

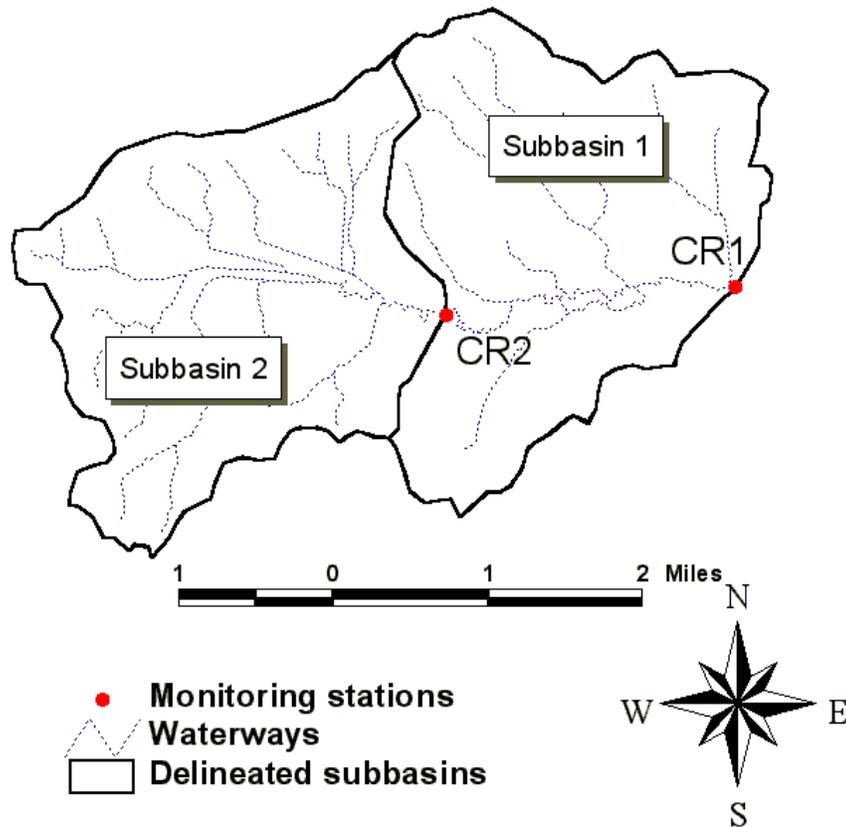
Craborchard Creek, Kentucky

TMDL Fact Sheet

Project Name:	Craborchard Creek
Location:	Hopkins County, Kentucky
Scope/Size:	Craborchard Creek, watershed 6893 acres (10.77 mi ²). The listed segment was from river mile 0.0 to 7.6. The TMDL is for the subbasin that extends from river mile 4.0 to 7.6. Data indicate that the segment from river mile 0.0 to 4.0 can be delisted.
Land Type:	Forest, agricultural, barren/spoil
Type of Activity:	Acid Mine Drainage (AMD) caused by Strip/Abandoned Mines
Pollutant(s):	H⁺ Ion mass , Sulfuric Acid
TMDL Issues:	Non-point sources
Water Quality Standard/Target:	pH shall not be less than six (6.0) or more than nine (9.0) and shall not fluctuate more than one and zero-tenths (1.0) pH unit over a 24-hour period. This standard is found within regulation 401 KAR 5:031.
Data Sources:	Division of Water Sampling Data, Murray State University Sampling Data
Control Measures:	Kentucky non-point source TMDL implementation plan, Kentucky Watershed Framework
Summary:	The Kentucky Division of Water has previously determined that Craborchard Creek was not supporting its designated uses of primary and secondary contact recreation (swimming and wading), and warm water aquatic habitat (aquatic life). Therefore, the creek was placed on the 1998 and 2002 303(d) list for Total Maximum Daily Load (TMDL) development. Historically, the creek segment was characterized by a depressed pH, the result of acid mine drainage from strip and abandoned mining sites. Recent monitoring indicates that the downstream portion of

Craborchard Creek (designated as Subbasin 1) is currently meeting the water quality standards for pH for recreational use and aquatic habitat and can therefore be delisted. Subbasin 1 extends from river mile 0.0 to 4.0. Therefore, the TMDL has been determined for Subbasin 2 alone as recent monitoring shows that this segment remains impaired. Subbasin 2 extends from river mile 4.0 to 7.6. The period of lowest pH is at low-flow conditions; however, the period of greatest hydrogen ion load has been determined at a critical flow condition for selected subbasins of Craborchard Creek. For pH violations on such streams, the Kentucky DOW has determined that maximum daily mean flow having a 3-year exceedance frequency be used for setting the appropriate TMDL and associated loading reduction. However, for this TMDL the critical flow was defined from the observed data. This flow will be used for this TMDL.

Craborchard Watershed



TMDL Development: Total maximum daily loads in grams H⁺ ions per day were computed based on the allowable minimum pH value (6.0) for creeks and streams for recreation and aquatic life. The TMDL was done for grams of ions (subsequently converted to pounds per day) because the units for pH do not allow for the computation of a quantitatively useful load or reduction amount.

Reduction Needed for Subbasin 2 of Craborchard Creek = 0.142 lbs H ⁺ Ions/day				
	Critical Flow Rate (cfs)	TMDL for pH=6 (lbs/day)	Predicted Maximum Load (lbs/day)	Reduction Needed (lbs/day)
Subbasin 2	2.6	0.016	0.158	0.142

New Permitting in the Craborchard Creek Watershed

Permitting Other Than in Subbasin 2:

Permitting for locations in the Craborchard Creek Watershed other than in Subbasin 2 would require no special considerations related to 303(d). As shown by the values listed for Site CR1 in Table 2, all pH values were equal to or greater than 6.0. Remediation of the abandoned mine areas in Subbasin 2 should result in improved water quality at Site CR1.

New Permits in Subbasin 2: New permits (except for new remining permits) for discharges to streams in Subbasin 2 of the Craborchard Creek watershed could be allowed anywhere in Subbasin 2, contingent upon the end-of-pipe pH being permitted at a range of 7.0 to 9.0 standard units. Water quality standards state that for meeting the designated uses of aquatic life and swimming, the pH value should not be less the 6.0, nor greater than 9.0. This range of 6.0 to 9.0 for pH is generally the value assigned for end-of-pipe effluent limits. However, because a stream impairment exists (low pH), new discharges can not cause or contribute to an existing impairment. A pH of 7.0 represents a neutral state between an acidic and a non-acidic condition. As such, a discharge having a pH of 7.0 to 9.0 standard units will not cause or contribute to the existing impairment. The discharge will not cause an impairment because the effluent discharge has a pH greater than 6.0 standard units. The discharge will not

contribute to the existing impairment because a pH of 7.0 represents a neutral condition with respect to acidity and effectively represents a background condition. The hydrogen ion load associated with a pH of 7.0 is insignificant (effectively zero) and therefore does not represent a contribution to the existing impairment. As such, new permits in Subbasin 2 having an effluent limit pH of 7.0 to 9.0 would not be assigned a hydrogen ion load as part of a Waste Load Allocation. There are no active permits in the Craborchard Creek Watershed that would contribute to the pH impairment.

Remining Permits in Subbasin 2:

New remining permits in Subbasin 2 may be approved on a case-by-case basis where streams are impaired because of low pH from abandoned mines. Permit approval is contingent on reclamation of the site after remining activities are completed. During remining, existing conditions of the water coming from the site must be maintained or improved. Reclamation of the site is the ultimate goal, but water quality standards (pH of 6.0 to 9.0 standard units) may not necessarily be met in the interim if the Commonwealth issues a variance to the discharger as defined by 401 Kentucky Administrative Regulation (KAR) 5:029. In instances where the Commonwealth issues a variance for a remining activity consistent with this regulation, hydrogen ion loads from this remining activity are allowed to exceed the waste load allocation. The variance allows an exception to the applicable water quality standard as well as the TMDL. Remining therefore constitutes a means whereby a previously disturbed and unreclaimed area can be reclaimed. The authority for remining is defined in Section 301(p) of the Federal Clean Water Act; Chapter 33, Section 1331(p) of the U.S. Code – Annotated (the Rahall Amendment to the Federal Clean Water Act); and the Kentucky Administrative Regulations (401 KAR 5:029 and 5:040).

The eventual reclamation of the remining site should result in a reduction of the overall ion load (specifically the nonpoint source load) of the subbasin where the remining was done. The reclamation should also result in improved stream condition (increased pH) because a previously disturbed and unreclaimed area will be reclaimed. Follow-up, in-stream monitoring would need to be done at the subbasin outfall to determine the effect of reclamation

activities (following remining) on the overall ion load coming from the subbasin. This constitutes a phased TMDL, where a remedial measure (reclamation at the end of remining) would then need to be followed by in-stream monitoring to see how well the remedial measure did in improving the low pH condition for the subbasin. There are currently no active remining permits in the Craborchard Creek watershed.

Distribution of Load:

Because there were no point source discharges during the study period, the existing Hydrogen Ion load for the watershed was defined entirely as a load allocation and that is what is reflected in the TMDL table. Because new permits (pH 7.0 to 9.0) would not cause or contribute to the existing impairment and remining permits would be exempt from the TMDL requirements, no load has been provided for the waste load allocation category. Therefore, the table below allocates all of the load to the load allocation category. New permits having a minimum pH effluent limit of 7.0, and new remining permits with modified effluent limits for pH essentially represent no net change in conditions in the subwatershed with respect to pH.

Waste Load and Load Allocation for Subbasin 2 in the Craborchard Creek Watershed

	Critical Flow Rate (cfs)	TMDL for pH=6 (lbs/day)	Waste Load Allocation (lbs/day)	Load Allocation (lbs/day)
Subbasin 2	2.6	0.016	0.000	0.016

Implementation/Remediation Strategy:

Remediation of pH-impaired streams as a result of current mining operations is the responsibility of the mine operator. The Kentucky Division of Field Services of the Kentucky Department of Surface Mining Reclamation and Enforcement (DSMRE) is responsible for enforcing the Surface Mining Control and Reclamation Act of 1977 (SMCRA). No governmental entity bears the responsibility to remediate pH impaired streams as a result of pre-law mining operations or mining operations associated with forfeited reclamation bonds. The Kentucky Division of Abandoned Mine Lands (KDAML), also a part of DSMRE, is charged with performing reclamation to address the impacts from pre-law mine sites in accordance with

priorities established in SMCRA. SMCRA sets environmental problems as third in priority in the list of AML problem types. There are currently no planned remediation activities for the Craborchard Creek watershed.

Two AML projects have been performed in the Craborchard Creek drainage area. The Craborchard Creek Reclamation Project was performed in 1987 at a cost of approximately \$1.0 million. The project reclaimed approximately 109 acres of disturbed land by covering large coal slurry impoundments with earth, regrading eroded slopes and revegetating the entire area. The Zugg Borehole Reclamation Project was conducted in the same area as the previous project at a cost of approximately \$12,000. This project involved plugging a borehole that continually discharged significant volumes of low quality water that damaged surrounding property.

Reclamation activities are underway at other locations within the state where water quality is affected by acid mine drainage (AMD). The success of the reclamation activities in these watersheds will first be evaluated before developing remediation strategies for other watersheds affected by AMD. The KDAML developed a reclamation project in response to documented sedimentation and flooding problems in the nearby Brier Creek Watershed. The project included reclamation of approximately 120 acres of barren or poorly vegetated areas affected by past strip mining. The project also entailed six acres of channel restoration to minimize sedimentation caused by erosion. The restoration of streams included construction of ditches and PVC coated gabion baskets utilized as velocity reducers and energy dissipaters; bale silt checks and silt trap dugouts were also utilized for sediment control. The reclamation project consisted of 67 acres of gradework to remove erosion gullies, redistribute sediment deposits, and prepare a surface to receive a soil cover. The area under consideration received a two foot soil cover layer, taken from 20 acres of watershed area designated for borrow. Gradework areas were treated with an application of agricultural limestone to neutralize acidic conditions and all areas were revegetated using a combination of seedbed preparation, agricultural limestone, fertilizer, seed, mulch, and crimping. The agricultural limestone provided a variety of particle sizes so that it dissolved at different rates and mobilized under a range of flow conditions. The

strategy employed at Brier Creek is similar in some respects to a project that is currently underway on Rock Creek and a tributary, White Oak Creek in McCreary County, Kentucky. This 12-acre project is part of the Kentucky Clean Water Action Plan. It involves the removal of coal refuse from the banks of Rock Creek, the establishment of a vegetative cover on other refuse areas in the watershed, and the application of limestone sand at selected locations to neutralize the effects of AMD.

The total cost for the Brier Creek project was \$913,000.00 (i.e. \$7600/acre) while the total cost of the Rock Creek project is estimated to be approximately \$650,000 (i.e. \$54,200/acre). Last year the total federal Kentucky AML budget allocation was approximately \$17 million. However the bulk of these funds were used to support priority 1 (extreme danger of adverse effects to public health, safety, welfare, and property) and priority 2 (adverse effects to public health, safety, and welfare) projects. Based on the cost of current remediation efforts, it would appear that a significant increase in federal funding to the AML projects, particularly priority 3 projects, would be required in order for the AML program to play a significant part in meeting the TMDL implementation requirement associated with pH impaired streams in the state of Kentucky.

Just recently (June 2003), 319 funding (specifically Clean Water Action Plan funds) has been awarded to the KDAML. This grant is the Homestead Refuse Reclamation Project and includes reclamation of a portion of the upper Pleasant Run watershed. The project involves a 92-acre area. The total cost of the reclamation project is \$1.26 Million, of which 60% is federal funds and 40% is supplied by the KDAML. The reclamation activities will be very similar to what was described above for the Brier Creek reclamation effort.