# RECLAMATION

*Managing Water in the West*

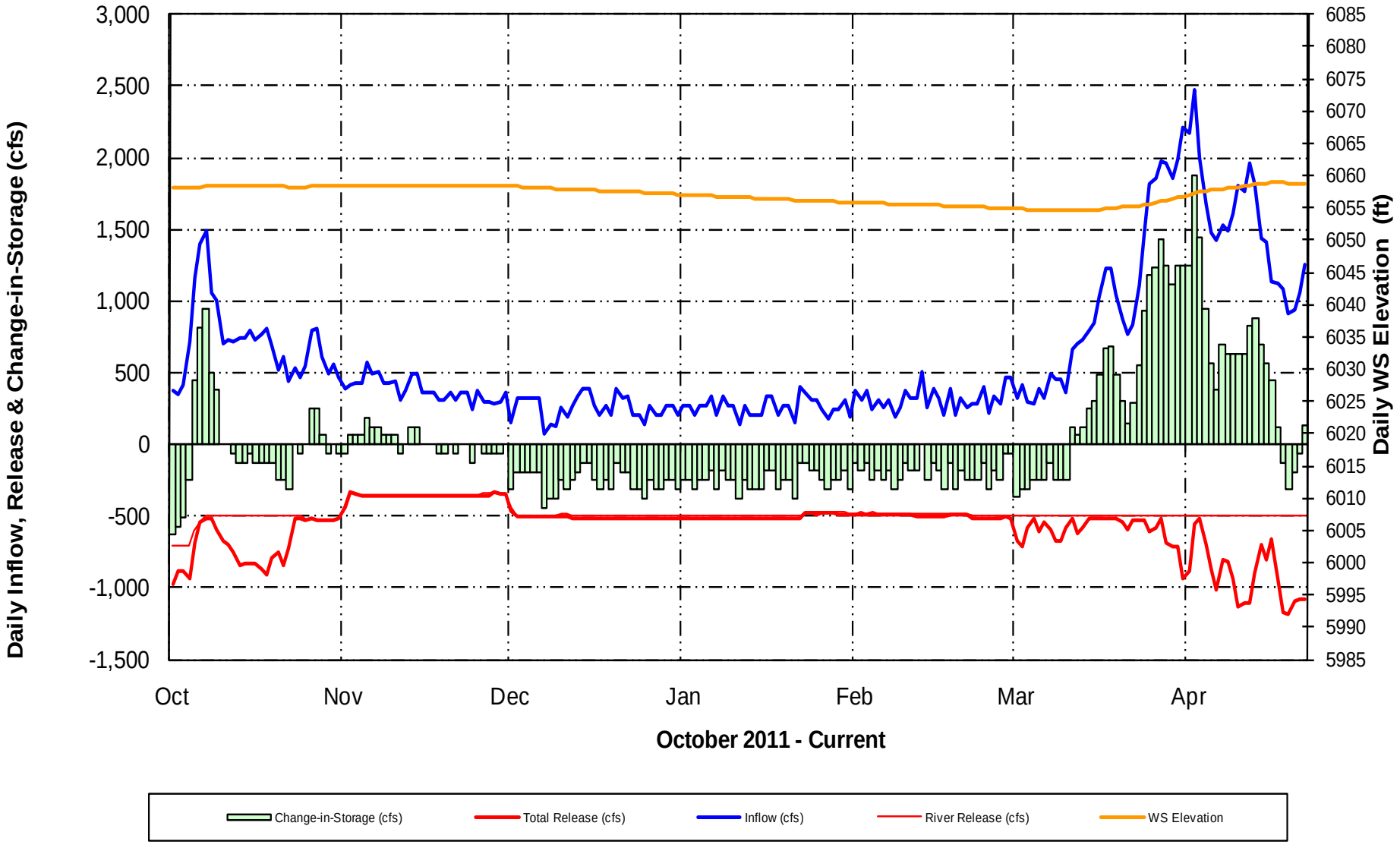
## Navajo Unit Operations
## April 24, 2012
## Coordination Meeting

U.S. Department of the Interior
Bureau of Reclamation

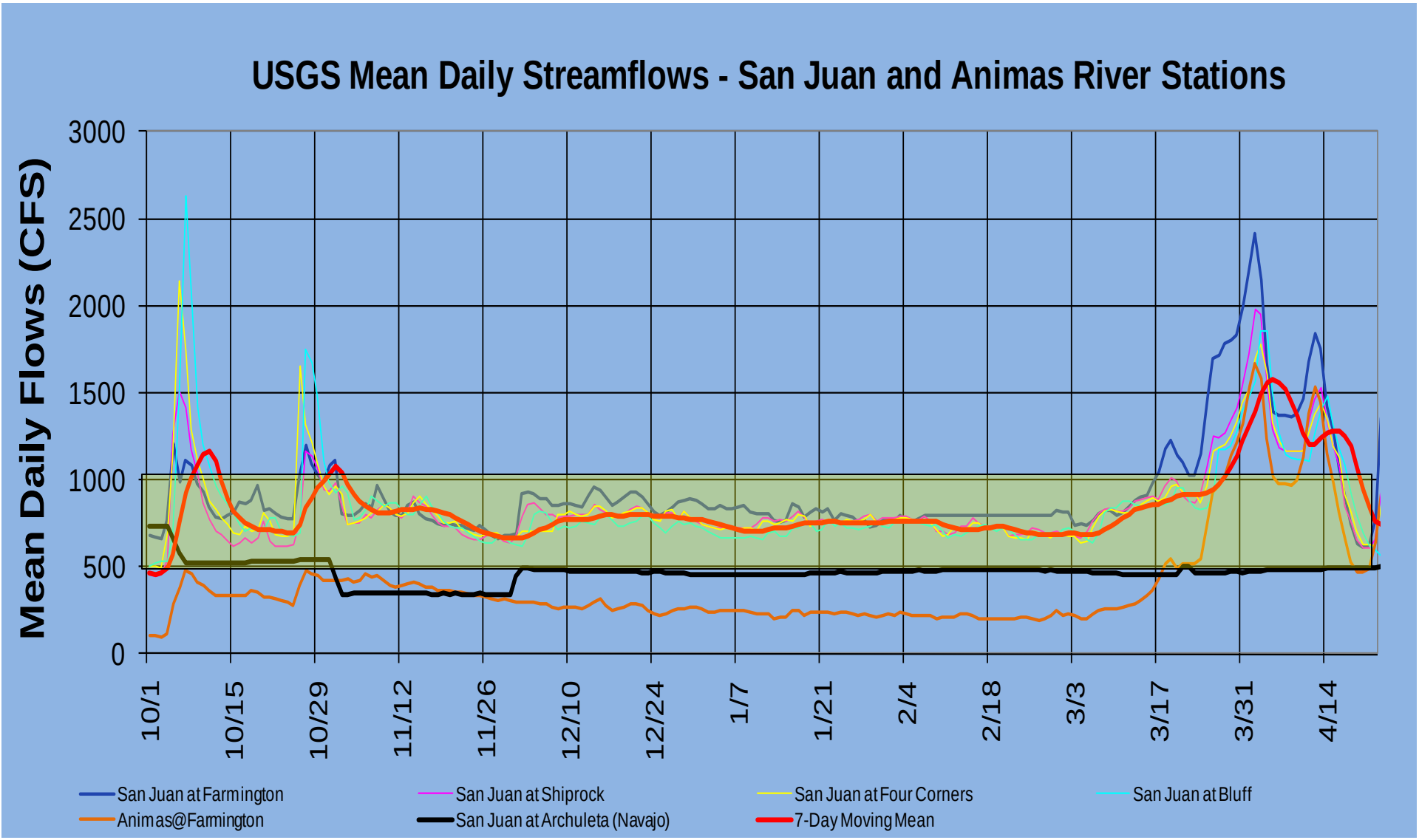
# Agenda

- Welcome
- Special Presentation – San Juan River Basin Recovery Implementation Program – Scott Durst, FWS
- Review of Water Year 2012 Operations (to date)
- Water Year 2012 Current Conditions/Snowpack
- Water Year 2012 Forecasts & Proposed Operations
- Modeled Results of Operation Plan
- Nearby Projects Update
- Navajo Dam Maintenance Activities
- Fish & Wildlife Service/San Juan RIP Update
- Reports from other Agencies
- Questions from Audience
- How To Access Information
- Close

# NAVAJO RESERVOIR OPERATIONS



# Downstream Flows




Target Baseflow Range 500-1000 cfs

# Navajo Current Conditions

(as of 4/22/12)

Elevation = 6058.82  (98% of Average)

Storage = 1,332,880 af (78% Full)

Inflow = 1250 cfs

Release = 500 cfs

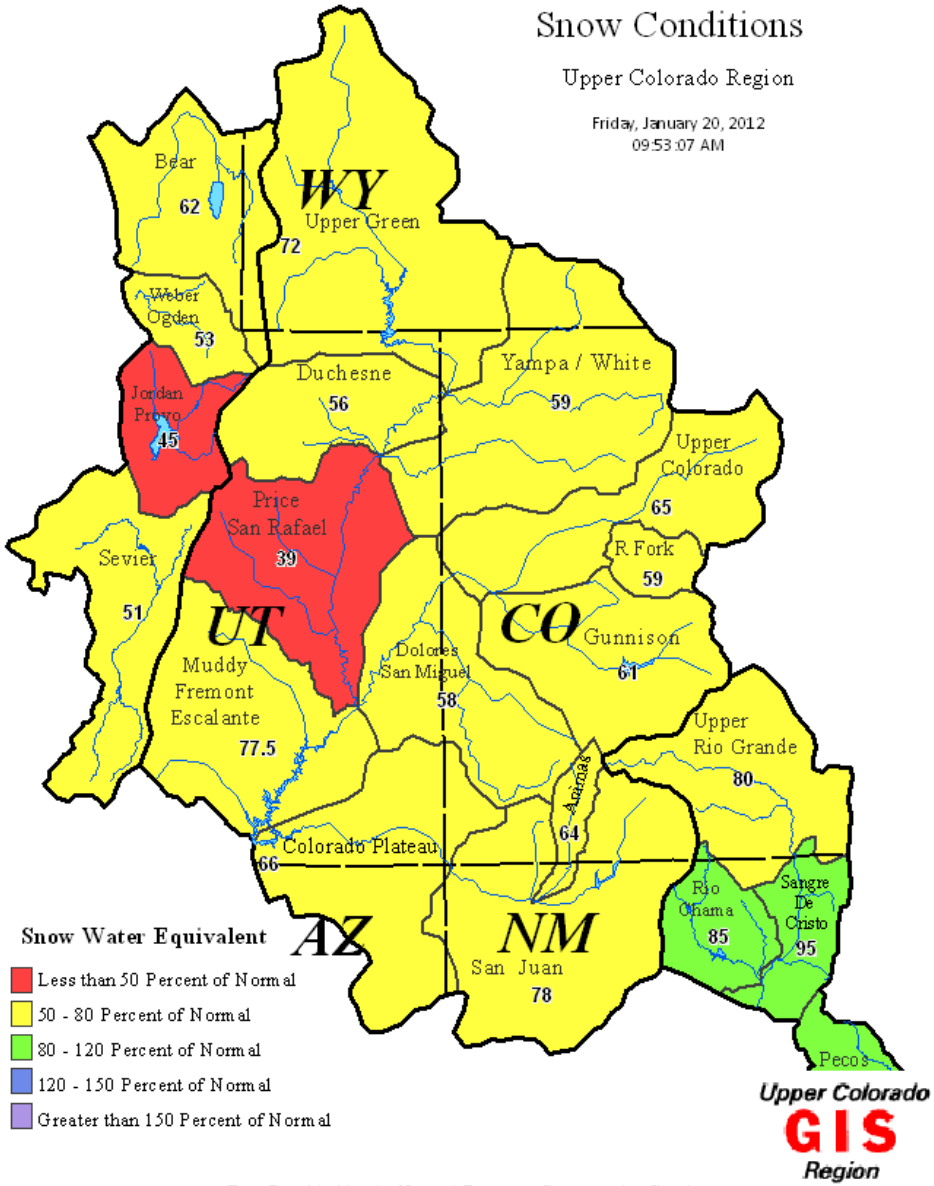
NIIP = 580 cfs

SJ-Chama Diversion = 265 cfs

# Snow Conditions

Upper Colorado Region

Friday, January 20, 2012
09:53:07 AM




**Snow Water Equivalent**

- Less than 50 Percent of Normal
- 50 - 80 Percent of Normal
- 80 - 120 Percent of Normal
- 120 - 150 Percent of Normal
- Greater than 150 Percent of Normal

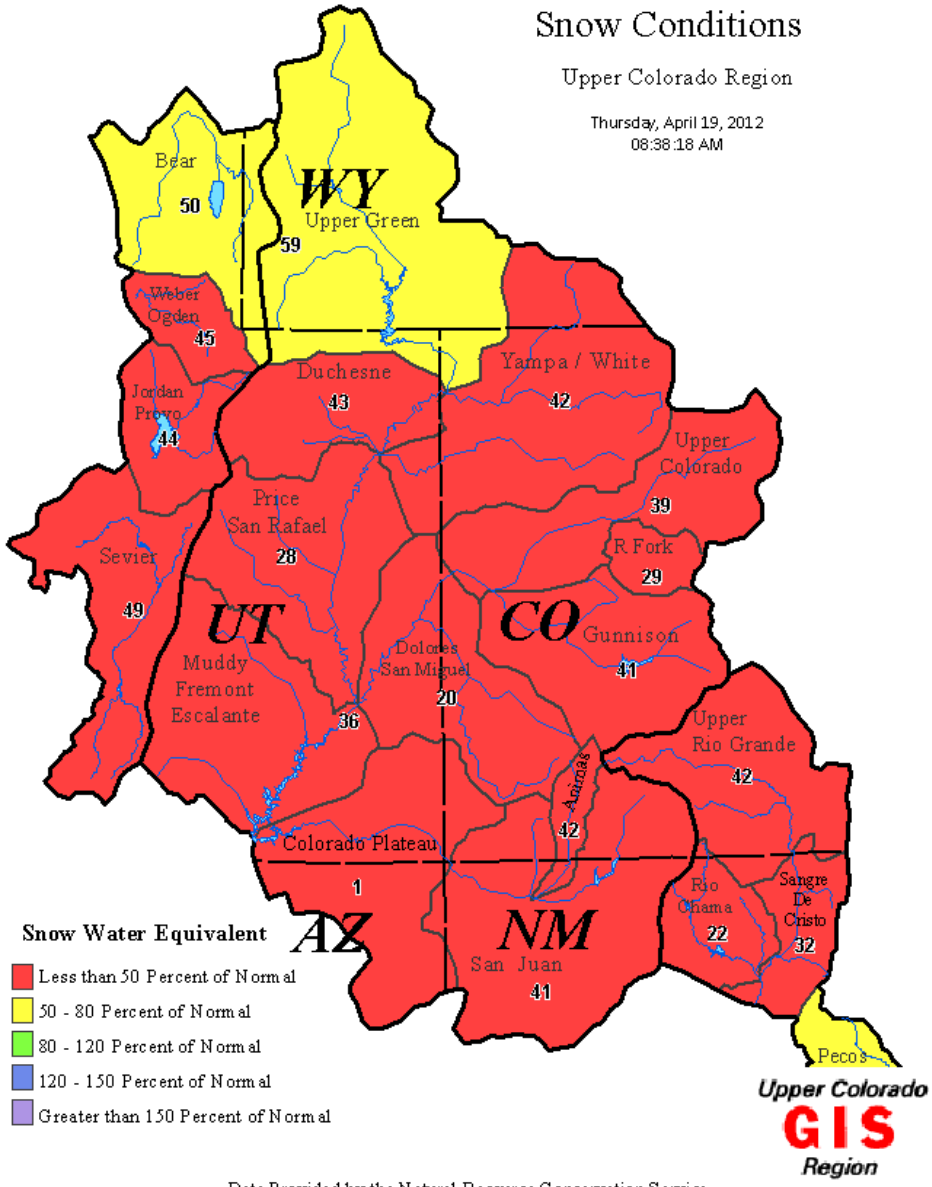
Upper Colorado GIS Region

Data Provided by the Natural Resource Conservation Service

# Snow Conditions

Upper Colorado Region

Thursday, April 19, 2012
08:38:18 AM

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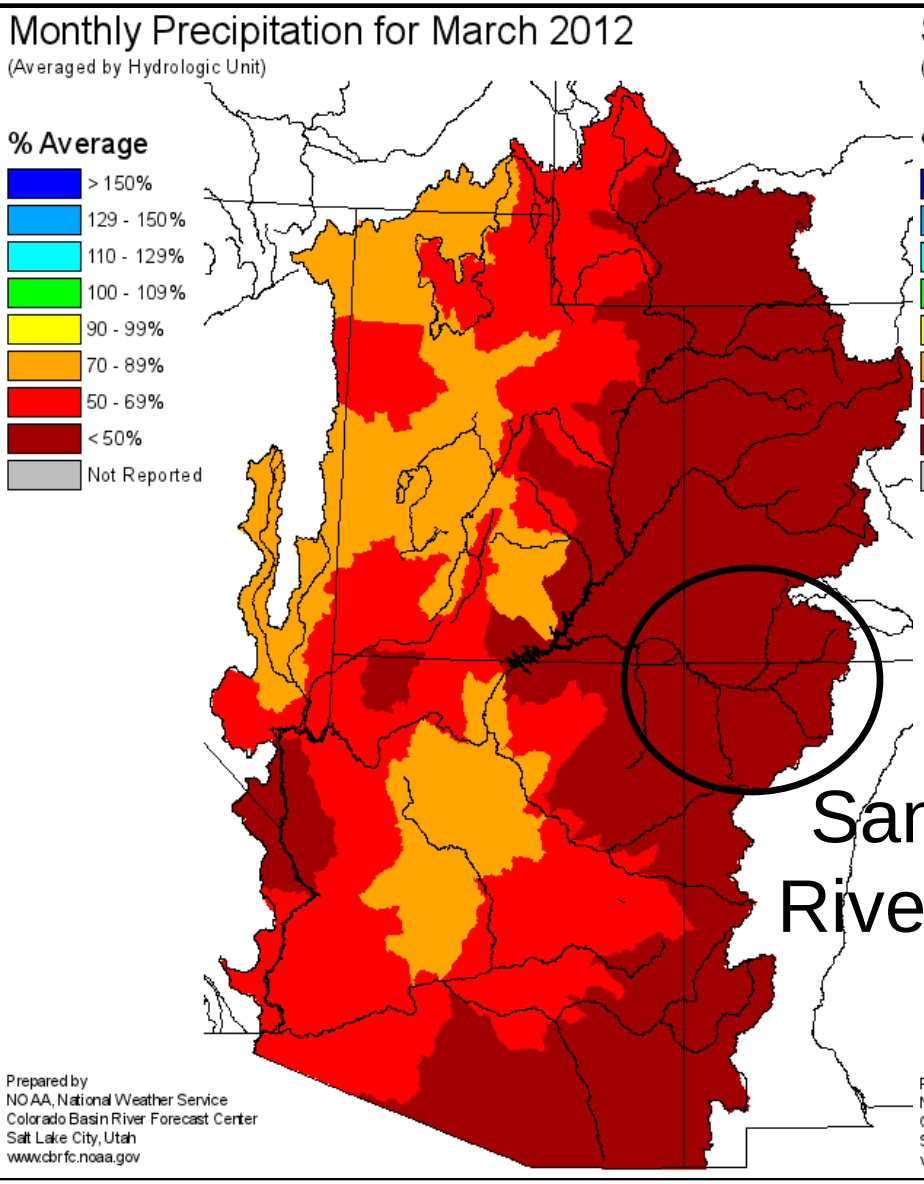
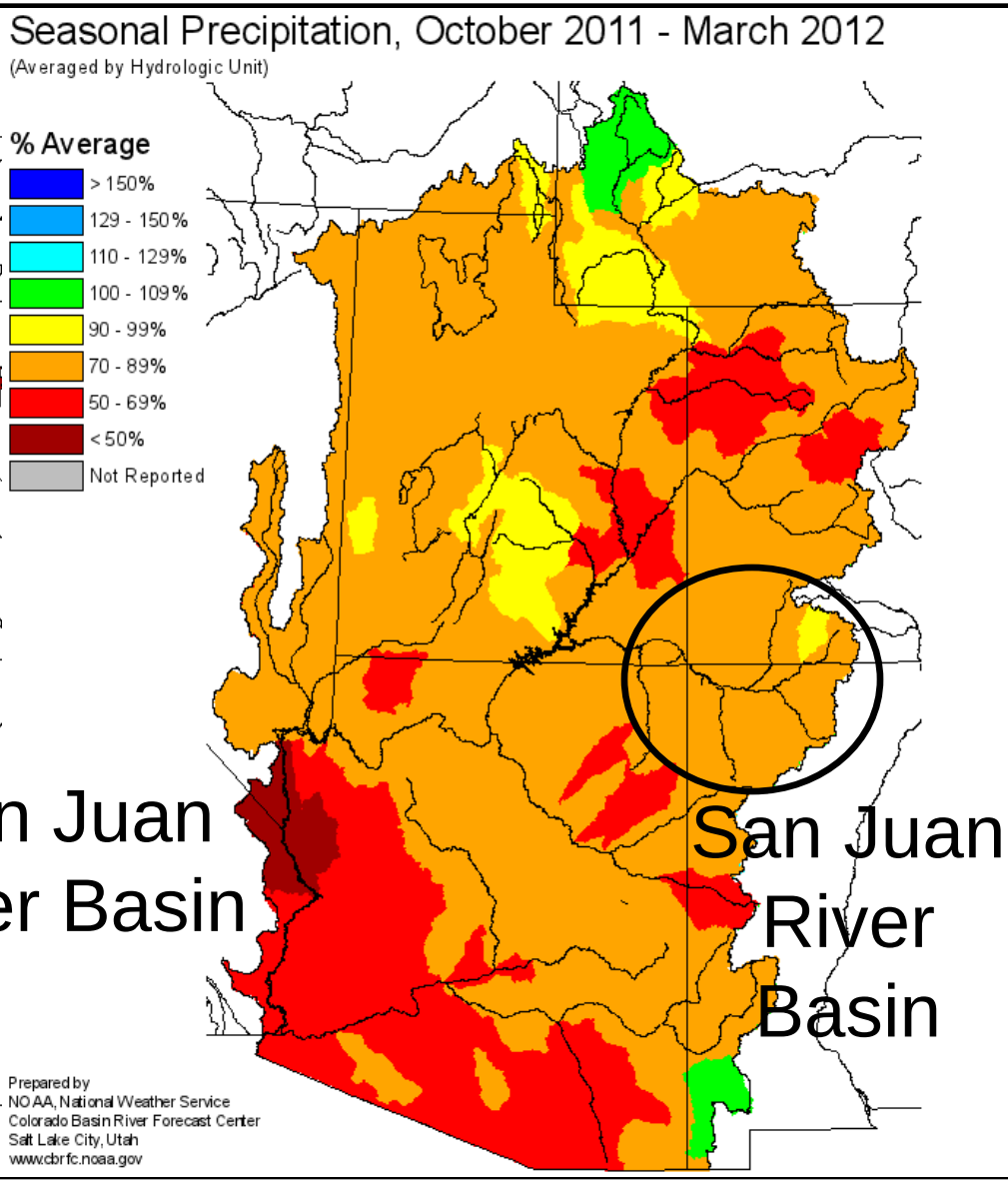
Upper Colorado GIS Region

Data Provided by the Natural Resource Conservation Service


Monthly Precipitation for March 2012
(Averaged by Hydrologic Unit)
% Average
> 150%
129 - 150%
110 - 129%
100 - 109%
90 - 99%
70 - 89%
50 - 69%
< 50%
Not Reported
San Juan River Basin
Prepared by
NOAA, National Weather Service
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov


Seasonal Precipitation, October 2011 - March 2012
(Averaged by Hydrologic Unit)
% Average
> 150%
129 - 150%
110 - 129%
100 - 109%
90 - 99%
70 - 89%
50 - 69%
< 50%
Not Reported
San Juan River Basin
Prepared by
NOAA, National Weather Service
Colorado Basin River Forecast Center
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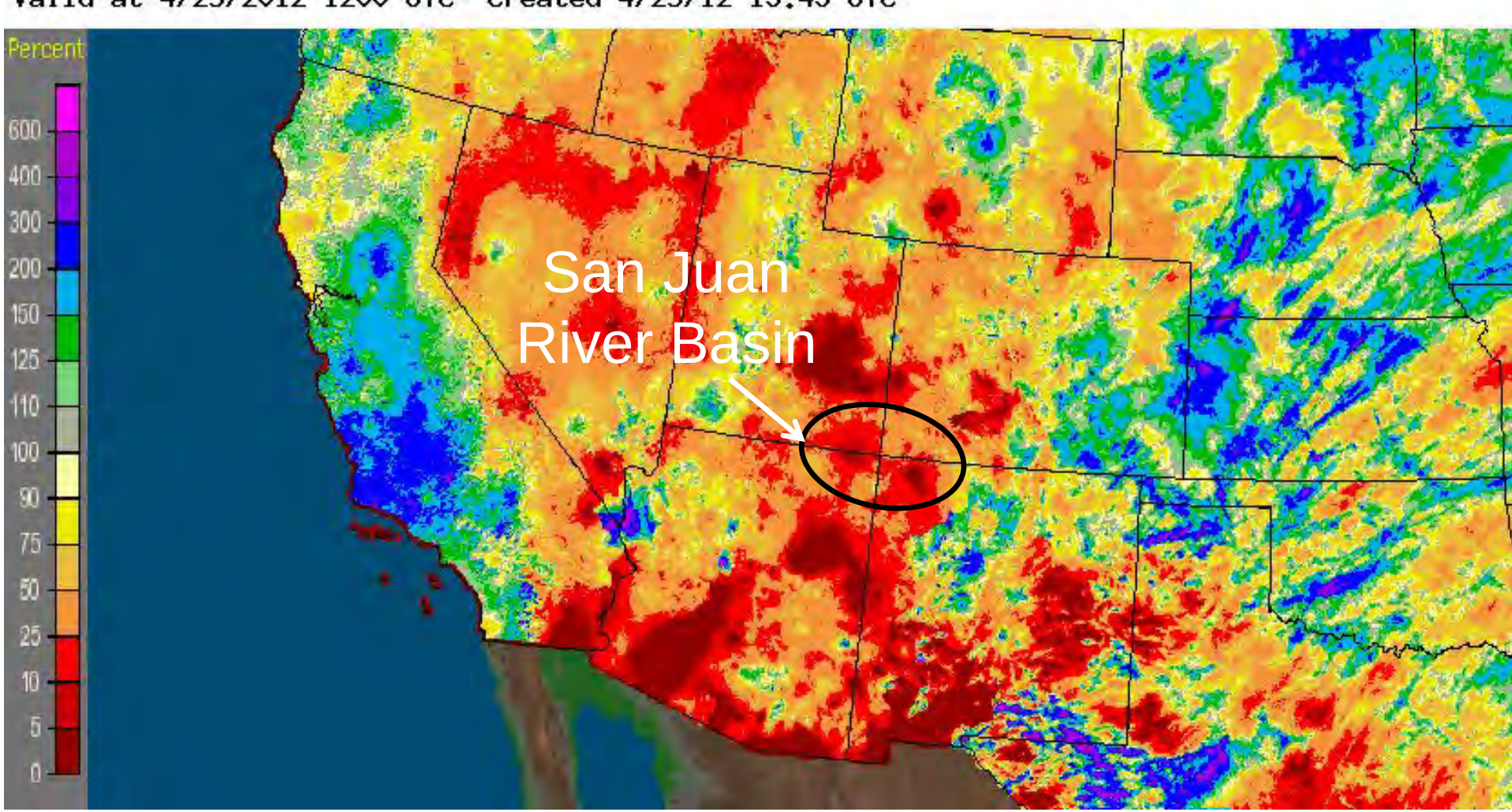
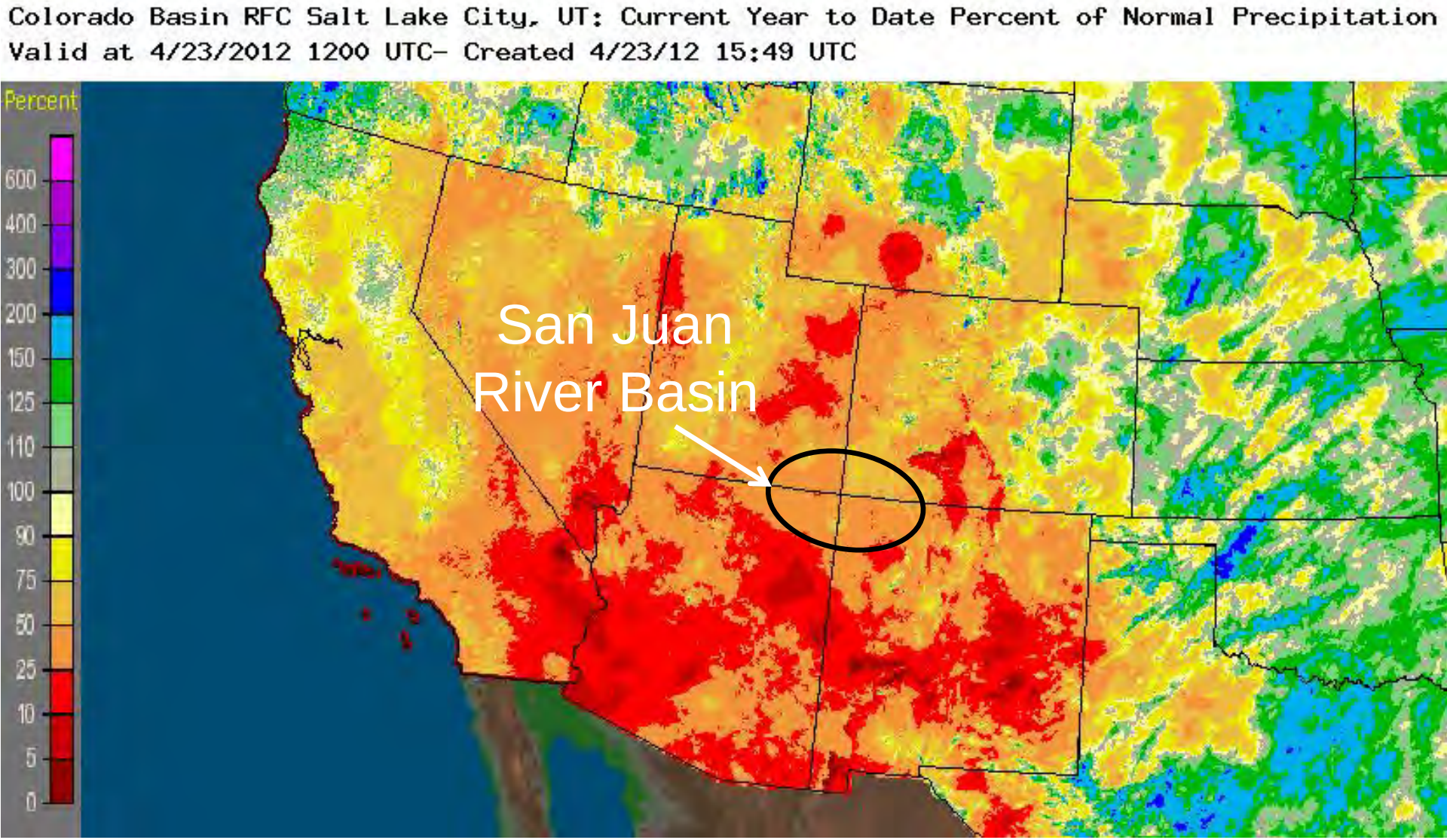
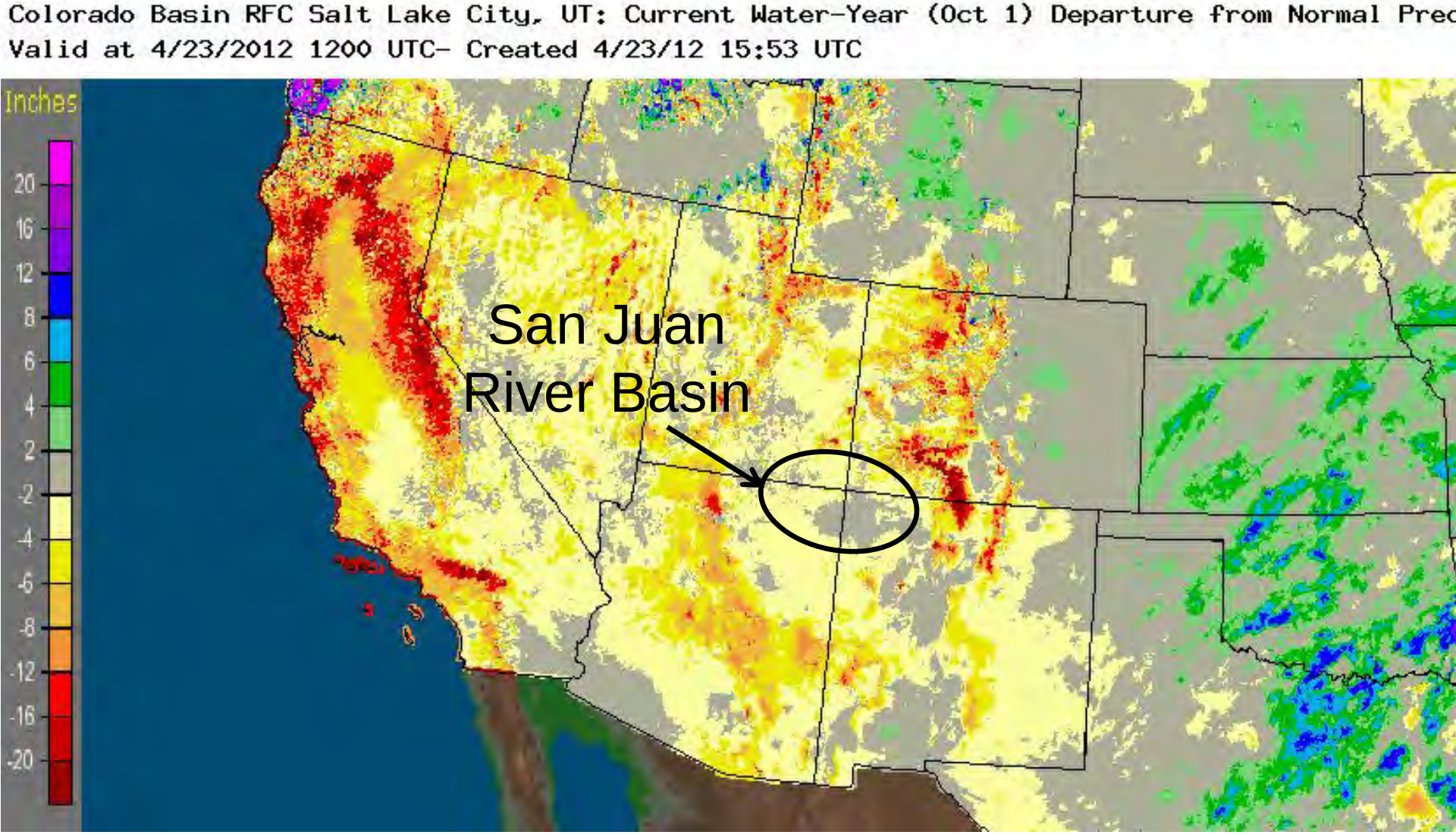
# % of Average Precipitation for April through 4/23



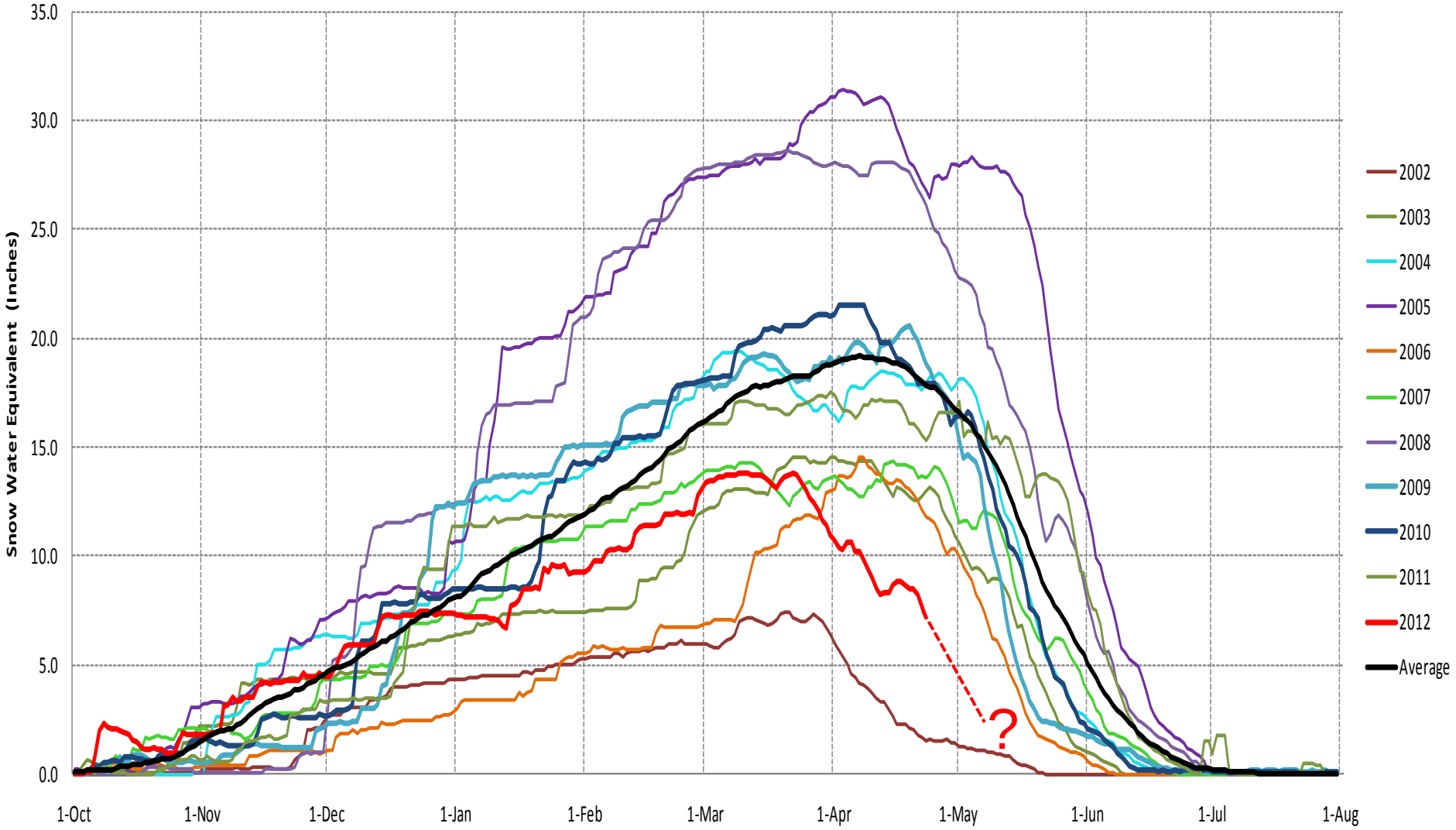
# % of Average Precipitation for the Water Year



# WY 2012 Departure from Normal Precipitation



# Navajo Reservoir SNOTEL SWE from 2002-2012




2012 Max SWE = 13.8 inches on 3/22/12

2011 Max SWE = 17.5 inches on 3/31/11

# Water Year 2012 (as of 4/22/2012)

# Navajo Inflows & Snowpack above Navajo

| EOM | Inflow (af) | % Average | Above Navajo EOM SWE (in.) | % Average |
|---|---|---|---|---|
| **October** | 44,162 | 87% | 1.8 | 124% |
| **November** | 22,770 | 70% | 4.5 | 99% |
| **December** | 15,616 | 64% | 7.4 | 92% |
| **January** | 15,996 | 78% | 9.3 | 79% |
| **February** | 18,585 | 62% | 12.8 | 80% |
| **March** | 61,037 | 67% | 11.0 | 59% |
| **April (Current Forecast)** | 101,948 | 70% | 7.2 | 40% |

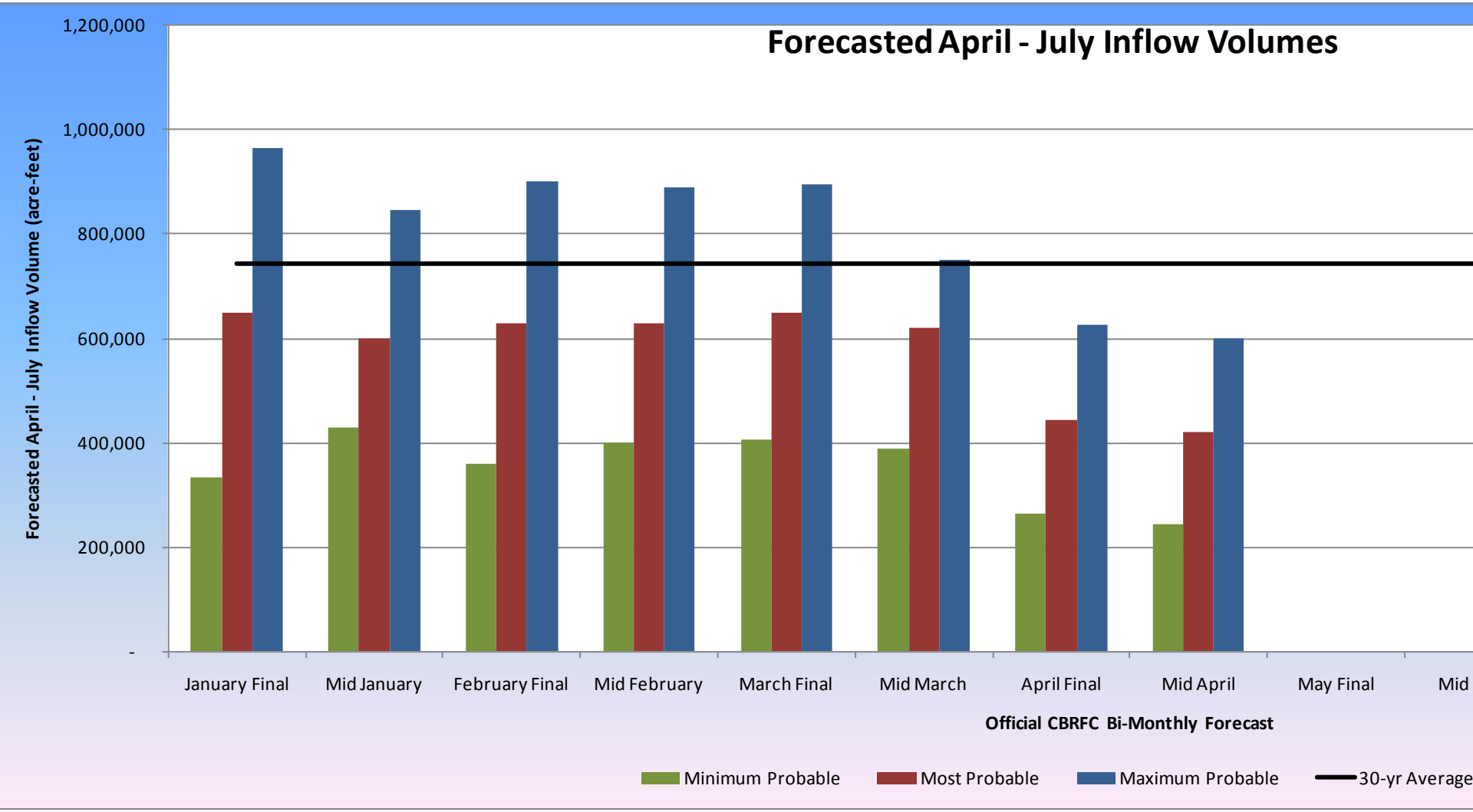
# Mid-April 2012 Forecast
# Navajo Reservoir Mod Unregulated
# April-July Inflow Volume

| | Inflow (af) | % of Average | 2011 Forecast |
|---|---|---|---|
| Most Probable | 420,000 | 56% | 550,000 (75%) |
| Minimum Probable | 244,000 | 33% | 395,000 (54%) |
| Maximum Probable | 600,000 | 81% | 725,000 (98%) |

2011 Actual = 576,000 acre-feet

NOTE: Colorado Basin RFC Forecast Issue Date was 4/16/2012

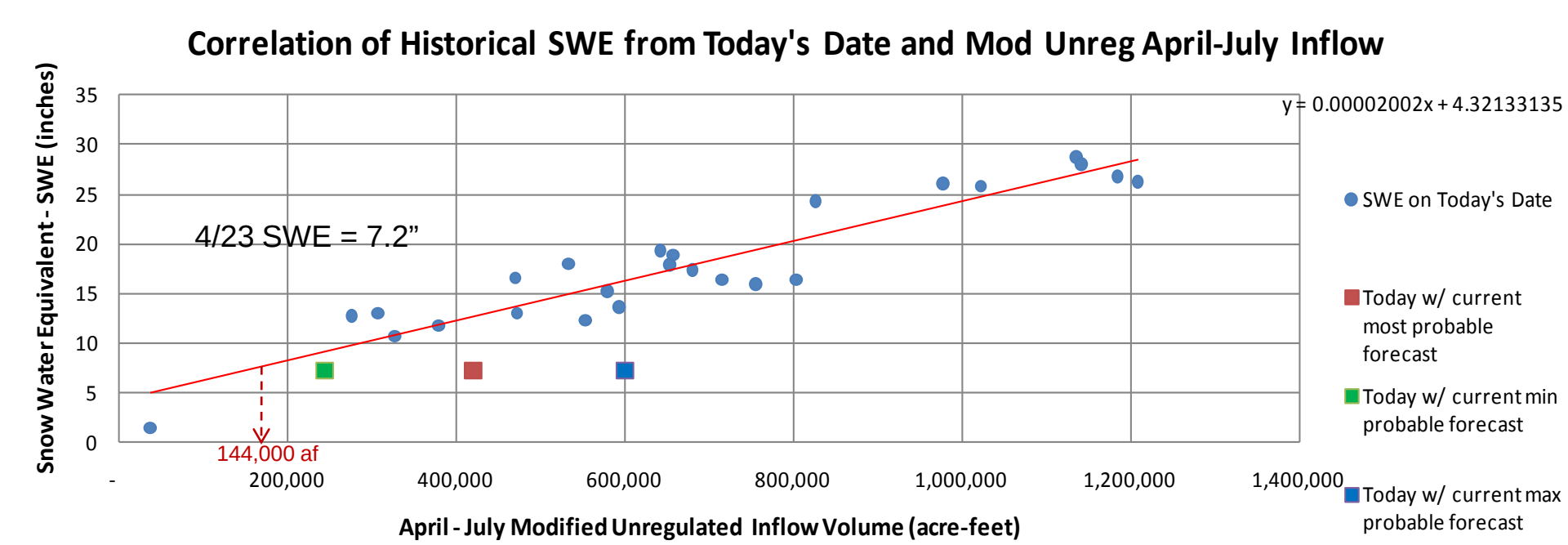
# Water Year April-July Inflow Forecast Evolution

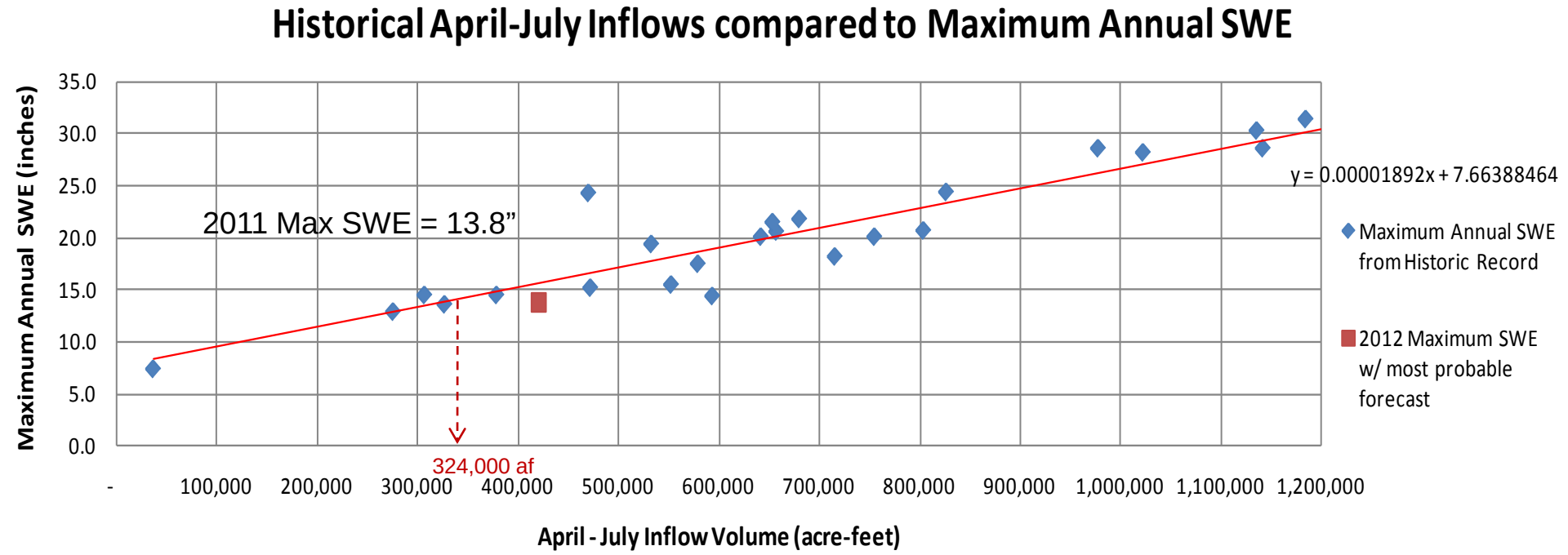


# Comparing the current snowpack to year's past & the resultant April-July inflow observed:

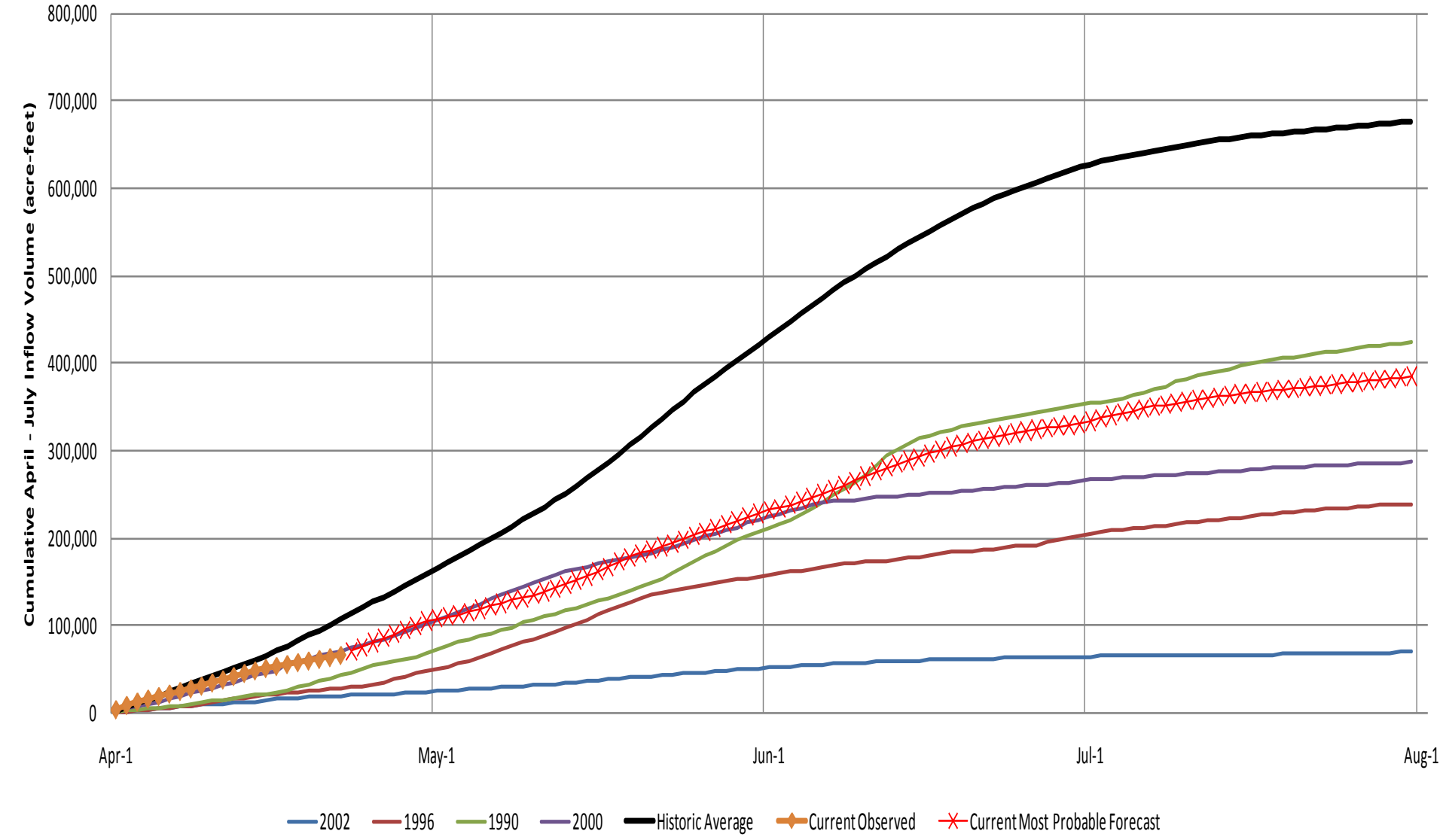
| 40% of average | 2002 | Current | 1996 | 1990 | 2000 | 1988 | 2007 | 2006 | 2003 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1.5 | **7.20** | 12.7 | 12.3 | 10.7 | 13 | 13.6 | 11.8 | 13 | 16 |
| Percentile of Historical Record | 0% | 4% | 20% | 16% | 8% | 24% | 32% | 12% | 24% | 40% |
| Rank (Wettest) | 26 | 25 | 21 | 22 | 24 | 19 | 18 | 23 | 19 | 16 |
| Rank (Driest) | 1 | 2 | 6 | 5 | 3 | 8 | 9 | 4 | 8 | 11 |
| Modified Unregulated April-July Inflow | 36,741 | 420,000 | 275,589 | 552,470 | 326,843 | 472,055 | 593,479 | 378,589 | 306,809 | 754,853 |
| Total April-July Mod Unreg Inflow on this Date | 30,086 | 66,542 | 44,168 | 60,582 | 94,455 | 96,408 | 90,711 | 81,987 | 46,112 | 69,238 |
| Total April-July Mod Unreg Inflow Remaining | 6,655 | 353,458 | 231,421 | 491,889 | 232,388 | 375,647 | 502,768 | 296,601 | 260,697 | 685,615 |
| Observed as a percent of April-July Total | 82% | 16% | 16% | 11% | 29% | 20% | 15% | 22% | 15% | 9% |

| 2011 | 1994 | 2004 | 1998 | 2009 | 1992 | 1991 | 2010 | 1989 | 2001 | 1995 | 1987 | 1997 | 2008 | 1993 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15.3 | 16.4 | 18 | 19.3 | 18.9 | 16.4 | 17.4 | 17.9 | 16.6 | 24.3 | 28.1 | 26.3 | 25.8 | 26.1 | 28.7 | 26.8 |
| 36% | 44% | 64% | 72% | 68% | 44% | 56% | 60% | 52% | 76% | 96% | 88% | 80% | 84% | 100% | 92% |
| 17 | 14 | 10 | 8 | 9 | 14 | 12 | 11 | 13 | 7 | 2 | 4 | 6 | 5 | 1 | 3 |
| 10 | 13 | 17 | 19 | 18 | 13 | 15 | 16 | 14 | 20 | 25 | 23 | 21 | 22 | 26 | 24 |
| 579,084 | 715,458 | 532,747 | 641,825 | 657,267 | 803,651 | 680,093 | 653,418 | 470,125 | 826,273 | 1,141,609 | 1,208,662 | 1,022,287 | 977,548 | 1,135,466 | 1,184,293 |
| 83,075 | 101,805 | 125,534 | 77,530 | 70,529 | 159,393 | 164,165 | 167,542 | 154,167 | 118,294 | 108,045 | 215,696 | 107,213 | 176,689 | 180,910 | 217,333 |
| 496,009 | 613,653 | 407,214 | 564,295 | 586,738 | 644,258 | 515,929 | 485,876 | 315,958 | 707,979 | 1,033,564 | 992,966 | 915,074 | 800,859 | 954,557 | 966,960 |
| 14% | 14% | 24% | 12% | 11% | 20% | 24% | 26% | 33% | 14% | 9% | 18% | 10% | 18% | 16% | 18% |


Correlation of Historical SWE from Today's Date and Mod Unreg April-July Inflow
Snow Water Equivalent - SWE (inches)
35
30
25
20
15
10
5
0
y = 0.00002002x + 4.32133135
4/23 SWE = 7.2”
144,000 af
-
200,000
400,000
600,000
800,000
1,000,000
1,200,000
1,400,000
April - July Modified Unregulated Inflow Volume (acre-feet)
SWE on Today's Date
Today w/ current most probable forecast
Today w/ current min probable forecast
Today w/ current max probable forecast


Historical April-July Inflows compared to Maximum Annual SWE
Maximum Annual SWE (inches)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
y = 0.00001892x + 7.66388464
2011 Max SWE = 13.8”
324,000 af
-
100,000
200,000
300,000
400,000
500,000
600,000
700,000
800,000
900,000
1,000,000
1,100,000
1,200,000
April - July Inflow Volume (acre-feet)
Maximum Annual SWE from Historic Record
2012 Maximum SWE w/ most probable forecast

# Cumulative April - July Observed Inflow of Representative SWE Years



# Looking Ahead to Summer/Fall

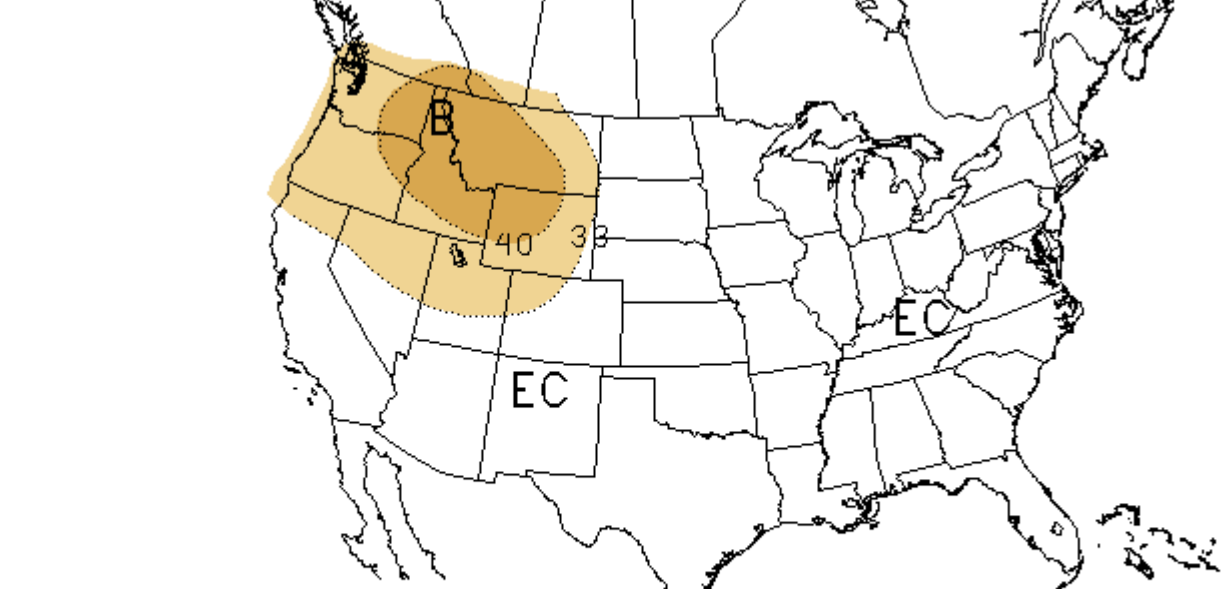
| EOM | Forecasted Most Probable Mod Unreg Inflow (af) | % Average | Predicted Observed Inflow (af) | % Average |
|---|---|---|---|---|
| **April** | 145,000 | 84% | 101,948 | 70% |
| **May** | 153,000 | 55% | 114,203 | 52% |
| **June** | 98,000 | 43% | 100,296 | 54% |
| **July** | 24,000 | 36% | 53,767 | 73% |
| **August*** | 28,696 | 64% | 53,040 | 86% |
| **September*** | 35,338 | 83% | 50,374 | 95% |

Modified unregulated inflow forecasts are not adjusted for upstream regulation (such as Vallecito and San Juan-Chama Project)

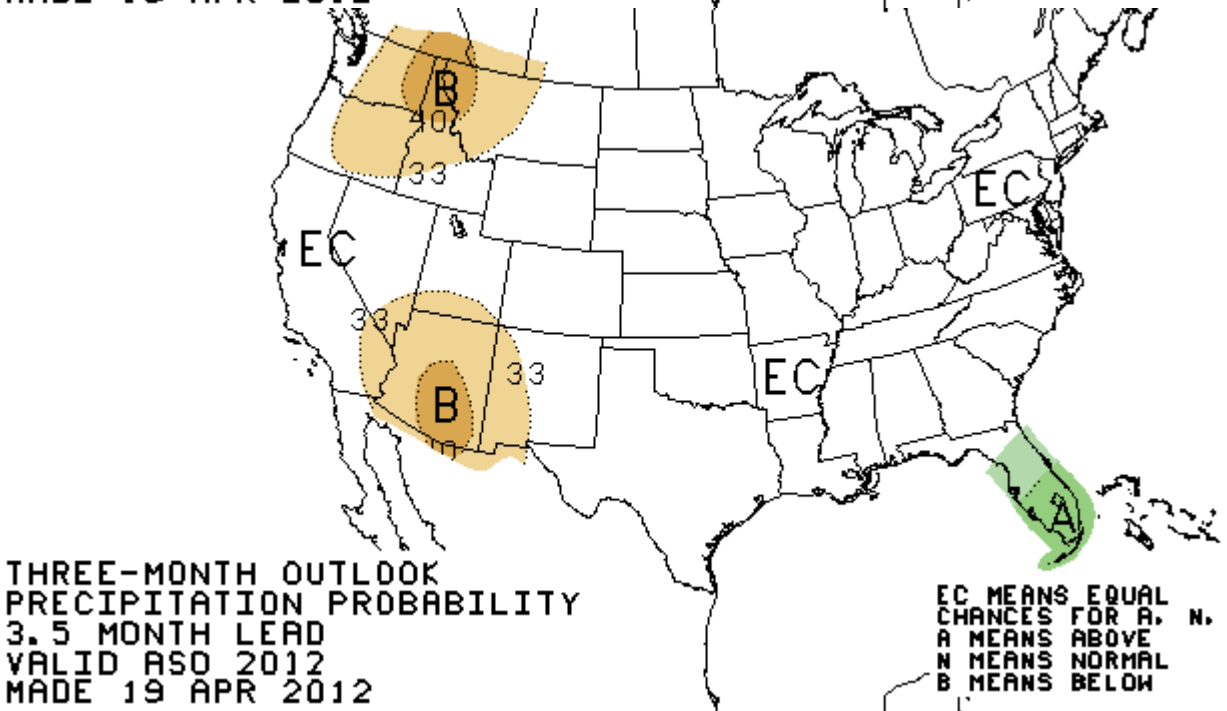
*August & September volumes are based on a linear regression between July and 100% of Average for October.

# Climate Prediction Center Seasonal Precipitation Outlooks

May-June-July



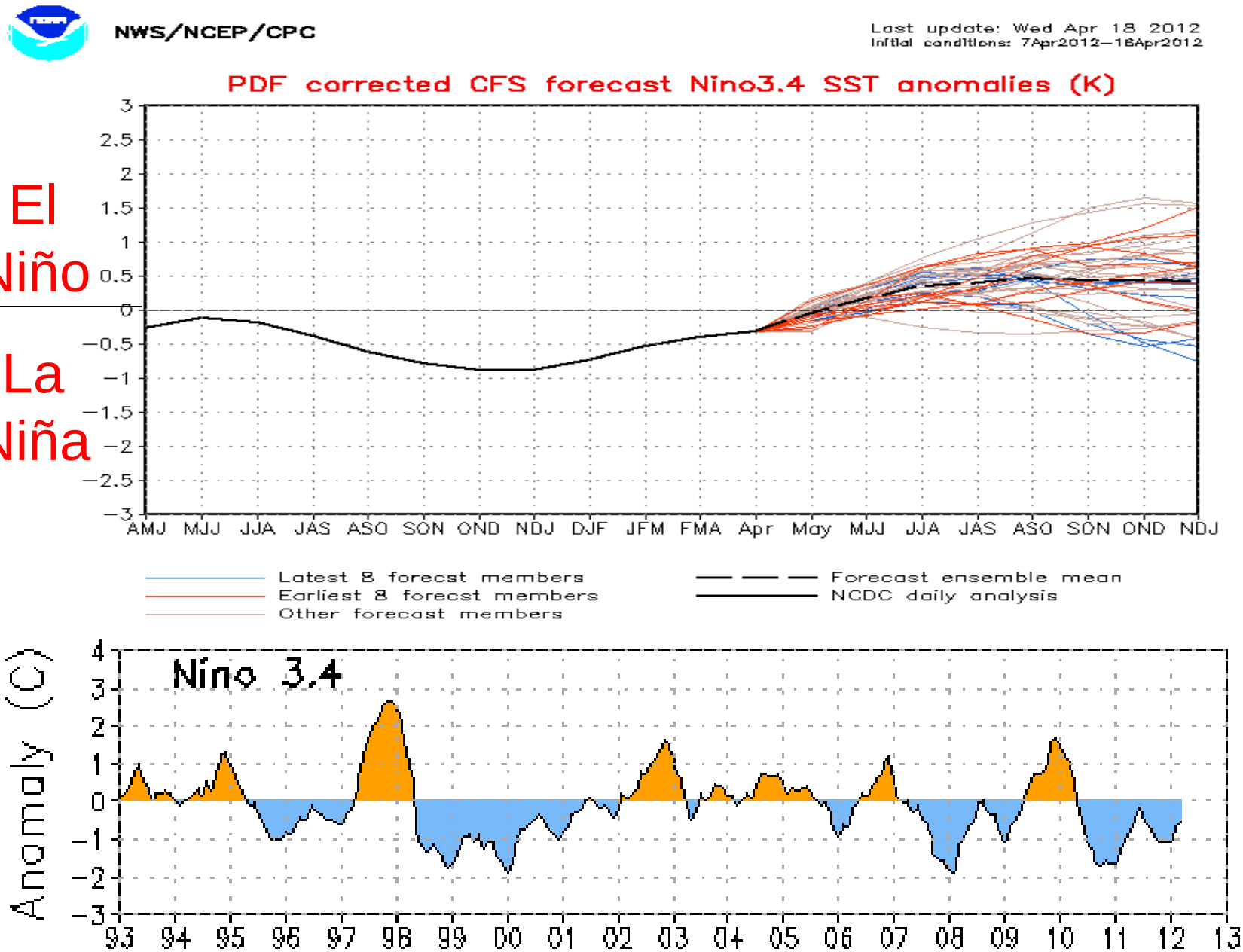

August-September-October



# El Niño/La Niña Status

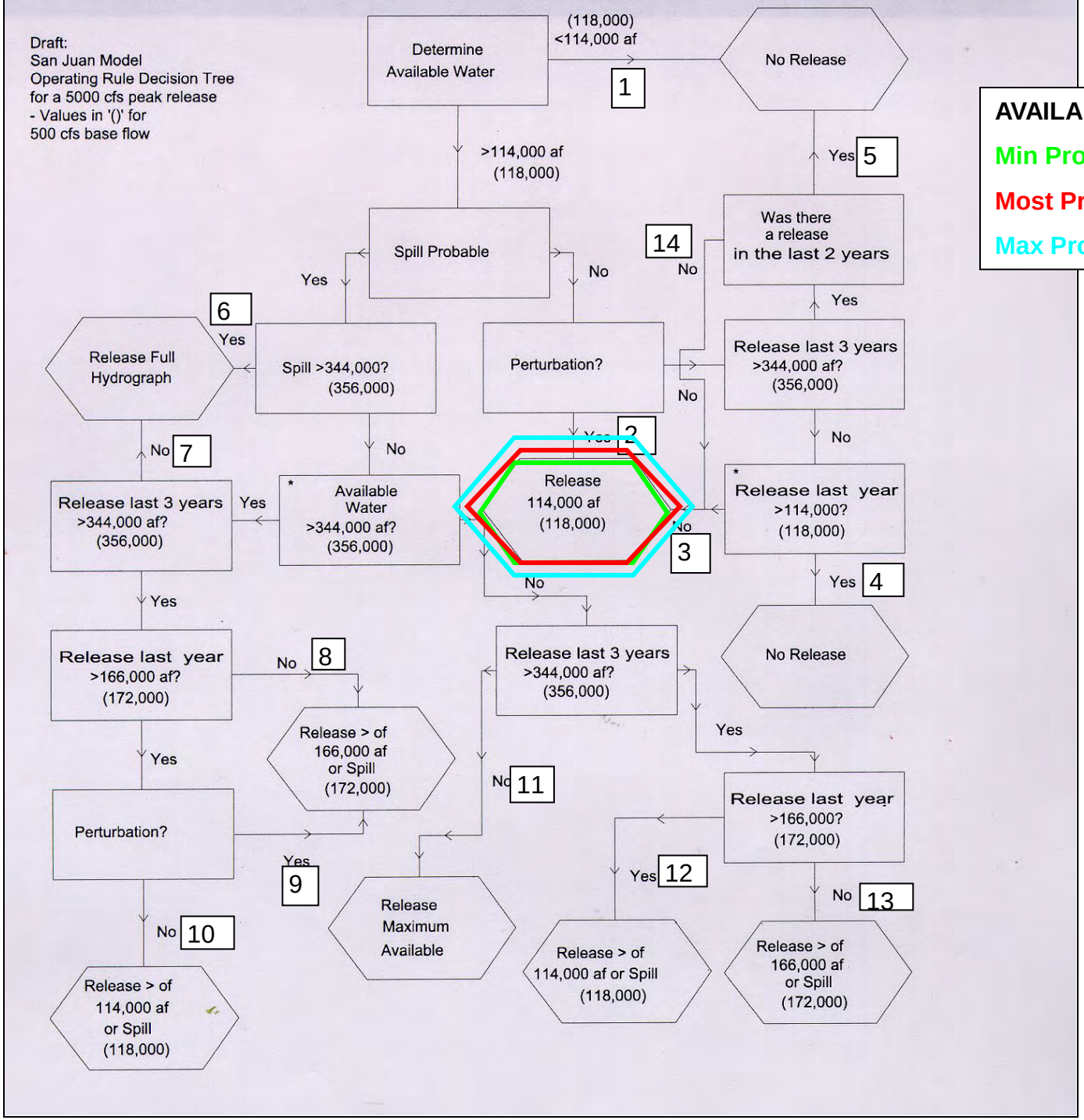
El Niño

La Niña



# Spring Peak Release 2012 – How Much?

- Based on the all (min/most/max) forecasts and calculated available water, San Juan RIP Flow Recommendations call for a 1-week Spring Peak Release this year (7 days @ 5000 cfs w/ week-long ramp up/down), which is ~80,000 af on top of the base release when including ramping rates
- 500 cfs base release is anticipated until beginning of ramp up and after ramp down
- Inflow forecast would need to drop below ~126,000 af to eliminate the Spring Peak Release (not likely)




| AVAILABLE WATER | | PATH |
|---|---|---|
| Min Prob: | 212,000 af | #2/3 |
| Most Prob: | 374,000 af | #2/3 |
| Max Prob: | 539,000 af | #2/3 |

# Spring Peak Release 2012 – When?

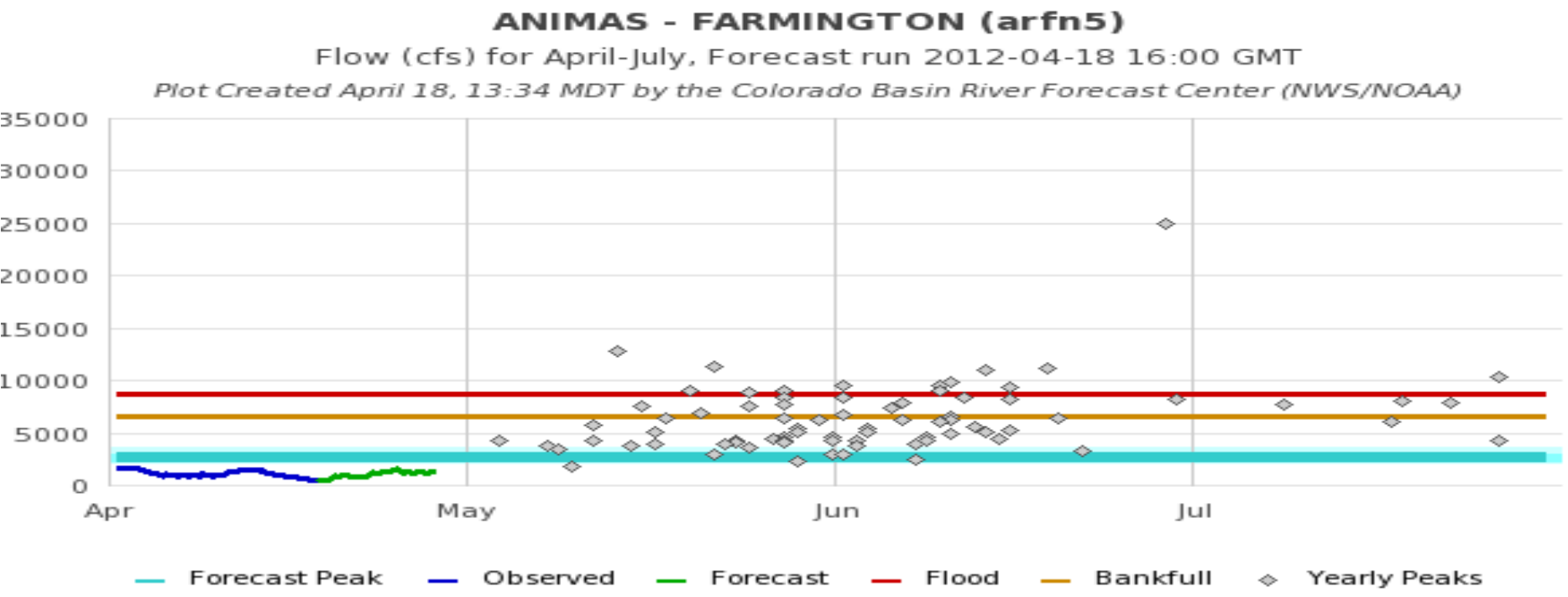
(Factors that must be considered)

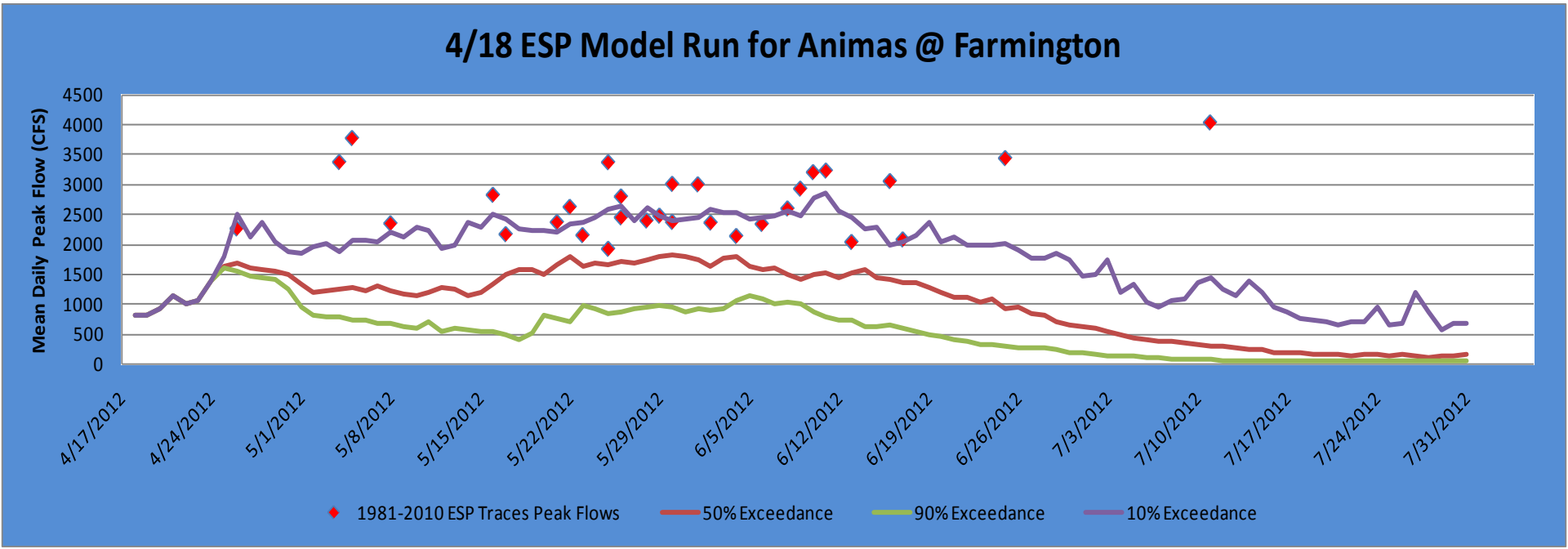
Goal: To match the peak on the Animas River to provide maximum habitat benefit in the critical habitat area of the San Juan River

- Historical Peak used in Flow Recommendations is June 4th
- Average Peak over the last 10 years (2000-2010) is May 25th
- CBRFC ESP Model Run for the Animas at Farmington shows the Peak Flow is more likely to occur around May 22nd

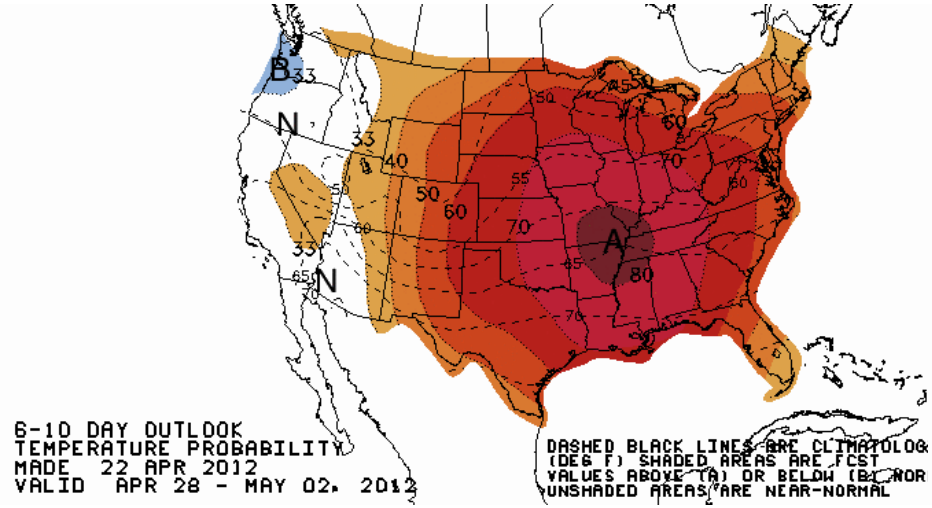
Constraints:

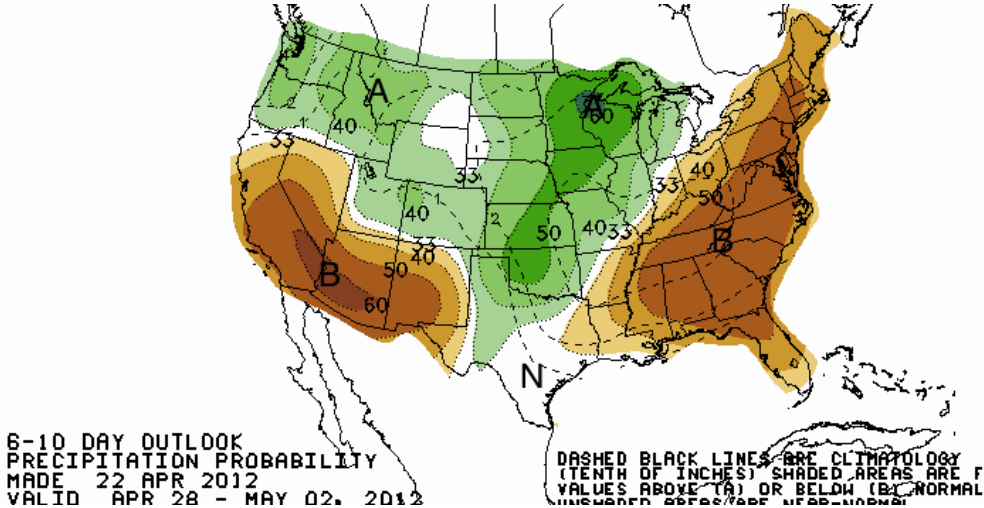
- Adjustments cannot be made on weekends or holidays
- Maximum change of 200 cfs or 10% every 2 hours


ANIMAS - FARMINGTON (arfn5)
Flow (cfs) for April-July, Forecast run 2012-04-18 16:00 GMT
Plot Created April 18, 13:34 MDT by the Colorado Basin River Forecast Center (NWS/NOAA)
35000
30000
25000
20000
15000
10000
5000
0
Apr
May
Jun
Jul
Forecast Peak
Observed
Forecast
Flood
Bankfull
Yearly Peaks

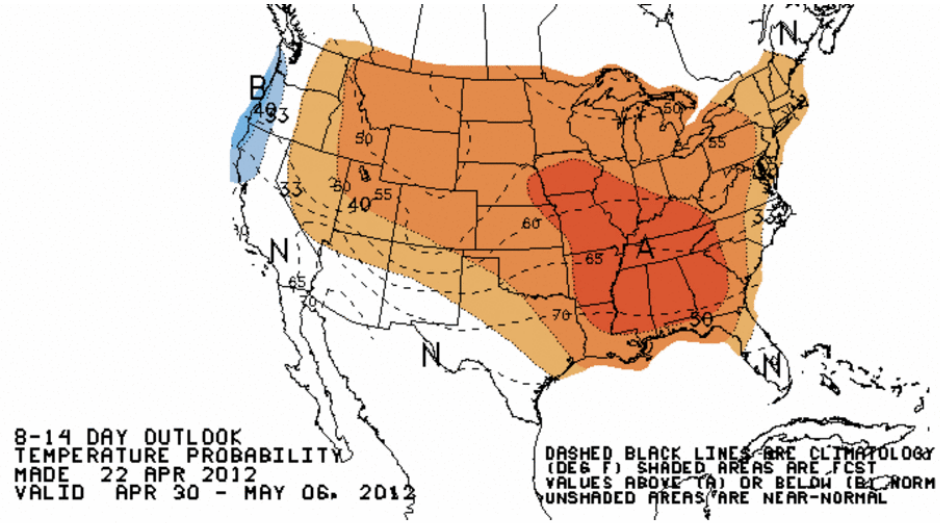

4/18 ESP Model Run for Animas @ Farmington
Mean Daily Peak Flow (CFS)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
4/17/2012
4/24/2012
5/1/2012
5/8/2012
5/15/2012
5/22/2012
5/29/2012
6/5/2012
6/12/2012
6/19/2012
6/26/2012
7/3/2012
7/10/2012
7/17/2012
7/24/2012
7/31/2012
1981-2010 ESP Traces Peak Flows
50% Exceedance
90% Exceedance
10% Exceedance

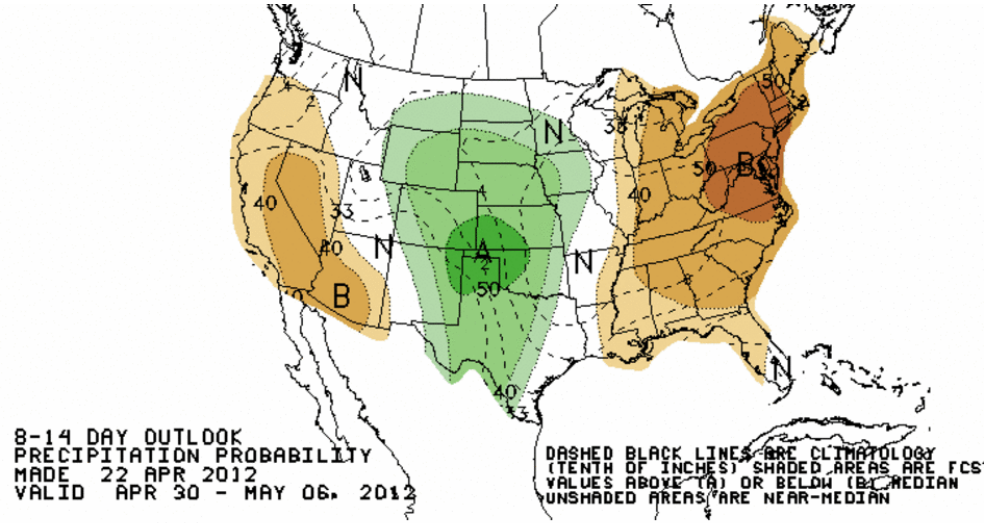
# 6-10 Day Temperature and Precipitation Probability

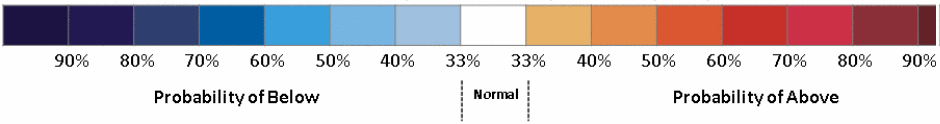


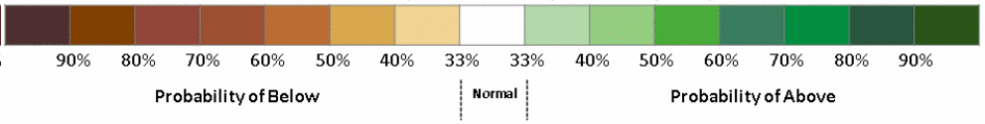




# 8-14 Day Temperature and Precipitation Probability



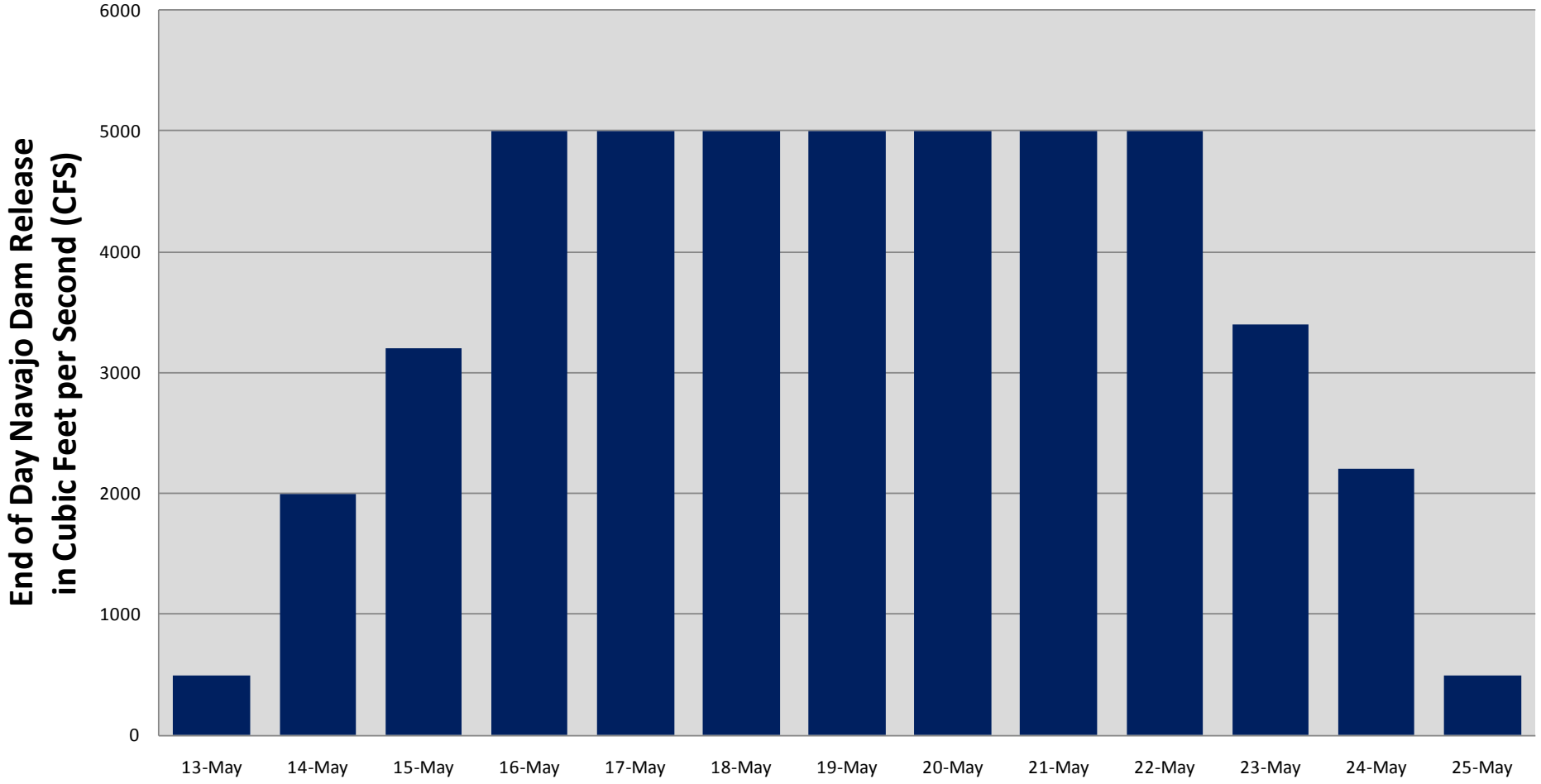



# Navajo Reservoir 2012 Spring Peak Release Schedule

**(As of 4/23/2012)**



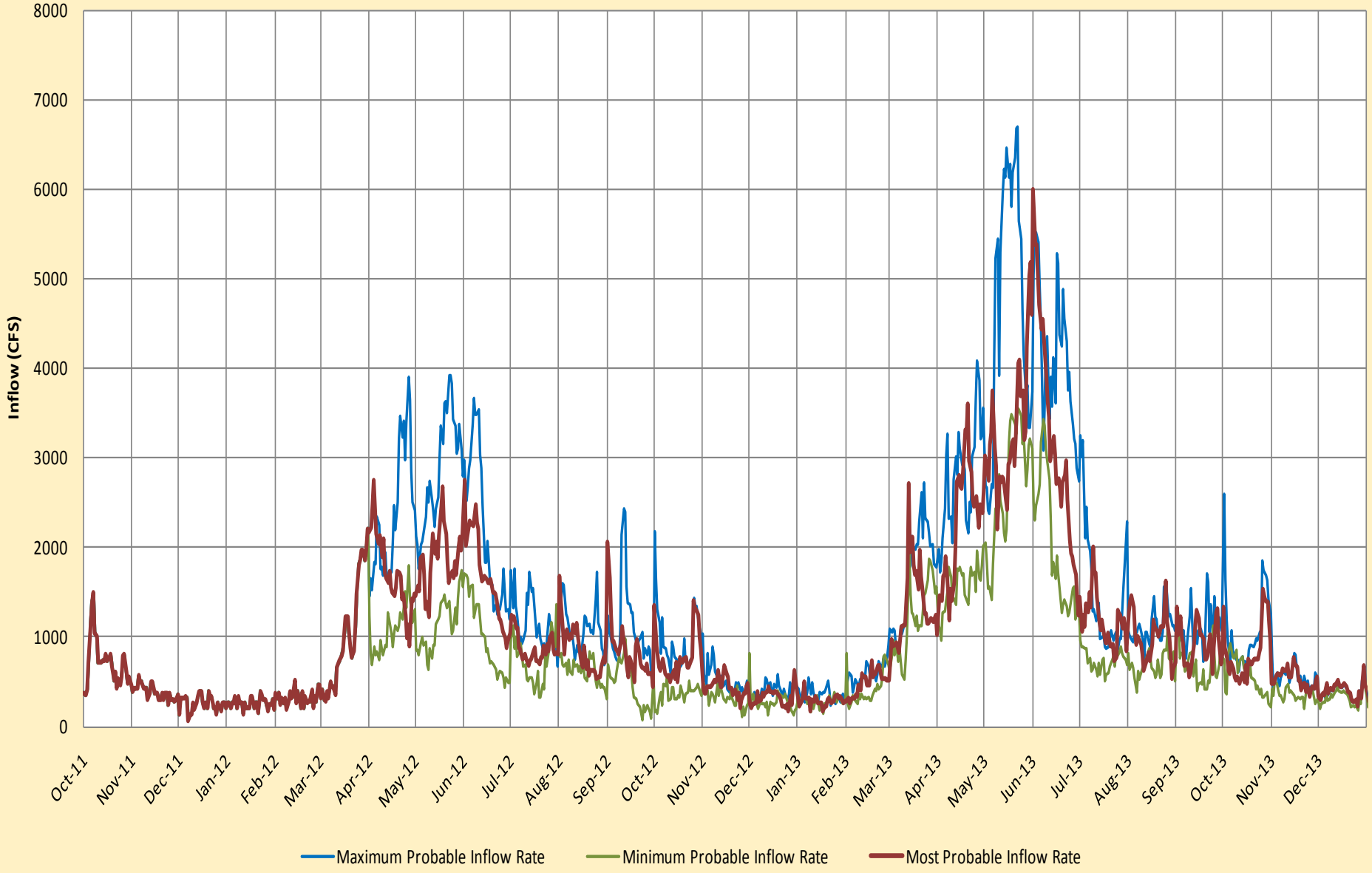

| | 13-May | 14-May | 15-May | 16-May | 17-May | 18-May | 19-May | 20-May | 21-May | 22-May | 23-May | 24-May | 25-May |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Release (CFS) | 500 | 2000 | 3200 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 3400 | 2200 | 500 |

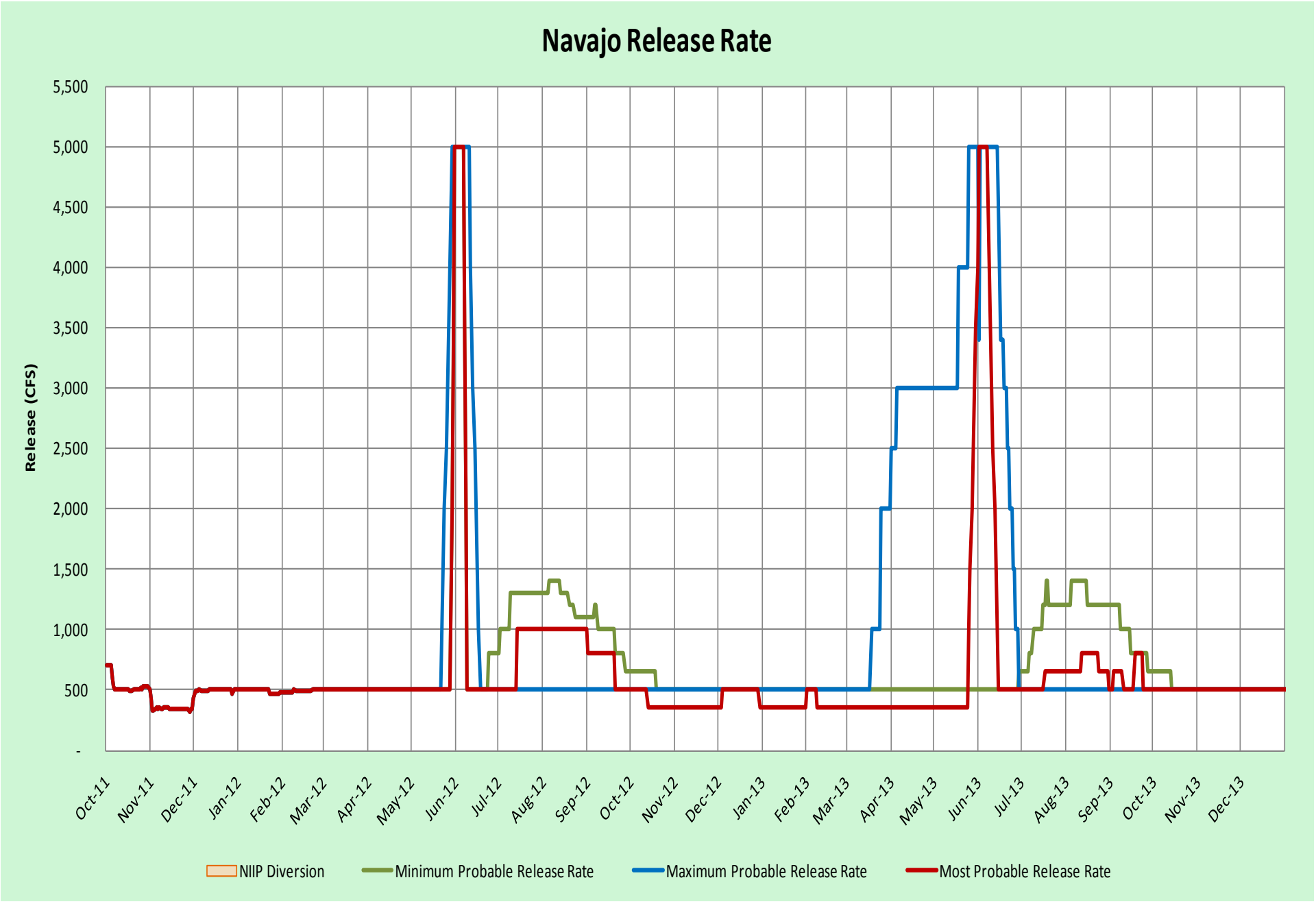
Total Release over 500 cfs base = 79,934 acre-feet

# Elimination of the 500 cfs base release

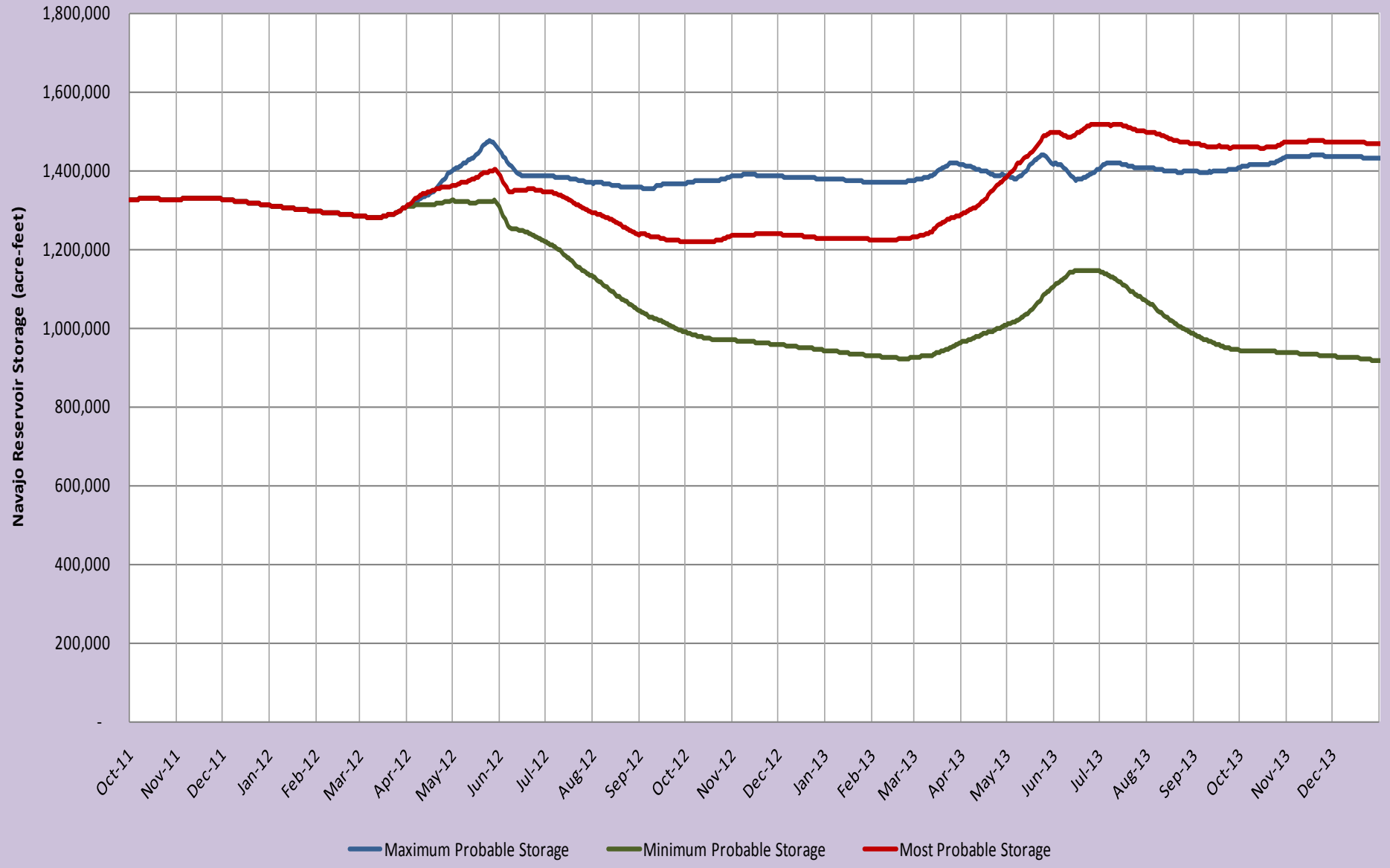
- ROD implements the 250/5000 Alternative described in the EIS
- Reservoir levels have previously allowed the flexibility to keep a 500 cfs minimum base release
- Current hydrologic conditions have made it necessary to have a lower base release
- Base release will be dependent on current hydrologic conditions and reservoir elevations
- Releases will still be used to meet Target Base Flows
- Releases <500 cfs will likely occur after the irrigation season and before the Spring Peak Release

# Navajo Inflow Rate

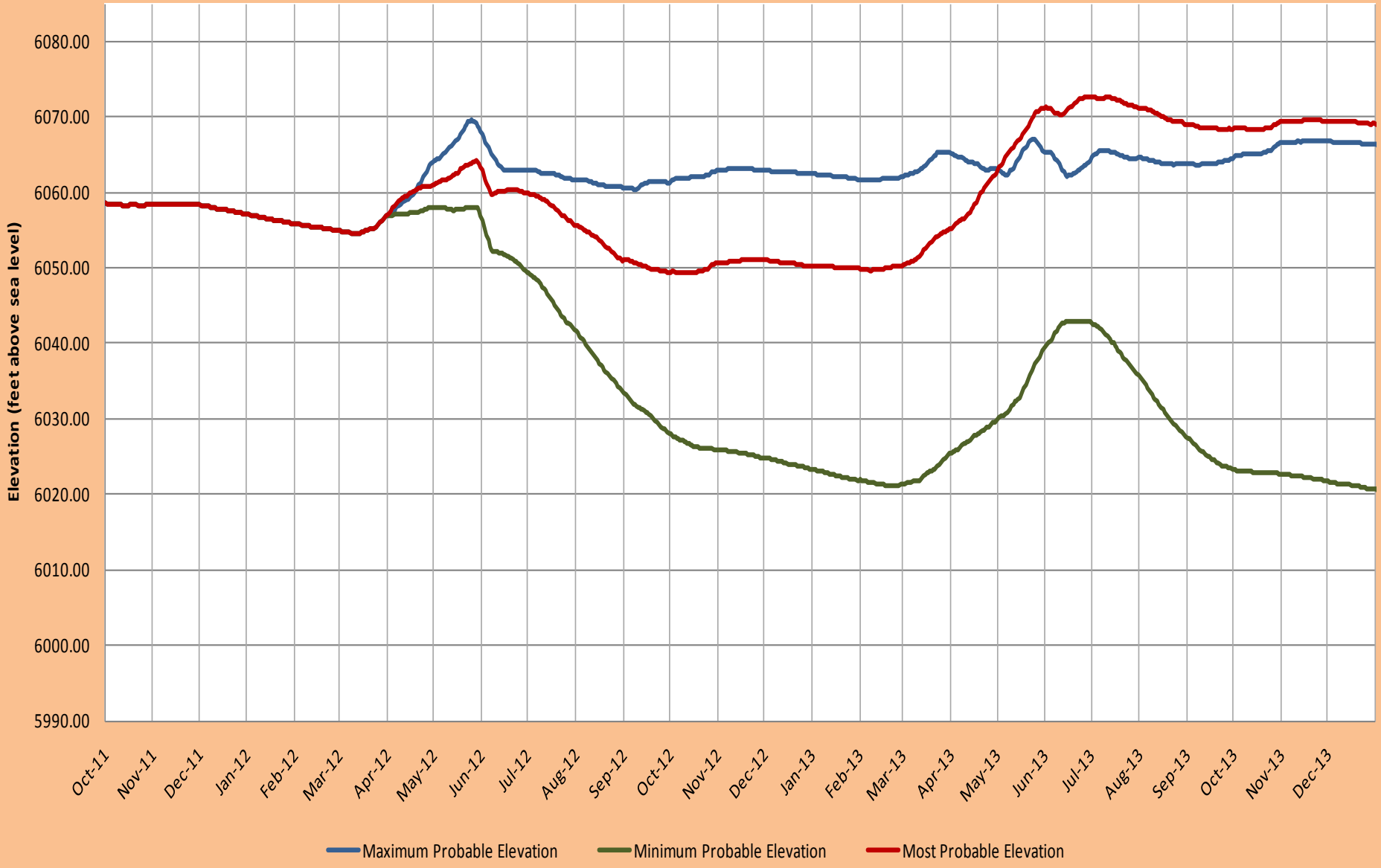



Navajo Release Rate
Release (CFS)
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
-
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12
Jul-12
Aug-12
Sep-12
Oct-12
Nov-12
Dec-12
Jan-13
Feb-13
Mar-13
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Dec-13
NIIP Diversion
Minimum Probable Release Rate
Maximum Probable Release Rate
Most Probable Release Rate

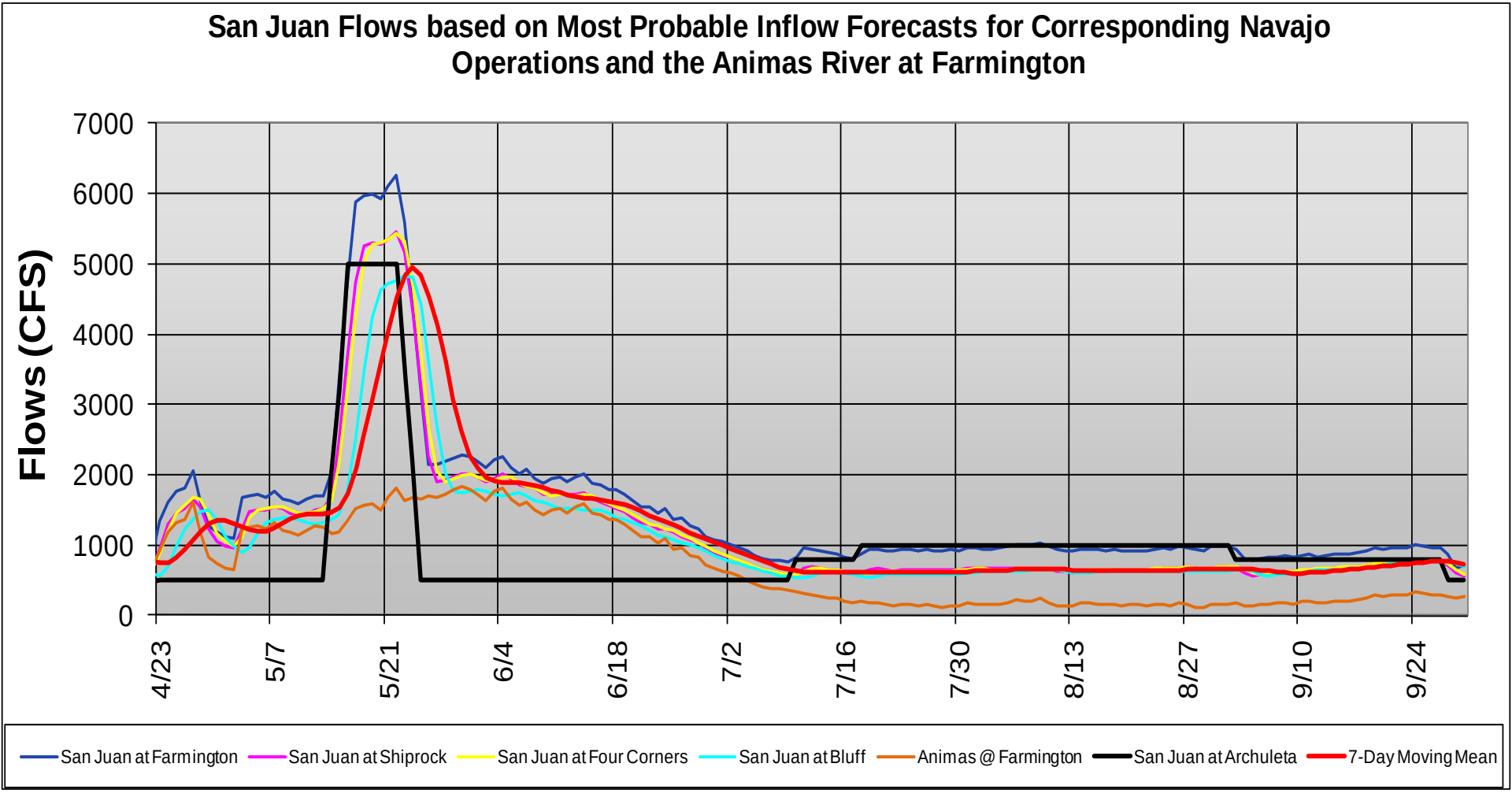
# Navajo Reservoir Storage



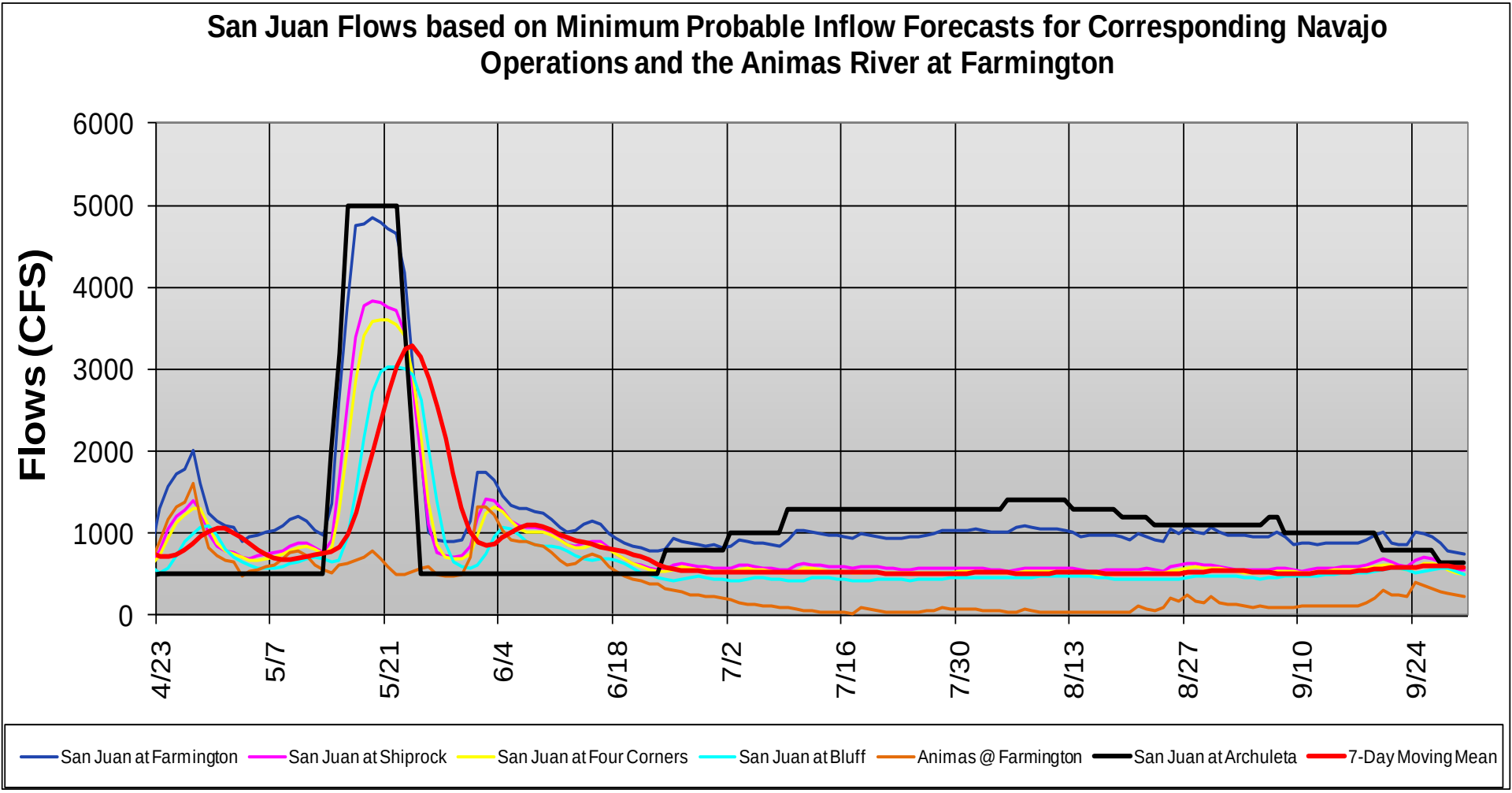
# Navajo Reservoir Elevation



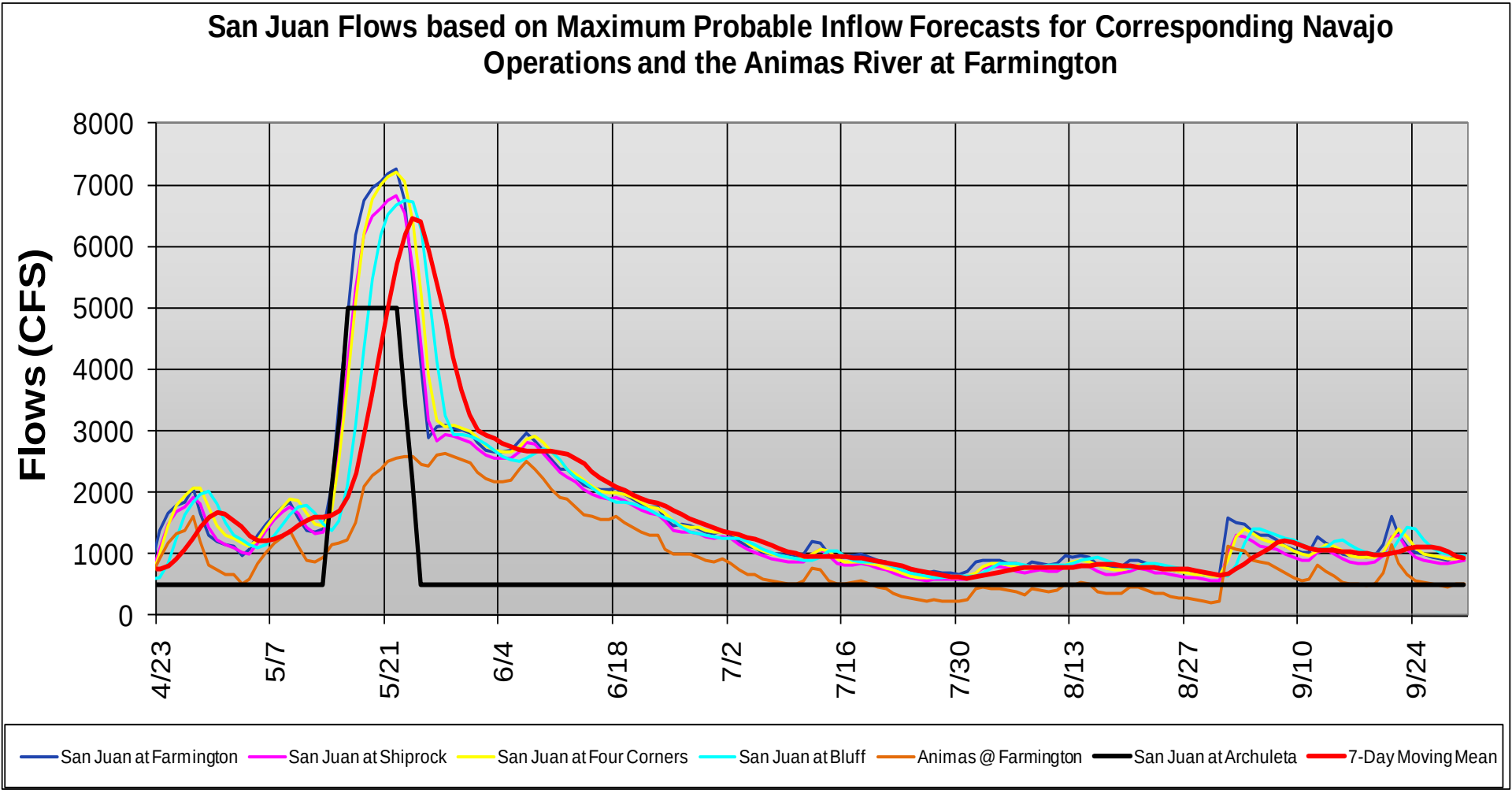
# San Juan River Downstream Flows



# San Juan River Downstream Flows

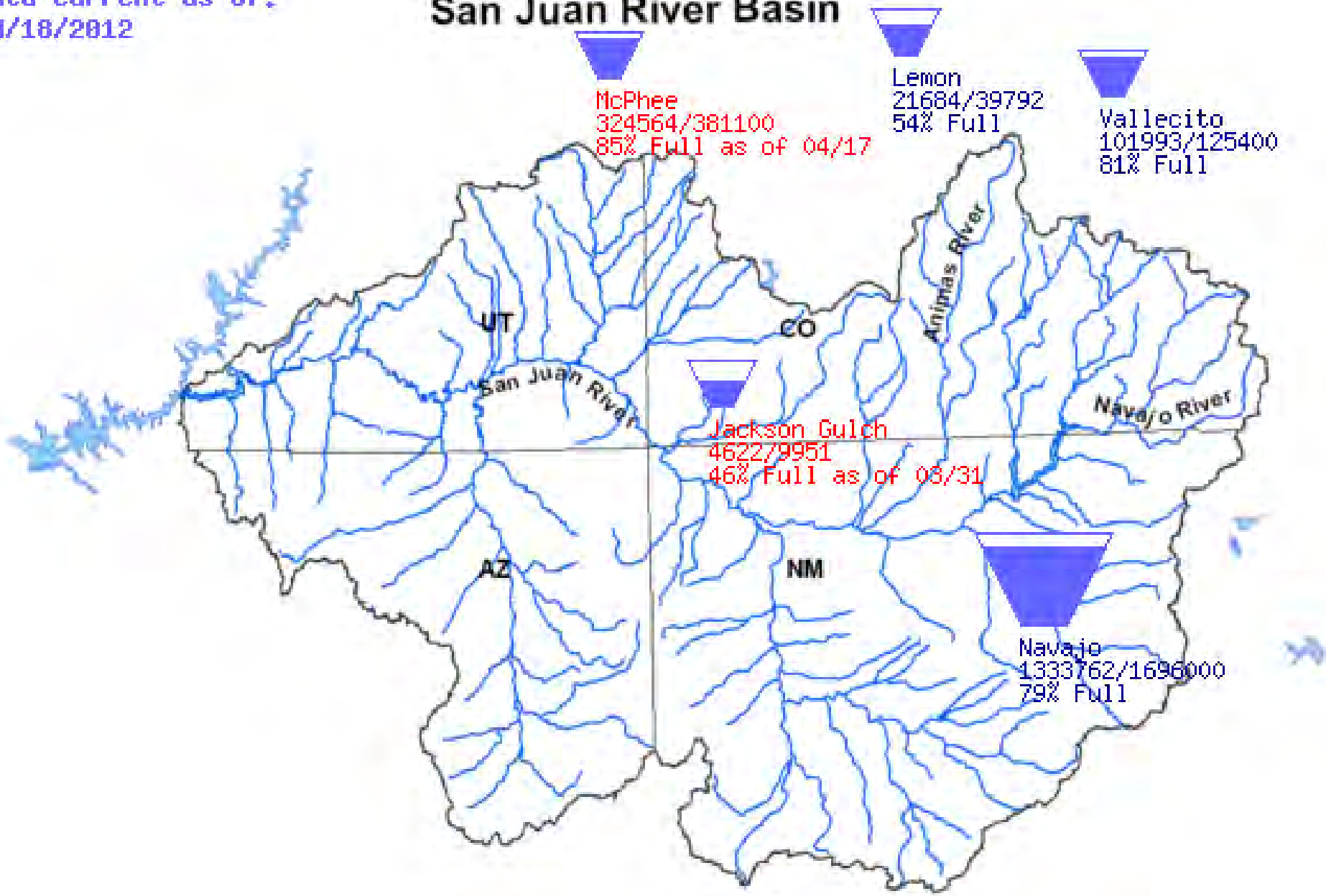


# San Juan River Downstream Flows



Data Current as of:
04/18/2012

# San Juan River Basin



Major San Juan River Basin Reservoirs
(4/22/2012)

## Nighthorse

- Elevation = 6880.1 (98% Full)
- Storage = 112,319 af
- Release = 0 cfs
- Pumping = 0 cfs

## Vallecito

- Elevation = 7657.37 (84% Full, 141% of average)
- Storage = 105,282 af
- Release = 55 cfs
- Inflow = 615 cfs

## Lemon

- Elevation = 8117.19 (58% Full, 96% of average)
- Storage = 22,873 af
- Release = 11cfs
- Inflow = 13 cfs

# Future Navajo Dam Maintenance Activities:

Drainage rehabilitation work will commence in June/July at downstream left groin

Maintenance building/yard improvements potentially occurring late summer or fall

# Upcoming Meetings of Importance

- SJRIP Biology Committee Meeting 5/15
- SJRIP Annual Meeting 5/16
- SJRIP Coordination Committee Meeting 5/17

All meetings held at the Public Lands Building in Durango, Colorado

# Reports from other Agencies

# How You Can Access Information

**Bureau of Reclamation**
**(Presentation & Meeting Minutes)**
**www.usbr.gov/uc/wcao/water/rsvrs/mtgs/nmcurrnt.html**

**USGS**
**http://water.usgs.gov/nwis**

**Colorado Basin River Forecast Center**
**www.cbrfc.noaa.gov**

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# Summary

- Precipitation has been below average for most of the winter and into spring, March and April were extremely dry and warm
- Most Probable April–July Inflow Forecast is 56% of average
- There will likely be a 1-Week Spring Peak Release (7-days @5000 cfs with a short ramp up and down)
- Minimum Base release will no longer be 500 cfs and will be adjusted as needed (beginning after this spring peak release)
- Downstream flows are likely to below average
- Increased releases may be necessary to meet Target Base Flows

- Next Operations Meeting: August ?, 2012