, generally serves to remove the iron and hydrogen sulphide from the ground waters of Florida. The purification of some waters is aided by the addition of small quantities of lime or some other agent that will make the separation of the undesirable constituents more rapid and more complete. The condition in which the iron exists in a water and the quantities of the other constituents determine the treatment for removal of the iron and affect the result. Thus each new installation is a separate problem, which may not yield to treatment that has been successful under apparently similar conditions.

SOFTENING WITH LIME AND SODA

The lime-soda process for softening water has been used so long that it need not be described in detail. Theoretically lime equivalent to the free carbon dioxide, the carbonate hardness, and the magnesium is added to the water, also soda ash or sodium carbonate equivalent to the noncarbonate hardness. In practice the quantities of chemicals to be added are often determined by tests of the softened water. If the softening is conducted at a high temperature, there is a saving of chemicals and the softening is more nearly complete than at ordinary temperatures.

The lime-soda process works best with water of constant composition. Changes in the mineral content of the water make it necessary to alter the rate of addition of the chemicals and may make it necessary to alter their relative proportions. Well waters and waters obtained from large lakes or other sources of constant composition are more easily treated than waters from rivers, whose content of dissolved mineral matter may fluctuate from 50 to 150 per cent of the average. Municipal softening of a public supply is a help to the operation of a plant using the lime-soda process for further softening in that it tends to keep the hardness of the water more uniform.

Lime-soda softening properly conducted always decreases the total quantity of dissolved material in the water. The carbonate hardness is nearly all removed, and the dissolved solids are correspondingly decreased. The calcium and magnesium of the noncarbonate hardness are replaced by sodium, so that this part of the process makes little difference in the quantity of dissolved solids. Some waters have so much noncarbonate hardness that after treatment they are likely to cause foaming in steam boilers because of the great increase in the concentration of sodium salts.

SOFTENING WITH EXCHANGE SILICATES

A newer process for softening water depends on the property of some insoluble silicates of exchanging sodium for calcium or magnesium. When used in treating ordinary hard water these silicates take from it practically all its calcium and magnesium and give in exchange sodium. Water thus treated is for all practical purposes free from hardness, although analyses may show that it still contains a few parts per million of calcium and magnesium.

When the silicate in a softener begins to lose its exchange capacity it is regenerated by passing a strong solution of common salt through the layer of silicate, which now takes sodium from the salt solution in exchange for the calcium and magnesium that it had removed from the hard water. The salt solution must be completely washed out before water is again taken from the softener for use in steam boilers.

Whatever may be the composition of a water it can not be overtreated in an exchange-silicate softener, and unless the capacity of the apparatus is overtaxed the water will not be undertreated. The size of the softener required for a given output between regenerations depends, however, on the hardness of the water. The exchange-silicate process makes practically no change in the total quantity of dissolved solids in a water. This is a disadvantage that is sometimes overcome by first treating the water with lime to remove most of the carbonate hardness and filtering out the precipitated calcium carbonate before passing the water through the bed of silicate.

Some waters contain so much sodium that they are not softened satisfactorily by exchange silicates. Other waters are so hard that they can not be softened in this way. Such waters are uncommon, and their use is not often considered even for private supplies.

TREATMENT WITH HEAT AND WITHIN THE BOILER

Systems are in use for removing scale-forming substances by heating feed water to boiler temperature before it enters the boiler. These systems serve for boiler feed water but have not the universal applicability of the lime-soda or exchange-silicate systems, which are used to supply soft water for all purposes.

Treatment within the boiler is under many conditions the best method of preventing scale and is the only method of preventing foaming. At small plants waters of moderate hardness can generally be treated more satisfactorily in the boiler than in an outside softening apparatus. Some large plants have obtained the best results by treatment within the boiler, but the large plants also offer the best field for the softening of water outside the boiler.

RESULTS OF WATER SOFTENING

The changes in composition of waters that result from softening are shown in Figure 32. Diagrams A and B represent respectively untreated and softened water of part of the public supply at Daytona Beach. The treatment when the samples were taken involved the addition of 24 pounds of lime and 7 pounds of soda ash to 10,000 gallons of water. The waters represented by diagrams A and B may have been slightly different before the treatment, but the sulphate and nitrate did not differ more than could be attributed to unavoidable errors of analysis, and the chloride was exactly the same. The diagrams show the reduction in bicarbonate, calcium, and magnesium that is accomplished by the addition of lime. Diagram A shows an excess of calcium and magnesium together over the bicarbonate. This excess is the noncarbonate hardness. The large content of chloride suggests that the water would be corrosive if heated in a steam boiler. The addition of sodium carbonate (soda ash) helped the precipitation of calcium carbonate and magnesium hydroxide and served to balance more of the chloride. Thus not only is the noncarbonate hardness decreased, but the probability of corrosive action is also reduced.

Diagrams C and D represent corresponding analyses for another part of the Daytona Beach public water supply. When the samples were collected the water was being treated with 24 pounds of lime to 10,000 gallons. The noncarbonate hardness in C is much less than in

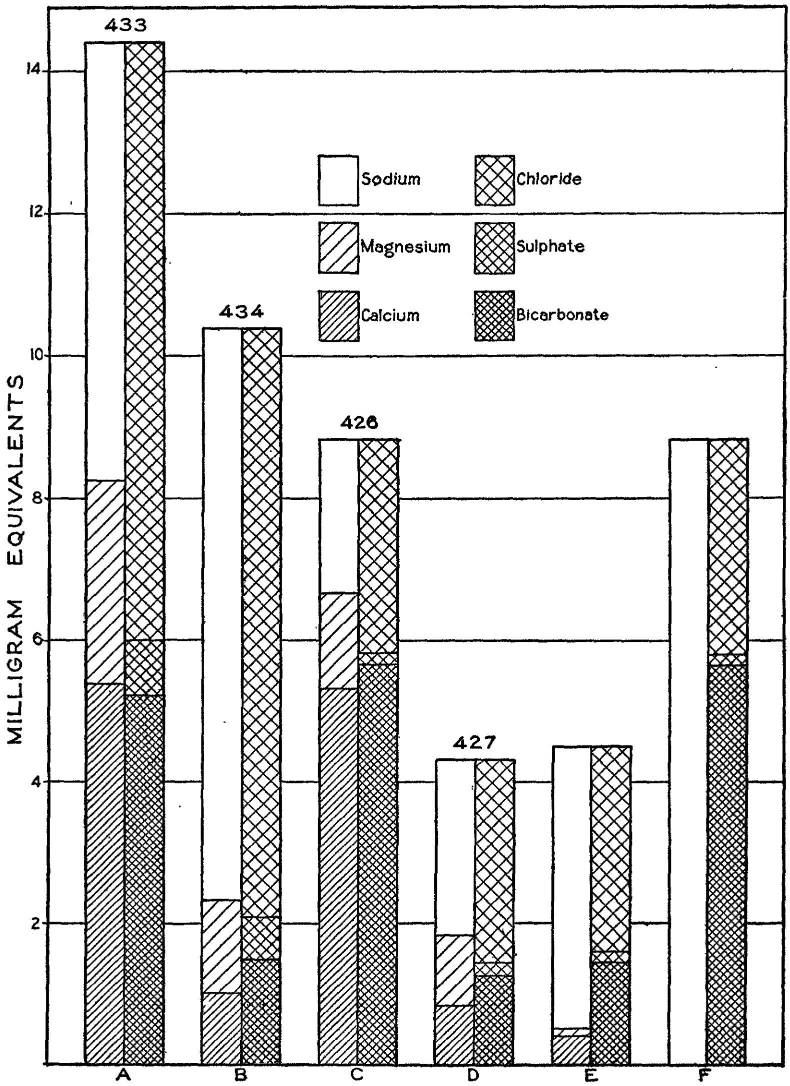

FIGURE 32.—Analyses of natural and softened waters in Florida. A, C, Natural water; B, D, E, F, softened water. Numbers refer to analyses in the table

A and therefore there is less need for the use of soda ash in the treatment. The probability of corrosion is also less in C than in A. The results of treatment at the two places are practically the same as regards hardness. The use of soda ash at Daytona Beach makes a noticeable increase in the rather large quantity of sodium already in the water.

Diagram E represents the probable result of treating the Daytona water (C) in a hot-process lime-soda softener, so as to attain the

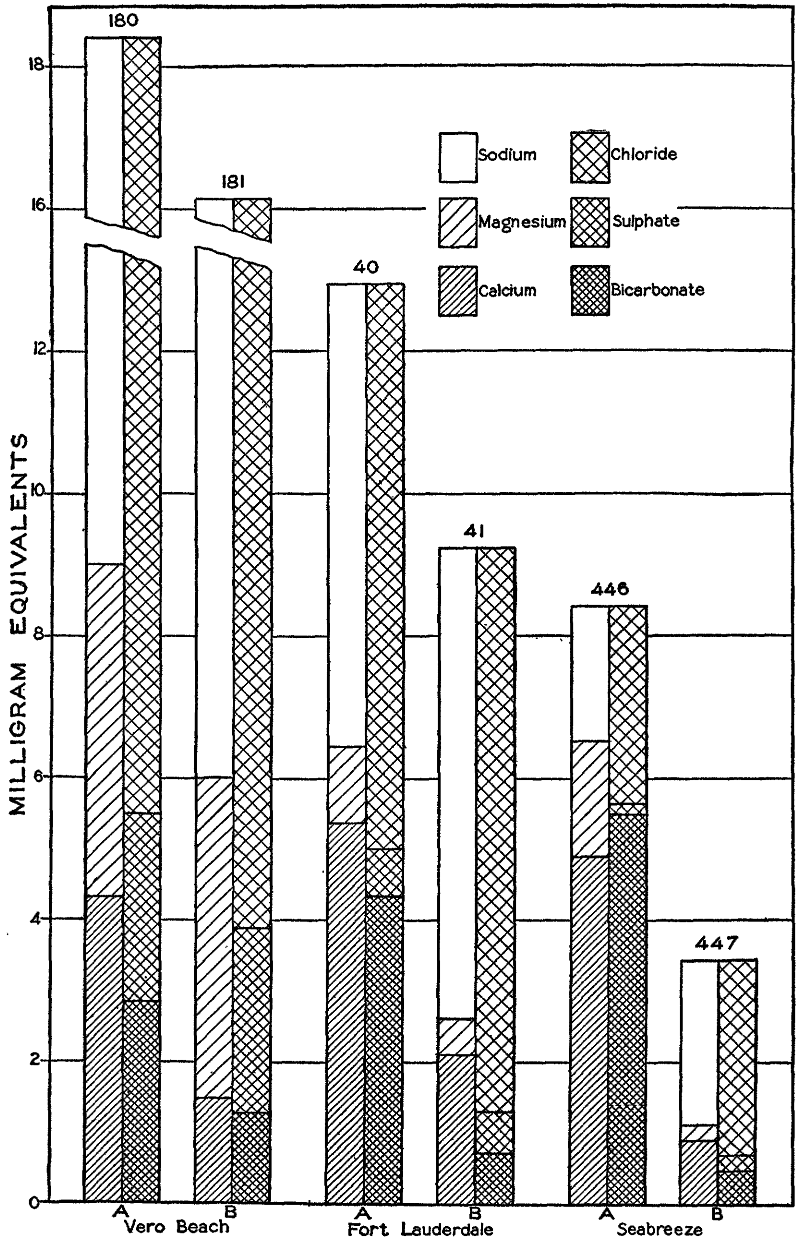

FIGURE 33.—Analyses of waters from public supplies in Florida before and after treatment. A, Before treatment; B, after treatment. Numbers refer to analyses in the table

greatest practicable softening. It is necessary to add a decided excess of soda ash to accomplish the greatest softening by this process.

The total quantity of mineral matter remaining in solution may be a little greater than in the less thoroughly softened water represented by diagram D, but the water is much superior for boiler or laundry use.

Diagram F represents water C softened by an exchange-silicate softener. For all practical purposes the hardness is completely removed. The total quantity of dissolved mineral matter is, however, almost the same as before treatment; the acid radicles are unchanged, and the calcium and magnesium are replaced by sodium. This water is ideal for laundry work or other processes in which soap is used. It is not the best for boiler use. Waters like C are sometimes treated with lime to give practically the composition shown in diagram D and then with an exchange silicate to remove the remaining calcium and magnesium.

Sodium, chloride, and sulphate remain in the waters throughout the treatments shown. Changes in these constituents are increases. It is possible to decrease the sulphate by the use of barium salts, and this means is occasionally resorted to in treating very bad waters. There is no practical way to remove sodium and chloride except by distillation of the water.

Figure 33 shows the changes resulting from treatment of public water supplies at Vero Beach, Fort Lauderdale, and Seabreeze. Sodium chloride to the amount of 2 milligram equivalents is omitted from each of the diagrams for Vero Beach, as indicated by the numbers at the margin. These waters are all greatly improved by the treatment.

TREATMENT OF SURFACE WATER

Practically all surface waters are exposed to pollution and therefore require treatment to render them safe to drink. The surface waters of Florida are nearly all too highly colored also to be satisfactory for domestic use. The necessity for the removal of color determines the type of treatment to be applied for purification of the waters.

Surface waters are treated with aluminum sulphate to produce a flocculent precipitate, which will remove the coloring matter. It is necessary to add lime or soda to some waters in order to obtain a satisfactory precipitate. After the precipitate has settled, the water is filtered rapidly through sand until the accumulation of precipitate on top of the sand bed has reduced the rate of filtration a predetermined amount. The flow is then reversed and the accumulation of precipitate and mud is washed away from the sand bed into a sewer by filtered water. The precipitate that removes the color and aids the filter in removing suspended mud or silt also removes most of the harmful bacteria that may have been in the water. As an added precaution a small quantity of chlorine is added to nearly all filtered waters just before they enter the mains.

The proper proportioning of the materials used in water purification calls for careful chemical control. If the composition of the water to be treated does not change greatly from day to day, a filter plant may possibly be operated by set rules, but changes in composition of the water must be met promptly by corresponding changes in the treatment.

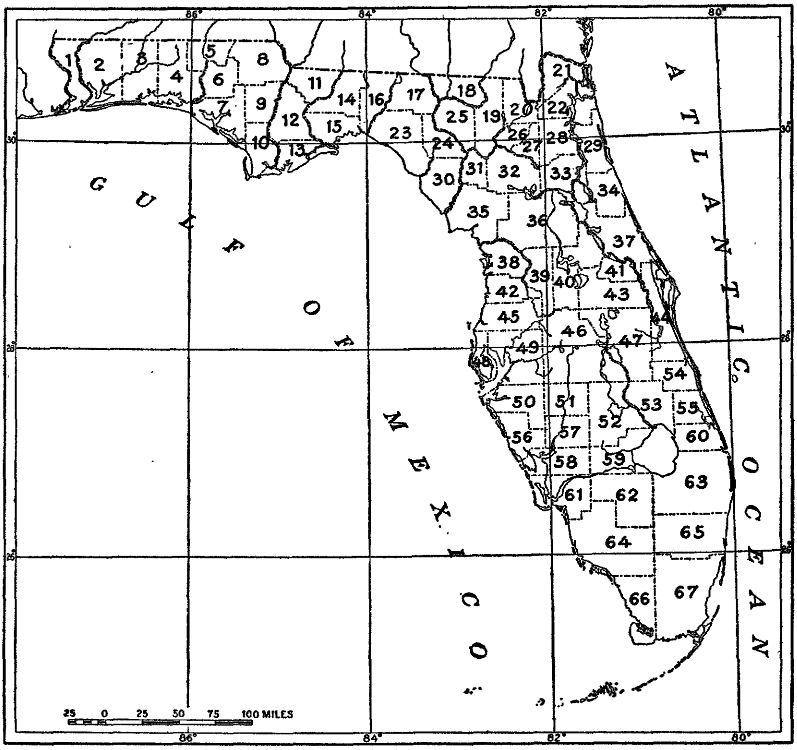

FIGURE 34.—County lines in Florida at time of compilation of table of analyses

1. Escambia.
2. Santa Rosa.
3. Okaloosa.
4. Walton.
5. Holmes.
6. Washington.
7. Bay.
8. Jackson.
9. Calhoun.
10. Gulf.
11. Gadsden.
12. Liberty.
13. Franklin.
14. Leon.
15. Wakulla.
16. Jefferson.
17. Madison.
18. Hamilton.
19. Columbia.
20. Baker.
21. Nassau.
22. Duval.
23. Taylor.
24. Lafayette.
25. Suwannee.
26. Union.
27. Bradford.
28. Clay.
29. Saint Johns.
30. Dixie.
31. Gilchrist.
32. Alachua.
33. Putnam.
34. Flagler.
35. Levy.
36. Marion.
37. Volusia.
38. Citrus.
39. Sumter.
40. Lake.
41. Seminole.
42. Hernando.
43. Orange.
44. Brevard.
45. Pasco.
46. Polk.
47. Osceola.
48. Pinellas.
49. Hillsborough.
50. Manatee.
51. Hardee.
52. Highlands.
53. Okeechobee.
54. Indian River.
55. Saint Lucie.
56. Sarasota.
57. De Soto.
58. Charlotte.
59. Glades.
60. Martin.
61. Lee.
62. Hendry.
63. Palm Beach.
64. Collier.
65. Broward.
66. Monroe.
67. Dade.

ANALYSES OF WATERS IN FLORIDA

The following table contains analyses of waters from Florida, arranged by counties. Figure 34 shows the boundaries of the counties as they were at the time of compilation of the table. Nearly all the samples were collected for this report by or under the direction of

George W. Simons, jr., sanitary engineer of the State board of health. The chemists who analyzed these samples are indicated in the table by initials—Margaret D. Foster (F), C. S. Howard (H), and H. B. Riffenburg (R). The table includes a few analyses of samples collected in connection with the field work for Water-Supply Paper 319. These were made by or under the direction of R. B. Dole (D). Practically all the analyses in the table were made in the water-resources laboratory of the United States Geological Survey.

The table contains several partial analyses, in which sulphate and calcium were determined by comparison of turbidity produced by the appropriate reagents. Such determinations are indicated by a footnote. In these partial analyses the hardness was usually determined and is so indicated.

Some samples contained carbonate (CO_3) when analyzed. It is probable that only bicarbonate was present in most of the samples when collected; accordingly the equivalent of the carbonate found was calculated and added to the bicarbonate. In the analyses of treated waters, some of which undoubtedly contained carbonate when sampled, the amount of carbonate found is given in a footnote; in the other analyses the actual amount found is not given.

Iron was precipitated from many samples when they were analyzed. If the samples were marked "clear" by the collectors, the amount of iron precipitated at the time of analysis is not given separately but is included with the amount found in solution, and this fact is stated in a footnote.

Hydrogen sulphide was determined in a few samples and was reported by the collectors as present in others. Failure to report hydrogen sulphide in any analysis does not necessarily mean that it is absent from the water. Several samples from sources previously reported to yield sulphur water gave no evidence of the presence of hydrogen sulphide when received in the laboratory, and its presence was not reported by the collectors.

95221°—28——14

For convenience of reference an alphabetic list of the towns represented by the analyses is given below with the names of some of the larger lakes, rivers, and springs. Numbers refer to analyses.

Ground and surface

No.	Description
	ALACHUA COUNTY
1	Alachua; municipal supply. 8-inch drilled well 360 feet deep. Aug. 12, 1924
2	Alachua. 3-inch drilled well 80 feet deep; owned by Atlantic Coast Line R. R. Co. Aug. 13, 1924
3	Gainesville. Boulware Spring; part of public supply. (See No. 4.) Aug. 10, 1923
4	Gainesville. 8-inch drilled well 380 feet deep; part of public supply. (See No. 3.) Aug. 10, 1923
5	Gainesville. 2-inch drilled well 39 feet deep; used for cooling at city waterworks. Aug. 10, 1923
6	Gainesville. 1¼-inch driven well 15 feet deep; owned by Atlantic Coast Line R. R. Co.; water used for cooking and drinking by employees of Creosote plant. Aug. 10, 19 23.
7	Gainesville. 8-inch drilled well 365 feet deep; owned by Diamond Ice Co. Aug. 10, 1923
8	Gainesville. 8-inch drilled well 396 feet deep, at Florida Farm Colony for epileptics. Aug. 10, 1923.
9	High Springs; municipal supply. 8-inch drilled well 425 feet deep. Nov. 8, 1923
10	High Springs. 8-inch drilled well more than 150 feet deep; owned by Atlantic Coast Line R. R. Co.; water used for boilers only. Nov. 8, 1923.
11	High Springs. Poe Springs, 3 miles northwest of High Springs; owned by H. McL. Grady; discharge February 19, 1917, 86 second-feet (Water-Supply Paper 452, p. 61). Oct. 31, 1914.
12	High Springs. Santa Fe River near Poe Springs, 3 miles northwest of High Springs; color, 120. Oct. 31, 1924.
13	Newberry; municipal supply. 10-inch drilled well 100 feet deep. Nov. 8, 1923
14	Waldo. 2-inch driven and drilled well 57 feet deep; owned by J. L. George; water used for making ice and for drinking by the public. Nov. 16, 1923.
	BAKER COUNTY
	Few deep wells have been drilled in Baker County, but it is probable that wells from 250 to 500 feet deep will obtain water from the Ocala limestone. The head is not likely to be sufficient to give a flow. The water will be similar in composition and concentration to that found in the deeper wells in Bradford, Columbia, and Duval Counties and will probably be more concentrated than water from shallow wells.
15	Glen St. Mary. 6-inch drilled well 65 feet deep; owned by Glen St. Mary Nursery Co. Feb. 26, 1924.
16	MacClenny. Public well; 1¼ inches in diameter and 23 feet deep. Dec. 23, 1907
17	MacClenny, 6 miles north of. St. Marys River. Color, 180. Feb. 13, 1924
18	MacClenny; South Prong of St. Marys River at bridge between MacClenny and Glen St. Mary across State road No. 1. Color, 180. Feb. 26, 1924.
	BAY COUNTY
19	Millville. 6-inch drilled well 227 feet deep; owned by St. Andrews Bay Lumber Co. Apr. 17, 1924
20	Panama City; municipal supply. 8-inch drilled well 710 feet deep. Apr. 17, 1924
21	St. Andrews. Driven well 1¼ inches in diameter and 22 feet deep; owned by L. A. Comstock; supply of Villa Hotel. Most wells in the locality are about 22 feet deep. Apr. 18, 1924.
	BRADFORD COUNTY
	Shallow wells in Bradford County will probably yield hard water, similar to No. 25.
22	Starke; municipal supply. 6-inch drilled well 529 feet deep, known as "Old well." Nov. 16, 1923.
23	Starke; municipal supply when collected. 6-inch drilled well 529 feet deep, known as "Old well." Nov. 9, 1907.
24	Starke; municipal supply. 10-inch well 400 feet deep, drilled in 1923; known as "New well." Aug. 12, 1924.
25	Starke, 5 miles west of; Heilbronn Springs; owned by Heilbronn Mineral Water Co., Starke. Nov. 7, 1924.
	BREVARD COUNTY
26	Cocoa; municipal supply. 12-inch well 30 feet deep, drilled in 1924; color, 62. July 29, 1925
27	Cocoa. Flowing well 6 inches in diameter and 265 feet deep; owned by Brevard County Power Co. Oct. 31, 1923.
28	Cocoa. 2-inch driven well 27 feet deep; owned by M. B. Pruitt. Oct. 31, 1923
29	Eau Gallie. Flowing well 2 inches in diameter and 325 feet deep; owned by Dixie Garage. July 9, 1923.
30	Eau Gallie. Flowing well 6 inches in diameter and 500 feet deep; owned by East Coast Lumber Co. Estimated flow 1,000 gallons a minute. July 9, 1923.
31	Melbourne, Front Street. Driven well 1¼ inches in diameter and 28 feet deep; owned by E. R. Hedges. July 10, 1923.
32	Melbourne. Drilled well 1¼ inches in diameter and 42 feet deep; owned by Sam Martin. Sept. 20, 1924.

[a] Calculated. [b] Includes iron precipitated at time of analysis.

waters of Florida

Analyses (parts per million)												
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	No.
H.	487	17	0.20	99	24	9.4	206	164	16	Tr.	346	1
H.	255	-------	.14	72	6.4	[a] 7.1	207	27	16	1.5	206	2
F.	94	6.4	.06	17	11	2.8	89	2.4	8.8	5.4	88	3
F.	273	24	.07	57	20	6.3	218	43	9.6	Tr.	224	4
F.	299	16	[b] 6.6	41	21	15	126	9.9	74	Tr.	189	5
F.	27	3.1	.18	.8	1.0	6.6	7.3	3.0	9.6	Tr.	6	6
F.	209	14	.06	52	11	6.5	202	7.3	8.2	Tr.	175	7
F.	220	32	[b] .34	41	19	8.2	219	7.6	9.0	Tr.	180	8
F.	[a] 212	-------	-------	62	8.4	([c])	183	25	9.4	1.8	189	9
F.	204	11	.02	57	7.0	5.5	174	26	7.6	.25	171	10
H.	204	8.7	.05	64	4.7	5.7	201	10	7.0	Tr.	179	11
H.	190	9.7	[b] .27	41	7.0	8.6	122	35	10	Tr.	131	12
F.	[a] 174	-------	-------	53	6.7	([c])	181	6.1	2.9	1.1	160	13
F.	264	18	.07	47	26	14	227	5.9	29	17	224	14
H.	188	24	Tr.	34	19	Na 7.7; K 1.0	194	4.7	10	Tr.	163	15
D.	127	15	1.0	2.1	1.8	31	10	10	32	18	13	16
H.	74	7.3	.03	3.8	2.4	Na 5.8; K 1.2	8.5	3.4	12	Tr.	19	17
H.	80	9.4	.02	3.4	1.7	Na 7.5; K 1.6	7.3	2.1	12	Tr.	15	18
H.	214	18	.15	46	14	Na 12; K 1.6	189	4.2	20	Tr.	172	19
H.	264	17	1.5	66	11	Na 14; K 1.8	233	6.0	26	Tr.	210	20
H.	53	15	.09	13	.6	Na 3.2; K .6	39	4.2	4.0	1.5	35	21
H.	187	23	Tr.	40	12	12	188	8.1	13	Tr.	149	22
D.	198	26	.11	38	16	15	[d] 188	11	16	Tr.	161	23
H.	255	46	.98	42	22	15	244	2.3	19	Tr.	195	24
H.	197	23	.03	38	19	8.7	206	2.5	14	Tr.	173	25
H.	311	7.6	[b] .31	23	9.9	54	40	24	114	Tr.	98	26
F.	2,630	16	.12	177	101	643	144	253	1,342	1.7	857	27
F.	466	9.8	[b] .65	99	13	51	320	21	83	.14	301	28
R.	1,262	24	.27	115	61	206	154	129	504	3.2	538	29
R.	1,312	22	.20	110	61	232	144	147	536	1.0	525	30
R.	500	24	.24	113	9.6	38	298	1.8	100	.30	322	31
H.	592	14	.04	152	5.1	[a] 38	293	6.6	168	Tr.	401	32

[a] Less than 10 parts per million. [d] Includes equivalent of small quantity of carbonate (CO_3).

Ground and surface

No.	Description
	BREVARD COUNTY—continued
33	Melbourne. Flowing (in 1908) well 1¼ inches in diameter and 45 feet deep; owned by M. D. Rhodes. Jan. 30, 1908.
34	Melbourne Beach. Flowing well 4 inches in diameter and 250 feet deep; owned by L. T. Hunt and C. E. Farrington. Oct. 31, 1923.
35	Melbourne Beach. Flowing well 4 inches in diameter and 350 feet deep; 100 yards north of bridge approach; owned by Richard C. Fishers. July 10, 1923.
36	Titusville. 2-inch driven well 20 feet deep; one of 8 wells furnishing city supply. July 9, 1923
37	Titusville. 4-inch drilled well 400 feet deep at Dixie Hotel; owned by C. Fielden. Bromide (Br), 50 parts per million. July 9, 1923.
38	Titusville, 8 miles west of; a typical salt lake. Jan. 31, 1908
	BROWARD COUNTY
39	Dania; municipal supply. 6-inch drilled well 75 feet deep in SW. ¼ sec. 34, T. 51 S., R. 42 E.; water level 3 feet above surface; yield 500 gallons a minute. Oct. 25, 1924.
40	Fort Lauderdale. 8-inch drilled well 70 feet deep; owned by municipality; the water after softening is used for municipal supply (No. 41); color, 70. June 24, 1924.
41	Fort Lauderdale; municipal supply. Water from No. 40 after softening and filtration. June 24, 1924.
42	Fort Lauderdale. 2-inch drilled well 62 feet deep; owned by Crown Bottling Works. July 12, 1923.
43	Fort Lauderdale. 2-inch driven well 30 feet deep; owned by Southern Utilities Co. July 12, 1923.
44	Fort Lauderdale, 6 miles above. North New River Canal in T. 50 S., R. 41 E.; color, 32. June 24, 1913.
45	Hollywood; municipal supply. 7 driven wells 2 inches in diameter and 50 feet deep; color, 100. Nov. 3, 1923.
	CALHOUN COUNTY
46	Blountstown. Public well 6 inches in diameter and 428 feet deep. Apr. 10, 1924
47	Blountstown. Driven well 1¼ inches in diameter and 27 feet deep; owned by S. A. Leonard; used by public school. May 29, 1924.
	CHARLOTTE COUNTY
	Shallow wells in Charlotte County may yield hard water of moderate mineral content that will be much better than the deep-well water represented by analysis 50.
48	Murdock. Large spring locally known as Salt Spring. Feb. 10, 1927
49	Punta Gorda; municipal supply. Drilled well 92 feet deep. June 1, 1925
50	Punta Gorda. 8-inch drilled well 680 feet deep; owned by Southern Utilities Co. Water level 20 feet above surface. Feb. 21, 1924.
	CITRUS COUNTY
51	Crystal River. Spring supplying water for drinking at the municipal tourist camp; one of many springs that feed Crystal River; discharge of group of springs estimated at 445 second-feet, 1907 (Water-Supply Paper 319, p. 281). Nov. 9, 1923.
52	Inverness. 10-inch drilled well 187 feet deep; owned by the city. Sept. 7, 1923
	CLAY COUNTY
53	Green Cove Springs; municipal supply. 6-inch drilled well 753 feet deep. Feb. 16, 1924
54	Green Cove Springs. Flowing well 4 inches in diameter and 400 feet deep on Walkill Stock Farms; owned by Grant Van Sant, St. Paul, Minn. Water level 6 feet above surface; yield 300 gallons a minute. Jan. 12, 1925.
55	Green Cove Springs. Qui-Si-Sana Spring, owned by Qui-Si-Sana Co.; yield 3,000 gallons a minute. Feb. 16, 1924.
56	Green Cove Springs. Flowing well 4 inches in diameter and about 500 feet deep; owned by N. B. Ivey. Dec. 24, 1907.
57	Keystone Heights. Drilled well 2½ inches in diameter and 50 feet deep at schoolhouse; owned by Clay County. Jan. 10, 1925.
58	Keystone Heights. Lake Geneva. Jan. 10, 1925
59	Middleburg, 3½ miles south of. South Fork of Black Creek at Dowling Bridge; color, 180. Mar. 6, 1924.
60	Middleburg, 2½ miles northwest of. North Fork of Black Creek at Tritt Bridge; color, 200. The color of a sample collected Mar. 24, 1924, was 240. The other constituents were about the same as in the earlier sample. Mar. 5, 1924.
61	Middleburg, 5 miles northwest of. North Fork of Black Creek 100 feet below mouth of Yellow Water Creek; color, 180. Feb. 21, 1924.

[a] Calculated.
[b] Includes iron precipitated at time of analysis.

waters of Florida—Continued

Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	No.
	Analyses (parts per million)											
D.	370	-------	Tr.	105	3.0	[a] 27	[d] 349	2	34	--------	276	33
F.	1,079	-------	-------	103	61	196	158	116	490	Tr.	508	34
R.	1,208	24	0.20	111	62	230	154	124	540	3.0	532	35
R.	263	12	1.0	89	2.3	4.7	261	4.6	16	Tr.	232	36
R.	26,334	24	2.0	688	859	7,739	170	2,111	14,276	Tr.	5,242	37
D.	7,114	-------	1.3	358	148	[a] 2,051	[d] 102	642	3,700	--------	1,502	38
H.	336	5.8	.18	101	17	[a] 11	281	28	16	Tr.	322	39
H.	910	7.2	[b] 1.2	122	19	167	293	35	338	Tr.	383	40
H.	673	5.0	[b] .10	46	7.2	179	[e] 48	31	329	Tr.	145	41
H.	336	6.0	1.5	104	1.1	20	311	8.1	36	Tr.	264	42
H.	372	24	Tr.	88	1.5	41	256	2.6	68	2.7	222	43
D.	130	8.2	.03	26	6.7	Na 19 K 2.0	94	4.1	26	.1	92	44
F.	253	8.1	.60	77	3.6	8.2	240	4.0	12	2.0	207	45
H.	168	19	.11	37	11	Na 8.7 K .4	200	6.1	2.3	Tr.	138	46
H.	56	12	[b] 1.0	2.1	1.6	9.8	16	7.5	11	Tr.	12	47
F.	17,812	18	.12	766	471	5,124	167	1,704	9,350	--------	3,846	48
H.	1,678	27	[b] 2.0	247	41	268	259	83	761	6.7	786	49
H.	3,899	16	.08	238	159	Na 895 K 14	127	502	1,800	Tr.	1,247	50
H.	134	13	.08	28	6.7	6.5	99	13	8.0	Tr.	97	51
F.	130	1.5	.15	34	3.5	3.7	111	4.0	8.4	Tr.	99	52
F.	212	-------	-------	30	22	[a] 1.2	93	80	6.0	--------	165	53
H.	111	10	1.6	21	11	6.0	106	9.4	5.0	Tr.	98	54
F.	170	15	.08	28	16	Na 2.4 K 1.8	100	49	5.7	Tr.	136	55
D.	332	-------	.2	46	26	[a] 13	[d] 122	132	8	--------	222	56
H.	66	4.1	.07	13	6.9	3.7	61	5.5	6.4	Tr.	61	57
H.	18	1.0	.03	1.2	.9	4.6	4.9	3.7	6.0	Tr.	6	58
H.	53	4.0	Tr.	3.1	1.3	Na 6.9 K 1.6	10	2.5	10	Tr.	13	59
H.	66	6.0	.01	5.2	1.7	Na 5.7 K 1.4	13	2.3	10	Tr.	20	60
H.	59	6.3	Tr.	3.6	2.6	Na 5.5 K .8	21	1.8	10	Tr.	20	61

[d] Includes equivalent of small quantity of carbonate (CO_3).
[e] Includes equivalent of 11 parts per million of carbonate (CO_3).

Ground and surface

No.	Description
	CLAY COUNTY—continued
62	Middleburg, about 5 miles northwest of. North Fork of Black Creek at Tutt Bridge, sec. 34, T. 4 S., R. 24 E.; color, 220. Feb. 29, 1924.
63	Starke, 6 miles east of. Lake Kingsley; color, 8. Aug. 12, 1924
64	Wadesboro Spring; Wadesboro Spring, 4 miles south of Orange Park and 300 feet from Atlantic Coast Line tracks; owned by L. Wade, Green Cove Springs. Feb. 16, 1924.
	COLLIER COUNTY
65	Everglades; municipal supply. 6-inch well about 432 feet deep; flows 90 gallons per minute; owned by Baron Collier interests. Jan. 2, 1926.
66	Marco. Drilled well 640 feet deep; owned by J. H. Doxsee & Sons. Nov. 16, 1923
67	Port Dupont. Flowing well 405 feet deep; owned by Baron Collier interests. Jan. 2, 1926
	COLUMBIA COUNTY
	Water from shallow wells in Columbia County will probably be less hard than that from the deep wells; the yield is likely to be much less.
68	Lake City; municipal supply. 10-inch drilled well 400 feet deep. Aug. 29, 1923
69	Lake City. 10-inch drilled well at city waterworks. Dec. 31, 1907
70	Lake City. Magnolia Springs; owned by E. A. McColsky. Aug. 29, 1923
71	Watertown. 6-inch drilled well 300 feet deep; owned by East Coast Lumber Co. Aug. 29, 1923
	DADE COUNTY
72	Hialeah. 6-inch drilled well 60 feet deep; owned by Miami Water Co.; sample taken from well No. 4 after 156 hours' pumping; color, 52. Dec. 24, 1923.
73	Hialeah. 6-inch drilled well 86 feet deep; owned by Miami Studio Corporation. July 13, 1923
74	Homestead; municipal supply. 6-inch drilled well 62 feet deep. July 13, 1923
75	Homestead. 10-inch drilled well 63 feet deep; owned by Florida East Coast Railway Co. Water from this well is carried in tank cars to Key West for use by the railroad. Aug. 14, 1923.
76	Lemon City. Driven well 1¼ inches in diameter and 25 feet deep at 58th St. and 1st Ave. NW.; owned by Thomas F. Lyons. July 13, 1923.
77	Miami. 8-inch drilled well 55 feet deep at 17th Ave. and Flagler St.; owned by Miami Water Co.; used for public supply. July 13, 1923.
78	Miami. 6-inch drilled well 65 feet deep; Club House well; owned by Miami Water Co. and used for public supply; color, 52. Dec. 8, 1923.
79	Miami. 6-inch drilled well 95 feet deep; well No. 2; owned by Miami Water Co.; used for public supply; color, 62. Dec. 8, 1923.
80	Miami. Reservoir, at Royal Palm golf grounds, 1¼ miles from shore; fed by 12 of 18 wells, 40 to 45 feet deep; used for public supply. Jan. 21, 1920.
81	Miami. Wells 73 to 95 feet deep; owned by Miami Water Co.; composite sample from 4 wells. Apr. 20, 1907.
82	Miami. 2-inch drilled well 98 feet deep; owned by H. F. Gilbert, 517 17th Ave. Oct. 2, 1923
83	Miami. 2-inch drilled well 81 feet deep at 1650 South 5th St.; owned by Grarock Water Co. July 13, 1923.
84	Miami. 2-inch drilled well 70 feet deep at 1658 Southwest 3d St.; owned by J. M. Powers. Oct. 2, 1923.
85	Miami (Coconut Grove). 10-inch well 59 feet deep in SE. ¼ sec. 20, T. 54 S., R. 41 E.; after treatment by aeration, the addition of hydrated lime, and sedimentation is used for public supply (No. 86). Sept. 1, 1926.
86	Miami (Coconut Grove); municipal supply. Water from No. 85 after treatment. June 23, 1926
87	Miami Beach; municipal supply. 6-inch drilled well 1,070 feet deep at 51 Miami Beach. July 13, 1923.
	DE SOTO COUNTY
88	Arcadia; municipal supply. 8-inch drilled well 366 feet deep; water level 20 feet above surface; flows 125 gallons a minute. Feb. 21, 1924.
89	Arcadia. 8-inch drilled well 384 feet deep; owned by Southern Utilities Co. Feb. 21, 1924
90	Arcadia. Courthouse well; 3 inches in diameter and 250 feet deep. Feb. 18, 1908
91	Arcadia. 50-foot well of Arcadia Electric Light, Ice & Telephone Co. Feb. 18, 1908
92	Arcadia. Flowing sulphur well 4 inches in diameter and 214 feet deep; owned by J. W. Whidden. Feb. 18, 1908.
	DIXIE COUNTY
	No samples were obtained from Dixie County. The ground water is undoubtedly similar to that in Levy, Lafayette, and Taylor Counties. Wells near the coast may yield salty water.

[a] Calculated. [b] Includes iron precipitated at time of analysis.

waters of Florida—Continued

Analyses (parts per million)												
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	No.
H.	70	4.6	Tr.	3.5	0.8	Na 7.5, K 1.6	11	2.1	11	Tr.	12	62
H.	22	1.0	Tr.	2.2	1.0	3.5	3.7	2.9	8.0	Tr.	9.6	63
H.	110	6.3	Tr.	33	1.7	Na 5.0, K .7	104	3.6	11	Tr.	89	64
H.	579	14	0.26	29	40	Na 124, K 8.0	294	80	133	Tr.	236	65
H.	7,350	44	[b]105	220	266	2,085	131	719	3,764	Tr.	1,641	66
H.	629	16	.17	29	38	Na 146, K 11	296	77	166	Tr.	228	67
H.	248	25	.12	48	20	11	223	16	9.0	Tr.	202	68
D.	256	36	.0	47	18	14	[d]237	10	9.8	.20	191	69
H.	97	3.2	.11	6.0	1.3	18	Tr.	2.9	22	26	20	70
H.	235	21	.12	47	16	10	221	6.8	10	.44	183	71
H.	308	-------	[b]2.3	96	3.5	[a]7.1	264	28	17	Tr.	254	72
H.	329	15	1.0	94	7.0	22	300	4.4	29	Tr.	264	73
H.	208	7.2	Tr.	72	2.8	7.2	218	3.0	11	Tr.	191	74
F.	211	6.5	.12	70	4.0	7.7	222	4.3	12	.91	191	75
H.	227	5.4	Tr.	65	2.4	16	189	15	13	3.5	172	76
H.	461	9.2	Tr.	103	2.8	48	262	16	102	.67	259	77
H.	340	-------	[b].50	98	5.1	[a]5.4	272	28	17	1.6	266	78
H.	318	-------	[b].79	91	6.9	[a]8.2	290	4.5	22	Tr.	256	79
F.	772	12	.64	116	18	[a]141	282	56	269	Tr.	364	80
D.	315	2.8	Tr.	90	7.2	18	285	16	29	.10	254	81
F.	298	6.5	.15	93	4.7	11	272	26	13	Tr.	252	82
H.	286	7.2	Tr.	93	1.1	12	257	19	17	Tr.	237	83
F.	283	7.4	.29	88	4.0	13	251	20	23	Tr.	236	84
H.	253	13	.49	80	2.2	Na 9.4, K 1.8	243	8.4	13	.28	209	85
H.	79	4.2	.15	15	1.9	Na 9.6, K 1.8	[d]48	11	14	Tr.	45	86
H.	3,376	13	Tr.	121	126	895	145	519	1,485	15	819	87
H.	670	27	.10	94	55	Na 18, K 3.7	205	276	30	Tr.	460	88
H.	451	23	.28	86	22	Na 28, K 2.6	259	103	28	.75	305	89
D.	360	-------	.60	52	29	[a]20	[d]295	4	34	-------	249	90
D.	314	25	.56	84	8.0	21	[d]307	3.4	17	.48	243	91
D.	382	-------	.05	47	28	[a]29	[d]264	11	48	-------	232	92

[d] Includes equivalent of small quantity of carbonate (CO_3).

Ground and surface

No	Description
	DUVAL COUNTY
93	Bayard. Flowing well 4½ inches in diameter and 353 feet deep; owned by W. W. Powell. June 16, 1925.
94	Eastport. 8-inch drilled well 1,100 feet deep; owned by Brooks-Scanlon Corporation; water level 6 feet above surface. Dec. 11, 1923.
95	Eastport. 10-inch drilled well 350 feet deep; owned by Brooks-Scanlon Corporation. Dec. 11, 1923.
96	Fort George. 8-inch drilled well 450 feet deep; owned by Rear Admiral Victor Blue; sulphur water, hydrogen sulphide (H_2S), 15 parts per million. May 27, 1924.
97	Jacksonville. McGirts Creek at 104th St.; color, 200. Mar. 7, 1925.
98	Jacksonville, about 15 miles southwest of. Sal Taylor Creek just above junction with Yellow Water Creek, sec. 35, T. 3 S., R. 24 E.; color, 180. Feb. 22, 1924.
99	Jacksonville. City tap water. Aug. 7, 1922. Published in Water-Supply Paper 496, p. 32, No. 36, 1923.
100	Jacksonville. 8-inch drilled well 750 feet deep at Municipal Docks on Talleyrand Avenue; owned by municipality. Aug. 24, 1923.
101	Jacksonville (Brentwood), 8-inch drilled well 750 feet deep near north city limits of Jacksonville; owned by J. E. Lee; leased to city of Jacksonville for public supply. Mar. 10, 1924.
102	Jacksonville. 12-inch drilled well, 1,210 feet deep; owned by Atlantic Ice & Coal Corporation. Aug. 24, 1923.
103	Jacksonville. 4-inch drilled well 86 feet deep; owned by J. C. De Bevoise, route 4, box 700. Nov. 23, 1923.
104	Jacksonville. 11-inch drilled well 1,690 feet deep; cased to about 800 feet; owned by J. I. Daniels, route 4, box 252-B. May 30, 1924.
105	Jacksonville. 4-inch drilled well 500 feet deep; owned by Elixir Water Co.; water level 6 feet above surface. Aug. 24, 1923.
106	Jacksonville. 6-inch drilled well 1,000 feet deep; owned by Good Hope Water Co.; water level 12 feet above surface. Aug. 23, 1923.
107	Jacksonville. Wi-Wachula Spring; owned by Wi-Wachula Water Co. Aug. 24, 1923.
108	Jacksonville. 8-inch drilled well 1,026 feet deep; owned by Jacksonville Terminal Co.; water level 25 feet above surface. Aug. 24, 1923.
109	Jacksonville (St. Nicholas.) St. Nicholas Spring; owned by St. Nicholas Spring Water Co., Jacksonville. Oct. 31, 1923.
110	Mandarin. 2-inch drilled well 193 feet deep; owned by Thomas M. Loucks. June 16, 1925.
111	Mayport. Flowing well 8 inches in diameter and 780 feet deep; owned by Capt. John Daniels. July 28, 1925.
112	Ortega. St. Johns River at foot of River Street on Ortega Boulevard. Color, 128. Jan. 26, 1925.
113	Ortega. 8-inch drilled well 700 feet deep; owned by Florida Country Club; flows 400 gallons a minute. July 30, 1925. Water of practically the same composition was obtained from an 8-inch well 500 feet deep at Ortega; owned by the Ortega Co., and from an 8-inch well 690 feet deep, 1 mile south of Ortega in the Venetia development; owned by the Consolidated Development & Engineering Corporation of Jacksonville.
114	Pablo Beach; public supply. Flowing well 6 inches in diameter and 650 feet deep on sand dunes about 300 feet west of beach; owned by J. G. Christopher, Jacksonville. June 8, 1925.
115	Riverview. Trout Creek at Trout Creek Bridge on Lem Turner Road; color, 152. Feb. 2, 1925.
116	South Jacksonville. 8-inch drilled well 900 feet deep; owned by city and used for public supply. Oct. 22, 1923.
117	South Jacksonville. 4-inch drilled well 500 feet deep; owned by city; water level, 10 feet above surface; flows 300 gallons a minute; used for public supply. Nov. 13, 1923.
118	South Jacksonville. 6-inch drilled well 640 feet deep; owned by city; water level 10 feet above surface; flows 250 gallons a minute; used for public supply. Nov. 13, 1923.
119	South Jacksonville. 8-inch drilled well 780 feet deep; owned by city; water level, 40 feet above surface; flows 1,150 gallons a minute; used for public supply. Nov. 13, 1923.
120	Whitehouse. 2-inch drilled well 200 feet deep; owned by Chas. F. Cox. Oct. 20, 1923.
121	Yukon. Artesian well; supply for Camp Johnston; owned by military department of the State of Florida, St. Augustine. June 8, 1925.
	ESCAMBIA COUNTY
122	Century. 3-inch drilled well 305 feet deep; owned by Alger Sullivan Lumber Co. May 24, 1924.
123	Fort Barrancas; United States Army post. 10-inch drilled well 240 feet deep. Apr. 4, 1924.
124	Molino. 2-inch drilled well 218 feet deep in SE. ¼ SE. ¼ sec. 35, T. 3 N., R. 31 W.; owned by Louisville & Nashville Railroad Co. Apr. 7, 1924.
125	Pensacola; municipal supply. 10-inch drilled well 200 feet deep; well No. 1. Apr. 5, 1924
126	Pensacola; municipal supply. 10-inch drilled well 200 feet deep; well No. 2. Apr. 5, 1924.
127	Pensacola. Composite sample from group of 13 6-inch wells 112 to 150 feet deep. Dec. 16, 1907.
128	Pensacola; naval air station. Well No. 3; 6 inches in diameter, 40 feet deep; one of six wells in series on the same line. May 16, 1924.
129	Pensacola; naval air station. 12-inch drilled well 150 feet deep. May 16, 1924.
130	Pensacola; naval air station supply. Mixture of water from wells 128 and 129, which has been aerated, treated with lime and alum, filtered, and chlorinated. Sample taken from a tap. Apr. 4, 1924.

[a] Calculated.
[b] Includes iron precipitated at time of analysis.
[c] Less than 10 parts per million.

waters of Florida—Continued

Analyses (parts per million)												
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	No.
H.	478	28	0.19	------	------	------	172	187	15	------	[g] 336	93
F.	323	29	.16	54	26	13	188	81	17	Tr.	242	94
F.	249	29	.17	35	18	24	176	41	17	0.38	161	95
H.	445	38	[b] .35	62	24	37	212	98	48	Tr.	253	96
F.	343	6.0	.21	12	12	83	22	24	151	.61	79	97
H.	71	7.6	.01	5.2	2.6	Na 7.9, K 3.4	21	2.1	12	Tr.	24	98
F.	420	24	.15	76	28	Na 12, K 2.1	163	165	15	.42	305	99
F.	410	25	1.2	70	28	11	166	149	16	Tr.	290	100
H.	410	19	.17	74	27	14	168	156	15	Tr.	296	101
F.	399	22	.15	66	29	10	152	155	13	Tr.	284	102
F.	394	26	.08	63	32	14	166	151	11	Tr.	289	103
H.	200	18	.04	35	14	12	133	51	8.0	Tr.	145	104
F.	114	13	.08	20	11	4.4	[d] 94	16	4.9	Tr.	95	105
F.	387	27	.14	68	26	12	167	136	15	Tr.	277	106
F.	46	3.9	.21	3.0	2.2	6.1	8.1	5.6	5.6	14	17	107
F.	436	24	.08	76	32	9.9	155	184	13	Tr.	321	108
F.	86	12	[b] 1.4	12	3.5	11	39	8.6	16	1.5	44	109
H.	272	20	.22	------	------	------	162	63	11	------	[g] 202	110
H.	352	31	.05	56	26	17	183	93	20	Tr.	247	111
H.	448	8.0	[b] .45	28	16	103	48	43	193	Tr.	136	112
H.	292	22	[b] .28	44	24	13	149	86	14	.52	208	113
H.	469	28	.36	------	------	------	139	202	14	------	[g] 336	114
H.	732	8.0	[b] .34	20	29	193	22	58	360	Tr.	169	115
F.	------	------	------	73	34	(c)	151	176	9.6	.50	322	116
F.	------	------	------	71	33	[e] 7.1	151	180	12	.33	313	117
F.	------	------	------	69	45	(c)	157	202	13	.38	357	118
F.	------	------	------	70	33	[e] 9.0	155	180	11	Tr.	310	119
F.	319	33	.16	83	14	11	325	3.0	10	Tr.	265	120
H.	271	26	.17	------	------	------	142	76	12	------	[g] 202	121
H.	111	14	[b] 1.2	16	3.1	19	94	8.5	2.7	Tr.	53	122
H.	57	12	[b] 2.2	4.6	.8	8.7	21	3.1	10	Tr.	15	123
H.	131	34	1.0	20	3.1	13	95	9.0	3.5	Tr.	63	124
F.	41	9.4	.06	1.1	2.3	Na 5.3, K .6	2.9	4.1	7.8	7.2	12	125
F.	------	------	------	------	------	[e] 6.6	3.7	[f] 2	7.2	7.2	[g] 4.8	126
D.	22	8.8	Tr.	.7	.4	3.1	3.7	2.0	4.8	.2	3.4	127
H.	68	5.8	[b] .28	9.2	2.6	12	27	10	19	Tr.	34	128
H.	89	16	[b] .87	10	2.3	8.2	37	2.2	17	Tr.	34	129
H.	80	6.8	[b] .94	12	1.0	[e] 12	37	12	13	Tr.	34	130

[d] Includes equivalent of small quantity of carbonate (CO_3).
[f] By turbidity.
[g] Determined.

Ground and surface

No.	Description
	FLAGLER COUNTY
	The analysis given below is typical of water that may be found at various depths in Flagler County. Ground waters obtained here are similar to those in St. Johns and Volusia Counties.
131	Bunnell; municipal supply. 3-inch drilled well 123 feet deep. Aug. 5, 1924
	FRANKLIN COUNTY
132	Apalachicola; municipal supply. 6-inch drilled well 360 feet deep. Feb. 13, 1924
133	Apalachicola. 6-inch drilled well 77 feet deep; owned by E. S. Wefing. Feb. 13, 1924
134	Carrabelle. 10-inch drilled well 1,050 feet deep; owned by Carrabelle Ice Co.; used for public supply. Feb. 12, 1924.
135	Carrabelle. 6-inch drilled well 360 feet deep, at ice plant of Gulf Trading Co. Dec. 19, 1907
	GADSDEN COUNTY
136	Chattahoochee. Spring in NW.¼ sec. 33, T. 4 N., R. 6 W.; owned by Florida State Insane Hospital; flows 20,000 gallons a day. Apr. 1, 1924.
137	Chattahoochee. Apalachicola River 1 mile south of junction of Chattahoochee and Flint Rivers, 50 feet north of Liberty Bridge across river from Chattahoochee; river exceptionally clear at time sample was collected; color, 22. Oct. 29, 1924.
138	Quincy; municipal supply. 6-inch drilled well 865 feet deep. Apr. 1, 1924
139	Quincy. City waterworks well. Nov. 21, 1907
140	Quincy. 8-inch drilled well 84 feet deep; owned by Max Medels. Nov. 21, 1907
141	River Junction. 4-inch drilled well 250 feet deep; owned by W. L. Shepard. Apr. 1, 1924
	GILCHRIST COUNTY
	No samples were obtained from Gilchrist County. The ground water is undoubtedly similar to that in Alachua County.
	GLADES COUNTY
	No samples of ground water from Glades County were analyzed. Shallow wells are likely to yield highly colored soft water. Deep wells should furnish large quantities of hard water, which may be highly mineralized like that from the deep well at Okeechobee (No. 269).
142	Moore Haven. Moore Haven Canal; used after treatment for public water supply. Sept. 4, 1923. The color of a sample collected Feb. 28, 1925, was 80.
143	Moore Haven; municipal supply. Filtered water from Moore Haven Canal. Sept. 4, 1923. The color of a sample collected Feb. 28, 1925, was 24.
	GULF COUNTY
	No samples were obtained from Gulf County. The ground water is probably like that in Calhoun County. Wells near the coast may yield salty water.
	HAMILTON COUNTY
144	Jasper; municipal supply. 5-inch drilled well 550 feet deep. Aug. 14, 1924
145	Jasper. A typical driven well 3 inches in diameter and 33 feet deep. Aug. 14, 1924
146	Jennings; municipal supply. 10-inch drilled well 369 feet deep. Oct. 21, 1924
147	White Springs. 2½-inch drilled well 110 feet deep; owned by W. Cates. Apr. 9, 1924
148	White Springs. White Springs; owned by Mrs. Amy Matthews. Discharge Feb. 13, 1907, 72 second-feet (Water-Supply Paper 242, p. 136). Sept. 3, 1923.
	HARDEE COUNTY
	Most shallow wells in Hardee County will yield hard water similar to that from deep wells that are represented by analyses. At some places soft water may be obtained from shallow wells.
149	Bowling Green; municipal supply. 8-inch drilled well 380 feet deep. Oct. 26, 1923
150	Wauchula; municipal supply. 8-inch drilled well 732 feet deep. Oct. 26, 1923
151	Zolfo. Aquavita Springs; owned by Aquavita Springs Co. Feb. 21, 1924
	HENDRY COUNTY
	The analyses below are typical of the deeper waters of Hendry County. Shallow wells and surface sources are likely to furnish colored water that is not so hard as these.
152	La Belle. 3-inch drilled well 740 feet deep; owned by J. N. Blont; water level 20 feet above surface. Feb. 20, 1924.
153	La Belle. 6-inch drilled well 582 feet deep; owned by E. E. Goodno; water level 8 feet above surface; flows 700 gallons a minute. Feb. 20, 1924.

[a] Calculated. [b] Includes iron precipitated at time of analysis.

waters of Florida—Continued

Analyses (parts per million)												
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	No.
H.	1,610	18	0.08	150	66	315	287	62	735	Tr.	646	131
F.	680	24	.14	75	67	Na 54 K 8.0	358	154	93	1.3	462	132
F.	249	11	3.1	48	5.7	Na 29 K 2.3	133	2.9	66	Tr.	143	133
F.	453	15	.08	101	18	Na 22 K 3.8	247	93	53	Tr.	326	134
D.	516	-------	-------	106	14	[a]43	[d]279	105	55	--------	322	135
H.	34	4.0	.07	4.2	1.3	1.5	2.4	1.7	3.8	14	16	136
H.	66	10	[b].50	13	1.5	6.3	46	4.5	4.0	.67	39	137
H.	444	23	.35	32	20	93	156	52	145	Tr.	162	138
D.	480	21	.06	33	18	113	[d]160	56	158	.10	156	139
D.	59	6.4	.13	4.1	1.9	7.9	11	.3	7.3	22	18	140
H.	265	13	.12	54	27	5.5	288	6.5	9.0	Tr.	246	141
H.	320	11	[b].27	41	11	[a]46	182	13	60	Tr.	148	142
H.	319	7.0	[b].42	41	12	45	148	37	56	Tr.	152	143
H.	465	25	.23	84	24	29	250	146	10	Tr.	308	144
H.	170	14	.12	31	9.7	10	154	2.3	16	Tr.	117	145
H.	173	25	.05	36	10	3.9	138	18	2.0	Tr.	131	146
H.	228	29	Tr.	47	14	12	228	8.2	8.0	Tr.	175	147
F.	203	17	.21	43	13	5.6	171	19	7.7	Tr.	161	148
F.	242	29	.08	39	19	20	204	29	14	Tr.	175	149
F.	382	17	.16	63	30	7.9	156	147	10	.60	280	150
H.	445	22	.09	69	32	Na 16 K 2.6	177	153	17	Tr.	304	151
H.	2,868	22	0.10	64	69	Na 799 K 12	131	650	1,020	Tr.	443	152
H.	1,274	12	.08	59	46	Na 310 K 3.2	120	291	440	Tr.	336	153

[d] Includes equivalent of small quantity of carbonate (CO_3).

Ground and surface

No.	Description
	HERNANDO COUNTY
	In Hernando County shallow wells in sand yield soft water, which is liable to pollution. The deeper wells are represented by No. 154.
154	Brooksville; municipal supply. 10-inch drilled well 205 feet deep. Oct. 5, 1923
155	Brooksville (near), Weekewachee Spring, in sec. 2, T. 23 S., R. 17 E.; owned by M. M. Metcalf Co., Oberlin, Ohio; estimated discharge 220 second-feet. Oct. 4, 1923.
	HIGHLANDS COUNTY
156	Avon Park; public supply. 8-inch drilled well, 1,040 feet deep; owned by Florida Ice & Power Co. Oct. 26, 1923.
157	Seabring; municipal supply. 13-inch drilled well 150 feet deep. Feb. 13, 1924
	HILLSBOROUGH COUNTY
158	Coronet. 12-inch drilled well 800 feet deep; owned by Coronet Phosphate Co. Feb. 14, 1924
159	Lithia. Spring owned by South Tampa Land Co.; yield 25,000 to 30,000 gallons a minute. July 19, 1923.
160	Plant City; part of municipal supply. 8-inch drilled well 360 feet deep. Feb. 14, 1924
161	Plant City; part of municipal supply. 12-inch drilled well 630 feet deep. Aug. 23, 1923
162	Plant City. 5-inch drilled well 584 feet deep; owned by Warnell Lumber Co. Feb. 14, 1924
163	Port Tampa; municipal supply. 5-inch drilled well 20 feet deep. Jan. 6, 1925
164	Sulphur Springs. Spring owned by Josiah Richardson; yield 5 gallons a minute. Oct. 9, 1923
165	Tampa, 6 miles northeast of. Hillsboro River directly above Tampa Electric Co.'s dam. Color, 110. July 20, 1923.
166	Tampa; municipal supply in 1927. Hillsboro River, raw water at filtration plant; color, 20. Suspended matter 0.5. June 29, 1927.
167	Tampa; municipal supply in 1927. Filtered water from main at Tampa waterworks; color, 6. June 29, 1927.
168	Tampa; municipal supply in 1922. Composite of samples from Magbee Spring, 16-inch conduit, 20-inch conduit, substation No. 2, substation No. 3, substation No. 4, and fire plug at Seventh and Twenty-second Streets. Each source was represented by a quantity of water that would make the composite represent the average composition of water supplied to the city at the date of collection. Sept. 25, 1922.
169	Tampa. Composite sample from 9 wells used for municipal supply in 1908. Feb. 21, 1908
170	Tampa. 10-inch drilled well 118 feet deep; owned by Tampa Electric Co. Aug. 26, 1923
171	Tampa; 4 miles from city, on highway to Palm River. DeShong Spring; owned by Joseph Hendry. Nov. 16, 1923.
172	Tampa. Palma Ceia Springs; owned by Thomas Palmer. Aug. 26, 1923
173	Tampa; north of city on Hillsboro River. Purity Springs; owned by Harry G. Warner; yield 500 gallons a minute. July 20, 1923.
174	Tampa; north of city on Hillsboro River. Sulphur Springs; owned by J. S. Richardson; discharge 35 second-feet Feb. 24, 1917 (Water-Supply Paper 452, p. 61). July, 1923.
175	Tampa, Seminole Heights, privately owned water system for suburb. 6-inch drilled well 300 feet deep; owned by H. A. DeLoach. Oct. 10, 1923.
176	Turkey Creek. Turkey Creek. About 1907
177	West Tampa; municipal supply. Drilled wells 400 feet deep. Feb. 21, 1908.
178	Ybor City. Drilled well 1½ inches in diameter and 50 feet deep; owned by Reed & Dorchester. Feb. 8, 1908.
	HOLMES COUNTY
•	In Holmes County shallow wells in sand yield soft water, which is liable to pollution. The deeper waters are likely to be harder than No. 179.
179	Bonifay; municipal supply. 8-inch drilled well 450 feet deep. Apr. 2, 1924
179a	Ponce De Leon. Ponce De Leon Springs. Feb. 21, 1927
	INDIAN RIVER COUNTY
180	Vero Beach. 8-inch drilled well 661 feet deep; owned by municipality; flows 1,500 gallons a minute; used for public supply after softening (No. 181). July 10, 1923.
181	Vero Beach; municipal supply. Water from No. 180 after treatment with lime and soda ash. Oct. 31, 1923.
	JACKSON COUNTY
182	Cottondale. 2-inch drilled well 118 feet deep; owned by J. R. Showmaker. Dec. 2, 1907
183	Grand Ridge. 4-inch drilled well 256 feet deep at Cohasset Sugar Plantation. Dec. 13, 1907
184	Marianna; municipal supply. 10-inch drilled well 255 feet deep. July 18, 1923
185	Marianna, 6 miles east of. Spring in NE. ¼ SW. ¼ sec. 33, T. 5 N., R. 9 W.; owned by Milton Land Co. Apr. 2, 1924.
186	Marianna. 6-inch drilled well 276 feet deep at State Reform School. Nov. 27, 1907
187	Sneads. Public well 4 inches in diameter and 200 feet deep. Nov. 26, 1907

[a] Calculated.
[b] Includes iron precipitated at time of analysis.

waters of Florida—Continued

Analyses (parts per million)												
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	No.
F.	254	29	0.12	72	7.7	9.3	251	4.7	11	1.0	212	154
F.	173	14	.14	49	7.8	3.7	178	7.5	4.7	Tr.	154	155
F.	152	28	[b]1.4	29	15	4.7	155	3.4	4.6	.75	134	156
} F.	32	7.1	.04	.5	1.8	Na 4.1, K .7	2.4	2.7	6.0	7.5	8.6	157
F.	227	-------	-------	50	18	[a]3.6	221	11	10	-------	199	158
F.	331	19	.15	65	14	14	135	93	23	.76	220	159
F.	208	-------	-------	44	15	[a]4.1	195	6.9	8.8	-------	172	160
H.	258	28	.09	60	11	16	253	1.7	14	Tr.	195	161
F.	224	-------	-------	47	22	[a]2.2	233	5.8	11	-------	208	162
F.	1,323	25	[b].38	221	26	223	322	7.1	611	1.6	659	163
F.	8,454	14	.29	391	254	2,386	162	820	4,405	Tr.	2,019	164
F.	87	3.3	.14	16	2.2	4.0	44	4.9	3.0	Tr.	49	165
} F.	186	11	.10	48	5.8	Na 5.6, K .8	140	25	10	.10	144	166
} F.	149	7.3	.03	32	5.5	Na 7.3, K 1.0	70	45	10	.10	103	167
F.	1,273	22	.48	113	33	[a]275	176	92	548	2.8	418	168
D.	645	15	.06	76	12	126	140	40	253	.85	239	169
F.	1,313	14	.26	132	33	292	200	95	588	Tr.	465	170
H.	5,902	22	Tr.	236	164	1,671	215	513	2,973	Tr.	1,262	171
F.	692	17	.19	109	15	100	249	29	231	.58	334	172
F.	157	8.9	.07	45	3.4	6.0	142	3.6	11	.26	126	173
F.	619	15	.21	63	15	110	103	77	209	Tr.	219	174
F.	161	15	.09	36	4.1	8.6	88	18	13	18	107	175
------	33	6.9	[b]2.1	3.4	.6	4.0	3.0	8.2	6.1	-------	11	176
D.	650	21	1.9	94	12	110	195	45	226	.15	284	177
D.	208	-------	.4	35	5	[a]1.8	55	32	24	-------	108	178
H.	140	15	.08	42	5.6	1.7	[d]151	3.6	7.0	Tr.	128	179
F.	113	8.8	.27	30	9.2	Na 1.9, K .4	123	3.8	2.6	.25	113	179a
R.	1,120	22	.20	87	57	215	174	128	453	2.7	451	180
F.	966	15	.09	30	55	233	[d]78	125	440	1.2	300	181
D.	170	-------	.0	49	Tr.	[a]7.8	[d]165	-------	3	-------	123	182
D.	138	-------	Tr.	27	13	[a]3	[d]151	Tr.	2	-------	121	183
F.	238	14	.12	56	11	15	211	6.2	23	3.8	185	184
H.	125	12	.09	43	1.0	2.3	126	2.4	2.0	1.6	112	185
D.	125	17	.07	34	4.9	4.9	[d]138	3.3	2.5	.12	105	186
D.	126	-------	1.0	25	13	[a]3	[d]140	5	3	-------	116	187

[d] Includes equivalent of small quantity of carbonate (CO_3).
[b] Includes iron and aluminum oxides ($Fe_2O_3 + Al_2O_3$).

Ground and surface

No.	Description
	JEFFERSON COUNTY
188	Monticello; municipal supply. 8-inch drilled well 500 feet deep. Mar. 1, 1924
189	Monticello, 3 miles east of. Dug well 4 feet in diameter and 30 feet deep; owned by W. W. Bassett. A typical shallow well for Jefferson County. Mar. 1, 1924.
	LAFAYETTE COUNTY
	In Lafayette County shallow wells in sand yield soft water; deeper wells are like No. 190. They may yield sulphur water.
190	Alton. 8-inch drilled well 300 feet deep; owned by Standard Lumber Co.; water used at mill and piped to all homes. Nov. 22, 1923.
	LAKE COUNTY
191	Astor. St. Johns River 4 miles south of Lake George; color, 163. Oct. 25, 1924
192	Clermont; municipal supply. 4-inch drilled well 200 feet deep. Aug. 8, 1924
193	Clermont. Crystal Lake; sample collected near the old pump house. Color, 11. Sept. 6, 1924
194	Eustis; public supply. Composite sample from two drilled wells 4 inches in diameter and 125 feet deep; owned by Florida Public Service Co. Aug. 8, 1924.
195	Eustis. Driven well 1¼ inches in diameter and 25 feet deep; owned by Stephen White. Aug. 8, 1924.
196	Leesburg; municipal supply. Composite sample from 3 drilled wells about 150 feet deep; the diameter of one well is 4 inches and that of the other two is 6 inches. Oct. 30, 1924.
197	Leesburg. Lake Griffin; sample collected at end of Atlantic Coast Line pier; color, 21. Aug. 8, 1924.
198	Leesburg. Lake Harris; sample collected 200 feet from shore, near foot of Canal Street; color, 15. Aug. 8, 1924.
199	Mount Dora; municipal supply. 5-inch drilled well 167 feet deep. Aug. 8, 1924
200	Tavares; municipal supply. 8-inch drilled well 240 feet deep. Dec. 21, 1924
201	Umatilla; municipal supply. 3-inch drilled well 250 feet deep. Aug. 8, 1924
	LEE COUNTY
202	Fort Myers; municipal supply. 8-inch drilled well 950 feet deep; flows 250 gallons a minute. Sept. 5, 1923.
203	Fort Myers. 8-inch drilled well 495 feet deep; owned by municipality; used for fire service; water level 47 feet above surface; flows 900 gallons a minute. Sept. 5, 1923.
204	Fort Myers. 2-inch drilled well 90 feet deep; owned by municipality; a typical shallow well for the locality. Sept. 5, 1923.
205	Fort Myers. Composite sample from two flowing wells 570 and 587 feet deep; used for municipal supply at time of collection. Feb. 15, 1908.
206	Fort Myers. 4-inch drilled well 200 feet deep; owned by Bradford Hotel; water level 1 foot above surface. Sept. 5, 1923.
207	Fort Myers. Drilled well 1½ inches in diameter and 102 feet deep; owned by Gay Laundry. Sept. 5, 1923.
208	Fort Myers. 6-inch drilled well 1,050 feet deep; owned by Southern Utilities Co.; flows 300 gallons a minute. Sept. 5, 1923.
	LEON COUNTY
209	Lake Jackson. Lake Jackson at bridge on Meridian Road. Feb. 28, 1924
210	Tallahassee; municipal supply. Composite sample from 12-inch drilled wells 250 and 700 feet deep. A sample collected in 1908 from "city well" had almost exactly the same composition. Feb. 27, 1924.
211	Tallahassee. 8-inch drilled well 375 feet deep; owned by Middle Florida Ice Co. May 26, 1908
	LEVY COUNTY
212	Cedar Keys. Driven well 1¼ inches in diameter and 20 feet deep; owned by Levy County. This water is used by school children from Cedar Keys, Sumner, and outlying districts. Nov. 7, 1923.
213	Cedar Keys, near. Spring in NW. ¼ sec. 3, T. 15 S., R. 13 E.; owned by W. H. Hale. July 27, 1923.
214	Cedar Keys, near. Spring in NE. ¼ sec. 10, T. 15 S., R. 13 E.; owned by W. H. Hale. Nov. 12, 1923.
215	Cedar Keys, near. Spring in NE. ¼ sec. 10, T. 15 S., R. 13 E.; owned by J. B. Lutterloh. July 27, 1923.
216	Cedar Keys. 2½-inch driven well 35 feet deep; owned by G. T. Lewis. Nov. 7, 1923
217	Cedar Keys. Dug well 6 feet in diameter and 25 feet deep 350 feet from the beach; owned by Mr. Toler. Water is served through pipes to about 20 families. April 24, 1920.
218	Cedar Keys. Dug well 6 feet in diameter and 8 feet deep on narrow point of land about 150 feet from tide either north or south. Well easily pumped dry; water used at a small factory making fiber product from palmetto leaves. April 24, 1920.

[a] Calculated.

waters of Florida—Continued

Analyst	Analyses (parts per million): Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	No.
H.	164	13	0.04	46	7.3	Na 3.4, K .4	167	4.7	6.0	Tr.	145	188
H.	39	2.1	.18	1.8	.6	Na 9.4, K .8	18	1.3	4.7	7.1	7.0	189
H.	260	12	[b]1.1	68	15	7.8	287	3.8	6.2	2.0	232	190
H.	238	3.6	[b].12	16	6.8	51	29	19	98	Tr.	68	191
H.	251	20	1.0	68	6.3	9.9	239	3.7	12	Tr.	196	192
H.	33	1.1	[b].12	1.3	1.3	6.9	6.1	4.2	10	Tr.	8.6	193
H.	108	14	.04	23	4.8	8.2	96	1.7	8.0	Tr.	77	194
H.	68	1.7	.16	4.0	2.3	22	18	3.7	18	34	19	195
H.	174	18	.05	43	6.4	6.5	144	4.1	15	2.1	134	196
H.	102	5.6	[b].12	14	4.4	7.3	59	2.5	14	1.1	53	197
H.	83	8.4	[b].15	11	2.9	7.6	41	3.3	12	1.0	39	198
H.	176	15	.08	36	4.4	33	170	7.9	15	Tr.	108	199
H.	152	12	[b].37	34	11	7.8	151	8.3	10	Tr.	130	200
H.	247	14	.12	63	10	15	254	8.4	12	Tr.	198	201
F.	1,740	14	.14	109	93	371	156	326	718	Tr.	654	202
F.	1,936	14	.27	128	103	414	163	331	832	Tr.	742	203
F.	357	24	.10	79	14	28	295	9.2	44	.35	255	204
D.	2,007	17	.18	234	26	419	168	316	833	Tr.	692	205
F.	460	15	.06	46	35	75	238	25	143	Tr.	258	206
F.	410	23	.10	68	26	44	298	10	84	Tr.	277	207
F.	1,895	12	[b]3.5	130	101	394	165	343	786	Tr.	739	208
H.	17	.8	.07	1.6	.9	2.7	3.7	1.9	5.0	1.0	8	209
H.	155	11	Tr.	36	9.8	[a]2.4	144	4.9	8.0	1.2	130	210
D.	200	18	.09	48	10	8.5	174	2.5	20	9.6	161	211
F.	358	12	.18	83	10	31	277	14	47	Tr.	248	212
F.	255	6.0	[b]3.7	80	5.2	8.6	258	2.2	16	1.1	221	213
F.	--------	-------	2.3	92	14	[a]19	276	6.1	68	.46	287	214
F.	495	7.0	[b]2.5	91	14	71	274	15	137	.62	285	215
F.	506	7.6	.08	56	14	102	174	43	143	30	197	216
F.	310	12	.11	52	7.9	44	141	35	55	7.5	162	217
F.	609	16	.46	55	9.8	133	159	56	205	8.0	178	218

[b] Includes iron precipitated at time of analysis.

95221°—28——15

No.	Description
	LEVY COUNTY—continued
219	Otter Creek. 2½-inch drilled well 70 feet deep; owned by Cummer Cypress Co.; supply for basket mill and for domestic use of employees. Nov. 7, 1923.
220	Sumner. 1¼-inch driven well 30 feet deep; owned by Cummer Cypress Co.; water used by primary-school children at Sumner. Nov. 7, 1923.
221	Sumner. 6-inch drilled well 96 feet deep; owned by Cummer Cypress Co.; used for supply of mill and mill town. Nov. 6, 1923.
222	Williston; municipal supply. 9-inch drilled well 125 feet deep. Aug. 11, 1924
	LIBERTY COUNTY
223	Bristol; public supply. Driven well 1¼ inches in diameter and 33 feet deep; owned by municipality. May 29, 1924.
224	Bristol. Driven well 1¼ inches in diameter and 35 feet deep; owned by Mrs. S. G. Smith; supplies the Florida Hotel and several stores. April 15, 1924.
225	Hosford. 4-inch drilled well 492 feet deep; owned by Graver Bros. April 15, 1924
	MADISON COUNTY
226	Ellaville. 2-inch drilled well 72 feet deep in front of Seaboard Air Line station; owned by H. C. Noegel. Feb. 26, 1924.
227	Greenville. 6-foot dug well 30 feet deep; owned by town. Nov. 21, 1923
228	Madison; municipal supply. 8-inch drilled well 400 feet deep. Nov. 21, 1923
229	Madison. 4-inch drilled well 240 feet deep; owned by municipality. April 11, 1908
	MANATEE COUNTY
	Samples from 14 wells in Bradentown, from 45 to 250 feet deep, were of about the same composition as Nos. 232 and 235.
230	Bradentown; municipal supply. 4-inch drilled wells 85 feet deep; composite sample from four wells. Aug. 29, 1923.
231	Bradentown. 6-inch wells 410 and 427 feet deep; composite sample from two wells of the city waterworks. Feb. 27, 1908.
232	Bradentown. 2-inch drilled well 75 feet deep; owned by R. M. Beall. Aug. 29, 1923
233	Bradentown. 3-inch drilled well 64 feet deep; owned by William Kellar. Aug. 29, 1923
234	Bradentown. 2-inch drilled well 88 feet deep; owned by C. A. Morrow. Sept. 13, 1923
235	Bradentown. Drilled well 1½ inches in diameter and 64 feet deep; owned by A. Perrie. Aug. 29, 1923.
236	Bradentown. Dug well 25 feet deep; owned by Louise Richason. Oct. 29, 1923
237	Bradentown. Flowing well 3 inches in diameter and 400 feet deep; owned by H. L. Wadham. Sept. 13, 1923.
238	Bradentown. Tiger Lake. Color, 44. Oct. 18, 1923
239	Bradentown, 2 miles west of. 4-inch drilled well 550 feet deep; owned by V. I. Allen. Aug. 29, 1923.
240	Bradentown, 2 miles west of. Spring owned by W. R. Brack. Aug. 29, 1923
241	Manatee; municipal supply. Flowing well 8 inches in diameter and 650 feet deep. Sept. 13, 1923.
242	Manatee. Spring; owned by S. C. Gates. Sept. 13, 1923
243	Palmetto; municipal supply. 8-inch drilled well 620 feet deep. Nov. 5, 1923
244	Parish. 6-inch drilled well 522 feet deep; owned by J. Parish. March, 1908
	MARION COUNTY
244a	Dunnellon, 2 miles northeast of. Blue Springs at Juliette, owned by Strohmeyer Realty Co., Sarasota. Mar. 4, 1927.
245	Ocala; municipal supply. 8-inch drilled well 350 feet deep. Aug. 13, 1923
246	Ocala; municipal supply. 12-inch drilled well 380 feet deep. Aug. 13, 1923
247	Ocala; municipal supply. 8-inch drilled well 1,220 feet deep. Aug. 13, 1923
248	Ocala. 8-inch drilled well 1,250 feet deep; owned by Ocala Water Co. Dec. 16, 1907
249	Ocala. Silver Springs; sample collected from a point directly over the largest "boil"; discharge 545 second-feet on May 26, 1906 (Water-Supply Paper 204, p. 50). Aug. 14, 1923.
250	Ocala. Silver Springs. Dec. 16, 1907
251	Norwalk, 3 miles west of. Salt Springs. Apr. 24, 1924
252	Norwalk, 3 miles west of. Salt Springs; sample from boiling spring. Aug. 19, 1924
253	Norwalk, 3 miles west of. Salt Springs; sample from stream carrying total discharge from the many small springs; yield estimated at 187 second-feet (Water-Supply Paper 319, p. 369). Aug. 19, 1924.
	MARTIN COUNTY
254	Jensen. Indian River about 500 feet east of west shore line off Jensen bridge. Color, 60. Nov. 11, 1924.
255	Olympia; public supply. Composite sample from group of sixteen 2-inch driven wells 33 feet deep; owned by the Olympia Corporation. Nov. 2, 1923.
256	Stuart. 4-inch drilled well 60 feet deep; owned by Southern Utilities Co. July 11, 1923

[a] Calculated.
[b] Includes iron precipitated at time of analysis.
[c] Less than 10 parts per million.

waters of Florida—Continued

Analyses (parts per million).												No.
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	
F.	326	12	[b]7.1	105	4.3	8.0	317	3.2	17	0.67	280	219
F.	-------	-------	-------	73	6.5	([c])	229	6.3	11	Tr.	209	220
F.	249	6.7	[b]3.5	77	5.6	9.1	259	4.5	6.6	.44	215	221
H.	324	5.3	.10	98	4.4	9.0	268	3.7	44	3.8	263	222
H.	151	3.3	.10	5.6	4.6	17	2.4	1.6	6.0	66	33	223
H.	174	24	.10	7.6	7.4	[e]23	1.2	2.0	26	74	49	224
H.	221	23	.19	41	11	24	227	15	3.9	Tr.	148	225
} H.	246	8.0	2.0	60	18	{Na 5.1, K .6}	} 250	19	7.0	Tr.	224	226
H.	185	6.0	.10	16	5.2	29	26	21	46	27	61	227
H.	167	14	[b].24	45	9.7	3.6	173	3.7	5.0	Tr.	152	228
D.	163	15	.03	44	8.7	4.6	[d]178	2.8	4.9	.50	146	229
H.	1,762	24	.15	280	96	102	161	782	244	Tr.	1,094	230
D.	1,163	30	Tr.	260	30	37	172	594	49	Tr.	773	231
H.	338	43	.11	57	18	21	231	19	41	Tr.	216	232
H.	243	9.6	.08	57	12	13	223	9.1	14	Tr.	192	233
H.	472	42	-------	75	20	[e]62	322	21	84	Tr.	270	234
H.	425	32	.26	88	19	30	334	14	50	Tr.	298	235
H.	-------	-------	[b]1.2	-------	-------	-------	24	[f]10	26	-------	[g]41	236
H.	1,270	27	Tr.	205	81	25	163	669	52	Tr.	845	237
H.	37	2.1	.02	3.0	1.2	6.3	3.5	4.0	7.7	Tr.	12	238
H.	1,273	10	[b]8.0	189	75	54	102	644	107	Tr.	780	239
H.	71	3.2	.04	3.4	1.9	15	2.4	4.1	25	Tr.	16	240
H.	1,173	22	Tr.	193	64	33	161	616	38	Tr.	745	241
H.	1,020	28	[b].67	177	60	24	185	519	30	Tr.	688	242
H.	1,282	-------	.17	214	85	[e]21	166	691	53	Tr.	884	243
D.	494	-------	Tr.	86	37	-------	195	208	19	-------	167	244
} F.	83	9.4	.15	21	5.1	{Na 1.4, K .5}	} 72	16	3.0	.34	73	244a
F.	540	27	2.3	116	28	11	215	213	17	0.70	405	245
F.	652	27	.15	150	29	14	259	270	19	Tr.	494	246
F.	485	63	.48	89	21	17	[d]170	174	14	.64	309	247
D.	659	21	.02	151	25	18	[d]256	266	18	.22	480	248
F.	284	32	.06	70	11	4.4	205	43	7.6	.86	220	249
D	274	13	Tr.	73	9.2	9.8	219	44	7.7	.20	220	250
H.	5,377	8.4	.36	254	181	1,418	85	580	2,662	Tr.	1,377	251
H	4,800	-------	-------	213	134	[e]1,238	90	501	2,254	-------	1,082	252
H.	5,210	-------	-------	218	138	[e]1,362	84	542	2,439	-------	1,111	253
H.	11,432	2.4	.30	166	412	[e]3,548	93	394	6,249	Tr.	2,104	254
F.	77	5.7	.27	16	2.3	8.0	50	6.2	15	.30	49	255
H.	221	13	6.6	64	.7	9.4	199	2.6	13	Tr.	163	256

[d] Includes equivalent of small quantity of carbonate (CO_3).
[f] By turbidity.
[g] Determined.

No.	Description
	MONROE COUNTY
257	Big Pine. Dug well 8 feet deep; owned by Florida East Coast Ry. Co. Mar. 16, 1908
258	Key West. Well at Columbia Steam Laundry. June 7, 1913
259	Key West. Deep well at waterworks. (See No. 75.) June 7, 1913
	NASSAU COUNTY
260	Callahan. 1¼-inch well driven for 40 feet and drilled in rock 5 feet; owned by A. E. Braddock. May 27, 1924.
261	Callahan. Town well; 3-inch drilled well 400 feet deep. Dec. 26, 1907
262	Fernandina; municipal supply. 8-inch drilled well 1,101 feet deep; used for part of public supply; flows 250 gallons a minute. Jan. 8, 1924.
263	Fernandina; municipal supply. 6-inch drilled well 731 feet deep; used for part of public supply; flows 175 gallons a minute. Jan. 8, 1924.
264	Fernandina. Old well at city waterworks; 3-inch drilled well 110 feet deep. Nov. 4, 1907
265	Verdie. Su-No-Wa Spring, in SE. ¼ SE. ¼ sec. 3, T. 1 S., R. 24 E.; owned by M. McFadden. Jan. 12, 1924.
	OKALOOSA COUNTY
266	Camp Walton. Driven well 1¼ inches in diameter and 33 feet deep; owned by Theodore Staff; supply for Gulf View Hotel. Apr. 8, 1924.
267	Crestview. 4-inch drilled well 94 feet deep; owned by Okaloosa County; supplies the courthouse. Apr. 8, 1924.
268	Laurel Hill. Dug well 57 feet deep; used in 1907 by a hotel; a typical well for the region. Dec. 20, 1907.
	OKEECHOBEE COUNTY
269	Okeechobee; municipal supply. Flowing 6-inch drilled well 660 feet deep. Oct. 31, 1923
270	Okeechobee. Driven well 1½ inches in diameter and 15 feet deep; owned by Okeechobee Telephone Co. Oct. 31, 1923.
271	Kissimmee River at mouth. Color, 87. July 9, 1913
	ORANGE COUNTY
272	Apopka; public supply. 8-inch drilled well 400 feet deep; owned by Apopka Water & Light Co. Sept. 9, 1923.
273	Oakland. Lake Apopka, at foot of main road. Color, 15. Aug. 8, 1924
274	Orlando. Lake Ivanhoe; source of water that is treated for public supply. Nov. 12, 1923
275	Orlando; municipal supply. Water from Lake Ivanhoe, treated with aluminum sulphate and lime. Nov. 12, 1923.
276	Orlando. Drilled well 350 feet deep; owned by A. J. Nye. Sept. 9, 1923
277	Wekiwa Springs. Wekiwa Springs; owned by A. C. Starbird, Apopka. Aug. 8, 1924
278	Winter Garden; municipal supply. 12-inch drilled well 285 feet deep; used for part of public supply. Sept. 9, 1923.
279	Winter Garden; municipal supply. 12-inch drilled well 300 feet deep; used for part of public supply. Sept. 9, 1923.
280	Winter Garden. 8-inch drilled well 238 feet deep; owned by Winter Garden Ice & Cold Storage Co. Sept. 9, 1923.
281	Winter Park. Driven well 1½ inches in diameter and 37 feet deep; owned by D. D. Hunter. Jan. 14, 1908.
282	Winter Park. 4-inch drilled well 150 feet deep; owned by C. A. Morse. Jan. 14, 1908
283	Winter Park. 6-inch drilled well 380 feet deep; owned by Winter Park Refrigerator Co. Sept. 9, 1923.
	OSCEOLA COUNTY
284	Kissimmee; municipal supply. Flowing wells 12 inches in diameter and 420 and 450 feet deep; composite sample. Nov. 10, 1923.
285	Kissimmee. Drilled well 1½ inches in diameter and 180 feet deep at courthouse; owned by Osceola County. Jan. 15, 1908.
286	St. Cloud; municipal supply. 10-inch drilled well 625 feet deep. Nov. 10, 1923
	PALM BEACH COUNTY
287	Boynton; municipal supply. 4-inch drilled well 57 feet deep. Color, 44. The composition of the water is the same as shown by analysis 288. Apr. 26, 1924.
288	Boynton. 2-inch drilled well 54 feet deep; owned by Charles Austin. Aug. 23, 1923
289	Boynton. 2-inch drilled well 26 feet deep about 300 feet west of the ocean; owned by Boynton Beach Hotel Association. Aug. 23, 1923.
290	Boynton. 3-inch drilled well 43 feet deep about a quarter of a mile west of ocean; owned by Boynton Beach Hotel Association. Aug. 23, 1923.

[a] Calculated.
[b] Includes iron precipitated at time of analysis.
[d] Includes equivalent of small quantity of carbonate (CO_3).
[f] By turbidity.

waters of Florida—Continued

Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	No.
	Analyses (parts per million)											
D.	1,042	7.0	Tr.	84	23	269	231	17	484	0.30	304	257
	2,390						380	170	910			258
	30,450	36	[b]20	507	1,005	[a]9,344	206	2,392	16,320		5,388	259
H.	395	22	Tr.	73	23	21	234	79	28	Tr.	277	260
D.	414	35	.12	65	29	23	191	126	26	.32	281	261
F.	470			66	29	[a]41	193	167	29		284	262
F.	496	37	.06	73	40	Na 19 K 3.2	194	173	31	Tr.	346	263
D.	286	27	.08	62	9.5	26	220	18	29	.20	194	264
F.	49	6.4	.38	7.6	4.0	Na 2.7 K .9	35	3.4	6.5	Tr.	35	265
H.	40	3.5	.06	2.2	.5	6.9	4.9	1.1	11	Tr.	7.6	266
H.	42	4.2	.14	1.6	.5	9.4	7.3	6.7	9.0	Tr.	6.2	267
D.	48		.3	6	1	[a]3.7	27	3	2		19	268
F.	1,300	19	.10	109	60	265	125	235	532	.77	518	269
F.	114	6.1	[b]4.8	3.2	3.0	16	17	12	13	Tr.	20	270
D.	57	1.0	.05	4.5	2.7	Na 7.2 K 1.4	13	4.3	10	.2	22	271
H.	161	15	[b].39	37	11	5.7	150	3.5	10	Tr.	138	272
H.	129	6.7	[b].17	18	8.3	11	89	4.5	17	1.1	79	273
H.	56	1.4	.08	4.6	2.3	8.9	13	10	10	Tr.	21	274
H.	90	.9	.11	15	2.4	9.9	[c]35	22	9.0	Tr.	47	275
H.	178	19	.05	40	9.7	13	161	2.3	13	1.0	140	276
H.	122	8.0	.06	28	7.1	4.0	117	5.3	8.0	Tr.	99	277
H.	217	28	Tr.	43	16	13	178	2.3	23	1.5	173	278
H.	132	17	.06	31	8.2	4.0	122	1.7	7.0	Tr.	111	279
H.	148	20	.05	30	11	5.2	145	1.4	7.3	Tr.	120	280
D.	40		1.2	4	3	[a]8.1	35	3	7		22	281
D.	202		.3	58	4	[a]11	[d]209	3	8		161	282
H.	181	18	.05	45	12	8.7	174	2.4	10	Tr.	162	283
H.	123	14	Tr.	30	5.9	5.5	120	3.9	5.5	Tr.	99	284
D.	131		.1	30	6	[a]11	[d]137	2	6		100	285
H.	242	23	[b]1.0	48	8.7	10	142	41	8.5	Tr.	156	286
H.			.39				179	[f]8	16		[a]174	287
F.	222	7.6	[b]1.1	64	2.4	11	189	14	16	.60	170	288
H.	560	9.6	.19	84	16	97	243	41	163	2.2	276	289
F.	1,883	10	[b].44	264	17	401	249	16	991	.28	730	290

[a] Determined.
[b] Includes iron and aluminum oxides ($Fe_2O_3+Al_2O_3$).
[c] Includes equivalent of 12 parts per million of carbonate (CO_3).

No.	Description
	PALM BEACH COUNTY—continued
291	Boynton. 2-inch drilled well 40 feet deep in SW. ¼ sec. 34, T. 45 S., R. 43 E.; owned by Ward B. Miller. Free carbon dioxide, 42 parts per million. Aug. 23, 1923.
292	Delray; municipal supply. 6-inch drilled well 45 feet deep. Distinct odor of hydrogen sulphide. Aug. 23, 1923.
293	Delray; municipal supply. 6-inch drilled well 63 feet deep. July 12, 1923
294	Delray (Delray Beach); municipal supply. 2-inch drilled well 42 feet deep. Distinct odor of hydrogen sulphide. Aug. 23, 1923.
295	Jupiter. 2-inch driven well 27 feet deep at wireless station on U. S. Navy reservation. Nov. 2, 1923.
296	Kelsey City; public supply. Composite sample from group of six driven wells 2 inches in diameter and 43 feet deep. Nov. 2, 1923.
297	Pahokee. Lake Okeechobee. Color, 48. Aug. 17, 1923
298	Pahokee. Lake Okeechobee 3 miles north of Ritter Island; sample taken 1 foot below surface; color, 41. July 9, 1913.
299	West Palm Beach. 2-inch driven well 39 feet deep; owned by Baker Bros. Market, 323 Clematis Avenue. Sept. 7, 1923.
300	West Palm Beach. 10-inch drilled well 1,080 feet deep; owned by Southern Utilities Co.; flows 1,000 gallons a minute. July 11, 1923.
301	West Palm Beach. 2-inch drilled well 186 feet deep; owned by Deep Rock Mineral Co., Ohmar Road. July 11, 1923.
302	West Palm Beach. Clear Lake; color, 144. Nov. 11, 1924
303	West Palm Beach; municipal supply. Lake Mangonea, near canal leading to Clear Lake; raw water; color, 62. Suspended matter, 0.4. June 24, 1927.
304	West Palm Beach; municipal supply. Water from No. 303 after addition of alum and filtration; color, 6. June 25, 1927.
	PASCO COUNTY
305	Crystal Springs. Crystal Springs; northeast of Tampa. Flow 25,000 gallons a minute. July 19, 1923.
306	Dade City; municipal supply. 8-inch drilled well 100 feet deep. Oct. 6, 1923
307	Dade City. 6-inch drilled well 45 feet deep; owned by Muller & Zinsser; used at ice plant in 1907. Nov. 27, 1907.
308	Trilby. 10-inch drilled well 31 feet deep; owned by Atlantic Coast Line R. R. Co. Nov. 28, 1907
309	Zephyrhills; municipal supply. 2-inch drilled well 260 feet deep. Oct. 6, 1923
	PINELLAS COUNTY
310	Belleair. 12-inch drilled well 146 feet deep; owned by Bellview Hotel Co.; test well No. 1. July 28, 1924.
311	Belleair. 2-inch drilled well 43 feet deep; owned by Bellview Hotel Co.; test well No. 2. July 28, 1924.
312	Clearwater; municipal supply. 10-inch drilled well 190 feet deep; well No. 6. Sept. 1, 1923
313	Clearwater; municipal supply. 10-inch drilled well 165 feet deep; well No. 7. Sept. 1, 1923
314	Clearwater. 8-inch drilled well 204 feet deep; owned by municipality; known as "Old well." Sept. 1, 1923.
315	Clearwater. 4-inch drilled well 52 feet deep, at ice plant. Feb. 28, 1908
316	Dunedin; municipal supply. 18-inch drilled well 78 feet deep. Sept. 1, 1923
317	Olsmar. 6-inch drilled well 196 feet deep; owned by Olsmar Light & Development Co. Aug. 19, 1924.
318	Safety Harbor. Espiritu Santo Springs. A sample from flowing spring No. 2 had practically the same composition. Oct. 16, 1923.
319	Safety Harbor. Drilled well 1¼ inches in diameter and 296 feet deep in sec. 3, T. 29 N., R. 16 E.; owned by D. M. Pipkin. Oct. 16, 1923.
320	St. Petersburg; municipal supply. 12-inch drilled well 200 feet deep; well No. 1. Aug. 31, 1923
321	St. Petersburg; municipal supply. 12-inch drilled well 200 feet deep; well No. 3. Aug. 31, 1923
322	St. Petersburg; municipal supply. 12-inch drilled well 200 feet deep; well No. 5. Aug. 31, 1923
323	St. Petersburg. Flowing well 4 inches in diameter and 216 feet deep; owned by municipality; known as "Fount of Youth." Nov. 3, 1923.
324	St. Petersburg. 3-inch drilled well 116 feet deep; owned by A. P. Avery. Feb. 7, 1908
325	St. Petersburg. 6-inch drilled well 265 feet deep; owned by Crystal Ice Works. Feb. 7, 1908
326	St. Petersburg. Drilled well 1½ inches in diameter and 40 feet deep in NE. ¼ sec. 20, T. 31 S., R. 16 E.; owred by Pasadena Estates. Jan. 11, 1924.
327	St. Petersburg. Flowing well 8 inches in diameter and 162 feet deep; owned by Pasadena Estates. Aug. 21, 1923.
328	St. Petersburg. Flowing well 8 inches in diameter and 162 feet deep; owned by Pasadena Estates. Same as No. 327. Jan. 16, 1925. A sample collected from this well Mar. 6, 1925, had the same composition.
329	Tarpon Springs; municipal supply. Composite sample from three 6-inch and two 10-inch drilled wells 115 to 127 feet deep. Sept. 1, 1923.
330	Tarpon Springs. Lake Butler. Color, 152. Aug. 19, 1924
331	Tarpon Springs. 6-inch drilled well 105 feet deep; well No. 3 at city waterworks. March, 1908
332	Wall Springs. Spring owned by Edgar Wall, Tampa; flows 800 gallons a minute. Sept. 1, 1923

[a] Calculated. [b] Includes iron precipitated at time of analysis.

waters of Florida—Continued

Analyses (parts per million)												
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[e]	No.
H.	644	14	[b]1.5	145	6.7	62	311	110	105	0.38	390	291
H.	224	7.8	[b]3.0	64	2.0	15	184	9.4	20	Tr.	168	292
H.	235	23	.36	59	1.9	16	184	9.8	17	Tr.	155	293
F.	497	6.6	[b]1.3	99	11	60	273	57	101	.53	293	294
F.	345	3.2	.43	37	7.7	73	107	15	127	2.8	124	295
F.	157	6.1	.05	41	3.5	9.6	113	9.9	13	15	117	296
F.	272	5.9	.25	37	11	34	128	19	58	Tr.	138	297
D.	183	8.2	.03	31	7.0	Na 16 K 2.0	[d]114	7.3	28	.1	106	298
H.	199	6.3	.08	44	6.3	12	93	43	23	2.5	136	299
H.	4,740	23	.17	140	175	1,343	187	449	2,345	13	1,068	300
H.	180	13	Tr.	41	2.3	14	[d]110	30	10	3.0	112	301
H.	66	1.3	[b].10	6.5	1.4	9.6	29	2.9	13	Tr.	22	302
F.	99	2.8	.22	14	2.8	Na 6.7 K 1.0	34	6.9	18	.12	46	303
F.	108	1.0	.05	17	3.7	Na 7.6 K 1.6	3.7	43	18	1.0	58	304
F.	177	14	.08	53	5.0	3.8	168	9.3	5.5	.42	153	305
F.	149	16	.08	37	5.9	5.7	127	9.2	6.6	3.3	117	306
D.	204	20	Tr.	58	4.2	9.1	191	2.2	13	.55	162	307
D.	136	16	.49	39	1.2	6.6	113	2.3	5.4	1.6	102	308
F.	184	21	.18	46	2.6	8.5	130	2.8	20	4.9	126	309
H.	221	15	.08	56	5.8	16	204	2.1	18	Tr.	164	310
H.	190	40	.05	20	7.4	9.2	67	7.4	22	Tr.	80	311
H.	229	22	.13	53	5.3	16	170	4.4	30	Tr.	154	312
F.	721	27	[b]1.1	86	18	140	201	28	287	.44	289	313
F.	1,763	19	[b].18	118	53	461	178	80	915	.96	512	314
D.	254	-------	1.3	52	6	[a]24	[d]228	2	14	-------	155	315
H.	210	20	.12	37	7.0	16	137	26	19	2.1	121	316
H.	1,279	-------	[b].42	155	23	[a]246	203	54	545	Tr.	482	317
H.	3,473	14	.09	176	108	960	261	232	1,775	Tr.	883	318
F.	29,779	4.4	[b]15	834	1,070	8,969	281	2,374	16,422	4.2	6,472	319
H.	458	-------	-------	106	16	[a]23	200	[f]6	150	-------	331	320
H.	483	20	.06	108	11	34	205	5.7	148	2.9	315	321
H.	754	-------	-------	132	18	[a]100	214	[f]10	309	-------	404	322
F.	1,086	27	.34	215	37	113	207	107	458	1.2	689	323
D.	314	-------	.2	66	8	[a]17	[d]201	6	46	-------	198	324
D.	608	-------	.05	112	14	[a]42	[d]226	13	163	-------	338	325
H.	684	30	[b].59	108	21	87	207	21	262	Tr.	356	326
H.	1,076	30	.12	184	29	127	214	48	454	1.0	579	327
F.	1,067	33	.01	200	35	126	212	52	490	-------	644	328
H.	854	9.0	.15	68	25	190	[d]99	57	378	13	272	329
H.	90	1.2	[b].11	5.6	3.1	14	18	3.7	27	Tr.	27	330
D.	279	-------	.9	30	7	[a]50	[d]86	14	91	-------	104	331
H.	564	6.1	.06	33	15	148	107	38	252	Tr.	144	332

[d] Includes equivalent of small quantity of carbonate (CO_3). [f] By turbidity.

Ground and surface

No.	Description
	POLK COUNTY
333	Auburndale; municipal supply. 10-inch drilled well 248 feet deep. May 20, 1924
334	Auburndale. Ariana Lake; color, 8. Aug. 13, 1924
335	Bartow; municipal supply. 6-inch drilled well 700 feet deep. Aug. 23, 1923
336	Bartow, 1½ miles west of. 18-inch drilled well 644 feet deep; owned by Morris Fertilizer Co. Aug. 6, 1924.
337	Bartow, 5 miles southwest of. Kissengen Springs; owned by R. W. Bennett; flow 10,000 gallons a minute. Aug. 24, 1923.
338	Brewster. 16-inch drilled well 980 feet deep; owned by American Cyanamid Co. Feb. 14, 1924
339	Fort Meade; municipal supply. 10-inch drilled well 800 feet deep. Oct. 26, 1923
340	Fort Meade, 1 mile north of. 5-inch drilled well 640 feet deep at phosphate mine; owned by Pembroke Mine Co. August, 1924.
341	Fort Meade, 1 mile north of. Peace River; color, 216. Aug. 6, 1924
342	Frost Proof. 4-inch drilled well 770 feet deep; owned by Frost Proof Citrus Growers Association; water supplied to the city for public use. Oct. 25, 1923.
343	Frost Proof. Clinch Lake; color, 23. July 24, 1924
344	Haines City. 1-inch driven well 42 feet deep; owned by Miss E. Dahm. Sept. 30, 1924
345	Haines City. 2-inch drilled well 40 feet deep; owned by V. C. Thompson. July 22, 1924
346	Haines City. Drilled well 600 feet deep; owned by Florida Ice & Power Co. Mar. 17, 1924
347	Lake Alfred. 4-inch drilled well 107 feet deep; owned by John Monson. Nov. 9, 1923
348	Lakeland; municipal supply. 16-inch drilled well 741 feet deep. Aug. 23, 1923
349	Lakeland. Mirror Lake; color, 20. Aug. 8, 1924
350	Lake Wales. 8-inch drilled well 800 feet deep; owned by Florida Ice & Power Co. This water is supplied to the city for public use. Oct. 24, 1923.
351	Mulberry; municipal supply. 8-inch drilled well 335 feet deep. Nov. 15, 1923
352	Mulberry, 1 mile west of. 8-inch drilled well 350 feet deep; owned by Southern Phosphate Corporation. Aug. 7, 1924.
353	Nichols. 6-inch drilled well 600 feet deep 2 miles west of Mulberry; owned by the Phosphate Mining Co. Aug. 7, 1924.
354	Pierce. 8-inch drilled well 700 feet deep; owned by American Agricultural Chemical Co. Feb. 14, 1924.
355	Winterhaven; municipal supply. 10-inch drilled well 630 feet deep. Oct. 17, 1923
356	Winterhaven. Lake Martha; color, 15. Aug. 12, 1924
	PUTNAM COUNTY
357	Crescent City; municipal supply. Composite sample from wells 6 inches and 4 inches in diameter and 130 feet deep; flow 100 gallons a minute. Jan. 10, 1925.
358	Florahome. Town well 25 feet deep. Dec. 31, 1907
359	Grandin. Lake Grandin. Jan. 10, 1925
360	Interlachen. Lake Interlachen. Jan. 10, 1925
361	Palatka. St. Johns River; color, 100. Feb. 18, 1925
362	Palatka; part of municipal supply. 12-inch drilled well 250 feet deep. Jan. 4, 1924
363	Palatka; part of municipal supply. Composite sample from one 8-inch, one 6-inch, and two 4-inch drilled wells 250 to 300 feet deep. Jan. 4, 1924.
364	Palatka; part of municipal supply. Spring 1½ miles southwest of courthouse. Jan. 4, 1924
365	Palatka. 2-inch drilled well 183 feet deep on South Front Street; owned by municipality. Jan. 2, 1908.
366	Palatka (Palatka Heights). 3-inch drilled well 150 feet deep; owned by A. Waterman; water bottled and sold. Jan. 4, 1924.
367	Satsuma. Driven well 22 feet deep; owned by E. B. Wright. Jan. 10, 1925
	ST. JOHNS COUNTY
368	Hastings; part of public supply. 4-inch drilled well 258 feet deep (Sweeney well); owned by Hastings Water Co. Oct. 24, 1923.
369	Hastings; part of public supply. 4-inch drilled well 252 feet deep (Park Avenue well); owned by Hastings Water Co. Oct. 24, 1923.
370	St. Augustine; part of municipal supply. 12-inch drilled well 85 feet deep in NE. ¼ sec. 23, T. 7 S., R. 29 E. Apr. 18, 1924.
371	St. Augustine; part of municipal supply. 6-inch drilled well 452 feet deep (South well No. 3 at waterworks). Oct. 24, 1923.
372	St. Augustine; 10-inch drilled well 520 feet deep (city power plant well No. 2); owned by municipality. Oct. 24, 1923.
373	St. Augustine. 8-inch drilled well 340 feet deep; owned by H. Walker. Oct. 24, 1923
374	St. Augustine. Spring owned by Mrs. L. M. Day. Oct. 24, 1923

[a] Calculated.
[b] Includes iron precipitated at time of analysis.
[c] Less than 10 parts per million.
[d] Includes equivalent of small quantity of carbonate (CO_3).
[f] By turbidity.

waters of Florida—Continued

Analyses (parts per million)												
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	No.
H.	132	24	0.06	26	7.8	3.5	124	1.4	6.0	Tr.	97	333
H.	35	2.1	Tr.	1.0	1.4	6.6	4.9	3.7	10	Tr.	8.2	334
F.	234	13	.09	51	14	3.6	143	60	8.0	Tr.	185	335
H.	169	12	.08	39	15	[a] 2.0	173	9.9	8.0	Tr.	159	336
F.	232	17	.06	45	17	4.2	131	65	7.6	.85	182	337
F.	178	-------	-------	35	17	([c])	149	24	8.4	-------	157	338
F.	201	18	.15	40	15	6.1	154	35	7.2	.21	162	339
H.	267	34	.15	46	21	[a] 21	255	13	17	Tr.	201	340
H.	80	7.8	.09	9.4	3.2	6.3	37	4.9	6.0	Tr.	37	341
F.	-------	-------	-------	44	16	-------	193	2.1	8.8	.75	176	342
H.	30	1.0	.04	2.6	1.2	5.0	8.5	3.0	8.0	Tr.	11	343
H.	99	3.6	.13	11	2.8	13	3.7	44	8.0	8.3	39	344
H.	53	-------	-------	-------	-------	-------	17	[f] 4	5.0	4.6	[g] 10	345
H.	192	12	.09	51	4.5	13	189	3.5	12	Tr.	146	346
H.	78	16	[b] .17	11	5.3	5.9	60	2.9	7.0	Tr.	49	347
H.	199	24	.08	41	15	8.0	199	2.8	7.0	1.2	164	348
H.	178	1.0	.11	29	9.1	24	128	4.8	36	Tr.	110	349
F.	160	19	.13	38	12	2.8	160	3.2	6.2	.71	144	350
H.	191	22	[b] .10	43	12	10	183	5.5	15	Tr.	157	351
H.	141	23	.06	31	12	[a] 1.0	142	2.6	7.0	Tr.	127	352
H.	222	28	.19	42	13	[a] 19	214	6.4	13	Tr.	158	353
F.	187	-------	-------	41	13	[a] 3.8	149	33	5.4	-------	156	354
H.	148	19	[b] .70	39	5.2	6.3	139	2.8	6.0	Tr.	119	355
H.	36	1.6	Tr.	1.4	1.4	7.9	8.5	5.1	11	Tr.	9.2	356
H.	171	11	.08	40	6.8	14	150	3.4	24	Tr.	128	357
D.	55	-------	3.3	3	1	[a] 3	18	2	6	-------	12	358
H.	35	1.1	.03	1.5	1.4	8.3	15	5.5	7.8	Tr.	9.5	359
H.	19	.7	.03	1.0	1.0	5.0	6.1	3.9	6.1	Tr.	6.6	360
F.	394	7.6	[b] .21	30	13	85	52	39	165	.64	128	361
H.	532	12	.07	62	28	Na 70 K 2.4	140	62	174	Tr.	270	362
H.	526	-------	.07	58	28	[a] 68	132	69	162	Tr.	260	363
H.	34	9.1	.04	6.2	1.2	Na 3.3 K 1.8	11	4.0	9.0	Tr.	20	364
D.	462	17	.06	66	18	56	[d] 149	54	136	.40	239	365
H.	111	11	.06	27	2.0	Na 6.5 K 1.3	85	14	7.0	Tr.	76	366
H.	52	2.6	1.1	3.1	5.1	7.0	18	12	10	1.8	29	367
H.	1,338	21	[i] 2.4	165	93	91	109	616	181	Tr.	794	368
H.	1,422	21	[k] 26	173	98	106	117	651	205	Tr.	834	369
H.	472	12	.38	137	3.0	28	423	2.0	42	Tr.	355	370
H.	937	28	[l] .48	116	62	69	152	351	154	Tr.	544	371
H.	1,780	27	.11	143	87	302	162	361	635	Tr.	714	372
H.	791	27	.07	103	57	47	150	347	70	Tr.	491	373
H.	434	11	.08	113	22	17	415	37	19	Tr.	373	374

[g] Determined.
[i] Includes 2.3 parts per million precipitated as sulphide at time of analysis.
[k] Includes 0.1 part per million of iron in solution at time of analysis and 26 parts per million precipitated as iron sulphide.
[l] Precipitated as iron sulphide at time of analysis.

Ground and surface

No.	Description
	ST. LUCIE COUNTY
375	Fort Pierce. Driven well 2½ inches in diameter and 32 feet deep; owned by municipality. July 10, 1923.
376	Fort Pierce; municipal supply. 8-inch drilled well 800 feet deep; flows 200 gallons a minute. July 10, 1923.
377	Fort Pierce. 4-inch drilled well 750 feet deep; owned by S. H. Hale, Kansas City, Mo., flows 220 gallons a minute. Sept. 19, 1924.
378	Fort Pierce. Driven well 1¼ inches in diameter and 12 feet deep; owned by Fee & Stuart; typical shallow well. Jan. 17, 1908.
379	Fort Pierce. Taylor Creek. Slight yellow color. July 10, 1923.
380	Fort Pierce, 3 miles south of. Driven well 1¼ inches in diameter and 32 feet deep; owned by Egret Springs Water Co. July 11, 1923.
	SANTA ROSA COUNTY
381	Bagdad. 8-inch drilled well 168 feet deep in SE. ¼ sec. 10, T. 1 N., R. 28 W., owned by Bagdad Land & Lumber Co. Apr. 7, 1924.
382	Bagdad. Driven well 1½ inches in diameter and 30 feet deep; owned by J. C. McArthur. Dec. 14, 1907.
383	Bagdad. Drilled well 1¼ inches in diameter and 74 feet deep; owned by Charles Summers. Dec. 14, 1907.
384	Milton; municipal supply. 4-inch drilled well 125 feet deep. Apr. 7, 1924.
	SARASOTA COUNTY
385	Sarasota; municipal supply. Drilled wells, one 4-inch and two 6-inch, 400 feet deep; water level 8 feet above surface. Aug. 28, 1923.
386	Sarasota. Flowing well 6 inches in diameter and 470 feet deep in center of Banana Avenue; piped to side of road; owned by J. C. Brown. Aug. 28, 1923.
387	Sarasota. 4-inch drilled well 200 feet deep; owned by S. H. Highsmith. Aug. 28, 1923.
388	Sarasota. 2-inch drilled well 80 feet deep; owned by L. W. Pickett; water level 3 feet above surface. Aug. 28, 1923.
389	Sarasota. 8-inch drilled well 640 feet deep; owned by Sarasota Ice & Cold Storage Co.; flows 450 gallons a minute; water used only for cooling. Aug. 28, 1923.
390	Sarasota. 4-inch drilled well 303 feet deep; owned by J. B. Turner; flows 200 gallons a minute. Aug. 28, 1923.
391	Venice. 8-inch drilled well (No. 4) 405 feet deep in N. ½ SE. ¼ sec. 7, T. 39 S., R. 19 E., owned by B. L. E. Realty Corporation. Mar. 5, 1927.
392	Venice. 6-inch drilled well about 460 feet deep in NW. ¼ sec. 10, T. 29 S., R. 19 E., owned by C. A. McKenney, Washington, D. C. Mar. 5, 1927.
	SEMINOLE COUNTY
393	Altamonte Springs. Lake Orienda in rear of residence of F. P. Waterhouse. Mar. 8, 1924.
394	Lake Mary; public supply. 2-inch drilled well 125 feet deep; owned by A. E. Sjoblom. July 30, 1923.
395	Lake Monroe. 4-inch drilled well 150 feet deep; owned by F. H. Black. Nov. 10, 1923.
396	Sanford; part of public supply. 10-inch drilled well 435 feet deep; at small ice plant; owned by Southern Utilities Co.; flows 100 gallons a minute. July 30, 1923.
397	Sanford; part of public supply. 10-inch drilled well 452 feet deep; at ice and water plant; owned by Southern Utilities Co.; flows 200 gallons a minute. July 30, 1923.
398	Sanford, 2 miles west of, on Dixie Highway. 2-inch drilled well 94 feet deep; owned by A. P. Connelly; water level 10 feet above ground. July 30, 1923.
399	Sanford, 5½ miles south of, on Orlando Road; spring owned by T. A. Frazer. July 30, 1923.
400	Sanford, south of. 2-inch drilled well 194 feet deep at 7-mile post on Dixie Highway; owned by J. M. Scaucer. Nov. 10, 1923.
	SUMTER COUNTY
401	Bushnell; public supply. 4-inch drilled well 540 feet deep. Apr. 25, 1924.
402	Bushnell. Drilled well 1½ inches in diameter and 70 feet deep; owned by Standard Oil Co., used by general public. Apr. 25, 1924.
403	Bushnell. Driven well 1½ inches in diameter and 50 feet deep; owned by Mrs. S. M. Wall. Apr. 25, 1924.
404	Sumterville. Drilled well 45 feet deep; owned by F. T. Knight. Apr. 25, 1924.
405	Sumterville. Driven well 1¼ inches in diameter and 62 feet deep; owned by J. T. Williams. Apr. 25, 1924.

[a] Calculated. [b] Includes iron precipitated at time of analysis.

waters of Florida—Continued

Analyses (parts per million)												No.
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	
H.	159	7.2	0.37	13	3.1	36	17	27	54	0.52	45	375
R.	1,355	26	.20	51	50	368	255	296	434	2.1	332	376
H.	1,480	26	.09	44	40	409	259	425	375	Tr.	274	377
D.	362	4.0	.12	18	5.6	91	18	58	94	.40	68	378
H.	134	9.0	.14	18	2.2	9.4	52	8.9	16	.50	54	379
H.	63	3.2	.41	4.6	1.8	9.1	4.9	8.9	12	5.7	19	380
H.	26	6.3	.08	1.8	.4	4.9	2.4	2.8	6.0	1.0	6.1	381
D.	84	-------	2.0	12	2	[a]63	[d]200	6	5	-------	38	382
D.	34	-------	Tr.	5	2	[a]2.8	19	5	4	-------	20	383
F.	19	4.4	.02	.8	.7	Na 1.5; K .4	4.4	1.9	2.4	Tr.	4.9	384
H.	1,063	28	.11	124	60	110	183	398	157	.41	556	385
F.	1,677	24	.21	250	116	89	165	868	177	Tr.	1,101	386
F.	497	35	.10	42	26	90	241	126	53	Tr.	212	387
F.	478	22	.14	72	27	56	282	52	85	.64	291	388
F.	1,997	23	.23	285	128	152	155	924	341	Tr.	1,237	389
F.	804	36	.09	75	63	78	204	310	91	Tr.	446	390
F.	2,436	24	.13	389	151	98	154	1,321	194	.12	1,592	391
F.	2,464	-------	2.6	396	159	[a]49	162	1,340	157	.10	1,642	392
H.	47	1.6	.02	3.0	1.6	Na 9.9; K .8	9.8	15	10	Tr.	14	393
F.	129	19	.18	33	5.7	3.1	122	1.9	4.4	Tr.	106	394
H.	286	-------	.10	49	10	[a]30	[d]161	12	59	Tr.	164	395
F.	1,039	6.8	[b]4.8	40	45	289	63	53	565	Tr.	284	396
F.	990	16	.12	80	39	226	142	104	448	Tr.	360	397
F.	172	18	.12	46	5.0	6.1	156	2.6	11	Tr.	136	398
F.	74	15	.05	11	2.4	5.0	33	3.1	7.4	9.4	37	399
H.	194	-------	.11	45	8.5	[a]6.7	167	6.3	13	Tr.	147	400
H.	204	11	.30	65	.4	Na 5.1; K .2	212	1.9	2.4	.73	164	401
H.	197	7.8	3.0	61	.7	Na 6.2; K .3	182	6.9	11	1.7	155	402
H.	213	7.8	.10	62	.5	Na 3.3; K 1.1	171	6.2	18	8.6	157	403
H.	209	6.5	.09	70	.4	Na 9.0; K 1.6	216	4.1	9.0	.38	177	404
H.	186	7.2	.80	69	.3	Na 3.0; K .6	204	1.8	8.0	Tr.	174	405

[d] Includes equivalent of small quantity of carbonate (CO_3).

Ground and surface

No.	Description
	SUWANNEE COUNTY
406	Branford. Suwannee River at bridge on road west to Mayo; color, 69. Nov. 19, 1924.
407	Falmouth. Newland's Spring, located ¼ mile southwest of Seaboard Air Line track; owned by M. M. Foxworth; estimated discharge 220 second-feet (Water-Supply Paper 319, p. 409). Feb. 26, 1924.
408	Live Oak; municipal supply. 8-inch drilled well 660 feet deep in NE. ¼ SE. ¼ sec. 23, T. 2 S., R. 13 E. June 27, 1923.
409	Live Oak. Underground stream penetrated by 6-inch drilled well about 1,080 feet deep; in SE. ¼ NE. ¼ sec. 23, T. 2 S., R. 13 E. Water not used. June 27, 1923.
410	Live Oak. 6-inch drilled well 1,080 feet deep; owned by municipality; same as No. 409. Dec. 31, 1907.
411	Live Oak. Typical drilled well 2 inches in diameter and about 75 feet deep. June 27, 1923.
412	Live Oak. 8-inch drilled well 280 feet deep in SW. ¼ SW. ¼ sec. 24, T. 2 S., R. 13 E.; owned by Southern Utilities Co. (ice-plant well). June 27, 1923.
413	Suwannee Springs, near Suwannee River 12 miles north of Live Oak, above junction with Withlacoochee River. Color, 200. Feb. 26, 1924.
414	Suwannee Springs. Suwannee Springs; owned by M. Reese, Live Oak; estimated flow 115 second-feet (Water-Supply Paper 319, pp. 323–325). Feb. 26, 1924.
	TAYLOR COUNTY
415	Boyd. 6-inch drilled well 330 feet deep; owned by Weaver-Loughridge Lumber Co. Nov. 22, 1923.
416	Carbur. 10-inch drilled well 85 feet deep; owned by Carbur Logging Co. Sample turbid when collected. Nov. 22, 1923.
417	Fenholloway. Fenholloway Springs; owned by Mrs. Emerson, Savannah, Ga. Nov. 22, 1923.
418	Hampton Springs. Hampton Springs; owned by Hampton Springs Co.; flow 260 gallons a minute. Nov. 21, 1923.
419	Perry; public supply. 6-inch drilled well 220 feet deep in SW. ¼ sec. 24, T. 4 S., R. 7 E.; owned by J. D. Scruggs. June 26, 1923.
420	Perry. "The flowing well," 4-inch drilled well 1,220 feet deep in SE. ¼ sec. 24, T. 4 S., R. 7 E.; owned by municipality; formerly much used, but since casing has rusted badly is used by only a few persons. The casing is rusted through at about 500 feet, so the sample may not represent water from the full depth of the well. June 26, 1923.
421	Perry. 8-inch drilled well 85 feet deep; owned by Burton-Swartz Cypress Co. Nov. 22, 1923.
422	Perry. City well, 10 inches in diameter and 76 feet deep. Apr. 9, 1908.
423	Perry. Typical dug well 18 feet deep. Nov. 22, 1923.
	UNION COUNTY
424	Raiford. 6-inch drilled well 265 feet deep; owned by State prison farm. Odor of hydrogen sulphide when analyzed. Nov. 14, 1923.
425	Worthington. Worthington Spring; owned by Mrs. H. B. Lamb. Aug. 13, 1924.
	VOLUSIA COUNTY
426	Daytona Beach. 6-inch drilled well 399 feet deep; owned by municipality; used for public supply after treatment with lime. June 25, 1923.
427	Daytona Beach; municipal supply. Water from No. 426 treated with 2.6 pounds of lime to 1,000 gallons. July 28, 1923.
428	Daytona Beach. 6-inch drilled well 565 feet deep; owned by municipality. June 25, 1923.
429	Daytona Beach. 4-inch drilled well 488 feet deep; owned by municipality. June 25, 1923.
430	Daytona Beach. 4-inch drilled well 170 feet deep; owned by Daytona Public Service Co. June 25, 1923.
431	Daytona Beach. 2-inch drilled well 280 feet deep; owned by Florida East Coast Ry. Co.; flows 100 gallons a minute. June 25, 1923.
432	Daytona Beach. 2-inch driven well 60 feet deep at 118 Palmetto Ave.; owned by T. M. Mabbette. June 25, 1923.
433	Daytona Beach. 4-inch drilled well 215 feet deep; owned by municipality; used for public supply after treatment. July 6, 1923.
434	Daytona Beach; municipal supply. No. 433; treated with 2.4 pounds of lime and 0.7 pound of soda ash to 1,000 gallons. July 27, 1923.
435	Daytona Beach. 6-inch drilled well 183 feet deep; owned by Peninsular Ice & Cold Storage Co. July 5, 1923.
436	Daytona Beach. Driven well 2 inches in diameter and 70 feet deep at Brick Front Garage; owned by Branch estate. July 6, 1923.
437	De Land; municipal supply. 10-inch drilled well 275 feet deep. July 30, 1923.
438	Deleon Springs. Spring owned by Fred N. Conrad, Daytona; estimated flow 16,000 gallons a minute. Oct. 26, 1923.
439	Lake Helen; municipal supply. 5-inch drilled well 160 feet deep. Aug. 7, 1924.
440	New Smyrna. Flowing well 4 inches in diameter and 125 feet deep at electric plant; owned by municipality. July 28, 1923.

[a] Calculated.
[b] Includes iron precipitated at time of analysis.

waters of Florida—Continued

Analyst	Analyses (parts per million)											No.
	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	
H.	151	7.6	0.05	40	3.9	4.7	129	10	3.0	Tr.	116	406
H.	218	6.1	.04	65	9.2	Na 3.1 K .4	228	9.5	4.0	Tr.	200	407
H.	220	16	.20	68	6.2	6.1	224	8.5	5.0	Tr.	195	408
H.	257	16	3.0	75	6.4	9.2	234	8.5	10	2.4	214	409
D.	219	17	.04	68	5.7	7.2	224	8.9	3.9	.6	193	410
R.	280	16	.2	85	5.2	6.3	278	12	8.0	1.5	234	411
R.	338	18	.24	84	12	21	239	12	60	Tr.	259	412
H.	116	8.2	.02	18	5.3	[a] 1.8	61	9.0	8.0	Tr.	67	413
H.	220	14	.16	53	12	Na 5.5 K .6	185	27	7.0	Tr.	182	414
H.	238	8.1	[b] 1.2	59	20	4.6	272	2.3	5.0	Tr.	230	415
H.	323	9.4	[b] 1.4	76	17	19	285	7.5	35	Tr.	260	416
F.	348	7.4	.08	81	29	1.4	289	72	6.0	Tr.	321	417
H.	914	15	.10	162	72	6.6	294	440	10	Tr.	700	418
R.	215	12	.17	48	14	16	195	4.9	22	3.0	177	419
R.	1,074	19	3.0	166	75	67	315	418	96	1.7	722	420
H.	155	11	.10	34	15	5.7	173	5.9	3.8	Tr.	146	421
D.	153	7.6	.06	36	13	9.4	164	3.8	4.2	.45	143	422
H.	201	3.6	[b] .41	11	7.1	42	11	13	17	110	57	423
H.	247	43	.09	52	18	5.5	246	3.7	9.0	Tr.	204	424
H.	189	24	.04	40	7.9	12	166	8.8	10	Tr.	132	425
R.	520	27	.30	107	16	55	346	6.1	102	2.4	333	426
R.	270	23	.40	17	12	55	[m] 77	8.9	100	2.3	92	427
R.	504	26	.27	98	17	50	320	6.6	104	1.5	315	428
R.	523	27	.2	106	16	47	342	5.9	102	1.5	331	429
R.	493	29	.24	108	14	42	349	5.6	84	1.2	327	430
R.	492	30	.30	104	13	53	351	4.3	90	2.4	313	431
R.	468	31	.20	106	13	42	354	5.6	76	1.0	318	432
R.	833	30	Tr.	108	35	148	322	37	296	2.0	414	433
R.	640	42	Tr.	21	16	185	[n] 91	28	296	1.0	117	434
R.	816	27	.20	101	32	151	327	34	280	1.3	384	435
R.	450	30	Tr.	93	24	30	332	7.6	76	2.0	331	436
F.	172	16	.07	39	6.8	7.6	140	9.0	12	4.3	125	437
F.	1,256	19	.15	64	44	332	130	93	622	1.1	340	438
H	154	9.4	.09	46	2.0	8.3	144	2.4	10	Tr.	123	439
F.	2,941	18	.18	159	109	777	307	181	1,510	Tr.	844	440

[m] Includes equivalent of 22 parts per million of carbonate (CO_3).
[n] Includes equivalent of 41 parts per million of carbonate (CO_3).

Ground and surface

No.	Description
	VOLUSIA COUNTY—continued
441	New Smyrna, 2 miles west of, on De Land Road. Flowing well 4 inches in diameter and 182 feet deep; owned by East Coast Milling Co. July 28, 1923.
442	New Smyrna, 3 miles west of, on De Land Road. Flowing well 4 inches in diameter and 187 feet deep; owned by Mineral Well farm. July 28, 1923.
443	Orange City. 10-inch drilled well 157 feet deep; owned by A. B. Granger. Mar. 9, 1924.
444	Orange City. 3-inch drilled well 167 feet deep; owned by Wm. Laws, jr. June, 1924.
445	Ormond. 4-inch drilled well 183 feet deep; owned by Ormond Supply Co. July 8, 1923.
446	Seabreeze. 6-inch drilled well 181 feet deep; owned by municipality; the water after treatment is used for public supply. July 5, 1923.
447	Seabreeze; municipal supply. Water from No. 446 treated with 2.35 pounds of lime and 0.18 pound of soda ash to 1,000 gallons. July 28, 1923.
448	Seabreeze. Driven well 1½ inches in diameter and 55 feet deep 400 yards from Halifax River; owned by Geddes Long, Daytona Beach. July 6, 1923.
	WAKULLA COUNTY
449	Crawfordsville. 3-inch drilled well 349 feet deep in SW. ¼ SW. ¼ sec. 30, T. 3 S., R. 1 W.; owned by Wakulla County. Apr. 14, 1924.
450	Newport, 1 mile north of. Spring owned by Nathal Breun, jr., Tallahassee. Nov. 2, 1924.
451	Wakulla. Wakulla Springs, at head; discharge 3 miles downstream on Feb. 13, 1917, was 326 second-feet (Water-Supply Paper 452, p. 61). Feb. 28, 1924.
	WALTON COUNTY
452	De Funiak Springs; municipal supply. 8-inch drilled well 525 feet deep. July 17, 1923.
453	Freeport. 8-inch drilled well 180 feet deep; flowing city well; odor of hydrogen sulphide. Dec. 7, 1907.
454	Freeport. Flowing well 4 inches in diameter and 186 feet deep; owned by Blackman & McLean. Dec. 6, 1907.
	WASHINGTON COUNTY
455	Caryville. 5-inch drilled well 726 feet deep in SW. ¼ sec. 2, T. 4 N., R. 16 W.; owned by Henderson Waite Lumber Co. April 9, 1924.
456	Chipley; municipal supply. 10-inch drilled well 180 feet deep. July 18, 1923.
457	Chipley. 10-inch drilled well 160 feet deep; owned by municipality. Dec. 5, 1907.
458	Chipley. 3-inch drilled well 390 feet deep in NW. ¼ sec. 3, T. 4 N., R. 13 W.; owned by Chipley Packing Co. Apr. 2, 1924.

[a] Calculated. [d] Includes equivalent of small quantity of carbonate (CO_3).

waters of Florida—Continued

Analyses (parts per million)												No.
Analyst	Total dissolved solids at 180° C.	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate radicle (HCO_3)	Sulphate radicle (SO_4)	Chloride radicle (Cl)	Nitrate radicle (NO_3)	Total hardness as $CaCO_3$[a]	
R.	2,040	26	0.20	154	64	467	348	99	912	Tr.	647	441
F.	777	29	.07	138	25	125	354	22	272	Tr.	448	442
F.	183	10	Tr.	55	5.0	Na 5.2, K 1.0	168	8.8	9.6	4.1	158	443
H.	128	17	.08	32	4.4	4.0	104	4.6	10	Tr.	98	444
R.	603	26	.17	115	17	57	332	9.2	146	Tr.	357	445
H.	494	35	Tr.	98	20	47	337	7.6	94	Tr.	327	446
R.	291	53	.2	18	2.6	57	[c]29	10	92	1.5	56	447
H.	269	15	.83	19	9.5	54	44	21	96	3.8	86	448
H.	162	9.3	.14	42	6.7	4.8	152	1.9	9.0	Tr.	132	449
H.	216	8.3	.03	62	7.3	4.8	205	18	7.0	Tr.	185	450
H.	167	16	Tr.	39	9.6	5.7	154	11	8.0	Tr.	137	451
F.	94	17	.07	18	8.6	2.7	[d] 91	6.2	2.2	.43	80	452
D.	110	20	.01	21	7.8	7.7	[d]115	5.7	2.3	--------	84	453
D.	144	-------	.05	23	8	[e]8.8	[d]122	7	2	--------	90	454
H.	196	45	.06	31	16	3.7	173	12	1.8	Tr.	143	455
F.	126	15	.08	38	2.8	2.4	[d]127	2.8	2.5	.15	106	456
D.	123	12	.17	38	.5	3.9	[d]132	1.0	2.4	.35	98	457
H.	128	14	.11	37	.4	7.4	134	1.8	2.5	Tr.	94	458

[c] Includes equivalent of 9.6 parts per million of carbonate (CO_3).