Water Quality Concerns

Mineral Extraction

Mineral extraction activities, including coal mining, conventional and unconventional oil and gas development, and waste disposal have historically and continue to exert pressure on water quantity, water quality, and ecological health in the upper Ohio River Drainage Basin. Mineral extraction activities can potentially compromise human health and safety and the full execution of our congressionally authorized project purposes. Bituminous coal mining in particular has had a significant impact on water resources in our District. Coal deposits contain large amounts of pyrite, which, along with the large extent of historical surface coal mining in the basin, has caused widespread, legacy acid mine drainage (AMD) pollution. The sources of the AMD are seeps and discharges from areas disturbed by surface and deep mining prior to passage of state mining regulations, which caused depressed pH levels and elevated turbidity and metal concentrations. AMD is the result of water percolating through sub-surface mines rich in sulfides (principally pyrite), which then react with oxygen to form sulfuric acid. The acidic water can have a pH of 5 or less and eventually flows back into surface waters. If left untreated, AMD impacted waters can adversely affect the water quality and aquatic life of receiving waters. Due to mitigation efforts and natural attenuation (oxidation and depletion of exposed pyrite), AMD water quality conditions have improved throughout the Pittsburgh District as a whole over the last four decades.

Environmental Flows (E-Flows)

Environmental flow management (Environmental Flows) at Corps facilities is defined as replicating, where constraints and opportunities allow, aspects of the natural, or pre-impoundment, flow regime of a given riverine system to improve overall ecological function and sustainability. It is widely understood that impounding rivers to create reservoirs substantially alters their natural character to include: flow, energy, thermal, and sediment regimes. Water Management is therefore working with the Nature Conservancy and project stakeholders to evaluate the possibility of integrating environmental flow management principles into the operation of District reservoirs. The goal is to improve ecosystem function in accordance with our authorization for Fish and Wildlife improvement at District reservoirs and their downstream regulated river reaches, while assuring that other project purposes are not compromised. In 2014, the Allegheny River Basin system of reservoirs was selected as a USACE / TNC Sustainable Rivers Project.

Nutrient Overloading (Eutrophication)

Nutrient overloading, or eutrophication, is the addition and accumulation of nutrients (such as nitrogen and phosphorus) to an aquatic system. Although eutrophication can be due to natural occurrences, much of the eutrophication in the Pittsburgh District comes from agricultural runoff (fertilizer & animal waste), lawn fertilizer, mineral extraction and industrial

processes, and treated and untreated human sewage (WWTP treated effluent, combined sewer overflows, leaking sanitary sewers, illegal sanitary sewer connections, functioning and failing septic systems). Nutrient overloading can result in high growths of phytoplankton that can lead to nuisance level and harmful algal blooms (HABs), which can then impact the entire ecosystem, including the organisms living in it, as well as human uses and health and safety.

Invasive and Non-Native Species

Invasive non-native plant and animal species compete with and threaten the health and existence of native species and their supporting ecosystems. Invasive species often spread and dominate ecosystems due to the absence of natural biological controls and other factors, which constrain native populations. Asian carp, zebra mussels, Chinese mysterysnails, spiny waterflea, Eurasian watermilfoil, purple loosestrife, hydrilla, Japanese knotweed, Autumn olive and reed canary grass are examples of non-native species that may need to be managed on Pittsburgh District project lands and waterways. Non-Native species disturb ecosystem function by interfering with trophic and competition processes. One of the most prevalent non-native species in the District is the Zebra mussel (Dreissena polymorpha). Zebra mussels are known to have invaded the entire Ohio, Allegheny, and Monongahela River navigation system, and also Berlin Lake, Mosquito Creek Lake, and Michael J. Kirwan Dam and Reservoir. Zebra mussels influence water quality via nutrient transport and water clarity. Zebra mussels alter the pre-existing food chain when they filter out algae and sediment and increase substrate nutrient concentrations, which can negatively impact food supplies, growth rates, and habitat for native fish, macroinvertebrates, and mussels. With water clarity improved, sunlight is able to penetrate farther into the water column reaching the lake bed in some areas of the lake. Aquatic plant populations begin to increase rapidly, generally dominated by the non-native Eurasian watermilfoil, which can interfere with recreational use, clog drinking water intakes, and compete with native plant species.

Bioaccumulation and Biomagnification of Contaminants in Aquatic Organisms

Bioaccumulation is the build-up in an organism of bioavailable chemicals (harmful organic chemicals that can be stored in an organism's tissue). These harmful organic chemicals can enter the organism via respiration, ingestion, or direct contact. Biomagnification is the transfer of these bioaccumulated chemicals up the food chain when predatory organisms eat prey that contains stocks of stored harmful organic chemicals. As a predatory organism consumes its prey, it acquires concentrations of harmful organic chemicals that can harm or kill the organism, as well as any other organisms that consume it (such as humans consuming predatory game fish). Chemicals such as pesticides, methylmercury (bioavailable mercury), and other bioavailable metals can bioaccumulate or biomagnify in lakes and can be a threat to the organisms, the ecosystem, and even humans.

Climate Change

Climate change is defined by the National Oceanic and Atmospheric Administration as “A non-random change in climate that is measured over several decades or longer. The change may be due to natural or human induced causes”. USACE policy requires that climate change adaption be mainstreamed into all Corps activities to help enhance the resilience of our built and natural water resource infrastructure and reduce its potential vulnerabilities to the effects of climate change and variability. Climate change can exert new and potentially unexpected pressures upon project purposes, human health and safety, and water resources and their dependent ecosystems.

Photo Captions and Credits (From Top to Bottom)

Artesian aquifer releasing acidic mine water into the Monongahela River (2014) – Carl Nim, Biologist
Meadow Run, tributary to Youghiogheny River – Carl Nim, Biologist

Algae bloom on Allegheny Reservoir (2014) – Rose Reilly, Biologist

Zebra mussels from ERDC website (http://el.erdc.usace.army.mil/zebra/zmis/zmishelp/bioaccumulation.htm)