DEPARTMENT OF THE INTERIOR
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GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 340—K

STREAM-GAGING STATIONS
AND
PUBLICATIONS RELATING TO WATER RESOURCES
1885–1913

PART XI. PACIFIC COAST BASINS IN CALIFORNIA

COMPILED BY B. D. WOOD

Part of Water-Supply Paper 340

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CONTENTS.

	Page.
Introduction	III
How Government reports may be obtained or consulted	III
Stream-flow reports	IV
Principal streams	131
Gaging stations	131
Reports on water resources of the Pacific coast of California	139
Publications of United States Geological Survey	139
Water-supply papers	139
Annual reports	142
Bulletins	144
Geologic folios	144
Miscellaneous reports	146
Geological Survey hydrologic reports of general interest	IX
Water-supply papers	IX
Professional papers	XVI
Annual reports	XVI
Bulletins	XVIII
Index by areas and subjects	XIX
Index of streams	XXI

STREAM-GAGING STATIONS AND PUBLICATIONS RELATING TO WATER RESOURCES, 1885-1913.

Compiled by B. D. Wood.

INTRODUCTION.

Investigation of water resources by the United States Geological Survey has consisted in large part of measurements of the volume of flow of streams and studies of the conditions affecting that flow, but it has comprised also investigation of such closely allied subjects as irrigation, water storage, water powers, underground waters, and quality of waters. Most of the results of these investigations have been published in the series of water-supply papers, but some have appeared in the bulletins, professional papers, monographs, and annual reports.

The results of stream-flow measurements are now published annually in 12 parts, each part covering an area whose boundaries coincide with natural drainage features as indicated below:

Part I. North Atlantic basins.
II. South Atlantic and eastern Gulf of Mexico basins.
III. Ohio River basin.
IV. St. Lawrence River basin.
V. Upper Mississippi River and Hudson Bay basins.
VI. Missouri River basin.
VII. Lower Mississippi River basin.
VIII. Western Gulf of Mexico basins.
IX. Colorado River basin.
X. Great Basin.
XI. Pacific basins in California.
XII. North Pacific basins.

HOW GOVERNMENT REPORTS MAY BE OBTAINED OR CONSULTED.

Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below.

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C. The edition printed for free distribution is, however, small and is soon exhausted.

2. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C., who will on application furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

4. Complete sets are available for consultation in the local offices of the water-resources branch of the Geological Survey, as follows:

Albany, N. Y., Room 18, Federal Building.
Atlanta, Ga., Post Office Building.
St. Paul, Minn., Old Capitol Building.
Madison, Wis., Capitol Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 302 Chamber of Commerce Building.
Salt Lake City, Utah, Federal Building.
Boise, Idaho, 615 Idaho Building.
Phoenix, Ariz., 417 Fleming Building.
Portland, Oreg., 416 Couch Building.
Tacoma, Wash., Federal Building.
San Francisco, Cal., 328 Customhouse.
Los Angeles, Cal., Federal Building.
Santa Fe., N. Mex., Capitol Building.
Honolulu, Hawaii, Kapiolani Building.

A list of the Geological Survey's publications will be sent on application to the Director of the United States Geological Survey, Washington, D. C.

STREAM-FLOW REPORTS.

Stream-flow records have been obtained at more than 1,550 points in the United States and have been published in the reports tabulated below:

Stream-flow data in reports of the United States Geological Survey.

[A=Annual Report; B=Bulletin; WS=Water-Supply Paper.]

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge and descriptive information	1884 to Sept., 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
WS 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
WS 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
WS 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
WS 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.

Stream-flow data in reports of the United States Geological Survey—Continued.

Report.	Character of data.	Year.
WS 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
WS 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
WS 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
WS 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
WS 75	Monthly discharge	1901.
WS 82 to 85	Complete data	1902.
WS 97 to 100	do	1903.
WS 124 to 135	do	1904.
WS 165 to 178	do	1905.
WS 201 to 214	do	1906.
WS 241 to 252	do	1907–8.
WS 261 to 272	do	1909.
WS 281 to 292	do	1910.
WS 301 to 312	do	1911.
WS 321 to 332	do	1912.
WS 351 to 362 [a]	do	1913.

[a] In preparation.

NOTE.—No data regarding stream flow are given in the 15th and 17th annual reports.

The records at most of the stations discussed in these reports extend over a series of years, and miscellaneous measurements at many points other than regular gaging stations have been made each year. An index of the reports containing records obtained prior to 1904 has been published in Water-Supply Paper 119.

The following table gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1913. The data for any particular station will, in general, be found in the reports covering the years during which the station was maintained or in special reports. For example, data for Machias River at Whitneyville, Me., 1903 to 1913, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, and 351, which contain records for the New England streams from 1903 to 1913. Results of miscellaneous measurements are published by drainage basins.

Numbers of water-supply papers containing results of stream measurements, 1899–1913.

	1899[a]	1900[b]	1901	1902	1903	1904	1905	1906	1907–8	1909	1910	1911	1912	1913
North Atlantic coast	35	47, [c] 48	65, 75	82	97	[d] 124, [e] 125 [f] 126	[d] 165, [e] 166 [f] 167	[d] 201, [e] 202 [f] 203	241	261	281	301	321	351
South Atlantic coast and eastern Gulf of Mexico	[g] 35, 36	48	65, 75	[g] 82, 83	[g] 97, 98	[f] 126, 127	[f] 167, 168	[f] 203, 204	242	262	282	302	322	352
Ohio River basin	36	48, [h] 49	65, 75	83	98	128	169	205	243	263	283	303	323	353
St. Lawrence River and Great Lakes	36	49	65, 75	[i] 82, 83	97	129	170	206	244	264	284	304	324	354
Hudson Bay and Upper Mississippi River	36	49	[j] 65, 66, 75	[j] 83, 85	[j] 98, 99, [k] 100	[j] 128, 130	171	207	245	265	285	305	325	355
Missouri River	[l] 36, 37	49, [m] 50	66, 75	84	99	130, [n] 131	172	208	246	266	286	306	326	356
Lower Mississippi River	37	50	[j] 65, 66, 75	[j] 83, 84	[j] 98, 99	[j] 128, 131	[j] 169, 173	[j] 205, 209	247	267	287	307	327	357
Western Gulf of Mexico	37	50	66, 75	84	99	132	174	210	248	268	288	308	328	358
Colorado River	[o] 37, 38	50	66, 75	85	100	133	175, [p] 177	211	249	469	289	309	329	359
Great Basin	38, [q] 39	51	66, 75	85	100	133, [r] 134	176, [r] 177	212, [r] 213	250, [r] 251	270, [r] 271	290, [r] 291	310	330	360
California	38, [s] 39	51	66, 75	85	100	134	177	213	251	271	291	311	331	361
North Pacific coast	38	51	66, 75	85	100	135	[t] 177, 178	214	252	272	292	312	[u] 332	[u] 362

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39.
[b] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52.
[c] Wissahickon and Schuylkill rivers to James River.
[d] New England rivers only.
[e] Hudson River to Delaware River, inclusive.
[f] Susquehanna River to Yadkin River, inclusive.
[g] James River only.
[h] Scioto River.
[i] Lake Ontario and tributaries to St. Lawrence River proper.
[j] Tributaries of Mississippi from east.
[k] Hudson Bay only.
[l] Gallatin River.
[m] Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.
[n] Platte and Kansas rivers.
[o] Green and Gunnison rivers and Grand River above junction with Gunnison.
[p] Below junction with Gila.
[q] Mohave River only.
[r] Great Basin in California, excepting Truckee and Carson drainage basins.
[s] Kings and Kern rivers only.
[t] Rogue, Umpqua, and Siletz rivers only.
[u] In three parts: *A*, Pacific basins in Washington and Upper Columbia River; *B*, Snake River basin; *C*, Lower Columbia River and Pacific basins in Oregon.

In these papers and in the following lists the stations are arranged in downstream order. The main stem of any river is determined by measuring or estimating its drainage area—that is, the headwater stream having the largest drainage area is considered the continuation of the main stream, and local changes in name and lake surface are disregarded. All stations from the source to the mouth of the main stem of the river are presented first, and the tributaries in regular order from source to mouth follow, the streams in each tributary basin being listed before those of the next basin below.

The exceptions to this rule occur in the records for Mississippi River, which are given in four parts, as indicated on page III, and in the records for large lakes, where it is simpler to take up the streams in regular order around the rim of the lake than to cross back and forth over the lake surface.

PART XI.—PACIFIC COAST BASINS IN CALIFORNIA.

PRINCIPAL STREAMS.

The rivers draining into the Pacific Ocean from California include Tia Juana, Sweetwater, San Diego, Bernardo, San Luis Rey, and Los Angeles rivers, draining areas to the south of San Francisco Bay; San Joaquin River, whose chief tributaries are Kern, Kings, Merced, Tuolumne and Stanislaus rivers; Sacramento River, whose principal tributaries are Pit, Feather, and American; and Russian, Eel, Mad, and Klamath rivers, which flow into the ocean north of San Francisco Bay. Except Klamath River, which receives the drainage from a small area in Oregon, and a few streams in Oregon that flow into Goose Lake, at the head of Pit River, all the streams in this division are entirely in California.

In addition to the list of gaging stations and the annotated list of publications relating specifically to the section, these pages contain a similar list of reports that are of general interest in many sections and cover a wide range of hydrologic subjects, and also brief references to reports published by State and other organizations. (See p. 146.)

GAGING STATIONS.

NOTE.—Dash following a date indicates that the station was being maintained June 30, 1913; period after date indicates discontinuance.

DRAINAGE BASINS SOUTH OF SAN FRANCISCO BAY.

Tia Juana River:
- Cottonwood Creek and Dulzura conduit near Jamul, Cal., 1905–
- Pine Valley Creek near Jamul, Cal., 1906–1908.

Sweetwater River near Descanso, Cal., 1905–
San Diego River at Lakeside, Cal., 1905–
San Diego River near Santee, Cal., 1912–
- Boulder Creek at Cuyamaca reservoir near Lakeside, Cal., 1912–
- Boulder Creek at mouth near Lakeside, Cal., 1912–
- San Diego flume at diverting dam near Lakeside, Cal., 1912–
- San Diego flume near Lakeside, Cal., 1907–

Santa Ysabel Creek (head of San Dieguito River) near Ramona, Cal., 1912–
Santa Ysabel Creek near Escondido, Cal., 1905–1912.
San Dieguito River at Bernardo, Cal., 1912–
- East San Pasqual ditch near Escondido, Cal., 1912.
- West San Pasqual ditch near Escondido, Cal., 1912.

San Luis Rey River at diversion flume, 1894–1899.
San Luis Rey River near Mesa Grande, Cal., 1911–

[1] For special reports on stream measurements in California, see Water-Supply Papers 298–300. (See p. 142.)

San Luis Rey River near Pala, Cal., 1903–1911.
San Luis Rey River at Pala, Cal., 1912.
San Luis Rey River at Bonsall, Cal., 1912–
San Luis Rey River near Oceanside, Cal., 1912–
Escondido Mutual Water Co.'s canal near Nellie, Cal., 1905–1912.
Rincon Indian Reservation ditch near Valley Center, Cal., 1912.
Pala Indian Reservation canal at Pala, Cal., 1912.
Temecula Creek (head of Santa Margarita River) near Temecula, Cal., 1905–6.
Santa Ana River and power canal near Mentone, Cal., 1896–
Highlands or North Fork canal at intake weir, San Bernardino County, Cal., 1896–1904.
Redlands or South Fork canal at Sand Box weir, San Bernardino County, Cal., 1896–1904.
Mill Creek in canyon near headworks of Crafton canal, Cal., 1896–1905.
Mill Creek at Forest Home, Cal., 1903–
Waterman Canyon Creek near San Bernardino, Cal., 1911–
Devil Canyon Creek near San Bernardino, Cal., 1911–
Lytle Creek at mouth of canyon, Cal., 1894–1901.
Lytle Creek near San Bernardino, Cal., 1904–
Temescal Creek near Rincon, Cal., 1899.
Coldwater Creek above dam, Riverside County, Cal., 1899.
San Antonio Creek near Upland, Cal., 1901–
San Gabriel River above Fish Fork, near Azusa, Cal., 1900–1901; 1910; 1912. (Low-water records.)
San Gabriel River and canals near Azusa, Cal., 1895–
Pacific Light & Power Co.'s canal near Azusa, Cal., 1896–
West branch of North Fork of San Gabriel River at weir, 1911.
North branch of North Fork of San Gabriel River at weir, 1911.
West Fork of San Gabriel River above North Fork, Cal., 1900.
Coldwater Creek at weir above mouth, 1900.
Fish Fork of San Gabriel River near Azusa, Cal., 1900–1901; 1910; 1912. (Low-water record.)
Iron Fork of San Gabriel River near Azusa, Cal., 1900–1901; 1910; 1912. (Low-water record.)
Los Angeles River at Los Angeles, Cal., 1896–1900.
Arroyo Seco near Pasadena, Cal., 1910–
Malibu Creek near Calabasas, Cal., 1903–1906.
Triunfo Creek near Calabasas, Cal., 1903–1906.
Santa Clara River at Fillmore, Cal., 1911–12.
Piru Creek near Piru, Cal., 1911–
Sespe Creek at Sespe, Cal., 1911–
Santa Paula Creek near Santa Paula, Cal., 1911–
Ventura River near Nordhoff, Cal., 1911–
Ventura River near Ventura, Cal., 1911–
San Roqui Creek, Santa Barbara County, Cal., 1890.
San Jose Creek, Santa Barbara County, Cal., 1890.
Loma Abajo River, Santa Barbara County, Cal., 1890.
Gato Creek at mouth, Santa Barbara County, Cal., 1890.
Santa Ynez River near Santa Barbara, Cal., 1903–1908; 1910–
Santa Ynez River near Lompoc, Cal., 1906–
Mono Creek at Mono dam site near Santa Barbara, Cal., 1902–1904.
Santa Maria River near Santa Maria, Cal., 1903–1905.

Salinas River near Salinas, Cal., 1900–1901.
Nacimiento Creek near Bryson, Cal., 1901.
San Antonio River near Jolon, Cal., 1900–1901.
San Lorenzo Creek near King City, Cal., 1900–1903; 1911–12.
Arroya Seco near Soledad, Cal., 1901–
Pajaro River at Watsonville, Cal., 1911–

SAN FRANCISCO BAY.

Minor streams.

Coyote River near Madrone, Cal., 1902–

San Joaquin River basin.

San Joaquin River near North Fork, Cal., 1910–
San Joaquin River near Friant, Cal., 1907–
San Joaquin River at Hamptonville, Cal., 1878–1884.
San Joaquin River at Herndon, Cal., 1891–1909.
San Joaquin River near Newman, Cal., 1912–
Tulare Lake in Kings County, Cal., 1906–
Kern River near Kernville, Cal., 1912–
Kern River at Kernville, Cal., 1905–
Kern River Power Co.'s canal at Kernville, Cal., 1910–
Kern River at Isabella, Cal., 1910–
Kern River at Rio Bravo ranch, Cal., 1878–1884.
Kern River near Bakersfield, Cal., 1893–
South Fork of Kern River near Onyx, Cal., 1911–
South Fork of Kern River at Isabella, Cal., 1910–
Erskine Creek near Isabella, Cal., 1911–
Caliente Creek at base of foothills, Kern County, 1878–1884.
Basin Creek near Havilah, Cal., 1911–
Tejon House Creek at Tejon ranch house, Cal., 1895–6.
San Emigdio Creek at San Emigdio ranch house, Cal., 1894–5.
Poso Creek at base of foothills, Kern County, Cal., 1878–1884.
White River at base of foothills, Tulare County, Cal., 1878–1884.
White River near Hot Springs, Cal., 1911–
Deer Creek at base of foothills, Tulare County, Cal., 1878–1884.
Deer Creek at Hot Springs, Cal., 1910–
Tyler Creek near Hot Springs, Cal., 1911–
Tule River at Portersville, Cal., 1878–1884.
Tule River near Portersville, Cal., 1901–
North Fork of Middle Fork of Tule River near Springville, Cal., 1909–
South Fork of Middle Fork of Tule River near Springville, Cal., 1909–
Bear Creek near Springville, Cal., 1911–
South Fork of Tule River near Success, Cal., 1910–
Kaweah River at Wachumna Hill, Cal., 1878–1884.
Kaweah River near Three Rivers, Cal., 1903–
North Fork of Kaweah River at Kaweah, Cal., 1910–
South Fork of Kaweah River near Three Rivers, Cal., 1911–

San Joaquin River tributaries—Continued.
Kings River at Suspension Bridge, Cal., 1895.
Kings River near Sanger, Cal., 1895–
Kings River at Slate Point, Cal., 1878–1884.
Kings River at Kingsburg, Cal., 1891–1904.
North Fork of Kings River:
Dinkey Creek near Ockenden, Cal., 1910–
Big Creek near Tollhouse, Cal., 1911–
Rush Creek near Ockenden, Cal., 1910–
Big Creek near Shaver, Cal., 1910–
Pitman Creek near Shaver, Cal., 1910–
North Fork of San Joaquin River near North Fork, Cal., 1910–11.
Crane Valley reservoir near North Fork, Cal., 1910–
South Fork Creek near North Fork, Cal., 1910–
South Fork ditch near North Fork, Cal., 1910.
Whisky Creek near North Fork, Cal., 1910–
Cascadel Creek near North Fork, Cal., 1910–
Fresno River at base of foothills, Madera County, Cal., 1878–1884.
Fresno River near Knowles, Cal., 1911–
Nelder Creek near Fresno Flats, 1910–
North Fork of Fresno River near Sugar Pine, Cal., 1910–
Chowchilla Creek at base of foothills, near Buchanan, Cal., 1878–1884.
Mariposa Creek at base of foothills, Mariposa County, Cal., 1878–1884.
Bear Creek at base of foothills, Merced County, Cal., 1878–1884.
Merced River at Yosemite, Cal., 1904–1909; 1912–
Merced River near Merced Falls, Cal., 1901–
Merced River at Merced Falls, Cal., 1878–1884.
Merced River near Newman, Cal., 1912.
Tenaya Creek near Yosemite, Cal., 1904–1909; 1912–
Yosemite Creek at Yosemite, Cal., 1904–1909; 1912–
South Fork of Merced River at Wawona, Cal., 1910–
Big Creek near Wawona, Cal., 1910–11.
Tuolumne River at Hetch Hetchy Valley dam site, 1901.
Tuolumne River near Lagrange, Cal., 1895–
Modesto canal near Lagrange, Cal., 1903–
Turlock canal near Lagrange, Cal., 1899–
Lagrange (Yosemite) Water & Power Co.'s canal near Lagrange, Cal., 1908–
Tuolumne River at Modesto, Cal., 1878–1884; 1891–1897.
Cherry River at Eleanor trail crossing, 1901.
Eleanor Creek at Eleanor trail crossing, 1901.
Jawbone Creek near Tuolumne, Cal., 1910–
Corral Creek near Groveland, Cal., 1910–
South Fork of Tuolumne River near Groveland, Cal., 1910–
Clavey River near Tuolumne, Cal., 1910–
Indian Creek near Tuolumne, Cal., 1910–11.
North Fork of Tuolumne River near Tuolumne, Cal., 1910–11.
Hunter Creek near Tuolumne, Cal., 1910–
Stanislaus River at Knights Ferry, Cal., 1903–
Stanislaus and San Joaquin Water Co.'s canal at Knights Ferry, Cal., 1904–

San Joaquin River tributaries—Continued.
Stanislaus River at Oakdale, Cal., 1878–1884; 1895–1900.
Middle Fork of Stanislaus River at Sand Bar Flat, near Avery, Cal., 1905–
Relief Creek near Baker Station, Cal., 1910–
Rose Creek near Jupiter, Cal., 1910–
Knight Creek near Jupiter, Cal., 1910–
South Fork of Stanislaus River near Confidence, Cal., 1911–
South Fork of Stanislaus River near Columbia, Cal., 1910–
Calaveras River at Jenny Lind, Cal., 1907–
Calaveras River near Bellota, Cal., 1878–1884.
Mokelumne River at Electra, Cal., 1901; 1903–
Mokelumne River at Lone Star Mill, Cal., 1878–1884.
Mokelumne River near Clements, Cal., 1904–
Mokelumne River at Lodi, Cal., 1891.
Middle Fork of Mokelumne River at West Point, Cal., 1911–
South Fork of Mokelumne River near Railroad Flat, Cal., 1911–
Licking Fork of Mokelumne River near Railroad Flat, Cal., 1911–
Dry Creek near Ione, Cal., 1911–12.
Dry Creek at base of foothills, San Joaquin County, Cal., 1878–1884.
North Fork of Cosumnes River (head of Cosumnes River) near Eldorado, Cal., 1911–
North Fork of Cosumnes River near Pleasant Valley, Cal., 1906–7.
Cosumnes River at Michigan Bar, Cal., 1907–
Cosumnes River below Michigan Bar, Cal., 1878–1884.
Sly Park Creek at Park, Cal., 1906.

Sacramento River basin.

Sacramento River at Castella, Cal., 1910–
Sacramento River at Antler, Cal., 1910–11.
Sacramento River at Jellys Ferry, Cal., 1895–1902.
Sacramento River near Red Bluff, Cal., 1902–
Sacramento River at Red Bluff, Cal., 1894–1896.
Sacramento River at Collinsville, Cal., 1878–1885.
Pit River near Canby, Cal., 1904–5.
Pit River near Bieber, Cal., 1904–1908.
Pit River at Henderson, Cal., 1910–
Pit River near Ydalpom, Cal., 1910–
Goose Lake:
Drews Creek near Lakeview, Oreg., 1909–
Dog Creek near Lakeview, Oreg., 1912–
Cottonwood Creek near Lakeview, Oreg., 1908–
Thomas Creek near Lakeview, Oreg., 1912–
South Fork of Pit River near Ivy, Cal., 1904–5.
West Valley Creek, near Likely, Cal., 1904–5.
Ash Creek at Adin, Cal., 1904–5.
Fall River at Fall River mills, Cal., 1912–
Hat Creek at Hawkin's ranch near Hat Creek, Cal., 1911–
Hat Creek at Hat Creek, Cal., 1910–
Rising River near Cassel, Cal., 1911–
Burney Creek near Burney, Cal., 1911–

Sacramento River tributaries—Continued.
Pit River tributaries—Continued.
Kosk Creek near Henderson, Cal., 1910–
Montgomery Creek at Montgomery Creek, Cal., 1911–
Squaw Creek near Ydalpom, Cal., 1911–
McCloud River near Gregory, Cal., 1902–1908.
McCloud River at Baird, Cal., 1910–
Clear Creek near Shasta, Cal., 1911–
Cow Creek at Millville, Cal., 1911–
Clover Creek at Millville, Cal., 1911–
Little Cow Creek at Palo Cedro, Cal., 1911–
Bear Creek near Millville, Cal., 1911–
Cottonwood Creek:
North Fork of Cottonwood Creek at Ono, Cal., 1907–
Mill Creek near Los Molinos, Cal., 1909–
Deer Creek near Vina, Cal., 1911–
Stony Creek near Fruto, Cal., 1901–1912.
Little Stony Creek near Lodoga, Cal., 1907–
Feather River, North Fork (head of Feather River) above Prattville, Cal., 1905–1907.
Feather River, North Fork, below Prattville, Cal., 1905–
Feather River, North Fork, at Big Bar, Cal., 1911–
Feather River, North Fork, at Big Bend, Cal., 1905–1908.
Feather River at Oroville, Cal., 1902–
Hamilton Branch near Prattville, Cal., 1905–1907.
Butt Creek at Butte Valley, Cal., 1905–
Indian Creek near Crescent Mills, Cal., 1906–1909; 1911–
Spanish Creek at Keddie, Cal., 1911–
Middle Fork of Feather River at Cromberg, Cal., 1910–
Middle Fork of Feather River near Oroville, Cal., 1911–
Grizzly Creek near Beckwith, Cal., 1905–6.
South Fork of Feather River at Enterprise, Cal., 1911–
Palermo Land & Water Co.'s canal at Enterprise, Cal., 1911–
Yuba River, Middle Fork (head of Yuba River) at Freeman's bridge near North San Juan, Cal., 1900.
Yuba River, Middle Fork, near North San Juan, Cal., 1910–
Yuba River near Smartsville, Cal., 1903–
Yuba River at Parks Bar bridge, near Smartsville, Cal., 1900.
Oregon Creek (tributary to Middle Fork of Yuba) near North San Juan, Cal., 1910–
North Fork of Yuba River near Sierra City, Cal., 1911–
North Fork of Yuba River at Goodyear Bar, Cal., 1910–
North Fork of Yuba River near North San Juan, Cal., 1900.
North Fork of North Fork of Yuba River at Downieville, Cal., 1910–
Rock Creek at Goodyear Bar, Cal., 1910–
Goodyear Creek at Goodyear Bar, Cal., 1910–
Bear River and Pacific Gas & Electric Co.'s power canal near Colfax, Cal., 1911–
Bear River at Van Trent, Cal., 1904–
American River, North Fork (head of American River) near Colfax, Cal., 1911–

Sacramento River tributaries—Continued.
American River at Fairoaks, Cal., 1904–
Middle Fork of American River near East Auburn, Cal., 1911–
Rubicon River at Rubicon Springs, Cal., 1910–1912.
Rubicon River near Quintette, Cal., 1909–1912.
Little Rubicon River near Rubicon Springs, Cal., 1910–11.
Little South Fork of Rubicon River at sawmill near Quintette, Cal., 1910–1912.
Little South Fork of Rubicon River below Gerlé Creek near Quintette, Cal., 1910–1912.
Little South Fork of Rubicon River at mouth near Quintette, Cal., 1909–1911.
Little South Fork ditch at sawmill near Quintette, Cal., 1910–1912.
Gerlé Creek near Rubicon Springs, Cal., 1910–1912.
Pilot Creek near Quintette, Cal., 1910–1912.
Pilot Creek ditch near Quintette, Cal., 1910–1912.
South Fork of American River at Kyburz, Cal., 1906–7.
South Fork of American River near Kyburz, Cal., 1906.
South Fork of American River below Kyburz, Cal., 1907.
South Fork of American River near Placerville, Cal., 1911–
Clear Lake in Lake County, Cal., 1874–1900.
Cache Creek at Lower Lake, Cal., 1901–
Cache Creek at Yolo, Cal., 1903–
Putah Creek near Guenoc, Cal., 1904–1906.
Putah Creek at Winters, Cal., 1905–

STREAMS NORTH OF SAN FRANCISCO BAY.

Russian River basin.

Russian River near Ukiah, Cal., 1911–
Russian River at Geyserville, Cal., 1910–
East Fork of Russian River near Ukiah, Cal., 1911–

Mattole River basin.

Mattole River near Petrolia, Cal., 1911–

Eel River basin.

South Eel River (main stream) at Hearst, Cal., 1910–
Eel River at Two Rivers (near Laytonville), Cal., 1911–
Eel River at Scotia, Cal., 1910–
Middle Eel River near Covelo, Cal., 1911–
South Fork of Eel River at Garberville, Cal., 1911–
Van Duzen River at Bridgeville, Cal., 1911–
Yager Creek at Carlotta, Cal., 1911–

Mad River basin.

Mad River near Arcata, Cal., 1910–

Redwood Creek basin.

Redwood Creek near Korbel, Cal., 1911–
Redwood Creek at Orick, Cal., 1911–

Klamath River basin.

Williamson River (head of Klamath River) above Spring Creek, near Chiloquin, Oreg., 1908–1910; 1912–
Williamson River at Chiloquin, Oreg., 1911–
Upper Klamath Lake near Klamath Falls, Oreg., 1904–
Link River at Klamath Falls, Oreg., 1904–
Lower Klamath Lake near Brownell, Cal., 1912–
Klamath River below Klamath Falls, Oreg., 1907–1909.
Klamath River at Keno, Oreg., 1904–
Klamath River near Happy Camp, Cal., 1911–
Klamath River near Requa, Cal., 1910–
Miller Creek near Crescent, Oreg., 1911–
Sprague River near Yainax, Oreg., 1912–
Sprague River at Chiloquin, Oreg., 1911–
Sycan River near Silverlake, Oreg., 1905–6.
Sycan River near Yainax, Oreg., 1911–
Wood River at Fort Klamath, Oreg., 1911–
Fourmile Creek near Odessa, Oreg., 1912.
Lost River near Clear Lake, Cal., 1904–1909.
Lost River at Olene, Oreg., 1904; 1907–1912.
Lost River at Wilson Bridge near Olene, Oreg., 1912.
Lost River near Merrill, Oreg., 1904–1909.
Tule Lake near Merrill, Oreg., 1904–1912.
Miller Creek near Lorella, Oreg., 1909–
Shasta River near Montague, Cal., 1911–
East Fork of Scott River (head of Scott River) near Callahan, Cal., 1910–1912.
Scott River at Callahan, Cal., 1911–
Scott River near Scott Bar, Cal., 1911–
Indian Creek near Happy Camp, Cal., 1911–
Reeve-Davis Consolidated Mining Co.'s flume near Happy Camp, Cal., 1911–
Salmon River at Somesbar, Cal., 1911–
Trinity River near Trinity Center, Cal., 1910–
Trinity River at Lewiston, Cal., 1911–
Trinity River near China Flat, Cal., 1911–
Trinity River at Hoopa, Cal., 1911–
Coffee Creek at Coffee, Cal., 1910–
East Fork of Trinity River near Trinity Center, Cal., 1910–
Swift Creek near Trinity Center, Cal., 1910–
North Fork of Trinity River at Helena, Cal., 1911–
South Fork of Trinity River near China Flat, Cal., 1911–

Smith River basin.

Smith River, Middle Fork (head of Smith River) near Crescent City, Cal., 1911–
North Fork of Smith River near Crescent City, Cal., 1911–
South Fork of Smith River near Crescent City, Cal., 1911–

REPORTS ON WATER RESOURCES OF THE PACIFIC SLOPE OF CALIFORNIA.

PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

WATER-SUPPLY PAPERS.

*17. Irrigation near Bakersfield, Cal., by C. E. Grunsky. 1898. 96 pp., 16 pls.

*18. Irrigation near Fresno, Cal., by C. E. Grunsky. 1898. 94 pp., 14 pls. 10c.

*19. Irrigation near Merced, Cal., by C. E. Grunsky. 1899. 59 pp., 11 pls. 15c.

Water-Supply Papers 17, 18, and 19 discuss the development of irrigation in the San Joaquin Valley, outline physiographic features, and give history of the various irrigation districts. Chiefly of historic interest as indicated by dates of publication.

*43. Conveyance of water in irrigation canals, flumes, and pipes, by Samuel Fortier. 1901. 86 pp., 15 pls. 15c.

Describes the location and construction of various types of canals for irrigation.

45. Water storage on Cache Creek, Cal., by A. E. Chandler. 1901. 48 pp., 10 pls. 15c.

Discusses topography, precipitation, stream measurements, underground waters, and irrigation works in Cache Creek basin; includes description of Clear Lake.

46. Physical characteristics of Kern River, Cal., by F. H. Olmsted, and reconnaissance of Yuba River, Cal., by Marsden Manson. 1901. 57 pp., 8 pls. 10c.

Describes topography of Kern River basin, gives estimates of daily and monthly discharge, and discusses possible utilization of storage sites and development of power. The second paper in the report gives similar data for Yuba River (tributary through Feather River to the Sacramento).

57. Preliminary list of deep borings in the United States, Part I (Alabama-Montana), by N. H. Darton. 1902. 60 pp. (See No. 149.) 5c.

No. 57 contains information as to depth, diameter, yield, and head of water in borings more than 400 feet deep; under head "Remarks" gives information concerning temperature, quality of water, purposes of boring, etc.

*58. Storage of water on Kings River, Cal., by J. B. Lippincott. 1902. 100 pp., 32 pls. 15c.

Discusses physical features, rainfall, stream flow, evaporation, and seepage and power development; includes chapter (by Lewis A. Hicks) on the generation and transmission of electric power and installation of pumping plants.

*59. Development and application of water near San Bernardino, Colton, and Riverside, Cal., Part I, by J. B. Lippincott. 1902. 95 pp., 11 pls.

*60. Development and application of water near San Bernardino, Colton, and Riverside, Cal., Part II, by J. B. Lippincott. 1902. 96–140 pp. 15c.

Nos. 59 and 60 describe topography, soil, climate, crops, canals, wells, and pumping plants; discuss briefly the manufacture of Portland cement in southern California.

*81. California hydrography, by J. B. Lippincott. 1903. 448 pp., 1 pl. 25c.

A collection of published records of stream flow "hitherto much scattered, some of them out of print and difficult to secure," brought together as a book of reference for engineers and irrigators.

86. Storage reservoirs on Stony Creek, Cal., by Burt Cole. 1903. 62 pp., 16 pls. 15c.

Discusses briefly water supply of Glenn County, as related to population, industry, irrigation districts, the proposed Stony Creek forest reserve, and storage sites on Grindstone, Salt, Briscoe, and Stony Creeks.

89. Water resources of the Salinas Valley, Cal., by Homer Hamlin. 1904. 91 pp., 12 pls. 15c.

Describes briefly the geography, topography, general and economic geology, climate, water supply, and irrigation of the Salinas Valley.

*112. Underflow tests in the drainage basin of Los Angeles River, by Homer Hamlin. 1905. 55 pp., 7 pls. 5c.

Discusses conditions under which ground water occurs in arid regions, and fluctuations in water level; describes machinery and methods used in sinking test wells and the results obtained at each station.

116. Water problems of Santa Barbara, Cal., by J. B. Lippincott. 1905. 99 pp., 8 pls. 10c.

Reviews earlier work in Santa Barbara region and describes near-by and distant water supplies, including Ventura and Santa Ynez rivers; discusses the quality of the water of the Santa Ynez (giving analyses) and the available reservoir sites.

*137. Development of underground waters in the eastern coastal-plain region of southern California, by W. C. Mendenhall. 1905. 140 pp., 7 pls. 35c.

*138. Development of underground waters in the central coastal-plain region of southern California, by W. C. Mendenhall. 1905. 162 pp., 5 pls. 25c.

*139. Development of underground waters in the western coastal-plain region of southern California, by W. C. Mendenhall. 1905. 105 pp., 8 pls. 25c.

Three reports discussing the topography, crops, irrigation systems, and wells, and the effects of development and drought on changes in ground-water level. The area covered by these reports includes the Anaheim, Santa Ana, Downey, Las Bolsas, Santa Monica, and Redondo quadrangles in Orange and Los Angeles counties.

140. Field measurements of the rate of movement of underground waters, by C. S. Slichter. 1905. 122 pp., 15 pls. 15c.

Contains chapters on measurements of underflow of Rio Hondo and San Gabriel River and at the Narrows of Mohave River.

142. The hydrology of San Bernardino Valley, Cal., by W. C. Mendenhall. 1905. 124 pp., 12 pls. 25c.

Discusses rainfall, soils, artesian areas, temperature, and chemical character of the ground waters, gives tables of flow of Santa Ana River, Mill Creek, and other streams, and lists of wells in Redlands and San Bernardino quadrangles.

146. Proceedings of second conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1905. 267 pp. 15c. [Inquiries concerning this report should be addressed to the Reclamation Service.] Contains:

A brief account of the organization of the hydrographic (water resources) branch and the Reclamation Service, reports of conferences and committees, circulars of instruction, and many brief reports on subjects closely related to reclamation, and a bibliography of technical papers by members of the service.

A report on "Underground waters of southern California," by W. C. Mendenhall. Gives an account of early irrigation by use of surface waters, the development of artesian wells for irrigation, and discusses the origin, distribution, and character of the artesian waters, the causes of fluctuations in the supply, and the need of moderation in use.

146. Proceedings of second conference, etc.—Continued.

A report on the Klamath project, by J. B. Lippincott. Describes Klamath River and its principal tributaries and Lost River and Tule Lake. Describes also the irrigable lands in Butte Valley around Tule and Lower Klamath Lakes and in the Klamath Indian Reservation.

A brief report on "Pumping underground water in southern California," by F. C. Finkle. Discusses underground reservoirs, the source, extent, and methods of replenishment of the water supply, and describes the efficiency of pumps and the development of electric power for pumping.

147. Destructive floods in the United States in 1904, by E. C. Murphy and others. 1905. 206 pp., 18 pls. 15c. Contains:

Sacramento River flood, California, from report of S. G. Bennett. Gives accounts of flood on Sacramento River; describes briefly the streams of the basin, precipitation, discharge, damages, and prevention of future losses.

149. Preliminary list of deep borings in the United States, second edition with additions, by N. H. Darton. 1905. 175 pp. 10c.

Gives by States (and within the States by counties), location, depth, diameter, yield, height of water, and other valuable information concerning wells 400 feet or more in depth; includes all wells listed in Water-Supply Papers 57 and 61; mentions also principal publications relating to deep borings.

*162. Destructive floods in the United States in 1905, with a discussion of flood discharge and frequency and an index to flood literature by E. C. Murphy and others. 1906. 105 pp., 4 pls. 15c.

Gives estimates of flood flow and frequency (p. 85) for Tuolumne River at Lagrange, Kern River at Rio Brava Ranch, and Kings River at Sanger; contains also index to literature on floods on American streams.

*213. Surface water supply of California, 1906, by W. B. Clapp, with a section on ground-water levels in southern California, by W. C. Mendenhall. 1907. 219 pp., 4 pls. 25c.

Gives the results of a series of measurements of the fluctuation of ground-water levels made during 1904, 1905, and 1906. The wells were "so selected that they would be evenly distributed over the various basins which together make up the lowland areas of southern California, and would thus give an adequate basis for conclusions as to conditions in each of these basins."

*219. Ground waters and irrigation enterprises in the foothill belt, southern California, by W. C. Mendenhall. 1908. 180 pp., 9 pls. 50c.

Describes the general geologic conditions, physical features, rainfall, storage facilities, character and condition of subterranean reservoirs, measures for conservation of waters, and the ground waters by districts; discusses fluctuation in ground-water levels and gives results of measurements; describes irrigation enterprises and systems and gives statistics of wells.

*222. Preliminary report on the ground waters of San Joaquin Valley, Cal., by W. C. Mendenhall. 1908. 52 pp., 1 pl. 10c.

Describes the geography of the valley, the rocks, soils, surface waters, and the origin, circulation, quantity accessibility, and development of the underground waters; gives notes on water supply by counties.

237. The quality of the surface waters of California, by Walton Van Winkle and F. M. Eaton. 1910. 142 pp., 1 pl. 20c.

Describes geography, climate, industrial development, and drainage, and gives results of mineral analyses of the river waters.

251. Surface-water supply of the United States, 1907–8, Part XI, California. 35c.

Contains a section (pp. 338–348) on "fluctuations in ground-water levels in the valley of southern California." The measurements here published form a continuation of those published in Water-Supply Paper 213. They were made at irregular intervals during 1907–8 on the same wells that were measured during the earlier period, except for a few wells that had become inaccessible.

274. Some stream waters of the western United States, with chapters on sediment carried by the Rio Grande and the industrial applicaton of water analyses, by Herman Stabler. 1911. 188 pp. 15c.

Describes collection of samples, plan of analytical work, and methods of analyses; discusses soap-consuming power of waters, water softening, boiler waters, and water for irrigation; gives results of analyses of waters of Sacramento, Pit, Feather, Yuba, and American rivers, Stony and Putah creeks, and Tuolumne River; also of Link River, Oreg., in Klamath River basin.

295. Gazetteer of surface waters of California, Part I: Sacramento River basin, by B. D. Wood. 1912. 99 pp. 10c.

*296. Gazetteer of surface waters of California, Part II: San Joaquin River basin, by B. D. Wood. 1912. 102 pp. 10c.

*297. Gazetteer of surface waters of California, Part III: Pacific coast and Great Basin streams, by B. D. Wood. 1913. 244 pp. 20c.

Nos. 295–297 embrace descriptions of streams and lakes named on best available maps of California.

*298. Water resources of California, Part I: Stream measurements in Sacramento River basin, by H. D. McGlashan and F. F. Henshaw. 1912. 411 pp., 8 pls. 30c.

*299. Water resources of California, Part II: Stream measurements in San Joaquin River basin, by H. D. McGlashan and H. J. Dean. 1912. 439 pp., 7 pls. 50c.

*300. Water resources of California, Part III: Stream measurements in the Great Basin and Pacific coast river basins, by H. D. McGlashan and H. J. Dean. 1913. 956 pp., 4 pls. 55c.

Nos. 298–300 comprise all data concerning stream flow in California available up to September 30, 1912. The reports describe the drainage basins, precipitation, temperature, and forests, and give the results of work at gaging stations. See also Nos. 295–297.

ANNUAL REPORTS.

Each of the papers contained in the annual reports was also issued in separate form. Annual reports are distributed free by the Geological Survey as long as its stock lasts. An asterisk (*) indicates that this stock has been exhausted. Many of the papers so marked, however, may be purchased from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C.

*Tenth Annual Report of the United States Geological Survey, 1888–89, J. W. Powell, Director. 1890. 2 parts. *Pt. II, Irrigation, viii, 123 pp. 35c.

Makes a preliminary report on the organization and prosecution of the survey of the arid lands for purposes of irrigation; includes an account of the methods of topographic and hydraulic work, the segregation work on reservoir rites and irrigable lands, field and office methods, and brief descriptions of the topography of some of of the river basins.

Eleventh Annual Report of the United States Geological Survey, 1889–90, J. W. Powell, Director. 1891. 2 parts. Pt. II, Irrigation, pp. xiv, 395, 30 plates and maps. $1.25. Contains:

*Hydrography, pp. 1–110. Discusses scope of work, methods of stream measurement, rainfall and evaporation, and describes the more important streams.

*Engineering, pp. 111–200. Defines the scope of the work and gives an account of the surveys in the Sun River basin and in the Arkansas, Rio Grande, California, Lahontan, Utah, and Snake River divisions.

*The arid lands, pp. 201–289. Includes statement of the Director to the House Committee on Irrigation, extracts from the constitutions of States relating to irrigation.

*Topography, pp. 291–343. Comprises reports of the topographic surveys in California, Nevada, Colorado, Idaho, Montana, and New Mexico, and a report on reservoir sites.

*Irrigation literature, pp. 345–388. Gives a list of books and pamphlets on irrigation and allied subjects mainly contained in the library of the United States Geological Survey.

Twelfth Annual Report of the United States Geological Survey, 1890–91, J. W. Powell, Director. 1891. 2 parts. Pt. II, Irrigation, xviii, 576 pp., 93 pls. $2. Contains:

*Hydrography of the arid regions, by F. H. Newell, pp. 213–361, Pls. LVIII–CVI. Discusses the available water supply of the arid regions, the duty of water, flood waters, relation of rainfall to river flow; classifies the drainage basins; and describes the rivers of the Missouri, Arkansas, Rio Grande, Colorado, Sacramento, and San Joaquin basins, and the principal streams of the Great Basin in Nevada and Utah and the Snake River drainage.

*Report upon the location and survey of reservoir sites during the fiscal year ending June 30, 1891, by A. H. Thompson, pp. 1–212, Pls. LIV–LVII. Describes reservoir sites on Yuba River, Deer Creek, Mokelumne River, Pacific Valley Creek, Big Canyon Creek, Hull Creek, Granite Lake, Cherry River, Lake Vernon, Big Meadows north of Hetch Hetchy Valley, and in Hetch Hetchy, California; for each reservoir site gives the location, height of dam, area inclosed by top contour, approximate contents of reservoir, position of irrigable lands, and areas of segregated lands.

Thirteenth Annual Report of the United States Geological Survey, 1891–92, J. W. Powell, Director. 1892. (Pts. II and III, 1893.) 3 parts. Pt. III, Irrigation, pp. xi, 486, 77 pls. $1.85. Contains:

*Engineering results of irrigation survey, by H. N. Wilson, pp. 351–437, Pls. CXLVII–CLXXXII. Describes results of surveys of high Sierra reservoirs—Bear Valley, Kennedy's Meadow, Kennedy's Lake, Lake Eleanor, Tuolumne Meadow, Lake Tenaya, and Lake Yosemite—and of Bear Lake, Cal.

*Sixteenth Annual Report of the United States Geological Survey, 1894–95. 4 parts. *Pt. II. Papers of an economic character, pp. xix, 598, 43 pls. $1.25. Contains:

*The public lands and their water supply, by F. H. Newell, pp. 457–533, Pls. XXXV–XXXIX. Describes general character of the public lands, the lands disposed of (railroad, grant, and swamp lands, and private miscellaneous entries), lands reserved (Indian, forest, and military reservations), the vacant lands, and the rate of disposal of vacant lands; discusses the streams, wells, and reservoirs as sources of water supply; gives details for each State.

Eighteenth Annual Report, United States Geological Survey, 1896–97, Charles D. Walcott, Director. 1897. 5 parts in 6 volumes. *Pt. IV, Hydrography, pp. x, 756, 102 pls. $1.75. Contains:

*Reservoirs for irrigation, by J. D. Schuyler, pp. 617–740, Pls. XLVII–CII. Describes rock fill, masonry, and earthenware dams, and hydraulic dam construction in California, and projected reservoirs; gives tables for reservoir capacities and areas.

Twentieth Annual Report of the United States Geological Survey, 1898–99, Charles D. Walcott, Director. 1899. (Parts II, III, IV, V, and VII, 1900.) 7 parts in 8 vols. and separate case for maps with Pt. V. *Pt. V, Forest Reserves, pp. xix, 498, 159 pls., 8 maps in separate case. $2.80. Contains:

*The San Gabriel Forest Reserve, by J. B. Leiberg, pp. 411–428, Pls. CXLIII–CXLVI. The San Bernardino Forest Reserve, by J. B. Leiberg, pp. 429–454, Pls. CXLVII–CLIII. The San Jacinto Forest Reserve, by J. B. Leiberg, pp. 455–478, Pls. CLIV–CLIX. Describes general topographic features of forest reserves and drainage, part of which is by streams tributary to the Pacific, and part by streams that are lost in the sands of the Mohave and other deserts.

BULLETINS.

An asterisk (*) indicates that the Geological Survey's stock of the paper is exhausted. Many of the papers so marked may be purchased from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C.

264. Record of deep-well drilling for 1904, by M. L. Fuller, E. F. Lines, and A. C. Vetch. 1905. 106 pp. 10c.

Discusses the importance of accurate well records to the driller, to owners of oil, gas, and water wells, and to the geologist; describes the general methods of work; gives tabulated records of wells in California, and detailed records of wells in Monterey and San Diego counties, California. These wells were selected because they give definite stratigraphic information.

*298. Record of deep-well drilling for 1905, by M. L. Fuller and Samuel Sanford. 1906. 209 pp. 25c.

Gives an account of progress in the collection of well records and samples; contains tabulated records of wells in California; and detailed records of wells in Alameda, Fresno, Kern, Orange, San Luis Obispo, Santa Clara, Tulare, and Ventura counties. The wells of which detailed sections are given were selected because they afford valuable stratigraphic information.

GEOLOGIC FOLIOS.

Under the plan adopted for the preparation of a geologic map of the United States the entire area is divided into small quadrangles, bounded by certain meridians and parallels, and these quadrangles, which number several thousand, are separately surveyed and mapped.[1] The unit of survey is also the unit of publication, and the maps and description of each quadrangle are issued in the form of a folio. When all the folios are completed they will constitute a Geologic Atlas of the United States.

A folio is designated by the name of the principal town or of a prominent natural feature within the quadrangle. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped and several pages of descriptive text. The text explains the maps and describes the topographic and geologic features of the country and its mineral products. The topographic map shows roads, railroads, waterways, and, by contour lines, the shapes of the hills and valleys and the height above sea level of all points in the quadrangle. The areal-geology map shows the distribution of the various rocks at the surface. The structural-geology map shows the relations of the rocks to one another underground. The economic-geology map indicates the location of mineral deposits that are commercially valuable. The artesian-water map shows the depth to underground-water horizons. Economic-geology and artesian-water maps are included in folios if the condi-

[1] Index maps showing areas in California covered by topographic maps and by geologic folios will be mailed on receipt of request addressed to the Director, U. S. Geological Survey, Washington, D. C.

tions in the areas mapped warrant their publication. The folios are of special interest to students of geography and geology and are valuable as guides in the development and utilization of mineral resources.

The folios numbered from 1 to 163, inclusive, are published in only one form (18 by 22 inches), called the library edition. Some of the folios that bear numbers higher than 163 are published also in an octavo edition (6 by 9 inches). Owing to a fire in the Geological Survey building May 18, 1913, the stock of geologic folios was more or less damaged by fire and water, but 80 or 90 per cent of the folios are usable. They will be sold at the uniform price of 5 cents each, with no reduction for wholesale orders. This rate applies to folios in stock from 1 to 184, inclusive, also to the library edition of folio 186. The library edition of folios 185, 187, and higher numbers sells for 25 cents a copy, except that some folios which contain an unusually large amount of matter sell for 50 cents a copy. The octavo edition of folio 185 and higher numbers sells for 50 cents a copy. If 34 folios selling at 25 cents each (or their equivalent in higher-priced folios) are ordered at one time a discount of 40 per cent is allowed; $5.10 is the minimum amount accepted at this rate.

All the folios contain descriptions of the drainage of the quadrangles. The folios in the following list contain also brief discussions of the underground waters in connection with the economic resources of the areas and more or less information concerning the utilization of the water resources.

An asterisk (*) indicates that the stock of the folio is exhausted.

*17. Marysville folio.

Includes, under "Economic geology," a section on the water supply.

*39. Truckee folio.

Describes the general and economic geology of an area extending westward and northward from Truckee Lake, drained by streams a part of which flow through Yuba and American rivers to the Sacramento, and part through Lake Tahoe to the Great Basin; discusses the topography and geology and, under "Economic geology," the mineral springs which occur abundantly throughout the area.

*66. Colfax folio.

Under "General features" describes the streams and hydraulic mining ditches, and under "Economic geology" gives a brief paragraph on the water supply, mentioning the springs.

101. San Luis folio.

Under "Economic geology" describes mineral springs.

*138. Redding folio.

Describes the relief and drainage, the stratigraphic and historical geology and, under "Economic geology," discusses briefly irrigation and artesian water.

*163. Santa Cruz folio.

Under "Economic geology" describes the water resources, including streams, springs, flowing wells, and reservoirs.

MISCELLANEOUS REPORTS.

Other Federal bureaus and State and other organizations have from time to time published reports relating to the water resources of various sections of the country. Notable among those pertaining to the Pacific slope of California are the reports of the State engineer and surveyor, the State conservation commission, and the State water commission.

The following reports deserve special mention:

Hall, W. H., Physical data and statistics of California, 1886.

Report of the Commissioner of Public Works to the Governor of California, 1895.

Report of the State Water Commission of California, 1912.

GEOLOGICAL SURVEY HYDROLOGIC REPORTS OF GENERAL INTEREST.

The following list comprises reports not readily classifiable by drainage basins and covering a wide range of hydrologic investigations:

WATER-SUPPLY PAPERS.

*1. Pumping water for irrigation, by H. M. Wilson. 1896. 57 pp., 9 pls.

Describes pumps and motive powers, windmills, water wheels, and various kinds of engines; also storage reservoirs to retain pumped water until needed for irrgiation.

*3. Sewage irrigation, by G. W. Rafter. 1897. 100 pp., 4 pls. (See Water-Supply Paper 22.) 10c.

Discusses methods of sewage disposal by intermittent filtration and by irrigation; describes utilization of sewage in Germany, England, and France, and sewage purification in the United States.

*8. Windmills for irrigation, by E. C. Murphy. 1897. 49 pp., 8 pls. 10c.

Gives results of experimental tests of windmills during the summer of 1896 in the vicinity of Garden, Kansas; describes instruments and methods and draws conclusions.

*14. New tests of certain pumps and water lifts used in irrigation, by O. P. Hood. 1898. 91 pp., 1 pl. 10c.

Discusses efficiency of pumps and water lifts of various types.

*20. Experiments with windmills, by T. O. Perry. 1899. 97 pp., 12 pls. 15c.

Includes tables and descriptions of wind wheels, makes comparisons of wheels of several types, and discusses results.

*22. Sewage irrigation, Part II, by G. W. Rafter. 1899. 100 pp., 7 pls. 15c.

Gives résumé of Water-Supply Paper No. 3; discusses pollution of certain streams, experiments on purification of factory wastes in Massachusetts, value of commercial fertilizers, and describes American sewage disposal plants by States; contains bibliography of publications relating to sewage, utilization, and disposal.

32. Water resources of Puerto Rico, by H. M. Wilson. 1899. 48 pp., 17 pls. 15c.

Describes briefly topography, climate, rivers, irrigation methods, soils, forestation, water power, and transportation facilities.

*41. The windmill; its efficiency and economic use, Part I, by E. C. Murphy. 1901. 72 pp., 14 pls. 15c.

*42. The windmill; its efficiency and economic use, Part II, by E. C. Murphy. 1901. 75 pp., 2 pls. 10c.

Nos. 41 and 42 give details of results of experimental tests with windmills of various types.

*43. Conveyance of water in irrigation canals, flumes, and pipes, by Samuel Fortier. 1901. 86 pp., 15 pls. 15c.

44. Profiles of rivers in the United States, by Henry Gannett. 1901. 100 pp., 11 pls. 15c.

Gives elevations and distance along rivers of the United States; also brief descriptions of many of the streams. Arrangement geographic. Many river profiles are scattered through other reports on surface waters in various parts of the United States.

*56. Method of stream measurement. 1901. 51 pp., 12 pls. 15c.

Describes the methods used by the Survey in 1901–2. (See also Nos. 64, 94, and 95.)

57. Preliminary list of deep borings in the United States, Part I (Alabama-Montana), by N. H. Darton. 1902. 60 pp. (See No. 149.) 5c.

61. Preliminary list of deep borings in the United States, Part II (Nebraska-Wyoming), by N. H. Darton. 1902. 67 pp. 5c.

Nos. 57 and 61 contain information as to depth, diameter, yield, and head of water in borings more than 400 feet deep; under head "Remarks" gives information concerning temperature, quality of water, purposes of boring, etc. The lists are arranged by States, and the States are arranged alphabetically. A second revised edition was published in 1905 as Water-Supply Paper 149 (q. v.). 5c.

64. Accuracy of stream measurements, by E. C. Murphy. 1902. 99 pp., 4 pls. (See No. 95.) 10c.

Describes methods of measuring velocity of water and of measuring and computing stream flow and compares results obtained with the different instruments and methods; describes also experiments and results at the Cornell University hydraulic laboratory. A second, enlarged edition published as Water-Supply Paper 95.

*67. The motions of underground waters, by C. S. Slichter. 1902. 106 pp., 8 pls. 15c.

Discusses origin, depth, and amount of underground waters; permeability of rocks and porosity of soils; causes, rates, and laws of motions of underground water; surface and deep zones of flow; and recovery of waters by open wells and artesian and deep wells; treats of the shape and position of the water table; gives simple methods of measuring yield of flowing well; describes artesian wells at Savannah, Ga.

72. Sewage pollution in the metropolitan area near New York City and its effect on inland water resources, by M. O. Leighton. 1902. 75 pp., 8 pls. 10c.

Defines "normal" and "polluted" waters and discusses the damage resulting from pollution.

77. The water resources of Molokai, Hawaiian Islands, by Waldemar Lindgren. 1903. 62 pp., 4 pls. 10c.

Describes briefly the topography, geology, coral reefs, climate, soils, vegetation, forests, fauna of the island, the springs, running streams and wells, and discusses the utilization of the surface and underground waters.

*80. The relation of rainfall to run-off, by G. W. Rafter. 1903. 104 pp. 10c.

Treats of measurements of rainfall and laws and measurements of stream flow; gives rainfall run-off and evaporation formulas; discusses effect of forests on rainfall and run-off.

87. Irrigation in India (second edition), by H. M. Wilson. 1903. 238 pp., 27 pls. 25c.

First edition was published in Part II of the Twelfth Annual Report.

93. Proceedings of first conference of engineers of Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1904. 361 pp. 25c.

Contains, in addition to an account of the organization of the hydrographic [water-resources] branch of the United States Geological Survey and the reports of the conferences, the following papers of more or less general interest:

Limits of an irrigation project, by D. W. Ross.
Relation of Federal and State laws to irrigation, by Morris Bien.
Electrical transmission of power for pumping, by H. A. Storrs.
Correct design and stability of high masonry dams, by Geo. Y. Wisner.
Irrigation surveys and the use of the planetable, by J. B. Lippincott.
The use of alkaline waters for irrigation, by Thomas A. Means.

*94. Hydrographic manual of the United States Geological Survey, prepared by E. C. Murphy, J. C. Hoyt, and G. B. Hollister. 1904. 76 pp., 3 pls. 10c.

Gives instruction for field and office work relating to measurements of stream flow by current meters. (See also No. 95.)

95. Accuracy of stream measurements (second, enlarged edition), by E. C. Murphy. 1904. 169 pp., 6 pls.

Describes methods of measuring and computing stream flow and compares results derived from different instruments and methods. (See also No. 94.)

103. A review of the laws forbidding pollution of inland waters in the United States, by E. B. Goodell. 1904. 120 pp. (See No. 152.)

Explains the legal principles under which antipollution statutes become operative, quotes court decisions to show authority for various deductions, and classifies according to scope the statutes enacted in the different States.

110. Contributions to the hydrology of eastern United States, 1904; M. L. Fuller, geologist in charge. 1905. 211 pp., 5 pls. 10c.

Contains the following reports of general interest. The scope of each paper is indicated by its title.

Description of underflow meter used in measuring the velocity and direction of underground water, by Charles S. Slichter.

The California or "stovepipe" method of well construction, by Charles S. Slichter.

Approximate methods of measuring the yield of flowing wells, by Charles S. Slichter.

Corrections necessary in accurate determinations of flow from vertical well casings, from notes furnished by A. N. Talbot.

Experiment relating to problems of well contamination at Quitman, Ga., by S. W. McCallie.

Notes on the hydrology of Cuba, by M. L. Fuller.

113. The disposal of strawboard and oil-well wastes, by R. L. Sackett and Isaiah Bowman. 1905. 52 pp., 4 pls. 5c.

The first paper discusses the pollution of streams by sewage and by trade wastes, describes the manufacture of strawboard and gives results of various experiments in disposing of the waste. The second paper describes briefly the topography, drainage, and geology of the region about Marion, Ind., the contamination of rock wells and of streams by waste oil and brine.

114. Underground waters of eastern United States; M. L. Fuller, geologist in charge. 1905. 285 pp., 18 pls. 25c.

Contains report on "Occurrence of underground waters," by M. L. Fuller, discussing sources, amount, and temperature of waters, permeability and storage capacity of rocks, water-bearing formations, recovery of water by springs, wells, and pumps, essential conditions of artesian flows, and general conditions affecting underground waters in eastern United States.

115. River surveys and profiles made during 1903, by W. C. Hall and J. C. Hoyt. 1905. 115 pp., 4 pls. 10c.

Contains results of surveys made to determine location of undeveloped power sites.

119. Index to the hydrographic progress reports of the United States Geological Survey, 1888 to 1903, by J. C. Hoyt and B. D. Wood. 1905. 253 pp. 15c.

120. Bibliographic review and index of papers relating to underground waters published by the United States Geological Survey, 1879–1904, by M. L. Fuller. 1905. 128 pp. 10c.

Scope indicated by title.

*122. Relation of the law to underground waters, by D. W. Johnson. 1905. 55 pp. 5c.

Defines and classifies underground waters, gives common-law rules relating to their use, and cites State legislative acts affecting them.

140. Field measurements of the rate of movement of underground waters, by C. S. Slichter. 1905. 122 pp., 15 pls. 15c.

Discusses the capacity of sand to transmit water, describes measurements of underflow in Rio Hondo, San Gabriel, and Mohave River valleys, Cal., and on Long Island, N. Y.; gives results of tests of wells and pumping plants, and describes stovepipe method of well construction.

143. Experiments on steel-concrete pipes on a working scale, by J. H. Quinton. 1905. 61 pp., 4 pls.

Scope indicated by title.

144. The normal distribution of chlorine in the natural waters of New York and New England, by D. D. Jackson. 1905. 31 pp., 5 pls. 10c.

Discusses common salt in coast and inland waters, salt as an index to pollution of streams and wells, the solutions and methods used in chlorine determinations, and the use of the normal chlorine map; gives charts and tables for chlorine in the New England States and New York.

145. Contributions to the hydrology of eastern United States, 1905; M. L. Fuller, geologist in charge. 1905. 220 pp., 6 pls.

Contains brief reports of general interest as follows:

Drainage of ponds into drilled wells, by Robert E. Horton. Discusses efficiency, cost, and capacity of drainage wells and gives statistics of such wells in southern Michigan.

Construction of so-called fountain and geyser springs, by Myron L. Fuller.

A convenient gage for determining low artesian heads, by Myron L. Fuller.

146. Proceedings of second conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1905. 267 pp. 15c.

Contains brief account of the organization of the hydrographic [water-resources] branch and the Reclamation Service, reports of conferences and committees, circulars of instruction, and many brief reports on subjects closely related to reclamation, and a bibliography of technical papers by members of the service. Of the papers read at the conference those listed below (scope indicated by title) are of more or less general interest:

Proposed State code of water laws, by Morris Bien.

Power engineer applied in irrigation problems, by O. H. Ensign.

Estimates on tunneling in irrigation projects, by A. L. Fellows.

Collection of stream-gaging data, by N. C. Grover.

Diamond-drill methods, by G. A. Hammond.

Mean-velocity and area curves, by F. W. Hanna.

Importance of general hydrographic data concerning basins of streams gaged, by R. E. Horton.

Effect of aquatic vegetation on stream flow, by R. E. Horton.

Sanitary regulations governing construction camps, by M. O. Leighton.

Necessity of draining irrigated land, by Thos. H. Means.

Alkali soils, by Thos. H. Means.

Cost of stream-gaging work, by E. C. Murphy.

Equipment of a cable gaging station, by E. C. Murphy.

Silting of reservoirs, by W. M. Reed.

Farm-unit classification, by D. W. Ross.

Cost of power for pumping irrigating water, by H. A. Storrs.

Records of flow at current-meter gaging stations during the frozen season, by F. H. Tillinghast.

147. Destructive floods in United States in 1904, by E. C. Murphy. 15c.

Contains a brief account of "A method of computing cross-section area of waterways," including formulas for maximum discharge and areas of cross section.

149. Preliminary list of deep borings in the United States, second edition with additions, by N. H. Darton. 1905. 175 pp. 10c.

Gives by States (and within the States by counties) location, depth, diameter, yield, height of water, and other available information concerning wells 400 feet or more in depth; includes all wells listed in Water-Supply Papers 57 to 61; mentions also principal publications relating to deep borings.

150. Weir experiments, coefficients, and formulas, by R. E. Horton. 1906. 189 pp., 38 pls. (See Water-Supply Paper 200.) 15c.

Scope indicated by title.

151. Field assay of water, by M. O. Leighton. 1905. 77 pp., 4 pls. 10c.

Discusses methods, instruments, and reagents used in determining turbidity, color, iron, chlorides, and hardness in connection with the studies of the quality of water in various parts of the United States.

152. A review of the laws forbidding pollution of inland waters in the United States (second edition), by E. B. Goodell. 1905. 149 pp.

Scope indicated by title.

155. Fluctuations of the water level in wells, with special reference to Long Island, N. Y., by A. C. Veatch. 1906. 83 pp., 9 pls. 25c.

Includes general discussion of fluctuation due to rainfall and evaporation, barometric changes, temperature changes in rivers, changes in lake level, tidal changes, effects of settlement, irrigation, dams, underground-water developments, and to indeterminate causes.

*160. Underground water papers, 1906; M. L. Fuller, geologist in charge. 1906. 104 pp., 1 pl.

Gives account of work in 1905; lists of publications relating to underground waters, and contains the following brief reports of general interest:

Significance of the term "artesian," by Myron L. Fuller.
Representation of wells and springs on maps, by Myron L. Fuller.
Total amount of free water in the earth's crust, by Myron L. Fuller.
Use of fluorescein in the study of underground waters, by R. B. Dole.
Problems of water contamination, by Isaiah Bowman.
Instances of improvement of water in wells, by Myron L. Fuller.

*162. Destructive floods in the United States in 1905, with a discussion of flood discharge and frequency and an index to flood literature, by E. C. Murphy and others. 1906. 105 pp., 4 pls. 15c.

163. Bibliographic review and index of underground-water literature published in the United States in 1905, by M. L. Fuller, F. G. Clapp, and B. L. Johnson. 1906. 130 pp. 15c.

Scope indicated by title.

*179. Prevention of stream pollution by distillery refuse, based on investigations at Lynchburg, Ohio, by Herman Stabler. 1906. 34 pp., 1 pl. 10c.

Describes grain distillation, treatment of slop, sources, character, and effects of effluents on streams; discusses filtration, precipitation, fermentation, and evaporation methods of disposal of wastes without pollution.

180. Turbine water-wheel tests and power tables, by R. E. Horton. 1906. 134 pp.; 2 pls. 20c.

Scope indicated by title.

*185. Investigations on the purification of Boston sewage, by C–E. A Winslow and E. B. Phelps. 1906. 163 pp. 25c.

Discusses composition, disposal, purification, and treatment of sewages and recent tendencies in sewage-disposal practice in England, Germany, and the United States; describes character of crude sewage at Boston, removal of suspended matter, treatment in septic tanks, and purification in intermittent sand filtration and coarse material; gives bibliography.

*186. Stream pollution by acid-iron wastes, a report based on investigations made at Shelby, Ohio, by Herman Stabler. 1906. 36 pp., 1 pl. 10c.

Gives history of pollution by acid-iron wastes at Shelby, Ohio, and resulting litigation; discusses effect of acid-iron liquors on sewage purification processes, recovery of copper as from acid-iron wastes, and other processes for removal of pickling liquor.

*187. Determination of stream flow during the frozen season, by H. K. Barrows and R. E. Horton. 1907. 93 pp., 1 pl. 15c.

Scope indicated by title.

*189. The prevention of stream pollution by strawboard waste, by E. B. Phelps. 1906. 29 pp., 2 pls. 5c.

Describes manufacture of strawboard, present and proposed methods of disposal of waste liquors, laboratory investigations of precipitation and sedimentation, and field studies of amounts and character of water used, raw material and finished product, and mechanical filtration.

*194. Pollution of Illinois and Mississippi rivers by Chicago sewage (a digest of the testimony taken in the case of the State of Missouri *v.* The State of Illinois and the Sanitary District of Chicago), by M. O. Leighton. 1907. 369 pp., 2 pls. 40c.

Scope indicated by amplification of title.

*196. Water supply of Nome region, Seward Peninsula, Alaska, 1906, by J. C. Hoyt and F. F. Henshaw. 1907. 52 pp., 6 pls. 15c.

Gives results of measurements of flow of Alaskan streams, discusses available water supply for ditch and pipe lines and power development; presents notes for investors.

*200. Weir experiments, coefficients, and formulas, revision of paper No. 150, by R. E. Horton. 1907. 195 pp., 38 pls. 35c.

Scope indicated by title.

*218. Water-supply investigations in Alaska, 1906–7 (Nome and Kougarok regions, Seward Peninsula; Fairbanks district, Yukon-Tanana region), by F. F. Henshaw and C. C. Covert. 1908. 156 pp., 12 pls. 25c.

Describes the drainage basins, gives results of observations at the gaging stations, and discusses the water supply of the ditches and pipe lines, and possibilities of development; gives also meteorological records.

*226. The pollution of streams by sulphite-pulp waste, a study of possible remedies, by E. B. Phelps. 1908. 37 pp., 1 pl. 10c.

Describes manufacture of sulphite pulp, the waste liquors, and the experimental work leading to suggestions as to methods of preventing stream pollution.

228. Water-supply investigations of the Yukon-Tanana region, Alaska, 1907 and 1908 (Fairbanks, Circle, and Rampart districts), by C. C. Covert and C. E. Ellsworth. 1909. 108 pp., 7 pls. 20c.

Describes the drainage basins; gives results of observations at gaging stations; discusses the water supplies of the ditches and pipe lines and possibilities of hydraulic development.

*229. The disinfection of sewage and sewage filter effluents, with a chapter on the putrescibility and stability of sewage effluents, by E. B. Phelps. 1909. 91 pp., 1 pl. 15c.

Scope indicated by title.

234. Papers on the conservation of water resources. 1909. 96 pp., 2 pls. 15c.

Contains the following papers, whose scope is indicated by their titles: Distribution of rainfall, by Henry Gannett; Floods, by M. O. Leighton; Developed water powers, compiled under the direction of W. M. Steuart, with discussion by M. O. Leighton; Undeveloped water powers, by M. O. Leighton; Irrigation, by F. H. Newell; Underground waters, by W. C. Mendenhall; Denudation, by R. B. Dole and Herman Stabler; Control of catchment areas, by H. N. Parker.

*235. The purification of some textile and other factory wastes, by Herman Stabler and G. H. Pratt. 1909. 76 pp. 10c.

Discusses waste waters from wool-scouring, bleaching, and dyeing cotton yarn, bleaching cotton piece goods, and manufacture of oleomargarine, fertilizer, and glue.

236. The quality of surface waters in the United States: Part I, Analyses of waters east of the one-hundredth meridian, by R. B. Dole. 1909. 123 pp. 10c.

Describes collection of samples, method of examination, preparation of solutions, accuracy of estimates, and expression of analytical results.

238. The public utility of water powers and their governmental regulation, by René Tavernier and M. O. Leighton. 1910. 161 pp. 15c.

Discusses hydraulic power and irrigation, French, Italian, and Swiss legislation relative to the development of water powers, and laws proposed in the French Parliament, reviews work of bureau of hydraulics and agricultural improvement of the French department of agriculture, and gives résumé of Federal and State water-power legislation in the United States.

255. Underground waters for farm use, by M. L. Fuller. 1910. 58 pp., 17 pls. 15c.

Discusses rocks as sources of water supply and the relative safety of supplies from different materials; springs, and their protection; open or dug and deep wells, their location, yield, relative cost, protection, and safety; advantages and disadvantages of cisterns and combination wells and cisterns.

*257. Well-drilling methods, by Isaiah Bowman. 1911. 139 pp., 4 pls. 15c.

Discusses amount, distribution, and disposal of rainfall, water-bearing rocks, amount of underground water, artesian conditions, and oil and gas bearing formations; gives history of well drilling in Asia, Europe, and the United States; describes in detail the various methods and the machinery used; discusses loss of tools and geologic difficulties; contamination of well waters and methods of prevention; tests of capacity and measurement of depth; and costs of sinking wells.

258. Underground water papers, 1910, by M. L. Fuller, F. G. Clapp, G. C. Matson, Samuel Sanford, and H. C. Wolff. 1911. 125 pp., 2 pls. 15c.

Contains the following papers (scope indicated by titles) of general interest:
Drainage by wells, by M. L. Fuller.
Freezing of wells and related phenomena, by M. L. Fuller.
Pollution of underground waters in limestone, by G. C. Matson.
Protection of shallow wells in sandy deposits, by M. L. Fuller.
Magnetic wells, by M. L. Fuller.

*259. The underground waters of southwestern Ohio, by M. L. Fuller and F. G. Clapp, with a discussion of the chemical character of the waters, by R. B. Dole. 1912. 228 pp., 9 pls. 35c.

Describes the topography, climate, and geology of the region, the water-bearing formations, the source, mode of occurrence, and head of the waters, and municipal supplies; gives details by counties; discusses in supplement, under chemical character, method of analysis and expression of results, mineral constituents, effect of the constituents on waters for domestic, industrial, or medicinal uses, methods of purification, chemical composition; many analyses and field assays. The matter in the supplement was also published in Water-Supply Paper 254 (The underground waters of north-central Indiana).

274. Some stream waters of the western United States, with chapters on sediment carried by the Rio Grande and the industrial application of water analyses, by Herman Stabler. 1911. 188 pp. 15c.

Describes collection of samples, plan of analytical work, and methods of analyses; discusses soap-consuming power of waters, water softening, boiler waters, and water for irrigation; gives results of analyses of waters of the Rio Grande and of Pecos, Gallimas, and Hondo rivers.

*280. Gaging stations maintained by the United States Geological Survey, 1888–1910, and Survey publications relating to water resources, compiled by B. D. Wood. 1912. 102 pp. 10c.

314. Surface water supply of Seward Peninsula, Alaska, by F. F. Henshaw and G. L. Parker, with a sketch of the geography and geology by P. S. Smith, and a description of methods of placer mining by A. H. Brooks. 1913. 317 pp., 17 pls. 45c.

Contains results of work at gaging stations.

*315. The purification of public water supplies, by G. A. Johnson. 1913. 84 pp., 8 pls. 10c.

Discusses ground, lake, and river waters as public supplies, development of waterworks systems in the United States, water consumption, and typhoid fever; describes methods of filtration and sterilization of water, and municipal water softening.

*318. Water resources of Hawaii, 1909–1911, by W. F. Martin and C. H. Pierce. 1913. 552 pp., 15 pls. 50c.

Describes the general features of the Islands and gives results of measurements of streams and of observations of rainfall and evaporation; contains a gazetteer.

334. The Ohio Valley flood of March–April, 1913 (including comparisons with some earlier floods), by A. H. Horton and H. J. Jackson. 1913. 96 pp., 32 pls. 20c.

Although relating specifically to floods in the Ohio Valley, this report discusses also the causes of floods and the prevention of damage by floods.

336. Water resources of Hawaii, 1912, by C. H. Pierce and G. K. Larrison. 1914. 392 pp. 50c.

Contains results of stream measurements on the islands in 1912.

337. The effects of ice on stream flow, by William Glenn Hoyt. 1913. 76 pp., 7 pls. 15c.

Discusses methods of measuring the winter flow of streams.

PROFESSIONAL PAPERS.

*72. Denudation and erosion in the southern Appalachian region and the Monongahela basin, by L. C. Glenn. 1911. 137 pp., 21 pls. 35c.

Describes the topography, geology, drainage, forests, climate and population, and transportation facilities of the region, the relation of agriculture, lumbering, mining, and power development to erosion and denudation, and the nature, effects, and remedies of erosion; gives details of conditions in Holston, Nolichucky, French Broad, Little Tennessee, and Hiwassee river basins, along Tennessee River proper, and in the basins of the Coosa-Alabama system, Chattahoochee, Savannah, Saluda, Broad, Catawba, Yadkin, New, and Monongahela rivers.

ANNUAL REPORTS.

*Fifth Annual Report of the United States Geological Survey, 1883–84, J. W. Powell, Director. 1885. xxxvi, 469 pp., 58 pls. $2.25. Contains:

*The requisite and qualifying conditions of artesian wells, by T. C. Chamberlain, pp. 125 to 173, Pl. XXI. Scope indicated by title.

Twelfth Annual Report of the United States Geological Survey, 1890–91, J. W. Powell, Director. 1891. 2 parts. Pt. II, Irrigation, xviii, 576 pp., 93 pls. $2. Contains:

*Irrigation in India, by H. M. Wilson, pp. 368–561, Pls. CVII to CXLVI. (See Water-Supply Paper 87.)

Thirteenth Annual Report of the United States Geological Survey, 1891–92, J. W. Powell, Director. 1892. (Pts. II and III, 1893.) 3 parts. Pt. III, Irrigation, pp. xi, 486, 77 plates. $1.85. Contains:

*American irrigation engineering, by H. M. Wilson, pp. 101–349, Pls. CXI to CXLV. Discusses the economical aspects of irrigation, alkaline drainage, silt and sedimentation; gives brief history of legislation; describes perennial canals in Idaho-California, Wyoming, and Arizona; discusses water storage at reservoirs of the California and other projects, subsurface sources of supply pumping and subirrigation.

Fourteenth Annual Report of the United States Geological Survey, 1892–93, J. W. Powell, Director. 1893. (Pt. II, 1894.) 2 parts. *Pt. II, Accompanying papers, pp. xx, 597, 73 pls. $2.10. Contains:

*Potable waters of the eastern United States, by W J McGee, pp. 1 to 47. Discusses cistern water, stream waters, and ground waters, including mineral springs and artesian wells.

*Natural mineral waters of the United States, by A. C. Peale, pp. 49–88, Pls. III and IV. Discusses the origin and flow of mineral springs, the source of mineralization, thermal springs, the chemical composition and analysis of spring waters, geographic distribution, and the utilization of mineral waters; gives a list of American mineral spring resorts; contains also some analyses.

Nineteenth Annual Report of the United States Geological Survey, 1897–98, Charles D. Walcott, Director. 1898. (Parts II, III, and V, 1899.) 6 parts in 7 vols. and separate case for maps with Pt. V. *Pt. II, papers chiefly of a theoretical nature, pp. v, 958, 172 plates. $2.65. Contains:

*Principles and conditions of the movements of ground water, by F. H. King, pp. 59–294, Pls. VI to XVII. Discusses the amount of water stored in sandstone, in soil, and in other rocks, the depth to which ground water penetrates; gravitational, thermal, and capillary movements of ground waters, and the configuration of the ground-water surface; gives the results of experimental investigations on the flow of air and water through a rigid, porous media, and through sands, sandstones, and silts; discusses results obtained by other investigators, and summarizes results of observations; discusses also rate of flow of water through sand and rock, the growth of rivers, rate of filtration through soil, interference of wells, etc.

*Theoretical investigation of the motion of ground waters, by C. S. Slichter, pp. 295–384, Pls. XVII. Scope indicated by title.

Twentieth Annual Report of the United States Geological Survey, 1898–99, Charles D. Walcott, Director. 1899. (Parts II, III, IV, V, and VII, 1900.) 7 parts in 8 vols. and separate case for maps with Pt. V. *Pt. IV, Hydrography, vii, 660 pp., 75 plates. $1.40. Contains:

*Hydrography of Nicaragua, by A. P. Davis, pp. 563–637, Pls. LXIV to LXXV. Describes the topographic features of the boundary, the lake basin, and Rio San Juan; gives a brief résumé of the boundary dispute; discusses rainfall, temperaure, and relative humidity, evaporation, resources, and productions, the ship, railway, and canal projects; gives the history of the investigations by the Canal Commission, and results of measurements on the Rio Grande, on streams tributary to Lake Nicaragua, and on Rio San Juan and its tributaries.

Twenty-second Annual Report of the United States Geological Survey, 1900–1901, Charles D. Walcott, Director. 1901. (Parts III and IV, 1902.) 4 parts. Pt. IV, Hydrography, 690 pp., 65 pls. $2.20. Contains:

*Hydrography of the American Isthmus, by A. P. Davis, pp. 507–630, Pls. XXXVII to L. Describes the physiography, temperature, rainfall, and winds of Central America; discusses the hydrography of the Nicaragua Canal route and the Panama Canal route; gives estimated monthly discharges of many of the streams, rainfall, and evaporation tables at various points.

BULLETINS.

*32. Lists and analyses of the mineral springs of the United States (a preliminary study), by A. C. Peale. 1886. 235 pp.

Defines mineral waters, lists the springs by States, and gives tables of available analyses.

264. Record of deep-well drilling for 1904, by M. L. Fuller, E. F. Lines, and A. C. Veatch. 1905. 106 pp. 10c.

*298. Record of deep-well drilling for 1905, by M. L. Fuller and Samuel Sanford. 1906. 299 pp. 25c.

Bulletins 264 and 298 discuss the importance of accurate well records to the driller, to owners of oil, gas, and water wells, and to the geologist; describes the general methods of work; gives tabulated records of wells by States, and detailed records selected as affording valuable stratigraphic information.

*319. Summary of the controlling conditions of artesian flows, by Myron L. Fuller. 1908. 10c.

Describes underground reservoirs, the sources of underground waters, the confining agents, the primary and modifying factors of artesian circulation, the essential and modifying factors of artesian flow, and typical artesian systems.

*479. The geochemical interpretation of water analyses, by Chase Palmer. 1911. 31 pp. 5c.

Discusses the expression of chemical analyses, the chemical character of water and the properties of natural waters; gives a classification of waters based on property values and reacting values, and discusses the character of the waters of certain rivers as interpreted directly from the results of analyses; discusses also the relation of water properties to geologic formations, silica in river water, and the character of the water of the Mississippi and the Great Lakes and St. Lawrence River as indicated by chemical analyses.

INDEX BY AREAS AND SUBJECTS.

[A=Annual Reports; M=Monograph; B=Bulletin; P=Professional Paper; W=Water-Supply Paper; G F=Geologic Folio.]

Alaska: Surface waters ..... W 196, 218, 228, 314
Artesian waters: Essential conditions ..... A 5; B 319; W 44, 67, 114
Bibliographies[1] ..... W 119, 120, 163, 280
California: Irrigation ..... A 10 ii, 11 ii, 12 ii; W 17, 18, 19, 43, 45, 89, 137, 138, 139, 146, 219; G F 138
Quality of waters ..... W 116, 142, 237, 274
Surface waters ..... A 12 ii, 13 iii, 16 ii, 18 iv; W 45, 46, 58, 81, 86, 116, 142, 147, 162, 237, 274, 295, 296, 297, 298, 299, 300
Underground waters ..... A 16 ii; B 264, 298; W 45, 59, 60, 89, 112, 137, 138, 139, 140, 142, 146, 213, 219, 222, 251; G F 17, 39, 66, 101, 138, 163
Chemical analyses:[2] Methods and interpretation ..... W 151, 236, 259, 274; B 479
Conservation ..... W 234
Cuba: Surface, underground, and quality of waters ..... W 110
Denudation ..... P 72
Engineering methods ..... W 1, 3, 8, 20, 41, 42, 43, 56, 64, 94, 95, 110, 143, 150, 180, 187, 200, 257, 337
Floods ..... W 147, 162, 334
Hawaiian Islands: Surface waters ..... W 77, 318, 336
India: Irrigation ..... A 12 ii; W 87
Ice measurements ..... W 187, 337
Irrigation, general ..... A 10 ii, 11 ii, 12 ii, 13 iii, 16 ii; W 20, 22, 41, 42, 87
Legal aspects: Surface waters ..... W 103, 152, 238
Underground waters ..... W 122
Mineral springs: Analyses ..... A 14 ii; B 32
Origin, distribution, etc ..... A 14 ii
Lists ..... B 32; W 114
Motions of ground waters ..... A 19 ii; B 319; W 67, 110, 140, 155
Nicaragua: Surface waters ..... A 20 iv, 22 iv
Panama: Surface waters ..... A 22 iv
Pollution: By industrial wastes ..... W 179, 186, 189, 226, 235
By sewage ..... W 72, 194
Laws forbidding ..... W 103, 152
Indices of ..... W 144, 160
Porto Rico: Surface waters and irrigation ..... W 32
Profiles of rivers ..... W 44, 115

[1] Many of the reports contain brief subject bibliographies. See abstracts.

[2] Many analyses of river, spring, and well waters are scattered through publications, as noted in abstracts.

River profiles ..... W 44, 115
Sanitation; quality of waters; pollution; sewage irrigation ..... W 3, 22, 72, 103, 110, 113, 114, 144, 145, 152, 160, 179, 185, 186, 189, 194, 226, 229, 235, 236, 255, 258, 315
Sewage disposal and purification ..... W 3, 22, 72, 113, 185, 194, 229
Underground waters: Legal aspects ..... W 122
Methods of utilization ..... W 114, 255, 257
Pollution ..... W 110, 145, 160, 258
Windmill papers ..... W 1, 8, 20, 41, 42

INDEX OF STREAMS.

	Page.
American River, Cal	137
American River, Middle Fork, Cal	137
American River, North Fork, Cal	136
American River, South Fork, Cal	137
Arroyo Seco (tributary to Los Angeles River), Cal	132
Arroyo Seco (tributary to Salinas River), Cal	133
Ash Creek, Cal	135
Basin Creek, Cal	133
Bear Creek (tributary to Sacramento River), Cal	136
Bear Creek (tributary to San Joaquin River), Cal	134
Bear Creek (tributary to South Fork of Middle Fork of Tule River), Cal	133
Bear River, Cal	136
Big Creek (tributary to North Fork of Kings River), Cal	134
Big Creek (tributary to San Joaquin River), Cal	134
Big Creek (tributary to South Fork of Merced River), Cal	134
Boulder Creek, Cal	131
Burney Creek, Cal	135
Butt Creek, Cal	136
Cache Creek, Cal	137
Calaveras River, Cal	135
Caliente Creek, Cal	133
Cascadel Creek, Cal	134
Cherry River, Cal	134
Chowchilla Creek, Cal	134
Clavey River, Cal	134
Clear Creek, Cal	136
Clear Lake, Cal	137
Clover Creek, Cal	136
Coffee Creek, Cal	138
Coldwater Creek (tributary to Temescal Creek), Cal	132
Coldwater Creek (tributary to San Gabriel River), Cal	132
Corral Creek, Cal	134
Cosumnes River, Cal	135
Cosumnes River, North Fork	135
Cottonwood Creek (tributary to Tia Juana River), Cal	131
Cottonwood Creek (tributary to Sacramento River), Cal	136
Cottonwood Creek, Oreg	135
Cottonwood Creek, North Fork, Cal	136
Cow Creek, Cal	136
Cow Creek, Little, Cal	136
Coyote River, Cal	133
Crane Valley reservoir, Cal	134
Deer Creek (tributary to Tulare Lake), Cal	133
Deer Creek (tributary to Sacramento River), Cal	136
Devil Canyon Creek, Cal	132
Dinkey Creek, Cal	134
Dog Creek, Oreg	135
Drews Creek, Oreg	135
Dry Creek, Cal	135
Dulzura conduit and Cottonwood Creek, Cal	131
East Fork of Russian River, Cal	137
East Fork of Scott River, Cal	138
East Fork of Trinity River, Cal	138
East San Pasqual ditch, Cal	131
Eel River, Cal	137
Eel River, Middle, Cal	137
Eel River, South, Cal	137
Eel River, South Fork, Cal	137
Eleanor Creek, Cal	134
Erskine Creek, Cal	133
Escondido Mutual Water Co.'s canal, Cal	132
Fall River, Cal	135
Feather River, Cal	136
Feather River, Middle Fork, Cal	136
Feather River, North Fork, Cal	136
Feather River, South Fork, Cal	136
Fish Fork of San Gabriel River, Cal	132

	Page.
Fourmile Creek, Oreg	138
Fresno River, Cal	134
Fresno River, North Fork, Cal	134
Gato Creek, Cal	132
Gerle Creek, Cal	137
Goodyear Creek, Cal	136
Goose Lake, Oreg	135
Grizzly Creek, Cal	136
Hamilton Branch, Cal	136
Hat Creek, Cal	135
Highlands (North Fork) canal, Cal	132
Hunter Creek, Cal	134
Indian Creek (tributary to Clavey River), Cal	134
Indian Creek (tributary to Feather River), Cal	136
Indian Creek (tributary to Klamath River), Cal	138
Iron Fork of San Gabriel River, Cal	132
Jawbone Creek, Cal	134
Kaweah River, Cal	133
Kaweah River, North Fork, Cal	133
Kaweah River, South Fork, Cal	133
Kern River, Cal	133
Kern River Power Co.'s canal, Cal	133
Kern River, South Fork, Cal	133
Kings River, Cal	134
Kings River, North Fork, Cal	134
Klamath Lake, Lower, Oreg	138
Klamath Lake, Upper, Oreg	138
Klamath River, Cal., Oreg	138
Knight Creek, Cal	135
Kosk Creek, Cal	136
Lagrange Water & Power Co.'s canal, Cal	134
Licking Fork of Mokelumne River, Cal	135
Link River, Oreg	138
Little Cow Creek, Cal	136
Little Rubicon River, Cal	137
Little South Fork of Rubicon River, Cal	137
Little South Fork ditch, Cal	137
Little Stony Creek, Cal	136
Loma Abajo River, Cal	132
Los Angeles River, Cal	132
Lost River, Cal., Oreg	138
Lower Klamath Lake, Oreg	138
Lytle Creek, Cal	132
Mad River, Cal	137
Malibu Creek, Cal	132
Mariposa Creek, Cal	134
Mattole River, Cal	137
McCloud River, Cal	136
Mentone Power Co.'s canal, Cal. *See* Santa Ana River.	
Merced River, Cal	134
Merced River, South Fork, Cal	134
Middle Eel River, Cal	137
Middle Fork of American River, Cal	137
Middle Fork of Feather River, Cal	136
Middle Fork of Mokelumne River, Cal	135
Middle Fork of Smith River, Cal	138
Middle Fork of Stanislaus River, Cal	135
Middle Fork of Tule River, North Fork, Cal	133
Middle Fork of Tule River, South Fork, Cal	133
Middle Fork of Yuba River, Cal	136
Mill Creek (tributary to Santa Ana River), Cal	132
Mill Creek (tributary to Sacramento River), Cal	136
Miller Creek (tributary to Klamath River), Oreg	138
Miller Creek (tributary to Lost River), Oreg	138
Modesto canal, Cal	134
Mokelumne River, Cal	135
Mokelumne River, Licking Fork, Cal	135
Mokelumne River, Middle Fork, Cal	135
Mokelumne River, South Fork, Cal	135
Mono Creek, Cal	132
Montgomery Creek, Cal	136
Nacimiento Creek, Cal	133
Nelder Creek, Cal	134
North Branch of North Fork of San Gabriel River, Cal	132
North Fork canal, Cal	132
North Fork of American River, Cal	136

	Page.
North Fork of Cosumnes River, Cal	135
North Fork of Cottonwood Creek, Cal	136
North Fork of Feather River, Cal	136
North Fork of Fresno River, Cal	134
North Fork of Kaweah River, Cal	133
North Fork of Kings River, Cal	134
North Fork of Middle Fork of Tule River, Cal	133
North Fork of North Fork of Yuba River, Cal	136
North Fork of San Gabriel River, North Branch, Cal	132
North Fork of San Gabriel River, West Branch, Cal	132
North Fork of San Joaquin River, Cal	134
North Fork of Smith River, Cal	138
North Fork of Trinity River, Cal	138
North Fork of Tuolumne River, Cal	134
North Fork of Yuba River, Cal	136
North Fork of Yuba River, North Fork of, Cal	136
Oregon Creek, Cal	136
Pacific Gas & Electric Co.'s canal, Cal	136
Pacific Light & Power Co.'s canal, Cal	132
Pajaro River, Cal	133
Pala Indian Reservation canal, Cal	132
Palermo Land & Water Co.'s canal, Cal	136
Pilot Creek, Cal	137
Pilot Creek ditch, Cal	137
Pine Valley Creek, Cal	131
Piru Creek, Cal	132
Pit River, Cal	135
Pit River, South Fork, Cal	135
Pitman Creek, Cal	134
Poso Creek, Cal	133
Putah Creek, Cal	137
Redlands (South Fork) canal, Cal	132
Redwood Creek, Cal	137
Reeve Davis Consolidated Mining Co.'s ditch, Cal	138
Relief Creek, Cal	135
Rincon Indian Reservation ditch, Cal	132
Rising River, Cal	135
Rock Creek, Cal	136
Rose Creek, Cal	135
Rubicon River, Cal	137
Rubicon River, Little, Cal	137
Rubicon River, Little South Fork, Cal	137
Rush Creek, Cal	134
Russian River, Cal	137
Russian River, East Fork, Cal	137
Sacramento River, Cal	135
Salinas River, Cal	133
Salmon River, Cal	138
San Antonio Creek, Cal	132
San Antonio River, Cal	133
San Diego flume, Cal	131
San Diego River, Cal	131
San Dieguito River, Cal	131
San Emigdio Creek, Cal	133
San Gabriel River and canals, Cal	132
San Gabriel River, Fish Fork, Cal	132
San Gabriel River, Iron Fork, Cal	132
San Gabriel River, North Branch of North Fork, Cal	132
San Gabriel River, West Branch of North Fork, Cal	132
San Joaquin River, Cal	133
San Joaquin River, North Fork, Cal	134
San Jose Creek, Cal	132
San Lorenzo Creek, Cal	133
San Luis Rey River, Cal	131
San Pasqual ditch, East, Cal	131
San Pasqual ditch, West, Cal	131
San Roqui Creek, Cal	132
Santa Ana River and power canal, Cal	132
Santa Clara River, Cal	132
Santa Maria River, Cal	132
Santa Paula Creek, Cal	132
Santa Ynez River, Cal	132
Santa Ysabel Creek, Cal	131
Scott River, Cal	138
Scott River, East Fork, Cal	138
Seco, Arroyo (tributary to Los Angeles River), Cal	132
Seco, Arroyo (tributary to Salinas River), Cal	133

	Page.
Sespe Creek, Cal	132
Sly Park Creek, Cal	135
Smith River, Middle Fork, Cal	138
Smith River, North Fork, Cal	138
Smith River, South Fork, Cal	138
South Eel River, Cal	137
South Fork canal, Cal	132
South Fork Creek, Cal	134
South Fork ditch, Cal	134
South Fork ditch, Little, Cal	137
South Fork of American River, Cal	137
South Fork of Eel River, Cal	137
South Fork of Feather River, Cal	136
South Fork of Kaweah River, Cal	133
South Fork of Kern River, Cal	133
South Fork of Merced River, Cal	134
South Fork of Middle Fork of Tule River, Cal	133
South Fork of Mokelumne River, Cal	135
South Fork of Pit River, Cal	135
South Fork of Rubicon River, Little, Cal	137
South Fork of Smith River, Cal	138
South Fork of Stanislaus River, Cal	135
South Fork of Trinity River, Cal	138
South Fork of Tule River, Cal	133
South Fork of Tuolumne River, Cal	134
Spanish Creek, Cal	136
Sprague River, Oreg	138
Squaw Creek, Cal	136
Stanislaus River, Cal	134
Stanislaus River, Middle Fork, Cal	135
Stanislaus River, South Fork, Cal	135
Stanislaus & San Joaquin Water Co.'s canal, Cal	134
Stony Creek, Cal	136
Stony Creek, Little, Cal	136
Sweetwater River, Cal	131
Swift Creek, Cal	138
Sycan River, Oreg	138
Tejon House Creek, Cal	133
Temecula Creek, Cal	132
Temescal Creek, Cal	132
Tenaya Creek, Cal	134
Thomas Creek, Oreg	135
Tia Juana River, Cal	131
Trinity River, Cal	138
Trinity River, East Fork, Cal	138
Trinity River, North Fork, Cal	138
Trinity River, South Fork, Cal	138
Triunfo Creek, Cal	132
Tulare Lake, Cal	133
Tule Lake, Oreg	138
Tule River, Cal	133
Tule River, North Fork of Middle Fork, Cal	133
Tule River, South Fork of Middle Fork, Cal	133
Tule River, South Fork, Cal	133
Tuolumne River, Cal	134
Tuolumne River, North Fork, Cal	134
Tuolumne River, South Fork, Cal	134
Turlock canal, Cal	134
Tyler Creek, Cal	133
Upper Klamath Lake, Oreg	138
Van Duzen River, Cal	137
Ventura River, Cal	132
Waterman Canyon Creek, Cal	132
West Branch of North Fork of San Gabriel River, Cal	132
West Fork of San Gabriel River, Cal	132
West San Pasqual ditch, Cal	131
West Valley Creek, Cal	135
Whisky Creek, Cal	134
White River, Cal	133
Williamson River, Oreg	138
Wood River, Oreg	138
Yager Creek, Cal	137
Yosemite Creek, Cal	134
Yosemite Water & Power Co.'s canal. See La Grange Water & Power Co.'s canal.	
Yuba River, Cal	136
Yuba River, Middle Fork, Cal	136
Yuba River, North Fork, Cal	136
Yuba River, North Fork of North Fork, Cal	136