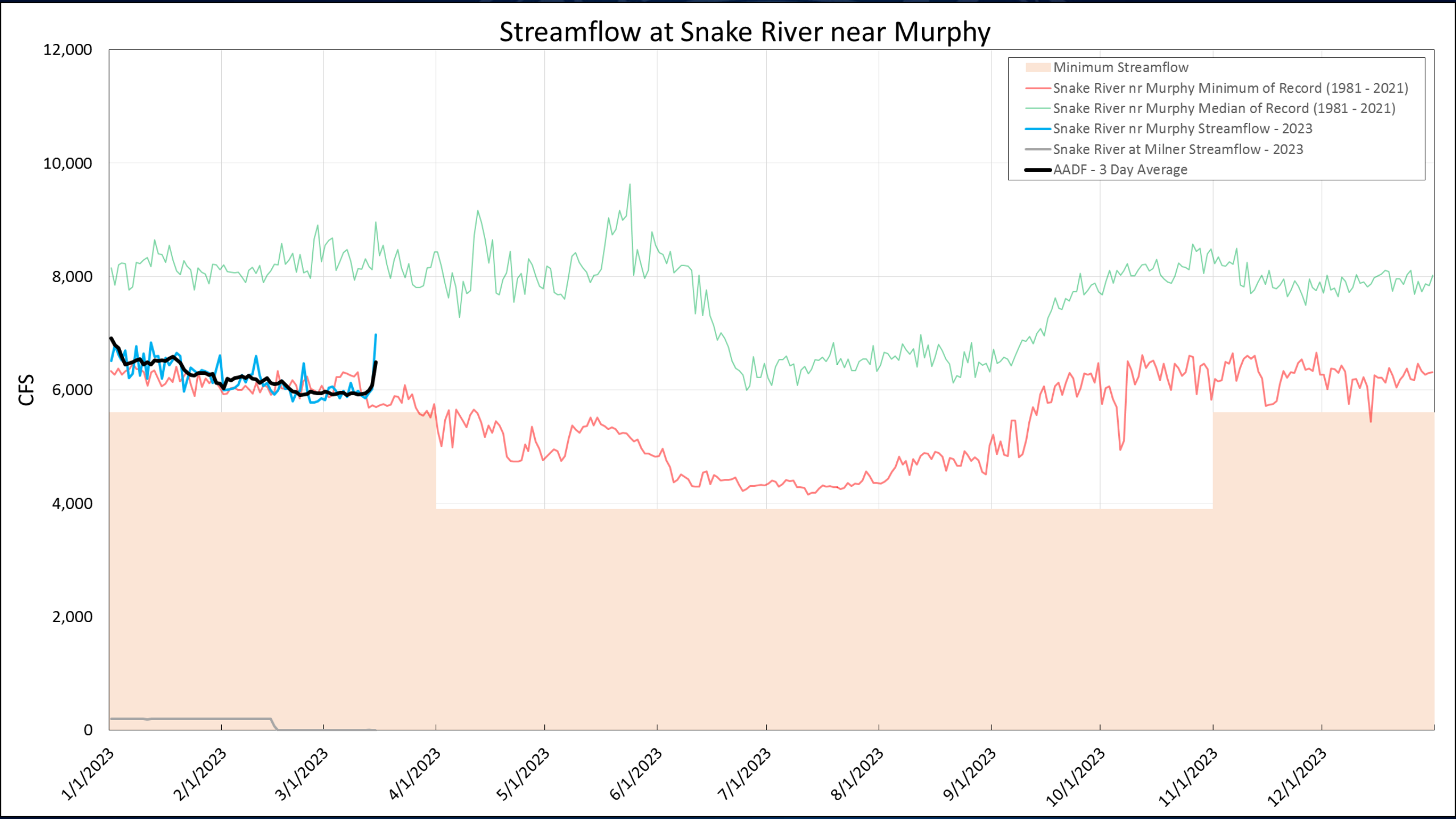
IDAHO Department of Water Resources

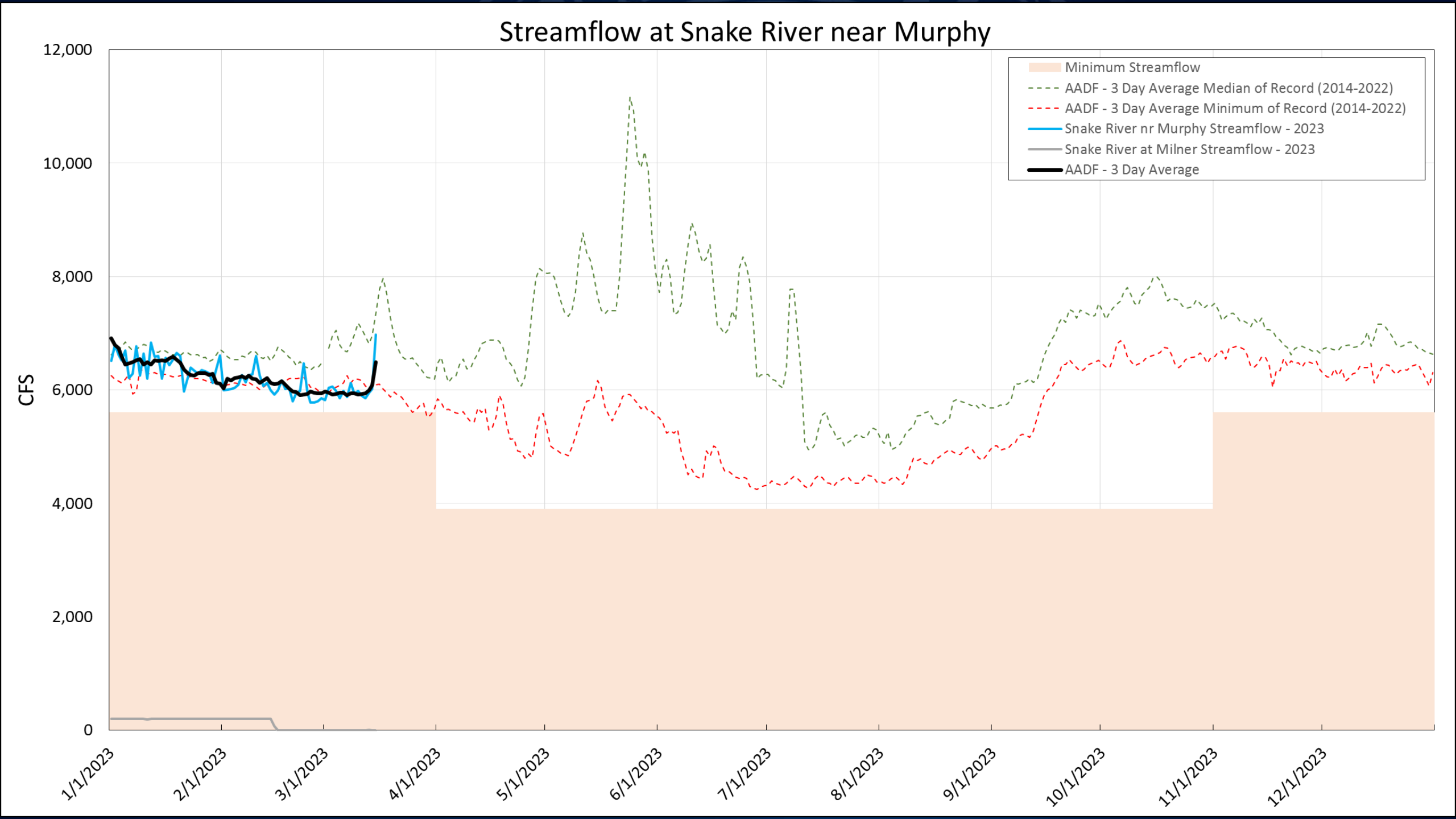
IDAHO DEPARTMENT OF WATER RESOURCES

Swan Falls AADF Update

Presented by Ethan Geisler

Mar 16th, 2023

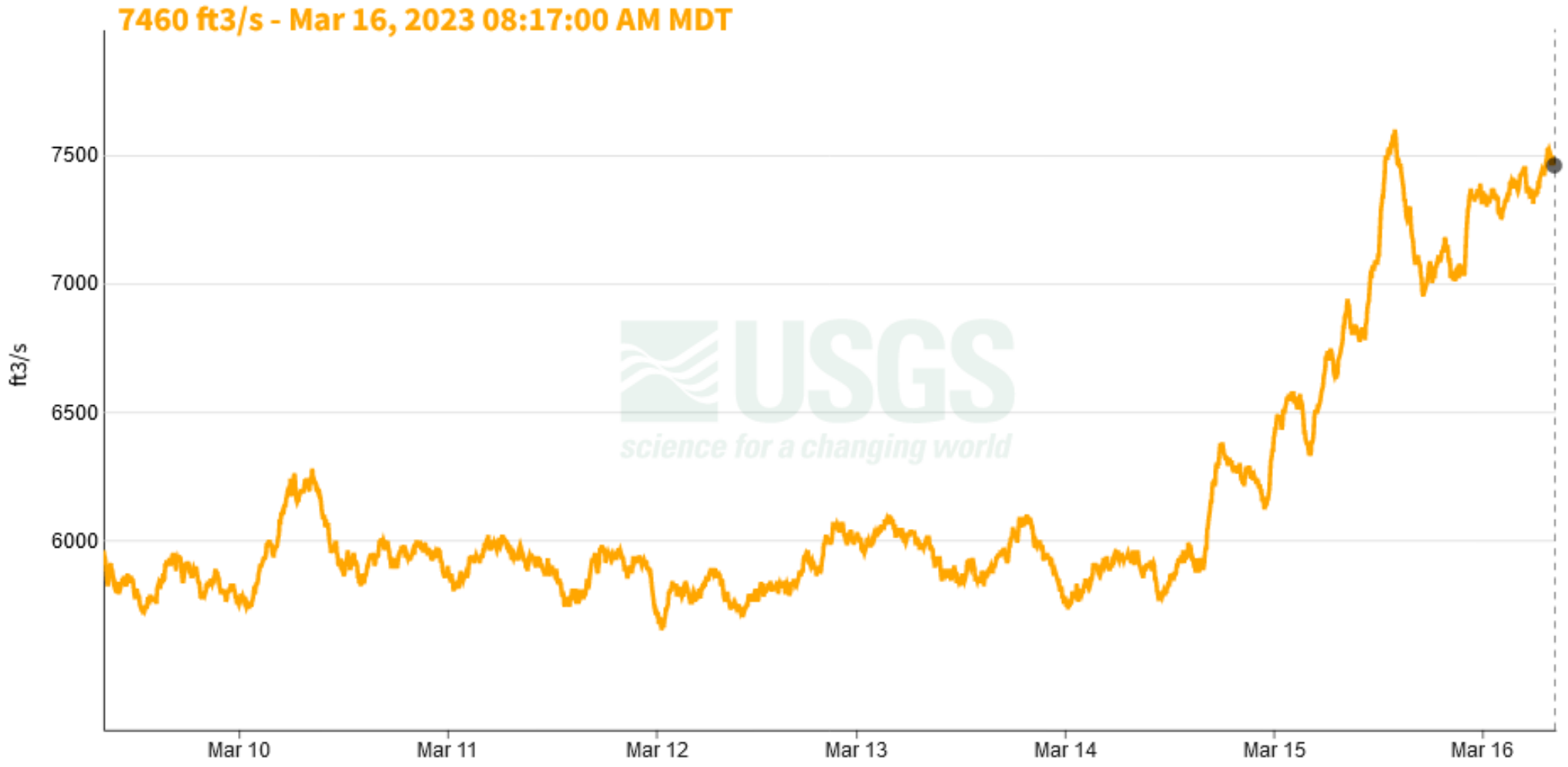

Streamflow at Snake River near Murphy
12,000
10,000
8,000
6,000
4,000
2,000
0
CFS
Minimum Streamflow
Snake River nr Murphy Minimum of Record (1981 - 2021)
Snake River nr Murphy Median of Record (1981 - 2021)
Snake River nr Murphy Streamflow - 2023
Snake River at Milner Streamflow - 2023
AADF - 3 Day Average
1/1/2023
2/1/2023
3/1/2023
4/1/2023
5/1/2023
6/1/2023
7/1/2023
8/1/2023
9/1/2023
10/1/2023
11/1/2023
12/1/2023

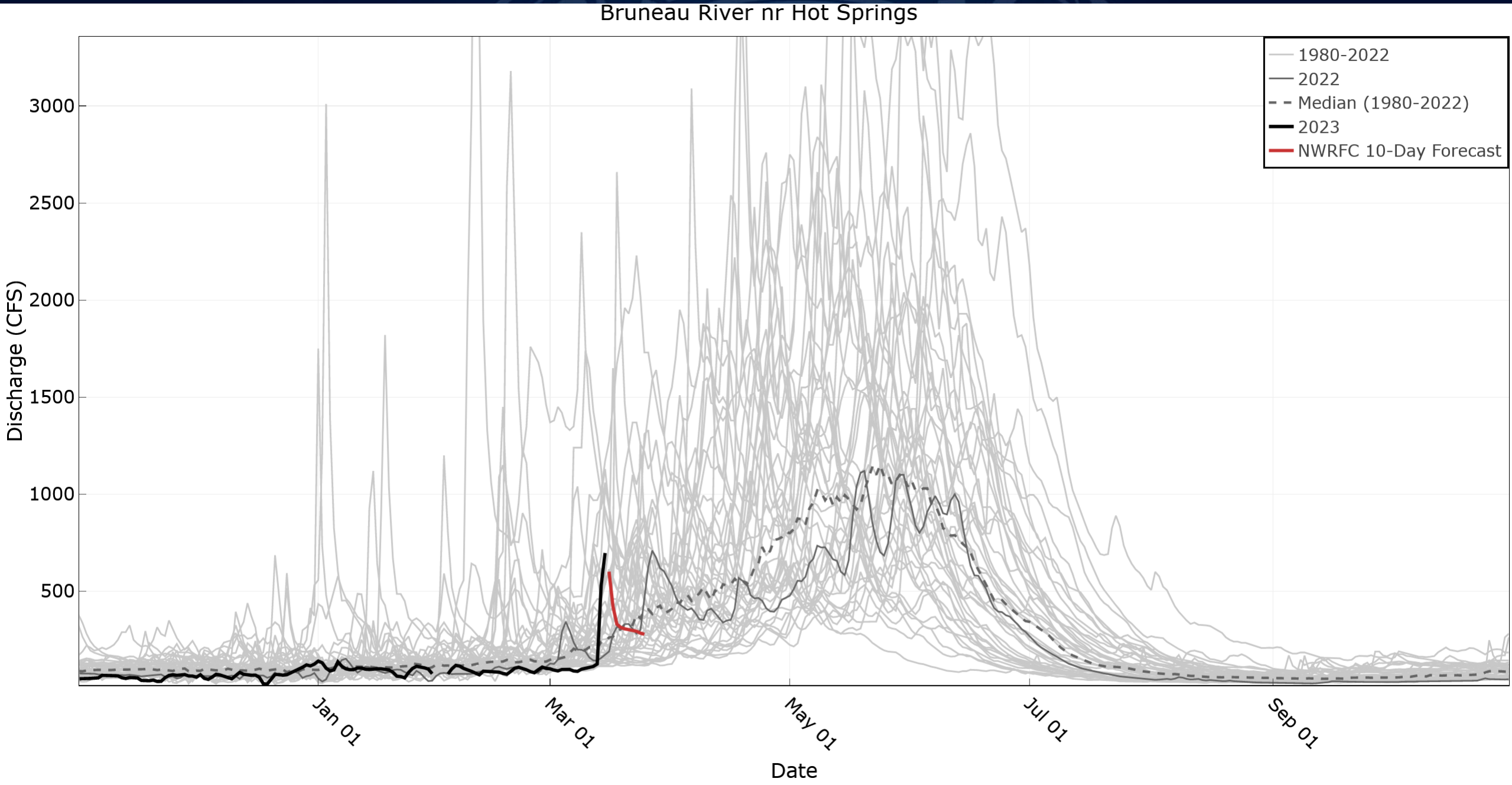

Streamflow at Snake River near Murphy
12,000
10,000
8,000
6,000
4,000
2,000
0
CFS
1/1/2023
2/1/2023
3/1/2023
4/1/2023
5/1/2023
6/1/2023
7/1/2023
8/1/2023
9/1/2023
10/1/2023
11/1/2023
12/1/2023
Minimum Streamflow
AADF - 3 Day Average Median of Record (2014-2022)
AADF - 3 Day Average Minimum of Record (2014-2022)
Snake River nr Murphy Streamflow - 2023
Snake River at Milner Streamflow - 2023
AADF - 3 Day Average

Snake River NR Murphy ID

March 9, 2023 - March 16, 2023

Streamflow, ft³/s

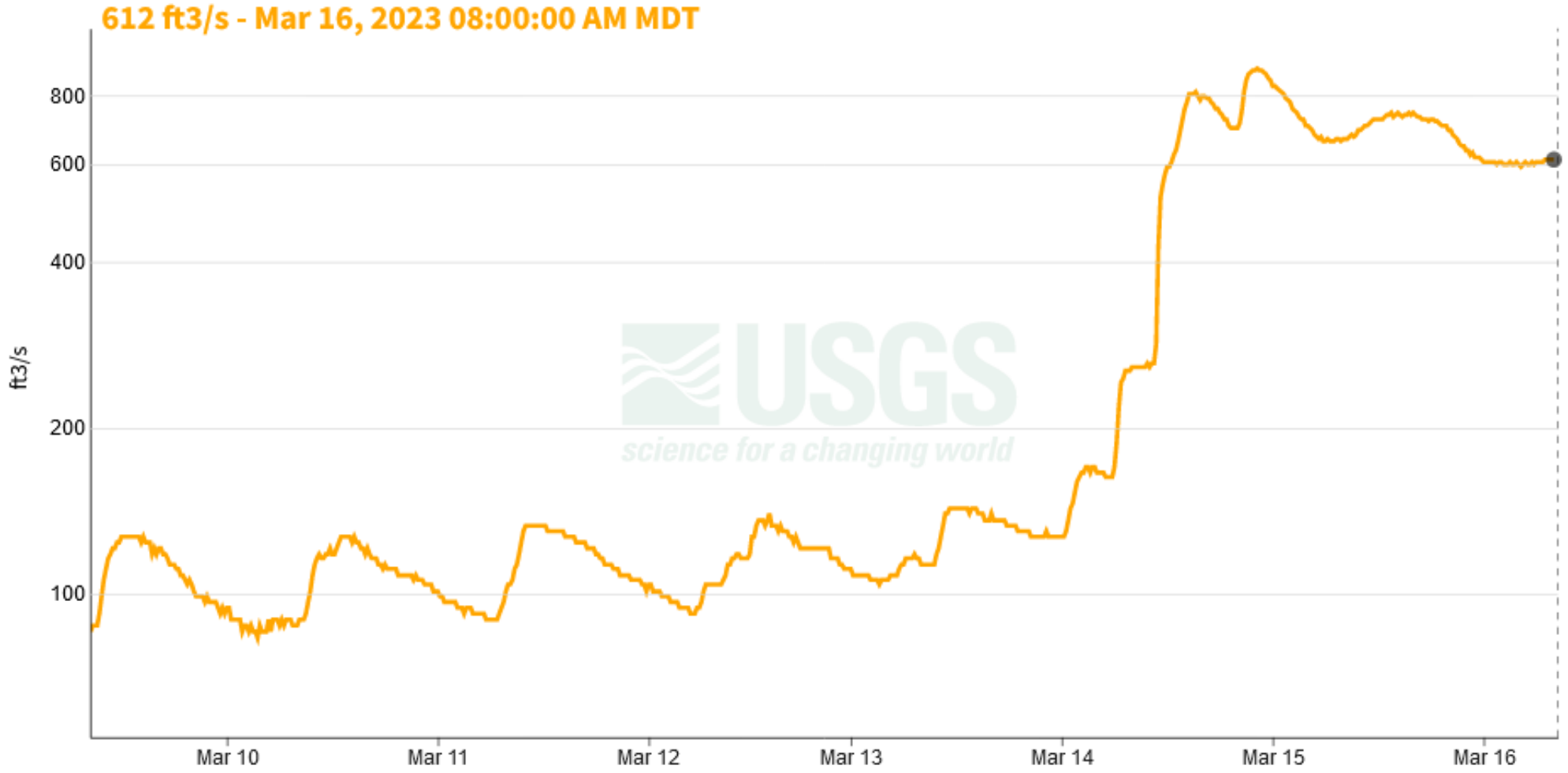


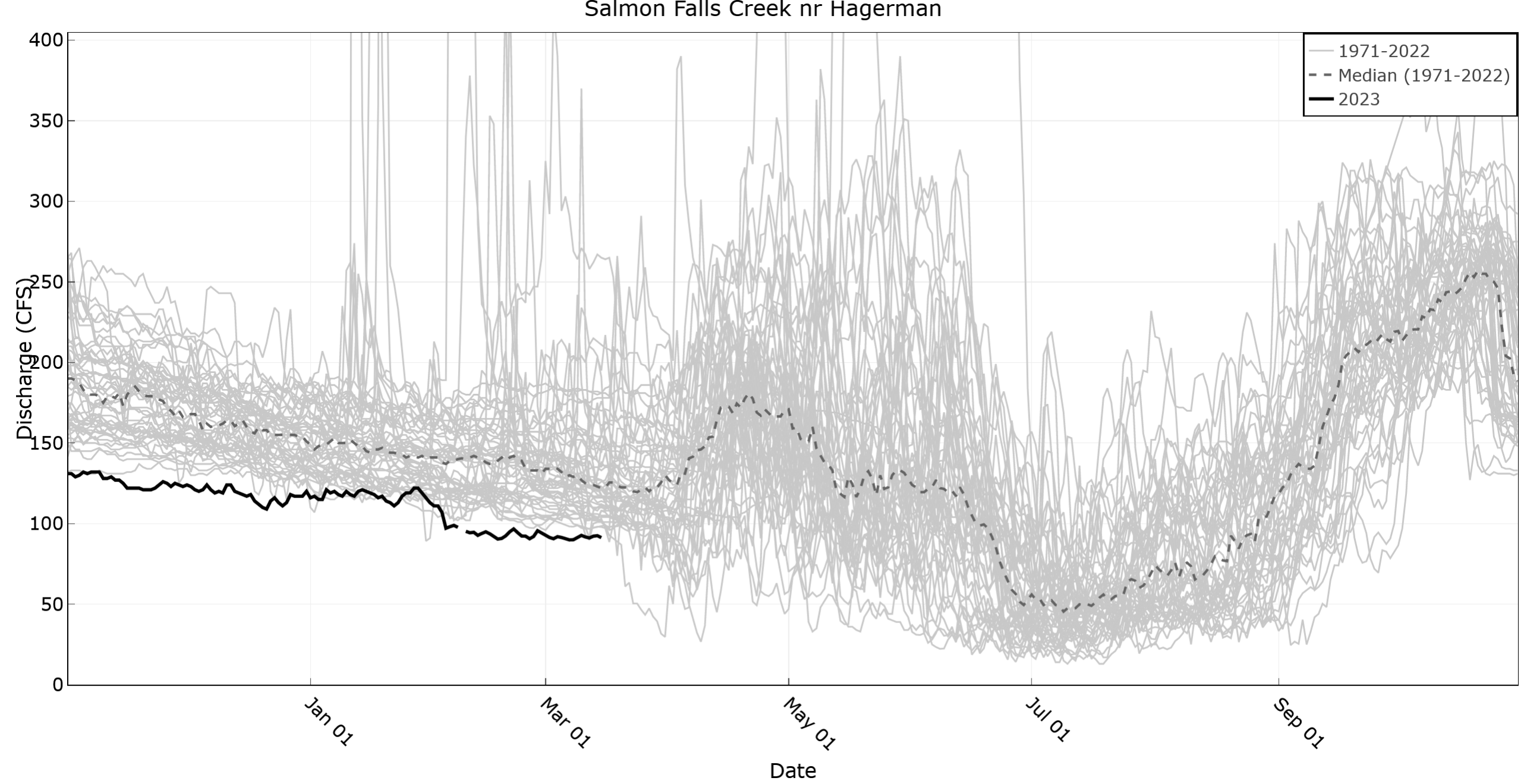

Bruneau River nr Hot Springs
1980-2022
2022
Median (1980-2022)
2023
NWRFC 10-Day Forecast
Discharge (CFS)
3000
2500
2000
1500
1000
500
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date

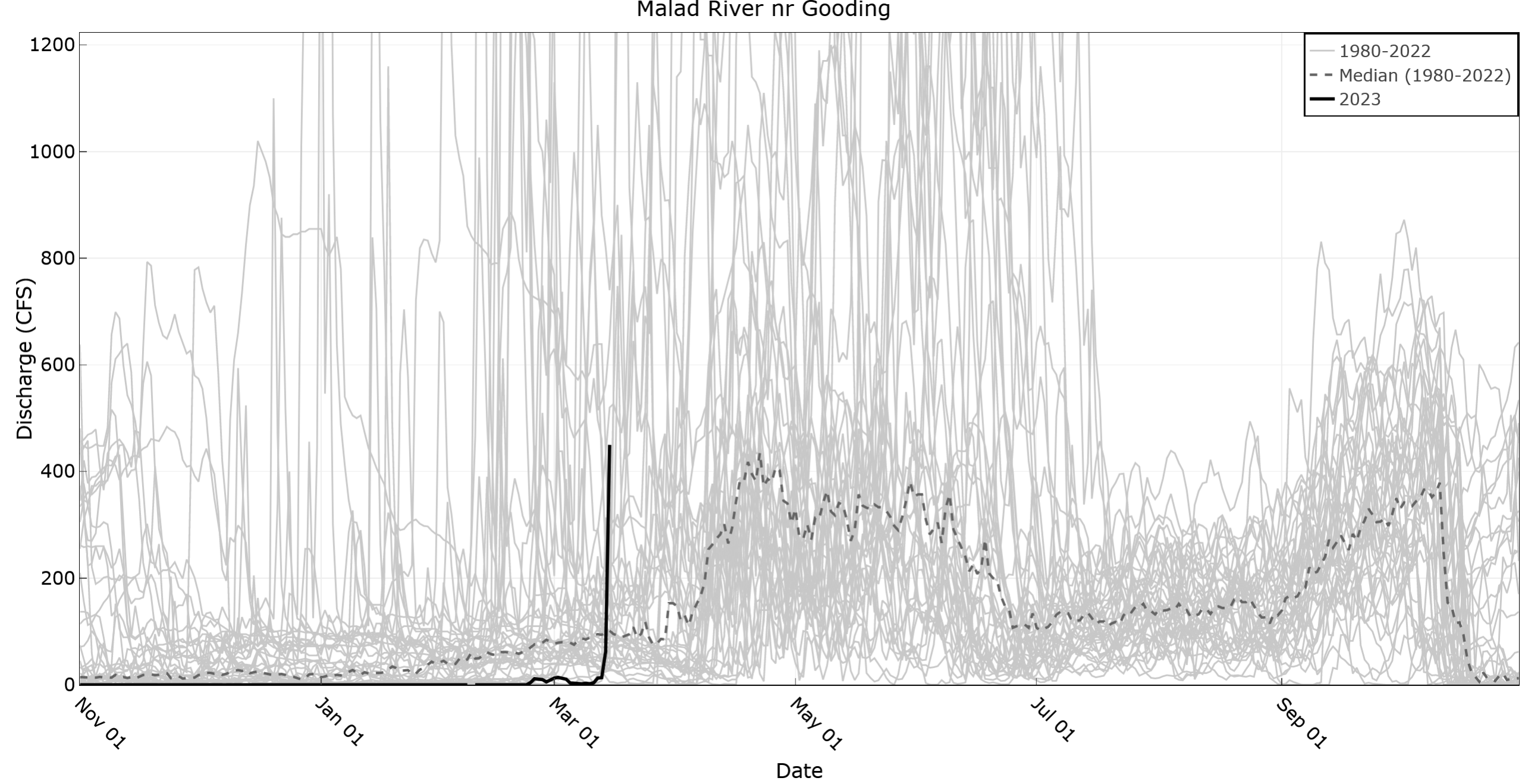
Bruneau River NR Hot Spring ID

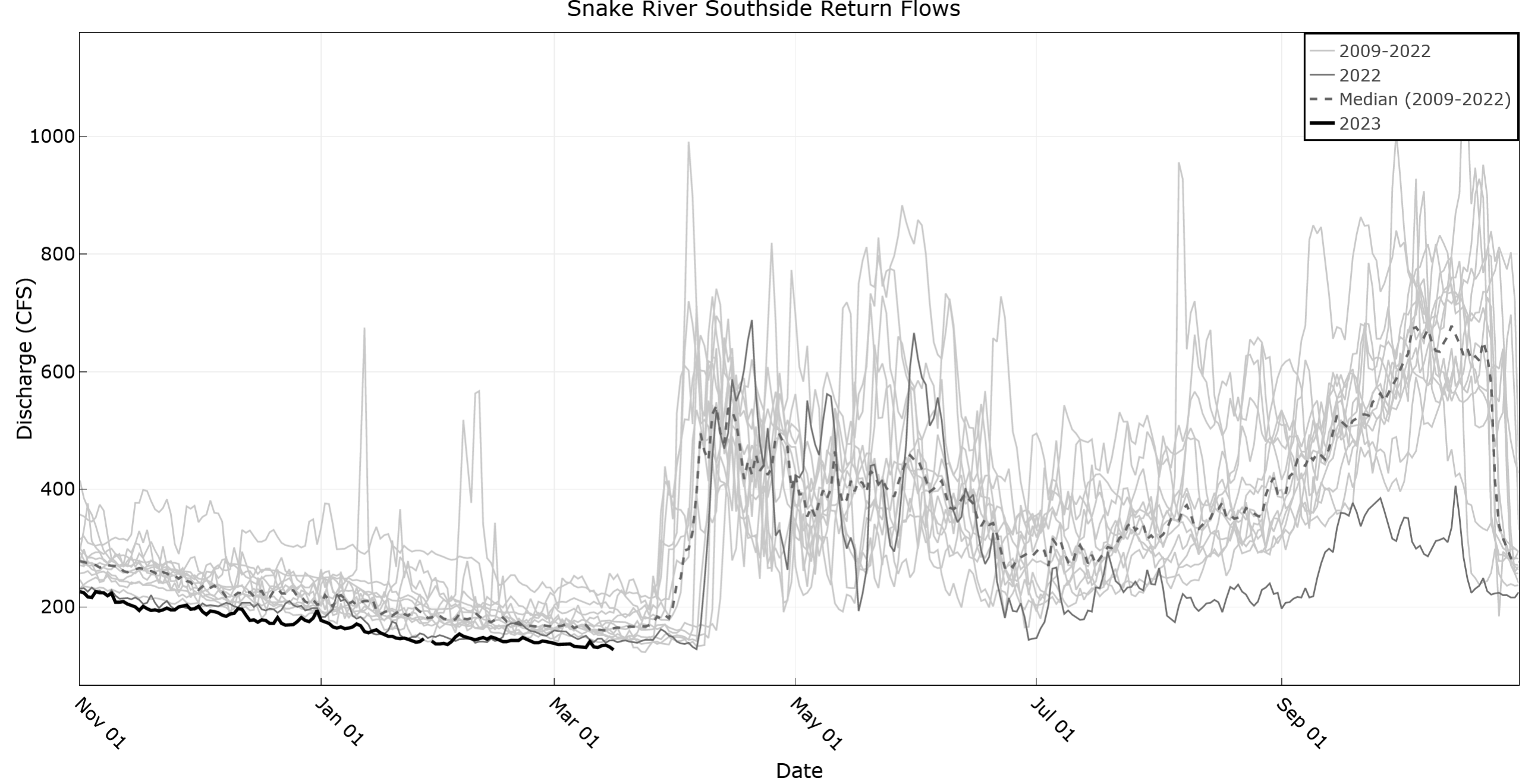
March 9, 2023 - March 16, 2023

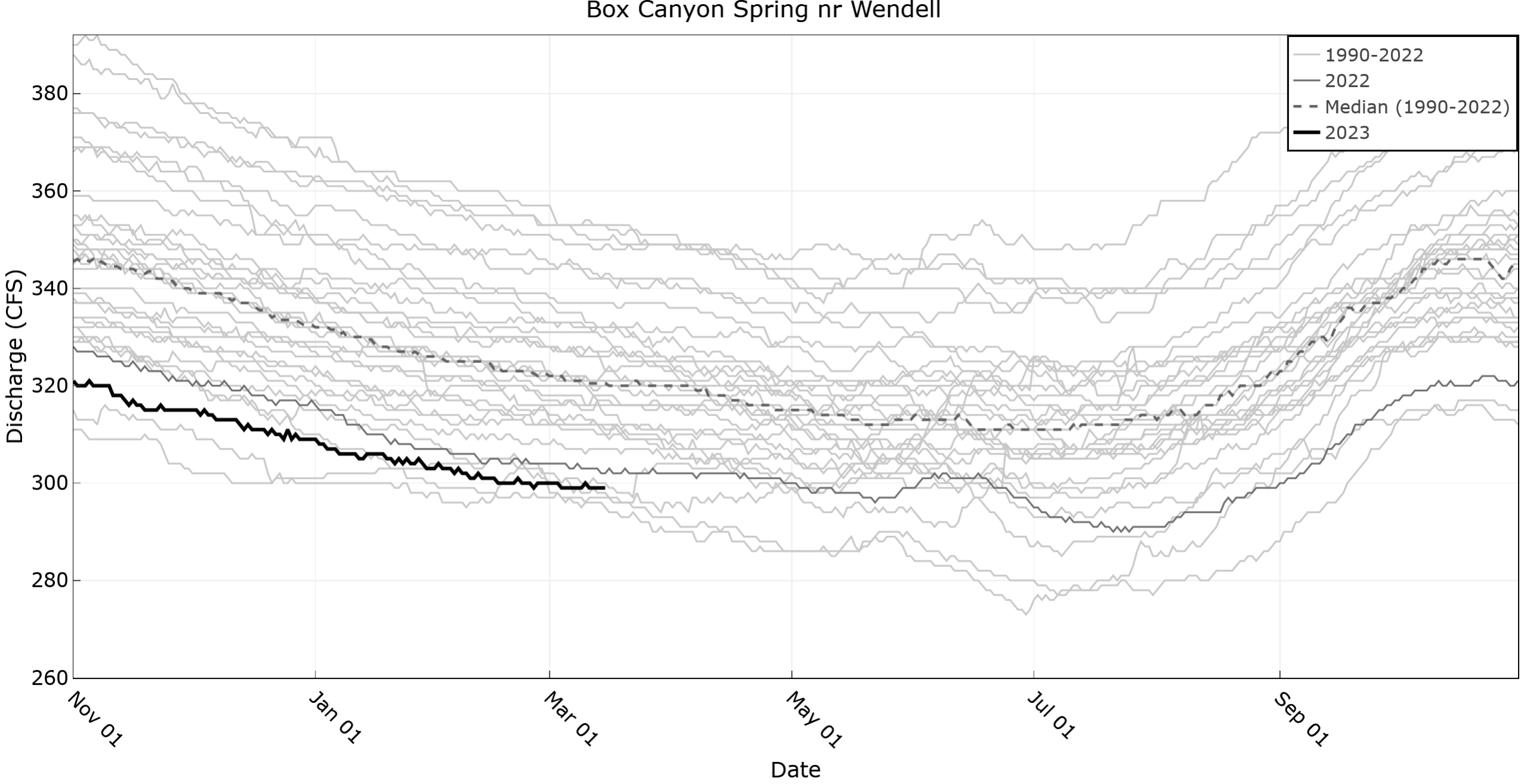
Streamflow, ft³/s

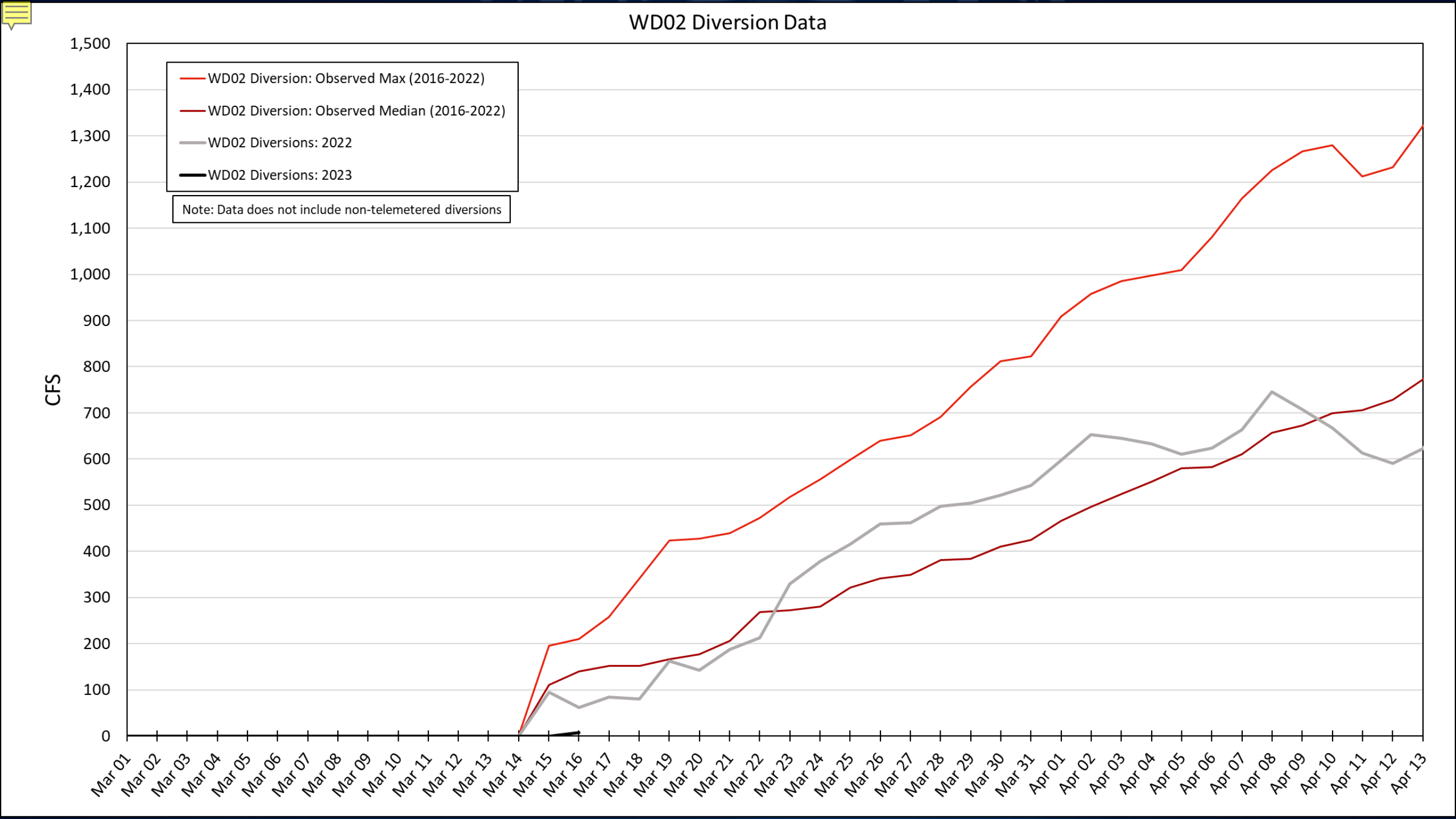


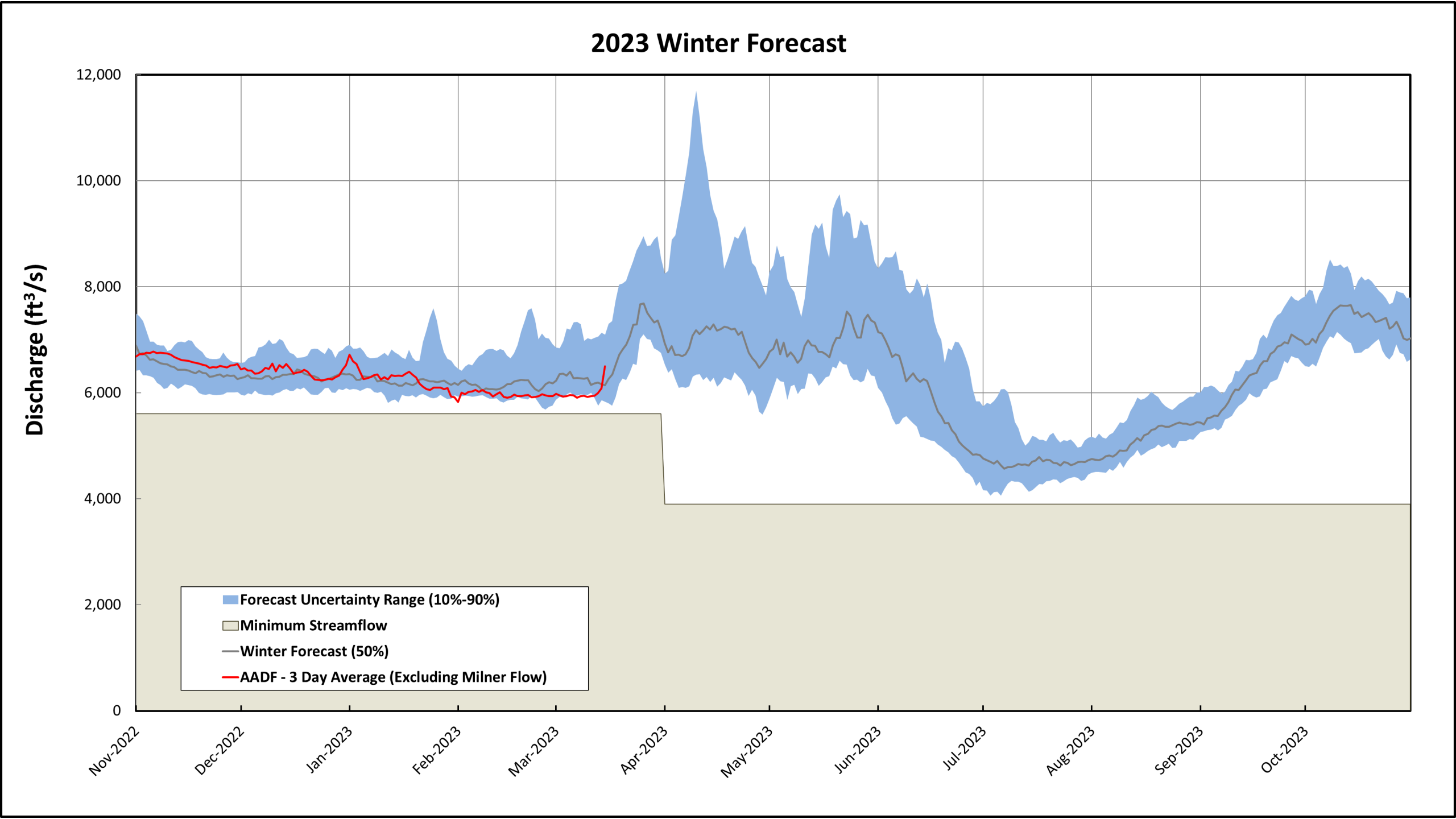

Salmon Falls Creek nr Hagerman
1971-2022
Median (1971-2022)
2023
Discharge (CFS)
400
350
300
250
200
150
100
50
0
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date


Malad River nr Gooding
1980-2022
Median (1980-2022)
2023
Discharge (CFS)
0
200
400
600
800
1000
1200
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date


Snake River Southside Return Flows
2009-2022
2022
Median (2009-2022)
2023
1000
800
600
400
200
Discharge (CFS)
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date

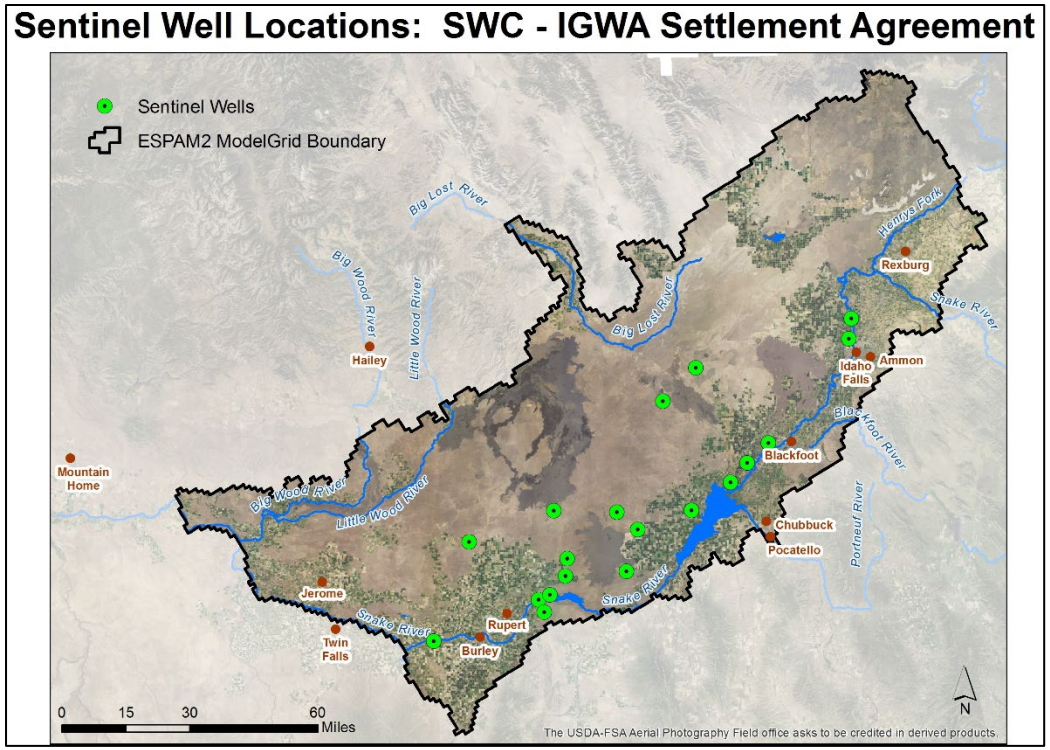

Box Canyon Spring nr Wendell
1990-2022
2022
Median (1990-2022)
2023
Discharge (CFS)
380
360
340
320
300
280
260
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date

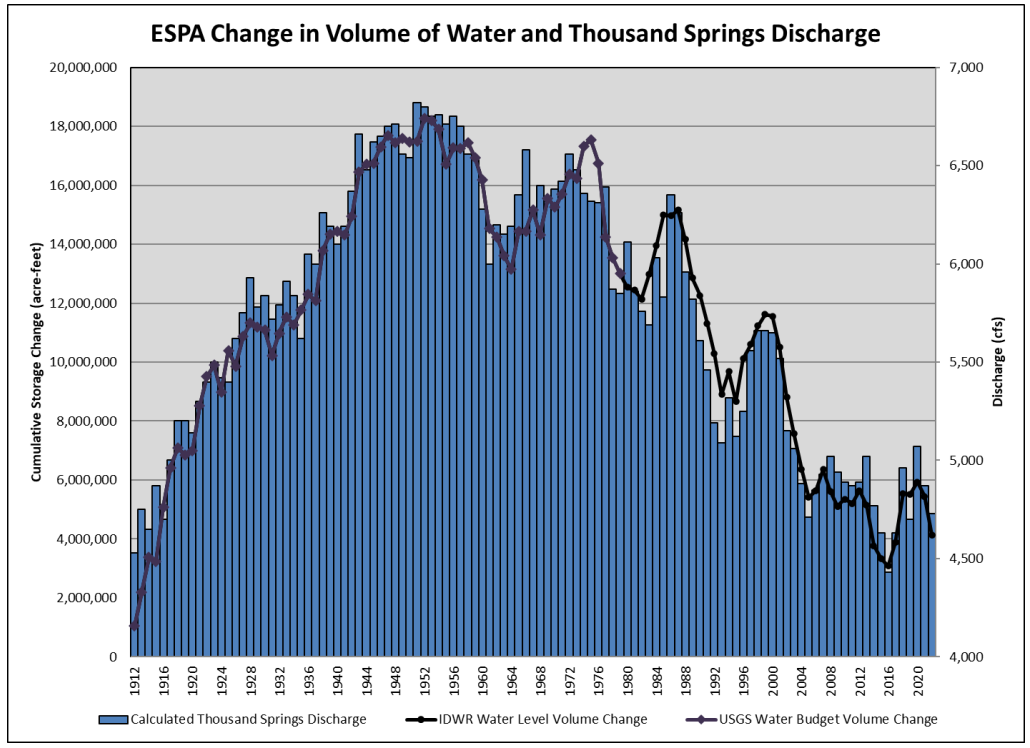

WD02 Diversion Data
WD02 Diversion: Observed Max (2016-2022)
WD02 Diversion: Observed Median (2016-2022)
WD02 Diversions: 2022
WD02 Diversions: 2023
Note: Data does not include non-telemetered diversions
CFS
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
Mar 01
Mar 02
Mar 03
Mar 04
Mar 05
Mar 06
Mar 07
Mar 08
Mar 09
Mar 10
Mar 11
Mar 12
Mar 13
Mar 14
Mar 15
Mar 16
Mar 17
Mar 18
Mar 19
Mar 20
Mar 21
Mar 22
Mar 23
Mar 24
Mar 25
Mar 26
Mar 27
Mar 28
Mar 29
Mar 30
Mar 31
Apr 01
Apr 02
Apr 03
Apr 04
Apr 05
Apr 06
Apr 07
Apr 08
Apr 09
Apr 10
Apr 11
Apr 12
Apr 13

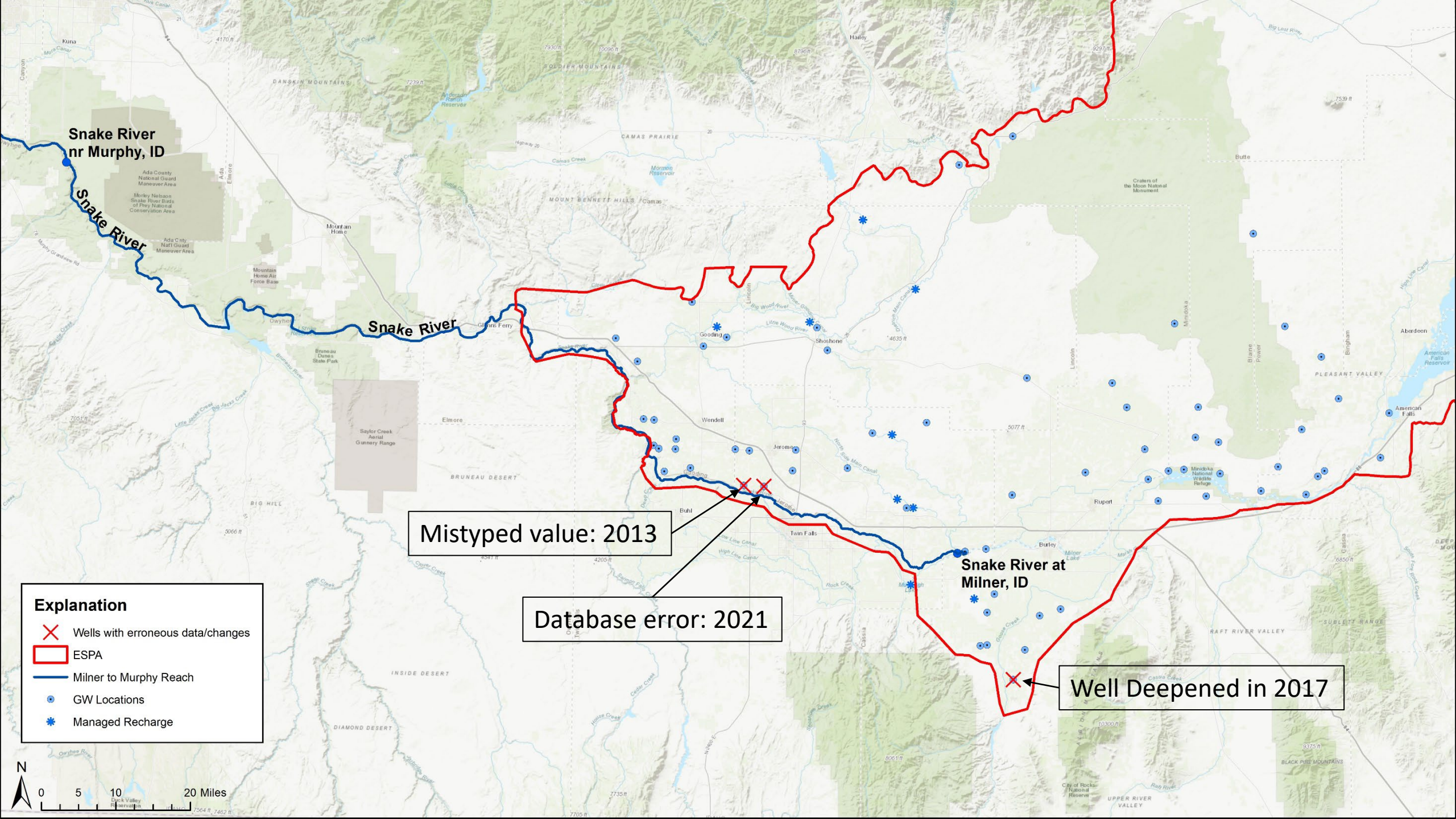

2023 Winter Forecast
Discharge (ft³/s)
12,000
10,000
8,000
6,000
4,000
2,000
0
Nov-2022
Dec-2022
Jan-2023
Feb-2023
Mar-2023
Apr-2023
May-2023
Jun-2023
Jul-2023
Aug-2023
Sep-2023
Oct-2023
Forecast Uncertainty Range (10%-90%)
Minimum Streamflow
Winter Forecast (50%)
AADF - 3 Day Average (Excluding Milner Flow)

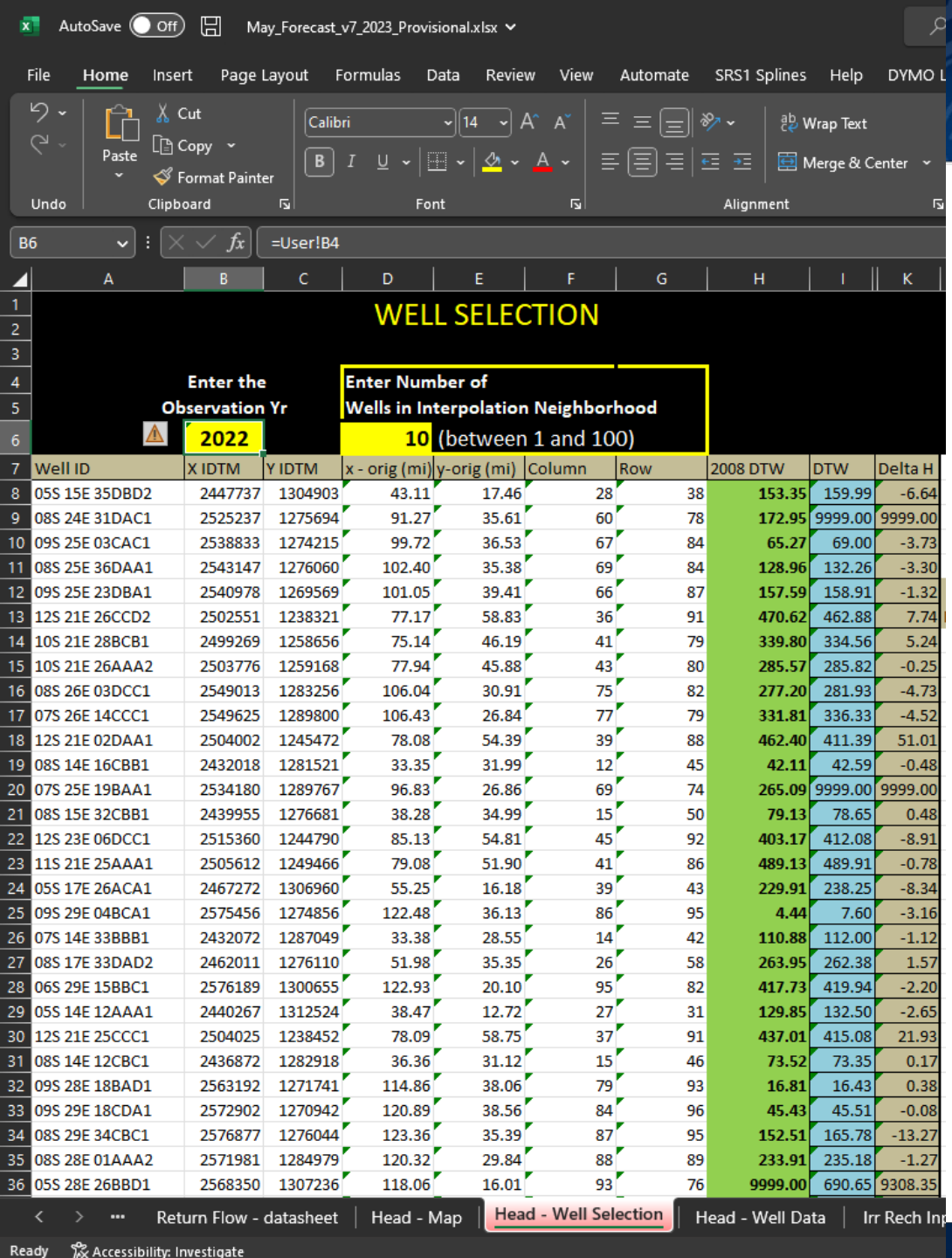
Question 5

- Analysis of the necessary ESPA levels, storage volumes, ~~and discharge~~ required to maintain minimum flows at the Murphy Gage



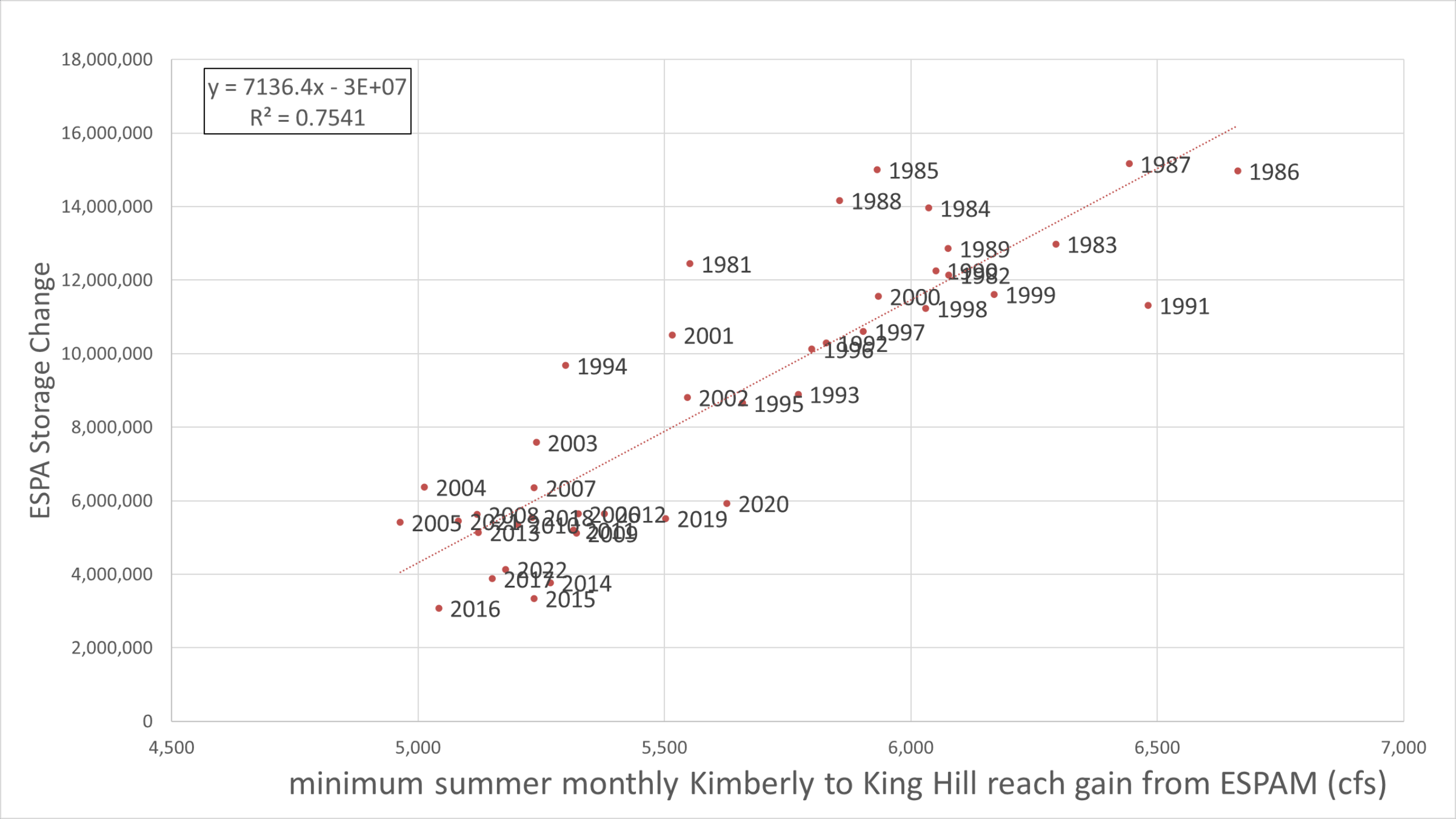


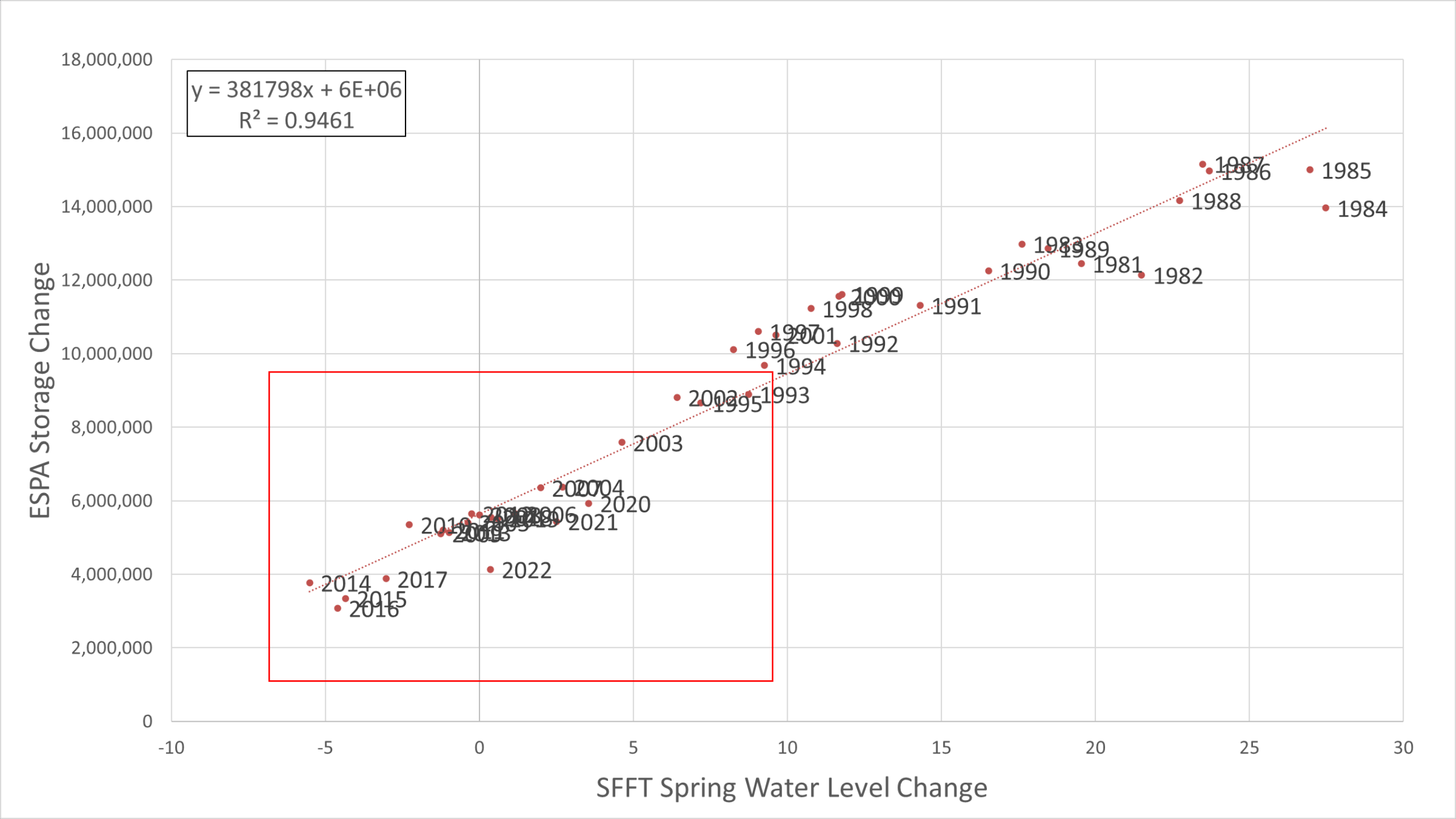

Snake River nr Murphy, ID
Snake River
Snake River
Snake River at Milner, ID
Mistyped value: 2013
Database error: 2021
Well Deepened in 2017
Explanation
Wells with erroneous data/changes
ESPA
Milner to Murphy Reach
GW Locations
Managed Recharge
N
0
5
10
20 Miles
Kuna
Mountain Home
Glenns Ferry
Elmore
Wendell
Gooding
Shoshone
Jerome
Buhl
Twin Falls
Rupert
Burley
Hailey
Butte
Aberdeen
American Falls
Ada County National Guard Maneuver Area
Morley Nelson Snake River Birds of Prey National Conservation Area
Ada Cnty Natl Guard Maneuver Area
Mountain Home Air Force Base
Bruneau Dunes State Park
Saylor Creek Aerial Gunnery Range
Craters of the Moon National Monument
Minidoka National Wildlife Refuge
DANSKIN MOUNTAINS
SOLDIER MOUNTAINS
CAMAS PRAIRIE
MOUNT BENNETT HILLS
BRUNEAU DESERT
BIG HILL
INSIDE DESERT
DIAMOND DESERT
PLEASANT VALLEY
RAFT RIVER VALLEY
SUBLETT RANGE
BLACK PINE MOUNTAINS
UPPER RIVER VALLEY

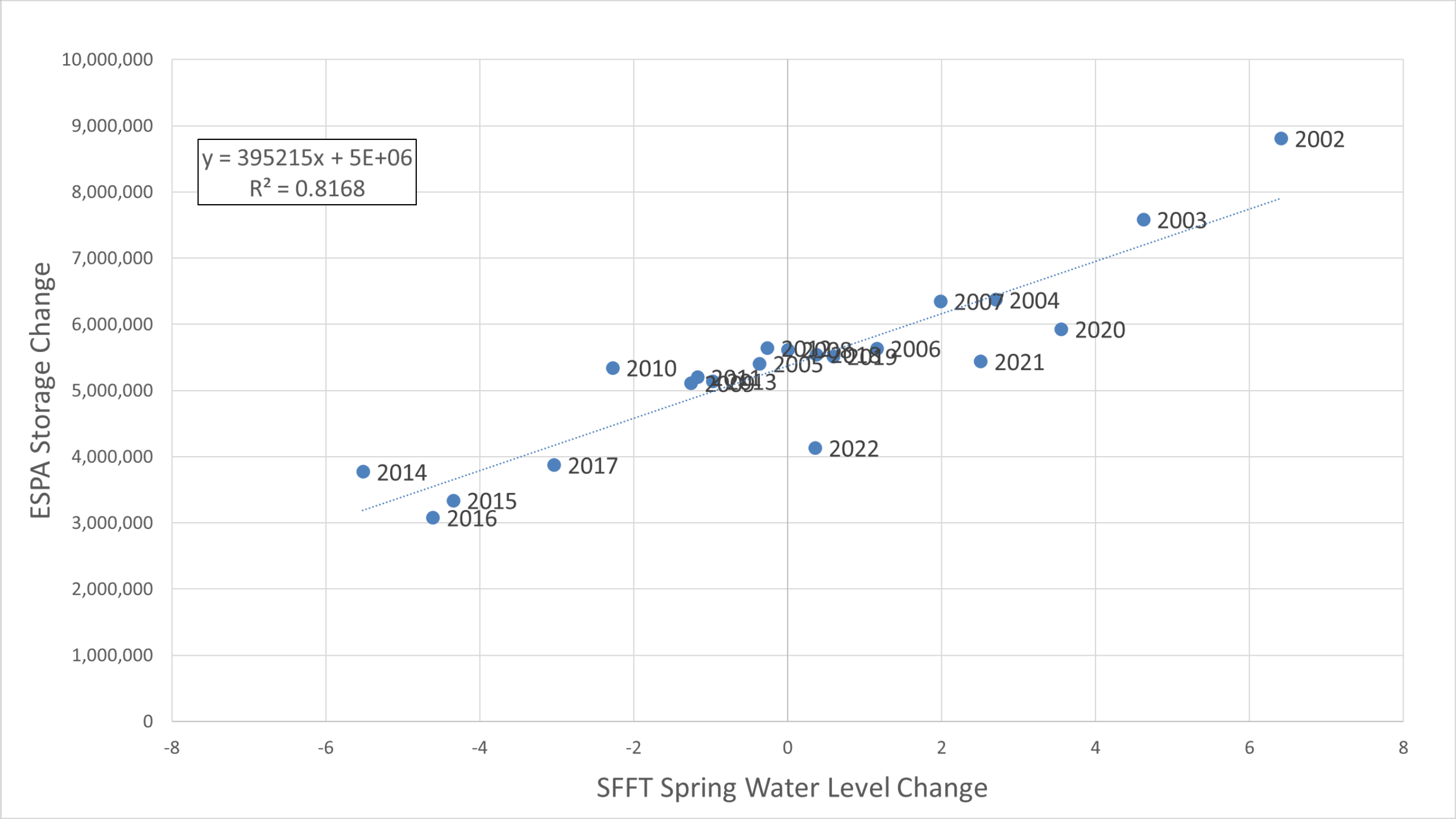


IDAHO DEPARTMENT OF WATER RESOURCES

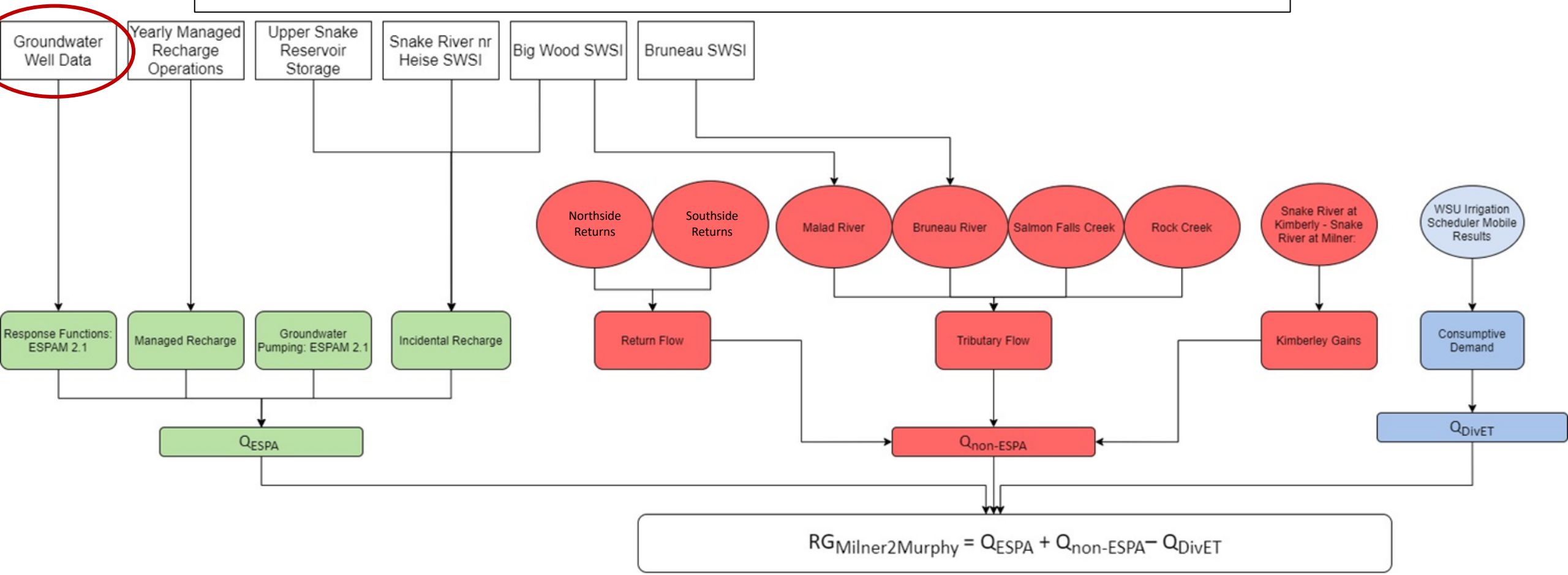
- Recalibrate from 2002 -2021 with updated “Head – Well Selection” Tab
  - ESPAM 2.2 observed data vs Forecast Tool forecasted data
  - Recalculated residuals for each year


y = 7136.4x - 3E+07
R² = 0.7541
ESPA Storage Change
minimum summer monthly Kimberly to King Hill reach gain from ESPAM (cfs)
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
4,500
5,000
5,500
6,000
6,500
7,000
1985
1987
1986
1988
1984
1983
1989
1981
1990
1982
1999
2000
1998
1991
2001
1997
1996
1994
1993
2002
1995
2003
2004
2007
2020
2005
2019
2013
2009
2022
2017
2014
2015
2016

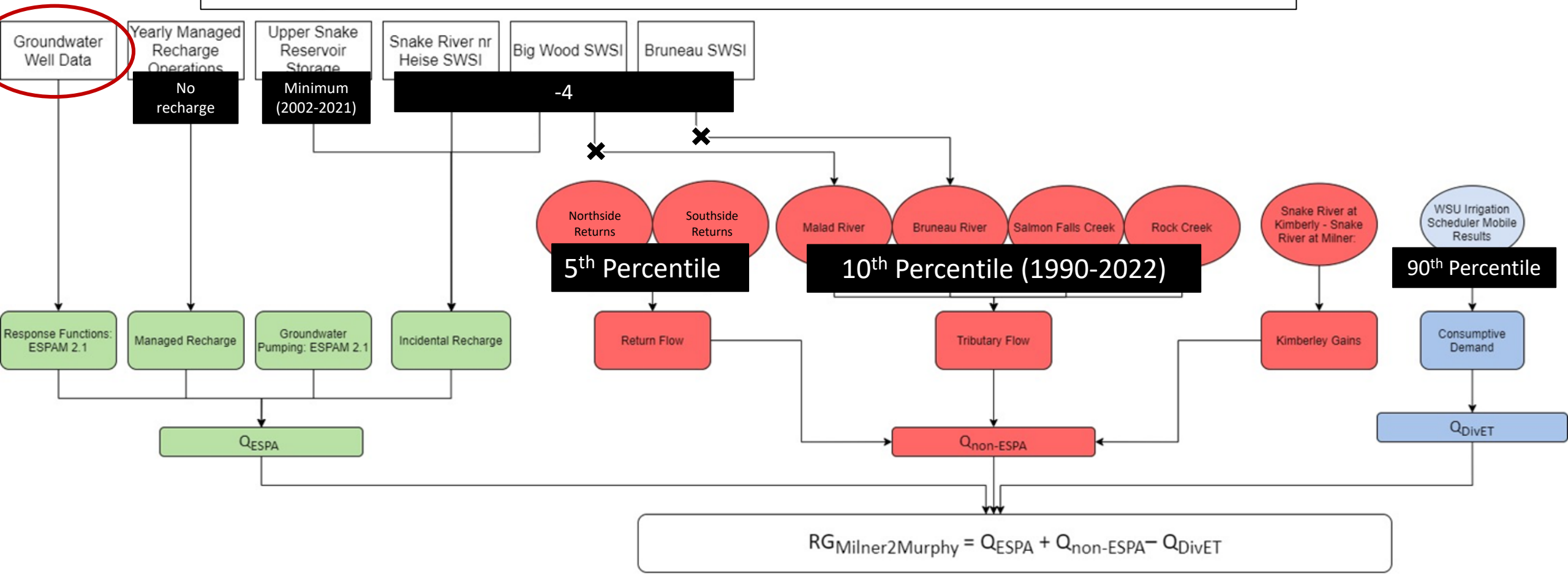

y = 381798x + 6E+06
R² = 0.9461
ESPA Storage Change
SFFT Spring Water Level Change
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
-10
-5
0
5
10
15
20
25
30
1985
1984
1988
1983
1989
1981
1982
1990
1991
1998
1996
1992
1994
1993
1995
2003
2020
2021
2022
2014
2017
2015
2016

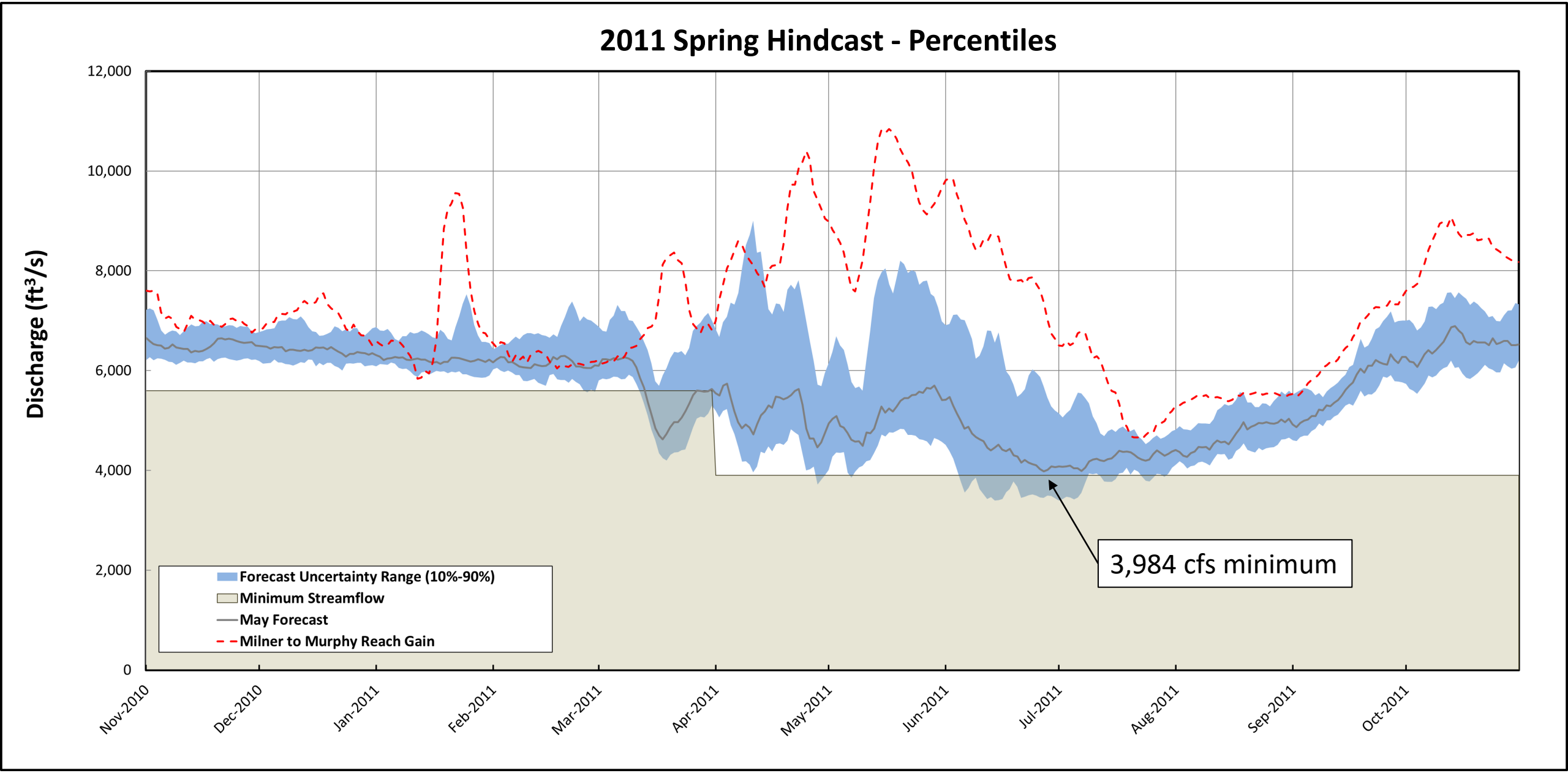

y = 395215x + 5E+06
R² = 0.8168
ESPA Storage Change
SFFT Spring Water Level Change
10,000,000
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
-8
-6
-4
-2
0
2
4
6
8
2002
2003
2007
2004
2020
2006
2010
2005
2021
2013
2022
2014
2017
2015
2016

Swan Falls Forecast Tool (SFFT) Inputs

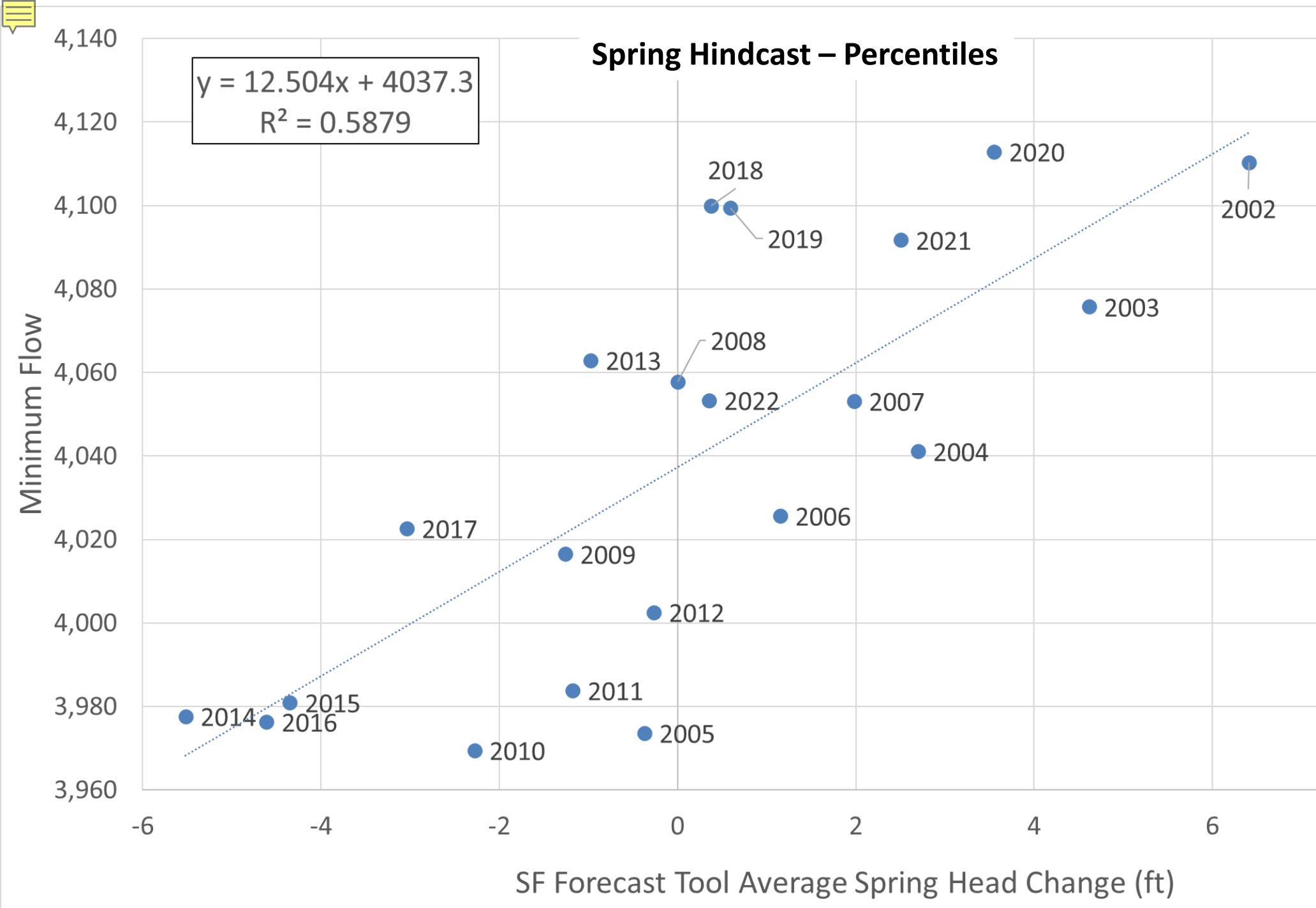


Swan Falls Forecast Tool (SFFT) Inputs



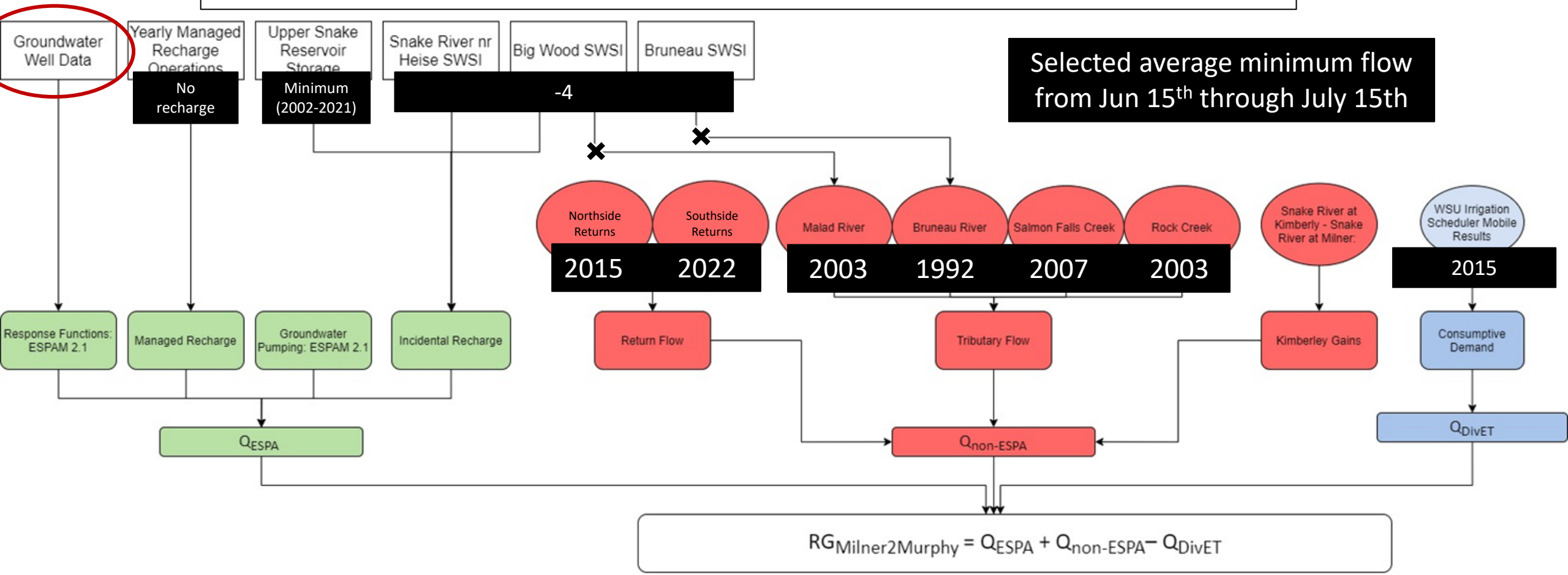

2011 Spring Hindcast - Percentiles
Discharge (ft³/s)
12,000
10,000
8,000
6,000
4,000
2,000
0
Nov-2010
Dec-2010
Jan-2011
Feb-2011
Mar-2011
Apr-2011
May-2011
Jun-2011
Jul-2011
Aug-2011
Sep-2011
Oct-2011
Forecast Uncertainty Range (10%-90%)
Minimum Streamflow
May Forecast
Milner to Murphy Reach Gain
3,984 cfs minimum

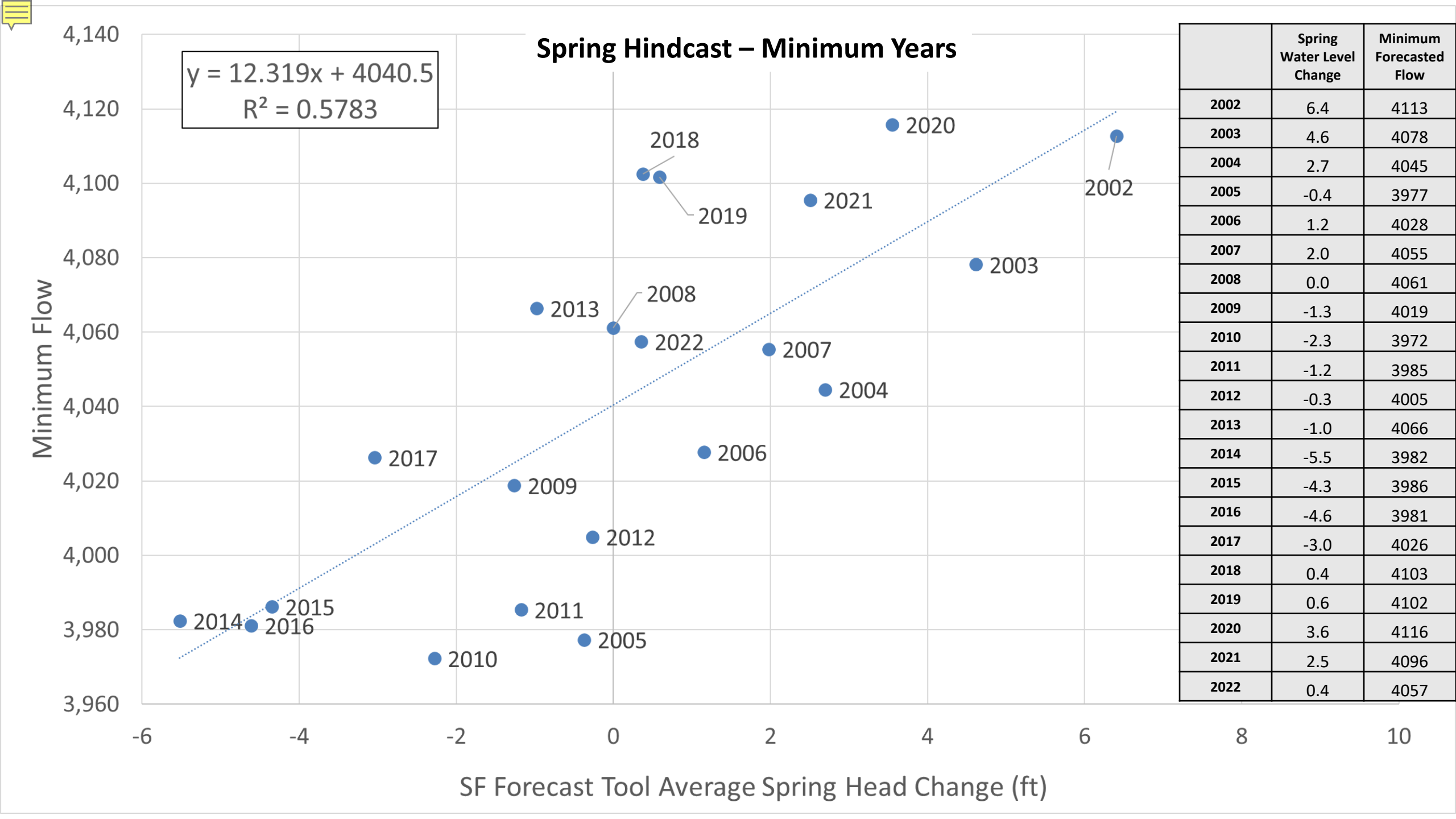
Spring Hindcast – Percentiles



	Spring Water Level Change	Minimum Forecasted Flow
2002	6.4	4110
2003	4.6	4076
2004	2.7	4041
2005	-0.4	3974
2006	1.2	4026
2007	2.0	4053
2008	0.0	4058
2009	-1.3	4017
2010	-2.3	3970
2011	-1.2	3984
2012	-0.3	4003
2013	-1.0	4063
2014	-5.5	3978
2015	-4.3	3981
2016	-4.6	3976
2017	-3.0	4023
2018	0.4	4100
2019	0.6	4099
2020	3.6	4113
2021	2.5	4092
2022	0.4	4053

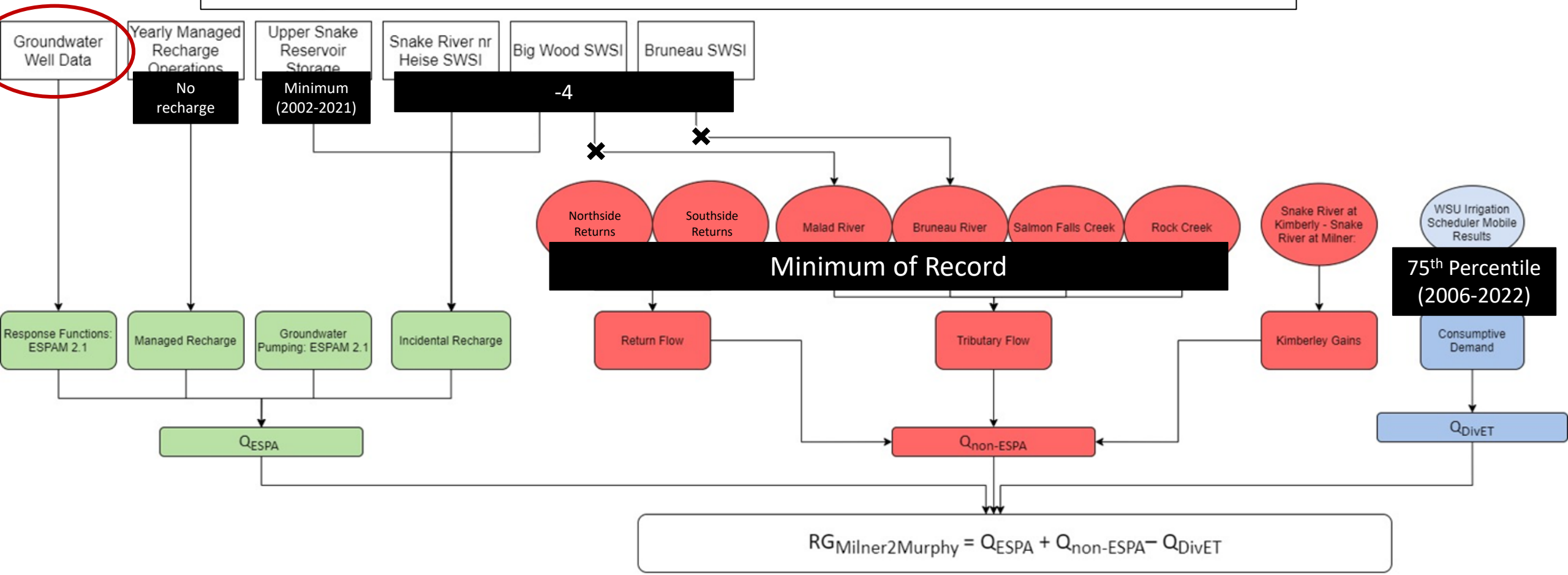
Swan Falls Forecast Tool (SFFT) Inputs



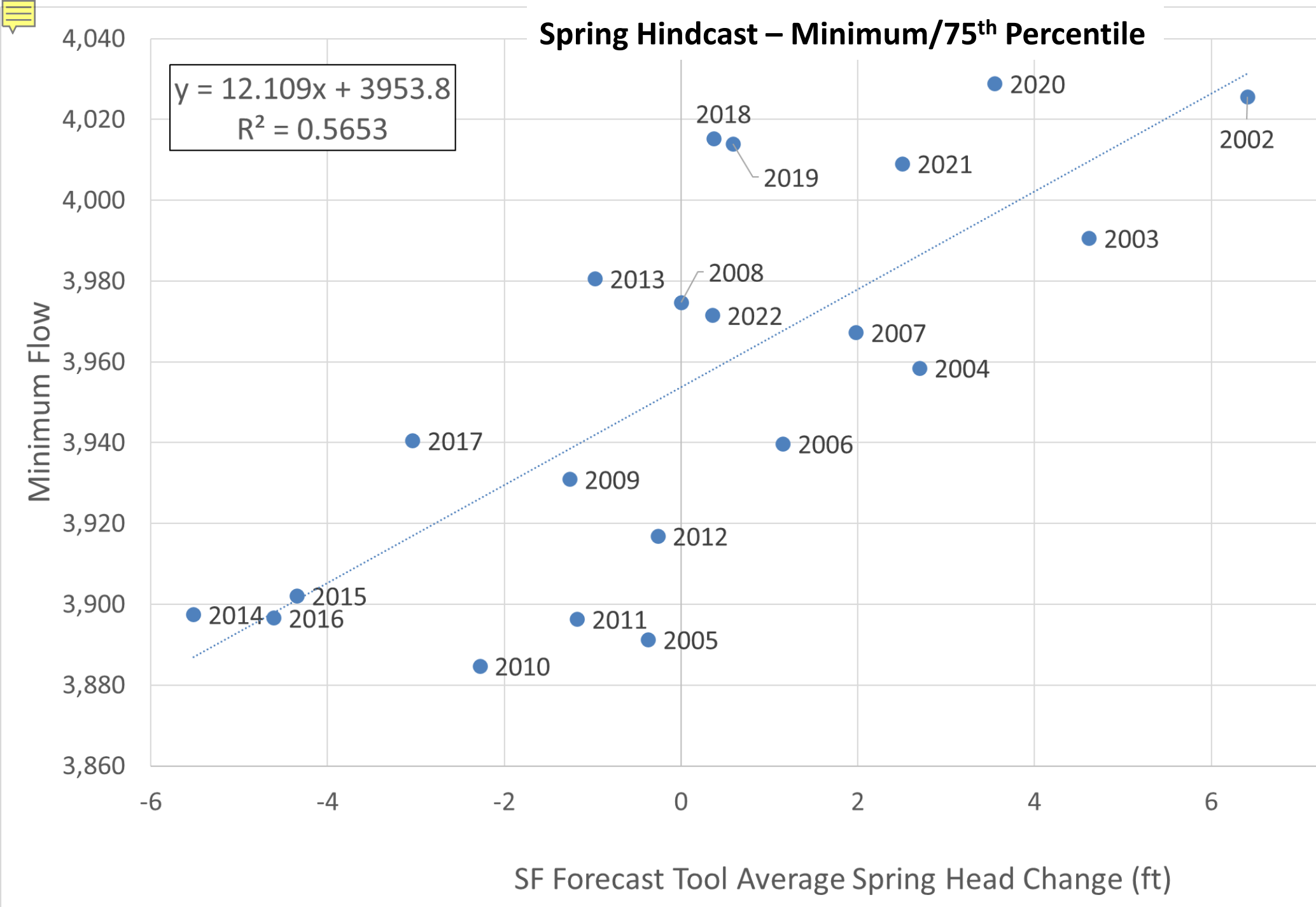


	Spring Water Level Change	Minimum Forecasted Flow
2002	6.4	4113
2003	4.6	4078
2004	2.7	4045
2005	-0.4	3977
2006	1.2	4028
2007	2.0	4055
2008	0.0	4061
2009	-1.3	4019
2010	-2.3	3972
2011	-1.2	3985
2012	-0.3	4005
2013	-1.0	4066
2014	-5.5	3982
2015	-4.3	3986
2016	-4.6	3981
2017	-3.0	4026
2018	0.4	4103
2019	0.6	4102
2020	3.6	4116
2021	2.5	4096
2022	0.4	4057

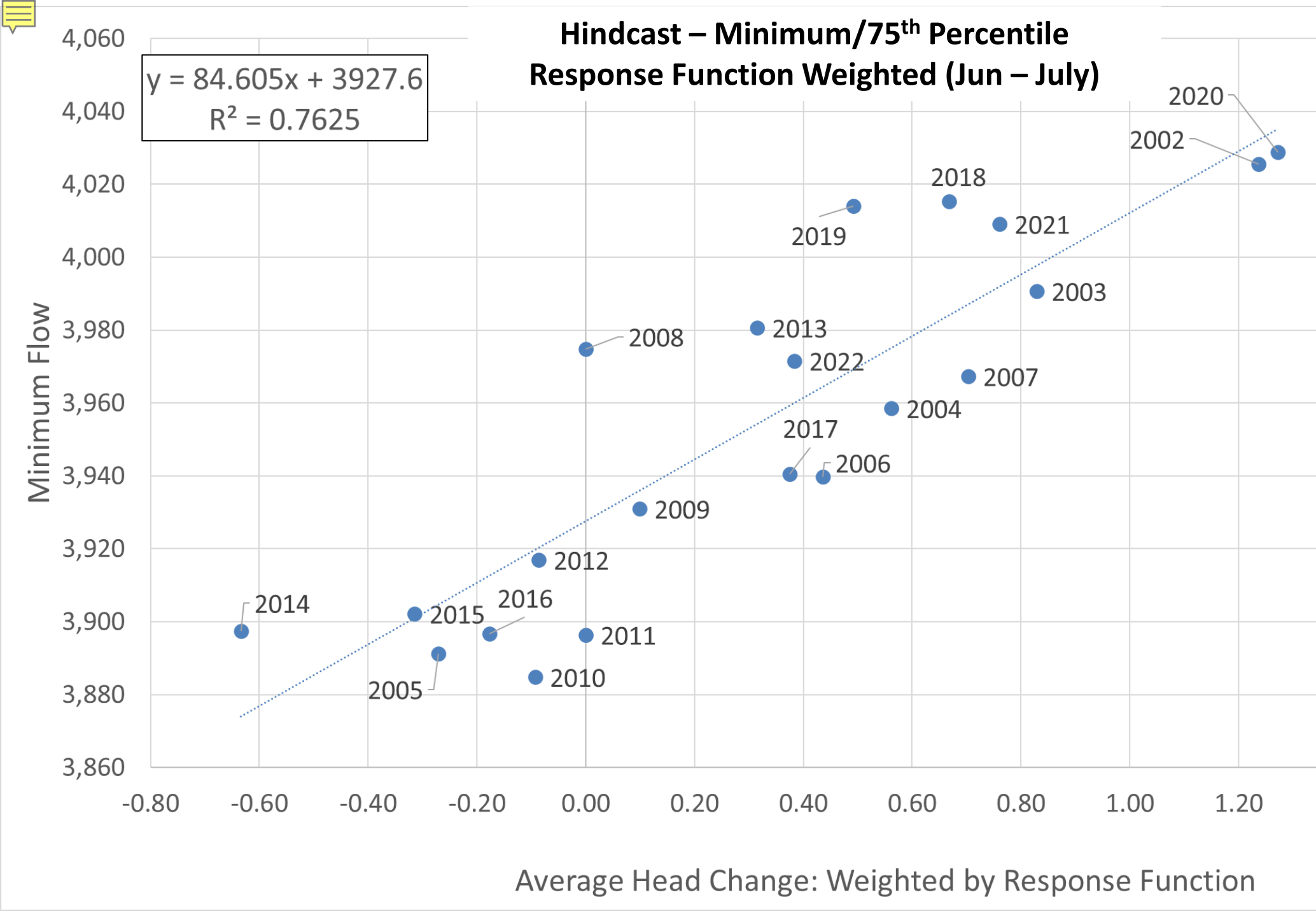
Swan Falls Forecast Tool (SFFT) Inputs



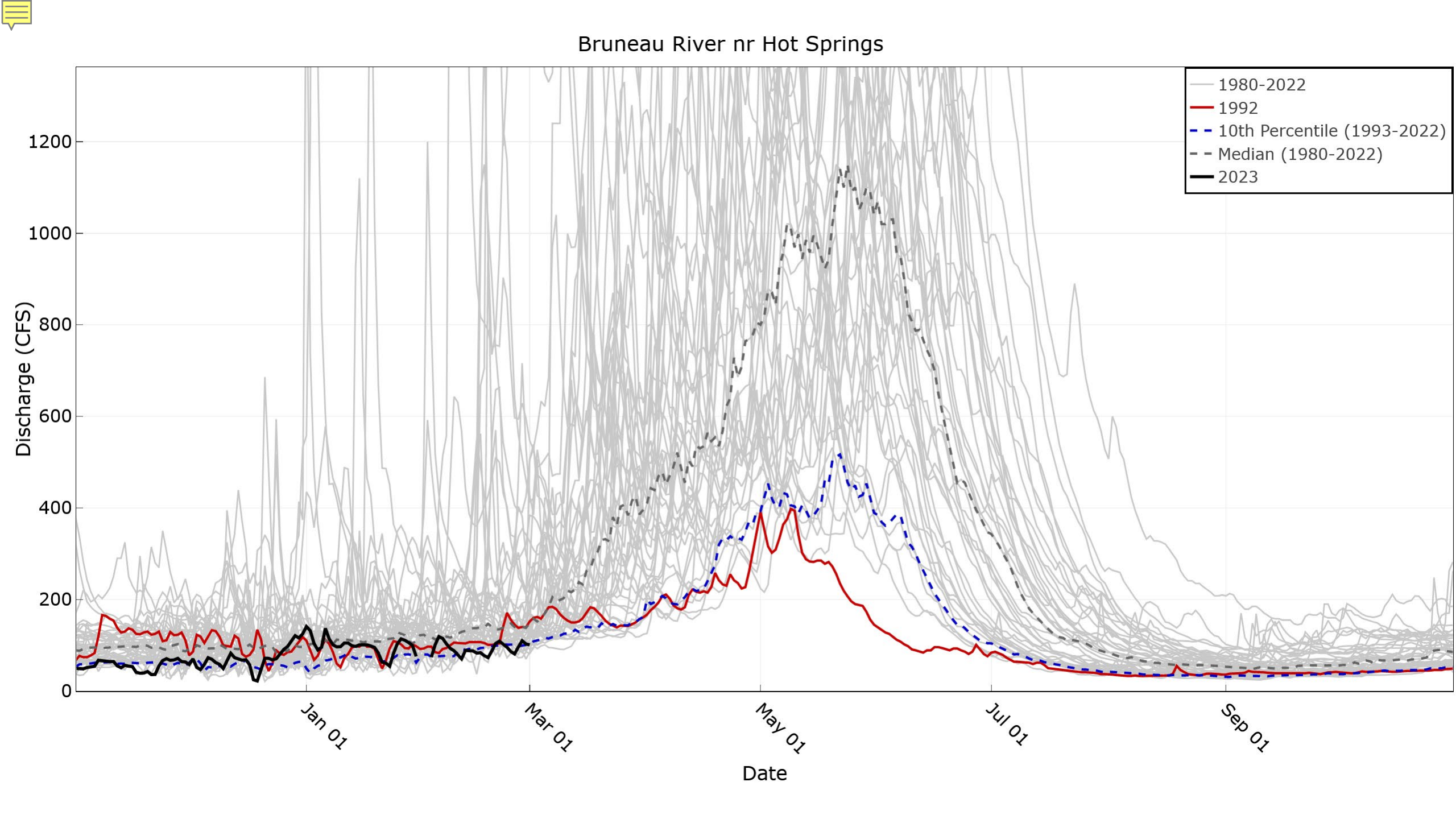
Spring Hindcast – Minimum/75th Percentile

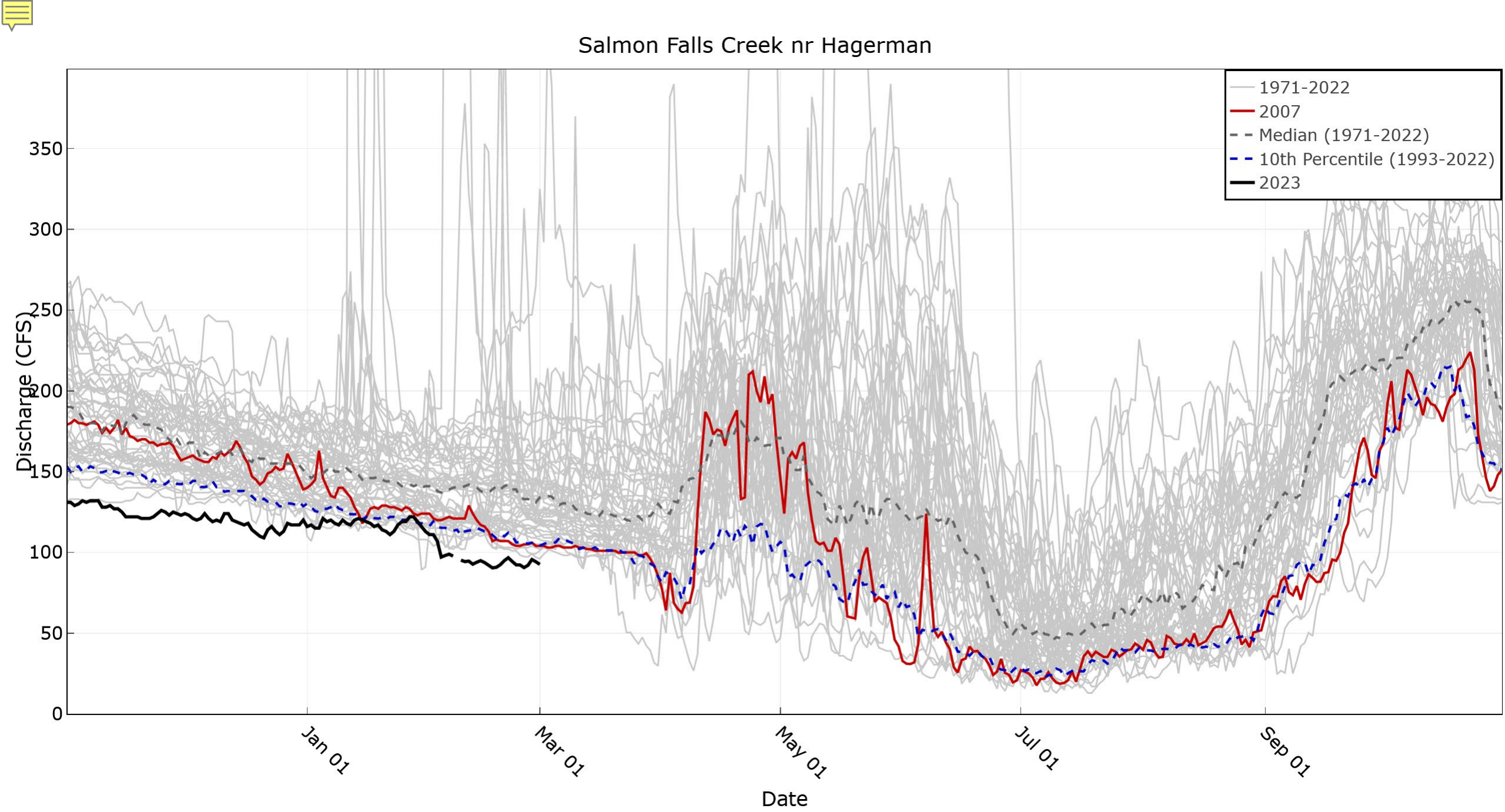


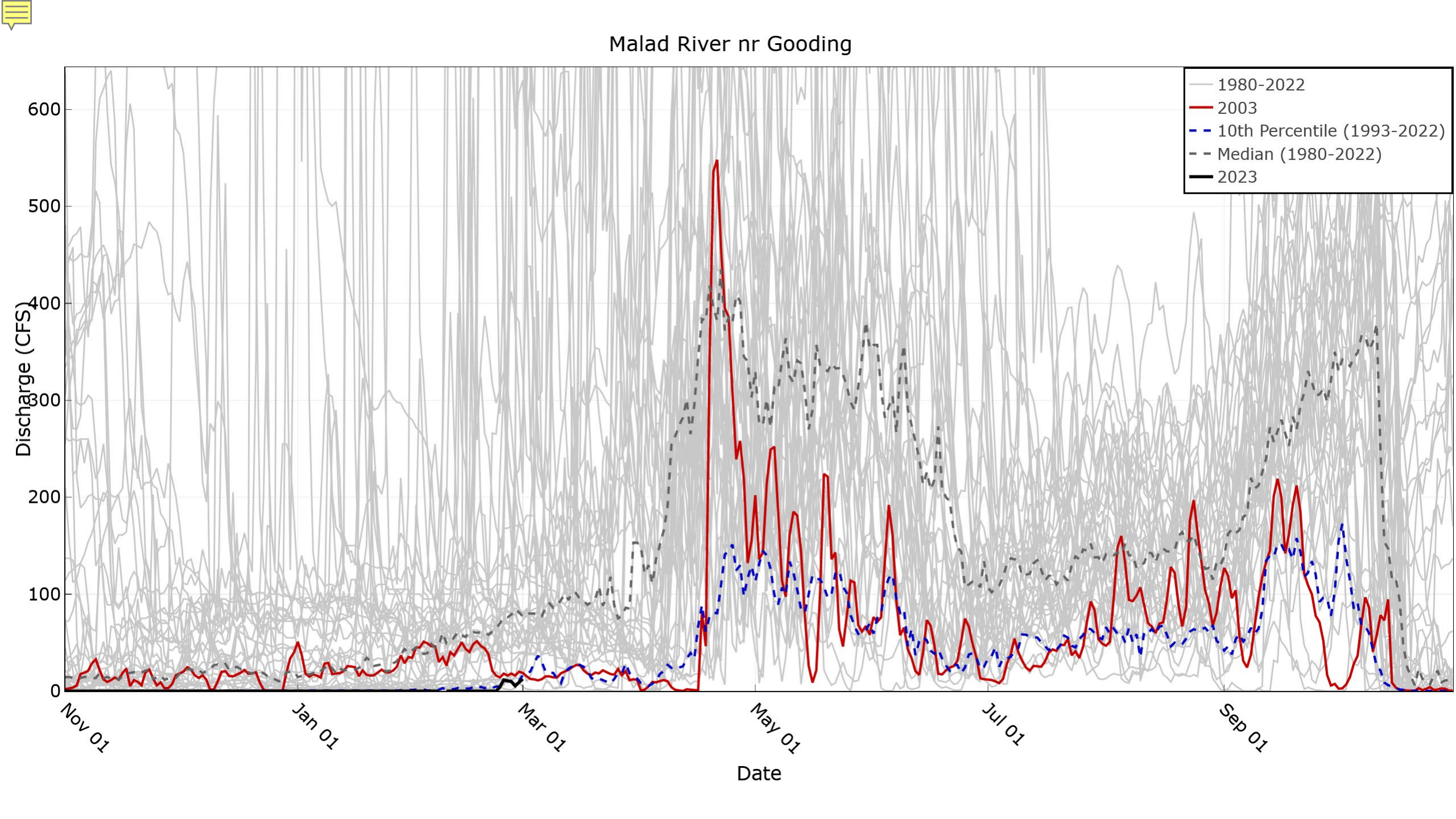
	Spring Water Level Change	Minimum Forecasted Flow
2002	6.4	4026
2003	4.6	3991
2004	2.7	3959
2005	-0.4	3891
2006	1.2	3940
2007	2.0	3967
2008	0.0	3975
2009	-1.3	3931
2010	-2.3	3885
2011	-1.2	3896
2012	-0.3	3917
2013	-1.0	3981
2014	-5.5	3898
2015	-4.3	3902
2016	-4.6	3897
2017	-3.0	3941
2018	0.4	4015
2019	0.6	4014
2020	3.6	4029
2021	2.5	4009
2022	0.4	3972

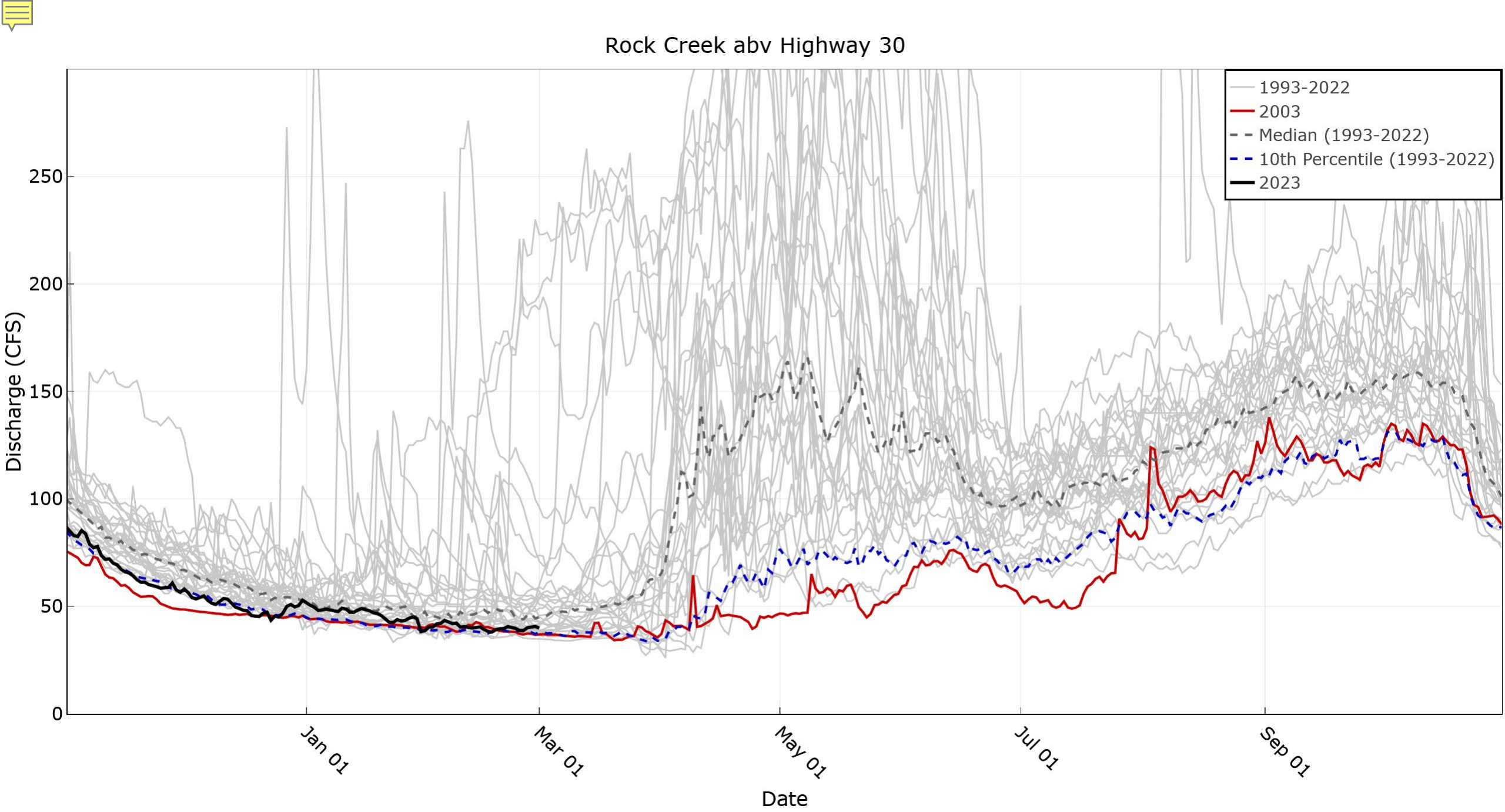


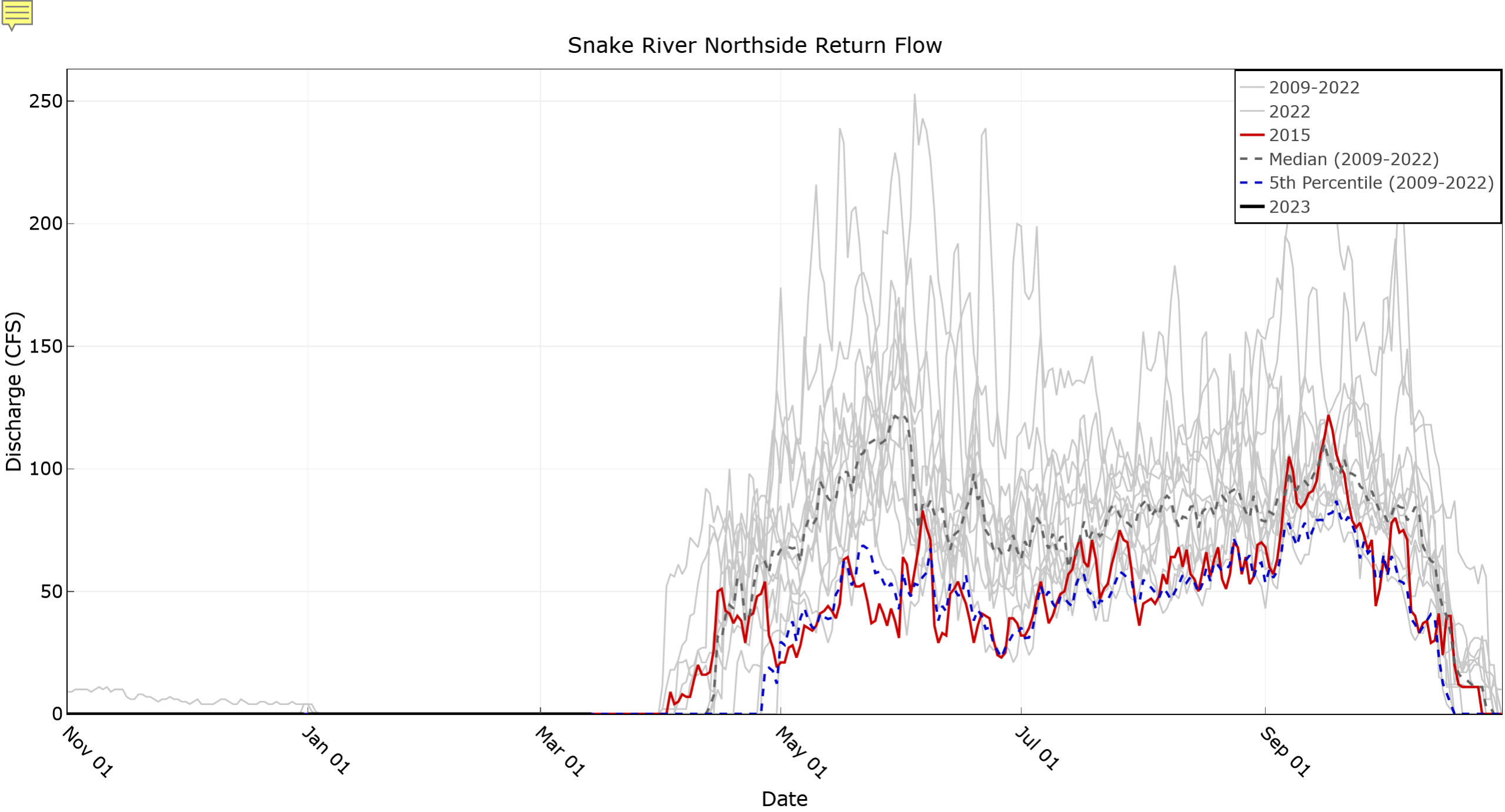
	Spring Water Level Change – Weighted by Response Function	Minimum Forecasted Flow
2002	1.24	4026
2003	0.83	3991
2004	0.56	3959
2005	-0.27	3891
2006	0.44	3940
2007	0.70	3967
2008	0.00	3975
2009	0.10	3931
2010	-0.09	3885
2011	0.00	3896
2012	-0.09	3917
2013	0.32	3981
2014	-0.63	3898
2015	-0.31	3902
2016	-0.18	3897
2017	0.38	3941
2018	0.67	4015
2019	0.49	4014
2020	1.27	4029
2021	0.76	4009
2022	0.38	3972

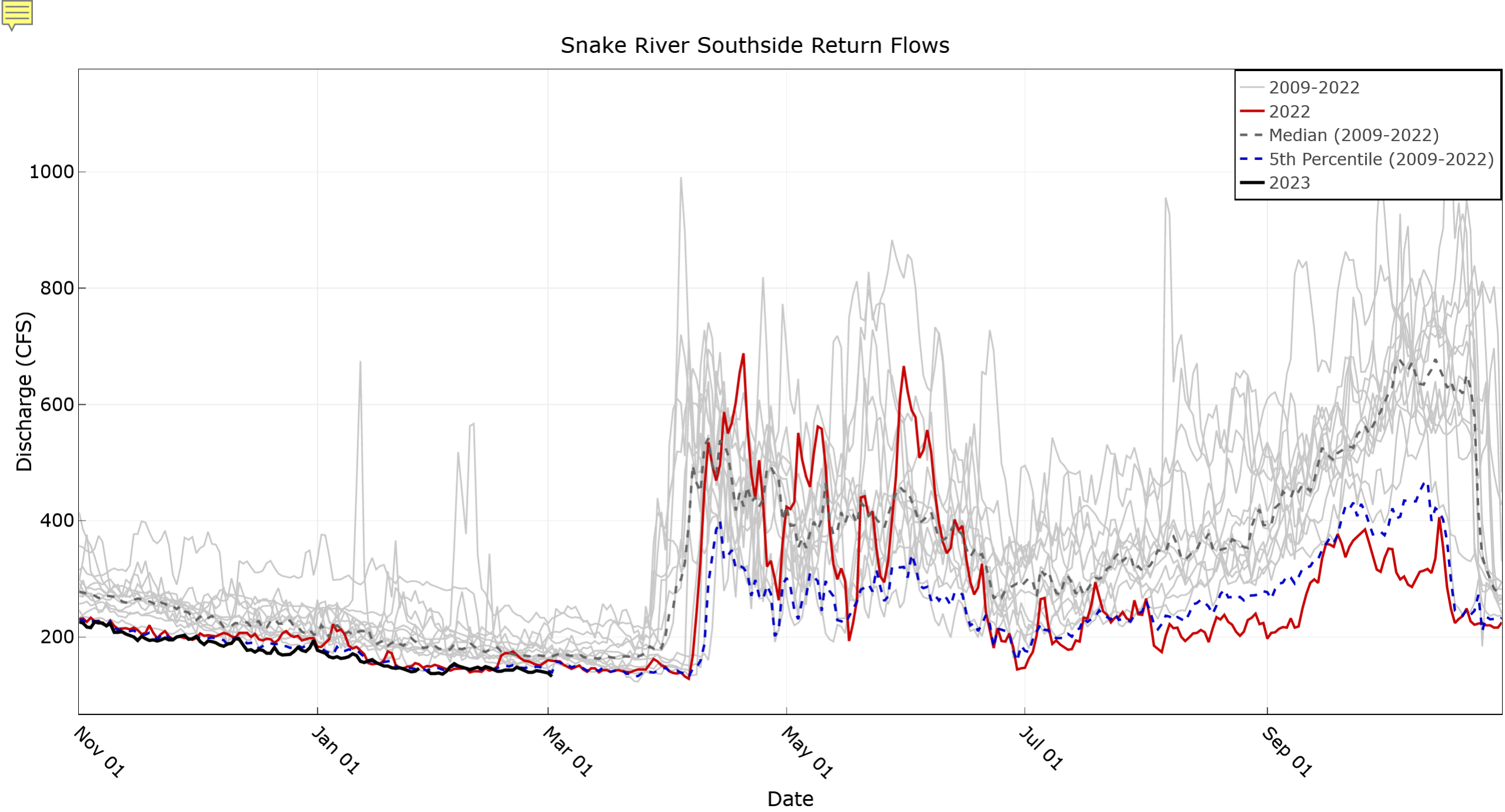

Bruneau River nr Hot Springs
1980-2022
1992
10th Percentile (1993-2022)
Median (1980-2022)
2023
Discharge (CFS)
0
200
400
600
800
1000
1200
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date

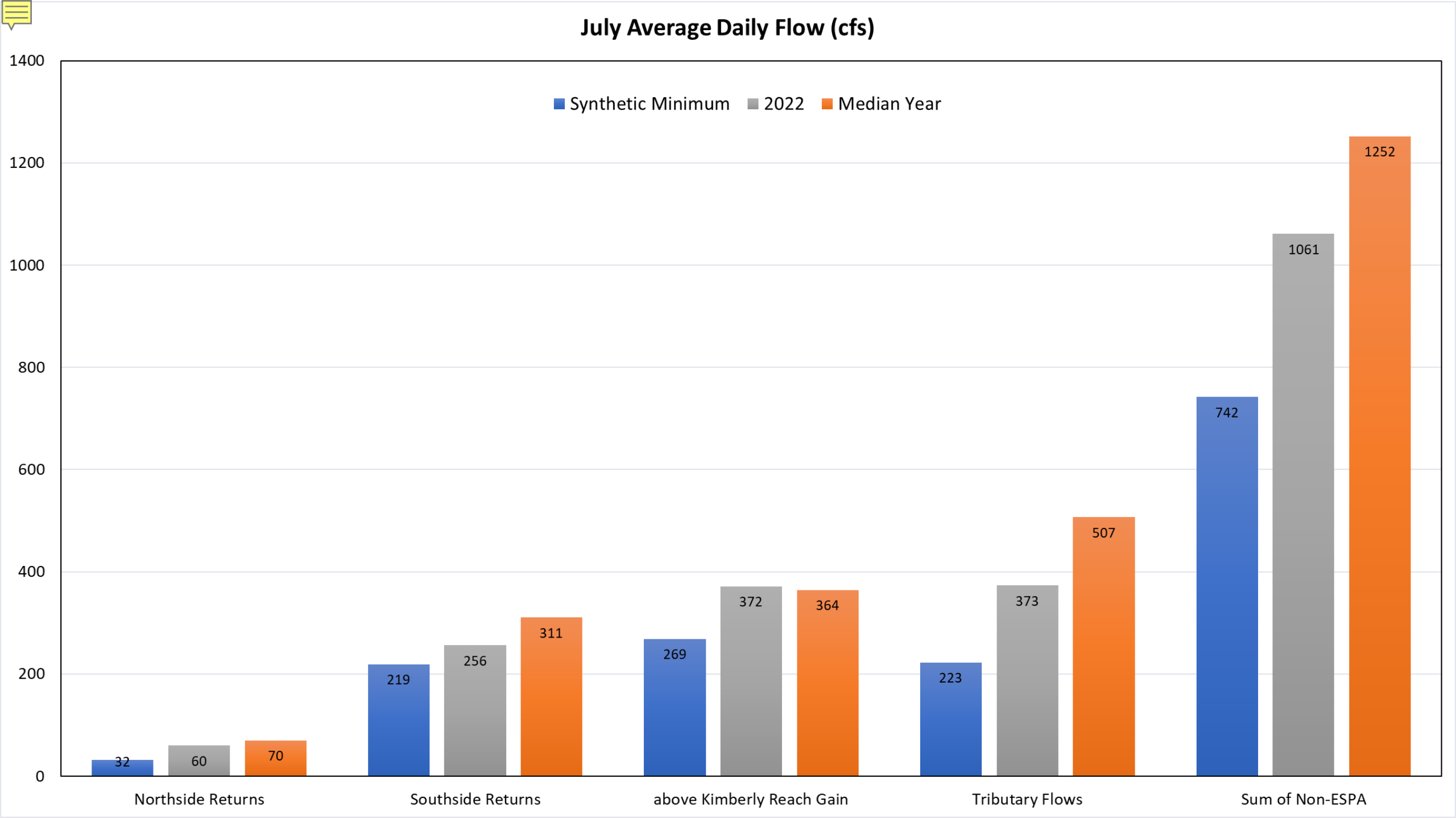

Salmon Falls Creek nr Hagerman
1971-2022
2007
Median (1971-2022)
10th Percentile (1993-2022)
2023
Discharge (CFS)
0
50
100
150
200
250
300
350
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date

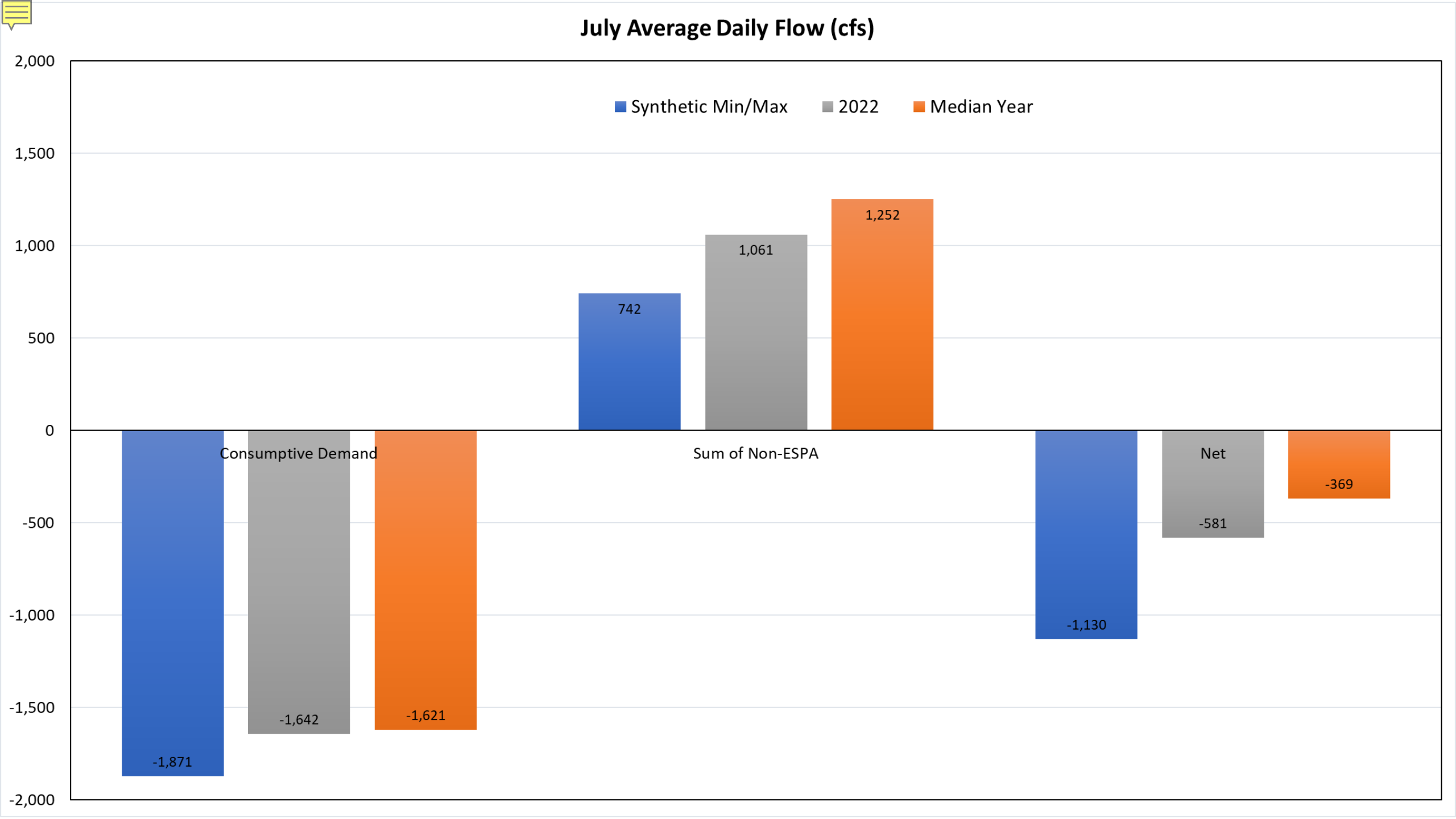

Malad River nr Gooding
1980-2022
2003
10th Percentile (1993-2022)
Median (1980-2022)
2023
Discharge (CFS)
600
500
400
300
200
100
0
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date


Rock Creek abv Highway 30
1993-2022
2003
Median (1993-2022)
10th Percentile (1993-2022)
2023
Discharge (CFS)
0
50
100
150
200
250
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date


Snake River Northside Return Flow
2009-2022
2022
2015
Median (2009-2022)
5th Percentile (2009-2022)
2023
250
200
150
100
50
0
Discharge (CFS)
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date


Snake River Southside Return Flows
2009-2022
2022
Median (2009-2022)
5th Percentile (2009-2022)
2023
1000
800
600
400
200
Discharge (CFS)
Nov 01
Jan 01
Mar 01
May 01
Jul 01
Sep 01
Date


July Average Daily Flow (cfs)
Synthetic Minimum
2022
Median Year
1400
1200
1000
800
600
400
200
0
32
60
70
219
256
311
269
372
364
223
373
507
742
1061
1252
Northside Returns
Southside Returns
above Kimberly Reach Gain
Tributary Flows
Sum of Non-ESPA


July Average Daily Flow (cfs)
2,000
1,500
1,000
500
0
-500
-1,000
-1,500
-2,000
Synthetic Min/Max
2022
Median Year
-1,871
-1,642
-1,621
742
1,061
1,252
-1,130
-581
-369
Consumptive Demand
Sum of Non-ESPA
Net