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

Liberty and Toole Counties, Montana

Published by
MONTANA WATER RESOURCES BOARD
Helena, Montana—June, 1969

WATER RESOURCES SURVEY

LIBERTY AND TOOLE COUNTIES MONTANA

Part I

History of Land and Water Use on Irrigated Areas

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Helena, Montana
June, 1969

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MONTANA STATE AGRICULTURAL EXPERIMENT STATION

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June, 1969

Honorable Forrest H. Anderson
Governor of Montana
Capitol Building
Helena, Montana

Dear Governor Anderson:

Submitted herewith is a consolidated report on a survey of Water Resources for Liberty and Toole Counties, Montana.

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 colors the lands irrigated from each source or canal system.

Surveys have been made in the counties of Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Deer Lodge, Fallon, Flathead, Gallatin, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, **Liberty**, Lincoln, Madison, Meagher, Missoula, Musselshell, Park, Phillips, Pondera, Powder River, Powell, Ravalli, Rosebud, Silver Bow, Stillwater, Sweet Grass, Teton, **Toole**, Treasure, Valley, Wibaux, Wheatland, and Yellowstone. Reports are available for all of the counties except a few of the ones which were surveyed a number of years ago and these are now out of print. However, reports will again be published on these counties sometime in the future after they have been updated.

The office files contain minute descriptions and details of each individual water right and land use, 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 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.

Respectfully submitted,
E. V. DARLINTON, Director
Montana Water Resources Board

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.

LIBERTY COUNTY OFFICIALS

John H. McDowell, Commissioner

Arlo Graham, Commissioner — M. Sterling Wardell, Commissioner

Mrs. Aileen Greiner, Clerk and Recorder

Darby O'Brien, Clerk of District Court — Mrs. Edris Jensen, Assessor

TOOLE COUNTY OFFICIALS

H. E. Benjamin, Jr., Commissioner

Alton Wigen, Commissioner — Robert Tomsheck, Commissioner

Mrs. Jeannette E. McDonald, Clerk and Recorder

Mrs. Vivian S. Hall, Clerk of District Court — Mrs. Phyllis Dumon, Assessor

OTHER AGENCIES AND INDIVIDUALS

Robert G. Dunbar.....Professor of History, Montana State University

Dr. M. G. Burlingame.....Retired, Department Head of History, Montana State University

R. A. Dightman.....Meteorologist in Charge, U. S. Dept. of Commerce, Weather Bureau

Grant W. Buswell.....Office Engineer, U. S. Geological Survey

Charles W. Lane.....District Engineer, U. S. Geological Survey

Uuno M. Sahinen.....Associate Director, Montana Bureau of Mines and Geology and other members of the Bureau Staff

Arthur N. Whitney.....Fisheries Division Chief, Fish & Game Dept.

Roger R. Fliger.....District Information Officer, Fish & Game Dept.

Larry S. Brownell.....County Extension Agent, Liberty County

Robert R. Vollrath.....Work Unit Conservationist, S.C.S., Liberty County

Dennis J. Berkram.....County Extension Agent, Toole County

Orval F. Erwin.....Work Unit Conservationist, S.C.S., Toole County

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FOREWORD

SURFACE WATER

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 the 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. The law restricted the use of water to riparian owners and forbade them to reduce appreciably the stream flow, but 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 another 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 Mattler vs. Ames Realty 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 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 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 diversion 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 a 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 the 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.

Montana laws do not require water users to file official records of the completion of their appropriations; therefore, 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 make all the other claimants parties to the suit. The Judge of the District Court then examines all of the claims and issues a decree establishing priority of the right of each water user and the amount of water he is entitled to use. 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 percent of the water rights affected, must appoint a water commissioner to distribute the water. Chapter No. 231, Montana Session Laws 1963, Senate Bill 55 amended Section 89-1001 R.C.M. 1947, to provide that a water commissioner be appointed to distribute decreed water rights by application of fifteen percent (15%) of the owners of the water rights affected, or, under certain circumstances at the discretion of the Judge of the District Court—**"provided that when petitioners make proper showing they are not able to obtain the application of the owners of at least fifteen percent (15%) of the water rights affected, and they are unable to obtain the water to which they are entitled, the Judge of the District Court having jurisdiction may, in his discretion, appoint a water commissioner."** After the Commissioner has been appointed the Judge gives his instructions on how the water is to be apportioned and distributed in accordance with the full terms of the decree.

The recording 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 or 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 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 about 50 cfs. Today, the Big Hole River with an average flow of about 1,000 cfs. has filings totaling 173,912 cfs. One is unable to distinguish in the county courthouses the perfected rights from the unperfected ones since the law requires no official recording 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 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 orig-

inal counties have been divided and subdivided, the water right filings have frequently not been transcribed from the records of one county to the other. Thus, a 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 readily be seen that this system of recording offers little protection to rights in the use of water until they are determined by adjudication. In other words, an appropriator does not gain 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 extremely 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 one-half 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, the decree 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 subdivided in later years and the water is not apportioned to the land by deed or otherwise. There is no provision made by law requiring the recording of specific water right ownership on deeds and abstracts.

The Legislative Session of 1957 passed Chapter 114 providing for the policing of water released from storage to be transmitted through a natural stream bed to the place of use. The owner of the storage must petition the court for the right to have the water policed from the storage reservoir to his place of use. If there are no objections the court may issue the right and appoint a water commissioner to distribute the water in accordance therewith. This law applies only to unadjudicated streams.

Administration of water on adjudicated streams 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 appointee for so temporary a position. The present administration of adjudicated streams which cross the county boundaries of judicial districts creates problems. Many of the water decrees stipulate head gates and measuring devices for proper water distribution, but in many instances the stipulation is not enforced, causing disagreement among water users.

Since a water right is considered property and may be bought and sold, the nature of water requires certain limitations in its use. One of the major difficulties encountered after an adjudication of a stream is the failure of the District Court to have control over the transfer of water rights from their designated places 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. Legal action necessary to correct this situation must be initiated by the injured parties as it is their responsibility and not that of the court.

At one time or another all of the 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 are 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 title to the use of water as definite and 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: (1) to catalogue by counties in the office of the State Engineer, all recorded, appropriated, and decreed water rights including the 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 in any transaction involving water; (4) to help State and Federal agencies in pertinent matters; (5) to eliminate unnecessary court action in water right disputes; and (6) to have a complete inventory of our perfected water rights in case of need to defend these rights against the encroachments of lower states, or Wyoming or Canada.

GROUND WATER

Ground water and surface water are often intimately related. In fact, it is difficult in some cases to consider one without the other. In times of heavy precipitation and surface runoff, water seeps below the land surface to recharge underground reservoirs which, in turn, discharge ground water to streams and maintains their flow during dry periods. The amount of water stored underground is far greater than the amount of surface water in Montana, and, without seepage from underground sources it is probable that nearly all the streams in the state would cease to flow during dry periods.

It is believed that Montana's ground water resources are vast and only partly developed. Yet, this resource is now undergoing accelerated development as the need for its use increases and economical energy for pumping becomes available. Continued rapid development without some regulation of its use would cause a depletion of ground water in areas where the recharge is less than the withdrawal. Experience in other states has shown that once excessive use of ground water in a specific area has started, it is nearly impossible to stop, and may result in painful economic readjustments for the inhabitants of the affected area.

Practical steps aimed at conserving ground water resources as well as correcting related deficiencies in surface water laws became necessary in Montana. Prior to the Legislative Session of 1961, there was no legal method of appropriating ground water. Proposed ground water codes were introduced and rejected in four biennial sessions of the Montana Legislative Assembly — 1951, 1953, 1955, and 1959.

In 1961, during the 37th Legislative Session, a bill was introduced and passed creating a Ground Water Code in Montana (Chapter 237, Revised Codes of Montana, 1961). This bill became effective as a law on January 1, 1962, with the State Engineer of Montana designated as "Administrator" to carry out provisions of the Act. However, the 1965 Legislature abolished the office of the State Engineer and transferred his duties to the State Water Conservation Board, effective July 1, 1965. On July 1, 1967, the name of the State Water Conservation Board was changed to the Montana Water Resources Board. Therefore, the Montana Water Resources Board became the "Administrator" of this Act.

Some of the important provisions contained in Montana's Ground Water Law are:

Section 1. **Definitions or Regulations as Used in the Act.**

(a) "Ground Water" means any fresh water under the surface of the land including the water under the bed of any stream, lake, reservoir, or other body of surface water. Fresh water shall be deemed to be the water fit for domestic, livestock, or agricultural use. The Administrator, after a notice of hearing, is authorized to fix definite standards for determining fresh water in any controlled ground water area or sub-area of the State.

(b) "Aquifer" means any underground geological structure or formation which is capable of yielding water or is capable of recharge.

(c) "Well" means any artificial opening or excavation in the ground, however made, by which ground water can be obtained or through which it flows under natural pressures or is artificially withdrawn.

(d) "Beneficial use" means any economically or socially justifiable withdrawal or utilizations of water.

(e) "Person" means any natural person, association, partnership, corporation, municipality, irrigation district, the State of Montana, or any political sub-division or agency thereof, and the United States or any agency thereof.

(f) "Administrator" means the Montana Water Resources Board of the State of Montana.

(g) "Ground Water Area" means an area which, as nearly as known facts permit, may be designated so as to enclose a single distinct body of ground water, which shall be described horizontally by surface description in all cases and which may be limited vertically by describing known geological formations, should conditions dictate this to be desirable. For purpose of administration, large ground water areas may be divided into convenient administrative units known as "sub-areas."

Section 2. **Right to Use.**

Rights to surface water where the date of appropriation precedes January 1, 1962, shall take priority over all prior or subsequent ground water rights. The application of ground water to a beneficial use prior to January 1, 1962, is hereby recognized as a water right. Beneficial use shall be the extent and limit of the appropriative right. As to appropriations of ground water completed on and after January 1, 1962, any and all rights must be based upon the filing provisions hereinafter set forth, and as between all appropriators of surface or ground water on and after January 1, 1962, the first in time is first in right.

Any ground water put to beneficial use **after** January 1, 1962, **must** be filed with the County Clerk and Recorder in the county where the ground water is withdrawn in order to establish a right to use of the water.

Montana's Ground Water Code now provides for three different types of forms available for filing water rights depending upon the nature of the ground water development. The old Form No. 4 became invalid after January 1, 1966.

Form No. 1 **"Notice of Appropriation of Ground Water"**—shall require answers to such questions as (1) the name and address of the appropriator; (2) the beneficial use for which the appropriation is made, including a description of the lands to be benefited if for irrigation; (3) the rate of use in gallons per minute of ground water claimed; (4) the annual period (inclusive dates) of intended use; (5) the probable or intended date of first beneficial use; (6) the probable or intended date of commencement and completion of the well or wells; (7) the location, type, size, and depth of the well or wells contemplated; (8) the probable or estimated depth of the water table or artesian aquifer; (9) the name, address, and license number of the driller engaged; and (10) such other similar information as may be useful in carrying out the policy of this Act. This form is optional but it has an advantage in that after filing the Notice of Appropriation, a person has 90 days in which to commence actual excavation and diligently prosecute construction of the well. Otherwise, failure to file the Notice of Appropriation deprives the appropriator of his right to relate the date of the appropriation back upon filing the Notice of Completion. (Form No. 2.)

Form No. 2 **"Notice of Completion of Ground Water by Means of Well"**—this form shall require answers to the same sort of questions as required by Form No. 1 (Notice of Appropriation of Ground Water), except that for the most part it shall inquire into accomplished facts concerning the well or means of withdrawal, including (a) information as to the static level of water in the casing or the shut-in pressure if the well flows naturally; (b) the capacity of the well in gallons per minute by pumping or natural flow; (c) the approximate drawdown or pumping level of the well; (d) the approximate surface elevation at the well head; (e) the casing record of the well; (f) the drilling log showing the character and thickness of all formations penetrated; (g) the depth to which the well is drilled; and similar information.

It shall be the responsibility of the driller of each well to fill out the Form No. 2, "Notice of Completion of Ground Water by Means of a Well," for the appropriator, and the latter shall be responsible for its filing.

Form No. 3 **"Notice of Completion of Ground Water Appropriation Without a Well"**—is for the benefit of persons obtaining (or desiring to obtain) ground water without a well, such as by sub-irrigation or other natural processes so as to enable such persons to describe the means of using ground water; to estimate the amount of water so used; and requiring such other information pertinent to this particular type of ground water use.

Montana's Ground Water Code, as amended by the 1965 Legislature, provides for a period of four (4) years after January 1, 1962, for filing on vested ground water rights (all ground water used prior to January 1, 1962, from water wells, developed springs, drain ditches, sub-irrigation, etc.). Therefore, the deadline was December 31, 1965. A person did not lose his vested ground water rights by failure to file within the four-year period although, in the event of a future ground water dispute, he may be called upon to prove his rights in court. If a person files now on ground water developed prior to January 1, 1962, his date of priority becomes the date of filing, rather than the date when the water was first used.

It shall be recognized that all persons who have filed a Water Well Log Form as provided for under Section 1 and 2 of Chapter 58, Session Laws of Montana, 1957, shall be considered as having complied with the requirements of this Act.

It is important to note that ground water law states, **"Until a Notice of Completion (form #2 or #3) is filed with respect to ANY use of ground water instituted AFTER January 1, 1962, NO right to that use of water shall be recognized."**

Copies of the forms used in filing on ground water are available in the County Clerk and Recorder's Office in each of Montana's 56 counties. It shall be the duty of the County Clerk in every instance to file the original copy of the county records; transmit the second copy to the Administrator (Montana Water Resources Board); and the third copy to the Montana Bureau of Mines and Geology; and the fourth copy to be retained by the appropriator (person making the filing).

Accurate records and the amount of water available for future use are essential in the administration and investigation of water resources. In areas where the water supply becomes critical, the ground water law provides that the administrator may define the boundaries of the aquifer and employ inspectors to enforce rules and regulations regarding withdrawals for the purpose of safeguarding the water supply and the appropriators (see wording of the law for establishing a "controlled area").

The filing of water right records in a central office under control of a responsible State agency, provides the only efficient means for the orderly development and preservation of our water supplies and it protects all of Montana's use—on both ground and surface water.

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 with landowners. 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 taken from the files of the county courthouse and the data required includes: landownership, water right records (decrees and appropriations), articles of incorporation of ditch companies and any other legal papers concerning the distribution and use of water. Deed records of landownership are reviewed and abstracts are checked for water right information when available.

Aerial photography is used by the survey to assure accuracy in mapping the land areas of water use and all the other detailed information which appears on the final colored township maps in Part II. Section and township locations are determined by the photogrammetric system, based on government land office survey plats, plane-table surveys, county maps and by "on-the-spot" location during the field survey. Noted on the photographs are the locations of each irrigation system, with the irrigated and irrigable land areas defined. All the information compiled on the aerial photo is transferred and drawn onto a final base map by means of aerial projection. From the base map, color separation maps are made and may include three to ten overlay separation plates, depending on the number of irrigation systems within the township.

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, 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 are listed on the field forms with the description of intended place of use. During the field survey, all water rights listed on the field form are verified with the landowner. 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 and 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 found at the time of completion of 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.

Complete data obtained from this survey cannot be included in this report as it would make the text too voluminous. However, if one should desire detailed information about any particular water right, lands irrigated, or the number and amount of water rights diverting from any particular stream, such information may be obtained by writing the Montana Water Resources Board in Helena.

Every effort is being made to insure accuracy of the data collected rather than to speed up the work which might invite errors.

WATER RESOURCES SURVEY

Toole County, Montana

PART I

History of Land and Water Use
On Irrigated Areas

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HISTORY AND ORGANIZATION

The early history of what is now Toole County began with the first visit of the exploring party led by Meriwether Lewis on his return eastward from the Pacific coast. The diary of Lewis left an interesting description of the Toole County area as it appeared to him in the latter part of July, 1806.

This country now included in Toole County was for generations the home and hunting ground of the Blackfeet Indians. It was also a part of the bison range of the northwest. These bison furnished the Indians with food, clothing, and shelter and in later years their pelts were traded for white men's goods.

A short time after the Lewis and Clark expedition, the Blackfeet Indians became increasingly hostile to the Americans, who, for many years did not enter their country even to trade. It was apparent however, that a few British traders ventured into the country to visit them. In 1830, Kenneth McKenzie sent a party of four men from Fort Union near the mouth of the Yellowstone River into the Blackfeet country to determine if a trading post might be established among Blackfeet tribes. This party followed up the Missouri to the mouth of the Marias and up this river which crossed the southern part of present Toole County without seeing any Indians, but they did see an abundance of game along the way and many beavers in the river itself. Finally, they met a party of Blackfeet with whom they remained for some time. The white traders persuaded the Indians that they had more to gain by trading with them than by fighting and once convinced, the Indians returned with the white traders to Fort Union. James Kipp was sent in 1832 to trade with the Blackfeet and he started a post at the mouth of the Marias. The principal trade by the Indians was buffalo, beaver, otter and martin pelts. This trade continued for ten years with the Blackfeet Tribe until 1842 when F. A. Chardon in charge of the trading post killed a number of Blackfeet as punishment for killing a negro employee of the trading post. After this incident the Blackfeet moved north and no longer brought their furs to the Americans.

The whole of what is now Toole County remained under Blackfeet control until 1873 when President Grant, by Executive Order, set aside a reservation for these Indians.

The area of Toole County was once a part of the Louisiana Purchase of 1803. It was included in the Missouri Territory organized in 1812 and then became a part of the vast Indian country left in 1821 after Missouri became a state; when Nebraska was organized as a territory by the Kansas-Nebraska Act of 1854, the whole country, drained by the Marias and upper Missouri Rivers, was placed within its boundaries. Later this area was included in the Dakota Territory organized in 1861 and in 1863 all of what is now Montana was incorporated within the newly organized territory of Idaho. The first legislature then divided all of this country into counties and included most of the present Toole County within the boundaries of Chouteau County. When Montana Territory was formed in 1864, the first territorial legislature made no changes in the boundaries of Chouteau County and it was not until 1891 when construction of the Great Northern Railway through the northern part that led to an influx of population and a demand for smaller units of local government. This resulted in the creation of Teton County from northwestern Chouteau County and a strip of Missoula County. In 1912, Hill County was created from the northern part of Chouteau County by petition and election. Two years later on May 7, 1914, Toole County was formed also by petition and election from part of Teton County and part of Hill County. Shelby was named as the county seat. Toole County was named in honor of Joseph K. Toole, first governor of the State of Montana.

The first white settlers of what is now Toole County were prospectors who, at the news of the discovery of gold, moved into the Sweet Grass Hills in the early 70's. This mining excitement was short lived. Soon after the Blackfeet Reservation was formed and the lands along the Marias River thrown open to entry, large cattle herds moved into the country. After the construction of the Great Northern Railway through northern Montana in 1891, there followed a migration of settlers into the narrow valley of the Marias River and to the plains for miles around. Shelby, the county seat, became an important trading center for the farmers and ranchers of the valley and the country beyond. These early immigrants were devoted entirely to stock raising and dryland farming. Flax, oats and wheat were the principal dryland crops. There were others who, from the first, were not prospecting for gold, but for oil and gas. However, it was not until March, 1922, that the first important oil well began to produce and Toole County changed from strictly an agricultural stock raising and farming community to include the oil and gas industry. The oil region north of Shelby in the Kevin-Sunburst field was soon producing as much as 25,000 barrels a day, but decreased in 1928 to about 10,000 barrels. This region continued to become one of the most productive oil fields in Montana until 1935, when the Cut Bank field in Glacier County took the lead.

Some of the larger towns in the county, including smaller rural communities, are Shelby, Kevin, Sunburst, Oilmont, Sweetgrass, Ethridge, Dunkirk, Devon, and Galata. Shelby, the county seat, has a population of about 4,000 residents and is located on the main line of the Great Northern Railway. The town was named for an official of the Great Northern Railway. Shelby is probably best known throughout the United States as the site of the famous Dempsey-Gibbons fight, July 4, 1923, which made up in publicity what it lacked in financial success. Kevin, Sunburst and Oilmont are small towns located in the oil fields of the county. Sweetgrass, in the northern part, is a port of entry from Montana into Canada. Ethridge, Dunkirk, Devon and Galata are small rural farming communities located along the main line of the Great Northern Railway.

The main transportation facilities in the county are the Great Northern Railway which runs east and west along the southern part of the county adjacent to U. S. Highway No. 2; U. S. Highway No. 15 and No. 91 enters the county in the south central part following a route north through Shelby and Sunburst and leaves Montana entering Canada at the Sweetgrass port of entry; U. S. Highway No. 215 enters Toole County from the west passing through Kevin and connects with U. S. Highway No. 15 and No. 91 near Oilmont. Other means of transportation in the county are numerous—graded and improved county roads, bus and trucking lines, and a small local airport at Shelby.

Toole County has an area of 1,965 square miles and is located in the north central part of Montana. The last census in 1960 listed Toole County with a population of 7,904. It is bordered on the north by Canada, on the south and east by Liberty County, on the south by Pondera County, and on the west by Glacier County. In the northeast part, rise the isolated Sweet Grass Hills while the remainder of the county is rolling prairie and benchland. The Marias River, which flows through the southern part of the county is the principal drainage and the only stream of any size.

CLIMATE

With the Marias River and the upper end of Tiber Reservoir along or near the southern boundary, and with Alberta on the northern edge, Toole County ranges in elevation from about 2,850 feet at Tiber Dam to nearly 7,000 feet on West Butte near the Canadian Border. Most of the county averages a slope to the southeast, with the primary drainages being the Marias River and Willow

Creek. Except for the elevation factor, climate varies less with distance here than in most Western Montana counties, but there are still local variations between hill and valley—particularly on clear nights when the wind is light. The principal difference in these situations is that it is somewhat cooler at night in valley bottoms where there is no wind.

On the larger scale, the increase in elevation from south to north produces important differences in precipitation, but less marked differences in temperature. Annual precipitation ranges from about 10 inches along the Marias River up to 15 inches or more in the higher elevations near and south of the Alberta boundary. There are eight precipitation records long enough to sample precipitation fairly well, and these averages range from 10.11 inches at the Shelby Airport to 14.30 inches at Sweetgrass. An important feature of this precipitation climate is that from 76 to 86 per cent of the annual average comes during the warmer half of the year (growing season). Average annual temperature, on the other hand, varies less than 2°F. at points where records have been kept—from 40.9° at Dunkirk 14NNE to 42.7° for 11 years at Sweetgrass.

The limited range in temperature appears due in part to the frequency of the locally well-known "chinook" (Foehn) wind throughout the year, which at times blows with considerable force. Over the years an occasional unofficial wind report has suggested that gusts may occasionally reach hurricane or stronger speeds (75 mph or more). The frequency of this wind throughout the cold season has an important modifying effect on what otherwise would be very near to a true "continental" type climate. January average temperatures, for example, run as much as 5° to 10° warmer than in continental climate areas 200 miles or less to the east at the same latitude—notwithstanding the lower elevations in these eastern sections.

Cold winter weather can—and does—occur, but really severe cold (below zero) seldom lasts for more than two or three days because of the ease with which relatively warm chinook winds blow in this area roughly 60 to 120 miles east and northeast of the Continental Divide. Summers are generally pleasantly warm, with July averaging about 65° to 68°. Oppressive combinations of heat and humidity are practically unknown. On 10 to 15 days a year, maximum temperature may reach 90° or warmer, but 100° heat occurs on less than one day in five years.

Summer mornings usually are quite clear, but midsummer afternoons sometimes give way to thunderstorm cloud types—on about 25 to 30 days a year. These thunderstorms occasionally will produce hail and gusty winds, and actually are the most troublesome storm type even though winter cold waves receive more publicity. Almost every year there will be some hail damage to crops, but, on the other hand, such damage is seldom widespread.

The freeze-free season (32°F.) averages about 108 days from about May 20 to near September 5, with a variation of about 30 days from earliest to latest possible dates spring and fall. For hardy varieties, which can stand freezes as cold as 28° the season is three to four weeks longer. Snowfall over the county averages 35 inches a year or less except in the higher elevations in the north where 50 inches or more may fall in most years. Some summarized data for Toole County official weather stations appear in the following table:

TEMPERATURE

Station	Years of Record	Elevation	Highest and Year of Record	Lowest and Year of Record	January Average	July Average	Annual Average
Dunkirk 14 NNE	1922-67	3,348	108 (1961)	–46 (1957)	15.6*	66.1*	40.9*
Goldbutte 7 N	1942-67	3,499	105 (1961) (1953)	–42 (1950) (1954)	17.6	64.3	41.6
Shelby	1950-57	3,272	101 (1957)	–44 (1957)	11.3	66.4	41.9
Shelby Airport	1959-67	3,420	106 (1961)	–30 (1964)	16.9	67.6	42.5
Sweetgrass	1957-67	3,466	105 (1961)	–39 (1957)	17.6	66.8	42.7

*1938-67

PRECIPITATION

Station	Years of Record	Elevation	Yearly Average Total	Growing Season Average Total	Percent Falling in Growing Season	Wettest Year	Driest Year
Dunkirk	1912-67	3,348	11.15*	8.52*	76	20.31 (1927)	7.11 (1952)
Ethridge	1949-67	3,544	11.19	9.30	83	17.38 (1953)	6.67 (1967)
Galata 16 SSW	1949-67	3,100	12.36	9.59	78	17.21 (1965)	7.42 (1952)
Goldbutte	1942-67	3,499	12.96	10.44	80	20.00 (1951)	8.04 (1952)
Shelby	1940-58	3,272	10.81	8.75	81	18.42 (1953)	6.85 (1952)
Shelby Airport	1959-67	3,420	10.11	8.72	86	14.80 (1964)	6.96 (1962)
Sunburst 8 E	1951-67	3,600	11.85	9.82	83	16.70 (1953)	7.29 (1960)
Sweetgrass	1957-67	3,466	14.30	11.89	83	19.61 (1959)	9.51 (1963)

*1938-67 average

POTENTIAL IRRIGATION DEVELOPMENT

Glenn R. Smith, Soil Scientist

INTRODUCTION

Many factors determine the desirability of an area for irrigation development. The major ones are soil, water, climate, and markets. The first three determine the capacity of an area to produce; all four determine the kind of **crops** that might be grown and the monetary returns that might be expected. This article is based on long range projection which disregards the present available water supply and market factors of irrigation development. The climate of the county is discussed in another section of this publication.

The author realizes that the presently inadequate water supply hinders any large scale irrigation in the major portion of Toole County, however, the future agricultural needs may warrant delivery of water from other sources than the local natural stream flows and reservoir storage.

The purpose of the land classification studies is to outline the land areas that have a future potential for irrigated agriculture into the ultimate of year 2020. Technological advances in irrigation are considered in this report and the slope and surface topography become less important, due to the rapid expansion of sprinkler irrigation in the west.

The final test of the success of any irrigation project is the ability of the land to provide economic benefits. It follows, therefore, that land for irrigation should be selected to ensure that this objective can be achieved. The areas outlined on the map accompanying this report are only of a generalized reconnaissance type of land classification and any definite irrigation project should be based on a detailed study.

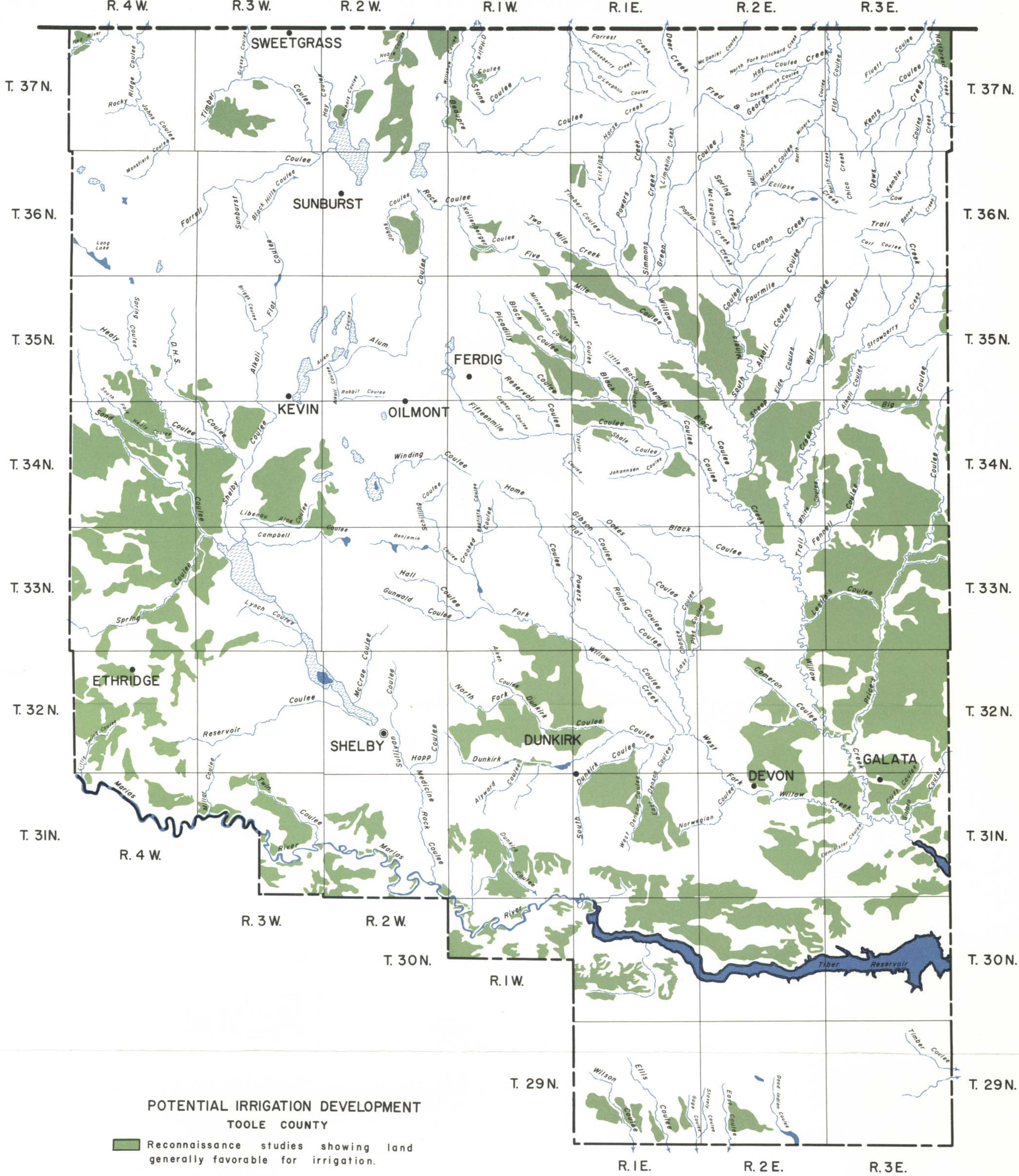
The term **irrigable land** is defined as lands capable of being irrigated by gravity or sprinkler methods of water application; however, the land must have soil, topography and drainage features which will withstand a sustained irrigated agriculture.

PHYSIOGRAPHIC FEATURES

Toole County is located in the more shallow glacial drift covered portions of the Great Plains. The greater part of the area is a high rolling plain, characterized by glaciated divides, sloping gently to the south. The Sweet Grass Hills rise several thousand feet above the plains in the north-central part and have a local influence on the drainage and climate. Erosion has not greatly changed the surface features of the glacial drift-covered area since the time of glaciation, except along some of the more deeply entrenched perennial streams and on the more shallow glacial drift-covered divides. With the exception of the West Butte and Gold (Middle) Butte of the Sweet Grass Hills, the entire county is mantled earth material deposited by glacial ice.

The elevations within Toole County range from 7,000 feet at West Butte in the northeastern part of the county to 2,850 feet at Tiber Reservoir. The average elevation of the glacial drift-covered plains is between 3,400 and 3,500 feet.

The drift-covered plains have a rolling to billowy, hummocky topography characterized locally by shallow lake depressions and low mounds and ridges. The deeper deposits of drift cover occur



POTENTIAL IRRIGATION DEVELOPMENT

TOOLE COUNTY

Reconnaissance studies showing land generally favorable for irrigation.

NOTE: Lands are mapped regardless of available water supply.

on the ridges of the Sweet Grass Hills. The more stony moraine sections are found (1) on the eastern slopes of the Sweet Grass Hills, (2) on high divides between the buttes. Very stony tracts are found locally along some preglacial stream courses and on the crest of the high divides extending out from the Sweet Grass Hills. The hilly area is rough and broken land with only a few scattered tracts of presently irrigated and potentially irrigable land within the area.

SURFACE DRAINAGE

Glaciation did not greatly influence the drainage of Toole County. The larger streams were dammed and their valleys partly filled with glacial drift, but when the ice receded most of the streams returned to their former courses. There is sufficient evidence to presume the presence of many miles of buried valleys and stream channels under the Marias River floodplain and elsewhere that are filled with glaciofluvial deposits. These valleys are vestiges of preglacial and glacial drainage systems. The pre-glacial drainage may aid in subdrainage of the glacial uplands by furnishing a vertical movement downward of subsurface water.

Marias River Basin

The Marias River follows a generally southeasterly course through the southern part of Toole County. The river flows on a sandy-gravelly bottom averaging 60 feet in width and during low water is from one to two feet deep. The stream carries a large volume of water during the spring runoff and again in May and June when it is swollen by the seasonal rains and by melting snow on the high divides and mountains. The valley area above Tiber Reservoir is subject to flooding, however, the occurrence of major floods do not prevent irrigation beyond feasibility of development. There are several farm-pumping stations for tracts of irrigated land which produce forage crops for livestock feed.

The intermittent streams and coulees draining into the Marias River are entrenched in narrow valleys and do not add appreciable acreages to the potential irrigable land of Toole County. The majority of the county drains into small creeks of the Marias River Basin and the network of drainage will furnish outlets for necessary subsurface drains under an irrigated agriculture.

The main drainage basin entering the Marias River in Toole County is Willow Creek. The perennial branches head on the southern slopes of West and Middle Buttes and unite below the escarpment. Willow Creek flows south through the eastern part of the county as far as the mouth of Galata Creek, where it turns to the southeast and enters Tiber Reservoir across the county line in Liberty County. Within the mountains the stream and its small tributaries flow through enclosed valleys between high hummocky stony ridges, but below the escarpment the valleys widen out and are bordered by gently rising uplands along most of their courses.

The intermittent branches of Willow Creek, heading on a high glaciated divide and extending out from the Sweet Grass Hills, drain a rolling to sharply rolling area characterized by stony ridges along the stream. Galata Creek and its branches drain an undulating to rolling section in the east-central part of the county. These intermittent streams are cut-bank type and flow through narrow valleys, which are not deeply entrenched below the uplands. Low stony ridges, mounds, and shallow lake depressions are quite numerous in this part of the county.

The valleys of the perennial and intermittent streams do not add appreciable irrigable acreage to

Toole County. The glaciated uplands bordering the Willow Creek drainage north of Galata are the larger irrigable areas within the county. If irrigation does expand, the subsurface and surface drainages of the upland area will substantially increase the flow of Willow Creek.

Milk River Basin

The area north of the Sweet Grass Hills and a small tract in the northwestern portion of Toole County are drained by streams entering the Milk River, which crosses the international line a short distance east of the Liberty-Hill County line. The larger perennial branches of the Milk River are a branch of the Red River, North Miners Coulee and Halfbreed Creek. There are approximately 2,000 acres of potential irrigable land located on the glacial upland areas adjacent to natural drainageways of the Milk River Basin. The morainic divide is very near the international line and any future irrigation will drain into Canada.

SOILS

The soils of Toole County have been developed from glacial material deposited in the district and can be divided according to the soil forming process from the material: (1) glacial soils formed as a result of ice during the glacial period, (2) alluvial soils formed by streams during ancient and recent times, (3) residual soils formed from material weathered from the geologicial formations.

The physiography, drainage, and geologic history influence deposition of materials and account for many differences found in soils. Soil depth, texture, and acidity or alkalinity are directly related within limits to the material from which the soil is formed.

The variations in the soils result from the alteration of geologic material, by climate and living organisms, especially plant growth. The length of time these factors have been active, and the topography are particularly influential in causing visible soil differences over short distances, often within a few feet.

Glacial Soils

The major event in the geologic history that influenced the soils of Toole County was continental glaciation. The Keewatin ice sheet which developed in central Canada during the Late Wisconsin period of Glaciation spread over the greater part of southern Alberta and northern Montana, east of the main range of mountains. It covered the plains of Toole County and extended well up the slopes of the Sweet Grass Hills. This major event influenced the soils of the northern plains; the sand, silt, clay, gravel and boulders were picked up by the ice sheet which mixed them by crushing and then redeposited the mixture known as glacial till. This mantle varies from less than one foot to over 100 feet in thickness. Although the glacier mixed materials it had carried for long distances with materials from underlying bedrock, in the main the largest percentage of till is of local origin; this means it strongly reflects the nature of the underlying bedrock.

The till varies in permeability, depending on its chemical and physical composition, also in salt and free carbonate content.

Till was deposited by a pushing action, and there are natural cleavage lines running vertically as well as horizontally. The permeability may vary considerably within short distances depending

upon the number of cleavage lines and also the variability of the composition. In general, there is downward movement of excess water. This water is held at the till-bedrock contact, and if the bedrock dip is toward the natural drainage channels it eventually moves laterally and then out along the drainage channels.

The retreat of the glacial ice caused an abundance of water either in running streams or if enclosed basins existed lakes were formed. The coarser materials, sand and gravel, usually settled out near the margins of ice; the fine materials silt, and clay, settled farther from the ice margins and were often deposited in bodies of still water such as ponds and lakes.

There are 199,255 acres of potential irrigable lands in Toole County located on the glacial uplands and ancient lake beds of the plains.

The topography of the area varies from level to hilly—much of the hilly topography occurs in the northern part of the county and near the Sweet Grass Hills. The acreages of potential irrigable land in this hilly country are too insignificant for consideration in this report.

The dryland wheat areas of the county are generally on the glacial upland areas that have potential for irrigated agriculture. Most of these areas can be divided into gently rolling topography and relatively level terrain. The topographic conditions have influenced the soil forming process.

The soils of the rolling terrain are shallower to glacial till, and have a definite high lime zone which becomes shallower on the higher ridges. The only means of irrigation would be by sprinkler, and then with limitations. The limitations being a network of tile drainage and with proper application of water being applied to ensure leaching of salts. However the amount of water applied would have to be sufficient to prevent salt accumulation in the root zone. The ordinary sprinkler heads would have to be enlarged to increase water application. Experiments performed in Canada showed salt accumulation increasing in areas where too little amount of water is applied by sprinkling. The required amount of water application is not known at this time, however, future experiments could determine the proper practices to be followed.

A typical soil of the undulating glacial uplands is as follows:

The soils are well drained, thin solum Brown soils developed in friable loam to clay loam till. These soils when cultivated have a loam to clay loam "A" horizon which includes most of the "B" horizon, a thin prismatic lower zone, and a distinct "C" horizon with segregated lime. The weathered soil material over till varies from 28" to 48" in depth.

Typical Soil Profile

0″ - 5″	Dark grayish brown loam to clay loam, moist, strong fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; noncalcareous.
5″ - 6½″	Dark grayish brown clay loam, moist, prismatic breaking to strong fine blocky structure; hard friable, sticky and plastic; noncalcareous.
6½″ - 9″	Dark grayish brown loam to clay loam, moist, moderate medium prismatic breaking to a weak fine blocky structure; hard, friable, sticky and plastic; strong lime zone; thin continuous clay films on vertical faces.

9″ - 32″ Dark grayish brown clay loam, moist, weak medium and coarse prismatic structure; hard, friable, sticky and plastic, high lime.

32″ - 60″ Light brownish gray to olive grayish brown light clay loam till, extremely hard when dry; firm, sticky and plastic when moist; slight lime; mildly alkaline; with slight to moderate soluble salts; numerous nests of gypsum.

The soils in the lower portion of the undulating topography have a thicker solum over the "C" horizon, and are of a darker brown color. The depth to till will average 48" to below 60". The areas occupied by these deeper soils are not large enough to delineate separately.

The geologic formations of Toole County include glacial lake deposits. The meltwater drained into natural drainages and the sand, silt and clay were moved by water and settled into the present fans, terraces and slightly undulating glacial plains of the present time. The soils consist of deep, calcareous, predominantly silty clay loam sediments deposited as alluvium, and glacio-lacustrine material over the original bedrock. The texture, structure, and depth of the material over bedroock varies and only the soils with adequate subsurface drainage are considered irrigable. The recent erosion and formation of the soils of these areas have altered the flat topography into slight undulations and minor drainage channels. The two predominant irrigable soils can be illustrated by the following typical soil profiles.

Profile A—These soils occupy the fans, terraces and undulating to level glaciated plains.

0″ - 7″ Moist very dark grayish brown silty clay loam; moderate fine granular structure, friable.

7″ - 10″ Dark brown moist heavy silty clay loam or light silty clay; strong medium prismatic breaking to strong fine and very fine blocky structure, friable, sticky and plastic, thick continuous clay films; noncalcareous; clear boundary.

10″ - 14″ Dark grayish brown light silty clay, moist, strong medium prismatic breaking to strong medium and fine block structure; very hard, friable, sticky and plastic, thick continuous clay films; noncalcareous; clear boundary.

14″ - 18″ Olive brown moist silty clay loam; strong medium prismatic structure separating moderate fine and medium blocks; friable, sticky and plastic; very thin discontinuous clay films; calcareous, gradual boundary; 3" to 5" thick.

18″ - 34″ Olive moist silty clay loam; moderate medium and coarse prismatic structure; very friable, sticky and plastic; calcareous with soft lime nodules; diffused boundary; 12" to 18" thick.

34″ - 60″ Olive moist silty clay loam, with few thin strata of silt loam; massive structure; very friable, sticky and plastic; calcareous.

The principle soil variations are that the materials below 30" may become more stratified or they may consist of firm heavy clay loam till. The areas of clay loam till are continuous in some areas and may cause questionable drainage.

There are large acreages of clay soils in Toole County. The clay textured soils are generally not considered too satisfactory for irrigation. The limiting factors are poor drainage and high salinity. The exceptions are the heavy textured soils occurring on upland plains or on valley terraces with a

high shrink-swell capacity which allows adequate drainage and aggregation for irrigation. Large areas of these soils occur on terraces and uplands above the Marias River and Tiber Reservoir.

A typical soil profile of the irrigable clay soil is as follows:

Profile B

0″ - 6″	Dark grayish brown moist clay; strong very fine granular structure; granules friable, sticky and very plastic; crust on surface 1/32″ thick forms after hard rain; slightly calcareous; abrupt boundary of cultivation.
6″ - 11″	Dark grayish brown moist clay; structure of strong coarse blocks easily separated to fine angular blocks; very hard, firm, sticky and very plastic; flat faces of blocks have glossy appearance; tongues of dark grayish brown soil 1/8" to 1/2" thick form fine geometric patterns on the horizontal surface just below the plow depth; slightly calcareous, gradual boundary.
11″ - 27″	Dark grayish brown moist clay; structure of strong coarse blocks easily separated to moderate very fine angular blocks; very hard, firm, sticky and very plastic; slickensides with intersecting surface 20 to 40 degrees from horizontal are common and have surfaces 6" to 10" in diameter observed in moist soil; slightly calcareous; clear smooth boundary. The "Al" horizon is 18" to 34" thick.
27″ - 48″	Very dark gray moist clay; structure of moderate very coarse prisms easily separating to moderate very fine granules; very hard, firm, sticky and very plastic; thick large patches of organically stained clay films on some prism faces; small clusters of gypsum crystals, slightly calcareous.
48″ - 74″	Very dark gray moist clay; structure of moderate very coarse prism in which gray and light gray very fine granules are distinct but held firmly in place; very hard, firm, sticky and very plastic, thick large patches of organically darkened clay films on some prism faces; small clusters gypsum crystals slightly calcareous.

Clay is the dominant texture of the Marias Series. Following hard rains on fallow ground, a thin (approximately 1/4″) fragile crust forms that does not bear handling and in which the form of granules are distinct. Clay plus silt ranges from 80 to 98 per cent in all horizons between 8" to 30". Silt laminations may occur in the clay below 30". Rounded and sub-angular stones, cobbles and gravel comprise up to 10 percent in total volume of upper soil horizons in glaciated areas of this soil. In these areas medium and coarser sands may comprise up to 10 percent of the soil less than 2 mm. in size. Clay in the sub-soil horizons range from about 50 to 75 percent. Profiles are slightly or moderately saline below depths of about 20".

Marias clays occur on upland plains or on valley terraces and the soils consist of thick clay materials. These clay materials have a high shrink-swell capacity. The clays are well drained; surface runoff is medium; permeability is very slow in the wet soil and infiltration into the dry soil is medium to rapid.

The retreat of the glacial ice caused an abundance of water that drained slowly to rapidly into streams. The rate of water movement influenced the soil textures by settling of the coarser materials next to the margins of ice, and the finer materials farther from the ice. The velocity of the streams also sorted the soil particles by current washing actions and still basins settling of particles. There are

areas of sandy loam soils located on the uplands adjacent to the Marias River. The topography of these areas are nearly level; fans, terraces or meltwater plains. The irrigability of these areas are limited due to the depth of soil overlying the glacial till, the depth from the ground surface to till varies from 36" to below 60". The sandy loam surface soil has a high water intake rate. The abrupt permeability change from rapid to slow occurs at the soil and till contact zone. The slow permeability of the till may cause a high water table, however, construction of drains should correct the problem. The light textured soils that are shallow to glacial till are considered as limited irrigable land due to the drainage requirements and rapid water intake rate. The high water and drainage costs of the estimated 10,000 acres of these soils are large enough to influence irrigation development; especially pumping from either the Marias River or Tiber Reservoir.

Comparative Investigations

The development of large acreages of irrigated land in northern Montana has been in the existing stream valleys of recent alluvial soils. The small acreages of irrigated glacial soil do not furnish an adequate basis for comparative studies to potential irrigable dryland areas. The glacial ice age never followed international boundaries and the southern portion of the Alberta Province of Canada is similar in topography, soils, drainage and climate to Toole County. The large irrigated areas near Lethbridge, Alberta have glacial soils which are similar to the dryland areas of Toole County. The glacial soils have been irrigated for 40 years in some areas. The irrigated crops are sugar beets, alfalfa, field and canning peas, sweet corn, potatoes, small grains and vegetables. In general the yields of these crops are satisfactory and irrigation is a profitable agricultural enterprise.

The Soil Scientists of the Montana Water Resources Board reveiwed the irrigation of glacial soils of Canada with the Soil Science Section of the Canada Department of Agriculture Research Station; and the Agrohydrology Branch of the Water Resources Division, Alberta Department of Agriculture, both agencies are located in Lethbridge, Alberta. The main conclusion that was determined at the meeting was that the glaciated area of northern Montana compares more closely with irrigation in southern Alberta than with other irrigated areas of the United States. Therefore, the future methods of potential irrigation, drainage, soil problems and future irrigated crops of Toole County should be similar to those practiced in southern Alberta.

The Soil Scientists and Agricultural Engineers at Lethbridge, Alberta have accomplished a large quantity of useful research studies on irrigated areas within their boundaries. Several conclusions of these studies can be applied to the north-central Montana area.

First, and most important is that proper planning and studies are necessary before irrigation can prove itself as a profitable agricultural enterprise. The reconnaissance land classification survey is considered only as a primary indication of an area's potential for future irrigation, and a comparison of other nearby proven irrigated areas will help determine the accuracy of predicting the potential of an area for irrigated agriculture. Second, the irrigated areas of Alberta, Canada, are similar to the glacial plains of Toole County, and by considering the characteristics of their soils, topography and drainage features of irrigated lands the following conclusions emerge.

1. If the glacial plains of northern Montana were irrigated the area would be similar to southern Alberta, however, both would differ from most of the world's irrigated areas in that the surface ground is frozen three to five months of the year. During this period no water is being added but subdrainage may continue below the frost level.

2. The irrigation of soils underlain by glacial till is practical, if adequate constructed drainage is provided; however the areas in which the till is less than 36" from the ground surface are not irrigable due to excessive drainage costs.

3. The glacial soils underlain by till require careful water management, excessive irrigation is not permissable due to the slow permeability of the sub-stratum. The farmers of Alberta do not use excess water, the amount and frequency of rainfall is considered, and the crops are irrigated generally whenever 50 percent of the soil moisture has been depleted.

4. In the soils of the glacial plains of northern Montana and southern Alberta, Canada, the evaporation and evapotranspiration during the year normally are less than most irrigated areas of the United States and consequently there is less upward movements of salts. Therefore, if adequate drainage is maintained glacial soils can be irrigated and crops can be sucessfully produced for many years. Adequate drainage should be considered, but it may be necessary to construct tile drainage with a depth of tile at, about 36", more or less, and 30 foot spacings between tile lines. It is understood that this type of drainage system is costly, however, as the value of irrigated crops and land increase in the future the high drainage costs may be acceptable.

5. The glacial soil underlain by till requires proper laboratory evaluation before irrigation. Soil sampling is essential for this laboratory testing to determine the salinity, alkalinity, and permeability. The irrigated soils near Lethbridge, Alberta were tested and whenever the exchangeable sodium (measured by the sodium adsorption ratio method) was greater than 12, the land generally showed poor drainage, high alkalinity and restricted crop growth.

Sub-Surface Drainage

The drainage of shallow glacial till soil is the most critical item of consideration in irrigation planning. The feasibility of irrigating an area depends upon adequate protective measures to keep the crop production at a high level for a sustained irrigated agriculture. The absence of constructed drainage will cause the water table to rise, and the salt from the soil and irrigation water to accumulate within the root zone. The construction of drainage, mainly tile drains, will prevent salinization of the root zone. Research experiments in Canada proved that shallow tile drains at 36" depth, and spacing as close as 30 ft. apart may be needed to adequately drain the shallow till soils.

The detail studies of an irrigation project should include a drainage survey to determine the costs of minimizing seepage and salinization of the soil. It should be remembered that soil which has become seeped and high alkalinity and salinity develops to where crop production is curtailed a waste of irrigated or dryland cultivated land is the result.

Non-Irrigable Glacial Soils

The glaciated plains area of Toole County have large areas of soils developed over alkaline shaly glacial-drifts that are characterized by irregular bare spots, also known as slick spots and blowouts. The larger areas of these soils occur in the central and southern portions of the county generally south of the Marias River.

The alkaline bottoms of glacial lakes and some of the bottoms of the pre-glacial streams valleys

have scabby, slick spot soils. The beneficial use of the alkaline slick spot soils are for dryland cultivation and livestock grazing, depending upon the percentage of the surface-exposed slick spots.

The dryland cultivated areas of Toole County cannot always be considered as irrigable land. The heavy clay loam and clay glacial till may have a high exchangeable sodium content, or a bulk density in excess of 1.5 grams per centimeter which will not allow sufficient vertical or horizontal movement of subsurface water to prevent seepage and high salinity build up in irrigated lands. There are large acreages of heavy clay loam and clay tills underlying the surface soils at a depth of 24" to 48" which are beneficial for dryland cultivation and livestock grazing. However, irrigation of these areas is not recommended.

Residual Soils

The residual soils of Toole County are divided into two separate origins; the mountainous non-glacial slopes of the Sweet Grass Hills, and the areas of sedimentary shales and sandstones in the northern and central part of the area and along the Marias River.

The mountainous non-glacial slopes of the Sweet Grass Hills have stony loams at elevations above 4500 to 5000 feet. Portions of these slopes have shallow loamy, rocky soils developed over the parent material of sandstones and shales. The size and extent of the residual soils are not significant because of the intermixing of deeper soils of alluvial-colluvial origin. The beneficial use of the rocky slopes generally is for livestock grazing.

The soils developed over sedimentary shales and sandstones are locally immature. These olive-brown heavy clays are without distinct soil horizons and usually have the platy structure of the shales below 1' to 3'. Beneficial use of the land is livestock grazing.

Alluvial Soils

Alluvial soils occur along streams of Toole County, the largest stream being the Marias River. The soils distinguishing characteristics are influenced by their parent material but also to some extent to the degree of development under the agency of the soil forming process. The material below the surface is essentially the same as it was at the time of deposition. Most of the alluvial soils of Toole County are found in the Marias River valley, with some being along every stream and drainage throughout the county.

There are 3,000 acres of irrigable alluvial soils along the Marias River, which flows in a southeasterly direction in a deeply entrenched valley 1/2 to one mile in width. The lower 20 miles of the river valley is inundated by Tiber Reservoir. The river valley from the Glacier County line and downstream for approximately 10 miles averages 1/2 mile in width and is bordered by rugged glacial drift covered breaks rising 100 to 200 feet high. Dark colored shales outcrop below the covering of glacial drift, and locally, colluvial wash from them extends down to the stream.

The remaining portion of the valley is entrenched 75 to 100 feet in broad basins. Although in general appearance the valley floor is fairly level, it is very uneven in many places. Recent deposits of alluvium have built up the land bordering the present stream course so that it may be actually a few feet higher than some of the land farther away from the stream; old oxbows representing former channels of the river are filled with heavy textured soils and sometimes filled with water part of the

year. These depressions plus the present meandering stream course divide the arable land into very irregular areas which interfere somewhat with its use. The alluvial deposits of the tributary streams cause rough gravel and shale debris areas which are washed-in material overlying the original river terraces; these areas are non-irrigable.

There are several large acreages of light to medium textured alluvial soils which irrigated agriculture is proving profitable in Toole County. Additional pumping plants are needed to enhance the agricultural benefits of these tracts. The main interfering factor that should be considered in irrigation planning is the general topography of the area adjacent to the river, the meandering stream channel interferes with land forms. The areas of irrigable land are small and generally can be considered only for river pump irrigation by individual farmers. The flood hazard is a problem if excessively high water does occur; this does not occur frequently and continued irrigation is generally possible.

The majority of small streams in Toole County head in the Sweet Grass Hills and flow through narrow deeply entrenched valleys of the mountainous terrain then broadens to an average width of 1/4 mile through the rolling uplands. The alluvial soils of these valleys are scabby land of slick spots, high alkaline content and seeped areas. The most beneficial use is for livestock grazing.

SUMMARY

The 1,965 square miles in Toole County are basically utilized for dryland farming and livestock grazing which is the principle adaptable agriculture for the "Triangle" area of northern Montana. Wheat is the basic dryland crop and should remain so for sometime. Irrigation would be very beneficial to the economy, however, the limited water supply hinders expansion. The ultimate development of any large acreage of irrigation would depend on importing water from another area. The reconnaissance studies of the land classification survey show approximately 202,225 acres being suitable for irrigation planning; a further breakdown of the type of irrigation, either sprinkler or gravity, was not attempted by this survey. Considering the generalities of a reconnaissance study, it is probable that detail studies would decrease this irrigable acreage as much as 40 percent in some instances. It should be noted that any irrigation development would warrant a detail study of the soil, topography and drainage for the purpose of evaluating the project area to withstand a sustained irrigated agriculture.

The glacial soils of the county are adaptable to irrigation development; a comparative area of large irrigated acreage is only a few miles north of the International Boundary, these are the irrigated farms near Lethbridge, Alberta. The irrigated economy of the Lethbridge area is very productive; the main crops are sugar beets, field and canning peas, alfalfa, potatoes, small grains, irrigated pasture, and sweet corn.

The local Federal and State Agricultural Agencies have available soil surveys, and experimental information which help in determining areas for future irrigation and management of presently irrigated lands within Toole County. Contacting these Agencies will help individual farmers save money and labor, and also conserve the land for future use.

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CROPS AND LIVESTOCK

Toole County is located in the north central part of Montana. It is bounded on the west by Glacier County, on the east by Liberty County, and on the south by Pondera and Chouteau Counties. To the north is the Canadian Border. The southern part of the county is located in the Triangle Area. The Marias River forms part of the southern boundary and then moves through the southern tip of the county. A portion of the Sweet Grass Hills is located in northeastern Toole County. These hills form an absolute environment for livestock and wildlife.

The economy of Toole County is largely agricultural. The county is 54 miles long and 42 miles wide. It consists of 1,965 square miles, and has an approximate elevation of 3,300 feet and an average annual rainfall of 11.85 inches.

The area of Toole County contains approximately 1,248,000 acres of which 92.8 percent are used for agriculture. The average size of the farms is 2,795.1 acres and has an average value per acre of $62.08. The average gross sales per farm is about $20,732.00.

Toole County has about 575,818 acres devoted to dryland cropland, 3,362 acres devoted to irrigated cropland, 6,000 acres in hay pasture, 563,007 in range, 9,000 acres in woodland, and about 18,000 acres in farmsteads, idle land, roads, towns, etc.

The farmland is almost completely dominated by small grains. The majority of the farms throughout the county follow the alternate crop and fallow system to build moisture reserves and to carry out a weed control program. The majority of the crops grown in Toole County are primarily wheat and barley. There are small acreages of oats, rye, and mustard.

The Montana Agricultural Statistics, Volume XI, August, 1967, states that there are 20,300 cattle and calves, 200 milk cows, 8,600 sheep, 1,800 hogs, and 12,700 chickens. Sheep and hogs have been decreasing in recent years but other livestock numbers have been holding steady.

A large amount of the hay in Toole County is alfalfa with an equally large amount coming from grains being cut for hay.

The majority of the county is included in the Toole County Weed District and carries on the practice of spraying all noxious weeds to prevent them from spreading. The District also sprays county road right-of-ways and borrow pits. They own and operate their own equipment.

The Toole County Soil and Water Conservation District includes all of Toole County with 267 active farmers cooperating.

CROP PRODUCTION — 1965 HARVESTED ACRES†

Non-Irrigated

Crop	Acres	Yield/A	Bushels	Value
Winter Wheat	85,300	32	2,729,600	$3,239,300.00
Durum	3,500	30	105,000	151,300.00
Other Spring Wheat	74,500	25.5	1,899,800	2,559,700.00
Rye	3,700	39.5	146,200	124,800.00
Oats	4,700	40	188,000	93,200.00
Barley	108,800	43	4,678,400	4,117,000.00
Flax	900	8	7,200	18,000.00
Potatoes	26	73 cwt.	1,900 cwt.	5,400.00
Mustard*	5,540	395.2 lbs.	2,190,240 lbs.	.....
Alfalfa Hay	3,600	1.86 tons	6,700 tons	.....
Wild Hay	3,300	.88 ton	2,900 tons	.....
Grains Cut for Hay*	5,642	1.01 tons	5,721 tons	.....
All Hay	14,700	1.41 tons	20,700 tons	479,000.00

*1964 United States Census of Agriculture

LIVESTOCK ON FARMS AND RANCHES — 1966†

Cattle and Calves	Milk Cows	Sheep	Hogs	Chickens**
20,300	200	8,600	1,800	12,700

†Montana Agricultural Statistics, Volume XI, August, 1967

**1965

STREAM GAGING STATIONS

The U. S. Geological Survey measures the flow of streams, co-operating with funds supplied by several state and federal agencies. The results have been published yearly in book form by drainage basins in Water-Supply Papers through the year 1960. Beginning with 1961, the streamflow records have been published annually by the U. S. Geological Survey for the entire state under the title, "Surface Water Records of Montana." Data for 1961-65 and subsequent five-year periods will be published in Water-Supply Papers. Prior to general issuance, advance copies of station records may be obtained from the U. S. Geological Survey. That agency's records and reports have been used in the preparation of this resume'.

Data given below cover the stream gaging records, which are available for Toole County from the beginning of measurements through the water year 1967. The water year begins October 1 and ends September 30 of the following year.

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.

For reference purposes, the stream gaging stations are listed in downstream order.

Marias River near Shelby*

The water-stage recorder is 200 feet downstream from the bridge on U. S. Highway 91, 6 miles south of Shelby, and 24 miles downstream from Cut Bank Creek. The drainage area is 3,242 square miles, of which 518 square miles is probably noncontributing. Records are available from April 1902 to December 1904, May 1905 to December 1906, May 1907 to January 1908, April 1911 to date (1968). The maximum discharge was 241,000 c.f.s. (June 9, 1964), largely due to failure of Swift Dam, and the minimum observed, 10 c.f.s (August 20, 1919). The average discharge for 59 years (1902-4, 1905-6, 1911-67) was 953 c.f.s. or 689,900 acre feet per year. The highest annual runoff was 1,396,000 acre-feet (1927) and the lowest 255,400 acre-feet (1941). There is some regulation of flow by Lower Two Medicine Lake, Four Horns Reservoir, Swift Reservoir, and Lake Frances, having a combined capacity of about 178,000 acre-feet. There are diversions for irrigation of about 50,000 acres above the station and about 15,000 acres below.

Willow Creek near Devon

The staff gage was at road bridge, 2½ miles upstream from Trail Creek, and 12 miles north of Devon. The drainage area is 310 square miles. Records are available from April 1921 to Septem-

*This station is now in operation (1968).

ber 1925 (no winter records). The maximum discharge observed was 430 c.f.s. (July 14, 1921) and the minimum, no flow at times in each year. There are diversions for irrigation above the station.

Partial Records Stations and Miscellaneous Discharge Measurements

In order to provide information on more streams than are covered by stream gaging stations, the U. S. Geological Survey has for several years been collecting some partial records. These are in addition to the miscellaneous discharge measurements which have always been reported. These partial records, when correlated with simultaneous discharges of nearby continuous-record stations, give fair indications of available flow.

There is one crest-stage partial-record station in Toole County. A station is now being operated on Van Cleeve Coulee tributary near Sunburst.

The partial-record stations as well as the miscellaneous discharge measurements are listed at the end of each U. S. Geological Survey Water-Supply Paper or Surface Water Records report.

Reservoirs

There are no records published by the U. S. Geological Survey for reservoirs in Toole County.

DAMS AND RESERVOIRS

The State of Montana has no statutes governing the design or construction of dams and, except for projects which the Montana Water Resources Board has constructed, the Board has no means of automatically obtaining information concerning design specifications, storage capacities, locations, or ownerships of dams and reservoirs built throughout the State. Consequently, steps have been taken to make this information available for use by the State, the Federal Government, and private citizens.

By means of a questionnaire, the Montana Water Resources Board recently obtained from the various federal agencies who design structures, the basic engineering data, locations, and ownerships of dams and reservoirs for which they either have, or had, responsibility and which have storage capacities of 50 acre-feet or more. The contributing federal agencies were the Soil Conservation Service, the Forest Service, the Bureau of Reclamation, and the Bureau of Land Management. The Montana Power Company also participated in the study.

Information on numerous dams and reservoirs constructed by private individuals in Montana is not available and is, therefore, omitted. However, the Board's Water Resources Survey crew, while working in Toole County, obtained information on private dams and reservoirs within this county. The available information obtained from all sources was compiled by the Board for each county in the State and a list of dams and reservoirs which store 50 acre-feet or more of water was published.

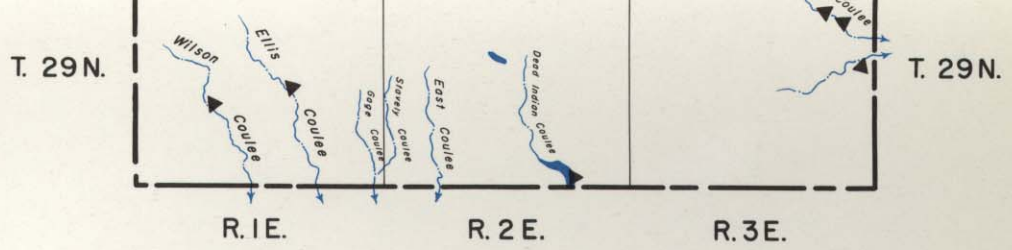
ALBERTA

TOOLE COUNTY LOCATION MAP

Registry of Dams

LEGEND

- ▼ Dams 50 acre feet or more
- Major Lakes and Reservoirs
- Dry Lake Beds



GROUNDWATER

A. J. Mancini, Geologist

GEOLOGY

The availability of groundwater and the distribution of aquifers in the county are directly related to geologic events of far-reaching consequences. These events have great economic significance, apparent from the dollar-value of oil and gas extracted from accumulations related thereto. There is also an economic effect on water-well drilling in that structural uplift and erosion are determining factors in the depth to aquifer and therefore the cost of a well.

The record of historical geology tells us that some 60- or 70-million years past, the Rocky Mountain uplift in Montana was accompanied by folding and faulting of rock strata and the raising of the land surface thousands of feet. A sea which extended north-south across what is now Montana withdrew to the east, and a vast land area came into being. Episodic earth movements continued for millions of years; material eroded from the mountainous region was spread over large areas to the east, and a drainage pattern developed in response to conditions of climate and topography.

More recently—about 1,000,000 years ago—changing climatic conditions following the period of great earth movements brought about the southward expansion of polar ice across Canada and into Montana. Glaciers advanced and retreated intermittently, finally retreating out of Toole County some 30- to 40-thousand years ago. Much of the present topography and drainage system evolved after the last ice-retreat. With the exception of the West Butte and Gold (Middle) Butte of the Sweetgrass Hills, the entire county is mantled with earth material deposited by glacial ice. Retreating ice left behind a mixture of clay, silt, sand, gravel, and larger rock fragments, of varying thickness. Beneath this cover of glacial material is a bedrock pattern reflecting geologic structure associated with earlier earth movements. The predominant structural feature is the Kevin-Sunburst Dome, a broad feature having the configuration of an inverted bowl. The Dome has a circular expanse of more than 25 miles in diameter, with only slight dip (about one degree) in all directions away from a central apex in T. 34 N., R. 1 W. Structural relief amounts to above 800 feet. The significance of the domal configuration is such that subsurface formations at the center are nearer to the surface than formations at the edge of the Dome. On the northeast flank of the Dome, igneous intrusions have pushed upward into overlying sedimentary formations and have caused surface expressions of smaller subsidiary domal features. The cores of the intruding igneous masses are now partially exposed due to erosion.

The structural development and subsequent erosion of the Kevin-Sunburst Dome has resulted in the removal of potential shallow bedrock aquifers. Consequently, the surface bedrock in much of the county consists of shale which is not normally an aquifer. This condition is evident in the distribution of water-well concentrations: there are relatively few wells scattered across the area of the Dome, and heavier concentrations in flank areas where shallow sandstones are present.

The Kevin-Sunburst Dome has undergone intense oil development in the past, and is still an area of active exploration and production. This is probably one reason why few water-wells have been drilled, and the paucity of water-wells in itself is not an accurate indication of the presence or absence of shallow groundwater.

AQUIFERS

Groundwater is available in both unconsolidated and consolidated aquifers. Unconsolidated aquifers include recent alluvium and colluvium of rivers and streams, lake deposits, terrace deposits associated with past and present running water, glacial sands and gravels, and glaciofluvial valley fill. Consolidated aquifers include all the water-bearing bedrock, including subsurface formations. Individual aquifers are discussed in sequence of geologic age, the youngest or most shallow first and the oldest or deepest last. Data has been taken from records of the Groundwater Code Administrator, the Oil and Gas Conservation Commission, and the Department of Health, and from pertinent publications.

Alluvium (Quaternary)—is not represented by wide-spread deposition in the county. No deposits of recent alluvium or colluvium are indicated on existing geological maps, but accumulations of limited extent may exist in the Sweetgrass Hills, and/or along some of the drainages, and/or in the vicinity of lakes and lake beds.

Terrace Deposits (Quaternary)—may be present locally along the Marias River as remnants of former river stages. If present, the probable limited extent of such sands and gravels precludes their use for any but small yield purposes, although they can be areas of recharge for underlying aquifers.

Glacial Deposits (Quaternary)—mantle almost the entire county, in varying thicknesses; the majority of reported thicknesses penetrated by wells are about 100 feet, with almost 200 feet reported in the buried Marias River valley. Most of the glacial material is till composed of dense green and grey clays, with smaller amounts of coarser material such as sands and gravels associated with local meltwater deposits and glaciofluvial sand/gravel which accumulated in valleys and depressions. The glacial cover may also include lake beds deposited as a result of the damming of meltwater by ice or ground moraine, or in lakes formed by meltwater flooding natural depressions. The coarser material, where saturated, can be utilized as aquifers within the unstratified heterogeneous till if dependable sources of recharge exist. The aquifer material usually is composed of jermeable sands and gravel deposits, linear in shape and of limited extent and distribution.

Numerous linear trends of glaciofluvial deposits are interpreted to be present in Toole County, and some are known to coalesce into major preglacial and glacial channels which may contain significant thicknesses of buried valley-fill clastics, including sand and gravel aquifers. Three major ancient drainage systems are evident: a preglacial Marias River channel, closely approximating the present course of the river; a north-south channel from the northern county border near the town of Sweetgrass extending to the towns of Sunburst, Kevin, and Shelby, and joining the ancient Marias channel in the southeastern corner of T. 31 N., R. 2 W.; and another system in the eastern part of the county which parallels the southwest flank of the Sweetgrass Hills and extends past the mappoint of Galata. A major tributary of the latter system followed a west to east course starting almost at the townsite of Shelby. Almost all of the dry lake beds and some of the live lakes in the county appear to be related to these ancient channel systems. Some of the lakes and channels may have been in existence prior to the glacial epoch. An interesting aspect of the ancient drainage pattern is that it outlines the oil-productive Kevin-Sunburst Dome, suggesting a structural influence of the "Laramide Orogeny" which persisted into the time of glaciation. Elsewhere in the county segments of other ancient buried channels are interpreted to be present.

Based on the available information, relatively few water wells have been drilled into buried valley-fill aquifers, and most of these are in the buried Marias River Valley in Township 31 North, Ranges 1 and 2 West. The available appropriation filings indicate that the valley fill here is at

R.4W. R.3W. R.2W. R.1W. R.1E. R.2E. R.3E.

T.37N. T.36N. T.35N. T.34N. T.33N. T.32N. T.31N. T.30N. T.29N.

SWEETGRASS
SUNBURST
KEVIN
OILMONT
SUNBURST DOME
ETHRIDGE
SHELBY
DUNKIRK
DEVON
GALATA
Tiber Reservoir
UNGLACIATED LIMIT OF CONTINENTAL GLACIER ADVANCE
LIMIT OF WEST GOLD BUTTE GLACIER ADVANCE
LIMIT OF GOLD BUTTE GLACIER ADVANCE
MARIAS RIVER

EXPLANATION

- Buried Preglacial Marias River Valley--Valley fill locally provides small to moderate yields.
- Buried Preglacial and Glacial Channels--Locally provide small to moderate yields.
- Tertiary Intrusives--May provide conduits for groundwater movement in recharge areas.
- Glaciated Upland, Bedrock Surface Predominantly Two Medicine Formation--Small yields from basal part.
- Two Medicine Formation Equivalents
  - Glaciated Upland, Bedrock Surface Predominantly Judith River Sandstone--Small yields possible locally, within the zone of saturation.
  - Glaciated Upland, Bedrock Surface Predominantly Claggett Shale--Not normally considered an aquifer.
  - Glaciated Upland, Bedrock Surface Predominantly Upper Part of Eagle Formation--Small yields within the zone of saturation.
- Glaciated Upland, Bedrock Surface Predominantly Virgelle Sandstone--Small to moderate yields, equivalent to lower Eagle formation.
- Glaciated Plain and Upland, Bedrock Surface Predominantly Colorado Shale (including the Telegraph Creek Formation Where Applicable)--Shale is not normally an aquifer, but small yields possible from lower sandy interval.
- Unglaciated Upland, Bedrock Surface Predominantly Judith River Sandstone--Small yields possible within the zone of saturation.
- Unglaciated Upland, Bedrock Surface Predominantly Claggett Shale--Not normally an aquifer.
- Unglaciated Upland, Bedrock Surface Predominantly Upper Part of Eagle and Virgelle--Small yields possible within the zone of saturation.
- Unglaciated Upland, Bedrock Surface Predominantly Colorado Shale--Shale is not normaly an aquifer, but small yields possible from lower sandy interval.
- Unglaciated Upland, Bedrock Surface Jurassic to Mississippian in Age--No reported potential excepting as an intake area.
- (S) Reported Spring
- Domal Axis

MONTANA WATER RESOURCES BOARD
GROUNDWATER INVENTORY
TOOLE COUNTY

COMPILED FROM DATA AVAILABLE AS OF OCTOBER 1, 1968

Compiled from reports of U.S. Geological survey, the Montana Bureau of Mines & Geology, and others.

Geologist: A.J. Mancini
Asst'd by: R.J. Guse
Drafted by: L.J. Petersen

Scale
2 mi.
8 mi.

least 90 feet thick and contains from 20 to 45 feet of sand-gravel interval. Six municipal wells for the town of Shelby report individual pumping yields of 30-300 gpm (gallons per minute), from 10-15 feet of effective aquifer. Municipal use claims a total of 376,000,000 gallons of water annually from these wells. Other wells which appear to have been drilled in buried valley fill and/or outwash sands and gravels report yields of 4-40 gpm, from depths of 20-50 feet. Two wells in Township 37 North, Range 3 East report flowing yields (40 gpm) from gravels 140 feet deep. The reported quality of water obtained from glacial aquifers, at least locally, is on the order of 600 ppm (parts per million) total dissolved solids.

Tertiary Intrusives—are masses of "granite" which pushed upward prior to the glacial advance, and caused deformation of the overlying sedimentary strata. These hard-rock masses form the cores of West Butte and Gold (Middle) Butte and are exposed due to erosion of the overlying broken rock cover. The intrusives do not store appreciable quantities of water but do convey runoff into the subsurface through fractures and through conduits which developed at the igneous-sedimentary contacts. The intruding masses of rock caused local domal uplift and resulted in relatively horizontal sedimentary strata becoming tilted away from the igneous cores. Tilted strata may be more effective aquifers due to the apparent greater formation thickness encountered by the drill. Aquifer effectiveness is enhanced by fracturing which accompanied uplift.

Two Medicine Formation (Cretaceous)—consists of interbedded sandstones and shales on the west flank of the Kevin-Sunburst Dome. A complete section, if it were present, would be more than 2,000 feet thick. Much of the section has been removed by erosion in Toole County where the remaining interval is slightly more than 500 feet thick. The complete Two Medicine formation is equivalent to the interval on the east side of the Dome represented by the Judith River sandstone, the Claggett shale, and the upper part of the Eagle formation. All of the Two Medicine and its equivalents are absent from the surface of the Kevin-Sunburst Dome, most likely as a result of erosion prior to and during the glacier advance. The basal part of the Two Medicine formation is equivalent to the upper member of the Eagle formation. Numerous water wells completed in the Two Medicine formation of western Toole County appear to be pumping water from the Eagle equivalent. These wells pump at rates of 4-40 gpm from depths of about 200 feet.

Judith River Sandstones—are present on the northeast flank of the dome, in the area of the Sweetgrass Hills. The sandstones can be aquifers in the zone of saturation, but have not been utilized in Toole County. They are in an area of recharge by precipitation, by virtue of the higher elevations of the Hills. The presence of natural gas has been reported in the Judith River.

Claggett Shale—is also present in the Sweetgrass Hills, is not normally an aquifer but may contain local thin sandstones that can be water-bearing.

Upper Member of Eagle Formation—is present in the area of the Sweetgrass Hills and can be water-bearing in the zone of saturation. Natural gas has been reported in the Eagle (including the Virgelle).

Virgelle Sandstone (Cretaceous)—is the lower member of the Eagle formation and widely utilized as an aquifer. The Virgelle is 170-185 feet thick in the subsurface, thinner in the outcrop due to erosion. It is absent in the area of the Kevin-Sunburst Dome. Most of the water wells have small

yields, in the range of 4-20 gpm, with a few wells reporting 50-150 gpm. The water is reported to be mineralized, used mostly for livestock but also claimed for domestic use.

The qualities which make the Virgelle an effective aquifer are thickness and distribution, porosity and permeability, and geologic structure. Not all of the section is effective aquifer, but the overall thickness of almost 200 feet consists mostly of white and grey to buff, fine-to-medium-grained sandstone, sometimes having massive sandstones (6 to 8 feet thick) at the base. The remainder of the section consists of thin shales or lignite seams. The actual porosity of the Virgelle in the area is not known, but other similar sandstones are known to have porosities of about 10-20% by volume. Permeabilities are estimated to be relatively low. A useful term to evaluate the water-bearing properties of rock is "transmissivity," or "transmissibility," which is a measure of the ability of the rock to transmit water, based on aquifer thickness and a permeability coefficient. The U. S. Geological Survey Water Resources Division has estimated values of 11,000 to 50,000 for the "coefficient of transmissibility" of the Virgelle in western Toole County and adjoining Glacier County. These figures are in units of gallons per day per foot of width, for the thickness of the aquifer. The U. S. G. S. estimates that properly constructed wells should yield 250 gpm from the Virgelle.

Colorado Shale (Cretaceous)—is a sequence of shales and local sandstone beds, about 500 feet thick on the Kevin-Sunburst Dome and over 2,000 feet thick (including 170 feet of **Telegraph Creek formation** between the Virgelle and Colorado shale) under younger bedrock. Even though shale is not normally an aquifer, the Colorado shales do contain interbeds of sandstones which can be water-bearing, and some water reportedly is obtained through wells completed in the "shale." The upper part of the Colorado, where present, is known as the Marias shale and the lower more sandy part as the Blackleaf. The Blackleaf has been further subdivided into the Bootlegger, Vaughan, Taft Hill, and Flood members. Water might be obtained locally from sandstones within the Blackleaf, especially the basal Flood member. However, the risk of prospecting for water is much greater in the Colorado than in sandstones such as the Virgelle, and yields most likely would be smaller and the water more mineralized.

Kootenai Formation (Cretaceous)—consists of sandstones and shales, 450-725 feet thick. Sandstones within the Kootenai are lenticular in distribution but can be sources of groundwater. Some of the sandstones have associated hydrocarbons and oil-field waters. There is a risk in seeking Kootenai water due to the unknown distribution and varying quality of water, in addition to the depth to aquifer which is in excess of 1,000 feet below the surface.

Jurassic Interval—varies in thickness from less than 200 to more than 300 feet. Sandstone and carbonate units within this interval can be water-bearing although the local association of hydrocarbons with these same units implies that water-quality may not be satisfactory for domestic, livestock, or agricultural use without pretreatment.

Madison (Mississippian)—interval is more than 1,000 feet of carbonates sometimes having cavernous porosity at the top, developed at a major depositional break between Mississippian and Jurassic rocks. This is referred to at times as "buried karst topography." The Madison is a prolific water-producer but the water is mineralized and apparently is suitable only for industrial use without pretreatment. The U. S. Geological Survey reports "coefficients of transmissibility" (estimated) in the Madison of 600-6,500 gpd (gallons per day) per foot. These are relatively low, compared to values for cavernous limestones in other regions. The erratic distribution of voids in the rock and depth to aquifer, which is about 2,000-3,000 feet below the surface, deter drilling wells for any but indus-

trial use, even if suitable water-quality is surmised. Based on appropriation forms of record, at least 55,000,000 gallons of Madison water are used annually in water-flooding operations for the secondary recovery of oil in the county.

Devonian Interval—is about 1,000 feet of carbonates with minor amounts of evaporites and clastics. The Devonian is known to be water-bearing, at least locally and some of the water may be relatively fresh; however, lack of information, depth to aquifer, and availability of water in shallow aquifers deters utilization of this potential source.

Cambrian Interval—is about 500-1,000 feet thick, unexplored as a potential source of groundwater.

Pre-Cambrian—rocks at a depth of approximately 5,000 feet are not normally considered a source of groundwater.

GROUNDWATER AREAS

Toole County can be divided into three groundwater areas, based on physiography and geology. These herein are (1) the Kevin-Sunburst Dome, (2) the Sweetgrass Hills, and (3) the western flank of the Kevin-Sunburst Dome.

Kevin-Sunburst Dome. This feature has a broad configuration encompassing most of the county, including all that large area where the bedrock surface is indicated to be Colorado shale, flanked by the Sweetgrass Hills on the northeast and rising ground in the northwestern and southwestern parts of the county. Relatively few water wells have been drilled in the area of the Dome, probably due in part to oil-field activity, but also undoubtedly to the presence of a thick shale sequence at or near the surface. A scattering of wells produce small amounts of water from coarse material within the glacial cover, and other wells, scattered and in clusters, produce moderate amounts of water from buried valley fill of an ancient Marias River and other drainage systems. The absence of shallow bedrock aquifers such as the Virgelle sandstone is due to the development of the structural dome and subsequent erosion.

Sweetgrass Hills. The high ground characteristically serves as an intake area for certain aquifers and hosts numerous springs. Wells have been completed in the upper Eagle (the Two Medicine formation) and the Virgelle sandstone, normally at maximum depths of 200-300 feet, with an occasional well going deeper than 500 feet. Colluvium is also water-bearing, and several wells reportedly get water from glacial sands and gravels on the flanks of the Hills. Natural gas may be found in shallow sandstones.

Western Flank of the Kevin-Sunburst Dome. The basal part of the Two Medicine formation, and the Virgelle sandstone are the major sources of groundwater presently utilized here. Wells normally are drilled 100-300 feet deep, deeper in a westward direction due to inclination of strata away from the top of the structural dome. Five wells drilled into the Virgelle sandstone bedrock in Township 35 North, Range 4 West claim an aggregate of 425 gpm and 223,380,000 gallons annually for the town of Kevin and an oil refinery. Conditions are similar in the southwestern part of the county, where most wells are drilled less than 200 feet deep into the Two Medicine and Virgelle.

Permeability of the aquifers, which permits water to move through the bedrock into the wellbore, is improved in the outcrop (even where mantled with glacial material) by weathering and

fracturing and wells drilled in or near this area, in the zone of saturation, have better yields than those drilled farther downdip. As a rule the water-quality is also better near the area of recharge. The present drainage system in the county is poor, and some of the runoff from the flanking escarpments finds its way into intermittent lakes and underlying unconsolidated aquifers.

GROUNDWATER AVAILABILITY AND USE

Groundwater in Toole County is used for domestic, livestock and agricultural, and municipal purposes, and for the secondary recovery of oil. Both unconsolidated and consolidated aquifers are utilized, with the Eagle formation (Two Medicine and Virgelle) being the most important source of domestic, livestock and agricultural, and municipal water.

The Madison limestone provides abundant water for industry, specifically for the secondary recovery of oil. The use of Madison water for small waterflood projects may not be feasible, however, because of uneconomic high pumping lifts. A minor amount of Eagle water is also used for this purpose. Locally the quality of Eagle water is poor and the water probably could not be satisfactorily used for any other purpose; however, any proposed substantial increase in the use of Eagle water by industry would probably meet strong objections by other users.

Alluvial aquifers of recent geologic age have not been mapped as being extensive and apparently do not now constitute an important source of groundwater. There reportedly is some water in colluvium in the Sweetgrass Hills, and wells locally utilize this restricted type of aquifer.

The most significant type of unconsolidated aquifer is in the buried valley fill of ancient drainage systems. There are many miles of ancient valleys and channels which have an undetermined groundwater potential. In other counties these buried valleys contain good water supplies, adequate for all but sustained large-scale withdrawals. Scattered wells and a few well-clusters suggest that this potential may also exist in Toole County, but sparse drilling has not evaluated these aquifers. Of a detrimental nature in Toole County is the wide extent of Colorado shale bedrock. Almost all of the buried valleys interpreted to be present are cut into Colorado shale, and groundwater in the buried fill may contain high amounts of dissolved solids derived from shale bedrock. Water percolating across or through the shale undoubtedly will suffer a deterioration of quality, and if the aquifer permeability is poor this characteristic will be even more predominant.

A cluster of 6 water wells about 200 feet deep in Section 35, T. 35 N., R. 3 W., reportedly drilled in a "Tertiary lake bed," pump an aggregate of 800 gpm and 39,000,000 gallons annually, cooling water for a refinery in the town of Kevin. It has also been reported that the quality of this water is unsuitable.

Numerous reported springs along a portion of an ancient valley between the towns of Kevin and Shelby indicate saturated aquifers in an undrilled portion of the county. The extent, depth and area, and water-quality of these aquifers is unknown. Outwash glacial sands and gravels of a more limited distribution are not a very satisfactory source of groundwater due to small storage capacity and inadequate recharge. However, limited as they are, these shallow aquifers can become significant in localities where the surface bedrock is a thick sequence of shale and other unconsolidated aquifers are lacking.

Toole County inhabitants and industry depend on water from bedrock aquifers for most needs. Water in bedrock aquifers can be undesirable for some uses due to high mineral content, but close

to the outcrop, even when mantled with till, the water quality probably is at least fair. The value of using bedrock aquifers is derived from the wide extent of the aquifer, the possibility of finding an artesian aquifer due to structural relief, and the lesser chance of contamination from surface pollutants. None of the presently utilized aquifers appears to have a potential for sustained large-scale withdrawals, although the Madison formation does produce sufficient amounts of water for sustained industrial withdrawals used in the secondary recovery of oil.

Spring water is utilized for domestic and livestock purposes, mostly in the Sweetgrass Hills. A few springs reportedly also supply water for small-scale irrigation. Appropriations of record claim a total of almost 320,000,000 gallons of spring-water annually for all beneficial uses. This is not a large amount of water, but represents less than 20 percent of the spring (and subirrigation) appropriations inasmuch as the other 80 percent do not report the total annual amount claimed. Yields from individual springs reportedly vary from 1 to 150 gpm. The larger yields, 50-150 gpm, are reported in Township 36 North, Range 2 East between West Butte and Gold (Middle) Butte. The town of Oilmont reportedly gets municipal water from 6 nearby springs. Spring water usually has a relatively low amount of total dissolved solids and is preferred for domestic use where available in sufficient and reliable quantity. Springs are found in northwestern and southwestern parts of the county, where the Virgelle sandstone and Two Medicine formation are recharged by precipitation, and some of the infiltrating water discharges where sandstone conduits are breached by erosion in topographic depressions or in the face of the rimrock cliffs of the Virgelle.

The greatest increase in demand for groundwater most likely will be for industrial use—for the secondary recovery of oil, for refinery operations, and for the drilling of oil wells. The Madison limestone is estimated to be capable of supplying the quantity of water needed for industrial use, but the economics of pumping this water may be a deterrent to expanded use. Water for industrial purposes may also be available in other deep aquifers, such as lower Cretaceous and Jurassic sandstones, and Devonian carbonates. The areal extent of the Virgelle and Two Medicine is limited in Toole County. If the need for domestic/municipal and livestock/agriculture water should increase greatly, the shallow unconsolidated aquifers will probably have to be more extensively evaluated, and utilized if water-quality proves suitable. Another potential source of additional water is the Tiber Reservoir.

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MONTANA BUREAU OF MINES AND GEOLOGY
GROUNDWATER DIVISION
WATER WELL INVENTORY

TOOLE COUNTY

YEAR	A	C	D	F	H	I	N	P	S	R	T	U	X	Total
1940+ older	....	1	....	....	16	....	2	7	50	50	....	....	....	126
1941	....	....	....	....	1	....	....	....	2	2	....	....	....	5
1942	....	....	....	....	1	....	....	....	1	1	....	....	....	3
1943	....	....	....	....	2	1	....	....	....	2	....	....	....	5
1944	....	....	....	....	....	....	....	....	2	1	....	....	....	3
1945	....	....	....	....	....	....	....	....	4	8	....	....	....	12
1946	....	....	....	....	2	....	1	2	1	3	....	....	....	9
1947	....	....	....	....	1	....	....	....	1	1	....	....	....	3
1948	....	....	....	....	1	....	....	....	5	3	....	....	....	9
1949	....	....	....	....	1	....	....	....	1	....	....	....	....	2
1950	....	....	....	....	....	....	....	....	4	3	....	....	....	7
1951	....	....	....	....	....	....	....	1	1	....	....	....	....	2
1952	....	....	....	....	1	....	....	....	2	1	....	....	....	4
1953	....	....	....	....	....	1	....	....	1	3	....	....	....	5
1954	....	....	....	....	1	....	....	....	1	3	....	....	....	5
1955	....	....	....	....	....	....	....	....	....	1	....	....	....	1
1956	....	....	....	....	....	....	6	....	8	2	....	....	....	16
1957	....	....	....	....	3	1	1	....	6	2	....	....	....	13
1958	....	....	....	....	1	1	....	....	8	5	....	....	....	15
1959	....	....	....	....	....	....	....	1	4	3	....	....	....	8
1960	....	....	....	....	....	....	....	....	4	6	....	....	....	10
1961	....	....	....	....	1	2	1	....	13	5	....	....	....	22
1962	....	....	....	....	1	....	....	2	3	1	....	....	....	9
1963	....	....	....	....	....	....	....	1	13	1	....	....	....	15
1964	....	....	....	....	1	....	1	....	1	1	....	....	....	4
1965	....	....	....	....	....	....	....	....	1	1	....	....	....	2
1966	....	....	....	....	....	....	....	....	2	....	....	....	....	2
Totals	....	1	....	....	34	6	12	14	139	109	....	....	....	315

A—Conditioning
C—Commercial
D—Dewatering
F—Fire Protection
H—Domestic
I—Irrigation
N—Industrial
P—Public Supply
S—Stock
R—Domestic and Stock
T—Institutional
U—Unused
X—Unknown

ECONOMIC MINERAL DEPOSITS

Geologic Situation

Toole County is situated in the northwestern part of Montana's Great Plains fronting the Rocky Mountains and occupies part of a broad plateau dissected by the east-flowing Marias River and Willow Creek, its southeast-flowing tributary. In the northeast corner of the county are the Sweetgrass Hills (West Butte and Middle Butte) rising about 3,000 feet above the surrounding plains. The greater part of the county is covered by the broad anticlinal Sweetgrass arch containing the Kevin-Sunburst dome, which is in this region, an important structural feature for the accumulation of oil and gas.

Within the county in ascending order is represented the Mississippian Madison limestone, Jurassic Ellis Group, and Upper Cretaceous Colorado Group, Virgelle Formation, Eagle Sandstone, Claggett Formation, and Judith River Formation. Surficial deposits of Quaternary glacial drift are widespread throughout.

The plains area of the county is underlain by near-horizontal Upper Cretaceous sedimentary rocks, with the Colorado Group covering by far the greatest areal extent. In the Sweetgrass Hills, Mississippian, Jurassic, Upper Cretaceous, and Quaternary sedimentary rocks are represented. Igneous rocks are present in the Sweetgrass Hills as coarse-grained laccoliths and/or stocks, and sills and dikes. The contact effects of an intrusive has metamorphosed a coal bed at West Butte (McDermott mine).

Metallic Minerals

Within the western Sweetgrass Hills, near the site of the former town of Gold Butte, are early placer diggings and reported occurrences of gold from which Gold Butte in Middle Butte obtained its name. Placer gold is believed derived from intrusive bodies penetrating Colorado Shales with accompanying silicification and pyritization of the sedimentary rock. Placer mining was active in the 1880's with brief revivals in the present century. It is reported the probable total yield of placer gold from the Gold Butte area was less than 2,000 ounces.

Sparce amounts of iron-bearing minerals and native gold have been described at West Butte, with small-scale production of lead ore containing gold and silver in 1908.

Nonmetallic Minerals

Claggett Shale, which is known to contain beds of bentonite, occurs in the northeastern part of the county. Most of the county is underlain by Colorado Shale, which probably also contains some bentonite beds. Expandable shale suitable for use in the manufacture of lightweight aggregate may also occur in the Colorado Shale.

Mineral Fuels

Production of oil and gas began in Toole County when Kevin-Sunburst Field was discovered by the drilling of the Gordon Campbell-Kevin Syndicate No. 1 Goeddertz well in 1922. Since that time Toole County can claim another 11 fields and a sizeable total production of oil and gas.

Considerably more than 2,200 wells have been drilled in the search for oil and gas. Cretaceous, Jurassic, and Mississippian rocks are productive. Of 52 wells drilled in 1967, seven produced oil and 45 were abandoned. Exploration is still continuing at an active pace.

Average daily oil production during 1967 was about 4,250 barrels per day or about 1,530,000 barrels of oil for the year. Oil production alone, therefore, accounted for a product valued at about $3.5 million during 1967. Total production has been about 186 million barrels.

Gas production during 1967 amounted to about 3.3 billion cubic feet. Total gas production has been about 153 billion cubic feet.

Future exploration should prove sizeable additional reserves of oil and gas in Toole County. Economics of exploration are favorable for operation of independent producing companies, and their efforts will probably continue at a fairly constant rate.

SOIL AND WATER CONSERVATION DISTRICTS

Toole County is served by the Toole County Soil and Water Conservation District which was organized in 1948. The area of the county is 1,248,000 acres.

The District is governed by a board of five supervisors who are elected by the land occupiers of the District. This number will be increased to seven when the incorporated towns become a part of the District. These supervisors carry out a program of complete resource conservation including erosion control, water conservation, soil management, land improvement, wildlife management, recreation, and land use adjustment. This program is accomplished by providing assistance, on a voluntary basis, to farmers and ranchers and later, to urban groups or organizations, through the analyzing of all resources, followed by the planning and applying of economically sound conservation treatment.

Under state law, the supervisors have the power to call upon local, state, and federal agencies to assist in carrying out a soil and water conservation program. The Toole County Soil and Water Conservation District has memoranda of understandings with the Soil Conservation Service, State Forestry Department and Extension Service to provide technical assistance to District cooperators in carrying out sound soil and water conservation programs. Close working relations are maintained with these and with the Montana Fish and Game Department, the Fish and Wildlife Service, the Bureau of Indian Affairs, the Farmers Home Administration, the Agricultural Stabilization and Conservation Service, and the United States Forest Service.

The Soil Conservation Service assists the District by furnishing and interpreting basic data on soils and plant cover and other features of the land. Technical data is interpreted in terms of acceptable alternative uses and treatments to help guide the farm and ranch operator in developing sound conservation plans. It also aids District cooperators in performing operations requiring technical skills beyond the experience of the individuals involved.

The office of the State Forester and Forest Service cooperate with the District by coordinating the programs in tree planting.

The Extension Service assists the District with its education and information programs. An

important function of each District is to inform land owners and occupiers of the benefits derived from wise use of the communities soil and water resources.

One of the major problems of these Districts is to acquaint the urban people, who comprise a large percentage of the total population of the Districts, of the need for conservation.

Technical phases of the District's program include detailed soil surveys, range site and condition surveys, ground water investigations, topographic and other engineering surveys. By a careful analysis of this basic resource information, proper land use, the needed conservation treatment of each field can be determined. The technician interprets the surveys and provides the District cooperator with alternatives in land use and treatment that will enable him to treat the hazards and limitations that occur on each tract of land. With this information and by counseling with the technician the farmer or rancher makes the final decisions. These decisions are recorded in the Conservation Plan. The cooperator determines what will be done on his place and when it will be carried out.

When the plan is completed, the cooperator is given further technical assistance on surveying and layout work essential in establishing conservation practices on the land as called for in the Conservation Plan. This technical assistance is provided without cost to the cooperating farmer or rancher.

There are approximately 600,000 acres of non-irrigated cropland, 3,500 acres of irrigated cropland, 6,000 acres of tame pasture, 550,000 acres of rangeland, 9,000 acres of woodland and 17,500 acres of land considered other land, such as farmsteads, highways and roads, townsites, etc.

All of the land irrigated is by private systems. There are no designated irrigation projects.

There are approximately 37,000 acres of federal land in Toole County. Most of this is administered by the Bureau of Land Management.

The major enterprises on agricultural land are small grain and livestock production. The grains consist mainly of spring and winter wheat and barley. Beef cattle, sheep, and some swine are produced.

The major soil and water conservation practices completed through 1967 since the Toole County Soil and Water Conservation District was organized in 1948, are as follows:

On cropland, contour strips have been established on 2,884 acres and the wind and field stripcropping on 216,651 acres. There are 28,304 feet of field drainage ditches and 88 acres of grassed waterways in addition to the yearly establishment of approximately 55,000 acres of conservation cropping systems with 70,000 acres stubble mulched.

Irrigation practices consist of 800 acres of land leveling, 20,120 feet of canals or laterals, 161,523 feet of field ditches, 166 water control structures, 18 sprinkler systems, 50 pumping plants, 17 surface water systems, 91 irrigation storage water reservoirs, and 10 irrigation pits.

On the rangeland, 593 farm ponds have been constructed with 8 sealed or lined, 115 grade stabilization structures built, 103 range wells dug, 28 springs developed, 1,604 acres of waterspreading

completed, 16,720 acres seeded to tame hay or pasture, 512 acres seeded to native range grasses with 694 acres of cropland converted to range grasses, 80 acres of range pitted or furrowed, 15,625 feet of livestock watering pipeline laid, 700 livestock troughs or tanks constructed, 14 diversion dams, and 210,059 feet of diversion ditch constructed. In addition there has been an annual deferred grazing of about 12,000 acres which with the other range practices result in proper range use of approximately 100,000 acres each year.

For farmstead and ranch protection and beautification and for wildlife propagation, 853 acres of farmstead and feedlot windbreaks and 573,425 feet of single row field windbreaks have been planted.

The Toole County SWCD owns its own tree planter which is available to District cooperators on a rental basis. Other needed equipment to establish the conservation developments or practices is owned by the farmers or ranchers themselves or provided by contractors.

The District is co-sponsor with the city of Shelby on the multiple-purpose City of Shelby Watershed Project which is now being completed and will provide fishing, boating, skiing, picnicking and other recreation in addition to needed flood protection.

Cooperative efforts of land owners and operators, groups, organizations, and agencies have contributed to the overall success of the District.

FISH AND GAME

Toole County waters offer a variety of fishing opportunities to the enthusiast. The main river of the county is the Marias. It is free flowing along the southwestern boundary of the county and provides fine fishing for ling, and trout. Catfish have been stocked in this stretch of the Marias by the Montana Fish and Game Department. Tiber Dam on the Marias backs water into Toole County, offering ling, trout, and the best yellow perch fishing in the area.

Another impoundment created by the Shelby Watershed Dam in the town of Shelby provides good rainbow trout fishing. The best fishing in the county is in the numerous farm ponds of the area, some of which are stocked by the Montana Fish and Game Department.

Toole County offers hunting opportunities for four big game species: whitetail deer, mule deer, elk, and antelope. Whitetail deer are found in the Marias River breaks and in various tributary stream bottoms. The mule deer is also found in the Marias breaks and in the Sweetgrass Hills area. Elk are found in the Sweetgrass Hills in limited numbers and are hunted by special permit only. Antelope inhabit and may be hunted throughout the entire county.

Bird hunters will find sharptail hunting good throughout most of the county and excellent in the Sweetgrass Hills. Hungarian partridge may be found near abandoned farms, in brushy ravines, and around old grain bins with weed cover. Limited numbers of pheasants are found near agricultural lands.

Ducks and geese may be found on the Marias River, on the Tiber Reservoir, and on many of the small lakes and farm ponds in the county.

Several species of fur bearing animals may be trapped in Toole County during the regular trapping season. These species include mink, muskrat, beaver, otter, and martin. Lynx, fox and bobcat may be trapped throughout the county during any season of the year.

The presence of fox, coyotes, bobcats, and lynx in the county offers the hunter an opportunity to hunt varmints and predators during the off season. Marmots and ground squirrels may also be hunted at any time.

Bison inhabited Toole County before they were nearly exterminated in the late 19th century. The Plains Indians who came to hunt them in the area have left many reminders of their presence. Buffalo "jumps" in the Marias River breaks and northeast of Shelby are easily observed. More difficult to observe but equally as fascinating are the "teepee" rings, stone piles, and other archeological finds associated with Indian encampments and hunting areas.

The historical and aesthetic value of these areas is another contribution of Toole County waters to the people of Montana.

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

Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Deer Lodge, Fallon, Flathead, Gallatin, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis & Clark, **Liberty,** Lincoln, Madison, Meagher, Missoula, Musselshell, Park, Phillips, Pondera, Powder River, Powell, Ravalli, Rosebud, Silver Bow, Stillwater, Sweet Grass, Teton, **Toole,** Treasure, Valley, Wheatland, Wibaux & Yellowstone

RIVER BASIN	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigated and Irrigable Acres Under Present Facilities
Missouri River Drainage Basin			
*Missouri River	134,575.50	26,711.33	161,286.83
Jefferson River	61,291.00	9,713.00	71,004.00
Beaverhead River	40,771.00	6,076.00	46,847.00
Big Hole River	23,775.00	1,950.00	25,725.00
Madison River	39,445.00	7,660.00	47,105.00
Gallatin River	112,054.00	21,242.00	133,296.00
Smith River	32,934.00	19,679.00	52,613.00
Sun River	124,474.58	4,385.00	128,859.58
Marias River	125,199.42	17,267.88	142,467.30
Teton River	74,653.00	15,882.33	90,535.33
Musselshell River	64,789.00	57,870.00	122,659.00
Milk River	215,923.62	49,326.76	265,250.38
Yellowstone River**	303,657.00	96,016.00	399,673.00
Stillwater River**	30,423.50	8,028.53	38,452.03
Clarks Fork River**	88,160.97	1,530.83	89,691.80
Big Horn River**	65,005.00	23,858.00	88,863.00
Tongue River	28,170.00	7,762.00	35,932.00
Powder River	35,948.00	2,299.00	38,247.00
Little Missouri River	42,513.00	1,499.00	44,012.00
Grand Total Missouri River Basin	**1,643,762.59**	**378,756.66**	**2,022,519.25**
Columbia River Drainage Basin			
Columbia River	0.00	0.00	0.00
Kootenai (Kootenay) River	9,914.13	968.00	10,882.13
Clark Fork (Deer Lodge) (Hellgate) (Missoula) River	146,287.70	14,934.20	161,221.90
Bitter Root River	111,102.43	3,200.00	114,302.43
Flathead River	135,907.19	4,532.22	140,439.41
Grand Total Columbia River Basin	**403,211.45**	**23,634.42**	**426,845.87**
Grand Total Counties Completed to Date	**2,046,974.04**	**402,391.08**	**2,449,365.12**

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

**Figures in these river basins revised by resurvey of Carbon County, 1965.

IRRIGATION SUMMARY OF TOOLE COUNTY BY RIVER BASINS

MISSOURI RIVER BASIN	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigated and Irrigable Acres Under Present Facilities
Missouri River	0.00	0.00	0.00
Marias River	1,189.00	0.00	1,189.00
Price's Butte (Hilger) (Shekelton) Coulee	117.00	0.00	117.00
Medicine Rock Coulee	0.00	0.00	0.00
Shelby (Kevin) (Kevin Flats) (Aloe) Coulee	20.00	572.00	592.00
Tiber (Buckley) Coulee	17.00	0.00	17.00
Sunburst Coulee	70.00	0.00	70.00
Rim Coulee	8.00	0.00	8.00
Cow Coulee	7.00	0.00	7.00
Big Spring Coulee	0.00	0.00	0.00
Davis Coulee	0.00	30.00	30.00
Beaupre (Lake) Coulee	13.00	6.00	19.00
Hagrewe (Joe Bush) (Sonnemaker) (Kleinert) Coulee	0.00	45.00	45.00
Bear Coulee	0.00	0.00	0.00
Wells	10.00	0.00	10.00
Allen Coulee	0.00	0.00	0.00
O'Laughlin Coulee	2.00	0.00	2.00
D. H. S. Coulee	217.00	0.00	217.00
Healy (Roaney) Coulee	213.00	0.00	213.00
McCallum Coulee	18.00	0.00	18.00
Campbell (Cotterell) (Johnson) Coulee	0.00	16.00	16.00
Bothum Coulee	0.00	5.00	5.00
McCrae Coulee	55.00	0.00	55.00
Watson Coulee	80.00	0.00	80.00
Reservoir (Loomis) (Nate Miller) (Schinick) Coulee	0.00	0.00	0.00
Wiegand Coulee	14.00	0.00	14.00
Unnamed Coulee	6.00	0.00	6.00
Total Shelby Coulee And Tributaries	**750.00**	**674.00**	**1,424.00**
Willow (Sweetgrass) Creek	397.00	805.00	1,202.00
Simeros Coulee	10.00	0.00	10.00
Kicking Horse Creek (Willow Creek)	54.00	40.00	94.00
Unnamed Coulee	20.00	0.00	20.00
Unnamed Coulee	0.00	0.00	0.00
Unnamed Lakes	11.00	0.00	11.00
Timber Coulee	43.00	0.00	43.00
North Fork Timber Coulee	20.00	0.00	20.00
Powers Creek	466.00	0.00	466.00
Simmons Creek	295.00	85.00	380.00
Spring (Willow Grove) Creek	93.00	40.00	133.00
West Grove Springs	30.00	0.00	30.00
Green (Daugherty) (Bushway) Coulee	90.00	40.00	130.00
Limekiln (Boucher) Creek	69.00	0.00	69.00
Five Mile Coulee	0.00	12.00	12.00
South Miners (Poplar Creek) Coulee	131.00	0.00	131.00
Cherry (Gunn Coulee) Creek	33.00	0.00	33.00
Eclipse (East Branch Miners Coulee) Creek	93.00	0.00	93.00
Spring Creek	22.00	0.00	22.00
McLaughlin Creek	28.00	0.00	28.00
Poplar (Buffalo)) Creek	18.00	0.00	18.00
Four Mile (Alkali) Coulee	108.00	0.00	108.00
Alkali (Greasewood) Coulee	113.00	56.00	169.00
Unnamed Coulee	0.00	0.00	0.00
Unnamed Coulee	0.00	0.00	0.00
T. Scalese Stock Well	5.00	0.00	5.00

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

IRRIGATION SUMMARY OF TOOLE COUNTY BY RIVER BASINS

MISSOURI RIVER BASIN—(Continued)	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigated and Irrigable Acres Under Present Facilities
Sheep Creek	181.00	91.00	272.00
Unnamed Coulee	6.00	0.00	6.00
Eide Coulee	72.00	15.00	87.00
Lemky Coulee	6.00	0.00	6.00
Wolf (Bobzeners) (Whites) (Hay) Coulee	69.00	174.00	243.00
Trail Creek	1,225.00	39.00	1,264.00
Strawberry Creek	59.00	0.00	59.00
Sleeper Coulee	30.00	15.00	45.00
Alkali Coulee	0.00	0.00	0.00
Big (Henry) (Hallenbeck) (Porter Gulch) Coulee	60.00	0.00	60.00
White Coulee	0.00	34.00	34.00
Fennell Coulee	0.00	0.00	0.00
Woen Coulee	16.00	0.00	16.00
Unnamed Coulee	27.00	0.00	27.00
Total Trail Creek and Tributaries	**1,417.00**	**88.00**	**1,505.00**
Cameron Coulee	0.00	249.00	249.00
Price's (Kinyon) Coulee	198.00	0.00	198.00
West Fork Willow (Antelope Coulee) (Dry Fork) Creek	0.00	0.00	0.00
Hall (Dry) Coulee	6.00	0.00	6.00
Dunkirk (Willow) (Railroad) Coulee	0.00	137.00	137.00
North Fork Dunkirk (Antelope) (Aiken) (Jackson) (Wood Lake) Coulee	8.00	0.00	8.00
Norweigan Coulee	36.00	0.00	36.00
Unnamed Coulee	0.00	31.00	31.00
Unnamed Coulee	0.00	15.00	15.00
Total Willow Creek and Tributaries	**4,148.00**	**1,878.00**	**6,026.00**
Sulphur Springs Coulee	20.00	0.00	20.00
Unnamed Coulee	34.00	0.00	34.00
Pondera Coulee	0.00	0.00	0.00
Powder (Antelope) Coulee	0.00	0.00	0.00
Fowler Coulee	0.00	0.00	0.00
Wilson Coulee	19.00	0.00	19.00
Total Marias River and Tributaries	**6,277.00**	**2,552.00**	**8,829.00**
Milk River	0.00	0.00	0.00
Red River	11.00	8.00	19.00
South West Branch Red River	0.00	0.00	0.00
Grassy Lake	0.00	0.00	0.00
Gillette Coulee	0.00	0.00	0.00
Long Lake	45.00	9.00	54.00
South Fork Red River (South Red River Coulee)	0.00	0.00	0.00
Reservoir (Fitzpatrick) Lake	62.00	0.00	62.00
O'Haire (School) Coulee	10.00	0.00	10.00
Willshaw (O'Neals) Coulee	37.00	0.00	37.00
Police Coulee	0.00	0.00	0.00
O'Laughlin Coulee	42.00	0.00	42.00
Certain Coulee	62.00	0.00	62.00
Forest Creek	102.00	0.00	102.00
Gooseberry Creek	19.00	0.00	19.00

IRRIGATION SUMMARY OF TOOLE COUNTY BY RIVER BASINS

MISSOURI RIVER BASIN—(Continued)	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigated and Irrigable Acres Under Present Facilities
Deer Creek	0.00	0.00	0.00
West Branch Deer Creek	12.00	0.00	12.00
North Miners Coulee	45.00	0.00	45.00
North Creek	0.00	0.00	0.00
East Fork (North Fork) North Creek	10.00	0.00	10.00
Chicora (Cicory) (Sacera) Creek	18.00	0.00	18.00
Fred and George Creek	284.00	0.00	284.00
Spring Creek	4.00	10.00	14.00
Pritchard Creek	0.00	0.00	0.00
North Fork Pritchard Creek	19.00	0.00	19.00
Flat (Bridges) Coulee	5.00	0.00	5.00
Half Breed Creek	150.00	0.00	150.00
Larsens (Simmons) Creek	131.00	0.00	131.00
Dews Creek	119.00	0.00	119.00
Kemble (Hawk) Coulee	15.00	40.00	55.00
Murray Creek	28.00	0.00	28.00
Spring Coulee	2.00	0.00	2.00
Cow (Trail) Creek	80.00	0.00	80.00
North Creek	0.00	0.00	0.00
Certain Spring	5.00	0.00	5.00
Banner Creek	80.00	8.00	88.00
Kent (Christian) (Carrols Creek) Coulee	126.00	75.00	201.00
Fluett Coulee	143.00	0.00	143.00
Total Half Breed Creek and Tributaries	**879.00**	**123.00**	**1,002.00**
Total Milk River and Tributaries	**1,666.00**	**150.00**	**1,816.00**
GRAND TOTAL TOOLE COUNTY	**7,943.00**	**2,702.00**	**10,645.00**

WATER RIGHT DATA—TOOLE 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	0	0.00	0.00				
Marias River	29	26,261.00	656.53				
Two Medicine Creek	0	0.00	0.00				
Badger Creek	1	28,000.00	700.00				
Birch Creek	0	0.00	0.00				
Unnamed Coulee	0	0.00	0.00				
Abbott Lake	1	1,000.00	25.00				
Little Spring Coulee	1	400.00	10.00				
East Branch Little Spring Coulee	1	200.00	5.00				
Graff Coulee	1	300.00	7.50				
Strike Coulee	1	1,000.00	25.00				
Millar Coulee	1	300.00	7.50				
Unnamed Coulee	0	0.00	0.00				
Nesbo Spring	1	400.00	10.00				
Graverly Hill Coulee	1	400.00	10.00				
North Fork Graverly Hill Coulee	1	400.00	10.00				
A Lake	1	500.00	12.50				
Schultz Coulee	1	200.00	5.00				
Price's Butte (Hilger) (Shekelton) Coulee	3	500.00	12.50				
Twin Coulee (Reko)	2	500.00	12.50				
Lyon Coulee	1	240.00	6.00				
Zell Coulee	2	500.00	12.50				
Robison Coulee	1	200.00	5.00				
Moore Coulee	2	340.00	8.50				
Russell (Sylvan) Coulee	2	800.00	20.00				
Fritzes Coulee	1	300.00	7.50				
Snow Coulee	2	1,320.00	33.00				
Two Certain Lakes	1	200.00	5.00				
Reko's Coulee	1	1,000.00	25.00				
Martian Coulee	1	200.00	5.00				
Bridge Coulee	1	100.00	2.50				
Johnson Coulee	1	100.00	2.50				
Medicine Rock Coulee	2	1,200.00	30.00				
Unnamed Coulee	1	All	---				
Unnamed Coulees	1	All	---				
McHale Coulee	1	400.00	10.00				
Spring Coulee	1	200.00	5.00				
Sullivan Coulee	1	200.00	5.00				
4 East Coulees	1	400.00	10.00				
Vines Coulee	1	4,000.00	100.00				
Unnamed Coulee	1	200.00	5.00				
Nordin Coulee	1	400.00	10.00				
Cox Coulee	1	200.00	5.00				
Houdek (Seven Mile - Nevins - Lucky - Rainbow) Coulee	7	5,700.00	142.50				
Certain Coulee	1	All	---				
Unnamed Coulee	1	200.00	5.00				
Spring Coulee	1	400.00	10.00				
Haap Coulee	1	4,000.00	100.00				

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

WATER RIGHT DATA—TOOLE 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.
Shelby (Kevin)							
(Kevin Flats)							
(Aloe) Cle	6	2,410.00	60.25				
Hay (Railway)							
Coulee	4	1,400.00	35.00				
Mantles Coulee							
(Little Mantles)	4	1,000.00	25.00				
Mensell's Coulee	1	200.00	5.00				
Rock Coulee	1	280.00	7.00				
Thomas Coulee	1	400.00	10.00				
Standard Coulee	1	200.00	5.00				
Spring Coulee	1	280.00	7.00				
Nichols Coulee	1	240.00	6.00				
Timber (Buckley)							
Coulee	0	0.00	0.00				
Keenan Coulee	1	4,000.00	100.00				
Neubert Coulee	1	400.00	10.00				
Grassy Coulee	1	200.00	5.00				
Halfway							
Coulee	1	200.00	5.00				
Dunham							
Coulee	1	400.00	10.00				
Grassy Lake	2	1,760.00	44.00				
Coyote Springs	1	400.00	10.00				
Wolf Springs							
Coulee	0	0.00	0.00				
Wolf Springs	2	300.00	7.50				
Smith's Coulee	1	400.00	10.00				
Antelope Coulee	0	0.00	0.00				
Antelope							
Spring	3	800.00	20.00				
Windy Coulee	1	400.00	10.00				
Perry's Coulee	2	800.00	20.00				
Sunburst Coulee	2	360.00	9.00				
Rim Coulee	1	240.00	6.00				
Cow Coulee	1	500.00	12.50				
Unnamed							
Coulee	1	120.00	3.00				
Tom's Springs	1	50.00	1.25				
Snake Head							
Springs	1	100.00	2.50				
Buck Coulee	1	240.00	6.00				
Alkali Springs	1	50.00	1.25				
Farrell Coulee	1	120.00	3.00				
2 Lakes	1	150.00	3.75				
A Lake	2	500.00	12.50				
Three Lakes	1	100.00	2.50				
Buckley's Springs, Sullivans Springs (Davis)	3	2,000.00	50.00				
Black Hills							
Springs	1	50.00	1.25				
Dutch Springs	1	50.00	1.25				
Chokecherry							
Coulee	1	200.00	5.00				
Big Spring							
Coulee	2	800.00	20.00				

WATER RIGHT DATA—TOOLE COUNTY
APPROPRIATIONS AND DECREES BY STREAMS

STREAMS	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per. Sec.	Case No.	DECREED RIGHTS No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Davis Coulee ..	1	400.00	10.00				
Benton Trail Lakes	1	4,000.00	100.00				
Davis Lakes	1	4,000.00	100.00				
Foxtail Lakes	1	300.00	7.50				
Unnamed Coulee	0	0.00	0.00				
Andreas Springs	1	100.00	2.50				
Hemings Lake	2	155.00	3.88				
East Fork Big Spring Coulee	2	4,000.00	100.00				
Nichols Coulee ..	1	280.00	7.00				
Simmes Summer Camp Lake	1	100.00	2.50				
Black Hills Coulee	2	1,040.00	26.00				
Unnamed Coulee	2	240.00	6.00				
Stinson Coulee	1	800.00	20.00				
Engemoen Coulee	1	200.00	5.00				
Dutchmans Spring	1	250.00	6.25				
Unnamed Coulee	0	0.00	0.00				
Shale Spring	1	100.00	2.50				
Unger Coulee ..	2	640.00	16.00				
A Ditch and Reservoir	1	All	---				
A Certain Coulee ..	1	All	---				
Sunburst Coulee	1	200.00	5.00				
Bills Coulee	1	400.00	10.00				
Engle Coulee	1	240.00	6.00				
Stone Coulee	1	400.00	10.00				
Unnamed Coulee ..	1	120.00	3.00				
Beaupre (Lake) Coulee	10	5,400.00	135.00				
Sulphur Springs	1	100.00	2.50				
O'Laughlin Lake	2	300.00	7.50				
Duck Lake	2	400.00	10.00				
George Coulee	1	400.00	10.00				
Dry Lake	1	---	---				
Hagrewe (Joe Bush) (Sonnemaker) (Kleinert) Coulee	5	4,840.00	121.00				
Gottwerth (Elm) Coulee ..	2	480.00	12.00				
Kallenberger Coulee	1	200.00	5.00				
Blueberry Coulee (Haynes) ..	2	600.00	15.00				
Sandstone (Philips) Coulee	2	500.00	12.50				

WATER RIGHT DATA—TOOLE COUNTY
APPROPRIATIONS AND DECREES BY STREAMS

STREAMS	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per. Sec.	Case No.	DECREED RIGHTS No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Powers Creek	1	400.00	10.00				
Peterson Coulee	1	800.00	20.00				
Bertha Coulee	1	400.00	10.00				
Shultz Coulee	2	4,000.00	100.00				
Raven Coulee	1	2,000.00	50.00				
Rock Coulee (Dale)	3	5,200.00	130.00				
Kallenbergers Coulee	2	360.00	9.00				
Heskins Coulee	1	4,000.00	100.00				
Shorty Lake	1	160.00	4.00				
Rose Coulee	1	200.00	5.00				
O'Neil (Pettigrew) Coulee	3	560.00	14.00				
Bear Coulee	1	400.00	10.00				
Wells	1	20,000.00	500.00				
A Stock Well	3	80.00	2.00				
Sunburst Spring	1	160.00	4.00				
Bob's Coulee	1	400.00	10.00				
Unnamed Coulee	1	120.00	3.00				
Black Hill Coulee	1	280.00	7.00				
Unnamed Coulee	1	800.00	20.00				
Peters (Rock) Coulee	2	480.00	12.00				
Certain Coulee	1	All	---				
Halls Coulee	1	400.00	10.00				
Casar Lake	1	400.00	10.00				
East Fork Certain Coulee	1	All	---				
Dutch Coulee	1	160.00	4.00				
Gopher (Old Kevin) Coulee	2	440.00	11.00				
Unnamed Coulee	1	120.00	3.00				
Big Wolf Coulee	1	160.00	4.00				
Engle Coulee	1	240.00	6.00				
Badger Coulee	1	280.00	7.00				
Prospect Coulee	1	80.00	2.00				
Hugi Coulee	1	80.00	2.00				
Allen Coulee	2	2,200.00	55.00				
Rose Coulee	3	1,200.00	30.00				
Certain Ravine Or Coulee	1	All	---				
Leader Coulee	2	800.00	20.00				
Certain Dry Lake	1	All	---				
Alum (Dry Flat) Coulee	6	1,800.00	45.00				
Johns Coulee	1	400.00	10.00				
Elm Coulee	1	1,600.00	40.00				
Haggerty Coulee	1	400.00	10.00				
Unnamed Coulee	1	100.00	2.50				
Two Reservoir Sites	1	10,100.00	252.50				
Unnamed Coulee	1	120.00	3.00				

WATER RIGHT DATA—TOOLE 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.
Alkali Coulee	1	50.00	1.25				
Rabbit Coulee	5	670.00	16.75				
Basin Coulee	1	100.00	2.50				
Gulch	2	200.00	5.00				
Unnamed Coulee	1	100.00	2.50				
Lost Lake	1	40,000.00	1,000.00				
Certain Reservoir	1	All	---				
Unnamed Coulee	1	40.00	1.00				
Boeck Coulee And Tributaries	1	10,000.00	250.00				
Certain Reservoir Site	1	All	---				
Branch (Davidson) Coulee	4	1,600.00	40.00				
Kenneally Coulee	1	320.00	8.00				
Alkali Flat (Bear) Coulee	2	600.00	15.00				
O'Laughlin Coulee	1	100.00	2.50				
Deep Cut Coulee	1	120.00	3.00				
Rabbit Coulee	1	400.00	10.00				
Coyote Coulee	1	400.00	10.00				
Briggs Coulee (Sheepherders)	2	900.00	22.50				
Goddertz Springs	1	500.00	12.50				
Davidson Coulee	1	600.00	15.00				
Gumbo Coulee	1	280.00	7.00				
Thompson Coulee	1	400.00	10.00				
Fox Coulee	1	50.00	1.25				
Kit Fox Coulee	1	50.00	1.25				
Hearly Coulee	1	400.00	10.00				
Altman Coulee	1	4,000.00	100.00				
D. H. S. Coulee	4	2,970.00	74.25				
D. H. S. Spring	3	23.00	0.58				
Frenchman Lake	1	300.00	7.50				
Cowboy's Lakes	1	200.00	5.00				
5 Different Lakes	1	200.00	5.00				
Unnamed Coulee	0	0.00	0.00				
Rocky Springs	4	240.00	6.00				
Rocky Springs Coulee	1	400.00	10.00				
Unnamed Coulee	1	10.00	0.25				
Unnamed Coulee	1	13.00	0.33				
Unnamed Spring	2	40.00	1.00				
Unnamed Coulee	0	0.00	0.00				
Unnamed Spring	1	13.00	0.33				
Unnamed Coulee	0	0.00	0.00				
Davidson's Springs	1	600.00	15.00				

WATER RIGHT DATA—TOOLE COUNTY
APPROPRIATIONS AND DECREES BY STREAMS

STREAMS	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per. Sec.	Case No.	DECREED RIGHTS No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Sand (Rattle Snake) Creek ..	1	200.00	5.00				
Rocky Springs Coulee	1	600.00	15.00				
Anderson Coulee	1	50.00	1.25				
Davidson Spring	1	All	---				
Unnamed Coulee	1	2,000.00	50.00				
Sheep Coulee	1	200.00	5.00				
Healy (Roaney) Coulee	6	30,400.00	760.00				
Unnamed Coulee	0	0.00	0.00				
Unnamed Spring	1	80.00	2.00				
McCallum Coulee	5	1,060.00	26.50				
Spring Coulee	1	400.00	10.00				
Spargurs Coulee	1	4,000.00	100.00				
Unnamed Coulee	1	All	---				
Jackson Coulee	1	1,000.00	25.00				
South Fork Healy (Roaney) Coulee	2	4,200.00	105.00				
Escallier Coulee	2	600.00	15.00				
Coyote Coulee	1	200.00	5.00				
Branch Coulee	1	400.00	10.00				
Yoan Yoanas Coulee	1	1,600.00	40.00				
Unnamed Coulee ..	1	400.00	10.00				
Unnamed Coulee ..	1	All	---				
Rocky Springs Coulee	1	300.00	7.50				
Sand Coulee (Healy)	10	65,680.00	1,642.00				
Springs And Coulees	1	All	---				
South Branch Sand Coulee	1	400.00	10.00				
Bonnett Lakes	1	400.00	10.00				
Spring Coulee	6	3,000.00	75.00				
Unnamed Coulee	0	0.00	0.00				
Town Spring	1	240.00	6.00				
Lone Tree Coulee	1	400.00	10.00				
Liebenau Aloe (Boeck) (Fredricks) (Swimming Horse) Coulee ..	5	13,500.00	337.50				
Repsher Coulee ..	1	200.00	5.00				
Overby (Miller) Coulee	2	4,100.00	102.50				
Coyote Coulee	1	3,200.00	80.00				
Sheep Coulee	1	120.00	3.00				
Rimvale Creek ..	1	200.00	5.00				

WATER RIGHT DATA—TOOLE 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.
Campbell (Cotterell) (Johnson) Coulee	4	1,600.00	40.00				
Bothum Coulee	1	2,000.00	50.00				
Unnamed Coulees	1	All	---				
Linder (Overby) Coulee	1	100.00	2.50				
Unnamed Coulee	0	0.00	0.00				
A Lake	1	400.00	10.00				
Roberts Lake (Virden) (Shelby)	1	2,000.00	50.00				
Roberts Coulee	1	All	---				
Unnamed Coulee	1	All	---				
Seepage Spring Coulee	1	200.00	5.00				
Lynch Coulee	1	500.00	12.50				
Rutrle Coulee	1	4,000.00	100.00				
Gavagan (Gavigan) Coulee	2	1,000.00	25.00				
Unnamed Coulee	1	800.00	20.00				
Eastern Coulee	1	4,000.00	100.00				
Lund (Robinson) (Roberts) Coulee	3	4,500.00	112.50				
Hilger Coulee	2	500.00	12.50				
Sullivan Coulee	1	300.00	7.50				
Flat Coulee	1	400.00	10.00				
McCrae Coulee	3	1,200.00	30.00				
Lutz Coulee	1	200.00	5.00				
McSweeney Coulee (West Branch McCrae)	3	1,200.00	30.00				
Watson Coulee	2	600.00	15.00				
Reservoir (Loomis) (Nate Miller) (Schinick) Coulee	6	9,800.00	245.00				
Unnamed Coulee	1	400.00	10.00				
Wiegand Coulees	1	1,000.00	25.00				
Dumas Coulee	1	400.00	10.00				
Wiegand Coulee	1	1,000.00	25.00				
Cyr Coulee	0	0.00	0.00				
Garland Coulee	1	80.00	2.00				
Mud Spring	1	200.00	5.00				
A Reservoir	1	1,000.00	25.00				
Davis Coulee	1	1,000.00	25.00				
Little Spring Coulee	1	80.00	2.00				
East Fork Little Spring Coulee	2	120.00	3.00				
West Fork Little Spring Coulee	2	120.00	3.00				

WATER RIGHT DATA—TOOLE 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.
A, P, and B Coulees	1	60.00	1.50				
Wilcox Coulee	1	300.00	7.50				
Basin Coulee	1	600.00	15.00				
A Coulee And Tributaries	1	2,000.00	50.00				
Martin Coulee	1	100.00	2.50				
Hulehan Coulee	1	200.00	5.00				
Shelby Lake	2	1,200.00	30.00				
McMahan (Morison) Coulee	3	240.00	6.00				
Clayton Coulee	1	200.00	5.00				
Chase Coulee	1	300.00	7.50				
Total Shelby Coulee And Tributaries	**366**	**367,084.00**	**9,177.12**				
Narogage Coulee	1	1,000.00	25.00				
Dunkvic Coulee	1	200.00	5.00				
Branch Of Dunkvic Coulee	1	240.00	6.00				
Willow Creek (Sweet Grass Creek)	33	66,737.00	1,668.43				
Simeros Coulee	3	600.00	15.00				
George Coulee	2	800.00	20.00				
Kicking Horse Creek (Willow Creek)	14	3,320.00	83.00				
Price Coulee	1	80.00	2.00				
Unnamed Coulee	0	0.00	0.00				
Swan Lake	1	400.00	10.00				
Timber Coulee	4	590.00	14.75				
North Fork Timber Coulee	3	300.00	7.50				
Gooseberry Coulee	1	100.00	2.50				
Fisher Creek	3	720.00	18.00				
Powers Creek	4	640.00	16.00				
Two Mile Coulee	3	560.00	14.00				
Springs & Creeks	1	80.00	2.00				
Simmons Creek	11	1,660.00	41.50				
Rock Coulee	1	40.00	1.00				
Deep Coulee	1	100.00	2.50				
Rocky Spring	1	400.00	10.00				
Sulphur Springs Coulee	1	240.00	6.00				
Sulphur Springs	2	200.00	5.00				
Grove Springs	1	100.00	2.50				
Certain Coulee	1	100.00	2.50				
Spring (Willow Grove) Creek	1	200.00	5.00	8740	1	200.00	5.00
White Spring	2	1,040.00	26.00				
Daisy Spring	1	100.00	2.50				
West Grove Springs	1	80.00	2.00				
Green Coulee (Daugherty) (Bushway)	12	2,100.00	52.50				
Big Rocky Springs	5	700.00	17.50				

WATER RIGHT DATA—TOOLE 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.
Coal Mine Springs	1	80.00	2.00				
Little Rocky Spring	1	40.00	1.00				
Spring Coulee	2	300.00	7.50				
Deep Coulee Spring	2	140.00	3.50				
Limekiln Creek (Boucher)	7	1,520.00	38.00				
Edmunds Coulee	2	200.00	5.00				
Five Mile Coulee	10	4,107.00	102.68				
Berry Coulee	1	50.00	1.25				
Fauque Lake	1	100.00	2.50				
Spring Coulee	2	200.00	5.00				
A Certain Spring	1	120.00	3.00				
Marsh Spring	1	400.00	10.00				
South Miners Coulee (Poplar Creek)	13	2,160.00	54.00				
Cherry Creek (Gunn Coulee)	1	100.00	2.50				
Moltz Coulee	2	300.00	7.50				
Eclipse Creek (East Branch Miners Coulee)	11	1,820.00	45.50				
Christian Lake	1	All	---				
Willow Creek	0	0.00	0.00				
East Fork Willow Creek	1	500.00	12.50				
MacHale Reservoir	1	200.00	5.00				
North Fork Eclipse Creek	1	100.00	2.50				
Smith Lake	1	100.00	2.50				
Flat Lake	1	100.00	2.50				
Unnamed Coulee	0	0.00	0.00				
Rock Springs	1	80.00	2.00				
Verona Springs	1	80.00	2.00				
Rosedale Coulee	1	160.00	4.00				
A Certain Lake	1	400.00	10.00				
Sulphur Springs	1	100.00	2.50				
Spring (Alkali) Coulee	2	200.00	5.00				
Unnamed Coulee	0	0.00	0.00				
Duck Lake	1	100.00	2.50				
Earnest (Karlen) Coulee	4	400.00	10.00				
Big Spring	1	40.00	1.00				
Spring Creek	4	600.00	15.00				
Flagstone Spring	2	230.00	5.75				
Canon Creek	2	180.00	4.50				
Douglas Coulee	1	200.00	5.00				
Shipley Coulee	1	80.00	2.00				
Camerons Lake	1	400.00	10.00				
McLaughlin Creek	7	1,220.00	30.50				
McLaughlin Spring	2	113.00	2.83				
Berthlote Lake	1	120.00	3.00				
Poplar (Buffalo) Creek	0	0.00	0.00				
Unnamed Coulee	0	0.00	0.00				
Stock Well	1	100.00	2.50				
Badger Coulee	1	160.00	4.00				

WATER RIGHT DATA—TOOLE 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.
Reynolds Coulee	1	50.00	1.25				
Reynold's Spring	2	150.00	3.75				
Buffalo (Lambrecht) Coulee	2	4,120.00	103.00				
Four Mile (Alkali) Coulee	5	600.00	15.00				
Sink Creek (Sliderock Coulee)	3	240.00	6.00				
Certain Spring	1	120.00	3.00				
Middle Fork Four Mile Coulee	1	100.00	2.50				
McDonald Spring	1	100.00	2.50				
East Fork Four Mile Coulee	1	100.00	2.50				
Maixner (Snow) Coulee	2	240.00	6.00				
Alkali (Greasewood) Coulee	5	1,520.00	38.00				
Unnamed Coulee	0	0.00	0.00				
Mud Spring	1	100.00	2.50				
Sheep Creek	12	12,220.00	305.50				
Deep Coulee	1	80.00	2.00				
Unnamed Coulee	0	0.00	0.00				
Chokecherry Spring	1	50.00	1.25				
Four Springs	1	50.00	1.25				
Meadow Creek	1	100.00	2.50				
Stark Creek	1	120.00	3.00				
Spring Coulee	2	200.00	5.00				
Eide Coulee	1	1,000.00	25.00				
Lemky Coulee	1	200.00	5.00				
Sweet Coulee	1	200.00	5.00				
Wolf (Bobzeners) (White) (Hay) Coulee	4	660.00	16.50				
A Spring	1	50.00	1.25				
Black Coulee (Twelve Mile Coulee)	6	5,900.00	147.50				
Clear Coulee	1	200.00	5.00				
Minnesota (Houliston) Coulee	2	300.00	7.50				
Dakota Coulee	1	400.00	10.00				
Unnamed Coulee	1	400.00	10.00				
Elmer Coulee	1	200.00	5.00				
Picadilly (Petry) (Picadella) (Highwood) Coulee	12	4,980.00	124.50				
West Branch Picadilly Coulee	2	300.00	7.50				
East Branch Picadilly Coulee	1	100.00	2.50				
Little Black Coulee	1	200.00	5.00				

WATER RIGHT DATA—TOOLE 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.
Fifteen Mile Coulee (Head) (South Branch Black Coulee)	11	4,400.00	110.00				
Lost Lake	1	200,000.00	5,000.00				
McKee Coulee	2	12,800.00	320.00				
Lost Lake Coulee	1	140.00	3.50				
Unnamed Coulee	1	All	---				
Stewart Coulee	1	140.00	3.50				
Caghey Coulee	1	200.00	5.00				
Reservoir (Copper) Coulee	3	1,400.00	35.00				
Rice Coulee	1	400.00	10.00				
Dipple Coulee	1	4,000.00	100.00				
Taylor Coulee	2	320.00	8.00				
Shale Coulee	1	400.00	10.00				
Johannsen Coulee	1	8,000.00	200.00				
Nine Mile Coulee	0	0.00	0.00				
East Black Coulee	2	360.00	9.00				
Trail Creek	28	30,640.00	766.00	6476	4	400.00	10.00
Calf Coulee	1	100.00	2.50				
Spring Coulee	0	0.00	0.00				
Unnamed Coulee	0	0.00	0.00				
A Certain Spring	1	240.00	6.00				
A Certain Spring	1	80.00	2.00				
Huse Coulee	1	100.00	2.50				
Unnamed Coulee	0	0.00	0.00				
Soda Spring	1	80.00	2.00				
Whyte Coulee	1	50.00	1.25				
Gormley Coulee	1	120.00	3.00				
Strawberry Creek	8	4,890.00	122.25				
Snow Coulee	3	480.00	12.00				
Sleeper Coulee	2	6,000.00	150.00				
Gagnon Spring	1	80.00	2.00				
Alkali Coulee	0	0.00	0.00				
Unnamed Coulee	0	0.00	0.00				
Alkali Spring	1	80.00	2.00				
Big (Henry) (Hallenbeck) (Porter Gulch) Coulee	5	3,680.00	92.00				
McDonald Coulee	1	100.00	2.50				
Snow (Snowdrift) Coulee	2	700.00	17.50				
Steep Coulee	1	4,000.00	100.00				
Sand Rock Coulee (Westcott)	1	80.00	2.00				
Grandma Coulee	0	0.00	0.00				
Cavitt Coulee	1	100.00	2.50				

WATER RIGHT DATA—TOOLE 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.
Grassy Butte Coulee	1	200.00	5.00				
Certain Coulee	1	All	---				
White Coulee	1	200.00	5.00				
Fennell Coulee	1	All	---				
Total Trail Creek And Tributaries	**65**	**52,000.00**	**1,300.00**				
Leslie's Coulee	2	520.00	13.00				
Cameron Coulee	1	200.00	5.00				
Unnamed Coulee	1	All	---				
Unnamed Coulee	1	All	---				
Prices (Kinyon) Coulee	7	42,140.00	1,053.50				
Unnamed Coulee	1	4,000.00	100.00				
Dorn's Coulee	1	800.00	20.00				
Small Coulee	1	400.00	10.00				
A Small Coulee	1	400.00	10.00				
Bleeker Coulee	2	400.00	10.00				
Big Owl Coulee	1	100.00	2.50				
Little Owl Coulee	1	100.00	2.50				
West Fork Willow Creek (Antelope Coulee) (Dry Fork)	7	3,120.00	78.00				
Hall (Dry) Coulee	2	500.00	12.50				
Clint (Root) Coulee	1	400.00	10.00				
Dry Fork Coulee	1	200.00	5.00				
Unnamed Coulee	1	4,000.00	100.00				
Gunwald Nesbo (Seven Mile, Houdek, Hanson) Coulee	7	21,000.00	525.00				
Frogge Coulee	3	22,000.00	550.00				
Enterprice (South West Fork Seven Mile) Coulee	2	900.00	22.50				
Kohnen Coulee	1	400.00	10.00				
Wood Lake	1	1,000.00	25.00				
O'Hearn Coulee	2	4,200.00	105.00				
Certain Coulee	1	866.00	21.65				
Benjamin Coulee	3	40,500.00	1,012.50				
Certain Coulee	1	400.00	10.00				
Allen Coulee	1	400.00	10.00				
Certain Coulee	2	800.00	20.00				
Schilling Coulee	2	240.00	6.00				
Township Coulee	1	400.00	10.00				
Stafford Coulee	1	400.00	10.00				
Unnamed Coulee	0	0.00	0.00				
Lost Lake	0	0.00	0.00				

WATER RIGHT DATA—TOOLE 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.
Tweedy (Jacob) Coulee ..	3	920.00	23.00				
Certain Draws	1	All	---				
Fredericks Coulee	1	200.00	5.00				
Scotty Coulee ..	1	400.00	10.00				
Unnamed Coulee	1	120.00	3.00				
Winding (Scot) (Wall) (Raglin Butte) (Hasquet) Coulee ..	13	23,800.00	595.00				
Moffat Coulee	1	200.00	5.00				
Stinchfield Coulee ..	1	400.00	10.00				
Smith Coulee And Tributaries	1	400.00	10.00				
Miller Coulee ..	1	400.00	10.00				
Crooked Coulee ..	3	800.00	20.00				
Baptiste Coulee	1	200.00	5.00				
Twelve Mile Coulee	1	200.00	5.00				
Dunkirk (Willow) (Railroad) Coulee	6	20,900.00	522.50				
Jack Shaws Coulee	1	300.00	7.50				
McGinnis Coulee	1	400.00	10.00				
Deep Coulee	1	100.00	2.50				
Aylward Coulee (DAHLS)	3	1,440.00	36.00				
Branch of Dunkirk Coulee	1	800.00	20.00				
North Fork Dunkirk (Antelope) (Aiken) (Jackson) (Wood Lake) Coulee	7	2,720.00	68.00				
Summers Coulee	1	300.00	7.50				
Aiken Coulee ..	0	0.00	0.00				
Unnamed Coulee	1	400.00	10.00				
Gagner Coulee	1	1,000.00	25.00				
Unnamed Coulee	1	800.00	20.00				

WATER RIGHT DATA—TOOLE 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.
South Dunkirk Coulee	1	300.00	7.50				
Gesche Coulee	1	400.00	10.00				
West Denson Coulee	2	500.00	12.50				
East Denson (Peers) Coulee	3	1,400.00	35.00				
Unnamed Coulee	0	0.00	0.00				
Monument Lake	2	680.00	17.00				
Powers Coulee (West Wolf) (Antelope Cle)	4	4,260.00	106.50				
Crooked Coulee	1	200.00	5.00				
Home ((Hasquet) (Harte) Coulee	3	800.00	20.00				
Teeds Coulee	1	200.00	5.00				
Unnamed Coulee	1	320.00	8.00				
Flat (Dry Fork)) (East Wolf) Coulee	5	21,100.00	527.50				
Gibson Coulee	1	400.00	10.00				
Creighton Coulee	1	4,000.00	100.00				
Roland Coulee	1	1,000.00	25.00				
Last Chance (Haines) (Wilkins) Coulee	4	8,880.00	222.00				
Oakes (Gibson) Coulee	2	1,500.00	37.50				
Pike (Butte Creek) Coulee	2	400.00	10.00				
Johnson Coulee	1	200.00	5.00				
Norweigan Coulee	1	120.00	3.00				
Coyote Coulee	1	300.00	7.50				
Clark Coulee	1	200.00	5.00				
Edmister Coulee	1	240.00	6.00				
North Fork Willow Creek	1	20.00	0.50				
Unnamed Coulee	2	560.00	14.00				
Clift Coulee	2	12,825.00	320.63				
Unnamed Coulee	1	400.00	10.00				
Galata Coulee (Ravine)	2	520.00	13.00				
Old Galata Spring	3	338.00	8.45				
A Spring	1	144.00	3.60				
Unnamed Coulee	1	24,000.00	600.00				
Woods Coulee	1	800.00	20.00				
Unnamed Coulee	1	24,000.00	600.00				
Total Willow Creek And Tributaries	**556**	**738,490.00**	**18,462.27**				
West Coulee	1	100.00	2.50				
Ben Ryan Coulee	1	100.00	2.50				
Middle Coulee	1	100.00	2.50				
Unnamed Coulee	1	160.00	4.00				

WATER RIGHT DATA—TOOLE 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.
Sulphur Springs Coulee	1	240.00	6.00				
Certain Lake	1	200.00	5.00				
Unnamed Coulee	0	0.00	0.00				
A Lake	4	1,480.00	37.00				
Unnamed Coulee	0	0.00	0.00				
A Lake	2	2,280.00	57.00				
Dead Indian Coulee	1	100.00	2.50				
Unnamed Coulee	1	All	---				
Deep Coulee	1	100.00	2.50				
A Certain Lake	1	400.00	10.00				
Dea Coulee	1	400.00	10.00				
Mumper Coulee	1	800.00	20.00				
Unnamed Coulee	0	0.00	0.00				
A Spring	1	50.00	1.25				
Hargrove Coulee	1	400.00	10.00				
Walsh Coulee	1	1,200.00	30.00				
Freebury Coulee	1	1,000.00	25.00				
Flood Coulee	1	480.00	12.00				
Coulee Number 4	1	200.00	5.00				
A Certain Coulee	1	200.00	5.00				
Spring Coulee And Springs	1	200.00	5.00				
Pondera Coulee	0	0.00	0.00				
Powder (Antelope) Coulee	0	0.00	0.00				
Gage Coulee	2	400.00	10.00				
Stavely Coulee	1	400.00	10.00				
Fowler Coulee	0	0.00	0.00				
Wilson Coulee	2	3,000.00	75.00				
Certain Coulee	1	1,000.00	25.00				
Ellis (Dead Indian) Coulee	2	1,400.00	35.00				
Hoffman Coulee	2	20,400.00	510.00				
Hoffman Lake	1	400.00	10.00				
Mud Lake Coulee	1	1,000.00	25.00				
A Dry Coulee	1	120.00	3.00				
East Coulee	3	1,400.00	35.00				
Unnamed Coulee	0	0.00	0.00				
A Certain Spring	1	All	---				
Middle Coulee	1	600.00	15.00				
Dead Indian Coulee	1	200.00	5.00				
Cratchett Coulee	1	400.00	10.00				
Garfield Coulee	1	400.00	10.00				
Cockerell Coulee	1	400.00	10.00				
Dry Coulee	1	200.00	5.00				
Peg Coulee	1	600.00	15.00				
Certain Coulee	1	200.00	5.00				
Bethune Coulee	1	600.00	15.00				
Timber Coulee	0	0.00	0.00				
South Fork Timber Coulee	1	4,032.00	100.80				
Total Marias River And Tributaries	**1,063**	**1,237,517.00**	**30,937.97**				

WATER RIGHT DATA—TOOLE 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.
Milk River	0	0.00	0.00				
Red River	5	5,680.00	142.00				
South West Branch Red River	0	0.00	0.00				
Grassy Lake	0	0.00	0.00				
Gillette Coulee	0	0.00	0.00				
Round Lake	1	40.00	1.00				
Long Lake	0	0.00	0.00				
Twin Springs	1	120.00	3.00				
Boundary Spring	1	280.00	7.00				
South Fork Red River (South Red River Cle)	1	400.00	10.00				
Reservoir (Fitzpatrick) Lake	1	280.00	7.00				
Lake Coulee	1	200.00	5.00				
Rocky Ridge Coulee	2	800.00	20.00				
Johns Coulee	2	1,600.00	40.00				
Mansfield Coulee	2	1,140.00	28.50				
Corval Lakes	1	100.00	2.50				
Upper Lake	1	800.00	20.00				
Grassy Lakes	1	1,000.00	25.00				
Mars Coulee	1	200.00	5.00				
Treadwell Coulee	1	400.00	10.00				
Morgan Coulee	1	300.00	7.50				
Noble Coulee	2	600.00	15.00				
Erro's Coulee	3	900.00	22.50				
O'Haire (School) Coulee	3	1,000.00	25.00				
Stone Coulee	1	200.00	5.00				
Sherman Coulee	1	400.00	10.00				
East Coulee	1	200.00	5.00				
Shearing Camp Coulee	1	1,000.00	25.00				
Langman Coulee	2	600.00	15.00				
Flat Rock Coulee	1	100.00	2.50				
Willshaw (O'Neals) Coulee	3	1,600.00	40.00				
Rocky Coulee	1	400.00	10.00				
Gooseberry Creek	1	200.00	5.00				
Police Coulee	0	0.00	0.00				
Clarks Coulee (North)	5	1,600.00	40.00				
Unnamed Coulee	0	0.00	0.00				
McDonald Lake	1	200.00	5.00				
O'Laughlin Coulee	1	200.00	5.00				
Swamp Coulee	1	160.00	4.00				
Sulphur Spring	2	420.00	10.50				
Little Sulphur Springs	1	40.00	1.00				
Swamp Spring	1	50.00	1.25				
Certain Coulee	1	100.00	2.50				
Unnamed Coulee	0	0.00	0.00				
McGowan Reservoir	1	160.00	4.00				
Gooseberry (Sherman) Coulee	3	1,200.00	30.00				
Unnamed Coulee	0	0.00	0.00				

WATER RIGHT DATA—TOOLE COUNTY
APPROPRIATIONS AND DECREES BY STREAMS

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O'Laughlin Spring	1	100.00	2.50				
Frank Rich Coulee	1	400.00	10.00				
Lamb Lake	5	1,200.00	30.00				
Forest Creek	5	800.00	20.00				
Buckley Springs	1	400.00	10.00				
Timber Coulee	1	160.00	4.00				
Maverick Coulee	1	400.00	10.00				
Kicking Horse Lake	1	800.00	20.00				
Gooseberry Creek	8	1,300.00	32.50				
Snake Creek	1	200.00	5.00				
Evans Coulee	3	380.00	9.50				
Karel Coulee	1	2,000.00	50.00				
Deer Creek	9	3,900.00	97.50				
West Branch Deer Creek	1	500.00	12.50				
West Fork Springs	1	200.00	5.00				
McDaniels (McDonald) Creek	6	1,440.00	36.00				
Roscoe Coulee	1	200.00	5.00				
Unnamed Coulee	0	0.00	0.00				
Jones Lake	2	300.00	7.50				
North Miners Coulee	10	1,650.00	41.25				
North Creek	6	1,160.00	29.00				
Spring Coulee	1	80.00	2.00				
East Fork North Creek (North Fork)	7	1,680.00	42.00				
Chicora (Cicory) (Sacera) Creek	3	500.00	12.50				
Lookout Spring	2	200.00	5.00				
A Branch Of Chicora Creek	1	80.00	2.00				
Unnamed Coulee	0	0.00	0.00				
Corrall Spring	1	30.00	0.75				
North Spring	1	100.00	2.50				
South Spring	1	100.00	2.50				
Telephone Coulee	0	0.00	0.00				
Feys Storage Reservoir	3	300.00	7.50				
Feys Coulee	1	80.00	2.00				
Fred & George Creek	27	4,690.00	117.25				
Spring Creek	6	900.00	22.50				
Barnes Coulee	1	200.00	5.00				
Canyon Springs	1	100.00	2.50				
Dead Horse Coulee	1	80.00	2.00				
Hay Coulee	1	100.00	2.50				
Swan Lake	1	400.00	10.00				
Whitmore Lake	1	200.00	5.00				
Pritchard Creek	8	1,175.00	29.25				
North Fork Pritchard Creek	6	655.00	16.37				
South Fork Pritchard Creek	3	260.00	6.50				
Fey Coulee	1	20.00	0.50				
Jones and Ralph Reservoir	1	100.00	2.50				

WATER RIGHT DATA—TOOLE 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.
Flat (Bridges) Coulee	5	720.00	18.00				
Rocky Lake	1	100.00	2.50				
Spring Coulee	1	80.00	2.00				
Craine Coulee	2	200.00	5.00				
North Fork Craine Coulee	1	100.00	2.50				
Christian Coulee	1	100.00	2.50				
East Coulee	3	400.00	10.00				
Half Breed Creek	14	5,420.00	135.50	3054	1	360.00	9.00
Larsens (Simmons) Creek	2	300.00	7.50				
Dews Creek	15	1,660.00	41.50				
Rock Springs	1	200.00	5.00				
Murray Spring	1	200.00	5.00				
West Branch Dews Creek	1	80.00	2.00				
East Fork Dews Creek	2	180.00	4.50				
Badger Spring	1	80.00	2.00				
Kemble (Hawk) Coulee	16	2,540.00	63.50				
Stark Coulee	1	120.00	3.00				
Murray Creek	1	100.00	2.50				
Spring Coulee	1	160.00	4.00				
Hay Coulee	1	200.00	5.00				
Cow (Trail) Creek	6	750.00	18.75				
Spring Coulee	1	50.00	1.25				
North Creek	2	150.00	3.75				
Certain Spring	1	50.00	1.25				
Banner Creek	1	200.00	5.00				
Gray's Coulee	1	100.00	2.50				
Spring Coulee	1	50.00	1.25				
Murray Coulee	1	50.00	1.25				
Mud Spring	1	80.00	2.00				
Fitzpatrick Spring	1	120.00	3.00				
Cooks Coulee	1	100.00	2.50				
Kent (Christian) Coulee (Carrols Cr.)	7	1,200.00	30.00				
Certain Spring	1	120.00	3.00				
Reservoir Creek Coulee	3	680.00	17.00				
Small Coulee	1	240.00	6.00				
Boundary Lake	1	200.00	5.00				
Fluett Coulee	3	740.00	18.50				
Total Half Breed Creek And Tributaries	**90**	**16,120.00**	**403.00**				
Total Milk River And Tributaries	**308**	**72,010.00**	**1,800.12**		**1**	**360.00**	**9.00**
GRAND TOTAL TOOLE COUNTY	**1,371**	**1,309,527.00**	**32,738.09**		**6.00**	**960.00**	**24.00**

DRAINAGES IN TOOLE COUNTY NOT LOCATED

STREAMS	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.
Avery Creek	1	100.00	2.50
Buck Creek	1	100.00	2.50
Carles Coulee	1	80.00	2.00
Denny Creek	1	100.00	2.50
Duncan's Coulee	1	100.00	2.50
Lake Coulee	2	360.00	9.00
Rosa Creek	1	150.00	3.75
Spring Coulee	1	100.00	2.50
Spring Coulee	1	80.00	2.00
Spring Creek	1	200.00	5.00
Willow Coulee	1	1,000.00	25.00
Branch of Willow Creek	1	200.00	5.00
Middle Fork Willow Creek	2	300.00	7.50
South Fork Willow Creek	2	1,200.00	30.00
Willow Spring Creek	1	200.00	5.00
Unnamed Coulee	2	80.00	2.00
Big Hole Spring	1	150.00	3.75
Cow Camp Springs	1	100.00	2.50
Eleven Mile Spring	1	300.00	7.50
Healy Springs	1	400.00	10.00
Lower Camp Springs	1	100.00	2.50
Sullivan Springs	1	400.00	10.00
Timber Coulee Springs	1	400.00	10.00
Unnamed Spring	1	200.00	5.00
Fitzpatrick or Water Dog Lake	1	200.00	5.00
Muskrat Lake	1	100.00	2.50
TOTAL	**30**	**6,700.00**	**167.50**

WATER RESOURCES SURVEY

Toole County, Montana

PART II

Maps Showing Irrigated Areas in Colors
Designating the Sources of Supply

Published by
MONTANA WATER RESOURCES BOARD
Helena, Montana
June, 1969

MAP INDEX

All maps have been made from aerial photographs

ALBERTA

R. 4 W. R. 3 W. R. 2 W. R. 1 W. R. 1 E. R. 2 E. R. 3 E.

T. 37 N. T. 36 N. T. 35 N. T. 34 N. T. 33 N. T. 32 N. T. 31 N. T. 30 N. T. 29 N.

SWEETGRASS
SUNBURST
FERDIG
KEVIN
OILMONT
ETHRIDGE
SHELBY
DUNKIRK
DEVON
GALATA

Red River Coulee, Rocky Ridge Coulee, Johns Coulee, Mansfield Coulee, Long Lake, Timber Coulee, Grassy Coulee, Hay Coulee, Nicholas Coulee, Noble Coulee, Farrell Coulee, Sunburst Coulee, Black Hills Coulee, Flat Coulee, Bridge Coulee, Spring Coulee, Healy Coulee, D.H.S. Coulee, Alkali Coulee, Alum Coulee, Rabbit Coulee, South Fork Healy Coulee, Sand Coulee, Shelby Coulee, Libenau Coulee, Aloe Coulee, Campbell Coulee, Benjamin Coulee, Spring Coulee, Lynch Coulee, Gunwald Coulee, Hall Coulee, Crooked Creek Coulee, Sullivan Coulee, McCrae Coulee, Little Spring Coulee, Reservoir Coulee, Willar Coulee, Twin Coulee, Marias River, Rock Coulee, Happ Coulee, Medicine Coulee, Alyward Coulee, North Fork Dunkirk Coulee, Dunkirk Coulee, Dunkirk River, Willow Creek, Norwegian Coulee, Eldminister Coulee, Cliff Coulee, Galata Coulee, Beaupre Coulee, O'Hollie Coulee, Stone Coulee, Williams Coulee, Deer Creek, Forrest Gooseberry Creek, McLaughlin Coulee, Fred & George Coulee, McDaniel Coulee, North Fork Pritchard Creek, Hay Coulee, Dead Horse Coulee, Flat Coulee, Fluett Coulee, Kents Coulee, Halfbreed Creek, Haase Creek, Kicking Horse Creek, Timber Coulee, Powers Creek, Upsalita Creek, Spring Coulee, McLaughlin Creek, Miners Coulee, Eclipse Coulee, North Chico Creek, Dewey Coulee, Kemble Coulee, Cow Creek, Trail Coulee, Calf Coulee, Simmons Green Coulee, Two Mile Creek, Canon Creek, Fourmile Coulee, Wilton Coulee, Mile Coulee, Picadilly Coulee, Minnesota Coulee, Elmer Coulee, Little Black Coulee, Black Coulee, Reservoir Coulee, Fifteenmile Coulee, Osprey Coulee, Taylor Coulee, Shale Coulee, Johannsen Coulee, Ninemile Coulee, Nilers Coulee, South Alkali Coulee, Wolf Coulee, Strawberry Creek, Sheep Creek, Big Coulee, White Coulee, Fennell Coulee, Trail Coulee, Gibson Flat Coulee, Oakes Coulee, Home Coulee, Winding Coulee, Gilchrist Coulee, Powers Coulee, Roland Coulee, Pike Coulee, Chance Coulee, Lesher Coulee, Willow Creek, Alken Coulee, North Fork Dunkirk Coulee, Cameron Coulee, Prices Coulee, West Fork Willow Creek, South Dunkirk Coulee, West Denson Coulee, East Denson Coulee, Timber Reservoir, Wilson Coulee, Ellis Coulee, Siderius Coulee, Gage Coulee, East Coulee, Dead Indian Coulee, Timber Coulee

DRAINAGE MAP
of
Toole County
Showing Irrigated Areas

MAP SYMBOL INDEX

BOUNDARIES

- COUNTY LINE
- NATIONAL FOREST LINE

DITCHES

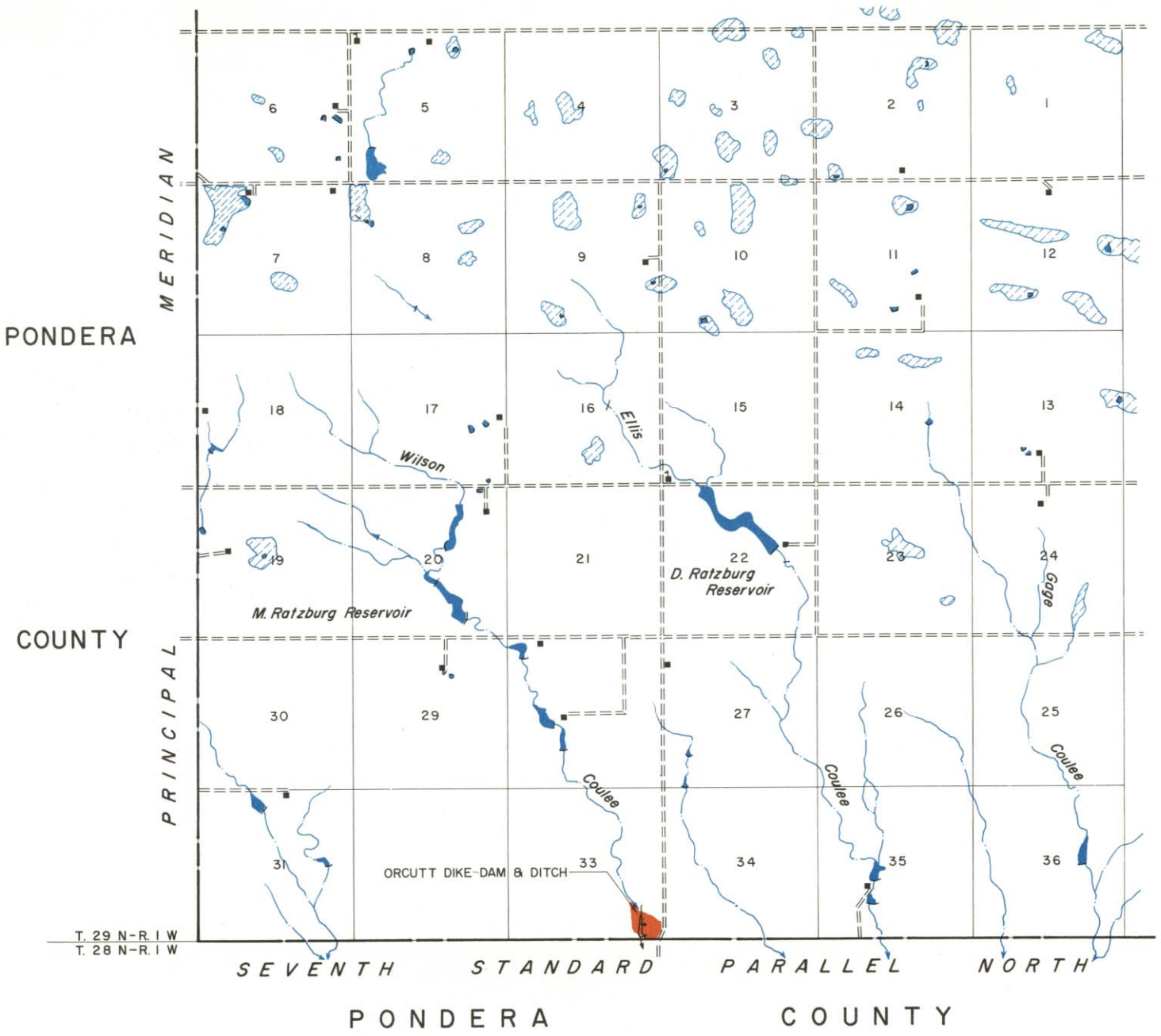
- CANALS OR DITCHES
- DRAIN DITCHES
- PROPOSED DITCHES

TRANSPORTATION

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

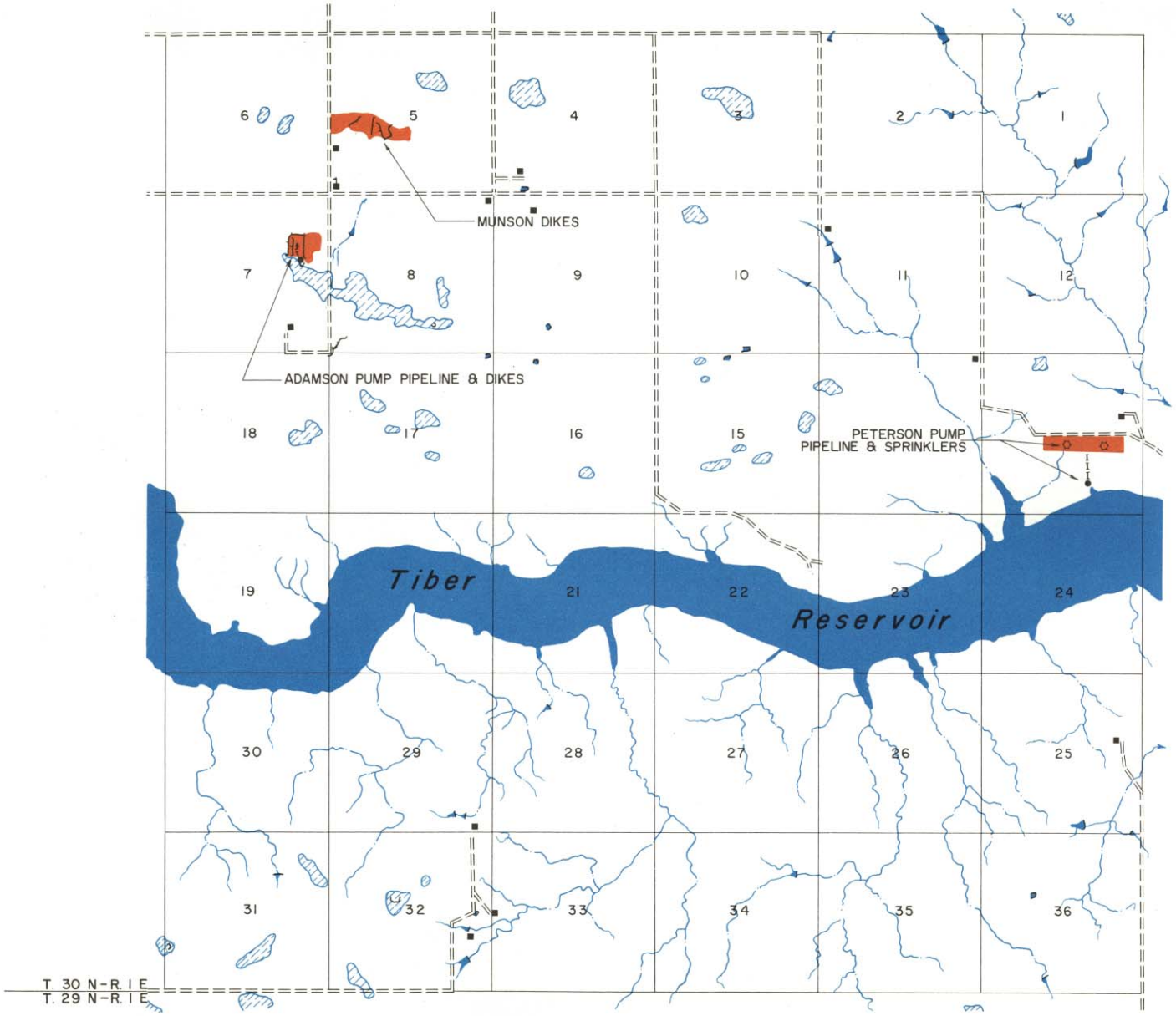
STRUCTURES & UNITS

- 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. 29 North

Rge. 1 East

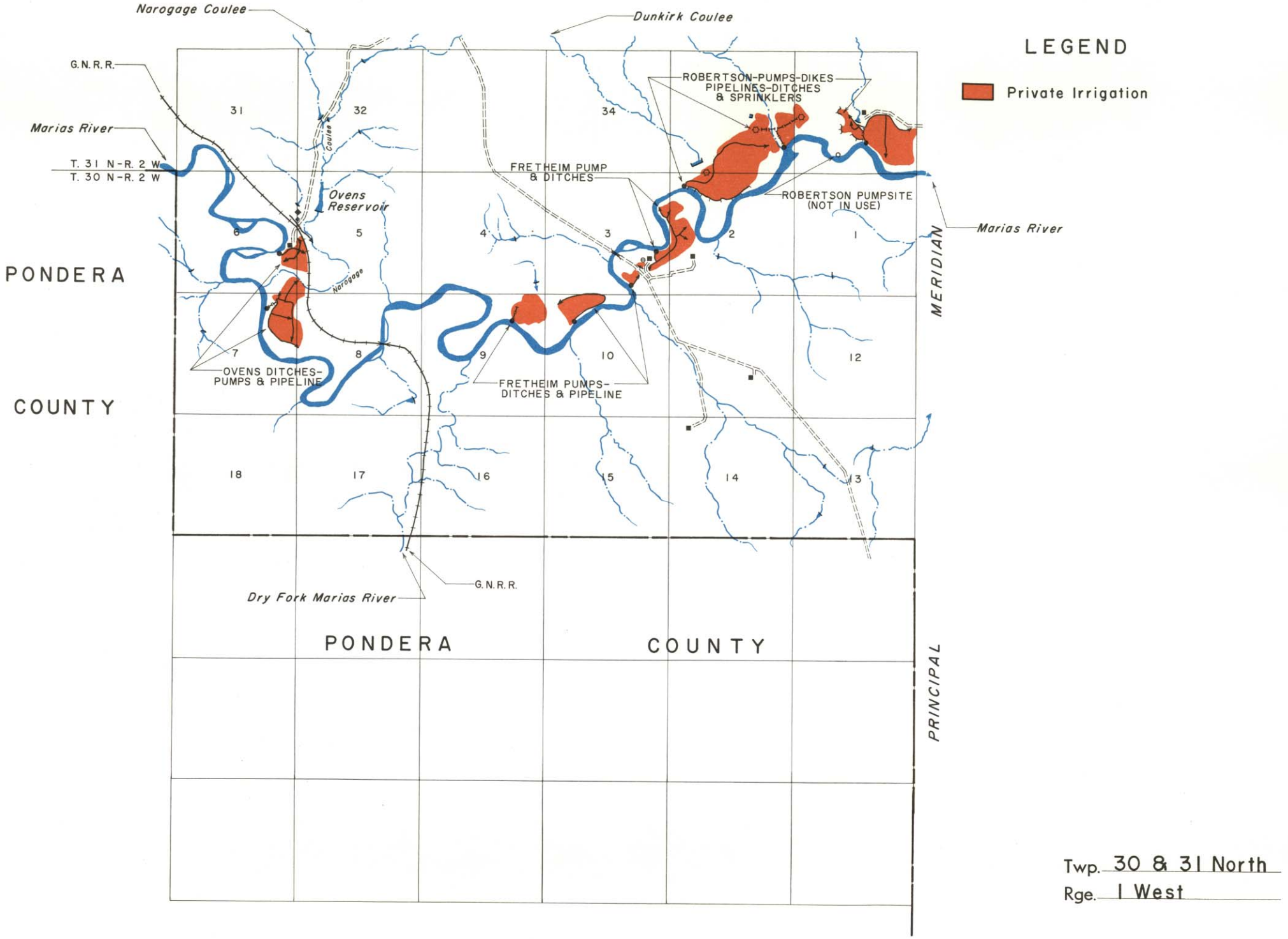


LEGEND

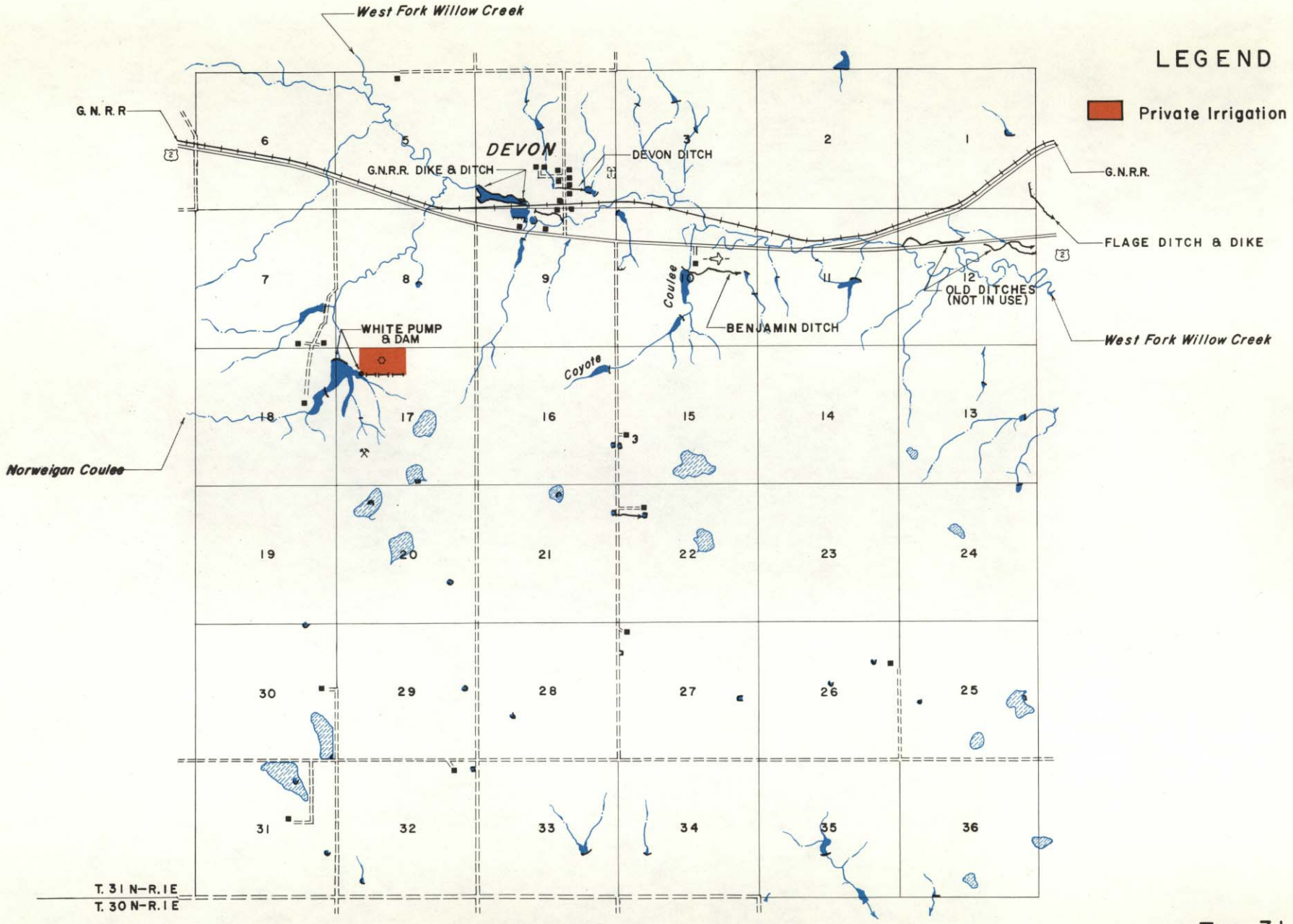
Private Irrigation

Twp. 30 North

Rge. 2 East

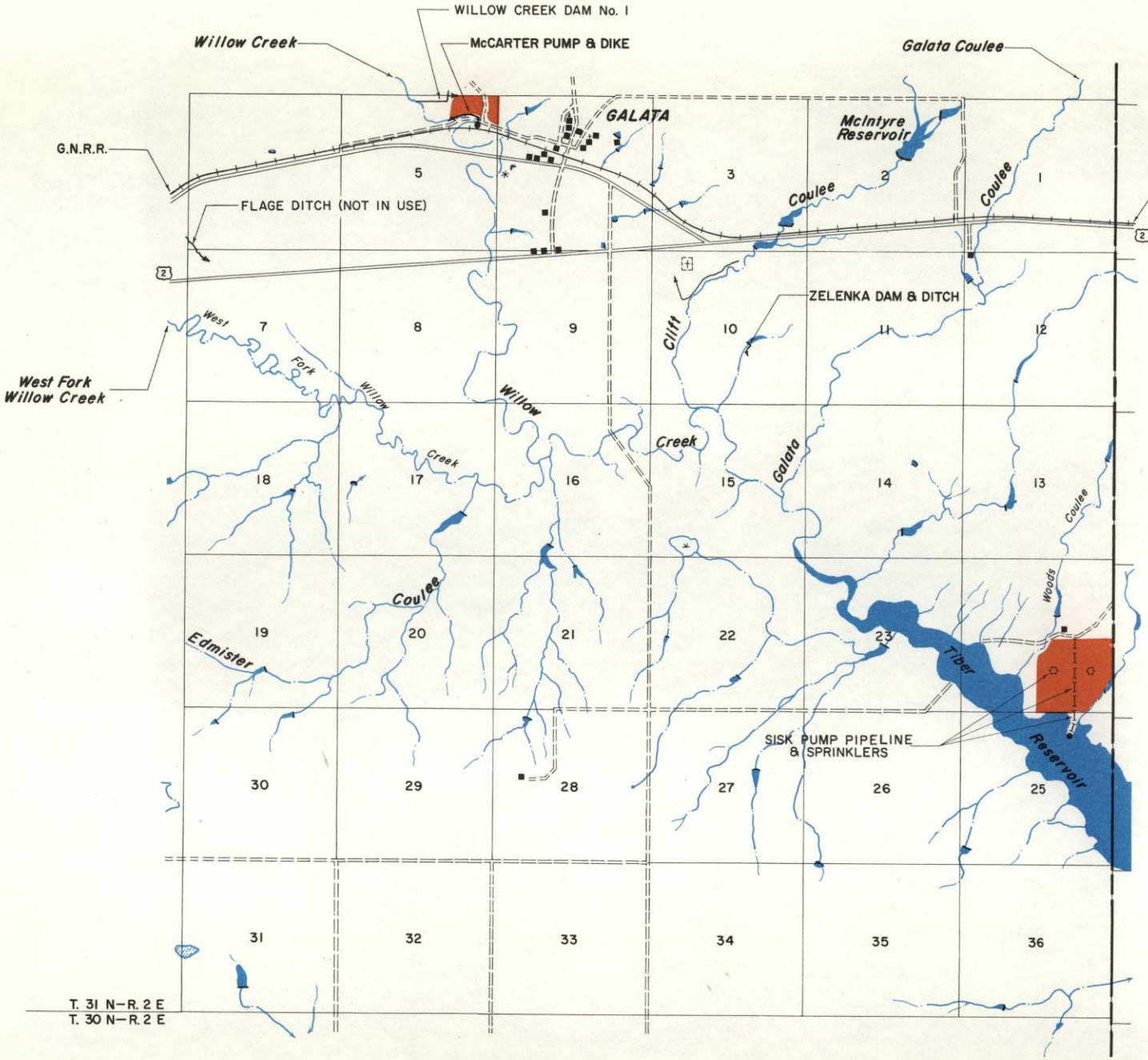


Twp. 30 & 31 North
Rge. 1 West



Twp. 31 North

Rge. 2 East



LEGEND

Private Irrigation

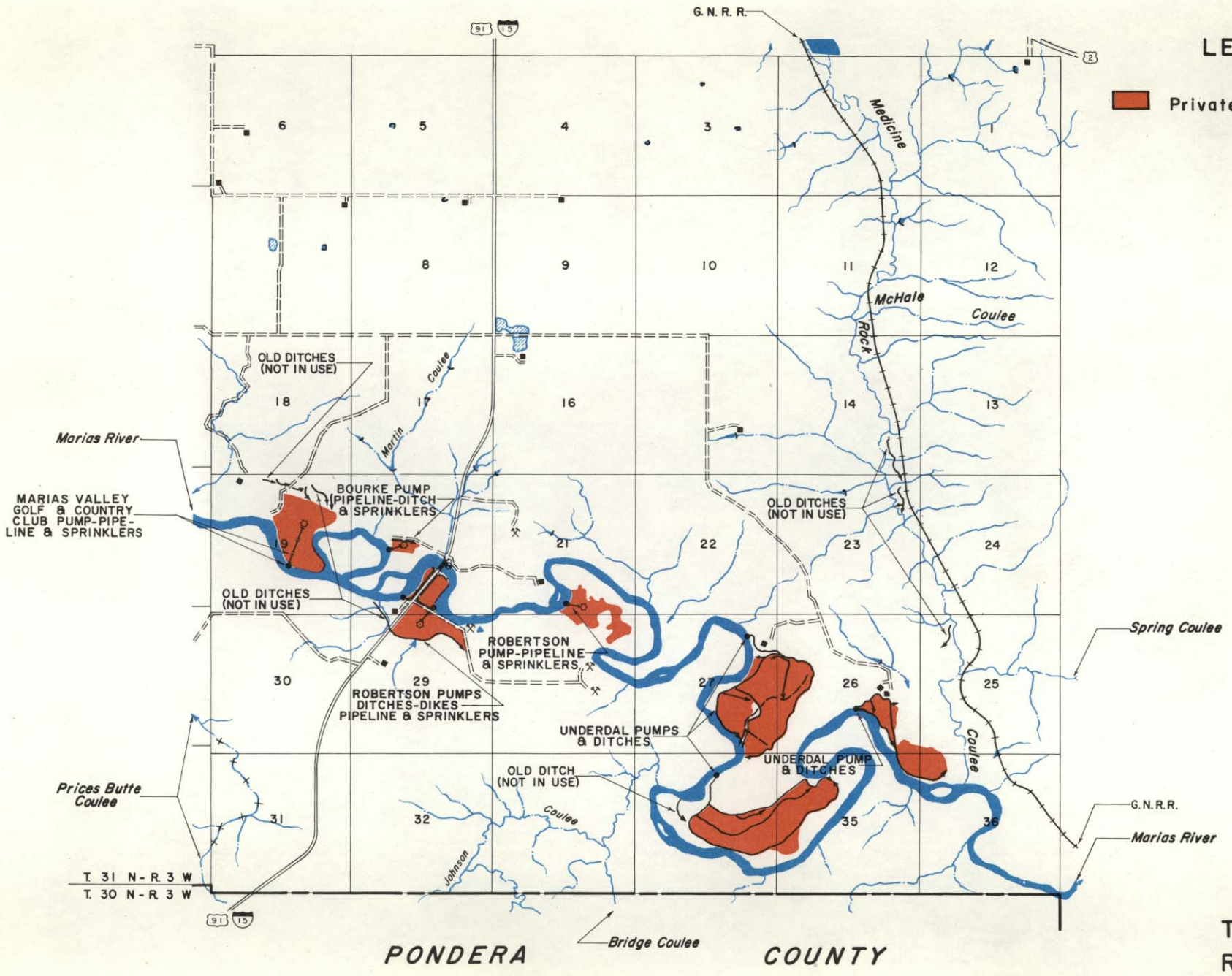
G.N.R.R.

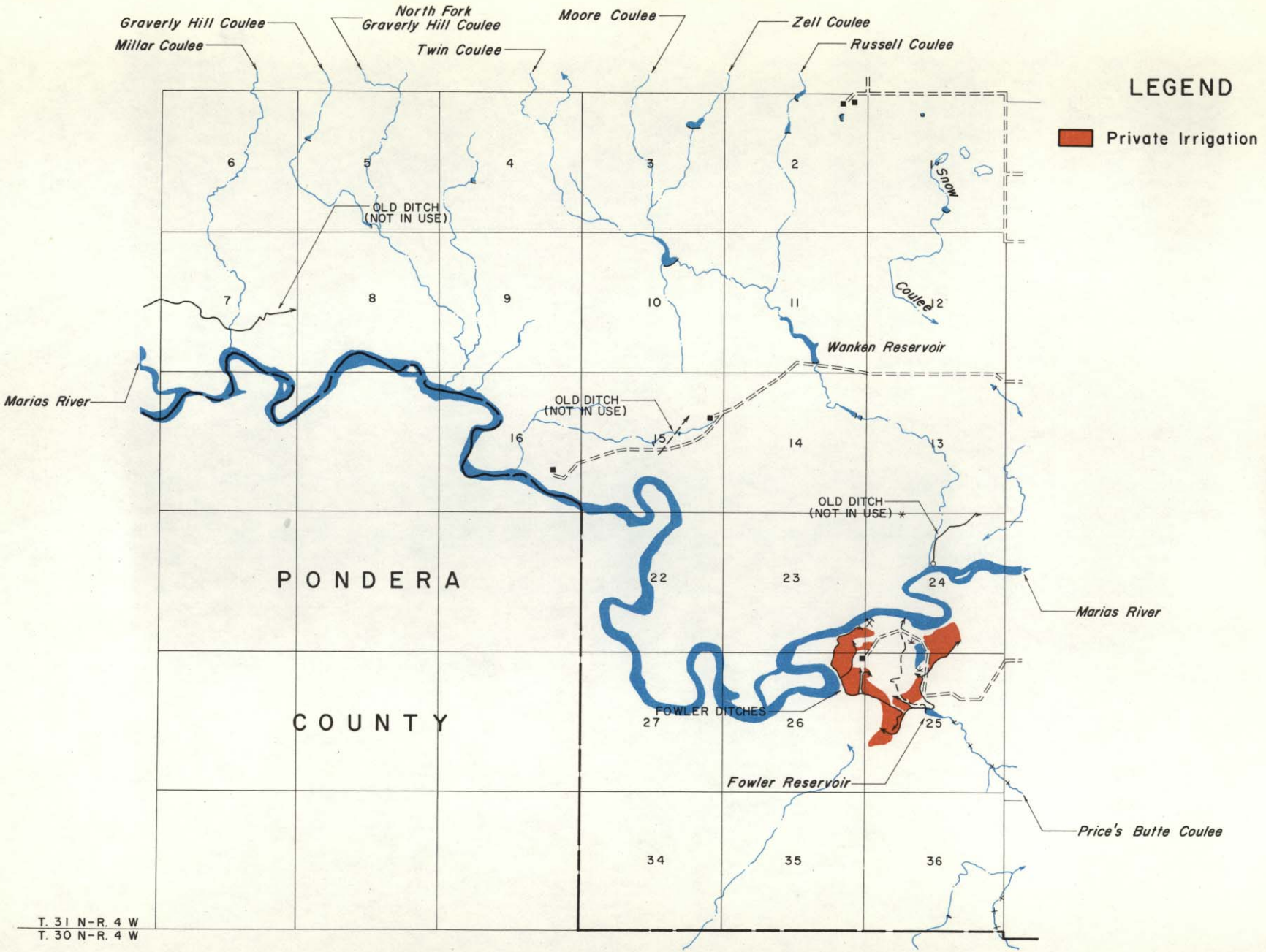
LIBERTY

COUNTY

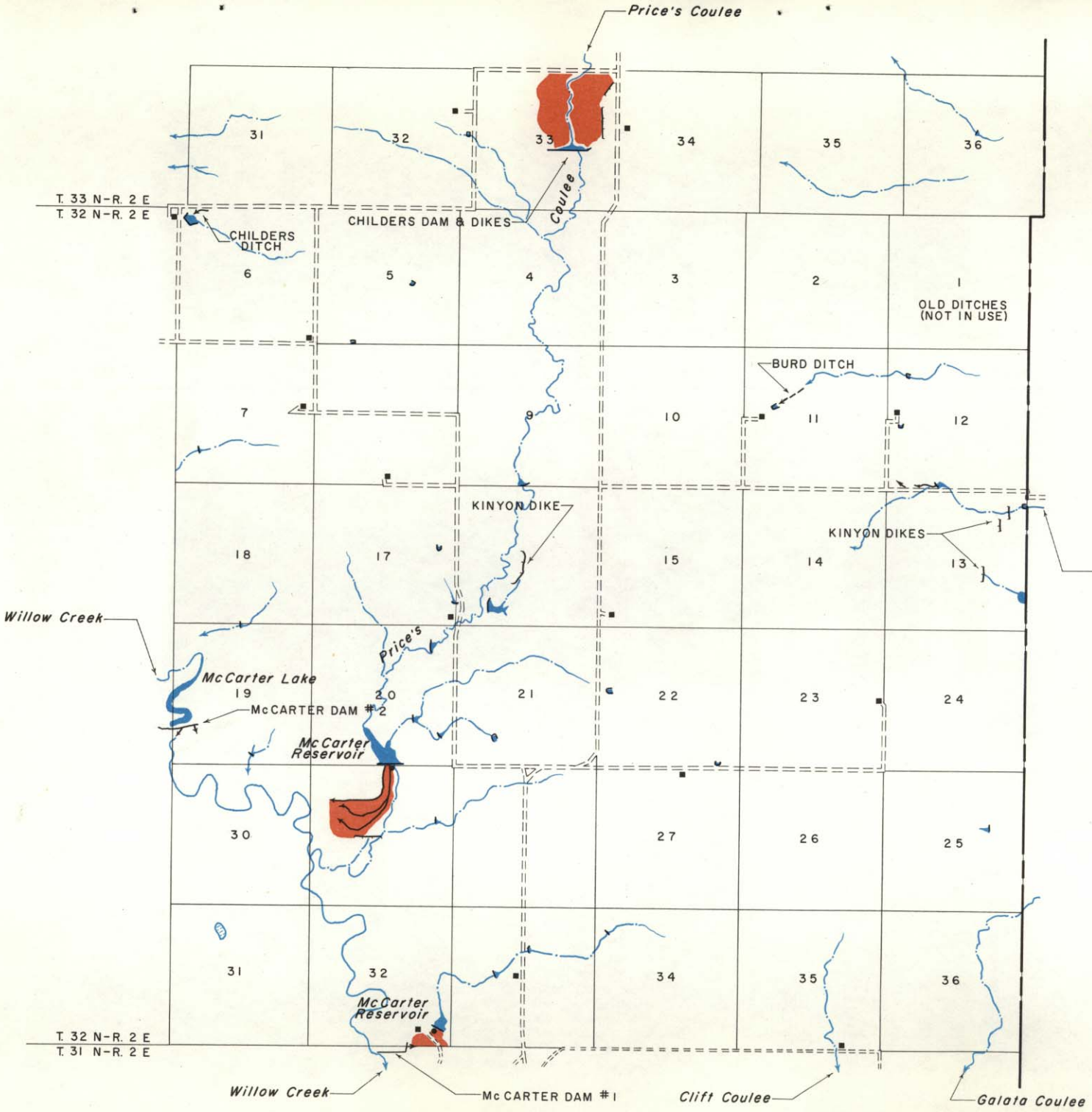
Twp. 31 North

Rge. 3 East


G. N. R. R.
91
15
2
LEGEND
Private Irrigation
Medicine
McHale
Rock
Coulee
OLD DITCHES
(NOT IN USE)
Martin
Coulee
Marias River
MARIAS VALLEY
GOLF & COUNTRY
CLUB PUMP-PIPE-
LINE & SPRINKLERS
BOURKE PUMP
(PIPELINE-DITCH
& SPRINKLERS
OLD DITCHES
(NOT IN USE)
OLD DITCHES
(NOT IN USE)
ROBERTSON
PUMP-PIPELINE
& SPRINKLERS
ROBERTSON PUMPS
DITCHES-DIKES
PIPELINE & SPRINKLERS
Spring Coulee
UNDERDAL PUMPS
& DITCHES
UNDERDAL PUMP
& DITCHES
OLD DITCH
(NOT IN USE)
Coulee
Prices Butte
Coulee
Johnson
Coulee
G.N.R.R.
Marias River
T. 31 N - R. 3 W
T. 30 N - R. 3 W
Bridge Coulee
PONDERA
COUNTY
Twp. 31 North
Rge. 2 West



Twp. 31 North
Rge. 3 West



LEGEND

Private Irrigation

LIBERTY

COUNTY

Twp. 32 & 33 North

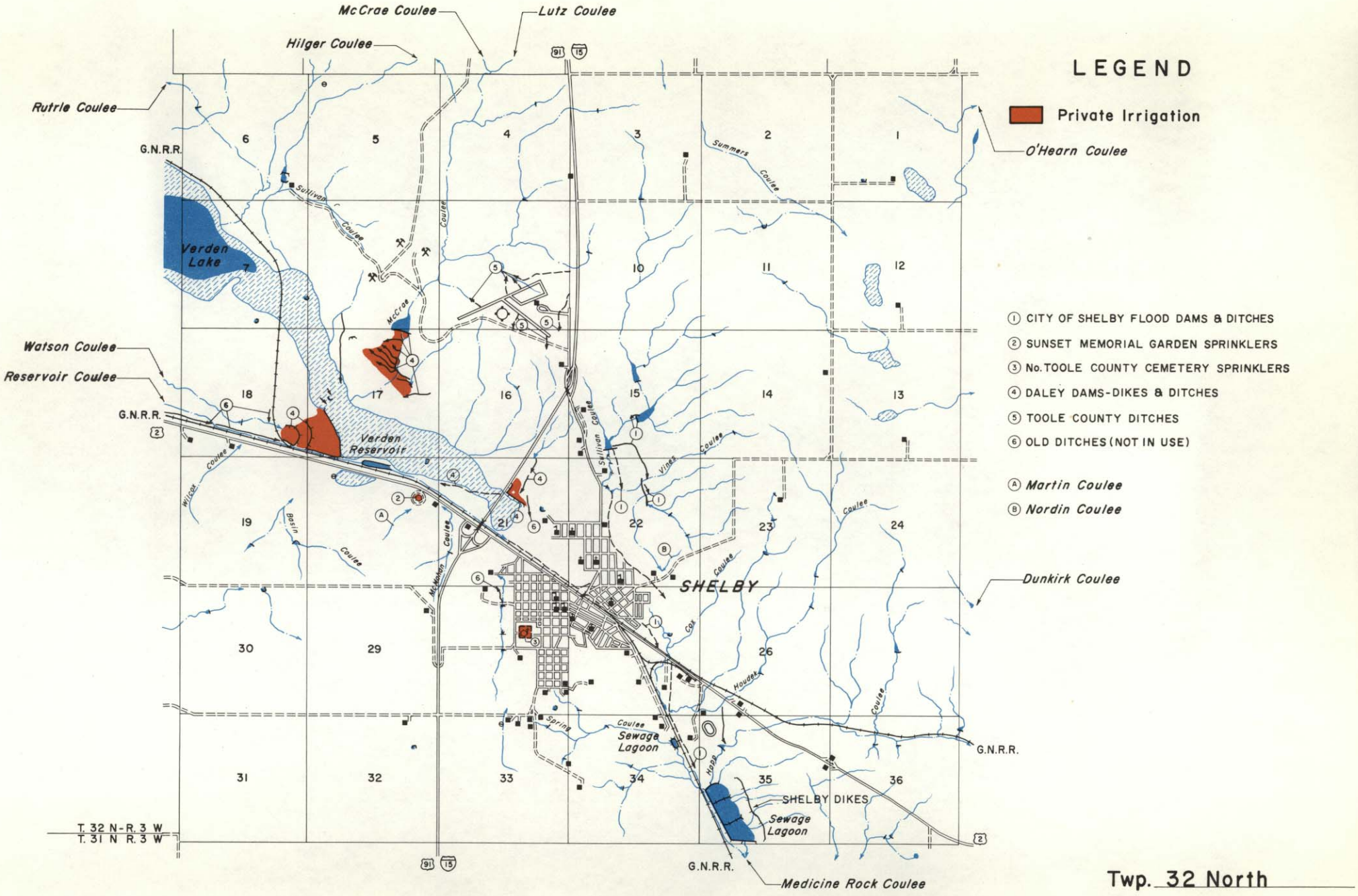
Rge. 3 East

LEGEND

Private Irrigation

Twp. 32 North

Rge. 1 West



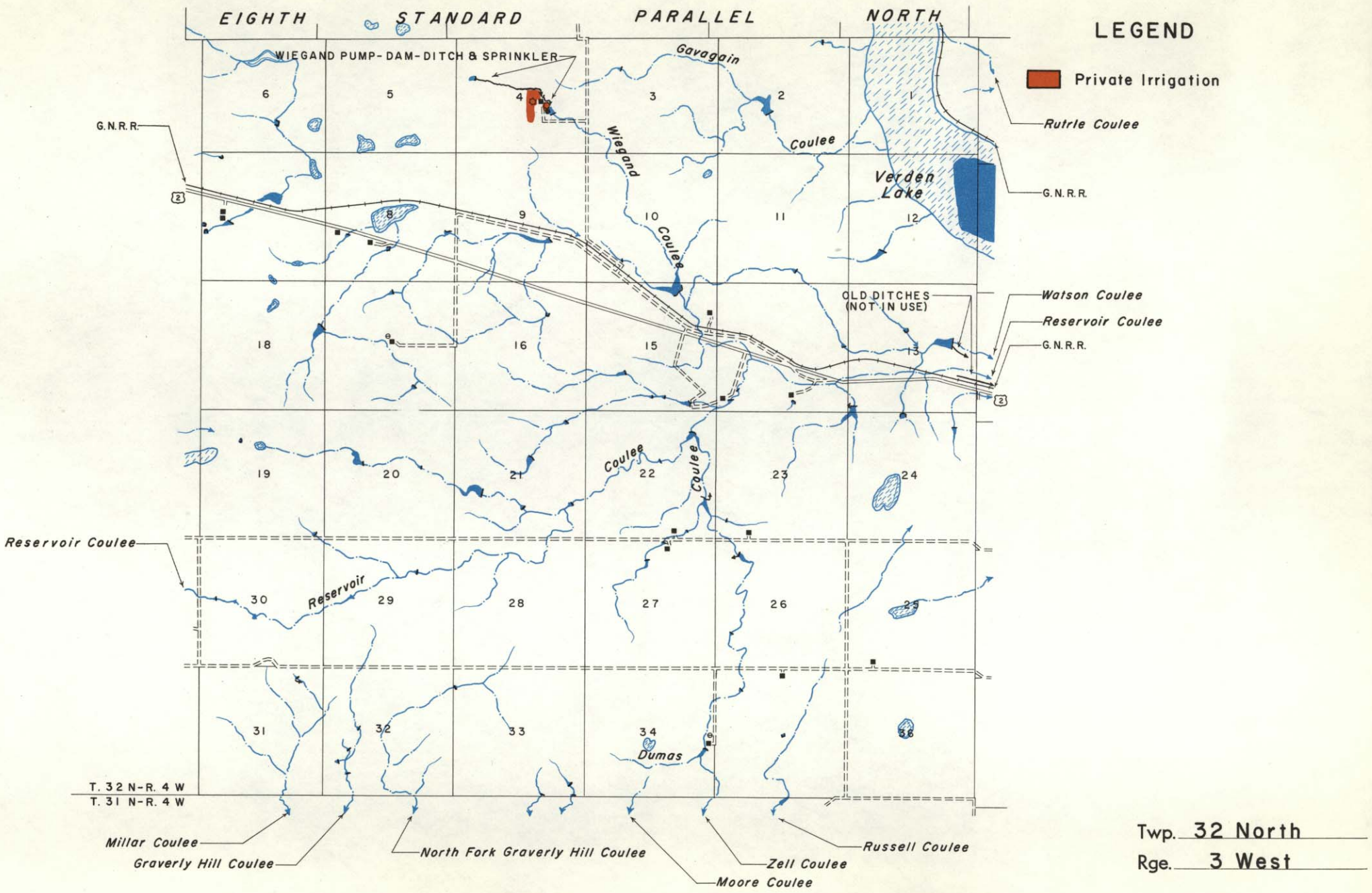
LEGEND

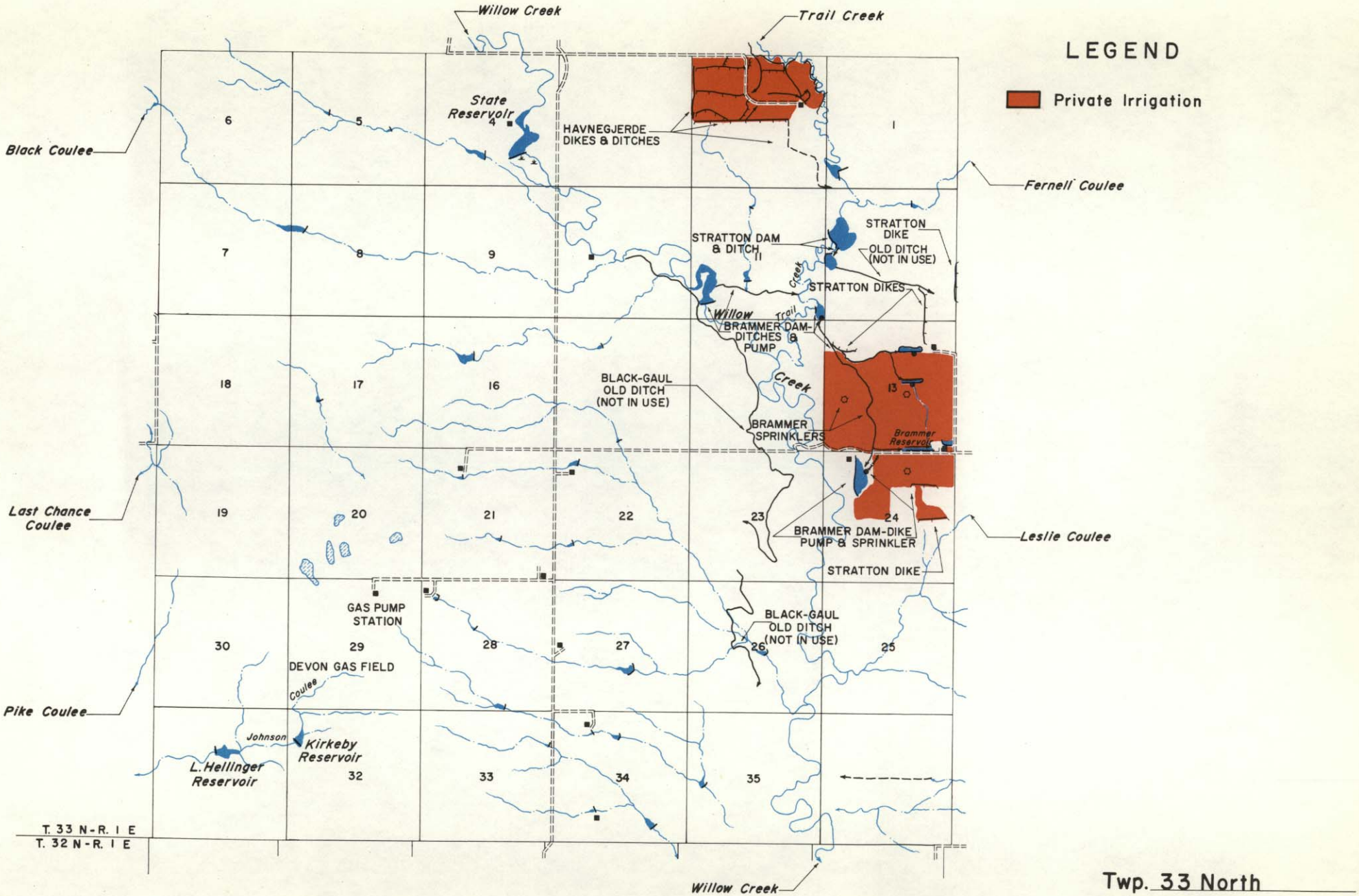
Private Irrigation

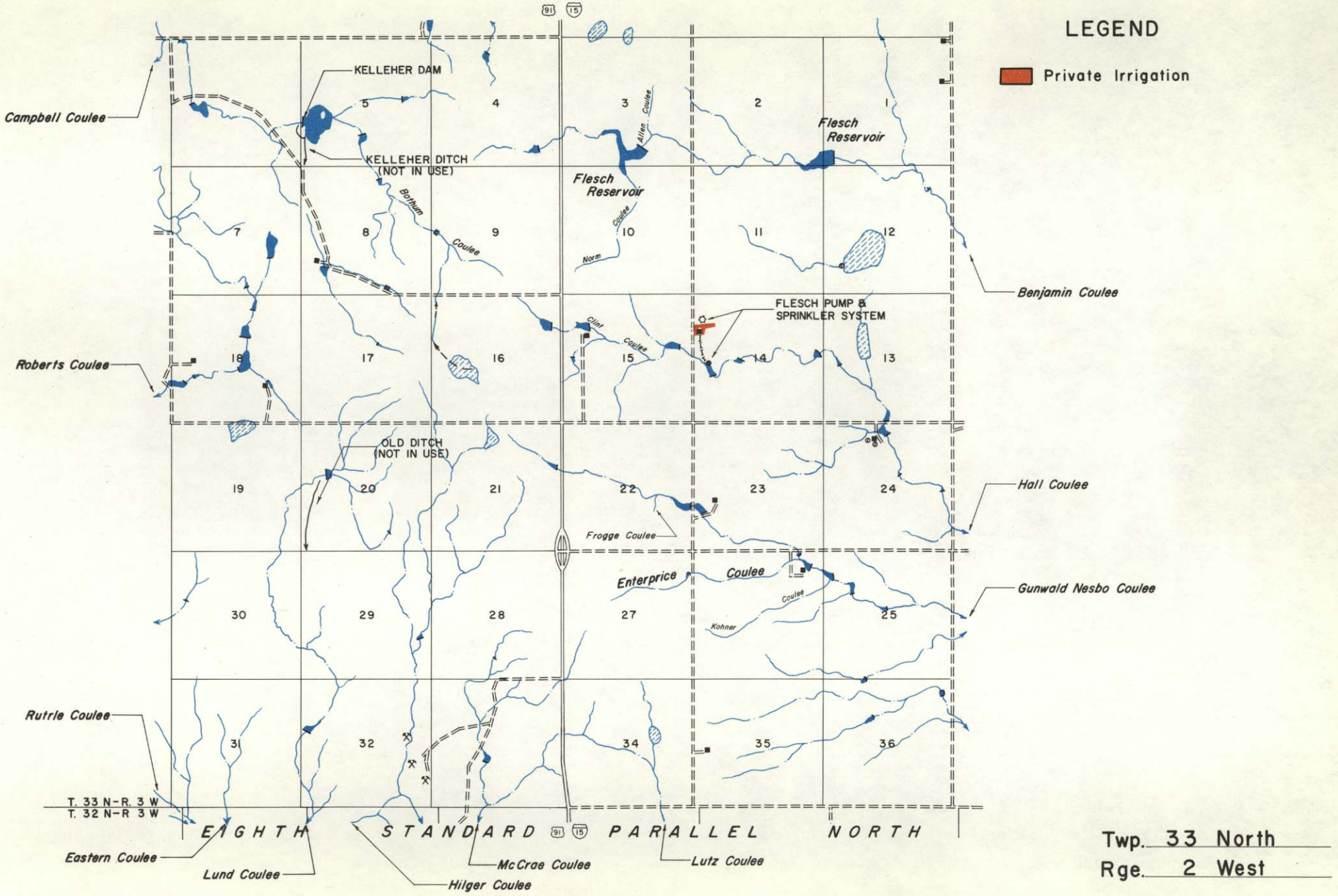
① CITY OF SHELBY FLOOD DAMS & DITCHES
② SUNSET MEMORIAL GARDEN SPRINKLERS
③ No. TOOLE COUNTY CEMETERY SPRINKLERS
④ DALEY DAMS-DIKES & DITCHES
⑤ TOOLE COUNTY DITCHES
⑥ OLD DITCHES (NOT IN USE)

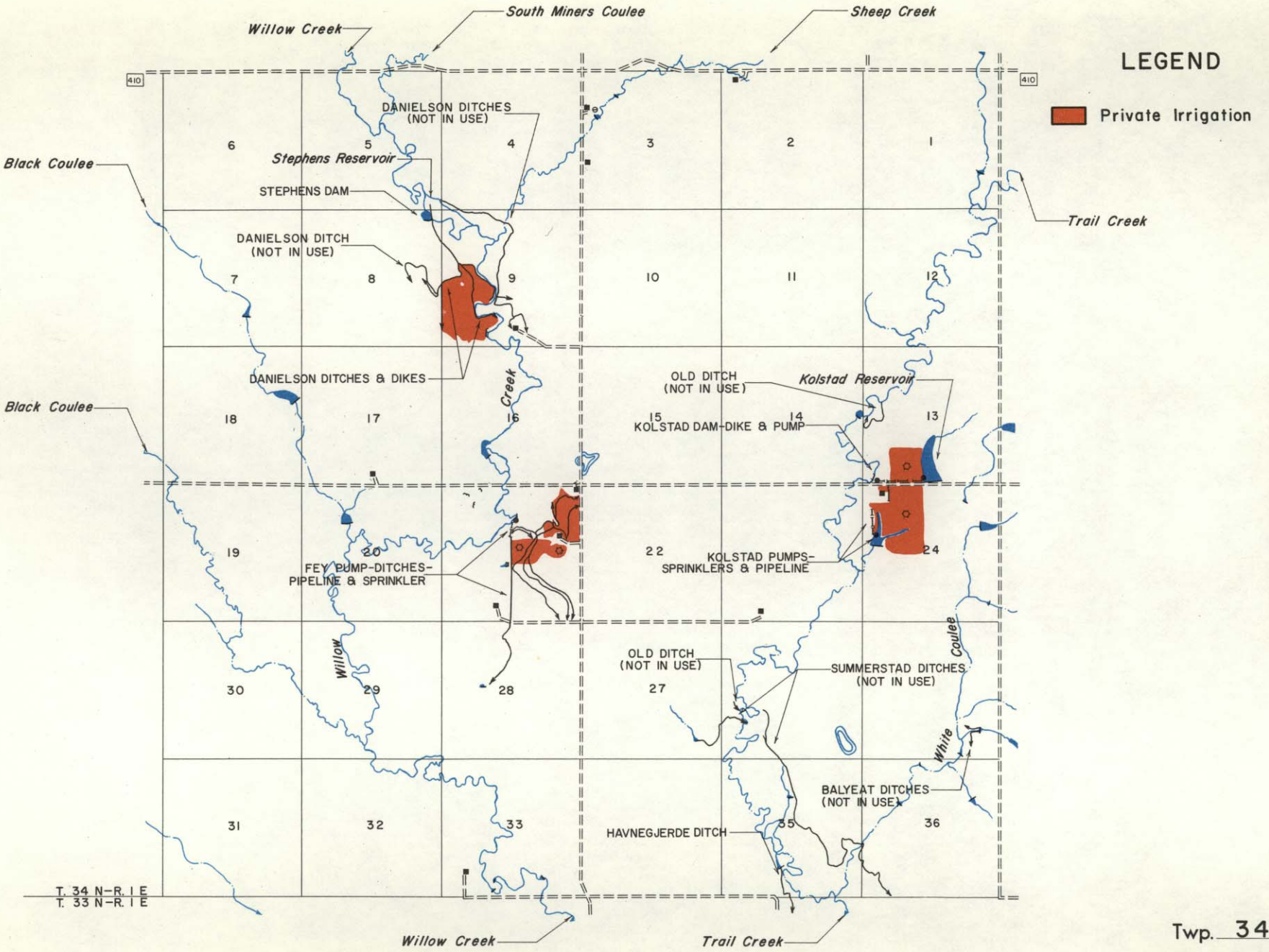
Ⓐ *Martin Coulee*
Ⓑ *Nordin Coulee*

Twp. 32 North
Rge. 2 West


EIGHTH STANDARD PARALLEL NORTH
WIEGAND PUMP-DAM-DITCH & SPRINKLER
Gavagain
Wiegand Coulee
Verden Lake
Rutrle Coulee
G.N.R.R.
OLD DITCHES (NOT IN USE)
Watson Coulee
Reservoir Coulee
Coulee
Reservoir
Dumas
T. 32 N-R. 4 W
T. 31 N-R. 4 W
Millar Coulee
Graverly Hill Coulee
North Fork Graverly Hill Coulee
Moore Coulee
Zell Coulee
Russell Coulee
LEGEND
Private Irrigation
Twp. 32 North
Rge. 3 West

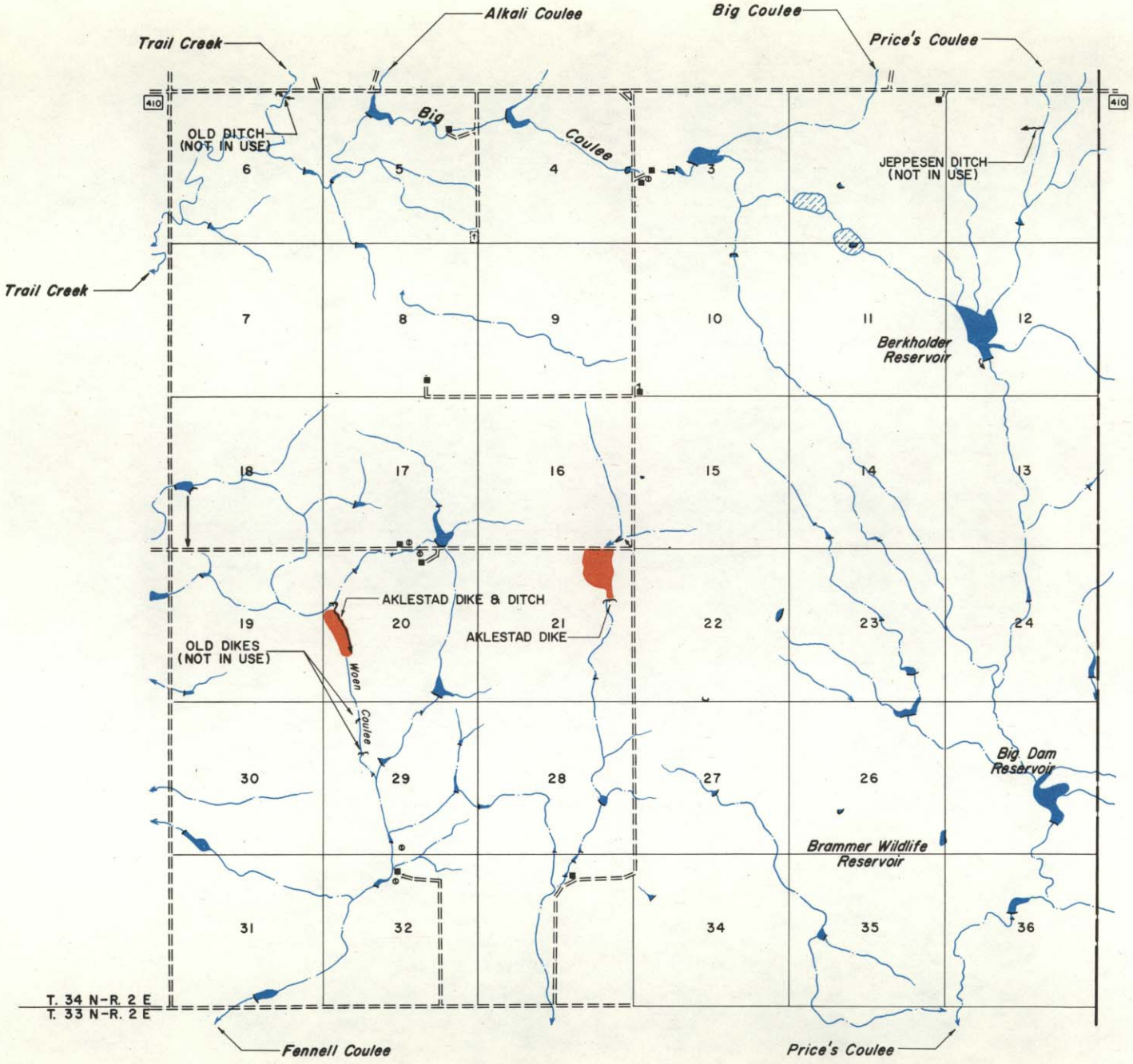

Willow Creek
Trail Creek
LEGEND
Private Irrigation
State Reservoir
HAVNEGJERDE DIKES & DITCHES
Black Coulee
Fernell Coulee
STRATTON DAM & DITCH
STRATTON DIKE
OLD DITCH (NOT IN USE)
STRATTON DIKES
Willow Creek
Trail
BRAMMER DAM-DITCHES & PUMP
BLACK-GAUL OLD DITCH (NOT IN USE)
BRAMMER SPRINKLERS
Brammer Reservoir
Last Chance Coulee
BRAMMER DAM-DIKE PUMP & SPRINKLER
Leslie Coulee
STRATTON DIKE
GAS PUMP STATION
BLACK-GAUL OLD DITCH (NOT IN USE)
DEVON GAS FIELD
Coulee
Pike Coulee
Johnson
Kirkeby Reservoir
L. Hellinger Reservoir
T. 33 N-R. 1 E
T. 32 N-R. 1 E
Willow Creek
Twp. 33 North
Rge. 2 East


LEGEND
Private Irrigation
KELLEHER DAM
KELLEHER DITCH (NOT IN USE)
OLD DITCH (NOT IN USE)
FLESCH PUMP & SPRINKLER SYSTEM
Flesch Reservoir
Flesch Reservoir
Campbell Coulee
Roberts Coulee
Benjamin Coulee
Hall Coulee
Gunwald Nesbo Coulee
Rutrle Coulee
Eastern Coulee
Lund Coulee
Hilger Coulee
McCrae Coulee
Lutz Coulee
Bothum Coulee
Norm Coulee
Allen Coulee
Clint Coulee
Frogge Coulee
Enterprice Coulee
Kohner Coulee
T. 33 N-R. 3 W
T. 32 N-R 3 W
EIGHTH STANDARD PARALLEL NORTH
Twp. 33 North
Rge. 2 West



Twp. 34 North

Rge. 2 East



LEGEND

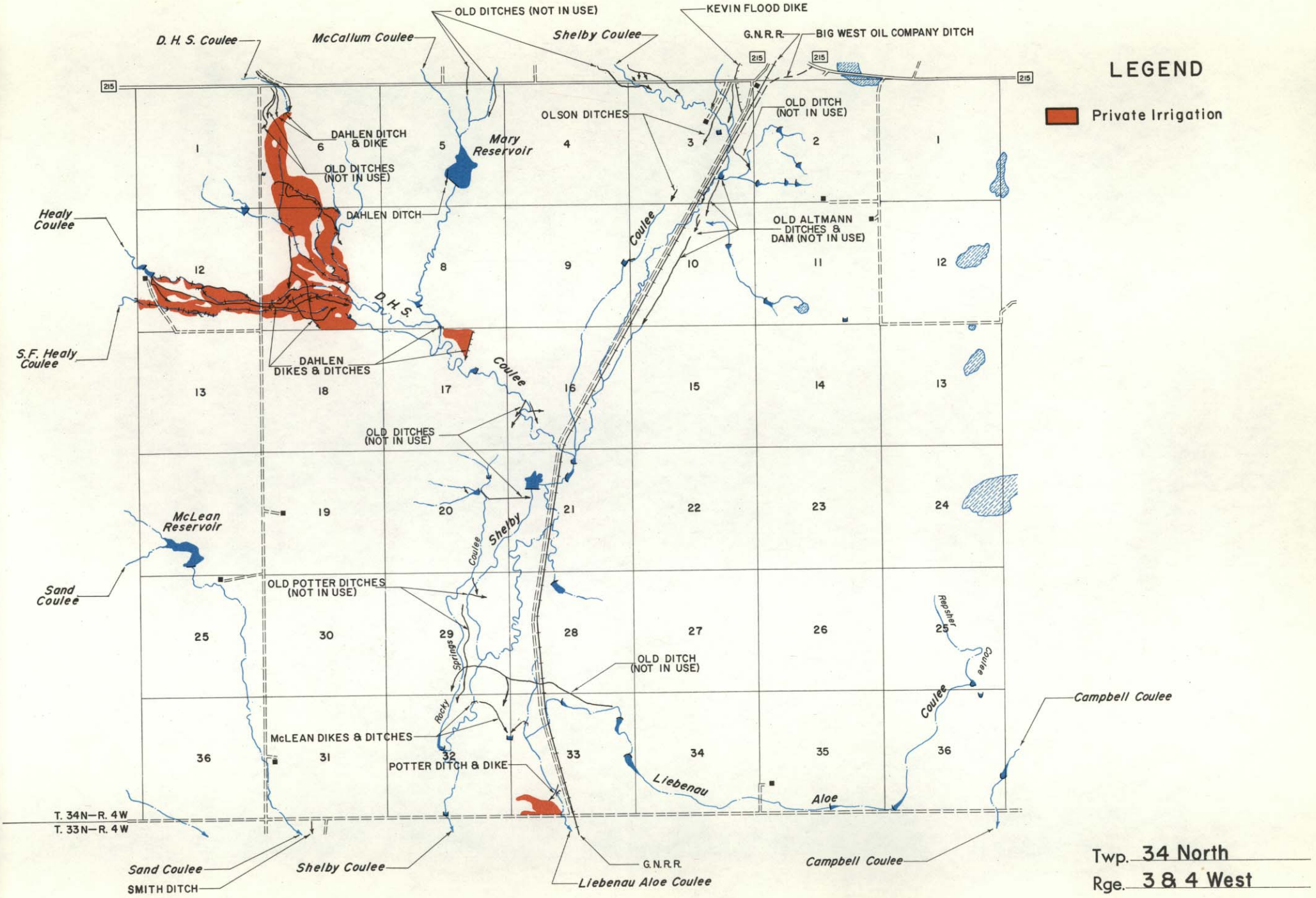
Private Irrigation

LIBERTY

COUNTY

Twp. 34 North

Rge. 3 East

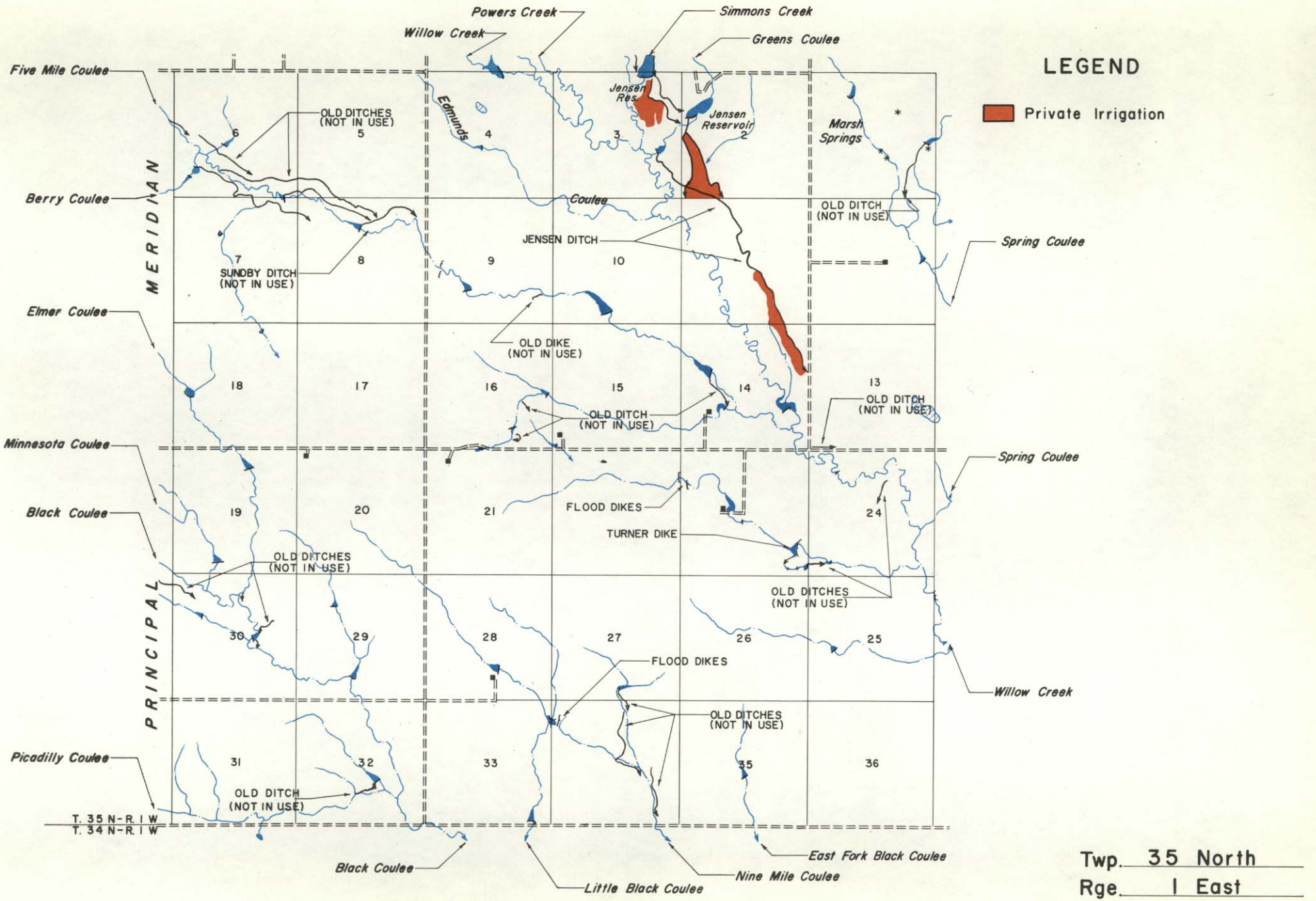


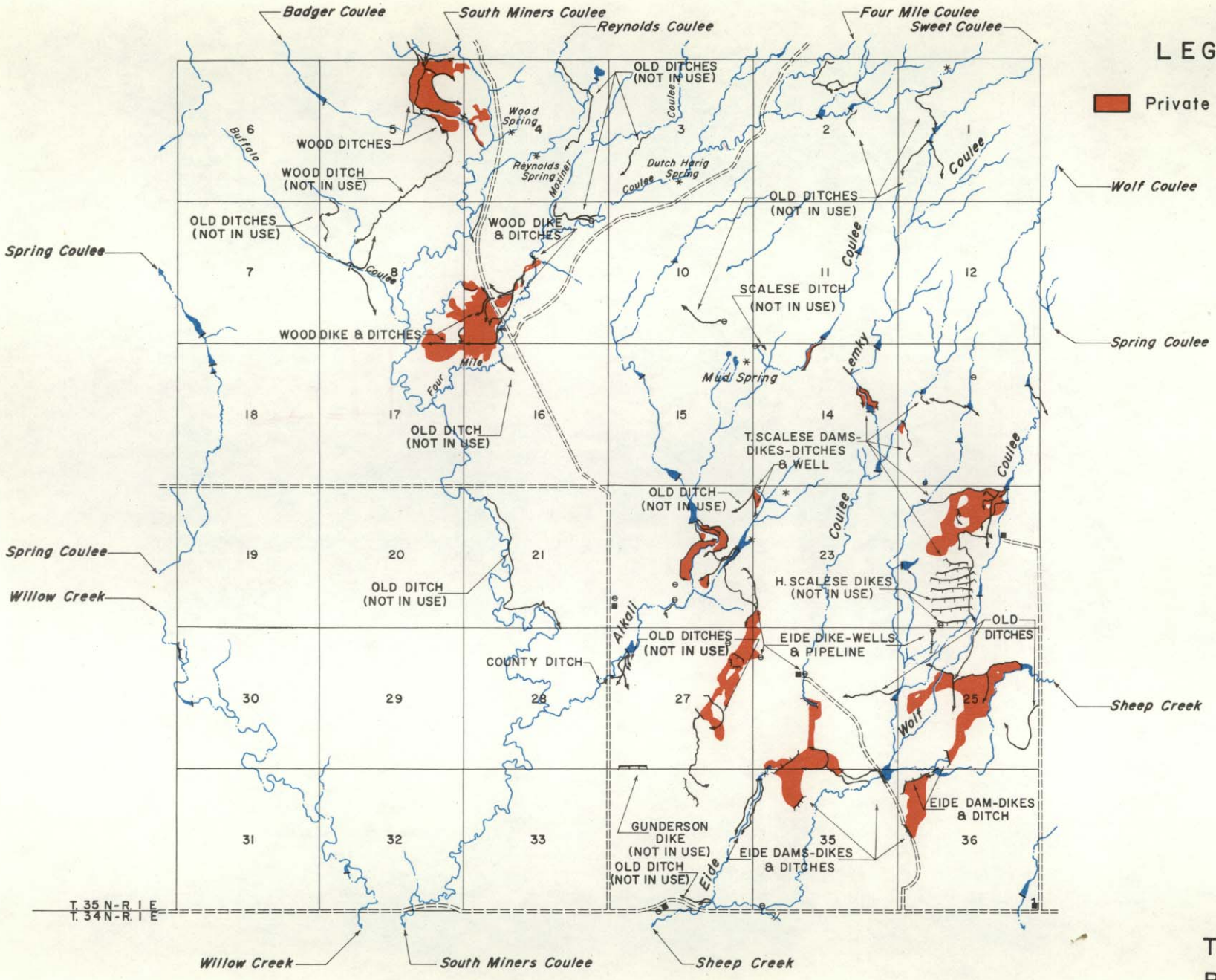
LEGEND

Private Irrigation

Twp. 34 North

Rge. 3 & 4 West


Powers Creek
Willow Creek
Simmons Creek
Greens Coulee
Five Mile Coulee
Jensen Res.
Jensen Reservoir
Marsh Springs
OLD DITCHES (NOT IN USE)
Edmunds
Berry Coulee
Coulee
OLD DITCH (NOT IN USE)
JENSEN DITCH
Spring Coulee
SUNDBY DITCH (NOT IN USE)
MERIDIAN
Elmer Coulee
OLD DIKE (NOT IN USE)
OLD DITCH (NOT IN USE)
Minnesota Coulee
Spring Coulee
Black Coulee
FLOOD DIKES
TURNER DIKE
OLD DITCHES (NOT IN USE)
OLD DITCHES (NOT IN USE)
PRINCIPAL
FLOOD DIKES
Willow Creek
OLD DITCHES (NOT IN USE)
Picadilly Coulee
OLD DITCH (NOT IN USE)
T. 35 N-R. 1 W
T. 34 N-R. 1 W
Black Coulee
East Fork Black Coulee
Nine Mile Coulee
Little Black Coulee
LEGEND
Private Irrigation
Twp. 35 North
Rge. 1 East

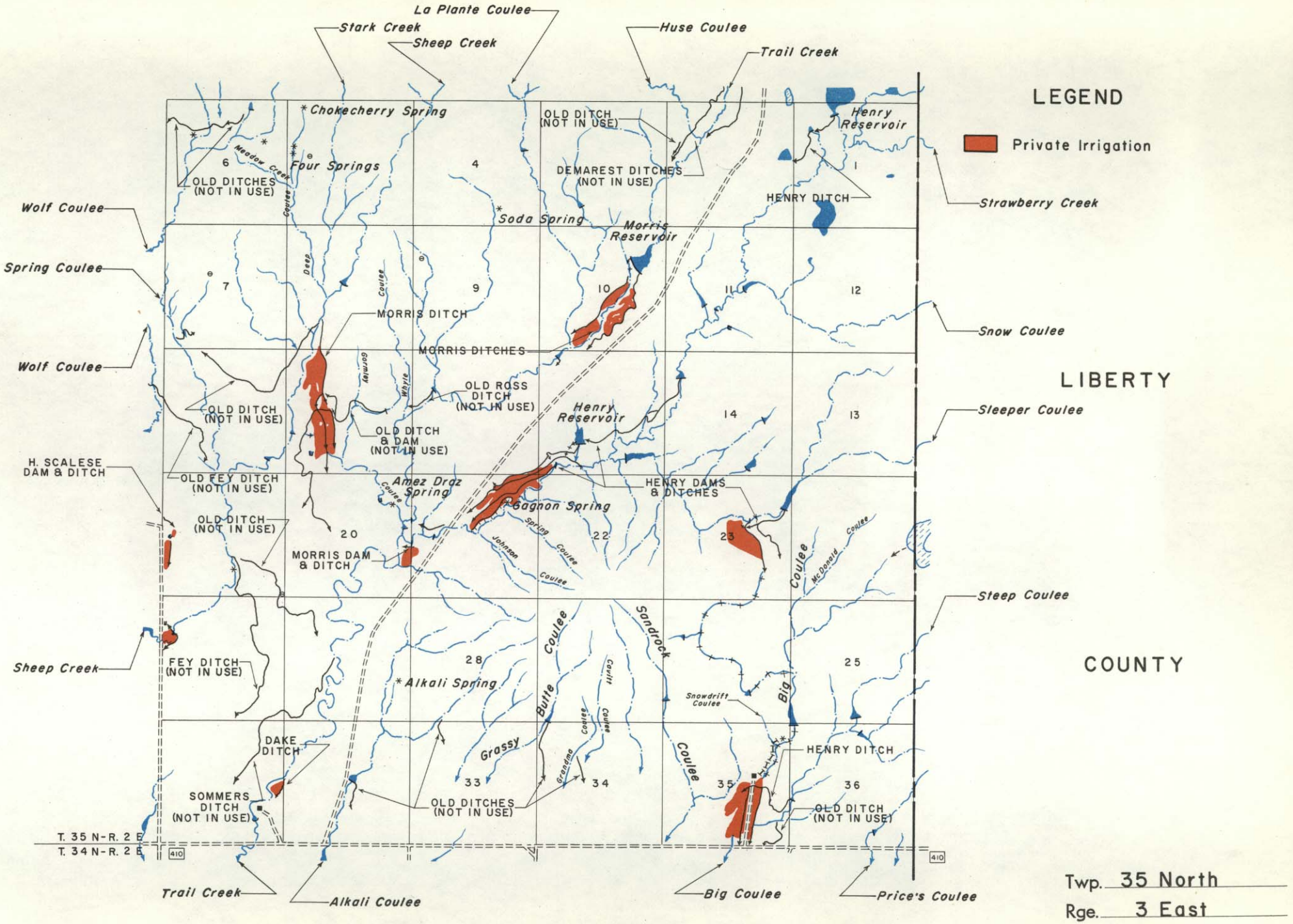


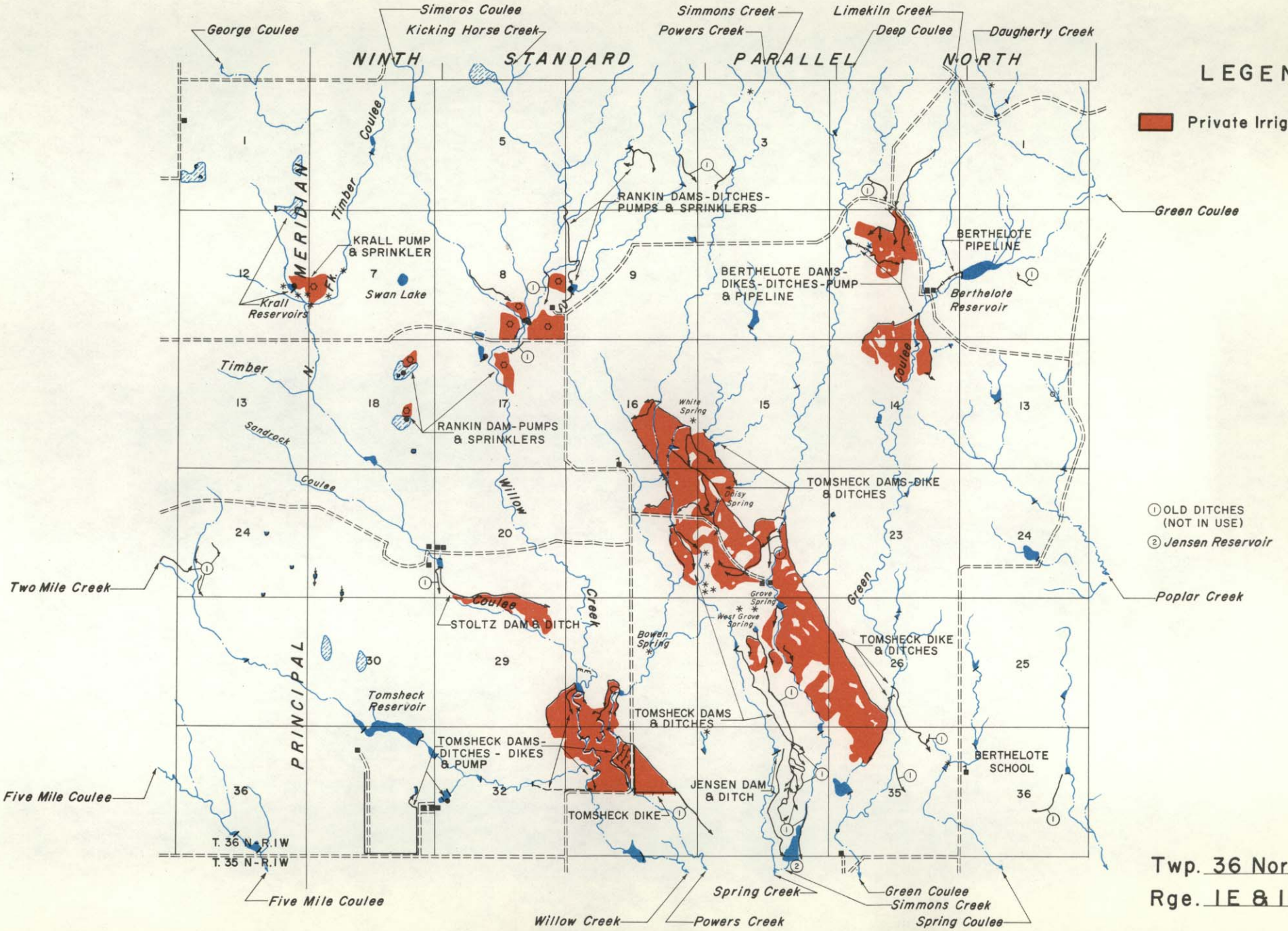
LEGEND

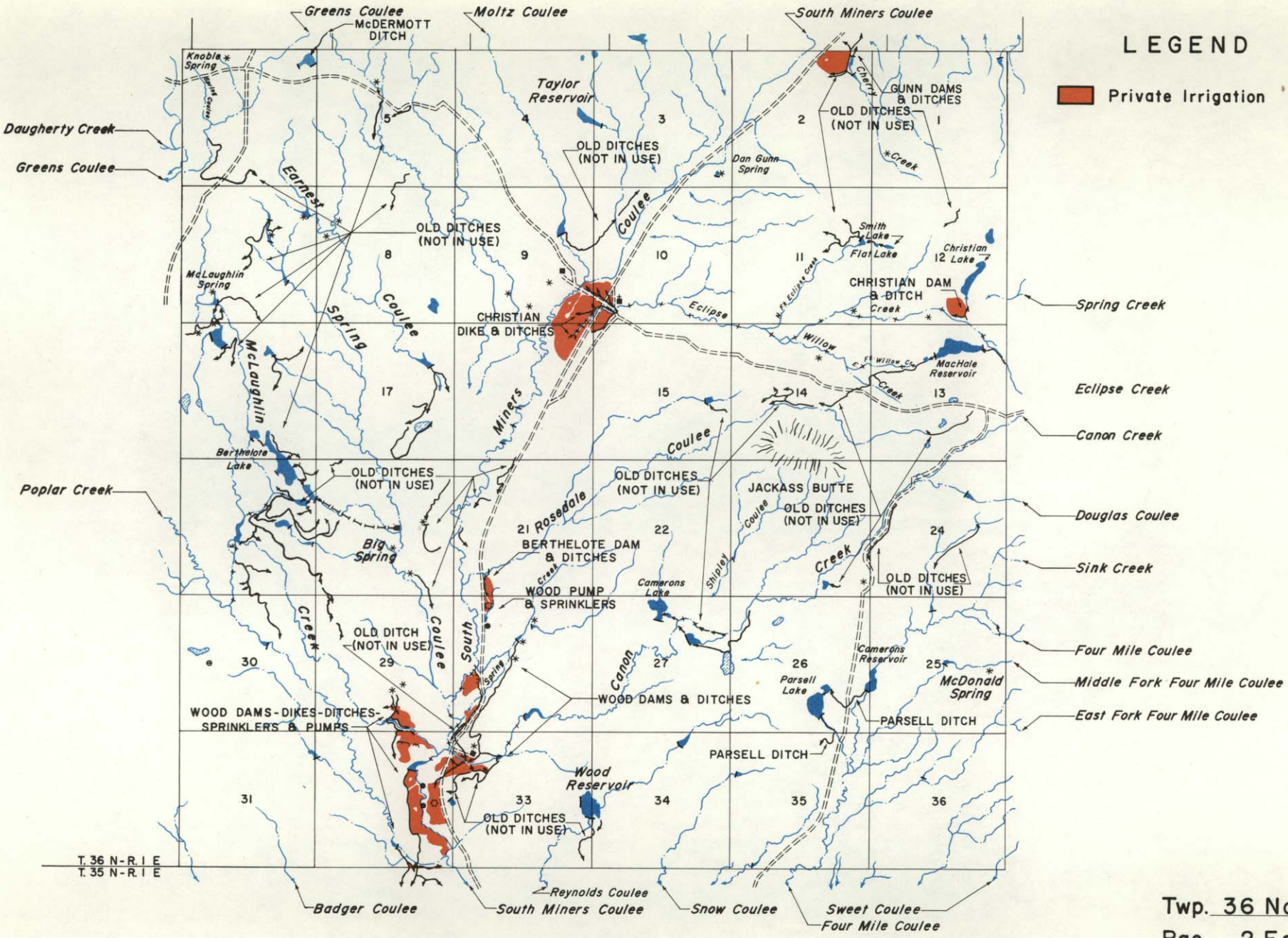
Private Irrigation

Twp. 35 North

Rge. 2 East


La Plante Coulee
Stark Creek
Sheep Creek
Huse Coulee
Trail Creek
Chokecherry Spring
Four Springs
OLD DITCHES (NOT IN USE)
OLD DITCH (NOT IN USE)
DEMAREST DITCHES (NOT IN USE)
Henry Reservoir
HENRY DITCH
Strawberry Creek
Soda Spring
Morris Reservoir
Wolf Coulee
Spring Coulee
MORRIS DITCH
MORRIS DITCHES
Snow Coulee
OLD ROSS DITCH (NOT IN USE)
OLD DITCH (NOT IN USE)
OLD DITCH & DAM (NOT IN USE)
Henry Reservoir
Sleeper Coulee
H. SCALESE DAM & DITCH
OLD FEY DITCH (NOT IN USE)
Amez Droz Spring
Gagnon Spring
HENRY DAMS & DITCHES
OLD DITCH (NOT IN USE)
MORRIS DAM & DITCH
Steep Coulee
Sheep Creek
FEY DITCH (NOT IN USE)
Alkali Spring
Snowdrift Coulee
DAKE DITCH
SOMMERS DITCH (NOT IN USE)
OLD DITCHES (NOT IN USE)
HENRY DITCH
OLD DITCH (NOT IN USE)
T. 35 N-R. 2 E
T. 34 N-R. 2 E
Trail Creek
Alkali Coulee
Big Coulee
Price's Coulee
LEGEND
Private Irrigation
LIBERTY
COUNTY
Twp. 35 North
Rge. 3 East


George Coulee
Simeros Coulee
Kicking Horse Creek
Simmons Creek
Powers Creek
Limekiln Creek
Deep Coulee
Daugherty Creek
NINTH STANDARD PARALLEL NORTH
PRINCIPAL MERIDIAN
Timber Coulee
Timber N. Fk.
Green Coulee
KRALL PUMP & SPRINKLER
Krall Reservoirs
Swan Lake
RANKIN DAMS-DITCHES-PUMPS & SPRINKLERS
BERTHELOTE PIPELINE
BERTHELOTE DAMS-DIKES-DITCHES-PUMP & PIPELINE
Berthelote Reservoir
Timber
Sandrock Coulee
RANKIN DAM-PUMPS & SPRINKLERS
White Spring
Daisy Spring
TOMSHECK DAMS-DIKE & DITCHES
Willow Creek
Two Mile Creek
STOLTZ DAM & DITCH
Grove Spring
West Grove Spring
Bowen Spring
Green
Poplar Creek
TOMSHECK DIKE & DITCHES
Tomsheck Reservoir
TOMSHECK DAMS & DITCHES
TOMSHECK DAMS-DITCHES - DIKES & PUMP
BERTHELOTE SCHOOL
Five Mile Coulee
JENSEN DAM & DITCH
TOMSHECK DIKE
T. 36 N.-R. 1W
T. 35 N.-R. 1W
Five Mile Coulee
Willow Creek
Powers Creek
Spring Creek
Green Coulee
Simmons Creek
Spring Coulee
LEGEND
Private Irrigation
① OLD DITCHES (NOT IN USE)
② Jensen Reservoir
Twp. 36 North
Rge. 1E & 1W

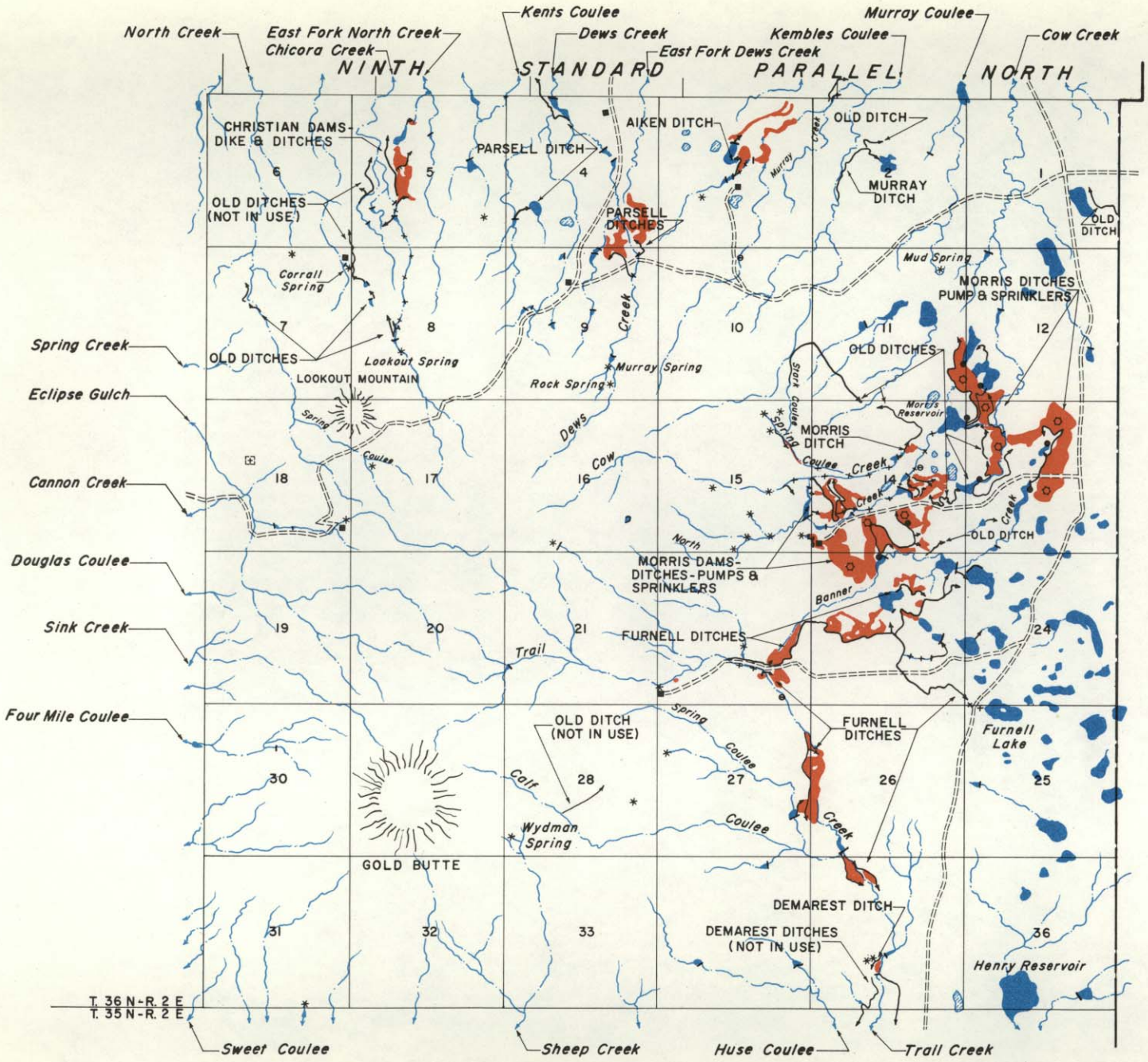


LEGEND

Private Irrigation

Twp. 36 North

Rge. 2 East



LEGEND

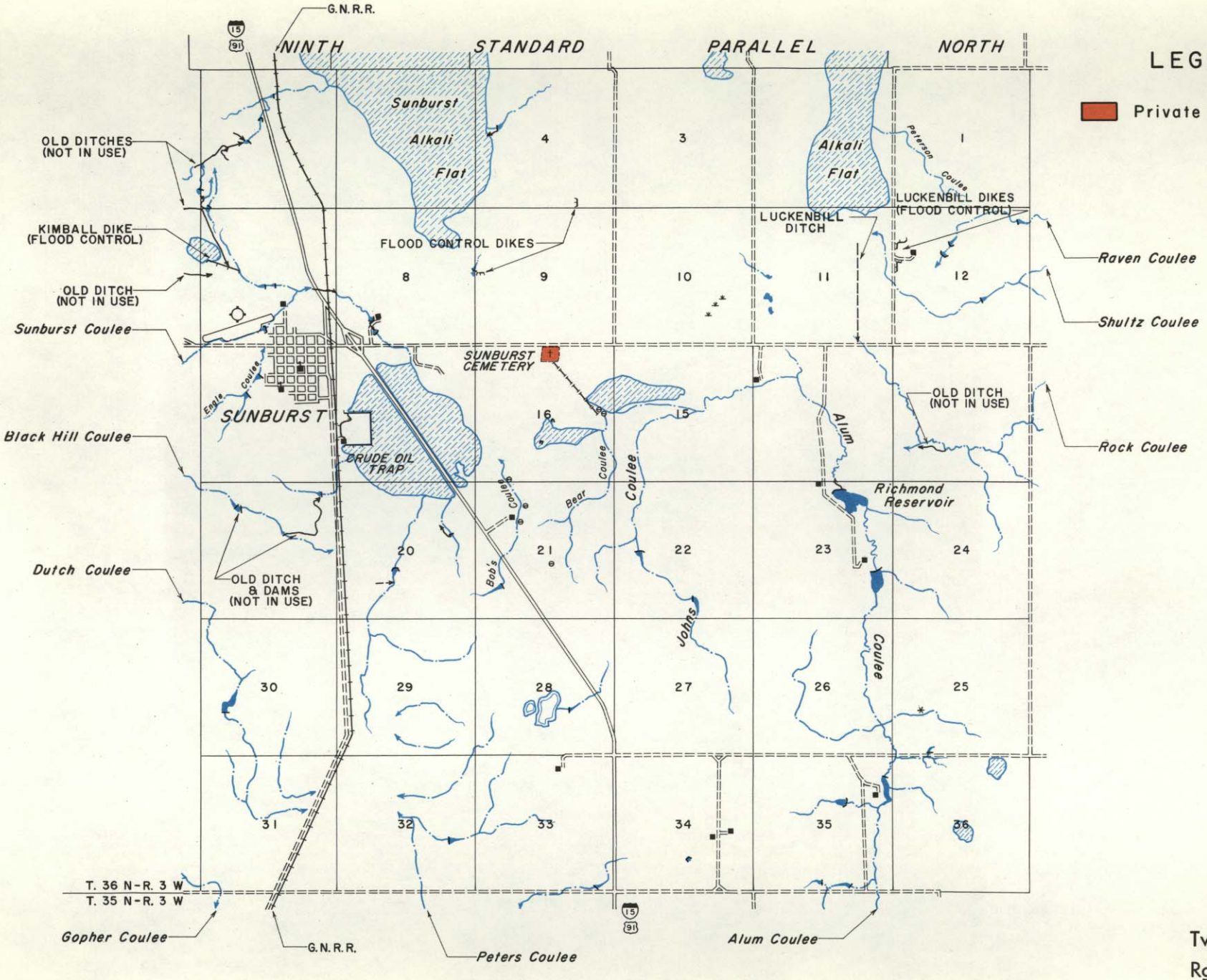
Private Irrigation

LIBERTY

COUNTY

Twp. 36 North

Rge. 3 East

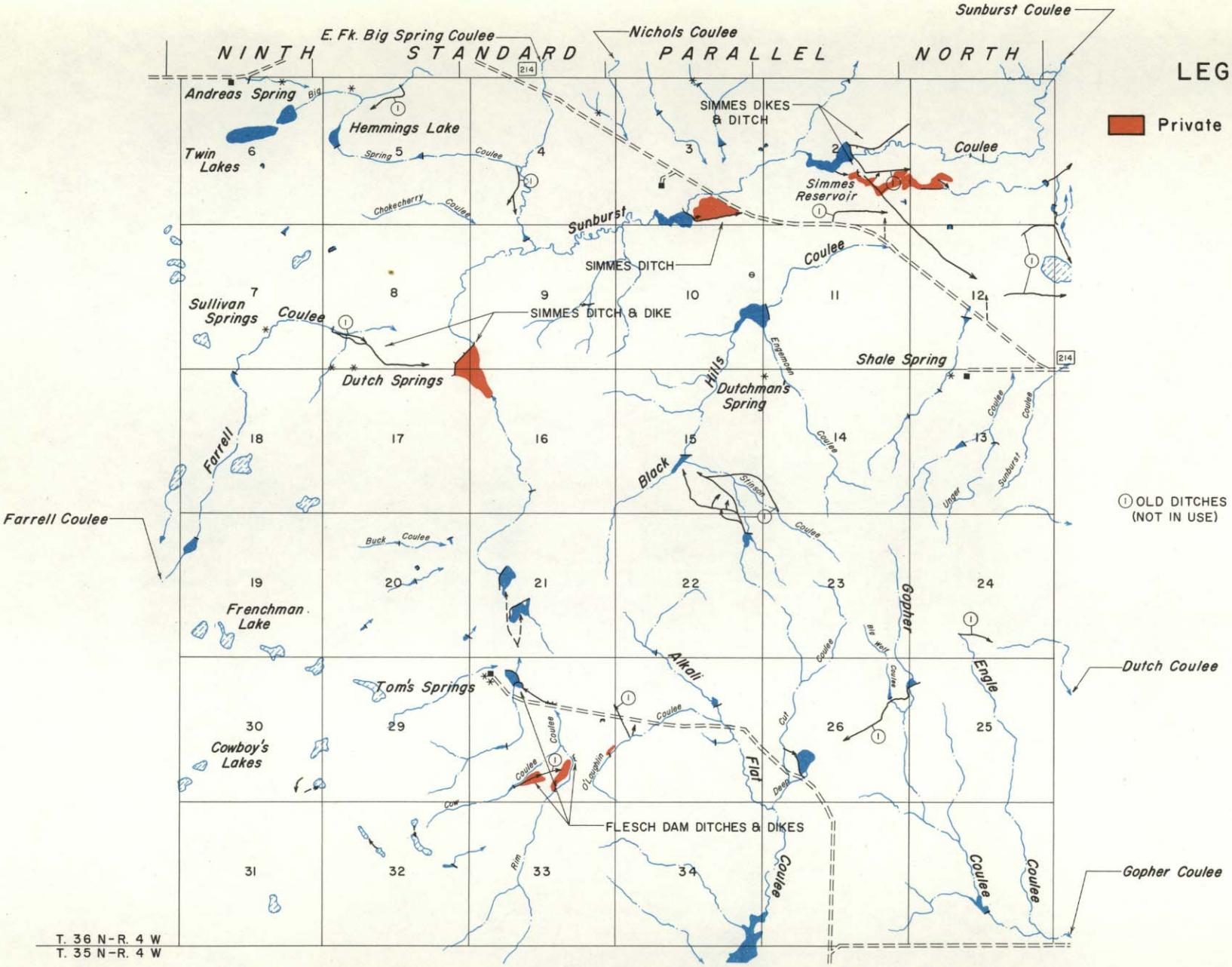


LEGEND

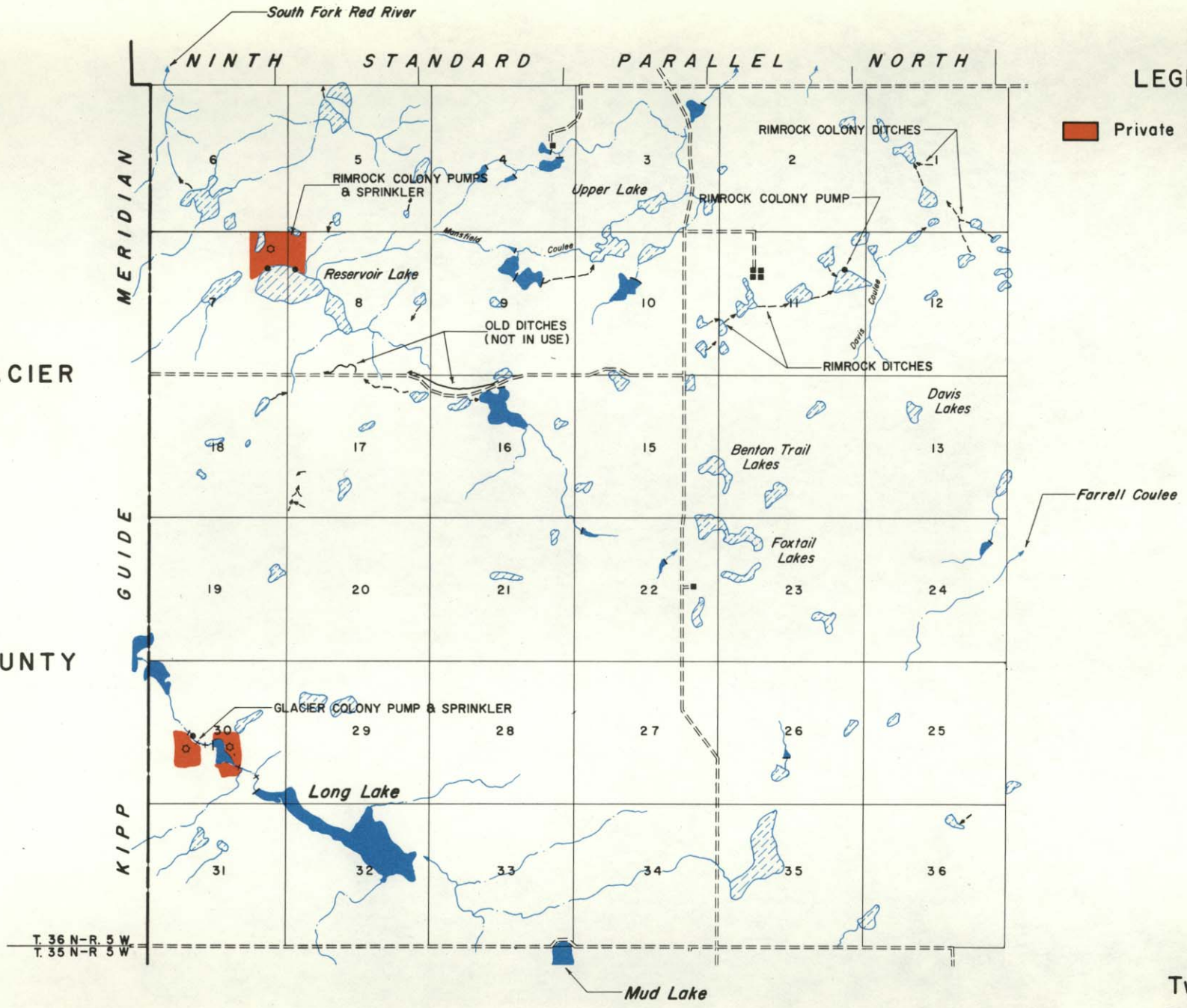
Private Irrigation

Twp. 36 North

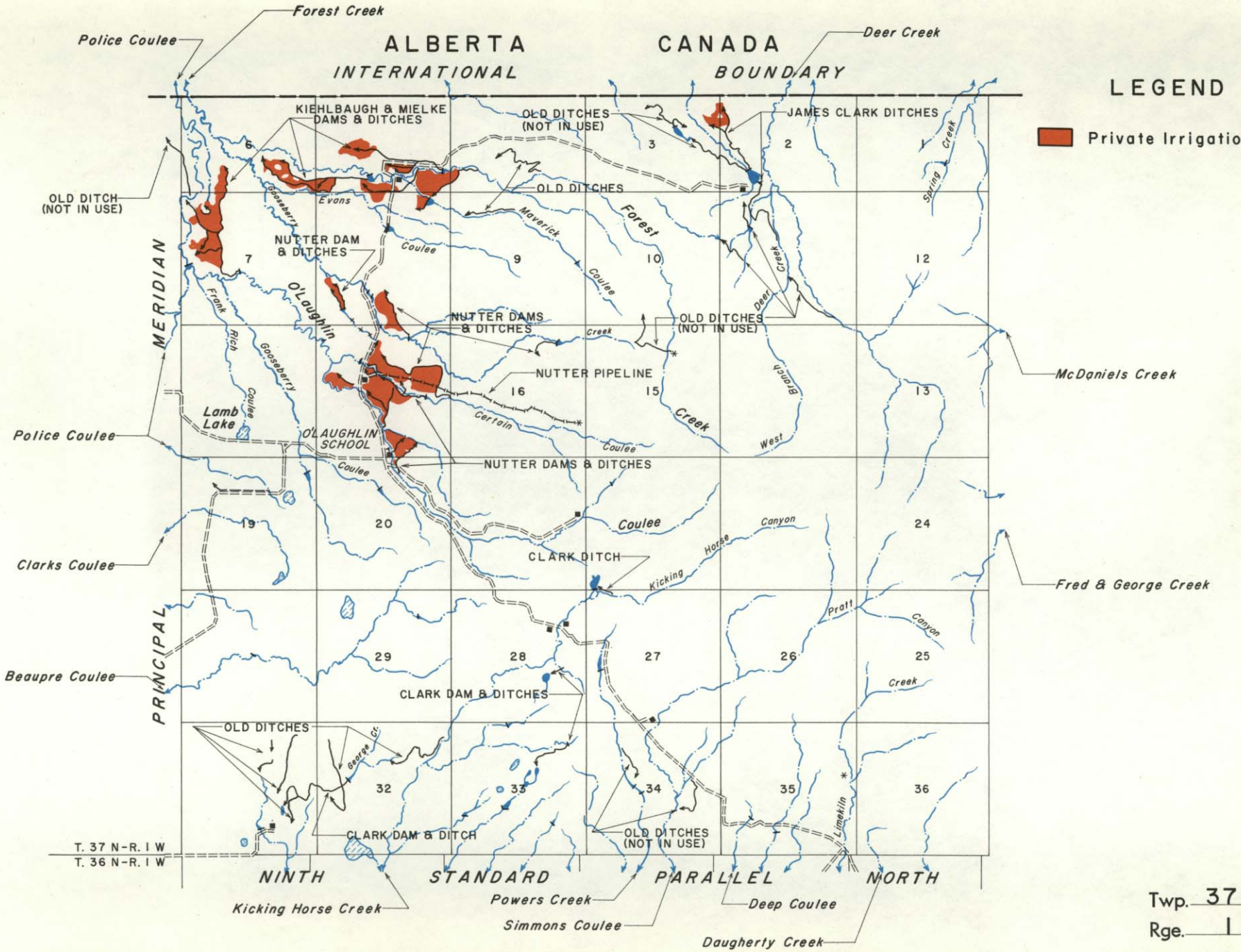
Rge. 2 West



Twp. 36 North
Rge. 3 West



Twp. 36 North
Rge. 4 West

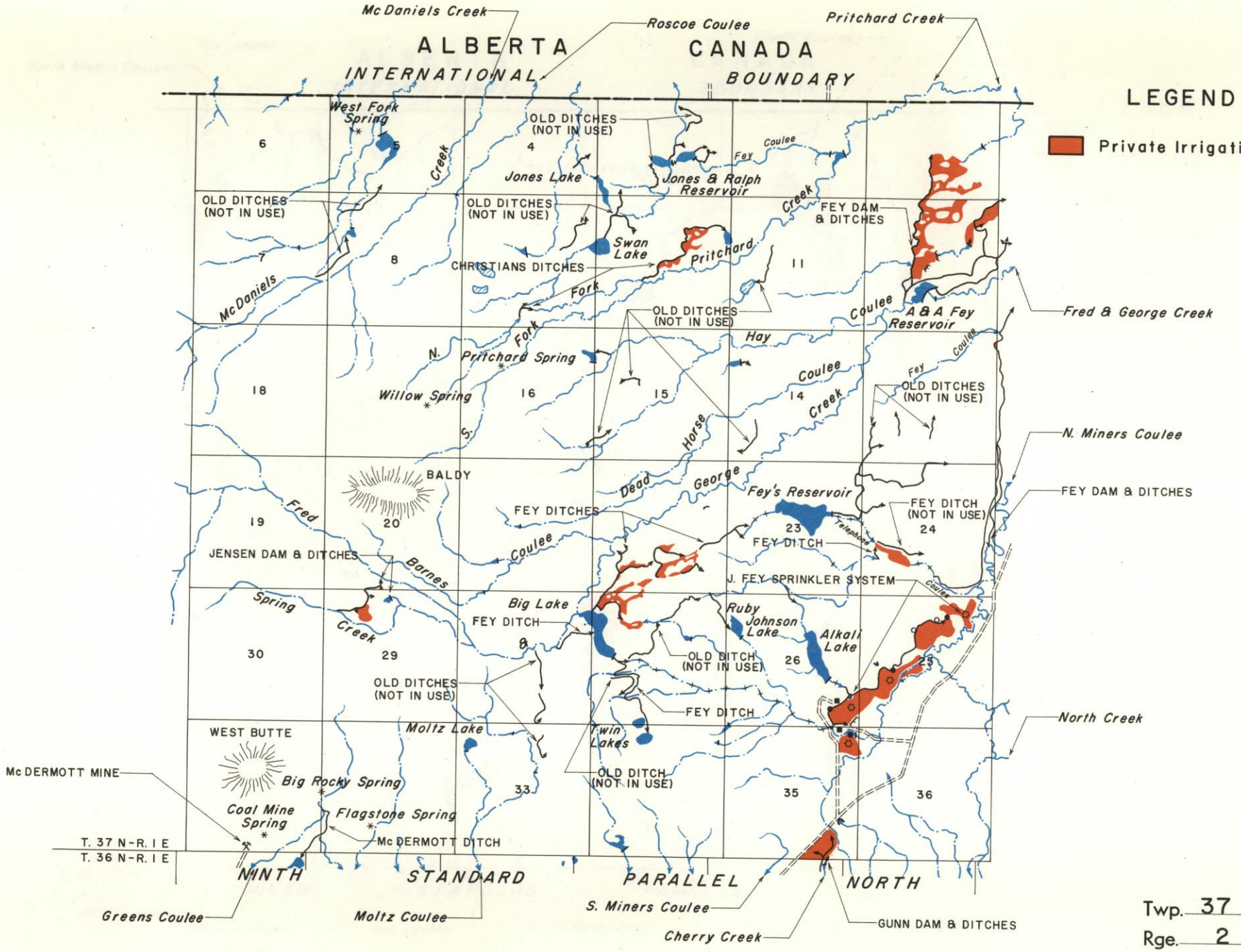


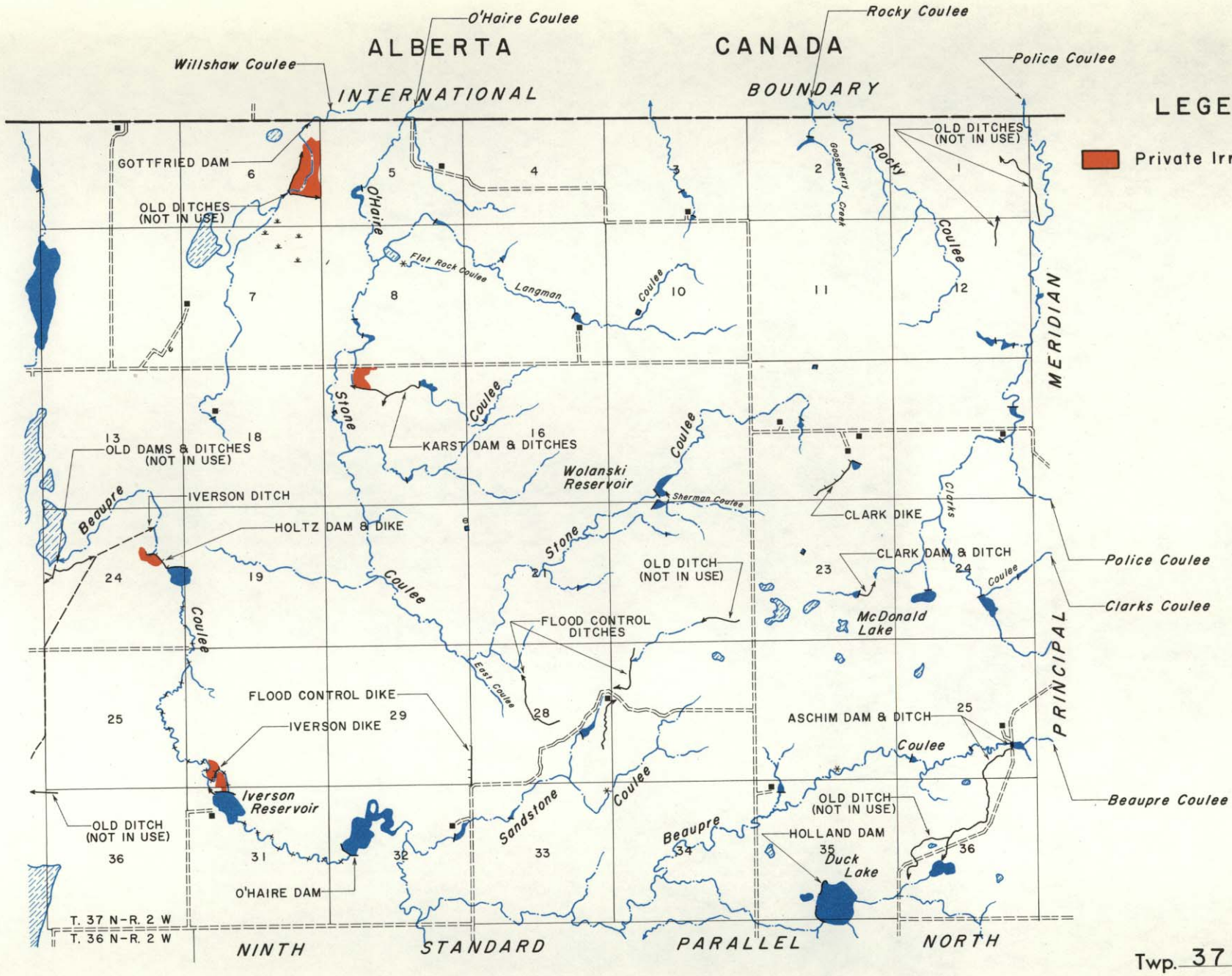
LEGEND

Private Irrigation

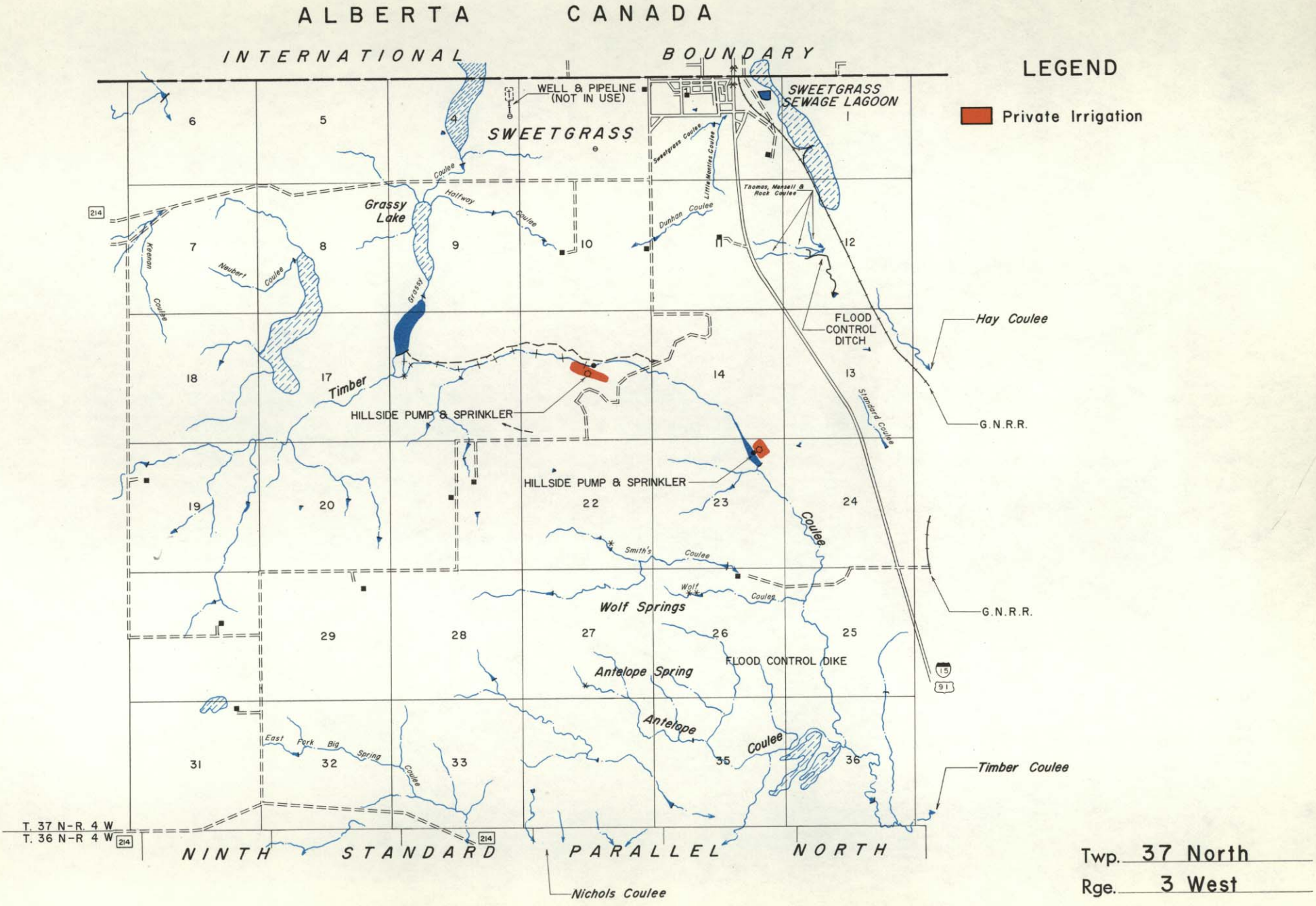
Twp. 37 North

Rge. 1 East


ALBERTA
CANADA
INTERNATIONAL BOUNDARY
McDaniels Creek
Roscoe Coulee
Pritchard Creek
West Fork Spring
OLD DITCHES (NOT IN USE)
Jones Lake
Jones & Ralph Reservoir
Fey Coulee
Creek
FEY DAM & DITCHES
Swan Lake
Pritchard Fork Creek
CHRISTIANS DITCHES
McDaniels Fork
A & A Fey Reservoir
Fred & George Creek
N. Pritchard Spring
Willow Spring
Hay Coulee
Horse Creek
N. Miners Coulee
BALDY
Dead George Coulee
Fey's Reservoir
FEY DITCHES
FEY DITCH (NOT IN USE)
Fred Barnes Coulee
JENSEN DAM & DITCHES
Telephone
J. FEY SPRINKLER SYSTEM
Spring Creek
Big Lake
Ruby Johnson Lake
Alkali Lake
FEY DITCH
OLD DITCH (NOT IN USE)
North Creek
WEST BUTTE
Moltz Lake
Twin Lakes
McDERMOTT MINE
Big Rocky Spring
Coal Mine Spring
Flagstone Spring
McDERMOTT DITCH
T. 37 N-R. 1 E
T. 36 N-R. 1 E
NINTH STANDARD PARALLEL NORTH
Greens Coulee
Moltz Coulee
S. Miners Coulee
Cherry Creek
GUNN DAM & DITCHES
LEGEND
Private Irrigation
Twp. 37 North
Rge. 2 East

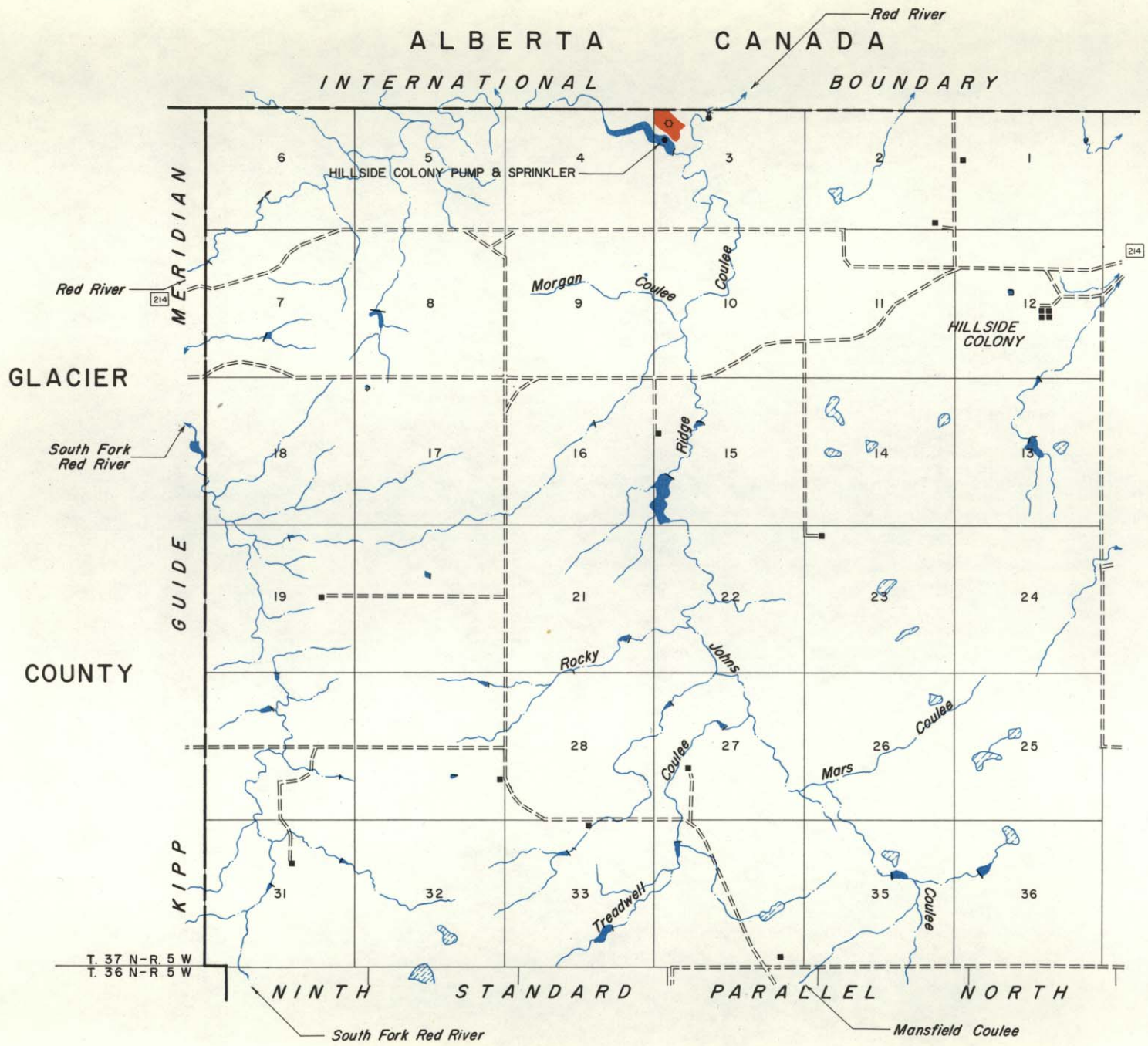


Twp. 37 North
Rge. 1 & 2 West



Twp. 37 North

Rge. 3 West



LEGEND

Private Irrigation

Twp. 37 North

Rge. 4 West