

City of Baltimore
Raw Water Supply
Zebra Mussel Monitoring and Control

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RESERVOIR WATERSHEDS

- The City of Baltimore, Department of Public Works is responsible for the operation and maintenance of a water supply system which services approximately 1.8M people in the greater Baltimore metropolitan region.
- This 215 square mile service area, includes the City of Baltimore and portions of Anne Arundel, Baltimore, Howard, Carroll, and Harford Counties.
- The two primary sources of this supply are the Gunpowder Falls and the North Branch of the Patapsco River. A secondary source is available from the Susquehanna River at Conowingo.



RESERVOIR WATERSHEDS

City of Baltimore uses surface water from rainfall and snowmelt as the primary source of its water.

Loch Raven Reservoir

- Located in northern Baltimore County, small parts of western Harford County and southern York County, Pennsylvania.
- The source of reservoir water is Gunpowder Falls.
- Raw water from Loch Raven Reservoir travels through a 7.3 mile long, 12 foot diameter tunnel for treatment at the Montebello Filtration Plant in Baltimore.

Prettyboy Reservoir

- Located in the northwest corner of Baltimore County
- 80 square mile watershed.
- It impounds about 19 billion gallons of water.
- The reservoir has an outlet through the Prettyboy Dam into the Gunpowder River.



RESERVOIR WATERSHEDS

Liberty Reservoir

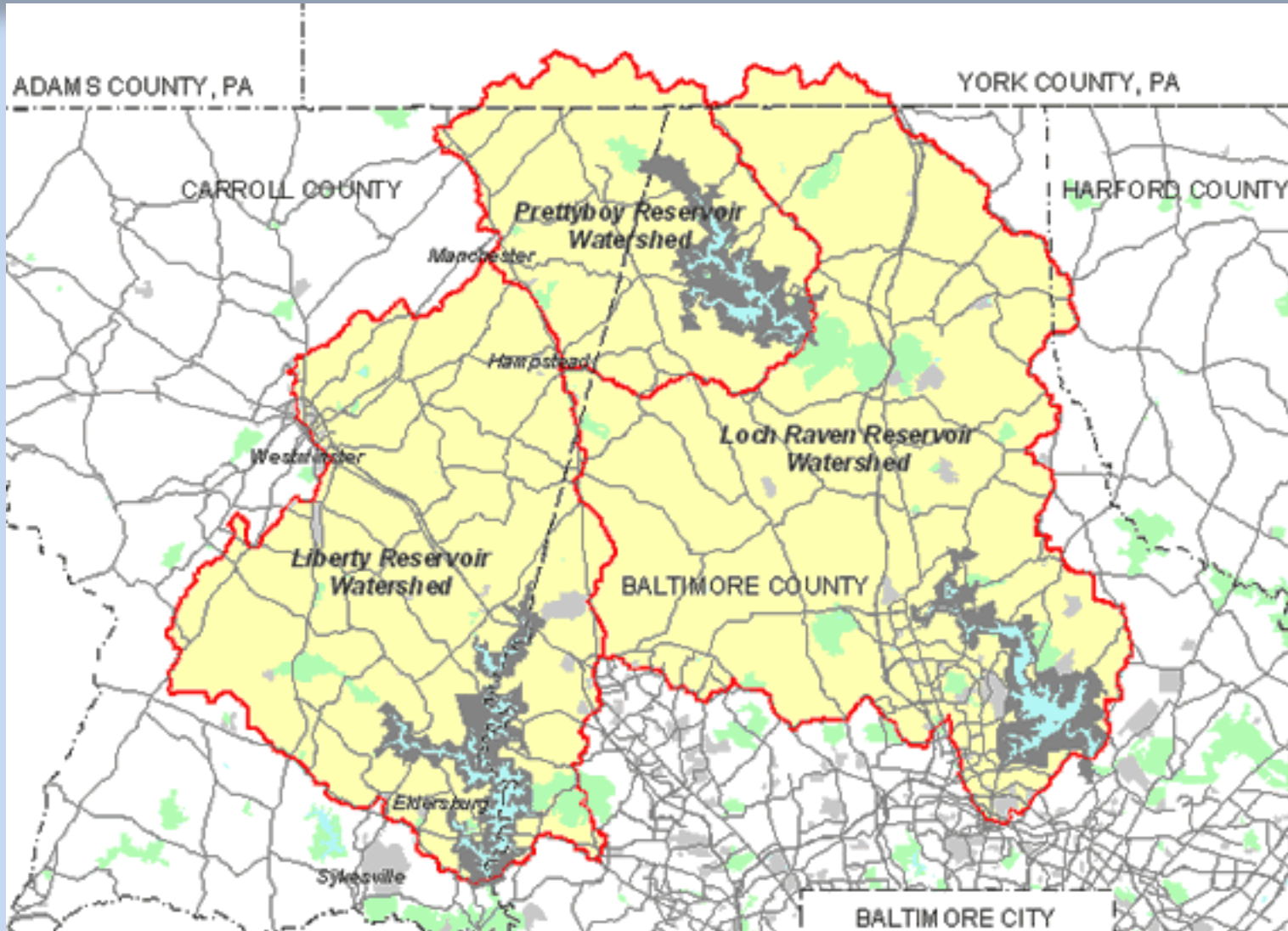
- Located on the North Branch of the Patapsco River on the boundary between Baltimore and Carroll Counties.
- It collects water from a 164 square mile drainage area that includes eastern Carroll County and southwestern Baltimore County.
- Water from the reservoir flows, by gravity, through a 12.7 mile long, 10 foot diameter tunnel to the Ashburton Water Filtration Plant for treatment.

Conowingo Intake

- Auxiliary water intake on the Susquehanna River, approximately 11 miles north of Aberdeen near the Pennsylvania State line.
- Pumped via the Deer Creek Pumping Station to the Montebello Filtration Plants through the 38 mile long Susquehanna Conduit.



RESERVOIR WATERSHEDS

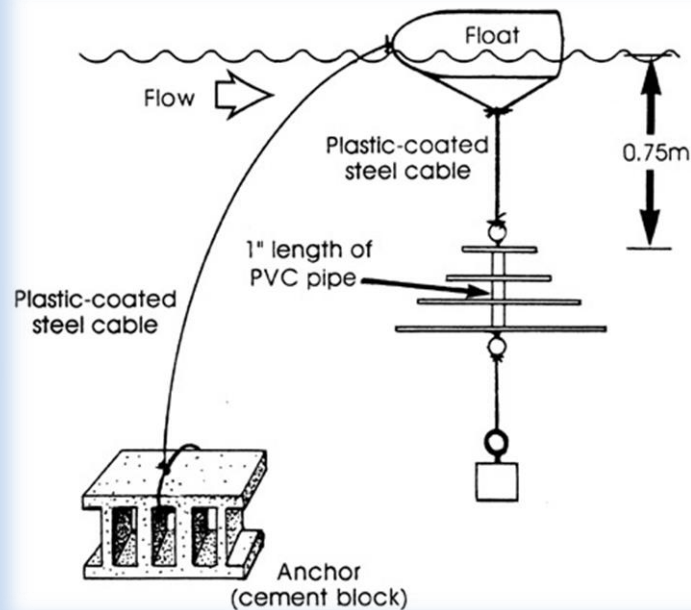


MANAGEMENT ACTIONS

- The presence of several dreissenid mussels in the Susquehanna River near Binghamton, NY, in the early 1990s, prompted City of Baltimore to evaluate the dreissenid mussel control options and to explore alternatives to dreissenid mussel control.
- **1992** - Enacted boating moratorium
- **1992** - Modified boating permits to restrict access to Liberty, Loch Raven, and Prettyboy reservoirs
 - Signed affidavit: use only on City's three reservoirs
 - No gasoline-powered motors on boats
 - No boats longer than 18 feet (currently 20 feet)
 - Boating moratorium could be reinstated if necessary
- **1992** - Required live bait used by anglers in City reservoirs to be certified zebra mussel-free
- **1992** - Established ongoing zebra mussel monitoring program, April-November, using multi-plate samplers, at City reservoirs and intake of Conowingo Pool
- **1993** - Constructed zebra mussel control facilities at all 4 water supply intakes
- **2010** - Completed new vulnerability assessment of City's reservoir system's to dreissenid infestation, and reviewed current control methods
- **2013** - Started evaluating renovations to intake in Conowingo Pool

MANAGEMENT ACTIONS

- Monitoring stations established at each of the city-owned reservoirs and at the Conowingo Intake
- Sampling stations located at each the intakes and boat ramp areas
- Multi-plate sample design
- Samples collected every two weeks during the monitoring season.



MANAGEMENT ACTIONS

- Zebra Mussel Control facilities were constructed at each of the three reservoir locations and the Conowingo Intake.
- With the exception of the Prettyboy Reservoir, all facilities use potassium permanganate as the primary control chemical with a chlorine backup system.
- Potassium permanganate is commonly used in the treatment process and does not negatively impact water quality.
- The Prettyboy system, due to the potential discharge of treatment chemicals into the Gunpowder Falls, is designed for thermal treatment superheating water for control.



VULNERABILITY ASSESSMENT

- **2010 “Vulnerability of City of Baltimore Drinking Water Reservoirs and Intakes to Dreissenid Infestation” Renata Claudi, M. Sc. & Katherine Prescott, M. Eng., RNT Consulting Inc.**
- RNT examined data available on the environmental parameters of to better understand the size of the potential infestation.
- The data available generally showed alkalinity or calcium levels which would at best support
 - Low infestation levels for Prettyboy and Liberty Reservoirs
 - Moderate for Loch Raven Reservoir
- Additional mitigating factors such as low pH and low levels of oxygen below the thermocline of the reservoirs may further depress any developing dreissenid population.
- All three reservoirs have been closed to boats coming in from other water bodies since 1992. Recreational boats are a common transport vector for mussel infestation. This proactive step has significantly decreased the potential for introduction of dreissenid mussels.
- It is also recommended to monitor the progress of Zequanox (*Pseudomonas fluorescens*), a new bacterial product which specifically controls only dreissenid mussels.



CURRENT CONDITION

- In 2013 a cluster of adult zebra mussels were found on the Conowingo intake structure by divers working on intake structure improvements.
- Later that year zebra mussels were found by RNRS biologist on the multi-plate sampler at the Conowingo intake.
- Currently, zebra mussels have not been found at any of the primary source water supply reservoirs.
- Ongoing exchange of information with other users upstream, such as water filtration plants and nuclear energy plants when zebra mussel numbers change.

Zebra Mussel WATCH
Adapted with permission from Wisconsin Sea Grant

ATTENTION BOATERS
HELP STOP ZEBRA MUSSELS, HARMFUL AQUATIC HITCHHIKERS, FROM COMING TO MARYLAND
IF YOU'RE LAUNCHING A BOAT IN MARYLAND, HERE'S WHAT YOU CAN DO!

INSPECT and remove mussels and aquatic plants from boat and trailer; put in trash can

DRAIN water from bilge, live wells, bait buckets, engine, trailer, coolers, and SCUBA gear

RINSE hull, trailer, engine, live wells, bait buckets, and SCUBA gear with hot water (if available) or tap water

DUMP DRY leftover bait on land, away from water
boat, engine, and trailer in sun for 3-4 days between outings

IDENTIFY THE ENEMY
Looks like a small clam: yellow or brown with stripes; usually about thumbnail size; often occurs in clusters

ZEBRA MUSSEL ALERT!
FOR MORE INFORMATION OR TO REPORT SUSPECTED SIGHTINGS, CALL MARYLAND DEPARTMENT OF NATURAL RESOURCES (410-266-6560)

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www.dnr.state.md.us

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