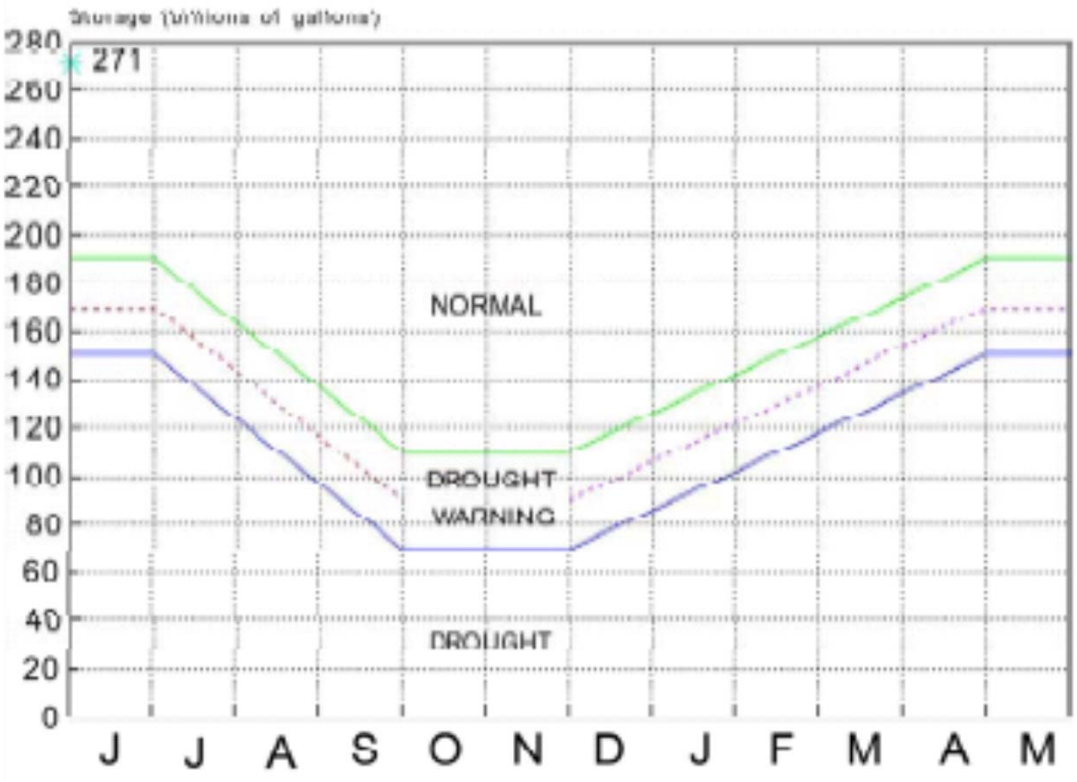
Origins of Good Faith/FFMP Delaware Basin Reservoir Rule Curves

Known Unknowns and Unknown Unknowns

RFAC April 17, 2012

Figure 1. OPERATION CURVES FOR CANNONSVILLE, PEPACTON AND NEVERSINK RESERVOIRS



Origins of Good Faith/FFMP Reservoir Rule Curves

- US Supreme Court Decision and Decree of 1931 – Releases Required to Lower Basin in return for right to build two reservoirs in Delaware Basin and export 490 mgd to NYC in the Hudson Basin

- US Supreme Court Decree of 1954
  - 1,750 cfs for Lower Basin
  - 800 mgd for NYC and third reservoir
  - 100 mgd for NJ
  - Most of what NYC does not need to be released for Lower Basin – Excess Release Quantity
  - If there were no ERQ, NYC could draw down the Delaware Basin reservoirs and Hudson basin reservoirs could be left full

Origins of the Good Faith/FFMP Reservoir Rule Curves

- How would the ERQ work?
- Safe Yield of combined NYC System specified as 1,665 mgd
- This is quantity available in a repeat of the Drought of Record (1930's Drought)
- Court Formula: 1,665 mgd minus NYC demand, say 1,000 mgd = 665 mgd
- City to release 83% of this as Excess Release quantity - .83 x 665 = 551 mgd

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- If City's draft from its water supply facilities did not exceed 1,665 mgd, its combined Hudson and Delaware systems could provide this amount without any cutbacks during a repeat of the Drought of Record (1930's), unless it wanted to be able to operate during a drought more severe than the Drought of Record.

Origins of the Good Faith/FFMP Reservoir Rule Curves

- 1961-66 Drought was more severe than 1930's Drought, so it became the new Drought of Record

  -USGS calculated new safe yield: 480 mgd from the Delaware reservoirs by themselves – no conjunctive operations with Hudson system and with releases made to maintain 1,750 cfs at Montague <u>at all times</u>

  -NYC indicated its combined safe yield was 1,290 mgd while maintaining 1,750 cfs at all times

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- Cannonsville constructed and filled during 1960's Drought - used predominantly for Montague releases
  - Conservation releases became low flows on the East Branch and Neversink Rivers for longer periods
  - Cold water fisheries more sensitive to low flows and high water temp

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- Sudden increases in West Branch flows interfered with fishing
- Impact on canoeing

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- NYSDEC did model runs to seek remedy –

  "Proposed Alternative Releases from NYC Reservoirs in the Upper Delaware River Basin," NYSDEC, 1974

- Consultation with NYC and more model runs –

  "Supplemental Report on Releases from NYC Reservoirs in the Upper Delaware River Basin," NYSDEC, 1976

Origins of the Good Faith/FFMP Reservoir Rule Curves

Release/Div.	Original	Proposed
– Pepacton	7.7 - 23.1 cfs	125 cfs
– Neversink	4 - 12 cfs	70 cfs
– Cannonsville	4.6 - 15.4 cfs	50 cfs
– Callicoon Min.	NA	1,000 cfs
– Montague Min.	1,750 cfs	1,750 cfs
– Del.Res. Safe Yield	--	530 mgd

Origins of the Good Faith/FFMP Reservoir Rule Curves

Not enough water – but rather than reduce specified safe yield in Decree, different approach was taken

- Different approach was incorporated into “Good Faith” Agreement negotiated between 1978 and 1982 and executed in 1983. “Normal” reservoir operations ignore the safe yield reductions caused by the new Drought of Record (1960’s) but extensive cutbacks are imposed on all parties during “drought.”

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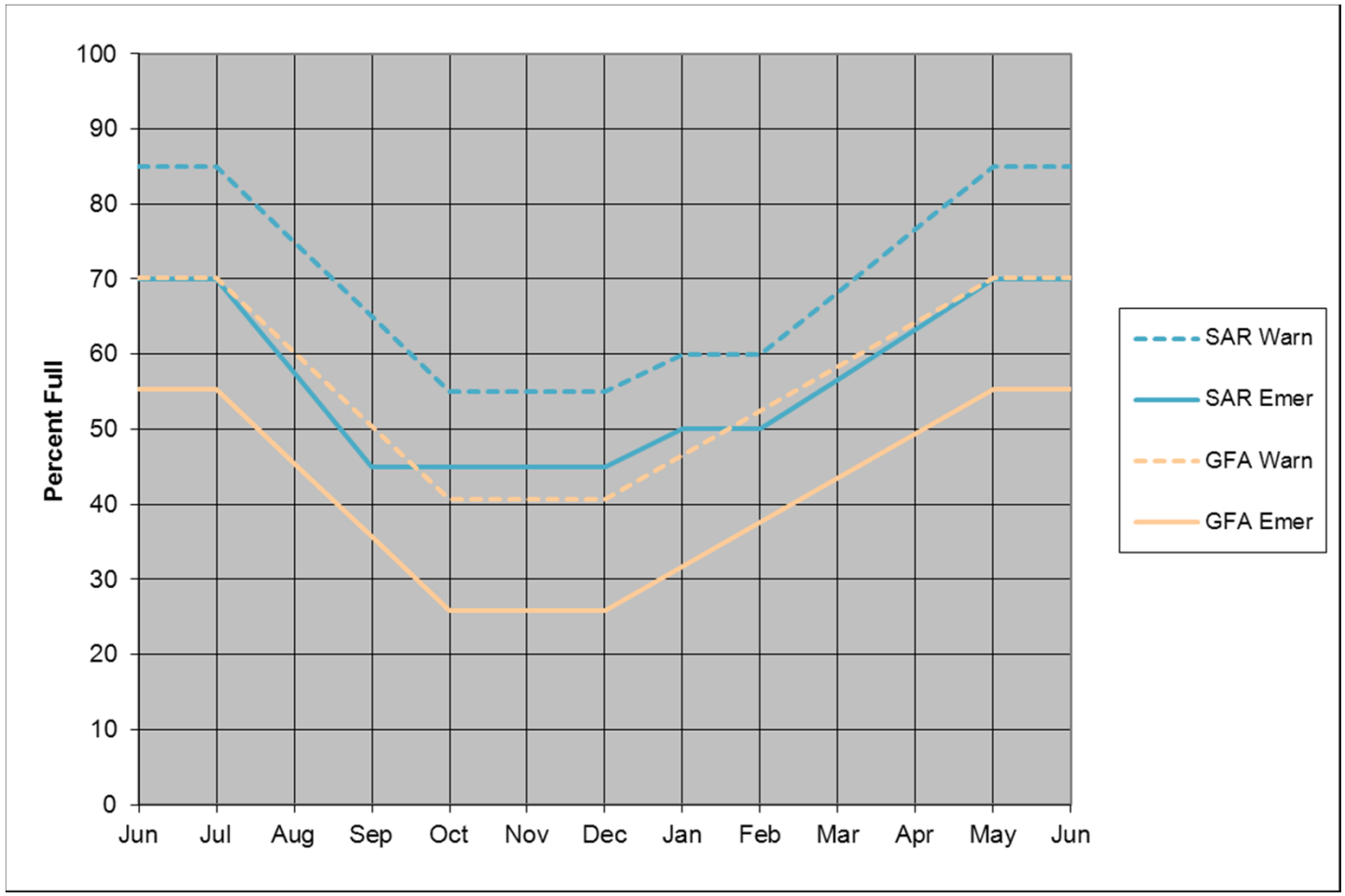

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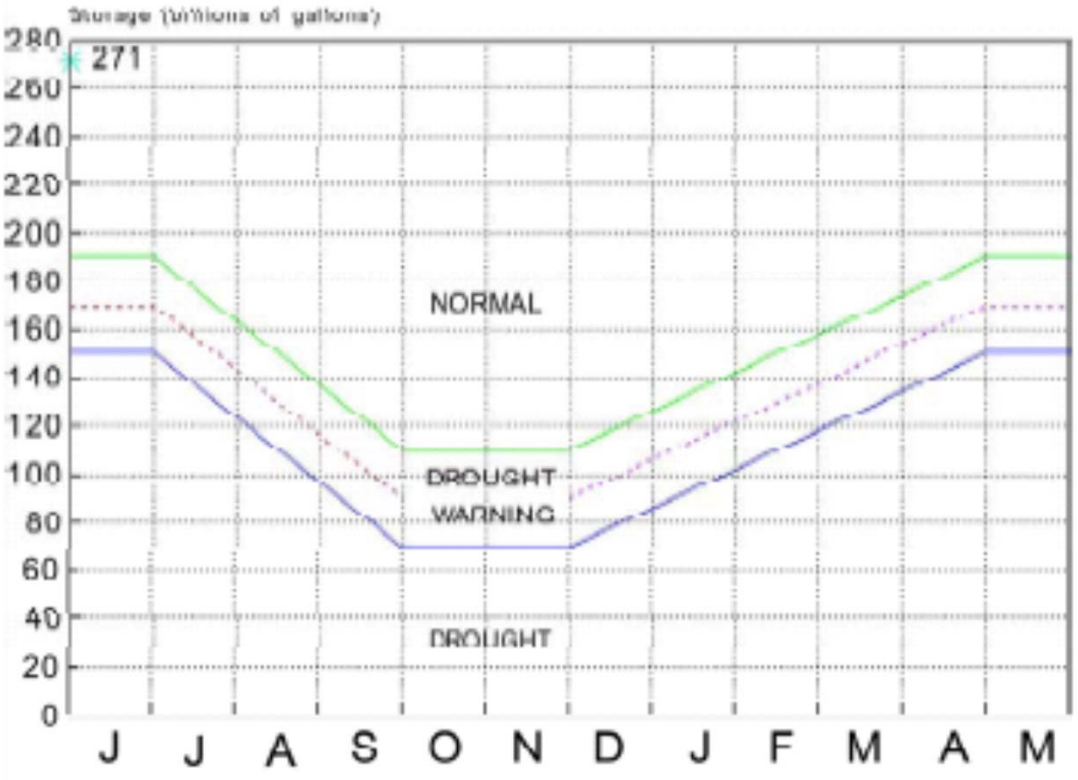

TABLE 1: INTERSTATE OPERATION FORMULA FOR REDUCTIONS IN DIVERSIONS, RELEASES AND FLOW OBJECTIVES DURING PERIODS OF DROUGHT

NYC storage condition	NYC Div. Mgd	NJ Div. mgd	Montague flow objective cfs	Trenton flow objective cfs
Normal	800	100	1,750	3,000
Upper Half-Drought Warning	680	85	1,655	2,700
Lower Half-Drought Warning	560	70	1,550	2,700
Drought	520	65	1,100-1,650*	2,500-2,900*
Severe Drought (to be negotiated based on conditions)				
* Varies with time of year and location of salt front as shown in Table 2.				

TABLE 2: FLOW OBJECTIVES FOR SALINITY CONTROL DURING DROUGHT PERIODS

	Flow objective, cubic feet per second at:					
	Montague, NJ			Trenton, NJ		
7-day average location of "Salt Front," River-mile*	Dec-Apr.	May-Aug.	Sept-Nov.	Dec-Apr.	May-Aug.	Sept-Nov.
Upstream of R.M. 92.5	1,600	1,650	1,650	2,700	2,900	2,900
Between R.M. 87.0 and R.M. 92.5	1,350	1,600	1,500	2,700	2,700	2,700
Between R.M. 82.9 and R.M. 87.0	1,350	1,600	1,500	2,500	2,500	2,500
Downstream of R.M. 82.9	1,100	1,100	1,100	2,500	2,500	2,500
* Measured in statute miles along the navigation channel from the mouth of Delaware Bay.						

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	Orig.	SAR	Good Faith
Montague	1,750 cfs	1,750 cfs	1,100-1,75 cfs
NYC Safe yield	--	530 mgd	480 mgd

Origins of the Good Faith Reservoir Rule Curves

- Without adjustment to safe yield specified in Decree, several questions arose
- How calculate Excess Release Quantity?
  - In 1970's, reduction in safe yield would reduce the ERQ, since NYC's demand had been growing
- Parties decided that formula for ERQ would not change to reflect safe yield reductions caused by 1960's Drought

Origins of the Good Faith Reservoir Rule Curves

- How can ERQ actually be available in a repeat of the Drought of Record, as the pre-1960's ERQ was, if safe yield dropped so much?
- Answer: It isn't. ERQ disappears in a repeat of the DOR, but it also disappears during many much less dry periods.
  - These less dry periods add up to 5,900-6,000 "drought days" occurring over the modeled period of record (over 16 years out of some 80-odd years) in the GFA/FFMP/OST, or about 20% of the time
  - Fisheries releases also either are curtailed or terminated during these less dry periods

Origins of the Good Faith Reservoir Rule Curves

- Without reconciling the anomalous results of the Supplemental Report of 1976 and the Good Faith model runs calculated in the Flow Management Technical Advisory Committee Report of 1983, its difficult to accurately explain the origins of the Good Faith rule curves