



## AQUATIC RESOURCES MANAGEMENT, LLC

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December 19, 2011

United States Army Corps of Engineers  
Louisville District  
845 Sassafra Creek Road  
Sassafra, KY 41759-8806



Re: DNR# 813-0360

Dear Reviewer,

Please find enclosed one (1) original copy of the First Year Monitoring report for the Big Sourwood Branch Reach 04 Mitigation site.

Should you require any more information upon your review of this package or require a site visit feel free to contact me at 859-388-9595 or by e-mail at [nbaker@aquaticresources.us](mailto:nbaker@aquaticresources.us).

Sincerely,

Nick Baker  
Vice President and Environmental Scientist

YEAR ONE MONITORING REPORT  
UNITED STATES CORPS OF ENGINEERS  
Big Sourwood Branch Reach 04  
KDNR PERMIT NO. 813-0360



*Laurel Mountain Resources, LLC.*

Prepared:  
December 19, 2011

Prepared by:



**Aquatic Resources  
Management**

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## **Laurel Mountain Resources, LLC Big Sourwood Branch Reach 04 Mitigation Year One Monitoring Report**

### **Project Overview**

This report is to notify the United States Army Corps of Engineers (USACE) of the completion of one full growing season for the Laurel Mountain Resources, LLC (LMR) Big Sourwood Mitigation site. This USACE permit is an Individual Permit associated with LMR KDSMRE Permit # 813-0360 (previously 813-0310). Aquatic Resources Management is the agent responsible for conducting the monitoring reports on behalf of LMR. The inspection date of the field visit was conducted on **10 November 2011**.

### **Purpose of the Approved Project**

This mitigation project was conducted in order to offset stream impacts associated with LMR's 813-0360 mining project. Stream impacts occurred from the surface mining method of extraction of coal reserves. Four sediment structures at this project were necessitated to control sediment runoff. Restoration performed at Big Sourwood Branch partially mitigates losses of 1,353 linear feet from the structures. The mitigation provided at Big Sourwood Branch for the associated impacts to this permitting action equates to 1,180 linear feet of intermittent stream mitigation and 2,330 linear feet of perennial stream mitigation. Total length of off-site stream mitigation is 3,510 linear feet.



### **Site Location**

Big Sourwood Branch is located approximately 2 miles east of the intersection of Highway 30 and Highway 542 in Breathitt County Kentucky. The latitude and longitude of the project is 37° 35' 22.73" and -83° 9' 19" respectively. Big Sourwood Branch is located on Big Caney Creek of Quicksand Creek in the North Fork of the Kentucky River watershed Hydrologic Unit Code (HUC) 05100201.

### **Mitigation Commencement and Completion Dates**

Construction on Big Sourwood Branch was started in the fall of 2010 and was completed in the winter of 2010.

### **Performance Standards**

After one full growing season of construction completion all performance standards are being met. The restoration activities have decreased the amount of sediment entering the stream from the past impacts, increased bank stability, created macroinvertebrate habitat, as well as achieved vertical and lateral channel stability. Further tree plantings are necessary along the upper section of intermittent stream. Perennial stream mitigation requires additional tree plantings and maintenance along a stream incision at the abatement pond to achieve the full potential of the mitigation reach. These problems will be corrected in the dormant season of this year. After transplanting trees and completing the described maintenance LMR will be meeting all of their performance standards.

### **Requirements**

The requirements as stated in the approved Clean Water Act Section 404 permit are as follows; Mitigation efforts were implemented by the applicant using their own qualified equipment operators to conduct the mitigation plan under Best Management Practices. The stream morphology will be determined successful when the proposed structures are constructed in the approximate location proposed in this mitigation plan. Stream stability will be examined for successful erosion controls. The erosion controls will be considered successful if the stream and proposed stream structures are stable laterally and vertically. The limits of the mitigation sites will be delineated and flagged with surveyor's stake to indicate restored reaches.

The vegetation will be maintained at an 80% success rate for native species in the riparian corridors. It is also anticipated that natural succession of native species will occur on-site in the riparian zones. Non-native and invasive species will be kept to less than 20% overall on the project restoration area.

After stream restoration standards have been met for all areas, the applicant or consultant will be responsible for conducting annual monitoring reports to inform the Louisville District of the United States Army Corps of Engineers of progress. The applicant is obligated to maintain the project area mitigation by following requirements set forth by DSMRE and USACE. Monitoring and maintenance of the mitigation site will continue until final mitigation approval is achieved. The compensatory mitigation project site is successfully achieving the standards set forth in the approved USACE permit. As stated, the aforementioned tree plantings and maintenance will be performed by LMR to meet performance standards. The Rapid Bioassessment Protocol demonstrates trends toward the stated mitigation goals in table 1.

Table 1.

Big Sourwood Branch Mitigation Monitoring						
Left Fork of Big Sourwood Segment 1 - Intermittent						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Five Year
Epifaunal Substrate	10	14				15
Embeddedness	10	13				11
Velocity/Depth Regime	5	10				10
Sediment Deposition	7	14				12
Channel Flow Status	5	14				10
Channel Alteration	10	14				16
Frequency of Riffles	5	14				12
Bank Stability (both)	12	16				16
Veg. Protection (both)	16	16				18
Riparian Width (both)	18	14				20
<b>Total Habitat Score</b>	<b>98</b>	<b>139</b>				<b>140</b>
Left Fork of Big Sourwood Segment 2 - Intermittent						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Five Year
Epifaunal Substrate	15	14				15
Embeddedness	8	13				11
Velocity/Depth Regime	6	10				10
Sediment Deposition	12	14				12
Channel Flow Status	6	14				10
Channel Alteration	16	14				16
Frequency of Riffles	12	14				12
Bank Stability (both)	16	16				16
Veg. Protection (both)	18	16				18
Riparian Width (both)	20	14				20
<b>Total Habitat Score</b>	<b>129</b>	<b>139</b>				<b>140</b>
Left Fork of Big Sourwood Segment 3 - Intermittent						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Year Five
Epifaunal Substrate	5	14				12
Embeddedness	5	13				11



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Velocity/Depth Regime	8	10				14
Sediment Deposition	9	14				11
Channel Flow Status	9	14				12
Channel Alteration	10	14				10
Frequency of Riffles	10	14				12
Bank Stability (both)	6	16				12
Veg. Protection (both)	20	16				20
Riparian Width (both)	20	14				20
Total Habitat Score	102	139				134
Left Fork of Big Sourwood Segment 4 - Intermittent						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Year Five
Epifaunal Substrate	8	14				13
Embeddedness	10	13				11
Velocity/Depth Regime	8	10				12
Sediment Deposition	6	14				11
Channel Flow Status	7	14				13
Channel Alteration	10	14				10
Frequency of Riffles	8	14				12
Bank Stability (both)	12	16				12
Veg. Protection (both)	20	16				20
Riparian Width (both)	20	14				20
Total Habitat Score	109	139				134
Left Fork of Big Sourwood Segment 5 - Intermittent						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Year Five
Epifaunal Substrate	0	14				15
Embeddedness	0	13				12
Velocity/Depth Regime	0	10				14
Sediment Deposition	0	14				12
Channel Flow Status	0	14				14
Channel Alteration	0	14				10
Frequency of Riffles	0	14				15
Bank Stability (both)	0	16				14
Veg. Protection (both)	0	16				14

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Riparian Width (both)	0	14				14
Total Habitat Score	0	139				134
Left Fork of Big Sourwood Segment 6 -Perennial						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Year Five
Epifaunal Substrate	0	15				15
Embeddedness	0	14				12
Velocity/Depth Regime	0	12				14
Sediment Deposition	0	15				12
Channel Flow Status	0	16				14
Channel Alteration	0	15				10
Frequency of Riffles	0	16				15
Bank Stability (both)	0	18				14
Veg. Protection (both)	0	18				14
Riparian Width (both)	0	18				14
Total Habitat Score	0	157				134
Left Fork of Big Sourwood Segment 7 - Perennial						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Year Five
Epifaunal Substrate	12	15				12
Embeddedness	7	14				11
Velocity/Depth Regime	11	12				11
Sediment Deposition	10	15				11
Channel Flow Status	13	16				13
Channel Alteration	15	15				15
Frequency of Riffles	13	16				13
Bank Stability (both)	12	18				12
Veg. Protection (both)	20	18				20
Riparian Width (both)	20	18				20
Total Habitat Score	133	157				138
Left Fork of Big Sourwood Segment 8 - Perennial						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Year Five
Epifaunal Substrate	17	15				17



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Embeddedness	13	14				14
Velocity/Depth Regime	13	12				14
Sediment Deposition	11	15				12
Channel Flow Status	14	16				15
Channel Alteration	19	15				19
Frequency of Riffles	15	16				15
Bank Stability (both)	16	18				16
Veg. Protection (both)	20	18				20
Riparian Width (both)	20	18				20
Total Habitat Score	158	157				162
Left Fork of Big Sourwood Segment 9 - Perennial						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Year Five
Epifaunal Substrate	17	15				17
Embeddedness	13	14				14
Velocity/Depth Regime	13	12				14
Sediment Deposition	11	15				12
Channel Flow Status	14	16				15
Channel Alteration	19	15				19
Frequency of Riffles	15	16				15
Bank Stability (both)	16	18				16
Veg. Protection (both)	20	18				20
Riparian Width (both)	20	18				20
Total Habitat Score	158	157				162
Left Fork of Big Sourwood Segment 10 - Perennial						
RPB Habitat Parameters	Pre-mitigation	Year One	Year Two	Year Three	Year Four	Predicted Year Five
Epifaunal Substrate	9	15				15
Embeddedness	6	14				12
Velocity/Depth Regime	11	12				14
Sediment Deposition	6	15				12
Channel Flow Status	10	16				14
Channel Alteration	6	15				10
Frequency of Riffles	10	16				15
Bank Stability (both)	12	18				14

Veg. Protection (both)	10	18				14
Riparian Width (both)	10	18				14
Total Habitat Score	90	157				134

### Summary Data

The success of the project is based on the stabilization of the stream as well as the creation of macroinvertebrate habitat. The Pre-mitigation vs. year one post mitigation scores are listed in table 1 above. The table shows the general trend toward the stated goals in the compensatory mitigation plan.

The Big Sourwood Branch restoration project had various challenges to overcome to ensure its success. The entrenched stream bed was causing unstable banks and the introduction of excess sediment; two segments were so disturbed by previous operations that no stream channel was present. LMR was able to remedy impacts by restoring the natural stream pattern and profile, re-grading, planting native riparian species, and improving habitat to a minimum width of 50 feet beyond stream banks to create a continuous corridor along the channel. Rock and log cross vanes were installed at designed intervals within each segment to increase sediment transport, and create macroinvertebrate habitat.

Pictures of the mitigation site illustrating the current condition (figures 1-6), as well as the map showing the locations of the photos (figure 7) and site location map (figure 8) are included. The only part of the mitigation that is not meeting the stated standards is the riparian survival rate and damage along the removed pond as aforementioned.





Figure 1. Big Sourwood Branch Reach 04 11/10/11  
Pic. 801 Facing Upstream, 37.58832, -83.15542



Figure 2. Big Sourwood Branch Reach 04 11/11/01  
Pic. 797 Facing Upstream, 37.58969, -83.15524



Figure 3. Big Sourwood Branch Reach 04, Left Fork  
11/10/11 Pic. 794  
Facing Upstream, 37.59076, -83.15618



Figure 4. Big Sourwood Branch Reach 04, Left Fork  
11/10/11 Pic. 789  
Facing Upstream, 37.59254, -83.15742



Figure 5. Big Sourwood Branch Reach 04, Left Fork  
11/10/11 Pic. 788  
Facing Upstream, 37.59261, -83.15777



Figure 6. Big Sourwood Branch Reach 04, Left Fork  
11/10/11 Pic. 781  
Facing Upstream, 37.59432, -83.15987



### **Conclusions**

The Big Sourwood Branch left fork mitigation site is meeting all performance standards with the exception of tree survival rate and aforementioned damage at the old embankment pond. LMR will return to the site and transplant more trees and perform necessary maintenance during the dormant season of this year.

Once these conditions are corrected the LMR mitigation site will continue to trend toward the stated mitigation performance standards in the Clean Water Act 404 permit.