

Appendix G.

VII. Potential Future Water Demand

Past Efforts to Estimate Future Demand

Water Reservations and Water Availability in the Yellowstone River Basin, May 1982

Sobashinski and Lozovoy, DNRC Water Resources Division

A computer model was used to determine the amount of water available for appropriation in the Yellowstone Basin. The amount of surplus water available for appropriation was determined by accounting for all reservations and estimating depletions for future Wyoming, Indian, and federal uses. Existing uses were accounted for by using the 1975 level of development flows, as determined by the U.S. Bureau of Reclamation, and subtracting the depletions for provisional water rights permits issued in Montana between 1975 and 1981.

The monthly analyses indicate the amount of water available for appropriation directly from the river, particularly for irrigation. Assuming that a reliable supply of irrigation water is needed in at least eight out of ten years, the tables show that there is not a reliable supply of that amount of water anywhere in the Yellowstone mainstem; the 80th percentile flows are all 0.0 for the irrigation months. The majority of the 60th percentile flows are also 0.0 during the irrigation season because of the relatively large instream flow requirements.

The annual frequency flows indicate that water is available throughout the basin on a yearly basis. This water would be available for offstream storage projects and could be used for irrigation or industrial purposes, depending on the costs associated with the storage.

All of the excess flow calculations are affected by the values estimated for future Wyoming depletions and Indian reserved water rights. The excess flows also reflect the assumption that all of the reservations are final. As previously mentioned, the Board of Natural Resources and Conservation has the authority to modify each reservation if the objectives of the reservation are not met or progress towards the completion of necessary facilities is not made. Therefore, the excess flows in Tables 2 through 10 should be viewed as the amount of water available for appropriation, considering all of these assumptions. The values should be used only to obtain general information on water availability and the seasonal availability of water in the basin.

Because all of the consumptive reservations of Yellowstone River Basin water have yet to be developed, and because Indian reserved water rights and the amounts of water apportioned to Wyoming under the Yellowstone River Compact have yet to be quantified or developed, some additional water in excess of the flows presented in Tables 2 through 10 is now available for use. This water would be available on a provisional basis until the reservations, Indian reserved water rights, and Wyoming's share of the water under the terms of the Yellowstone River Compact have been quantified, developed, and put to beneficial use.

The values in Tables 2 through 10 indicate that little or no water for direct withdrawal for irrigation is available in the basin. Therefore, the logical alternative for obtaining irrigation water would seem to be through the irrigation reservations of the Conservation Districts (CDs) in the basin. However, all of the water reserved by the CDs may not be available during a given year. This is particularly true above Billings, where the irrigation reservations are junior to the instream flow reservations. Future depletions in the Wyoming portion of the Yellowstone Basin and by the Northern Cheyenne and Crow Indians may also have a minor effect on the amount of water available for the irrigation reservations below Billings. The availability of water for the irrigation reservations is analyzed in Appendix D. Results indicate that shortages would occur if the irrigation reservations in the portion of the basin above Billings were fully developed. Below Billings, where the irrigation reservations are senior to the instream flow reservations, no significant shortages are expected.

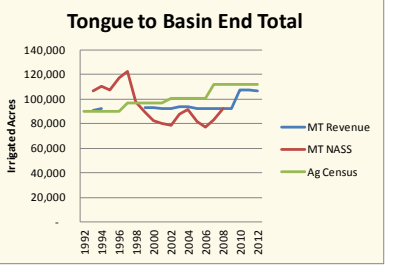
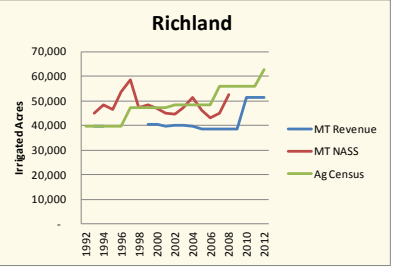
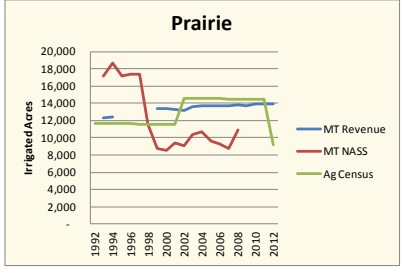
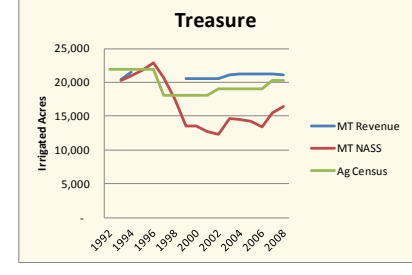
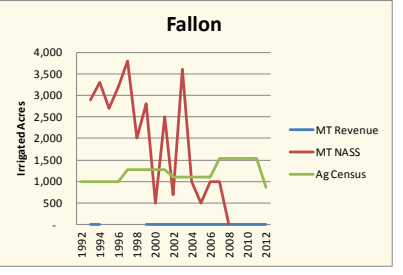
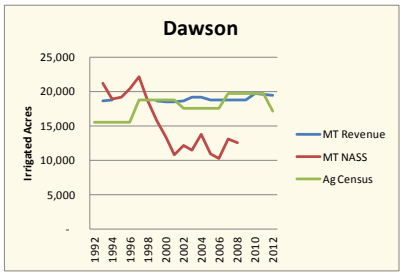
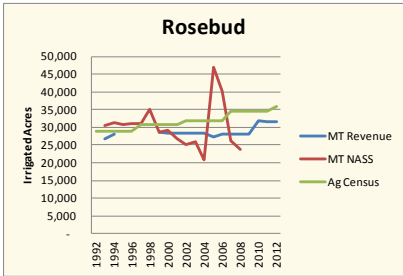
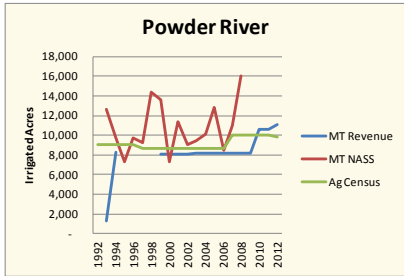
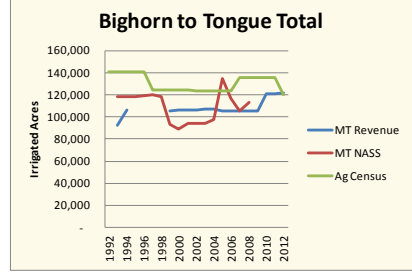
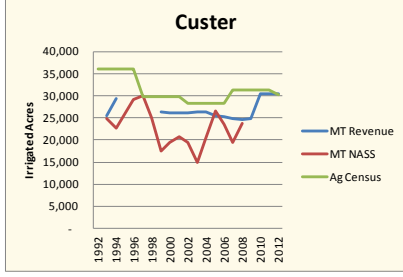
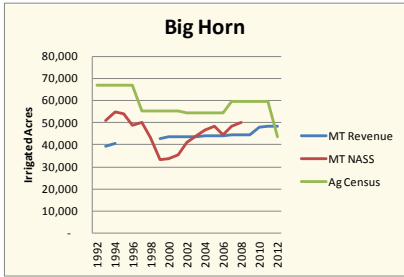
Agricultural Demand Projections

Historical Trends in Irrigated Agricultural Development

Sources of information on historical trends county-wide irrigated acreage include the the Montana Department of Revenue Final Lands Unit (FLU) mapping; the National Agricultural Statistics Service (NASS) data; and Agricultural Census Data



Appendices Yellowstone River Basin Water Plan - 2014



Appendices Yellowstone River Basin Water Plan - 2014

| MSWI 2035 Projected Growth by HUC (Additional Water Use above Present Day Estimates) | | | | | | |
|--|----------|---------|----------|--------------|----------|---------------|
| Huc_8 Name | Huc_8 | Acres | Consumed | Field Applie | Diverted | Source |
| Upper Missouri-Dearborn Rivers | 10030102 | 1386.2 | 2079.3 | 2599.1 | 2599.1 | Surface Water |
| Sun River | 10030104 | 637.0 | 955.4 | 1194.3 | 1194.3 | Surface Water |
| Two Medicine River | 10030201 | 276.0 | 414.0 | 517.5 | 517.5 | Surface Water |
| Judith River | 10040103 | 132.4 | 198.6 | 248.3 | 248.3 | Surface Water |
| Prarie Elk-Wolf Creeks | 10060001 | 2342.5 | 3513.8 | 4392.2 | 4392.2 | Surface Water |
| Charlie-Little Muddy Creeks | 10060005 | 11651.6 | 17477.4 | 21846.7 | 21846.7 | Surface Water |
| Big Muddy Creek | 10060006 | 3487.9 | 5231.8 | 6539.8 | 6539.8 | Groundwater |
| Upper Yellowstone River | 10070002 | 2877.3 | 4316.0 | 5395.0 | 5395.0 | Surface Water |
| Clarks Fork Yellowstone River | 10070006 | 491.5 | 737.3 | 921.6 | 921.6 | Surface Water |
| Upper Yellowstone River-Pompeys Pilla | 10070007 | 2070.1 | 3105.2 | 3881.5 | 3881.5 | Surface Water |
| Lower Bighorn River | 10080015 | 3872.1 | 5808.2 | 7260.3 | 7260.3 | Surface Water |
| Lower Powder River | 10090209 | 2803.1 | 4204.6 | 5255.7 | 5255.7 | Surface Water |
| Lower Yellowstone River-Sunday Creek | 10100001 | 5742.6 | 8614.0 | 10767.4 | 10767.4 | Surface Water |
| Lower Yellowstone River | 10100004 | 18339.1 | 27508.7 | 34385.8 | 34385.8 | Surface Water |
| O'Fallon Creek | 10100005 | 456.4 | 684.5 | 855.7 | 855.7 | Surface Water |
| Statewide | | 56565.9 | 84848.8 | 106061.0 | 106061.0 | |
| Assumptions: | | | | | | |
| Net Irrigation Requirement: 1.5 AF/acre | | | | | | |
| Field Application Efficiency: 80% (Pivots) | | | | | | |
| Conveyance Efficiency: 100% (Pipeline) | | | | | | |
| Acres determined from projected allocations (diversions). Based on projected allocations, this is essentially a maximum consumptive use. | | | | | | |
| The buildout of the West Crane Project is included as future use for Richland CD. | | | | | | |

| MSWI 2035 Projected Growth by CD (Additional Water Use above Present Day Estimates) | | | | | | |
|---|---------|----------|---------------|----------|----------|--|
| Conservation District | Acres | Consumed | Field Applied | Diverted | Huc_8 | Huc_8 Name |
| CHOUTEAU | 1386.2 | 2079.3 | 2599.1 | 2599.1 | 10030102 | Upper Missouri-Dearborn Rivers |
| PONDERA | 276.0 | 414.0 | 517.5 | 517.5 | 10030201 | Two Medicine River |
| TETON | 637.0 | 955.4 | 1194.3 | 1194.3 | 10030104 | Sun River |
| FERGUS | 132.4 | 198.6 | 248.3 | 248.3 | 10040103 | Judith River |
| McCONE | 2342.5 | 3513.8 | 4392.2 | 4392.2 | 10060001 | Prarie Elk-Wolf Creeks |
| RICHLAND | 5800.0 | 8700.0 | 10874.9 | 10874.9 | 10060005 | Charlie-Little Muddy Creeks |
| ROOSEVELT | 5851.6 | 8777.4 | 10971.7 | 10971.7 | 10060005 | Charlie-Little Muddy Creeks |
| SHERIDAN | 3487.9 | 5231.8 | 6539.8 | 6539.8 | 10060006 | Big Muddy Creek |
| BIG HORN | 3872.1 | 5808.2 | 7260.3 | 7260.3 | 10080015 | Lower Bighorn River |
| CARBON | 491.5 | 737.3 | 921.6 | 921.6 | 10070006 | Clarks Fork Yellowstone River |
| CUSTER | 3811.6 | 5717.4 | 7146.8 | 7146.8 | 10100001 | Lower Yellowstone River-Sunday Creek |
| DAWSON | 1906.7 | 2860.0 | 3575.0 | 3575.0 | 10100004 | Lower Yellowstone River |
| LITTLE BEAVER | 456.4 | 684.5 | 855.7 | 855.7 | 10100005 | O'Fallon Creek |
| PARK | 547.5 | 821.2 | 1026.5 | 1026.5 | 10070002 | Upper Yellowstone River |
| POWDER RIVER | 2803.1 | 4204.6 | 5255.7 | 5255.7 | 10090209 | Lower Powder River |
| PRAIRIE | 1970.9 | 2956.3 | 3695.4 | 3695.4 | 10100004 | Lower Yellowstone River |
| RICHLAND | 14461.6 | 21692.4 | 27115.5 | 27115.5 | 10100004 | Lower Yellowstone River |
| ROSEBUD | 1295.4 | 1943.0 | 2428.8 | 2428.8 | 10100001 | Lower Yellowstone River-Sunday Creek |
| STILLWATER | 351.2 | 526.9 | 658.6 | 658.6 | 10070002 | Upper Yellowstone River |
| SWEET GRASS | 1978.6 | 2967.9 | 3709.9 | 3709.9 | 10070002 | Upper Yellowstone River |
| TREASURE | 635.7 | 953.5 | 1191.9 | 1191.9 | 10100001 | Lower Yellowstone River-Sunday Creek |
| YELLOWSTONE | 2070.1 | 3105.2 | 3881.5 | 3881.5 | 10070007 | Upper Yellowstone River-Pompeys Pillar |
| Statewide | 56565.9 | 84848.8 | 106061.0 | 106061.0 | | |