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Division of Water Supply Protection
www.mass.gov/dcr/watersupply.htm

Water Level Control

When it rains, it pours...into the reservoirs

John Gregoire, MWRA Reservoir Operations Program Manager



The Wachusett Dam holds back up to 65 billion gallons of water from the Nashua River in the Wachusett Reservoir. While the amount of water varies with the weather and the seasons, the supply to the river remains relatively constant.

A reservoir is essentially a bowl designed to collect runoff from its watershed. Some reservoir watersheds are considered “flashy” in that they are less able to absorb rainfall, resulting in runoff that quickly fills the bowl. Typically this is due to a high percentage of impervious surfaces, like paved parking lots. Large watersheds with substantial forest cover have a greater ability to act like a sponge and hold the rainfall and release it more slowly. Even these watersheds, however, can become saturated, for example with spring rainfall on top of melting snowpack, resulting in more runoff filling the bowl. Reservoir managers have to balance runoff with existing water levels and operational needs for each reservoir.

DCR’s Division of Water Supply Protection oversees the well being of the reservoir systems and the land that surrounds them. The Massachusetts Water Resources Authority (MWRA) operates spillways, gates and valves at source and emergency distribution reservoirs to maintain elevations for water supply needs, as well as to control routine and storm-related inflows and releases for dam safety, and public safety downstream. The two agencies work cooperatively to operate this massive, complex system that provides drinking water to a third of the state. These

operations vary across the system and the seasons.

MWRA monitors reservoir elevations, precipitation, inflows and discharges at all of the reservoirs (see Page 4). Data are collected hourly and daily and several reports are generated to keep a wide audience of MWRA, DCR and other interested parties informed. The following details the way the reservoirs in this drinking water system are managed.

Quabbin Reservoir

The Quabbin Reservoir watershed is 120,000 acres (187 square miles). This source reservoir’s surface area is 38 square miles. There is a main spillway at

Continued on Page 4

Kiosks Along Route 122 Describe Lost Villages

Remembrance of a busy time By George Barnes, Worcester Telegram and Gazette (reprinted with permission)

There are few reminders anymore, but along Route 122 from Paxton through Petersham was once a thriving area of industry and community life.

The small villages along the way were lost to the need for good drinking water, and there has been little until now to remind people of the history of the area.

Through the efforts of local residents, the Central Massachusetts Regional Planning Commission, the state and the Federal Highway Administration, some of that history is now available to those traveling the Route 122 Lost Villages Scenic Byway, if



Jonathan Yeo, at left, director of DCR's Division of Water Supply Protection, and Wesley Dwelly of Oakham talk after an unveiling ceremony for the Route 122 Lost Villages Scenic Byway information kiosk in Oakham. (Photo: T&G Staff/Paul Kapteyn)

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Wachusett Dam

they are willing to stop for a few minutes, read a bit and look around.

“People drive a scenic byway and all they see is scenery, not history,” said Bill Musha of Oakham, whose family came from the lost village of White Valley, which is on the Oakham-Barre line.

In helping dedicate historical kiosks for Coldbrook Springs in Oakham and White Valley, Mr. Mucha said the history is there for people willing to stop.

In Coldbrook Springs a kiosk and an engraved stone mark the area. Wes Dwelly of Oakham said the area once had inns, homes, stores, a post office and factories.

“Along here there were once three gas stations,” he said. “Now there are none in Oakham, and Barre has one.”

One family, the Parker family, was so prominent and successful with businesses that Coldbrook was also called Parkersville by many people.

The Route 122 Lost Villages Scenic Byway includes Barre, Oakham, Paxton, Petersham and Rutland and is being extended into Franklin County

to Orange. Along with Coldbrook Springs and White Valley, the lost villages include Moore State Park in Paxton, Nichewaug Village in Petersham and the Village of West Rutland. All were lost because of the creation of the Quabbin Reservoir and Wachusett Reservoir and the need to preserve land around water sources to keep the reservoirs clean.

At the dedication of the White Village kiosk, Barre Selectman Kathlyn Inman suggested the lost villages present a teaching opportunity.

“All students who are juniors in Boston schools should take a civics course about the Quabbin Reservoir and what each of us have given up,” she said.

Trish Settles of the Central Massachusetts Regional Planning Commission said the lost villages byway is 29 miles, and more kiosks are planned along the way to give visitors an opportunity to discover the history of the area, which is now generally undeveloped state watershed land.

Continued on Page 6

Fishing Wrap-Up

Another great season at Quabbin Reservoir

Paul Lyons, DCR/DWSP Environmental Analyst

Quabbin Reservoir provides high-quality fishing opportunities in a wilderness-like setting for tens of thousands of visitors each year. The clear clean water, varied aquatic habitats, and outstanding scenery make for rewarding experiences, regardless of the catch!

The Quabbin fishing season runs from mid-April through mid-October, and in a typical year, more than 30,000 visitors use the three Boat Launch Areas (BLAs) that DCR operates at the reservoir. Those with a fishing license can launch their own boat or rent a rowboat, motorboat, canoe or kayak for very reasonable full or half-day rates. Once on the reservoir, they have access to more than 15,000 acres of prime fishing habitat. Although 27 fish species can be found at Quabbin, particularly popular target species include lake trout, landlocked salmon, several bass species and rainbow trout.

In addition to those who access the reservoir through the three BLAs, an unknown number of fishermen choose to hike in through one of many gates around the reservation to fish from the shoreline. More than 46 miles of reservoir shoreline are open to shore fishing.

Quabbin was first opened for fishing (from portions of the shoreline) in 1946 – just 2 weeks after the reservoir filled for the first time. Boat fishing was first allowed in 1952; by 1954, almost 18,000 anglers fished from boats on the reservoir. More than 12,000 others fished from the shoreline.

Since then, numbers of users have fluctuated, usually in response to weather conditions. During the 2015 fishing season, more than 30,700 people visited Quabbin’s BLAs – almost 12,000 used DCR rental boats; more than 14,000 launched private boats; and about 3,500 parked at a BLA and then fished from shore.

Despite the modest rates, DCR still generates a fair amount of income - from its boat rentals and from parking and boat launching fees. Those revenues only partially offset the cost of operating the fishing program. Since 2009, fishermen have been able to purchase a Season Pass that allows them to park and/or launch a private boat all season long for just one initial fee. On average, more than 600 people annually use this money-saving option. In 2014, one avid fisherman used his season pass 106 times!

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Quabbin’s Fishing Area 3 Named to Honor Senator Stephen Brewer



Quabbin Reservoir’s Fishing Area #3 was dedicated in October of 2014 to honor retired State Senator Stephen M. Brewer. State officials, local legislators, and members of the senator’s family gathered at Quabbin Fishing Area #3 in Hardwick for a ceremony to designate the facility as the “Stephen M. Brewer Fishing Area.” Senator Brewer served in the Massachusetts State Legislature since 1988, representing the second largest Senate district in the Commonwealth. A long time advocate for parks and open space issues throughout the state, Senator Brewer was a passionate supporter of effective watershed management, as it had a direct impact to his constituents. He led the creation of the Water Supply Protection Trust in 2004, which provides effective oversight, support and consistent funding from MWRA to DCR’s Division of Water Supply Protection for watershed protection.



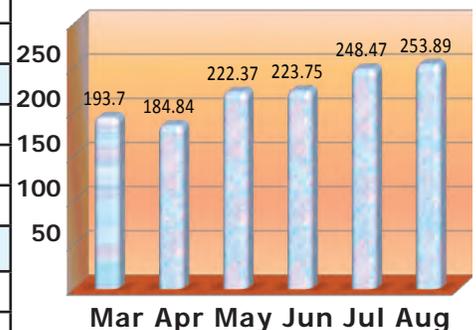
A peaceful day fishing on the Quabbin Reservoir.

- Reservoir Watch -

Reservoir levels and 6-month precipitation

Reservoir	Quabbin	Wachusett
Minimum	526.01'	387.12'
% Full	92.6%	84.5%
Date(s)	8/31/15	3/26/15
Maximum	528.37'	390.87'
% Full	96.9%	91.8%
Date	4/28/15	6/23/15
Precipitation	20.85"	17.17"
Seasonal Avg	25.09"	23.18"

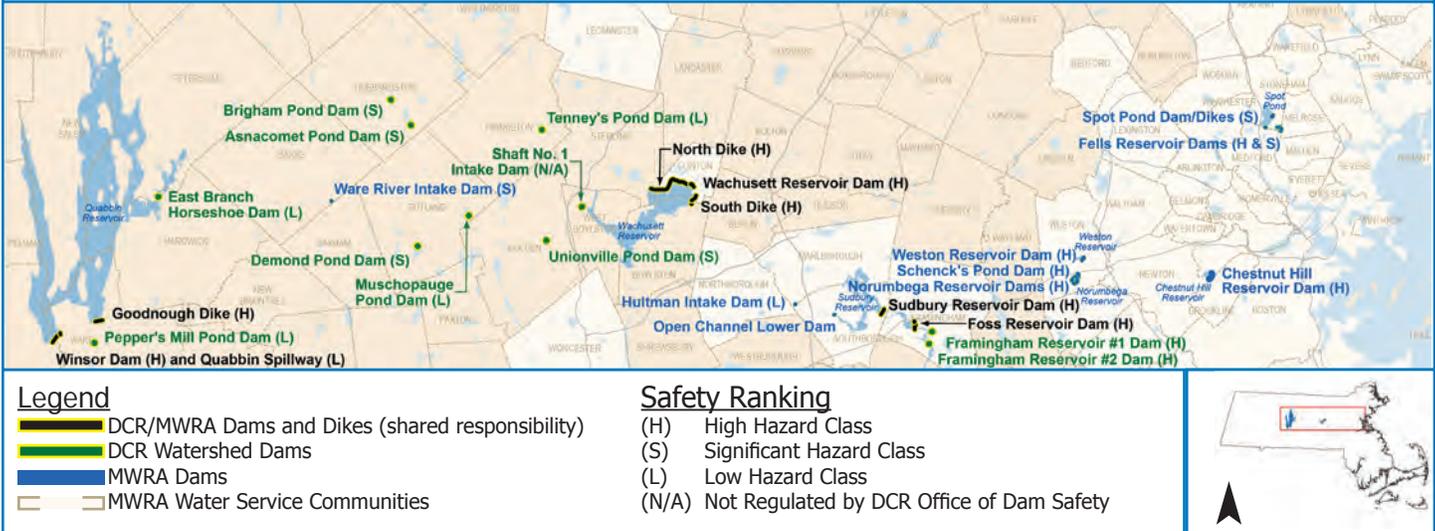
System-wide 6-month Water Usage (in million gallons per day) March to August 2015



Water Level Control From Page 1

Dams and Reservoirs in the DCR/MWRA Water Supply System

This map of the DCR/MWRA reservoir water supply system shows the dams and reservoirs that are located across the state from Quabbin to Boston. The light shaded communities are many of the 51 municipalities that obtain their water supply service from MWRA and DCR. The safety ranking lists the hierarchy of dams under the regulations enforced by DCR's Office of Dam Safety.



530 ft. elevation (full reservoir) with a lower notch at 528 ft. elevation. This lower spillway has stop logs which can be inserted and removed to release water. MWRA consults with DCR Quabbin staff over this operation. There is also an auxiliary spillway which has never been used since the reservoir first filled in 1941.

MWRA releases water through two recently upgraded valves into the Swift River. Under a 1927 "War Department" Permit, a minimum flow of 20 million gallons a day (MGD) must be released daily to the Swift River, which flows to the Chicopee River and then the Connecticut River. The permit also requires higher

releases of 45 MGD and 71 MGD when the Connecticut River reaches lower flows between June 1 and November 30.

Given the massive size of Quabbin, however, there is really little that can be done to "control" the elevation in a short time frame. In a wet year Quabbin is like a large freight train, it is slow to gain momentum but, once it starts, it will continue to fill and then spill. For example, in 2006, Quabbin spilled continuously for 306 days!

Wachusett Reservoir

The Wachusett Reservoir is the catchment for a watershed that is 75,000 acres (117 square miles). This

source reservoir is managed very differently than Quabbin. The reservoir elevation is maintained in the range of 390 ft. to 391.5 ft.; when there is full ice cover the operating band is dropped to 388 ft. to allow storage for spring runoff. As required by an 1895

Massachusetts statute, MWRA must release 12 million gallons to the Nashua River each week; this amount is often exceeded. During the non-winter months, this is typically done by release of water through the fountain below the main dam.

The reservoir's spillway design analysis required a full Probable Maximum Flood analysis because there is a hydropower facility at Cosgrove Intake that is permitted by the Federal Energy Regulatory Commission. That analysis required a major reconstruction of the main spillway, an expanded auxiliary spillway and a new hydraulically-operated 100 ft. long stainless steel crest gate.

Wachusett Reservoir elevation is much more responsive to storm and runoff events than Quabbin because it is a smaller reservoir with a smaller watershed with a bit more impervious surface. For major rain storms or hurricane preparation, MWRA can lower water elevation by releases through a valve in the main dam's Lower Gatehouse. Should the reservoir elevation be above 390 ft., the spillway crest gate can also be used to discharge



The Quabbin Reservoir's spillway releasing water over the top of the wall (used when the reservoir exceeds 100% capacity) and the lower spillway. The lower spillway enables water releases even when the reservoir is not completely full.



Wachusett crest gates, raised (at left) and lowered (right) allowing excess water to flow through the spillway and into the Nashua River

excess water. During major storms, MWRA will often adjust the crest gate elevation throughout a storm period to “pace” inflows to outflows so as not to create downstream problems in the Nashua River. MWRA staff monitors Nashua River conditions from just below the Wachusett Dam and at critical nodes along the river as it flows downstream.

Sudbury Reservoir System

During the late 19th century, the Sudbury Reservoir System was the primary source of drinking water for the much smaller but rapidly growing Boston area. But with the completion of the Wachusett reservoir in 1906, this system was designated to backup status, where it remains today ready to be employed if an emergency need should arise.

The Sudbury Reservoir watershed is 14,000 acres (22 square miles). This emergency source reservoir is managed in conjunction with the downstream Foss Reservoir. According to an 1872 law, MWRA must release 1.5 MGD to the Sudbury River from this system, which includes the off-line Stearns and Brackett Reservoirs (Stearns, Brackett, and Foss Reservoirs are commonly referred to, respectively, as

Sudbury Reservoir dam has a main spillway, but elevation control is done predominantly by the operation of sluice gates. There is a one foot

operating band at Sudbury Reservoir. Sluice gates are raised to discharge water into Stony Brook, which discharges to Foss Reservoir. At just 3,400 acres (five square miles), the Foss Reservoir watershed is truly “flashy” with the elevation responding quickly to large rain storms. When gate operations are made at the Sudbury Gatehouse, there is typically an associated gate opening at the Foss Reservoir Gatehouse, which releases to Stearns Reservoir, and subsequently spills to the Sudbury River. Maintenance of the 1.5 ft. operating band at Foss Reservoir prevents uncontrolled spilling. MWRA lowered the operating bands in the spring of 2015 to accommodate runoff from last winter’s

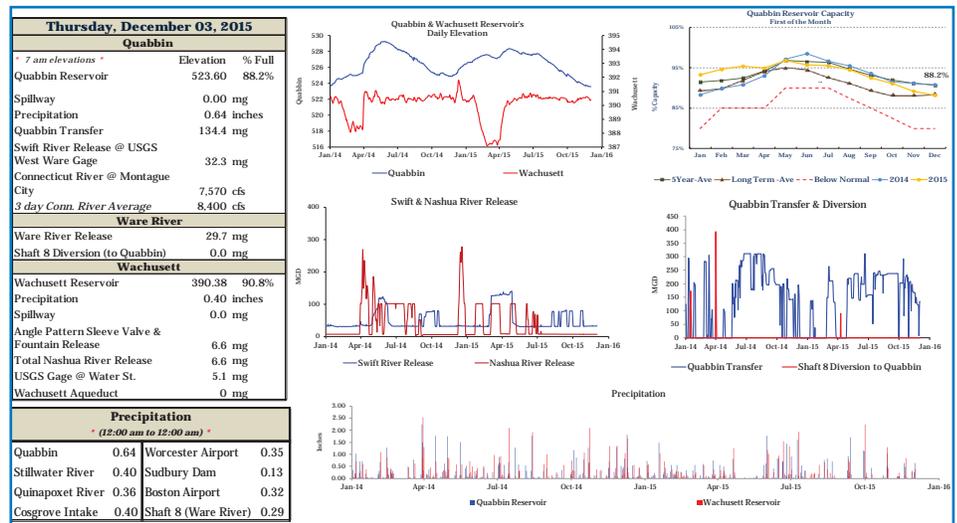
record snowpack in the watersheds to prevent uncontrolled spilling.

MWRA elevation control in the Sudbury system is much attuned to downstream conditions given the urbanized nature of the Sudbury River area. MWRA staff routinely monitors the Sudbury River at Saxonville for flood conditions during significant rain events. There are limits, however, to MWRA’s ability to control flows to the Sudbury River, though at times the gates at both Sudbury and Foss Reservoirs are closed to temporarily detain water or more water may be released in advance of a storm to create storage. MWRA also cooperates with the Northeast River Forecast Center by routinely providing reservoir operations data for their flood modeling. The last time these two reservoir spillways were activated was during a series of spring storms on top of snow-melt in 2010.

MWRA Distribution Reservoirs

There are a number of smaller emergency distribution reservoirs in the MetroWest and Metro Boston areas that are also part of the overall water transmission system. Most distribution reservoirs were originally designed to be filled by aqueducts and drawn down periodically accord-

Continued on Page 6



An example of the daily water report produced by MWRA for quick reference to vital water flow and usage information.

Route 122 Kiosks - from Page 2

“This is in recognition that the villages and their history is compelling,” she said. “We encourage tourists to travel the byway, to explore, to seek and understand.”

The focus on the lost villages is also an effort to put a focus on the communities Route 122 passes through and the businesses visitors might like to discover. Not far from Coldbrook is

Oakham Common, a tiny but perfect New England common, and the road travels through Paxton and Barre commons. Barre Common is under reconstruction. The route also passes close to the centers of Petersham and Rutland.

Ms. Settles said this is only the beginning. Along with the already listed lost villages, there will be a

focus on the lost towns of the Quabbin Reservoir, Indian caves in New Salem, the Rutland Prison Camp and other small mill villages and farm settlements.

There are six state-designated scenic byways in Western Massachusetts. The Lost Villages byway is the only one in Central Massachusetts. They are all part of the U.S. Department of Transportation’s National Scenic Byway program. ♦



Kiosks with posters describing the “Lost Villages” in central Massachusetts are placed along a 29 mile stretch of Rt. 122 from Paxton to Orange.

Quabbin Fishing - from Page 3

For the most part, the Quabbin boat fishing program has operated on a seven day a week schedule. However, it’s also gone through a number of changes in recent years, largely in response to factors beyond DCR’s control. Following the events of September 11, 2001, the reservation was temporarily closed to all public access. In 2009, when zebra mussels were discovered in a western Massachusetts lake, private boat launchings were halted for several weeks, until a

program of boat inspection and decontamination was put in place. Since then, only boats that are contaminant-free and secured with a DCR seal are allowed to launch on the reservoir.

In addition to the boat decontamination program, several other regulations and/or procedures help to minimize potential environmental impacts from the fishing program. For example, DWSP is switching its rental motors over to larger but cleaner 4-stroke outboard motors and is providing the

same incentive to private boat owners as well. The state has also banned all lead sinkers and fishing jigs to reduce incidents of lead poisoning in loons.

DCR has run a fishing line recycling program since 2006 that has 10 collection containers for used monofilament line placed at key locations around the reservoir for use by fishermen. In 2014 alone, that program removed 42,000 feet of fishing line from the Quabbin environment, thereby reducing a major threat to the health of loons, cormorants, owls, and other Quabbin wildlife. ♦

Water Level Control - from Page 5

ing to demand needs. All of these reservoirs are maintained at specific operating bands. Excess water can be discharged through drains as needed. Some of these reservoirs, such as Norumbega Reservoir in Weston, and Fells Reservoir and Spot Pond in Stoneham, have emergency spillways designed for major flood events. Yet others such as Weston Reservoir in Weston, and Chestnut Hill Reservoir in Boston, do not have spillways. Chestnut Hill Reservoir has practically no watershed, so runoff and flooding there is not generally a concern. Weston Reservoir has a small water-



Left: The Foss Dam spillway in Framingham. Above: Parapet wall at Weston Reservoir.

shed so that a major storm event, with the right combination of conditions, could produce enough inflow to overtop the dam. For that situation, based on a detailed analysis, MWRA constructed a parapet wall (also known as a wave wall) to contain the design

storm inflows and protect the dam from overtopping.

MWRA and DCR will continue to cooperatively monitor the water levels of its reservoirs. The goal is for each facility in the drinking water supply system to continually meet state and federal requirements, including downstream releases. ♦

Just for Fun

The Flood Control Word Search

The words below are taken from the flood control article starting on page 1. See if you can also find them in the puzzle; they are vertical and horizontal as well as forwards and backwards.

Good luck!

WORD LIST:

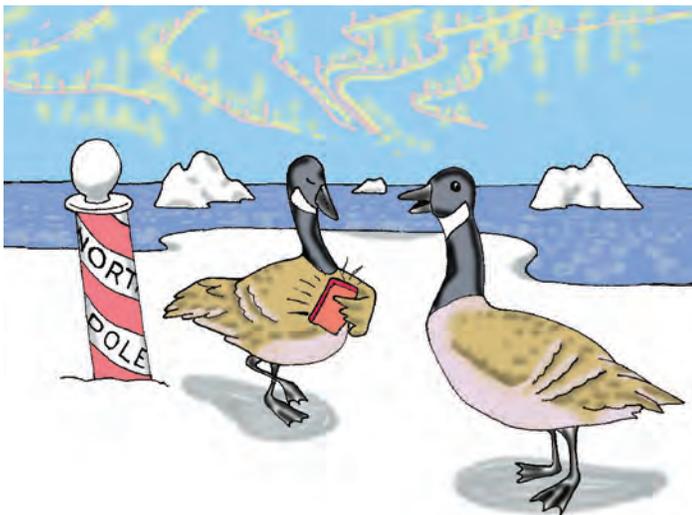
- | | |
|-----------|------------|
| Dams | Downstream |
| Flood | Measure |
| Quabbin | Rain |
| Reservoir | River |
| Runoff | Saturated |
| Sluice | Snow |
| Spillway | Storm |
| Valve | Wachusett |
| Watershed | Weir |

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R U N O F F V Z N I V U X D F
T J D I D M E A S U R E S H C
T M W J B C K Q U T P Z F L R
H C Z S M A D U Z F V A L V E
N B D J V A D N I A R W R P C
I W A T E R S H E D W O F S K
B E M D O O L F K M S W S I J
B S D O W N S T R E A M E M M
A Q V B I V S P I L L W A Y R
U Q R C R I O V R E S E R H O
Q T H Q R E V I R J X I B F T
E C I U L S Q N C V Z R T G S
M P D E T A R U T A S N O G R
H L M Q T T E S U H C A W G J
L T X J C S P N W O N S F B D
    
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And another thing...

by J. Taylor



"I don't care what that thing says.
This doesn't look like Florida!"

For more information about...

Dams and Flood Control

MWRA Dam Safety Modification Projects

www.mwra.com/projects/2011/dams/damsafety.html

DCR Office of Dam Safety

www.mass.gov/eea/agencies/dcr/conservation/dam-safety

Mass Scenic Byways

Route 122

www.bywayswestmass.com/byways/route-122/

Other Western Mass Scenic Byways

www.bywayswestmass.com/

DCR Fishing

Quabbin

www.mass.gov/eea/agencies/dcr/water-res-protection/watershed-mgmt/quabbin-reservoir-fishing-guide.html

Wachusett/Sudbury

www.mass.gov/eea/agencies/dcr/water-res-protection/watershed-mgmt/wachusett-and-sudbury-reservoir-fishing-guide.html

MassParks

www.mass.gov/eea/agencies/dcr/massparks/recreational-activities/fishing.html

Then and Now

Reservoir Discharges

By Clif Read, Director, DCR Quabbin Visitors Center and Joel Zimmerman, DCR Regional Planner

The Swift River exits the Quabbin Reservoir through the Winsor Dam Outlet Works and when water is flowing over the Winsor Dam Spillway, via the Spillway Channel. The Outlet Building was constructed in the late 1930s to regulate the release of water back into the Swift River.

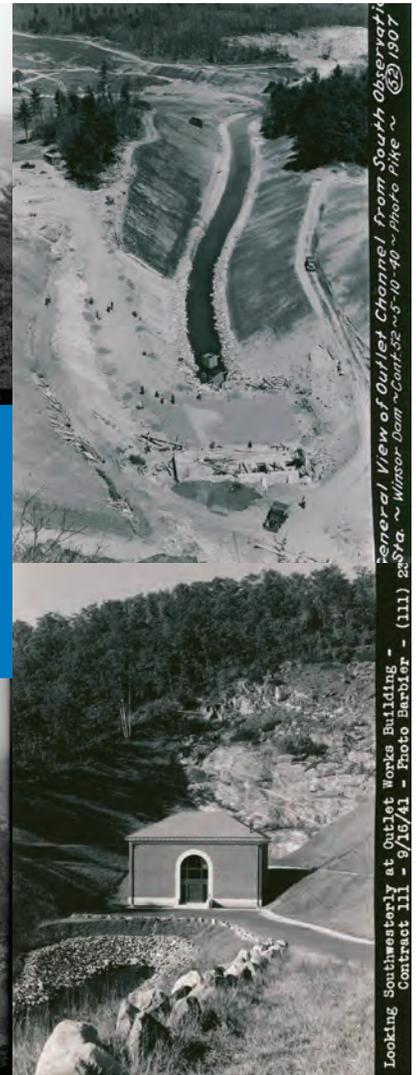
A minimum of 20 million gallons per day is released, as required by a 1927 law, into the Discharge Channel which flows southeastward to meet the Spillway Channel at the “Y” Pool, a popular catch and release fly fishing spot. From there, the Swift River resumes its historical channel southward where it joins the Ware and Quabog rivers to form the Chicopee River. The Chicopee flows westward for 15 miles where it meets the Connecticut River.

The Wachusett Reservoir also has legally mandated discharges: 12 million gallons must flow to the Nashua River each week. This water passes through the fountain below the main dam or flows via the spillway.

See current views of the Wachusett Dam on pages 1 and 2. ♦



Center: Construction of the Wachusett Dam in May 1903 (top) shows the discharge pipes that will carry water from under the dam, through turbines, and down the Nashua River through a fountain. The base of the fountain can be seen below, along with significant progress on the dam in just five months. Right: The Quabbin Outlet works and channel under construction in 1940 (top) and completed in 1941 (below).



General View of Outlet Channel from South Observatory - 2337a. ~ Winsor Dam - Cont. Se. - 3-10-40 - Photo Pike ~ © 1997
Looking Southwesterly at Outlet Works Building - Contract 111 - 9/16/41 - Photo Barber - (111) 2337a

downstream

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Downstream is produced twice a year by the Massachusetts Department of Conservation and Recreation, Division of Water Supply Protection. It includes articles of interest to the Watershed System communities. Our goal is to inform the public about watershed protection issues and activities, provide a conduit for public input and promote environmentally responsible land management practices.

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