October 18, 2000

Proposed Instream Flow Rules **Goff's Falls Example of an Event**

Regulatory Event Example

PURPOSE

There has been discussion as to how orders would begin end and overlap, within and between seasons. The sample data set using the Merrimack R. at Goff's Falls in 1988-89 illustrates many of the possible combinations. The data set was been evaluated using the Instream Flow Rules methods for determining the quantile for which the river would have been regulated from 12/01/1988 to 04/05/1989, a prolonged period of lowflow. In this example there are five Trigger Flows, however only three trigger flows are proposed in the rules.

REGULATORY EVENT DESCRIPTION

Average daily stream flows from gage data are assessed daily against each trigger flow. An event begins A concurrent with the issuance of a reduction/cessation order at 12:01 AM on the day after a Decision Day B when average daily streamflow has been less than the trigger flow for the Decision Day during each of the prior four days C. Stream flow is always assessed using the trigger flows for the current Decision Day. For example D, for Decision Day March 16, if average daily streamflow has been less than the spring trigger flow associated with Q60 for each of March 12, 13, 14, & 15 then an order is issued on March 16 that causes a winter Q60 event to begin at 12:01 AM on March 17.

A new order is issued at 12:01 AM on the 1lth day after the previous order was issued if streamflow has been less than the trigger flow for the Decision Day during each of the four previous days. If this condition is not met, the order expires at 11:59 on the Decision Day and the event ends. For example E, if stream flow has been less than the spring Q60 trigger for each of March 20, 21, 22, & 23 then an order is issued on March 24 that causes a subsequent spring Q60 order to begin on March 25. This is considered a continuation of the event.

In addition to the criteria for order expiration above, a reduction/cessation order expires at 11:59 PM on a Decision Day when average daily streamflow for each of the four previous days has been greater than 1.5 times the trigger flow for the Decision Day F. The ending of an order with a greater trigger flow also ends all orders with lesser trigger flows G. Orders issued in one season continue into the next season. An order in the new season is not issued until an order issued in the previous season has expired. An event in the new season begins when an order is issued using the new season's trigger flow.

For concurrent orders, the most restrictive consumptive use limitations of any order in effect apply.

READING THE DATA TABLE

The following "coding" has been used to assist in the understanding of the Goff's Falls sample data in the table.

Decision Day - Each decision day is indicated by "DD" and is followed by the appropriate discharge for that quantile and season (ex. DD3430 is the Winter Q60).

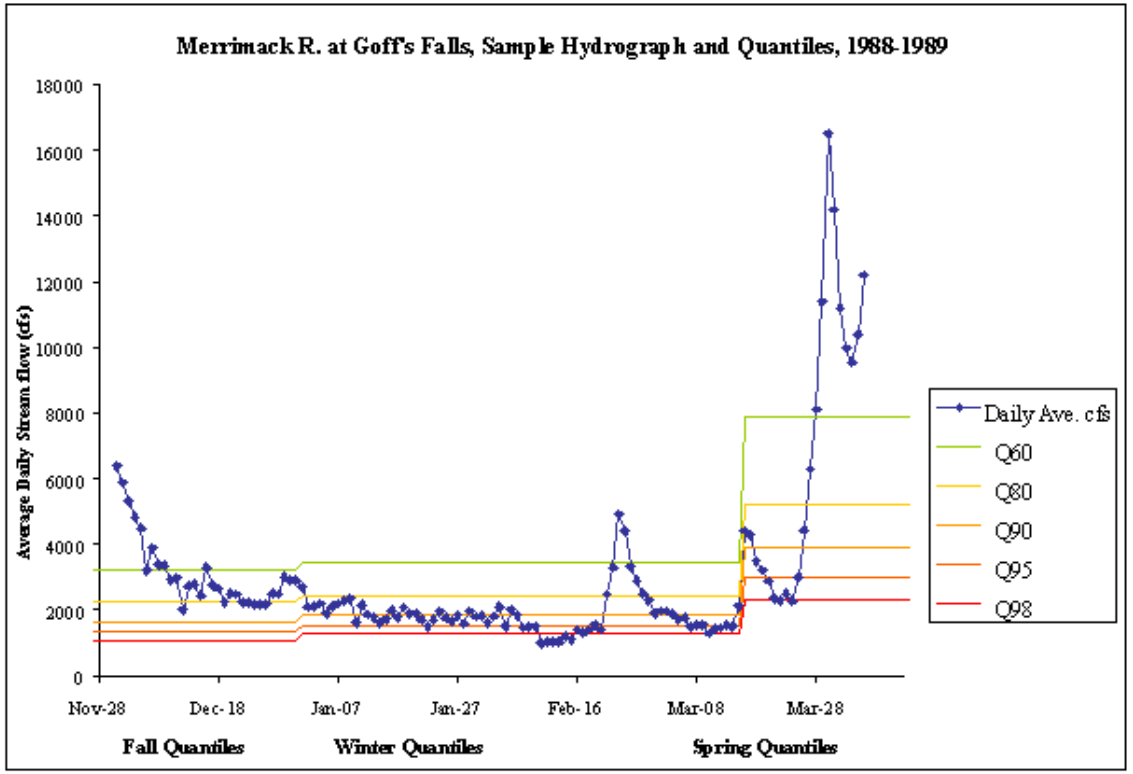
Colored Numbers - For this example, all decision day (DD) trigger values and counts of days are color coded to a particular quantile (ex. DD3430 is the Winter Q60).

Italics - Italics have been used in the dataset to highlight counts and quantiles that are related to the 1.5x rule (ex. ***DD5145*** is 1.5x the Winter Q60)..

Non-Colored Numbers - Series of days used in the determination of an order start or stop have been left black so as not to be confused with the numbers counted within an order.

Shading - Days that are shaded yellow are days for which a particular quantile would be enforced.

Additional Note: The Instream Flow Rules as currently written contain only three phases of regulation where each phase will correspond to a stream flow quantile. The example contained here has five, stream flow quantiles to illustrate how the process would work.



Merrimack River at Goff's Falls, Seasonal Trigger Flows								
			Q98	Q95	Q90	Q80	Q60	7Q10
Beginning Date	Ending Date							
01/01/1936	03/14/1998	Winter	1300	1520	1850	2400	3430	1430
		1.5 x trigger	***1950***	***2280***	***2775***	***3600***	***5145***	***2145***
03/15/1936	05/31/1998	Spring	2305	3020	3895	5200	7860	1880
		1.5 x trigger	***3458***	***4530***	***5843***	***7800***	***11790***	***2820***
06/01/1936	10/31/1998	Summer	543	770	946	1160	1580	648
		1.5 x trigger	***815***	***1155***	***1418***	***1740***	***2370***	***972***
11/01/1936	12/31/1998	Fall	1060	1352	1660	2240	3230	1220
		1.5 x trigger	***1590***	***2027***	***2490***	***3360***	***4845***	***1830***
Date	**Daily Average Discharge (cfs)**	**Season**						
12/01/1988	6400	Fall						
12/02/1988	5890	Fall						
12/03/1988	5300	Fall						
12/04/1988	4820	Fall						
12/05/1988	4490	Fall						
12/06/1988	3210	Fall						
12/07/1988	3880	Fall						
12/08/1988	3370	Fall						
12/09/1988	3360	Fall						
12/10/1988	2920	Fall					1	
12/11/1988	2980	Fall					2	
12/12/1988	2000	Fall					3	C
12/13/1988	2720	Fall					4	
12/14/1988	2790	Fall					DD3230	B
12/15/1988	2440	Fall					1	A
12/16/1988	3300	Fall					2	
12/17/1988	2750	Fall					3	

12/18/1988	2650	Fall					4	
12/19/1988	2250	Fall					5	
12/20/1988	2510	Fall					6	
12/21/1988	2490	Fall					7	
12/22/1988	2230	Fall					8	
12/23/1988	2240	Fall					9	
12/24/1988	2170	Fall					10 DD3230	
12/25/1988	2170	Fall					1	
12/26/1988	2180	Fall					2	
12/27/1988	2510	Fall					3	
12/28/1988	2490	Fall					4	
12/29/1988	3010	Fall					5	
12/30/1988	2890	Fall					6	
12/31/1988	2910	Fall					7	
01/01/1989	2690	Winter					8	
01/02/1989	2090	Winter				1	9	
01/03/1989	2100	Winter				2	10 DD3430	
01/04/1989	2200	Winter				3	1	
01/05/1989	1900	Winter				4	2	
01/06/1989	2100	Winter				DD2400	3	
01/07/1989	2200	Winter				1	4	
01/08/1989	2270	Winter				2	5	
01/09/1989	2350	Winter				3	6	
01/10/1989	1610	Winter				4	7	
01/11/1989	2170	Winter				5	8	
01/12/1989	1860	Winter				6	9	
01/13/1989	1790	Winter				7	10 DD3430	
01/14/1989	1610	Winter				8	1	
01/15/1989	1730	Winter				9	2	
01/16/1989	1990	Winter				10 DD2400	3	
01/17/1989	1790	Winter				1	4	
01/18/1989	2090	Winter				2	5	
01/19/1989	1900	Winter				3	6	
01/20/1989	1900	Winter				4	7	
01/21/1989	1700	Winter				5	8	
01/22/1989	1500	Winter				6	9	
01/23/1989	1710	Winter				7	10 DD3430	
01/24/1989	1960	Winter				8	1	
01/25/1989	1760	Winter			1	9	2	

01/26/1989	1670	Winter			2	10 DD2400	3	
01/27/1989	1830	Winter			3	1	4	
01/28/1989	1570	Winter			4	2	5	
01/29/1989	1980	Winter			DD1850	3	6	
01/30/1989	1800	Winter			1	4	7	
01/31/1989	1820	Winter			2	5	8	
02/01/1989	1600	Winter			3	6	9	
02/02/1989	1800	Winter			4	7	10 DD3430	
02/03/1989	2100	Winter			5	8	1	
02/04/1989	1500	Winter			6	9	2	
02/05/1989	2010	Winter			7	10 DD2400	3	
02/06/1989	1850	Winter			8	1	4	
02/07/1989	1460	Winter		1	9	2	5	
02/08/1989	1500	Winter		2	10 DD1850	3	6	
02/09/1989	1500	Winter		3		4	7	
02/10/1989	1000	Winter	1	4		5	8	
02/11/1989	1050	Winter	2	DD1520	DD1850	6	9	
02/12/1989	1050	Winter	3	1	1	7	10 DD3430	
02/13/1989	1030	Winter	4	2	2	8	1	
02/14/1989	1200	Winter	DD1300	3	3	9	2	
02/15/1989	1100	Winter	1	4	4	10 DD2400	3	
02/16/1989	1400	Winter	2	5	5	1	4	
02/17/1989	1300	Winter	3	6	6	2	5	
02/18/1989	1400	Winter	4	7	7	3	6	
02/19/1989	1550	Winter	5	8	8	4	7	
02/20/1989	1400	Winter	6	9	9	5	8	
02/21/1989	2480	Winter	7	10 DD1520	***1*** 10 DD1850	6	9	
02/22/1989	3300	Winter		G	***2***	7	10 DD3430	
02/23/1989	4930	Winter			***3*** ***2***	8	1	
02/24/1989	4410	Winter			***4*** ***4***	9	2	
02/25/1989	3320	Winter			***D2275***	10 DD2400	3	
02/26/1989	2890	Winter					4	
02/27/1989	2500	Winter					5	
02/28/1989	2300	Winter				1	6	
03/01/1989	1900	Winter				2	7	
03/02/1989	1970	Winter				3	8	
03/03/1989	1970	Winter				4	9	
03/04/1989	1880	Winter				DD2400	10 DD3430	
03/05/1989	1720	Winter			1	1	1	

03/06/1989	1760	Winter			2	2	2	
03/07/1989	1500	Winter			3	3	3	
03/08/1989	1550	Winter			4	4	4	
03/09/1989	1560	Winter			DD1850	5	5	
03/10/1989	1290	Winter			1	6	6	
03/11/1989	1430	Winter			2	7	7	
03/12/1989	1460	Winter		1	3	8	8	
03/13/1989	1540	Winter		2	4	9	9	
03/14/1989	1490	Winter		3	5	10 DD2400	10 DD3430	
03/15/1989	2130	Winter		4	6	1	1	
03/16/1989	4420	Spring	D	DD3020	7	2	2	
03/17/1989	4290	Spring		1	8	3	3	
03/18/1989	3480	Spring		2	1	4	4	
03/19/1989	3230	Spring		3	2	5	5	
03/20/1989	2880	Spring		4	3	6	6	
03/21/1989	2360	Spring		5	4	7	7	
03/22/1989	2300	Spring		6	DD3895	8	8	
03/23/1989	2500	Spring		7	1	9	9	
03/24/1989	2260	Spring		8	2	10 DD 5200	10 DD7860	E
03/25/1989	3020	Spring		9	3	1	1	
03/26/1989	4430	Spring		10 DD3020	4	2	2	
03/27/1989	6290	Spring			***1***	3	3	
03/28/1989	8110	Spring			***2 6***	***1***	4	
03/29/1989	11400	Spring			***3***	***2 5***	5	
03/30/1989	16500	Spring			***4 8***	***3 6***	6	
03/31/1989	14200	Spring		F	***DD5842***	***4 7***	7	
04/01/1989	11200	Spring				***00***	8	
04/02/1989	9990	Spring					9	
04/03/1989	9550	Spring					10 DD7860	
04/04/1989	10400	Spring						
04/05/1989	12200	Spring						

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