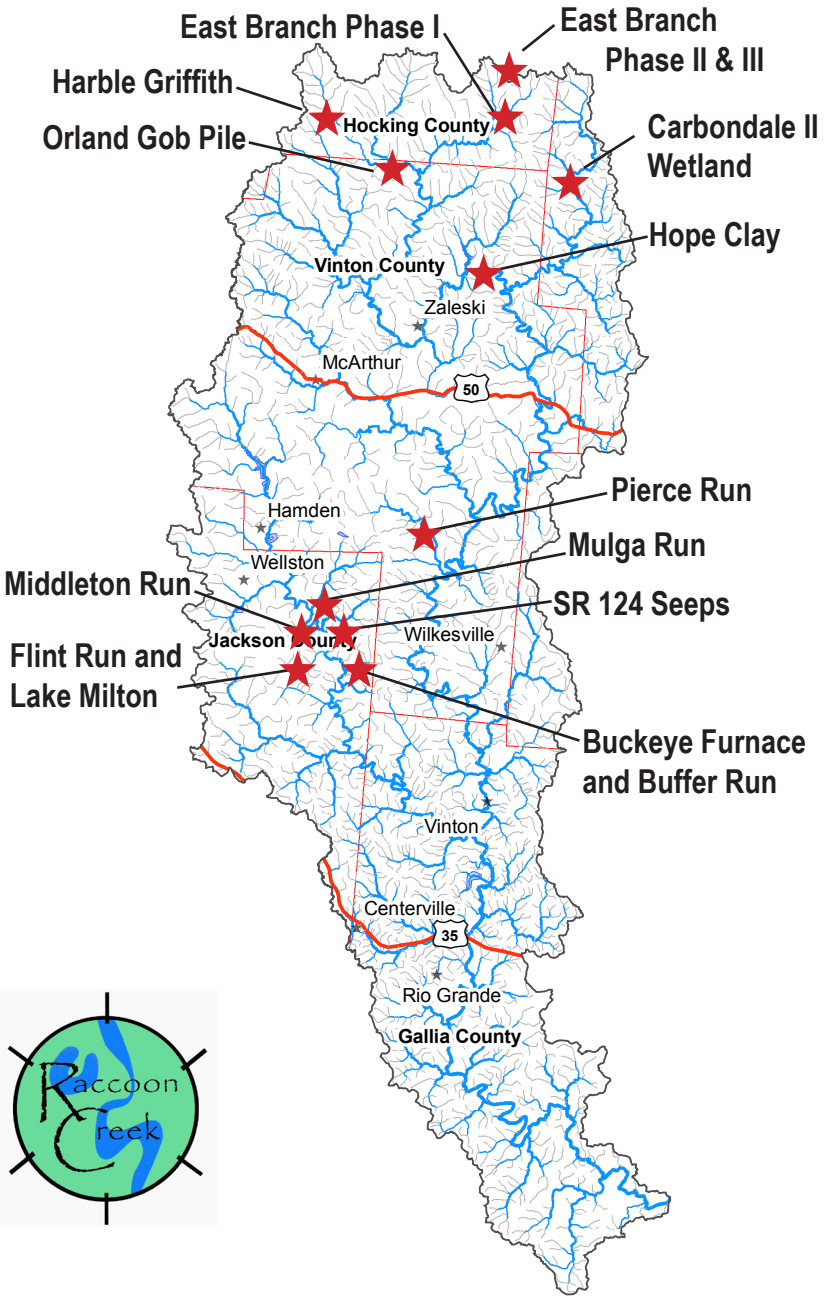
2011 NPS Report - Raccoon Creek Watershed

Generated by Non-Point Source Monitoring System
www.watersheddata.com

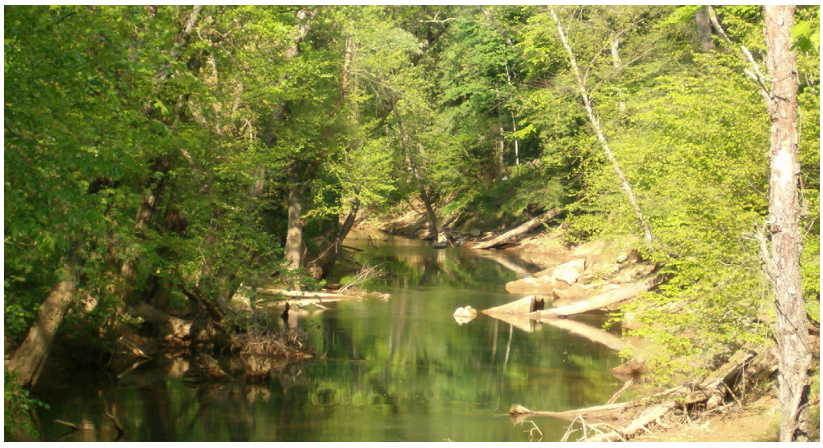
The Raccoon Creek Partnership is a local partnership working towards conservation, stewardship, and restoration of the watershed for a healthier stream and community. The partnership consists of multiple agencies and individuals working to restore and promote the waters of Raccoon Creek. Encompassing over 683 square miles, the watershed lies in portions of six southeast Ohio Counties (Athens, Hocking, Meigs, Vinton, Jackson and Gallia). Raccoon Creek is one of Ohio's longest streams, measuring 112 miles draining into the Ohio River in Gallia County. Major sources of impairment to the stream include acid mine drainage (AMD), drainage from wastewater treatment facilities, and industrial discharges. By and large, AMD contributes to the vast majority of pollution issues in the watershed.

The watershed currently has over 25,610 acres of underground coal mines and 21,550 acres of surface coal mines within its boundaries. About 110 acres of abandoned coal refuse piles also lie in the watershed. These abandoned mines and refuse piles leach thousands of pounds of sulfuric acid and metals into the creek daily, significantly degrading the water quality of streams. In the late 1990's, representatives from several partnering agencies, including the Voinovich School of Leadership and Public Affairs at Ohio University, Ohio Department of Natural Resources, Division of Mineral Resource Management, and Ohio EPA, prioritized sites that contributed the most AMD pollution to Raccoon Creek and began to implement restoration strategies on these sites. Because the watershed is so large, three major sub-shed divisions are used to break up the region into more manageable sections. These consist of the Headwaters, Little Raccoon, and the Middle Basin sub-sheds. Each of these sections has priority AMD projects. Some of these projects have been completed, some are in progress, and some are anticipated future projects.



Headwaters

The major priority sites in the headwaters sub-shed include East Branch and West Branch, where several impacted tributaries contribute to significant acid and metal loadings in Raccoon Creek. Brushy Creek and the Mainstem of Raccoon Creek above Brushy Creek are also priority AMD abatement sites.



Raccoon Creek near Moonville, Photo by Ben McCament

2011 NPS Report - Raccoon Creek Watershed

Generated by Non-Point Source Monitoring System
www.watersheddata.com

Little Raccoon

Flint Run is the largest contributor of AMD in the Little Raccoon Creek watershed. A majority of this (90%) is attributed to a 240-acre site in the headwaters. This site, called Broken Aro, previously housed a coal preparation facility and mine tailings dump. Project was completed in 2006. Major AMD contributors in this basin include Mulga Run, Buffer Run and Goose Run.

Middle Basin

Major acid contributors in the middle basin include Rock Camp and Pierce Run. Rock Camp is the most consistent contributor of AMD, and has net acidic water regardless of flow. Pierce Run has experienced some net alkaline flows; it is thought that this might result from current mining operations in the area.

Watershed Outreach

In addition to the technical work of AMD remediation, other activities in the watershed are geared toward meeting goals of stewardship and conservation in the region are coordinated by the Raccoon Creek Partnership. Annual litter pick-ups, and canoe-floats all encourage residents to become stewards of our watershed. The Waterloo Aquatic Education Center is used for school programs for youths to help educate students about water quality, acid mine drainage, and the value of clean water. In addition, a community group, the Raccoon Creek Water Trail Association, has formed to address access issues for canoers and kayakers who wish to paddle on the creek.

For further updates on the progress in Raccoon Creek, please visit our webpage at:
www.raccooncreek.org

Biological Health Performance

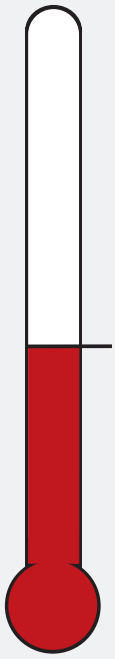
Total stream miles assessed/impacted by mine drainage = 190 miles

Target #1 indicates 30% attainment of impaired streams by 2010 = 57 miles

2010 progress=23.3+18.42=41.72 miles met both the IBI & MAIS targets

2006 progress = 23.3 miles meeting Full WWH attainment
(48 miles assessed in 2006)

Completion



Sub-target 2

Total projects proposed in three Raccoon Creek Watershed AMDATS = 25

Total projects complete = 14

Reductions

Total acid load reduction = 5,414 lbs/day
Total metal load reduction = 1,052 lbs/day

Data derived using the Mean Annual Load Method (Stoertz, 2004).

Cost

Design = $1,800,521
Construction = $7,909,974

Total Costs through 2011 = $9,710,495

2011 NPS Report - Raccoon Creek Watershed

Generated by Non-Point Source Monitoring System
www.watersheddata.com

TIMELINE OF THE RACCOON CREEK WATERSHED PROJECT MILESTONES & AMD PROJECTS

1980s
- Formation of Raccoon Creek Improvement Commitee (RCIC): Grassroots citizens group to address water quality issues in Raccoon Creek

Early 1990s
- RCIC invited citizens from all six counties to join efforts

Late 1990s
- Formation of Raccoon Creek Watershed Partnership,a loosely based partnership of agencies to address technical AMD issues

1999
- State Route 124 Strip Pit and Buckeye Furnace Project completed

2000
- Little Raccoon Creek AMDAT completed
- Watershed Coordinator position funded for six years

2001
- Headwaters AMDAT completed
- State Route 124 seeps project completed

2002

2003
- Mulga Run project completed
- Middle Basin AMDAT completed
- Completed management plan for Raccoon Creek Watershed

2004
- Carbondale II project completed

2005
- Middleton Run-Salem Road project completed

2006
- Raccoon Creek Water Trail Association formed to establish a water trail on Raccoon Creek
- Flint Run and Lake Milton Projects completed
- Watershed Coordinator three year extension funded

2007
- Raccoon Creek Partnership formed 501 (c) 3
- Waterloo Aquatic Education Center opened

2008
- East Branch Phase I AMD Project completed

2009
- Pierce Run AMD Project and East Branch Phase II Project began

2010
- East Branch Phase II completed
- Watershed Coordinator 3 year extension funded

2011
- East Branch III Completed

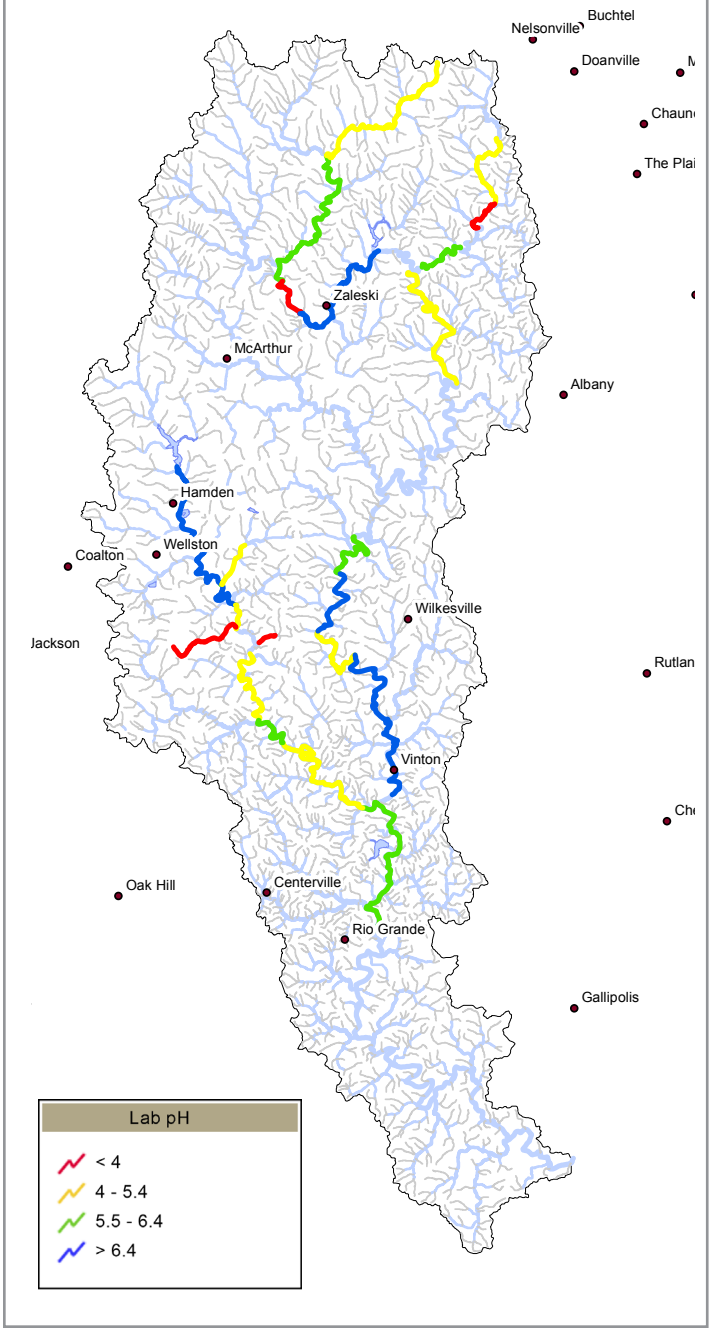
This timeline shows the history of the Raccoon Creek Watershed Partnership, started almost two decades ago by a group of concerned local citizens. Today, the partnership consists of multiple state and local agencies and private citizens. AMD projects have been administered through Ohio University's Voinovich School, with funding from various state and federal grants but mostly from Ohio EPA's 319 program and ODNR-DMRM's AMD program.

2011 NPS Report - Raccoon Creek Watershed

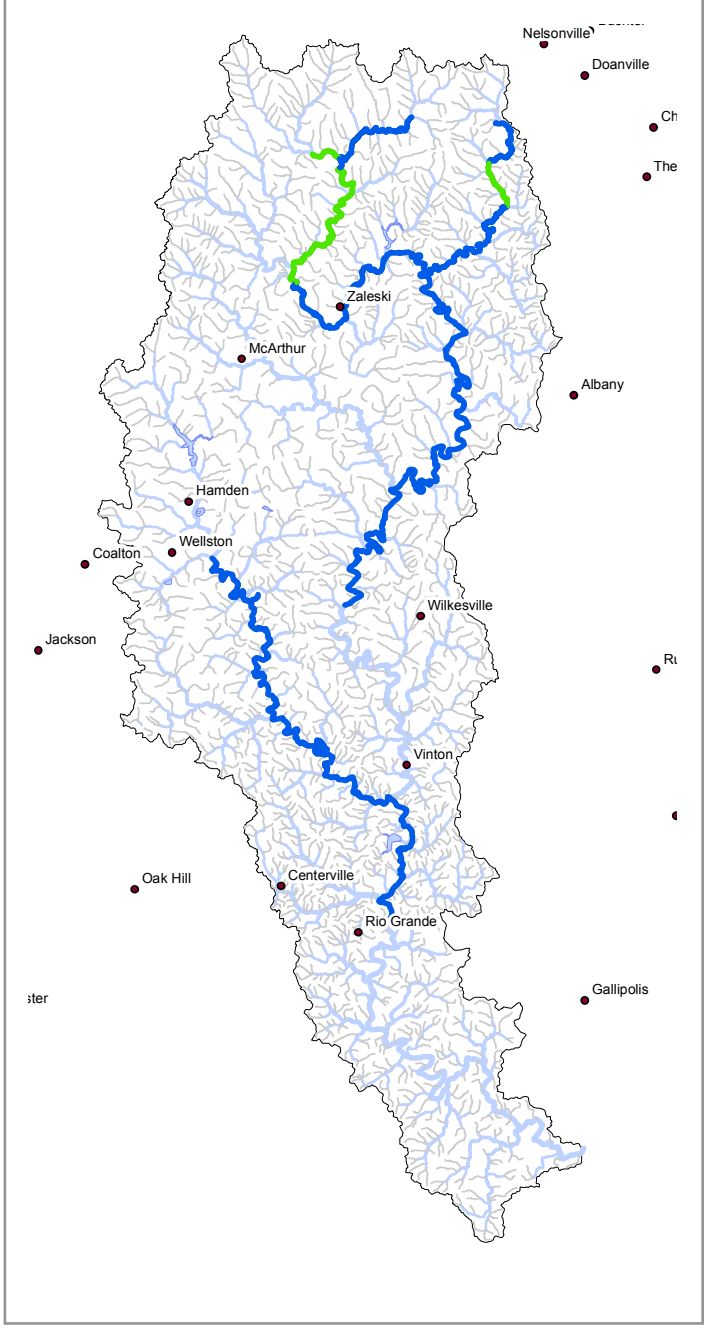
Generated by Non-Point Source Monitoring System
www.watersheddata.com

Chemical Water Quality

Raccoon Creek baseline pH



Raccoon Creek 2011 pH



In Raccoon Creek pH values have improved throughout the watershed from baseline conditions (1994-2001) to 2010. Raccoon Creek mainstem, Hewett Fork and Little Raccoon Creek average pH values have increased from a range of 4.0-5.4 during baseline to 5.5-8.0 in 2010, 6.24-7.3 in 2011. In 2010, 10.7 river miles in Hewett Fork, 6 miles in East Branch, all 27 river miles in Little Raccoon Creek (LRC), and all 68 miles along the mainstem of Raccoon Creek met the pH standard (pH >6.5). In 2011, Hewett Fork gained 1.5 miles meeting the pH target, LRC and East Branch remained the same, and the headwaters of Raccoon Creek sites MSBC100 & MSLH020 average pH dropped just below the target with an average pH of 6.4.

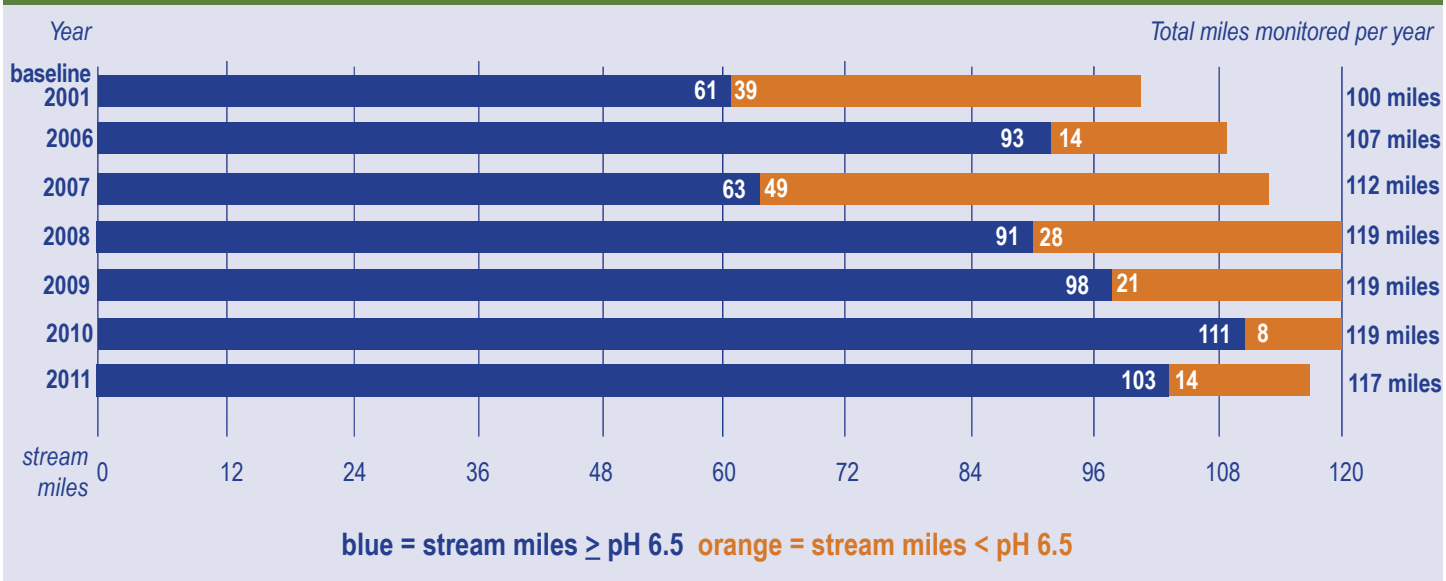
2011 NPS Report - Raccoon Creek Watershed

Generated by Non-Point Source Monitoring System
www.watersheddata.com

Chemical Water Quality

There are approximately 119 stream miles monitored each year along the mainstem of Raccoon Creek (downstream to Rio Grande), Little Raccoon Creek, Hewett Fork, and East and West Branch. A pH target has been set to 6.5. Each year there is an increase in the number of miles that meet this target. In 2007 nearly 64 miles of the 113 monitored met this target. In 2008, there was a large increase (30%) with nearly 91 stream miles meeting the pH target of 6.5 of the 119 miles monitored. In 2009, 98 of the 119 miles monitored met the target, a 7% increase from 2008. Currently in 2011, 103 of the 117 miles of stream monitored met the pH target, a slight decrease from 2010 (Figure A).

Figure A. Raccoon Creek total stream miles monitored for pH through time

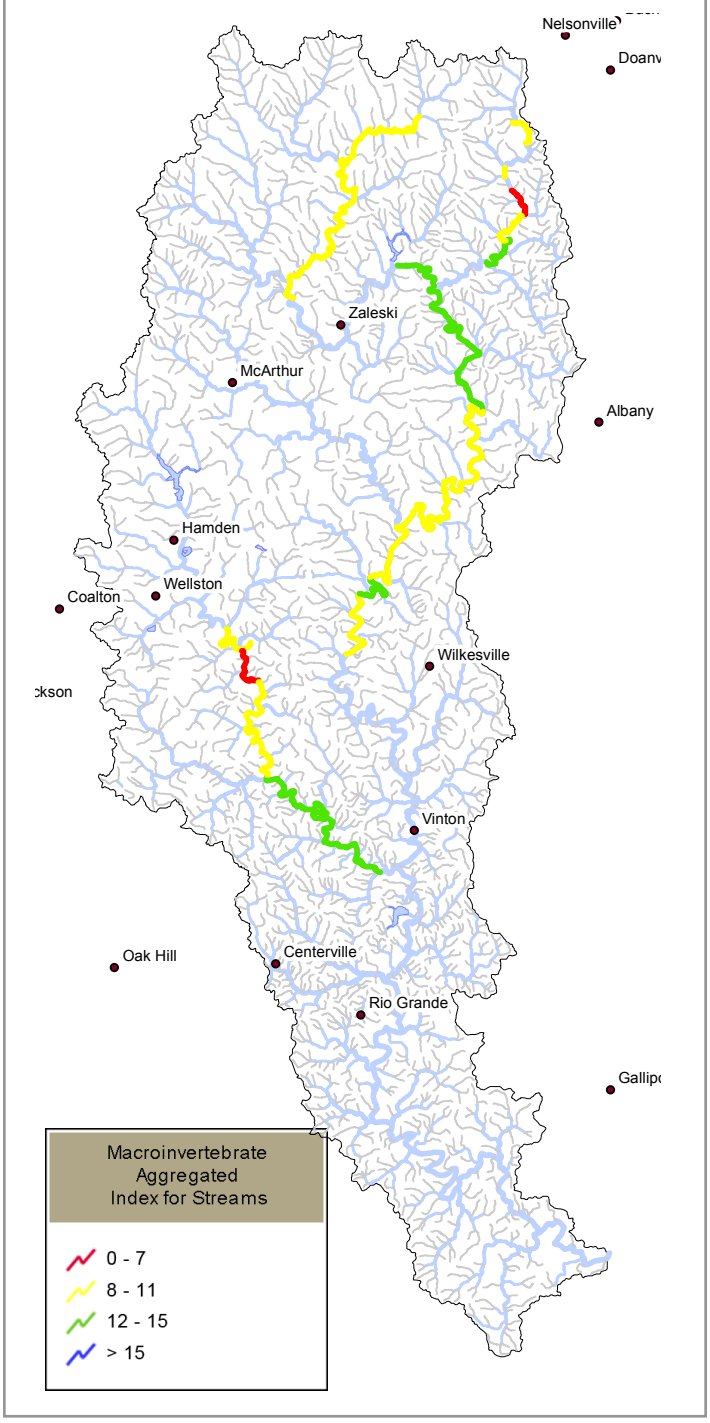


2011 NPS Report - Raccoon Creek Watershed

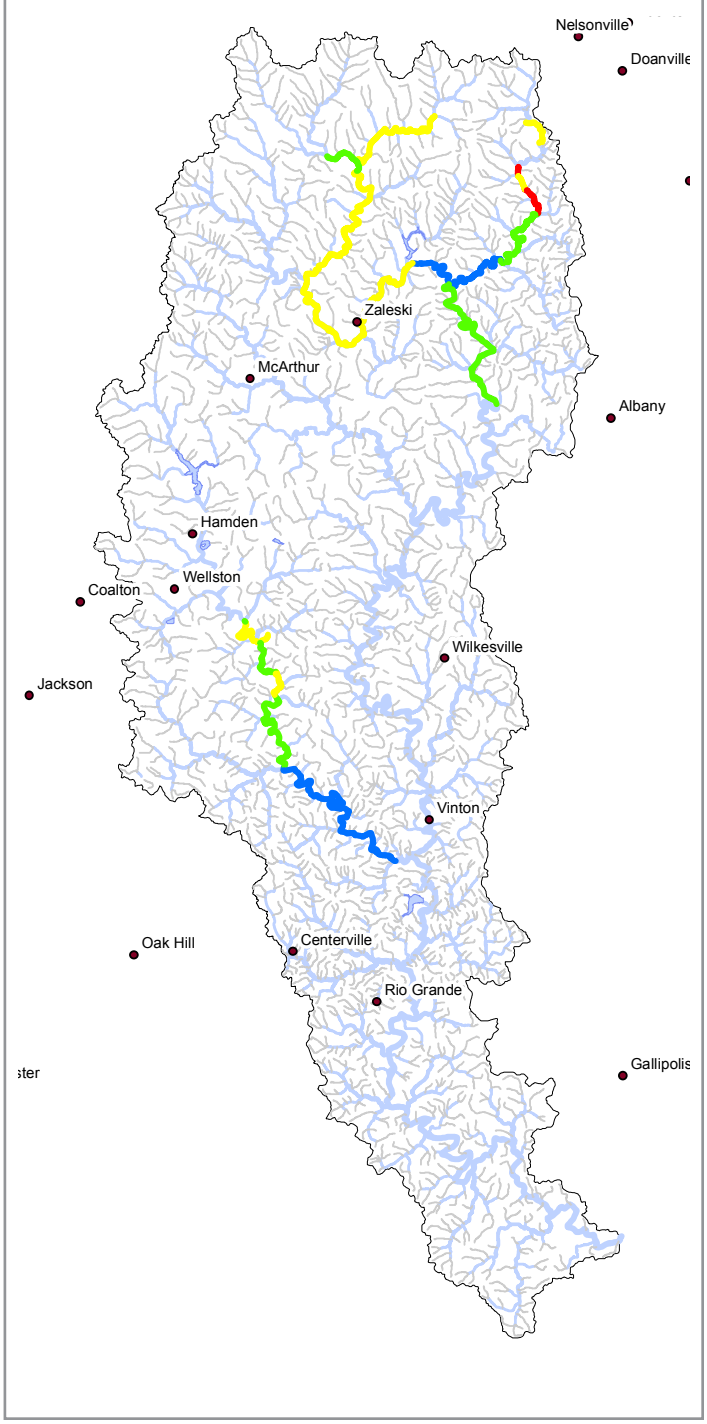
Generated by Non-Point Source Monitoring System
www.watersheddata.com

Biological Water Quality

Raccoon Creek baseline MAIS



Raccoon Creek 2011 MAIS

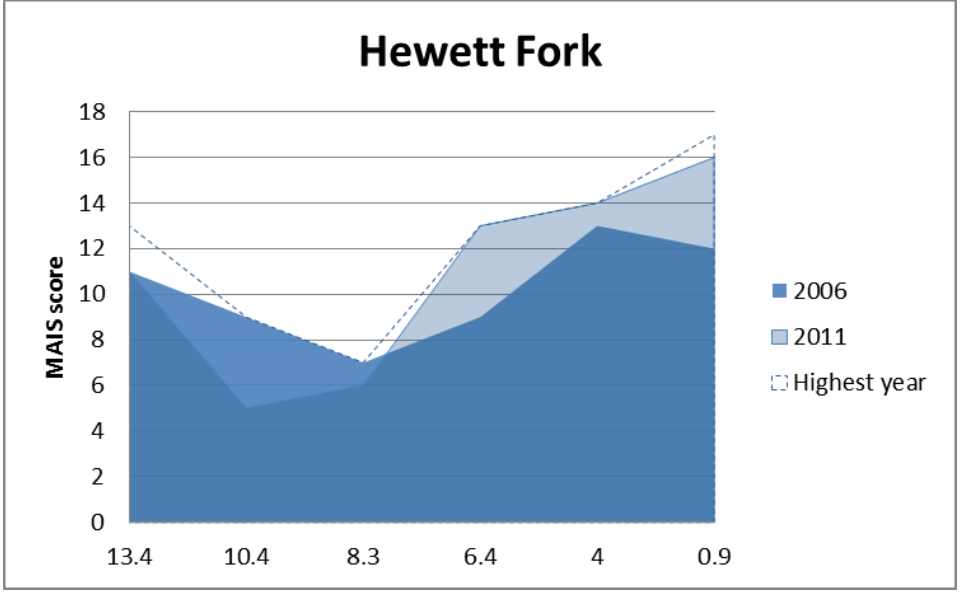


MAIS samples were collected throughout Raccoon Creek in 2011 (excluding Middle Basin sites). These stations have been established as annual monitoring stations for macroinvertebrates. The sites are used to track incremental changes each year (figures 1 and 2).

Raccoon Creek - Hewett Fork

In 2011, the overall biological quality of the eleven mile reach below the Carbondale doser was close to the highest it has been over the past six years (Figure B). All but two sites scored their highest scores in 2011. One of these sites, at RM 10.4, is immediately downstream of the doser in the 'impacted zone' where high quantities of metals have precipitated onto the substrate. Biological quality has declined at this site over the past six years, after the doser was installed in 2004. For several miles downstream, macroinvertebrate scores exhibit high annual variability that may be related to episodic pulses of acid mine drainage or re-suspension of sediment metals. In 2011, the lower four miles of Hewett Fork all scored above '12', the highest quality observed in this section to date.

Figure B. Area of degradation for MAIS scores in Hewett Fork from 2006 to 2011.



The blue dashed line identifies the highest MAIS score ever achieved at that site throughout the monitoring time period.

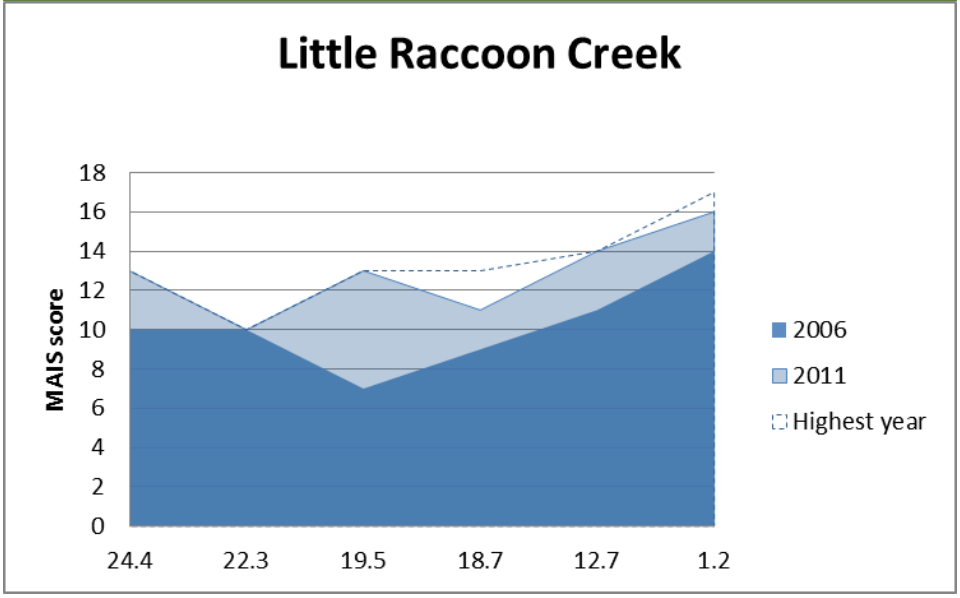
Hewett Fork MAIS Regressions

RM	*2001*	*2002*	*2003*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	Linear trends	P-value	Yrs
13.4					11	8	9	12	13	11	no change	0.294	6
10.4					9	3	7	6	6	5	some decline	0.087	6
9.8					4	3	6	3	3	8	no change	0.385	6
8.3	2	3	3	5	7	3	5	6	3	6	no change	0.106	10
6.4					9	9	8	10	10	13	**some improvement**	0.070	6
4					13	13	14	13	13	14	no change	0.414	6
0.9					12	12	15	17	13	16	no change	0.184273	6

Raccoon Creek - Little Raccoon Creek

Little Raccoon Creek continues to show solid trends of improved biological quality since 2006 (Figure C). Much of the improvements followed the completion of the six major reclamation projects upstream of RM 19.5 (Mulga Run, Salem Road/Middleton Run, State Rte. 124 seeps, Flint Run East, Lake Milton, and Buckeye Furnace). In 2011, four out of six sites achieved target macroinvertebrate scores of '12'.

Figure C. Area of degradation for MAIS scores in Little Raccoon Creek from 2006 to 2011.



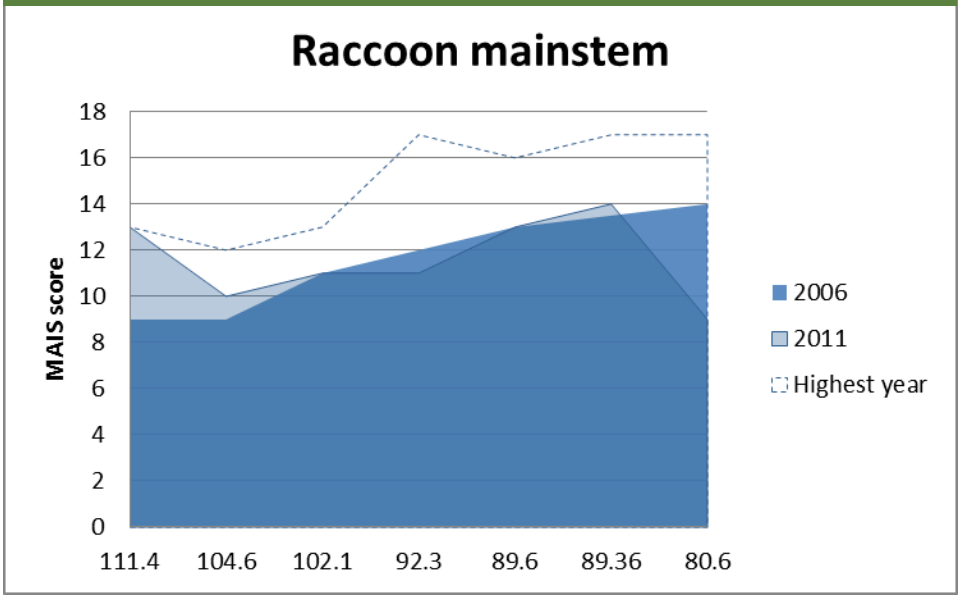
Little Raccoon Creek MAIS Regressions

RM	2005	2006	2007	2008	2009	2010	2011	Linear trends	P-value	No. of years
24.4	8	10	11	11	9	9	13	no change	0.246	7
22.3	8	10	10	9	10	10	10	no change	0.165	7
19.5		7		9	11	12	13	improved	5.65E-05	6
18.7	14	9	12	9	13	11	11	no change	0.726	7
12.7	3	11	13	13	14	14	14	improved	0.041	7
1.2	14	14	13	15	17	16	16	improved	0.046	7

Raccoon Creek Mainstem

The thirty or more miles of the Raccoon Creek Mainstem have shown transient years of improved quality, some achieving MAIS scores of 17 ('very good' quality rating) in the 2008 and 2010. However, trends are modest and thus far only the uppermost headwaters sites have achieved statistical significance (Figure D).

Figure D. Area of degradation for MAIS scores in Raccoon Creek Mainstem from 2006 to 2011.



The blue dashed line identifies the highest MAIS score ever achieved at that site throughout the monitoring time period.

Raccoon Creek Mainstem MAIS Regressions

RM	2005	2006	2007	2008	2009	2010	2011	Linear trends	P-value	No. of years
111	8	9	12	9	10	12	13	improved	0.043	7
105		9	11	12	9	11	10	no change	0.868	6
102		11	11	10	13	10	11	no change	1.00	6
92.3				10	10	17	11			
89.6		13	14	11	16	12	16	no change	0.863	6
89.4			12	16	14	17	13	no change	0.711	5
80.6		14	14	17	16	12	14	no change	0.686	6