Chapter 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Water Rights

3.1.1 Affected Environment

Island Park Reservoir and Grassy Lake

Reclamation holds a water right with a March 14, 1935, priority date to store 135,000 acre-feet in Island Park Reservoir. Reclamation acquired several natural flow water rights when Island Park Reservoir lands were originally purchased. Reclamation transferred the points of diversion for these rights to the canals that serve FMID lands. Reclamation holds a Wyoming Certificate to a water right (Grassy Lake Permit No. 18685) for 15,204 acre-feet of Grassy Lake water with a February 13, 1936, priority date.

Water District 01 Rental Pool

When available, FMID acquires varying amounts of storage water from the Water District 01 Rental Pool to augment the Island Park Reservoir and Grassy Lake storage supplies. The Idaho Water Resources Board has appointed the Committee of Nine (the local Water District 01 advisory committee) to facilitate the rental of stored water pursuant to Idaho Code 42-1765. The Minidoka and Palisade Projects contracts allow spaceholders to rent water on an annual basis at rates approved by the Secretary.

FMID coordinates with Canal Companies to meet daily irrigation demands using water released from Island Park Reservoir and Grassy Lake as needed. The District works closely with both the watermaster and Reclamation to account for water use and to meet irrigation needs.

Teton Exchange Wells

As described in Section 2.2.2, Reclamation applied for a State of Idaho permit to appropriate water by drilling wells that would provide exchange water for the planned Lower Teton Division. Reclamation drilled five test wells in the mid-1970s. FMID and Reclamation entered into a contract on September 17, 1977, (#7-07-10-W0179) to allow FMID to use the wells as a backup water supply in low water years. The Conveyance Act extends this contract to the date that all conditions of the Act are fulfilled.

FMID uses several factors to determine when and how much water to pump from the Teton Exchange Wells. These factors include the storage allocation for Island Park Reservoir and Grassy Lake, the early April hydrologic forecast, spring precipitation, and requests for additional storage from Canal Companies within the District. Typically, FMID purchases water from the rental pool before commencing water exchange operations. While operating the exchange wells, FMID coordinates the timing of the pumping with the District 01 watermaster.

3.1.2 Environmental Consequences

Alternative A – No Action

Reclamation and FMID would continue the process for proving beneficial use for the permit for the existing five exchange wells. Reclamation has requested extensions for the permit in the past and would likely request an additional extension to complete the proving process before the permit expires. During the proving process, IDWR would exercise its discretion on whether to allow the remaining 40 wells from the permit to expire or to assign them to another entity. This reassignment would not require a legal notice if permit characteristics such as points of diversion, place of use, and purpose of use remain unchanged. Only in the notice process do other entities have the opportunity to protest. Upon completion of the proving process, Reclamation would hold the water right for the five existing wells.

Alternative B – Title Transfer

The United States would transfer title and the Teton Exchange Wells water right permit. FMID would prove beneficial use of the permit by November 1, 2007, or request an extension of time for beneficial proof. FMID may develop an additional five to eight Teton Exchange Wells before completing the proving process. However, the current water environment in eastern Idaho and the moratorium on water development in the Snake River Plain make the drilling of additional wells less likely than originally anticipated.

If FMID drills additional wells, the water would further help FMID meet demands during periods of low water. FMID declares its intent, in its Memorandum of Agreement with Reclamation (see Appendix B), to assign the unneeded and undeveloped portion of permit number 22-7022 to the Idaho Water Resource Board. Potential actions IDWR could take with the assigned portion of the permit would remain as described under No Action.

If FMID proves beneficial use for the well water, the State would likely grant FMID a water right. Section 3.2 provides a detailed analysis of this current and potential future water development. FMID would still be able to use the Water District 01 Rental Pool.

3.2 Hydrology

3.2.1 Affected Environment

Previous hydrologic investigations in the Eastern Snake River Plain have demonstrated that groundwater gains in the Henrys Fork contribute substantially to flows in the Snake River, especially during the irrigation season (Wytzes 1980; Johnson et al. 1985; USBR 1992; Garabedian 1992). The principal hydrologic concern is the impact of future Teton Exchange Well pumping on groundwater gains in the Henrys Fork, and in turn on the potential for depletions to Snake River flow.

Henrys Fork Flows in the FMID Service Area

Of the nine Hydromet gaging stations in the FMID service area, three are located on the main stem of the Henrys Fork of the Snake River. Six others are located on main tributaries to the Henrys Fork: two on the Fall River and four on the Teton River. In addition, there are Hydromet gaging stations on eleven major canals in the FMID service area; seven of these canals are between Ashton and Rexburg on the Henrys Fork, including the Cross Cut Canal, the Egin Canal, the St. Anthony Union Feeder, and the Independent Canal. Figure 4 shows the FMID service area boundaries, the three main gaging stations on the Henrys Fork, the five Teton Exchange Wells, and other area hydrologic features.

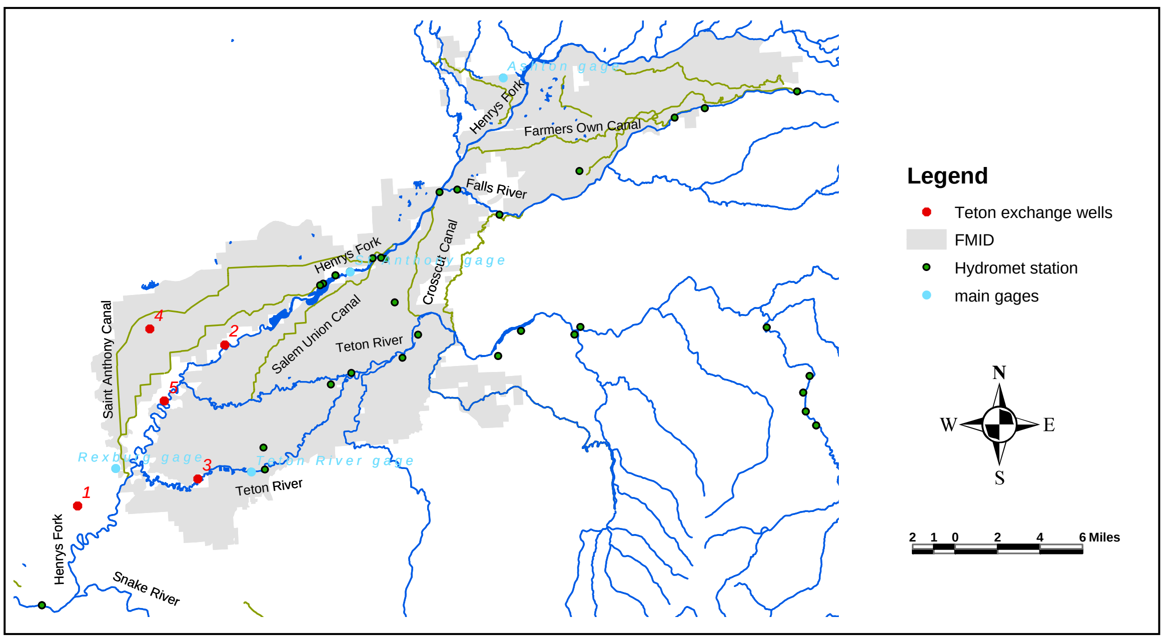

Figure 4. Location of gaging stations, major canals, and Teton Exchange Wells on and near the Henrys Fork of the Snake River.

The Ashton gaging station is just below Ashton Reservoir on the Henrys Fork. On average, about 1.25 million acre-feet of water pass this gage each year. A second gaging station adjacent to St. Anthony, Idaho, is about ten miles downstream from the Crosscut Diversion Dam. During the irrigation season, the Crosscut Canal conveys water from the river between these two gages to the Teton River. The Fall River also enters the Henrys Fork between these two stations. On average, approximately 1.59 million acre-feet of water pass the St. Anthony gage each year.

A third gaging station on the Henrys Fork is downstream from the South Fork of the Teton River, just west of Rexburg, Idaho. The North and South Forks of the Teton River enter the Henrys Fork between the St Anthony and the Rexburg gages. The Egin Canal, St Anthony Union Feeder Canal, Independent Canal, and the Consolidated Farmers Ditch also divert water from the river between the St. Anthony and Rexburg gages. On average, approximately 1.75 million acre-feet of water passes the Rexburg gage each year.

Figure 5 shows the average monthly flow hydrographs for these three Henrys Fork gaging stations. The flows are averages for the years 1977 through 2002. As this figure shows, the Henrys Fork reach between Ashton and Rexburg is a gaining reach for most of the year. Reach gains range from about 500 cfs in October to over 2,000 cfs in May. The exception to this gaining trend occurs during July, August, and September when the flows at Ashton are higher than those at St. Anthony and Rexburg. These reach losses occur because releases from Island Park Reservoir upstream from the Ashton gage are being diverted before they reach the St. Anthony gage. Some of this diverted water re-enters the river as irrigation return flow to the Henrys Fork or the Teton River. Overall, surface water returns from the FMID service area to the Henrys Fork are estimated to be about 5 percent of the total FMID diversion (Swensen 2003).

Figure 6 shows the contribution made by the Teton River to flow in the Henrys Fork. The contribution from the South Fork of the Teton River is accurately gaged at Rexburg. However, the contribution from the North Fork (which is gaged at Teton) is “adjusted” in this figure to reflect diversion estimates for the Teton Island Feeder Canal and other canals downstream from this gage (Swensen 2003). The combined average contribution from the North and South Forks of the Teton River ranges from less than 200 cfs during September to as much as 1,000 cfs during June.

Figure 7 shows the average daily flow hydrographs for these four main diversions from the Henrys Fork between St. Anthony and Rexburg: the Egin Canal, the St. Anthony Union Feeder, the Independent Canal, and the Consolidated Farmers Ditch. Historically, diversions to these canals were made year-around in order to sustain the groundwater level for sub-level irrigation in the Egin Bench area of the FMID. Average monthly diversions range from a low of 275 cfs during winter months to a high of almost 900 cfs during the irrigation season.

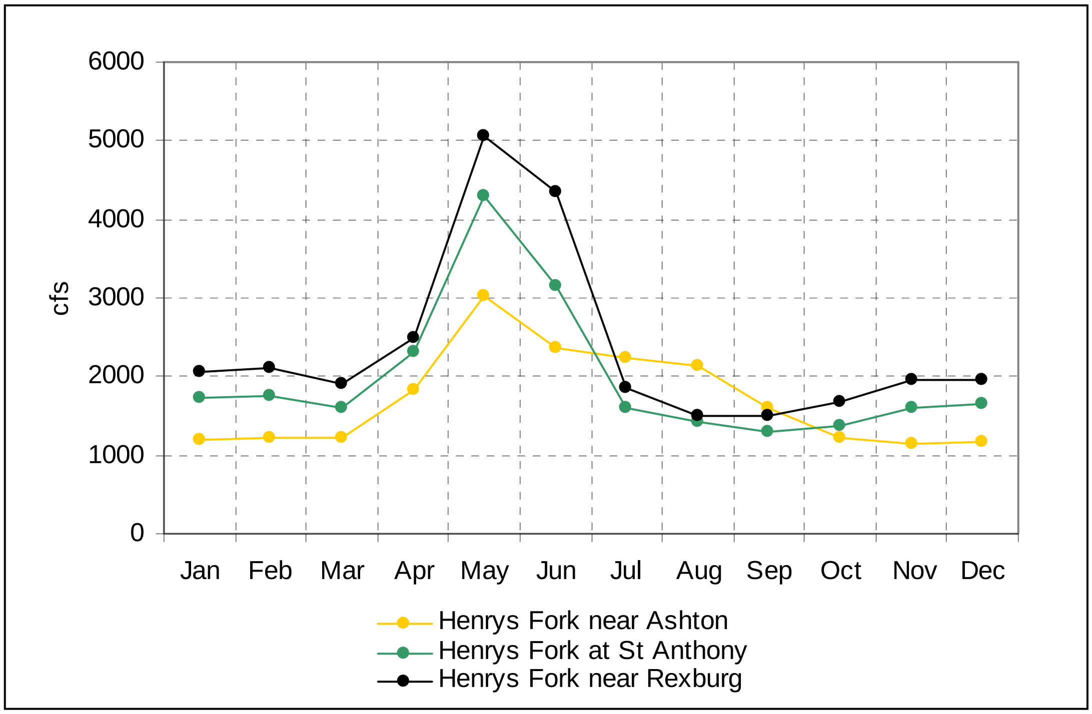

Figure 5. Average monthly flows at three gaging stations on the Henrys Fork of the Snake River from 1977 to 2002.

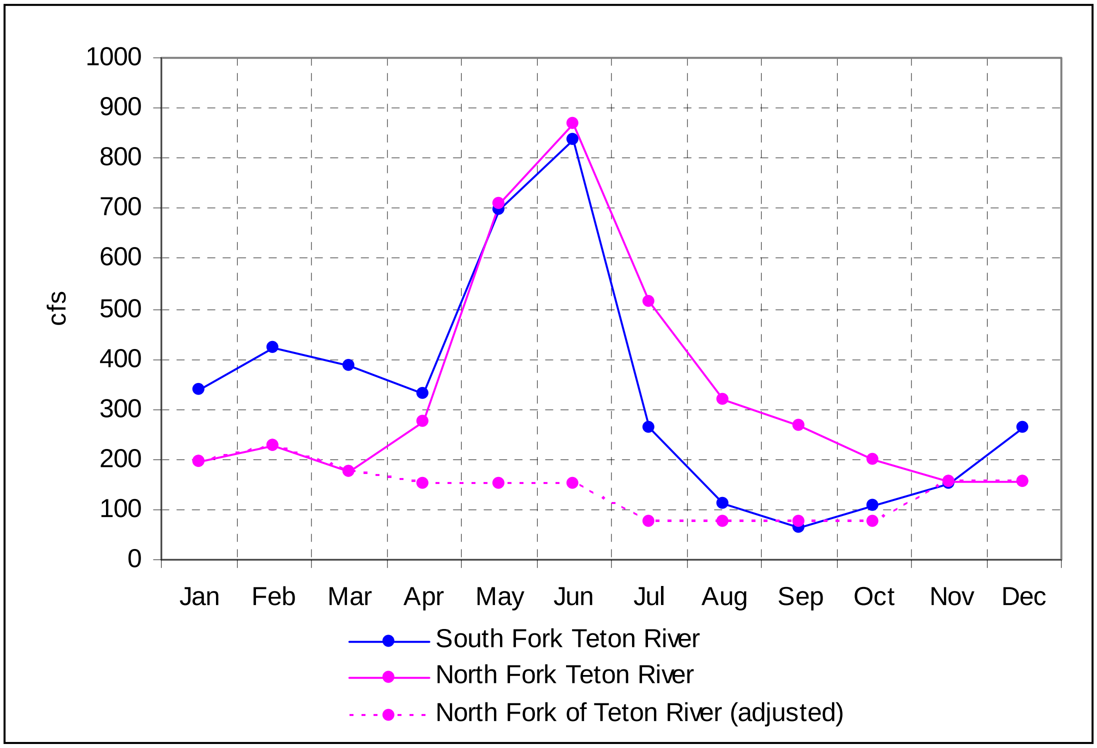

Figure 6. Average monthly flow in the Teton River (from gaging stations at Rexburg and Teton, respectively) from 1977 to 2002.

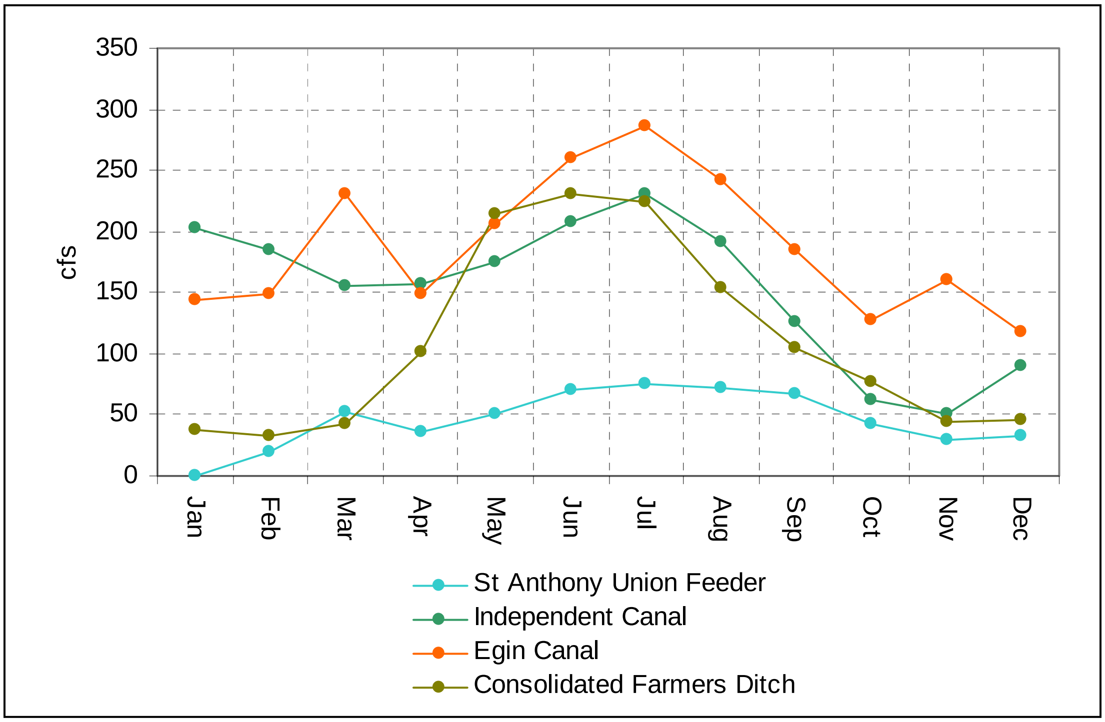

Figure 7. Combined average monthly flow in St. Anthony Union Feeder, Independent Canal, Egin Canal, and Consolidated Farmers Ditch from 1977 to 2002.

FMID manages its water delivery system based in part on the measured flows in the Henrys Fork at the St. Anthony gaging station. Because this station is immediately upstream from the four main irrigation canals (Egin Canal, St Anthony Union Feeder Canal, Independent Canal, and Consolidated Farmers Ditch), it is a logical location to balance supply and demand within the District.

Groundwater Gains in the Henrys Fork

The average monthly groundwater contribution made to total reach gains between St. Anthony and Rexburg can be estimated using the previous hydrograph data and the following water balance expression:

Henrys Fork groundwater gain	=	Rexburg flow	–	St. Anthony flow	–	S. Fork Teton flow	–	(adjusted) N. Fork Teton flow	+	diversion to Egin Canal	+	diversion to St. Anthony Union Feeder	+	diversion to Independent Canal	+	diversion to Consolidated Farmers Ditch	–	estimated surface water return		

Figure 8 shows the computation's results to illustrate the average monthly groundwater gain to the St. Anthony to Rexburg reach of the Henrys Fork between 1977 and 2002. This figure shows groundwater gains to the Henrys Fork ranging from 100 to over 900 cfs. Groundwater gains are lowest in the winter months, increase abruptly at the start of the irrigation season in May and June, and gradually taper off during the remainder of the season.

The fact that groundwater gains occur throughout the year demonstrates that the aquifer is hydraulically connected to the river in this reach. Also, these gains peak early in the irrigation season, suggesting that some of the groundwater flow paths between FMID irrigated lands and the Henrys Fork are relatively short.

FMID Operation of the Teton Exchange Wells

Essentially, the five Teton Exchange Wells provide mitigation to downstream water right holders and users for FMID's upstream diversions of reservoir water during years when a full FMID storage allocation in Island Park Reservoir is not available.

Two of the five Teton Exchange Wells discharge water directly into the Henrys Fork. The other wells discharge into the Cartier Slough, the Teton River, and the North Branch Independent Canal; water from these wells eventually travels into the Henrys Fork. All five exchange wells are located within 3 miles of the main stem of the Henrys Fork. Two of the five wells are within 1/4-mile of the river (see Figure 4).

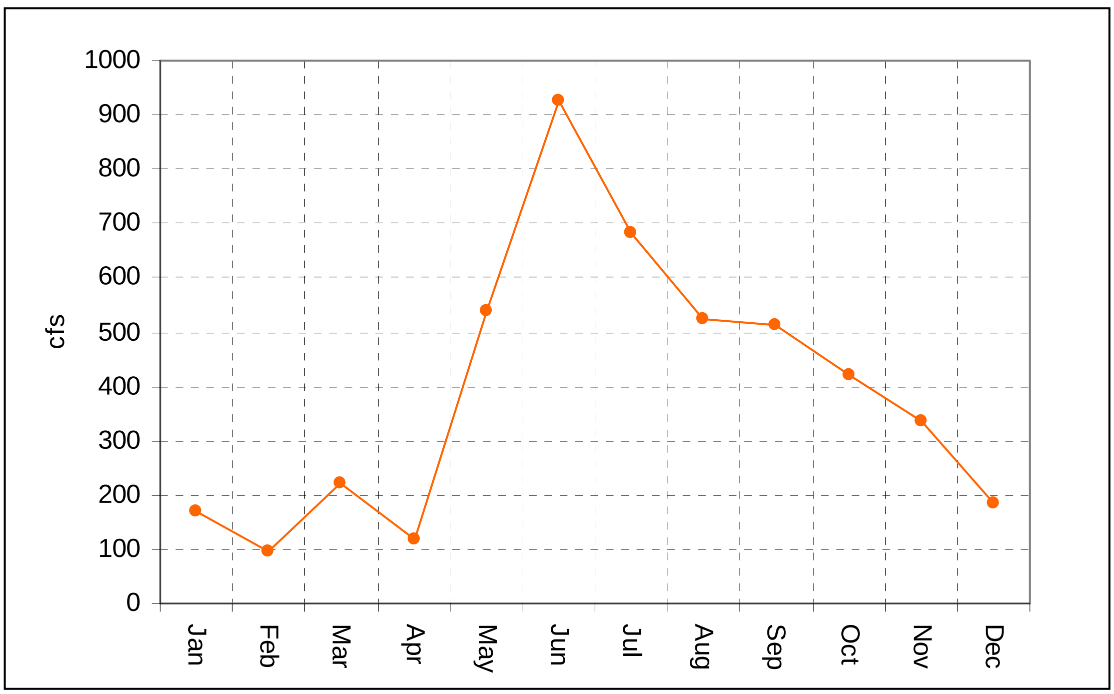

Figure 8. Computed average monthly gains from groundwater to the Henrys Fork reach between St. Anthony and Rexburg from 1977 to 2002.

Exchange well pumping has occurred in ten years since the use was authorized in 1977. Figure 9 and Table 3 show the chronology of exchange well pumping between 1977 and 2002. Figure 9 shows the total discharge from all five exchange wells in four-month intervals (referred to as trimesters) between 1977 and 2002. Table 3 shows the monthly discharge for each exchange well and the annual totals.

Although the Teton Exchange Wells have operated in 10 of the past 25 years, the wells were used much more extensively in some years than in others. For instance, just two of the wells were used to pump about 800 acre-feet in 1980, whereas all five of the wells were used to pump more than 29,000 acre-feet in 1992. In recent years, the exchange wells have been used more heavily. Just over 27,000 acre-feet were pumped in 2001, and nearly 25,000 acre-feet were pumped in 2002. The wells were also used in 2003, although discharge volumes are not yet available (Swensen 2003).

Teton Exchange Well pumping and FMID releases from Island Park Reservoir do not necessarily occur at the same time or at the same rate during the irrigation season. Over the course of a year however, the total amount of water FMID pumps from the Teton Exchange Wells meets or exceeds the volume of water they divert above the wells.

In addition to the five Teton Exchange Wells, there are 14 non-Project exchange wells within the FMID service area that discharge water into either the Fall River or the Teton River. The state of Idaho regulates the operation of these non-Project wells.

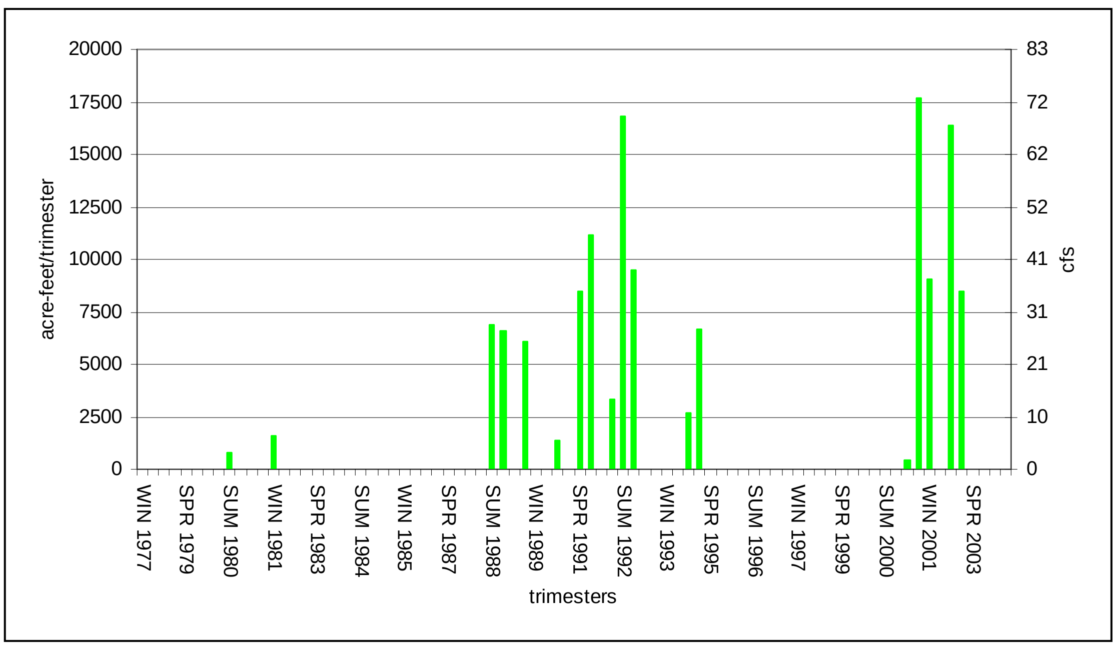

Figure 9. Total Teton Exchange Well pumping by trimester from 1977 to 2002.

Table 3. Teton Exchange Wells usage rates (in acre-feet) since 1977 (source: FMID 2003).

Year	Well	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	Yearly Totals
1977-1979	No pumping occurred									**NA**
	1	0	0	0	0	0	0	0	0	**0**
	2	0	0	0	0	0	293	0	0	**293**
1980	3	0	0	0	0	0	170	0	0	**170**
	4	0	0	0	0	0	0	0	0	**0**
	5	0	0	0	0	0	334	0	0	**334**
Monthly Totals		**0**	**0**	**0**	**0**	**0**	**797**	**0**	**0**	**797**
	1	0	0	0	0	0	0	286	216	**502**
	2	0	0	0	0	0	0	249	232	**481**
1981	3	0	0	0	0	0	0	0	0	**0**
	4	0	0	0	0	0	0	0	0	**0**
	5	0	0	0	0	0	0	288	327	**615**
Monthly Totals		**0**	**0**	**0**	**0**	**0**	**0**	**823**	**775**	**1598**
1982-1987	No pumping occurred									**NA**
	1	0	0	0	0	487	1162	1125	450	**3224**
	2	0	0	0	0	397	1027	994	397	**2815**
1988	3	0	0	0	0	228	590	552	228	**1598**
	4	0	0	0	0	378	932	898	361	**2568**
	5	0	0	0	0	487	1162	1125	450	**3224**
Monthly Totals		**0**	**0**	**0**	**0**	**1977**	**4873**	**4694**	**1886**	**13429**
	1	0	0	0	0	413	825	0	0	**1238**
	2	0	0	0	0	662	728	0	0	**1390**
1989	3	0	0	0	0	381	419	0	0	**800**
	4	0	0	0	0	531	584	0	0	**1115**
	5	0	0	0	0	750	825	0	0	**1575**
Monthly Totals		**0**	**0**	**0**	**0**	**2737**	**3381**	**0**	**0**	**6118**
	1	0	0	0	0	0	0	0	0	**0**
	2	0	0	0	0	0	0	0	0	**0**
1990	3	0	0	0	0			0	0	**0**
	4	0	0	0	0	680	679	0	0	**1359**
	5	0	0	0	0	0	0	0	0	**0**
Monthly Totals		**0**	**0**	**0**	**0**	**680**	**679**	**0**	**0**	**1359**
	1	885	1107	1144	1107	74	0	0	0	**4317**
	2	643	964	996	964	64	0	0	0	**3631**
1991	3	466	559	578	503	37	0	0	0	**2143**
	4	434	656	722	674	46	0	0	0	**2534**
	5	942	1805	2164	1982	140	0	0	0	**7033**
Monthly Totals		**3370**	**5091**	**5604**	**5230**	**361**	**0**	**0**	**0**	**19658**
	1	0	790	947	982	428	401	1101	1138	**5787**
	2	0	685	1021	934	985	1002	964	994	**6585**
1992	3	0	393	584	530	533	572	553	572	**3737**
	4	0	657	920	869	760	771	920	950	**5847**
	5	0	807	1193	1089	1145	1162	1125	1162	**7683**
Monthly Totals		**0**	**3332**	**4665**	**4404**	**3851**	**3908**	**4663**	**4816**	**29639**
1993	No pumping occurred									**NA**
	1	0	0	0	0	0	1002	1250	1291	**3543**
	2	0	0	0	0	0	225	964	996	**2185**
1994	3	0	0	0	0	0	0	0	0	**0**
	4	0	0	0	0	0	0	0	0	**0**
	5	0	0	0	0	325	1114	1077	1113	**3629**
Monthly Totals		**0**	**0**	**0**	**0**	**325**	**2341**	**3291**	**3400**	**9357**
1995-2000	No pumping occurred									**NA**
	1	0	86	794	1269	1290	1175	1317	1181	**7112**
	2	0	248	1002	970	1002	1002	970	1002	**6196**
2001	3	0	99	541	524	541	541	524	541	**3311**
	4	0	0	677	662	684	684	662	684	**4052**
	5	0	0	1089	1065	1101	1101	1065	1101	**6522**
Monthly Totals		**0**	**433**	**4103**	**4490**	**4618**	**4503**	**4538**	**4509**	**27193**
	1	0	0	1065	1481	1406	1378	1347	1394	**8071**
	2	0	0	731	991	990	829	931	909	**5381**
2002	3	0	0	438	520	576	550	533	557	**3174**
	4	0	0	235	320	317	299	300	306	**1777**
	5	0	0	821	1169	1151	1126	1083	1119	**6469**
Monthly Totals		**0**	**0**	**3290**	**4481**	**4440**	**4182**	**4194**	**4285**	**24872**

3.2.2 Environmental Consequences

Methods and Rationale

The impacts of exchange well pumping on reach gains in the Henrys Fork depends on the pumping rates of wells, their proximity to the river, FMID's supplemental diversions from Island Park Reservoir, and the resulting aquifer recharge. While groundwater pumping has a negative impact on reach gains, the additional aquifer recharge that results from supplemental diversions has a positive impact on reach gains. The net river depletion attributed to exchange well pumping and FMID's supplemental diversions is the sum of both positive and negative impacts.

The amount of aquifer recharge that results from supplemental diversions of Island Park Reservoir water is based on calculation of a net use factor for FMID irrigation. Cosgrove and Johnson (2000a) calculated FMID's net use factor for irrigation at 0.36, meaning that 36 percent of the water FMID diverts is consumptively used by crops. The remaining 64 percent either returns to the river via drains or infiltrates the aquifer. During low water years, when exchange well pumping occurs, drain returns to the river are negligible and aquifer infiltration accounts for nearly all of the irrigation water that is not consumptively used.

Even though most of the exchange well water is discharged directly into the Henrys Fork, this discharge by itself provides no net benefit to instream flows. The exchange well pumping simply replaces storage water that was released from Island Park Reservoir for irrigators downstream from FMID.

Estimating River Depletion from Exchange Well Pumping

The impact that exchange well pumping has on reach gains in the Henrys Fork between Ashton and it confluence with the Snake River at Lewisville is estimated using the Eastern Snake Plain Aquifer (ESPA) groundwater model. The ESPA groundwater model was developed at the University of Idaho (Johnson and Brockway 1983; Johnson and Cosgrove 1999) and has been widely used by State and Federal water management agencies in Idaho to address a diverse set of hydrologic issues, including the feasibility of large-scale managed aquifer recharge (IDWR and USBR 1999), the delineation of critical groundwater areas (IDWR 1997), and the determination of mitigation requirements for water-rights transfers (Cosgrove and Johnson 2003).

The ESPA groundwater model was developed using the U.S. Geological Survey (USGS) Modflow computer code (McDonald and Harbaugh 1988). The Modflow code employs a finite-difference modeling method that requires that the entire aquifer be discretized in terms of model cells. The model calculates one aquifer head and one aquifer flow rate for each 3- by 3-mile square cell.

Figure 10 shows the distribution of approximately 1,100 model cells that represent the entire ESPA. Figure 11 shows a closer view of those cells that are used to represent the aquifer beneath FMID and the Henrys Fork. The entire FMID and the entire Henrys Fork reach between Ashton and Lewisville are encompassed within 21 model cells, which are identified in this figure by their model coordinates.

Most applications of the ESPA groundwater model involve calculation of river response functions. An ESPA river response function is a modeling result that describes the increase (gain) or decrease (loss) in groundwater in one of four hydraulically connected reaches of the Snake River resulting from a pumping stress (or a recharge stress) that is imposed somewhere on the ESPA. The four hydraulically connected river reaches of the Snake River are:

- Milner to King Hill reach
- Neeley to Minidoka reach
- Shelley to Neeley reach
- Ashton to Lewisville reach

River response functions are calculated using a specially developed spreadsheet that is linked to the ESPA groundwater model. In the last few years, the University of Idaho

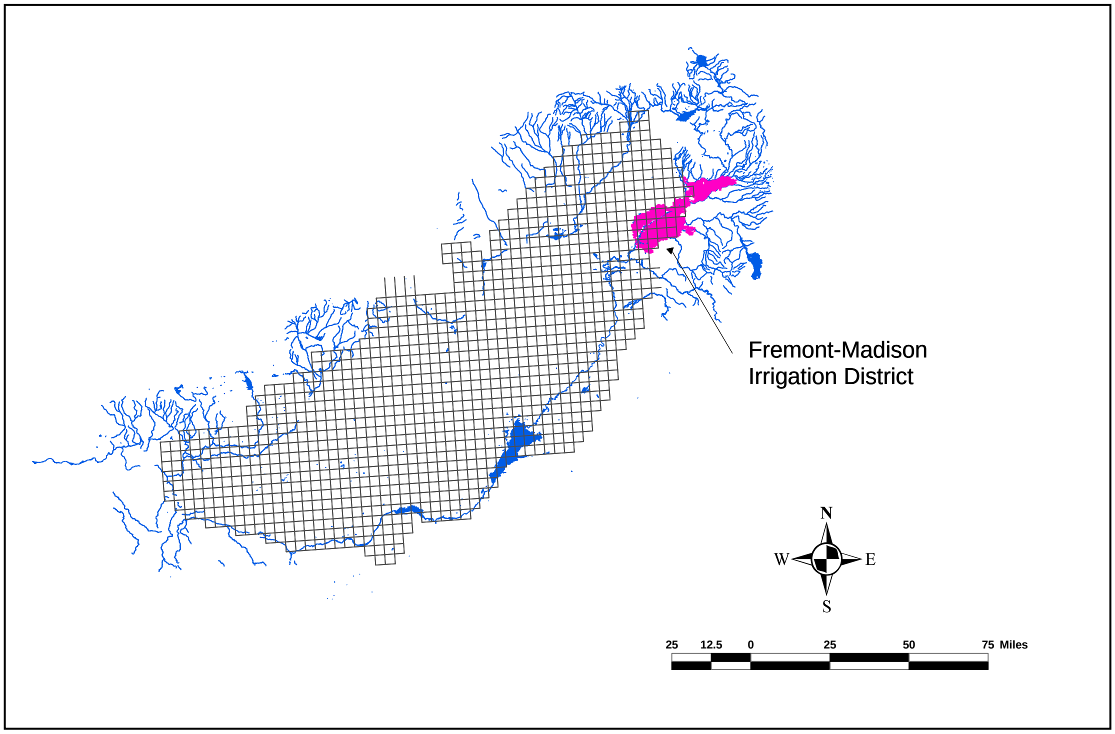

Figure 10. Eastern Snake Plain Aquifer (ESPA) model grid cells.

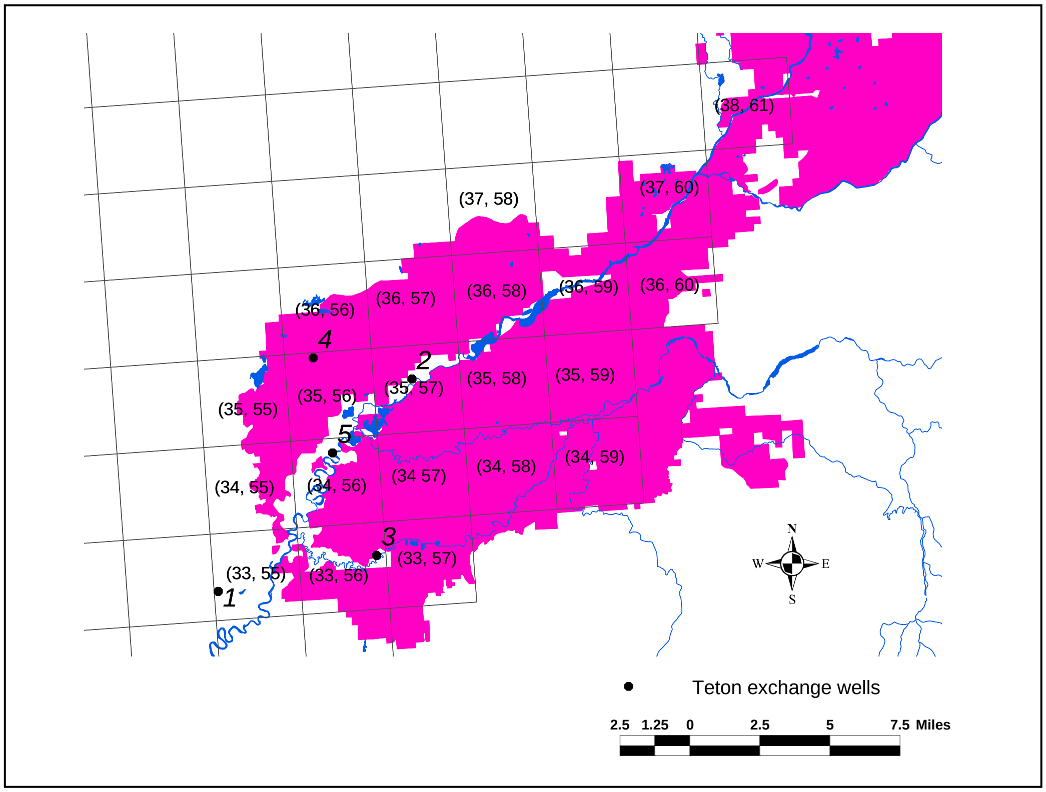

Figure 11. Teton Exchange Wells and FMID in relation to the ESPA model grid.

has developed two such response function spreadsheets (Cosgrove and Johnson 2000b; 2003). The first spreadsheet divided the ESPA into 21 zones and calculated the average river response to aquifer recharge or discharge within each zone. The entire FMID service area and its 45 model cells shown in Figure 10 was part of a single zone.

The second response function spreadsheet, referred to as the ESPA groundwater rights transfer spreadsheet, or simply the transfer spreadsheet, was developed primarily to assess the impact of transfers of individual groundwater rights from one location to another in the ESPA. It allows the user to evaluate the river response to aquifer recharge and discharge stresses that are imposed on individual model cells. While this enables a more precise calculation of river responses to aquifer stresses, this spreadsheet is limited because pumping and recharge stresses can be imposed on only four model cells at a time.

A reasonably accurate model representation of Teton Exchange Well operations requires that stresses be imposed on all 21 cells shown in Figure 11 because the net river response to exchange well pumping is due to a combination of aquifer pumping and recharge stresses. While pumping stresses are imposed on only five model cells ((34,56), (35,57), (33,55), (33,56) and (35,56) in Figure 11), the additional recharge stresses, which result from supplemental diversions from Island Park Reservoir, must be imposed on all 21 FMID model cells.

In order to overcome the four-cell limitation of the transfer spreadsheet, a separate spreadsheet procedure is used in conjunction with application of the transfer spreadsheet. This procedure relies on a simple extension of the widely applied "superposition principle" that underlies the development of river response functions in the ESPA groundwater model (and most other groundwater flow models) (De Marsily 1986; Strack 1989).

Briefly, the superposition principle states that solutions to the governing linear differential equation for time-dependent groundwater flow in a confined aquifer (or very thick unconfined aquifer) are additive. In other words, the river response that results from imposing pumping or recharge stresses on 21 model cells collectively is simply the sum of the river responses that result from imposing stresses on these cells individually.

The spreadsheet procedure used to estimate the Ashton-to-Lewisville reach response to Teton Exchange Well pumping is outlined below. This procedure is used to generate time-dependent estimates of net river depletion in the Ashton-to-Lewisville reach of the Henrys Fork for historical and projected future Teton Exchange Well pumping.

1. In the ESPA groundwater model, a unit aquifer stress is imposed individually on each of the 21 ESPA model cells representing the FMID during a single four-month trimester.
2. The transfer spreadsheet then calculates the river response in the Ashton-to-Lewisville reach to each unit stress over the next 80 years (240 trimesters).
3. A unit response matrix (240 x 240 trimesters) is created for each of the 21 ESPA model cells that represent the FMID. The initial (first trimester) river response to a unit stress is inserted along the main diagonal of the matrix. The remainder of the matrix below the main diagonal is filled with the river response to the unit stress during the following 240 trimesters.
4. A table containing historical (and projected future) pumping rates for each of the five exchange wells and the associated aquifer recharge rates is created. Aquifer recharge is assumed to be uniformly distributed over the 21 cells representing FMID lands in the ESPA groundwater model.
5. The superposition principle is then invoked. First, the unit stress matrix of each model cell representing FMID lands is multiplied by the historical record of pumping or recharge in that cell. Second, the individual responses of all 21 FMID cells are summed.

This procedure was verified by comparing the results to those of the "transfer spreadsheet" for a test case involving four-cell stresses.

Each response function model analysis incorporates a level of exchange well pumping anticipated to occur during the corresponding course of action. Each course of action is assumed to be implemented beginning in 2003 and to continue for the next 25 years. The model results show the anticipated depletion to Snake River flow at Lewisville during this 25-year period.

ESPA Groundwater Model Application to Historical Conditions

The ESPA groundwater model and the response function spreadsheet were used initially to estimate river depletion resulting from 1977 to 2002 exchange well pumping. Figure 12 shows the historical record of exchange well pumping and the resulting estimates of river depletion between Ashton and Lewisville.

The model results show that river depletions from exchange well pumping are not constant through time. They depend on the magnitude of pumping, when it begins, and how long it lasts. Figure 12 shows that river depletions at Lewisville reached a peak of between 2,900 and 3,100 acre-feet per trimester (between 12 and 13 cfs) in the winters of 1992 and 2002, following peaks in exchange well pumping of between 16,000 and 18,000 acre-feet per trimester (about 67 and 75 cfs respectively) during the summers of 1992 and 2001/2002.

Figure 12 indicates that the Henrys Fork depletions peak within a trimester following an episode of exchange well pumping. Depletions are generally greatest during the winter trimester (September to December) immediately following a summer of exchange well pumping. Within a year following a pumping episode, river depletion diminishes by more than half, and within five years, depletion diminishes to near zero.

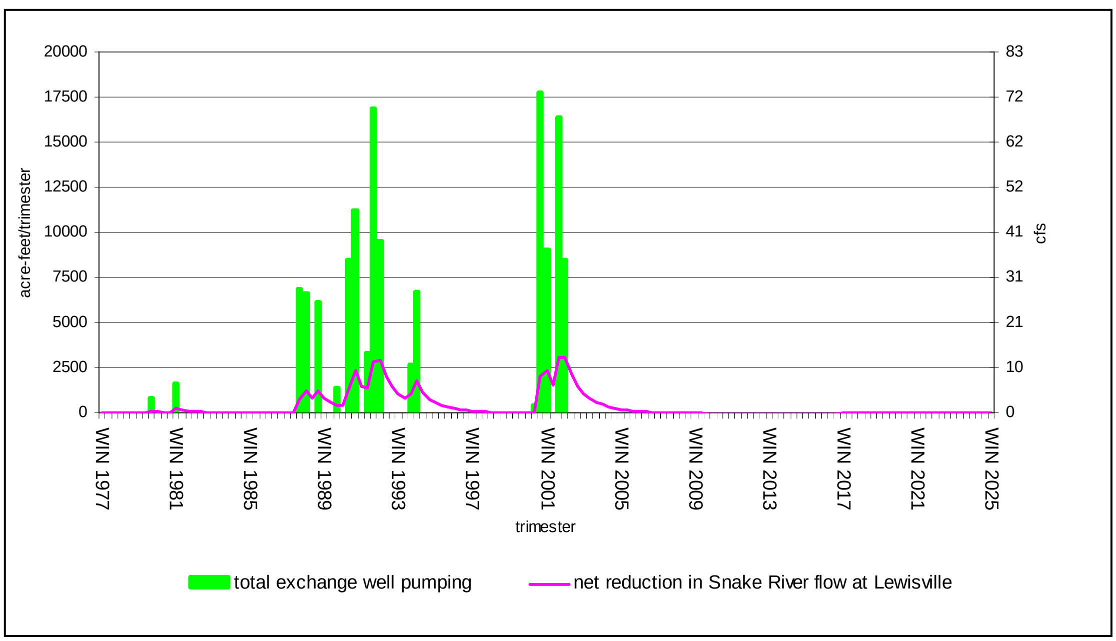

Figure 12. Historical pumping from Teton Exchange Wells and net depletion of Snake River flow.

Figure 12 shows the net effects of exchange well pumping. Without the offsetting positive effects of increased aquifer recharge due to Island Park diversions, exchange well pumping would result in significantly greater river depletions than those shown in Figure 12. Figure 13 illustrates this by separating the negative effects of exchange well pumping from the positive effects of increased aquifer recharge on FMID lands. Absent the positive effects of increased aquifer recharge, river depletions due to exchange well pumping would be about 70 percent greater than those shown in Figure 12. This would be as much as 5,200 acre-feet per trimester, about 22 cfs, following the 1992 and 2002 episodes of exchange well pumping.

Figure 13 reveals another aspect of response function model application: lag effects. Because most FMID lands are farther from the river than the exchange wells, the positive river response from supplemental diversion from Island Park Reservoir lags behind the negative river response from exchange well pumping at Lewisville. Thus, when episodes of exchange well pumping are many years apart, flow in the river may be slightly greater than it would otherwise be without exchange well pumping in some intervening years.

For example, exchange well pumping occurred in 1994 and in 2001 but not in the six intervening years. Although it is difficult to see in Figure 13, by the year 2000, the negative response from exchange well pumping is slightly less than the positive response from supplemental Island Park diversions. The result is that in the year 2000, there is a small net positive impact on Henrys Fork flow that can be traced to exchange well pumping that occurred in 1994. The impact is small, totaling only 14 acre-feet during the entire third trimester of 2000.

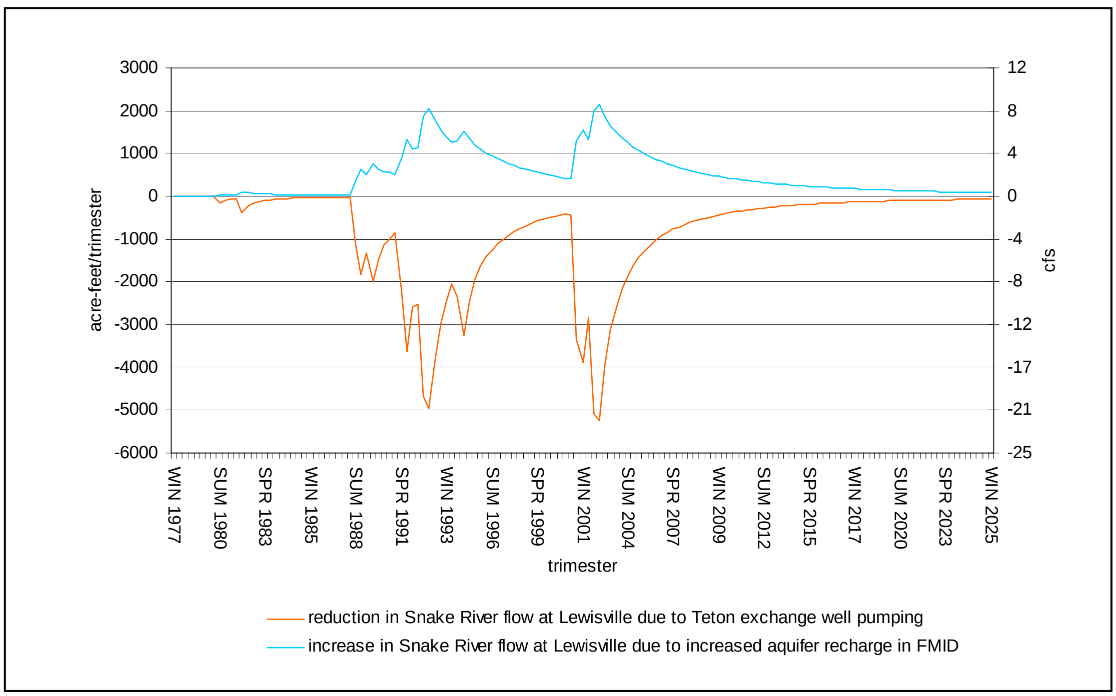

Figure 13. Negative effects of exchange well pumping and positive effects of increased aquifer recharge on Snake River flows.

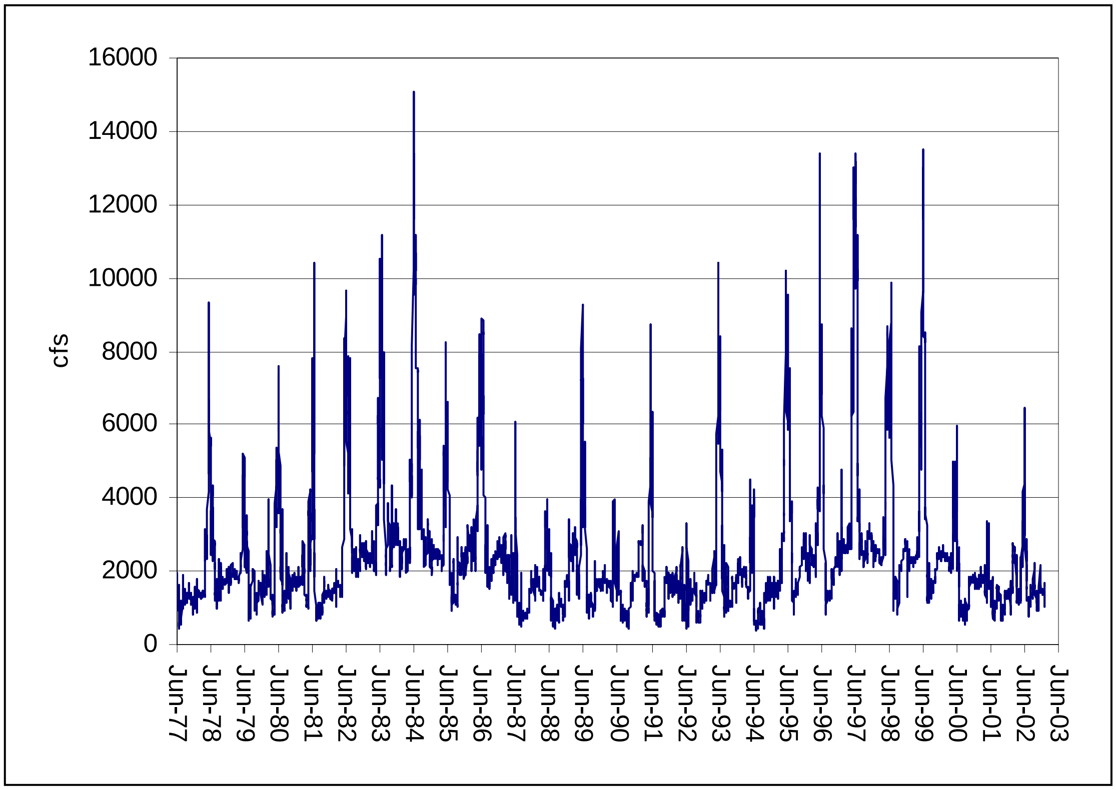

Figure 14. Gaged flow in the Henrys Fork at Rexburg.

When compared to the total flow at Rexburg or Lewisville, the net river depletion that results from exchange well pumping is very small. Figure 14 shows the average daily flow at Rexburg during the past 25 years. During the irrigation season, flows in the river at this location have averaged about 2,800 cfs. During very low water years, such as 1992 and 2001 when maximum exchange well pumping was occurring, average daily flows during the irrigation season were about 1,300 cfs. The net depletions resulting from past exchange well pumping (12 to 13 cfs) represent about one percent of the flow in the river at this location during low water years.

Alternative A – No Action

Under the No Action alternative, FMID demand for supplemental water is assumed to continue in accordance with historical patterns. FMID would continue to use the rental pool and exchange wells in about the same relative proportions as it has in the past. Operations of Island Park Reservoir, Cross Cut Diversion Dam, and Cross Cut Canal would not change. The hydrologic analysis of the No Action alternative therefore simply replicates the historical pattern of exchange well pumping during the past 25 years and extends it another 25 years into the future.

Figure 15 shows both the historical pattern of exchange well pumping between 1977 and 2002 and the pattern of exchange well pumping projected to occur under the No

Action alternative through 2028. This figure also shows the expected depletion of Snake River flows at Lewisville based on ESPA response function model results. Under the No Action alternative, peak river depletions at Lewisville of 2,900 acre-feet and 3,100 acre-feet per trimester (between 12 and 13 cfs) occur during 2017, 2026, and 2027, in the trimesters immediately following peak episodes of exchange well pumping. These depletions represent less than 1 percent of the average flow in the river at this location during a low water year.

Exceedance curves for exchange well pumping and river depletion were also developed for this alternative. The pumping exceedance curve in Figure 16 demonstrates that some amount of pumping could be expected to occur in about 40 percent of the years between 2003 and 2028 under the No Action alternative. Pumping at least 10,000 acre-feet per year could be expected in about 20 percent of these years, and pumping at least 25,000 acre-feet could be expected in about 8 percent of these years.

Figure 16 demonstrates that some depletion of Snake River flow at Lewisville could be expected in about 84 percent of the years between 2003 and 2028 under the No Action alternative. However, depletion exceeding 5,000 acre-feet per year could be expected in only about 10 percent of these years. In no case would Snake River depletion exceed 10,000 acre-feet per year.

A small increase in flow at Lewisville (less than 150 acre-feet per year) could be expected to occur in about 16 percent these years. As described previously, this small increase in flow is due to river response lag effects.

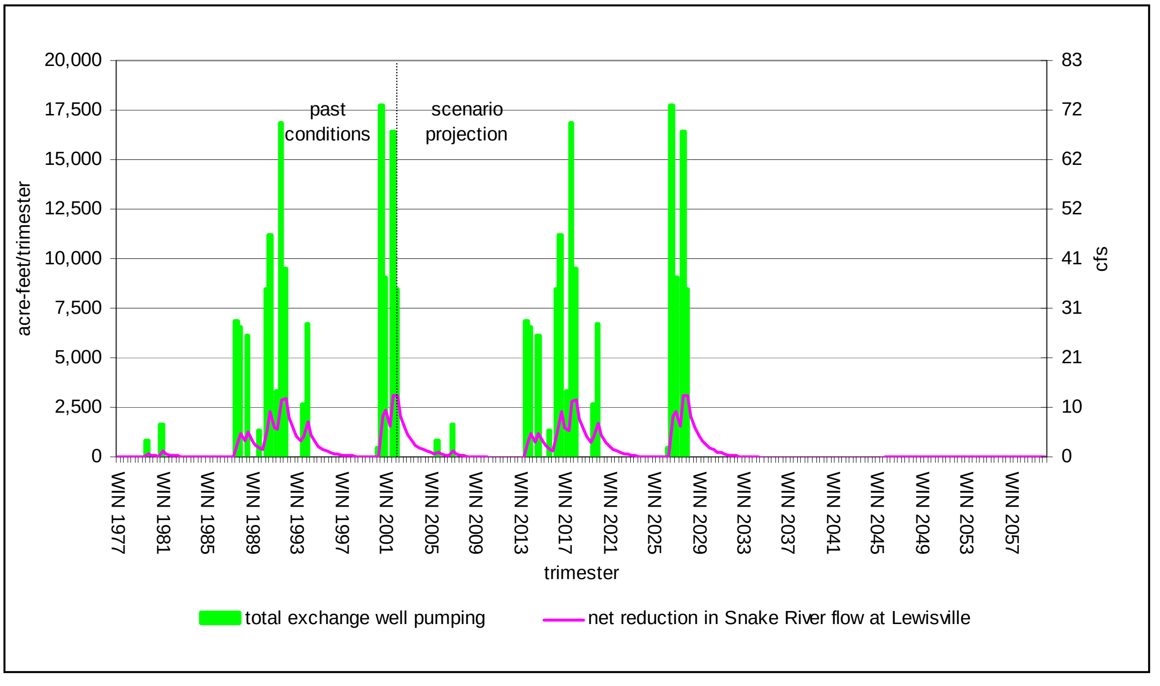

Figure 15. Depletion of Snake River flow at Lewisville assuming continuation of current exchange well operations through 2028 under the No Action alternative.

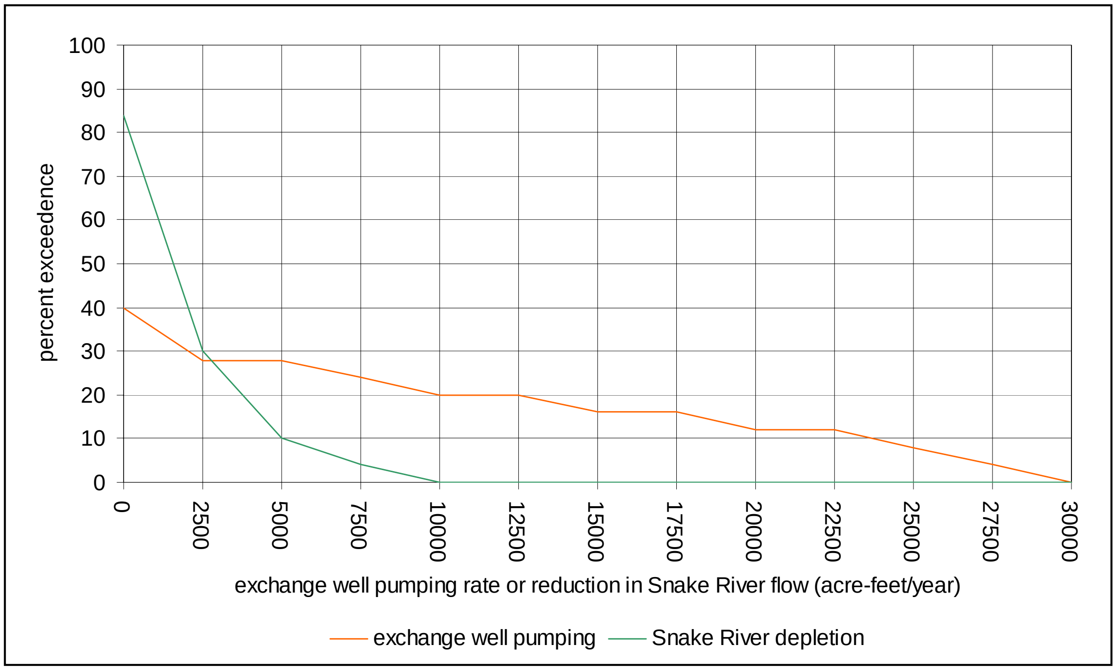

Figure 16. Exceedance curves for exchange well pumping and depletion of Snake River flow under the No Action alternative.

Alternative B – Title Transfer

Under this alternative, it is reasonable and foreseeable that FMID would:

- continue to operate the five existing exchange wells as it has in the past (these environmental consequences would be identical to those described under No Action);
- seek to develop up to five or eight additional exchange wells to allow greater cropping flexibility and assurances during low water years (thus, less acreage would go fallow during low water years);
- limit its well expansion to 80,000 acre-feet per year during low water years (FMID agreed to this limitation in a Memorandum of Agreement between FMID, the Twin Falls Canal Company, and the North Side Canal Company, Ltd., dated March 15, 2002, and contained in Appendix C);
- develop the five to eight additional wells at approximately the same locations as the five existing FMID exchange wells (this is conservative because the new wells could be located farther from the river than the existing wells);
- use the rental pool and the exchange wells in about the same relative proportions as in the past.

Well expansion would cause additional river depletions. The environmental consequences are described below.

In this analysis, the historical pattern of exchange well pumping is modified before it is extended 25 years into the future. When the historical record indicates that wells operated at maximum capacity of 30,000 acre-feet per year, the future exchange well pumping would occur at a maximum rate of 80,000 acre-feet per year. In other moderately low water years, exchange well pumping is increased proportionally (the constant of proportionality for all years is 2.70). Thus, a future low water year that is "equivalent" to a past low water year would nevertheless result in a proportionally greater demand for supplemental water because FMID would fallow less land in low water years or would grow crops that require more water.

As a simplifying assumption for this analysis, the historic withdrawals were multiplied by a factor of 2.7 to simulate future pumping. This may overstate future pumping in years when the five existing wells were not operated to the maximum capacity; this would be less likely to overstate future pumping if additional well development is associated with irrigation of crops requiring more water than crops grown in the past.

Figure 17 shows both the historical pattern of exchange well pumping between 1977 and 2002 and the pattern of expanded exchange well pumping projected to occur through 2028. Again, the ESPA model response functions are used to estimate depletions to Snake River flows at Lewisville. Peaks in exchange well pumping of 44,000 acre-feet and 48,000 acre-feet per trimester (about 182 and 198 cfs) occur during the summers of 2017, 2026, and 2027. Snake River depletions peak at about 8,300 acre-feet per trimester (about 34 cfs; Figure 18 highlights this net reduction in flow) during the winters of 2017, 2026, and 2027. These depletions represent less than 3 percent of the average flow in the river at this location during a low water year.

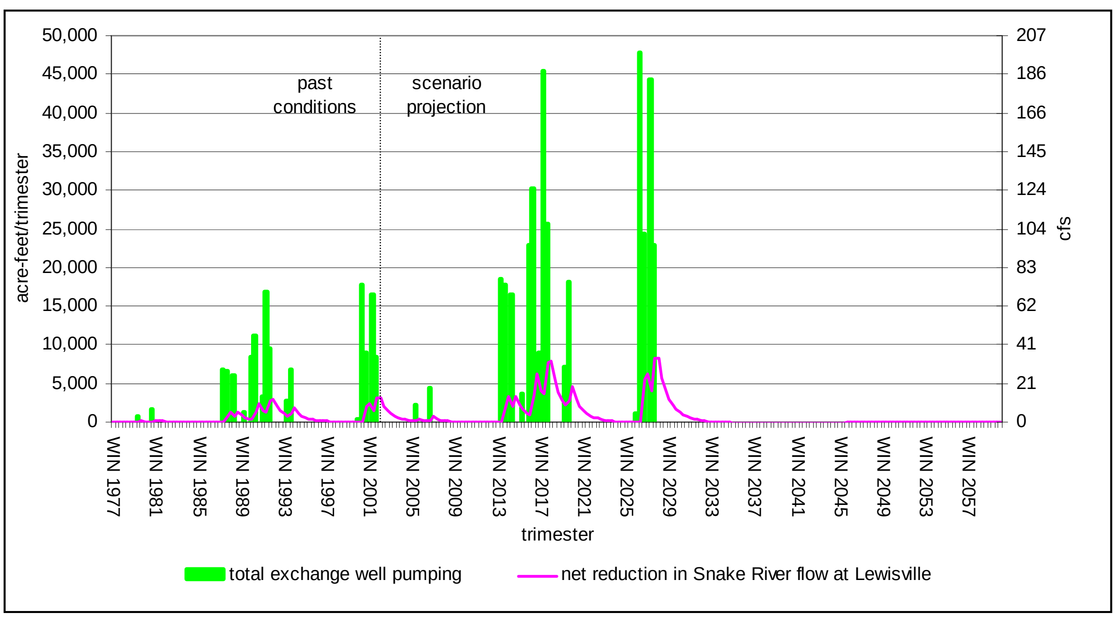

Figure 17. Depletion of Snake River flow at Lewisville assuming 80,000 acre feet of exchange well pumping during very low water years.

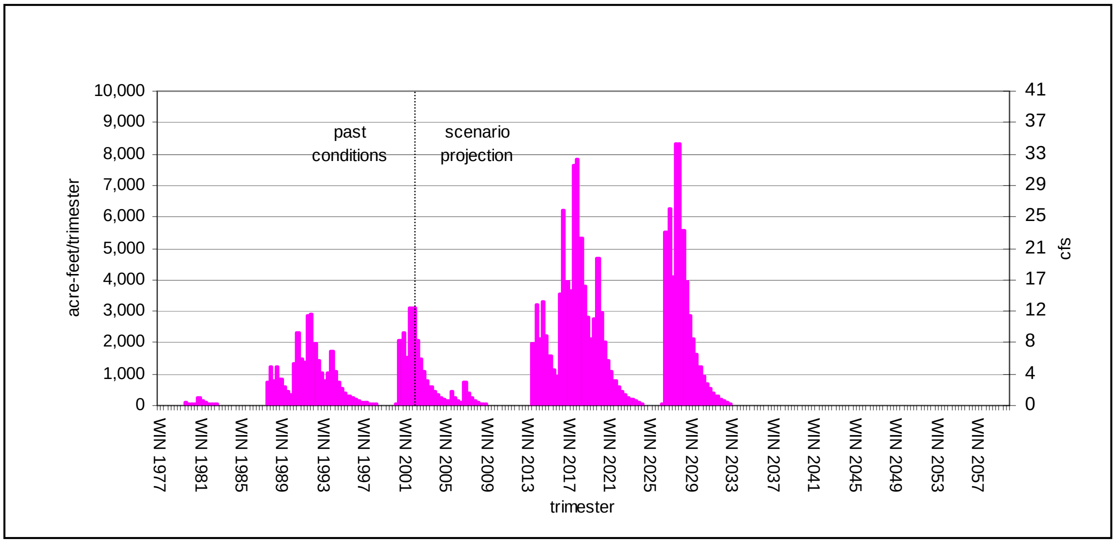

Figure 18. Net reduction in Snake River flow at Lewisville assuming 80,000 acre-feet of exchange well pumping during very low water years.

The predicted 34-cfs depletion during the years of highest pumping would slightly diminish reach gains but would not turn any gaining reach into a losing reach. As Figure 8 shows on page 21, pumping during the irrigation season would need to exceed 400 cfs to transform the Henrys Fork reach between St. Anthony and Rexburg to a losing reach. This provides some independent validation that the response function spreadsheet results are valid at these pumping rates.

Figure 19 shows the exceedance curves for expanded well pumping under this alternative. The pumping exceedance curve in this figure shows that some amount of exchange well pumping is expected to occur in about 40 percent of the years between 2003 and 2028. Exchange well pumping exceeding 10,000 acre-feet per year could be expected in about 27 percent of the time during these years, pumping exceeding 55,000 acre-feet per year could be expected in about 12 percent of the time, and pumping exceeding 75,000 acre-feet per year could be expected in about 4 percent of the time. Pumping would never be expected to exceed 80,000 acre-feet per year.

The river depletion exceedance curve in Figure 19 shows that under this alternative, some reduction in Snake River flow at Lewisville could be expected about 84 percent of the time between 2003 and 2028. Snake River depletions exceeding 5,000 acre-feet per year could be expected about 38 percent of the time. Depletions exceeding 10,000 acre-feet per year could be expected about 23 percent of the time, and depletions exceeding 20,000 acre-feet per year about 4 percent of the time. Snake River depletions would likely never exceed 22,000 acre-feet per year. A small increase in flow at Lewisville (less than 400 acre-feet per year) could be expected about 16 percent of the time.

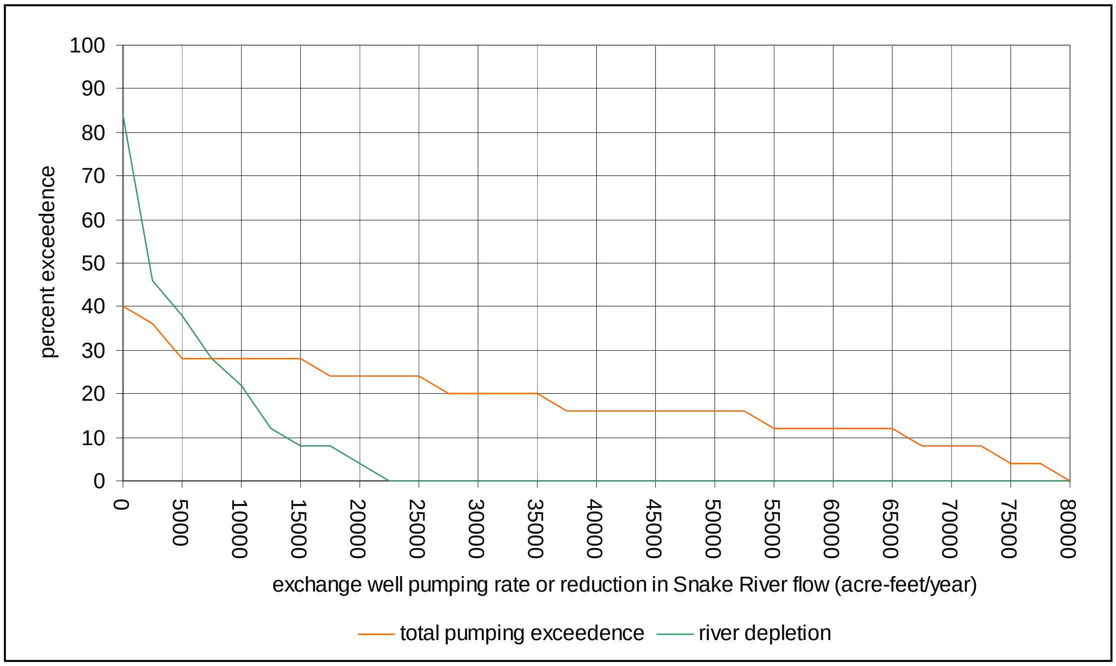

Figure 19. Alternative B exceedance curves for expanded exchange well pumping and depletion of Snake River flow.

The flow reductions in farther downstream reaches are even smaller and occur much less frequently. Reclamation analyzed the period from 1980 to 2000 to see how lower streamflows at Lewisville would affect reservoir operations and ultimately influence flows below Milner. Table 4 summarizes stream losses in the Snake River at Lewisville with potential well expansion. Table 5 summarizes stream losses in the Snake River at Milner with potential well expansion. These tables illustrate how the effect of small flow reductions in the Henrys Fork from expanded well pumping would diminish in farther downstream reaches.

According to the model results displayed in Table 5, these small reductions in flow would occur very infrequently (in only 14 of 252 of the months modeled) and would occur during spring months when they would only be a small fraction of the runoff-fed Snake River flow (February through June). When flow reductions were evident in the model, they were most often very small (8 occurrences were under 10 cfs; 4 were between 11 and 20 cfs).

The model results do show two larger flow reductions in June 1993 (533 cfs) and May 1995 (121 cfs). As described above, well expansion would diminish river gains to the Snake River. With less river gains above Lewisville, downstream irrigators would order additional water from storage. As long as the reservoir system is not required to make flood control releases (or does not run dry), there would be little or no flow reduction. However, American Falls and Palisades Reservoirs would be

Table 4. Modeled flow changes (in cfs) at Lewisville from Teton Well expansion.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1980	0	0	0	0	0	0	0	-1	-1	-1	-1	0
1981	0	0	0	0	0	0	0	0	0	0	0	-2
1982	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1	-1	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	-5	-5	-5	-5	-9
1989	-9	-9	-9	-6	-6	-6	-6	-9	-9	-9	-9	-6
1990	-6	-6	-6	-4	-4	-4	-4	-3	-3	-3	-3	-3
1991	-3	-3	-3	-9	-9	-9	-9	-16	-15	-16	-16	-11
1992	-11	-11	-11	-10	-10	-10	-10	-20	-18	-20	-20	-21
1993	-21	-21	-21	-14	-14	-14	-14	-10	-11	-10	-10	-7
1994	-7	-7	-7	-6	-6	-6	-6	-7	-7	-7	-7	-12
1995	-12	-12	-12	-8	-8	-8	-8	-5	-6	-5	-5	-4
1996	-4	-4	-4	-3	-3	-3	-3	-2	-2	-2	-2	-2
1997	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1	-1	-1
1998	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0

slightly less full. Eventually, a high-water year would require flood control releases. Because the reservoirs would be less full, less water would be released downstream as the reservoirs completely fill and Reclamation operators must begin releasing additional flood flows. The larger flow reduction in June 1993 is the sudden occurrence of several years of accumulated small flow reductions at Lewisville. These flow reductions would accompany flood control releases when the reduction of flow would be a much smaller component of the total streamflow than during average flow conditions.

The two larger modeled flow reductions (121 and 533 cfs) would have been an extremely small component of the spring flows in downstream reaches such as Brownlee Reservoir inflows or Lower Granite Dam outflows. The most extreme case of a 533-cfs flow reduction modeled for June 1993 would have reduced Snake River inflows to Brownlee Reservoir by about 2 percent for that month (the June 1993 flows at the Brownlee Reservoir inflow gage fluctuated between around 20,000 to 29,200 cfs). This reduction would have been about 0.5 percent of Snake River's average 99,000 cfs flow at Lower Granite Dam for that month. The 121-cfs reduction

Table 5. Modeled flow changes (in cfs) at Milner from Teton Well expansion.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1980	0	0	0	0	0	0	0	0	-1	0	0	0
1981	0	0	0	0	0	0	-1	0	0	0	0	0
1982	0	0	0	0	0	0	-5	-4	-1	0	0	0
1983	0	0	0	0	0	0	0	0	-1	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-533	0	0	0
1994	0	0	0	0	0	0	-11	0	0	0	0	0
1995	0	0	0	0	0	0	0	-121	0	0	0	0
1996	0	0	0	0	0	-18	-17	0	0	0	0	0
1997	0	0	0	0	-10	-11	0	0	0	0	0	0
1998	0	0	0	0	0	0	-6	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0

modeled for May 1995 would have reduced Snake River inflows to Brownlee Reservoir by about 0.5 percent for that month (the May 1995 flows at the Brownlee Reservoir inflow gage fluctuated between around 29,100 and 35,300 cfs). This reduction would have been about 0.1 percent of the Snake River's average 109,000 cfs flow at Lower Granite Dam for that month.

As mentioned previously, FMID has agreed to implement an IDWR-approved water mitigation plan to avoid effects to downstream water users in connection with any exchange well pumping beyond that associated with the five existing exchange wells. IDWR would likely require FMID to implement a plan to mitigate the effects of depletions identified in this analysis for those with senior water rights.

3.3 Power Generation

3.3.1 Affected Environment

Hydropower generation at both Federal and non-Federal facilities on the Columbia and Snake Rivers is an important resource for contributing to the reliability of the electrical power system in the Pacific Northwest. The network of hydropower dams below the action area includes 21 hydroelectric facilities owned by the United States and Idaho Power Company (see Figure 20).

The Federal dams are coordinated to maximize power generation within administrative and legal guidelines. These include eight Corps of Engineers facilities on the lower Columbia and Snake Rivers, and Reclamation's powerplant at Minidoka Dam. Palisades Dam can also be indirectly affected. The Idaho Power Company owns and operates 12 powerplants on the Snake River from American Falls Dam to the Hells Canyon Complex. Idaho Power also coordinates these facilities to maximize power generation within administrative and legal guidelines. This analysis does not consider the small municipal powerplants at Idaho Falls.

3.3.2 Environmental Consequences

Alternative A – No Action

A water service or repayment contract between the United States and FMID would have no effect on river flows downstream from the FMID service area. Depletions

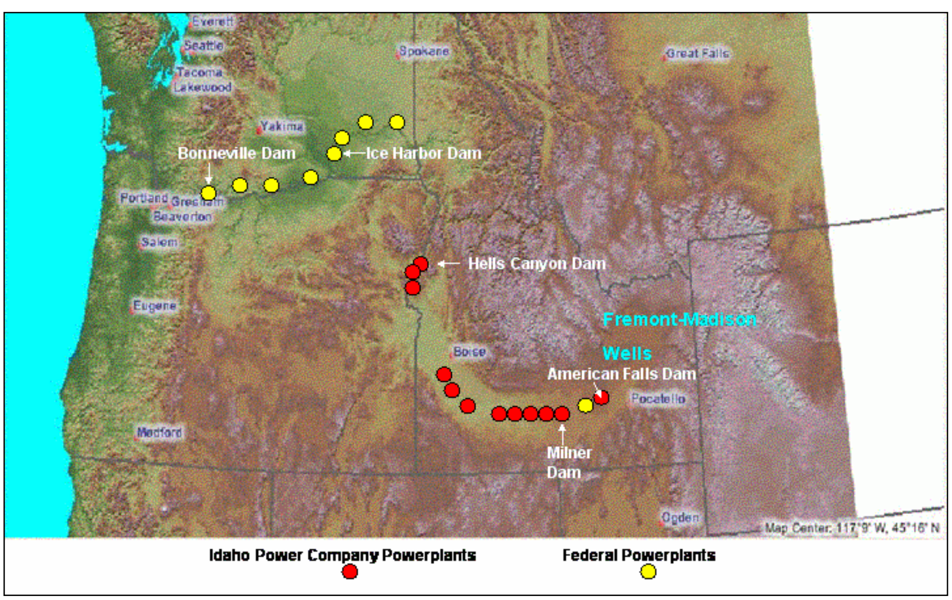

Figure 20. Columbia River and Snake River hydropower dams below FMID.

resulting from FMID's continued operation of the Teton Exchange Wells would continue as they have occurred in the past.

Alternative B – Title Transfer

Under this alternative, FMID could simply take ownership of the associated facilities, including the existing five Teton Exchange Wells, and could continue to operate them as it has in the past. The effects of this action on downstream power generation would be identical to the No Action alternative.

However, FMID could also develop five to eight additional exchange wells to pump up to 80,000 acre-feet per year. Section 3.2 describes when expanded pumping would likely occur. Expanded pumping in low water years would eventually decrease river flows. This decrease potentially affects hydropower generation at powerplants downstream from the action area. Hydropower effects may accumulate in the upper Snake River storage system; downstream effects would be delayed for months or even years and would be eventually passed along with flood control and spring runoff in wet years. Hydropower generation would not be affected when a change in flow reduces the bypassed water that occurs when turbines are operating at capacity and additional flows must be passed to the river; this is often the case during periods of spring runoff. Power losses would occur if the expanded wells deplete the river flows within power production capacity.

As described in Section 3.2, well expansion would diminish river gains to the Snake River. With less river gains above Lewisville, downstream irrigators would order additional water from storage. As long as the reservoir system is not required to make flood control releases (or does not run dry), there would be no measurable impacts to hydropower generation. However, American Falls and Palisades Reservoirs would be slightly less full. Eventually, a high-water year would require flood control releases. Because the reservoirs would be less full, less water would be released downstream as the reservoirs approach flood control rule curve elevations. In this scenario, timing would be critical. If downstream power reservoirs are spilling water past their turbines, then there would be no loss to power generation. However, if the downstream power reservoirs are not spilling, lower reservoir releases would result in less hydropower production.

Reclamation analyzed the period from 1980 to 2000 to see how lower streamflows at Lewisville would affect reservoir operations and ultimately influence flows below Milner. Table 4 summarizes stream losses in the Snake River at Lewisville with potential well expansion. Table 5 summarizes stream losses in the Snake River at Milner with potential well expansion.

Table 6 shows an estimate of what the hydropower losses in kilowatt-hours would have been if expanded pumping had occurred from 1980 to 2000. Despite less water in the river below the action area, expansion of the Teton Exchange Wells would cause few power losses. In all but two of the months analyzed, the hydropower generation facilities on the Columbia and Snake Rivers downstream from the action area would be spilling water at the time reservoir releases would be affected.

Reclamation used hydro-regulation data and the current values for replacing lost energy production to evaluate the economic impact of this additional pumping on electrical energy production at downstream powerplants on the Snake and Columbia Rivers. Two factors can influence energy production:

- The consumptive use and deep recharge to the aquifer portions of the water diverted that is not available for power production
- The potential change in the seasonal flow pattern of river flows; many of the downstream reservoirs are run-of-the-river and cannot store flows to release them at specified periods for optimum generation.

Table 6. Computed total hydropower losses (kilowatt-hours) from expanded well use (assuming historic reservoir regulation 1980 through 2000 and computed decreases in flow at Lewisville).

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1980	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-58	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	-891	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0
Average	0	0	0	0	0	0	-45	0	0	0	0	0

The monthly hydro-regulation analysis for the period of record between 1980 and 2000 showed only a small loss in generation. Generation was reduced in only 2 of the 252 months of the 21-year period of record (April 1981 and April 1994).

The lost generation was valued at projected 2004 monthly rates provided by the Bonneville Power Administration (2003). The average annual power loss was estimated at approximately $1,000 per year. The estimate's standard deviation is rather large at $4,360 per year; there was no difference in 250 of the 252 months, and there was a loss of $20,500 in April 1994. Power losses would likely occur very infrequently.

3.4 Land Use

3.4.1 Affected Environment

The Federal Act of September 7, 1964, authorized the construction of the Lower Teton Division of the Teton Basin Project to provide water to lands that were to be included in FMID. The project had two phases. Phase I would provide supplemental water supply to lands in the existing District. Phase II would provide a full water supply to new lands in the District, including the Rexburg Bench. When the Teton Dam was completed, the Rexburg Bench area was already developed with groundwater.

Reclamation changed Phase II by using the water originally intended for the Rexburg Bench to irrigate the Clementsville area. The District annexed lands that were to receive this Phase II water. FMID completed the annexation process, and Reclamation began to classify the lands to complete authorization for those lands to receive Phase II water. The classification process was still underway when the Teton Dam failed.

Before Teton Dam failed, irrigators who had made agreements with Reclamation to receive Phase II water had already begun the necessary investments in pumping, pipeline, storage facilities, and irrigation systems. After the dam failed, the District had annexed some 49,000 acres of lands; however, these lands had no authorization to receive Project water and were left without a water supply.

The affected irrigators applied to the State of Idaho for late-priority surface water rights and groundwater rights in the lower Teton River to replace instream flows that are diverted onto their farms. Their primary water supply became dependent on this groundwater source. Over the years, FMID has also purchased 1,616 acre-feet of storage water in Island Park Reservoir from willing sellers. This total does not include 1,000 acre-feet the Conant Creek Canal Company purchased from the District in 1975 in anticipation of storage space behind Teton Dam becoming available.

The Conveyance Act directs that "the acreage within the District eligible to receive water from the Minidoka Project and the Teton Basin Projects is increased to reflect the number of acres within the District as of the date of enactment of this Act, including lands annexed into the District prior to enactment of this Act as contemplated by the Teton Basin Project" (see Appendix A).

3.4.2 Environmental Consequences

Alternative A – No Action

The existing five Teton Exchange Wells would continue to provide FMID water users with a supplemental supply during periods of low water. The agricultural nature of FMID and adjacent land use would continue unchanged.

Alternative B – Title Transfer

The existing five Teton Exchange Wells would continue to provide FMID water users with a supplemental supply during periods of low water. The potential water from an additional five to eight wells would give farmers greater flexibility in cropping mixes during low water years and would strengthen the area's agricultural land use.

3.5 Socioeconomics

3.5.1 Affected Environment

FMID is located in Fremont, Madison, and Teton counties in eastern Idaho. FMID is organized under the laws of the State of Idaho and serves numerous Canal Companies in eastern Idaho. The individual entities, which own shares in FMID for water accruing to space contracted by FMID, operate and maintain their own diversions, canals, and ditches. FMID, representing the individual entities, contracted with the United States for irrigation water from the Minidoka and Teton Projects. The individual entities combine the water accrued to space contracted by FMID with privately held natural flow rights and groundwater rights. The individual entities irrigate approximately 285,000 acres, with a distribution of lands estimated at 60 percent in Fremont County, 25 percent in Madison County, and 15 percent in Teton County.

Population and Income

The July 2002 population for the three counties was estimated at 46,404, a 29.1 percent increase over the 1990 Census of Population. During the same time period the population for the State of Idaho increased 32.2 percent. The 2000 Census population data for major towns and cities in the area include: Rexburg (17,257), St. Anthony (3,342), Ashton (1,129), Driggs (1,100), Sugar City (1,242), Victor (840), Teton (569), Newdale (358), Parker (319), Tetonia (247), and Island Park (215). The population of the area increases significantly during the summer tourist season.

Total personal income for the three counties in 2001 was $693.8 million, which is 2.1 percent of Idaho's total ($32.4 billion). Average per capita income for the three-county area in 2001 was $15,177, which is 62 percent of Idaho's average ($24,506). Per capita incomes in rural Idaho have historically been below the overall state average. Table 7 and Table 8 contain additional population and personal income data.

Table 7. Population and area details for Fremont, Madison, and Teton Counties.

Detail	Fremont	Madison	Teton	Three-County Total	Idaho
July 2002 estimate	11,859	27,686	6,859	46,404	1,341,131
2000 Census	11,819	27,467	5,999	45,285	1,293,953
1990 Census	10,937	23,674	3,439	38,050	1,006,734
1990 to 2002 change	+ 8.4 %	+ 16.9 %	+ 99.4 %	+ 29.1 %	+ 33.2 %
Area (square miles)	1,867	472	450	2789	82,747
Persons per square mile	6.35	58.65	4.04	16.64	16.21

Source: U.S. Census Bureau 2003.

Table 8. Personal income details for Fremont, Madison, and Teton Counties.

2001 Data	Fremont	Madison	Teton	Three-County Total	State of Idaho
Personal income	$198 million	$392 million	$103 million	$694 million	$32.4 billion
Per capita personal income	$16,759	$14,319	$15,919	$15,177	$24,506
Per capital personal income as a percentage of Idaho total	0.68	0.58	0.62	0.62	1.0

Source: BEA 2003.

Employment and Industry

Table 9 shows the percent of total employment for several major industries in the area. Farming alone accounts for approximately 10 percent of the employment. The food and lodging industry relies heavily on area tourist attractions, including Henrys Lake, the Henrys Fork, Mesa Falls, and Harriman State Park. Travelers and tourist that use highways serving as a portal to Yellowstone National Park and Grand Teton National Park enhance local employment. Significant use of automotive services also enhances the retail trade and services industries. Table 10 summarizes employment by type for 2002, and Table 11 summarizes employment by industry for 2002.

Table 9. Major industries in Fremont, Madison, and Teton Counties.

Major Industry	Percent of Total Employment	
	Three-County Area	State of Idaho
Services	36.0	26.8
Retail trade	16.1	17.2
Farming, agricultural related, and forestry	15.2	7.6
State and local government	13.3	11.7
Manufacturing	7.0	10.5

Source: BEA 2003.

As expected, wage and salaried employment and non-farm proprietors constitute a significant portion of the area's total employment. The major non-farm employers in the three-county area are: school districts, local, State, and Federal governments, ML Technology, Brigham Young University Idaho (formerly Ricks College), Artco, Basic American Foods, Madison Memorial Hospital, Melaleuca, High Country Potato, Ashton Nursing Home, Fall River Electric Co-op, Grand Targhee Resort, Teton Valley Hospital, Broulim's Thriftway, Eagle Computer Systems, Teton Telecom, and Fremont Telecom. In addition, farmers in the area hire significant amounts of seasonal labor. Employment by type is shown below.

Agricultural Economy Information

Fremont Madison Irrigation District

In terms of irrigated acreage, value of farm production, and water supply, FMID and its associated districts play a major role in the area. FMID also serves as a spokesman on water issues, including water allocation and water rights issues.

Table 10. Employment by type in Fremont, Madison, and Teton Counties.

Year 2000 Data	Fremont	Madison	Teton	Three-County Total	Idaho
Wage and Salary Employment	2,944	12,767	1,820	17,531	611,371
Farm Proprietors	538	480	304	1,322	24,400
Non-Farm Proprietors	1,204	2,163	607	3,974	152,648

Source: BEA 2003.

Table 11. Employment by industry in Fremont, Madison, and Teton Counties in 2000.

Year 2000 Data	Fremont	Madison	Teton	Three-County Total	Three-County Total Percent	State of Idaho Total	State of Idaho Total Percent
Farm	823	932	454	2,209	10.71	41,554	0.0527
Agricultural Services, Forest, and Fish	296	517	116	929	4.50	19,131	0.0243
Manufacturing	81	1,268	97	1,446	7.01	82,809	0.1050
Mining	D	D	D	D	D	3,227	0.0041
Construction	330	643	333	1,306	6.33	56,241	0.0713
Transportation, Communication and Public Utilities	232	D	92	D	D	34,711	0.0440
Wholesale Trade	145	1,066	D	D	D	35,671	0.0452
Retail Trade	688	2,199	431	3,318	16.08	135,425	0.1718
Finance, Insurance and Real Estate	D	678	162	840	4.07	53,070	0.0673
Services	792	6,094	537	7,423	0.3597	211,281	0.2680
Federal Civilian	127	61	46	234	0.0113	13,379	0.0170
Federal Military	48	112	25	185	0.0090	9,536	0.0121
State & Local Government	860	1,510	374	2,744	0.1330	92,384	0.1172
Total				**20,634**	**100.00**	**788,419**	**100.00**

Source: BEA 2003.

Canal Companies within FMID have various combinations of irrigation water sources, including Reclamation-contracted water through FMID, natural flow rights (rivers), and groundwater rights (wells). The local area also includes substantial irrigation using solely groundwater wells; these irrigators have no connection with Reclamation.

Agricultural Production

Although located at higher elevations and limited by the growing season, irrigated lands in the FMID contain highly productive soils. Lands within FMID constitute a significant portion of the irrigated acreage in the three-county area. However, the cropping distribution is more intensive in FMID than for the three-county area. FMID estimates its cropping distribution is 24 percent in potatoes (including a significant acreage of seed potatoes in the upper basin), 49 percent in grain (wheat and barley), 18 percent in hay, 6 percent in pasture, and 3 percent in other crops. FMID estimates that over 70 percent of the acreage is sprinkler irrigated; the remaining lands are flood or sub-irrigated.

Reclamation estimates prepared for a Grassy Lake Safety of Dams study estimated that FMID lands generate approximately $104 million annually in crop sales (farm gate value), or 200,000 acres at $520 per acre.

Fremont, Madison, and Teton County Agricultural Information

The 1997 Census of Agriculture for Idaho reports 1,233 farms in the three-county area with total farm sales of $184.3 million ($159.7 million in crop sales and $24.6 million in livestock and livestock product sales). The 1997 Census of Agriculture reported 930 irrigated farms totaling 515,834 acres. Of these, 304,919 acres were irrigated and 381,460 acres were harvested cropland. Table 12 summarizes farm and crop information from the census.

Major crops grown in the three-county area include barley, wheat, potatoes, alfalfa hay, and pasture. A significant infrastructure has developed supporting the agricultural industry, such as the several potato shipping and processing plants in the area. Although potatoes are only 24 percent of the cropping area, their contribution to farm income is much higher. The Grupo Group and Anheuser-Busch have malting barley processing plants located in the Idaho Falls area. Owing to the geographical isolation and high elevation, a significant seed potato industry also exists in the area. Table 13 shows the major crops grown in the area in 2002.

Table 12. Farm and crop data for Fremont, Madison, and Teton Counties.

1997 Agricultural Census	Fremont	Madison	Teton	Three-County Total
All Farms	493	470	270	1,233
Irrigated Farms	349	393	188	930
Land in Farms (acres)	334,151	222,817	132,678	689,646
Land in Irrigated Farms (acres)	224,924	190,003	100,907	515,834
Irrigated Land (acres)	118,997	128,649	57,273	304,919
Total Cropland (acres)	193,394	174,147	101,862	469,403
Harvested Cropland (acres)	157,298	147,243	76,919	381,460
Harvested Irrigated Cropland (acres)	124,659	139,391	63,240	302,631
Irrigated Harvested Cropland (acres)	106,925	123,690	49,729	280,344
Crop Sales	$69.6 million	$73.1 million	$16.9 million	$159.7 million
Livestock and Product Sales	$11.4 million	$7.3 million	$5.9 million	$24.7 million
Total Sales	**$81.0 million**	**$80.4 million**	**$22.4 million**	**$184.4 million**

Source: Idaho Department of Agriculture 2003.

Table 13. Major crops grown in Fremont, Madison, and Teton Counties.

Crop	Fremont	Madison	Teton	Three-County Total	Percent
All wheat (acres)	25,300	34,800	5,300	65,400	17.64
Barley (acres)	78,200	48,600	44,500	171,300	46.21
Alfalfa hay (acres)	26,200	22,000	15,000	63,200	17.05
Oats (acres)	1,700	1,100	–	2,800	0.76
Potatoes (acres)	28,500	32,000	7,500	68,000	18.34
Total				**370,700**	**100.00**

Source: U.S. Department of Agriculture 2003.

3.5.2 Environmental Consequences

This section uses qualitative terms to discuss the economic impacts of the alternatives. Potential economic impacts associated with the operation of the Teton Exchange Wells were identified for two irrigated areas. The first impact area encompasses FMID lands that directly benefit from exchange well pumping. The second impact area is the irrigated land downstream from FMID that includes lands with more senior natural flow rights and storage rights in American Falls Reservoir. Increased diversions upstream could potentially adversely affect these lands.

This analysis is qualitative because:

- The additional pumping would occur for the most part in dry years, and is a relatively small portion of FMID's total water supply.
- The river depletions are relatively small compared to the flow of the Snake River (less than 3 percent of the flow at Lewisville when the expanded exchange wells are operating at their maximum).
- Additional well development might adversely impact downstream water users who may have mitigation rights under Idaho water law.

The analysis focuses solely on irrigation. Additional exchange well pumping would have no measurable economic effects on recreation, flood control, or hydropower production.

Alternative A – No Action

A water service or repayment contract between the United States and FMID would have no effect on the economics of the FMID service area or downstream water users. As described in Section 3.2, FMID's continued operation of the Teton Exchange

Wells would provide additional water to FMID lands in 40 percent of the years to reduce the water shortage in low water years. This continuation would continue to provide the existing level of economic benefit to FMID irrigators.

Alternative B – Title Transfer

Effects to the FMID Service Area

Under this alternative, FMID could simply take ownership of the associated facilities, including the existing five Teton Exchange Wells, and could continue to operate them as it has in the past. The economic effects of this action would be identical to the No Action alternative. However, FMID could develop five to eight additional exchange wells to pump up to 80,000 acre-feet per year. Section 3.2 describes when expanded pumping would likely occur.

Figure 21 is an exceedance graph showing the relationship between the amount and probability of exchange well pumping for the existing five wells and the analysis of future pumping. The difference between the two graphed lines is the potential impact. For example, the probability of pumping at least 2,500 acre-feet per year is 28 percent for Alternative A and 36 percent for Alternative B. Exchange well pumping of 20,000 acre-feet or more per year has a probability of 12 percent for Alternative A and 24 percent for Alternative B.

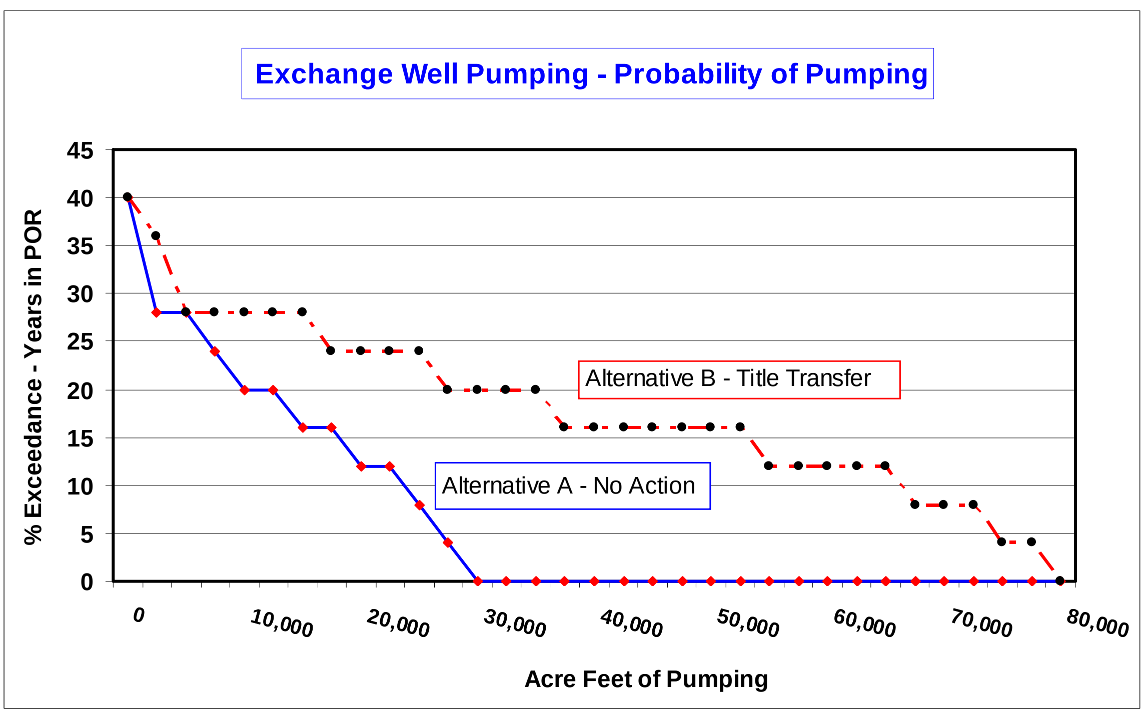

Figure 21. Probability and volume of Teton Exchange Well pumping (this may overstate future pumping).

FMID has indicated that the assurance of a late-season water supply is critical for potato production. Crop production cost for potatoes is relatively capital intensive. Without a dependable full-season water supply, potato production becomes too risky. Potatoes are grown in a 3-to-5-year rotation with other crops. This rotation with a reliable water supply allows the production of the higher value crop. During low water years, irrigators reduce water deliveries to hay and grain in late season to maintain deliveries to potatoes. They also adjust spring cropping using water supply forecasts.

Annual crop revenues generated by irrigated lands in FMID are estimated at $104 million. Expanded exchange well pumping would have a positive impact on FMID-area farm income and the supporting infrastructure in the upper Snake River basin.

The cost for FMID to pump water from the wells would be an economic impact. These costs would be a function of the dynamic head (lift), volume of water pumped, and the electrical charge from the local utility. However, any negative economic effect from pumping costs would be more than offset by the increased crop income. If pumping water from the exchange wells would have a negative economic effect, FMID would not pump water from the exchange wells.

Effects to Downstream Water Users

Downstream water users could potentially be affected only if FMID developed the five to eight additional wells described in Section 3.2. As that section notes, the net effect of increased exchange well pumping is a slight reduction in Snake River flows at Lewisville. The essential question for impact analysis is to what extent, if any, the reduction in river flows impacts those irrigation districts and individuals with natural flow rights and storage in American Falls Reservoir. The incidence of these potential impacts could be scattered from Idaho Falls downstream to Twin Falls, though it may not require mitigation.

River depletion data developed from hydrologic models indicates that Snake River depletions at Lewisville would occur about 84 percent of the time under both alternatives.

Figure 22 is an exceedance graph showing the relationship between historical pumping and the analysis of future pumping proportionally by a factor of 2.7. The difference between the two graphed lines is the potential impact. Depletions of the Snake River at Lewisville are never expected to exceed 10,000 acre-feet per year for Alternative A or 22,000 acre-feet per year for Alternative B. For example, the probability of a 5,000 acre-feet per year depletion is 10 percent for Alternative A and 38 percent for Alternative B; a 7,500 acre-feet per year depletion has a probability of 4 percent for

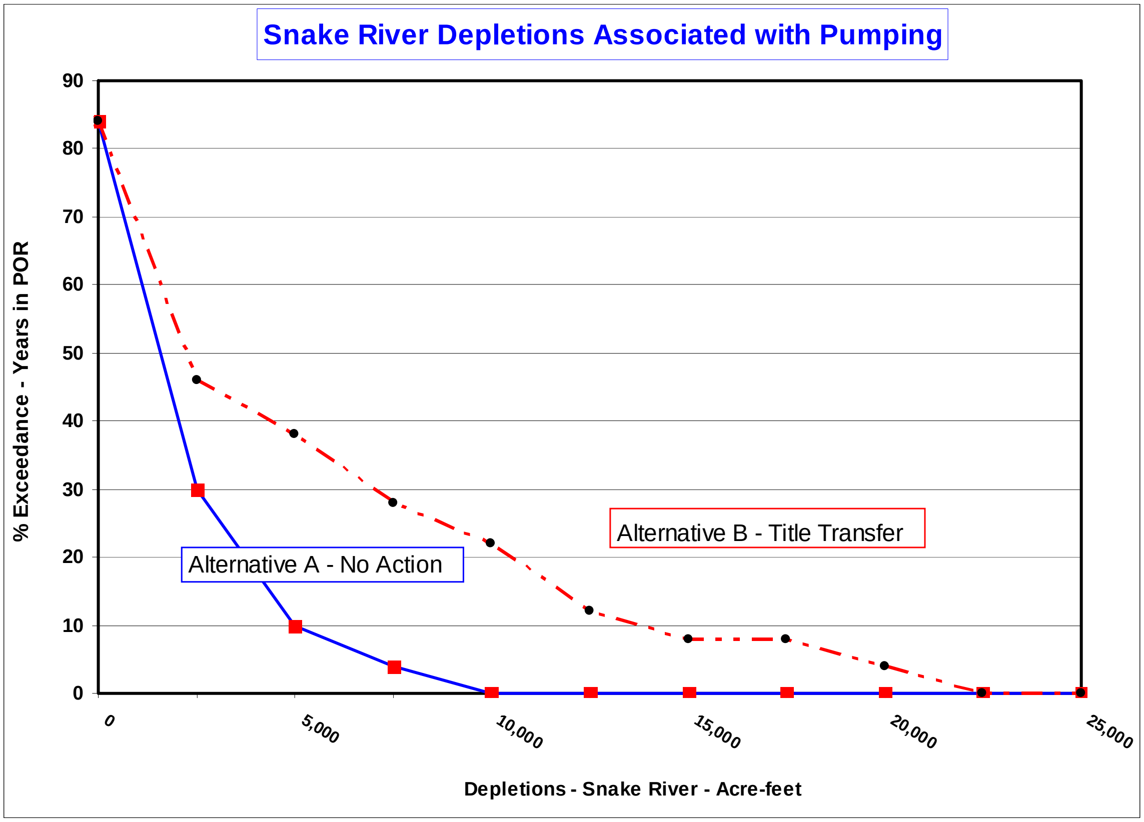

Figure 22. Probability and volume of Teton Exchange Well depletions in the Snake River at Lewisville (this may overstate future pumping).

Alternative A and 28 percent for Alternative B; a 20,000 acre-feet per year depletion has a probability of 0 percent for Alternative A and 4 percent for Alternative B.

An additional 12,000 acre-foot depletion is worst-case scenario for expanded well pumping. The impact of this increase is unknown at this time, but it is believed to be small.

The probability of a 12,000 acre-foot depletion is relatively low. Any resulting impact on the river would probably be transient from one right to the next. Groundwater impacts would be less immediate and would become apparent in subsequent years.

As noted in FMID's Memorandum of Agreement with other irrigators (see Appendix C), IDWR would require FMID to mitigate any adverse effects of additional well pumping to avoid effects to downstream water users. For example, FMID could pump additional replacement water to supplement American Falls Reservoir storage or implement a groundwater recharge strategy during high-runoff periods. FMID could also seek other forms of exchanges and financial transactions.

The economic value of 12,000 acre-feet of incremental reduction in the flow of the Snake River at Lewisville depends on the type of water year and if the water would be stored in the reservoir system and actually used for irrigation.

The average value of irrigated crop production in south-central Idaho ranges from $550 to $700 per acre. Allowing for evaporation, transportation, and storage losses (20 to 30 percent) and on-farm irrigation losses (3.57 acre-feet per acre for consumption and on-farm loss), the value of crop production in south-central Idaho associated with 12,000 acre-feet would be $1.3 million to $1.6 million. The total crop income for the eight counties in south-central Idaho and the six counties in southeast Idaho was estimated respectively at $612 million and $443 million annually for the 1988 to 1995 time period (USBR 1999). The actual economic value, or net farm income, after allowing for variable and fixed production cost would yield a lesser value.

In general, depletions to the river below American Falls caused by increased exchange well pumping without mitigation would have a very small negative impact on farm income and the supporting infrastructure in the Snake River basin in south-central Idaho.

3.6 Recreation

3.6.1 Affected Environment

The Cross Cut Diversion area is a heavily-used recreation area on the lower Henrys Fork (effects to fish populations are discussed separately in Section 3.10). Boaters and anglers use the Cross Cut Diversion Dam area to access the river. These users launch below Ashton Reservoir and float the river to the Cross Cut Diversion Dam or launch at the Cross Cut Diversion Dam and float to St. Anthony.

Except for two unimproved boat launches, the Cross Cut Diversion Dam area has no developed recreational areas or facilities. The boat launch and ramp above the dam is generally muddy; the boat launch and ramp below the dam is dangerously steep and rocky. The sole access point to the dam and the launches is along the Cross Cut Canal access road. This access road was improved in the summer of 2001. The Cross Cut Canal is not considered a recreational resource.

3.6.2 Environmental Consequences

Alternative A – No Action

Public access for recreation would not change. FMID would continue to regulate access to other areas of the canal and protect public safety.

Alternative B – Title Transfer

Although FMID would receive title for the dam, canal, and associated facilities, it is not anticipated that it would change the current public access to recreation near the Cross Cut Diversion Dam. FMID would continue to regulate access to other areas of the canal and protect public safety. River recreation opportunities would remain unchanged if FMID continues to operate only the existing Teton Exchange Wells. If FMID drills an additional five to eight exchange wells, the slight change in surface water hydrology would not likely affect river recreation.

3.7 Environmental Justice

3.7.1 Affected Environment

As discussed previously, FMID service area farms span across Fremont, Madison, and Teton Counties in eastern Idaho. Agriculture is a predominant employer in these counties and provides primarily seasonal and some year-round employment.

3.7.2 Environmental Consequences

Alternative A – No Action

With no changes in water supply and on-farm income, there would be no effects on low-income or minority populations.

Alternative B – Title Transfer

FMID may develop an additional five to eight Teton Exchange Wells in the future to meet demands during periods of low water. This additional water would stabilize the District's water supply, increase efficiency in crop management, and strengthen the socioeconomic conditions in Fremont, Madison, and Teton Counties. These changes would provide some positive impacts to low-income and minority farm laborers during low water years.

3.8 Water Quality

3.8.1 Affected Environment

The Henrys Fork of the Snake River in Fremont and Madison Counties is currently classified as a Class 3A waterway that supports salmonid spawning and primary or secondary recreational contact. The Henrys Fork and Teton Rivers within the project vicinity are not on the State of Idaho's 303(d) list of impaired waters.

The most widespread contaminant of groundwater in the Henrys Fork basin is nitrate (USGS 2000). Nitrate naturally occurs as a result of oxygen and nitrogen combining in the soil, but this process produces the compound only in small amounts. Fertilizers, livestock waste, and septic systems in rural or agricultural areas are the sources of high amounts of excess nitrate. Because nitrate is water soluble, it travels easily through soils and can be carried into the groundwater supply. Wells in sandy soil or wells that are shallow are more likely to have nitrate contamination. The five Teton Exchange Wells have depths ranging from 394 feet to 685 feet; these are considered deep for the area.

Data from the USGS NWIS system was used to categorize the nitrate concentration of groundwater wells in the action area. The analysis included 341 data points that accounted for 224 individual wells sampled between 1972 and 2001. Dissolved nitrate (measured as N) ranged from 0.03 mg/L to 35 mg/L over this time period. Ninety percent of the wells had depth data associated with them, which ranged from 12 feet to over 1,000 feet. The median concentration for this data set was 1.5 mg/L.

Figure 23 shows the average nitrate (as N) in and around the action area. The spatial means for nitrate concentrations at the well sites ranged from 0.434 mg/L to 1.71 mg/L; the overall average was 0.971 mg/L.

Using the hydrology data set discussed in Section 3.2 and the overall spatial mean for the wells, nitrate loading in kilograms per year was calculated and compared to average yearly nitrate loading in the Henrys Fork near Rexburg (USGS Station 13056500). As Figure 24 shows, nitrate loading from the wells accounts for an average of 5 percent of the total load in the river.

Temperature of the groundwater wells during the May through October pumping season in the action area ranges from 4 to 59 °C, but most of the groundwater in the area is nonthermal (less than 29 °C). As Figure 25 shows, the average temperatures within a 2-mile radius of the Teton Exchange Wells are consistently lower during the summer months than the average temperature on the Henrys Fork. A corresponding data set for temperature during the winter months was not available; however, groundwater remains relatively constant throughout the year and is approximately equal to the area's annual average air temperature. The 1971 to 2000 average annual air temperature for Rexburg was 6 °C.

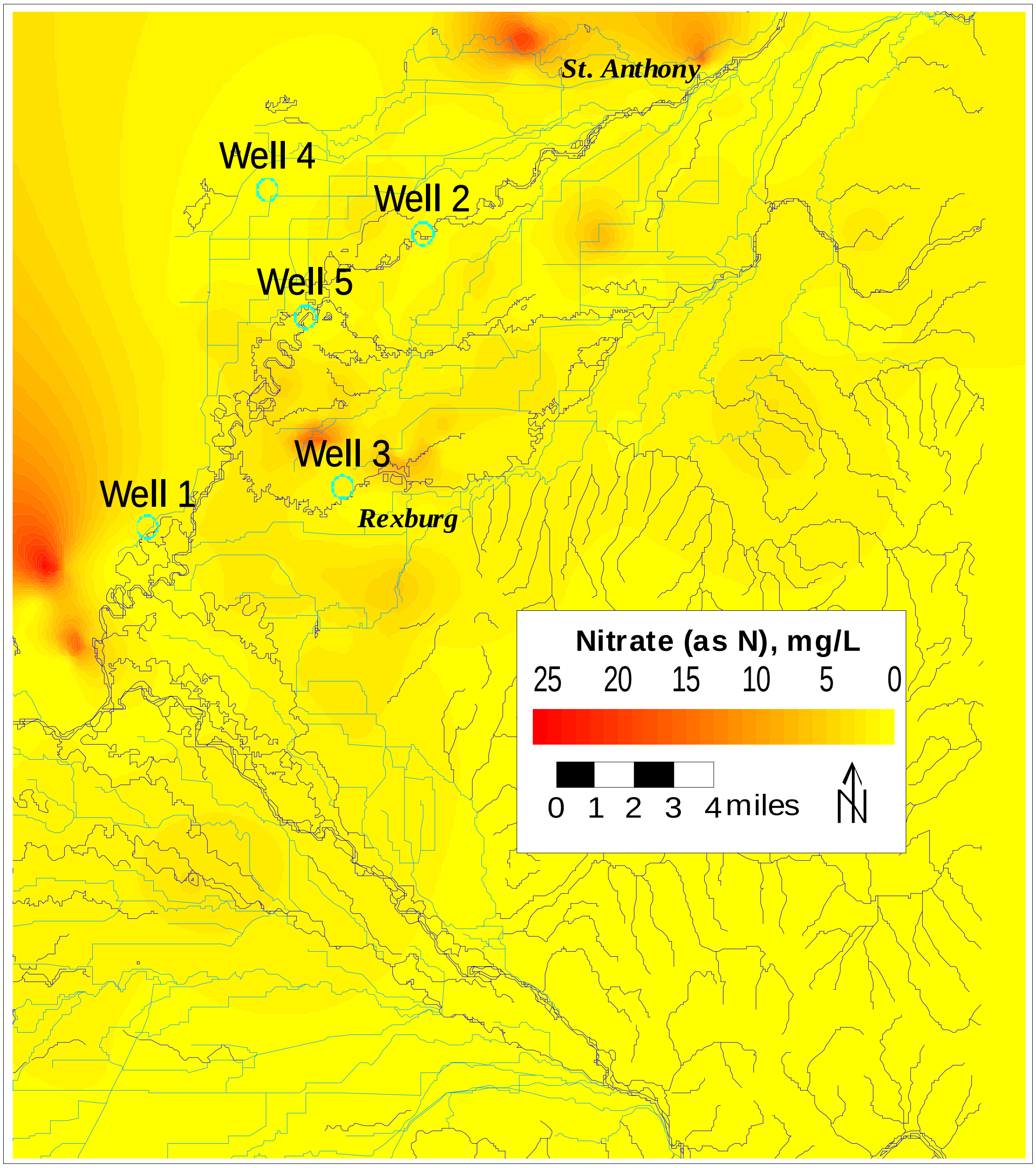

Figure 23. Average nitrate (as N) concentrations in the groundwater of the action area. The five Teton Exchange Wells are also shown.

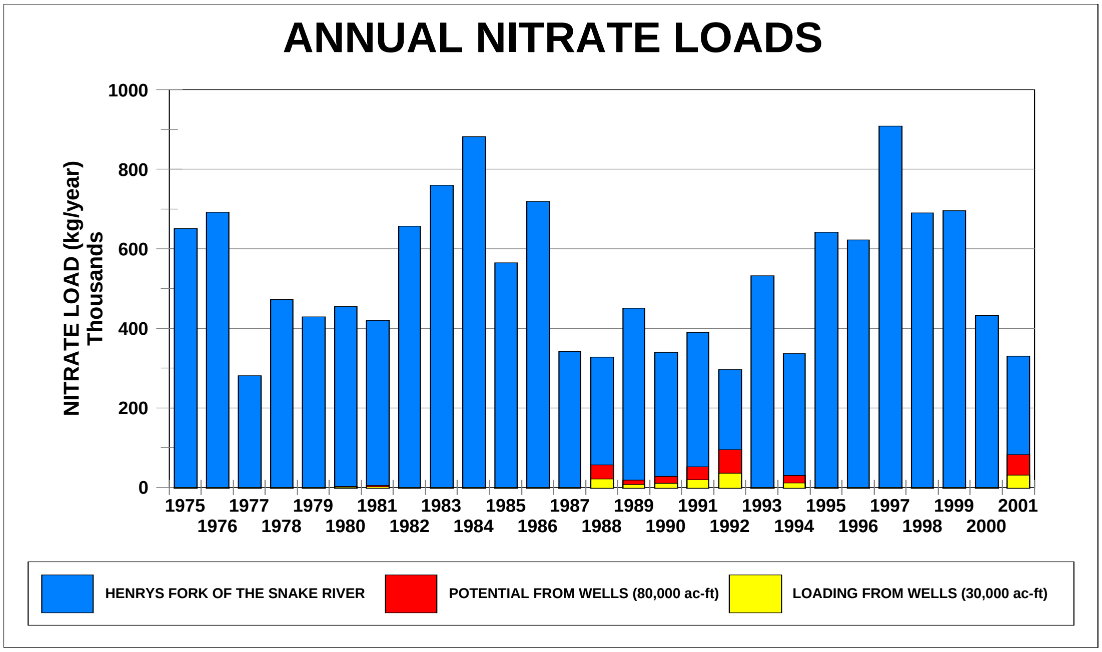

Figure 24. Annual nitrate loading in the Henrys Fork of the Snake River at Rexburg. Loading contributed by the Teton Exchange Wells for the same years is illustrated in yellow. Potential nitrate loading if the 80,000 acre-feet of water is developed is illustrated in red.

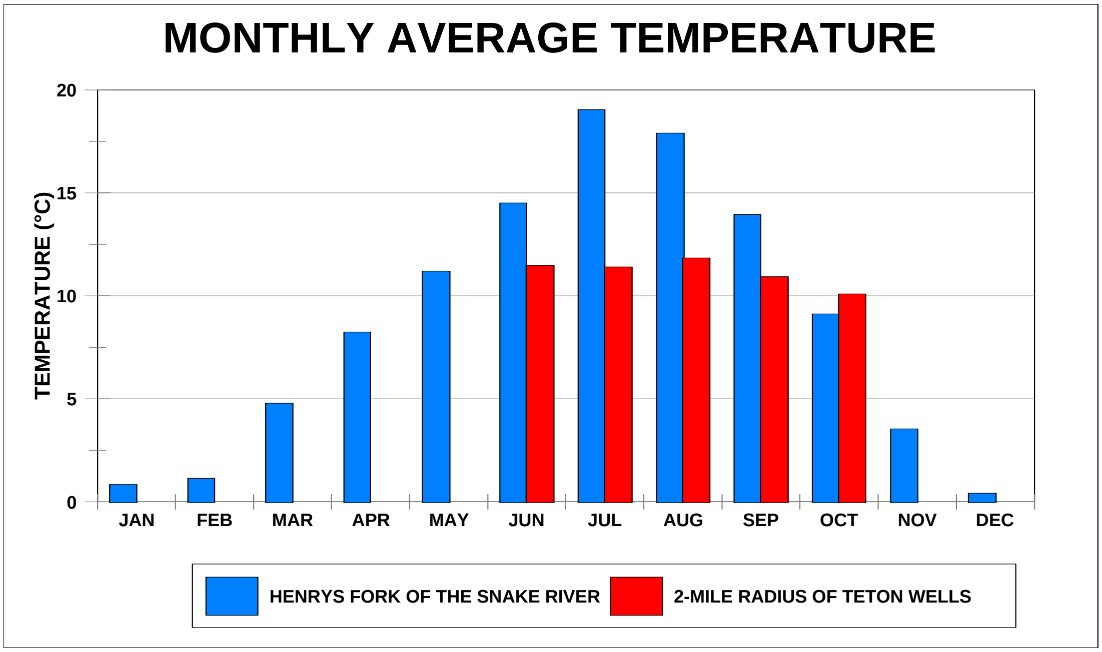

Figure 25. Average monthly temperature of the Henrys Fork of the Snake River at Rexburg as well as the average monthly temperature of groundwater wells within a 2-mile radius of the Teton Exchange Wells.

3.8.2 Environmental Consequences

Alternative A – No Action

Use of the Teton Exchange Wells during low water years would continue to provide lower temperature water and a slight increase in nitrogen loading to the Henrys Fork.

Alternative B – Title Transfer

FMID may develop an additional five to eight Teton Exchange Wells in the future to meet demands during periods of low water. If the Teton Exchange Wells provided up to 80,000 acre-feet per year of supplemental water supply during the period between 1975 and 2001, the average nitrate loading into the system would have increased by approximately 7 percent during years FMID would have pumped, but the nitrate concentrations would have decreased slightly. Additional groundwater would also slightly decrease the summer water temperatures of the Henrys Fork during these years. Henrys Fork water would likely remain below relevant water quality criteria, and the changes, although positive, would be minimal.

3.9 Vegetation

3.9.1 Affected Environment

The action area is in the upper Snake River basin within the Intermountain Sagebrush Province (Baily 1980). Agriculture has already disturbed and altered much of the adjacent land. The predominant crops in the area are wheat, barley, alfalfa hay, and potatoes. In undisturbed areas, dominant plant species include big sagebrush, willow, and bunch grasses. The proximity of the project to roads and pasture facilities has caused an increase in weedy species, including St. John’s wort, common mullein, and pasture grasses. Wildlife habitat elements near the area include wetlands, riparian areas, and river banks with associated forbs and graminoids.

The riparian area of greatest concern is Cartier Slough near the outflow for Teton Exchange Well 1. Though the slough exists without supplemental flows from the exchange well, Well 1 increases its total area and productivity (Ragotzkie 2003).

3.9.2 Environmental Consequences

Alternative A – No Action

There would be no changes to operation, maintenance, or management of the surrounding wetlands and riparian areas. These areas would continue unchanged.

Alternative B – Title Transfer

Well 1, which provides additional water to the Cartier Slough, would continue to provide water in low water years. If FMID drilled five to eight additional wells to provide additional supplemental water during low water years, general cropping types, methods, and predominant vegetation would likely remain unchanged.

3.10 Fisheries

3.10.1 Affected Environment

Historically, the Henrys Fork is one of the most heavily fished streams in Idaho (Coon 1977). However, the reach from the Cross Cut Diversion Dam to the confluence with the South Fork of the Snake River is not on a par with the Henrys Fork below Island Park Dam in Box Canyon. Instream flows in the action area fluctuate throughout the summer according to irrigation needs; however, these flows are apparently sufficient to support a healthy trout population.

The Idaho Department of Fish and Game compiled recent survey information on the reach downstream from the Cross Cut Diversion Dam to the confluence with the South Fork of the Snake River (Garren 2003). They also provided comparison data from the South Fork of the Snake River. Table 14 and Table 15 present these data.

Cutthroat trout are a very minor population component, and the sampling on the Henrys Fork did not recover any cutthroat. Overall, rainbow trout densities in the Henrys Fork are highest in Box Canyon and decline in each successive downstream reach. Whitefish are abundant in all reaches and do not follow a longitudinal change in density. Brown trout have a much smaller role here compared to the South Fork, although densities have increased over the past 15 years.

An issue of concern in the lower reaches of the Henrys Fork is water temperature. During the spring and summer, optimal temperatures for growth of fry and adult rainbow and brown trout in the Henrys Fork range from 14 to 18 °C (Stoltz and Schnell 1991). Temperatures at or above 20 °C may be harmful to adult trout (Raleigh et al. 1984; Stoltz and Schnell 1991).

Table 14. Mountain whitefish per kilometer in four Henrys Fork reaches.

Year	Menan	Chester	Warm River	Box Canyon
2003	--	957	--	717
2002	--	1,371	2,170	705
1987	960	--	--	--

Source: Garren 2003.

Table 15. Trout per kilometer in four Henrys Fork reaches and the South Fork Snake River.

Year	Henrys Fork Reaches				Snake River (South Fork)
	Menan	Chester	Warm River	Box Canyon	Lorenzo
2003	--	657 (RBT)	830 (RBT)	1,007 (RBT)	--
2002	16 (BRN)	501 (RBT)	802 (RBT)	1,802 (RBT)	1,290[b]
1990	--[a]	--	800 (RBT)	1,000 (RBT)[d]	1,293[b]
1987	62[b]	--	1,162 (RBT)[c]	3,631 (RBT)	933[b]

a – too few recaps for estimate
b – all trout combined
c – estimate conducted in 1988
d – estimate conducted in 1989

Source: Garren 2003.

Table 16 displays random summer (May to September) water temperatures from the Rexburg gage for times when the wells that affect the Rexburg-Ashton reach were operated. This table shows that while high daily air temperatures and low river flows contribute to high water temperatures, the water exchange scheme and operation of the pumps do not.

FMID operates the Teton Exchange Wells during low water years when the full FMID storage allocation is not available. This normally occurs when the water in the storage space of Island Park belongs to downstream water users and is therefore passed downstream and results in higher flows at the Rexburg gage. During good water years, when the majority of the water in Island Park belongs to FMID and downstream water users have their rights filled, the District is able to divert more water to their water users and release less water downstream; this results in lower flows at Rexburg.

3.10.2 Environmental Consequences

Alternative A – No Action

There would be no change in distribution or abundance of fish within the action area. Streamflows above and below Cross Cut Diversion Dam would continue at historical levels. FMID’s operation and maintenance of the wells, diversion dam, and canal would continue into the future as it has in the past. Water temperature would tend to be high during good water years when flows are below 1,000 cfs and daily air temperatures are above 21 °C for extended periods of time.

Table 16. Historical temperature, flow, and rate data for selected Teton Exchange Wells.

Sample Date	Water Temperature (°C)	Air Temperature (°C)	Instantaneous Discharge (cfs)	Water Pumped per Month from Pumps 2, 3, and 5 (acre-feet)	Computed Pumpage - assumes month-long pumping (cfs)
07-13-1973	20.5	29.0	872	No pumps	
07-07-1975	20.0		6400	No pumps	
08-11-1978	20.0	27.0	1030	0	
Aug 1980	No Summer Data			797	
07-09-1981	20.0	21.0	951	0	
Sep 1981				537	
08-23-1982	20.0	22.0	2110	0	
07-28-1987	21.0	31.0	533	0	
08-05-1988	17.0		955	2779	47
09-13-1988	12.0	15.0	1300	2671	44
07-14-1989	19.0	21.0	1180	1793	30
08-15-1989	19.0	22.0	1390	1972	33
05-23-1991	13.0	14.5	7030	3738	63
06-07-1991	13.0	16.0	6050	3449	58
07-01-1991	17.9	20.0	1490	241	4
08-14-1991	17.0	19.0	713		
05-11-1992	13.0	20.0	1380	1798	30
06-16-1992	11.5	12.0	2050	2553	43
07-29-1992	21.2	27.0	1230	2683	45
07-25-1994	23.7	31.0	853	325	5
08-31-1994	17.8	25.5	746	1339	23
09-13-1994	15.6	24.0	717	2041	34
07-24-1998	20.5	28.0	907	0	0
07-17-2000	20.6	24.0	848	0	0
05-20-2002	14.8	26.3	2710	1990	33
06-17-2002	19.0	24.6	1940	2680	45

Sources: USGS 2003; FMID unpublished data.

Alternative B – Title Transfer

FMID may develop an additional five to eight Teton Exchange Wells in the future to meet demands during periods of low water. Streamflows above Cross Cut Diversion Dam would continue at historical levels. As shown in Section 3.2.2, the highest level of operation of the existing and potential wells would decrease the river flow at Lewisville about 34 cfs, which is less than 3 percent of the average flow in the river during a low water year. This alternative would not cause an adverse impact to river habitat or the fishery in the action area.

3.11 Wildlife

3.11.1 Affected Environment

Common mammals found throughout the upper Snake River basin include mountain cottontails, black-tailed jackrabbits, and white-tailed jackrabbits. Three bat species are also found in the basin; the Townsend’s big-eared bat is a State of Idaho species of special concern. Big game in the basin include moose, pronghorn, elk, and mule deer. Table 17 lists possible game species within the action area.

Area waterfowl and shorebirds include green-winged teals, northern pintails, American widgeons, cinnamon teals, northern shovelers, blue-winged teals, mallard ducks, gadwalls, redheads, canvasbacks, Canadian geese, buffleheads, common mergansers, ruddy ducks and whooping cranes. The trumpeter swan, bald eagle, ferruginous hawk, peregrine falcon, sharp-tailed grouse, long-billed curlew, and black tern are Idaho species of special concern found within the action area. The western toad, an Idaho and Federal species of concern, is also found within the action area.

3.11.2 Environmental Consequences

Alternative A – No Action

There would be no change in distribution or abundance of wildlife or habitat within the action area. Streamflows would be maintained at historical levels. FMID would continue operating and maintaining the facilities without change.

Table 17. Game species that may occur in the action area.

Scientific Name	Common Name
Alces alces	moose
Antilocarpa americana	pronghorn
Cervus elaphus	elk
Odocoileus hemionus	mule deer
Syvilagus nuttallii	mountain cottontail
Lepus californicus	black-tailed jackrabbit
Lepus townsendii	white-tailed jackrabbit
Zenaida macroura	mourning dove
Centrocerous urophasianus	sage grouse
Perdix perdix	gray partridge
Phasianus colchicus	ring-necked pheasant
Tympanuchus phasianellus	sharp-tailed grouse
Anas crecca	green-winged teal

Scientific Name	Common Name
Anas acuta	northern pintail
Anas americana	American wigeon
Anas cyanoptera	cinnamon teal
Anas clypeata	northern shoveler
Anas discors	blue-winged teal
Anas platyrhynchos	mallard duck
Anas strepera	gadwall
Aytha americana	redhead
Aytha valisineria	canvasback
Branta canadensis	Canada goose
Bucephala albeola	bufflehead
Mergus merganser	common merganser
Oxyura jamaicensis	ruddy duck

Alternative B – Title Transfer

The proposed additional wells would provide localized increases in Henrys Fork flow and help sustain farmland habitat for birds and small mammals. Well pumping during low water periods would increase or sustain habitat in areas directly affected by the supplemental flows such as Cartier Slough.

3.12 Endangered Species

3.12.1 Affected Environment

Reclamation first requested a list of species occurring in or near the action area from USFWS and NOAA Fisheries on December 6, 2001. Table 18 shows the current USFWS Federally listed species that reside in, migrate through, or may be affected by operations in the action area. Table 19 shows other State of Idaho species of concern that may occur in the action area.

Table 18. USFWS listed species that may occur in the action area.

Scientific Name	Common Name	Status
Haliaeetus leucocephalus	Bald eagle	Threatened
Spiranthes diluvialis	Ute ladies' tresses	Threatened
Valvata utahensis	Utah Valvata	Endangered

Table 19. State of Idaho species of concern that may occur in the action area.

Scientific Name	Common Name	Status
Bufo boreas	Western toad	Species of Concern
Cygnus buccinator	Trumpeter swan	Species of Concern
Buteo regalis	Ferruginous hawk	Watch Species
Tympanuchus phasianellus	Sharp-tailed grouse	Species of Concern
Numenius americanus	Long-billed curlew	Species of Concern
Myotis yumanensis	Yuma myotis	Watch Species
Myotis ciliolabrum	Western small-footed myotis	Watch Species
Corynorhinus townsendii	Townsend's big-eared bat	Species of Concern

A biological opinion from USFWS (1999) found that continued operation and maintenance of Reclamation's Snake River Projects upstream from Lower Granite Dam Reservoir will not adversely affect bald eagles and may affect but is not likely jeopardize the continued existence of Ute ladies'-tresses.

No listed anadromous fish exist in the FMID service area. However, NOAA Fisheries (1999) has indicated in a past biological opinion that streamflow depletions in the upper Snake River could affect Federally listed anadromous fish that occur in the lower Snake River and in the Columbia River. In reality, numerous appropriators between the FMID service area and Twin Falls would be legally entitled to that water. Reclamation initiated contact with NOAA Fisheries on December 6, 2001, regarding potential effects of title transfer on anadromous fish.

A biological opinion from NOAA Fisheries (1999) found that continued operation and maintenance of Reclamation's Snake River Projects upstream from Lower Granite Dam Reservoir were not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. This document included recommendations related to the surety of sufficient salmon augmentation water being delivered. Augmentation water pertained only to storage space in the reservoirs and contracts for that space.

Table 20. NOAA Fisheries listed species that may be affected by the proposed action.

Scientific Name	Common Name	Status
Oncorhynchus nerka	Snake River Sockeye Salmon	Endangered
Oncorhynchus tshawytscha	Snake River Fall Chinook Salmon	Threatened
Oncorhynchus tshawytscha	Snake River Spring/Summer Chinook Salmon	Threatened
Oncorhynchus tshawytscha	Lower Columbia River Chinook Salmon	Threatened
Oncorhynchus tshawytscha	Upper Willamette River Chinook Salmon	Threatened
Oncorhynchus tshawytscha	Upper Columbia River Spring-run Chinook Salmon	Endangered
Oncorhynchus keta	Columbia River Chum Salmon	Threatened
Oncorhynchus mykiss	Upper Columbia River Steelhead	Endangered
Oncorhynchus mykiss	Snake River Basin Steelhead	Threatened
Oncorhynchus mykiss	Lower Columbia River Steelhead	Threatened
Oncorhynchus mykiss	Upper Willamette River Steelhead	Threatened
Oncorhynchus mykiss	Middle Columbia River Steelhead	Threatened

3.12.2 Environmental Consequences

Alternative A – No Action

There would be no change in distribution or abundance of any listed species within or near the action area. Streamflows would be maintained at levels similar to the period of record. FMID would continue operating and maintaining the project without change, and both FMID and Reclamation would remain responsible to comply with ESA requirements. Thus, this alternative would have no effect on any listed species.

Alternative B – Title Transfer

As shown in Section 3.2.2, the highest level of operation of the existing and potential wells would deplete the river flow at Lewisville about 34 cfs, which is less than 3 percent of the average river flow during a low water year. This quantity of water is measurable within the hydrologic model but is not measurable within the river system. Further, 34 cfs, or 3 percent of the average river flow during a low water year, would likely have no measurable biological effect on listed species associated with the river or District lands. Therefore, Reclamation has determined this alternative would have no effect on USFWS listed species.

Section 3.2.2 also describes the flow reductions that may occur on the Snake River at Milner gage. In almost all of the months in the modeled period from 1980 to 2000 (238 of the 252 months), there was no reduction in flow at this gage. In 8 of these months, the flow reduction at Milner was less than 10 cfs; in 4 of the months, the flow reduction was from 11 to 20 cfs. Only twice did the flow reductions elevate to the higher levels of 121 and 533 cfs; during the largest modeled flow reduction, inflows at Brownlee Reservoir would have been reduced only 2 percent, and outflows from Lower Granite Dam would have been reduced only 0.5 percent.

As the *Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act* (NOAA Fisheries and USFWS 1998) notes, a "may affect but not likely to adversely affect" determination is warranted when the proposed action may affect listed species, but the agency determines these effects on listed species will be discountable, insignificant, or completely beneficial. In this case, Reclamation views the modeled 2 percent reduction in flow in 0.4 percent of months as an insignificant effect that does not reach the scale where take occurs. Therefore, Reclamation has determined this alternative may affect but would not likely adversely affect NOAA Fisheries listed species in the Snake and Columbia Rivers.

Because the associated facilities would leave Federal ownership, Section 7 of the ESA would only apply to new activities at the project that require Federal approval or that have Federal funding. Section 9 of the ESA would continue to prohibit the taking of endangered species.

3.13 Hazardous Materials and Waste

Reclamation completed a Hazardous Materials and Wastes Survey on September 16, 2003. There are no hazardous materials in the action area. None of the alternatives would have any affect on hazardous materials. Appendix D contains the complete report.

3.14 Cultural Resources

Cultural resources are historic, archaeological, architectural, and traditional cultural properties that reflect the national heritage. Significant cultural resources are referred to as "historic properties." Federal law and regulation define "historic properties" to include prehistoric and historic sites, buildings, structures, districts, and objects that are included in or eligible for inclusion in the National Register of Historic Places (National Register). "Traditional Cultural Properties" (TCPs) are locations that have special heritage value to contemporary communities (often American Indian groups). This special value is because the TCPs are associated with the historical practices or beliefs needed to maintain a culture's identity and are eligible to the National Register.

Federal laws and regulations require agencies both to identify cultural resources that will be affected by a Federal action and to address the effects of the agency's actions on properties eligible for or on the National Register. The National Historic Preservation Act (NHPA) is the principal law defining these management responsibilities. Section 106 of NHPA and related regulations (found in 36 CFR Part 800) define a phased data collection and consultation process to implement the agency's responsibilities. The process requires an agency to first identify cultural resources in the impact area; then, in consultation with the Idaho State Historic Preservation Office (SHPO), it must evaluate their eligibility for listing on the National Register. If eligible sites are present, then further consultation is required to determine how they would be affected by the action and appropriate means to treat adverse effects.

3.14.1 Affected Environment

In the fall of 2002, Sagebrush Consultants conducted a Class III cultural resources survey of the action area. The survey included the Cross Cut Diversion Dam, the Cross Cut Canal's two outlet works, the full length of the Cross Cut Canal, the Last Chance Canal, and the five well locations. This survey identified a total of 53 cultural resource properties and 7 isolated finds in the action area. These cultural resource properties included both features that are integral parts of or directly associated with the function of the canal, such as concrete check structures and drops, and features that are associated with the canal but are not an integral part of its function, such as metal flumes, bridges, siphons, and basalt-lined drainage inlets.

Appendix E contains related correspondence with the SHPO, and Appendix F contains the Memorandum of Agreement with the SHPO.

Using criteria set forth in 36 CFR Part 60.4, recommendations regarding site eligibility to the National Register of Historic Places were made for each site. Of the 53 recorded sites, 23 have been recommended eligible to the National Register. The basis for the National Register recommendations relates to their design and construction as well as their historic role in the development of agriculture in the upper Snake River basin.

In addition to making use of the National Register criteria, recommendations regarding site eligibility to the National Register were also based upon the historic integrity of the site. Sites not retaining their historic integrity, or sites not meeting the National Register criteria, or both, were recommended to be not eligible for listing on the National Register. Sites that were found to retain their integrity and to meet one or more of the four criteria set forth in 36 CFR Part 60.4 were recommended eligible for listing on the National Register.

The action area for this title transfer is known to have been the aboriginal territory of the Fort Hall Shoshone-Bannock Tribes. Reclamation has communicated with the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation about the proposed FMID title transfer. The Tribes responded by pointing out that water is a valuable cultural resource to the Tribes and is considered a traditional cultural property due to its sacredness. However, the Tribes have not indicated specific locations within the area of the title transfer known to contain TCPs or sensitive areas harboring such sites. There is no indication that the Tribes currently use the lands involved in the title transfer for traditional cultural or religious purposes. Much of the land associated with the title transfer has been transformed in the past century due to agricultural development and construction and maintenance of associated irrigation systems.

3.14.2 Environmental Consequences

Alternative A – No Action

There would be no effect on historic properties. Reclamation would continue to consult with the SHPO for Federal undertakings and would work with the SHPO to mitigate any adverse effects on historic properties.

Alternative B – Title Transfer

If the title were transferred to FMID, application of the NHPA to potential future actions by FMID would be limited to activities involving funds or support from Federal agencies. Under those circumstances, Section 106 compliance would be the responsibility of the participating Federal agency. Alternatively, protection of archaeological resources under the Archaeological Resources Protection Act (ARPA) would cease if the title was transferred since this law is linked with Federal ownership.

Under 36 CFR Part 800, the transfer of an historic property out of Federal ownership without protection is an adverse effect. The Class III cultural resources survey conducted for the proposed title transfer identified 23 historic properties; Reclamation has completed Section 106 consultations with the SHPO over National Register eligibility, effects, and mitigation of adverse effects regarding the 23 historic properties.

As described in Appendix F, Reclamation and the Idaho SHPO agreed that Reclamation would mitigate the adverse effect on historic property to meet Reclamation's responsibilities under Section 106 of the NHPA. The June 25, 2003, letter from the Idaho SHPO to Reclamation asserts that Reclamation's submissions of site records, final survey report, and photographs meet the documentation requirements for mitigation.

If the additional five to eight exchange wells are located on lands included in the title transfer, there would be no effect to historic properties other than those already addressed. If FMID privately pursues the wells' construction on non-Federal lands without any Federal funding or assistance, there could be an effect on cultural properties; however, Section 106 of the NHPA would not then apply. If Federal lands or money are involved in the construction, the lead Federal agency would be required to carry out Section 106 consultations over identification of historic properties, effects to historic properties, and mitigation of historic properties.

3.15 Sacred Sites

Federal responsibility for Indian sacred sites is defined in Executive Order 13007. The executive order defines Indian sacred sites as specific, discrete, narrowly delineated locations on Federal land identified by Indian tribes or knowledgeable practitioners as sacred by virtue of their religious significance to, or ceremonial use by, an Indian religion.

3.15.1 Affected Environment

Reclamation is not aware of any Indian sacred sites on the Federal lands under consideration for the title transfer. The Tribes have not indicated specific locations within the area of the title transfer known to contain sacred sites or sensitive areas harboring such sites, and there is no indication that these lands are used for Tribal religious purposes. Due to surface modifications and modern encroachments that have taken place with respect to the Cross Cut Diversion Dam and Cross Cut Canal, Reclamation believes it is very unlikely that Indian sacred sites would be present.

3.15.2 Environmental Consequences

Alternative A – No Action

FMID would continue operating and maintaining the project without change. Within the guidelines established by the executive order, Reclamation would continue to ensure that its actions do not adversely affect Indian sacred sites, if such sites are present, to the extent practicable, and that access to and ceremonial use of Indian sacred sites is accommodated.

Alternative B – Title Transfer

If Indian sacred sites were present on any of the fee title rights-of-way included in the transfer, then Indian religious practitioners would lose the right of access to those locations for religious purposes unless FMID granted permission for access. FMID has no plans to deny access to Indian sacred sites, if present.

Since the right of access under Executive Order 13007 is provided only for Federal fee lands, there would be no loss of the right to access for those easement lands or areas where Reclamation simply holds a non-fee interest. The executive order does not authorize mitigation for loss of access to or damage to Indian sacred sites. Therefore, if such sites were present on fee title lands included in the transfer, no mitigation would occur as part of the undertaking.

3.16 Indian Trust Assets

3.16.1 Affected Environment

Indian Trust Assets (ITA) are legal interests in property held in trust by the United States for Indian Tribes or individuals. The Secretary, acting as the trustee, holds many assets in trust for Indian Tribes or Indian individuals. Examples of things that may be trust assets are lands, minerals, hunting and fishing rights, and water rights. While most ITAs are on-reservation, trust assets may also be off-reservation.

The United States has an Indian trust responsibility to protect and maintain rights reserved by or granted to Indian Tribes or Indian individuals by treaties, statutes, and executive orders. These are sometimes further interpreted through court decisions and regulations.

The Shoshone-Bannock Tribes, a Federally-recognized Tribe located at the Fort Hall Indian Reservation in southeastern Idaho, have trust assets both on-reservation and off-reservation. The Fort Bridger Treaty was signed and agreed to by the Bannock and Shoshone headman on July 3, 1868. The treaty states in Article 4, that members of the Shoshone-Bannock Tribes “shall have the right to hunt on the unoccupied lands of the United States.” The Tribes believe their right extends to the right to fish. The Fort Bridger Treaty for the Shoshone-Bannock has been interpreted in the case of State of Idaho v. Tinno, an off-reservation fishing case in Idaho. The Idaho Supreme Court determined that the Shoshone word for “hunt” also included fishing. Under Tinno, the Court affirmed the Tribal Members’ right to take fish off-reservation pursuant to the Fort Bridger Treaty (Shoshone-Bannock Tribes 1994). The Federal lands for this proposed project lie within the ceded territory of the Shoshone-Bannock Tribes.

The Nez Perce Tribe is a Federally-recognized Tribe of the Nez Perce Reservation in northern Idaho. The United States and the Tribe entered into three treaties (Treaty of 1855, Treaty of 1863, and Treaty of 1868) and one agreement (Agreement of 1893). The rights of the Nez Perce Tribe include the right to hunt, gather, and graze livestock on open and unclaimed lands, and the right to fish in all usual and accustomed places (Nez Perce Tribe 1995).

The Northwestern Band of the Shoshone Indians, a Federally-recognized Tribe without a reservation, possess treaty-protected hunting and fishing rights that may be exercised on unoccupied lands within the area acquired by the United States pursuant to the Fort Bridger Treaty of 1868. No opinion is expressed as to which areas maybe regarded as “unoccupied lands.”

Other Federally-recognized Tribes do not have off-reservation ITAs but may have cultural and religious interests in the area. These interests may be protected under historic preservation laws and the Native American Graves Protection and Repatriation Act (NAGPRA). Sections 3.14 and 3.15 discuss other Tribal interests.

3.16.2 Environmental Consequences

Alternative A – No Action

Indian Trust Assets that may exist on these Federal lands would be the right to hunt and the right to fish. Because the United States would retain title, there would be no effect on Indian Trust Assets.

Alternative B – Title Transfer

Indian Trust Assets that may exist on these Federal lands would be the right to hunt and the right to fish. Since the United States would transfer lands out of Federal ownership, the right to hunt or the right to fish would no longer apply on the affected lands.

Reclamation has communicated with the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation about the proposed title transfer. The response of the Fort Hall Business Council and staff members is that any reduction of Federal lands would affect their Indian Trust Assets. The right to hunt applies on Federal lands; land transferred out of Federal ownership would diminish the land base on which they would have an opportunity to hunt.

3.17 Cumulative Impacts of the Proposed Alternative

The Drought Management Plan and the planning process described in Sections 2.2.5 and 4.1.3 would likely improve water management practices in the Henrys Fork area. Because FMID proposes to work cooperatively with interested stakeholders, potential management changes such as flow shaping during low water years would likely provide benefits to fisheries and recreation. However, without more definition as to what actions would need to be taken to provide for benefits to the ecological, social, and economical aspects of water management in the watershed, it is not possible to state specific cumulative effects that could occur. It is not currently possible to determine if the proposed alternative would trigger any additional Federal action.

The proposed hydroelectric powerplant that may be constructed on the Cross Cut Diversion Dam is not part of this title transfer process. However, the Federal Council on Environmental Quality (CEQ) considers it a “direct action” because it occurs in the same location and relative time frame as the Proposed Action. The hydro project could affect regional socioeconomics, recreational use around the diversion dam, streamflows, and downstream water quality. Because the Proposed Action is primarily an administrative action (as opposed to a physical alteration of the environment), there are no measurable direct cumulative effects. The powerplant could be constructed regardless of ownership of the diversion. The hydro project would require a FERC license for construction and operation. This licensing process is a Federal action; full compliance with environmental regulations would be required.

Actions taking place later in time and farther removed from the Proposed Action include the reconstruction of the spillway and drain system at Grassy Lake Dam. The Finding of No Significant Impact for the Grassy Lake Dam, Safety of Dams Modification Report environmental assessment was signed in October 2002 (USBR 2002). This Reclamation Safety of Dams Program activity is scheduled for

2004. Construction of a new spillway and drain system will occur on the dam embankment and all related activities will be confined to previously disturbed areas and existing roadways. Again, impacts associated with this activity combined with the Proposed Action are not measurable. The Safety of Dam rehabilitation program will occur regardless of ownership of the facilities to be transferred. The various alternatives being considered for Grassy Lake Dam are not a result of the proposed changed ownership.

In the recent past, FMID requested title to all its facilities and water rights. The District has since modified the request to include only the facilities listed in the Conveyance Act. Implementing the Proposed Action neither aids nor restricts the future transfer of additional facilities.