NORTHERN WATER DAILY PLANNING MODEL

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RiverWare User Group Meeting August 27, 2013



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Municipal Subdistrict

Water Conservancy District















Onerations

Operations		1400		4	dams Tun	nel (kAF)	
 Willow Creek Kes preemptive relea Granby outlet release set to 430 cf. 	ise of 1250 cfs. No s through July or u	o Willow Creek Kes pumping Intil the preemptive spillway	unless pool elev is greater than 8118 (one pump) or 8120 (two pumps). Willow Creek Kes outlet to release full capacity if pool elev reaches 8128 (2000 cfs).	Jun	24.3	24.3	
3) Granby spillway preemptive release (4 ft) shuts off when Upper Colorado undepleted reaches 275 kAF or two days after the peak, whichever comes first. Max preemptive release through spillway is 2000 cfs.							
 At 8278.50, Granby passes inflows up to 2500 cfs. This operation shuts off on 7/31/2011. 							
				Sep	12.2	91.6	
Model Initialization Date	6/2/2011	Forecast Run Date	6/3/2011	Oct	14.4	106.0	
Initial Granby End-of-Day Pool Elev.	8253.47	Forecast Modeler	KR				
Initial Granby End-of-Day Storage (AF)	363,604	Operations Modeler	LS				

Initial Granby End-of-Day Storage (AF) 363,604 Operations Modeler

2 P	Upper Colorado Inflows		Willow Creek Inflows			Lake Granby										Willow Creek Reservoir								
														Max		T.						Max		
	Year-to-	Forecast	Total	Year-to-	Forecast	Total		Pool	Pool	First			Max	Spillway				Max Pool	Pool P	ool Pool	Max	Spillway		
	Date	Remaining	April-July	Date	Remaining	April-July	Maximum Po	ol Elev.>	Elev. >	Spillway	Preempt V	olume (Dutflow	Spill*	Days of	Spill*	Pump to	Elev.by	Elev. > El	ev. > Elev. >	Outflow	Spill	Spill	Total Spill
Trace	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	Elevation	8260	8256	Spill*	(AF) & End	Date	(cfs)	(cfs)	Spill*	(AF)	Granby (AF)	6/30	8118** 81	20** 8128*	(cfs)	(cfs)	(AF)*	(AF)
14 1993	79,602	316,124	395,726	49,623	76,329	125,952	8279.82	8/7 6/10	6/29	6/11	104,402	7/5	2,245	1,815	44	152,809	2,301	8,119.99	6/7		1,250	0	73,803	226,611
13 1992	79,6	224.045	101.100	10.000	10 200	100.000	0000.00	100 020	a 10.00			100	1.000		2013	1 10 000			or the		1.000	0	65,736	214,397
18 1997	79,6	Tata	1	mni	60																	0	75,831	253,881
3 1982	79,6	IOla	i pu	mpi	ng																	0	74,847	238,643
7 1986	79,6			/				-		_				-								0	70,837	225,739
8 1987	79,6	t=DSUM(RunData "WillowCreekReservoirPumpOutflow" PeriodOfResults) 📃 🧖 🕬													220,167									
15 1994	79,6														71,555	201,932								
29 2008	79,6	069,6														69,639	226,847							
10 1989	79,6	0 71,254														218,736								
16 1995	79,6	d 0 73,637														73,632	250,754							
24 2003	79,6	Pirst day nool elevation crosses a threshold value													68,966	224,349								
21 2000	79,6	M <u>rinst day poor elevation crosses a trireshold value</u>													66,841	210,938								
1 1980	79,6														62,556	197,122								
28 2007	79,6	1 = DIVIIN(RunData, "Date", \$X\$63: \$X\$64)												09,430	206,930									
11 1990	79,0														221,554									
12 1001	70.6	X63: LakeGranbyPoolElevation												220,394										
17 1996	79.6													219 619										
20 1999	79.6													256.255										
23 2002	79,6	$1 \times 64: >=82/8.5$													209,357									
26 2005	79,6															238,239								
22 2001	79,6																					0	66,257	216,643
27 2006	79,6																			1		0	69,601	217,258
19 1998	79,6	Davia				lan		<u></u>	a + l		ا م ما م	al	مابية	~								0	83,270	292,686
6 1985	79,6	Days	5 00	orei	leval	lion	is ad	Jve	aι	ne	SNOI	uva	aiue	e								0	86,388	253,889
9 1988	79,6	0 80,39														80,394	249,234							
4 1983	79,6			JT/R	nnn	lata	"Lake	Gra	nh	vPn	olFl	อเ/ล	itio	n" \$:X¢/	62.9	62X3	Λ				0	84,319	292,479
25 2004	79,6	-00	001	N I (I)	und	ata,	Lan			yi U		cvu		ιι ₁ 4	νψι	00.4	μΛψΟ	יר				0	81,268	303,690
2 1981	79,6	1200020-		0010000		100000	00000000							21222	2.41		2002		- 1-	1.44		0	71,312	246,843
5 1984	79,602	424,972	504,574	49,623	88,471	138,094	8280.00	/11 6/0	6/15	6/9	107,941	6/28	2,644	2,419	71	280,999	6,585	8,128.00	6/6	6/7	1,419	0	82,895	363,894
Minimum 10th Bass		316,124	395,726		67,349	116,972	8278.71	/10 6/8	6/15	6/9	58,774	6/24	1,982	1,651	38	130,377	0	8110.96	6/4	6/4	1,250	0	62,556	197,122
Average		351 707	400,702		75 359	175 987	8279.67	/10 6/11	6/26	6/12	95 977	7/3	2,240	2 226	30	164 890	1 362	8116.94	6/8	6/8	1,250	18	73 547	209,115
Median		350.013	429,615		75,916	125,539	8279.75	8/7 6/11	6/25	6/12	98,556	7/3	2,500	2,220	44	155,143	1,502	8116.07	6/8	6/8	1,250	0	72.078	226.175
90th Perc.		376,986	456,588		85,754	135,378	8280.00	/20 6/12	7/2	6/13	104,469	7/7	2,500	2,419	59	208,286	4,483	8127.01	7/26	7/28	1,267	0	83,356	292,500
Maximum		424,972	504,574		88,471	138,094	8280.00 1	/17 6/13	7/4	6/14	107,941	7/7	2,869	2,439	71	280,999	6,585	8130.00	6/16	6/9	2,435	535	86,388	363,894
0 ⁻ N		10.		Av	erage of Spil	ling Traces	8279.67	/10 6/11	6/26	6/12	95,977	7/3	2,437	2,226	47	164,890	1,362	8,117		- A-	1,317	18	73,547	238,437
*Including any	preemptis	ve spill		M	edian of Spil	ling Traces	8279.75	8/7 6/11	6/25	6/12	98,556	7/3	2,500	2,419	44	155,143	0	8,116			1,250	0	72,078	226,175
**If during Wil	**If during Willow Creek Res. preemptive release.				Condition	>= 3	#1) (1)				3	Max <=		Traces		Traces w/				Max <=	Spillway	fraces w/		
10000000000000000000000000000000000000					12707-05270-	some of the	8279.50 82	8.5					2500 cfs	9	w/ Spill	2	Pumping				1250 cfs	Spill	Spill	2
Model Run Dat	e	6/3/2011			Number	r of Traces:	27	30					28		30		12				27	1	30	
Report Created		6/3/2011		1	%	of Traces:	90% 1	00%					93%		100%		40%				90%	3%	100%	

DISTRIBUTION SYSTEM East Slope

























Summing Up

Streamflow forecast ensembles for spill prediction and operation (MRM)
 Elegant handling of MRM output
 Automatic routing of project water around outages and operations
 Automatic flexible reservoir target handling
 Skimming native flows for power generation

Questions?