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Ebola Preparedness Update

January 14, 2015

Proximity of Hospitals


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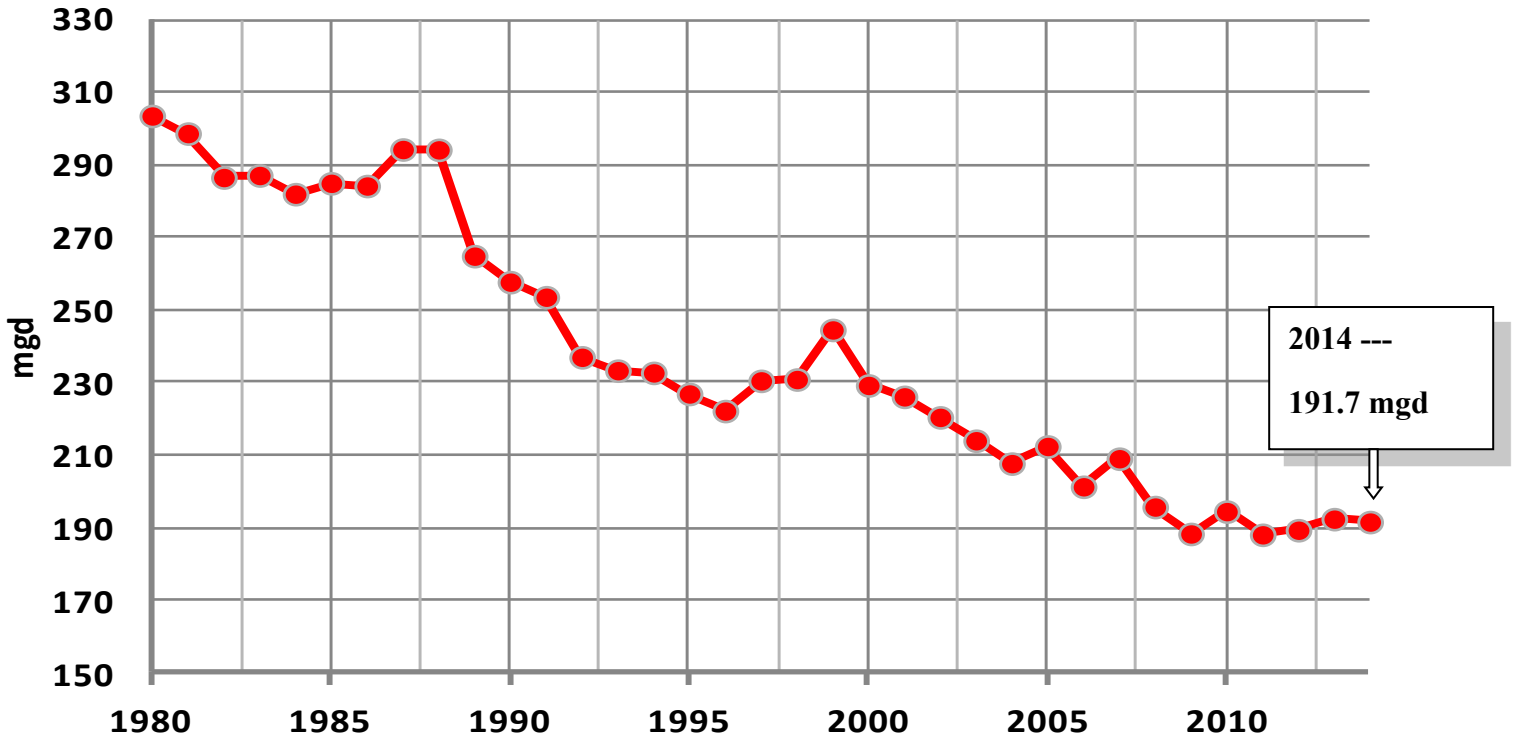
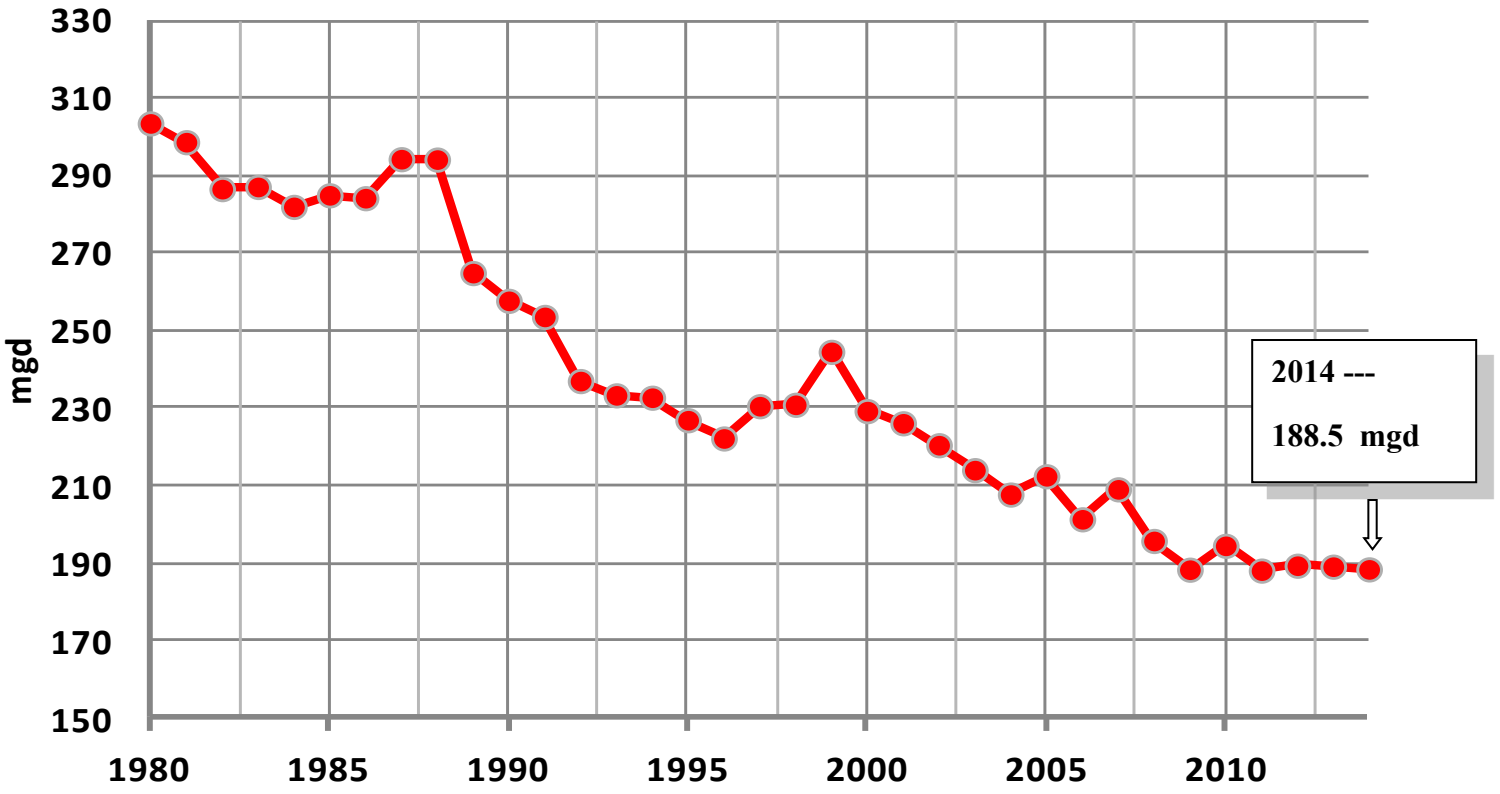
2014 Water Use Trends

January 14, 2015

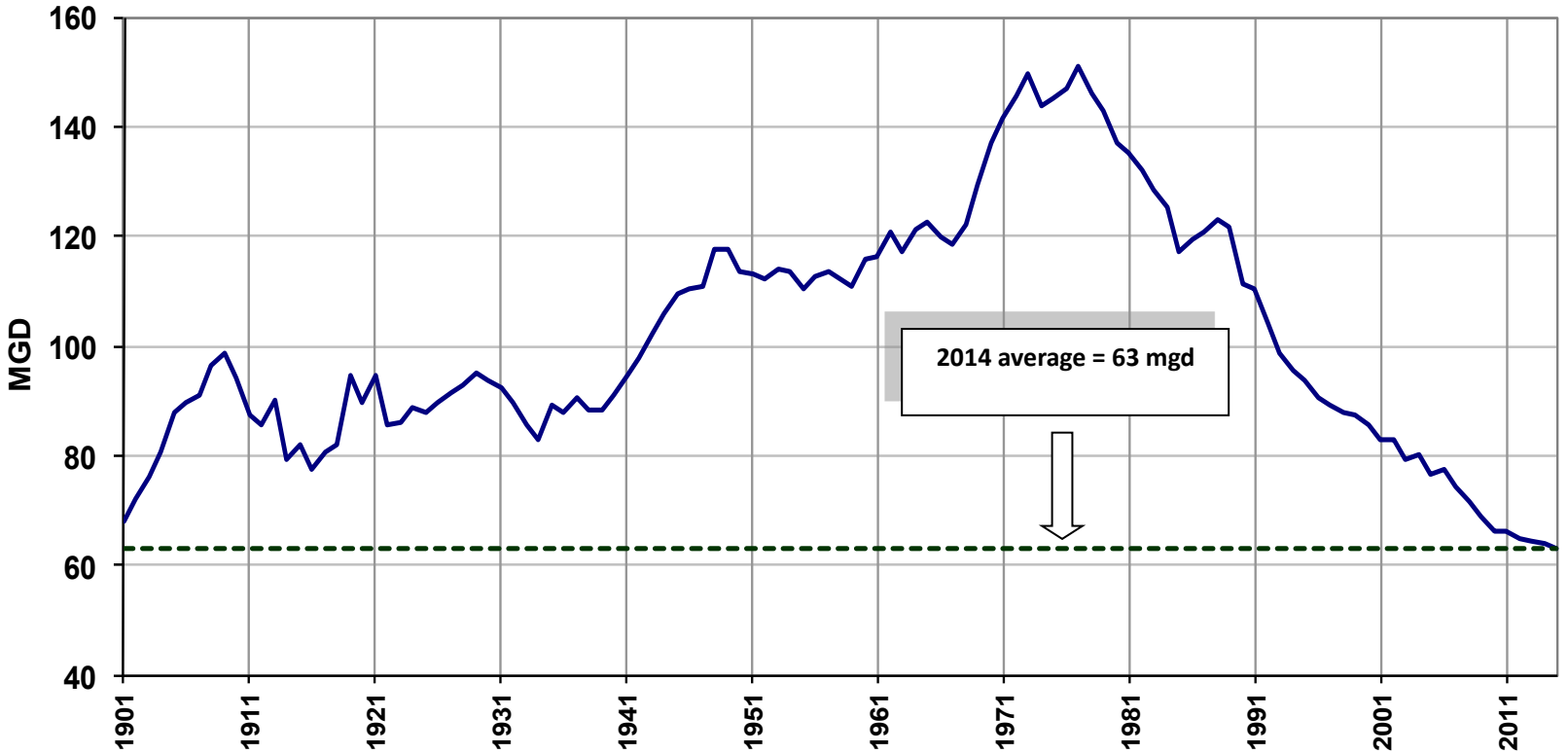
2014 Water Consumption By Communities: About The Same As Last Year



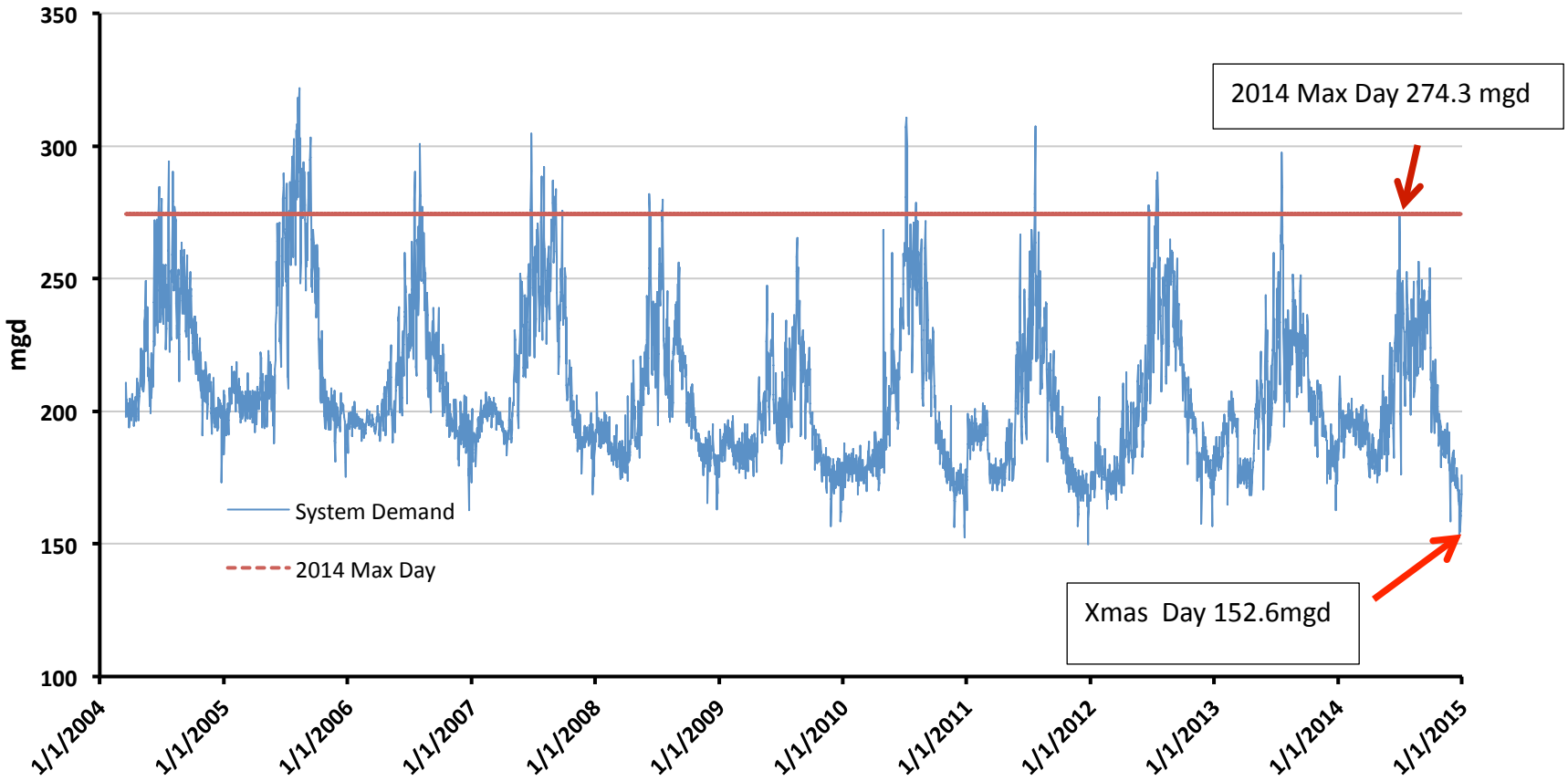
Excluding Cambridge and Hudson – Consumption Was Essentially Flat



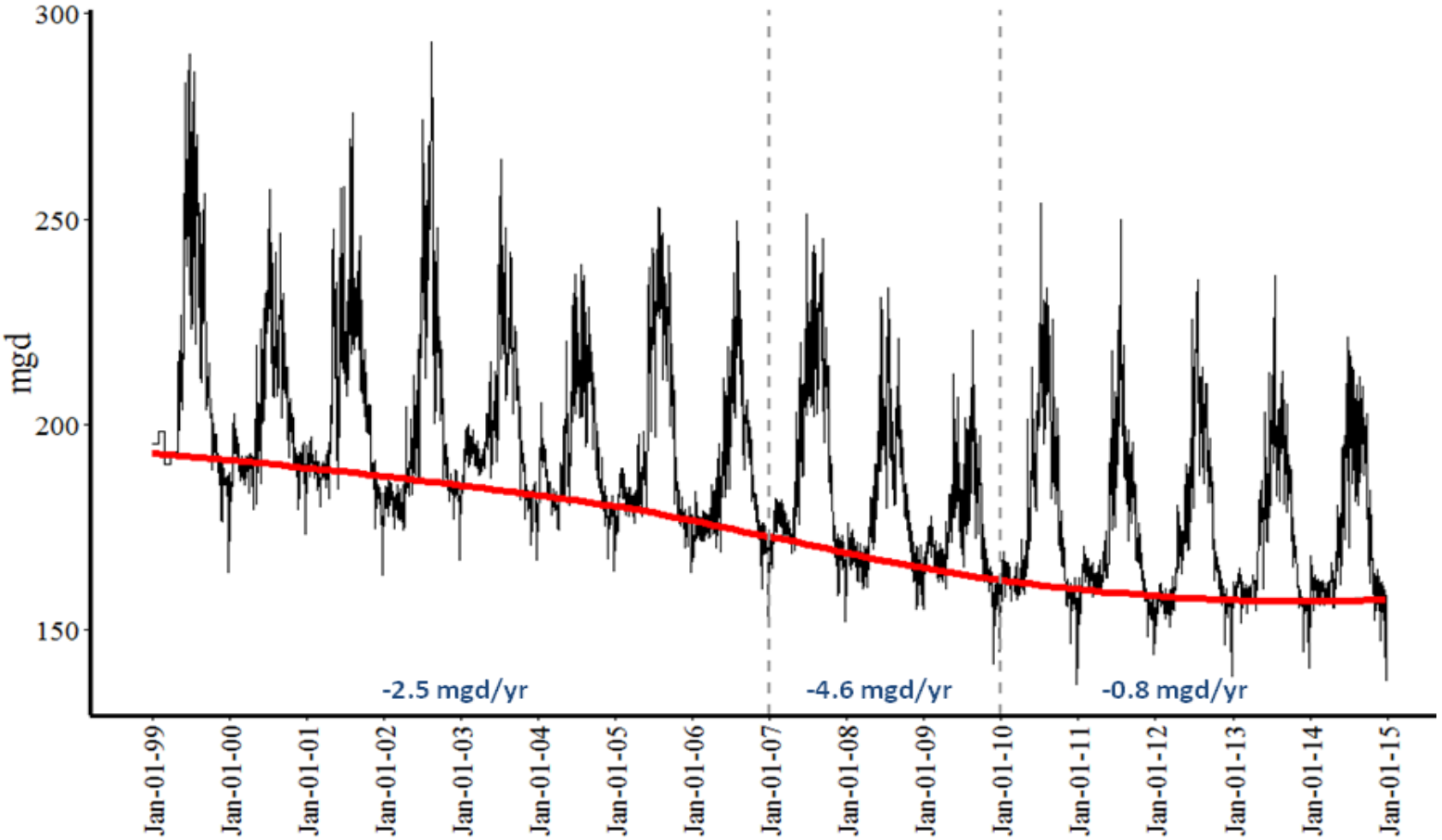
City of Boston Water Use 1900-2014



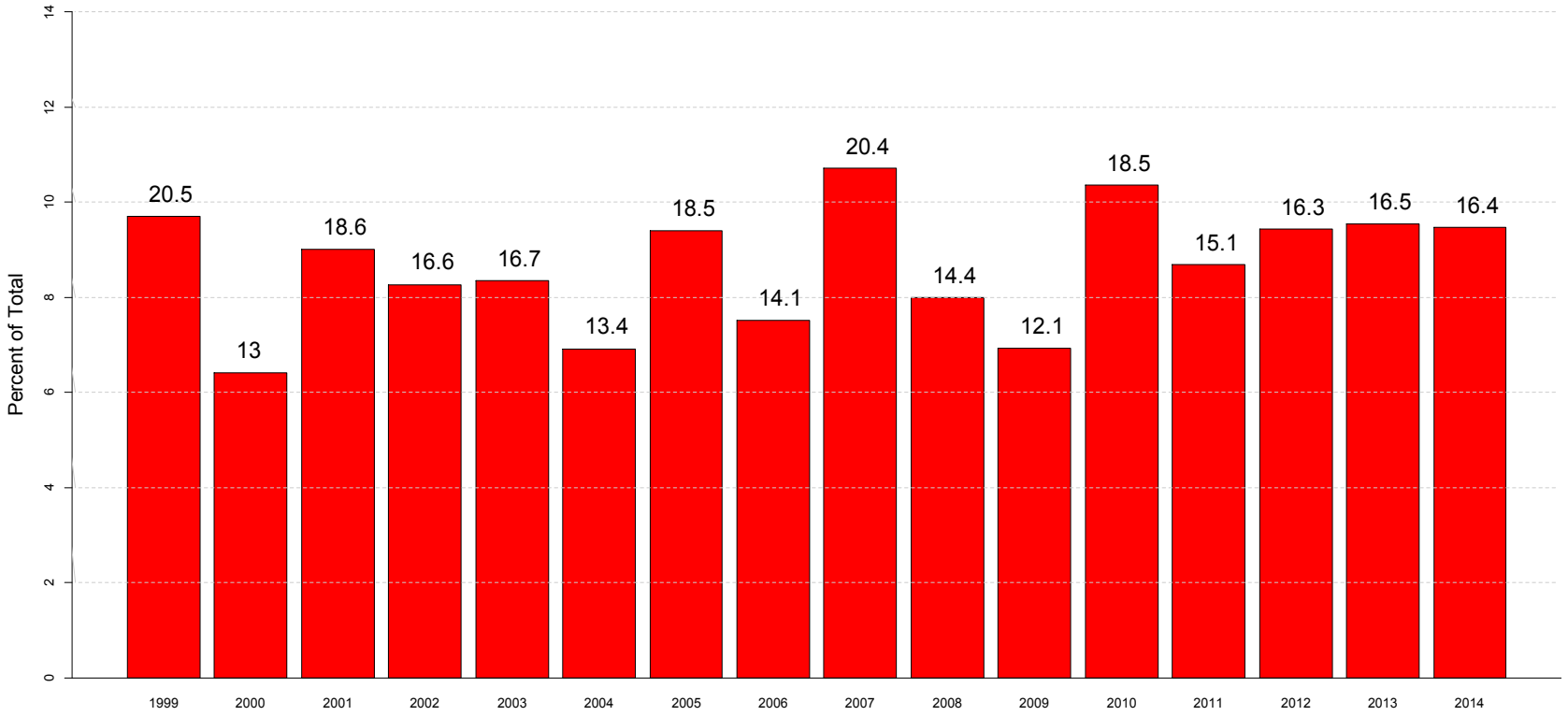
System Demand 2004 to 2014



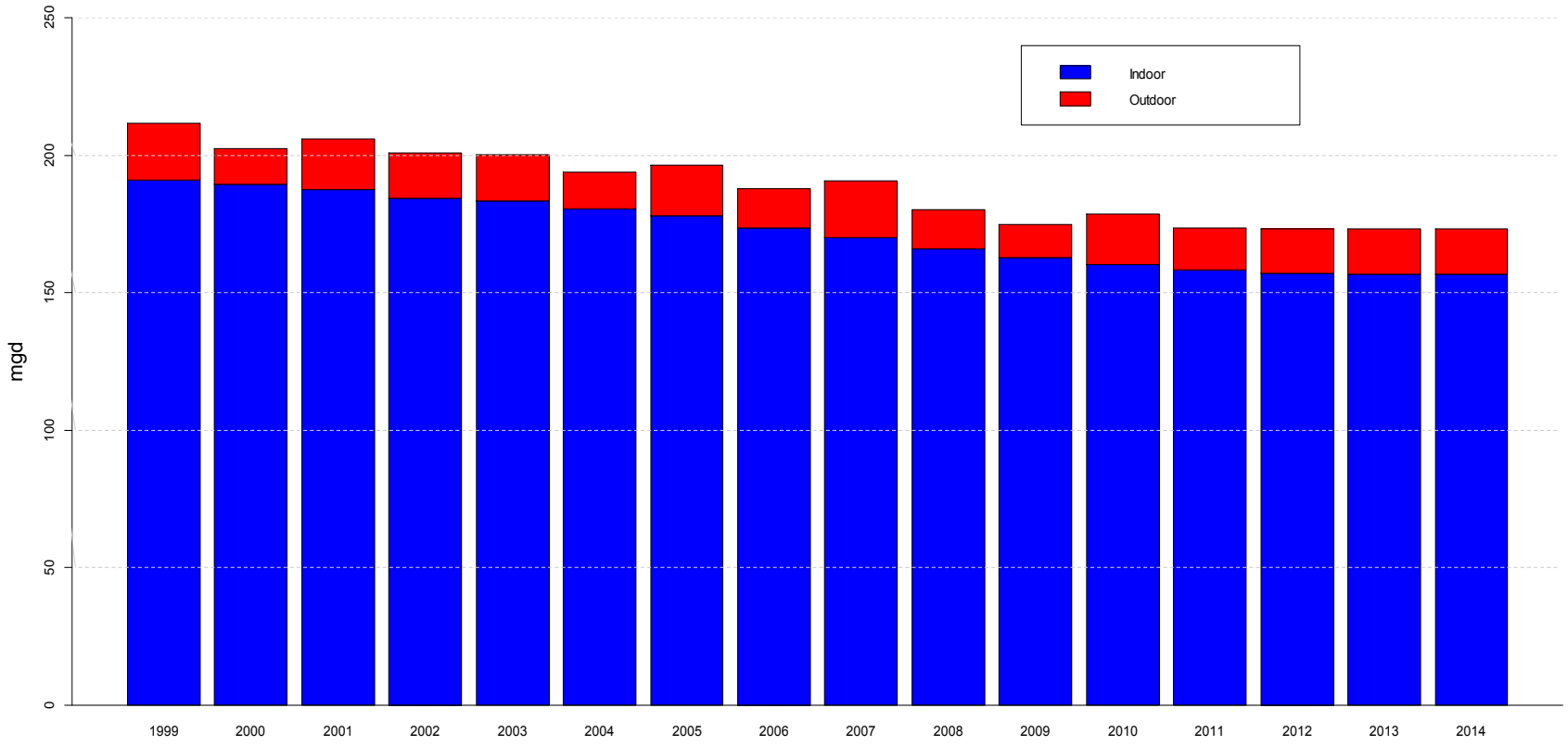
Fully Supplied Communities Demand 2000-2014
Decline In Indoor Use Trend



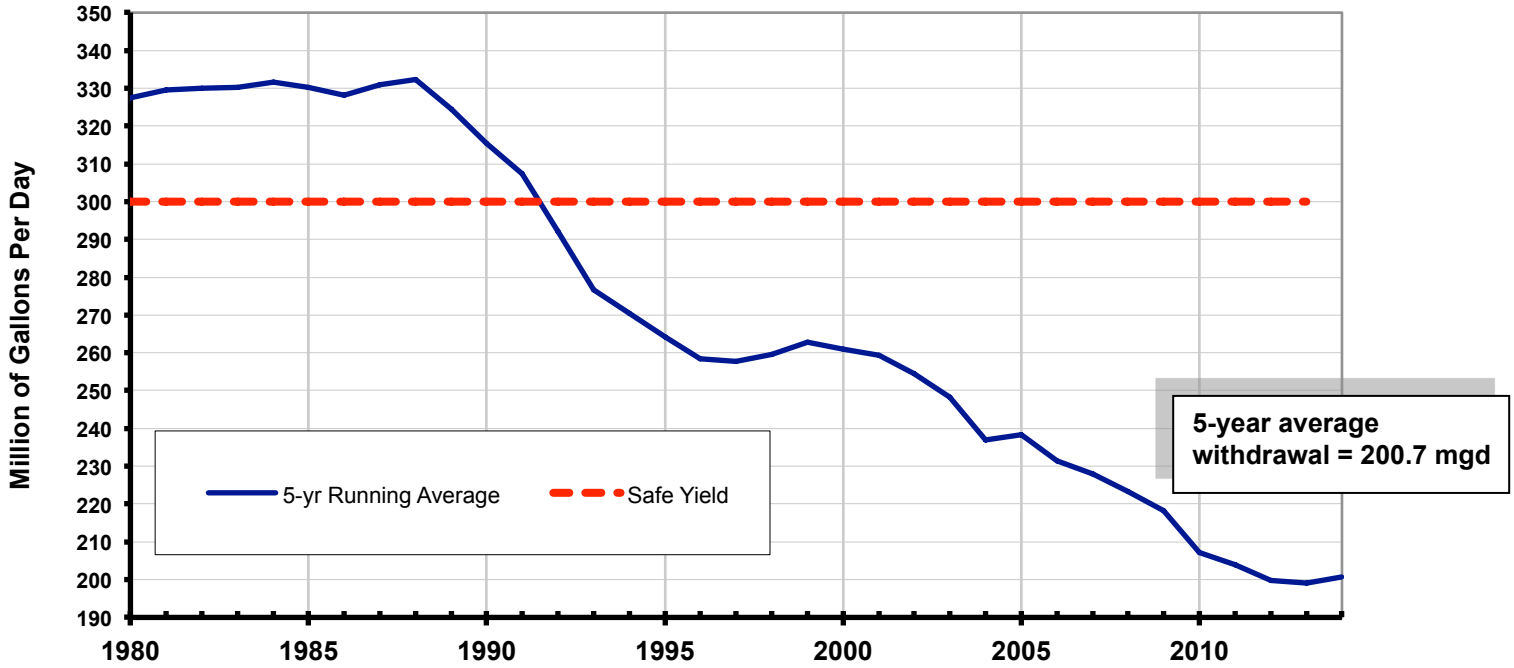
Fully Supplied Communities Seasonal Use (Labels show demand in mgd)



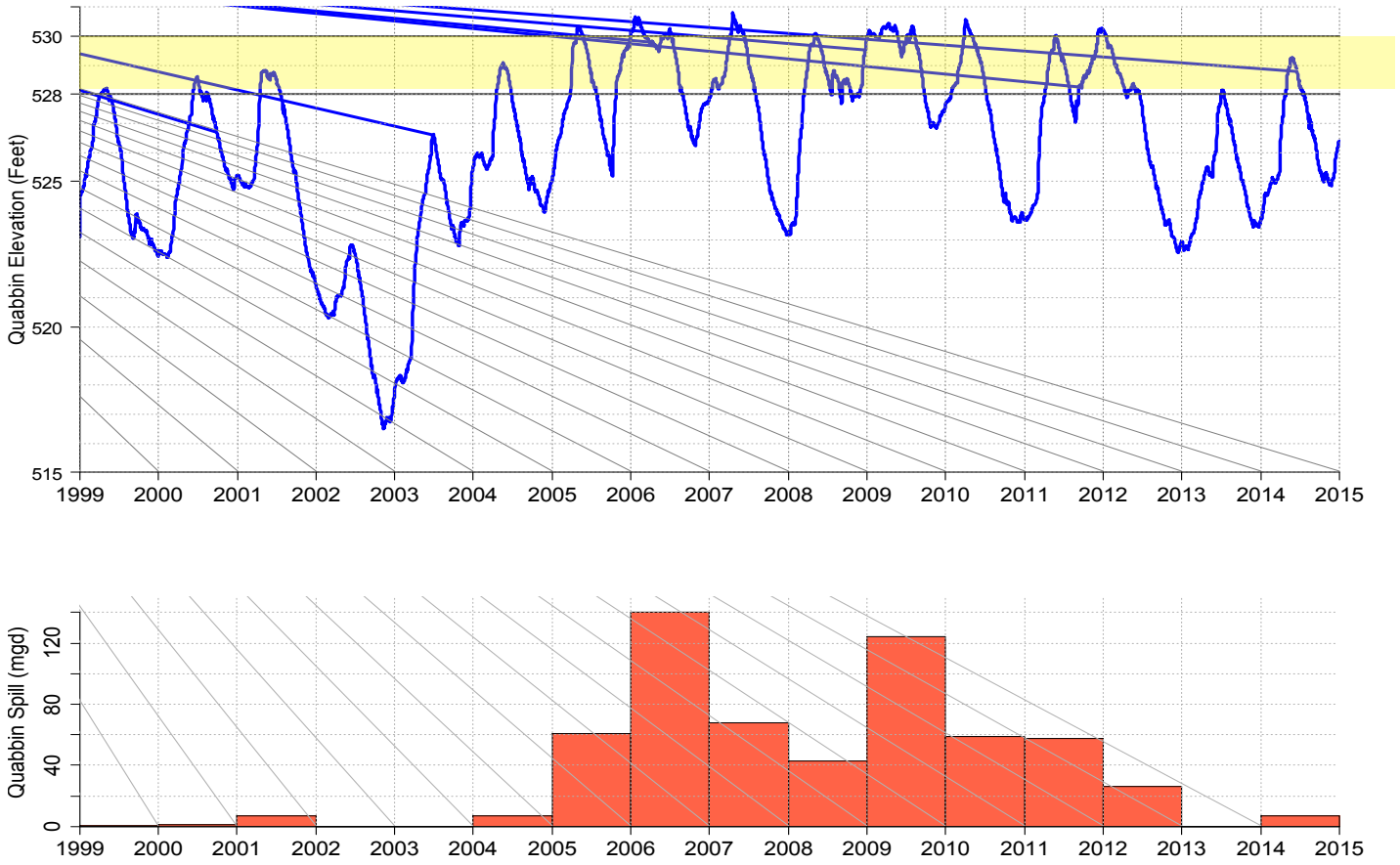
Fully Supplied Communities Annual Demand Components



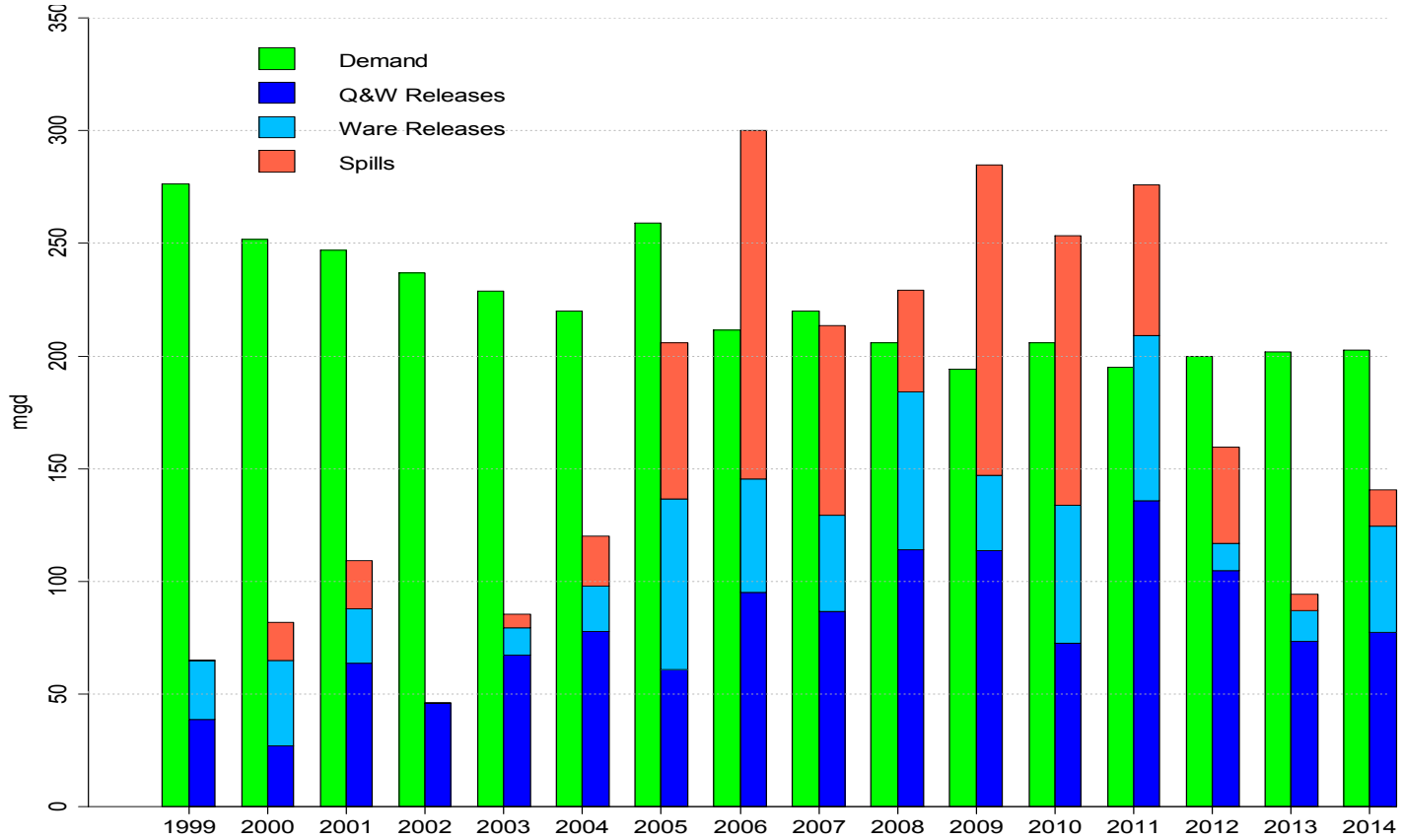
Five-Year Running Average Total Reservoir Withdrawals Slight Increase



Quabbin Elevation with Quabbin Spill Volumes



Withdrawals, Spills and Releases (Quabbin, Wachusett and Ware)

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Quabbin Spillway Fence Completed

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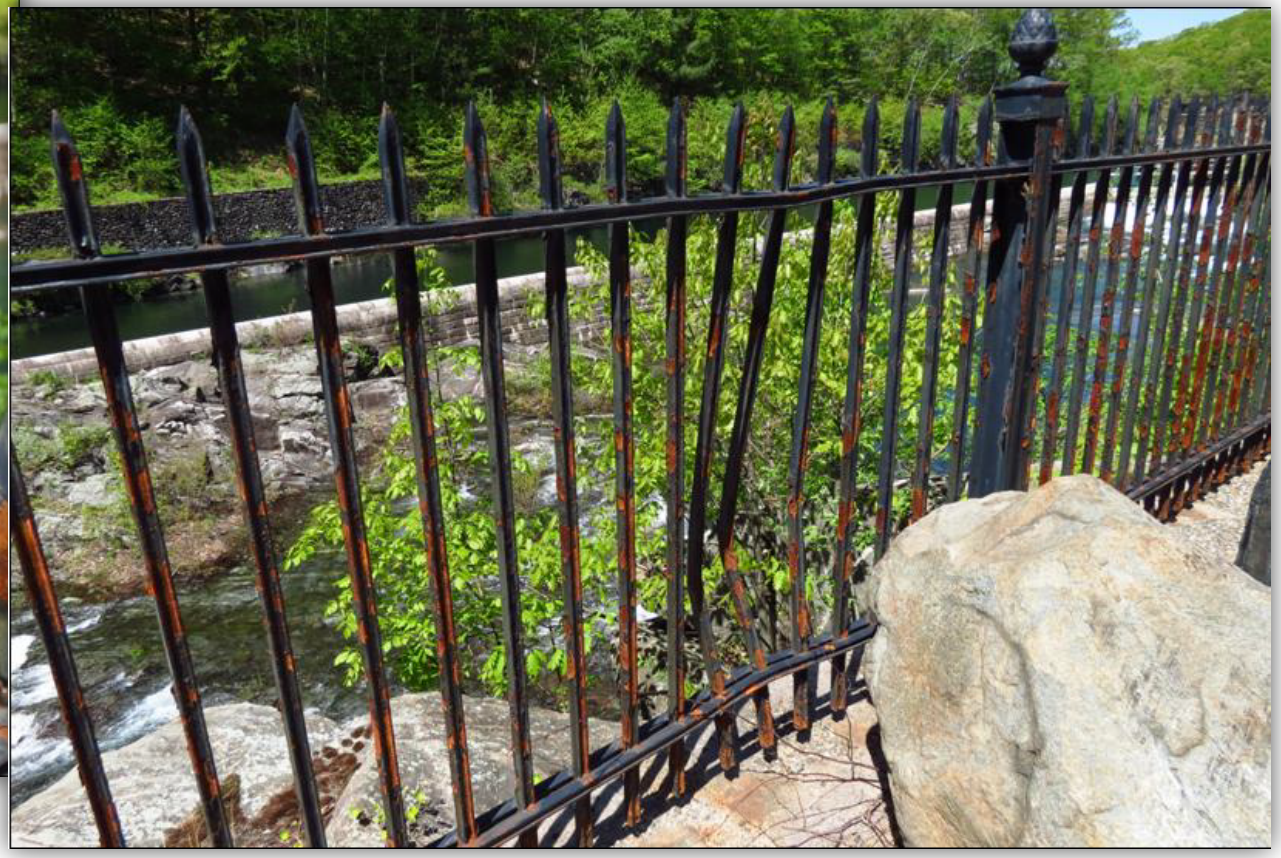
Fence Was Installed in 1940-41




SLOW

Restored brass gate hardware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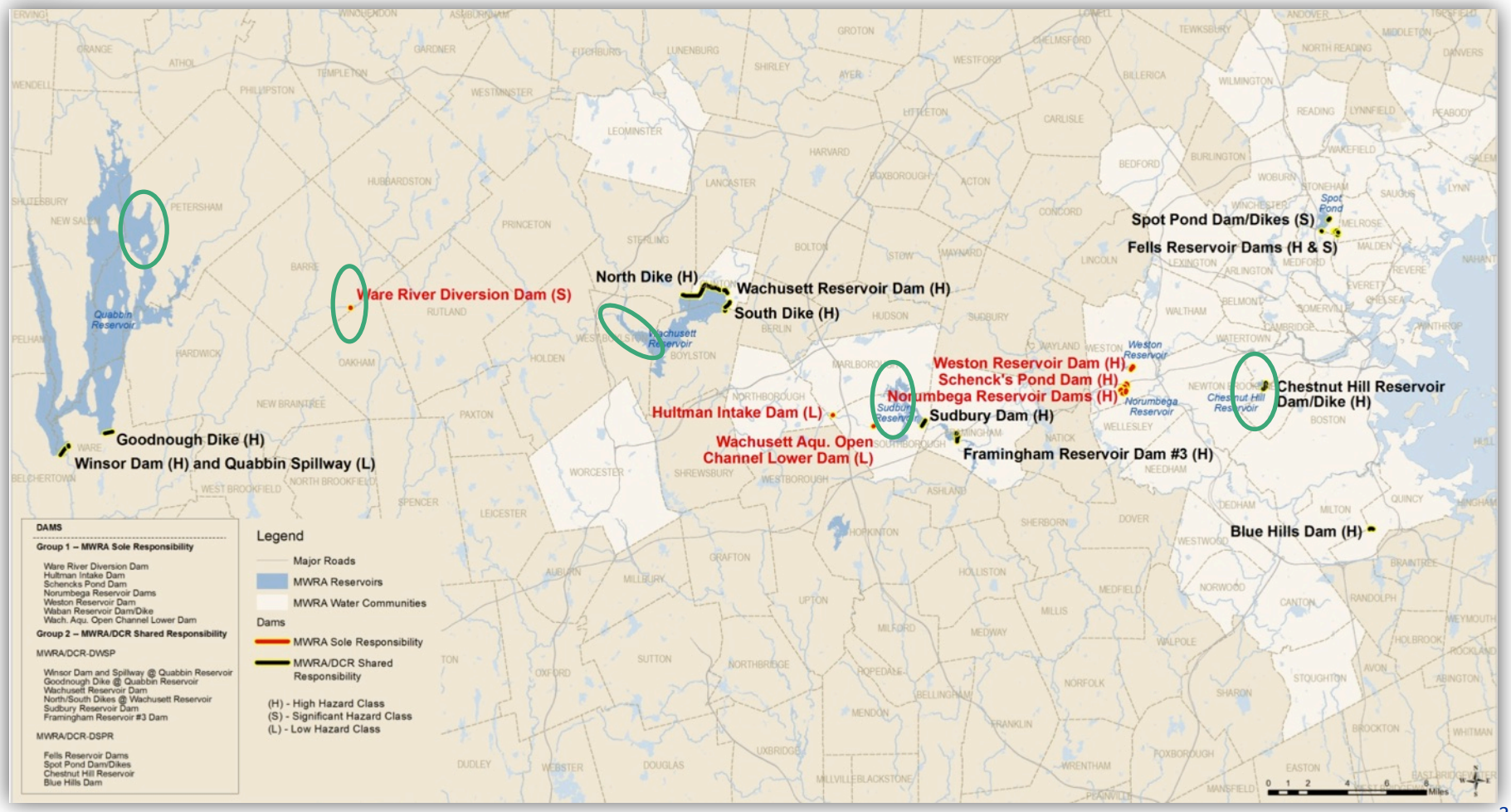
Invasive Aquatic Plant Management at MWRA Reservoirs

January 14, 2015

Overview

- Reservoirs
- History of Threats
- Actions
  - System-wide plant surveys
  - Harvesting, Smothering, DASH, Hand-pulling… and Weevils
  - Decon/Quarantine
- Vigilance against new invasive plants

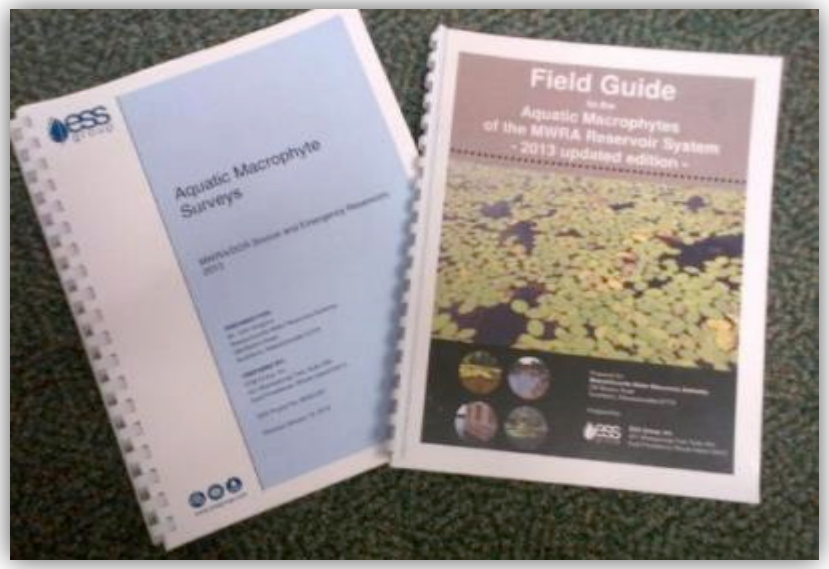
Aquatic Invasives Control Underway



Reservoir System-wide Surveys Guide Activities

- Comprehensive system-wide surveys (Quabbin to Boston) to track plant populations and ID any new invasives in the reservoir system

- Initially on a 3-year cycle, Surveys now annual



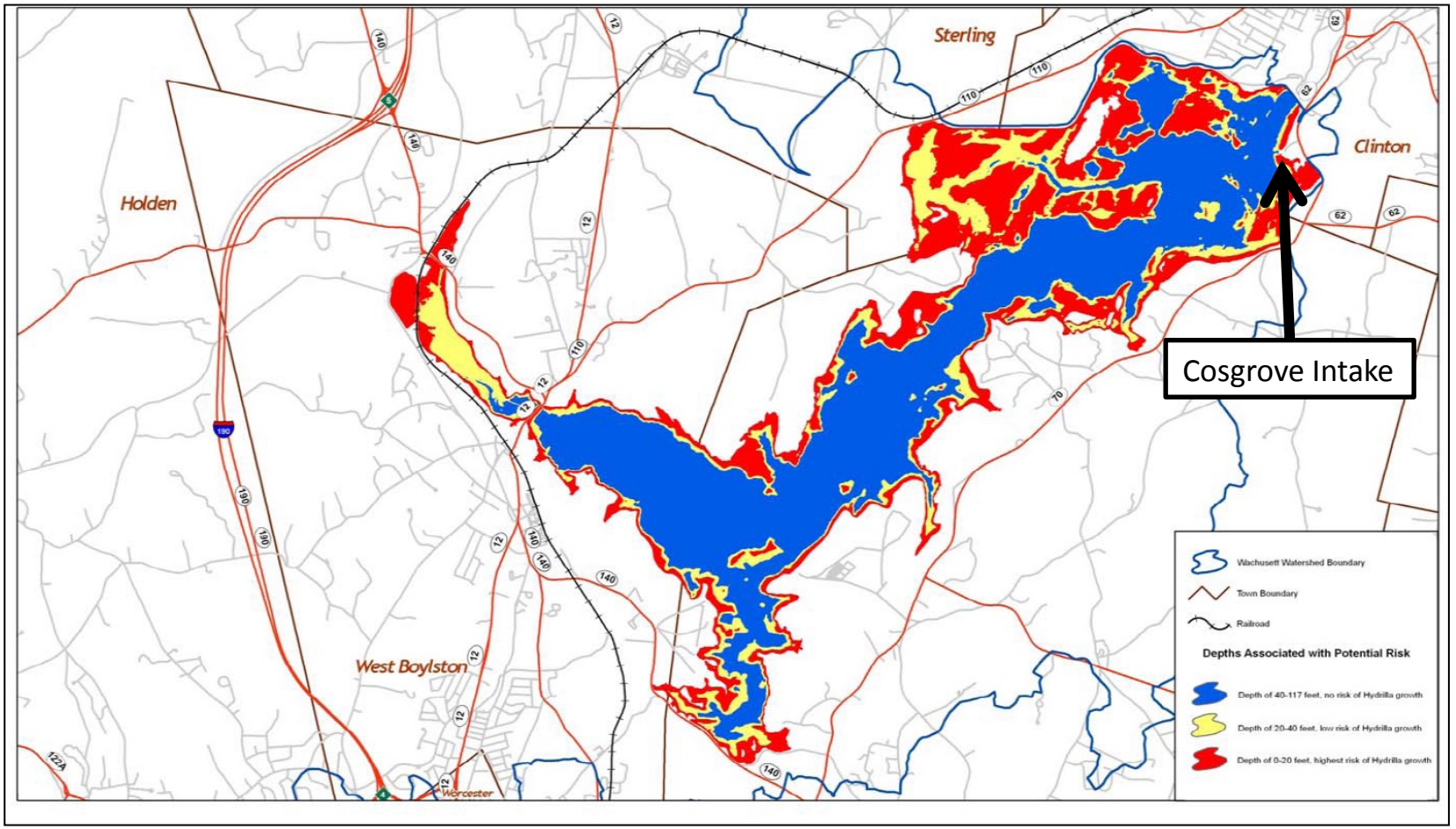
Plants That We Are Addressing

- Invasive/Exotic:
  - Eurasian Water milfoil (*Myriophylum spicatum)*
  - Fanwort (*Cabomba caroliniana*)
  - Curly Leaf Pondweed (*Potamogeton crispus)*
  - Brittle or European Naiad (*Najas minor)*
  - Water Chestnut (*Trapa natans)*
  - Brittle Naiad (*Najas minor)*

- Established, non-native
  - Variable Milfoil (*Myriophyllum heterophyllum)*

- Native, grows to nuisance levels
  - Coontail (*Ceratophyllum demersum)*

Wachusett Reservoir Is A High Risk For New Invasives



Wachusett Reservoir – Longest Duration, And Greatest Investment In Plants Control

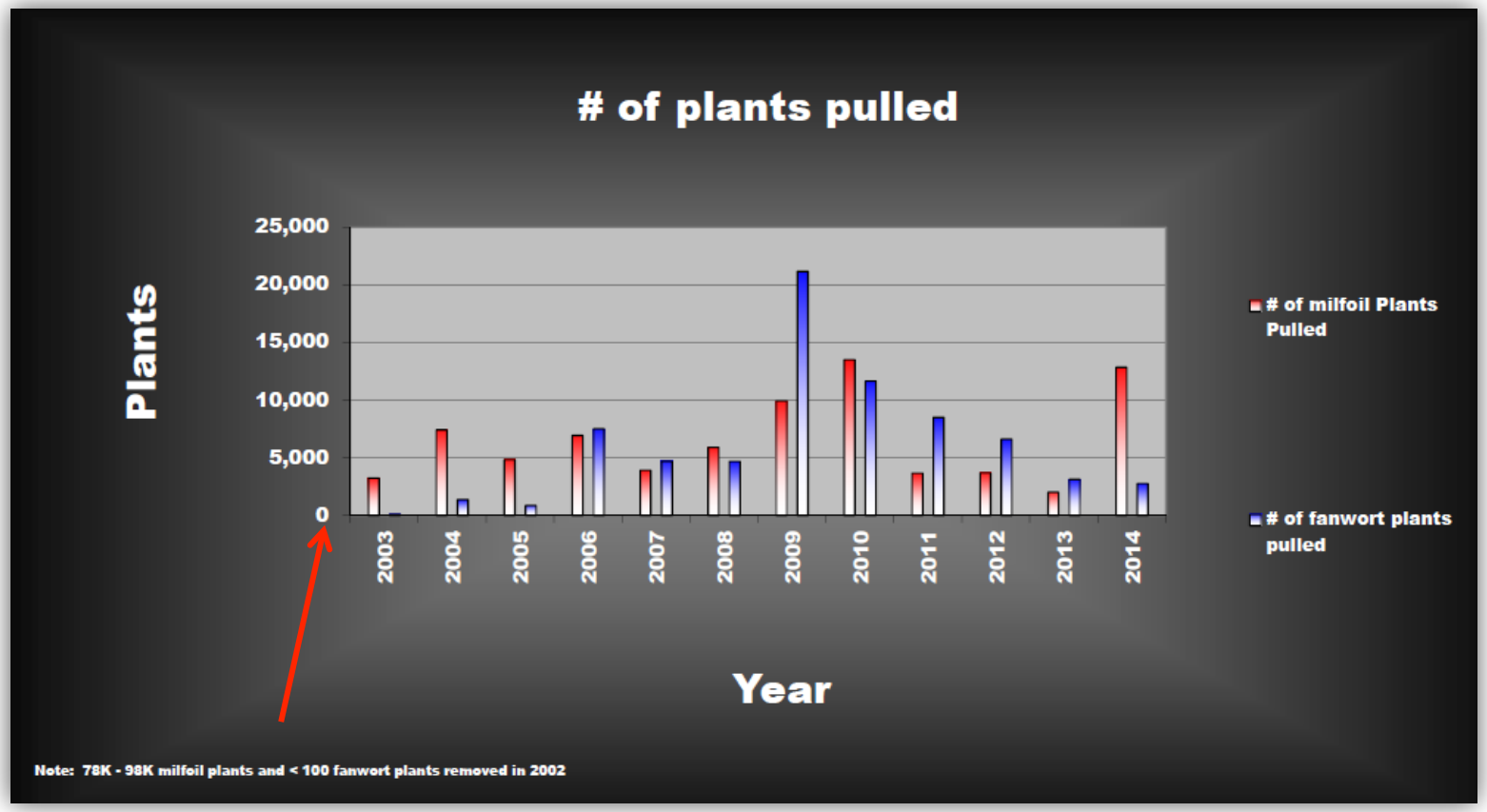
Eurasian Water milfoil

Native to Europe, Asia, and North Africa. Introduced into North America between the late 1800s and 1940

Native to the southeastern United States. Originally used as an aquarium plant.

Fanwort

Wachusett Reservoir Invasives Harvest by Year

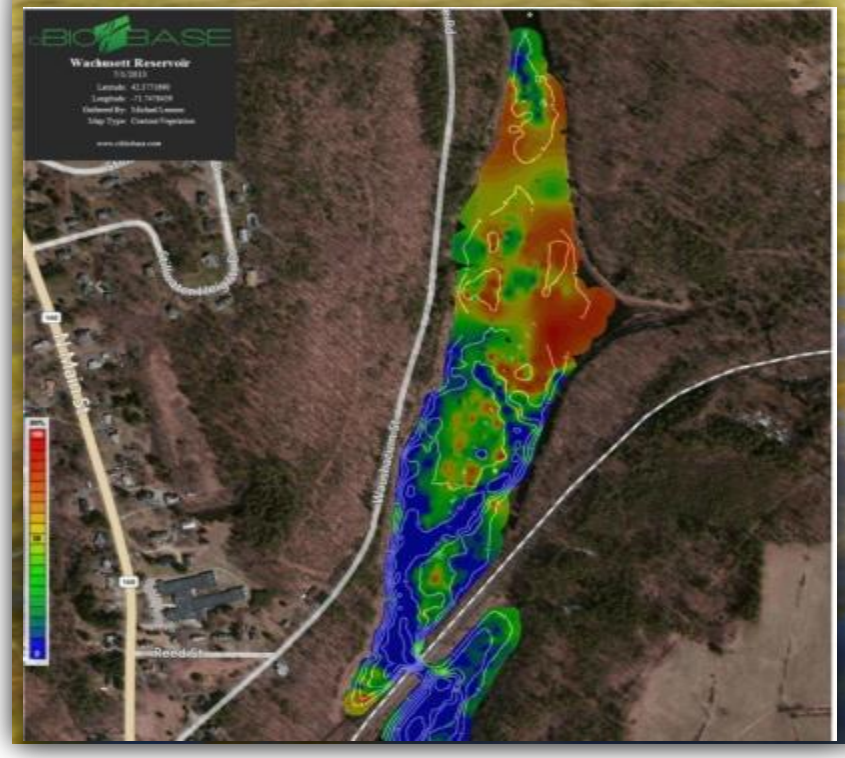


Wachusett Saw Different Approaches

- 2004 – attempt at biological control (weevil)
- Floating Fragment Barriers - annual
- Routine Annual Harvesting:
  - Spring survey
  - First diver hand-harvest in July
  - Second diver hand-harvest in fall
- Enhanced efforts 2012 onward:
  - Diver Assisted Suction Harvesting (DASH)
  - piloted in Oakdale and Thomas Basin
- 2013 – DASH deployed in wider scale in Stillwater Basin
- 2014 – Second full DASH effort in Stillwater Basin

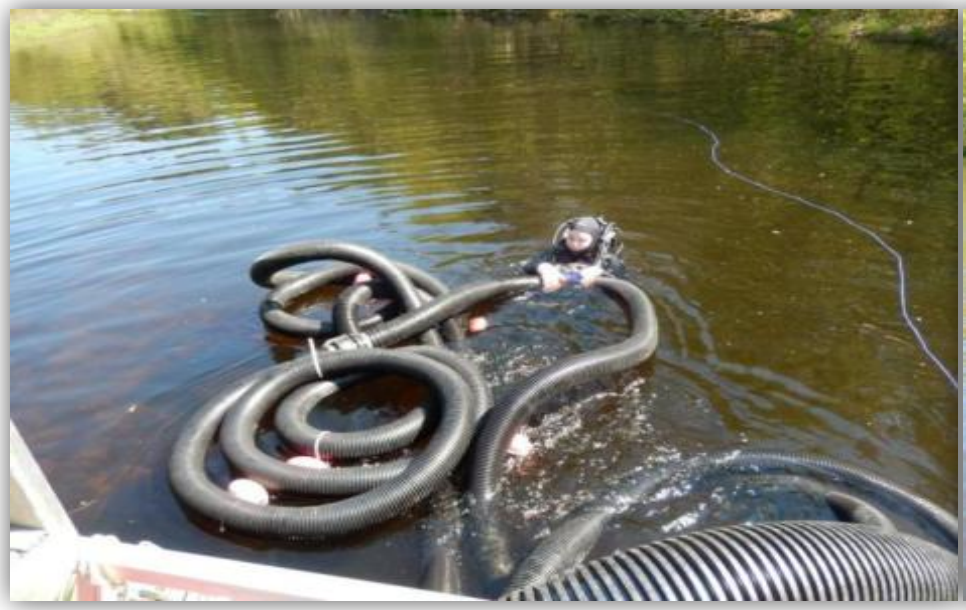
Stillwater Basin – Return To The Source Of The Problem

Stillwater Basin = 37.5 acres
Max depth = 17.5 ft. / ave. depth 8 ft.



Three DASH Boats Operating In Stillwater Basin

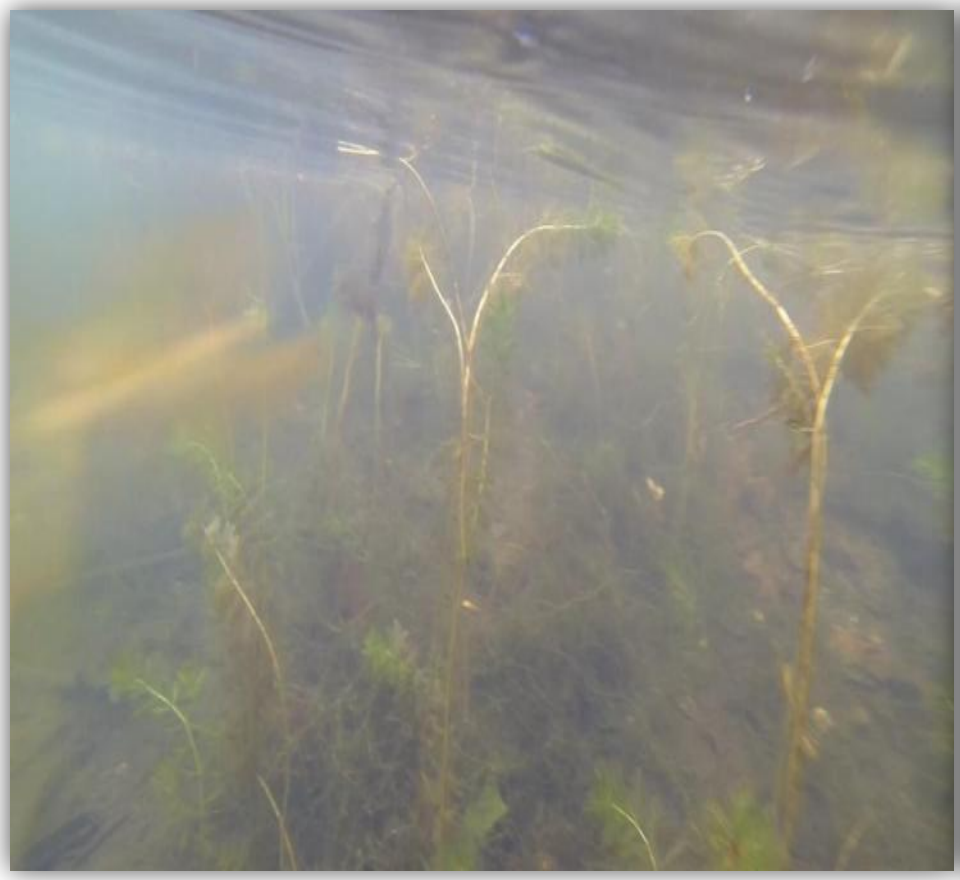
Divers Deploying Suction Hose



Suction Harvested Plants Collected Aboard DASH Boats

Plants Stored In Bins, Then To Dumpster

Underwater Views – Before And After

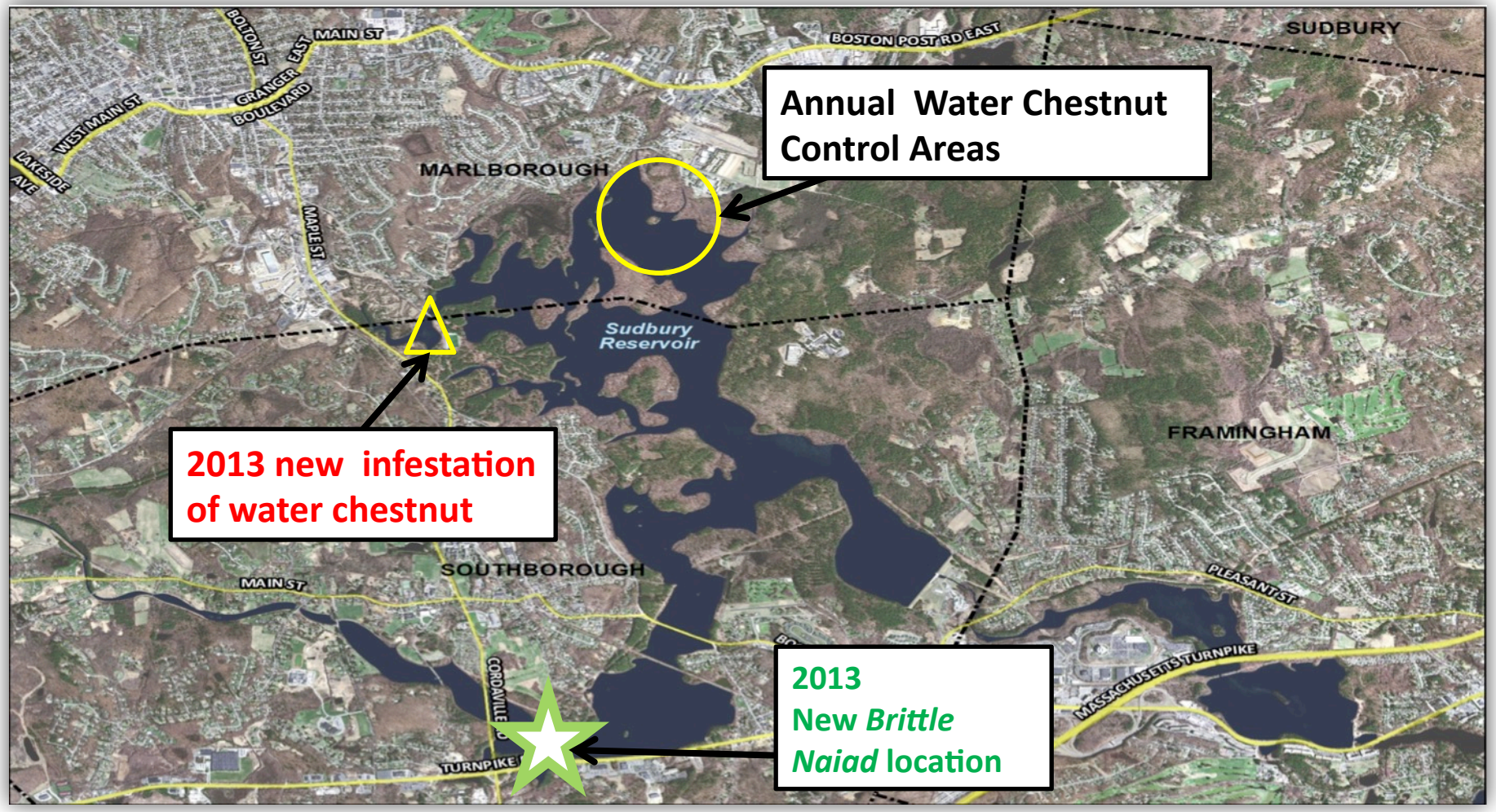


Water Chestnut Control At Sudbury Reservoir

- Highly invasive plant first discovered in 2006
- Annual efforts of mechanical harvesting and hand-pulling

Water Chestnut And Its Seed

Water Chestnut Control Zones in Sudbury Reservoir



Water Chestnut Harvesting at Sudbury Reservoir

Harvested plants

Harvested plants 1 year later

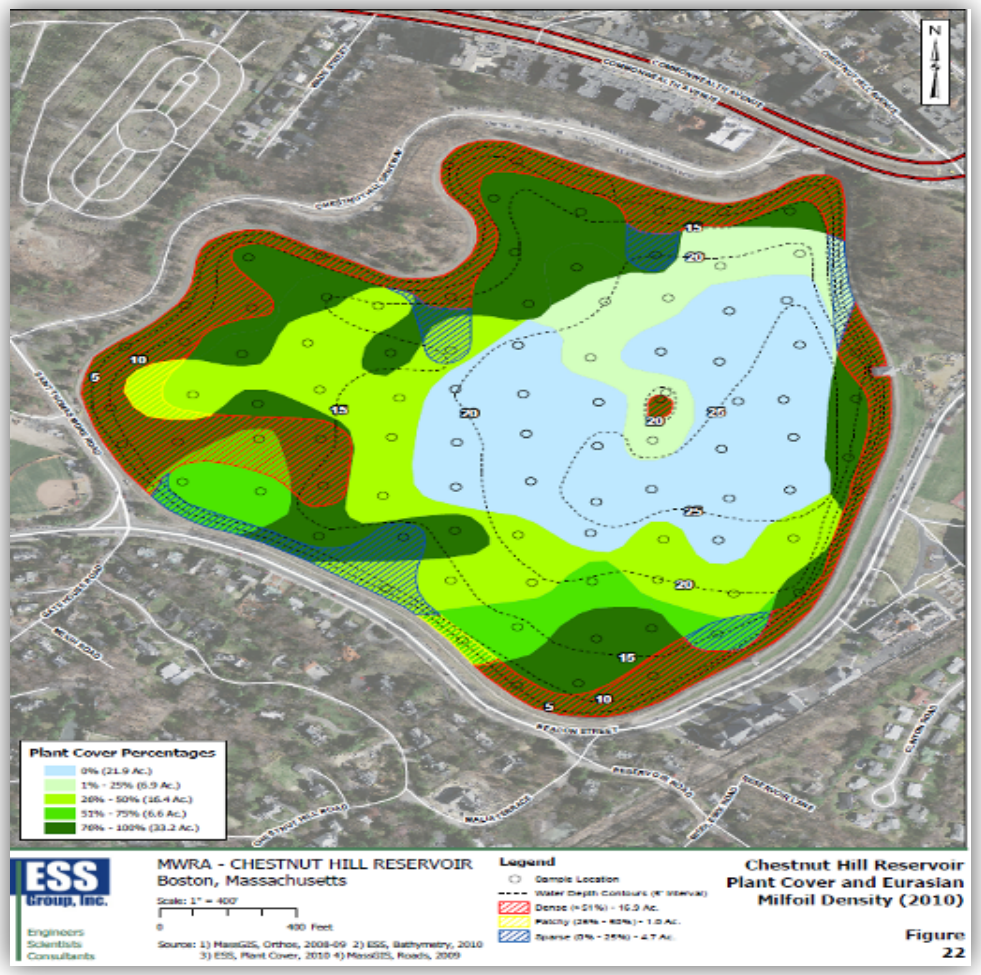
Northern Sudbury Reservoir Control Areas

Brittle Naiad Harvesting

Chestnut Hill Reservoir – Eurasian Water Milfoil control

Plants:
- Eurasian milfoil
- Coontail
- Curly Leaf Pondweed

Methods:
- Winter drawdown
- Mechanical Harvesting
- Diver Hand pulling



Curly Leaf Pondweed Creates Floating, Smelly Rafts At Chestnut Hill Reservoir

Winter Drawdown Of 10 Feet Exposes EWM In Riprap Zone

Spring Time Cleaning To Remove Plant Matter

Aquatic Plant Harvester at Chestnut Hill

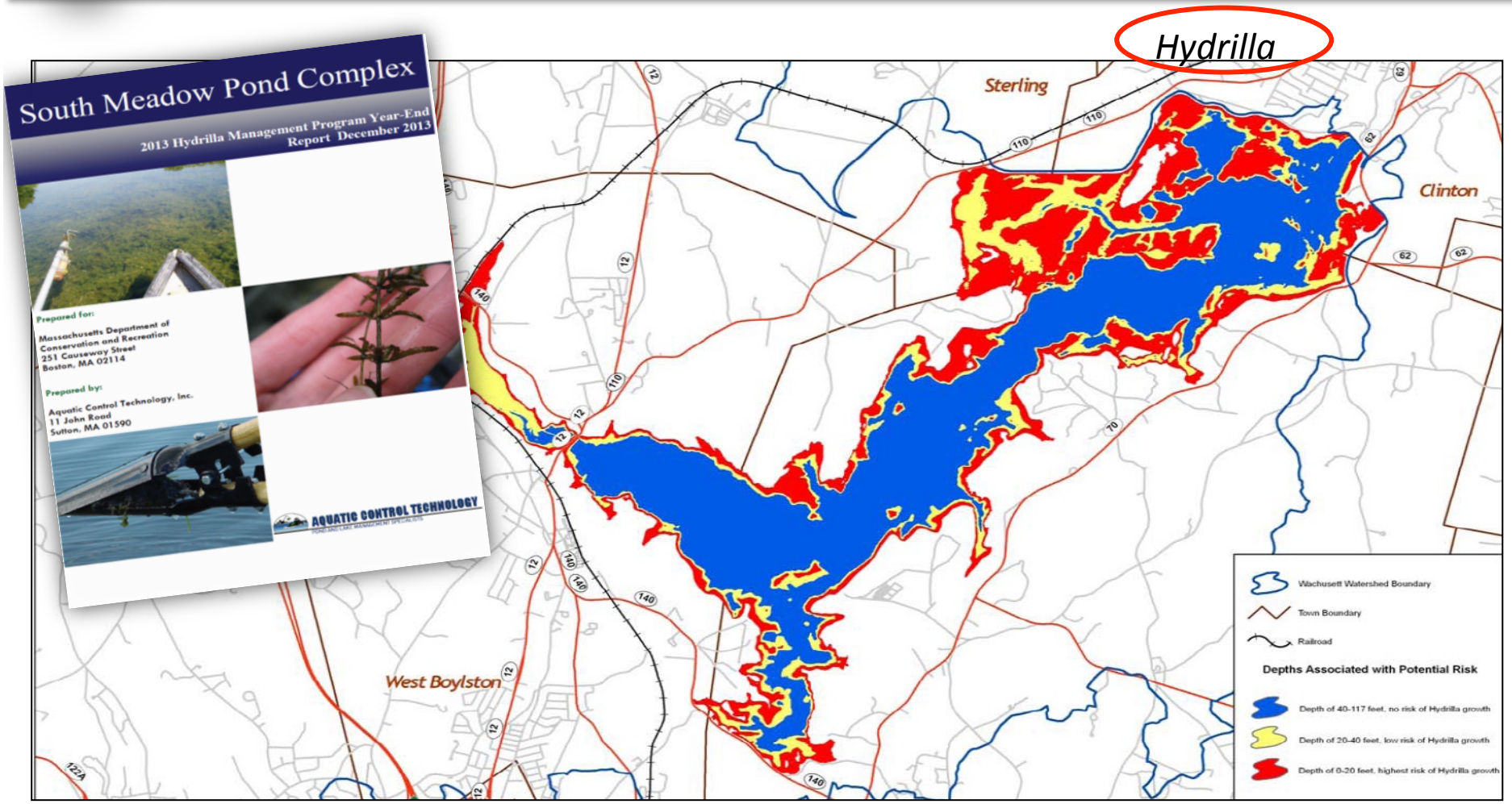
Harvester Removes Bulk Of Invasive Plants In Main Basin

On The Look Out…

- Hydrilla (*Hydrilla verticulata)*
- Rocksnot (*Didymosphenia geminata)*
- Asian clams (*Corbicula fluminea*)
- Zebra Mussels (*Dreissena polymorpha)*

Hydrilla Is A Very Aggressive Invasive And VERY Close To One Of Our Main Source Reservoirs

Hydrilla Risk areas at Wachusett Reservoir



Quabbin Reservoir Boat Seal And Decontamination Program: A Success

- Boat fishing is permitted in Quabbin Reservoir at specific locations

- In 2009, zebra mussels were discovered in Laurel Lake, in Lee, MA. ~ 60 miles west of Quabin.

Boats And Trailers Are Vectors For Invasives In Quabbin

Quabbin Boat Inspection Program

Quabbin Boat Inspection/Decontamination Program

Good News …

NO exotic aquatic plant beds observed in these distribution reservoirs:

- Weston Reservoir
- Norumbega Reservoir
- Spot Pond Reservoir
- Fells Reservoir

Stable or declining infestations of exotic species at these reservoirs:

- Quabbin Reservoir - Variable-leaf milfoil (decline)
- Chestnut Hill Reservoir - Eurasian milfoil (rapid decline), curly-leaf pondweed (apparent decline)
- Sudbury Reservoir - Eurasian milfoil (stable), Water Chestnut (decline)

One new exotic plant species documented at:

- Sudbury Reservoir - Brittle naiad (pioneering plants removed in 2014 season)
- Quabbin Reservoir - Brittle naiad (pioneering plants removed in 2014 season)

Moving Forward On Invasive Plants …

- Continue DASH at Stillwater Basin
- Continue annual aquatic plant surveys
- Aggressively respond to new invasives
- Remain Vigilant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MWRA's Harbor and Outfall Monitoring 2013 Results

January 14, 2015

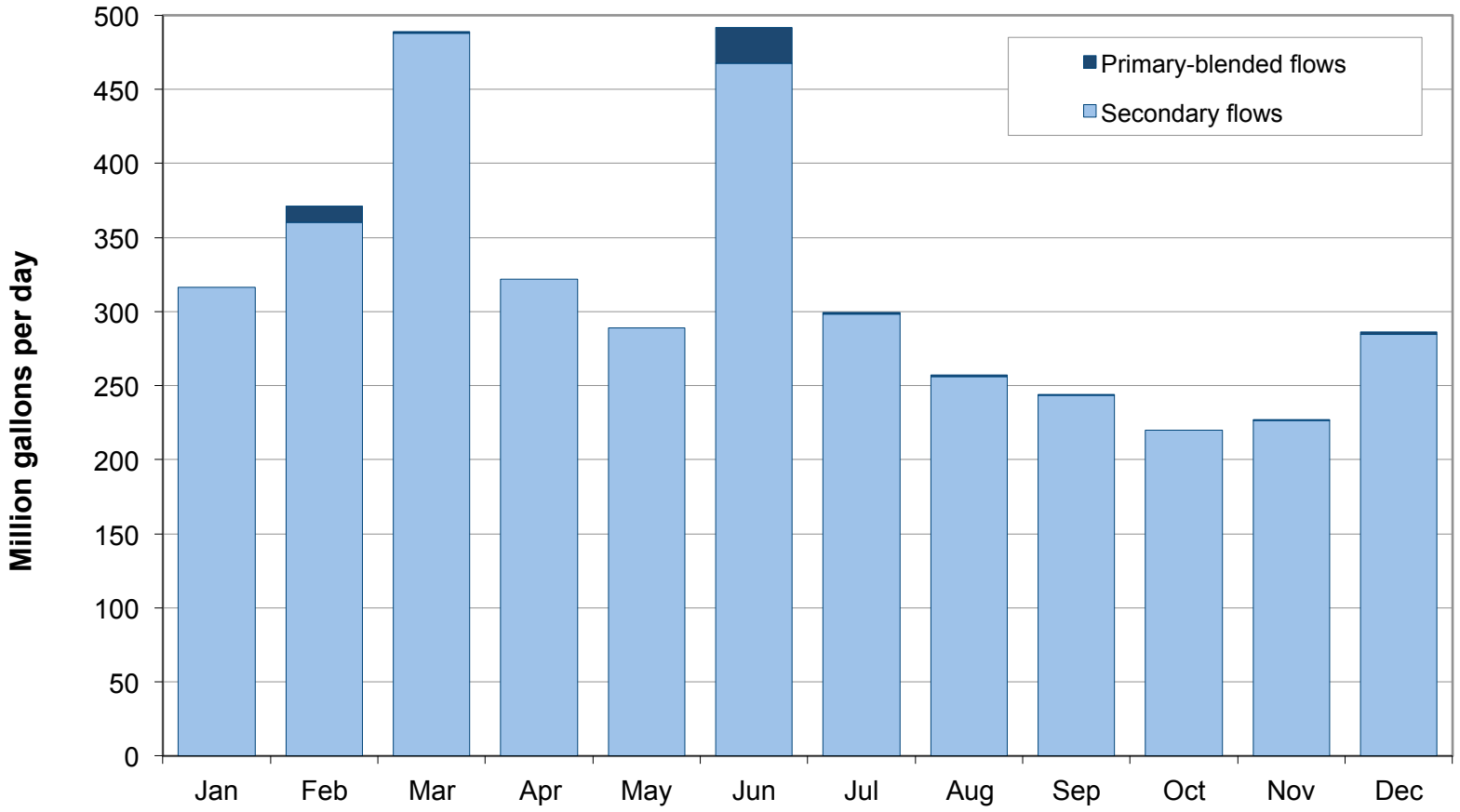
Harbor and Outfall Monitoring 2013 Highlights

- Effluent quality (Platinum 7 award!)
- Outfall Monitoring
  - Water quality good year-round
  - No water quality exceedances
  - Sediment animal communities-diversity exceedance
  - Flounder liver disease low

- Harbor Monitoring
  - Water quality improvements
  - Sediment improvements
  - Flounder health improvements

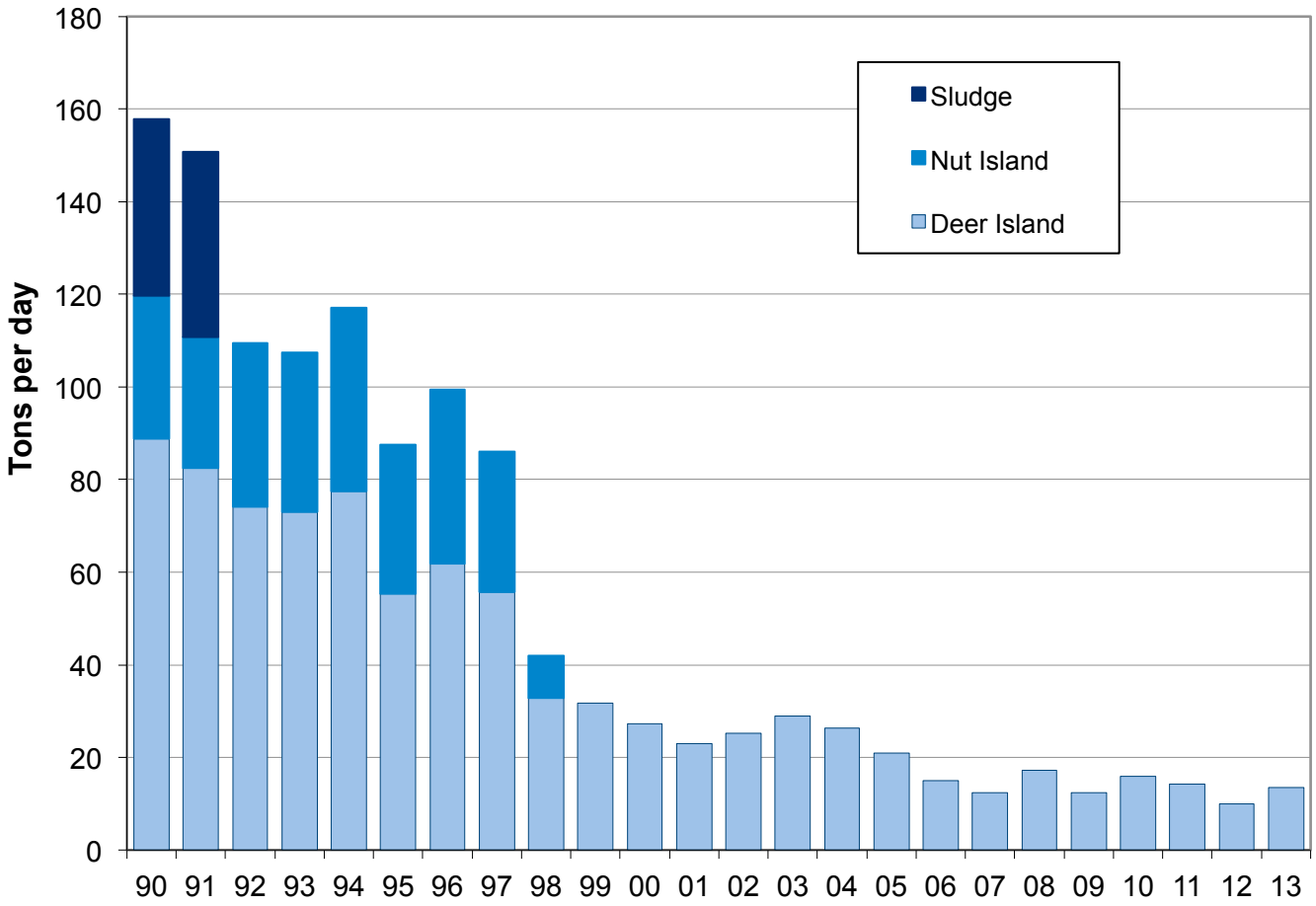
Sieving animals from the bottom sediments

2013 Was A Dry Year With Almost No Blending



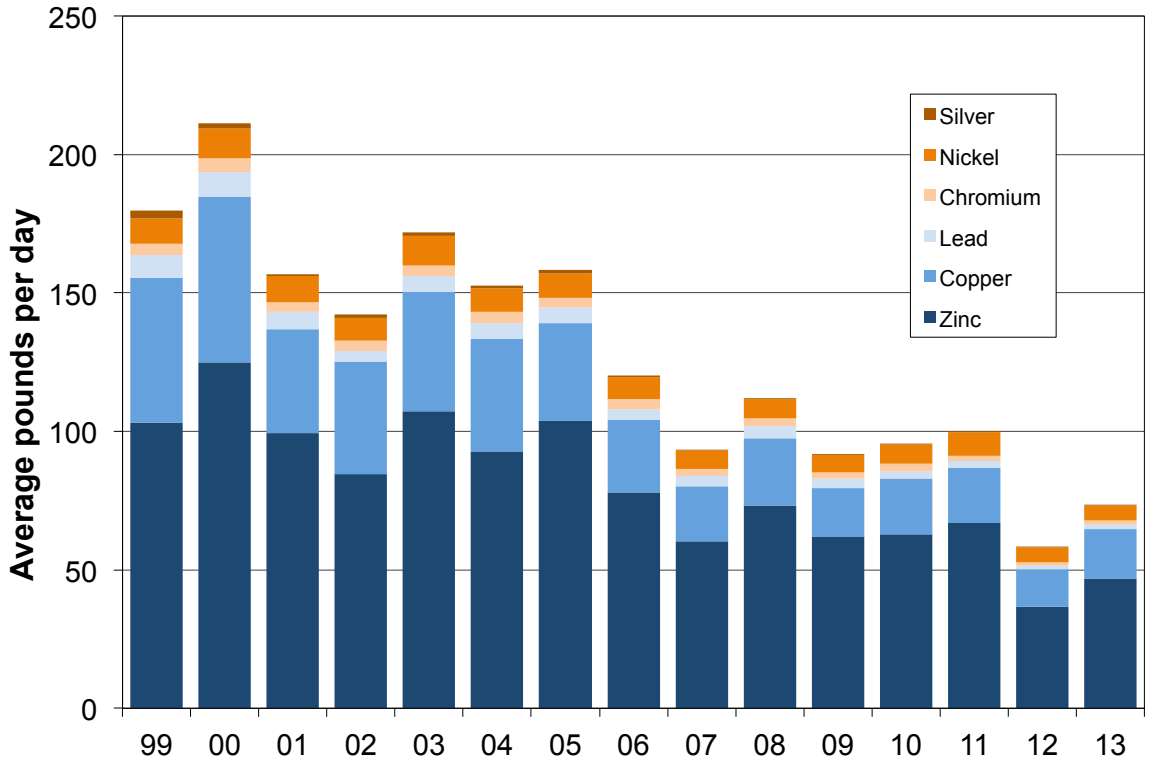
Average flow by month at DITP, 2013

Total Solids Discharged (Tons/Day), 1990-2013



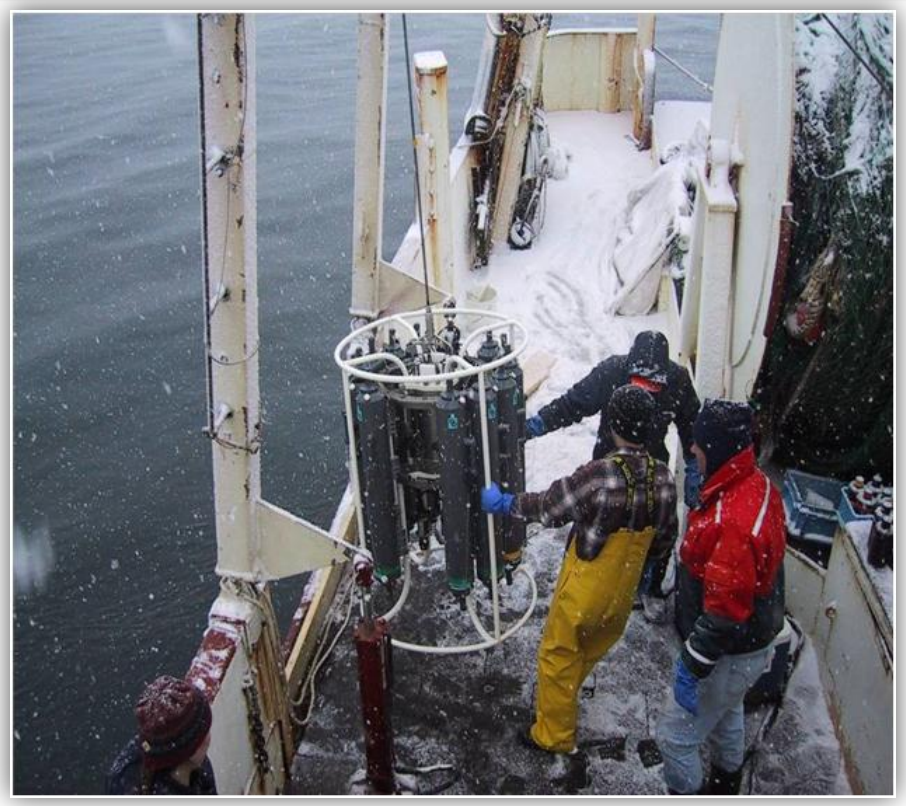
Metals discharged From DITP 1999-2013

- Metals remained low in 2013
  - ~ 75 lbs/day .
  - ~10% of discharge to Harbor in early 1990s.
  - Zinc has the highest load and is least toxic; has many sources.
  - Mercury has declined over last decade, < 5 pounds per year in 2013.



Water Quality Monitoring 2013 Results

- Surface and bottom waters were warmer than average most of the year, but not abnormally so
- Dissolved oxygen in bottom waters stayed at healthy levels all year
- No red tide or nuisance algae blooms
- No evidence of outfall impact

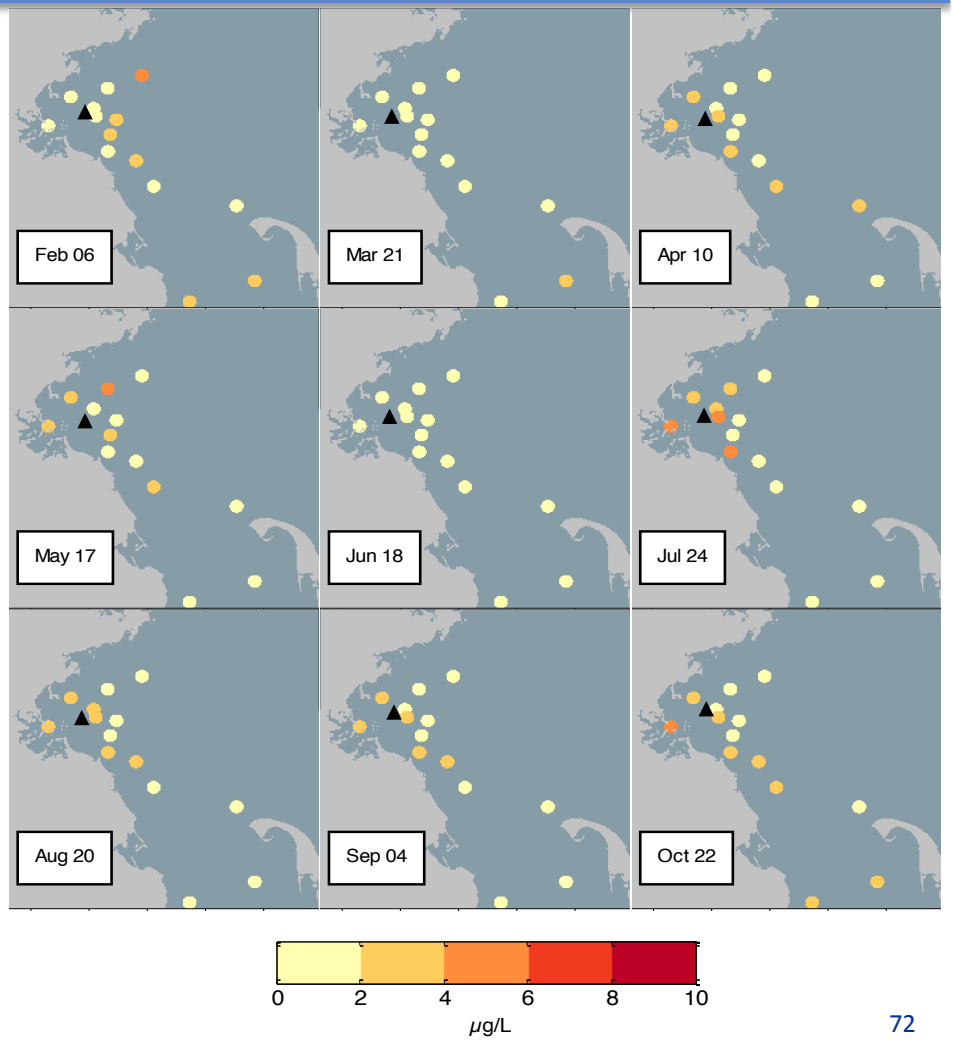


Deploying a “rosette” that collects water samples from multiple water depths in early February.

Water Quality: Algal Biomass (Chlorophyll) In 2013

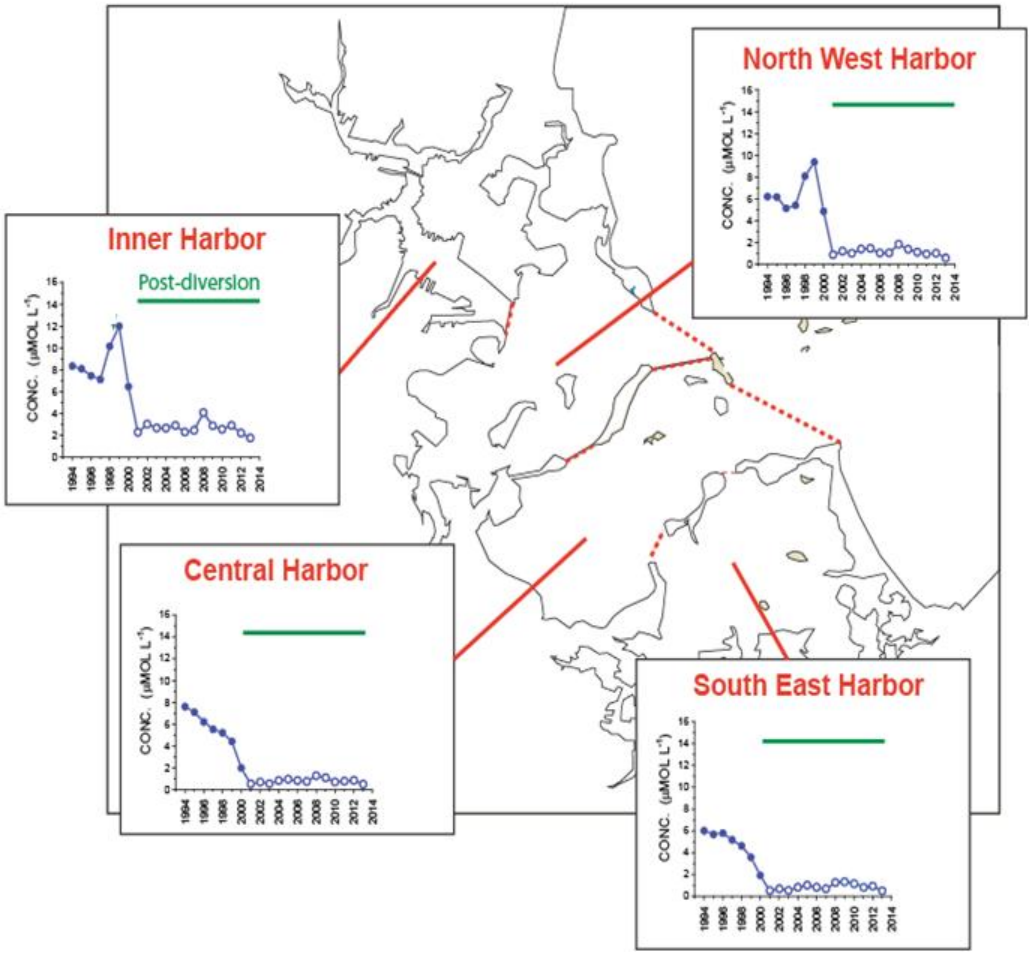
▲ Outfall Location

- Plankton in the Bays is controlled by a variety of factors
- Plankton in the Bays does not show a strong response to effluent nutrients
- Chlorophyll levels were low throughout 2013, without pronounced spring or fall blooms

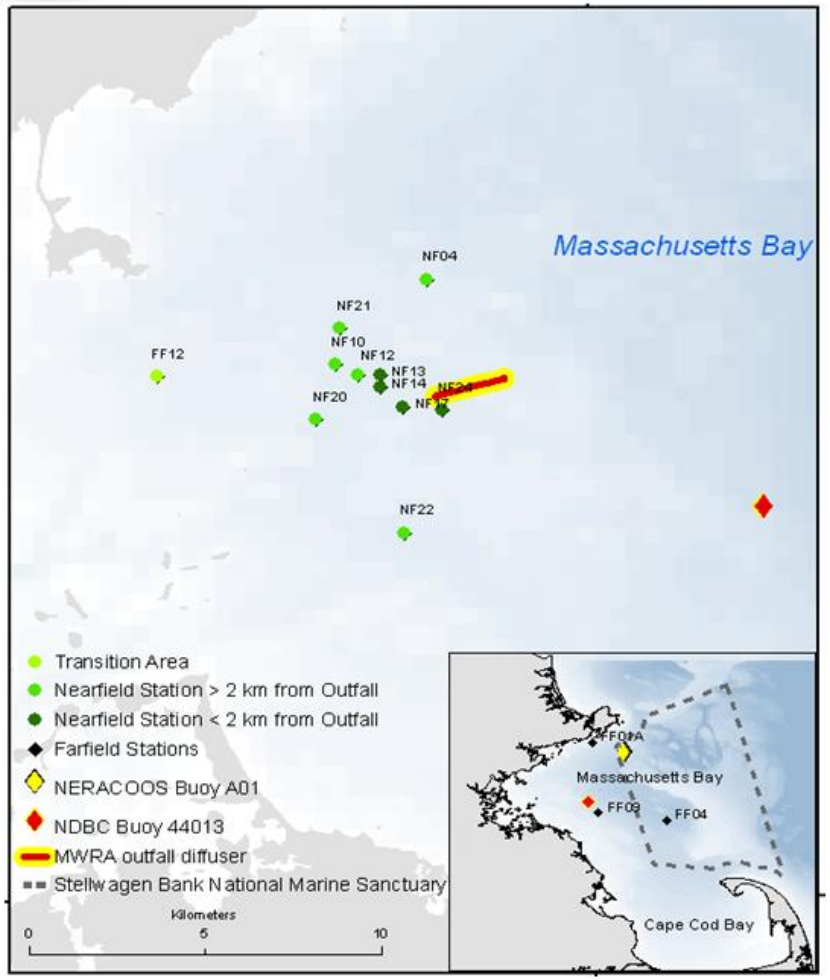


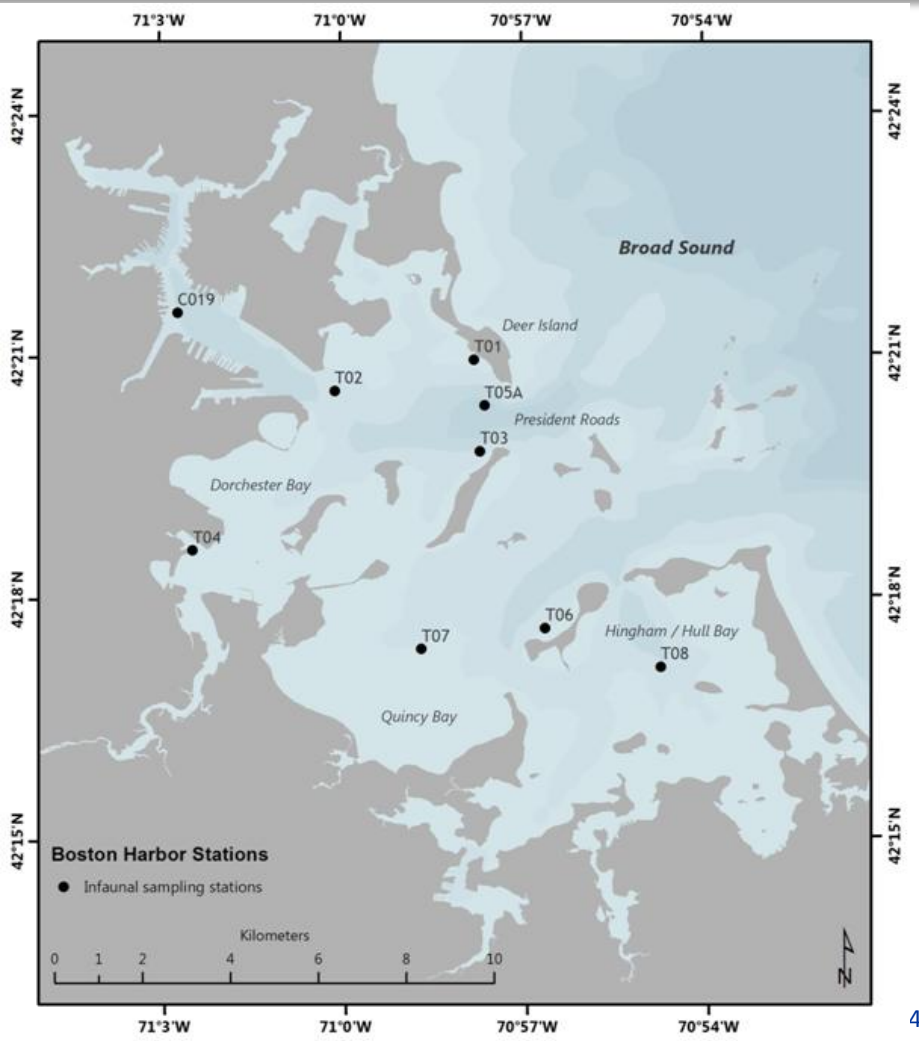
Boston Harbor Nutrient Water Quality

- Monitoring is conducted throughout the Harbor
- Nutrients (shown here) decreased following every stage of the Boston Harbor Project
- In response, algal biomass (chlorophyll) decreased
- Dissolved Oxygen increased

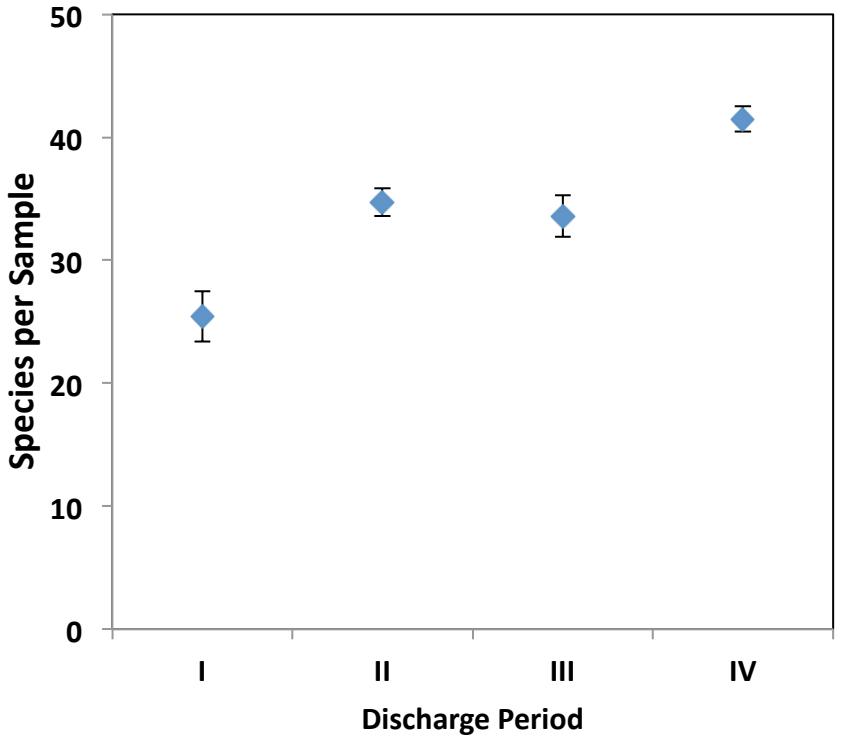


Sea Floor (Benthic) Monitoring



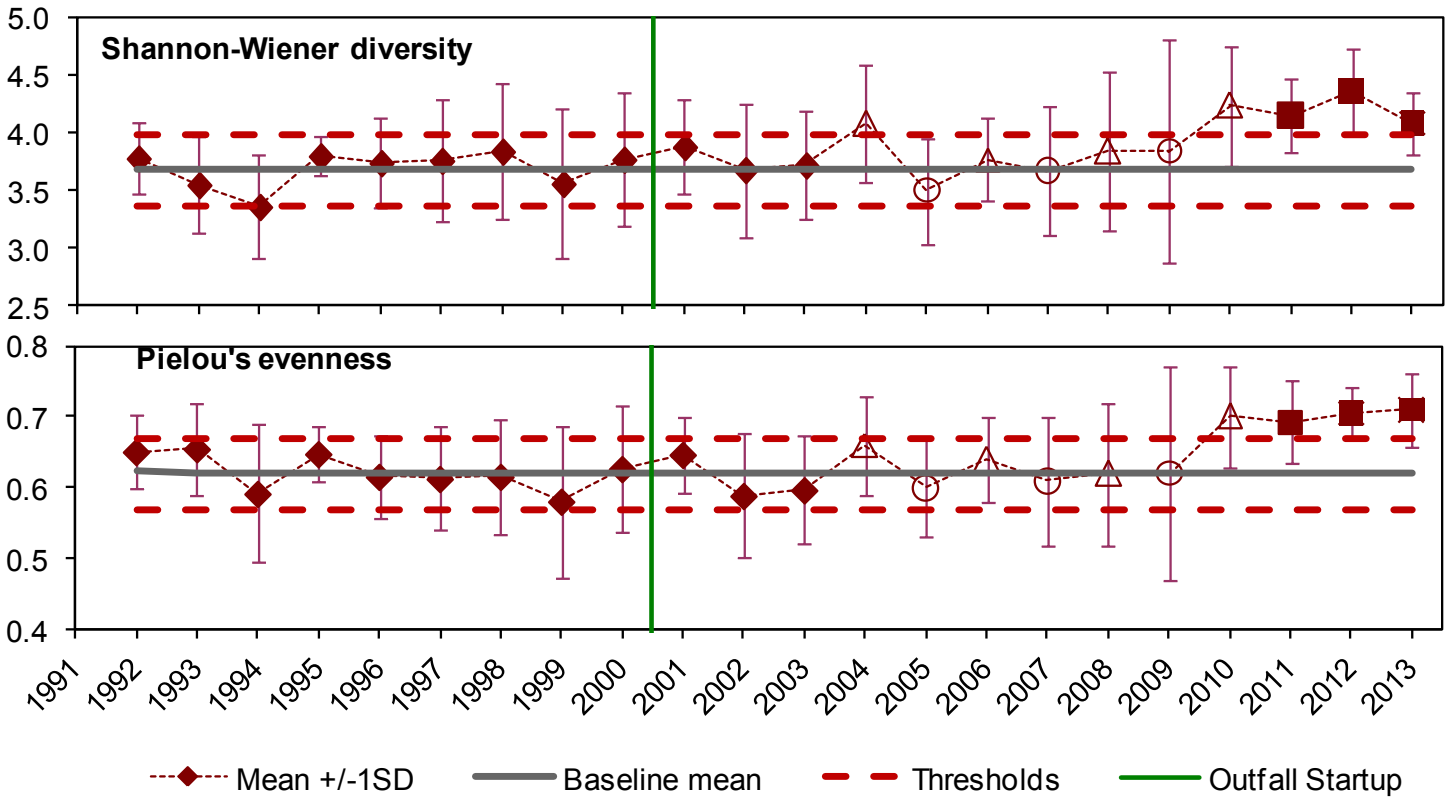


Harbor Sediment Communities Recover From Pollution



Collecting sea-floor sediments off of Deer Island

Sea Floor: In 2013, Contingency Plan Threshold Exceedance

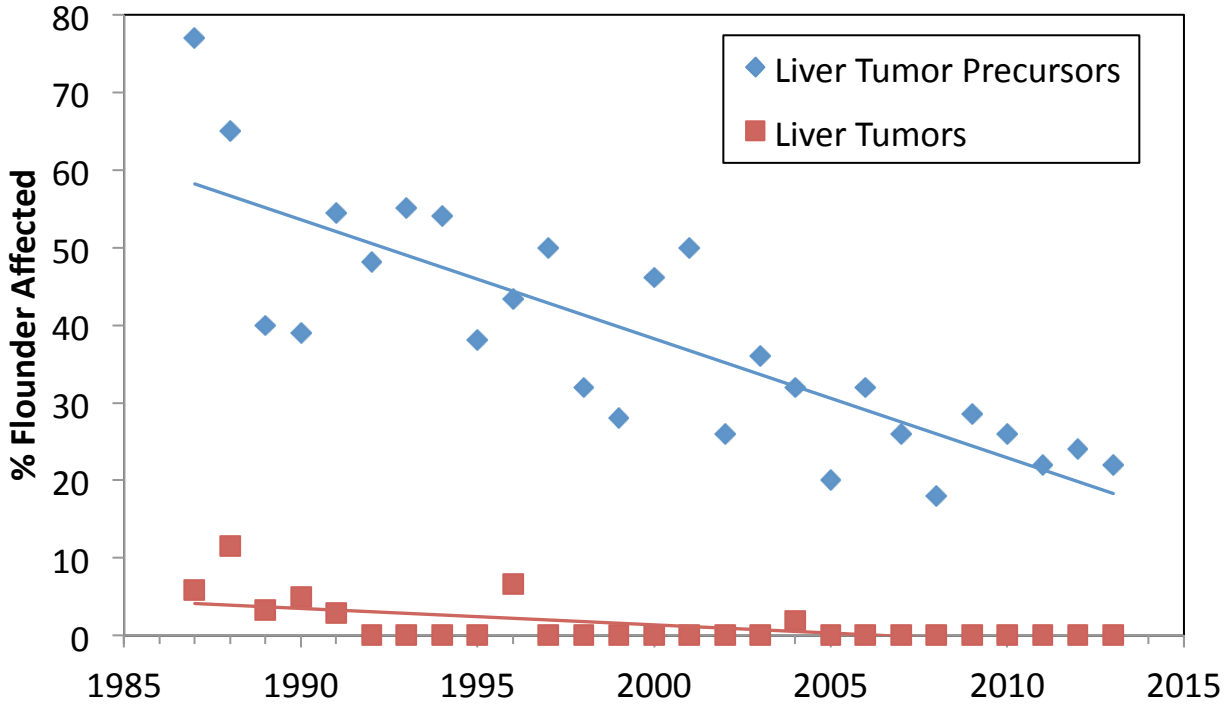


- Same exceedances seen in 2010-2013, again in 2014
- Don't indicate outfall effect, likely due to normal fluctuations in animal populations

Flounder Liver Health

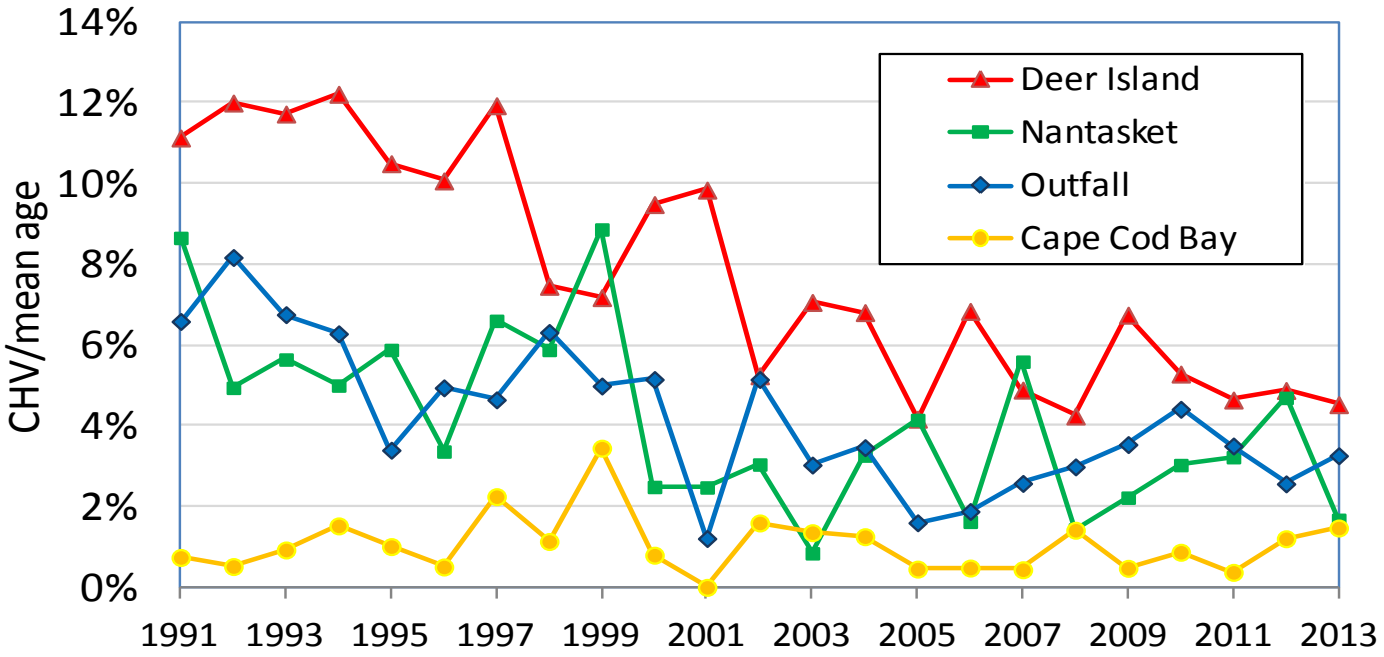
Winter flounder and cod on sea-floor near outfall

Flounder Health in Boston Harbor



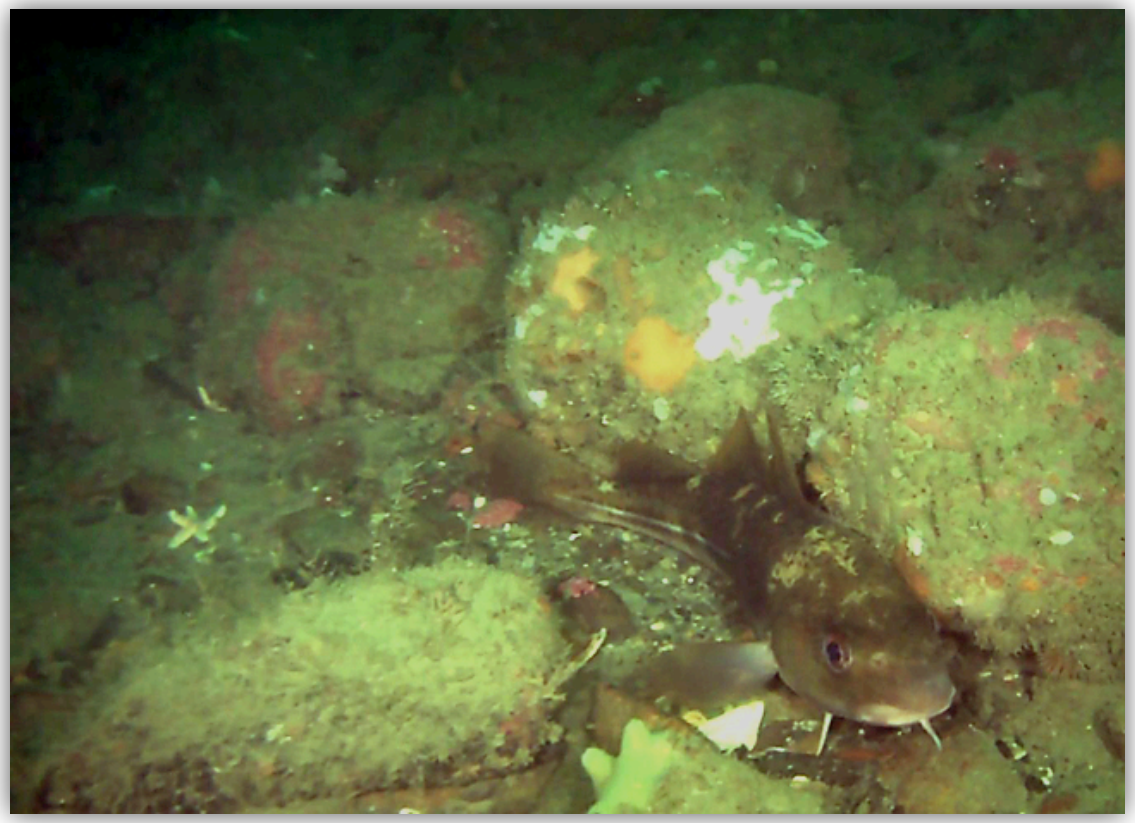
- Diseased flounder were one cause of Boston Harbor being termed “Dirtiest in the Nation”
- Liver tumors were last observed in 2004
- Prevalence of liver tumor precursors has decreased by more than 2/3

Flounder: Liver Tumor Precursors Throughout The Region



- Liver tumor precursors in flounder near the outfall are lower than before discharge began
- 2014 results from Deer Island, outfall site (not shown) were the lowest yet observed

Hardbottom Communities Are Healthy



Hard bottom monitoring shifted to every 3 years with new plan,
Survey occurred in June 2014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