The Wonders of Water for Families

CMU Children's School
Staff / Parent Discussion 2/1/13

Developmental Benefits of Exploring Water

• **Self-Esteem & Independence** – explaining why safe water is important for each person, taking responsibility for personal hygiene without wasting water
• **Interaction & Cooperation** – taking responsibility for providing plants and pets with the water they need to survive, sharing resources with others to help more people have safe water, taking turns with water exploration materials
• **Communication** – learning new vocabulary in English and other languages, describing water properties and experiences, writing labels or drawing illustrations for water explanations and stories, etc.
• **Discovery & Exploration** – exploring concepts of water flow, sinking & floating, etc., predicting what will happen to the puddle after a rain or the condensation on windows, counting water drops and using liquid measures to compare amounts (volume), discovering multiple solutions to water flow problems, challenges of making a vessel float, etc., and appreciating the value of learning from "mistakes"
• **Physical Capabilities / Health & Safety** – strengthening eye-hand coordination for scooping and pouring water, building dexterity for effectively using eye droppers, pipettes, tubing, etc., managing body movements to avoid spills, following safety procedures with water, etc.
• **Artistic Expression & Appreciation** – experimenting with design & decoration while using water as an art medium and representing water with paint, collage, sculpture, dance, creative movement, and music, as well as appreciating the artistry of others.

Key Concepts Related to Water

• ***Physical science*** - states of matter, flotation, absorption, cohesion, adhesion
• ***Life science*** - the necessity of fresh water for life, adaptation to wet or dry habitats
• ***Earth science*** - the water cycle, effects of water on land, conservation & recycling
• ***Technologies*** for collecting, containing, moving, purifying & using water for power
• ***Math*** for measuring, comparing, contrasting, and graphing water amounts, sources, properties, and impact
• ***The arts*** - ways to represent water visually, via music and poetry, and in dance or drama, as well as the ways that water can be used as a medium in all of the arts
• ***Geography*** - fresh and salt water locations and proportions on earth (map & globe)
• ***History*** of humans using and misusing water, plus ***social justice*** issues related to providing safe water for everyone in the global community

Adult Support For Exploring Water **[I wonder … I think … I learned …]**

• Explore **WITH the children** to gently support their investigation without directing or frustrating them. Use trays or dishpans to contain the water so that children can try sinking/floating, scooping and pouring, washing & drying, etc.

• Take the **child's lead**, follow the child's interest, and provide only the level of support they need.
• Allow children to mix and pour water with a **variety of utensils and containers**.
• Allow children to continue working with the same materials for a **period of days**.
• Add a variety of props to the water, such as animals, waterproof blocks, and sponges to **extend the play**.
• Encourage children to **clean up from their explorations** so the materials are ready for the next day by draining the water and leaving the materials on a towel to dry. Be ready with a fresh set of warm, dry clothes!

Home Activity Ideas

• Go on a **scavenger hunt for all the water** in and around your home, including the natural water (rain, puddles, etc.) and the water that comes through pipes to our sinks, refrigerator, bathtub / shower, washing machine, etc. Remember to include water in different forms (e.g., steam in the shower or from the teapot, ice in the freezer or icicles on the roof, etc.).
• Reinforce **water concepts while cooking**, such as which ingredients sink and float, which dissolve, etc. Consider making foods with very obvious water / ice ingredients, such as jello, soup, beverages like tea, hot chocolate and lemonade, popsicles. Also notice the water that is involved in cleaning foods, steaming or boiling foods, etc.
• Record all the **water your family uses in a day** for cleaning, bathing, cooking, flushing the toilet, etc. Suggest ways to reduce the amount of water you use, recycle extra water, or even reuse water (e.g., cool leftover from pasta water for plants.

Neighborhood Activity Ideas

• Take a trip to **Phipps Conservatory, the Zoo, or the Aviary** and notice the ways that the plants and animals get their water, as well as those that live IN the water. Think about how many amazing adaptations there are for habitats where water is scarce vs. plentiful, fresh vs. salt, etc.
• Take a **River Walk** on the south side or north shore to see the river from different angles. Observe the wildlife along the way, notice the ways that people have been polluting our city's water, and keep an eye out for interesting fountains, too.

Your Drinking Water Quality

• Presentation by Anna Mehrotra, Ph.D. PE (mother of Naveen, AM 4's)
• Water Treatment Plant Tours (Fridays at 1pm on Feb 8, Feb 22, and March 8)

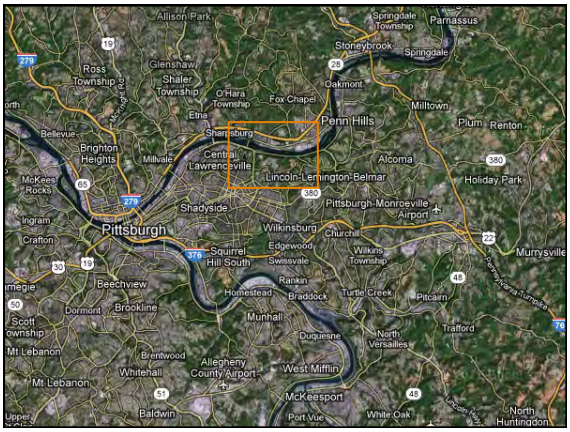
Additional Resources

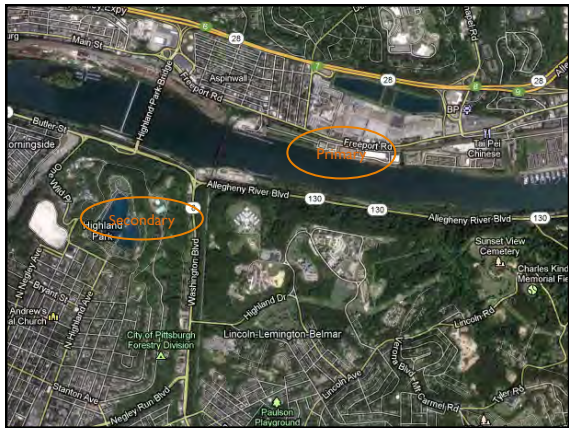
WaterAid (http://www.wateraidamerica.org/)
    • Learn Zone
WQED OnQ OnDemand (http://www.wqed.org/tv/watch/onq/?id=788)
    • Rain Gardens
    • Three Rivers Waterkeeper (local chapter of Waterkeeper Alliance)

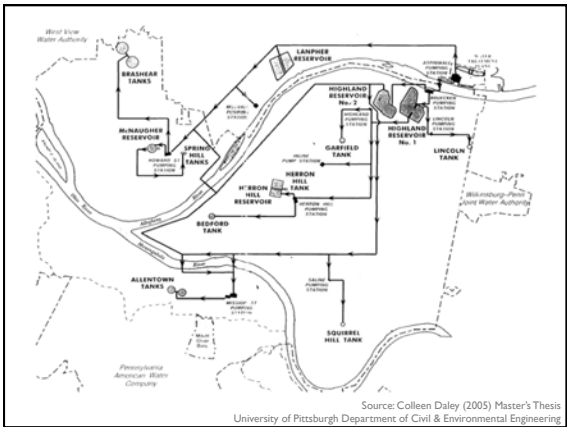
Your Drinking Water Quality

Anna Mehrotra, PhD PE | Children's School | February 1, 2013

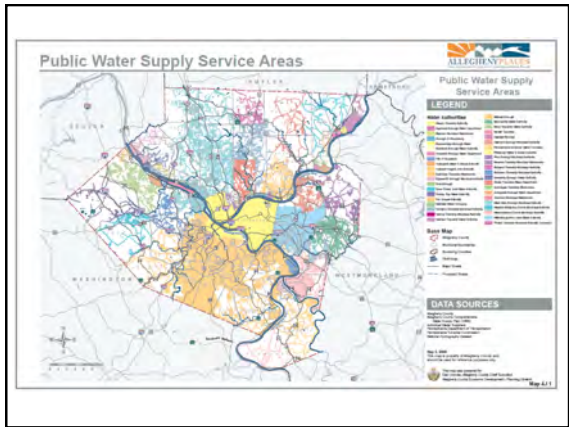
Where?







Source: Colleen Daley (2005) Master's Thesis
University of Pittsburgh Department of Civil & Environmental Engineering



Quality?

Water Quality Reports

- Required by EPA/PA
- Published by July for previous year
- http://www.pgh2o.com/waterQuality.htm

Microbiological Contaminants

Contaminant (Unit of Measurement)	Violation?	Level Detected	Range	MCLG	MCL: Maximum Contaminant Level	Sources
Turbidity (a)	N	0.11 (b) 100%	N/A	N/A	TT = 1 NTU for a single measurement TT = at least 95% of Samples ≤ 0.3 NTU	Soil runoff
Total Chlorine Residual at Distribution System (ppm)	N	0.60	0.29 to 0.80	(c) 4	(d) 4	Water additive used to control microbes
Free Chlorine Residual at Entry Point to Distribution System (ppm)	N	(e) 0.28	0.26 to 0.89	——	(f) 0.2	Water additive used to control microbes

http://www.pgh2o.com/docs/2011_Water_Quality_Report.pdf

Disinfection Byproducts

Contaminant (Unit of Measurement)	Violation?	Level Detected	Range	MCLG	MCL: Maximum Contaminant Level	Sources
Total Trihalomethanes (ppb)	N	66	18 to 106	N/A	80	Byproduct of drinking water chlorination
Total Haloacetic Acids (ppb)	N	17	6 to 32	N/A	60	Byproduct of drinking water disinfection

http://www.pgh2o.com/docs/2011_Water_Quality_Report.pdf

Lead and Copper

Contaminant (Unit of Measurement)	Violation?	Level Detected	Range	MCLG	MCL: Maximum Contaminant Level	Sources
Lead (ppb) (g)	N	90th percentile = 10	2 sites above AL (50 sites sampled)	0	AL = 15	Corrosion of household plumbing systems; erosion of natural deposits
Copper (ppm) (g)	N	90th percentile = 0.082	No sites above AL (50 sites sampled)	1.3	AL = 1.3	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives

http://www.pgh2o.com/docs/2011_Water_Quality_Report.pdf

Inorganic Contaminants

Contaminant (Unit of Measurement)	Violation?	Level Detected	Range	MCLG	MCL: Maximum Contaminant Level	Sources
Chromium (ppb)	N	1	<1 to 1	100	100	Discharge from steel and pulp mills
Fluoride (ppb)	N	1.61	0.07 to 1.65	2	2	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories
Nitrate (ppm)	N	3.63	0.46 to 3.63	10	10	Runoff from fertilizers; leaching from sewage; natural deposits
Barium (ppm)	N	0.023	(k)	2	2	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits

http://www.pgh2o.com/docs/2011_Water_Quality_Report.pdf

TOC Removal

Contaminant (Unit of Measurement)	Violation?	Level Detected	Range	MCLG	MCL: Maximum Contaminant Level	Sources
Total Organic Carbon (TOC) (% removal) (a)	N	No quarter out of compliance	37 to 53	N/A	TT = 35%	Naturally present in the environment

http://www.pgh2o.com/docs/2011_Water_Quality_Report.pdf

Radioactive Contaminants

Contaminant (Unit of Measurement)	Violation?	Level Detected	Range	MCLG	MCL: Maximum Contaminant Level	Sources
Uranium (pCi/L)	N	1.77	ND to 1.77	0	30	Erosion of natural deposits
Combined Radium (pCi/L)	N	3.1	ND to 3.1	0	5	Erosion of natural deposits
Beta Photon Emitters (pCi/L)	N	39.6	ND to 39.6	0	(j) 50	Decay of natural man-made deposits

http://www.pgh2o.com/docs/2011_Water_Quality_Report.pdf

Marcellus Shale Impacts?

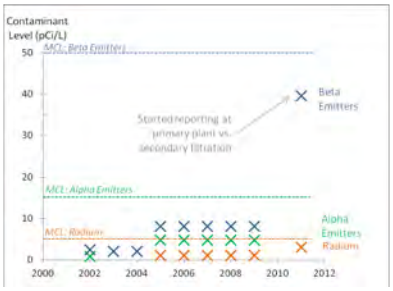
Flowback Water

- Higher radium than non-Marcellus shale; EPA to study
- Also high in bromide ➔ THMs and HAAs
- Other issues for groundwater

USGS Report on Radium of Oil- and Gas-Field Produced Waters in the Northern Appalachia Basin (2011): http://www.slideshare.net/MarcellusDN/usgs-study-of-marcellus-shale-wastewater-radioactivity-levels

Watch Quality Over Time

Radioactive Elements



Watch Quality Over Time

Disinfection Byproducts

Questions?