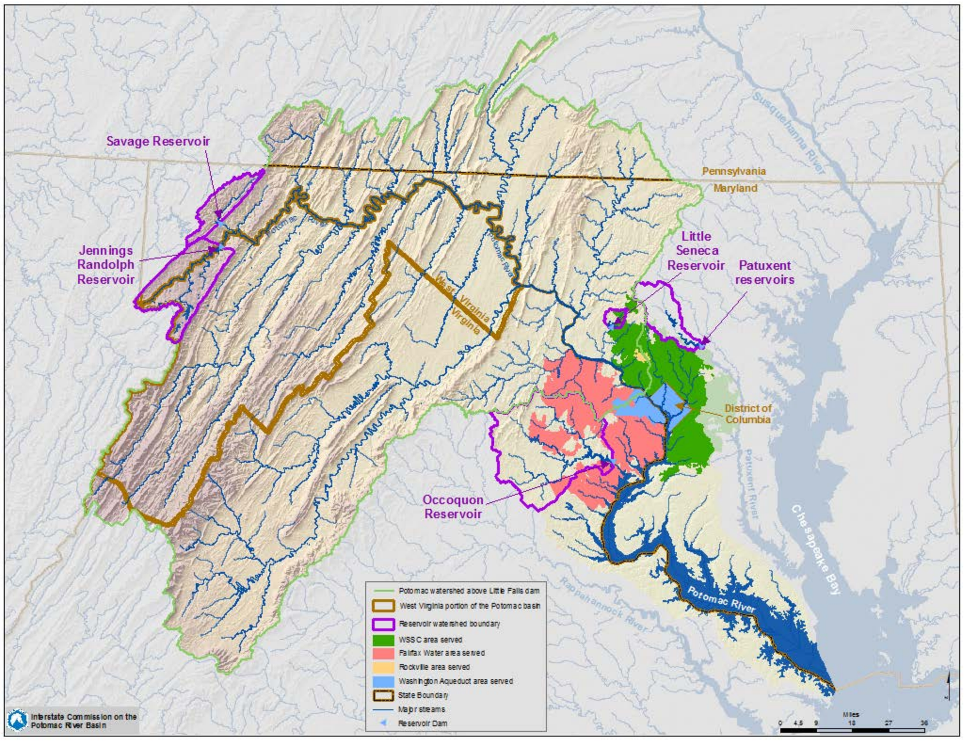
Cooperative Water Supply Operations for the Washington Metropolitan Area



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Abbreviations

Aqueduct	Washington Aqueduct Division of the U.S. Army Corps of Engineers
CO-OP	Section for Cooperative Water Supply Operations on the Potomac
DC Water	D.C. Water and Sewer Authority
ICPRB	Interstate Commission on the Potomac River Basin
LFAA	Low Flow Allocation Agreement
NBPRAC	North Branch Potomac River Advisory Committee
PRRISM	Potomac River and Reservoir Simulation Model
SFH	Single Family Household
USACE	U.S. Army Corps of Engineers
WMA	Washington, D.C., metropolitan area
WSCA	Water Supply Coordination Agreement
WSO	Water Supply Outlook
WSSC	Washington Suburban Sanitary Commission

Units of Measurement

cfs	Cubic feet per second
Mgal	Million gallons
Mgal/d	Million gallons per day

1 Washington, D.C., Metropolitan Area Water Supply System

The Potomac River is the primary water supply source for the Washington, D.C., metropolitan area (WMA) – defined as the District of Columbia and the city's Maryland and Virginia suburbs. Most WMA residents receive water from one of three water suppliers:

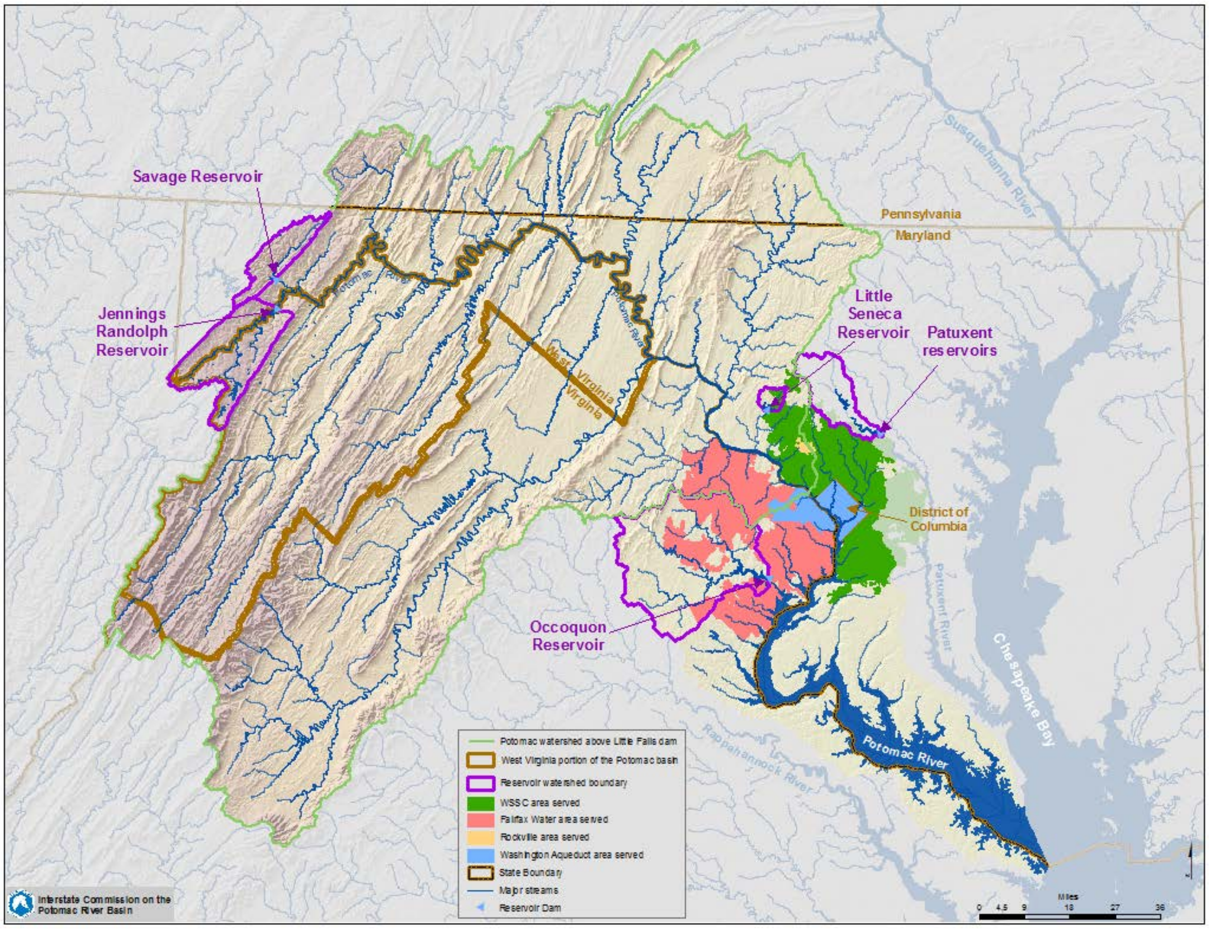
- Washington Aqueduct Division of the U.S. Army Corps of Engineers (Aqueduct), serving the District of Columbia via the D.C. Water and Sewer Authority (DC Water), and parts of northern Virginia;
- Washington Suburban Sanitary Commission (WSSC), serving parts of Maryland; and
- Fairfax Water, serving Fairfax County, Virginia, and providing wholesale water to other suppliers in northern Virginia.

These three suppliers obtain approximately 78 percent of their water from the Potomac River (Ahmed et al. 2010). The WMA suppliers jointly own storage capacity (not the water itself) in two upstream reservoirs, Jennings Randolph and Little Seneca. The water in Jennings Randolph available to the WMA is referred to as being in the reservoir's water supply account. Storage in the reservoir is also allocated for flood control and water quality uses.

Releases from these reservoirs can be used to augment natural river flows during times of drought. The suppliers provide funding for operations and maintenance for a third reservoir, Savage Reservoir, which is used to match a portion of water supply releases from Jennings Randolph. In addition, Fairfax Water and WSSC rely on water stored in reservoirs that are outside of the Potomac River drainage area on the Occoquan and Patuxent rivers, respectively (Figure 1). The WMA suppliers provide treated water either directly to customers or to independent wholesale suppliers.

The Section for Cooperative Water Supply Operations on the Potomac (CO-OP) of the Interstate Commission on the Potomac River Basin (ICRPB) assists the WMA suppliers in 1) cooperatively managing the water supply system during droughts and 2) forecasting future demands and assessing the system's ability to meet these demands. CO-OP also provides a variety of technical and logistical support to the utilities. This includes special studies on water supply issues; tool and model development; drought response exercises; hazardous spill travel-time estimates; participation in third-party research projects; assessments of water withdrawal permit applications; and outreach to local, national, and international audiences.

Figure 1. CO-OP water supply system, including reservoirs and areas served by the WMA water suppliers.



2 History of Cooperative Water Supply Operations

After experiencing the lowest Potomac River flow on record in 1966 and a severe drought in the Occoquan sub-watershed in 1977, basin stakeholders were looking for ways to improve the reliability of water supply to Washington, D.C. Subsequently in 1978, the Low Flow Allocation Agreement (LFAA) was signed by the Secretary of the Army of the United States, Maryland, Virginia, District of Columbia, Fairfax Water, and WSSC. This agreement equitably divides the available water between the WMA suppliers in the event of an emergency shortage. The LFAA also calls for an environmental flow-by of 100 million gallons per day (Mgal/d) at the Little Falls dam.

With the LFAA newly in place, CO-OP was created in 1979 at the request of WMA suppliers and the Potomac basin states. The goal in creating CO-OP was to cooperatively manage water supply resources as a means of meeting demands during dry periods without having to enact the required LFAA allocations.

While the LFAA guaranteed that available water would be equitably allocated, there was still a need to meet growing demands. In the decades leading up to the establishment of CO-OP, the region had experienced rapid population growth and a severe drought. This led many to dire predictions of serious water supply shortages. After considering structural solutions, including a series of 16 reservoirs, many in the region, including ICPRB staff and researchers at Johns Hopkins University, suggested that a cooperative regional supply plan could better and more cost-effectively meet the growing demand.

In 1980, the WMA Water Supply Task Force, made up of elected officials and technical and citizens advisory committees, was created to address the problem. This task force led to cost-sharing agreements between the WMA suppliers to construct, maintain, and operate water supply storage in Jennings Randolph and Little Seneca reservoirs. A call was also made for a formal cooperative regional water supply agreement.

Subsequently, the Potomac River and Reservoir Simulation Model (PRRISM) was developed and helped to show stakeholders the benefits to each utility, individually and collectively, from managing the water supply resources as a system. Using this model to run drought exercises built confidence in the system and in the ability of all the players to cooperate. Eventually, in 1982, the Water Supply Coordination Agreement (WSCA) was signed by the Baltimore District of the U.S. Army Corps of Engineers (USACE), Fairfax Water, WSSC, District of Columbia, and ICPRB. This agreement set up a more cooperative approach than the one in the LFAA for sharing available water resources when flows drop below a specified threshold. The main goals of the WSCA are to optimize the use of available water by the signatories and equitably share the costs of constructing, operating, and maintaining future jointly owned upstream reservoirs. The agreement also provides for system reliability assessments to be completed every five years. CO-OP has been conducting such assessments since the initial study in 1990.

Through these agreements, CO-OP, as a special section of ICPRB, is governed by a subset of ICPRB’s commissioners. Quarterly meetings of these commissioners are held to review CO-OP’s current and proposed efforts. Additionally, CO-OP is overseen by an Operations Committee set up by the WSCA. This committee is comprised of the general managers of each of the WMA suppliers and has a technical committee of utility staff that meets regularly. CO-OP’s annual work plan and budget are subject to approval by the Operations Committee members, who provide the Section’s funding.

3 CO-OP Functions and Responsibilities

3.1 Long-term Planning

CO-OP’s daily water balance model, PRRISM, is used for long-term planning. The model simulates Potomac River flows and the various inflows and outflows that determine water availability for the WMA suppliers. The reliability of the system for the simulation period is judged on a set of metrics including daily Potomac River flow at Little Falls, which is located downstream of the WMA intakes, minimum reservoir storage levels, and the number of days during which demands could not be met.

PRRISM requires three primary datasets: temperature, precipitation, and stream flow. Hydrologic conditions in the current version of PRRISM are simulated for the 78-year period of record which extends from October 1929 through December 2007. Thus, PRRISM can be used to evaluate the reliability of the current system to meet future demands if hydrologic conditions in the future are similar to those experienced in the past. This allows CO-OP to understand how the system would perform if a drought occurred that was similar to one experienced during the period of record. Past drought periods in the historic dataset include:

- Summer and fall of 1930 – A prolonged period of low flow conditions considered the drought of record for the region.
- Summer of 1966 – A relatively brief drought in which Potomac River flow dropped to its lowest ever recorded value.

- Summer of 1999 – The first drought which required releases from the WMA's system of reservoirs.
- Summer of 2002 – The second drought requiring releases from system reservoirs.

3.2 Drought Response

Between April and October of each year – the most likely time for a drought in the basin – CO-OP distributes a monthly Water Supply Outlook (WSO). The WSO provides the suppliers and general public with the probability that releases will be needed from one or more of the system's reservoirs to meet demands.

In the event of a drought, CO-OP assists the WMA suppliers in cooperatively managing water withdrawals and reservoir releases throughout the system. The goals during a drought are to meet utility demands, maintain environmental flow-by recommendations, and balance the use of the system's reservoirs. CO-OP has developed a series of tools to guide management decisions on a daily and hourly basis, depending on the severity of the situation. Staff members communicate at a minimum of once a day to update stakeholders on recent flows, demands, and release and withdrawal recommendations.

In order to keep both CO-OP and utility staff current on drought response procedures, a drought exercise is held every year when no actual drought has occurred. These exercises allow staff at all organizations to practice working together, maintain confidence in the cooperative system, and provide an opportunity to test out new management ideas and learn about system changes at the utilities.

Since construction of Jennings Randolph in 1981, WMA suppliers through CO-OP have requested releases during three droughts periods – 1999, 2002, and 2010. The amount of additional water needed to meet demand and the 100 Mgal/d flow-by recommendation is calculated by CO-OP and translated into a flow target at the USGS gage in Luke, Maryland, for the USACE staff that manages the reservoirs. The minimum flow target at Luke for the USACE is 120 cubic feet per second (cfs) when there are no flood control releases occurring. This minimum flow target is met with releases from Jennings Randolph's water quality storage and Savage Reservoir.

The tables below are reproductions of those that appear in CO-OP reports following the three droughts that required water supply releases (**Table 1**, **Table 2**, and **Table 3**). CO-OP's ability to track and account for releases from water quality and water supply storage from Jennings Randolph and from Savage has improved over time which is why the information is more detailed for the 2010 drought operations.

Table 1. Releases from Jennings Randolph water supply account during 1999 drought operations. Adapted from Hagen et al. 1999.

Date	Jennings Randolph Release (million gallons [Mgal])	Jennings Randolph Release (cfs)	Daily Mean Discharge (cfs) at Luke, Md.
7/9/1999	0	0	178
7/10/1999	0	0	160
First release			
7/11/1999	360	557	445
7/12/1999	360	557	698
7/13/1999	200	309	543
7/14/1999	100	155	369
7/15/1999	100	155	288
7/16/1999	200	309	366
7/17/1999	200	309	459
7/18/1999	100	155	369
7/19/1999	100	155	287
7/20/1999	100	155	283
7/21/1999	50	77	243
7/22/1999	50	77	200
7/23/1999	50	77	198
7/24/1999	50	77	202
7/25/1999	50	77	198
7/26/1999	50	77	195
7/27/1999	31	48	184
7/28/1999	25	39	167
7/29/1999	12	19	169
7/30/1999	0	0	163
7/31/1999	0	0	165
Second Release			
8/10/1999	0	0	160
8/11/1999	120	186	257
8/12/1999	171	265	384
8/13/1999	150	232	384
8/14/1999	120	186	342
8/15/1999	120	186	342
8/16/1999	120	186	328
8/17/1999	60	93	261
8/18/1999	0	0	184
Total	3049	4718	-

Table 2. Releases from Jennings Randolph water supply account during 2002 drought operations. Adapted from Kiang and Hagen 2003.

Date	Jennings Randolph Release (Mgal)	Jennings Randolph Release (cfs)	Daily Mean Discharge (cfs) at Luke, Md.
8/10/2002	0	0	365
8/11/2002	0	0	449
8/12/2002	0	0	623
8/13/2002	0	0	627
8/14/2002	0	0	625
8/15/2002	0	0	625
8/16/2002	79	122	625
8/17/2002	0	0	984
8/18/2002	0	0	916
8/19/2002	187	289	532
8/20/2002	270	418	818
8/21/2002	270	418	1004
8/22/2002	230	356	958
8/23/2002	230	356	859
8/24/2002	230	356	863
8/25/2002	196	303	800
8/26/2002	161	249	673
8/27/2002	161	249	617
8/28/2002	161	249	645
8/29/2002	109	169	574
8/30/2002	109	169	486
8/31/2002	109	169	476
9/1/2002	0	0	415
9/2/2002	0	0	339
9/3/2002	0	0	336
9/4/2002	0	0	334
9/5/2002	0	0	330
9/6/2002	120	186	404
9/7/2002	120	186	490
9/8/2002	120	186	476
9/9/2002	240	371	627
9/10/2002	240	371	886
9/11/2002	187	289	787
9/12/2002	187	289	674
9/13/2002	187	289	684
9/14/2002	187	289	684
9/15/2002	135	209	611
9/16/2002	135	209	538
9/17/2002	135	209	535
9/18/2002	135	209	534
9/19/2002	135	209	537
9/20/2002	135	209	538
9/21/2002	103	159	526
9/22/2002	103	159	500
9/23/2002	0	0	379

Date	Jennings Randolph Release (Mgal)	Jennings Randolph Release (cfs)	Daily Mean Discharge (cfs) at Luke, Md.
9/24/2002	0	0	255
9/25/2002	0	0	254
9/26/2002	0	0	280
9/27/2002	0	0	305
9/28/2002	0	0	274
9/29/2002	0	0	258
9/30/2002	0	0	254
Total	5106	7900	-

Table 3. Water release accounting during 2010 drought operations. Adapted from Ahmed et al. 2011. (JRR – Jennings Randolph Reservoir)

Date	ICPRB calculated values			USACE calculated volumes and allocations				
	Estimated water supply need	Luke target		Luke observed		Release from JRR water supply account	Release from JRR water quality account	Savage Reservoir release
	Mgal	cfs	Mgal	cfs	Mgal	Mgal	Mgal	Mgal
9/10/2010	170	435	281	419	271	176	62	36
9/11/2010	170	435	281	442	286	174	62	36
9/12/2010	170	435	281	439	284	174	62	36
9/13/2010	150	405	262	408	264	154	59	36
9/14/2010	115	351	227	354	229	123	57	36
9/15/2010	140	390	252	391	253	142	57	36
9/16/2010	140	390	252	405	262	154	57	36
9/17/2010	90	312	202	333	215	110	57	36
9/18/2010	45	243	157	323	209	53	110	36
9/19/2010	45	243	157	322	208	52	110	36
9/20/2010	40	235	152	254	164	64	57	31
9/23/2010	90	312	202	303	196	109	59	28
Total	1365	-	-	-	-	1485	809	419

The largest total withdrawal to augment natural flows occurred during the 2002 drought. But even then, the approximately 5 billion gallons that was released is less than half of the water supply storage capacity. While releases during these three drought operation periods did not come close to using all the stored water in any one season, recent CO-OP work on the reliability of the water supply system under climate change shows that the system would become more stressed under hotter and drier conditions, even causing storage in the reservoirs to drop to extremely low levels in some scenarios (Ahmed et al. forthcoming).

4 Future CO-OP Water Demands

4.1 2010 Demand and System Reliability Study – Part 1[1]

Part one of the “2010 Washington Metropolitan Area (WMA) Water Supply Reliability Study – Demand and Resource Availability for the Year 2040” provides a long-term forecast for water managers in the WMA. Water demand forecasts estimate the amount of water required to meet customer demand for a period of time into the future. A reliability and resource availability analysis accounts for the water available to meet these demands and the ability of the system to deliver the water when and where it is needed.

Completed every five years, this iteration of the study indicates a slight upward trend in summertime water use by WMA customers, while population in the region has risen by about 10 percent from approximately 3.9 to 4.3 million people. Model simulations of the current water supply system predict that for the 2030 forecasted demands the system is likely adequate, but might become strained given estimated 2040 demands. For a 2040 scenario of high demands, model simulations indicate that if the WMA was to experience conditions similar to the worst drought on record (1930) that emergency water use restrictions would be required, portions of the system could experience water supply shortfalls, and water shortages in the system’s water supply reservoirs could occur.

4.1.1 Demand Forecasting Method

Forecasts of average annual water demand were developed by combining recent water use information derived from three data sources. These included:

1) Billing data provided by the WMA suppliers and their wholesale customers,
2) information on the current and future extent of the areas supplied with water from the WMA suppliers and local planning agencies, and
3) the most recent demographic forecasts from the Metropolitan Washington Council of Governments.

Forecasts were also made for the City of Rockville, which withdraws water from the Potomac. Water use data were disaggregated into three categories for forecasting purposes: single family households, multi-family households (apartments), and employees (including commercial, industrial, and institutional use). Two forecast scenarios were developed to address some of the uncertainty involved in forecasting water use (**Table 4**).

Table 4. Forecasted demand for both high and likely scenarios at five-year intervals for the period from 2010 to 2040 (adapted from Ahmed et al. 2010).

Demand Scenario	Withdrawals (Mgal/d)						
	2010	2015	2020	2025	2030	2035	2040
Likely Scenario - Fairfax Water	175.2	186.9	199.4	210.2	218.2	223.8	228.9
High Scenario - Fairfax Water	187.2	201.7	217.8	234.2	247.3	259.0	269.1
Likely Scenario - Washington Aqueduct	150.9	157.7	164.8	168.7	172.2	174.2	177.8
High Scenario - Washington Aqueduct	150.9	158.6	166.6	171.4	175.5	178.1	182.4
Likely Scenario – WSSC	171.9	177.5	186.7	191.6	197.1	201.1	203.8
High Scenario – WSSC	171.9	179.6	190.4	196.9	203.5	208.7	212.5

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[1] This text originally appeared in or was adapted from: ICPRB. *Cooperative Water Supply Operations on the Potomac*. http://www.potomacriver.org/2012/drinking-water/water-supply?id=180, 2012, accessed 2/24/2013.

Likely Scenario - WMA Supplier Subtotal	497.9	522.1	551.0	570.6	587.5	599.1	610.5
High Scenario - WMA Supplier Subtotal	509.9	540.0	574.8	602.5	626.3	645.7	664.0
Likely Scenario - City of Rockville DPW	4.8	5.0	5.3	5.6	5.8	6.1	6.3
High Scenario - City of Rockville DPW	4.8	5.0	5.4	5.7	6.0	6.3	6.5
Likely Scenario - TOTAL WMA Suppliers plus Rockville	**502.7**	**527.1**	**556.3**	**576.2**	**593.3**	**605.1**	**616.8**
Potential additional demand from growth areas	12	13	15	19	23	28	32
Additional demand assuming constant SFH unit use	0.0	4.9	8.9	13.0	16.0	18.9	21.7
High Scenario - TOTAL WMA Suppliers plus Rockville	**514.7**	**545.0**	**580.2**	**608.2**	**632.3**	**652.0**	**670.5**

Note: SFH = single family home, units are million gallons per day

4.1.2 Resource Analysis Method

The resource analysis assessed the ability of the current WMA water supply system to meet the forecasted demand discussed above. This analysis was done using PRRISM to simulate future water availability based on forecasted demands and the historical hydrologic and meteorological record. PRRISM simulates the processes that govern water supply and demand in the WMA system on a daily basis: flows in the Potomac River; inflows, storage, and releases from the WMA reservoirs; and water withdrawals by the three main WMA suppliers.

4.1.3 Conclusions of the Demand and Resource Availability Forecast for the Year 2040

1. The WMA's current water supply system will continue to meet demands through 2030, under a range of hydrologic conditions similar to the 78-year period of historical record, with no water supply shortfalls and no emergency water use restrictions.
2. By the year 2040, the current system may have difficulty meeting the region's demands during periods of drought without water use restrictions, and/or the development of additional supply resources.
3. Summertime outdoor water use may be increasing in some areas of the WMA, offsetting the benefits of adopting more water efficient indoor fixtures and appliances.
4. The system's largest reservoir, Jennings Randolph, appears to be losing storage capacity due to sedimentation at a higher rate than previously estimated.

4.2 2010 Demand and System Reliability Study – Part 2 Climate Change[2]

A second part of the 2010 demand study looked at the impact a changing climate could have on the reliability of the current system. Using a variety of global climate models and greenhouse gas emission scenarios, modified precipitation, temperature, and stream flow data were used as input to the PRRISM model. The same demands from Part 1 of the study were used. The results indicate that if the climate were to change, the CO-OP system as currently designed would require more days of mandatory water use restrictions and may not be as reliable as it has been in the past.

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[2] This report is forthcoming. Ahmed, S.N., C.L. Schultz, and K.R. Bencala, 2013. 2010 Washington Metropolitan Area water supply reliability study, Part 2: Climate change and resource availability forecast for the year 2040. Interstate Commission on the Potomac River Basin, ICPRB 13-01, Rockville, Maryland.

5 Options for Meeting Future Demands

When the current water supply system was envisioned in the 1980s, it was assumed that it would provide a reliable source of drinking water for 30 years. The system has indeed been strong for more than 30 years now, but the recent reliability studies indicate that the system will become more stressed in the future. Therefore, the time to start thinking about additional storage resources or new ways of managing the system is nearing.

The 2010 reliability study cites four possible additional sources of water, one of which is in the process of being constructed. The report suggests that two new intakes could be constructed – one in the Potomac estuary and one in the Occoquan estuary. The intake, pumping station, and distribution system that would carry water from the Potomac estuary to Washington Aqueduct's Dalecarlia Treatment Facility was constructed in the 1970s but was never used for water supply. Water quality assessments were completed that show the water in this area is essentially fresh and could be treated with conventional treatment. An intake in the Occoquan estuary would be more complicated and expensive to run because the water tends to be brackish. A costly reverse-osmosis membrane treatment plant would be required to treat the water during low flows.

The 2010 report also identifies two quarry sites as locations for additional storage, one in Fairfax County, Virginia, and one in Loudon County, Virginia. Fairfax Water owns two quarries – Lorton Quarry, currently used for solids disposal, and Vulcan Quarry. Both of these are located near one of their existing water treatment plants. Assessments of both quarries were done to gauge costs and storage capacity, but neither is set for use in the near term.

Loudoun Water, currently a wholesale customer of Fairfax Water, recently received permits for the construction of a Potomac River intake, quarry storage, and a 40 Mgal/d water treatment plant. One of four proposed quarries is scheduled to be available for storage between 2017 and 2020. This quarry would have a storage volume of over one billion gallons. Loudoun Water will construct a system to allow water to fill the quarry when flows are high and then rely on water stored in the quarry when flows drop to the threshold specified in their permit. According to Loudoun's Potomac River withdrawal permit being issued by the Virginia Department of Environmental Quality, the quarry will be managed in coordination with the WMA cooperative water supply system to the benefit of both Loudoun Water and the other CO-OP suppliers.

In addition to building new structures, alternative management guidelines might also allow the system to keep up with increasing demands. Research is currently being conducted by the consulting firm Hydrologics through a Water Research Foundation grant to investigate "dynamic reservoir operations," that is, operations that respond to changing conditions, to meet the challenges of climate change. Through this research project, Hydrologics evaluated the effectiveness of more frequent and stricter water use restrictions during droughts and increased flexibility in production rates at WSSC. At the time of completion of this report, the report on Hydrologics' study, *Dynamic Reservoir Operations: Managing for Climate Variability and Change*, is in draft form.

Another method that has received some attention in the region is the adjustment of pricing structures to incentivize reduced water use by consumers. This approach to reducing demand has been successful in other regions of the country. According to Mehan and Kline (2012), alternative pricing structures are meant to recover the full cost of providing water to customers and/or to reduce demand in water stressed regions or during droughts[3]. Key to the success of these programs is metering water use and making this information available to customers so they can respond to the price signals. Some concerns that have been raised about these structures include increased customer bills, burdens on low-income customers, and decreasing revenue for the water suppliers. In response to these concerns, Mehan and Kline provide citations showing that customer bills often drop despite the increased rates because of reduced consumption, that alternate rate structures or direct subsidies can assist low-income customers, and that utilities can account for the lower consumption rates when developing the price structure.

5.1 Reallocation of Storage Capacity in Jennings Randolph Reservoir

The question has also been raised as to whether or not some of the water quality storage in Jennings Randolph could be reallocated to allow for additional water supply storage. The reservoir was initially authorized by the United States Congress in 1962[4] for the purpose of flood control, domestic and industrial water supply, water quality control, and recreation (USACE Baltimore District 1997a). White water recreation was added as a formal purpose in the Water Resources Development Act of 1988.

According to the USACE Master Manual for reservoir operations, about 13.4 billion gallons of water supply storage is available to the WMA suppliers in Jennings Randolph, with an additional 16.6 billion gallons allocated to water quality purposes, though sediment is known to be accumulating behind the reservoir thus decreasing total capacity (USACE Baltimore District 1997a). Additionally, Savage Reservoir has 6.3 billion gallons of storage for water quality purposes. Releases are made from Savage concurrently with water supply releases from Jennings Randolph at an approximate 20 percent match.

Originally, water quality releases were needed to offset poor water quality coming out of Jennings Randolph due to acid mine drainage and municipal and industrial wastewater, but this is no longer a concern due to Federal policies requiring increased treatment of pollution at its source (USACE Baltimore District 1997a). Authorized water quality purposes include downstream water quality, with emphasis in recent years on support of a coldwater fishery immediately below the dam; in-lake and lakeside recreation; and whitewater recreation.

While increasing the water supply storage in Jennings Randolph Reservoir could bolster the reliability of the WMA water supply system, it would be difficult to reallocate the storage. The Jennings Randolph Master Manual states that flood control will always be the highest priority, but “priorities for project purposes other than flood control are constantly re-evaluated.” Multiple attempts were made in the 1990s to assess the feasibility of reallocating some of the flood control storage to water supply storage (USACE Baltimore District 1995). These efforts were suspended after a review of the maximum probable flood determined that the dam needed to be modified to increase the spillway capacity due to revised dam safety criteria. Therefore, reallocation of flood storage was no longer a possibility (USACE Baltimore District 1997b). In subsequent years, work was done to figure out the improvements that need to be made to the dam, but no physical changes have been made to date (USACE Baltimore District 2011).

In the authorized reallocation studies, one potential alternative that was to be considered was the reallocation of water quality storage to supply storage (Federal Register 1994), though in the draft reallocation study this option does not appear as a considered alternative (USACE Baltimore District unpublished).

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[3] Mehan and Kline (2012) provide a brief, but thorough review of how pricing structures can be used to reduce demand. They also provide useful references for more information.

[4] Flood Control Act of 1962, Pub. L. No. 87-874, 76 Stat. 1173 (1962)

Water quality releases are made year-round, including during low flows. Without them there would be additional need for water supply releases. During low-flow periods when CO-OP is evaluating water supply demands and the potential need for releases, the analysis accounts for the amount being released from water quality storage. If this release was not occurring, there could be more frequent and extended water supply releases. That said, a significant portion of the water quality storage is used in a typical year and sometimes these releases have to be scaled back to preserve storage.

If the stakeholders in reservoir operations and downstream uses wanted to consider reallocating some of the water quality storage to water supply storage, a number of steps would have to be taken. First, funding would have to be authorized by Congress for a reallocation study. Regulations for the USACE require a Reconnaissance Study, a Feasibility Cost Share Agreement with a non-federal partner, a Feasibility Report, and an Environmental Impact Statement. These reports would also have to go through a public comment period before any final decisions could be made.

In addition to CO-OP, another active stakeholder group is the North Branch Potomac River Advisory Committee (NBPRAC). This group was formed in 2005 by the National Park Service to provide a forum for stakeholders to provide input regarding the operations of Jennings Randolph and Savage reservoirs. Since 2008, ICPRB has taken on the role of the NBPRAC coordinator. The group developed a list of flow management recommendations for the USACE (National Park Service 2008):

- Maximize opportunities for fishing and boating in the region.
- Maximize opportunities for all types of fishing (float, bank, wading).
- Maximize opportunities for lake swimming and lake boating.
- Provide opportunities for whitewater paddling at different skill levels.
- Provide opportunities for two-day weekends of paddling.
- Maintain optimum habitat for fish population.

These objectives would have to be considered in any reallocation study. Evaluation of storage allocations could part of a comprehensive basin-wide plan that considers not only water supply needs but also water quality, the health of the basin’s flora and fauna, and recreation opportunities.

Finally, given the tradition of cooperation in the basin, many stakeholders, including CO-OP, would like to see more water suppliers enter into a cooperative management agreement as a means of improving the reliability of the system. If this was done and the needed tools were developed, better use could be made of the water released from the upstream reservoirs. Currently, many utilities withdrawing from the Potomac have provisions in their permits that require them to reduce or stop withdrawals during certain low flow conditions. At the same time, it is not uncommon for releases to be made from the reservoirs only to have it rain while the water is taking the approximate nine days to make it to the WMA suppliers’ intakes. This can lead to stored water being “wasted” as it is no longer needed to meet demands and the recommended flow-by. If there was a cooperative management agreement in place, more efficient use of the available water would be possible. This could become more of an issue as population and water use continues to increase in upstream areas.

6 References

_____. Intent to prepare a Draft Environmental Impact Statement (DEIS) for the proposed reallocation of storage at Jennings Randolph Lake in Mineral County, West Virginia, and Garrett County, Maryland (Notice of intent). Federal Register Doc No: 95-17179, July 13, 1995, pg. 36122-36123. http://www.gpo.gov/fdsys/pkg/FR-1995-07-13/html/95-17179.htm, accessed 3/25/2013.

Ahmed, S.N., K.R. Bencala, and C.L. Schultz. 2011. 2010 Washington metropolitan area drought operations summary and lessons learned. Interstate Commission on the Potomac River Basin. ICPRB Report No. 11-04.

Ahmed, S.N., K.R. Bencala, and C.L. Schultz. 2010. 2010 Washington metropolitan area water supply reliability study, Part 1: Potential impacts of climate change. Interstate Commission on the Potomac River Basin. ICPRB Report No. 10-01.

Ahmed, S.N., C.L. Schultz, and K.R. Bencala. Forthcoming. 2010 Washington metropolitan area water supply reliability study, Part 2: Demand and resource availability forecast for the year 2040. Interstate Commission on the Potomac River Basin. ICPRB Report No. 13-01.

Hagen, E., C. Dalpra, and R.C. Steiner. 1999. Washington area 1999 drought operations. Interstate Commission on the Potomac River Basin. ICPRB Report No. 99-6.

Kiang, J.E. and E.R. Hagen. 2003. 2002 Drought operations and lessons learned Washington Metropolitan Area. Interstate Commission on the Potomac River Basin. ICPRB Report No. 03-6.

Mehan III, G.T. and I. Kline. 2012. Pricing as a demand-side management tool: Implications for water policy and governance. Journal of the American Water Works Association 104(2).

National Park Service. 2008. Letter from Dennis R. Reidenbach, Regional Director, Northeast Region, National Park Service to Joe Hoffman, Executive Director, Interstate Commission on the Potomac River Basin. September 16, 2008.

USACE Baltimore District. 1995. Jennings Randolph Lake reallocation feasibility Study.

USACE Baltimore District. 1997a. Master manual for reservoir regulation, North Branch Potomac River Basin – Appendix A.

USACE Baltimore District. 1997b. Letter from Dr. James F. Johnson, Chief Planning Division, U.S. Army Corps of Engineers Baltimore District to J.L. Hearn, Director, Water Management Administration, Maryland Department of the Environment, March 6, 1997.

USACE Baltimore District. 2011. Discussion at 2011 meeting of the Low Flow Allocation Agreement signatories. May 4, 2011.

USACE Baltimore District. 2013. Jennings Randolph Lake. http://www.nab.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/10470/Article/9071/jennings-randolph-lake.aspx, accessed 3/25/2013.

USACE Baltimore District. Unpublished. Draft Jennings Randolph Lake reallocation feasibility study: Integrated feasibility report and environmental impact statement.