# 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

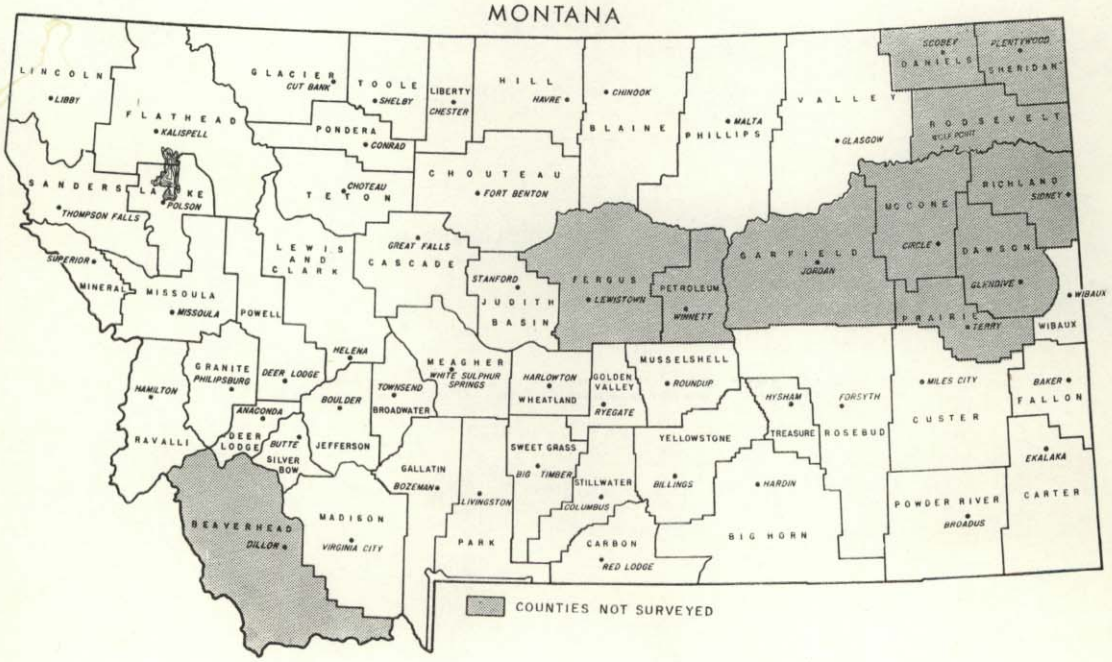
# Mineral and Sanders Counties, Montana

Published by
MONTANA WATER RESOURCES BOARD
Helena, Montana — September, 1969
3

# 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

## SANDERS COUNTY OFFICIALS

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

## OTHER AGENCIES AND INDIVIDUALS

Robert G. Dunbar.....Professor of History, Montana State University
Dr. M. G. Burlingame.....Retired, Department Head of History Montana State University
R. A. Dightman.....Meteorologist in Charge, U. S. Dept. of Commerce, Weather Bureau
Grant W. Buswell.....Office Engineer, U. S. Geological Survey
Charles W. Lane.....District Engineer, U. S. Geological Survey
Uuno M. Sahinen.....Associate Director Montana Bureau of Mines and Geology and other members of the Bureau Staff
Phillip E. Farnes.....Snow Survey Supervisor U. S. Dept. of Agriculture, S. C. S.
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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

Sanders County, Montana

## PART I

History of Land and Water Use
on Irrigated Areas

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## HISTORY AND ORGANIZATION

Some of the first white men to explore the area of what is now Sanders County in addition to the Lewis and Clark expedition in 1806 were David Thompson in 1809 and Father Pierrie Jean De-Smet in 1841.

It was in 1809, three years and two months after Lewis and Clark returned to St. Louis that David Thompson, famed cartographer and explorer, came up the Clark Fork River on his initial exploration trip looking for a place to establish a trading post. Thompson established his trading post —the "Salish House"—near the present site of Thompson Falls that same year, and earlier had established the "Spokane House" in Washington and the "Kullyspell House" near Hope, Idaho.

One of the rugged topographical features encountered by Thompson and others on their travels overland up the Clark Fork River route was a steep mountain slope known as "Bad Rock." Bad Rock was located along the present route of Montana Highway #200 between the towns of Thompson Falls and Plains. This steeply sloping mass of flinty stone rose almost perpendicular from the bed of the Clark Fork River. In recent years railroads and highway construction has removed much of the rocky ridge so that it no longer presents any perils to today's traveler.

The Clark Fork Valley formed one of the chief routes of travel into Montana during the early 1800s. This area was a favorite rendezvous for the Indian, fur trader and missionary. When David Thompson, the explorer, came up the Clark Fork River and established his Salish House near Thompson Falls it became the only permanent post in that region of western Montana. Although this area was explored earlier, the lack of mineral deposits and the distance from a center of population resulted in the establishment of only scattered settlements until the Northern Pacific Railroad came through the area in 1883.

Sanders County is located in western Montana and borders Idaho on the western side of the Continental Divide. On the north the county is bounded by Lincoln and Flathead Counties, on the east by Lake County and on the south by Mineral and Missoula Counties. The topography of the county is characterized by mountains and mountain valleys.

The county contains a total of 1,773,000 acres with four-fifths of the land area consisting of forest land; 65 percent is public owned, and 35 percent privately owned. One-fifth of the land area in the eastern end of the county is part of the Flathead Indian Reservation on which reside the Confederated Salish and Kootnai Indian Tribes.

Forest products and agriculture provide the major sources of income in Sanders County. Lumber production rates high in the annual income; farming provides the means of livelihood for about 22 percent of the county's population. The valleys of the Flathead and Clark Fork Rivers broaden in the eastern end of the county and provide the majority of the land area developed for agriculture.

An unusual crop produced in Sanders County is mint, grown on the farm of Robert Stonebrook, near the town of Plains. During the harvest season the processing mint plant runs 24 hours a day extracting the mint oil.

Mechanization is the key to successful farming today and mint farming in this respect is no different. Machines now do most of the work that was once done by hand. One form of this mech-

anization that applies to the mint farming operation is an all metal wagon used in transporting and processing the mint. This all metal wagon has proved to be a real labor saving device. The mint after curing in windrows for a couple of days is field chopped and then blown into the enclosed metal wagons. It usually takes about an acre of mint to fill one wagon. At the processing plant live steam is run through the chopped mint. Properly cured mint will require about one hour of steaming to remove all of the oil. The steam when applied vaporizes the oil in the mint which is recovered in a condenser. After vaporizing, the oil is then drained off into barrels. In former years the mint hay residue was hauled back on to the fields, but in 1968 the residue or mint hay was made into silage. Moisture is added to the hay by means of a sprinkler. Compaction is applied to prevent spoilage and promote fermentation.

The moisture and nutrient required for the growing of mint are quite high, therefore, irrigation of this crop is mandatory. There are about 850 acres of mint raised on the Stonebrook farm and irrigation is carried on almost constantly during the growing season. In recent years Stonebrook has gone to self propelled and wheel line sprinklers rather than the conventional hand operated pipelines. The source of water supply for these sprinkler systems is primarily from irrigation wells. Much of the technical assistance in the location of the wells was provided by the Soil Conservation Service.

A part of the forest products industry of the county is the production of Christmas trees, estimated to bring into the county one-quarter million dollars annually.

Sanders County's wilderness area and proximity to the urban population of Spokane, Washington, and several Montana cities provide a bright future for potential growth in recreation and tourism. This county with its forested mountains, numerous lakes, streams and wild game offer an attraction for those who are interested in outdoor recreation.

Thompson Falls, the county seat, is the largest town in Sanders County and was first settled in 1883. The townsite was first platted by George Reeder in 1893 and is the location of one of the state's largest hydro-electric plants. The town of Thompson Falls, named for David Thompson, is located near one of Montana's oldest historical sites. It was here in the winter of 1809-10 that David Thompson, fur-trader, explorer, and geographer for the North West Fur Company of Montreal, established the Salish House, the first trading post in western Montana.

Today Thompson Falls is a busy lumbering and agricultural center and the location of the Montana Power Company hydro-electric plant which generates 40,000 KW of electric power for western Montana.

Plains is the second largest town in Sanders County and was once named Wild Horse Plains because of the large number of wild horses which ran loose in the valley during the early days. This town is supported by the lumber industry and by the farming area surrounding it.

Another town, Hot Springs, is famous as a health resort, having bathing facilities of the healing mineral waters of Camas Hot Springs. The healing waters of the springs have been beneficial to the health of thousands of people who have visited the resort. A large bath house facility located here is owned and operated by the Confederated Flathead, Salish, Kootenai Tribes of the Flathead Indian Reservation. The mineral waters are well known for the reputed relief and cure of people who are suffering from arthritis, high blood pressure, skin diseases, stomach ulcers, kidney ailments, rheumatism, and other similar ailments.

Some of the other towns and small rural communities in the county are: Noxon, Trout Creek, Whitepine, Belknap, Paradise, Niarada, Perma and Dixon.

Transportation facilities in the county include State Highway #200 (formerly 10A) which enters the county two miles west of the town of Ravalli in Lake County. This highway runs northwest the entire length of Sanders County where it leaves Montana and enters Idaho. Another State Highway in the county is #202 which branches off from State Highway #200 about 5 miles west of Noxon and follows a northerly direction out of the county where it meets U. S. Highway #2 about three miles east of Troy in Lincoln County.

Public utilities in Sanders County include the Northern Pacific Railroad with a main line that runs the length of the county, and three branch lines; others are the Yellowstone Pipeline Company, Montana Power Company, Mountain States Telephone & Telegraph and the Northern Lights Incorporated-Rural Electrication Co-operative.

The last census in 1960 showed a total of 6,880 people living in Sanders County; of this total about 23 percent of the people live on farms, 37 percent within the corporate limits of three towns (Hot Springs, Plains, and Thompson Falls) and the other 40 percent of the population live in numerous small rural communities in the Clark Fork Valley, and in the valleys north of Paradise, Camas Prairie, and Lonepine.

Sanders County was named after Colonel Wilbur F. Sanders, and was created by an Act of the State Legislature on February 7, 1905.

## CLIMATE

Surrounded almost completely by segments of Bitterroot, Coeur d'Alene, and Cabinet Mountain Ranges, Sanders is one of Montana's more mountainous counties. Elevations range from about 8,700 feet on the higher peaks downward to just under 2,200 feet where the Clark Fork River flows westward into Idaho. The major drainage of the county is the Clark Fork River, flowing northwestward from its confluence with the Flathead River near Paradise. Smaller drainages can be found running in almost all directions in this area of rugged topography, and it is not surprising to find that climate variations are large, depending upon elevation, and exposure on leeward or windward slopes as determined by prevailing southwest to west winds.

Among the climate features most commonly sampled, precipitation varies by far the most, as reference to the data tables will indicate. It is interesting to note that the highest elevation station, Lonepine, averages only about a third as much annual precipitation as Heron, which has the lowest elevation. This is a result of Lonepine's leeward location, downwind most of the time from several very steep mountain ranges. Most east slope areas in the southeastern end of the county are relatively dry, while the western end and higher elevations are fairly wet—at least during the winter. While the eastern end of the county receives about half its annual rainfall during the growing season, areas near Idaho get only about a third; the balance comes as snow or rain during the colder half of the year. Sheltered less by high mountains, the northwestern half of the county has a seasonal precipitation pattern very much like the northwest Pacific Coast or Puget Sound areas of Washington State.

The total climate complex, in fact, can be classified as a modified Pacific Maritime. The pattern changes slowly from northwest to southeast in the direction of a continental type, but even in the

drier sections around Lonepine to Perma maritime characteristics predominate much of the time. While quite cold winter weather can occur, it comes much less often than in the continental type climate of eastern Montana. On the other hand, winters tend to be cloudy and wet, particularly in the northwest half. Hot weather can and does occur, typical of inland valleys where maritime effects are common—but seldom with oppressively high relative humidity. At lower elevations along the Clark Fork River few years pass without a few 100° plus afternoon high temperatures.

Common to many mountain-valley complexes in clear, still weather, summer temperatures can have very high ranges—from 90° to 100° afternoons down to 50° or even less on following mornings. This has the effect of producing a somewhat shorter 32° freeze-free season than one might expect. At Thompson Falls, for example, the freeze-free season runs, on the average, from May 25 to September 17, 115 days, and the season should be somewhat shorter as valley elevation increases. The prevalence of cloudy weather much of the cold season prevents much night-time cooling, but also inhibits much warming during the afternoon. At Thompson Falls the August average daily range is 40°—from 48° to 88°, but the December average range (24° to 38°) is only 14°.

Really severe storms are not common in Sanders County, and tornados and damaging hailstorms are practically unknown. Very heavy snowstorms occur a few times each cold season at higher elevations, but seldom do such storms amount to more than a few inches of snowfall per day in the valleys. Snowfall averages only 34 inches/year at Thompson Falls, about 100 inches/year at Heron, but probably much more at higher elevations. The following table lists selected climate data for the county stations with fairly long records—Plains has had a precipitation gage only since 1941, and the station at Paradise started in 1962.

**PRECIPITATION**

| Station | Years of Record | Elevation | Total Yearly Average | Growing Season Average Total | Percent Falling in Growing Season | Wettest Year | Driest Year |
|---|---|---|---|---|---|---|---|
| Heron TNW | 1912-67 | 2240 | 34.34* | 11.11* | 32 | 49.97 (1933) | 21.12 (1944) |
| Lonepine 1 WNW | 1919-67 | 2875 | 11.83* | 6.00* | 51 | 16.46 (1948) | 6.13 (1939) |
| Plains | 1941-66 | 2490 | 14.50 | 6.80 | 47 | 19.19 (1948) | 8.01 (1952) |
| Thompson Falls | 1911-67 | 2380 | 21.97* | 8.81* | 40 | 32.08 (1927) | 9.74 (1952) |
| Trout Creek (Ranger Station) | 1961-67 | 2356 | 29.12 | 10.18 | 35 | 39.00 (1964) | 24.40 (1963) |
| Trout Creek 2W | 1912-60 | 2485 | 29.99 | 8.83 | 29 | 44.19 (1933) | 17.86 (1952) |

**TEMPERATURE**

| Station | Years of Record | Elevation | Highest & Year of Record | Lowest & Year of Record | January Average | July Average | Annual Average |
|---|---|---|---|---|---|---|---|
| Heron 2NW | 1912-67 | 2240 | 106 (1961) (1919) | –39 (1927) | 24.7* | 63.8* | 44.0* |
| Lonepine 1WNW | 1919-67 | 2875 | 105 (1924) | –40 (1936) | 23.0* | 67.4* | 45.2* |
| Thompson Falls | 1911-67 | 2380 | 109 (1953) | –36 (1950) | 27.0* | 68.8* | 47.8* |
| Trout Creek (Ranger Station) | 1961-67 | 2356 | 110 (1961) | –30 (1962) | 26.2 | 65.4 | 45.6 |
| Trout Creek 2W | 1912-60 | 2485 | 107 (1940) | –40 (1937) | 23.0 | 64.4 | 43.7 |

*1938-67

## POTENTIAL IRRIGATION DEVELOPMENT

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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 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.

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

### PHYSIOGRAPHY

Sanders County is in the mountains and mountain valley portion of western Montana. It bor-

ders Mineral and Missoula Counties on the south with the boundary falling along the Clark Fork-St. Regis divide and the Flathead River-Nine Mile Creek divide. The west boundary follows the Montana-Idaho line. It is bordered on the north by Lincoln and Flathead Counties with the boundary following the Clark Fork-Kootenai divide. and on the east by Lake County along the land survey line and the Flathead River.

The Flathead River is the largest tributary to the Clark Fork which is the principal drainage in Sanders County. Other principal tributaries are the Thompson River, Vermillion River and Bull River which enter the Clark Fork from the north and east. The largest tributaries to the Flathead River in the county are the Little Bitterroot and Jocko Rivers.

The valleys in this county were once included in Ancient Lake Missoula which were formed by glaciers blocking the Clark Fork River.

The Clark Fork River was dammed by glaciers several times during the Pleistocene Epoch. The basin was alternately flooded and drained during successive glacial and interglacial periods. Geologists estimate the glacial ice was 2,000 feet thick at the point of damming of the Clark Fork River near the present Montana-Idaho boundary. Wave cut benches within the lake basin indicate maximum impoundages to 4,150-4,200 feet above sea level. Presently remaining remnants, however, are generally at elevations lower than 4,000 feet. The high benches and fans along the principal streams are remnants of both depositional and erosional deposits associated with "Glacial Lake Missoula." Some surfacial deposits near the headwater of the Thompson River are of older Geologic Age. The low terraces and flood plains along the major streams were derived from erosion and redeposition of the Lake Missoula sediments mixed with residum from bedrock consisting chiefly of quartzite, argillite and shales.

## LANDS

A large portion of Sanders County is mountainous with dense forests of coniferous trees. Native grassland and vegetation is confined to a relatively narrow strip along the eastern boundary lying in the Little Bitterroot Valley and in the area from Camas Prairie east and south to the Flathead River and to a small area (of 4 to 5 square miles) just north of Plains.

There are, at the present time, 29,147 acres of irrigated land in Sanders County. Reconnaissance studies show there are about 182,000 acres in the county having soils and relief suitable for irrigation.

The soils, topography and drainage of land suitable for irrigation are explained by subareas within Sanders County as follows:

### Little Bitterroot, Flathead and Jocko Valleys

There are an estimated 52,000 acres of irrigable land, of which about 4,000 acres are in class 2 and 48,000 acres in class 3. A large part of the irrigable class 2 lands are already irrigated in the area along the Little Bitterroot River and along the Flathead and Jocko Rivers.

Soils representing class 2 irrigable land are deep silty and deep loam textured with moderate

# POTENTIAL IRRIGATION DEVELOPMENT

## RECONNAISSANCE LAND CLASSIFICATION

## SANDERS 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.

HERON
NOXON
NOXON RAPIDS DAM
NOXON RESERVOIR
TROUT CREEK
WHITE PINE
BELKNAP
THOMPSON FALLS
PLAINS
PARADISE
PERMA
DIXON

to good drainage, moderate permeability and high moisture holding capacity.

**A typical profile of the deep silty soils in class 2 is as follows:**

**Soil Profile:**

0" - 1" Dull brownish gray laminated, noncalcareous very fine sandy loam or silt loam that becomes friable when cultivated. About 1 inch thick.

1" - 7" Grayish brown coarse noncalcareous silt loam of single-grain structure and friable. About 6 inches thick.

7" - 15" Yellowish gray, friable, noncalcareous silty clay loam which breaks into somewhat cloddy condition. About 8 inches thick.

15" - 35" Light gray, calcareous, coarse silt loam or very fine sandy loam that is fairly friable. About 20 inches thick.

35" - 60" Stratified layers of calcareous silt, fine sand and sand which is quite firm and continues to an undertermined depth.

**Variations:** Chiefly in color of the surface and content of organic matter which varies more or less with the effective soil moisture. The areas receiving 13 or more inches have the darkest color and the highest organic matter content, whereas the soils receiving about 10 inches are the lightest in color and have slightly less organic matter content. A few areas of steep relief have been included. These are badly eroded, light colored, and very low in fertility.

**Topography:** Most areas range from level to gently rolling and are well suited to irrigation. A few areas adjacent to streams and drainageways are quite steep and have broken relief.

**Drainage:** Most areas are well drained and have adequate permeability for leaching of harmful salts, although local spots of alkali occur.

Class 3 irrigable land includes soils with clay texture in the surface or subaerial (or both) with restricted permeability and may include slight to moderately saline soils. Also in class 3 are soils of moderately shallow depth over gravel with low moisture holding capacity.

**A representative profile of soils with clay texture and restricted permeability is as follows:**

**Soil Profile:**

A21p 0" - 5" Pale brown silt loam, dark brown moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic.

A22 5" - 6" Pale brown silt loam; dark brown, moist; moderate very thin platy structure; soft, very friable, slightly sticky and slightly plastic, tops of plates are frosted with light gray color; abrupt boundary. A2 is 4 to 8 inches thick.

| | | |
|---|---|---|
| B2t | 6″ - 10″ | Grayish brown silty clay, very dark grayish brown, moist; strong fine columnar structure separating to moderate fine blocks; extremely hard, firm, stocky and plastic; moderately thick clay films but with all pores filled; tops of columns covered with white silt; clear boundary. 3 to 5 inches thick. |
| B22t | 10″ - 14″ | Light olive brown light silty clay; dark grayish brown, moist; strong fine and medium prismatic structure separating to strong fine and medium blocks; extremely hard, firm, sticky and plastic; moderately thick clay films with clay flour throughout mass; clear boundary. 3 to 5 inches thick. |
| B3ca | 14″ - 20″ | Light yellowish brown heavy silty clay loam; dark grayish brown, moist; strong medium and coarse prismatic structure, separating to weak medium blocks; very hard, friable, sticky and plastic; thin patchy clay films; calcareous with common threads and a few nodules of lime; gradual boundary. 4 to 8 inches thick. |
| C1ca | 20″ - 36″ | Light brownish gray silty clay loam and silt loam, dark grayish brown, moist; thinly laminated with weak coarse prismatic structure; hard, very friable; calcareous with common nodules and few threads of lime, gradual boundary. |
| IIC2 | 36″ - 50″ | Light yellowish brown loam, very fine sandy loam, and silt loam thinly laminated, dark grayish brown, moist; weakly calcareous. |
| IIIC3cs | 50″ - 62″ | Grayish brown silty clay, dark grayish brown, moist; massive structure; weakly calcareous with a few seams and nests of gypsum. |

**Range in Characteristics:** Silt loam is the dominant type. There may be an A1 horizon less than 3 inches thick. The B2t has 38 to 50 percent clay. The columnar structure does not always separate to blocks. There may be a transition A2&B2 horizon less than 2 inches thick. The B3ca and Cca is stratified materials of varying textures. Combined thickness of A and B2 horizons is 12 to 16 inches and depth to Cca 16 to 20 inches and to Ccs 30 inches or more.

**Topography:** Nearly level to sloping fans and terraces or undulating to rolling silty uplands.

**Drainage and Permeability:** Well drained subsoil permeability is very slow to slow.

### Camas Prairie Area

The Camas Prairie area has approximately 20,000 acres with soils that are suitable for irrigation but except for a few hundred acres that are irrigated at present time there is no apparent source of water for irrigating additional acres. About 200 acres are in irrigable class 2 with the remaining acres in irrigable class 3.

Class 3 land in this area includes soil with a high percentage of gravel and cobbles through the soil profile and clay soils with moderate salinity. A representative profile of class 3 soils having a high percentage of gravel or cobbles is as follows:

**Soil Profile:**

| | | |
|---|---|---|
| A11 | 0″ - 11″ | Gray, gravelly loam containing rounded gravel of argillite and quartzite; black, moist; moderate fine crumb structure; soft, friable, slightly sticky and slightly plastic; noncalcareous; gradual boundary. |
| A12 | 11″ - 18″ | Dark grayish brown gravelly loam, very dark brown moist; weak medium blocky structure; slightly hard, friable, slightly sticky and slightly plastic; noncalcareous; clear boundary; A1 horizon is 16 to 26 inches thick. |
| B2 | 18″ - 38″ | Yellowish brown very gravelly loam, dark yellowish brown, moist; moderate very fine granular structure; soft friable, slightly sticky and slightly plastic; abundant fine roots, noncalcareous; gradual boundary. |
| C | 38″ - 60+″ | Pale brown very gravelly loam, brown, moist; massive structure; slightly hard, friable, slightly sticky and nonplastic; plentiful roots; noncalcareous. |

**Type Location:** Ravalli County, Montana; T. 10 N., R. 19 W., Section 8, 1/4 mile north of W. 1/4 corner, then 120 feet east of fence and 60 feet north of road.

**Range in Characteristics:** Gravelly loam and cobbly loam are dominant types, but gravelly or cobbly sandy loams occur. The mollic epipedon ranges from 16 to 40 inches thick and includes the A1 and B2 horizons. The color of the A1 horizon varies from a dry very dark gray to gray with a brownish color showing in the lower A1 and B horizons. Calcium carbonate may occur in the lower part of the C horizon as thin crusts on the undersides of gravel and cobble. Coarse textured substrata may occur below depths of 40 inches.

**Setting:** The shallow gravelly soils occur on nearly level, low terraces of rivers and creeks in valleys of the northern Rocky Mountains. The alluvial parent material is largely from argillite and quartzite rocks. The soils generally occur at elevations ranging from 4,000 to 5,000 feet. The climate is cool humid with mean annual precipitation ranging from 12 to 16 inches. Mean annual air temperature is colder than 45 degrees F. and mean summer air temperature is warmer than 65 degrees F.

**Drainage and Permeability:** Runoff is slow and permeability is moderately rapid in these well drained soils.

**Use and Vegetation:** Used for pasture and production of crops under dryland and irrigation. Native vegetation consists of associations of tall and intermediate grasses.

**Distribution and Extent:** Intermountain valleys in western Montana.

### Plains Area

(Includes Clark Fork River and Tributaries from Sanders County Line to Mouth of Thompson River.)

There are approximately 18,000 acres of land having soils that are suitable for irrigation of which about 1,300 acres is irrigable class 2. A large part of the class 2 land is presently irrigated.

**A representative profile of soils in class 2 is as follows:**

| | | |
|---|---|---|
| Ap1 | 0″ - 8″ | Dark grayish brown dry loam; very dark brown moist; weak fine and very fine granular structure; soft, very friable. Clear lower boundary. A1 is 4 to 10 incshes thick. |
| B2 | 8″ - 13″ | Pale brown dry loam or silt loam; dark brown moist; weak very coarse prismatic and coarse blocky structure; little or no clay coating on the peds; soft to slightly hard, friable; neutral reaction to slightly calcareous in the lower one-inch. Clear lower boundary. 5 to 9 inches thick. |
| Cca | 13″ - 30″ | Pale yellow dry silt loam; light olive brown moist; massive in place; breaks out into weak medium and fine subangular blocks or lumps; slightly hard, slightly firm in place but very friable, moist when disturbed, abundant accumulated floury lime carbonate. Gradual lower boundary. 12 to 18 inches thick. |
| C | 30″ - 45″ | Pale yellow dry loam or very fine sandy loam; light olive brown moist; calcareous; massive; soft, friable. |

**Range in Characteristics:** The A1 horizon ranges in color from dark grayish brown to dry to very dark grayish brown moist; being thinner and the surface soil being somewhat lighter colored than noted above on the moderately to steeply sloping areas. Loam and silt loam types and substratum phases are recognized in mapping. Small areas of the soils are slightly to moderately affected by saline-alkali conditions. Where more than 10 to 15 percent of an area is so affected, a Solenetz complex is recognized, the topography is generally flat and associated with poor surface drainage.

**Topography:** Nearly level to gently rolling terraces; moderately steep slopes occur along entrenched terrace edges.

**Drainage:** Well drained; moderately permeable; runoff slow to moderate.

Class 3 irrigable soils are represented in this area by (1) moderate to strongly sloping dark colored sandy loam soils developed from lightly calcareous sandy materials under grass. (2) soil with a high percentage of cobbles through the soil profile and sandy soils with a clay loam layer at depths ranging from 24 to 40 inches.

**A representative profile of the sandy loam soils on moderate slopes is as follows:**

| | | |
|---|---|---|
| Ap | 0″ - 9″ | Grayish brown dry sandy loam; very dark grayish brown when moist; weak medium and fine granular structure; soft and very friable; strongly calcareous; contains few scattered pebbles; abrupt lower boundary. 4 to 10 inches thick. |
| Cca1 | 9″ - 15″ | Light brownish gray sandy loam; dark grayish brown when moist; massive; slightly hard, very friable; strongly calcareous with some white soft nodular lime segregation; small gravels are lime coated on all sides. Clear lower boundary. 5 to 10 inches thick. |

| | | |
|---|---|---|
| Cca2 | 15″ - 21″ | Light gray dry loam or sandy loam; grayish brown when moist; massive; hard, friable, slightly sticky and slightly plastic; very strongly calcareous with pebbles completely lime coated (estimated $CaCO_3$ 30 to 40 percent equivalent). The high lime content of this horizon makes the texture feel like a loam. Gradual, irregular lower boundary. 5 to 20 inches thick. |
| C3 | 21″ - 29″ | Light gray dry loamy sand; grayish brown when moist; massive; soft and very friable; very strongly calcareous with lime disseminated except for light coatings on pebbles; gradual lower boundary. 0 to 5 inches thick. |
| C4 | 29″ - 60″+ | Very pale brown dry sandy loam; brown when moist; massive; soft, very friable; very strong calcareous; lime disseminated except for light coatings on pebbles. |

**Range in Characteristics:** Sandy loam types are dominant but loamy fine sandy types and gravelly phases occur. Moist soil colors of the A1 or Ap horizon are very dark brown to very dark grayish brown. In nontilled areas there may be a very thin "B" horizon with a black color. The Cca horizon has from 15 to 40 percent $CaCO_3$ equivalent, and dry soil color ranging from grayish brown to very pale chroma of brown. The amount of gravel in the profile is less than 50 percent by volume to depths greater than three feet, and there are very few fragments of cobble or stone size. In undisturbed areas the A horizon may be noncalcareous but soils are generally calcareous to the surface in cropland areas. Colors are of the dry soil unless otherwise stated.

**Topography and Physiography:** Nearly level to strongly sloping high terraces and fans that are dissected by drainage channels. Local relief may be modified by wind action.

**Drainage and Permeability:** These soils are well drained. Surface runoff is low and the water intake rate is high. Subsoil permeability is moderate to rapid.

### Clark Fork River and Tributaries from Mouth of Thompson River to Heron

There are approximately 70,000 acres having soils that are suitable for irrigation with 1,500 to 2,000 acres in irrigable class 2. Only a few small areas are irrigated at present and most of the area is covered by conifer forest.

Irrigable class 2 land includes silty or loam textured soils; some of which may have a restrictive clay layer below a 40-inch depth.

**A representative soil profile of class 2 is as follows:**

| | |
|---|---|
| 0″ - 2″ | Dark brown to nearly black highly organic silty material. 1 to 2 inches thick. |
| 2″ - 12″ | Light brown or yellowish brown friable silt loam becoming rich brown or bright moderate brown when wet. About 10 inches thick. |
| 12″ - 36″ | Mottled grayish brown and lavender slightly compact very fine sandy loam. 20 to 26 inches thick. |
| 36″ - 48″ | Brownish gray silty clay loam mottled with purple or lavender grading at 48 inches into similar colored, tough, compact clay. |

**Range in Characteristics:** The thickness of the sandy horizon in the upper subsoil varies. In places it may extend only to a depth of 30 inches; elsewhere to about 4 feet.

**Topography and Drainage:** The topography is gently undulating with good surface and subsurface drainage.

**Vegetation:** Principally mixed conifers.

Class 3 irrigable land is represented by (1) soils with clay textured slowly permeable subsoils or (2) soils with a high percentage of cobbles or stone throughout the soil profile and (3) deep loamy sand soils.

**A representative profile of class 3 having slowly permeable subsoils is as follows:**

0″ - 2″ Dark brown silty material, high in organic matter, containing rounded iron pellets or "shot" and with a very thin imperfectly-developed adhering ash-gray layer. About 2 inches thick.

2″ - 14″ Light yellowish brown or buff friable silt loam, high in rounded "shot." About 12 inches thick.

14″ - 26″ Light brownish gray mottled compact siliceous silt loam with faint pinkish or lavender silt coating the mottled brown and gray prisms. This degraded layer is hard and compact when dry but may be crumbled to a powdery mass with pressure. Root channels and cavities are stained with iron and frequently filled with decomposing organic matter, the large chambers lined with clay. The upper part of this horizon generally is vesicular. 10 to 14 inches thick.

26″ - 40″ Light grayish brown, pinkish brown or mottled gray and rusty brown, compact, tough, dense prismatic clay. The prisms are about 4 inches in diameter. The fracture planes are lined with pale reddish colloidal material and roots generally are confined to the fissures and occur as flattened masses which do not penetrate the soil masses to any extent. 14 inches thick.

40″ - 60″ Light pinkish or faintly reddish brown dense massive clay in which some of the fracture planes are lined with colloids and occupied by roots. About 20 inches thick.

60″ - 68″ Grayish brown thinly stratified tough sticky clay stained with pink, chocolate or lavender. About 6 inches thick.

68″ Pale pinkish brown laminated iron-stained very fine sandy loam and fine sand in thin layers of clay.

**Range in Characteristics:** Variations are connected with the depth at which the various horizons occur. In places, instead of a continuous light colored horizontal layer, light colored powdered streaks extend downward. In places, vertical channels with rusty-iron colloid coating extend into the subsoil. Differences in relief give rise to steep and other slope phases.

**Topography:** Comparatively flat with numerous kettle holes or basins.

**Drainage:** Surface drainage fair, subdrainage slow because of the heavy subsoil.

**Vegetation:** Mixed coniferous forests.

**A representative profile of soil in irrigable class 3 having a high percentage of cobbles and stones throughout the soil is as follows:**

| | | |
|---|---|---|
| A00&A0 | 1" - 0" | Leaf litter and duff. |
| A1 | 0" - 1" | Grayish brown dry cobbly fine sandy loam; very dark grayish brown moist; moderate fine crumb structure; soft, very friable; clear lower boundary. 0 to 3 inches thick. |
| B2 | 1" - 8" | Light yellowish brown dry cobbly fine sandy loam; dark yellowish brown moist; weak subangular blocky structure; soft, very friable; gradual lower boundary. 6 to 12 inches thick. |
| C | 13" - 50+" | White very cobbly loamy fine sand, single grain structure; loose, noncalcareous. |

**Range in Characteristics:** Cobbly, gravelly, or stony sandy loam and loam types occur. Texture throughout the five-foot profile ranges from loamy fine sand to loam filling interstices between cobbles, gravels and stones. Lime may coat undersides of cobbles in lower part of soil profile. Moist soil color A1 may be a very dark brown and moist color of B2 horizon ranges from pale to dark brown. An A2 horizon as thick as 4 inches may occur if it overlies a B horizon having moist soil color of light brown to yellowish brown without increase in amount of clay. Patches of clay films may occur on rocks and as scattered very thin bands of clay bridging sand grains in lower depths of the profile. Soil colors are of dry soil unless otherwise stated.

**Topography:** Nearly level, undulating and sloping stream terraces and alluvial fans with steep areas on terrace edges and valley sides.

**Drainage:** Well drained; runoff is slow; internal drainage is rapid.

### Upper Thompson River

This area has approximately 20,000 acres of land with soils that are suitable for irrigation. Soils are variable in depth texture and water holding capacity. The large area has soils which have 16 inches of grayish brown granular fine sandy loam overlying a reddish brown, cobbly silt loam. The large bench is very gently sloping and slightly undulating. The area is presently covered by a moderate growth of yellow pine, and smaller secondary timber.

The land use of the area for anything other than timber production is very doubtful due to the higher elevations, location and water supply.

**SUMMARY**

About 180,000 acres of land in Sanders County has soils which are suitable for irrigation. Between 50,000 and 60,000 acres could be developed with pump lifts of 300 feet or less if unallocated water is available. There are approximately 7,000 acres of irrigable class 2 land and 173,000 acres of irrigable class 3 land. The large acreage of class 3 lands that have moderately steep slopes and limited moisture holding capacity are adaptable for sprinkler irrigation. Their use for irrigation will help stabilize the livestock industry in the county.

When an area of irrigation development is anticipated, a detailed land classification and drainage investigation should be made prior to construction. These detailed studies will help to locate the best land for irrigation and will point out the measures needed to minimize erosion, seepage, alkalinity and salinity problems.

The local Federal and State Agricultural Agencies may have detailed soil surveys and experimental information that can be utilized in future development.

**References**

Alden, W. C. 1953. Physiography and glacial geology of western Montana and adjacent areas; U. S. Geological Survey Prof. Paper 231, 154 p. (1954)

Brietkrietz, Alex; Konizeski, R. A.; and McMurtrey, R. G., 1965. Geology and Groundwater Resources of the Missoula Basin, Montana. State of Montana Bureau of Mines and Geology, Bulletin No. 47, July 1965.

Mohlman, Mark R., Gooch, Dale; and other assisting Soil Scientists. Unpublished reconnaissance land classification survey of Columbia Basin, Montana; Upper Columbia Development Office, Bureau of Reclamation, U. S. Department of Interior, Spokane, Washington, 1967.

Reconnaissance report Clark Fork Basin, Montana. Region 1, Bureau of Reclamation, U. S. Department of Interior, Boise, Idaho, June 1959, 150 p.

Soil Scientist of Soil Conservation Service; Unpublished soil survey and soil series information; Soil Conservation Service, U. S. Department of Agriculture, 1914 to present time.

## CROPS AND LIVESTOCK

Sanders County, located in the western border of Montana, lies west of the Continental Divide. The county contains 1,773,000 acres. It is bordered on the north by Lincoln and Flathead Counties, on the east by Lake County, by Mineral and Missoula Counties on the south, and by Idaho on the west. The terrain is characterized by mountains and mountain valleys.

The majority of the people live in the valley of the Clark Fork of the Columbia River, which flows in a north-westerly direction through the county. This valley is narrow at the western end of the county, widening at the eastern and where the valleys of the Flathead and the Clark Fork Rivers broaden. The Clark Fork River, a major tributary of the Columbia, has an average flow of approximately 22,000 cubic feet per second at Thompson Falls, the County Seat. Numerous small rivers and streams flow into this river as it flows westward through the valley.

Four-fifths of the county is forest land. Of the total land area, 65% is in public ownership and 35% in private ownership. About 22% of the land is in farms. About 1/3 of the eastern end of the county is a part of the Flathead Indian Reservation, on which reside the Confederated Salish and Kootenai Tribes.

The climate of the area is moderate, without the extremes that characterize much of Montana. Severe storms seldom occur and tornados are unknown in this area of the state. At Thompson Falls, elevation 2,400 feet, precipitation averages about 20 inches annually. However, upstream about 25 miles, the average is 6 or 7 inches less. Downstream or west of Thompson Falls, about 20 miles, the precipitation averages 10 inches or more. There is considerable variation in the county. Almost all of the precipitation from April through October falls as rain. Temperatures are not severe.

The western half of Sanders County has many small acreages of 80 acres and less and very few landowners derive all their income from the farm. Cattle, hay and pasture are the primary things grown.

The Plains area is the more productive area with many good irrigation systems. Cattle is the main livestock enterprise here.

The Hot Springs area has gone more to a cattle area in recent years. There are a number of good irrigated farms and ranches.

Most of the grain in the county is produced in the areas of Plains and Camas Prairie.

## FROM MONTANA AGRICULTURAL STATISTICS VOLUME XII, December 1968

### Crop Production — 1967 Harvested Acres

| Crop | Irrigated Acres | Irrigated Yield/A | Non-Irrigated Acres | Non-Irrigated Yield/A | Total Acres | Total Value |
|---|---|---|---|---|---|---|
| Winter Wheat | 100 | 42.0 | 4,100 | 29.0 | 4,200 | $163,800 |
| Spring Wheat | 300 | 32.0 | 900 | 13.0 | 1,200 | 32,400 |
| Oats | 200 | 50.0 | 500 | 32.0 | 700 | 18,900 |
| Barley | 400 | 40.0 | 1,000 | 30.0 | 1,400 | 44,100 |
| Alfalfa Hay (@ $20/Ton) | 8,900 | 2.45 | 10,400 | 1.65 | 19,300 | 780,000 |
| Wild Hay (@ $15/Ton) | 900 | 1.30 | 1,400 | .80 | 2,300 | 34,500 |

### LIVESTOCK ON FARMS — JANUARY 1, 1968

| | |
|---|---|
| All Cattle and Calves | 29,000 |
| Cows, 2 years & older kept for milk | 600 |
| Hogs and Pigs | 700 |
| Stock Sheep and Lambs | 1,800 |
| Chickens | 13,100 |

## 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 Sanders 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.

### Little Bitterroot River near Niarada

The staff gage was on a footbridge at Angus McDonald's ranch, 2 miles southwest of Niarada. The drainage area is 223 square miles. Records are available from April to October 1908, March to November 1909, April to November 1916, April to September 1917. The maximum discharge observed was 412 c.f.s. (May 7, 1916) and the minimum observed, 3.0 c.f.s. (August 28, 1917). There are several small diversions for irrigation above station. Natural storage in Little Bitterroot Lake with some regulations by temporary dams at lake outlet.

### Revais Creek near Dixon

The staff gage was 100 feet downstream from highway bridge, 0.7 mile upstream from mouth, and 3 miles west of Dixon. The drainage area is 35.0 square miles. Records are available from May 1911 to December 1914, March 1915 to September 1916, October 1917 to September 1918, April to

September 1919. The maximum discharge observed was 512 c.f.s. (June 19, 1916) and the minimum, not determined. The average discharge for 5 years (1911-14, 1915-16, 1917-18) was 36.1 c.f.s. or 26,140 acre-feet per year. The highest annual runoff was 36,800 acre-feet (1916) and the lowest, 18,600 acre-feet (1914). There are a few small diversions for irrigation above the station.

**Clark Fork near Plains***

The water-stage recorder is 2 miles upstream from Plains and 6 miles downstream from Flathead River. The drainage area is 19,958 square miles. Records are available from October 1910 to date (1968). The maximum discharge was 134,000 c.f.s. (June 5, 1948) and the minimum, 3,200 (February 8, 1936, December 10, 1940). The average discharge for 57 years was 19,740 c.f.s., or 14,200,000 acre-feet per year. The highest annual runoff was 21,300,000 acre-feet (1928) and the lowest, 6,404,000 acre-feet (1941). Flow is partly regulated by Flathead Lake and Hungry Horse Reservoir. There are diversions for irrigation of about 335,000 acres above the station.

**Thompson River near Thompson Falls***

The water-stage recorder is 1 mile upstream from the mouth and 6 miles east of Thompson Falls. The drainage area is 642 square miles. Records are available from March to September 1911, October 1911 to September 1916 (occasional gage heights, discharges and discharge measurements), April 1956 to date (1968). The maximum discharge during the period of record was 6,080 c.f.s. (June 9, 1964) and the minimum daily, 68 c.f.s. (December 10, 1961). The flood of May to June 1948 reached a discharge of 6,190 c.f.s., by slope-area measurement of peak flow at site a quarter of a mile downstream. The average discharge for 11 years was 473 c.f.s. or 342,400 acre-feet per year. The highest annual runoff was 473,800 acre-feet (1959) and the lowest, 242,100 acre-feet (1958). There are minor diversions for irrigation above the station and a diversion from headwaters of Alder Creek to supplement water supply for storage in Upper Dry Fork Reservoir in Little Bitterroot River basin.

**Prospect Creek near Thompson Falls**

The staff gage was located on left bridge abutment just upstream from Dry Creek and about 1 mile southwest of Thompson Falls. The drainage area is 145 square miles. Records are available from February to September 1911, October 1911 to September 1916 (discharge measurements and occasional gage heights and discharges). The maximum discharge observed during the period of record was 1,860 c.f.s. (May 29, 1913), but may have been exceeded during period of no gage-height record in 1916, and the minimum, not determined. The flood of May to June 1948 reached a discharge of 2,800 c.f.s. from contracted opening measurement. A powerplant when in operation diverted about 40 c.f.s. past the station after February 15, 1913. No other diversion or regulation above the station.

**Prospect Creek at Thompson Falls***

The water-stage recorder is 500 feet downstream from Dry Creek, half a mile upstream from mouth, and half a mile south of Thompson Falls. The drainage area is 182 square miles. Records

are available from April 1956 to date (1968). The maximum discharge was 2,860 c.f.s. (May 21, 1956) and the minimum, 30 c.f.s. (December 11, 1961). The average discharge for 11 years was 255 c.f.s. or 184,600 acre-feet per year. The highest annual runoff was 242,700 acre-feet (1959) and the lowest, 137,200 acre-feet (1958). No regulation or diversion above station.

**Clark Fork near Thompson Falls**

The water-stage recorder was a quarter of a mile downstream from the Montana Power Co. dam, a quarter of a mile downstream from Prospect Creek and half a mile west of Thompson Falls. The drainage area is 21,113 square miles. Records are available from October 1951 to September 1959. The maximum discharge during the period of records was 109,000 c.f.s. (May 26, 1956) and the minimum, 495 c.f.s. (September 1, 2, 1958) when the powerplant was shutdown. The flood of May 31, 1948, reached a discharge of 150,000 c.f.s. The average discharge for 8 years was 21,920 c.f.s. or 15,870,000 acre-feet per year. The highest annual runoff was 20,140,000 acre-feet (1959) and the lowest, 13,050,000 acre-feet (1953). Flow regulated by Flathead Lake, Hungry Horse Reservoir, Thompson Falls Reservoir and numerous smaller reservoirs. There are diversions for irrigation of about 340,000 acres above the station.

**Clark Fork below Noxon Rapids Dam, near Noxon***

Records collected by the Washington Water Power Co. at Noxon Rapids Dam 1 mile upstream from Rock Creek and 3 miles southeast of Noxon, and published by the U. S. Geological Survey. The drainage area is 21,833 square miles. Records are available from May 1960 to date (1968). The maximum daily discharge was 124,900 c.f.s. (June 12, 1964) and the minimum daily, 80 c.f.s. (October 16, 1960, August 26, 1962, August 18, 25, 31, September 1, 1963) when the powerplant was shut down. The average discharge for 7 years was 21,280 c.f.s. or 15,410,000 acre-feet per year. The highest annual runoff was 19,970,000 acre-feet (1965) and the lowest, 13,040,000 acre-feet (1963). Flow regulated by Hungry Horse Reservoir, Flathead Lake, Thompson Falls Reservoir and Noxon Reservoir. Some sub-surface flow is indicated by comparison with records for adjacent gaging stations. There are diversions for irrigation of about 350,000 acres above the station.

**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 two crest-stage partial-record stations in the Little Bitterroot River basin in Sanders County. Stations are now (1968) being operated on Mill Creek near Niarada and South Fork Garden Creek near Hot Springs.

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

Details of operation records of the following reservoirs are available in U. S. Geological Survey publications.

### Upper Dry Fork Reservoir near Lonepine*

The reservoir is located on Dry Fork Creek, 4 miles northwest of Lonepine. The drainage area is 8.53 square miles. Records of month-end contents are available for April 1940, September 1940 to date (1968). The maximum month-end contents was 2,910 acre-feet (April 30, 1965, June 30, 1967) and the minimum, no storage at times in 1940, 1942, and 1943. The usable capacity is 2,810 acre-feet (2,700 acre-feet prior to 1960). Natural flow of Alder Creek in Thompson River basin is diverted and carried by interbasin canal to augment storage in this reservoir. Water is used for irrigation and recreation.

### Dry Fork Reservoir near Lonepine*

The staff gage is at dam on Dry Fork Creek, 1 mile west of Lonepine. The drainage area is 17.8 square miles. Records of month-end contents are available for December 1939, April 1940, September 1940 to date (1968). The maximum month-end contents was 4,080 acre-feet (April 30, 1942) and the minimum, no storage (August 31, 1944, August 31, 1946, September 30, 1946, October 31, 1951). The usable capacity is 3,860 acre-feet (4,000 acre-feet prior to 1960). Water is used for irrigation and recreation.

### Thompson Falls Reservoir at Thompson Falls*

The staff gage is located at dam on Clark Fork at Thompson Falls. The drainage area is 20,968 square miles. Records are available from October 1939 to date (1968). The maximum month-end contents was 16,060 acre-feet (November 30, 1949) and the minimum, no storage (July 31, 1958). The usable capacity is 14,970 acre-feet. Water is used for power production and recreation.

### Noxon Rapids Reservoir near Noxon*

The water-stage recorder is at dam on Clark Fork, 3 miles southeast of Noxon, and 7 1/2 miles upstream from Bull River. The drainage area is 21,833 square miles. Records are available from April 1959 to date (1968). The maximum contents was 335,400 acre-feet (April 7, 1960) and the minimum, since first filling, 26,380 acre-feet (May 10, 1967). The usable capacity is 334,600 acre-feet. Water is used for power production, flood control, and recreation.

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

## DAMS AND RESERVOIRS

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

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

Information on numerous dams and reservoirs constructed by private individuals in Montana is not available and is, therefore, omitted. However, the Board's Water Resources Survey crew, while working in Sanders County, obtained information on private dams and reservoirs within the 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

Sanders County is a mountainous region on the Montana-Idaho State line, within the Rocky Mountain physiographic province. Lofty mountain ranges and broad intermontane valleys provide a wide range of topographic relief. The present mountains are uplifted fault-blocks that are rooted in low-relief truncated rock folds which originated about 70 million years ago. When large fault-blocks in the earth's crust were uplifted thousands of feet, the accumulated runoff from the mountainous region was channeled into large intervening valleys. The valleys became the sites for stream and lake deposits, including sands and gravels capable of storing and transmitting groundwater.

One of the major effects of the glaciation which followed the uplift of the Rocky Mountains was the formation of Glacial Lake Missoula. About one million years ago 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. Runoff from the mountainous regions could not escape by means of the Clark Fork River, and a giant lake was formed, backing water in the interconnected mountain valleys of Montana for more than 200 miles. The depth of this lake is thought to have been more than 2,000 feet near the ice front. Almost all of the county was once inundated by Glacial Lake Missoula. Mountain tops above an elevation of approximately 4,150 feet were islands in the ancient lake. When the ice finally retreated, some 30- or 40-thousand years ago, Glacial Lake Missoula was drained and most streams and rivers returned to the preglacial drainage pattern.

### AQUIFERS

Rock-types in Sanders County are the unconsolidated or poorly consolidated stream and lake deposits, and the indurated rocks which form the mountains. The water-bearing sediments are in


## SANDERS COUNTY LOCATION MAP

*Registry of Dams*

LEGEND

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

the valleys and basins. Information on aquifer characteristics was taken from the records of the Montana Water Resources Board and the State Department of Health, 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. There are extensive deposits of alluvium within the county, the most prominent of which is that of the Clark Fork River floodplain. Alluvium is deposited in the valley by moving water, and almost everywhere in Sanders County is within the inferred boundary of ancient Glacial Lake Missoula. In parts of the county alluvium is found above lake bed silt, which in turn may overlie deposits of preglacial alluvium, now referred to as valley fill. The sands and gravels within the alluvium are reservoirs for groundwater, from which hundreds of wells withdraw water.

**Lacustrine deposits of Glacial Lake Missoula (Quaternary)** are fresh water accumulations of silt which are similar to floodplain deposits locally. Lake bed sediments are several hundreds of feet thick locally and may include intervals of sand and gravel which could be aquifers. The boundary of the glacial lake outlines the area once covered by water; lake bed deposits are indicated within the boundary of the lake.

**Glacial drift or till (Quaternary)** is distributed in the county in small isolated patches of bouldery earth material which represents the remains of glacial moraines or outwash. These deposits have no known groundwater potential in the county.

**Terrace deposits (Quaternary-Tertiary)** are small patches of gravels, at several levels above the river or valley bottom, which represent remnants of former fluvial accumulations. The gravels are locally water-bearing but are seldom extensive enough to be reliable aquifers.

**Undifferentiated Tertiary sediments** have a very local distribution in the northeastern part of the county. 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 Sanders County.

**Tertiary volcanic rocks** are represented in a very local area, in Township 24 North, Range 24 West. These and several bands of **Tertiary intrusive rocks** farther south have no groundwater potential.

**Idaho batholith and associated masses (Cretaceous)** are "hard rocks" exposed locally on either side of the Clark Fork floodplain, just north and west of White Pine, and have no groundwater potential although several springs reportedly issue from this rock mass.

**Pre-Cambrian rocks** constitute almost all of the mountainous areas, and are composed of indurated and metamorphosed 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 minimal amounts of groundwater from fracture-reservoirs. (An isolated **Cambrian** remnant, overlying the pre-Cambrian, is reported near Heron and has no known groundwater potential.)

### GROUNDWATER AREAS

There are several significant groundwater areas in the county, including the Clark Fork River floodplain, the Little Bitterroot River valley, the Camas Prairie Basin and the floodplain of the Flat-

head River. A minor groundwater area, in terms of development, is the valley of the Thompson River and its tributaries.

**Clark Fork River floodplain.** Most of the course of the Clark Fork River is over a floodplain one to four miles in width. The floodplain is composed of alluvial silt, sand, and gravel which has accumulated for thousands of years as the result of erosion and deposition by the Clark Fork River and its tributaries. Several short segments of the river are narrowly trenched in bedrock, where floodplain does not exist. Hundreds of wells have been drilled in the floodplain, with the greatest concentration of wells being in the vicinity of Plains. In this area groundwater is found 5 to 25 feet below the surface near the river, and most wells are drilled to depths of 10 to 50 feet. A few wells are drilled 150 to 200 feet below the surface, but these start in elevated terraces, which represent fluvial deposits of an earlier age.

Numerous wells in the vicinity of Plains claim in excess of 200 gpm (gallons per minute) each, and reported yields of 500 to 1,000 gpm are not uncommon. The saturated aquifer thickness varies from 8 to 30 feet and may have an even greater maximum thickness inasmuch as the actual aquifer thickness is not reliably known, because the wells are drilled into the upper part of the aquifer and not through it. Wells of larger yields have capacities in excess of 100 gpm per foot of drawdown; wells with yields of 5 to 50 gpm report 2 to 30 gpm per foot of drawdown.

Groundwater is withdrawn for domestic, irrigation, livestock, municipal, and industrial uses. Irrigation uses the most, an estimated 4,500 acre-feet per year. Industry use is estimated to be about 1,000 acre-feet annually; an estimated total of about 6,500 acre-feet are withdrawn annually for all purposes.

Downriver from Plains the concentration of wells is sparse. Reported yields vary from 1 to 400 gpm, with most in the range of 10 to 75 gpm. Groundwater is claimed for domestic, stock, and irrigation uses. Generally speaking, the quality of groundwater in the Clark Fork River floodplain, in terms of total dissolved solids, is good.

**Little Bitterroot River valley.** This valley is at the eastern edge of the county, partially in adjoining Lake and Mineral Counties. It has been conjectured, based on geologic investigations, that the Little Bitterroot valley at one time was the natural outlet for Flathead Lake. The present valley is surfaced with silt of ancient Glacial Lake Missoula, although buried sands and gravels are known to be present. The latter may indicate more recent floodplain or lacustrine deposits composed of reworked silt and detritus. Locally the silt has accumulated into windblown mounds and ridges of slight surface relief.

The silt at the surface is part of a sequence hundreds of feet thick which includes at least two water-productive intervals of subsurface sand and gravel. A shallow aquifer is found at depths of 10 to 100 feet below the surface, depending on the topographic elevation of the well site. Groundwater yields reportedly are in the range of 5 to 500 gpm. Aquifer thickness varies, and is more than 20 feet at some locations; however, the majority of wells have not penetrated the entire aquifer. Wells that have been drilled to the deeper aquifer found only thin intervals of gravel at shallow depths.

The deeper, artesian aquifer is about 300 feet below the surface, covered by impervious lake bed silt, and probably represents deposition by streams flowing through the valley prior to the glacial epoch. Numerous flowing wells have been reported, with yields up to 700 gpm. Wells with

# MONTANA WATER RESOURCES BOARD

## GROUNDWATER INVENTORY

## SANDERS COUNTY

*COMPILED FROM DATA AVAILABLE AS OF JUNE 1, 1969*

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

*Geologist: A.J. Mencini*
*Assist by: R.J. Guse*
*Drafted by: R.P. Madon & Daniel R. Erving*

Scale
2 mi.
8 mi.

## EXPLANATION

- Qal — Alluvium--recent accumulations of sand, silt, clay and gravel; yields of 1 to 2,000 gpm reported.
- Qlm — Glacial Lake Missoula--inferred area once covered by ancient glacial lake.
- Qgl — Glacial lake deposits--accumulations of silt, with sand and gravel, deposited in Glacial Lake Missoula, similar to recent alluvium and locally water-bearing.
- Qg — Glacial drift (till)--very small patches of heterogeneous deposits of clay, silt, sand, gravel and boulders; no known groundwater potential.
- QTt — Terrace deposits--remnants of former fluvial accumulations which may include local aquifers.
- 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.
- Ki — Idaho batholith and associated masses.
- pC — Precambrian rocks--mountainous regions which are intake areas for recharging surface supplies and groundwater aquifers.
- Limit of 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

HERON
NOXON
TROUT CREEK
WHITE PINE
BELKNAP
THOMPSON FALLS
PLAINS
PARADISE
PERMA
DIXON

T. 29N
T. 28N
T. 27N
T. 26N
T. 25N
T. 24N
T. 23N
T. 22N
T. 21N
T. 20N
T. 19N
T. 18N
T. 17N
T. 16N

R. 33W
R. 32W
R. 34W
R. 31W
R. 30W
R. 29W
R. 28W
R. 27W
R. 26W
R. 25W
R. 24W
R. 23W
R. 22W
R. 21W

smaller yields originally reported 20 gpm with no preceptible drawdown. The actual regional thickness of this valley fill is not reliably known, and other aquifers may be present at even greater depths. The thickest sequence of unconsolidated material thus far reported is in Section 24, Township 23 North, Range 24 West, where a well reached the first "hard rock" at a depth of about 1,200 feet and ended in hard limestone at 1,485 feet. An oil exploration test hole two miles north of this well reached "hard rock" at a depth of 700 feet below the surface.

Several wells are known to yield hot water, with a temperature at the surface of over 100° F. The high temperature most likely is related in origin to the source of water of the Camas Hot Springs, in Section 3, Township 21 North, Range 24 West. The hot water probably comes from a deep source, escaping through fractures into buried unconsolidated sediments where it may be withdrawn through wells, or at the surface as springs.

**Camas Prairie Basin.** The Camas Prairie Basin is an elevated valley in Township 20 North, Ranges 23 and 24 West, drained by Camas Creek. The thickness of the alluvium is not reliably known, although one well in Section 4, Township 19 North, Range 24 West reported intervals of clay and gravel to a depth of 208 feet. Most of the wells are drilled only deep enough to reach the first gravel aquifer, at depths of 15 to 50 feet. Reported yields vary from 2 to 20 gpm, with one at 100 and another at 500 gpm. At least two wells have found groundwater in bedrock underlying the valley-fill alluvium, in "soft sandstone" and in "harder rock." The thickness of valley fill suggests that the basin at one time could have been the site of a lake.

**Floodplain of the Flathead River.** The Flathead River forms a portion of the eastern county boundary and then flows westward to join the Clark Fork River near Paradise. That segment of the Flathead River in Sanders County traverses a floodplain for the most part surfaced with glacial lake deposits. A portion of the floodplain is surfaced with alluvium, and several wells in the vicinity of Dixon have been drilled from 25 to 250 feet deep, with reported yields of 20 to 100 gpm. A portion of the river bed, from the junction of the Flathead River with the Clark Fork River, to several miles east of Perma, is narrowly trenched in hard bedrock and does not have a floodplain.

**Valley of the Thompson River.** In the north-central part of the county is Big Prairie, which like Camas Prairie, is an elevated valley. Big Prairie is in the valley of the Thompson River which follows an arcute course from the northern part of the county to its juncture with the Clark Fork River near Thompson Falls. A few wells have been drilled in the valley to total depths of from 58 to 139 feet. "Clay, gravel, and boulders" are reported from top to bottom in the deepest hole; other wells report "rock" at depths of 8 to 102 feet. Two wells along the river in Township 24 North, Range 28 West, indicated a deep water table when drilled, with thick intervals of dry gravel above. Two wells along a tributary in Township 25 North, Range 27 West found a much shallower water table. The deep wells report yields of 12 to 85 gpm, and the shallow wells report less than 1 to 40 gpm.

## GROUNDWATER AVAILABILITY AND USE

Groundwater is available at relatively shallow depths from unconsolidated aquifers in all of the major river valleys. A few wells are known to produce water from fractured bedrock underlying alluvium and valley fill. Two groundwater areas are in basins several hundreds of feet above the major river valleys, due to relatively recent geologic uplift.

The earliest recorded use of groundwater in the county was in 1883. There are now more than 500 wells of record and approximately 300 springs. The largest number of wells have been drilled

for domestic and livestock uses; a significant number of wells reportedly are also used for irrigation. Springs are developed mainly for domestic and livestock purposes. It is estimated that between 6,500 and 8,000 acre-feet of groundwater have been appropriated, through wells and other means, for beneficial use in Sanders County.

Groundwater is of good quality throughout the county, and is almost everywhere suitable for domestic and livestock uses. Most analyses indicate total dissolved solids in amounts less than 500 ppm (parts per million). The amounts of certain chemical constituents vary from one area to another, and certain groundwater may not be suitable for long-range irrigation due to the content of sodium unless the supply is properly augmented with sodium-free water. An occasional well will produce hydrogen sulfide gas with the water, which is a disagreeable quality to some people, and can cause casing corrosion.

The floodplains of the major rivers are the areas of dense population and the areas where most wells have been drilled. Floodplain deposits, and buried valley fill, contain the aquifers which sustain the wells and springs. A few wells produce water from fractured bedrock underlying alluvium or valley fill.

The complete groundwater regimen of Sanders County is unknown. Areas exist where potential groundwater aquifers have not yet been explored. If the need for new sources of groundwater arises, the buried valley fill in the elevated basins and in the valley of the Little Bitterroot River, as well as alluvium in portions of the Clark Fork River valley, might be expected to yield additional supplies.

Present usage suggests that rural, domestic, and livestock needs will continue to be satisfied by the available water in alluvial and valley-fill aquifers. The present needs of small-scale irrigation and industry also will probably continue to be satisfied. However, sufficient data is not yet accessible for the determination of the possible effects of any sustained large-scale irrigation or increased industrial withdrawal of groundwater.

**References**


Alden, W. C., 1953, Physiography and glacial geology of western Montana and adjacent areas: U. S. Geological Survey Professional Paper 231.

Crowley, F. A., 1963, Mines and mineral deposits (except fuels) Sanders County, Montana: Montana Bureau of Mines and Geology Bulletin 34.

Meinzer, Oscar E., 1916, Artesian water for irrigation in Little Bitterroot Valley, Montana: U. S. Geological Survey Water-Supply Paper 400-B.

Montana Water Resources Board, Records of groundwater appropriation.

Montana State Department of Health, Records of water analyses.

Perry, Eugene S., 1933, Shallow wells as a source of irrigation water in Frenchtown and Camas Prairie Valleys, Montana: Montana Bureau of Mines and Geology Miscellaneous Contributions No. 5.

Perry, Eugene S., 1962, Montana in the geologic past: Montana Bureau of Mines and Geology Bulletin 26.

Ross, Clyde P., Andrews, David A., and Witkind, Irving I., 1955, Geologic map of Montana: U. S. Geological Survey in cooperation with the Montana Bureau of Mines and Geology.

Soward, Kenneth S., 1965, Geology of damsites on Flathead River, mouth to Flathead Lake, Lake and Sanders Counties, Montana: U. S. Geological Survey Water-Supply Paper 1550.

MONTANA BUREAU OF MINES AND GEOLOGY
GROUNDWATER DIVISION

## WELL WATER INVENTORY, SANDERS COUNTY

| Year | A | C | D | F | H | I | N | P | S | R | T | U | X | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1940+ older | .. | 2 | .. | .. | 61 | 23 | .. | 2 | 31 | 119 | .. | .. | 5 | 243 |
| 1941 | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 1 |
| 1942 | .. | .. | .. | .. | 5 | .. | .. | .. | 1 | 1 | .. | .. | .. | 7 |
| 1943 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | .. | .. | 2 |
| 1944 | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 1 |
| 1945 | .. | .. | .. | .. | 3 | .. | .. | .. | .. | 2 | .. | .. | .. | 5 |
| 1946 | .. | .. | .. | .. | 7 | 1 | .. | .. | .. | 4 | .. | .. | .. | 12 |
| 1947 | .. | .. | .. | .. | 3 | 1 | .. | .. | 4 | 6 | .. | .. | .. | 14 |
| 1948 | .. | .. | .. | .. | 6 | 3 | .. | .. | .. | 5 | .. | .. | .. | 14 |
| 1949 | .. | .. | .. | .. | 2 | .. | .. | 1 | 2 | 3 | .. | .. | .. | 8 |
| 1950 | .. | .. | .. | .. | 6 | 1 | .. | .. | 3 | 1 | .. | .. | .. | 11 |
| 1951 | .. | .. | .. | .. | 3 | .. | .. | .. | .. | 1 | .. | .. | .. | 4 |
| 1952 | .. | .. | .. | .. | 7 | 2 | .. | .. | .. | 2 | .. | .. | .. | 11 |
| 1953 | .. | .. | .. | .. | 3 | .. | .. | .. | .. | 2 | .. | .. | .. | 5 |
| 1954 | .. | .. | .. | 1 | 3 | 1 | .. | .. | 2 | 1 | .. | .. | .. | 8 |
| 1955 | .. | .. | .. | .. | 3 | 1 | .. | .. | 1 | .. | .. | .. | .. | 5 |
| 1956 | .. | .. | .. | 1 | 2 | 1 | .. | .. | 1 | 1 | .. | .. | .. | 6 |
| 1957 | .. | .. | .. | .. | 1 | .. | .. | .. | 1 | 4 | .. | .. | .. | 6 |
| 1958 | .. | .. | .. | .. | 9 | .. | .. | .. | 2 | 2 | .. | .. | .. | 13 |
| 1959 | .. | .. | .. | .. | 6 | 3 | .. | .. | 2 | .. | .. | .. | .. | 11 |
| 1960 | .. | .. | .. | .. | 7 | 4 | .. | .. | .. | 2 | .. | .. | .. | 13 |
| 1961 | .. | .. | .. | .. | 6 | 2 | .. | .. | 1 | 1 | .. | .. | .. | 10 |
| 1962 | .. | .. | .. | .. | 12 | 4 | .. | .. | 2 | 1 | .. | .. | 1 | 20 |
| 1963 | .. | .. | .. | .. | 11 | 16 | .. | 4 | 1 | 4 | .. | .. | .. | 36 |
| 1964 | .. | .. | .. | .. | 9 | 6 | .. | .. | 4 | 2 | .. | .. | .. | 21 |
| 1965 | .. | .. | .. | .. | 6 | 2 | .. | 2 | 2 | 2 | .. | .. | .. | 14 |
| 1966 | .. | .. | .. | .. | 7 | 2 | .. | .. | .. | 2 | .. | .. | 1 | 12 |
| 1967 | .. | .. | .. | .. | 7 | .. | .. | .. | .. | 3 | .. | .. | .. | 10 |
| | | | | | | | | | | | | | | 523 |

A=Conditioning
B=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

Sanders County is in heavily forested mountainous terrain, a part of the northern Rocky Mountain physiographic province characterized by mountains and intermontane valleys. The Cabinet and Salish Mountains and the Bitterroot Range, respectively, occupy the northern and southern parts of the county, and are separated by the northwest-flowing Clark Fork River.

Underlying the greater part of the county is a thick sequence (up to 50,000 feet) of ancient rocks consisting of argillite, quartzite, sandstone, and impure limestone and dolomitic limestone named the Precambrian Belt Series. In ascending order the units of the Belt Series are the Prichard, Ravilli, Wallace, Striped Peak, and Libby Formations. Stratigraphically overlying the Belt Series are several fault-bounded blocks of outcropping Cambrian sedimentary rocks consisting of sandstone, shale, and limestone, all believed to be of Middle Cambrian age. Lake Missoula lacustrine silts, fluvial gravels, and Quaternary alluvium occupy the valleys. Igneous rocks in the county include metadiorite and gabbro sills and dikes, and granitic stocks and dikes composed of quartz monzonite, granodiorite, monzonite, and syenite.

### Metallic Minerals

Metallic mineral deposits in Sanders County occur as fissure-filled veins, veins in shear zones, and as replacement deposits. Lead, zinc, copper, silver, gold, and antimony have been produced, with reported occurrences at some properties of arsenic, bismuth, cobalt, and nickel. Total production of recoverable metals from Sanders County during the period 1906-61 amounts to 708,700 tons valued at $12,764,000. Gold and silver production from placer mines during the same period amounts to $17,184.

### Blue Creek District

The Blue Creek district is situated at the western end of Sanders County. Ore deposits are related to the Hope fault, a transverse northwest-trending structure of great vertical displacement. Properties having production records include the Blue Creek and Broken Hill mines.

### Camas Prairie and Noxon-Cabinet Districts

The Camas Prairie district lies north of Perma and has been a substantial producer of copper ore. The largest producer was the Glaucus mine, with some production recorded for the June Bug and Exchange properties.

North of Noxon in the Noxon-Cabinet district is located the Heidelberg mine. Some gold and silver ore was mined from this property prior to World War II.

### Plains and Prospect Creek Districts

South of Plains is the Letterman mine, a limited producer of gold and silver ore.

The Prospect Creek district west of Thompson Falls has produced considerable precious and base metal ores. Production has been recorded for the Montana Standard, Copper Creek Mining Com-

pany, and Shamrock properties. Stibnite (antimony sulfide) has been shipped from the Coeur d'Alene, Eureka & Ellis, Interstate, and Stibnite Hill mines.

### Revais Creek and Seepay Creek Districts

The adjoining Revais Creek and Seepay Creek districts are south of the Clark Fork River between Perma and Dixon. The larger production from the Revais Creek district is from the Drake mine, a producer of copper, silver, gold, and platinum. Small lots of ore have been shipped from the Lucky Strike and Blue Ox properties.

Small lots of copper ore were shipped from the New Deal mine, and nickel-bearing pyrrhotite has been reported from the Lucky Lode prospect, both properties located in the Seepay Creek district.

### Thompson River District

The Thompson River district, northeast of Thompson Falls, has been a substantial producer of silver, copper, and lead. Production of these metals in the district has been largely from the Silver King, Copper King, and Raven mines.

### Trout Creek, Vermilion River, and White Pine District

Southwest of Trout Creek is the Trout Creek district, with metal production from both lode and placer mines. Small shipments of gold-silver-copper-lead ore were made from the Ambassador mine, with placer gold produced prior to 1933 from the Driftwood, Ogoma, Windfall, and Mammy Lou placers.

The Vermilion River district occupies an area north of Vermilion River, the district production derived from placer and lode mines. The Vermilion (Carpenter) and Copper Ridge mines are reported to have produced small tonnages of gold-lead ore. Placer gold was produced from the Ajax placer in the early 1960s.

West of Belknap is the White Pine mining district, which enclosed the area drained by Big Beaver Creek. The largest producer in the district is the Jack Waite mine. Lead-zinc-silver ore mined from this property accounts for the largest percentage of metal production from Sanders County. Small shipments of copper-silver ore are credited to the Lucky Luke property.

More detailed descriptions of mines and placers in Sanders County can be found in Montana Bureau of Mines and Geology Bulletin 34, titled "Mines and Mineral Deposits (except fuels), Sanders County, Montana."

### Nonmetallic Minerals

Building stone has been quarried at three sites in the vicinity of Thompson Falls. At two of these quarries Cambrian-age sandstone was quarried. Quartzite of the Striped Peak Formation was quarried at the third quarry. Brick clay has been dug up from a pit, also in the vicinity of Thompson Falls.

## SOIL AND WATER CONSERVATION DISTRICTS

There are two Soil and Water Conservation Districts in Sanders County—Green Mountain and Eastern Sanders County.

Green Mountain, organized in 1941 as the eighth district in Montana, takes in the western part of the County. It extends from a north-south line which passes near the mouth of the Thompson River westward to the Idaho state line. Within this area about 210 rural families live, mostly along the shores and tributaries of the Clark Fork River.

Eastern Sanders County Soil and Water Conservation District covers the remaining part of the county to the east and a portion of western Lake County. This District, organized in 1945, has about 250 farms and ranches.

Soil and Water Conservation Districts are political subdivisions of the state, and created under state law. They are governed by a local board of five elected officers who serve without pay.

The express purpose of the Districts is conservation and enhancement of soil, water, and other natural and human resources. The ultimate aim is the accomplishment of this purpose through the education and motivation of private land owners—both rural and urban.

Actions taken to achieve their purpose are most often in the form of information, technical assistance, and sponsorship. Districts carry on an information program to acquaint the public of activities and efforts in the field of conservation. They furnish technical assistance to cooperators for planning and applying soil and water conservation practices. They also act as sponsors for various projects, such as Resource Conservation & Development Projects, Agricultural Conservation Program (ACP), and Small Watershed Projects.

Upon organization, the United States Department of Agriculture supplies to Districts, free of charge, technical assistants. These technicians, trained and financed by the Soil Conservation Service, USDA, are assigned to one or more Districts to help in all phases of District activities.

Districts also work closely with other federal and state agencies. They enter into agreements and have memorandums of understanding with most agencies in the county. Recognized assistance comes from the Agricultural Stabilization and Conservation Service, Bureau of Indian Affairs, Public Health Service, U. S. Forest Service, Farmers Home Administration, State Forester, State Extension Service, and State Fish and Game Department. There are also many private organizations and people who generously contribute to the conservation effort.

As elsewhere, water is of prime importance in Sanders County. Many irrigation and other developments have been made. The end is not in sight. Water exploration in the arid Camas Prairie basin is being initiated (1968). Several ranchers there plan to sink test wells for irrigation. Many other individual developments are being made each year.

In the more arid portions of the county the soils are shallow and sometimes have layers which are restrictive to plant growth. In these areas the District emphasizes water management, that is, proper application and use of irrigation water.

The results of these two Soil and Water Districts' efforts in conserving water through private ownership is immediately visible to the observer. The hundreds of irrigation systems and thousands of acres of leveled and shaped lands, as well as stock-water, irrigation, fish ponds, and other water developments, are evidence of this great concerted effort.

Without doubt it has greatly stabilized the agriculture of Sanders County.

## 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 operation, 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, Box 698, Plains, Montana 59859.

Snow courses, snow pillows and soil moisture stations in or immediately adjacent to Sanders 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 | Established Year | Dates Measured[1]/ |
|---|---|---|---|
| **Clark Fork River** | | | |
| Baree Creek | 5500 | 1956* | 3, 4, 5, 5½ |
| Baree Midway | 4600 | 1966 | 3, 4, 5, 5½ |
| Baree Trail | 3800 | 1965 | 3, 4, 5 |
| Baree Trail Soil Moisture | 3800 | 1965 | Monthly |
| Bassoo Peak | 5000 | 1961 | 3, 4, 5 |
| Lookout | 5250 | 1936 | 1, 2, 3, 4, 5 |
| Lookout Snow Pillow | 5250 | 1969 | Continuously |
| Lookout Soil Moisture | 5250 | 1962 | Monthly |

* Estimated records available, 1937-55.

1/ Numerals 1, 2, 3, 4, 5, 5½ refer to January 1, February 1, March 1, April 1, May 1 and May 15 measurements.

## FISH AND GAME

Big game hunting is the foremost outdoor recreational activity in Sanders County. A majority of the land is within the National Forest boundaries and is therefore open to public hunting. Accompanying this asset is the fact that this county embraces some of the best big game habitat in western Montana.

Elk, deer (mule and white-tailed), bighorns, moose and rocky mountain goats are included in the bag limits of annual seasons regulated by the Montana Fish and Game Commission.

Waterfowl are also found in limited numbers in the northeastern portion of the county where some grain crops are raised along the two main rivers (Flathead and Clark Fork) that bisect the county.

Other wildlife species hunted are snowshoe hare, bobcat, coyote, mountain lion and ground squirrel.

All species hunted receive relative light hunting pressure.

Winter range is a major factor on most game species and it is the limiting factor in this county. In relation to other surrounding counties it has substantially more numbers of big game animals per unit area. However, the numbers of big game will be limited to the tolerance of ranchers living on the valley floor when winter and spring populations of deer and elk invade their hay and grain fields. The success of the Forest Service efforts in providing winter range by clear cutting timber and controlled burning will also play a large role in the future big game numbers.

The major stream in the county is the Clark Fork River which flows from east to west. Major tributaries flowing into the Clark Fork are the Bull River, Thompson River, Prospect Creek and Elk Creek, all of which have numerous smaller tributaries flowing into them, all producing some fishing possibilities.

Warm water fishing is not an important source of recreation in this county. The few bass areas are found in shallow sloughs and backwaters along the main river.

There are numerous natural lakes in this county that produce fishing for both the fisherman who likes to drive to his lake, walk to a lake or ride a horse to a high-country lake.

## KANIKSU AND LOLO NATIONAL FORESTS

National Forest lands in Sanders County total 911,524 acres. Of this, 485,300 acres are in the Lolo National Forest and 426,224 acres are in the Kaniksu National Forest.

Originally, nearly all the National Forest land in Sanders County was a part of the Cabinet National Forest created from the Forest Reserve in 1907 by President Theodore Roosevelt. In 1954 the Cabinet National Forest was eliminated and the land was divided between the Kaniksu, Kootenai, and Lolo National Forests. The balance of the National Forest land in the county was a part of Lolo National created in 1906 from the Forest Reserve.

These National Forest lands in Sanders County are managed under the multiple use concept by District Rangers and their assistants at Plains, Thompson Falls, Trout Creek, and Noxon 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.

Topography on National Forest land in Sanders County ranges from nearly level land in the Clark Fork Valley bottom to rugged mountainous terrain along the Cabinet Mountains Divide. Elevations vary from 2,175 feet along the shore of Cabinet Gorge Reservoir to 8,712 feet at Snowshoe Peak in the Cabinet Mountains.

Four broad soil groupings are found on the National Forest lands of Sanders County and are described as follows:

a. Deep soils, ashy surface over loamy materials with high (60 percent) content of coarse fragments, stable, high water holding capacity, low production of sediment. The bedrock is argillite and quartzite. Extensive west and south of Clark Fork River, on Trout Creek-Noxon and Thompson Falls Ranger Districts.

b. Same as above with lower content of coarse fragments (20-40 percent) moderately stable, high and very high water holding capacity, moderately low production of sediment. The material below the rooting zone is glacial till which overlies bedrock of argillite and quartzite. Extensive east of Clark Fork River on Trout Creek-Noxon, Thompson Falls, and Plains Ranger Districts.

c. Deep and shallow soils of the glaciated high area of Cabinet Mountains east of Trout Creek and Noxon Falls. Very steep, moderately stable. Moderately extensive east of Noxon, Trout Creek, and north of Thompson Falls. Bedrock is argillite and quartzite.

d. Alluvium along streams and silty deposits on terraces and benches, high water holding capacity, low stability, very limited in area.

According to the Weather Bureau records, average annual precipitation varies from 19 inches at Paradise, 20.8 inches at Thompson Falls, 28 inches at Trout Creek to 34 inches at Heron. It is estimated more than 60 inches of precipitation falls in the higher elevations along the Bitterroot Divide and in the Cabinet Mountains. Most of the moisture falls as snow.

While water is undoubtedly the most valuable resource on these public lands in Sanders County, it is difficult to assign a dollar value and measure this important resource. Water stored in the heavy snows on National Forest land is released into the Columbia River system in warmer months and makes significant contributions to irrigation, power production, domestic needs, and industrial demands in the local area as well as throughout the Columbia River drainage. The Noxon and Cabinet Gorge and Thompson Falls Reservoirs play an important part in the use of this water.

The National Forest lands in Sanders County have relatively stable soils. Watershed conditions are generally good except for some stream channels in the old 1910 burned areas that are clogged with deep gravel deposits and will be unstable for many years to come. 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 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 insects and disease control, all contribute to watershed protection of these National Forest lands.

Water is but one of the basic resources managed by the Forest Service under the multiple use concept. Wood, wildlife, recreation, forage, as well as water, contribute to the economy of Sanders County. In addition to their impact on local economy, Sanders County receives 25 percent of the Forest Service revenue from National Forest lands within the county. In fiscal year 1968, this amounted to $166,232. These funds are made available to the county for local schools and roads.

Grazing on National Forest land in Sanders County is mostly transitory. In 1968, grazing permits allowed 755 head of cattle to be grazed on these public lands. Forage produced on this National Forest land is an important part of local ranch operations.

National Forest lands are playing a big part in the growing outdoor recreation activity in Sanders County. Recreation visits to this area are increasing rapidly with as much greater use of the Noxon, Cabinet Gorge, and Thompson Falls Reservoirs, Cabinet Mountains Wilderness Area, and adjacent areas expected in the immediate future.

An estimated 89,100 recreation visits were made to National Forest lands in Sanders County in 1967. Nine camp and picnic facilities are available at popular sites. Forest Service plans include more and improved recreation facilities in Sanders County.

Approximately 100,000 acres of the Cabinet Mountain Wilderness Area is within the county. This area and other National Forest lands offer beautiful mountain lakes and quiet mountain trails for the enjoyment of all.

National Forest fish and game resources are important to the local economy and recreation. Big game animals in the area include white-tailed deer, mule deer, elk, moose, mountain goat, black bear, and a few grizzly bear. Mountain lion are also found. Fishing is fair to good in the many streams, lakes, and reservoirs of the area. Hunting of upland game birds and waterfowl is a very popular form of recreation in the county.

Large stands of timber cover the National Forest lands. 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. Considerable road construction and logging have taken place since 1945. Prior to this, most logging was done on areas in and adjacent to the Clark Fork Valley bottom. To meet future needs, objectives are to intensify management of existing timber stands; grow more and better trees; reduce losses from insects, diseases, and fire; plant trees on cutover and burned areas; and improve wood utilization.

Today National Forest lands in Sanders County have a sustained-yield annual allowable timber cut of approximately 78 million board feet. This stabilized sustained timber production capacity is important to the local economy.

Numerous mineral deposits occur on the National Forest lands in Sanders County. Lead, silver, and gold are the important minerals found. 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<br>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 SANDERS 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 Columbia (Missoula) (Hellgate) (Pend'Oreille) (Deer Lodge) River** | **1,693.00** | **255.00** | **1,948.00** |
| **Alder (Donlan) Creek** | **17.00** | **0.00** | **17.00** |
| **Flathead River** | **538.00** | **0.00** | **538.00** |
| Little Bitterroot River | 13,083.00 | 190.00 | 13,273.00 |
| Well | 20.00 | 0.00 | 20.00 |
| Sullivan Creek | 100.00 | 0.00 | 100.00 |
| Well | 77.00 | 0.00 | 77.00 |
| Well | 61.00 | 0.00 | 61.00 |
| Warm Springs Creek | 282.00 | 13.00 | 295.00 |
| Pierre (Mill) Creek | 1.00 | 43.00 | 44.00 |
| Springs | 5.00 | 0.00 | 5.00 |
| Larum Creek | 8.00 | 0.00 | 8.00 |
| Stream | 0.00 | 0.00 | 0.00 |
| Spring | 45.00 | 0.00 | 45.00 |
| Dry Creek | 12.00 | 17.00 | 29.00 |
| Garden Creek | 385.00 | 74.00 | 459.00 |
| Stream | 58.00 | 0.00 | 58.00 |
| Spring | 56.00 | 0.00 | 56.00 |
| Stream | 20.00 | 0.00 | 20.00 |
| Dry Fork Warm Springs (Dry Fork) Creek | 21.00 | 0.00 | 21.00 |
| Markle (Merkle) Creek | 91.00 | 0.00 | 91.00 |
| Spring Branch Creek | 23.00 | 0.00 | 23.00 |
| Stream | 0.00 | 0.00 | 0.00 |
| Spring | 9.00 | 0.00 | 9.00 |
| Christenson Wells | 161.00 | 0.00 | 161.00 |
| Stream | 0.00 | 0.00 | 0.00 |
| Springs | 18.00 | 0.00 | 18.00 |
| Well | 5.00 | 0.00 | 5.00 |
| White Wells | 145.00 | 0.00 | 145.00 |
| Carr Wells | 175.00 | 0.00 | 175.00 |
| Oliver (Oliver Gulch) Creek | 15.00 | 0.00 | 15.00 |
| Stream | 0.00 | 0.00 | 0.00 |
| Springs | 2.00 | 0.00 | 2.00 |
| Malinak Springs & Wells | 130.00 | 0.00 | 130.00 |
| Cameron Reservoir & Wells | 27.00 | 0.00 | 27.00 |
| Well | 20.00 | 0.00 | 20.00 |
| Well | 51.00 | 0.00 | 51.00 |
| Delia (Stillman) (Timber) Creek | 0.00 | 0.00 | 0.00 |
| Springs | 67.00 | 0.00 | 67.00 |
| Stream | 0.00 | 0.00 | 0.00 |
| Springs | 38.00 | 0.00 | 38.00 |
| School Section Gulch | 0.00 | 0.00 | 0.00 |
| Spring | 52.00 | 0.00 | 52.00 |
| Pine Creek | 10.00 | 0.00 | 10.00 |
| Stream | 0.00 | 0.00 | 0.00 |
| Springs | 24.00 | 0.00 | 24.00 |
| **Total Little Bitterroot River & Tributaries** | **15,297.00** | **337.00** | **15,634.00** |
| Mission Creek | 186.00 | 47.00 | 233.00 |
| Newman Well | 227.00 | 0.00 | 227.00 |
| Jocko River | 1,165.00 | 272.00 | 1,437.00 |
| Valley Creek | 167.00 | 0.00 | 167.00 |
| Hewolf Creek | 121.00 | 0.00 | 121.00 |

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

| COLUMBIA RIVER BASIN (Continued) | Present Irrigated Acres | Irrigable Acres Under Present Facilities | Maximum Irrigated & Irrigable Acres Under Present Facilities |
|---|---|---|---|
| North Fork Valley Creek | 156.00 | 0.00 | 156.00 |
| Middle Fork Valley Creek | 303.00 | 0.00 | 303.00 |
| Nicola (Nicada) Creek | 31.00 | 0.00 | 31.00 |
| Slough | 6.00 | 0.00 | 6.00 |
| Creek | 0.00 | 0.00 | 0.00 |
| Stream | 0.00 | 5.00 | 5.00 |
| Slough | 23.00 | 0.00 | 23.00 |
| Selon (Huotte) (Selow) (Seelot) Creek | 12.00 | 0.00 | 12.00 |
| **Total Jocko River & Tributaries** | **1,984.00** | **277.00** | **2,261.00** |
| Revais Creek | 471.00 | 0.00 | 471.00 |
| Canon Creek | 0.00 | 0.00 | 0.00 |
| Slough | 28.00 | 0.00 | 28.00 |
| Magpie Creek | 113.00 | 0.00 | 113.00 |
| West Magpie Creek | 36.00 | 0.00 | 36.00 |
| Magpie Spring Creek | 0.00 | 40.00 | 40.00 |
| Vanderburg Creek | 54.00 | 0.00 | 54.00 |
| Camas (Courville) (Sweet Water) Creek | 462.00 | 0.00 | 462.00 |
| North Fork Camas Creek (Nicala Gulch) | 26.00 | 0.00 | 26.00 |
| Cottonwood Creek | 356.00 | 40.00 | 396.00 |
| North Fork Cottonwood Creek | 46.00 | 0.00 | 46.00 |
| Seepage Spring | 45.00 | 0.00 | 45.00 |
| East Fork Cottonwood Creek | 0.00 | 0.00 | 0.00 |
| Corks Creek | 0.00 | 0.00 | 0.00 |
| Well | 0.00 | 24.00 | 24.00 |
| Well | 0.00 | 40.00 | 40.00 |
| Well | 176.00 | 20.00 | 196.00 |
| Spring | 24.00 | 0.00 | 24.00 |
| Well | 120.00 | 0.00 | 120.00 |
| Spring | 44.00 | 0.00 | 44.00 |
| Well | 41.00 | 0.00 | 41.00 |
| Well | 110.00 | 0.00 | 110.00 |
| Argo Springs | 0.00 | 80.00 | 80.00 |
| Spring Creek | 15.00 | 0.00 | 15.00 |
| Well | 38.00 | 0.00 | 38.00 |
| Michel (Coppage Gully) (Cottonwood) Creek | 30.00 | 0.00 | 30.00 |
| Clear Creek | 246.00 | 0.00 | 246.00 |
| **Total Camas Creek & Tributaries** | **1,779.00** | **204.00** | **1,983.00** |
| Stream | 26.00 | 0.00 | 26.00 |
| Burgess Creek | 26.00 | 0.00 | 26.00 |
| Stream | 8.00 | 0.00 | 8.00 |
| Creek | 45.00 | 0.00 | 45.00 |
| Pickering Well | 0.00 | 35.00 | 35.00 |
| Wilson Creek | 19.00 | 0.00 | 19.00 |
| Stream | 64.00 | 0.00 | 64.00 |
| **Total Flathead River & Tributaries** | **20,901.00** | **940.00** | **21,841.00** |
| **McLaughlin (L'Amoureaux) (Laughlins) Creek** | **2.00** | **0.00** | **2.00** |
| **Henry Creek** | **38.00** | **0.00** | **38.00** |
| **Smileys Slough** | **20.00** | **0.00** | **20.00** |
| **Well** | **121.00** | **0.00** | **121.00** |
| **Boyer (Lynch) Creek** | **116.00** | **36.00** | **152.00** |
| Ryan Creek & Springs (Deemer Creek) | 0.00 | 15.00 | 15.00 |
| **Well** | **28.00** | **0.00** | **28.00** |
| **Well** | **9.00** | **0.00** | **9.00** |
| **Slough** | **33.00** | **0.00** | **33.00** |

| COLUMBIA RIVER BASIN (Continued) | Present Irrigated Acres | Irrigable Acres Under Present Facilities | Maximum Irrigated & Irrigable Acres Under Present Facilities |
|---|---|---|---|
| **Well** | **177.00** | **0.00** | **177.00** |
| **Well** | **133.00** | **0.00** | **133.00** |
| **Well** | **42.00** | **0.00** | **42.00** |
| **Well** | **5.00** | **0.00** | **5.00** |
| **Combest (Combpest) Creek** | **30.00** | **0.00** | **30.00** |
| Well | 42.00 | 0.00 | 42.00 |
| West Fork Combest (Sewell) Creek | 81.00 | 80.00 | 161.00 |
| **Well** | **40.00** | **0.00** | **40.00** |
| **Well** | **119.00** | **0.00** | **119.00** |
| **Well** | **137.00** | **0.00** | **137.00** |
| **Well** | **94.00** | **0.00** | **94.00** |
| **Well** | **156.00** | **0.00** | **156.00** |
| **Well** | **11.00** | **0.00** | **11.00** |
| **Well** | **291.00** | **0.00** | **291.00** |
| **Well** | **58.00** | **0.00** | **58.00** |
| **Lynch (Clark) Creek** | **499.00** | **0.00** | **499.00** |
| West Fork Lynch (Cedar) Creek | 39.00 | 0.00 | 39.00 |
| East Fork Lynch (Hinchwood) Creek | 547.00 | 0.00 | 547.00 |
| Clark's Creek | 0.00 | 0.00 | 0.00 |
| South Fork Clark's Creek | 85.00 | 0.00 | 85.00 |
| (Old) Lansing Slough | 35.00 | 0.00 | 35.00 |
| Stream | 0.00 | 0.00 | 0.00 |
| Stream | 0.00 | 0.00 | 0.00 |
| Well | 8.00 | 0.00 | 8.00 |
| Well | 8.00 | 43.00 | 51.00 |
| Well | 18.00 | 82.00 | 100.00 |
| Well | 36.00 | 0.00 | 36.00 |
| Well | 207.00 | 0.00 | 207.00 |
| Stream | 50.00 | 0.00 | 50.00 |
| Well | 28.00 | 0.00 | 28.00 |
| **Buffalo Bill Creek** | **54.00** | **0.00** | **54.00** |
| Weeksville Creek | 106.00 | 0.00 | 106.00 |
| **Stream** | **0.00** | **0.00** | **0.00** |
| Spring | 38.00 | 0.00 | 38.00 |
| **Swamp Creek** | **427.00** | **71.00** | **498.00** |
| East (Left) Fork Swamp Creek | 16.00 | 0.00 | 16.00 |
| South Branch Swamp Creek | 116.00 | 0.00 | 116.00 |
| Springs & Ponds | 17.00 | 0.00 | 17.00 |
| **Stream** | **0.00** | **0.00** | **0.00** |
| Spring | 41.00 | 6.00 | 47.00 |
| **Stream** | **0.00** | **0.00** | **0.00** |
| Spring | 76.00 | 30.00 | 106.00 |
| **Well** | **52.00** | **0.00** | **52.00** |
| **Slough** | **40.00** | **0.00** | **40.00** |
| **Well** | **0.00** | **21.00** | **21.00** |
| **Squaw (Munson) Creek** | **22.00** | **0.00** | **22.00** |
| **Big Chief Mine Gulch** | **0.00** | **0.00** | **0.00** |
| Spring | 3.00 | 0.00 | 3.00 |
| Vaughn Spring | 20.00 | 0.00 | 20.00 |
| **Spring** | **5.00** | **7.00** | **12.00** |
| **Thompson River** | **0.00** | **0.00** | **0.00** |
| Schroeder Creek | 0.00 | 156.00 | 156.00 |
| Bear (Twin Lakes) Creek | 155.00 | 0.00 | 155.00 |
| Little Thompson River | 0.00 | 0.00 | 0.00 |
| Little Rock Creek | 64.00 | 0.00 | 64.00 |
| **Total Thompson River Tributaries** | **219.00** | **156.00** | **375.00** |

| COLUMBIA RIVER BASIN (Continued) | Present Irrigated Acres | Irrigable Acres Under Present Facilities | Maximum Irrigated & Irrigable Acres Under Present Facilities |
|---|---|---|---|
| **Cherry Creek** | **0.00** | **41.00** | **41.00** |
| **Ashley Creek** | **113.00** | **30.00** | **143.00** |
| **Stream** | **0.00** | **0.00** | **0.00** |
| Mass Spring | 60.00 | 0.00 | 60.00 |
| **Oliver Well** | **7.00** | **0.00** | **7.00** |
| **Prospect Creek** | **4.00** | **0.00** | **4.00** |
| Clear Creek | 4.00 | 0.00 | 4.00 |
| Dry Creek | 0.00 | 24.00 | 24.00 |
| **Total Prospect Creek & Tributaries** | **8.00** | **24.00** | **32.00** |
| **Coleman (Weber) Creek** | **31.00** | **0.00** | **31.00** |
| **Squaw Creek** | **170.00** | **0.00** | **170.00** |
| **Graves Creek** | **0.00** | **0.00** | **0.00** |
| Thorne (South Fork Graves) Creek | 76.00 | 0.00 | 76.00 |
| **Mosquito (Moscow) (Prospect) Creek** | **13.00** | **0.00** | **13.00** |
| Lake Creek | 0.00 | 0.00 | 0.00 |
| Spring | 20.00 | 0.00 | 20.00 |
| **Fantom (Phantom) (Phanthom) Creek** | **32.00** | **0.00** | **32.00** |
| **Deep Creek** | **115.00** | **0.00** | **115.00** |
| **Grimes Creek** | **62.00** | **0.00** | **62.00** |
| **Big Beaver Gulch (West Fork Big Beaver Creek)** | **253.00** | **0.00** | **253.00** |
| Little Beaver Creek | 396.00 | 0.00 | 396.00 |
| White Pine Creek | 53.00 | 0.00 | 53.00 |
| Well | 4.00 | 0.00 | 4.00 |
| **Dry (Tuscor) Creek** | **6.00** | **0.00** | **6.00** |
| Creek | 0.00 | 0.00 | 0.00 |
| Spring | 13.00 | 0.00 | 13.00 |
| **Stream** | **0.00** | **0.00** | **0.00** |
| Reservoir | 29.00 | 36.00 | 65.00 |
| **Swamp Creek** | **375.00** | **747.00** | **1,122.00** |
| Creek | 40.00 | 6.00 | 46.00 |
| **Carlson (Kutter) Creek** | **0.00** | **0.00** | **0.00** |
| Crystal Springs | 0.00 | 15.00 | 15.00 |
| **Elk Creek** | **38.00** | **0.00** | **38.00** |
| Stream | 0.00 | 0.00 | 0.00 |
| Spring | 11.00 | 27.00 | 38.00 |
| **Brewer (Mile) Creek** | **0.00** | **0.00** | **0.00** |
| Stream | 0.00 | 0.00 | 0.00 |
| Spring | 16.00 | 0.00 | 16.00 |
| **GRAND TOTAL FOR SANDERS COUNTY** | **29,147.00** | **2,668.00** | **31,815.00** |

## FLATHEAD IRRIGATION PROJECT

### (Including parts of Flathead and Jocko Valley Districts)

**History**

The Flathead Irrigation Project is on the Flathead Indian Reservation and is located in part of Lake, Sanders and Missoula Counties.

In 1904, Congress authorized a preliminary survey of the reservation lands to determine whether or not an irrigation project was feasible. Three years later, in 1907, an arrangement was made between the office of Indian Affairs and the Reclamation Service whereby the latter would furnish the engineering service for the survey and to carry on the construction work. Engineer Robert S. Stockton was in charge of the first preliminary survey. His report on the feasibility and irrigation development was completed in 1908. Actual construction of the project began in 1909 and has been carried on continuously to the present time. Until April, 1924, the engineering work was done by the Reclamation Service, but since then, all of the work in connection with the Flathead Irrigation Project has been under the Bureau of Indian Affairs.

The irrigated lands are located in Lake, Sanders and Missoula Counties; and extend along the Jocko River from above Arlee to below Dixon; along the Flathead River from Bison Range to Polson; and along the Little Bitterroot River from below Hot Springs to above Lonepine.

Organized under Montana State Law are the Flathead Irrigation District, Mission Irrigation District and Jocko Valley Irrigation District. All three districts were created by a court decree on August 26, 1926. (For the exact location of the land under the two districts in Sanders County see maps in Part II of this report.)

In Sanders County the major part of the irrigation is under the Flathead Irrigation District, with the next largest irrigated acreage under the Jocko Valley District.

The irrigation system of the Camas Division of the Flathead Irrigation District in Sanders County consists of the Camas "A", "B", "C", and "D" Canals, the Alder Creek Ditch, McGinnis Creek Ditch and Briggs Creek Ditch.

The Camas "A" Canal is a direct diversion from the Little Bitterroot River and flows through a tunnel for about one-fourth mile and follows a southerly direction. The Camas "B" and Camas "D" Canals have a common headgate and one-half mile of ditch from Camas "A" which is also fed from the Upper Dry Fork Reservoir. They flow in a southerly and southeasterly direction. The Camas "C" Canal is a direct diversion from the Lower Dry Fork Reservoir. The Alder Creek Ditch is used only as a supplemental water supply from Alder Creek to the Upper Dry Fork Reservoir. The McGinnis Creek Ditch supplies supplemental water for the Camas "C" Canal, following a northeasterly direction for approximately 3 1/2 miles where it spills into Garden Creek and is picked up in the "C" Canal several miles below. The small part of the Mission "H" Canal of the Flathead Irrigation District extends into Sanders County from the north for a distance of approximately 3 miles to vicinity of Dixon.

The irrigation system of the Jocko Valley Division in Sanders County consists of Jocko "J" Canal, Revais Canal, the Revais Pump Canal.

The Jocko "J" Canal enters Sanders County from the east and follows a westerly direction for a distance of about 4 1/2 miles, where it terminates on Selow Creek. The water from the end of the Jocko "J" Canal is pumped via pipeline into the Revais Pump Canal. The Revais Canal diverts directly from Revais Creek and follows an easterly direction for about 4 3/4 miles where it supplies early spring water for the Revais Pump Canal. The Revais Pump Canal from the end of the Jocko "J" Canal follows a generally westerly direction below the Revais Canal for about 4 3/4 miles.

**PRESENT STATISTICS**

**Location:** The location of the irrigated land under the two districts of the Flathead Irrigation Project in Sanders County are:

For the Flathead Irrigation District land irrigated is located in Section 34, T. 24N - R. 24W; Sections 3, 21, 27, 28, 33, 34, 35 and 36, T. 23N - R. 24W; Sections 1-4 inclusive, 9-15 inclusive, 21-27 inclusive, Sections 34, 35 and 36, T. 22 N - R. 23W; Sections 7, 18, 19, 30 and 31, T. 22N - R. 24W; Sections 1, 2, 3, 11, 12 and 13, T. 21N - R. 24W; Section 6, T. 21N - R. 23W; Sections 4, 8 and 9, T. 18N - R. 21W. For the Jocko Valley Irrigation District land irrigated is located in Sections 17-21 inclusive, 26, 27, 28, and Section 36, T. 18N - R. 21W; Sections 13, 22, 23 and 24, T. 18N - R. 22W.

**Length and Capacity of Canals:** The points of diversion, length and capacity of the main canals under the Flathead Irrigation District are: The Camas "A" Canal diverts from the Little Bitterroot River in the E½SE¼, Section 16, T. 24N - R. 24W. This canal has total length including 1/4 mile of tunnel of 8 3/4 miles and has an initial capacity of 90 c.f.s.

The Camas "B" Canal has its point of diversion from the Upper Dry Fork Reservoir in the SE¼SE¼NW¼ of Section 21, T. 23N - R. 24W. This canal is approximately 11 3/4 miles in length with an initial capacity of 85 c.f.s.

The Camas "C" Canal has its point of diversion from the Lower Dry Fork Reservoir in the NW¼SW¼NW¼, Section 3, T. 22N - R. 24 W. This canal is approximately 16 1/4 miles in length and has an initial capacity of 33.5 c.f.s.

The Camas "D" Canal diverts from the Upper Dry Fork Reservoir in the SE¼SE¼NW¼, Section 21, T. 23N - R. 24W. This canal is approximately 6 1/2 miles long, with an initial capacity of about 11.2 c.f.s.

The Alder Creek Ditch which supplies water to the Upper Dry Fork Reservoir has its point of diversion from Alder Creek in the NE¼SW¼, Section 16, T. 23N - R. 25W. This ditch is approximately 5 1/2 miles in length and has an initial capacity of 64.6 c.f.s.

The McGinnis Creek Ditch supplies a supplemental water supply for the Camas "C" Canal and diverts from McGinnis Creek from the SW¼NE¼, Section 34, T. 22N - R. 25W. The ditch has an initial capacity of 58.7 c.f.s. and is approximately 3 1/2 miles long.

The Briggs Creek Ditch diverts into Hubbart Reservoir with its point of diversion in the NE¼SW¼, Section 24, T. 25N - R. 25W. The ditch has an initial capacity of 80 c.f.s. and is approximately 2 miles long.

The Mission "H" Canal has its point of diversion from Mission Creek in the SE¼NW¼, Section 36, T. 19N - R. 21W, in Lake County. From where it enters Sanders County, this canal follows a southerly direction from approximately 3 miles, with a capacity of 22 c.f.s.

Under the Jocko Valley Irrigation District the following are the points of diversions, length and capacities of the main canals. The Lower Jocko "J" Canal has its point of diversion from the Jocko River in the NE¼NW¼, Section 31, T. 18N - R. 20W, Lake County. This canal has a total length of approximately 6 miles, with about 5 1/4 miles extending into Sanders County and has a capacity of 24.6 c.f.s.

The Revais Pump Canal has its point of beginning in the NE¼SW¼SW¼, Section 20, T. 18N - R. 21W. It has a length of approximately 4 3/4 miles and an initial capacity of 10 c.f.s.

The Revais Canal diverts from Revais Creek in the SW¼NW¼, Section 23, T. 18N - R. 22W. It follows an easterly direction from its point of diversion for approximately 4 3/4 miles and has an initial capacity of 38.0 c.f.s. This canal supplies water to the Revais Pump Canal.

**Size and Capacity of Reservoirs:** The following storage reservoirs are used in connection with the Camas Division of the Flathead Irrigation District in Sanders County.

The Little Bitterroot Reservoir is located approximately 35 miles north of Hot Springs, in Flathead County, and has a capacity of 24,000 acre-feet.

The Hubbart Reservoir is located on the Little Bitterroot River about 22 miles north of Hot Springs, in Flathead County, and has a capacity of 12,125 acre-feet.

The Upper Dry Fork Reservoir is an off-stream storage reservoir on a tributary of the Little Bitterroot River and is located about 9 miles north of Hot Springs and has a capacity of 2,814 acre-feet.

The Lower Dry Fork Reservoir is an off-stream storage reservoir on a tributary of the Little Bitterroot River and is located about 6 miles north of Hot Springs and has a capacity of 3,856 acre-feet.

**Operation and Maintenance:** The water charge per acre on this project includes both operation and maintenance and the cost of pumped water. The charges for the different type of land ownership on the Flathead Project vary annually with the changing costs and acreages, an example follows:

**White Owned Land (1968)**

| | |
|---|---|
| Flathead Irrigation District | $3.49 per acre |
| Jocko Valley Irrigation District | $3.21 per acre |

**Indian Owned Land**

| | |
|---|---|
| Camas Division | $3.30 per acre |
| Jocko Valley Division | $2.96 per acre |

**Present Users:** Under the Flathead Irrigation Project in Sanders County in 1968 there were 117 water users listed for the Flathead Irrigation District and there were 30 water users for the Jocko Valley Irrigation District.

**Acreage Irrigated:** In 1968 the two districts of the project had the following irrigated acreage: Flathead Irrigation District had 11,335 acres irrigated with 201 acres potentially irrigable under existing facilities, making a maximum irrigable acres of 11,536; for the Jocko Valley Irrigation District there were 1,132 acres irrigated with 87 acres potentially irrigable under existing facilities, making a total of 1,219 maximum irrigable acres.

**WATER RIGHT DATA**

An appropriation from Dry Creek dated 12-27-09 for 80,000 miner's inches; (Reference: Book A, page 15, Water Right Records); from Dry Creek dated 12-27-09 for 40,000 miner's inches; (Reference: Book A, page 18, Water Right Records); from Jocko River dated 1-22-10 for 200,000 miner's inches; (Reference: Book A, page 34, Water Right Records); from Jocko River dated 5-21-13 for 16,000 miner's inches; (Reference: Book A, page 268, Water Right Records); from Jocko River dated 9-7-20 for All; (Reference: Book A, page 371, Water Right Records); from Middle Fork Jocko River dated 11-23-11 for 4,000 miner's inches; (Reference: Book A, page 81, Water Right Records); from North Fork Jocko River dated 7-21-11 for 16,000 miner's inches; (Reference: Book A, page 72, Water Right Records); from South Fork Jocko River dated 11-23-11 for 8,000 miner's inches; (Reference: Book A, page 79, Water Right Records); from Mission Creek dated 12-27-09 for 120,000 miner's inches; (Reference: Book A, page 12, Water Right Records); from Mission Creek dated 3-8-10 for 160 miner's inches; (Reference: Book A, page 49, Water Right Records); from Mission Creek dated 7-1-10 for 8,000 miner's inches; (Reference: Book A, page 264, Water Right Records); from Mission Creek dated 3-13-13 for 8,000 miner's inches; (Reference: Book A, page 91, Water Right Records); from Mission Creek dated 3-14-13 for 6,000 miner's inches; (Reference: page 232, Water Right Records); from Mission Creek dated 4-2-13 for 12,000 miner's inches; (Reference: Book A, page 260, Water Right Records).

The above listed appropriations may be found in the County Clerk and Recorder's Office, Polson, Montana.

An appropriation from Griffin Creek dated 10-14-42 for 8,000 miner's inches; (Reference: Book 250, page 45, Miscellaneous Records); from Little Bitterroot River dated 9-1-09 for 40,000 miner's inches; (Reference: Book 71, page 364, Water Right Records); from Little Bitterroot River dated 12-21-13 for 400,000 miner's inches; (Reference: Book 71, page 376, Water Right Records); from Little Bitterroot River dated 12-21-13 for 400,000 miner's inches; (Reference: Book 71, page 500, Water Right Records); from Little Bitterroot River dated 12-20-13 for 400,000 miner's inches; (Reference: Book 71, page 502, Water Right Records).

The above listed appropriations may be located in the County Clerk and Recorder's Office, Kalispell, Montana.

An appropriation from Jocko River dated 12-27-09 for 1,600 miner's inches; (Reference: Book D, page 524, Water Right Records); from Jocko River dated 1-27-23 for 8,000 miner's inches; (Reference: Book J, page 211, Water Right Records); from Jocko River dated 4-2-10 for 200,000 miner's inches; (Reference: Book D, page 559, Water Right Records); from Placid Creek dated 5-9-31 for 8,000 miner's inches; (Reference: Book J, page 287, Water Right Records); from Placid Creek dated 5-7-34 for 200 miner's inches; (Reference: Book J, page 324, Water Right Records).

The above listed appropriations may be located in the County Clerk and Recorder's Office, Missoula, Montana.

An appropriation from Alder Creek dated 7-19-32 for 3,000 miner's inches; (Reference: Book 3, page 118, Water Right Records); from Camas Creek dated 10-2-09 for 40,000 miner's inches; (Reference: Book 1, page 332, Water Right Records); from Cottonwood Creek dated 10-15-21 for 40,000 miner's inches; (Reference: Book 3, page 89, Water Right Records); from Dog Lake dated 10-15-21 for 40,000 miner's inches; (Reference: Book 3, page 86, Water Right Records); from Garden Creek dated 3-9-17 for 40,000 miner's inches; (Reference: Book 3, page 21, Water Right Records); from Little Bitterroot River dated 10-2-09 for 200,000 miner's inches; (Reference: Book 1, page 341, Water Right Records); from Little Bitterroot River dated 12-22-13 for 200,000 miner's inches; (Reference: Book 1, page 591, Water Right Records); from Little Bitterroot River dated 3-18-17 for 400,000 miner's inches; (Reference: Book 3, page 18, Water Right Records); from Markle Creek dated 2-25-13 for 40,000 miner's inches; (Reference: Book 1, page 537, Water Right Records); from McGinnis Creek dated 7-31-39 for 2,400 miner's inches; (Reference: Book 3, page 180, Water Right Records); from Mitchell Creek dated 10-15-21 for 4,000 miner's inches; (Reference: Book 3, page 92, Water Right Records); from Revais Creek dated 1-17-23 for 8,000 miner's inches; (Reference: Book 3, page 106, Water Right Records); from Selow Creek dated 3-1-13 for 1,600 miner's inches; (Reference: Book 1, page 568, Water Right Records); from Sullivan Creek dated 10-2-09 for 200,000 miner's inches; (Reference: Book 1, page 339, Water Right Records); from Sullivan Creek dated 3-8-17 for 200,000 miner's inches; (Reference: Book 3, page 15, Water Right Records); from Sullivan Creek dated 12-22-13 for 200,000 miner's inches; (Reference: Book 1, page 598, Water Right Records); from Sweetwater Creek dated 10-15-21 for 8,000 miner's inches; (Reference: Book 3, page 95, Water Right Records); from Warm Springs Creek dated 3-9-17 for 40,000 miner's inches; (Reference: Book 3, page 27, Water Right Records); from Dry Fork Warm Springs Creek dated 3-9-17 for 80,000 miner's inches; (Reference: Book 3, page 24, Water Right Records); from Unnamed Stream dated 10-2-09 for 4,000 miner's inches; (Reference: Book 1, page 345, Water Right Records); from Unnamed Stream dated 12-23-13 for 4,000 miner's inches; (Reference: Book 1, page 594, Water Right Records); from Unnamed Stream dated 10-2-09 for 4,000 miner's inches; (Reference: Book 1, page 349, Water Right Records); from Unnamed Stream dated 10-2-09 for 40,000 miner's inches; (Reference: Book 1, page 351, Water Right Records); from Unnamed Stream dated 12-23-13 for 4,000 miner's inches; (Reference: Book 1, page 584, Water Right Records); from Unnamed Stream dated 7-31-39 for 1,000 miner's inches; (Reference: Book 3, page 176, Water Right Records); from Unnamed Stream dated 7-31-39 for 1,000 miner's inches; (Reference: Book 3, page 183, Water Right Records); from Unnamed Stream dated 7-31-39 for 1,000 miner's inches; (Reference: Book 3, page 186, Water Right Records); from Unnamed Stream dated 10-2-09 for 40,000 miner's inches; (Reference: Book 1, page 334, Water Right Records); from Unnamed Stream dated 10-2-09 for 4,000 miner's inches; (Reference: Book 1, page 328, Water Right Records); from Unnamed Stream dated 10-2-09 for 8,000 miner's inches; (Reference: Book 1, page 330, Water Right Records); from Unnamed Stream dated 12-27-09 for 800 miner's inches; (Reference: Book 1, page 368, Water Right Records); from Unnamed Stream dated 10-15-21 for 20,000 miner's inches; (Reference: Book 3, page 98, Water Right Records); from Unnamed Spring dated 10-2-09 for 40,000 miner's inches; (Reference: Book 1, page 343, Water Right Records); from Unnamed Spring dated 2-26-13 for 800 miner's inches; (Reference: Book 1, page 541, Water Right Records); from Unnamed Spring dated 2-27-13 for 4,000 miner's inches; (Reference: Book 1, page 545, Water Right Records).

The above listed appropriations may be located in the County Clerk and Recorder's Office, Thompson Falls, Montana.

(See maps in Part II of this report: Flathead Irrigation District pages 2, 17, 18, 23, 26 and 30; Jocko Valley Irrigation District pages 2 and 3.)

## GREEN MOUNTAIN PROJECT
## (GREEN MOUNTAIN WATER USERS ASSOCIATION)
## M. W. R. B.

**History**

This project consists of a canal and diversion headworks from Swamp Creek which diverts water into various laterals for irrigation of the project lands. The project is located on the east side of the Clark Fork River, about 30 miles below Thompson Falls. Construction work consisted of the diversion works, main canal, farm ditches and appurtenant headgates, drops, turn-outs, roads, culverts, etc. Originally water was to be diverted by a gravity system from Swamp Creek to irrigate 36 tracts of land, aggregating approximately 1,800 acres. This project first started to operate during the irrigation season of 1941.

Since 1948, the Green Mountain Project has been inactive in its operation and has been more or less in a dormant state. At the present time the Green Mountain Water Users Association has accumulated a large indebtedness of several thousands of dollars, with the whole system in a very poor state of repair. There is a lack of interest in rehabilitation of the project by a majority of the water users in assuming the past indebtedness and commitments for additional financing to reconstruct the irrigation system.

One of the original requirements in the construction of the project was the formation of the Green Mountain Water Users Association for the purpose of administering and entering into contracts with Water Conservation Board.

The following information was compiled during our survey on the land irrigable and irrigated at the present time (1968).

**PRESENT STATISTICS**

**Location:** Lands irrigable and irrigated under the ditch system are located in Sections 19, 20, 29, 30, 31, 32 and 33, T. 25N - R. 31W; Sections 23, 24 and 25, T. 25N - R. 32W.

**Length and Capacity of Canal:** The main canal has its point of diversion from Swamp Creek in the NE¼NE¼, Section 20, T. 25N - R. 31W. The main canal runs in a southerly direction for approximately 3 1/2 miles with an initial capacity of 50 c.f.s. Including the main canal the original ditch system consisted of about 8 miles of laterals and 8 miles of farm ditches, totaling 19 miles of ditches.

**Operation and Maintenance:** Under this project operation and maintenance charges were included in the total repayment costs which were 60 cents for each miner's inch of water purchased.

**Present Users:** At the time of our survey, during the summer of 1968, there were 26 water users under the project with approximately one-half of them using some water for irrigation of small tracts.

**Acreage Irrigated:** In 1968, our survey found 375 acres of land irrigated and 747 acres potentially irrigable under the Green Mountain Water Users Association Project.

**WATER RIGHT DATA**

The water right for the Green Mountain Project was made by the State Water Conservation Board from Swamp Creek dated 5-18-39 for all unappropriated waters; (Reference: Book 3, page 175, Water Right Records); County Clerk and Recorder's Office, Thompson Falls, Sanders County, Montana.

(See maps in Part II, pages 32 and 33.)

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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) (Pend Oreille) (Deer Lodge) River** | 59 | 20,041,405.00 | 501,035.13 | | | | |
| **Alder Creek (Donlan Creek)** | 2 | 200.00 | 5.00 | | | | |
| **Sesame Creek** | 1 | 50.00 | 1.25 | | | | |
| **Dunns Draw** | 1 | 100.00 | 2.50 | | | | |
| **Patrick Creek** | 1 | 60.00 | 1.50 | | | | |
| **Fourteen Mile Creek** | 2 | 100.00 | 2.50 | | | | |
| **Zeigler Creek (Siegle Creek)** | 2 | 4,200.00 | 105.00 | | | | |
| Taylor Creek | 1 | 300.00 | 7.50 | | | | |
| **Flathead River** | 14 | 22,800,945.00 | 570,023.63 | | | | |
| Stillwater River | 0 | 0.00 | 0.00 | | | | |
| Middle Fork Stillwater River (Good Creek) | 0 | 0.00 | 0.00 | | | | |
| South Fork Stillwater River (Logan Creek) | 0 | 0.00 | 0.00 | | | | |
| Griffin Creek | 1 | 8,000.00 | 200.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Springs | 1 | 5.00 | .13 | | | | |
| Little Bitterroot River | 26 | 1,602,270.00 | 40,056.75 | | | | |
| Crossing Creek | 3 | 240.00 | 6.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Bassoo Creek | 0 | 0.00 | 0.00 | | | | |
| Mill Creek (Mill Pocket Creek) | 1 | 40,000.00 | 1,000.00 | | | | |
| Stream | 2 | 8,000.00 | 200.00 | | | | |
| Sullivan Creek | 19 | 603,025.00 | 15,075.63 | | | | |
| Sullivan Springs | 6 | 1,700.00 | 42.50 | | | | |
| Spring | 2 | 400.00 | 10.00 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Spring | 1 | 100.00 | 2.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Werths Spring | 1 | 200.00 | 5.00 | | | | |
| Rileys Spring | 1 | 200.00 | 5.00 | | | | |
| Waste Water of Camas Division "B" Canal | 1 | 80.00 | 2.00 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Artesian well | 1 | 20.00 | .50 | | | | |
| Warm Springs Creek | 23 | 161,410.00 | 4,035.25 | 2221 | 10 | 290.00 | 7.25 |
| Spring | 1 | All | --- | | | | |
| Pierre Creek (Mill Creek) | 4 | 95.00 | 2.38 | | | | |

*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 SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| Larum Creek | 1 | 15.00 | .38 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Pitts Spring | 2 | 720.00 | 18.00 | | | | |
| Dry Creek | 2 | 50.00 | 1.25 | | | | |
| Creek | 1 | 1,000.00 | 25.00 | | | | |
| Stream | 2 | 2,000.00 | 50.00 | | | | |
| Garden Creek | 8 | 80,944.00 | 2,023.60 | | | | |
| Stream | 2 | 180.00 | 4.50 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Stream | 1 | 80.00 | 2.00 | | | | |
| Stream | 1 | 40,000.00 | 1,000.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Dry Fork Warm Springs Creek (Dry Fork Creek) | 8 | 248,160.00 | 6,204.00 | | | | |
| Finley Creek | 1 | 100.00 | 2.50 | | | | |
| Letzen Creek | 2 | 8,000.00 | 200.00 | | | | |
| Little Creek | 1 | 40.00 | 1.00 | | | | |
| Spring | 1 | 50.00 | --- | | | | |
| Stream | 1 | All | 1.00 | | | | |
| Stream | 1 | 40.00 | 1.25 | | | | |
| Markle Creek (Merkle Creek) | 5 | 80,000.00 | 2,000.00 | | | | |
| Spring Branch Creek | 3 | 230.00 | 5.75 | | | | |
| Spring | 1 | 100.00 | 2.50 | | | | |
| Morgan Creek | 2 | 120.00 | 3.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 32.00 | .80 | | | | |
| Spring | 2 | 20.00 | .50 | | | | |
| Stream | 1 | 10.00 | .25 | | | | |
| Spring | 3 | 240.00 | 6.00 | | | | |
| Spring | 1 | 10.00 | .25 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 300.00 | 7.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Springs | 1 | 200.00 | 5.00 | | | | |
| Wilks Creek | 2 | 8.00 | .20 | | | | |
| Pond or Lake | 1 | 50.00 | 1.25 | | | | |
| Willow Brook | 1 | 3.60 | .09 | | | | |
| Spring Creek (Dan Spring Creek) | 2 | 320.00 | 8.00 | | | | |
| Dan Springs | 2 | 160.00 | 4.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Springs | 2 | 50.00 | 1.25 | | | | |
| Oliver Creek (Oliver Gulch) | 1 | 160.00 | 4.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Blackman Spring | 1 | 40.00 | 1.00 | 1445 | [illegible] | All | --- |
| Spencer Spring | 1 | 60.00 | 1.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Bartlett Spring | 1 | 25.00 | .63 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| STREAM | APPROPRIATIONS (Filings of Record) No. of Filings | Miner's Inches | Cu. Ft. Per Sec. | Case No. | DECREED RIGHTS No. of Decrees | Miner's Inches | Cu. Ft. Per Sec. |
|---|---|---|---|---|---|---|---|
| Patton Spring | 1 | 25.00 | .63 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Springs | 1 | 25.00 | .63 | | | | |
| Big Gulch | 0 | 0.00 | 0.00 | | | | |
| South Fork Big Gulch (South West Fork Little Bitterroot River) | 1 | 160.00 | 4.00 | | | | |
| North Fork Big Gulch | 2 | 16.00 | .40 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Thomsen Spring | 1 | 20.00 | .50 | | | | |
| Unnamed Ravine | 1 | 40.00 | 1.00 | | | | |
| Whiskey Creek | 1 | 150.00 | 3.75 | | | | |
| Magpie Creek | 2 | 320.00 | 8.00 | | | | |
| Delia Creek (Stillman Creek) (Timber Creek) | 3 | 200.00 | 5.00 | | | | |
| Springs | 1 | 60.00 | 1.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Springs | 1 | 10.00 | .25 | | | | |
| Streams | 1 | 4,000.00 | 100.00 | | | | |
| Springs | 1 | 4,000.00 | 100.00 | | | | |
| School Section Gulch | 1 | 40.00 | 1.00 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| Stream | 1 | 20.00 | .50 | | | | |
| Springs | 2 | 45.00 | 1.13 | | | | |
| Creek | 2 | 120.00 | 3.00 | | | | |
| Springs | 1 | 40.00 | 1.00 | | | | |
| Springs | 1 | 40.00 | 1.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Pine Creek | 2 | 320.00 | 8.00 | | | | |
| Springs | 1 | 40.00 | 1.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Springs | 1 | 25.00 | .63 | | | | |
| Spring | 1 | 100.00 | 2.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Big Spring | 1 | 40.00 | 1.00 | | | | |
| Springs | 2 | 200.00 | 5.00 | | | | |
| Springs | 1 | --- | 27.2 A/F | | | | |
| **Total Little Bitterroot River & Tributaries** | **206** | **2,891,453.60** | **72,286.38** | | **11** | **290.00** | **7.25** |
| Creek | 1 | 100.00 | 2.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Eneas Springs | 1 | 60.00 | 1.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 25.00 | .63 | | | | |
| Bowser Coulee | 1 | 160.00 | 4.00 | | | | |
| Jocko River | 15 | 483,355.00 | 12,083.88 | | | | |
| Valley Creek | 12 | 5,100.00 | 127.50 | | | | |
| Hewolf Creek | 1 | 20.00 | .50 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| North Fork Valley Creek | 11 | 670.00 | 16.75 | | | | |
| North Fork of North Fork Valley Creek | 1 | --- | --- | | | | |
| Middle Fork Valley Creek | 3 | 580.00 | 14.50 | | | | |
| Nicola Creek (Nicada Cr.) | 1 | 60.00 | 1.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 3 | 200.00 | 5.00 | | | | |
| Stream | 1 | 40.00 | 1.00 | | | | |
| Creek | 4 | 190.00 | 4.75 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 80.00 | 2.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Springs | 1 | 100.00 | 2.50 | | | | |
| Selon Creek (Huotte Cr.) (Selow Cr.) (Seelot Cr.) | 8 | 3,825.00 | 95.63 | 1245 | 1 | 80.00 | 2.00 |
| Spring | 1 | 320.00 | 8.00 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Springs | 1 | All | --- | | | | |
| Spring | 1 | 4.00 | .10 | | | | |
| Spring | 2 | 10.00 | .25 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| **Total Jocko River & Tributaries** | **69** | **494,614.00** | **12,365.36** | | **1** | **80.00** | **2.00** |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 40.00 | 1.00 | | | | |
| Revais Creek | 22 | 57,213.00 | 1,430.33 | | | | |
| Middle Fork Revais Creek | 1 | 450.00 | 11.25 | | | | |
| West Fork Revais Creek | 1 | 150.00 | 3.75 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 70.00 | 1.75 | | | | |
| Springs | 1 | 100.00 | 2.50 | | | | |
| Canon Creek | 1 | 75.00 | 1.88 | | | | |
| Springs | 3 | 37.00 | .93 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Mineral Spring | 1 | 75.00 | 1.88 | | | | |
| Stream | 1 | 40.00 | 1.00 | | | | |
| Bacon Creek | 1 | 18.00 | .45 | | | | |
| First Right Fork Revais Creek | 1 | 400.00 | 10.00 | | | | |
| Wenatchee Creek (Spring Creek) | 4 | 330.00 | 8.25 | | | | |
| Magpie Creek | 5 | 8,324.00 | 208.10 | | | | |
| Magpie Spring Creek | 3 | 890.00 | 22.25 | | | | |
| Creek | 2 | 400.00 | 10.00 | | | | |
| Vanderburg Creek | 2 | 300.00 | 7.50 | | | | |
| Magpie Creek | 4 | 1,450.00 | 36.25 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| Spring | 1 | 3.00 | .08 | | | | |
| Spring | 1 | 3.00 | .08 | | | | |
| Spring | 2 | 50.00 | 1.25 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Guyette Spring No. 1 | 1 | 50.00 | 1.25 | | | | |
| Guyette Spring No. 2 | 1 | 50.00 | 1.25 | | | | |
| Guyette Spring No. 3 | 1 | 50.00 | 1.25 | | | | |
| Race Track Springs | 1 | 160.00 | 4.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Weatherly Spring | 1 | 30.00 | .75 | | | | |
| Lost Creek | 1 | 100.00 | 2.50 | | | | |
| Camas Creek (Courville Creek) (Sweet Water Creek) | 17 | 65,390.00 | 1,634.75 | | | | |
| Stream | 1 | 8,000.00 | 200.00 | | | | |
| Garden Creek | 1 | 40.00 | 1.00 | | | | |
| Mill Creek | 3 | 250.00 | 6.25 | | | | |
| Seepage Spring Creek | 1 | 100.00 | 2.50 | | | | |
| Webber Spring | 1 | 4,000.00 | 100.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Cold Spring | 1 | 80.00 | 2.00 | | | | |
| North Fork Camas Creek (Nicala Gulch) | 3 | 400.00 | 10.00 | | | | |
| North Fork of North Fork Camas Creek | 1 | 120.00 | 3.00 | | | | |
| South Fork of North Fork Camas Creek | 1 | 180.00 | 4.50 | | | | |
| Spring | 1 | 800.00 | 20.00 | | | | |
| Cottonwood Creek | 21 | 121,822.00 | 3,045.55 | | | | |
| North Fork Cottonwood Creek | 1 | 150.00 | 3.75 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Dry Creek | 1 | 50.00 | 1.25 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 5.00 | .13 | | | | |
| East Fork Cottonwood Cr. | 1 | 100.00 | 2.50 | | | | |
| Corks Creek | 4 | 500.00 | 12.50 | | | | |
| East Fork Corks Cr. | 1 | 200.00 | 5.00 | | | | |
| Spring | 1 | 1,600.00 | 40.00 | | | | |
| Spring | 1 | 4.00 | .10 | | | | |
| Prospect Cr. | 1 | 160.00 | 4.00 | | | | |
| Underground Stream | 1 | 100.00 | 2.50 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| Spring Creek | 1 | 100.00 | 2.50 | | | | |
| Spring | 1 | 10.00 | .25 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Micharl Creek (Michel Creek) | 4 | 12,160.00 | 304.00 | | | | |
| South Fork Micharl Creek (Michel Creek) | 3 | 160.00 | 4.00 | | | | |
| Stream | 1 | 80.00 | 2.00 | | | | |
| Spring | 1 | 200.00 | 5.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 80.00 | 2.00 | | | | |
| Stream | 2 | --- | 34 A/F | | | | |
| Michel Creek (Coppage Gully Creek) (Cottonwood Cr.) | 5 | 4,240.00 | 106.00 | | | | |
| Smiths Spring | 1 | 40.00 | 1.00 | | | | |
| Creek | 1 | 20.00 | .50 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| Kline Creek | 1 | 40.00 | 1.00 | | | | |
| Stream | 2 | 65.00 | 1.63 | | | | |
| Bianco Spring | 1 | 10.00 | .25 | | | | |
| Clear Creek | 5 | 60,130.00 | 1,503.25 | | | | |
| Spring | 1 | 30.00 | .75 | | | | |
| **Total Camas Creek & Tributaries** | **100** | **281,476.00** | **7,036.91** | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 30.00 | .75 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 30.00 | .75 | | | | |
| Spring Creek | 1 | 100.00 | 2.50 | | | | |
| Spring | 1 | 1.00 | .03 | | | | |
| Burgess Creek | 2 | 165.00 | 4.13 | | | | |
| Olive Creek | 1 | 200.00 | 5.00 | | | | |
| Creek | 2 | 210.00 | 5.25 | | | | |
| Stream | 1 | 72.00 | 1.80 | | | | |
| Robinson Creek (Robertson Creek) | 3 | 365.00 | 9.13 | | | | |
| Creek | 4 | 300.00 | 7.50 | | | | |
| Wilson Creek | 8 | 497.00 | 12.43 | | | | |
| Joe Seapee Creek | 2 | 550.00 | 13.75 | | | | |
| Spring | 1 | 80.00 | 2.00 | | | | |
| Mintline Creek | 2 | 240.00 | 6.00 | | | | |
| Creek | 1 | 10.00 | .25 | | | | |
| Spring | 1 | 10.00 | .25 | | | | |
| Stream | 1 | 400.00 | 10.00 | | | | |
| **Total Flathead River & Tributaries** | **495** | **26,550,956.60** | **663,774.04** | | | | |
| **McLaughlin Creek (L'Amoureaux Creek) (Laughlins Creek)** | **3** | **940.00** | **23.50** | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| North Fork McLaughlin Creek (North Fork, North East Fork L'Amoureaux Creek) | 2 | 320.00 | 8.00 | | | | |
| Dry Creek | 1 | 80.00 | 2.00 | | | | |
| Spring | 1 | 1.00 | .03 | | | | |
| **Taylor Creek** | **0** | **0.00** | **0.00** | | | | |
| South Fork Taylor Creek | 1 | 160.00 | 4.00 | | | | |
| West Fork Taylor Creek | 2 | 360.00 | 9.00 | | | | |
| **Creek** | **1** | **50.00** | **1.25** | | | | |
| **Spring** | **1** | **10.00** | **.25** | | | | |
| **Tony's Creek** | **1** | **100.00** | **2.50** | | | | |
| **Henry Creek** | **3** | **440.00** | **11.00** | | | | |
| **Smileys Slough** | **1** | **200.00** | **5.00** | | | | |
| **Sink Hole Creek** | **1** | **75.00** | **1.88** | | | | |
| Sink Hole Spring | 2 | 130.00 | 3.25 | | | | |
| **Boyer Creek (Lynch Creek)** | **17** | **3,437.00** | **85.93** | **Amend 1420-a Sup. Ct. 5612-b** | **4** | **180.00** | **4.50** |
| Wagner Creek | 1 | 160.00 | 4.00 | | | | |
| Dog Lake (Rainbow Lake) | 5 | 167,000.00 | 4,175.00 | | | | |
| Dog Lake Creek | 1 | 150.00 | 3.75 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Ryan Creek & Springs (Deemer Creek) | 4 | 384.00 | 9.60 | 273 | 2 | All | --- |
| Stream | 0 | 0.00 | **1.25** | | | | |
| Spring | 1 | 200.00 | 0.00 | | | | |
| Spring | 1 | 7.00 | 5.00 | | | | |
| **Stream** | **0** | **0.00** | .18 | | | | |
| Spring | 1 | 1.00 | **0.00** | | | | |
| **Spring** | **1** | **50.00** | .03 | | | | |
| **Combest Creek (Combpest Creek)** | **4** | **1,460.00** | **36.50** | | | | |
| Second Creek | 1 | 40.00 | 1.00 | | | | |
| East Fork Combest Creek (First Creek) | 3 | 320.00 | 8.00 | | | | |
| Meadow Lark Spring | 2 | All | --- | | | | |
| Miller Creek (West Fork Combest Cr.) | 3 | 580.00 | 14.50 | | | | |
| Spring | 2 | All | --- | | | | |
| Slough | 1 | 100.00 | **2.50** | | | | |
| West Fork Combest Creek (Sewell Cr.) | 3 | 940.00 | 23.50 | | | | |
| **Black Jack Gulch** | **0** | **0.00** | **0.00** | | | | |
| Black Jack Spring | 3 | 111.50 | 2.79 | | | | |
| Group of Springs | 1 | 100.00 | 2.50 | | | | |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 2 | 4.00 | .10 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| **Lynch Creek (Clark Creek)** | 8 | 1,266.00 | 31.65 | 2888 | 2 | 520.00 | 13.00 |
| | | | | 1134 | 5 | 824.00 | 20.60 |
| | | | | 1599 | 1 | 100.00 | 2.50 |
| | | | | See Case No. 2888 | | | |
| West Fork Lynch Creek (Cedar Creek) | 5 | 670.00 | 16.75 | | | | |
| Waste Water | 1 | 160.00 | 4.00 | | | | |
| East Fork Lynch Creek (Hinchwood Creek) | 7 | 2,020.00 | 50.50 | See Case No.'s 2888 & 1134 | | | |
| Clark's Creek | 8 | 1,454.00 | 36.35 | | | | |
| South Fork Clark's Creek | 3 | 400.00 | 10.00 | | | | |
| Spring | 3 | 120.00 | 3.00 | | | | |
| Springs | 1 | 160.00 | 4.00 | | | | |
| Lansing Slough (Old Lansing Slough) | 2 | 300.00 | 7.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 8.00 | .20 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Magpie Spring | 1 | 10.00 | .25 | | | | |
| Underground Stream | 1 | 50.00 | 1.25 | | | | |
| Stream | 1 | 60.00 | 1.50 | | | | |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 2 | 102.00 | 2.55 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 30.00 | .75 | | | | |
| **Buffalo Bill Creek** | **2** | **400.00** | **10.00** | | | | |
| Smiley Creek | 1 | All | --- | | | | |
| Silver Thorn Spring | 2 | 40.00 | 1.00 | | | | |
| Creek | 1 | 160.00 | 4.00 | | | | |
| Weeksville Creek | 4 | 1,020.00 | 25.50 | | | | |
| West Fork Weeksville Creek | 1 | 500.00 | 12.50 | | | | |
| East Fork Weeksville Creek | 1 | 500.00 | 12.50 | | | | |
| **Stream** | **1** | **40.00** | **1.00** | | | | |
| Spring | 1 | All | --- | | | | |
| **Swamp Creek** | **11** | **4,869.00** | **121.73** | | | | |
| North Fork Swamp Creek (West Fork Swamp Creek) | 3 | 4,540.00 | 113.50 | | | | |
| South Fork of North Fork Swamp Cr. | 2 | 320.00 | 8.00 | | | | |
| East Fork Swamp Creek (Left Fork) | 1 | 100.00 | **2.50** | | | | |
| South Branch Swamp Creek | 4 | 2,150.00 | 53.75 | | | | |
| Springs & Ponds | 1 | 300.00 | 7.50 | | | | |
| **Beaton Creek** | **1** | **300.00** | **7.50** | | | | |
| **Wilkins Creek** | **1** | **400.00** | **10.00** | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | 60.00 | 1.50 | | | | |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Springs | 2 | 20.00 | .50 | | | | |
| **Eddy Creek (Big Eddy Creek)** | **8** | **3,240.00** | **81.00** | | | | |
| Rough Journey Creek | 2 | 2,000.00 | 50.00 | | | | |
| Crossman Gulch | 1 | 75.00 | 1.88 | | | | |
| **Squaw Creek (Munson Creek)** | **6** | **1,215.00** | **30.38** | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 1.00 | .03 | | | | |
| **Unnamed Spring Creek** | **1** | **50.00** | **1.25** | | | | |
| **Dry Creek** | **1** | **200.00** | **5.00** | | | | |
| **Big Chief Mine Gulch** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | All | --- | | | | |
| Vaughn Spring | 1 | 300.00 | 7.50 | | | | |
| **Thompson River** | **11** | **70,000.00** | **1,750.00** | | | | |
| Schroeder Creek | 1 | 320.00 | 8.00 | | | | |
| Cold Spring Creek | 1 | 200.00 | 5.00 | | | | |
| Springs | 1 | 40.00 | 1.00 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| Bear Creek (Twin Lakes Creek) | 1 | 200.00 | 5.00 | | | | |
| Indian Creek | 0 | 0.00 | 0.00 | | | | |
| Stream | 1 | 200.00 | 5.00 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 1.00 | .03 | | | | |
| Spring Creek | 1 | 14.00 | .35 | | | | |
| Spring | 2 | 200.00 | 5.00 | | | | |
| Little Thompson River | 2 | 400.00 | 10.00 | | | | |
| Alder Creek | 1 | 3,000.00 | 75.00 | | | | |
| Nancy Creek | 0 | 0.00 | 0.00 | | | | |
| Meadow Creek | 1 | 160.00 | 4.00 | | | | |
| Spring | 1 | 3.00 | .08 | | | | |
| McGinnis Creek (West Fork McGinnis Creek) | 3 | 3,413.60 | 85.34 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 1.00 | .03 | | | | |
| Little Rock Creek | 2 | 200.00 | 5.00 | | | | |
| Martin Creek | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Fish Trap Creek | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 7.00 | .18 | | | | |
| Creek | 1 | 2.00 | .05 | | | | |
| Buckeye Creek (Buckeye Canyon) | 2 | 800.00 | 20.00 | | | | |
| Liver Gulch | 1 | 20.00 | .50 | | | | |
| Goat Creek | 3 | 840.00 | 21.00 | | | | |
| Spring | 1 | 25.00 | .63 | | | | |
| **Total Thompson River & Tributaries** | **44** | **80,126.60** | **2,003.19** | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| **Grouse Creek** | **1** | **50.00** | **1.25** | | | | |
| Springs | 1 | 10.00 | .25 | | | | |
| **Cherry Creek** | **12** | **9,950.00** | **248.75** | | | | |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | 100.00 | 2.50 | | | | |
| Springs | 2 | 40.00 | 1.00 | 1185 | 1 | Part of All | --- |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 40.00 | 1.00 | 1185 | 1 | Part of All | --- |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | 50.00 | 1.25 | | | | |
| **Ashley Creek** | **12** | **2,365.00** | **59.13** | | | | |
| Springs | 2 | 175.00 | 4.38 | | | | |
| **Stream** | **1** | **80.00** | **2.00** | | | | |
| Springs | 3 | 312.00 | 7.80 | | | | |
| Spring | 1 | 160.00 | 4.00 | | | | |
| Mass Spring | 1 | 160.00 | 4.00 | | | | |
| **Spring** | **1** | **All** | --- | | | | |
| **Daly Creek Gulch** | **1** | **All** | --- | | | | |
| **Prospect Creek** | **32** | **512,350.00** | **12,808.75** | **253** | **1** | --- | --- |
| Glidden Gulch (Left Hand Fork of Prospect Creek) | 3 | 2,400.00 | 60.00 | | | | |
| Blossom Creek | 2 | 2,250.00 | 56.25 | | | | |
| Lesser Lake (Pond) | 2 | 3,000.00 | 75.00 | | | | |
| Blossom Lake (Alpine Lake) | 7 | 6,250.00 | 156.25 | | | | |
| Evans Gulch | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| Cooper Creek (Gulch) | 1 | 150.00 | 3.75 | | | | |
| South Fork Cooper Creek | 1 | 600.00 | 15.00 | | | | |
| East Branch of South Fork Cooper Creek (Summit Creek) | 1 | 400.00 | 10.00 | | | | |
| East Fork Cooper Creek | 1 | 24,000.00 | 600.00 | | | | |
| Cox Creek | 1 | All | --- | | | | |
| Mowich Gulch | 1 | 80.00 | 2.00 | | | | |
| Lucky Boy Gulch | 0 | 0.00 | 0.00 | | | | |
| Stream | 1 | 200.00 | 5.00 | | | | |
| Crow Creek (Gulch) | 10 | 30,800.00 | 770.00 | | | | |
| Daisy Creek (Iron Daisy Creek) (Gulch) | 3 | 900.00 | 22.50 | | | | |
| Boyers Gulch (Shamrock Gulch) | 1 | 50.00 | 1.25 | | | | |
| Gilbert Gulch (Brush Gulch) | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 50.00 | 1.25 | | | | |
| Wilks Creek | 2 | 420.00 | 10.50 | | | | |
| Spring | 2 | 240.00 | 6.00 | | | | |
| Valentine Gulch | 1 | 100.00 | 2.50 | | | | |
| Clear Creek | 3 | 1,260.00 | 31.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 100.00 | 2.50 | | | | |
| Howard Creek | 1 | 500.00 | 12.50 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| Dry Creek | 14 | 13,600.00 | 340.00 | | | | |
| West Fork Dry Creek | 6 | 1,200.00 | 30.00 | | | | |
| Spring Creek | 1 | 40.00 | 1.00 | | | | |
| Mill Creek | 1 | 40.00 | 1.00 | | | | |
| East Fork Dry Creek | 1 | 160.00 | 4.00 | | | | |
| Warwick Creek | 1 | 150.00 | 3.75 | | | | |
| Spring | 1 | 50.00 | 1.25 | | | | |
| **Total Prospect Creek & Tributaries** | 107 | 601,535.00 | 15,038.38 | | 1 | --- | --- |
| **Coleman Creek (Weber)** | 2 | 2,200.00 | 55.00 | | | | |
| **Cold Spring Creek** | 2 | 55.00 | 1.38 | | | | |
| Spring | 1 | 60.00 | 1.50 | | | | |
| **Maier Gulch** | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 5.35 | .13 | | | | |
| **Squaw Creek** | 6 | 3,000.00 | 75.00 | 92 | 4 | 815.00 | 20.38 |
| **Spring** | 1 | All | --- | | | | |
| **Waste Water** | 1 | 1,000.00 | 25.00 | | | | |
| **Stream** | 0 | 0.00 | 0.00 | | | | |
| Seven Mile Spring | 2 | 25.00 | .63 | | | | |
| **Graves Creek** | 19 | 31,020.00 | 775.50 | | | | |
| Thorne Creek (South Fork Graves Creek) | 10 | 4,340.00 | 108.50 | 2187 | 2 | 700.00 | 17.50 |
| **Mosquito Creek (Moscow Creek) (Prospect Creek)** | 8 | 3,540.00 | 88.50 | | | | |
| Lake Creek | 1 | 500.00 | 12.50 | | | | |
| Spring | 1 | All | --- | | | | |
| Spring | 6 | 390.00 | 9.75 | | | | |
| **Stream** | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 160.00 | 4.00 | | | | |
| **Fantom Creek (Phantom) (Phanthom)** | 4 | 460.00 | 11.50 | | | | |
| Springs | 2 | 160.00 | 4.00 | | | | |
| **Springs** | 1 | 25.00 | .63 | | | | |
| **Conger Gulch (Cougar Gulch)** | 2 | 500.00 | 12.50 | | | | |
| **Deep Creek** | 23 | 7,730.00 | 193.25 | | | | |
| Middle Fork Deep Creek | 1 | 100.00 | 2.50 | | | | |
| North Fork Deep Creek | 2 | 700.00 | 17.50 | | | | |
| Stream | 1 | 100.00 | 2.50 | | | | |
| **Little Creek** | 1 | 100.00 | 2.50 | | | | |
| **Bear Creek** | 8 | 1,745.00 | 43.63 | | | | |
| **Grimes Creek** | 1 | 150.00 | 3.75 | | | | |
| **Spring Creek (Gulch) (Cameron Gulch)** | 1 | 200.00 | 5.00 | | | | |
| Cameron Spring | 1 | 5.00 | .13 | | | | |
| **Flint Creek (Kirby Creek) (Gulch)** | 6 | 768.00 | 19.20 | | | | |
| Spring | 1 | All | --- | | | | |
| West Kirby Creek | 1 | 80.00 | 2.00 | | | | |
| Spring | 1 | 25.00 | .63 | | | | |
| **Spring** | 1 | 50.00 | 1.25 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| **Creek** | 2 | 250.00 | 6.25 | | | | |
| **Rasberry Creek** | 1 | All | --- | | | | |
| **Water Gulch** | 4 | 500.00 | 12.50 | | | | |
| **Big Beaver Gulch (West Fork Big Beaver Creek)** | 17 | 6,516.00 | 162.90 | | | | |
| Pyatt Creek | 1 | 100.00 | 2.50 | | | | |
| Little Beaver Creek | 6 | 7,260.00 | 181.50 | | | | |
| Deer Creek (Saw Creek) (Spring Creek) | 2 | 150.00 | 3.75 | | | | |
| Creek | 1 | 150.00 | 3.75 | | | | |
| White Pine Creek | 3 | 1,058.00 | 26.45 | | | | |
| Grays Creek (Gulch) | 1 | 500.00 | 12.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| Spring | 2 | All | --- | | | | |
| Jack Pine Flats Spring | 1 | 10.00 | .25 | | | | |
| Spring | 1 | 50.00 | 1.25 | | | | |
| **Vermillon River (Vermilion Creek)** | 10 | 28,330.00 | 708.25 | | | | |
| Spring Creek | 2 | 100.00 | 2.50 | | | | |
| Sims Creek | 1 | --- | --- | | | | |
| Elk Creek | 1 | 400.00 | 10.00 | | | | |
| Carpenter Creek (Lions, Lyons - Gulch, Creek) | 12 | 22,580.00 | 564.50 | | | | |
| Ross Creek | 0 | 0.00 | 0.00 | | | | |
| North Fork Ross Creek | 1 | 200.00 | 5.00 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Cataract Creek | 4 | 2,900.00 | 72.50 | | | | |
| Canyon Creek | 1 | 200.00 | 5.00 | | | | |
| Roe Creek (Gulch) | 1 | 80.00 | 2.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 100.00 | 2.50 | | | | |
| Berry Creek (Gulch) | 1 | 40.00 | 1.00 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Basin Draw | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| **Stream** | 0 | 0.00 | 0.00 | | | | |
| Springs | 7 | 120.00 | 3.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 60.00 | 1.50 | | | | |
| Spring | 2 | 60.00 | 1.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 150.00 | 3.75 | | | | |
| **Springs** | 1 | 150.00 | 3.75 | | | | |
| **Stream** | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | All | --- | | | | |
| **Spring Creek** | 1 | 400.00 | 10.00 | | | | |
| **Spring** | 1 | All | --- | | | | |
| **Stream** | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 5.00 | .13 | | | | |
| Pyrite Spring | 1 | 40.00 | 1.00 | | | | |
| Spring | 1 | 12.00 | .30 | | | | |
| Spring | 3 | All | --- | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| **Belgian Gulch** | **0** | **0.00** | **0.00** | | | | |
| Stream | 1 | 15.00 | .38 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Spring | 1 | 10.00 | .25 | | | | |
| **Trout Creek (Big Trout Creek)** | **18** | **23,862.06** | **596.55** | | | | |
| West Fork Trout Creek | 2 | 160.00 | 4.00 | | | | |
| East Fork Trout Creek | 0 | 0.00 | 0.00 | | | | |
| Granite Creek | 2 | 50.00 | 1.25 | | | | |
| Right Hand Fork Trout Creek | 1 | 500.00 | 12.50 | | | | |
| Minton Creek | 1 | 160.00 | 4.00 | | | | |
| Little Trout Creek | 2 | 240.00 | 6.00 | | | | |
| West Branch Little Trout Creek | 1 | 100.00 | 2.50 | | | | |
| South East Br. Little Trout Creek (East Br. Little Trout Creek | 2 | 900.00 | 22.50 | | | | |
| East Branch Little Trout Creek | 1 | 100.00 | 2.50 | | | | |
| First Right Hand Fork Little Trout Creek | 1 | All | --- | | | | |
| Spring | 1 | 5.00 | .13 | | | | |
| **Spring** | **1** | **5.00** | **.13** | | | | |
| **Spring** | **2** | **170.00** | **4.25** | | | | |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | All | --- | | | | |
| **Spring** | **1** | **60.00** | **1.50** | | | | |
| **Dry Creek (Tuscar Creek)** | **6** | **720.00** | **18.00** | | | | |
| Creek | 1 | 200.00 | 5.00 | | | | |
| Spring | 2 | 90.00 | 2.25 | | | | |
| Spring | 1 | 25.00 | .63 | | | | |
| **Spring** | **3** | **154.00** | **3.85** | | | | |
| **Martin Creek (Marten Creek)** | **4** | **1,560.00** | **39.00** | | | | |
| North Branch Martin Creek (No. Br. Marten Creek) | 1 | 100.00 | 2.50 | | | | |
| East Fork Martin Creek (Clinton Gulch) | 1 | 200.00 | 5.00 | | | | |
| South Fork Martin Creek | 2 | 200.00 | 5.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Fredenick Spring | 2 | 200.00 | 5.00 | | | | |
| Iff Gulch | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Spring | 1 | 64.00 | 1.60 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| **Stream** | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 50.00 | 1.25 | | | | |
| Springs | 2 | 180.00 | 4.50 | | | | |
| **Swamp Creek** | 19 | 24,770.00 | 619.25 | | | | |
| Goat Creek | 1 | 500.00 | 12.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 41.00 | 1.03 | | | | |
| Creek | 1 | 80.00 | 2.00 | | | | |
| **Stream** | 0 | 0.00 | 0.00 | | | | |
| Spring | 4 | 480.00 | 12.00 | | | | |
| **Unnamed Reservoir** | 1 | 640.00 | 16.00 | | | | |
| **Spring** | 2 | 100.00 | 2.50 | | | | |
| **Stevens Creek** | 1 | 600.00 | 15.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Elder Spring | 1 | 160.00 | 4.00 | | | | |
| **McKay Creek** | 2 | 320.00 | 8.00 | | | | |
| **Stream** | 1 | 160.00 | 4.00 | | | | |
| Spring | 1 | 100.00 | 2.50 | | | | |
| **Rock Creek** | 2 | 1,800.00 | 45.00 | | | | |
| East Fork Rock Creek | 3 | 2,000.00 | 50.00 | | | | |
| Engle Creek (North Fork) | 1 | 60.00 | 1.50 | | | | |
| South Fork Engle Creek | 2 | 180.00 | 4.50 | | | | |
| **Carlson Creek (Kutter Creek)** | 4 | 400.00 | 10.00 | | | | |
| Crystal Springs | 1 | 100.00 | 2.50 | 2415 | 1 | All | --- |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| Spring | 1 | 500.00 | 12.50 | | | | |
| **Springs** | 2 | 61.00 | 1.53 | | | | |
| **Miller Gulch** | 0 | 0.00 | 0.00 | | | | |
| Big Spring Creek | 1 | 29.00 | .73 | | | | |
| Poplar Creek | 1 | 29.00 | .73 | | | | |
| **Government Creek** | 3 | 240.00 | 6.00 | | | | |
| **Pilgrim Creek** | 25 | 5,065.00 | 126.63 | | | | |
| Telegraph Creek | 1 | 600.00 | 15.00 | | | | |
| West Fork Pilgrim Creek | 1 | 1,000.00 | 25.00 | | | | |
| Skelton Creek | 1 | 20,000.00 | 500.00 | | | | |
| Four Mile Gulch | 0 | 0.00 | 0.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 36.00 | .90 | | | | |
| Spring | 2 | 360.00 | 9.00 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 4.00 | .10 | | | | |
| **Stream** | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 60.00 | 1.50 | | | | |
| **Spring** | 1 | 50.00 | 1.25 | | | | |
| **Smith Creek** | 1 | 63.00 | 1.58 | 2386 | 2 | ½ of Flow | --- |
| **Stream** | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 120.00 | 3.00 | | | | |
| **Thirteen Gulch** | 1 | 200.00 | 5.00 | | | | |
| Hammond Gulch | 0 | 0.00 | 0.00 | | | | |
| Stream | 2 | 210.00 | 5.25 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | 30.00 | .75 | | | | |
| Spring | 4 | 3.00 | .07 | | | | |
| **Ellis Gulch** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | 160.00 | 4.00 | | | | |
| **Bull River** | **1** | **3.00** | **.07** | | | | |
| Creek | 1 | 2.00 | .05 | | | | |
| Dry Creek | 1 | --- | --- | | | | |
| Stream | 1 | 120.00 | 3.00 | | | | |
| Spring | 1 | All | --- | | | | |
| Napoleon Gulch (Nepolain) | 1 | 8.00 | .20 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 2 | 1.50 | .04 | | | | |
| Stream | 1 | 70.00 | 1.75 | | | | |
| Spring | 1 | 2.00 | .05 | | | | |
| Spring | 1 | 4.00 | .10 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 30.00 | .75 | | | | |
| Creek | 2 | 60.00 | 1.25 | | | | |
| Spring | 2 | 20.00 | .50 | | | | |
| East Fork Bull River | 1 | 100.00 | 2.50 | | | | |
| Spring Creek (Lost Girl Creek) | 1 | 80.00 | 2.00 | | | | |
| Snake Creek | 1 | 100.00 | 2.50 | | | | |
| Copper Creek (Copper Gulch) | 4 | 1,650.00 | 41.25 | | | | |
| Creek | 1 | 2,000.00 | 50.00 | | | | |
| Spring | 1 | 100.00 | 2.50 | | | | |
| Basin Creek | 1 | 150.00 | 3.75 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Finnelly Creek (Gin Creek or Gulch) | 2 | 160.00 | 4.00 | | | | |
| Rocky Point Draw | 0 | 0.00 | 0.00 | | | | |
| Stream (Left Hand Creek) | 1 | 24.00 | .60 | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| Spring | 1 | 25.00 | .63 | | | | |
| Spring | 2 | 20.00 | .50 | | | | |
| **Smeads Creek** | **0** | **0.00** | **0.00** | | | | |
| Stream | 1 | 35.00 | .88 | | | | |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | 120.00 | 3.00 | | | | |
| **Spring** | **1** | **40.00** | **1.00** | | | | |
| **Millers Creek** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | 40.00 | 1.00 | | | | |
| **Maude L. Creek** | **1** | **250.00** | **6.25** | | | | |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| **Stream** | **0** | **0.00** | **0.00** | | | | |
| Double Springs | 1 | 50.00 | 1.25 | | | | |
| **Spring** | **3** | **83.00** | **2.08** | | | | |
| **Creek** | **2** | **600.00** | **15.00** | | | | |
| **Creek** | **1** | **200.00** | **5.00** | | | | |
| **Sand Creek** | **1** | **30.00** | **.75** | | | | |
| Sand Spring | 1 | 20.00 | .50 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| **Emergency Water Tank Overflow** | 1 | 30.00 | .75 | | | | |
| **Big Eddy Creek** | 0 | 0.00 | 0.00 | | | | |
| Creek | 1 | 100.00 | 2.50 | | | | |
| **Spring** | 1 | 100.00 | 2.50 | | | | |
| **Elk Creek** | 14 | 17,242.00 | 431.05 | | | | |
| West Fork Elk Creek | 3 | 185.00 | 4.63 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 1 | 10.00 | .25 | | | | |
| Spring | 1 | 25.00 | .63 | | | | |
| East Fork Elk Creek (South Fork Elk River) | 4 | 740.00 | 18.50 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Spring | 3 | 130.00 | 3.25 | | | | |
| Dry Gulch Creek | 1 | 200.00 | 5.00 | | | | |
| Deer Creek | 3 | 2,120.00 | 53.00 | | | | |
| Miller Creek | 1 | 100.00 | 2.50 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| Brie Creek | 1 | 160.00 | 4.00 | | | | |
| Spring | 1 | 6.00 | .15 | | | | |
| Beaver Creek | 4 | 810.00 | 20.25 | | | | |
| Spring | 1 | 2.00 | .05 | | | | |
| Stream | 0 | 0.00 | 0.00 | | | | |
| Beaver Spring | 1 | 100.00 | 2.50 | | | | |
| Stream | 2 | 112.00 | 2.80 | | | | |
| Spring | 1 | 4.00 | .10 | | | | |
| Stream | 3 | 326.00 | 8.15 | | | | |
| Rice Draw (East Fork Rice Draw) | 2 | 320.00 | 8.00 | | | | |
| **Creek** | 2 | 70.00 | 1.75 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| **Springs** | 3 | 130.00 | 3.25 | | | | |
| **Dead Horse Creek** | 1 | 100.00 | 2.50 | | | | |
| West Fork Dead Horse Creek | 4 | 240.00 | 6.00 | | | | |
| Stream | 2 | 740.00 | 18.50 | | | | |
| **Stream** | 1 | 40.00 | 1.00 | | | | |
| West Spring | 1 | 10.00 | .25 | | | | |
| East Spring | 1 | 10.00 | .25 | | | | |
| **Stream** | 3 | 240.00 | 6.00 | | | | |
| Spring | 2 | 600.00 | 15.00 | | | | |
| Spring | 2 | 80.00 | 2.00 | | | | |
| Spring | 1 | 20.00 | .50 | | | | |
| **Spring** | 2 | 20.00 | .50 | | | | |
| **Twenty Nine Creek** | 2 | 140.00 | 3.50 | | | | |
| Spring | 1 | All | --- | | | | |
| Springs | 1 | 160.00 | 4.00 | | | | |

# WATER RIGHT DATA SANDERS COUNTY

## APPROPRIATIONS AND DECREES BY STREAMS

| 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. |
|---|---|---|---|---|---|---|---|
| **Brewer Creek (Mile Creek)** | **5** | **867.00** | **21.68** | | | | |
| Spring Creek | 2 | 105.00 | 2.63 | | | | |
| **Blue Creek** | **2** | **90.00** | **2.25** | | | | |
| East Fork Blue Creek | 1 | 400.00 | 10.00 | | | | |
| Stream | 1 | 20.00 | .50 | | | | |
| Spring | 1 | 50.00 | 1.25 | | | | |
| Spring | 1 | 10.00 | .25 | | | | |
| **Baker Creek** | **3** | **324.00** | **8.10** | | | | |
| **GRAND TOTAL FOR SANDERS COUNTY** | **1,486** | **47,075,484.01** | **1,176,889.67** | | **38** | **3,509.00** | **87.73** |

a. District Court Amendment 1420
b. Supreme Court 5612

## DRAINAGES IN SANDERS COUNTY NOT LOCATED

| STREAM | No. of Filings | Miner's Inches | Cu. Ft. Per Sec. |
|---|---|---|---|
| Paynes Gulch | 1 | 1,000.00 | 25.00 |
| Unnamed Spring | 1 | 40.00 | 1.00 |
| Unnamed Spring | 1 | 40,000.00 | 1,000.00 |
| Laughlins Creek | 1 | 100.00 | 2.50 |
| Unnamed Stream | 1 | 1,000.00 | 25.00 |
| Unnamed Stream | 1 | 1,000.00 | 25.00 |
| Unnamed Stream | 1 | 1,000.00 | 25.00 |
| Unnamed Stream | 1 | 4,000.00 | 100.00 |
| Unnamed Stream | 1 | 800.00 | 20.00 |
| Bourgault Creek | 1 | 160.00 | 4.00 |
| Unnamed Stream | 1 | 20,000.00 | 500.00 |
| West Drainage of Clover Mt. | 1 | 140.00 | 3.50 |
| Springs | 1 | 40.00 | 1.00 |
| Spring | 1 | 500.00 | 12.50 |
| Rosebud Creek | 1 | 500.00 | 12.50 |
| Sepeie Creek | 1 | 5,000.00 | 125.00 |
| South Fork Clark Fork Columbia | 1 | 15,000.00 | 375.00 |
| Dry Creek Right Hand Fork | 1 | 1,000.00 | 25.00 |
| Duck Lake | 1 | 500.00 | 12.50 |
| Fox Creek | 1 | 200.00 | 5.00 |
| Handy Creek | 1 | All | --- |
| Kinen Creek | 1 | 500.00 | 12.50 |
| **TOTAL** | **22** | **92,480.00** | **2,312.00** |

# WATER RESOURCES SURVEY

## Sanders 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 SYMBOL INDEX

## BOUNDARIES

- INTERNATIONAL
- STATE
- COUNTY
- NATIONAL FOREST

## DITCHES

- CANALS OR DITCHES
- DRAIN DITCHES

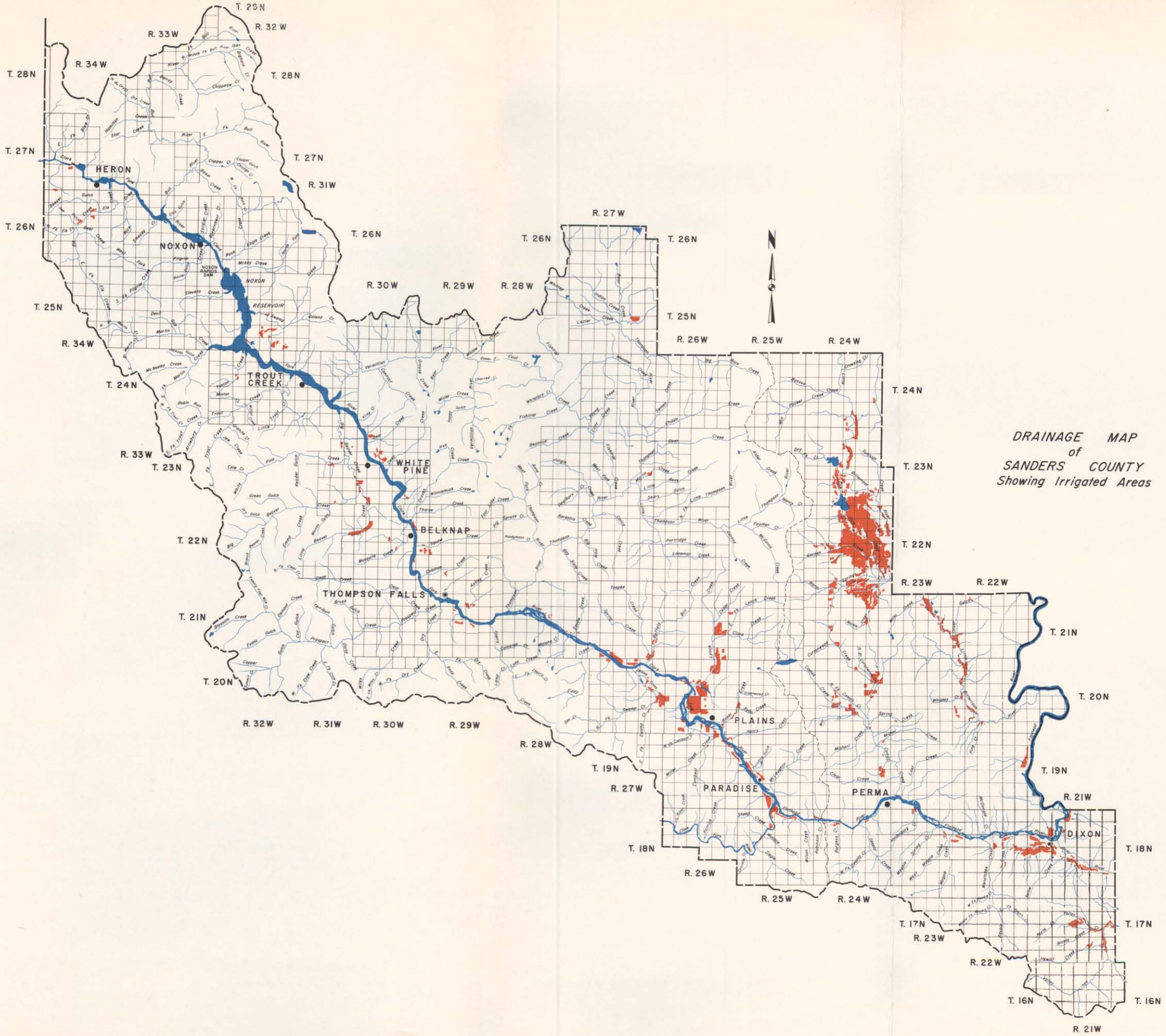
## TRANSPORTATION

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

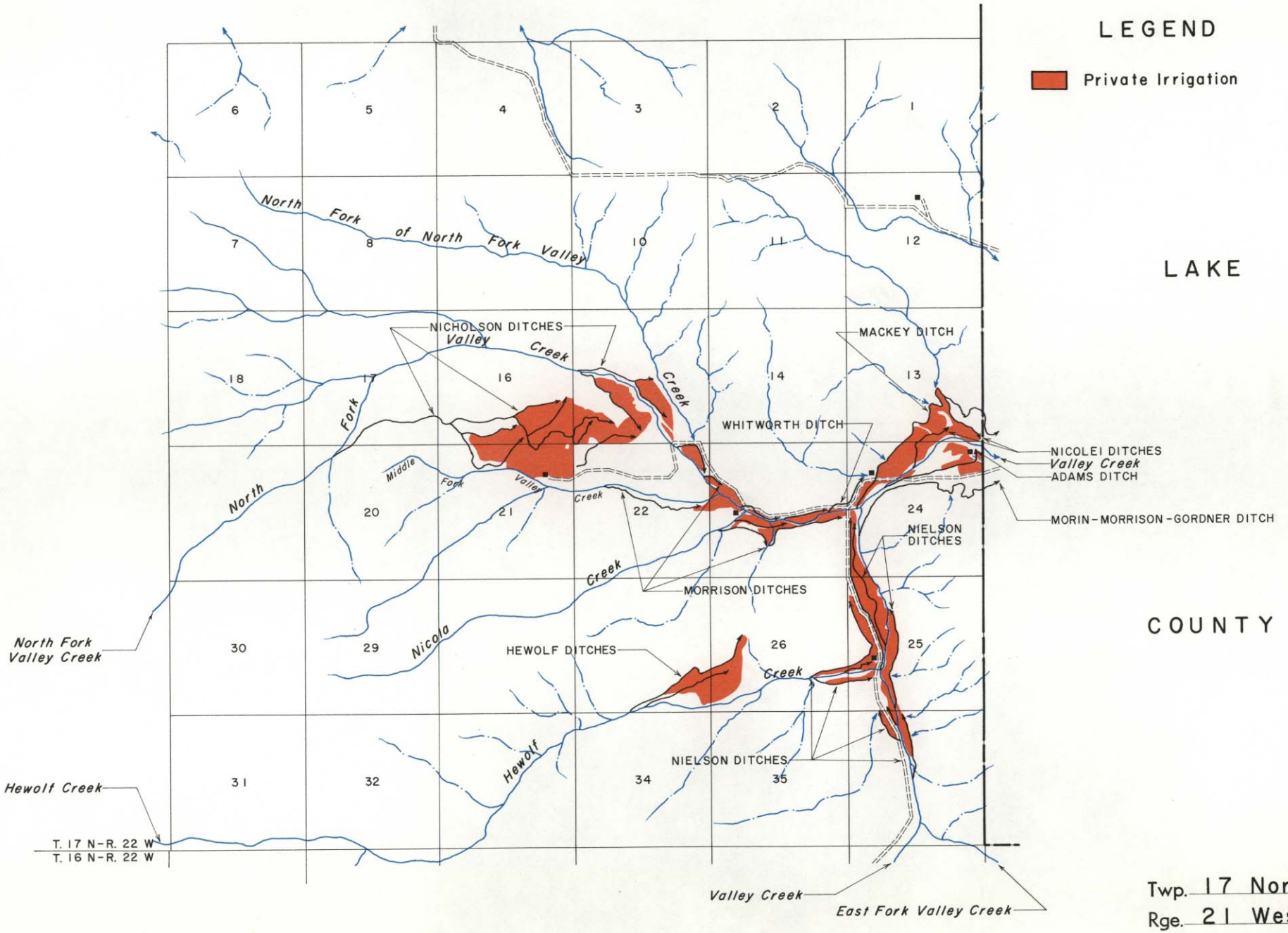
## STRUCTURES & UNITS

- 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*
*SANDERS COUNTY*
*Showing Irrigated Areas*


LEGEND
Private Irrigation
LAKE
COUNTY
Twp. 17 North
Rge. 21 West
T. 17 N-R. 22 W
T. 16 N-R. 22 W
NICHOLSON DITCHES
MACKEY DITCH
WHITWORTH DITCH
NICOLEI DITCHES
Valley Creek
ADAMS DITCH
MORIN-MORRISON-GORDNER DITCH
NIELSON DITCHES
MORRISON DITCHES
HEWOLF DITCHES
NIELSON DITCHES
North Fork Valley Creek
Hewolf Creek
Valley Creek
East Fork Valley Creek
North Fork of North Fork Valley
Middle Fork Valley Creek
North Fork Valley Creek
Nicola Creek
Hewolf Creek
6
5
4
3
2
1
7
8
10
11
12
18
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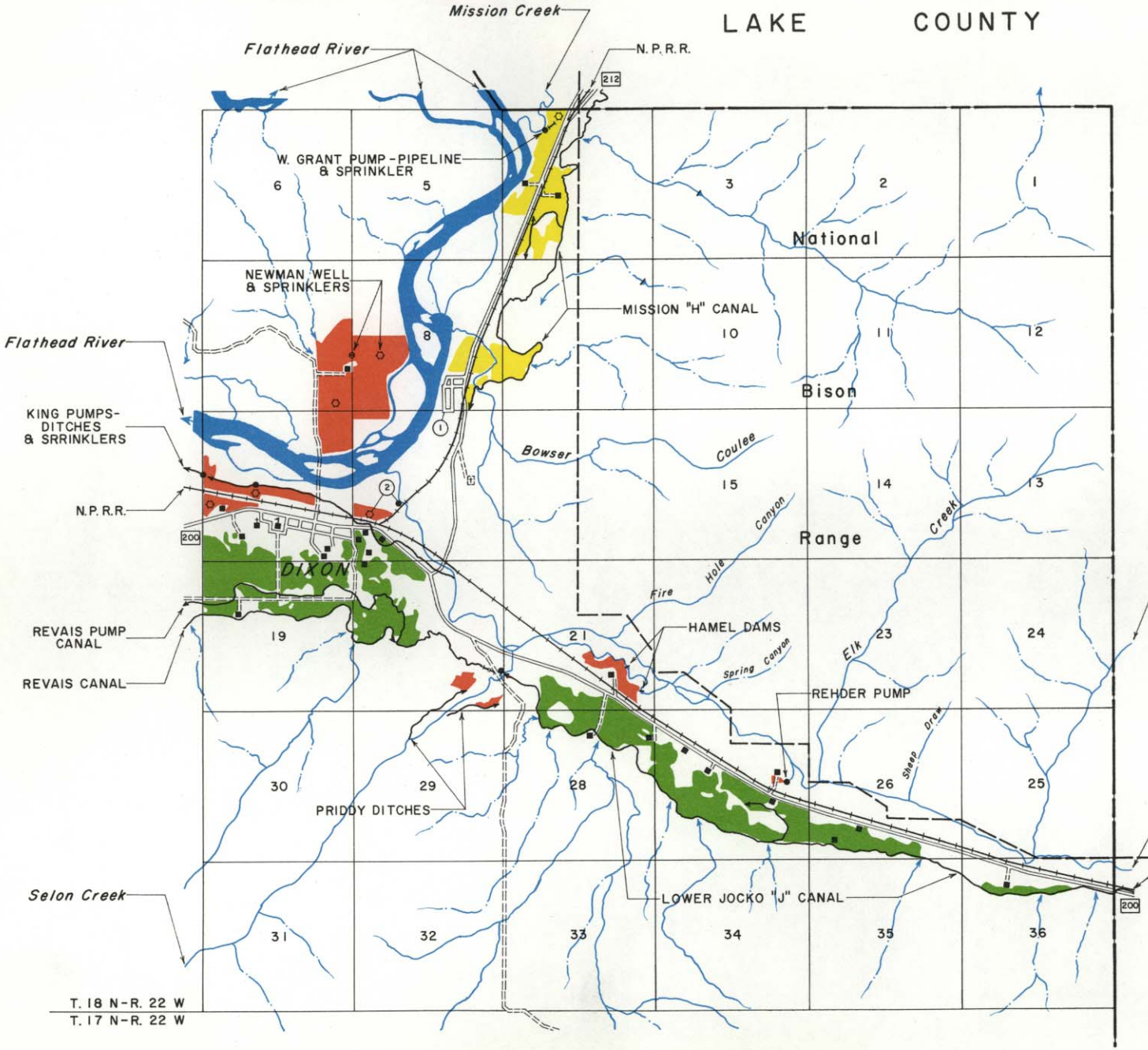
LAKE COUNTY
Mission Creek
Flathead River
N.P.R.R.
212
W. GRANT PUMP-PIPELINE & SPRINKLER
NEWMAN WELL & SPRINKLERS
MISSION "H" CANAL
Flathead River
KING PUMPS-DITCHES & SRRINKLERS
N.P.R.R.
200
DIXON
REVAIS PUMP CANAL
REVAIS CANAL
National
Bison
Range
Bowser
Coulee
Canyon
Hole
Fire
Creek
HAMEL DAMS
Spring Canyon
Elk
Sheep
Draw
REHDER PUMP
Trisk Creek
PRIDDY DITCHES
Jocko River
N.P.R.R.
LOWER JOCKO "J" CANAL
Selon Creek
T. 18 N-R. 22 W
T. 17 N-R. 22 W
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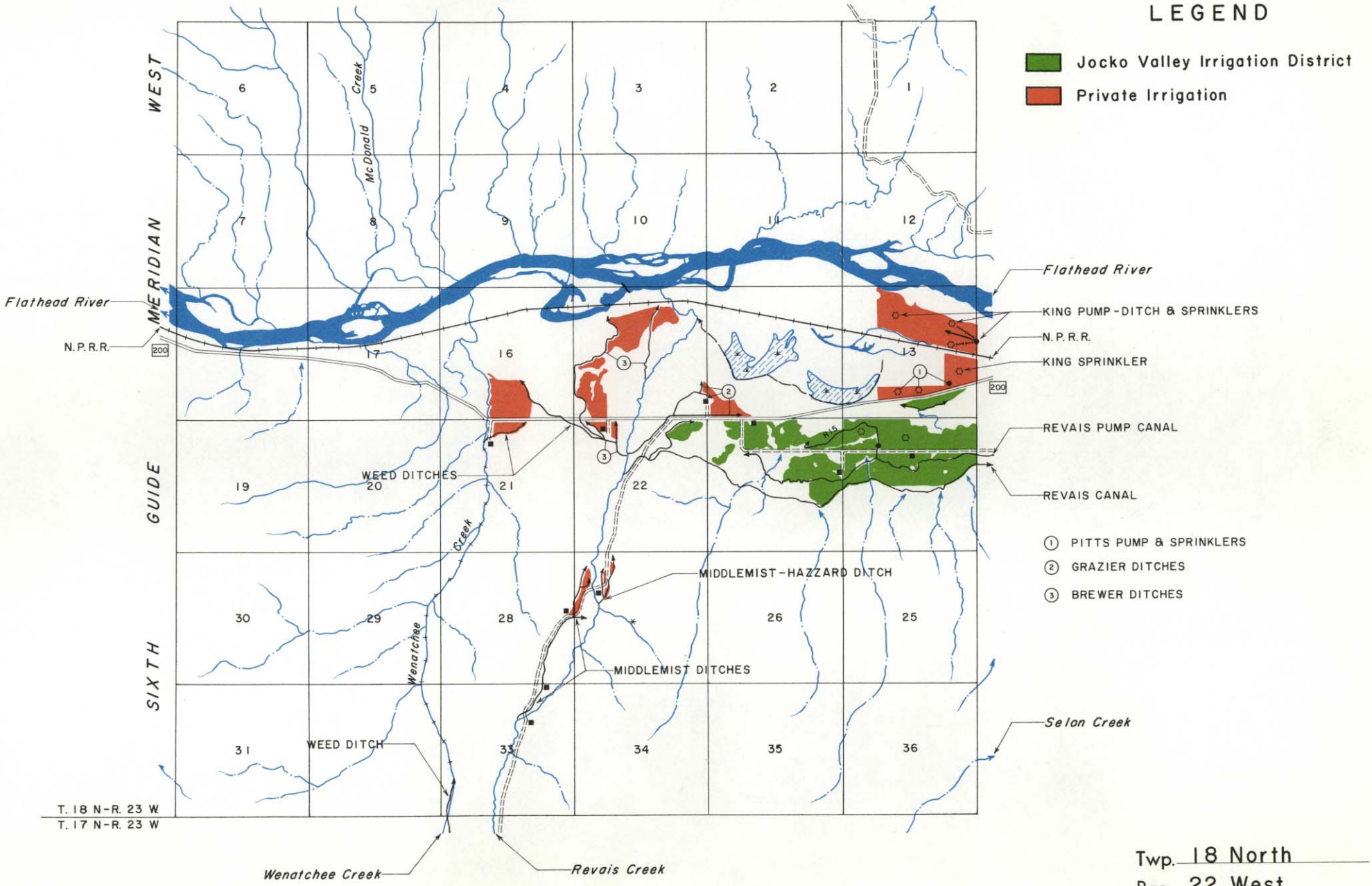
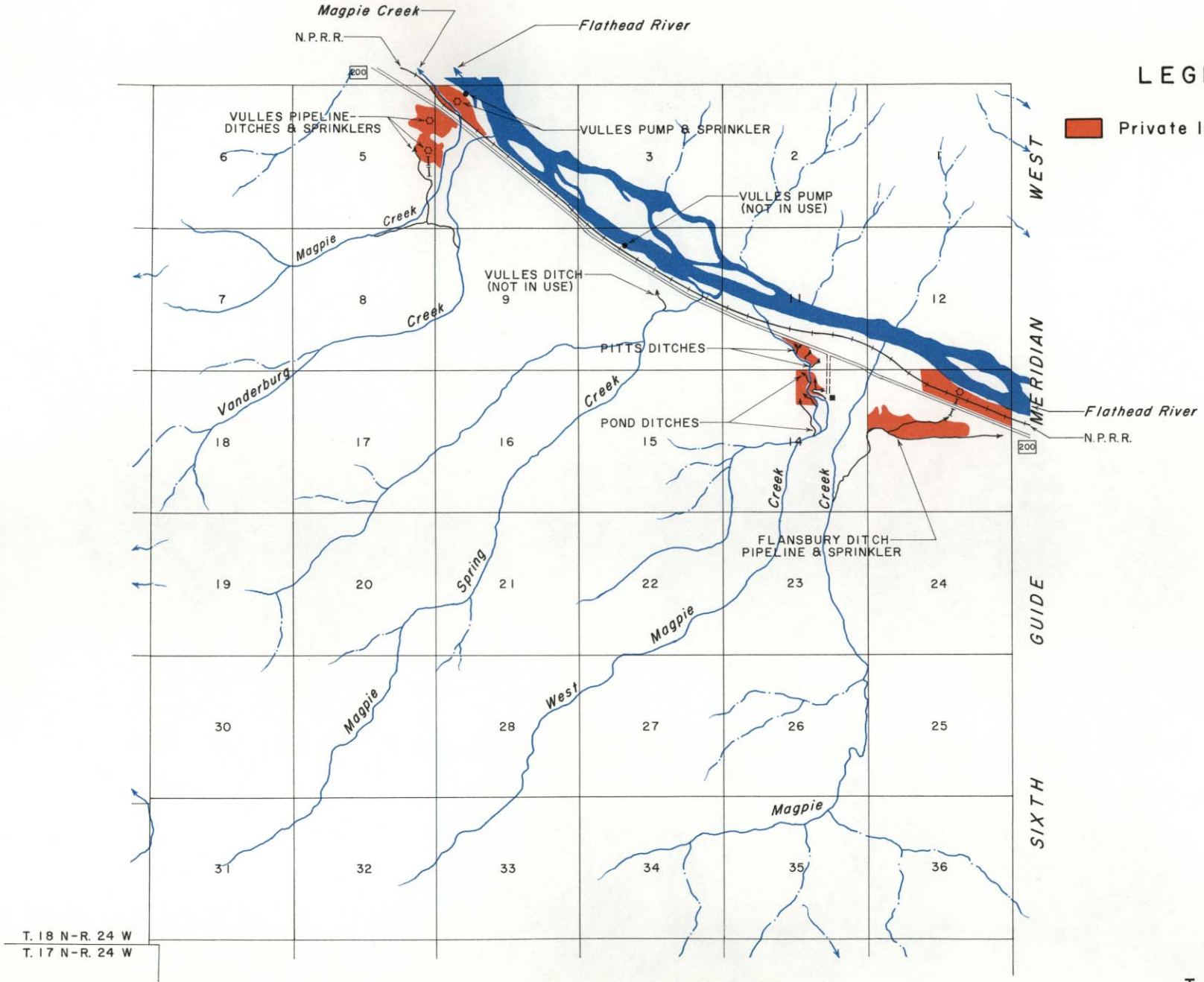
36
LEGEND
Jocko Valley Irrigation District
Flathead Irrigation District
Private Irrigation
LAKE
① FLATHEAD INDIAN RESERVATION AGENCY
② PITTS PUMP & SPRINKLER
COUNTY
Twp. 18 North
Rge. 21 West

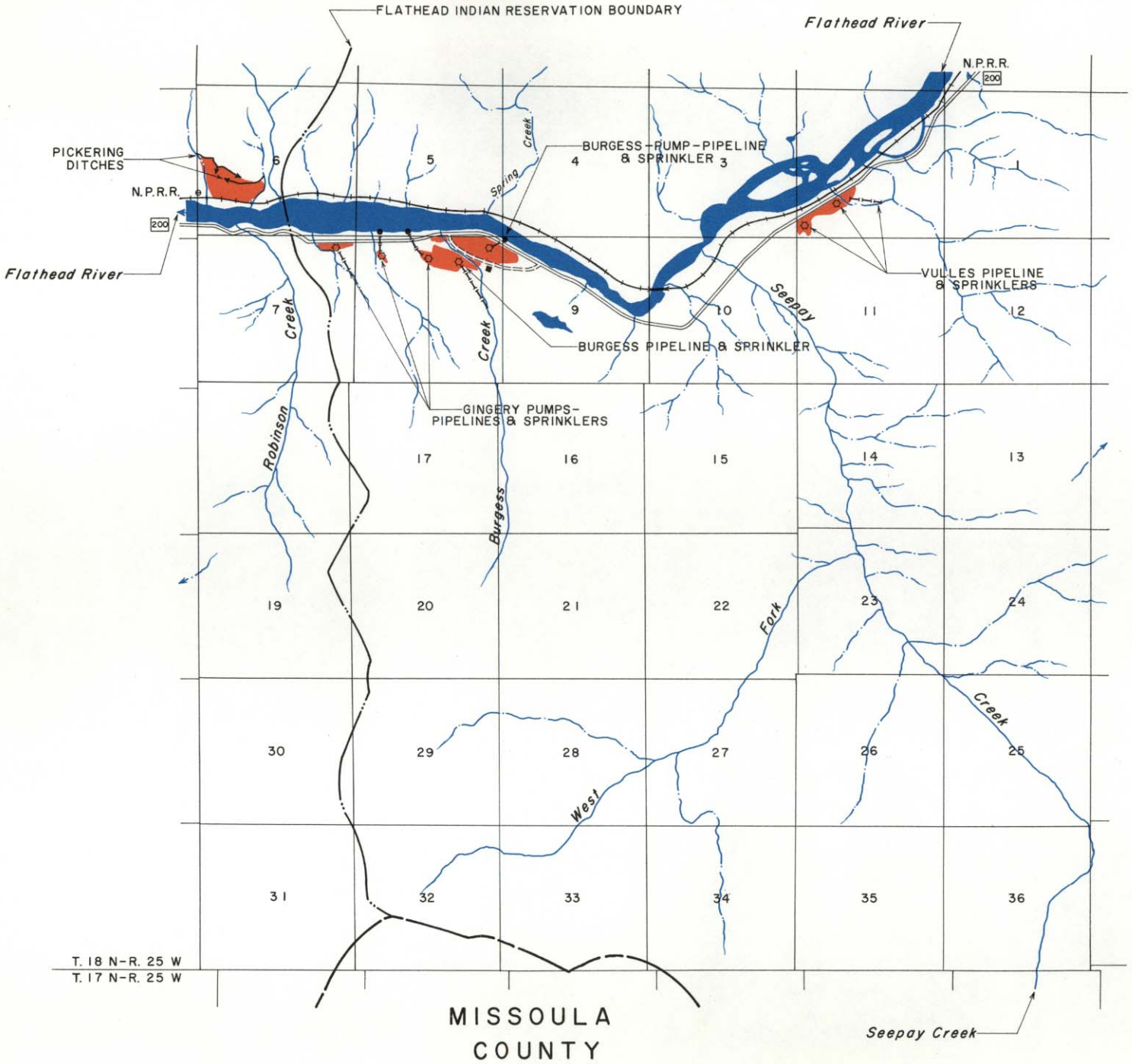

LEGEND
Jocko Valley Irrigation District
Private Irrigation
Flathead River
KING PUMP-DITCH & SPRINKLERS
N.P.R.R.
KING SPRINKLER
REVAIS PUMP CANAL
REVAIS CANAL
① PITTS PUMP & SPRINKLERS
② GRAZIER DITCHES
③ BREWER DITCHES
MIDDLEMIST-HAZZARD DITCH
MIDDLEMIST DITCHES
WEED DITCHES
WEED DITCH
Selon Creek
Wenatchee Creek
Revais Creek
McDonald Creek
Wenatchee Creek
SIXTH GUIDE MERIDIAN WEST
T. 18 N-R. 23 W.
T. 17 N-R. 23 W
Twp. 18 North
Rge. 22 West




## LEGEND

Private Irrigation

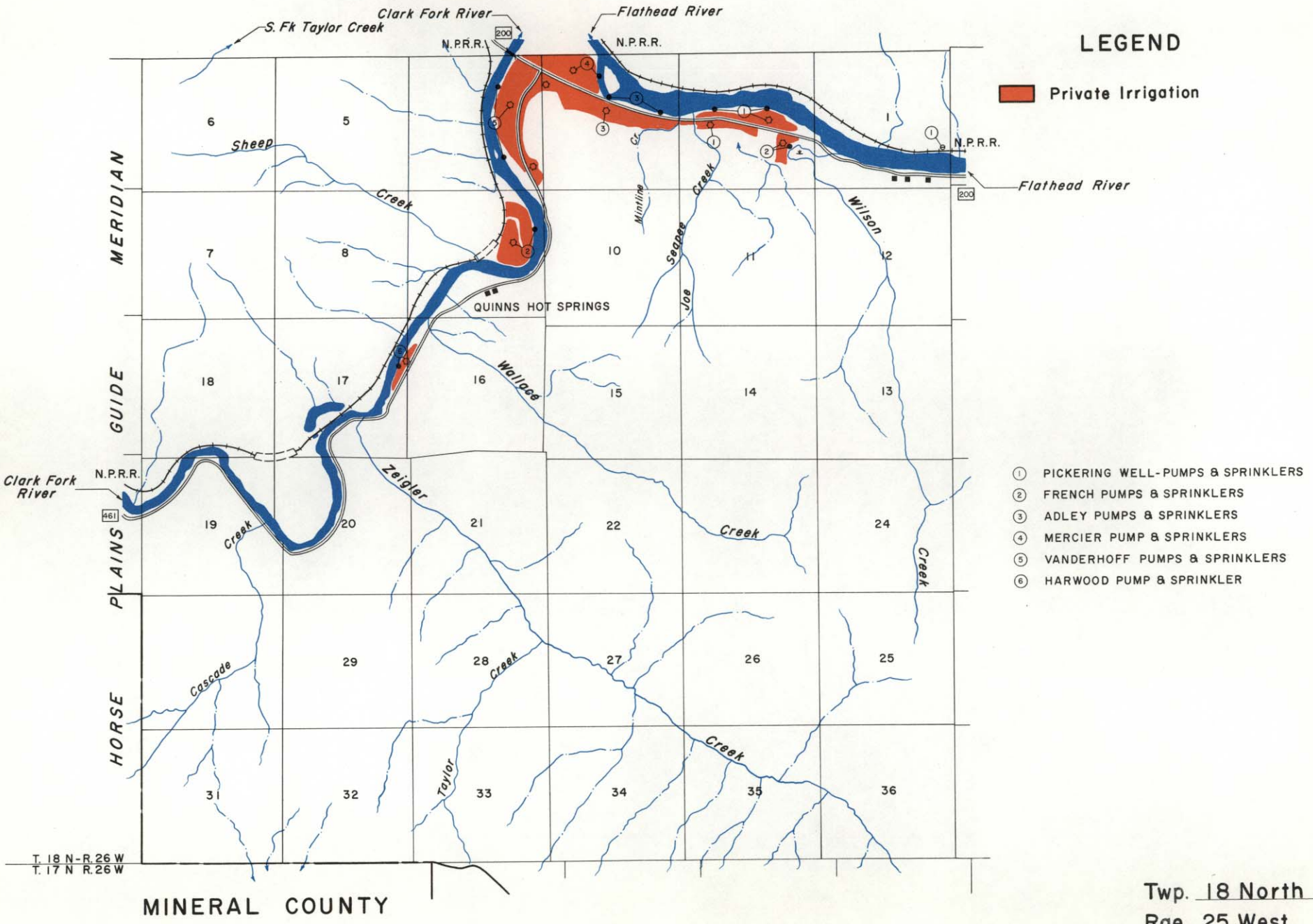
Twp. 18 North
Rge. 23 West



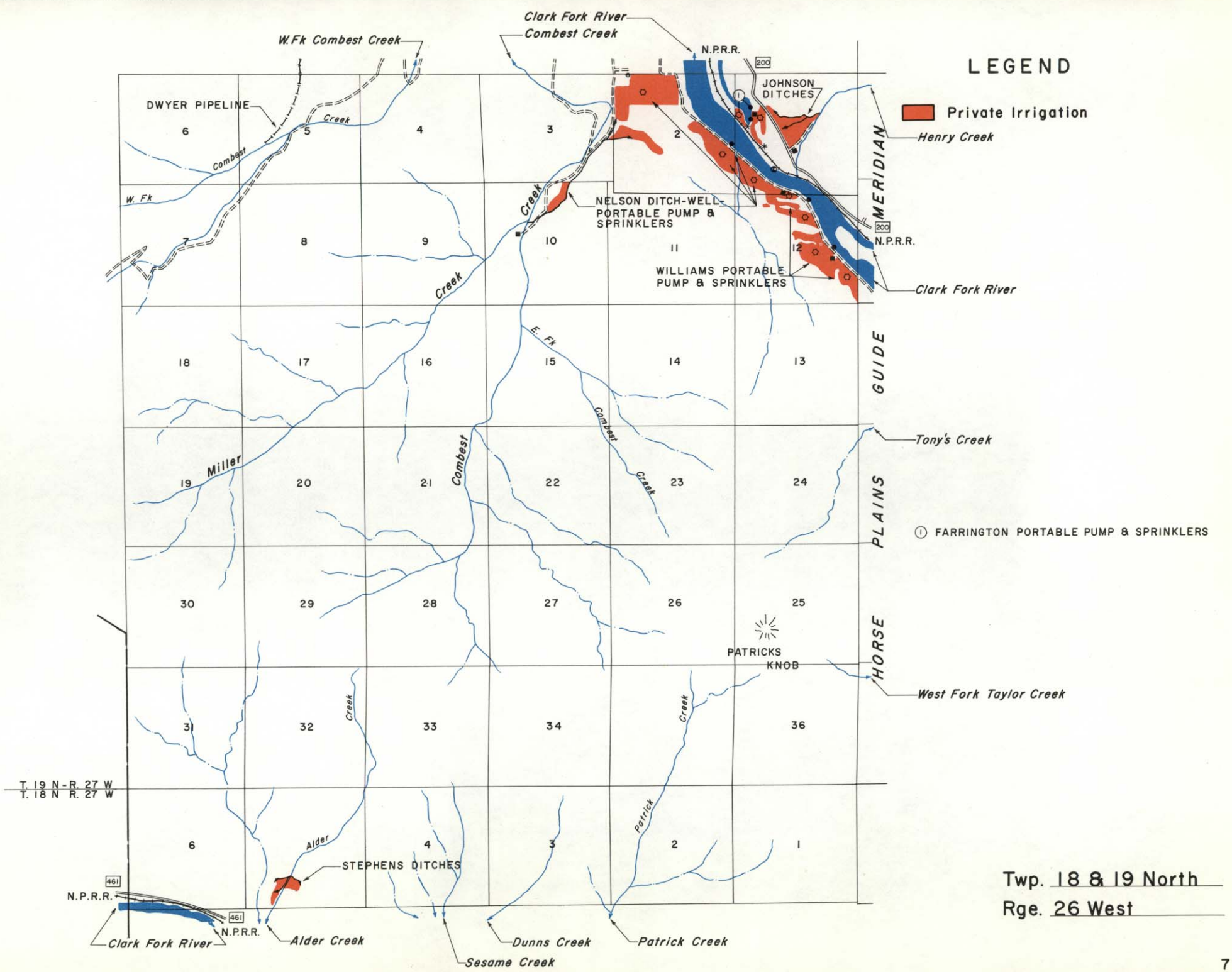

## LEGEND

Private Irrigation

Twp. 18 North
Rge. 24 West




Twp. 18 North
Rge. 25 West

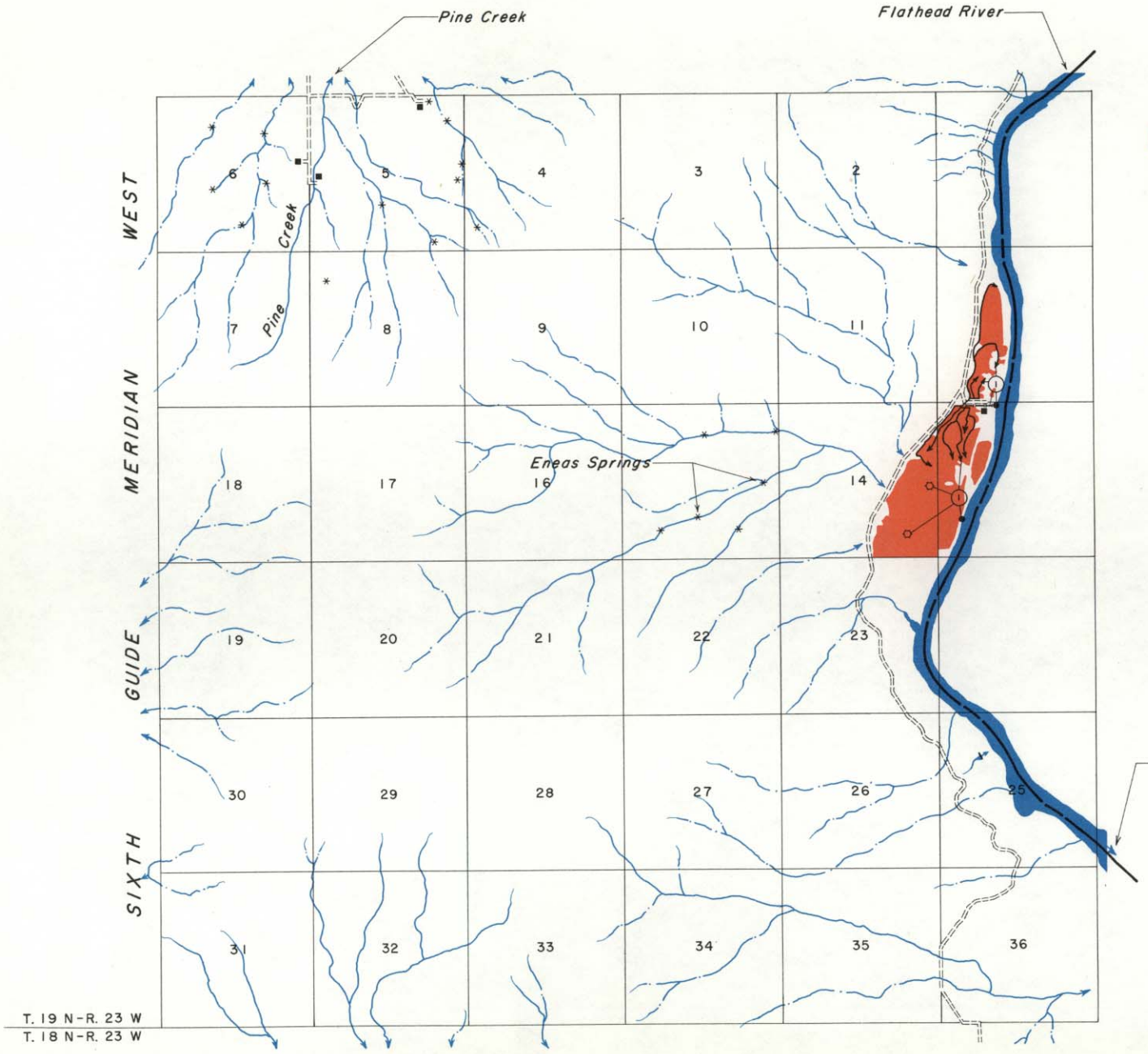



## LEGEND

Private Irrigation

Twp. 18 & 19 North

Rge. 26 West




LEGEND

Private Irrigation

LAKE

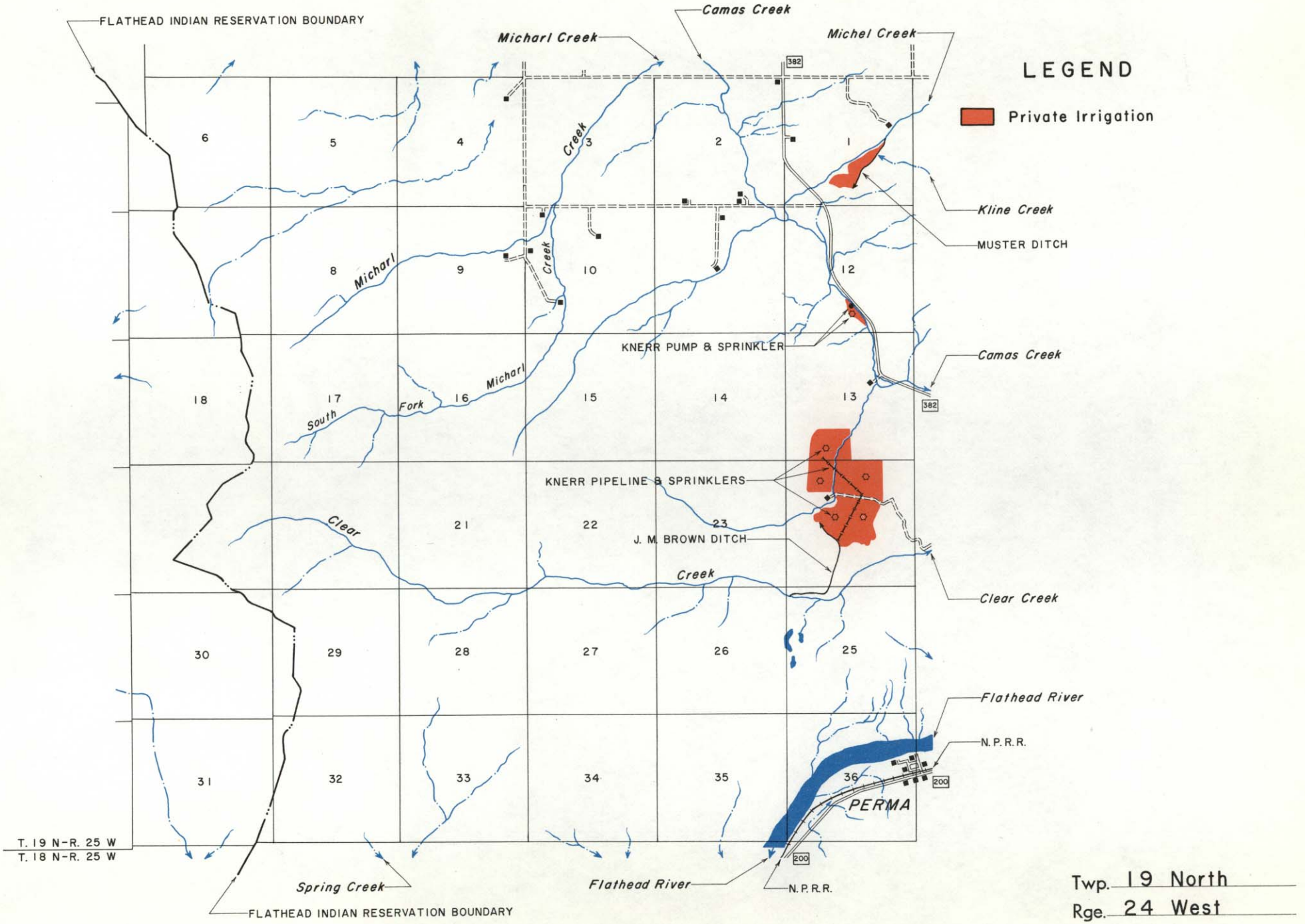
① MOSS PUMPS-PIPELINE-DITCHES & SPRINKLERS

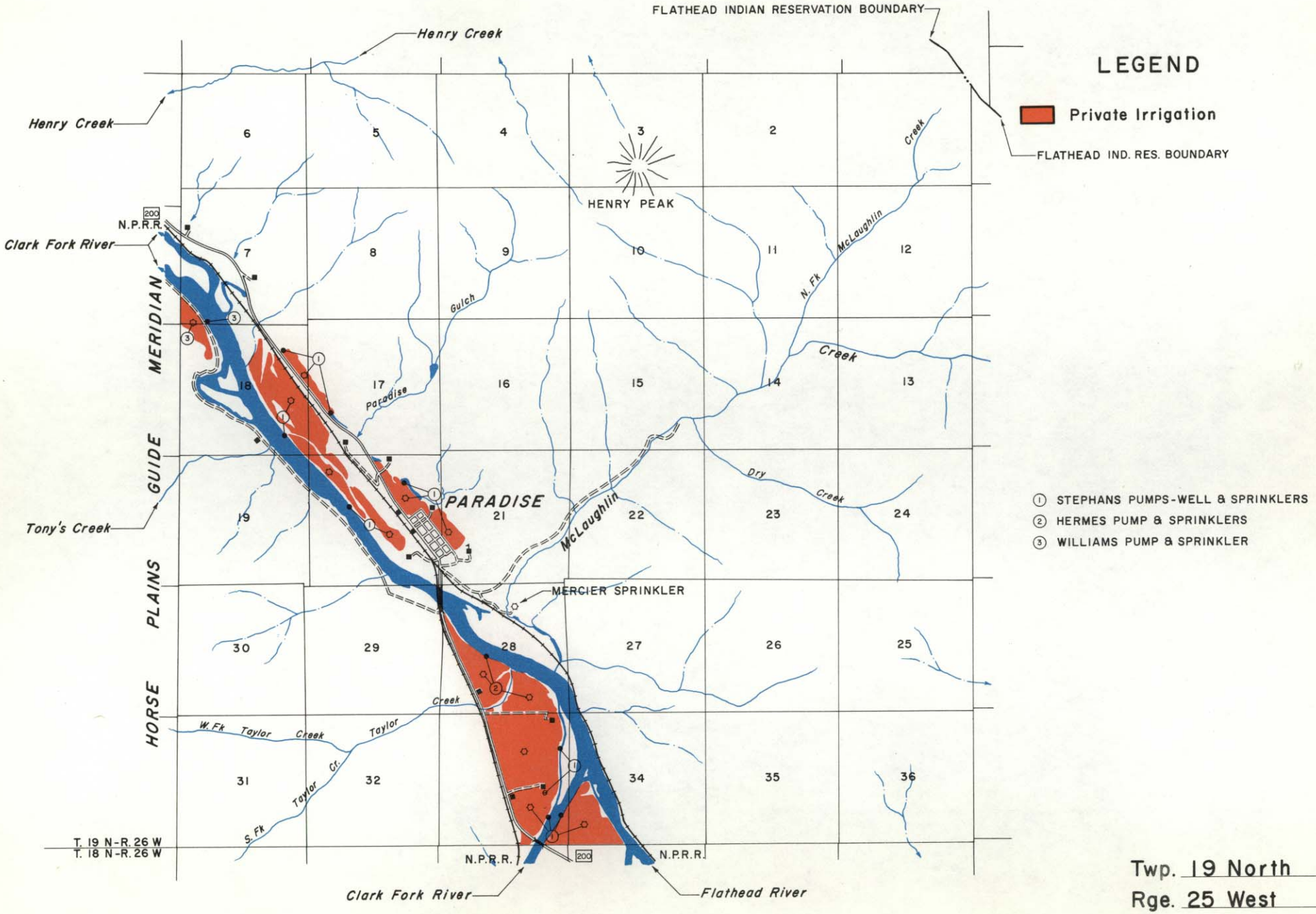
COUNTY

Flathead River

Twp. 19 North

Rge. 22 West


FLATHEAD INDIAN RESERVATION BOUNDARY
Michari Creek
Camas Creek
Michel Creek
382
LEGEND
Private Irrigation
Kline Creek
MUSTER DITCH
Michari Creek
KNERR PUMP & SPRINKLER
Camas Creek
382
South Fork Michari
KNERR PIPELINE & SPRINKLERS
J. M. BROWN DITCH
Clear Creek
Clear Creek
Flathead River
N. P. R. R.
200
PERMA
T. 19 N-R. 25 W
T. 18 N-R. 25 W
Spring Creek
Flathead River
N. P. R. R.
200
FLATHEAD INDIAN RESERVATION BOUNDARY
Twp. 19 North
Rge. 24 West


FLATHEAD INDIAN RESERVATION BOUNDARY
Henry Creek
Henry Creek
HENRY PEAK
N.P.R.R.
200
Clark Fork River
MERIDIAN
GUIDE
PLAINS
HORSE
Gulch
Paradise
N. Fk
McLaughlin
Creek
Dry
Creek
PARADISE
McLaughlin
Tony's Creek
MERCIER SPRINKLER
W. Fk Taylor Creek
Taylor
Creek
Taylor Cr.
S. Fk
T. 19 N-R. 26 W
T. 18 N-R. 26 W
N.P.R.R.
200
N.P.R.R.
Clark Fork River
Flathead River
6
5
4
3
2
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8
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10
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18
17
16
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34
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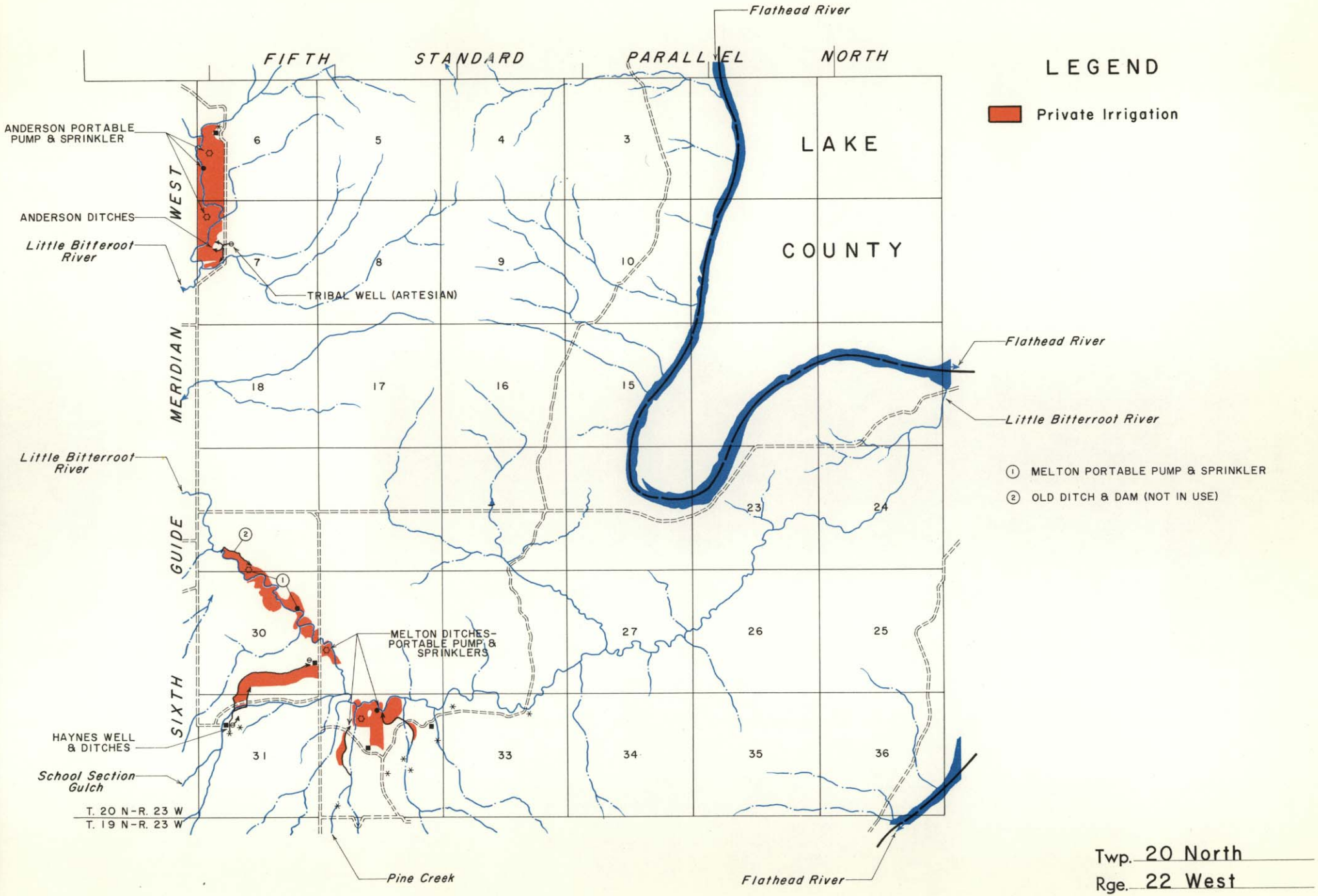
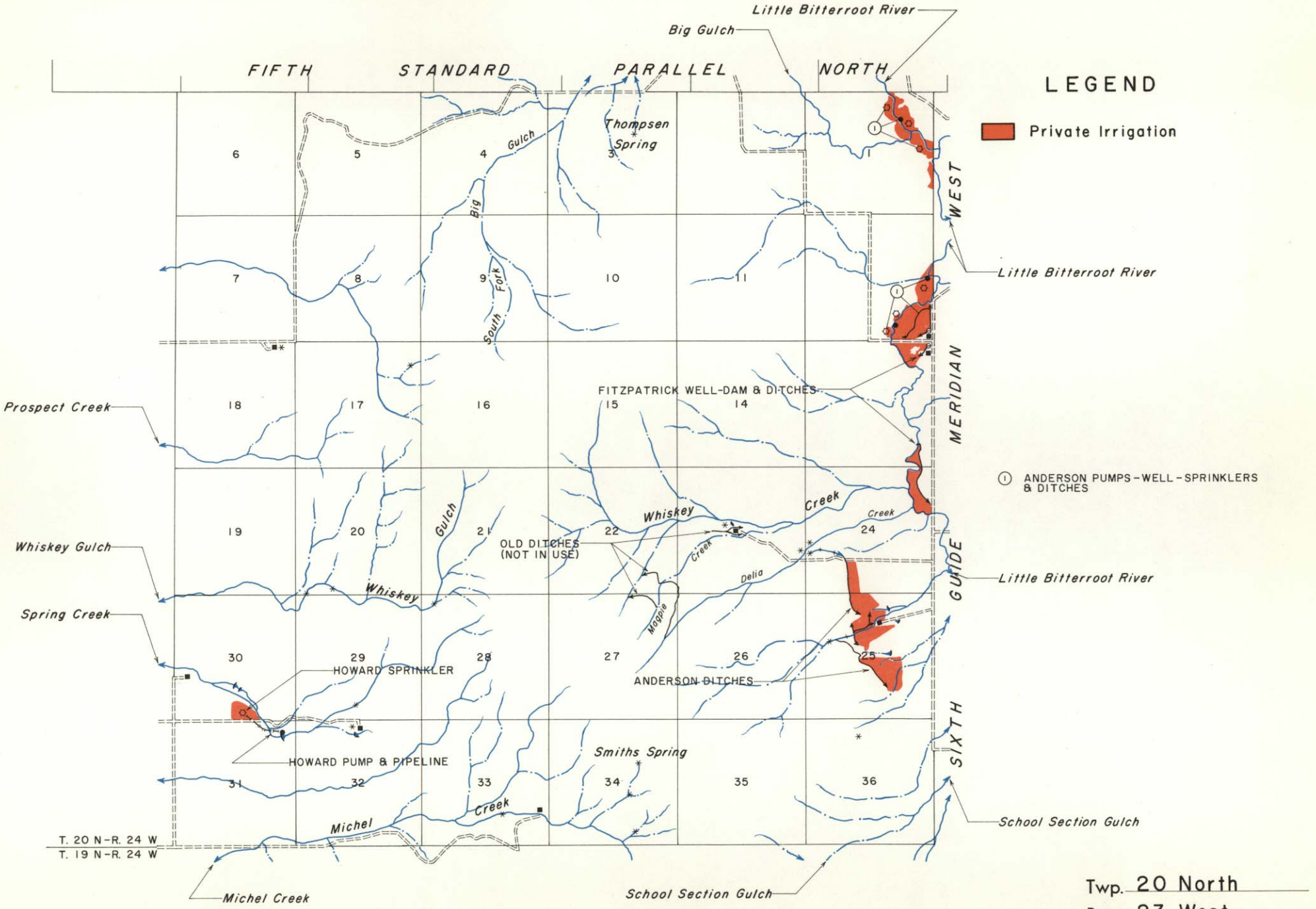
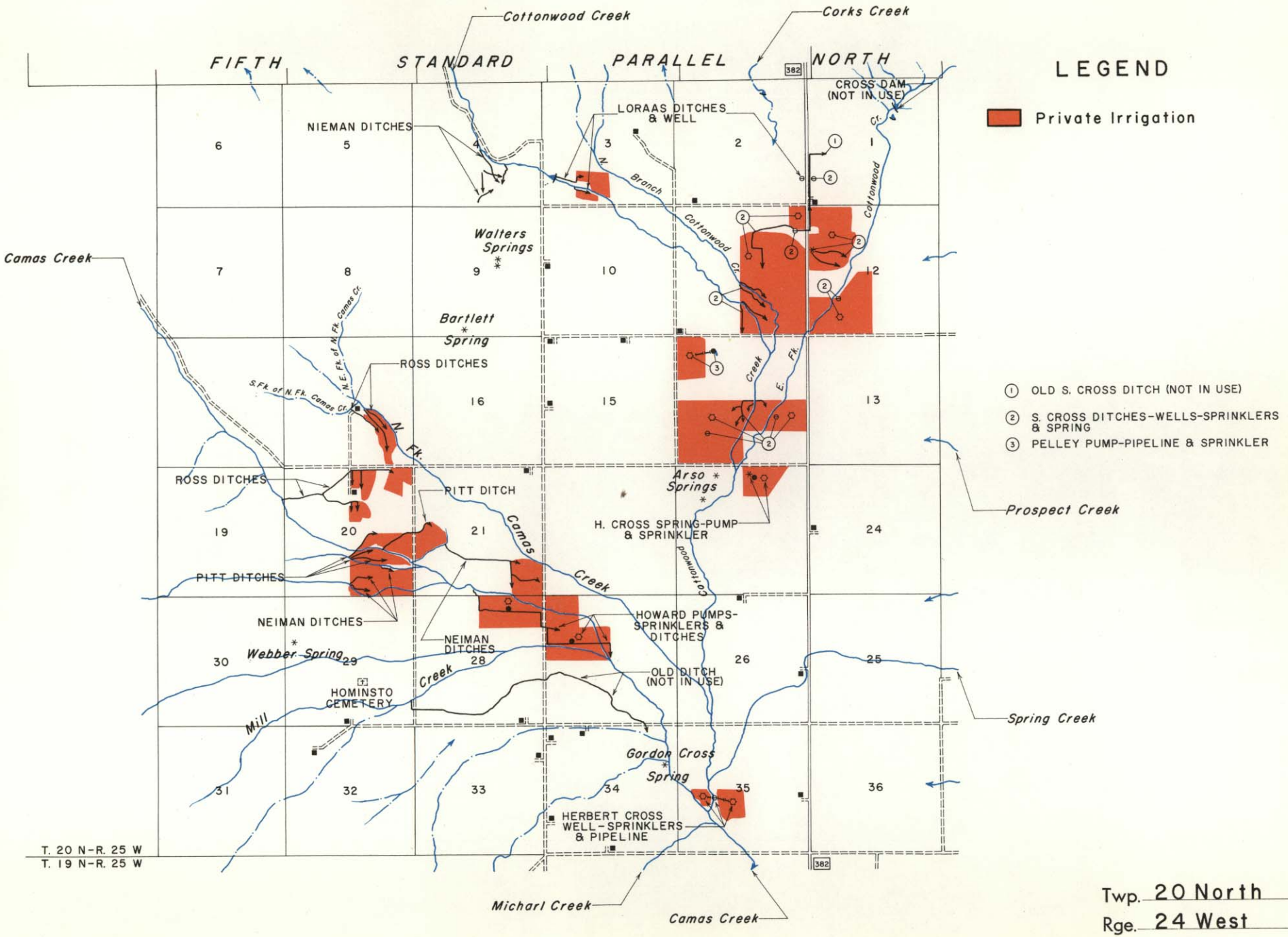
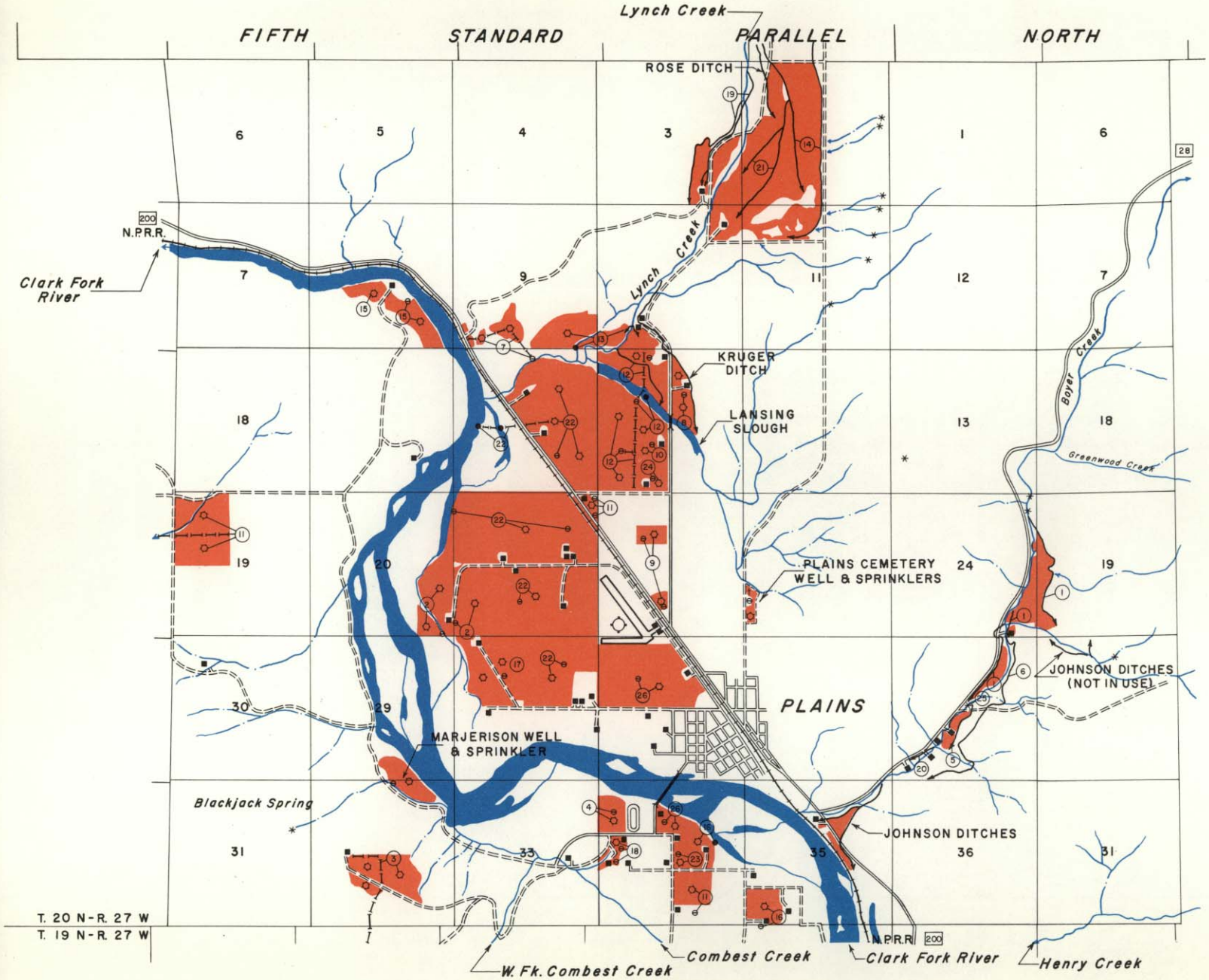
36
LEGEND
Private Irrigation
FLATHEAD IND. RES. BOUNDARY
① STEPHANS PUMPS-WELL & SPRINKLERS
② HERMES PUMP & SPRINKLERS
③ WILLIAMS PUMP & SPRINKLER
Twp. 19 North
Rge. 25 West


Flathead River
FIFTH STANDARD PARALLEL NORTH
LAKE COUNTY
WEST MERIDIAN SIXTH GUIDE
ANDERSON PORTABLE PUMP & SPRINKLER
ANDERSON DITCHES
Little Bitteroot River
TRIBAL WELL (ARTESIAN)
Flathead River
Little Bitterroot River
Little Bitterroot River
MELTON DITCHES-PORTABLE PUMP & SPRINKLERS
HAYNES WELL & DITCHES
School Section Gulch
T. 20 N-R. 23 W
T. 19 N-R. 23 W
Pine Creek
Flathead River
6 5 4 3
7 8 9 10
18 17 16 15
23 24
30 27 26 25
31 33 34 35 36
LEGEND
Private Irrigation
① MELTON PORTABLE PUMP & SPRINKLER
② OLD DITCH & DAM (NOT IN USE)
Twp. 20 North
Rge. 22 West


Little Bitterroot River
Big Gulch
FIFTH STANDARD PARALLEL NORTH
LEGEND
Private Irrigation
Thompsen Spring
Gulch
Big
South Fork
WEST
MERIDIAN
Little Bitterroot River
FITZPATRICK WELL-DAM & DITCHES
Prospect Creek
ANDERSON PUMPS-WELL-SPRINKLERS & DITCHES
Whiskey Gulch
Whiskey Creek
Creek
OLD DITCHES (NOT IN USE)
Delia
Magpie
Spring Creek
Whiskey
Gulch
GUIDE
Little Bitterroot River
HOWARD SPRINKLER
ANDERSON DITCHES
HOWARD PUMP & PIPELINE
Smiths Spring
SIXTH
School Section Gulch
Michel
Creek
T. 20 N-R. 24 W
T. 19 N-R. 24 W
Michel Creek
School Section Gulch
Twp. 20 North
Rge. 23 West


FIFTH STANDARD PARALLEL NORTH
Cottonwood Creek
Corks Creek
CROSS DAM (NOT IN USE)
LORAAS DITCHES & WELL
NIEMAN DITCHES
Walters Springs
Camas Creek
Bartlett Spring
ROSS DITCHES
S.Fk. of N.Fk. Camas Cr.
N.E. Fk. of N.Fk. Camas Cr.
N. Fk.
PITT DITCH
Arso Springs
H. CROSS SPRING-PUMP & SPRINKLER
Prospect Creek
PITT DITCHES
Camas Creek
HOWARD PUMPS-SPRINKLERS & DITCHES
NEIMAN DITCHES
Webber Spring
OLD DITCH (NOT IN USE)
HOMINSTO CEMETERY
Mill Creek
Spring Creek
Gordon Cross Spring
HERBERT CROSS WELL-SPRINKLERS & PIPELINE
Michael Creek
Camas Creek
T. 20 N-R. 25 W
T. 19 N-R. 25 W
LEGEND
Private Irrigation
① OLD S. CROSS DITCH (NOT IN USE)
② S. CROSS DITCHES-WELLS-SPRINKLERS & SPRING
③ PELLEY PUMP-PIPELINE & SPRINKLER
Twp. 20 North
Rge. 24 West

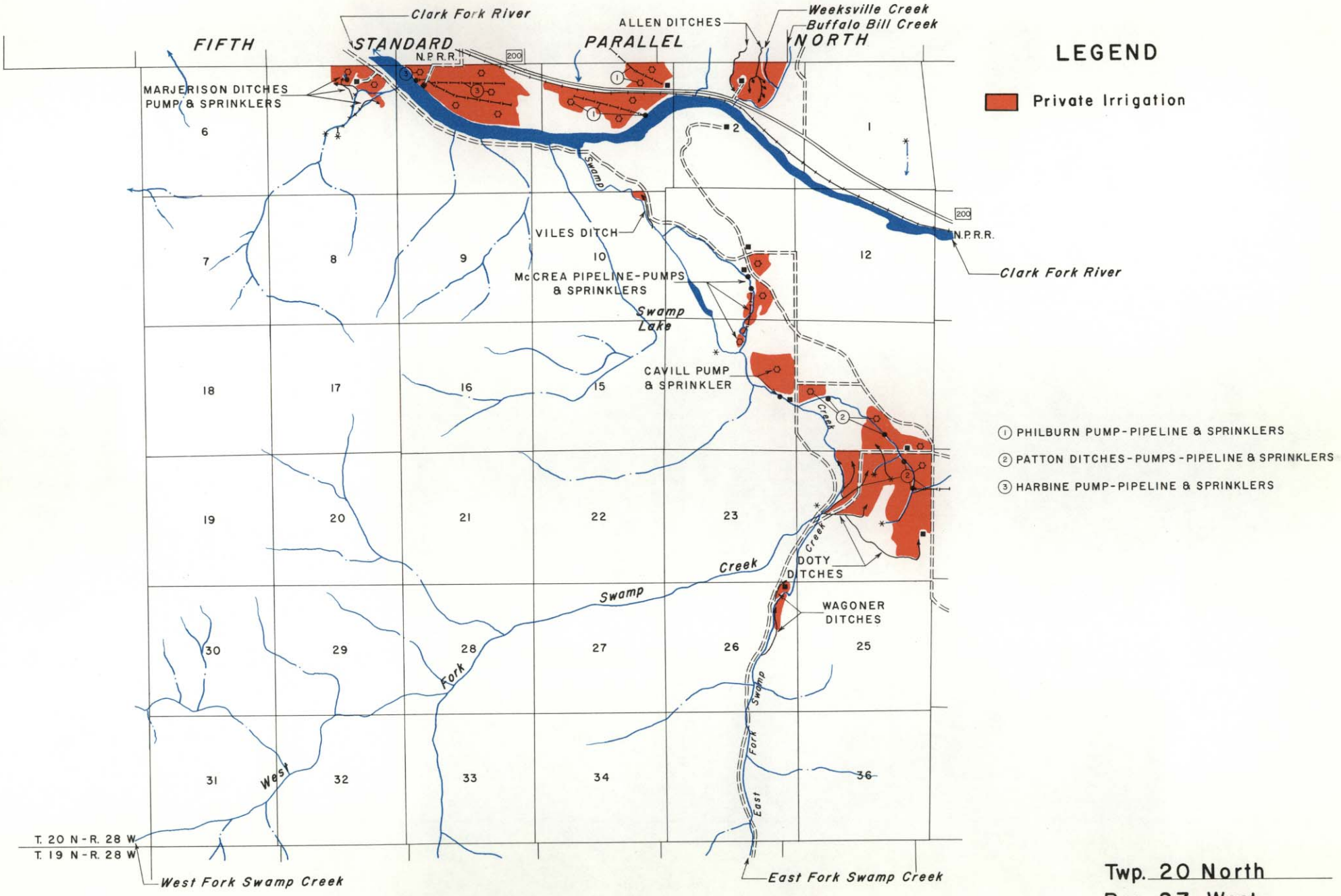



## LEGEND

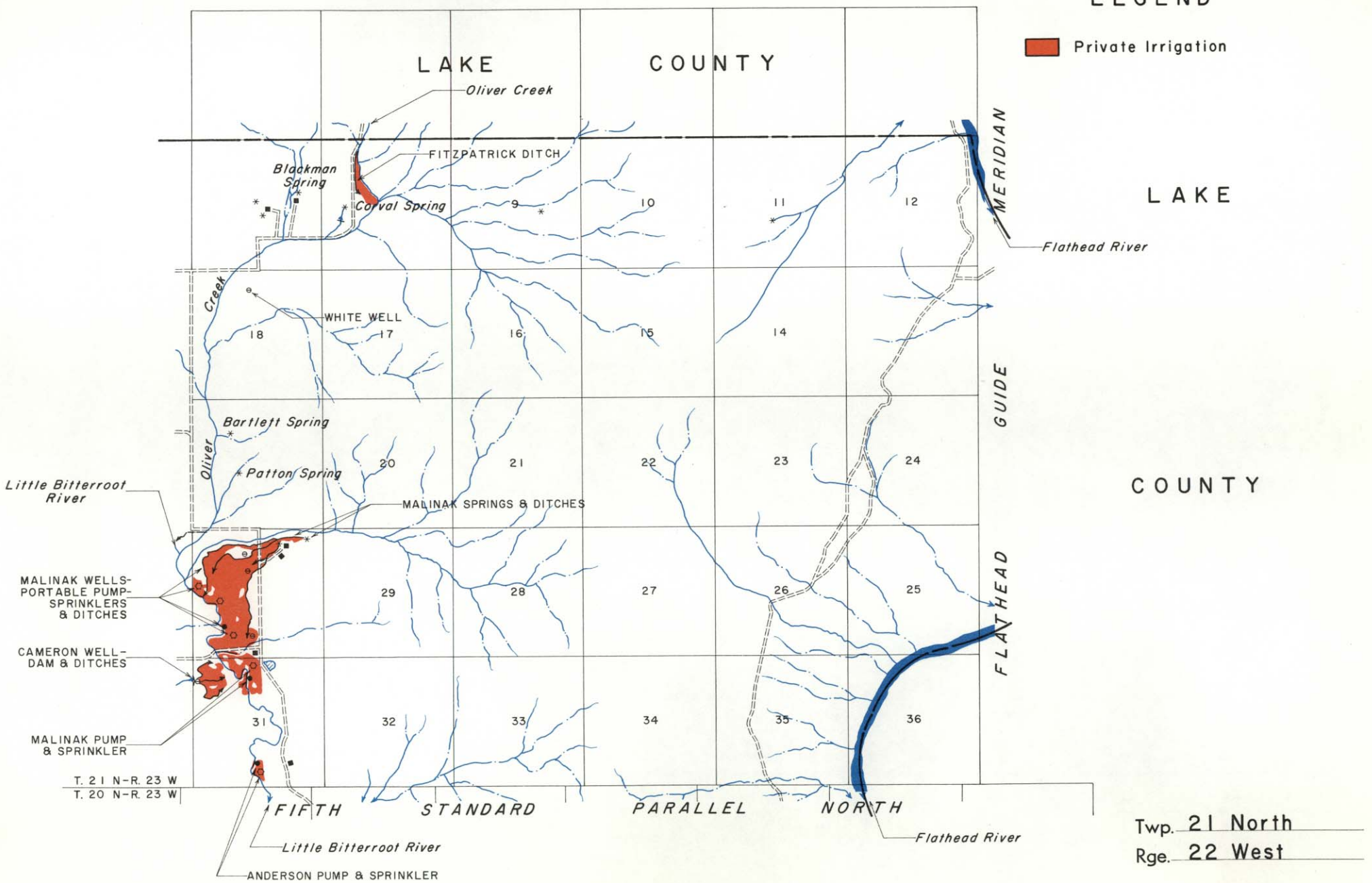
Private Irrigation

1. BOEHLER DITCHES
2. DIEHL WELLS & SPRINKLERS
3. DWYER PIPELINE & SPRINKLERS
4. FRENCH WELL & SPRINKLER
5. GARDNER DITCH
6. GARDNER-JOHNSON-CYR & WEBER DITCH
7. GOLF COURSE WELL-PIPELINE & SPRINKLERS
8. HOLLAND WELL & SPRINKLERS
9. HOWELLS WELLS & SPRINKLERS
10. HUTCHINSON WELL & SPRINKLERS
11. JOHNSON WELLS-PUMP-DITCHES PIPELINES & SPRINKLERS
12. KRUDDE WELLS-PUMP-DITCH PIPELINES & SPRINKLERS
13. LODER DAM-DITCHES-PUMP & SPRINKLERS
14. LYNCH DITCHES
15. McCREA WELL & SPRINKLERS
16. NELSON WELL-SPRINKLERS & PUMP
17. OLFERT WELL & SPRINKLERS
18. PERRODIN WELLS & SPRINKLERS
19. PILGERAM DITCHES
20. SCOTT DITCH
21. SPRING DITCH
22. STONEBROOK WELLS-PUMPS-PIPELINES & SPRINKLERS
23. STRIPE WELL & SPRINKLERS
24. TOMPKINS WELL & SPRINKLERS
25. PLAINS WATER Co. SPRINGS
26. GEBHARDT WELL & SPRINKLER

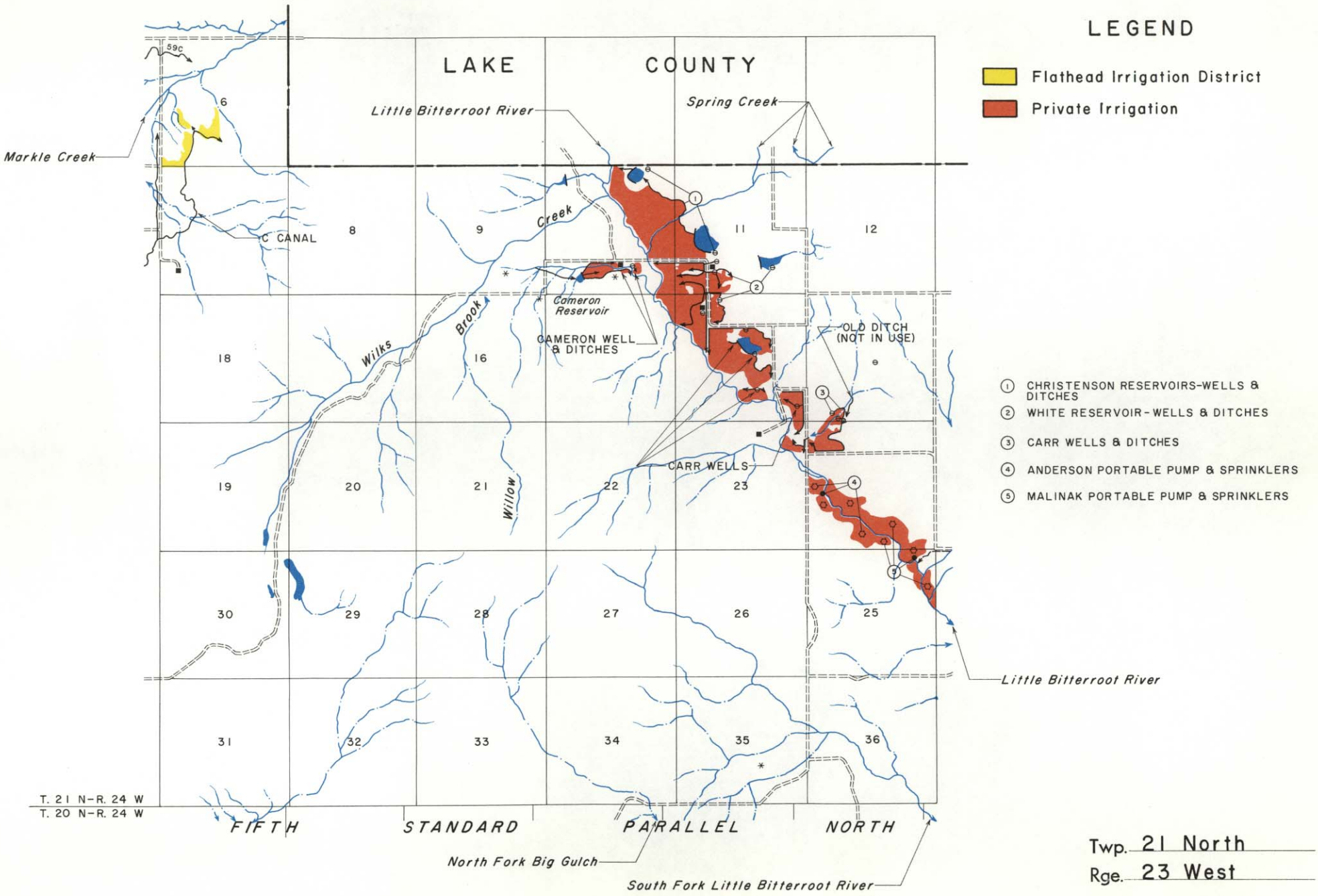
**Twp. 20 North**
**Rge. 25 & 26 West**

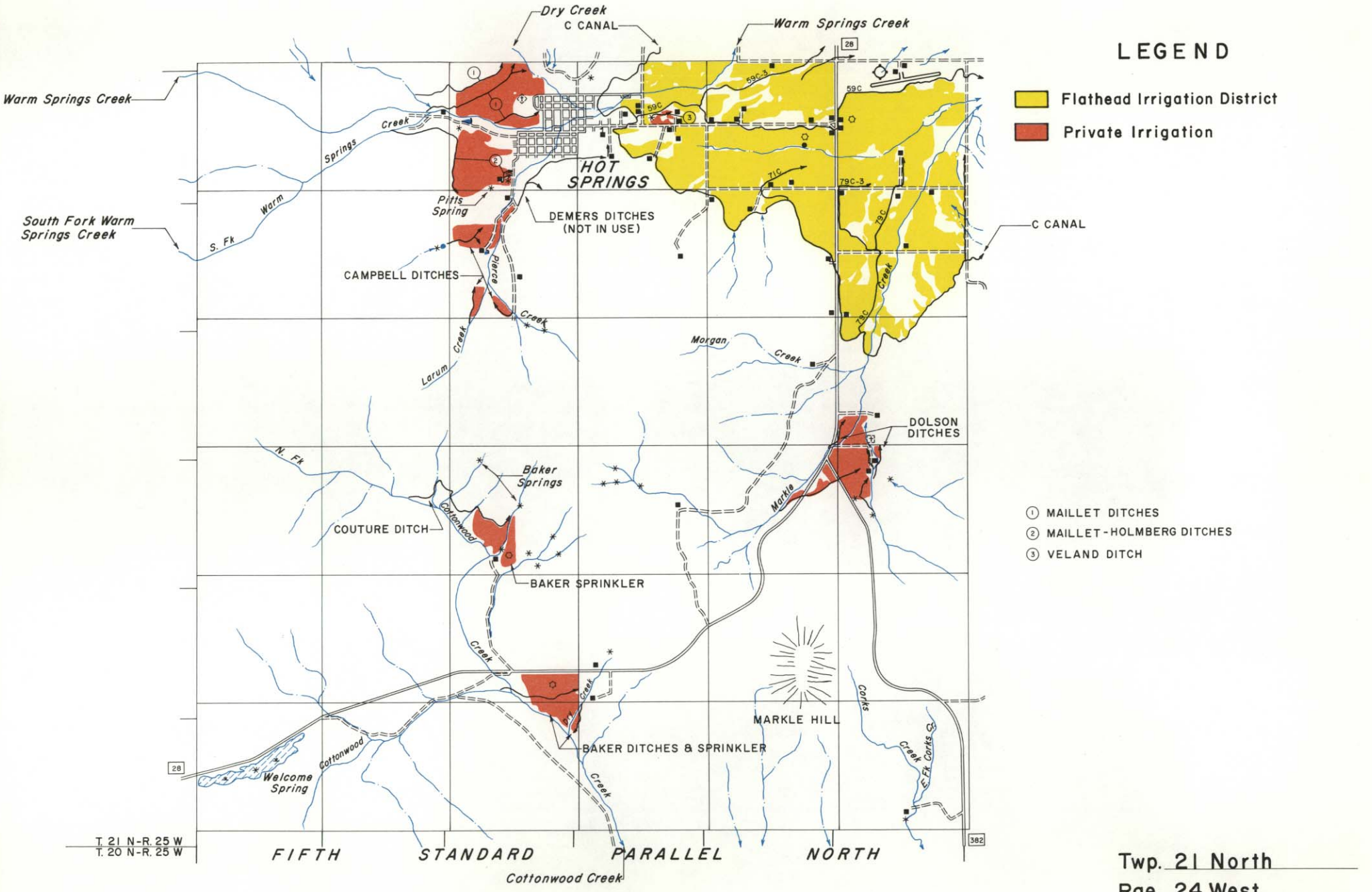



Twp. 20 North
Rge. 27 West




Twp. 21 North
Rge. 22 West


LAKE COUNTY
Little Bitterroot River
Spring Creek
Markle Creek
59C
6
C CANAL
8
9
Creek
11
12
Cameron Reservoir
CAMERON WELL & DITCHES
OLD DITCH (NOT IN USE)
Wilks Brook
18
16
CARR WELLS
19
20
21
Willow
22
23
30
29
28
27
26
25
Little Bitterroot River
31
32
33
34
35
36
T. 21 N-R. 24 W
T. 20 N-R. 24 W
FIFTH STANDARD PARALLEL NORTH
North Fork Big Gulch
South Fork Little Bitterroot River
LEGEND
Flathead Irrigation District
Private Irrigation
① CHRISTENSON RESERVOIRS-WELLS & DITCHES
② WHITE RESERVOIR - WELLS & DITCHES
③ CARR WELLS & DITCHES
④ ANDERSON PORTABLE PUMP & SPRINKLERS
⑤ MALINAK PORTABLE PUMP & SPRINKLERS
Twp. 21 North
Rge. 23 West

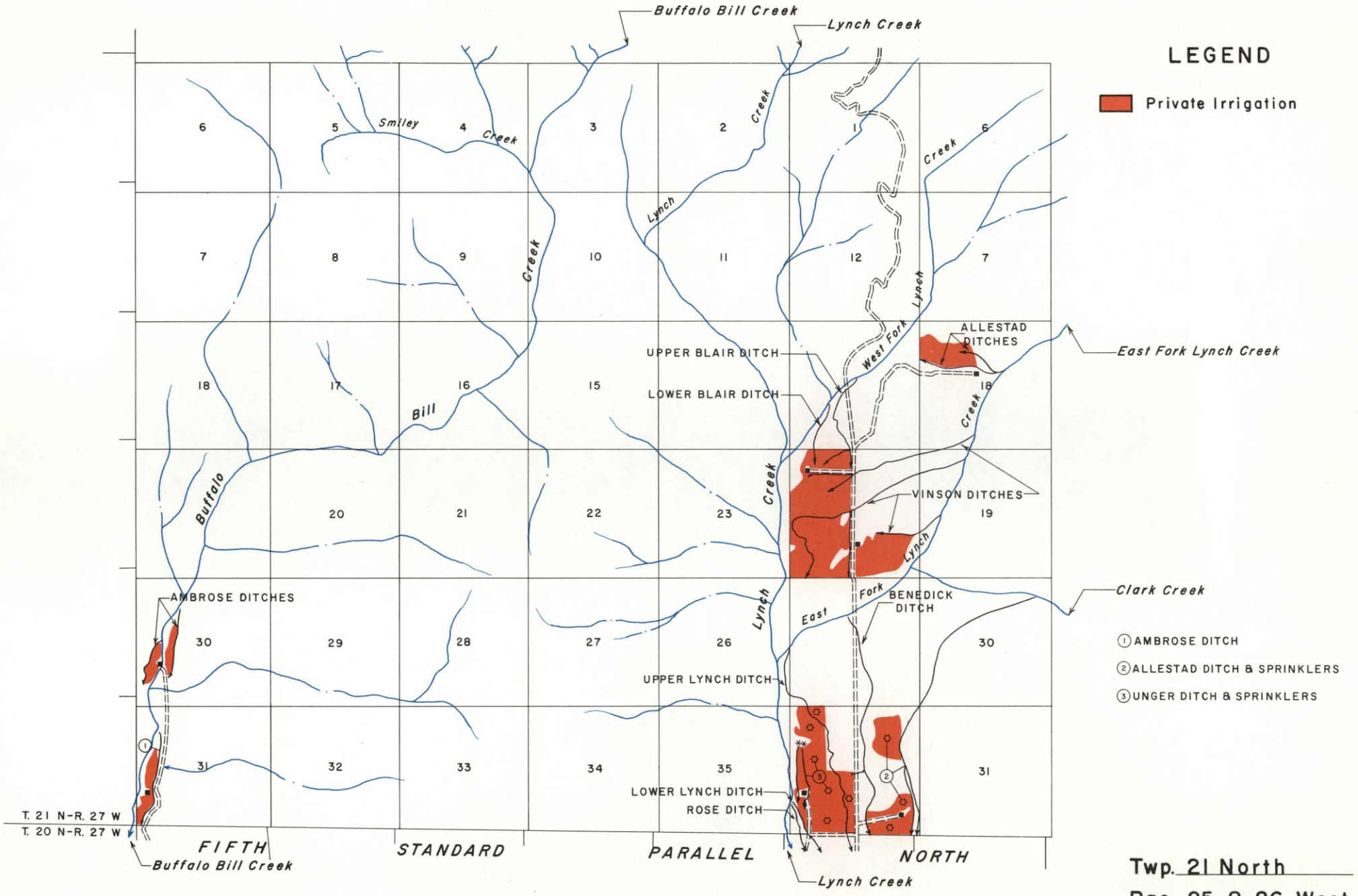


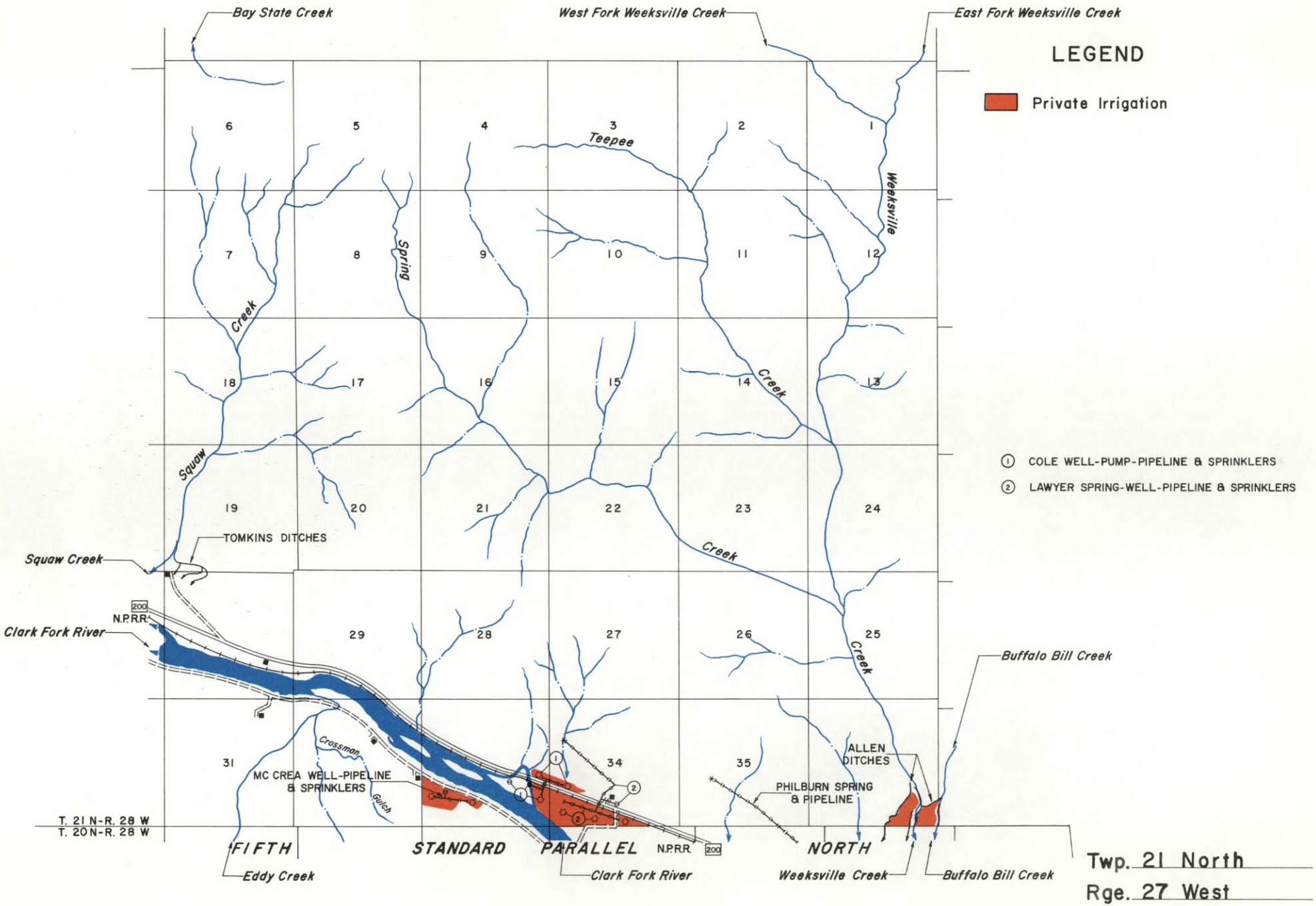

## LEGEND

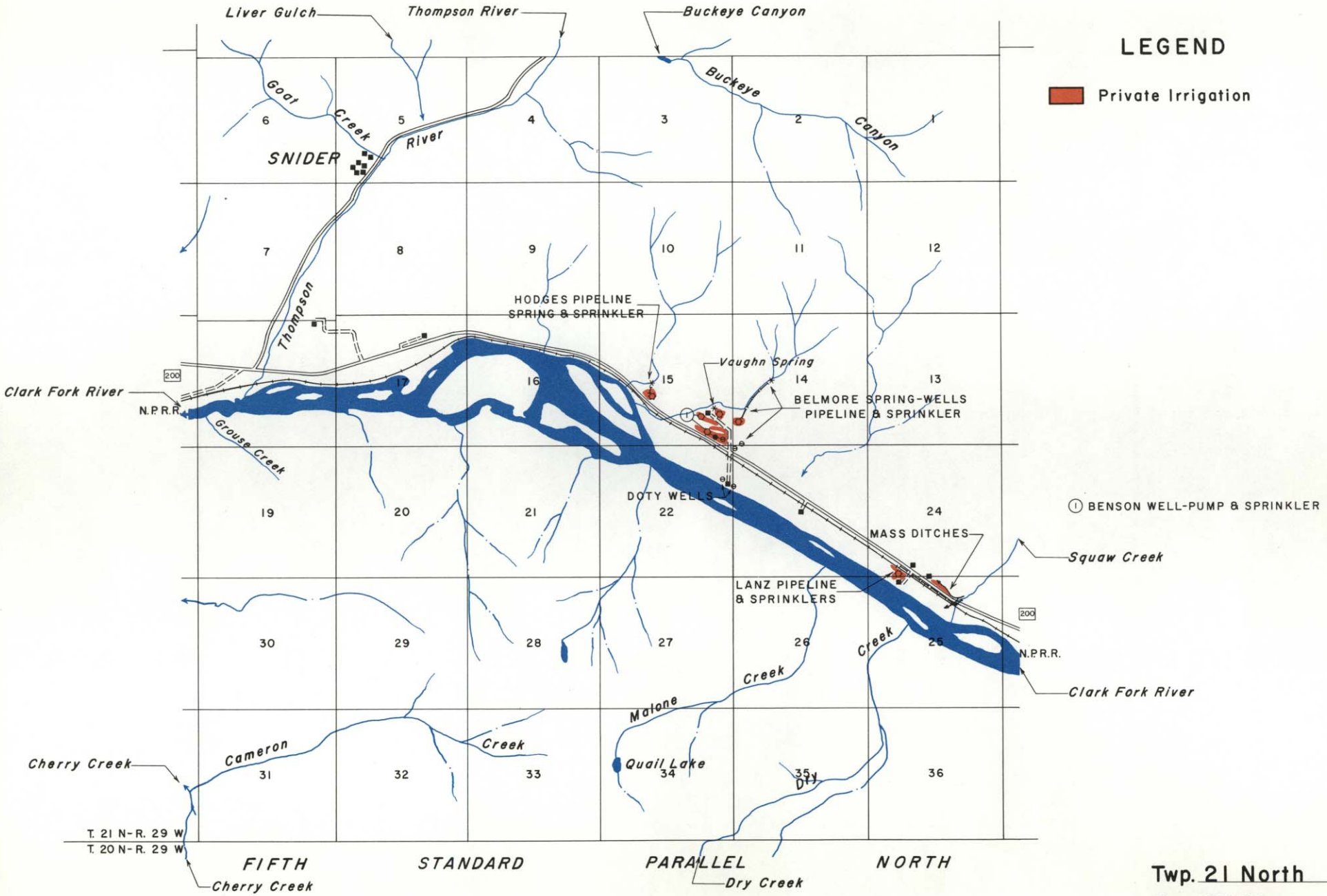
- Flathead Irrigation District
- Private Irrigation

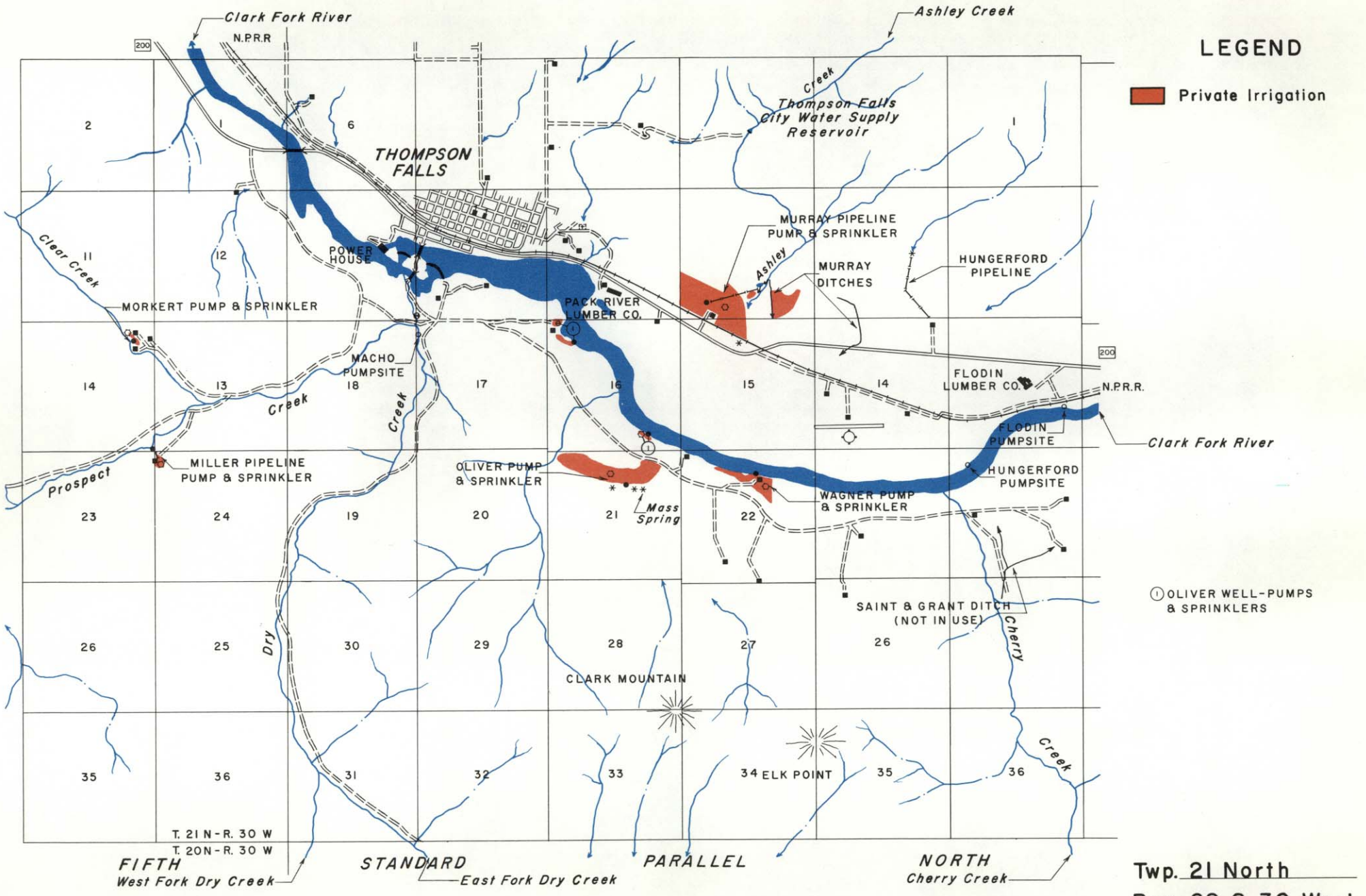
① MAILLET DITCHES
② MAILLET-HOLMBERG DITCHES
③ VELAND DITCH

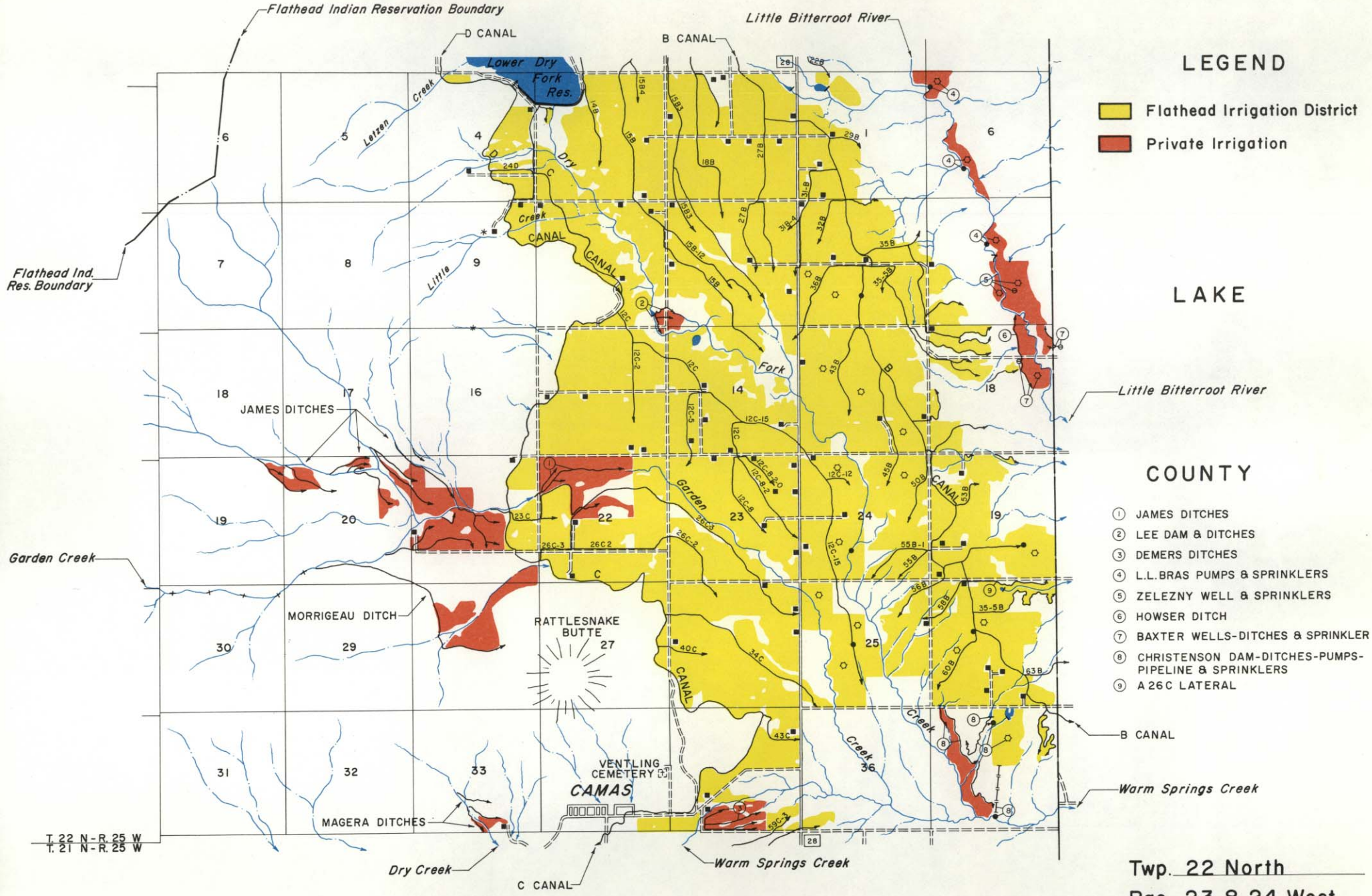
Twp. 21 North
Rge. 24 West

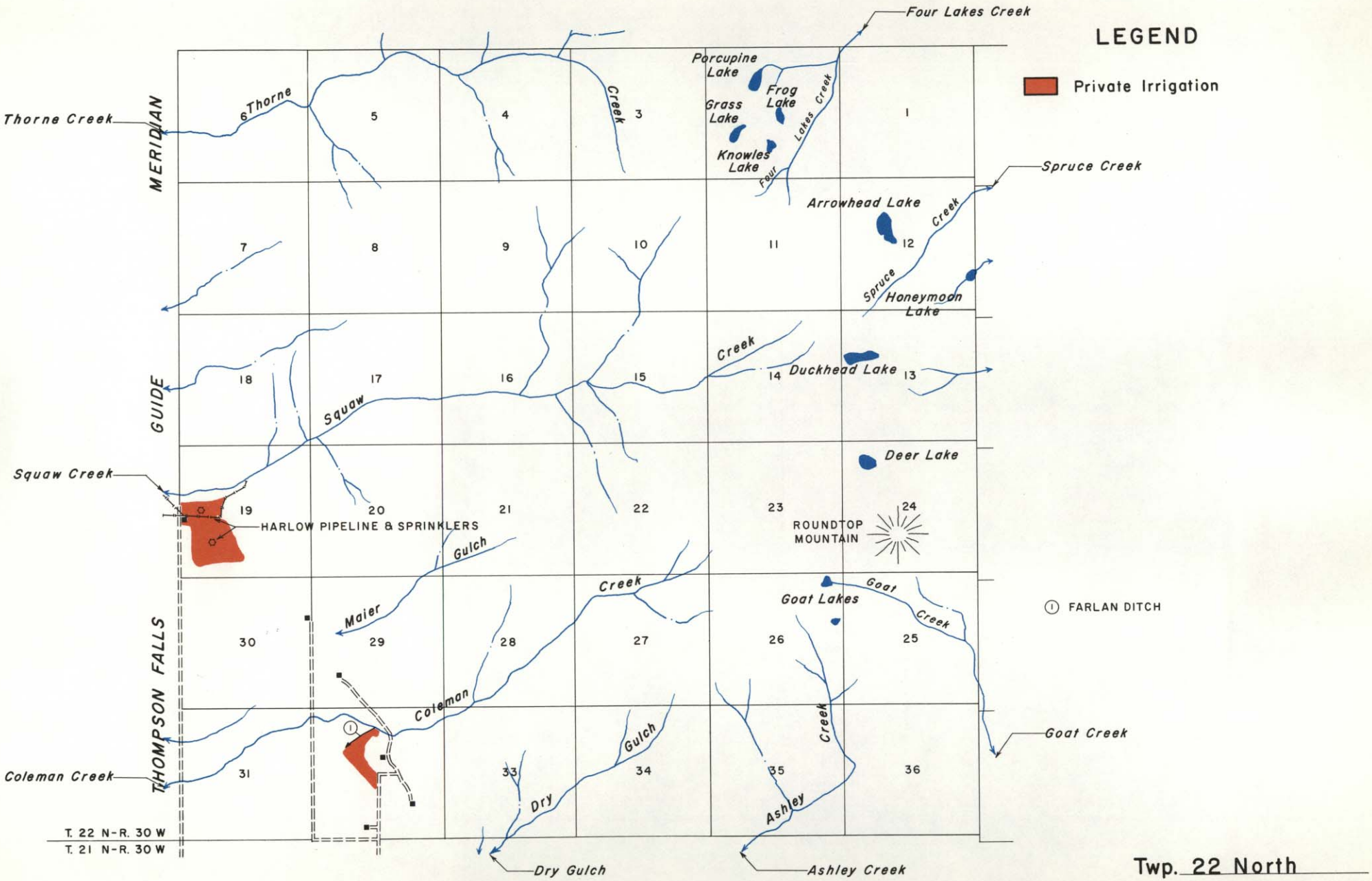

Buffalo Bill Creek
Lynch Creek
Smiley Creek
Lynch Creek
Bill Creek
Buffalo Creek
West Fork Lynch Creek
East Fork Lynch Creek
Clark Creek
ALLESTAD DITCHES
UPPER BLAIR DITCH
LOWER BLAIR DITCH
VINSON DITCHES
AMBROSE DITCHES
BENEDICK DITCH
UPPER LYNCH DITCH
LOWER LYNCH DITCH
ROSE DITCH
6
5
4
3
2
1
6
7
8
9
10
11
12
7
18
17
16
15
18
20
21
22
23
19
30
29
28
27
26
30
31
32
33
34
35
31
T. 21 N-R. 27 W
T. 20 N-R. 27 W
FIFTH STANDARD PARALLEL NORTH
Buffalo Bill Creek
Lynch Creek
LEGEND
Private Irrigation
① AMBROSE DITCH
② ALLESTAD DITCH & SPRINKLERS
③ UNGER DITCH & SPRINKLERS
Twp. 21 North
Rge. 25 & 26 West

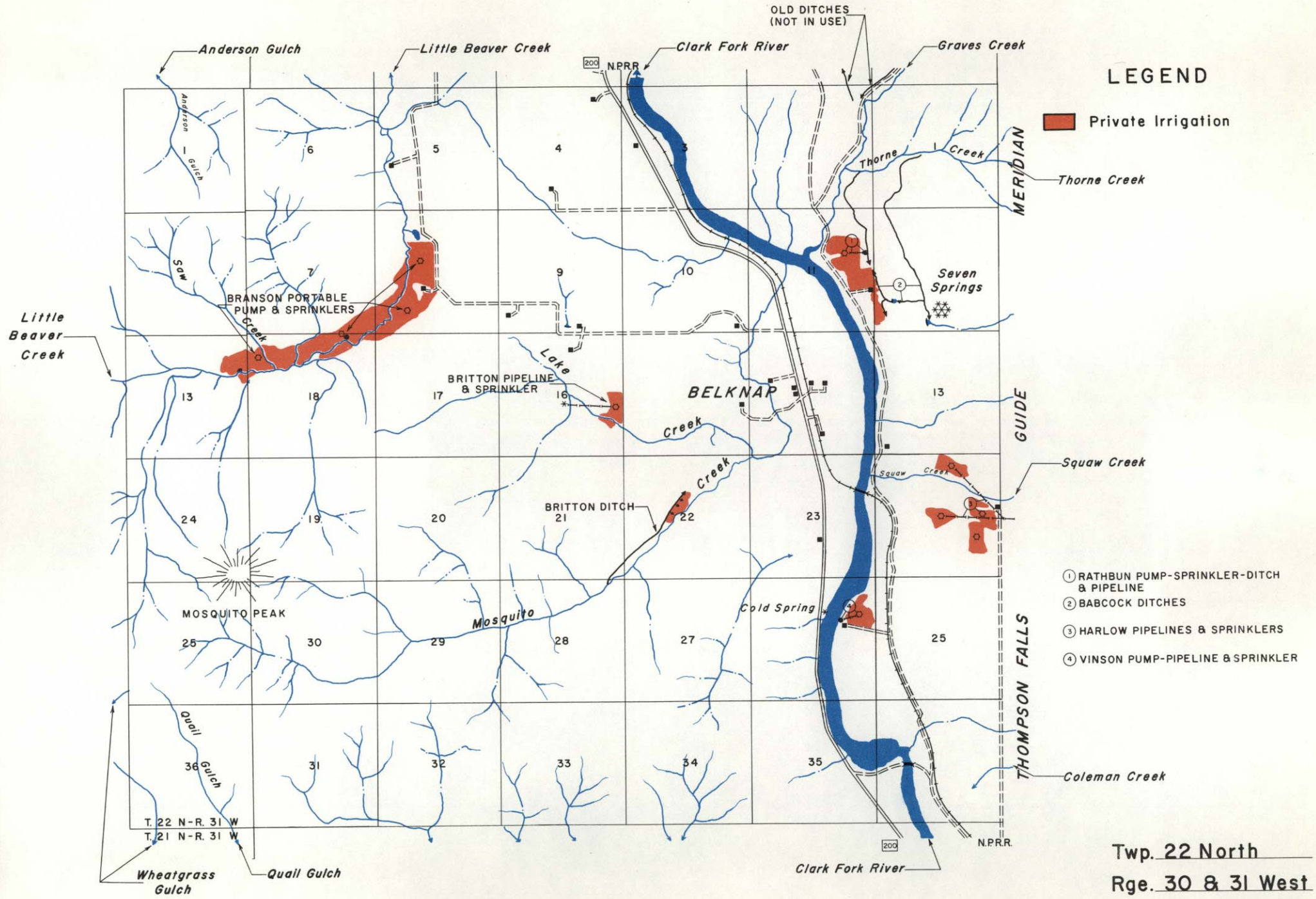

Bay State Creek
West Fork Weeksville Creek
East Fork Weeksville Creek
LEGEND
Private Irrigation
Teepee
Weeksville
Spring
Creek
Squaw
Creek
Creek
Creek
Creek
Squaw Creek
TOMKINS DITCHES
N.P.R.R.
Clark Fork River
Buffalo Bill Creek
Crossman
Gulch
MC CREA WELL-PIPELINE & SPRINKLERS
ALLEN DITCHES
PHILBURN SPRING & PIPELINE
① COLE WELL-PUMP-PIPELINE & SPRINKLERS
② LAWYER SPRING-WELL-PIPELINE & SPRINKLERS
T. 21 N-R. 28 W
T. 20 N-R. 28 W
FIFTH STANDARD PARALLEL N.P.R.R. NORTH
Eddy Creek
Clark Fork River
Weeksville Creek
Buffalo Bill Creek
Twp. 21 North
Rge. 27 West

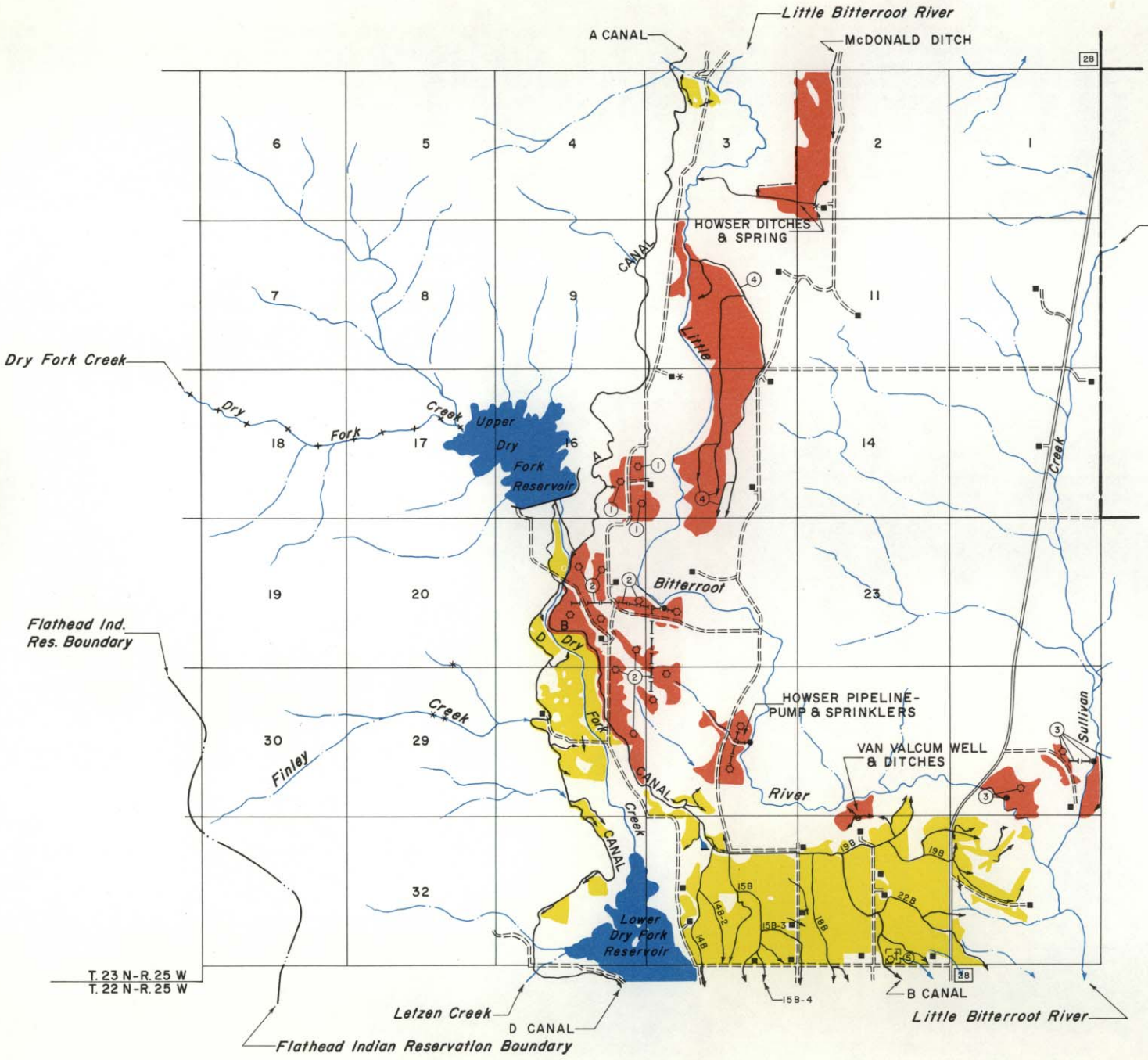

Liver Gulch
Thompson River
Buckeye Canyon
Goat Creek
Buckeye Canyon
SNIDER
River
Thompson
HODGES PIPELINE
SPRING & SPRINKLER
Vaughn Spring
BELMORE SPRING-WELLS
PIPELINE & SPRINKLER
Clark Fork River
N.P.R.R.
Grouse Creek
DOTY WELLS
BENSON WELL-PUMP & SPRINKLER
MASS DITCHES
Squaw Creek
LANZ PIPELINE
& SPRINKLERS
N.P.R.R.
Clark Fork River
Malone Creek
Cameron Creek
Cherry Creek
Quail Lake
Dry
T. 21 N-R. 29 W
T. 20 N-R. 29 W
FIFTH STANDARD PARALLEL NORTH
Cherry Creek
Dry Creek
LEGEND
Private Irrigation
Twp. 21 North
Rge. 28 West


Clark Fork River
N.P.R.R
200
Ashley Creek
Thompson Falls City Water Supply Reservoir
THOMPSON FALLS
POWER HOUSE
MURRAY PIPELINE PUMP & SPRINKLER
MURRAY DITCHES
HUNGERFORD PIPELINE
Ashley
Clear Creek
MORKERT PUMP & SPRINKLER
PACK RIVER LUMBER CO.
MACHO PUMPSITE
FLODIN LUMBER CO.
N.P.R.R.
FLODIN PUMPSITE
Clark Fork River
Prospect Creek
MILLER PIPELINE PUMP & SPRINKLER
OLIVER PUMP & SPRINKLER
Mass Spring
HUNGERFORD PUMPSITE
WAGNER PUMP & SPRINKLER
SAINT & GRANT DITCH (NOT IN USE)
Dry Creek
Cherry Creek
CLARK MOUNTAIN
34 ELK POINT
T. 21 N - R. 30 W
T. 20N - R. 30 W
FIFTH
West Fork Dry Creek
STANDARD
East Fork Dry Creek
PARALLEL
NORTH
Cherry Creek
LEGEND
Private Irrigation
① OLIVER WELL-PUMPS & SPRINKLERS
Twp. 21 North
Rge. 29 & 30 West


Flathead Indian Reservation Boundary
D CANAL
B CANAL
Little Bitterroot River
Lower Dry Fork Res.
Letzen Creek
Dry Fork Creek
Little Fork
CANAL
Flathead Ind. Res. Boundary
JAMES DITCHES
Garden Creek
MORRIGEAU DITCH
RATTLESNAKE BUTTE
VENTLING CEMETERY
CAMAS
MAGERA DITCHES
Dry Creek
C CANAL
Warm Springs Creek
T. 22 N - R. 25 W
T. 21 N - R. 25 W
LEGEND
Flathead Irrigation District
Private Irrigation
LAKE
COUNTY
① JAMES DITCHES
② LEE DAM & DITCHES
③ DEMERS DITCHES
④ L.L. BRAS PUMPS & SPRINKLERS
⑤ ZELEZNY WELL & SPRINKLERS
⑥ HOWSER DITCH
⑦ BAXTER WELLS-DITCHES & SPRINKLER
⑧ CHRISTENSON DAM-DITCHES-PUMPS-PIPELINE & SPRINKLERS
⑨ A 26C LATERAL
Twp. 22 North
Rge. 23 & 24 West


LEGEND
Private Irrigation
① FARLAN DITCH
Four Lakes Creek
Porcupine Lake
Frog Lake
Grass Lake
Knowles Lake
Four Lakes Creek
Spruce Creek
Arrowhead Lake
Spruce Creek
Honeymoon Lake
Duckhead Lake
Deer Lake
Thorne Creek
Thorne Creek
Squaw Creek
Squaw Creek
HARLOW PIPELINE & SPRINKLERS
ROUNDTOP MOUNTAIN
Maier Gulch
Coleman Creek
Goat Lakes
Goat Creek
Goat Creek
Coleman Creek
Dry Gulch
Ashley Creek
MERIDIAN
GUIDE
THOMPSON FALLS
T. 22 N-R. 30 W
T. 21 N-R. 30 W
Twp. 22 North
Rge. 29 West


OLD DITCHES
(NOT IN USE)
Anderson Gulch
Little Beaver Creek
200 N.P.R.R.
Clark Fork River
Graves Creek
Thorne Creek
Thorne Creek
MERIDIAN
Anderson Gulch
Saw Creek
BRANSON PORTABLE
PUMP & SPRINKLERS
Seven Springs
Little Beaver Creek
Lake Creek
BRITTON PIPELINE
& SPRINKLER
BELKNAP
GUIDE
Squaw Creek
Squaw Creek
BRITTON DITCH
Creek
MOSQUITO PEAK
Mosquito
Cold Spring
THOMPSON FALLS
Coleman Creek
Quail Gulch
T. 22 N-R. 31 W
T. 21 N-R. 31 W
Wheatgrass Gulch
Quail Gulch
200 N.P.R.R.
Clark Fork River
LEGEND
Private Irrigation
1 RATHBUN PUMP-SPRINKLER-DITCH & PIPELINE
2 BABCOCK DITCHES
3 HARLOW PIPELINES & SPRINKLERS
4 VINSON PUMP-PIPELINE & SPRINKLER
Twp. 22 North
Rge. 30 & 31 West




## LEGEND

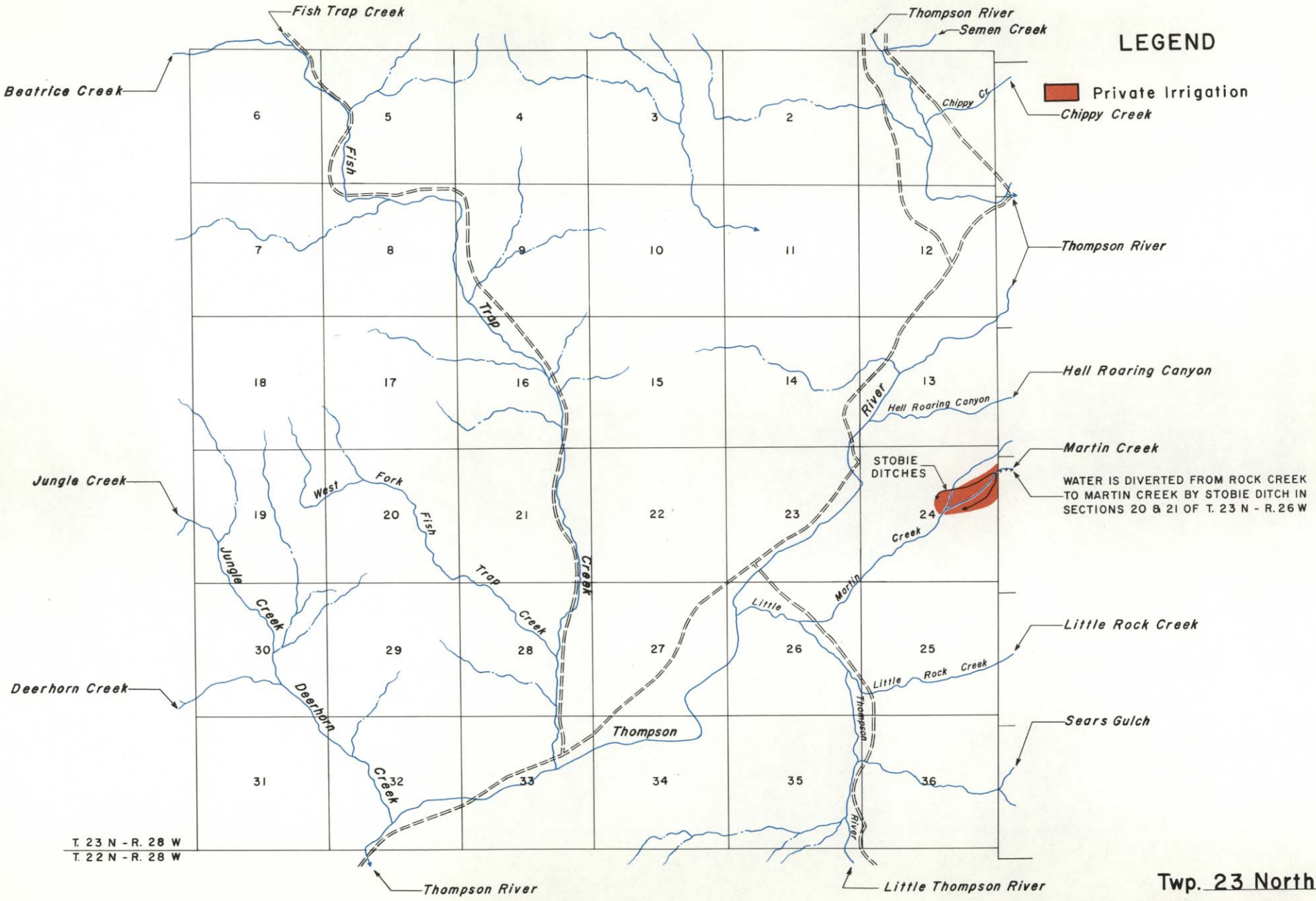
- Flathead Irrigation District
- Private Irrigation

LAKE

COUNTY

① MURRY SPRINKLERS
② PEDERSON PUMP-PIPELINES & SPRINKLERS
③ McCOY PUMPS-DITCH-PIPELINE & SPRINKLERS
④ JACKSON-SWOPE-PEDERSON DITCHES
⑤ MURRY CEMETERY

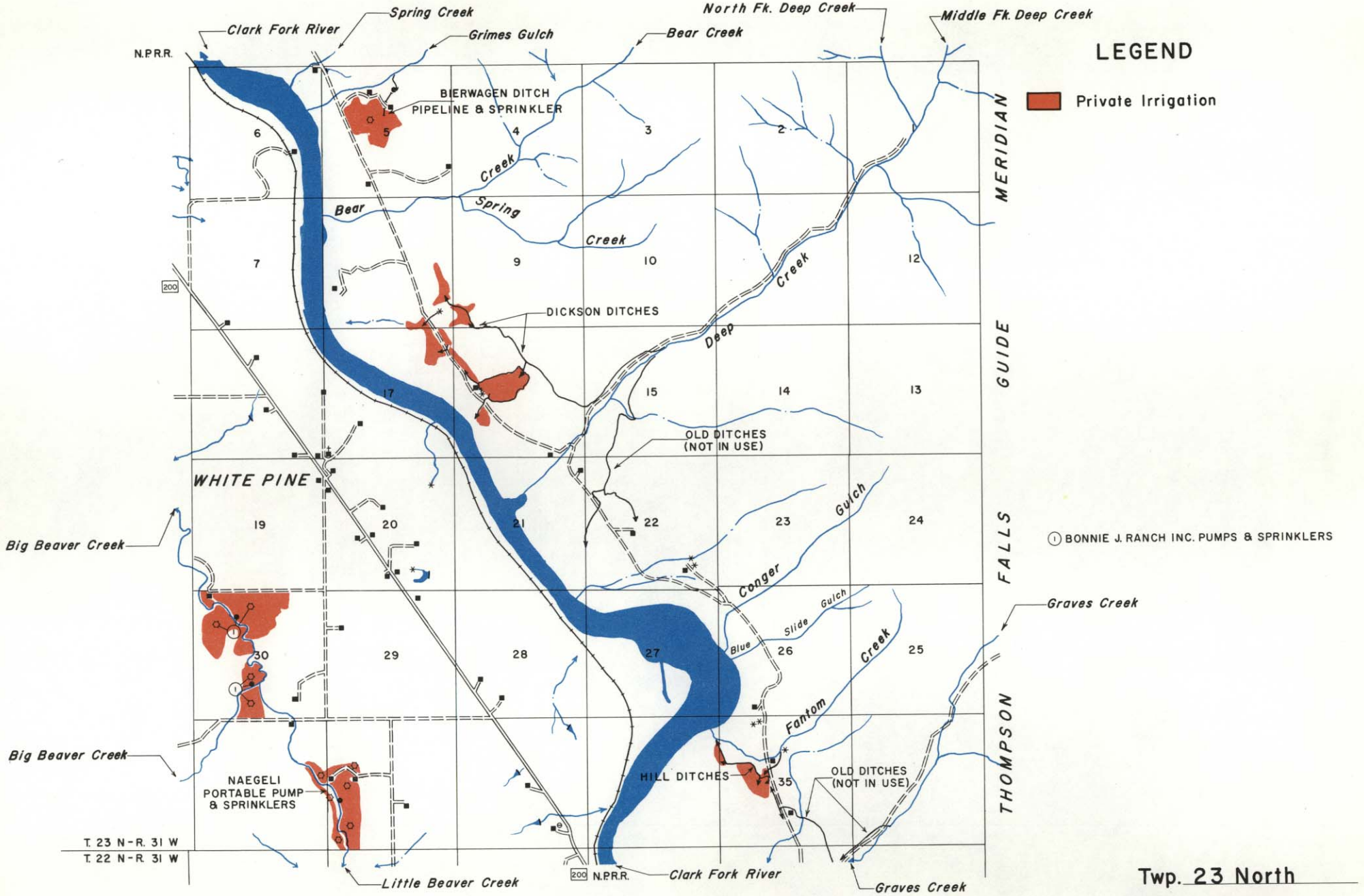
Twp. 23 North
Rge. 24 West

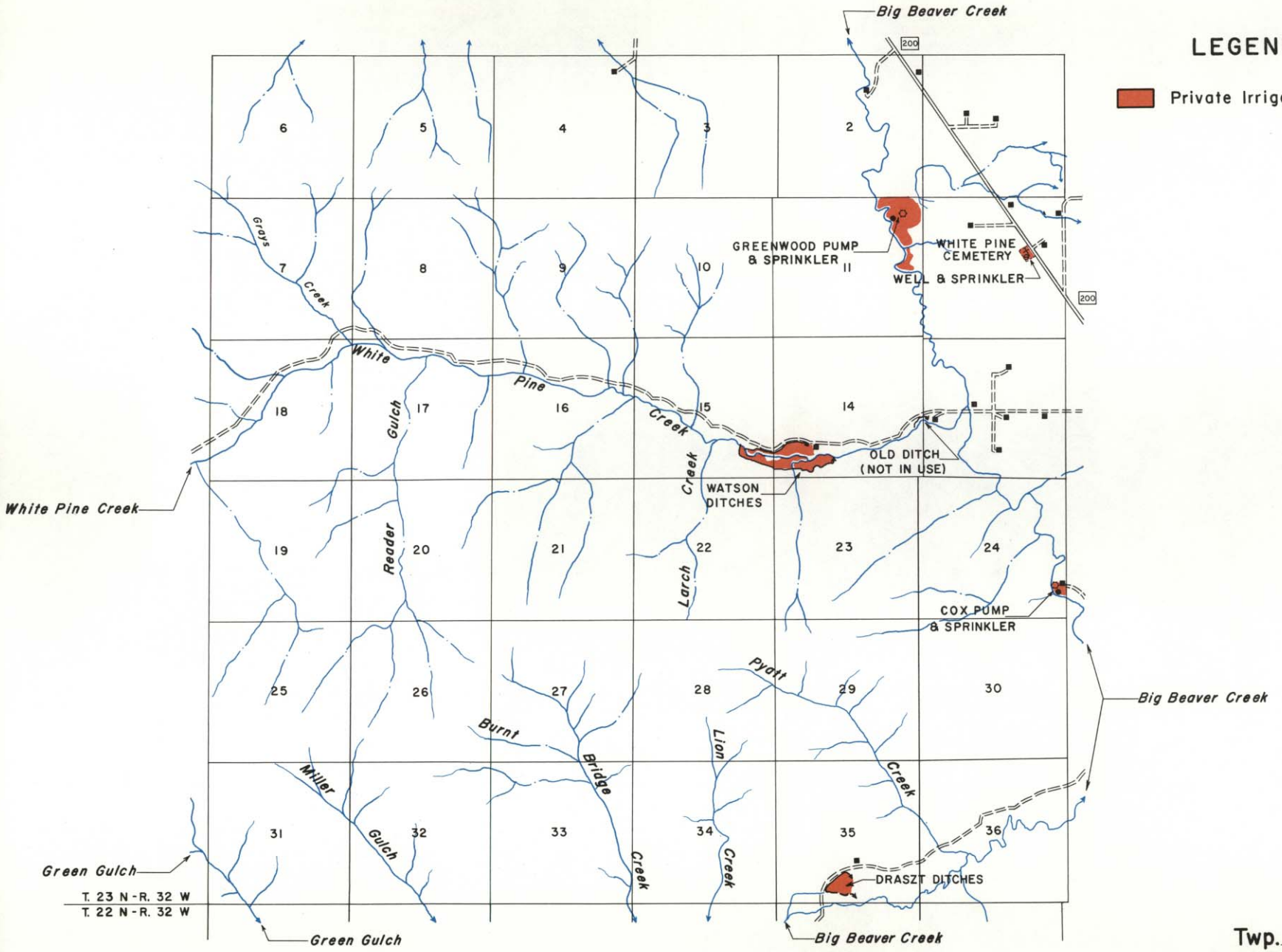



## LEGEND

Private Irrigation

Twp. 23 North
Rge. 27 West


Clark Fork River
Spring Creek
Grimes Gulch
Bear Creek
North Fk. Deep Creek
Middle Fk. Deep Creek
N.P.R.R.
BIERWAGEN DITCH
PIPELINE & SPRINKLER
Bear Spring Creek
DICKSON DITCHES
Deep Creek
OLD DITCHES
(NOT IN USE)
WHITE PINE
Big Beaver Creek
Conger Gulch
Blue Slide Gulch
Graves Creek
Fantom Creek
HILL DITCHES
OLD DITCHES
(NOT IN USE)
NAEGELI
PORTABLE PUMP
& SPRINKLERS
Big Beaver Creek
Little Beaver Creek
Clark Fork River
Graves Creek
MERIDIAN
GUIDE
FALLS
THOMPSON
T. 23 N - R. 31 W
T. 22 N - R. 31 W
LEGEND
Private Irrigation
① BONNIE J. RANCH INC. PUMPS & SPRINKLERS
Twp. 23 North
Rge. 30 West

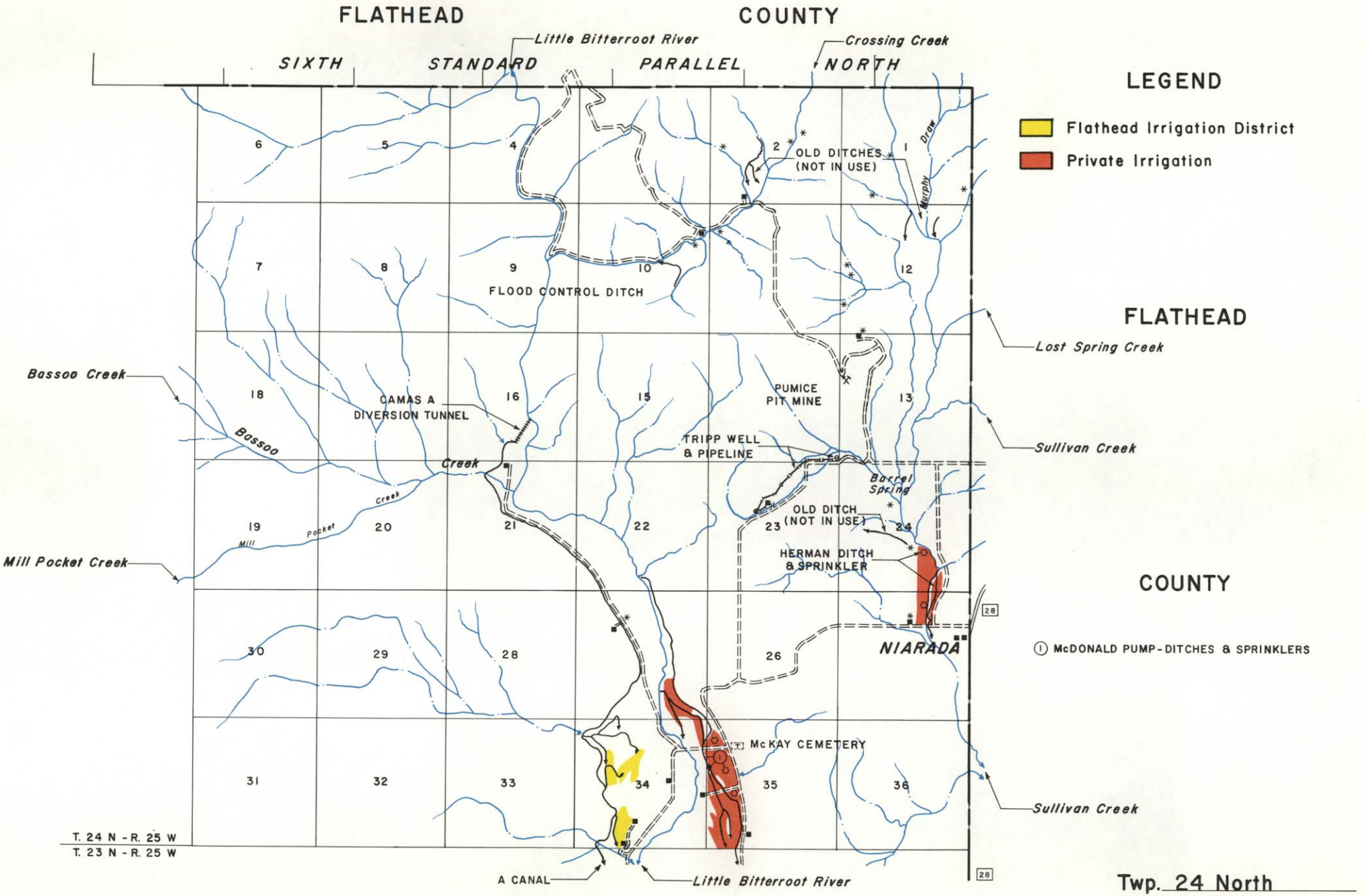


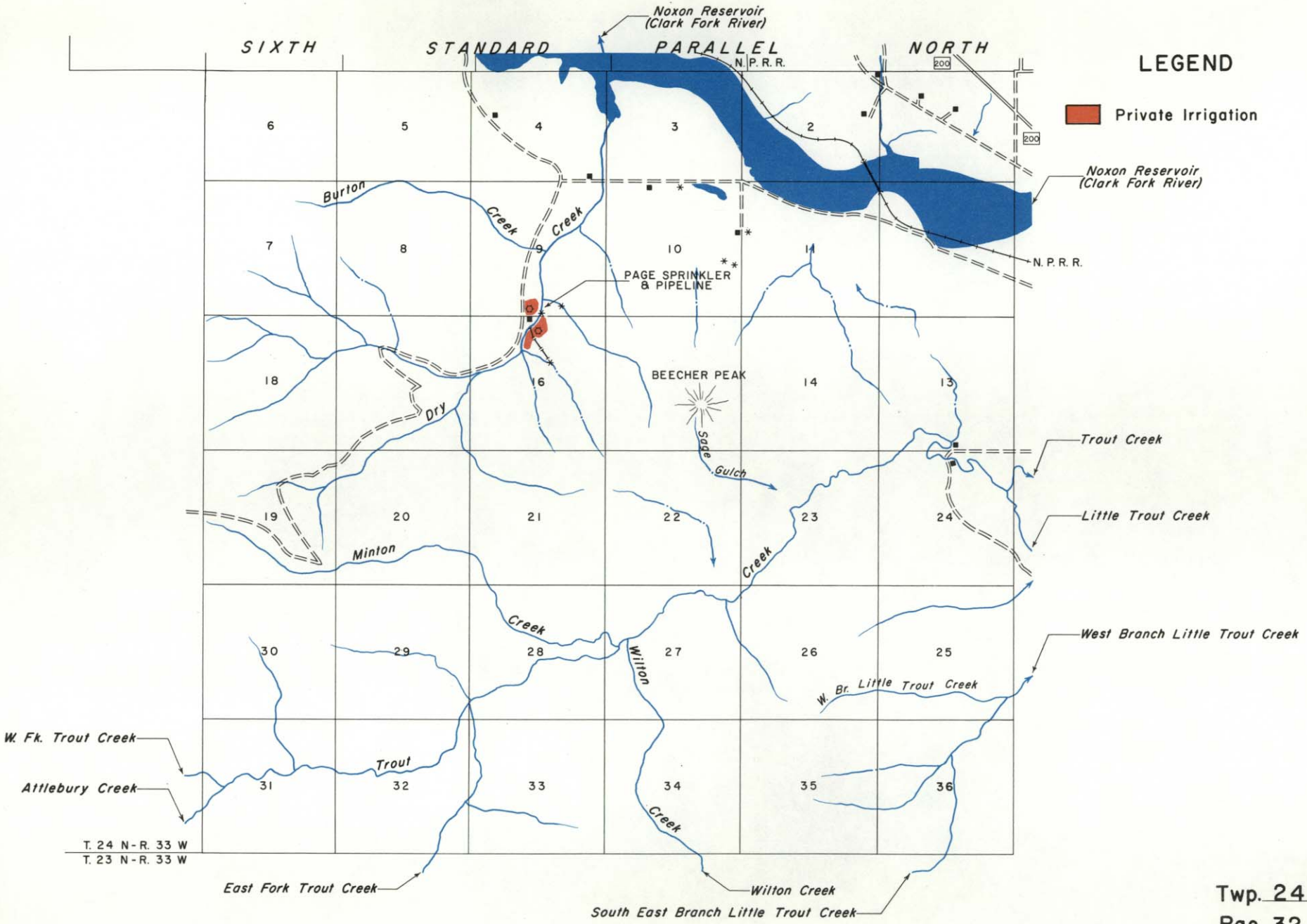

## LEGEND

Private Irrigation

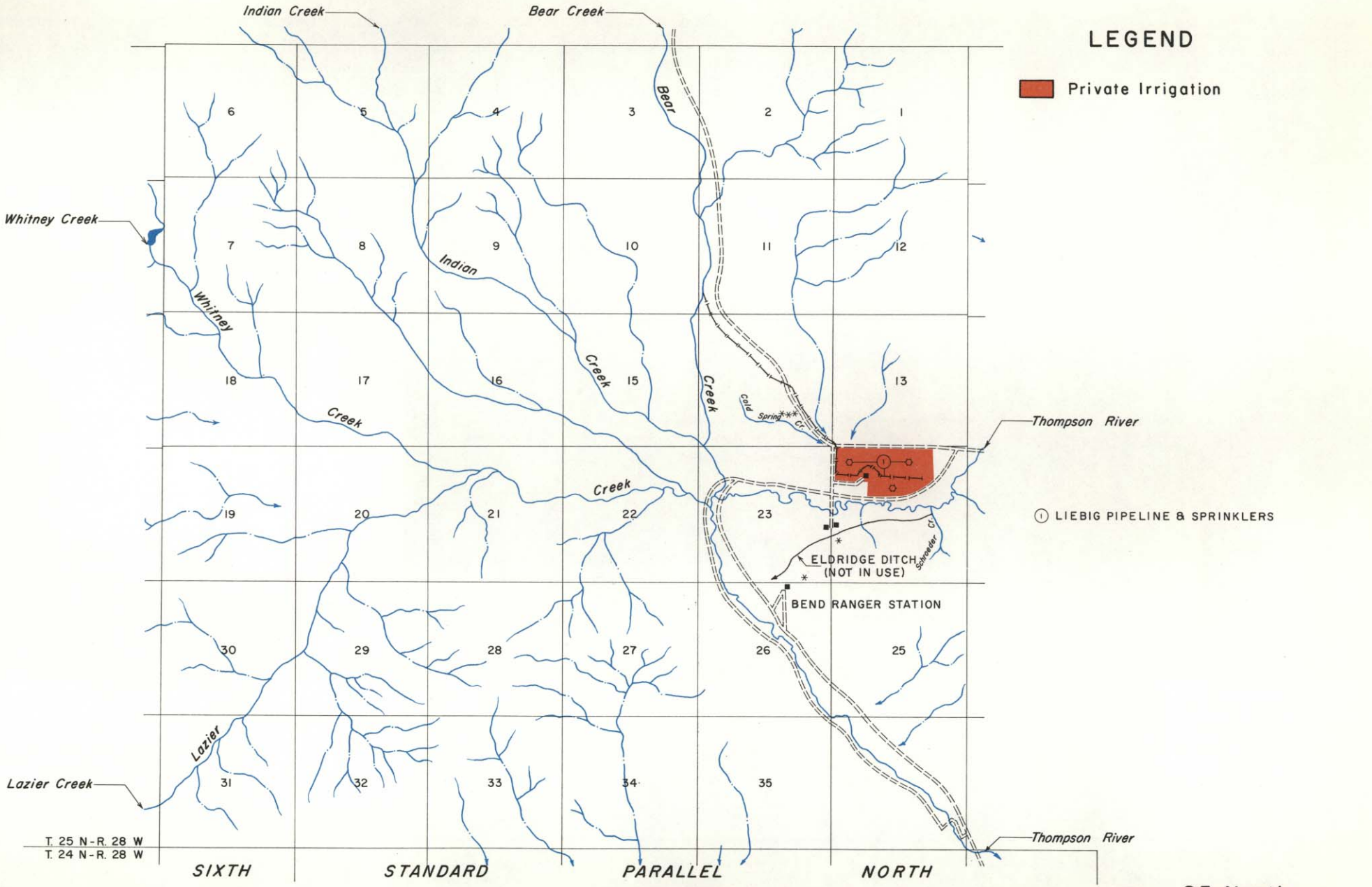
Twp. 23 North

Rge. 31 West


FLATHEAD COUNTY
SIXTH STANDARD PARALLEL NORTH
Little Bitterroot River
Crossing Creek
OLD DITCHES (NOT IN USE)
Murphy Draw
FLOOD CONTROL DITCH
Lost Spring Creek
Bassoo Creek
CAMAS A DIVERSION TUNNEL
PUMICE PIT MINE
TRIPP WELL & PIPELINE
Sullivan Creek
Barrel Spring
Bassoo Creek
OLD DITCH (NOT IN USE)
Mill Pocket Creek
HERMAN DITCH & SPRINKLER
NIARADA
McKAY CEMETERY
Sullivan Creek
T. 24 N - R. 25 W
T. 23 N - R. 25 W
A CANAL
Little Bitterroot River
LEGEND
Flathead Irrigation District
Private Irrigation
FLATHEAD
COUNTY
① McDONALD PUMP-DITCHES & SPRINKLERS
Twp. 24 North
Rge. 24 West




Twp. 24 North
Rge. 32 West



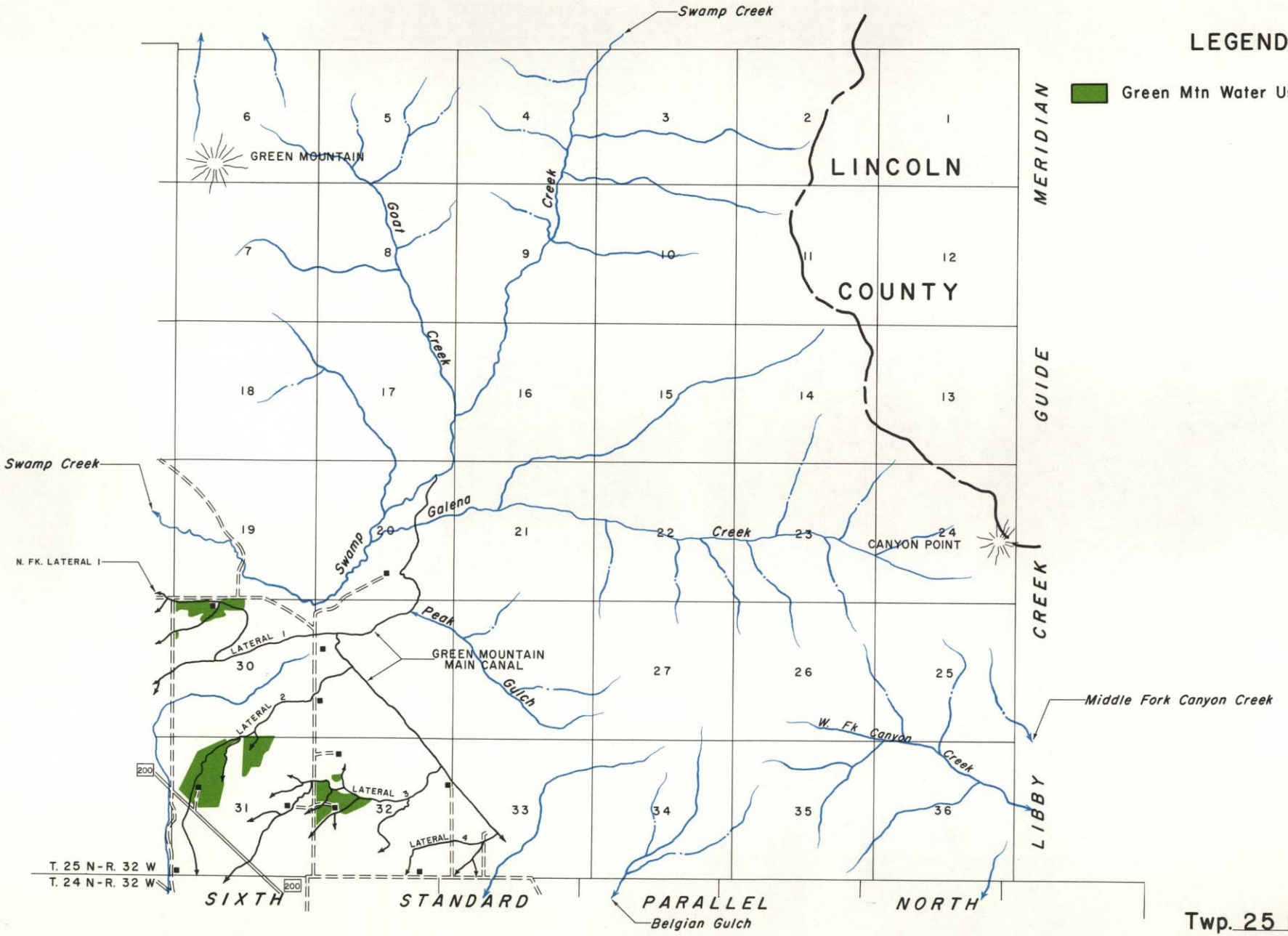

## LEGEND

Private Irrigation

① LIEBIG PIPELINE & SPRINKLERS

Twp. 25 North

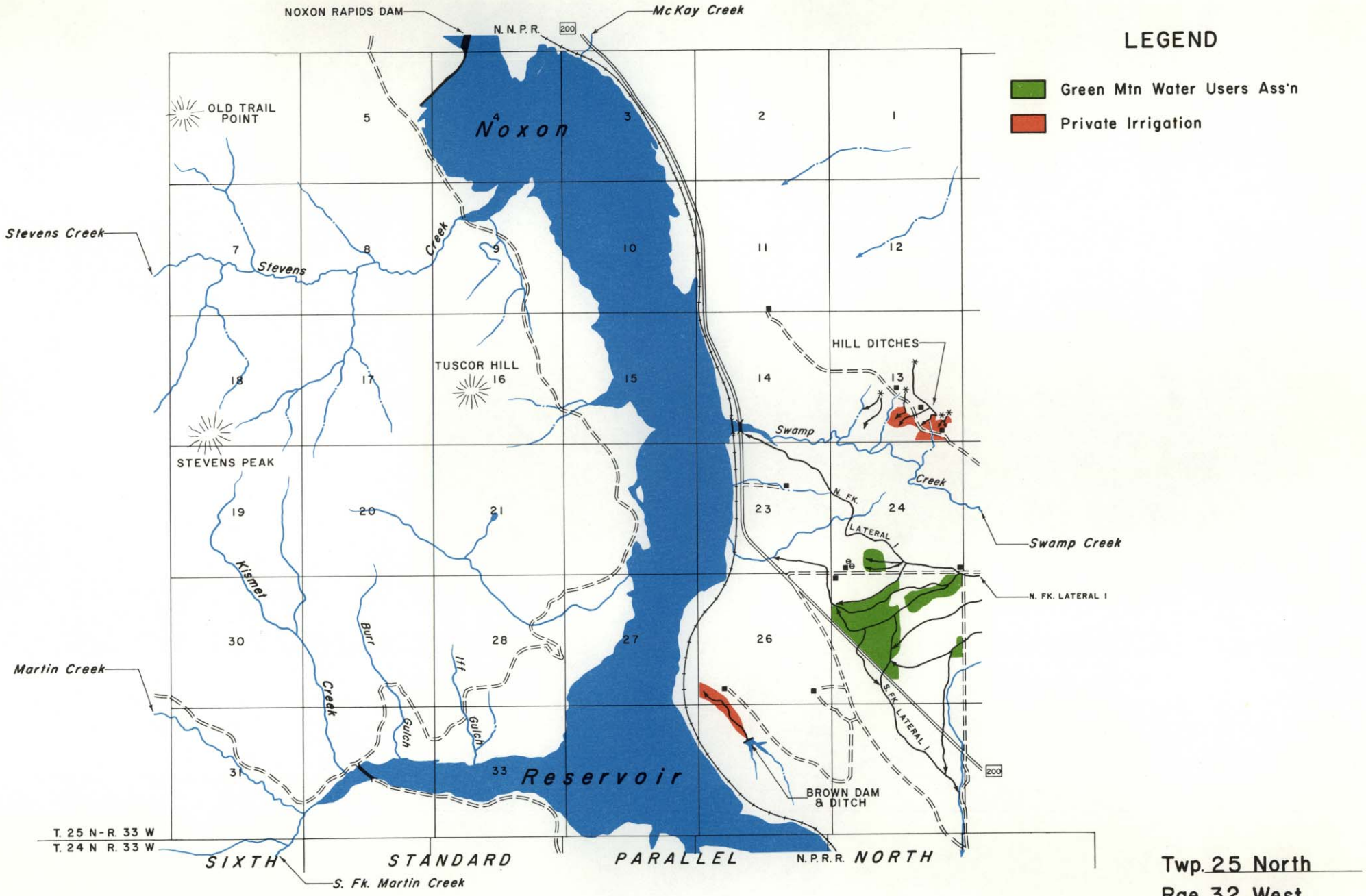
Rge. 27 West



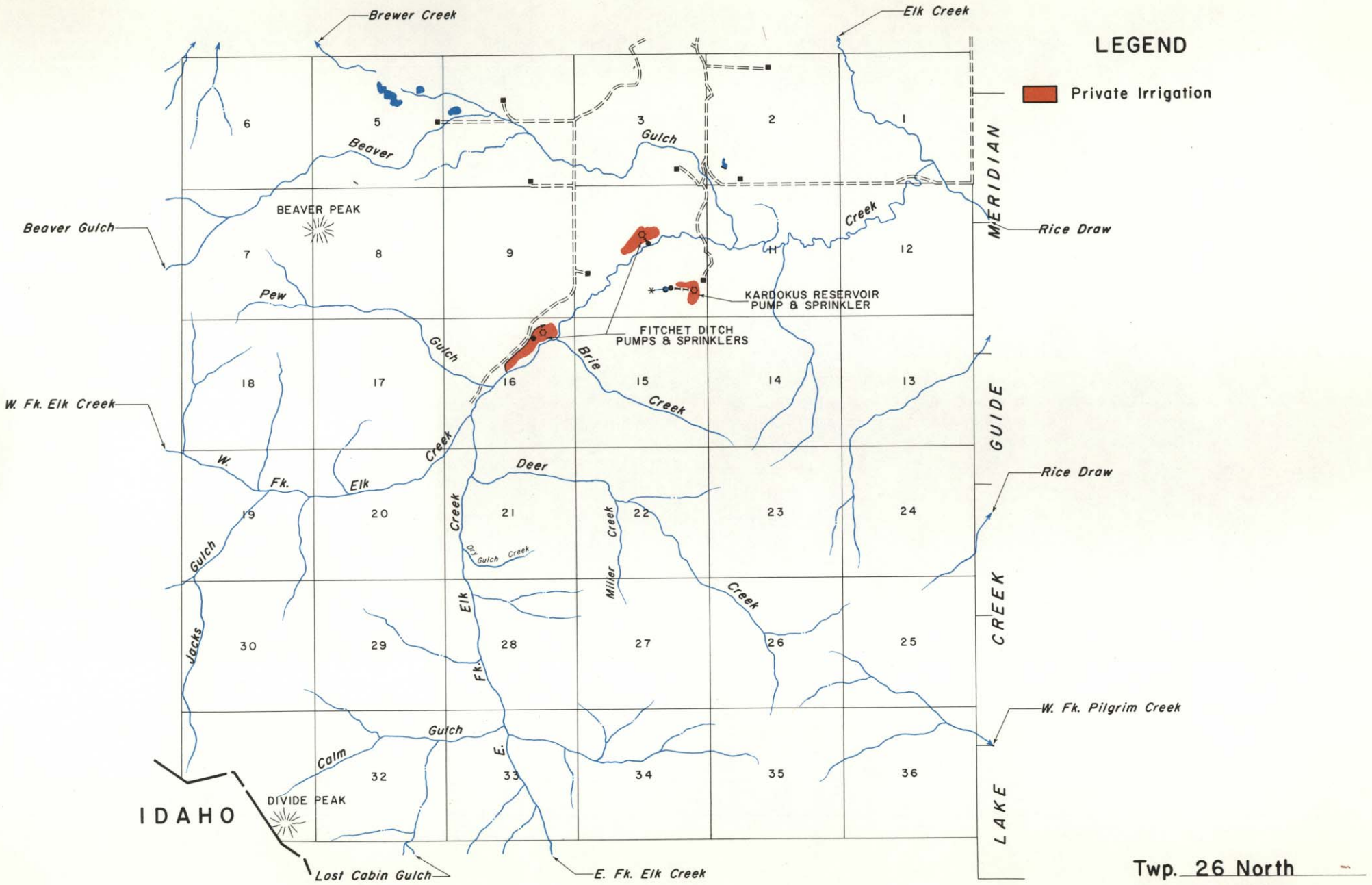

## LEGEND

Green Mtn Water Users Ass'n

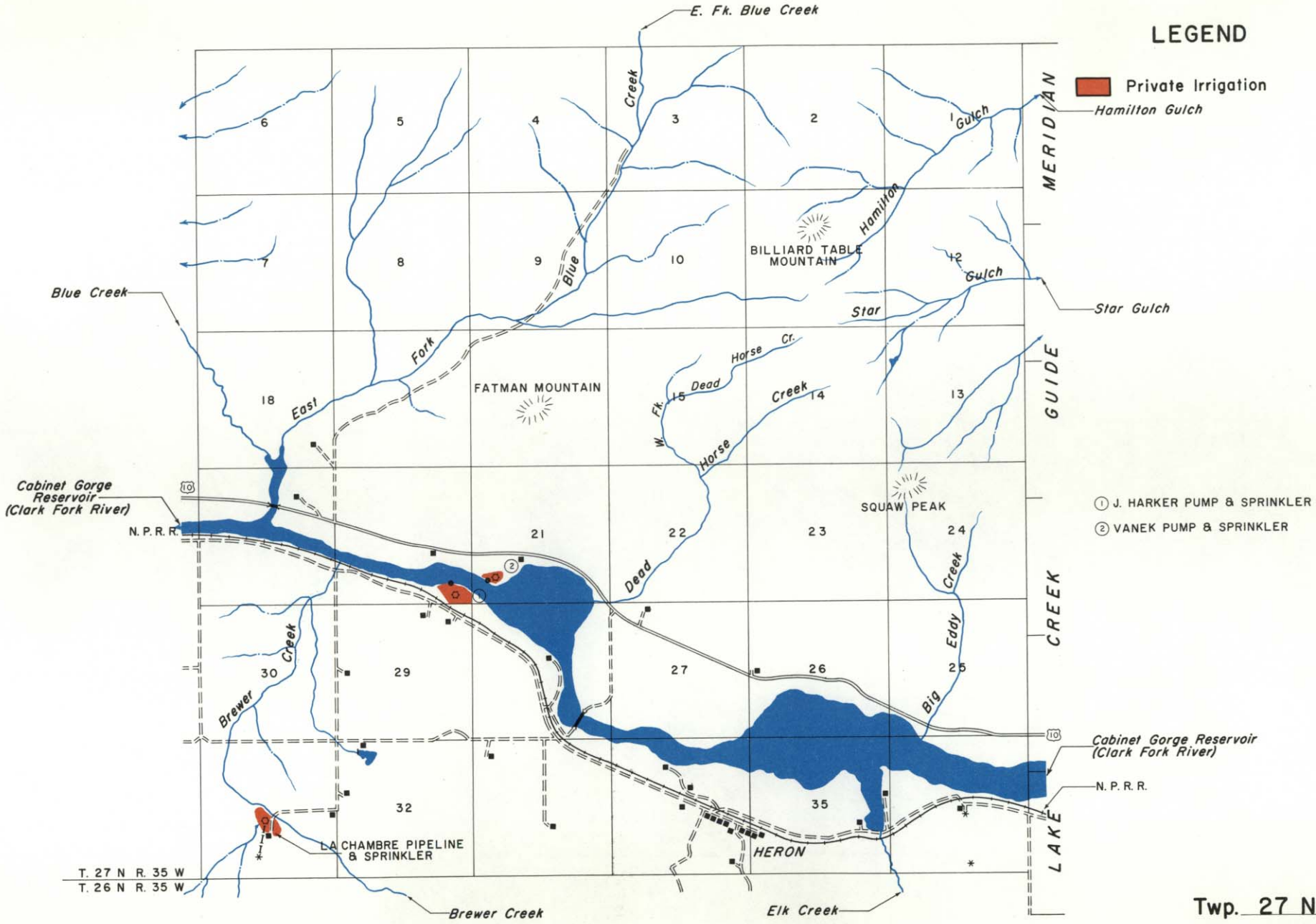
Twp. 25 North
Rge. 31 West




Twp. 25 North
Rge. 32 West




Twp. 26 North
Rge. 34 West


E. Fk. Blue Creek
LEGEND
Private Irrigation
Hamilton Gulch
Star Gulch
MERIDIAN
GUIDE
CREEK
LAKE
Blue Creek
East Fork Blue Creek
Creek
Gulch
Hamilton
Star
Gulch
BILLIARD TABLE MOUNTAIN
FATMAN MOUNTAIN
W. Fk. Dead Horse Creek
Horse Creek
Dead
Creek
Eddy
Creek
Big
Brewer Creek
SQUAW PEAK
Cabinet Gorge Reservoir (Clark Fork River)
N. P. R. R.
① J. HARKER PUMP & SPRINKLER
② VANEK PUMP & SPRINKLER
LA CHAMBRE PIPELINE & SPRINKLER
HERON
Brewer Creek
Elk Creek
T. 27 N R. 35 W
T. 26 N R. 35 W
Twp. 27 North
Rge. 34 West