

for these six polluted springs using bond money the mining company was required to set aside prior to mining (Carrello, 2005). North of Morgan Run near Dimeling were a number of historical surface mining operations for Upper and Middle Kittanning, Clarion #1, #2 and #3, and Mercer coals that were possibly a cause for moderately polluted areas along Morgan Run in the middle to late 1980s. There was a 56.9 acre permit for a small active mining operation in 2005 that was considered to be in Stage 2 of reclamation, meaning that the topsoil had been replaced and vegetation was growing on the site (Pennsylvania Department of Environmental Protection, 1996).

In general, pollution levels decreased from M7 to M8. The pH increased, while conductivity, sulfate, iron, manganese, and aluminum decreased. Alkalinity, pH, manganese, aluminum, and hot acidity still exceeded levels of concern in all four samples, and acidity exceeded levels in two samples. Iron values remained low. The macroinvertebrate community continued to be moderately impaired, and although the number of macroinvertebrates decreased, diversity increased. Of particular notice at M8 were a dragonfly (*Lanthus*), a Perlidae stonefly (*Acroneuria*), and a caddisfly (*Lepidostoma*), all of which also were found in Crooked Sewer Run. Only one individual of each taxon was found, indicating that these taxa may have drifted from Crooked Sewer Run during rain events the night before sampling and may not be residents of Morgan Run. Electrofishing results indicated no fish were present at M8 (Figure 6 and Table 3). The habitat was rated excellent with large boulders lining the streambed in a mixed forest area with good stream canopy and cover. Some wetland areas existed in the riparian area, and AMD precipitate was evident on the rocks.

Conclusions/Recommendations

Morgan Run has been severely impacted by AMD from past mining practices in the watershed. Mining practices prior to mining regulations in

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the late 1960s left abandoned mine areas, open pits, and spoil piles that have allowed the pollution of surface and groundwater in this watershed. The most prevalent and extensive mining was conducted in the upper portion of the watershed (Figure 2). The entire length of Morgan Run was polluted and exhibited low pH and alkalinity, and high metals and acidity. In addition, the metal precipitate on the streambed adversely impacted the instream habitat by coating substrate and filling niches. The worst section of Morgan Run was the section of the watershed from M2 to M6. This section had severely impaired macroinvertebrate populations and some of the most severe water quality impacts. The habitat was degraded from the headwaters to M3, mostly due to the disruption of streamflow by beaver dams and, consequently, larger amounts of sediment and AMD precipitate. Overall habitat ratings were high due to the forested and remote nature of the watershed. AMD metal precipitate degraded the habitat; however, the other aspects of the habitat were sufficient for support of aquatic life, indicating the stream has potential for remediation.

Two of the three major tributaries to Morgan Run were polluted by AMD. James Run was the most severely

polluted tributary, with pollution concerns being acidity, manganese, and aluminum. It was impacted by the AML north of Newtown and in SGL #98. Alberts Run had good field chemistry and supported a fish population in the headwaters; however, it became polluted downstream by the abandoned mining in SGL #98 and possibly the abandoned mining operations north of the stream. This stream has excellent potential for remediation, since it supports a fish population in the headwaters. Remediation efforts could concentrate on increasing the alkalinity and decreasing manganese levels on this stream. Crooked Sewer Run was a good quality stream, and efforts should be made to protect it.

The 13 discharges sampled on Morgan Run exude extreme AMD pollution in the form of high acidity and high metal concentrations. The most severe discharges were D5, D3, D6, D4, and D14, in addition to the cumulative impact of the SGL discharges. Some of the most severe discharges likely originate in abandoned deep clay mines.

Figures 4 and 5 indicate that elevated manganese levels were a problem throughout the watershed. High aluminum concentrations also were fairly widespread and, considering the higher toxicity to

aquatic life, are as much, if not more, of a concern as manganese. Discharges highest in aluminum were SGL #98 discharges, in particular D14 and D13. Iron was not as widespread of a pollutant (Figure 5); however, it is a large problem at D5 and has a huge impact at M3 (Figure 4).

Morgan Run did not support healthy populations of macroinvertebrates, and the mainstem did not support any fish populations. Recolonization potential exists through fish and macroinvertebrate populations in Crooked Sewer and the headwaters of Alberts Run. Habitat was sufficient to support a healthy, reproducing fishery, if AMD in this watershed were to be remediated.

Technology for AMD remediation varies depending on the site specific characteristics such as metal concentrations and space available for remediation systems. Site specific recommendations for the Morgan Run discharges will be made in the restoration plan. Remediation of AMD may be costly and difficult; therefore, it is important that mining companies follow current regulations and use best management practices in order to minimize or avoid any detrimental impact. For more information on mining and AMD treatment, see the following web sites and contact information:



Mouth of Morgan Run

Information on Mining - "Inspect a Surface Coal Mine" (Pennsylvania Department of Environmental Protection) http://www.dep.state.pa.us/dep/deputate/enved/go_with_inspector/coalmine/Table_of_Contents.htm

Information on Mining - Bureau of Deep Mine Safety (Pennsylvania Department of Environmental Protection) <http://www.dep.state.pa.us/dep/deputate/minres/dms/dms.htm>

AMD Passive Treatment - "Overview of Passive Systems for Treating Acid Mine Drainage" (West Virginia University Extension Service) <http://www.wvu.edu/~agexten/landrec/passtrt/passtrt.htm>

Active Treatment - "Overview of Acid Mine Drainage Treatment with Chemicals" (West Virginia University Extension Service) <http://www.wvu.edu/~agexten/landrec/chemtrt.htm>

AMD Treatment - Abandoned Mine Reclamation Clearinghouse (Pennsylvania Department of Environmental Protection and Western Pennsylvania Coalition for Abandoned Mine Reclamation) <http://www.amrclearinghouse.org/index.html> and <http://www.amrclearinghouse.org/Sub/AMDtreatment/>

AMD Information - Office of Surface Mining (U.S Department of the Interior) <http://amd.osmre.gov/amdtreat.asp>

MORGAN RUN WATERSHED CONTACTS:

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New Miles of Blue Stream

(Jennifer Demchak, *President*)

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Phone: (814) 343-5676

Susquehanna River Basin Commission

(Beth Dillon, *Water Quality Chemist*)

Address: 1721 North Front Street, Harrisburg, PA 17102

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