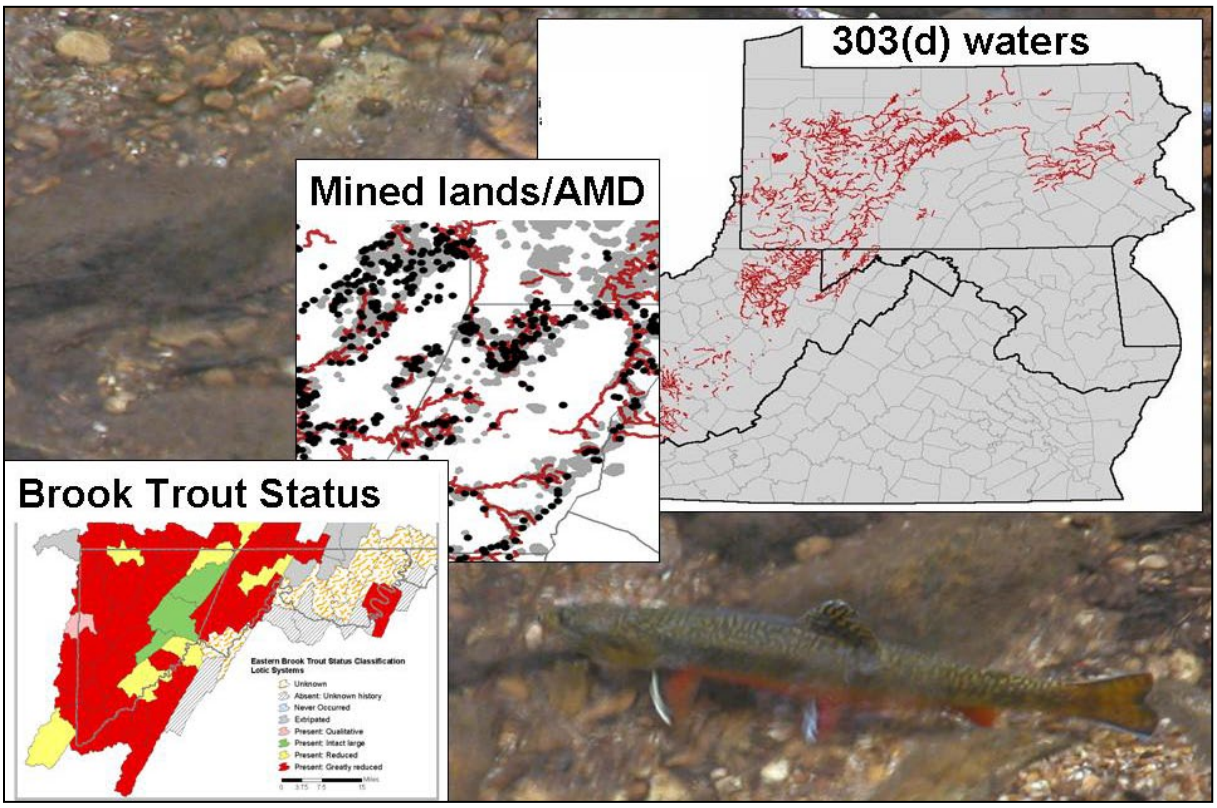

Project Summary

A Rapid Screening Assessment of Brook Trout Recovery Potential in Mining-Impacted Middle Atlantic Region Watersheds

Abandoned mine lands (AML) and acid mine drainage (AMD) are major causes of Brook Trout population extirpations and reductions throughout the eastern range of the species, especially in the highlands of West Virginia, western Maryland and Pennsylvania. The impacts of AMLs on stream condition and native trout populations are being addressed by three federal programs in collaboration with states. The Office of Surface Mining (OSM) has program resources to reclaim abandoned mines and neutralize AMD, and has provided financial assistance to state projects such as Aaron Run (Maryland) and Williams Run (Pennsylvania). The US Environmental Protection Agency (EPA) oversees the Clean Water Act impaired waters (303(d)) program, a state-delegated activity involving identification, listing and restoration planning for waters that do not meet Water Quality Standards. Many 303(d)-listed waters in middle-Atlantic states are impaired by AMD. Both EPA and OSM are also collaborating with the US Fish and Wildlife Service (FWS) and many other federal and state agencies through the FWS-led National Fish Habitat Action Plan (NFHAP), which has supported a regional partnership called the Eastern Brook Trout Joint Venture (EBTJV) to assess and restore Brook Trout throughout their range.

Through their coordination in NFHAP, participants from OSM, EPA and FWS recognized their common interests in the same types of waters for three slightly different but highly compatible program goals. There were hundreds of potential project areas in the Brook Trout's

native range where fish habitat could be restored during the course of AML project construction supported by OSM. EPA was also interested in working with states with Clean Water Act resources to target many of the same impaired stream segments for restoration to Water Quality Standards. In addition, EPA's Region 3 office had developed a Highlands Action Plan with the middle Atlantic states to help coordinate environmental and socio-economic issues much like the Brook Trout/AMD situation. NFHAP's EBJTV partnership had already conducted a range-wide assessment of Brook Trout status in sub-watersheds from Maine to Georgia, providing an important dataset distinguishing healthy populations from reduced, greatly reduced, and extirpated populations. NFHAP also had funded several restoration projects beneficial to Brook Trout through an annual competition involving local-scale proposals.

It was likely that some sub-watersheds would make better restoration candidates than others due to differences in recovery potential. These differences could involve social context factors as well as ecological condition and the effects of AML-related stressors. Given the clear need, the data already compiled, and the availability of restoration resources, the FWS, EPA, OSM and the State of Pennsylvania agreed to explore the possibilities to enhance restoration planning of AML-related and 303(d)-listed Brook Trout sub-watersheds at state scale through a recovery potential screening.

Approach. The collaborators were seeking a joint effort of state and federal participants with common interests in rehabilitating abandoned mine lands, restoring native fish habitats, and returning impaired waters to healthy condition. One immediate-term goal was to conduct a rapid screening assessment of recovery potential in the highlands sub-watersheds and use the information to promote restoration funding proposal submission by higher-ranking candidate watersheds. This assessment would be constructed in a way that all three programs – 303(d) impaired waters restoration, AML remediation, and fish habitat restoration – would have their programmatic interests addressed in the metrics used. A longer-term goal of the collaborative effort was to explore ways in which these federal programs could help states integrate their mined land, impaired waters, and native fish habitat restoration efforts, partnering, and resources more effectively. As the latter goal involved but went far beyond recovery potential screening, this project summary focuses primarily on the former goal.

The development of a rapid, statewide screening assessment was driven by rapidly approaching project evaluation periods in upcoming program funding cycles. In order to effectively identify good candidates for restoration that also reflected the interests of all three programs, and then leave time for the individual localities to develop proposals, the screening assessment would need to generate statewide results in a few weeks. Although the schedule was challenging, data availability was very good. Also, the screening purpose was simple and straightforward, and didn't require prolonged discussions to arrive at preferred recovery potential indicators.

Results. Statewide screening assessments were carried out on sub-watersheds in Pennsylvania, West Virginia, Virginia, and the highlands (western) ecoregion of Maryland. All assessments were completed and had identified a set of higher priority sub-watersheds within a few weeks. Pennsylvania's assessment in particular utilized the most indicators (13) and was completed within a week. Table 1 contains the recovery potential indicators used in these screening studies.

Table 1. Recovery potential screening indicators used in screening and comparing the relative restorability of highland region sub-watersheds in the middle-Atlantic states. All indicators below were used in Pennsylvania, a subset was used in Virginia, West Virginia and Maryland.		
Ecological Indicators	**Stressor Indicators**	**Social Context Indicators**
EBTJV Brook Trout Status by sub-watershed	Abandoned mineland (AML) proximity	303(d)-listed for AML/AMD related pollutants
Green infrastructure hub or corridor proximity	AMD discharge points	Eligibility for AMD remediation set-aside funds
Brook Trout natural reproduction		Eligibility for NFHAP restoration funds
		Watershed group activity
		Section 319 watershed project proximity
		Public lands within watershed
		NAI species of concern
		High quality forests in watershed

Although Virginia was also initially included in the assessment, their AML locales did not tend to co-occur with native Brook Trout range (see figure 1) and therefore did not result in the type of findings appropriate to Brook Trout restoration proposal development in specific sub-watersheds.

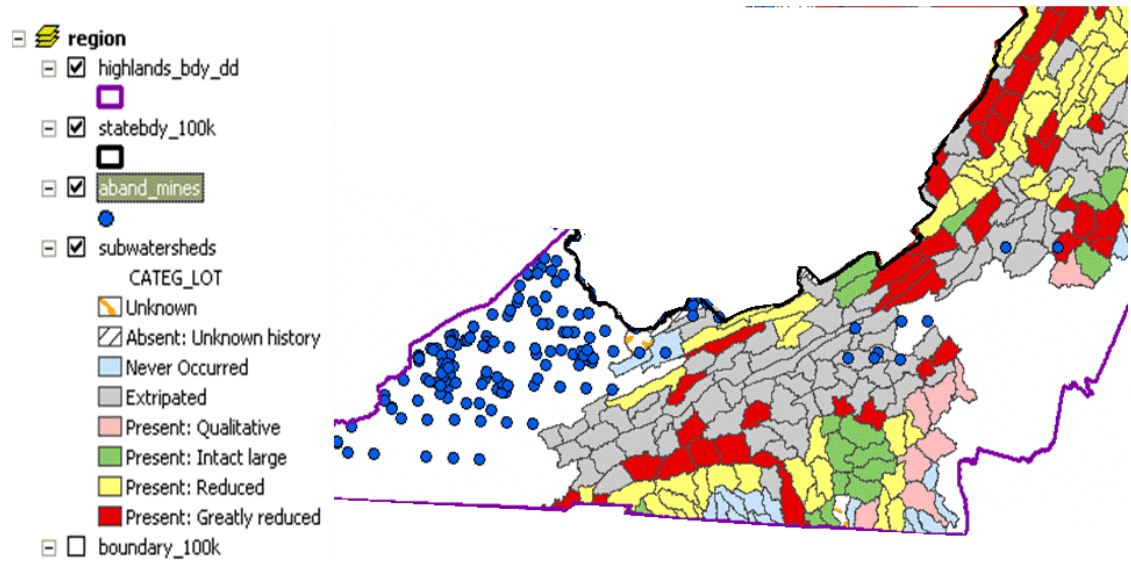

Figure 1. State of Virginia southwest portion with AMLs and EBJTV Brook Trout sub-watersheds status. One sub-watershed contained AMLs and a greatly reduced Brook Trout population, and seven contained AMLs and extirpated populations.

The screening assessment in West Virginia was able to generate a statewide map of sub-watersheds with higher restorability (see figure 2). Co-occurrence of AMLs, reduced Brook Trout populations, and 303(d)-listed waters was fairly common and nearly 150 watersheds were identified as of interest. As with the Virginia study, the screening was provided by the EPA Region 3 GIS team.

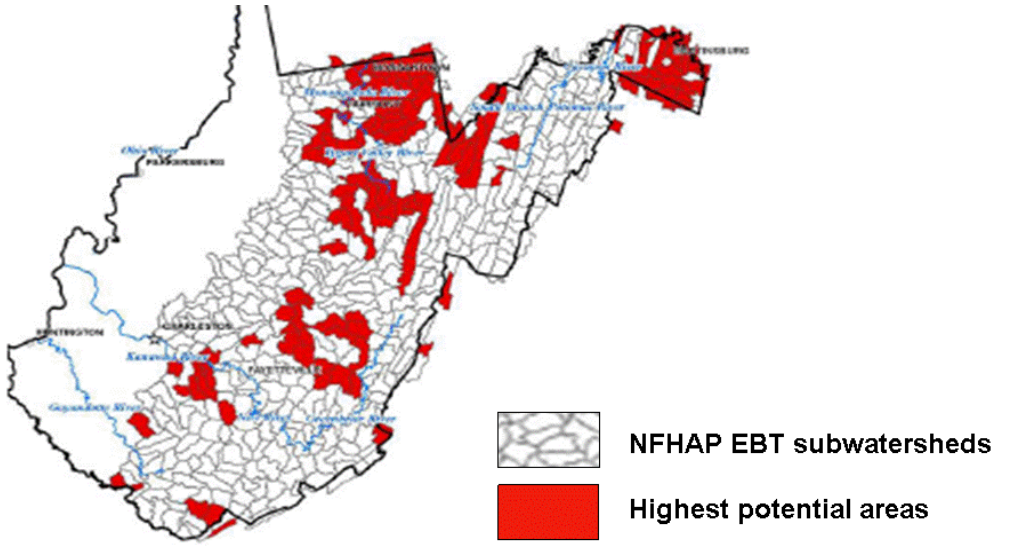

Figure 2. West Virginia statewide screening results, utilizing a set of equally weighted recovery potential indicators.

The western Maryland screening also found several co-occurring areas of interest to the project. Using a selection of indicators from table 1, the GIS team screened the Allegheny highlands area and identified two potential areas of interest. What distinguished these areas from other candidate sub-watersheds in the region that also were 303(d) listed, had reduced trout populations, and had AML problems, was their relationship to the green infrastructure of the area. On the principle of reestablishing connectivity being favorable for fragmented populations that become joined, these areas were identified. This part of Maryland had already been recognized and addressed by trout-oriented AMD restoration projects involving NFHAP and OSM.

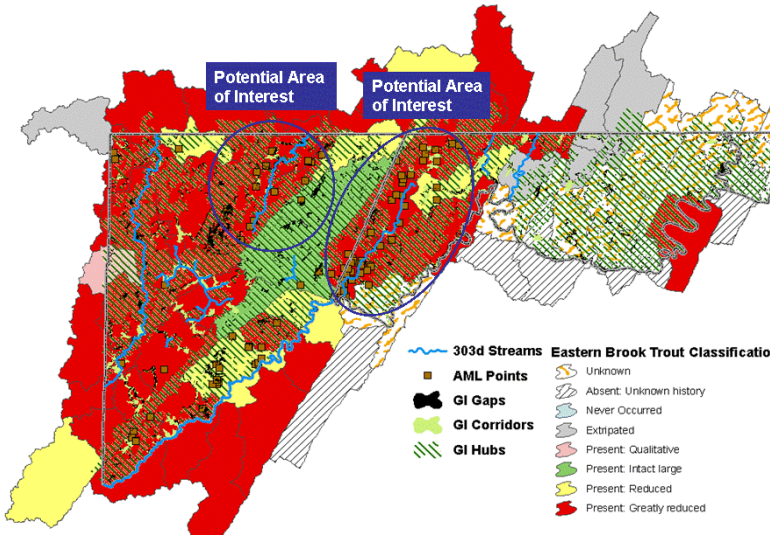

Figure 3. Western Maryland recovery potential screening for Brook Trout sub-watershed recovery potential targeted two areas of highest interest based on indicators that included reduced populations, 303(d) listing, AMLs, and gaps in green infrastructure that could be reconnected.

Pennsylvania was the fourth state in which recovery potential screening was conducted. The screening was carried out by Pennsylvania Department of Environmental Protection (DEP) in coordination with EPA. In addition to the datasets used in the other states, the DEP added its own data on public lands, designated high quality forest areas, species of concern habitats, CWA section 319 projects, and waters with naturally reproducing Brook Trout populations in a statewide screening process (see figure 4). As in West Virginia, high numbers of sub-watersheds with reduced Brook Trout, 303(d) waters and AML-related stressors were evident statewide, and as in Maryland, two specific parts of the state stood out as having ample opportunities for restoration involving the project's criteria.

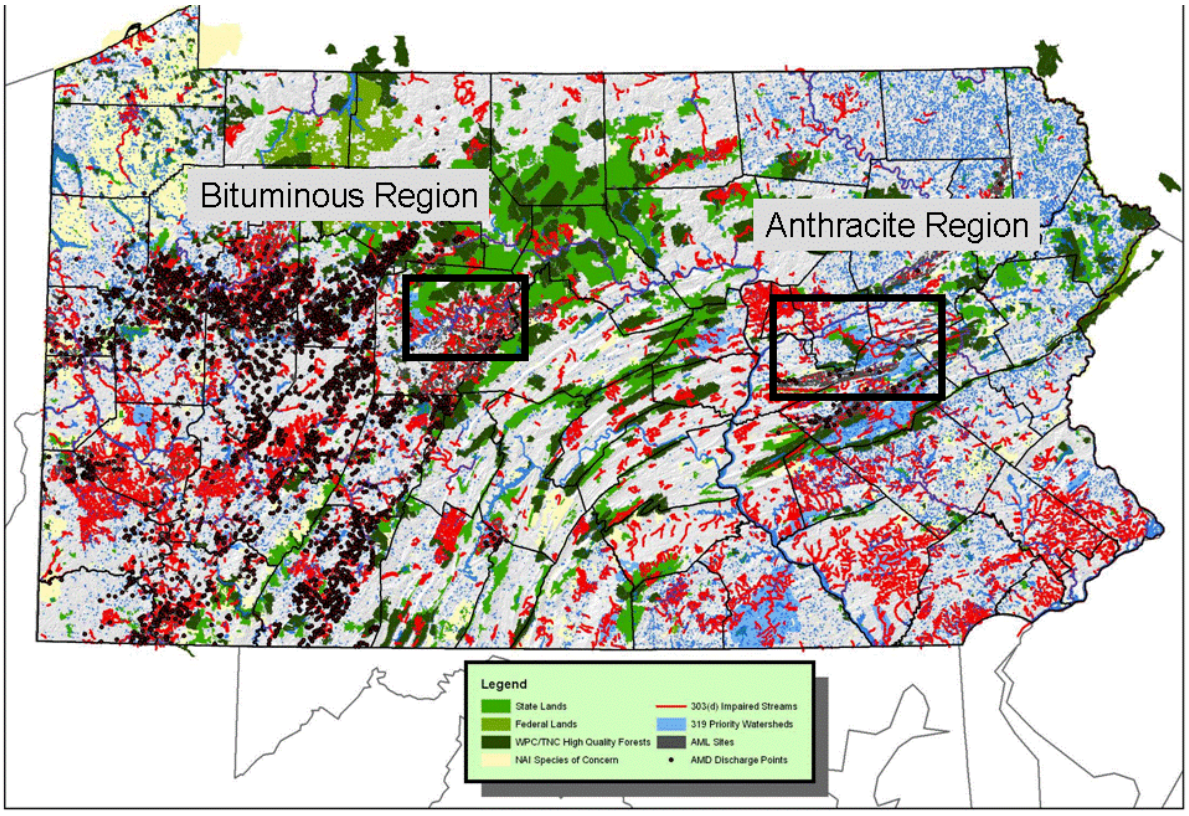

Figure 4. Pennsylvania statewide recovery potential assessment dataset showing many of the features of interest to the screening and two zones of elevated interest due to their past histories of Mining and historical Brook Trout populations.

Within the two zones of elevated interest, the State compared numerous watersheds on the basis of the recovery potential indicators they used in the screening. Two specific waters – Catawissa Creek (see figure 5) and Montgomery Run – scored highly and merited further action. Working with local organizations a restoration proposal was developed for Catawissa Creek. In the following months, a Brook Trout restoration project was funded through NFHAP and EBTJV.

Ongoing activities. As stated earlier, the longer-term goals for this project also involved catalyzing more cross-program interactions and efficiencies based on common interests in restoration of native trout-bearing waters with AML impacts. Although the assessments were rapidly completed, the process of developing better coordination among complex programs

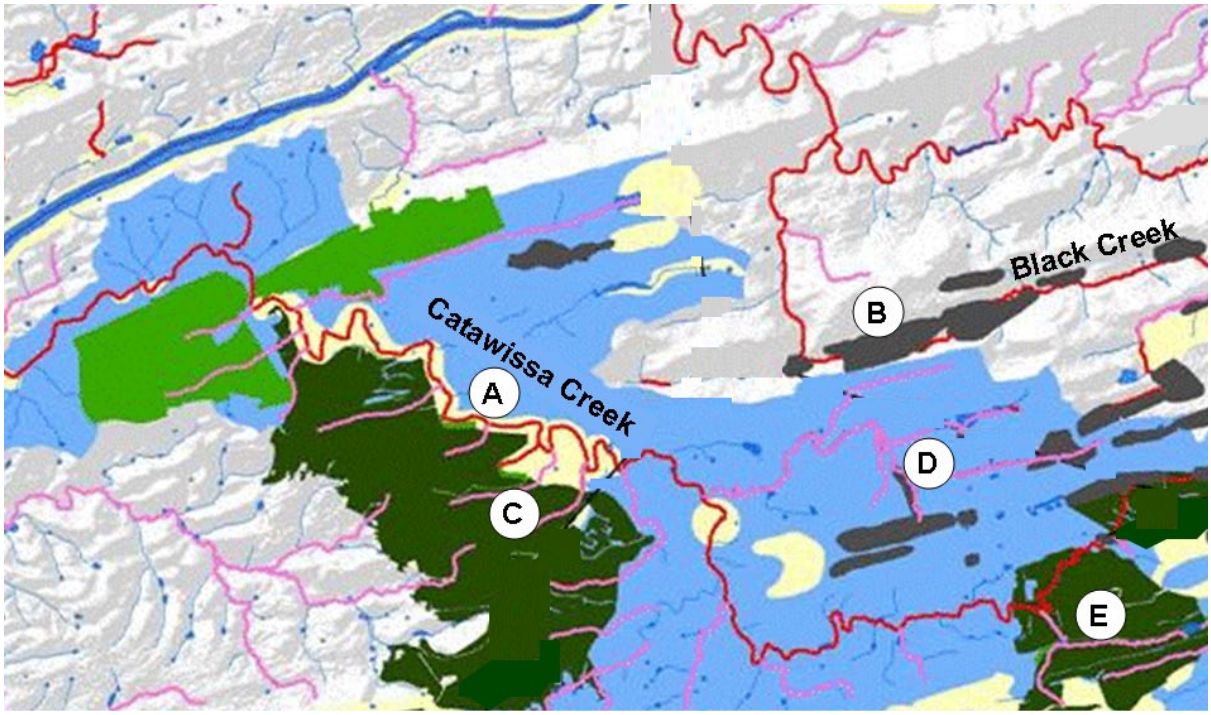

Figure 5. Recovery indicators that elevated this Catawissa Creek, PA example (A) over nearby Black Creek (B) and other Anthracite region waters included protected land (light and dark green at C), recolonization access (trout waters in pink, e.g., at D), plan existence (319 watershed plan area in blue) and contiguity with headwaters green infrastructure (dark green at C and E). Restoring downstream from "green hubs" also links previously fragmented trout waters. From Norton et al (2009) A method for comparative analysis of recovery potential in impaired waters restoration planning. *Environmental Management* 44:356–368. DOI 10.1007/s00267-009-9304-x. http://www.springerlink.com/content/d51523tq8784643k/

requires a longer time frame to develop. Especially in Pennsylvania, progress is evident. During 2008 and 2009, a series of meetings was held to assemble federal, state and sub-state regional counterparts involved in impaired waters, minelands, and fisheries programs. The State Fish and Boat Commission began to take an active role along with the DEP and Pennsylvania's Bureau of Abandoned Mineland Remediation. The information exchange on respective program activities, schedules, and evaluation/prioritization procedures was promising, and revealed many opportunities to work toward common goals in specific areas. The group agreed to explore the possibilities further in the Sinnemahoning watershed, where work continues. Based on the Pennsylvania model, EPA also funded similar assistance to West Virginia, Virginia and Maryland in connection with the EPA Region 3 Highlands Action Program.

References

Hudy M., T. Thieling, N. Gillespie, and E. Smith. 2005. Distribution, status, and threats to brook trout within the eastern United States. Report to the Eastern Brook Trout Joint Venture, International Association of Fish and Wildlife Agencies, Washington, DC.

Norton, D.J., J. Wickham, T. Wade, K. Kunert, J. Thomas and P. Zeph. 2009. A method for comparative analysis of recovery potential in impaired waters restoration planning. *Environmental Management* 44:356–368. DOI 10.1007/s00267-009-9304-x. http://www.springerlink.com/content/d51523tq8784643k/