



IFC Region 4 State Drought Management Plan Summary

Brian D. Murphy

Drought of Record 1962-67

Federal Aid Plan To Be Determined

Study Of Drought Conditions In East Ordered By President

WASHINGTON (UPI) — President Johnson has ordered a study to determine how the federal government can help meet severe drought problems in the New England and Middle Atlantic regions.

Concern is growing over the continuing drought in the eastern United States," Johnson said. "We must do whatever we can to help the people of the Eastern Seaboard in their plight."

Johnson issued a statement after conferring about the drought with Buford Ellington, head of the Federal Office of Emergency Planning. Press Secretary Bill D. Moyers said

Johnson directed Ellington to "move ahead as rapidly and efficiently as possible" to coordinate federal and state efforts to cope with the problem.

The President asked for a report within a week.

In his statement, Johnson noted he comes from "a part of America where droughts are depressingly familiar."

"I know the anxiety they bring," he said. "I also know our water requirements will grow at an incredible rate in the years ahead, at the stimulus of expanding populations and new industries."

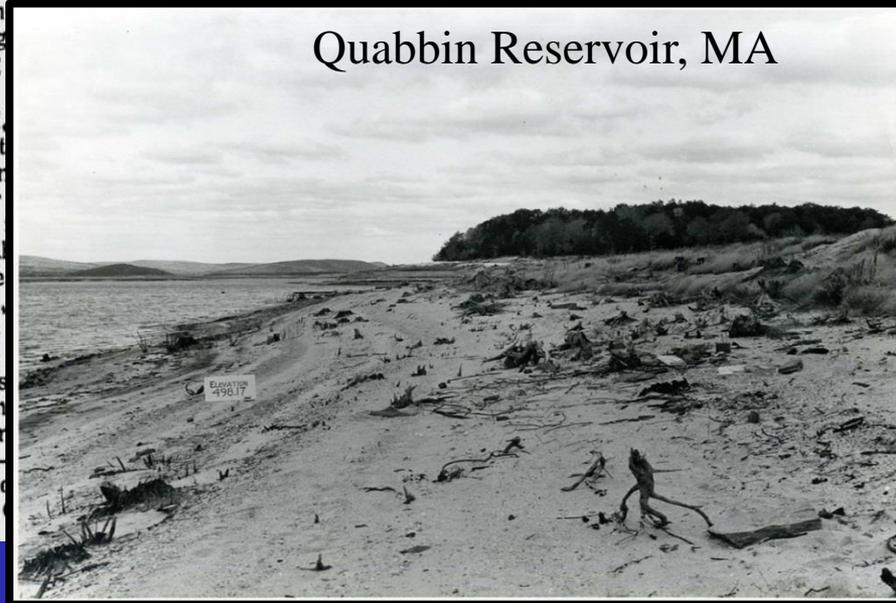
The President said federal agencies already were working

with eastern states and interests "in attempting measures for meeting shortage problems."

However, he said, he asked Interior Secretary L. Udall as chairman of a special federal water council to convene immediately "together with other federal agencies with water resources," he said. "I also know what further actions taken to assist the meeting the problems confronting the New England Middle Atlantic region

Confucius is buried in the city of Kiuh-fow,

Quabbin Reservoir, MA



Mayor of York, Pennsylvania, took \$350 out of his pocket to pay for a rainmaker!

State of Connecticut



Drought Preparedness and Response Plan : 2003 (Rev. 2016)

Managed by the Interagency Drought Workgroup

- Department of Public Health
- Department of Energy and Environmental Protection (Fisheries Division)
- Department of Agriculture
- Department of Emergency Services and Public Protection
- Office of Policy and Management (OPM) “Lead Agency”

“New” 5 Tiered Approach for Drought Stages

- Heightened Awareness, Below Normal Conditions, Moderate, Severe and Extreme Drought

Each stage determined by monitoring 2 groups of criteria:

- **Primary:** Precipitation, Groundwater levels, Streamflow levels & U.S. Drought Monitor
- **Secondary:** Reservoir levels, Palmer Drought Severity Index, Crop Moisture Index, Fire Danger

Drought stages can now be declared by area

State of Connecticut



Assessment of effectiveness “State Drought Plan” relative to protection of aquatic life in streams is difficult to measure.

- DEEP has statutory authority during drought to “suspend/impose conditions” on water diversions and regulate streamflow standards/dams.
- To date, none of these actions been necessary.

Public health/drinking water concerns typically take a precedent over ecological flow maintenance; however, increasing public awareness of need for ecological flow protection.

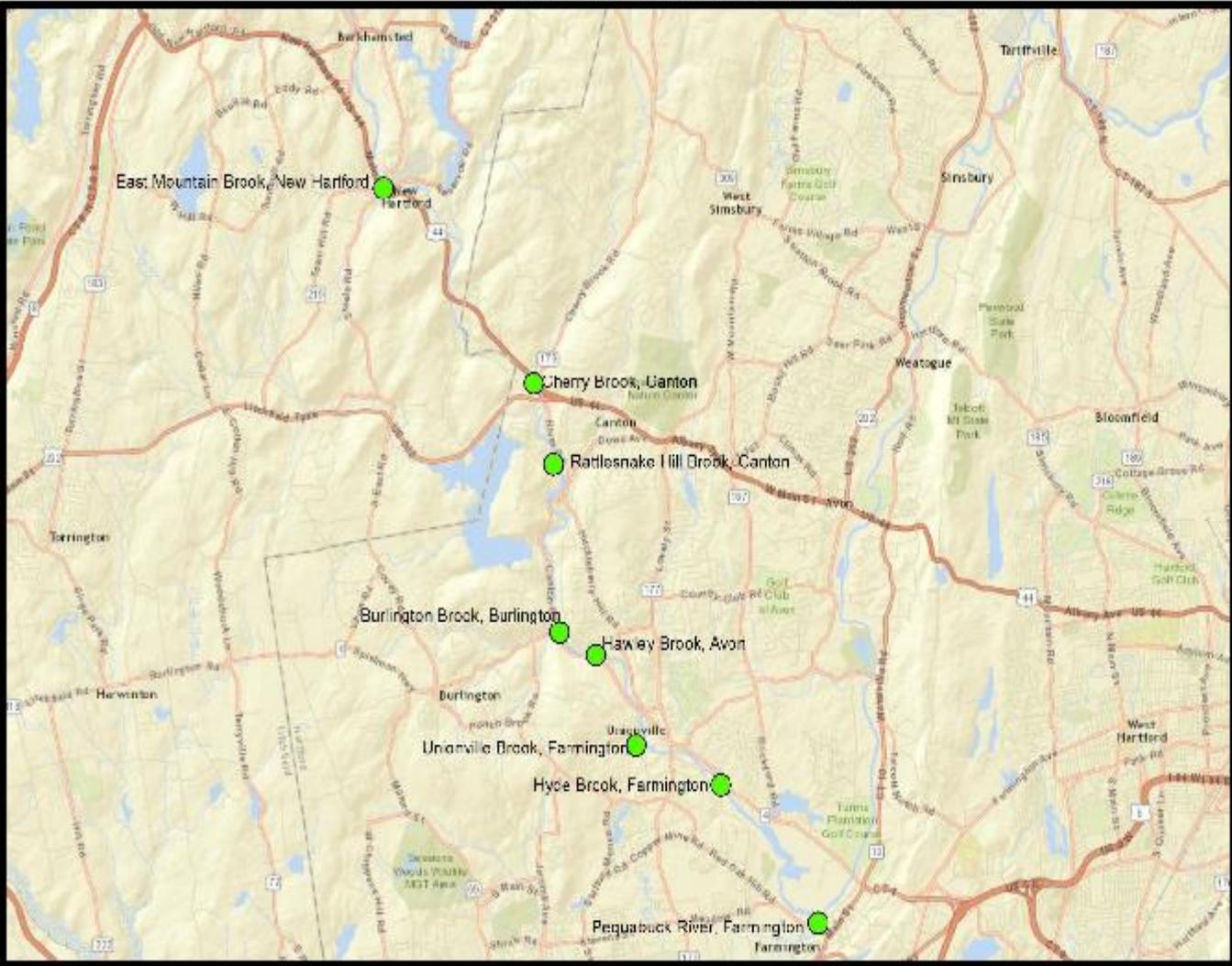
UCONN campus groundwater wells dried up Fenton River and resulted in fishkill in 2005. Registered "grandfathered" withdrawal with no restrictions.

- Resulted in ISF Study : Diversions curtailed at river flow less than 3 cfs!



Connecticut experienced most recent drought in 2016

Emergency Closure to Fishing of Eight Key Tributaries to the West Branch Farmington River and Farmington River Effective August 18, 2016



Under Authority of section 26-102 of the Connecticut General Statutes, the Commissioner of the Department of Energy and Environmental Protection is authorized to establish fish refuge areas and may, if deemed necessary, close any waters, or portions thereof, in the inland district to fishing for limited periods of time. In accordance with the aforementioned authority, the following is declared, effective August 18, 2016:

Due to high water temperatures and low flows in the West Branch Farmington River and Farmington River, thermally stressed fish including recreationally important trout are congregating at the mouths of certain tributary streams where cooler water is entering the West Branch Farmington River and Farmington River. To protect these fish from undue depletion by angling induced stress, refuges shall be established on portions of the West Branch Farmington River and Farmington River around the mouths of the following tributaries to the West Branch Farmington River and Farmington River, from upstream to downstream :

- East Mountain Brook (Hallock Brook), New Hartford
- Cherry Brook, Canton
- Rattlesnake Hill Brook, Canton
- Burlington Brook, Burlington
- Hawley Brook, Avon
- Unionville Brook, Farmington
- Hyde Brook, Farmington
- Pequabuck River, Farmington



These refuges shall include all water within 100 feet of signs (similar to the example above) indicating such closures posted by the Department of Energy and Environmental Protection and shall be closed to all fishing immediately.

This closure shall remain in effect until September 15 or until any earlier date as the Commissioner of Energy and Environmental Protection may declare, should conditions improve.



Connecticut Department of Energy and Environmental Protection
Inland Fisheries Division
www.ct.gov/DEEP/fishing
860-424-3474

State of Pennsylvania



Drought Management is the responsibility of Emergency Management Agency with Primary support/coordination from Department of Environmental Protection (DEP)

Drought Coordinator is assigned by Secretary of DEP and works closely with Drought Task Force comprised of various state, federal and interstate agencies.

➤ *Fish and Boat Commission (PFBC) is a member of the Task Force.*

3 Tiered Approach for Drought Stages : Watch, Warning and Emergency

Stages determined by 4 monitoring criteria (Scale generally on a “county” basis)

Precipitation, Groundwater levels, Streamflow, Palmer Drought Severity Index (Soil Moisture)

State statute requires water suppliers to develop drought contingency plans (rev. 3 years)

<http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=5537&DocName=DROUGHT%20MANAGEMENT%20IN%20PENNSYLVANIA.PDF%20>

State of Pennsylvania



Regulatory actions that can be taken to protect aquatic resources during drought

- Water withdrawals are regulated through DEP, the Susquehanna River and Delaware River Basin Commissions with input from PFBC.
- Often there are withdrawals that include instream flow requirements to protect downstream aquatic life during periods of low flow.
- Many reservoirs have drought plans geared toward protecting downstream aquatic life. PFBC provide guidance on flows needed to support downstream aquatic life.
- PFBC can close “Wild Trout” Stream sections to angling during low flow/high temperature periods where trout tend to congregate at tributary mouths.
 - More recent approach on very select waters to limit angling stress

State of Massachusetts



Drought Management Plan 2013 (Process of Revision)

MASSACHUSETTS DROUGHT MANAGEMENT PLAN

MAY 2013



Massachusetts Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 500
Boston, MA 02114



Massachusetts Emergency Management Agency
400 Worcester Rd, Box 1496
Framingham, MA 01701

Governor Deval Patrick

Secretary Richard K. Sullivan, Jr., Executive Office of Energy and Environmental Affairs
Secretary Andrea J. Cabral, Esq., Executive Office of Public Safety and Security

Lead Agencies:

Office of Energy and Environmental Affairs
Emergency Management Agency

Drought Management Task Force comprised of
multiple agencies/organizations/conservation groups;

Fish and Game

Environmental Protection

Public Health

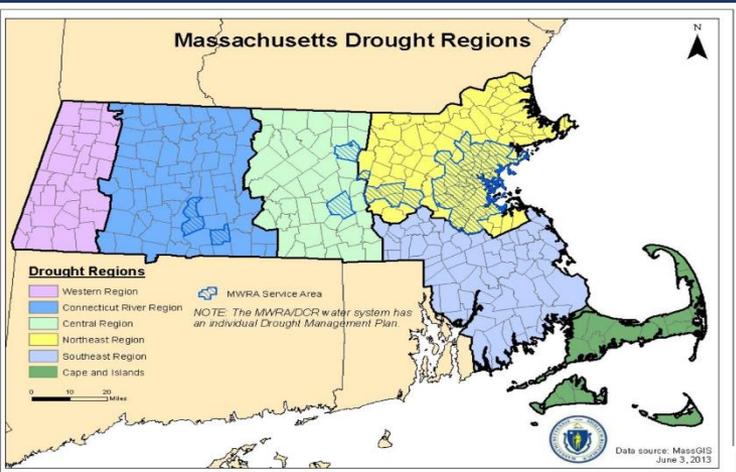
MA Water Resources Agency

<http://www.mass.gov/eea/docs/eea/wrc/droughtplan.pdf>

Becca Quinones

MASSWILDLIFE

6 Drought Management Regions



Seven Drought Management Parameters

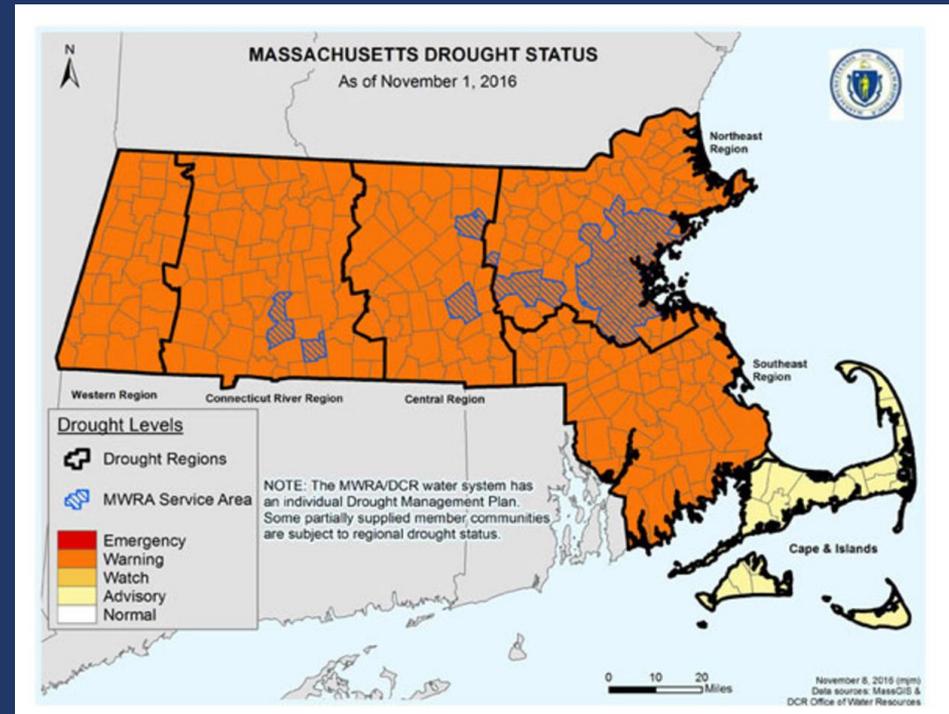
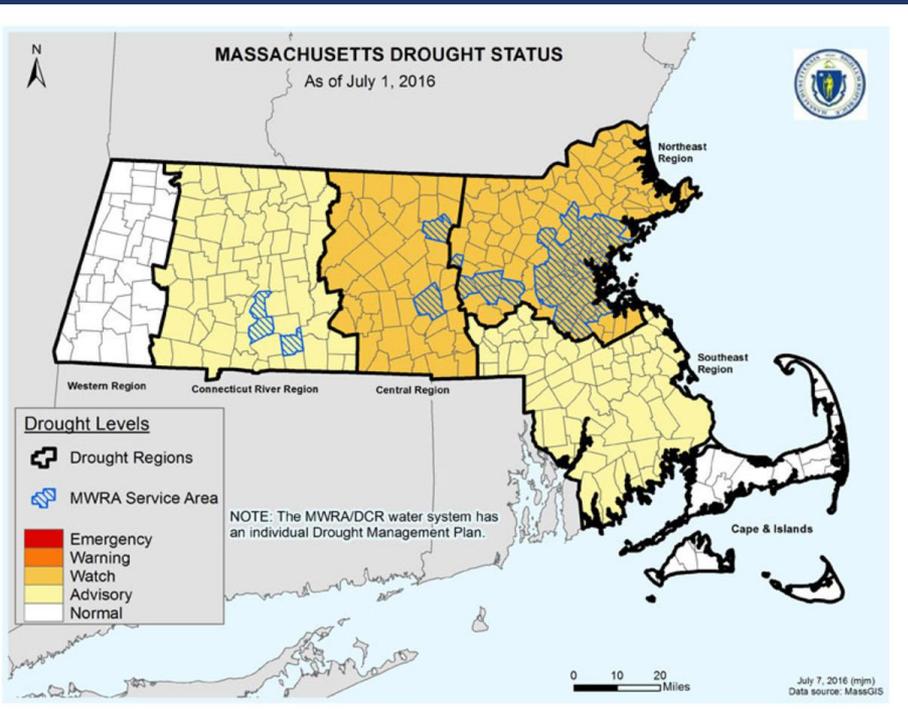
Five Action Levels

Drought Level	Standardized Precipitation Index	Crop Moisture Index*	Keetch-Byram Drought Index*	Precipitation	Groundwater	Streamflow	Reservoir***
Normal	3-month > -1.5 <u>or</u> 6-month > -1.0 <u>or</u> 12-month > -1.0	0.0 to -1.0 slightly dry	< 200	1 month below normal	2 consecutive months below normal**	1 month below normal**	Reservoir levels at or near normal for the time of year
Advisory	3-month = -1.5 to -2.0 <u>or</u> 6-month = -1.0 to -1.5 <u>or</u> 12-month = -1.0 to -1.5	-1.0 to -1.9 abnormally dry	200-400	2 month cumulative below 65% of normal	3 consecutive months below normal**	At least 2 out of 3 consecutive months below normal**	Small index Reservoirs below normal
Watch	3-month < -2.0 <u>or</u> 6-month = -1.5 to -3.0 <u>or</u> 12-month = -1.5 to -2.0	-2.0 to -2.9 excessively dry	400-600	1 of the following criteria met: 3 month cum. < 65% <u>or</u> 6 month cum. < 70% <u>or</u> 12 month cum. < 70%	4-5 consecutive months below normal**	At least 4 out of 5 consecutive months below normal**	Medium index Reservoirs below normal
Warning	6-month < -3.0 <u>or</u> 12-month = -2.0 to -2.5	< -2.9 severely dry	600-800	1 of the following criteria met: 3 month cum. < 65% and 6 month cum. < 65%, <u>or</u> 6 month cum. < 65% and 12 month cum. < 65%, <u>or</u> 3 month cum. < 65% and 12 month cum. < 65%	6-7 consecutive months below normal**	At least 6 out of 7 consecutive months below normal**	Large index reservoirs below normal
Emergency	12-month < -2.5	< -2.9 severely dry	600-800	Same criteria as Warning and previous month was Warning or Emergency	>8 months below normal**	>7 months below normal**	Continuation of previous month's conditions

Drought Status 2016

July

November (warning level most state)



<https://www.mass.gov/service-details/past-drought-declarations-maps-and-history>



While not always explicitly stated, drought plan provides protection for fisheries resources;

- Plan identifies MassWildlife's role to assess impacts to fish and implement measures to mitigate impacts.
- Task Force receives input from fisheries staff when deciding on drought level actions.

Though public health/drinking water concerns are main priorities, timely water conservation actions help protect fish and wildlife resources.

- Reduced water demand lessens impact on water supply sources.

Adam Kautza
Becca Quinones

State of New Hampshire



Drought Management Plan : 2016

Managed by the Drought Management Team (DMT)

- DMT is comprised of 31 Support Agencies/Officials
- Department of Environmental Services is the “Lead Agency”

Five Drought Management Areas with the State

Table 1: NH DROUGHT MANAGEMENT PARAMETERS SUMMARY

A summary of recommended drought trigger levels. Recommendations for Standardized Precipitation and Palmer Indices are based on meteorological data for each drought management area. These differ significantly from National Climate Data Center.

Five Action Levels

Four Parameters

	WATCH D0 Abnormally Dry	ALERT D1 Moderate	WARNING D2 Severe	EMERGENCY D3 Extreme	DISASTER D4 Exceptional
Conditions to be used by NH Drought Management Team as basis for recommendations to the US Drought Monitor					
PRECIPITATION					
1-month SPI	<0.0	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3-month SPI	Not Applicable	<0.0	<-1.0	Not Applicable	Not Applicable
6-month SPI	Not Applicable	Not Applicable	Not Applicable	<-1.0	Not Applicable
12-month SPI	Not Applicable	Not Applicable	Not Applicable	Not Applicable	<-1.0
STREAMFLOW					
28-day streamflow 65% normal	Up to 1 Month	1-3 Months	3-6 Months	6-9 Months	>9Months
PALMER INDEX PDSI	Not Applicable	<0.0	<-1.0	<-2.0	<-3.0
GROUNDWATER	Not Applicable	Monthly Levels Drop Below Mean	Monthly Levels Persist Below Monthly Mean		Not Quantified

Specific Actions Taken During 2016 Drought

Lamprey and Souhegan Rivers have protective instream flow requirements and individual water management plans per statute

Management Plans identifies actions for “Affected Water Users” and “Affected Dam Owners”

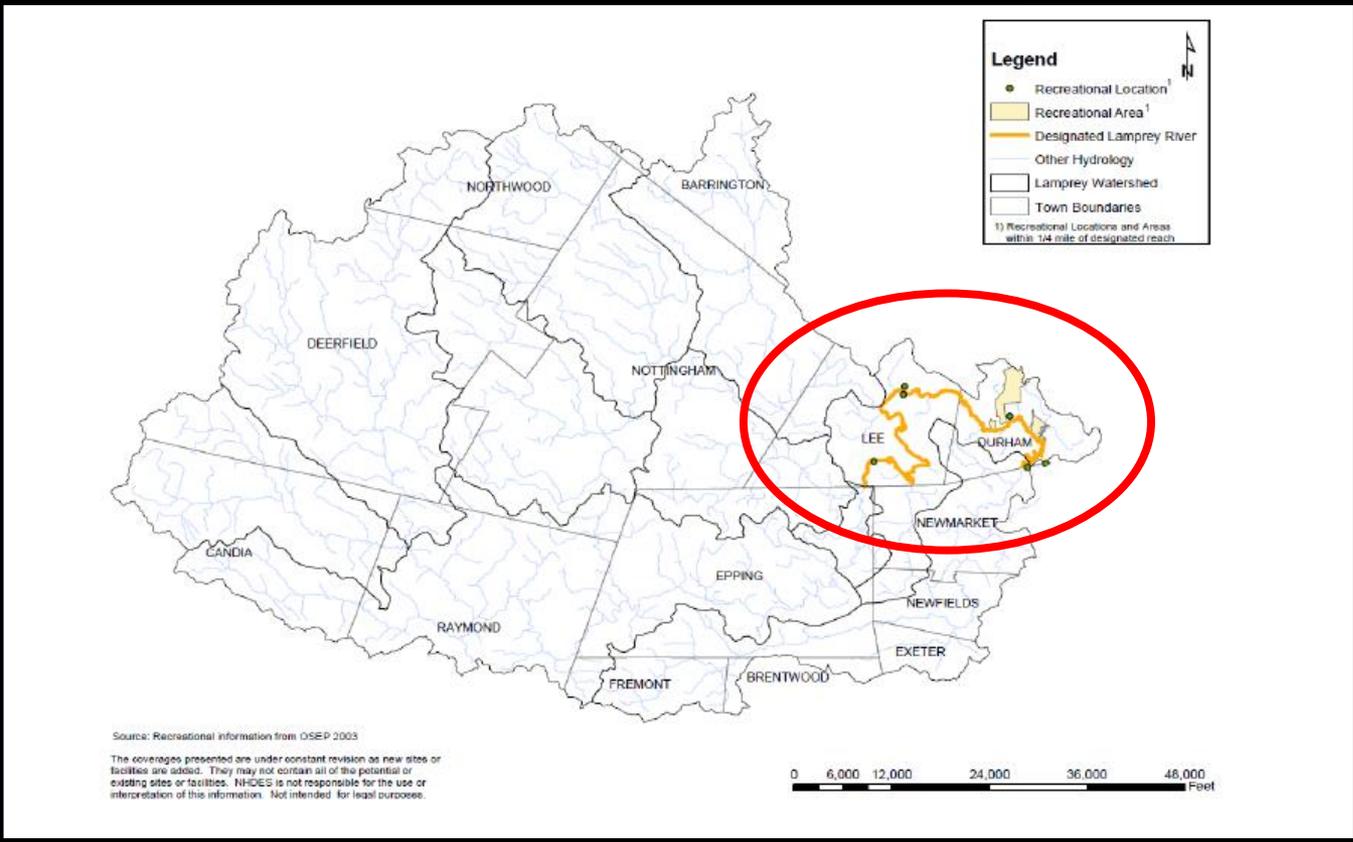
- Affected Water Users: Reduce withdrawals of groundwater/surface water
- Two state owned dams (Mendums Pond and Pawtuckaway Lake) can release waters to increase flows in Lamprey River.

<https://www.des.nh.gov/organization/divisions/water/wmb/rivers/instream/lamprey/water-management-plan.htm#task12>

https://www.des.nh.gov/organization/divisions/water/wmb/rivers/instream/souhegan/water_management_plan.htm#task12

Specific Actions taken During 2016 drought

- **Lamprey River** “only” has the infrastructure changes needed to accomplish flow augmentation releases.
- **Lamprey River** : September two day release of 10.5 cfs from Pawtuckaway Lake. Resulted in lowering lake level 6 inches.





IFC Region 4 Plan Summary

- Plans guide activities in response to droughts, define actions of various state agencies, require assessment/monitoring of drought parameters and public outreach component.
Drought Mgt. Teams include fisheries/environmental protection staff.
- Plans don't always specifically "spell-out" instream flow, aquatic resource protections; however there are inherent protections as water conservation helps reduce impact on water supplies.
- In the long term, State Agency Permit requirements for withdrawals and instream flows are "most important" to ensure protection of aquatic resources during seasonal low flow periods as well as droughts.
- Fisheries agencies have authority to close areas to fishing to reduce angling stress on coldwater fish species.