

Water Supply and the U.S. Army Corps of Engineers

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Abstract

The purpose of this paper is to present the role of the Corps of Engineers in supplying water to urban and agricultural areas of the United States. The following aspects will be discussed: (1) overview of water supply storage in Corps reservoirs; (2) increasing demand for municipal and industrial water in the U.S.; (3) authorities available to Corps for reallocation of existing storage for additional water supply purposes; (4) Corps assistance during droughts; (5) water supply concerns and the environment, and (6) security issues in managing Corps reservoirs.

Keywords: water supply, Corps reservoir, reallocation

Introduction

Water is important for the well-being of both humans and ecological systems and in many of our recreational and economic activities. Neither man nor plant nor animals could survive without water and water is employed in virtually everything that we do. It is used in industry, used to produce electricity (hydroelectric power); it is very important in both our inland and maritime transportation industry; it is used in the disposal of our waste products. This precious resource also provides cultural and amenity values. Both our way and quality of life depends, to a great extent, on an adequate supply of fresh water.

Our planet earth is blessed with an abundance of this essential liquid, water. It covers about two-thirds of the surface of our planet. On the other hand, the actual supply of fresh water is fairly small. Nearly 97 percent of the water is found in the oceans. Of the remaining 3 percent, about 2 percent is contained in ice caps in the Arctic and Antarctic regions of the world. Much of the rest is underground, temporarily stored in the atmosphere or of such poor quality that it cannot be effectively utilized. Thus, the amount of water that we can actually use from rivers, lakes, streams and underground sources amounts only approximately 0.3 percent of the world's supply.

On the whole, the United States has an ample water supply. While about 1400 billion gallons per day are available, we actually only withdraw about 380 billion gallons on an average day. These numbers to some extent do not reveal the entire story about water shortages in the United States. There are seasonal variations in supply and some parts of the country are mostly dry (the West) while the East has a more dependable water supply.

Role of the U.S. Army Corps of Engineers in Managing Our Nation's Water Supply

The U.S. Army Corps of Engineers, as one of the Nation's largest water management agencies, has been given a major role by the U.S. Congress in assuring our supply of water. Water under Corps management is utilized for our homes, our industries, recreation, agricultural production, generation of electricity,

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flow augmentation for enhanced fish habitat and for water quality.

Although municipalities, in general, have been given the responsibility for municipal and industrial water supplies, the Corps of Engineers has developed and maintained distribution systems for the Washington, DC area and some surrounding cities since the 1860s. The Corps through its reservoirs continues to supply water to municipalities and industries.

With respect to Corps of Engineers facilities that contain water supply storage, this agency, through 235 agreements operates 117 such reservoir projects in 24 states and Puerto Rico having about 9.5 million acre-feet of storage for water supply along with other project purposes such as flood damage reduction, navigation, recreation etc. In total the Corps has constructed over 600 reservoirs with 200 million acre-feet of storage. (An acre-foot is equivalent to one area acre, covered by one foot of water that equals 43,560 cubic feet or 325,851 gallons). It is estimated that if all the water currently stored in Corps reservoirs for water supply needs were utilized, about 85 million Americans could be served for a year. This amounts to about 3 trillion gallons of water for use by communities and businesses.

Agricultural Needs for Water

About 80 percent of the water utilized in the United States is for agricultural purposes, including the irrigation of crops and the feeding of livestock. The U.S. Army Corps of Engineers is a key player in providing irrigation water to farmers, primarily in the Western states along with the Bureau of Reclamation. Farmers in these states are responsible for the cultivation of approximately 10 million acres of land, resulting in the production. Presently, about 57 million acre-feet of storage has been included in 50 Corps projects for irrigation and other joint use purposes. Most of this water storage (84 percent) is located in Corps reservoirs in the states of Montana, North Dakota, and South Dakota, in the Missouri River Basin.

Reallocation Authority

The Corps of Engineers can reallocate existing reservoir storage for water supply and to include such uses along with other project purposes. This type of authority has great potential to supply additional sources of water due to the fact that few new projects are being built. Reallocation of water storage includes:

- Dedication of space in a reservoir, presently not being utilized.
- Transfer of space from some existing uses to water supply purposes.
- Physical modification of dam (raising its height etc.) to increase the storage capacity.
- Changes in reservoir operating patterns to better optimize project benefits.

About 50 such allocations have been completed at Corps facilities, resulting in the reallocation of over 400,000 acre-feet of storage.

Corps Assistance during Droughts

A drought may be defined as a time of below normal precipitation, resulting in water supply shortages. Such droughts may result from normal variations in the weather or possibly be a by-product of global warming, El Niño, etc. In times of drought, the Corps of Engineers may assist in the reduction in some of the effects of these water-scarce periods. This assistance may take on several forms:

- Contingency water--The Corps can coordinate with state or municipalities to temporarily withdraw water from existing Corps projects to augment normal needs. These efforts may also involve meetings or other coordination sessions with water agencies to maximize regional or local water needs.
- Planning assistance to states--States can receive Corps water resources planning expertise on cost-shared studies.
- Emergency supplies of water--Water can be provided from Corps reservoirs to a municipality if water is sub-quality or

contaminated and may pose a public health threat.

- Construction of emergency wells and water transportation--The Corps can construct wells under its emergency power authorities or transport water after a determination is made that farms and/or communities etc. are likely to be impacted by a drought.

Corps of Engineers Water Management and the Environment

The Corps performs many studies involving water supplies every year to protect and restore the environment. Many of these studies and projects involve improving fish and wildlife habitats by reallocating supplies or revising reservoir operating procedures.

On rivers or streams that may have periodic low flow conditions, the Corps can temporarily store water in its reservoirs and periodically release it to increase flow, and thus improve habitats and enhance overall water quality in the stream. The Corps has currently 89 environmental storage projects underway to supplement low stream flows.

A number of other studies are presently being conducted by the Corps whose purpose is to improve environmental conditions for selected fish species. An example of this is a water supply analysis being done on the Snake River in Idaho. The goal of the study is to identify actions to improve Chinook and sockeye salmon runs.

Environmental considerations are a top priority in Corps water supply projects. The Corps carefully evaluates methods to minimize negative environmental impacts and to enhance the environmental benefits of each project.

Population Growth Equal Greater Water Demand

The population of many urban areas in the United States is increasing at a rate that is

compelling these areas to develop new sources of water to meet growing needs. Even though water today is being more efficiently managed, our population growth is exceeding these efficiencies. Many of these growing regions are located in the Mountain and Southwest states. The percent of growth in some of these areas during the past ten years demonstrates the need to increase availability of fresh water supplies:

- Nevada, 66 percent
- Arizona, 40 percent
- Colorado, 31 percent
- Utah, 30 percent
- Idaho, 29 percent

In the Western states, the development of water resources for irrigation has often been the highest water priority. However the total withdrawal of water for all purposes in the U.S. has declined principally due to reductions in water usage for irrigation and mining. In a few areas, this allows the Corps or other water agencies to reallocate water previously reserved for irrigation to municipal and industrial water supply.

Our Aging Water Infrastructure

Federal, state and municipal water supply reservoirs, diversion structures, pipelines, wells, water treatment plants distribution lines are called collectively our water infrastructure. In several areas of the U.S., major parts of this infrastructure are from 50 to 100 years old or older and should be replaced or upgraded. Such rehabilitation on a massive scale offers several challenges and can be quite expensive. However, the rehabilitation of these aging structures can present several opportunities, including the following:

- Conservation of water supplies by better transport systems and water treatment plants.
- Use of a variety of incentives to conserve water.
- Use of economies of scale through combining numerous small water systems into a larger regional facility.

- Upgraded security of water supply systems against chemical and biological threats.

The Corps of Engineers may do water storage reallocation studies that sometimes includes the planning of the design level and estimates of cost and associated expenses to other portions of the distribution system. Reallocation is very relevant if a potential exists to combine municipal or regional approaches.

Economic Benefits of Corps Water Supply

Economic benefits associated with Corps water supplies have been estimated to include the following:

- About \$770 million in annual benefits attributable to 3 trillion gallons of water stored in 117 Corps projects.
- At 750 gallons per capita per day, these 3 trillion gallons would satisfy water requirements of every American for approximately 17 days.
- The Corps supplies 18.5 trillion gallons of water for agricultural purposes and other joint use water needs.

Security Issues

The September 2001 terrorist attacks generated concern at all levels of water resources management about the security and safety of our water supply facilities. Perhaps on a more positive note, it should be borne in mind that our country's water supply is safe and not as nearly vulnerable to a terrorist attack or contamination as it first may appear.

This is true in part because security has been a high priority in the design, management and operation of our water supply systems. Most of these systems are subject to stringent testing and monitoring. Secondly, the quantity of water treated at most municipal facilities is so large and that it would potentially take many tanker loads of chemical and biological contaminants to circumvent the powerful dilution and

treatment processes employed in the purification of water. In addition, physical barriers such as fences, monitoring systems and frequent water quality testing make it highly unlikely that contaminants could be added to the system without immediate detection.

Conclusions

As one of the Nation's largest water management agency, the U.S. Army Corps of Engineers has been given a major role by Congress in assuring adequate supplies of municipal, industrial and agricultural water supplies from its reservoirs. In addition, water from these same facilities is used for recreation, generation of electricity, enhancement of water quality and instream flows for fish and wildlife needs. The Corps can reallocate existing storage to augment water supply uses. Additionally, in times of drought, this same agency may assist states and municipalities by providing emergency water and other forms of drought assistance.

Acknowledgments

The author of this paper appreciates the reviews of Mr. Ted Hillyer of the Army Institute of Water Resources and Mr. Lawrence Merkle of the Seattle District, Corps of Engineers.

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