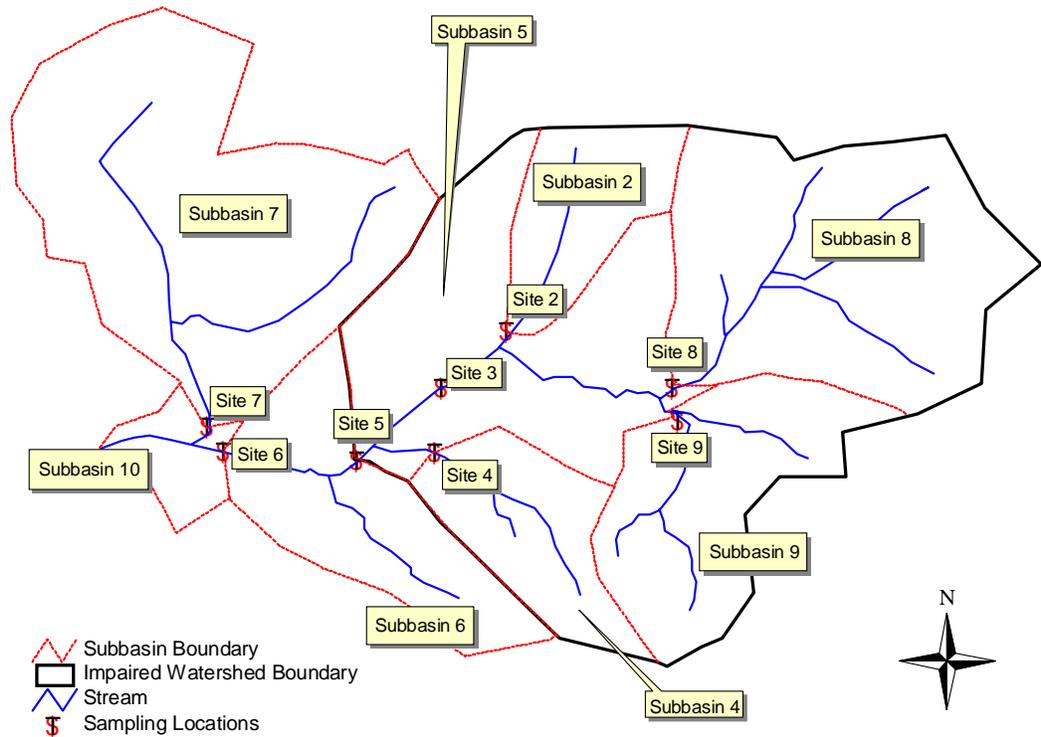


Butchers Branch of Blackford Creek

Total Maximum Daily Load (TMDL) Fact Sheet

Project Name:	Butchers Branch of Blackford Creek
Location:	Hancock County, Kentucky
Scope/Size:	Butchers Branch watershed 2,138 acres (3.34 mi ²) Stream Segment: river mile 0.0 to 2.3 Note: river mile 0.0 to 0.3 received midcycle delisting approval on June 3, 2005
Land Type:	forest, agricultural, barren/spoil
Type of Activity:	acid mine drainage (AMD) caused by abandoned mines
Pollutant(s):	H ⁺ Ion mass, sulfuric acid
TMDL Issues:	nonpoint sources
Water Quality Standard/Target:	The 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:	Kentucky Pollutant Discharge Elimination System permit historical sampling data, Kentucky Division of Water (KDOW) data collection
Control Measures:	Kentucky nonpoint source TMDL implementation plan, Kentucky Watershed Framework
Summary:	Butchers Branch was determined as not supporting the 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 303(d) List for TMDL development. The creek segment is characterized by a depressed pH, the result of AMD from abandoned mining sites. In developing the TMDL for Butchers Branch, pH readings and corresponding streamflow measurements were made at eight different locations within the watershed. This sampling supports the conclusion that Subbasin 8 (which is that portion of the watershed upstream from river mile 1.6)

is the primary contributor to the pH impairment on Butchers Branch and that remediation of Subbasin 8 (and to a lesser extent Subbasin 9) would result in the entire length of Butchers Branch meeting acceptable pH levels. All other tributaries to the main stem had acceptable pH values except one value of 5.83 at Site 9. The impairment for low pH on the main stem of Butchers Branch currently extends from the headwaters (Subbasin 8) to Site 5, which is at river mile 0.7. This TMDL though will be developed for the watershed upstream from Site 6, which is at river mile 0.3. All other main stem sites downstream from Site 6 had acceptable pH values. Therefore, there is no impairment below Site 6 (river mile 0.0 to 0.3). The EPA granted a midcycle delisting request for river mile 0.0 to 0.3 for low pH on June 3, 2005.



Kentucky Division of Water Sampling Locations on Butcher's Branch

TMDL Development:

TMDLs in grams H⁺ ions per day were computed based on the allowable minimum pH value of 6.0 for streams to meet primary and secondary contact recreation (swimming and wading) and aquatic life uses. The TMDL was done for grams of ions (subsequently converted to lbs/day) because

the units for pH do not allow for the computation of a quantitatively useful load or reduction amount.

In recognition of the inherent difficulties associated with imposition of a “no-exceedance” pH criteria on potentially intermittent streams, the KDOW has decided to use the lowest one year average discharge of the most recent 10-year flow record as the flow basis for setting the appropriate TMDL and associated loading reduction. Previous pH TMDLs have used a 3-year recurrence interval of the average flow as the critical flow. However, this flow resulted in a target discharge that frequently was significantly greater than any of the observed flows for the sites as collected over several years. Thus use of a 3-year flow would require an extrapolation of the observed ion vs. flow model, well beyond the upper limit of the observed data. The selection of the 10-year frequency was based on a consideration of water quality standards (WQSs) (i.e. 7Q10). However, since many of these streams have a 7Q10 of zero, a greater duration was needed. The consensus of the KDOW was to use the 1-year duration. The use of an average annual flow as the basis for determining the TMDL provides a more appropriate mechanism for determining: (1) the total annual load; (2) the total annual reduction that would be derived from an annual summation of the daily TMDLs; and (3) the associated daily load reductions for the critical year using historical daily flows.

**TMDL for Butchers
Branch:**

In developing a TMDL for Butchers Branch, there are two possible strategies. Either a cumulative TMDL may be obtained for the downstream extent of the impaired portion of the watershed, or separate TMDLs (and associated load reductions) may be developed for each individual subbasin. As a result of the availability of sampling data at multiple sampling points, individual TMDLs were developed for Subbasins 8, 9, 5, and 6. Subbasins 8 and 9 are headwater subbasins. Subbasin 5 includes Subbasins 2 and 4 in addition to Subbasins 8 and 9. Subbasin 6 receives flow from Subbasins 2, 4, 5, 8, and 9. The greatest impairment is the result of Subbasin 8. It is hypothesized that the remediation of Subbasin 8 (and to a lesser extent Subbasin 9) will lead to the restoration of the complete watershed. The focus should be on Subbasin 8. The low pH condition extends to Site 5, which is the downstream extent of Subbasin 5, but this TMDL will be developed for the

watershed upstream of Site 6, which is the downstream extent of Subbasin 6. The TMDLs and associated load reductions for Subbasins 8, 9, 5, and 6 are shown below.

TMDLs and Associated Load Reductions

Subbasin	Upstream contributing area (mi ²)	Incremental critical flow (cfs)	Incremental TMDL for a pH of 6.0 (lbs/day)	Predicted incremental load (lbs/day)	Load reduction needed (lbs/day)
8	0.70	0.435	0.00235	0.2084	0.2061
9	0.38	0.236	0.00127	0.0042	0.0029
5	2.01	0.323	0.00174	0.0000	0.0000
6	2.36	0.217	0.00118	0.0000	0.0000

Permitting Other Than

in Subbasins 8, 9, 5 and 6: Permitting for locations in the Butchers Branch watershed other than in Subbasins 8, 9, 5, and 6 would require no special considerations related to 303(d). Subbasin 5 includes Subbasins 2 and 4.

New Permits:

New permits (except for new reming permits) for discharges to streams in the Butchers Branch watershed could be allowed anywhere in Subbasins 8, 9, 6, and 5 (which includes Subbasins 2 and 4), contingent upon end-of-pipe pH permit limits in the range of 6.35 to 9.0 standard units. WQS state that the pH value should not be less than 6.0 nor greater than 9.0 for meeting the designated uses of aquatic life and swimming. This range of 6.0 to 9.0 for pH is generally assigned as end-of-pipe effluent limits. However, because a stream impairment exists (low pH), new discharges should not cause or contribute to an existing impairment. Application of agricultural limestone on mine sites results in highly buffered water leaving the site. A buffered solution with nearly equal bicarbonate and carbonic acid components will have a pH of 6.35 (Carew, personal communication, 2004). Discharge of this buffered solution will use up free hydrogen ions in the receiving stream, thus it should not cause or contribute to an existing low-pH impairment. New permits having an effluent limit pH of 6.35 to 9.0 will not be assigned a hydrogen ion load as part of a Waste Load Allocation (WLA).

Remining Permits:

Remining permits 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 mining activities are completed. Existing water quality conditions must be maintained or improved during the course of remining. The permittee is required to monitor in-stream conditions during remining to make sure that current water quality conditions are maintained or improved. Reclamation of the site is the ultimate goal, but WQSs (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. 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 WLA. The variance allows an exception to the applicable WQS 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 remediation of the remining site will result in a reduction of the nonpoint source ion load of the subbasin where the remining is done. When remining is completed, the remediation should result in a reduction in the load allocation. Follow-up, in-stream monitoring will 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.

**General KPDES Permit
for Coal Mine Discharges:**

This permit covers all new and existing discharges associated with coal mine runoff. This permit does not authorize discharges that (1) are subject to an existing individual KPDES permit or application, (2) are subject to a promulgated storm water effluent guidelines or standard, (3) the Director has determined to be or may reasonably be expected to be contributed to a violation of a water of a WQS or to the impairment of a 303(d) listed water, or (4) are into a surface water that has been classified as an Exceptional or Outstanding or National Resource Water. A signed copy of a Notice of Intent (NOI) form must be submitted to the Kentucky Division of Water (KPDES

Branch) when the initial application is filed with the Division of Mine Permits. However, coverage under this general permit may be denied and submittal of an application for an individual KPDES permit may be required based on a review of the NOI and/or other information.

Antidegradation Policy: Kentucky’s Antidegradation Policy was approved by EPA on April 12, 2005. For impaired waters, general permit coverage will not be allowed for one or more of the pollutants commonly associated with coal mining (i.e., sedimentation, solids, pH, metals, alkalinity of acidity). The individual permit process remains the same except new conditions may apply if a Total Maximum Daily Load (TMDL) has been developed and approved.

Distribution of Load: Because there were no point source discharges active during the 2000-2002 monitoring period, the existing hydrogen ion load for the watershed was defined entirely as a nonpoint source load. Because new permits (pH 6.35 to 9.0) should 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 WLA category.

Wasteload and Load Allocation for Each Subbasin in the Butchers Branch Watershed

Subbasin	Incremental Critical Flow Rate (cfs)	TMDL for pH = 6.0 (lbs/day)	Wasteload Allocation* (lbs/day)	Load Allocation (lbs/day)
Subbasin 8	0.435	0.00235	0.0	0.00235
Subbasin 9	0.236	0.00127	0.0	0.00127
Subbasin 5	0.323	0.00174	0.0	0.00174
Subbasin 6	0.217	0.00118	0.0	0.00118

*pH limits for new discharges must be between 6.35 and 9.0

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). The Kentucky Division of Abandoned Mine Lands (DAML), also a part of DSMRE, is charged with

performing reclamation to address the impacts from pre-law and bond forfeiture mine sites in accordance with priorities established in SMCRA. SMCRA sets environmental problems as third in priority in the list of abandoned mine land (AML) problem types.

Prior to initiating reclamation activities to improve water quality, a watershed plan should be developed in order to more precisely identify past mine site operations in the watershed. For example, the watershed plan should include a detailed overview of past mine operations, including the location of the mine, the permit number, the type of mining and the status of the mine (e.g. active, bond forfeited, bond released, illegal “wildcat” mining, etc.). Refining historic landuses in the watershed, with a particular focus on mine site operations, will assist with identifying the most appropriate funding source(s) as well as the best management practices needed for remediating the pH impacts.

In addition to historic mine operation inventory, the watershed plan should identify (1) point and nonpoint source controls needed to attain and maintain WQSs, (2) who will be responsible for implementation of controls and measures, (3) an estimate of the load reductions to be achieved, (4) threats to other waters, (5) an estimate of the implementation costs and identify financing sources, (6) a monitoring plan and adaptive implementation process and (7) a public participation process. The watershed plan should consider non-traditional opportunities and strive for the most cost-effective long-term solutions for restoring the water quality of Butchers Branch.

Practical application of pH TMDLs, especially for AMLs, will normally involve a phased implementation approach with associated monitoring in order to insure that the implemented measures are having the desired effect. That has been the strategy pursued thus far with regard to watersheds in Kentucky. Typical remediation strategies have involved channel restoration, re-vegetation, and the use of agricultural limestone. On sites where applicable, and funding allows, passive treatment systems have been used to treat AMD including open limestone channels, vertical flow systems, limestone dosing, and constructed wetlands.

There are currently no remediation activities underway in the Butchers Branch watershed. However, reclamation activities have occurred at other locations within the state where AMD affects water quality. Examples of reclamation projects addressing AMD in western KY are summarized below.

Reclamation Projects Addressing AMD in Western KY

Watershed	Project Name	Cost
Brier Creek	Brier Creek	\$522,041
	Buttermilk Road	\$403,320
Crab Orchard Creek	Crab Orchard Mine	\$1,038,203
	Zugg Borehole	\$11,974
Pleasant Run	Pleasant Run	\$2,162,085
	Pleasant Run II	\$421,384
Pond Creek	Pond Creek I	\$50,118
	Pond Creek II	\$3,801,740
	Pond Creek III	\$4,011,514
Flat Creek	East Diamond Mine	\$535,000
	Flat Creek	\$720,572
Render Creek	McHenry Coop. Agreement	\$130,165
	McHenry II	\$1,075,340
	Vulcan Mine	\$585,359

For 2000, the total federal DAML 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. Of the total annual federal budget allocation, AML receives only approximately \$700,000 in Appalachian Clean Streams Initiative funds, which are targeted for Priority 3 environmental problems. Based on the cost of current remediation efforts, it would appear that a significant increase in federal funding to the DAML 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.