

POWDER RIVER

**BIG FOUR DITCH DIVERSION
MORGAREIDGE & FRANCES DITCH DIVERSION
SAHARA DITCH DIVERSION
VRUWINK (KAYCEE) DITCH DIVERSION**

POWDER RIVER DRAINAGE

INTRODUCTION

BACKGROUND

The Powder River begins in the east face of the Big Horn Mountains, gathering numerous tributaries from the southeastern face of the mountains to the Powder River Basin. It eventually crosses the Wyoming-Montana border just southwest of Moorehead, Montana, carrying water from Crazy Woman, Spotted Horse, Clear, Wild Horse, Fortification, and Buffalo Creeks. The Powder River drainage covers the majority of the geography in the Powder/Tongue Basin, but much of the land it crosses has little agricultural value. As a result, much of the Wyoming consumptive use for the Powder is restricted to the Powder's southern reaches, near its source in the Middle, Red Fork, and North Fork tributaries.

CHARACTERISTICS

As its name implies, the Powder River flows through very erodable soils. They can be found on either side of the North, Red, and Middle forks where the streams leave their canyons. The tributaries of the Powder have little high mountain country and little forested watershed to regulate its flows. As a result, rains can mean "flashy," damaging floods capable of disabling diversions. Also, unlike the other drainages on the East Slope of the Big Horns, the Powder has its oldest and best water rights up at the mouths of the tributary canyons, rather than down in the lower plain. Finally, irrigators have learned that the sediment load in the Powder quickly wears out pumps. Though sprinklers have higher efficiencies, most irrigators on the Powder do not use them.

The North Fork is the only tributary favored with storage above the water users (Dull Knife Reservoir). It is also the tributary that feeds the mysterious "sinks" in its canyon. These subterranean aqueducts to the Madison formation tap an unknown amount of water from the North Fork before it can reach the USGS gaging station at the mouth of the canyon. Water commissioners have learned to keep the sinks full or risk spending much precious time in regulation waiting for Dull Knife's releases to fill the sinks before irrigators below see requested increases in flow.

USAGE

The Powder River's diversions are entirely devoted to irrigation.

Regulation

Water commissioners estimate that regulation is imposed on Powder River drainage diversions with the following timing:

Wet Year	Average Year	Dry Year
none	Third week of July	First week of July

Because irrigators on the Powder tend to cooperate among themselves, regulation on the Powder is rare. In general, irrigators rotate their usage as much as possible, allowing each other to use full appropriations much later in the season than they could if they didn't cooperate.

Agriculture

Growers in the Powder River drainage tend to devote approximately 85 percent of their lands to alfalfa, 10 percent to grass hay, and five percent to oats.

50 years ago, the split was approximately the same, but growers produced more out of dependence on what they grew. As a result, they tended to plant all possible lands. Today, because transportation and a shift in the focus of economics in the region make landowners less dependent on what they produce, irrigators are less likely to develop every acre available.

To deliver water from their diversions, they have the following irrigation practices:

Percent of lands irrigated by irrigation practice:

Flood	Gated Pipe	Sprinklers
95	2	3

The typical irrigation season runs from April 15-May 1 (depending on whether the spring runoff is delayed by colder weather) to early/mid October (depending on when the first snows fall and the ground freezes). Powder River users do not typically use post-season irrigation.

Double Appropriation

Irrigation water rights with priority dates of March 1, 1945 or earlier are entitled to an additional 1cfs per 70 acres under Wyoming's surplus water statutes. Whenever the supply in a stream exceeds to amount required to satisfy all existing appropriations established prior to March 1, 1985, the stream is said to be in an excess flow condition and water right holders with priorities between March 2, 1945 and March 1, 1985 may use an additional 1 cfs for each 70 acres irrigated.

In the Powder River, this practice is limited primarily by the condition of ditches. Many of the ditches are not capable of carrying all of the water an irrigator could use.

% of appropriation	% of ditches in drainage capable of flow
200	10
150	10
100-150	90
0-100	90

Permitted Uses

Permits granted for water appropriation are granted for specific uses. The following pages contain tables of permits and their associated uses. The following table provides a key to those uses:

Code	Use
Chem	Chemical
Com	Commercial
Cul	Culinary
D	Domestic
Drl	Drilling
Eng	Steam Engines
Fire	Fire Protection
Fish	Fish Propagation
F.C.	Flood Control
I	Irrigation
Ind	Industrial
I.F.	Instream Flow
Mech	Mechanical
Mfg	Manufacturing
Mil	Milling

Code	Use
Min	Mining
Misc	Miscellaneous
Mun	Municipal
Oil	Oil Refining or Production
P.C.	Pollution Control
Power	Power Development
R.R.	Railroad
Rec	Recreational
Ref	Refining
Res. Supply	Supply Facility for a Reservoir
S	Stock
T	Transportation

WATER RIGHTS

Two water rights summary tables are provided for each diversion serving irrigation referenced here. The first, included in the body of the diversion synopsis, refers to the rights on record with the State

Engineer's Office and is derived from that office's *Tabulation of Adjudicated Surface Water Rights of the State of Wyoming, Water Division Number Two* (Oct. 1999).

Because this rights summary is pulled directly from the SEO *Tab*, the rights cited follow the SEO's priority order:

Hierarchy	Format of right	Example
1	Day, Month, Year	05-15-1884
2	Month and Year	05-00-1884
3	Specified Season and Year	Spring 1884
4	Year Only	1884
5	Before Year	Before 1884

Board orders or court orders may also establish a specific priority.

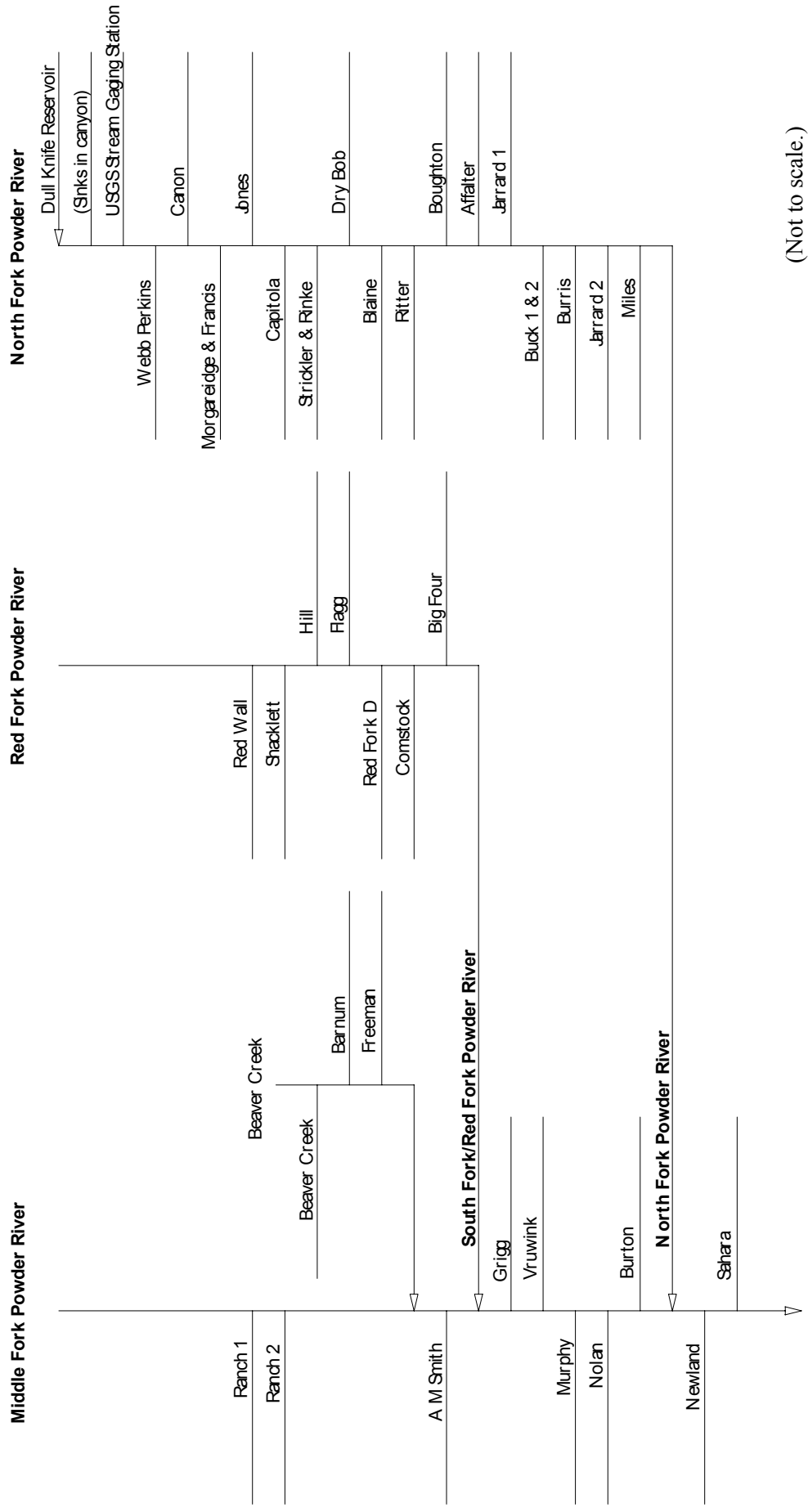
Irrigated Lands Water Rights Database

The second table, which follows the diversion synopsis, is taken from the irrigated lands water rights database developed for the basin plan. It can be used as a reference with the following caveats: It only lists water rights associated with the irrigated lands polygons mapped by HKM. The table does not include nonirrigation rights devoted to reservoir supply, municipal, fish propagation, etc. The rights on this table are associated only with those irrigated lands identified through the course of this study, both actively irrigated and currently idle.

Column Heading Key

PerNo	Permit Number	"Terr" denotes a territorial right.
PerSfx	Permit Suffix	D = direct flow E = enlargement R = reservoir
Facility Name		Parentheses denote the former means of conveyance for the water right.
Unit	Flow or volume	CFS = cubic feet per second AF = acre-feet GPM = gallons per minute
SupTyp	Supply Type	OS = original supply SS = supplement supply, for lands having an original supply from another source Sec = secondary supply, for water stored in a reservoir
Status	Status of adjudication	Adj = adjudicated Una = unadjudicated
Source	Source water	Parentheses denote the permit number of the related storage right.

Schematic of the upper Powder River stream and diversions:



(Not to scale.)

KEY DIVERSIONS

Diversion: **BIG FOUR DITCH DIVERSION**

Date: 5 Jan. 2001

Diversion Description: Headgate consists of a single, 3.2 x 2.8-foot rectangular wooden gate in steel sliders raised/lowered by a Waterman-type screw mounted in a rock headwall.

Diversion Location: The diversion is located on the Red Fork of the Powder River and is just upstream from the Red Fork's confluence with the Middle Fork.



Big Four Ditch headgate

Headgate:

Lat. Long.
N 43° 39' 32.0" W 106° 47' 32.7"

Flume:

Lat. Long.
N 43° 39' 30.6" W 106° 47' 29.9"



Big Four Ditch flume

Conveyance Description: Open channel canal, approximately 4.5 mi. long.

Direct Flow Water Rights: The direct-flow rights summary follows:

Permit	Priority Date	Permitted Use	Acres	Flow (cfs)	Cumulative (cfs)
1805	04-18-1898	I	20.20	0.26	0.26
1805	04-18-1898	D,I,S	34.70	0.46	0.72
1805	04-18-1898	I	198.00	2.82	3.54
1805	04-18-1898	I	211.00	3.01	6.55
1805	04-18-1898	I	279.20	3.96	10.51
751E	12-14-1901	I	131.00	1.85	12.36
1027E	04-20-1903	I	20.00	0.26	12.62
1663E	01-12-1907	I	238.00	3.40	16.02
2081E	06-12-1909	I	127.00	1.81	17.83

Associated Storage Rights: None

Irrigation Practices: See introduction to Powder River drainage

Agricultural Practices: See introduction to Powder River drainage

Return Flows: Estimated percentage of total diversion developing into return flows:

Destination	Wet Yr.	Avg. Yr.	Dry Yr.
Middle Fork Powder	20	20	20

Much of the land irrigated by this ditch is served by sprinklers, which reduce return flows.

Losses: This ditch crosses the red, sandy soil that gives the Powder River its distinctive hue and opacity and areas of bentonite. Though the bentonite

seals the ditch walls and floor, the red soil tends to seep water. Losses on the Big Four Ditch are approximately 35 percent by the end of the ditch

References:

Sandy Dixon, water commissioner, State Engineer's Office, interview, 5 Jan. 2001, 12 Nov. 2001

Irrigated Lands Water Rights Database

PerNo	PerSfx	Facility Name	Priority	Acres	Amount	Unit	SupTyp	Status	Source
1805	D	Big Four	April 18, 1898	743.1	10.51	CFS	OS	Adj	Red Fork Powder River
751	E	Enl. Big Four	Feb. 14, 1901	131	1.85	CFS	OS	Adj	Red Fork Powder River
1027	E	Enl. Big Four	April 20, 1903	20	0.26	CFS	OS	Adj	Red Fork Powder River
1663	E	Enl. Big Four	Jan. 12, 1907	238	3.4	CFS	OS	Adj	Red Fork Powder River
2081	E	Enl. Big Four	June 12, 1909	127	1.81	CFS	OS	Adj	Red Fork Powder River
972	D	David A. Rinker (Big Four)	April 30, 1995	177	2.52	CFS	OS	Adj	Red Fork Powder River

Name	Big Four Ditch Diversion												
Source	Red Fork Powder River												
District	8												
Data	Total monthly flow in AF												
Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1970													
1971													
1972													
1973													
1974													
1975													
1976													
1977													
1978													
1979													
1980													
1981								0.00	247.09	678.13	670.23	22.31	1617.76
1982								0.00	0.00	0.00	323.38	0.00	323.38
1983								0.00				149.67	
1984													
1985								245.18	1097.87	1071.19	916.00	325.51	3655.75
1986								619.65	1363.93	980.86	0.00	0.00	2964.44
1987								0.00	831.39	890.78	634.71	0.00	2356.88
1988								1122.91	1283.27	1066.60	246.93	0.00	3719.71
1989								360.95	1788.18	1439.34	989.67	545.93	5124.07
1990								233.74	1490.59	1227.05	1168.04	0.00	4119.42
1991								147.17	557.01	841.92	664.61	174.05	2384.76
1992								43.52	1109.11	893.67	1098.05	439.24	3583.59
1993								85.95	224.40	1171.10	1181.95	1063.83	3727.23
1994								1194.57	1263.11	543.20	849.80	748.11	4598.79
1995								0.00	0.00	216.85	887.25	587.31	1691.41
1996								229.56	948.05	1080.05	764.16	705.85	3727.67
1997								122.72	1121.04	1128.52	1016.10	610.94	3999.32
1998								157.93	453.77	847.57	780.53	895.32	3135.12
1999								24.72	614.62	868.10	754.93	922.59	3184.96
Mean								254.92	846.67	879.11	761.55	399.48	3171.43
Max								1194.57	1788.18	1439.34	1181.95	1063.83	5124.07
Min								0.00	0.00	0.00	0.00	0.00	323.38

- Notes: 1. Monthly data is derived from spot measurements in the Hydrographers' Annual Reports for years 1980 and later, and from WRDS for years prior to 1980
2. Zero flow is assumed prior to the first and after the last measurement

Name	Big Four Ditch Diversion		
Source	Red Fork Powder River		
District	8		
Data	First & Last Dates, Max. Days		
Water Year	First Date of Measurement	Last Date of Measurement	Maximum Days Missing
1970			
1971			
1972			
1973			
1974			
1975			
1976			
1977			
1978			
1979			
1980			
1981	16-Jun	1-Sep	27
1982	19-Aug	26-Aug	7
1983	2-Jun	11-Sep	59
1984	One Reading	One Reading	One Reading
1985	28-May	10-Sep	21
1986	20-May	29-Jul	20
1987	6-Jun	16-Aug	21
1988	15-May	11-Aug	28
1989	26-May	13-Sep	28
1990	27-May	28-Aug	31
1991	28-May	13-Sep	30
1992	31-May	13-Sep	38
1993	7-May	22-Sep	18
1994	4-May	28-Sep	15
1995	19-Jul	22-Sep	18
1996	1-May	26-Sep	17
1997	28-May	29-Sep	15
1998	18-May	29-Sep	19
1999	26-May	29-Sep	15
Avg.	31-May	9-Sep	24
Earliest	1-May	29-Jul	7
Latest	19-Aug	29-Sep	59

Notes: 1. Data is from Hydrographers' Annual Reports for years 1980 and later, and from WRDS for years prior to 1980.

KEY DIVERSIONS

Diversion: **MORGAREIDGE & FRANCIS DITCH DIVERSION**

Date: 5 Jan 2001

Diversion Description: Headgate consists of a single, 3.8 x 1.7-foot rectangular steel gate in steel slider raised/lowered by Waterman-type screw mounted in concrete headwall. The headwall appears to be tilting.



Morgareidge & Francis Headgate

Diversion Location: The Morgareidge & Francis Ditch diversion is located on the North Fork of the Powder River.

Headgate:

Lat. Long.
N 43° 52' 54.9" W 106° 51' 10.6"

Flume:

Lat. Long.
N 43° 52' 53.9" W 106° 51' 9.1"



Morgareidge & Francis Flume

Conveyance Description: Open channel canal, approximately 2.2 mi. long.

Direct Flow Water Rights: The direct-flow rights summary follows:

Permit	Priority Date	Permitted Use	Acres	Flow (cfs)	Cumulative (cfs)
Terr.	10-01-1888	I	107	1.43	1.43
Terr.	10-01-1888	I	113	1.61	3.04

Associated Storage Rights: Dull Knife Reservoir

Irrigation Practices: See introduction to Powder River drainage

Agricultural Practices: See introduction to Powder River drainage

Return Flows: Estimated percentage of diverted water re-entering system as return flows:

Destination	Wet yr.	Mid yr.	Dry yr.
North Fork of Powder	50	50	20

Note: This is dependent on irrigators cooperating in their orders from the dams.

Losses: The Morgareidge & Francis Ditch Company often cleans the ditch, reducing losses significantly. In addition, the ditch flows quickly, further reducing losses.

Percent losses by end of ditch:

Wet yr.	Mid yr.	Dry yr.
10	20	25

References: Sandy Dixon, water commissioner, State Engineer's Office, interview, 5 Jan. 2001, 12 Nov. 2001

Irrigated Lands Water Rights Database

PerNo	PerSfx	Facility Name	Priority	Acres	Amount	Unit	SupTyp	Status	Source
Terr	D	Morgareidge & Francis	Oct. 1, 1888	220	3.04	CFS	OS	Adj	North Fork Powder River

Name	Morgareidge & Frances Ditch Diversion												
Source	North Fork Powder River												
District	8												
Data	Total monthly flow in AF												
Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1970													
1971													
1972													
1973													
1974								0.00	459.87	904.50	777.24	10.79	2152.40
1975													
1976													
1977													
1978													
1979													
1980													
1981								0.00	529.83	775.46	527.79	119.74	1952.82
1982								0.00	0.00	910.36	598.02	47.65	1556.03
1983								0.00	666.01	342.09	764.80	229.74	2002.64
1984													
1985								194.58	587.07	677.66	370.50	163.89	1993.70
1986								201.90	645.60	583.67	728.71	136.75	2296.63
1987								25.79	460.52	849.87	628.75	0.00	1964.93
1988								391.49	526.53	533.80	517.65	161.61	2131.08
1989								211.77	521.48	798.11	672.14	102.40	2305.90
1990								205.47	566.41	359.21	830.73	358.19	2320.01
1991								55.16	303.54	792.72	755.86	308.81	2216.09
1992								435.81	490.27	368.44	556.53	265.65	2116.70
1993								92.23	130.78	729.39	797.47	282.17	2032.04
1994								238.02	418.55	716.27	648.80	419.29	2440.93
1995								0.00	146.75	297.91	624.43	497.69	1566.78
1996								126.83	369.08	653.21	752.47	72.97	1974.56
1997								163.54	819.92	503.90	636.74	355.37	2479.47
1998								348.19	434.60	574.06	532.03	668.90	2557.78
1999								10.71	342.59	736.57	948.21	561.95	2600.03
Mean								142.18	443.13	637.22	666.78	250.71	2140.03
Max								435.81	819.92	910.36	948.21	668.90	2600.03
Min								0.00	0.00	297.91	370.50	0.00	1556.03

- Notes: 1. Monthly data is derived from spot measurements in the Hydrographers' Annual Reports for years 1980 and later, and from WRDS for years prior to 1980
2. Zero flow is assumed prior to the first and after the last measurement

Name	Morgareidge & Frances Ditch Diversion		
Source	North Fork Powder River		
District	8		
Data	First & Last Dates, Max. Days		
Water Year	First Date of Measurement	Last Date of Measurement	Maximum Days Missing
1970			
1971			
1972			
1973			
1974	16-Jun	1-Sep	0
1975			
1976			
1977			
1978			
1979			
1980			
1981	11-Jun	23-Sep	13
1982	6-Jul	8-Sep	14
1983	1-Jun	19-Sep	20
1984			
1985	17-May	17-Sep	21
1986	23-May	8-Sep	17
1987	30-May	31-Aug	14
1988	20-May	12-Sep	19
1989	20-May	11-Sep	21
1990	21-May	15-Sep	20
1991	20-May	16-Sep	22
1992	3-May	14-Sep	20
1993	1-May	21-Sep	30
1994	17-May	20-Sep	15
1995	1-Jun	25-Sep	29
1996	2-May	10-Sep	40
1997	27-May	18-Sep	20
1998	20-May	28-Sep	13
1999	24-May	20-Sep	9
Avg.	24-May	15-Sep	19
Earliest	1-May	31-Aug	0
Latest	6-Jul	28-Sep	40

Notes: 1. Data is from Hydrographers' Annual Reports for years 1980 and later, and from WRDS for years prior to 1980.

KEY DIVERSIONS

Diversion: **SAHARA DITCH DIVERSION**
AKA: Sussex Irrigation Canal

Date: 5 Jan. 2001

Note: The double flumes used to measure flow in this creek appear to be undersized and submerged, making accurate measurements difficult.

Diversion Description: Headgate consists of two hydraulically operated, 3.8 x 4.2-foot rectangular steel gates in steel sliders mounted in concrete headwall. One of the actuator arms appears to be bent. Water commissioners report that the gate is not adjusted, but left open in its present condition.



Sahara Headgate

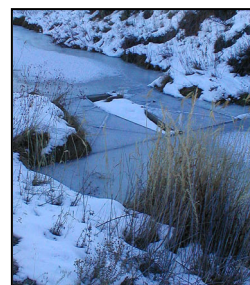
Diversion Location: The Sahara Ditch diversion is located on the main stem of the Powder River and is the lowest monitored diversion on the river.

Headgate:

Lat. Long.
N 43° 41' 33.6" W 106° 31' 53.0"

Flume:

Lat. Long.
N 43° 41' 33.8" W 106° 31' 52.1"



Sahara flumes

Conveyance Description: Open channel canal, approximately 14 mi. long. It is siphoned across the Powder River in one instance, providing a bottleneck to flows.

Direct Flow Water Rights: The direct-flow rights summary follows:

Permit	Priority Date	Permitted Use	Acres	Flow (cfs)	Cumulative (cfs)
3729	02-21-1902	I	13.00	0.19	0.19
3729	02-21-1902	I	28.00	0.40	0.59
3729	02-21-1902	I	33.00	0.47	1.06
3729	02-21-1902	I	40.00	0.57	1.63
3729	02-21-1902	I	50.00	0.71	2.34
3729	02-21-1902	I	54.00	0.77	3.11
3729	02-21-1902	I	62.00	0.88	3.99
3729	02-21-1902	I	64.00	0.91	4.90
3729	02-21-1902	I	76.00	1.08	5.98
3729	02-21-1902	I	80.00	1.14	7.12
3729	02-21-1902	I	80.00	1.14	8.26
3729	02-21-1902	I	80.00	1.14	9.40
3729	02-21-1902	I	90.00	1.29	10.69
3729	02-21-1902	I	126.00	1.80	12.49
3729	02-21-1902	I	150.00	2.14	14.63
3729	02-21-1902	I	154.00	2.20	16.83
3729	02-21-1902	I	160.00	2.28	19.11
3729	02-21-1902	I	160.00	2.28	21.39
3729	02-21-1902	I	271.00	3.87	25.26
3729	02-21-1902	I	367.27	5.24	30.50

Direct Flow Water Rights cont'd:

Permit	Priority Date	Permitted Use	Acres	Flow (cfs)	Cumulative (cfs)
3729	02-21-1902	I	515.29	7.35	37.85
994E	02-23-1903	I	5.00	0.07	37.92
994E	02-23-1903	I	9.00	0.13	38.05
994E	02-23-1903	I	13.00	0.19	38.24
994E	02-23-1903	I	20.00	0.28	38.52
994E	02-23-1903	I	21.00	0.30	38.82
994E	02-23-1903	I	22.50	0.32	39.14
994E	02-23-1903	I	25.60	0.36	39.50
994E	02-23-1903	I	28.00	0.40	39.90
994E	02-23-1903	I	46.50	0.66	40.56
994E	02-23-1903	I	81.00	1.15	41.71
994E	02-23-1903	I	101.00	1.44	43.15
994E	02-23-1903	I	132.70	1.89	45.04
994E	02-23-1903	I	137.00	1.85	46.89
994E	02-23-1903	I	153.00	2.18	49.07
994E	02-23-1903	I	326.00	4.65	53.72
1388E	05-11-1905	I	8.50	0.12	53.84
1388E	05-11-1905	I	20.00	0.28	54.12
1388E	05-11-1905	I	26.00	0.37	54.49
1388E	05-11-1905	I	29.00	0.41	54.90
1388E	05-11-1905	I	35.00	0.50	55.40
1388E	05-11-1905	I	50.00	0.71	56.11
1388E	05-11-1905	I	55.00	0.78	56.89
1388E	05-11-1905	I	62.00	0.88	57.77
1388E	05-11-1905	I	63.00	0.90	58.67
1388E	05-11-1905	I	120.00	1.71	60.38
1388E	05-11-1905	I	128.00	1.83	62.21
1388E	05-11-1905	I	142.00	2.02	64.23
5246E	05-20-1940	I	33.00	0.47	64.70
6382E	05-08-1963	I	808.90	11.56	76.26
6503E	12-24-1973	I	35.10	0.50	76.76
6576E	09-29-1975	I	36.40	0.51	77.27
7040E	05-01-1992	I	12.86	0.18	77.45

Associated Storage Rights: Dull Knife Reservoir

Irrigation Practices: See introduction to Powder River drainage

Agricultural Practices: See introduction to Powder River drainage

Return Flows: Often, the bentonite-charged runoff is allowed to flow into this ditch to seal leakage. SEO personnel were not able to estimate return flows other than to estimate that they would be minimal because the ditch diverts water so far from the river. Much of the acreage irrigated is underlain by gravel.

Destination	Wet Yr.	Avg. Yr.	Dry Yr.
Powder River	25	20	15

Ave. year: All irrigators can irrigate twice.

Dry year: Sahara doesn't carry enough water to effectively irrigate.

Losses:

Percent losses by end of ditch:

Wet yr.	Mid yr.	Dry yr.
15	17	20

References:

Sandy Dixon, water commissioner, State Engineer's Office, interview, 5 Jan. 2001, 12 Nov. 2001

Pat Garrett, Sahara Ditch Rider, phone interview, 12 Nov. 2001

Irrigated Lands Water Rights Database

PerNo	PerSfx	Facility Name	Priority	Acres	Amount	Unit	SupTyp	Status	Source
3612	D	Figure Eight (Sahara)	Dec. 31, 1901	56.72	0.81	CFS	OS	Adj	Powder River
3729	D	Sahara	Feb. 21, 1902	2653.56	37.85	CFS	OS	Adj	Powder River
994	E	Enl. Sahara	Feb. 23, 1903	1121.3	15.87	CFS	OS	Adj	Powder River
1388	E	Enl. Sahara	May 11, 1905	738.5	10.51	CFS	OS	Adj	Powder River
1388	E	Enl. Sahara	May 11, 1905	10	0		SS	Adj	Powder River
15102	D	Streeter (Sahara)	May 31, 1918	40	0.57	CFS	OS	Adj	Powder River
5246	E	Enl. Sahara	May 20, 1940	33	0.47	CFS	OS	Adj	Powder River
6382	E	Enl. Sahara	May 8, 1963	808.9	11.56	CFS	OS	Adj	Powder River
6382	E	Enl. Sahara	May 8, 1963	100	0		SS	Adj	Powder River
6503	E	Enl. Sahara	Dec. 24, 1973	35.1	0.5	CFS	OS	Adj	Powder River
6576	E	Enl. Sahara	Sep. 29, 1975	36.4	0.51	CFS	OS	Adj	Powder River

Name	Sahara Ditch Diversion												
Source	Powder River												
District	8												
Data	Total monthly flow in AF												
Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1970													
1971													
1972													
1973													
1974								0.00	1880.57	3871.89	3583.71	87.05	9423.22
1975								0.00	0.00	7507.71	6726.64	5699.56	19933.91
1976													
1977													
1978													
1979													
1980													
1981													
1982													
1983													
1984													
1985								0.00	1605.42	2381.75	1189.91	751.91	5928.99
1986													
1987													
1988								0.00	2664.30	2600.73	2138.81	1087.42	8491.26
1989													
1990													
1991													
1992													
1993													
1994								0.00	0.00	3694.31	3251.19	2137.19	9082.69
1995								3095.86	5018.89	7483.02	9038.80	9644.65	34281.22
1996								131.44	152.30	124.83	121.68	105.37	635.62
1997													
1998													
1999								0.00	4079.01	7518.06	4954.99	2340.49	18892.55
Mean								403.41	1925.06	4397.79	3875.72	2731.71	13333.68
Max								3095.86	5018.89	7518.06	9038.80	9644.65	34281.22
Min								0.00	0.00	124.83	121.68	87.05	635.62

- Notes: 1. Monthly data is derived from spot measurements in the Hydrographers' Annual Reports for years 1980 and later, and from WRDS for years prior to 1980
2. Zero flow is assumed prior to the first and after the last measurement

Name	Sahara Ditch Diversion		
Source	Powder River		
District	8		
Data	First & Last Dates, Max. Days		
Water Year	First Date of Measurement	Last Date of Measurement	Maximum Days Missing
1970			
1971			
1972			
1973			
1974	16-Jun	1-Sep	0
1975	1-Jul	30-Sep	0
1976			
1977			
1978			
1979			
1980			
1981			
1982			
1983			
1984			
1985	10-Jun	17-Sep	14
1986			
1987			
1988	10-Jun	15-Sep	18
1989			
1990			
1991			
1992			
1993			
1994	5-Jul	27-Sep	21
1995	1-May	26-Sep	15
1996	3-May	23-Sep	43
1997			
1998			
1999	7-Jun	30-Sep	14
Avg.	6-Jun	21-Sep	16
Earliest	1-May	1-Sep	0
Latest	5-Jul	30-Sep	43

Notes: 1. Data is from Hydrographers' Annual Reports for years 1980 and later, and from WRDS for years prior to 1980.

KEY DIVERSIONS

Diversion: VRUWINK (KAYCEE) DITCH DIVERSION

Date: 5 Jan. 2001

Diversion Description: Headgate consists of a single, 3.9 x 3.2-foot rectangular steel gate in steel sliders raised/lowered by a Waterman-type screw, mounted in a steel stilling box. This diversion is two years old.



Vruwink Ditch headgate

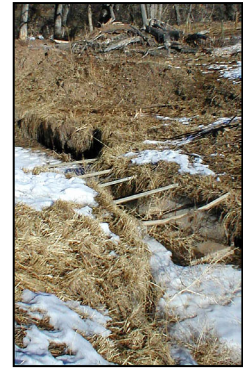
Diversion Location: The Vruwink Ditch diversion is located on the Middle Fork of the Powder River between the confluences of the Middle Fork with the Red Fork and the North Fork.

Headgate:

Lat. Long.
N 43° 41' 4.6" W 106° 41' 29.4"

Flume:

Lat. Long.
N 43° 41' 13.7" W 106° 41' 35.2"



Vruwink Ditch flume

Conveyance Description: Open channel canal, approximately 6.0 mi. long.

Direct Flow Water Rights: The direct-flow rights summary follows:

Permit	Priority Date	Permitted Use	Acres	Flow (cfs)	Cumulative (cfs)
3413	09-24-1901	I	73.70	1.05	1.05
1144E	12-26-1903	I	182.00	2.60	3.65
2340E	11-18-1910	I	108.00	1.54	5.19
2340E	11-18-1910	I	129.00	1.84	7.03
2340E	11-18-1910	I	228.20	3.26	10.29
2426E	04-17-1911	I	163.50	2.34	12.63
5250E	06-15-1940	D,I,S	18.00	0.26	12.89

Associated Storage Rights: None

Irrigation Practices: See introduction to Powder River drainage

Agricultural Practices: See introduction to Powder River drainage

Return Flows: Estimated percentage of total diversion developing into return flows:

Destination	Wet yr.	Mid yr.	Dry yr.
Middle Fork Powder	20	20	20

Losses: Approximately 25 percent by the end of the ditch

References: Sandy Dixon, water commissioner, State Engineer's Office, interview, 5 Jan. 2001, 12 Nov. 2001

Irrigated Lands Water Rights Database

PerNo	PerSfx	Facility Name	Priority	Acres	Amount	Unit	SupTyp	Status	Source
869	D	Vruwink & Waegle (Vruwink)	Dec. 1, 1894	124	1.76	CFS	OS	Adj	Middle Fork Powder River
1012	D	Vruwink & Waegle (Vruwink)	May 23, 1895	37.5	0.53	CFS	OS	Adj	Middle Fork Powder River
603	E	Enl. Murphy No. 2 (Vruwink)	Nov. 3, 1900	96.8	1.37	CFS	OS	Adj	Middle Fork Powder River
3413	D	Vruwink	Sep. 24, 1901	73.7	1.06	CFS	OS	Adj	Middle Fork Powder River
1144	E	Enl. Vruwink	Dec. 26, 1903	182	2.6	CFS	OS	Adj	Middle Fork Powder River
2340	E	Enl. Vruwink (Hauber No. 1, No. 2, & No. 3 Sprinkler Systems)	Nov. 18, 1910	465.2	6.64	CFS	OS	Adj	Middle Fork Powder River
2426	E	Enl. Vruwink	April 17, 1911	163.5	2.34	CFS	OS	Adj	Middle Fork Powder River
5250	E	Enl. Vruwink	June 15, 1940	18	0.26	CFS	OS	Adj	Middle Fork Powder River

Name	Vruwink (Kaycee) Ditch Diversion												
Source	Middle Fork Powder River												
District	8												
Data	Total monthly flow in AF												
Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1970													
1971													
1972													
1973													
1974													
1975													
1976													
1977													
1978													
1979													
1980													
1981								0.00	498.79	1235.12	602.76	21.24	2357.91
1982								0.00	0.00	0.00	238.81	0.00	238.81
1983								0.00	169.32	444.14	702.27	296.28	1612.01
1984													
1985								0.00	89.95	594.22	545.99	146.35	1376.51
1986								322.68	789.47	462.64	306.74	0.00	1881.53
1987								161.61	402.64	535.64	257.00	0.00	1356.89
1988								171.30	771.14	534.44	530.93	0.00	2007.81
1989								87.83	709.81	564.52	241.50	0.00	1603.66
1990								327.20	455.34	342.50	599.74	126.26	1851.04
1991								32.01	126.61	293.20	190.06	0.00	641.88
1992								0.00	239.65	392.45	484.36	54.14	1170.60
1993								172.56	252.89	440.23	468.86	76.49	1411.03
1994								474.73	409.04	276.85	524.06	183.38	1868.06
1995								170.58	93.22	317.95	248.24	85.20	915.19
1996								108.81	440.67	428.98	475.51	187.96	1641.93
1997								6.94	470.20	506.34	134.63	227.14	1345.25
1998								84.95	223.56	137.22	356.24	253.22	1055.19
1999												479.70	
Mean								124.78	361.31	441.56	406.34	118.74	1431.49
Max								474.73	789.47	1235.12	702.27	479.70	2357.91
Min								0.00	0.00	0.00	134.63	0.00	238.81

- Notes: 1. Monthly data is derived from spot measurements in the Hydrographers' Annual Reports for years 1980 and later, and from WRDS for years prior to 1980
2. Zero flow is assumed prior to the first and after the last measurement

Name	Vruwink (Kaycee) Ditch Diversion		
Source	Middle Fork Powder River		
District	8		
Data	First & Last Dates, Max. Days		
Water Year	First Date of Measurement	Last Date of Measurement	Maximum Days Missing
1970			
1971			
1972			
1973			
1974			
1975			
1976			
1977			
1978			
1979			
1980			
1981	16-Jun	1-Sep	27
1982	19-Aug	26-Aug	7
1983	1-Jun	14-Sep	26
1984	One Reading	One Reading	One Reading
1985	18-Jun	10-Sep	22
1986	20-May	29-Aug	26
1987	20-May	21-Aug	24
1988	25-May	31-Aug	28
1989	27-May	23-Aug	21
1990	17-May	9-Sep	26
1991	28-May	26-Aug	15
1992	7-Jun	12-Sep	18
1993	7-May	22-Sep	15
1994	4-May	29-Sep	29
1995	3-May	11-Sep	19
1996	6-May	26-Sep	16
1997	28-May	29-Sep	21
1998	18-May	30-Sep	16
1999	18-May	27-Sep	99
Avg.	27-May	10-Sep	25
Earliest	3-May	21-Aug	7
Latest	19-Aug	30-Sep	99

Notes: 1. Data is from Hydrographers' Annual Reports for years 1980 and later, and from WRDS for years prior to 1980.