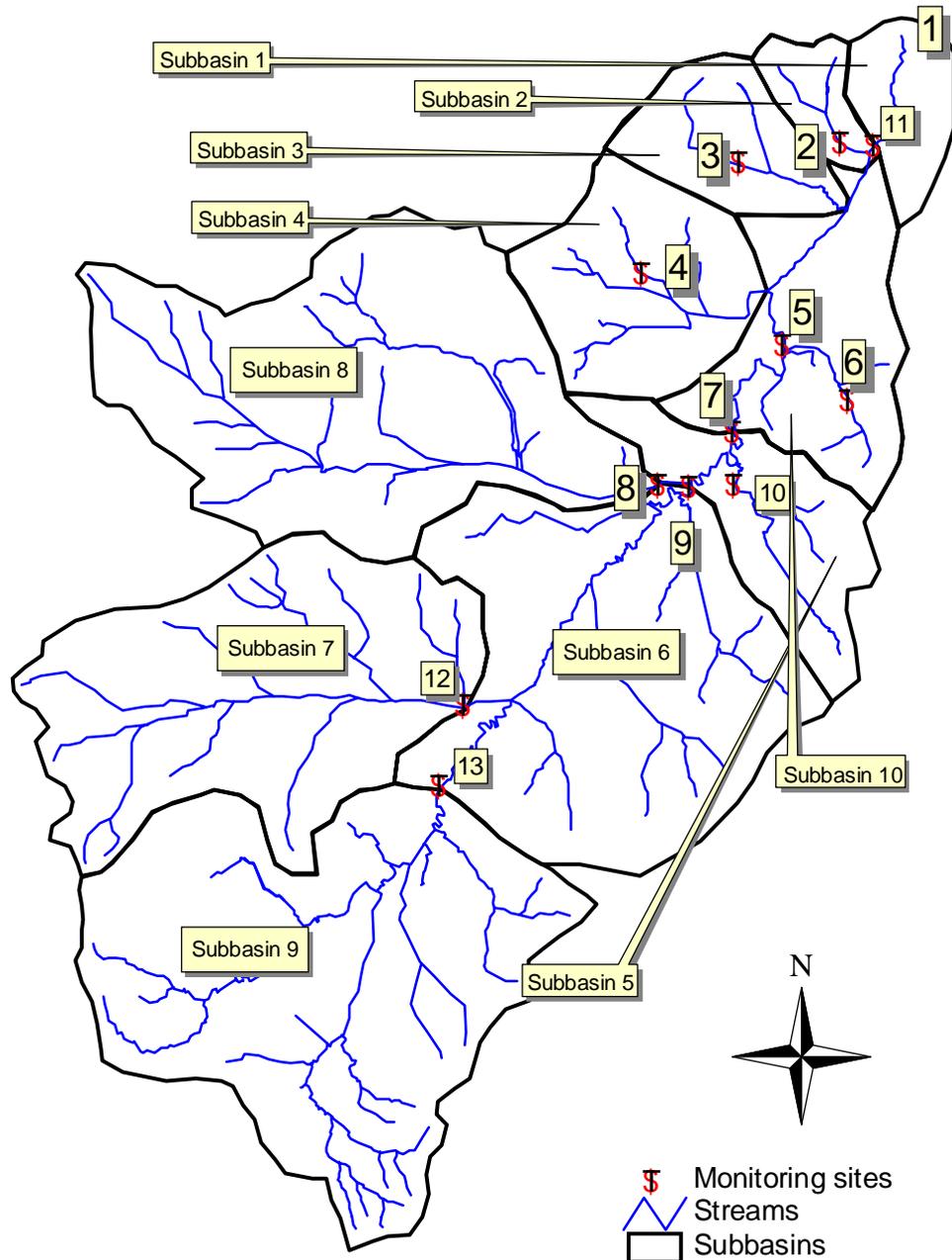


# Drakes Creek of Pond River, Kentucky

## Total Maximum Daily Load (TMDL) Fact Sheet

<b>Project Name:</b>	Drakes Creek of Pond River
<b>Location:</b>	Hopkins County, Kentucky
<b>Scope/Size:</b>	Drakes Creek, watershed 41,298 acres (64.43 mi <sup>2</sup> ) Stream Segment: River Mile (RM) 0.0-8.5
<b>Land Type:</b>	forest, agricultural, barren/spoil
<b>Type of Activity:</b>	acid mine drainage (AMD) caused by abandoned mines
<b>Pollutant(s):</b>	H <sup>+</sup> ion mass, sulfuric acid
<b>TMDL Issues:</b>	nonpoint sources
<b>Water Quality Standard/Target:</b>	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.
<b>Data Sources:</b>	Kentucky Pollutant Discharge Elimination System permit historical sampling data, Murray State University sampling data, Kentucky Division of Water (KDOW) sampling data
<b>Control Measures:</b>	Kentucky nonpoint source TMDL implementation plan, Kentucky Watershed Framework
<b>Summary:</b>	Drakes Creek 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 1998 and 2002 303(d) lists 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 Drakes Creek, pH readings were collected at thirteen different locations within the watershed. Recent sampling supports the conclusion that Subbasins 2, 3, 4, and 8 have unacceptable pH levels. Data at Sites 11 and 7 also reveal occasional impairment, however it is readily apparent that the impairment at Site 11 is due to impairments in Subbasins 2-4, while the

impairment at Site 7 is due to impairment from Subbasin 8. Subbasin 8 is the Pleasant Run watershed, and has already been addressed through a separate TMDL. As a result, individual TMDLs are developed for Subbasins 2, 3 and 4.



Monitoring Sites and Subbasin Delineation in Drakes Creek Watershed

**TMDL Development:**

TMDLs in grams H<sup>+</sup> ions per day were computed based on the allowable minimum pH value (6.0) for creeks and 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 (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. Use of an average annual flow as the basis for determining the TMDL also provides a convenient mechanism for determining the total annual load, the total annual reduction that would be derived from an annual summation of both the daily TMDLs, and the associated daily load reductions for the critical year using the actual historical daily flows.

**TMDL for  
Drakes Creek:**

In developing a TMDL for Drakes Creek, there are two possible strategies. Either a cumulative TMDL may be obtained for the outlet 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 2-4. It is hypothesized that the remediation of Subbasins 2, 3, and 4 (as well as Subbasin 8 through the Pleasant Run TMDL) will lead to the restoration of the entire watershed. The

TMDL and associated load reductions for Subbasins 2, 3, and 4 are shown below.

TMDL and Associated Load Reductions

Subbasin	Incremental Upstream contributing area (mi <sup>2</sup> )	Incremental Critical Flow (cfs)	Incremental TMDL for a pH of 6.0 (lbs/day)	Predicted Incremental load (lbs/day)	Load reduction needed (lbs/day)
2	0.90	0.56	0.0030	4.960	4.957
3	2.38	1.48	0.0080	0.760	0.752
4	4.31	2.68	0.0145	0.180	0.166

### Permitting in the Drakes Creek Watershed

#### Permitting Other

#### Than in Subbasins 2-4:

Permitting for locations in the Drakes Creek Watershed other than in Subbasins 2-4 and Subbasin 8 (the Pleasant Run watershed) would require no special considerations related to 303(d). As shown by the values listed for the remaining sites (excluding Sites 11 and 7), at least 90% of the pH values were equal to or greater than 6.0. Sites 11 and 7 are directly impacted from drainage from Subbasins 2-4 and 8, which will be addressed through this and the Pleasant Run TMDL. Remediation of the abandoned mine areas in Subbasins 2-4 should thus result in improved water quality at Sites 2-4 and lead to the improvement of the water quality at Site 11. Further improvement at Site 8 (as well as Site 7) is expected to be accomplished by implementation of the TMDL associated with the Pleasant Run watershed (Subbasin 8).

#### New Permits:

New permits (except for new remaining permits) for discharges to streams in the Drakes Creek watershed could be allowed anywhere in the watershed contingent upon end-of-pipe pH permit limits in the range of 6.35 to 9.0 standard units. Water quality standards (WQSs) 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:**

New 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 remining activities are completed. During remining, existing water quality conditions must be 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 overall nonpoint source ion load of the subbasin where the remining is done. The remediation should also result in an improved stream condition (increased pH) because a previously disturbed and unreclaimed area will be reclaimed. 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 water quality standard 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 study 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 reminging permits would be exempt from the TMDL requirements, no load has been provided for the WLA category.

Wasteload and Load Allocation in the Drakes Creek Watershed

Subbasin	Incremental Critical Flow Rate (cfs)	TMDL for pH = 6.0 (lbs/day)	Wasteload Allocation* (lbs/day)	Load Allocation (lbs/day)
2	0.56	0.0030	0.0	0.0030
3	1.48	0.0080	0.0	0.0080
4	2.68	0.0145	0.0	0.0145

\*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 is responsible for enforcing the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The Kentucky Division of Abandoned Mine Lands (DAML) 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 water quality standards, (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 Drakes Creek.

The DAML proposed and conducted a two-part reclamation project in the Drakes Creek watershed from 1985-1986. The first part of the project addressed a landslide along the west side of Drakes Creek near its

confluence with the Pond River. The second part dealt with a slurry pond and a breached dam that were damaging adjacent bottomland and contributing coal fines and pollutants to Drakes Creek. Specific reclamation activities included the reclamation of 40 acres of unstable material and associated bench areas, including two impoundments, a 14-acre slurry impoundment, restoration of 6,500 feet of clogged stream and 5.4 acres of cropland covered with fines. The total cost of the project was \$750,572.

More recently, during the summer and fall of 2003, additional reclamation was performed along the west side of Drakes Creek near its confluence with the Pond River. This reclamation project, the White City Stave Factory (AML) Reclamation Project, consisted of five sites totaling 145 acres. The final cost of the project was approximately 1.3 million dollars. Reclamation included the removal of two acidic pits and the creation of a new freshwater pond, grading of 117 acres to a stable configuration, placement of limestone sand and alkaline producing stone to improve water quality and to control the flow of water on the project areas, and revegetation of the areas.

Reclamation activities have also occurred at other locations within the state where water quality is affected by AMD. Examples of reclamation projects addressing AMD in western KY are summarized below.

Reclamation Projects Addressing AMD in Western KY

<b>Watershed</b>	<b>Project Name</b>	<b>Cost</b>
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 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. 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 AML program, as well as a rearrangement of priorities as established in SMCRA, 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.

Until recently (June 2003), 319(h) Nonpoint Source Pollution Control Grant funds were awarded to the DAML. This grant is the Homestead Refuse Reclamation Project and includes reclamation of a 92-acre area of the upper Pleasant Run watershed. The total cost of the reclamation project is \$1.26 million, of which 60% is federal funds and 40% is supplied by the DAML. The reclamation activities include channel restoration, re-vegetation, and the use of agricultural limestone. Section 319(h) Nonpoint Source Pollution Control Grant funds may only be used for pre-Law mine sites where no KPDES permits were issued.