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# ***I Introduction***

## **A. Introduction**

The Powder/Tongue River Basin Plan was authorized by the Wyoming Legislature in 2000. The objectives of this plan are to:

- determine the current level of water consumption for agriculture, municipal, domestic, industrial, environmental and recreational uses;
- quantify available surface water and ground water supplies;
- project water demands over the 30-year planning horizon; and,
- identify future water use opportunities and constraints for satisfying existing shortages and future demands.

The primary products of this planning study are technical memoranda prepared for the large number of topics addressed in the plan. These memoranda provide detailed descriptions of the data collected, analyses performed, tools developed, and the results of each investigation required to fully explore the water resources within the planning area.

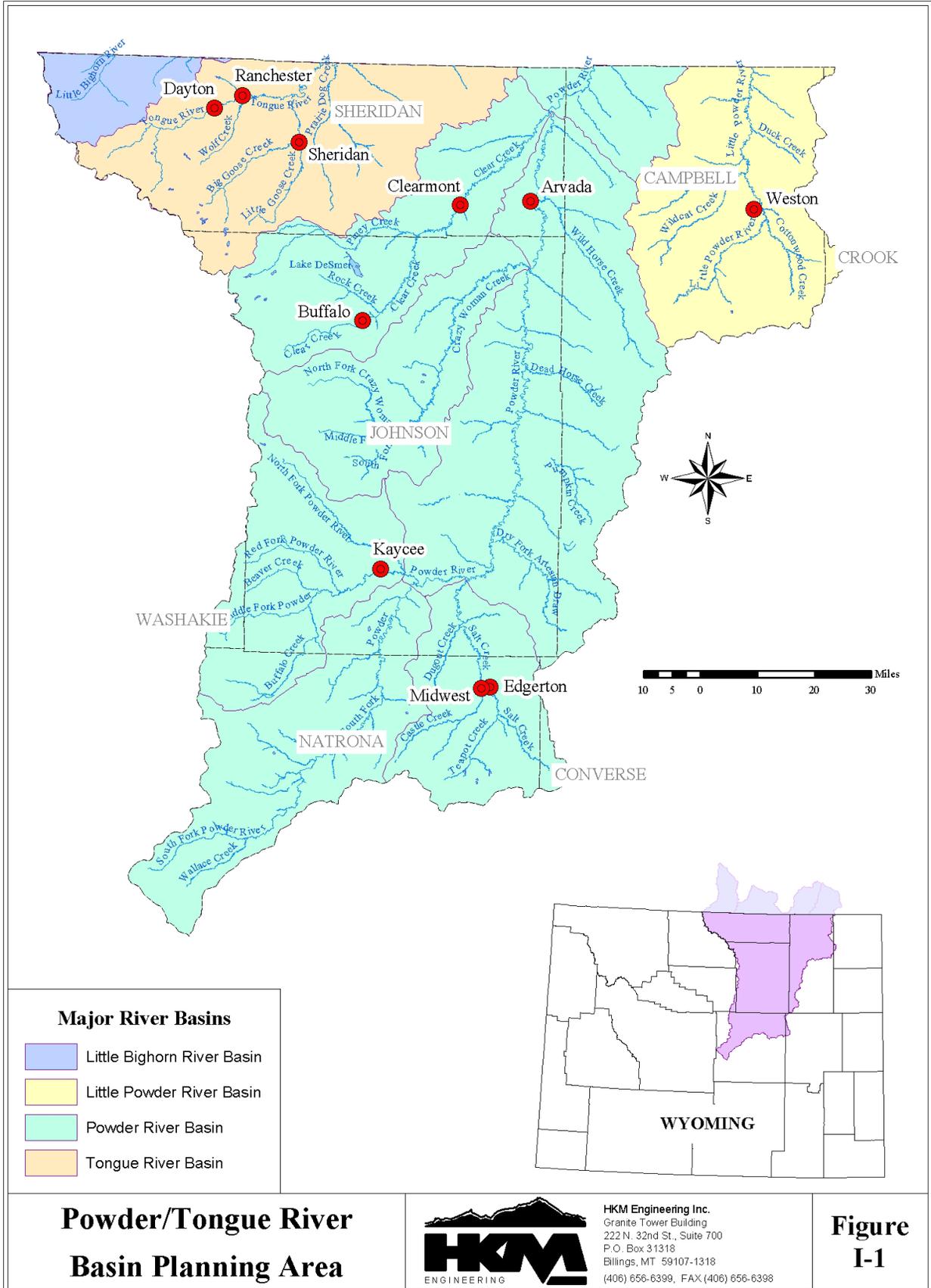
The intent of this summary report is to describe the planning study in sufficient detail for the reader to gain a general understanding of the investigations that were performed and the results of those investigations. For detailed information on a specific topic the reader is directed to the technical memorandum prepared for that topic. References used in preparing the technical memoranda are not repeated in this summary report. These references are presented in the individual technical memoranda.

## **B. Description**

### ***Location***

The planning area of the Powder/Tongue River Basin Plan includes the drainages of the Little Bighorn River, Tongue River, Powder River, and Little Powder River. These river basins encompass all or part of Sheridan, Johnson, Campbell, Natrona, and Converse counties in north central Wyoming.

The planning area is bounded on the north by the Wyoming-Montana stateline, and on the west by the Bighorn Mountains. The east and south boundaries are the limits of the Powder and Little Powder River drainages. The planning area is presented in Figure I-1.



**Powder/Tongue River  
Basin Planning Area**



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**Figure  
I-1**

### ***Topography***

The Little Bighorn, Tongue, and Powder Rivers flow generally east out of the Bighorn Mountains and north into Montana where they join the Yellowstone River. The Little Powder River flows north and joins the Powder River in Montana.

The Bighorn Mountains, which generally crest between 8,000 feet and 10,000 feet, give way abruptly to a relatively narrow band of foothills standing about 2,000 feet above the plains. The remainder of the planning area consists primarily of hilly to rugged uplands, wide valleys, and badlands. The lowest elevations of the planning area are the locations where each of the rivers cross the stateline, the lowest elevation being about 3,320 feet where the Little Powder River flows into Montana.

### ***Climate***

Annual precipitation across the planning area ranges from a low of approximately 10 inches along the South Fork of the Powder River to a high of in excess of 30 inches in the Bighorn Mountains. Average total annual precipitation between 13 and 15 inches appear to be the norm throughout the majority of the planning area. Figure I-2 describes precipitation characteristics of the planning area.

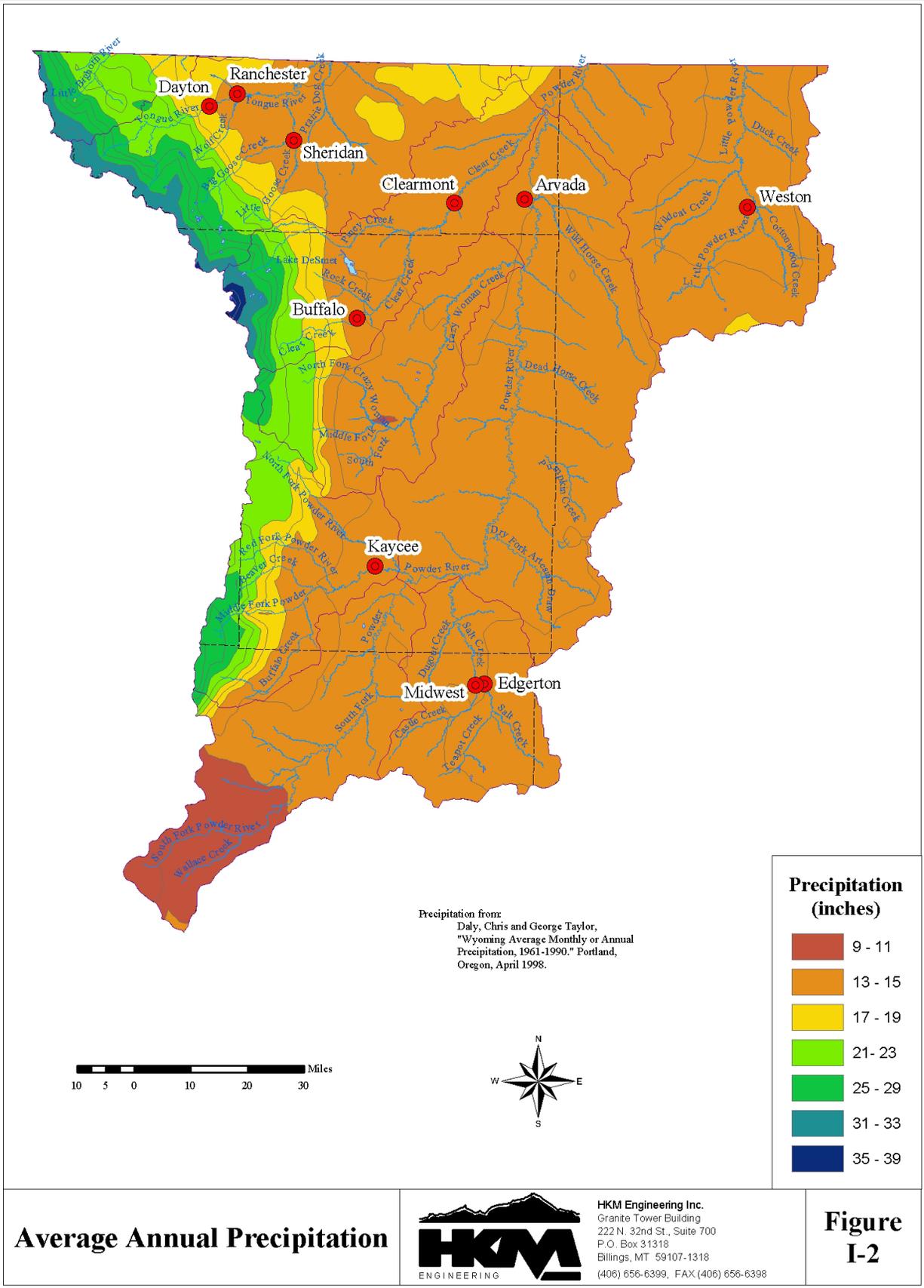
### ***Water Features***

Significant water features in the Little Bighorn River Basin include the Little Bighorn River, Elkhorn Creek, Red Canyon Creek, and East Pass Creek. There are no significant reservoirs in the Little Bighorn River drainage.

The major rivers and streams in the Tongue River Basin include the Tongue River, Goose Creek, Big Goose Creek, Little Goose Creek and Prairie Dog Creek. Principal tributaries of these streams include:

- Tongue River – Little Tongue River and Wolf Creek
- Goose Creek – Soldier Creek
- Big Goose Creek – Beaver Creek and Rapid Creek

Significant storage facilities developed in the Tongue River Basin include Twin Lakes, Big Goose Park Reservoir, Bighorn Reservoir, and Dome Lake.



The major streams of the Powder River Basin include the Powder River, Little Powder River, Clear Creek, and Crazy Woman Creek. Principal tributaries of these streams include:

- Powder River – Salt Creek, South Fork Powder River, North Fork Powder River, Red Fork Powder River, Beaver Creek, Middle Fork Powder River, and Buffalo Creek
- Clear Creek – Piney Creek, Little Piney Creek, North Piney Creek, South Piney Creek, Shell Creek, Rock Creek, Johnson Creek and French Creek
- Crazy Woman Creek – Middle Fork Crazy Woman Creek, Billy Creek, Muddy Creek, North Fork Crazy Woman Creek, Little North Fork Crazy Woman Creek, and Kelly Creek

Significant storage facilities developed in the Powder River Basin include Lake DeSmet, Kearney Lake, Willow Park Reservoir, Cloud Peak Reservoir, and Tie Hack Reservoir, all in the Clear Creek watershed, and Wallows Creek in the drainage of Crazy Woman Creek, Dull Knife Reservoir on the North Fork of the Powder, and Lower Salt Reservoir on Salt Creek.

### C. Water-Related History of the Basin

The following excerpt from *Water-Right Problems of the Bighorn Mountains* written in 1899 by Elwood Mead provides a synopsis of water development in the 19<sup>th</sup> Century. Dr. Mead served as Wyoming's first Territorial Engineer, and, following statehood in 1890, served as the State Engineer until 1899.

*The Bighorn Range is the most impressive feature in the landscape of northern Wyoming, and its scenic beauties are made the more attractive by the striking contrast they afford to the surrounding region. The traveler from the East or the South finds the clear, cold, perennial streams which flow from its snow-clad summits a grateful relief from the alkaline pools or dry sand channels which have to be largely relied on when journeying toward them. The lofty and rugged pinnacles of Cloud Peak are made all the more commanding because the bad-land hills, which form the summit of the Cheyenne watershed, are so commonplace and unattractive. West of the range is the Bighorn Basin, the lowest and most arid section of the State, where the dusty roads and gray stretches of sagebrush make a traveler look with longing at the snow-crowned, forest-clad slopes of -the mountain barrier to the east.*

*In the arid States mountains, not plains, control agricultural development, and this isolated barrier, which rises near the middle of the northern boundary and extends southeast nearly to the center of the State, has done more to people the northern half of Wyoming than all other influences combined. Without it the section, now gridironed with ditches and supporting about one-fourth the population of the State, would be an open range supporting a few migratory flocks of sheep and herds of cattle. The latent wealth of the few hundred square miles of rocky, barren, and almost unoccupied land surface, over 8,000 feet above sea level, is far greater than that of any equal area in the valley below. This region gathers and stores the moisture which alone gives value to the land below. The perennial streams thereby created have, in their diversion and use, given employment to more people, attracted the investment of more capital, and created more problems to tax the wisdom of the lawmakers than has all the unimproved unirrigated farming land in the State.*

*The ease and cheapness with which the streams can be diverted, the fertility of the soil, and the exceptional value of the surrounding grazing land have made this section an attractive location for the home seeker of limited means. It is a region of small ditches and individual appropriators of water. On the eastern slope appropriation began before there were any laws governing the recording or establishment of rights thereto, while the isolation of the early settlers made them disregard or give little heed to water-right problems until the needs of users began to exceed the available supply; since then the multitude of rights, resulting from the haphazard location of ditches, has made a satisfactory settlement of many of these problems unusually difficult. Before discussing these problems a brief review will be given of the progress made in the twenty years which have elapsed since Manlius Redmond, a settler on Clear Creek, built the first ditch and became the pioneer farmer of the northern half of the State.*

*At that time the nearest railway station in the State was Rock Creek, on the Union Pacific, nearly 300 miles away. There was not a flour mill in the State, and the long, hazardous, and expensive trip necessary to secure the plow which turned the first furrow and the food for the men who worked on it added greatly to its cost. Reclaiming the desert under such conditions had many drawbacks, and the earlier ditches were of the crudest and simplest character. There was no attempt at any comprehensive projects. Each irrigator was a law to himself. Cooperative ditches or canals were rare exceptions. This explains the large number of ditches of record, and is the cause of many of the obstacles to the satisfactory division of water which confront those charged with this duty.*

*The records of the State engineer's office show that there are 1,051 adjudicated rights to the water flowing out of these mountains. There are also 269 claims which have been recorded and approved, but not adjudicated. In addition there are probably 100 ditches using water for which no claim has been filed. The adjudicated rights describe 139,478 acres of land to which these rights are attached in the orders of the board of control establishing them, and there are appropriations from Crazy Woman Creek aggregating 925.25 second-feet where the land irrigated is not described. Four flour mills have rights to water for power purposes aggregating 324.50 second-feet, and the several cities and towns of this region have adjudicated rights for power and domestic purposes amounting altogether to 80.6 second-feet.*

*Along the northern end of the range some promising placer fields have been discovered, and rights to 137.6 second-feet have been acquired with which to work them. The total volume of the adjudicated rights (3,455.4 second-feet) is in excess of the low-water discharge of the streams against which they are held, but is below the maximum discharge, so that the securing of a stable and adequate water supply for many of the irrigators holding adjudicated rights is a question of storage. While all of the rights for irrigation, established by the board of control, are based on State surveys of the ditches and on sworn statements of the acreage irrigated by the appropriators, there is no question that these statements are somewhat in excess of the truth. Irrigation and reclamation are elastic terms. Spreading water over land to increase the growth of grass for pasturage purposes is irrigation and is so held by the board of control, but it is not the complete reclamation that is accomplished by cultivation. The tendency to augment the acreage actually watered is so common as to lead to the belief that it is unconscious. In the absence of exaggeration so gross as to constitute an injustice to other users, such a claim usually*

*passes without protest unless it includes land which the State engineer's surveys show to be not susceptible of irrigation. The total acreage irrigated is, therefore, below the figures before given. A deduction of 10 per cent for exaggerated acreages and for areas which have only a surplus or flood-water supply would not be excessive, and would leave 126,000 acres as the actual area irrigated under rights established by the board of control. This is more than half the acreage given as irrigated in the entire State by the Tenth Census.*

*It is impossible to speak with equal certainty regarding the acreage irrigated under appropriations approved by the State engineer's office, but which have not yet been established by order of the board of control. In making a summary of these rights from the records of the engineer's office, all canceled permits, or those which have not complied with the requirements of the State law, have been excluded. This disposes of all the speculative filings which were made prior to 1894, during the time that no fee was required for the examination and record of applications to appropriate water. Since that time the stringent regulations governing the preparation of these filings have made applications so expensive that the tendency to make these for speculative purposes has almost disappeared. While the applications for permits recently approved do not represent actual utilization, they do represent projects based on reliable surveys, which are being carried out by people who are in earnest and who have sufficient investment in the work to make its completion probable. This is more nearly true of the appropriation of water from the streams of this region than of any other section of the State, as there are no large projects. These recorded and approved permits describe 214,000 acres of land for which irrigation appropriations are claimed, and 34 rights to water for power and domestic purposes.*

After the turn of the century water development was pursued more to enhance and expand existing uses rather than to develop new sources of supply for new uses. Nearly all of the storage that has been developed in the planning area has been constructed in the 20<sup>th</sup> Century. Regarding storage development, Elwood Mead offers the following discussion in his 1899 paper:

*By drawing on the larger streams when the smaller ones were exhausted it has been possible to utilize a large percentage of the flow from the east side of the range without resorting to storage, but the time is approaching when storage will be necessary if the reclaimed area is to be extended. Storage has been somewhat delayed, because there is no law at present defining and protecting rights to stored water. This is one of the legislative questions to be dealt with in the near future. Much can be done whenever it becomes necessary. The sites for mountain reservoirs are both numerous and valuable. From the summit of Cloud Peak over 100 mountain lakes can be counted, and a large percentage of these will in time be utilized.*

*Actual construction has begun on only one of these reservoir sites – Dome Lake. ... The elevation of the lake is 8,720 feet, as determined by the topographers of the United States Geological Survey during the season of 1897. The area of the water surface is 320 acres, the average depth 20 feet and the total flow of water 6,400 acre-feet. The estimated cost of the reservoir is \$50,000. The improvements have been made with the double object of storing water for irrigation and of making this point an attractive summer resort.*

The most notable storage development in the planning area has been Lake DeSmet. Beginning as a small natural lake situated between Piney Creek and Clear Creek, a number of construction projects have increased both the storage capacity of the lake and the ability to deliver water to the reservoir. The expansion projects were initiated by the Reynolds Mining Corporation and were completed by Texaco, Inc. after all interests in the facilities were acquired by Texaco, Inc. In 2001, all interests excepting a small storage allocation, which was retained by Texaco, were transferred to Sheridan, Johnson, and Campbell counties and are currently being managed by the Lake DeSmet Joint Powers Board.

#### **D. Wyoming Water Law**

The Wyoming constitution establishes water in the state to be the property of the state. Consequently, all development and management of water resources in Wyoming is governed by the water laws embodied in the Constitution and Statutes. These water laws are recognized as inviolate in the river basin planning program.

The use of water is administered by the State Engineer and the State Board of Control which consists of the State Engineer and the Superintendent of each of the four water divisions of the state. Water is administered under the prior appropriations doctrine that dictates the water right with a senior or earlier priority date is entitled to receive its full amount before water rights with later, or junior, priority dates receive any of their allocation. The priority date of a water right is established as the date the water right application is filed with the State Engineer. Before water is available for use by a new project all water rights with priority dates senior to the priority of the proposed project need to be satisfied.

#### **E. Interstate Compacts**

Another significant event in the water history of the basins is the negotiation, adoption, and ratification of the Yellowstone River Compact of 1950 which controls the development and use of water from the Tongue River, Powder River, and Little Powder River. This compact divides the water of the tributaries of the Yellowstone River between the States of Wyoming and Montana under the following rules:

- existing rights as of January 1, 1950 maintain their status quo;
- existing and future domestic and stock water uses including stock water reservoirs up to a capacity of twenty acre-feet are exempted from the provisions of the compact; and,
- devices and facilities for the control and regulation of surface water are exempted from the provisions of the compact.

The unappropriated or unused total divertible flow of the Tongue River, Powder River, and Little Powder River, after needs for supplemental supply for existing rights are met, is allocated to Wyoming and Montana as follows:

- Tongue River: 40% to Wyoming, 60% to Montana
- Powder River and Little Powder River: 42% to Wyoming, 58% to Montana

The Compact defines the location on each tributary where the divertible flow is measured. For the Tongue River this location is at the mouth near Miles City, Montana. For the Powder River this location is at the mouth near Locate, Montana.

Article X of the Compact stipulates that no water shall be diverted out of the Yellowstone River Basin without the unanimous consent of the three signatory states, Wyoming, Montana, and North Dakota.

The Yellowstone River Compact Commission was established by Article III. The Commission meets annually and is comprised of a representative of each of the states of Montana and Wyoming, and a federal representative appointed by the Director of the United States Geological Survey. The primary function of the Commission is to develop and maintain a network of stream gages to collect data required to administer the provisions of the Compact. To date there has been no interstate regulation. However, an unresolved issue before the Commission is how diversions in Wyoming and Montana would be regulated if there were ever a need for administration. This issue arises from the fact the official gaging locations established by the Compact to effect a regulation are located at the downstream end of the basins. These downstream locations can't be used to forecast water supply conditions that would trigger the need for regulation.