

2019 Massachusetts Drought Management Plan - draft

What's New, What's Changed?

WATER RESOURCES COMMISSION

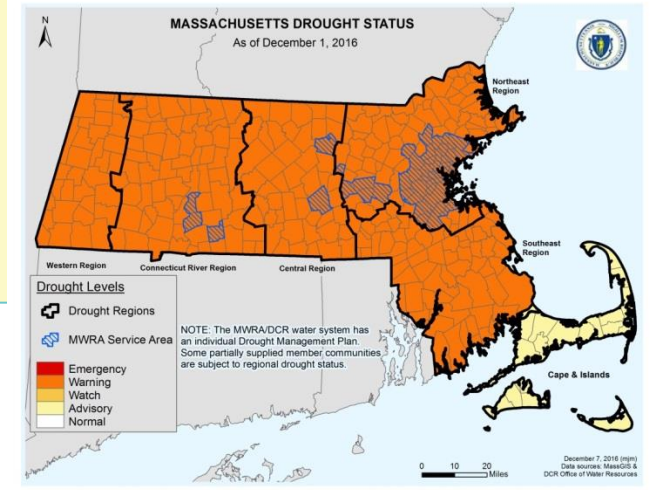
February 14, 2019

History of the Drought Plan

- Originally developed in the early 2000s as a result of the drought of the late 1990s-early 2000s
- Ad-hoc Drought Management Task Force made recommendations to Secretary
- First DMP developed in 2001 as a working document
- Minor Updates in 2013
- Major changes and updates to DMP in current draft

The Plan

1. Introduction
2. Authority and Coordination
3. Drought Assessment and Determination
4. Process of Determining Drought Status
5. Drought Communication
6. Summary of Responsibilities by State Agency
7. Drought Preparedness & Response Actions of State Agencies
8. Drought Preparedness & Response Actions – Guidance for Communities
9. Post-Drought Actions
10. Drought and Emergency Declarations: Legal Powers



Section 2: Authority and Coordination

- Lays out the primary functions of EEA and MEMA
- Specifies the composition and responsibility of the DMTF
- Establishes the “Drought Management Mission Group” to codify the coordination by staff between DMTF meetings to prioritize and track response actions
 - Led by EEA and MEMA
 - Formed at level 2 significant drought
 - DEP, DCR, DAR, DFG, DPH & other agencies as needed
- Clarifies state and federal responsibilities for data analysis, impact assessment, impact reporting, communication to constituents and stakeholders, and coordination of assistance

Section 3: Drought Assessment and Determination

Drought Levels

- new more intuitive nomenclature, same number of levels

Drought Regions

- small adjustments to regions, 1 region split, total of 7 regions

Drought Indices

- kept 6 of 7, removed duplicate precipitation index

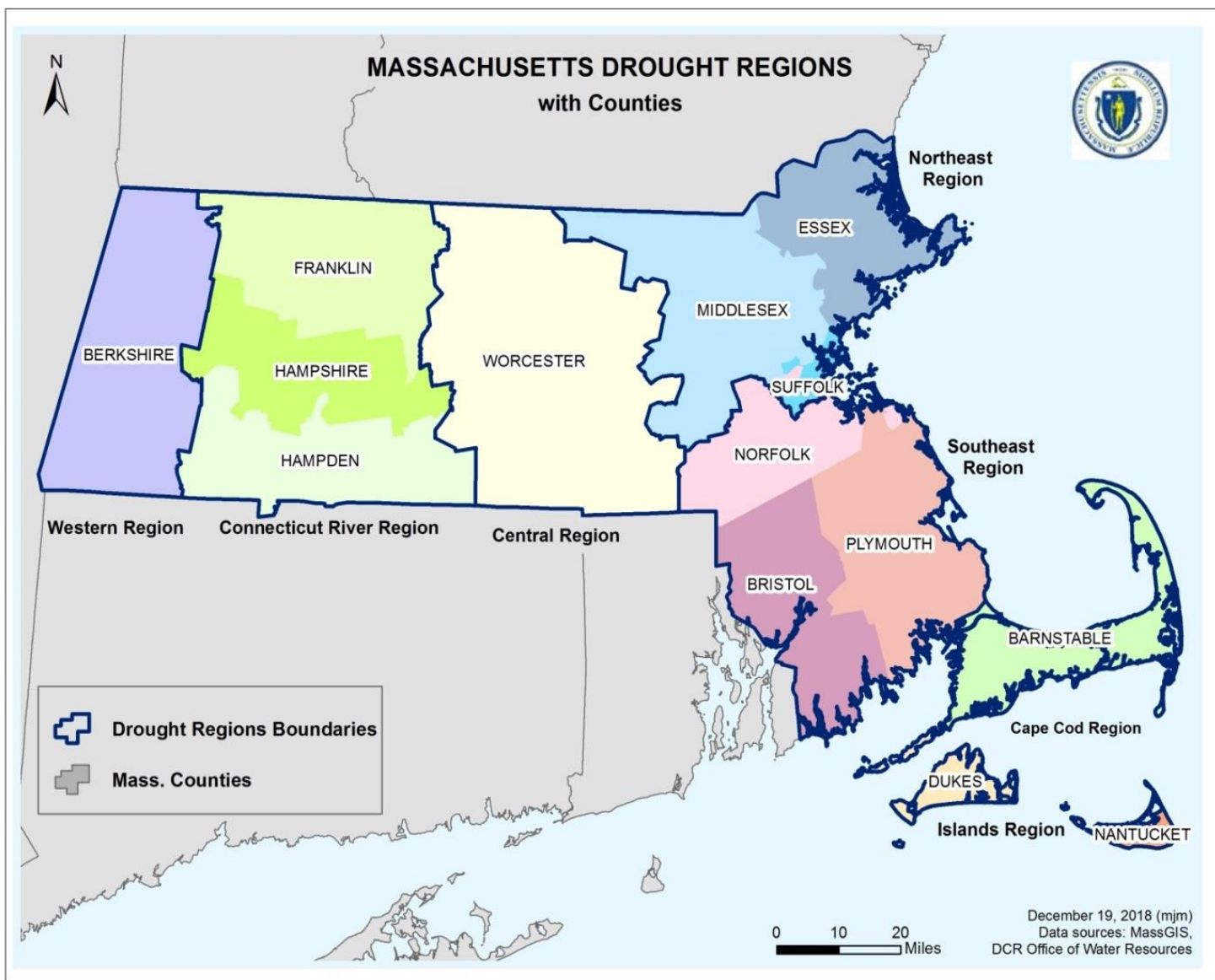
Methods for Calculating Indices

- new method uses percentiles
- detailed description of steps, allows duplication by others

Additional Information

- forecasts and impact reports

Revised Drought Regions



- Small adjustments to regions
- 1 region split

7 Drought Regions

Drought Region	County(ies)
Western	Berkshire
Connecticut River Valley	Franklin, Hampshire and Hampden
Central	Worcester
Northeast	Essex, Middlesex and Suffolk counties, plus Brookline
Southeast	Norfolk (minus Brookline), Bristol and Plymouth counties
Cape Cod	Barnstable county
Islands	Nantucket and Dukes (includes Elizabeth Islands)

- Separated the Islands into their own drought region from Cape Cod given the different impacts seen during the drought.
- Drought Regions refined along boundaries to align with county boundaries.
- County alignment facilitates more streamlined communication and response when droughts occur.

Drought Levels

Level 0 - Normal

Level 1 - Mild Drought

Level 2 - Significant Drought

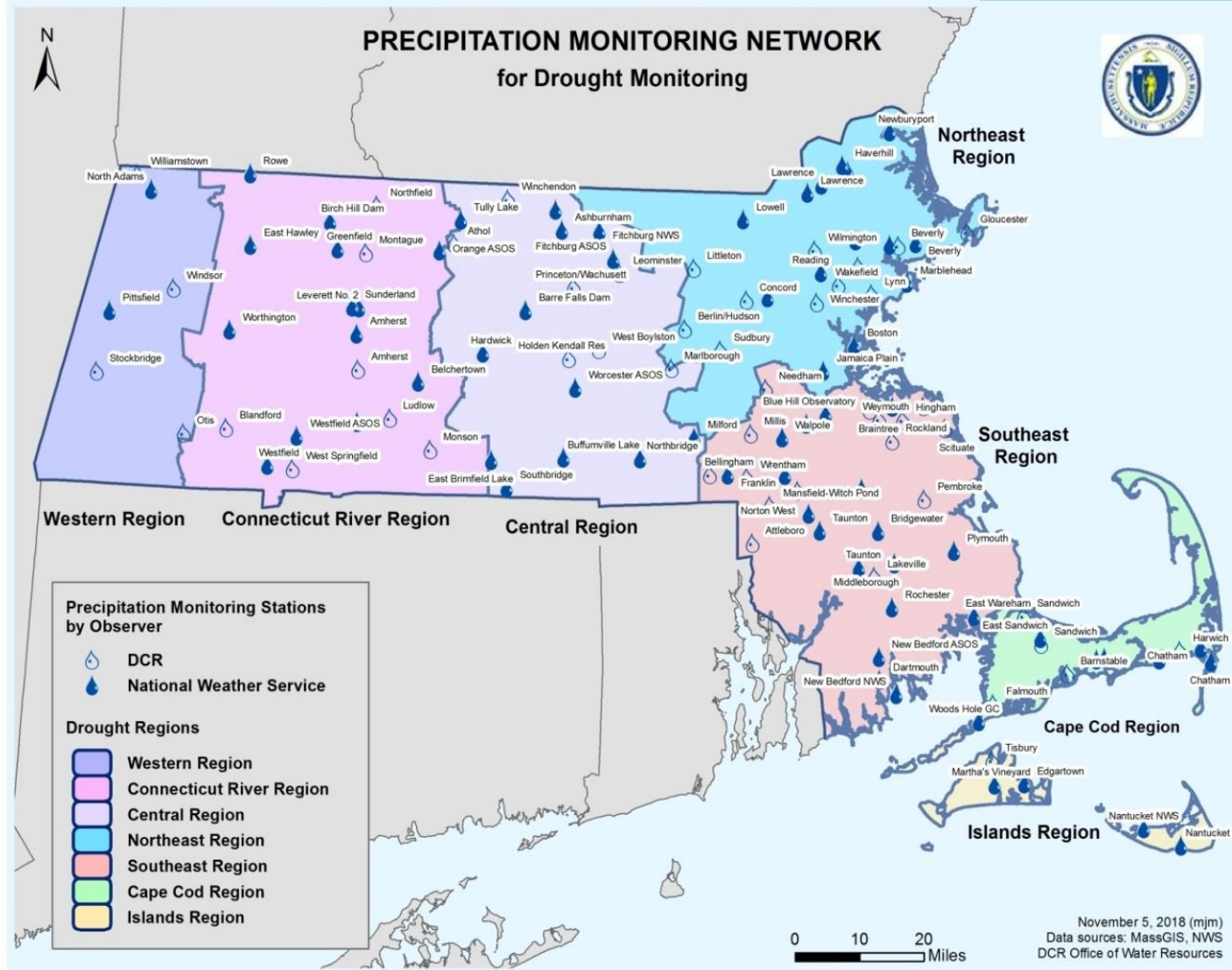
Level 3 - Critical Drought

Level 4 - Emergency Drought

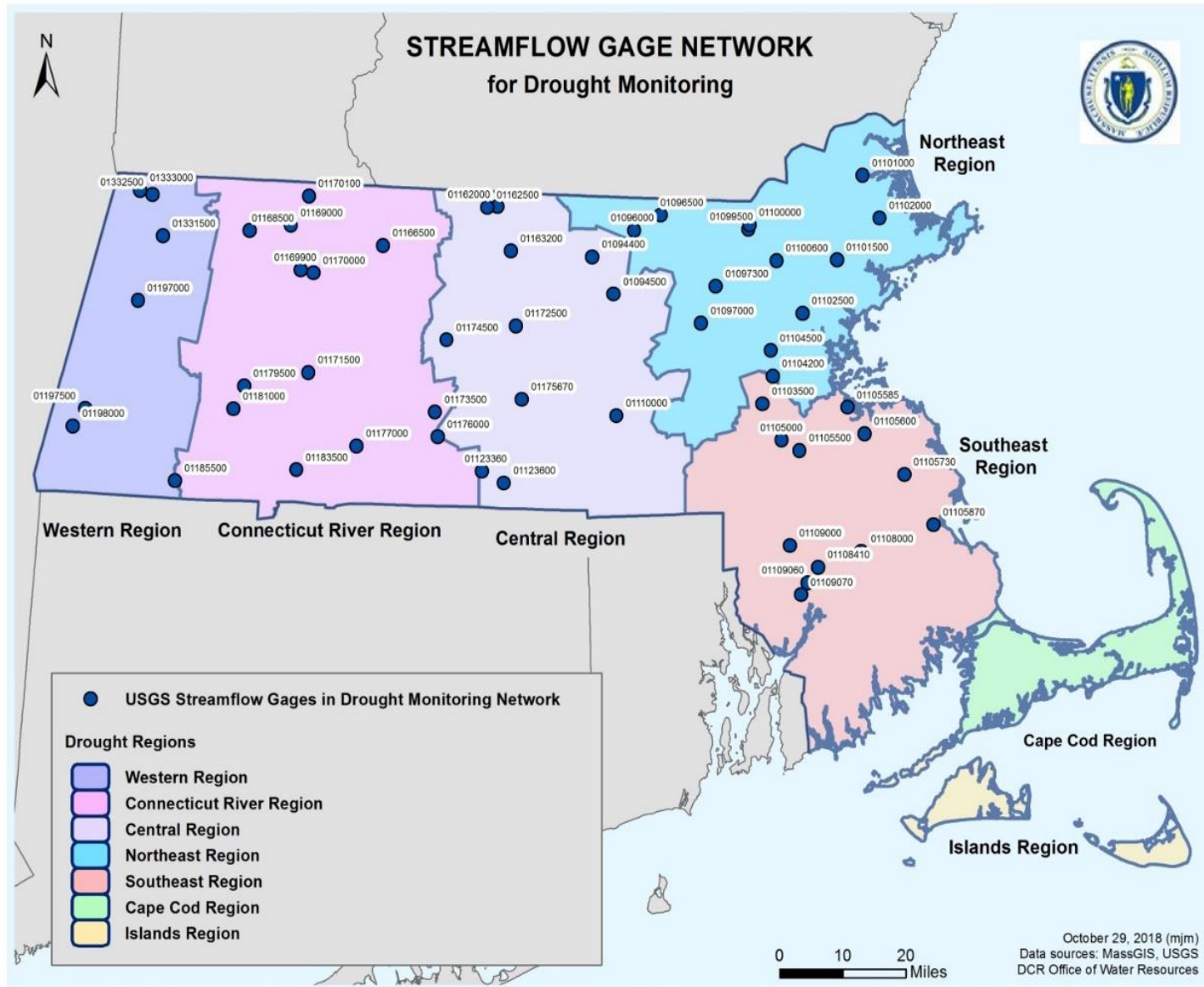
USDM Names	Recurrence	Percentile Ranges	MA DMP Levels	MA Percentile Ranges	MA DMP Names
D0: Abnormally Dry	once per 3 to 5 years	21 to 30	1	>20 and ≤30%	Mild Drought
D1: Moderate	once per 5 to 10 years	11 to 20	2	>10 and ≤20%	Significant Drought
D2: Severe Drought	once per 10 to 20 years	6 to 10	3	>2 and ≤10%	Critical Drought
D3: Extreme Drought	once per 20 to 50 years	3 to 5			
D4: Exceptional Drought	once per 50 to 100 years	0 to 2	4	≤2%	Emergency Drought

Drought Indices- Precipitation

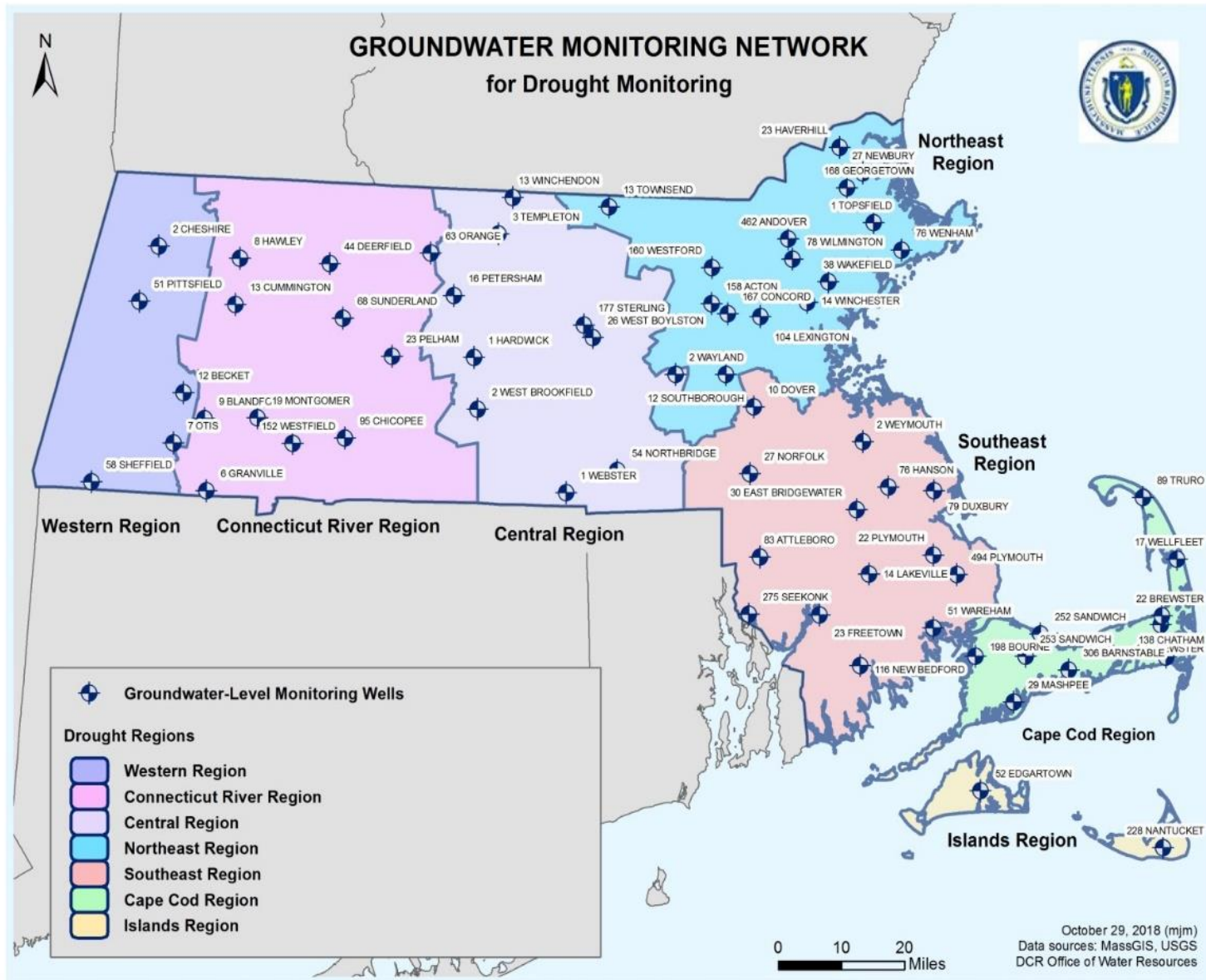
- Kept 6 of 7 indices
- Removed duplicate precipitation index



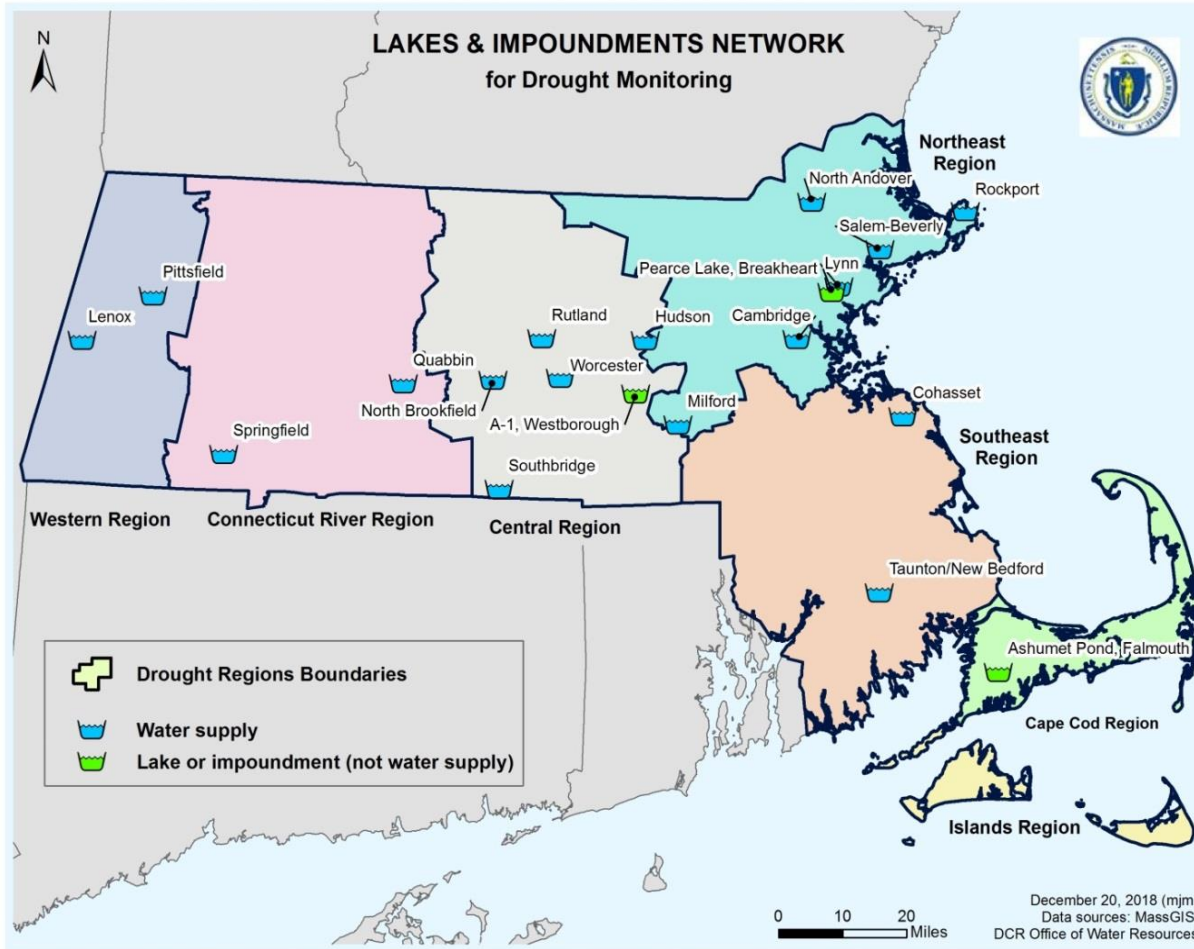
Drought Indices- Streamflow



Drought Indices- Groundwater

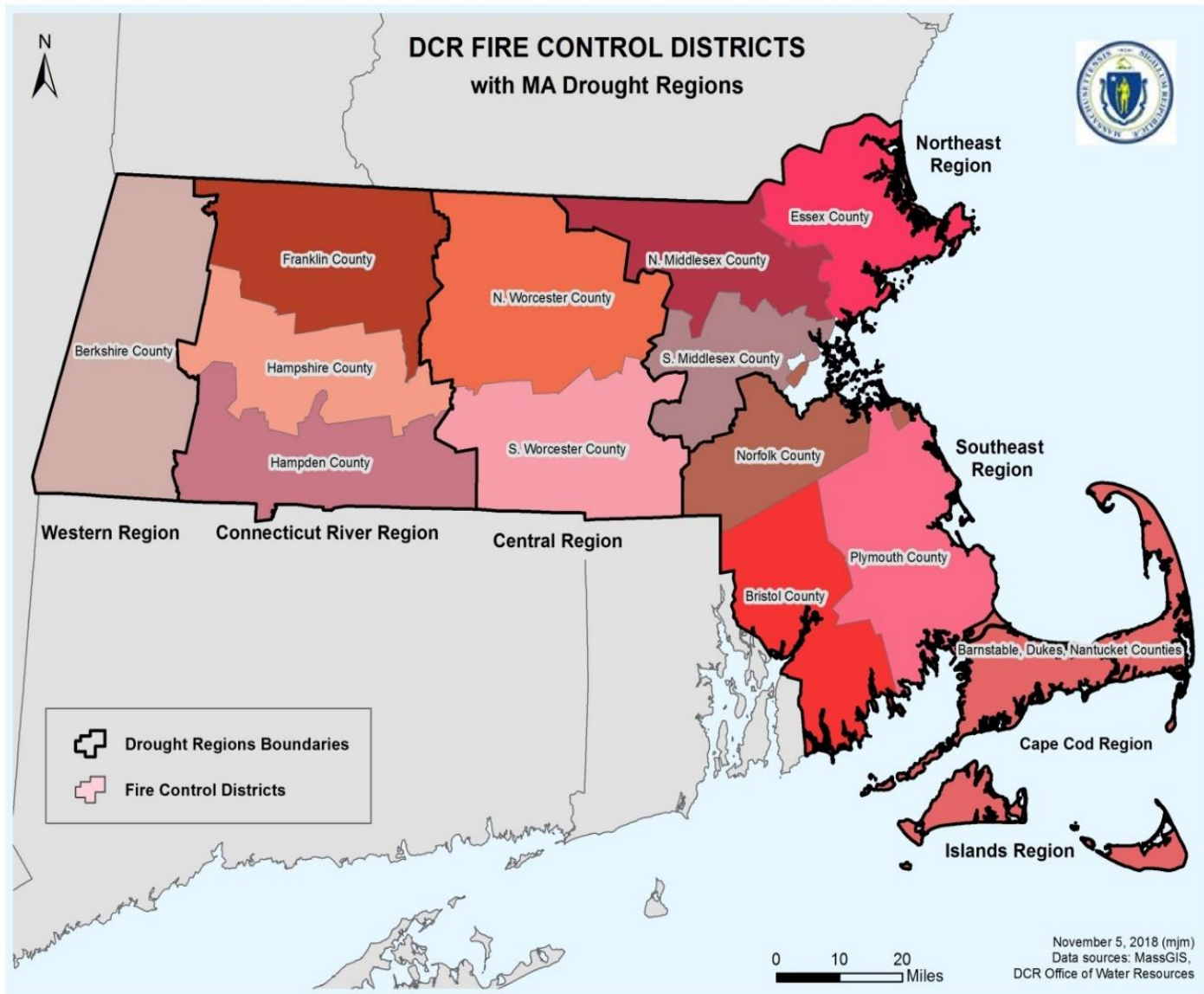


Drought Indices- Lakes and Impoundments

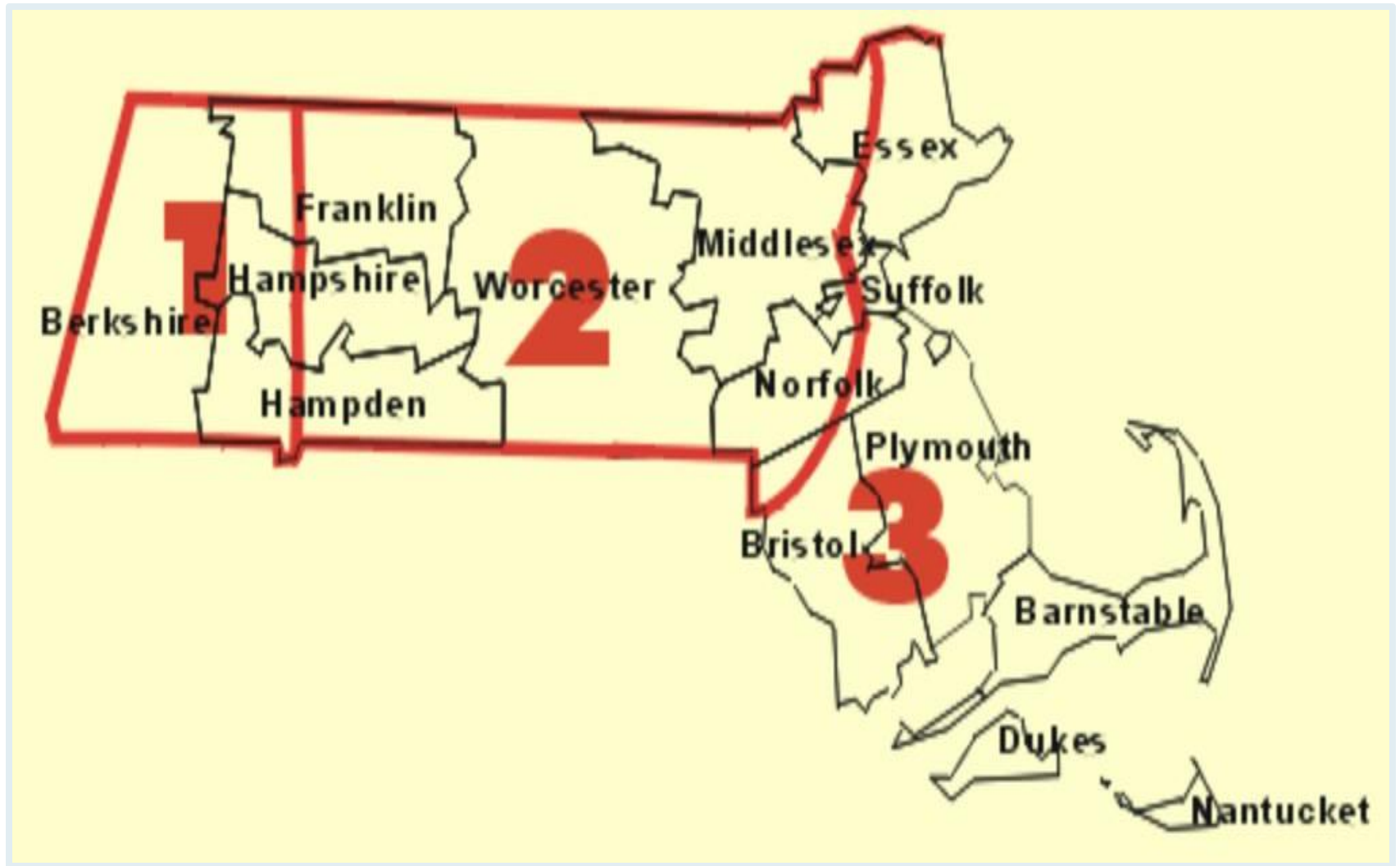


- “Reservoirs” was renamed
- Represents surface storage and not water supply storage
- Includes both natural and human-made surface water bodies

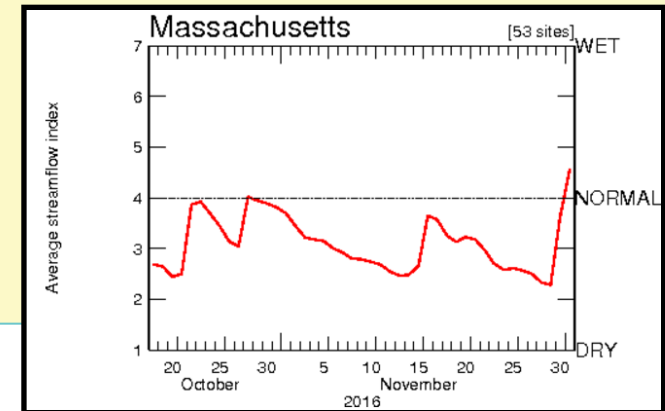
Drought Indices- Fire Danger



Drought Indices- Crop Moisture Index



Index Calculations

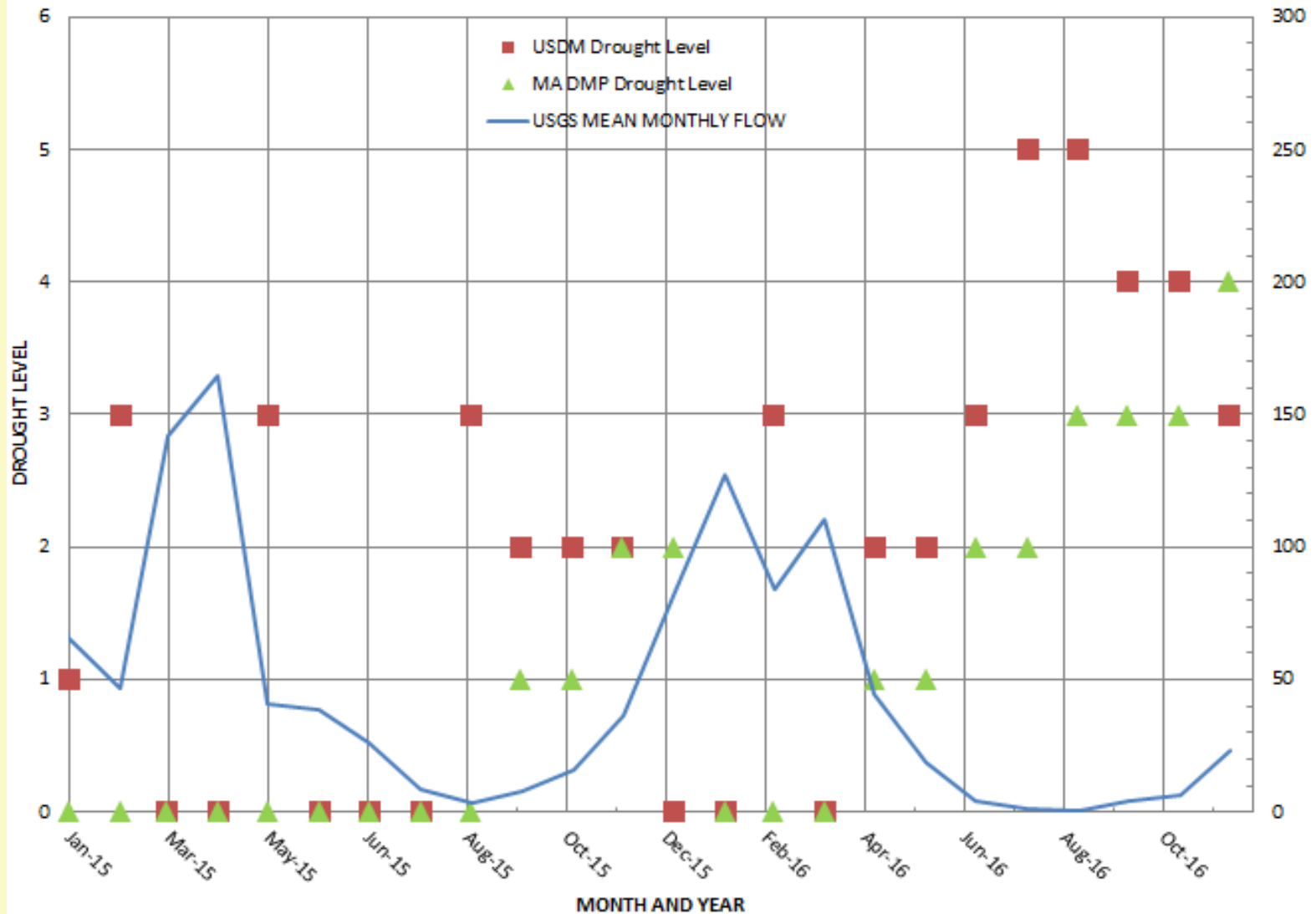


GOALS

- Provide earlier warning of drought onset (e.g., multiple indices required two to three months to signal a Level 1 drought),
- Provide more accurate reflection of drought severity (e.g., streamflow was a count of months below 25th percentile but did not consider whether those flow were 10th percentile or even record low flows),
- Include longer look-back periods for precipitation to capture the cumulative effect of dry periods over multiple years

Streamflow example of MA DMP under representing relative to USDM

USGS streamgauge Wading River near Norton, MA (01109000)



Index Calculations Rationale for New Method


- Better indication of severity of conditions (i.e. how frequently conditions are this far from “usual”).
- Aligns with USDM and USGS approach.
- Makes use of extensive MA groundwater network (primary difference from USDM).
- Allows for comparable scale across indices and regardless of data distribution.

Indices Values Corresponding to Index Severity Levels

Index Severity Level	Standardized Precipitation Index	Streamflow	Lakes and Impoundments*	Groundwater	Keetch- Byram Drought Index	Crop Moisture Index
0	>30 th percentile				< 200	> -1.0
1	≤30 and >20				200-400	≤-1.0 and > -2.0
2	≤20 and >10				400-600	≤-2.0 and < -3.0
3	≤10 and >2				600-700	≤ -3.0 and > -4.0
4	≤2				700-800	≤-4.0

* Water suppliers are consulted to determine if outlier, below-normal reservoir conditions are due to operational issues.

Drought Level	MA SPI	CMI*	KBDI	Precipitation	Groundwater	Streamflow	Reservoir
Normal	3-month > -1.5 or 6-month > -1.0 or 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 or 6-month -1.0 to -1.5 or 12-month -1.0 to -1.5	-1.0 to -1.9 abnormally dry	200 to 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 or 6-month -1.5 to -3.0 or 12-month -1.5 to -2.0	-2.0 to -2.9 excessively dry	400 to 600	1 of the following criteria met: 3 month cum. < 65% or 6 month cum. < 70% or 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 or 12-month -2.0 to -2.5	< -2.9 severely dry	600 to 800	1 of the following criteria met: 3 month cum. < 65% and 6 month cum. < 65% or 6 month cum. < 65% and 12 month cum. < 65% or 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 to 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

Old Method 

- less consistency across indicators
- level names less descriptive of conditions
- reflected duration but not always severity

Mock DMTF Meeting to Test Revised Indices Methods on Drought Determinations

- Indices workgroup met to make mock drought calls based on monthly data presented without knowing month and year of data
- Data presented
 - Three indices using new methods- precipitation, surface water, and groundwater
 - Other indices and data as available from historical reports (e.g., fire index, weather forecasts)
 - Two time periods: 9/2001 - 4/2002 and 6/2010 - 10/2010
 - Months ranged from non-drought conditions to level 3 drought
- The drought calls were compared to those that were made historically by the State and the USDM. As the revisions intended, droughts were called slightly earlier and with slightly higher severity compared to the previous methods. Based on historical experience and recollection with the two time periods, the group deemed the changes appropriate.

Section 4: Process of Determining Drought Status

- Updated description of how overall drought determinations are made once all the indices are calculated
- Describes all factors considered by the DMTF and how they may be differentially weighted based on whether we are coming into a new drought, experiencing a prolonged drought, or moving toward drought recovery

Section 5: Drought Communication

- New descriptions of communication platforms, procedures, and responsibilities
- Lays out all the communication tools and platforms that are mobilized during a drought
- Assigns specific communication responsibilities

Section 6: Summary of Responsibilities by State Agency

- Repackages the various responsibilities into an overview of responsibilities by agency

Section 7: State Agency Actions

Preparedness and Response Tables have 7 Action Categories:

1. Data Gathering, Analysis and Reporting
2. Coordination
3. Water Conservation
4. Communication and Public Outreach
5. Technical Assistance
6. Financial Assistance
7. Policy and Regulatory Action
 - Responsible Agency listed for each action
 - Actions listed by drought level

Section 7: State Drought Guidance

State Drought Condition (by Region)	Nonessential Outdoor Water Use Restrictions
Level 1 (Mild Drought)	1 day per week watering, after 5 p.m. or before 9 a.m. (to minimize evaporative losses)
Level 2 (Significant Drought)	Limit outdoor watering to hand-held hoses or watering cans, to be used only after 5 p.m. or before 9 a.m.
Level 3 (Critical Drought)	Ban on all nonessential outdoor water use
Level 4 (Emergency Drought)	Ban on all nonessential outdoor water use

The actions in this table apply to all outdoor water users and represent one of the most effective ways to minimize the impacts of drought on water supply and the environment.

Section 8: Drought Preparedness and Response Actions- Guidance for Communities

- Identifies key actions that can be taken at the local level before a drought (to prepare) and during a drought (to respond), along with resources to implement key actions
- Audience: municipalities and/or public water systems, partners that can support and assist with implementation, including environmental groups, concerned citizens, and local boards such as the planning board, conservation commission, and town select board or city council
- **Action 1: Develop a Water Conservation Program**
- **Action 2: Develop a Local Drought Management Plan**

Section 9: Post-Drought Actions

- Continue monitoring
- Hold 'After Action Review' to assess response and lessons learnt

Section 10: Drought and Emergency Declarations, Legal Authorities

- Local government
- State government: Governor, MEMA, DEP, MWRA, DPH, DPU

Public Comment

Written Comments Deadline: **February 25, 2019**

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