Water Resources Survey

Part I:
HISTORY OF LAND AND WATER USE ON IRRIGATED AREAS

and

Part II:
MAPS SHOWING IRRIGATED AREAS IN COLORS DESIGNATING THE SOURCES OF SUPPLY

Broadwater County, Montana

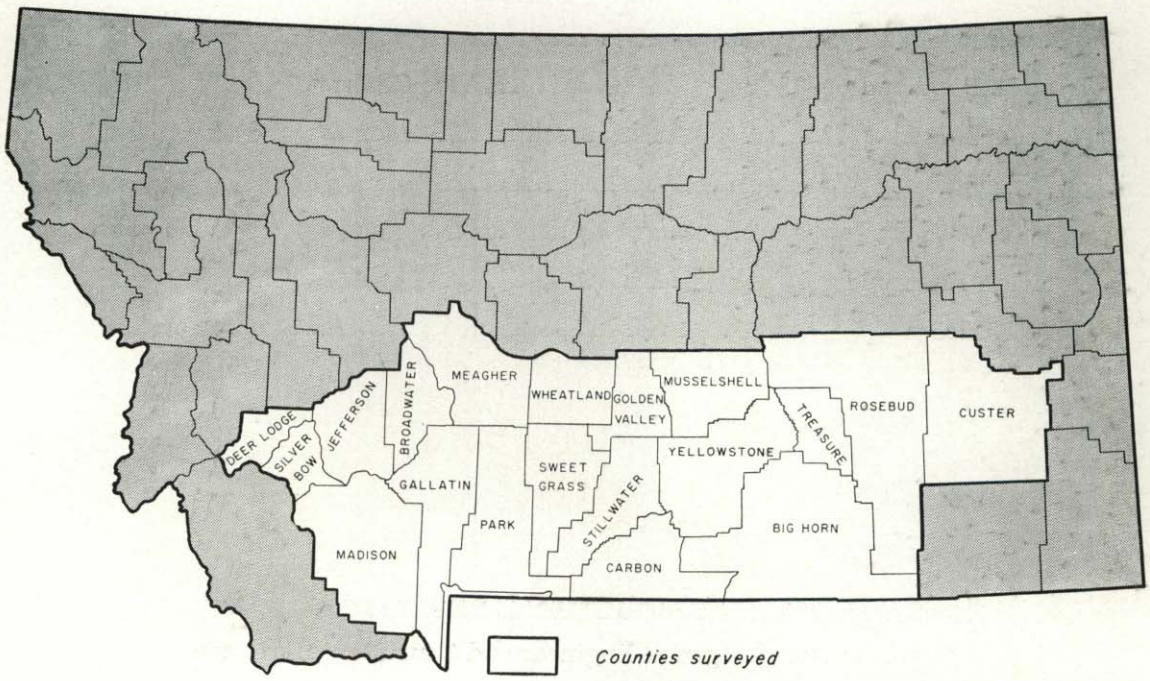
Published by
STATE ENGINEER'S OFFICE
Helena, Montana, June, 1956

WATER RESOURCES SURVEY

BROADWATER COUNTY MONTANA

Part I

History of Land and Water Use
on Irrigated Areas



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MONTANA STATE AGRICULTURAL EXPERIMENT STATION

O. W. Monson, Irrigation Engineer and Consultant, Bozeman

June, 1956

Honorable J. Hugo Aronson
Governor of Montana
Capitol Building
Helena, Montana

Dear Governor Aronson:

Submitted herewith is a consolidated report on the Water Resources Survey of Broadwater County, Montana.

This work is being carried on with funds made available to the State Engineer by the 34th Legislative Session, 1955, and in cooperation with the State Water Conservation Board and the Montana State Agricultural Experiment Station.

The report is divided into two parts. Part I consists of history of land and water use, irrigated lands, water rights, etc., and Part II contains the township maps in the county showing in color the lands irrigated from each source or canal system.

Work has been completed and reports are now available for the following counties: Big Horn, Broadwater, Carbon, Custer, Deer Lodge, Gallatin, Golden Valley, Jefferson, Madison, Meagher, Musselshell, Park, Rosebud, Silver Bow, Stillwater, Sweet Grass, Treasure, Wheatland and Yellowstone.

The office files contain minute descriptions and details of each individual water right, water and land use, etc., which are too voluminous to be included herein. These office files are available for inspection to those who are interested.

The historical data on water rights contained in this report can never become obsolete. If new information is added from time to time as new developments occur, the records can always be kept current and up to date.

Respectfully submitted,
FRED E. BUCK, State Engineer

ACKNOWLEDGMENTS

A survey and study of water resources involves many phases of both field and office work in order to gather the necessary data to make the information complete and comprehensive. Appreciation of the splendid cooperation of various agencies and individuals who gave their time and assistance in aiding us in gathering the data for the preparation of this report is hereby acknowledged.

Broadwater County Officials

Edward E. Heuer, Commissioner — George H. Hensley, Commissioner

Michael Massa, Commissioner

H. M. Sperry, Clerk of District Court

Ann M. Stiner, Clerk and Recorder — Frank Holloway, Assessor

Robert G. Dunbar
Historical Data ... "Foreword" ... Prof. of History, Montana State College

"History and Organization" ... Inventory of the County Archives of Montana

R. A. Dightman ... "Climate" ... State Climatologist, U. S. Weather Bureau

David R. Cawlfield ... "Soils" ... State Soil Scientist, S.C.S.

Stanley W. Howard ... "Crops and Livestock" ... County Agent

Frank Stermitz
"Stream Gaging Stations" ... District Geologist, U.S.G.S.

U. M. Sahinen ... "Mining" ... Chief of Information and Service, Montana School of Mines

Clayton E. Ogle
"Soil Conservation Districts" ... Work Unit Conservationist, S.C.S.

G. E. Greene ... "Helena National Forest" ... District Ranger, U. S. Forest Service

Hugh Whitehead ... Ditch Commissioner, Broadwater-Missouri Diversion Project

Harry Stanley ... Unit Manager, Crow Creek Pump Unit

J. G. Rains ... Secretary, Montana Ditch Company

The State Engineer's Office, Water Resources Survey, hereby expresses sincere appreciation to the many ranchers, farmers and stockmen who have given their helpful cooperation in this survey.

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FOREWORD

MONTANA'S WATER RIGHT PROBLEM

Our concern over surface water rights in Montana is nearly a century old. When the first Territorial Legislature, meeting in Bannack, adopted the common law of England on January 11, 1865, the Territory's legal profession assumed that it had adopted the Doctrine of Riparian Rights. This doctrine had evolved in England and in eastern United States where the annual rainfall is generally more than twenty inches. It gave the owners of land bordering a stream the right to have that stream flow past their land undiminished in quantity and unaltered in quality and to use it for household and livestock purposes. Since the law restricted the use of the water to riparian owners and forbade them to reduce appreciably the stream flow, the early miners and ranchers in Montana favored the Doctrine of Prior Appropriation which permitted diversion and diminution of the streams. Consequently, the next day the legislature enacted a law which permitted diversion by both riparian and non-riparian owners. Whether or not this action provided Montana with one or two definitions of water rights was not settled until 1921 when the Montana Supreme Court in the Mettler vs. Ames Realty Co. Case declared the Doctrine of Prior Appropriation to be the valid Montana water right law. "Our conclusion," it said, "is that the common law doctrine of riparian rights has never prevailed in Montana since the enactment of the Bannack Statutes in 1865 and that it is unsuited to the conditions here . . ."

The appropriation right which originated in California was used by the forty-niners to divert water from the streams to placer mine gold. They applied to the water the same rules that they applied to their mining claims—first in time, first in right and limitation of the right by beneficial use. Those who came to the Montana gulches brought with them these rules, applying them to agriculture as well as to mining.

The main points of consideration under the Doctrine of Prior Appropriation are:

1. The use of water may be acquired by both riparian and non-riparian landowners.

2. It allows diversion of water regardless of the reduction of the water supply in the stream.

3. The value of the right is determined by the priority of the appropriation; i.e., first in time is first in right.

4. The right is limited to the use of the water. Stream waters in Montana are the property of the State and the appropriator acquires only a right to their use. Moreover, this use must be beneficial.

5. A right to the use of water is considered real property only in the sense that it can be bought or sold; its owner may not be deprived of it except by due process of law.

The State Legislature has provided methods for the acquisition, determination of priority and administration of the right. No right may be acquired on a stream without diver-

sion of water and its application to a beneficial use. On unadjudicated streams, the Statutes stipulate that the diversion must be preceded by posting a notice at the point of intended diversion and by filing a copy of it within 20 days in the County Clerk's Office of the county in which the appropriation is being made. Construction of the means of diversion must begin within 40 days of the posting and continue with reasonable diligence to completion. However, the Montana Supreme Court has ruled that an appropriator who fails to comply with the Statutes may still acquire a right merely by digging a ditch and putting the water to beneficial use.

To obtain a water right on an adjudicated stream, one must petition the District Court having jurisdiction over that stream for permission to make an appropriation. If the other appropriators do not object, the court gives its consent and issues a supplementary decree granting the right subject to the rights of the prior appropriators.

Inasmuch as the Montana laws do not require water users to make official records of the completion of their appropriations, it becomes advisable, as soon as the demand for the waters of a stream becomes greater than its supply, to determine the rights and priorities of each user by means of an adjudication or water right suit. This action may be initiated by one or more of the appropriators who may make all the other claimants parties to the suit. Thereupon the Judge of the District Court examines the claims of all the claimants and issues a decree establishing priority of the right of each water user. The court decree becomes in effect the deed of the appropriator to his water right.

Whenever scarcity of water in an adjudicated stream requires an allocation of the supply according to the priority of rights, the Judge upon petition of the owners of at least 15 per cent of the water rights affected must appoint a water commissioner to distribute the water. These rules were formulated to protect the rights. However, they constitute a system of local regulation which imposes such a limited control upon the individual's use of the water that they often fail to protect him.

The recordings of appropriations in local courthouses provides an incomplete record of the water rights on unadjudicated streams. In fact, the county records often bear little relation to the existing situation. Since the law places no restriction on the number and extent of the filings which may be made on an unadjudicated stream, the total amount of water claimed is frequently many times the available flow. There are numerous examples of streams becoming over appropriated. Once six appropriators each claimed all of the water in Lyman Creek near Bozeman. Before the adjudication of claims to the waters of Prickly Pear Creek, 68 parties claimed thirty times its average flow of 50 cfs. Today, the Big Hole River with an average flow of 1,131 cfs has filings totaling 173,912 cfs. A person is unable to distinguish in the county courthouses the perfected rights from the unperfected ones since the law requires no official recordation of the completion of an appropriation. Recognition by the courts of unrecorded appropriations adds to the incompleteness of these records. To further complicate the situation, appropriators have used different names for the same stream in their filings. In Montana many of the streams flow through several counties, consequently, water right filings on these inter-county streams are found distributed in two or more county courthouses. Anyone desirous of determining appropriations on a certain river or

creek finds it difficult and expensive to examine records in several places. In addition, the records are sometimes scattered because the original nine counties of 1865 have now increased to 56. As the original counties have been divided and sub-divided, the water right filings have frequently not been transcribed from the records of one county to the other. Thus, the record of an early appropriation in what is at present Powell County may be found in the courthouse of the original Deer Lodge County.

It can be readily seen that this system of recording offers little protection to rights in the use of water until they are determined by an adjudication. In other words, an appropriator does not gain a clear title to his water right until after adjudication and then the title may not be clear because the Montana system of determining rights is also faulty. In the first place, adjudications are costly, sometimes very costly when they are prolonged for years. It is estimated that litigation over the Beaverhead River, which has lasted more than twenty years, has cost the residents of the valley nearly a half a million dollars. In the second place, unless the court seeks the advice of a competent irrigation engineer, the adjudication may be based upon inaccurate evidence. In the third place, if some claimant has been inadvertently left out of the action, it is not final and may be reopened for consideration by the aggrieved party. Another difficulty arises in determining the ownership of a water right when land under an adjudicated stream becomes sub-divided in later years and the water not proportioned to the land by deed or otherwise. There is no provision made by law requiring the recording of specific water right ownerships on deeds and abstracts.

There is no provision of law for the distribution of water from an unadjudicated stream. Administration of water on an adjudicated stream is done by the District Court but it has its drawbacks. The appointment of a water commissioner is often delayed until the shortage of water is acute and the court frequently finds it difficult to obtain a competent man for a position so temporary. The present administration of adjudicated streams which cross the county boundaries of judicial districts creates problems. Many of the water decrees stipulate headgates and measuring devices for proper water distribution, but in many instances the stipulation is not enforced, causing disagreement among the water users.

Since a water right is considered real property and may be bought and sold, the nature of water requires certain limitations in its use. One of the major faults affecting a stream after an adjudication is the failure of the District Court to have some definite control over the transfer of water rights from their designated place of use. The sale and leasing of water is becoming a common practice on many adjudicated streams and has created serious complications. By changing the water use to a different location, many of the remaining rights along the stream are disrupted, resulting in a complete breakdown of the purpose intended by the adjudication. To correct this situation, legal action must be initiated by the injured parties as it is their responsibility and not the Court's.

At one time or another all of the other Western Reclamation States have used similar methods of local regulation of water rights. Now all of them except Montana have more or less abandoned these practices and replaced them by a system of centralized state control such as the one adopted by the State of Wyoming. The key characteristics of the Wyoming system is the registration of both the initiation and completion of an appropriation in

the State Engineer's Office, the determination of rights and administration by a State Board of Control headed by the State Engineer. These methods give the Wyoming water users titles to the use of water as definite and as defensible as those which they have to their land.

When Montana began to negotiate the Yellowstone River Compact with Wyoming and North Dakota in 1939, the need for some definite information concerning our water and its use became apparent. The Legislature in 1939 passed a Bill (Ch. 185) authorizing the collection of data pertaining to our uses of water and it is under this authority that the Water Resources Survey is being carried on. The purpose of this survey is six fold: (1) to catalogue by counties, in the office of the State Engineer, all recorded, appropriated and decreed water rights including use rights as they are found; (2) to map the lands upon which the water is being used; (3) to provide the public with pertinent water right information on any stream, thereby assisting them in any transactions where water is involved; (4) to help State and Federal Agencies in pertinent matters; (5) to eliminate unnecessary court action in water right disputes; (6) and to have a complete inventory of our perfected water rights in case we need to defend these rights against the encroachments of lower states.

In conclusion, some mention should be made regarding the enactment of laws for the orderly development of our ground water supplies. Delay in the enactment of these laws by other states has contributed to the over-development of these valuable natural resources. This in turn has caused financial losses and innumerable legal difficulties. A knowledge of the ground water hydrology with an established ground water code in Montana would protect the interests of those who have already developed ground water supplies as well as protect those who may drill wells in the future.

METHOD OF SURVEY

Water Resources data contained in Part I and Part II of this report are obtained from courthouse records in conjunction with individual contacts of land-ownership. A survey of this type involves extensive detailed work in both the office and field to compile a comprehensive inventory of water rights as they apply to land and other uses.

The material of foremost importance used in conducting the survey is as follows: From the files of the county courthouse the data required includes; land-ownership, water right records (decrees and appropriations), articles of incorporations of ditch companies and any other legal papers in regard to the distribution and use of water. Deed records of land ownership are reviewed and abstracts are checked for water right information when available.

Another important part of the survey is complete aerial photo coverage of each county in order to map accurately the land areas of water use. On the aerial photographs, section and township corner locations are determined by the photogrametric system, based on Government Land Office survey plats, plane-table surveys, county maps, and by "on the spot" location during the field survey. Shown on the aerial photograph is all the information pertaining to the location of the irrigation system with irrigated and potentially irrigable land areas under private and incorporated ditches distinguished by different colors.

Field forms are prepared for each land-owner, showing the name of the owner and operator, photo index number, a plat defining the ownership boundary, type of irrigation system and source of water supply and the total acreage irrigated and irrigable under each. All of the appropriated and decreed water rights that apply to each ownership by the description of intended place of use are listed on the field form. During the field survey, all water rights listed on the field form are verified with the land-owner. Whenever any doubt or complication exists in the use of a water right, deed records of the land are checked to determine the absolute right of use.

So far as known, this is the first survey of its kind ever attempted in the United States. The value of the work has become well substantiated in the counties completed to date by giving Montana its first accurate and verified information concerning its water rights and their use. New development of land for irrigation purposes by State and Federal Agencies is not within the scope of this report. The facts presented are as found at the time of completing each survey and provide the items and figures from which a detailed analysis of water and land use can be made.

The historical data contained in these reports can never become obsolete. If new information is added from time to time as new developments occur the records can always be kept current and up-to-date.

HISTORY AND ORGANIZATION

On March 1, 1897, Broadwater County was formed by an act of the State Legislature from portions of Meagher and Jefferson counties. Located in west central Montana, Broadwater is one of the younger counties in the State. The famous Missouri River passes through the center of the county and its valley reaches from the southern to northern boundaries a distance of about 50 miles in length. The Elkhorn Mountains on the west and the Big Belt Mountains on the north and east form a natural pattern for the county boundary lines. Between these mountain ranges lies the Missouri River Valley with some of the finest farming land in Montana. This area is favored by numerous natural drainages, with an abundance of water supplied from many mountain streams, springs and the Missouri River itself, for irrigation in the principal parts of the Valley.

Among the most prominent early day settlers in the county were Job Thompson, Thomas Neild, Patrick Gurnett, Mark Shelly, Joseph Kirscher, Flavius Keene, James Kannouse, J. R. Marks, Jacob Titman, W. E. Tierney, D. T. Williams, A. B. Cook and John E. O'Conner. Most of these men were engaged in cattle raising and farming, although many others not mentioned here had interests in mining and were equally important in the early development of Broadwater County. Mining in the early sixties was perhaps more actively engaged in than farming and cattle raising, but today agriculture is the stable industry.

Townsend, the county seat and principal town, has existed since 1883. At that time, the old town of Centerville, a stage-stop on the Missouri River, was moved to the present location of Townsend on the route of the Northern Pacific Railroad. Thereafter, the town of Centerville ceased to exist and the new town was named Townsend after an official of the railroad. With the arrival of the railroad in 1883, the town grew rapidly because of its location in the center of the mining, farming and stock raising area. Today, Townsend, with a population of about 1,300, is the educational, financial and social center of the county. The other towns in the county are Toston, Radersburg, Lombard and Winston.

Toston, a small town on the Missouri River, eleven miles southeast of Townsend, was once a shipping point for the mining camp of Radersburg. Its population today, is less than 100 people, with a Post Office, two stores and two restaurants serving the few residents of the outlying community.

One of the early mining settlements of the county, Radersburg, is located twenty miles southwest of Townsend. Radersburg was originally the county seat of Jefferson County, but it became a part of Broadwater County in the land-transfer from Jefferson to create Broadwater County in 1897. It was named in honor of Rueben Rader, one of the early pioneers of the district. Mr. Rader also had the honor of being the first county commissioner of Jefferson County. Once a flourishing mining town, Radersburg is now nearly deserted.

In the early days there was considerable placer mining along the banks of the streams draining the east slope of the Elkhorn Mountains extending to Crow Creek. However, Radersburg's principal mining industry has been its quartz mines. John A. Keating, a native of England, discovered the first quartz lodes in the Radersburg District. The best known of these mines were the Leviathan, Ohio, Congress and the Keating which was the most profitable and best producer of them all. In 1886, a smelter was built at Toston to process ore from the Radersburg Mining District, but as most of the ore contained a high iron content, it was shipped to the smelters at Butte and East Helena.

The town of Winston, eleven miles northwest of Townsend, was named for the Winston Brothers who migrated to Montana from Virginia after the Civil War. It became another shipping point for the mining industry in the vicinity nearby. At the present time, Winston is little more than a roadside stop with very few inhabitants.

Another "boom town," now non-existent in Broadwater County, was Diamond City. With the discovery of gold in Confederate Gulch in 1864, hundreds of miners thronged to this rich new field. At its peak, the population of Diamond City was 2,000 and the total population of the entire gulch 5,000. Amateur prospectors who did not know how to discover gold were known as "pilgrims." It is said that one of these "pilgrims" naively asked an old-timer to suggest where he could "do some digging." The older man, in true frontier style, pointed out the most unpromising spot in sight and suggested, "try that bar up there; you might find something." The novice followed his advice and staked his claim on the Montana Bar, placer ground covering less than two acres that proved to be one of the richest spots ever found.

Confederate Gulch has now returned to its natural state and very little remains of what was Diamond City. There were other more famous and larger gold fields which have produced more gold, but Confederate Gulch for the size of the area worked, produced more gold than any other gulch in the world.

Most of the early historical data on Broadwater County noted in this brief history occurred in Jefferson and Meagher counties before the county was created in 1897. Some local historians claimed the county was named in honor of Colonel Charles A. Broadwater, a leading citizen of the pioneer days; others believe it was so named because the broad Missouri River flows through the county.

The area of Broadwater County totals 1,243 square miles, ranking it 50th among the 56 counties in Montana, and its population according to the 1950 census is 2,922 persons.

TRANSPORTATION

Broadwater County is served by two major highways, one is U. S. Highway 10 North which traverses the county in a south to northwest direction for a distance of about 42 miles. This highway starts at the junction with U. S. Highway 10 South, near the Jefferson River at the south boundary of the county, three miles west of the town of Three Forks. U. S. Highway 10N travels north through the towns of Toston, Townsend and Winston and somewhat parallels the Missouri River in passing through the county. Beginning at the same junction, U. S. Highway 10S follows along the Jefferson River for a distance of six miles in a southwesterly direction before it leaves the county.

Another main highway is Montana State Highway No. 6 which starts at Townsend and courses east along Deep Creek Canyon to the county line at the top of the divide between Broadwater and Meagher Counties, a distance of about 25 miles.

There are two improved paved county roads within the county, the first one leaves U. S. Highway 10 North at Toston and courses west to Radersburg, where a graded road con-

tinues on from there to join the Boulder Valley Road in Jefferson County. The other paved road starts from Montana State Highway No. 6 a few miles east of Townsend and continues north a distance of 12 miles. From that point it becomes a graded road and continues in a northwest direction until it leaves the county on the east side of Canyon Ferry Lake.

Places of interest along these roads are: Radersburg, an old mining settlement west of Toston; Confederate Gulch northeast of Townsend, which is an old mining camp and site of the famous placer mining ground, The Montana Bar; and Canyon Ferry Lake, a storage reservoir, that can be seen from the right side of U. S. Highway 10 North in traveling from Townsend to Helena. A herd of wild antelope, which is protected by the State Fish and Game Department, can be seen along Highway 10N between Townsend and Winston.

The two railroads which serve the county are the Northern Pacific Railway and the main line of the Chicago, Milwaukee, St. Paul and Pacific Railroad. The Northern Pacific Railway enters the county at Lombard and follows the Missouri River to Toston, then it follows almost parallel to U. S. Highway 10 North where they both leave the county east of Louisville (Clasoil). The Chicago, Milwaukee, St. Paul and Pacific Railroad enters the county just east of Lombard and where it crosses Sixteen Mile Creek. Near Lombard it crosses the Missouri River and follows south on the west bank of the river to a point near the mouth of the Madison River where it leaves the county.

The county is served by two bus lines; the Northland Greyhound Lines, which follows routes of U. S. Highways 10N and 10S and the Canyon Line, a local concern that runs between Helena and White Sulphur Springs.

Numerous motor freight truck lines pass through the county, but the most important is the Consolidated Freightways.

The nearest airport facilities are located at Helena, a distance of about 34 miles from Townsend.

CLIMATE

From a climatic point of view, the main topographic feature of Broadwater County is the valley of the Missouri River, which traverses the county from near Three Forks to Canyon Ferry. Near Three Forks the river is at an elevation of about 4,100 feet above sea level, from where it gradually falls to about the 3,800-foot elevation near Townsend. From near Toston to Canyon Ferry the river valley is fairly wide and level. To the west of the valley are the foothills and side ranges of the main chain of the Continental Divide. To the east, the rise from the valley to the Big Belt Range is more abrupt, especially in the northern part of the county. Many small streams from the mountain areas flow into the Missouri. Almost all the water impounded by the Canyon Ferry Dam lies within the county and when the reservoir is at maximum capacity the backwater reaches nearly to the city limits of Townsend.

As of the date of this summary, there is only one full climatological station in operation in the county. It was established eleven miles east-southeast of Townsend in June 1935

and about three years later it was moved to a new location two miles west. The station remained in operation at the latter site until June 1947, then the equipment was relocated in Townsend. Due to differences in elevation and terrain, records unfortunately are only roughly comparable between the city and county observation sites. Continuous temperature and precipitation records have been made since July 1937, at Trident, just across the Missouri River from Broadwater County near Three Forks. The longest continuous record for the area was made at the old Canyon Ferry Dam site from January 1899, through February 1950, when the station was closed and moved to its present site at the new Canyon Ferry Dam.

Stations were maintained at Dry Creek and Toston until they were closed in 1912 and 1909. The records for these stations, as well as those for the recording rain gages at Townsend 12 ENE and Toston 2 SW, are available at the U. S. Weather Bureau State Climatologist's Office in Helena.

Broadwater County's climate follows a pattern similar to that of other Montana counties along the east slopes of the Continental Divide. About three-fourths of the usual year's precipitation falls during the six months April through September. May and June are normally the wettest months, totals varying from a long-term average of 4.15 inches for those two months at Canyon Ferry to 5.07 inches at Trident. There normally is a second precipitation maximum each year in September, but it is not nearly as pronounced as the May-June period. The winter months are normally the driest in the valleys, but the mountains usually accumulate considerable snow during the December-March period. Valley snowfall is rather light, with a yearly average of only a little over 27 inches at Canyon Ferry and Trident.

Spring is usually cloudy with comparatively frequent rains, but snow has been observed as late as early in May in some years. After the middle of June rains are not so frequent and the rain falls mostly in afternoon showers or thundershowers. During late summer and early fall the days are mostly clear and warm and nights are comfortably cool. The usual afternoon late-summer low relative humidity is very helpful in curing hay and ripening grains. Precise data are not available on the length of growing season, but in the valleys data from nearby station indicate usual freeze-free seasons of about 110 to 120 days. In the higher elevations away from the valleys the season is shorter. Aside from an occasional heavy thunderstorm accompanied infrequently by hail, severe storms seldom occur. Extreme high winds and tornadoes are almost unknown.

During winter seasons there usually are a few invasions of cold Arctic air when temperatures can drop to well below zero. The severe cold ordinarily continues only for a few days, but some cold waves have persisted for a week or more. Snow and blowing snow sometimes accompany the cold-air invasions, but this type of storm condition usually persists only for two or three days.

Listed below is a condensed summary of precipitation and temperature data at the Townsend stations, and at those stations located near Broadwater County boundaries.

Stations	Years of Record	Average Annual Temperature	Highest	Lowest	Average Annual Precipitation	Wettest Year	Driest Year
Townsend	8	42.8*	100	-32	10.80*	14.74(1948)	8.63(1953)
Townsend 9 ESE	13	42.9#	103	-43	11.53#	18.70(1941)	9.32(1945)
Canyon Ferry	51	43.9†	104	-41	11.40†	17.43(1947)	6.01(1919)
Canyon Ferry Dam	7	43.6**	98	-33	12.44**	15.91(1955)	10.74(1950)
Trident	19	45.4%	105	-36	13.21%	17.24(1941)	9.39(1954)

Periods of Records: (*1948-1955); (#1935-1947); (†1931-1949); (%1937-1952); (**1949-1955).

SOILS

Broadwater County covers an intermountain basin between the Belt and Elkhorn Mountains in central Montana. The Missouri River flows north through this basin and forms the county's southern boundary.

The character of soils is determined by parent material, topography, vegetation and climate. About 45% of Broadwater County is included in the Belt and Elkhorn Mountains. The remainder of the area consists of outwash materials of Tertiary age and recent Alluvial deposits in the stream valleys. The bedrock materials in the mountain and adjacent foot hills include granites, gneisses, basalts, limestones, argillites and quartzites.

Silt loam to sandy loam soils are most common but clay loam and clay soils also occur on the lower terraces and fans adjacent to the Missouri River. Most of the soils on outwash benches and fans and along the flood plains of streams are deep. Shallow soils occur on broken terrace edges and in the higher foothills and mountains.

Brown soils occupy the lower elevations in this county. These soils have brown surface soils and friable prismatic subsoils which grade into a gray horizon of lime accumulation. Chestnut (dark brown) and Chernozem (black) soils occupy the higher benches and fans. In the more heavily forested sections the soils are representative of the Gray Wooded great soils group. The latter have a layer of partially decomposed forest litter over light gray leached surface soils and finer textured darker colored subsoils.

Most of the irrigated land and much of the dry farmed land in the county is made up of Brown soils. Some Chestnut and Chernozem soils are farmed but many of them are too stony or are on slopes too steep for cultivation. Very few of these darker colored soils are irrigated. The stony and steep areas of these soils, together with shallow soils that overlie bedrock, are used for grazing. The gray wooded soils are used mostly for timber production and for grazing.

Seepage is a problem in scattered locations throughout the county. Some seeped soils have been reclaimed through the installations of deep drains. Most seeped soils in the

county can be reclaimed since they usually do not contain excessive amounts of harmful salts. Most soils in the county contain gravel or coarse sand in the subsoils layers and therefore can be drained by use of deep drainage ditches.

CROPS AND LIVESTOCK

Broadwater county is primarily an agricultural county with most of its income derived from the sale of crops and livestock. According to the 1954 Census of Agriculture as compiled by the U. S. Department of Commerce, this amount totaled $2,397,174.00. Slightly more than half of this total, $1,341,211.00 came from the sale of livestock and livestock products.

The land area of Broadwater County covers 795,520 acres. Approximately 242,783 acres is controlled by the Federal Government through the Forest Service and Bureau of Land Management and represents 30% of the land area. About 501,352 acres or 63% is in private ownership, with 3% listed as county and state land. The remaining 4% is taken up in rivers, streams and reservoirs.

The uses of the 501,352 acres of privately owned land changes constantly, but in 1954, an estimated 388,317 acres was used for grazing, 58,989 acres termed as tillable non-irrigated and 37,240 acres assessed as irrigated land. The balance of the privately owned land is taken up in towns, patented mining claims and timber.

The irrigated land has been a stabilizing factor in assuring feed for livestock and income from the sale of cash crops. The principal crops and approximate acreages grown are as follows: Hay crops—35,000 acres; winter wheat—18,000 acres; spring wheat—7,000 acres; barley—5,000 acres; oats—3,000 acres; potatoes—700 acres; and sugar beets—450 acres. In addition there are small acreages of rye, seed peas, alfalfa seed, grass seed and corn.

In 1955, the County Assessor's Office listed 22,015 beef cattle, 11,769 sheep, 769 hogs, 679 dairy cows and 10,000 chickens. The sheep production pattern during the past few years has changed to more farm flock operators and less range sheep operators. There are thirty-five farm flock operators of sheep in the county. Beef cattle of all popular breeds are grown throughout the county and several operators are engaged in quality production of purebred stock.

Dairying is quite limited and is confined generally to the Townsend-Winston area. The sugar beets, potatoes and seed peas produced in the county are limited to the irrigated valley lands. These crops provide a cash income and may also be used as a cultivated rotation crop, which is important in the control of weeds. Wheat is produced mostly in the southern end of the county and on the benchlands bordering the eastern side of the Missouri River Valley.

SOURCES OF WATER SUPPLY

Broadwater County, probably named after the broad Missouri River that flows from south to north through the central part, has a drainage area which consists entirely of the Missouri River and its tributaries.

The Elkhorn Mountains on the west and the Big Belt Mountain Range on the north and east, form the headwaters for many streams which are tributaries to the Missouri River within the county.

About 15,500 acres or one-fourth of the total land irrigated in Broadwater County is by ditch systems from the Missouri River. The most important of these irrigation systems are: Crow Creek Pump Unit, Broadwater-Missouri Diversion Project, Montana Ditch Company and the Big Spring Ditch. All of the ditch systems are diversions from the Missouri River, except the Big Spring Ditch, which diverts its water from a large spring on the bank of the river itself. The Crow Creek unit is irrigated by pumping from the river.

The first tributary of the Missouri River in the county is the Jefferson River. In the southern part, where the Jefferson River forms the county boundary, two private ditches use water by pumping from the river and one farm is supplied water from the Old Hale Ditch that extends into Broadwater County from Jefferson County. A total of more than 1,000 acres are irrigated in this area from the Jefferson River.

The other main tributary streams of the Missouri River in the county which supply water for the irrigation of more than 25,000 acres of land are as follows: Crow Creek, Warm Springs Creek, Mammoth Springs, Spring Creek, Willow Swamp, Dry Creek, Grayson Creek, Deep Creek, North Fork Deep Creek, Indian Creek, Cottonwood Creek, Ray (South) Creek, Gurnett (North) Creek, Duck Creek, North Fork Duck Creek, Confederate Creek, Hinaman Creek, Clear Creek, Lone Tree Creek, Beaver Creek, Pole Creek, Antelope Creek, Staubach Creek, Whites Creek, Avalanche Creek, Spokane Creek, Sheep Creek, Miller Creek and Farrow Creek.

Several of the above named creeks have been adjudicated and all of the water is diverted by private ditches. Reference is made to the Water Right Data in this report, listing the names of the creeks that have been adjudicated with the number of decreed water rights noted.

STREAM GAGING STATIONS

The United States Geological Survey carries on the work of measuring stream flows in cooperation with funds supplied by the State and several Federal agencies. The results are published yearly in book form. The data given below on maximum, minimum and average flows covers the period from the beginning of measurements through the year 1950. The water year begins October 1 and ends September 30 of the following year. Storage reservoirs that regulate stream flows at some of the stations given below are: Lima Reservoir (built 1902), Ruby Reservoir (1938), Willow Creek (1937), Hebgen (1915), Madison (1900) and Whitetail (1921). Where diversions for irrigation above the gage are shown, the acreages given are estimates and will not necessarily agree with the final results of the Water Resources Survey.

Following are equivalents useful in converting from one unit of measurement to another:

(a) In Montana, one cubic foot per second equals 40 miner's inches.
(b) One acre foot is the amount of water required to cover an acre one foot deep.
(c) One cubic foot per second will nearly equal two acre feet (1.983) in 24 hours.
(d) A flow of 100 miner's inches will equal five acre feet in 24 hours.
(e) One miner's inch flowing continuously for 30 days will cover one acre 1½ feet deep.

All the stream gaging that has been done in Broadwater County is as follows:

Missouri River Near Toston

The gage is located two miles southeast of Toston, four and one-half miles upstream from Crow Creek and seven miles downstream from 16-Mile Creek. The drainage area has not been measured but the drainage area of the Old Missouri River station at Townsend is given as 14,500 square miles. Records are available from April, 1890, through February, 1891; April, 1910, through December, 1916; April, 1941, through September, 1950. At the present time a water-stage recorder is used. A chain gage was used at a different site two miles downstream from April 5, 1910, to December 25, 1916. The maximum yearly discharge for the fifteen water years of record has varied from a maximum of 5,094,000 acre feet (1913) to a minimum of 2,948,000 acre feet (1945) or a mean of 4,058,000 acre feet or 5,601 cfs. The maximum discharge was 32,000 cfs (June 6, 1948) and the minimum 562 cfs (April 30, 1941). The records are subject to regulation of several upstream reservoirs. There are diversions above the gage for irrigation of about 521,000 acres. Since May, 1941, the East and West Broadwater Canals, with a combined capacity of about 350 cfs, have diverted water from the river at a point about three miles above the gaging station. These canals furnish full and/or supplemental water supply to irrigate about 15,000 acres.

Missouri River Near Townsend

This gaging station was located on the highway bridge one mile northwest of Townsend. The drainage area above the gage is 14,500 square miles. A wire-weight gage was used. Records are available from October, 1891, through May, 1904. The annual runoff for the twelve water years of record has varied from a minimum of 3,012,000 acre feet (1901) to a maximum of 5,504,000 acre feet (1894) with a mean of 3,830,000 acre feet or 5,215 cfs. The maximum discharge was 52,500 cfs (June 24, 1899) and the minimum 1,020 cfs (January 1, 1901). There were numerous irrigation diversions above the gage. The flow was partly regulated by the Madison Reservoir at Ennis having a capacity of 41,000 acre feet which was built about 1900.

Broadwater East Canal Near Toston

This gage is located three miles southeast of Toston in the East Canal, one and three-quarters miles below its point of diversion. A water-stage recorder is used. Records are available for the irrigation season only from June, 1941, through September, 1949. The amount of water diverted annually for the seven years of record has varied from a minimum of 21,760 acre feet (1942) to a maximum of 42,200 acre feet (1946) or a mean of 31,801 acre feet. The maximum daily discharge was 240 cfs (June 11, 1946). There were many periods when there was no flow at all.

Broadwater West Canal Near Toston

The gaging station is located in the West Canal three miles southeast of Toston or one and three-quarters miles downstream from the point of diversion. A water-stage recorder is used. Records are available for the irrigation season only from June, 1941, through September, 1949. The maximum amount of water diverted was 6,000 acre feet (1945) and the minimum 4,000 acre feet (1942) or a mean of 5,316 acre feet for the eight years of record. The maximum daily discharge was 45 cfs (July 30, 1947). The canal was dry for long periods.

Crow Creek Near Radersburg

The station was located five and one-half miles northwest of Radersburg at the Glendale Ranger Station one mile upstream from Slim Sam Creek. Records are available from June, 1919, through September, 1929. The annual discharge for the ten full water years of record varied from a minimum of 25,000 acre feet (1924) to a maximum of 49,500 acre feet (1922) or a mean of 35,080 acre feet or 48.3 cfs. The maximum discharge was about 1,000 cfs (July 14, 1920) and the minimum 1.4 cfs (January 10, 1922). There were no reservoirs or diversions above the gage.

Crow Creek and Deep Creek Near Townsend

Gage heights only were taken at these two stations. The record for Crow Creek was from 1912 to 1913 and Deep Creek from 1910 to 1915.

MINING

Mining in Broadwater County dates from the discovery of gold in Confederate Gulch in 1864. Mining spread to the nearby gulches of White, Avalanche, Hellgate, and Magpie. These gulches partly in Lewis and Clark County, are credited with a production of about $17,500,000 in placer gold, mostly from Confederate Gulch. Prospecting for placer gold led to the discovery of the lode deposits of Radersburg, Indian Creek (Townsend) and Beaver Creek (Winston) districts, but gold was still the most important metal in point of value.

From 1900 to 1953, the county has produced 357,522 ounces of gold valued at $9,518,039; 1,371,856 ounces of silver ($920,010); 6,925,640 pounds of copper ($1,255,352); 21,714,594 pounds of lead ($1,496,294) and 6,293,064 pounds of zinc ($746,995). The total value of metals produced (excluding iron ore) is $13,936,690. Figures prior to 1900 are difficult to obtain, but production prior to 1900 was probably equal to, if not greater than, the production since that time; thus the total for the county would be valued at about $30,000,000, by far the greater part of which was in gold.

Some iron ore has been mined for its iron content and magnetic iron ore containing 9 per cent titanium dioxide has been reported on the Iron Cross property.

In recent years some uranium has been found near Winston. It occurs as autunite in carbonaceous shale with associated bentonite and rhyolite tuff in "lake bed" sediments of Oligocene age.

Mining of nonmetallic industrial minerals is of little importance in Broadwater County. The famous Montana "Black and Gold" marble was formerly quarried for decorative stone near Radersburg, but at present limestone is quarried only for rough structural purposes such as railroad ballast.

Diatomaceous earth is known to occur at two localities in the County; on Grayson Creek (Sec. 13, T 6N., R. 2E.) and along a bluff facing the Missouri River a mile north of Beaver Creek (Sec. 27, T. 9N., R. 1E.). The deposits have not been developed.

Thin deposits of rock phosphate occur in the Phosphoria formation in the northern and western part of the county. Coal occurs in the Toston-Lombard area.

Confederate Gulch Area

The Confederate Gulch area is on the western slope of the Belt Mountains northeast of Winston in the extreme northern part of the county. It includes the placer mining areas of Confederate Gulch, White Gulch, Avalanche Gulch, Hellgate Gulch and the upper extremity of Magpie Gulch. Confederate Gulch alone is said to have yielded $12,000,000 in placer gold and the gulches and river bars to the northwest (partly in Lewis and Clark County), an additional $5,500,000. Confederate Gulch is a deep narrow canyon cut into the southwest flank of the Belt Mountains. For the area worked, it proved to be the richest placer ground in Montana and some very large nuggests were recovered. Diamond City, near the mouth of the canyon, was a rough and lively mining camp in the 1860's and 70's but was practically deserted by 1880. In 1949, its sole resident was prospecting the sites of former stores and saloons for gold dust and coins lost by the early-day miners. The gold-bearing lodes of the area were discovered soon after the placers. The reported yield of lode mines was over $100,000.

The principal rocks of the region are shales of the Spokane and Greyson formations and limestones of the Newland formation of Beltian age. They are cut by small dikes and stocks of diorite or quartz diorite. Upper Paleozoic rocks occur in fault contact with Spokane Shale near the mouth of Confederate Gulch. High grade gold ore occurs in the upper parts of small, narrow quartz veins associated with the diorite. The veins are found in both the diorite and in the shale, with a depth sometimes as low as 50 to 100 feet, the veins become too low in grade to be profitably worked. They are also too narrow to be worked to any great depth. Another type of ore deposit occurs here which in future may prove to be an important source of gold. This is large low grade mineralized sheer zones in diorite. One dike is reported to "carry for a width of 200 feet or more a small but possibly profitable amount of gold". An 800-foot diamond drill core from another is said to have carried $1.50 to $1.60 in gold. Galena and pyrite are associated with both types of ore deposits. Galena is present in the richer ore. The principal mines in this area are Miller (Slim Jim), Hummingbird, Schabart, Durant and Baker (Satellite).

The Hellgate district, near the head of Hellgate Canyon, is about 19 miles north of Winston, a station on the Northern Pacific Railroad. Placer gold was discovered here in the early days, but production for placers has been negligible. The production of copper from lode mines prior to 1918 is about 3,000,000 pounds valued at $500,000.

The principal rocks of the region are shales and limestones of the Spokane, Greyson, Helena and Newland formations. Paleozoic rocks are exposed at the mouth of the canyon. The Beltian rocks are cut by intrusive dikes of diorite and quartz diorite with which are associated all the ore bodies. Mineral deposits can be divided into two groups—gold lodes and copper lodes. The gold lodes occur as small narrow quartz veins associated with diorite dikes in the northern part of the area. The copper lodes to the south occur in fissures along the contact of the Spokane and Greyson Shales and are not closely associated with exposed igneous rocks, although they are of the type formed by ascending solutions. They are of moderate width and persistent in strike. The principal minerals are quartz, ankerite and chalcopyrite. The Argo Vein has been developed to a depth of 600 feet. It is said that "The costs reported by the operators of the Argo Mine—indicate that such bodies cannot be profitably worked were the price of copper less than about 20 cents a pound". The principal mines are the Argo, Lee Mountain, White, Finchville & Winnie and Walston.

That portion of Magpie Gulch which lies in Broadwater County is noted for its placer deposits. Lode mining has been done only in the lower part of the Gulch, in Lewis and Clark County. During the close of the last century the placer gravels of Magpie Gulch were worked by drift mining. The district has been active in recent years. It is estimated that $280,000 in placer gold has been recovered from Magpie Gulch and its tributaries. Considerable placer ground is said to still remain unworked in the main gulch.

In Broadwater County, Magpie Creek flows through an area of Beltian rocks. Near the headwaters of the creek the Belt rocks are cut by a large east-west trending quartz diorite dike which probably is the source of at least a part of the gold in Upper Magpie Gulch.

Deep Creek District

The Deep Creek District is on Deep Creek which enters the Missouri about 3 miles south of Townsend. The district has produced moderate amounts of placer gold since 1876. No production has been reported since at least 1916.

Lone Mountain District

The Lone Mountain District is east of Toston, a station on the Northern Pacific Railroad 11 miles south of Townsend. Little information can be obtained regarding mining in this area. Production has not been important. Some ore from lodes carrying gold, silver and copper has been shipped from this area.

Park (Hassel, Indian Creek, Townsend) District

The Park District is west of Townsend, in the area drained by Indian Creek and its tributaries. Mining of Indian Creek placers began in 1870 and gold-bearing veins were discovered later. The total production is more than $1,000,000, mostly from lode mines.

The principal rocks of the region are andesitec and latite lavas which have been intruded by small stocks of quartz monzonite. West of Hassel (St. Louis) the lavas are in contact with Paleozoic sediments which in turn lie in Spokane Shale.

Ore deposits occur in veins cutting all older rocks. The veins are persistent in length and generally strike northerly or westerly, dipping from 50° to 80°. The outcrops are conspicuous. The ore is essentially auriferous pyrite with some arsenophrite, galena, sphalerite, pyrrhotite, chalcopyrite, chalcocite and marcasite. It is valued chiefly for its gold content. Gold also occurs with pyrite as disseminations in acidic dikes. Pockets of such ore have yielded as much as 16 ounces of gold per ton.

The principal mines are: Blacksmith, Diamond Hill, Iron Mask, Little Fannie, Little Giant, Lookout, Marietta, Queen Bee, Silver Wave, Spring Hill, Whitehorse, Park-New Era, Custer and Little Annie.

Radersburg (Cedar Plains) District

Radersburg is about 10 miles west of Toston. The area is mountainous and the climate semiarid. Timber for mining is available. The region was discovered in the early 60's when the placers yielded about $500,000 in gold. Lode mining began in the 70's and was confined to oxidized ores as early attempts to treat sulphide ores were unsuccessful. Activity increased after 1910 when sulphide ores were accepted at the Butte and Helena smelters. The total production to the end of 1928 is estimated at $6,130,000.

Sedimentary rocks exposed in the region range in age from Algonkian (Beltian) to Tertiary. These are intruded by small stocks of quartz monzonite, and in places, covered by andesitic lavas. The ore deposits are associated with the igneous rocks, but veins also occur in the sediments.

The ores are found in narrow fissure veins in eruptive rocks and in the sediments. The veins usually strike north and dip steeply west. They are but little disturbed by faulting. The veins are persistent in strike and have been worked to a depth of about 1,200 feet. The unoxidized ore consists of auriferous pyrite with quartz and calcite. Chalcopyrite, sphalerite, galena, marcasite, pyrrhotite and scheelite are also found, but are of minor importance. The grade of the ore ranges up to $50 per ton. Mining costs are around $15 per ton.

The principal mines are: Black Friday, Bluebird, Bonanza, Cyclone, Delome, Gold Butte, Gold Cross, Gopher, Hard Cash, Highland Mary, Iron Age, Iron Cross (titaniferous magnetite), Jo Dandy, Jo Jo, Keating, North Home, Ohio Kealing, Ruby, Santa Anita, Spar, Summit, North Star, Cleo and Last Chance.

Winston (Beaver Creek) District

The Winston District extends southwest about 8 miles from Winston, a station on the Northern Pacific Railroad, 20 miles southeast of Helena. It is in a well-timbered mountainous area ranging in elevation from 4,500 to 8,000 feet.

The first lode was discovered in 1867 but systematic mining did not begin until about 1889. The district has been fairly active except for a brief period from 1918 to 1926. The total production is estimated to be at least $3,000,000.

The district is underlain chiefly by flows, tuffs and breccias of the andesite—latite group which have been intruded by six quartz monzonite stocks, each less than a square mile in area and thought to be connected below surface. Contact effects are not noticeable. Ore deposits occur in veins that are narrow but persistent in both strike and dip. Nearly all strike east or northeast and dip more than 45 degrees. They cut both granite and andesite. All are quartz veins carrying pyrite, galena, sphalerite and chalcopyrite and their oxidation product. Oxidation extends to depths ranging from less than 100 feet to 400 feet. Gold was the chief metal in the oxidized ores, but sulphide ores are valued more than their silver-lead content. Zinc is abundant and copper is present in appreciable amounts. Some mines have been developed to a depth of 800 feet.

The principal mines are Buzz, Custer-Iron Age-Hyantha, East Pacific, January, Kelly, Little Bonanza, Little Olga (Kleinschmidt), Stray Horse, Gold Bug, Sunrise, Vosburg, Edna and Dome.

SOIL CONSERVATION DISTRICTS

A Soil Conservation District is a legal subdivision of the State, established by the farm and ranch owners and operators, which permits group action in dealing with the problems in soil erosion, moisture conservation, soil fertility and land use.

The Montana State Soil Conservation District Law was passed by the 26th General Assembly on February 28, 1939 and gives the authority for organizing Soil Conservation Districts within the State. Under provisions of the Law, no district can be formed unless the people want it, nor unless they register this want; first by petition and later by a favorable vote of at least 65 per cent of the qualified voters in the proposed district. The law also provides for the formation of a State Soil Conservation Committee, which assists in the organization of districts and also in securing cooperation from State and Federal Agencies.

The main governing body of a Soil Conservation District is the board of five supervisors who are elected by the people of the District. This board is empowered by the law to study the conservation problems of the district and to formulate programs to deal with these problems. This Board may call upon local, state and federal agencies to assist in executing the district's program. By applying to the Board of Supervisors, farmers and ranchers may obtain such technical assistance as the District may have without expense to the operator. The use of other facilities, such as earth-moving equipment, owned, leased or contracted for by the districts, are made available at rates fixed by the Board of Supervisors.

In the State, at the present time, there are 59 Soil Conservation Districts organized and 22 cooperative Grazing Districts receiving technical assistance from the Soil Conservation Service in conducting conservation programs.

Two Soil Conservation Districts have been organized in Broadwater County. The Broadwater County Soil Conservation District is entirely contained in that portion of the county lying North of the line between Townships 3 and 4 North with headquarters at Townsend, in the approximate center of the District. The southern portion of the county is in the Three Rivers Soil Conservation District, which includes parts of five counties headquartered at Three Forks. The districts were organized in 1946 and 1944, respectively.

The 74,000 acres in the Three Rivers District are predominately dryland, cropland and grazing land, with about 500 acres irrigated on two farm units by gravity and pump irrigation systems. There are approximately 25 farm operating units in this portion of the County.

The Broadwater County Soil Conservation District serves 535,000 acres of agricultural land in 279 operating units. The remaining land within the District is Federally owned and administered by the Bureau of Land Management and Forest Service. Approximately 40,000 acres are irrigated by diversions from creeks and the Missouri River. The governing bodies of the Districts have signed memorandums of understanding with the U. S. Soil Conservation Service and State Extension Service to provide technical and educational assistance. Farmers installing conservation practices on their lands may receive cost-sharing assistance through the Agricultural Conservation Program. Soil and Water Conservation loans are available through Farmers Home Administration.

The governing bodies have developed district programs and work plans describing problems in the Districts and the way they intend to meet them. Problems within the Districts vary, but the annual plans stress guidance in proper land use and the development of sound conservation measures on these lands. Water development and control practices established by the Soil Conservation Service assisting Soil Conservation Districts has been emphasized. Farm irrigation systems have been installed on approximately 1,400 acres of the Bureau of Reclamation's 5,000 acre pumping unit south of Toston. The remaining 3,600 acres of farm irrigation systems will be developed in the future. Over 3,000 acres of new land have been brought under irrigation through the Broadwater District by construction of irrigation storage dams, creek diversions and pumps. Fifty-three groups have been assisted with irrigation, drainage and flood control problems. Over 2,000 acres of land have been drained. Along with irrigation, drainage, land levelling and other structural practices, emphasis is put on improved pastures, proper range management, range re-seeding, crop rotations, stubble mulching, grassed waterways and weed control.

In addition to on-site technical assistance, the Districts with the help of Soil Conservation Service technicians and County Agents, carry on an education and information program. Tours are held on range management, tillage and pasture seeding. With the cooperation of the school system, general conservation tours are conducted for the students. The District furnishes transportation to conservation camps for 4-H members each year; an annual report of activities is printed and distributed to cooperators.

Much has been done to improve and develop land and conserve natural resources through the efforts of these districts and the cooperating agencies. People realize more each year the need for community action to conserve water, soil and vegetation for future generations.

HELENA NATIONAL FOREST

The Townsend Ranger District comprises the southermost portion of the Helena National Forest. The District includes land in Jefferson, Broadwater and Meagher Counties. The bulk of the area consists of approximately 127,000 acres of forest and range land in Broadwater County. About 27,000 acres lie west of Townsend in the Elkhorn Mountains, while 100,000 acres are situated east of Townsend in the Big Belt Mountains. For the area in Broadwater County, drainage is to the east and west into the Missouri River which flows northward from Townsend. Of the numerous streams on the District, Crow Creek is the largest on the west side and drains into the Missouri River from the Elkhorn Mountains, while Deep Creek is the largest on the east side and flows into the Missouri River from the Big Belt Mountains.

Early mining activities are apparent on many parts of the District. Most prominent are the early placer operations which included dredging and hydraulic operations on Confederate Gulch in the Big Belt Mountains and Indian Creek in the Elkhorn Mountains. The results of less extensive mining exploitation are to be seen on many of the other sub-drainages. Considerable timber was cut from National Forest lands to furnish mine props, lumber and fuel wood.

Much of the forest land is characterized by grassy parks along the stream bottoms and ridge tops. Before the establishment of the National Forest, these areas were heavily grazed by work animals used in the mines and livestock owned by ranchers in and adjacent to the area. After creation of the Helena National Forest, the use of the grazing areas within the forest boundaries was controlled by permit under a system designed to perpetuate the forage year after year.

In 1954, over 4,000 head of cattle and more than 7,000 head of sheep were distributed over the thirty allotments on the Townsend Ranger District. Seasons of use vary among allotments, but in general range from June 1 to September 30. In order to provide for the maximum quantity and quality of water production and to obtain the optimum use of the range, the primary objective is to allow half the available forage to be left each year.

Nearly all the cattle are "preference" stock in that the permitted numbers tend to remain the same each year. Each preference permit is designed to supplement and thus complete an economic ranch operation. A fee is charged each year for the privilege of grazing stock on National Forest range. This fee is based on stock prices the preceding year adjusted to a previously established base, to provide an equitable charge in line with current economic conditions.

Wise use of the National Forest range and timber resources is the chief goal in National Forest Administration. Following the guiding principle of multiple use of the natural resources, the District Ranger's primary job is to coordinate all the uses on the National Forest in order to obtain good watershed management. The domestic water supply for the town of Townsend is derived chiefly from National Forest lands. A continuous supply of water is furnished Townsend in the amount of 800,000 gallons per day on the average. At present, chlorination is the only treatment process used. Facilities are available for limited settlement

and filtration, but these have become inadequate. Siltation occurs in the spring as a result of the snow melt and high stages of Deep Creek during that period. Most of the siltation occurs as a direct result of poorly located roads and overgrazed private lands within and below the National Forest boundary. Nine ranches are located between the Forest boundary and the Townsend intake and either discharge raw sewage directly into the creek or have septic tanks located nearby.

The timber business on the Townsend District has been of relatively minor importance compared to grazing. This has been due primarily to two factors: First, the occurrence of timber of merchantable size is characteristically confined to relatively small areas, thus limiting timber businesses to small operations. Secondly, the demand for timber has been limited because of the relatively low quality of product available and the limited supply. With the increased demand for timber in the past year or so, quality standards have been lowered with the result that unmerchantable timber stands of a decade ago now have a ready market. Principal species in the Townsend District are Douglas Fir and Lodgepole Pine. Douglas Fir has a ready outlet in the form of lumber, while Lodgepole Pine is marketed mainly as pulpwood. All timber removed from National Forest land in the Townsend District is in accordance with an overall management plan designed to fill local demand, but at the same time leave the stands in better condition, provide for adequate regeneration and to improve or maintain watershed values at optimum levels.

Timber sale contracts are made with provisions for operator contributions for brush disposal resulting from logging and thus reduce the danger of wildfire to adjacent stands. Provisions are also made to provide for erosion control on sale areas characterized by unstable soils.

By law, 25 per cent of the receipts from the sale of National Forest timber, forage, special uses, water power, etc., is returned each year to the State for distribution to the County for the development of schools and roads. In addition, 10 per cent of the National Forest revenue is returned to the Helena National Forest for betterment of forest roads and trails. The balance of the National Forest receipts are turned into the United States Treasury. Today, nationwide Forest Service receipts exceed expenditures.

Recreation comprises a major use of the National Forest lands in the Townsend Ranger District. In 1955, it was estimated that over 11,000 visits were made annually to the National Forest by recreationists. Camping and picnicing facilities, although limited, are provided by one improved and two unimproved campgrounds in the District. There are a number of recreational residences of which five are under special use permit. Winter sports activities are provided by a locally operated ski run on National Forest land. A great deal of the recreational use on the District is made by hunters. The District provides a home for two medium sized Elk herds with a combined population estimated to be over 500 animals. Deer are more numerous than Elk and are more uniformly distributed. In 1954, the Deer population was estimated to number 2,600 animals. The Townsend Valley has an abundance of Pronghorn Antelope but these animals are rarely seen on forest range lands. Antelope, Deer and Elk have increased manyfold in the last few years. The increase of Deer and Elk is important from the standpoint of forest resources since these animals spend approximate-

ly 8 months out of the year on National Forest land, including sheep and cow ranges. This means that grazing use by Deer and Elk must be considered in management plans drawn up for domestic stock.

In National Forest administration, fire protection is an important phase of resource management. On the average, the fire control job occurs between June 1 and September 15. Severe lightning storms with little or no rainfall during this period cause most of the forest and grass fires. About one out of every four fires, is caused by man's carelessness. The District forces are increased during the fire season to include one headquarters guard stationed at Townsend and a two-man maintenance crew in the field. In order to initiate prompt suppression action on all fires, communication between the ranger and the maintenance crew in the field with the District headquarters in Townsend is provided by a 2-way radio system. The District radio network is an integral part of the Helena National Forest communication system for the purpose of fire control. Local cooperators, composed of strategically located ranchers in the County, are trained and equipped by the Forest Service and complete the District fire organization. The primary objective in fire control is to confine to the least possible acreage any fires that do occur and to carry on a continuous campaign to reduce and prevent the man-caused fires, ultimately preserving the benefits of good watershed management.

The District Ranger is concerned chiefly with the renewable natural resources of the National Forest. Wise use of the natural resource through supervised logging, controlled grazing, erosion control on unstable soils, hunter harvest of over-populated big game herds and fire control will insure good watershed management. At the same time, multiple use will be provided for the natural resources available from the National Forests.

SUMMARY OF IRRIGATED LAND BY RIVER BASINS IN THE FOLLOWING COUNTIES COMPLETED TO DATE

Big Horn, Broadwater, Carbon, Custer, Deer Lodge, Gallatin, Golden Valley, Jefferson, Madison, Meagher, Musselshell, Park, Rosebud, Silver Bow, Stillwater, Sweet Grass, Treasure, Wheatland and Yellowstone.

RIVER BASIN	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigable Acres
Missouri River Drainage Basin			
***Missouri River**	46,273	11,918	58,191
Jefferson River	61,291	9,713	71,004
Beaverhead River	40,771	6,076	46,847
Big Hole River	23,775	1,950	25,725
Madison River	39,445	7,660	47,105
Gallatin River	111,914	21,097	133,011
Smith River	30,304	18,398	48,702
Musselshell River	64,789	57,870	122,659
Grand Total Missouri River Basin	**418,562**	**134,682**	**553,244**
Yellowstone River Drainage Basin			
Yellowstone River	299,053	96,088	395,141
Stillwater River	27,489	16,403	43,892
Clarks Fork River	91,768	24,195	115,963
Big Horn River	65,395	25,579	90,974
Tongue River	22,137	7,479	29,616
Powder River	8,264	1,804	10,068
Grand Total Yellowstone River Basin	**514,106**	**171,548**	**685,654**
Columbia River Drainage Basin			
Clark Fork (Deer Lodge, Hellgate) River	15,636	1,438	17,074
Grand Total Columbia River Basin	**15,636**	**1,438**	**17,074**
Grand Total in the Counties Completed to Date	**948,304**	**307,668**	**1,255,972**

*Names of streams indented on the lefthand margin indicate that they are tributaries of the first stream named above which is not indented.

IRRIGATION SUMMARY OF BROADWATER COUNTY BY RIVER BASINS

MISSOURI RIVER BASIN	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigable Acres
*Missouri River	15,568	5,005	20,573
Jefferson River	1,026	126	1,152
Total Jefferson River and Tributaries	**1,026**	**126**	**1,152**
Hanson (Big) Springs	1,623	433	2,056
Crow Creek	8,118	1,496	9,614
Unnamed Spring (Sec. 22, T.5N,R.1E)	40	0	40
Warm Springs Creek	154	0	154
Mammoth Springs	686	0	686
Spring Creek	176	184	360
Willow Swamp	927	123	1,050
Waste (Sec. 31, T.5N,R.2E)	120	0	120
Total Crow Creek and Tributaries	**10,221**	**1,803**	**12,024**
Dry Creek	635	18	653
Grayson Creek	309	0	309
Deep Creek	1,884	75	1,959
North Fork Deep Creek	452	604	1,056
Well (Sec. 2, T.6N,R.2E)	77	0	77
Total Deep Creek and Tributaries	**2,413**	**679**	**3,092**
Waste (Sec. 7 & 8, T.6N,R.2E)	29	0	29
Well (Sec. 32, T.7N,R.2E)	4	0	4
Well (Sec. 29, T.7N,R.2E)	9	0	9
Indian Creek	99	61	160
Cottonwood Creek	126	35	161
Warm Springs Creek	40	0	40
Ray (South) Creek	809	0	809
South Fork Ray Creek	12	37	49
North Fork Ray Creek	22	0	22
Total Ray Creek and Tributaries	**843**	**37**	**880**
Gurnett (North) Creek	707	113	820
Dry Gulch Creek	1	4	5
Total Gurnett Creek and Tributaries	**708**	**117**	**825**

*Names of streams indented on the lefthand margin indicate that they are tributaries of the first stream named above which is not indented.

IRRIGATION SUMMARY OF BROADWATER COUNTY BY RIVER BASINS

MISSOURI RIVER BASIN (continued)	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigable Acres
Duck Creek	1,073	51	1,124
North Fork Duck Creek	246	183	429
Total Duck Creek and Tributaries	**1,319**	**234**	**1,553**
Confederate Gulch Creek	1,820	1,024	2,884
Woods Gulch Creek	43	0	43
Hinaman Creek	113	0	113
Hunters Gulch Creek	13	0	13
Clear Creek	123	28	151
Lone Tree (Willow) Creek	290	102	392
Total Confederate Creek and Tributaries	**2,402**	**1,154**	**3,556**
Beaver Creek	3,538	20	3,558
Weasel Creek	6	0	6
Pole Creek	84	21	105
Antelope Creek	237	12	249
Staubach Creek	472	0	472
Tony (Pauley) Creek	0	0	0
Tilleke Hollow Creek	3	0	3
Unnamed Spring (Sec. 29, T.9N,R.1E)	17	0	17
Total Beaver Creek and Tributaries	**4,357**	**53**	**4,410**
Whites Gulch Creek	219	130	349
Avalanche Gulch Creek	202	545	747
Hellgate Gulch Creek	6	0	6
Spokane Creek	101	141	242
Unnamed Springs (Sec. 16,T.9N,R.1W)	76	0	76
Sheep Creek	101	40	141
Little Sheep Creek	49	0	49
Miller Creek	61	0	61
Spring Gulch Creek	9	0	9
Farrow (Dobler Gulch) Creek	87	0	87
Total Spokane Creek and Tributaries	**484**	**181**	**665**
Total Missouri River and Tributaries	**42,642**	**10,611**	**53,253**

BROADWATER-MISSOURI DIVERSION PROJECT

(S.W.C.B.)

HISTORY

The Broadwater-Missouri Diversion Project consists of an overflow gravity type concrete diversion dam across the Missouri River and a main Canal, which divides into East and West Side distribution canals to irrigate an estimated 15,000 acres of land in the vicinity of Toston and Townsend.

On October 27, 1938, the State Water Conservation Board received a Federal loan offer of $900,000 to finance the building of the project. Later, on June 17, 1940, this offer was amended to an estimated cost of $958,000, of which $463,000 was to be a grant and $495,000 a loan. To secure the funds to construct the Project, the Board issued its Water Conservation Bonds, Series "S" in the amount of $495,000. This action required the formation of the Broadwater-Missouri Water Users' Association and the sale of 42,000 acre feet of water under contracts acceptable to the Finance Division of the P. W. A.

The Broadwater-Missouri Water Users' Association was incorporated on November 10, 1938, for a period of 40 years. The project operated for the first time in 1941. During the winter months when the canals are not used for irrigation, the flood gates in the dam are opened and the accumulated storage released down the river.

PRESENT STATISTICS

Location: The dam is located in the NW¼NW¼, Section 7, T. 4N., R. 3E., about 5 miles above Toston on the Missouri River. Because of the raised water level in the river channel above the dam, it was necessary to relocate and elevate 3½ miles of the main line of the Northern Pacific Railway tracks.

Diverting on the west bank of the river at the dam, the Main Canal follows near the river bank for a short distance to a point in the NE¼NW¼ of Section 6, T. 4N., R. 3E., where it divides into the East Side and West Side Canals. From this point the West Side Canal courses northwesterly to the lower end of the Crow Creek Valley. One of the most important structures contained in the West Side Canal, is an inverted syphon, 1,442 feet long and 54 inches in diameter, built through a narrow section of the river canyon. The East Side Canal, almost at its point of beginning, crosses the Missouri River by a steel pipe line 84 inches in diameter and 667 feet long, supported by concrete piers at a height of 25 feet above the river bottom. After crossing the river, the East Side Canal follows a northerly direction, terminating at Confederate Gulch.

Length and Capacity of Canals: The Main Canal which diverts directly from the west end of the diversion dam, is 1½ miles long and has a capacity of 342 second-feet.

The West Side Canal extends a distance of 12.4 miles to the lower end of the Crow Creek Valley and has an initial capacity of 90 second-feet.

The East Side Canal, 38.4 miles in length, has an initial capacity of 262 second-feet and terminates at Confederate Gulch with a capacity of 42 second-feet.

Operation and Maintenance: O. and M. charges for the last fourteen years have averaged 37 cents per year for each acre foot of water sold. In addition to the O. and M. assessment, the repayment charge for construction of the project amounts to 91 cents per acre foot, making a total yearly cost per acre foot of $1.28.

Present Users: During the year of 1955, eighty-seven water users under the project purchased water in varying amounts from 10 to 1,500 acre feet, with a total of 27,080 acre feet sold.

Acreage Irrigated: In 1955, 11,478 acres were irrigated or supplemented with water from the Broadwater-Missouri Diversion Project. Approximately 979 acres are potentially irrigable under the present existing ditch systems.

WATER RIGHT DATA

Prior to the construction of the Project, the State Water Conservation Board filed and recorded a water right from the Missouri River, dated June 28, 1938 in the amount of 16,000 miner's inches. (Ref. Book 3, Page 75 of Water Right Records, Broadwater County).

See Maps in Part II, Pages 5, 7, 10, 13.

WATER MARKETING CONTRACT

This is an agreement between the Water Users' Association and State Water Conservation Board; whereby the Board agrees to sell to the Association all of the available water of the project and the Association agrees to distribute same to water purchasers and provides methods of payment of sums due, levying of assessment for operation and maintenance cost, time of notification of such levy to be given water purchasers, time of default and remedies in the event of default.

WATER PURCHASE CONTRACT

This is a three party contract entered into between the individual water purchaser, the Association and the State Water Conservation Board; whereby the individual agrees to purchase a definite amount of water and to pay therefore a definite sum of money on or before a definite day, until a definite future date; in addition to such definite annual sum, the individual agrees to pay such additional sum or sums as may be required annually as his proportionate share of the cost of operation and maintenance of the Association. This contract is void unless the water purchaser executes a Subscription and Pledge Agreement.

CROW CREEK PUMP UNIT

(U. S. Bureau of Reclamation Project)

HISTORY

First settlement took place adjacent to the Unit on Crow Creek in 1865 with the establishment of several large cattle ranches. The Unit was homesteaded between 1912 and 1914, but because of small farms and drought conditions beginning in 1918 and continuing into the early 1920's, many of the settlers moved away. In 1918, the Crow Creek Irrigation District was formed to investigate and develop irrigation in the area. Nearly all of the 42,000 acres included in the District became tax delinquent in the early 1920's and in 1936 the county took tax deeds to the lands. The district was dissolved in 1940 and subsequently the county sold the lands to individuals.

Farmers in the vicinity of the Crow Creek Pump Unit have recognized the need for irrigation since the first drought that followed settlement. The first investigation of the area that now includes the Crow Creek Pump Unit was made by the Reclamation Service in 1905 and 1906 for a Madison River Project. A reconnaissance survey of the area extending from Three Forks to Canyon Ferry was made by the Bureau of Reclamation in 1942 and disclosed a total of arable acreage of 32,800 acres under the Crow Creek Unit. Later, revisions of the report revealed an irrigable area of 23,400 acres of new land, including the 5,020 acres of the present Crow Creek Unit. All of this land could be supplied water by a gravity system diverting from the Madison River.

At the time Canyon Ferry Reservoir was authorized and money appropriated for construction of the dam, there were objections from local people to the effect that a suitable acreage of good agricultural land would be flooded by the Canyon Ferry Reservoir and this area taken off the tax rolls. It was, therefore, proposed that the elevation of the water surface in the reservoir be held at 3,766 feet which elevation would not flood the good agricultural land around the shore of the reservoir until a similar acreage could be developed somewhere else within the county to replace the area to be flooded and taken off the tax rolls.

The Congress, in making the first appropriation for building Canyon Ferry Reservoir, restricted the elevation of the lake to 3,766 feet until the area to be flooded by the lake at the proposed 3,800 foot level could be replaced by the irrigation of other lands within the county. After making numerous surveys, the Bureau of Reclamation decided upon the area in the Crow Creek Valley as being the most logical place to develop a project of some 5,000 acres to replace the area flooded. The time element to complete the Canyon Ferry Dam made it mandatory to build the Crow Creek Pumping Project near Toston, prior to the creation of an Irrigation District.

Studies made by the Bureau of Reclamation indicated that the loss in power revenues every four years at Canyon Ferry between elevation 3,766 and 3,800 would pay for the cost of building the Crow Creek Pumping Project. After this condition had been made known,

the Congress instructed the Bureau of Reclamation to build the Project as soon as possible and create the Irrigation District and secure water purchase contracts afterwards. In order to comply with this request, the Toston Irrigation District was created in 1955.

PRESENT STATISTICS

Location: The Crow Creek Pump Unit is located in Southwestern Montana, Broadwater County, about 47 miles Southeast of Helena and 13 miles south of Townsend. Water supply for the Unit is pumped from the Missouri River an average lift of 176 feet through a 1,175 foot discharge pipe-line. It will continue by gravity flow through the 2,044 foot Toston Tunnel, the Toston and Lombard Canals and lateral system. Point of diversion is in the NW¼ NE¼ of Section 11, T. 4N., R. 2E., and 1.8 miles upstream from the existing Broadwater-Missouri Diversion Dam.

Length and Capacity of Canals: The main Toston Canal is 6.1 miles in length with a maximum capacity of 100 c.f.s. Branching off from the Toston Canal near the center of the SE¼ of Section 3, T 4N., R. 2E., is the Lombard Canal with a capacity of 78 c.f.s. and a length of 2.2 miles.

Pumping Plant and Pipeline: At the Point of Diversion an indoor type structure was built having a reinforced concrete substructure, steel frame asbestos siding, 100 feet long and 24 feet wide at the operating platform. Within the structure, the pumping plant consists of three electrically driven pumps, each with a capacity of 33 1/3 second feet, operating against a head of 176 feet and driven by 900 horsepower motors. The discharge pipeline contains 1,175 linear feet of metal pipe, 5 feet in diameter having a capacity of 100 c.f.s.

Operation and Maintenance: A $2.00 per acre operation and maintenance charge will be made during the development period of the Project. The remaining costs in excess of $2.00 per acre annually are to be borne and charged against the operation cost at Canyon Ferry.

Present Users: First delivery of water to users under the Crow Creek Pump Unit was made during the summer of 1955. Eleven land owners at the present time hold title to all of the land under the project. There are two title holders who own more than 50% of the land under the Unit and refused to be made a part of the Toston Irrigation District. Water purchase contracts were secured from the other nine land owners, but only seven benefited from the water on their land during the year 1955.

Acreage Irrigated: In 1955, there were 1,456 acres irrigated on the Crow Creek Pump Unit project lands, with 3,989 acres potentially irrigable.

WATER RIGHT DATA

On September 18, 1952, the United States of America made and recorded a water right filing for 3,960 miner's inches of water from the Missouri River. The point of diversion being

in NW¼NE¼ of Section 11, T. 4N., R. 2E., from the Crow Creek Pumping Plant. (Ref.: Recorded in Book 3, Page 116-117 of Water Rights Records, Broadwater County Courthouse, Townsend, Montana).

See Maps in Part II, Pages 2, 3, 5.

MONTANA DITCH COMPANY

HISTORY

The exact date of the first use of the Montana Ditch will probably never be known, but from available records it was either in the year of 1900 or 1901. The Montana Ditch Company filed Articles of Incorporation on October 16, 1900, with a capital stock of $4,400, which was divided into 44 shares, at a par value of $100 each. The term of existence for this corporation was for 40 years from and after the date of its incorporation. The original 44 shares of stock were subscribed to by the following persons: Dennis Carl, John Hines Sr., Henry Whaley, M. Gurnett, Ed. Ragen, E. H. Goodman, Chas. Lefever, Catherine Riley, W. F. Tayne, Thomas McCormick, F. T. McCormick, M. D. Sullivan, L. D. Burt, H. Klein, and Louis Gans, the last three names jointly representing the American Land and Sheep Company.

On March 4, 1931, the Montana Ditch Company amended its Articles of Incorporation and changed the par value of its stock from $100 a share to $1,000 each. In 1940, the term of existence for the corporation expired and since that time a renewal has not been filed.

PRESENT STATISTICS

Location: Point of diversion of the ditch is described as diverting at a point on the east bank of the Missouri River, in the NW¼SE¼, Section 17, T. 6N., R. 2E., then following a general northerly direction across the Missouri Valley. Land irrigated under the ditch system is located in Sections 3, 4, 8, 9, 16, 17, 19, 20, 21, 28, 29, 30, and 32, T. 7N., R. 2E., and Sections 33 and 34 in T. 8N., R. 2E.

Length and Capacity of Ditch: Length of the ditch is approximately 11 miles, with a capacity sufficient to carry the 10,000 miners inches of water allotted to the system.

Operation and Maintenance: A charge of $60.00 for each share of stock owned is the annual assessment for operation and maintenance of the ditch. One share of stock represents 227 miners inches of water.

Present Users: The original 44 shares of stock are now divided among 28 water users. Since the completion of the Canyon Ferry Dam, a considerable amount of land under this ditch has been inundated by the lake above the dam and many more acres will become seeped if the 3,800 foot level of the reservoir is maintained every year. In 1955, during the first year of operation at Canyon Ferry Dam, six shares of stock in the ditch company have become inactive because of flooding and seepage from the lake. Three other landowners, with a total of five shares in the ditch company, have had their land severely dam-

aged. The exact acreage under the Montana Ditch which will be effected by the lake water cannot be determined until the maximum water level is maintained in the reservoir over a period of several years.

Acreage Irrigated: In 1955, there were 2,117 acres irrigated from the Montana Ditch, with 17 acres potentially irrigable under the system.

WATER RIGHT DATA

The water right which applies to the Montana Ditch was recorded under the names of the original stockholders in the ditch company and includes the following pertinent information: 10,000 miners inches of water from the Missouri River, appropriated on September 29, 1900. (Ref.: Book 2, Page 176 of Water Right Records, Broadwater County).

See Maps in Part II, Pages 10, 13.

WATER RIGHT DATA — BROADWATER COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAMS	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
MISSOURI RIVER BASIN							
***Missouri River**	37	810,620	20,265.500				
Jefferson River	5	6,630	165.750				
Dry Gulch Creek	1	80	2.000				
Mud Springs Creek	4	820	20.500				
Unnamed Spring	1	20	.500				
Warren Spring Creek	1	100	2.500				
Dog Spring	1	20	.500				
Unnamed Spring	1	20	.500				
Mud Springs	4	420	10.500				
Cottonwood Creek	1	100	2.500				
Unnamed Spring	1	40	1.000				
Sixteen Mile Creek	4	10,200	255.000				
Spring Creek	5	875	21.875				
West Branch Spring Creek	1	100	2.500				
Southwest Fork Spring Creek	1	100	2.500				
Hanson (Big) Springs	1	1,500	37.500	921[1]	6	——	——
Unnamed Spring	1	All	——				
Six Mile Creek	14	43,360	1,084.000				
North Fork Six Mile Creek	2	100	2.500				
Unnamed Springs	3	80	2.000				
Big Springs	1	100	2.500				
Unnamed Springs	1	25	.625				
Crow Creek	66	93,420	2,335.500	236	34	11,500	287.500
				615	1	500	12.500
				412	1	360	9.000
				501	1	300	7.500
				616	1	700	17.500
				648	1	400	10.000
				699	2	560	14.000
				746	1	200	5.000
				816	1	300	7.500
Cable Gulch Creek	1	2	.050				
Cherry Spring	1	25	.625				
Corn Creek	1	All	——				
Cottonwood Springs	1	All	——				
Crow Creek Spring	1	All	——				
Davis Springs	1	10	.250				
Mariott Creek	1	15	.375				
Mill Gulch Creek	1	600	15.000				
Rock Spring	1	50	1.250				
Unnamed Spring	1	All	——				
West Branch Crow Creek	1	——	——				
Eureka Creek	4	800	20.000				
Eagle Creek	2	270	6.750				
South Fork Crow Creek	3	800	20.000				
Slim Sam Creek	10	1,490	37.250				
Prairie Gulch Creek	3	160	4.000				
Left Fork Prairie Gulch Creek	1	200	5.000				
Cold Spring Creek	1	20	.500				
Unnamed Spring	1	50	1.250				
Mud Springs	1	50	1.250				
Big Flume Gulch Creek	2	60	1.500				
Cottonwood Creek	1	50	1.250				
Unnamed Spring	1	150	3.750				
Keating Gulch Creek	13	640	16.000				
Easterly Gulch Creek	1	10	.250				

*Names of streams indented on the lefthand margin indicate that they are tributaries of the first stream named above which is not indented.

WATER RIGHT DATA — BROADWATER COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAMS	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Unnamed Springs	3	135	3.375				
Waste	1	20	.500				
Johnny's Gulch Creek	10	2,960	74.000				
Houghs Gulch Creek	1	10	.250				
Spears Gulch Creek	3	150	3.750				
Unnamed Spring	1	20	.500				
Springer Spring	1	10	.250				
Unnamed Spring	1	50	1.250				
Unnamed Creek	1	40	1.000				
Unnamed Spring	1	80	2.000				
Unnamed Springs	4	790	19.750				
Warm Springs Creek	3	500	12.500				
Mammoth Springs	3	280	7.000				
Unnamed Springs	2	35	.875				
Antonetti Spring	2	50	1.250				
Unnamed Springs	4	125	3.125				
Mountain Spring	1	50	1.250				
Unnamed Springs	2	150	3.750				
Waste	2	200	5.000				
Unnamed Swamp	1	200	5.000				
Spring Creek	5	2,050	51.250				
Rattlesnake (Galen Gulch) Creek	2	12,000	300.000				
Unnamed Springs	2	200	5.000				
Rock Creek	3	1,280	32.000				
Unnamed Springs	2	400	10.000				
Ruby Spring Creek	1	100	2.500				
Unnamed Springs	3	145	3.625				
Lone Mountain Spring	2	—	—				
North Salt Gulch Canyon Creek	1	100	2.500				
Unnamed Springs	2	110	2.750				
Unnamed Spring	1	150	3.750				
Cottonwood Creek	4	104	2.600				
Left Fork Cottonwood Creek	1	100	2.500				
Unnamed Springs	4	10	.250				
Willow Swamp	1	500	12.500	236	(See Crow Creek)		
Unnamed Spring	1	125	3.125				
Middle Creek	1	1,000	25.000				
Waste	2	300	7.500				
Unnamed Springs	2	200	5.000				
Bear Spring	3	16	.400				
Cottonwood Basin Spring	1	100	2.500				
Unnamed Spring	1	25	.625				
Cannon Gulch Spring	1	100	2.500				
Dry Creek	13	3,060	76.500	331	6	1,135	28.375
Unnamed Springs	2	55	1.375				
Grayson Creek	8	1,150	28.750	118	6	475	11.875
Unnamed Springs	2	10	.250				
Swamp	1	100	2.500				
Cottonwood Springs	1	10	.250				
Unnamed Springs	3	55	1.375				
Deep Creek	36	35,420	885.500	465[2]	20	2,910	72.750
Unnamed Spring	1	25	.625				
Russel Fork Deep Creek	1	1,000	25.000				
Granger Creek	6	9,300	232.500				
Cabin Gulch Creek	1	100	2.500				
Unnamed Spring	1	35	.875				
North Fork Deep Creek	9	1,969	49.225				
Unnamed Spring	1	All	—				

WATER RIGHT DATA — BROADWATER COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAMS	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Spring Creek	1	50	1.250				
Unnamed Spring	1	50	1.250				
Ross Springs	1	25	.625				
Wests Gulch Creek	1	200	5.000				
Dry Hollow	0	0	0				
Unnamed Spring	1	20	.500				
Flume Hollow	0	0	0				
Unnamed Spring	1	10	.250				
Unnamed Spring	1	2	.050				
Unnamed Well	1	200	5.000				
Unnamed Spring	3	40	1.000				
Indian Creek	25	7,533	188.325				
Cold Spring	1	50	1.250				
East Fork Indian Creek	2	276	6.900				
Left Fork Indian Creek	10	875	21.875				
North Fork Indian Creek	2	500	12.500				
Right Fork Indian Creek	3	900	22.500				
South Fork Indian Creek	3	140	3.500				
Spring Creek	1	200	5.000				
Squaw Gulch Creek	1	All	——				
Turpin Gulch Creek	2	1,000	25.000				
Waste	1	150	3.750				
Unnamed Springs	2	320	8.000				
Rabideau Gulch Creek	1	36	.900				
Badger Creek	1	160	4.000				
Badger Spring	1	20	.500				
Graham Springs	1	20	.500				
West Fork Indian Creek	1	60	1.500				
Yellowstone Gulch Creek	1	10	.250				
Unnamed Spring	1	All	——				
South Spring	1	5	.125				
Boomerang Gulch Creek	1	20	.500				
Cottonwood Creek	8	2,125	53.125				
Willow Springs	1	200	5.000				
South Fork Cottonwood Creek	1	300	7.500				
Unnamed Spring	1	30	.750				
Doggett Springs	2	70	1.750				
Unnamed Spring	1	200	5.000				
Warm Springs Creek	4	868	21.700	17	2	150	3.750
Warm Springs	1	300	7.500				
Waste	1	15	.375				
Whipcracker Gulch Creek	3	150	3.750				
Iron Mask Tunnel	4	360	9.000				
Unnamed Spring	1	40	1.000				
Rathbun Gulch Creek	1	100	2.500				
Little Cottonwood Creek	1	100	2.500				
Magpie Springs	1	100	2.500				
Deer Spring	1	20	.500				
Unnamed Springs	3	130	3.250				
Waste	1	25	.625				
Bailey Gulch Creek	4	225	5.625				
Unnamed Springs	2	70	1.750				
White Horse Creek	7	1,060	26.500				
Left Fork White Horse Creek	1	50	1.250				
Right Fork White Horse Creek	1	100	2.500				
Unnamed Spring	1	25	.625				
Cabin Gulch Creek	1	50	1.250				
Unnamed Spring	1	20	.500				
South Cabin Gulch Creek	1	100	2.500				
Unnamed Creek	1	300	7.500				

WATER RIGHT DATA — BROADWATER COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAMS	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Ray (South) Creek	4	400	10.000	20	9	755	18.875
				836	2	240	6.000
				967	2	100	2.500
South Fork Ray Creek	1	50	1.250				
Mill Fork Creek	1	100	2.500				
Faulkner Spring	1	10	.250				
Ray Creek Spring	2	15	.375				
Unnamed Springs	2	45	1.125				
Middle Fork Ray Creek	1	30	.750				
Middle Ray Creek Springs	2	60	1.500				
Unnamed Springs	2	55	1.375				
North Fork Ray Creek	1	100	2.500				
Unnamed Spring	1	50	1.250				
Unnamed Spring	1	40	1.000				
Dry Gulch Creek	6	1,025	25.625				
Dry Gulch Spring	1	50	1.250				
Kimber Gulch Creek	2	50	1.250				
Kimber Gulch Springs	2	50	1.250				
Kelly Gulch Creek	1	25	.625				
Kelly Gulch Springs	4	55	1.375				
Iron Age Gulch Creek	3	280	7.000				
Eurman Springs	1	30	.750				
Gurnett (North) Creek	6	550	13.750	1152[3]	8	785	19.625
Unnamed Springs	12	637	15.925				
Duck Creek	18	6,600	165.000	2047	13	1,386.25	34.656
Dunns Gulch Creek	1	100	2.500				
Three Mile Creek	1	All	——				
Middle Fork Duck Creek	1	100	2.500				
Unnamed Springs	3	155	3.875				
Mill Gulch Creek	1	20	.500				
North Fork Duck Creek	3	660	16.500	2047	(See Duck Creek)		
Unnamed Spring	1	All	——				
Unnamed Spring	1	60	1.500				
Unnamed Creek	1	200	5.000				
Confederate (Gulch) Creek	35	12,670	316.750	1918 1931	21	5,075	126.875
Spencer Gulch Creek	1	All	——				
Cement Gulch Creek	4	100	2.500	1918 1931	(See Confederate Creek)		
Ready Cash Gulch Creek	1	——	——				
Unnamed Spring	1	25	.625				
Reservoir Gulch Creek	1	100	2.500				
Blacktail Creek	3	All	——	1918 1931	(See Confederate Creek)		
Montana (Gulch) Creek	4	175	4.375	1918 1931	(See Confederate Creek)		
East Fork Montana Gulch Creek	1	All	——				
Spring Gulch Creek	1	All	——				
Unnamed Spring	1	10	.250				
Greenhorn (Gulch) Creek	0	0	0	1918 1931	(See Confederate Creek)		
Greenhorn Springs	4	All	——				
Boulder Creek	18	11,040	276.000	1918 1931	(See Confederate Creek)		
Boulder Lakes	3	All	——				
South Boulder Creek	2	350	8.750				
Tributary of Boulder Creek	1	All	——				
Spruce Creek	8	850	21.250				
South Spruce Creek	1	60	1.500				
Woods (Gulch) Creek	5	700	17.500	1918 1931	(See Confederate Creek)		

WATER RIGHT DATA — BROADWATER COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAMS	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Hinaman Creek	1	300	7.500	1918, 1931	(See Confederate Creek)		
Hunters (Gulch) Creek	2	50	1.250	1918, 1931	(See Confederate Creek)		
Unnamed Spring	1	300	7.500				
Clear Creek	2	All	——	1918, 1931	(See Confederate Creek)		
Lone Tree (Willow) Creek	5	550	13.750	1918, 1931	(See Confederate Creek)		
Unnamed Spring	1	15	.375				
Mound Spring Gulch Creek	1	100	2.500				
Unnamed Spring	1	40	1.000				
Horse Creek	4	160	4.000				
Unnamed Spring	1	500	12.500				
Beaver Creek	60	28,060	701.500	208	38	6,375.6	159.390
				690	1	1,500	37.500
				743	1	100	2.500
				1044	1	600	15.000
				1057	3	1,150	28.750
				1063	1	500	12.500
				1072	1	200	5.000
Cornell Creek	1	All	——				
Goodman Springs	1	25	.625				
Left Fork Beaver Creek	1	100	2.500				
North Fork Beaver Creek	3	1,200	30.000				
Southeast Fork Beaver Creek	1	200	5.000				
South Fork Beaver Creek	4	3,200	80.000				
Vose Gulch Creek	1	200	5.000				
West Fork Beaver Creek	1	2,000	50.000				
South Pole Creek	2	200	5.000				
Weasel Creek	7	1,470	36.750				
Pole Creek	7	635	15.875	1842	5	190	4.750
Antelope Creek	9	795	19.875	253	2	510	12.750
Sawmill Springs	1	100	2.500				
Chime Gulch Creek	1	300	7.500				
Unnamed Springs	1	100	2.500				
Staubach Creek	6	975	24.375	328	3	415	10.375
Kelch (Sheule) Gulch Creek	3	65	1.625				
Tony (Pauley) Creek	3	85	2.125				
Unnamed Spring	1	30	.750				
Tilleke Hollow Creek	1	250	6.250				
Unnamed Spring	1	40	1.000				
Grubb Gulch Creek	0	0	0				
Grubb Gulch Spring	1	75	1.875				
Nolan (Gulch) Creek	2	30	.750				
Jacob Coulee Creek	1	10	.250				
Unnamed Spring	1	50	1.250				
Whites Gulch Creek	20	5,250	131.250	467	4	1,300	32.50
				839	1	400	10.00
Uncle Johnnys Spring	1	All	——				
Spring Gulch Creek	5	400	10.000				
Unnamed Spring	1	50	1.250				
Unnamed Springs	2	75	1.875				
Bilk Gulch Creek	4	550	13.750				
Unnamed Springs	4	95	2.375				
Avalanche Gulch Creek	19	6,635	165.875				
Landon Gulch Creek	1	All	——				
Spiling Gulch Creek	1	100	2.500				
Cooney Creek	1	100	2.500				
Unnamed Creek	1	100	2.500				
Narytime Gulch Creek	1	150	3.750				

WATER RIGHT DATA — BROADWATER COUNTY

APPROPRIATIONS AND DECREES BY STREAMS

STREAMS	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Hellgate Gulch Creek	11	1,730	43.250				
Little Hellgate Creek	2	1,000	25.000				
Magpie Creek	4	400	10.000				
Never Sweat Gulch Creek	1	All	——				
Unnamed Spring	1	150	3.750				
Spokane Creek	8	1,700	42.500	73[4]	1	300	7.500
				5764[5]	1	90	2.250
Branch of Spokane Creek	1	100	2.500				
Jims Spring	1	15	.375				
Moran Gulch Creek	1	50	1.250				
Sheep Creek	7	750	18.750				
Unnamed Springs	3	170	4.250				
Miller Creek	4	250	6.250				
Unnamed Spring	1	All	——				
Spring Gulch Creek	3	140	3.500				
Boulder Spring	1	——	——				
Farrow (Dobler Gulch) Creek	3	250	6.250				
Unnamed Spring	1	All	——				
TOTAL	957	1,171,548	29,288.700		201	41,461.85	1036.546

[1] A "Ditch Decree", defining the capacity and water rights pertaining to a particular ditch system.

[2] Deep Creek Decree recorded and filed in Meagher County Courthouse.

[3] Gurnett (North) Creek Decree recorded and filed in Meagher County Courthouse.

[4] Decree for Spokane Creek, Case No. 73, applies to Broadwater and Lewis & Clark Counties. Number rights listed pertain to Broadwater County only. Recorded and filed in Jefferson County Courthouse.

[5] Decree for Spokane Creek, Case No. 5764, applies to Broadwater and Lewis & Clark Counties. Number of rights listed pertain to Broadwater County only. Recorded and filed in Lewis & Clark County Courthouse.

DRAINAGES IN BROADWATER COUNTY NOT LOCATED

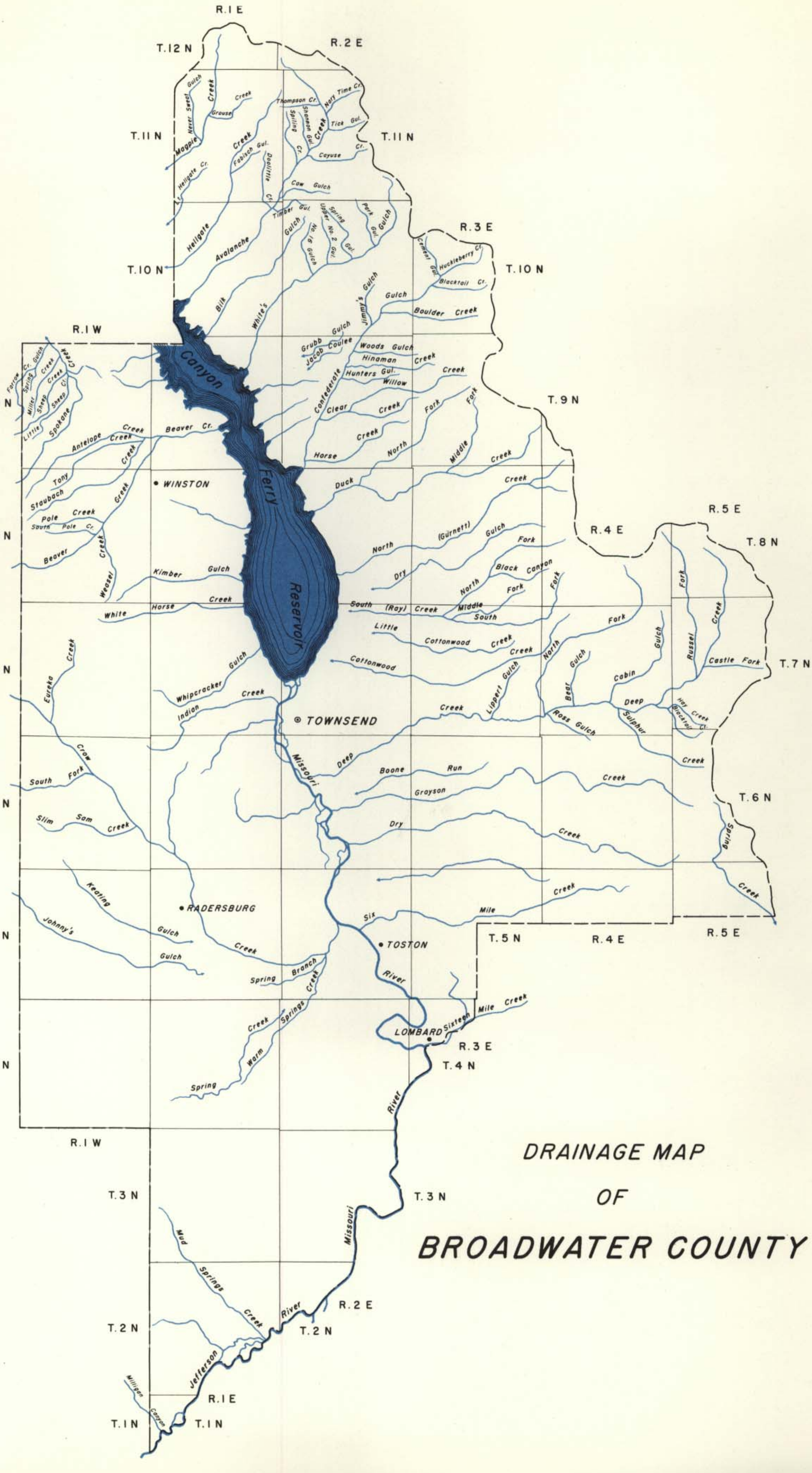
STREAMS	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.
Cascade Gulch Creek	1	50	1.250
Pomeroys Gulch Spring	1	——	——
Sawmill Gulch Springs	1	25	.625
Spring Creeks	6	2,950	73.750
Unnamed Creeks	2	200	5.000
Unnamed Springs	19	490	12.250
Unnamed Well	1	50	1.250
TOTAL	31	3,765	94.125

WATER RESOURCES SURVEY

Broadwater County, Montana

Part II
Maps Showing Irrigated Areas

Published by
STATE ENGINEER'S OFFICE
Helena, Montana
June, 1956



DRAINAGE MAP OF BROADWATER COUNTY

MAP INDEX

MAP SYMBOL INDEX

BOUNDARIES

- COUNTY LINE
- NATIONAL FOREST LINE

DITCHES

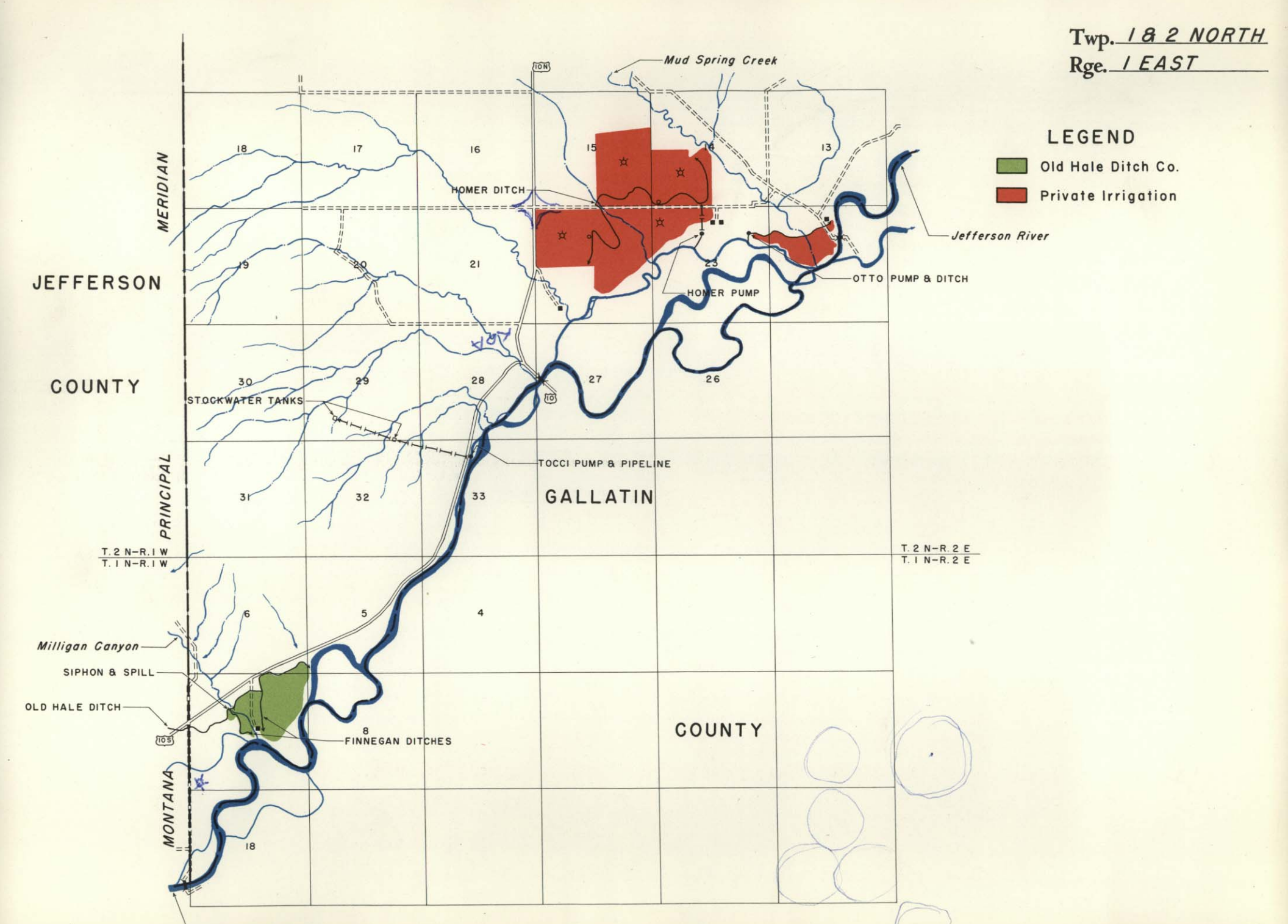
- CANALS OR DITCHES
- DRAIN DITCHES
- PROPOSED DITCHES

TRANSPORTATION

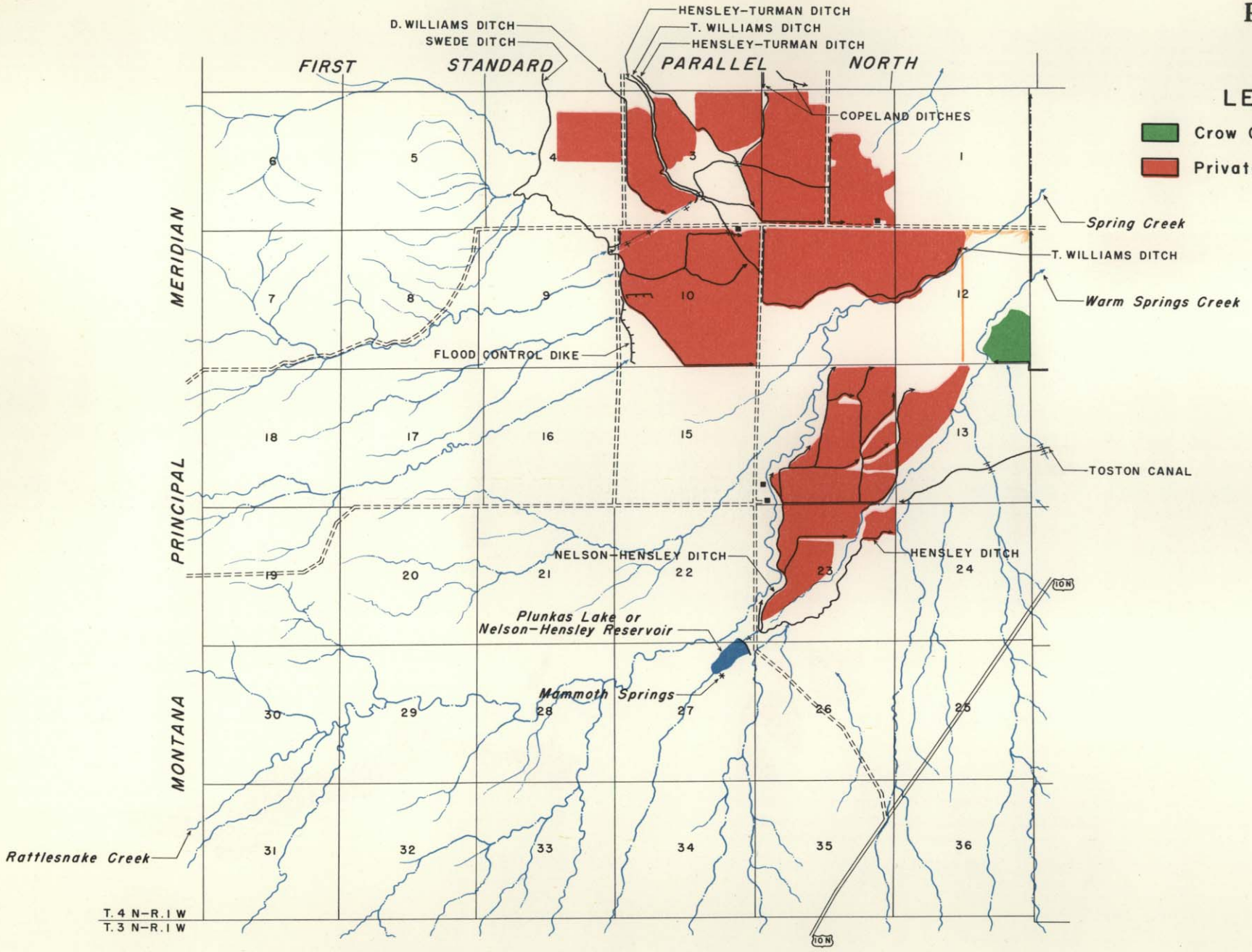
- PAVED ROADS
- UNPAVED ROADS
- RAILROADS
- STATE HIGHWAY
- U.S. HIGHWAY
- AIRPORT

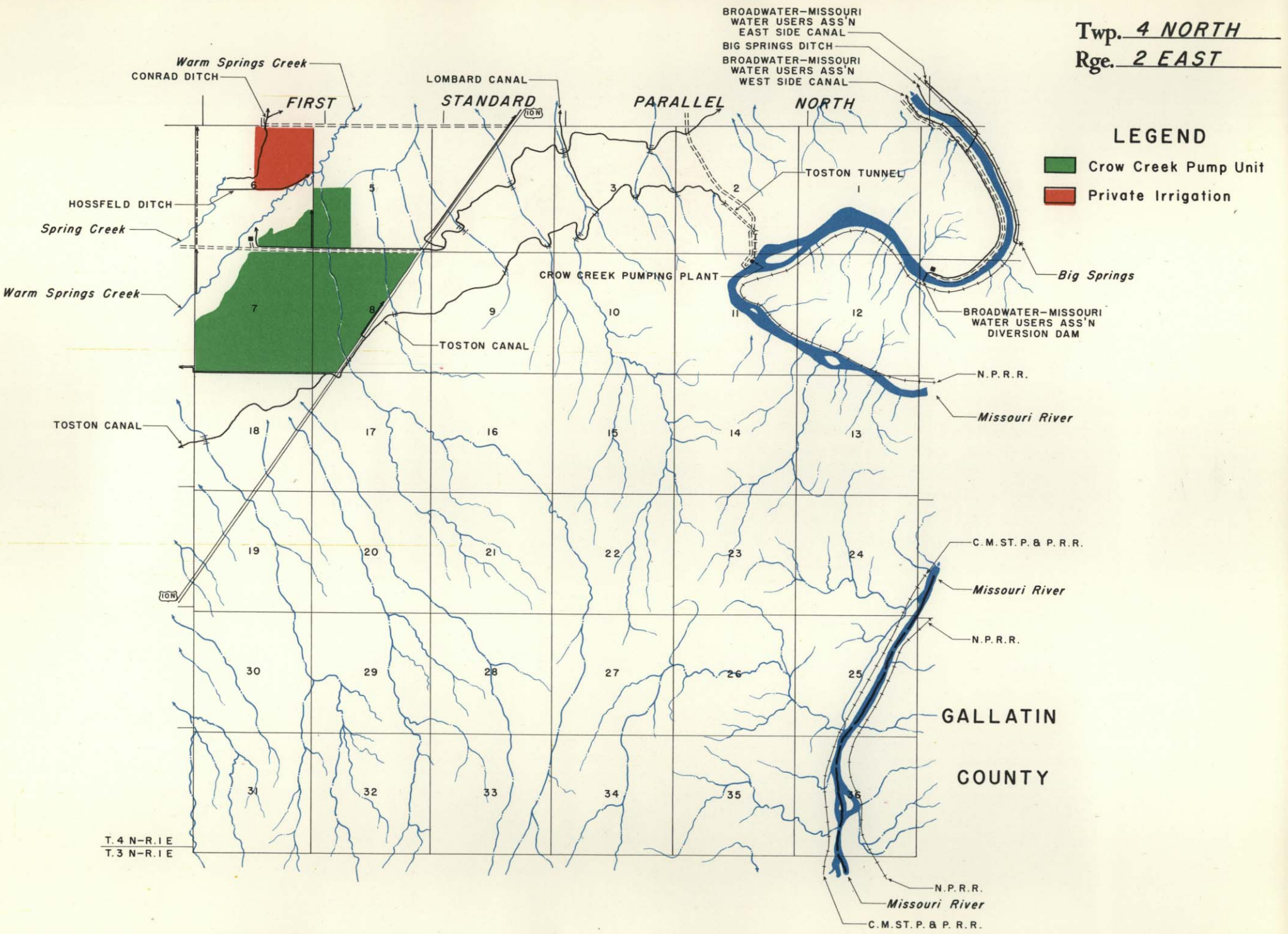
STRUCTURES & UNITS

- DAM
- DIKE
- FLUME
- SIPHON
- SPILL
- SPRINKLER SYSTEM
- WEIR
- PIPE LINE
- PUMP
- PUMP SITE
- RESERVOIR
- WELL
- NATURAL CARRIER USED AS DITCH
- SPRING
- SWAMP
- GAUGING STATION
- POWER PLANT
- STORAGE TANK
- CEMETERY
- FAIRGROUND
- FARM OR RANCH UNIT
- LOOKOUT STATION
- RANGER STATION
- RAILROAD TUNNEL
- SCHOOL
- SHAFT, MINE, OR DRIFT

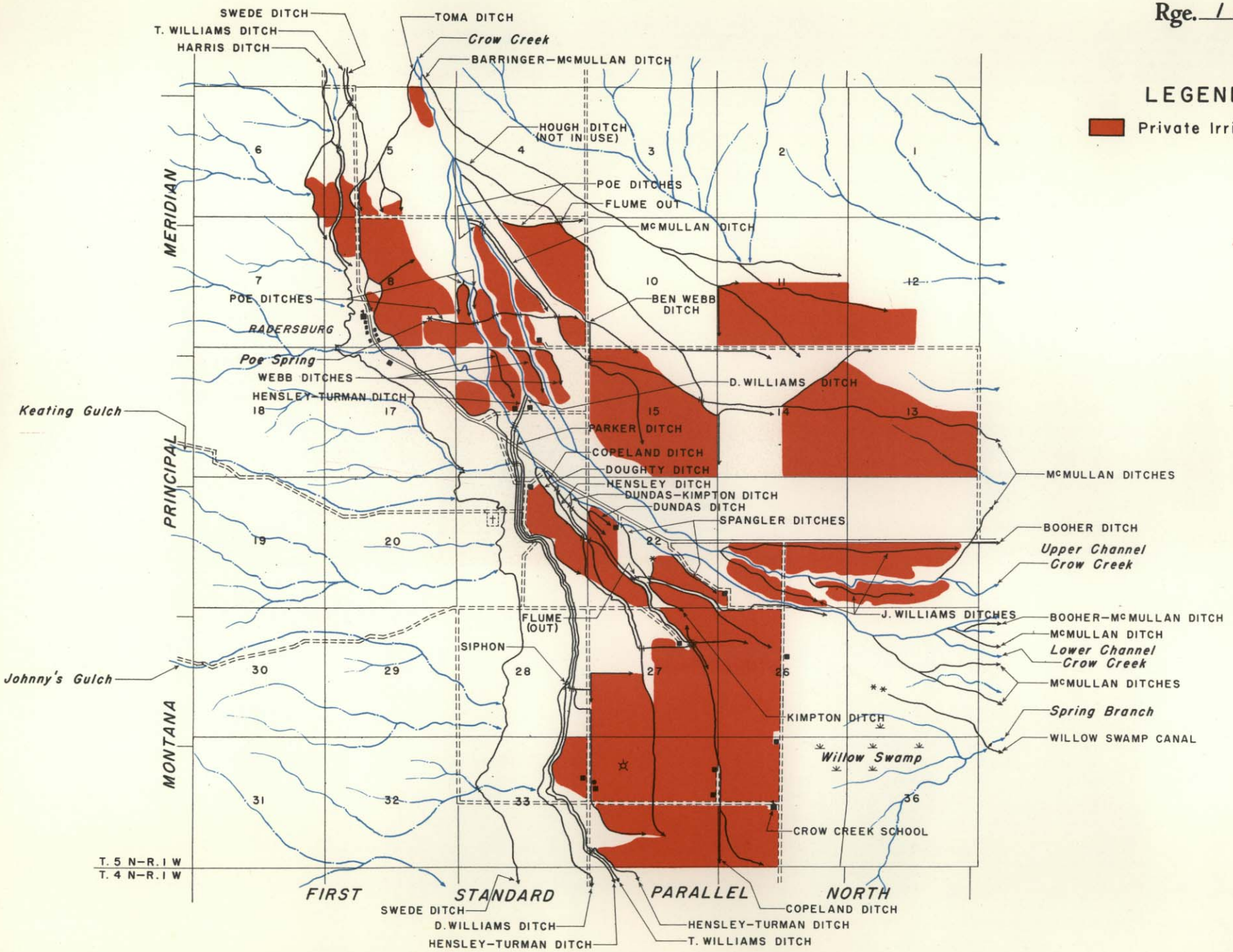

Twp. 1 & 2 NORTH
Rge. 1 EAST
LEGEND
Old Hale Ditch Co.
Private Irrigation
Mud Spring Creek
HOMER DITCH
Jefferson River
OTTO PUMP & DITCH
HOMER PUMP
JEFFERSON
COUNTY
MERIDIAN
PRINCIPAL
MONTANA
STOCKWATER TANKS
TOCCI PUMP & PIPELINE
GALLATIN
COUNTY
T. 2 N-R. 1 W
T. 1 N-R. 1 W
T. 2 N-R. 2 E
T. 1 N-R. 2 E
Milligan Canyon
SIPHON & SPILL
OLD HALE DITCH
FINNEGAN DITCHES
10N
10
10S
18
17
16
15
14
13
19
20
21
23
30
29
28
27
26
31
32
33
6
5
4
8
18

Twp. 4 NORTH
Rge. 1 EAST




Twp. 4 NORTH
Rge. 2 EAST
BROADWATER-MISSOURI WATER USERS ASS'N EAST SIDE CANAL
BIG SPRINGS DITCH
BROADWATER-MISSOURI WATER USERS ASS'N WEST SIDE CANAL
Warm Springs Creek
CONRAD DITCH
LOMBARD CANAL
FIRST STANDARD PARALLEL NORTH
LEGEND
Crow Creek Pump Unit
Private Irrigation
TOSTON TUNNEL
HOSSFELD DITCH
Spring Creek
Warm Springs Creek
CROW CREEK PUMPING PLANT
Big Springs
BROADWATER-MISSOURI WATER USERS ASS'N DIVERSION DAM
TOSTON CANAL
N.P.R.R.
Missouri River
TOSTON CANAL
C.M.ST.P.& P.R.R.
Missouri River
N.P.R.R.
GALLATIN
COUNTY
N.P.R.R.
Missouri River
C.M.ST.P.& P.R.R.
T.4 N-R.1E
T.3 N-R.1E

Twp. 5 NORTH
Rge. 1 EAST



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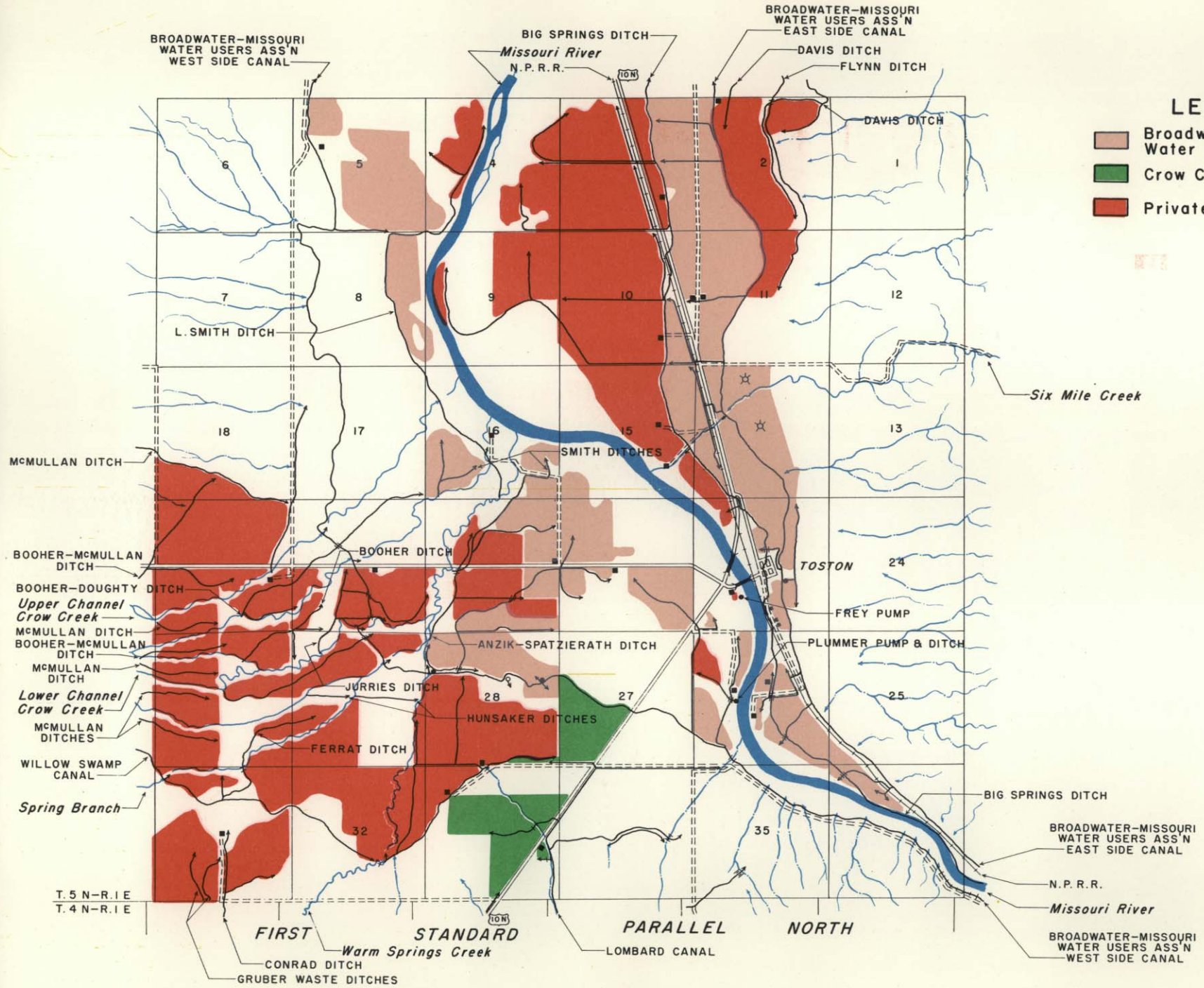
Rge. 2 EAST



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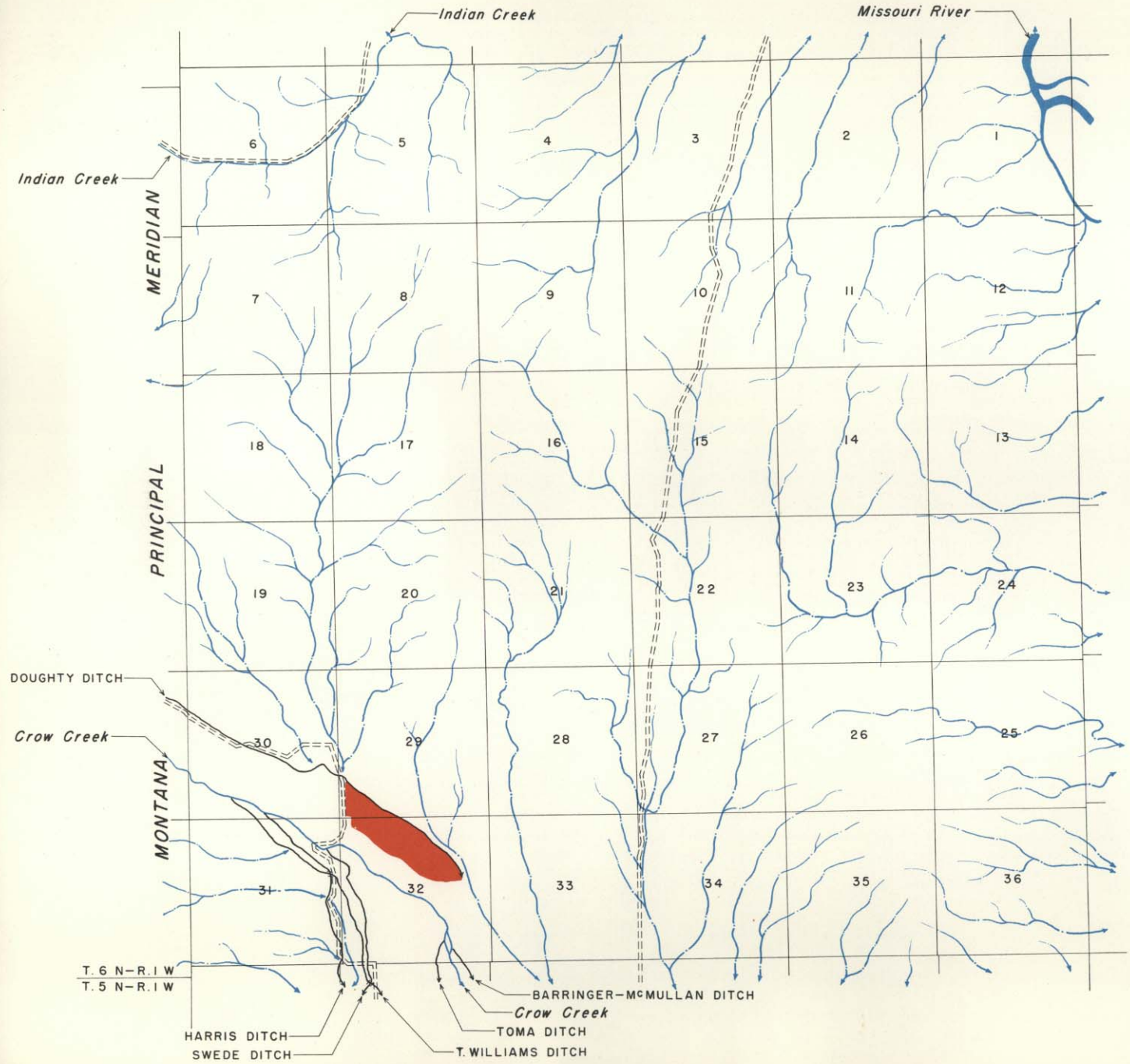
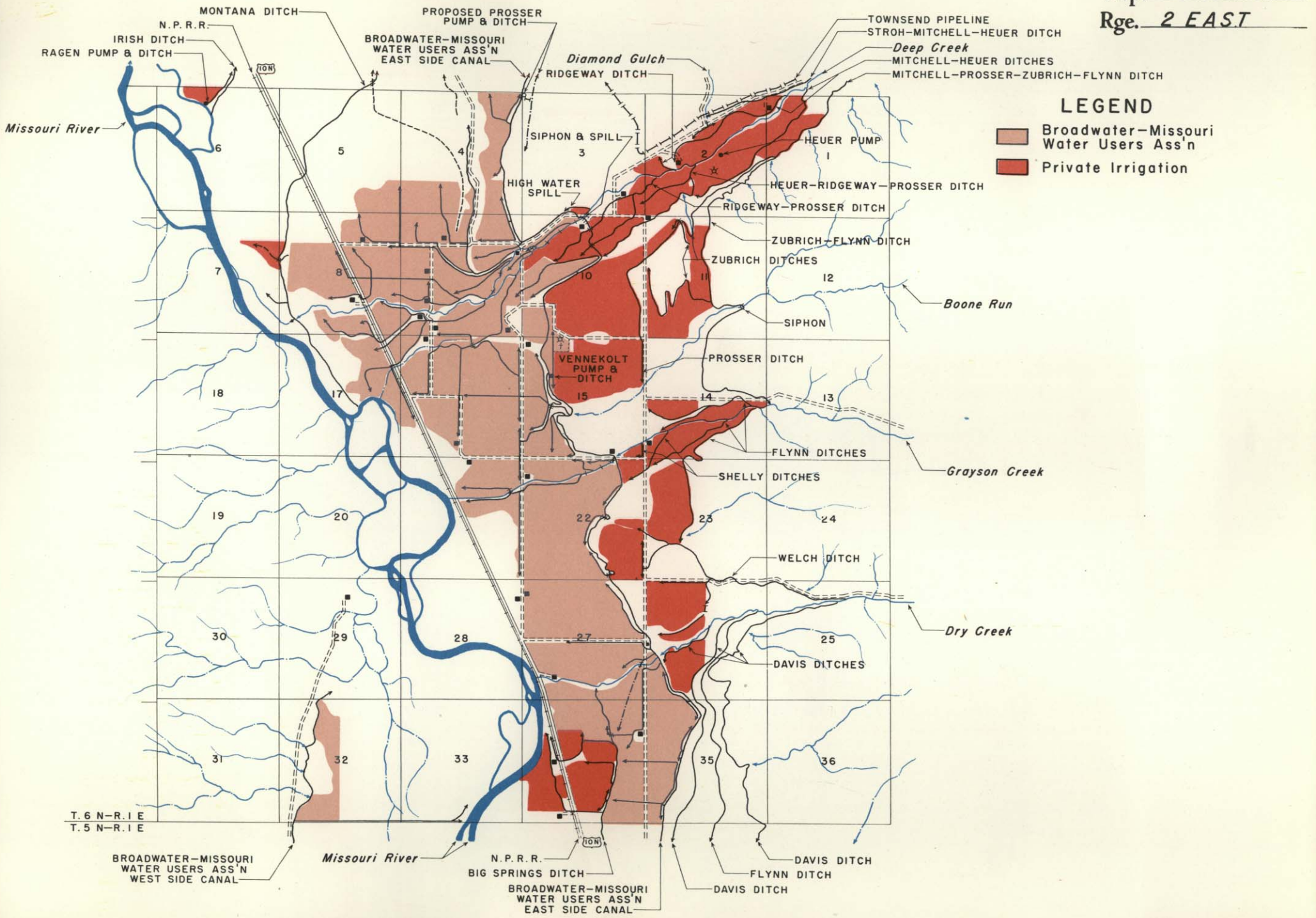
Rge. 1 EAST



LEGEND

Private Irrigation

Twp. 6 NORTH
Rge. 2 EAST



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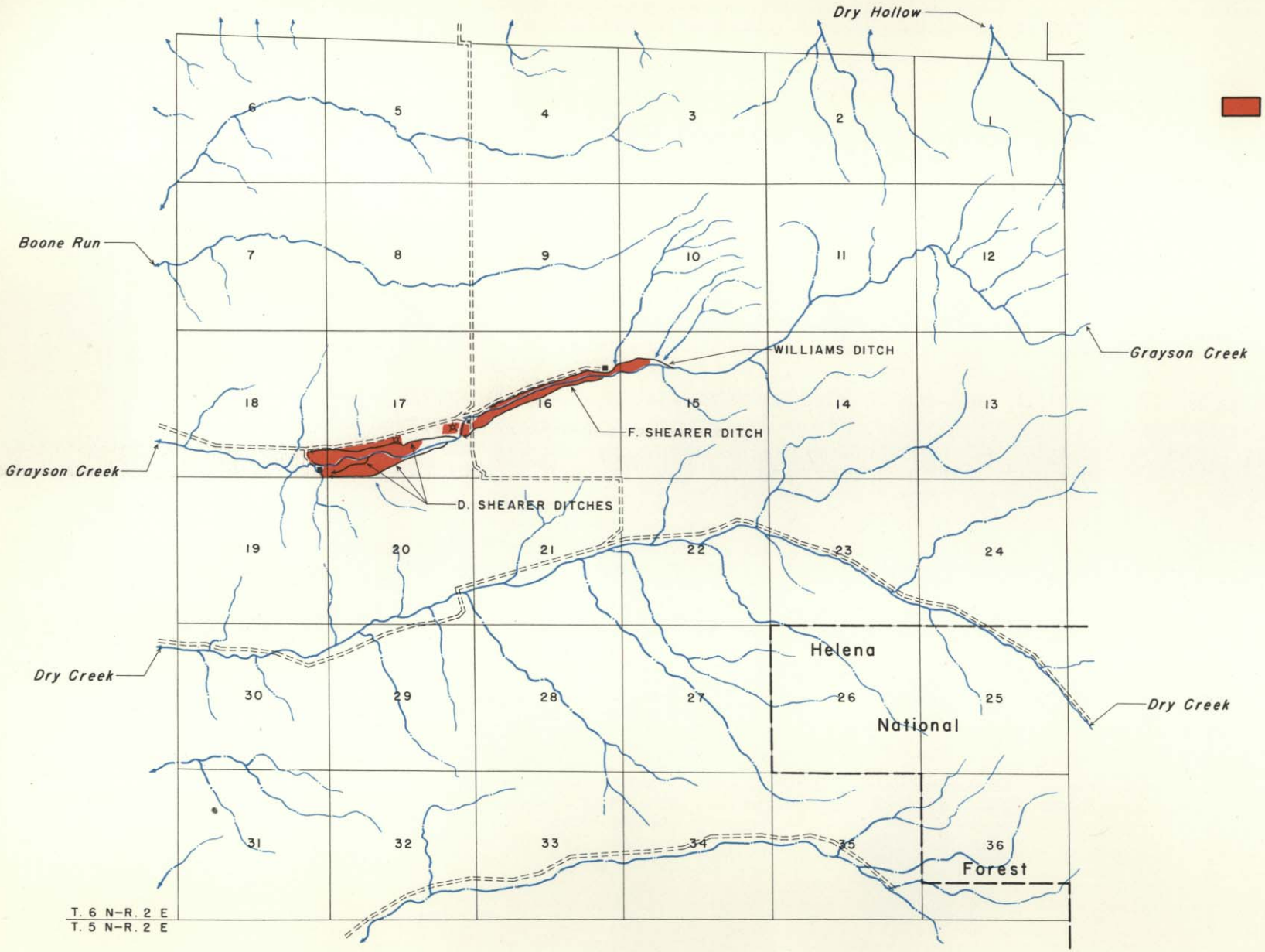
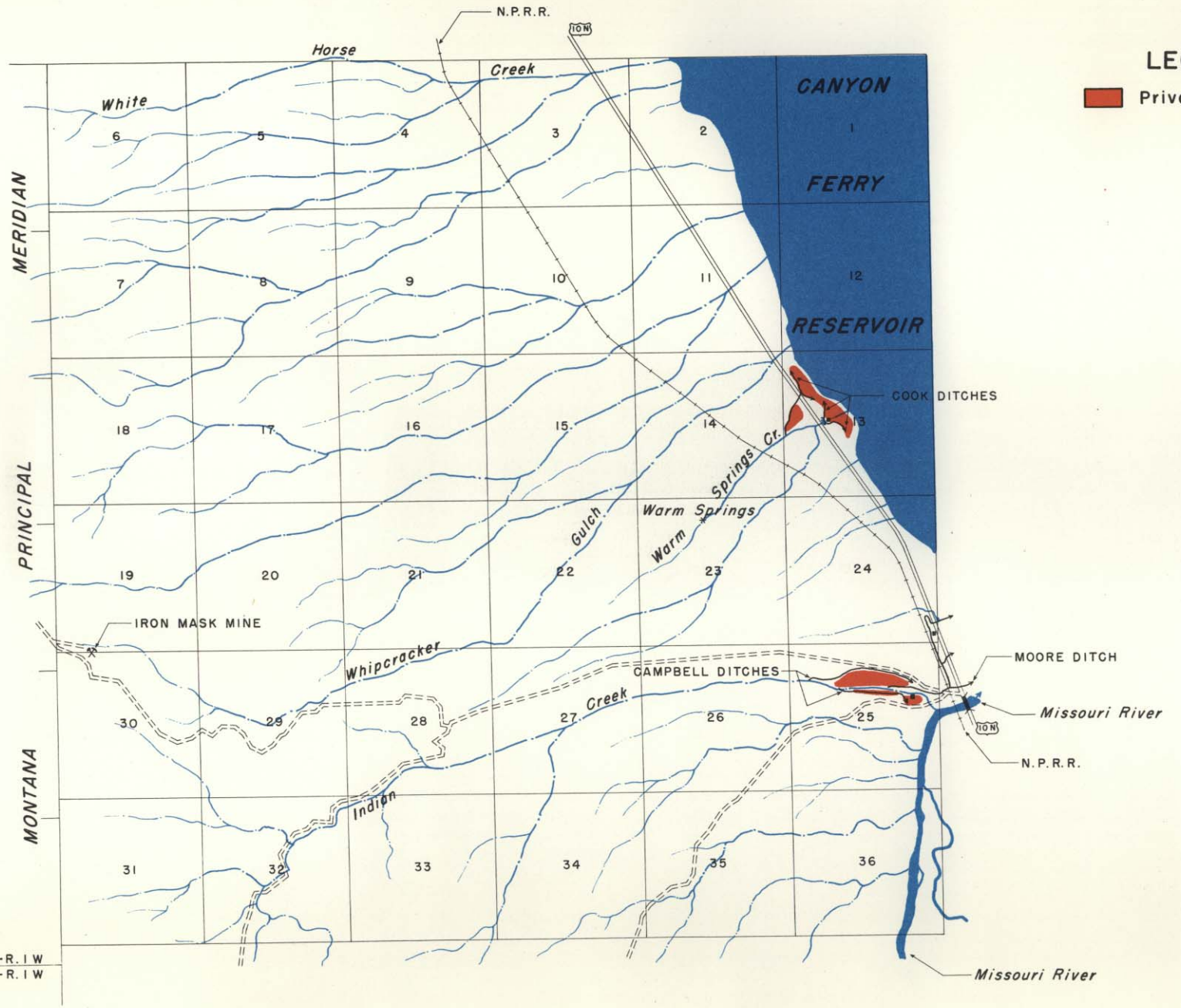
Rge. 3 EAST



LEGEND

Private Irrigation

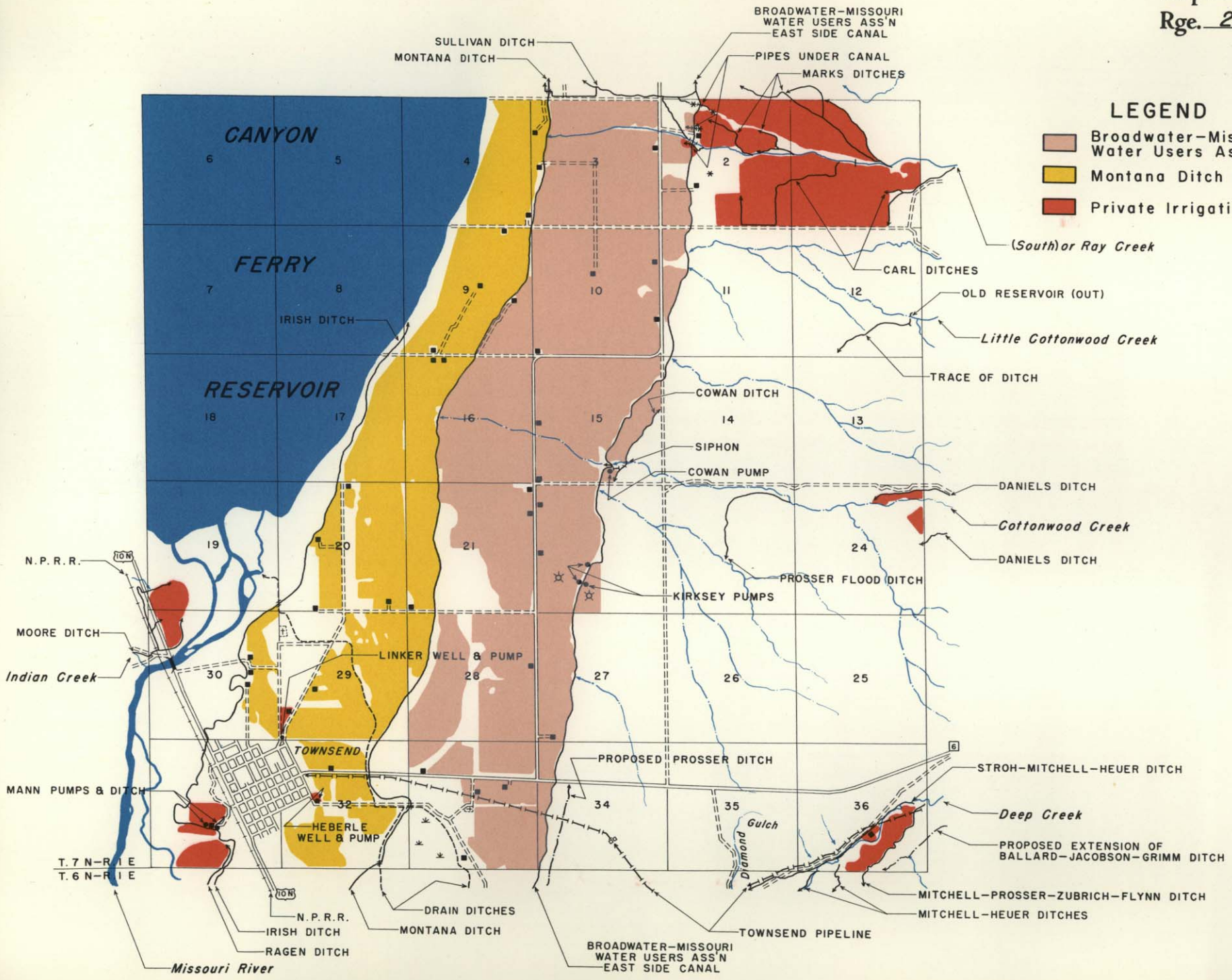
Twp. 7 NORTH
Rge. 1 EAST



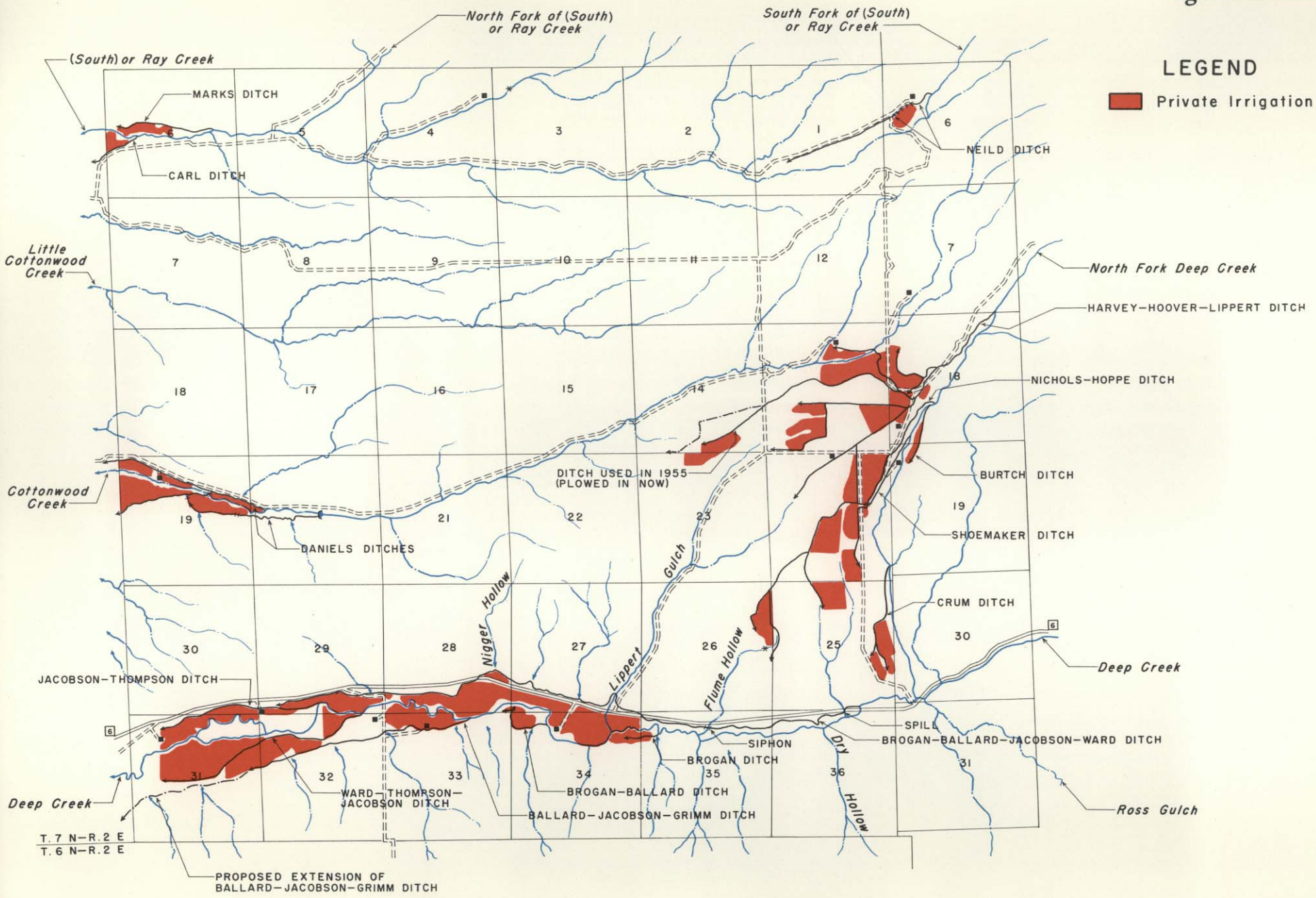
LEGEND

Private Irrigation

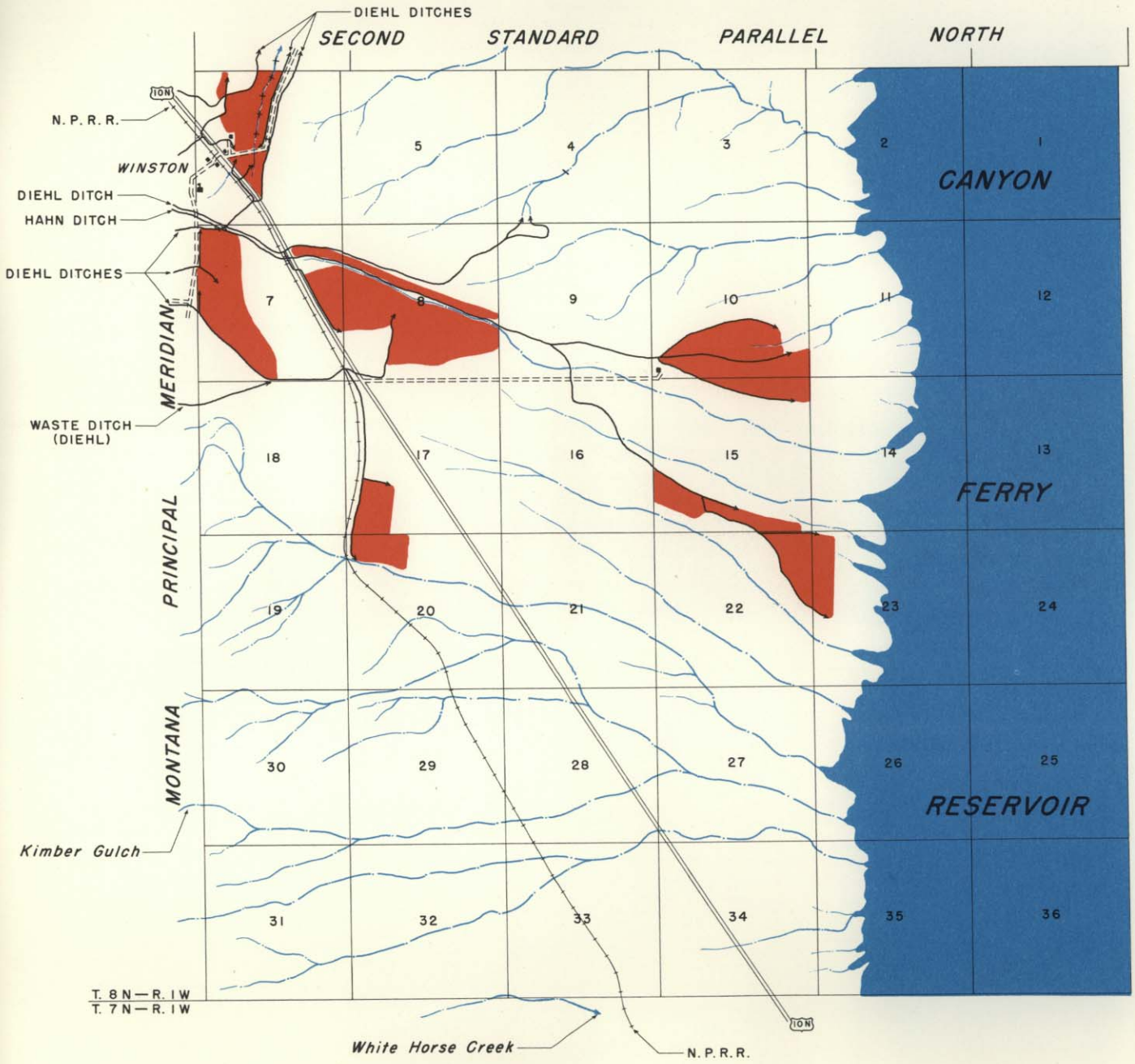
Twp. 7 NORTH
Rge. 2 EAST



Twp. 7 NORTH
Rge. 3 & 4 EAST



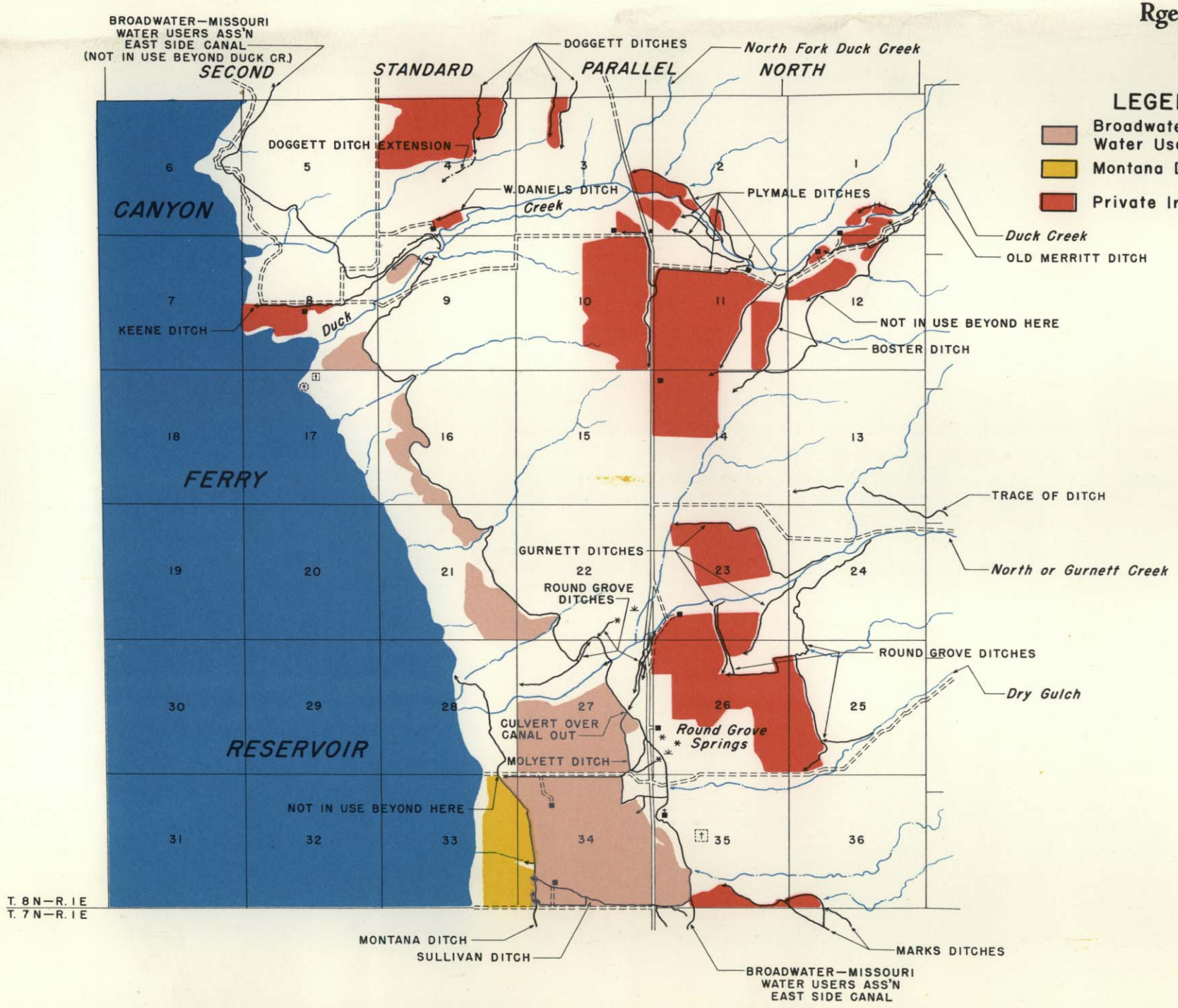
Twp. 8 NORTH
Rge. 1 EAST



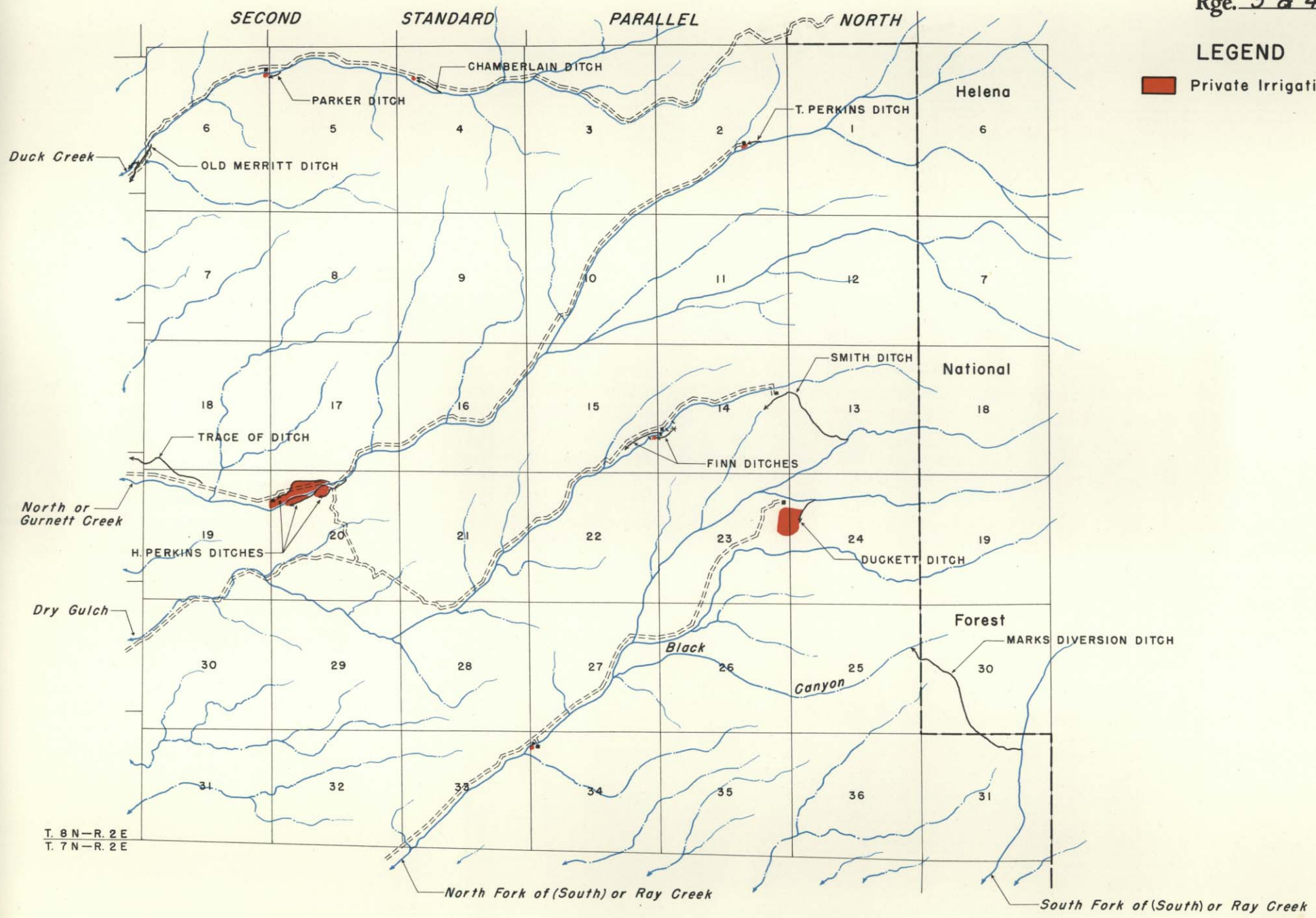
LEGEND

Private Irrigation

Twp. 8 NORTH
Rge. 2 EAST

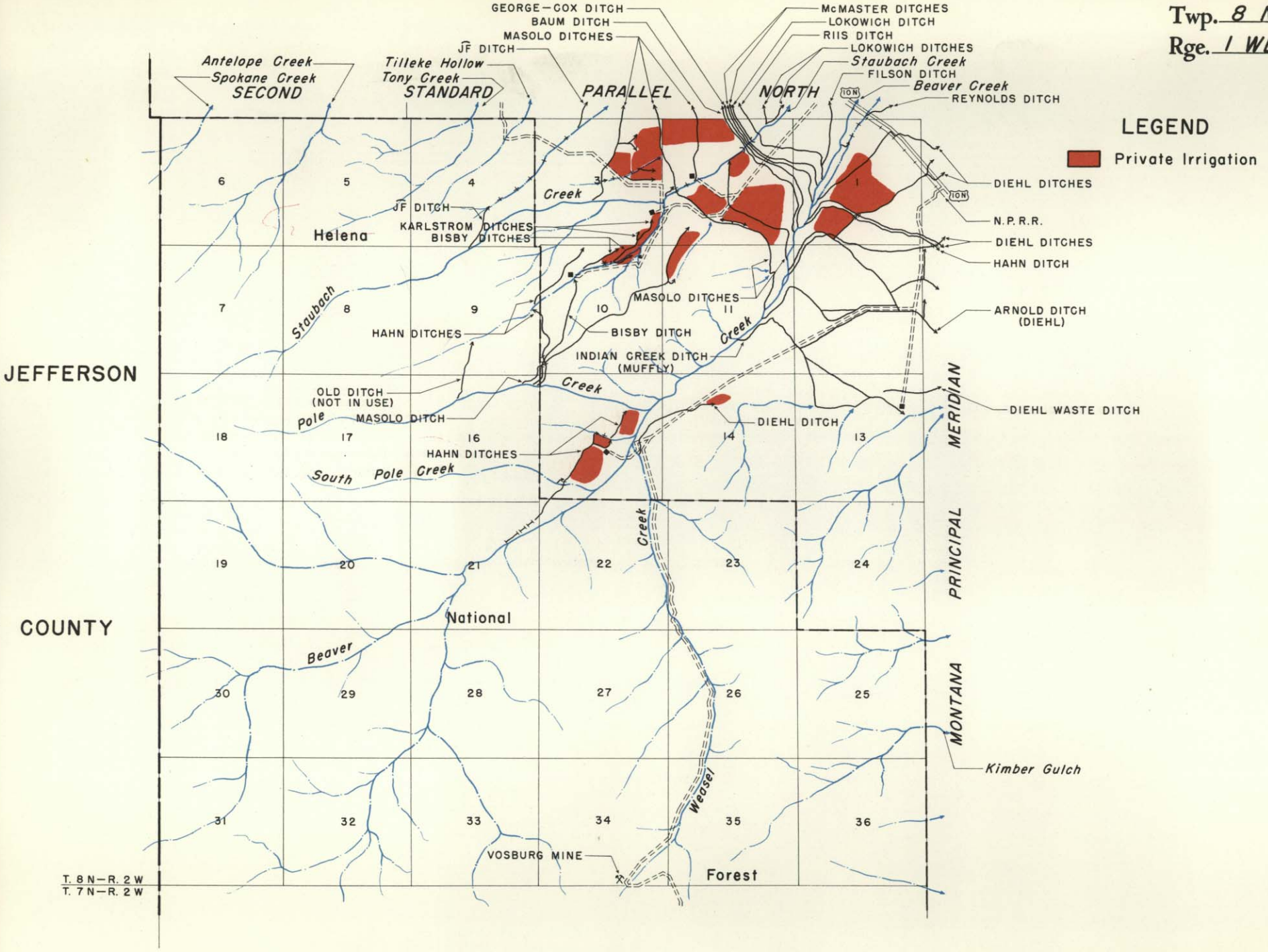


Twp. 8 NORTH
Rge. 3 & 4 EAST

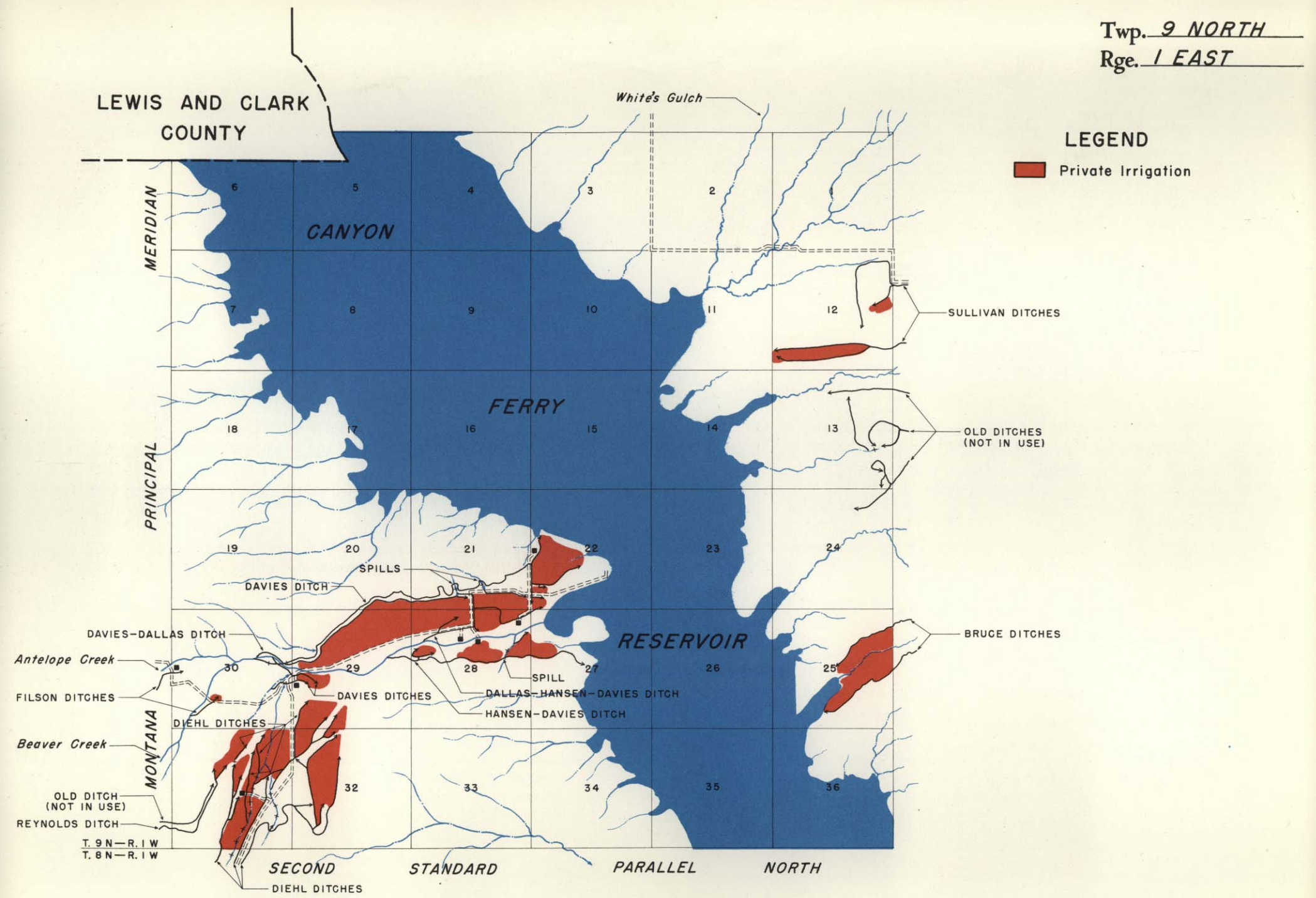


LEGEND

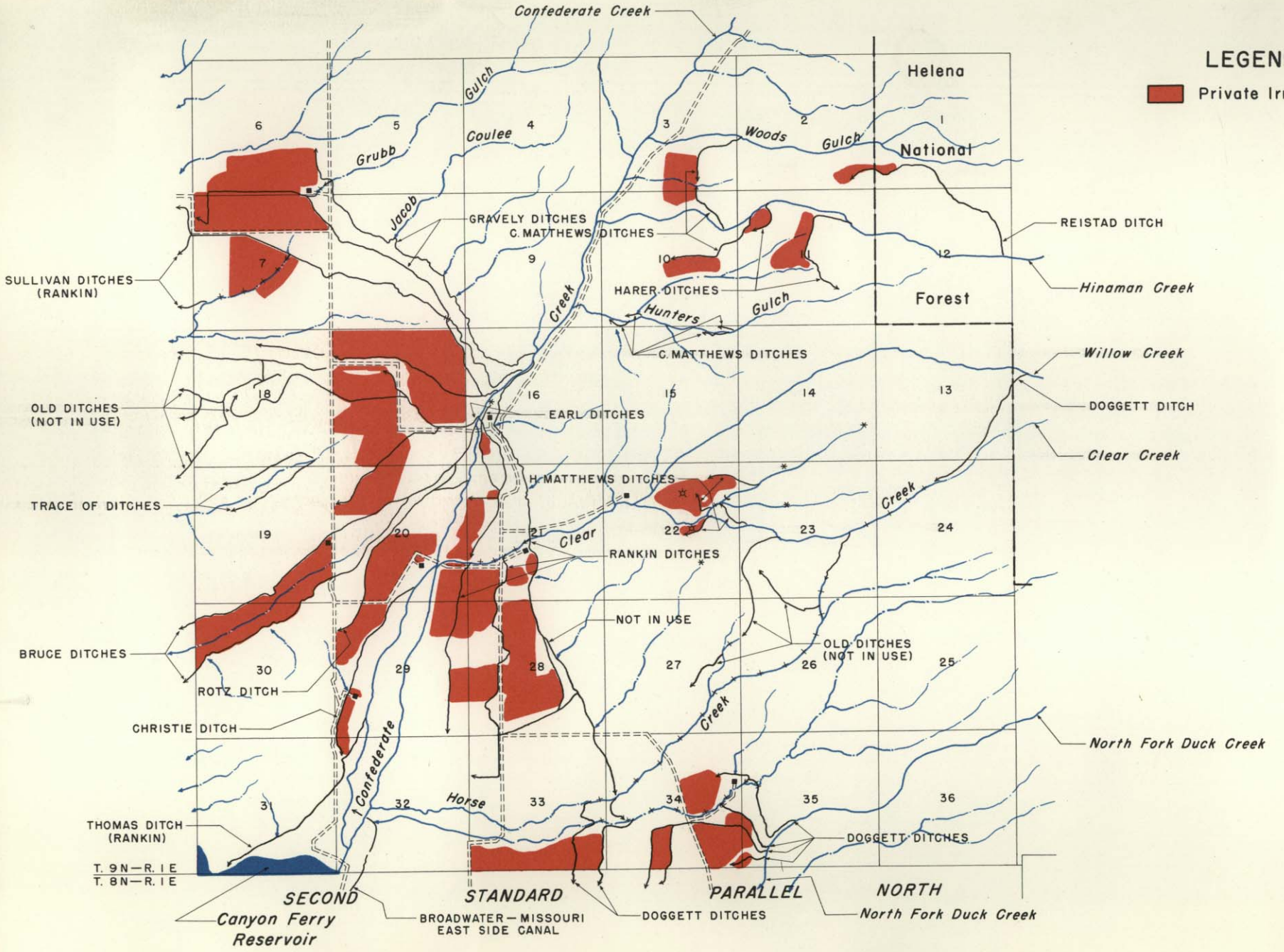
Private Irrigation


Twp. 8 NORTH
Rge. 1 WEST
GEORGE-COX DITCH
BAUM DITCH
MASOLO DITCHES
JF DITCH
McMASTER DITCHES
LOKOWICH DITCH
RIIS DITCH
LOKOWICH DITCHES
Staubach Creek
FILSON DITCH
Beaver Creek
REYNOLDS DITCH
Antelope Creek
Spokane Creek
SECOND
Tilleke Hollow
Tony Creek
STANDARD
PARALLEL
NORTH
LEGEND
Private Irrigation
DIEHL DITCHES
N.P.R.R.
DIEHL DITCHES
HAHN DITCH
ARNOLD DITCH (DIEHL)
DIEHL WASTE DITCH
JEFFERSON
COUNTY
Helena
National
Forest
Staubach Creek
Pole Creek
South Pole Creek
Beaver Creek
Weasel Creek
JF DITCH
KARLSTROM DITCHES
BISBY DITCHES
HAHN DITCHES
MASOLO DITCHES
BISBY DITCH
INDIAN CREEK DITCH (MUFFLY)
OLD DITCH (NOT IN USE)
MASOLO DITCH
DIEHL DITCH
HAHN DITCHES
VOSBURG MINE
Kimber Gulch
PRINCIPAL MERIDIAN
MONTANA
T. 8 N-R. 2 W
T. 7 N-R. 2 W

Twp. 9 NORTH
Rge. 1 EAST

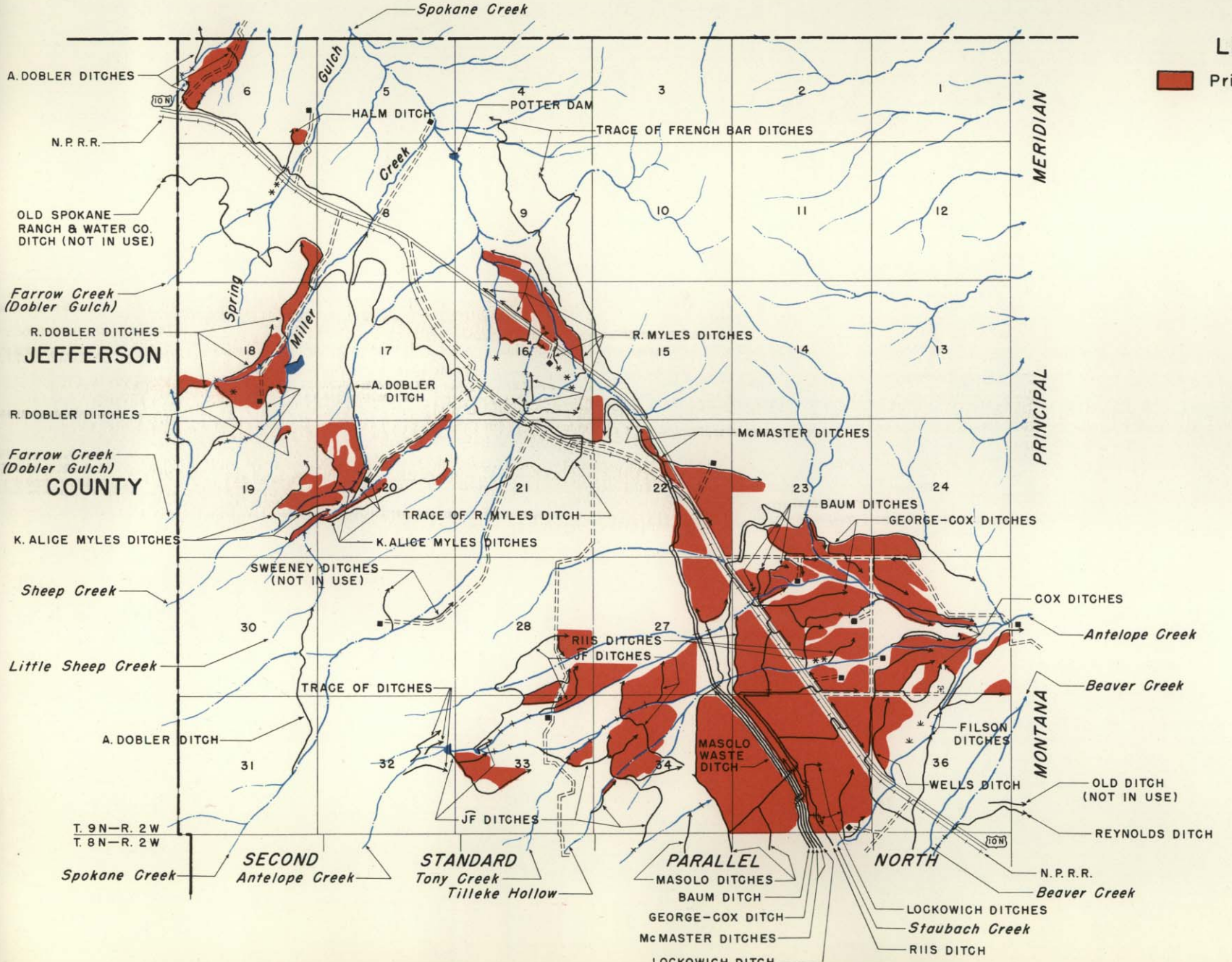


Twp. 9 NORTH
Rge. 2 EAST



LEWIS AND CLARK COUNTY

Twp. 9 NORTH
Rge. 1 WEST



LEGEND

Private Irrigation

Twp. 10 NORTH
Rge. 1 & 2 EAST