

SPDSS Memorandum Final

To: Ray Alvarado and Ray Bennett
From: LRE, Rick Parsons and Duane Herring
Subject: Task 3 – Identify Key Diversion Structures
Notes from Water District 48 and Water District 76 Meeting
Date: January 11, 2005

Introduction

This memorandum provides notes from the October 21, 2004 meeting with the Water Commissioner responsible for the Laramie River basin (Water District 48) and Sand Creek basin (Water District 76) within the state of Colorado. The South Platte Decision Support Systems (SPDSS) study area includes the South Platte River, North Platte River, and Laramie River basins within the state of Colorado. Meetings are being held with Water Commissioners in each Water District in the study area. The objectives of these meetings are 1) to develop an initial basin understanding; 2) to determine what irrigation structures should be included as “Key Structures” in future detailed modeling efforts; and 3) to determine which reservoirs and diversions warrant more detailed investigation and technical documentation. These objectives support Task 3 – Identify Key Diversion Structures and Task 5 – Identify Key Storage Reservoirs and Develop Operating Memoranda. Information in this memorandum is believed to be accurate. However, this information should not be relied upon in any legal proceeding.

Approach

Prior to the meeting, potential Key Structures for Districts 48 and 76 were identified using the following procedure outlined in the SPDSS Scope of Work:

- 1) Identify net absolute water rights per structure. Select initial key structure cutoff value based on the 85 percent recommendation (SPDSS Feasibility Study, October 2001) for each water district.
- 2) Determine average annual diversion data for structures during three average hydrologic years, one year each during the 1950s, the 1970s, and the 1990s. Add additional structures to the key list that diverted an average of 1,000 acre-feet (ac-ft) per year on the main stem during any of the representative years. Note that this step will allow the inclusion of larger diversion structures having active water rights during the earlier years of the study that were subsequently transferred to other ditches or other uses.

- 3) Review readily available straight-line diagrams and include additional structures as appropriate, based on water rights and location. A large-scale map with a quadrangle background was also produced showing stream gages and the potential Key Structures and was used for discussion purposes at the meeting.

Table 1a and Table 1b, provided at the end of this memorandum, provide the initial lists of key diversion structures in Districts 48 and 76, respectively, the total of their decreed water rights, the period of record of available diversion records, the average annual diversions for the period of record, and the water source. In addition, as noted in the comment line, it includes new structures added during the interview, or structures that were removed as key and should be modeled in an aggregated fashion. Table 1a and Table 1b generally list structures in upstream to downstream order.

The interview was intended to determine additional structures that should be considered key based on seniority, water administration, or basin operations (including structures with supplemental reservoir water). Prior to the meeting, a brief description of the purpose and goals of the interview was relayed to the Water Division 1 Engineer, Jim Hall. The following is a summary of the meeting agenda:

- 1) Discuss overall river basin management in Colorado within the context of the Laramie River Compact (1957) and Sand Creek Memorandum of Agreement (1939 and 1997 Revision) between the states of Colorado and Wyoming.
- 2) Develop a list of major projects, reservoirs, and ditches in the Water Districts, including names of knowledgeable contact people.
- 3) Gather information on dry-up points on the river, calling rights, augmentation plans, and administration specific to the Water Districts.
- 4) Gather general information on the preliminary list of municipal and irrigation diversions selected to included in future detailed modeling efforts (Key Structures), and solicit input on their final inclusion.
- 5) Develop information on reservoirs, such as owner entities, ditches that get reservoir deliveries, assigned delivery losses, etc.

Meeting Attendance

The meeting was held at the Water Division 1 office in Greeley. The following people attended part or all of the meeting:

Jim Hall – Division 1 Engineer
Dave Nettles – Assistant Division 1 Engineer
David Ellington – Division 1 Hydrographer
Heidi Peterson – Water Commissioner Districts 48 and 76
Rick Parsons - Leonard Rice Engineers
Duane Herring - Leonard Rice Engineers

Meeting Notes

Rick Parsons began the meeting with an overview of the SPDSS modeling effort, the Task 3 and Task 5 data collection efforts, and the role of the Laramie River basin and Sand Creek basin in the SPDSS effort. Dave Nettles discussed general operations in the river drainages within the context of the respective interstate compact/agreements. Heidi Peterson then described the general characteristics of the hydrograph in the Laramie River basin and discussed general administration and operations specific to the river drainages within the basin. Details regarding the hydrology, transbasin diversions, ditch and storage use, inter-basin diversions, and return flow locations were discussed. Heidi then described similar information related to the Sand Creek basin.

Transbasin Diversions

Transbasin water is diverted out of Districts 48 and 76 for use in the Cache la Poudre River basin (Water District 3). There are no imports into Districts 48 and 76 except that Deadman Creek diversions from the Laramie River can be conveyed into the upper Sand Creek basin for subsequent transbasin diversion into Sheep Creek for storage in Eaton Reservoir in the Cache la Poudre River basin. Transbasin diversions from Districts 48 and 76 are made at the following structures:

- **Skyline Ditch** (4800577) is an open canal that diverts water from the West Branch Laramie River down a ditch five miles along on the west side of the upper Laramie River into Chambers Lake (0303679). Water available to the Skyline Ditch can also be run down the West Branch to the Laramie River and diverted at the Laramie Poudre Tunnel (0304600), a transbasin diversion structure located below the West Branch-Laramie River confluence (see below). Due to its location at high elevation in the basin, the ditch is only operated during a portion of the spring and summer months (typically May-August). Water from the Skyline Ditch and Chambers Lake is used by Water Supply and Storage Company in the Cache la Poudre River basin. Transbasin diversions through the Skyline Ditch system are recorded in HydroBase under the Skyline Ditch at Chambers Lake stream gage (06746500).
- **Laramie Poudre Tunnel** (4804600) is a 2.1-mile long tunnel that conveys water from its ditch headgate on the Laramie River below the confluence with the West Branch Laramie River into Joe Wright Creek, tributary to the Cache la Poudre River. The Laramie Poudre Tunnel can also re-divert water conveyed from the downstream Rawah Creek basin via the Rawah Lower Supply Ditch (4800500) into the Laramie River below the West Branch confluence and upstream of the Laramie Poudre Tunnel headgate. Due to its location at high elevation in the basin, the ditch is only operated during a portion of the spring and summer months (typically May-September). Water from the Laramie Poudre Tunnel is managed by the Tunnel Water Company and used by Water Supply and Storage Company (2/3 ownership) and the Windsor Reservoir and Canal Company (1/3 ownership) in the Cache la Poudre River basin. Transbasin

diversions through the Laramie Poudre Tunnel system are recorded in HydroBase under the Laramie Poudre Tunnel @ 10 Ft. Parshall Flume gage (06747000).

- **Deadman Ditch** (0304608), is an open canal that diverts water from upper Deadman Creek, tributary to Nunn Creek, tributary to the Laramie River into upper Sand Creek. This transbasin water is picked up downstream on Sand Creek, along with native flows in Sand Creek, by the **Wilson Supply Ditch** (0304604) and conveyed to Sheep Creek for storage in Worster Reservoir (aka Eaton Reservoir, 0303726) and ultimately used in the Cache la Poudre River basin. The Deadman Ditch, which has been used sporadically in the last few years after decades of non-use, is only operated during a portion of the spring and summer months due to its location at high elevation in the basin. The Wilson Supply Ditch Water from the Deadman Ditch, Wilson Ditch, and Eaton Reservoir is used by Divide Reservoir and Canal Company. Transbasin diversions through the Deadman Ditch are recorded in HydroBase under ID 0304608. Transbasin diversions through the Wilson Supply Ditch system are recorded in HydroBase under the Wilson Supply Ditch near Eaton Reservoir @ 10 Ft. Parshall Flume gage (06750500).
- **Bob Creek Ditch** (4800573 and 0304608) is an open canal owned by the city of Greeley used to convey transbasin water from the upper Nunn Creek sub-basin into the Cache la Poudre River basin. Bob Creek Ditch was shut down in the mid-1950s prior to the ruling of the Laramie River Decree. The city of Greeley started to open up the Bob Creek Ditch in the late-1990s, ran water in earnest through the earth- and bedrock-lined ditch system in 2003, and plans to continue to run transbasin water through this system in the future. The Bob Creek Ditch, is only operated during a portion of the spring and summer months due to its location at high elevation in the basin. Transbasin diversions through the Bob Creek Ditch system are recorded in HydroBase under the Bob Creek Ditch near Deadman Mountain, near Glendevey gage (BOBGLNCO).

Where to find more information:

- Additional information on the Skyline Ditch, Laramie Poudre Tunnel, Wilson Supply Ditch (including Deadman Ditch), and Bob Creek Ditch is presented in the structure-specific memoranda prepared for SPDSS Task 4 – Identify Key Transmountain Diversion Structures
- Additional information on the Skyline Ditch, Laramie Poudre Tunnel, and the Water Supply and Storage Company is presented in the SPDSS Task 5 - Water Supply and Storage Company Memorandum.
- Additional information on the Laramie Poudre Tunnel, Wilson Supply Ditch, Windsor Reservoir and Canal Company, and Divide Reservoir and Canal Company is presented in the SPDSS Task 5 – Larimer-Weld Irrigation Company Memorandum.

Compacts and Agreements Affecting Districts 48 and 76 Administration

Laramie River Compact. The 1957 Substitute Decree in Wyoming v. Colorado [353 U.S. 953 (1957)], known as the Laramie River Decree or Laramie River Compact, permits Colorado to divert 49,375 acre-feet per year from the Laramie River basin. The Laramie River Compact explicitly excludes waters from the Sand Creek basin, which are addressed in a separate Memorandum of Understanding (MOU) between Wyoming and Colorado.

The Laramie River basin water available to the state of Colorado under the Laramie River Compact is summarized below.

- 1) 29,500 acre-feet per calendar year may be diverted by Colorado for use within the Laramie River basin, of which not more than 1,800 acre-feet may be diverted after July 31st of each year.
- 2) 19,875 acre-feet per calendar year may be diverted by Colorado for uses outside of the Laramie River basin. Transbasin diversions through the Skyline Ditch, Laramie Poudre Tunnel Diversion, and Bob Creek Ditch convey water from the Laramie River basin directly into the Cache la Poudre River basin. Transbasin diversions through the Deadman Ditch are conveyed to the Sheep Creek tributary of Sand Creek prior to being re-diverted through the Wilson Supply Ditch into the Cache la Poudre River basin. Native Sand Creek flows diverted through the Wilson Supply Ditch are not subject to the transbasin diversion limitation in the Laramie River Compact.
 - Colorado typically reaches this transbasin diversion limit in average- and wet-years. Transbasin diversions in all years are operated to ensure that sufficient water supplies are bypassed on the Laramie River to satisfy downstream users. Delivery of sufficient water for in-basin demands is satisfied by the following internal agreements:
 - 5 cubic feet per second (cfs) of streamflow available in the Laramie River below the Laramie Poudre Tunnel headgate and
 - 30 cfs of streamflow available at the Laramie River at Glendevey gage (06657500).
 - Any portion of the 19,875 acre-feet per year not diverted by Colorado for use outside the basin can be used within the basin. Any non-diverted transbasin water is not subject to the 1,800 ac-ft limitation discussed above.
- 3) All waters diverted by Colorado for use within the basin are restricted to diversion through the headgates serving the 4,845 acres being irrigated in 1942. The amount of irrigated acreage in the Laramie River basin has not expanded since that time.
 - River diversions are governed by allocations of water for each ranch that were established in accordance with the Laramie River Compact and the amount of acreage under the ditches at that time.

Sand Creek Memorandum of Understanding. The original 1939 MOU and the 1997 Revision address the use of water from the Sand Creek basin in Wyoming and Colorado

in accordance with the relative priority of water rights in each state. The 1939 MOU established the seniority of 50.64 cfs of Wyoming water rights with respect to the Wilson Supply Ditch (288 cfs, June 15, 1899 appropriation date), which diverts water from the Sand Creek basin in addition to re-diverting water conveyed from the Laramie River basin into Sand Creek through the Deadman Ditch. The 1997 Revision codified decades-long administrative practices on Sand Creek, which recognize the return flow benefits to the stream from irrigation in Wyoming, thereby requiring less delivery of water from Colorado to satisfy senior water rights in Wyoming. The operation of the Sand Creek MOU is summarized below.

- 1) At the start of each irrigation season, Wyoming gives notice to Colorado when Wyoming's demand reaches 40 cfs. Colorado then delivers 40 cfs to the state line gage, or such lesser amount as can be made available by administering Colorado's June 15, 1899, and more senior water rights on Sand Creek.
- 2) Colorado delivers the 40 cfs to the state line gage for a period of seven days, which need not be consecutive, and then delivers 35 cfs to the state line gage for the rest of the irrigation season.

Stream Gages and General Administration

There is only one active stream gage in the Laramie River basin in Colorado and one active stream gage in the Sand Creek basin, as discussed below:

- 1) The Laramie River near Glendevey gage (06657500, USGS 1904-1982, DWR 1982-present), located below the Nunn Creek confluence with the Laramie River and above the Stub Creek confluence with the Laramie River is considered good.
 - 2) The USGS Sand Creek at Colorado-Wyoming State Line gage (06659580, 1968-present) is considered good.
- Heidi Peterson has lived in the Laramie River basin since 1986 and became Water Commissioner in 2001. Over the April-October period, Heidi actively administers the Laramie River basin and oversees administration in the Sand Creek basin. There are no major diversions of water during the winter in Districts 48 and 76.
 - There are no active diversions in the Sand Creek basin except for the Wilson Supply Ditch. Eddie Wilks has lived in the Sand Creek basin for decades and operates the Deadman Ditch and the Wilson Supply Ditch for the Divide Reservoir and Canal Company. Eddie also operates the state line gage and Heidi and Eddie are in contact over the summer to ensure that operations in the Sand Creek basin follow the interstate MOU. Due to the fact that only one in-basin diversion is actively operated and no irrigation diversions occur in the basin, there will be no further discussion of Sand Creek operations within this memorandum.
 - River administration in the Laramie River basin is simplified, to an extent, by the fact that there are a number of large ranches that have amassed multiple water rights over

time for use at the ranches. Based on discussions regarding the general operations on the different tributaries and identification of the geographic extent of the ranch operations in the basin, it is recommended diversion structures be aggregated to simplify future modeling efforts of the Laramie River basin within the state of Colorado. These recommendations are discussed by tributary, below, and summarized in Figure 1 and the comments in Table 1a, located at the end of the memorandum.

- Storage reservoirs are not actively operated in the Laramie River basin. Hohnholz Lake, located in the lower basin the west of the Laramie River between Grace Creek and Slough Creek, is owned and operated by the Colorado Department of Wildlife (CDOW).
- A number of natural lakes exist at high elevations within the basin but are not used for supplemental storage purposes.
- The population in the Laramie River basin totals about 80 to 100 people. Domestic water supplies are provided by low-capacity, exempt wells.
- Water use in the basin is primarily for irrigation, stock water, and recreational uses, primarily fishing.
- Meadow grasses and pasture are the only crops irrigated in the Laramie River basin. Irrigated grasses are cut only once per year due to the short growing season. All of the lands in the Laramie River basin are flood-irrigated.
- One augmentation plan has been adjudicated in the basin and another plan is pending. These plans are summarized below:
 - **Laramie River Ranch**, located along the Laramie River and its confluences with Jimmy Creek and La Garde Creek, changed the use of some irrigation water rights in the Jimmy Creek Ditch (4800553) and the La Garde Ditch (4800559) to domestic uses to support a dude ranch on the property. These changed uses amount to a few acre-feet per year.
 - **Sholine Ranch**, located predominantly in the Nunn Creek sub-basin, is planning to develop some ponds along the east side of the Laramie River for fishery and wildlife purposes. An application is pending in water court to change the use of irrigation water rights to make replacements for evaporation depletions from tributary ground water anticipated to be intercepted by the ponds. These changed uses are estimated to be on the order of twenty to thirty acre-feet per year.

Although the distribution of water in the Laramie River basin is primarily governed by ranch appropriations that were established pursuant to the Laramie River Compact, irrigators in the basin work together to ensure that everyone gets irrigation water, that no one is ever called out, and the river does not dry up within the state of Colorado.

The following table summarizes the normal-year hydrology in the Laramie River basin. Specifics for each of the tributaries in the basin, and the recommended aggregation of water rights in the basin are described in more detail, following.

Normal-Year Laramie River Hydrology

Winter	No supplemental storage in the basin. Ditches typically freeze up in the fall and diversions cease throughout the winter season.
Begin Irrigation Season	1 to 2 ditches turn on during the first two weeks of April. All 53 ditches in the basin are operating by May 31.
Early- to Mid-June	River peaks at Glendevy gage
August 1	Irrigation season ends. 6 to 8 ditches stay on to run stock water into early fall

Information regarding the different sub-basins, key diversion structures, and the major layout of the ranches in the Laramie River basin are described below. Aggregate diversion systems are recommended for future modeling efforts of the Laramie River basin based on the location of the diversion headgates on tributaries and the use of multiple ditches on ranches in the basin. These aggregate diversion systems are discussed in the text and summarized in Figure 1 and Table 1a at the end of the memorandum.

Upper Laramie River

The Upper Laramie River extends essentially from below Chambers Lake down to the Laramie River near Glendevy stream gage. Chambers Lake is located on the divide between the Cache la Poudre River and Laramie River basins and releases water to Joe Wright Creek in the Cache la Poudre River basin. Water from the Chambers Lake system only reaches the Laramie River basin during high-water, overtopping flow events.

Other than the two major transbasin diversion systems in the upper basin, the Skyline Ditch system and the Laramie Poudre Tunnel system, there are only two major, active ditches on the upper Laramie River. Return flows from all in-basin ditches in this area return to the Laramie River upstream of the Glendevy stream gage.

Ditch-specific information related to Upper Laramie River ditches includes the following:

- **Chas E Lanning Ditch** (4800501) and **Laramie River Ditch** (4800522) are both abandoned and no longer active.
- **Brinker Creek Ditch** (4800523) relies primarily on spring water from the Brinker Creek sub-basin and typically diverts for only a few weeks per year.
- **Link Ditch 1** (4800505) irrigates land northwest of Middle Mountain, below the Link Creek confluence with the Laramie River. Returns flows from these lands accrue to the Laramie River both above and below the Link Ditch 2 headgate.
- **Link Ditch 2** (4800527) diverts from Link Creek, tributary to the Laramie River and irrigates land west of the Laramie River between Link Creek and Stub Creek.

- For modeling purposes, the key upper Laramie River ditches (Chas E Lanning Ditch, Laramie River Ditch, Brinker Creek Ditch, Link Ditch 1, and Link Ditch 2) could be operated together.

The **Sholine Ranch** covers an area along the main stem Laramie River, Nunn Creek, and Stub Creek. The Sholine Ranch uses the following major diversion structures for irrigation and stock water purposes, listed in generally upstream to downstream order:

Nunn Creek – The Sholine Ranch essentially uses all of the ditches other than the recently re-activated Deadman Creek transbasin diversion system, including:

- Nunn Creek Ditch (4800528)
- Deadman Nunn Creek Ditch (4800530)
- Brown Ditch Porter Creek (4800524)
- Brown Ditch Nunn Creek (4800529)
- Davy Ditch (4800531)
- For modeling purposes, the key ditches on the Sholine Ranch (Nunn Creek Ditch, Deadman Nunn Creek Ditch, Brown Ditch Porter Creek, Brown Ditch Nunn Creek, and Davy Ditch) could be operated together.

Lower McIntyre Creek and Laramie River below Glendevey Stream Gage

The four major ditches listed below were identified on the Laramie River below the Glendevey stream gage and above the next major ranch, all of which are used on the Sholine Ranch:

Stub Creek

- Cabin Ditch (4800533)
- Stub Creek Ditch (4800532)
 - For modeling purposes, the two key Sholine Ranch ditches identified on Stub Creek (Cabin Ditch and Stub Creek Ditch) could be operated together.

Brown Creek

- Forrester Ditch (4800534)

Lower Laramie River

- Parker Ditch (4800506)

Return flows from approximately 70 percent of the irrigated lands on the Sholine Ranch return to the Laramie River above the Glendevey gage with the remaining 30 percent of return flows accruing to the Laramie River below the headgate of the Parker Ditch (4800506).

Upper McIntyre Creek

The **Glendevey Ranch** and **Pine Creek Ranch** are located in the upper McIntyre Creek basin. The following major ditches are used to irrigate lands on these ranches:

- Glendevey Ditch (4800536)
- Talmage Ditch 1 (4800537)

- Pine Creek Ditch (4800544), located on Pine Creek, tributary to McIntyre Creek
- McIntyre Ditch (4800538)
- For modeling purposes, the key ditches on the Glendevey and Pine Creek ranches (Glendevey Ditch, Talmage Ditch 1, Pine Creek Ditch, and McIntyre Ditch) could be operated together.

Return flows from the irrigated lands on the Glendevey Ranch and the Pine Creek Ranch return to the McIntyre Creek system above the Comet Ditch (4800539).

The **Diamond Tail Ranch** covers approximately 16,000 acres along the main stem Laramie River, the lower McIntyre Creek basin, the upper Jimmy Creek basin, and the upper La Garde Creek basin. The Diamond Tail Ranch uses the following major diversion structures for irrigation and stock water purposes, listed in generally upstream to downstream order:

Laramie River

- Timothy Ditch (4800507)
- Wright Ditch (4800508)
- Martin Ditch 1 (4800509)
- Lone Tree Ditch (4800535), located on Lone Tree Creek, tributary to Laramie River
- Martin Ditch 2 (4800510)
- Upper Hills Ditch (4800511)
- Hills Ditch (4800512)
- Smiths Brown Ditch (4800513)
- Yelton Ditch (4800514)
- For modeling purposes, the key ditches on the Laramie River used on the Diamond Tail Ranch (Timothy Ditch, Wright Ditch, Martin Ditch 1, Lone Tree Ditch, Martin Ditch 2, Upper Hills Ditch, Hills Ditch, Smiths Brown Ditch, and Yelton Ditch) could be operated together.

McIntyre Creek

- Comet Ditch (4800539), located on McIntyre Creek
- Stuart Ditch 2 (4800540)
- Grant Ditch Upper (ID 4800569) and Grant Ditch Lower (ID 4800545)
- Stuart Ditch (4800546), located on Stuart Creek, tributary to McIntyre Creek
- Lamb Ditch (4800542)
- British Creek Ditch 2 (4800541), located on British Creek, tributary to McIntyre Creek
- Homestead Ditch (4800541)
- For modeling purposes, the key ditches in the McIntyre Creek basin used on the Diamond Tail Ranch (Comet Ditch, Stuart Ditch 2, Grant Ditch Upper, Grant Ditch Lower, Stuart Ditch, Lamb Ditch, British Creek Ditch 2, and Homestead Ditch) could be operated together.

La Garde Creek

- Nellie Ditch (4800560), located on McGuire Creek, tributary to La Garde Creek
- Pache Ditch (4800557)
- Homestead Ditch 1 (4800562), located on Big Jenkins Creek, tributary to La Garde Creek
- Homestead Ditch 2 (4800561), located on Little Jenkins Creek, tributary to La Garde Creek
- La Garde Ditch 1 (4800558)
- Schnitger Ditch (4800556)
- For modeling purposes, the key ditches on La Garde Creek used on the Diamond Tail Ranch (Nellie Ditch, Pache Ditch, Homestead Ditch 1, Homestead Ditch 2, La Garde Ditch 1, and Schnitger Ditch) could be operated together.

Jimmy Creek

- Jim Creek Ditch (4800549)
- Ward Ditch 2 (4800550)
- Ward Ditch 1 (4800551)
- Trollope Creek Ditch (4800554), located on Trollope Creek, tributary to Jimmy Creek
- Ollie Ditch (4800552)
- For modeling purposes, the key ditches on Jimmy Creek used on the Diamond Tail Ranch (Jim Creek Ditch, Ward Ditch Nos. 1 and 2, Trollope Creek Ditch, and Ollie Ditch) could be operated together.

Return flows from lands irrigated on the Diamond Tail Ranch typically benefit other portions of the ranch with the lands irrigated on the lower reaches of Jimmy Creek, La Garde Creek, and the Laramie River returning to the Laramie River Ranch, located downstream of the Diamond Tail Ranch.

The **Laramie River Ranch** covers an area along the Laramie River and the lower reaches of La Garde Creek and Jimmy Creek. The Laramie River Ranch uses the following major diversion structures for irrigation and stock water purposes:

Jimmy Creek

- Jimmy Creek Ditch (4800553)

La Garde Creek

- La Garde Ditch (4800559)

Laramie River

- Jimmie Creek Ditch (4800515)

Return flows from lands irrigated on the Laramie River Ranch return to the Laramie River upstream of the Mansfield Ditch headgate (4800518).

Lower Laramie River

Ditch-specific information related to the major Lower Laramie River ditches includes the following:

- **Forrester Creek** – The following ditches were identified as key structures on Forrester Creek:
 - **Forrester Creek Ditch** (4800563) irrigates lands on the same ranch that uses the Grace Creek Ditch (see below).
 - **Detro Ditch 1** (4800564) irrigates lands above the Forrester Creek confluence with the Laramie River with return flows accruing to the Laramie River above the Mansfield Ditch headgate (4800518).
- **Mansfield Ditch** (4800518) irrigates lands along the east side of the main stem Laramie River with the majority of return flows accruing to the river below the Mansfield Ditch 2 (4800519).
- **Mansfield Ditch 2** (4800519) irrigates lands along the west side of the main stem Laramie River with return flows accruing to the river above the Warren Ditch headgate (4800520).
- For modeling purposes, the key ditches identified on the Laramie River below La Garde Creek and above Grace Creek (Mansfield Ditch, Mansfield Ditch 2, and Detro Ditch 1) could be operated together.
- **Grace Creek** – The following ditches were identified as key structures on Grace Creek:
 - **Grace Creek Ditch** (4800565) irrigates lands around Hohnholz Lake (No Structure ID). Grace Creek Ditch is one of the first ditches to turn on in the spring and is used to fill Hohnholz Lake, owned and operated by CDOW for recreation and wildlife purposes. CDOW uses the Grace Creek Ditch to replace evaporation depletions that occur from the lake. Irrigation off of the Grace Creek Ditch system occurs above, around, and below Hohnholz Lake and uses the reservoir as a flow-through structure to deliver irrigation water to the lower irrigated lands. Return flows from the lands irrigated under the Grace Creek Ditch accrue to Grace Creek above the confluence with the Laramie River and the Warren Ditch headgate (4800520).
 - **Slough Creek Ditch** (4800567) and **Hance Ditch** (4800566) were operated historically according to records available in HydroBase. The Slough Creek Ditch is no longer actively operated. The Hance Creek Ditch was recently restored.
- For modeling purposes, the key ditches identified on Grace Creek (Grace Creek Ditch, Slough Creek Ditch, and Hance Ditch) and the Forrester Creek Ditch could be operated together.
- **Bliler Boswell Ditch** (4800521), **Warren Ditch** (4800520), and **Stuck Creek Ditch** (4800568) are the furthest downstream major structures that irrigate land from the Laramie River in the state of Colorado. The Stuck Creek Ditch diverts from Stuck Creek, the northernmost tributary with a confluence with the Laramie River in Colorado. Return flows from these lands accrue to the Laramie River in the state of Wyoming.
- For modeling purposes, the key ditches identified on the lower Laramie River (Bliler Boswell Ditch, Warren Ditch, and Stuck Creek Ditch) could be operated together.

Recommended Detailed Documentation

Additional technical memoranda are not recommended for individual ditch or reservoir systems beyond the information provided herein. Operation of diversion systems in the Laramie River basin, with multiple ditches serving each ranch, is the norm rather than the exception. It is recommended that, using the information summarized in Table 1a, a number of ranches and ditch systems in District 48 be modeled as diversion systems to simulate the effects of river diversions and returns in the basin.

Comments and Concerns

- All of the structures included in Table 1a have historical diversions starting in 1973, or later. Water Division 1 personnel advised they do not have any diversion data beyond what is available from HydroBase.

Figure 1
Simplified Schematic of Proposed Modeling of Laramie River Basin
(District 48) and Sand Creek Basin (District 76) for SPDSS Effort

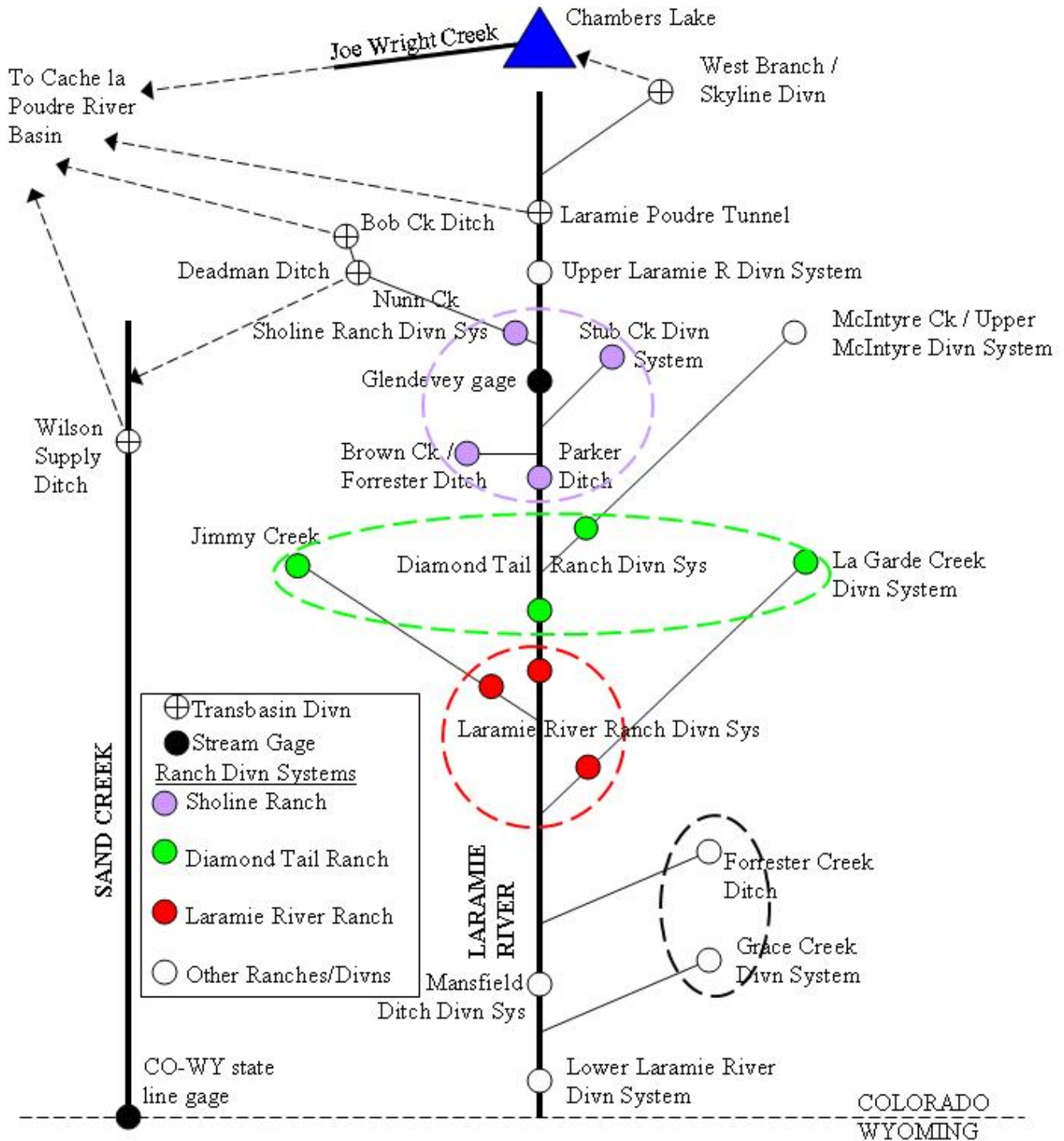


TABLE 1a - LARAMIE RIVER BASIN

NUMBER OF KEY STRUCTURES = 22
 NUMBER OF MULTISTRUCTURES = 44

Key?
 ms=multi-
 structure

Structure ID	Name	Total Decree (cfs)	Diversion Period Record	Average Annual Divn. (ac-ft)	Water Source	Comments	Key?
4800577	SKYLINE DITCH	0.00	1998 - 2001	1,944	SPRING CREEK	Transbasin diversion	Yes
4800500	RAWAH LOWER SUPPLY DITCH	275.00	1997 - 1998	150	BIG LARAMIE RIVER	Feeder to Laramie Poudre Tunnel aka Laramie Poudre Tunnel	ms
4800576	LARIME RIVER TUNNEL SYS	300.00	1998 - 2003	9,296	BIG LARAMIE RIVER		Yes
4800573	BOB CREEK DITCH DIVR	60.00	1998 - 2003	20	BOB CREEK	Transbasin diversion	Yes
0304608	DEADMAN DITCH	0.00	None		DEADMAN CREEK	Transbasin diversion	Yes
4800522	LARIMIE RIVER DITCH	300.00	None		W BRANCH LARAMIE R	Not originally identified as key structures but should be included in Upper Laramie R Divn System	ms
4800501	CHAS E LANNING DITCH	0.00	1980 - 1981	781	BIG LARAMIE RIVER		ms
4800582	RAWAH DITCH LAR R SYS	225.00	None		RAWAH CREEK		ms
4800523	BRINKER CREEK DITCH	8.00	1973 - 2001	30	BRINKER CREEK		ms
4800505	LINK DITCH 1	14.22	1973 - 2001	695	BIG LARAMIE RIVER	Key diversions on upper Laramie River included in Upper Laramie R Divn System	ms
4800527	LINK DITCH 2	5.40	1973 - 2001	107	LINK CREEK		Yes
4800528	NUN CREEK DITCH	5.00	None		NUN CREEK	Key diversions on Nunn Creek included in Sholine Ranch Divn System	ms
4800530	DEADMAN NUN CREEK DITCH	0.00	2000 - 2001	497	DEADMAN CREEK		ms
4800529	BROWN DITCH NUNN CREEK	10.00	1973 - 2003	411	NUN CREEK		ms
4800524	BROWN DITCH PORTER CREEK	15.90	1973 - 2003	57	PORTER CREEK		ms
4800531	DAVY DITCH	20.00	1973 - 2003	328	DEADMAN CREEK		Yes
4800533	CABIN DITCH	7.94	1973 - 2003	96	STUB CREEK	Key diversions on Stub Creek included in Stub Ck Divn Sys used on Sholine Ranch Div Sys	ms
4800532	STUBB CREEK DITCH	5.00	1973 - 2003	128	STUB CREEK		Yes
4800534	FORRESTER DITCH	7.00	1973 - 2003	98	BROWN CREEK	Key diversion on Brown Creek used on Sholine Ranch Divn System	Yes
4800506	PARKER DITCH	14.10	1975 - 2003	890	BIG LARAMIE RIVER		Yes
4800536	GLENDEVEY DITCH	2.00	1973 - 2003	18	MC INTYRE CREEK	Key diversions used on Glendevey Ranch and Pine Creek Ranch in Upper McIntyre Divn System	ms
4800537	TALMAGE DITCH 1	8.00	1973 - 2003	48	MC INTYRE CREEK		ms
4800544	PINE CREEK DITCH	5.75	1973 - 2003	116	PINE CREEK		ms
4800538	MCINTYRE DITCH	7.00	1973 - 2003	455	MC INTYRE CREEK		Yes
4800507	TIMOTHY DITCH	34.36	1973 - 2003	1,114	BIG LARAMIE RIVER	Key diversions on Laramie River included in Diamond Tail Ranch Divn System	ms
4800508	WRIGHT DITCH	0.00	1973 - 2003	1,277	BIG LARAMIE RIVER		ms
4800509	MARTIN DITCH 1	15.50	1973 - 2003	668	BIG LARAMIE RIVER		ms
4800535	LONE TREE DITCH	25.00	1973 - 2003	142	LONE TREE CREEK		ms

TABLE 1a - LARAMIE RIVER BASIN

NUMBER OF KEY STRUCTURES = 22
 NUMBER OF MULTISTRUCTURES = 44

Key?
 ms=multi-
 structure

Structure ID	Name	Total Decree (cfs)	Diversion Period Record	Average Annual Divn. (ac-ft)	Water Source	Comments	Key?
4800510	MARTIN DITCH 2	20.50	1973 - 2003	1,257	BIG LARAMIE RIVER		ms
4800511	UPPER HILLS DITCH	10.00	1973 - 2003	457	BIG LARAMIE RIVER		ms
4800512	HILLS DITCH	11.00	1973 - 2003	397	BIG LARAMIE RIVER		ms
4800513	SMITHS BROWN DITCH	16.63	1973 - 2003	318	BIG LARAMIE RIVER		ms
4800584	WRIGHT DITCH 2	15.00	None		BIG LARAMIE RIVER		ms
4800514	YELTON DITCH	30.14	1973 - 2003	686	BIG LARAMIE RIVER		Yes
4800539	COMET DITCH	7.40	1973 - 2003	365	MC INTYRE CREEK	Key diversions on McIntyre Creek used on Diamond Tail Ranch Divn System	ms
4800526	COMET DITCH	2.60	None		MC INTYRE CREEK		ms
4800540	STUART DITCH 2	0.00	1976 - 2003	143	MC INTYRE CREEK		ms
4800569	GRANT DITCH UPPER	0.00	1973 - 2003	232	ROARING FORK		ms
4800545	GRANT DITCH LOWER	0.00	1973 - 2003	275	ROARING FORK		ms
4800546	STUART DITCH	7.20	1973 - 2003	172	STUART CREEK		ms
4800542	LAMB DITCH	18.88	1973 - 2003	991	MC INTYRE CREEK		ms
4800548	BRITISH CREEK DITCH 2	12.00	1976 - 2003	76	BRITISH CREEK		ms
4800579	GRANT DITCH	10.00	None		GRACE CREEK		ms
4800541	HOMESTEAD DITCH	9.00	1973 - 2003	335	MC INTYRE CREEK		Yes
4800560	NELLIE DITCH	15.30	1973 - 2003	145	MC GUIRE CREEK	Key diversions on La Garde Creek used on Diamond Tail Ranch Divn System	ms
4800557	PACHE DITCH	18.14	1973 - 2003	488	LA GARDE CREEK		ms
4800562	HOMESTEAD DITCH 1	5.00	1973 - 2003	190	BIG JENKINS CREEK		ms
4800561	HOMESTEAD DITCH 2	8.00	1973 - 2003	70	LITTLE JENKINS CREEK		ms
4800558	LA GARDE DITCH 1	15.40	1974 - 2003	318	LA GARDE CREEK		ms
4800556	SCHNITGER DITCH	17.00	1973 - 2003	216	LA GARDE CREEK		Yes
4800549	JIM CREEK DITCH	9.00	1973 - 2003	187	JIMMY CREEK	Key diversions on Jimmy Creek used on Diamond Tail Ranch Divn System	ms
4800550	WARD DITCH 2	9.48	Nov/1973 - Oct/2003	90	JIMMY CREEK		ms
4800551	WARD DITCH 1	4.25	Nov/1973 - Oct/2003	26	JIMMY CREEK		ms
4800554	TROLLOPE CREEK DITCH	17.75	Nov/1973 - Oct/2003	76	TROLLOPE CREEK		ms
4800552	OLLIE DITCH	3.45	Nov/1973 - Oct/2003	102	JIMMY CREEK		Yes
4800553	JIMMY CREEK DITCH	29.95	Nov/1973 - Oct/2003	492	JIMMY CREEK	3 Key ditches, from 3 different streams, included in Laramie River Ranch Divn System	Yes
4800515	JIMMIE CREEK DITCH	0.00	Nov/1973 - Oct/2003	59	BIG LARAMIE RIVER		Yes

TABLE 1a - LARAMIE RIVER BASIN

NUMBER OF KEY STRUCTURES = 22
 NUMBER OF MULTISTRUCTURES = 44

Key?
 ms=multi-
 structure

Structure ID	Name	Total Decree (cfs)	Diversion Period Record	Average Annual Divn. (ac-ft)	Water Source	Comments	Key?
4800559	LA GARDE DITCH	15.20	Nov/1973 - Oct/2003	654	LA GARDE CREEK		Yes
4800563	FORRESTER CREEK DITCH	3.80	1973 - 2003	142	FORRESTER CREEK	Key diversion on Forrester Creek used on Grace Creek Divn System	ms
4800564	DETRO DITCH 1	5.00	1973 - 2003	96	FORRESTER CREEK	Key diversion on Forrester Creek	Yes
4800518	MANSFIELD DITCH	15.61	1973 - 2003	1,149	BIG LARAMIE RIVER	Key diversions on Laramie River below Jimmy Ck and above Grace Ck included in Mansfield Ditch Divn System	ms
4800519	MANSFIELD DITCH 2	21.74	1973 - 2003	810	BIG LARAMIE RIVER		Yes
4800567	SLOUGH CREEK DITCH	4.11	1998-1999	131	SLOUGH CREEK	Slough Creek Ditch & Hance Ditch no longer operated but should be included in Grace Creek Divn System to model hist. operations	ms
4800566	HANCE DITCH	19.44	1974 - 2001	119	GRACE CREEK		ms
4800565	GRACE CREEK DITCH	19.37	1973 - 2003	1,604	GRACE CREEK		Yes
4800568	STUCK CREEK DITCH	16.12	1973 - 2003	620	STUCK CREEK	Key diversions on lower Laramie River below Grace Creek included in Lower Laramie River Divn System	ms
4800521	BLILER BOSWELL DITCH	16.43	1973 - 2003	966	BIG LARAMIE RIVER		ms
4800520	WARREN DITCH	6.67	1973 - 2003	295	BIG LARAMIE RIVER		Yes

TABLE 1b - SAND CREEK BASIN

NUMBER OF KEY STRUCTURES = 1
 NUMBER OF MULTISTRUCTURES = 0

Key?
 ms=multi-
 structure

Structure ID	Name	Total Decree (cfs)	Diversion Period Record	Average Annual Divn. (ac-ft)	Water Source	Comments	Key?
7600506	DRY CREEK DITCH	10.00	None		DRY CREEK	Not actively used	No
7600500	SAND CREEK DITCH	8.30	1995 - 1998	147	SAND CREEK	Not actively used	No
7600600	WILSON SUPPLY DITCH	0.00	1998 - 2001	1,699	SAND CREEK	Transbasin diversions recorded under 0304604	Yes
7600503	JOHN GOETZ DITCH 1	7.80	None		SAND CREEK	Not actively used	No
7600508	SPRING CREEK DITCH 2	6.60	None		SAND CREEK	Not actively used	No
7600501	SEEPAGE DITCH 2	5.85	None		SAND CREEK	Not actively used	No
7600502	SPRING CREEK DITCH 1	2.70	None		SAND CREEK	Not actively used	No
7600504	JOHN GOETZ DITCH 2	10.00	None		SHELL CREEK	Not actively used	No
7600505	SHELL CREEK DITCH	6.97	None		SHELL CREEK	Not actively used	No