

RECLAMATION

Managing Water in the West

Western Water Assessment Workshop

Lyle D. Myler
Water and Lands
Division Chief
Wyoming Area Office



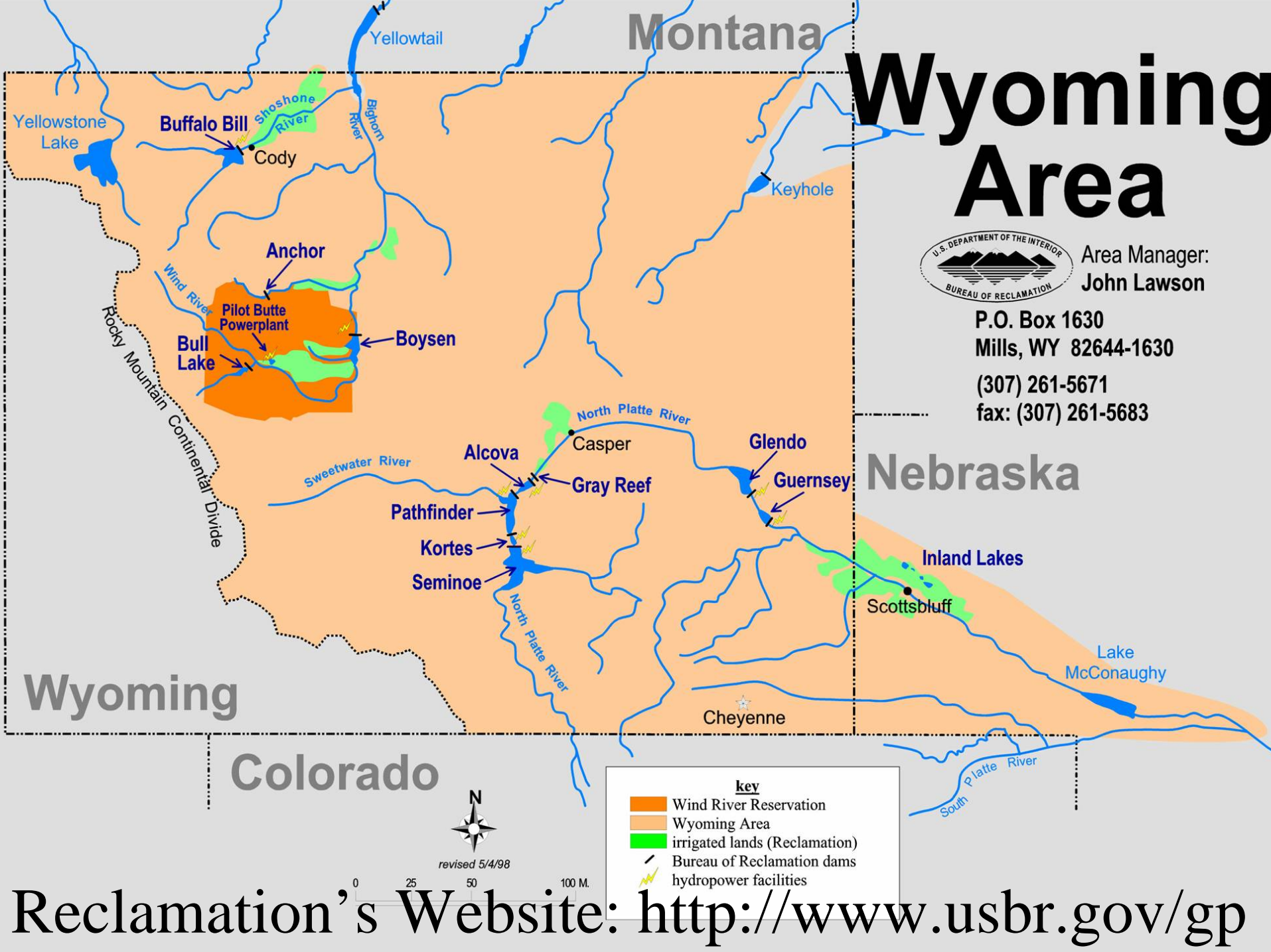
December 12, 2005

Wyoming Area



Area Manager:
John Lawson

P.O. Box 1630
Mills, WY 82644-1630
(307) 261-5671
fax: (307) 261-5683



Wyoming

Montana

Nebraska

Colorado



key

- Wind River Reservation
- Wyoming Area
- irrigated lands (Reclamation)
- Bureau of Reclamation dams
- hydropower facilities

Reclamation's Website: <http://www.usbr.gov/gp>

Forecasting Snowmelt Runoff

- Forecasts of the April-July snowmelt runoff into Reclamation reservoirs
 - Wind/Bighorn (January 1 to June 1)
 - North Platte (February 1 to May 1)
- SNOTEL & Snow Course data from the Natural Resources Conservation Service (NRCS)
- Precipitation data from the National Weather Service (NWS)
- November Inflow as estimate of Soil Conditions
- Compare forecast with those developed by NRCS
- Use the forecasted reservoir inflow in monthly revisions of the annual reservoir operating plan

S N O W - P R E C I P I T A T I O N U P D A T E

Based on Mountain Data from NRCS SNOTEL Sites

As of MONDAY: NOVEMBER 21 , 2005

BASIN Data Site Name	ELEV. (Ft)	SNOW WATER EQUIVALENT			TOTAL PRECIPITATION		
		Current	Average	Avg %	Current	Average	Avg %
WYOMING							
WIND RIVER							
BURROUGHS CREEK	8750	2.6	2.8	93	4.9	3.8	129
COLD SPRINGS	9630	1.4	2.5	56	3.6	3.5	103
DEER PARK	9700	2.7	4.0	68	4.0	5.6	71
HOBBS PARK	10100	2.4	4.3	56	4.0	3.8	105
LITTLE WARM	9370	2.4	2.6	92	4.2	3.7	114
SOUTH PASS	9040	2.4	3.8	63	4.0	4.7	85
ST. LAWRENCE ALT	8620	.5	2.1	24	2.6	2.9	90
TOGWOTEE PASS	9580	6.6	5.5	120	7.0	5.8	121
TOWNSEND CREEK	8700	1.3	2.4	54	3.9	3.7	105
Basin wide percent of average				74	102		
ELKHART PARK G.S.	9400	2.3	2.6	88	3.2	3.6	89
BIGHORN BASIN							
BALD MTN.	9380	3.7	5.0	74	3.3	4.4	75
BEAR TRAP MEADOW	8200	.6	1.3	46	2.7	2.9	93
BLACKWATER	9780	6.8	6.1	111	6.0	5.7	105
BONE SPRINGS DIV	9350	4.3	4.5	96	4.4	4.1	107
EVENING STAR	9200	5.8	6.4	91	8.3	6.4	130
GRAVE SPRINGS	8550	.9	2.3	39	3.4	3.1	110
KIRWIN	9550	4.3	3.5	123	4.6	3.4	135
MARQUETTE	8760	.9	3.2	28	3.2	3.5	91
MIDDLE POWDER	7760	1.6	2.9	55	3.4	4.2	81
OWL CREEK	8975	.6	1.6	37	2.7	1.9	142
POWDER RIVER PASS	9480	1.6	2.7	59	3.3	3.4	97
SHELL CREEK	9580	3.3	4.3	77	3.4	3.7	92
SYLVAN LAKE	8420	-M	4.8	*	-M	5.6	*
SYLVAN ROAD	7120	1.8	2.4	75	5.6	5.1	110
TIMBER CREEK	7950	.6	2.0	30	2.7	2.6	104
YOUNTS PEAK	8350	-M	3.5	*	7.0	4.1	171
Basin wide percent of average				76	109		
SHOSHONE RIVER							
BLACKWATER	9780	6.8	6.1	111	6.0	5.7	105
EVENING STAR	9200	5.8	6.4	91	8.3	6.4	130
KIRWIN	9550	4.3	3.5	123	4.6	3.4	135
MARQUETTE	8760	.9	3.2	28	3.2	3.5	91
SYLVAN LAKE	8420	-M	4.8	*	-M	5.6	*
SYLVAN ROAD	7120	1.8	2.4	75	5.6	5.1	110
YOUNTS PEAK	8350	-M	3.5	*	7.0	4.1	171
Basin wide percent of average				91	123		

Precipitation Totals

Issued by NWS Riverton, WY

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CSUS45 KRIW 152153

HYMRIW

ZCZC CYSHYMRIW 000

TTAA00 KRIW 092227

WYC003-013-017-019-023-025-029-035-037-039-043-601-312300-

MONTHLY PRECIPITATION FOR WYOMING...UPDATED

NATIONAL WEATHER SERVICE RIVERTON WY

250 PM MST TUE NOV 15 2005

WYOMING PRECIPITATION TOTALS FOR OCT 2005.

ALL DATA PRELIMINARY...OFFICIAL CLIMATE DATA AVAILABLE THROUGH THE NATIONAL CLIMATIC DATA CENTER APPROXIMATELY 60 DAYS AFTER END OF THE MONTH.

.BR RIW 1101 M DH00/PPM

:SHEF ID	PCPN	PERCENT	STATION
ACVW4	0.97	: 104%	PATHFINDER DAM
AFOW4	1.31	: 88%	AFTON
ALTW4	2.53	: 123%	ALTA 1NNW
BCRW4	1.16	: 87%	BATES CREEK
BDFW4	2.03	: 106%	BEDFORD 3SE
BFFW4	2.90	: N/A	BUFFALO 5WSW
BFLW4	2.43	: N/A	BUFFALO SPOTTER
BITW4	1.10	: 162%	BITTER CREEK 4NE
BKRW4	4.62	: N/A	BECHLER RANGER STATION
BLYW4	2.21	: 208%	BILLY CREEK
BMTW4	2.98	: 227%	THERMOPOLIS 9NE
BNWW4	0.70	: 52%	BONDURANT
BPI	0.27	: N/A	BIG PINEY-MARBLETON ASOS
BPIW4	0.30	: 51%	BIG PINEY
BRRW4	1.40	: 209%	BURRIS
BRSW4	0.34	: 48%	BOULDER REARING STATION
BSNW4	1.45	: 238%	BASIN
BTXW4	2.54	: 169%	BLACK MOUNTAIN
BUFW4	2.65	: 255%	BUFFALO
BYG	1.36	: N/A	BUFFALO ASOS
CDYW4	1.02	: 115%	BUFFALO BILL DAM
CLAW4	0.66	: 108%	CLARK
COPW4	0.69	: 78%	CODY
COYW4	1.53	: 120%	CODY 21SW
CORW4	0.52	: 63%	CORA
CPR	1.18	: 104%	CASPER AIRPORT ASOS
CRDW4	2.27	: 208%	CRANDALL CREEK (PAINTER OUTPOST)
CSWW4	1.48	: N/A	CASPER 1SW
CWWW4	1.22	: N/A	CSPER-WWTP
DANW4	0.51	: 76%	DANIEL FISH HATCHERY
DARW4	1.55	: 142%	DARWIN RANCH

BIGHORN SNOWPACK WATER CONTENT

The tables shown below display the Snotel stations used in the development of the April - July snowmelt runoff forecasts displayed on page six of this report.

SWE in inches ¹

WATERSHED	April 1 snow-water content			Comparative April 1 snow-water content		
	W. Yr. 2005	30 Yr. Avg. ²	% of Avg.	W. Yr. 2004	W. Yr. 2003	W. Yr. 2002
Bull Lake Reservoir	11.50	13.57	85	9.4	12.8	10.5
Boysen Reservoir	10.74	14.96	72	9.8	15.4	12.4
Buffalo Bill Reservoir	12.37	20.30	61	13.1	20.9	16.7

Boysen Reservoir Watershed

SWE in inches ¹

Snotel Stations (Elevation)	Water Content	30 Yr. Avg. ²
Burroughs Creek (8,750)	9.7	14.8
Hobbs Park (10,100)	14.1	15.1
Kirwin (9,800)	6.6	11.5
Little Warm (9,620)	8.1	12.0
Togwotee Pass (9,580)	16.5	25.2
Townsend Creek (8,700)	10.0	8.8
Younts Peak (8,350)	10.2	17.3
Watershed Average	10.74	14.96

Buffalo Bill Reservoir Watershed

SWE in inches ¹

Snotel Stations (Elevation)	Water Content	30 Yr. Avg. ²
Blackwater (9,780)	14.3	24.8
Evening Star (9,200)	17.4	30.1
Marquette (8,760)	4.3	9.0
Sylvan Lake (8,420)	14.8	22.8
Sylvan Road (8,120)	9.1	12.9
Togwotee Pass (9,580)	16.5	25.2
Younts Peak (8,350)	10.2	17.3
Watershed Average	12.37	20.30

Boysen Reservoir April 1 Forecast Considering All Parameters

YEAR	AVG EST	WTD EST	ACTUAL	DIFFA	DIFFW	ORDER	PLT PT
1981	403.	449.	438.	34.	-12.	240.	2.1
1982	578.	595.	606.	28.	11.	189.	6.3
1983	734.	804.	1044.	310.	240.	126.	10.4
1984	582.	640.	701.	118.	61.	117.	14.6
1985	459.	414.	315.	-144.	-99.	115.	18.8
1986	804.	874.	1001.	196.	126.	61.	22.9
1987	683.	691.	506.	-177.	-185.	54.	27.1
1988	211.	273.	238.	27.	-34.	52.	31.3
1989	705.	677.	401.	-304.	-276.	43.	35.4
1990	307.	290.	317.	11.	27.	35.	39.6
1991	826.	781.	898.	72.	117.	27.	43.8
1992	532.	390.	284.	-248.	-106.	11.	47.9
1993	620.	577.	632.	11.	54.	-12.	52.1
1994	277.	331.	220.	-57.	-110.	-13.	56.3
1995	944.	1078.	1130.	186.	52.	-30.	60.4
1996	809.	800.	725.	-84.	-74.	-34.	64.6
1997	924.	902.	937.	13.	35.	-46.	68.8
1998	807.	770.	813.	6.	43.	-74.	72.9
1999	1181.	1176.	1146.	-36.	-30.	-83.	77.1
2000	359.	324.	278.	-80.	-46.	-99.	81.3
2001	-48.	-71.	118.	166.	189.	-106.	85.4
2002	73.	44.	159.	86.	115.	-110.	89.6
2003	428.	345.	262.	-165.	-83.	-185.	93.8
2004	290.	334.	321.	31.	-13.	-276.	97.9

AVERAGE RUNOFF 562.

AVERAGE SOLUTION

$$Y = 4.742X2 \quad .763X3 \quad .228X4 \quad .783X5 \quad -886.7480$$

$$R = .87701$$

$$S = 158.68$$

BEST WEIGHTED SOLUTION

$$Y = 4.135X2 \quad .533X3 \quad .248X4 \quad .699X5 \quad -864.0250$$

$$R = .92231$$

$$S = 127.63$$

BEST TRY = 220. OF 408

FORECASTED INFLOWS
 UNITS 1000 AF

28:MAR:05
 09:41:39

BOYSEN RESERVOIR

	APR 1 SNOW	APR 1 SNOW NOV INFLOW	APR 1 SNOW NOV INFLOW	APR 1 SNOW NOV INFLOW OCT-MAR PREC	APR 1 SNOW NOV INFLOW OCT-MAR PREC APR-JUN PREC
FORECASTED AVG INFLO	386.2523	462.7397	392.6220	393.7137	
AVERAGE R	.5815	.7057	.7422	.8770	
AVERAGE S	268.6800	234.0000	221.3500	158.6800	
AVERAGE R O	562.0000	562.0000	562.0000	562.0000	
1.645 . S	441.9786	384.9300	364.1208	261.0286	
FORECASTED WTD INFLO	462.1690	513.1740	370.8897	400.2504	
BEST WTD R	.7111	.7696	.8259	.9223	
BEST WTD S	232.2100	210.9000	186.2100	127.6300	
1.645 . S	381.9854	346.9305	306.3155	209.9513	

RUNOFF FORECAST

BOYSEN INFLOW YEAR	ACTUAL APR-JUL RUNOFF (KAF)	JANUARY 1 FORECAST		FEBRUARY 1 FORECAST		MARCH 1 FORECAST		APRIL 1 FORECAST		MAY 1 FORECAST		JUNE 1 FORECAST	
		Percent of Actual		Percent of Actual		Percent of Actual		Percent of Actual		Percent of Actual		Percent of Actual	
		(%)	(KAF)	(%)	(KAF)	(%)	(KAF)	(%)	(KAF)	(%)	(KAF)	(%)	(KAF)
1993	631.6	71	447	79	501	71	451	67	425	88	554	78	495
1994	220.4	190	418	143	315	201	444	201	444	204	450	157	345
1995	1129.8	55	620	50	570	49	550	49	550	55	617	89	1010
1996	725.4	96	700	124	900	117	850	117	850	117	850	103	750
1997	937.2	117	1100	123	1150	114	1070	105	980	96	900	84	784
1998	812.8	71	580	86	700	85	690	91	740	87	710	76	617
1999	1145.6	63	720	66	760	78	890	72	820	95	1084	100	1149
2000	278.4	165	460	176	490	180	500	162	450	108	300	108	300
2001	118.0	356	420	280	330	280	330	169	200	169	200	144	170
2002	159.2	236	375	236	375	204	325	204	325	188	300	132	210
2003	262.3	95	250	95	250	130	340	172	450	95	250	91	240
2004	320.6	137	440	109	350	125	400	62	200	78	250	78	250
2005	589.3	89	525	87	510	68	400	68	400	71	420	98	575

	Jan 1	Feb 1	Mar 1	Apr 1	May 1	June 1
# of forecasts within + or - 10% of the actual runoff:	2	2	0	2	4	5
# of forecasts within + or - 20% of the actual runoff:	4	4	3	3	7	7
Total years of forecast data available from 1993-2005:	13	13	13	13	13	13

RUNOFF FORECAST

BUFFALO BILL INFLOW YEAR	ACTUAL APR-JUL RUNOFF (KAF)	JANUARY 1 FORECAST		FEBRUARY 1 FORECAST		MARCH 1 FORECAST		APRIL 1 FORECAST		MAY 1 FORECAST		JUNE 1 FORECAST	
		Percent of Actual		Percent of Actual		Percent of Actual		Percent of Actual		Percent of Actual		Percent of Actual	
		(%)	(KAF)	(%)	(KAF)	(%)	(KAF)	(%)	(KAF)	(%)	(KAF)	(%)	(KAF)
1993	596.8	109	653	100	595	93	557	87	518	102	609	105	625
1994	413.4	119	494	131	543	145	599	134	554	129	535	107	444
1995	805.4	91	730	91	730	87	700	87	700	107	864	104	836
1996	1114.1	74	830	79	885	79	885	79	885	81	900	81	900
1997	1136	97	1100	110	1250	103	1175	103	1175	97	1100	86	977
1998	641.6	90	580	109	700	106	680	109	700	97	625	82	525
1999	833.2	90	750	102	850	106	880	97	810	102	851	103	855
2000	536.2	93	500	101	540	103	550	103	550	93	500	93	500
2001	374.8	133	500	115	430	107	400	100	375	107	400	96	360
2002	552.5	100	550	100	550	89	490	90	500	100	550	96	530
2003	667.8	75	500	82	550	82	550	97	650	84	560	81	540
2004	387.1	163	630	137	530	137	530	103	400	90	350	103	400
2005	513.4	97	500	88	450	83	425	78	400	78	400	94	485

	Jan 1	Feb 1	Mar 1	Apr 1	May 1	June 1
# of forecasts within + or - 10% of the actual runoff:	8	7	6	8	9	9
# of forecasts within + or - 20% of the actual runoff:	9	10	10	10	11	13
Total years of forecast data available from 1993-200!	13	13	13	13	13	13

RUNOFF FORECAST

SEMINOIE		FEBRUARY 1		MARCH 1		APRIL 1		MAY 1	
INFLOW		FORECAST		FORECAST		FORECAST		FORECAST	
YEAR	ACTUAL APR-JUL RUNOFF (KAF)	Percent of Actual (%)	(KAF)	Percent of Actual (%)	(KAF)	Percent of Actual (%)	(KAF)	Percent of Actual (%)	(KAF)
1993	873	78	685	86	750	86	750	106	925
1994	415	169	700	176	730	157	650	139	575
1995	1061	47	500	47	500	42	450	50	535
1996	942	106	1000	106	1000	111	1050	123	1160
1997	1074	121	1300	119	1275	98	1050	102	1100
1998	662	103	680	113	750	106	700	91	600
1999	915	86	790	87	800	71	650	96	875
2000	471	142	670	155	730	138	650	111	525
2001	387	142	550	142	550	129	500	136	525
2002	117	299	350	350	410	256	300	214	250
2003	530	47	250	74	390	113	600	129	685
2004	277	162	450	162	450	90	250	94	260
2005	733	78	575	64	470	67	490	55	403

	Feb 1	Mar 1	Apr 1	May 1
# of forecasts within + or - 10% of the actual runoff:	2	1	3	5
# of forecasts within + or - 20% of the actual runoff:	3	5	6	6
Total years of forecast data available from 1993-2005:	13	13	13	13

RUNOFF FORECAST

Alcova to Glendo		FEBRUARY 1 FORECAST		MARCH 1 FORECAST		APRIL 1 FORECAST		MAY 1 FORECAST	
INFLOW YEAR	ACTUAL APR-JUL RUNOFF (KAF)	Percent of Actual		Percent of Actual		Percent of Actual		Percent of Actual	
		(%)	(KAF)	(%)	(KAF)	(%)	(KAF)	(%)	
1993	204	91	185	91	185	78	160	123	250
1994	31	645	200	548	170	452	140	323	100
1995	408	25	100	20	80	10	40	19	79
1996	168	113	190	104	175	119	200	95	160
1997	237	118	280	127	300	114	270	97	230
1998	55	218	120	236	130	200	110	164	90
1999	225	44	100	49	110	36	80	107	240
2000	134	90	120	90	120	90	120	82	110
2001	113	88	100	80	90	62	70	66	75
2002	18	222	40	222	40	222	40	111	20
2003	93	32	30	54	50	108	100	145	135
2004	34	132	45	221	75	118	40	74	25
2005	39	154	60	141	55	154	60	100	39

	Feb 1	Mar 1	Apr 1	May 1
# of forecasts within + or - 10% of the actual	2	3	2	4
# of forecasts within + or - 20% of the actual	5	4	5	6
Total years of forecast data available from	13	13	13	13

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 Option VOL

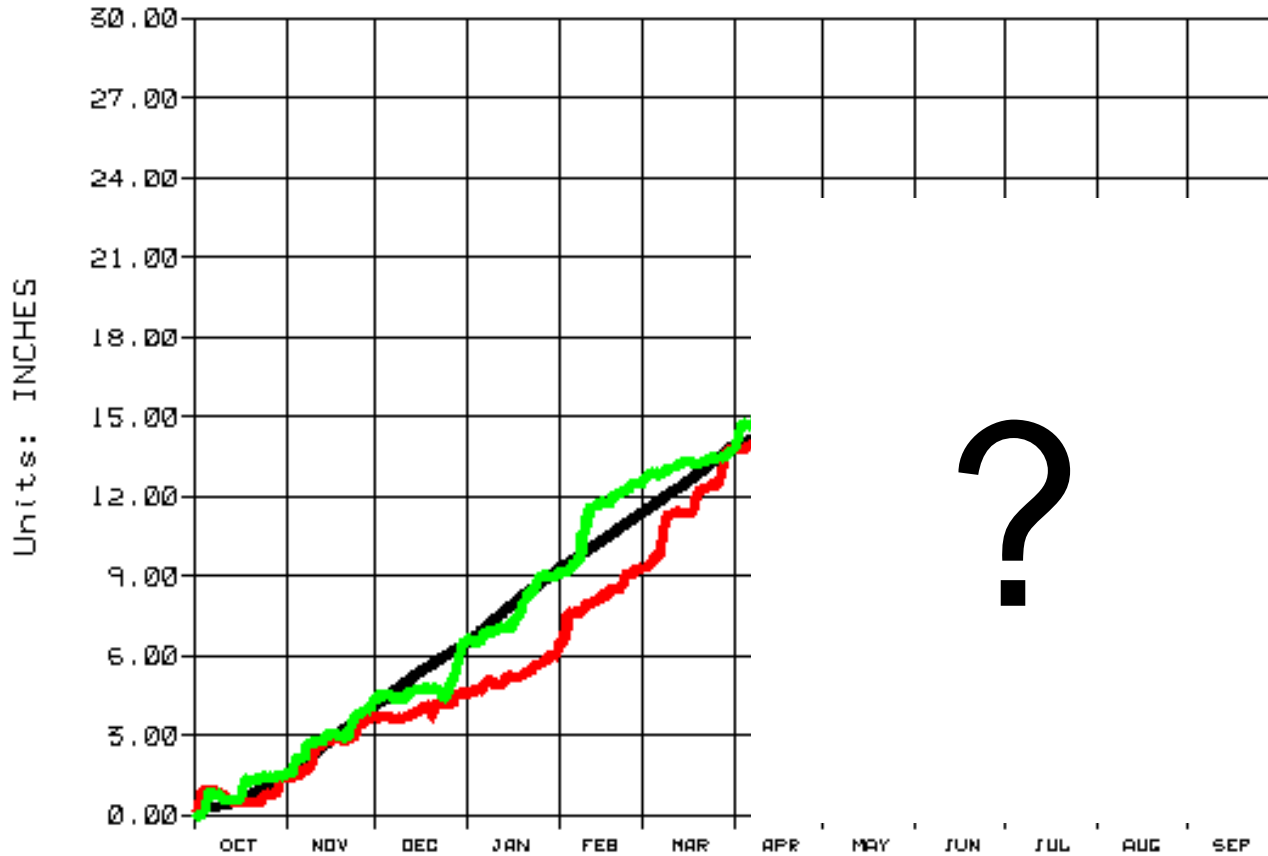
Station name BOYR Begin and end year 1981-2004
 Parameter code IN Begin and end date APR 1-JUL 31
 Option VOLAF

BY YEAR			RANKED	
YEAR	SUMMATION	MISS	YEAR	SUMMATION
1981	10.49	0	1986	20.48
1982	17.74	0	1997	18.62
1983	13.29	0	1982	17.74
1984	11.60	0	1996	15.83
1985	10.66	0	1998	14.25
1986	20.48	0	2003	13.84
1987	13.22	0	1999	13.77
1988	11.00	0	1995	13.76
1989	13.43	0	1989	13.43
1990	11.74	0	1983	13.29
1991	11.47	0	1987	13.22
1992	9.05	0	2005	12.58
1993	10.75	0	1990	11.74
1994	11.64	0	1994	11.64
1995	13.76	0	1984	11.60
1996	15.83	0	1991	11.47
1997	18.62	0	1988	11.00
1998	14.25	0	1993	10.75
1999	13.77	0	2002	10.73
2000	9.86	0	1985	10.66
2001	6.33	0	1981	10.49
2002	10.73	0	2004	10.18
2003	13.84	0	2000	9.86
2004	10.18	0	1992	9.05
2005	12.58	0	2001	6.33
Average of 25 years:			12.65	

BY YEAR			RANKED	
YEAR	SUMMATION	MISS	YEAR	SUMMATION
1981	437724.88	0	1999	1145642.13
1982	605809.94	0	1995	1129901.88
1983	1043971.94	0	1983	1043971.94
1984	700380.44	0	1986	1000480.38
1985	314675.41	0	1997	937256.75
1986	1000480.38	0	1991	897798.63
1987	506038.16	0	1998	812774.38
1988	238239.63	0	1996	725460.94
1989	401230.94	0	1984	700380.44
1990	317450.81	0	1993	631652.13
1991	897798.63	0	1982	605809.94
1992	284041.69	0	1987	506038.16
1993	631652.13	0	1981	437724.88
1994	220507.81	0	1989	401230.94
1995	1129901.88	0	2004	320644.63
1996	725460.94	0	1990	317450.81
1997	937256.75	0	1985	314675.41
1998	812774.38	0	1992	284041.69
1999	1145642.13	0	2000	278433.66
2000	278433.66	0	2003	262324.44
2001	117846.94	0	1988	238239.63
2002	159183.56	0	1994	220507.81
2003	262324.44	0	2002	159183.56
2004	320644.63	0	2001	117846.94
Average of 24 years:			562061.38	

Basin above Boysen Reservoir Snow Water Equivalent

Data From 1-OCT Through 30-SEP
Plotted 11/21/2005 13:13



BOYR Boysen Reservoir, Wind River near Thermopole, WY

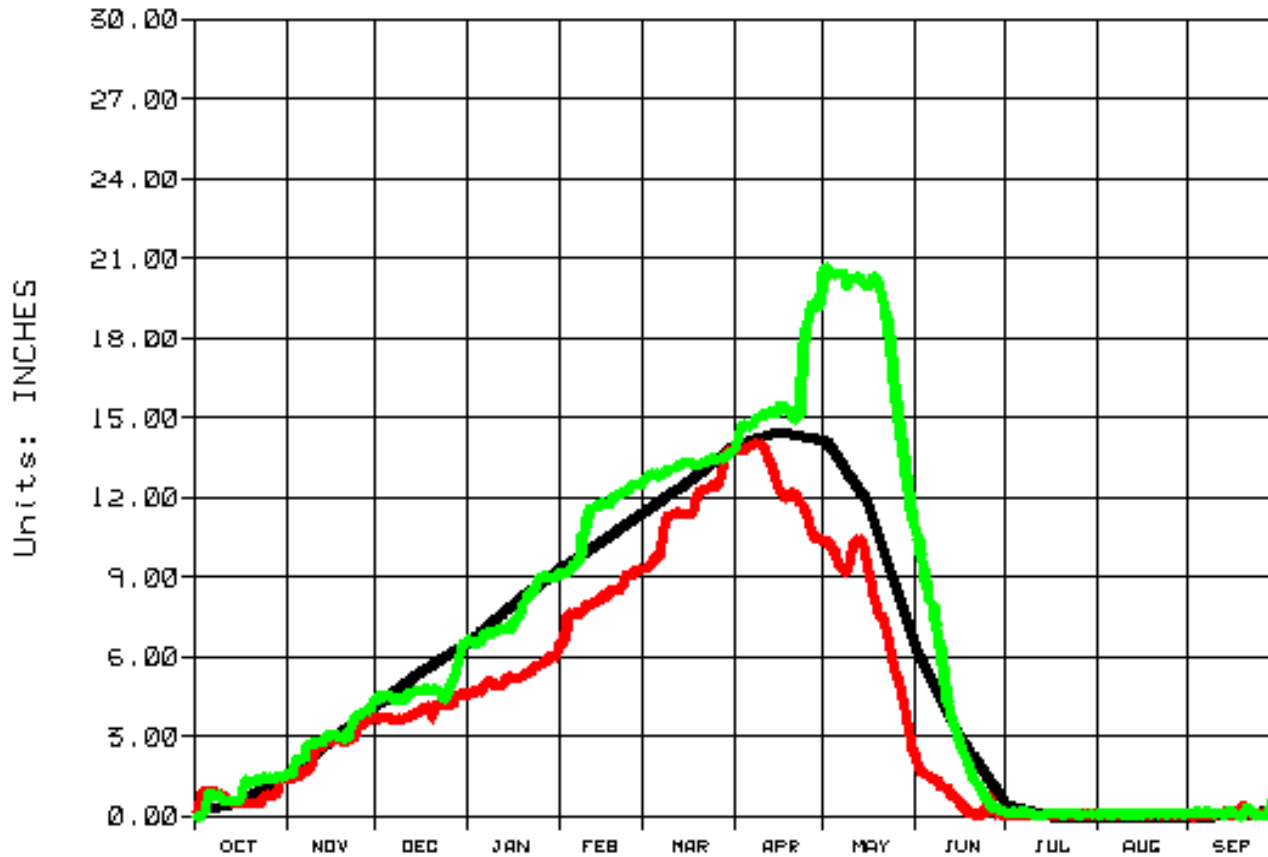
SEAVG Snow Water Equivalent Average [inches]
SE Snow Water Equivalent [inches]

2006
2003 1999

Water Year	April-July Inflow (acre-feet)
1999	?
2003	
Average 564,500	

Basin above Boysen Reservoir Snow Water Equivalent

Data From 1-OCT Through 30-SEP
Plotted 11/21/2005 13:13



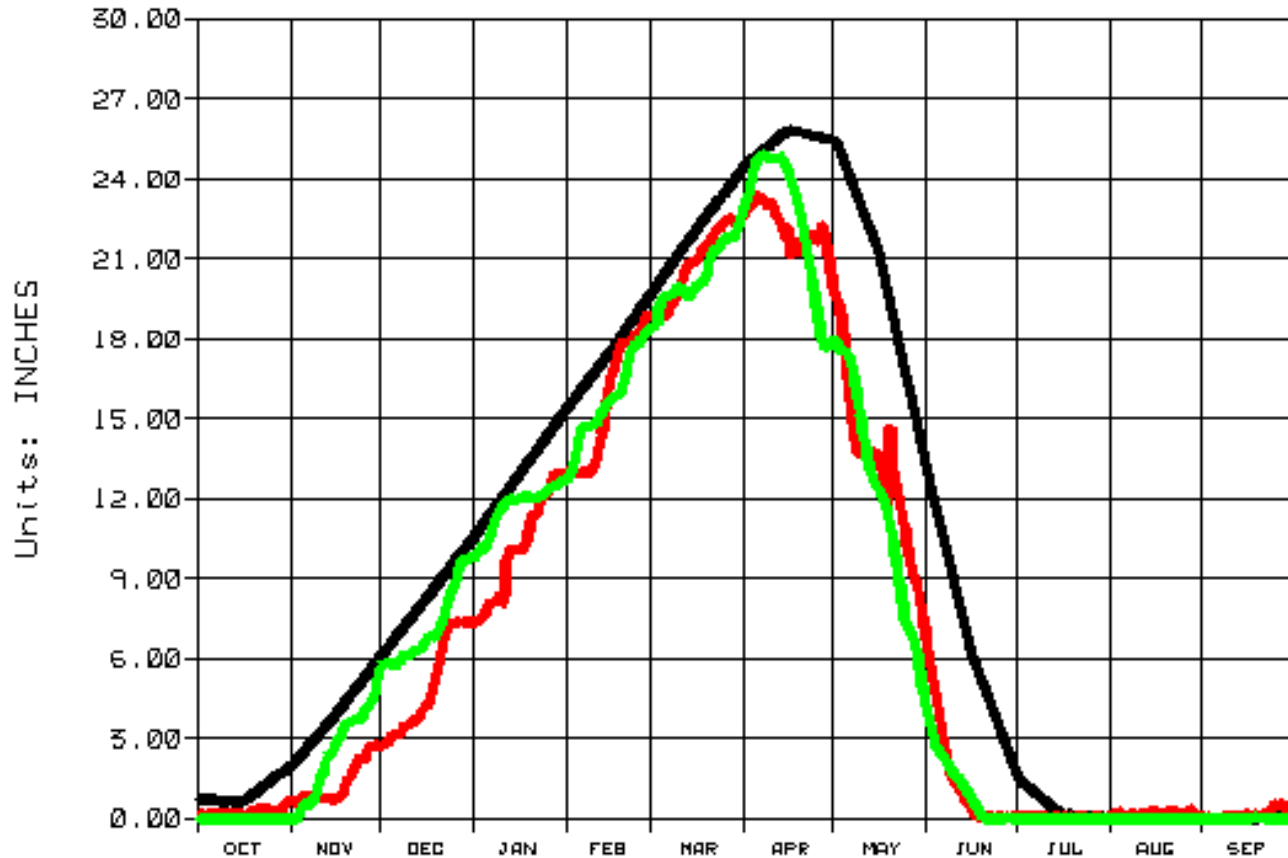
BOYR Boysen Reservoir, Wind River near Thermopole, WY
 —SEAVG Snow Water Equivalent Average [inches]
 —SE Snow Water Equivalent [inches]

2006
2003 1999

Water Year	April-July Inflow (acre-feet)
1999	1145,600
2003	262,300
Average 564,500	

Basin above Seminoe Reservoir Snow Water Equivalent

Data From 1-OCT Through 30-SEP
Plotted 12/11/2005 11:15



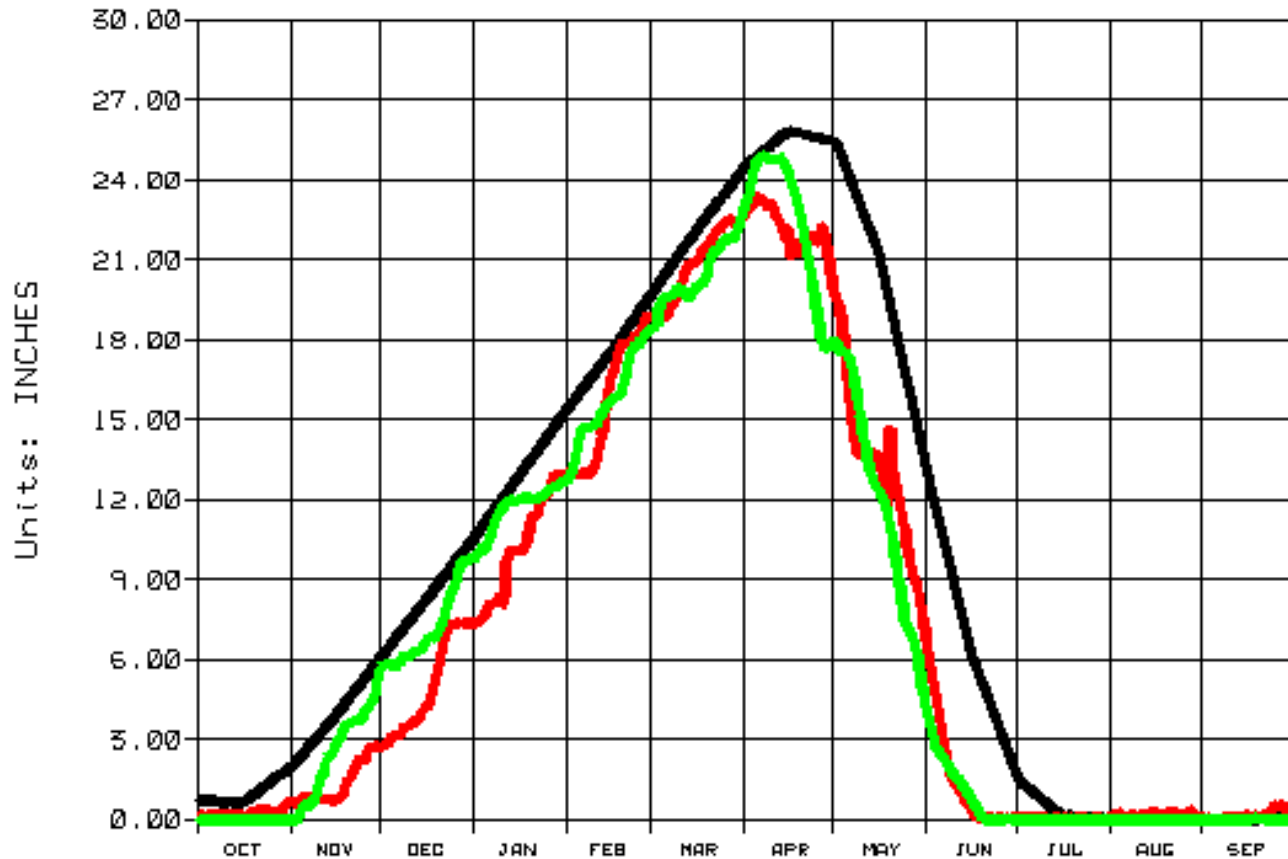
SEMP Seminoe Reservoir, WY
 — SEAVE Snow Water Equivalent Average (Inches)
 — SE Snow Water Equivalent (Inches)

2006
 2000 1989

Water Year	April-July Inflow (acre-feet)
1989	?
2000	
Average 702,300	

Basin above Seminoe Reservoir Snow Water Equivalent

Data From 1-OCT Through 30-SEP
Plotted 12/11/2005 11:15



SEMP Seminoe Reservoir, WY
 — SEAVE Snow Water Equivalent Average (Inches)
 — SE Snow Water Equivalent (Inches)

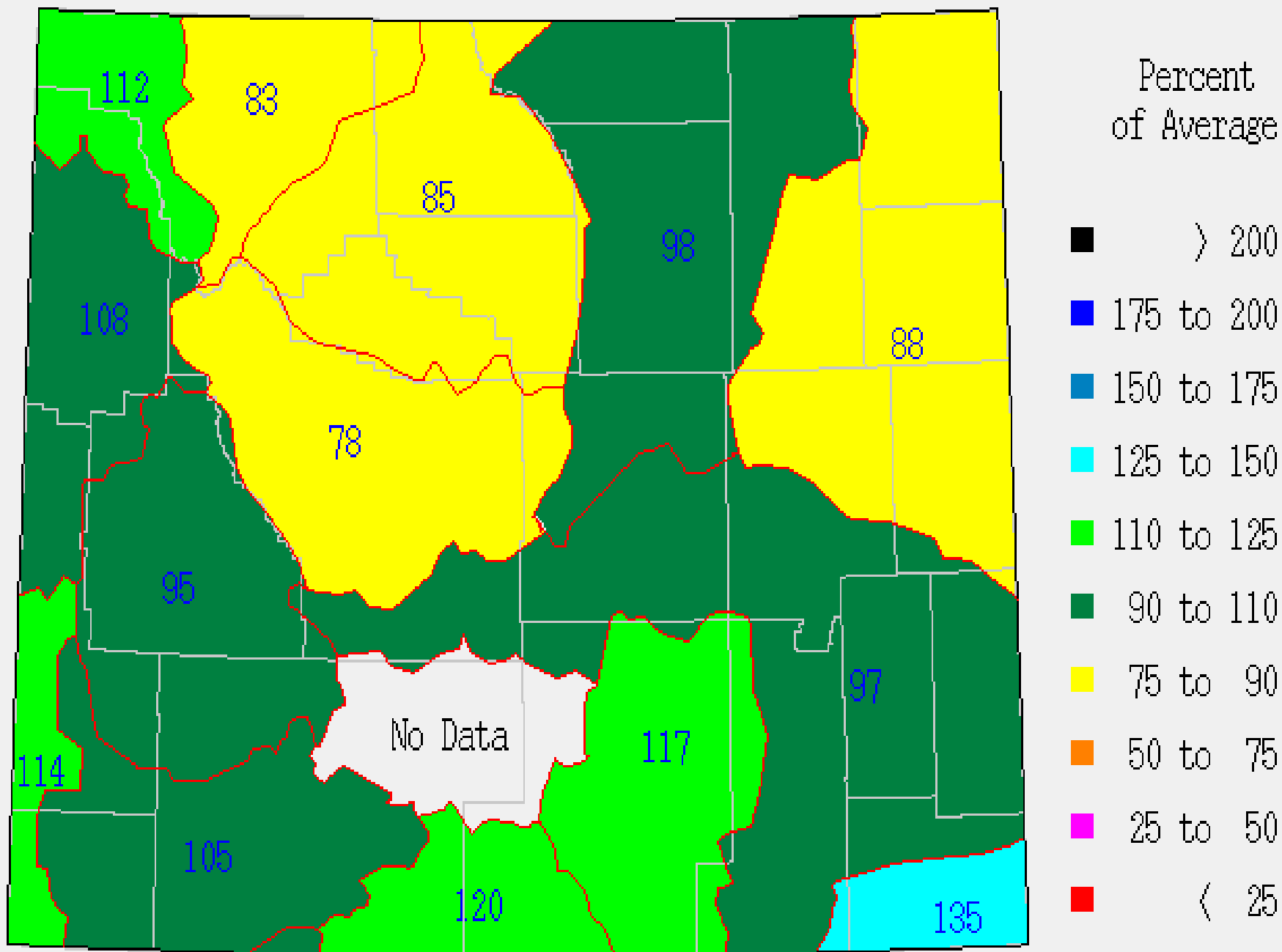
2006
 2000 1989

Water Year	April-July Inflow (acre-feet)
1989	279,600
2000	470,700
Average 702,300	

Factors

- Size of Basin
- Location of Basin
- Elevation of Basin
- Influence of Rainstorms
- Temperature
- Soil Moisture
- Upstream Development
- Historic Trends

SWE % of Average as of Sunday, 11 December 2005



* = Data may not provide a valid measure of conditions