

The Metropolitan District

Water Bureau Presentation May 18, 2016



• WATER SUPPLY SAFE YIELD

• DROUGHT

• WATERSHED MANAGEMENT

ACTIVE WATER SUPPLY SOURCES

- Nepaug Reservoir
 - 9.5 BG
 - completed in 1917
- Barkhamsted Reservoir
 - 30.3 BG
 - completed in 1940



These reservoirs provide drinking water to a population of approximately 400,000 people



WATER SALES IN THE MDC'S EXCLUSIVE SERVICE AREAS AND SALES OF EXCESS WATER

- The MDC does not have contracts with any of its customers within its exclusive service area. The MDC does have contracts for sale of excess water to customers outside of its exclusive service area.
- Examples outside of service area:
 - Portland
 - Unionville



MDC'S WATER COMES FROM SURFACE WATER RESERVOIRS





NOT FROM GROUNDWATER WELLS





MDC SAFE YIELD

- The CT DPH approved "SAFE YIELD" for the Barkhamsted/Nepaug Reservoir System is 77.1 MGD
- The MDC uses a more conservative approach (1960s drought) than the 1-in-100 year drought analysis required of all water companies by the CT DPH.
- Safe Yield using the CT DPH guidelines would be 83.9 MGD for Barkhamsted and Nepaug reservoirs.
- Safe yield calculation was developed and approved in 1996.DPH, DEEP, OPM and PURA reviewed and approved the water supply plan in 2003 and 2012.

CALCULATION OF SAFE YIELD

Factors Considered: STORAGE CAPACITY

INFLOW:

- Direct Rainfall
- Run-off from Watershed (Typically 55-70% of precipitation)
- Transfers from other reservoirs

OUTFLOW

- Water Supply Withdrawals
- Spillage over spillway
- Downstream releases
- Losses (Evaporation + Seepage)



RESERVOIR INFLOWS AND OUTFLOWS







1960s DROUGHT

YEAR Daily Produc (MGD)	Average Daily Production	Total Annual Precipitation Nepaug	Precipitation Deficit (100 YR AVG 47" per year)	Reservoir Levels		
	(MGD)	Reservoir (inches)		Percent Capacity End of Year (Barkhamsted + Nepaug)	Volume in Storage End of Year (Billion Gallons)	Days Supply at Average Daily Demand (Days)
1965**	49.11	31.34	-15.66	42.0	16.7	340
2001	58.94	42.99	-4.01	77.8	30.9	525
2015	49.60	41.31	-5.69	87.9	35.0	705

**Safe yield of 77.1 MGD is based on the extreme drought event of 1965

WHY THE 1960S DROUGHT IS STILL APPROPRIATE

- MDC's reservoirs are LARGE, Multi-Year Reservoirs.
- Larger reservoirs have sufficient storage to carry them through short term droughts (less than 1 year).
- Large reservoirs with storage ratios greater than 150 MG per Square mile are insensitive to short term droughts and have sufficient storage to last through multi year droughts such as 1960s.

- Historic Drought of Record for Connecticut.
- Almost 16-inch rainfall deficit.
- More Severe than 100 year drought.
- MDC's analysis uses real stream flow gage data which is monitored for changes.

DROUGHT

Why aren't residents given priority over businesses in a drought?

- A mandatory restriction on public water for commercial entities so residential customers can wash their cars and water their lawns would effectively halt all commercial activity in the state, closing restaurants, manufacturing facilities, hospitals and alike.
- CT DPH already has the discretion to prioritize water customers in the event of an emergency under existing law.
- As to residential use, the MDC's drought contingency plan does not include ANY restrictions on the use of water for drinking and sanitary purposes under any circumstances.
- Historically, any time the MDC has requested a water use restriction in the last 50 years, it has been voluntary, including the severe drought of the 1960s.
- In fact, actual data recorded at the MDC's Nepaug Reservoir over the last 100 years has shown that the annual precipitation has *increased* by almost 10% over that time period.

DROUGHT CONTINGENCY PLANNING

(MDC's "DROUGHT CONTINGENCY PLAN" is approved by CT DPH and is based on "<u>Connecticut Preparedness and Response Plan</u>" created by CT DEEP, CT DPH, CT DPUC, CT OPM, and CT Office of Emergency Management).

DROUGHT TRIGGERS:

- Days of Water Supply Remaining in reservoirs.
- Percent of Reservoir Capacity.

DROUGHT STAGES:

- Drought Advisory
- Drought Watch
- Drought Warning
- Drought Emergency



DROUGHT CONTINGENCY PLANNING

- MDC monitors:
- Reservoir Levels
- Precipitation
- Streamflows







MDC uses the 1960s drought to calculate its safe yield as it is the worst on record in CT, with a 16 inch rainfall deficit.

Stream flow gages serve as real stream flow data confirmation that the safe yield calculations based on the drought of 1965 are still valid today.

USGS Data – Hubbard River

≊USGS

USGS 01187300 HUBBARD RIVER NEAR WEST HARTLAND, CT





PLANNING FOR THE FUTURE

- IMPACT OF BUILDING and LAND DEVELOPMENT
- IMPACT OF CLIMATE CHANGE
- SOURCE WATER PROTECTION

CHANGING CONDITIONS

What we are seeing:

- Increasing ANNUAL RAINFALL Totals At MDC Reservoirs Over The Past 50-100 Years.
- Increase In EXTREME STORM EVENTS and FLOODING.

What we can expect

- Increase in average temperature.
- Continued increase in annual precipitation with more intense, heavy rain events.
- Impact on water quality due to increased run-off.
- Increase in Evaporation.

Total Precipitation (inches)666666 YEAR

Nepaug Reservoir- Total Annual Precipitation 1913-2015 (Inches)



2016 Drought Outlook

U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for April 21 - July 31, 2016 Released April 21, 2016

> Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Drought persists

Drought remains but improves

Drought removal likely

Drought development likely



http://go.usa.gov/3eZ73





Hotter/Drier Conditions (Interior West)

Heat Trapped by the Atmosphere Causes more Evaporation

Hotter/Wetter Conditions (NE and Coasts)



MDC Watershed Management Unit

 Responsible for protecting and managing the lands that drain to our water supply reservoirs



 Goal is to provide an abundant source of clean water to our water treatment facilities



Source Water Protection

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Water quality sampling - • Watershed inspections reservoirs and streams





Source Water Protection

- Review land use proposals in the watersheds
- Monitor on-going development & other activities
- Emergency spill response
- Patrol & enforcement





The cumulative impact of residential and other development results in more impervious surfaces (roads, driveways, parking lots, roof tops, sidewalks), less ground water infiltration, and an increase in storm water runoff to streams and reservoirs.

A rule of thumb for any given watershed or drainage area: Water quality decreases

as impervious surfaces increase.



This graphic is taken from UCONN's NEMO Fact Sheet #3 entitled: Impacts of Development on Waterways.

Source Water Protection

- Watershed Land Acquisition & Protection
- Acquired 211 acres since 2006 -4 parcels in 3 different watersheds
- 2013 protected 2 parcels (715 acres) in the Barkhamsted Reservoir watershed through a partnership with the Commonwealth of MA, Town of Granville, and New England Forestry Foundation





A healthy forest and watershed protects both the quality and quantity of our water supply for the future.