Water Resources Survey

Part I:

WATER AND RELATED LAND RESOURCES

and

Part II:

IRRIGATION DEVELOPMENT WITH MAPS SHOWING IRRIGATED AREAS IN COLORS DESIGNATING SOURCES OF SUPPLY

Prairie County, Montana

Published by

MONTANA WATER RESOURCES BOARD

Sam W. Mitchell Building

Helena, Montana 59601 — September, 1970

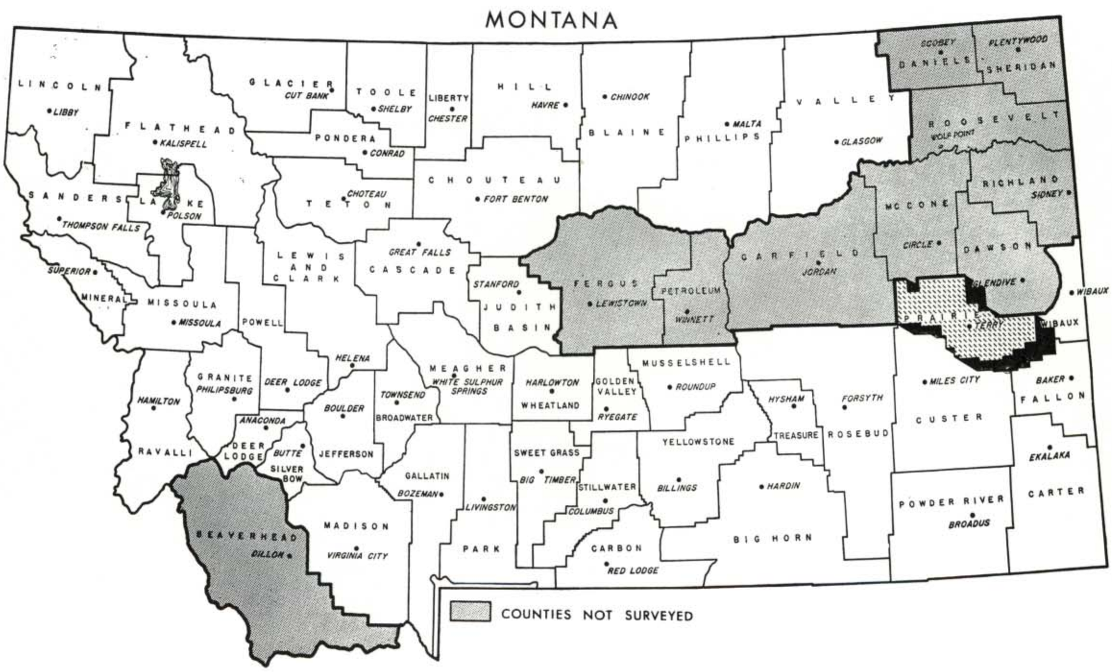
Telephone: 406/449-3648

WATER RESOURCES SURVEY

PRAIRIE COUNTY, MONTANA

Part I

Water and Related Land Resources



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September, 1970

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

Dear Governor Anderson:

Submitted herewith is a consolidated report on a survey of Water Resources for Prairie County, Montana.

The report is divided into two parts: Part I consists of history of land and water uses, and Part II contains the summary of water rights and irrigated lands, and the township maps in the County showing in colors the lands irrigated from each source of water supply.

Surveys have been made in the counties of Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Deer Lodge, Fallon, Flathead, Gallatin, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Meagher, Mineral, Missoula, Musselshell, Park, Phillips, Pondera, Powder River, Powell, **Prairie**, Ravalli, Rosebud, Sanders, 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 are now out of print. However, reports will again be published on these counties sometime in the future after they have been updated. Copies of these Water Resources Survey reports are available upon request to the Montana Water Resources Board.

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,
DOUGLAS G. SMITH, 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.

PRAIRIE COUNTY OFFICIALS

Gottlieb Ulrich, Commissioner

Maynard Liles, Commissioner — Jay Fluss, Commissioner

John D. Strobel, Clerk and Recorder

Mrs. Borghild Carlson, Clerk of District Court — Arthur Meidinger, Assessor

OTHER AGENCIES AND INDIVIDUALS

Robert G. Dunbar	Professor of History, Montana State University
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Philip R. Wilson	County Extension Agent
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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 landowner 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 ensure accuracy of the data collected rather than to speed up the work which might invite errors.

SURFACE WATER RIGHTS

Our concern over surface water rights in Montana is more than 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 Mettler 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 continued with reasonable diligence to completion (Section 89-810 R.C.M. 1947). 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 may 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 15 percent 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 15 percent 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 Prickley Pear Creek, 68 parties claimed thirty times its average flow of about 50 c.f.s. Today, the Big Hole River with an average flow of about 1,000 c.f.s. has filings totaling 173,912 c.f.s. One is unable to distinguish in the county courthouse 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 flow through several counties; consequently, water right filings on those inter-county streams are found distributed in two or more county courthouses. Anyone desirous of determining appropriations on a certain river or creek finds it difficult and expensive to examine records in several places. In addition, the records are sometimes scattered because the original nine counties of 1865 have now increased to 56. As the original counties have been divided and 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 of 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 are no provisions 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.

In 1967, the Montana Legislative Assembly passed Section (89-813) Water Laws of Montana which states: "From and after July 1, 1967, the county clerk and recorder shall forward to the Montana Water Resources Board a copy of any instrument of water appropriation or any instrument transferring any water appropriation which is filed as provided in this section."

This means that copies of **all surface water filings** (appropriations) and copies of **all deed transfers** of water appropriations filed in the office of the county clerk and recorder on or after July 1, 1967, are to be forwarded to the Montana Water Resources Board, Sam W. Mitchell Building, Helena, Montana 59601.

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 Montana Water Resources Board, 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 downstream states, or Wyoming or Canada.

GROUNDWATER RIGHTS

Groundwater 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 groundwater to streams and maintain 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 groundwater 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 groundwater in areas where the recharge is less than the withdrawal. Experience in other states has shown that once excessive use of groundwater 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 groundwater 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 groundwater. Proposed groundwater 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 Groundwater 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 Groundwater Law are:

Section 1. DEFINITIONS OR REGULATIONS AS USED IN THE ACT.

(a) "Groundwater" 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 groundwater area or subarea 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 groundwater 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 utilization of water.

(e) "Person" means any natural person, association, partnership, corporation, municipality, irrigation district, the State of Montana, or any political subdivision 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) "Groundwater area" means an area which, as nearly as known facts permit, may be designated so as to enclose a single distinct body of groundwater, 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 groundwater areas may be divided into convenient administrative units known as "subareas."

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 groundwater rights. The application of groundwater 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 groundwater 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 water or groundwater on and after January 1, 1962, the first in time is first in right.

Montana's Groundwater Code now provides for three different types of forms available for filing water rights, depending upon the nature of the groundwater development. The use of GW-4, Declaration of Vested Groundwater Rights, expired January 1, 1966.

Form GW-1, **"Notice of Appropriation of Groundwater"**—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 groundwater 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 GW-2, **"Notice of Completion of Groundwater Appropriation by Means of Well"**—this form shall require answers to the same sort of questions as required by Form GW-1 (Notice of Appropriation of Groundwater), 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 GW-2, "Notice of Completion of Groundwater Appropriation by Means of Well," for the appropriator, and the latter shall be responsible for its filing.

Form GW-3, **"Notice of Completion of Groundwater Appropriation Without Well"**—is for the benefit of persons obtaining (or desiring to obtain) groundwater without a well, such as by subirrigation or other natural processes so as to enable such persons to describe the means of using groundwater; to estimate the amount of water so used; and requiring such other information pertinent to this particular type of groundwater appropriation.

Montana's Groundwater Code provided for a period of four (4) years after January 1, 1962, for filing vested groundwater rights. The deadline for filing was December 31, 1965. A person did not automatically lose his vested groundwater rights by failure to file within the four-year period, but in the event of a future groundwater dispute, he would bear the burden of proving his rights in court.

It shall be recognized that all persons who have filed a Water Well Log Form as provided for under Sections 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 the groundwater law states, "UNTIL A NOTICE OF COMPLETION (Form GW-2 or GW-3) IS FILED WITH RESPECT TO ANY USE OF GROUNDWATER INSTITUTED AFTER JANUARY 1, 1962, NO RIGHT TO THAT USE OF WATER SHALL BE RECOGNIZED."

Copies of the forms used in filing on groundwater 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 record and file the original copy of the appropriation, transmit the second copy to the Administrator (Montana Water Resources Board) and the third copy to the Montana Bureau of Mines and Geology. A fourth copy is to be retained by the appropriator (person making the filing).

An accurate method of compiling data on the amount of water being used and the amount of water available for future use is essential in the administration and investigation of water resources. In areas where the water supply becomes critical, the groundwater 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 rights of 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 an efficient means for the orderly development and preservation of our water supplies while protecting all appropriators.

HISTORY AND ORGANIZATION

Some of the earliest white men to pass through the area now embraced within the boundary of Prairie County were Captain Clark and members of the Lewis and Clark Expedition in July, 1806. The expedition, under Clark, was traveling through the Prairie County area on its way to join Lewis at the mouth of the Yellowstone River. It was in this area, and while traveling down the Yellowstone River by canoe, as Captain Clark mentioned in his journal, that the party's journey was interrupted for two days, by a tremendous herd of buffalo fording the river, going north to summer range.

One of the first settlers in the area that is now Prairie County was J. W. Montagne, who located in the Yellowstone River valley. Montagne raised hay which he sold to freighters passing along the route between Miles City and Bismarck, North Dakota.

Except for Montagne and the occasional freighter, the Prairie County area remained practically as Clark found it, until 1881 when westward expansion of the Northern Pacific Railway brought an influx of homeseekers. Most of these people settled along the Yellowstone and tributary streams, to transform the great pasture north and south of the river into a noted livestock raising district.

Prairie County is located in the central part of eastern Montana and has some of the finest farm and ranch land in the state. It also has some of the most desolate (yet scenic) land in the region.

More than 650,000 of the county's 1,105,280 acres are classed as farm land and much of the remainder is high class grazing land. Some of the county consists of a rugged stretch of bad-lands, more pronounced here than in any other part of the state. The bad-lands area exhibits the startling effects of wind and water erosion with variegated colors and seams of coal running through them, topped with scattered pines and cedars.

A historic locale in Prairie County is the site, 25 miles northwest of Terry, of the battle between the U. S. Army Fifth Infantry of 110 men under Lieutenant Frank D. Baldwin, where they attacked and dispersed 122 lodges of Sioux Indians under Sitting Bull, on December 18, 1876.

Being typical of the eastern Montana region, Prairie County experienced a late development compared to other counties in Montana. It was in the late years of the nineneenth century, when the mining boom subsided, that people began to see the agricultural possibilities of this region.

The stockmen were the first persons who established residences in the Prairie County area. One of the pioneer livestock ranches in Prairie County is the Kempton Ranch. This cattle and horse ranch was first established in 1882, in a green spring-fed valley in the center of 3,500 acres of fee land extending to the banks of the historic Powder River, and adjacent to thousands of acres of what was then called open range. In the early days of its existence, the Kempton Ranch was a favorite eastern Montana meeting place and convention site.

The stockmen brought great herds of cattle into the area, the first of which came from the western Montana mountain valleys. Such large outfits as the Kempton-Tusler Cattle Company and the XIT of Texas fame ran cattle for many miles north and south of the Yellowstone River. The cattle boom was not destined to last, however, and with the coming of the railroad and passage of various homestead acts, new settlers came into the area and become interested in other agricultural pursuits.

In 1883, the Northern Pacific Railway came through the Prairie County area, bringing many homesteaders and their families into the region.

The Milwaukee Railroad entered the present county from the southeast corner and consequently opened more land for settlement. Within three years after the Milwaukee Railroad's completion in 1907, numerous homesteads were scattered throughout the area. Of the many people who complied with the homestead law, relatively few remained to make a living out of farming. Most of them stayed only long enough to gain title to the land and sold out to others who came west with the intention of farming. These later settlers shipped all their goods and their families by means of the railroad. Their farm equipment usually consisted of a plow, a drill, and three horses. For several years these settlers made a living from their farming operations and some even prospered. But with the depression in 1929, and the accompanying failure of the stock market, and the drought of the thirties, many farmers and ranchers were forced to cease operations. Many ranchers sold their stock to the government in 1934; for some this was the end of their ranching days, while others had enough left to hang on and rebuild herds of cattle and bands of sheep. The government in 1936 began buying much of this submarginal land. Today, over one-half of Prairie County is public land. It is, however, rented to stockmen, through the Prairie County Cooperative Grazing Association, for grazing purposes. For many of the hard-hit farmers who were able to survive the depression and drought years of the thirties, relief to any great extent did not come until the construction of the Buffalo Rapids Irrigation Project in 1938. This meant paying jobs for farmers, giving them a chance to get back on their feet. New techniques in farming practices were introduced which helped increase production and assured the farmer of some income each year. Some of the new methods of farm practices introduced were the planting of winter wheat instead of the usual spring wheat, and the innovation of summer fallowing and strip farming.

Irrigation development and work by the Soil Conservation Service have been beneficial to the county. The Buffalo Rapids Irrigation Project has contributed much to the county's greatest need—irrigation.

Prairie County has two main valleys slicing through its rolling hills. The largest valley is that of the east-flowing Yellowstone River, which cuts the county almost in equal halves; the Powder River flows in a valley from the southeast to the Yellowstone River.

Coal mining and natural gas production also are important sources of revenue in this area. Part of the Cedar Creek gas field of the Montana-Dakota Utilities Company is in the eastern edge of the county and supplies Miles City, Terry and Glendive. A small portion of the prolific Pine Oil Field operated by the Shell Oil Company, also lies in Prairie County.

The oldest and largest town in Prairie County is Terry, the county seat. Originally Terry was known as Joubert's Landing and was a site on the Yellowstone River used to refuel the steamboats with a supply of wood. In 1880, the town was named Terry after General Alfred Terry. At one time, Terry was the only crossing on the Yellowstone River between Glendive and Miles City and for a number of years it was the largest livestock shipping point in the northwest. In 1881, the Northern Pacific Railway passed Terry and the town was built near the railroad rather than next to its river location. Terry was incorporated in 1883 and in 1960 had a population of 1,140. The town of Terry is located in an extensive artesian groundwater basin and obtains municipal water from wells. These wells are privately owned and operated by town residents, with each well furnishing a water supply to 4 to 10 town residences. The wells range from depths of 400 to 780 feet, under artesian pressure varying from 10 to 40 pounds per square inch. The water quality is exceptionally good for domestic use, crystal clear and cool.

The next town of importance in Prairie County's history and present day status is Fallon. There exists some discrepancy as to how Fallon received its name. One report states that Fallon was named for O'Fallon, who was a paymaster for the U. S. troops in that area in the early 1870's. Another states that the town was named for O'Fallon, who was a nephew of Captain William Clark and a prominent St. Louis fur trader. Fallon's population is listed as about 200 persons and serves the nearby surrounding farm area. The town was never incorporated and its population has declined in the last twenty years.

The only other town of any significance in Prairie County is Mildred. It is one of several towns created and developed by the Milwaukee Railroad. Mildred was not only developed by the Milwaukee Railroad, but its existence depended on the railroad's need for its services. When the locomotives were no longer in need of Mildred's water and coal, the town declined from a business-minded community of two hundred and fifty people, to a postoffice-general store village with a population of less than twenty.

As more people settled in the area now comprising Prairie County, the need for its development increased. People felt that the commissioners of Custer County were not looking after this area (now Prairie County) as they should. They felt that the Custer County Commissioners were spending all of the people's tax money in and around Miles City. As this unrest grew, some of the far-sighted businessmen of Terry made an agreement with the businessmen of Mildred to support Terry, rather than Ismay, as the county seat for any new county division. This group of interested people formed a County-Division Committee and obtained the services of Eddie Booth, of Baker, as legal advisor. The committee's first action was to determine what area was to be contained in the new county. This step was followed by petition for an election. Part of the new county area was to be taken from Custer and part from Dawson County. There was also a very small part incorporated out of Fallon County.

Out of 1,400 registered voters, 831 voted in the county election. When the final vote was totaled, only 63 voted against the formation of a new county. It was also the first election in which women could vote for county officials. The return ballots were sent to Helena, and Prairie County was established by proclamation of Governor Stewart on February 5, 1915. The new county government began functioning immediately and the old Cameron laundry building in Terry was remodeled into a courthouse. This building, with a few additions and changes, is still used as Prairie County's center of government today.

The make-up of Prairie County has not changed drastically in the last twenty-five years. Although it may not have lived up to the highest expectations of some people, it has developed gradually into a rather prosperous and economically successful community. Many of the founders of Prairie County are alive today and are justly proud of their efforts and accomplishments.

CLIMATE

Located in eastern Montana near the North Dakota Border, Prairie County is bisected by the Yellowstone River, about mid-way between the northern and southern borders of Montana. Topography varies from the flat river bottom of the Yellowstone Valley to hilly terrain that is fairly rugged in places. The land slopes upward from the Yellowstone River into hilly country paralleling the river's northeastward course on both sides. The terrain west of the river rises higher than that to the east.

The crests of the hills about 25 miles west of the river rise approximately 1,000 to 1,500 feet above the valley floor. East of the Yellowstone River the terrain is about 500 feet lower with the crests of the hills lying east of county boundaries. The highest peak in the area is Big Sheep Mountain northwest of Terry with an elevation of 3,625 feet. The lowest point in the county is along the Yellowstone River northeast of Fallon where the elvation is slightly less than 2,100 feet.

The area is drained by numerous small creeks, most of which become dry in the late summer. The Yellowstone River is the principal drainage, flowing northeastward through the middle of the county. The Powder River flows northward through the southern portion of Prairie County, joining the Yellowstone River southwest of Terry. O'Fallon Creek flows northwestward through the southeastern portion of the county emptying into the Yellowstone River northeast of Terry. The northwestern portion of the county drains into the Redwater River which flows northward to the Missouri River.

Prairie County is within an area having climate generally described as Continental, with cold winters, warm summers, and marked variation in seasonal precipitation. During a normal year about 80 percent of the annual precipitation will fall during the April-September growing season, and normally June is the wettest month by quite a margin, followed by July and May, respectively. Practically all of the area averages 12 to 14 inches of precipitation a year, with some of the higher terrain undoubtedly averaging slightly more. Winter snowfall is usually not heavy, averaging about 28 inches annually in the Yellowstone Valley with heavier amounts in the hills.

While annual snowfall averages are not large compared to the rest of the State, heavy snows do occur infrequently, usually in late winter or early spring. Summer precipitation usually occurs as showers, but steady, gentle rains can occur in May, June and September. Summer thundershowers are fairly frequent, and occasionally produce hail locally heavy enough to damage crops.

Winters, while quite cold, are not as severe as is thought by many. Some very cold weather can occur each winter, but these cold spells ordinarily last only a few days at a time. About once every 9 or 10 years the January or February temperature will average below zero. Relatively mild winter weather is not uncommon. However, periods of mild weather do not occur as frequently during the winter in Prairie County as in the counties to the west nearer the Rocky Mountains. In the spring the change from wintry to warmer weather is quite rapid, and the progressive cooling of the fall season is very noticeable during October and November.

Summers are characterized by warm weather which often lasts for weeks at a time. Sunny weather prevails 70 to 80 percent of the summer, with interruptions mostly during the afternoons from occasional showers and thundershowers. A few days of hot weather occur almost every year, but hot spells seldom last more than a few days, and the hot weather seldom occurs with high humidity. Temperatures can reach highs of 90° or more during any month May-September, and on about half of the afternoons in July and August temperatures will reach 90° or warmer.

With cold winters and warm summers, the length of the growing season assumes importance, particularly as far as vegetative growth and harvest are concerned. The average length of season between spring and fall occurrences of 32° F. varies greatly in the county, from about 110 days in the hills up to more than 130 days in the Yellowstone Valley.

Local flash flooding caused by sudden heavy thunderstorms can occur somewhere in the county about every two or three years. A more general type flood can develop during the late winter, following a cold spell, caused by ice jams when thawing begins upstream while freezing continues downstream. Here again this condition tends to localize itself and to recur at bridges, shallows, and other places where ice can become lodged and begin to pile up.

PRECIPITATION

Station	Years of Record	Elevation	Yearly Average Total	Growing Season Average Total	Percent Falling in Season Growing	Wettest Year	Driest Year
Mildred	1911-1968	2407	13.23*	10.55*	80	20.93 (1953)	3.73 (1934)
Terry	1950-1968	2248	11.27	9.56	85	18.34 (1953)	5.37 (1960)
Terry 25NNW	1951-1960	3325	12.92	9.67	75	21.61 (1953)	7.47 (1960)

*1939-1968

TEMPERATURE

Station	Years of Record	Elevation	Highest and Year of Record	Lowest and Year of Record	January Average	July Average	Annual Average
Mildred	1919-1968	2407	113 (1960)	–50 (1936)	15.9*	72.3*	44.3
Terry	1950-1968	2248	108 (1960) & (1968)	–45 (1954)	12.1	72.2	43.4

*1939-1968

POTENTIAL IRRIGATION DEVELOPMENT

Glenn R. Smith, Soil Scientist
Dave R. Cawlfield, Consulting Soil Scientist

INTRODUCTION

The major features that determine the desirability of an area for irrigation development are kind of soil, availability and quality of irrigation water, the climate and markets. Soils, together with frost free season and mean temperature largely determine the ability of an area to produce, assuming that a dependable water supply is available, and finally a market is necessary to obtain a profit from crops that are produced.

Land classification is the process by which soils, relief and climate are systematically appraised and lands are placed in categories based on similarity of characteristics. Land classification surveys which are made by the Montana Water Resources Board are specifically designed to establish the degree of suitability of land for sustained irrigation farming. The objective is to outline the land areas that have a potential for irrigated agriculture projected to the year 2020. Technological advances in irrigation are taken into account. Therefore slope and surface topography become less important because of rapid expansion of sprinkler irrigation.

The land classification system used in the water resources survey separates the land areas into (1) lands having potential for irrigation termed "irrigable" in contrast to (2) the inferior "non-irrigable" lands which are unsuited for present or future irrigation because of unfavorable characteristics. The term "irrigable land" as used in this classification, includes land with soils, topography and drainage features that are suitable for irrigation by gravity or sprinkler methods. Lands classed as "irrigable" have soil, topography and climate that will support sustained irrigated agriculture.

Lands which are classified as "irrigable" are divided into classes on the basis of their relative suitability for irrigation farming. Class 1 represents irrigable land with potentially high productive value; class 2 represents land of intermediate value; and class 3 includes land of the lowest value that may be considered suitable for irrigation.

The intensity of this land classification is a general reconnaissance survey. **Any future project development should be based on a detailed study** to pinpoint the exact location and limits of the land best suited for irrigation.

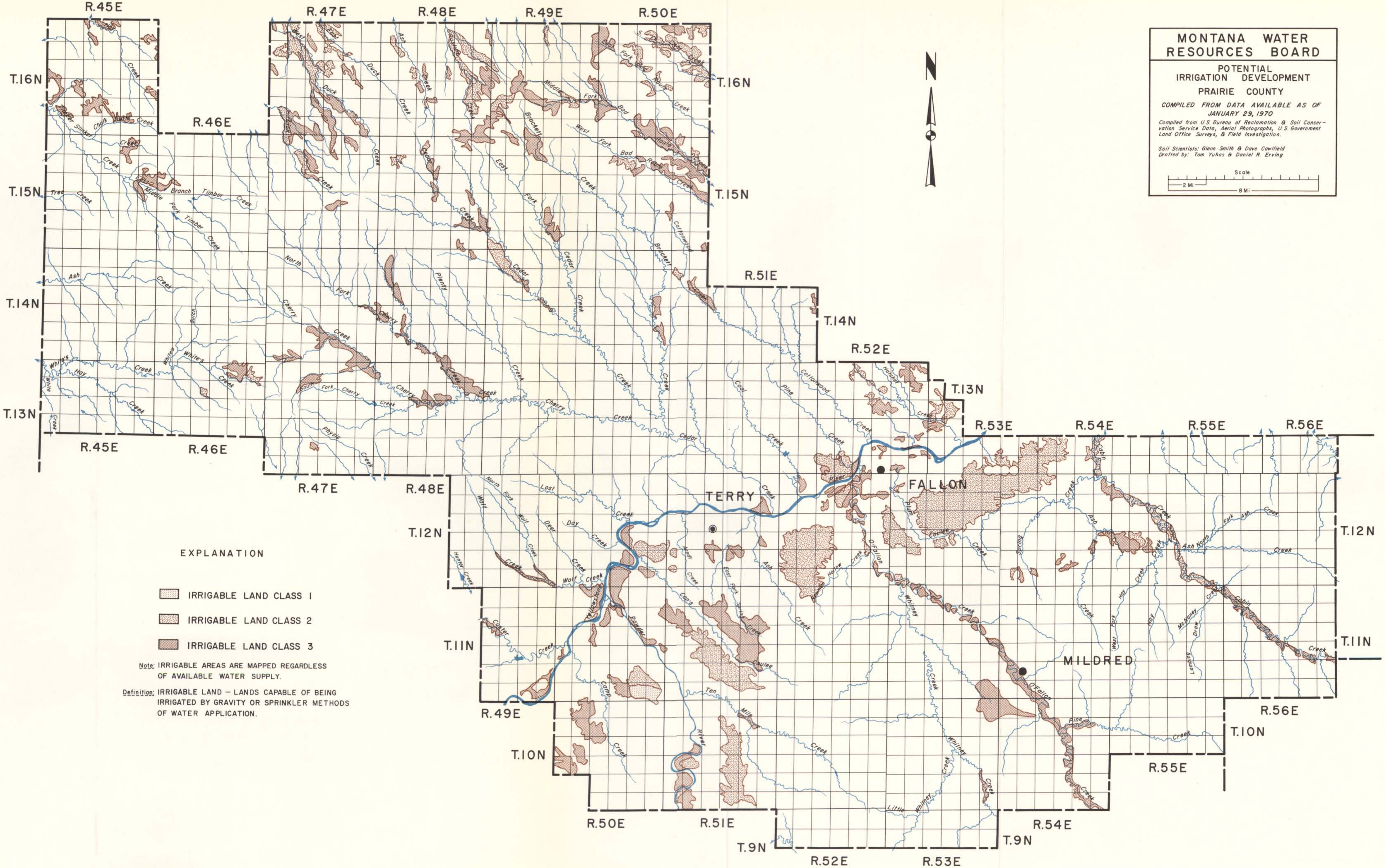
PHYSIOGRAPHIC FEATURES

Prairie County lies within the residual plains area of southeastern Montana. The Yellowstone River which cuts through the center of the county running from southwest to northeast, is the principal drainage. The main tributary drainages entering the Yellowstone River from the north are Cherry Creek, Coal Creek and Cottonwood Creek. Drainages and streams entering the Yellowstone River from the south are Camp Creek, Powder River, O'Fallon Creek, and Cabin Creek with Cabin Creek entering the Yellowstone below the village of Marsh in Dawson County. Approximately 8 townships in the northwest part of Prairie County drain west and north into the Missouri River (or Fort Peck Reservoir) through Timber Creek and tributaries, Duck Creek, Ash Creek and Pasture Creek.

Principal physiographic areas in the county are (1) rolling to dissected "residual uplands"; (2) high terraces or "benches"; and (3) floodplains along the Yellowstone and Powder River and the lower reaches of the tributary streams.

Approximately 44 percent of the potentially irrigable land in Prairie County lies in the residual uplands. Approximately a fourth of this is in irrigable classes 1 and 2 and consists of deep loam to clay loam soils in small upland valleys, and on smooth sloping fans.The remainder includes clay textured soils, sandy soils with limited moisture capacity, loam soils over non-saline shales and soils with a correctible drainage problem. The individual areas of irrigable soils in the uplands range from about 40 acres to a few hundred acres in size.

"Benches" lying along the Yellowstone River and Powder River include approximately 39 percent of the irrigable land but only a small area (approximately 300 acres) is irrigated at present. These



MONTANA WATER RESOURCES BOARD
POTENTIAL IRRIGATION DEVELOPMENT
PRAIRIE COUNTY
COMPILED FROM DATA AVAILABLE AS OF JANUARY 29, 1970
Compiled from U.S. Bureau of Reclamation & Soil Conservation Service Data, Aerial Photographs, U.S. Government Land Office Surveys, & Field Investigation.
Soil Scientists: Glenn Smith & Dave Cowlfield
Drafted by: Tom Yuhas & Daniel R. Erving
Scale
2 Mi
8 Mi
N
EXPLANATION
IRRIGABLE LAND CLASS 1
IRRIGABLE LAND CLASS 2
IRRIGABLE LAND CLASS 3
Note: IRRIGABLE AREAS ARE MAPPED REGARDLESS OF AVAILABLE WATER SUPPLY.
Definition: IRRIGABLE LAND – LANDS CAPABLE OF BEING IRRIGATED BY GRAVITY OR SPRINKLER METHODS OF WATER APPLICATION.
TERRY
FALLON
MILDRED
R.45E
R.46E
R.47E
R.48E
R.49E
R.50E
R.51E
R.52E
R.53E
R.54E
R.55E
R.56E
T.16N
T.15N
T.14N
T.13N
T.12N
T.11N
T.10N
T.9N
Yellowstone River
Powder River
O'Fallon Creek
Cedar Creek
Cherry Creek
Timber Creek
Bad Route Creek
Cabin Creek
Whitney Creek
Ten Mile Creek
Ash Creek
Pine Creek

high "benches" lie at elevations ranging from 200 feet to 400 feet above the Yellowstone and/or Powder Rivers. About 60 percent of the soils on these benches are class 1 or class 2 irrigable land. The remaining land is class 3 because of the soils (shallow depth or sandy texture) and/or the topography (rolling or broken relief). The largest of these "benches" is Fallon Bench which includes about 12,000 acres of irrigable land.

"Floodplains" along the Yellowstone River, Powder River and the larger creeks in the county contain approximately 17 percent of all irrigable land in Prairie County. Almost all presently irrigated land is in this physiographic area. There are approximately 1,000 acres of class 1 irrigable land in the county and most of this is on the floodplain of these larger streams and is presently irrigated. A large part of class 2 irrigable lands are also on these floodplains. Approximately 65 percent of irrigable soils on the floodplains are in class 3 irrigable land because of shallow depth to gravel, clay texture, slight to moderate salinity or a correctible drainage problem.

Also included on floodplains are significant acres of land classified as "non-irrigable" because of the soils being too sandy, shallow to gravel or fine clay texture, high salinity, high sodium or poor drainage. Some large areas of clay soils are excluded from irrigable land because of their high sodium.

SOIL RELATED TO IRRIGABLE LAND CLASSES

Soil profiles representative of the three irrigable land classes in each of the three physiographic areas in Prairie County are as follows:

Irrigable Class 1 Land: Representative profile of loam textured soil mainly on floodplains.

Typifying Soil Profile:

Ap	0″ - 7″	Light brownish gray loam, dark grayish brown moist; weak granular structure; soft, very friable, slightly sticky and slightly plastic; moderate effervescence, moderately alkaline (pH 8.4) (7 to 10 inches thick).
C1	7″ - 31″	Light brownish gray loam, grayish brown moist; massive but with evident stratification varying slightly in color and amount of silt and sand in loam; slightly hard, friable, slightly sticky and slightly plastic; moderate effervescence, moderately alkaline (pH 8.4); clear boundary (20 to 60 inches thick).
C2	31″ - 58″	Light gray sandy loam, grayish brown moist; massive; soft, very friable, nonsticky and nonplastic; moderate effervescence, moderately alkaline (pH 8.1); clear boundary (0 to 30 inches thick).
IIC3	58″ - 68″	Light gray sand and gravel; single grain; loose; slight effervescence.

Range in Characteristics: These soils have mean annual soil temperature of 47 degrees F. or more. The profile may be noncalcareous in surface layers. The texture below the Ap horizon is loam or light clay loam with between 18 to 35 percent clay and more than 15 percent fine and coarse sand. The profiles are nongravelly. Buried A1 horizons are common.

Irrigable Class 2 Land: Representative profile of the floodplains with a moderately fine textured soil without soils structure below the surface horizon.

Typifying Soil Profile:

Ap	0″ - 8″	Light olive gray clay loam, olive gray moist; moderate medium grandular structure; very hard, friable, sticky and plastic; strong effervescence; abrupt boundary.
C	8″ - 60″	Light olive gray clay loam, olive gray moist; massive; very hard, friable, sticky and plastic; strong effervescence (32 or more inches thick).

Range in Characteristics: These soils have mean annual temperature ranges from 48 to 50 degrees F. They are calcareous with only about 1 percent of segregated lime. Soil between 10 to 40 inches in usually stratified with textures of loam and light clay or silt loam and silty clay, or may be of uniform texture. Average clay percentage in the 10 to 40 inch depth ranges from 35 to 45.

Irrigable Class 2 Land: Representative profile of a moderately fine textured soil on "benches" with strong grade of blocky structure in the subsoil.

Typifying Soil Profile:

A1	0″ - 2″	Grayish brown silt loam, very dark grayish brown moist; weak thin platy structure parting to weak very fine crumb structure; soft, very friable, slightly sticky and plastic; common bleached silt and very fine sand-size particules; moderately acid (pH 5.8); abrupt boundary (2 to 5 inches thick).
B2t	2″ - 11″	Brown crushed heavy silty clay loam, dark brown moist, brown crushed moist; strong fine and medium prismatic structure separating easily to strong fine and very fine subangular blocky structure; very hard, friable, sticky, plastic; moderately thick continuous clay films coating and bridging mineral grains and partly filling many pores; neutral (pH 7.0); clear boundary (8 to 12 inches thick).
B3	11″ - 16″	Dark grayish brown, silty clay loam, very dark grayish brown moist; strong medium prismatic structure separating to strong fine subangular blocky structure; hard, friable, sticky, plastic; moderately thick and continuous clay films coating and bridging mineral grains; mildly alkaline (pH 7.7); gradual wavy boundary (2 to 5 inches thick).
C1ca	16″ - 20″	Light olive brown light silty clay loam, olive brown moist; moderate medium and fine blocky structure; hard, friable, sticky, slightly plastic; moderate effervescence; common white nodules of lime; moderately alkaline (pH 8.3); gradual boundary.
C2ca	20″ - 44″	Pale olive heavy silt loam, olive gray moist; blocky structure; hard, very friable, slightly sticky, slightly plastic; moderate effervescence; many soft white nodules of lime; moderately alkaline (pH 8.3); gradual boundary.
C3	44″ - 60″	Olive very fine sandy loam, moist; blocky structure; soft, very friable, slightly sticky; moderate effervescence, few seams of lime; moderately alkaline (pH 8.3).

Range in Characteristics: These soils have mean annual soil temperature ranges from 47 to 50 degrees F. Thickness of solum ranges from 10 to 20 inches. Most pedons have Ap horizons 5 to 8 inches thick of silty clay loam. Clear uncoated silt and fine sand grains are abundant in the A horizon. The finest texture is in the upper 3 to 5 inches of the B2t horizon, starting at depths of 2 to 5 inches below the surface. These layers contain between 35 and 50 percent clay. In plowed soils they are mixed in the Ap horizon. The B2t remaining beneath the Ap horizon ranges from 35 to 45 percent clay and contains 2 to 8 percent more clay than the Ap horizon. Distinct clay films are on faces of peds in the B2 horizon, and many pores are partially filled with clay. The Cca horizon contains less than 15 percent $CaCO_3$ equivalent but has accumulations of secondary lime. The C horizon is silt loam that contains less than 15 percent fine and coarser sand. Some pedons have IIC horizons of contrasting texture below depths of 40 inches.

Irrigable Class 2 Land: Representative profile of a loam textured soil with strong blocky structure on "benches", 20 to 40 inches deep over loose sand and gravel.

Typifying Soil Profile:

Ap	0″ - 6″	Grayish brown loam, very dark grayish brown moist; weak fine crumb structure; soft, very friable.
B2t	6″ - 14″	Brown clay loam, dark brown moist; strong medium prismatic structure separating to moderate medium blocks; very hard, friable, slightly sticky, slightly plastic; moderate thick clay films; clear boundary (6 to 10 inches thick).
B3	14″ - 17″	Grayish brown heavy loam, dark grayish brown moist; weak medium prismatic structure; hard, friable; thin patchy clay films; clear boundary (2 to 4 inches thick).
C1ca	17″ - 30″	Light brownish gray loam, light olive brown moist; massive; hard, friable, strongly calcareous with many soft masses of lime; abrupt boundary (6 to 16 inches thick).
C2ca	30″ - 32″	Light, brownish gray gravelly loam, light olive brown moist; massive; slightly hard, very friable; strongly calcareous with many masses of lime; abrupt boundary (2 to 4 inches thick).
IIC3	32″ - 40″	Very gravelly sandy loam and loamy sand; moderately calcareous with lime crusts on gravels (0 to 8 inches thick).
IIC4	40″ - 60″	Loose sands and gravels; calcareous.

Range in Characteristics: Loam is the dominant type; in deeply tilled fields, however, the texture of the surface soil is clay loam. Virgin profiles have an A1 horizon 2 to 4 inches thick, and an AB horizon, also of a loam texture, 3 to 5 inches thick. The B2 horizon has about 28 to 38 percent clay with an absolute increase of 5 to 10 percent over the Ap horizon and as much as 15 percent over the A1 horizon. The structure ranges from moderate to strong in grade in the B2 horizon. Thickness of solum ranges from 12 to 20 inches. The Cca horizon

is not as distinct in some profiles and lime may be accumulated in the upper part of the IIC horizon in the shallower range of the series. The depth to the sand and gravel substratum ranges from 20 to 40 inches. Colors are of dry soil unless otherwise stated.
Topography: Nearly level to sloping fans and terraces.

Drainage and Permeability: Well drained. The subsoil permeability is moderate.

Irrigable Class 3 Land: Representative profile of a moderately to slowly permeable clay textured soil of the floodplains with little or no salt or sodium in the soil.

Typifying Soil Profile:

Ap	0" - 6"	Olive gray, heavy silty clay, very dark gray moist; strong fine and very fine granular structure; very hard, friable, sticky and very plastic; weak effervescence; cracks are 1 to 3 inches wide and 8 to 18 inches apart; abrupt wavy boundary (6 to 10 inches thick).
AC	6" - 10"	Olive gray heavy silty clay, very dark gray moist; strong very fine blocky structure separating to strong fine granules; extremely hard, firm, sticky and very plastic; weak effervescence; 1 to 2 inch wide cracks; diffuse boundary.
C1	10" - 24"	Olive gray heavy silty clay, dark grayish brown moist; moderate fine blocky structure; extremely hard, firm, sticky and very plastic; stress or pressure cutans on surface of structural aggregates; ½ to 1 inch wide cracks; weak effervescence; diffuse boundary.
C2	24" - 42"	Olive gray heavy silty clay, olive gray moist; weak blocky structure in upper part and massive in lower part; extremely hard, firm, sticky and very plastic; some stress or pressure cutans on surface of structural aggregates and on vertical surfaces of ¼ to ⅓ inch cracks; an occasional thin lens of heavy silty clay loam up to 2 inches thick; weak effervescence; diffuse boundary.
C3	42" - 60"	Light olive gray heavy silty clay, olive gray moist; massive; extremely hard, firm, sticky and plastic; lenses of silty clay loam and light silty clay up to 2 inches thick and lenses of loam and silt loam less than 1 inch thick; few fine faint light yellowish brown dry, mottles; weak effervescence.

Range in Characteristics: The control section is silty clay or clay with a weighted average of about 52 percent clay but with a range from 46 to 60 percent clay, 40 to 50 percent silt plus very fine sand and 0 to 10 percent fine and coarser sand. Montmorillonite or expanding mixed with moderate amounts of montmorillonite is the dominant clay type having a CEC of 60 to 70 me/100 gm clay. The mean annual temperature is about 44 degrees F. but has a range of 42 to 47 degrees F. These soils are usually dry. The epidedon has moderate to strong grades of granular structure. The subsoils have massive or blocky (fragmental) structural aggregates and have weak to moderate effervescence. Occasional lenses up to 2 inches thick of coarser textured materials occur in some pedons at any depth below 24 inches, and contrasting materials occur between depths of 40 to 60 inches as phases.

Drainage and Permeability: Well and moderately well drained with slow infiltration. Permeability is slow to very slow.

Irrigable Class 3 Land: Representative profile of benchland soils, 24 to 40 inches deep over loose sand and gravel.

Typifying Soil Profile:

A1p	0" - 7"	Grayish brown fine sandy loam, very dark grayish brown moist; weak fine and very fine granular structure; soft, very friable, nonsticky and nonplastic, abrupt wavy boundary (6 to 8 inches thick).
B1	7" - 10"	Grayish brown, heavy sandy loam, very dark grayish brown, moderate medium and coarse prismatic structure; very hard, very friable, slightly sticky and nonplastic; clay as bridging and filling between and as coatings on individual sand grains; clear wavy boundary (0 to 3 inches thick).
B2t	10" - 20"	Brown light fine sandy clay loam, dark brown moist; moderate medium and coarse prismatic structure; very hard, very friable, slightly sticky and slightly plastic; clay as film on surface of peds and as filling and bridging between and as coatings on individual sand grains; clear wavy boundary (8 to 12 inches thick).
B3	20" - 26"	Brown heavy fine sandy loam, dark brown moist; moderate medium and coarse prismatic structure; very hard, very friable, slightly sticky and nonplastic; clay as bridging between and as coatings on sand grains; no effervescence; few fine pebbles; clear wavy boundary (4 to 8 inches thick).
C1ca	26" - 32"	Light gray heavy sandy loam, light olive brown moist, very weak coarse and very coarse prismatic structure; hard, very friable, nonsticky and nonplastic; strong effervescence with common fine and medium masses of segregated lime; few small pebbles with lime crusts on undersides; clear wavy boundary (4 to 8 inches thick).
IIC2ca	32" - 36"	Light brownish gray very gravelly loamy sand, light olive brown moist; massive, soft, very friable, nonsticky and nonplastic; very strong effervescence with common coarse masses of segregated lime; about 30 percent gravel; diffuse boundary.
IIC3	36" - 60"	Medium and coarse sands with a few pebbles; loose, weak effervescence; less than 5 percent silt and clay.

Range in Characteristics: The noncalcareous solum is 20 to 28 inches thick. Depth to sandy-skeletal substratum is usually between 30 to 40 inches but ranges between 24 to 40 inches. Mineralogy is mixed but montmorillonite is the dominant clay type. The mean annual temperature is about 43 to 47 degrees F. (6 to 8 degrees C.). These soils are usually dry in their moisture control section, 8 to 16 inches (15 to 40 cm), for more than one-half the time the soil temperature at 20 inches (50 cm) is above 41 degrees F. (5 degrees C.). Sandy loam and fine sandy loam are the principal surface texture phases.

Irrigable Class 3 Land: Representative profile of the uplands and benches with deep fine sandy soil.

Typifying Soil Profile:

A1	0″ - 3″	Dark grayish brown loamy fine sand, very dark grayish brown moist; very weak medium subangular blocky, separating to single grain; loose; many roots, almost matted in top inch; neutral; gradual boundary (1 to 6 inches thick).
C1	3″ - 20″	Grayish brown fine sand, brown moist; very weak coarse subangular blocky separating to single grain; common fine roots; neutral; gradual boundary.
C2	20″ - 44″	Brown fine sand, brown moist; single grain; loose; a few small and medium sized roots; slightly alkaline; gradual boundary.
C3	44″ - 65″	Pale brown fine sand, brown moist; single grain; loose; and occasional fine root; slightly alkaline.

Range in Characteristics: The texture of the control section ranges from sand to loamy fine sand. Evidence of recent wind action, as thin dark layers and variations in amount of fine and medium sand in the C horizon, occurs in places. Most profiles are noncalcareous for more than 60 inches.

SUMMARY

The 1,727 square miles of land in Prairie County is largely used for grazing by livestock. There is approximately 117,000 acres (183 square miles) of cropland. Nearly 14,000 acres of this is irrigated and the remaining cropland is dry farmed with wheat and barley being grown in a crop-fallow system.

Approximately 91,000 acres of land in Prairie County is suitable for irrigation. The ultimate development of additional lands for irrigation will depend on development of a system or systems to get water to the land. The largest areas of potentially irrigable land are on the benches and on the floodplain of larger streams. About 55 percent of irrigable soils in Prairie County are in these physiographic areas. These areas warrant consideration for irrigation development ahead of most upland areas because of the larger tracts of irrigable land and lower pump lifts and shorter distances from a water source.

Acknowledgments

Soil Scientists of Soil Conservation Service: unpublished soil survey and soil series information: Soil Conservation Service, U. S. Department of Agriculture.

Soil Scientists of Bureau of Reclamation: Land Classification, soil descriptions and drainage information; Bureau of Reclamation, U. S. Department of the Interior.

CROPS AND LIVESTOCK

Located in eastern Montana near the North Dakota border, Prairie County is bounded by Garfield County on the west, by McCone and Dawson Counties on the north, Wibaux County on the east, and by Custer and Fallon Counties on the south. Prairie County is bisected by the Yellowstone River about midway between the northern and southern boundaries of Montana.

Prairie County has a land area of 1,727 square miles or 1,105,280 acres. Land ownership is divided as follows: 6 percent by the Northern Pacific Railway, 41 percent by the United States under the control of the Bureau of Land Management, 46 percent by private resident and non-resident owners, and about 7 percent by the State of Montana. The economy of the area is based primarily upon agriculture.

Livestock and livestock products are the major sources of income, followed by dryland and irrigated cropland production. On the dryland, wheat and livestock rank first and second as sources of income; with sugar beets, livestock and feed grain, in that order, providing the main sources of income on the irrigated land.

In Prairie County there are approximately 200 farms, with a total of 93,949 acres classified as cropland. Of this total cropland acreage, 84,982 acres fall into the category of dryland and 8,967 acres are assessed as irrigated land. The dryland is assessed at $9.96 per acre, irrigated land $37.56 per acre, and grazing land at $2.31 per acre. Approximately 52 percent of the total land area is assessed for tax purposes in Prairie County.

CROP PRODUCTION
1967 Harvested Acres

Crop	Irrigated Acres	Irrigated Yield/Acre	Non-Irrigated Acres	Non-Irrigated Yield/Acre	Total Acres	Total Value
Sugar Beets	2,460	16.70 tons	....	....	2,460	$ 560,600
Winter Wheat	200	36.00 bu.	**62,182	26.50 bu.	33,500	1,110,000
Barley	....	....	4,900	30.00 bu.	4,900	147,000
*All Hay	4,000	3.10 tons	12,200	0.75 tons	16,200	441,700
Alfalfa	3,400	3.40 tons	2,300	1.15 tons	5,700	284,000
*Wild Hay	500	1.30 tons	3,400	0.65 tons	3,900	42,000

*Includes 1,593 acres of flood-irrigated land, non-assessable.

**Includes 28,882 acres not cropped each year (in fallow).

LIVESTOCK ON FARMS
1968

All Cattle and Calves	Hogs	Sheep
40,000	1,500	15,000

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 Prairie 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.

GROUNDWATER

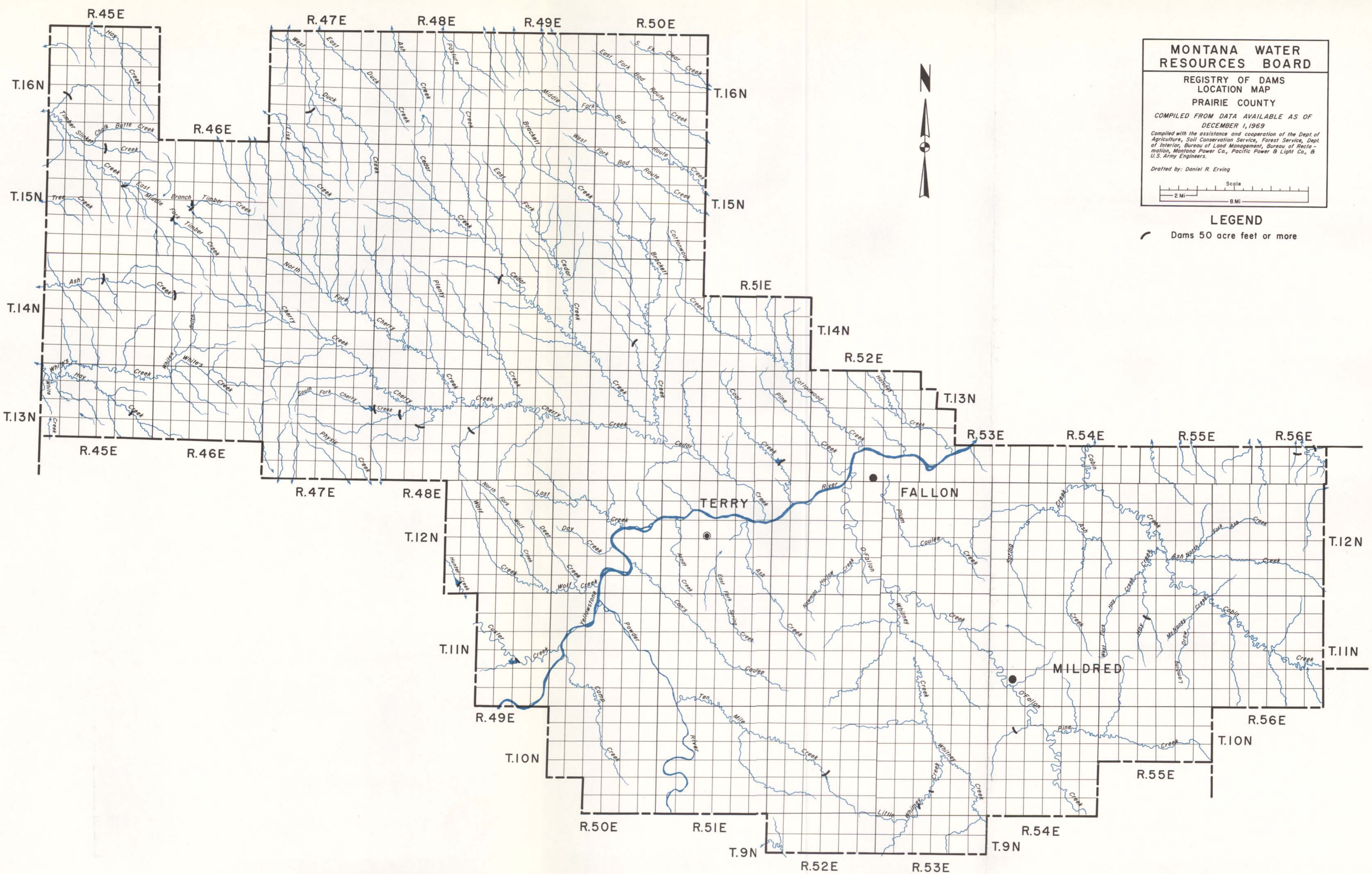
GEOLOGY*

Prairie County is surfaced with flat-lying sandstones of the Fort Union rock sequence. There are subtle indications of broad, gentle structural warping in the western part of the county, and more apparent signs of a sharp uplift passing through the northeastern part of the county. The sharp uplift is the Cedar Creek Anticline, also known as the Baker-Glendive Anticline. The anticline has its origin in a fold associated with the Black Hills in South Dakota, and plunges more than a hundred miles to the northwest, into eastern Montana.

In Prairie County the anticline has a broad eastern limb, and a sharp western limb which merges into a downwarp known as the Sheep Mountain Syncline. The amount of structural relief, from the crest of the asymmetrical Cedar Creek Anticline to the trough of the Sheep Mountain Syncline, is about 1,500 feet. Large quantities of petroleum and natural gas are produced through wells drilled on top of the anticline. Some of these wells are in Prairie County.

The rolling plains and uplands of the county have developed on sandstone, shale, and coal of the Fort Union, and also of the Hell Creek-Fox Hills sequence and the Bearpaw shale. The present topography is the result of episodic uplift and eons of erosion, modified by the drainage system of the Yellowstone River.

*By A. J. Mancini, CPG; Director, Water Resources Division, Montana Water Resources Board.



MONTANA WATER RESOURCES BOARD
REGISTRY OF DAMS LOCATION MAP
PRAIRIE COUNTY
COMPILED FROM DATA AVAILABLE AS OF DECEMBER 1, 1969
Compiled with the assistance and cooperation of the Dept. of Agriculture, Soil Conservation Service, Forest Service, Dept. of Interior, Bureau of Land Management, Bureau of Reclamation, Montana Power Co., Pacific Power & Light Co., & U.S. Army Engineers.
Drafted by: Daniel R. Erving
Scale
2 Mi
8 Mi
LEGEND
Dams 50 acre feet or more
N
TERRY
FALLON
MILDRED
R.45E
R.46E
R.47E
R.48E
R.49E
R.50E
R.51E
R.52E
R.53E
R.54E
R.55E
R.56E
T.16N
T.15N
T.14N
T.13N
T.12N
T.11N
T.10N
T.9N
Yellowstone River
Powder River
O'Fallon Creek
Cherry Creek
Cedar Creek
Bad Route Creek
Whitney Creek
Ash Creek
Timber Creek
Hay Creek
White's Creek
Ten Mile Creek
Pine Creek
Cottonwood Creek

The flow of the Yellowstone River is southwest to northeast, and approximately through the center of the county. During an earlier geologic time the Yellowstone flowed on top of the Fort Union upland. There are several small remnants of Flaxville gravel on top of present-day hills, attesting to the existence of higher drainage levels at some previous time. There are also remnants of topographically intermediate terraces, capped with gravels deposited by a downcutting Yellowstone River.

At one time, more than 1,000,000 years ago, climatic changes caused the expansion of glaciers into Montana from Canada and North Dakota. Glaciers reportedly did not move as far south as Prairie County, but did dam north-flowing rivers so that glacial lakes backed-up into Prairie County.

Glacial "Lake Glendive" formed behind a glacier-dam near the present location of Intake, in Township 18 North, Range 56 East, Dawson County. Water backed-up in the Yellowstone Valley even beyond Miles City, and in the Powder River Valley at least as far as Mizpah, and in other tributary valleys as well. The high stage level of this lake is estimated to have been at an elevation of about 2,500 feet above sea-level. The lake would have included all of the Yellowstone Valley in Prairie County.

Another glacial lake, "Lake Jordan" in Central Montana, reached the western edge of Prairie County in fingers of water reaching up the valleys of Dry Creek, Timber Creek, and Hay Creek. The high level stage of this lake is estimated to have been about 3,000 feet above sea-level.

A mantle of fine sand, silt, and clay was deposited by these lakes; the mantle has been removed, or has only a patchy distribution at present in the areas of Prairie County that were once covered by glacial lakes.

The Yellowstone Valley is floored with alluvium deposited during recent time, after the glaciers retreated from northern Montana, and the glacial lakes were drained.

The Yellowstone River drainage pattern probably has not changed perceptibly since glacial time.

WELLS*

Location of Wells

Prairie County has between 600-700 wells reported within the county (as of January, 1970). Approximately 75-80 percent of these wells are drilled or dug to a depth of less than 300 feet. The remaining 20-25 percent are drilled to depths ranging from 300-1,600 feet. The average depth for all wells is 302 feet, the minimum 8 feet and the maximum 1,600 feet.

Reported wells are not grouped in areas except in towns like Terry and Fallon. Generally the wells are scattered fairly even over the entire county with more density south and southeast of the Yellowstone River. Only a sparse amount of wells are found north and northwest of the Yellowstone River at a distance of 15-20 miles. The north and northwest one-third of the county has numerous wells, not as dense as that south and southeast of the Yellowstone River, but more than the area 15-20 miles north and northwest of the Yellowstone River.

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*By R. J. Guse, Groundwater Supervisor, Water Resources Division, Montana Water Resources Board.

Availability of Groundwater

The following is a discussion of the availability of groundwater from: alluvium, glacial lake deposits of Lake Glendive and Lake Jordan, terrace deposits, Flaxville gravel, Fort Union, Hell Creek, Fox Hills, and Pierre (Bearpaw) shale. The rock units or formation will be discussed from youngest (alluvium) to oldest (Pierre shale) that outcrop in Prairie County.

Wells located in alluvium are mainly along the Yellowstone and Powder Rivers with some along O'Fallon Creek and other minor tributaries. The lithology of sand, gravel and silt produces reported yields of 5-150 gpm with most yields in the range of 10-20 gpm. The over-all approximate thickness of alluvium ranges from 0-40+ feet. One well in section 16, T. 12 N., R. 51 E. claims 150 gpm for irrigation from a depth of 37 feet. The static water level is 20 feet and the pumping water level is 25 feet. Another well in section 25, T. 13 N., R. 52 E. claims 8 gpm for stock from a 20-foot well with a static water level of 9 feet and a pumping water level of 12 feet.

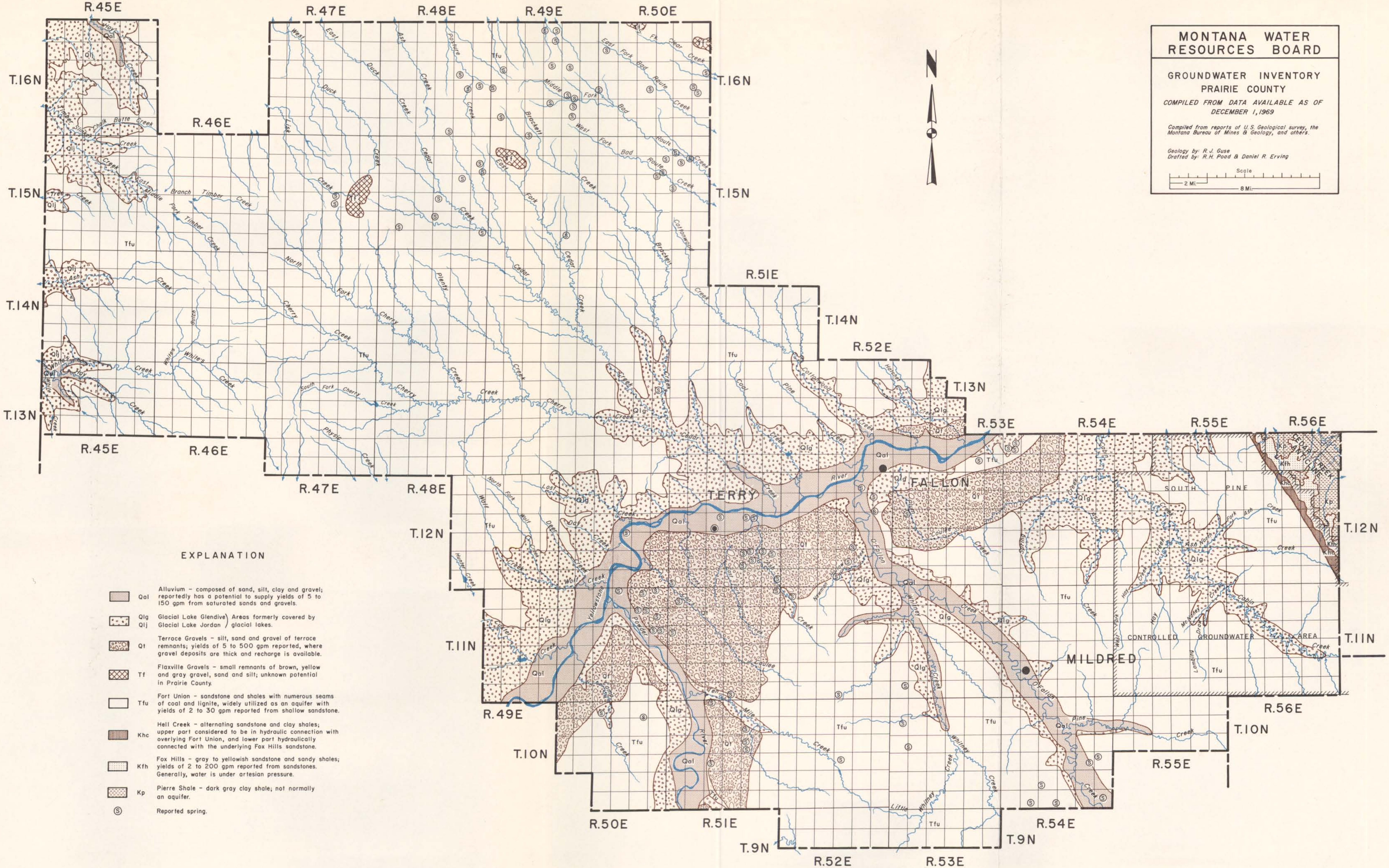
There are no reported wells in the glacial lake deposits of Lake Glendive and Lake Jordan. The water-bearing character and approximate thickness of the glacial lake deposits are unknown.

Thick terrace deposits are found mostly south and southeast of the Yellowstone River. Several dozen wells are reported in terrace deposits south of Terry. A well located in section 21, T. 11 N., R. 51 E. claims 5 gpm from a 144-foot well and another in section 3, T. 11 N., R. 51 E. claims 45 gpm for stock from a depth of 120 feet. The approximate thickness of the terrace deposits ranges from 0-120 feet. Yields of 5-500 gpm have been reported, but most range from 5-20 gpm. Groundwater from these terrace deposits are adequate for domestic needs and small scale irrigation.

The Fort Union formation nearly covers all of Prairie County and has more wells drilled in it than all others combined. Thickness ranges from 0-600+ feet and contain interbedded buff sandstone and shale with coal seams. Most well yields range from 2-12 gpm with some reporting 20 gpm. Water from this formation in most instances is used for stock. In section 26, T. 13 N., R. 47 E. a well reportedly yields 3 gpm from a 188-foot depth and another in section 7, T. 16 N., R. 49 E. uses water for stock from a 136-foot well at a reported yield of 7 gpm.

The Hell Creek formation produces adequate yields for ranchers in some instances. Lithology consists of interbedded gray-brown sandstone and carbonaceous gray shale with approximate thickness ranging from 0-600+ feet. The upper part of the formation is considered to be in hydraulic connection with the overlying Fort Union, and the lower part hydraulically connected with the underlying Fox Hills sandstone. Since this formation is closer to the surface in the area south and east of the Yellowstone River, this is where most of the Hell Creek wells are located.

Deep wells under artesian pressure, with some reported flowing, is typical of the Fox Hills formation. Here most wells are found in the southeast and east part of the county. Yields of 2-200 gpm have been reported and are usually adequate for ranchers. Locally adequate for municipal and small-scale industrial uses. Probably the most widely used aquifer for domestic purposes. Thickness of the Fox Hills formation ranges from 0-200 feet and the lithology consists of gray to white, massive to thin-bedded sandstone, silty and shaly in part. A well in section 5, T. 12 N., R. 55 E. reportedly yields 10 gpm from a 1,225-foot well. Another in section 4, T. 11 N., R. 56 E. at a depth of 1,220 feet yields 20 gpm for domestic and stock purposes.



MONTANA WATER RESOURCES BOARD

GROUNDWATER INVENTORY PRAIRIE COUNTY

COMPILED FROM DATA AVAILABLE AS OF DECEMBER 1, 1969

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

Geology by: R.J. Guse
Drafted by: R.H. Pood & Daniel R. Erving

Scale
2 Mi. 8 Mi.

EXPLANATION

Qal		Alluvium - composed of sand, silt, clay and gravel; reportedly has a potential to supply yields of 5 to 150 gpm from saturated sands and gravels.
Qlg	Glacial Lake Glendive	Areas formerly covered by glacial lakes.
Qlj	Glacial Lake Jordan	
Qt		Terrace Gravels - silt, sand and gravel of terrace remnants; yields of 5 to 500 gpm reported, where gravel deposits are thick and recharge is available.
Tf		Flaxville Gravels - small remnants of brown, yellow and gray gravel, sand and silt; unknown potential in Prairie County.
Tfu		Fort Union - sandstone and shales with numerous seams of coal and lignite, widely utilized as an aquifer with yields of 2 to 30 gpm reported from shallow sandstone.
Khc		Hell Creek - alternating sandstone and clay shales; upper part considered to be in hydraulic connection with overlying Fort Union, and lower part hydraulically connected with the underlying Fox Hills sandstone.
Kfh		Fox Hills - gray to yellowish sandstone and sandy shales; yields of 2 to 200 gpm reported from sandstones. Generally, water is under artesian pressure.
Kp		Pierre Shale - dark gray clay shale; not normally an aquifer.
(S)		Reported spring.

There are no reported wells in the Pierre (Bearpaw) shale in Prairie County. The lithology of dark colored shale is not normally an aquifer. The approximate thickness varies from 200-1,200 feet.

Well Use

Historically the oldest well reported, dates back to 1891 and was used for domestic and stock. Most wells in Prairie County have been drilled between 1940 and 1970. The dominate use is stock, representing 68.2 percent of all well uses. Approximately 644 wells have been reported. The following table shows well uses in Prairie County. Figures are based on available data as of January, 1970.

Well Use	Number of Each Use	Reported Annual Withdrawals*	Total Number Reporting Annual Withdrawals	Total Number Not Reporting Annual Withdrawals	Percent of Total
1. Stock	439	242,308,650	220	219	68.2
2. Domestic/Stock	83	188,919,250	63	20	13.0
3. Domestic	59	20,794,890	27	32	9.2
4. Domestic/Stock/Garden	14	113,943,500	13	1	2.2
5. Industrial	10	39,900,000	5	5	1.6
6. Irrigation	9	9,815,000	6	3	1.3
7. Domestic/Garden	8	5,816,400	7	1	1.2
8. Domestic/Stock/Irrigation.	4	10,184,000	4	0	.6
9. Stock/Garden	4	1,470,000	4	0	.6
10. Stock/Irrigation	2	1,700,000	2	0	.3
11. Domestic/Irrigation	2	2,247,000	2	0	.3
12. Stock/Garden/Irrigation	2	47,321,000	2	0	.3
13. Municipal	2	0	0	2	.3
14. Domestic/Institutional	1	0	0	1	.1
15. Unknowns	5	0	0	5	.8
TOTALS	644	684,419,690	355	289	100%

*Withdrawals are shown in gallons.

SPRINGS

Location of Springs

Springs in Prairie County are grouped into three distinct areas. The largest area extends along both sides of the Yellowstone River from the southwest where the river enters the county to the northeast where it leaves. The next area is located in the northern part of the county on both sides of the divide separating the Yellowstone and Missouri drainages. The last and smallest area is found in the southern part of the county south of Terry and between the Powder River and O'Fallon Creek. These are the three areas representing between 250-300 springs within the county.

The average reported spring yield is 11 gpm, but in most cases a yield of 1-3 gpm is common. The largest reported spring yield is 400 gpm in section 14, T. 12 N., R. 51 E. Other large yields are reported in the following locations: 40 gpm in section 14, T. 12 N., R. 51 E.; 30 gpm in section 1, T. 11 N., R. 51 E.; 50 gpm in section 25, T. 12 N., R. 51 E.; and 50 gpm in section 26, T. 13 N., R. 53 E. It is important to note, that most high yield springs are located in the vicinity of Terry, south of the Yellowstone River. Presumably these springs originate in terrace gravels and alluvium and are fed by irrigation water. The high yields in this area are in contrast to lower yields of other areas where the underlying geology is in most cases the Fort Union formation. Locally, where alluvium, terrace gravel and colluvium are found, larger yields may be expected.

Spring Use

The use of springs historically dates back to the 1860's. At that time springs were dominantly used for stock watering just as they are today. Following this from most used to least used are: stock; domestic, stock and irrigation; stock and irrigation; domestic and stock; domestic, stock and garden; domestic and garden; and a small number of unknown uses.

It is interesting that no single spring is appropriated specifically for domestic use, but in all cases domestic use is combined with some other. Also of interest is the fact that one-third of the springs were appropriated between 1930 and 1945.

Prairie County has 254 springs appropriated (as of January, 1970). As noted earlier the dominant use is stock with 193 reported, representing 76 percent of the total spring use.

The table below shows spring uses in Prairie County. Figures are based on available data as of January, 1970.

Spring Use	Number of Each Use	Reported Annual Withdrawals*	Total Number Reporting Annual Withdrawals	Total Number Not Reporting Annual Withdrawals	Percent of Total
1. Stock	193	335,393,150	90	103	76
2. Domestic/Stock/Irrigation	17	24,978,800	17	0	6.7
3. Stock/Irrigation	28	52,760,000	22	6	11
4. Domestic/Stock	5	6,928,800	5	0	2
5. Domestic/Stock/Garden	2	100,000	1	1	.8
6. Domestic/Garden	1	978,000	1	0	.4
7. Unknowns	8	0	0	8	3.1
TOTALS	254	421,138,750	136	118	100%

*Withdrawals are shown in gallons.

Springs have a reported average annual withdrawal of over 421 million gallons, representing 54 percent (136 springs reporting) of all springs. This is the equivalent of 1,291 acre-feet. (One acre-foot is a volume of one acre in area and one-foot in depth—326,000 gallons per one acre-foot.)

Water yields from springs are not of large quanties. Of the 154 reporting yields the average is 11 gpm, with a maximum of less than 1 gpm to a maximum of 400 gpm. The spring reporting 400 gpm is used for stock and irrigation.

SOUTH PINE CONTROLLED GROUNDWATER AREA*

The South Pine Controlled Groundwater Area is the first controlled area of its type ever established in Montana. It was created on November 1, 1967, by order of the Montana Water Resources Board, following findings of fact and includes the following described lands: Township 12 North, Range 55 East; Township 11 North, Range 55 East; Township 11 North, Range 56 East; that portion of Township 12 North, Range 56 East which is west of the Cedar Creek Anticline; that portion of Township 11 North, Range 57 East which is west of the Cedar Creek Anticline; and that portion of Township 13 North, Range 55 East which is in Prairie County.

Geology**

Structural Geology

The structure of the Cedar Creek Anticline can be described as follows: Cedar Creek Anticline is an asymmetric fold whose axial line trends about North 30° west. The beds on the western flank dip as much as 850 feet per mile near the crest of the anticline. Beds on the eastern flank dip more gently at about 70 feet per mile into the Williston Basin. Several normal faults have been mapped on the eastern flank. The anticline plunges to the northwest, and north of the area the Pierre Shale, Fox Hills Sandstone, and Hell Creek Formation crop out for only a few miles.

Two related structures, the Sheep Mountain syncline and the Ekalaka syncline, are west of the Cedar Creek Anticline. The structures are nearly parallel to the axis of the anticline and also plunge to the northwest. West of these structures the beds dip gently to the north.

The Cedar Creek Anticline seems to merge with the Black Hills uplift to the south, and the two structures may be related. The Black Hills uplift, the Cedar Creek Anticline, the Poplar dome, and the Regina-Hummingbird trough are all along the Nemo-Estes structural trend. (DeMille, Shouldice, and Nelson, 1964.)

Geologic History

At the time of deposition of the Pierre Shale, Fox Hills Sandstone, and Hell Creek Formation, the Late Cretaceous seas were regressive toward the east and south. Formational contacts do not coincide with time lines, and the formations increase in age toward the west.

The uplift and folding that formed the Cedar Creek Anticline occurred throughout much of middle Tertiary time according to H. L. Garrett (oral communications, 1964). The Eocene, Oligocene, and Miocene Series in the region are represented by isolated remnants left by the erosion that followed deposition and uplift. It is not known whether uplift and folding continued into Pliocene and Pleistocene time.

Geologic Formations

Pierre Shale—(Upper Cretaceous Series)

The Pierre Shale is the oldest formation exposed in the South Pine Controlled Groundwater Area. It consists mainly of marine shale and sandstone of Late Cretaceous age. Where younger beds

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*By R. J. Guse.

**From O. James Taylor, Memoir 40, 1965.

have been removed by erosion the Pierre Shale is exposed only along the crest of the anticline. Outcrop consists of impure dark-gray shale that contains bentonite, concretions as much as one foot in diameter, large boulders of sandstone, gypsum veins and crystals and local beds of sandstone. The shale in the upper part of the formation is relatively impervious and not water bearing. Deep sandstones in the Pierre Shale are water bearing, but the water generally is of poor chemical quality and may contain natural gas (Perry, 1935.)

The contact between the Pierre Shale and the overlying Fox Hills Sandstone is transitional. The transitional beds consist of sandy shales containing concretions, phosphatic pebbles, and orogomite. (Erdmann and Larsen, 1934.)

Fox Hills Sandstone—(Upper Cretaceous Series)

The Fox Hills Sandstone consists of marine and brackish-water deposits of cross-bedded sandstones, siltstone, and shale (Dobbin and Reeside, 1929). The upper part consists of a light-gray sandstone about 40 feet thick, which is named the Colgate Member. The sandstone in the lower unnamed member is fine to medium grained, light brown, yellow brown, or light green and contains some concretions. The sand grains in the lower member are variegated as contrasted to the sand grains of the overlying Hell Creek Formation, which are more nearly uniform in color.

The Fox Hills ranges in thickness from 100 to 150 feet. It is exposed in a narrow belt on each side of the anticline. Exposures of the Colgate Member are poor or absent in the southern part.

The sandstone beds of the Fox Hills are water bearing and yield soft water, which is satisfactory for domestic and stock use.

Hell Creek Formation—(Late Cretaceous Series)

The Hell Creek Formation consists of non-marine and brackish water sandstone, shale, mudstone, and siltstone (Dobbin and Reeside, 1929). The base of the Hell Creek commonly consists of about 100 feet of light-brown to green, medium to coarse-grained, cross-bedded sandstone. The sandstone characteristically contains abundant 1-inch sandstone concretions with black sooty cores that are surrounded by orange or yellow layers.

The basal sandstone of the Hell Creek is in contact with the Fox Hills Sandstone, and these sandstones constitute a relatively thick and continuous aquifer. This aquifer yields water for many towns and ranches in eastern Montana.

Fort Union Formation—(Paleocene Series)

Overlying the Hell Creek Formation is the Fort Union Formation of Paleocene Age. Perry (1935) regarded the Fort Union Formation and Hell Creek Formation as coastal plain deposits.

The Fort Union has been divided into three members in eastern Montana by some workers: a lower member known as the Tullock, a middle member known as the Lebo Shale, and an upper member known as the Tongue River. Difficulties in distinguishing the contact between the Tullock and the Lebo caused Perry (1935) and Jelelsky (1962) to use the name Ludlow in this area.

PRAIRIE COUNTY STRATIGRAPHIC SECTION

Rock Unit or Formation (Youngest to Oldest)	Geologic Age	Symbol	Approximate Thickness In Feet	Lithology	Water-Bearing Character
Alluvium	Quaternary	Qal	0 to 40+	Sand, gravel, silt.	Yields of 5 to 150 gpm reported, with most yields in the range of 10 to 20 gpm.
Glacial lake deposits of Lake Glendive and Lake Jordan	Quaternary	Qlg Qlj	Unreported	Fine sand, silt, and clay; patchy distribution or absent, resulting from prior existence of Glacial Lake Glendive (Qlg) and Glacial Lake Jordan (Qlj).	Unreported.
Terrace deposits	Quaternary	Qt	0 to 120+	Sand, gravel, silt.	Yields of 5 to 500 gpm reported, most in the range of 5 to 20 gpm; adequate for domestic needs, and small-scale irrigation.
Flaxville gravel	Tertiary	Tf	Unreported	Sand and gravel; patchy distribution where present.	Unreported.
Fort Union	Tertiary	Tfu	0 to 600±	Interbedded buff sandstone and shale, with coal seams.	Yields of 2 to 20 gpm reported, most in the range of 2 to 12 gpm; adequate for ranchers in some instances.
Hell Creek	Cretaceous	Khc	0 to 600±	Interbedded gray-brown sandstone and carbonaceous gray shale.	Yields adequate for ranchers in some instances. The upper part of the formation is considered to be in hydraulic connection with the overlying Fort Union, and the lower part hydraulically connected with the underlying Fox Hills sandstone.
Fox Hills	Cretaceous	Kfh	0 to 200	Gray to white massive to thin-bedded sandstone, silty and shaly in part.	Yields of 2 to 200 gpm reported; usually adequate for ranchers, and locally adequate for municipal and small-scale industrial uses. Most-widely used aquifer for domestic purposes; water is under artesian pressure, and flowing yields are reported.
Pierre (Bearpaw) shale	Cretaceous	Kp(Kb)	200 to 1,200	Dark colored shale.	Not normally an aquifer.
Judith River	Cretaceous	Kjr	400 to 600	Interbedded tan sandstone, siltstone, and shale.	Sandstone intervals may yield small amount of water locally. Produces natural gas on the Cedar Creek Anticline.
Claggett	Cretaceous	Kcl	300 to 500	Tan-gray shale and sandy shale.	Not normally an aquifer.
Eagle	Cretaceous	Ke	200 to 300	Gray, white, "salt and pepper" sandstone and gray shale.	Sandstone intervals may yield small amounts of water locally. Produces natural gas on the Cedar Creek Anticline.
Telegraph Creek	Cretaceous	Ktc	50 to 100	Gray sandy shale.	Not normally an aquifer.
Colorado group	Cretaceous	Kc	2,000±	Dark-colored shales with thin sandstone stringers.	Not normally an aquifer, although sandstones within the interval may locally yield water.
Dakota	Cretaceous	Kd	70 to 100	Light-colored siltstone and sandstone.	Sandstone intervals may yield small to moderate amounts of water locally.
Fuson	Cretaceous	Kf	50 to 100	Dark and varicolored shales, locally with light-colored sandstone.	Sandstone may yield moderate amounts of water.
Lakota	Cretaceous	Kl	80 to 150	White sandstone, locally clay-filled.	Normally yields small to moderate, and occasionally large, amounts of potable water.
Jurassic interval	Jurassic	Ju	900 to 1,000	Light-colored sandstone, tan limestone, gray and dark-colored shales.	Sandstone may locally yield small amounts of water.
Triassic interval	Triassic	Tr	150 to 350	Red, brown, sandstones and shales.	Not considered an aquifer, although sandstones locally may yield water.
Permian interval	Permian	P	440±	Light-colored limestone and varicolored shale.	Not normally an aquifer in this area.
Pennsylvanian interval	Pennsylvanian	P	150±	Varicolored shales, limestone stringers, and sandstone lenses.	Sandstone lenses may yield water.
Big Snowy group	Mississippian	Mbs	450 to 800	Dark and varicolored shales, light-colored limestone, and red sandstones and siltstones.	Limestone and sandstone may locally yield water.
Madison group	Mississippian	Mm	1,400 to 1,700	Light-colored massive and thin-bedded limestone.	May yield copious amounts of water locally from solution cavities in massive limestone.
Devonian interval	Devonian	D	20 to 600	Tan, brown dolomites and limestones, with shale interbeds.	Several units within this interval yield small amounts of water.
Silurian interal	Silurian	S	175 to 300	Cream-colored, white, tan, and brown dolomites.	May yield small to moderate amounts of water locally. Produces oil on the Cedar Creek Anticline.
Ordovician interval	Ordovician	O	700±	Tan and brown dolomites, dark shales, and light-colored sandstones.	May yield water locally. Produces oil on the Cedar Creek Anticline.
Cambrian interval	Cambrian	Ꞓ	1,000±	Sandstone, shale, dolomite, and limestone.	May yield water locally.
Precambrian	Precambrian	pꞒ		"Hard rock."	May yield small amounts of water through fractures.

The Fort Union attains a maximum thickness of 600 feet in the study area but thickens to the west. Both members are composed of interlayered beds of shale, sandstone, siltstone, lignite, and limestone which are difficult to trace laterally because of facies changes. The Tongue River member contains clinker beds which are very resistant to erosion. Differential erosion has produced typical badlands and the variety of color in the beds adds to the striking appearance of the resulting landscape of the Fort Union. The Fort Union is exposed over very wide areas in eastern Montana and in Wyoming, North Dakota, South Dakota, and Canada.

Many shallow water wells in eastern Montana produce water from the sandstone and coal beds in the Fort Union. North of Ollie and Carlyle a good well may be obtained at a shallow depth in the Fort Union, hence few wells have been drilled to the aquifer in the Fox Hills and basal part of the Hell Creek. Perry (1931) noted that most of the water wells are less than 200 feet deep. Two or three test holes may have to be drilled to obtain a satisfactory well and the yield of the well may decline within a few years. The groundwater in the Fort Union generally is harder than water from the aquifer in the Fox Hills and basal part of the Hell Creek.

Recharge*

Aquifer in Fox Hills Sandstone and Basal Part of Hell Creek Formation

It is believed that the main recharge area for the western flank of the anticline is on the northern flank of the Black Hills uplift where there are wide exposures of the aquifer at a relatively high altitude. Another potential recharge area is the outcrop of the aquifer along the western flank of the anticline. There may be some recharge in T. 12 N., R. 56 E., where exposures of the Fox Hills Sandstone are more extensive than elsewhere along the western flank of the anticline. The configuration of the piezometric contours in the area is also affected by many flowing and pumped wells, some of which have been used for many years. It is difficult to assess the amount of recharge along the narrow outcrop because control is not adequate for the determination of the slight contour deflections that would be expected.

Very little discharge would be expected in the outcrop area because the exposure area of the aquifer is small, the precipitation is light, and evaporation is aided by low relative humidity, moderate wind movement, and hot summers. The aquifer permeability is low, and therefore the downward percolation of precipitation would be small and capillary rise above the water table would be large. In the northern part of the anticline, water accumulates in undrained depressions in the outcrop, but the aquifer is not saturated below the ponds, because they have been partly sealed with fine sediment washed from nearby exposures. Thus, most of the ponded water is lost by evaporation.

Recharge of the aquifer on the eastern flank of the anticline probably occurs in the broad exposures east of Baker. The entire outcrop of the aquifer along the eastern flank may be an important recharge area because of the relatively large area of outcrop.

Upper Part of Hell Creek Formation and Fort Union Formation

Cabin Creek loses a large part of its flow before it reaches the Yellowstone River, and evaporation alone cannot account for the loss. Thus, recharge to the Fort Union Formation probably occurs through sandstone beds exposed in its extensive outcrop area. The sandstone beds probably re-

*From O. James Taylor, Memoir 40, 1965.

ceive recharge from precipitation as well as from influent streams. Presumably the exposed sandstone beds are interconnected with deeper aquifers in the upper part of the Hell Creek Formation and in the Fort Union Formation, and thus both formations are recharged. Also, the aquifer in the Fox Hills and basal part of the Hell Creek may be in hydraulic connection with the aquifer of the upper part of the Hell Creek in certain places.

Movement*

Groundwater always moves down gradient because it flows from one energy state to a lower energy state and in so doing dissipates energy in the form of friction in the aquifer. The movement occurs perpendicular to the piezometric contours. Therefore, the general direction of groundwater movement in the aquifer in the Fox Hills and basal part of the Hell Creek is toward the northwest and approximately parallel to the trend of the anticline. The velocity of groundwater movement would be extremely low, probably less than 4 feet per year, in this aquifer because of the low regional hydraulic gradient and low permeability.

Discharge*

Aquifer in Fox Hills Sandstone and Basal Part of Hell Creek Formation

Groundwater in the aquifer in the Fox Hills Sandstone and basal part of the Hell Creek Formation is discharged to the Yellowstone River in the area of T. 13 N., R. 54 E. The river crosses the outcrop a little farther downstream.

Groundwater in this aquifer also is discharged where Cabin Creek crosses the outcrop in section 27, T. 11 N., R. 57 E. Springs issuing from the aquifer feed Cabin Creek and add considerably to its flow.

Nearly every town in the area obtains its municipal supply from the aquifer. The towns of Baker, Plevna, Mildred, Ismay and Willard would have great difficulty in obtaining a suitable water supply from any other source. There are hundreds of private and domestic and livestock wells completed in the aquifer. Many wells are drilled along O'Fallon and Cabin Creeks because flowing wells can be obtained in these topographically low areas. Industrial wells use water from the aquifer for secondary recovery of petroleum, petroleum treatment, and associated processes.

Upper Part of Hell Creek Formation and Fort Union Formation

It is likely that the discharge from aquifers in the upper part of the Hell Creek Formation and in the Fort Union Formation would discharge naturally into the Yellowstone River. A few springs issue from the aquifer, especially where the surface relief is great and sandstone beds are exposed. Many private livestock and domestic wells are completed in the aquifers; many of these wells are artesian, and some have moderate flows.

Observation Wells**—South Pine Controlled Groundwater Area

Dave Strobel: SE¼SW¼ section 25, T. 12 N., R. 55 E.

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*From O. James Taylor, Memoir 40, 1965.

**Measurements by U. S. Geological Survey and Shell Oil Company.

Drilled stock and artesian well in Fox Hills Sandstone and Hell Creek Formation, diameter 4 inches, depth 1,275 feet, cased with pipe. MP (measuring point) hole in side of pump, 3.6 feet above LSD (land-surface datum) and 2,445.6 feet above MSL (mean sea-level). Records available 1965-1969.

March 15, 1966	6.70	August 20, 1968	21.18
July 6	9.01	September 21	23.56
September 13	11.30	November 25	22.58
November 17	(a)	March 5, 1969	22.86
March 21, 1967	13.49	April 7	22.82
June 21	14.83	May 8	23.49
August 15	15.88	June 4	23.65
October 31	16.93	July 15	24.01
February 14, 1968	16.28	August 11	24.13
May 7	20.57	September 8	24.68
June 18	20.46	October 8-9	24.88
July 18	20.94	November 4	27.10

(a) well being pumped.

T. Strobel: NE¼NW¼ section 27, T. 12 N., R. 55 E.

Drilled domestic and stock flowing artesian well in Fox Hills Sandstone and Hell Creek Formation, diameter 2 inches, depth 1,000 feet, steel casing. MP top of outer casing, 0.5 feet above LSD and 2,334 feet above MSL. Records available 1968-1969.

June 18, 1968	+50.6	June 4, 1969	+47.9
July 18	+50.8	July 15	+53.6
August 20	+53.8	August 11	+49.8
November 25	+52.7	September 8	+48.8
April 7, 1969	+33.7	October 8-9	+48.3
May 8	+46.8	November 4	+48.4

Shell Oil Company: SW¼SE¼ section 23, T. 12 N., R. 56 E.

Drilled unused artesian well in Fox Hills Sandstone and Hell Creek Formation, diameter 4 inches, depth 1,185 feet, cased with pipe. MP top of casing, 1.50 feet above LSD and 2,703 feet above MSL. Records available 1965-1969.

March 15, 1966	347.33	July 18, 1968	412.35
May 2	357.14	August 20	405.96
July 6	358.64	September 21	404.84
September 13	358.86	November 25	404.22
November 17	398.94	March 5, 1969	399.03
March 21, 1967	468.92	April 7	399.05
June 21	466.93	May 8	399.09
August 15	468.41	June 4	400.57
October 31	468.55	July 15	399.11
February 14, 1968	466.36	August 11	399.13
May 7	423.18	September 8	399.16
June 18	415.47	October 8-9	Plugged at 397.0±

Shell Oil Company: NE¼SE¼ section 34, T. 12 N., R. 56 E.

Drilled observation artesian well in Fox Hills Sandstone and Hell Creek Formation, diameter 4 inches, depth 1,467 feet, cased with pipe. MP base of shelter house, 3.1 feet above LSD and 2,710 feet above MSL. Records available 1966-1969.

May 2, 1966	349.46	August 20, 1968	355.05
July 6	354.08	September 21	353.03
September 13	359.69	November 25	351.84
November 17	358.94	April 7, 1969	358.72
April 4, 1967	363.48	May 8	362.44
June 21	360.41	June 4	364.51
August 15	359.95	July 15	366.31
October 31	361.76	August 11	365.15
February 14, 1968	360.95	September 8	367.51
May 7	361.70	October 8-9	369.32
June 18	358.01	November 4	368.01
July 18	356.43		

Arthur McNaney: NW¼NW¼ section 32, T. 11 N., R. 57 E.

Drilled domestic and stock artesian well in Fox Hills Sandstone and Hell Creek Formation, diameter 4 inches, depth 980 feet, cased with pipe. MP top of culvert and 2,594 feet above MSL. Records available 1965-1969.

January 17, 1966	63.75	September 21, 1968	74.51
February 21	64.83	November 25	75.50
March 15	65.42	March 6, 1969	77.91
July 6	68.86	April 7	76.77
November 17	71.92	May 8	77.93
March 21, 1967	70.33	June 4	78.21
October 31	70.84	July 15	80.15
February 14, 1968	72.03	August 11	79.80
May 7	72.13	September 9	79.95
June 18	72.22	October 8-9	80.54
July 18	73.35	November 4	80.48
August 20	74.19		

Union Texas Petroleum: NW¼NE¼ section 17, T. 11 N., R. 57 E.

Drilled industrial artesian well in Fox Hills Sandstone and Hell Creek Formation, diameter 8 inches, depth 1,100 feet, MP 0.8 feet above LSD and 2,633 feet above MSL Records available 1965-1969.

May 2, 1966	82.35	May 7, 1968	82.02
July 6	82.34	June 18	82.89
September 13	81.85	July 18	82.62
November 17	81.65	August 20	82.32
March 21, 1967	81.80	September 21	82.29
October 31	81.93	November 25	82.54
February 14, 1968	81.91	March 5, 1969	81.97

April 7, 1969	82.16	August 11, 1969	82.45
May 8	82.80	September 8	82.84
June 4	82.57	October 8-9	82.89
July 15	82.69		

B. Brownfield: SW¼SW¼ section 2, T. 12 N., R. 56 E.

Drilled unused artesian well in Fox Hills Sandstone, diameter 6 inches, depth 70 feet MP 1.5 feet above LSD and 2,561 feet above MSL. Records available 1965-1969.

January 28, 1965	12.48	September 21, 1968	13.02
April 2	12.34	November 25	13.08
May 28	12.11	March 5, 1969	12.82
July 12	12.18	April 7	12.73
November 17, 1966	12.98	May 8	12.47
March 21, 1967	12.76	June 4	12.47
October 31	13.57	July 15	12.30
February 14, 1968	13.08	August 11	12.54
May 7	12.79	September 8	12.92
June 18	12.60	October 8-9	13.15
July 18	12.80	November 4	13.12
August 20	13.00		

(Not within boundaries of controlled area.)

Pasture 3: NE¼SE¼ section 25, T. 13 N., R. 55 E.

Drilled stock artesian well in Fox Hills Sandstone, diameter 4 inches, depth 100 feet. MP 3.0 feet above LSD and 2,441 feet above MSL. Records available 1965-1969.

May 2, 1966	33.26	November 25, 1968	34.67
November 17	33.85	March 5, 1969	34.31
March 21, 1967	33.65	April 7	34.38
October 31	34.04	May 8	34.59
February 14, 1968	34.09	June 4	34.64
May 7	34.22	July 15	35.58
June 18	34.49	August 11	34.41
July 18	34.47	September 8	35.93
August 20	35.54	October 8-9	36.10
September 21	35.91	November 4	34.69

B. Brownfield: NE¼SW¼ section 24, T. 12 N., R. 56 E.

Drilled unused artesian well in Fox Hills Sandstone, diameter 4 inches, depth 145 feet MP .10 above LSD and 2,654 feet above MSL. Records available 1965-1969.

May 27, 1965	114.75	February 14, 1968	116.88
July 12	114.55	May 7	117.19
August 31	114.83	June 18	117.42
November 17, 1966	115.45	July 18	118.76
March 21, 1967	119.72	August 20	117.77
October 31	116.37	September 21	117.86

November 25, 1968	118.13	July 15, 1969	118.98
March 5, 1969	118.02	August 11	118.81
April 7	118.25	September 8	119.19
May 8	118.82	October 8-9	119.44
June 4	118.86	November 4	119.12

D. Hoffer: SW¼SE¼ section 20, T. 12 N., R. 55 E.

Drilled domestic and stock artesian well in Fox Hills Sandstone and Hell Creek Formation, diameter 4 inches, depth 1,187 feet. MP 10 feet below LSD and 2,477 feet above MSL. Records available 1967-1969.

March 21, 1967	76.39	March 5, 1969	82.08
October 31	76.22	April 7	84.51
February 14, 1968	78.66	May 8	81.94
May 7	78.81	June 4	81.57
June 18	78.18	July 15	83.60
July 18	79.34	August 11	81.44
August 20	78.93	September 8	84.55
September 21	79.22	October 8-9	83.33
November 25	79.83	November 4	84.06

D. H. Baggott: SE¼SW¼ section 19, T. 12 N., R. 56 E.

Drilled stock artesian well in Fox Hills Sandstone and Hell Creek Formation, diameter 2 inches, depth 1,140 feet below top of LSD and 2,431 feet above MSL. Due to lack of sufficient data, measurements are not shown.

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ECONOMIC MINERAL DEPOSITS

Economic mineral deposits—metallic, nonmetallic, mineral fuels, and groundwater—are directly related to the geology of a given area. The geologic situation in Prairie County is therefore summarized before the resources are considered.

Prairie County is situated within the Northern Great Plains physiographic province, which may also be called the High Plains province. There are no mountains within the county, and the terrain is typically a high plain dissected by stream valleys.

The Fort Union Formation is the underlying bedrock throughout the county except the extreme northeast corner. In this area, formations underlying the Fort Union Formation are exposed on the Cedar Creek Anticline. These are the Hell Creek Formation, Fox Hills Sandstone, and Pierre Shale.

Petroleum Resources

Discovery of oil in the Pine field in 1952 ushered in production from one of Montana's greater oil producing provinces, the Cedar Creek Anticline. Paradoxically, Prairie County has not enjoyed extensive exploration during the subsequent years, but interest is rising. Approximately 40 exploratory wells have been drilled, of which 17 were completed during 1968. Most of these tests were looking for production from the Muddy Sandstone, but they resulted in no additional production beyond the part of Pine field that belongs to Prairie County. Extensive areas still remain virtually untested.

Coal

Prairie County has an estimated 1,580 million short tons of lignite (coal). Four strippable coal fields of undetermined tonnage are situated in close proximity to Yellowstone River, and leasing is active at present. These are the Coal Creek field, the Custer Creek field, the Crow Rock field, and the Timber Creek field. The coal is 8 to 12 feet thick and is in the Fort Union Formation (Tertiary).

Sand and Gravel

Sand and gravel deposits are widespread along the Yellowstone River and other major streams in the county.

Metals

Prairie County has no known deposits of metals.

PRAIRIE COUNTY COOPERATIVE STATE GRAZING DISTRICT

Prairie County is served by the Prairie County Cooperative State Grazing District. The District, which was organized in 1939, is governed by a board of five Directors who are elected by **preference holding** members of the district. The district signed the original basic memorandum of understanding with the U. S. Department of Agriculture on February 14, 1941.

It is the policy of this district to provide for the conservation of the soil, moisture, and forage resources of the district, to preserve and develop natural resources of the district, to control floods, prevent deterioration of dams and reservoirs, preserve wildlife, protect the tax base, protect public lands and protect and promote the health, safety and general welfare of the people of the district.

The Prairie County Grazing District works closely with the Soil Conservation Service, the Bureau of Land Management, the Extension Service, the Farmers Home Administration, the Agricultural Stabilization and Conservation Service and the Montana State Fish and Game Department.

The cooperation of these agencies makes a complete and balanced soil and water conservation program possible in the District.

The Soil Conservation Service assists the District by furnishing basic data on soils and plant cover and other features of the land. Technical data are 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 experiences of the individuals involved.

The technical assistance is available to any operator in the county without cost upon request to the District by the farmer or rancher. Cost-sharing assistance to help in the cost of applying conservation practices is available through the Great Plains Conservation Program administered by the Soil Conservation Service and the Agricultural Conservation Program administered by the Prairie County Agricultural Stabilization and Conservation Service.

Prairie County comprises 1,105,280 acres of land. The Federal Government owns 451,054 acres or 41 percent of the county. The State of Montana owns 71,843 acres or 6½ percent of the county. The balance of 582,383 acres is privately owned and makes up 52½ percent of the county.

There are approximately 119,000 acres of cropland, of which 13,927 are irrigated. Over 85 percent of the county, 966,000 acres, is used for range, pasture or hayland. In addition, there are approximately 9,500 acres of "other lands" which include towns, railroads, highways, airports, cemeteries, etc.

The major crops grown in Pairie County are forage crops, small grains, and sugar beets. Beef cattle is the major livestock enterprise.

The major conservation practices in the district on rangeland are development of dams, springs and wells for livestock water, grass seeding for hay and pasture and cross fencing for better management of grazing. Cropland problems are wind and water erosion. Erosion on dry cropland is controlled by the following practices: stripcropping and stubble mulching, grassed waterways, diversions, and farmstead and field windbreaks. On irrigated cropland conservation practices include: land leveling, water control structure, drainage, and concrete ditch lining.

FISH AND GAME

Prairie County falls within the sagebrush-grassland prairie of eastern Montana. This prairie country historically supported a great variety and abundance of game animals. The Yellowstone

Valley was once considered the greatest hunting area in the west. Livestock and agriculture have mostly replaced the once great game herds, but the prairie continues to be the most productive wildlife habitat in Montana.

Antelope in large numbers may be found throughout the sagebrush range they depend on for food and cover. Eight out of every ten hunters successfully hunt antelope in the fall. Mule deer range freely over the prairie; buttes and bottomlands alike, having the greatest abundance on well managed range. The whitetail deer is distributed along the stream and river bottoms where there is sufficient cover for his secretive habits. Deer hunters average 90 percent success each fall. Two-deer bag limits are allowed and many non-residents hunt the easily accessible terrain.

Game bird hunting is considered some of the finest in the northwest. Pheasants, Hungarian partridge, sharptail grouse, sage grouse and many species of waterfowl all vie for the hunters' attention.

Fishing is largely for warm-water species such as pike, sauger, walleye, bass and crappie. As water is not a plentiful commodity, most landowners have developed stock ponds. The Montana Fish and Game Department and the U. S. Bureau of Sport Fisheries and Wildlife have planted warm-water fish in many of these where the landowner will allow public fishing. In deeper and colder ponds, trout have been stocked to round out the fishing variety. Catfish abound in the Yellowstone River and provide excellent fishing for young and old alike.

WATER RESOURCES SURVEY

Prairie County, Montana

PART II

Irrigation Development With Maps Showing Irrigated Areas In Colors Designating Sources of Supply

Published by
MONTANA WATER RESOURCES BOARD
Sam W. Mitchell Building
Helena, Montana 59601
September, 1970

IRRIGATION DEVELOPMENT

The first irrigation of the land now contained within the Buffalo Rapids Project was made by farmers prior to the drought period of the early 1930's.

One of two methods tried was by a diversion dam from the Yellowstone River and the other by pumping. The diversion dam method failed because a suitable dam was not provided and the pumping unit proved unsatisfactory because the fuel operated power plant was too costly.

In 1933, investigations by local businessmen to combat depressed conditions of the area, led to the formation of the Mid-Yellowstone Recovery Association and financing by National Recovery Act funds to further investigate the Project Area by the Bureau of Reclamation. Based on the report of this investigation, the Glendive Unit of the First Division, Buffalo Rapids Project, was authorized for construction by the Bureau of Reclamation.

BUFFALO RAPIDS PROJECT

HISTORY

The Glendive Unit was approved by the President on September 27, 1937, to irrigate an estimated 15,500 acres, with funds provided under the Emergency Relief Appropriation Act of 1937. The Glendive Extension was approved by the President on May 15, 1940, for 3,000 acres under the Water Conservation and Utilization Act of May 10, 1939, (53 Stat. 685). The Glendive Unit and Extension constitute the First Division.

The construction of the Glendive Unit, First Division, was initiated in 1937 by the Bureau of Reclamation. The main canal and portions of the laterals of this unit were completed in the spring of 1941. In 1942 and 1943, the Farm Security Administration completed the balance of irrigation laterals and concrete structures on the First Division. A third pumping unit at the Glendive Pumping Plant was installed by the Bureau of Reclamation in 1944 to increase the capacity of the pumping plant and furnish irrigation water for an additional 6,000 acres, or to be used as a standby in case one of the other two pump units need repairs during the irrigation season.

The **Shirley, Terry** and **Fallon** Units of the Second Division were approved by the President on October 11, 1939, and a revised plan on May 15, 1940, under the Water Conservation and Utilization program.

As a natural outgrowth of the initial development, the Second Division, comprising the Shirley, Terry and Fallon Units along the east bank of the Yellowstone River, was conceived. Construction of the Second Division began in September 1940 and proceeded, with some delays, throughout World War II, although work on the Fallon Unit did not begin until August 1945. Construction of the Second Division was essentially completed in 1948.

The project is operated by the Buffalo Rapids Board of Control as the agent of the Buffalo Rapids Irrigation District No. 1 and Buffalo Rapids Irrigation District No. 2.

PRESENT STATISTICS

Location: Lands irrigated under the **Glendive Unit, First Division** are located in sections 24, 25 and 26, T. 13 N., R. 52 E.; and in sections 17, 18, 19, 20, 29 and 30, T. 13 N., R. 53 E

Location of irrigated lands in the Second Division are: **Shirley Unit**—sections 25 and 36, T. 11 N., R. 49 E.; and sections 17, 18, 19, 20, 21, 29, 30 and 31, T. 11 N., R. 50 E.

Terry Unit—section 13, T. 12 N., R. 50 E.; sections 8, 9, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24, T. 12 N., R. 51 E.

Fallon Unit—sections 25, 26, 27, 28, 33, 34, 35 and 36, T. 13 N., R. 52 E.; and section 31, T. 13 N., R. 53 E.; **Fallon Relift Canal**—sections 33, 34, 35 and 36, T. 13 N., R. 53 E., sections 1 and 2, T. 12 N., R. 52 E., and sections 5 and 6, T. 12 N., R. 53 E.

Location and capacity of pumping plants:

Glendive Unit pumping plant is located in the SE¼NW¼ section 25, T. 13 N., R. 52 E. and has three pumps with capacities of 110 c.f.s. each.

Shirley Unit pumping plant is located in Custer County in the NW¼SW¼ section 32, T. 10 N., R. 49 E. and contains three pumps with capacities of 37 c.f.s. each.

Terry Unit pumping plant is located in NE¼SW¼ section 13, T. 12 N., R. 50 E. and has three pumps with capacities of 20.5 c.f.s. each.

Fallon Unit pumping plant contains three pumps with capacities of 24 c.f.s each and is located in SE¼NW¼ section 33, T. 13 N., R. 52 E.

Fallon Relift pumping station is located on the Fallon Canal in NW¼NW¼ section 5, T. 12 N., R. 53 E. and contains two pumps with capacities of 20 c.f.s. each.

Length and Capacities of Canals:

The **Glendive Canal** from the pumping plant has an initial capacity of 330 c.f.s., and a total length of about 35 miles. This canal extends into Dawson County with approximately 6.25 miles of the canal in Prairie County.

The **Shirley Canal** originates in Custer County and has a total length of 13.3 miles, of which 4.5 miles extends into Prairie County. At the pumping plant the canal capacity is 105 c.f.s.

The **Terry Canal** has an initial capacity of 60 c.f.s. and length of 7.7 miles.

The **Fallon Canal** is approximately 3.5 miles in length and has a capacity of 72 c.f.s.

The **Fallon Relift Canal** has a capacity of 40 c.f.s. and a total length of about 3 miles.

Operation and Maintenance:

The operation and maintenance charges are the same for all units of the Buffalo Rapids Project. This charge is $4.35 for each acre of land irrigated.

Present Users:

In Prairie County the number of water users under various units in 1969 were: Glendive Unit—16; Shirley Unit—11; Terry Unit—23; Fallon Unit—8; and Fallon Relift—19.

Acreage Irrigated:

In 1969, there were 1,535 acres irrigated under the **Glendive Unit**, First Division, in Prairie County, with 41 acres potentially irrigable under present facilities, making a maximum irrigable acreage of 1,576 acres under the system.

For the Second Division, in 1969, the **Shirley Unit** had 1,712 acres irrigated in Prairie County and 67 acres potentially irrigable, totaling a maximum irrigable acreage of 1,779 acres; the **Terry Unit** has 3,167 acres irrigated, with 185 acres potentially irrigable, and a maximum of 3,352 acres irrigable under the Unit; the **Fallon Unit** (including relift canal) has 2,974 acres irrigated, 86 acres potentially irrigable under existing ditch facilities and a total irrigable acreage of 3,060 acres.

WATER RIGHT DATA

The water right filing that applies to the Buffalo Rapids Project in Prairie County was filed by Paul A. Jones, Construction Engineer for the Buffalo Rapids Project, acting in behalf of the United States of America. This filing was made as of August 27, 1940, with the priority date given as June 17, 1938, for 1,340 cubic feet per second of the waters of the Yellowstone River and its tributaries. The filing is recorded in Book I of Water Right Records, page 333, Clerk and Recorder Office, Prairie County Courthouse, Terry, Montana.

See Maps in Part II

Glendive Unit—pages 15 and 16

Shirley Unit—pages 5 and 6

Terry Unit—page 10

Fallon Unit—pages 11, 15 and 16

WATER RIGHT DATA AND IRRIGATION SUMMARY BY STREAMS

(Filings of Record)

**Locator	STREAM	APPROPRIATIONS: No. of Filings	APPROPRIATIONS: Miner's Inches	APPROPRIATIONS: Cu. Ft. Per Sec.	DECREED RIGHTS: Case No.	DECREED RIGHTS: No. of Decrees	DECREED RIGHTS: Miner's Inches	DECREED RIGHTS: Cu. Ft. Per Sec.	IRRIGATION SUMMARY: Present Irrigated Acres	IRRIGATION SUMMARY: Irrigable Acres Under Present Facilities	IRRIGATION SUMMARY: Maximum Irrigated and Irrigable Acres Under Present Facilities
	MISSOURI RIVER BASIN										
	Missouri River										
	***Big Dry Creek**										
	Little Dry Creek										
13N-45E	Crow Rock Creek	1	8,000.00	200.00	1950	1	Water For 102 Acres	....	80	28	108
13N-45E	Unnamed Trib.	1	120.00	3.00	....	..	....	....	0	0	0
13N-45E	Unnamed Trib.	1	10,000.00	250.00	....	..	....	....	9	0	9
13N-45E	Hay Creek	1	1,200.00	30.00	....	..	....	....	54	0	54
13N-45E	White's (Gulch) Creek	2	534.40	13.36	....	..	....	....	71	0	71
14N-46E	Unnamed Trib.	1	320.00	8.00	....	..	....	....	0	0	0
13N-46E	South Prong White's Creek	1	200.00	5.00	....	..	....	....	42	15	57
13N-45E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	11	0	11
13N-45E	White Creek	1	200.00	5.00	....	..	....	....	3	0	3
14N-45E	Ash Creek	2	10,600.00	265.00	....	..	....	....	205	0	205
15N-45E	Tree (Coulee) Creek	1	7,000.00	175.00	....	..	....	....	0	0	0
16N-45E	**Timber (Big Timber) Creek**	**2**	**1,000.00**	**25.00**	....	..	....	....	**138**	**31**	**169**
15N-46E	East Branch (No. Fk.) Timber Creek	2	1,200.00	30.00	....	..	....	....	77	0	77
15N-46E	Unnamed Trib.	1	800.00	20.00	....	..	....	....	5	0	5
15N-46E	Unnamed Trib.	1	80.00	2.00	....	..	....	....	0	0	0
15N-46E	Unnamed Trib.	1	120.00	3.00	....	..	....	....	0	0	0
15N-45E	Middle Fork Timber Creek	1	1,000.00	25.00	....	..	....	....	44	0	44
15N-45E	South Fork Timber Creek	1	400.00	10.00	....	..	....	....	0	0	0
15N-45E	Unnamed Trib.	1	800.00	20.00	....	..	....	....	57	0	57
15N-45E	Unnamed Trib.	1	80.00	2.00	....	..	....	....	0	0	0
15N-45E	Unnamed Creek	1	80.00	2.00	....	..	....	....	0	0	0
16N-45E	Slinker Creek	1	80.00	2.00	....	..	....	....	0	0	0
15N-45E	Chalk Butte Creek	1	80.00	2.00	....	..	....	....	0	0	0
16N-45E	Hay Creek	1	300.00	7.50	....	..	....	....	0	0	0
	Total Of Tributaries To Big Dry Creek	**27**	**44,194.40**	**1,104.86**	**1950**	**1**	Water For 102 Acres	....	**796**	**74**	**870**
	Redwater River (Creek)										
16N-47E	**Lisk Creek**	**0**	**0.00**	**0.00**	....	..	....	....	**0**	**0**	**0**
15N-46E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	0	75	75
15N-46E	Springs	1	....	....	....	..	....	....	0	0	0
16N-47E	**Duck (West Duck) Creek**	**2**	**4,300.00**	**107.50**	....	..	....	....	**7**	**0**	**7**
16N-47E	East Duck Creek	0	0.00	0.00	....	..	....	....	0	0	0
16N-47E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	56	0	56
16N-48E	**Ash Creek**	**0**	**0.00**	**0.00**	....	..	....	....	**0**	**0**	**0**
16N-48E	Branch of Ash Creek	1	200.00	5.00	....	..	....	....	13	0	13
	Tusler Creek										
16N-49E	South Branch of Tusler Creek	1	400.00	10.00	....	..	....	....	0	0	0
16N-49E	Unnamed Branch of Tusler Creek	1	....	....	....	..	....	....	0	0	0
16N-49E	Branch (South Branch) Tusler Creek	2	60.00	1.50	....	..	....	....	0	0	0
16N-49E	Unnamed Branch of Tusler Creek	1	All	All	....	..	....	....	0	0	0
16N-47E	Unnamed Creek	1	All	All	....	..	....	....	0	0	0
16N-48E	Unnamed Creek	1	....	....	....	..	....	....	0	0	0
16N-48E	Pasture Creek	3	2,935.00	73.38	....	..	....	....	13	0	13
16N-48E	Unnamed Creek	2	445.00	11.13	....	..	....	....	22	0	22
16N-48E	Unnamed Creek	0	0.00	0.00	....	..	....	....	0	4	4
16N-48E	Redwater Creek	0	0.00	0.00	....	..	....	....	0	0	0
16N-48E	Unnamed Creek	1	200.00	5.00	....	..	....	....	0	0	0
	Total Of Tributaries To Redwater River	**17**	**8,540.00**	**213.51**	....	..	....	....	**111**	**79**	**190**
13N-53E	**Yellowstone River**	**19**	**36,580.00**	**914.50**	....	..	....	....	**10,158**	**379**	**10,537**
11N-49E	**Unnamed Trib.**	**1**	**10,000.00**	**250.00**	....	..	....	....	**0**	**0**	**0**
11N-50E	**Camp Creek**	**4**	**2,000.00**	**50.00**	....	..	....	....	**0**	**0**	**0**
10N-50E	Unnamed Trib.	1	500.00	12.50	....	..	....	....	0	0	0
10N-50E	Unnamed Trib.	3	1,500.00	37.50	....	..	....	....	0	0	0
11N-50E	**Custer Creek**	**2**	**1,160.00**	**29.00**	....	..	....	....	**458**	**0**	**458**
13N-47E	North Fork Custer Creek	0	0.00	0.00	....	..	....	....	19	0	19
13N-47E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	5	0	5
11N-49E	Batchelor Creek	1	500.00	12.50	....	..	....	....	0	0	0
11N-50E	**Yellowstone Coulee**	**1**	**400.00**	**10.00**	....	..	....	....	**80**	**0**	**80**
11N-50E	Unnamed Gulch	1	1,000.00	25.00	....	..	....	....	0	0	0
11N-50E	**Unnamed Trib.**	**1**	**100.00**	**2.50**	....	..	....	....	**0**	**0**	**0**
11N-50E	Unnamed Stream	1	25.00	.62	....	..	....	....	0	0	0
11N-50E	**Gate (Reservoir) Coulee**	**3**	**1,500.00**	**37.50**	....	..	....	....	**89**	**0**	**89**
11N-50E	**Powder River**	**9**	**14,700.00**	**367.50**	....	..	....	....	**49**	**279**	**328**
11N-51E	Ten Mile Creek	0	0.00	0.00	....	..	....	....	0	0	0
10N-50E	South Fork Ten Mile Creek	1	4,000.00	100.00	....	..	....	....	0	0	0
11N-50E	Spring Creek	1	1,000.00	25.00	....	..	....	....	0	0	0
11N-50E	Spring Creek	1	100.00	2.50	....	..	....	....	33	0	33
11N-51E	Boulder Springs	1	240.00	6.00	....	..	....	....	0	0	0
11N-50E	McQuoid Creek	1	640.00	16.00	....	..	....	....	0	0	0
11N-50E	Unnamed Creek	0	0.00	0.00	....	..	....	....	0	0	0
11N-51E	Certain Springs	1	1,000.00	25.00	....	..	....	....	0	0	0
11N-51E	"J" Springs	1	640.00	16.00	....	..	....	....	0	0	0
11N-51E	Certain Springs	1	1,000.00	25.00	....	..	....	....	0	0	0
11N-50E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	0	0	0
11N-50E	Lake Springs	1	100.00	2.50	....	..	....	....	0	0	0
12N-50E	**Deer (East Crooked) Creek**	**5**	**3,000.00**	**75.00**	....	..	....	....	**0**	**0**	**0**
12N-50E	Wolf (Crooked) Creek	1	100.00	2.50	....	..	....	....	0	0	0
11N-50E	Unnamed Trib.	2	1,000.00	25.00	....	..	....	....	0	0	0
12N-50E	**Coal Mine Creek**	**1**	**200.00**	**5.00**	....	..	....	....	**0**	**0**	**0**
12N-50E	Cow Creek	2	800.00	20.00	....	..	....	....	0	0	0
12N-50E	Spring Coulee	1	500.00	12.50	....	..	....	....	0	0	0
12N-50E	**Con's Coulee (Conn's, Cahn's, Kahn's) Creek**	**4**	**4,000.00**	**100.00**	....	..	....	....	**0**	**0**	**0**
12N-50E	**Dry (Sullivan) Creek**	**0**	**0.00**	**0.00**	....	..	....	....	**0**	**0**	**0**
12N-50E	Como (Swank) Creek	2	2,500.00	62.50	....	..	....	....	0	0	0
12N-50E	**Johnson Creek**	**1**	**120.00**	**3.00**	....	..	....	....	**0**	**0**	**0**
12N-51E	**Arndt (Arnedt) Creek**	**2**	**2,200.00**	**55.00**	....	..	....	....	**0**	**0**	**0**
12N-51E	Well	0	0.00	0.00	....	..	....	....	6	0	6
12N-51E	Unnamed Coulee	0	0.00	0.00	....	..	....	....	7	0	7
12N-51E	**Unnamed Coulee**	**2**	**2,000.00**	**50.00**	....	..	....	....	**0**	**0**	**0**
12N-51E	**Spring Creek**	**0**	**0.00**	**0.00**	....	..	....	....	**280**	**0**	**280**
12N-51E	East Fork Spring Creek	3	1,200.00	30.00	....	..	....	....	0	0	0
12N-51E	Middle Fork Spring Creek	1	100.00	2.50	....	..	....	....	0	0	0
12N-51E	West Fork Spring Creek	3	1,100.00	27.50	....	..	....	....	0	0	0
12N-51E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	0	0	0
12N-51E	Spring	1	100.00	2.50	....	..	....	....	0	0	0
12N-51E	**Ash (North Ash) Creek**	**2**	**2,000.00**	**50.00**	....	..	....	....	**0**	**0**	**0**
12N-51E	Sand Creek	0	0.00	0.00	....	..	....	....	6	0	6
12N-51E	Hay Coulee	0	0.00	0.00	....	..	....	....	0	0	0
12N-51E	Springs	1	1,000.00	25.00	....	..	....	....	0	0	0
12N-51E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	0	0	0
12N-51E	Spring	1	All	All	....	..	....	....	0	0	0
12N-51E	Unnamed Creek	0	0.00	0.00	....	..	....	....	0	0	0
12N-51E	Iron Springs	1	500.00	12.50	....	..	....	....	0	0	0
12N-51E	**Cedar Creek**	**2**	**4,000.00**	**100.00**	....	..	....	....	**0**	**0**	**0**
14N-49E	East Fork Cedar Creek	1	2,000.00	50.00	....	..	....	....	0	0	0
14N-49E	Unnamed Creek	1	2,000.00	50.00	....	..	....	....	0	0	0
13N-50E	Brackett Creek	4	3,040.00	76.00	....	..	....	....	117	118	235
14N-50E	Wilma's Coulee	0	0.00	0.00	....	..	....	....	5	0	5
13N-50E	Cherry Creek	2	3,000.00	75.00	....	..	....	....	0	0	0
13N-48E	North Fork Cherry Creek	2	800.00	20.00	....	..	....	....	70	0	70
14N-47E	Unnamed Creek	1	....	....	....	..	....	....	0	0	0
14N-48E	Unnamed Creek	1	....	....	....	..	....	....	0	0	0
14N-48E	Unnamed Creek	1	2,000.00	50.00	....	..	....	....	6	0	6
14N-49E	Plenty Creek	0	0.00	0.00	....	..	....	....	0	0	0
14N-49E	North Fork Plenty Creek	1	800.00	20.00	....	..	....	....	0	0	0
13N-51E	Linn Creek	1	150.00	3.75	....	..	....	....	0	0	0
13N-51E	Svenson Creek	1	150.00	3.75	....	..	....	....	0	0	0
13N-51E	Unnamed Trib.	1	2,000.00	50.00	....	..	....	....	0	60	60
12N-52E	**Coal Creek**	**2**	**500.00**	**12.50**	....	..	....	....	**242**	**0**	**242**
12N-52E	**Deer Creek**	**1**	**1,000.00**	**25.00**	....	..	....	....	**0**	**0**	**0**
13N-52E	**O'Fallon Creek**	**8**	**6,950.00**	**173.75**	....	..	....	....	**0**	**50**	**50**
10N-54E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	35	0	35
10N-54E	Lunatic Creek	0	0.00	0.00	....	..	....	....	34	27	61
10N-54E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	25	0	25
10N-54E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	34	0	34
10N-54E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	18	0	18
10N-54E	Pine Creek	4	12,000.00	300.00	....	..	....	....	76	47	123
10N-54E	Tree Coulee	1	400.00	10.00	....	..	....	....	0	0	0
10N-54E	Unnamed Trib.	1	7,000.00	175.00	....	..	....	....	0	0	0
11N-54E	Unnamed Trib.	1	....	....	....	..	....	....	29	13	42
11N-53E	Unnamed Trib.	1	1,000.00	25.00	....	..	....	....	0	0	0
12N-53E	Whitney Creek	4	5,320.00	133.00	....	..	....	....	100	0	100
10N-53E	Little Whitney Creek	8	7,280.00	182.00	....	..	....	....	195	0	195
10N-53E	Unnamed Trib.	1	All	All	....	..	....	....	27	0	27
9N-53E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	10	0	10
10N-53E	Unnamed Trib.	1	200.00	5.00	....	..	....	....	10	0	10
12N-52E	Newman Hollow Creek	1	500.00	12.50	....	..	....	....	0	0	0
12N-52E	Brights Valley Creek	1	300.00	7.50	....	..	....	....	0	0	0
12N-52E	Mamie's Coulee	1	100.00	2.50	....	..	....	....	14	0	14
12N-52E	Johnson Creek	1	500.00	12.50	....	..	....	....	10	0	10
12N-52E	Unnamed Creek	0	0.00	0.00	....	..	....	....	0	0	0
12N-52E	Pat Delaney Springs	1	160.00	4.00	....	..	....	....	0	0	0
13N-52E	**Pine Creek**	**2**	**1,500.00**	**37.50**	....	..	....	....	**0**	**0**	**0**
13N-52E	**Cottonwood Creek**	**1**	**600.00**	**15.00**	....	..	....	....	**118**	**0**	**118**
14N-51E	Diamond G Creek	3	580.00	14.50	....	..	....	....	0	0	0
13N-52E	**Plum Coulee Creek**	**5**	**2,300.00**	**57.50**	....	..	....	....	**0**	**35**	**35**
12N-53E	Spring Brook Creek	1	16.00	.40	....	..	....	....	0	0	0
13N-53E	**Hatchett Creek**	**1**	**320.00**	**8.00**	....	..	....	....	**0**	**0**	**0**
13N-53E	Unnamed Creek	1	14.00	.35	....	..	....	....	0	0	0
13N-53E	**Spring**	**1**	**16.00**	**.40**	....	..	....	....	**0**	**0**	**0**
13N-53E	**Spring Brook Creek**	**2**	**300.00**	**7.50**	....	..	....	....	**0**	**0**	**0**
	Bad Route Creek										
16N-50E	East Fork Bad Route Creek	1	2,000.00	50.00	....	..	....	....	0	0	0
15N-50E	Middle Fork Bad Route Creek	1	320.00	8.00	....	..	....	....	0	0	0
16N-50E	Branch (No. Br.) Middle Fk. Bad Route Cr.	2	800.00	20.00	....	..	....	....	0	0	0
16N-50E	Branch (So. Br.) Middle Fk. Bad Route Cr.	1	200.00	5.00	....	..	....	....	0	0	0
15N-50E	Unnamed Creek	1	640.00	16.00	....	..	....	....	0	0	0
15N-50E	West Fork Bad Route Creek	1	120.00	3.00	....	..	....	....	14	0	14
13N-53E	Unnamed Creek	1	800.00	20.00	....	..	....	....	0	0	0
13N-52E	Unnamed Creek	1	14.00	.35	....	..	....	....	0	0	0
13N-54E	**Cabin Creek**	**4**	**2,070.00**	**51.75**	....	..	....	....	**90**	**0**	**90**
11N-56E	Cow Creek	4	4,400.00	110.00	....	..	....	....	84	9	93
11N-56E	Unnamed Trib.	1	1,000.00	25.00	....	..	....	....	21	0	21
11N-56E	Unnamed Trib.	2	1,600.00	40.00	....	..	....	....	39	0	39
11N-56E	Spring (Deer) Creek	2	1,600.00	40.00	....	..	....	....	36	0	36
11N-56E	Unnamed Trib.	1	1,000.00	25.00	....	..	....	....	35	0	35
11N-55E	McNaney Coulee	0	0.00	0.00	....	..	....	....	21	0	21
11N-55E	Lambing Draw	0	0.00	0.00	....	..	....	....	29	0	29
12N-55E	Red Barn Coulee	0	0.00	0.00	....	..	....	....	12	0	12
12N-55E	Ash (Day) Creek	3	2,600.00	65.00	....	..	....	....	36	0	36
12N-56E	Unnamed Coulee	0	0.00	0.00	....	..	....	....	7	0	7
12N-55E	North Fork Ash Creek	0	0.00	0.00	....	..	....	....	28	0	28
12N-55E	Little Ash Creek	0	0.00	0.00	....	..	....	....	12	0	12
12N-55E	Hay Creek	3	1,400.00	35.00	....	..	....	....	117	0	117
12N-55E	West Fork Hay Creek	1	40.00	1.00	....	..	....	....	13	0	13
12N-55E	Gulch #1	1	500.00	12.50	....	..	....	....	0	0	0
12N-55E	Gulch #2	1	500.00	12.50	....	..	....	....	0	0	0
12N-55E	Reohl Coulee	0	0.00	0.00	....	..	....	....	19	0	19
12N-54E	Spring Creek	0	0.00	0.00	....	..	....	....	0	0	0
12N-54E	Unnamed Trib.	1	500.00	12.50	....	..	....	....	0	0	0
12N-54E	Unnamed Trib.	1	500.00	12.50	....	..	....	....	0	0	0
12N-54E	Ash Creek	0	0.00	0.00	....	..	....	....	0	0	0
12N-54E	Sand Butte Creek	0	0.00	0.00	....	..	....	....	10	0	10
13N-54E	Certain Coulee	1	....	....	....	..	....	....	0	0	0
	U-E Creek										
13N-55E	South Fork U-E Creek	0	0.00	0.00	....	..	....	....	0	0	0
13N-55E	4-E Creek	1	36A/F	36A/F	....	..	....	....	0	0	0
13N-55E	Haystack Coulee	0	0.00	0.00	....	..	....	....	10	0	10
13N-55E	Unnamed Creek	0	0.00	0.00	....	..	....	....	4	0	4
13N-55E	Coulee 29	0	0.00	0.00	....	..	....	....	8	0	8
	Clear Creek										
16N-50E	South (Upper) Fork Clear Creek	2	All	All	....	..	....	....	0	0	0
16N-50-	Upper Fork Clear Creek	1	600.00	15.00	....	..	....	....	0	0	0
13N-56E	**Cedar Creek**	**0**	**0.00**	**0.00**	....	..	....	....	**0**	**0**	**0**
13N-56E	Unnamed Trib.	0	0.00	0.00	....	..	....	....	10	0	10
	Total Of Yellowstone River And Tributaries	**205**	**193,105.00**	**4,827.62**	....	..	....	....	**13,020**	**1,017**	**14,037**
	GRAND TOTAL OF PRAIRIE COUNTY	**249**	**245,839.40**	**6,145.99**	**1950**	**1**	Water For 102 Acres	....	**13,927**	**1,170**	**15,097**

TOTALS OF MAJOR TRIBUTARIES TO YELLOWSTONE RIVER

**Locator	STREAM	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigated and Irrigable Acres Under Present Facilities
13N-53E	**Yellowstone River**										
11N-50E	**Powder River And Tributaries**	**18**	**23,420.00**	**585.50**	....	..	....	....	**82**	**279**	**361**
12N-51E	**Cedar Creek And Tributaries**	**22**	**21,440.00**	**536.00**	....	..	....	....	**440**	**178**	**618**
13N-52E	**O'Fallon Creek And Tributaries**	**35**	**41,710.00**	**1,042.75**	....	..	....	....	**617**	**137**	**754**
13N-54E	**Cabin Creek And Tributaries**	**27**	**18,310.00**	**457.75**	....	..	....	....	**631**	**9**	**640**

*Names of streams indented on the left hand margin indicate that they are tributaries of the first stream above which is not indented as far.
**The township & range shown in the locator column indicates either where a stream enters the next larger drainage or where a stream or drainage leaves the county.

DRAINAGES NOT LOCATED

STREAM	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	Case No.	No. of Decrees
Antelope Creek	1	500.00	12.50	....	..
Embleton Coulee	1	200.00	5.00	....	..
Phillips Creek	1	300.00	7.50	....	..
Red Butte Creek	1	300.00	7.50	....	..
Sand Rock Coulee	1	2,000.00	50.00	....	..
Short Creek	1	500.00	12.50	....	..
Steir Coulee	1	233.20	58.30	....	..
Swist Creek Spring	1	400.00	10.00	....	..
Two Unnamed Coulees	2	1,300.00	32.50	....	..
TOTAL	**10**	**5,733.20**	**198.50**	....	..

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 Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis & Clark, Liberty, Lincoln, Madison, Meagher, Mineral, Missoula, Musselshell, Park, Phillips, Pondera, Powder River, Powell, **Prairie**, Ravalli, Rosebud, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux and Yellowstone.

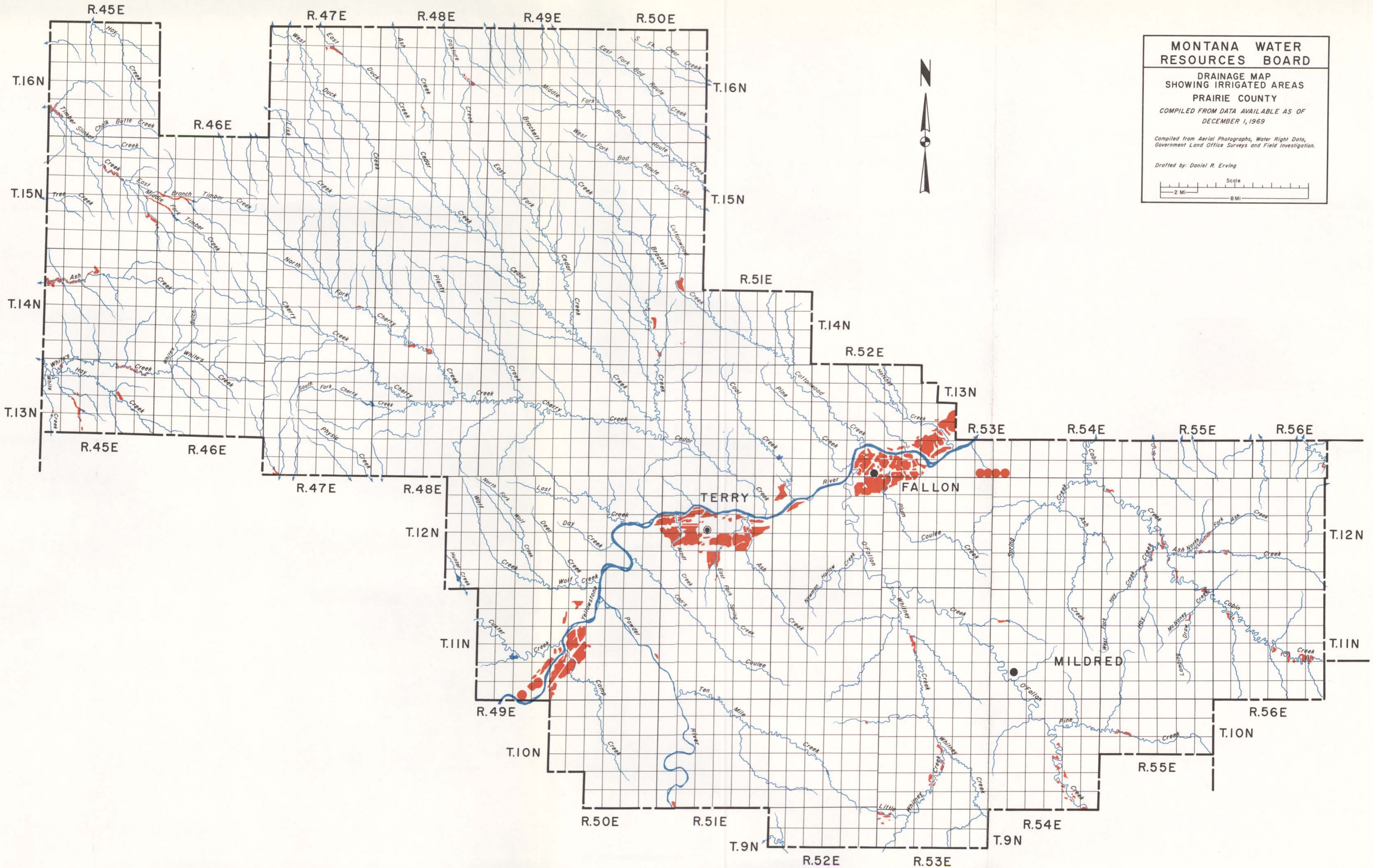
RIVER BASIN Hudson Bay Drainage Basin	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigated & Irrigable Acres Under Present Facilities
***Hudson Bay**	**0.00**	**0.00**	**0.00**
Nelson River	**0.00**	**0.00**	**0.00**
Lake Winnipeg	**0.00**	**0.00**	**0.00**
Saskatchewan River	0.00	0.00	0.00
Oldman River	0.00	0.00	0.00
St. Mary River	587.00	0.00	587.00
Unnamed Coulee	26.00	0.00	26.00
Kennedy (Otatso) Creek	0.00	71.00	71.00
Willow Creek	0.00	4.00	4.00
Grand Total Hudson Bay Drainage Basin	**613.00**	**75.00**	**688.00**
Missouri River Drainage Basin			
Missouri River	**135,486.50**	**26,864.33**	**162,350.83**
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	**149,004.42**	**29,756.88**	**169,761.30**
Teton River	**74,653.00**	**15,882.33**	**90,535.33**
Musselshell River	**64,789.00**	**57,870.00**	**122,659.00**
Milk River	**217,402.62**	**50,044.76**	**267,447.38**
Yellowstone River**	**316,595.00**	**96,754.00**	**413,349.00**
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	**36,030.00**	**2,578.00**	**38,608.00**
Little Missouri River	**42,513.00**	**1,499.00**	**44,012.00**
Grand Total Missouri River Basin	**1,682,977.59**	**384,133.66**	**2,067,111.25**
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	**156,269.70**	**17,293.20**	**173,562.90**
Bitterroot River	**111,102.43**	**3,200.00**	**114,302.43**
Flathead River	**141,511.19**	**5,135.22**	**146,646.41**
Little Bitterroot River	15,297.00	337.00	15,634.00
Grand Total Columbia River Basin	**434,094.45**	**26,933.42**	**461,027.87**
GRAND TOTAL COUNTIES COMPLETED TO DATE	**2,117,685.04**	**411,142.08**	**2,528,827.12**

*Name 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.

MAP INDEX

All maps have been made from aerial photographs



MONTANA WATER RESOURCES BOARD
DRAINAGE MAP
SHOWING IRRIGATED AREAS
PRAIRIE COUNTY
COMPILED FROM DATA AVAILABLE AS OF
DECEMBER 1, 1969
Compiled from Aerial Photographs, Water Right Data, Government Land Office Surveys and Field Investigation.
Drafted by: Daniel R. Erving
Scale
2 Mi
8 Mi
N
R.45E
R.46E
R.47E
R.48E
R.49E
R.50E
R.51E
R.52E
R.53E
R.54E
R.55E
R.56E
T.16N
T.15N
T.14N
T.13N
T.12N
T.11N
T.10N
T.9N
TERRY
FALLON
MILDRED
Yellowstone
River
Powder
River

MAP SYMBOL INDEX

BOUNDARIES

- INTERNATIONAL
- STATE
- COUNTY
- NATIONAL FOREST

DITCHES

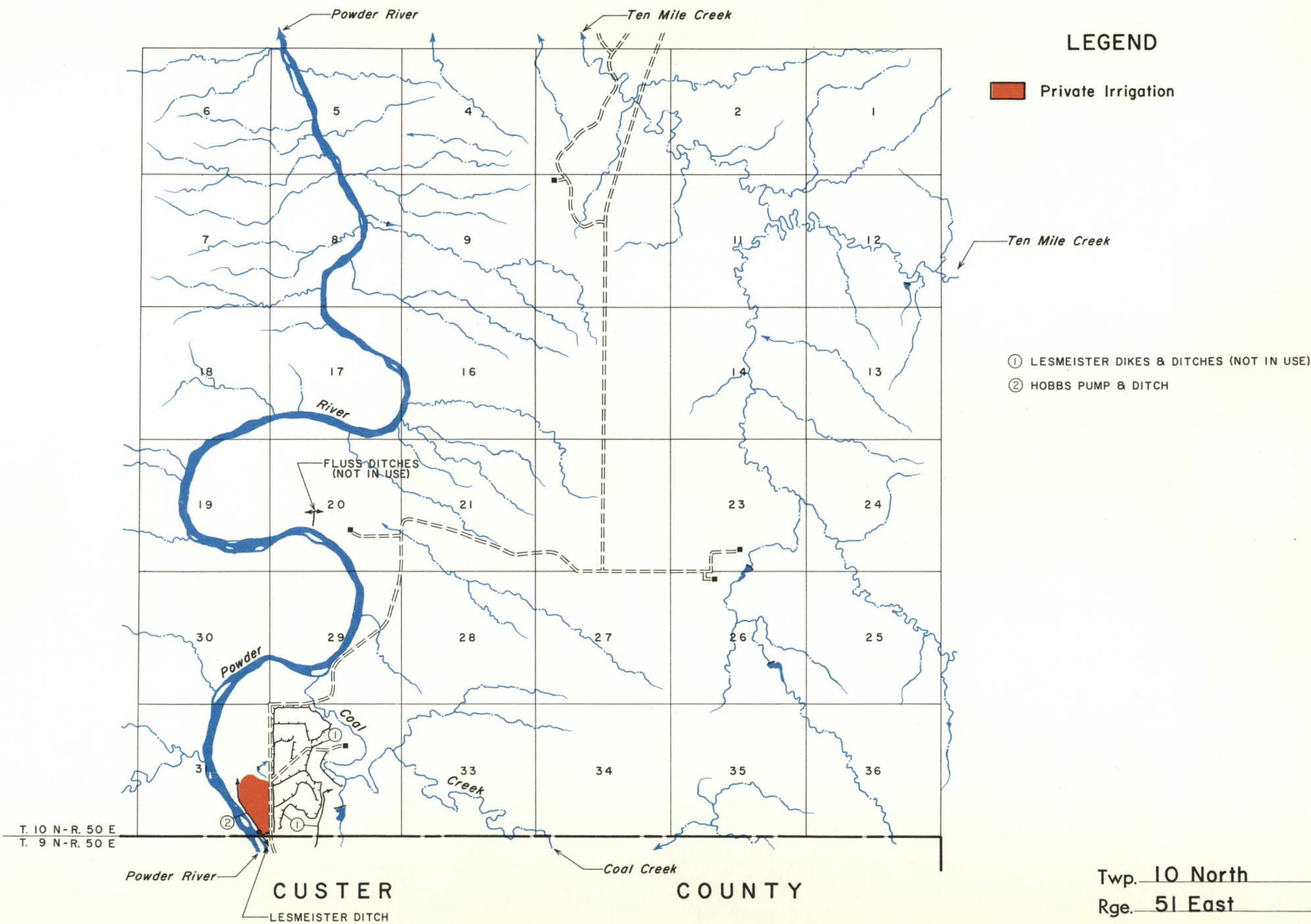
- CANALS OR DITCHES
- DRAIN DITCHES

TRANSPORTATION

- PAVED ROADS
- UNPAVED ROADS
- RAILROADS
- 10 STATE HIGHWAY
- 89 U.S. HIGHWAY
- 94 INTERSTATE HIGHWAY
- AIRPORT
- LANDING STRIP

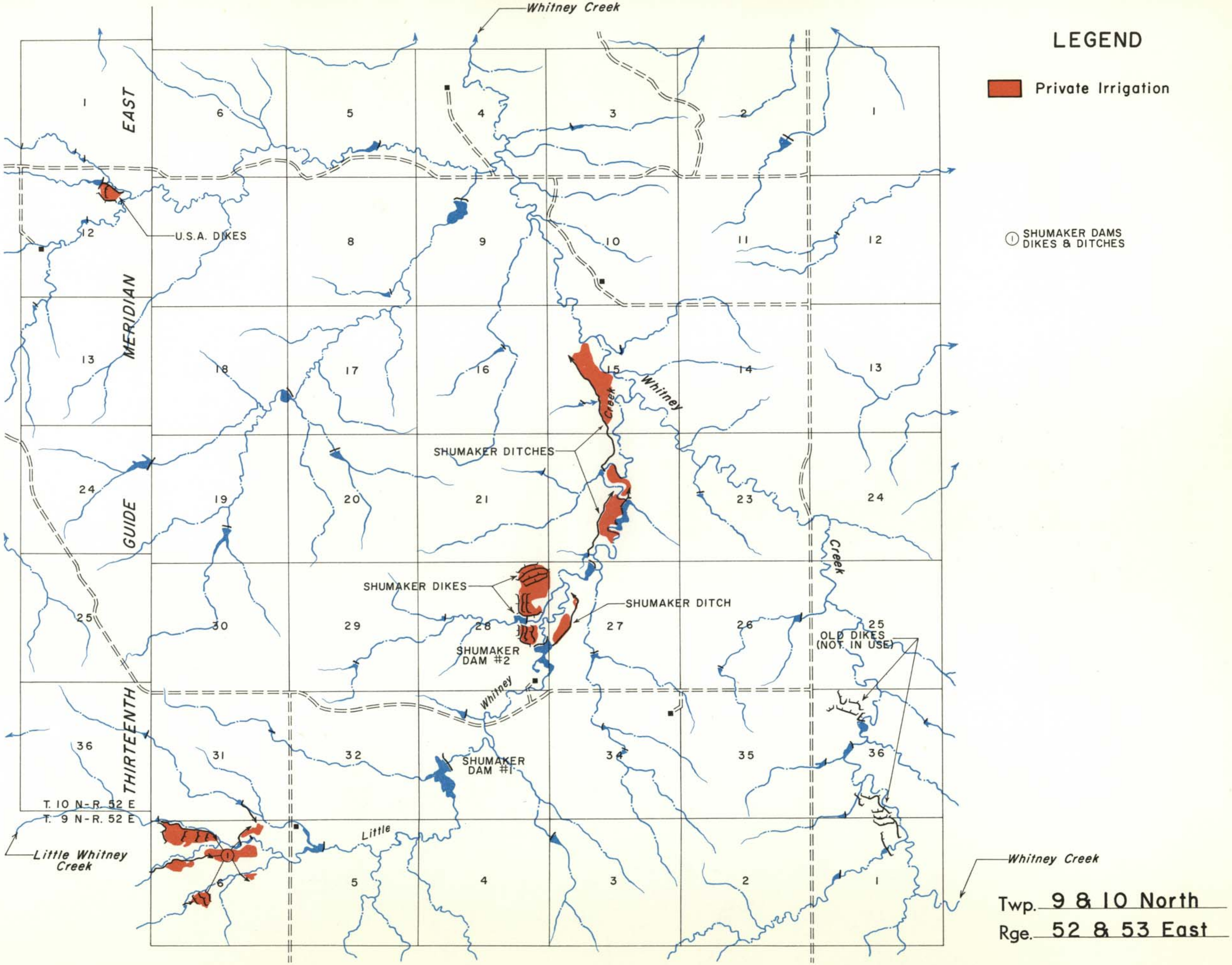
STRUCTURES & UNITS

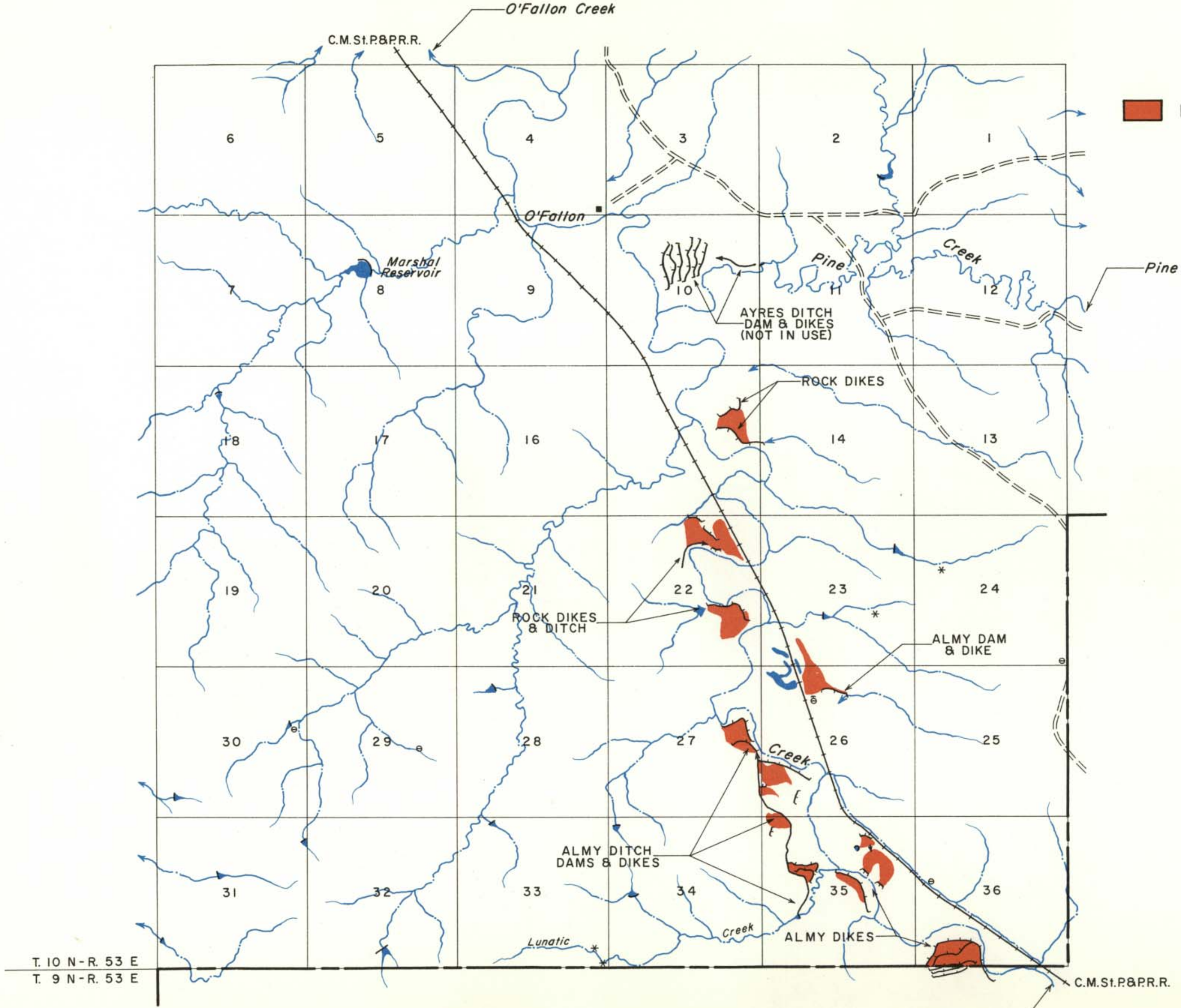
- DAM
- DIKE
- FLUME
- SIPHON
- SPILL
- SPRINKLER SYSTEM
- WEIR
- PIPELINE
- PUMP
- PUMP SITE
- WELL
- ARTESIAN WELL
- + + + NATURAL CARRIER USED AS DITCH
- SPRING
- RESERVOIR
- SWAMP
- GAUGING STATION
- POWER PLANT
- STORAGE TANK
- CEMETERY
- FAIRGROUNDS
- FARM OR RANCH UNIT
- SCHOOL
- LOOKOUT STATION
- RANGER STATION
- BRIDGE
- RAILROAD TUNNEL
- REST AREA
- SHAFT, MINE, OR GRAVEL PIT
- OIL WELL OR OIL FIELD



Twp. 10 North

Rge. 51 East


LEGEND
Private Irrigation
① SHUMAKER DAMS DIKES & DITCHES
Whitney Creek
EAST
MERIDIAN
GUIDE
THIRTEENTH
U.S.A. DIKES
SHUMAKER DITCHES
SHUMAKER DIKES
SHUMAKER DITCH
SHUMAKER DAM #2
SHUMAKER DAM #1
OLD DIKES (NOT IN USE)
Whitney Creek
Creek
Whitney
Little
T. 10 N-R. 52 E
T. 9 N-R. 52 E
Little Whitney Creek
Whitney Creek
Twp. 9 & 10 North
Rge. 52 & 53 East



LEGEND

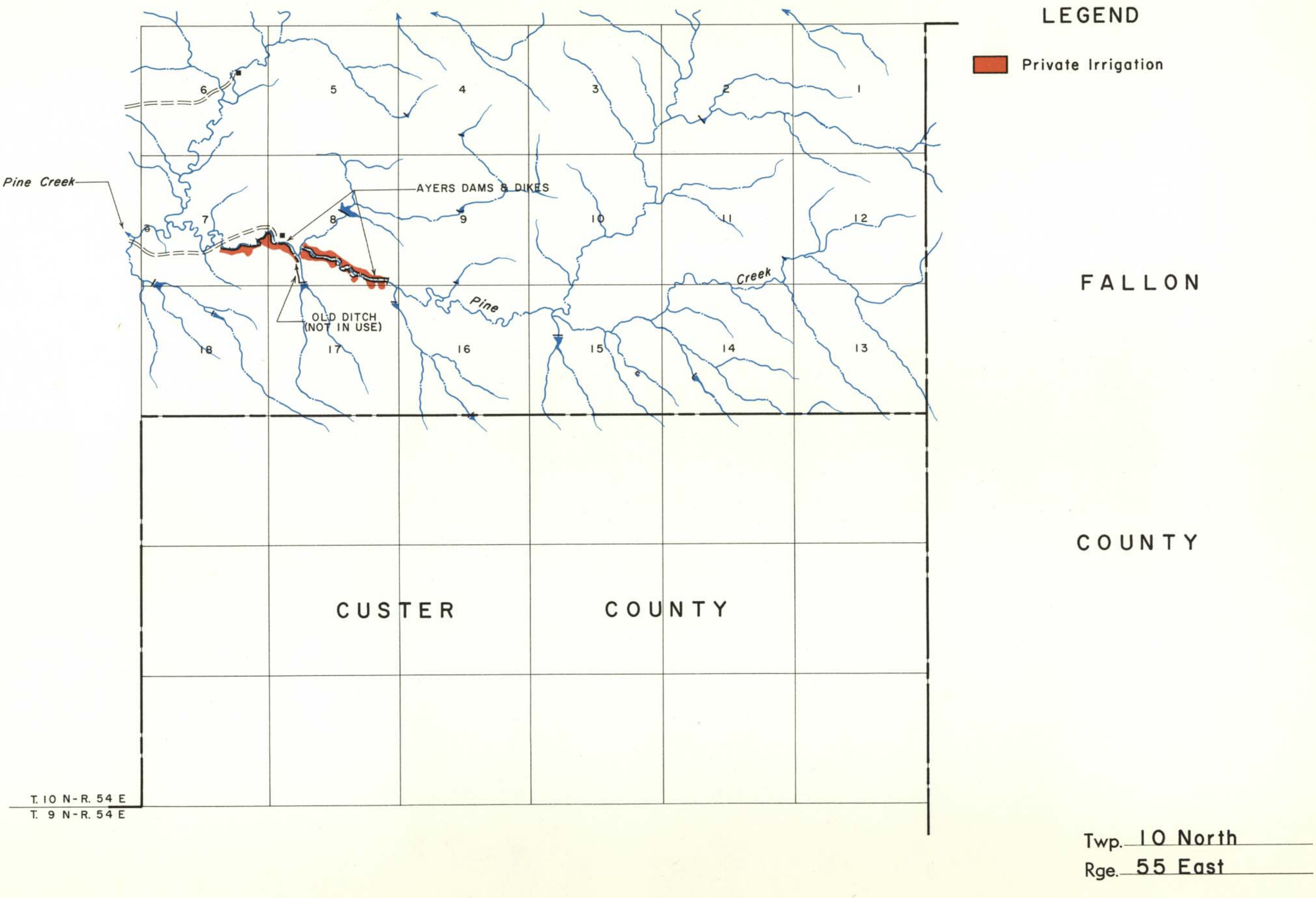
Private Irrigation

CUSTER COUNTY

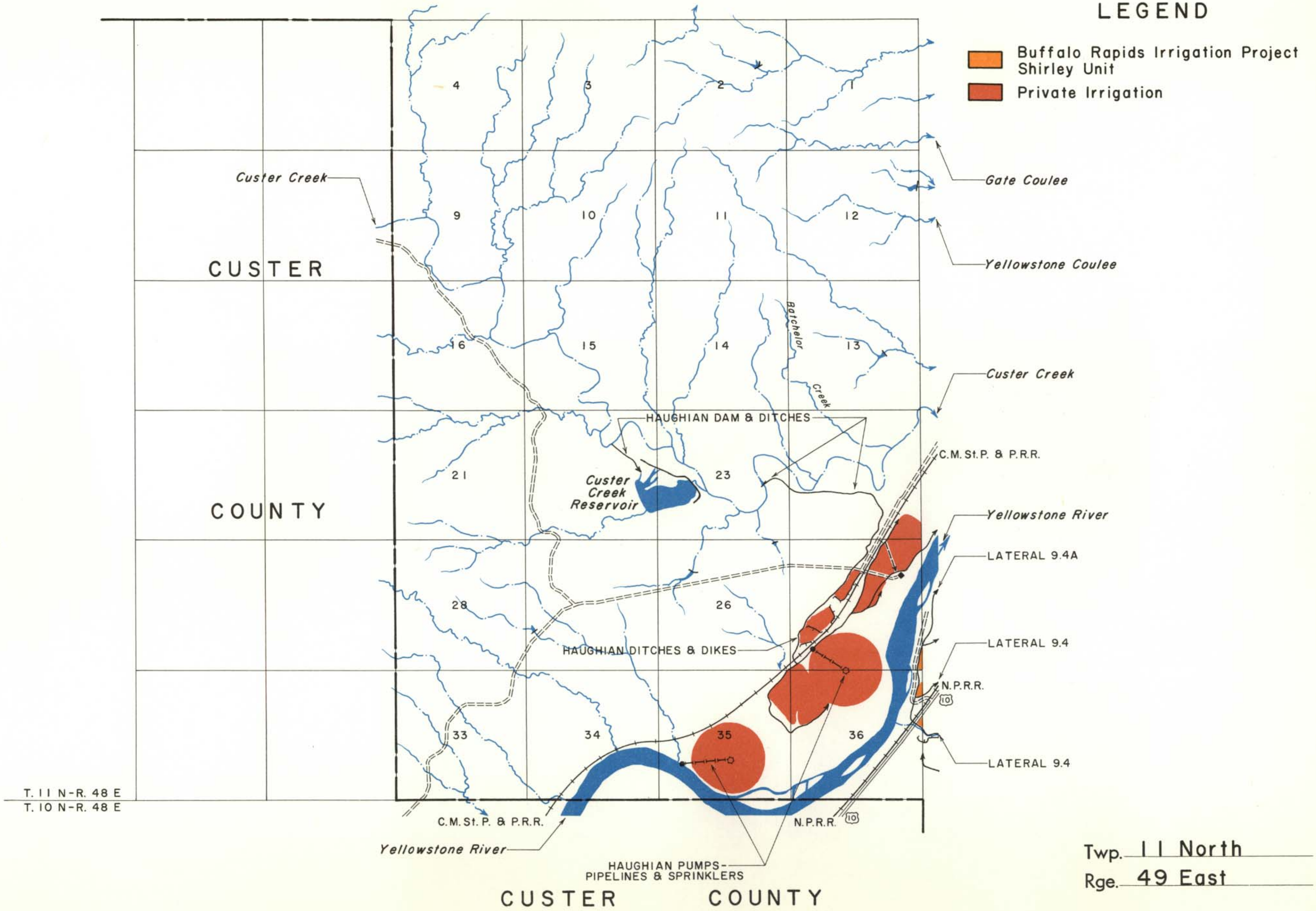
CUSTER COUNTY

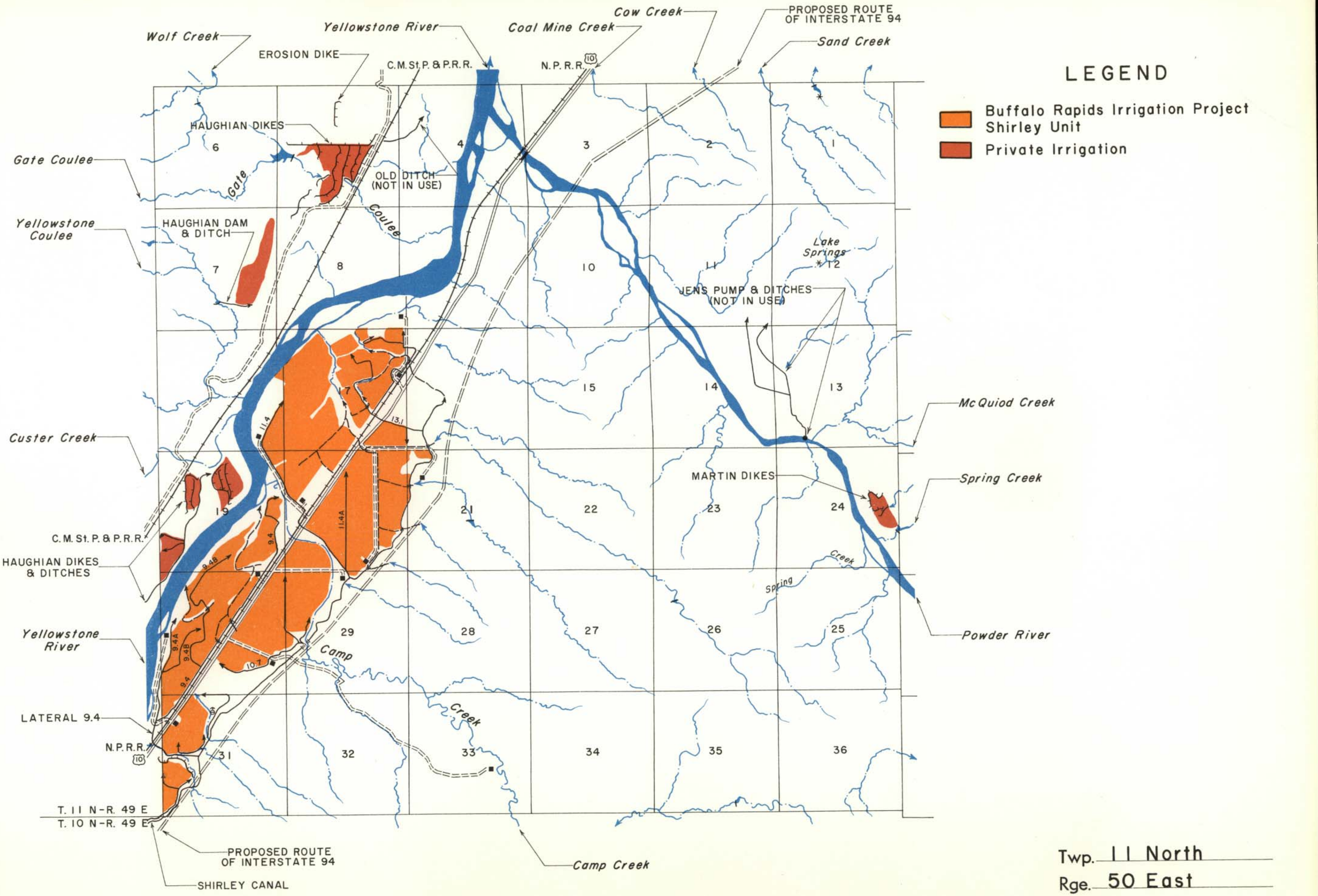
Twp. 10 North

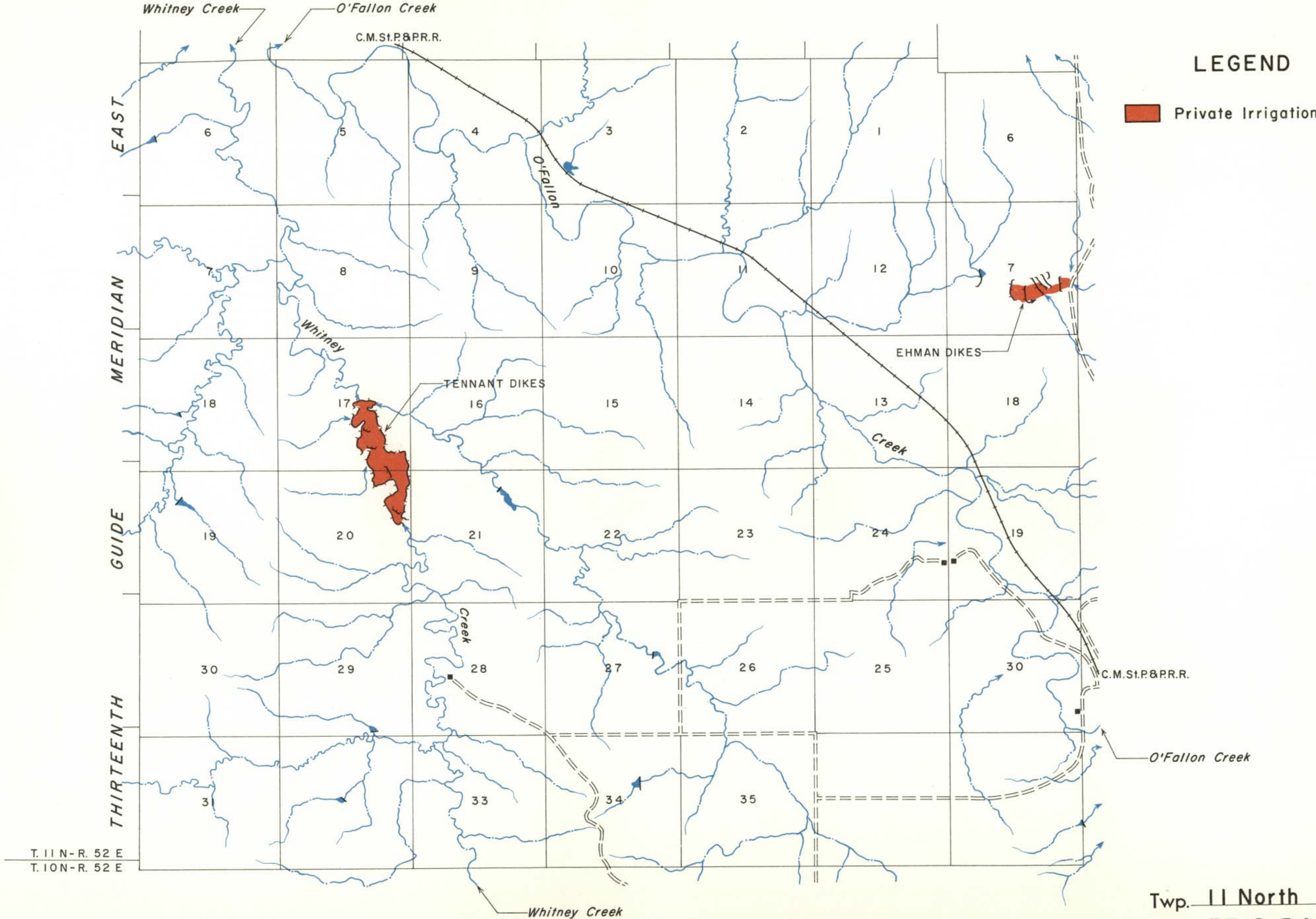
Rge. 54 East



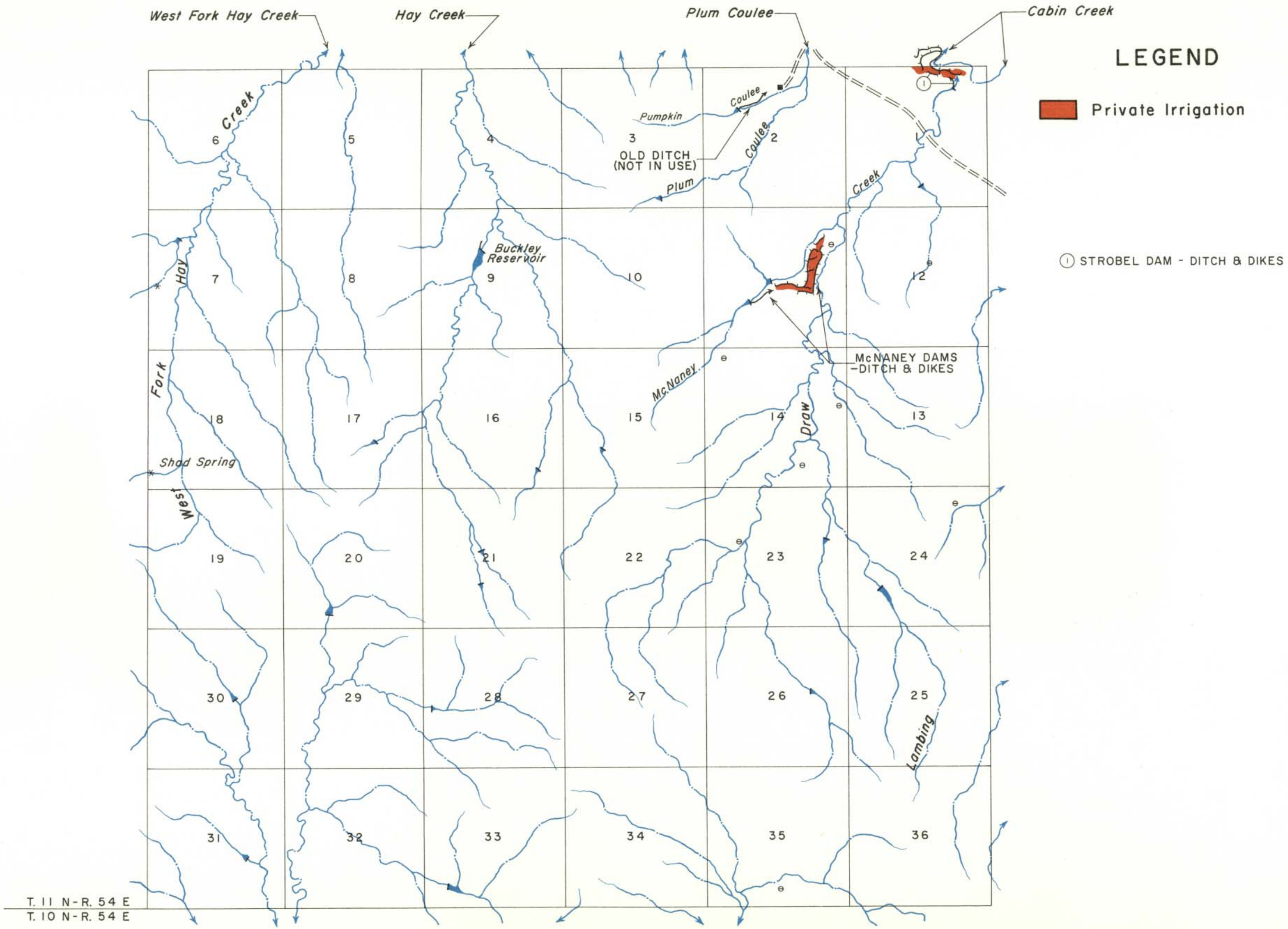
LEGEND
Private Irrigation
Pine Creek
AYERS DAMS & DIKES
OLD DITCH (NOT IN USE)
Pine
Creek
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
FALLON
COUNTY
CUSTER
COUNTY
T. 10 N-R. 54 E
T. 9 N-R. 54 E
Twp. 10 North
Rge. 55 East


LEGEND
Buffalo Rapids Irrigation Project Shirley Unit
Private Irrigation
Custer Creek
CUSTER
COUNTY
Gate Coulee
Yellowstone Coulee
Batchelor Creek
Custer Creek
HAUGHIAN DAM & DITCHES
C.M. St. P. & P.R.R.
Custer Creek Reservoir
Yellowstone River
LATERAL 9.4A
LATERAL 9.4
HAUGHIAN DITCHES & DIKES
N.P.R.R.
LATERAL 9.4
T. 11 N-R. 48 E
T. 10 N-R. 48 E
C.M. St. P. & P.R.R.
N.P.R.R.
Yellowstone River
HAUGHIAN PUMPS-PIPELINES & SPRINKLERS
CUSTER COUNTY
Twp. 11 North
Rge. 49 East


LEGEND
Buffalo Rapids Irrigation Project Shirley Unit
Private Irrigation
Wolf Creek
Yellowstone River
Coal Mine Creek
Cow Creek
PROPOSED ROUTE OF INTERSTATE 94
Sand Creek
EROSION DIKE
C.M.St.P.&P.R.R.
N.P.R.R.
HAUGHIAN DIKES
Gate Coulee
OLD DITCH (NOT IN USE)
Yellowstone Coulee
HAUGHIAN DAM & DITCH
Lake Springs
JENS PUMP & DITCHES (NOT IN USE)
McQuiod Creek
Custer Creek
MARTIN DIKES
Spring Creek
C.M.St.P.&P.R.R.
HAUGHIAN DIKES & DITCHES
Yellowstone River
Powder River
Camp Creek
LATERAL 9.4
N.P.R.R.
T. 11 N-R. 49 E
T. 10 N-R. 49 E
PROPOSED ROUTE OF INTERSTATE 94
SHIRLEY CANAL
Camp Creek
Twp. 11 North
Rge. 50 East

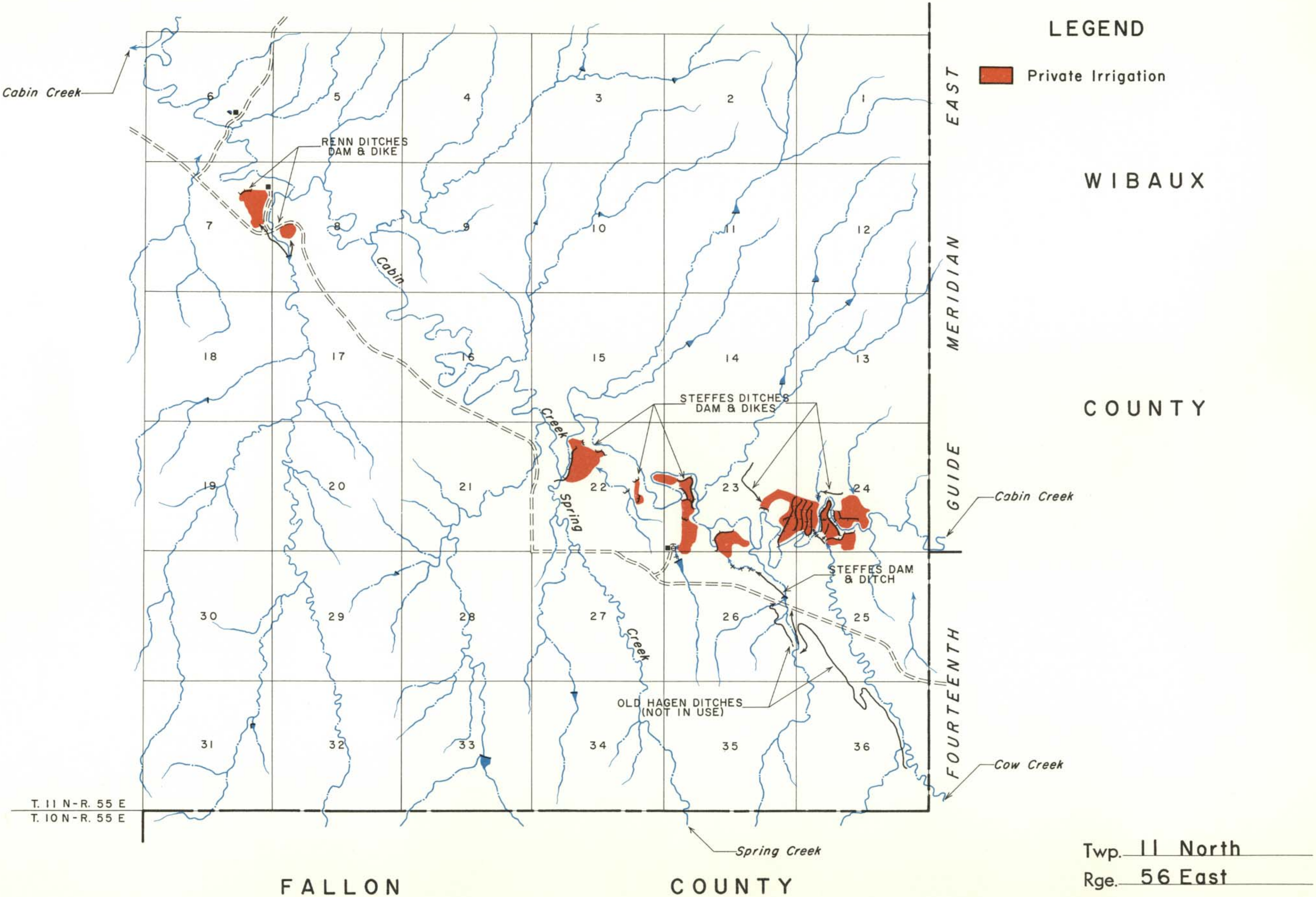


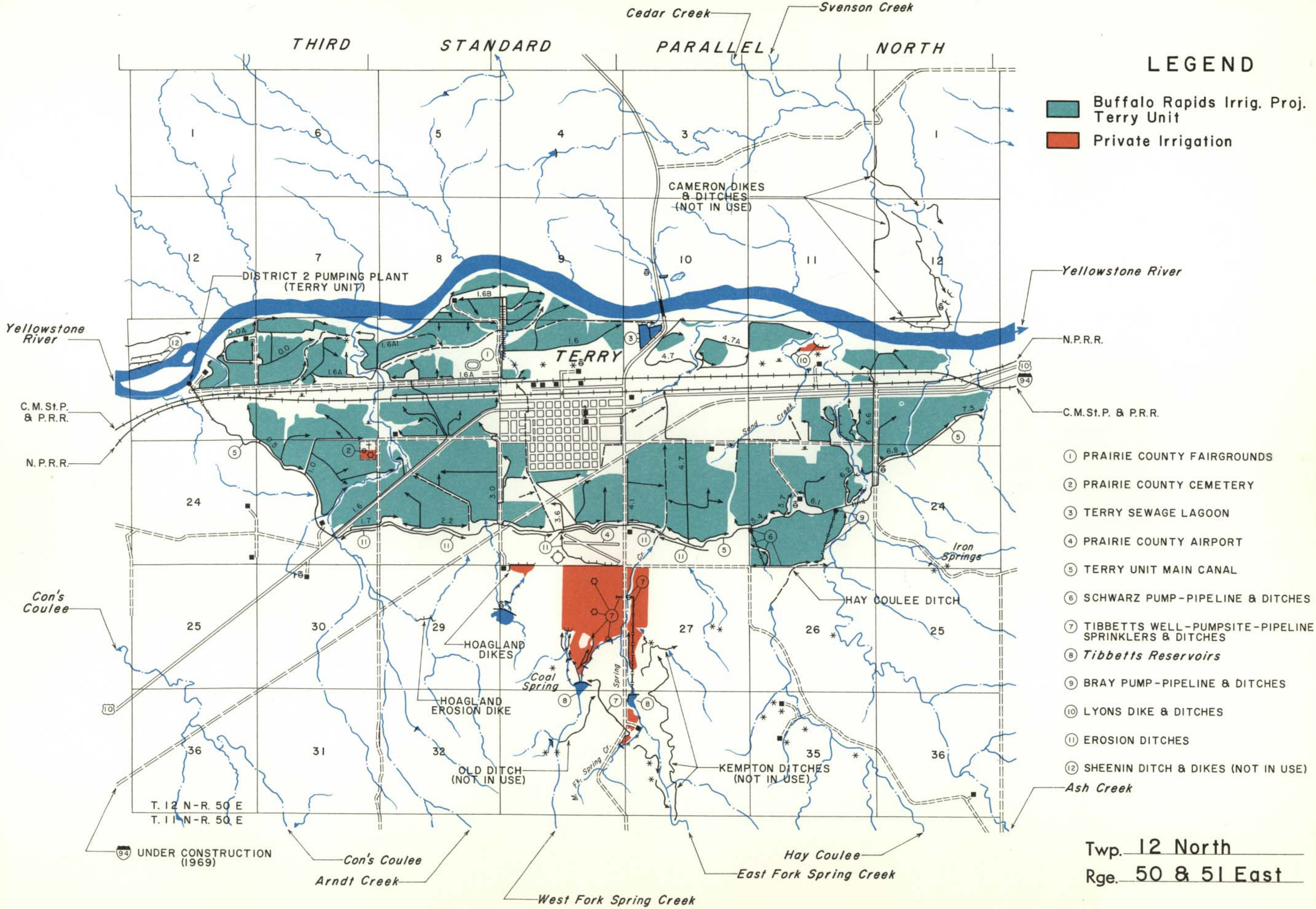
Twp. 11 North
Rge. 53 & 54 East

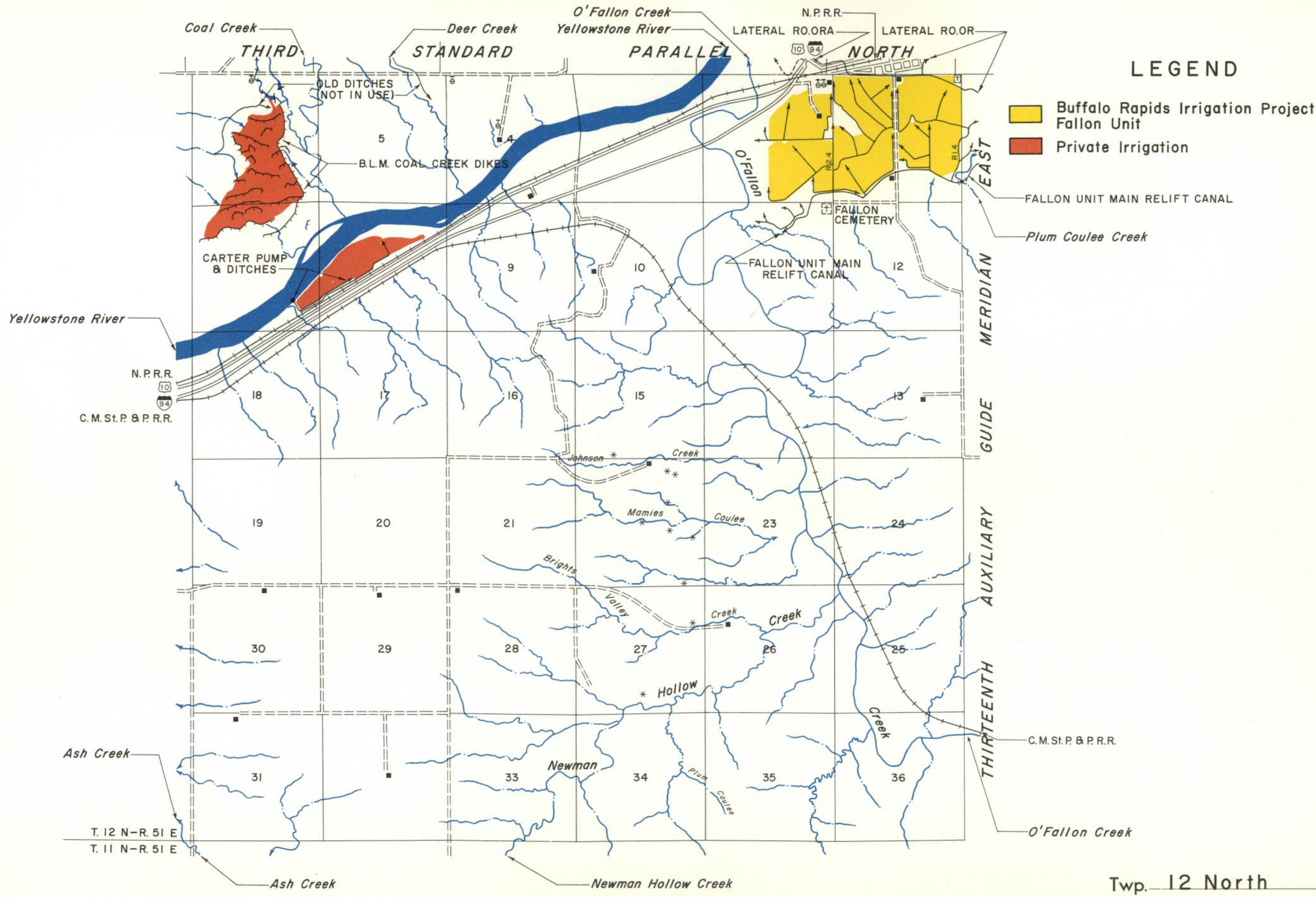


Twp. 11 North

Rge. 55 East

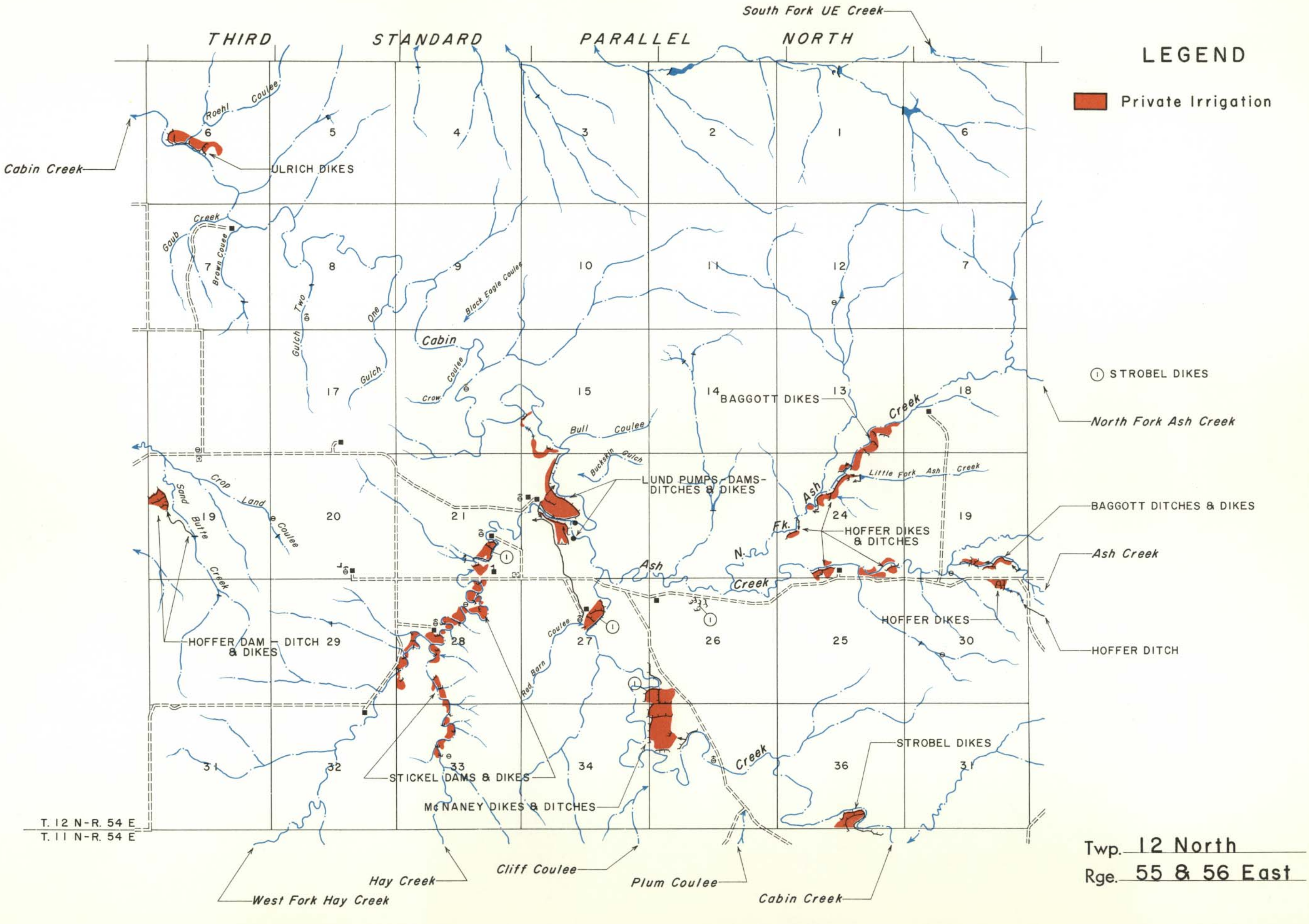

LEGEND
Private Irrigation
WIBAUX
COUNTY
EAST MERIDIAN
GUIDE
FOURTEENTH
Cabin Creek
RENN DITCHES DAM & DIKE
Cabin
Creek
Spring
STEFFES DITCHES DAM & DIKES
Cabin Creek
STEFFES DAM & DITCH
Creek
OLD HAGEN DITCHES (NOT IN USE)
Cow Creek
Spring Creek
T. 11 N-R. 55 E
T. 10 N-R. 55 E
FALLON
COUNTY
Twp. 11 North
Rge. 56 East

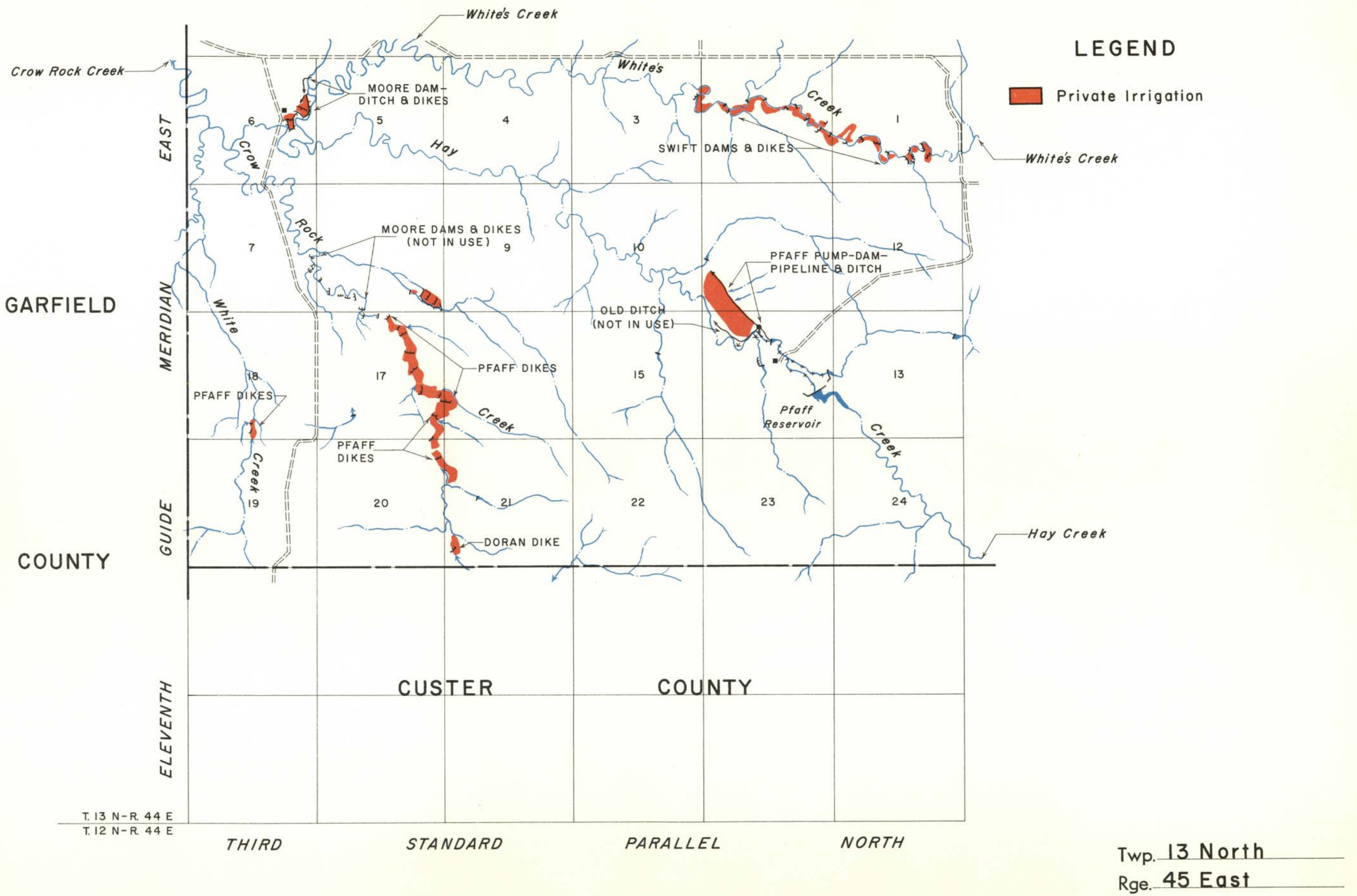

THIRD STANDARD PARALLEL NORTH
Cedar Creek
Svenson Creek
LEGEND
Buffalo Rapids Irrig. Proj. Terry Unit
Private Irrigation
CAMERON DIKES & DITCHES (NOT IN USE)
DISTRICT 2 PUMPING PLANT (TERRY UNIT)
Yellowstone River
Yellowstone River
TERRY
N.P.R.R.
C.M.St.P. & P.R.R.
C.M.St.P. & P.R.R.
N.P.R.R.
Sand Creek
Iron Springs
HAY COULEE DITCH
Con's Coulee
HOAGLAND DIKES
Coal Spring
Spring Cr.
HOAGLAND EROSION DIKE
OLD DITCH (NOT IN USE)
M. Fk. Spring Cr.
KEMPTON DITCHES (NOT IN USE)
T. 12 N-R. 50 E
T. 11 N-R. 50 E
UNDER CONSTRUCTION (1969)
Con's Coulee
Arndt Creek
West Fork Spring Creek
East Fork Spring Creek
Hay Coulee
Ash Creek
1 PRAIRIE COUNTY FAIRGROUNDS
2 PRAIRIE COUNTY CEMETERY
3 TERRY SEWAGE LAGOON
4 PRAIRIE COUNTY AIRPORT
5 TERRY UNIT MAIN CANAL
6 SCHWARZ PUMP-PIPELINE & DITCHES
7 TIBBETTS WELL-PUMPSITE-PIPELINE SPRINKLERS & DITCHES
8 Tibbetts Reservoirs
9 BRAY PUMP-PIPELINE & DITCHES
10 LYONS DIKE & DITCHES
11 EROSION DITCHES
12 SHEENIN DITCH & DIKES (NOT IN USE)
Twp. 12 North
Rge. 50 & 51 East

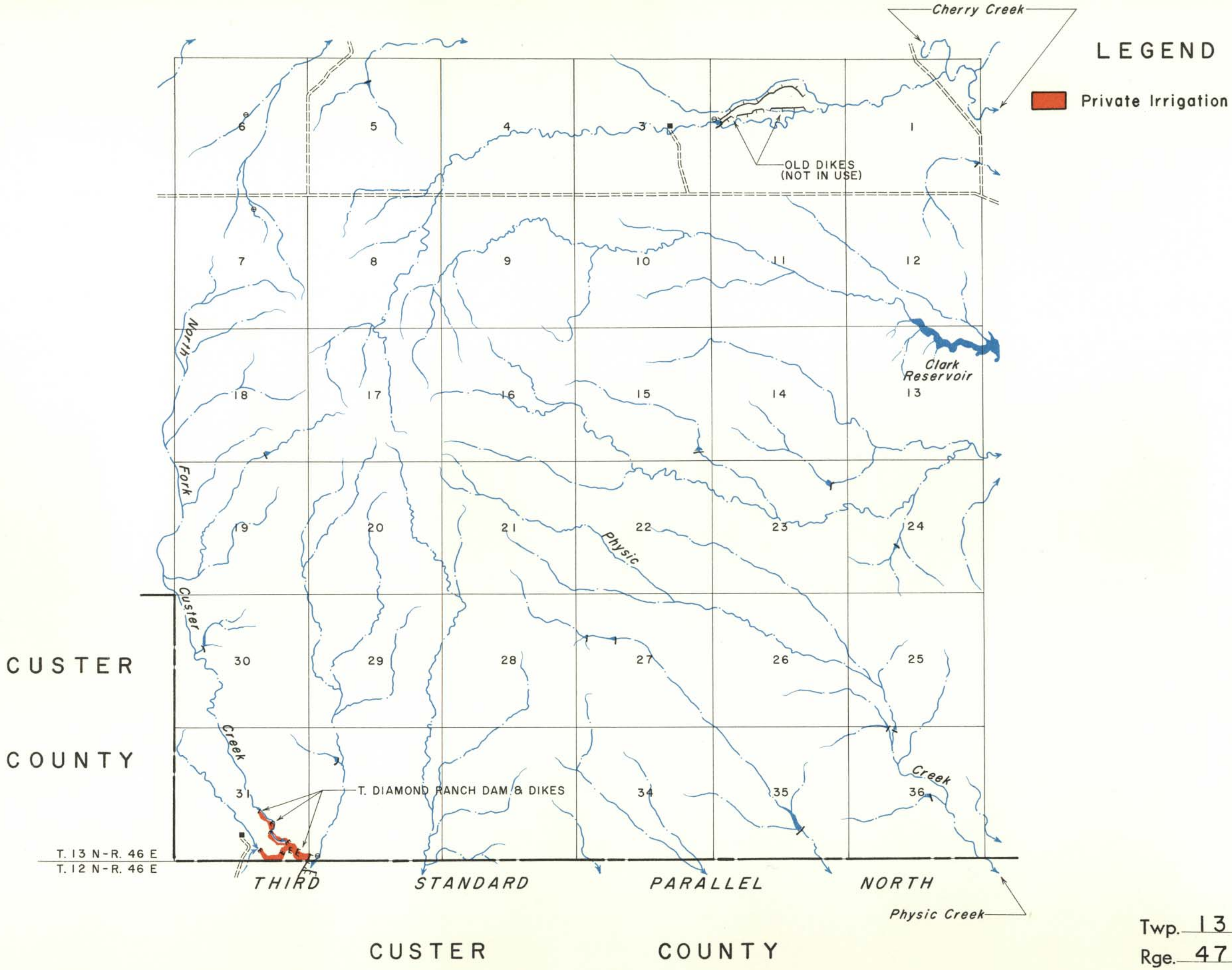


Twp. 12 North

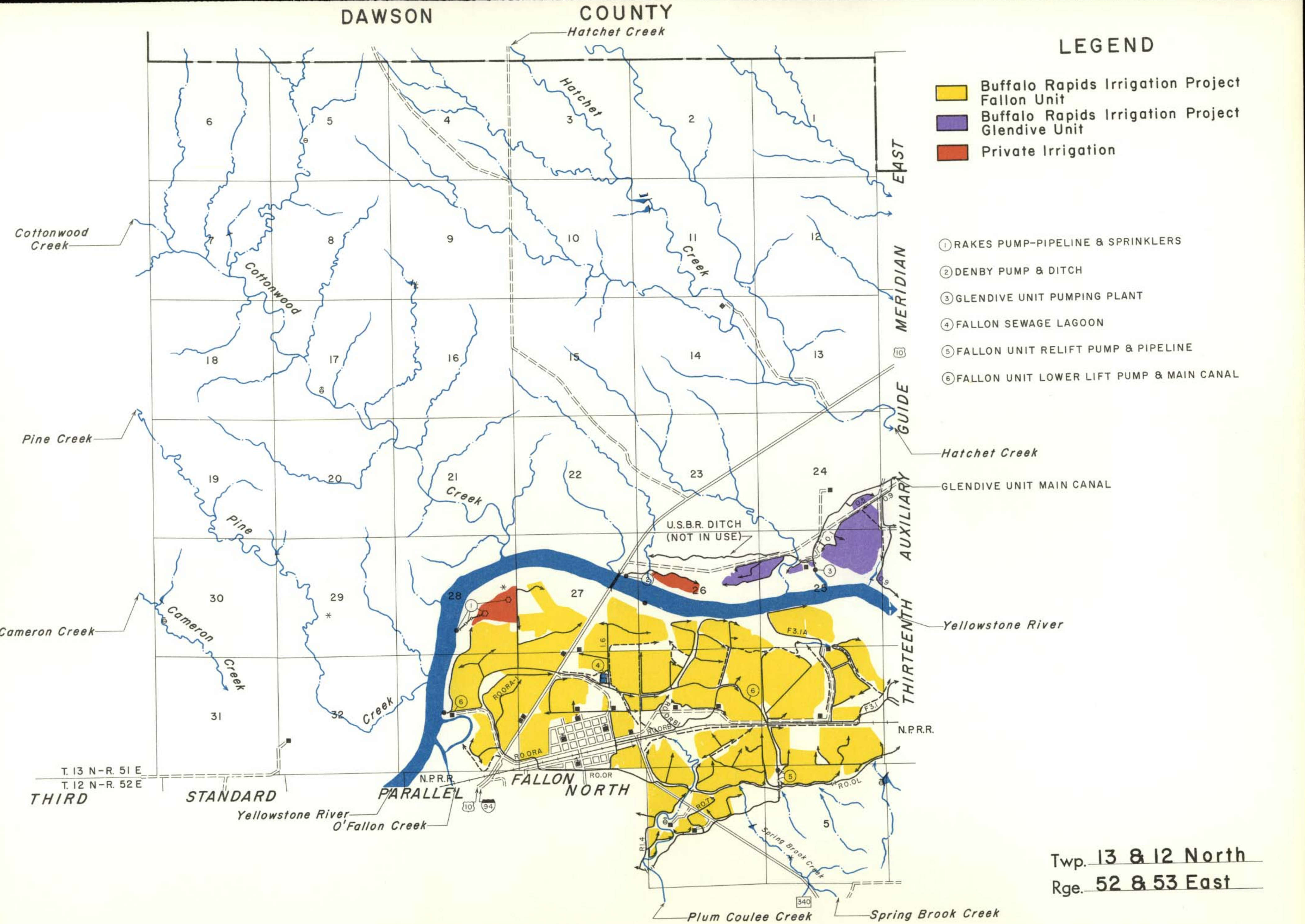
Rge. 52 East

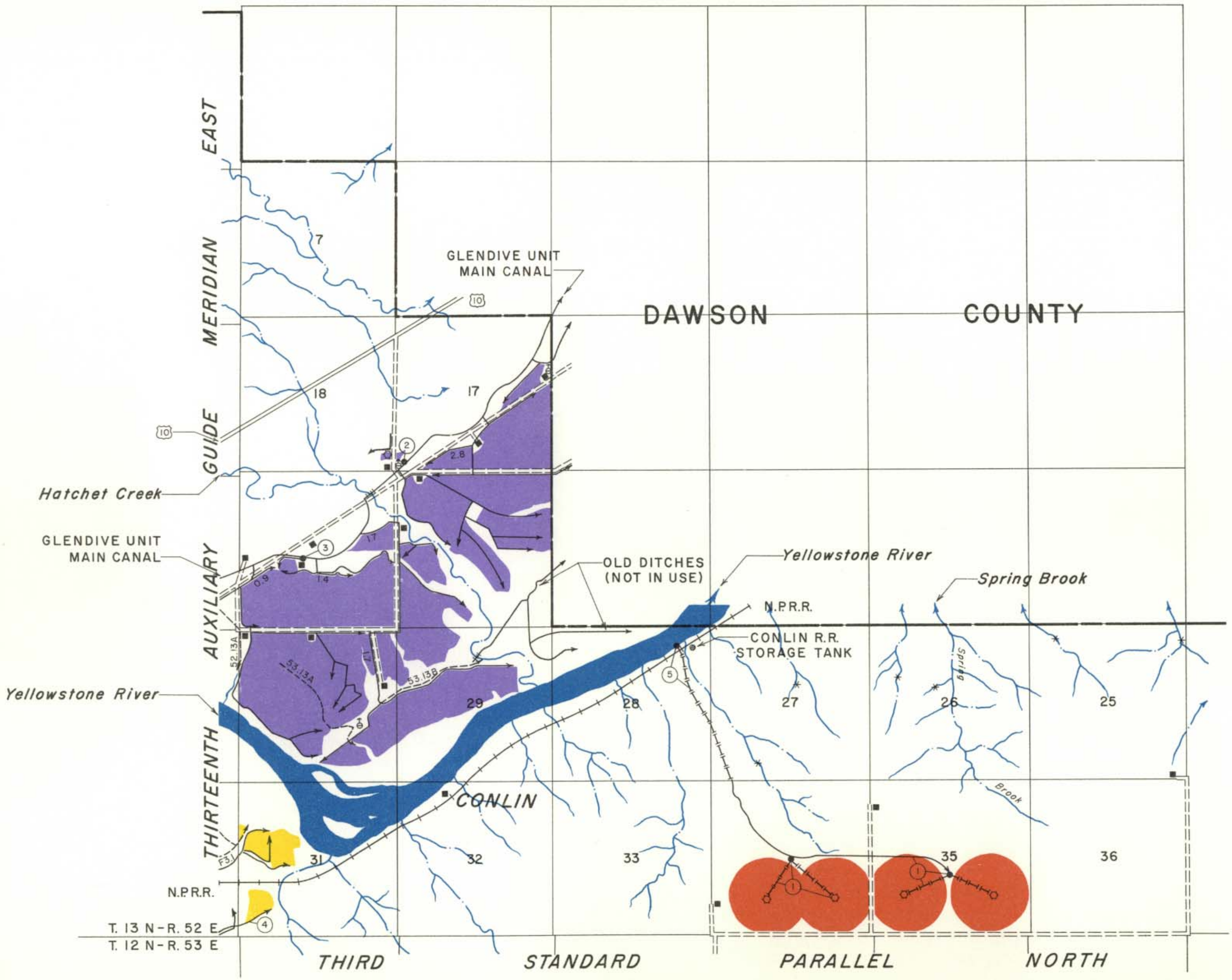

THIRD STANDARD PARALLEL NORTH
South Fork UE Creek
LEGEND
Private Irrigation
Cabin Creek
ULRICH DIKES
Roehl Coulee
Creek
Goub
Brown Couee
Two
Gulch
One
Gulch
Cabin
Black Eagle Coulee
Crow
Coulee
Bull Coulee
Buckskin Gulch
LUND PUMPS, DAMS-DITCHES & DIKES
BAGGOTT DIKES
Creek
Little Fork Ash Creek
Ash
N. Fk.
HOFFER DIKES & DITCHES
(1) STROBEL DIKES
North Fork Ash Creek
BAGGOTT DITCHES & DIKES
Ash Creek
HOFFER DIKES
HOFFER DITCH
Crop Land Coulee
Sand Butte Creek
HOFFER DAM - DITCH & DIKES
Ash Creek
Coulee
Red Barn
STICKEL DAMS & DIKES
McNANEY DIKES & DITCHES
Creek
STROBEL DIKES
T. 12 N-R. 54 E
T. 11 N-R. 54 E
West Fork Hay Creek
Hay Creek
Cliff Coulee
Plum Coulee
Cabin Creek
Twp. 12 North
Rge. 55 & 56 East


LEGEND
Private Irrigation
White's Creek
Crow Rock Creek
MOORE DAM-DITCH & DIKES
SWIFT DAMS & DIKES
White's Creek
Hay
Crow
Rock
MOORE DAMS & DIKES (NOT IN USE)
PFAFF PUMP-DAM-PIPELINE & DITCH
OLD DITCH (NOT IN USE)
PFAFF DIKES
PFAFF DIKES
PFAFF DIKES
White
Creek
Pfaff Reservoir
DORAN DIKE
Hay Creek
GARFIELD
COUNTY
EAST MERIDIAN GUIDE ELEVENTH
CUSTER COUNTY
T. 13 N-R. 44 E
T. 12 N-R. 44 E
THIRD STANDARD PARALLEL NORTH
1
3
4
5
6
7
9
10
12
13
15
17
18
19
20
21
22
23
24
Twp. 13 North
Rge. 45 East



Twp. 13 North
Rge. 47 East


DAWSON COUNTY
LEGEND
Buffalo Rapids Irrigation Project Fallon Unit
Buffalo Rapids Irrigation Project Glendive Unit
Private Irrigation
(1) RAKES PUMP-PIPELINE & SPRINKLERS
(2) DENBY PUMP & DITCH
(3) GLENDIVE UNIT PUMPING PLANT
(4) FALLON SEWAGE LAGOON
(5) FALLON UNIT RELIFT PUMP & PIPELINE
(6) FALLON UNIT LOWER LIFT PUMP & MAIN CANAL
Hatchet Creek
Cottonwood Creek
Pine Creek
Cameron Creek
Yellowstone River
O'Fallon Creek
Plum Coulee Creek
Spring Brook Creek
GLENDIVE UNIT MAIN CANAL
U.S.B.R. DITCH (NOT IN USE)
N.P.R.R.
FALLON
T. 13 N-R. 51 E
T. 12 N-R. 52 E
THIRD STANDARD PARALLEL NORTH
EAST MERIDIAN GUIDE AUXILIARY THIRTEENTH
Twp. 13 & 12 North
Rge. 52 & 53 East



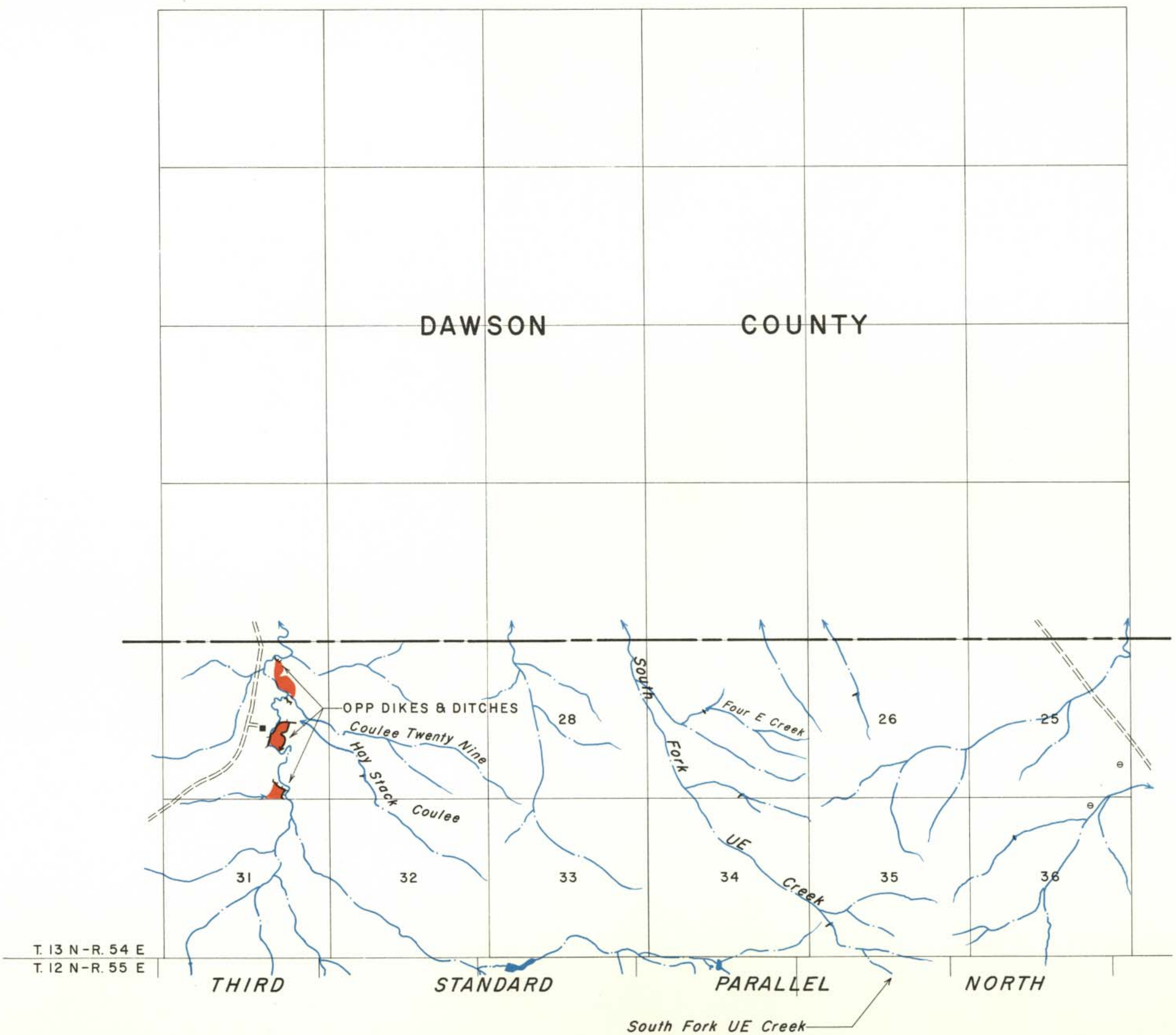
LEGEND

- Buffalo Rapids Irrigation Project Glendive Unit
- Buffalo Rapids Irrigation Project Fallon Unit
- Private Irrigation

1. HAIDLE DITCH-PUMPS-PIPELINE & SPRINKLERS
2. HESS PUMP-PIPELINE & SPRINKLERS
3. LAPP PUMP
4. HJORTH DITCH
5. HAIDLE PUMP & PIPELINE

Twp. 13 North

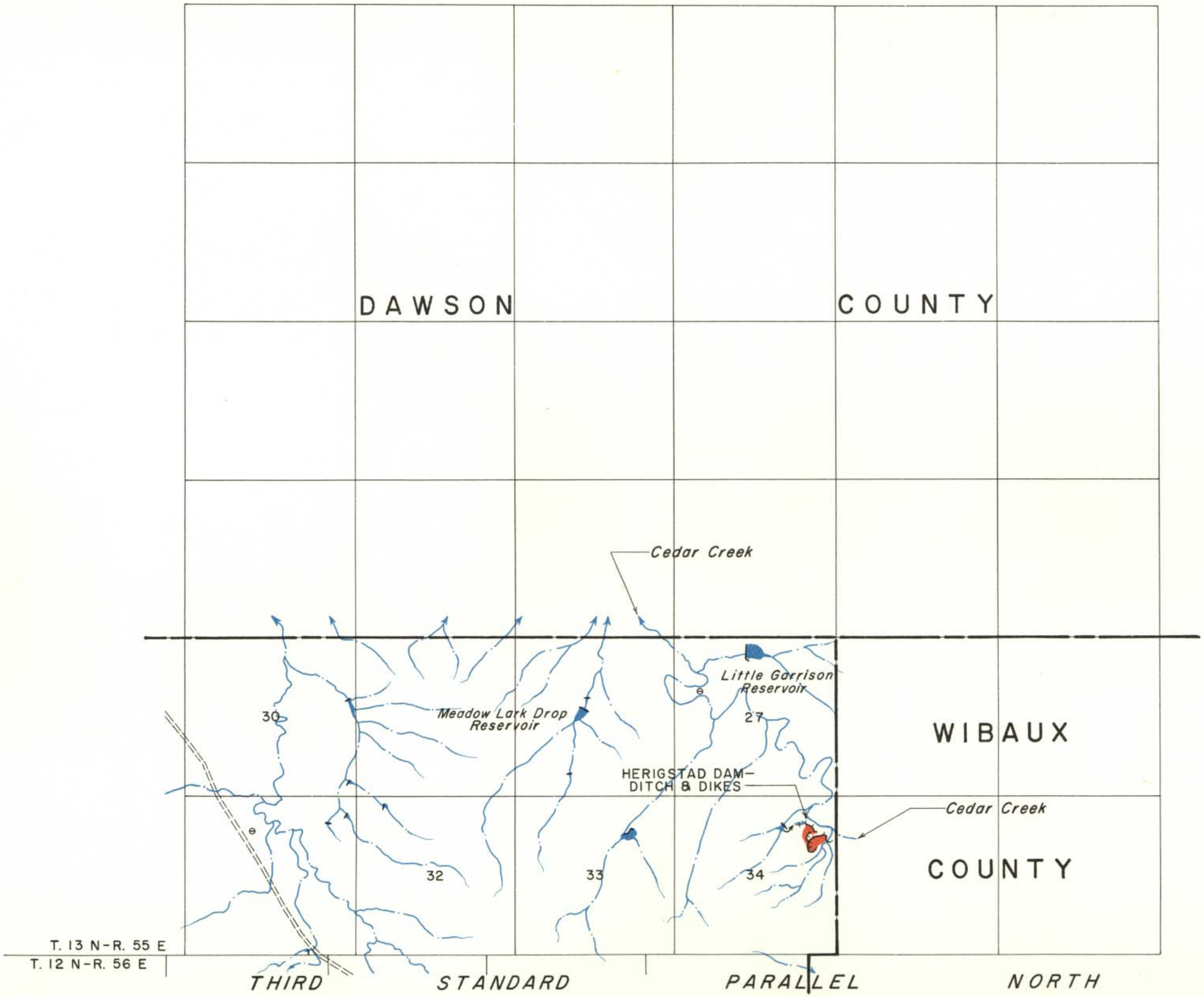
Rge. 53 East



LEGEND

Private Irrigation

Twp. 13 North
Rge. 55 East

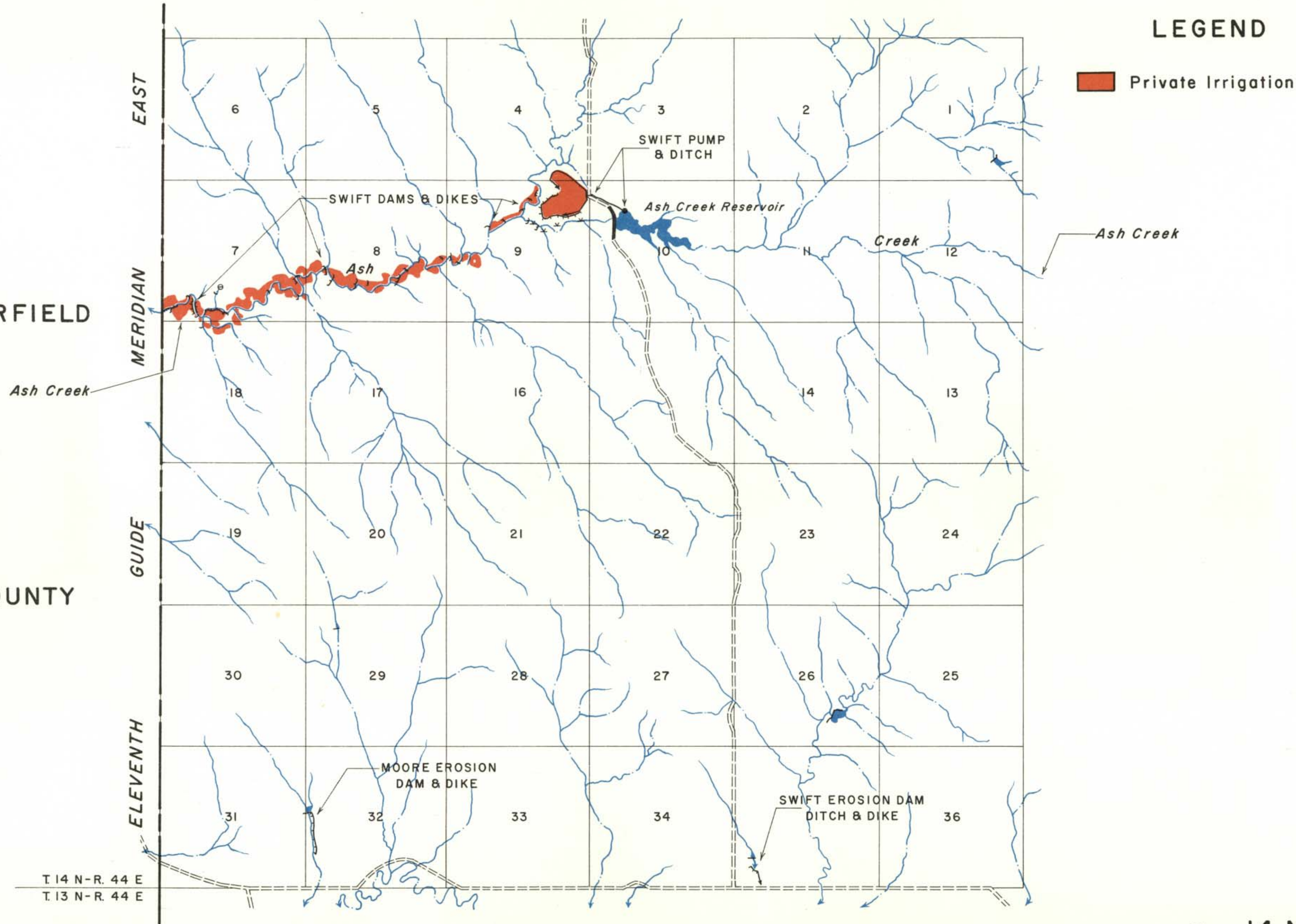


LEGEND

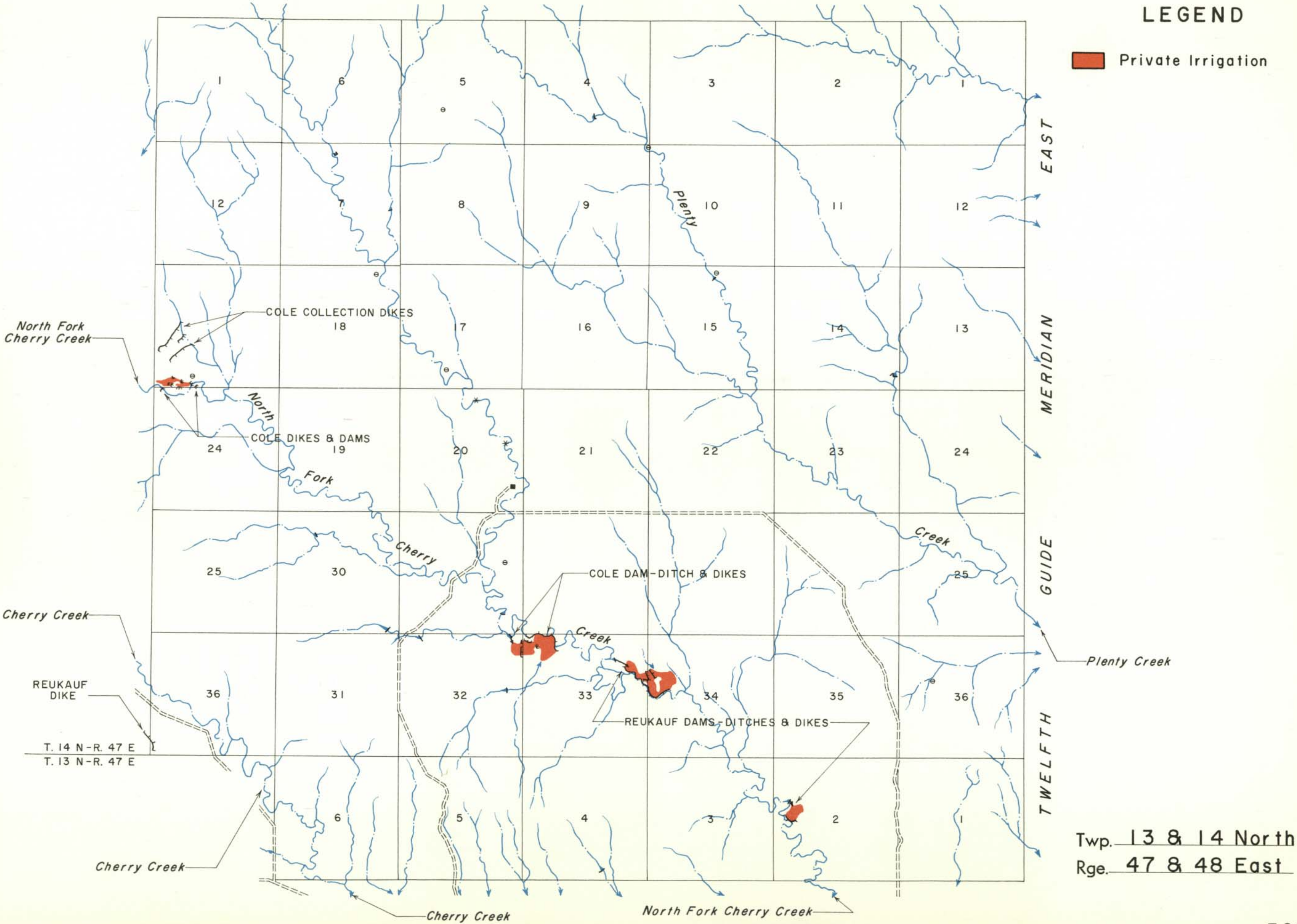
Private Irrigation

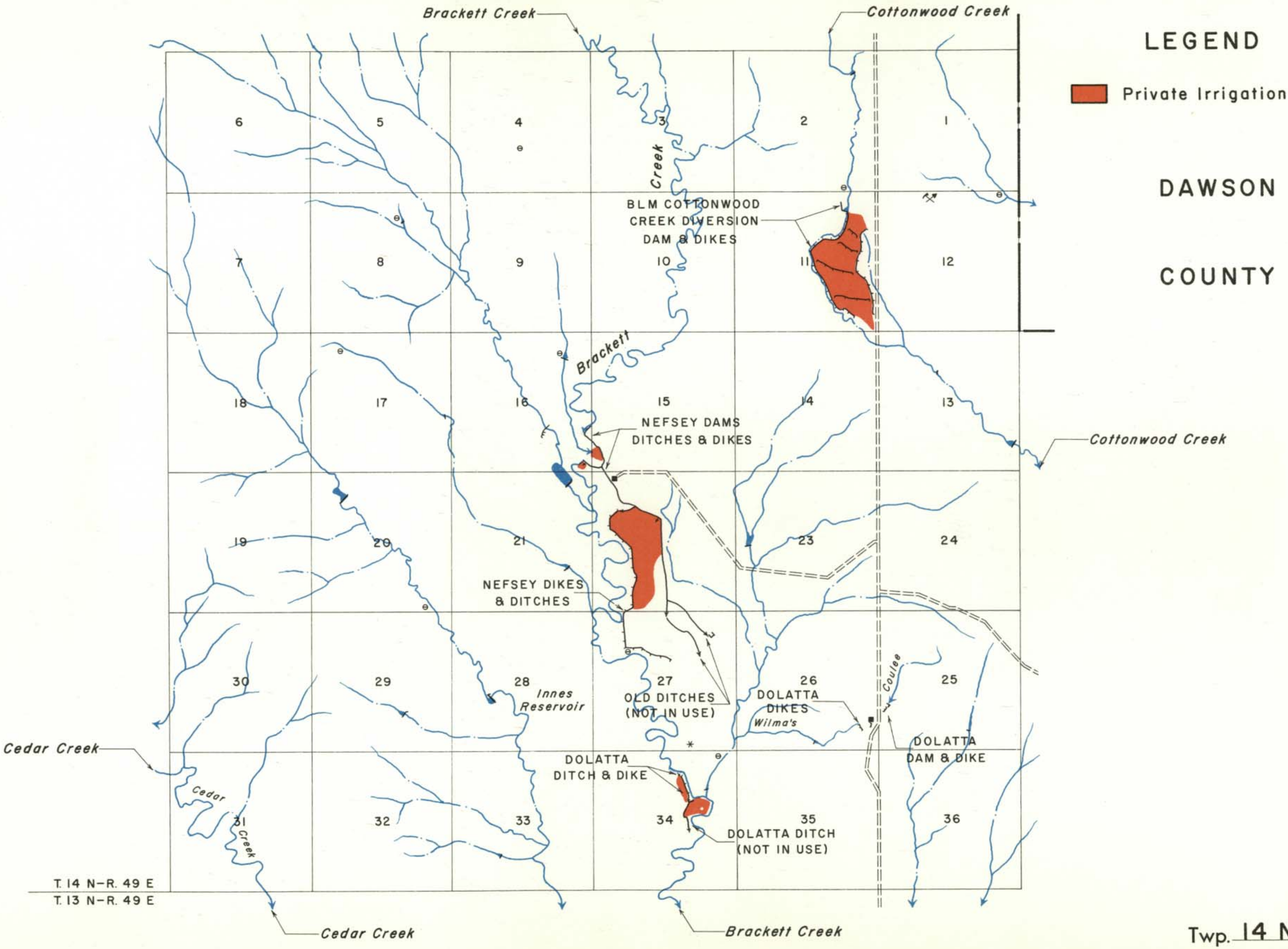
Twp. 13 North

Rge. 56 East



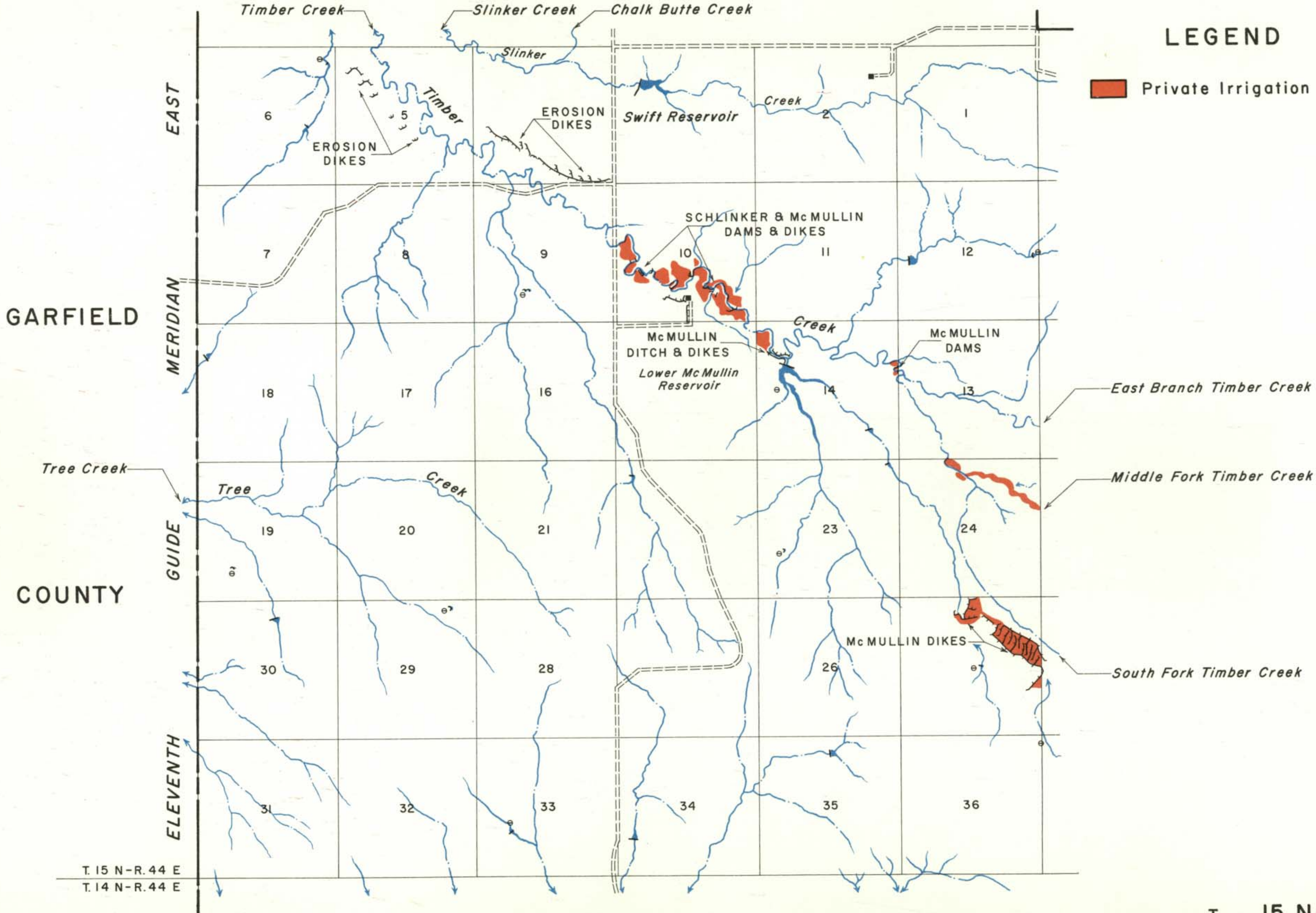
Twp. 14 North
Rge. 45 East


LEGEND
Private Irrigation
COLE COLLECTION DIKES
North Fork Cherry Creek
COLE DIKES & DAMS
North Fork Cherry Creek
Plenty
Creek
COLE DAM-DITCH & DIKES
Cherry Creek
REUKAUF DIKE
REUKAUF DAMS-DITCHES & DIKES
T. 14 N-R. 47 E
T. 13 N-R. 47 E
Plenty Creek
Cherry Creek
Cherry Creek
North Fork Cherry Creek
TWELFTH GUIDE MERIDIAN EAST
Twp. 13 & 14 North
Rge. 47 & 48 East



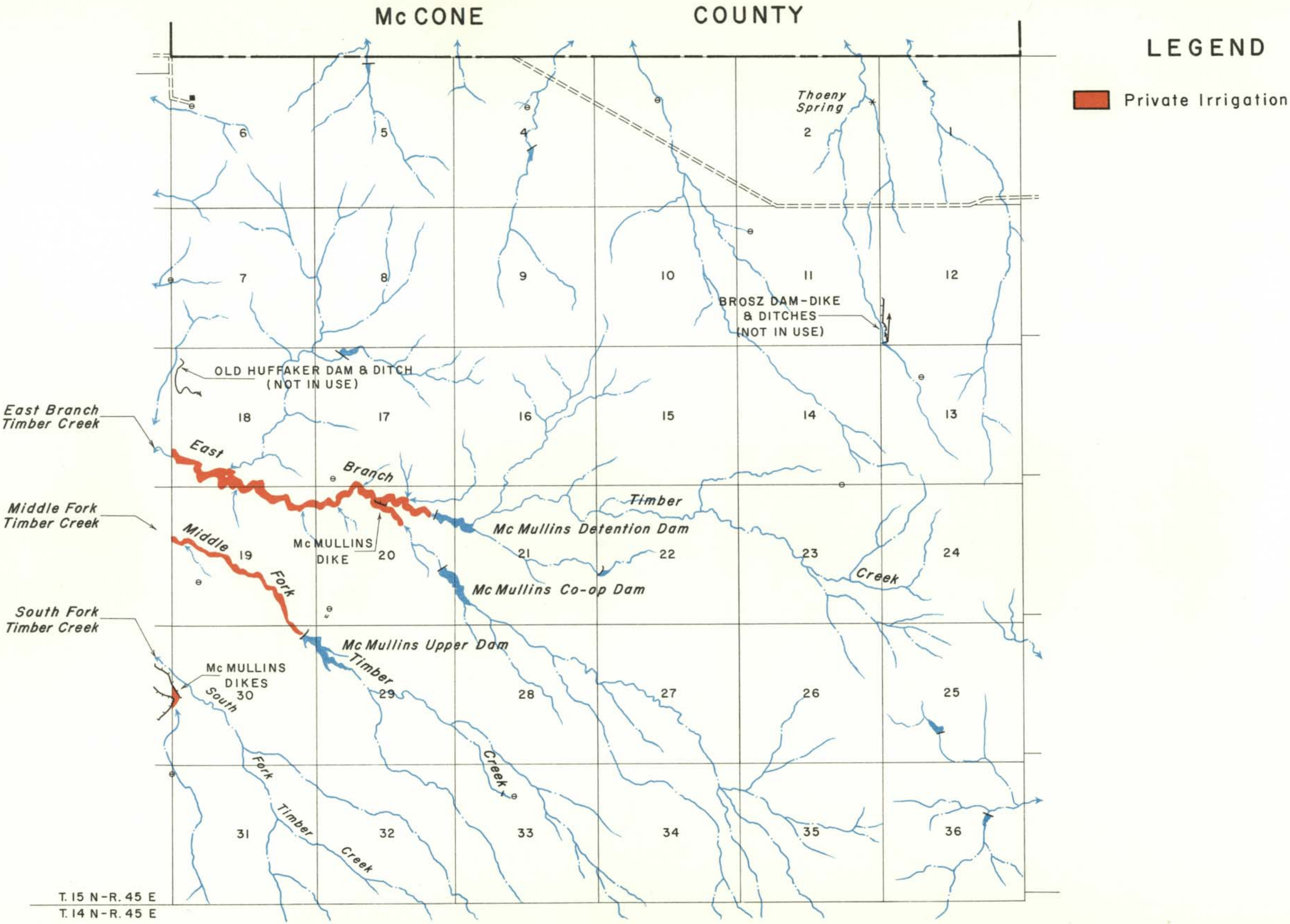
Twp. 14 North

Rge. 50 East

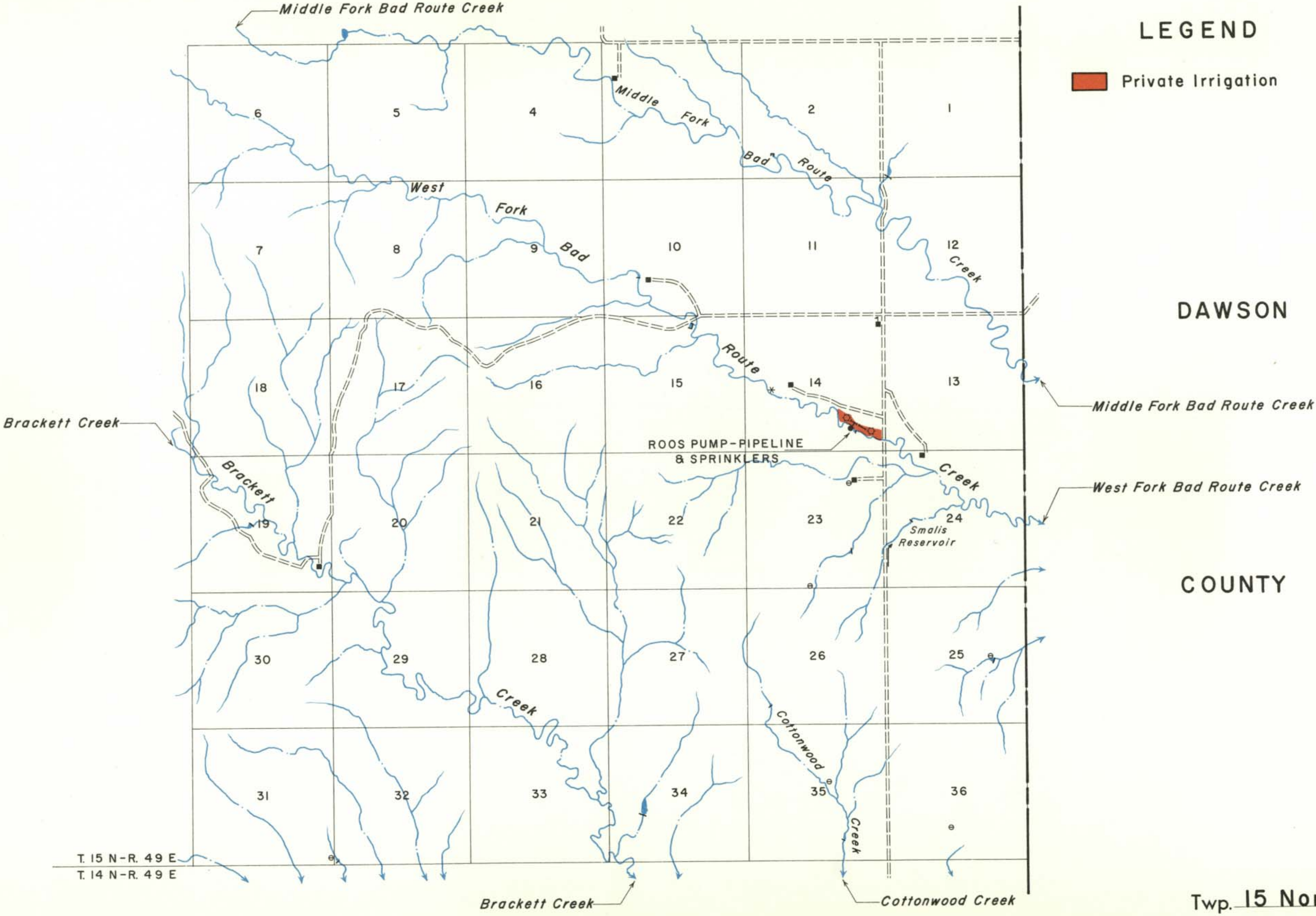


Twp. 15 North

Rge. 45 East

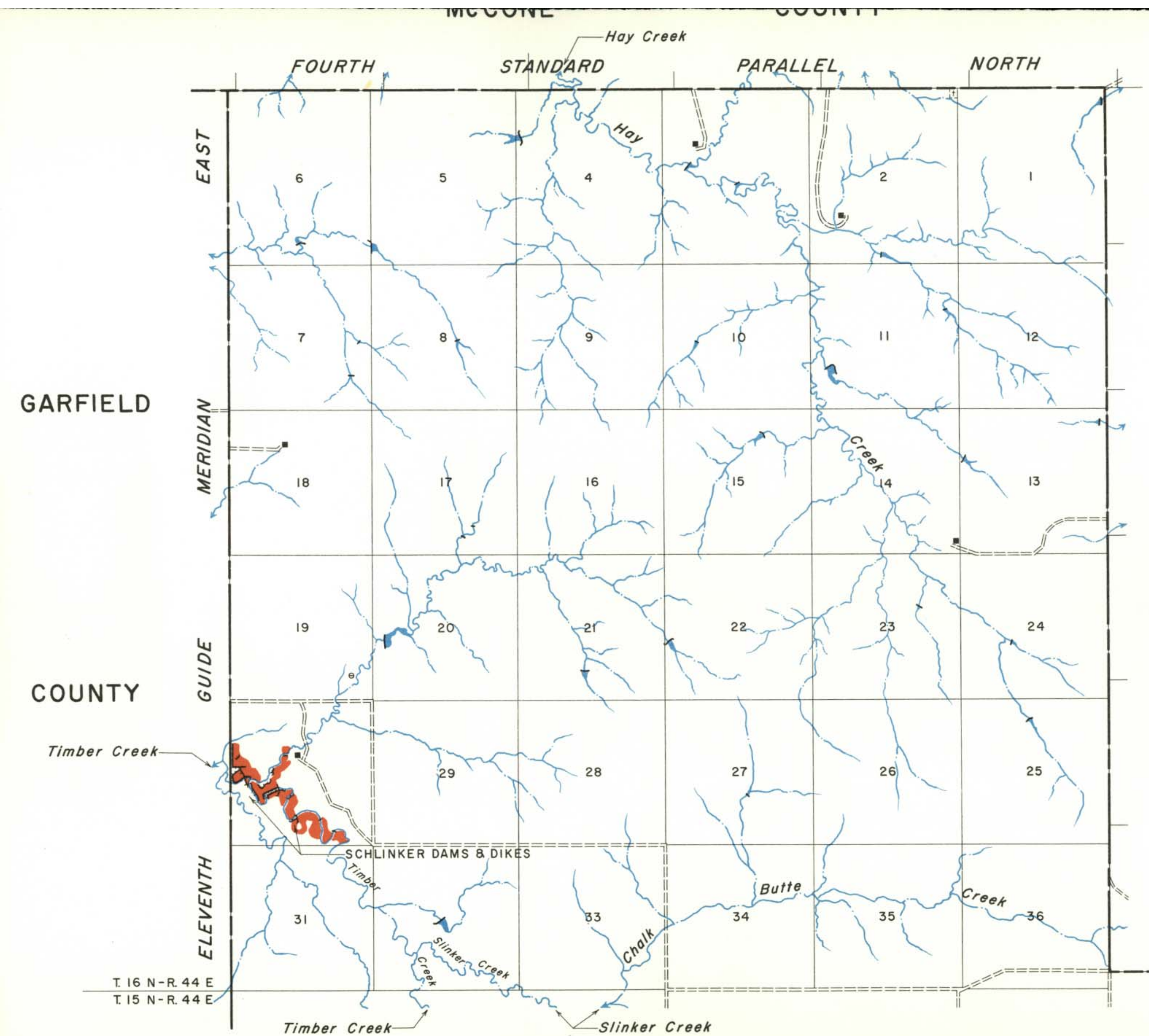


Twp. 15 North
Rge. 46 East



Twp. 15 North

Rge. 50 East

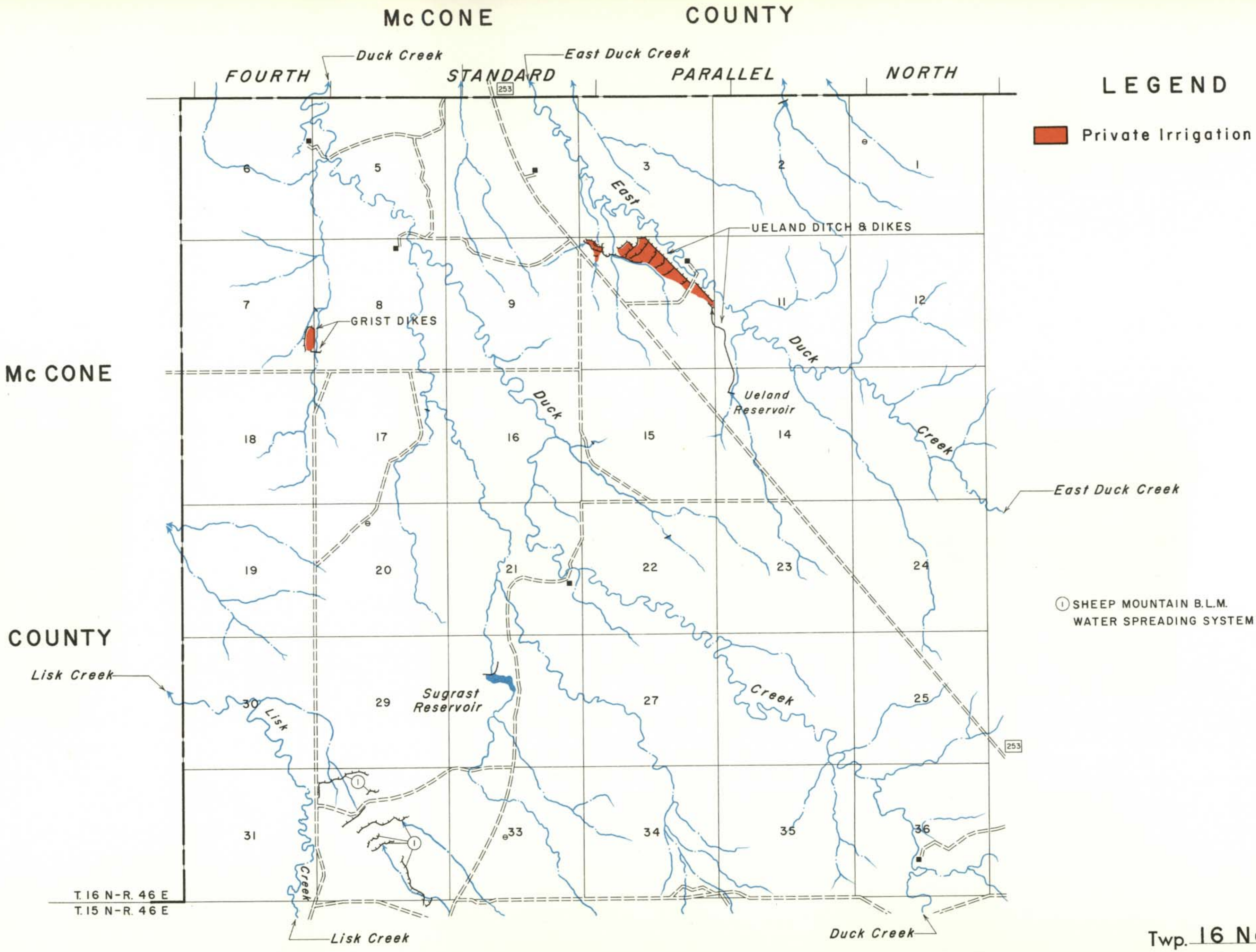


LEGEND

Private Irrigation

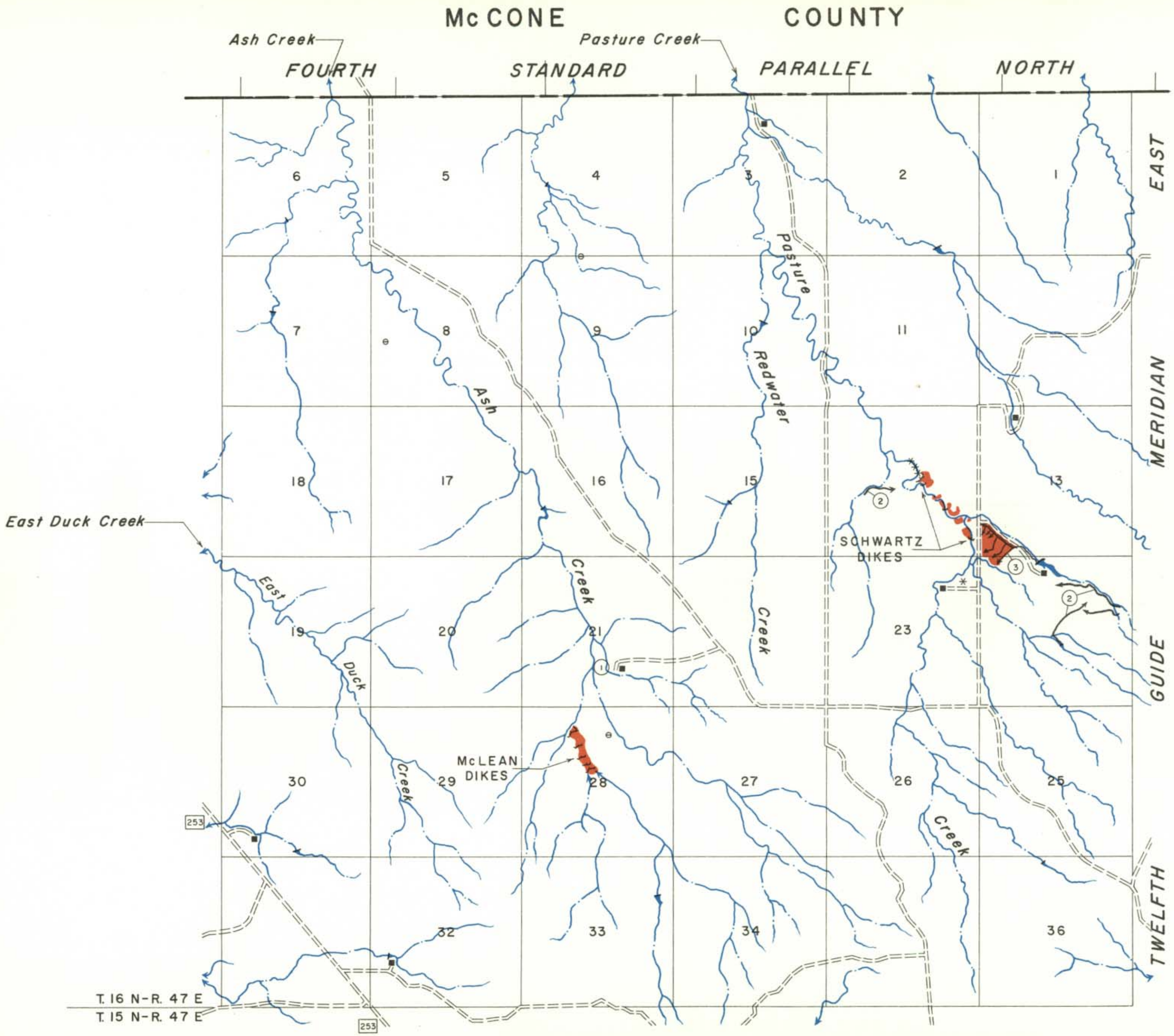
Twp. 16 North

Rge. 45 East



Twp. 16 North

Rge. 47 East



LEGEND

Private Irrigation

(1) Lieutenant Frank D. Baldwin of the Fifth Infantry, 110 men in all, attacked and dispersed 122 lodges of Sioux Indians under Sitting Bull December 18, 1876.

(2) OLD DITCHES (NOT IN USE)

(3) SCHWARTZ DAM & DITCHES

Twp. 16 North

Rge. 48 East

MEMBERS OF THE WATER RESOURCES DIVISION

APRIL, 1970

A. J. Mancini, Director

Bernece Arts, Secretary
Janice Schutt, Clerk-typist
Carol Lyons, Clerk-typist

Hans L. Bille
Coordinator

Ronald J. Guse
Groundwater Supervisor

D. A. Pouliot
Coordinator

Robert Poad, Office Supervisor
- John Serquina
- June Virag
- Warren Fisher
- Dan Erving
- John McBee
- Dan Nelson
- John Rummel

Ned Johnson, Field Supervisor
- Ron Haynes
- Jim Rehbein
- Duane Smith
- William Flynn
- Art Preston
- Silvio Rodriguez
- Gary Wiseman
- Ed Fallang
- Tom Reynolds

Assisted by: Robert Peter, Microfilm Specialist