M.E.R.G.E:

Monongahela Enrichment River Guide for the Environment

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Overview

- Mission Statement
- Watershed Characterization
- History
- Land use
- Governance Organizations
- River Issues
  - Interstate Cooperation
  - Urbanization
  - Industry
- Solutions
  - Responsible Allocation
  - Cleanup
  - Long-term goals

Photo courtesy from brooklineconnection.com

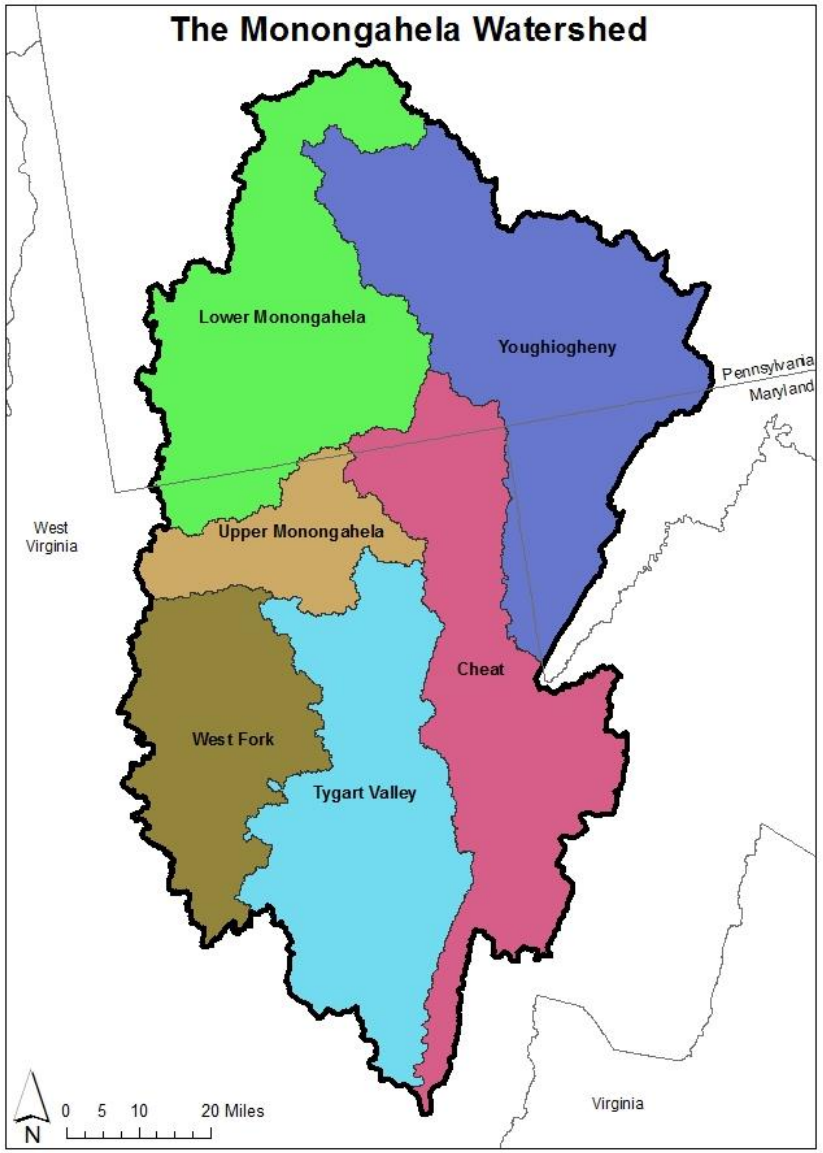
Mission Statement

Collaborate with Pennsylvania, West Virginia, and Maryland to produce a water budget, improve current river infrastructure to be more efficient, safe, and green, and to encourage water quality by 2035.

- By 2017, create a water budget consolidating data from all three states into one dataset that determines where water is coming from, the quality of that water, and where the water is going
- By 2035, replace or improve critical infrastructure with green building practices
- By 2035, reduce TDS and increase oxygen levels by 20%

Watershed Characterization

- Total Drainage Area: 7,340 mi.^{2}
- Length of River: 128 mi.
- Climate: humid continental
  - Average precipitation: 41 inches
- Major Tributaries:
  - Cheat River
  - Lower Monongahela
  - Upper Monongahela
  - Tygart Valley
  - West Fork
  - Youghiogheny

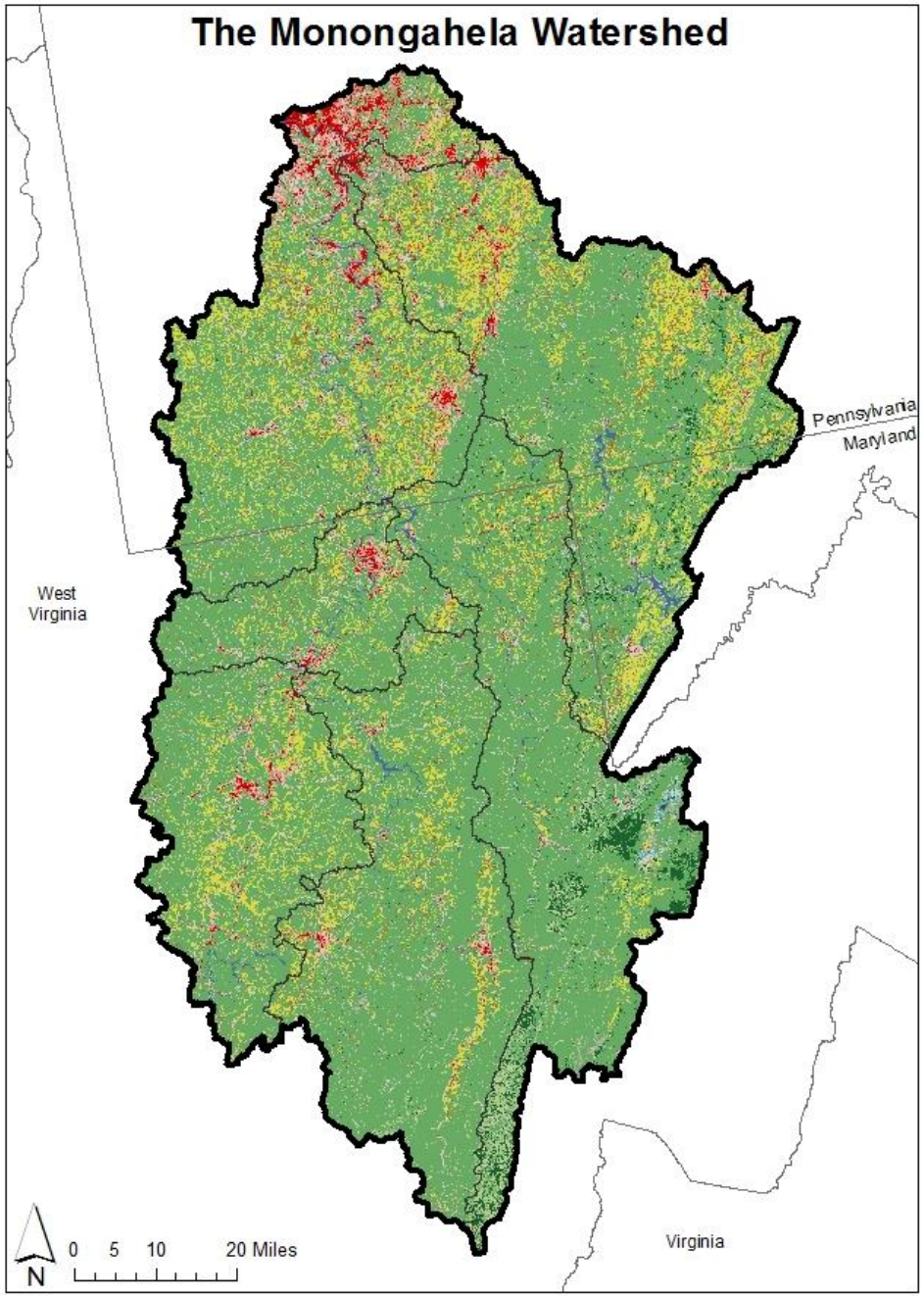


Land Use

Forest: 70%

Agriculture: 20%

Urban: 10%



History

8,000 B.C. – 1700 A.D.	• Native American territory for hunting grounds • (1600 A.D.) Colonists settled into area, bloody battles fought between Native Americans
1817 - 1844	• 16 locks and dams installed along the river for increased navigation to the Mississippi River
1900's	• Heavy mining companies emerged (steel and coal) • (1907) Monongah mining disaster kills >360 men. Worst mining disaster in American history
2010	• Monongahela ranked #9 on America's Most Endangered Rivers
2013	• Monongahela River nominated as "Pennsylvania's River of the Year" • Raises river awareness for conservation needs

Governance Organizations

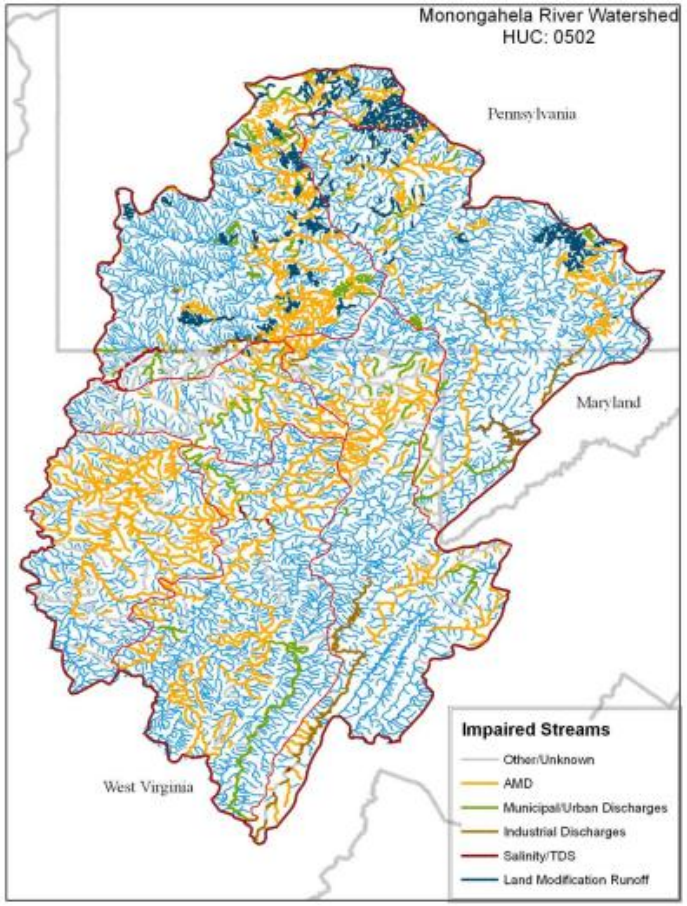
- 3 Rivers Quest- West Virginia University
  - Monitors water quality
- Pennsylvania Organization for Watersheds and Rivers (POWA)
  - “River of the Year” award
- Pennsylvania Environmental Council (PEC)
  - Energy/environment, trails/recreation, watersheds, policy
- Monongahela River Towns
  - Beautification of outdoor/recreational areas
- WV/PA Monongahela Area Watersheds Compact
  - Fracking in the Monongahela
- Upper Monongahela River Association
  - water quality, drinking water, and local water bodies

3RQ THREE RIVERS QUEST Allegheny Monongahela Ohio

POWR

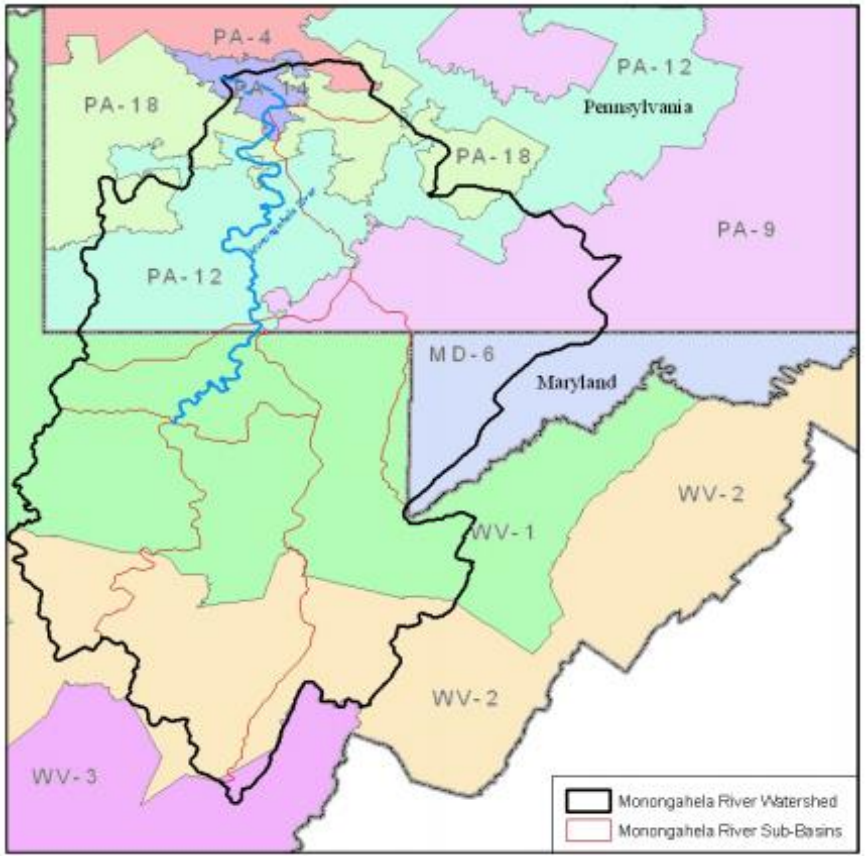
pec pennsylvania environmental council

River Issues



- Lack of Interstate Cooperation
- Urbanization
- Industry
  - Acid Mine Drainage
  - Fracking

Lack of Interstate Cooperation

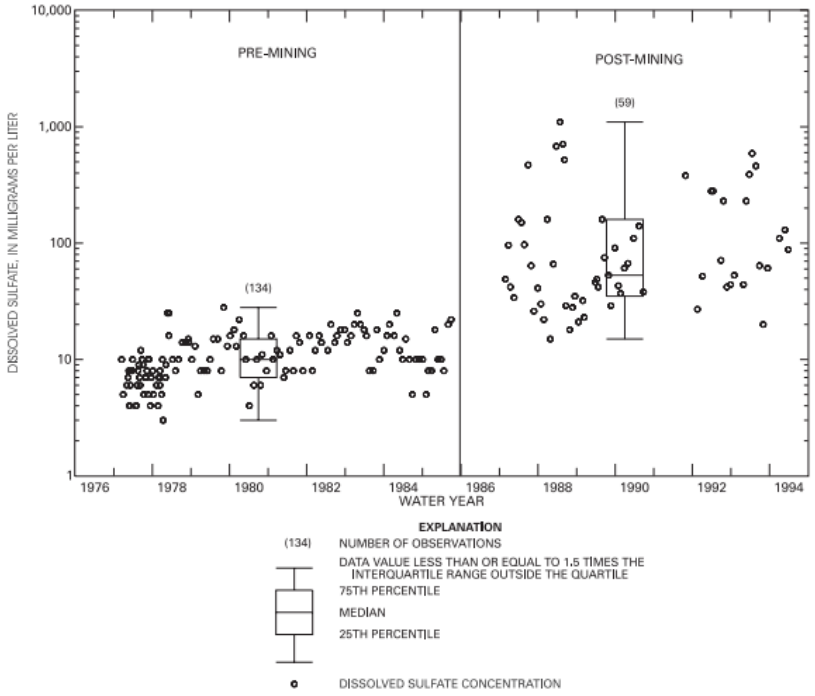


- Watershed is spread across PA, MD, WV
- Lack of comprehensive water resource regulation
  - No interstate regulation on water withdrawal
    - Natural Gas Extraction
    - Mining
  - Differences in state regulations, permitting, and enforcement

Urbanization

- Contaminants
  - Urban runoff
    - Fertilizer
    - Heavy Metals
    - Pesticides
    - Salts (Winter)
    - Increased Temperatures (Summer)
  - Increased Garbage
  - Sewage
    - Combined Sewage Overflow
    - Leaky and aging infrastructure
- Navigation Channels
  - Locks
  - Culverts

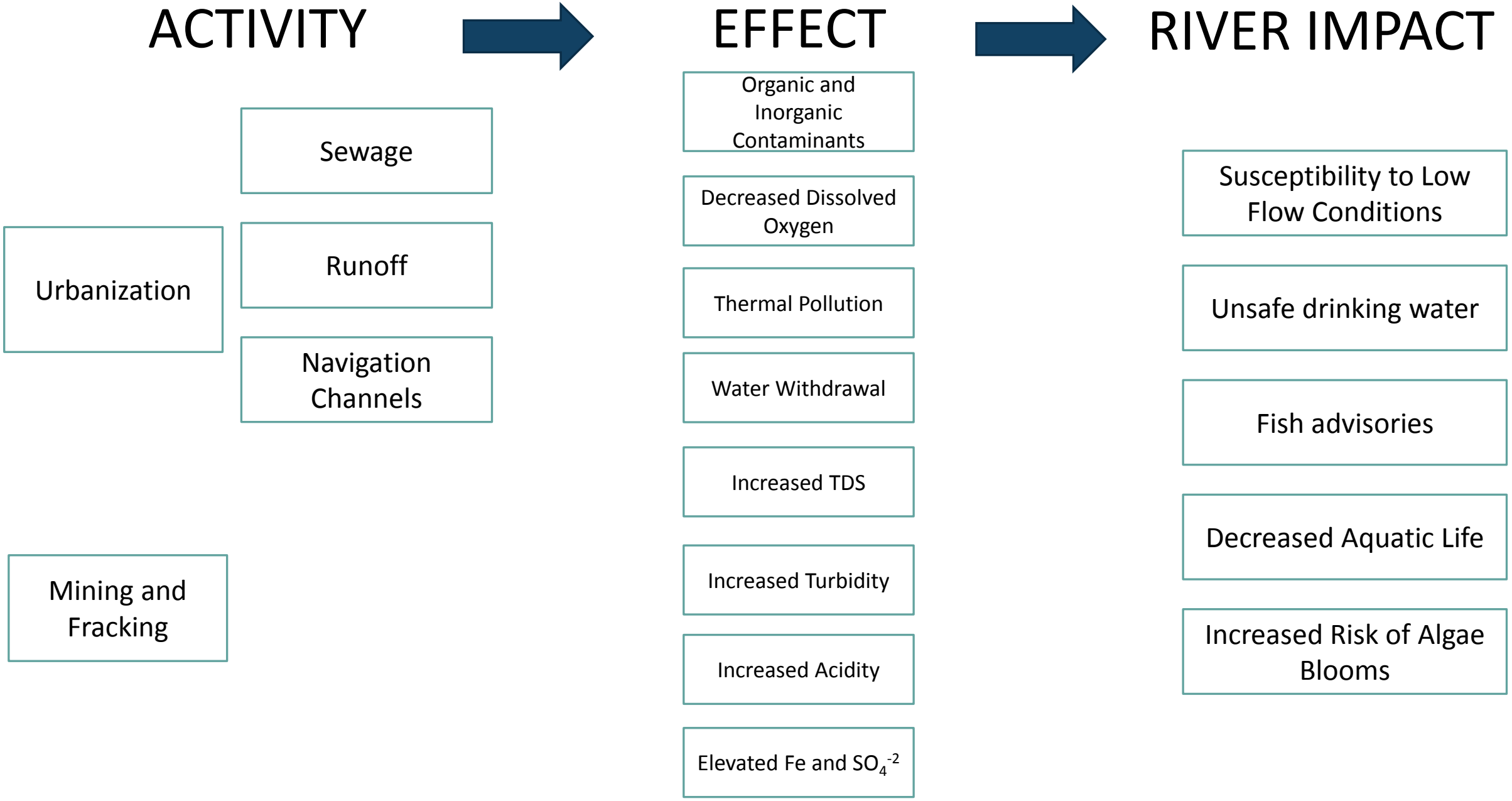
Industry: Coal Mining



- 6,564 coal mines have operated in the Monongahela watershed
  - 2,685 abandoned coal mines
- 200 past years of mine, available resources for 100 more years
- Acid Mine Drainage (AMD) from abandoned sites
  - Results in increased levels of acidity, iron, manganese, sulfate
  - Sulfate levels measured at 110 mg/L for Monongahela at Braddock
- 2,390 mi^2 of river degraded by AMD (1998)
  - AMD toxic to aquatic life (benthic algae, invertebrates, fish)

Industry: Natural Gas

- PA has regulation prohibiting deep well injection of wastewater
  - Truck to other states
  - Pay local treatment plants to process
    - Not equipped to remove salts
    - Send frack water into local rivers
- Wastewater contains added chemicals, radioactive material, brine water, and heavy metals
- Dunkard Creek Fish Kill
- Water withdrawal


ACTIVITY
EFFECT
RIVER IMPACT
Urbanization
Sewage
Runoff
Navigation Channels
Mining and Fracking
Organic and Inorganic Contaminants
Decreased Dissolved Oxygen
Thermal Pollution
Water Withdrawal
Increased TDS
Increased Turbidity
Increased Acidity
Elevated Fe and SO_4^{-2}
Susceptibility to Low Flow Conditions
Unsafe drinking water
Fish advisories
Decreased Aquatic Life
Increased Risk of Algae Blooms

Strategies for Remediation

Photo courtesy from riskandinsurance.com

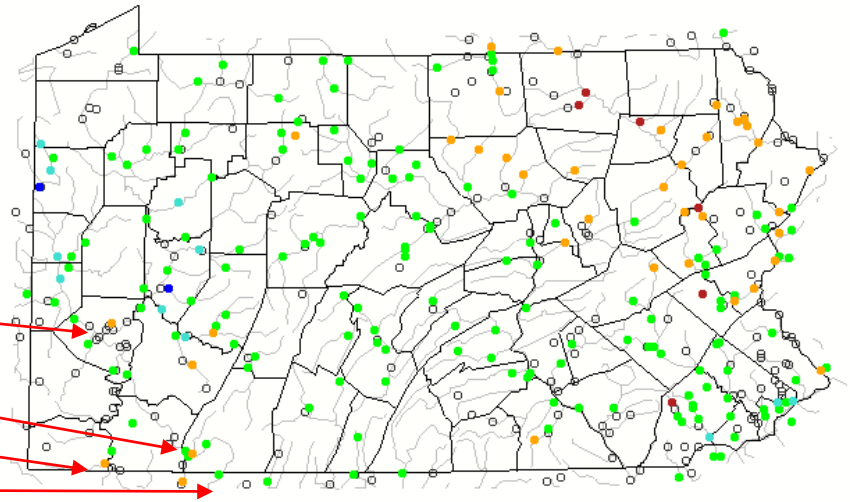
1. Allocation of Responsibility

1.A. Primary responsibility for remediation to be based on discharge:

1. Easy to quantify
2. Water availability
3. Pollutant loads

Sites to be used

i. 030485152 Monongahela River @ Pittsburgh, PA--Total
ii. 03071600 Cheat River @Lake Lynn, PA--WV
iii. 03063000 Monongahela River @ Point Marion, PA--WV
iv. 03076850 Youghiogheny River @ Bridge, PA--MD



1.B. Allocation of Responsibility—Baseline Assessment

- As the main stakeholder in the river's water quality, the city of Pittsburgh in combination with the PA-DEP and ES-EPA will coordinate remediation efforts:

- Beginning with a synoptic sampling :

  - 20 subwatersheds representative of LULC, divided between 3 states based on total discharge contribution

  - Baseline: quarterly for first 3 years; annual follow-up

  - Census of abandoned and active mining and fracking operations

  - Statistical model to allocate pollutant loads to the Monangahela based on empirical data from subwatersheds--extrapolation to unmeasured subwatersheds with similar LULC (outside consultant)

1.B. Baseline Sampling

- Conducted by state environmental monitoring institutions: PA-DEP, WV-DEP, MDE
- Analyses consistent with previous regional studies to target specific aspects of issues noted above:

Basic Water Quality	Metals	Pesticides, Solvents, VOCs	Biology
Alkalinity and Hardness; BOD; **Chloride; DO**; DOC; **Fecal Coliform**, Giardia & *E. Coli*; **pH; Specific Conductance; SO_4, Temperature; Total N (NHO_4, NO_3, NO_2, DON); Total P (Orthophosphorous); Total Suspended Solids Discharge**	**Al, As**, Ba, Cd, Ca, **Cu**, Fe, **Pb**, Mg, Mn, **Hg**, **Ni**, K, Se, Ag, Na	Aroclor, **BTEX,** Cyanide, Dieldrin, Lindane, **MBAS,** Methoxychlor, Mirex, Nonachlor, DDD, DDT, Oxychlordane, Phenols	**Benthic macroinvertebrate survey**

Source: http://ofmpub.epa.gov/apex/STORETSummary/

1.C. Resource Allocation

- Application for EPA funding based on subwatershed assessments, focus on cleaning up mining sites:
    - *EPA Brownfield Area-Wide Planning Pilot Program*
    - *Targeted Brownfield Assessments*
    - *Superfund where applicable*
- Should EPA funding be acquired, allocations will be determined based on baseline sampling and associated pollutant load models outlined above.
- Remainder of burden (after EPA funds exhausted) to meet targeted reductions will fall on states

2. Cleanup

Brownfield/mine cleanup

Urban stormwater diversions

Oversight of mining withdrawals and discharges

*"Many impaired waters exist within the watershed mainly due to **urban runoff and abandoned mine drainage**. Should a group (watershed organization, water supplier, municipalities) implement a watershed protection plan, the focus should be placed on **controlling stormwater runoff along transportation corridors** near the streams leading to the intake, including **combined sewer overflows**. Best Management Practices should be used to divert runoff from agricultural areas and mines away from streams, reservoirs and other waterways. Lastly, Best Management Practices for **spill prevention and containment** can reduce the threat of PCB exposure to the streams from utility substations"*

- Pennsylvania American Water Company

2. Goals for Continued Regulation

Long Term Goal	Regulation or Engineering Strategy
Reduce withdrawals for industrial/mining operations by 25% where flow volume is impaired	*Increased oversight of mining operations by state regulatory agencies*
Mitigate occult dumps and/or spills from mining/industrial activity	*Divert portion of cleanup funds to implementing BMP's for mines (retention ponds, bioreactors, lime treatments, etc.)*
Divert CSO and urban runoff from direct discharge to Monongahela tributaries	*Allocate portion of cleanup funds for improvement of urban storm water controls (retention ponds, vegetated swales, and armored spillways) particularly around Pittsburgh metropolitan area*
Catalog all active and discontinued mining operations to address future pollutants and incorporate into progress reports.	*Development of interstate committee for census of mining operations*

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