2016 Annual Operating Plan

April 1 Runoff Forecast
Definitions

Native/Natural Rio Grande water: Water that comes directly from the Rio Grande Basin

San Juan-Chama water: Water that is imported into the Rio Grande Basin from the San Juan Basin through the San Juan-Chama Project

Rio Grande Compact: Agreement between the states of Colorado, New Mexico, and Texas that apportions Rio Grande water between the three states.

Article 7: Section of the Rio Grande Compact that dictates storage in reservoirs. If Rio Grande Project storage is less than 400,000 ac-ft at Elephant Butte and Caballo, no storage of Rio Grande water can take place at El Vado except to satisfy Native American needs or as part of the Emergency Drought Water Agreement.
Definitions (cont.)

cfs- cubic feet per second (roughly 7.5 gallons/second)

Acre foot - approximately 326,000 gallons or 43,560 cubic feet

Hydrograph – graph of flow rate per unit time

The District – Middle Rio Grande Conservancy District (MRGCD)

The City – City of Albuquerque now Albuquerque Bernalillo County Water Utility Authority (ABCWUA)

NRCS – Natural Resources Conservation Service

Supplemental water – Water leased by Reclamation to meet flow targets specified in the 2003 Biological Opinion

P&P – Prior & Paramount
What Drives the Process

Volume Forecast from the NRCS
Based on snowpack, soil moisture, climate forecast

Choose similar year based on similar volume
Actual hydrograph vs. average hydrograph
Can tweak timing of hydrograph to best match forecasted conditions (warm Spring vs. cool Spring)

Inflows/Outflows based on nature and policies
Article VII restrictions
Flood control and channel capacity
Timing of water deliveries
Demand curves from water users
Requirements of the 2003 Biological Opinion
Similar Year Hydrographs

Rio Chama @ La Puente

Mar-Jul Volume
1956: 117,279
2003: 143,907
2004: 145,170
2012: 119,740
<table>
<thead>
<tr>
<th>Dams</th>
<th>Operated By:</th>
<th>Reclamation Corps</th>
<th>Water Supply</th>
<th>Recreation</th>
<th>Flood Control</th>
<th>Sediment Control</th>
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<td>ELEPHANT BUTTE</td>
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2015: The Year in Review
El Vado Reservoir
Abiquiu Reservoir
Cochiti Reservoir
Elephant Butte Reservoir

[Diagrams showing flow and storage data over time]
Current Snow Conditions
Rio Chama Snow Data

Chamita SNOTEL 2015-16
Elev. 8400'

Snow Water Equivalent & Precip (in.)

Rio Chama Snow Data

Cumbres SNOTEL Site 2015-16
Elev. 10,400'

Snow Water Equivalent & Precip (in.)


Rio Chama Snow Comparison

Rio Chama Basin

Total Basin SWE (inches)

11/2 12/2 1/2 2/2 3/2 4/2 5/2

14-15
15-16
Average
Similar Snowpack Years

2016 vs. Similar Years, and Average Rio Chama Snowpack Index

Runoff Volumes (ac-ft)
2007: 196,060
2011: 173,096
2015: 184,199
2012: 119,740
1996: 95,191
2013: 65,937
Rio Grande Snow Data

Upper Rio Grande SNOTEL 2015-16
Elev. 9,400'

Snow Water Equivalent & Precip (in.)


'S15-16 SWE data Avg. SWE '15-16 Precip. data Avg. Precip.'
Sangre de Cristo Snow Data

Gallegos Peak SNOTEL 2015-16
Elev. 9,800'

Snow Water Equivalent & Precip (in.)

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<td>5/16/2016</td>
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</table>
Sangre de Cristo Snow Data

Wesner Springs SNOTEL 2015-16
Elev. 11,120'

Snow Water Equivalent & Precip (in.)

11/2/2015
11/16/2015
11/30/2015
12/14/2015
12/28/2015
1/11/2016
1/25/2016
2/8/2016
2/22/2016
3/7/2016
3/21/2016
4/4/2016
4/18/2016
5/2/2016
5/16/2016

15-16 SWE data
Avg. SWE
15-16 Precip.
Avg. Precip.
Spring and Summer Streamflow Forecasts as of April 1, 2016

Percent of 1981-2010 Average

- > 180
- 150 - 180
- 130 - 149
- 110 - 129
- 90 - 109
- 70 - 89
- 50 - 69
- 25 - 49
- < 25

50% exceedance probability forecasts shown. For forecasts at other exceedance probabilities, see individual state reports.

Prepared by: USDA Natural Resources Conservation Service National Water and Climate Center Portland, Oregon
http://www.wcc.nrcs.usda.gov
Created: 7 Apr 2016 08:20
Monsoon Season Temperature Outlook

THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
3.5 MONTH LEAD
VALID JAS 2016
MADE 17 MAR 2016

EC MEANS EQUAL CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
2016 Water Operations Modeling
March 2003 BiOp Flow Requirements – Dry Year

Cochiti

Winter

Central

Isleta

San Acacia

San Marcial

Nov 16 – June 15

June 16 – Nov 15

Winter & Spawn

Post Spawn / Summer

100 cfs
Major Assumptions

- April 1 50% most probable forecast
- Dry year target flow requirements
- Same monsoon conditions as forecast hydrograph year
- Storage occurs under the Emergency Drought Water Agreement for MRGCD
- Storage of water for Prior & Paramount lands
- Out of Article VII restrictions for several weeks, but back in late April
## April Forecast Data

<table>
<thead>
<tr>
<th>Location</th>
<th>Most Probable Percent of Average</th>
<th>April 1 50% Probability Volume, ac-ft</th>
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<tbody>
<tr>
<td>Rio Grande nr Del Norte</td>
<td>58%</td>
<td>84%</td>
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<tr>
<td>El Vado Reservoir Inflow</td>
<td>53%</td>
<td>60%</td>
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<tr>
<td>Rio Grande at Otowi</td>
<td>55%</td>
<td>60%</td>
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<tr>
<td>Nambe Reservoir Inflow</td>
<td>65%</td>
<td>71%</td>
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<tr>
<td>Jemez blw Jemez Dam</td>
<td>50%</td>
<td>44%</td>
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<tr>
<td>Rio Blanco @ Diversion</td>
<td>56%</td>
<td>76%</td>
</tr>
<tr>
<td>Navajo River @ Diversion</td>
<td>55%</td>
<td>75%</td>
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</tbody>
</table>

- Rio Grande nr Del Norte: 84% chance of reaching 435,000 ac-ft in 2016.
- El Vado Reservoir Inflow: 60% chance of reaching 134,000 ac-ft in 2016.
- Rio Grande at Otowi: 60% chance of reaching 435,000 ac-ft in 2016.
- Nambe Reservoir Inflow: 71% chance of reaching 4,600 ac-ft in 2016.
- Jemez blw Jemez Dam: 44% chance of reaching 20,000 ac-ft in 2016.
- Rio Blanco @ Diversion: 76% chance of reaching 41,000 ac-ft in 2016.
- Navajo River @ Diversion: 75% chance of reaching 49,000 ac-ft in 2016.
Heron Reservoir
Proposed 2016 Heron Operations

Storage Capacity = 401,000 ac-ft

Reservoir will drop 8 feet from beginning of year to end
El Vado Reservoir
El Vado Reservoir:
Lake Level: 47’ of fluctuation between May and Dec
Proposed 2016 Abiquiu Operations

2016 Abiquiu Operations

Flow [cfs]

Storage [ac-ft]

Inflow
Outflow
Storage
Estimated Hydrograph at Embudo

2016 Flow at Embudo

Flow [cfs]

COCHITI LAKE
Estimated Hydrograph at Central Ave.

2016 Flow at Central Ave Gage

Flow [cfs]

Month

4/1/2016
5/1/2016
6/1/2016
7/1/2016
8/1/2016
9/1/2016
10/1/2016
11/1/2016
12/1/2016
Estimated Flow at San Acacia

2016 Flow at San Acacia Gage
Maximum Elevation = 4335.12’. Minimum Elevation= 4298.21’
Watershed and Infrastructure Protection

Reclamation has been taking steps to decrease the vulnerability of the San Juan-Chama Project and the watersheds that serve it, through:

- Application to the WaterSMART Drought Response Program to fund the development of a Wildfire Emergency Response Plan for the SJC Project,
- Becoming a signatory to the Rio Grande Water Fund, a network of public, private, and non-profit partners that seeks to enhance the resilience of upland forests to the impacts of wildfires and post-fire debris flows through forest thinning and controlled burns.
- Participation in local watershed organizations that seek to prioritize resilience-building activities, such as those funded by the Rio Grande Water Fund.
  • Navajo-Blanco Resilience Project
  • San Juan-Chama Watershed Partnership
- Partnership with the Chama Peak Land Alliance to sponsor a VISTA Volunteer to perform community outreach and planning projects associated with efforts to build upland forest resilience in the San Juan and Chama watersheds. A sequence of volunteers will be in this role for the next three years.