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V *Future Water Use Opportunities*

As with all chapters in this final plan report, explicit lists of references are not provided. Instead, all references to report, documents, maps, and personal communications are maintained in the Technical Memoranda that were prepared during the current planning process. Should the reader desire to review a complete list of references for the information presented in this chapter, the following memoranda should be consulted:

- Criteria for Screening Future Water Use Opportunities
- Water Conservation
- Institutional Constraints

A. **Review of Previous Planning Studies**

Over the years many planning studies have been undertaken for Wyoming's Green River Basin. A summary outline of those most dedicated to additional development of water resources includes:

- Person, H.T., Lee, C.A., and Moir, C.D., Workers on WPA Project 65_83_107, February 1938, "Report on Water Resources of Colorado River Basin in Wyoming (Green River and Little Snake River)," Wyoming State Engineer's Office.

Focus: This was probably the first comprehensive hydrologic study of the Green and Little Snake River Basins in Wyoming. The report evaluated climate, runoff, irrigated lands, and future needs and studied 16 potential irrigation projects and 36 reservoir sites. A recommended plan of development was proposed which included three groups of priorities; those projects needed immediately, those that were desirable but needed further study, and those that could be deferred. The concept of transbasin diversion of water was discussed, but caution was advised in taking water that could ultimately be needed in-basin.

- J. T. Banner & Associates, Inc., July 1969, "Report on Preliminary Reconnaissance of Potential Reservoirs: Green River Basin, Wyoming," Department of Economic Planning and Development, and Wyoming Water Planning Program, State Engineer's Office.

Focus: Discussed physical studies of Upper and Lower Kendall, New Fork Narrows, and Lower Green Reservoir sites. Did not review needs or depletions, but relied upon the Wyoming Water Planning Program for those details.

- Wyoming Water Planning Program, September 1970, "Water and Related Land Resources of the Green River Basin, Wyoming," Wyoming Water Planning Program Report No. 3, Wyoming State Engineer's Office.

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Focus: The predecessor plan to the current study, this document evaluated water resources of the Basin and proposed alternative plans to meet future municipal, industrial, agricultural, recreation and environmental needs for water.

- United States Bureau of Reclamation Region 4, May 1972, “Alternative Plans for Water Resource Developments: Green River Basin, Wyoming,” United States Department of the Interior.

Focus: Another broad planning document, this report focused primarily on the Kendall, New Fork, Boulder Lake and Lower Green Reservoir sites. The study also evaluated delivery of significant amounts of water for industrial use to Baggs Junction and Point of Rocks. Out-of-basin diversions to the North Platte River drainage were included.

- Tipton and Kalmbach, Inc., October 1972, “Engineering Report on the Development of Presently Unused Water Supplies of the Green River Basin in Wyoming: With Particular Reference to the Feasibility of Providing Additional Reservoir Storage,” Wyoming Department of Economic Planning and Development.

Focus: This relatively complete planning study used depletion estimates from the WWPP Report No. 3 (above) for agricultural uses, although the report looked primarily at providing water for industrial use. At the time this report was prepared, significant industrial growth in the lower basin was anticipated. Storage evaluation was limited to the Plains and Lower Green sites. This report gives a relatively strong discussion of the effects of such development on Wyoming’s Compact allotments.

- Hanson, Michael L., Buhel R. Heckathorn and Robert A. Rathjen, April 1978, “Environmental Base Working Paper,” Green River Basin Wyoming, Type IV Study, Based on a Cooperative Survey by the State of Wyoming – Wyoming State Engineer and the U.S. Department of Agriculture.

Focus: One of a series of working papers under the Type IV umbrella, this document presents a descriptive overview of environmental and recreational characteristics and needs in the Basin. Significant discussion is devoted to the fishing resource including relative “use vs. capacity” analyses.

- Economics, Statistics, and Cooperatives Service, Forest Service, and Soil Conservation Service, September 1978, “Green River Basin, Wyoming: Cooperative River Basin Study,” United States Department of Agriculture and State of Wyoming.

Focus: An overall planning study, this report is among the first to discuss in detail the recreational aspects of water development, and acknowledged the already-developing problem of limited stream fishing access. In addition to traditional water development via storage, this was also one of the first studies

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found to mention conservation of water by evaluating conveyance system efficiencies.

- ARIX, January 1983, “Pre-Feasibility Study of the Upper Green River Drainage Potential Reservoir Sites,” Wyoming Water Development Commission.

***Focus:** This report was confined to evaluation of supplemental irrigation supplies at eight small reservoir sites in the northwestern part of the Basin. Relatively complete analysis is provided including geotechnical evaluation of the dam sites, storable flow estimation (with water rights considerations) and construction cost estimates.*

- Western Water Consultants, Inc., November 1991, “Little Snake River Basin Planning Study, Level I Feasibility Study,” Wyoming Water Development Commission.

***Focus:** This broad-based investigation evaluated 20 potential reservoir sites within the Little Snake River Basin and was preceded by several related studies. Most notably, previous work had focused upon Sandstone Dam and the City of Cheyenne’s Stage I and Stage II (and also Stage III, preliminarily) studies. Further aspects of the 1991 work included studies of irrigation structure rehabilitation, evaluation of the West Side and First Mesa canals, and water supply for the Town of Baggs.*

For the current planning effort, these documents were reviewed to determine the extent to which previously identified projects could contribute to meeting current needs. While not an all-inclusive list of planning efforts in the Basin, the above documents were found most valuable in summarizing the extent and history of projects, storage sites, and other features suitable for analysis against newly minted demands.

B. Review of Future Basin Demands

To guide the process of evaluating projects to meet future needs and develop water under Wyoming’s Compact entitlements, it was important to compare projected demands (and locations of those demands) to estimated water availability. In this process, several facts became clear. To summarize, the following study results lent direction to determination of future water use opportunities:

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- Industrial growth projections in the Basin, while significant, fall below projections made in the planning studies of the 1970s. Projected growth in the iron and power generation industries in the lower basin (not including the Ham's Fork Naughton plant) can be served from storage space in Fontenelle Reservoir even under the high growth scenario. The Naughton plant holds unbuilt enlargement rights for Viva Naughton reservoir.
- Municipal demands from surface water are generally well below existing water rights held by the various towns and cities. The Rock Springs/Green River and Pinedale service areas, for example, have recently upgraded their supplies to meet significant future growth.
- No unmet current demands exist for industrial or municipal uses.

Considering consumptive uses, only agriculture currently sees shortages to existing needs. Predictably, these shortages are in areas not already served by storage to any significant extent. Unfortunately, the main reason these shortages exist is that agriculture is the economic sector least able to afford the high cost of storage construction, especially those operators focused upon raising forage instead of cash crops, to provide late season supplemental supplies. A situation is created where shortages are faced by users who cannot by themselves shoulder the entire financial burden of the work that would solve their problem, even when current funding programs can assist with large portions of the capital costs covered by grants.

Considering non-consumptive uses, such as recreational and some environmental applications (e.g. instream flows), funding is also a concern. In recent years, mitigation associated with reservoir construction has been used to replace or enhance environmental values with funding provided by others. There also exists the notion that environmental and recreational needs are not always compatible with storage. Where stream access for fishing is in short supply, the inundation of stream habitat by storage only exacerbates the problem. Where instream flows are desirable, the hydrology of the natural stream system still cannot put water in the river in a dry year unless those flows are tied to storage. Compounding the conflict, where run-of-the-river hydrology is favorable for aquatic and riparian habitats (and recreation pursuits), the reservation of flows for this purpose, while valuable, may preclude the use of this water for other consumptive needs allowed under the governing compacts. In fact, Wyoming's Instream Flow law requires that instream flow use "shall not result in more water leaving the State than the amount of water that is allocated by interstate compact or United States Supreme Court Decree for downstream uses outside of Wyoming."

Therefore, the general direction taken for recommending future use opportunities focused largely on providing supplemental irrigation supplies. However, the effects of the various projects on environmental and recreational values are very important and can result in otherwise similar projects being viewed quite differently. Where multiple uses are available, these are also investigated.

C. Compact Considerations

One possibility for the ultimate disposition of water under the compacts is the sale or lease of water to downstream out-of-state interests. This is an unpopular result largely because of the perceived irreversibility of the process. Once sold or leased, such water may never be retrievable for Wyoming should future demands need it. Additionally, under current state law, the sale of water outside the State is disallowed without legislative action. Any move in this direction would therefore require state legislature approval and would also have to be approved by the Upper Colorado River Commission (the coalition of upper basin states established by the Upper Colorado River Basin Compact).

In large part, the concept of sale or lease of Wyoming's unused share of Compact-allocated water is an understandable expression of the feeling that if not used or planned to be used, Wyoming may somehow lose its undeveloped water to thirsty downstream states. The compacts wisely anticipated such a situation, and the Law of the River includes language protecting Wyoming's future uses:

- Colorado River Compact, Article III (a):

*There is hereby apportioned from the Colorado River system **in perpetuity** to the upper basin and to the lower basin the exclusive beneficial use of seven million five hundred thousand (7,500,000) acre-feet of water per annum, which shall include all water necessary **for the supply of any rights which may not exist.***
(emphasis added)

- Upper Colorado River Basin Compact, Article XVI:

*The failure of any state to use the water, or any part thereof, the use of which is apportioned to it under the terms of this Compact, **shall not constitute a relinquishment of the right** to such use to the lower basin or to any other state, **nor shall it constitute a forfeiture or abandonment of the right** to such use.*
(emphasis added)

There exists additional language in the junior Compact that protects states' rights to develop allocated water in accordance with any particular state's power of regulation, in effect allowing out-of-basin (but in-state) transfers of water:

- Upper Colorado River Basin Compact, Article XV (b):

The provisions of this Compact shall not apply to or interfere with the right or power of any signatory state to regulate within its boundaries the appropriation, use and control of water, the consumptive use of which is apportioned and available to such state by this Compact.

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Because both compacts contain language that preclude their termination without the consent of *all* signatory states, Wyoming alone can keep the above language in force as long as it remains in the State's best interest.

D. Long List of Water Supply Opportunities

From the planning studies previously listed, and from newer potential project ideas provided by Basin Advisory Group (BAG) members, over 80 projects were reviewed for potential application to current and future needs. Items such as groundwater use and conservation are not evaluated in the long list but do show up in the short list to follow.

Screening of the initial list resulted in the removal of certain projects from further consideration. Examples of these include most projects that exist on what now are dedicated Wilderness lands. While Wilderness boundaries have been known to be moved to allow project construction, such an action is singularly rare and in most cases creates a fatal flaw for that feature. The one project involving Wilderness boundary issues that made it past the initial cut was the BAG-suggested project involving the enlargement of Green River Lakes. This project was kept alive in the process for several reasons, notwithstanding the fact that the Wilderness issue could render it unbuildable: first, its location could serve many users currently experiencing agricultural shortages; second, review of earlier studies did not indicate that it had been studied in depth as yet; and finally, while there are obvious environmental impacts associated with construction of the project, the benefits associated with augmented late season flows have not been evaluated.

Another example of a previous project that did not pass initial muster is the oft-discussed Sandstone Dam in the Little Snake River Basin. The subject of considerable study in the 1980s, this project has been effectively replaced with the imminent construction of High Savery Dam in the same drainage.

From the long list, projects of minimal size were also deleted. Generally, if a project stored or depleted 1000 acre-feet or less, it was not considered further. This decision is not intended to reflect on the importance of small projects or to diminish their need. Instead, it is simply a matter of keeping the planning process from becoming unwieldy having to consider a multitude of smaller projects. If previous studies indicated a project to be uneconomical or undesirable, this also served as impetus to delete the project from short list consideration. Projects appearing in very early studies that no longer are attractive due to location, benefits, or because other nearby sites have garnered recent favorability have also been deleted.

The long list is shown in Table V-1. A map showing the locations of these features is given as Figure V-1 (p.V-21). Because the forecasted need for agricultural water (Chapter IV) describes a maximum of 50,000 acre-feet of storage development, no grand schemes involving multiple reservoirs are put forth. Instead, individual projects are evaluated on their own merits, and combinations thereof can be evaluated in further level I or level II studies at the pleasure of project sponsors. Where projects have been

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evaluated in combination by previous authors, such combinations are described in the technical memorandum on screening criteria.

Table V-1 Long List of Potential Reservoir Sites

PID**	NAME	SIZE (AF)	SOURCE	SECTION	TOWNSHIP	RANGE	USE
1	Fish Creek	1,400	Fish Creek	26	30	115	irr
2	Fontenelle No. 1	2,500	Fontenelle Creek	4	24	115	irr
3	Fontenelle Creek	15,950	Fontenelle Creek	30	26	115	irr
4	Green River Lakes Enl. Green River Canal	250,000	Green River	2	39	109	irr, pow
5	Supplemental Supply Project	Enlargement Only	Green River	4	33	110	irr
6	Kendall	100,000	Green River	33	36	111	ind, mun, irr
7	LaBarge Meadows	4,800	LaBarge Creek	8	29	116	irr
8	Lower Green Reservoir	450,000	Green River	25	19	108	irr
9	Lower Kendall	100,000	Green River	4	35	111	irr, rec, wl, pow
10	McNinch Wash	5,600	North Piney Creek	10	30	113	irr
11	Middle Piney Lake	4,200	Middle Piney Creek	8	30	115	irr
12	North Piney Cr	5,600	North Piney Creek	24	31	115	irr
13	Plains Reservoir	480,000	Green River	8	23	109	irr, ind, mun, wl
14	Sand Hill	14,100	Middle Piney Creek	36	30	113	irr
15	Seedskadee Project	57,000 ac	Green River		23	111	irr
16	Sixty-Seven Enl.	5,600	North Piney Creek	17	30	112	irr
17	Snider Basin	4,300	South Piney Creek	11	29	115	irr
18	South Cottonwood	6,000	Cottonwood Creek	12	32	115	irr
19	Warren Bridge Res	33,400	Green River	4	35	111	irr
20	Cottonwood No. 1*	1,465	S Cottonwood Cr	16	32	115	irr
21	Fogarty Creek*	700	Dry Piney Creek	24	28	114	irr
22	Horse Creek*	36,660	Horse Creek	7	34	114	irr
23	LaBarge Reservoir*	4,030	LaBarge Creek	12	29	116	irr
24	Middle Beaver Creek*	5,905	Middle Beaver Creek	29	36	112	irr
25	North Cottonwood Creek*	10,805	North Cottonwood Creek	24	33	115	irr
26	South Beaver Creek*	5,905	South Beaver Creek	24	35	114	irr
27	South Cottonwood Creek*	10,805	South Cottonwood Creek	11	32	115	irr
28	South Horse Creek*	36,660	South Horse Creek	30	34	114	irr
29	Straight Creek*	4,815	Straight Creek	4	30	115	irr
30	East Fork	2,100	East Fork River	10	31	106	irr
31	East Fork # 1	4,735	East Fork River	4	31	105	irr

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PID**	NAME	SIZE (AF)	SOURCE	SECTION	TOWNSHIP	RANGE	USE
32	East Fork Gorge	unknown	East Fork River	12	31	106	irr
33	East Side Project	22,000 ac	East Fork River		30	106	irr
34	Burnt Lake	15,570	Fall Creek	31	34	107	irr
35	Halfmoon Enl.	95,000	Pole Creek	15	34	108	irr, pow
36	New Fork Narrows	100,000	New Fork River	14	30	110	irr, wl, rec
37	Silver Creek	17,740	Silver Creek	11	32	107	irr
38	Dad's Lake*	740	Dad's Creek	18	32	104	irr
39	East Fork River*	46,070	East Fork River	7	31	105	irr
40	Feltner*	1,280	Pole Creek	12	34	108	irr
41	Mack No. 1*	766	Skeleton Draw	5	30	108	irr
42	Marm's Lake*	562	Dad's Creek	7	32	104	irr
43	New Fork Lake Enl.*	45,937	New Fork River	15	36	110	irr, pow
44	Pyramid*	636	Pyramid Creek	17	33	104	irr
45	Eden No. 2 (Sander's Ranch)	60,000	Big Sandy Creek	17	30	104	irr, ind
46	Eden Reservoir Rehabilitation	6,300	Little Sandy River	17	26	105	irr
47	Eden Valley Improvements	3,100 ac	East Fork/Big Sandy		25	106	irr
48	Meeks Cabin Dam Enl.	unknown	Blacks Fork	11	12	117	irr
49	Stateline Enl.	unknown	E Smiths Fork Cr		Utah		irr
50	BB*	650	Blacks Fork	18	18	112	irr
51	Deer Lake*	1,000	E Smiths Fork Cr	29	13	115	irr
52	Hams Fork*	215,475	Hams Fork	12	21	116	irr, mun, ind
53	McWinn*	800	Hertley Hollow Cr.	16	22	117	irr
54	Uinta Canal No. 3*	16,790	Uinta Can. Blacks Fk	34	17	114	irr
55	Big Gulch	10,000	Big Gulch	19	13	88	irr
56	Dutch Joe Creek	14,000	Dutch Joe Creek	35	13	90	irr
57	Grieve Res.	4,860	Grieve Res.	5	12	88	irr
58	Lower Willow Creek, Wy	7,000	Lower Willow Creek, Wy	8	12	90	irr
59	Pot Hook, CO	20,000	Pot Hook, CO		Colo rado		irr
60	Upper Willow Creek, CO	10,000	Upper Willow Creek, CO		Colo rado		irr
61	Cottonwood Creek*	2,500	Cottonwood Creek	34	13	90	irr
62	East Willow*	12,000	East Willow, CO		Colorado		irr
63	Loco Creek*	3,000	Loco Creek	34	14	89	irr
64	Lower Battle Creek*	20,000	Lower Battle Creek	13	12	88	irr
65	Middle Battle Creek*	20,000	Middle Battle Creek	7	12	87	irr
66	Muddy Creek*	12,000	Muddy Creek	9	13	91	irr
67	Negro Creek*	1,000	Negro Creek	16	13	89	irr

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PID**	NAME	SIZE (AF)	SOURCE	SECTION	TOWNSHIP	RANGE	USE
68	Old Upper Savery Cr*	20,000	Old Upper Savery Cr	36	15	89	irr
69	Roaring Fork*	5,000	Roaring Fork	28	13	86	irr
70	Sandstone*	20,000	Sandstone	2	13	89	irr
71	South Fork Little Snake*	17,000	South Fork Little Snake, CO		Colo rado		irr
72	Upper Battle Creek*	20,000	Upper Battle Creek	20	13	87	irr
73	Upper Slater*	20,000	Upper Slater, CO		Colo rado		irr
74	Big Basin Antelope*	107,680	Henry's Fork		Utah		irr
75	Vermilion/Red Creek Basin	unknown	Vermilion/Red Creek	19	13	101	irr

* Project deleted from short list consideration

* PID = point identification number on Figure V-1 (p.V-21)

E. Criteria for Ranking Future Water Use Opportunities

Based upon comments received during Basin Advisory Group (BAG) meetings, review of previously published criteria and questionnaire results, and the Scope of Services, the following procedure for screening opportunities for future water use was developed:

- From the notes and recordings of BAG meetings it was obvious that at least some BAG members would like to establish a set of priorities that are more general than project-specific criteria. For instance, the view that existing uses and economic dependencies should have first priority with respect to future plans seemed to enjoy general acceptance.
- A nested set of criteria were developed that take into consideration the comments of BAG members, the study results with respect to both current and future needs, and the previously proposed draft criteria.
- The individual criteria will be applied to projects grouped by priority as given below:

Priority

Description

- 1 Rehabilitation projects that preserve existing uses and economic dependencies.
- 2 Projects that rectify existing demands/needs/shortages.
- 3 Projects that meet projected future demands/needs/shortages
- 4 Trans-basin diversions of water that enhance in-state uses.

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Six criteria will be evaluated under each of these priorities to present an overall picture of the favorability of a project or opportunity. These criteria, and the method by which they will be applied, are:

1 Water Availability

This criteria reflects the general ability of a project to function, given likely bypasses for environmental uses and prior rights. It is not a reflection of the relative size of the project.

2 Financial Feasibility

This criteria reflects the effects of the combination of technical feasibility (high or low construction cost) and economic use to which the water would be put (e.g. irrigation of native meadow vs. cultivation of alfalfa or row crops). The intent of this ranking is to indicate the likely ability to afford the project or meet Wyoming Water Development Commission (or other) funding source criteria. A low number represents a project with suspect ability to be repaid, whereas a high number represents a project that should more easily meet funding and repayment requirements.

3 Public Acceptance

This criteria reflects the extent to which a project will encounter or create public controversy (low number) versus a project that would likely engender broad public support (high number). For example, on-stream storage in environmentally sensitive areas would be very controversial, while off-channel storage in less sensitive areas would more likely be supported.

4 Number of sponsors/beneficiaries/participants

This criteria reflects the desirability, all other things being equal, that a project serving a larger segment of the population should rank higher (higher number) than one serving only a few (lower number).

5 Legal/Institutional concerns

This criteria reflects the perceived relative ease (high number) or difficulty (low number) with which a project could be authorized and permitted under existing state and federal law.

6 Environmental/Recreation benefits

This criteria reflects the net effect of positive environmental and recreational aspects of a project as offset, to the extent it can be determined, by potential negative impacts on these attributes.

F. Short List of Water Supply Opportunities

The planning project technical memorandum *Criteria For Screening Future Water Use Opportunities* contains descriptions of all projects considered in the first cut. Applying the criteria described above to those that remained resulted in the matrix shown on Table V-2. The projects listed in Table V-2 are the short list of water supply opportunities. Because many projects have different types of information available and many were studied in varying depth of detail, the process of ranking using these criteria was admittedly subjective. In many cases, the number of beneficiaries or the precise recreational and environmental benefits could not be known with certainty absent further study. As much as possible, ranking was performed based on experience with other recent projects, knowledge of basin conditions, and with the input of BAG members.

Some discussion of the scoring system used in Table V-2 is warranted. **First, the scores in and of themselves are meaningless other than to place the projects in some relative order.** The resulting ranking, with higher scores placing projects higher within their respective priorities, represents the relative likelihood that a project is desirable, functional and could receive enough public support to be constructed. **Projects with similar “scores” but under different priorities should not be considered equally desirable or equally likely, because the weighting factors for each criteria differ depending on the priority.** Potential projects are grouped by sub-basin so that plan readers can review the studied projects by geographic locale.

Conservation Opportunities

Improved irrigation practices, such as conversion from flood irrigation to sprinkler irrigation, is one means of improving the efficiency of water usage. Conveyance losses are another major factor contributing to inefficiency in agricultural use. Many ditches and canals in the Basin experience higher than normal conveyance losses, generally due to porous soils. Lining the canal with concrete or other material can greatly reduce the amount of flow lost to the surrounding soils.

Losses of 10 percent in irrigation ditches and canals are considered normal, or typical. Ditches and canals in sandy, cobbled, or alluvial soils, or fractured rock, where losses exceed 10 percent are potential candidates for rehabilitation. There are a number of canals in the Basin that exceed even 20 percent losses (see technical memorandum *Water Conservation*). These fall under the category of “Miscellaneous Canal Rehabilitation” in the short list of water supply opportunities.

Table V-2 Criteria Matrix

Priority Type	PID	Est. Yield(y), Cap(c) or Depl(d) (AF)	Water Availability	Financial Feasibility	Public Acceptance	No. of Sponsors/ Beneficiaries	Legal/ Institutional	Environmental/ Recreation Benefits	Score**
Priority 1*			3	9	3	9	5	5	
Eden Reservoir Rehabilitation**	46	6,300 c	6	9	9	8	8	2	248
Misc. Canal Rehab (Conservation)		unk	9	7	8	6	6	2	208
Middle Piney Reservoir	11	4,201 c	8	5	5	5	3	4	164
Sixty Seven Enlargement (off ch)	16	5,600 c	5	5	6	4	6	2	154
Grieve Reservoir	57	4,860 y	4	4	6	4	6	4	152
Priority 2			8	5	8	6	10	3	
<i>Upper Green River</i>									
Green River Supplemental Supply	5	22,000 d	7	6	6	8	5	2	238
Sand Hill (off ch)	14	14,100 c	5	6	7	6	6	3	231
Fontenelle Creek Narrows	2	2,500 c	6	5	6	4	6	5	220
McNinch Wash (off ch)	10	5,600 c	5	5	7	4	6	3	214
Snider Basin	17	4,300 c	6	6	5	5	5	5	213
South Cottonwood	18	6,000 c	6	5	5	5	5	5	208
Groundwater Development		unk	2	2	9	2	9	2	206
North Piney Creek	12	5,600 c	6	2	5	5	5	5	193
LaBarge Meadows	7	4,800 c	5	3	5	4	5	5	184
Warren Bridge	19	33,400 c	8	5	2	8	1	4	175
Fish Creek	1	1,400 c	3	5	5	2	5	4	163
Green River Lakes Enl.	4	<250,000 c	9	5	0	9	0	2	157
<i>New Fork River</i>									
East Fork	30	2,100 c	7	5	5	5	5	5	216
East Fork Gorge	32	unk	7	5	5	5	5	5	216
Boulder Lake Enl.		<120,000 c	8	7	4	6	3	5	212
Groundwater Development		unk	2	2	9	2	9	2	206
Silver/Spring Creeks	37	17,000 c	5	5	5	4	5	5	194
Burnt Lake Enl.	34	15,570 c	8	7	2	5	2	5	180
Halfmoon Enl.	35	<95,000 c	8	7	2	5	2	5	180
East Fork No.1	31	4,700 c	8	3	2	5	2	5	160

Priority Type	PID	Est. Yield(y), Cap(c) or Depl(d) (AF)	Water Availability	Financial Feasibility	Public Acceptance	No. of Sponsors/ Beneficiaries	Legal/ Institutional	Environmental/ Recreation Benefits	Score* **
Priority 2			8	5	8	6	10	3	
<i>Big Sandy River</i>									
Sander's Ranch (Leckie Ranch) Groundwater Development	45	60,000+ c unk	7 2	5 3	5 9	6 2	5 9	5 2	222 211
<i>Black's Fork River</i>									
Groundwater Development		unk	2	2	9	2	9	2	206
<i>Little Snake River</i>									
Groundwater Development		unk	2	2	9	2	9	2	206
Lower Willow Creek	58	2,700 y	5	5	5	5	4	5	190
Big Gulch	55	5,250y	3	6	5	4	5	5	183
Upper Willow Creek (Co)	60	1,500 y	4	5	5	4	4	5	176
Pot Hook	59	6,700 y	6	4	4	6	1	5	161
Dutch Joe	56	5,000 y	4	6	5	5	2	3	161
<i>Vermilion/Red Creek Basins</i>									
Groundwater Development		unk	2	2	9	2	9	2	206
Storage Project	75	unk	5	4	7	3	5	4	196
Priority 3			8	5	8	6	10	3	
<i>Green Below Fontenelle</i>									
Groundwater Development		unk	2	2	9	2	9	2	206
Eden Project Improvements (USBR)	47	10,000 d	6	5	6	6	2	2	183
Seedskadee Project (USBR)		86,000 d	9	3	4	5	1	2	165
<i>Upper Green River</i>									
Green River Supplemental Supply	5	22,000 d	6	6	6	8	5	2	230
Groundwater Development		unk	2	2	9	2	9	2	206
East Side Project	33	32,000 d	6	5	4	4	3	3	168
Kendall (Upper Kendall)	6	>100,000 c	9	5	1	8	0	4	165
Lower Kendall	9	>100,000 c	9	5	1	8	0	4	165
New Fork Narrows	36	>100,000 c	9	4	1	5	0	4	142

Priority Type	PID	Est. Yield(y), Cap(c) or Depl(d) (AF)	Water Availability	Financial Feasibility	Public Acceptance	No. of Sponsors/ Beneficiaries	Legal/ Institutional	Environmental/ Recreation Benefits	Score* **
Priority 3			8	5	8	6	10	3	
<i>Black's Fork /Ham's Fork Rivers</i>									
Viva Naughton Enlargement		36,000 c	7	5	6	5	5	6	227
Stateline Enlargement	49	unk	6	5	6	7	4	5	218
Meek's Cabin Enlargement	48	unk	5	5	6	7	4	5	210
Groundwater Development		unk	2	2	9	2	9	2	206
<i>Little Snake River</i>									
Groundwater Development		unk	2	2	9	2	9	2	206
Lower Willow Creek	58	2,700 y	5	5	5	5	4	5	190
Upper Willow Creek (Co)	60	1,500 y	4	5	5	4	4	5	176
Dolan Mesa Canal		2,700 d	5	3	5	3	4	4	165
Savery-Pot Hook Project (USBR)		5,000 y	6	4	4	6	1	5	161
Priority 4			3	5	10	6	9	5	
<i>Green Below Fontenelle</i>									
Plains Reservoir (off ch)	13	<480,000 c	9	3	3	3	1	4	89
Lower Green Reservoir	8	<450,000 c	9	2	2	2	1	3	73
<i>Upper Green River</i>									
Kendall (Upper Kendall)	6	>100,000 c	9	4	0	7	0	3	104
Lower Kendall	9	>100,000 c	9	4	0	7	0	3	104
New Fork Narrows	36	>100,000 c	9	3	0	5	0	3	87

Notes:

- * Each criteria has a different weighting under each priority; 10 is most important, 1 is least important
- ** Under each project, the criteria are individually ranked; 10 means largely favorable, 0 is unfavorable
- *** Scores are the additive result of multiplying each project criteria weighting by the associated priority criteria ranking

- Priorities:
1. Preserves existing uses and dependencies
 2. Addresses existing shortages
 3. Addresses future projected needs
 4. Addresses future out-of-basin, in-state needs

G. Legal and Institutional Constraints

In recent years, federal and state laws, rules, regulations and policies have affected the business of water development and management. The purpose of this section is to identify some of these institutional constraints to water development and to discuss some steps that a project proponent may take to address those constraints.

Federal Environmental Laws

In the late 1960's and early 1970's, Congress passed legislation to protect the environment. Prior to the passage of these laws, most water projects were designed and operated for specific consumptive uses for municipal, agricultural or industrial purposes. Environmental benefits derived from the projects were largely indirect and incidental to the purposes for which they were designed. With the passage of environmental laws, minimum flow releases became requirements of federal project permits. At the same time, the economic benefits of recreation and reservoir fisheries became more apparent, which resulted in minimum pools becoming a planned component of reservoir operations.

Actions relating to water supplies and development that might be requested of the federal government that initiate or "trigger" the federal environmental laws include, but are not necessarily limited to, the following:

- 1) Issuance of special use and right-of-way permits for new water projects on federal lands, including those lands administered by the Bureau of Land Management (BLM), the U.S. Forest Service (USFS), and other federal agencies.
- 2) Renewal of special use and right-of-way permits for existing water projects on federal lands, including those lands administered by the BLM, the USFS, and other federal agencies.
- 3) Contracting for storage water from federal reservoirs.
- 4) Renewal of existing contracts for storage water from federal reservoirs.
- 5) Actions that involve the discharge of dredged and/or fill material into waters of the United States, including rivers, streams, and wetlands, require the issuance of a Section 404 permit under the Clean Water Act. (e.g. the construction of dams, diversion dams, pipeline crossings, etc.)
- 6) Procurement and renewal of licenses from the Federal Energy Regulatory Commission (FERC) to produce hydropower.
- 7) Use of federal funds, loans or grants, to construct a new water project or rehabilitate an existing water project.

The only water development activity that presently falls outside the aegis of federal environmental laws is drilling a well with non-federal funds on non-federal lands outside the banks of rivers, streams, and wetlands. However, piping the water from such wells

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across federal lands or rivers, streams, and wetlands could initiate a federal environmental review.

Endangered Species Act

The Endangered Species Act of 1973 (ESA) requires the Secretary of Interior, through the U.S. Fish and Wildlife Service (USFWS), to determine whether wildlife and plant species are endangered or threatened based on the best available scientific information. The ESA constrains all federal agencies from taking any action that may jeopardize the continued existence of an endangered or threatened species. If a federal agency is considering an action that may jeopardize an endangered species, Section 7 of the ESA requires that the agency must consult with the USFWS.

National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA) requires that federal agencies consider all reasonably foreseeable environmental consequences of their proposed actions. A review of that action under NEPA can be in the form of a simple finding of no significant impact (FONSI), an environmental assessment (EA), or an environmental impact statement (EIS). Further, NEPA requires federal decision makers to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." (42 USC 4321 et seq., Sec. 102(2)E). NEPA provides federal agencies the opportunity to determine which alternative, including no action, they feel best serves the applicant's purpose and need. The alternative selected by the federal agency may differ from the one preferred by the applicant.

Clean Water Act

Section 404 of the Clean Water Act of 1972 prohibits discharging dredged or fill materials into waters of the United States without a permit from the U.S. Army Corps of Engineers (USCOE). The waters of the United States include rivers and streams and, as of 1993, wetlands. USCOE policy requires applicants for 404 permits to avoid impacts to waters of the U.S. to the extent practicable, then minimize the remaining impacts, and finally, take measures to mitigate unavoidable impacts. In addition to the alternative review required by NEPA, Section 404 (b)(1) guidelines require an alternative review to define the least environmentally damaging practicable alternative.

Summary

The federal government, with the authorizations provided by the Endangered Species Act, the National Environmental Policy Act, and the Clean Water Act, has the tools to ensure the protection of endangered species, critical habitat, and other federal environmental interests.

Federal Lands

Approximately 68 percent of the Green River Basin is federal land. In particular, the Bureau of Land Management (BLM) administers about 58 percent, over 6 percent are national forests, while recreation areas, wilderness areas, and wildlife refuges combined comprise just under 4 percent. Moreover, there are candidate lands for wild and scenic designations. The BLM, the U.S. Forest Service, or others agencies managing the federal lands must assure that the requirements of the above laws are met before they can issue a special use permit authorizing a proposed action on federal lands, such as construction of a water project.

The scrutiny under which the federal laws will be applied is based on the sensitivity of the environment impacted or effected. For example, it may be a rather simple process to obtain a special use permit to construct a small water pipeline across the prairie within BLM jurisdiction. However, it would be virtually impossible to obtain a special use permit to construct a large dam within a wild and scenic river designation.

Project proponents must demonstrate a "purpose and need" for a project in order to obtain federal clearances for major water projects, whether or not the proposed project is located on federal lands. However, if the proposed location of the project is on federal lands, the "purpose and need" of the project proponent may be secondary to goals of the federal agency's management plans. Providing supplemental irrigation water has been recognized as sufficient purpose and need to justify a project.

As previously noted, NEPA provides federal agencies the opportunity to determine which alternative, including no action, they feel best serves the applicant's purpose and need. If the proposed project is located on federal lands and does not comply with the federal agency's management plan, project proponents may be faced with the task of convincing that federal agency that the proposed project at that specific location is the only alternative available to meet the proponent's purpose and need.

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The Section 401 Permit is the state certification of the Section 404 Dredge and Fill Permits required from the U.S. Army Corps of Engineers. A separate permit application is not required since all 404 Permit applications are automatically forwarded to the state in which a the 404 permit is being requested. The Section 401 permit also outlines those additional permits required prior to the initiation of construction activities.

Wyoming Water Law

Wyoming water law is based on the prior appropriation doctrine, or "first in time-first in right". Therefore, in times when there is not enough water to fulfill all the water rights, those water users having an earlier-priority-date water right are allowed to receive their full entitlement before those water users that have a later priority date or "junior" water right may receive any water under their right.

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The priority date for a new project is established by the date the project proponent applies for a water right from the Wyoming State Engineer's Office. In order to determine the water supply a new project may achieve, it is important to evaluate the existing water rights that will be "senior" to the new project. Before the decision is made to pursue a project at a particular location, the potential yield of the project should be estimated. The firm yield is the water supply benefits the project proponent could expect under worst case or drought conditions. If the proposed project is located on a stream or river that has several "senior" water rights, a new project may not be able to achieve a water supply in the drier months, such as July and August, or during drought years. Under these conditions, the development of storage facilities would be required to store water when flows are surplus to existing water rights.

Due to the costs involved, water users are naturally interested in a firm supply before they are willing to invest in a water project. In fact, industrial water users are interested in the yield of a potential project under "doomsday" conditions, such as assuming that the worst water year of record occurs in consecutive years. These expectations of water users make the priority date of the water rights of new projects relative to existing water rights a critical factor in assessing the feasibility of new water development projects.

H. Solutions

The following is a list of actions project proponents may take to address the institutional constraints within federal and state laws, rules, regulations and policies.

Project Purpose

Project proponents should have a clear definition of the purpose of their project. There are several purposes for a project: agricultural, municipal, or industrial water use; power generation; flow control; recreation; fisheries and others. In fact, the project proponent may have several purposes in mind. For example, a reservoir could serve all of the above listed purposes. However, the alternatives analyses required by NEPA can become very complex, time consuming and costly for a multipurpose project. Each of the purposes for a proposed project will typically have its own individual alternative analysis.

Project Need

The project proponent must define the need for water to meet the defined purpose or purposes for the project. For example, if the purpose of a proposed agricultural project is to increase the yield of alfalfa or native hay, the amount of water needed for this purpose must be calculated. If the purpose of a proposed municipal project is to meet future water needs, the project proponent must complete population projections and future demand estimates in a manner that withstands the scrutiny of the federal permitting agencies. The needs analyses will have to quantify the amount of water that will be stored or diverted and consumed by the proposed action. Typically, the federal permitting agencies will require that future water conservation activities be considered in the needs analysis.

Alternative Analyses

Project proponents should have evaluated several alternatives prior to selecting the alternative that is going to be subjected to the federal review process. As previously noted, NEPA regulations require that the "no action" alternative be considered; all reasonable alternatives should be considered; and the reasons for eliminating potential alternatives must be provided. Therefore, project proponents should develop sufficient information for alternatives to evaluate how well the preferred alternative will fare under the federal review. The federal agencies will typically require that water conservation must be considered as an alternative to the project.

Selection of the Preferred Alternative

Cost and technical feasibility are the primary factors considered by project proponents in determining project feasibility. While these factors are also considered by federal permitting agencies, the federal perspective is more interested in the environmental damage that may occur if the project is constructed and implemented. Therefore, project proponents should consider potential environmental impacts in developing project alternatives.

Federal Lands

If possible, project proponents should avoid locating their project on national forests. It is virtually impossible to locate new water projects within wilderness areas, wildlife refuges, and wild and scenic designations.

Wyoming Water Development Program

Planning, constructing, and operating a water project is costly. Adding the costs to acquire state and federal permits can be overwhelming for public entities in Wyoming. In 1975, in recognition that water development was becoming more difficult and additional water development was necessary to meet the goals and objectives of the State, the Wyoming Legislature authorized the Wyoming Water Development Program and defined the program in W.S. 41-2-112(a), which states:

"The Wyoming water development program is established to foster, promote, and encourage the optimal development of the State's human, industrial, mineral, agricultural, water and recreation resources. The program shall provide through the commission, procedures and policies for the planning, selection, financing, construction, acquisition and operation of projects and facilities for the conservation, storage, distribution and use of water, necessary in the public interest to develop and preserve Wyoming's water and related land resources. The program shall encourage development of water facilities for irrigation, for reduction of flood damage, for abatement of pollution, for preservation and development of fish and wildlife resources [and] for protection and improvement of public lands and shall help make available the water of

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this State for all beneficial uses, including but not limited to municipal, domestic, agricultural, industrial, instream flows, hydroelectric power and recreational purposes, conservation of land resources and protection of the health, safety and general welfare of the people of the State of Wyoming."

The Wyoming Water Development Commission can invest in water projects as state investments or can provide loans and grants to public entities (municipalities, irrigation districts and special districts) for the construction of projects specific to their water needs. The WWDC has adopted operating criteria to serve as "a general framework for the development of program/project recommendations and generation of information." Individuals and project entities interested in the development of specific water projects should seek information regarding the Wyoming Water Development Program and the possibility of obtaining financial and technical assistance for the development of those projects.

Upper Colorado River Recovery Implementation Program

The State of Wyoming has historically been proactive in dealing with institutional constraints that may impact its ability to develop its water resources as allocated by court decrees and interstate compacts. State representatives review proposed federal mandates ranging from new federal environmental legislation to forest management plans to interject the State's position on these matters and provide for a state perspective in their development and implementation.

One example deals directly with water development in the Green River Basin and the institutional constraints contained in the Endangered Species Act (ESA). In 1988, the States of Wyoming, Utah, and Colorado; the Department of the Interior; and the Western Area Power Administration executed a cooperative agreement to recover four endangered fish species in the Upper Colorado River Basin, while allowing water development to continue. Wyoming's participation in this Upper Colorado River Recovery Implementation Program has facilitated the process by which Wyoming water projects obtain federal clearances under ESA. Rather than spending thousands of dollars on evaluations of potential impacts to the fish species and developing expensive mitigation plans, a project proponent may be able to pay a one-time charge for new depletions which is paid into a fund to benefit the endangered fish. The one-time charge is approximately \$14 per acre-foot of depletions, adjusted annually for inflation.

Figure V-1 Potential Reservoir Sites

