Water Resources Survey

Part I:

HISTORY OF LAND AND WATER USE ON IRRIGATED AREAS

and

Part II:

MAPS SHOWING IRRIGATED AREAS IN COLORS DESIGNATING THE SOURCES OF SUPPLY

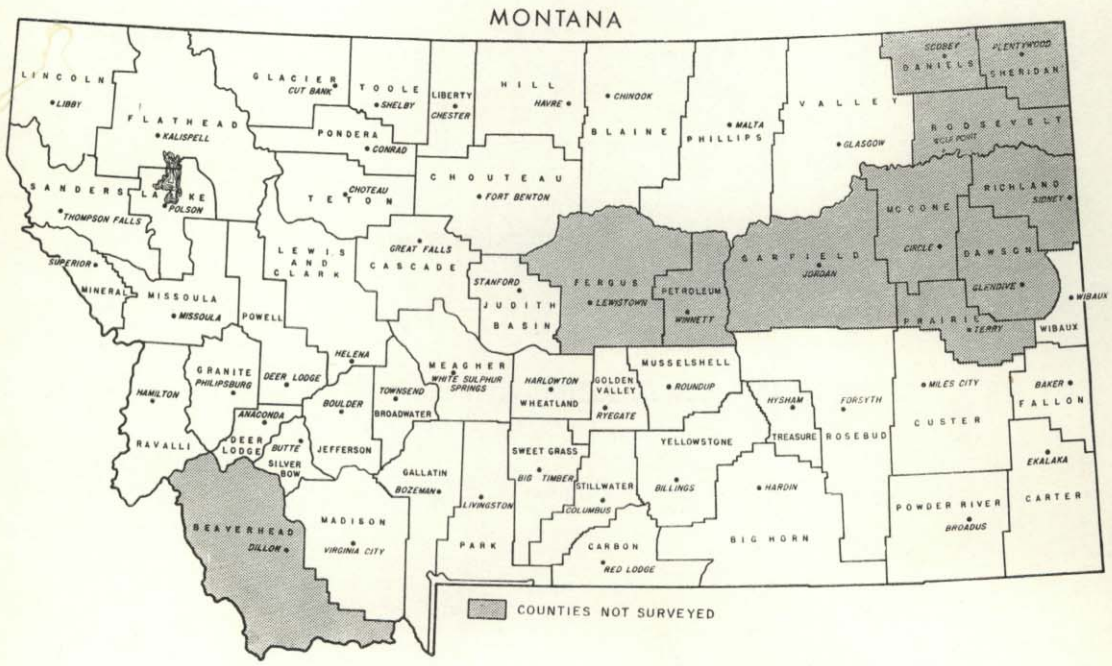
Mineral and Sanders Counties, Montana

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

WATER RESOURCES SURVEY

MINERAL AND SANDERS COUNTIES MONTANA

Part I
History of Land and Water Use on Irrigated Areas



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Water Resources Survey

MONTANA STATE AGRICULTURAL EXPERIMENT STATION

C. C. Bowman, Irrigation Engineer and Consultant, Bozeman

3 REPORTER PRTG. & SUPPLY CO

September, 1969

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

Dear Governor Anderson:

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

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

Surveys have been made in the counties of Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Deer Lodge, Fallon, Flathead, Gallatin, 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, 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 these are now out of print. However, reports will again be published on these counties sometime in the future after they have been updated.

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

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

Respectfully submitted,
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.

MINERAL COUNTY OFFICIALS

Mrs. L. P. Bennett, Commissioner
Ralph E. Johnson, Commissioner — Arthur N. Jensen, Commissioner
J. A. Wilkinson, Clerk and Recorder
Mrs. Elizabeth Tamietti, Clerk of District Court — Mrs. Martha Corn, Assessor

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Jesse W. Lee, Commissioner
Wesley W. Stearns, Commissioner — Roy M. DeLong, Commissioner
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Mrs. Winifred I. Diehl, Clerk of District Court — Paul J. Farlan, Assessor

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Phillip E. Farnes.....Snow Survey Supervisor
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Clarence H. Keirns.....Member of Green Mountain Water Users Association
W. H. Cardon.....Work Unit Conservationist, S. C. S.
Torlief S. Aasheim.....Director, Montana Cooperative Extension Service
Walt Reisdorfer.....Work Unit Conservationist, S. C. S.
Robert Racicot.....County Extension Agent
Frank M. Faller.....County Extension Agent

TABLE OF CONTENTS

MINERAL AND SANDERS COUNTIES

TABLE OF CONTENTS (Continued)

SANDERS COUNTY

FOREWORD

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-raparian 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. Construc-

tion of the means of diversion must begin within 40 days of the posting and continued with reasonable diligence to completion. However, the Montana Supreme Court has ruled that an appropriator who fails to comply with the Statutes may still acquire a right merely by digging a ditch and putting the water to beneficial use.

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

Montana laws do not require water users to file official records of the completion of their appropriations; therefore, it becomes advisable as soon as the demand for the waters of a stream becomes greater than its supply, to determine the rights and priorities of each user by means of an adjudication or water right suit. This action may be initiated by one or more of the appropriators who 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 adjudicated 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 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 applied 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 or 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 had 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 sub-area of the State.

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

(c) "Well" means any artificial opening or excavation in the ground, however made, by which 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 "sub-areas."

Section 2. **Right to Use.**

Rights to surface water where the date of appropriation precedes January 1, 1962, shall take priority over all prior or subsequent groundwater rights. The application of groundwater to a bene-

ficial 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.

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 insure accuracy of the data collected rather than to speed up the work which might invite errors.

WATER RESOURCES SURVEY

Mineral County, Montana

PART I

History of Land and Water Use
on Irrigated Areas

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

HISTORY AND ORGANIZATION

The area known as Mineral County was probably first visited by the trappers and fur traders of the early 1800s, but the first known visitors were the Jesuit Missionaries, Father DeSmet, Cataldo, Grossi and Ravalli, during the 1840s. The country they saw was the heavily timbered slopes and valleys of the Clark Fork of the Columbia and the St. Regis Rivers.

In 1850, Major John Owen, a trader, inaugurated an annual trip to The Dalles traveling the route down the Clark Fork River, up the St. Regis River and over Lookout Pass. During the middle 1850s the first permanent settlers in what is now Mineral County homesteaded near the present town of Alberton. They were the Brown and Albert families, the latter for whom Alberton was later named.

In 1858 the possibilities of further settlement were enhanced when U. S. Army Captain John Mullan arrived in the area to construct the military road which now bears his name. He spent the winter of 1859 in a camp near the present town of DeBorgia. The "Mullan Road", as it was known, was completed to Walla Walla in 1861.

With the completion of the Mullan Road through this region and the passage of travelers heading for the Washington territory, many of the travelers stopped and settled in the area along the way. Several "Road Houses" were established along the route. Some of these were "The Kitchen" operated by Peter Rabbit and was located near St. Regis; "Rothchilds Hotel" located near the present town of Superior; and the "St. Regis House" at Silver City, presently the town of Saltese.

The real settlement of the area began with Louis Barrette in 1868. After returning from the Idaho gold fields that year he tested a few streams for "color", which resulted in the opening of the Cedar Creek Placer District the following spring. The spring of 1870 saw the town of Louisville established with a population of 3,000 people. By 1872, the Cedar Creek "Diggings" were playing out but the impetus of travelers had begun and the population moving was westward. By 1873 the towns of Louisville, Forest City, and Mayville had flourished and faded and the "Diggings" were almost abandoned. After the miners left the placer claims the Chinese moved in and reworked the old diggings which were reported to have yielded considerable gold. Another flurry occurred in 1884 when Louis Barrette returned to the Cedar Creek District and reworked the old placers until 1906.

In 1880 the area around the St. Regis House started to develop with the opening of mines to the north along Packer Creek. The community of Silver City grew up around the old St. Regis House when the railroad came through in 1891. At this time the name of Silver City was changed to Saltese in honor of a Nez Perce chieftain.

The area around Pardee on Flat Creek was another notable gold camp with the Iron Mountain Mine being established here in 1886. At first the ore was hauled out by pack train north over the mountain to the railroad near Perma and some ore loaded on barges for Paradise. With the completion of the Wallace Branch of the Northern Pacific Railroad the town of Iron Mountain was established near the Rothschild Hotel and the ore ferried over the river and loaded on the railroad.

In 1887 John Cromey and two companions returning from Idaho and prospecting along the way camped in a small gulch about four miles from Superior. They prospected more for veins than for placer and finally found a large vein of silver and lead ore, which included some copper. When the

boom was over, the remaining miners decided they wanted a post office and, after many suggestions, finally decided on Carter for its location. When silver was demonitized the camp was closed down, but in 1900 the mines were again reopened, and it was then decided to rename the town of Carter, —"Keystone"—. The mine at Keystone is still in operation. In 1897 gold was discovered on some of the tributaries of Quartz Creek. The gold associated with these placers was of a much coarser grade than that found in other districts of the county. One nugget recovered was reported to be valued at $60.00, ($16.00 per oz.) then the prevailing value.

With the completion of the Northern Pacific Railroad over the mountain to Wallace, Idaho, in 1891, the lumber and sawmill industry boosted the sagging economy of the area and a number of mill towns grew up around the sawmills. The most notable of these sawmill towns were Lothrop, Superior, DeBorgia, and St. Regis. The town of Lothrop has since disappeared from the scene.

In 1908 the Northern Pacific line finished the cut-off route between St. Regis and Paradise. At the same time the Milwaukee Railroad was building its line through the county. The activity of these two railroads gave St. Regis the impetus needed to establish a permanent community.

In the summer of 1910 a series of forest fires started in Idaho across the mountain from Saltese. By August of that year these fires had all coalesced creating a solid front. The wind carried the fire into western Montana, and sparks and coals were pushed far in advance, starting numerous fires ahead of the main body of the conflagration. Trains were held at Saltese to take refugees out of the danger area and one of these was hard pressed to beat the fire to St. Regis as the flames raced along both sides of the track.

Before the fire it was estimated that 28 years of potential logging was available in the burned out area and afterwards the accessible timber remaining was limited to four years of logging. Subsequently logging declined until access roads could be built to the larger stands of virgin timber. Presently the only remaining lumber mill now operating is the Diamond International Corporation located on Trout Creek.

In the year or two following the big fire a nursery was established at Haugen to raise seedlings for replanting the burned over area. This nursery now is rated as the largest of its kind in the world. The major species of trees raised are White pine, Ponderosa pine, Western Larch, Douglas fir, and Englemann spruce.

Prior to 1914 the people of the western portion of Missoula County became dissatisfied with their county administration. They had the feeling they were coming up short on almost everything including money, schools and roads. On August 14, 1914, an election was held and the voters favored the creation of Mineral County with Superior as the county seat. Other competitors for the county seat were St. Regis and Alberton.

Agriculture has played only a minor role in the settlement and economy of Mineral County. The heavily timbered valleys and hillsides precluded any extensive development of farming and stock raising. Most of the valley bottoms are not extensive enough for any large scale ranching and farming operations.

Mineral County has good access to rail, highway and bus transportation facilities. Two transcontinental railroads pass through the county from east to west. The Northern Pacific Railway has

its main freight line passing through the county from Alberton to Paradise. It also has a branch line that serves a western portion of the county extending into Idaho. The main line of the Chicago, Milwaukee, St. Paul and Pacific Railroad passes through the county from east to west. These two lines maintain only freight business at present time. The county is interlaced with a network of federal, state, and county roads. The main highways are U. S. Highway #10 and Interstate Highway #90 that traverse the county east to west. State Highway #461 crosses from St. Regis and intersects with Montana #200 near Paradise.

The Greyhound Bus Lines provide passenger service in and out of the county serving Alberton, Superior, St. Regis and Saltese. There are no commercial airports in the county, the nearest airport facility being located at Missoula.

According to the 1960 census, Superior the county seat, is the largest town, with a population of 1,242. Other towns of importance and their population are: St. Regis—500; Alberton—356; Saltese—85; DeBorgia—75; and Haugen—40. Mineral County covers a land area of 1,223 square miles and had a population in 1960 of 3,037 people.

CLIMATE

Bounded by mountains on all sides except for part of the Missoula County boundary, Mineral County is among the more mountainous in the State. Elevations range from about 2,500 feet where the Clark Fork River flows eastward into Sanders County up to nearly 8,000 feet on some of the higher peaks of Bitterroot and Coeur d'Alene Mountains. Primary drainages are the St. Regis River, flowing roughly southeastward to its confluence near St. Regis with the northwestward flowing Clark Fork. Below this confluence the Clark Fork River runs eastward into Sanders County before turning northwestward again just above Paradise. The rugged mountain terrain is mostly heavily forested, with smaller drainages generally flowing into the main river system.

The mountainous character of the county, and its northwest southeast extent and orientation, combine with prevailing weather patterns to produce a county climate of considerable variability with elevation and with northwest-southeast distance. As in most Western Montana areas, the higher mountains are much wetter than valley bottoms, especially during the cold season. With distance southeastward from Lookout Pass, precipitation decreases rapidly, with the sharpest decrease showing up in valley bottoms as the mountain lee slope sheltering effect increases southeast of about Haugen. In fact, a few years of records at Alberton, close to the eastern edge of the county, and many years of observations at Superior, indicate that the southeast end of the county receives little more than half as much moisture as the northwest half. This shows the decreasing influence of the Pacific Maritime climate of Northern Idaho as one moves eastward through Western Montana's mountains.

Winter snowfall, especially at higher elevations, is classed as heavy, but is heaviest northwest and along the Bitterroot Ridge. At Haugen, annual snowfall averages 10 feet or more, while over the mountains it is even larger. But at Superior a 30-year record shows an average of only 45 inches —not much more than in some of the plains areas of Eastern Montana. Winter snowfall accumulations along the mountains are the primary source of the relatively high spring runoff in this and other Western Montana mountain counties. The precipitation climate is mostly close to the North Pacific maritime type, but the Pacific influence decreases steadily in this area as one moves from northwest to southeast, with occasional continental effects showing up east of Superior.

Temperatures, particularly in the valley bottoms, are subject to wide daily ranges. At Superior in July, for example, an afternoon average maximum of nearly 88° gives way to an average morning minimum of 47°. While this is a common summer weather phenomenon, the average range decreases during the winter—because of cloudiness—to about 15° to 16°. Very cold winter weather can occur when an Arctic source air mass spills westward through the mountains, but this doesn't happen at all some winters, and only a time or two at the most in an average winter. Summer afternoons sometimes can be quite hot, but rarely with high relative humidity. At Superior about half the years have experienced at least one 100° or slightly warmer maximum. Freeze-free seasons in most of the county are relative short, with the last freeze (32°) of the spring usually near June 1, and the first in the fall (actually late summer) about the first week in September in the warmer sections. In higher areas, however, frost may occur in any month, including July and August (Haugan, for example).

Severe storms are practically unknown if one accepts the occasional heavy winter snowstorms as normal to the area. Tornadoes are practically unknown, and hail is uncommon. High winds can occur, but not very often. Summers are characterized by much sunny, clear, and warm weather; winters by cloudiness, and frequent periods of rain or snow. Some elements of Mineral County climate have been summarized for the following temperature and precipitation tables.

PRECIPITATION

Station	Years of Record	Elevation	Yearly Average	Growing Season Average	Percent Falling in Growing Season	Wettest Year	Driest Year
Haugan	1912-66	3150	31.40	9.67	31	44.08 (1933)	17.54 (1952)
St. Regis	1961-66	2680	23.37	9.45	40	28.02 (1964)	18.17 (1963)
Superior	1914-66	2710	17.60	8.46	48	23.47 (1927)	7.61 (1931)

TEMPERATURE

Station	Years of Record	Elevation	Highest Year of Record	Lowest Year of Record	January Average	July Average	Annual Average
Haugan	1912-66	3150	107 (1961)	–49 (1933)	21.3	62.8	42.8
St. Regis	1961-66	2680	108 (1961)	–33 (1964)	24.5	64.8	44.8
Superior	1914-66	2710	108 (1935)	–39 (1936)	23.9	67.2	45.9

POTENTIAL IRRIGATION DEVELOPMENT

Glenn R. Smith, Soil Scientist

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INTRODUCTION

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

Land classification is the systematic appraisal of lands and their designation by categories on the basis of similar characteristics. The Water Resources Board land classification surveys are conducted for the specific purpose of establishing the extent and degree of suitability of lands for sustained irrigation farming. The objective of the survey is to outline the land areas that have a future potential for irrigated agriculture to the ultimate in the year 2020. Technological advances in irrigation are considered in this report. The slope and surface topography become less important, because of the rapid expansion of sprinkler irrigation throughout the western states.

The final test of the success of any irrigation project is the ability of the land to provide economic benefits; it follows, therefore, that land selected for irrigation should ensure that this objective can be achieved. The most important phase of land classification is the separation, according to suitability of the lands satisfactory for irrigation development, which are termed "irrigable" from inferior, non-irrigable lands. The term "irrigable land" as used in connection with land classification in the Water Resources Survey is defined as lands suitable for irrigation by gravity or sprinkler methods. The land must have soil, topography and drainage features which will withstand a sustained irrigated agriculture.

Another important phase of the land classification process is the division of lands into classes on the basis of their relative degree of suitability for irrigation farming. Class 1 represents irrigable lands with a potentially high productive value; class 2 represents lands of intermediate value; and class 3 includes lands of the lowest productive value that may be considered. Class 6 lands are of low productivity and are considered non-irrigable.

The intensity of this land classification survey for potential irrigation development should be considered as a general reconnaissance survey, **and any future irrigation project development should be based on a detailed study.** The areas outlined on the potential irrigation development map of this report show irrigable land classes 1, 2, 3 and the presently irrigated land. Further details of the presently irrigated land areas are given in Part II of this publication.

The land classification survey of Mineral County is a portion of a broad reconnaissance appraisal of the entire Clark Fork Basin, Montana, conducted in 1967 jointly by the Soil Scientists of the Bureau of Reclamation, U. S. Department of the Interior and the Montana Water Resources Board.

PHYSIOGRAPHY

Mineral County is a mountainous region of Western Montana. The central portion of the main stem of the Clark Fork River Basin forms an almost natural boundary for the county. The Bitterroot Divide running in a northwest-southeasterly direction, forms a boundary between Idaho and Mineral County. The Coeur d'Alene Mountain Divide forms the northeastern boundary.

The valley of the Clark Fork River, and its tributary the St. Regis River, cover a small acreage which is considered the main agricultural, transportation and population center of Mineral County.

The valley area in geological times was a portion of the Ancient Missoula Lake Basin. Geologic evidence shows that the Clark Fork River was dammed several times during the Pleistocene Epoch. The basin was flooded and drained during successive glaciations and interglaciations. The ancient wave-cut benches of the resultant glacial lakes relates to a maximum impoundage to 4,150-4,200 feet

POTENTIAL IRRIGATION DEVELOPMENT

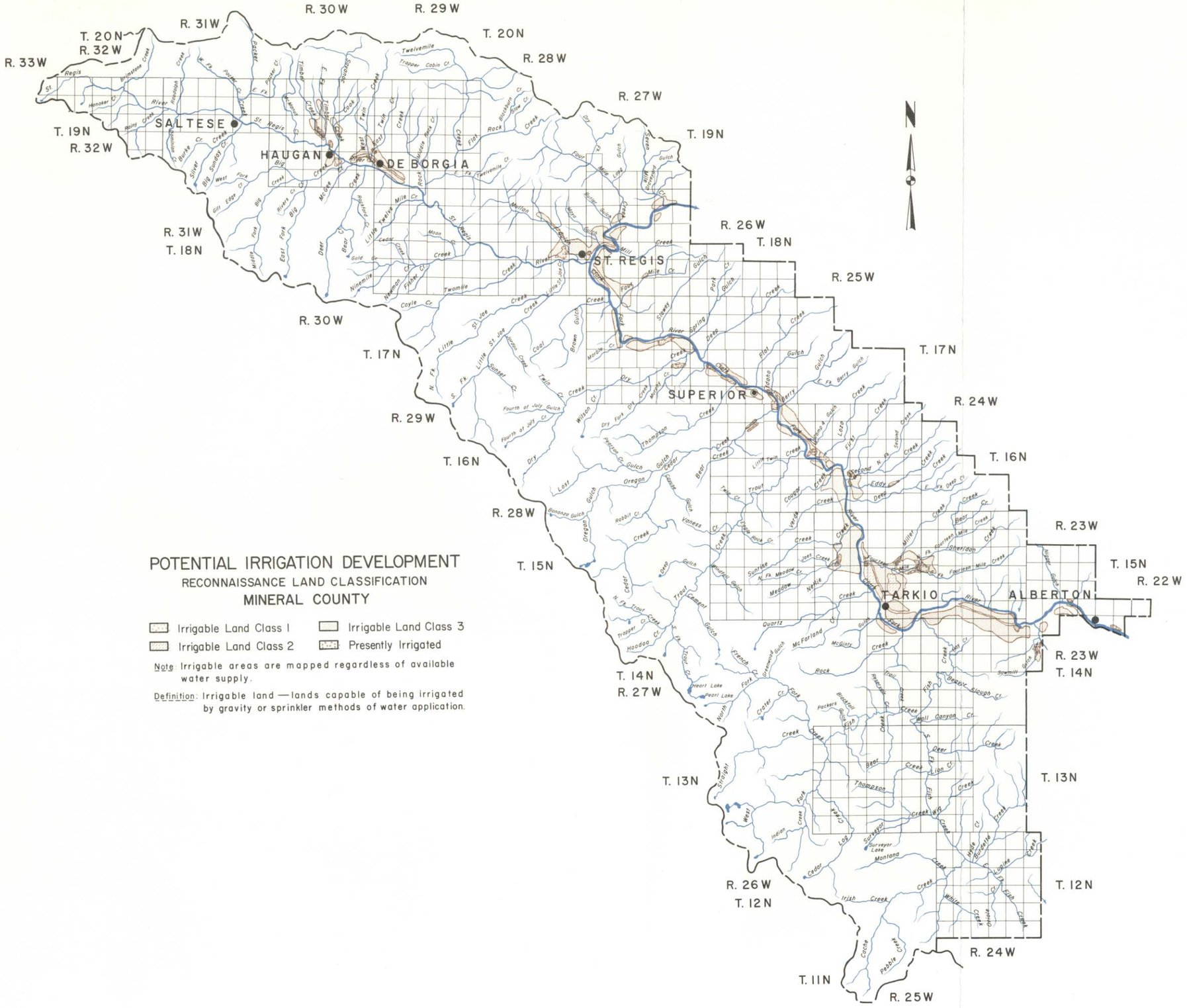
RECONNAISSANCE LAND CLASSIFICATION

MINERAL COUNTY

- Irrigable Land Class 1
- Irrigable Land Class 2
- Irrigable Land Class 3
- Presently Irrigated

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.



above sea level. The geologic formations indicate the glacial ice depth of 2,000 feet at the point of damming of the Clark Fork River 6 to 7 miles southeast of the village of Clark Fork, Idaho, which is just west of the Montana-Idaho border. The upper end of the glacial lake was just east of Missoula.

The large volume of water moved through the narrow valley of the Clark Fork whenever ancient Lake Missoula drained. There were more than 200 feet of unconsolidated glaciolacustrine gravel, sand and clay deposited during the glacial periods. The present drainage system is eroded into these deposits. The principal topographic features are of a composite depositional and erosional origin. The present high-terraces, low-terrace, and flood plain topography is mostly a past Lake Missoula development. The high benches 300 to 500 feet above the Clark Fork River may be erosional remnants of the ancient lake floor. The low terraces and the Clark Fork flood plain are composite erosional stream deposits.

LANDS

The majority of Mineral County is mountainous with heavy growths of coniferous trees. There is very little open grass terrain within the county for livestock grazing. The main utilization of the region is the cutting of timber for the lumber industry.

Comparatively restricted agricultural lands, transportation facilities, towns and other economic developments are largely concentrated in the Valley of the Clark Fork River and its tributary, the St. Regis River. There are 1736 acres of presently irrigated land being utilized for livestock pasture and hayland. The 20,000 acres of irrigable land are generally located on high benchlands which limits the use to pump irrigation. Also, the railroads, highways and other construction in the narrow valley hinders irrigation development.

The soils, topography and drainage of the irrigable land on the high and intermediate benchland terraces from the Mineral-Missoula County line to the Mineral-Sanders County line are as follows:

The Alberton Narrows

The Clark Fork River from the Missoula County line to one mile east of Cyr is entrenched in a narrow canyon. There are 3 small bench remnants which have a total of approximately 600 acres of class 3 irrigable land. The soils and topography are suitable for irrigation development. However, the pump lift from the Clark Fork River may be too high for irrigation of small benches.

The Cyr-Fish Creek Area

There are 3,500 acres of irrigable land on several intermediate and high benches which are located on the south side of the Clark Fork River between the Cyr railroad siding and Fish Creek. The benches are 300 to 500 feet above the narrowly entrenched Clark Fork River. The topography varies from a slightly undulating to pit and kettle areas. Sprinkler application from main pipeline laterals may be the method of irrigation due to the undulating topography and high pump lift.

The soils of the higher benchlands are deep, colored from light gray to brown and texture loamy to sandy. The soils have developed from wind-modified sandy deposits on terraces and outwash fans. The lighter textured soils are on the sandier portions of the terraces which are in associations with heavier textured soils. They have developed from sands that contained a high proportion of fine

fragments of green, reddish and brown argillite, quartzite and dolimitic limestone, all of the Belt geological formation. The soils have developed under a forest cover of pine, fir and spruce. They are slightly acid in the upper part but grade through a neutral subsoil to a highly calcareous parent material.

The main restricting soil factors for irrigation are the low water holding capacity and the erosion hazard of wind blowing the light textured surface soil. The principal crops under irrigation would be pasture and hay land.

A typical soil profile of the very light textured high benchlands is as follows:

AO	1½ - 0″	About equal portions of humus and very fine sand; grayish brown dry to very dark grayish brown moist; matted and slightly firm in place but loose, soft and fluffy when disturbed.
A2	0 - 10″	Very pale brown dry loamy fine sand; soft and loose both dry and moist; slightly acid to neutral reaction. Gradual lower boundary; 6 to 12 inches thick.
A2&BA	10 - 27″	Pinkish gray loamy fine sand matrix (A2 horizon) surrounding fine subangular blocks of brown loam (B2 horizon) the matrix is soft and loose both dry and moist; the blocks are firm when moist and hard when dry; slightly acid to neutral. Abrupt lower boundary. 10 to 20 inches thick.
B2&A2	27 - 32″	Mottled light brown and brown loam or fine sandy loam; hard, firm. When a large piece of dry soil is pressed the darker colored material tends to separate as very hard subangular, block-like lumps and the surrounding material to single grains. 2 to 6 inches thick, pH 7.0.
C	32 - 72″	Light gray fine sand; pale brown loose; single grained; strongly calcareous.

Range in Characteristics: The thickness of the A2 and the mixed A2 and B2 horizons; and the depth of the B2 horizons that separates the acid layers above from the calcareous material below, increases as the amount of silt in the parent material decreases. A1 horizons, 2 to 4 inches thick, are common to some areas.

Topography: Gently rolling and undulating. Sprinkler irrigation is recommended.

Drainage: Surface drainage is good.

Vegetation: Chiefly conifers of several species; numerous shrubs, Oregon grape and "sand grasses" where the timber stands have been thinned.

The soils of the lower terraces immediately above the Clark Fork River consists of Brown Podzolic soils formed in a thin cover of loess and volcanic ash over gravelly and cobbly glacial outwash material, dominantly mixed granitic and Belt series rocks, including shale, sandstone, quartzite and argillite. Immediately underlying the decomposed coniferous twigs, needles and other organic debris is a very thin, discontinuous, light gray podzol. The next 12 to 15 inches consists, to a more or less degree, of very friable and floury loessal, and ash material, being crumb structure in the upper few

inches and weak, medium subangular blocky in the lower part. Below this to about 20 to 35 inches, a very weakly developed profile has very thin patchy clay films and a firmer consistence, which upon drying is somewhat brittle, suggesting a very weak fragipan. Underlying these medium-textured horizons are loose somewhat stratified gravelly or cobbly sands, which extend to great depths.

A typical soil profile of the medium textured lower terraces is as follows:

1.3 - 1.1″ Relatively fresh coniferous needles and twigs; strongly acid (pH 5.2) 0.1 to 1 inch thick.

1.1 - 0″ Partially decomposed coniferous needles, twigs; and other organic debris, medium acid (pH 5.6) in the least decomposed material and slightly acid (pH 6.2) in the more completely decomposed organic material. 0.5 to 1.5 inches thick.

0.0 - 1″ Light-gray gritty silt loam; gray when moist; weak, very fine crumb structure; very friable; slightly sticky; nonplastic; abundant roots; many very fine pores; slightly acid (pH 6.4); abrupt, broken boundary. O to 0.3 inch thick.

0.1 - 3″ Yellowish-brown gritty silt loam; dark yellowish brown when moist; moderate, very fine crumb structure; very friable; slightly sticky; nonplastic; abundant roots; many very fine pores; slightly acid (pH 6.2); clear, smooth boundary. 2 to 4 inches thick.

3 - 11″ Light yellowish-brown gritty loam; dark yellowish brown when moist; moderate, very fine crumb structure; very friable; slightly sticky; nonplastic; abundant roots; many, many very fine pores; medium acid (pH 5.6); clear, smooth boundary. 5 to 10 inches thick.

11 - 15″ Light yellowish-brown loam, which is slightly gravelly; dark yellowish brown when moist; weak, fine crumb structure; very friable, slightly sticky, and slightly plastic; abundant roots; many very fine pores; medium acid (pH 5.8); clear, smooth boundary, 4 to 6 inches thick.

15 - 22″ Light yellowish-brown gravelly light loam; dark yellowish brown when moist; very weak, medium subangular blocky, breaking to weak, fine crumb structure; firm; slightly thick; nonplastic; plentiful roots; common very fine pores; very thin, patchy clay films; very weak fragipan; very strongly acid (pH 4.8); contains few splotches, 0.5-inch in diameter, of yellowish-brown light loam, which is dark yellowish brown when moist, weak medium subangular blocky, and firm; clear, smooth boundary.

22 - 31″ Light yellowish-brown gravelly light sandy loam; slightly sticky; nonplastic; yellowish brown when moist; massive; very friable; slightly sticky; nonplastic; plentiful roots; common very fine pores; medium acid (pH 5.6); abrupt smooth boundary. 8 to 12 inches thick.

31+″ Sand and gravel; single grain; loose; few roots; somewhat stratified; some pebbles have white silica coating on lower side; slightly acid (pH 6.4).

Range in Characteristics: The principal types are silt loam, loam, and gravelly loam. Few slope phases are mapped since the hazard of erosion is relatively slight. The thin A_2 may be absent. pH ranges from 5.5 to 6.5.

Topography: Level to gently sloping glacial outwash terraces and plains.

Drainage and Permeability: Well drained. Permeability of the solum is moderately rapid, while the permeability of the underlying stratified material is very rapid.

Present Vegetation: Mixed stand of Ponderosa pine, Douglas fir, and lodgepole pine having a timber site class of III to IV; some larch. Major understory special are pinegrass, Oregon grape, wild rose, snowberry, ceanothus, bearberry, yarrow.

The present use of the benchland is secondary growth of timber with a few acres cleared for pasture land. Irrigation of these benches is possible by pumping 300 to 500 feet from the deeply entrenched Clark Fork River. Small grains, pasture and hayland would be the major irrigated crops. The costs of high pump lifts are the restricting factors of present irrigated agriculture; however, this cost may be permissive in the near future.

The Tarkio-Nemote Creek Area

There are 4,000 acres of irrigable land on the north side of the Clark Fork River in the vicinity of Tarkio. The bench terraces are 300-500 feet above the river. However, if there is an adequate water supply it may be a possibility that irrigation water could be stored by damming Nemote Creek or Miller Creek.

The large areas north of Tarkio are alluvial terraces formed by the Clark Fork River and recent alluvium washed in from Nemote Creek. The open area is one of the few cultivated croplands of Mineral County. The dryland small grain is growing on rolling, undulating topography. The topographic features would limit the area to sprinkler irrigation.

The soils have a brownish gray grading to pale brown, fine sandy loam B2 horizon, a Cca horizon, and a C horizon of sandy loam textures.

A typical soil profile is as follows:

Ap	0 - 10″	Grayish brown fine sandy loam, very dark grayish brown moist; weak fine crumb structure; soft, very friable, nonsticky and nonplastic; noncalcareous; clear boundary. 7 to 14 inches thick.
B1	10 - 14″	Grayish brown fine sandy loam, dark grayish brown moist; weak medium and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; noncalcareous; clear boundary. 2 to 10 inches thick.
B21	14 - 26″	Light brownish gray fine sandy loam, dark brown moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; noncalcareous; clear boundary.
B22	26 - 32″	Pale brown sandy loam, brown moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; noncalcareous; clear boundary.

C1ca 21 - 65″ Very pale brown very fine sandy loam, pale brown moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; strong effervescence; gradual boundary. 20 to 40 inches thick.

C2 65 - 75″ Light brownish gray fine sandy loam, brown moist; massive; soft; very friable, nonsticky and nonplastic; weak effervescence.

Type of Location: Missoula County, Montana; 2,000 feet south and 1,800 feet east of the northwest corner of Section 8, T. 14 N., R. 22 W.

Range in Characteristics: Mean annual soil temperature ranges from 44 to 47 degrees F. and average summer soil temperature ranges from 60 to 63 degrees F. Loam, fine sandy loam and silt loam types occur. Texture of the control section varies from sandy loam to loam with from 10 to 18 percent clay and 40 to 60 percent fine and coarser sands. Thin strata of silt loam or clay often occur in the control section. Depth to sand and gravel is more than 40 inches. Depth to the Cca horizon ranges from 24 to 40 inches.

Setting: The soil occurs on nearly level to sloping streams and lake terraces and on fans within the main Clark Fork Valley. The soils are formed in sandy loam to loam lacustrine or stream deposits. The climate is cool subhumid. Mean annual temperature is 45 to 47 degrees F. and mean annual precipitation is 15 to 18 inches.

Drainage and Permeability: Well drained with moderately rapid permeability.

Use and Vegetation: The principal use is for small grains, hayland or pasture.

Distribution and Extent: The soils are inextensive in intermountain valleys in western Montana.

The potential irrigation development of this area requires either pumping 300-500′ from the Clark Fork River or storing water in local creeks. The expected cropping should be satisfactory yields of grain, alfalfa, and pasture.

The Tarkio-Trout Creek Area

There are 3,600 acres of potentially irrigable class 3 on benches which are an estimated 300 to 500 feet above the west side of the Clark Fork River. The present vegetation consists mainly of coniferous trees, with scattered grass.

The topography of the benches are rolling undulations which are broken by several small creek drainages. Sprinkler irrigation would be advisable; however, irrigation by gravity could be accomplished in portions of the area.

The texture of the benchland soils vary from a sandy loam to clay surface and a silt loam to clay subsurface. The bench terraces near the Clark Fork River are generally a deposition of alluvial soil material deposited over glacial lacustrine terraces. The benches that are of a higher elevation and further from the Clark Fork River have a clay to silty clay loam surface and clay subsurface.

The internal drainage of the clay subsoil is slow. Irrigation of heavy textured soils tend to cause a high subsurface water table and salinity buildup. The depth of the subsurface water table and salinity buildup can be minimized by irrigating with a large head of water for a short period of time. The use of a large amount of water for a short period of time requires a greater number of surface drains. The construction of subsurface drain ditches will be necessary in a few areas.

The clay soils comprise thick solum gray soils developed in reddish colored unconsolidated calcareous clays of the Pleistocene age. Below a layer of forest litter and duff, the soil profile consists of a thin A2 horizon, and a very thick B2 horizon. The A2-B2 horizon boundary is a gradual one that starts with isolated small remnants of B2 within the A2 and ends with threads of the A2 on clay coated blocks in the upper part of the B2.

The clay soil is moderately extensive and is locally important in crop and timber production.

A typical soil profile is as follows:

A00+A0	2 - 0″	Pine and grass litter and decomposed humus layer.
A2	0 - 5″	Pinkish gray silty clay loam; moist; moderate coarse platy structure to moderate fine subangular blocky structure; slightly hard, friable; insides of peds have thread-like net pattern of reddish brown color; pH 5.0. Gradual lower boundary. 2 to 8 inches thick.
B26A2	5 - 9″	Pinkish gray silty clay; moist; coated with clear silt and very fine sand on strong medium prisms and blocks giving ped surfaces a lighter color; very hard, firm; pH 5.0. Clear lower boundary. 2 to 6 inches thick.
B2	9 - 34″	Weak red clay; moist; strong medium prisms separating into very strong medium and coarse blocks; extremely hard, very firm sticky and plastic; blocks have many pressure faces and have very thick continuous clay films on concave surfaces; many threads of bleached silt extend from above and disappear in this horizon; pH 5.0. Clear boundary. 15 to 30 inches thick.
C	34 - 60″	Pinkish gray with bands of dark reddish gray varved clay; moist; extremely hard, very firm; few pressure faces; calcareous.

The range in characteristics of the soil are: Silty clay loam is the dominant texture, but silt loam and silty clay textures occur. These soils vary in their red color, and in the amount of black or very dark brown organic stain on ped faces in the B horizon. In places there are stones on and in the soil. The texture in B2 and C horizons is of clay with 50 percent or more clay in heaviest texture of B2 and above 40 percent clay in parent material.

The lower benches along the Clark Fork River have sandy loam to very fine sandy loam surface soil. The moisture holding capacity of the surface 12″ of soil is very good. The workability of the soil is satisfactory except for some rockiness in parts of the area. The rocks may be cleared or if irrigated pasture is grown under sprinkler irrigation the scattered rocks should not hinder production.

Superior Areas

There are 1,800 acres of irrigable land located on the north side of the Clark Fork River and southeast of the town of Superior. The irrigable land is on a narrow bench which is approximately

150′ above the river. The small benches from Superior to St. Regis and on the south side of the Clark Fork River have 1,700 acres of class 3 irrigable land. The benches are 150′ to 300′ above the river. The slightly rolling topography, shallow, gravelly subsoil and scattered surface rocks limits the general area to sprinkler irrigation. The cover of coniferous trees and scattered shrubs presents a moderate clearing cost, however, the lumber harvested should pay these costs.

The soil of the lower benches generally vary from a silt loam to loam surface soil. The 0 to 12″ layer may be gravelly. These soils have a thin yellowish brown volcanic ashfall resting on a very gravelly sandy substratum. The subsoil 12″ to 20″ varies from a gravelly loam to light sandy loam. The texture becomes coarser with depth. The pH is generally moderately acid. The drainage of the gravelly soil is excessive below 20 to 30-inch depths. The lower water holding capacity of the shallow soil restricts the lower benches to irrigated pasture and hay production.

The elevation of the irrigated and potential irrigable land is not excessively high, however, the frost free growing season is short due to the air flows from the mountains. The growing season is near 80-90 days which restricts the area to irrigated pasture and hayland.

The soils are similar to the lower benches just above the town of Superior. The limiting factor being water holding capacity of the root zone. The terraces have variable soil within the individual boundaries and also each terrace may vary from the other. A typical profile of the lower terrace shallow alluvial soils is as follows: These soils have a thin yellowish brown volcanic ashfall andic horizon resting on a very gravelly sandy substratum. (Colors are for dry conditions unless otherwise noted.)

A1	0 - 1″	Grayish brown gravelly loam, very dark brown moist; weak fine crumb structure; soft, friable; medium acid; abrupt boundary; ¼ to 1-inch thick.
B	1 - 12″	Light yellowish brown gravelly loam, dark yellowish brown moist; very porous massive structure; soft, very friable, nonsticky and nonplastic; abundant roots; medium acid; clear boundary; 6 to 14 inches thick.
IIC1	12 - 20″	Pale brown very gravelly loamy sand; dark brown moist; loose single grained structure; soft, very friable, nonsticky and nonplastic; slightly to medium acid; clear boundary; 6 to 10 inches thick.
IIC2	20 - 60″	Loose very gravelly and cobbly coarse sand; lime carbonate crusts on lower sides of gravel below a depth of 5 to 6 feet.

Type Location: Flathead County, Montana, T.28N., R.20W., NW 1/4 of NW 1/4 Section 26.

Range in Characteristics: Gravelly loam and cobbly loam types are dominant. Depth of gravelly or cobbly sand substratum ranges from 12 to 20 inches. An A1 horizon may be present and ranges to a thickness of 3 inches.

Setting: The soils occur in valleys of the Northern Rocky Mountains under conifer forest vegetation. They are developed in a thin mantle of alluvium and volcanic ash resting on very cobbly sand of glacial outwash from a variety of rock sources. The climate is cool subhumid with a mean annual temperature colder than 43 degrees F. and a mean summer temperature colder than 60 degrees F. Mean annual precipitation ranges from 18 to 30 inches.

Drainage and Permeability: Excessively drained with slow runoff and rapid permeability.

Use and Vegetation: Use is chiefly for forestry and woodland pasture. Vegetation cover consists of Douglas fir, lodgepole pine and Englemann spruce with deciduous shrubs and pinegrass.

Distribution and Extent: Western Montana. The shallow alluvial soils are moderately extensive.

The St. Regis River Area

The St. Regis area of Mineral County is located near the confluence of the St. Regis and the Clark Fork Rivers. The economy of the area is primarily lumbering. There is very little ranching in this valley, the restricting factors being the lack of grazing land; very little irrigable land available for gravity water diversion; and the short growing season.

The elevation of 2650 feet is not excessively high for the agricultural crops of grain, alfalfa, beets and other cultivated crops; however, the surrounding mountains cause a cold air flow into the valley which limits the growing season to less than 90 days. The irrigable land should be considered for pasture and hayland production.

There are 2,300 irrigable acres of land north of the mouth of the St. Regis River. The present use of this land is primarily second growth timber. The small open grassland areas within the overall boundaries of the irrigable lands are being utilized for grazing.

The soils of the St. Regis area are of recent alluvial deposits washed in by the St. Regis River and McManus Creek. The depth of soil over the gravel substrata varies from near the ground surface to 30 inches below. The limiting factor for irrigation being the water holding capacity of the soil. The shallow soil areas will require very frequent irrigation.

The topography of the St. Regis area varies, with the majority being slightly rolling and undulating. The rocky surface terrain and rocks within the 12″ surface soil layer prohibits extensive cultivation in large portions of the area.

The combination of the low water holding capacity of the soil plus the undulating topography makes sprinkler irrigation advisable, however, detailed studies may show large tracts favorable for gravity irrigation.

The high bench terraces on the east side of the Clark Fork River and across from the confluence of the St. Regis River are 200 to 300 feet above the river flow and have 1,880 acres of class 3 irrigable land. The present vegetation consists of secondary timber growth and sparse grassland. The benches are glacial lacustrine deposits of the Ancient Lake Missoula. The glacial deposits are eroded and have a thin cover of loess and volcanic ash over a moderately cobbly soil which is underlain by gravelly and cobbly glacial outwash material.

The majority of the benches have adequate soil depth to allow irrigation of pasture and hayland. The depth of soil over the glacial outwash varies from 12 to 30 inches. The soil textures vary from a silt loam to loam, with gravel being present throughout the soil profile. The surface gravel and cobble hinder cultivation in parts of the benchland area, however, this is considered only a slight hinderance because the short growing season restricts the area to pasture and hayland production.

There are several small benches from the St. Regis Area to the Sanders County line which are 150 to 300 feet above the Clark Fork River. The soils are similar to the benchlands near St. Regis. The limiting factor for future irrigation is the height of the irrigable land above the river level. Pump lifts for water delivery to these benchlands will vary from 150 to 300 feet, which may not be economical for small areas.

A typical profile of the deep soils on benchlands in the St. Regis area and portions of the St. Regis River Valley is as follows:

Typically these soils have an 0 horizon, a light brownish gray, very fine loam A2 horizon, a mixed A & B horizon, a pink light silty clay loam B2t horizon, and a pink very fine sandy loam Cca horizon. (Colors are for dry soil unless otherwise noted.)

0	2 - 0″	Forest litter and decomposed conifer leaves and twigs.
A2	0 - 14″	Light brownish gray very fine sandy loam, dark grayish brown moist; weak medium and fine platy structure; slightly hard, very friable, nonsticky and nonplastic; common fine and few coarse roots; many very fine and common fine and medium tubular pores; slightly acid (pH 6.4); clear wavy boundary. 10 to 20 inches thick.
B&A	14 - 28″	Horizon of two parts, 70 percent of which is 1/4 to 1 1/2-inch thick interconnecting bands of light brown coated with brown silty clay loam, light brown coated with brown moist; with masses of pinkish gray silt loam, pinkish gray moist; silty clay loam is: massive; hard, friable, slightly sticky and plastic; silt loam is: weak fine platy structure; slightly hard, very friable, nonsticky and nonplastic; common fine and few coarse roots; many fine and few medium tubular pores; slightly acid (pH 6.4); gradual wavy boundary. 10 to 20 inches thick.
B2t	28 - 34″	Pink crushed, light brown coated light silty clay loam, brown crushed and brown coated, moist; moderate medium and fine subangular blocky structure; hard, friable, slightly sticky and plastic; common fine and a few coarse roots; many very fine and common fine tubular pores; neutral (pH 6.8); gradual wavy boundary.
C1ca	34 - 60″	Pink very fine sandy loam, light brown moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and coarse roots; common fine and very fine tubular pores; strong effervescence with common small threads and film of lime.

Type Location: Mineral County, Montana; 1300 feet north and 1,800 feet east of the southwest corner of Section 32, T. 18N., R. 27W.

Range in Characteristics: The soils have mean annual temperature ranging from 45 to 47 degrees F. and have average summer temperature ranging from 50 to 64 degrees F. if without an O horizon forest canopy. Very fine sandy loam, silt loam and fine sandy loam types occur.

Texture of the B2t varies from heavy silt loam to heavy silty clay loam from 20 to 35 percent. Profiles may be weakly to strongly calcareous in the substratum.

Setting: The soils occur on nearly level to rolling lacustrine terraces and on steep terrace edges. The soils are formed in silty lacustrine sediments. The climate is cool subhumid. The mean annual air temperature is 44 to 46 degrees F., and the mean annual precipitation is 16 to 20 inches.

Drainage and Permeability: Well drained with moderately slow permeability.

Use and Vegetation: The principal use of the soils is for forest products. Small areas have been cleared for hayland or pasture. Ponderosa pine and Douglas fir are in the overstory. The ground cover consists of spiraea, rose, ninebark, and pinegrass.

Distribution and Extent: The soils are inextensive in intermountain valleys in western Montana.

The DeBorgia-Haugan Area

In Mineral County the St. Regis River is the main tributary of the Clark Fork. The river is a fast flowing stream which meanders through a narrow valley bounded by mountains. The valley is too narrow for irrigation except near DeBorgia and Haugan where the stream valley widens into alluvial terraces and bottom lands. The terraces and bottomlands are located along four tributary streams of the St. Regis River.

There are 1,500 acres of potential irrigable land near the town of DeBorgia. The majority of the irrigable land appears on two narrow benches adjacent to the St. Regis River. The area is presently growing secondary timber with open spots of grassland. The height of the irrigable land above the river is approximately 50 feet. The terraces have soil which is satisfactory for hay and pasture development. The soil is generally a gritty silt loam to a depth of 20 inches then a gravelly sandy loam to approximately 30 inches. The substratum of cobble and gravel appears below the sandy loam.

The irrigable land extends up the alluvial terraces and bottom lands of Twin Creek which confluences with the St. Regis River at DeBorgia. The bottom lands are hayland areas which may produce medium to light yields, the major restricting factor being the depth of water table. The shallow water table areas will restrict the root zone of the grass causing root matting, invasion of sedge grasses and poor fertility.

There are 900 acres of irrigable land near the small settlement of Haugan. The irrigable land is located in the bottom lands and alluvial terraces along Big Creek on the south side; Timber and Savenac Creeks on the north side of the St. Regis River.

The presently irrigated land near Haugan is being watered by pumping from Timber Creek, Big Creek and the St. Regis River. The clearing of timber would make available a large acreage of land for the irrigation of pasture and hayland.

The soils of the Haugan area are variable in texture and depth to the gravelly substratum. The soil depth varies from 12 to 30 inches, with an average of 15 to 20 inches. The surface terrain is rocky in spots which will hinder mowing of hay. The water holding capacity of the soil is low in spots.

The high water table of the meadow lands near Haugan and DeBorgia are typical of high mountain meadows. The high snowfall of these areas cause the water table to be near the ground surface during spring thawing and for some time afterwards. The construction of drains would help lower the water table, however, the limited production due to the short growing season may not warrant extensive costs for drainage.

CLIMATE

The general climate of the county is discussed in another section of this publication. The main climatic conditions that influence agricultural production of Mineral County are mainly the amount of precipitation and the short frost free growing season.

The large amount of moisture in the mountainous region causes a heavy growth of timber and only sparse open grassland. Therefore, a lack of grazing land for livestock production. The lack of grazing land in the mountains plus the rugged terrain and narrow valleys limiting the irrigable land acreage restricts the ranching and farming potential to only a small acreage.

The heavy snowfall in the Haugan and DeBorgia area (10 feet average for some winters) creates a long feeding period for livestock. This increases labor and feed costs for ranching operations, or restricts the land use to summertime range and hay production. The hay is hauled to other areas. Generally, the summertime pasture and hay production is the selected procedure of this area.

The heavy spring runoff caused by melting snow raises the water table to nearly ground level in lowland meadows along the creeks in the Haugan and DeBorgia areas. The high water table may recede during the summer months, but the matted root system of the native hay and pasture land restricts growth, thus causing low yielding hay.

The soil temperature is relatively low even in the summer months. The cool nights and moisture content of the soil influences the soil temperature and especially in late spring the soil does not warm up enough for good germination of all the grass seeds. The slow growth of the plants in spring months is somewhat compensated for by long daylight hours in the summer. The growth of grain and alfalfa is not generally found below Superior. This is partially due to soil moisture, and cold air flows in spring months causing low soil temperatures. The Haugan-DeBorgia areas also are cold areas which have low soil temperatures.

The frost free growing season is short especially at higher elevations. The Haugan-DeBorgia area can expect frost sometime during every month of the year. The average frost free growing season is 80 days. The Clark Fork Valley below Superior is also a short growing season area. The mountainous area causes a cold air flow into the valley. The crop growth is restricted to hay and pasture production in both the Haugan-DeBorgia area and valley lands below Superior.

The average precipitation for the months of June, July and August is low. The growing season averages of 9.67 inches at Haugan, 9.45 inches at St. Regis and 8.46 inches at Superior will restrict good growth of native grass for hay production; the irrigation of meadows and grain is important during these dry months.

SUMMARY

The principle use for the majority of the land in Mineral County is for timber production. Rec-

reational benefits of the mountainous area will increase as population growths demand more recreation. The grazing of livestock is limited due to the dense forest growth.

Ranching operations are limited to the Clark Fork and St. Regis valleys where the majority of irrigable land is located.

The climate of Mineral County is considered a major limiting factor for irrigated crops. The short growing seasons in the St. Regis area and especially the Haugan-DeBorgia areas is less than 90 days. Under irrigation the land will produce grassland hay and pasture but production of cultivated crops is not recommended.

The reconnaissance land classification of Mineral County shows a total of approximately 22,000 irrigable acres suitable for future irrigation development. There are 700 irrigable acres of class 2 land, and 21,300 irrigable acres of class 3 land.

The reconnaissance land classification does not attempt to separate the type of irrigation as to sprinkler or gravity. However, the majority of irrigable land in Mineral County appears on high bench terraces which are generally more adaptable to sprinkler irrigation.

The land classification of Mineral County should be considered as a general reconnaissance survey. Therefore, it is possible that a detailed land classification will show either an increase or decrease in the irrigable areas as much as 15 to 25 percent in some places.

It is anticipated that the expansion of irrigated agriculture in Mineral County will develop at a relatively slow pace. The irrigable land is located on high bench terraces which will require high pump lifts from the Clark Fork River.

The costs of pumping irrigation water has restricted the higher benchlands to dryland conditions which are generally timber growth.

Whenever an area of irrigation development is anticipated both a detailed land classification and drainage investigation should be completed prior to construction. The drainage survey will establish the cost of minimizing seepage and salinization of the soil. The land classification survey will establish the acreage that will withstand an irrigated agriculture and a basis for figuring the economic costs of pumping water onto a given area.

The local Federal and State Agricultural Agencies have soil surveys and experimental information available that help determine areas for future irrigation and management of presently irrigated land within Mineral County. Contacting these agencies will save individual farmers money and labor and will also conserve the land for future use.

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CROPS AND LIVESTOCK

Mineral County, located along the Idaho border in western Montana, is made up of 1,221 square miles of land, 781,440 acres.

Of this 781,440 acres 665,953 acres are public owned, or about 85%, leaving only 15% of the county to private ownership.

Farms and ranches average 457.4 acres in size, with crop land along the creeks and the Clark Fork River. Due to the mountainous terrain, grain farming is not as prominent an enterprise in Mineral County as it is in most other counties of the state, but it does contribute substantially to the economy of the county.

Livestock operations of all types are a major source of farm income.

The Mineral County Weed Control District is becoming very active. A power sprayer which can be mounted on a truck was purchased in the spring of 1968 for use in controlling noxious weeds such as leafy spurge and dalmatian toadflax.

Hog production in the county has increased from about 17 breeding animals to about 215. This increase is due to the addition of an indoor hog operation. The production from this plant should be about 1,500 fat hogs per year.

The county assessor's report lists a total of 258 horses, 1,387 cattle and 103 sheep on the tax rolls. The Montana Agriculture Statistics show a net movement of cattle out of the county of 1,488, with a net total of about 2,100 head of cattle and calves and calves on farms and ranches in the county on January 1, 1966. These figures were obtained from counts of cattle sold at market places.

The following is a summary of the land use in the county. Total acres in 75 farms is 34,305 acres. Of this, 957 are irrigated; 3,690 acres are non-irrigated tilled land; 15,047 acres are in grazing land and the remainder is timber land.

The following table contains data from the U.S.D.A. Statistical Reporting Service at Helena, Montana, 1967.

Crops	Irri. Acres	Yield/ Acres	Non-Irri. Acres	Yield/ Acres	Production	Value
Winter Wheat	.....	.....	400	27.5	11,000	13,200
Spring Wheat	.....	.....	200	34.5	6,900	8,500
Oats	100	46	200	44.5	13,500	8,400
Barley	.....	.....	200	33.0	6,600	6,200
Potatoes	4	160 cwt.	4	60 cwt.	800	2,300
Alfalfa Hay	800	2.65 T	1600	1.8 T	5,000 T	100,000
Wild Hay	100	1.4 T	.....	.....	140 T	2,800
Alfalfa Seed	.....	.....	100	75 lbs.	7,500	2,600

Total crop receipts in 1967 were $180,000 and livestock receipts were $188,000. All farm products sold in 1964 were valued at $286,888 and in 1959 they were valued at $424,561.

STREAM GAGING STATIONS

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

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

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

(a) In Montana, one cubic foot per second equals 40 miner's inches.

(b) One acre-foot is the amount of water required to cover an acre one foot deep.

(c) One cubic foot per second will nearly equal two acre-feet (1.983) in 24 hours.

(d) A flow of 100 miner's inches will equal five acre-feet in 24 hours.

(e) One miner's inch flowing continuously for 30 days will cover one acre 1 1/2 feet deep.

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

Clark Fork at Tarkio

The staff gage was a quarter of a mile northwest of Tarkio, 1 mile upstream from Quartz Creek, 3 1/4 miles downstream from Fish Creek, and 15 miles west of Alberton. The drainage area is 9,882 square miles. Records are available from October 1944 to September 1949. The maximum discharge was 63,200 c.f.s. (May 30, 1948) and the minimum daily, 1,200 c.f.s. (December 26, 1944). The average discharge for 5 years was 7,094 c.f.s. or 5,136,000 acre-feet per year. The highest annual runoff was 7,290,000 acre-feet (1948) and the lowest, 3,385,000 acre-feet (1945). There are diversions for irrigation of about 235,000 acres above station.

St. Regis River near St. Regis*

The water-stage recorder is at county road bridge, 500 feet upstream from Little Joe Creek, 1 1/4 miles west of St. Regis, and 1 1/2 miles upstream from mouth. The drainage area is 303 square miles. Records are available from September 1910 to September 1917 (no winter records in most years), September 1958 to date (1968). The maximum discharge observed during the period of record was 7,740 c.f.s. (May 28, 1917) and the minimum daily, 45 c.f.s. (December 11, 1962). The floods of about December 20, 1933 and May 19, 1954 were both considerably greater than the maximum of 1917. The aver-

age discharge for 9 years (1958-67) was 558 c.f.s. or 404,000 acre-feet per year. The highest annual runoff since 1958 was 529,100 acre-feet (1959) and the lowest, 307,800 acre-feet (1966). There are minor diversions for irrigation of hay meadows above the station.

Clark Fork at St. Regis*

The water-stage recorder is at St. Regis, half a mile downstream from St. Regis River. The drainage area is 10,709 square miles. Records are available from October 1910 to date (1968). The maximum discharge was 68,900 c.f.s. (May 24, 1948) and the minimum, 1,000 c.f.s. (December 17, 1940), but may have been less during period of ice effect February 19-22, 1929. The average discharge for 57 years was 7,438 c.f.s. or 5,385,000 acre-feet per year. The highest annual runoff was 8,260,000 acre-feet (1916) and the lowest 2,476,000 acre-feet (1941). There are diversions for irrigation of about 244,000 acres above the station.

*This gaging station is now in operation (1968).

Partial Record Stations and Miscellaneous Discharge Measurements.

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

There are four crest-stage partial-record stations in the Clark Fork River Basin in Mineral County. Stations are now (1968) being operated on Nigger Gulch near Alberton, Thompson Creek near Superior, East Fork Timber Creek near Haugan, and North Fork Little Joe Creek near St. Regis.

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

Reservoirs

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

DAMS AND RESERVOIRS

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

By means of a questionnaire, the Montana Water Resources Board recently obtained from the various federal agencies who design structures, the basic engineering data, locations, and ownerships of dams and reservoirs for which they either have, or had, responsibility and which have stor-

age 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 Mineral 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

A. J. Mancini, Geologist

GEOLOGY

The several mountain ranges within Mineral County are parts of the Rocky Mountains, and as such have had a complex and active geologic history dating back millions of years. The Rocky Mountains as now known have undergone several periods of development. The first mountains were wrinkles or folds in the earth's crust, of relatively low relief, dating from some 70 million years ago. During many millions of ensuing years, the mountains were eroded and worn away almost to a level surface. A second phase of mountain-building took place; this time the crust of the earth shattered and large fault-blocks were uplifted thousands of feet and the mountain ranges of today came into being.

The history of the streams and rivers began with the first mountains, and the present drainage pattern developed in response to environmental conditions dating back to this time. Mountain-making brought about the development of large valleys which became sites for stream and lake deposits, and these deposits contain the major groundwater aquifers in the county.

About one million years ago, following the uplift of the Rocky Mountains, climatic changes resulted in the advance of sheets of glacier ice from the higher mountain elevations towards the lower plains and valleys. One of the major effects of glaciation was the formation of ancient Glacial Lake Missoula. Glaciers moved southward from British Columbia, down the Purcell Valley in northern Idaho, and dammed the Clark Fork and Kootenai Rivers near the present Montana-Idaho State line. Water backed up in the interconnected mountain valleys of Montana for more than 200 miles. It has been reported that the maximum depth of this lake was 2,000 feet. A large arm of the ancient lake existed in Mineral County, from one end to the other. The lake surface, according to published information, would have been at a present elevation of about 4,150 feet above sea level.

The final retreat of the ice took place about 30 to 40 thousand years ago, at which time Glacial Lake Missoula was drained and most streams and rivers returned to the preglacial drainage pattern. Some of the present mountain lakes date back to the glacial epoch.

Mountainous regions are recharge areas for surface streams and groundwater aquifers and not normally attractive for the drilling of wells. In addition to having only slightly favorable physiography, mountainous areas are not permanently inhabited by human residents; therefore groundwater development would be less than active even if springs, streams, and lakes did not provide adequate sources of supply. However, at the base of a steep mountain slope, a large pile of weathered rock detritus can provide a reservoir for the accumulation of potable groundwater.

AQUIFERS

The distribution of available groundwater is limited to unconsolidated aquifers in the main valley, and the larger tributary valleys. The following discussion will describe the water-bearing sediments in the valleys, and associated rock units. Information was taken from the files of the Montana Water Resources Board and from available publications.

Alluvium (Quaternary) is a fresh water accumulation of sand, silt, clay, and gravel of recent geologic age and unconsolidated or only weakly cemented. The floodplain of the Clark Fork River is a deposit of alluvium, several miles wide in places, and of variable thickness. Alluvial deposits are also found in the larger tributary valleys. Almost all of the alluvium is within the inferred outline of ancient Glacial Lake Missoula; much of the material in the alluvium is the result of erosion in the mountainous areas, but clays and silts probably originated in part from lake bed sediments. Within the alluvium are intervals of sand and gravel which are reservoirs for groundwater, and from which numerous wells withdraw water. Many of the groundwater appropriations claim less than 25 gpm (gallons per minute), but a few claim 1,000 or more gpm. The average well depth is about 100 feet below the surface of the floodplain.

The greatest concentration of reported wells is in the vicinity of St. Regis. Another concentration occurs in the Clark Fork floodplain for several miles above and below Superior. Most of the springs of record are in the vicinity of Tarkio and Alberton, discharging from sediments of the floodplain or the ancient lake bed.

Lacustrine deposits of Glacial Lake Missoula (Quaternary) are fresh water accumulations of silt which are similar to floodplain deposits locally. Lake bed sediments have a maximum reported thickness of 200+ feet and may include intervals of sand and gravel which could be aquifers. Some wells which start in the floodplain reach total depths greater than 200 feet and finish in thick intervals (30 feet or greater) of silt which probably are earlier lake bed deposits. The glacial lake boundary does not infer that unconsolidated lake deposits exist everywhere within the boundary, but only that the lake at one time probably covered the area indicated.

Glacial drift or till (Quaternary) in Mineral County is distributed in very small isolated patches of bouldery earth material which probably are vestiges of glacial moraines or glacial outwash deposits. These deposits have no known groundwater potential in Mineral County.

Undifferentiated Tertiary sediments have a local distribution in the northwestern part of the county, in an intensely faulted area. These are poorly consolidated deposits of sand, gravel, silt, and clay, probable remnants of stream and lake deposits predating the glacial epoch. They have no known groundwater potential in Mineral County.

Tertiary volcanic rocks in Mineral County are represented by a very local exposure in the southwestern part of the county. These and the few very small isolated exposures of coarse-grained **Tertiary intrusive rocks** have no groundwater potential.

Idaho batholith and associated masses (Cretaceous) are "hard rocks" which make up a small portion of the mountainous area on the Montana-Idaho State line, and have no known groundwater potential. Fractures in the "hard rocks" may conduct runoff into alluvium which has collected in a small tributary valley in the batholith topography.

EXPLANATION

- Qal — Alluvium--recent accumulations of sand, silt, clay and gravel; yields of 5 to 1,000 gpm reported.
- Qlm — Glacial Lake Missoula--inferred area once covered by ancient glacial lake; boulders dropped by floating ice found at many places.
- Qg — Glacial drift (till)--very small patches of heterogeneous deposits of clay, silt, sand and gravel; no known groundwater potential.
- Ts — Undifferentiated Tertiary sedimentary rocks--poorly consolidated deposits of sand, gravel, silt and clay; no known groundwater potential.
- Tv — Tertiary volcanic rocks--no known groundwater potential.
- Tg — Tertiary coarse-grained intrusive rocks.
- Ki — Idaho batholith and associated masses.
- pC — Precambrian rocks--mountainous regions which are intake areas for recharging surface supplies and groundwater aquifers.
- Limit of alpine glacier advance.
- Fault--a fracture in rock, visible or inferred, along which one side has moved relative to the other.
- (S) Reported Spring
- (G) Glaciated
- (U) Unglaciated

MONTANA WATER RESOURCES BOARD

GROUNDWATER INVENTORY

MINERAL COUNTY

COMPILED FROM DATA AVAILABLE AS OF MAY 1, 1969

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

Geologist: A.J. Mancini
Asst'd by: R.J. Gase
Drafted by: R.P. Medon

Scale
2 mi.
8 mi.

Pre-Cambrian rocks constitute almost all of the mountainous areas, and are composed of indurated and metamorphased sediments of the Belt series—no longer having any primary porosity but locally faulted and fractured. Fractures sometimes conduct water into the subsurface and a few wells withdraw small quantities of water (1 gpm each) from fracture-reservoirs.

GROUNDWATER AREAS

The Clark Fork River flows into the county from the southeast, entering near the town of Alberton, then follows a northwestward course by Superior and exits to the northeast, near the town of St. Regis. The entire course of the river in Mineral County is within the limits of ancient Glacial Lake Missoula. Some places the river flows through a narrow gorge cut into bedrock, and at others it meanders across a floodplain which has developed on the ancient lake bed. There are remnants of from one to four terraces, 50 to 700 feet above the river, which indicates various stages of valley development. Gravels veneer the terraces but are present only as very thin discontinuous patches.

The great majority of wells have been drilled in the floodplain. A few wells have been drilled through lake bed silt into water-bearing fractured bedrock, but the floodplain is the only groundwater area of any significance.

The ancient lake bed sediments locally may give up water to wells but the silts which comprise much of the lake bed sequence normally have very poor permeability. The mountains surrounding the valley are intake areas and supply water both for surface flow and groundwater recharge.

AVAILIBILITY AND USE OF GROUNDWATER

There are fewer than 200 groundwater appropriations of record in the county, including both wells and springs. Of the 150 wells of record as of June, 1969, more than 100 are used wholly or in part for domestic water supplies. Most of the appropriations claim groundwater for multiple purposes, including (in addition to domestic) stock, irrigation, industry, and municipal uses. Few appropriations indicate a total annual withdrawal; those that do suggest by interpolation that about 4,000 to 5,000 acre-feet of groundwater are withdrawn annually through wells in Mineral County. An additional quantity is utilized from springs, 35 of which are of record. Most of the springs are developed for domestic and stock use.

The quality of the groundwater, as measured by the amount of total dissolved solids, almost everywhere is good. Total dissolved solids reported in analyses by the State Department of Health mostly are amounts less than 500 ppm (parts per million).

Well depths reportedly range from 8 to 370 feet, with an average depth of about 100 feet. Alluvium in the main valley has collected to depths of 100 feet and includes reworked lake bed silt. One well drilled at the confluence of a major tributary with the Clark Fork River has been logged as having more than 200 feet of alluvium. Alluvium of the St. Regis River has collected in a floodplain separated from the Clark Fork floodplain by the gorge of the St. Regis River. The alluvium in the St. Regis floodplain reportedly is about 75 feet thick and consists of sand and gravel mixed with silt. One well in Section 27, Township 19 North, Range 30 West, claims 1,040 gpm for irrigation, with a drawdown of 18 feet. The average yield from alluvial wells, however, is about 80 gpm, from an average pumping depth of about 70 feet below ground level. There are at least three aqui-

fers within the floodplain-lake bed sequence, each from about 10 to 40 feet thick. All three may not be present at one well site, and a well starting in the silt may have to be drilled through the entire lake bed sequence into fractured bedrock in order to yield water. The thickness of unconsolidated material is not everywhere known, and one or deeper aquifers may be present but yet undrilled. However, deeper exploratory drilling is not warranted, as shallower groundwater supplies are of adequate quantity and quality for the present needs of the appropriators.

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MONTANA BUREAU OF MINES AND GEOLOGY
GROUNDWATER DIVISION

WATER WELL INVENTORY, MINERAL COUNTY

Year	A	C	D	F	H	I	N	P	S	R	T	U	X	Total
1940+ older	..	1	..	..	11	..	..	..	1	6	..	..	..	19
1941	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1942	..	..	..	..	1	..	..	..	..	..	..	..	..	1
1943	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1944	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1945	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1946	..	..	..	..	1	..	..	..	..	..	..	..	..	1
1947	..	..	..	..	2	..	..	..	..	..	..	..	..	2
1948	..	1	..	..	..	..	..	..	..	1	..	..	..	2
1949	..	1	..	..	1	..	..	..	..	..	..	..	..	2
1950	..	..	..	..	2	..	..	..	..	1	..	..	..	3
1951	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1952	..	..	..	..	1	..	..	..	..	..	..	..	..	1
1953	..	1	..	..	3	..	..	..	..	..	..	..	..	4
1954	..	..	..	..	..	..	..	2	..	..	1	..	..	3
1955	..	1	..	..	3	..	..	1	..	..	..	..	..	5
1956	..	..	..	..	1	..	..	..	..	1	..	..	..	2
1957	..	..	..	..	11	1	..	..	2	..	..	..	..	14
1958	..	..	..	..	4	..	..	1	..	..	..	..	..	5
1959	..	..	..	..	10	..	1	1	..	1	..	..	..	13
1960	..	..	..	..	6	2	1	..	..	..	..	..	..	9
1961	..	..	..	..	2	..	..	..	..	1	..	..	..	3
1962	..	..	..	..	4	1	..	..	1	1	..	..	..	7
1963	..	..	..	..	8	1	..	3	..	..	..	..	..	12
1964	..	..	..	..	6	..	..	1	..	..	..	..	..	7
1965	..	..	..	..	4	2	1	..	..	1	..	..	..	8
1966	..	..	..	..	6	..	..	..	..	..	..	..	..	6
1967	..	..	..	..	8	..	1	..	..	1	..	..	..	10
Totals	..	5	..	..	95	7	4	9	4	14	1	..	..	140

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

ECONOMIC MINERAL DEPOSITS

Geologic Situation

Mineral County lies within the northern Rocky Mountains physiographic province and includes parts of the Coeur d'Alene Mountains and Bitterroot and Squaw Peak Ranges of western Montana. The county is traversed by the northwest-flowing Clark Fork and southeast-flowing St. Regis Rivers joining at St. Regis. The terrain is characterized by steep heavily forested mountains separating the linear intermontane valley occupied by the Clark Fork and St. Regis Rivers.

Precambrian Belt clastic and carbonate-bearing rocks, which in ascending order include the Prichard Formation (Pre-Ravalli Group), Burke-Revett and St. Regis Formations (Ravalli Group), Wallace Formation (Piegan Group), and the Spruce, Lupine, Sloway, and Bouchard Formations (Missoula Group), occupy within the county the greatest areal extent. In several localities lower Paleozoic quartzite, shale, and limestone of probable Middle Cambrian age crop out. Tertiary gravel, sand, and silt deposits and Quarternary lacustrine silt, fluvial gravel, and alluvium are present within the valley. Igneous rocks ranging in composition from diorite to diabase occur as dikes and sills.

The major structural element is the Osburn fault zone, extending southeastward from Coeur d'Alene, Idaho district, to Superior, Montana, and beyond, possibly as far southeast as Missoula, Montana. It is one of the structures in the Lewis and Clark line, this line described as a northwest tear fault zone of continental scale.

Metallic Minerals

Lead-zinc-copper-silver ore deposits occur as fissure filling or replacement deposits, of which most are related to the Lewis and Clark line, particularly the Osburn fault. Some ore deposits are associated with diorite dikes and sills.

Total ore production was not determined for the county; however, ore production from the St. Regis-Superior area for the period 1901-53 amounts to 248,345 tons from which 7,932,958 pounds of lead, 8,086,827 pounds of zinc, and 2,046,963 pounds of copper were recovered. Placer gold recovered from Mineral County (essentially the eastern and western parts) from the period 1904-45 amounts to $614,000.

Western Mineral County

The Silver Cable, Last Chance, and Rick Island mines have produced some lead-zinc-copper-silver ore from fissure veins near the Osburn fault. Other properties with little or no production include the Wabash, Meadow Mountain, and Tarbox mines, True Fissure and St. Lawrence mines, and the Silver Strand, Agnes, Amazon Dixie, Miller, Silver Bell, Deer Creek, and Aladdin properties.

Placer gold was recovered from Deer Creek and Big Creek, with some rich gravel reported found in these areas.

Central Mineral County

The ore deposits in central Mineral County essentially include those in the St. Regis-Superior

area, near the Osburn fault or other parallel faults. Substantial production has been recorded for the Iron Mountain, Nancy Lee, Amador, Nite Owl, and Little Pittsburg mines. Other properties with little or no production include the Little Anaconda and Santa Rita groups, and the Upper Keesey and Deadwood Gulch prospects.

Eastern Mineral County

Substantial amounts of placer gold have been produced from eastern Mineral County. The most productive placers were located on Windfall and Deep Creeks, tributaries of Trout Creek. Other productive placers were located on Meadow Creek, Quartz Creek, and Tucker Gulch, and on Straight and Cache Creeks, tributaries of Fish Creek.

For detailed descriptions of mines in Mineral County the reader is referred to U. S. Geol. Survey Bull. 1027-M and 1082-I respectively titled **Reconnaissance geology of western Mineral County, Montana,** and **Geology and mineral deposits of the St. Regis-Superior area, Mineral County, Montana.** Additional data on placer deposits may be found in Montana Bur. of Mines and Geology Mem. 26, titled **The gold placers of Montana.**

Nonmetallic Minerals

There are four reported fluorite deposits in the county. Three of these deposits (Bear Creek or Spar, Wilson Gulch, and Lime Gulch) are situated within the Dry Creek drainage west of Superior. The fourth deposit is the Snowbird mine, which is located on the headwaters of Cedar Log Creek in the southeastern part of the county. Although fluorite is not presently being mined from these deposits, it has been produced from the Bear Creek (Spar), Wilson Gulch, and Snowbird deposits.

A vein of barite is reported in the Packer Creek area, in the western part of the county. Traces of beryl have been found in the vicinity of Rivulet.

SOIL AND WATER CONSERVATION DISTRICT

The Mineral County Soil and Water Conservation District boundaries are identical with those of Mineral County. This District was organized under the Montana State Soil Conservation Act in 1945 with headquarters in Superior, Montana. This act provides for voluntary action, home rule, and protection of the rights of individuals.

The District is governed by a board of five supervisors who are elected by the land occupiers within the District. They carry out a program of soil management, proper land use, resulting in soil erosion control, water conservation, and soil improvement. These supervisors have the power under State law to call upon County, State, Federal, and other agencies to assist in executing the District's program.

To date, the District Supervisors have working agreements with the Soil Conservation Service to provide technical assistance, with the Cooperative Extension Service to provide educational assistance, and the Montana State Forester to give technical assistance on forest lands. They also work closely with the Agricultural Stabilization and Conservation Service, Forest Service, Montana Fish

and Game Department, and other state agencies. It is through cooperation with these agencies that a balanced soil and water conservation program can be realized in the county.

With the assistance the District governing body secures from the various agencies and organizations, a work program is developed and carried out. The work program outlines the major soil and water conservation problems. It also indicates the work needed to solve these problems. A work plan is prepared each year by the governing body for the scheduling of actual activities which will be stressed and carried out during the year.

The District directly assists farmers and land owners on a voluntary basis in planning and applying conservation on the land. This technical assistance is provided without cost to the farmer or land occupier upon formal request to the District.

There are 782,720 acres in Mineral County with approximately 648,266 in public ownership. After deducting the acreage occupied by water, major roads, urban and built-up areas, there remains less than 16 percent of the county in private ownership. There are about 75 farms on 54,830 acres.

Technical assistance is provided land owners and occupiers to develop basic conservation plans for their land. These plans include detailed soil surveys, range site and condition surveys, forest site surveys, and other engineering surveys. These surveys indicate the kind and amount of conservation work needed to prevent erosion and to develop the resources of the farm or tract of land. Conservation planning is done with individuals or groups of land owners or occupiers with Soil Conservation Service technicians assisting the District. The land owner or occupier makes the final decisions as to what will be done and when it will be carried out. This is recorded in the conservation plan on various surveys and the counsel of the technicians.

On irrigated land the assistance given is primarily on irrigation systems, drainage, water control structures, sprinkler irrigation systems, proper application of irrigation water, water storage, soil management, crop rotations and irrigated pasture management.

On drylands, technical assistance is given on reseeding methods, and cropping systems. On range lands and grazed woodlands, assistance is given on deferred grazing, proper grazing management, and livestock water development. On woodlands, most assistance is for stand improvement and adopted cutting methods.

Since the District was organized in 1945, assistance has been provided to install 22 sprinkler irrigation systems to irrigate 900 acres of land. This required installing 20,000 feet of main line pipe. There have been over 18 miles of laterals and ditches and 63 water control structures installed to improve irrigation water delivery. Over 4 miles of pipelines have been installed, and 19 springs developed for livestock water as an aid to grazing management. Nine ponds have been built to supplement irrigation and as farm fish ponds. There have been 1,096 acres of woodland thinned and pruned for stand improvement.

An inventory of soil and water conservation needs in Mineral County has recently been completed. This inventory is a part of a national inventory, and estimates remaining conservation needs by land uses. The inventory is based upon statistically expanded data obtained from randomly selected 160 acre samples on which detailed soil surveys were completed. The inventory estimates

that approximately 93 percent of the non-irrigated cropland and approximately 95 percent of the irrigated cropland needs additional treatment and is feasible to treat; that approximately 87 percent of native range needs improvement, and 64 percent of private woodlands need stand improvement.

Progress has been achieved in attaining sound land use. At this time a soil survey of the entire county is near completion. This survey is a joint endeavor of the Soil Conservation Service and Forest Service. This survey should provide invaluable basic data for the conservation program. Cooperative efforts of the land owner and operator and other groups and agencies have contributed to the success of the District. There has developed a public realization of the importance of community action in solving the basic resource problems of the area.

SNOW SURVEYS

The Soil Conservation Service issues water supply forecasts and coordinates the snow survey measurements. Snow surveys are made throughout the winter and spring months by the SCS and other cooperating federal, state and private agencies. These data provide the main information used to predict streamflow. Water supply forecasts are used by farmers and ranchers to assess the amount of irrigation water that will be available, by irrigation and flood control organizations to manage reservoir operations, by power companies and many other groups and individuals whose operations are related to or dependent on streamflow. This three to six months advance knowledge of spring and summer runoff allows water users and managers time to plan operations according to the expected streamflow. Farmers and ranchers can plan crops for the coming spring. Reservoirs can be operated for maximum efficiency by combining flood control with power generation and irrigation storage. Bankers, railroad managers, farm equipment builders and persons in various other businesses can determine and plan for the effect the anticipated water supply may have on their operation.

A snow survey consists of measuring the depth and amount of water in the snow, or snow water equivalent. Measurements are taken at the same place each year, using standard snow sampling equipment. Almost all courses are measured near the first of March, April and May, with a few courses measured earlier and later in the season. In recent years, the snow pillow, a pressure sensing device, has been developed to provide a continuous record of snow water equivalent. Most snow pillow sites have a mountain precipitation storage gage.

Soil moisture and soil temperature is measured at five depths by electrical resistance units at permanently established locations. The total is the amount of water contained in the top four feet of soil.

Current information on snow surveys and streamflow forecasts can be obtained from Soil Conservation Service, Box 970, Bozeman, Montana 59715, or Soil Conservation Service, 2801 Russell Street, Missoula, Montana 59801.

Snow courses, snow pillows and soil moisture stations in or immediately adjacent to Mineral County are shown in the following tabulation. Other snow courses in upstream drainages are also used to forecast the Clark Fork River streamflow.

SNOW COURSES, SNOW PILLOWS AND SOIL MOISTURE STATIONS

Drainage and Name	Elevation	Year Established	Dates Measured*
Clark Fork River			
Heart Lake Trail	4,800	1965	3, 4, 5
Hoodoo Basin	6,000	1967	3, 4, 5
Hoodoo Basin Snow Pillow	6,000	1967	Continuously
Hoodoo Creek	5,900	1937	3, 4, 5
St. Regis River			
Lookout	5,250	1936	1, 2, 3, 4, 5
Lookout Snow Pillow	5,250	1969	Continuously
Lookout Soil Moisture	5,250	1962	Monthly

*Numerals 1, 2, 3, 4, 5 refer to January 1, February 1, March 1, April 1, and May 1 measurements.

FISH AND GAME

The mountainous terrain of Mineral County provides water for the many miles of trout streams that abound in this area. Historical reports indicate that westslope cutthroat, Dolly Varden, whitefish and suckers were the species available to the first white settlers in this area. Most of the valley's streams support populations of trout, with westslope cutthroat still predominating in the upper watersheds.

The Clark Fork River is the largest river flowing through this area and provides some of the most spectacular trout fishing. This main river system contains populations of brown trout, rainbow trout, cutthroat trout, whitefish, suckers, squawfish, and peamouth. Most streams are fast flowing and cold. Growth rates of fish are slow compared to fish from more fertile streams, east of the Continental Divide. Lakes and streams of this area are becoming more important for recreation due to the excellent access and scenic areas. The Clark Fork River provides year round quality trout fishing and will continue to do so with proper water use.

The large expanse of mountainous, forested land in Mineral County provides good habitat for forest-dwelling game animals. Four species of big game are abundant. These are mule deer, white-tailed deer, elk and black bear. Moose, mountain goat, and bighorn sheep are scarce. Three species of mountain grouse provide good hunting during the fall season. Merriam turkeys have been introduced into the county. They are now common enough to allow a short hunting season. Birds associated with farming, such as pheasants and partridge, are scarce. Water fowl habitat occurs chiefly along the Clark Fork River which is used by several species of ducks and Canada geese.

Mineral County is popular for its big game hunting. Access to hunting areas is good because of the large amount of public land. More than 4,000 people hunted deer and elk in the county in 1967. Elk are the main attraction. The number of people hunting elk is about twice as great as the number that hunt deer. Elk hunting success is about 30 percent which is considerably above the state average. Deer hunting success is about 50 percent.

The perpetuation of game resources will depend on habitat conditions. A limited winter range is the bottleneck which limits big game populations. Most of the existing winter range areas are los-

ing their value for game because of forest encroachment. Effective fire control precludes the creation of much new range. Therefore, a vital problem in future years will be to provide sufficient winter range to support sizeable big game populations. This will probably have to be done in conjunction with timber management.

LOLO NATIONAL FOREST

National Forest lands in Mineral County total 648,316 acres, all in the Lolo National Forest. However, at present, the 267,160 acres of the St. Regis Ranger District have been administered by the Coeur d'Alene National Forest. The other 381,156 acres are administered by the Superior and Ninemile Ranger Districts of the Lolo National Forest.

Originally all the National Forest land in Mineral County was a part of the Lolo Forest Reserve created September 20, 1906. An act of March 4, 1967, changed it to the Lolo National Forest.

The earliest recorded history was that of the construction of the Mullan Road in 1859. This road entered Montana from the west through St. Regis Pass. Present day roads closely follow much of the original location.

The Northern Pacific Railway to St. Regis and part of the Coeur d'Alene branch line which follows the St. Regis River were completed in 1890. The Chicago, Milwaukee, St. Paul and Pacific Railroad was completed in 1909. During the construction of the St. Paul Pass tunnel through the Bitterroot Mountains, the town of Taft had a population of over 2,000 people. Today, the only landmark left is the Taft Hotel.

The famous 1910 fire raged over portions of the county. Early logging companies that salvaged timber from 1911 to 1916 includes Polley's Lumber Company in Rainy, Brimstone and Pader Creeks; the Mann Lumber Company in Big Creek, and Otto Westfall who had a mill at Boran and logged the upper St. Regis River. The Big Blackfoot mill was constructed below St. Regis by the Anaconda Company in the 1890's and then dismantled and moved to Bonner in 1915.

Elevations range from 2,613 feet near the county boundary on the Clark Fork River to 7,690 feet at Illinois Peak on the Idaho-Montana line south of Superior. Two main rivers, the Clark Fork passing through the county and the St. Regis entirely within the county, make up the main drainage pattern with private land along the valley bottoms and National Forest land occupying the foothills and the rugged terrain along the Idaho-Montana boundary.

Average annual precipitation ranges from plus 60 inches on the Bitterroot Divide to less than 25 inches along the Clark Fork River below the town of St. Regis.

Soils surveys have been completed for all of the National Forest land in Mineral County. The survey shows stable soils on a high percentage of the forest land with isolated erosion hazard areas. One objective is to manage the forest with a minimum of soil disturbance and sedimentation.

The National Forest lands in Mineral County are managed under the multiple use concept by District Rangers and their assistants on the St. Regis, Superior, and Ninemile Ranger Districts. Multiple use is management of all renewable resources so that they are used in the combination that

will best meet the needs of the American people. It provides for judicious use of the several land resources with adjustments and coordinated management to conform with changing conditions and needs. Sustained yield is continuous achievement and maintenance of forest resources without impairment of land productivity. Water, forage, outdoor recreation, timber, wildlife, and fish are the services and products provided by the National Forests.

While water is undoubtedly the most valuable resource on these public lands in Mineral County, it is difficult to assign a dollar value and measure this important resource. Water stored in the large acreages of heavy snowpack on these National Forest lands supplies water to the Columbia River system via the St. Regis and Clark Fork River basins. This continuous water supply is used for hydroelectric power production, domestic, and industrial purposes, irrigation, navigation, and recreation. While there is little local demand for water other than for domestic use, it becomes highly important when released for downstream use.

The National Forest lands in Mineral County have relatively stable soils. Recognizing the importance of favorable soil-water conditions as the foundation for all other uses and resource management, the Forest Service gives first consideration to soil and water in all planning. Timber is cut and roads are built only when adequate provision is made to prevent harmful erosion and stream pollution. Fire prevention and suppression, balancing the number of livestock against available forage, maintaining wildlife numbers within the support capacity of these public lands, and insect and disease control all contribute to water shed protection of these National Forest lands.

The community water supply of Alberton, Saltese, and Superior originates from stream sources partly on National Forest lands. Several springs and creeks that originate on National Forest land are used for domestic water on continguous private lands. Top priority of Forest resource management is to avoid polluting streams.

Water is but one of the basic renewable resources managed by the Forest Service under the multiple use concept. Wood, wildlife, recreation, forage, as well as water, contribute to the economy of Mineral County. In addition to their impact on the local economy, Mineral County receives 25 percent of the Forest Service revenue from National Forest lands within the county. In fiscal year 1968, this amounted to $97,566. These funds are made available to the county for local schools and roads.

The wide variety of elevation, aspects, and precipitation result in timber types common to western Montana. Much of the western portion of the county burned in the 1910 fire leaving 50 to 60 year old pole size stands in this area. Mature timber stands occur throughout the county but are primarily located in the eastern half. Under sustained-yield management, mature trees being cut now will be replaced in 100 to 120 years by a new crop of mature trees, thus providing an endless supply of timber. To meet future needs, objectives are to intensify management of existing timber stands, grow more and better trees; reduce losses from insects, disease, and fire; plant trees on cutover and burned areas; and improve wood utilization.

Today National Forest lands in Mineral County have a sustained yield annual allowable timber cut of approximately 51 million board feet. This stabilized sustained timber production capacity is important to the local economy.

Elk, deer, and black bear are the most common big-game animals hunted, although occasional mountain goat and moose are taken. Grouse, ducks, and geese offer many hunter challenges. The virgin streams and high mountain lakes produce an excellent trout fishery. Hunting and fishing on the National Forest lands of the county are important to the local economy.

National Forest lands are playing a big part in the growing outdoor recreation activity in Mineral County. Nearly 2,500,000 people pass through yearly on Interstate Highway #90. An estimated 240,000 recreation visits were made to National Forest lands in Mineral County in 1967. Seven camp and picnic facilities are available at popular sites. Forest Service plans include more and improved recreation facilities in the next 10 to 15 years. Lookout Pass ski area is located partially in Mineral County and receives an increasing popularity year after year.

Grazing on National Forest lands is mostly on fire created range and as a result is transitory in nature. In 1968, 28 permits were issued and 628 cattle and 1,000 sheep were allowed to graze. Forage produced is an important part of local ranch operations.

Numerous mineral deposits occur on the National Forest lands in the county. Lead, silver, and gold are the important minerals found. At present, mining activity over the area is generally inactive.

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, 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	134,575.50	26,711.33	161,286.83
Jefferson River	61,291.00	9,713.00	71,004.00
Beaverhead River	40,771.00	6,076.00	46,847.00
Big Hole River	23,775.00	1,950.00	25,725.00
Madison River	39,445.00	7,660.00	47,105.00
Gallatin River	112,054.00	21,242.00	133,296.00
Smith River	32,934.00	19,679.00	52,613.00
Sun River	124,474.58	4,385.00	128,859.58
Marias River	149,004.42	20,756.88	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**	303,657.00	96,016.00	399,673.00
Stillwater River**	30,423.50	8,028.53	38,452.03
Clarks Fork River**	88,160.97	1,530.83	89,691.80
Bighorn River**	65,005.00	23,858.00	88,863.00
Tongue River	28,170.00	7,762.00	35,932.00
Powder River	35,948.00	2,299.00	38,247.00
Little Missouri River	42,513.00	1,499.00	44,012.00
Grand Total Missouri River Basin	**1,669,046.59**	**382,963.66**	**2,052,010.25**
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	**2,103,754.04**	**409,972.08**	**2,513,726.12**

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

**Figures in these River Basins revised by resurvey of Carbon County, 1965.

IRRIGATION SUMMARY OF MINERAL COUNTY BY RIVER BASINS

COLUMBIA RIVER BASIN	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigated & Irrigable Acres Under Present Facilities
***Columbia River**	**0.00**	**0.00**	**0.00**
Clark Fork (Missoula) (Hellgate) (Deer Lodge) River	**252.00**	**34.00**	**286.00**
Unnamed Creek	**0.00**	**0.00**	**0.00**
Lime Stone Springs	41.00	25.00	66.00
Sawmill (Morse) Creek	**0.00**	**0.00**	**0.00**
Unnamed Stream	77.00	0.00	77.00
Bestwick Gulch	**0.00**	**0.00**	**0.00**
Springs	11.00	0.00	11.00
Adams Gulch	**0.00**	**0.00**	**0.00**
Unnamed Stream	0.00	0.00	0.00
A Spring	25.00	0.00	25.00
Camp (Nigger) Creek	**11.00**	**0.00**	**11.00**
West Fork Camp (Nigger) Creek	9.00	0.00	9.00
Moose Creek	**1.00**	**0.00**	**1.00**
Quartz Creek	**5.00**	**0.00**	**5.00**
Fourteen Mile (Nemote) Creek	**109.00**	**213.00**	**322.00**
South Fork Fourteen Mile (S. Fk. Nemote) (Jakey) (Schaffer) Creek	49.00	0.00	49.00
Miller (Mills) (First Right Fork) Creek	68.00	0.00	68.00
Meadow Creek	**35.00**	**39.00**	**74.00**
Sunrise Creek	14.00	9.00	23.00
Verde Creek	**0.00**	**8.00**	**8.00**
Deep (North Fork) Creek	**20.00**	**0.00**	**20.00**
Eddy Creek	**14.00**	**9.00**	**23.00**
Second Creek	**14.00**	**0.00**	**14.00**
First Creek	**38.00**	**0.00**	**38.00**
Lazoe (Lozeau) (First) Creek	**130.00**	**0.00**	**130.00**
Cedar Creek	**94.00**	**0.00**	**94.00**
Berry Gulch (Berry's, Johnston, & Johnson Creek)	**34.00**	**0.00**	**34.00**
Flat Creek	**17.00**	**0.00**	**17.00**
Thompson Creek	**48.00**	**0.00**	**48.00**
Deep Creek (Pardee Gulch)	**0.00**	**167.00**	**167.00**
Dry Creek	**70.00**	**0.00**	**70.00**
Murphy Creek	21.00	0.00	21.00
Unnamed Creek	13.00	0.00	13.00
Spring Gulch (Keystone Creek)	**7.00**	**0.00**	**7.00**
Park (Pack) Creek	20.00	0.00	20.00
Four Mile Creek	**0.00**	**0.00**	**0.00**
Swift Creek	**16.00**	**0.00**	**16.00**
Well	**4.00**	**0.00**	**4.00**
St. Regis River	**22.00**	**0.00**	**22.00**
Timber Creek (North Fork of)	100.00	0.00	100.00
Well (In the NE¼NE¼ Sec. 27)	76.00	0.00	76.00
Savenac Creek	33.00	0.00	33.00
West Fork Twin Creek	39.00	0.00	39.00
East Fork Twin Creek	17.00	0.00	17.00
Mullan Gulch	113.00	0.00	113.00
Spring Creek (East Gulch)	4.00	0.00	4.00
Unnamed Creek	0.00	6.00	6.00
Sansom (Wolf) Creek	15.00	12.00	27.00
Plourde Creek	13.00	10.00	23.00
Roots Gulch	5.00	0.00	5.00
Total St. Regis River & Tributaries	**437.00**	**28.00**	**465.00**

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

COLUMBIA RIVER BASIN	Present Irrigated Acres	Irrigable Acres Under Present Facilities	Maximum Irrigated & Irrigable Acres Under Present Facilities
Burr Well	10.00	0.00	10.00
Well No. 1	5.00	0.00	5.00
Well No. 2	11.00	0.00	11.00
Well	6.00	0.00	6.00
Four Mile (Tamarack) Creek	0.00	47.00	47.00
Long Gulch (Deer Gulch Creek)	0.00	10.00	10.00
Seven Mile Creek	0.00	42.00	42.00
GRAND TOTAL FOR MINERAL COUNTY	1,736.00	631.00	2,367.00

WATER RIGHT DATA — MINERAL COUNTY

APPROPRIATIONS AND DECREES BY STREAM

STREAM	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
COLUMBIA RIVER BASIN							
***Columbia River**	**0**	**0.00**	**0.00**				
Clark Fork (Missoula) (Hellgate) (Deer Lodge) River	**15**	**85,211.00**	**2,130.28**				
Unnamed Creek	**1**	**100.00**	**2.50**				
Lime Stone Springs	1	All	---				
A Certain Spring	**2**	**30.00**	**.75**				
A Certain Spring	**2**	**2.00**	**.05**				
Unnamed Stream	**0**	**0.00**	**0.00**				
A Spring	1	50.00	1.25				
Sawmill Creek (Morse)	**1**	**300.00**	**7.50**				
Bear Gulch Creek	1	All	---				
Slab Gulch Creek	1	All	---				
Engineers Creek	1	All	---				
Sawmill Gulch (Dry Creek)	2	All	---				
Ash Creek	**1**	**50.00**	**1.25**				
Cyr Spring	3	70.00	1.75				
A Spring	1	10.00	.25				
Unnamed Creek	**0**	**0.00**	**0.00**				
A Spring	1	5.00	.13				
A Spring	**1**	**300.00**	**7.50**				
Bestwick Gulch	**0**	**0.00**	**0.00**				
Springs	1	All	---				
Adams Gulch	**0**	**0.00**	**0.00**				
Unnamed Stream	0	0.00	0.00				
A Spring	1	300.00	7.50				
Camp Creek (Nigger Creek)	**3**	**1,300.00**	**32.50**				
West Fork Camp Creek (West Fork Nigger Creek)	2	300.00	7.50				
Mountain Creek	0	0.00	0.00				
Unnamed Creek	0	0.00	0.00				
Cold Springs	1	20.00	.50				
Cherry Springs	**1**	**50.00**	**1.25**				
Moose Creek	**1**	**500.00**	**12.50**				
Smokey Creek	**1**	**100.00**	**2.50**				
Hutter Creek	**1**	**200.00**	**5.00**				

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

WATER RIGHT DATA — MINERAL COUNTY

APPROPRIATIONS AND DECREES BY STREAM

STREAM	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Scenic Spring	1	80.00	2.00				
Perkins Creek	2	115.00	2.87				
North Fork of Perkins Creek	1	100.00	2.50				
Unnamed Stream	0	0.00	0.00				
A Spring	1	200.00	5.00				
Unnamed Spring	1	10.00	.25				
Fish Creek	5	19,000.00	475.00				
North Fork Fish Creek	0	0.00	0.00				
French Creek	1	1,500.00	37.50				
Unnamed Stream	0	0.00	0.00				
French Lake	1	5,000.00	125.00				
Greenwood Gulch (Creek)	1	1,100.00	27.50				
Clearwater Crossing Spring	1	40.00	1.00				
South Fork Fish Creek	0	0.00	0.00				
East Fork of South Fork Fish Creek	2	250.00	6.25				
Burdette Creek	1	200.00	5.00				
Hyde Creek	3	680.00	17.00				
Cache Creek	2	250.00	6.25				
Montana Creek	6	3,800.00	95.00				
South Fork Montana Creek	2	1,000.00	25.00				
O'Neal Creek	0	0.00	0.00				
Moose Lake	1	12.00	.30				
Johnston Creek	2	800.00	20.00				
O'Neal Lake	1	All	---				
Reservoir Creek (Winkler Gulch)	1	50.00	1.25				
Unnamed Stream	1	50.00	1.25				
Spring Creek	2	700.00	17.50				
Crystal Springs	1	50.00	1.25				
A Spring	1	50.00	1.25				
Meginty Creek (McGinty Gulch)	2	600.00	15.00				
Unnamed Stream	1	20.00	.50				
Unnamed Creek	0	0.00	0.00				
A Spring	1	50.00	1.25				
McGuitz Creek	1	100.00	2.50				
Quartz Creek	20	17,540.00	438.50				
South Fork Quartz Creek (Patrick) (St. Patrick)	3	1,300.00	32.50				
Unnamed Stream	1	100.00	2.50				
Tucker Gulch	1	125.00	3.12				
McFarland Creek	3	6,200.00	155.00				
Whiskey Gulch	0	0.00	0.00				
A Spring	1	1.00	.03				
A Spring	1	10.00	.25				
Fourteen Mile Creek (Nemote)	8	7,100.00	177.50				
North Fork Fourteen Mile Creek (No. Fk. Nemote Cr.) (Sheridan Creek)	1	160.00	4.00				

WATER RIGHT DATA — MINERAL COUNTY

APPROPRIATIONS AND DECREES BY STREAM

STREAM	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Ellert Creek (Alice Creek)	1	100.00	2.50				
Bear Creek	1	10.00	.25				
South Fork Fourteen Mile Creek (Jakey Creek) (South Fk. Nemote Creek) (Schaffer Creek)	2	900.00	22.50				
Ross Spring	1	All	---				
Unnamed Creek	0	0.00	0.00				
A Spring	3	75.00	1.88				
Miller Creek (Mills) (First Right Fork)	4	600.00	15.00				
Mullan Creek (Mullan Gulch)	1	100.00	2.50				
Middle Creek (First Branch of Fourteen Mile Creek) (Pole Gulch)	4	713.00	17.83				
Quartz Spring	**2**	**21.00**	**.53**				
Cayuse Creek	**2**	**260.00**	**6.50**				
North Branch of Cayuse Creek	1	100.00	2.50				
Cayuse Spring	1	17.00	.43				
Forest Grove Spring	1	25.00	.63				
Meadow Creek	**8**	**2,707.00**	**67.68**				
North Fork Meadow Creek (Smith Gulch)	1	800.00	20.00				
Joe's Creek (Joe's Gulch)	3	178.00	4.45				
Nellie Creek (Weaver Gulch)	1	360.00	9.00				
Unnamed Creek	0	0.00	0.00				
A Spring	3	154.00	3.85				
Sunrise Creek	5	2,800.00	70.00				
A Spring	1	100.00	2.50				
Allen Springs	1	16.00	.40				
A Spring	1	All	---				
Brushy Gulch (Creek)	**1**	**10.00**	**.25**				
Verde Creek	**7**	**1,944.00**	**48.60**	657	2	165.00	4.13
Deep Creek (North Fork)	**22**	**7,784.00**	**194.60**				
Unnamed Stream	1	200.00	5.00				
East Fork Deep Creek (South Fork)	0	0.00	0.00				
Middle Fork Deep Creek (Malley Gulch)	3	800.00	20.00				
Spring Creek	2	660.00	16.50				
A Spring	1	20.00	.50				
Remillard Creek	1	All	---				
A Spring	1	20.00	.50				
Eddy Creek	**7**	**2,050.00**	**51.25**				
Second Creek	**6**	**3,144.00**	**78.60**				
North Fork Second Creek	1	300.00	7.50				
Westfall Creek	1	60.00	1.50				
First Creek	**1**	**200.00**	**5.00**				
Cougar Creek	**2**	**620.00**	**15.50**				

WATER RIGHT DATA — MINERAL COUNTY

APPROPRIATIONS AND DECREES BY STREAM

STREAM	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Trout Creek	**18**	**43,100.00**	**1,077.50**				
North Fork Trout Creek	4	5,500.00	137.50				
South Fork Trout Creek	1	1,200.00	30.00				
Cement Gulch	4	6,000.00	150.00				
Dunn Creek	1	200.00	5.00				
Bond Creek	1	300.00	7.50				
Deep Gulch (Creek)	3	3,000.00	75.00				
Deep Gulch Lake	1	3,000.00	75.00				
Hungry Gulch (Hungry Hollow Gulch) (Certain Creek)	2	425.00	10.63				
Lime Creek (Gulch)	1	500.00	12.50				
Windfall Gulch (Creek)	5	5,100.00	127.50				
Squirrel Creek	3	750.00	18.75				
South Fork Windfall Creek	2	1,000.00	25.00				
Middle Fork Windfall Creek	2	600.00	15.00				
South East Fork Windfall Creek (Ohio Creek)	1	600.00	15.00				
Clear Creek (Russian Bill Creek)	1	250.00	6.25				
Tin Can Creek (Tin Cup Creek)	1	200.00	5.00				
Gray's Creek (Grey Gulch)	1	500.00	12.50				
Vanness Creek (Van Ness)	2	1,000.00	25.00				
Trout Creek Campground Spring	2	44.00	1.10				
Unnamed Stream	1	25.00	.63				
Little Twin Creek	1	100.00	2.50				
Unnamed Stream	1	25.00	.63				
Front Creek	2	80.00	2.00				
Lozoe (Lozeau) Creek (First Creek)	**4**	**1,950.00**	**48.75**				
Camp "4" Gulch (Rabb Creek)	**1**	**80.00**	**2.00**				
A Certain Spring	1	2.00	.05				
Unnamed Gulch	**0**	**0.00**	**0.00**				
A Spring	1	300.00	7.50				
Springs	**1**	**All**	**---**				
Springs	**1**	**All**	**---**				
Unnamed Gulch	**0**	**0.00**	**0.00**				
A Spring	1	All	---				
Unnamed Gulch	**0**	**0.00**	**0.00**				
A Spring	1	All	---				
Unnamed Stream	**0**	**0.00**	**0.00**				
A Spring	1	All	---				
Unnamed Stream	**0**	**0.00**	**0.00**				
A Spring	1	All	---				
Unnamed Stream	**0**	**0.00**	**0.00**				
A Spring	1	---	---				
Cedar Creek	**27**	**31,000.00**	**775.00**				

WATER RIGHT DATA — MINERAL COUNTY

APPROPRIATIONS AND DECREES BY STREAM

STREAM	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Snowshoe Gulch (Creek)	2	1,200.00	30.00				
California Gulch	5	1,250.00	31.25				
Homestake Gulch	7	3,550.00	88.75				
Pichette Gulch	2	115.00	2.88				
Illinois Gulch (Creek) (South Fork Cedar Creek)	6	5,505.00	137.63				
Elizabeth Gulch	3	800.00	20.00				
Marion Gulch (Mary Ann Gulch)	5	650.00	16.25				
A Spring	1	All	---				
Montreal Gulch	1	500.00	12.50				
Town Gulch	3	900.00	22.50				
Unnamed Stream	0	0.00	0.00				
A Spring	1	10.00	.25				
Forest Creek	1	100.00	2.50				
Rabbit Creek	5	2,600.00	65.00				
Cayuse Gulch (Creek)	2	1,600.00	40.00				
Oregon Gulch (Creek) (North Fork Cedar Creek)	17	52,820.00	1,320.50				
Grubstake Gulch (Creek)	3	1,800.00	45.00				
Bonanza Gulch	0	0.00	0.00				
Missoula Gulch	3	2,700.00	67.50				
Mink Gulch (Creek) (Little Mink) (Etta Martin or Anna Morton Creek)	4	2,800.00	70.00				
Lost Gulch (Creek)	14	30,950.00	773.75				
Lost Gulch Lake	1	2,500.00	62.50				
Pearson Creek (Pierson) (Wallace)	2	1,000.00	25.00				
Whites Creek	1	All	---				
A Certain Spring	2	50.00	1.25				
Twin Springs	1	60.00	1.50				
Bear Creek (Gulch)	2	1,500.00	37.50				
Upham Gulch	2	500.00	12.50				
Second Creek (Lie Gulch)	1	250.00	6.25				
McIntyre Gulch	0	0.00	0.00				
Unnamed Spring	1	---	---				
First Creek (Deer Lick)	2	110.00	2.75				
A Spring	2	60.00	1.50				
A Spring	1	All	---				
Berry Gulch (Berry's Johnson Creek)	**5**	**1,044.00**	**26.10**				
A Certain Spring	**1**	**100.00**	**2.50**				
Welch Gulch	**1**	**100.00**	**2.50**				
Idaho Gulch	**1**	**144.00**	**3.60**				
Flat Creek	**15**	**7,490.00**	**187.25**				
Hall Creek	2	750.00	18.75				
A Spring	3	450.00	11.25				
A Spring	2	20.00	.50				
Wood Gulch (Campbell Creek)	1	100.00	2.50				

WATER RIGHT DATA — MINERAL COUNTY

APPROPRIATIONS AND DECREES BY STREAM

STREAM	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Unnamed Stream	0	0.00	0.00				
Spring	1	5.00	.13				
Wood Gulch Spring	2	104.00	2.60				
Campbell Spring	3	160.00	4.00				
Cordroy Bridge Spring	2	150.00	3.75				
Daisy Gulch Creek	1	10.00	.25				
A Certain Spring	**3**	**175.00**	**4.38**				
Thompson Creek	**8**	**2,347.00**	**58.68**				
Spring Creek	1	200.00	5.00				
A Certain Spring	2	150.00	3.75				
Harman Gulch (Kelly Gulch)	**2**	**360.00**	**9.00**				
Unnamed Spring	1	10.00	.25				
Hargrove Gulch (Charette Gulch)	**1**	**50.00**	**1.25**				
Hargrove Spring	2	75.00	1.88				
King Gulch	**1**	**144.00**	**3.60**				
Spring	1	10.00	.25				
Deep Creek (Pardee Gulch)	**9**	**3,275.00**	**81.88**				
Unnamed Stream	0	0.00	0.00				
A Spring	1	25.00	.63				
Unnamed Stream	1	100.00	2.50				
Dry Creek	**28**	**31,530.00**	**788.25**				
Turin Creek	1	1,600.00	40.00				
Fourth of July Creek (Torino Creek)	0	0.00	0.00				
Cliff Lake	1	1,500.00	37.50				
Diamond Lake	2	1,700.00	42.50				
Twin Creek (Ann Arbor Gulch)	1	1,600.00	40.00				
Queen Creek	1	400.00	10.00				
Marco Creek	2	800.00	20.00				
Wilson Creek	1	500.00	12.50				
Dry Fork Creek	1	160.00	4.00				
Murphy Creek	1	200.00	5.00				
Unnamed Creek	1	500.00	12.50				
Spring Gulch (Keystone Creek)	**12**	**1,625.00**	**40.62**				
North Branch Spring Gulch	3	2,200.00	55.00				
(No Name) Spring	1	80.00	2.00				
Park Creek (Pack Gulch)	8	863.00	21.57				
Firman Gulch	0	0.00	0.00				
Unnamed Stream	0	0.00	0.00				
A Spring	1	200.00	5.00				
King Gulch	2	750.00	18.75				
A Spring	2	All	---				
Unnamed Creek	**0**	**0.00**	**0.00**				
A Spring	2	5.00	.13				
Slowey Gulch (Slowey's Water Gulch)	**7**	**2,080.00**	52.00				
Rattlesnake Gulch	0	0.00	0.00				
A Certain Spring	1	10.00	.25				
Unnamed Spring	**1**	**7.00**	**.18**				
A Spring	**1**	**20.00**	**.50**				

WATER RIGHT DATA — MINERAL COUNTY

APPROPRIATIONS AND DECREES BY STREAM

STREAM	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Marble Creek	1	**200.00**	**5.00**				
Reeves Creek	1	**400.00**	**10.00**				
A Spring	1	100.00	2.50				
Coal Creek	4	**2,760.00**	**69.00**				
Unnamed Creek	1	All	---				
Four Mile Creek	4	**640.00**	**16.00**				
Swift Creek	1	400.00	10.00				
Spring Creek	0	**0.00**	**0.00**				
North Branch Spring Creek	1	500.00	12.50				
Springs	1	30.00	.75				
Unnamed Creek	1	**5.00**	**.13**				
2 Springs	3	60.00	1.50				
Unnamed Creek	1	**1,000.00**	**25.00**				
A Spring	1	20.00	.50				
Unnamed Creek	0	**0.00**	**0.00**				
Spring	1	120.00	3.00				
St. Regis River	16	**66,250.00**	**1,656.25**				
Copper Creek (Cooper Creek)	3	1,050.00	26.25				
Borax Creek	0	0.00	0.00				
Spring	1	.50	.01				
Unnamed Creek	2	400.00	10.00				
Brimstone Creek	1	80.00	2.00				
Denna Mora Creek (Bismark Creek)	3	1,100.00	27.50				
Gladstone Creek	2	220.00	5.50				
Shamrock Gulch	1	8.00	.20				
Cold Spring	1	2.00	.05				
Mephisto Creek	1	75.00	1.88				
Whitmore Creek	1	100.00	2.50				
Rainy Creek (Ranier) (Buck)	4	20,170.00	504.25				
West Fork Rainy Creek	1	120.00	3.00				
East Fork Rainy Creek (South Fork)	3	520.00	13.00				
West Fork of East Fork Rainy Creek	1	120.00	3.00				
Dominion Creek	0	0.00	0.00				
West Fork Dominion Creek	1	80.00	2.00				
Unnamed Creek	1	30.00	.75				
North Spring Creek	1	100.00	2.50				
South Spring Creek	1	100.00	2.50				
Unnamed Creek	1	20.00	.50				
Packer Creek	15	69,400.00	1,735.00				
East Fork Packer Creek	2	530.00	13.25				
West Fork Packer Creek (East Fork)	3	700.00	17.50				
North Fork of West Fork Packer Creek (Sewall)	4	1,800.00	45.00				
A Trib of North Fork of West Fork Packer Creek	2	550.00	13.75				

WATER RIGHT DATA — MINERAL COUNTY

APPROPRIATIONS AND DECREES BY STREAM

STREAM	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Unnamed Stream	1	100.00	2.50				
Unnamed Stream	1	45.00	1.13				
Silver Creek	12	287,449.00	7,186.23				
Silver Lake	2	2,900.00	72.50				
McManus Creek	2	300.00	7.50				
Timber Creek (North Fork of)	4	838.00	20.95	136	2	71.00	1.78
West Fork Timber Creek	1	500.00	12.50				
East Fork Timber Creek (Cougar Creek)	1	200.00	5.00	136	3	165.00	4.13
Savenac Creek	9	41,482.00	1,037.05				
Middle Fork Savenac Creek	2	180.00	4.50				
East Fork Savenac (Brush) (Cook) (Silver Creek)	5	450.00	11.25				
Big Spring Creek	1	750.00	18.75				
Big Creek	6	6,630.00	165.75				
West Fork Big Creek	0	0.00	0.00				
Gilt Edge Creek	1	100.00	2.50				
Middle Fork Big Creek	0	0.00	0.00				
East Fork of Middle Fork Big Creek	1	5,000.00	125.00				
East Fork Big Creek	1	10,000.00	250.00				
McKinney Creek	1	500.00	12.50				
Rivers Creek	1	200.00	5.00				
McGee Creek	0	0.00	0.00				
A Spring	1	100.00	2.50				
Kenney Creek	1	100.00	2.50				
Deer Creek	8	15,430.00	385.75				
Clear Lake (Oregon Lake)	1	500.00	12.50				
Unnamed Creek	0	0.00	0.00				
Crystal Lake	3	200.00	5.00				
Bear Creek (Cronie Creek)	1	500.00	12.50				
Gold Mt. Lake	1	1,000.00	25.00				
Rockford Creek (Upup Creek)	1	500.00	12.50				
West Fork Twin Creek	6	1,070.00	26.75	1018	3	218.00	5.45
Deep Gulch Spring	1	75.00	1.87				
East Fork Twin Creek	11	23,130.00	578.25	1018	3	118.00	2.95
Willow Spring	2	315.00	7.88				
Fir Creek	1	300.00	7.50				
Grouse Creek	1	500.00	12.50				
Unnamed Stream	1	50.00	1.25				
Mayo Spring	1	200.00	5.00				
Hillside Spring	1	50.00	1.25				
Twelve Mile Creek	1	300.00	7.50				
East Fork Twelve Mile Creek	0	0.00	0.00				
Grouse Creek	1	100.00	2.50				
Rock Creek	8	17,170.00	429.25				

WATER RIGHT DATA — MINERAL COUNTY

APPROPRIATIONS AND DECREES BY STREAM

STREAM	APPROPRIATIONS (Filings of Record) No. of Filings	Miner's Inches	Cu. Ft. Per Sec.	DECREED RIGHTS Case No.	No. of Decrees	Miner's Inches	Cu. Ft. Per Sec.
Little Twelve Mile Creek (Henderson Creek)	2	3,200.00	80.00				
Nine Mile Creek (Ward)	6	9,030.00	225.75				
Unnamed Stream	0	0.00	0.00				
Square Lake	1	500.00	12.50				
Wing Creek	1	1,000.00	25.00				
Unnamed Creek	2	600.00	15.00				
Two Mile Creek	2	2,000.00	50.00				
Coyle Creek (Gulch)	6	4,450.00	111.25				
Unnamed Creek	1	50.00	1.25				
Spring Creek	1	1.00	.03				
Blair Creek	1	50.00	1.25				
Riberdy Creek	1	400.00	10.00				
Little St. Joe Creek (Little Joe Creek)	1	400.00	10.00				
South Fork Little St. Joe Creek	2	900.00	22.50				
Sunset Creek	1	1,000.00	25.00				
North Fork of Little St. Joe Creek	2	2,600.00	65.00				
Mullan Gulch	1	400.00	10.00				
Spring Creek (East Gulch)	2	120.00	3.00				
Unnamed Creek	1	40.00	1.00				
Sansom Creek (Wolf)	1	400.00	10.00				
Plourde Creek	1	200.00	5.00				
Keith Creek	1	20.00	.50				
Deer Point Creek	1	500.00	12.50				
Roots Gulch	0	0.00	0.00				
Roots Spring (Cayuse)	1	20.00	.50				
Total St. Regis River & Tribs.	**215**	**610,620.50**	**15,265.54**		**11**	**572.00**	**14.31**
A Spring	**1**	**400.00**	**10.00**				
Mayo Gulch	**1**	**800.00**	**20.00**				
Section 12 Creek	1	35.00	.88				
Butler Gulch	**0**	**0.00**	**0.00**				
Butler Creek Springs	1	200.00	5.00				
Unnamed Lake	1	200.00	5.00				
Four Mile Creek (Tamarack)	**5**	**3,840.00**	**96.00**				
Long Gulch (Deer Gulch Creek)	1	60.00	1.50				
No Name Spring	**2**	**14.00**	**.35**				
Seven Mile Creek	**4**	**3,900.00**	**97.50**				
Graham Gulch (Dumphy Creek)	2	125.00	3.13				
Springs	1	All	---				
Shoot Draw	0	0.00	0.00				
Right and Left Shoot Draw Springs	1	400.00	10.00				
Unnamed Creek	0	0.00	0.00				
Bulldog Spring	1	80.00	2.00				
A Spring	1	5.00	.13				
GRAND TOTAL FOR MINERAL COUNTY	**856**	**1,100,592.50**	**27,514.95**		**13**	**737.00**	**18.44**

DRAINAGES IN MINERAL COUNTY NOT LOCATED

STREAM	No. of Filings	Miner's Inches	Cu. Ft. Per Sec.
Top O' The Morning Creek	1	200.00	5.00
Dowling Creek	1	100.00	2.50
A Certain Spring	1	100.00	2.50
Stone Creek	1	50.00	1.25
Deer Lick Spring	1	20.00	.50
Iron King Spring	1	100.00	2.50
Water Cress Spring	1	50.00	1.25
Mile Creek	1	400.00	10.00
Fourteen Mile Creek	1	600.00	15.00
Sullivan Creek	1	500.00	12.50
Certain Spring (Group of)	1	100.00	2.50
Birdie Creek	1	300.00	7.50
Dew Drop Creek	1	500.00	12.50
Group Spring	1	100.00	2.50
Miles Spring	2	125.00	3.13
Unnamed Stream	2	100.00	2.50
Spring	1	150.00	3.75
Succession of Springs	1	20.00	.50
Big Head Creek	1	50.00	1.25
Unknown Stream	1	200.00	5.00
Alder Creek	1	150.00	3.75
Billy Creek	1	100.00	2.50
Brown Gulch or Creek	1	1,000.00	25.00
Unnamed Stream	1	300.00	7.50
Conford Creek	1	300.00	7.50
Little Four Mile Creek	1	75.00	1.88
Martin Creek	1	2,000.00	50.00
McGregor Creek	1	30.00	.75
Niagra Creek	1	800.00	20.00
Canadian Gulch and Little Quartz Creek	1	All	---
Right Hand Fork of Quartz Creek	1	1,000.00	25.00
Wood Creek	1	200.00	5.00
A Creek	1	All	---
Springs	1	50.00	1.25
Spring	1	40.00	1.00
A Certain Spring	1	20.00	.50
TOTAL	**38**	**9,830.00**	**245.76**

WATER RESOURCES SURVEY

Mineral County, Montana

PART II

Maps Showing Irrigated Areas in Colors Designating the Sources of Supply

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

MAP INDEX

All maps have been made from aerial photographs

MAP SYMBOL INDEX

BOUNDARIES

- INTERNATIONAL
- STATE
- COUNTY
- NATIONAL FOREST

DITCHES

- CANALS OR DITCHES
- DRAIN DITCHES

TRANSPORTATION

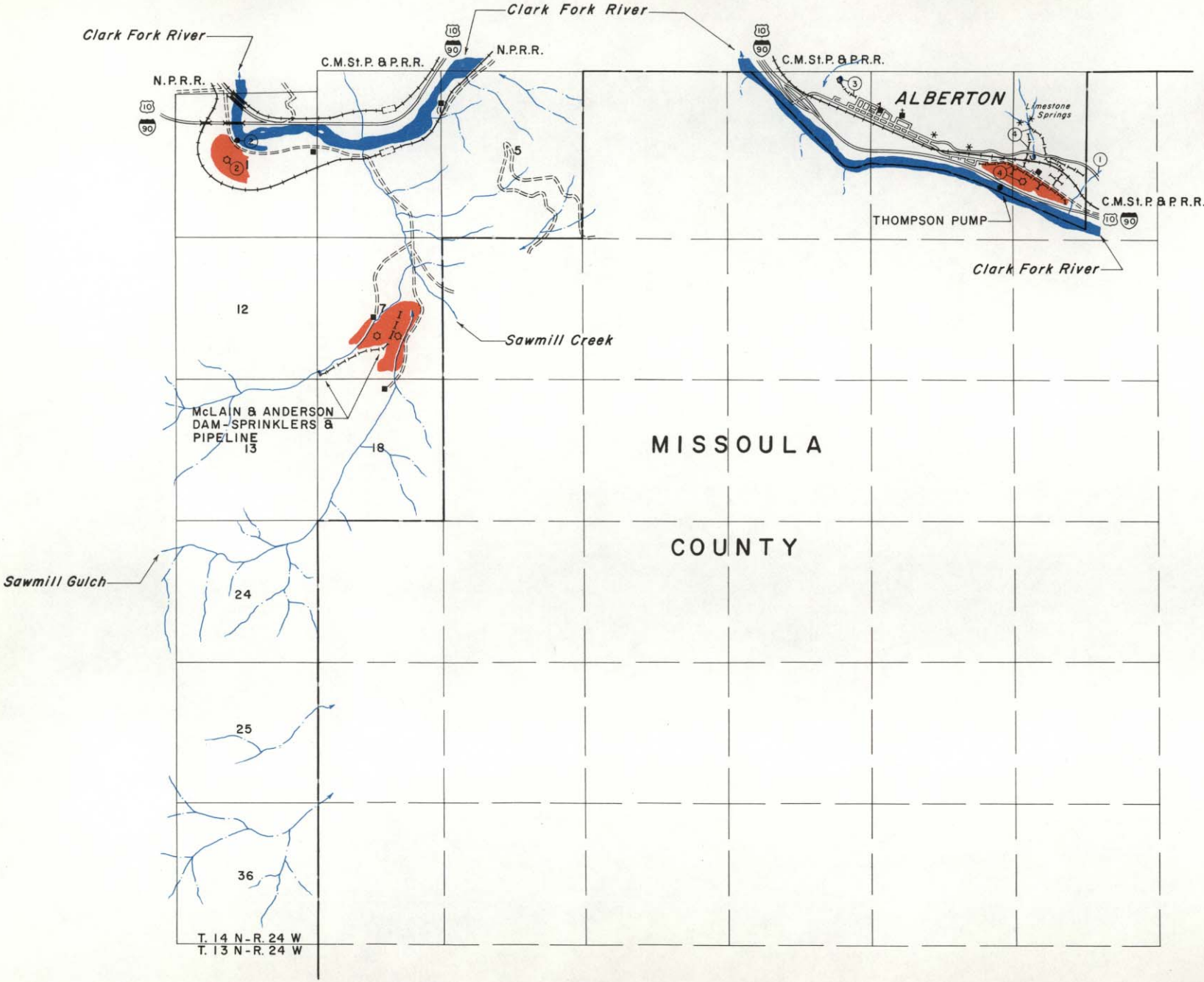
- PAVED ROADS
- UNPAVED ROADS
- RAILROADS
- STATE HIGHWAY
- U.S. HIGHWAY
- INTERSTATE HIGHWAY
- AIRPORT
- LANDING STRIP

STRUCTURES & UNITS

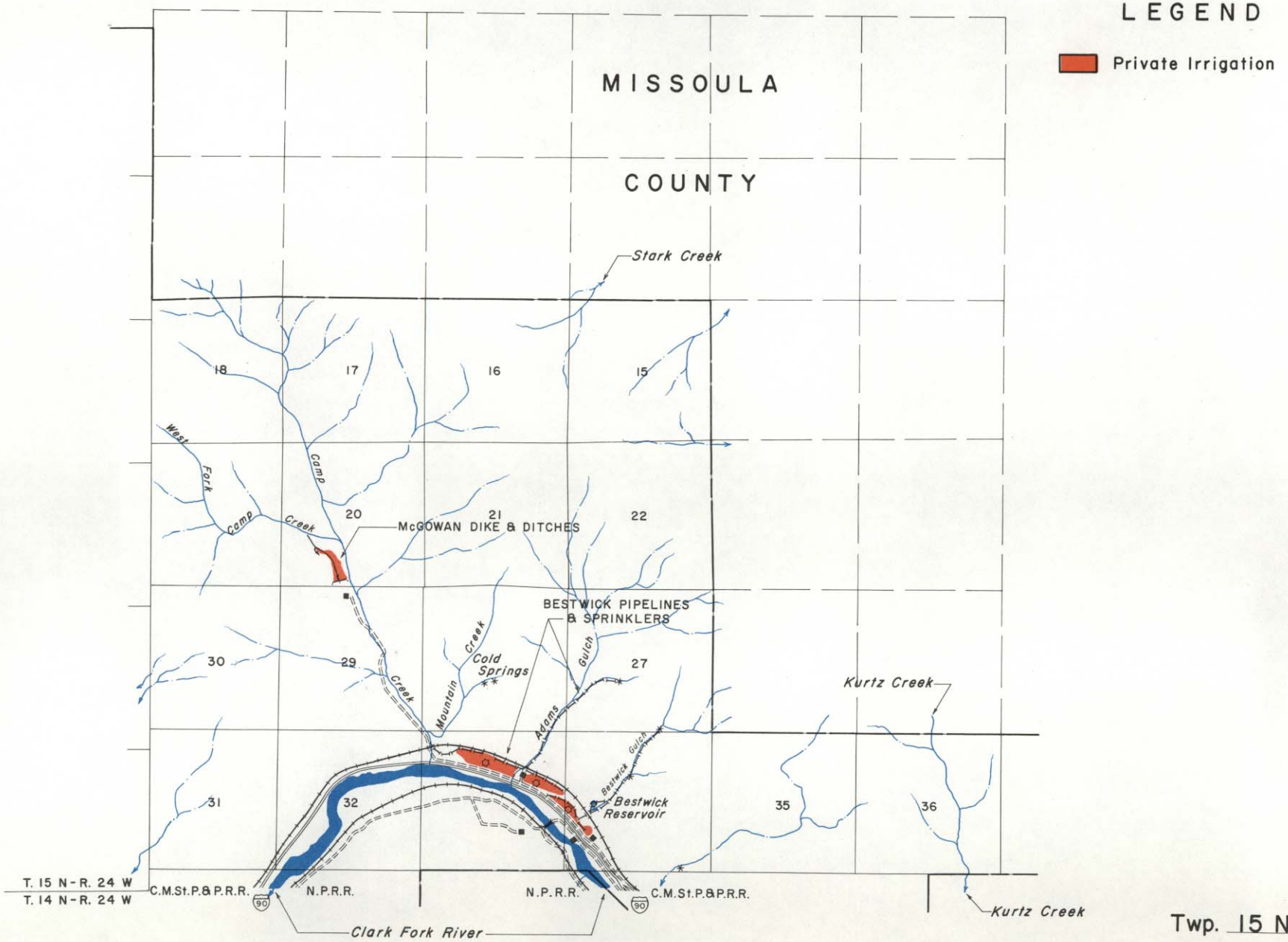
- DAM
- DIKE
- FLUME
- SIPHON
- SPILL
- SPRINKLER SYSTEM
- WEIR
- PIPELINE
- PUMP
- RESERVOIR
- WELL
- ARTESIAN WELL
- NATURAL CARRIER USED AS DITCH
- SPRING
- SWAMP
- GAUGING STATION
- POWER PLANT
- STORAGE TANK
- CEMETERY
- FAIRGROUNDS
- FARM OR RANCH UNIT
- SCHOOL
- LOOKOUT STATION
- RANGER STATION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

10-20-69

DRAINAGE MAP of MINERAL COUNTY Showing Irrigated Areas

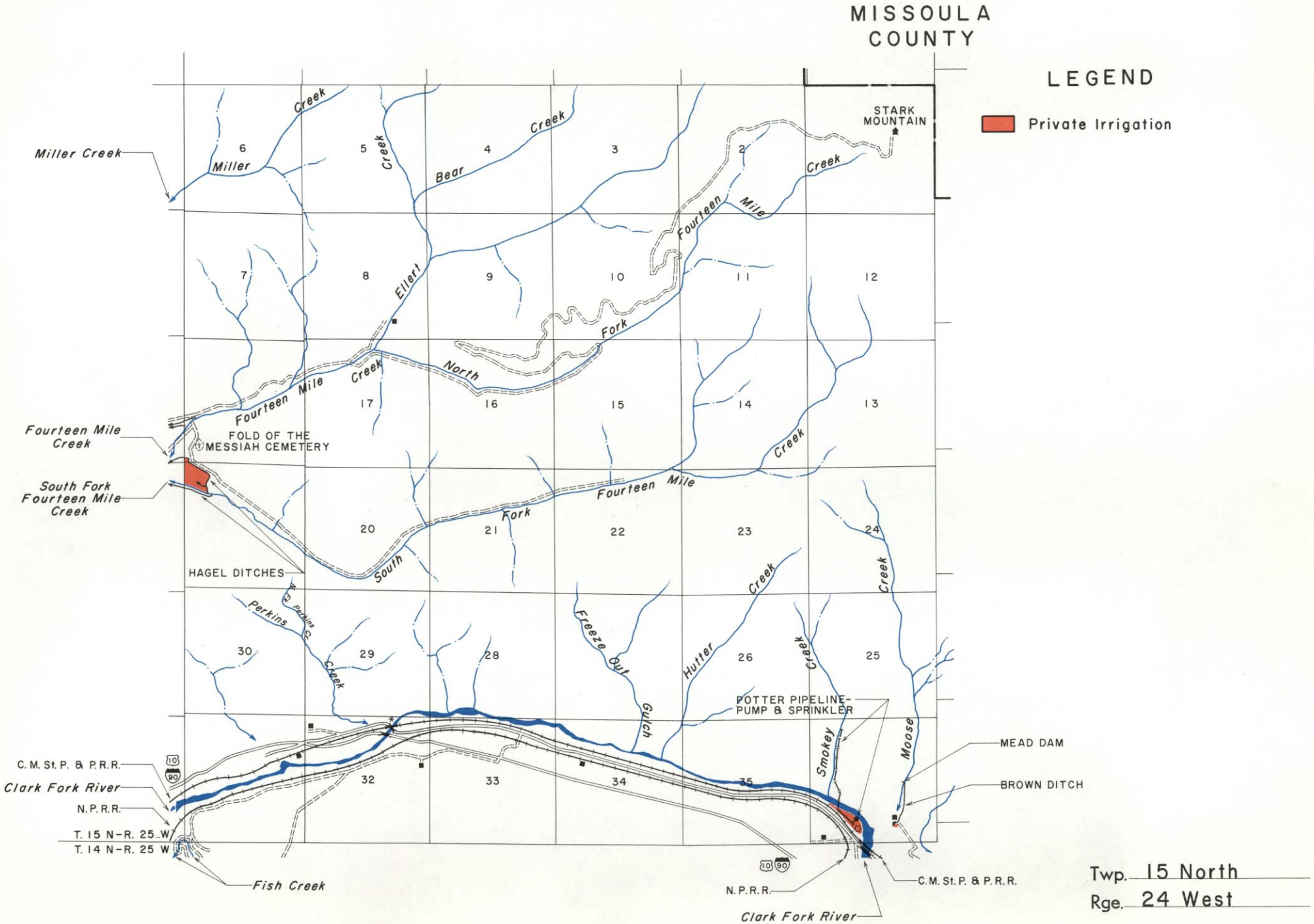


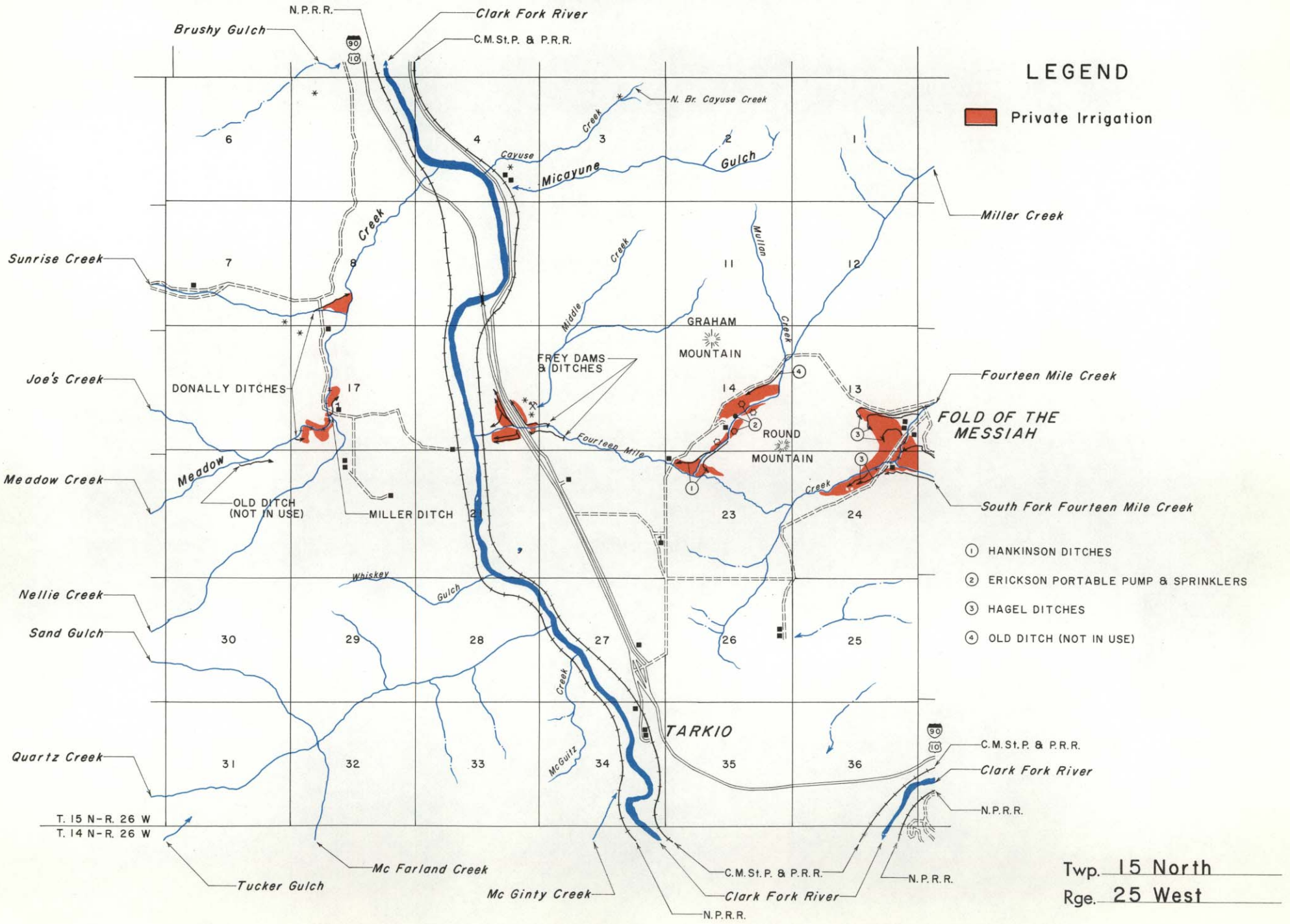
Twp. 14 North
Rge. 23 & 24 West

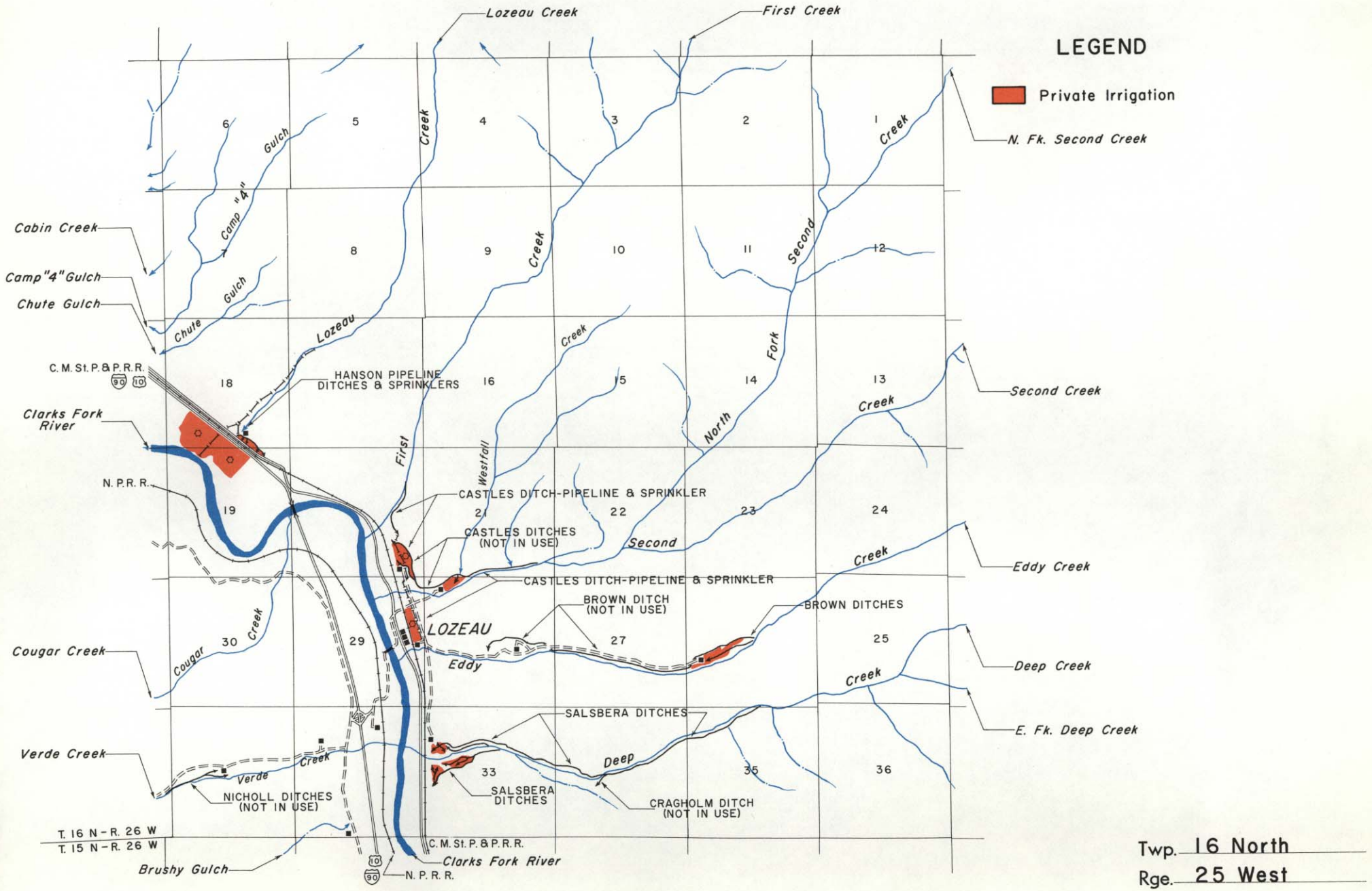


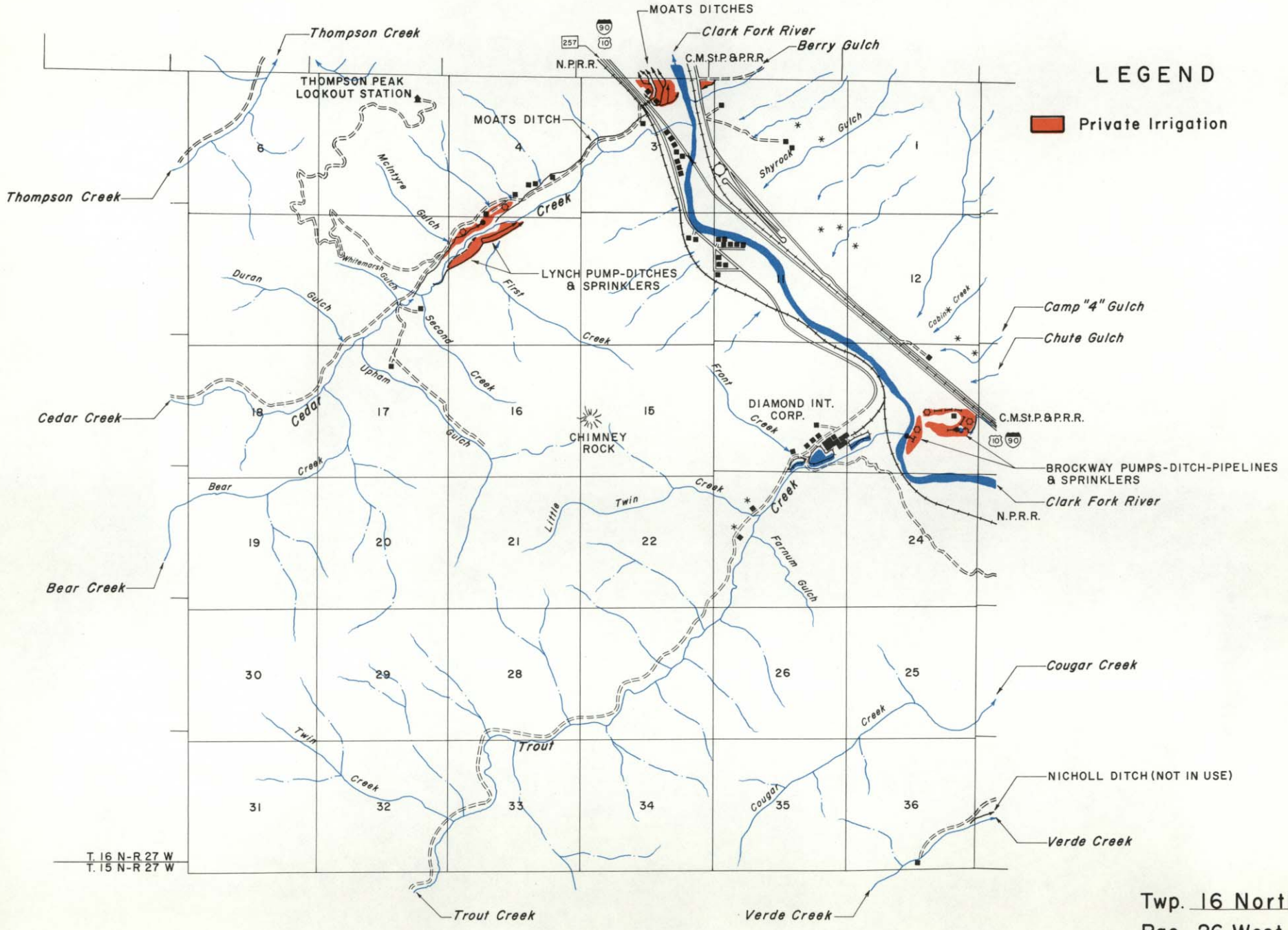
Twp. 15 North

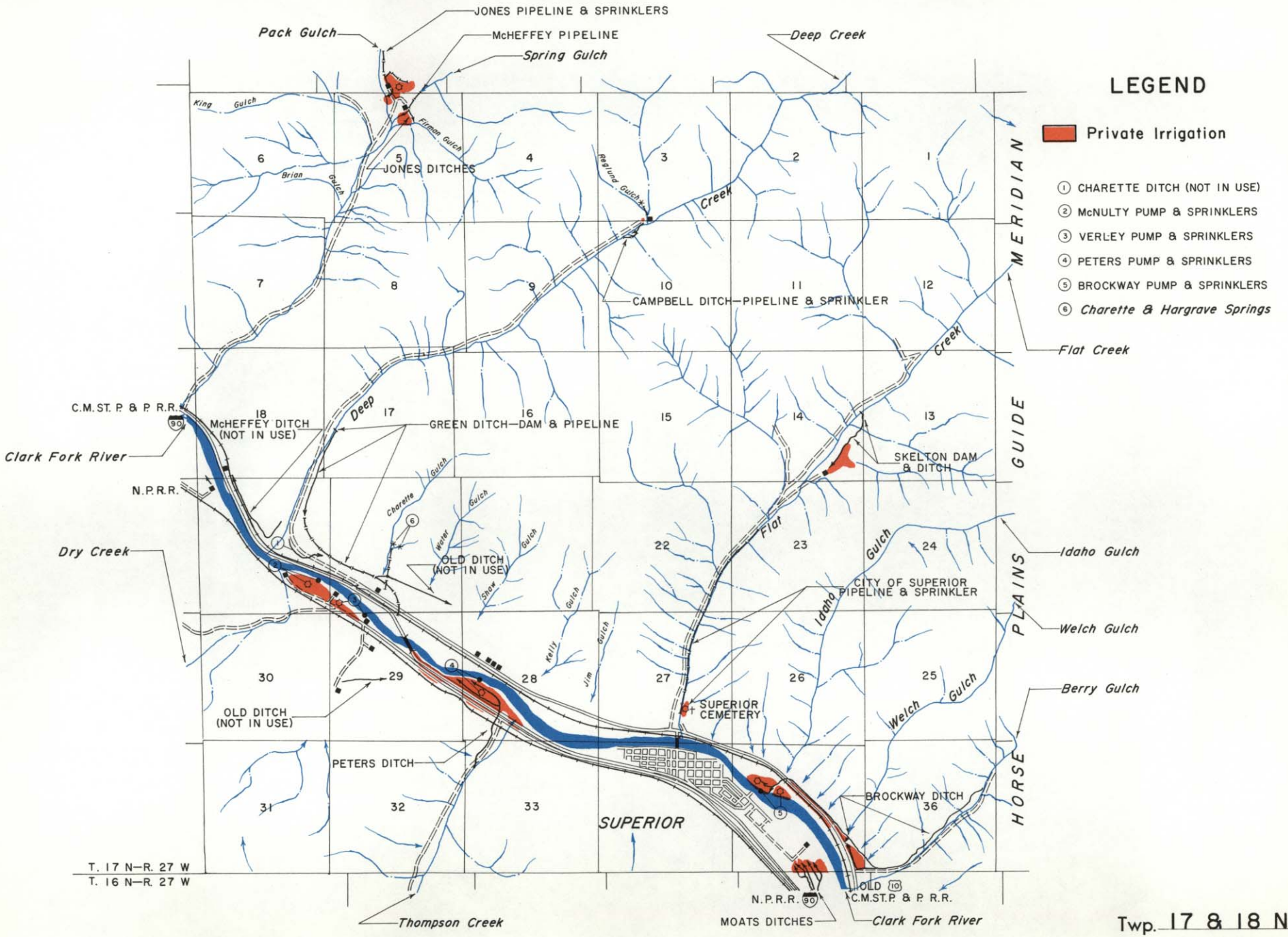
Rge. 23 West


MISSOULA COUNTY
LEGEND
Private Irrigation
STARK MOUNTAIN
Miller Creek
Miller Creek
Bear Creek
Ellert Creek
Fourteen Mile Creek
Fourteen Mile Creek
North Fork
Fourteen Mile Creek
Fourteen Mile Creek
FOLD OF THE MESSIAH CEMETERY
South Fork Fourteen Mile Creek
South Fork
HAGEL DITCHES
Perkins Creek
E. Fk. Perkins Cr.
Freeze Out Gulch
Hutter Creek
Smokey Creek
Moose Creek
POTTER PIPELINE-PUMP & SPRINKLER
MEAD DAM
BROWN DITCH
C. M. St. P. & P. R. R.
Clark Fork River
N. P. R. R.
T. 15 N-R. 25 W.
T. 14 N-R. 25 W.
Fish Creek
N. P. R. R.
Clark Fork River
C. M. St. P. & P. R. R.
Twp. 15 North
Rge. 24 West


LEGEND
Private Irrigation
N.P.R.R.
Brushy Gulch
Clark Fork River
C.M.St.P. & P.R.R.
N. Br. Cayuse Creek
Cayuse Creek
Micayune Gulch
Miller Creek
Sunrise Creek
Creek
Middle Creek
Mullan Creek
GRAHAM MOUNTAIN
FREY DAMS & DITCHES
Joe's Creek
DONALLY DITCHES
Fourteen Mile Creek
FOLD OF THE MESSIAH
ROUND MOUNTAIN
Meadow Creek
Meadow Creek
OLD DITCH (NOT IN USE)
MILLER DITCH
South Fork Fourteen Mile Creek
① HANKINSON DITCHES
② ERICKSON PORTABLE PUMP & SPRINKLERS
③ HAGEL DITCHES
④ OLD DITCH (NOT IN USE)
Nellie Creek
Sand Gulch
Whiskey Gulch
Creek
TARKIO
Quartz Creek
McGuitz
C.M.St.P. & P.R.R.
Clark Fork River
N.P.R.R.
T. 15 N-R. 26 W
T. 14 N-R. 26 W
Tucker Gulch
Mc Farland Creek
Mc Ginty Creek
C.M.St.P. & P.R.R.
Clark Fork River
N.P.R.R.
N.P.R.R.
Twp. 15 North
Rge. 25 West


LEGEND
Private Irrigation
Lozeau Creek
First Creek
N. Fk. Second Creek
Second Creek
Eddy Creek
Deep Creek
E. Fk. Deep Creek
Cabin Creek
Camp "4" Gulch
Chute Gulch
Clarks Fork River
Cougar Creek
Verde Creek
Brushy Gulch
C. M. St. P. & P. R. R.
N. P. R. R.
HANSON PIPELINE DITCHES & SPRINKLERS
CASTLES DITCH-PIPELINE & SPRINKLER
CASTLES DITCHES (NOT IN USE)
CASTLES DITCH-PIPELINE & SPRINKLER
BROWN DITCH (NOT IN USE)
BROWN DITCHES
LOZEAU
SALSBERA DITCHES
SALSBERA DITCHES
CRAGHOLM DITCH (NOT IN USE)
NICHOLL DITCHES (NOT IN USE)
C. M. St. P. & P. R. R.
Clarks Fork River
N. P. R. R.
T. 16 N - R. 26 W
T. 15 N - R. 26 W
Twp. 16 North
Rge. 25 West


MOATS DITCHES
Thompson Creek
Clark Fork River
Berry Gulch
257
90
10
N.P.R.R.
C.M.St.P.&P.R.R.
THOMPSON PEAK LOOKOUT STATION
MOATS DITCH
McIntyre Gulch
Shyrock Gulch
Thompson Creek
Creek
Whitemarsh Gulch
LYNCH PUMP-DITCHES & SPRINKLERS
Duran Gulch
First Creek
Second Creek
Cobick Creek
Camp "4" Gulch
Chute Gulch
Front Creek
DIAMOND INT. CORP.
C.M.St.P.&P.R.R.
Cedar Creek
Cedar Gulch
Upham Creek
CHIMNEY ROCK
BROCKWAY PUMPS-DITCH-PIPELINES & SPRINKLERS
Clark Fork River
N.P.R.R.
Bear Creek
Bear Creek
Little Twin Creek
Fornum Gulch
Cougar Creek
Trout Creek
Twin Creek
Cougar Creek
NICHOLL DITCH (NOT IN USE)
Verde Creek
Trout Creek
Verde Creek
T. 16 N-R 27 W
T. 15 N-R 27 W
LEGEND
Private Irrigation
Twp. 16 North
Rge. 26 West

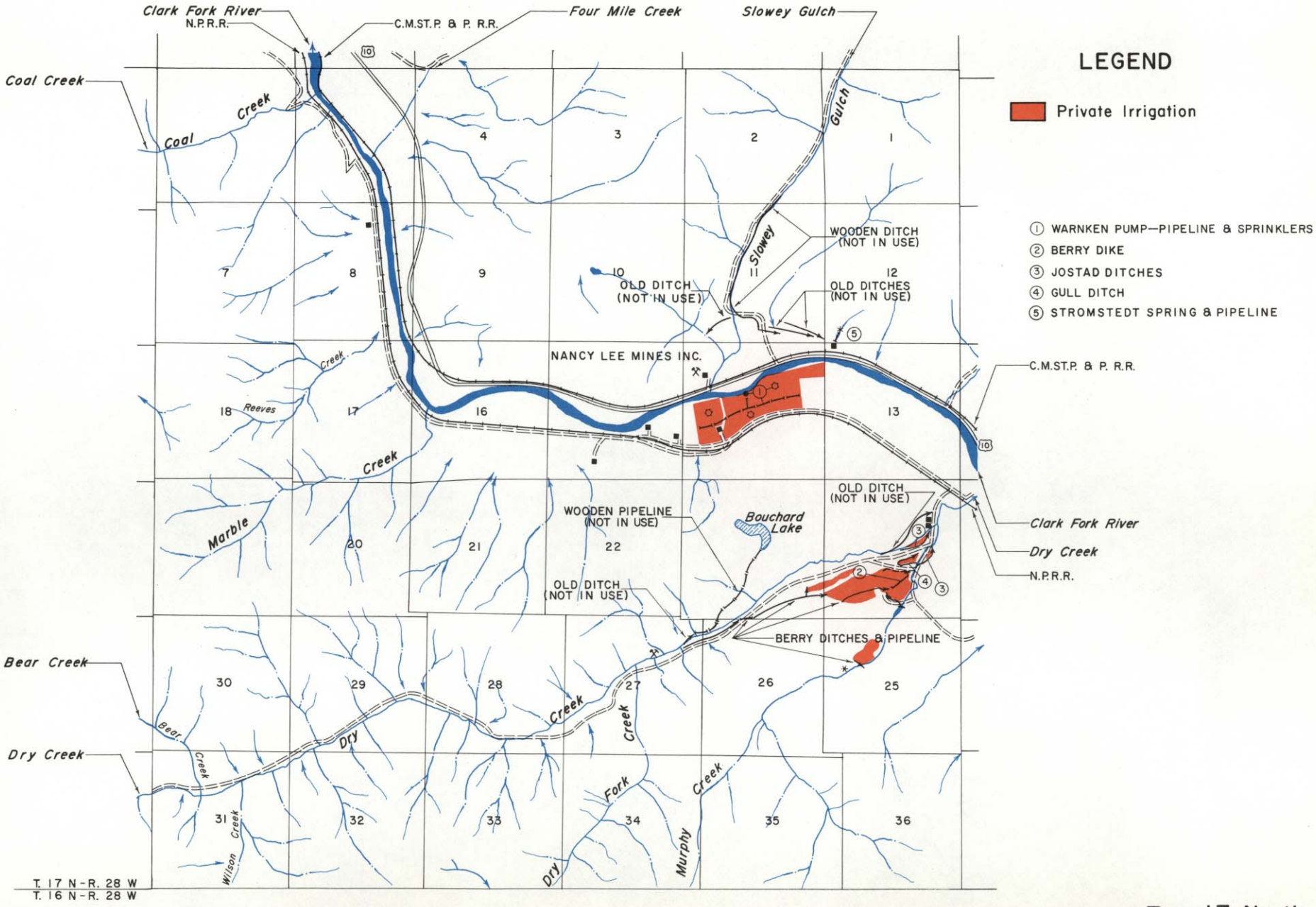


LEGEND

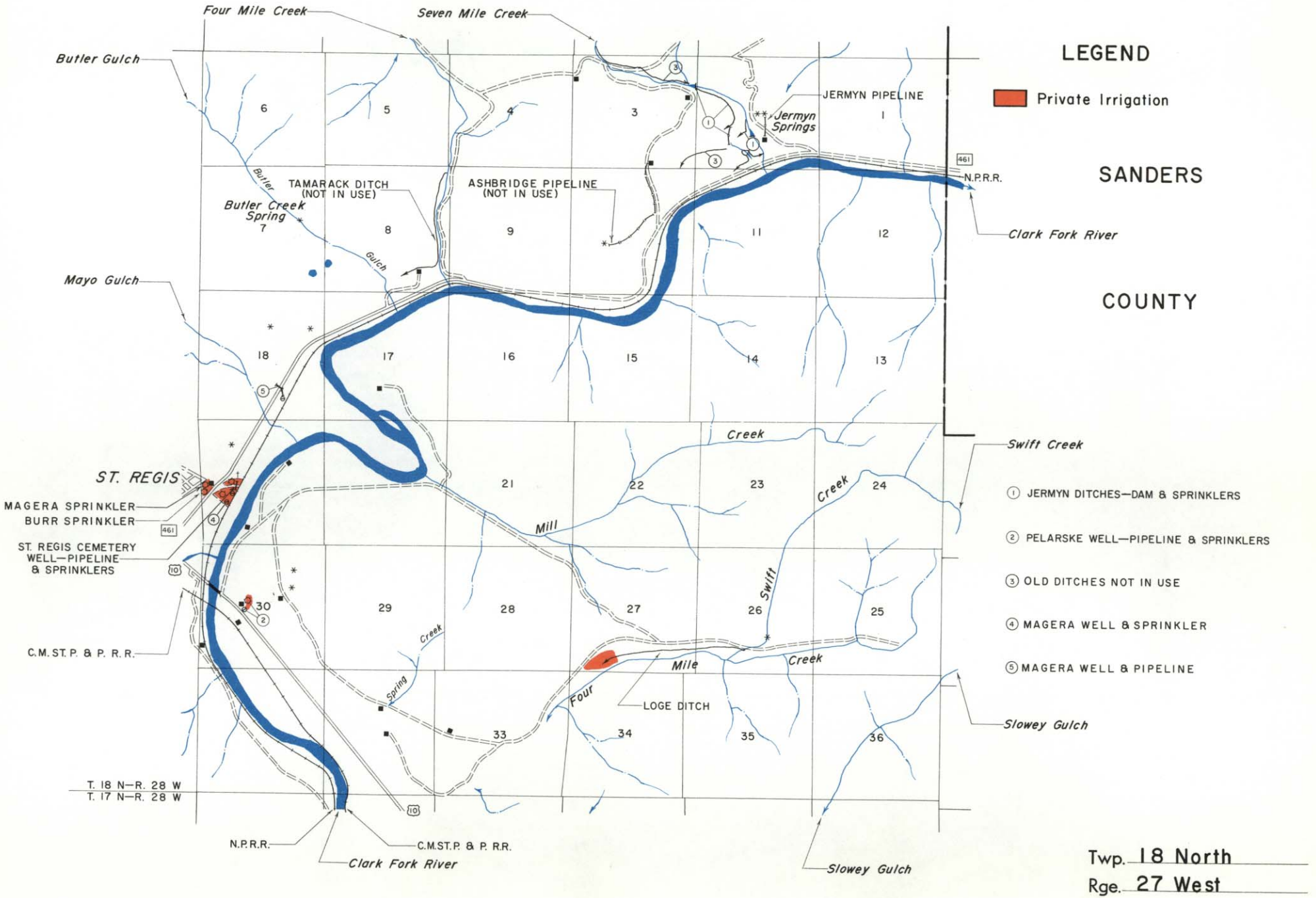
Private Irrigation

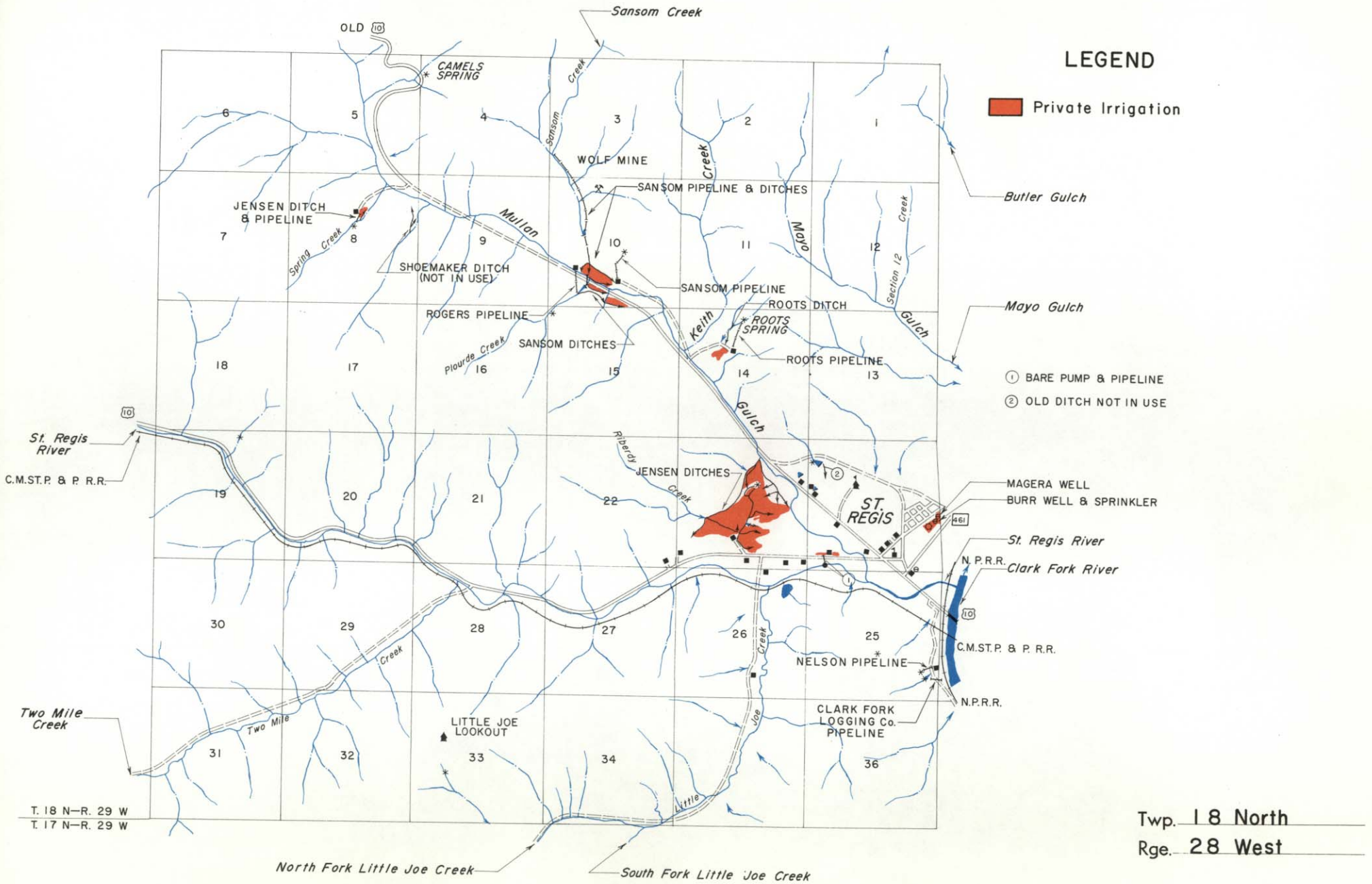
1. CHARETTE DITCH (NOT IN USE)
2. McNULTY PUMP & SPRINKLERS
3. VERLEY PUMP & SPRINKLERS
4. PETERS PUMP & SPRINKLERS
5. BROCKWAY PUMP & SPRINKLERS
6. *Charette & Hargrave Springs*

Twp. 17 & 18 North
Rge. 26 West



Twp. 17 North
Rge. 27 West


Four Mile Creek
Seven Mile Creek
Butler Gulch
JERMYN PIPELINE
Jermyn Springs
N.P.R.R.
Clark Fork River
TAMARACK DITCH (NOT IN USE)
ASHBRIDGE PIPELINE (NOT IN USE)
Butler Creek Spring
Butler Gulch
Mayo Gulch
SANDERS COUNTY
Swift Creek
ST. REGIS
MAGERA SPRINKLER
BURR SPRINKLER
ST. REGIS CEMETERY WELL—PIPELINE & SPRINKLERS
Mill Creek
Swift Creek
C.M.ST.P. & P. R.R.
Four Mile Creek
Spring Creek
LOGE DITCH
Slowey Gulch
T. 18 N—R. 28 W
T. 17 N—R. 28 W
N.P.R.R.
C.M.ST.P. & P. R.R.
Clark Fork River
Slowey Gulch
LEGEND
Private Irrigation
① JERMYN DITCHES—DAM & SPRINKLERS
② PELARSKE WELL—PIPELINE & SPRINKLERS
③ OLD DITCHES NOT IN USE
④ MAGERA WELL & SPRINKLER
⑤ MAGERA WELL & PIPELINE
Twp. 18 North
Rge. 27 West

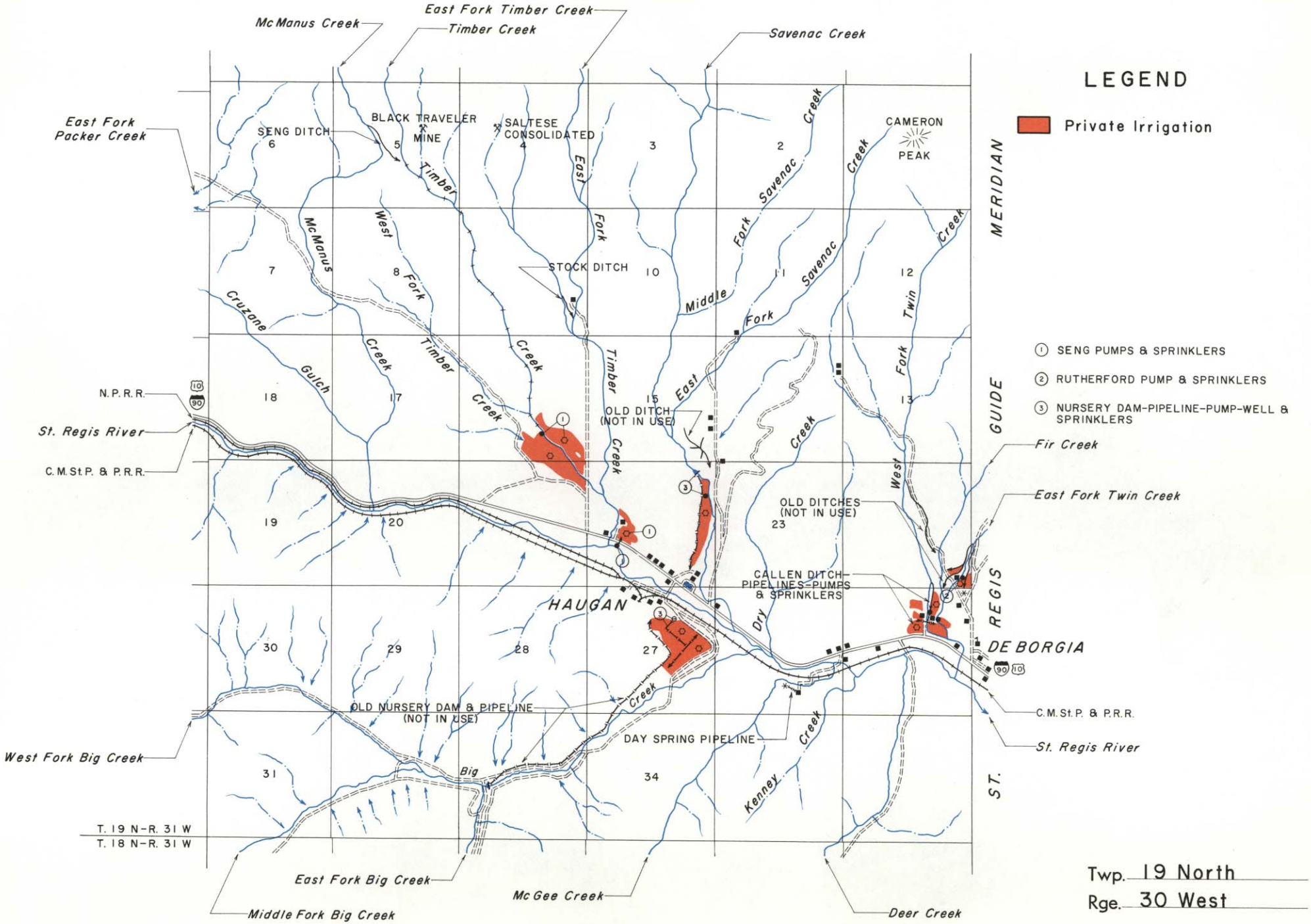


LEGEND

Private Irrigation

Twp. 18 North

Rge. 28 West


McManus Creek
East Fork Timber Creek
Timber Creek
Savenac Creek
East Fork Packer Creek
SENG DITCH
BLACK TRAVELER MINE
SALTESE CONSOLIDATED
CAMERON PEAK
STOCK DITCH
OLD DITCH (NOT IN USE)
OLD DITCHES (NOT IN USE)
CALLEN DITCH-PIPELINES-PUMPS & SPRINKLERS
OLD NURSERY DAM & PIPELINE (NOT IN USE)
DAY SPRING PIPELINE
HAUGAN
DE BORGIA
N.P.R.R.
St. Regis River
C.M.St.P. & P.R.R.
West Fork Big Creek
East Fork Big Creek
Middle Fork Big Creek
McGee Creek
Deer Creek
Fir Creek
East Fork Twin Creek
T. 19 N-R. 31 W
T. 18 N-R. 31 W
GUIDE MERIDIAN
ST. REGIS
LEGEND
Private Irrigation
① SENG PUMPS & SPRINKLERS
② RUTHERFORD PUMP & SPRINKLERS
③ NURSERY DAM-PIPELINE-PUMP-WELL & SPRINKLERS
Twp. 19 North
Rge. 30 West