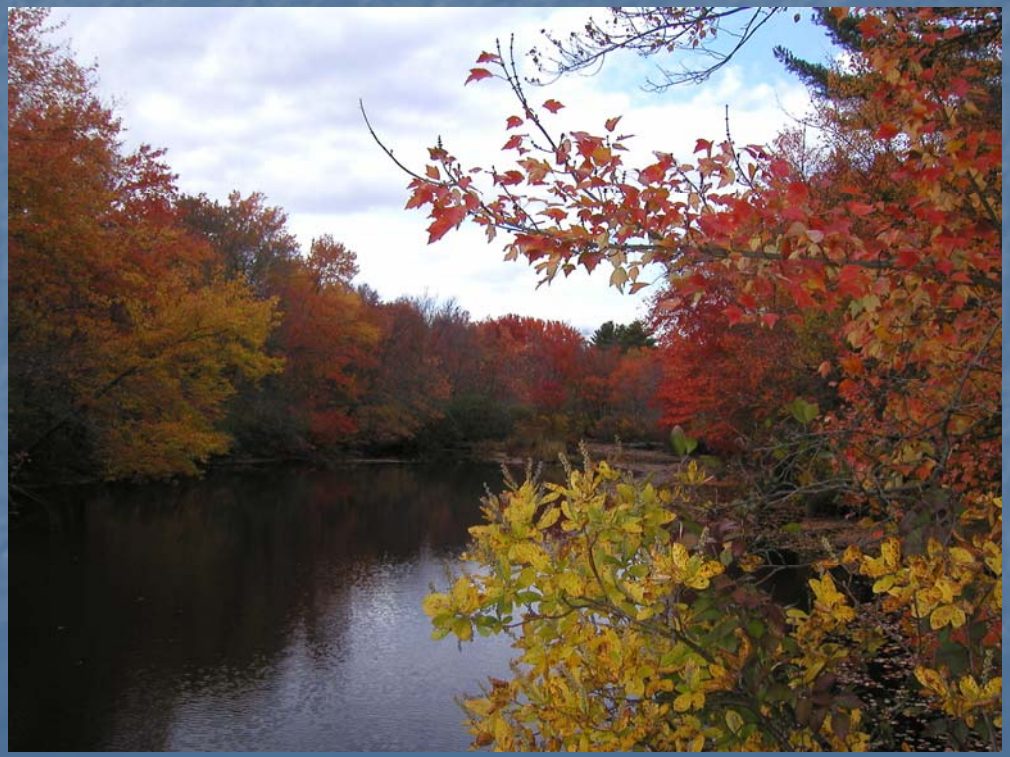
# It seems like we have enough rain.... so why isn't there enough water?



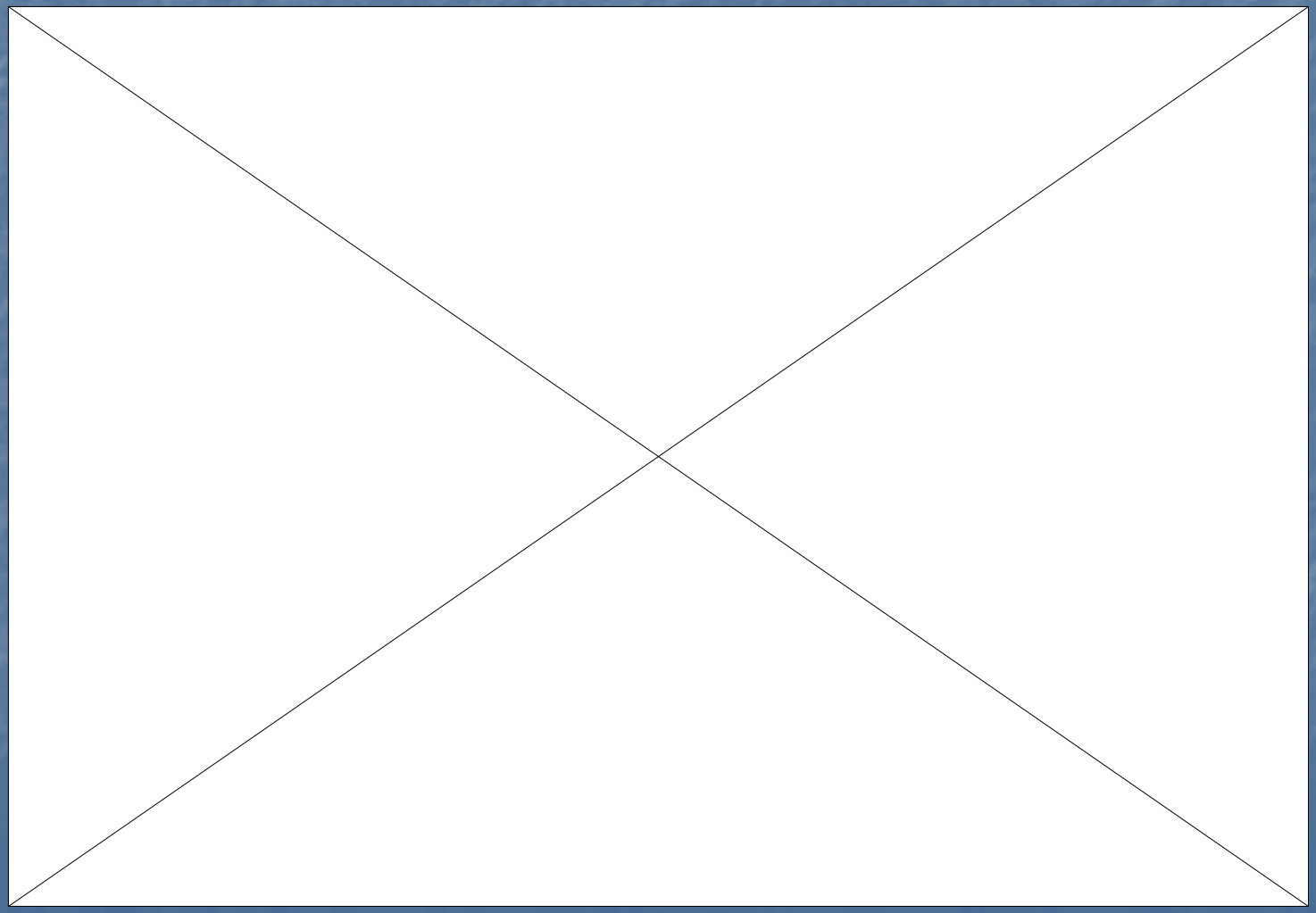
Alisa Richardson, P.E.
Principal Engineer
RIDEM office of Water Resources

# The Main Problem

The problem is the water is not always where we need it... when we need it...and the key word here is **need**

10
NBC

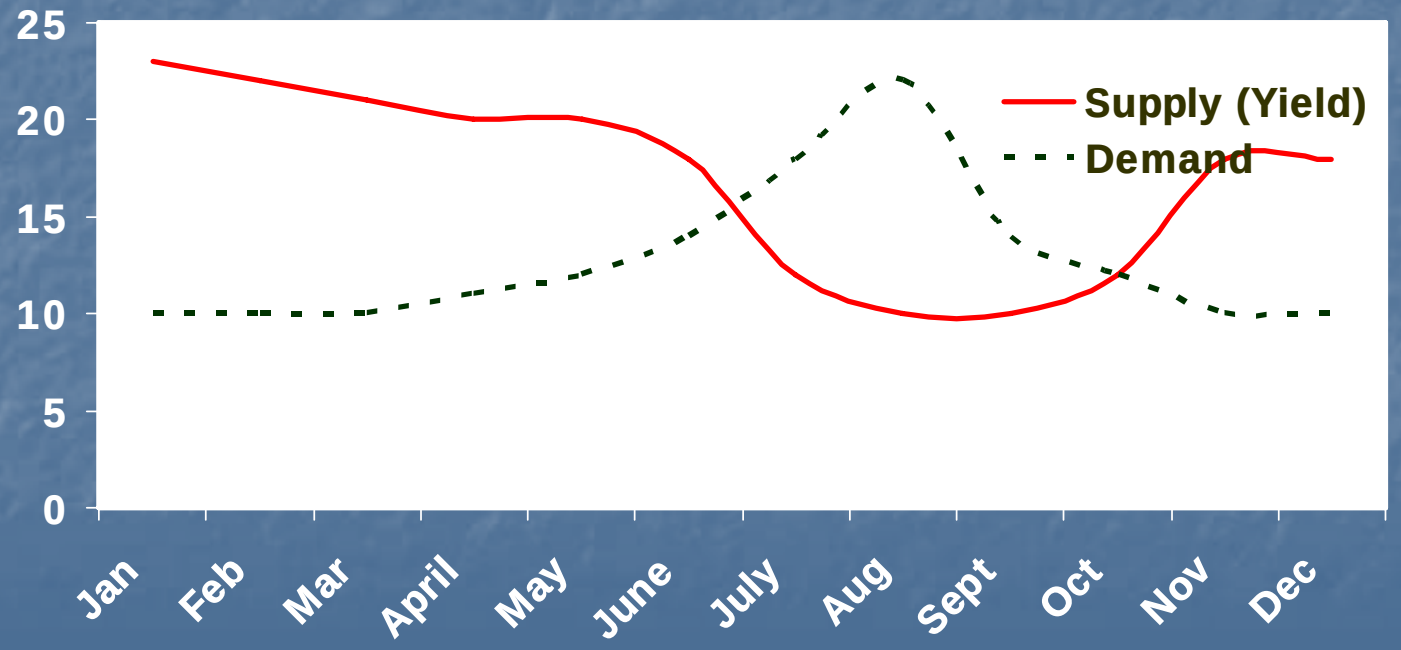
# How does this happen?



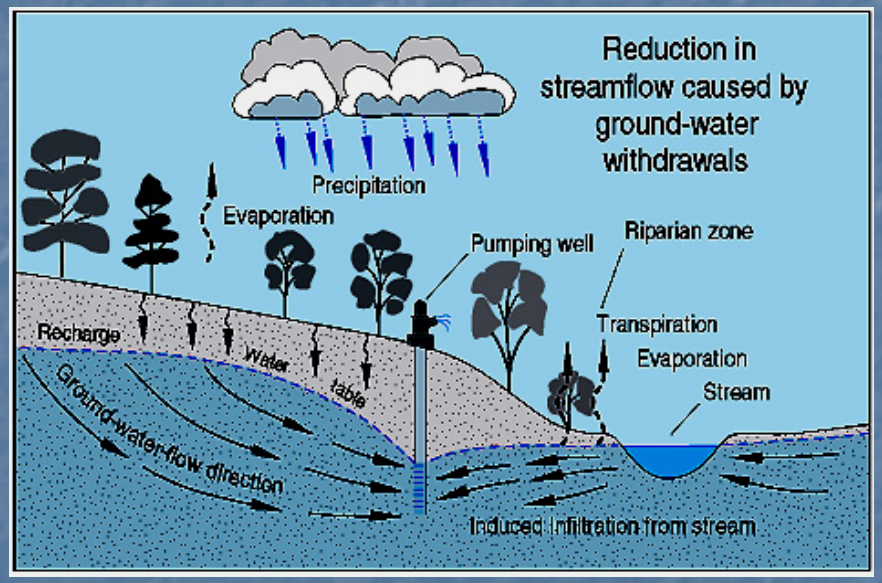
Houghton-Miflin publishing company

# Supply and Demand

- Summer demand peaks while the supply diminishes

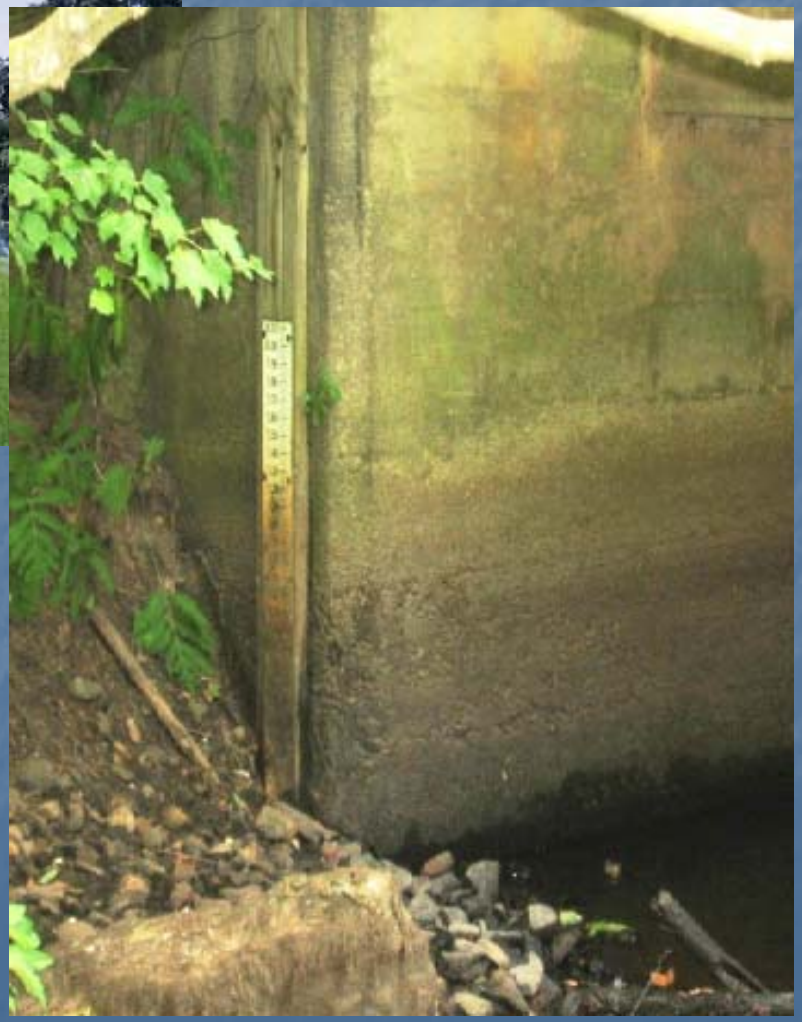


# Effect of Groundwater Withdrawals and Impervious Areas



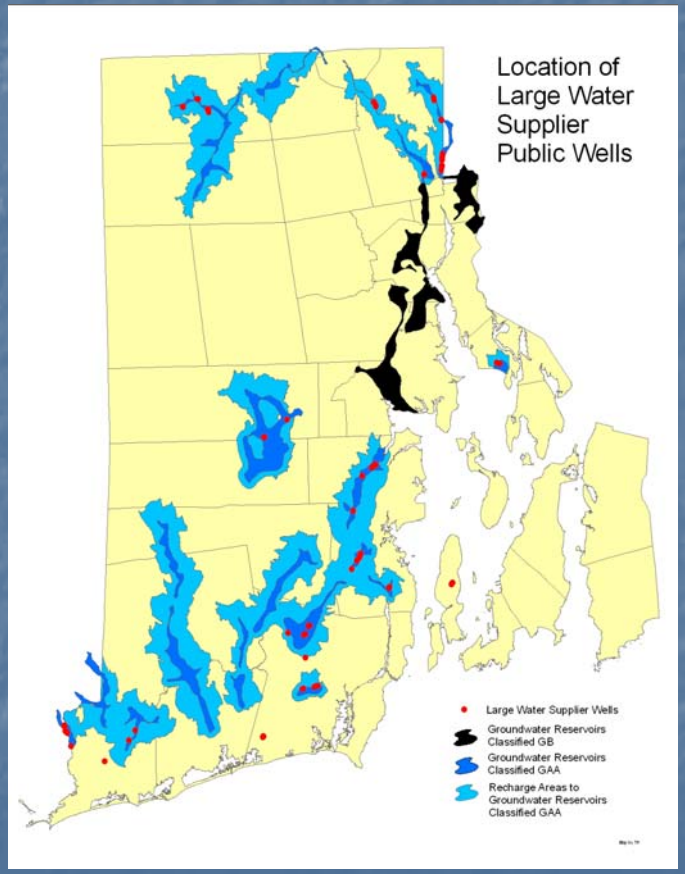

- Takes water from the stream
- Lowering the groundwater table
- In summer take away cold springs
- Introducing hot runnoff

# What happens



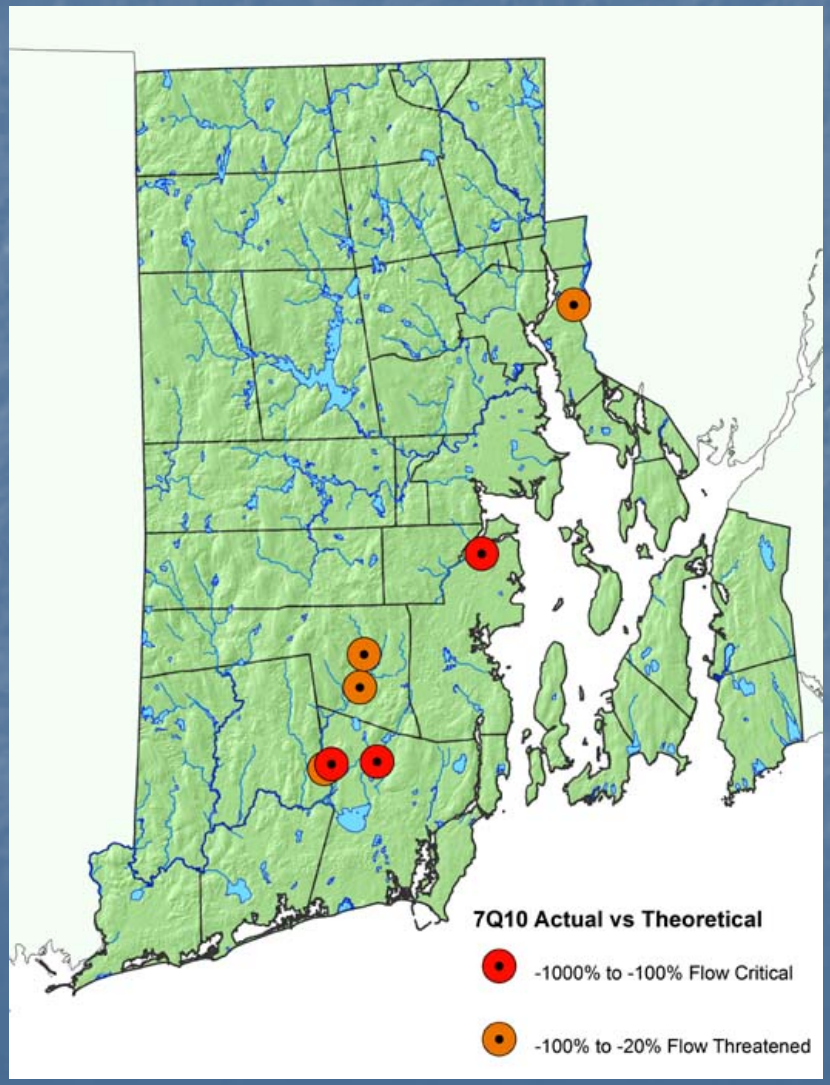
Change in temperature of water
Change in quality of water
Change in habitat availability
Change in the fish community

# Where are the Groundwater Reservoirs?

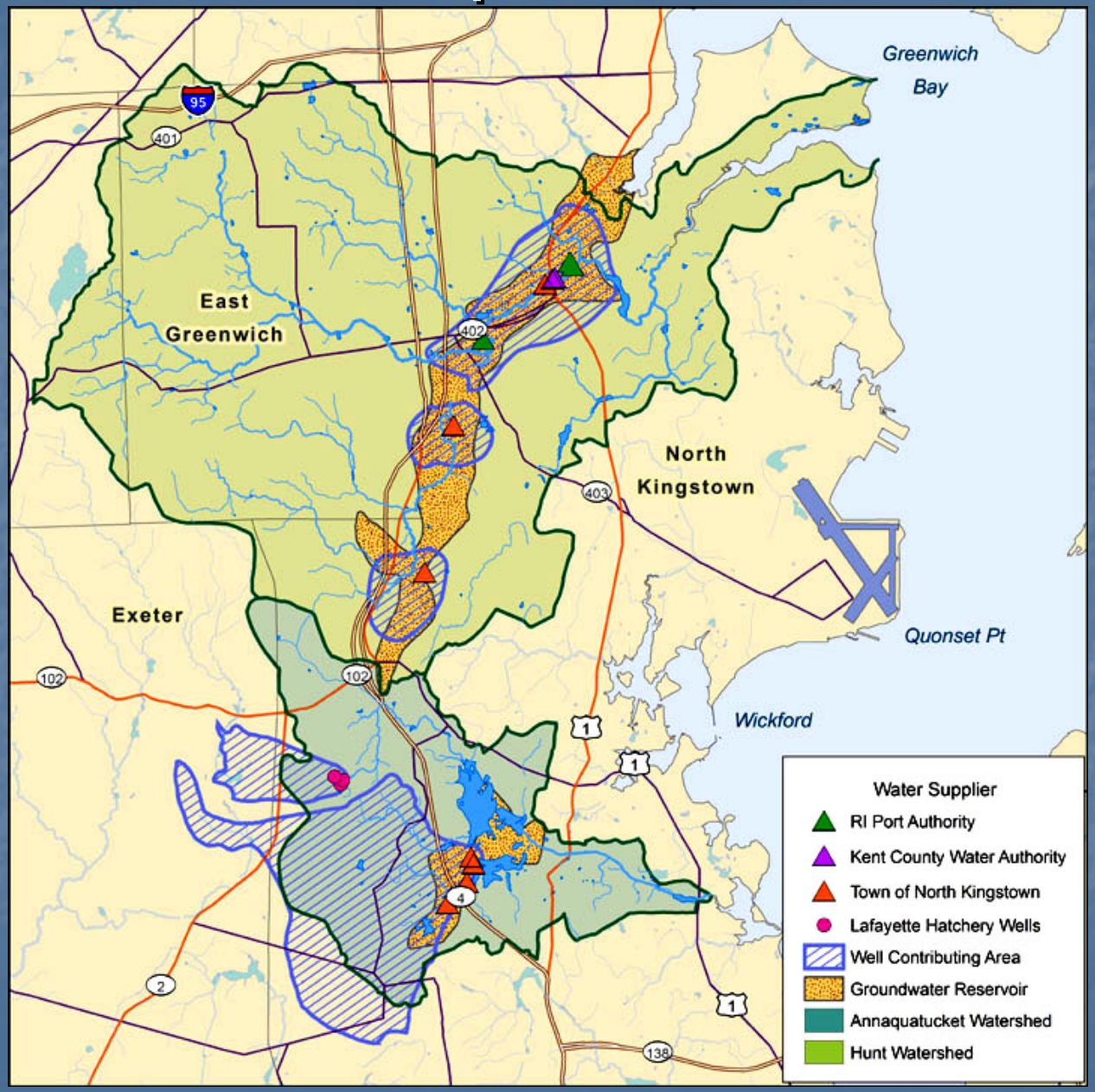



- 93% of major public supply wells located in these aquifers (79 of 85).
- Highly productive & clean sources of water.

# Where are areas of concern?

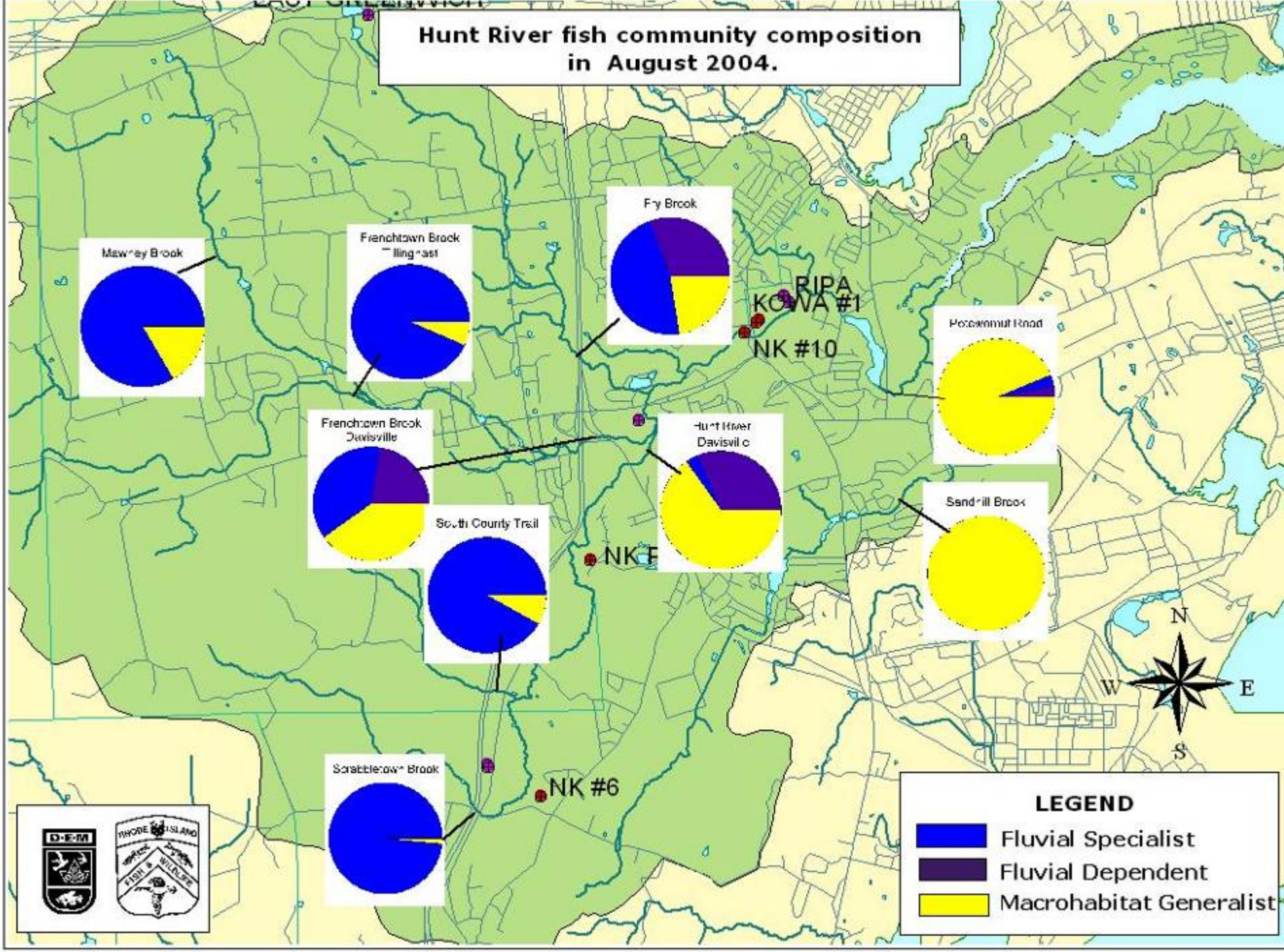


# Hunt/Annaquatucket Basin

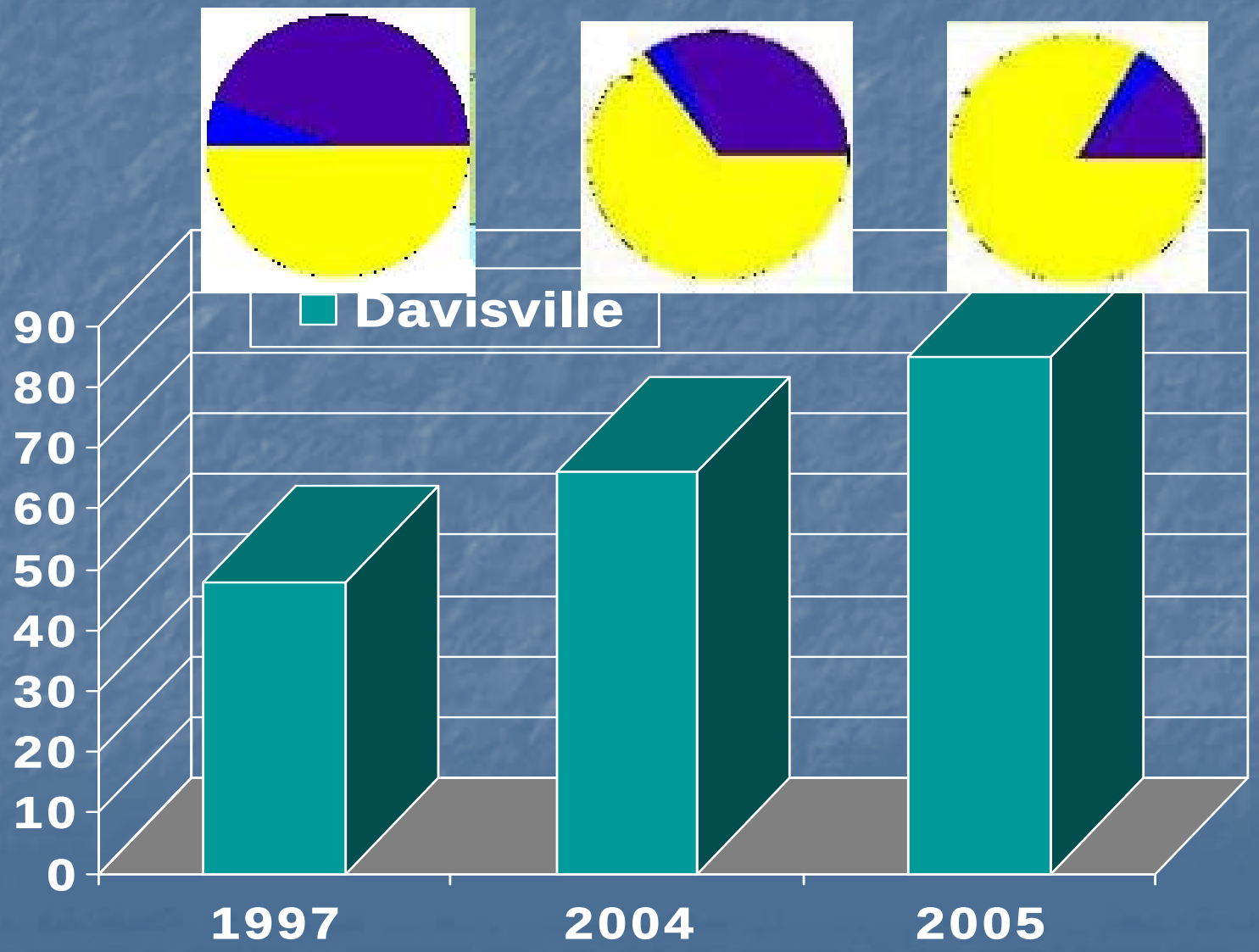


# Fish Communities

| Fluvial Specialists | Fluvial Dependents | Macrohabitat generalists |
|---|---|---|
| Requires Flowing water some of the time | Requires Flowing water a majority of the time | Does not require flowing water |
| alewife<br>blueback herring | brook trout<br>Atlantic salmon | American eel<br>brown bullhead<br>chain pickerel<br>largemouth bass<br>yellow perch |

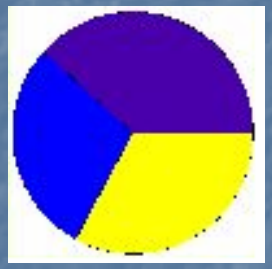

Hunt River fish community composition
in August 2004.
Mawney Brook
Frenchtown Brook
Fry Brook
RIPA
KOWA #1
NK #10
Potowomut Road
Frenchtown Brook
Davisville
Hunt River
Davisville
Sandhill Brook
South County Trail
NK F
Scrabbletown Brook
NK #6
N
W
E
S
LEGEND
Fluvial Specialist
Fluvial Dependent
Macrohabitat Generalist
D·E·M
RHODE ISLAND
FISH & WILDLIFE

# Withdrawals above Davisville

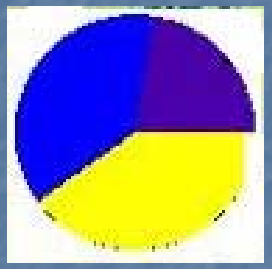


# Other Portions of the Hunt

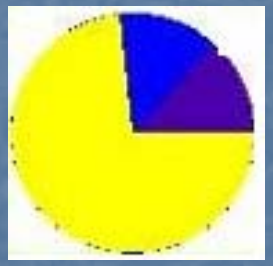
- Frenchtown Brook



1997

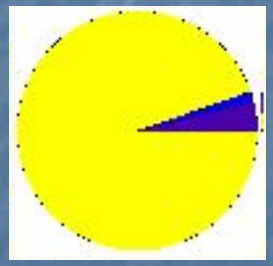


2004

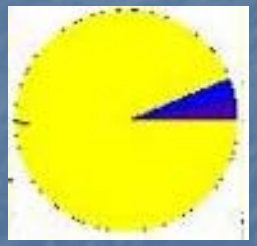


2005

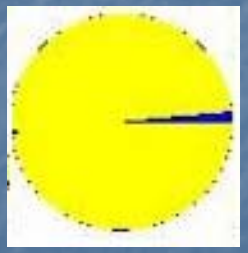
- Potowomet Pond



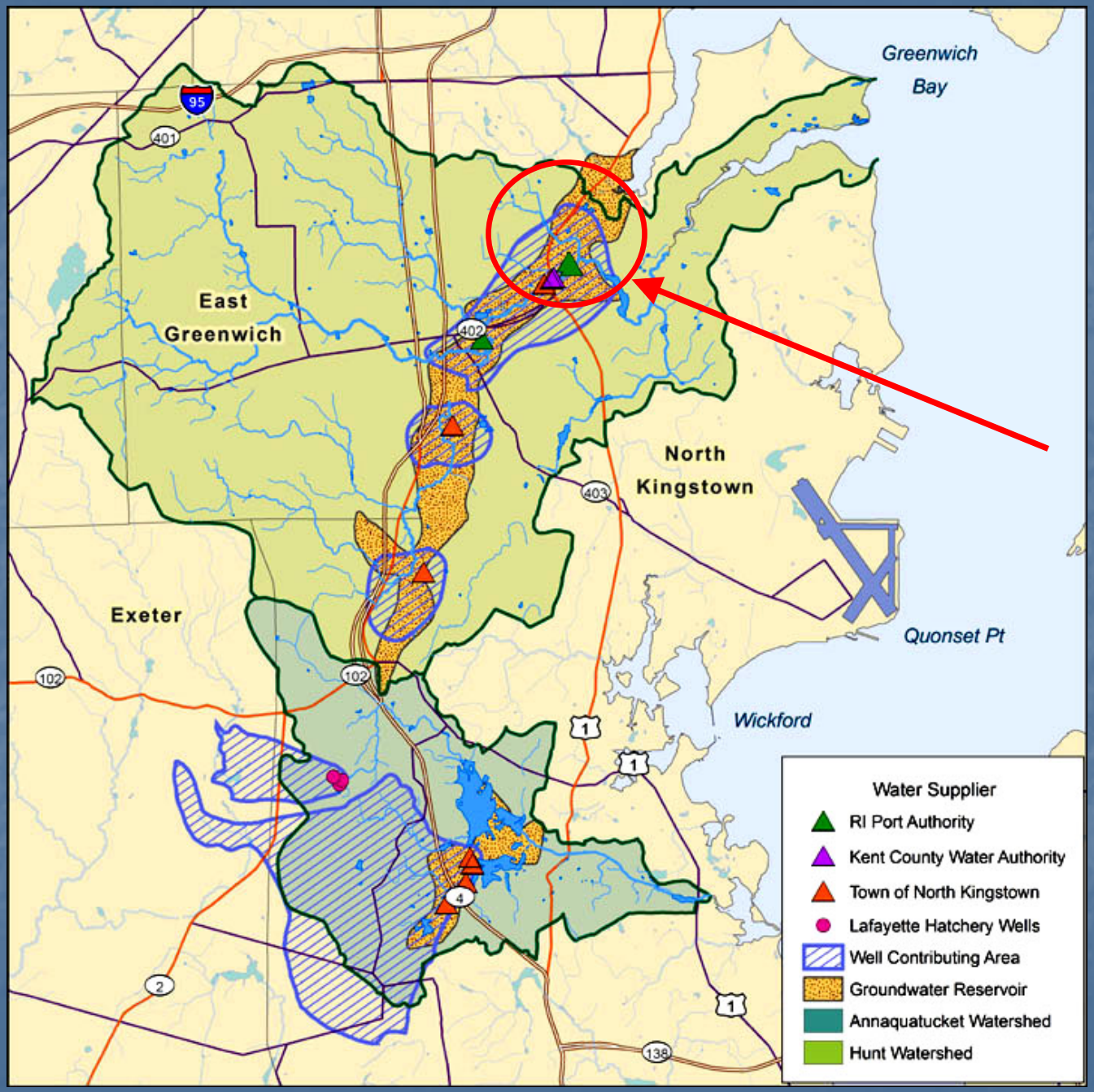
1997

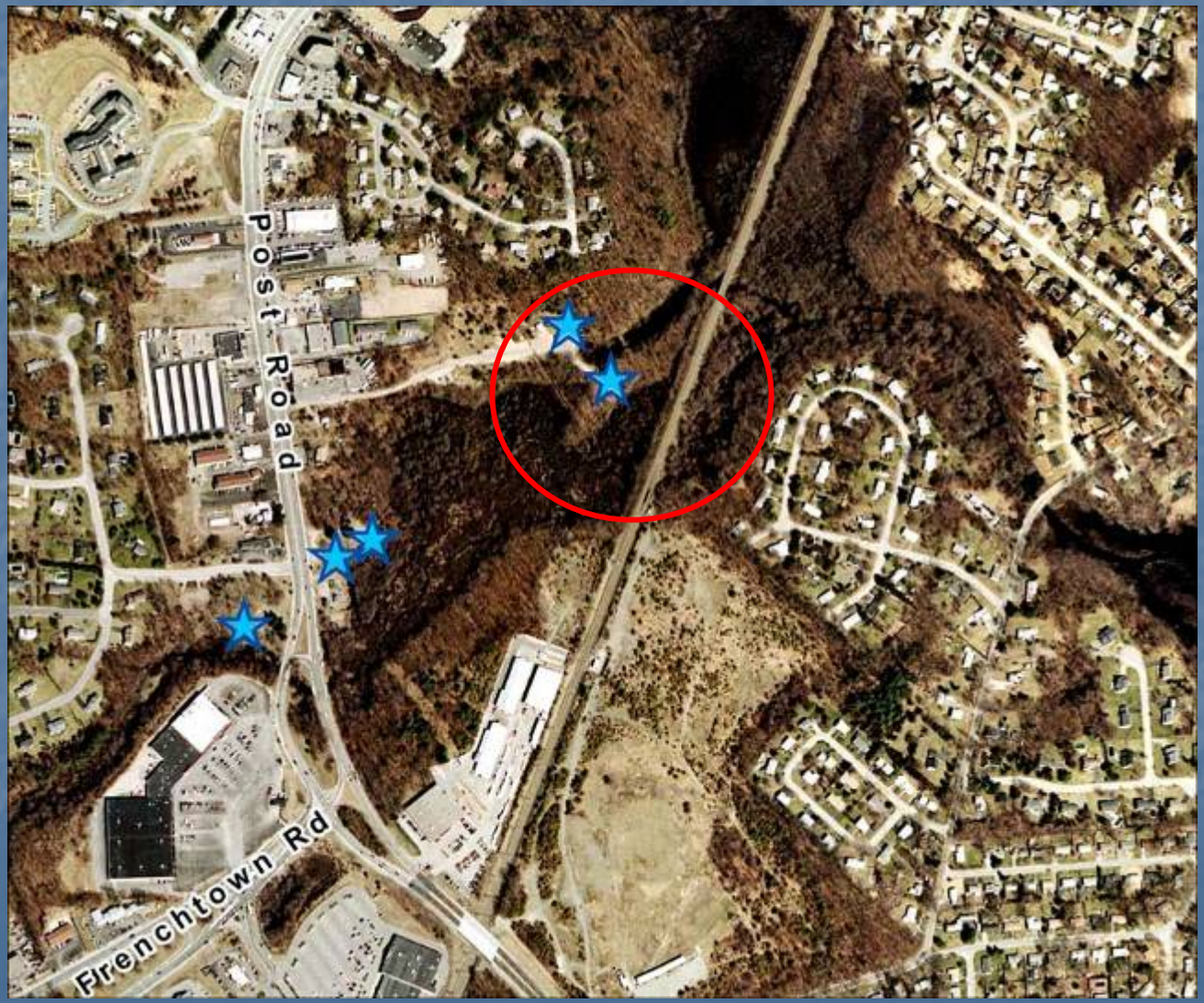


2004



2005


Greenwich
Bay
East
Greenwich
North
Kingstown
Exeter
Quonset Pt
Wickford
95
401
402
403
102
1
4
2
138
Water Supplier
RI Port Authority
Kent County Water Authority
Town of North Kingstown
Lafayette Hatchery Wells
Well Contributing Area
Groundwater Reservoir
Annaquatucket Watershed
Hunt Watershed


Post Road
Frenchtown Rd

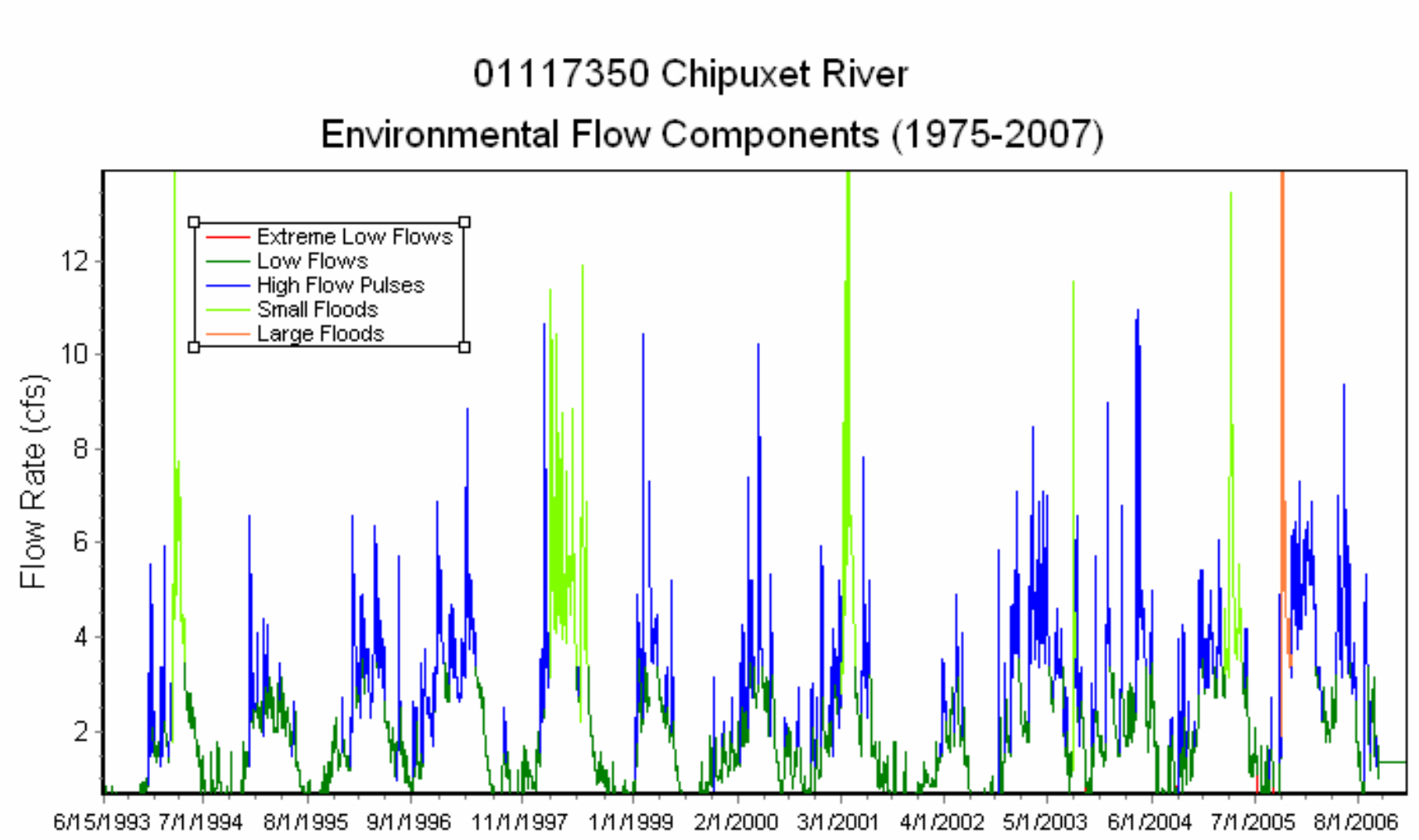
# Wetlands are also affected

Wetlands along the Hunt River in the summer of 2005

Fish and Wildlife depend on wetlands

# What have we done?

- First Environmental Agencies developed standards for stream flow
  - 1984 – New England Aquatic Base Flow
  - 2000 Colin Apse –Thesis CT
  - RI Aquatic Base Flow
- Though we continue to rely on  Aquatic Base Flow to evaluate impacts of withdrawals on streamflow, we are faced with difficulties in that sophisticated modeling is needed to apply the standard to median flows


01117350 Chipuxet River
Environmental Flow Components (1975-2007)
Extreme Low Flows
Low Flows
High Flow Pulses
Small Floods
Large Floods
Flow Rate (cfs)
12
10
8
6
4
2
6/15/1993
7/1/1994
8/1/1995
9/1/1996
11/1/1997
1/1/1999
2/1/2000
3/1/2001
4/1/2002
5/1/2003
6/1/2004
7/1/2005
8/1/2006

# 2005/6 Breakthrough

## Fish Assemblage Responses to Water Withdrawals and Water Supply Reservoirs in Piedmont Streams

MARY C. FREEMAN*
US Geological Survey
Patuxent Wildlife Research Center
University of Georgia
Athens, Georgia 30602, USA

PAULA A. MARCINEK
Institute of Ecology

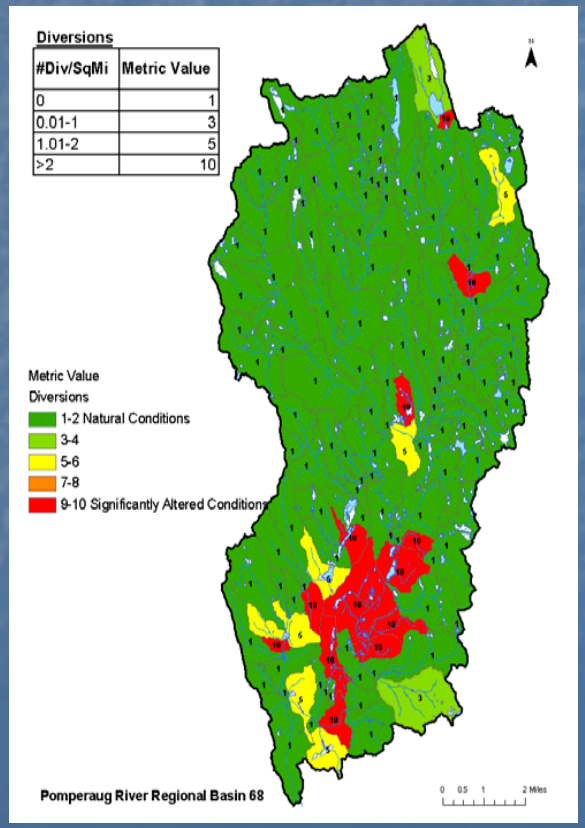
University of Georgia
Athens, Georgia 30602, USA

Summary: when you withdraw 50% of the 7Q10 you see changes in the fish community

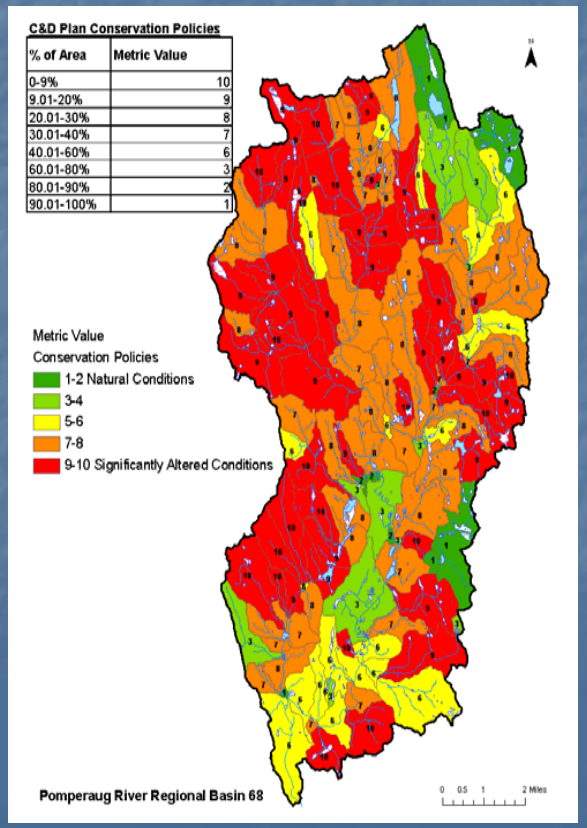
# Watching Connecticut

## CT Approach: Standards Establish Allowable Withdrawals

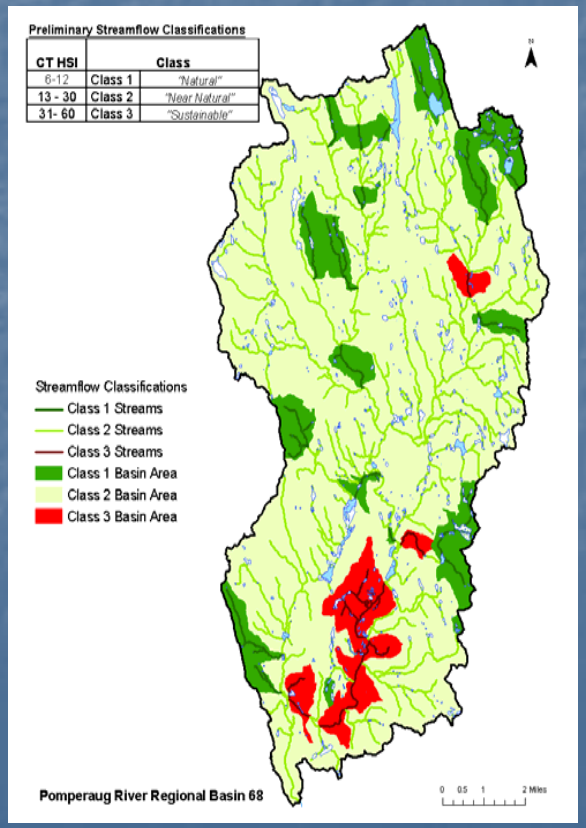
Diversions & Impervious Cover



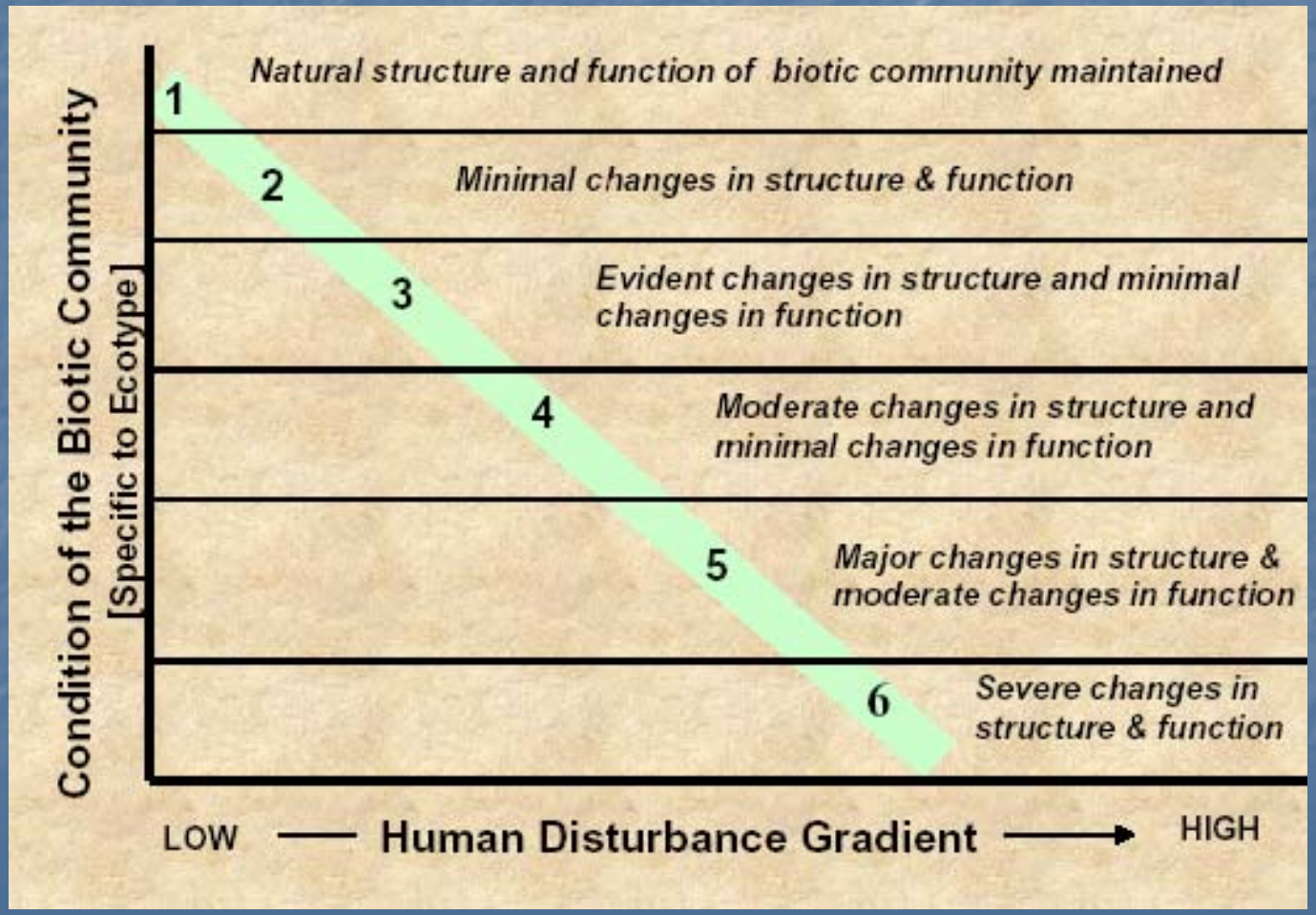

Conservation & Development




Streamflow Classifications

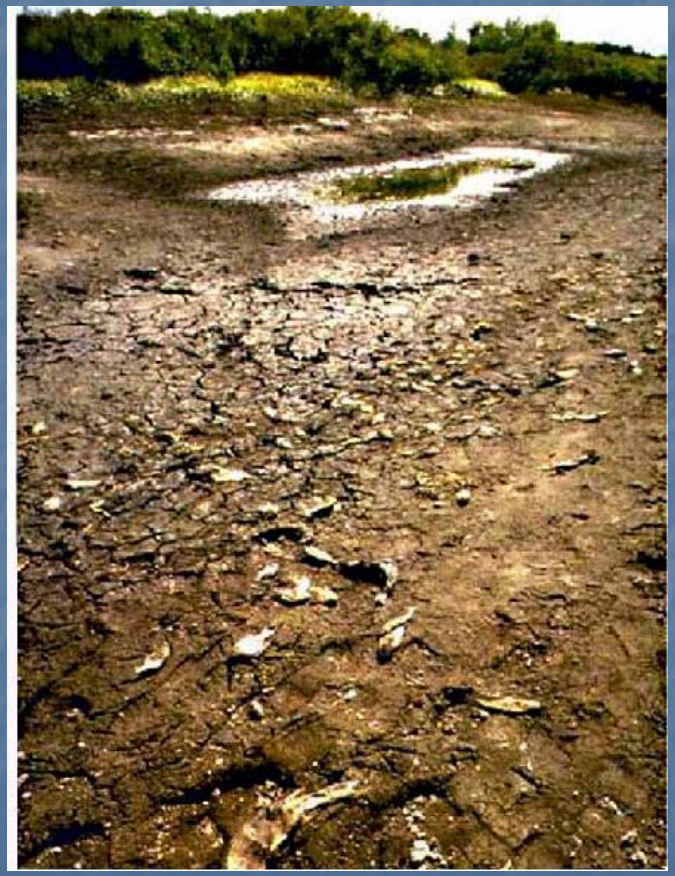


# Work from the Nature Conservancy Limits of Hydrologic Alteration



# Working with Massachusetts

| Gage Name | Parker | Ipswich | Charles | Housatonic | Hoosic | Chipuxet | Hunt |
|---|---|---|---|---|---|---|---|
| | Byfield | uth Middle | Dover | eat Barring | Williamstown | | |
| 2001 Stress Level | High | High | Medium | Low | Low | | |
| | | | | | | | |
| Pre-August Median | 0.41 | 0.43 | 0.41 | 0.15 | 0.34 | 0.8 | 0.7 |
| Post-August Median | 0.03 | 0.16 | 0.40 | 0.57 | 0.61 | 0.9 | 0.425 |
| Percent Difference | -1267% | -169% | -2% | 74% | 44% | 11% | -65% |
| Absolute value | 1267% | 169% | 2% | 74% | 44% | 11% | 65% |
| | | | | | | | |
| Pre- 7-Day Min | 0.13 | 0.16 | 0.13 | 0.08 | 0.18 | 0.422 | 0.3671 |
| Post- 7-Day Min | 0.01 | 0.02 | 0.18 | 0.37 | 0.41 | 0.46 | 0.1693 |
| Percent Difference | -1200% | -700% | 28% | 78% | 56% | 8% | -117% |
| Absolute value | 1200% | 700% | 28% | 78% | 56% | 8% | 117% |
| | | | | | | | |
| Pre- 7-Day Max | 9.46 | 9.5 | 9.46 | 10.65 | 13.15 | 5.9 | 5.78 |
| Post- 7-Day Max | 9.87 | 7.46 | 5.99 | 8.29 | 11.67 | 6.5 | 7.114 |
| Percent Difference | 4% | -27% | -58% | -28% | -13% | 9% | 19% |
| Absolute value | 4% | 27% | 58% | 28% | 13% | 9% | 19% |
| | | | | | | | |
| Pre -High Flow pulse frequency | 13 | 17 | 13 | 14 | 16 | 6 | 6 |
| Post -High Flow pulse frequency | 6 | 8 | 5 | 15 | 21 | 7 | 12 |
| Percent Difference | -117% | -113% | -160% | 7% | 24% | 14% | 50% |
| Absolute Value | 117% | 113% | 160% | 7% | 24% | 14% | 50% |
| | | | | | | | |
| Pre -Low flow duration | 3 | 4 | 3 | 1 | 4.75 | 6.75 | 5.5 |
| Post -Low flow duration | 12.5 | 5 | 10 | 0 | 2 | 7.75 | 8.25 |
| percent difference | 76% | 20% | 70% | | -138% | 13% | 33% |
| Absolute value | 76% | 20% | 70% | 0% | 138% | 13% | 33% |
| | | | | | | | |
| Pre - Zero Flow Days | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Post - Zero Flow Days | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| Difference | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | |
| Pre-Rise Rate | 0.16 | 0.32 | 0.16 | 0.21 | 0.28 | 0.125 | 0.115 |
| Post -Rise Rate | 0.14 | 0.16 | 0.11 | 0.18 | 0.27 | 0.21 | 0.26 |
| Percent Difference | -14% | -100% | -45% | -17% | -4% | 40% | 56% |
| Absolute value | 14% | 100% | 45% | 17% | 4% | 40% | 56% |
| sum % difference 4 factors | 2678% | 1129% | 364% | 204% | 278% | 96% | 339% |
| MARI LOHA Class based on Per | Severe | Severe | Moderate | Minimal | Moderate | Minimal | Moderate |

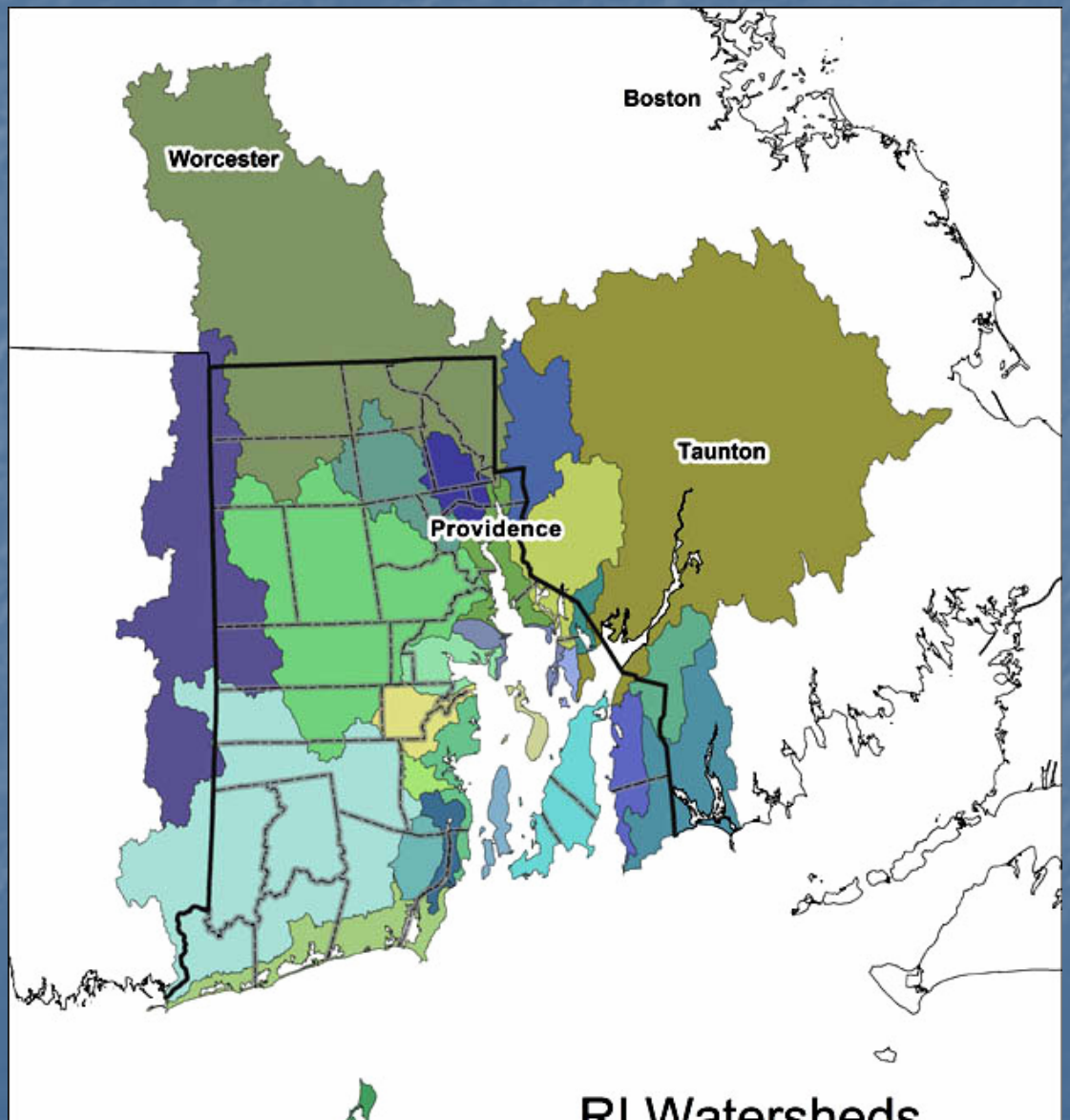


Ipswich River, MA

# So What are we doing?

- Working hard to refine standards that work to permit reliable groundwater withdrawals while protecting our rivers and streams
- Looking at holistic solutions like
  - Rewriting our stormwater manual to require infiltration
  - Continuing to phase in our stormwater program
  - Pressing for conservation
  - Reviewing permits within a watershed context
  - Continuing to try to relate ecosystem changes to streamflow depletion

# The Future – Keep Pressing On



"When the well's dry,
we know the worth of water."

- Ben Franklin