STATE OF NEVADA

BIENNIAL REPORT

OF THE

STATE ENGINEER

For the Period
July 1, 1940, to June 30, 1942, Inclusive

ALFRED MERRITT SMITH
State Engineer of Nevada

CARSON CITY, NEVADA
STATE PRINTING OFFICE  JOE FARNWORTH, SUPERINTENDENT 1942
CHAPTER VII
Civilian Defense

By JEROME A. SHAMBERGER, Director Nevada State Council of Defense

Hugh A. Shamberger, Assistant State Engineer, was elected Director of the Nevada State Council of Defense on May 8, 1941. For some months thereafter no funds were available to defray the expenses of the director. During this period the State Engineer supplied clerical help, office space, and traveling expenses. Much traveling is necessary in the performance of work by the Department of the State Engineer, and it has been to some extent economically combined with the extensive traveling that must also be done by the director. The office of the director has been established in the offices of the State Engineer, and Mr. Shamberger performs this service without additional compensation by either the State or the Government.

In this critical time of war a properly developed home front is a vital necessity. Fully realizing this, the members of the staff of the State Engineer have aided Director Shamberger in all ways possible.

Continuous assistance in many ways, through the use of a large personnel, has also been rendered by Robert A. Allen, State Highway Engineer, and the members of his efficient staff.

A paper entitled "Civilian Defense" was presented by Director Shamberger before Nevada's First Economic Conference, called by Governor E. V. Carmichael in Reno on May 8, 1942, and is herewith reproduced in full:

On March 28, 1939, an Act creating the State Council of Defense was approved by the Twenty-ninth Session of the Nevada Legislature. You will note that this was after the opening of the new term. I would like to quote a portion of the preamble to this Act:

WHEREAS, the state, county, and community councils of Nevada, cooperating with the national government, proved invaluable agencies during the war period in carrying out government requests, and in the presentation to the people of the real needs and problems of the federal government and its departments in meeting the emergencies of war; and

WHEREAS, it is the manifest duty of Nevada to cooperate with the national government in meeting such conditions and demands as may arise during the readjustment period; and

WHEREAS, the national government, through the councils of national defense, has specifically requested the continuance of the state council of defense and its subordinate and auxiliary councils for an indefinite period and ask that the same be legalized by act of the legislature.

This is the statute under which our present State, county, and local councils of defense have been set up. It provides among other things that the members of the State Council of Defense shall not exceed twenty-five; that the State Council of Defense shall have the power to prescribe the powers and duties of all county and community councils, and that all county and community councils shall be organized under and by virtue of authority of the State Council of Defense and shall be under its control and supervision.
CHAPTER VI
Common Methods of Measuring Water as Practiced in Western States

The booklet entitled “Common Methods Of Measuring Water As Practiced In Western States” which was prepared by the Office of the State Engineer in the year 1940 has proven to be a valuable aid to ranchers, miners, stockmen, and water engineers, not only in the United States, but in many foreign countries. This booklet was prepared mainly for the purpose of describing the measurement of water through the various types of weirs, orifices, and the Parshall Flume in a simple manner that could be understood by the layman. Drawings are included of the various types of weirs and orifices, together with seven discharge tables which cover all of the various types of measuring devices that would be used under ordinary conditions.

The demand for these pamphlets has been rather heavy, and over five hundred have been sent out to some thirty States outside of Nevada—Arizona, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Oklahoma, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, Washington, D.C., and Wyoming. In Nevada over one thousand copies have been distributed to water users. Requests have come from the following countries outside the United States for copies of this pamphlet: San Salvador, Central America; Mexico City, Mexico; Vancouver, British Columbia; Havana, Cuba; Caracas, Venezuela; South America; Bogota, Colombia; South America; Canada; Manila, Philippine Islands; Oporto, Douro, New Zealand; Buenos Aires, Argentina; Brisbane, Queensland, Australia; Hobart, Tasmania, Australia; Wellington, W. L., New Zealand; Pointe-A-Pierre, Trinidad; B. W. L., Honduras, T. H.

Copies of this bulletin are still available and can be furnished without cost to interested parties.
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Snip to determine relative rights, dated May 9, 1936. Proofs submitted, 341 acres.

Quinn River (Humboldt County)—Civil suit decree, Pacific Livestock Company v. Ellison Ranching Company and others, entered April 5, 1929; a petition for an alternative writ of mandate was filed in the Supreme Court on August 12, 1929, requesting the State Engineer to assume and take control and to regulate the waters of Quinn River; the Supreme Court on July 7, 1930, handed down a decision which failed to maintain the alternative writ and dismissed the proceedings. Decreed rights for 17,413.24 acres.

Reno River (Nye and Lander Counties)—1910; To notice of pending proceedings.

Elko Creek (Elko County)—1910; Court decree entered June 29, 1922; decreed rights for 882.73 acres.

Eldorado Creek (Douglas County)—1922; To object to proposed adjudication initiated under provision 330, chapter 253, Statutes of 1919.

Salmon River (Elko County)—March 1, 1921; Court decree entered March 1, 1921; a separate decree was entered March 23, 1919, in the United States District Court for the District of Idaho, Third Division, in the matter of Twin Falls Salmon River Leasing and Water Company vs. Vineyard Lead and Stoback Company; paid involved approximately 150 acres.

Sethi Creek (White Pine County)—September 15, 1914; Decree entered June 15, 1924. Decreed rights for 109.72 acres.

Sierra Creek (White Pine County)—1911; To proofs taken.

Silver Creek (Lander County)—March 17, 1927; Decree entered on February 21, 1927.

Silver River (White Pine County)—Decree entered July 5, 1911; civil suit.

Spring Creek (Nye County)—1911; To notice of pending proceedings.

Six Mile Creek (Elko County)—July 23, 1919; Court decree filed and entered December 12, 1929; certificates issued December 31, 1928, under Court decree. Decreed rights for 417.90 acres.

South Spring (Nye County)—Nevada and South Springs.

Spanish Creek (Perry Aiken Creek)—1919; Court decree entered on January 23, 1926. Decreed rights for 1,433 acres.

Stein Creek (Elko County)—To notice and order continuing hearings.

Stout Creek (White Pine County)—February 21, 1927; Decree entered November 6, 1924. Decreed rights for 1,003.06 acres.

Thousand Mile Creek (Elko County)—March 24, 1924; Court decree entered December 6, 1929; certificates issued April 19, 1929, under Court decree. Decreed rights for 1,125.56 acres.

Tony Creek (Humboldt County)—1923; Court decree entered August 30, 1929. Decreed rights for 29.48 acres.

Trent Creek (Elko County)—1929; To notice pending proceedings; tributary to Humboldt River, adjudicated as part of Humboldt River stream system.

Truckee River (Washoe, Lyon and Churchill Counties)—1923; Temporary order issued by United States Court, February 14, 1928. On April 20, 1942, the Truckee River Agreement and a stipulation for entry of Final Decree was filed.

Virgin River (Clark County)—1921; Court decree entered May 14, 1927. Decreed rights for 1,903.22 acres.

Walker River (Douglas, Lyon and Mineral Counties)—1923; March 5, 1923, final decree; Amended Final Decree of Walker River System was filed on April 25, 1940. On August 7, 1940, Don C. Pfeifer, Superintendant of the Oregon Irrigation Agency, was appointed as a member of the Board of water conservators. This Board, known as the U. S. Water Commissions, and the other who served as Chairman, George Parker, Members F. M. Folsom, R. H. Hanusell, P. O. Stickney, John H. Welhousen, Don C. Pfeifer, C. O. Halsted is Secretary.

Wesley Creek (White Pine County)—Decree entered May 12, 1920; civil suit.

Whitney Creek (Elko County)—1923; To notice of inspection served on Winters. Refer to E. C. Creek.

White River (White Pine and Nye Counties)—Certificates issued by State Engineer under sections 14 to 19, inclusive, of Statutes 1907, in 1912; Decreed...
LETTER OF TRANSMITTAL

STATE OF NEVADA,
OFFICE OF STATE ENGINEER,
CARSON CITY, JULY 31, 1942.

To His Excellency, HONORABLE R. P. CARVILLE, Governor of Nevada,
Carson City, Nevada.

Sir: In compliance with the provisions of section 14, chapter 140, Nevada Statutes of 1939, and section 1, chapter 171, Nevada Statutes of 1933, I have the honor to transmit herewith the Biennial Report of the State Engineer for the period ending June 30, 1942.

Following your appointment of Deputy State Engineer Hugh A. Shamberger on May 5, 1941, to be Director of the State Council of Defense of Nevada, most of his own time and also a considerable portion of the time of department personnel and use of office facilities have been devoted to the war effort. The performance of this work, in addition to regular duties of the staff, is deserving of high praise. We are proud, and Nevada may well be proud, of the efficiently functioning State organization for civilian defense.

Respectfully Submitted,

ALFRED MEREDITH SMITH,
State Engineer.
STATE ENGINEERS SINCE CREATION OF OFFICE

A. E. Chandler .......................... May 29, 1903, to May 1, 1909
Henry Thurnell .......................... May 1, 1896, to May 1, 1907
Frank E. Nicholas ......................... May 1, 1907, to March 9, 1910
Emmet D. Boyle .......................... March 8, 1910, to March 21, 1911
W. M. Kaiman ............................ February 21, 1911, to May 16, 1917
J. G. Scovinham .......................... May 16, 1917, to January 18, 1918
Seymour C. Adair ........................ January 25, 1918, to March 25, 1919
J. G. Scovinham .......................... March 28, 1919, to October 7, 1922
Robert A. Allin .......................... October 7, 1922, to March 29, 1927
Geo. W. Malone .......................... March 29, 1927, to May 28, 1933
Alfred Merriit Smith ........................ May 29, 1933—

REPORT OF STATE ENGINEER

of Determination prepared prior to 1927, but not filed. Land involved
approximately 497.25 acres.
Cleat Creek (Presidio County) ............................. June 10, 1918; decree rendered November
25, 1915, affirming Order of Determination; certificate issued October
25, 1925, under Court decree; land with decreed rights 1,932.56 acres.
Cleat Creek (Webb County, New Mexico) .................... July 22, 1922, civil suit; notice and
Order of Unscrewing Procuning, February 3, 1914.
Clyde and Wilson Creeks (Webb County) ................. July 14, 1915; Court decree entered
May 28, 1917; Certificate issued July 25, 1924, under Court decree.
Current Creek (Nye County) .......................... October 5, 1919; Notice for submission of proofs
duly served May 28, 1924; decree entered April 25, 1924; Confirmation issued October
25, 1925, and February 13, 1926, under Court decree; Decree rights for 600 acres.
Deep Lake Springs, Clear Creek, Seipan Valley Creek, Lost Creek, Ochita Valley Creek, Outlaw Creek, Red Mountain Creek, and Hot Springs (Washoe County) ........................... 1915; To abstain of proofs; adjudication initiated under provi-
sion 88, chapter 203, statutes of 1915.
Duck Creek (White Pine County) .................... December 24, 1899, civil suit.
Duckwater Creek (Nye County) .................... December 1, 1909; The first Court decree was
rendered by Hon. M. R. Arville, adjudicating the various rights; June 25, 1919, another decree was entered by the abovementioned Court. October
4, 1925, a stipulation was entered into by the various water users and
endorsed by the Court requesting the State Engineers to take hold inve-
sigation as to types of structures, etc., required for more economical and
reduction of excess of distributing water; investigation completed and
report filed April 12, 1925; May 27, 1939, a stipulation was entered into
by the various water users which brought to a conclusion the remaining
questions involved in the adjudication of the waters of this stream. Decree
rights for approximately 4,050 acres.
Ezra Creek (Humboldt County) .................... 1915; To abstain of proofs, adjudication
initiated under provision 88, chapter 203, statutes of 1915.
Edgewood Creek (Douglas County) .................... Petition for determination of Relative
Rights April 28, 1928; Warrant of notice filed.
Eyre Creek and its Tributaries, Biggins, Franklin, or Lakees Creek, and Warm Springs (Eureka and Elko Counties) ............................ To abstain of proofs; adjudica-
tion initiated under provisions 88, chapter 203, statutes of 1915. Lands
controlled approximately 8,400.49 acres.
Franklin River (Elko County) ............................ October 14, 1927; To investigation of facts and
conditions; pending order granting petition.
Gembre Creek (Douglas County) .................... Decree entered July 22, 1923, civil suit.
Glencoe Creek (Douglas County) .................... Petition for determination received Septem-
ber 6, 1920. Findings of Fact, Conclusions of Law and Decree filed August
1, 1921.
Goose Creek (Elko County) .................... March 5, 1915; Decree entered March 5, 1923; land
involved 900.87 acres.
Humboldt River (Elko, Eureka, Landor, Humboldt, and Pershing Counties) .................... 1921; January 7, 1931; Opinion and decision of the Court entered and
filed; August 25, 1921, Proposed Findings of Fact, Conclusions of Law
and Decree filed with the District Court at Winnemucca; December 24-31, 1921, motion for new trial presented and argued; March 18, 1922, motion
on motion for new trial filed; February 5-9, 1922, Mention before the Hon. H. W. Edwards, presiding District Judge at Winnemucca, Nevada, on new trial. Amended, changed and corrected Findings of Fact, Conclusions of Law and Decree by H. W. Edwards, Judge Presiding, filed, with Clerk of Court on December 28, 1924. Proposed Findings of Fact, Conclusions of Law and Decree by H. W. Edwards, Presiding Judge, entered October 7, 1925, filed with Clerk of Court October 9, 1925. Aggregate
area with decreed water rights entire stream system;
Harvest grass: 174,791.55 acres
Meadow pasture: 52,540.45 acres
Diversified pasture: 78,962.70 acres
Total: 296,295.50 acres
on an airline in a northeasterly direction from Rly. and about 67 miles distant by road. The creek heads in the Shell Creek range of mountains and runs in an easterly direction into Spring Valley.

January 4 and 31, 1940—Petitions filed with the State Engineer to initiate proceedings for the determination of the relative rights in and to the waters of Kalamaoo Creek.

December 1, 1939—Report filed in the office of the State Engineer of field investigation of the stream system.

June 14, 1940—The State Engineer entered an order granting petition and signifying his intention to make proper arrangements to proceed with the determination in question.

ADJUDICATIONS BY DEPARTMENT OF STATE ENGINEER

Streams on Which Decrees Have Been Entered Under Civil Suit, Statutory Court Decrees, and Streams Adjudicated by United States District Courts, and the Federal Government:

The following table shows the status of all the streams in the State that have been or are subject to adjudication proceedings, given in the order of:

1. Name of stream system.
2. Location.
3. Date adjudication proceedings initiated.
4. Status toward completion, etc.

Baker and Leamery Creeks (White Pine County)—May 26, 1935; both streams considered as one; Findings of Fact, Conclusions of Law and Decree entered October 1, 1934; Average land involved 2,121.7 acres.

Barber Creek (Douglas County)—September 31, 1914; Court Decree entered May 27, 1921. Land involved 220.35 acres.

Bassett Creek (White Pine County)—Petition for Determination received December 20, 1939; Proofs of Appropriation voluntarily filed. Proofs submitted for 284.0 acres.

Bassett Creek (White Pine County)—Petition for Determination received December 14, 1939; Hearing on the Order of Determination and Exceptions April 22, 1942.

Battle Creek (Humboldt County)—Petition for Determination received December 20, 1939; report on investigation made May 22, 1939; Proofs of Appropriation voluntarily filed. Land involved approximately 606.90 acres.

Bishop Creek (Elko County)—Included in adjudication of Humboldt River system.

Buena Vista Creek (Eureka County)—Petition for Determination of Right of Way—May 23, 1931.

Carries Creek (Laurel County)—July 29, 1937; Court Decree entered November 26, 1937; Certificates issued under Court Decree July 3, 1939. Derived rights for 133.1 acres.

Carson River (Dougherty, Lyon and Churchill Counties)—Petition for Determination received, May 8, 1931; on November 13, 1931, Miss Ada A. King, as special master in chancery, was appointed to hold public hearings on the purpose of taking testimony, the transcript of which to be submitted to the Judge for his final action. After a series of meetings, hearings were held off and on in Fallon and Carson City. The taking of testimony was completed during April 1942. Litigants have been given one year within which to file final briefs. March 19, 1943, order made by Court appointing Geo. A. Bartlett as special master in chancery and John V. Mazzio assistant special master in chancery to examine all files and report to the Court. October 8, 1943, plaintiff's opening briefs filed. June 30, 1945, no order was entered by Geo. A. Bartlett granting defendants to September 30, 1945, to file their answering briefs.

Chislovoo Creek (Samoa County)—1914; Notice and Order for Taking (Appended) October 3, 1919; Preliminary Order

Clarks Valley Creek (Laurel County)—November 4, 1939; Preliminary Order

OFFICIAL ROSTER DEPARTMENT OF STATE ENGINEER

CARSON CITY, NEVADA

July 1, 1942, to June 30, 1942

ALFRED D. MILLER, State Engineer

H. W. REYNOLDSON, Assistant State Engineer

HUGH A. SHAPIRO, Assistant State Engineer

EDWARD MURPHY, Deputy State Engineer

F. N. FISHER, Office Engineer

C. E. THIER, Chief Clerk

MADEGRAHAM ANDERSON, Statistician

RETA P. ABEY, Secretary

WATER DISTRIBUTION PERSONNEL

Humboldt River, 1938

J. A. MILLER, Superintendent Water Commissioners

ENTIRE RIVER

D. E. WYCHERLY, Water Commissioner

LOVELock DISTRICT

F. E. RACKER, Water Commissioner

WINNEMUSSA DISTRICT

MYRON CLARK, Water Commissioner

BATTLE MOUNTAIN DISTRICT

OVRUS STRICK, Water Commissioner

LANESBURG AND SOUTH FORK DISTRICTS

ALBERT QUIL, Water Commissioner

STATE VALLEY AND NORTH FORK DISTRICTS

JAS. REYNOLDS, Hydrographer

G. R. THOMAS, Hydrographer

Elko

Humboldt River, 1941

J. A. MILLER, Supervising Water Commissioner

ENTIRE RIVER

D. E. WYCHERLY, Water Commissioner

LOVELock DISTRICT

F. E. RACKER, Water Commissioner

WINNEMUSSA DISTRICT

MYRON CLARK, Water Commissioner

BATTLE MOUNTAIN DISTRICT

OVRUS STRICK, Water Commissioner

LANESBURG AND SOUTH FORK DISTRICTS

EDWARD KING, Hydrographer

ELKO DISTRICT

ALBERT QUIL, Water Commissioner

STATE VALLEY AND NORTH FORK DISTRICTS

JAS. REYNOLDS, Hydrographer

G. R. THOMAS, Hydrographer

Humboldt River, 1942

J. A. MILLER, Supervising Water Commissioner

ENTIRE RIVER

F. E. RACKER, Water Commissioner

WINNEMUSSA DISTRICT

MYRON CLARK, Water Commissioner

BATTLE MOUNTAIN DISTRICT

OVRUS STRICK, Water Commissioner

LANESBURG AND SOUTH FORK DISTRICTS

EDWARD KING, Hydrographer

ELKO DISTRICT

JOHN FRANKLIN, Hydrographer

LOVELock DISTRICT

Humboldt River, 1940

RUDY VAN HUESER, Water Commissioner

ENTIRE DISTRICT

Humboldt River, 1941

RUDY VAN HUESER, Water Commissioner

ENTIRE DISTRICT

(1) Appointed Deputy State Engineer May 1, 1942.
REPORT OF STATE ENGINEER

December 22, 1938—The State Engineer entered an order granting the petition and signifying his intention to make proper arrangements to proceed with the determination in question.

December 23, 1938—The State Engineer entered notice and order for taking proofs.

June 29, 1940—Notice sent by registered mail advising claimants that proof of appropriation and supporting maps must be filed on or before July 15, 1940.

August 29, 1940—Abstract of claims filed in State Engineer’s office.

August 21, 1941—Final order of determination made and filed in the office of the State Engineer.

September 25, 1941—Order Setting Time for Hearing, November 17, 1941.

November 12, 1941—Notice of Exceptions to the Final Order of Determination.

April 10, 1942—Affidavit of Compliance with Jurisdictional Requirements.

McPaul Creek

McPaul Creek lies in Township 13 N., Range 18 E., M. D. B. & M., and flows westward and drains into the southerly end of Lake Tahoe. There is only one claimant to the waters of this source, i.e., Arthur K. Bourne, and the amount of land claimed to be irrigated under the vertical right is approximately 34 acres.

June 19, 1938—Arthur K. Bourne, through his agent, H. M. Payne, filed a petition in the State Engineer’s office requesting a determination of the relative rights in and to those waters.

July 6, 1938—The report of the investigation of the stream system was filed in the office of the State Engineer.

July 11, 1938—The State Engineer entered an order granting the petition and signifying his intention to make proper arrangements to proceed with the determination in question.

October 30, 1941—Order of Determination made and filed in the office of the State Engineer.


Muny Creek

Muny Creek and all of its tributaries are located in Township 20 N., Range 66 E., M. D. B. & M. approximately thirty miles distant on an airline in a northwesterly direction from Ely, Nevada, and about 70 miles distant by road. The creek heads in the Shell Creek range of mountains and runs in an easterly direction into Spring Valley.

August 27, 1938—Petition filed with the State Engineer to initiate proceedings for the determination of the relative rights in and to the waters of Muny Creek.

September 22, 1938—Report of field investigation of the stream system was filed in the State Engineer’s office.

June 14, 1940—Order filed by State Engineer granting petition to determine the relative rights in and to the waters of Muny Creek.

Kalamazoo Creek

Kalamazoo Creek and tributaries mainly rise and flow in Township 20 N., Range 66 E., M. D. B. & M., approximately 20 miles distant on
Supreme Court Opinion filed December 18, 1940, upholding ruling of District Court.

GLENBROOK CREEK

Glenbrook Creek and its tributaries has its origin in an offshoot range of the Sierra Nevada Mountains skipping the eastern side of Lake Tahoe and forming the divide between the Tahoe drainage basin and the Carson Valley drainage, and flows in a westerly direction into Lake Tahoe. The main portion of the watershed lies within the northeast corner of Township 14 N., Range 18 E., M. D. B. & M.

September 6, 1939—The Glenbrook Company filed a petition with the State Engineer to initiate proceedings for the determination of the relative rights in and to the waters of Glenbrook Creek.

June 1, 1940—Report of field investigation of the stream system was filed in the State Engineer's office.

June 14, 1940—The State Engineer entered an order granting petition and signing his intention to make proper arrangements to proceed with the determination in question.

February 10, 1941—Abstract of Claims filed in State Engineer's office.

May 2, 1941—Order of Determination filed in State Engineer's office.

May 3, 1941—Order Setting Time for Hearing June 12, 1941.

August 1, 1941—Findings of Fact, Conclusions of Law, and Decree filed.

NORTH LOGAN CREEK

North Logan Creek or Logan Shoals Creek No. 1 has its origin the same as Glenbrook Creek, in an offshoot range of the Sierra Nevada Mountains, and is the next mountain stream south of Glenbrook Creek. It flows in a westerly direction and enters Lake Tahoe near the northern boundary of Section 22, Township 14 N., Range 18 E.

September 6, 1939—Petition filed by the Glenbrook Company to initiate proceedings for the determination of the relative rights in and to the waters of North Logan Creek.

June 10, 1940—Report of field investigation of the stream system filed in the State Engineer's office.

June 14, 1940—Order entered granting petition and signing intention to make proper arrangements to proceed with the determination in question.

September 4, 1941—Findings of Fact, Conclusions of Law, and Decree filed.

ADJUDICATIONS PENDING

BASSETT CREEK

Bassett Creek is located on the eastern slope of the Shell Creek Range and drains into Spring Valley in and about Township 18 N., Range 66 E., M. D. B. & M. There are two claimants to the waters of the source.

December 16, 1938—B. H. Robinson, through his attorney, W. Howard Gray, filed a petition in the State Engineer's office requesting a determination of the relative rights in and to the waters of Bassett Creek.

December 21, 1938—The report of the investigation of the stream system was filed in the office of the State Engineer.
COOPERATIVE WORK

The State Engineer also carries on cooperative work in the compilation of stream gaging and stream runoff observations through the medium of two State appropriations. The cooperative agencies are: The Water Resources Branch of the United States Geological Survey. The Nevada Cooperative Snow Survey. The activities of the State Engineer in each of the fields are briefly related under their proper headings elsewhere.

PUBLIC SERVICE COMMISSION

The Nevada Public Service Commission is composed of the following members:
Charles B. Sexton, Chairman, Carson City.
Charles V. Williams, Yermo.
Albert Merritt Smith, Carson City.
Lee S. Scott, Secretary, Carson City.
The work of this Commission is published by the Chairman in a biennial report. During the past biennium many hearings have been held in various parts of the State on matters concerning the rate schedules of public utilities, rail and motor vehicle carriers, complaints as to public service, and requests for certificates of convenience and necessity for the operation of public utilities.

THE NEVADA STATE BOARD OF IRRIGATION

The board is composed of the following members: E. P. Carillo, Governor of Nevada, Carson City.
Wayne T. McLeod, Surveyor General, Carson City.
Gray Mashburn, Attorney-General, Carson City.
Albert Merritt Smith, State Engineer, Carson City.

This board was created by the provisions of section 2, chapter 59, Nevada Statutes of 1901 (Nevada Compiled Laws 1929, section 8231), for the purpose of administering an appropriation of $4,000 made by that Legislature to carry on hydrographic work, irrigation studies, and stream measurements in cooperation with the United States Geological Survey and the United States Department of Agriculture, in association with the Nevada Agricultural Experiment Station. The State appropriation was contingent upon an equal amount of money

REPORT OF STATE ENGINEER

6. Proofs of commencement of work filed, July 1, 1940, to June 30, 1942.
7. Proofs of completion of work filed, July 1, 1940, to June 30, 1942.
8. Proofs of beneficial use file, July 1, 1940, to June 30, 1942.
9. Protests filed against the granting of applications, July 1, 1940, to June 30, 1942.
10. Certificates of appropriation issued under permitted water rights, July 1, 1940, to June 30, 1942.
12. Proofs of appropriation filed, July 1, 1940, to June 30, 1942.

ADJUDICATIONS COMPLETED

Mamie Springs

The location of Manse Springs and tributary is in the southern portion of Nye County about six miles southerly from Pahrump, Nevada, and about twenty-eight miles northwesterly from Shoshone, California. There are two claimants to the waters from this source, one by virtue of vested rights and the other under application to the State Engineer for permission to appropriate this water.
April 14, 1937—Petition filed with State Engineer by water users to initiate proceedings to determine relative rights in and to the waters of Manse Springs and tributaries.
May 7, 1937—Field investigation completed and report filed by the State Engineer in his office.
May 18, 1937—Order filed granting petition to determine relative rights in and to the waters of Manse Springs and tributaries.
Copies of order and letter advising claimants that since the claimants had all signed waiver of notices the State Engineer would proceed under section 36b.
May 24, 1937—Abstract of claims prepared by the State Engineer and filed in his office.
June 8, 1937—Order of Determination filed by State Engineer in his office.
June 12, 1937—Order of Determination, together with all original evidence and data as of record in the State Engineer’s office, were filed with the Clerk of the Fifth Judicial District Court of the State of Nevada, in and for the County of Nye.
June 15, 1937—Court entered an order setting July 29, 1937, as the date for hearing exceptions. This hearing was postponed and set over from time to time, the last order setting the time for November 8, 1937.
November 5, 1937—Hearing before Hon. William D. Hatton, Judge of the Fifth Judicial District Court of the State of Nevada, in and for the County of Nye. Case submitted pending filing of briefs by respective counsel.
February 24, 1939—Decision entered by Hon. William D. Hatton, Judge of the Fifth Judicial District Court.
March 2, 1939—Motion for new trial made by claimant Eddie Barry.
October 19, 1938—Motion for new trial overruled by Hon. William D. Hatton, Judge of the Fifth Judicial District Court.
November 14, 1939—Findings of Fact and Conclusions of Law filed.
November 28, 1939—Eddie Barry appeals to the Supreme Court of the State of Nevada from the order of the District Court denying objectors motion for a new trial. September 11, 1940, was set for the arguments before the Supreme Court.
CHAPTER V

Adjudication of Water Rights

Section 1, chapter 4, Statutes of 1903, provided a law creating the office of State Engineer and furnished a method for the determination of the relative rights in and to waters already appropriated. Several amendments were subsequently made, with the result that our water law is now admirably adapted to conditions in Nevada, and has been declared constitutional in its entirety by decisions rendered by the Supreme Court of Nevada.

Amendatory Acts were passed during the 1907 and 1909 sessions of the Legislature. In 1913 a new water law was enacted and the old water law in its entirety was repealed. The new law was approved March 22, 1913. Under this Act the water law was greatly broadened, both as to the adjudication procedure on the determination of vested rights and the appropriation of water procedure by application to the State Engineer. Subsequent amendments to the laws relating to the adjudication procedure were enacted in the following sessions of the Legislature, viz. 1915, 1917, 1919, 1921, 1923, 1927, 1931, 1933, and 1937. A brief description of these various amendments may be found in chapter 6 of the 1936-1939 report, wherein a summary of the laws enacted by the Nevada Legislature relating to water and the office of the State Engineer is given. A summary of the statutory procedure to determine the relative rights in and to the waters of a stream system under a claim of vested right may be found in our 1934-1936 Biennial Report, and in the compiled edition of the water laws of this State published in 1941 by this office, both of which are available upon request.

PROOFS OF APPROPRIATION FILED DURING THE YEARS OF THE PRESENT BIENNIAL

During this period the following proofs of appropriation, which are claims of vested water rights, have been filed, for future use in the determination of the relative rights and also to make of record such claims. A condensed statement giving the salient data is hereon given in the order of:
1. Proof serial number.
2. Date filed.
3. Name of claimant.
4. Source of water supply.
5. Location by county.
6. Use claimed.

being appropriated by the Government. The State Printing Office was authorized to publish additional copies of the Government reports. The board was also authorized to have printed copies of or extracts from any United States report on irrigation or related matters which, in the opinion of the board, would be of value to the people of Nevada.

The activity of the Board of Irrigation was continued by the last Legislature through an appropriation of $1,500 for cooperative work with the United States Geological Survey, Water Resources Branch, and the State Engineer (section 20, chapter 191, 1941 Nevada Stats.). This work, which has been continuously carried on since 1916, is continuously adding to the valuable information regarding Nevada's water resources and supply.

THE STATE IRRIGATION DISTRICT BOND COMMISSION

The State Irrigation District Bond Commission was created by an Act of the Legislature approved February 26, 1921, being sections 3217-3228 NevadaCompiled Laws 1929. The Commission consists of the following members:

E. P. Carville, Governor of Nevada.
D. O. LeRoi, Bank Examiner.
Alfred Merritt Smith, State Engineer.

It is the duty of the Commission to pass upon the eligibility of bonds of irrigation districts as legal investments within Nevada.

THE STATE RANGE COMMISSION

This Commission consists of the following members:

E. P. Carville, Governor of Nevada.
Charles B. Sexton, Chairman, Public Service Commission.
Alfred Merritt Smith, State Engineer.

The 1929 Legislature created the "State Range Commission" for the purpose of determining the principles, laws, or policies that should apply to the grazing use of the natural range forage resources of publicly owned lands within Nevada.

The work of this commission has been dormant, since the major part of the range area in Nevada has come under the supervision of the Taylor Grazing Division of the Department of the Interior. It should be noted, however, that in the areas not within Division of Grazing Districts the State Engineer bases decisions and makes rulings on water rights according to the Nevada Water Law of 1925.
CHAPTER IV
Applications for Water Rights

During the biennial period dating from July 1, 1940, to June 30, 1942, there have been 318 applications filed with this office for permission to appropriate water, as compared to 272 filed during the preceding biennium.

MANNER OF USE COMPARISON

<table>
<thead>
<tr>
<th>Purpose</th>
<th>1940-41</th>
<th>1938-39</th>
<th>1936-37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>110</td>
<td>73</td>
<td>47</td>
</tr>
<tr>
<td>Mining and milling</td>
<td>75</td>
<td>180</td>
<td>110</td>
</tr>
<tr>
<td>Stock watering</td>
<td>46</td>
<td>40</td>
<td>48</td>
</tr>
<tr>
<td>Domestic</td>
<td>21</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Migratory waterfowl refuge</td>
<td>...</td>
<td>...</td>
<td>3</td>
</tr>
<tr>
<td>To change point of diversion, manner or place of use</td>
<td>11</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>Municipal</td>
<td>8</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Bathing</td>
<td>2</td>
<td>...</td>
<td>2</td>
</tr>
<tr>
<td>Gravel and sand washing</td>
<td>2</td>
<td>...</td>
<td>2</td>
</tr>
<tr>
<td>Power</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Recreational</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Fish rearing</td>
<td>...</td>
<td>...</td>
<td>1</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Quasi municipal</td>
<td>37</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Railroad</td>
<td>4</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

Definite action has been taken on 303 applications during this biennium. This represents action on 325 applications filed prior to July 1, 1940, and 178 filed during this period.

Pertinent information regarding water applications filed in this office since its creation will be found on page 9. The status of applications filed and certificates issued will be found as follows:

1. Status of applications filed during the biennium 1940-1942, chapter XVIII.
2. Status of applications filed prior to July 1, 1940, upon which action has been taken during the past biennium, chapter XIX.
3. Certificates issued under permits during the past biennium, chapter XX.
CHAPTER III
State Water Right Surveyors of Nevada

Following is a complete list of licensed State Water Right Surveyors authorized to practice before the office of the State Engineer during the past biennium:

NEVADA

Manhattan—Arthur E. Smith.
Mina—L. B. Spencer.
Minden—J. A. Miller.
Mountain City—Edward C. Stephenson.
Montello—John D. Smith.
James Norman Nelson.
Palmdale—W. F. Ramirez.
Paradise Valley—F. R. Stewart.
Pioche—Frank Walker.
Reno—R. W. Prince.
Rhyolite—H. B. Taylor.
R. B. Taylor.
D. H. Updegraff.
Thea, H. King.
John V. Studier.
M. A. Fytry.
Harold Layman.
David Mitchell.
William J. Moran.
C. J. Pruess.
James B. Wyman.
Reno—L. E. B. Rechel.
Sparks—E. C. Taylor.
Sparks—J. G. Huntington.
Sparks—J. L. Vundiver.
Tonopah—S. S. Johnson.
C. A. Liddell.
Tuscumow—Richard T. Woodruff.
Winemucca—F. R. O'Leary.
R. H. Shuttle.
A. V. Tatsch.
Yerington—George Parker.

CALIFORNIA

Alturas—W. Z. Archer.
Beecher—R. L. Tolbert, 6220 Bovmeuse Avenue.
Sacramento—C. T. Engle, 2074 Forty-Fourth Street.
Benton—Joseph Markert.

IDAHO

Twin Falls—Harold Wm. Merritt.

OREGON

Barnes—Mott V. Dodge.

UTAH

St. George—Leo A. Snow.
Ogden—Louis H. Bank, Civic Southern Pacific Company.
K. W. Kennedy, 1541 Twenty-seventh Street.
Salt Lake City—Newman Roy, 208 Scott Building.
E. A. Vail, Box 860.

Harry W. Reppert

On February 28, 1942, the Department of the State Engineer of Nevada lost by death Assistant State Engineer Harry W. Reppert. He had held that position with dignity and honor for sixteen years.

The integrity and ability of Harry Reppert is written into the voluminous records of the office, extending back through the long years. His work for the State of Nevada was more than business to Harry. People from all parts of the State brought their land and water-use problems to him, sure of willing and wise counsel. To work with him was to be his friend. Possessed of unusual engineering qualifications, inherent tolerance, calm good nature, and a buoyant sense of humor, he was never ruffled by the complex problems that came to his desk or confronted him in many journeys afield. His serene spirit and unfailing love for his work and thoughtfulness for his associates were an unfailing source of encouragement, and inspired in us all a desire to do our best work.

With his passing, we have lost an association of great value, a precious friendship, impossible to replace.

ALFRED MERRITT SMITH.
CHAPTER II
Office Engineering and Miscellaneous Office Work

By F. N. DONHIER, Office Engineer

Despite the shifting from a peace time era to helping our friendly Nations in their war efforts and finally our entrance into the World War II, the regular routine office work, consisting of examining and filing applications to appropriate water, proofs of appropriation of water, checking and filing maps submitted in support of applications, proofs of appropriation and permits; examining applications for appropriation with respect to their denial or approval; examining filed reports, making rulings, issuing permits and certificates, and checking all affidavits in connection with water filings, has been conducted as heretofore. The volume of this work is evidenced by the list of filings tabulated in this report, which shows a noted increase.

Matters pertaining to the pending adjudication of streams, writing and checking decrees entered on such streams, etc., has had its place in the office work.

In addition to attending to callers relative to water rights, much time was devoted to answering inquiries and advising on water problems.

Many deeds covering transfers of water rights of record, affidavits, protests, and other instruments pertaining to water filings have been checked and filed, and indexed on the records.

Although many inquiries are made on range rights of record in this office, no additional maps have been filed.

Valuable reports and data pertaining to water rights and water resources and their developments have been received and given our careful consideration.

Budgets for water commissioners' services on the various streams have been prepared and sent to the County Clerks for their submission to the County Commissioners for consideration and approval.

Notifications of obligations due under water filings, compiling all data under adjudication proceedings, and the filing with the courts of such data, together with arranging for court hearings on pending adjudications, has been conducted as usual.

Although many important articles and maps on water rights and related data have been received, only a few have been given serial numbers and indexed due to pressure of other work. However, this is done when the time is available for such work.

The clerical department has conducted its usual routine work, accounting for all receipts, fees in connection with water filings, checking and filing statements of receipts and expenditures of this office, water commissioners' accounts and the Colorado River Commission, and in addition the filing of all applications, proofs, documents, and making and maintaining complete indexes thereof.

In addition to the daily correspondence, typing of field and office reports, rulings, permits, decrees, etc., the office stenographic department has been occupied in making copies of water filings, decrees, deeds, and many other documents of record on request from attorneys and others.
preserving watersheds in areas in the interest of the production of the greatest amount of usable irrigation water.

The State Engineer enters into direct cooperation with all these agencies in their efforts to conserve and perpetuate the one resource, irrigation water, upon which rests all agricultural activities in Nevada. In many respects this type of work is comparatively new, and extensive developments, in which the State Engineer’s office will take an active part, can be expected in the future.

The underground waters of Nevada, except flood waters, which may hereafter be stored by construction of expensive reservoirs, now form practically our only available supply. Obviously, all underground waters have only one original source—rainfall—and any draft on the supply must be made good annually or such supply will be exhausted. As early as 1913 the Nevada statutes recognized the appropriative doctrine as applying to underground waters, but it was not until 1939 that legislation was enacted giving the State Engineer supervisory control over the underground waters of the State.

Better use of such legislation can be pointed out than the consequences developing as the result of waste of the artesian waters in the Las Vegas basin. Since 1905 over 300 artesian wells have been drilled in this basin with a measured yield of over 18,000,000 gallons of water per day. In the early days of this development the supply of water to many people appeared inexhaustible. However, in recent years there has been a gradual but pronounced falling off in the artesian head, indicating that the draft from the basin exceeds its replenishment. In 1936 the State Engineer in cooperation with the U.S. G.S., the city of Las Vegas, Clark County and the Las Vegas Land & Water Company, conducted a well leakage survey in this area. As a result of this survey sufficient information was obtained to warrant the conclusion that the combined loss to the basin through uncontrolled flowing wells and underground leakage was over four million gallons of water per day. Subsequent conservation measures carried out by the State Engineer under the provisions of the 1939 Act have brought about an estimated saving per day of over one million gallons of water formerly wasted. The continuance of the program (as it is hoped) should reflect a saving of a sizable portion of the remainder of the water now flowing to waste.

In conclusion, it is to be noted that in addition to the duties herein enumerated the State Engineer is by law made an ex officio member of the Public Service Commission; member of the Bureau of Industry, Agriculture and Irrigation; member of the State Irrigation District Board Commission; member of the Board of Review; member of the State Board of Irrigation, and by appointment of the Governor a member of the Colorado River Commission, and chairman of the Nevada State Board of Registered Professional Engineers.

BIENNIAL REPORT OF STATE ENGINEER, 1940-1942

CHAPTER I

Duties and Accomplishments of the State Engineer

By H. W. REPPER

It has been said that "next to the air he breathes, water is man’s greatest necessity," a saying of particular significance here in Nevada where we have but a limited supply of this necessity, and which emphasizes the reason why strict caution be exercised at all times to insure its most economical and greatest beneficial use. It was, therefore, in the interest of the conservation and protection of our State’s limited water supply that the office of the State Engineer was created.

To provide a basis for a more complete understanding of the system of priority which prevails in Nevada, it would seem pertinent to give a brief resume of the two theories or doctrines which have had a profound effect on the evolution and growth of western water law, viz, the doctrine of riparian ownership and the doctrine of prior appropriation. The doctrine of riparian ownership is a product of the English or common law, and means “every proprietor of land on the banks of a natural stream has an equal right to have the waters of the stream continue to flow in its natural course as it is wont to run, undiminished in quantity and uninjured in quality except so far as either of these conditions may result from the reasonable use of water for irrigation or other lawful purposes by upper appropriators.” The riparian theory is in general use in the humid areas in the middle western and eastern parts of the United States.

The doctrine of appropriation is the outgrowth of a custom of unwritten law or precedent established in the early mining days of the West, and means first in time is first in right, commonly referred to as priority.

Nevada early adopted the appropriative theory, because its supply of water, even with the highest beneficial use, is insufficient to supply its needs, but such adoption did not occur until after earlier court decisions had given recognition to the doctrine of riparian ownership. However, as early as 1855 the Nevada Supreme Court approved the appropriative theory and has on subsequent occasions emphasized its rejection of the riparian doctrine.

In other words, our courts since 1855 have ruled, and our Legislature has so declared, that there can be no ownership in the corpus of the water within the State of Nevada, but that the right to the use of water only may be acquired, and that beneficial use shall be the basis and the measure of such right.

The legislative Act of 1903 created the office of the State Engineer primarily for the purpose of providing a method for determination and regulation of existing water rights in line with the then modern theory evolved in the western and semiarid States. This Act, which, while providing a method for adjudication of water rights which had
become vested or were then in the process of initiation, neglected to provide a specific method by which future rights could be legally acquired; hence, the twenty-second session of the Legislature passed an amendatory law, approved March 1, 1905, providing the exclusive method of subsequently initiating and perfecting a water right by application to the State Engineer for permission to appropriate and apply water to a beneficial use.

Other amendments to the original Act have been made from time to time to conform with changed conditions and legal precedents, so that today our water law represents the outcome of constructive evolution in the water affairs worth of which has been proven on numerous occasions by its triumphant emergence from repeated stubborn legal battles.

Under the Nevada water law there are two classes of water rights by appropriation; first, so-called vested rights, initiated in the early days of the State's development, by the unenacted laws concerning appropriation of water existed, and before the office of the State Engineer had been created; second, application rights under which water is appropriated and beneficially used by virtue of permits granted by the State Engineer upon due application being made to him. Rights prior to 1900 usually claimed as appropriative rights, the magnitude and extent of which are determined only by a process of adjudication by the State Engineer as outlined in the present water code, while rights initiated subsequent to 1905 are clear cut and well defined as to magnitude and extent, having been based upon direct application to the State Engineer.

In general then, the duties of the State Engineer under the water code may be summarized as follows: To make a determination of relative rights to water from streams, involving examination and filing proofs of use of water, field examinations and reports on character of soil and kind of crops cultivated and extent of water requirements; the order of determination to be filed with a court of jurisdiction and made the basis of a civil action; to issue certificates to appropriators in conformity with the final court decree rendered; to supervise the distribution of water as streams where the relative rights of claimants and appropriators have been determined by statutory adjudication proceedings; to accept, file, and approve applications for permission to appropriate the public waters of the State and issue certificates perfected by bona fide use. His duties also extend by law to Carey Act projects.

The water code also provides it to the State Engineer to have "such training in hydraulic and general engineering, and such practical skill and experience as shall fit him for the position."

The work of determining the relative water resources of the State has been in active progress since the creation of the office in 1903. During the period, the State Engineer has initiated proceedings for the determination of the relative rights of claimants and appropriators to the use of water on forty-four separate streams or systems. On twenty systems the proceedings have terminated with the entry of court decrees defining the relative rights of said claimants and appropriators. The aggregate area of adjudicated rights for irrigation purposes on the streams as evidenced by these court decrees is 382,696 acres. Although the vested rights to the use on most of our major streams have been adjudicated or are in the process of adjudication, there are approximately 400 minor streams in the State where the vested right claims remain undetermined.

Under the procedure outlined by the statutes for the initiation of a water right by direct application to the State Engineer, there have been received, examined, and filed since 1905, 10,842 applications for permission to appropriate the public waters of the State for various beneficial purposes. Over 2,700 of these filings have been perfected by application of water applied for to a beneficial use, with 2,550 final certificates of water right issued. Some conception of the value of some of the projects represented by these filings might be shown by citing that the total estimated cost of construction of proposed projects under 1,263 applications filed between January 1, 1930, and December 31, 1939, is over six million dollars, while actual expenditures in connection with work performed under approved applications in accordance with verified affidavits filed is in excess of two million, three hundred thousand dollars.

One of the major duties of the State Engineer under the water code is the distribution of water among the water users on stream systems where the relative rights to its use have been determined by court decree in a statutory adjudication proceeding, or where the State Engineer's order of determination in such proceeding has been officially filed with the District Court. Accordingly, distribution work is now maintained through duly appointed water commissioners on the Humboldt River and its tributaries, in Pershing, Humboldt, Lander, Eureka, and Nye Counties; Little Humboldt River and its tributaries in Humboldt and Elko Counties; Duckwater and Current Creeks in Nye County; White River in White Pine County; Pahranagat Lake and its tributaries in Lincoln County, and Muddy River and its tributaries in Clark County. Special service is also rendered to water users on minor streams in the absence of a regularly employed commissioner.

Under a cooperative working agreement between the State Engineer and the United States geological survey, stream measurement work is maintained on the Humboldt River and its tributaries, Little Humboldt River and its tributaries, Carson River, Walker River, Owyhee River, Salmon Falls River, and Virgin River. The data collected in the cooperative work is published in the annual water supply papers of the United States geological survey, which contains stream flow records for the whole United States. The State Engineer also cooperates in the Nevada snow survey work that is carried on under the direction of Dr. J. E. Church, meteorologist, University of Nevada.

Comparatively recently the soil conservation service was established in the Department of Agriculture for the purpose of further effecting conservation of the Nation's soil and moisture resources. In Nevada moisture conservation, in very large measure, means conservation of irrigation water supplies. This in turn entails the preservation of the watersheds of our streams against erosion, and thus integrates the soil conservation service, the forest service and the grazing service of the Department of the Interior in their efforts in
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BIENNIAL REPORT OF STATE ENGINEER, 1940-1942

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CHAPTER II
Office Engineering and Miscellaneous Office Work
By F. N. Donoho, Office Engineer

Despite the shifting from a peace time era to helping our friendly Nations in their war efforts and finally our entrance in the World War II, the regular routine office work, consisting of examining and filing applications to appropriate water, proofs of appropriation of water, checking and filing maps submitted in support of applications, proofs of appropriation and permits; examining applications for permission with respect to their denial or approval; examining filed reports, making rulings, issuing permits and certificates, and checking all affidavits in connection with water filings, has been conducted as heretofore. The volume of this work is evidenced by the list of filings tabulated in this report, which shows a noted increase.

Matters pertaining to the pending adjudication of streams, writing and checking decrees entered on such streams, etc., has had its place in the office work.

In addition to attending to calls for relative to water rights, much time was devoted to answering inquiries and advising on water problems.

Many deeds covering transfers of water rights of record, affidavits, protests, and other instruments pertaining to water filings have been checked and filed, and indexed on the records.

Although many inquiries are made on range rights of record in this office, no additional maps have been filed.

Valuable reports and data pertaining to water rights and water resources and their developments have been received and given our careful consideration.

Budgets for water commissioners' services on the various streams have been prepared and sent to the County Clerks for their submission to the County Commissioners for consideration and approval.

Notifications of obligations due under water filings, compiling all data under adjudication proceedings, and the filing with the courts of such data, together with arranging for court hearings on pending adjudications, has been conducted as usual.

Although many important articles and maps on water rights and related data have been received, only a few have been given serial numbers and indexed due to pressure of other work. However, this is done when the time is available for such work.

The clerical department has conducted its usual routine work, accounting for all receipts, fees in connection with water filings, checking and filing statements of receipts and expenditures of this office, water commissioners' accounts and the Colorado River Commission, and in addition the filing of all applications, proofs, documents, and making and maintaining complete indexes thereof.

In addition to the daily correspondence, typing of field and office reports, rulings, permits, decrees, etc., the office stenographic department has been occupied in making copies of water filings, decrees, deeds, and many other documents of record on request from attorneys and others.
CHAPTER III
State Water Right Surveyors of Nevada

Following is a complete list of licensed State Water Right Surveyors authorized to practice before the office of the State Engineer during the past biennium:

NEVADA

Manhattan—Arthur E. Smith.
Mina—L. B. Sprouse.
Minion—J. A. Miller.
Mountains City—Edward C. Stephenson.
Montello—John D. Smith.
James Norman Nelson.
Palouse—W. B. Bayne.
Paradise Valley—F. B. Stewart.
Pleasant—Frank Walker.
Reno—H. W. Price.
L. H. Taylor.
C. V. Taylor.
D. H. Updike.
Thos. R. King.
John V. Mudditer.
M. A. Pray.
Carl Studard.
Harold Layman.
David Mitchell.
William J. Morin.
C. J. Pruce.
James B. Wynn.
Rio Tinto—J. E. Brehal.
Sparks—C. C. Taylor.
Sparks—J. G. Huntington.
Sprague—J. L. Vanders.
Tompa—D. S. Johnson.
C. A. Laddell.
Tucson—Charles L. Woodward.
Winnemucca—F. R. O'Leary.
H. H. Shetson.
A. V. Tatham.
Yerington—George Parker.

CALIFORNIA

Alturas—W. Z. Archer.
Beach—H. L. Tholen, 2830 Bonneville Avenue.
Sacramento—G. P. Engle, 207 Forty-Fourth Street.
Benton—Joseph M. Hartman.

IDAHO

Twin Falls—Herald Wm. Merritt.

OREGON

Barnett—Mott V. Dodge.

UTAH

St. George—Leo A. Snow.
Ogden—Louis H. Beekil, Clay Southern Pacific Company.
K. W. Kennedy, 1814 Twenty-seventh Street.
Salt Lake City—Socony Mfg. 5th Scott Building.
R. A. Vail, Box 804.

Harry W. Reppert

On February 28, 1942, the Department of the State Engineer of Nevada lost by death Assistant State Engineer HARRY W. REPPERT. He had held that position with dignity and honor for sixteen years.

The integrity and ability of Harry Reppert is written into the voluminous records of the office, extending back through the long years. His work for the State of Nevada was more than business to Harry. People from all parts of the State brought their land and water-use problems to him, sure of willing and wise counsel. To work with him was to be his friend. Possessed of unusual engineering qualifications, inherent tolerance, calm good nature, and a buoyant sense of humor, he was never ruffled by the complex problems that came to his desk or confronted him in many journeys afield. His serene spirit and unfailing love for his work and thoughtfulness for his associates was an unceasing source of encouragement, and inspired in us all a desire to do our best work.

With his passing, we have lost an association of great value, a precious friendship, impossible to replace.

ALFRED MERRITT SMITH.
CHAPTER IV
Applications for Water Rights

During the biennial period dating from July 1, 1940, to June 30, 1942, there have been 318 applications filed with this office for permission to appropriate water, as compared to 272 filed during the preceding biennium.

MANNER OF USE COMPARISON

<table>
<thead>
<tr>
<th>Use</th>
<th>1940-1942</th>
<th>1942</th>
<th>1940</th>
<th>1938</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>101</td>
<td>73</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Mining and milling</td>
<td>75</td>
<td>140</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Stock watering</td>
<td>46</td>
<td>40</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Domestic</td>
<td>21</td>
<td>10</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Migratory waterfowl refuge</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>To change point of diversion, manner or place of use</td>
<td>11</td>
<td>9</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Municipal</td>
<td>8</td>
<td>2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Bathing</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Gravel and sand washing</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Recreational</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Fish rearing</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quasi municipal</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Railroad</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Definite action has been taken on 303 applications during this biennium. This represents action on 325 applications filed prior to July 1, 1940, and 178 filed during this period.

Pertinent information regarding water applications filed in this office since its creation will be found on page 9. The status of applications filed and certificates issued will be found as follows:

1. Status of applications filed during the biennium 1940-1942, chapter XVIII.
2. Status of applications filed prior to July 1, 1940, upon which action has been taken during the past biennium, chapter XIX.
3. Certificates issued under permits during the past biennium, chapter XX.
CHAPTER V

Adjudication of Water Rights

Section 1, chapter 4, Statutes of 1903, provided a law creating the office of State Engineer and furnished a method for the determination of the relative rights in and to waters already appropriated. Several amendments were subsequently made, with the result that our water law is now admirably adapted to conditions in Nevada, and has been declared constitutional in its entirety by decisions rendered by the Supreme Court of Nevada.

Amendatory Acts were passed during the 1907 and 1909 sessions of the Legislature. In 1913 a new water law was enacted and the old water law in its entirety was repealed. The new law was approved March 22, 1913. Under this Act the water law was greatly broadened, both as to the adjudication procedure on the determination of vested rights and the appropriation of water by application to the State Engineer. Subsequent amendments to the laws relating to the adjudication procedure were enacted in the following sessions of the Legislature, viz., 1915, 1917, 1919, 1921, 1923, 1925, 1927, 1931, 1933, and 1937. A brief description of these various amendments may be found in chapter 6 of the 1936-1939 report, wherein a summary of the laws enacted by the Nevada Legislature relating to water and the office of the State Engineer is given. A summary of the statutory procedure to determine the relative rights and to the waters of a stream system under a claim of vested right may be found in our 1934-1936 Biennial Report, and also in the compiled edition of the water laws of this State published in 1941 by this office, both of which are available upon request.

PROOF OF APPROPRIATION FILED DURING THE YEARS OF THE PRESENT BIENNIAL

During this period the following proofs of appropriation, which are claims of vested water rights, have been filed, for future use in the determination of the relative rights and also to make of record such claims. A condensed statement giving the salient data is hereinafter given in the order of:

1. Proof serial number.
2. Date filed.
3. Name of claimant.
4. Source of water supply.
5. Location by county.
6. Use claimed.

\[\text{Proper of State Engineer}\]

being appropriated by the Government. The State Printing Office was authorized to publish additional copies of the Government reports. The board was also authorized to have printed copies of or extracts from any United States reports on irrigation or related matters which, in the opinion of the board, would be of value to the people of Nevada.

The activities of the Board of Irrigation were continued by the last Legislature through an appropriation of $1,500 for cooperative work with the United States Geological Survey, Water Resources Branch, and the State Engineer (section 20, chapter 191, 1941 Nevada Stats.). This work, which has been continuously carried on since 1916, is充分利用 adding to the valuable information regarding Nevada water resources and supply.

THE STATE IRRIGATION DISTRICT BOND COMMISSION

The State Irrigation District Bond Commission was created by an Act of the Legislature approved February 26, 1921, being sections 3217-3228 Nevada Compiled Laws 1929. The Commission consists of the following members:

E. P. Carville, Governor of Nevada.
D. G. LeRoi, Bank Examiner.
Alfred Merritt Smith, State Engineer.

It is the duty of the Commission to pass upon the eligibility of bonds of irrigation districts as legal investments within Nevada.

THE STATE RANGE COMMISSION

This Commission consists of the following members:

E. P. Carville, Governor of Nevada.
Charles B. Sexton, Chairman, Public Service Commission.
Alfred Merritt Smith, State Engineer.

The 1929 Legislature created the "State Range Commission" for the purpose of determining the principles, laws, or policies that should apply to the grazing use of the natural range forage resources of publicly owned lands within Nevada.

The work of this commission has been dormant, since the major part of the range area in Nevada has come under the supervision of the Taylor Grazing Division of the Department of the Interior. It should be noted, however, that in the areas not within Division of Grazing Districts the State Engineer bases decisions and makes rulings on water rights according to the Nevada Stockwatering Act of 1925.
6. Proofs of commencement of work filed, July 1, 1949, to June 30, 1942. 207
7. Proofs of completion of work filed, July 1, 1940, to June 30, 1942. 112
8. Proofs of beneficial use filed, July 1, 1940, to June 30, 1942. 118
9. Protests filed against the granting of applications, July 1, 1940, to June 30, 1942. 74
10. Certificates of appropriation issued under permitted water rights, July 1, 1940, to June 30, 1942. 108
11. Proofs of appropriation filed, 1900, to June 30, 1942. 2,319
12. Proofs of appropriation filed, July 1, 1940, to June 30, 1942. 16

COOPERATIVE WORK

The State Engineer also carries on cooperative work in the compilation of stream gauging and stream runoff observations through the medium of two State appropriations. The cooperative agencies are: The Water Resources Branch of the United States Geological Survey.

The Nevada Cooperative Snow Surveys.

The activities of the State Engineer in each of the fields are briefly related under their proper headings elsewhere.

PUBLIC SERVICE COMMISSION

The Nevada Public Service Commission is composed of the following members:
Charles B. Sexton, Chairman, Carson City.
Charles V. Williams, Ely. Minutes.
Alfred Merritt Smith, Carson City.
Lee S. Scott, Secretary, Carson City.

The work of this Commission is published by the Chairman in a biennial report. During the past biennium many hearings have been held in various parts of the State on matters concerning the rate schedules of public utilities, road and motor vehicle carriers, complaints as to public service, and requests for certificates of convenience and necessity for the operation of public utilities.

THE NEVADA STATE BOARD OF IRRIGATION

The board is composed of the following members:
E. P. Caravel, Governor of Nevada, Carson City.
Wayne T. McLeod, Surveyor General, Carson City.
Gray Mashburn, Attorney-General, Carson City.
Alfred Merritt Smith, State Engineer, Carson City.

This board was created by the provisions of section 2, chapter 59, Nevada Statutes of 1901 (Nevada Compiled Laws 1929, section 9531), for the purpose of administering an appropriation of $4,000 made by that Legislature to carry on hydrographic work, irrigation studies, and stream measurements in cooperation with the United States Geological Survey and the United States Department of Agriculture, in association with the Nevada Agricultural Experiment Station. The State appropriation was contingent upon an equal amount of money

REPORT OF STATE ENGINEER

ADJUDICATIONS COMPLETED

MAMSE SPRINGS

The location of Mamse Springs and tributaries is in the southerly portion of Nye County about six miles southerly from Pahrump, Nevada, and about twenty-eight miles northwesterly from Shoshone, California. There are two claimants to the waters from this source, one by virtue of vested rights and the other under application to the State Engineer for permission to appropriate this water.

April 14, 1937—Petition filed with State Engineer by water users to initiate proceedings to determine relative rights in and to the waters of Mamse Springs and tributaries.
May 17, 1937—Field investigation completed and report filed by the State Engineer in his office.
May 18, 1937—Order filed granting petition to determine relative rights in and to the waters of Mamse Springs and tributaries. Copy of order and letter advising claimants that since the claimants had all signed waiver of notices the State Engineer would proceed under section 386.
May 24, 1937—Abstract of claims prepared by the State Engineer and filed in his office.
June 8, 1937—Order of Determination filed by State Engineer in his office.

June 12, 1937—Order of Determination, together with all original evidence and data as of record in the State Engineer's office, were filed with the Clerk of the Fifth Judicial District Court of the State of Nevada, in and for the County of Nye.
June 15, 1937—Court entered an order setting July 29, 1937, as the date for hearing exceptions. This hearing was postponed and set over from time to time, the last order setting the time for November 8, 1937.
November 5, 1937—Hearing before Hon. William D. Hatton, Judge of the Fifth Judicial District Court of the State of Nevada, in and for the County of Nye. Case submitted pending filing of briefs by respective counsel.
February 24, 1938—Decision entered by Hon. William D. Hatton, Judge of the Fifth Judicial District Court.
March 2, 1938—Motion for new trial made by claimant Eddie Barry.

October 19, 1938—Motion for new trial overruled by Hon. William D. Hatton, Judge of the Fifth Judicial District Court.
November 14, 1939—Findings of Fact and Conclusions of Law filed.
November 28, 1939—Eddie Barry appeals to the Supreme Court of the State of Nevada from the order of the District Court denying objects motion for a new trial. September 11, 1940, was set for the arguments before the Supreme Court.
REPORT OF STATE ENGINEER

Supreme Court Opinion filed December 16, 1940, upholding ruling of District Court.

GLENBROOK CREEK

Glenbrook Creek and its tributaries has its origin in an offshore range of the Sierra Nevada Mountains, skirting the easterly side of Lake Tahoe and forming the divide between the Tahoe drainage basin and the Carson Valley drainage, and flows in a westerly direction into Lake Tahoe. The main portion of the watershed lies within the northeast corner of Township 14 N., Range 18 E., M. D. B. & M.

September 6, 1939—The Glenbrook Company filed a petition with the State Engineer to initiate proceedings for the determination of the relative rights in and to the waters of Glenbrook Creek.

June 1, 1940—Report of Field investigation of the stream system was filed in the State Engineer's office.

June 14, 1940—The State Engineer entered an order granting petition and signing his intention to make proper arrangements to proceed with the determination in question.

February 10, 1941—Abstract of Claims filed in State Engineer's office.

May 2, 1941—Order of Determination filed in State Engineer's office.

May 3, 1941—Order Setting Time for Hearing June 12, 1941.

August 1, 1941—Findings of Fact, Conclusions of Law, and Decree filed.

NORTH LOGAN CREEK

North Logan Creek or Logan Shoals Creek No. 1 has its origin the same as Glenbrook Creek, in an offshore range of the Sierra Nevada Mountains, and is the next mountain stream south of Glenbrook Creek. It flows in a westerly direction and enters Lake Tahoe near the northern boundary of Section 22, Township 14 N., Range 18 E.

September 6, 1939—Petition filed by the Glenbrook Company to initiate proceedings for the determination of the relative rights in and to the waters of North Logan Creek.

June 10, 1940—Report of Field investigation of the stream system was filed in the State Engineer's office.

June 14, 1940—Order entered granting petition and signifying intention to make proper arrangements to proceed with the determination in question.

September 4, 1941—Findings of Fact, Conclusions of Law, and Decree filed.

ADJUDICATIONS PENDING

BASSETT CREEK

Bassett Creek is located on the easterly slope of the Shell Creek Range and drains into Spring Valley in and about Township 18 N., Range 66 E., M. D. B. & M. There are two claimants to the waters of its source.

December 16, 1938—B. H. Robinson, through his attorney, W. Howard Gray, filed a petition in the State Engineer's office requesting a determination of the relative rights in and to the waters of Bassett Creek.

December 31, 1938—The report of the investigation of the stream system was filed in the office of the State Engineer.

REPORT OF STATE ENGINEER

SUMMARY OF THE WORK OF THE STATE ENGINEER

STATE COMMISSIONS AND BOARD

The State Engineer upon taking office automatically becomes a member of the following commissions:

1. The Nevada Public Service Commission.

2. The Nevada State Board of Irrigation.

3. The Nevada State Irrigation District Bond Commission.


5. The State Range Commission.

6. The Nevada State Planning Board.

By gubernatorial appointment the present State Engineer is also a member of the following commissions:

7. The Colorado River Commission of Nevada.

8. State Board of Registered Professional Engineers.

RECLAMATION ORGANIZATIONS

1. The Association of Western State Engineers (seventeen Western States).


3. The "Committee of Fourteen." Two members from each of the Colorado River Basin States, appointed by respective Governors.

STATUS OF ADJUDICATION OF STREAM SYSTEMS

The work of adjudicating the waters of the Nevada stream systems has proceeded since the inception of this office in 1901 to the present time:

1. Stream systems adjudicated, 1901 to date 28

2. Acres under adjudicated streams 384,693

3. Vested water users under adjudicated streams 612

4. Adjudicated stream systems supervised by this office during the past biennium 6

5. Adjudicated stream systems not supervised by this office during the past biennium 22

6. Streams in process of adjudication 37

7. Adjudications completed during past biennium 3

8. Stream systems on which decree have been entered by civil suit not under supervision of this office 3

9. Stream systems adjudicated by United States District Court 11

10. Stream systems under process of adjudication by United States District Court 2

STATUS OF WATER APPLICATIONS AND PROOFS OF APPROPRIATION

1. Water applications filed, 1901 to June 30, 1942 10,644

2. Water applications acted upon, 1901 to June 30, 1942 10,171

3. Water applications on which no action has been taken 673

4. Water applications acted on, July 1, 1938, to June 30, 1942 383

5. Water applications filed, July 1, 1940, to June 30, 1942 918
December 22, 1938—The State Engineer entered an order granting the petition and singifying his intention to make proper arrangements to proceed with the determination in question.

December 23, 1938—The State Engineer entered notice and order for taking proofs.

June 28, 1940—Notice sent by registered mail advising claimants that Proof of Appropriation and supporting maps must be filed on or before July 15, 1940.

August 29, 1940—Abstract of Claims filed in State Engineer's office.

August 21, 1941—Final Order of Determination made and filed in the Office of the State Engineer.

September 25, 1941—Order Setting Time for Hearing, November 17, 1941.

November 12, 1941—Notice of Exceptions to the Final Order of Determination.

April 10, 1942—Affidavit of Compliance with Jurisdictional Requirements.

McPaul Creek

McPaul Creek lies in Township 13 N., Range 18 E., M. D. B. & M., and flows westwardly and drains into the southerly end of Lake Tahoe. There is only one claimant to the waters of this source, i.e., Arthur K. Bourque, and the amount of land claimed to be irrigated under the vertical right is approximately 34 acres.

June 19, 1938—Arthur K. Bourque, through his agent, H. M. Payne, filed a petition in the State Engineer's office requesting a determination of the relative rights in and to those waters.

July 6, 1939—The report of the investigation of the stream system was filed in the office of the State Engineer.

July 11, 1938—The State Engineer entered an order granting the petition and signifying his intention to make proper arrangements to proceed with the determination in question.

October 30, 1941—Order of Determination made and filed in the office of the State Engineer.


Muddy Creek

Muddy Creek and all of its tributaries are located in Township 20 N., Range 66 E., M. D. B. & M., approximately thirty miles distant on an air line in a north-easterly direction from Ely, Nevada, and about 70 miles distant by road. The creek heads in the Shell Creek range of mountains and runs in an easterly direction into Spring Valley.

August 27, 1938—Petition filed with the State Engineer to initiate proceedings for the determination of the relative rights in and to the waters of Muddy Creek.

September 23, 1938—Report of field investigation of the stream system was filed in the State Engineer's office.

June 14, 1940—Order filed by State Engineer granting petition to determine the relative rights in and to the waters of Muddy Creek.

Kalamazoo Creek

Kalamazoo Creek and tributaries mainly rise and flow in Township 20 N., Range 66 E., M. D. B. & M., approximately 28 miles distant on
on an airline in a northeasterly direction from Rly, and about 67 miles distant by road. The creek heads in the Shell Creek range of mountains and runs in an easterly direction into Spring Valley.

January 4 and 31, 1940—Petitions filed with the State Engineer to initiate proceedings for the determination of the relative rights in and to the waters of Kalamazo Creek.

December 1, 1939—Report filed in the office of the State Engineer of field investigation of the stream system. June 14, 1940—The State Engineer entered an order granting petition and signifying his intention to make proper arrangements to proceed with the determination in question.

ADJUDICATION BY DEPARTMENT OF STATE ENGINEER

Streams on Which Decrees Have Been Entered Under Civil Suits, Statutory Court Decrees, and Streams Adjudicated by United States District Courts.

The following table shows the status of all the streams in the State that have been or are the subject of adjudication proceedings, given in the order of:

1. Name of stream system.
2. Location.
3. Date adjudication proceedings initiated.
4. Status toward completion, etc.

Baker and Lehman Creeks (White Pine County)—May 26, 1935; both streams considered as one; Findings of Fact, Conclusions of Law and Decree entered October 1, 1934. Average land involved 2,151.7 acres.

Barber Creek (Douglas County)—September 31, 1914; Court Decree entered May 27, 1921. Land involved 20.85 acres.

Barrett Creek (Humboldt County)—Petition for Determination received December 20, 1929; Proofs of Appropriation voluntarily filed. Proofs submitted for 214.4 acres.

Bassett Creek (White Pine County)—Petition for Determination received December 8, 1913. Hearing on the Order of Determination and Exceptions April 23, 1914.

Battle Creek (Humboldt County)—Petition for Determination received December 20, 1929; report on investigation made May 22, 1930; Proofs of Appropriation voluntarily filed. Land involved approximately 666.80 acres.

Bishop Creek (Ely County)—Included in adjudication of Humboldt River system.

Buena Vista Creek (Pershing County)—Petition for Determination of Relative Rights filed May 21, 1931.

Carson Creek (Lander County)—July 29, 1937; Court Decree entered November 26, 1937; Certificate issued under Court Decree July 3, 1938. Derived rights for 21.11 acres.

Carson River (Douglas, Granty, Lyon and Churchill Counties)—Petition for Determination received May 21, 1931; on November 19, 1931, Max A. A. Barrett, representing special master, petitioned the Supreme Court of Nevada for permission to take testimony, the transcript of which is to be submitted to the Judge for his final action. Final hearing held and on 30 February and Carson City. The taking of testimony was completed during April 1942. Litigants have been given one year within which to file final briefs. March 19, 1943, order made by Court appointing Geo. A. Barrett as special master in chancery and John V. McClure assistant special master in chancery to make findings and report to the Court. October 8, 1943, plaintiff's opening briefs filed. June 30, 1943, order was entered by Geo. A. Barrett granting defendants to September 29, 1943, to file their answering briefs.

Chesnatch Creek (Reno Wash County)—November 4, 1939; Preliminary Order

Cleaver Valley Creek (Lincoln County)—November 4, 1939; Preliminary Order

OFFICIAL ROSTER DEPARTMENT OF STATE ENGINEER

Humboldt River, 1940

J. A. MILLER... Supervising Water Commissioner... Entire River

D. E. WYNCH... Water Commissioner... Lovelock District

F. E. BACCHUS Water Commissioner... Winnemucca District

MYRON CLARK, Water Commissioner... Battle Mountain District

OWENS BUCK, Water Commissioner... Lovelock and South Fork Districts

ALBERT QUILL, Water Commissioner... Statz Valley and North Fork Districts

J. V. REYNOLDS, Hydrographer... Willow Creek Reservoir

G. W. TRUMBULL, Hydrographer... Elko

Humboldt River, 1941

J. A. MILLER, Supervising Water Commissioner... Entire River

D. E. WYNCH, Water Commissioner... Lovelock District

F. E. BACCHUS, Water Commissioner... Winnemucca District

MYRON CLARK, Water Commissioner... Battle Mountain District

OWENS BUCK, Water Commissioner... Lovelock and South Fork Districts

EDWARD KING, Hydrographer... Elko District

ALBERT QUILL, Water Commissioner... Statz Valley and North Fork Districts

J. V. REYNOLDS, Hydrographer... Willow Creek Reservoir

Humboldt River, 1942

J. A. MILLER, Supervising Water Commissioner... Entire River

F. E. BACCHUS, Water Commissioner... Winnemucca District

MYRON CLARK, Water Commissioner... Battle Mountain District

EDWARD KING, Hydrographer... Elko District

OWENS BUCK, Water Commissioner... Lovelock District

JOHN FRANKLIN, Hydrographer... Lovelock District

Little Humboldt River, 1940

ROLAND V. BROBER, Water Commissioner... Entire District

Little Humboldt River, 1941

ROLAND V. BROBER, Water Commissioner... Entire District
STATE ENGINEERS SINCE CREATION OF OFFICE

A. E. Chandler
Henry Thurnell
Frank B. Nicholas
Emmett D. Botile
W. M. Kraner
J. G. Schurman
Severine C. Cade
J. G. Schurman
Robert A. Allen
Geo. W. Malone
Alfred Merrell Smith

May 29, 1905
May 1, 1906, to May 1, 1907
May 1, 1907
March 9, 1910
March 8, 1910, to March 21, 1911
March 21, 1911, to May 16, 1917
May 16, 1917, to January 18, 1918
January 25, 1918, to March 26, 1919
March 28, 1919, to October 7, 1922
October 7, 1922, to March 26, 1927
March 29, 1927, to May 28, 1933

REPORT OF STATE ENGINEER

of Determination prepared prior to 1927, but not filed. Land involved
Approximately 497.56 acres.
Clear Creek (Pershing County)—June 10, 1914; Court decree rendered
November 25, 1915, affirming Order of Determination; Certificate issued October 30, 1972, under Court decree. Land with decree rights 1,592.36 acres.
Clear Creek (Church, Douglas County)—According to decree of County Court, certified July 7, 1922, civil suit. Notice of Order of Procedures, Preliminary, February 7, 1914.
Crescent and Wilson Creeks (Lincoln County)—July 14, 1923; Court decree entered May 29, 1928. Certificate issued July 25, 1929, under Court decree. Land involved in decree rights 6,912.40 acres.
Cruitian Creek (Nye County)—1919; Notice of submission of proofs dated May 22, 1931; decree entered April 23, 1931. Certification issued October 28, 1932, and February 13, 1939, under Court decree. Decreed rights for 600 acres.
Deepvale Springs, Clear Creek, Seegmey Creek, Lost Creek, Owas Valley Creek, Outlawtown Creek, Bad Mountain Creek, and West Springs (Elko County)—1915; To abstract of proofs: Adjudication initiated under provisions 801, chapter 208, statutes of 1915.
Duck Creek (White Pine County)—Decree entered November 24, 1899, civil suit.
Duckwater Creek (Nye County)—December 1, 1908; The first Court decree was rendered by Hon. M. R. Arradell, adjudicating the various rights. June 20, 1915, another decree was entered by the above-mentioned Court. October 19, 1923, a stipulation was entered into by the various water users and endorsed by the Court requesting the State Engineer to take hold investigation as to types of structures, etc., required for more economical and satisfactory method of distributing water; investigation completed and report filed April 13, 1922; May 27, 1929, a stipulation was entered into by the various water users which brought to a conclusion the remaining questions involved in the adjudication of the waters of this stream. Decreed rights for approximately 4,000 acres.
Eden Creek (Humboldt County)—1915; To abstract of proofs, adjudication initiated under provisions 801, chapter 208, statutes of 1915.
Edgewood Creek (Douglas County)—Petition for Determination of Relative Rights April 28, 1928. Warrant of notice filed.
Elm Creek and its Tributaries, Being Hurford, or Lake's Creek, and Warm Springs (Elko and Humboldt Counties)—To abstract of proofs; Adjudication initiated under provisions 801, chapter 208, statutes of 1915. Lands involved approximately 8,335.49 acres.
Franklin River (Boulder County)—October 14, 1927, To investigation of facts and conditions; pending order granting petition.
Germ Creek (Douglas County)—Decree entered July 23, 1922, civil suit.
Goshen Creek (Douglas County)—Petition for Determination received September 6, 1929. Findings of Fact, Conclusions of Law and Decree filed August 1, 1931.
Goose Creek (Elko County)—March 5, 1935; Decree entered March 5, 1935; Land involved 992.87 acres.
Harvest crops: 174,709.10 acres
Medow pasture: 25,310.53 acres
Diversified pasture: 78,926.70 acres
Total: 280,915.53 acres
LETTER OF TRANSMITTAL

STATE OF NEVADA,
OFFICE OF STATE ENGINEER,
CARSON CITY, JULY 31, 1942.

To his excellency, honorable E. P. CAVALLE, Governor of Nevada, Carson City, Nevada.

SIR: In compliance with the provisions of section 14, chapter 140, Nevada statutes of 1931, and section 1, chapter 171, Nevada statutes of 1931, I have the honor to transmit herewith the Biennial Report of the State Engineer for the period ending June 30, 1942.

Following your appointment of Deputy State Engineer Hugh A. Shamberger on May 8, 1941, to be Director of the State Council of Defense of Nevada, most of his own time and also a considerable portion of the time of department personnel and use of office facilities have been devoted to the war effort. The performance of this work, in addition to regular duties by the staff, is deserving of high praise. We are proud, and Nevada may well be proud, of the efficiently functioning State organization for civilian defense.

Respectfully Submitted,
ALFRED MERRITT SMITH,
State Engineer.
Sing to determine relative rights, dated May 9, 1930. Proofs submitted, 541 acres.

Quina River (Humboldt County)—Civil suit decree, Pacific Lumber Company v. Klamath Ranching Company and others, entered April 9, 1929; a petition for an alternative writ of mandate was filed in the Supreme Court on August 12, 1929, requesting the State Engineer to assume and take control and to regulate the waters of Quina River; the Supreme Court on July 5, 1930, handed down a decision which failed to sustain the alternative writ and dismissed the proceedings. Decreed rights for 17,411.34 acres.

Klosp River (Klamath and Lander Counties)—1910; To notice of pending of proceedings.

Elke Creek (Klamath County)—1910; Court decree entered June 20, 1922; decreed rights for 80,725 acres.

Sanborn Creek (Siskiyou County)—1920; A petition of private adjudication initiated under provisions 581, chapter 341, Statutes of 1919.

Salmon River (Klamath County)—March 1, 1930; Court decree entered March 1, 1930; a separate decree was entered March 23, 1919, in the United States District Court for the District of Idaho, Union Division, in the matter of Twin Falls Salmon River Land and Water Company v. Township Coal and Black Company; land involved approximately 18,925 acres.

Serrell Creek (White Pine County)—September 15, 1925; Decree entered June 18, 1926. Decreed rights for 107.70 acres.

Short Creek (White Pine County)—1910; To proofs taken.

Silver Creek (Lander County)—March 17, 1927; Decree entered on February 13, 1927.

Silver Creek (White Pine County)—Decree entered July 6, 1911; civil suit.

Spencer Creek (Butte County)—1911; To notice of pending of proceedings.

Six Mile Creek (Elko County)—July 25, 1919; Court decree final and entered December 12, 1925; certificates issued December 31, 1926, under Court decree. Decreed rights for 437.90 acres.

South Spring (Nye County)—San North and South Springs.

Spanish Creek (Ferry Aiken Creek)—1899; Court decree entered on January 25, 1918. Decreed rights for 1,543 acres.

Steele Creek (Elko County)—To notice and order continuing hearings.

Summit Creek (White Pine County)—January 12, 1921; Decree entered November 6, 1925. Decreed rights for 1,098.98 acres.

Thousand Mile Creek (Elko County)—March 24, 1924; Court decree entered December 6, 1929; certificates issued April 19, 1929, under Court decree. Decreed rights for 24,250.80 acres.

Tony Creek (Humboldt County)—1932; Court decree entered August 30, 1933, Decreed rights for 15.50 acres.

Trout Creek (Elko County)—1930; To notice pending of proceedings; tributary to Humboldt River, adjudicated as part of Humboldt River stream system.

Truckee River (Washoe, Lyon and Churchill Counties)—1923; Temporary order issued by United States Court, February 12, 1928. On April 20, 1942, the Truckee River Agreement and a stipulation for entry of Final Decree was filed.

Virgin River (Clark County)—1921; Court decree entered May 14, 1927. Decreed rights for 1,933.22 acres.

Walker River (Douglas, Lyon and Mineral Counties)—1905; March 5, 1919, final decree; Amended Final Degree of Walker River System was filed on April 23, 1919. On August 7, 1920, Dean C. Peiser, Superintendent of the Clark Indian Agency, was appointed as a member of the Board of water commissioners, and its members are: Chairman, George Parker, Members F. H. Palutino, P. H. Raukwell, P. O. Stickleby, John H. Whibley, Dean C. Peiser and C. G. Selkirk is Secretary.

Walker Creek (Elko County)—Entered May 12, 1928; civil suit.

Washoe (Grav Creek) (Elko County)—1933; To notice of inspection served on claimant. Refer to K. C. Creek.

White River (White Pine and Nye Counties)—Certificates issued by State Engineer under sections 14 to 19, inclusive, of statutes 1907, in 1912; Decreed
REPORT OF STATE ENGINEER

July 1, 1922, case reopened under statutes 1913; order of determination filed with Court October 7, 1922; hearing on exceptions held December 4, 1922; decree entered noon of same day as of December 4, 1922. By Hon. H. W. Edwards, District Judge, Seventh Judicial District Court of Nevada, in and for the County of White Pine. Decree rights for 3,001 ft. acres.

Woods Cloud (Elko County)—Petition for determination of relative rights filed. Decree entered June 27, 1925. Petition withdrawn January 1926.

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CHAPTER VI
Common Methods of Measuring Water as Practiced in Western States

The booklet entitled "Common Methods Of Measuring Water As Practiced In Western States" which was prepared by the Office of the State Engineer in the year 1940 has proven to be a valuable aid to ranchers, miners, stockmen, and water engineers, not only in the United States, but in many foreign countries. This booklet was prepared mainly for the purpose of describing the measurement of water through the various types of weirs, orifices, and the Cardwell Flumes in a simple manner that could be understood by the layman. Drawings are included of the various types of weirs and orifices, together with seven discharge tables which cover all of the various types of measuring devices that would be used under ordinary conditions.

The demand for these pamphlets has been rather heavy, and over five hundred have been sent out to some thirty States outside of Nevada—Arizona, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Oklahoma, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, Washington, D. C., and Wyoming. In Nevada over a thousand copies have been distributed to water users. Requests have come from the following countries outside of the United States for copies of this pamphlet: San Salvador, Central America; Mexico City, Mexico; Vancouver, British Columbia; Havana, Cuba; Caracas, Venezuela; South America; Bogota, Colombia, South America; Canada; Manila, Philippine Islands; Oporto, Portugal; New Zealand; Buenos Aires, Argentina; Brisbane, Queensland, Australia; Hobart, Tasmania, Australia; Wellington, W. L., New Zealand; Pointe-a-Pierre, Trinidad, B. W. I.; Honolulu, T. H.

Copies of this bulletin are still available and can be furnished without cost to interested parties.
CHAPTER VII
Civilian Defense

By JOE A. SHAMBERGER, Director Nevada State Council of Defense

Hugh A. Shamberger, Assistant State Engineer, was elected Director of the Nevada State Council of Defense on May 8, 1941. For some months thereafter no funds were available to defray the expenses of the director. During this period the State Engineer supplied clerical help, office space, and traveling expenses. Much traveling is necessary in the performance of work by the Department of the State Engineer, and it has been to some extent economically combined with the extensive traveling that must also be done by the director. The office of the director has been established in the offices of the State Engineer, and Mr. Shamberger performs this service without additional compensation by either the State or the Government.

In this critical time of war a properly developed home front is a vital necessity. Fully realizing this, the members of the staff of the State Engineer have aided Director Shamberger in all ways possible.

Continuous assistance in many ways, through the use of a large personnel, has also been rendered by Robert A. Allen, State Highway Engineer, and the members of his efficient staff.

A paper entitled "Civilian Defense" was presented by Director Shamberger before Nevada's First Economic Conference, called by Governor E. V. Carville in Reno on May 8, 1942, and is herewith reproduced in full:

On March 28, 1919, an Act creating the State Council of Defense was approved by the Twenty-ninth Session of the Nevada Legislature. You will note that this was after the signing of the armistice. I would like to quote a portion of the preamble to this Act:

WHEREAS, that state, county, and community councils of Nevada, cooperating with the national government, have served invaluable agencies during the war period in carrying out government requests, and in the presentation to the people of the war needs and problems of the federal government and its departments in meeting the emergencies of war; and

WHEREAS, it is the manifest duty of Nevada to cooperate with the national government in meeting such conditions and demands as may arise during the readjustment period; and

WHEREAS, the national government, through the council of national defense, has specifically requested the continuance of the state council of defense and its subordinate and auxiliary councils for an indefinite period and ask that the same be legalized by act of the legislature.

This is the statute under which our present State, county, and local councils of defense have been set up. It provides among other things that the members of the State Council of Defense shall not exceed twenty-five; that the State Council of Defense shall have the power to prescribe the powers and duties of all county and community councils, and that all county and community councils shall be organized under and by virtue of authority of the State Council of Defense and shall be under its control and supervision.
CHAPTER XI
LAS VEGAS ARTESIAN BASIN, CLARKE COUNTY, NEVADA

In the 1940 Biennial Report of the State Engineer a rather complete discussion was made of the Las Vegas Artesian Basin which is located in and around Las Vegas, Nevada. During the past few years the State Engineer's Office has been carrying on investigations in this artesian basin. Starting in 1939 certain wells were designated as "observation wells," and each month pressure readings were made to determine the static head. The results of these investigations indicate a slow decline in the static head and a decrease in the rate of depletion, which would be evidence of a depletion of water in this basin. However, the tests have not been carried forward sufficiently at this time to determine whether or not there is an actual depletion or merely a period depletion.

Following the enactment of the present underground water law in 1939 the State Engineer's office has been on the job with a repair of many leaking wells in the valley, with a saving of over 2,000,000 gallons of water daily. Also, the owners of many wells that had previously been drilled on which no applications for permission to appropriate water had been filed have made applications and received permits to appropriate water.

Through the cooperation of the United States Forestry Service and the Nevada Cooperative Snow Surveys purely snow surveys are now being made in the Charleston Mountains. This, coupled with actual measurements made biannually by the State Engineer's office, may enable the State Engineer to determine with reasonable accuracy the amount of water that can be taken out of the basin without causing a depletion. Naturally it will take several years to gather the necessary information before any reasonable determination can be made.

It has become evident that before any real control can be had over the drilling of wells in the Las Vegas Artesian Basin the prevention of waste from leaky and uncontrolled wells, a licensing law should be enacted for well drillers and provisions made for a full-time artesian well supervisor. The 1939 underground water law provides a method whereby a special tax can be made on all taxable property situated within a prescribed artesian water basin for the payment of salaries of such supervisor. An effort will be made to have the County Commissioners of Clark County levy such a tax.

In the last two years there have been forty new wells drilled in the Las Vegas Artesian Basin on which applications have been made to appropriate water. The large increase of population brought about by the defense projects in and around Las Vegas has resulted in a greatly increased use of water. The new wells that have been drilled have, as far as can be determined by the State Engineer's office, been properly cased and control valves have been installed. During the first week of September 1942, Mr. Edmund Math, Deputy State Engineer, assisted by Harry Jameson of Las Vegas, made well measurements on approximately fifty of the larger wells in the Las

It is also provided that the State Council of Defense shall cooperate with all departments of the National, State, and county governments in the promotion of such plans, programs, and policies as may be made necessary by the readjustment period following the war.

If in the wisdom of our 1919 Legislature such a body was essential in the readjustment period following the first world war, it is obvious that such a body will be essential in carrying out the plans now under consideration. Our thousands of civilian volunteers will be trained and ready for that task.

Our present State Council of Defense was organized by Governor Carville on May 8, 1941. A Council of Defense Conference is primarily for the purpose of post-war planning, my paper will be devoted to the task at hand—to explain just what civilian defense means and to tell you of some of the programs that are now being carried on throughout our State. Also, I believe you will recognize the fact that such a program will have a definite post-war value.

Civilian defense has one main objective—to help win this war. It has two main functions: First, to enlist, organize and train volunteer personnel for the protection of civilian life and property and, second, to mobilize every man, woman, and child in carrying on programs essential to this war effort and seeing to it that everyone is throwing his full weight into this war.

The active defense of our country is the responsibility of our Army, Navy, and Air Force. The passive defense or the protection of civilian life and property in the event of an enemy attack is the responsibility of the civilians themselves. It covers every community, and every man, woman and child in those communities, and must therefore enlist the time, energy, and interest of every patriotic citizen.

Our councils of defense were not formed to make war, but to prepare the defense of the civilian population so that should attack come, casualties and property losses will be held to the minimum and hence offset the purpose of enemy air raids on communities, which are usually for the purpose of creating panic and breaking down public morale.

Immediately following May 8, 1941, the State Council of Defense started organizing county and community councils of defense in every county and in practically every community of our State. Work was started on essential programs, volunteers enrolled, protective services organized, and following December 7 very little readjustment had to be made. On that date our councils of defense were ready in every county and community.

At the present time there are sixty county and community councils of defense in Nevada and they are all working, getting stronger every day, and people everywhere are cooperating splendidly. I know, because I have visited them all many times during the past twelve months.

Civilian defense, as I have stated, has two main functions—civilian protection and civilian participation.

Civilian protection is designed for the protection of civilian life and property, to teach the people of Nevada how to save their lives and property from enemy attacks from the air. To this end there have been enlisted over 8,000 volunteer men and women to act as air-raid
wardens, auxiliary firefighters and policemen, emergency medical service, emergency utility repair, and public works corps, and other of the protective services, all essential to civilian defense.

Nevada is rapidly becoming a military and defense industry State. Now the southern tip of the State is Boulder Dam which furnishes the main supply of electrical power for the defense industries in southern California. At Boulder City is Camp Siebert, where there are over a thousand soldiers training for military police. Between Las Vegas and Boulder City the great 860,000,000 magnesium plant is now under construction, and the first unit is scheduled to produce strategic magnesium metal within a month or so.

Within a few miles of the magnesium plant a $1,500,000 manganese plant will soon be under construction. About ten miles north of Las Vegas is Camp Mccouran aerial gunnery school with over 4,000 army personnel. Near Tonopah an aerial bombing base is now under construction, and from this base bombers will take off for practice maneuvers on the 3,500,000 acres of aerial gunnery range lying south and east from Tonopah.

Near Hawthorne, a town of about 800 a year ago and now overflowing with some 9,000 people, is one of the larger Navy ammunition depots. An Army munitions depot is now under construction near Susanville, just over the Lassen County line in California. The great Lemmon Valley air depot with 2,000 or more employees and probably will be completed some time this fall, and there is talk of a Navy training base near here. Then there will be the contact fighter schools near Austin, Fallon, and Minden, and other military and defense industry activities are bound to follow.

Added to this we have our three transcontinental railroads, our strategic highways, our great copper mines and smelter in White Pine County, the large tungsten mine in Pershing County, the magnesium mine in Gabbs Valley which will furnish ore for the Las Vegas plant, and which is now furnishing ore for the reduction of magnesium at the Permanente plant near San Jose, the lead and zinc mines in Lincoln County, and other strategic mines throughout the State.

I mention these items in order to impress upon you this fact—that if enemy bombers attack this country on the west coast it is highly probable that some of these attacks will be concentrated on strategic points in Nevada. If the enemy fails to find his target or is turned back the bombs will be unloaded on our communities, not so much for destructive purposes but to cause panic which is more destructive than the actual bombing. Panic evinces a complete disintegration of the morale of the people. The predisposing cause of panic is complete unpreparedness to meet emergency situations. The correction of such a condition can be brought about only through an organizational set up, such as our protective services.

And so we are preparing here in Nevada with over 8,000 men and women volunteers assigned to these various protective services. Of this number over 3,000 have either completed their minimum training or are now in training. They are devoting a great deal of time to this work and will continue to devote their time and energy for the duration. Our auxiliary firefighters are being trained under the supervision of the fire fighting officials in each community, the auxiliary policemen seems to have been true also of Martin Creek in the Little Humboldt Basin.

The experience of the two years is providing more exact knowledge of the effect of excess rain in increasing the runoff and raising the water table and the reverse effect of the latter in reducing absorption and forcing an excess amount of melting snow into the streams. Ultimately all factors except the maximum of the summer precipitation can probably be estimated by May 1.

Moutain stream gaging should be expanded to all of the streams covered by the snow survey and should be begun as early and continued as late as the streams flow. Only thus can the problems mentioned above be solved. In particular, stream gaging should be inaugurated on the Upper Maws River, where the snowfields are difficult to reach but provide an essential water supply. Fortunately after several years endeavor, a year-round automatic recorder has been established at Chimney dam site on the Little Humboldt Basin above most diversions. The erection and maintenance are by the U. S. Geological Survey (Water Resources Branch) in cooperation with the State Engineer.

The forecasts of streamflow now cover the entire State and contain full details of snow cover and weather during melting. In the forecast of April 1 for the Humboldt Basin, a detailed analysis of the causes of the flood of 1910 and the runoff for 1941 and 1942 is given. The report of the runoff of the tributaries of the Upper Humboldt River for 1941, now compiled by the chairman, contains also a set of rating curves and snow normals based on a 37-year record at Pittsford and the percentage relationships of the March-July, April-July, and annual periods of each year.

The new and revised normal of 215,000 acre-feet for March-July will be substituted for the previous normal of 255,625 acre-feet and snow-cover normals will be adjusted to it. The lower normal fortunately corresponds to the normal beneficial use on the Humboldt. At the suggestion of the editor of Soil Conservation, Dr. Church, originator of streamflow forecasting, has written a perceptive article on "Organized Water." Fortunately the days of confusion and suspicion of 1910 are past and water control has taken their place. Best of all in this year of concentration, water over practically the entire United States is abundant.
of the U.S. Soil Conservation Service that is directing the Federal- 
State Snow Surveys, has recommended that each snow shelter-cabin 
be provided with a map of the route to the nearest habitation, and that 
a general map showing the location of snow cabins be placed on air- 
planes.

To reduce injury from falling, test is being made of ski lamings 
that promptly release the foot from ski when a spill occurs.

The experiment of conducting two detailed snow surveys in the 
Humboldt Basin March 1 and April 1 of each year with surveys at 
key stations January 1, February 1, and May 1, has now become an 
established custom, for the snow cover of April has a direct effect on 
the April-July runoff, and excess snow at the lower elevations must be 
known and carefully observed for flood menace. Two forecasts are 
issued, one in early March as to the season's water possibilities, the 
second in April when possibilities are more certain. On the basis of 
recent experience a supplementary statement of unusual conditions 
in May will frequently be desirable.

In strong contrast to the years of 1939 and 1940, the years of 1941 
and 1942 must be called unusual in their extreme deviation from the 
forecast. In 1941, the runoff at Palmade was 50% of normal in excess of 
the snow cover April 1. The Kue of Lavalette Creek and Martin Creek in the Little Humboldt Basin. This was due to 
summer precipitation averaging double normal, lasting present in 
the entire season from April 1 until winter. The Utah streams like-
wise exceeded their forecasts, for they were also in the belt of excess 
rain. The streams in the Sierra Nevada, however, being outside this 
belt, were unaffected and approximated their forecasts. Nearly half 
of the excess in the Humboldt was forecasted on May 1, leaving it still 
32.6% below the actual. This was inevitable, for there was no means 
of knowing that the excessive rains would continue.

The flood and March-July runoff of 1942 were almost unprecedented 
in the record of the Humboldt. The flood at least approached that of 
1910 for which only water stage rather than exact measurements of 
flow are available. The March-July runoff ranks third during the 39 
years of record, the three being 1907 with 655,000 acre-feet (based on 
Golconda), 1921 with 551,800 acre-feet, and 1942 with 451,640 
acre-

feet. Only seven seasons had a runoff in excess of 400,000 acre-feet. 
Of these, two occurred in 1906 and 1907 and four from 1914 to 1922. 
The other belongs to 1942 after an interval of twenty years since half 
the amount.

Like the flood of 1910, that of the present season was due to cold 
followed by sudden and extreme rise in temperature. The former 
flood occurred, however, in March, after long accumulation of snow, 
the latter in April with snow apparently only slightly above normal, 
but with a high water table caused by the continuous heavy rains of 
the previous season.

The percentage of the snow cover in the upper Humboldt Basin 
April 1 was 81.9%. The revised forecast of March-July runoff at 
Palmade was 141%, but the actual was 196%, or still 36.6% above 
final estimate. Much of the latter excess was due again to excess 
prefloration during April-May of approximately 50% of normal 
added by soil moisture that decreased the usual absorption. This 
under the police officers. The air raid wardens are operating in close 
contact with the police departments. The emergency medical services 
are under the supervision of our doctors and nurses. In every com-
munity in our State this work is going on. I wish I could tell you of 
some of the things that they are doing so you could appreciate more 
the time and energy that is being put forth.

Uniform blackout ordinances have been adopted in nearly all of the 
counties and incorporated cities in the State. Most of the communities 
are in the State have had blackout practices and all are equipped with air 
raid warning devices.

Civilian participation, the other major phase of civilian defense, is 
the mobilizing of all organizations, associations of people and indi-
vidual citizens to do effectively and efficiently the things they are best 
qualified to handle. This may be termed the channeling of the large 
reserve of volunteers in programs developed to safeguard health, wel-
fare, and morale. Many of these programs are being carried on by 
existing organizations, and in such cases assistance can be given by 
defense councils in referring volunteers to these programs in order 
that their organization activities can be further developed and stimu-
lated.

Perhaps one of the most vital programs at the moment is the salvage 
for victory program that is now well under way in Nevada. There 
have been appointed a State Salvage Committee and an Executive 
Secretary working under the War Production Board. In each com-

munity salvage committees are being formed by the councils of defense.

More than 35 of these committees have been set up and are operating 
with remarkable success. While this program covers the salvaging of 
scrap metal, rubber, paper, old cloth, and tin cans, at the present time 
emphasis is being placed on scrap metal and rubber due to the extreme 
shortage of these two items, and their importance in the production of 
implant of war. The salvage of tin cans which are being util-
ized by the Nevada Consolidated Copper Company at Ruth in the pre-
salvage of copper, is also emphasized.

The nutrition program carried on by the State and county nutrition 
councils in coordination with the councils of defense has made great 
progress in Nevada. More than 3,000 women have either completed 
this course or are now taking it. This program has three main points: 
1. It translates the result of modern nutrition research into simple, 
easy-to-follow rules.
2. It has its front line attack in the communities where people live, 
and make their purchases.
3. It utilizes all available channels of public information to combat 
the lack of knowedex which is the main cause of malnutrition.

Another important program that has made great progress is home 
nursing under the supervision of the Red Cross. This covers 24 hours 
of training in the fundamentals of home nursing, and has been taken 
by approximately 1,000 women in the past three or four months. Home 
nursing is essential because there will be a great shortage of doctors 
and nurses as the war continues, and in the event of an epidemic, such 
as we had in the last war. Women having this training and working 
under the supervision of doctors and nurses can well serve to relieve 
what can well be a critical situation.
The victory garden program, under the guidance of victory garden committees of the nutrition council, is making rapid progress and all over Nevada small home gardens are being planted.

Last January the rationing boards were organized under the council of defense in practically every community in the state. These boards, now known as rationing boards, under the direction of a State Rationing Administrator, have been doing a magnificent job. Their work has expanded from rationing tires and rubber, to automobiles and now sugar, and soon other commodities will be on the rationing list.
A State Consumer Interest Committee has been set up and soon suggested programs will be handed down to the local councils of defense.

The State Health and Welfare Committee is charged with the responsibility of inventorying all Federal, State, county and local health and welfare organizations and to coordinate their activities in our war effort.

Recreational committees are being set up to plan recreational schedules for the soldiers and defense workers.

In many of our communities volunteer offices have been established with a representative centralizing all of the local participation activities. Here volunteers fill out their registration cards and are interviewed, and as soon as possible assigned to a program for which their qualifications best suit them. We hope to have such offices in all of our communities.

Realizing the danger of range and forest fires, the councils of defense, in cooperation with the Forest Service, Grazing Service, Indian Service, Extension Service, county fire coordinators, representatives from the Highway Department, and others, are organizing rural fire boards in order that all fire fighting equipment and personnel may be coordinated. We believe this important to the threat of sabotage—and when we talk of sabotage we usually mean fire—and also the fact that one enemy bomber loaded with phosphorus leaflets could set fire to the entire northern part of our State. In addition to this a strong effort has been made through our State and county fire coordinators to have communities strengthen their fire departments.

In some localities there is no fire equipment whatever, and in others such equipment is inadequate. This condition should be corrected.

Since there is constant danger of enemy attack on our coastal areas there is always the possibility of a sudden and uncontrolled evacuation of people from those areas into our state. This not only represents a major traffic problem, but problems in sanitation, health, welfare, emergency housing, feeding and clothing. With this in mind Governor Carville has appointed, under the direction of the Council of Defense who will have the responsibility of coordinating all services essential for the proper handling of such a movement. This will include the health and welfare services, the Red Cross, which will have the job of emergency clothing, feeding, and housing, law enforcement, highway problems, and other essential services.

This work is progressing rapidly. I might state that the Army does not plan evacuation of civilians this far back at present, but there is the danger of a sudden and panicky movement. In addition to these, many other programs are being developed for community participation.

**Carson River.** This latter course was located and surveyed by the Mono National Forest.

**II. HUMBOLDT BASIN**

During the first year of the biennium, streamflow forecasting in the Humboldt Basin was directed as in previous years by Carl Rige, Assistant Meteorologist of the Nevada Agricultural Experiment Station and U. S. Soil Conservation Service, but since his transfer to active Army service the work has been taken over by Dr. J. B. Church, Meteorologist of the Experiment Station with the assistance of the chairman of the Forecast Committee.

The State and Federal cooperation of earlier years has been continued with ever-expanding participation by the U. S. Forest Service. The Nevada National Forest has established snow surveys in the Baker River Basin in far eastern Nevada to augment the service already established on Charleston Mountains at Las Vegas and on Murray Summit for the Steptoe Valley at Rhy.

The Toiyabe National Forest has developed a snow survey and forecast system for the upper Rose River Basin at Austin in Central Nevada, and the forecast for the Little Humboldt Basin has been applied also to the Quinn River Basin that shares the Santa Rosa Range and snowfields with the Little Humboldt.

Because of the early disappearance of the snow cover at the original Cave Creek snow-survey course at the Ruby Lake National Wildlife Refuge, a new course has been laid out at the same elevation, but better sheltered from the sun.

Safety for snow surveyors has become the leading problem. During the snow-survey trip from Jarbridge to the head of Marys River in late February 1941, an avalanche carried Karl Wilkinson, Ranger at the Humboldt Forest, to his death, while his associate, Dale Bohle, was seriously injured and made his way back to Jarbridge only by superhuman exertion. Two other rangers, L. E. McKenna in Lamoille Canyon and H. J. Snider in the upper American River Basin, suffered knee and leg injury from the twisting of the ski. Only the presence of companions and, in the latter case, the shelter of a cabin made ultimate escape possible.

The U. S. Forest Service and the Nevada Cooperative Snow Surveys prefer snow-survey parties of three, and the Humboldt Forest requires this number where the trip is overnight. More shelter cabins also are desirable, preferably with two-way radio, a tobologn, and two pairs of web snowshoes, which give better traction for pullers than the ski. The Toiyabe Forest and the Experiment Station have cooperated in the construction of a cabin in the autumn of 1941 at the headwaters of Rose River, and the former has placed a cabin on the lower slopes of Buckskin Mountain in the Santa Rosa Range. The Humboldt Forest and the Experiment Station are reorganizing the old shelter cabins and planning an additional cabin on the route from Jarbridge to Upper Marys River Basin in order to avoid the avalanche area and obtain essential snow data.

Owing to the chance escape of an airpilot this last winter in the Sierra Nevada by finding a mountain cabin, the Division of Irrigation
The rise of Tahoe April 1 to high water was 1.56 feet or 92.9% of normal, exceeding the forecast by 3 feet and the East Walker runoff reached nearly 124% of normal, over 20,000 acre-feet, or 32% of normal above the forecast. For the other three rivers the greatest divergence between forecast and actual runoff was for the Truckee River where the runoff was 53.7% of normal or 2.3% of normal above the forecast.

1942

The cooperating agencies were the same as listed for 1941.

The early winter precipitation was high so that February 1 and March 1 snow surveys formed relatively high water content, but light March precipitation caused small increase in high water content and even a loss in water stored by April 1 surveys of several low level courses, due to March melting.

Heavy rains in early and middle of December 1941 must have thoroughly pruned the snow with very excessive April and May precipitation, causing the April-July runoff to greatly exceed the forecast, which was based on an assumed normal spring precipitation.

Lake Tahoe was high in 1941 and the heavy early winter rise assured above maximum permissible elevation in 1942 if gates were kept closed, so gates were opened in February and the elevation was controlled with the result that the maximum reached was 6,230.01 on July 13, while the limit set in the Truckee River agreement is 6,220.10. Had the gates been kept closed after April 1 the maximum of 6,230.03 would have been reached July 26 which is 58 feet or 3.4% of normal higher than the forecast estimate.

The runoff of the Truckee exclusive of Tahoe, the Carson, and the East and West forks of the Walker all exceeded the forecast the amounts ranging from 13.5% of normal for the West Walker to 43.5% of normal for the Carson at Fort Churchill.

A study of the April-May precipitation at U. S. Weather Bureau stations nearest to the above basins shows the following: Truckee, Tahoe, and Marlette Lake had 3455, 1966, and 2000% of normal, respectively; the average percent of normal was 229 for the following ten stations: Sierraville, Bowman Dam, Lake Spaulding, Blue Canyon, Soda Springs, Twin Lakes, Tamarack (Blue Lakes), Lake Eleanor, Hetch Hetchy, and Gem Lake. Quantitatively the excess over normal ranged from 3.84 inches at Tahoe and 0.20 inches at Gem Lake (which is 13 miles southeast of Trego Pass at altitude 9,000 feet) to 11.66 inches at Blue Canyon and 12.64 at Lake Spaulding. This excess was 8.66 inches at Soda Springs and 8.42 at Tamarack (Blue Lake).

A reasonable quantitative estimate of the effect of this excess April-May precipitation indicates ample acre-feet to cover the difference between the forecast and the actual results for each of the basins involved.

Such high spring precipitation is very rare in this region.

Newly low level snow courses near Tahoe were established below Rubicon Peak, near Richardson's, and above Glenbrook. Also surveyed for the first time in the Little Valley (between Washoe Valley and Tahoe) and at Poison Flat on the East.
CHAPTER X

Snow Surveys

By H. F. Boardman, Chairman Forecasts Committee, Nevada Cooperative Snow Surveys

I. CENTRAL SIERRA

As was pointed out in the last biennial report, the rise of Lake Tahoe and the Truckee River runoff for 1940 greatly exceeded the forecast. The previous winter (December-March), precipitation was from 155% to 175% of normal at six U. S. Weather Bureau Stations including Tahoe and Truckee and four stations in the Sierras directly west of the Truckee and Tahoe basins. In spite of this, the April I snow surveys indicated only about normal water content for the high level courses and below 60% of normal for the low level courses. The partial explanation being much rain in January and March and a runoff that was above normal by about 18% in January and February and 75% in March.

The excess winter precipitation greatly surpassed quantitatively the excess winter runoff plus the discrepancy between snow survey forecast and actual April-July runoff, so it must be that much of the winter precipitation in the form of rain, combined with March melting, was stored in the ground and gave off along with melting snow to yield the high April-July runoff.

The organizations cooperating in our Sierra Snow Survey work for 1941 were: The Nevada Cooperative Snow Surveys, including the State of Nevada through the State Engineer's Office, the Truckee-Carson Irrigation District, the Washoe County Water Conservation District and the Sierra Pacific Power Company; The California Cooperative Snow Surveys headed by the Division of Water Resources of the Department of Public Works and including the Pacific Gas and Electric Company and the Nevada Irrigation District, whose employees make surveys of several of the courses used; The U. S. Forest Service and the Division of Irrigation of the U. S. Soil Conservation Service.

This latter is the Federal organization which is developing and coordinating the Snow Surveys throughout the Western States. The U. S. Weather Bureau and the Nevada Agricultural Experiment Station also cooperated.

Heavy early winter snows caused the February I and March 1 snow surveys to show a relatively high water content on most of the high level courses, but low March precipitation combined with evaporation and early melting resulted in many of the courses, even high level ones, yielding lower actual water content April 1 than March 1.

The April-July actual runoff for the Truckee, Carson, and West Walker rivers checked well with the forecast, but the rise of Lake Tahoe and runoff of the East Walker considerably exceeded the forecast, the probable explanation being high precipitation in April, exceeding the normal by from two to four inches at several high level U. S. Weather Bureau Stations.
COLORADO RIVER BASIN

Virgin River at Littlefield, Arizona, 1928—*

SNAKE RIVER BASIN

Salmon Falls Creek near San Jacinto, Nevada, 1906–1916; 1919—†
Owyhee River below Wild Horse Dam, 1937—†
Owyhee River at Mountain City, Nevada, 1927—†
Wild Horse Reservoir, 1929—†
Owyhee River at Owyhee, 1939—†

GREAT BASIN AND MINOR BASINS IN NEVADA

Walker Lake Basin—
Bridgesport Reservoir near Bridgesport, California, 1931—†
East Walker River near Bridgeport, California, 1913–1914; 1922—†
Walker Lake near Hawthorne, Nevada, 1928—†
West Walker River near Coleville, California, 1902–1910; 1915—†
Topaz Reservoir near Topaz, California, 1931—†
Pyramid Lake Basin—
Pyramid Lake at Nixon, Nevada, 1867—†
Carson—Humboldt Sink—
Carson River near Carson City, 1909—†
Carson River near Fort Churchill, Nevada, 1911—†
East Fork of Carson River at Horseshoe Bend, 1890–1893, 1900–1906, 1908–1910; 1924–1929; 1935–1937; 1939—†
West Fork of Carson River at Woodforks, California, 1890–1892; 1900–1902; 1908—†
Humboldt River at Palisade, Nevada, 1902–1906; 1911—†
Humboldt River near Inlay, Nevada, 1935—†
Rye Patch Reservoir, 1939—†
Humboldt River near Oreana, Nevada, 1896–1922; 1924—†
South Fork of Humboldt River near Elko, Nevada, 1896–1909; 1910—†
Little Humboldt River at Chimaoy dam site, 1941—†
Martin Creek near Carlin, Nevada, 1925—†
H. L. L. L. & P. Co.’s Feeder Canal near Mill City, Nevada, 1914–1931; 1939—†
H. L. L. L. & P. Co.’s Outlet Canal near Humboldt, Nevada, 1914—†

*Operated since April 1, 1942, by district office at Tuscon, Arizona.
†Operated by district office at Elko, Nevada.

CHAPTER VIII
WATER DISTRIBUTION HUMBOLDT RIVER SYSTEM—1941

By J. A. MILLER, Supervising Water Commissioner

ORGANIZATION

J. A. MILLER, Supervising Water Commissioner—Elko District
D. E. WINCHELL, Water Commissioner—Loveland District
P. E. BARKIN, Water Commissioner—Winnemucca District
RAY CLARK, Water Commissioner—Battle Mountain District
Owen STOKOL, Water Commissioner—Carson Sink and South Fork Districts
ALBERT QUAIL, Water Commissioner—Start Valley and North Fork Districts
Jon BYRON, Hydrographer—Willow Creek Reservoir
EDWARD KINDL, Hydrographer—Elko District

The irrigation season of 1941 followed a winter of heavy snow and moderate temperatures. During the late summer and fall of 1940 there was very little rainfall, and as a result the winter snow fell on comparatively dry ground, resulting in large amounts of the spring runoff seeping into the ground. However, the runoff water that reached the stream system created a flow at the Palisade gaging station that gradually increased from 75 c.f.s. on January 1 to 2,150 c.f.s. on June 13. This represented the peak flow of the season, and from that time on the flow began to recede. However, the many rainstorms of the summer prevented the usual abrupt drop in flow at this point after the June peak had been reached.

As a rule the low stage flow occurs about August 15 of each year, and amounts to 20 c.f.s. On August 15, 1941, the recorded flow at this station was 140 c.f.s., and the low stage flow was not reached until September 15, when 48 c.f.s. was recorded. From this time until the end of the year many fall storms increased the flow gradually, until there was 230 c.f.s. at this gaging station on December 31.

During the seasons of 1935 to 1940, inclusive, the river bed was always dry during the months of August and September at Ro Comus gaging station. During the same period of 1941 the flow at this point never dropped below 30 c.f.s., and gradually increased during the fall months. There was sufficient water in the river below the Winnemucca district to fill the H. L. L. L. & P. Company reservoir before the end of the year.

No irrigation took place in the Winnemucca and Battle Mountain districts until the last week of April, and no irrigation took place on the tributary streams until after the middle of May in the Elko district. The river bed under the Elko district began to flood early in April. With the exception of the above-named flooding condition, the entire flow of the river was allowed to reach the Rye Patch reservoir during all of March and nearly all of the month of April. After it reached the Rye Patch reservoir it was allowed to cumulate and was later released under a rotation system. Rotation systems were practiced in the Winnemucca, Battle Mountain, and tributary districts in the Elko district.

The large flows during the months of May and June or during the period of greatest need made it possible to serve all priorities. The
hay crops were sowed earlier in July. However, haying operations were delayed due to the high July flow which kept the water table high and prevented the drainage of the adjoining fields.

The Humboldt River Commission directed the work of a hydrographer who measured the discharge of several main tributary streams in the Elko district. The acquired data was compiled and weekly reports were submitted to Dr. J. E. Church, State Meteorologist.

After June 30 distribution of water was conducted only in the Love-look district and the Elko tributary districts, and continued until September 18. During the first weeks of September, October and November the Elko district Water Commissioner was called upon to regulate and distribute water for stock watering purposes. On July 1 the Winnemucca and Battle Mountain Water Commission and the hydrographers were laid off for the season.

**WATER DISTRIBUTION HUMBOLDT RIVER SYSTEM—1942**

By J. A. Millar, Supervising Water Commissioner

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<td>P. E. Backus</td>
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<tr>
<td>Battle Mountain</td>
<td>Myron Clark</td>
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<td>Great Basin</td>
<td>Edward Rings</td>
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Heavy rains followed several hours' duration during the months of July and August 1941 kept the flow of the river primed, and the river bed never went dry as usual during the late summer and early fall months. The September rainfall measured 1.58 inches as compared to a normal of 0.79 inches. The rainfall for October and November was 2.39 inches and 2.50 inches, respectively, or about 1.00 inch above normal. During the first part of December heavy snowstorm occurred in the mountain areas of the watershed, while rain fell in the valleys. Mild weather followed these storms, causing the low foothill snow to melt in the daytime and freeze at night. In the last week of December, another heavy snowstorm set in and lasted for ten days or more, covering the entire watershed with a heavy blanket of snow. This storm was followed by a period of unseasonable weather, which not only froze the covering of snow but also froze the film of water under the snow. A mild period followed this cold wave which caused serious flood conditions. In the town of Wells. The Marys River began to reach flood stage and the Firth of North Fork River and other northern feeder streams began to run off. However, mild weather followed the storm period and again snow accumulation was maintained.

The above summary of weather conditions from September to March serves as a forecast of future conditions. Although the precipitation during March was below normal, the temperatures were above normal, which not only caused flood conditions to start on the northern feeding streams but also maintained the northern feeding streams to flood very much earlier than usual. Heavy rains during the
WATER MEASURING STRUCTURES ON BAKER AND LEEMAN CREEKS, BAKER, WHITE PINE COUNTY, NEVADA

In order to facilitate the distribution of the decreed waters of Baker and Leeman Creeks at Baker, White Pine County, Nevada, weirs were installed by the Nevada State Engineer under the supervision of F. N. Dendro during the month of August 1940. These structures, made of concrete, are six inches wide and vary in height from two and a half feet to three feet and are from six to twelve feet long. They are provided with an opening in the center for removable headboards containing the various types and sizes of weirs. These structures are also provided with concrete aprons four inches in thickness imbedded deeply below the bottom of the ditches. The headboards are of two-inch finished select fir, and patterned after a headgate, fit in concrete grooves of the structures and held firmly in place by a two-inch by six-inch headboard bolted on top of the course. These removable headboards are for the purpose of providing any changes that may be made in the type of weir without altering the permanent concrete structure.

Orifices of varying dimensions in fourteen-gage galvanized iron were placed in all of the headboards except that for the Grant C. Smith, formerly B. P. Hockman, water right, which water measuring device consists of an eighteen-inch removable rectangular weir made of two-inch wood with a metal strip for edges and sitting in the concrete structure in the same manner as in the case of the orifices. The head required for each orifice to supply the decreed amount of water was determined by actual measurement by means of either a V-notch or an eighteen-inch rectangular weir, and is indicated on the headboard by means of a small angulated hole.

first week of April supplemented the flood condition and caused the heaviest runoff through the city of Elko since the year 1910. Prior to the rainstorm all the river bottom land from Wells to Elko was dry and barren. On April 7 the peak flow passed through the city of Elko, inundating all that part of the city adjacent to the river, forcing the residents to abandon their homes. On April 8 a peak flow of about 4,500 c.f.s. reached and passed the Palisade gaging station. By this time all the bottom lands from Wells to the Palisade Canyon were under several feet of water. The river flow immediately below the Palisade gaging station was augmented by a peak flow of about 500 c.f.s. from Pine Creek, which created a total flow of 5,000 c.f.s. at the head of the Battle Mountain Basin. This heavy flow of water soon covered all the river bottom land from Bowwame to the Filippi ranch. That part of the town of Bowwame north of the Western Pacific Railroad track was inundated to a depth of at least two feet, and remained under water for over two weeks. Bridges had to be built from the Western Pacific roadbed to the Post Office and to the Allen store. Residents of this part of town were forced to abandon their homes.

The dredged channel through the Filippi ranch was large enough to take care of the flood water. However, most of the area of the said ranch north of the river channel was covered with water due to the heavy overflow on the Dumphy ranch above.

In addition to the above-mentioned flows, Boulder and Rock Creeks were discharging about 1,000 c.f.s. into the Battle Mountain Basin. The Boulder and Rock Creek flows find their way into the old river channel, which in turn has its confluence with the present river channel above the Locking ranch near Battle Mountain. The approximate flow of 6,000 c.f.s. at this point put two to three feet of water over the entire Locking ranch, and it was not until the first of July that the river showed any signs of subsiding.

The dredged channel below the Locking ranch and through the Land Development ranch eliminated part of the flooding condition, but soon as the water reached the natural channel on the Russell "25" ranch, flooding again took place, and the entire river bottom land was under at least two feet of water. Part of this overflow, together with the overflow at the Wilcox dam, put about 250 c.f.s. in the Outside Slough. From the Wilcox dam to the Pimmon bridge general flooding took place in spite of dredged channels.

On or about the 20th of April flood conditions began in the Winnemucca district, and less than ten days all of the river bottom land from the Pimmon bridge to the gaging station below the Hillyer ranch was under at least a foot of water. Most of this area was still under water on July 1.

Although the river flow fluctuated materially during the month of May, the flood and overflow condition never ceased in the Elko district until the last part of June. On July 3 it was apparent that the flood condition in the upper end of the Battle Mountain district was subsiding, and on July 10 the flow of the river near Bowwame was confined to the river channel. However, the lower end of the Battle Mountain district was still at flood stage.

The flow of the river at the point of diversion of the H. L. L. & P. Company intake or feeder canal from September 15 to December 31
was sufficient to fill the company's reservoir to a capacity of 40,000 acre-feet, and on January 1, 1942, all the river water was turned into the Rye Patch reservoir. However, on March 1 the intake canal was again opened and a flow of about 150 c.f.s. was diverted into the reservoir until March 16.

During the period from January 1 to July 1 the following storage took place in the Rye Patch reservoir:

| January 1 | 33,884 acre-feet |
| February 1 | 45,469 acre-feet |
| March 1 | 62,184 acre-feet |
| April 1 | 81,905 acre-feet |
| May 1 | 116,604 acre-feet |
| June 1 | 150,922 acre-feet |
| July 1 | 180,828 acre-feet |

The above storage took place in spite of the following releases:

| March | 45,000 acre-feet |
| April | 12,546.00 acre-feet |
| May | 81,944.00 acre-feet |
| June | 68,686.00 acre-feet |

On May 17 more water than could be beneficially used was released from the Rye Patch reservoir in order to provide a cushion for the expected June high water and to protect the Rodgers diversion dam. The releases were increased from 800 c.f.s. to 1,527 c.f.s. on May 27 and then gradually decreased to 1,000 c.f.s. on June 28. The amount of water not used for irrigation was allowed to flow into the Humboldt River Sink. During the later part of June the Rodgers dam was unable to withstand the released flows, and was completely undermined and destroyed. About ten days later the spillway gates were closed, and only the necessary water was released by means of the regular release pipes. It is estimated that the reservoir will be filled some time before the last of July.

No irrigation water was released from the H. L. I. L. & P. Company reservoir. However, during the later part of May about 200 c.f.s. of the river flow was diverted into the feeder canal, conveyed through the reservoir and released into the Rye Patch reservoir. This was done to protect the road leading from Mill City to the Taupin mines. The Willow Creek reservoir was filled by the last of April and sufficient water was released to maintain a water level just below the crest of the spillway. This released water was allowed to flow into Rock Creek and thence to the Humboldt River until irrigation started about the middle of May.

According to the preliminary figures of the Geological Survey, Water Resources Branch, the runoff of the Humboldt River through the Palisade gaging station from October to June was about 540,000 acre-feet, and the March to June runoff through the same station was about 447,000 acre-feet. The average annual runoff, 1903-1906 and 1912-1942, has been about 243,500 acre-feet.

The runoff through the Callahao gaging station from January to June, inclusive, was about 295,000 acre-feet, and the March to June runoff through the same station was 202,670 acre-feet.
reservation and one by those on the lower half, a system was developed
by which each of the eighteen water users would have at least 2.19 c.f.s.
for irrigating two out of every eighteen days. By rotating the two
streams on alternating days only one visit per day to the reservation
was normally required.
The only improvement in the district during the 1941 season was the
new Cippolletti weir built by Ed. Halstead at his No. 3 diversion.
Due to the numerous heavy rains all the decreed rights of 28.40 c.f.s.
were satisfied until June 17. Only a very slow drop of the total daily
diversions was apparent, and on August 6 a low of 20.17 c.f.s. was
recorded. With the arrival of the late summer rains late in August
there was no necessity for my remaining after September 1.

Another late cold spring prevented a great deal of early irrigation
and consequently I was not called to Doakwater until May 9.
The tailings ditch below the Callaway ranch, as in the past, was
washed out and the large flow of tailings from the Callaway and Hal-
stead ranches prevented its repair until May 24. It is customary upon
the completion of this tailings ditch in the spring to install a Loris hori-
zontal water stage recorder above the Irwin and Irving Vanover
weirs. As yet this year I have not received this recorder from the repair shop
to which it was sent.
The usual Mendos and Munson rotation system began on May 12
and the regular Indian Reservation rotation schedule began on May 15.
On making my first round of the diversions I found all the diversions
in usable condition and a total of 33.87 c.f.s. being diverted. 7.09 c.f.s.
was flowing from the "Big Warm Spring" into the plateau lakes.
All of the water rights of 28.40 c.f.s. were satisfied until June 3.
Due to the dry, windy weather, the runoff from the hay meadows began
to dry up about this time and the usual rapid drop in the total meas-
ured daily diversions began nearly a month early. Between June 5
and June 34 a drop of 6.76 c.f.s., or nearly 25% in the total diverted
water has been recorded. This gives a low of 21.22 c.f.s. on the latter
date, which is normal for the latter part of July.
This shortage will not be very apparent to the most of the users
until after the wild hay crop is harvested and water is needed for over
1,000 acres of pasture besides the regular crops of grain, potatoes, etc.
Since nearly all of the wild hay meadows are third priority, to
which the entire drop in total flow below 22.50 c.f.s. is a loss, and the
water table has dropped from one to three feet, this valley is very apt
to be without the good late summer and early fall pastures it has
enjoyed for the past few years.
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**EYE PATCH RESERVOIR RELEASES—1942**

**DUCKWATER CREEK WATER DISTRIBUTION**

By New Tuckson, Water Commissioner

Duckwater Creek is situated about fifty miles south of Eureka, Nevada, in Nye County. Approximately 4,000 acres are irrigated in an area about twelve miles in length and from one-half to two miles in width.

The principal source of water is known as the "Big Warm Spring" located at the head of Duckwater Creek, and having a nearly constant flow of from 12.5 to 14 c.f.s. This flow is supplemented by approximately 12 c.f.s. from numerous small springs along the main channel, the first group being in the neighborhood of 2½ miles south of the head of the creek and the second group or east branch at about three miles. The early season's flow of these springs is augmented by underground storage of water from the "Big Warm Spring" which is forced onto the platters lakes to sink during the winter months.

The largest channel loss is in the first two miles of creek bottom where a sandy stream bed along the top of a wall-broken-up limestone plateu accounts for a loss of from 3½ to 4 c.f.s. This loss of approximately 10% of the flow of the Duckwater warm springs is most keenly felt by the Flora home ranch, now part of Duckwater Indian Reservation, since one of its decreed rights is the most recent priority on this irrigation system.

The Indian Service plans to build a new channel straight to what is known as the old stone mill. This will shorten the stream bed by nearly one mile and eliminate the poor bottom now traversed. If necessary the new channel will be lined with concrete and thus bring about an even greater saving of water.

**DISTRIBUTION, 1945**

Due to the late cool spring I was not called to Duckwater until May 9. I found that but 7.75 c.f.s. of the discharge of the "Big Warm Spring" was flowing into Duckwater Creek, with the remaining 6.84 c.f.s. flowing into the plateau lakes. A total of 30.83 c.f.s. was being diverted on May 10, which is a surplus of 2.43 c.f.s. over the decreed rights.

As usual the tailings ditch below the Callaway ranch was washed out, but since there was less than 2 c.f.s. flowing in this ditch it was repaired at once and by May 15 was carrying the tailings back into the main channel. On the completion of this work I installed a Leisert horizontal water stage recorder at the Irwin and Irving-Vanover weirs and used it throughout the season as a check on the water diverted to the Irwin and Irving-Vanover ranches.

The regular Mendes and Munson rotation schedule was started on May 10 with Mendes receiving 5½ days and Munson 3½ days of 3.95 c.f.s. for irrigation purposes, together with the full 8 days of 25 c.f.s. of domestic water delivered to the Mendes lower ranch. Since this "Old Mendes Right" of 2.20 c.f.s. is a third priority, it sometimes is cut to as low as 2.60 c.f.s. when the total daily diversions reach from 10.00 to 22.60 c.f.s.

On May 17 a regular rotation system was developed for the Indian Reservation. By dividing the entire Flora decreed rights into two streams, one to be used by the assignments on the upper half of the
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C.F.S.       | 7,432.60            | 7,977.60 | 10,032.00 |
Acres-feet   | 14,864.00           | 14,864.00 | 14,864.00 |
Cumulated acre-feet | 84,400.00         | 99,032.00 |

On the east side of Martin Creek the same sort of ditch could be dug to pick up the overflow from the fields north of the Sharron Lane and carry the water back to Merith Creek instead of allowing the water to be lost on Ohio (C) ground. This season more than 20 c.f.s. was lost this way for a month's time. This flow watered ground without any water right.

Stone House Creek, Colony Creek, Wash O'Neil Creek, and Prove Creek should all have channels cut through to Cottonwood Creek. Much of the water from these creeks floods land with no water right at all.

The system of cumulation as practiced by the upper users is unfair and some in some way be altered until proper channels are made to carry the water to the lower users so that a rotation can be carried on.
The 1941 season was one of the best for many years, both from the standpoint of water and growing conditions. A good runoff in March helped to serve the lower users, and both spring and summer rains kept the creeks flowing all year. This condition was true of streams such as Multinax which are considered as flash streams and usually stop by the first of July.

The season for 1942 was opened on March 1.

The users above Shelton Lane did not start to use water until late in April.

There was a short runoff in March, but for the most part March was cold and very little snow melted other than that which was low in the foothills.

The same condition prevailed in April.

The snow survey on the first of April showed a lower water content and less snow than in the year 1941 but increased the moisture and replaced snow melted in March.

Martin Creek had its peak in April. Snow remained on the entire month of May and began to decline after the middle of the month.

The Little Humboldt River had its peak in April, and flowed the entire month a better stream than in May or June.

DISTRIBUTION, 1941

In order to deliver water to the Godechaux ranch (now owned by Johnston Bros.) the dam that had been placed in Martin Creek where it turns to enter the Big Ditch was removed and water from Martin Creek has since been delivered that way to both Johnston Bros. and the Miller ranches. (This was the first water from Martin Creek to be delivered to Johnston Bros. since they had bought the ranch two years before.)

In May the most westerly channel connecting with Cottonwood Creek through the Law's property was opened up and Cottonwood water was turned that way. This is the most direct and best channel for distribution of Cottonwood Creek water to Johnston Bros. and the Miller ranches, and does not interfere with the Law's ranch irrigation system any more than any other route. (This was the first Cottonwood water to be delivered to the Millers or Johnsons since 1938.)

In June the Tule Slough or Big Ditch was opened to serve the Johnston Brothers' Tule Slough right, which is water from the Little Humboldt River, Cottonwood Creek, and Martin Creek.

RECOMMENDATIONS

After careful study of the channel conditions and giving consideration to the slope of the valley, I find that all the streams break to the west. Keeping this in mind, I believe a ditch run from Martin Creek just above the Shelton Lane to Cottonwood Creek would pick up all the overflow water west of Martin Creek that now flows Shelton Lane. This would also make it possible to run the water through the west branch of Martin Creek into the Miller slough, thus relieving the flood condition on the Stewart's home ranch without causing anyone else damage.
Water distribution under the direction of a water commissioner began on July 10, 1942. The sources of water for lands under irrigation in Pahranagat Valley are those springs which are known as Hiko, Crystal, and Ash springs. Since each of the above-named springs has its own distribution system, it is best, for the purpose of this report, to describe each spring individually.

**Hiko Spring**

Hiko spring is located in the north end of Pahranagat Valley about a half mile east of the village of Hiko. An embankment was built in front of the Spring in 1939. At the same time three flumes of exactly the same dimensions were set on an exact level and automatically divided the water accurately among the various users. There are three ditches heading from the pool at Hiko spring, but only two of them are allowed to flow at the same time. The center one, known as the Shipsfield ditch, flows continuously. The other two ditches, the Hiko Mining and Milling ditch flowing to the north, and the Castle ditch flowing to the south, alternate their share of the flow according to a rotating schedule which has been in successful operation for a number of years. Very little time or trouble need be spent on distribution of water from Hiko spring because the distribution system is all located right at the spring and is absolutely tamper proof. The water commissioner made it a practice to visit Hiko spring at least every other day to check on the flow of the spring and rake out any debris which may have collected in the flumes. A nearly constant flow of 6.52 c.f.s. was recorded.

**Crystal Springs**

Crystal springs are located in the upper end of Pahranagat Valley about a half mile west of U. S. Highway 93. The nearly constant continuous flow of these springs was 9.65 c.f.s. Water from these springs is used to irrigate lands belonging to the Lincoln Land & Livestock Company and to Mrs. C. W. Wright. The flow of the stream is used by each owner on a rotation basis. The rotation schedule has been in effect for several years and has proven very satisfactory to all concerned.

**Ash Springs**

Ash springs, the largest of the three sets of springs in Pahranagat Valley, is located adjacent to U. S. Highway 93 about eight miles above the town of Alamo. Water from Ash springs formerly was divided into eight separate heads or streams, resulting in great losses from seepage and evaporation. With the cooperation of the water users, the commissioner worked out a rotation schedule for the users on the old W. H. Sharp and Chish properties. This cut the number of continuous streams from eight to four and resulted in less water loss and less friction among the users and hence greater irrigation efficiency. With the four remaining irrigating streams, the commissioner endeavored to maintain a constant flow to each group of cooperators. These flows were as follows:

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<td>Richard &amp; Wege</td>
<td>1.57</td>
</tr>
</tbody>
</table>

As a whole, the distribution system for Ash springs is extremely poor and wasteful. There is a lack of proper diversions and measuring devices. Generally the ditches are so low in gradient and so poorly maintained that the loss from seepage and evaporation is terrific. On the main channel alone, a loss running from 4 to 7 c.f.s. is evident. The amount of loss depends upon the heat and the degree of elongation of the channel.

The water commissioner has gone over the plans of the Soil Conservation Service for the improvement of the Ash spring irrigation and drainage systems. If these plans were put into effect, the problem of Ash spring distribution would be completely solved. However, local prejudice and factional interests seem to be the only factors which are holding up this program.

**DISTRIBUTION, 1942**

The water commissioner arrived in Pahranagat Valley to regulate the distribution of water on June 7, 1942. No great shortage of water to any user or group of users was particularly evident up to that date. Some friction had arisen, however, as some users had either lost or forgotten to use their rotating schedules which had been worked out in former years. These matters were quickly straightened out and the rotation schedules put into practice.

A slight change was necessary in the rotation schedule for Crystal spring. This was due to the fact that part of the Lincoln Land & Livestock Company lands had been sold to a Mr. Byrnes. The old schedule for the Lincoln Land & Livestock Company was simply divided between the old and new owners on a land basis. This took care of the situation to the satisfaction of both users.

A change was also necessary in the new schedule, which was made last year, on the old W. H. Sharp properties stream from Ash Creek. This change was necessary because the owners had failed to clean their ditch sufficiently well to carry the combined head of water under rotation schedule. Their lands were simply dropped from the rotation schedule and they were allowed a smaller continuous flow according to their water rights. The rest of the users are successfully continuing the rotation schedule, though with a diminished stream.

As a result of this change there are five continuously flows from Ash Spring Creek instead of four, as reported last year. The flows are allowed as follows:

<table>
<thead>
<tr>
<th>Source</th>
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<tr>
<td>Chish &amp; West Sharp</td>
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<td>Richard &amp; Wege</td>
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<td>Alamo canal and cooperators</td>
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<td>East Sharp</td>
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</table>
Water distribution under the direction of a water commissioner began on July 10, 1942. The sources of water for lands under irrigation in Pahranagat Valley are those springs which are known as Hiko, Crystal, and Ash springs. Since each of the above-named springs has its own distribution system, it is best, for the purpose of this report, to describe each spring individually.

**MIKO SPRINGS**

Hiko spring is located in the northern end of Pahranagat Valley about a half mile east of the village of Hiko. An embankment was built in front of the Spring in 1939. At the same time three fences of exactly the same dimensions were set on an exact level and automatically divide the water accurately among the various users.

There are three ditches heading from the pool at Hiko spring, but only two of them are allowed to flow at the same time. The center one, known as the Schields's ditch, flows continuously. The other two ditches, the Hiko Milking and Milking ditch flowing to the north, and the Castle ditch flowing to the south, alternate their share of the flow according to a rotation schedule which has been in successful operation for a number of years. Very little time or trouble need be spent on distribution of water from Hiko spring because the distribution system is all located right at the spring and is absolutely tamper proof. The water commissioner has a right to visit Hiko spring at least every other day to check on the flow of the spring and rake out any debris which may have collected in the ditch. A nearly constant flow of 6.52 c.f.s. was recorded.

**CRYSTAL SPRINGS**

Crystal springs are located in the upper end of Pahranagat Valley about a half mile west of U. S. Highway 93. The nearly constant continuous flow of these springs was 9.68 c.f.s. Water from these springs is used to irrigate lands belonging to the Lincoln Land & Livestock Company and to Mrs. C. W. Wright. The flow of the stream is used by each owner on a rotation basis. The rotation schedule has been in effect for several years and has proven very satisfactory to all concerned.

**ASH SPRINGS**

Ash springs, the largest of the three sets of springs in Pahranagat Valley, is located adjacent to U. S. Highway 93 about eight miles above the town of Alamo. Water from Ash springs formerly was divided into eight separate heads or streams, resulting in great losses from seepage and evaporation. With the cooperation of the water users, the commissioner worked out a rotation schedule for the users on the old W. R. Sharp and Chisholm properties. This cut the number of continuous streams from eight to four and resulted in less water loss and less friction among the users and hence greater irrigating efficiency.

With the four remaining irrigating streams, the commissioner endeavored to maintain a constant flow to each group of cooperators. These flows were as follows:

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<th>Source</th>
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<td>Alamo Canal and others</td>
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<tr>
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</table>
The 1941 season was one of the best for many years, both from the standpoint of water and growing conditions. A good runoff in March helped to serve the lower users, and both spring and summer rains kept the creeks flowing all year. This condition was true of streams such as Muliinax which are considered as slack streams and usually stop by the first of July.

The season for 1942 was opened on March 1.

The users above Shelton Lane did not start to use water until late in April.

There was a short runoff in March, but for the most part March was cold and very little snow melted other than that which was low in the foothills.

The same condition prevailed in April.

The snow survey on the first of April showed a lower water content and less snow than in the year 1941 but in April snowstorms increased the moisture and replaced snow melted in March.

Martin Creek had its peak in April, flowed more over the entire month of May and began its decline after the middle of June.

The Little Humboldt River had its peak in April, and flowed the entire month a better stream than in May or June.

**DISTRIBUTION, 1942**

In order to deliver water to the Godbahn ranch (now owned by Johnston Bros.) the dike that had been placed in Martin Creek where it turns to enter the Big Ditch was removed and water from Martin Creek has since been delivered that way to both Johnston Bros. and the Miller ranches. (This was the first water from Martin Creek to be delivered to Johnston Bros. since they had bought the ranch two years before.)

In May the most westerly channel connecting with Cottonwood Creek through the Laws property was opened up and Cottonwood water was turned that way. This is the most direct and best channel for distribution of Cottonwood Creek water to Johnston Bros. and the Miller ranches, and does not interfere with the Laws ranch irrigation system any more than any other route. (This was the first Cottonwood water to be delivered to the Millers or Johnsons since 1938.)

In June the Tale Slough or Big Ditch was opened to serve the Johnston Brothers’ Tale Slough right, which is water from the Little Humboldt River, Cottonwood Creek, and Martin Creek.

**RECOMMENDATIONS**

After careful study of the channel conditions and giving consideration to the slope of the valley, I find that all the streams break to the west. Keeping this in mind, I believe a ditch run from Martin Creek just above the Shelton Lane to Cottonwood Creek would pick up all the overflow water west of Martin Creek that now floods Shelton Lane. This would also make it possible to run the water through the west branch of Martin Creek into the Muliinax slough, thus relieving the flood condition on the Stewart’s home ranch without causing anyone else damage.
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**Acre-feet**

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**Committed acre-feet**

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On the east side of Martin Creek the same sort of ditch could be dug to pick up the overflow from the fields north of the Shurton Line and carry the water back to Myers Creek instead of allowing the water to be lost on Ohio (C) ground. This season more than 20 c.f.s. was lost that way for a month's time. This flow watered ground without any water right.

Stone House Creek, Colony Creek, Wash O'Neil Creek, and Provo Creek should all have channels cut through to Cottonwood Creek. Much of the water from these creeks floods land with no water right at all.

The system of accumulation as practiced by the upper users is unfair and some in some way be altered until proper channels are made to carry the water to the lower users so that a rotation can be carried on.
### DUCKWATER CREEK WATER DISTRIBUTION

By New G. Nunnally, Water Commissioner

Duckwater Creek is situated about fifty miles south of Eureka, Nevada, in Nye County. Approximately 4,000 acres are irrigated in an area about twelve miles in length and from one-half to two miles in width.

The principal source of water is known as the "Big Warm Spring" located at the head of Duckwater Creek, and having a nearly constant flow of from 12.5 to 14 c.f.s. This flow is supplemented by approximately 12 c.f.s. from numerous small springs along the main channel, the first group being in the neighborhood of 25½ miles south of the head of the creek and the second group or east branch at about three miles. The early season's flow of these springs is augmented by underground storage of water from the "Big Warm Spring" which is forced onto the platters lakes to sink during the winter months.

The largest channel loss is in the first two miles of creek bottom where a sandy stream bed along the top of a well-broken-up limestone plateau accounts for a loss of from 25½ to 2 c.f.s. This loss of approximately 10% of the flow of the Duckwater warm springs is most keenly felt by the Floris home ranch, now part of Duckwater Indian Reservation, since one of its deeded rights is the most recent priority on this irrigation system.

The Indian Service plans to build a new channel straight to what is known as the old stone mill. This will shorten the stream bed by nearly one mile and eliminate the poor bottom now traversed. If necessary the new channel will be lined with concrete and thus bring about an even greater saving of water.

### DISTRIBUTION, 1945

Due to the late cool spring I was not called to Duckwater until May 9. I found that but 7.75 c.f.s. of the discharge of the "Big Warm Spring" was flowing into Duckwater Creek, with the remaining 8.84 c.f.s. flowing into the platter lakes. A total of 30.82 c.f.s. was being diverted on May 10, which is a surplus of 2.43 c.f.s. over the deeded rights.

As usual the tailings ditch below the Callaway ranch was washed out, but since there was less than 2 c.f.s. flowing in this ditch it was repaired at once and by May 15 was carrying the tailings back into the main channel. On the completion of this work I installed a Liest horizontal water stage recorder at the Irwin and Irving-Vanover weirs and used it throughout the season as a check on the water diverted to the Irwin and Irving-Vanover ranches.

The regular Mendes and Munson rotation schedule was started on May 10 with Mendes receiving 5½ days and Munson 3½ days of 8.85 c.f.s. for irrigation purposes, together with the full 8 days of 25 c.f.s. domestic water delivered to the Mendes lower ranch. Since this "Old Mendes Right" of 2.80 c.f.s. is a third priority, it sometimes is cut to as low as 2.60 c.f.s. when the total daily diversions reach from 19.00 to 23.60 c.f.s.

On May 17 a regular rotation system was developed for the Indian Reservation. By dividing the entire Floris deeded rights into two streams, one to be used by the assignments on the upper half of the

### EYE PATCH RESERVOIR RELEASES—1942

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<tr>
<th>Date</th>
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<th>June, c.f.s.</th>
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</table>
reservation and one by those on the lower half, a system was developed by which each of the eighteen water users would have at least 2.19 c.f.s. for irrigating two out of every eighteen days. By rotating the two streams on alternate days only one visit per day to the reservation was normally required.

The only improvement in the district during the 1941 season was the new Cippeletti weir built by Ed. Halstead at his No. 3 division. Due to the numerous heavy rains all the decreed rights of 28.40 c.f.s. were satisfied until June 17. Only a very slow drop of the daily diversions was apparent, and on August 6 a low of 20.17 c.f.s. was recorded. With the arrival of the late summer rains late in August there was no necessity for my remaining after September 1.

Another late cold spring prevented a great deal of early irrigation and consequently I was not called to Duckwater until May 9.

The tailings ditch below the Callaway ranch, as in the past, was washed out and the large flow of tailings from the Callaway and Halstead ranches prevented its repair until May 24. It is customary upon the completion of this tailings ditch in the spring to install a Leips horizontal water stage recorder above the Irwin and Irving Vanover weirs. As yet this year I have not received this recorder from the repair shop to which it was sent.

The usual Mendos and Muench rotation system began on May 12 and the regular Indian Reservation rotation schedule began on May 15.

On making my first round of the diversions I found all the diversions in usable condition and a total of 31.87 c.f.s. being diverted. 7.09 c.f.s. was flowing from the “Big Warm Spring” into the plateau lakes. All of the water rights of 28.80 c.f.s. were satisfied until June 3. Due to the dry windy weather, the runoff from the hay meadows began to dry up about this time and the usual rapid drop in the total measured daily diversions began nearly a month early. Between June 5 and June 24 a drop of 6.76 c.f.s., or nearly 25% in the total diverted water has been recorded. This gives a low of 21.22 c.f.s. on the latter date, which is normal for the latter part of July.

This shortage will not be very apparent to the most of the users until after the wild hay crop is harvested and water is needed for over 1,000 acres of pasture besides the regular crops of grain, potatoes, etc. Since nearly all of the wild hay meadows are third priorities, to which the entire drop in total flow below 22.80 c.f.s. is a loss, and the water table has dropped from one to three feet, this valley is very apt to be without the good late summer and early fall pastures it has enjoyed for the past few years.
was sufficient to fill the same company's reservoir to a capacity of 40,000 acre-feet, and on January 1, 1942, all the river water was turned into the Rye Patch reservoir. However, on March 1 the intake canal was again opened and a flow of about 150 c.f.s. was diverted into the reservoir until March 15.

During the period from January 1 to July 1 the following storage took place in the Rye Patch reservoir:

<table>
<thead>
<tr>
<th>Month</th>
<th>Storage (acre-feet)</th>
</tr>
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<tbody>
<tr>
<td>January 1</td>
<td>33,884</td>
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<tr>
<td>February 1</td>
<td>43,469</td>
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<tr>
<td>March 1</td>
<td>62,314</td>
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<td>April 1</td>
<td>81,065</td>
</tr>
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<td>May 1</td>
<td>116,054</td>
</tr>
<tr>
<td>June 1</td>
<td>126,022</td>
</tr>
<tr>
<td>July 1</td>
<td>130,828</td>
</tr>
</tbody>
</table>

The above storage took place in spite of the following releases:

<table>
<thead>
<tr>
<th>Month</th>
<th>Release (acre-feet)</th>
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<tbody>
<tr>
<td>March</td>
<td>450.00</td>
</tr>
<tr>
<td>April</td>
<td>12,541.00</td>
</tr>
<tr>
<td>May</td>
<td>61,944.00</td>
</tr>
<tr>
<td>June</td>
<td>88,950.00</td>
</tr>
</tbody>
</table>

On May 17 more water than could be beneficially used was released from the Rye Patch reservoir in order to provide a cushion for the expected June high water and to protect the Rodgers diversion dam. The releases were increased from 500 c.f.s. to 1,527 c.f.s. on May 27 and then gradually decreased to 1,000 c.f.s. on June 28. The amount of water not used for irrigation was allowed to flow into the Humboldt River Sink. During the later part of June the Rodgers dam was unable to withstand the released flows, and was completely undermined and destroyed. About ten days later the spillway gates were closed, and only the necessary water was released by means of the regular release pipes. It is estimated that the reservoir will be filled some time before the last of July.

No irrigation water was released from the H. L. I. L. & P. Company reservoir. However, during the later part of May about 200 c.f.s. of the river flow was diverted into the feeder canal, conveyed through the reservoir and released into the Rye Patch reservoir. This was done to protect the road leading from Mill City to the Tumapiste mines. The Williams creek reservoir was filled by the last of April and sufficient water was released to maintain a water level just below the crest of the spillway. This released water was allowed to flow into Rock Creek and thence to the Humboldt River until irrigation started about the middle of May.

According to the preliminary figures of the Geologic Survey, Water Resources Branch, the runoff of the Humboldt River through the Palmisde gaging station from October to June was about 510,000 acre-feet, and the March to June runoff through the same station was about 447,000 acre-feet. The average annual runoff, 1903-1906 and 1912-1942, has been about 243,500 acre-feet.

The runoff through the Callahans gaging station from January to June, inclusive, was about 295,000 acre-feet, and the March to June runoff through the same station was 262,500 acre-feet.
In order to facilitate the distribution of the decreted waters of Baker and Lehman Creeks at Baker, White Pine County, Nevada, weirs were installed by the Nevada State Engineer under the supervision of F. N. Dendro during the month of August 1940. These structures, made of concrete, are six inches wide and vary in height from two and a half feet to three feet and are from six to twenty feet long. They are provided with an opening in the center for removable headboards containing the various types and sizes of weirs. These structures are also provided with concrete aprons four inches in thickness imbedded deeply below the bottom of the ditches. The headboards are of two-inch slotted select lumber and patterned after a headgate, fit in concrete grooves of the structures and held firmly in place by a two-inch by six-inch headboard bolted on top of the concrete. These removable headboards are for the purpose of providing any changes that may be made in the type of weir without altering the permanent concrete structure.

Orifices of varying dimensions in fourteen-gage galvanized iron were placed in all of the headboards except that for the Grant S. Smith, formerly B. P. Hockett, water right, which water measuring device consists of an eighteen-inch removable rectangular weir made of two-inch wood with a metal strip for edges and fitting in the concrete structure in the same manner as in the case of the orifices. The head required for each orifice to supply the decreted amount of water was determined by actual measurement by means of either a V-notch or an eighteen-inch rectangular weir, and is indicated on the headboard by means of a small augured hole.

first week of April supplemented the flood condition and caused the heaviest runoff through the city of Elko since the year 1910. Prior to the rainstorms all the river bottom land from Wells to Elko was under water. On April 7 the peak flow passed through the city of Elko, inundating all that part of the city adjacent to the river, forcing the residents to abandon their homes. On April 8 a peak flow of about 4,000 c.f.s. reached and passed the Palaquio gaging station. By this time all the bottom lands from Wells to the Palisade Canyon were under several feet of water. The river flow immediately below the Palaquio gaging station was augmented by a peak flow of about 500 c.f.s. from Pine Creek, which created a total flow of 5,000 c.f.s. at the head of the Battle Mountain Basin. This heavy flow of water soon covered all the river bottom land from Beowawe to the Filippi ranch. That part of the town of Beowawe north of the Western Pacific Railroad tracks was inundated to a depth of at least two feet, and remained under water for over two weeks. Bridges had to be built from the Western Pacific roadbed to the Post Office and to the Allen store. Residents of this part of town were forced to abandon their homes.

The dredged channel through the Filippi ranch was large enough to take care of the flood water. However, most of the area of the said ranch north of the river channel was covered with water due to the heavy overflow on the Dumpy ranch above.

In addition to the above-named flows, Boulder and Rock Creeks were discharging about 1,000 c.f.s. into the Battle Mountain Basin. The Boulder and Rock Creek flows find their way into the old river channel, which in turn has its confluence with the present river channel above the Licking ranch near Battle Mountain. The approximate flow of 5,000 c.f.s. at this point put two to three feet of water over the entire Licking ranch, and it was not until the first of July that the river showed any signs of subsiding.

The dredged channel below the Licking ranch and through the Land Development ranch eliminated part of the flooding condition, but as soon as the water reached the natural channel on the Russell "25" ranch, flooding again took place, and the entire river bottom land was under at least two feet of water. Part of this overflow, together with the overflow at the Wilcox dam, put about 250 c.f.s. in the Outside Slough. From the Wilcox dam to the Pimms bridge general flooding took place in spite of dredged channels.

On or about the 20th of April flood conditions began in the Winnemucca district, and it was less than ten days all of the river bottom land from the Pimms bridge to the gaging station below the Haller ranch was under at least a foot of water. Most of this area was still under water on July 1.

Although the river flow fluctuated materially during the month of May, the flood and overflow conditions never ceased in the Elko district until the last part of June. On July 3 it was apparent that the flood condition in the upper end of the Battle Mountain district was subsiding, and on July 10 the flow of the river near Beowawe was confined to the river channel. However, the lower end of the Battle Mountain district was still at flood stage.

The flow of the river at this point of diversion of the H. L. L. & P. Company intake or feeder canal from September 15 to December 31...
hay crops were sowed early in July. However, haying operations were delayed due to the high July flow which kept the water table high and prevented the drainage of the adjoining fields.

The Humboldt River Commission directed the work of a hydrographer who measured the discharge of several main tributary streams in the Elko district. The acquired data was compiled and weekly reports were submitted to Dr. J. E. Church, State Meteorologist.

After June 30 distribution of water was conducted only in the Love- lock district and the Elko tributary districts, and continued until September 15. During the first weeks of September, October and November the Elko district Water Commissioner was called upon to regulate and distribute water for stockwatering purposes. On July 1 the Winnemucca and Battle Mountain Water Commissioner and the hydrographers were laid off for the season.

WATER DISTRIBUTION HUMBOLDT RIVER SYSTEM—1942
By J. E. MILLER Supervising Water Commissioner

J. E. MILLER, Supervising Water Commissioner, Elko River

JOHN FRANKLIN, Water Commissioner, Elko River

F. E. BARCRO, Water Commissioner, Winnemucca District

FRANK WILLIAMS, Water Commissioner, Battle Mountain District

OWEN STOCK, Water Commissioner, Elko District

WILLIAM KING, Hydrographer, Elko District

Heavy rainstorms of several hours' duration during the months of July and August 1941 kept the flow of the river primed, and the river bed never went dry as usual during the late summer and early fall months. The September rainfall measured 1.58 inches as compared to a normal of 0.79 inches. The rainfall for October and November was 2.39 inches and 2.56 inches, respectively, or about 1.00 inch above normal. During the first part of December heavy snowstorms occurred in the mountain areas of the watershed, while rain fell in the valleys. Mild weather followed these storms, causing the low foothill snow to melt in the daytime and freeze at night. In the last week of December another heavy snowstorm set in and lasted for ten days or more, covering the entire watershed with a heavy blanket of snow. This storm was followed by a period of unseasonable weather, which not only froze the covering of snow but also froze the film of water under the snow. A mild period followed this cold wave which caused serious flood conditions in and near the town of Wells. The Marys River began to reach flood stage and the flow of North Fork River and other northern feeders pointed toward a runoff from the northern watershed. However, the mild period was followed by a storm period and several heavy rains in January and February of 1942.

On March 1 the upper end of the watershed was covered with a foot or more of frozen snow, but the water levels were still high. The above summary of weather conditions from September to March serves as a forecast of the season.

Although the precipitation during March was below normal, the temperatures were above normal, which not only caused flood conditions to start on the northern feeders but also kept the southern feeders to flood very much earlier than usual. Heavy rains during the
GREAT BASIN AND MINOR BASINS IN NEVADA

Walker Lake Basin—

Bridgerport Reservoir near Bridgerport, California, 1913—
East Walker River near Bridgeport, California, 1913-1914, 1922—
Walker Lake near Hawthorne, Nevada, 1926—
West Walker River near Caliente, California, 1902-1910, 1915—
Topaz Reservoir near Topaz, California, 1911—
Pyramid Lake Basin—

Pyramid Lake at Nixon, Nevada, 1867—
Carson-Humboldt Sink—

Carson River near Carson City, 1939—
Carson River near Fort Churchill, Nevada, 1911—
West Fork of Carson River at Woodfords, California, 1880-1892, 1900-1920, 1928—
Humboldt River at Palisade, Nevada, 1902-1906, 1911—
Humboldt River near Inlay, Nevada, 1935—
Rye Patch Reservoir, 1939—
Humboldt River near Oreana, Nevada, 1906-1922, 1924—
South Fork of Humboldt River near Elko, Nevada, 1906-1909, 1910—
Little Humboldt River at Chimney dam site, 1941—
Martin Creek near Pine Valley, Nevada, 1925—
H. L. I. L. & P. Co.'s Feeder Canal near Mill City, Nevada, 1914-1931, 1936—

*Operated since April 1942 by district office at Nixon, Arizona. (Operated by district office at Ashio, Idaho.)

CHAPTER VIII
WATER DISTRIBUTION HUMBOLDT RIVER SYSTEM—1941
By J. A. MILLER, Supervising Water Commissioner

ORGANIZATION

J. A. MILLER, Supervising Water Commissioner—

ENTRE RIVER

D. E. WINCHELL, Water Commissioner—

LOVELock DISTRICT

F. E. BAKNER, Water Commissioner—

WINNEBAGA DISTRICT

M. B. SNYDER, Water Commissioner—

SOUTH BEND DISTRICT

G. D. SKILLOW, Water Commissioner—

LAUGHLIN DISTRICT

ALBERT QUILA, Water Commissioner—

DAVIS VALLEY AND NORTH FORK DISTRICTS

L. T. BRIDSON, Hydrographer—

WILLow CREEK RESERVOIR

EDWARD KING, Hydrographer—

ELKO DISTRICT

The irrigation season of 1941 followed a winter of heavy snow and moderate temperatures. During the late summer and fall of 1940 there was very little rainfall, and as a result the winter snow fell on comparatively dry ground, resulting in large amounts of the spring runoff seeping into the ground. However, the runoff water that reached the stream system created a flow at the Palisade gaging station that gradually increased from 75 c.f.s. on January 1 to 2,150 c.f.s. on June 13. This represented the peak flow of the season, and from that time on the flow began to recede. However, the many rainstorms of the summer prevented the usual abrupt drop in flow at this point after the June peak had been reached.

As a rule the low stage flow occurs about August 15 of each year, and amounts to 20 c.f.s. On August 15, 1941, the recorded flow at this station was 140 c.f.s., and the low stage flow was not reached until September 15, when 48 c.f.s. was recorded. From this time until the end of the year many fall storms increased the flow gradually, until there was 230 c.f.s. at this gaging station on December 31.

During the seasons of 1935 to 1940, inclusive, the river bed was always dry during the months of August and September at Ro Comus gaging station. During the same period of 1941 the flow at this point never dropped below 30 c.f.s., and gradually increased during the fall months. There was sufficient water in the river below the Winnemucca district to fill the H. L. I. L. & P. Company reservoir before the end of the year.

No irrigation took place in the Winnemucca and Battle Mountain districts until the last week of April, and no irrigation took place on the tributary streams until after the middle of May in the Elko district. The river bottom lands in the Elko district began to flood early in April. With the exception of the above-named flooding condition, the entire flow of the river was allowed to reach the Rye Patch reservoir during all of March and nearly all of the month of April. After it reached the Rye Patch reservoir it was allowed to conflate and was later released under a rotation system. Rotation systems were practiced in the Winnemucca, Battle Mountain, and tributary districts in the Elko district.

The large flows during the months of May and June or during the period of greatest need made it possible to serve all priorities. The
them. Behind these fellows, and keeping them going so that they can supply the fighting men, must be all the other workers of the country. The whole thing ties in together and no one is left out. We are organizing defensively for the protection of civilian life and property, and offensively for the success of our Army and Navy.

CHAPTER X

Snow Surveys

By H. P. Boardman, Chairman Forecastle Committee, Nevada Cooperative Snow Surveys

I. CENTRAL SIERRA

As was pointed out in the last biennial report, the rise of Lake Tahoe and the Truckee River runoff for 1940 greatly exceeded the forecast. The previous winter (December-March), precipitation was from 158% to 179% of normal at six U. S. Weather Bureau Stations including Tahoe and Truckee and four stations in the Sierras directly west of the Truckee and Tahoe basins. In spite of this, the April 1 snow surveys indicated only about normal water content for the high level courses and below 60% of normal for the low level courses. The partial explanation being much rain in January and March and a runoff that was above normal by about 18% in January and February and 7% in March.

The excess winter precipitation greatly surpassed quantitatively the excess winter runoff plus the discrepancy between snow survey forecast and actual April-July runoff, so it must be that much of the winter precipitation in the form of rain, combined with March melting, was stored in the ground and given off along with melting snow to yield the high April-July runoff.

The organizations cooperating in our Sierra Snow Survey work for 1941 were: The Nevada Cooperative Snow Surveys, including the State of Nevada through the State Engineer's Office, the Truckee-Carson Irrigation District, the Washoe County Water Conservation District and the Sierra Pacific Power Company; The California Cooperative Snow Surveys headed by the Division of Water Resources of the Department of Public Works and including the Pacific Gas and Electric Company and the Nevada Irrigation District, whose employees make surveys of several of the courses used; The U. S. Forest Service and the Division of Irrigation of the U. S. Soil Conservation Service. This latter is the Federal organization which is developing and coordinating the Snow Surveys throughout the Western States. The U. S. Weather Bureau and the Nevada Agricultural Experiment Station also cooperated.

Heavy early winter snows caused the February 1 and March 1 snow surveys to show a relatively high water content on most of the high level courses, but low March precipitation combined with evaporation and early melting resulted in many of the courses, even high level ones, yielding lower actual water content April 1 than March 1.

The April-July actual runoff for the Truckee, Carson, and West Walker rivers checked well with the forecast, but the rise of Lake Tahoe and runoff of the East Walker considerably exceeded the forecast, the probable explanation being high precipitation in April, exceeding the normal by from two to four inches at several high level U. S. Weather Bureau Stations.
The rise of Tahoe April 1 to high water was 1.56 feet or 92.9% of normal, exceeding the forecast by 3 feet and the East Walker runoff reached nearly 154% of normal, over 20,000 acre-feet, or 32% of normal above the forecast. For the other three rivers the greatest divergence between forecast and actual runoff was for the Truckee River where the runoff was 85.7% of normal or 5.9% of normal above the forecast.

1942

The cooperating agencies were the same as listed for 1941. The early winter precipitation was high so that February 1 and March 1 snow surveys formed relatively high water content, but light March precipitation caused small increase in high level water content and even a loss in water content as shown by April 1 surveys of several low level courses, due to March melting. Heavy rain in early and middle of December 1941 must have thoroughly pruned the basin with very excessive April and May precipitation, caused the April-July runoff to greatly exceed the forecast, which was based on assumed normal spring precipitation.

Lake Tahoe was high in 1941 and the heavy early winter rise assured above maximum permissible elevation in 1942 if gates were kept closed, so gates were opened in February and the elevation was controlled with the result that the maximum reached was 6,220.01 on July 15, while the limit set in the Truckee River agreement is 6,220.10. Had the gates been kept closed after April 1 the maximum of 6,230.03 would have been reached July 26 which is 58 feet or 8.4% of normal higher than the forecast estimate.

The runoff of the Truckee exclusive of Tahoe, the Carson, and the East and West forks of the Walker all exceeded the forecast by amounts ranging from 13.5% of normal for the West Walker to 43% of normal for the Carson at Fort Churchill. A study of the April-May precipitation at U. S. Weather Bureau stations nearest to the above basins shows the following; Truckee, Tahoe, and Marlette Lake had 345, 136.6, and 200% of normal respectively; the average percent of normal was 229 for the following ten stations: Sierraville, Bowman Dam, Lake Spaulding, Blue Canyon, Soda Springs, Twin Lakes, Tamarack (Blue Lakes), Lake Eleanor, Hetch Hetchy, and Gem Lake. Quantitatively the excess above normal ranged from 2.84 inches at Tahoe up to 3.85 inches at Gem Lake (which is 15 miles southeast of Taho Pass at altitude 9,000 feet) to 11.86 inches at Blue Canyon and 12.64 at Lake Spaulding. This excess was 8.66 inches at Soda Springs and 8.42 at Tamarack (Blue Lake). A reasonable quantitative estimate of the effect of this excess April-May precipitation indicates ample acre-feet to cover the difference between the forecast and the actual results for each of the basins involved.

Such high spring precipitation is very rare in this region. Recently new low level snow courses near Tahoe were established below Rubicon Peak, near Richardson's, and above Glenbrook. Also surveyed for the first time in Little Valley (between Washoe Valley and Tahoe) and at Poison Flat on the East
The victory garden program, under the guidance of victory garden committees of the nutrition council, is making rapid progress and all over Nevada small home gardens are being planted.

Last January the rationing boards were organized under the councils of defense in practically every community in the State. These boards, now known as rationing boards, under the direction of a State Rationing Administrator, have been doing a magnificent job. Their work has expanded from rationing tires and rubber, to automobiles and now sugar, and soon other commodities will be on the rationing list.

A State Consumer Interest Committee has been set up and soon suggested programs will be handed down to the local councils of defense.

The State Health and Welfare Committee is charged with the responsibility of inventorying all Federal, State, county and local health and welfare organizations and to coordinate their activities in our war effort.

Recreational committees are being set up to plan recreational schedules for the soldiers and defense workers.

In many of our communities volunteer offices have been established with a representative centralizing all of the local participation activities. Here volunteers fill our their registration cards and are interviewed, and as soon as possible assigned to a program for which their qualifications best suit them. We hope to have such offices in all of our communities.

Realizing the danger of range and forest fires, the councils of defense, in cooperation with the Forest Service, Grazing Service, Indian Service, Extension Service, county fire coordinators, representatives from the Highway Department, and others, are organizing rural fire boards in order that all fire fighting equipment and personnel may be coordinated. We believe this important in the threat of sabotage—and when we talk of sabotage we usually mean fire—and also the fact that one enemy bomber loaded with phosphorus leaflets could set fire to the entire State. In addition to this a strong effort has been made through our State and county fire coordinators to have communities strengthen their fire departments. In some localities there is no fire equipment whatever, and in others such equipment is inadequate. This condition should be corrected.

Since there is constant danger of enemy attack on our coastal areas there is always the possibility of a sudden and uncontrolled evacuation of people from those areas into our State. This not only requires a major traffic problem, but problems in sanitation, health, welfare, emergency housing, feeding and clothing. With this in mind Governor Carville has appointed under the direction of the Council of Defense who will have the responsibility of coordinating all services essential for the proper handling of such a movement. This will include the health and welfare services, the Red Cross, which will have the job of emergency clothing, feeding, and housing, law enforcement, highway problems, and other essential services. This work is progressing rapidly. I might state that the Army does not plan evacuation of civilians this far back at present, but there is the danger of a sudden and panicky movement. In addition to these, many other programs are being developed for community participation.

Carson River. This latter course was located and surveyed by the Mono National Forest.

II. HUMBOLDT BASIN

During the first year of the biennialium, streamflow forecasting in the Humboldt Basin was directed as in previous years by Carl Rige, Assistant Meteorologist of the Nevada Agricultural Experiment Station and U. S. Soil Conservation Service, but since his transfer to active Army service the work has been taken over by Dr. J. T. Church, Meteorologist of the Experiment Station with the assistance of the chairman of the Forecast Committee.

The State and Federal cooperation of earlier years has been continued with ever-increasing participation by the U. S. Forest Service. The Nevada National Forest has established snow surveys in the Baker River Basin in far eastern Nevada to supplement the service already established on Charleston Mountains at Las Vegas and on Murray Summit for the Steptoe Valley at Rey.

The Toiyabe National Forest has developed a snow survey and forecast system for the upper Roper River Basin at Austin in Central Nevada, and the forecast for the Little Humboldt Basin has been applied also to the Quinn River Basin that shares the Santa Rosa Range and snowfields with the Little Humboldt.

Because of the early appearance of the snow over the original Cave Creek Snow-survey Curve at the Ruby Lake National Wildlife Refuge, a new course has been laid out at the same elevation, but better sheltered from the sun.

Safety for snow surveyors has become the leading problem. During the snow-survey trip from Jarbridge to the head of Marys River in late February 1941, an avalanche carried Karl Wilkinson, Ranger at the Humboldt Forest, to his death, while his associate, Dale Boles, was seriously injured and made his way back to Jarbridge only by superhuman exertion. Two other rangers, L. E. McKenney in Lamoille Canyon and H. B. Snider in the upper American River Basin, suffered knee and leg injury from the twixting of the ski. Only the presence of companions and, in the latter case, the shelter of a cabin made ultimate escape possible.

The U. S. Forest Service and the Nevada Cooperative Snow Surveys prefer snow-survey parties of three; and the Humboldt Forest requires this number where the trip is overnight. More shelter cabins also are desirable, preferably with two-way radio, a toboggan, and two pairs of web snowshoes, which give better traction for pullers than the ski. The Toiyabe Forest and the Experiment Station have cooperated in the construction of a cabin in the autumn of 1941 at the headwaters of Roper River, and the former has placed a cabin on the lower slopes of Buckskin Mountain in the Santa Rosa Range. The Humboldt Forest and the Experiment Station are rearranging the old shelter cabins and planning an additional cabin on the route from Jarbridge to Upper Marys River Basin in order to avoid the avalanche area and obtain essential snow data.

Owing to the chance escape of an airpilot this last winter in the Sierra Nevada by finding a mountain cabin, the Division of Irrigation
under the police officers. The air raid wardens are operating in close contact with the police departments. The emergency medical services are under the supervision of our doctors and nurses. In every community in our State this work is going on. I wish I could tell you of some of the things that they are doing so you could appreciate more fully the time and energy that is being put forth.

Uniform blackout ordinances have been adopted in nearly all of the counties and incorporated cities in the State. Most of the communities in the State have had blackout practices and all are equipped with air raid warning devices.

Civilian participation, the other major phase of civilian defense, is the mobilizing of all organizations, associations of people and individual citizens to do effectively and efficiently the things they are best qualified to handle. This may be termed the channeling of the large reserve of volunteers in programs developed to safeguard health, welfare, and morale. Many of these programs are being carried on by existing organizations, and in such cases assistance can be given by the defense councils in referring volunteers to those programs in order that their organization activities can be further developed and stimulated.

Perhaps one of the most vital programs at the moment is the salvage for victory program that is now well under way in Nevada. There have been appointed a State Salvage Committee and an Executive Secretary working under the War Production Board. In each community salvage committees are being formed by the councils of defense. More than 35 of these committees have been set up and are operating with remarkable success. While this program covers the salvaging of scrap metal, rubber, paper, old cloth, and tin cans, at the present time emphasis is being placed on scrap metal and rubber due to the extreme shortage of these two items, and their importance in the production of implements of war. The salvage of tin cans which are being utilized by the Nevada Consolidated Copper Company at Bath in the precipitation of copper, is also emphasized.

The nutrition program carried on by the State and county nutrition councils in coordination with the councils of defense has made great progress in Nevada. More than 3,000 women have either completed this course or are now taking it. This program has three main points:

1. It translates the result of modern nutrition research into simple, easy-to-follow rules.
2. It utilizes the free first line attack in the communities where people live, eat, and make their purchases.
3. It utilizes all available channels of public information to combat the lack of knowledge which is the main cause of malnutrition.

Another important program that has made great progress is home nursing under the supervision of the Red Cross. This covers 24 hours of training in the fundamentals of home nursing, and has been taken by approximately 1,000 women in the past three or four months. Home nursing is essential because there will be a great shortage of doctors and nurses as the war continues, and in the event of an epidemic, such as we had in the last war, women having this training and working under the supervision of doctors and nurses can well serve to relieve what can well be a critical situation.
wardens, auxiliary firemen and policemen, emergency medical service, emergency utility repair, and public works corps, and other of the protective services, all essential to civilian defense.

Nevada is rapidly becoming a military and defense industry State. Now the southern tip of the State is Boulder Dam which furnishes the main supply of electrical power for the defense industries in southern California. At Boulder City is Camp Siebert, where there are over a thousand soldiers training for military police. Between Las Vegas and Boulder City the great 860,000,000 magnesium plant is now under construction, and the first unit is scheduled to produce strategic magnesium metal within a month or so.

Within a few miles of the magnesium plant a $4,500,000 manganese plant will soon be under construction. About ten miles north of Las Vegas is Camp McCarran aerial gunnery school with over 4,000 army personnel. Near Tonopah an aerial bombing base is now under construction, and from this base bombers will take off for practice maneuvers on the 3,000,000 acres of aerial gunnery ranges lying south and east from Tonopah.

Near Hawthorne, a town of about 800 a year ago and now overflowing with some 3,000 people, is one of the larger Navy ammunition depots. An Army munition depot is now under construction near Susanville, just over the Lassen County line in California. The great Lemmon Valley air depot was built for the service of the southwest and probably will be completed some time this fall, and there is talk of a Navy training base near here. Then there will be the contact pilot schools near Austin, Fallon, and Minden, and other military and defense industry activities are bound to follow.

Added to this we have our three transcontinental railroads, our strategic highways, our great copper mines and smelter in White Pine County, the large tungsten mine in Pershing County, the magnetcite mine in Gabbs Valley which will furnish ore for the Las Vegas plant, and which is now furnishing ore for the reduction of magnesium at the Permanente plant near San Jose, the lead and zinc mines in Lincoln County, and other strategic mines throughout the State.

I mention these items in order to impress upon you this fact—that if enemy bombers attack the west coast it is highly probable that some of these attacks will be concentrated on strategic points in Nevada. If the enemy fails to find his target or is turned back the bombs will be unloaded on our communities, not so much for destructive purposes but to create panic which is more deceptive than the actual bombing. Panic evidences a complete disintegration of the morale of the people. The predisposing cause of panic is complete unpreparedness to meet emergency situations. The correction of such a condition can be brought about only through an organizational set up, such as our protective services.

And so we are preparing here in Nevada with over 8,000 men and women volunteers assigned to these various protective services. Of this number over 3,000 have either completed their minimum training or are now in training. They are devoting a great deal of time to this work and will continue to devote their time and energy for the duration. Our auxiliary firemen are being trained under the supervision of the fire fighting officials in each community, the auxiliary policemen seems to have been true also of Martin Creek in the Little Humboldt Basin.

The experience of the two years is providing more exact knowledge of the effect of excess rain in increasing the runoff and raising the water table and the reverse effect of the latter in reducing absorption and forcing an excess amount of melting snow into the streams. Ultimately all factors except the maximum of the summer precipitation can probably be estimated by May 1.

Moutain stream gauging should be expanded to all of the streams covered by the snow surveys and should be begun as early and continued as late as the streams flow. Only thus can the problems mentioned above be solved. In particular, stream gauging should be inaugurated on the Upper Marys River, where the snowfields are difficult to reach but provide an essential water supply. Fortunately after several years endeavor, a year-round automatic recorder has been established at Chimney dam site on the Little Humboldt Basin above most diversions. The erection and maintenance are by the C. S. Geological Survey (Water Resources Branch) in cooperation with the State Engineer.

The forecasts of streamflow now cover the entire State and contain full details of snow cover and weather during melting. In the forecast of April 1 for the Humboldt Basin, a detailed analysis of the causes of the flood of 1910 and the runoff for 1941 and 1942 is given.

The report of the runoff of the tributaries of the Upper Humboldt River for 2541, now compiled by the chairman, contains also a set of rating curves and snow normals based on a 27-year record at Palisade and the percentage relationships of the March-July, April-July, and annual periods of each year.

The new and revised normal of 215,000 acre-feet for March-July will be substituted for the previous normal of 255,620 acre-feet and snow-cover normals will be adjusted to e. The lower normal unfortunately corresponds to the normal beneficial use on the Humboldt.

At the suggestion of the editor of Soil Conservation, Dr. C. Church, originator of streamflow forecasting, has written a provocative article on “Organized Water.” Fortunately the days of confusion and suspicion of 1910 are past and water control has taken their place. Best of all in this year of concentration, water over practically the entire United States is abundant.
CHAPTER XI
LAS VEGAS ARTESIAN BASIN, CLARK COUNTY, NEVADA

In the 1940 Biennial Report of the State Engineer a rather complete discussion was made of the Las Vegas Artesian Basin which is located in and around Las Vegas, Nevada. During the past few years the State Engineer’s office has been carrying on investigations in this artesian basin. Starting in 1939 certain wells were designated as “observation wells,” and each month pressure readings were made to determine the static head. The results of these investigations indicate a slow decline in the artesian head and, apparently, no further drawdown is expected. The data indicate a static level which is well above the maximum water table level for the basin. In conclusion it can be said that the Las Vegas Artesian Basin is not under artesian condition and can be safely developed for domestic purposes.

Following the enactment of the present underground water law in 1939 the State Engineer’s office has brought to the attention of the Nevada legislature the necessity of placing into effect a system of water supply for the entire state. This has been done by the passage of a bill which provides for the establishment of a State Water Board, consisting of seven members, three of whom shall be appointed by the Governor, one each from the State Engineer, the Board of Agriculture, and the State Highway Department. The Board shall have power to make rules and regulations for the conservation and development of all water resources in the state, and to prescribe methods of measuring and recording the quantity of water taken from any stream or body of water. The Board is authorized to create districts for the purposes of conservation and development, and to levy taxes upon property within such districts for the payment of the costs of operation and maintenance of the works constructed.

The Board is also authorized to acquire by condemnation or purchase all lands necessary for the construction of its works. It is directed to file annual reports with the Governor and the legislature, setting forth the work done and the costs incurred. The Board is empowered to issue bonds for the purpose of providing funds for the construction of its works.

In conclusion, it is evident that the state of Nevada is confronting a serious problem in the management of its water resources. The State Water Board, which has been newly created, is charged with the responsibility of developing and conserving the state’s water resources. The Board is well equipped to handle this task, and its actions will undoubtedly have a significant impact on the future of the state’s water supply.

It is also provided that the State Council of Defense shall cooperate with all departments of the National, State, and county governments in the promotion of such plans, programs, and policies as may be made necessary by the readjustment period following the war.

If in the wisdom of our 1919 Legislature such a body was essential in the readjustment period following the first world war, it is obvious that such a body will be essential in carrying out the plans now under consideration. Our thousands of volunteer workers will be trained and ready for that task.

Our present State Council of Defense was organized by Governor Carville on May 8, 1941, at the time the first Civilian Defense Conference was held in the state. This conference was primarily for the purpose of inculcating in the minds of all those present the need for a strong defense organization. The conference was attended by representatives from all parts of the state, and its success was evident in the enthusiastic reception given to the program of defense activities.

Civic defense has one main objective—to help win this war. It has two main functions: First, to enlist, organize and train volunteer personnel for the protection of civilian life and property and, second, to mobilize every man, woman, and child in carrying on programs essential to this war effort and seeing to it that everyone is doing his full work. Civic defense is the active defense of our country in the responsibility of our Army, Navy, and Air Force. The passive defense or the protection of civilian life and property is in the event of an enemy attack is the responsibility of the civilians themselves. It covers every community, and every man, woman and child in those communities, and must therefore enlist the time, energy, and interest of every patriotic citizen.

Our councils of defense were not formed to make war, but to prepare the defense of the civilian population so that should attack come, civilian casualties and property losses will be held to the minimum and hence offset the purpose of enemy air raids on communities, which are usually for the purpose of breaking down public morale.

Immediately following May 8, 1941, the State Council of Defense started organizing county and community councils of defense in every county and in practically every community of our State. Work was started on essential programs, volunteers enrolled, protective services organized, and following December, 1941, a very active defense system had to be developed. Upon that date our councils of defense were ready in every county and community.

The present time is the only time in our history in which the people of Nevada have been required to do their part in the war effort. The State Council of Defense has been functioning very effectively in the mobilization of all available resources for the defense of our country. Its success is evident in the way in which the people of Nevada have responded to the call for volunteers and other forms of assistance.

Civilian defense, as I have stated, has two main functions—civic protection and civilian participation. Civic protection is designed for the protection of civilian life and property, to teach the people of Nevada how to save their lives and property from enemy attacks from the air. To this end there have been enlisted over 8,000 volunteer men and women to act as air-raid
meantime supply Defense Plant Corporation with all power possible or necessary without waiting for the execution of a contract.

Much water will be required for the operation of the magnesium plant, which must be obtained from the Colorado River via Lake Mead. For this purpose a contract was drawn up between Nevada and the Bureau of Reclamation for delivery of not to exceed 100,000 acre-feet per year at the State of stored waters from Lake Mead. Discussions as to this contract were entered into and on June 1, 1942, the agreement was reached on all points excepting that of the cost to Nevada. The Nevada commissioners held that if any charge for storage was justifiable it should be storage service only and not include a charge for power which might have been generated by the stored water if it had been passed through the turbines. Mr. Kennedy agreed to refer this to the secretary. An excerpt from our letter to Secure an arbitrary charge of sixty cents per acre-foot follows:

Under provisions of the Colorado River Compact and the Boulder Canyon Project Act, use of water for domestic purposes has first priority, irrigation second, and use for generation of power last. This diversion into Nevada is for domestic and metallurgical uses, and at this time entirely for the use of the United States Government. As such, a charge for the power this water might have generated should, if it is at all proper to render such a charge, be allocated to all users of the water and not to users of the water. In the contemplation of the Act, the generation of power at Boulder dam is a secondary consideration, for the dam was constructed primarily for floodcontrol and irrigation, to save, conserve and reclaim lands, and for domestic use. The installation of hydroelectric power was to defray the costs of construction and operation during a period fixed at fifty years. Periodic adjustment of the rate was provided for in the contract necessary because of changing costs and fluctuating water supply, in order to amortize within a fifty-year period or a reasonable time thereafter. It would be as unfair to charge Nevada for the power that might be generated by this diversion as it would be to assess a similar charge against an upstream State for diversion of water within the 7,500,000 acre-feet limitation of the Colorado River Compact.

A nominal charge for storage alone may perhaps be justified under the Boulder Canyon Project Act, but this is debatable. If the water to be stored is considered as a part of the 300,000 acre-feet allotted to Nevada annually under the provisions of the proposed tri-State compact, there appears to be no fairness in a storage charge that does not treat all users of stored water alike. It is not equitable to charge Nevada for storage while not charging all other users a similar or equal rate. Among the various users of stored water Metropolitan Water District alone pays storage, other users being placed, by the terms of the Boulder Canyon Project Act, on
Well No. 72—Russell—Stop watch and measuring can. Flows 275 g.p.m.
Total flow of mud—292,000 gals. per day.
Well No. 76—Art Harris—Estimated. 175 gals. per min. continuous flow.
225,000 gals. per day.
Well No. 80—Wickman—No measurement. This well is used for domestic, daily, garden, and pastime. Estimated by average and use, probably 50 g.p.m. continuous flow or 72,000 gals. per day.
Well No. 82—Rooker—Estimated. 50 g.p.m. continuous flow or 72,000 gals. per day.
Well No. 83—Bohler 2nd Towndale Company—Stop watch and measuring can. Flows 155 g.p.m. Well No. 83—Estimated use 2,500 gals. per day.
Well No. 84—Rosedale—No measurement possible. About 30 families use this well. Probably 5 acres irrigated. Estimated daily use 256,000 gals. per day.
Well No. 110—E. S. Hatcher (Las Vegas). Because of leaks around casing a measurement was made by stop watch and measuring can and the estimated last was added to the measured quantity. Well flows 255 g.p.m. There is a continuous leak of approximately 50 gals. per min. or 72,000 gals. per day. The well had been closed for some time and the pond was very low.
Well No. 113—Smith—Estimated. This well is connected to pressure pump and supplies several homes and yards. Probably 30 g.p.m. continuous use or 14,000 gals. per day.
Well No. 111—Golf Course (Las Vegas). Approximately 450 g.p.m. used 8 to 9 months of year. Probably annual normal flow of well is allowed to waste. There was no way of measuring the normal flow. 566,000 gals. per day for Greene. If this well is pumped the capacity of the pump wills No. 110 and No. 90 stop flowing.
Well No. 116—Murray—Stop watch and measuring can. 67 g.p.m. continuous flow of 10,000 gals. per day. Used for irrigation and domestic.
Well No. 121—Nicholson—Stop watch and measuring can. 200 g.p.m. continuous flow of 256,000 gals. per day. This water not being used to fulfill beneficial use.
Well No. 122—Campbell—Stop watch and measuring can. 75 g.p.m. continuous. 165,000 gals. per day.
Well No. 123—Blamp—Stop watch and measuring can. 15 g.p.m. continuous. 21,000 gals. per day.
Well No. 124—Colby—Stop watch and measuring can. Flows 100 g.p.m. Good control. About 10 gals. allowed to flow continuously. Probably 10,000 gals. per day use. No inspection at time of measurement.
Well No. 156—Rice—Stop watch and measuring can. 90 g.p.m. A small continuous flow of approximately 10 g.p.m. 4,000 gals. per day. Used for watering horses and livestock.
Well No. 169—Cuyler—Estimated use 290 g.p.m. continuous flow of 144,000 gals. per day. Used for irrigation and domestic.
Well No. 166—H. R. Brown—Estimated. 0.02 c.f.s. or 940 g.p.m. This well partially closed. Continuous flow 25 g.p.m. or 75,000 gals. per day.
Well No. 165—Riggio—Yowell 80 g.p.m. estimated. 25 g.p.m. continuous flow or 72,000 gals. per day. Estimated use 25 g.p.m. continuous flow or 72,000 gals. per day. Estimated use 25 g.p.m. continuous flow or 72,000 gals. per day.
Well No. 201—Mahoney—Estimated use 25 g.p.m. continuous flow or 72,000 gals. per day. No beneficial use.
*Approximately 1,300 gals. per min. or 1,944,000 gals. per day.
Negotiations were at once opened with Metropolitan and the Bureau of Reclamation which eventually led to a contract between Defense Plant Corporation and the U. S. Bureau of Reclamation for most of Metropolitan's unused power. A few days later another conference was held at which Senators McCarren and Butler, Congressman Scruggs, engineers of Basic Ores Company, Major Ball of Magnesium Electron, Manchester, England, and Commissioners Smith and DeArmond were present, and discussed various phases of the program. On December 8, 1941, representatives of the Colorado River Commission, consisting of Alfred Merrick Smith, C. F. DeArmond, and Deputy Attorney-General Alan Bible, conferred in Washington with John C. Paps, Commissioner of Reclamation; J. Kenneth Chandle and Harvey McPhee, respectively Chief Counsel and Chief Engineer of the bureau. After some discussion the Nevada Commissioners agreed to supply by contract for a period of two years a quantity of 200,000,000 kilowatt-hours per year. It was also agreed that additional energy could be subsequently contracted for and withdrawn up to the limit of safety required by Nevada to meet other existing and immediately prospective contract demands within the State.

In round figures, it was estimated that Nevada's total allotment consisted of 750,000,000 kilowatt-hours. The present and prospective use for the year 1942 was taken at 333,000,000 kilowatt-hours, leaving a balance of 420,000,000 kilowatt-hours available, the contract to be entered into with the Government or its agent to be for 200,000,000 kilowatt-hours, which would leave a balance for Nevada for use in expanding industries and to meet the sure great demand which would be resultant upon increased population in Las Vegas and vicinity at 220,000,000 kilowatt-hours.

After a further conference at Los Angeles, Nevada eventually agreed to furnish Defense Plant Corporation 147,000,000 kilowatt-hours of energy during the period ending May 31, 1944, and 220,000,000 kilowatt-hours during the year ending May 31, 1945. The maximum demand in horsepower for this energy was fixed at 39,000.

The power was to be supplied to Defense Plant Corporation at cost. The State has a fixed charge of three-tenths mill per kilowatt-hour to cover administration and supervision through the Colorado River Commission. Purely from a patriotic viewpoint and because the large amount of power being contracted for by the Government would justify such reduction, this charge under the agreement was reduced to five-hundredths mill. Thereafter the commission returned to Nevada and the Government resumed negotiations for additional power with the other allottees. Progress in regard to the negotiations with these contractors was delayed in September due to complications arising regarding proposed use of Metropolitan Water District's unused Boulder power. This district had contracted for a large amount of Boulder energy which it will be unable to use for some years, but in the meantime it is obliged to pay for it at the falling water rate for firm power. Officials of the water district were considering the possibility of salvaging some of their expense for unused power by asking the Government to sell it for more than the fixed firm rate. The Government's desire to contract for all of Nevada's allotment of power at
### Wells in the Las Vegas Artesian Basin and Data Pertaining Thereto

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### Las Vegas Magnesium Plant

In late October 1941 the United States Government, acting through Defense Plant Corporation, decided upon the construction of a very large plant for the production of magnesium metal, to be erected at Las Vegas, Nevada. The estimated cost of the plant was to be approximately $60,000,000. Construction was to begin immediately on a very large scale. It was hoped that the plant would be able to go into production in the month of August 1942. One was to be supplied from a large deposit of magnesite located at Gabbia Valley about 30 miles north of the town of Luning in Nye County.

An enormous amount of electrical energy, estimated to be 1,500,000 kilowatt hours per year, will be required for the operation of the reduction plant at Las Vegas. At this date (July 1942) 30,000 men are employed in construction. A peak of 12,000 will be reached in September. When completed and in operation, 4,000 will be employed in production.

The first negotiations with the commission regarding this colossal wartime industry were held in Washington on May 23, 1941, where Commissioners Smith and DeArmond were participating in the Boulder Canyon Project Adjustment Act power contract hearings. Congressman James G. Scrugham advised the commissioners to confer with Attorney George B. Thatcher, representing Basic Magnesium, Incorporated, of Cleveland, Ohio. The commissioners assured Mr. Thatcher that Nevada would assist the industry in all ways possible, but could not alone, out of its allotment, supply sufficient power. They suggested immediate investigation of a probability of obtaining a large additional amount from Metropolitan Water District of Southern California which had contracted for a large block it had to pay for continuously, but would not be able to use for several years.
set of complex regulations by which the Government would control and operate the reservoir and power plant, upon which to base the said new contracts.

On July 27, 1940, the Secretary of the Interior appointed Mr. R. V. L. Wright as his special representative to prepare findings of fact and assist in the preparation of new contracts and the governing regulations. On August 11, 1940, Mr. Wright called a conference on these matters in San Diego, California, which continued in session for about two weeks and was attended by all allottees and State officials in interest, accompanied by engineers and attorneys, sometimes forty in number. Meanwhile, negotiations were being carried on between the generating agents and the U. S. Bureau of Reclamation which culminated in a new draft of generating agency contract dated November 14, 1940. All points of difference had been agreed upon excepting three, which were:

1. Whether the power-plant building should be operated and maintained by the Bureau of Reclamation as formerly, or whether the proposed operating agents should take over the operation.

2. Controversy as to use of water for "spinning reserve" at generating efficiencies less than the efficiency contemplated in the studies upon which existing contracts were based.

3. Controversy as to the finality to be accorded findings of the Secretary of the Interior under the terms of a new agreement.

On February 19, 1941, Mr. Wright prepared a "Draft of Proposed Findings and Recommendations for the Effectuation of the Boulder Project Adjustment Act" and submitted it to the allottees. This draft was at variance with the opinions of the power allottees in many particulars. It was studied by the interested parties, and a subcommittee prepared a lengthy answering letter to Mr. Wright on issues deemed vital to them if new contracts were to be entered into.

Shortly after receipt of the allottees' letter in Washington, D. C., Secretary Ickes asked for a conference there, which lasted throughout April and May 1941.

In the preliminary meeting before the secretary it seemed that he was not willing to yield or compromise on any point of difference. However, he consented to full hearings on all matters, which were ably conducted by Messrs. Nathan Margolis, J. Kenneth Chandie, Ivan Surfase and other lawyers for the department. Leland Olins, Harvey McPaul and other engineers also efficiently represented the Government. Governor Carville was able to be present at critical times and participate in the conferences. Each of the several power allottees was represented by special engineers and attorneys.

Space will not permit a summary of discussions that took place during the final six weeks of work on the contracts and the regulations. In the end, compromises were effected on all points of difference, although several times it seemed that agreement was impossible and that the Adjustment Act was doomed to extinction.

The greatest difficulty encountered was over a plan the Interior Department engineers had submitted to change the original basis of selling energy at high tension voltage to a program of selling energy as falling water only, leaving the risk of recovering that energy entirely on the allottees, and basing the efficiency of energy recovery...
these were Senator Pat McCarran, whose vigilance for the protection of labor as well as all other State interests was ceaseless; Senator Key Pittman, whose participation in all early Colorado River legislation made his help invaluable; Congressman James G. Sargent, who likewise has a background beginning with his services as Nevada State Engineer in 1919-1922, and continuing as a member of the Colorado Interstate Commission with Herbert Hoover in 1922; Governor of Nevada in 1923-1927, up to his introduction of the Adjustment Act in Congress in 1934. These statesmen also had the major share of responsibility in getting the Act through Congress as well. The successful fight of Senators McCarran and Pittman to overcome the opposition of certain political interests to the Adjustment Act in the Senate will always be a memorable chapter of Nevada history. Jay Carpenter, Director of the Mclain School of Mines; Charles F. DeArmond, Resident Engineer and Commission member from Las Vegas; Commission members Ed W. Clark and A. J. Caton; Attorney-General Gray Maschmorn, and Deputy Attorneys-General Howard Gray and Alan Rife, all gave unceasing help.

Agreement was had by the Colorado River Basin States on the terms of the proposed Adjustment Act in March 1939 at Denver. Subsequent further agreement on exact language was worked out in Washington by the States’ “Committee of Three,” with the Bureau of Reclamation, Bureau of the Budget, E. N. Treasury officials, and Senators and Congressman from the Basin States. These agencies and the statesmen were very helpful and deserving of high praise. The Colorado River Commission of Arizona, and in particular members Alma M. Davis and Donald G. Scott, who were often present in Washington, performed outstanding service.

NEW POWER REGULATIONS AND CONTRACTS

The Boulder Canyon Project Adjustment Act was passed by Congress and approved by the President on July 19, 1940, and was the culmination of over six years of work to secure amendments to the original Act which would assure definite revenue to Nevada. Effectiveness of the Adjustment Act had been conditioned upon execution of new power contracts between the Government and the original power allottees, and contracts to be in conformity and based upon new regulations agreed to by allottees and the Secretary of the Interior. Section 9 of the Adjustment Act provided the secretary with authority to negotiate a termination of the existing lease upon the power plant held by the Los Angeles Department of Water and Power and Southern California Edison Company. The secretary proposed, in the new program, that the leases continue operation as "agents" of the United States. New power contracts drawn to comply with the requirements of the Act had to be completed and entered into prior to June 1, 1941, or the Adjustment Act, upon which so much time and work had been expended, would become inoperative and void. Although these conditions to make the Adjustment Act effective are simply stated, there were many complex problems to be worked out between the Government and power allottees, and between power allottees and their contractors, before such new contracts could be written. It was necessary to prepare and approve a completely new
CHAPTER XV
Colorado River Commission of Nevada

GOVERNOR E. P. CARVILLE, CHAIRMAN.
ALFRED MERRITT SMITH, SECRETARY.
A. J. CAYON, COMMISSIONER.

ED W. CLARK, COMMISSIONER.

C. P. DEARMOND, COMMISSIONER AND RESIDENT ENGINEER AT LAS VEGAS.

The State Engineer has served, through successive reappointments, a period of six years as a member of the secretary of the Colorado River Commission. The service has been both State and National in scope, and in various capacities or functions. Reports of former proceedings have been prepared by the Secretary and published in the Biennial Report of the State Engineer, covering major transactions up to January 1, 1940. All important developments leading to the passage of the Boulder Canyon Project Adjustment Act, and the text of the Act itself will be found in the Biennial Report of the State Engineer for the period July 1, 1938, to June 30, 1940, pp. 102-122. Only the more important proceedings had since then are herein recorded. Many interesting details must of necessity be omitted in order to save space.

THOSE WHOM WE WOULD HONOR

Credit, as far as possible through complimentary mention, has been given to those who participated in these arduous tasks, in former reports by the Secretary, but the measure of their service to the State passes far beyond recognition by mere verbal praise. Beyond any question, this group of public-spirited men have rendered Nevada the most beneficial service in its history. Although the Boulder Canyon Project Act contained a provision for money to be paid to Nevada and Arizona from excess revenues, the amount was to have been determined on assumptions of unknown future power rates and production costs, placed on a competitive basis which could easily prevent accumulation of excess revenues.

Passage of the Adjustment Act provided and assured annual payments to Nevada of $500,000 per year, beginning June 1, 1938, and ending June 1, 1967, a total of $15,000,000.

During the period of most intensive work the commission has been under the leadership of Chairman E. P. Carville, Governor of Nevada, whose thorough legal training and wide judicial experience have been of the greatest value. His participation in the conferences held in Washington and western cities, his orderly and impartial dealing with controversial questions, and his ability to win the full trust and confidence of the many technicians, attorneys, and officials everywhere, have combined to make his contribution to the success of the program perhaps the greatest work ever performed by a Governor of Nevada.

I cannot refrain from again listing the men from Nevada who quietly and continuously worked on the plan which has so efficiently made possible a continuance of our slogan of "One Sound State." Among
During the past year, forty-seven new applications for registration have been approved. This is a larger number than in any previous year except at the time the board was first organized in 1905. The construction activities centering around the southern part of the State and around the Honey Lake and Lemmon Valley projects have doubtless been largely responsible for the increase. Many of the applications have come from prominent engineers registered in other States and now residing in or supervising work in Nevada.

**FINANCIAL STATEMENT**

Following is a statement of income and expenses of the board covering the period July 1, 1941, to July 1, 1942, as prepared by Secretary Palmer:

**Income**

- From 47 new applications approved: $700.00
- 15 new application pending: $10.00
- 120 renewal fees (not deposit): $210.00
- 45 renewal fees (cash and checks on hand): $112.50

**Total Income**: $1,142.50

**Expenses**

- Outstanding obligations in salary for former secretaries and stenographer: $100.00
- Stenographic help: $20.00
- Travel expenses, members to attend board meetings: $25.00
- Postage, printing, telephone service, supplies, etc.: $100.00
- Expense of conducting examinations: $40.00
- Membership in National Board, two years: $50.00
- Refunds on rejected applications: $90.00
- Collection charges on check: $10.00

**Total Expenses**: $531.00

**Net Income**: $611.50

**Funds withdrawn for purchase of two Series G war bonds, $500.00 each**: $1,000.00

**Balance on deposit in bank July 1, 1941**: $731.16

**Total deposits for the year 1941-1942**: $3,050.00

**Funds withdrawn during the year 1941-1942**: $1,067.28

**Funds remaining in bank July 1, 1942**: $1,172.28

**Total Assets**: $1,172.28

**On deposit in bank**: $1,172.28

**Cash and checks on hand July 1, 1942**: $112.50

**Total**: $1,284.78
CHAPTER XIV
State Board of Registered Professional Engineers

The personnel of this board, the members of which are appointed by the Governor, on whom elects its officers, is as follows:

ALFRED MINORRY SMITH, State Engineer, Chairman.
STANLEY G. PALMER, Dean of the School of Engineering, University of Nevada, Secretary and Treasurer.

BRADLEY D. MILLER, Assistant State Highway Engineer, Member.
PAUL H. STULLMEYER, County Surveyor, Elko County, Member.

ARTHUR J. SHAY, Manager Western States Utilities Company, Winnemucca, Nevada, Member.

ENGINEERS' REGISTRATION LAW

The Act providing for a State Board of Registered Professional Engineers was approved March 29, 1919, and was amended in 1933 and 1937. (Nev. Stats, 1935, 377; and Nev. Stats, 1937, 491-497.) The law provides for the licensure of professional engineers as defined by this statement:

The practice of professional engineering within the meaning and intent of this Act includes any professional service such as consultation, investigation, evaluation, planning and design, or responsible supervision of construction or operation in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works or projects wherein the public welfare or the safeguarding of life, health or property is concerned or involved, when such professional services require the application of engineering principles and data; that the provisions of this Act shall not apply to nonresident mining engineers employed for the purpose of making mine examinations.

The provision regarding nonresident mining engineers was an amendment introduced in 1937. It has the effect of relieving the board from having to decide the qualifications of mining engineers who enter the State for the purpose of making specific or special examinations. Such engineers, however, are in no manner prohibited from registering, prior to which their credentials and engineering qualifications must become a matter of State record, and whereby their professional findings and reports on properties in this State would receive wider recognition in professional circles. The purpose of the law is to prevent the practice of engineering in any branch of the profession by unqualified persons, whereby unnecessary loss of property or the public may be incurred, with possible loss of life, property, or both.

ACTIVITIES, JULY 1, 1940, TO JULY 1, 1942

On April 2, 1941, the board suffered the loss of its able and distinguished secretary, P. H. SHIBLY, Dean of the College of Engineering of the University of Nevada. Professor Stanley G. Palmer, appointed by Governor Carville in July 1941, was elected by the board to succeed Dean Shibly as Secretary and Treasurer.
aggregate thickness of about 10,000 feet. Each of the eight formations is widespread and uniform in its original geographic distribution. They are generally distinctly bedded and cut by numerous joints and faults. Except for the shale formations, the entire sequence is highly pervious in consequence of the open character of the bedding planes and zones of brecciation along faults.

The 3,000 foot sequence exposed in the Panaca area (Plate II) contains only one impervious shale member, and it is less than 10 feet thick. (Wheeler, 1889, pp. 33, 38, 39.) This shale could have only a local impeding effect because of the presence of numerous faults with more than 15 feet of stratigraphic displacement. The thicker Pine and Chisohin shales are nowhere exposed in the Panaca Hills. Thus the Cambrian rocks of the Panaca region consist almost exclusively of limestones and dolomites, and may be regarded generally as of medium porosity and high permeability. This conclusion is further indicated by the flat character of the water table in certain regions where sufficient data is available to give its relief.

**TERTIARY VOLCANICS**

Through the eastern four-fifths of Candelas Canyon and in the higher hills northeast of Panaca, more than 5,000 feet of lavas and volcanic tuffs lie unconformably upon the Cambrian limestones and dolomites. The lavas vary in composition, according to Westgate (1932), from extremely siliceous varieties (rhyolite and lattice) to basic types (basalt), though most of the flows are of intermediate composition (andesite and dacite). The individual flows vary in thickness from a few feet to several hundred. Most of the lavas are interbedded with volcanic ash and tuff beds with similar variations in thickness.

Most of the lavas are well-jointed, and therefore pervious. The interbedded tuffs, however, are mostly fine-textured, and would naturally be rather impervious to the flow of water. Because of these impervious intercalations the volcanics, except locally, are regarded as poor in water-bearing qualities.

These volcanic rocks are questionably assigned to the early part of the Tertiary period by Westgate (1932).

**PANACA LAKE BEDS**

Following the accumulation of the Tertiary volcanic series, the region was subjected to severe deformation in the form of intense faulting and broad folding. This faulting, with north-south trends and with displacements ranging from a few feet to thousands of feet, largely accounts for the present distribution of rocks in the various ranges of the region. This was followed by a period of minor east-west faulting. All this deformation was post-volcanic, but earlier than a period of basin-range faulting which was responsible for the present mountain ranges of the region and the intermountain valleys.

A series of these interconnected valleys, after the partial erosion of the adjacent ranges, was occupied by a great lake, the basin of which was gradually filled with sediment. These lake beds, which are extensively excavated and exposed only in Meadow Valley and vicinity, are known as the Panaca formation.

The sediments are mostly fine-textured clays and fine silts of
Creek across alluvial fan, $4.547$; will provide approximately $5$ c.f.s. for irrigation of approximately $400$ acres of land.

Will S. Heekathorn; White Pine County, North Spring Valley; approximately $6,200$ feet of $12$-inch metal pipeline transporting waters of McCoy Creek across alluvial fan, $47,500$; supplies approximately $9$ c.f.s. for irrigation of approximately $900$ acres crop and hay land and $1,000$ acres pasture.

Johnsen & Heekathorn; White Pine County, North Spring Valley; $2,600$ feet of $12$-inch metal pipeline transporting waters of Bastion Creek across alluvial fan, $8,200$; supplies approximately $6$ c.f.s. for irrigation of approximately $450$ acres of virgin land.

### WELL DATA—MEADOW VALLEY, PAHANAGAT VALLEY AND MOAPA VALLEY

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*Abandoned. No record—well unrecorded. Poor quality water.*

The Pauna Irrigation Company has recently drilled a well in the low saddle between two buttes at the northern edge of the Pauna township. The well penetrates the Pauena formation to a depth of $630$ feet. The water table was encountered at $47$ feet.

### GROUND WATER

The water products seen at the well are almost entirely of fine texture, though some limestone cuttings were observed. Examination of a sample of "porphyry" cuttings reveals limestone and dolomite pebbles with a few volcanic fragments. The writer assumes, therefore, that all the reported "porphyry" is mostly carbonate rock. This, of course, is to be expected in view of the close proximity of the Cambrian limestone and dolomites.

The leg indicates that the well penetrates $155$ feet of pebble-bearing strata (between $335$ feet and $490$ feet). The fact that this zone is underlain by at least $140$ feet of clay suggests that the normal facies trend of sedimentation (clay and pebble-bearing strata) was interrupted during a period when relatively strong currents prevailed. Such a change would most likely involve a temporary lowering of the lake level, and the local resumption of sub-aerial deposition. Although under such conditions, most of the resultant coarse detrital sediment might still have a matrix of fine material, and therefore be impervious. However, in view of the appreciable thickness of these pebble-bearing
PROPOSED DRILLING SITES FOR PANACA IRRIGATION COMPANY
CALLEWAY-MODENA WASH

In the event that the present well of the Panaca Irrigation Company is abandoned, one or more additional drilling sites where water may be developed at shallow depth may be desired. Of the two locations recommended, the Callaway-Modena Wash area at the east edge of the Panaca townsite is closer to the proposed water works system, and may therefore be the most desirable choice of the two.

The highly porous and pervious Quaternary sands and gravel of Callaway and Modena Washes are deposited in channels cut in the relatively impermeable sands of the Panaca formation. Thus there should be little water loss from the wash deposits. Callaway Wash, the larger of the two drainages, rises near the southeast rim of the summit of the unnamed range near the Nevada-Uintah boundary. The pithon vegetation of the higher reaches of the drainage area indicates probable annual precipitation of 12 to 15 inches. The deposits at the lower end of the wash should yield a limited supply from shallow depth quite indefinitely. This supply should be somewhat augmented from the smaller Modena Wash on the south.

To avoid any possibility of contamination from the cemetery, the eastern edge of the townsite is recommended at a point about 600 feet to 700 feet north of the Modena road.

FAULT ZONE DRILLING SITES

As stated on a previous page in this report, the Cambrian limestones and dolomites of the district are regarded as of medium porosity and high permeability. The water table within these rocks should stand at approximately the same level as in the adjacent Meadow Valley.

One of the most severely brecciated and shattered zones of the exposed Cambrian rocks of the district occurs along the south side of the limestone ridge in the N:\s:4 of Sec. 4, T. 2 S., R. 66 E. Here the faults of a broad, east-west fault zone in the N:\s:4 of Sec. 3 are gradually converging to form a zone of brecciation and brecciation. (See Plate II and III). In addition, the broad breccia zone of a N:\s:R-3 S:\s:W. fault meets and is offset by these east-west faults. Since the N:\s:R-3 S:\s:W. fault has an average westerly dip of 45 degrees, the drilling site should be located westerly from it at a distance equal to the desired depth of its intersection. The estimated depth to the water table in this vicinity is between 75 and 100 feet. Since a common intersection of both faults and the drill hole is desired below the water table, the suggested drilling site is located at the north edge of the east-west breccia zone and about 150 feet west of the exposure of the N:\s:R-3 S:\s:W. fault zone. The location is marked by a one-foot boulder of iron oxide-stained limestone about three or four feet north of the secondary road.

Highly fractured limestone should be encountered at this locality.
two thousand feet of the same ditch was realigned and repaired. The
capacity of this ditch is six cubic feet per second.
The White Wash Reclamation Company Canal was excavated to
carry 4.5 cubic feet per second from the Panaca Warm Springs to the
White Wash Farm area, southeast of Panaca. The excavation
began at the tunnel south of Panaca, where 169 feet of canal was,
concrete lined. Other construction work on the canal included the
installation of five twelve-battery and sixty-one feet of semi-
circular flume over the White Wash.
A sixteen-inch circular suspended flume, one hundred and fifteen
feet in length, was built over the White Wash at Callinute to carry
five cubic feet per second from Meadow Valley Wash to the
Duffin Ranch.

PAHRANAGAT VALLEY DISTRICT
Investigation, plans and cost estimates on a revision of the irrigation
systems of the Pahrangat Valley taking into consideration all neces-
sary drainage, was made. Construction of a drainage equal, irrigation
canal and water spreading system in the lower valley by cooperative
agreement and loan was completed.
In Pahrangat Valley, thirteen hundred and fifty-seven feet of
rectangular concrete ditch was enlarged by adding a trapezoidal sec-
tion to carry six cubic feet per second. This is part of the East
Alamo Canal and the portion immediately south of the Fremont Home.

MUDDY RIVER DISTRICT
Complete plans for drainage and flood channel improvement have
been made. Work has been done on both projects.
Field surveys have been under way in the Lower Moapa Valley,
leading toward a complete revision of the irrigation system.
The surveys were completed on the “West Side Irrigation Ditch,” and
work on the “East Side Irrigation Ditch” was in process at the end of
the 1942 fiscal year.
Near Wells Siding the headworks for the Moapa Valley West Side Canal
were constructed. These consist of one hundred and twenty
feet of curbless masonry conduit with control gates to carry forty cubic
feet per second, the conduit passing through the west end of the Wells
Siding earth fill dam; seventy-eight feet of No. 84 Lomax flume with
corrugated headwall piers, two transitions, and thirteen hundred feet of
canal. The flume carries the water over the emergency spillway.
The canal below the flume is to be protected from the railroad
track as soon as the labor supply permits, at which time the
balance of fluming necessary will be installed.

VIRGIN RIVER DISTRICT
Work has been done on revision of existing facilities on individual
farms. Considerable work has been completed on river bank protec-
tion.

WHITE PINE DISTRICT
Newly organized projects are being initiated and many problems
studied.
BLOWN BROTHEI\ APPLICATION

The Blown Brothers are applicants for a water facilities loan to

drill a well in the SE1/4 of the SW1/4, Section 28, Township 1 S.,

Range 68 E. This location is on the upper end of the Meadow Valley

footslope below the mouth of Condor Canyon.

Four rock units are involved in this area: Cambrian limestones and
dolomites, Tertiary volcanics, Panaca lake beds and Quaternary
alluvium. In Pleistocene time, after the Cambrian rocks of the Ely
Range were elevated along the N.-S. Ely Range fault, the entire range
in this vicinity, together with a portion of the downtown Tertiary
volcanics, was buried under the Panaca lake beds. After

the basin was completely filled with the sediment, Meadow Valley
Creek developed its present channel by cutting a consequent stream,
but a thousand feet or so higher on the flat surface of the lake
sediments. As a result of the downcutting of the lower portion of the

stream course, through regional rejuvenation, the stream entrenched

itself in the buried Ely Range, as a superimposed stream, to cut Condor

Canyon. That the gorge was cut ten feet level approximately below

the present floor of the Canyon and the surface of the Meadow Valley

footslope is indicated by the thickness of Quaternary valley fill

throughout this part of the drainage course. (See section B-B; Plate II).

Evidence to prove the existence of this filled channel are found both

upstream and downstream from Condor Canyon.

The well on Harry Mathews' property in the SW1/4 of the SW1/4,

Section 25, Township 3 S., Range 67 E., near the center of Meadow

Valley between Panaca and Caliente, penetrates 190 feet of Quater-

nary alluvium before reaching the surface of the Panaca clay.

About one and one-half miles southwest of the Harry Mathews

well at the Great Lee well, in the NE1/4 of NW1/4 of Section 2, TOW-

ship 3 S., Range 67 E., the Panaca clay is reached at a depth of

185 feet.

At the small water gap dam site at Delcame's Ranch, east of Condor

Canyon, the reported depth through alluvium to bedrock is 78 feet.

There can be no doubt that the Quaternary fill occupies a deep

channel through this region. Furthermore, in view of the Condor

Canyon constriction immediately upstream, the nature of that fill

at the proposed Blown Brothers drilling site should be mostly coarse

in texture, and therefore both pervious and pervious.

The development of a yield of one second-foot from this filled

channel appears highly probable.

As indicated on Plate II, the suggested drilling site is located close
to the present stream channel northwest of the railroad grade crossing.

IRRIGATION REVIEWS, SMITH AND MASON VALLEYS

Plains and estimates were made for the consolidation of six canals in Smith Valley into one system, thereby eliminating five dams in the West Walker River, reducing the length of irrigation laterals by 40%, making possible the reclaiming of some 200 acres of water-logged land, increasing duty of water, and reducing cost of operation and main-
tenance.

The investigation for ditch consolidation in the southeast portion of

Mason Valley indicates that over 50% of the length of the present
ditches can be eliminated, and that ditches in the revised system will

be located on property lines and all present ditches, drops, checks, turnouts, etc. be constructed of concrete; and that with the elimina-
tion of the six present dams in the West Walker River the flow line
of the river will be lowered from one to ten feet, thus reducing the
amount of water-logged land and improving drainage.

In the main Walker River the consolidation to one point of diversion

for the McLeod, Campbell, Nichols-Merritt, Joggies, Dairy, Spragg-

Aborn-Bigley, and the West Hyland systems would reduce the
diversions from the river from seven to one, and provide a consoli-
dated and efficient irrigation system for the lands affected.

A summary of results of studies in irrigation revision indicates not
only the feasibility but the economy of such revisions, as the mileage
of laterals would be reduced approximately 30%, and the number of
diversions from the river would be reduced from nineteen to two.

IN THE CARSON VALLEY SOIL CONSERVATION DISTRICT

A report, estimates, and map have been furnished indicating present
alignment of the East Carson River for a distance of ten miles, with
profile and topography, also proposed realignment of river, and pro-

posed grade rectification. The data submitted furnishes a basis for
study of irrigation revision. Also a map similar in scope has been
furnished including eight miles of West Carson River.

Therefore, data is available for a study of channel control and irri-
gation system revision for a large portion of the irrigated land in

Carson Valley district.

MEADOW VALLEY DISTRICT SUMMARY

Investigations and surveys were made of Pine Canyon, Mathews', and
Delume dam sites for flood control and irrigation of territory
within the Meadow Valley area. Construction of five reinforced con-
crete drop structures in the main Meadow Valley Wash to control
erosion and raise the water table with the purpose of bringing back
into production native meadows which have, to a large extent, been
destroyed by the lowering water table. Numerous log, rock, and
brush structures to serve the same purpose.

In the Meadow Valley Soil Conservation District, practices designed
to prevent water losses and increase crop production included survey-

ing and construction of 1,130 linear feet of irrigation canals.

North of Utica three hundred and fifty-eight feet of post-rocket
wire revetment was constructed to protect the east fork of the irriga-
tion ditch. This revetment stands five feet above ground. In addition
within the districts (excepting White Pine), a physical survey has been completed by the Soil Conservation Service consisting of:

- Soil: Slope, erosion, vegetative cover and culture.
- Range: Vegetative cover, carrying capacity.
- Forest: Vegetative type and class of timber.

A few of the installations, aside from concrete construction for grade rectification, consisting of drops, checks, and turnouts, are:

A 200-foot concrete-lined channel in Smith Valley with stagnant structures of twenty cubic feet capacity carrying irrigation water down a steep grade.

An irrigation canal (Tunnel ditch) in Mason Valley five miles long, having a capacity of 75 cubic feet per second, was located and the construction done by the soil conservation district with equipment loaned to the district by the Soil Conservation Service. This canal serves 2,700 acres on six farms. An interesting feature of this canal is the attempt to divide the water flow without the use of gates or flashboards. The structures designed by the Soil Conservation Service seem to be performing satisfactorily.

On the Saruni Canal (Smith Valley) overpasses have been constructed for the purpose of protecting the canal and the town of Wellington from exposure from the Wellington hills. Also, engineering assistance has been performed on grade revision and some realignment of this canal.

A design was made for the installation of a pipeline for a cooper in Washoe County to convey irrigation water. This line was so designed that it could be used for fire protection of farmstead if occasion required.

A design was made for pipeline for a cooper in Jack's Valley, Douglas County, to convey irrigation water to areas with possibilities of installation of overhead sprinkler system of irrigation.

Surveys were made and preliminary report and estimates were submitted for three possible dam sites on the East Walker River to form a regulating reservoir with a capacity of 1,000 acre-feet.

An investigation was made and feasibility established for the diversion of flood waters from the West to the East Walker River for conservation of water and benefits for farmers on the East Walker.

A report and estimate was made for a possible recreational park and game preserve in Smith Valley, to be constructed on Government or county-owned land, including approximately 300 acres, which area could be extended to 1,000 acres if desired. This project includes two small artificial lakes, having a storage capacity of 275 acre-feet, with a surface water area of 70 acres. It is proposed to landscape the park, planting numerous trees, shrubs, and grasses of numerous varieties for demonstrational purposes and to provide a habitat for wild life. The lakes are to be stocked with fish and also used for recreational purposes. Surplus water from these lakes is to be spread to improve forage on adjacent land.

A report and preliminary estimates were made to construct a concrete log dam in the West Walker to serve as a diversion dam for the Colony and Plymouth Canal (Smith Valley).

Also, the steep slopes of the ranges as a result of the Basin-Range faulting would be dissected, and much of the debris would accumulate as pediment fans.

Therefore, there is every reason to believe that the valleys and lower slopes of the ranges buried beneath the Panaea lake beds are covered with appreciable accumulations of stream gravels and fan-grolite deposits, the water-bearing qualities of both of which are well known.

Such detrital deposits, although generally overlain by the relatively impervious Panaea clays, should have some connection with the present surface by way of the coarse Panaea lake beds near the margin of the old lake basin. Further there should be free movement of water into them from the highly pervious Cambrian quartzites, limestones, and dolomites.

Since these coarsely detrital pre-Panaea rocks are nowhere exposed, and since they should have pervious connections with the more highly elevated zone of saturation on the margins of the basin, the water beneath the lake beds should be under appreciable hydrostatic head.

This does not mean that any hole to penetrate the Panaea beds will be a flowing well. In this regard, there are two matters of primary consideration: First, the local character of the pre-Panaea valley deposits; and, second, the frictional loss of head between the point of confinement and the point of aquifer penetration.

For example, in the center of the Meadow Valley Panaea Lake basin (not necessarily the center of the present Meadow Valley), the pre-Panaea alluvium may consist of playa deposits, and therefore be too fine for percolation. Also, how might the pressure gradient at the well site compare with the theoretical state of artesian water at that point? These are matters that should be given serious consideration before a deep test hole is drilled through the Panaea clay in the search for artesian water in Meadow Valley.

The writer is of the opinion, nevertheless, that the principal pre-Panaea drainage, which in all probability entered Meadow Valley from around the southern extremity of the Rhyolite, was in flood between Panaea and a point no more than five miles south. If penetrated, these pre-Panaea river gravels should contain water under artesian pressure. Whether that head would be positive (would lift the water above the local water table level) or negative, the writer will not hazard an opinion without the possession of additional facts of a regional nature.

REFERENCE:


CHAPTER XIII
Water Conservation and Development

(A statement covering some of the work done in this field by cooperating Federal agencies.)*

Briefly reviewed herein is the work done under the Water Facilities Program and the Soil Conservation District Program.

WATER FACILITIES

Under the Pope-Jones Act, commonly known as the Water Facilities Program, the Farm Security Administration and the Soil Conservation Service, working according to over-all plans drawn up by the Bureau of Agricultural Economics, have been forwarding the conservation and development of water for individual and group purposes in Nevada. This program offers financial and planning help to those who are not in a position to finance and carry through their projects by any other means. The activity has been in Clark, Lincoln, White Pine, and Lyon Counties.

To date the following areas in the State of Nevada have been approved for planning and/or operations by the Bureau of Agricultural Economics:


2. Virgin River Watershed—Below the Virgin narrows including the Moapa River watershed, Pahranagat Valley and White River watershed in Clark, Lincoln, Nye, and White Pine Counties, Nevada; Beaver and Iron Counties, Utah; and Mohave County, Arizona.


4. State of Nevada—On November 30, 1943, the board authorized the entire State for operations limited to the development of farmstead water facilities and irrigation of not to exceed one acre of garden.

At present the Bureau of Agricultural Economics is planning an additional area known tentatively as the Snake Valley area, located primarily in White Pine County, Nevada, and Millard County, Utah. This area has not been authorized for operations to date.

The following brief outline reviews the completed and proposed projects and should be a basis of future work and planning for development along these lines, given in the order of:

1. Location.
2. County.
3. Development.
4. Purpose.
5. Remarks.

Moapa Valley “Lower” (Clark County)—Wells; domestic; wells were drilled near Overton, Logandale, and Glendale and equipped

Acknowledgment is due given to the many cooperative spirit shown by the Soil Conservation Service and the Farm Security Administration. The information hereon was supplied by these agencies.

with pumps and pressure systems. The water was very poor in quality and tests were made, by use, to determine usability. After six months’ trial the projects were abandoned. It was concluded that the shallow underground water in this valley is not satisfactory, and that it will be necessary to obtain other sources of water for the use of the residents of the valley.

Moapa Valley “Upper” (Clark County)—Pump and motor; irrigation; rehabilitation of an existing low efficiency unit.

Moapa Valley “Upper” (Clark County)—Concrete pipe; irrigation; saving of water due to escapage and evaporation losses in transporta-

Virgin River (Clark County)—Pumps and engines; irrigation; pumping from river to eliminate long ditches and to make more water available to farm land.

Virgin River (Clark County)—Design; irrigation; engineering plans for a diversion structure for Bunkerville and Mesquite to replace present dam. Information on file with Soil Conservation Service at Caliente, Nevada.

Meadow Valley Wash, Pahranagat Valley (Lincoln County)—Wells; irrigation, stockwatering and domestic; twenty-two wells were drilled in this area. Pumps, engines, and motors were installed on some of the properties. The report by Dr. Harry Wheeler covers a portion of this area. Developments show that underground water is available in this area in sufficient quantity for irrigation.

Town of Panam (Lincoln County)—Water system; domestic; will supply acceptable culinary water for the town of Panam and eliminate waste of irrigation water.

Spring Valley, Steptoe Valley (White Pine County)—Pipelines; irrigation; four pipelines have been installed to transport water across porous alluvial fans. Water savings show from 40% to 100%, as was the case of one installation where water was delivered to the farm for a period of four months longer than before.

White River (White Pine County)—Wells; irrigation; assistance given and the presence of underground water in sufficient quantity for irrigation was determined.

Peralsley, Smith Valley (Lyon County)—Wells and/or pressure systems; domestic; sanitary, domestic, and farmstead water supply assured.

The Farm Security Administration has made available, to date, approximately $60,000 for financial assistance in the above projects.

SOIL CONSERVATION DISTRICTS

Meadow Valley District. Mason Valley District.
Pahranagat Valley District. Smith Valley District.
Virgin River District. Carson Valley District.
Muddy River District. White Pine District.

Accomplishments of soil conservation program in Nevada, including a partial list of construction, results of investigations, and results that may be anticipated.

An aerial survey has been made of the soil conservation districts in Nevada (excepting White Pine, just described). On the area
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Pahna, Smith Valley (Lyon County)—Wells and/or pressure systems; domestic; sanitary, domestic, and farmstead water supply assured.

The Farm Security Administration has made available, to date, approximately $5,000 for financial assistance in the above projects.

SOIL CONSERVATION DISTRICTS

1. Meadow Valley District.
2. Mason Valley District.
3. Pahranagat Valley District.
4. Smith Valley District.
5. Carson Valley District.

Accomplishments of soil conservation program in Nevada, including a partial list of construction, results of investigations, and results that may be anticipated.

An aerial survey has been made of the soil conservation districts in Nevada (excepting White Pine, just organized). On the area
within the districts (excepting White Pine), a physical survey has been completed by the Soil Conservation Service consisting of:

Soil—Slope, erosion, vegetative cover and culture.

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A few of the installations, aside from concrete construction for grade rectification, consisting of drops, checks, and turnouts, are:

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An irrigation canal (Tunnel ditch) in Mason Valley five miles long, having a capacity of 75 cubic feet per second, was located and the construction done by the soil conservation district with equipment loaned to the district by the Soil Conservation Service. This canal serves 2,700 acres on six farms. An interesting feature of this canal is the attempt to divide the water supply without the use of gates or flashboards. The structures designed by the Soil Conservation Service seem to be performing satisfactorily.

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A design was made for pipeline for a cooperator in Jack's Valley, Douglas County, to convey irrigation water with facilities for installation of overhead sprinkler system of irrigation.

Surveys were made and preliminary report and estimates were submitted for those possible dam sites up the East Walker River to form a regulating reservoir with a capacity of 1,000 acre-feet.

An investigation was made and feasibility established for the diversion of flood waters from the West to the East Walker River for conservation of water and benefits for farmers on the East Walker. A report and estimate was made for a possible recreational park and game preserve in Smith Valley, to be constructed on Government or county-owned land, including approximately 200 acres, which area could be extended to 1,000 acres if desired. This project includes two small artificial lakes having a storage capacity of 275 acre-feet, with a surface water area of 70 acres. It is proposed to landscape the park, planting numerous trees, shrubs, and grasses of numerous varieties for demonstrational purposes and to provide a habitat for wild life. The lakes are to be stocked with fish and also used for recreational purposes. Surplus water from these lakes is to be spread to improve forage on adjacent land.

A report and preliminary estimates were made to construct a concrete log dam in the West Walker to serve as a diversion dam for the Colony and Plymouth Canal (Smith Valley).

Also, the steep slopes of the ranges as a result of the Basin-Range faulting would be dissected, and much of the debris would accumulate as pediment fans.

Therefore, there is every reason to believe that the valleys and lower slopes of the ranges buried beneath the Panaman lake beds are covered with appreciable accumulations of stream gravels and fan-geodean deposits, the water-bearing qualities of both of which are well known.

Such detrital deposits, although generally overlain by the relatively impervious Panaman clays, should have some connection with the present surface by way of the course of Panaman lake beds near the margins of the old lake basin. Further there should be free movement of water into them from the highly pervious Cambrian quartzites, limestones, and dolomites.

Since these coarsely detrital pre-Panaman rocks are nowhere exposed, and since they should have pervious connection with the more highly elevated zone of saturation on the margins of the basin, the water beneath the lake clays should be under appreciable hydrostatic head.

This does not mean that any hole to penetrate the Panaman beds will be a flowing well. In this regard, there are two matters of primary consideration: first, the local character of the pre-Panaman valley deposits; and, second, the frictional loss of head between the point of confluence and the point of aquifer penetration.

For example, in the center of the Meadow Valley Panama Lake basin (not necessarily the center of the present Meadow Valley), the pre-Panaman alluvium may consist of playas deposits, and therefore be too fine for percolation. Also, how might the pressure gradient at the well site compare with the theoretical static level of artesian water at that point? These are matters that should be given serious consideration before a deep test hole is drilled through the Panaman clay in the search for artesian water in Meadow Valley.

The writer is of the opinion, nevertheless, that the principal pre-Panaman drainage, which in all probability entered Meadow Valley from around the southern extremity of the Elly Range, was influent between Panama and a point no more than five miles south. If penetrat- ed, these pre-Panama river gravels should contain water under artesian pressure. Whether that head would be positive (would lift the water above the local water table level) or negative, the writer will not hazard an opinion without the possession of additional facts of a regional nature.

REFERENCES


The Bonnow Brothers are applicants for a water facilities loan to drill a well in the SE1/4 of the SW1/4, Section 28, Township 1 S., Range 68 E. This location is on the upper end of the Meadow Valley floodplain below the mouth of Condon Canyon.

Four rock units are involved in this area: Cambrian limestones and dolomites, Tertiary volcanics, Panaca lake beds and Quaternary alluvium. In Pinnacan rocks of the Ely Range were elevated above the N.-S. Ely Range fault, the entire range in this vicinity, together with the downstream of the Ely Range, was buried under the north end of the Ely Range fault, the entire range in this vicinity, including a small watershed, the stream course, through the drainage system, the stream entrenched itself in the burried Ely Range, as a superimposed stream, to cut Condon Canyon. That the ground is cut too deeply below the present floor of the Canyon and the source of the Meadow Valley floodplain is indicated by the thickness of Quaternary valley fill throughout this part of the drainage course. (See section B-B; Plate H).

Evidence of the existence of this filled channel arc found both upstream and downstream from Condon Canyon.

The well on Harry Mathews' property in the SW1/4 of the SW1/4, Section 28, Township 1 S., Range 68 E., near the center of Meadow Valley between Panaca and Caliente, penetrates 190 feet of Quaternary alluvium before reaching the surface of the Panaca clay. About one and one-half miles southwest of the Harry Mathews well is the Grant Well, in the NE1/4 of NW1/4 of Section 2, Township 1 S., Range 68 E., the Panaca clay is reached at a depth of 185 feet.

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The development of a yield of one second-foot from this filled channel appears highly probable.

As indicated on Plate H, the suggested drilling site is located close to the present stream channel northwest of the railway grade crossing.


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Therefore, data is available for a study of channel control and irrigation system revision for a large portion of the irrigated land in Carson Valley district.

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In the Meadow Valley Soil Conservation District, practices designed to prevent water losses and increase crop production included surveying and construction of 1,350 linear feet of irrigation canals.

North of Urina three hundred and fifty-eight feet of post-rock wire revetment was constructed to protect the east fork of the irrigation ditch. This revetment stands five feet above ground. In addition
two thousand feet of the same ditch was realigned and repaired. The capacity of this ditch is six cubic feet per second.

The White Wash Reclamation Company Canal was excavated to carry 4.5 cubic feet per second from the Panaca Warm Springs to the White Wash Farm area, southeast of Panaca. The excavation began at the tunnel south of Panaca, where 160 feet of canal was concrete lined. Other construction work on the canal included the installation of five twenty-five hundred and sixty-one feet of semi-circular flume over the White Wash. A sixteen-inch circular suspended flume, one hundred and fifteen feet in length, was built over the White Wash at Caliente to carry five cubic feet per second from Meadow Valley Wash to the Duffin Ranch.

PAHRANAGAT VALLEY DISTRICT

Investigation, plans and cost estimates on a revision of the irrigation systems of the Pahrangat Valley taken into consideration all necessary drainage, was made. Construction of a drainage equal irrigation canal and water spreading system in the lower valley by cooperative agreement and loan was completed.

In Pahrangat Valley, thirteen hundred and fifty-seven feet of rectangular concrete ditch was enlarged by adding a trapezoidal section to carry six cubic feet per second. This is part of the East Alamo Canal and the portion immediately south of the Fremont home.

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Complete plans for drainage and flood control improvement have been made. Work has been done on both projects. Field surveys have been under way in the Lower Moapa Valley, leading toward a complete revision of the irrigation system. The surveys were completed on the "West Side Irrigation Ditch" and work on the "East Side Irrigation Ditch" was in process at the end of the 1942 fiscal year.

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VIRGIN RIVER DISTRICT

Work has been done on revision of existing facilities on individual farms. Considerable work has been completed on river bank protection.

WHITE PINE DISTRICT

Newly organized projects are being initiated and many problems studied.
be it the writer’s opinion that the well should not be abandoned without a test. The zone between 350 feet and 400 feet may carry one or more sufficiently widespread previous horizons to yield more than 100 gallons per minute without excessive drawdown.

PROPOSED DRILLING SITES FOR PANAACA IRRIGATION COMPANY GALLOWAY-MODENA WASH

In the event that the present well of the Panaaca Irrigation Company is abandoned, one or more additional drilling sites where water may be developed at shallow depth may be desired. Of the two locations recommended, the Callaway-Modena Wash area at the east edge of the Panaaca townsite is closer to the proposed water-works system, and may therefore be the most desirable choice of the two.

The highly porous and pervious Quaternary sands and gravels of Callaway and Modena Washes are deposited in channels cut in the relatively impermeable clay beds of the Panaaca formation. Thus there should be little seepage loss from the wash deposits. Callaway Wash, the larger of the two drainages, rises north of the eastward coast of the summits of the unnamed range near the Nevada-Utah boundary. The piano vegetation of the higher reaches of the drainage area indicates probable annual precipitation of 12 to 15 inches. The deposits at the lower end of the wash should yield a limited supply from shallow depth quite indefinitely. This supply should be somewhat augmented from the smaller Modena wash on the south.

To avoid any possibility of contamination from the cemetery, the eastern edge of the townsite is recommended at a point about 600 feet to 700 feet north of the Modena road.

FAULT ZONE DRILLING SITES

As stated on a previous page in this report, the Cambrian limestone and dolomite of the district are regarded as of medium porosity and high permeability. The water table within these rocks should stand at approximately the same level as in the adjacent Meadow Valley.

One of the most severely brecciated and sheared zones of the exposed Cambrian rocks of the district occurs along the south side of the limestone ridge in the NW14 of Sec. 4, T. 2 S., R. 86 E. Here the faults of a broad, east-west fault zone in the NW14 of Sec. 3 are gradually converging to form a zone of shearing and brecciation. (See Plates II and III.) In addition, the broad breccia zone of a N.N.E.-S.S.W. fault meets and is offset by these east-west faults. Since the N.N.E.-S.S.W. fault has an average westerly dip of 45 degrees, the drilling site should be located westerly from it at a distance equal to the desired depth of its intersection. The estimated depth to the water table in this vicinity is between 75 and 100 feet. Since a common intersection of both faults and the drill hole is desired below the water table, the suggested drilling site is located at the north edge of the east-west breccia zone and about 350 feet west of the exposure of the N.N.E.—S.S.W. fault zone. The location is marked by a one-foot boulder of iron oxide-stained limestone about three or four feet north of the secondary road.

Highly fractured limestone should be encountered at this locality
Creek across alluvial fan, 84,547; will provide approximately 5 c.f.s. for irrigation of approximately 460 acres of land.

Will S. Hecketzahl; White Pine County, North Spring Valley; approximately 6,200 feet of 12-inch metal pipeline transporting waters of McCoy Creek across alluvial fan, $7,500; supplies approximately 9 c.f.s. for irrigation of approximately 900 acres crop and hay land and 1,000 acres pasture.

Johansen & Hecketzahl; White Pine County, North Spring Valley; 2,600 feet of 12-inch metal pipeline transporting waters of Bastion Creek across alluvial fan, $8,200; supplies approximately 6 c.f.s. for irrigation of approximately 450 acres of virgin land.

WELL DATA—MOAPA VALLEY, PAHANAGAT VALLEY AND MOUSE VALLEY

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QUARTEYER DEPOSITS

The principal deposits of Quarternary age in the Panana region are the post-Panana valley fill and alluvial fans. The fans of the immediate area under discussion are too small to be of value as water bearers. The character of the valley fill varies from coarse gravel to fine silt and clay, depending upon the local conditions of deposition. Most of the Mountain Valley flood plain deposits are of fine texture near the top and more coarsely detrital at depth. The gravels and sands, where present, are both porous and pervious.

GROUND WATER

PANANA IRRIGATION COMPANY WELL

The Panana Irrigation Company has recently drilled a well in the low saddle between two buttes at the northern edge of the Panana townsite. The well penetrates the Panana formation to a depth of 630 feet. The water table was encountered at 47 feet.

Following is the driller's log:

0 feet to 335 feet—Clay.
335 feet to 340 feet—Clay with rock seams.
340 feet to 375 feet—Clay with phorphy.
375 feet to 400 feet—Porphyry and clay.
400 feet to 435 feet—Clay and porphyry.
435 feet to 485 feet—Clay with little porphyry.
485 feet to 490 feet—Porphyry with clay.
490 feet to 630 feet—Clay.

The boiler products seen at the well are almost entirely of fine texture, though some limestone cuttings were observed. Examination of a sample of "porphyry" cuttings reveals limestone and dolomite pebbles with a few volcanic fragments. The writer assumes, therefore, that all the reported "porphyry" is mostly carbonate rock. This, of course, is to be expected in view of the close proximity of the Cenomanian limestone and dolomites.

The log indicates that the well penetrates 155 feet of pebble-bearing strata (between 335 feet and 490 feet). The fact that this zone is underlain by at least 140 feet of clay suggests that the normal facies of the sedimentation (clay sedimentation) was interrupted during a period when relatively strong currents prevailed. Such a change would most likely involve a temporary lowering of the lake level, and the local resumption of subaerial deposition. Although under such conditions, most of the resultant coarsely detrital sediment might still have a matrix of fine material, and therefore be impermeable. However, in view of the appreciable thickness of these pebble-bearing volcanic origin, but grade into strata with sand and gravel intercalations near the shore lines. The formation as a whole is to be regarded as impervious to appreciable flow of subsurface water, though locally, the more coarsely detrital sediment may constitute small aquifers. As yet these are untested, however.

The character of the pre-Panana mantle is unknown except by inference. This problem will be discussed briefly on a later page under "Artesian Water Possibilities."
aggregated thickness of about 10,000 feet. Each of the eight formations is widespread and uniform in its original geographic distribution.

They are generally distinctly bedded and cut by numerous joints and faults. Except for the shale formations, the entire sequence is highly pervious in consequence of the open character of the bedding planes and zones of brecciation along faults.

The 3,000 foot sequence exposed in the Panaca area (Plate II) contains only one impervious shale member, and it is less than 10 feet thick. (Wheeler, 1894, pp. 33, 38, 39.) This shale could have only a local impervious effect because of the presence of numerous faults with more than 15 feet of stratigraphic displacement. The thicker Picacho and Chisoleh shales are nowhere exposed in the Panaca Hills.

Thus, the Cambrian rocks of the Panaca region consist almost exclusively of limestones and dolomites, and may be regarded generally as of medium porosity and high permeability. This conclusion is further indicated by the flat character of the water table in nearby regions where sufficient data is available to give its relief.

**TERTIARY VOLCANICS**

Through the eastern four-fifths of Condor Canyon, and in the higher hills northeast of Panaca, more than 5,000 feet of flows and volcanic tuffs lie unconformably upon the Cambrian limestones and dolomites. The lavas vary in composition, according to Westgate (1922), from extremely alkaline varieties (rhyodite and latite) to basic types (basalt), though most of the flows are of intermediate composition (andesite and dacite). The individual flows vary in thickness from a few feet to several hundred. Most of the lavas are interbedded with volcanic ash and tuff beds with similar variations in thickness.

Most of the lavas are well-jointed, and therefore pervious. The interbedded tuffs, however, are mostly fine-textured, and would naturally be rather impervious to the flow of water. Because of these impervious intercalations the volcanics, except locally, are regarded as poor in water-bearing qualities.

These volcanic rocks are questionably assigned to the early part of the Tertiary period by Westgate (1922).

**PANACA LAKE BEDS**

Following the accumulation of the Tertiary volcanic series, the region was subjected to severe deformation in the form of intense faulting and broad folding. This faulting, with north-south trends and with displacements ranging from a few feet to thousands of feet, largely accounts for the present distribution of rocks in the various ranges of the region. This was followed by a period of minor east-west faulting. All this deformation was post-volcanic, but earlier than a period of basin-range faulting which was responsible for the present mountain ranges of the region and the intermountain valleys.

A series of these interconnected valleys, after the partial erosion of the adjacent ranges, was occupied by a great lake, the basin of which was gradually filled with sediment. These lake beds, which are extensively excavated and exposed only in Meadow Valley and vicinity, are known as the Panaca formation.

The sediments are mostly fine-textured clays and fine silts of
CHAPTER XIV

State Board of Registered Professional Engineers

The personnel of this board, the members of which are appointed by the Governor, on which elects its officers, is as follows:

ALFRED M. SMITH, State Engineer, Chairman.
STANLEY G. PALMER, Dean of the School of Engineering, University of Nevada, Secretary and Treasurer.

HAROLD D. MILLER, Assistant State Highway Engineer, Member.
W. H. SUTTLEMEYER, County Engineer, Elko County, Member.
ARTHUR J. SHIVER, Manager Western States Utilities Company, Winnemucca, Nevada, Member.

ENGINEERS' REGISTRATION LAW

The Act providing for a State Board of Registered Professional Engineers was approved March 29, 1919, and was amended in 1933 and 1937. (Nev. Stat. 1933, 377; and Nev. Stat. 1937, 491-497.) The law provides for the licensing of professional engineers as defined by this statement:

The practice of professional engineering within the meaning and intent of this Act includes any professional service such as consultation, investigation, evaluation, planning and design, or reasonable supervision of construction or operation in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works or projects wherein the public welfare or the safeguarding of life, health or property is concerned or involved, when such professional services require the application of engineering principles and data; that the provisions of this Act shall not apply to nonresident mining engineers employed for the purpose of making mine examinations.

The provision regarding nonresident mining engineers was an amendment introduced in 1937. It has the effect of relieving the board from vouchering for the qualifications of mining engineers who enter the State for the purpose of making specific or special examinations. Such engineers, however, are in no manner prohibited from vouchering, prior to which their credentials and engineering qualifications must become a matter of State record, and whereby their professional findings and reports on properties in this State would receive wider recognition in professional circles. The purpose of the law is to prevent the practice of engineering in any branch of the profession by unqualified persons, whereby unnecessary loss of money to investors or the public may be incurred, with possible loss of life, property, or both.

ACTIVITIES, JULY 1, 1940, TO JULY 1, 1942

On April 2, 1941, the board suffered the loss of its able and distinguished secretary, F. H. Sibley, Dean of the College of Engineering of the University of Nevada. Professor Stanley G. Palmer, appointed by Governor Carville in July 1941, was elected by the board to succeed Dean Sibley as Secretary and Treasurer.

CHAPTER XII

Ground Water Possibilities Near Panaca, Lincoln County, Nevada* by HARLEY E. WILKIE, Associate Professor of Geology, University of Nevada

LOCATION AND AREA

The area discussed in this report lies entirely within the Water Facilities Area No. 3, or the Mendo Valley Sub-Area, in northeast- ers Lincoln County, Nevada. Specific estimates of ground water possibilities are made only for portions of sections 28 and 33, Township 1 South, Range 68 East, and sections 4 and 9, Township 2 South, Range 68 East. These sections lie on the eastern margin of Mendo Valley between the town of Panaca on the south and the western end of Conador Canyon on the north. This area may also be described as constituting the western flank of the Ely Range at its southern terminus where elevated areas of Cambrian limestones and dolomites are sometimes referred to as the “Panaca Hills.” Less specific mention is made of the entire Panaca basin and all the upstream drainage of Mendo Valley Wash and its tributary valleys.

PURPOSE OF INVESTIGATION

The immediate purpose of the examination upon which this report is based was to estimate the probable yield of the Panaca Irrigation Company well recently drilled to a depth of 420 feet in lacustrine clays at the north edge of the Panaca townsite, and to recommend one or more drilling sites of other location in the event that the Panaca well would yield appreciably less than the desired one-half second foot of water.

A brief examination was made of the log, cuttings, and history of the Lave Mathews well with the view of determining the cause of its loss of yield.

The area below the mouth of Conador Canyon was visited for the purpose of determining the most desirable drilling site for the proposed Bonnus Brothers well.

And finally, consideration was given to the geological structure of the region as a whole for an evaluation of the probabilities of developing aridion water in the Mendo Valley area.

GEOLOGY

CAMBRIAN LIMESTONES AND DOLOMITES

The formation of Cambrian age in southeastern Nevada are entirely of marine origin. Those rocks which consist of conglomerates, sandstones, shales, limestones, and dolomites, have accumulated to an


Note—The plates referred to in this report will be sent free of charge upon request to Mr. A. M. Smith, State Engineer, Carson City, Nevada. This service is taken in view of the war program and the necessary economies entailed.
During the past year, forty-seven new applications for registration have been approved. This is a larger number than in any previous year except at the time the board was first organized in 1935. The construction activities centering around the southern part of the State and around the Honey Lake and Lemons Valley projects have doubtless been largely responsible for the increase. Many of the applications have come from prominent engineers registered in other States and now residing in or supervising work in Nevada.

FINANCIAL STATEMENT

Following is a statement of income and expenses of the board covering the period July 1, 1941, to July 1, 1942, as prepared by Secretary Palmer.

INCOME

From 47 new applications approved $765.00
1 new application pending 15.00
120 renewal fees (as deposited) 250.00
45 renewal fees (cash and checks on hand) 112.50

$1,147.50

EXPENSES

Outstanding obligations in salary for former secre-
tary and stenographer $110.00
Salary of secretary, year 1941-1942 140.00
Stenographic help 20.00
Travel expense, members to attend board meetings 22.50
Postage, printing, telephone service, supplies 100.48
Expense of conducting examination 40.00
Membership in National Board, two years 50.00
Refunds on rejected applications 90.00
Collection charge on check 1.00

$608.88

Funds withdrawn for purchase of two Series G war bonds, $500 each 1,000.00

$1,647.88

Balance on deposit in bank July 1, 1941 $735.16
Total deposits for the year 1941-1942 3,020.00

$3,755.16

Funds withdrawn during the year 1941-1942 $1,067.28

$2,687.88

Funds coming in bank July 1, 1942 $1,722.28

$4,409.16

TOTAL ASSETS

On deposit in bank Two Series G war bonds $1,000.00
Cash and checks on hand July 1, 1942 112.50

$1,112.50

$2,821.78
CHAPTER XV
Colorado River Commission of Nevada

Governor E. P. Carville, Chairman.
Alfred Merriett Smith, Secretary.
A. J. CAYON, Commissioner.
Ed W. Clark, Commissioner.

C. F. DeArmond, Commissioner and Resident Engineer at Las Vegas.

The State Engineer has served, through successive reappointments, a period of six years as a member and the secretary of the Colorado River Commission. The service has been both State and National in scope, and is without special or additional compensation. Reports of former proceedings have been prepared by the Secretary and published in the Biennial Reports of the State Engineer, covering major transactions up to July 1, 1940. All important developments leading to the passage of the Boulder Canyon Project Adjustment Act, and the text of the Act itself will be found in the Biennial Report of the State Engineer for the period July 1, 1938, to June 30, 1940, pp. 102-122. Only the more important proceedings had since then are herein recorded. Many interesting details must of necessity be omitted in order to save space.

THOSE WHO WOULD HONOR

Credit, so far as possible through complimentary mention, has been given to those who participated in these arduous tasks, in former reports by the Secretary, but the measure of their service to the State passes far beyond recognition by mere verbal praise. Beyond any questions, this group of public-spirited men have rendered Nevada the most beneficial service in its history. Although the Boulder Canyon Project Act contained a provision for money to be paid to Nevada and Arizona from excess revenues, the amount was to have been determined on assumptions of unknown future power rates and production costs, placed on a competitive basis which could easily prevent accumulation of excess revenues.

Passage of the Adjustment Act provided and assured annual payments to Nevada of $300,000 per year, beginning June 1, 1938, and ending June 1, 1967, a total of $9,000,000. During the period of most intensive work the commission has been under the leadership of Chairman E. P. Carville, Governor of Nevada, whose thorough legal training and wide judicial experience have been of the greatest value. His participation in the conferences held in Washington and western cities, his utter fair and impartial dealing with controversial questions, and his ability to win the full trust and friendship of the many technicians, attorneys, and officials everywhere, have combined to make his contribution to the success of the program perhaps the greatest work ever performed by a Governor of Nevada.

I cannot refrain from again listing the men from Nevada who quietly and continuously worked on the plan which has so efficiently made possible a continuance of our slogan of "One Sound State." Among

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...
these were Senator Pat McCarran, whose vigilance for the protection of labor as well as all other State interests was ceaseless; Senator Key Pittman, whose participation in all early Colorado River legislation made his help invaluable; Congressman James G. Sargent, who likewise has a background beginning with his services as Nevada State Engineer in 1919-1922, and continuing as a member of the Colorado Interstate Commission with Herbert Hoover in 1922; Governor of Nevada in 1923-1927, up to his introduction of the Adjutant Act in Congress in 1940. These statesmen also had the major share of responsibility in getting the Act through Congress as well. The successful fight of Senators McCarran and Pittman to overcome the opposition of certain political interests to the Adjutant Act in the Senate will always be a memorable chapter of Nevada history. Jay Carpenter, Director of the Maday School of Mines; Charles F. Dean Armood, Resident Engineer and Commission member from Las Vegas; Commissioners Bob W. Clark and A. J. Condon; Attorney-General Gray Mashburn, and Deputy Attorneys-General Howard Gray and Alan Ride, all gave unceasing help.

Agreement was had by the Colorado River Basin States on the terms of the proposed Adjutant Act in March 1939 at Denver. Subsequent further agreement on exact language was worked out in Washington by the States' "Committee of Three," with the Bureau of Reclamation, Bureau of the Budget, T. S. Treasury, officials, and Senators and Congressmen from the Basin States. These agencies and the statesmen were very helpful and deserving of high praise. The Colorado River Commission of Arizona, and in particular members Alma M. Davis and Donald C. Scott, who were often present in Washington, performed outstanding service.

NEW POWER REGULATIONS AND CONTRACTS

The Boulder Canyon Project Adjutant Act was passed by Congress and approved by the President on July 19, 1940, and was the culmination of over six years of work to secure amendments to the original Act which would assure definite revenue to Nevada. Effectiveness of the Adjutant Act had been conditioned upon execution of new power contracts between the Government and the original power allottees, and contracts to be in conformity and based upon new regulations agreed to by allottees and the Secretary of the Interior. Section 9 of the Adjutant Act provided the secretary with authority to negotiate a termination of the existing lease upon the power plant held by the Las Angeles Department of Water and Power and Southern California Edison Company. The secretary proposed, in the new program, that the lease continue operation as "agents" of the United States. New power contracts drawn to comply with the requirements of the Act had to be completed and entered into prior to June 1, 1941, or the Adjutant Act, upon which so much time and work had been expended, would become inoperative and void.

Although these conditions to make the Adjutant Act effective are simply stated, there were many complex problems to be worked out between the Government and power allottees, and between power allottees and their contractors, before such new contracts could be written. It was necessary to prepare and approve a completely new
set of complex regulations by which the Government would control and operate the reservoir and power plant; upon which to base the
said new contracts.

On July 27, 1940, the Secretary of the Interior appointed Mr. E. V. L. Wright as his special representative to prepare findings of fact and assist in the preparation of new contracts and the governing regulations. On August 11, 1940, Mr. Wright called a conference on these matters in Los Angeles, California, which continued in session for about two weeks and was attended by all allottees and State officials in interest, accompanied by engineers and attorneys, sometimes forty in number. Meantime, negotiations were being carried on between the generating agents and the U. S. Bureau of Reclamation which culminated in a new draft of generating agency contract dated November 14, 1940. All points of difference had been agreed upon excepting three, which were:

1. Whether the power-plant building should be operated and maintained by the Bureau of Reclamation as formerly, or whether the proposed operating agents should take over the operation.

2. Controversy as to use of water for “spinning reserve” at generating efficiencies less than the efficiency contemplated in the studies upon which existing contracts were based.

3. Controversy as to the finality to be accorded findings of the Secretary of the Interior under the terms of a new agreement.

On February 19, 1941, Mr. Wright prepared a “Draft of Proposed Findings and Recommendations for the Effectuation of the Boulder Project Adjustment Act” and submitted it to the allottees. This draft was at variance with the opinions of the power allottees in many particulars. It was studied by the interested parties, and a sub-committee prepared a lengthy answering letter to Mr. Wright on issues deemed vital to them if new contracts were to be entered into.

Shortly after receipt of the allottees’ letter in Washington, D. C., Secretary Ickes asked for a conference there, which lasted throughout April and May 1941.

In the preliminary meeting before the secretary it seemed that he was not willing to yield or compromise on any point of principle. However, he consented to full hearings on all matters, which were ably conducted by Messrs. Nathan Margolis, J. Kennard Chadlie, Ivan Sw Jebb and other lawyers for the department. Leland Ollis, Harvey McPaul and other engineers also efficiently represented the Government. Governor Carville was able to be present at critical times and participate in the conferences. Each of the several power allottees was represented by special engineers and attorneys.

Space will not permit a summary of discussions that took place during the final six weeks of work on the contracts and the regulations. In the end, compromises were effected on all points of difference, although several times it seemed that agreement was impossible and that the Adjustment Act was doomed to extinction.

The greatest difficulty encountered was over a plan the Interior Department engineers had submitted to change the original basis of selling energy at high tension voltage to a program of selling energy as falling water only, leaving the risk of recovering that energy entirely on the allottees, and basing the efficiency of energy recovery
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*Note: All wells are located in the Las Vegas Artesian Basin and data are provided for analysis.*

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**Las Vegas Magnesium Plant**

In late October 1941 the United States Government, acting through Defense Plant Corporation, decided upon the construction of a very large plant for the production of magnesium metal, to be erected at Las Vegas, Nevada. The estimated cost of the plant was to be approximately $60,000,000. Construction was to begin immediately on a very large scale. It was hoped that the plant would be able to go into production in the month of August 1942. Ore was to be supplied from a large deposit of magnesite located at Gabba Valley about 30 miles north of the town of Luning in Nye County.

An enormous amount of electrical energy, estimated to be 1,500,000,000 kilowatt hours per year, will be required for the operation of the reduction plant at Las Vegas. At this date (July 1942) 30,000 men are employed on construction. A peak of 22,000 will be reached in September. When completed and in operation, 4,000 will be employed in production.

The first negotiations with the commission regarding this colossal wartime industry were held in Washington on May 22, 1941, where Commissioners Smith and DeArmond were participating in the Boulder Canyon Project Adjustment Act new power contract hearings. Congressman James G. Scrupham advised the commissioners to confer with Attorney George B. Thatcher, representing Basic Magnesium, Incorporated, of Cleveland, Ohio. The commissioners assured Mr. Thatcher that Nevada would assist the industry in all ways possible, but could not alone, out of its allotment, supply sufficient power. They suggested immediate investigation of a probability of obtaining a large additional amount from Metropolitan Water District of Southern California which had contracted for a large block it had to pay for continuously, but would not be able to use for several years.
Negotiations were at once opened with Metropolitan and the Bureau of Reclamation which eventually led to a contract between Defense Plant Corporation and the U. S. Bureau of Reclamation for most of Metropolitan's unused power. A few days later another conference was held at which Senators McCarthy and Bulger, Congressman Scraggum, engineers of Basic Ores Company, Major Ball of Magnesium Electron, Manchester, England, and Commissioners Smith and DeArmond were present, and discussed various phases of the program. On December 8, 1941, representatives of the Colorado River Commission, consisting of Alfred Dorrance Smith, C. F. DeArmond, and Deputy Attorney-General Alan Bible, conferred in Washington with John C. Pags, Commissioner of Reclamation; J. Kennard Chendle and Harvey McPhail, respectively Chief Counsel and Chief Engineer of the bureau. After some discussion the Nevada Commissioners agreed to supply by contract for a period of two years a quantity of 200,000,000 kilowatt-hours per year. It was also agreed that additional energy could be subsequently contracted for and withdrawn up to the limit of safety required by Nevada to meet other existing and immediately prospective contract demands within the State.

In round figures, it was estimated that Nevada's total allotment consisted of 750,000,000 kilowatt-hours. The present and prospective use for the year 1942 was taken at 333,000,000 kilowatt-hours, leaving a balance of 422,000,000 kilowatt-hours available, the contract to be entered into with the Government or its agent to be for 200,000,000 kilowatt-hours, which would leave a balance for Nevada for use in electric industries and to meet the sure great demand which would be resultant upon increased population in Las Vegas and vicinity at 220,000,000 kilowatt-hours.

After a further conference at Los Angeles, Nevada eventually agreed to furnish Defense Plant Corporation 147,000,000 kilowatt-hours of energy during the period ending May 31, 1944, and 220,000,000 kilowatt-hours during the year ending May 31, 1945. The maximum demand in horsepower for this energy was fixed at 33,000.

The power was to be supplied to Defense Plant Corporation at cost. The State has a fixed charge of three cents per kilowatt-hour to cover administration and supervision through the Colorado River Commission. Purely from a patriotic viewpoint and because the large amount of power being contracted for by the Government would justify such reduction, this charge under the agreement was reduced to five-hundredths mill. Thereafter the commission returned to Nevada and the Government resumed negotiations for additional power with the other allottees. Progress in regard to the negotiations with these contractors was delayed in September due to complications arising regarding proposed use of Metropolitan Water District's unused Boulder power. This district had contracted for a large amount of Boulder energy which it will be unable to use for some years, but in the meantime it is obliged to pay for it at the falling water rate for firm power. Officials of the water district were considering the possibility of salvaging some of their expense for unused power by asking the Government to sell it for more than the fixed firm rate. The Government's desire to contract for all of Nevada's allotment of power at
Well No. 2—Russell—Stop watch and measuring can. Flows 270 g.p.m. Total flow was 270,000 gals. per day. 
Well No. 36—Art Harris—Estimated, 175 gals. per min. continuous flow, 2,250,000 gals. per day.

Well No. 38—Wickman—No measurement. This well is used for domestic, daily, garden, and pasture. Estimated by average and use, probably 30 g.p.m. continuous flow of 72,000 gals. per day.

Well Nos. 31, 32, and 33—Lorenz—No measurement. From over cultivated probably at least 350 g.p.m. during irrigation season. 450,000 gals. per day.

Well No. 35—Bouder 2nd Towndie Company—Stop watch and measuring can. Flows 152 g.p.m. Well No. 35—Estimated 2,000 gals. per day.

Well No. 30—Roswell—No measurement possible. About 30 families use this well. Probably 5 acres irrigated. Estimated daily use 250,000 gals. per day.

Well No. 31—Fidie Hatcher (Las Vegas). Because of leaks around casing a measurement was made by stop watch and measuring can and the estimated leak was added to the measured quantity. Well flows 225 g.p.m. There is a continuous leak of approximately 50 gals. per min. or 72,000 gals. per day. The well had been closed for some time and the pond was very low.

Well No. 112—Smith—Eucalyptus well is connected to pressure pump and supplies several homes and yards. Probably 30 g.p.m. continuous use or 14,000 gals. per day.

Well No. 115—Golf Course (Las Vegas). Approximately 600 g.p.m. used 8 to 9 months of year. Any excess of normal flow of well is allowed to waste. There was no way of measuring the normal flow. 525,000 gals. per day for excess. If this well is pumped the capacity of the pump wells No. 119 and No. 30 stop flowing.

Well No. 116—Murray—Stop watch and measuring can. 67 g.p.m. continuous flow of 30,000 gals. per day. Used for irrigation and domestic.

Well No. 121—Nevada—Stop watch and measuring can. 200 g.p.m. continuous flow of 250,000 gals. per day. This water not being used to fullest beneficial use.

Well No. 128—Campbell—Stop watch and measuring can. 75 g.p.m. continuous flow. 160,000 gals. per day.

Well No. 129—Campbell—Stop watch and measuring can. 13 g.p.m. continuous flow. 21,000 gals. per day.

Well No. 133—Dundie—Stop watch and measuring can. 200 g.p.m. continuous flow. 100,000 gals. per day. Good control. About 10 gals. allowed to flow continuously. Probably 50,000 gals. per day use. No license at time of measurement.

Well No. 156—Bosco—Stop watch and measuring can. 90 g.p.m. A small continuous flow of approximately 10 g.p.m. 4,500 gals. per day. Used for watering horses and cattle.

Well No. 288—Washoe City (Dundie). Continuous flow 600 g.p.m. continuous flow of 144,000 gals. per day. Used for irrigation and domestic. 

Well No. 289—B. H. Reynolds—Purple crow ns. 0.21 c.f.s. or 94.5 g.p.m. This well partly closed. Continuous flow 25 g.p.m. or 7,500 gals. per day.

Well No. 290—Hughest—Observed flow 45 g.p.m. other flow 25 g.p.m. Stop watch and measuring can. Used for domestic and house yard. No irrigation this year. Violet purple crown. Continuous flow 5 g.p.m. Approximately 22,000 gals. per day. This well is affected by pumping at J. B. Rank well. Pumping of well No. 38 will stop this well at Well No. 190.

Well No. 291—Filip—Estimated. A continuous flow of 30 g.p.m. or 28,000 gals. per day due to leak.

Well No. 314—Van Boga.

Well No. 327—Starkweather Corp.

Well No. 337—Stephens—Estimated. 300 g.p.m. or 450,000 gals. per day continuous flow. Used for irrigation.

Well No. 370—Wright—Estimated. 30 g.p.m. continuous flow. 72,000 gals. per day. No beneficial use.

*Approximately 1,300 gals. per min. or 654,000 gals. per day.

The fixed rate was largely due to this position taken by Metropolitan Water District. The various officials of the Government with which the Nevada Commission came in contact during the process of negotiation complained the Nevada group for their cooperative and patriotic attitude.

The agreement which had been entered into by all power contractors from Boulder dam had been signed and executed as a basis for individual contracts. Some weeks later the City of Los Angeles and its Department of Water and Power directed a letter to the Nevada commission giving a special interpretation of its own to certain clauses within the agreement, and asking that this interpretation be understood by all contractors and be made in effect a part of the agreement. Nevada took exception to this procedure. In this procedure, Southern California Edison and California Electric Power Company censured by letters.

One point with which Nevada could not recur with the other allottees concerned certain restrictions they wished to place upon the Bureau of Reclamation's desire to salvage a part of the cost of the generator and transformer being installed by the bureau for use by Boise Magnesium Incorporated, designated Units 6-7 and T-7. It was contemplated that not all of the capacity of the large generator would be immediately required by the magnesiam plant, and also that for some time it would not be required by Metropolitan Water District, although Metropolitan would eventually become custodian of the generator and use all of its power. The Government wished authority to sell any of this surplus interim power to any purchaser qualified under the Boulder Canyon Project Act to purchase same. This contemplated procedure was objected to by the City, Edison Company, and the California Electric Power Company, who would require their earnest before the disposal of surplus energy was made by the Government the power for which the Government would stand the least risk in some way to their financial disadvantage.

During the proceedings at Washington, D. C., in working out negotiations and contracts, Nevada had been compelled, in order to expedite the validation of the Adjustment Act, to agree with the City to use only up to 4,000 kilowatts of capacity from generators A-1 and A-2 allotted to the City, after which time Nevada would be required to secure power from other generators installed at the dam if possible to do so, or if unable to do so, to install a generator for her own use. Installation of a generator would cost $3,000,000 and require at least two years. At the time Nevada's agreement was made it could not be foreseen by anyone that war would come and a sudden enormous demand for all power available. During the year 1942 Nevada will have exceeded the capacity allotted to her from the City's generators, and must ask other generating capacity. It now seems possible to supply some of this growing demand from the new generator being installed by the Government, and we do not wish to be hampered in obtaining a part of such power, if it should become available, by obligations on the part of California contractors. At present Nevada's contract with Defense Plant Corporation remains unexecuted pending the clarification of these two points. Nevada, however, will in the
meantime supply Defense Plant Corporation with all power possible or necessary without waiting for the execution of contract.

Much water will be required for the operation of the magnesium plant, which must be obtained from the Colorado River via Lake Mend. For this purpose a contract was drawn up between Nevada and the Bureau of Reclamation for delivery of not to exceed 100,000 acre-feet per year to the State of stored waters from Lake Mend. Discussions as to this contract were carried on between Los Angeles and the same time that the energy contract was under consideration. A final meeting was held at Boulder City, Nevada, on June 1, 1942. The agreement was reached on all points excepting that of the cost to Nevada. The Nevada commissioners held that if any change for storage was justifiable it should be by storage service only and not include a charge for power which might have been generated by the stored water if it had been passed through the turbines. Mr. Carey agreed to refer this to the secretary. An excerpt from our letter of protest to an arbitrary charge of sixty cents per acre-foot follows:

Under provisions of the Colorado River Compact and the Boulder Canyon Project Act, use of water for domestic purposes has first priority, irrigation second, and use for generation of power last. This division into Nevada is for domestic and metallurgical uses, and at this time entirely for the use of the United States Government. There seems to be no logical reason for the power this water might have generated should be, if it is at all proper to render such a charge, be allocated to all users of the power and not to users of the water. In the contemplation of the Act, the generation of power at Boulder dam is a secondary consideration, for the dam was constructed primarily for flood control and irrigation, to save, conserve and reclaim lands, and for domestic use. The installation of hydroelectric power was to defray the costs of construction and operation during a period fixed at fifty years. Periodic adjustment of the rate was provided for by the act because of changing costs and fluctuating water supply, in order to amortize within a fifty-year period or a reasonable time thereafter. It would be as unfair to charge Nevada for the power that might have been generated by this division as it would be to assess a similar charge against an upstream State for diversion of water within the 7,000,000 acre-feet limitation of the Colorado River Compact.

A nominal charge for storage alone may perhaps be justified under the Boulder Canyon Project Act, but this is debatable. If the water to be stored is considered as a part of the 300,000 acre-feet allotted to Nevada annually under the provisions of the proposed treaty, State compact, there appears to be no fairness in a storage charge that does not treat all users of stored water alike. It is not equitable to charge Nevada for storage while not charging all other users a similar or equal rate. Among the various users of stored water Metropolitan Water District alone pays storage, other users being placed, by the terms of the Boulder Canyon Project Act, on

Vegas Artesian Basin and also made estimates as to the amount of water that was being used from these wells. These measurements indicated that 16,912,565 gallons of water were being used daily from the wells measured. In order to arrive at the total amount of water being used from the Las Vegas Artesian Basin this amount was increased by 10% to cover the many small wells in the valley, bringing the total to 28,1 cubic feet per second of water. This no doubt represents the maximum use from the Las Vegas Artesian Basin during the summer months. Measurements will be made during February to arrive at the winter use and from this an estimate can be made of the annual average use of water. However, it has been tentatively estimated by this office that the average annual use would approximate about 20 cubic feet per second, or approximately 10,000 acre-feet of water yearly.

In order to make a record of the measurements of the water flowing from the various wells during the first week of September 1942, we are herewith including this information.

Well No. 7—Anderson (now Brady)—Stop watch and measuring can. 300 g.p.m. continuous flow of 144,000 g.p.m. per day. Irrigation and domestic.

Well No. 1—Oppen—Weir. 0.032 c.f.s. or 215 g.p.m. per min. This well runs open continuously and probably 90% of the water is wasted. 292,520 g.p.m. per day.

Well No. 12—Thur—Stop watch and measuring can. Well boundary—flows 225 g.p.m. continuously, 15,000 g.p.m. per day. This well was not closed and developed this year. Present water supply is insufficient for irrigation.

Well No. 13—Thur—Estimated. 80 g.p.m. Continuous flow of 57,000 g.p.m. per day.

Well No. 17—Bur—Stop watch and measuring can. 50 g.p.m. both ends closing. In addition supplies cistern and trailer camp. Probable use given waste of 85,000 g.p.m. per day. Could not measure entire flow of water from well.

Well No. 21—Umlang—Stop watch and measuring can. 300 g.p.m. (not much use this year).

Well No. 22—Umlang—Estimated. 100 g.p.m. (not much use this year).

Well No. 24—Lamb—Stop watch and measuring can. 300 g.p.m. continuous.

Well No. 26—Lamb—Estimated. 400 g.p.m. Continuous flow of 225,000 g.p.m. per day. No possibility to control.

Well No. 35—Henry—Stop watch and measuring can. 100 g.p.m. continuous flow of 72,000 g.p.m. per day. No control. No way to get an accurate measurement.

Well No. 39—Children—Stop watch and measuring can. 75 g.p.m. No use. No limit.

Well No. 40—Oppen—Stop watch and measuring can. 35 g.p.m. or 51,000 g.p.m. per day. Continuous flow. This flow is entirely wasted as it does not reach irrigation ditch.

Well No. 45—Sedgwick No. 4. Estimated. A continuous leak of approximately 10 g.p.m. per min or 14,000 g.p.m. per day.

Well No. 46—Stop watch and measuring can. 120 g.p.m. Used for irrigation and trailer camp. Probably 60% of use of 60,000 g.p.m. per day average use.

Well No. 48—Hunt—Stop watch and measuring can. Flows 135 g.p.m. Continuous about 5 g.p.m. continuous. No use. 6,000 g.p.m. per day.

*Estimated daily use of all wells in Sections 6 (Highland Park Addition) 200 g.p.m., or 280,000 g.p.m. per day.
the basis that they had vested rights before the dam was constructed. Yet it will be admitted that the dam has made more water available than the quantity covered by their old rights, and this excess water is or will be used, and the water so appropriated is not charged storage.

In conclusion, we state that Nevada’s only interest in water is for use to develop its natural resources. This can be done only if the water is made available to people in Southern Nevada at the lowest possible price. Furthermore, water under this contract is for use of the Federal Government in national defense. As yet no ruling has been made by the secretary regarding the price. The pipe line, 40 inches in diameter and 17 miles long, and a pumping plant, have been installed and are in operation, delivering water through a lift of about 450 feet into a reservoir located above the plant. Some of the water will be used by the Manganese Ore Company operating the “Three Kinds” mine, eight miles east of the magnesium plant. Eventually some of the water may be used to augment the artesian supply for Las Vegas City.

REPORT OF LAS VEGAS OFFICE, JUNE 1, 1940-MAY 31, 1942

by C. F. Dmekmuord, Las Vegas Resident Engineer

Administration of the sale and delivery of power, division of costs between the State’s contractors, billing and accounting and the collection and preparation of data for information of the commission are carried on through the Commission’s office in Las Vegas under the supervision of C. F. DeArmond, Resident Engineer for the Commission. Because of accounting and engineering problems involved Mr. DeArmond has been called upon, along with other members of the commission, to be present at many hearings, investigations and negotiations both in and outside the State. These covered, in 1940-1941, Senate hearings in Washington on the Adjustment Act. Bureau of Reclamation in Denver re power facilities. Tri-State Compact negotiations at Grand Canyon, San Diego, and Los Angeles. 15 hearings in Los Angeles re adjustments and new contracts under the Adjustment Act. meetings of Committees of Fourteen and Sixteen at Boulder City, three meetings of the commission at Carson City; two meetings with Bureau of Power and Light at Los Angeles re generating facilities and costs. Department of the Interior of Washington for final negotiations of new power contracts under the Adjustment Act, and consultations in Washington and Las Vegas with regard to power and water for the magnesium plant.

In 1941-1942 consultations regarding power for the magnesium plant were continued in Washington in June and again in December of 1941, and six meetings with other power contractors were attended in Los Angeles during which negotiations were reached for supplying power for this plant. A hearing by a sub-committee on strategic metals and minerals was attended in Los Angeles: a trip was made to the magnesium plant then being constructed near Pala Alto, California, with regard to power for a similar plant near Boulder dam; and other meetings as follows: National Reclamation Association at
Phoenix, Colorado River Drainage Basin section of the National Resources Planning Board at Los Angeles, Committee of Fourteen at Los Angeles, Sub-committee of Seven (engineers) of the Committee of Fourteen at El Paso, Texas, Sub-committee of Three (engineers) of the Sub-committee of Seven of El Paso, Texas. These two sub-
committees were appointed by the Committee of Fourteen to study and report to the main committee on matters relating to present and prospective uses of water of the Colorado River both in the United States and in Mexico. Five meetings of the commission in Carson City were attended and a trip made, with reference to water contract, power facilities and priorities, and one trip to Los Angeles on the same matters. The Resident Engineer, either for the United States or in company with other members of the commission and State offi-
cials, was obliged to participate in all of these important conferences.

The commission has also had in the establishment of the relationship of the various agencies using power from Boulder dam plant is given here for rapid reference. The Boulder dam contracts and operations in connection therewith are based on operating years beginning June 1 and ending May 31 of the following year.

The United States, Department of the Interior. Guarantees of full repayment within a fifty-year period of moneys advanced for construction of Boulder dam (except costs allocated to flood control), for installations of machinery and for costs of operation and maintenance of the project. The Act reduced the lowest rate on such advances from 4% to 3% with the exception of the flood control item of $25,000,000 which is repayable after June 1, 1967, and is without interest up to that date. Ownership at all times remains with the United States.
investigations by the Bureau of Reclamation for formulation of a comprehensive plan for the utilization of the waters of the Colorado River system.

The next $7,500,000 are authorized to be appropriated for the investigation and construction of such projects for such utilization in and equitably distributed among the four States of the upper division. After the year of operation ending in 1955 such receipts are authorized to be appropriated for the investigation and construction of projects for such utilization in and equitably distributed among the States of the upper division and the States of the lower division.

The States of Arizona and Nevada. The interests of these two States in revenue to be derived from Boulder dam plant under the Adjustment Act are identical. The Projet Act provided "If during the period of amortization the Secretary of the Interior shall receive revenues in excess of the amount necessary to meet the periodic payments to the United States as provided in the contract, or contracts, executed under this Act, then, immediately after the settlement of such periodic payments, he shall pay to the State of Arizona 18% per centum of such excess revenues and to the State of Nevada 18% per centum of such excess revenues." Studies of the contracts and of the Act indicated that immeasurable computations could be made as to what these States would receive and all would be guesses based on assumptions of undeterminable future values. Had the contracts provided for a uniform rate for falling water of 1.63 mills per kilowatt-hour throughout the fifty-year period, determination of benefits to the two States could have been had within reasonable limits, but the contracts all provided for revision of rates in 1945 and every ten years thereafter; "it being understood that such readjusted rates shall under no circumstances exceed the value of said energy, based upon competitive conditions at distributing points or competitive centers." This is one of several factors which led to the conclusion by the commissions of both States to provide for definite annual payments. Such an agreement was reached with the other affected States and allottees and incorporated in the Adjustment Act as an added cost to all users of power. Nevada has received two payments of $800,000 each; $800,000 additional was due as of June 1, 1942, and it is indicated that this will be received before June 1, 1943. Thereafter, $1,000,000 is provided for the State for each of the operating years to includings 1947, making a total during the fifty-year period of $15,000,000.

Arizona and Nevada, equally with other allottees of Boulder Dam energy, were eager to secure and will be benefited by the lower power rates provided by the Adjustment Act.

The Southern California Edison Company and the City of Los Angeles. Both are allottees of power and were lessees of generating equipment. Under the Adjustment Act contracts they are designated as agents of the United States for the operation and maintenance, and the making of replacements of such portions of the Boulder power plant as may be necessary for generation of electrical energy.


The Department of Water and Power of the City of Los Angeles

* * *

protection supplied. G. G. Good standline.
indicate the expanding use of power in the Las Vegas area. During the last quarter of the operating year 1942 the increase over the corresponding quarter of 1941 was 98.3% and use in May 1942 was 118.5% over that of May 1941. Estimated use by this company for the year ending May 31, 1943, is 89,250,000 KWH.

Lincoln County Power District No. 1

Use contract year ending May 31, 1941...18,325,000 KWH
Use contract year ending May 31, 1942...24,220,000 KWH
Estimated use for contract year ending May 31, 1943...37,000,000 KWH

In four years of operation this district has not only met all bond and interest requirements but has built up a substantial cash reserve against future bond requirements, but has reduced its sale price of energy to its Pioche substation from 20 mills per kilowatt-hour in March 1938 to six mills per kilowatt-hour in May 1942.

Owens Power District No. 5

Use contract year ending May 31, 1941...1,330,000 KWH
Use contract year ending May 31, 1942...1,950,000 KWH
Estimated use for contract year ending May 31, 1943...1,500,000 KWH

This is an R.E.A. project which takes off from the Lincoln County Power District lines at 63 miles from the Boulder dam substation. It is beginning its fourth year of successful operation.

The total use of Boulder dam energy under State contracts in the year ending May 31, 1942, was 59,073,156 KWH, or 7.8% of the State's allotment.

Use for the year ending May 31, 1943, is estimated at 11.6% Use for the year ending May 31, 1944, is estimated at 34 % Use for the year ending May 31, 1945, is estimated at 45 % These estimates are based on existing contracts.

The expansion in the Las Vegas area has brought upon the commission problems of securing transforming capacity to meet the increasing demands. Transformer capacity originally installed for Nevada's use was 15,000 KVA, and a portion of this was used by the Bureau of Reclamation to supply Kingman and Needles. Upon representations made through our Las Vegas office in 1939 and 1939 a new bank of transformers of 40,000 KVA capacity was installed and in use in November 1941. This bank will be fully loaded this winter, and negotiations are now proceeding for use of capacity allocated to other contractors in order to meet the rapidly growing demands. The magnification plant is not involved since Defense Plant Corporation has secured its own transformers and transmission lines for this service.

The use of water from Lake Mead by Defense Plant Corporation made it necessary for the State to enter into a contract with the Bureau of Reclamation for the delivery of this water from storage in the lake. The negotiation of terms for this contract, begun early this year, are nearly complete. A contract for reclamation of water to Defense Plant Corporation has been prepared, but final draft awaits completion of our contract with the Bureau of Reclamation.

FINANCIAL REPORTS

Power is sold by the State at cost, plus a charge of three-tenths mill per kilowatt-hour to cover costs of administration and the obligations of the commission prescribed by law.
OPERATING YEAR ENDING MAY 31, 1941

Power Account-
Cash as of June 1, 1941 $8,434.41
1941-1942 receipt $106,980.01
Total $115,414.44

Less Payments-
To U. S. for May 1941 costs $800.85
To U. S. for 1941-1942 costs $106,980.01
Total payments $107,780.86

Balance in power account as of June 1, 1942 $7,474.55

This balance is held in reserve pending final adjustment of costs for years prior to June 1, 1941.

OPERATING YEAR ENDING MAY 31, 1942

Power Account-
Cash as of June 1, 1942 $8,434.41
1942-1943 receipt $106,980.01
Total $115,414.44

Less Payments-
To U. S. for May 1941 costs $800.85
To U. S. for 1942-1944 costs $106,980.01
Total payments $107,780.86

Balance in power account as of June 1, 1942 $7,474.55

This balance is held in reserve pending final adjustment of costs for years prior to June 1, 1941.
Committee File Account—
Ctyk as of June 1, 1941.
1940-1941 receipts $6,300.41
Total $17,981.75
$24,300.00

Committee Expenditures, Cerro Gordo City Office—
Commissions' compensation $420.00
Travel 4,982.54
Expenses and postage 37.56
Telephone and telegraph 87.22
Supplies and equipment 18.25
Printing 18.34
Seven States' expenses 200.00
Miscellaneous 58.21
Cerro Gordo City Office $5,701.85

Committee Expenditures, Las Vegas Office—
Commissions $5,284.26
Travel 232.30
Expenses and postage 84.26
Telephone and telegraph 184.94
Office supplies 42.29
Rent 840.00
Repairs 594.00
Miscellaneous 22.40
Las Vegas Office $5,876.79

Total expenses 10,491.32
Balance as of June 1, 1942 $14,388.54

With the extraordinary expenses attendant upon passage and making effective the Adjutant Act a thing of the past, and with the expanding power sales, the commission will be able during the 1942-1943 operating year to refund to the State General Fund the $30,000 balance due it from the 1938 appropriation.

The commission holds bonds of contractors in the amount of $41,400 to secure fulfillment of contracts.
CHAPTER XVI
Irrigation Districts and Companies

IRIGATIONAL DISTRICTS
Walker River, Pershing County; Wasco County; Muddy River, Nevada. Project.

IRIGATIONAL COMPANIES
Proctor Irrigation Company, Land Irrigation Company, Burnleville Irrigation Company, Mesquite Irrigation Company, Alamo Irrigation Company, Panoche Irrigation Company. The following information was obtained through questionnaires and letters sent to the various organizations.

WALKER RIVER IRRIGATION DISTRICT
Officers—George Parker, President; John H. Wickersham, Vice President; Fred W. Seltzner, Treasurer; C. O. Belmont, Secretary; M. D. Laurenso, V. S. Connell, Directors; W. M. Kenozy, Attorney. Office at Yerington, Nevada. Organized April 14, 1919.

Walker River Irrigation District comprises all the irrigable lands of the east, west, and main Walker Rivers in the State of Nevada, with the exception of the Walker River Indian Reservation. These rivers have their source in the eastern slopes of the Sierra Nevada Mountains, draining from a watershed of some 3,000 square miles. The total area of the district is 260,000 acres, of which 160,000 acres are irrigable. At the present time, 110,000 acres are held under private ownership of which 79,686 acres have water rights. The irrigated area is approximately 33,000 acres.

During the past year, Senator McCarran, cooperating with the National Reclamation Association, the Nevada State Engineer, and the Walker River Irrigation District, has introduced U. S. Senate Bill S. 2416 which provides for the Bureau of Reclamation to take over the obligations of Irrigation Districts held by governmental agencies such as the Reconstruction Finance Corporation, and allow the districts to redeem the obligations without paying any further interest thereon. The enactment of this legislation would save the people of the Walker River Irrigation District $226,680 in interest now and year 1968, when the last of being will mature, and would place privately financed districts on a more equal basis with the many reclamation projects of the United States that have never had to pay interest on their obligations.

The outstanding bonded indebtedness of this district is now $380,000, a reduction of $490,500 since July 1, 1940. These bonds carry an interest rate of 4% per annum and are held by the Reconstruction Finance Corporation. They are scheduled to be redeemed over the period between now and the year 1967.

A complete description of the operation and status of this district may be found in the 1954-1936 Biennial Report of the State Engineer.
F. Mofley, Superintendent; R. S. Leighton, Engineer, and P. M. Preston, Car-taker at Rye Patch Dam.

The beginning of the fiscal year of 1941 marked the start of peaceful operation of the irrigation system in Lovelock Valley for the first time in many years. On June 19, 1941, a “Five Year Agreement” was negotiated and operated by all parties heretofore involved in lengthy and costly litigation.

During the irrigation season and winter months of 1940-1941 water supply was ample and agriculture made rapid progress.

On January 15, 1941, the operation and maintenance of the Humboldt project was officially placed with the Pershing County Water Conservation District by the Bureau of Reclamation. The Humboldt project works include Rye Patch dam and appurtenant works and property in Battle Mountain area from which water rights were transferred.

The irrigation season of 1941 was successful, with ample water supply being used efficiently through regulation at Rye Patch dam, and the year was ended with a holdover storage of 33,800 acre-feet. The entire river flow was taken into Rye Patch reservoir in the spring of 1942 as the Humboldt Lake irrigaation Light and Power Company reservoirs were filled on December 15, 1941. The winter and spring flow of the Humboldt during 1942 was abnormally high, and on June 1, 1942, Rye Patch reservoir contained 180,000 acre-feet and was being held at that point to leave a capacity of 20,000 acre-feet to level the peak expected later.

The personnel of the district has been engaged primarily in operation and maintenance work. However, notable improvements have been made on the distribution and drainage systems.

**LUNO IRRIGATION COMPANY**

Officers—James O. Osborne, President; Harold Evans, Vice President; Leland Hendrix, Secretary; Hugh A. Reid and Fernley Sinfeld, Directors.

Office at Land, Nevada.

Organized 1897.

This company delivers irrigation water to 1,500 acres of land in White Pine County through a gravity canal eight miles long. The source of the water is in Preston Big Springs, Land, Cold, Nicholas, and Hurley Springs.

The annual cost of operating averages $1,000, and the annual expenditures for repairs and replacements average $500.

**PRESTON IRRIGATION COMPANY**

Officers—Andrew D. Petersen, President; H. A. Read, Vice President; Pharo Arnoldson, Secretary and Treasurer; Lowell Petersen and Christian Branson, Directors.

Office at Preston, Nevada.

Organized March 24, 1911.

This company delivers irrigation water to 1,100 acres of land lying adjacent to Preston. The source of the water is Preston Big Spring and Arnoldson Spring.
The results of chemical analyses made on water samples taken from the Humboldt River from July 11 to December 31, 1941, were reported in January 1942. The monthly discharge data, for each of the stations at which the samples were taken, have been obtained from the Office of the State Engineer. This information was not available at the time the present report was written. The monthly discharge data are the present report in which is given the tonnages of dissolved salts passing each sampling station during each of the months in which water samples were taken. The locations of the sampling and reporting stations are as follows: Palisades—In the N 1/4 sec. 36, T. 32 N, R. 31 E. At this station 24 samples were taken at weekly intervals for the entire period. Comus—26 miles above Winnemucca (approximately in the SW1/4 sec. 13, T. 36 N, R. 41 E, and 1 mile east of Comus. Eighteen samples were taken from July 3 to December 7, 1941. Calaham Bridge—Approximately in the SW1/4 sec. 25, T. 33 N, R. 33 E. Four miles NW of Imbuck. Ten samples between July 16 and September 19. Pit Diversion Dam—Upper Lovelock Valley. Three samples between July 17 and August 13, 1941. Last Diversion—No regular samples. Five regular samples between July 18 and September 8, 1941. After collection, the samples and flow data were sent to the laboratory at Reno. On each sample the electrical conductance was determined and the results are given in Table I. The electrical conductance is given as the value of K x 10^6 at 25°C. This figure is a measure of the total amount of salts dissolved in the water. For the more complete analysis, a monthly composite sample was prepared by mixing portions of the samples in proportion to the discharge in c.f.s. when the sample was taken for each individual station for the month. The monthly composite sample thus obtained was analyzed for its separate constituents by the methods which have been standardized for such samples in the laboratories of the Division of Western Irrigation. The results of these samples are given in Table II. The tabulated analyses include some or all of the following determinations: 1. Specific electrical conductance, expressed as K x 10^6 at 25°C. 2. Total dissolved solids, expressed as tons per acre-foot of water. 3. Hydrogen-ion concentration, expressed as pH. 4. Calcium (Ca), expressed as equivalents per million (e.p.m.). 5. Magnesium (Mg), expressed as e.p.m. 6. Sodium (Na), expressed as e.p.m.
Note—In some of the analyses the values reported for sodium are the results of the direct determination of that constituent. In other analyses the values have been obtained by differences, i.e., by subtracting the sum of the calcium and magnesium from the sum of the anions, bicarbonate, sulphate, chloride, and nitrate, all these constituents being expressed as e.p.m.

7. Potassium (K), expressed as e.p.m.

8. Carbonate (CO₂), expressed as e.p.m.

9. Bicarbonate (HCO₃), expressed as e.p.m.

Note—Because the normal carbonate (CO₂) occurs infrequently in irrigation water it is not reported by the analyst; the values are added to the values for the bicarbonate in the tables.

30. Sulphate (SO₄), expressed as e.p.m.

11. Chloride (Cl), expressed as e.p.m.

12. Nitrate (NO₃), expressed as e.p.m.

13. Silica (SiO₂), expressed as parts per million.

14. Boron (B), expressed as parts per million.

Note—The boron values reported in the tables were determined by the method of electrometric titration.

15. Fluoride (F), expressed as parts per million.

16. Silt (total suspended matter), expressed as tons per acre-foot of water.

Note—Since the chief objective of the investigations here reported has been to learn the conditions of salinity in the area, only incidental consideration has been given to the silt burden of the streams. In collecting the water samples no serious effort has been made to obtain samples that would adequately represent the silt conditions, and consequently the data on silt content here reported should not be taken as the best available.

In Table III are given the results of the analyses in conjunction with the monthly discharge at the several points. The figures for monthly discharge were obtained from the State Engineer's office. Footnotes indicate the discharge in those cases in which complete weekly samples were not obtained; in those cases the discharge has been calculated from the flow at the time of sampling. This Table III indicates the salt burden, or amount of dissolved salts, being carried by the river at each point for the month indicated. The results are given in tons, both for the total quantity and for each salt constituent making up the total.

In Table IV the discharge and salt burden of the river at each station is given for the entire period, both the total tonnage and the tonnage of individual constituents. In the last column is given the average amount of dissolved salts per acre-foot of water at each station. The amount of dissolved salts per acre-foot of water increases as we proceed downstream. This increase in salinity is the result of several factors, namely, evaporation, leaching from deposits along the banks, contributions from tributaries, springs and seepages, and drainage and run-off water from irrigated areas.

The values given in Table V are derived from the preceding data.
The percent sodium is the percentage of the total cation constituents (Ca, Mg, Na) which is made up by sodium (Na). This figure may be taken as one of the indications of water quality in relation to maintenance of soil tilth. The use of irrigation water containing high sodium percentages tends to impair the physical condition of the soil while the use of waters of low sodium percentages tends to maintain good physical condition or to improve physical conditions where that condition has been caused by the deocclusion of the clay fraction. No definite value can be given for this figure above or below which the water may be considered dangerous or valuable, since the character of the soil and other factors must be considered. However, sodium percentages much above 40% may be considered undesirable.

The percent chloride or percentage of chloride of the total anion (SO₄²⁻, HCO₃⁻, Cl⁻) constituents is chiefly valuable in that together with the percent sodium the general character of the water may be indicated. It is probably true that water having the higher percent chloride, with total dissolved solids about equal, would be the less desirable since the chloride is regarded as more toxic than the sulphate or bicarbonate.

The foregoing report has been prepared from data obtained up to December 31, 1941, and is the first general report on salinity conditions on the Humboldt River. The work is being continued and it is hoped that during the next few years a more complete picture of water quality of the river may be obtained. Such an understanding of the quality of the irrigation water used along the Humboldt River will make possible more efficient and intelligent use of the available water supply in the development and maintenance of a permanent agriculture.

The cooperation of the officials of Nevada State Engineer’s office and officials of the Pershing County Water Conservation District in the collection of samples and in furnishing data and other information is hereby gratefully acknowledged. Without such generous cooperation this Perrin Project No. 56 of the Nevada Agricultural Experiment Station could not well be carried out.
### TABLE I-A

Humboldt River at Callahan, Pitt Division, Last Division
Concentration of dissolved solids as measured by specific electrical conductance (K x 10⁶ at 2°C)

<table>
<thead>
<tr>
<th></th>
<th>Callahan</th>
<th>Pitt Division</th>
<th>Last Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month</td>
<td>July</td>
<td>Aug.</td>
<td>July</td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>77</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>123</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>53</td>
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<td></td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>49</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TABLE I-B

Analytical data for Humboldt River Water

#### SAMPLES TAKEN AT PALMADALE, 1941

<table>
<thead>
<tr>
<th>Month</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>p.p.m.</td>
<td>K x 10⁶</td>
</tr>
<tr>
<td>July</td>
<td>296.6</td>
<td>64.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>296.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

#### SAMPLES TAKEN AT COMES, 1941

<table>
<thead>
<tr>
<th>Month</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>p.p.m.</td>
<td>K x 10⁶</td>
</tr>
<tr>
<td>July</td>
<td>296.6</td>
<td>64.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>296.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

#### SAMPLES TAKEN AT LAST DIVERSION DAM, 1941

<table>
<thead>
<tr>
<th>Month</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>p.p.m.</td>
<td>K x 10⁶</td>
</tr>
<tr>
<td>July</td>
<td>296.6</td>
<td>64.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>296.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

#### SAMPLES TAKEN AT LAST DIVERSION LOWER LOVELOCK VALLEY, 1941

<table>
<thead>
<tr>
<th>Month</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>p.p.m.</td>
<td>K x 10⁶</td>
</tr>
<tr>
<td>July</td>
<td>296.6</td>
<td>64.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>296.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

### TABLE II

Analytical data for Humboldt River Water

<table>
<thead>
<tr>
<th>Month</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>p.p.m.</td>
<td>K x 10⁶</td>
</tr>
<tr>
<td>July</td>
<td>296.6</td>
<td>64.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>296.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

**Explanation:**
- **T.D.S.** = total dissolved solids
- **K x 10⁶** = specific electrical conductance

Chemical Symbols:
- CaO = calcium oxide
- MgO = magnesium oxide
- Na₂O = sodium oxide
- K₂O = potassium oxide
- SO₄ = sulfate radicals
- Cl⁻ = chloride radicals

### TABLE III

Concentration of dissolved solids as measured by specific electrical conductance (K x 10⁶ at 2°C)

<table>
<thead>
<tr>
<th>Month</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>p.p.m.</td>
<td>K x 10⁶</td>
</tr>
<tr>
<td>July</td>
<td>296.6</td>
<td>64.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>296.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

**Conversion:**
- To convert weight ppm to million (M.M.) multiply by the factor
- **To convert equivalents per million (e.p.m.) to parts per million (ppm) multiply by the factor:**

**Conversion:**
- **29.0** = **12.2** = **23.8** = **81.8** = **48.8** = **15.5**

### TABLE IV

Analytical data for Humboldt River Water

<table>
<thead>
<tr>
<th>Month</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>p.p.m.</td>
<td>K x 10⁶</td>
</tr>
<tr>
<td>July</td>
<td>296.6</td>
<td>64.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>296.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

**Conversion:**
- **29.0** = **12.2** = **23.8** = **81.8** = **48.8** = **15.5**

### TABLE V

Analytical data for Humboldt River Water

<table>
<thead>
<tr>
<th>Month</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>p.p.m.</td>
<td>K x 10⁶</td>
</tr>
<tr>
<td>July</td>
<td>296.6</td>
<td>64.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>296.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

**Conversion:**
- **29.0** = **12.2** = **23.8** = **81.8** = **48.8** = **15.5**

### TABLE VI

Analytical data for Humboldt River Water

<table>
<thead>
<tr>
<th>Month</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>p.p.m.</td>
<td>K x 10⁶</td>
</tr>
<tr>
<td>July</td>
<td>296.6</td>
<td>64.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>296.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

**Conversion:**
- **29.0** = **12.2** = **23.8** = **81.8** = **48.8** = **15.5**

**TABLE III**

### Discharge and Salt Burden of the Humboldt River at Fallon Gaging Station from July 11 to December 31, 1941

<table>
<thead>
<tr>
<th>Date</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>SO₂</th>
<th>Cl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Avg.</td>
<td>2721.4</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>2721.4</td>
<td>46.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Oct.</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
<td>135.3</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
</tr>
<tr>
<td>Nov.</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
<td>135.3</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
</tr>
<tr>
<td>Dec.</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
<td>135.3</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
</tr>
<tr>
<td>Total</td>
<td>85818.4</td>
<td>54.5</td>
<td>76.8</td>
<td>135.3</td>
<td>85818.4</td>
<td>54.5</td>
<td>76.8</td>
</tr>
</tbody>
</table>

- **Discharge for period July 11 to August 1, 1941, calculated from flow reported at time of sampling.**

### Discharge and Salt Burden of the Humboldt River at Carson Gaging Station from July 11 to December 7, 1941

<table>
<thead>
<tr>
<th>Date</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>SO₂</th>
<th>Cl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Avg.</td>
<td>2721.4</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>2721.4</td>
<td>46.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Oct.</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
<td>135.3</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
</tr>
<tr>
<td>Nov.</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
<td>135.3</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
</tr>
<tr>
<td>Dec.</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
<td>135.3</td>
<td>2648.4</td>
<td>54.5</td>
<td>76.8</td>
</tr>
<tr>
<td>Total</td>
<td>85818.4</td>
<td>54.5</td>
<td>76.8</td>
<td>135.3</td>
<td>85818.4</td>
<td>54.5</td>
<td>76.8</td>
</tr>
</tbody>
</table>

- **Discharge for period July 11 to August 1, 1941, calculated from flow reported at time of sampling.**

### Discharge and Salt Burden of the Humboldt River at Calhoun Gaging Station from July 16 to September 25, 1941

<table>
<thead>
<tr>
<th>Date</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>SO₂</th>
<th>Cl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Avg.</td>
<td>2721.4</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>2721.4</td>
<td>46.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Total</td>
<td>85818.4</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>85818.4</td>
<td>46.6</td>
<td>71.4</td>
</tr>
</tbody>
</table>

- **Discharge for period July 12 to August 1, 1941, calculated from flow reported at time of sampling.**

### Discharge and Salt Burden of the Humboldt River at Main Diversion Gaging Station from July 15 to August 31, 1943

<table>
<thead>
<tr>
<th>Date</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>SO₂</th>
<th>Cl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Aug.</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>2529.8</td>
<td>46.6</td>
<td>71.4</td>
</tr>
<tr>
<td>Total</td>
<td>85818.4</td>
<td>46.6</td>
<td>71.4</td>
<td>128.1</td>
<td>85818.4</td>
<td>46.6</td>
<td>71.4</td>
</tr>
</tbody>
</table>

- **Discharge for period July 15 to August 1, 1943, calculated from flow reported at time of sampling.**
TABLE III
Discharge and Salt Burden of the Humboldt River at Fallon Gaging Station from July 11 to December 31, 1941

<table>
<thead>
<tr>
<th>Date</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>SO₄</th>
<th>NO₃</th>
<th>Cl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>32275</td>
<td>459</td>
<td>471</td>
<td>349</td>
<td>792</td>
<td>331</td>
<td>5524</td>
<td>9532</td>
</tr>
<tr>
<td>Aug.</td>
<td>27277</td>
<td>348</td>
<td>519</td>
<td>357</td>
<td>953</td>
<td>360</td>
<td>4971</td>
<td>8491</td>
</tr>
<tr>
<td>Sept.</td>
<td>31364</td>
<td>522</td>
<td>570</td>
<td>329</td>
<td>481</td>
<td>260</td>
<td>4732</td>
<td>9016</td>
</tr>
<tr>
<td>Oct.</td>
<td>28544</td>
<td>570</td>
<td>567</td>
<td>365</td>
<td>439</td>
<td>381</td>
<td>5041</td>
<td>9243</td>
</tr>
<tr>
<td>Nov.</td>
<td>28464</td>
<td>502</td>
<td>614</td>
<td>316</td>
<td>471</td>
<td>330</td>
<td>4960</td>
<td>8843</td>
</tr>
<tr>
<td>Dec.</td>
<td>22464</td>
<td>843</td>
<td>760</td>
<td>334</td>
<td>331</td>
<td>280</td>
<td>4795</td>
<td>8585</td>
</tr>
</tbody>
</table>
| Total      | 202084 | 5732 | 6524 | 3344 | 5255 | 3366 | 79163 | 139621 |}

Discharge for period July 11 to August 1, 1941, calculated from flow reported at time of sampling.

Discharge for period August 1 to August 1, 1941, calculated from flow reported at time of sampling.

Discharge for period September 1 to September 12, 1941, calculated from flow reported at time of sampling.

TABLE IV
Discharge and Salt Burden of the Humboldt River at Comus Gaging Station from July 11 to December 7, 1941

<table>
<thead>
<tr>
<th>Date</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>SO₄</th>
<th>NO₃</th>
<th>Cl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>27277</td>
<td>459</td>
<td>519</td>
<td>357</td>
<td>953</td>
<td>361</td>
<td>5524</td>
<td>9532</td>
</tr>
<tr>
<td>Aug.</td>
<td>27277</td>
<td>348</td>
<td>519</td>
<td>357</td>
<td>953</td>
<td>360</td>
<td>4971</td>
<td>8491</td>
</tr>
<tr>
<td>Sept.</td>
<td>31364</td>
<td>522</td>
<td>570</td>
<td>329</td>
<td>481</td>
<td>260</td>
<td>4732</td>
<td>9016</td>
</tr>
<tr>
<td>Oct.</td>
<td>28544</td>
<td>570</td>
<td>567</td>
<td>365</td>
<td>439</td>
<td>381</td>
<td>5041</td>
<td>9243</td>
</tr>
<tr>
<td>Nov.</td>
<td>28464</td>
<td>502</td>
<td>614</td>
<td>316</td>
<td>471</td>
<td>330</td>
<td>4960</td>
<td>8843</td>
</tr>
<tr>
<td>Dec.</td>
<td>22464</td>
<td>843</td>
<td>760</td>
<td>334</td>
<td>331</td>
<td>280</td>
<td>4795</td>
<td>8585</td>
</tr>
</tbody>
</table>
| Total      | 202084 | 5732 | 6524 | 3344 | 5255 | 3366 | 79163 | 139621 |}

Discharge for period July 12 to August 1, 1941, calculated from flow reported at time of sampling.

Discharge for period August 2 to October 22, 1941, calculated from flow reported at time of sampling.

Discharge for November calculated from flow reported at time of sampling.

Discharge for December calculated from flow reported at time of sampling.

TABLE V
Discharge and Salt Burden of the Humboldt River at Calahan Gaging Station from July 16 to September 25, 1941

<table>
<thead>
<tr>
<th>Date</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>SO₄</th>
<th>NO₃</th>
<th>Cl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>702</td>
<td>311</td>
<td>5324</td>
<td>9326</td>
</tr>
<tr>
<td>Aug.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Sept.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Oct.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Nov.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Dec.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Total</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
</tbody>
</table>

Discharge for period July 17 to August 1, 1941, calculated from flow reported at time of sampling.

Discharge for period August 1 to October 25, 1941, calculated from flow reported at time of sampling.

Discharge for November calculated from flow reported at time of sampling.

Discharge for December calculated from flow reported at time of sampling.

TABLE VI
Discharge and Salt Burden of the Humboldt River at Main Division Gaging Station from July 15 to August 31, 1941

<table>
<thead>
<tr>
<th>Date</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>SO₄</th>
<th>NO₃</th>
<th>Cl</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>702</td>
<td>311</td>
<td>5324</td>
<td>9326</td>
</tr>
<tr>
<td>Aug.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Sept.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Oct.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Nov.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Dec.</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
<tr>
<td>Total</td>
<td>19416</td>
<td>724</td>
<td>418</td>
<td>353</td>
<td>705</td>
<td>311</td>
<td>5334</td>
<td>9329</td>
</tr>
</tbody>
</table>

Discharge for period July 16 to August 1, 1941, calculated from flow reported at time of sampling.

Discharge for period August 1 to September 25, 1941, calculated from flow reported at time of sampling.

Discharge for period September 26 to September 30, 1941, calculated from flow reported at time of sampling.

Discharge for October calculated from flow reported at time of sampling.

Discharge for November calculated from flow reported at time of sampling.

Discharge for December calculated from flow reported at time of sampling.
The percent sodium is the percentage of the total cation constituents (Ca, Mg, Na) which is made up by sodium (Na). This figure may be taken as one of the indications of water quality in relation to maintenance of soil fertility. The use of irrigation water containing high sodium percentages tends to impair the physical condition of the soil while the use of waters of low sodium percentages tends to maintain good physical condition or to improve physical conditions where that condition has been caused by the depletion of the clay fraction. No definite value can be given for this figure above or below which the water may be considered dangerous or valuable, since the character of the soil and other factors must be considered. However, sodium percentages much above 40% may be considered undesirable.

The percent chlorides or percentage of chloride of the total anion (SO₄, CO₃, Cl) constituents is chiefly valuable in that together with the percent sodium the general character of the water may be indicated. It is probably true that water having the higher percent chlorides, with total dissolved solids about equal, would be the less desirable since the chloride is regarded as more toxic than the sulphate or bicarbonate.

The foregoing report has been prepared from data obtained up to December 31, 1941, and is the first general report on salinity conditions on the Humboldt River. The work is being continued and it is hoped that during the next few years a more complete picture of water quality of the river may be obtained. Such an understanding of the quality of the irrigation water used along the Humboldt River will make possible more efficient and intelligent use of the available water supply in the development and maintenance of a permanent agriculture.

The cooperation of the officials of Nevada State Engineer's Office and officials of the Pershing County Water Conservation District in the collection of samples and in furnishing data and other information is hereby gratefully acknowledged. Without such generous cooperation this report Project No. 96 of the Nevada Agricultural Experiment Station could not well be carried out.

### TABLE I

**Concentration of dissolved solids as measured by specific electrical conductivity**

<table>
<thead>
<tr>
<th>Month</th>
<th>July 21-23</th>
<th>Aug. 10-12</th>
<th>Sep. 22-24</th>
<th>Oct. 6-10</th>
<th>Nov. 14-18</th>
<th>Dec. 6-10</th>
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<td>1</td>
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<td>69</td>
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<td>62</td>
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<td>63</td>
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<td>69</td>
<td>65</td>
<td>62</td>
<td>69</td>
<td>63</td>
</tr>
</tbody>
</table>

**Status of Applications Filed During the Period from July 1, 1940, to June 30, 1942**

Following is a condensed statement giving the salient data in connection with applications filed during the period from July 1, 1940, to June 30, 1942, in the order of:

1. Application serial number.
2. Date of filing.
3. Name of applicant.
4. Source of water supply.
5. Purpose of appropriation.
6. Area or application.
7. Status of application as of June 30, 1942.
The Quality of the Water of the Humboldt River

By M. R. Miller, Chemist, Agricultural Experiment Station

HUMBOLDT RIVER SALINITY CONDITIONS

JULY 12-DECEMBER 31, 1941

The results of chemical analyses made on water samples taken from the Humboldt River from July 11 to December 31, 1941, were reported in January 1942.

The monthly discharge data, for each of the stations at which the samples were taken, have been obtained from the Bureau of the State Engineer. This information was not, however, always present in the reports previously submitted, and the discharge data was usually recorded for periods of 24 hours. The daily discharge data for periods of 24 hours was available for some of the stations.

The locations of the sampling stations are as follows:

Fallon—In the NV-12 sec. 36, T. 32 N. R. 31 E. At this station 24 samples were taken at weekly intervals for the entire period.

Comus—28 miles above Winnemucca (approximately in the NV-14 sec. 33, T. 36 N. R. 41 E. and 1 mile east of Comus. Eighteen samples taken from July 3 to December 7, 1941.

Calabash Bridge—Approximately in the NV-9 sec. 23, T. 33 N. R. 33 E. Four miles NW of Imlay. Ten samples between July 16 and September 19.

Pit Diversion Dam—Upper Lovelock Valley. Three samples between July 17 and August 13, 1941.

Last Diversion—No regular samples. Five regular samples between July 18 and September 8, 1941.

After collection, the samples and flow data were sent to the laboratory at Reno.

On each sample the electrical conductance was determined and the results are given in Table I. The electrical conductance is given as the value of K x 10^6 at 25°C. This figure is a measure of the total amount of salts dissolved in the water.

For the more complete analysis, a monthly composite sample was prepared by mixing portions of the samples in proportion to the discharge in c.f.s. when the sample was taken for each individual station for the month. The monthly composite sample thus obtained was analyzed for its separate constituents by the methods which have been standardized for such samples in the laboratories of the Division of Western Irrigation. The results of these analyses are given in Table II. The tabulated analyses include some or all of the following determinations:

1. Specific electrical conductivity, expressed as K x 10^6 at 25°C.
2. Total dissolved solids, expressed as tons per acre-foot of water.
3. Hydrogen-ion concentration, expressed as pH.
4. Calcium (Ca), expressed as equivalents per million (e.p.m.).
5. Magnesium (Mg), expressed as e.p.m.
6. Sodium (Na), expressed as e.p.m.
BUNKERVILLE IRRIGATION COMPANY

Officers—John Lewitt, President; Albert Lewitt, Secretary and Treasurer; John Lewitt, Hector Bunker, and Harley Adams, Directors.
Office at Bunkerville, Nevada.
Organized June 25, 1925.
In the decree entered in the Matter of the Determination of the Relative Rights of Claimants and Appropriatees in and to the Waters of the Virgin River, in Clark County, State of Nevada, dated May 14, 1937, the Bunkerville Irrigation Company was decreed 12,37 c.f.s. of continued flow of water from the Virgin River from March 1 to October 1, and a continuous flow of 8,666 c.f.s. from October 1 to March 1 of the following year, for the irrigation of 965.20 acres of land with a priority of prior to 1905.

Water is diverted from the Virgin River by means of a brush and rock dam and conveyed through a canal having an approximate capacity of 26 c.f.s. to the lands irrigated. At the present time 62 water users are being served on about 900 acres of land.

THE MESQUITE IRRIGATION COMPANY

Officers—James N. Pusipher, President; Leonard R. Abbott, Vice President; John A. Tobler, Secretary and Treasurer; Peetm Frelmer, Director.
Office at Mesquite, Nevada.
Organized June 8, 1925.

In the decree entered in the Matter of the Determination of the Relative Rights of Claimants and Appropriatees in and to the Waters of the Virgin River, in Clark County, State of Nevada, dated May 14, 1937, the Mesquite Irrigation Company was decreed 15,25 c.f.s. of continuous flow of water from the Virgin River from March 1 to October 1, and a continuous flow of 10,677 c.f.s. from October 1 to March 1 of the following year for the irrigation of 1,067.37 acres with a priority of prior to 1905.

Water is diverted from the Virgin River by means of a brush and rock dam in Arizona, and located in the NE\(\frac{3}{4}\)NW\(\frac{1}{4}\) of Section 3, Township 30 N., Range 16 W., S.I. & G.M., being about two and one-half miles easterly from the Nevada and Arizona State line, into a canal having a capacity of about 30 c.f.s. Some water is diverted from the canal to irrigate lands in Arizona.

The company has also a permitted right to appropriate 8 c.f.s. for the irrigation of 560 acres of land in Nevada. The total acreage irrigated in Nevada approximates 1,747 acres.
F. Meffly, Superintendent; R. S. Leighton, Engineer, and P. M. Preston, Car-taker at Rye Patch Dam.

The beginning of the fiscal year of 1941 marked the start of peaceful operation of the irrigation system in Lovelock Valley for the first time in many years. On June 10, 1941, a "Five Year Agreement" was negotiated and operated by all parties heretofore involved in lengthy and costly litigation.

During the irrigation season and winter months of 1940-1941 water supply was ample and agriculture made rapid progress.

On January 15, 1941, the operation and maintenance of the Humboldt project was officially placed with the Pershing County Water Conservation District by the Bureau of Reclamation. The Humboldt project works include Rye Patch dam and appurtenant works and property in Battle Mountain areas from which water rights were transferred.

The irrigation season of 1941 was successful, with ample water supply being used efficiently through regulation at Rye Patch dam, and the year was ended with a holdover storage of 53,860 acre-feet.

The entire river flow was taken into Rye Patch reservoir in the spring of 1942 as the Humboldt Levelock Irrigation Light and Power Company reservoirs were filled on December 15, 1941. The winter and spring flow of the Humboldt during 1942 was abnormally high, and on June 1, 1942, Rye Patch reservoir contained 103,900 acre-feet and was being held at that point to leave a capacity of 20,000 acre-feet to level the peak expected later.

The personnel of the district has been engaged primarily in operation and maintenance work. However, notable improvements have been made on the distribution and drainage system.

**LUNI IRRIGATION COMPANY**

Officers—James G. Oakhouse, President; Harold Evans, Vice President; Leland Hendrix, Secretary; Hugh A. Reid and Ferney Sinfeld, Directors.

Office at Luni, Nevada.

Organized 1897.

This company delivers irrigation water to 1,500 acres of land in White Pine County through a gravity canal eight miles long. The source of the water is Preston Big Springs, Luni, Cold, Nicholas, and Horsley Springs.

The annual cost of operating averages $1,000, and the annual expenditures for repairs and replacements average.

**PESTON IRRIGATION COMPANY**

Officers—Andrew Petersen, President; H. A. Read, Vice President; Pharo Arnoldson, Secretary and Treasurer; Lowell Peterson and Christian Bromanon, Directors.

Office at Preston, Nevada.

Organized March 24, 1911.

This company delivers irrigation water to 1,100 acres of land lying adjacent to Preston. The source of the water is Preston Big Spring and Arnoldson Spring.
CHAPTER XVI
Irrigation Districts and Companies

IRRIERATION DISTRICTS
Walker River, Pershing County; Washoe County, Muddy River, Nevada, Project.

IRRIERATION COMPANIES
Provo Irrigation Company, Lund Irrigation Company, Busberville Irrigation Company, Missou Pepple Irrigation Company, Aramo Pepple Irrigation Company. The following information was obtained through questionnaires and letters sent to the various organizations:

WALKER RIVER IRRIGATION DISTRICT
Officers—George Parker, President; John H. Wechman, Vice President; Fred W. Settles, Secretary; C. O. Gelmelstabil, Secretary; M. Delamons, R. V. Connell, Directors; W. M. Kenney, Attorney. Office at Yerington, Nevada. Organized April 14, 1919.

The Walker River Irrigation District comprises all the irrigable lands of the east, west and main Walker Rivers in the State of Nevada, with the exception of the Walker River Indian Reservation. These rivers have their source in the eastern slopes of the Sierra Nevada Mountains, draining from a watershed of some 3,000 square miles. The total area of the district is 263,000 acres, of which 165,000 acres are irrigable. At the present time, 112,260 acres are held under private ownership of which 79,868 acres have water rights. The irrigated area is approximately 23,000 acres.

During the past year, Senator McCarran, cooperating with the National Reclamation Association, the Nevada State Engineer, and the Walker River Irrigation District, has introduced U. S. Senate Bill S. 2416 which provides for the Bureau of Reclamation to take over the obligations of Irrigation Districts held by governmental agencies such as the Reconstruction Finance Corporation, and allow the districts to redeem the obligations without paying any further interest thereon. The enactment of this legislation would save the people of the Walker River Irrigation District $262,680 in interest now and the year 1963, when the last of their bonds will be matured, and would place privately financed districts on a more equal basis with the many reclamation projects of the United States that have never had to pay interest on their obligations.

The outstanding bonded indebtedness of this district is now $380,000, a reduction of $400,000 since July 1, 1940. These bonds carry an interest rate of 5% per annum and are held by the Reconstruction Finance Corporation. They are scheduled to be redeemed over the period between now and the year 1967.

A complete description of the operation and status of this district may be found in the 1954-1956 Biennial Report of the State Engineer.
<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commission Expenses, Carson City Office</td>
<td>$80,00</td>
</tr>
<tr>
<td>Commission Expenses, Las Vegas Office</td>
<td>$4,500</td>
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<tr>
<td>Total Carson City Office</td>
<td>$8,500</td>
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<td>Total Las Vegas Office</td>
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</tr>
<tr>
<td>Total expenses</td>
<td>$32,477</td>
</tr>
<tr>
<td>Balance as of June 1, 1941</td>
<td>$6,096,41</td>
</tr>
</tbody>
</table>

**Powers Accounts**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash as of June 1, 1941</td>
<td>$8,414,41</td>
</tr>
<tr>
<td>1941-1942 receipts</td>
<td>$196,980,70</td>
</tr>
<tr>
<td>Total</td>
<td>$195,394,44</td>
</tr>
<tr>
<td>Less Payments</td>
<td>$106,980,86</td>
</tr>
<tr>
<td>To U. S. for May 1941 costs</td>
<td>$200,83</td>
</tr>
<tr>
<td>To U. S. for 1941-1942 costs</td>
<td>$196,980,70</td>
</tr>
<tr>
<td>Total payments</td>
<td>$197,980,86</td>
</tr>
<tr>
<td>Balance in power account as of June 1, 1942</td>
<td>$7,414,41</td>
</tr>
</tbody>
</table>

This balance is held in reserve pending final adjustment of costs for years prior to June 1, 1941.
indicate the expanding use of power in the Las Vegas area. During the last quarter of the operating year 1942 the increase over the corresponding quarter of 1941 was 98.3% and use in May 1942 was 118.5% over that of May 1941. Estimated use by this company for the year ending May 31, 1948, is 39,500,000 KWH.

Lincoln County Power District No. 1

Use contract year ending May 31, 1941... 38,325,000 KWH
Use contract year ending May 31, 1942... 39,500,000 KWH
Estimated use for contract year ending May 31, 1942... 37,000,000 KWH

In four years of operation this district has not only met all bond and interest requirements but has built up a substantial cash reserve against future bond requirements, but has reduced its sale price of energy at its Pioche substation from 30 mills per kilowatt-hour in March 1938 to six mills per kilowatt-hour in May 1942.

Olton Power District No. 5

Use contract year ending May 31, 1944... 1,000,000 KWH
Use contract year ending May 31, 1942... 965,691 KWH
Estimated use for contract year ending May 31, 1945... 1,200,000 KWH

This is an H.E.A. project which takes off from the Lincoln County Power District lines at 63 miles from the Boulder dam substation. It is beginning its fourth year of successful operation.

The total use of Boulder dam energy under State contracts in the year ending May 31, 1942, was 59,073,156 KWH., or 7.8% of the State's allotment.

Use for the year ending May 31, 1943, is estimated at 11.6%
Use for the year ending May 31, 1944, is estimated at 34%
Use for the year ending May 31, 1945, is estimated at 45%
These estimates are based on existing contracts.

The expansion in the Las Vegas area has brought upon the commission problems of securing transforming capacity to meet the increasing demands. Transformer capacity originally installed for Nevada's use was 15,000 KVA, and a portion of this was used by the Bureau of Reclamation to supply Kingman and Needles. Upon representations made through our Las Vegas office in 1938 and 1939 a new bank of transformers of 40,000 KVA capacity was installed and in use in November 1941. This bank will be fully loaded this winter, and negotiations are now proceeding for use of capacity allocated to other contractors in order to meet the rapidly growing demands. The magnesium plant is not involved since Defense Plant Corporation has assured its own transformers and transmission lines for this service.

The use of water from Lake Mead by Defense Plant Corporation made it necessary for the State to enter into a contract with the Bureau of Reclamation for the delivery of this water from storage in the lake. The negotiation of terms for this contract, begun early this year, are nearly complete. A contract for reuse of water to Defense Plant Corporation has been prepared, but final draft awaits completion of our contract with the Bureau of Reclamation.

FINANCIAL REPORTS

Power is sold by the State at cost, plus a charge of three-tenths mill per kilowatt-hour to cover costs of administration and the obligations of the commission prescribed by law.
generates for itself, the States of Arizona and Nevada, the Metropoli-
tan Water District of Southern California, the municipalities of Ben-
dale, Burbank, and Pasadena, and the United States. As users of
Metropolitan District power it also generates for Citizens Utilities
Company of Kingsman, Arizona, California-Pacific Utilities Company
of Needles, California, and the Salt River Water Users Association
of Phoenix, Arizona.

Allotted of Boulder Dam Power. All have been enumerated in the
preceding paragraphs, but the users of Metropolitan District unused
energy are not allotted. All allottees were interested in a lower rate
of interest, and the postponement of the burden of paying for flood
control, an item of cost usually assumed by the Government. They
were also questions as to allocations of machinery and costs, provisions
for replacement annuities and operating problems which were adjusted
during hearings following the passage of the Adjustment Act and
during the negotiation of new contracts for all allottees under the Act.

Following the passage of the Adjustment Act and the execu-
tion of a new contract between the State of Nevada and the Department
of the Interior for Nevada's allotment of Boulder dam energy, new
contracts were drawn and signed between the State and its contractors.
These contracts superseded those concluded under the provisions of
the Project Act and extended to the State's contractors the benefits
of the Project Adjustment Act. These contracts are all effective as
of June 1, 1941.

Writing and Milling Operations. At the "Three Kids" mine, about
eight miles east of the magnesium plant, Manganese Ore Company is
constructing for Defense Plant Corporation a mill for the treatment of
an estimated 6,000,000 tons of manganese ore from the Three Kids
depot. This plant will probably be in operation early in 1943. Estimated
cost of plant and town is about $9,000,000. Power will be furnished by
the State's allotment through the Southern Nevada Power Company.
Estimated energy requirements for full operation are 30,000,000 kilowatt
hours per year. Estimated employment for operation 500.

The Blue Diamond Corporation has constructed a ball mill at its
gypsum properties located about 20 miles southwest of Las
Vegas. Employment is about 100.

On September 1, 1941, Combined Metals Reduction Company at
Pioche placed in operation its newly constructed selective flotation
plant for the treatment of 500 tons daily of its complex lead-zinc ore.
This is a material contribution to the stability of the town of Pioche
and may be directly attributable to the availability of energy from
Boulder dam distributed by Lincoln County, District No. 6.

As a result of the construction of the magnesium plant at Las
Vegas an ore treatment plant has been constructed at the mines of Bache
Ores Company at Gabbs in northwestern Nye County, at a cost
of several million dollars.

**USE OF BOULDER ENERGY UNDER STATE CONTRACTS**

Southern Nevada Power Company

Use contract year ending May 31, 1941 .................. 22,453,984 KWH
Use contract year ending May 31, 1942 .................. 23,175,106 KWH

This increase of approximately 30% in the last year does not fully

**CHAPTER XIX**

**Status of Applications Filed Prior to July 1, 1940**

Status of applications filed prior to July 1, 1940, upon which action
has been taken during the present biennium. Following is a condensed
statement giving the salient data in connection with applications filed
prior to July 1, 1940, upon which action has been taken during the years of the present biennium, in the order of:

1. Application serial number.
2. Date of filing.
3. Name of applicant.
4. Source of water supply.
5. Purpose of appropriation.
6. Action on application.
7. Status of permits as of June 30, 1942.

**1940.** 4-18-48. L. Cohn: All flood or surplus waters of West Walker River; Irrigation. Canceled October 21, 1941.

1941. 11-28-47. Robert B. Filmus and Floyd and Cornerwood Irrigation; Cancellation. Canceled October 21, 1941.


1944. 7-14-47. W.R. Fincher: Amargosa River; Irrigation. Denied March


ley Creek: Irrigation. Canceled November 25, 1941.

1949. 5-11-47. O.K. Farley: Lasmid Creek; Irrigation. Canceled October 21, 1941.


1951. 8-3-48. J.K. Atwood: Lone Creek; Mining, milling, and

1952. 9-21-48. Alice R. Fray: Residential. Irrigation and stock-


1954. 11-16-48. Thomas J. Rudge: Pahranagat Creek; Mining, milling, and


1956. 4-4-49. Geo. K. Siding and Henry C. Craiger: Maynard Spring; Irrigation, stockwatering, and

1957. 5-4-47. E. R. Allen: The Four Springs; Irrigation and stockwatering; and Domestic. Canceled April 15, 1942.

1958. 4-15-47. G. G. Smith: Sand Lake; Irrigation, stockwatering, and

1959. 5-21-47. O.K. Farley: Lasmid Creek; Irrigation, stockwatering, and

1960. 8-3-48. J.K. Atwood: Lone Creek; Mining, milling, and

1961. 8-15-48. beginning; C. C. Williams: Pahranagat Lake and Tributaries; Irriga-

1962. 9-21-48. Alice R. Fray: Residential. Irrigation and stock-

1963. 10-14-48. Tony Jones; Manganese Surface; Irrigation and Domestic. With-

1964. 5-21-47. Maynard Irrigation Company; Combined water of Hiko, Crystal, and Ash springs; No. 1, 2, 3, and 4, conditional water permits; Irrigation, domestic, and stockwatering. Canceled October 21, 1941.


*Protelated application. G. S. Good standing.
Phoenix, Colorado River Drainage basin section of the National Resources Planning Board at Los Angeles, Committee of Forty at Los Angeles, Sub-committee of Seven (engineers) of the Committee of Forty at El Paso, Texas; Sub-committee of Three (engineers) of the Sub-committee of Seven at El Paso, Texas. These two sub-committees were appointed by the Committee of Forty to study and report to the main committee on matters relating to present and prospective uses of water of the Colorado River both in the United States and in Mexico. Five meetings of the commission in Carson City were attended and a trip made, with reference to water contract, power facilities and priorities, and one trip to Los Angeles on the same matters. The Resident Engineer, either locally or in company with other members of the commission and State officials, was obliged to participate in all of these important conferences.

The commission has also been largely in the establishment of the magnesite and manganese industries.

A brief summary covering the obligations of the Federal Government, the relationship of the various agencies using power from Boulder dam plant is given here for rapid reference.

The Boulder dam contracts and operations in connection therewith are based on operating years beginning June 1 and ending May 31 of the following year.

The United States, Department of the Interior. Guarantees of full repayment within a fifty-year period of moneys advanced for construction of Boulder dam (except costs allocated to flood control), for installations of machinery and for costs of operation and maintenance of the project. The Act reduced the interest rate on such advances from 4% to 3% with the exception of the flood control item of $85,000,000 which is repayable after June 1, 1987, and is without interest up to that date. Ownership at all times remains with the United States.

The Seven States of the Colorado River Basin (Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming). The interest of all seven States were not identical and many preliminary meetings were necessary to compromise differences before effective work on passage of the Act could begin. All the States were interested in a "development fund" provided for in the Project Act, but of doubtful amount and almost certainly not available for expenditure during the lives of most of the negotiators. In order to expedite work between the States, two committees were set up. The Committee of Fourteen consists of two members from each State and deals with questions involving use of Colorado River water. The Committee of Sixteen consists of all members of the above except the additional of two members representing the California allottees of Boulder dam power, and deals with questions involving hydraulic power on the Colorado River. Alfred Merrill Smith, Secretary, and Charles F. DeArmond, both members of the commission, represent the State of Nevada on these committees.

By agreement reached in the Committee of Sixteen a provision is incorporated in the Adjustment Act whereby $600,000 each year goes into a development fund, the amount being raised through an added charge to power users. The first $1,500,000 is for "studies and
CHAPTER XX

Certificates Issued Under Permits, 1940-1942

Following is a condensed statement giving the salient data in connection with Certificates Issued Under Permits during the biennium for the period July 1, 1940, to June 30, 1942, in the order of:

2. Book number.
3. Permit number.
4. Name of appropriator.
5. Source of water supply.
6. Purpose of appropriation.
7. Amount of water in cubic feet per second, multiplied by number of days.
8. Date of certificate issued.

<table>
<thead>
<tr>
<th>Certificate Number</th>
<th>Appropriator</th>
<th>Source of Water Supply</th>
<th>Purpose of Appropriation</th>
<th>Volume of Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>S223-1</td>
<td>J. Y. Thrall</td>
<td>Underground Water (Las Vegas Valley Artesian Basin); M. A. Marson, Manager</td>
<td>Irrigation and domestic</td>
<td>7.30 ft³/s</td>
</tr>
<tr>
<td>S223-2</td>
<td>J. Y. Thrall</td>
<td>Underground Water (Las Vegas Valley Artesian Basin); M. A. Marson, Manager</td>
<td>Irrigation and domestic</td>
<td>8.45 ft³/s</td>
</tr>
<tr>
<td>S223-3</td>
<td>J. Y. Thrall</td>
<td>Underground Water (Las Vegas Valley Artesian Basin); M. A. Marson, Manager</td>
<td>Irrigation and domestic</td>
<td>6.00 ft³/s</td>
</tr>
<tr>
<td>S223-4</td>
<td>J. Y. Thrall</td>
<td>Underground Water (Las Vegas Valley Artesian Basin); M. A. Marson, Manager</td>
<td>Domestic</td>
<td>5.00 ft³/s</td>
</tr>
</tbody>
</table>

*Certified application. G. S. Good standing.*
CHAPTER XX
Certificates Issued Under Permits, 1940-1942

Following is a condensed statement giving the salient data in connection with Certificates Issued Under Permits during the biennium for the period July 1, 1940, to June 30, 1942, in the order of:
2. Book number.
3. Permit number.
4. Name of appropriator.
5. Source of water supply.
6. Purpose of appropriation.
7. Amount of water in cubic feet per second, under other conditions.
8. Date of certificate issued.

<table>
<thead>
<tr>
<th>Date</th>
<th>Certificate Number</th>
<th>Book Number</th>
<th>Permit Number</th>
<th>Appropriator Name</th>
<th>Source of Water Supply</th>
<th>Purpose of Appropriation</th>
<th>Amount of Water (cfs)</th>
<th>Date of Certificate Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940-12-30</td>
<td>80,549.2T</td>
<td>528</td>
<td>950</td>
<td>Y. C. Thacker</td>
<td>Underground Water (Las Vegas Artesian Basin)</td>
<td>Irrigation</td>
<td>320</td>
<td>8-12-40</td>
</tr>
<tr>
<td>1941-06-25</td>
<td>81,955.3T</td>
<td>528</td>
<td>950</td>
<td>Y. C. Thacker</td>
<td>Underground Water (Las Vegas Artesian Basin)</td>
<td>Irrigation</td>
<td>320</td>
<td>8-12-40</td>
</tr>
<tr>
<td>1942-01-02</td>
<td>83,061.4T</td>
<td>528</td>
<td>950</td>
<td>Y. C. Thacker</td>
<td>Underground Water (Las Vegas Artesian Basin)</td>
<td>Irrigation</td>
<td>320</td>
<td>8-12-40</td>
</tr>
</tbody>
</table>

**Protested application. G. S. Good standing.**
2452. 8. 1230. Jean A. Freston (formerly Jean A. Simonich): Tony Creek; irrigation and domestic use; 0.5244 ac; 1-20-42
2467. 8. 10469. Jean A. Freston: North Bunker, Old Home Road; fish watering; 0.5244 ac; 1-20-42
2468. 8. 7484. James H. Day; underground source through artesian well, irrigation and domestic use; 0.8336 ac; 1-30-42
2479. 8. 7806. James H. Day: underground source; irrigation and domestic use; 0.8336 ac; 1-30-42
2489. 8. 9771. N. L. Goddard, An Unlimited Partner: Milling; 0.0013 ac; 1-30-42
2491. 8. 10443. C. L. Averett; an underground source; domestic use; 0.0019 ac; 1-30-42
2492. 8. 10462. C. L. Averett: Averett Spring; stockwatering; 0.0019 ac; 1-30-42
2493. 8. 10466. C. L. Averett: Averett Springs; stockwatering; 0.0019 ac; 1-30-42
2494. 8. 10499. E. V. Honsedt and Pearl E. Honsedt: Dome Spring; stockwatering; 0.0021 ac; 1-30-42

*Pending application. O. & Good standing.
FINANCIAL STATISTICS
### REPORT OF STATE ENGINEER

#### L
- Las Vegas Artesian Basin
- Las Vegas Artesian Basin Well Data
- Las Vegas Artesian Well Measurements, September 1942
- Letter of Transmittal
- Little Humboldt River Finances
- Little Humboldt River Water Commissioners
- Little Humboldt River Water Distribution
- Lund Irrigation Company

#### M
- Mauve Springs
- McFarland Creek
- Mesquite, Irrigation Company
- Muddy River Distribution Finances
- Muddy River Water Commissioner
- Munny Creek

#### N
- Nevada Cooperative Snow Surveys, Finances
- Nevada State Board of Irrigation
- North Logan Creek

#### O
- Office Engineering and Miscellaneous Office Work
- Office Finances
- Office Personnel

#### P
- Parker-Hyatt Lake Distribution, Finances
- Parker-Hyatt Lake Water Commissioners
- Parker-Hyatt Lake Water Distribution
- Pahranagat Ground Water Possibilities
- Pershing County Water Conservation District
- Preston Irrigation Company
- Proofs of Appropriation Filed During Biennial
- Public Service Commission

#### Q
- Quality of the Water of the Humboldt River

#### R
- Reclamation Organizations

#### S
- Sevier Canal
- Snow Surveys
- Soil Conservation Districts
- Soil Conservation Service
- State Board of Registered Professional Engineers
- State Commission and Boards
- State Engineer's Office, Duties and Accomplishments
- State Irrigation District Bond Commission

### CHAPTER XXII

#### Office Finances

Statement showing receipts and disbursements of State Engineer's office accounts, and statements of disbursements of other accounts controlled by this office for the period July 1, 1940, to June 30, 1942.
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Unit</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>Description</td>
<td>Unit</td>
<td>Cost</td>
</tr>
<tr>
<td>Item 2</td>
<td>Description</td>
<td>Unit</td>
<td>Cost</td>
</tr>
<tr>
<td>Item 3</td>
<td>Description</td>
<td>Unit</td>
<td>Cost</td>
</tr>
<tr>
<td>Item 4</td>
<td>Description</td>
<td>Unit</td>
<td>Cost</td>
</tr>
<tr>
<td>Item 5</td>
<td>Description</td>
<td>Unit</td>
<td>Cost</td>
</tr>
</tbody>
</table>

Total: $X.XX

Note: Data as of [insert date].
### NEVADA COOPERATIVE STREAM MEASUREMENT, STATEMENT OF EXPENSES FROM JULY 1, 1940, TO JUNE 30, 1942

<table>
<thead>
<tr>
<th>Period Ending</th>
<th>Total Expense</th>
<th>Aggn. by Cogrs</th>
<th>Wage Expense</th>
<th>Miscellaneous Expense</th>
<th>Total Expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance July 1, 1940</td>
<td>$1,094.60</td>
<td></td>
<td></td>
<td></td>
<td>$1,094.60</td>
</tr>
<tr>
<td>July</td>
<td>$216.60</td>
<td>$26.30</td>
<td>$180.30</td>
<td></td>
<td>$523.20</td>
</tr>
<tr>
<td>August</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Expense</td>
<td>$216.60</td>
<td>$26.30</td>
<td>$180.30</td>
<td></td>
<td>$523.20</td>
</tr>
<tr>
<td>Year 1941</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1942</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$216.60</td>
<td>$26.30</td>
<td>$180.30</td>
<td></td>
<td>$523.20</td>
</tr>
</tbody>
</table>

**Note:** The table above details the expenses incurred from July 1, 1940, to June 30, 1942, under the Nevada Cooperative Stream Measurement program. The expenses include totals for each month and the cumulative expenses for the years 1941 and 1942.
### MUDDY RIVER DISTRIBUTION, STATEMENT OF EXPENSES FROM JULY 1, 1940, TO JUNE 30, 1942

<table>
<thead>
<tr>
<th>Month and year</th>
<th>1940</th>
<th>1941</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Salary</td>
<td>Miscellaneous</td>
<td>Expense</td>
</tr>
<tr>
<td>July</td>
<td>$125.00</td>
<td>$2.00</td>
<td>$127.00</td>
</tr>
<tr>
<td>August</td>
<td>45.00</td>
<td>1.00</td>
<td>46.00</td>
</tr>
<tr>
<td>September</td>
<td>45.00</td>
<td>1.00</td>
<td>46.00</td>
</tr>
<tr>
<td>October</td>
<td>45.00</td>
<td>1.00</td>
<td>46.00</td>
</tr>
<tr>
<td>November</td>
<td>45.00</td>
<td>1.00</td>
<td>46.00</td>
</tr>
<tr>
<td>December</td>
<td>45.00</td>
<td>1.00</td>
<td>46.00</td>
</tr>
<tr>
<td>Totals</td>
<td>$325.00</td>
<td>5.00</td>
<td>$330.00</td>
</tr>
</tbody>
</table>

### WHITE RIVER DISTRIBUTION, STATEMENT OF EXPENDITURES FROM JULY 1, 1940, TO JUNE 30, 1942

<table>
<thead>
<tr>
<th>Month and year</th>
<th>1940</th>
<th>1941</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Salary</td>
<td>Miscellaneous</td>
<td>Expense</td>
</tr>
<tr>
<td>July</td>
<td>$60.00</td>
<td>$1.00</td>
<td>61.00</td>
</tr>
<tr>
<td>August</td>
<td>30.00</td>
<td>0.50</td>
<td>30.50</td>
</tr>
<tr>
<td>September</td>
<td>30.00</td>
<td>0.50</td>
<td>30.50</td>
</tr>
<tr>
<td>October</td>
<td>30.00</td>
<td>0.50</td>
<td>30.50</td>
</tr>
<tr>
<td>November</td>
<td>30.00</td>
<td>0.50</td>
<td>30.50</td>
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<tr>
<td>December</td>
<td>30.00</td>
<td>0.50</td>
<td>30.50</td>
</tr>
<tr>
<td>Totals</td>
<td>$150.00</td>
<td>2.50</td>
<td>$152.50</td>
</tr>
</tbody>
</table>

### NEVADA COOPERATIVE SNOW SURVEY, STATEMENT OF DISBURSEMENTS FROM JULY 1, 1940, TO JUNE 30, 1942

<table>
<thead>
<tr>
<th>Month and year</th>
<th>1940</th>
<th>1941</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Appropriation</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>July 1, 1940</td>
<td>$112.10</td>
<td>$2.00</td>
</tr>
<tr>
<td>March</td>
<td></td>
<td>$12.00</td>
</tr>
<tr>
<td>April</td>
<td>$125.00</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>$237.10</td>
<td>$4.00</td>
</tr>
</tbody>
</table>

*Reverted to General Fund.*

### STATEMENT OF DISBURSEMENTS FROM JULY 1, 1940, TO JUNE 30, 1942

<table>
<thead>
<tr>
<th>Month and year</th>
<th>1940</th>
<th>1941</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Miscellaneous</td>
<td>Expense</td>
</tr>
<tr>
<td>July 1, 1940</td>
<td>$112.10</td>
<td>$2.00</td>
</tr>
<tr>
<td>March</td>
<td></td>
<td>$12.00</td>
</tr>
<tr>
<td>April</td>
<td>$125.00</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>$237.10</td>
<td>$4.00</td>
</tr>
</tbody>
</table>

### STATEMENT OF DISBURSEMENTS FROM JULY 1, 1940, TO JUNE 30, 1942

<table>
<thead>
<tr>
<th>Month and year</th>
<th>1940</th>
<th>1941</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Expense</td>
</tr>
<tr>
<td>July 1, 1940</td>
<td>$112.10</td>
<td>$2.00</td>
</tr>
<tr>
<td>March</td>
<td></td>
<td>$12.00</td>
</tr>
<tr>
<td>April</td>
<td>$125.00</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>$237.10</td>
<td>$4.00</td>
</tr>
</tbody>
</table>

### STATEMENT OF DISBURSEMENTS FROM JULY 1, 1940, TO JUNE 30, 1942

<table>
<thead>
<tr>
<th>Month and year</th>
<th>1940</th>
<th>1941</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Miscellaneous</td>
<td>Expense</td>
</tr>
<tr>
<td>July 1, 1940</td>
<td>$112.10</td>
<td>$2.00</td>
</tr>
<tr>
<td>March</td>
<td></td>
<td>$12.00</td>
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<td>April</td>
<td>$125.00</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>$237.10</td>
<td>$4.00</td>
</tr>
</tbody>
</table>
### Humboldt River Distribution, Statement of Expenses from July 1, 1940, to June 30, 1942

**Month and year** | **Salaries** | **Travel Expense** | **Miscellaneous** | **Total**
---|---|---|---|---
**July 1940** | $2,405.48 | $13.65 | $1,441.55 | $3,960.28
**August** | 1,654.68 | 144.25 | 1,066.97 | 3,865.80
**September** | 2,131.32 | 143.99 | 890.87 | 3,166.18
**October** | 3,240.47 | 143.48 | 730.79 | 4,114.74
**November** | 1,424.05 | 143.89 | 691.15 | 2,260.19
**December** | 1,154.38 | 134.12 | 566.13 | 2,054.63
---|---|---|---|---
**Total 1940** | $11,988.35 | $635.16 | $5,466.32 | $18,100.83

**January 1941** | $2,271.40 | $12.31 | $1,235.21 | $3,529.92
**February** | 1,615.39 | 121.42 | 1,142.16 | 3,888.97
**March** | 2,131.51 | 143.99 | 890.87 | 3,166.37
**April** | 3,240.47 | 143.48 | 730.79 | 4,114.74
**May** | 1,424.05 | 143.89 | 691.15 | 2,260.19
**June** | 1,154.38 | 134.12 | 566.13 | 2,054.63
---|---|---|---|---
**Total 1941** | $11,988.35 | $635.16 | $5,466.32 | $18,100.83

**January 1942** | $2,271.40 | $12.31 | $1,235.21 | $3,529.92
**February** | 1,615.39 | 121.42 | 1,142.16 | 3,888.97
**March** | 2,131.51 | 143.99 | 890.87 | 3,166.37
**April** | 3,240.47 | 143.48 | 730.79 | 4,114.74
**May** | 1,424.05 | 143.89 | 691.15 | 2,260.19
**June** | 1,154.38 | 134.12 | 566.13 | 2,054.63
---|---|---|---|---
**Total 1942** | $11,988.35 | $635.16 | $5,466.32 | $18,100.83

**Total 1940 to 1942** | $36,964.95 | $1,905.58 | $16,399.96 | $55,260.59

**Note:** Of this amount only $15,916.10 was an expenditure. $2,044.72 was a transfer made to correct an error of double reimbursement of travel costs in the Humboldt River Distribution Fund.
### Report of State Engineer

**Statement of Receipts and Disbursements, July 1, 1940, to June 30, 1942**

<table>
<thead>
<tr>
<th>Month and Year</th>
<th>Salaries</th>
<th>Travel Expense</th>
<th>Miscellaneous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1940</td>
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<td>$1,108.50</td>
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<tr>
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<td>$1,140.30</td>
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<tr>
<td>September</td>
<td>$1,151.80</td>
<td></td>
<td></td>
<td>$1,151.80</td>
</tr>
<tr>
<td>October</td>
<td>$1,132.90</td>
<td></td>
<td></td>
<td>$1,132.90</td>
</tr>
<tr>
<td>November</td>
<td>$1,115.70</td>
<td></td>
<td></td>
<td>$1,115.70</td>
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<tr>
<td>December</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
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<td>$4,478.50</td>
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**LITTLE HUMBOLDT RIVER DISTRIBUTION EXPENSES—CONTINUED.**

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<th>Month and Year</th>
<th>Salaries</th>
<th>Travel Expense</th>
<th>Miscellaneous</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>January</td>
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<td>$1,108.50</td>
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<tr>
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<tr>
<td>March</td>
<td>$1,151.80</td>
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<td>$1,151.80</td>
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<tr>
<td>April</td>
<td>$1,132.90</td>
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<td>$1,132.90</td>
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<tr>
<td>May</td>
<td>$1,115.70</td>
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<td>$1,115.70</td>
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<tr>
<td>June</td>
<td>$1,108.50</td>
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<td>$1,108.50</td>
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<tr>
<td><strong>Totals</strong></td>
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<td>$4,478.50</td>
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**CURRENT AND DUCKWATER DISTRIBUTION, STATEMENT OF EXPENSES FROM JUNE 1, 1940, TO JUNE 30, 1942**

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<thead>
<tr>
<th>Month and Year</th>
<th>Salaries</th>
<th>Travel Expense</th>
<th>Miscellaneous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1940</td>
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<td></td>
<td>$1,108.50</td>
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<tr>
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<td>$1,151.80</td>
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<tr>
<td>October</td>
<td>$1,132.90</td>
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<td>$1,132.90</td>
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<tr>
<td>November</td>
<td>$1,115.70</td>
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<td>$1,115.70</td>
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<tr>
<td>December</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>$4,478.50</td>
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<td></td>
<td>$4,478.50</td>
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**PAMERANAGAT LAKE DISTRIBUTION, STATEMENT OF EXPENSES FROM JUNE 1, 1940, TO JUNE 30, 1942**

<table>
<thead>
<tr>
<th>Month and Year</th>
<th>Salaries</th>
<th>Travel Expense</th>
<th>Miscellaneous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1940</td>
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<td>$1,108.50</td>
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<tr>
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<tr>
<td>September</td>
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<td>$1,132.90</td>
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<tr>
<td>November</td>
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<tr>
<td>December</td>
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<td>$1,108.50</td>
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<tr>
<td><strong>Totals</strong></td>
<td>$4,478.50</td>
<td></td>
<td></td>
<td>$4,478.50</td>
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</table>

### Report of State Engineer

**Little Humboldt River Distribution Funds—Continued.**

<table>
<thead>
<tr>
<th>Month and Year</th>
<th>Salaries</th>
<th>Travel Expense</th>
<th>Miscellaneous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
</tr>
<tr>
<td>February</td>
<td>$1,140.30</td>
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<td>$1,140.30</td>
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<tr>
<td>March</td>
<td>$1,151.80</td>
<td></td>
<td></td>
<td>$1,151.80</td>
</tr>
<tr>
<td>April</td>
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<td></td>
<td>$1,132.90</td>
</tr>
<tr>
<td>May</td>
<td>$1,115.70</td>
<td></td>
<td></td>
<td>$1,115.70</td>
</tr>
<tr>
<td>June</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
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<tr>
<td><strong>Totals</strong></td>
<td>$4,478.50</td>
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<td>$4,478.50</td>
</tr>
</tbody>
</table>

### Report of State Engineer

**Little Humboldt River Distribution Funds—Continued.**

<table>
<thead>
<tr>
<th>Month and Year</th>
<th>Salaries</th>
<th>Travel Expense</th>
<th>Miscellaneous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
</tr>
<tr>
<td>February</td>
<td>$1,140.30</td>
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<tr>
<td>March</td>
<td>$1,151.80</td>
<td></td>
<td></td>
<td>$1,151.80</td>
</tr>
<tr>
<td>April</td>
<td>$1,132.90</td>
<td></td>
<td></td>
<td>$1,132.90</td>
</tr>
<tr>
<td>May</td>
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<tr>
<td>June</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>$4,478.50</td>
<td></td>
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<td>$4,478.50</td>
</tr>
</tbody>
</table>

**Little Humboldt River Distribution Funds—Continued.**

<table>
<thead>
<tr>
<th>Month and Year</th>
<th>Salaries</th>
<th>Travel Expense</th>
<th>Miscellaneous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
</tr>
<tr>
<td>February</td>
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<td></td>
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<td>$1,115.70</td>
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<tr>
<td>June</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>$4,478.50</td>
<td></td>
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<td>$4,478.50</td>
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</table>

### Report of State Engineer

**Little Humboldt River Distribution Funds—Continued.**

<table>
<thead>
<tr>
<th>Month and Year</th>
<th>Salaries</th>
<th>Travel Expense</th>
<th>Miscellaneous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
</tr>
<tr>
<td>February</td>
<td>$1,140.30</td>
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<td>$1,140.30</td>
</tr>
<tr>
<td>March</td>
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<td></td>
<td></td>
<td>$1,151.80</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>$1,132.90</td>
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<td>$1,115.70</td>
</tr>
<tr>
<td>June</td>
<td>$1,108.50</td>
<td></td>
<td></td>
<td>$1,108.50</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>$4,478.50</td>
<td></td>
<td></td>
<td>$4,478.50</td>
</tr>
<tr>
<td>Month and Year</td>
<td>Salaries</td>
<td>Miscellaneous</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>----------</td>
<td>---------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>July 1942</td>
<td>$125.00</td>
<td>$2.50</td>
<td>$127.50</td>
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<tr>
<td>August</td>
<td>$105.00</td>
<td>$1.00</td>
<td>$106.00</td>
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<tr>
<td>September</td>
<td>$95.00</td>
<td>$1.00</td>
<td>$96.00</td>
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<td>October</td>
<td>$85.00</td>
<td>$1.00</td>
<td>$86.00</td>
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<tr>
<td>November</td>
<td>$75.00</td>
<td>$1.00</td>
<td>$76.00</td>
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</table>

**Totals:** $533.50

**Salaries:** $533.50

**Miscellaneous:** $5.50

**Total:** $539.00

<table>
<thead>
<tr>
<th>Month and Year</th>
<th>Salaries</th>
<th>Miscellaneous</th>
<th>Total</th>
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<td>January 1944</td>
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<td>February</td>
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<td>May</td>
<td>$11.00</td>
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<td>$11.00</td>
</tr>
<tr>
<td>June</td>
<td>$11.00</td>
<td></td>
<td>$11.00</td>
</tr>
</tbody>
</table>

**Totals:** $66.00

**Salaries:** $66.00

**Miscellaneous:** $6.00

**Total:** $72.00

<table>
<thead>
<tr>
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<th>Salaries</th>
<th>Miscellaneous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1945</td>
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<td>$61.50</td>
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</tr>
<tr>
<td>October</td>
<td>$10.00</td>
<td>$1.00</td>
<td>$11.00</td>
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</table>

**Totals:** $130.00

**Salaries:** $130.00

**Miscellaneous:** $5.00

**Total:** $135.00

**NEVADA COOPERATIVE SNOW SURVEY, STATEMENT OF DISBURSEMENTS FROM JULY 1, 1940, TO JUNE 30, 1942**

<table>
<thead>
<tr>
<th>Month and Year</th>
<th>Appropriation</th>
<th>Miscellaneous</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>$500.00</td>
</tr>
<tr>
<td>March 1941</td>
<td>$147.50</td>
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<td>$149.00</td>
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<tr>
<td>April</td>
<td>$85.00</td>
<td>$1.00</td>
<td>$86.00</td>
</tr>
<tr>
<td>Totals</td>
<td>$232.50</td>
<td>$2.50</td>
<td>$235.00</td>
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</table>

**Totals:** $235.00

**STATEMENT OF DISBURSEMENTS FROM JULY 1, 1941, TO JUNE 30, 1942**

<table>
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<tr>
<th>Month and Year</th>
<th>Appropriation</th>
<th>Miscellaneous</th>
<th>Total</th>
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<tr>
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<td>$85.00</td>
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<td>$86.00</td>
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<tr>
<td>September</td>
<td>$20.00</td>
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<tr>
<td>October</td>
<td>$10.00</td>
<td>$1.00</td>
<td>$11.00</td>
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</table>

**Totals:** $252.00

**Salaries:** $252.00

**Miscellaneous:** $3.00

**Total:** $255.00
<table>
<thead>
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<th>Amount</th>
<th>Purpose</th>
<th>Balance</th>
<th>Amount</th>
<th>Purpose</th>
<th>Balance</th>
</tr>
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<td>$250.00</td>
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<tr>
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<tr>
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**CHAPTER XXII**

Office Finances

Statement showing receipts and disbursements of State Engineer's office accounts, and statements of disbursements of other accounts controlled by this office for the period July 1, 1940, to June 30, 1941.
FINANCIAL STATISTICS
2456. S. 1350. Jean A. Frenties (formerly Jean A. Simonek): Tong Creek: irrigation and domestic. 0.5244 1-20-42
2457. S. 1040. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2460. S. 1360. Jean A. Frenties: Tong Creek: flood wearing. 0.5244 1-20-42
2461. S. 1350. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2462. S. 1360. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2463. S. 1350. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2464. S. 1360. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2465. S. 1350. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2466. S. 1360. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2467. S. 1350. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2468. S. 1360. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2469. S. 1350. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2470. S. 1360. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2471. S. 1350. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2472. S. 1360. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2473. S. 1350. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2474. S. 1360. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2475. S. 1350. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42
2476. S. 1360. Jean A. Frenties: Tong Creek: irrigation and domestic. 0.5244 1-20-42

*Pending application. O.S. Good standing.
STATE OF NEVADA

BIENNIAL REPORT

OF THE

STATE ENGINEER

For the Period
July 1, 1940, to June 30, 1942, Inclusive

ALFRED MERRITT SMITH
State Engineer of Nevada

CARSON CITY, NEVADA
STATE PRINTING OFFICE
JOE FARRINGTON, SUPERINTENDENT
1942