



MWH

Subject: Wind/Bighorn River Basin Plan
Task 2A – Agricultural Water Use and Diversion Requirements

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This Technical Memorandum discusses the existing agricultural water use patterns and calculation of Full Supply diversion requirements for existing lands for the Wind/Bighorn River Basin Plan. The document fulfills a portion of the reporting requirements of Task 2A from the original contract and is supplemental to Task 2A Technical Memorandum Water Supply and Demand in the Wind/Big Horn Basin (BRS, 2002).

This technical memorandum contains the following sections. Within each section are tables and figures containing the data for each of the main study area basins.

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Section 1 - Introduction

A key component of the Wind/Bighorn River Basin Plan is the development of a river basin model for the study area. The primary purposes of the river basin model effort are to identify and quantify water uses that experience shortages during dry, average and wet years; to determine the impact of Tribal futures projects; and to identify and quantify the amount of water that is available for future water development. The model runs on a monthly time step and utilizes dry, average and wet-year hydrology developed from a 1973-2001 period-of-record.

This memorandum discusses the development of agricultural water use and diversion requirements that were used in the model. Development of the hydrologic data is presented in the Task 3A Technical Memorandum Surface Water Hydrology (MWH, 2002). The construction, calibration and operation of the spreadsheet models is more fully described in the

Task 3B/3C Technical Memorandum Spreadsheet Model Development and Calibration (MWH, 2003), while results of the model are presented in the Task 3D Technical Memorandum Available Surface Water Determination (MWH, 2003).

Agricultural water use represents the vast majority of water use within the Wind/Bighorn River Basin planning area. Because of this, accurate estimation of agricultural water use within the basin is essential in producing an accurate model and calculating water availability. Water use by agriculture is a function of many physical and managerial functions including the quantity of land irrigated, crop types, conveyance mechanisms, irrigation types and management styles.

The model requires the historical diversion requirement for each point of diversion. Then, the model calculates the historical amount of consumptive use using irrigation efficiencies and returns non-consumptive demands back to the river according to surface water accretion functions, or lags. Then, because the amount of land historically irrigated is less than the amount of land with water rights, full supply diversions are modeled, where all irrigated lands with water rights are supplied from the existing water supplies. The development of historical diversions (both measured and estimated) as well as fully supply diversions are discussed in the following sections.

Section 2 - Historical Diversions

Historical diversions are used as input for the model calculation and calibration process. Therefore, based upon criteria used in previous river basin plans, historical diversion records were obtained for all diversions greater than 10 cfs. Diversions greater than 10 cfs are explicitly included in the model as separate diversions, while those less than 10 cfs are “lumped” with other small diversions less than 10 cfs that divert in the same reach of stream. Diversion records and the reduction of the diversion records for use in the model is discussed in this section. Estimated historical diversions for those diversions without diversion records are discussed in Section 3 – Estimated Historical Diversions.

Diversion records were collected from the State Engineer’s Office Division 3 Hydrographer’s Reports and USGS gaged flow, as detailed in the Technical Memorandum Wind/Bighorn River Basin Plan – Irrigation Diversion Operation and Description (BRS, 2003b). Two types of records are available:

1. Daily flow data available from USGS or SEO gaging stations;
2. Instantaneous flow data from SEO spot checks of diversions.

The reduction of daily data simply used the daily average diversion flow rate and converted it to a volumetric amount. Any missing daily data was estimated from the available data before and after the missing data using linear interpolation. Then, the daily volumetric amounts were summed for a monthly diversion. For most data in the Hydrographer’s reports, this is already done and these values were used.

The reduction of spot data involved a similar process. Data for days not measured was linearly interpolated from the available data. Starting and ending dates for irrigation seasons were taken from Consumptive Use and Consumptive Irrigation Requirements in Wyoming (Pochop, 1992). The daily flow values were then converted to monthly volumes and summed for each month.

Monthly diversions estimated from the daily and spot data were used to develop dry, average and wet year diversions. The development of dry, average and wet years, as well as the index gages for each basin are described in Technical Memorandum 2A/2B Surface Water Hydrology (MWH, 2002). In general, the 1973-2001 period-of-record was used for hydrologic calculations. Based upon selected index streamflow gages, which generally represent undepleted flows, dry years were defined as the driest 20 percent of years, average years were the middle 60 percent, and wet years were wettest 20 percent of years, as defined by the total annual flow at the gage.

To reduce diversion data, the monthly average of all available diversion data was taken for all years within the hydrologic condition. Unlike the gaged flow records, years without data were not filled. Therefore, occasionally, there are diversions with records in one hydrologic condition and not another. In this case, the estimated actual diversion methodology was used for the missing data. This primarily occurred only for smaller diversions.

Occasionally, calibration of the model required that the measured historical diversions be reduced to maintain mass balance in the model. This was accomplished using the same techniques as described in Section 4 – Full Supply Diversion Requirements.

A summary of the measured data as used in the model for each basin is presented in Table 2-1, Table 2-2 and Table 2-3, while the monthly measured diversion data is shown in Appendix A. There are very few diversions with long periods-of-record within the Wind River Basin, especially on the Wind River Reservation. It should be noted when reviewing the historical diversion data that some of the measurement points presented are at locations within a delivery system and do not necessarily represent additional diversions from the river. For instance, a large portion of the Dry Creek Canal diversion comes from the Dinwoody (feeder) Canal. Therefore, the values presented in the tables cannot simply be summed to find the diversion for the entire basin. Those canals that act as feeder canals for other diversions must be noted and the appropriate volume of water taken out of the receiving canal. This can be difficult for those feeder canals that also deliver water to irrigated lands along their routes and thus, this has not been done for presentation purposes. However, these are taken into account in the modeling through the actual structure of the model by setting return flow values and locations so that the appropriate amount of water is delivered to the receiving canal.

Table 2-1. Summary of Historical Diversions for Yellowstone and Clarks Fork Basins

Sub-Basin	Diversion Name	Annual Historical Diversions (ac-ft)			
		Period-of-Record Average	Dry-Year Average	Normal-Year Average	Wet-Year Average
Yellowstone	N/A	---	---	---	---
Clarks Fork	Bennett Creek	3,009	1,906	3,015	3,588
	Little Rocky	3,350	2,463	3,540	2,931

Table 2-2. Summary of Historical Diversions for Wind River Basin

Sub-Basin	Diversion Name	Annual Historical Diversions (ac-ft)			
		Period-of-Record Average	Dry-Year Average	Normal-Year Average	Wet-Year Average
Upper Wind	Dinwoody Canal	21,367	(1)	31,341	6,052
	Dry Creek Canal	50,825	55,667	50,580	47,375
	Johnstown Canal	6,490	7,682	5,927	6,022
	LeClair Canal	76,703	72,159	76,351	75,901
	Lefthand Canal	7,405	10,257	6,310	6,087
	Riverton Valley Canal	33,472	36,160	32,498	32,471
	Upper Wind River A Canal	17,296	19,557	18,380	15,526
	Wyoming Canal	355,542	294,587	370,754	353,173
Little Wind	Coolidge Canal	26,940	26,940	(1)	(1)
	Ray Canal	53,119	44,740	52,808	52,823
	Sub-Agency Canal	28,970	28,970	(1)	(1)

Notes:

- (1) No data available for the hydrologic year. Diversion estimated using techniques described in Section 4 – Full Supply Diversion Requirements.

Table 2-3. Summary of Historical Diversions for Bighorn River Basin

Sub-Basin	Diversion Name	Annual Historical Diversions (ac-ft)			
		Period-of-Record Average	Dry-Year Average	Normal-Year Average	Wet-Year Average
Upper Bighorn/ Owl Creek	Ackerman	1,516	147	2,082	1,223
	Baylor-Purvis-Thompson-Farmer	1,521	181	1,561	1,890
	Big Horn Canal	148,437	134,455	146,448	158,822
	Bluff Canal	33,375	31,549	33,774	32,098
	Brassington	2,166	6,061	833	1,511
	Caledonia	1,944	957	2,929	1,605
	Chessington-Wilson	1,514	368	1,529	1,706
	Hale	1,185	64	1,212	1,586
	Highland Ditch	9,484	(1)	9,256	9,644
	Highland Hanover	30,409	34,660	32,103	28,500
	Kirby Canal	18,416	16,777	17,932	20,967
	Lower Hanover Canal	48,810	49,622	47,706	50,198
	Lower Lucerne Canal	11,183	12,571	11,003	10,699
	Padlock	1,781	780	1,862	2,118
	Sliney and Mikkleson/Sliney No. 1	3,268	922	3,122	3,781
	Tenderfoot	2,023	415	2,595	1,723
	Upper Hanover Canal	151,046	139,552	149,403	155,958
	Upper Lucerne Canal	10,177	11,241	10,252	9,556
	Woodward-Johnson	1,454	319	1,423	1,844
Nowood	Anita	6,089	6,705	6,264	5,043
	Anita Supplemental	2,048	2,900	1,970	1,453
	Bernstein	2,342	2,769	2,346	1,896
	Big Bear Enl.	2,469	2,815	2,350	2,839
	Elk	2,168	2,722	2,083	2,106
	George & Bayne	2,590	3,429	2,471	2,199

Sub-Basin	Diversion Name	Annual Historical Diversions (ac-ft)			
		Period-of-Record Average	Dry-Year Average	Normal-Year Average	Wet-Year Average
	Go Ahead	2,285	2,685	2,262	1,985
	Harmony	2,759	3,719	2,696	2,056
	Highland	3,491	4,096	3,446	3,210
	Shafer	3,108	3,175	3,349	2,270
	Van Alstine (Avent)	7,178	8,328	7,078	6,738
	Western	2,049	2,196	2,246	1,485
Greybull/Dry	Agrarian	8,663	5,198	9,133	9,856
	Arnold	2,776	1,758	2,970	3,046
	Ashworth #2	2,776	1,758	2,970	3,046
	Avent	4,673	4,338	4,995	4,446
	Beck and Allen	5,473	5,659	5,225	5,568
	Bench Canal	55,408	39,435	56,971	63,395
	Borner & Harvey (Borner)	1,847	1,841	1,914	1,769
	Brown (Croxall and Brown)	4,877	4,260	4,975	5,074
	Butte	1,051	752	1,341	834
	Cheeseman	2,878	1,931	3,191	2,942
	Cockins	2,778	2,409	3,122	2,522
	Dodge	2,844	2,020	3,144	2,877
	Dyer	3,384	2,180	3,326	4,043
	Fairview	11,794	4,339	10,120	13,865
	Farmer's Canal	53,149	43,690	53,717	58,422
	German	3,783	2,387	3,837	4,423
	Greybull	2,667	937	2,949	3,182
	Hurlbut	3,127	4,514	2,675	2,988
	J.F.W.	5,827	4,497	5,133	6,743
	Jimmerfield	2,216	1,429	2,657	2,049
	Jimmerfield-Roach	4,573	3,412	4,558	4,777
	Keystone	4,711	3,418	4,813	5,208
	Meyers	2,595	1,749	2,600	3,009
	Moss & Long Hollow	1,005	918	1,211	798
	Only Chance	1,746	399	1,657	2,532
	Pappapau	3,775	4,196	4,514	2,616
	Perkins	9,607	6,802	8,931	10,425
	Rocky	2,766	1,620	3,138	2,873
	Ruby	1,623	843	2,032	1,507
	Sandstone	6,768	3,995	7,517	7,332
	Snyder (Nichols)	2,694	1,735	2,796	3,044
	T.L.	2,924	1,981	3,101	3,185
Tatman-St. Joe	7,751	4,387	6,910	8,530	
Watson	1,604	1,319	1,878	1,399	
Whitney Gleaver	699	580	779	671	
Winkle & Benbrooke	2,111	1,196	2,395	2,204	
Woods and Burnett	8,233	6,542	8,897	8,462	
Shoshone	Cody Canal	66,117	52,674	66,892	72,828
	Deaver-Frannie Canal	89,491	77,363	82,381	93,265

Sub-Basin	Diversion Name	Annual Historical Diversions (ac-ft)			
		Period-of-Record Average	Dry-Year Average	Normal-Year Average	Wet-Year Average
	Elk Lovell Canal	99,694	88,709	102,861	103,419
	Frannie Canal	263,069	---	256,405	277,262
	Garland Canal	276,409	247,305	280,015	245,658
	Garland-Frannie	263,069	---	256,405	277,262
	Globe Canal	15,997	14,110	16,086	17,111
	Heart Mountain Canal	205,770	190,665	219,858	177,985
	Hunt Canal	33,932	31,826	34,388	33,401
	Lakeview Canal	55,300	44,886	55,663	61,713
	North Fork Ditch	9,411	9,232	9,770	8,845
	Sidon Canal	86,935	85,830	89,490	78,104
	Willwood Canal	100,930	92,335	103,703	96,929
	Wilson & Mckissack	5,626	3,208	5,597	6,472
Lower Bighorn	Anita Ditch	71,731	56,223	76,536	(1)
	Bernie	1,125	1,152	1,158	901
	Dunshee	1,968	2,336	2,168	1,386
	Frieze	4,001	3,233	4,141	4,244
	Hatten	1,359	903	1,452	1,486
	High Line	2,431	1,841	2,433	2,947
	Kershner	2,360	2,107	2,230	2,860
	McDonald (Shell Canal)	24,014	20,654	24,252	25,544
	Porter	6,890	6,435	6,763	7,366
	Shell Canal	17,084	13,720	17,858	18,005
	Whaley	6,481	5,978	6,379	7,113
	Whaley Cem. (Howard Enl. Whaley)	4,423	4,007	4,249	5,369

Notes:

- (1) No data available for the hydrologic year. Diversion estimated using techniques described in Section 4 – Full Supply Diversion Requirements.

Section 3 - Estimated Historical Diversions

Because diversion records were not available for many of the smaller diversions within the study area, and because some diversion records were not obtained (those that did not meet the 10 cfs criteria), estimated historical diversions were developed. The quantification of estimated historical diversions for those irrigated lands without historical diversion records took place in two parts:

1. Develop the potential estimated historical diversion for the point of diversion given the irrigated lands and the consumptive use/diversion requirement calculations using the methodologies described below.
2. Adjust the estimated historical diversion using the model calibration procedures as described below.

The development of estimated historical diversion requirements for input into the model was performed in the same manner as described in Section 4 - Full Supply Diversion Requirements.

The calibration procedure, as more fully described in Task 3B/3C Technical Memorandum, Spreadsheet Model Development and Calibration (MWH, 2003), was used to adjust the estimated historical diversions. This calibration procedure utilizes the estimate of water availability at the point of diversion and compares it with the estimated historical diversion. If the estimated historical diversion is less than the amount of water available at the point of diversion, then the estimated historical diversion is not adjusted. If the estimated historical diversion is more than the available flow at the point of diversion, then the estimated historical diversion is adjusted so that it can take no more than the available streamflow. These adjustments are shown on the “Historical Diversions” worksheet within each model. See the Task 3B/3C Technical Memorandum, Spreadsheet Model Development and Calibration (MWH, 2003) for further information on the model and calibration process.

Section 4 - Full Supply Diversion Requirements

Full supply diversion requirements are based on the theoretical consumptive use and system efficiencies for each of the points of diversion. In general, the full supply diversion requirement is equated to the theoretical maximum diversion requirement as given in the following equation.

$$\text{Full Supply Diversion Requirement} = (\text{Area} \times \text{CIR}) / \text{Overall Efficiency}$$

Where:

Area = Area of Land that is Irrigated (acres) – Described in Section 4.1

CIR = Crop Irrigation Requirement (feet) – Described in Section 4.2

Overall Efficiency = Overall Irrigation Efficiency (%) – Described in Section 4.3

Each of these factors is described in the following sections.

4.1 Irrigated Lands

Mapping of irrigated lands within the basin was performed by the project team. Irrigated lands mapping is discussed more thoroughly in the Task 2A Technical Memorandum Wind/Bighorn Lands Mapping and Water Rights Data (TriHydro, 2003). This mapping was used for determining the area of land irrigated in each sub-basin model.

The irrigated lands mapping was attributed in the GIS as Irrigated Land (IRR), lands with Water Rights (Water Rights), man-made riparian (MM RIP) and sub-irrigated (SUB IRR) (Tri-Hydro, 2003). Islands of non-irrigated lands within larger irrigated areas, or polygons within polygons in the GIS database, were also mapped.

A summary of the irrigated lands is shown in Table 4-1. As shown in Table 4-4 (Section 4.3 of this report), the USDA estimates approximately 344,000 acres of irrigated lands while the Wyoming Agricultural services estimates approximately 354,000 acres of irrigated lands within the study area. Table 4-1 shows approximately 561,000 acres of irrigated lands with an additional 125,000 acres of lands with water awards. There are many reasons for the differences

in estimates, including the non-reporting of irrigated lands by many farmers, and the fact that some of the lands could have been fallow during the reporting year.

Table 4-1. Summary by Attribute of Irrigated Lands Mapping

County	Irrigated Lands (acres)	Man-Made Riparian (acres)	Sub-Irrigated (acres)	Lands with Water Awards (acres)	Total (acres)
Big Horn	167,669	0	9,915	0	177,583
Fremont	154,829	2,385	3,155	122,330	282,700
Hot Springs	24,389	0	32	3,131	27,552
Natrona	551	0	183	0	734
Park	162,772	0	6,440	0	169,212
Washakie	50,934	0	0	0	50,934
Total	561,144	2,385	19,726	125,461	708,716

Source:

- (1) Source: Reduction of Irrigated lands database (TriHydro, 2003).
- (2) Definitions
 - Irrigated Land – Lands irrigated with a valid water right.
 - Man-Made Riparian – Non-farmed riparian areas receiving irrigation return flows as classified by the USBR (these were classified as sub-irrigated in the final GIS attribution).
 - Sub-Irrigated Lands – Lands irrigated from a sub-surface source due to water received from neighboring irrigated lands.
 - Lands With Water Awards – Water futures awarded with a 1968 priority.
- (3) Acreages shown in table include those in the Popo Agie basin.

Table 4-2 presents a summary of the mapped irrigated acreage by county within the Wind/Bighorn River Basin Plan study area as used in the model. The following should be noted regarding the development of the modeled acreage:

- For purposes of the modeling analysis, sub-irrigated lands were not explicitly included within the model. The consumptive use of sub-irrigated lands is simply accounted for in the gain/loss calculations. Therefore, their consumptive use is implicit within the model calculations.
- The Popo Agie River Basin was not included within the modeling of the Wind/Bighorn River Basin Plan.
- Based upon the scenarios run by the model, the Tribal Futures lands were separated out from the historically irrigated lands and included separately. Tribal Futures projects are discussed in other Technical Memoranda.
- Man-made riparian areas were modeled because they are a consumptive use within historical diversions (in other words, historical diversion records include diversions made to meet consumptive use requirements of man-made riparian areas). Therefore, man-made riparian areas should be accounted for in the historical diversion requirements and in the Full Supply diversion requirements. The man-made riparian areas are all mapped within the Midvale Irrigation Project.

The remaining portion of this Technical Memorandum discusses historical and full supply diversion requirements for existing irrigated lands. Full Supply diversion requirements for Tribal Futures projects and any other potential irrigation development are discussed in Technical Memorandum 5A - Agricultural Water Demands and Projections (BRS, 2003a).

Table 4-2. Modeled Irrigated Acreage

County	Irrigated Lands for Full Supply Scenario ⁽²⁾ (acres)	Futures Projects (acres)	Total (acres)
Big Horn	164,404	0	164,404
Fremont (1)	196,501	52,667	249,168
Hot Springs	27,465	0	27,465
Natrona	551	0	551
Park	161,099	0	161,099
Washakie	50,405	0	50,405
Total	600,426	52,667	653,093

Notes:

- (1) Source: Reduction of Irrigated lands database (TriHydro, 2003) as used in sub-basin modeling.
- (2) Irrigated lands derived as follows:
 - 530,606 acres: Irrigated lands within model study area
 - 2,385 acres: Man-made riparian within model study area
 - 67,684 acres: Lands with water rights within model study area minus Futures Projects
- (3) Model Study Area: Wind/Bighorn Basin minus Popo Agie Basin, Clarks Fork Basin, Yellowstone Basin and Madison/Gallatin Basin

4.2 Theoretical Crop Irrigation Requirement

Crop consumptive use requirement is the maximum water use of a well-watered crop under optimum growing conditions (Pochop; et al, 1992). A portion of the crop consumptive use is met by effective rainfall (or rainfall that reaches the root zone and meets a portion of the consumptive water requirement before occurring as surface runoff). The portion of the crop consumptive use that is not met by rainfall is referred to as the Crop Irrigation Requirement (CIR). Actual conditions often vary from the theoretical CIR for a variety of reasons, such as the micro-climates at the site that may be different from the climate station, variations in genetics of different strains of the same crop, and more likely, varying soil types. However, CIR gives an estimate of the amount of water that is required to produce a crop under ideal conditions on a system-wide basis.

As has become a standard for use in the WWDC river basin plans, the crop irrigation requirements presented in Consumptive Use and Consumptive Irrigation Requirements – Wyoming (Pochop, et al, 1992) were used in this analysis. The study utilizes 1951 – 1990 climatic data to calculate CIR for several crops and climate stations throughout the study area. Because climatic dry, average and wet periods in summer months during irrigation are often different than the dry, average and wet periods in the winter that produce runoff, the average CIR was used for all three hydrologic conditions.

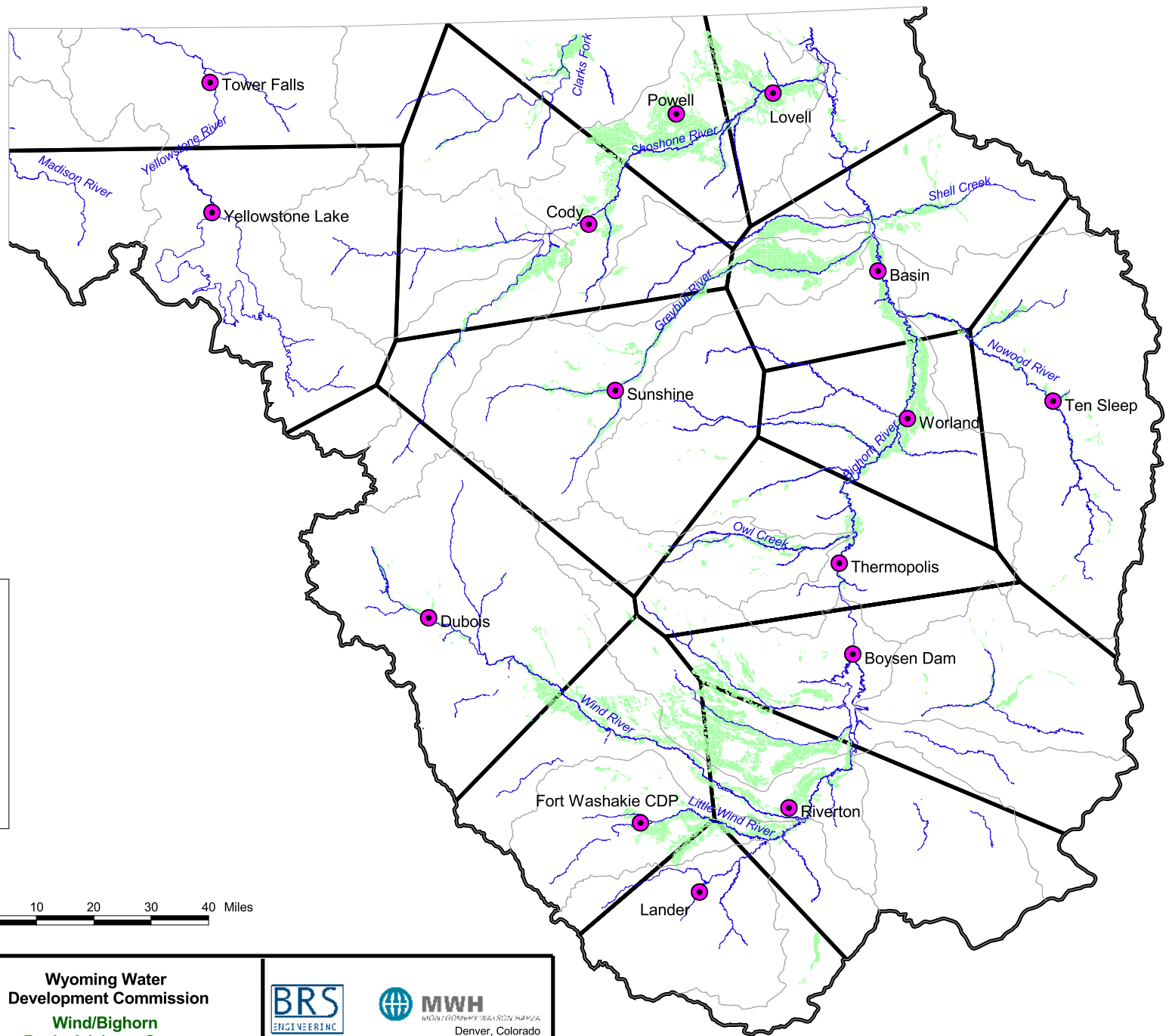
There are 13 climatic stations within the Wind/Bighorn River Basin at which CIR is reported. CIR continually varies between these stations based on localized climate, topography, elevation, etc. However, normally, these variations are small and for regional planning efforts, the CIR values can be extended to areas outside of the exact climatic station location. For purposes of this analysis, the Thiessen polygon method was utilized to determine the “influence area” for each climatic station. This method draws lines between each station, then bisects them midway with a perpendicular line. The intersections of these bisection lines makes up polygons for which all irrigated lands within the polygon uses the CIR at the climatic station. The climatic stations and their associated acreages within each basin are presented in Table 4-3, while a map showing the climate stations and the climatic areas developed using the Thiessen polygon method is presented in Figure 4-1.

Table 4-3. Area within Climate Station Thiessen Polygon

CIR Station	Acres within Station Polygon by Basin			Total (acres)
	Big Horn	Clarks Fork	Wind	
Basin	106,434	0	0	106,434
Boysen Dam	0	0	23,242	23,242
Cody	49,927	4,563	0	54,491
Dubois	0	0	20,185	20,185
Fort Washakie	0	0	49,483	49,483
Lander	0	0	11,603	11,603
Lovell	40,507	0	0	40,507
Powell	73,435	13,735	0	87,170
Riverton	0	0	91,528	91,528
Sunshine	28,962	0	0	28,962
Ten Sleep	18,395	0	0	18,395
Thermopolis	24,365	0	1,278	25,643
Worland	42,784	0	0	42,784
Grand Total	384,810	18,299	197,318	600,426

Notes:

- (1) Does not include Tribal Futures projects or Popo Agie Basin.



Legend

- Sub-Basin
- Irrigated Lands
- Climate Station
- Climatic Areas



10 0 10 20 30 40 Miles

Figure 4.1
Climate Stations and
Climatic Areas

March 2003

Wyoming Water
Development Commission
Wind/Bighorn
Basin Advisory Group



4.3 Cropping Patterns

Cropping patterns are available from two sources: the United States Department of Agricultural (USDA) 1992/1997 Census of Agriculture (USDA, 1997) and the Wyoming Agricultural Statistics for 2000 (WASS, 2002). A summary of the published cropping patterns and distributions are presented in Table 4-4, while the USDA cropping distribution by County is shown in Figure 4-2.

In general, for purposes of the modeling effort, the USDA values were used as the cropping pattern for the irrigated lands. The USDA values were used because they represent averages of more than one year within the study period (1973-2001), as compared with the Wyoming Agricultural Statistics, which represent only one year at the end of the study period. In addition, for certain climatic stations such as Sunshine and Dubois, it is recognized that many of the crops that are shown in the County-wide cropping patterns are not grown. Therefore, within these two polygons, it was assumed that only hay and alfalfa are grown (at the same distribution as without the remaining crops). Then, the cropping patterns for the remaining stations were modified so that the county-wide cropping pattern remains consistent.

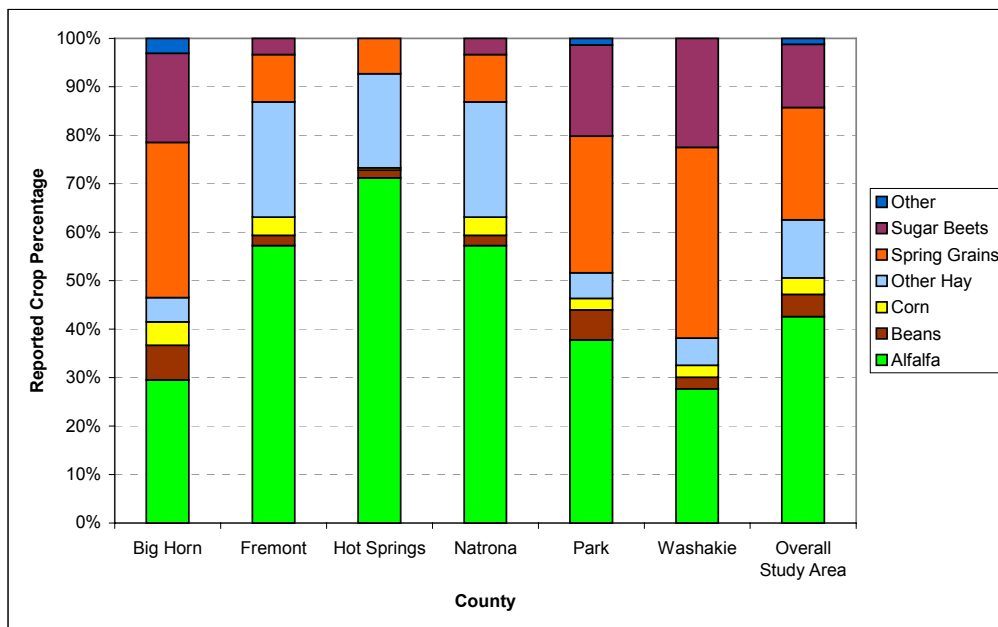


Figure 4-2. County-Wide Cropping Pattern for Study Area (USDA, 1997)

Table 4-4. Reported Acreage and Cropping Patterns within Wind/Bighorn Basin

Station	Crop	Wy. Ag. 2000 (1)		USDA 1992/1997 (2)	
		(acres)	(percent)	(acres)	(percent)
Big Horn	Alfalfa	26,000	31%	25,286	29%
	Beans	7,500	9%	6,145	7%
	Corn	7,200	8%	4,116	5%
	Other Hay	6,000	7%	4,321	5%
	Spring Grains	24,100	28%	27,476	32%
	Sugar Beets	14,400	17%	15,740	18%
	Other		0%	2,661	3%
Sub-Total		85,200	100%	85,745	100%
Fremont	Alfalfa	66,000	63%	65,349	57%
	Beans	2,000	2%	2,441	2%
	Corn	6,000	6%	4,282	4%
	Other Hay	20,000	19%	27,143	24%
	Spring Grains	5,700	5%	11,136	10%
	Sugar Beets	5,100	5%	3,836	3%
	Other		0%		0%
Sub-Total		104,800	100%	114,187	100%
Hot Springs	Alfalfa	10,000	60%	12,235	71%
	Beans	300	2%	274	2%
	Corn		0%	80	0%
	Other Hay	5,000	30%	3,335	19%
	Spring Grains	1,300	8%	1,255	7%
	Sugar Beets	0	0%		0%
	Other		0%		0%
Sub-Total		16,600	100%	17,179	100%
Park	Alfalfa	35,000	36%	36,378	38%
	Beans	8,000	8%	5,945	6%
	Corn	5,700	6%	2,283	2%
	Other Hay	8,000	8%	5,132	5%
	Spring Grains	23,700	25%	27,137	28%
	Sugar Beets	16,200	17%	18,100	19%
	Other		0%	1,332	1%
Sub-Total		96,600	100%	96,307	100%
Washakie	Alfalfa	13,000	32%	12,211	28%
	Beans	1,700	4%	1,065	2%
	Corn		0%	1,095	2%
	Other Hay	1,000	2%	2,471	6%
	Spring Grains	16,700	41%	17,369	39%
	Sugar Beets	8,800	21%	9,932	22%
	Other		0%		0%
Sub-Total		41,200	100%	44,143	100%
Total	Alfalfa	150,000	44%	151,459	43%
	Beans	19,500	6%	15,870	4%
	Corn	18,900	5%	11,856	3%
	Other Hay	40,000	12%	42,402	12%
	Spring Grains	71,500	21%	84,373	24%
	Sugar Beets	44,500	13%	47,608	13%
	Other	0	0%	3,993	1%
Total		344,400	100%	353,568	100%

Notes:

- (1) From Wyoming Agricultural Services (WASS, 2002)
Spring Grains: Irrigated Spring Wheat = Barley, Oats, Spring Wheat (a majority is Barley)
Other Hay: All Hay (-) Alfalfa Hay
- (2) From USDA 1997 Census of Agriculture (USDA, 1997)
Other Hay: Grass Hay, Small Grain Hay, Other Tame Hay, Wild Hay, Grass Silage
Other: Field Seed, Fruits

4.4 Full Supply Crop Irrigation Requirement

Based on the cropping patterns and crop irrigation requirements for the climatic station polygons, the CIR for each of the irrigated lands polygons was calculated. A summary of the CIR for the lands within the Wind/Bighorn River Basin Plan is shown in Table 4-5. These CIR values represent the theoretical maximum crop irrigation requirement calculated using the methodology above, and is considered the Full Supply irrigation requirement for purposes of the model.

Table 4-5. CIR for Irrigated Lands with Wind/Bighorn River Basin Plan by Model Sub-Basin

Model Sub-Basin	Irrigated Acres	Monthly CIR (acre-feet)								Unit CIR (ac-ft/ac)
		Apr	May	Jun	Jul	Aug	Sep	Oct	Annual	
Upper Wind	138,863	10,561	33,354	60,572	80,813	63,577	26,875	1,149	276,901	1.99
Little Wind	45,536	1,842	8,887	18,442	26,128	20,646	8,755	617	85,318	1.87
Lower Wind	12,919	1,913	3,870	6,317	8,198	6,385	2,950	219	29,851	2.31
Owl Creek	17,839	2,334	4,326	6,849	9,107	7,043	3,182	307	33,148	1.86
Nowood	21,725	1,360	4,204	9,104	12,053	7,335	2,925	156	37,136	1.71
Upper Bighorn	63,150	5,979	16,883	30,534	36,846	22,846	10,552	967	124,607	1.97
Greybull	98,046	8,042	24,528	43,862	56,399	38,320	18,034	2,023	191,206	1.95
Shoshone	158,187	13,547	36,759	65,870	91,206	59,951	26,728	3,355	297,416	1.88
Lower Bighorn	25,862	2,789	7,338	12,854	16,247	10,490	4,995	581	55,292	2.14
Clarks Fork	18,299	1,637	4,251	7,642	10,539	6,957	3,113	440	34,579	1.89
Yellowstone	0	0	0	0	0	0	0	0	0	0.00
Madison/Gallatin	0	0	0	0	0	0	0	0	0	0.00
Total	600,426	50,003	144,399	262,045	347,536	243,550	108,108	9,813	1,165,454	1.94

Notes:

- (1) Does not include Tribal Futures projects or Popo Agie basin.
- (2) Average values are reported; analysis does not distinguish between dry, normal or wet year hydrologic conditions for consumptive use calculations.

4.5 Calculation of Full Supply Diversion Requirements

The Crop Irrigation Requirement represents the theoretical amount of water that is needed by the crop. Water is transported from the river to the crop through a series of conveyance facilities and on-farm facilities. These facilities lose a portion of the water that is transmitted through them before the water reaches the crops due to headgate leakage, evaporative losses, seepage, etc. These inefficiencies must be accounted for in determining the monthly diversion requirement for any crop.

4.5.1 Overall Efficiencies

Overall Efficiency is typically represented as the product of the conveyance efficiency and the on-farm efficiency. Conveyance efficiencies represent the efficiencies of the canals and/or pipelines that transmit the water from the diversion headgate to the farm turnout. Conveyance efficiencies typically vary from 65 to 90 percent, with open channel distribution systems generally having lower efficiencies and pipe systems generally having the highest efficiencies (SCS, 1993 and WWDC, 1999). Distribution system length, soil types, lining types, canal cross section and condition of structures can all have an affect on conveyance efficiencies. The on-

farm efficiency represents the efficiency of applying water to the field from the farm turnout to consumptive use by the crop. On-farm efficiencies typically vary from less than 30 to nearly 65 percent, based upon the type of irrigation practices (SCS, 1993). Flood irrigation typically experiences lower efficiencies while sprinkler systems represent higher efficiencies.

Overall efficiencies are typically difficult to estimate. This study has relied upon Overall Efficiencies estimated from previous reports and from standard sources. For the Reservation area, efficiencies are taken from a study conducted by the SCS (1992), which estimated efficiencies for several areas within and in the vicinity of the Wind River Reservation. The SCS developed both annual and monthly overall efficiencies. For the remaining study area, efficiencies were based upon conveyance efficiencies reported by water users within the basin (WWDC, 1999), and typical field and application efficiencies estimated by the SCS (1993). Efficiencies typically vary by month due to antecedent moisture in banks (there is more moisture in the banks later in the season, thus there is less seepage from the canal), operational conditions, etc. Therefore, the efficiencies were varied by month using the same distribution as the monthly efficiencies calculated by the SCS for the Reservation. Table 4-6 presents the monthly and annual overall efficiencies used in the diversion requirement calculations.

Table 4-6. Monthly and Annual Overall Efficiencies

Area	Overall Efficiency by Month								Annual Average
	March	April	May	June	July	August	Sept	Oct	
Dubois ⁽¹⁾	(4)	(4)	18%	26%	34%	34%	34%	34%	30%
Lander ⁽¹⁾	(4)	17%	17%	24%	37%	35%	22%	22%	28%
Other, Large ⁽²⁾	(4)	27%	27%	38%	58%	55%	35%	35%	44%
Other, Small ⁽³⁾	(4)	19%	19%	27%	42%	40%	25%	25%	32%
Owl Creek ⁽¹⁾	19%	19%	21%	28%	36%	41%	21%	17%	29%
Reservation ⁽¹⁾	(4)	18%	18%	25%	33%	34%	21%	21%	27%
Riverton ⁽¹⁾	(4)	20%	24%	39%	52%	52%	27%	27%	41%

Notes:

- (1) From (SCS, 1992).
- (2) Based on average conveyance efficiencies from 1999 Irrigation System Survey Report (WWDC, 1999), large blocks with some lined canals and pipelines, and adequate management (SCS, 1992). Monthly distribution from (SCS, 1992)
- (3) Based on average conveyance efficiencies from 1999 Irrigation System Survey Report (WWDC, 1999), small systems with unlined canals and sufficient management (SCS, 1993). Monthly distribution from (SCS, 1992)
- (4) No consumptive use within month.

4.5.2 Full Supply Diversion Requirement

Based upon the crop irrigation requirements and overall irrigation efficiencies, Full Supply diversion requirements were calculated for the irrigated lands. The diversion requirement is calculated as the crop irrigation requirement divided by the efficiency of the system. The estimated Full Supply diversion requirements by sub-basin are shown in Table 4-7. As expected with the wide variations in efficiencies, the unit Full Supply diversion requirements expressed as acre-feet per acre also vary.

Table 4-7. Full Supply Diversion Requirements for Irrigated Lands within Wind/Bighorn River Basin Plan by Model Sub-Basin

Model Sub-Basin	Irrigated Acres	Monthly Diversion Requirement (ac-ft)								Unit DR (ac-ft/ac)
		Apr	May	Jun	Jul	Aug	Sep	Oct	Annual	
Upper Wind	138,863	52,990	148,602	171,535	172,482	134,611	102,584	4,465	787,269	5.67
Little Wind	45,536	10,235	49,374	73,769	79,175	60,722	41,692	2,939	317,907	6.98
Lower Wind	12,919	9,564	16,124	16,198	15,766	12,278	10,924	811	81,666	6.32
Owl Creek	17,839	12,282	20,600	24,462	25,298	17,178	15,153	1,804	116,776	6.55
Nowood	21,725	6,808	21,019	32,189	27,630	17,780	11,296	607	117,327	5.40
Upper Bighorn	63,150	24,750	68,152	87,259	69,516	45,400	33,940	3,206	332,223	5.26
Greybull	98,046	31,053	99,224	126,122	106,124	77,173	57,435	6,379	503,512	5.14
Shoshone	158,187	52,322	142,958	181,860	163,473	113,701	80,601	9,984	744,901	4.71
Lower Bighorn	25,862	13,143	34,599	42,899	35,225	24,039	18,191	2,113	170,209	6.58
Clarks Fork	18,299	7,765	20,260	25,860	23,152	16,156	11,494	1,605	106,293	5.81
Yellowstone	0	0	0	0	0	0	0	0	0	0.00
Madison/Gallatin	0	0	0	0	0	0	0	0	0	0.00
Total	600,426	220,913	620,912	782,154	717,841	519,040	383,310	33,912	3,278,082	5.46

Notes:

- (1) Does not include Tribal Futures projects or Popo Agie basin.

Section 5 - Summary and Conclusions

The purpose of the analysis summarized in this Technical Memorandum was to document the status of historical and current agricultural water use within the Wind/Bighorn River Basin and to document the methodologies used to develop data necessary for the River Basin simulation models. A summary of the irrigated lands identified in this study as well as those documented in the 1972 Water Plan (SEO) is presented in Table 5-1. The current estimate of irrigated lands is approximately 54,000 acres, or approximately 10 percent, greater than the estimate of 1972 irrigated lands in the 1972 Water Plan. In addition, the estimate of idle lands is approximately 44,000 acres, or approximately 150 percent, greater than the estimate of idle lands in 1972. The differences could be due to increased lands under irrigation, but are more likely a difference in estimation techniques. For instance, the definition of idle lands in the 1972 Water Plan (lands purposely left idle for any given year or lands on which a crop was planted but not harvested) is much more strict than used in this study (basically any land with a water right not currently irrigated but that has shown any signs of past irrigation). Another factor is that the current basin plan considered all lands in the Wind River Irrigation Project that were given water rights as either irrigated or idle, whereas the 1972 Water Plan may have not.

Table 5-1. Summary of Irrigated Lands

Category	1972 Water Plan (SEO)		2002 Wind/Bighorn Basin Plan ⁽³⁾
	Current (1972)	Projected (2000)	
Irrigated Lands (acres) ⁽¹⁾⁽²⁾	509,640	516,330	563,529
Idle Lands ⁽¹⁾ /Lands with Water Rights (acres) ⁽²⁾	29,190	22,500	72,794
New Land Development ⁽¹⁾ /Tribal Future Projects (acres) ⁽²⁾	---	102,670	52,667
Total	538,830	641,500	688,990

Notes:

- (1) Term used in 1972 Water Plan
- (2) Term used in Wind/Bighorn Basin Plan
- (3) From Irrigated Lands Mapping (Includes Popo Agie Basin)
 Irrigated Lands = Mapped Irrigated Lands + Man-Made Riparian
 Idle Lands = Lands with Water Rights – Tribal Futures Projects
 New Land Development = Tribal Futures Projects

Direct comparisons of consumptive use are not as easy because the current basin plan did not calculate consumptive use for the Popo Agie basin. However, a comparison of unit consumptive use (ac-ft/ac) can be made. The 1972 Water Plan calculated a total consumptive use for the 538,830 acres as 1,028,500 acre-feet, or approximately 1.91 acre-feet per acre. As shown in Table 4-5, the current basin plan calculated a consumptive use of 1,165,000 acre-feet for the 600,400 acres used in the model, or approximately 1.94 acre-feet per acre, which agrees very closely to the consumptive use calculated in the Water Plan.

As a major purpose of the irrigated lands and consumptive use calculations in this study was to provide data for overall basin planning, a conservative approach was taken. The conservative approach ensures that all lands with currently or recently active water rights are considered in the water needs analysis and are considered when available surface water is determined. More detailed analyses could be performed once specific projects are identified.

Section 6 - References

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Appendix A
Diversion Data

Summary of Average Monthly and Annual Diversions (1973-2001)

Overall

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Flow (ac-ft)												Total	
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
Clarks Fork Yellowstone	Bennett Creek	Spot	12	177	0	0	0	0	0	0	175	372	580	639	597	469	3,009
	Little Rocky	Spot	12	204	0	0	0	0	0	267	120	315	589	715	634	505	3,350
Upper Wind	Dinwoody Canal	Daily	6	280	0	0	0	0	0	0	4,154	2,997	3,289	4,038	3,611	2,997	21,367
	Dry Creek Canal	Daily	12	1,081	0	0	0	0	0	0	288	6,409	11,136	12,403	11,727	7,781	50,825
	Johnstown Canal	Daily	10	0	0	0	0	0	0	0	6	801	1,344	1,582	1,559	1,199	6,490
	LeClair Canal	Daily	29	3,097	0	0	0	0	0	0	1,469	9,018	15,644	19,747	16,293	11,435	76,703
	Lefthand Canal	Daily	10	0	0	0	0	0	0	0	0	1,089	1,521	1,764	1,589	1,443	7,405
	Riverton Valley Canal	Daily	28	430	0	0	0	0	0	0	1,120	5,650	6,928	8,383	6,378	4,582	33,472
	Upper Wind River A Canal	Daily	4	0	0	0	0	0	0	0	197	3,294	3,802	3,391	3,544	3,069	17,296
	Wyoming Canal	Daily	26	4,105	2,363	0	0	0	0	6,714	16,622	50,903	75,116	84,873	66,380	48,466	355,542
Little Wind	Coolidge Canal	Daily	1	0	0	0	0	0	0	0	0	5,770	7,890	6,610	3,920	2,750	26,940
	Ray Canal	Daily	11	2,774	0	0	0	0	0	0	751	6,415	11,764	14,358	10,693	6,362	53,119
	Sub-Agency Canal	Daily	1	0	0	0	0	0	0	0	470	6,100	4,840	7,150	6,140	4,270	28,970
Upper Bighorn	Ackerman	Spot	12	100	206	0	0	0	0	220	112	281	254	144	96	103	1,516
	Baylor-Purvis-Thompson-Far	Spot	6	75	0	0	0	0	0	37	55	253	428	321	224	128	1,521
	Big Horn Canal	Daily	27	3,588	0	0	0	0	0	0	12,071	25,521	26,881	30,190	27,433	22,752	148,437
	Bluff Canal	Daily	27	893	0	0	0	0	0	0	2,482	5,721	6,222	6,797	6,316	4,945	33,375
	Brassington	Spot	12	143	5	0	0	0	0	0	14	188	273	576	557	409	2,166
	Caledonia	Spot	12	47	0	0	0	0	0	307	314	486	416	175	123	77	1,944
	Chessington-Wilson	Spot	12	38	0	0	0	0	0	185	72	239	276	356	219	129	1,514
	Hale	Spot	12	33	0	0	0	0	0	110	89	244	304	174	138	93	1,185
	Highland Ditch	Daily	6	238	0	0	0	0	0	0	0	1,782	1,762	2,071	1,880	1,751	9,484
	Highland Hanover	Daily	7	0	0	0	0	0	0	0	1,283	4,951	5,719	7,521	6,981	3,953	30,409
	Kirby Canal	Daily	29	230	0	0	0	0	0	0	294	3,122	3,850	4,177	3,760	2,983	18,416
	Lower Hanover Canal	Daily	27	412	8	6	8	8	8	8	3,985	8,291	9,459	10,974	9,636	6,016	48,810
	Lower Lucerne Canal	Daily	16	0	0	0	0	0	0	0	224	1,912	2,420	2,849	2,374	1,403	11,183
	Padlock	Spot	12	22	0	0	0	0	0	0	96	326	605	467	181	84	1,781
	Slaney and Mikkleson/Slaney N	Spot	12	28	0	0	0	0	0	236	239	714	1,177	540	236	97	3,268
	Tenderfoot	Spot	12	166	366	0	0	0	0	5	181	369	371	180	168	218	2,023
	Upper Hanover Canal	Daily	28	5,044	0	0	0	0	0	0	11,405	25,537	27,904	30,493	28,008	22,654	151,046
	Upper Lucerne Canal	Daily	16	0	0	0	0	0	0	0	173	1,679	2,025	2,328	2,231	1,740	10,177
Woodward-Johnson	Spot	12	35	0	0	0	0	0	0	244	100	286	292	279	144	74	1,454
Nowood	Anita	Spot	11	465	0	0	0	0	0	0	268	1,048	1,299	1,135	960	915	6,089
	Anita Supplemental	Spot	11	127	0	0	0	0	0	0	83	354	463	426	326	270	2,048
	Bernstein	Spot	11	111	0	0	0	0	0	0	40	281	576	550	453	331	2,342
	Big Bear Enl.	Spot	10	114	0	0	0	0	0	0	27	245	611	595	520	356	2,469
	Elk	Spot	11	124	0	0	0	0	0	0	31	243	514	493	452	312	2,168
	George & Bayne	Spot	11	179	0	0	0	0	0	0	132	397	495	513	468	406	2,590
	Go Ahead	Spot	11	121	0	0	0	0	0	0	82	339	501	506	403	332	2,285
	Harmony	Spot	11	114	0	0	0	0	0	0	212	496	554	565	457	361	2,759
	Highland	Spot	11	248	0	0	0	0	0	0	71	453	744	782	695	499	3,491
	Shafer	Spot	11	138	0	0	0	0	0	0	132	434	733	676	559	435	3,108
	Van Alstine (Avent	Spot	11	529	0	0	0	0	0	0	475	1,128	1,384	1,354	1,234	1,074	7,178
	Western	Spot	10	107	0	0	0	0	0	0	23	222	543	477	390	287	2,049
Greybull/Dry	Agrarian	Spot	12	475	0	0	0	0	0	0	448	1,319	1,561	1,882	1,726	1,253	8,663
	Arnold	Spot	12	85	0	0	0	0	0	0	139	478	608	614	565	286	2,776
	Ashworth #2	Spot	12	85	0	0	0	0	0	0	139	478	608	614	565	286	2,776
	Avent	Spot	12	148	0	0	0	0	0	0	146	756	926	1,221	958	519	4,673

Summary of Average Monthly and Annual Diversions (1973-2001)

Overall

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Flow (ac-ft)												Total
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
	Beck and Allen	Spot	6	79	0	0	0	0	0	634	1,503	824	1,288	672	474	5,473
	Bench Canal	Daily	28	1,040	0	0	0	0	0	1,233	8,485	11,598	14,585	11,292	7,175	55,408
	Borner & Harvey (Borner)	Spot	12	103	0	0	0	0	0	117	313	331	369	350	263	1,847
	Brown (Croxall and Brown)	Spot	12	105	0	0	0	0	0	259	766	942	1,214	974	617	4,877
	Butte	Spot	12	10	0	0	0	0	0	57	197	395	247	103	41	1,051
	Cheeseman	Spot	12	69	0	0	0	0	0	132	500	1,008	537	393	239	2,878
	Cockins	Spot	12	108	0	0	0	0	0	154	449	568	575	561	362	2,778
	Dodge	Spot	12	96	0	0	0	0	0	69	304	629	625	709	412	2,844
	Dyer	Spot	12	65	0	0	0	0	0	152	580	716	760	692	418	3,384
	Fairview	Spot	12	357	0	0	0	0	2,260	577	1,358	1,864	2,410	1,801	1,167	11,794
	Farmer's Canal	Daily	27	794	0	0	0	0	0	1,717	9,409	11,349	12,773	10,425	6,682	53,149
	German	Spot	12	147	0	0	0	0	0	123	552	791	992	748	431	3,783
	Greybull	Spot	12	63	0	0	0	0	0	86	374	658	699	513	273	2,667
	Huribut	Spot	12	42	0	0	0	0	0	135	477	910	986	443	135	3,127
	J.F.W.	Spot	6	279	0	0	0	0	0	457	1,056	1,068	1,235	993	740	5,827
	Jimmerfield	Spot	12	76	0	0	0	0	0	104	384	468	481	404	300	2,216
	Jimmerfield-Roach	Spot	12	129	0	0	0	0	271	228	567	775	1,177	907	518	4,573
	Keystone	Spot	12	94	0	0	0	0	0	191	701	1,007	1,358	823	537	4,711
	Meyers	Spot	12	59	0	0	0	0	0	110	489	538	594	501	304	2,595
	Moss & Long Hollow	Spot	12	48	0	0	0	0	0	52	156	214	160	204	171	1,005
	Only Chance	Spot	12	27	0	0	0	0	0	101	311	454	436	277	140	1,746
	Pappapau	Spot	12	115	0	0	0	0	0	145	513	915	900	689	497	3,775
	Perkins	Spot	6	357	0	0	0	0	581	759	1,473	1,671	2,092	1,603	1,072	9,607
	Rocky	Spot	12	58	0	0	0	0	0	80	323	790	669	621	225	2,766
	Ruby	Spot	12	56	0	0	0	0	0	43	176	409	368	354	217	1,623
	Sandstone	Spot	12	315	0	0	0	0	0	303	1,040	1,331	1,460	1,403	915	6,768
	Snyder (Nichols)	Spot	12	76	0	0	0	0	0	83	468	488	616	602	361	2,694
	T.L.	Spot	12	143	0	0	0	0	0	113	429	685	637	567	349	2,924
	Tatman-St. Joe	Spot	12	225	0	0	0	0	1,118	246	855	1,313	1,836	1,338	821	7,751
	Watson	Spot	12	65	0	0	0	0	0	45	184	343	419	336	212	1,604
	Whitney Gleaver	Spot	12	48	0	0	0	0	0	32	96	171	121	105	126	699
	Winkle & Benbrooke	Spot	12	33	0	0	0	0	0	73	347	606	388	481	182	2,111
	Woods and Burnett	Spot	12	268	0	0	0	0	0	580	1,344	1,358	1,891	1,698	1,094	8,233
Shoshone	Cody Canal	Daily	28	2,667	0	0	0	0	0	1,858	10,574	14,303	15,483	12,481	8,751	66,117
	Deaver-Frannie Canal	Daily	16	8,110	0	0	0	0	0	4,017	14,928	15,180	16,191	16,261	14,803	89,491
	Elk Lovell Canal	Daily	28	3,111	0	0	0	0	0	4,945	16,316	18,616	20,773	19,506	16,427	99,694
	Frannie Canal	Daily	4	22,639	0	0	0	0	0	7,556	44,335	46,769	53,366	50,736	37,668	263,069
	Garland Canal	Daily	22	24,627	0	0	0	0	0	16,965	45,602	48,097	53,585	48,777	38,757	276,409
	Garland-Frannie	Daily	4	22,639	0	0	0	0	0	7,556	44,335	46,769	53,366	50,736	37,668	263,069
	Globe Canal	Daily	28	841	0	0	0	0	0	670	2,580	2,716	3,342	3,166	2,682	15,997
	Heart Mountain Canal	Daily	26	11,399	0	0	0	0	0	7,607	28,184	43,057	48,054	40,135	27,335	205,770
	Hunt Canal	Daily	28	1,681	0	0	0	0	0	1,611	5,491	6,016	7,007	6,640	5,486	33,932
	Lakeview Canal	Daily	28	1,594	0	0	0	0	0	1,185	8,012	12,722	13,434	11,014	7,338	55,300
	North Fork Ditch	Daily	8	0	0	0	0	0	0	57	1,553	2,068	2,085	1,882	1,767	9,411
	Sidon Canal	Daily	29	3,192	0	0	0	0	0	5,711	13,985	15,498	17,621	16,936	13,991	86,935
	Willwood Canal	Daily	27	6,541	46	0	0	0	0	6,144	15,757	15,695	21,557	19,932	15,258	100,930
	Wilson & Mckissack	Spot	9	300	0	0	0	0	0	118	595	1,158	1,550	1,171	733	5,626
Big Horn Lake	Anita Ditch	Daily	4	8,110	0	0	0	0	0	1,708	9,106	13,092	14,601	13,390	11,724	71,731

Summary of Average Monthly and Annual Diversions (1973-2001)
Overall

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Flow (ac-ft)												Total	
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
	Bernie	Spot	8	93	0	0	0	0	0	0	81	232	287	188	129	113	1,125
	Dunshee	Spot	12	59	0	0	0	0	0	0	70	310	416	437	413	264	1,968
	Frieze	Spot	12	124	0	0	0	0	0	0	119	731	922	840	787	478	4,001
	Hatten	Spot	6	112	0	0	0	0	0	0	15	289	252	314	208	169	1,359
	High Line	Spot	6	225	0	0	0	0	0	0	122	454	418	461	416	335	2,431
	Kershner	Spot	11	103	0	0	0	0	0	0	95	457	553	482	403	266	2,360
	McDonald (Shell Canal)	Spot	12	1,301	0	0	0	0	0	0	883	4,408	4,787	5,227	4,408	3,000	24,014
	Porter	Spot	12	524	0	0	0	0	0	0	145	963	1,452	1,322	1,417	1,066	6,890
	Shell Canal	Spot	12	1,135	0	0	0	0	0	0	635	3,228	3,582	3,322	3,137	2,045	17,084
	Whaley	Spot	12	443	0	0	0	0	0	0	182	1,407	1,234	1,145	1,189	881	6,481
	Whaley Cemetary (Howard E	Spot	7	524	0	0	0	0	0	0	117	929	946	703	615	590	4,423

Summary of Average Monthly and Annual Diversions (1973-2001)
Dry Years

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Diversion (ac-ft)												Total	
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
Clarks Fork Yellowstone	Bennett Creek	Spot	3	135	0	0	0	0	0	106	317	384	279	369	316	1,906	
	Little Rocky	Spot	3	302	0	0	0	0	0	125	315	488	507	407	320	2,463	
Upper Wind	Dinwoody Canal	Daily	0	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Dry Creek Canal	Daily	3	37	0	0	0	0	0	279	9,170	13,486	13,085	12,566	7,044	55,667	
	Johnstown Canal	Daily	3	0	0	0	0	0	0	25	1,467	1,712	1,507	1,591	1,379	7,682	
	LeClair Canal	Daily	6	0	0	0	0	0	0	2,458	11,567	16,435	15,985	14,647	11,067	72,159	
	Lefthand Canal	Daily	3	0	0	0	0	0	0	0	1,638	2,018	2,371	2,153	2,076	10,257	
	Riverton Valley Canal	Daily	6	0	0	0	0	0	0	1,799	7,994	7,441	7,664	6,678	4,584	36,160	
	Upper Wind River A Canal	Daily	1	0	0	0	0	0	0	592	4,508	4,564	2,795	3,697	3,400	19,557	
	Wyoming Canal	Daily	6	0	0	0	0	0	0	20,864	57,081	64,654	64,284	51,350	36,354	294,587	
Little Wind	Coolidge Canal	Daily	1	0	0	0	0	0	0	0	5,770	7,890	6,610	3,920	2,750	26,940	
	Ray Canal	Daily	2	0	0	0	0	0	0	0	10,535	15,680	8,835	7,245	2,445	44,740	
	Sub-Agency Canal	Daily	1	0	0	0	0	0	0	470	6,100	4,840	7,150	6,140	4,270	28,970	
Upper Bighorn	Ackerman	Spot	2	39	0	0	0	0	0	56	0	33	12	0	7	147	
	Baylor-Purvis-Thompson-Far	Spot	1	0	0	0	0	0	0	0	181	0	0	0	0	181	
	Big Horn Canal	Daily	5	0	0	0	0	0	0	10,358	26,207	26,448	26,697	24,629	20,116	134,455	
	Bluff Canal	Daily	5	0	0	0	0	0	0	2,214	6,374	6,523	6,445	5,833	4,160	31,549	
	Brassington	Spot	2	209	0	0	0	0	0	69	102	303	2,328	2,043	1,008	6,061	
	Caledonia	Spot	2	81	0	0	0	0	0	176	335	198	46	53	69	957	
	Chessington-Wilson	Spot	2	12	0	0	0	0	0	28	116	43	98	30	40	368	
	Hale	Spot	2	64	0	0	0	0	0	0	0	0	0	0	0	64	
	Highland Ditch	Daily	0	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Highland Hanover	Daily	1	0	0	0	0	0	0	1,090	6,280	7,510	7,660	7,750	4,370	34,660	
	Kirby Canal	Daily	6	0	0	0	0	0	0	225	3,114	3,549	3,900	3,383	2,606	16,777	
	Lower Hanover Canal	Daily	5	0	0	0	0	0	0	3,266	9,462	10,295	10,580	9,749	6,270	49,622	
	Lower Lucerne Canal	Daily	3	0	0	0	0	0	0	112	2,416	3,108	3,030	2,549	1,356	12,571	
	Padlock	Spot	2	0	0	0	0	0	0	53	171	268	168	118	0	780	
	Slincy and Mikkleson/Slincy N	Spot	2	0	0	0	0	0	0	64	205	288	220	98	47	922	
	Tenderfoot	Spot	2	43	0	0	0	0	0	54	133	58	22	38	66	415	
	Upper Hanover Canal	Daily	5	0	0	0	0	0	0	10,075	27,251	27,935	28,172	26,043	20,076	139,552	
Upper Lucerne Canal	Daily	3	0	0	0	0	0	0	224	1,889	2,308	2,469	2,355	1,996	11,241		
Woodward-Johnson	Spot	2	0	0	0	0	0	0	18	37	62	189	13	0	319		
Nowood	Anita	Spot	2	669	0	0	0	0	0	140	1,128	1,717	1,463	770	818	6,705	
	Anita Supplemental	Spot	2	288	0	0	0	0	0	45	669	967	571	197	163	2,900	
	Bernstein	Spot	2	193	0	0	0	0	0	45	311	719	630	519	352	2,769	
	Big Bear Enl.	Spot	2	15	0	0	0	0	0	0	317	826	864	505	289	2,815	
	Elk	Spot	2	16	0	0	0	0	0	16	363	953	928	329	116	2,722	
	George & Bayne	Spot	2	236	0	0	0	0	0	160	678	767	762	455	371	3,429	
	Go Ahead	Spot	2	17	0	0	0	0	0	111	474	769	682	353	277	2,685	
	Harmony	Spot	2	335	0	0	0	0	0	211	613	746	800	545	469	3,719	
	Highland	Spot	2	574	0	0	0	0	0	24	593	1,021	1,025	532	326	4,096	
	Shafer	Spot	2	14	0	0	0	0	0	65	450	925	730	503	489	3,175	
	Van Alstine (Avent	Spot	2	973	0	0	0	0	0	417	1,130	1,879	1,694	979	1,257	8,328	
	Western	Spot	2	19	0	0	0	0	0	0	218	516	690	506	247	2,196	
Greybull/Dry	Agrarian	Spot	2	223	0	0	0	0	0	402	1,134	1,128	929	691	692	5,198	
	Arnold	Spot	2	96	0	0	0	0	0	59	266	467	312	367	191	1,758	
	Ashworth #2	Spot	2	96	0	0	0	0	0	59	266	467	312	367	191	1,758	
	Avent	Spot	2	95	0	0	0	0	0	192	983	1,110	1,004	642	313	4,338	
	Beck and Allen	Spot	1	71	0	0	0	0	0	668	1,898	672	1,094	673	584	5,659	

Summary of Average Monthly and Annual Diversions (1973-2001)
Dry Years

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Diversion (ac-ft)												Total
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
	Bench Canal	Daily	6	0	0	0	0	0	0	469	7,490	9,879	10,184	7,244	4,169	39,435
	Borner & Harvey (Borner)	Spot	2	48	0	0	0	0	0	154	347	348	407	295	242	1,841
	Brown (Croxall and Brown)	Spot	2	131	0	0	0	0	0	253	804	859	897	774	542	4,260
	Butte	Spot	2	23	0	0	0	0	0	37	168	318	118	60	28	752
	Cheeseman	Spot	2	53	0	0	0	0	0	82	331	627	333	266	238	1,931
	Cockins	Spot	2	116	0	0	0	0	0	90	404	556	496	432	314	2,409
	Dodge	Spot	2	181	0	0	0	0	0	37	186	412	463	468	273	2,020
	Dyer	Spot	2	107	0	0	0	0	0	46	229	466	470	460	402	2,180
	Fairview	Spot	2	338	0	0	0	0	0	224	735	885	1,023	628	509	4,339
	Farmer's Canal	Daily	6	0	0	0	0	0	0	1,021	8,964	11,204	10,142	7,786	4,573	43,690
	German	Spot	2	118	0	0	0	0	0	173	445	543	607	374	127	2,387
	Greybull	Spot	2	55	0	0	0	0	0	26	123	171	336	194	33	937
	Hurlbut	Spot	2	11	0	0	0	0	0	183	748	1,342	926	910	395	4,514
	J.F.W.	Spot	1	71	0	0	0	0	0	365	1,342	940	773	386	619	4,497
	Jimmerfield	Spot	2	58	0	0	0	0	0	125	352	302	189	199	205	1,429
	Jimmerfield-Roach	Spot	2	152	0	0	0	0	0	187	689	817	765	523	279	3,412
	Keystone	Spot	2	66	0	0	0	0	0	214	615	778	848	444	453	3,418
	Meyers	Spot	2	66	0	0	0	0	0	116	350	324	329	358	206	1,749
	Moss & Long Hollow	Spot	2	46	0	0	0	0	0	34	123	190	94	267	164	918
	Only Chance	Spot	2	36	0	0	0	0	0	56	92	54	86	59	16	399
	Pappapau	Spot	2	161	0	0	0	0	0	121	683	745	1,010	735	740	4,196
	Perkins	Spot	1	183	0	0	0	0	0	863	962	1,387	2,005	611	791	6,802
	Rocky	Spot	2	56	0	0	0	0	0	62	279	578	340	187	119	1,620
	Ruby	Spot	2	80	0	0	0	0	0	32	121	226	175	113	97	843
	Sandstone	Spot	2	219	0	0	0	0	0	269	857	786	722	666	476	3,995
	Snyder (Nichols)	Spot	2	89	0	0	0	0	0	119	392	376	343	262	154	1,735
	T.L.	Spot	2	157	0	0	0	0	0	52	222	350	393	499	308	1,981
	Tatman-St. Joe	Spot	2	205	0	0	0	0	0	108	706	1,031	1,101	732	504	4,387
	Watson	Spot	2	97	0	0	0	0	0	44	163	263	345	229	178	1,319
	Whitney Gleaver	Spot	2	5	0	0	0	0	0	17	84	95	99	111	170	580
	Winkle & Benbrooke	Spot	2	22	0	0	0	0	0	31	179	379	173	290	122	1,196
	Woods and Burnett	Spot	2	211	0	0	0	0	0	507	1,210	1,239	1,524	989	862	6,542
Shoshone	Cody Canal	Daily	6	0	0	0	0	0	0	2,549	11,412	10,523	11,815	9,007	7,369	52,674
	Deaver-Frannie Canal	Daily	4	0	0	0	0	0	0	4,368	14,362	13,766	16,013	15,311	13,542	77,363
	Elk Lovell Canal	Daily	6	0	0	0	0	0	0	6,000	16,021	16,677	18,046	16,684	15,281	88,709
	Frannie Canal	Daily	0	---	---	---	---	---	---	---	---	---	---	---	---	---
	Garland Canal	Daily	5	0	0	0	0	0	0	20,442	45,830	45,203	52,617	46,701	36,513	247,305
	Garland-Frannie	Daily	0	---	---	---	---	---	---	---	---	---	---	---	---	---
	Globe Canal	Daily	6	0	0	0	0	0	0	890	2,763	2,358	2,917	2,833	2,348	14,110
	Heart Mountain Canal	Daily	6	0	0	0	0	0	0	9,026	33,725	40,381	45,080	36,250	26,204	190,665
	Hunt Canal	Daily	6	0	0	0	0	0	0	2,061	5,351	5,642	7,024	6,709	5,040	31,826
	Lakeview Canal	Daily	6	0	0	0	0	0	0	1,788	10,230	11,637	10,259	6,702	4,269	44,886
	North Fork Ditch	Daily	2	0	0	0	0	0	0	0	1,608	1,953	2,020	1,822	1,827	9,232
	Sidon Canal	Daily	6	0	0	0	0	0	0	6,506	14,850	15,816	17,889	16,902	13,867	85,830
	Willwood Canal	Daily	6	0	0	0	0	0	0	6,665	16,559	15,180	20,601	19,044	14,287	92,335
	Wilson & Mckissack	Spot	2	307	0	0	0	0	0	153	492	749	756	388	362	3,208
Big Horn Lake	Anita Ditch	Daily	1	0	0	0	0	0	0	1,954	8,586	10,931	13,983	10,739	10,030	56,223
	Bernie	Spot	2	41	0	0	0	0	0	66	230	268	244	166	139	1,152
	Dunshee	Spot	3	73	0	0	0	0	0	42	419	473	428	536	366	2,336

Summary of Average Monthly and Annual Diversions (1973-2001)
Dry Years

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Diversion (ac-ft)												Total
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
	Frieze	Spot	3	124	0	0	0	0	0	48	806	778	656	583	238	3,233
	Hatten	Spot	1	0	0	0	0	0	0	341	159	177	117	109	903	
	High Line	Spot	1	235	0	0	0	0	0	0	500	398	259	217	232	1,841
	Kershner	Spot	3	167	0	0	0	0	0	25	527	548	343	314	183	2,107
	McDonald (Shell Canal)	Spot	3	1,674	0	0	0	0	0	778	5,012	4,966	3,958	2,779	1,487	20,654
	Porter	Spot	3	692	0	0	0	0	0	57	1,355	1,312	893	1,217	909	6,435
	Shell Canal	Spot	3	1,194	0	0	0	0	0	381	3,553	3,484	2,396	2,022	689	13,720
	Whaley	Spot	3	403	0	0	0	0	0	0	1,542	1,264	952	969	848	5,978
	Whaley Cemetary (Howard E	Spot	1	603	0	0	0	0	0	0	1,064	924	569	372	477	4,007

Summary of Average Monthly and Annual Diversions (1973-2001)
Normal Years

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Diversion (ac-ft)													Total
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
Clarks Fork Yellowstone	Bennett Creek	Spot	7	182	0	0	0	0	0	192	376	602	650	583	430	3,015	
	Little Rocky	Spot	7	145	0	0	0	0	0	267	138	304	680	768	697	540	3,540
Upper Wind	Dinwoody Canal	Daily	3	0	0	0	0	0	0	4,154	4,811	5,200	6,652	5,624	4,899	31,341	
	Dry Creek Canal	Daily	5	1,311	0	0	0	0	0	354	6,219	11,311	12,135	11,228	8,022	50,580	
	Johnstown Canal	Daily	3	0	0	0	0	0	0	0	600	1,183	1,483	1,563	1,097	5,927	
	LeClair Canal	Daily	17	3,097	0	0	0	0	0	1,165	8,823	15,384	20,347	16,492	11,043	76,351	
	Lefthand Canal	Daily	3	0	0	0	0	0	0	0	870	1,490	1,450	1,213	1,287	6,310	
	Riverton Valley Canal	Daily	16	430	0	0	0	0	0	924	5,200	6,980	8,516	6,045	4,403	32,498	
	Upper Wind River A Canal	Daily	1	0	0	0	0	0	0	0	3,670	3,800	3,710	3,500	3,700	18,380	
	Wyoming Canal	Daily	16	4,105	2,363	0	0	0	0	6,714	15,763	51,228	80,114	89,592	69,897	50,977	370,754
Little Wind	Coolidge Canal	Daily	0	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Ray Canal	Daily	5	0	0	0	0	0	0	1,099	6,185	12,337	15,274	10,814	7,098	52,808	
	Sub-Agency Canal	Daily	0	---	---	---	---	---	---	---	---	---	---	---	---	---	
Upper Bighorn	Ackerman	Spot	5	207	206	0	0	0	180	199	373	410	211	165	131	2,082	
	Baylor-Purvis-Thompson-Far	Spot	2	113	0	0	0	0	37	12	400	483	220	195	102	1,561	
	Big Horn Canal	Daily	16	3,588	0	0	0	0	0	12,116	24,545	26,309	29,836	27,221	22,833	146,448	
	Bluff Canal	Daily	17	893	0	0	0	0	0	2,670	5,593	6,176	6,862	6,432	5,149	33,774	
	Brassington	Spot	5	17	5	0	0	0	0	0	150	245	80	149	187	833	
	Caledonia	Spot	5	40	0	0	0	0	692	428	527	594	339	211	98	2,929	
	Chessington-Wilson	Spot	5	31	0	0	0	0	185	87	295	359	318	148	107	1,529	
	Hale	Spot	5	37	0	0	0	0	0	99	273	329	169	179	125	1,212	
	Highland Ditch	Daily	3	188	0	0	0	0	0	0	1,919	2,191	2,131	1,205	1,621	9,256	
	Highland Hanover	Daily	2	0	0	0	0	0	0	1,630	4,790	6,093	7,465	7,510	4,615	32,103	
	Kirby Canal	Daily	17	230	0	0	0	0	0	371	2,996	3,710	4,074	3,750	2,799	17,932	
	Lower Hanover Canal	Daily	16	412	8	6	8	8	8	3,827	8,045	9,082	10,843	9,418	6,042	47,706	
	Lower Lucerne Canal	Daily	7	0	0	0	0	0	0	409	1,983	2,147	2,640	2,269	1,556	11,003	
	Padlock	Spot	5	29	0	0	0	0	0	89	391	653	491	163	46	1,862	
	Slincy and Mikkleson/Slincy N	Spot	5	43	0	0	0	0	129	302	859	776	728	242	42	3,122	
	Tenderfoot	Spot	5	250	366	0	0	0	0	272	461	567	256	178	246	2,595	
	Upper Hanover Canal	Daily	17	5,044	0	0	0	0	0	10,974	24,725	27,304	30,272	27,809	23,274	149,403	
Upper Lucerne Canal	Daily	7	0	0	0	0	0	0	265	1,889	1,991	2,245	2,116	1,747	10,252		
Woodward-Johnson	Spot	5	38	0	0	0	0	0	231	122	321	319	194	117	82	1,423	
Nowood	Anita	Spot	7	440	0	0	0	0	0	340	1,098	1,250	1,112	1,030	994	6,264	
	Anita Supplemental	Spot	7	122	0	0	0	0	0	99	283	331	425	393	317	1,970	
	Bernstein	Spot	7	113	0	0	0	0	0	47	276	556	576	458	319	2,346	
	Big Bear Enl.	Spot	7	129	0	0	0	0	0	37	202	516	560	530	376	2,350	
	Elk	Spot	7	147	0	0	0	0	0	36	186	432	460	457	364	2,083	
	George & Bayne	Spot	7	157	0	0	0	0	0	145	335	430	476	494	434	2,471	
	Go Ahead	Spot	7	112	0	0	0	0	0	94	321	446	498	429	362	2,262	
	Harmony	Spot	7	96	0	0	0	0	0	246	495	525	529	452	354	2,696	
	Highland	Spot	7	201	0	0	0	0	0	71	400	673	742	764	596	3,446	
	Shafer	Spot	7	151	0	0	0	0	0	196	457	708	745	643	450	3,349	
	Van Alstine (Avent	Spot	7	426	0	0	0	0	0	562	1,145	1,261	1,307	1,341	1,037	7,078	
	Western	Spot	6	114	0	0	0	0	0	45	248	622	473	429	313	2,246	
	Greybull/Dry	Agrarian	Spot	6	462	0	0	0	0	0	391	1,273	1,703	2,064	1,993	1,246	9,133
Arnold		Spot	6	73	0	0	0	0	0	136	470	716	746	587	242	2,970	
Ashworth #2		Spot	6	73	0	0	0	0	0	136	470	716	746	587	242	2,970	
Avent		Spot	6	147	0	0	0	0	0	191	709	1,157	1,303	999	489	4,995	
Beck and Allen		Spot	2	54	0	0	0	0	0	782	1,486	845	1,170	577	312	5,225	

Summary of Average Monthly and Annual Diversions (1973-2001)
Normal Years

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Diversion (ac-ft)												Total
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
	Bench Canal	Daily	16	0	0	0	0	0	0	1,269	8,194	12,249	15,165	12,190	7,905	56,971
	Borner & Harvey (Borner)	Spot	6	117	0	0	0	0	0	98	308	364	393	382	252	1,914
	Brown (Croxall and Brown)	Spot	6	132	0	0	0	0	0	204	679	1,077	1,233	981	669	4,975
	Butte	Spot	6	12	0	0	0	0	0	53	178	504	357	169	69	1,341
	Cheeseman	Spot	6	117	0	0	0	0	0	119	409	1,175	681	443	246	3,191
	Cockins	Spot	6	130	0	0	0	0	0	157	482	654	627	649	423	3,122
	Dodge	Spot	6	73	0	0	0	0	0	101	385	757	657	732	437	3,144
	Dyer	Spot	6	88	0	0	0	0	0	114	483	806	773	706	356	3,326
	Fairview	Spot	6	263	0	0	0	0	0	515	1,339	2,321	2,653	1,867	1,163	10,120
	Farmer's Canal	Daily	15	0	0	0	0	0	0	1,555	8,826	11,630	13,211	11,336	7,160	53,717
	German	Spot	6	139	0	0	0	0	0	118	531	983	931	713	422	3,837
	Greybull	Spot	6	57	0	0	0	0	0	113	448	778	661	617	276	2,949
	Hurlbut	Spot	6	80	0	0	0	0	0	54	184	868	996	366	126	2,675
	J.F.W.	Spot	2	305	0	0	0	0	0	510	720	1,161	1,008	933	495	5,133
	Jimmerfield	Spot	6	108	0	0	0	0	0	158	391	597	583	491	329	2,657
	Jimmerfield-Roach	Spot	6	111	0	0	0	0	0	171	514	883	1,279	1,033	566	4,558
	Keystone	Spot	6	161	0	0	0	0	0	253	596	1,220	1,365	777	440	4,813
	Meyers	Spot	6	61	0	0	0	0	0	115	447	651	514	494	319	2,600
	Moss & Long Hollow	Spot	6	32	0	0	0	0	0	82	262	312	166	181	176	1,211
	Only Chance	Spot	6	23	0	0	0	0	0	94	289	442	386	295	129	1,657
	Pappapau	Spot	6	154	0	0	0	0	0	175	588	1,235	1,004	782	576	4,514
	Perkins	Spot	2	395	0	0	0	0	0	737	1,416	1,940	1,944	1,522	978	8,931
	Rocky	Spot	6	59	0	0	0	0	0	90	327	926	753	750	233	3,138
	Ruby	Spot	6	34	0	0	0	0	0	69	259	494	445	457	274	2,032
	Sandstone	Spot	6	401	0	0	0	0	0	220	1,097	1,706	1,496	1,570	1,028	7,517
	Snyder (Nichols)	Spot	6	71	0	0	0	0	0	84	392	582	659	658	351	2,796
	T.L.	Spot	6	113	0	0	0	0	0	111	432	739	761	604	342	3,101
	Tatman-St. Joe	Spot	6	230	0	0	0	0	0	146	804	1,618	1,834	1,480	800	6,910
	Watson	Spot	6	65	0	0	0	0	0	59	216	431	503	372	232	1,878
	Whitney Gleaver	Spot	6	39	0	0	0	0	0	42	136	229	117	117	99	779
	Winkle & Benbrooke	Spot	6	58	0	0	0	0	0	56	298	786	528	551	118	2,395
	Woods and Burnett	Spot	5	310	0	0	0	0	0	603	1,383	1,528	2,183	1,798	1,092	8,897
Shoshone	Cody Canal	Daily	16	1,624	0	0	0	0	0	1,715	9,689	15,739	16,387	12,782	8,956	66,892
	Deaver-Frannie Canal	Daily	9	0	0	0	0	0	0	3,912	15,041	15,679	16,104	16,468	15,178	82,381
	Elk Lovell Canal	Daily	16	5,845	0	0	0	0	0	4,428	15,462	19,144	21,233	20,018	16,731	102,861
	Frannie Canal	Daily	2	23,504	0	0	0	0	0	3,199	40,481	47,299	52,630	51,686	37,606	256,405
	Garland Canal	Daily	13	24,627	0	0	0	0	0	16,204	45,876	49,545	54,091	49,973	39,699	280,015
	Garland-Frannie	Daily	2	23,504	0	0	0	0	0	3,199	40,481	47,299	52,630	51,686	37,606	256,405
	Globe Canal	Daily	16	1,031	0	0	0	0	0	643	2,311	2,803	3,373	3,240	2,684	16,086
	Heart Mountain Canal	Daily	14	11,358	0	0	0	0	0	7,422	27,516	47,656	51,994	44,158	29,753	219,858
	Hunt Canal	Daily	16	2,024	0	0	0	0	0	1,480	5,302	6,271	7,123	6,695	5,494	34,388
	Lakeview Canal	Daily	16	720	0	0	0	0	0	1,039	7,054	13,225	14,142	11,662	7,822	55,663
	North Fork Ditch	Daily	4	0	0	0	0	0	0	99	1,614	2,099	2,110	2,030	1,818	9,770
	Sidon Canal	Daily	17	3,546	0	0	0	0	0	5,621	13,876	16,163	18,304	17,417	14,562	89,490
	Willwood Canal	Daily	15	7,102	91	0	0	0	0	6,231	15,054	16,623	21,865	20,609	16,127	103,703
	Wilson & Mckissack	Spot	4	258	0	0	0	0	0	84	493	1,138	1,568	1,262	794	5,597
Big Horn Lake	Anita Ditch	Daily	3	8,110	0	0	0	0	0	1,585	9,626	14,172	14,910	14,715	13,418	76,536
	Bernie	Spot	4	98	0	0	0	0	0	112	240	338	186	93	90	1,158
	Dunshee	Spot	6	35	0	0	0	0	0	72	354	532	500	417	258	2,168

Summary of Average Monthly and Annual Diversions (1973-2001)
Normal Years

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Diversion (ac-ft)												Total	
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
	Frieze	Spot	6	105	0	0	0	0	0	0	164	748	898	885	831	510	4,141
	Hatten	Spot	4	63	0	0	0	0	0	0	21	310	303	365	223	168	1,452
	High Line	Spot	4	157	0	0	0	0	0	0	204	503	421	434	383	331	2,433
	Kershner	Spot	6	70	0	0	0	0	0	0	75	404	553	513	387	228	2,230
	McDonald (Shell Canal)	Spot	6	1,150	0	0	0	0	0	0	894	4,583	4,669	5,293	4,572	3,091	24,252
	Porter	Spot	6	404	0	0	0	0	0	0	246	920	1,335	1,345	1,421	1,091	6,763
	Shell Canal	Spot	6	1,082	0	0	0	0	0	0	716	3,428	3,551	3,365	3,488	2,227	17,858
	Whaley	Spot	6	326	0	0	0	0	0	0	244	1,381	1,217	1,119	1,262	831	6,379
	Whaley Cemetary (Howard E	Spot	4	311	0	0	0	0	0	0	118	982	947	669	609	612	4,249

Summary of Average Monthly and Annual Diversions (1973-2001)
Wet Years

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Diversion (ac-ft)													Total
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
Clarks Fork Yellowstone	Bennett Creek	Spot	2	229	0	0	0	0	0	0	150	388	601	780	758	683	3,588
	Little Rocky	Spot	2	203	0	0	0	0	0	0	51	356	373	735	641	570	2,931
Upper Wind	Dinwoody Canal	Daily	3	280	0	0	0	0	0	0	276	1,379	1,425	1,597	1,096	6,052	
	Dry Creek Canal	Daily	4	1,435	0	0	0	0	0	231	4,575	9,154	12,226	11,721	8,032	47,375	
	Johnstown Canal	Daily	4	0	0	0	0	0	0	0	451	1,188	1,713	1,530	1,139	6,022	
	LeClair Canal	Daily	6	0	0	0	0	0	0	1,203	6,990	15,545	21,908	17,409	12,847	75,901	
	Lefthand Canal	Daily	4	0	0	0	0	0	0	0	841	1,172	1,543	1,447	1,085	6,087	
	Riverton Valley Canal	Daily	6	0	0	0	0	0	0	0	913	4,505	6,278	8,748	6,967	5,060	32,471
	Upper Wind River A Canal	Daily	2	0	0	0	0	0	0	0	0	2,498	3,422	3,529	3,489	2,587	15,526
	Wyoming Canal	Daily	4	0	0	0	0	0	0	0	13,695	40,333	70,818	96,880	74,855	56,593	353,173
Little Wind	Coolidge Canal	Daily	0	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Ray Canal	Daily	4	2,774	0	0	0	0	0	0	673	4,643	9,091	15,975	12,266	7,400	52,823
	Sub-Agency Canal	Daily	0	---	---	---	---	---	---	---	---	---	---	---	---	---	
Upper Bighorn	Ackerman	Spot	5	50	0	0	0	0	0	240	54	330	208	143	76	122	1,223
	Baylor-Purvis-Thompson-Far	Spot	3	74	0	0	0	0	0	0	102	179	534	495	317	188	1,890
	Big Horn Canal	Daily	6	0	0	0	0	0	0	0	13,387	27,553	28,770	34,045	30,333	24,733	158,822
	Bluff Canal	Daily	5	0	0	0	0	0	0	0	2,148	5,504	6,080	6,928	6,404	5,034	32,098
	Brassington	Spot	5	204	0	0	0	0	0	0	0	270	287	195	224	332	1,511
	Caledonia	Spot	5	36	0	0	0	0	0	179	278	512	360	96	82	63	1,605
	Chessington-Wilson	Spot	5	57	0	0	0	0	0	0	78	242	304	489	352	183	1,706
	Hale	Spot	5	13	0	0	0	0	0	219	117	317	406	248	161	105	1,586
	Highland Ditch	Daily	3	288	0	0	0	0	0	0	0	1,577	1,333	2,012	2,554	1,880	9,644
	Highland Hanover	Daily	4	0	0	0	0	0	0	0	1,158	4,700	5,085	7,515	6,525	3,518	28,500
	Kirby Canal	Daily	6	0	0	0	0	0	0	0	184	3,443	4,550	4,747	4,162	3,882	20,967
	Lower Hanover Canal	Daily	6	0	0	0	0	0	0	0	4,953	7,970	9,768	11,652	10,122	5,733	50,198
	Lower Lucerne Canal	Daily	6	0	0	0	0	0	0	0	65	1,578	2,395	3,003	2,410	1,248	10,699
	Padlock	Spot	5	26	0	0	0	0	0	0	118	336	701	568	221	148	2,118
	Slaney and Mikkleson/Slaney N	Spot	5	27	0	0	0	0	0	289	224	701	1,675	454	259	152	3,781
	Tenderfoot	Spot	5	164	0	0	0	0	0	7	153	396	331	183	223	265	1,723
	Upper Hanover Canal	Daily	6	0	0	0	0	0	0	0	13,663	26,410	29,578	33,050	30,212	23,045	155,958
	Upper Lucerne Canal	Daily	6	0	0	0	0	0	0	0	41	1,328	1,923	2,355	2,303	1,605	9,556
Woodward-Johnson	Spot	5	54	0	0	0	0	0	257	114	358	363	383	217	98	1,844	
Nowood	Anita	Spot	2	433	0	0	0	0	0	0	180	816	1,025	877	939	774	5,043
	Anita Supplemental	Spot	2	0	0	0	0	0	0	0	73	250	356	285	255	234	1,453
	Bernstein	Spot	2	11	0	0	0	0	0	0	11	268	495	392	370	349	1,896
	Big Bear Enl.	Spot	1	120	0	0	0	0	0	0	0	431	972	534	479	303	2,839
	Elk	Spot	2	65	0	0	0	0	0	0	21	354	540	376	496	255	2,106
	George & Bayne	Spot	2	281	0	0	0	0	0	0	62	304	421	373	400	358	2,199
	Go Ahead	Spot	2	284	0	0	0	0	0	0	16	258	400	357	376	295	1,985
	Harmony	Spot	2	13	0	0	0	0	0	0	112	383	449	438	384	276	2,056
	Highland	Spot	2	254	0	0	0	0	0	0	118	470	678	659	648	382	3,210
	Shafer	Spot	2	175	0	0	0	0	0	0	10	348	618	416	363	339	2,270
	Van Alstine (Avent	Spot	2	806	0	0	0	0	0	0	270	1,074	1,261	1,157	1,166	1,003	6,738
	Western	Spot	2	160	0	0	0	0	0	0	0	175	411	271	194	274	1,485
	Greybull/Dry	Agrarian	Spot	4	664	0	0	0	0	0	0	542	1,470	1,599	2,132	1,909	1,541
Arnold		Spot	4	96	0	0	0	0	0	0	184	596	544	599	638	388	3,046
Ashworth #2		Spot	4	96	0	0	0	0	0	0	184	596	544	599	638	388	3,046
Avent		Spot	4	183	0	0	0	0	0	0	66	703	545	1,226	1,065	658	4,446
Beck and Allen		Spot	3	90	0	0	0	0	0	0	524	1,382	861	1,431	734	545	5,568

Summary of Average Monthly and Annual Diversions (1973-2001)
Wet Years

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Diversion (ac-ft)												Total	
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
	Bench Canal	Daily	6	1,040	0	0	0	0	0	1,894	10,258	11,581	17,442	12,947	8,234	63,395	
	Borner & Harvey (Borner)	Spot	4	116	0	0	0	0	0	122	304	281	320	339	287	1,769	
	Brown (Croxall and Brown)	Spot	4	52	0	0	0	0	0	316	832	850	1,354	1,067	602	5,074	
	Butte	Spot	4	0	0	0	0	0	0	73	235	298	175	41	12	834	
	Cheeseman	Spot	4	0	0	0	0	0	0	172	698	989	459	393	231	2,942	
	Cockins	Spot	4	67	0	0	0	0	0	183	430	468	550	515	310	2,522	
	Dodge	Spot	4	76	0	0	0	0	0	45	262	577	666	802	449	2,877	
	Dyer	Spot	4	0	0	0	0	0	0	252	878	729	888	792	504	4,043	
	Fairview	Spot	4	522	0	0	0	0	0	2,260	816	1,688	1,896	2,861	2,322	1,501	13,865
	Farmer's Canal	Daily	6	794	0	0	0	0	0	2,833	11,310	10,792	14,309	10,788	7,596	58,422	
	German	Spot	4	180	0	0	0	0	0	103	632	674	1,261	979	594	4,423	
	Greybull	Spot	4	80	0	0	0	0	0	83	407	754	927	542	390	3,182	
	Hurlbut	Spot	4	0	0	0	0	0	0	211	707	746	1,004	305	15	2,988	
	J.F.W.	Spot	3	340	0	0	0	0	0	451	1,186	1,048	1,540	1,235	943	6,743	
	Jimmerfield	Spot	4	34	0	0	0	0	0	26	392	391	498	397	311	2,049	
	Jimmerfield-Roach	Spot	4	151	0	0	0	0	0	271	306	560	644	1,281	973	4,777	
	Keystone	Spot	4	0	0	0	0	0	0	100	874	856	1,604	1,072	702	5,208	
	Meyers	Spot	4	51	0	0	0	0	0	102	609	506	827	581	333	3,009	
	Moss & Long Hollow	Spot	4	75	0	0	0	0	0	23	40	104	187	201	168	798	
	Only Chance	Spot	4	30	0	0	0	0	0	133	448	668	675	362	215	2,532	
	Pappapau	Spot	4	20	0	0	0	0	0	120	334	600	715	551	277	2,616	
	Perkins	Spot	3	402	0	0	0	0	0	581	740	1,682	1,585	2,219	1,988	1,227	10,425
	Rocky	Spot	4	58	0	0	0	0	0	77	339	725	728	676	269	2,873	
	Ruby	Spot	4	77	0	0	0	0	0	15	100	394	370	345	207	1,507	
	Sandstone	Spot	4	203	0	0	0	0	0	403	1,075	1,229	1,794	1,605	1,022	7,332	
	Snyder (Nichols)	Spot	4	76	0	0	0	0	0	64	600	426	699	702	477	3,044	
	T.L.	Spot	4	185	0	0	0	0	0	145	529	786	605	556	379	3,185	
	Tatman-St. Joe	Spot	4	232	0	0	0	0	0	1,118	441	993	1,072	2,206	1,463	1,005	8,530
	Watson	Spot	4	44	0	0	0	0	0	29	153	274	351	344	204	1,399	
	Whitney Gleaver	Spot	4	93	0	0	0	0	0	27	53	137	136	87	138	671	
	Winkle & Benbrooke	Spot	4	0	0	0	0	0	0	115	494	494	320	490	292	2,204	
	Woods and Burnett	Spot	5	219	0	0	0	0	0	595	1,374	1,304	1,861	1,921	1,189	8,462	
Shoshone	Cody Canal	Daily	6	3,709	0	0	0	0	0	1,285	12,098	14,255	16,742	15,153	9,586	72,828	
	Deaver-Frannie Canal	Daily	3	8,110	0	0	0	0	0	3,790	15,610	15,765	16,940	17,225	15,825	93,265	
	Elk Lovell Canal	Daily	6	378	0	0	0	0	0	5,012	18,887	19,146	22,274	20,962	16,761	103,419	
	Frannie Canal	Daily	2	21,775	0	0	0	0	0	16,268	52,044	45,709	54,837	48,835	37,793	277,262	
	Garland Canal	Daily	4	0	0	0	0	0	0	15,091	44,426	47,007	53,150	47,487	38,497	245,658	
	Garland-Frannie	Daily	2	21,775	0	0	0	0	0	16,268	52,044	45,709	54,837	48,835	37,793	277,262	
	Globe Canal	Daily	6	651	0	0	0	0	0	509	3,116	2,843	3,682	3,301	3,010	17,111	
	Heart Mountain Canal	Daily	6	11,439	0	0	0	0	0	6,618	24,201	35,768	41,836	35,301	22,823	177,985	
	Hunt Canal	Daily	6	994	0	0	0	0	0	1,504	6,102	5,754	6,698	6,435	5,916	33,401	
	Lakeview Canal	Daily	6	2,467	0	0	0	0	0	989	8,352	12,464	14,724	13,601	9,117	61,713	
	North Fork Ditch	Daily	2	0	0	0	0	0	0	0	1,375	2,120	2,100	1,645	1,605	8,845	
	Sidon Canal	Daily	6	2,485	0	0	0	0	0	4,990	13,412	13,407	15,531	15,687	12,591	78,104	
	Willwood Canal	Daily	6	5,980	0	0	0	0	0	5,418	16,713	13,890	21,743	19,128	14,058	96,929	
	Wilson & Mckissack	Spot	3	356	0	0	0	0	0	152	765	1,323	1,790	1,311	775	6,472	
Big Horn Lake	Anita Ditch	Daily	0	---	---	---	---	---	---	---	---	---	---	---	---	---	
	Bernie	Spot	2	115	0	0	0	0	0	21	214	171	84	162	133	901	
	Dunshee	Spot	3	87	0	0	0	0	0	85	164	184	337	323	206	1,386	

Summary of Average Monthly and Annual Diversions (1973-2001)
Wet Years

Sub-Basin	Diversion Name	Data Type	Years of Data	Average Monthly Diversion (ac-ft)												Total	
				Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
	Frieze	Spot	3	172	0	0	0	0	0	0	76	646	1,064	874	836	575	4,244
	Hatten	Spot	1	322	0	0	0	0	0	0	12	174	191	300	256	231	1,486
	High Line	Spot	1	350	0	0	0	0	0	0	0	260	430	745	715	447	2,947
	Kershner	Spot	2	48	0	0	0	0	0	0	215	522	555	546	529	446	2,860
	McDonald (Shell Canal)	Spot	3	1,121	0	0	0	0	0	0	931	3,655	4,902	5,942	5,166	3,827	25,544
	Porter	Spot	3	569	0	0	0	0	0	0	2	788	1,781	1,563	1,543	1,122	7,366
	Shell Canal	Spot	3	1,152	0	0	0	0	0	0	670	2,676	3,700	3,867	3,294	2,647	18,005
	Whaley	Spot	3	795	0	0	0	0	0	0	180	1,369	1,248	1,328	1,189	1,004	7,113
	Whaley Cemetary (Howard E	Spot	2	1,299	0	0	0	0	0	0	172	756	954	837	749	601	5,369