RECLAMATION

Managing Water in the West

What is the “24 Month Study”?

U.S. Department of the Interior
Bureau of Reclamation

24 Month Study

Current Reservoir Status

Reservoir	March Inflow (unregulated) (acre-feet)	Percent of Average (%)	Apr 6 Midnight Elevation (feet)	Reservoir Storage (acre-feet
Fontenelle	46,000	88	6467.53	109,00
Flaming Gorge	60,000	56	6020.33	2,991,00
Blue Mesa	40,000	112	7484.44	539,00
Powell	468,000	71	3610.16	12,746,00
Navajo	76,000	85	6055.35	1,290,00

Expected Operations

The operation of Lake Powell and Lake Mead in this April 2009 24-Month Study is pursuant to the December 2007 Record of Decision on Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead (Interim Guidelines), and reflects the 2009 Annual Operating Plan (AOP). Pursuant to the Interim Guidelines, the Upper Elevation Balancing Tier is the operational tier for water year 2009 for Glen Canyon Dam. The Intentionally Created Surplus (ICS) Surplus condition is the criterion governing the operation of Lake Mead f calendar year 2009.

The Interim Guidelines are available for download at
http://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf.
The 2009 AOP is available for download at
http://www.usbr.gov/uc/water/rsvrs/ops/aop/AOP09_final.pdf.

The April 24-Month study projects the end of water year elevation at Lake Powell to be 3637.13 feet and Lake Mead to be 1092.04 feet. Since the projected end of water year elevation at Lake Powell is below the 2009 Equalization Elevation of 3639 feet and the projected end of water year elevation at Lake Mead is above elevation 1075 feet, Sectio 6.B.1. and 6.B.4. of the Interim Guidelines provide for an annual release volume of 8.23 million acre-feet from Glen Canyon Dam during water year 2009.

RECLAMATION

Operation Plans

- Fontenelle
- Flaming Gorge
- Taylor Park
- Blue Mesa
- Morrow Point
- Crystal
- Vallecito
- Navajo
- Lake Powell
- Lake Mead
- Davis
- Parker

RECLAMATION

24 Month Study
Observed and Forecast Inflow

TO ALL ANNUAL OPERATING PLAN RECIPIENTS

MAILED FROM UPPER COLORADO REGION
WATER RESOURCES GROUP
ATTENTION UC-280
125 SOUTH STATE STREET, ROOM 6107
SALT LAKE CITY, UT 84138-5571
PHONE 801-524-5571

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RUNOFF AND INFLOW PROJECTIONS INTO UPPER BASIN RESERVOIRS ARE PROVIDED BY
THE COLORADO RIVER FORECASTING SERVICE THROUGH THE NATIONAL WEATHER SERVICES'S
COLORADO BASIN RIVER FORECAST CENTER AND ARE AS FOLLOWS

:	Observed Inflow				jan	Forecast			Outlook	
:	dec	jan	feb	mar	%Avg	apr	may	jun	apr-jul	%Avg
GLDA3:Lake Powell	320	329	329	468	71%:	900/	2400/	2800/	7200/:	91%
GBRW4:Fontenelle	30	33	27	46	88%:	85/	180/	295/	715/:	83%
GRNU1:Flaming Gorge	17.1	40	37	60	56%:	110/	205/	330/	810/:	68%
BMDC2:Blue Mesa	28	26	24	40	112%:	75/	225/	280/	690/:	96%
MPSC2:Morrow Point	29	28	24	42	103%:	90/	250/	300/	755/:	96%
CLSC2:Crystal	32	31	28	47	100%:	105/	280/	335/	845/:	92%
TPIC2:Taylor Park	5.7	5.2	4.1	4.5	104%:	8.5/	28/	46/	100/:	97%
VCRC2:Vallecito	4.8	5.5	5.2	9.3	115%:	18/	65/	65/	170/:	83%
NVRN5:Navajo	19.4	22	27	76	85%:	130/	265/	235/	690/:	88%
LEMC2:Lemon	0.99	0.82	0.74	1.59	108%:	4/	18.5/	17.5/	45/:	78%
MPHC2:McPhee	3.5	3.6	3.7	13.8	84%:	57/	135/	70/	280/:	88%
RBSC2:Ridgway	5.1	4.8	4.4	5.6	102%:	/	/	/	90/:	88%

RECLAMATION

Operation Plans

Crystal Reservoir

O P E R A T I O N P L A N F O R C O L O R A D O R I V E R S Y S T E M R E S E R V O I R S

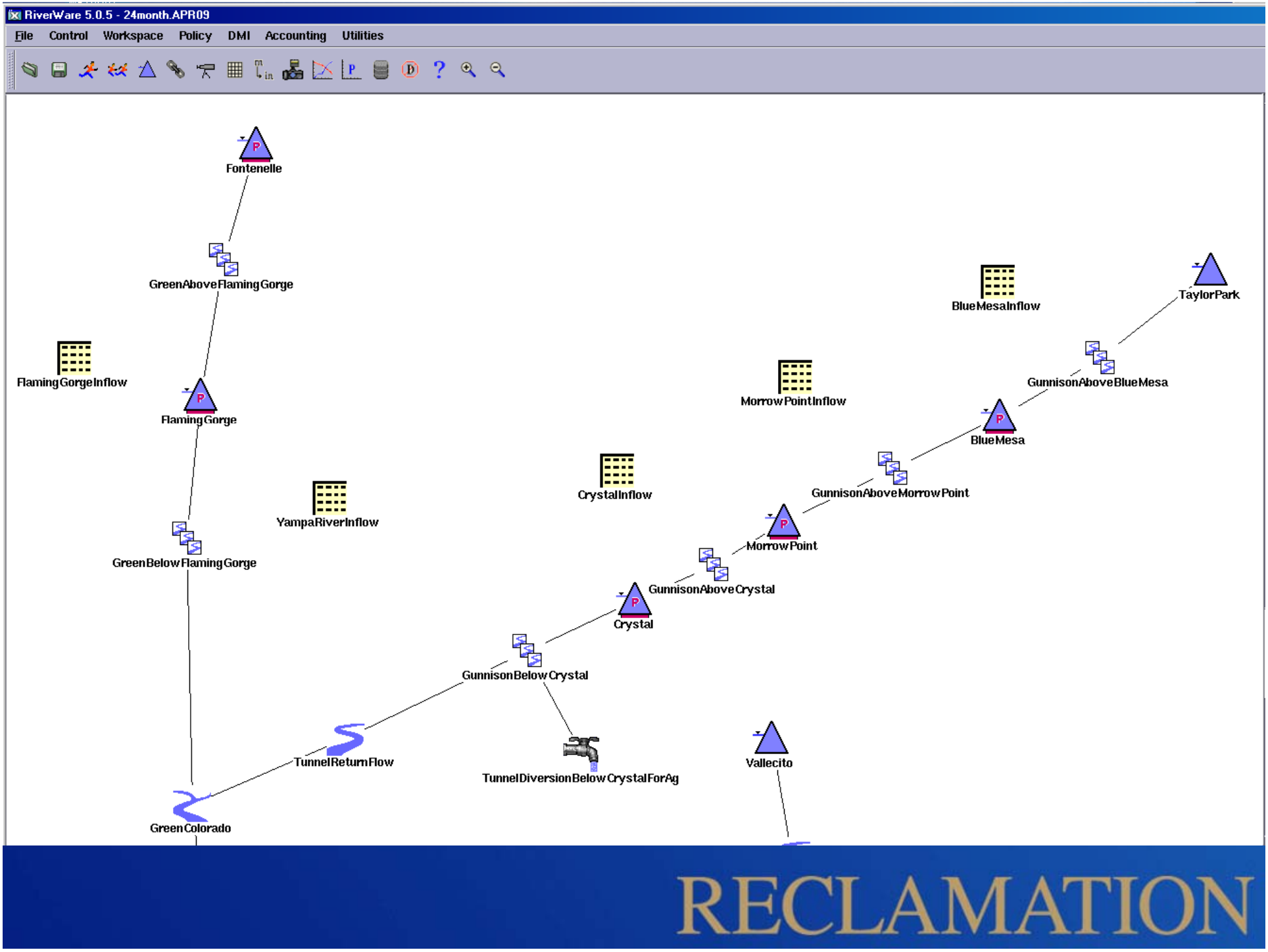
Bureau of Reclamation - CRFS 4/2009 Most Prob Water Supply 06-apr-2009 14:41:28
Crystal Reservoir

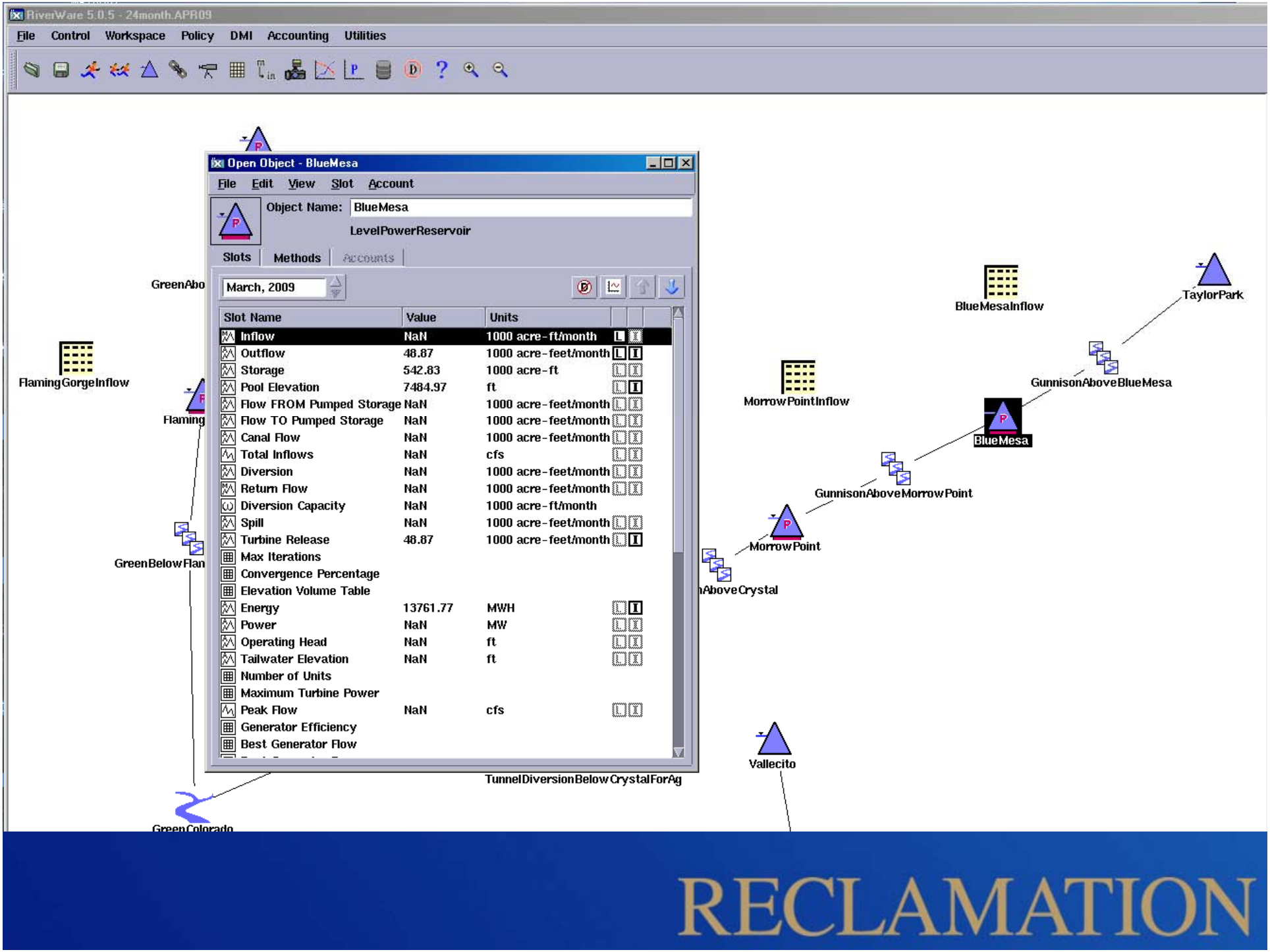
	unreg Inflow 1000 Ac-Ft	Morrow Release 1000 Ac-Ft	Side Inflow 1000 Ac-Ft	Total Inflow 1000 Ac-Ft	Power Release 1000 Ac-Ft	Bypass Release 1000 Ac-Ft	Total Release 1000 Ac-Ft	Reservoir Elevation EOM Feet	Live Storage 1000 Ac-Ft	Tunnel Flow 1000 Ac-Ft	Below_tunnel Flow 1000 Ac-Ft
* Apr 2008	124	153	16	168	127	40	168	6751.31	16	23	150
H May 2008	388	278	45	323	130	191	321	6760.22	19	54	279
I Jun 2008	484	180	52	232	118	116	234	6753.95	17	47	201
S Jul 2008	191	108	13	121	123	0	123	6747.80	15	62	73
T Aug 2008	75	117	5	122	123	0	123	6742.41	14	66	66
O Sep 2008	38	115	3	118	118	0	118	6741.71	14	61	63
WY 2008	1520	1392	162	1554	1164	392	1555			356	1283
R Oct 2008	36	86	3	89	89	0	89	6744.34	15	55	45
I Nov 2008	33	35	4	38	39	0	39	6742.20	14	1	40
C Dec 2008	32	39	3	42	42	0	42	6742.53	14	1	43
A Jan 2009	31	43	4	47	38	9	47	6741.02	14	1	49
L Feb 2009	28	45	3	48	24	20	45	6752.05	17	1	46
* Mar 2009	47	49	5	55	55	0	55	6751.30	16	9	47
Apr 2009	105	105	19	124	124	0	124	6753.04	17	30	94
May 2009	280	142	28	170	134	36	170	6753.04	17	55	115
Jun 2009	335	96	33	129	129	0	129	6753.04	17	60	69
Jul 2009	125	119	10	129	129	0	129	6753.04	17	65	64
Aug 2009	67	124	6	130	130	0	130	6753.04	17	65	65
Sep 2009	43	114	6	119	119	0	119	6753.04	17	55	64
WY 2009	1162	997	124	1121	1052	65	1117			396	741
Oct 2009	44	83	7	89	89	0	89	6753.04	17	30	59
Nov 2009	38	52	5	57	57	0	57	6753.04	17	0	57
Dec 2009	32	63	5	67	67	0	67	6753.04	17	0	67
Jan 2010	31	75	5	80	80	0	80	6753.04	17	0	80
Feb 2010	29	65	4	69	69	0	69	6753.04	17	0	69
Mar 2010	46	67	7	74	74	0	74	6753.04	17	5	69
Apr 2010	96	75	12	87	87	0	87	6753.04	17	30	57
May 2010	272	94	35	129	129	0	129	6753.04	17	55	74
Jun 2010	330	90	38	128	128	0	128	6753.04	17	60	68
Jul 2010	144	113	17	130	130	0	130	6753.04	17	65	65
Aug 2010	74	126	8	134	134	0	134	6753.04	17	65	69
Sep 2010	45	116	6	122	122	0	122	6753.04	17	55	67
WY 2010	1183	1017	151	1168	1168	0	1168			365	803
Oct 2010	44	81	7	87	87	0	87	6753.04	17	30	57
Nov 2010	38	50	5	55	55	0	55	6753.04	17	0	55
Dec 2010	32	74	5	79	79	0	79	6753.04	17	0	79
Jan 2011	31	75	5	80	80	0	80	6753.04	17	0	80
Feb 2011	29	65	4	69	69	0	69	6753.04	17	0	69
Mar 2011	46	67	7	74	74	0	74	6753.04	17	5	69

Operation Plan Development

- Upper reservoir operations are developed independently of what happens at Lake Powell or in the lower basin
- Upper basin operations do have an impact on Lake Powell and Lake Mead operations
- The December 2007 ROD – controls how Lake Powell and Lake Mead operations are set.

RECLAMATION


RiverWare 5.0.5 - 24month.APR09
File
Control
Workspace
Policy
DMI
Accounting
Utilities
Fontenelle
GreenAboveFlamingGorge
FlamingGorgeInflow
FlamingGorge
YampaRiverInflow
GreenBelowFlamingGorge
CrystalInflow
MorrowPointInflow
BlueMesaInflow
TaylorPark
GunnisonAboveBlueMesa
BlueMesa
GunnisonAboveMorrowPoint
MorrowPoint
GunnisonAboveCrystal
Crystal
GunnisonBelowCrystal
TunnelReturnFlow
TunnelDiversionBelowCrystalForAg
Vallecito
GreenColorado
RECLAMATION



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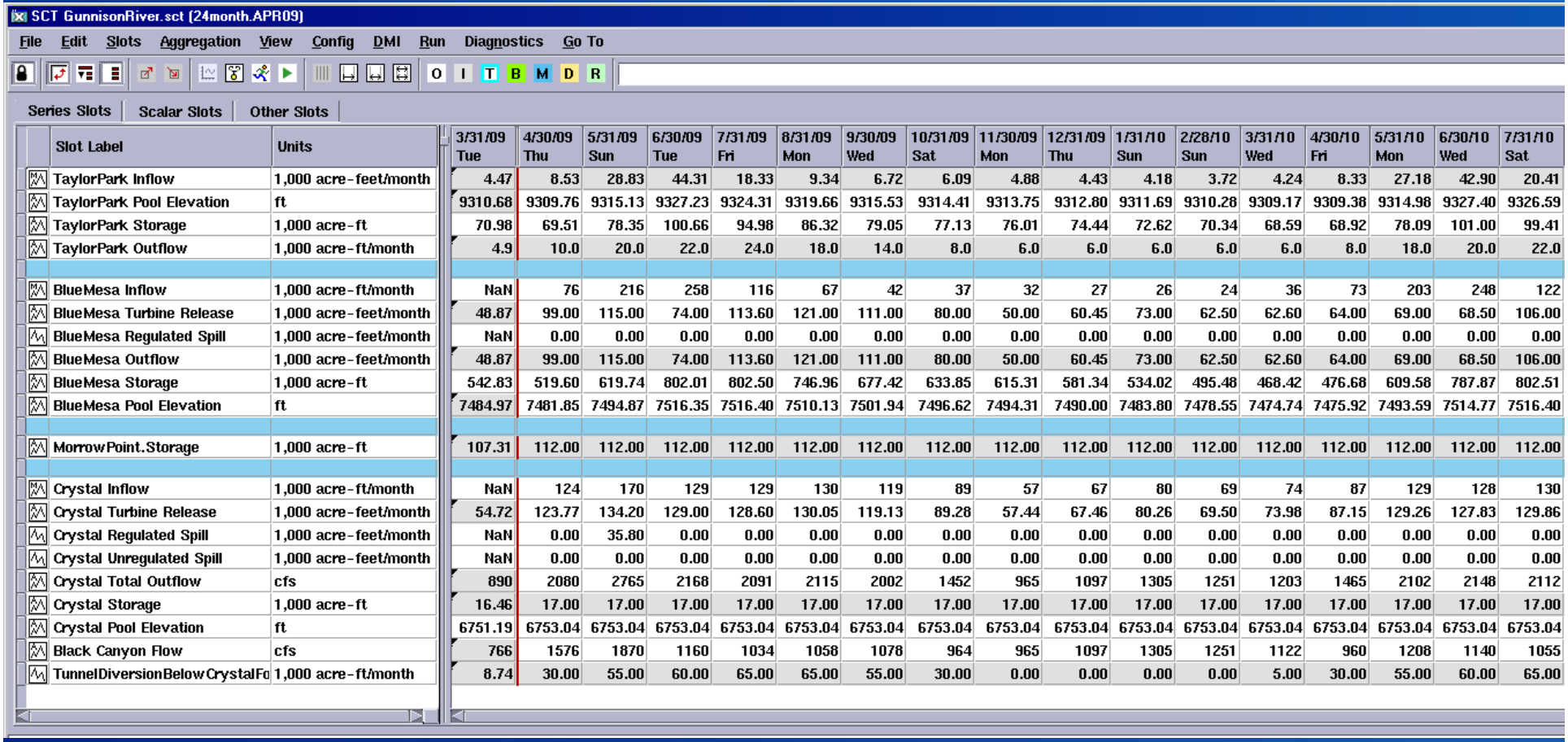


Slot Label	Units	3/31/09 Tue	4/30/09 Thu	5/31/09 Sun	6/30/09 Tue	7/31/09 Fri	8/31/09 Mon	9/30/09 Wed	10/31/09 Sat	11/30/09 Mon	12/31/09 Thu	1/31/10 Sun	2/28/10 Sun	3/31/10 Wed	4/30/10 Fri	5/31/10 Mon	6/30/10 Wed	7/31/10 Sat
TaylorPark Inflow	1,000 acre-feet/month	4.47	8.53	28.83	44.31	18.33	9.34	6.72	6.09	4.88	4.43	4.18	3.72	4.24	8.33	27.18	42.90	20.41
TaylorPark Pool Elevation	ft	9310.68	9309.76	9315.13	9327.23	9324.31	9319.66	9315.53	9314.41	9313.75	9312.80	9311.69	9310.28	9309.17	9309.38	9314.98	9327.40	9326.59
TaylorPark Storage	1,000 acre-ft	70.98	69.51	78.35	100.66	94.98	86.32	79.05	77.13	76.01	74.44	72.62	70.34	68.59	68.92	78.09	101.00	99.41
TaylorPark Outflow	1,000 acre-ft/month	4.9	10.0	20.0	22.0	24.0	18.0	14.0	8.0	6.0	6.0	6.0	6.0	6.0	8.0	18.0	20.0	22.0
BlueMesa Inflow	1,000 acre-ft/month	NaN	76	216	258	116	67	42	37	32	27	26	24	36	73	203	248	122
BlueMesa Turbine Release	1,000 acre-feet/month	48.87	99.00	115.00	74.00	113.60	121.00	111.00	80.00	50.00	60.45	73.00	62.50	62.60	64.00	69.00	68.50	106.00
BlueMesa Regulated Spill	1,000 acre-feet/month	NaN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BlueMesa Outflow	1,000 acre-feet/month	48.87	99.00	115.00	74.00	113.60	121.00	111.00	80.00	50.00	60.45	73.00	62.50	62.60	64.00	69.00	68.50	106.00
BlueMesa Storage	1,000 acre-ft	542.83	519.60	619.74	802.01	802.50	746.96	677.42	633.85	615.31	581.34	534.02	495.48	468.42	476.68	609.58	787.87	802.51
BlueMesa Pool Elevation	ft	7484.97	7481.85	7494.87	7516.35	7516.40	7510.13	7501.94	7496.62	7494.31	7490.00	7483.80	7478.55	7474.74	7475.92	7493.59	7514.77	7516.40
MorrowPoint.Storage	1,000 acre-ft	107.31	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00	112.00
Crystal Inflow	1,000 acre-ft/month	NaN	124	170	129	129	130	119	89	57	67	80	69	74	87	129	128	130
Crystal Turbine Release	1,000 acre-feet/month	54.72	123.77	134.20	129.00	128.60	130.05	119.13	89.28	57.44	67.46	80.26	69.50	73.98	87.15	129.26	127.83	129.86
Crystal Regulated Spill	1,000 acre-feet/month	NaN	0.00	35.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crystal Unregulated Spill	1,000 acre-feet/month	NaN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crystal Total Outflow	cfs	890	2080	2765	2168	2091	2115	2002	1452	965	1097	1305	1251	1203	1465	2102	2148	2112
Crystal Storage	1,000 acre-ft	16.46	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Crystal Pool Elevation	ft	6751.19	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04	6753.04
Black Canyon Flow	cfs	766	1576	1870	1160	1034	1058	1078	964	965	1097	1305	1251	1122	960	1208	1140	1055
TunnelDiversionBelowCrystalFo	1,000 acre-ft/month	8.74	30.00	55.00	60.00	65.00	65.00	55.00	30.00	0.00	0.00	0.00	0.00	5.00	30.00	55.00	60.00	65.00

RECLAMATION

Source of Monthly Unregulated Inflow for Upper Colorado Reservoirs in the 24 Month Study

				April-July Unregulated Inflow									April-July Unregulated Inflow									
Month 24-Month Study Issued	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Jan	RFC	RFC	RFC	RFC A-J	RFC A-J	RFC A-J	RFC A-J	inter-polate	inter-polate	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg
Feb		RFC	RFC	RFC	RFC A-J	RFC A-J	RFC A-J	inter-polate	inter-polate	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg
Mar			RFC	RFC	RFC	RFC A-J	RFC A-J	inter-polate	inter-polate	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg
Apr				RFC	RFC	RFC	RFC A-J	inter-polate	inter-polate	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg
May					RFC	RFC	RFC	inter-polate	inter-polate	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg
Jun						RFC	RFC	RFC	inter-polate	inter-polate	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg
Jul							RFC	RFC	RFC	inter-polate	inter-polate	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg	76-05 avg
Aug								RFC	RFC	RFC	inter-polate	inter-polate	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	76-05 avg	76-05 avg	76-05 avg
Sep									RFC	RFC	RFC	inter-polate	inter-polate	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	76-05 avg	76-05 avg	76-05 avg
Oct										RFC	RFC	RFC	inter-polate	inter-polate	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	76-05 avg	76-05 avg	76-05 avg
Nov											RFC	RFC	RFC	inter-polate	inter-polate	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	76-05 avg	76-05 avg	76-05 avg
Dec												RFC	RFC	RFC	inter-polate	inter-polate	ESP 50	ESP 50	ESP 50	ESP 50	ESP 50	76-05 avg	76-05 avg	76-05 avg

RFC values are issued by the Colorado Basin River Forecast Center (RFC) as the official forecast values over a three-month period of time. The values are calculated using Statistical Water Supply (SWS) modeling, Ensemble Streamflow Predictions (ESP) modeling and coordinated with the Natural Resource Conservation Service (NRCS) using VIPER modeling values. This official forecast has the least amount of error associated with it.

RFC A-J values are official forecast values issued by the RFC for the April-July runoff period using SWS, ESP and coordinated with the NRCS. Forecast error increases with increasing distance from the three-month official forecast period.

76-05 avg values are the monthly average inflow values generated from water years 1976-2005 calculated using the database maintained by the Bureau of Reclamation Upper Colorado Regional Office (UCBOR). A water year begins October 1 and ends September 30.

Interpolated values are calculated by the UCBOR and use the previous RFC or RFC A-J official forecast values and interpolate those percentages against the 76-05 average in order to smoothly transition between the end of the current water year and the next water year, which uses the 76-05 average inflow. This allows the current hydrological state to be represented in the reservoir operations rather than assuming average hydrology.

ESP 50 values are generated using the RFC ESP forecasted volume for the next year using with August initial hydrological conditions. These values are used until the SWS modeling

January Forecast

- 24-month study runs:
- WRG views January as beginning of spring operational decision making
- Three months of forecast volumes
- First April-July forecast volume
- Three Model Runs
  - Min
  - Most
  - Max
- Pearl script imports interpolated values for A-J and remainder of year

RECLAMATION

February-March Forecast

- Use Reservoir Forecast product
- Move ahead one month in forecasted value
- Pearl script imports interpolated values for A-J and remainder of year
- Decision-making
  - Flaming Gorge Technical Working Group Proposed Spring Operations

RECLAMATION

April Forecast

- Three 24-month study runs:
  - Min
  - Max
  - Most
- Decision-making documents
  - Glen Canyon tier evaluation according to Interim Guidelines
  - Spring Operational Working Group Meetings
    - Aspinall
    - Navajo
    - Flaming Gorge
    - Fontenelle

RECLAMATION

May-July Forecasts

- Use Reservoir Forecast product
- Move ahead one month in forecasted value
- Pearl script imports interpolated values for A-J and remainder of year
- Operation decisions become clearer as forecast accuracy increases and observed water values become available

RECLAMATION

August Forecast

- Use RFC water year volume forecast for three 24-month study runs:
  - Min
  - Max
  - Most
- Decision-making documents
  - Annual Operating Plan
    - Projected January 1 elevation of Powell & Mead
    - Projected September 30 elevation of Powell & Mead
  - Fall Operational Working Group Meetings
    - Aspinall
    - Navajo
    - Flaming Gorge
    - Fontenelle

RECLAMATION

September-December Forecasts

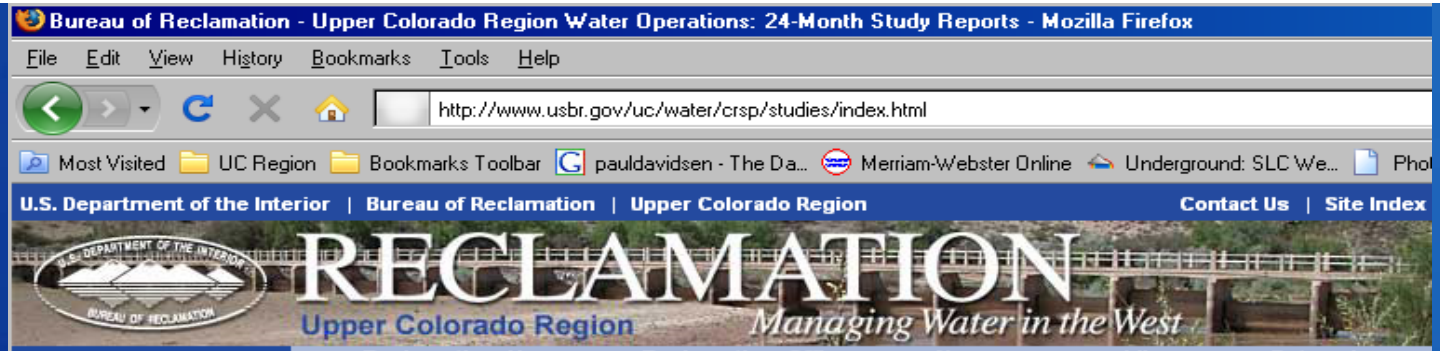
- Use Reservoir Forecast product for three forecasted months
- Continue to use August volume percentage for the remainder of the year
- Base flow operation period or schedule set in AOP
- Wait for January forecasting tools and April-July unregulated inflow forecast

RECLAMATION

24 Month Study

- **Other Information**
  - **Power Releases**
  - **Flood Control**

RECLAMATION



RECLAMATION

April 24-Month Study
Date: April 7, 2009

From: Water Resources Group, Salt Lake City
To: All Colorado River Annual Operating Plan (AOP) Recipients

Current Reservoir Status

Reservoir	March Inflow (unregulated) (acre-feet)	Percent of Average (%)	Apr 6 Midnight Elevation (feet)	Reservoir Storage (acre-feet)
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Questions - Answers

- December 2007 ROD:
  http://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf
- 24-Month Studies:
  http://www.usbr.gov/uc/water/crsp/studies/index.html

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