

installing a treatment system in the Johnson Creek Watershed at site DJC904. The Tioga County Concerned Citizens Committee (TCCCC), in conjunction with the Hillside Rod and Gun Club, will be submitting a proposal for funding to install passive treatment systems on discharges in the middle Fall Brook Watershed, as well as to treat non-AMD acidity in the watershed. These efforts should be encouraged and funding made available to support them.

## RECOMMENDATIONS

The Upper Tioga River Watershed is severely impacted by AMD from Fall Brook to Bear Creek, impairing or eliminating aquatic life in about 13 miles of the mainstem extending downstream to the Tioga/Hammond Dam Complex. Staining from precipitating metals and high acidity also limit the river's socioeconomic value to the local community. Other tributaries in the watershed show reduced pH due to non-AMD acidity sources, including tannins from natural headwaters wetlands and acid precipitation. Although AMD production will decline over time by depletion of the acid-forming minerals, this is a very slow process, particularly for underground mines, and significant impacts could continue for centuries without some form of abatement. The most common form of abatement is direct treatment of the AMD discharges by either active (chemical) or passive (wetland) systems. Other alternatives may include re-mining or land capping to limit infiltration on disturbed sites, alkaline addition to abandoned surface and underground mine works, streambed sealing to prevent infiltration to mine pools, or indirect treatment, such as increasing the alkalinity of reaches upstream of the AMD sources. The scope of the mine drainage problem in the Upper Tioga River Watershed is large, with some extremely severe sources of AMD.

SRBC and Gannett Fleming, Inc. constructed the following recommendations for the Upper Tioga River Watershed based on data collected and conclusions made during the present study, the areas in which additional study should be conducted, current and relevant literature, and professional experience. These recommendations should be viewed as dynamic as implementation efforts proceed in the watershed and additional needs are discovered that are beyond the scope of this assessment and restoration plan.

1. Support the efforts of local stakeholder groups working on AMD abatement in the watershed. Continue to provide funding for implementation of proposed restoration activities. Encourage stakeholders to establish interim restoration goals, focusing on the concerns of the community. Coordinate restoration activities with goals in the Tioga River TMDL.
2. Implement an initial, modestly sized demonstration project. The project would be beneficial for organizing stakeholders into a working team and will provide justification for future, larger scale efforts.
3. Develop GIS coverage of surface property ownership and underground mineral rights for problem areas identified. Locate and digitize deep mine maps for the area. Use geophysical techniques, if necessary, to map extent of deep mine workings throughout the study area.
4. Prior to AMD treatment for selected discharges, determine feasibility and estimated effectiveness of implementing source reduction techniques in the watershed to reduce the volume and possibly increase the quality of AMD. These actions would include reclaiming select pre-Act surface mined areas identified as high priority areas for

- restoration and sealing areas of stream infiltration into underlying abandoned workings.
5. Investigate feasibility of using innovative techniques for AMD treatment, including *in-situ* treatment using the deep mine complex and beneficial reuse of alkaline waste materials.
  6. Conduct watershed restoration in a phased fashion as discussed in this report and the restoration plan, beginning with the Fall Brook Watershed and ending with the Coal and Bear Creek Watersheds. Changes may be necessary to the current sequence based on the findings of feasibility using source reduction and innovative techniques.

Potential partners for implementation and further studies in the Upper Tioga River Watershed could include, but are not limited to the following:

SRBC, Pa. DEP, Pa. DCNR, PFBC, PennDOT, Tioga County Conservation District, Mansfield University, The Pennsylvania State University, Tioga County Concerned Citizens Committee, Hillside Rod and Gun Club, Tioga River Watershed Reclamation Projects, Inc., Tioga County Planning Commission, U.S. Office of Surface Mining, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Department of Agriculture, private consultants, government interests, local tourism and development interests

SRBC concludes that the restoration of the Upper Tioga River Watershed presents a formidable challenge. Strong, sustainable partnerships between local stakeholders and other entities will be crucial in assuring that the restoration of the watershed will be accomplished.