

DROUGHT MANAGEMENT IN THE WASHINGTON, D.C. METROPOLITAN AREA

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ABSTRACT

The water resources of the three major water utilities in the Washington, D.C. area are efficiently allocated in times of drought by the terms of a pre-existing agreement. This agreement not only allocates resources owned in common, but also those uniquely available to individual utilities. Its effect is to provide non-structural rather than structural solutions to meeting future water demands. Importantly, the allocation is performed by a regional agency (the Interstate Commission on the Potomac River Basin, ICPRB) which is independent from the management of any of the utilities. In times of plentiful water supply, and in all other matters, the utilities operate quite independently.

In order to maintain readiness for low water conditions, the ICPRB Section for Cooperative Water Supply Operations on the Potomac (ICPRB/CO-OP) routinely conducts drought preparedness exercises to strengthen the important lines of communication among the principal staff who will be involved in managing water supplies during an actual drought. These exercises are conducted with the full involvement of the subject utilities during the late summer when a drought is most likely to affect water resources.

Multiple water utilities and resources are not unique to the Washington, D.C. area, and may be similar to those in some areas of Georgia. Similar management arrangements may also be applicable in Georgia.

INTRODUCTION

Throughout the 1960's and 1970's local, state, and federal agencies studied the impending water resource deficit in the Washington, D.C. area (U.S. Army Corps of Engineers, 1963 and 1983). Suggested solutions to the supply problem invariably included more dams or inter-basin transfers, which were highly unpopular and vigorously opposed by citizens throughout the basin. After years of debate and prior to the first up-stream

Potomac River reservoirs coming on line in the early 1980's, an agreement to allocate previously unregulated flows during droughts was signed in 1978 by the concerned parties. However, the combined independent yields of all available sources was still insufficient to meet the future demands in the fast growing area of the nation's capital.

Among the many studies being conducted to address the problem was one which considered the combined operation of the local utilities' water resources without regard to ownership (Palmer et al, 1982). Each resource was considered accessible to the fullest physical extent possible. Another important assumption was that the run-of-the-river flows would be used to the maximum extent possible, thus conserving storage in local and up-stream reservoirs.

The striking results of this analysis indicated that the existing resources (including those under construction) would be sufficient to carry the area through a repeat of the drought of record with demands which were not expected until the year 2030 or beyond. The study was conducted with funding from a number of federal and state agencies and the Interstate Commission on the Potomac River Basin. There was immediate interest in the results by all parties concerned. At last, an acceptable solution to the problem seemed to be at hand.

In July of 1982, the formal adoption of these operating policies ended the acrimonious search for new resources. Importantly, the responsibility for maintaining and implementing these policies was assigned to the Section for Cooperative Water Supply Operations on the Potomac (CO-OP) of the Interstate Commission on the Potomac River Basin (Eastman, 1986).

PHYSICAL SETTING

The water utilities which supply Washington, D.C. and the adjacent suburban area depend on run-of-the-river flows in the Potomac River, up-stream reservoirs, and local reservoirs. The Fairfax County Water Authority (FCWA) provides water to most of the northern Virginia

suburbs west of the city. The Washington Aqueduct Division (WAD) of the U.S. Army Corps of Engineers supplies the city and limited areas in northern Virginia. The Washington Suburban Sanitary Commission (WSSC) supplies Montgomery and Prince George's counties in Maryland to the east of the city. The City of Rockville in Montgomery County obtains and treats its own water as a relatively small but independent utility.

FCWA owns a local reservoir of approximately 10 billion gallons (bg) capacity on the Occoquan River with an associated treatment plant, and an intake and treatment plant on the Potomac River. WAD is entirely dependent on the Potomac River, with two intakes and treatment plants (interconnected). WSSC owns two reservoirs in series having an approximate total capacity of 10 bg on the Patuxent River with an associated treatment plant, and an intake and treatment plant on the Potomac River. Rockville has an intake on the Potomac River with an associated treatment plant. The three major utilities jointly own approximately 13 bg storage in Jennings Randolph Reservoir (formerly called Bloomington Reservoir) on the North Branch Potomac River, and all of the 4 bg storage in Little Seneca Reservoir which is tributary to the Potomac River in Montgomery County.

Thus, there are several independent water utilities supplying the city and surrounding suburban and metropolitan areas. Each of the utilities draws its water from individually and/or jointly owned resources.

RESOURCE OPERATION

In times of plentiful flow in the Potomac River, the utilities operate quite independently. CO-OP continually monitors flows in the Potomac River. When there is a high probability of future low flow, the utilities are advised by CO-OP to maximize their use of the river in order to conserve storage in local reservoirs. When flows decline to approximately twice the sum of unrestricted withdrawals by the four utilities, CO-OP monitors river flow, water supply demands, and the levels in all reservoirs on a daily basis. The maximal use of run-of-the-river flow in the Potomac continues until it is predicted to be insufficient to meet unrestricted demand. At that point computer programs are run which determine withdrawals from each of the local reservoirs. The withdrawals are calculated such that each reservoir has the same probability of refilling by June 1 of the following year. The utilities are directed not to exceed the local reservoir withdrawal targets and to fulfill the remaining demand from the Potomac. The flow in the Potomac is then augmented by releases from both Jennings Randolph and Little Seneca reservoirs.

Due to the 5 to 7 day travel time in the river, releases from Jennings Randolph must be scheduled in accordance with results of forecasts of demands and river flows.

Releases from Little Seneca are made only to make up remaining deficiencies in the Potomac River flow as augmented by releases from Jennings Randolph.

In addition to meeting municipal water supply demands, releases must also be made to accommodate water quality objectives. Those releases made for up-stream water quality objectives are subsequently available for municipal use. However, there is a minimum flow requirement for environmental purposes down-stream of the last of the municipal intakes.

Jennings Randolph Reservoir is operated by the Baltimore District office of the Corps of Engineers (COE), and Little Seneca reservoir is operated by WSSC. Thus, when up-stream reservoir releases are required, CO-OP is in continual communication not only with the three major utilities, but also the COE.

DROUGHT EXERCISES

During summers when flows in the Potomac remain sufficiently high to meet the demands of all the utilities, CO-OP conducts a drought exercise. During the drought exercise, Potomac River flows are assumed to be artificially low. Actual demands are forecast and all other drought operating procedures are followed in a paper exercise. Several times a day water usage figures are obtained from the utilities, and river and reservoir withdrawals are adjusted accordingly. The drought exercises are conducted during the late summer when a drought is most likely to have an effect on water resources. They are designed to exercise the important lines of communication among the principal staff who will be involved. They also provide a regular opportunity for examination and modification of the allocation algorithms. Both operational improvements and changes in resource specifications have been incorporated in past drought exercises so as to keep the algorithms up-to-date with current conditions.

CONCLUSION

Drought management in the Washington, D.C. metropolitan area is anticipated by the development and implementation of efficient operating rules for limited physical resources. This non-structural, cooperative approach to resource shortages would be useful whenever resources will not meet demands, and it demonstrates conservation through efficient resource management. By prior agreement, multiple independent water supply utilities share jointly and individually owned resources (ICPRB, 1982). The allocation of all resources in time of drought is by an independent agency. In any year when operations are not required, a drought preparedness exercise is conducted in order to test lines of

communication and maintain readiness. This arrangement has been working successfully for nine years in the Washington, D.C. area and may be applicable to metropolitan areas in Georgia.

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