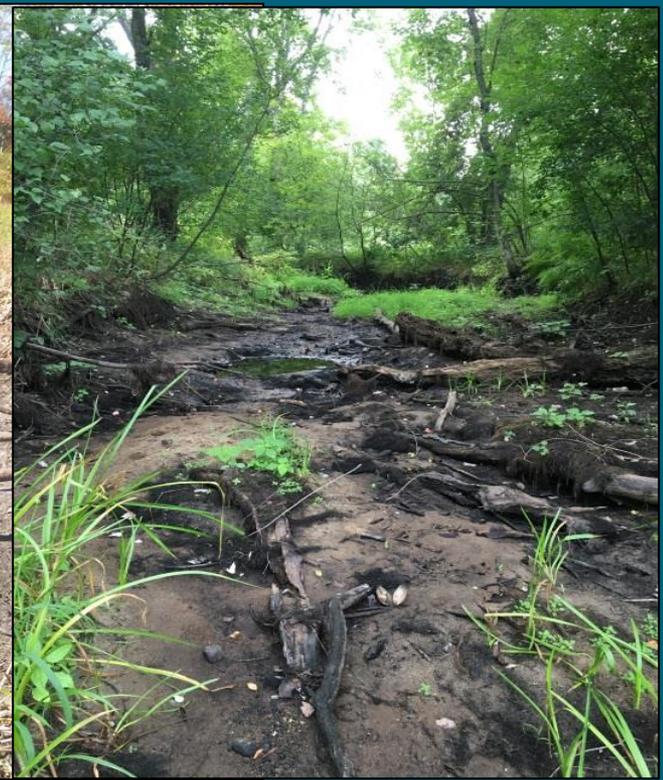


Ipswich River



Parker River



Martins Brook

Streamflow Conditions & Summer Water Use in Parker, Ipswich, Essex Watersheds



Massachusetts Department of Fish and Game
Division of
Ecological
Restoration

Invested in Nature and Community

Michelle Craddock, Watershed Ecologist
Massachusetts Division of Ecological Restoration

Presentation overview

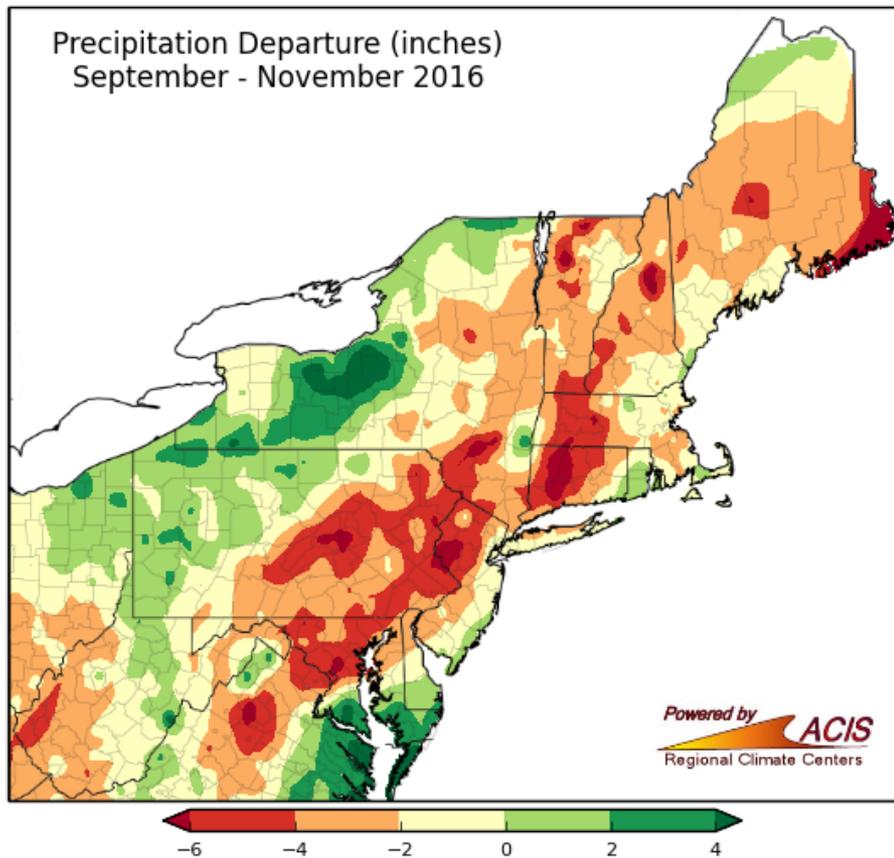
- Groundwater and precipitation
- Streamflow
- Summer water use
- Ways to influence summer water use behavior



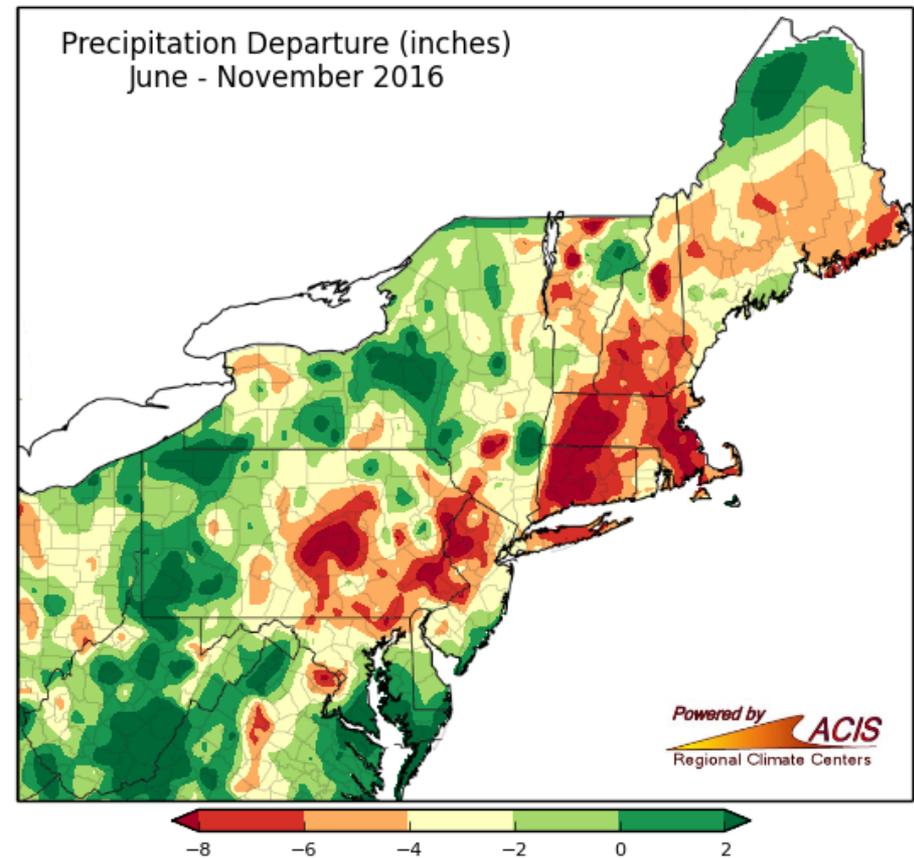
Ipswich River, Ipswich 9/11/16

Precipitation – Departure from Normal

3 month departure of normal

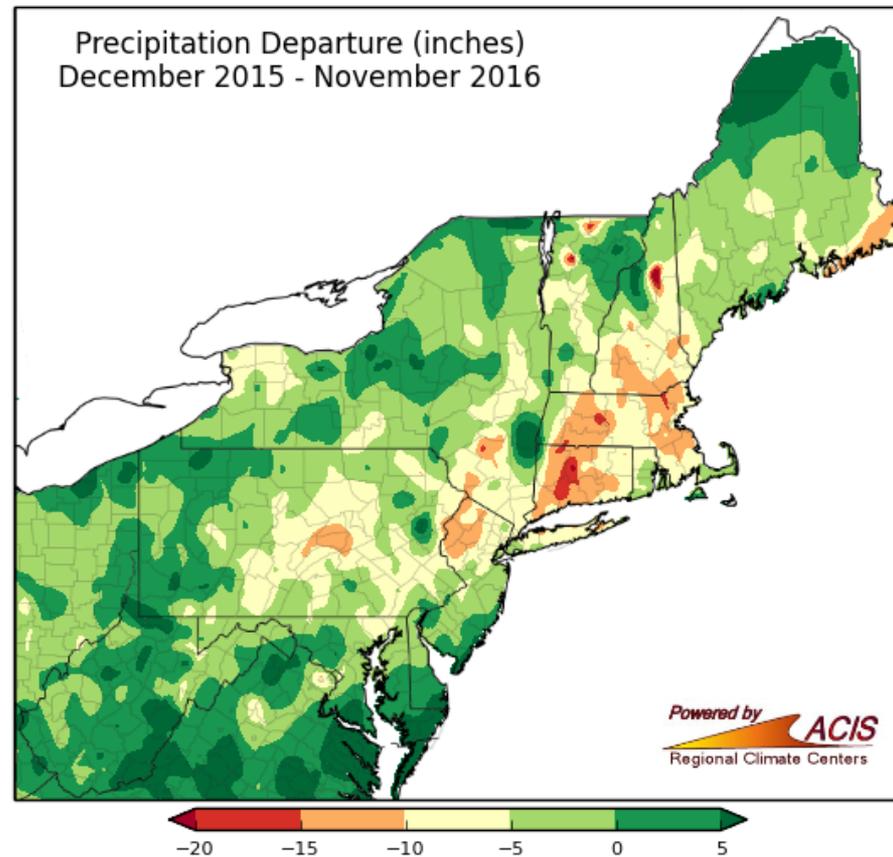


6 month departure of normal



Precipitation – Departure from Normal

12 month departure of normal

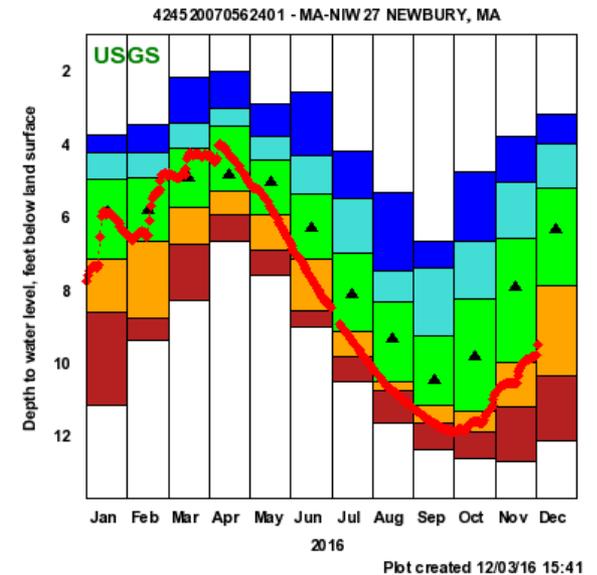
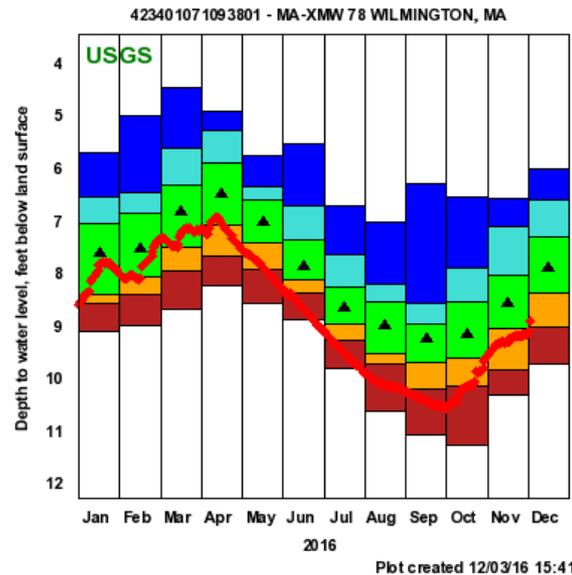
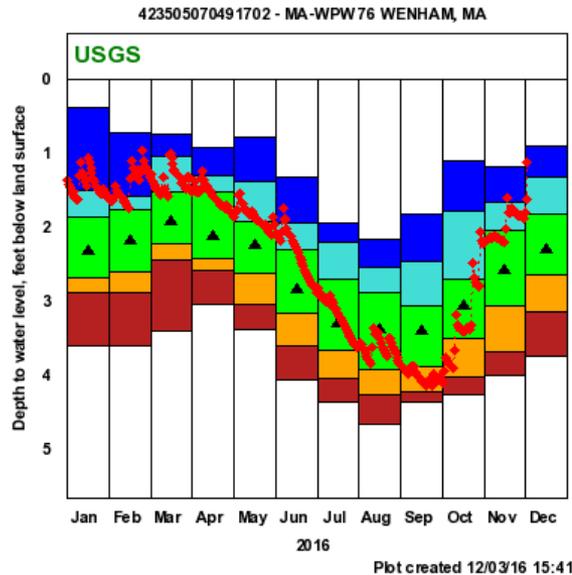


Groundwater

Wenham – 22 ft

Wilmington – 12 ft

Newbury, 19.8 ft



◆ Data Point

Explanation - Percentile Classes

● < 10 ● 10 - 24 ● 25 - 75 ● 76 - 90 ● > 90

▲ Monthly Median

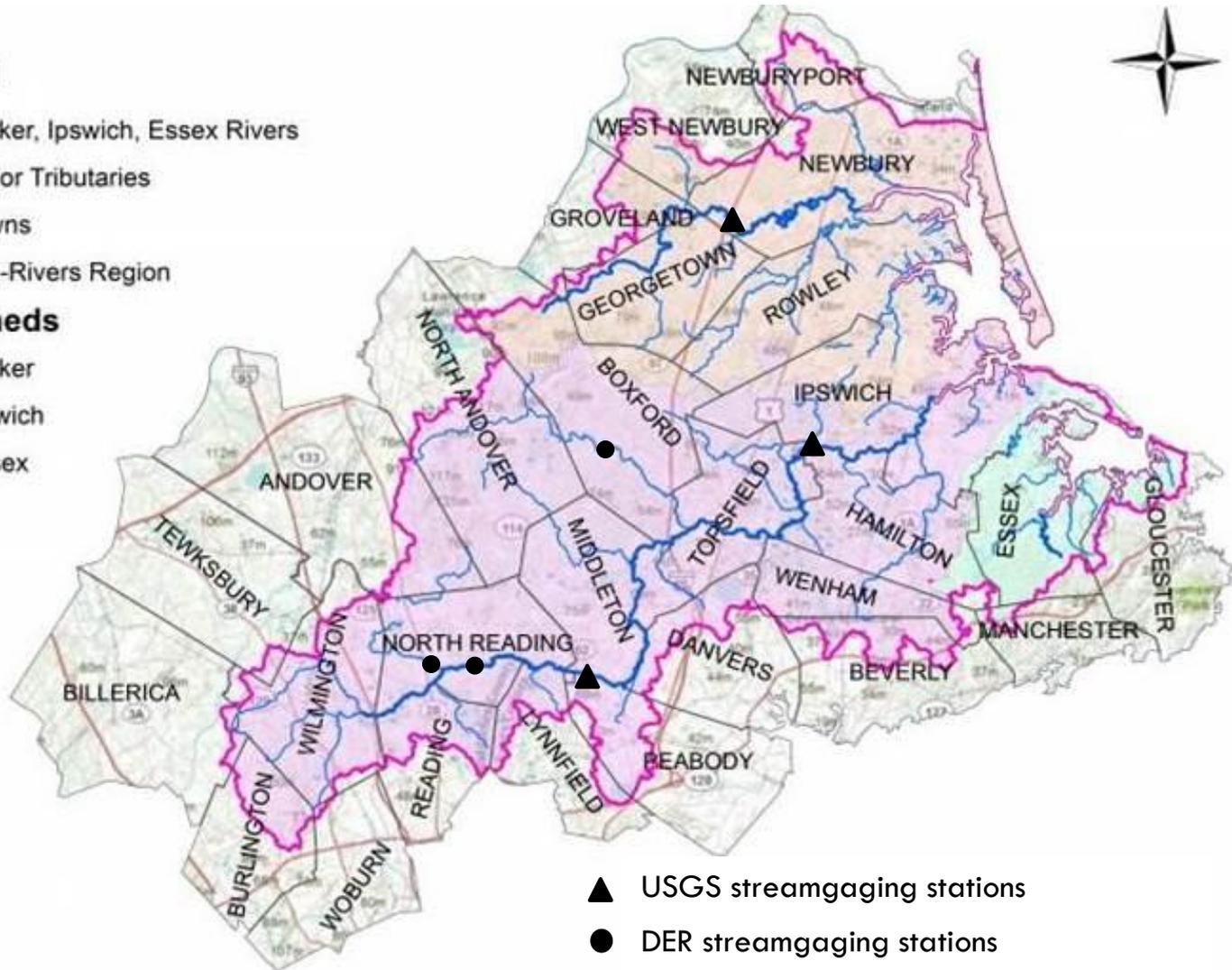
Map of streamgaging stations

Legend

- Parker, Ipswich, Essex Rivers
- Major Tributaries
- Towns
- ▭ PIE-Rivers Region

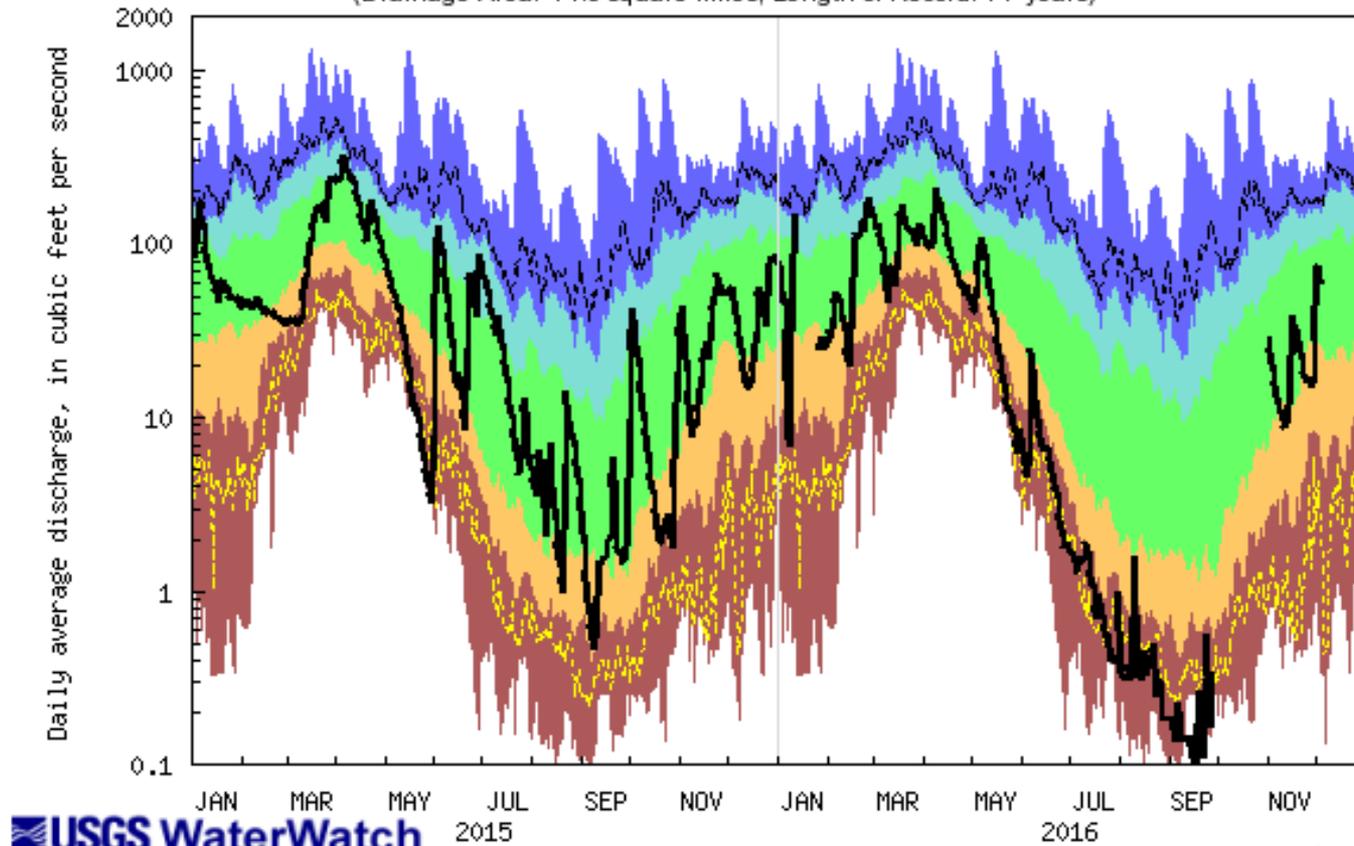
Watersheds

- ▭ Parker
- ▭ Ipswich
- ▭ Essex



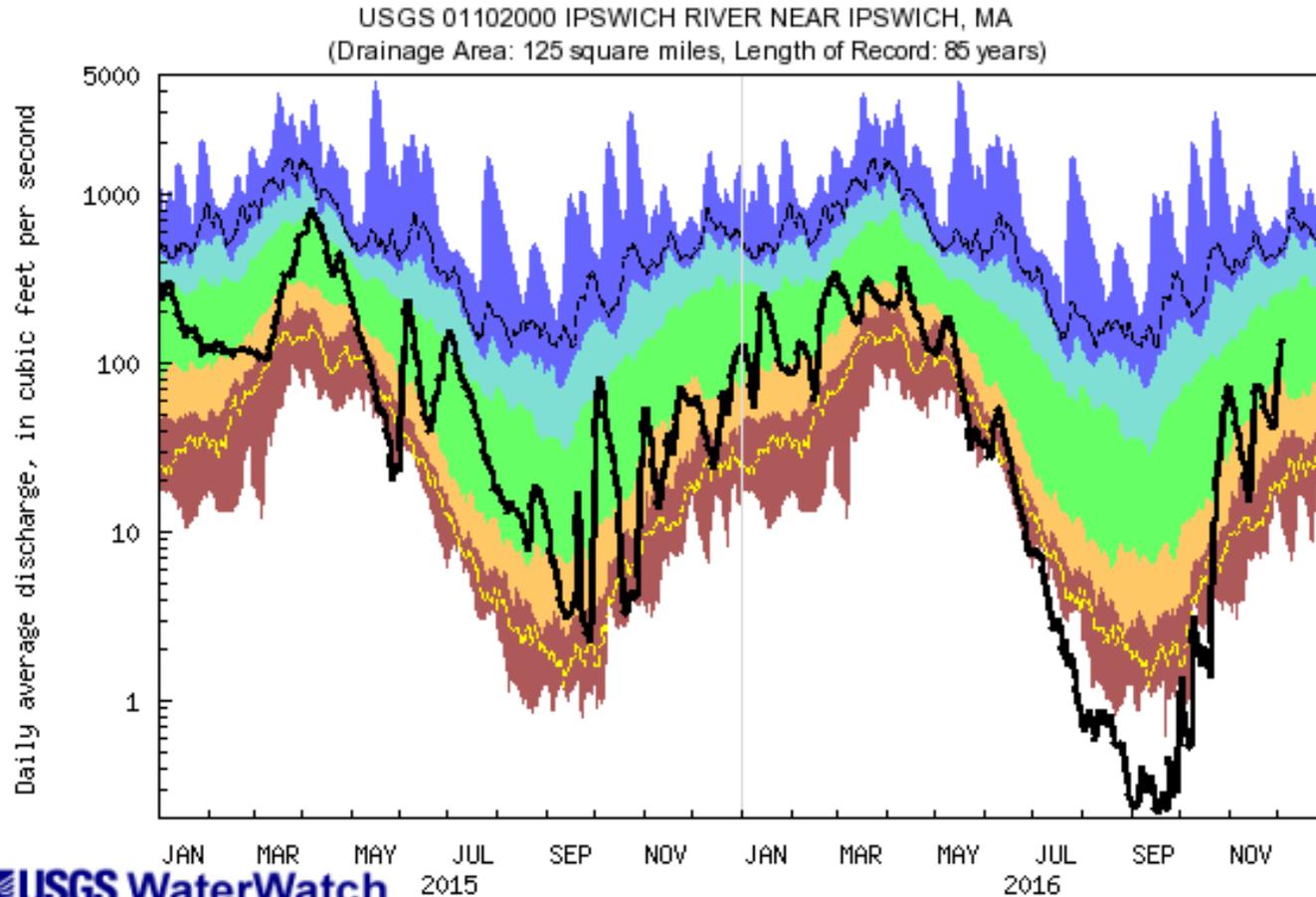
Ipswich River, South Middleton

USGS 01101500 IPSWICH RIVER AT SOUTH MIDDLETON, MA
(Drainage Area: 44.5 square miles, Length of Record: 77 years)



Explanation - Percentile classes						
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile-highest
Much below Normal		Below normal	Normal	Above normal	Much above normal	Flow

Ipswich River, Ipswich

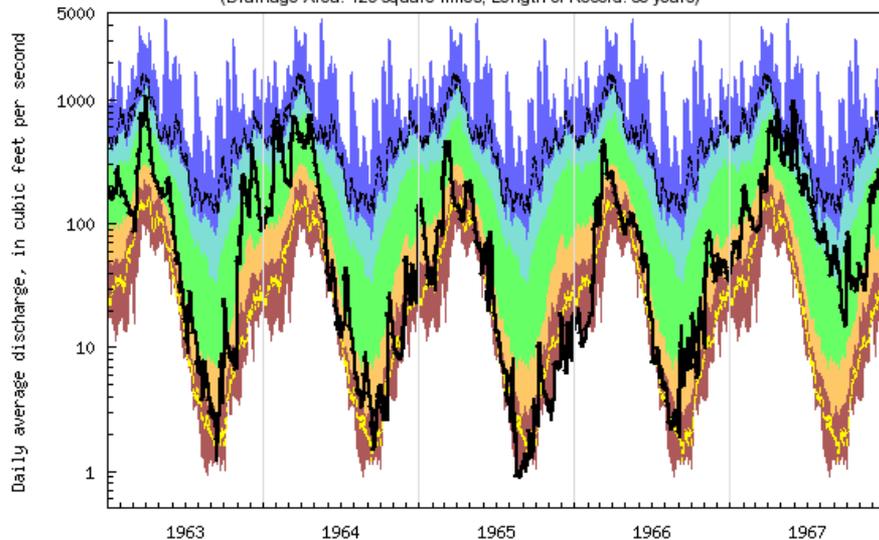


Explanation - Percentile classes							
						Flow	
lowest-10th percentile	5	10-24	25-75	76-90	95		90th percentile-highest
Much below Normal	Below normal	Normal	Above normal	Much above normal			

Ipswich River, 1960's vs 2016 Drought

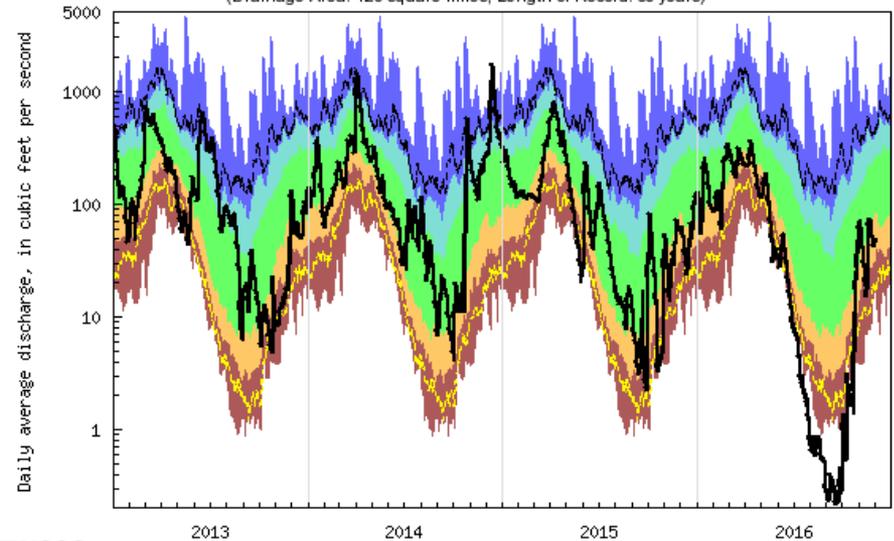
1960's Drought

USGS 01102000 IPSWICH RIVER NEAR IPSWICH, MA
(Drainage Area: 125 square miles, Length of Record: 85 years)



2016 Drought

USGS 01102000 IPSWICH RIVER NEAR IPSWICH, MA
(Drainage Area: 125 square miles, Length of Record: 85 years)



USGS WaterWatch

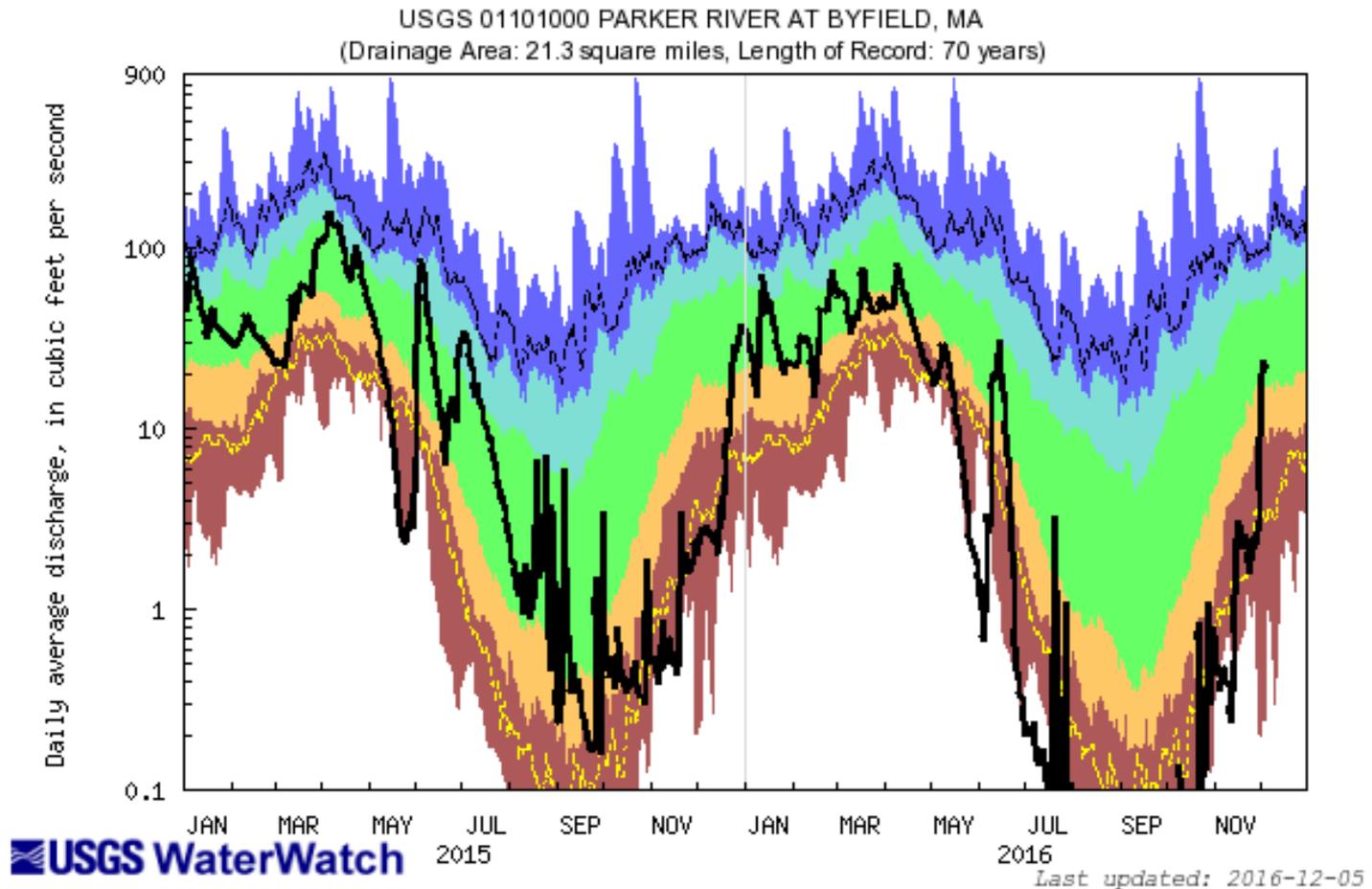
Last updated: 2016-11-04

USGS WaterWatch

Last updated: 2016-12-01

Explanation - Percentile classes						
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile-highest
Much below Normal	Below normal	Normal	Above normal	Much above normal		Flow

Parker River, Byfield

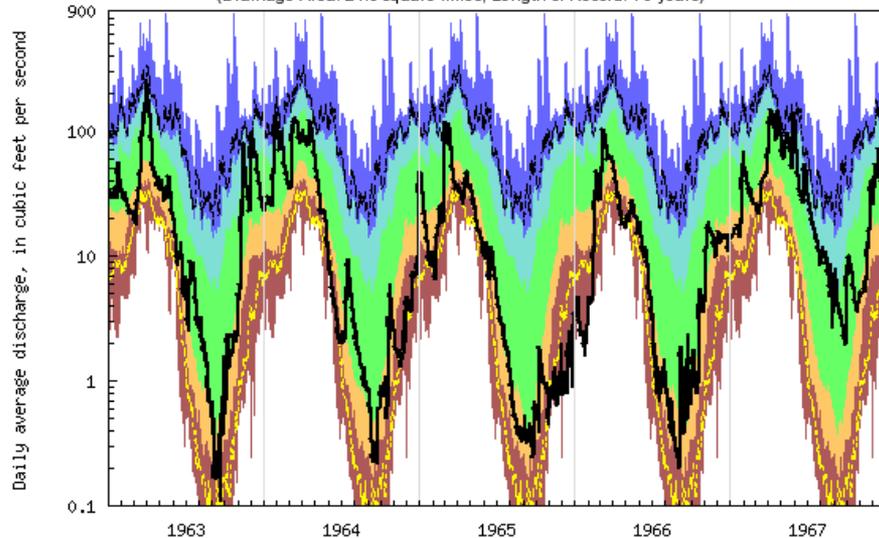


Explanation - Percentile classes						Flow
lowest-10th percentile	5	10-24	25-75	76-90	95 90th percentile-highest	
Much below Normal	Below normal	Normal	Above normal	Much above normal		

Parker River, 1960's vs 2016 Drought

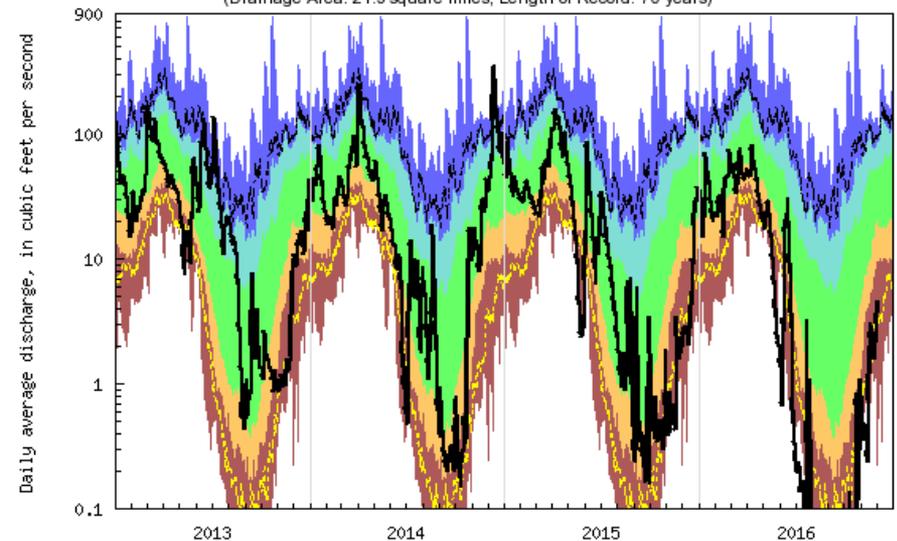
1960's Drought

USGS 01101000 PARKER RIVER AT BYFIELD, MA
(Drainage Area: 21.3 square miles, Length of Record: 70 years)



2016 Drought

USGS 01101000 PARKER RIVER AT BYFIELD, MA
(Drainage Area: 21.3 square miles, Length of Record: 70 years)



USGS WaterWatch

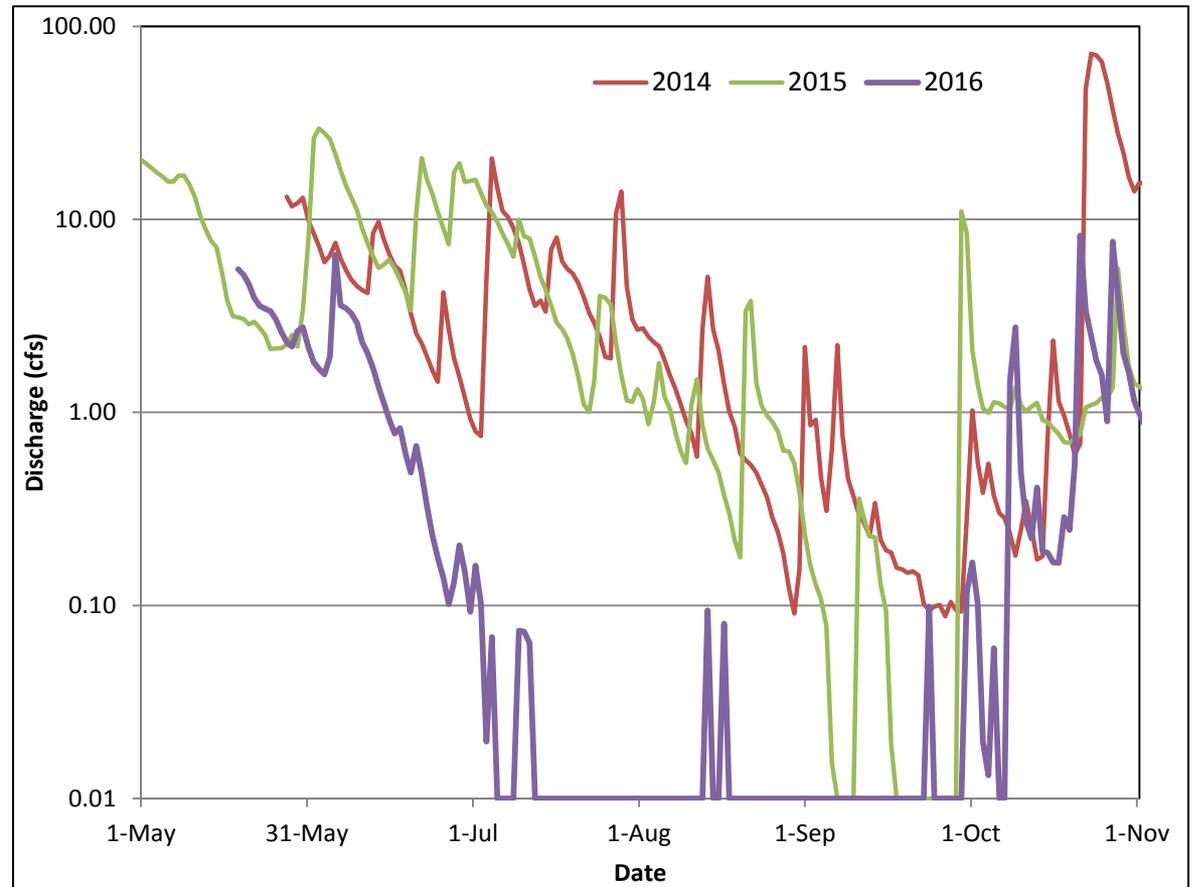
Last updated: 2016-11-04

USGS WaterWatch

Last updated: 2016-12-01

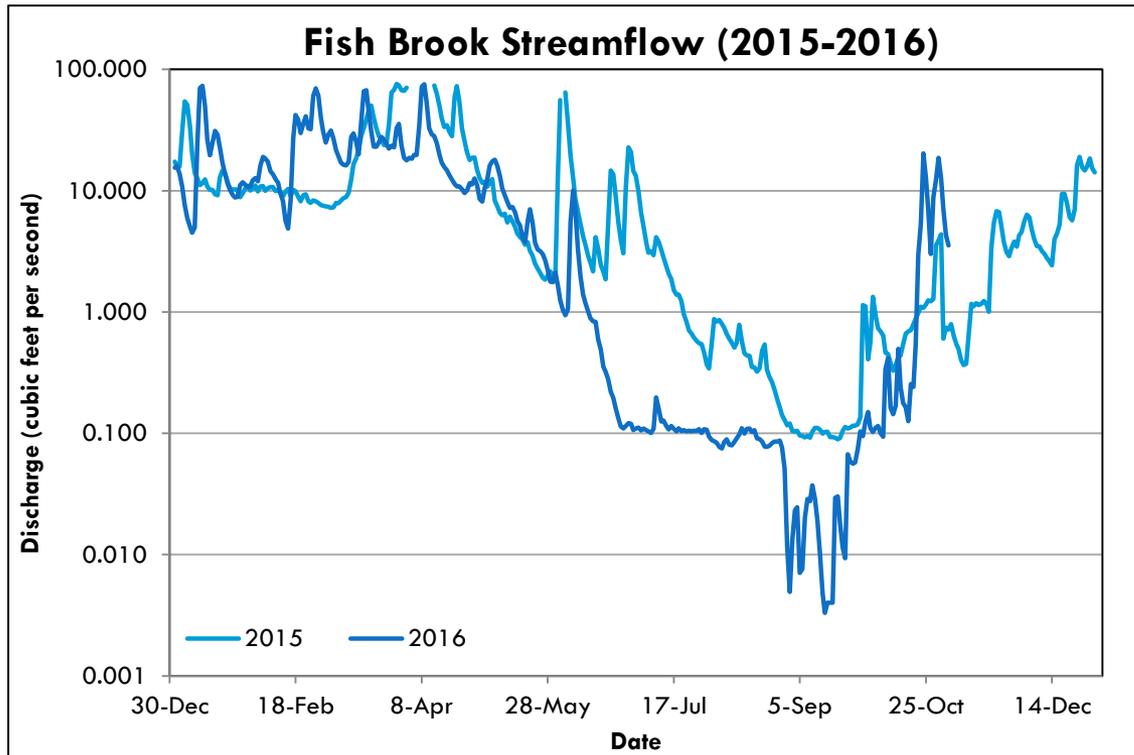
Explanation - Percentile classes						
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile-highest
Much below Normal	Below normal	Normal	Above normal	Much above normal		Flow

Martins Brook, North Reading



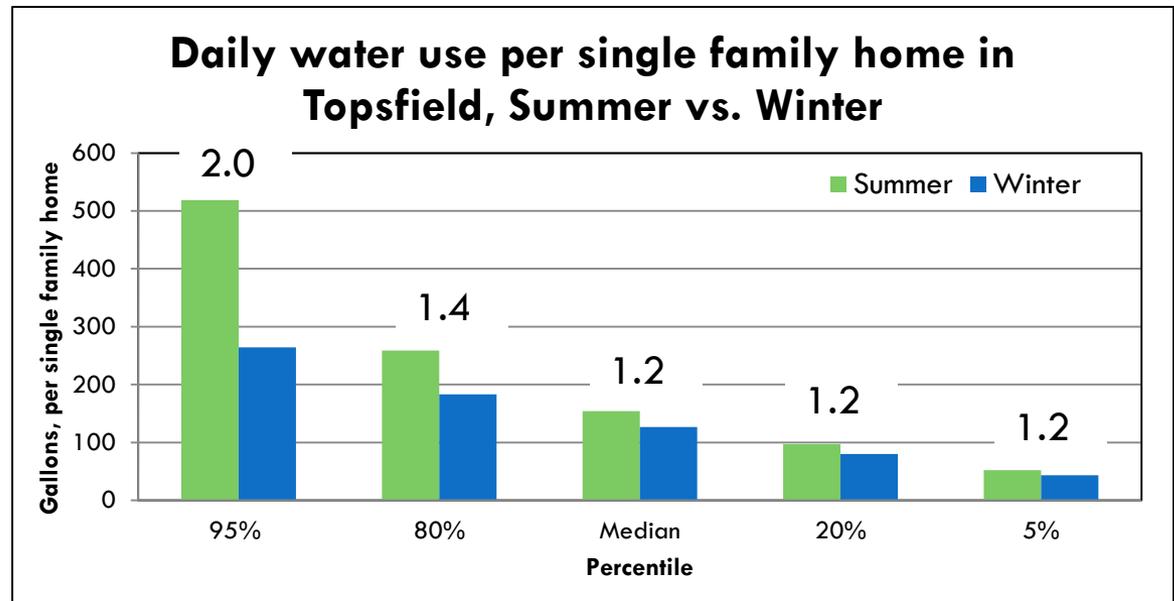
- No flow/dry from 7/4/16 - 10/8/16

Fish Brook, Boxford



Summer Water Use in PIE Towns

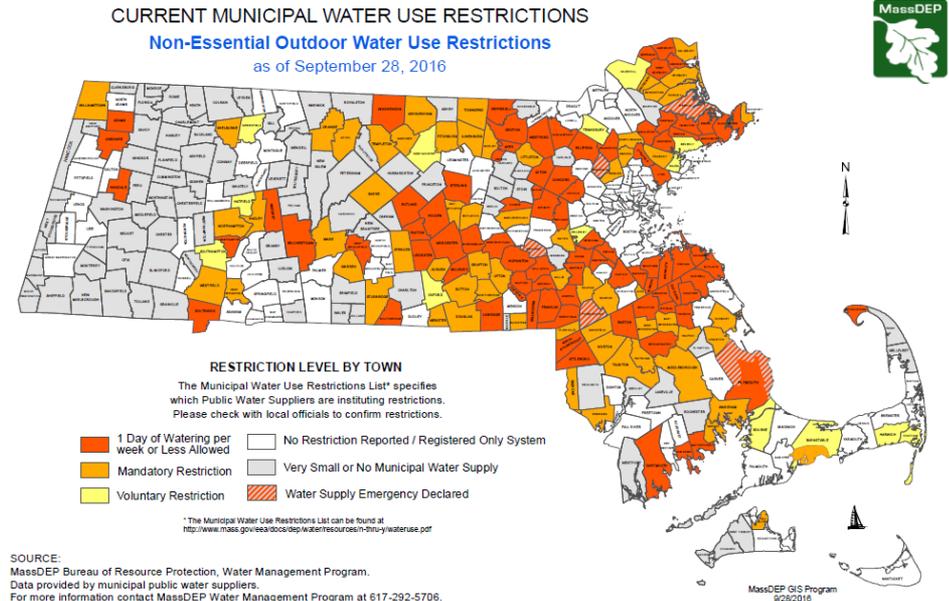
Town	Winter/Summer Water Use Ratio (2009-2014)
Byfield	1.3
Danvers	1.3
Essex	1.4
Georgetown	1.5
Hamilton	1.3
Ipswich	1.3
Lynnfield Center	1.8
Manchester	1.7
Middleton	1.6
North Reading	1.4
Peabody	1.3
Rowley	1.5
Salem-Beverly	1.2
Topsfield	1.4
Wenham	1.3
Wilmington	1.3



Average Winter/Summer Water Use Ratio in PIE River Towns: 1.4

Improving streamflow conditions

- Outdoor watering restrictions/bans
- Education and information campaign for water conservation
- Behavior change campaign (Community Based Social Marketing)



Community Based Social Marketing

- Many efforts to encourage consumers to change behavior/reduce resource use have fallen short of expectations
 - ▣ Information can increase knowledge but rarely produces significant behavior change
- More than just information and financial considerations drive behavior – social and psychological factors also play a significant role
- CBSM merges knowledge from psychology with social marketing to develop behavior changing strategies

CBSM Methods

Five major steps

1. Identify which behaviors are most important
2. ID community-specific barriers & find the benefits – why target audience would elect to participate in behavior change
3. Develop strategies which increase benefits for desired action & reduce barriers to desired action
4. Pilot several strategies against each other & evaluate
5. Implement broadly

DER, IRWA and CBSM

- In Spring 2016, DER and IRWA worked with Wenham and Topsfield on a study to determine benefits and barriers to reducing residential outdoor water use
- Biggest barriers to not watering/reducing lawn watering were:
 - Grass will die if not watered
 - Not watering wouldn't save much water

Ideas for Pilot CBSM campaign

□ Social norms campaign

- Compare high water users to other more efficient water users in same neighborhoods with similar property/household size
- Could be combined with offers for irrigation audits, direct outreach from watershed association
- Education on water use for different irrigation methods

□ Commitment Campaign

- Would work with water department on specifics, could be a voluntary commitment to water 1" per week including precipitation
- Education on how much water grass needs, impacts of over watering

Examples of CBSM Success

- Durham, Ontario – Water lawns max of 1” per week including rainfall
 - Households visited by college students, distributed brochures, explained that lawns only need 1” water per week – reduced water use by 26%
 - Households also signed commitments to only water 1”/week – water use reduced by 32%
 - Other households received only info packet on efficient water use – water use reduced by 15%

Questions?



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michelle.craddock@state.ma.us
617-626-1544

Groundwater well locations

