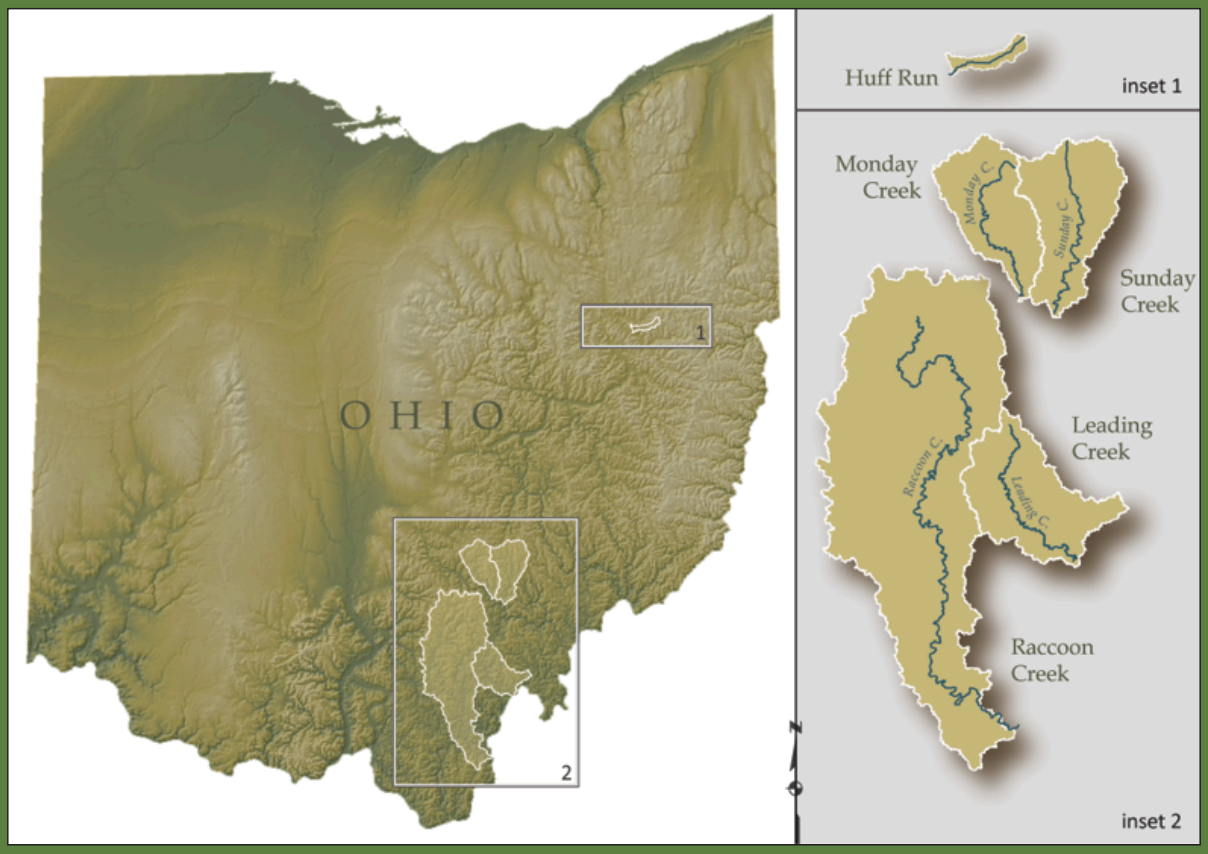
2015 STREAM HEALTH REPORT

AN EVALUATION OF WATER QUALITY, BIOLOGY, AND ACID MINE DRAINAGE RECLAMATION IN FIVE WATERSHEDS: RACCOON CREEK, MONDAY CREEK, SUNDAY CREEK, HUFF RUN, AND LEADING CREEK.



CREATED BY:

VOINOVICH SCHOOL OF LEADERSHIP AND PUBLIC AFFAIRS

AT OHIO UNIVERSITY

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Table of Contents

Specific AMD project entry forms used for report 2015 can be found at (watersheddata.com)

Section IV on the website shows the completed NPS data entry form for each individual AMD project in pdf format. These reports include all information gathered about the site description, contact, monitoring plan, design and reclamation information, average water quality data (pH, net acidity, and discharge) at long-term monitoring stations, complete list of pre and post reclamation water quality and biology data, and if applicable; photos, water quality and biology reports, and site map. These reports are available to download as pdf reports from the NPS monitoring website www.watersheddata.com under the 'Reports Tab'.

Acknowledgements

The Stream Health Report is a collective effort by many dedicated watershed professionals. This project would not have come together without the dedication and support of our watershed partnership. I would like to thank and acknowledge the following people for their input and contributions towards this project:

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Monday Creek: Nate Schlater and Tim Ferrell
Sunday Creek: Michelle Shively
Huff Run: Marissa Lautzenheiser
Leading Creek: Jim Freeman
I would like to thank the watershed groups for their cooperation and patience in this project for doing everything from data collections, participation in trainings, gathering historical data, data validation and verification, and data entry on top of their busy work schedules.

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Voinovich School – Steve Porter (GIS and data analysis), Elkan Kim (watersheddata.com), Lindsey Siegrist (graphic design), Kyoung Lim (assistant programmer), Natalie Kruse (research) and Ryan Kline (Voinovich School Scholar).

ABSTRACT

The Voinovich School of Leadership and Public Affairs at Ohio University created an evaluation system to track changes in chemical and biological data for the following watersheds: Monday Creek, Sunday Creek, Raccoon Creek, Huff Run and Leading Creek. The annual monitoring and reporting system was developed for the Ohio Department of Natural Resources Division of Mineral Resources Management (ODNR-DMRM) in 2005 to track progress towards the targets of the state's 2005 Non Point Source (NPS) management plan for acid mine drainage (AMD) on an annual basis. ODNR-DMRM is committed to tracking chemical and biological changes in the watersheds where active AMD abatement and treatment reclamation is planned and implemented.

The NPS annual reporting website (www.watersheddata.com) integrates water quality and biology data from watershed groups' with project status details including: maps, graphs, charts, photos, and printable reports to address the progress with respect to AMD treatment and reclamation. Water-quality and biological trends are compared through time at long-term monitoring stations and acid load reductions are measured at AMD reclamation project discharges. Incremental changes in pH, net alkalinity, iron, and aluminum are reported along stream reaches within key restoration areas, identified by river mile and sample site IDs.

Total number of stream miles impaired by acid mine drainage were evaluated during 1994-2001 and are considered the baseline conditions for this study, 341 stream miles were impacted at that time. Each year the number of stream miles surveyed that suggest they are meeting Warmwater Habitat (WWH), based on their fish and macroinvertebrate index scores, are recorded. As of 2010, 47 stream miles of the 175 miles assessed suggest they meet full attainment of the Warmwater Habitat Status. In addition to tracking the number of stream miles meeting their fish and macroinvertebrate target levels, incremental water-quality changes are also tracked, pH values show 172 miles of the 183 miles monitored met the pH 6.5 water quality standard in 2015.

Net alkalinity, iron, aluminum, pH, and macroinvertebrates were evaluated annually from 2006-2015. Incremental changes from year to year can be tracked using these indicators. Net alkalinity and pH values have improved from 2006 to 2015. The family-level biological indicator, Macroinvertebrate Aggregated Index for Streams (MAIS), were measured annually from 2006 to 2015, there have been slight fluctuations seen within each watershed, detailed in the biology section for each watershed. Macroinvertebrate data across all watersheds in 2015 indicated good results, most notable are the continued improvements seen in the West Branch of Sunday Creek, and mainstem of Monday Creek.

INTRODUCTION

The Nonpoint Source (NPS) Monitoring Project was created by the Voinovich School of Leadership and Public Affairs at Ohio University in 2005 and funded by the Ohio Department of Natural Resources Division of Mineral Resources Management (ODNR-MRM). This project was developed to address the targets set forth for Abandoned Mine Drainage in the State of Ohio's Non Point Source (NPS) Management Plan 2005-2010. www.epa.state.oh.us/dsw/nps/NPSMP/ET/amdjumppage.html Abandoned Mine Drainage is one of the six NPS pollutants listed as a key issue to address in Ohio to improve water quality. This plan is no longer active, however the ODNR-DMRM, watershed partners, and university researchers continue to monitor the effects of acid mine drainage and reclamation in the region. This report reflects the works of this partnership at the federal, state, and local level working together to improve water quality in the Appalachian coal region of Ohio.

As a result of the NPS Monitoring Project, an on-line reporting system, www.watersheddata.com, has been created to track environmental changes in five watersheds: Raccoon Creek, Monday Creek, Sunday Creek, Huff Run

and Leading Creek. These five watersheds represent where active AMD reclamation projects are being constructed. Chemical water quality and biological data trends have been evaluated at the project level, watershed level, and collectively to monitor the changes in water quality as a result of AMD reclamation. The website provides a repository of information related to acid mine drainage reclamation and water quality including reports of: AMD reclamation projects and watersheds water quality trends. All water quality data can be viewed, entered, edited, mapped and downloaded for each watershed.

REPORTS

All AMD project descriptions are compiled in a separate document containing pertinent static information describing the AMD project, titled "Collection of Acid Mine Drainage (AMD) Reclamation Projects in the Coal-Bearing Region of Ohio". This will eliminate redundancy in printing static project specific information each year. This report is available online at watershedata.com as well as with all partner organizations.

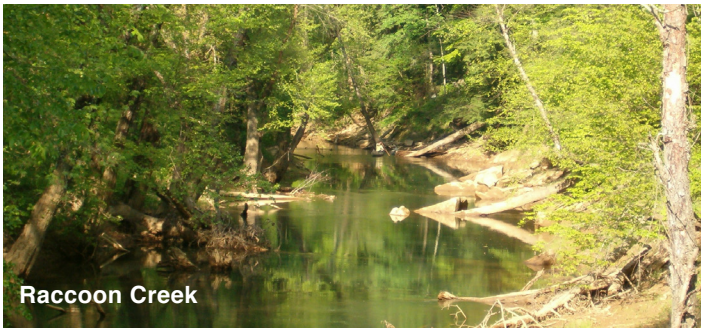
The "AMD project collection" report includes: a chronological collection of all projects completed since late 1990s. The 'AMD project collection' report displays general information about the AMD issues prior to reclamation and the AMD project description. Specifically the 'AMD project collection' report includes: pre and post construction photos, description of AMD problem, design and construction information, costs, contractors, dates of construction, identification of project discharge, map of site (optional), and pre-water quality data at project discharge. 'AMD project collection' report is a compilation of all projects completed since the late 1990s in chronological order including all past archived reports. This report is a stand-alone document. Each year, the newly completed project reports are simply added to the collection.

The "Annual Stream Health" report contains the dynamic yearly chemical and biological data that changes each year. This report includes the chemical and biological water quality data analysis for all target stream reaches within the five key watersheds. Stream reaches are identified as: Raccoon Creek Mainstem, Hewett Fork, Little Raccoon Creek, Monday Creek Mainstem, Sunday Creek Mainstem, West Branch of Sunday Creek, Huff Run, and Thomas Fork (Leading Creek). Data from these stream reaches are analyzed each year for changes and trends in pH, net alkalinity, iron, aluminum, and macroinvertebrates. Yearly trends of acid loading and metal loading reduction from each AMD project discharges are also displayed in this report. Long-term monitoring data, family-level macroinvertebrate data, and pre/post project discharge data collected by watershed groups and DMRM staff are utilized to generate the graphs of water quality trends along the stream reaches. However, 2015's annual health report does not contain yearly chemical or macroinvertebrate trend data for Sunday Creek mainstem or West Branch, due to a lack of water quality data. Similarly, Little Raccoon Creek was not evaluated for macroinvertebrate yearly trends in 2015.

To track the overall health of Raccoon Creek, Monday Creek, Sunday Creek, Leading Creek and Huff Run, the watersheds where acid mine drainage reclamation is active, chemical data were collected annually since 2005 (2009 in Leading Creek). Biological data are collected annually for family–level macroinvertebrates (MAIS) and every 3-5 years for fish (IBI, Index of Biotic Integrity). Baseline conditions were established during the time period of 1997-2001 with historic data. 2010 fish and macroinvertebrate data suggest a total of 47 miles of stream meet the use attainment criteria for WWH, with 51 stream miles evaluated. Over 158 miles were evaluated for MAIS and 54 miles for IBI. These data were collected to compare these indices to the biological health targets of 12 for MAIS and IBI scores of 44/40 for wadable/boatable streams. Stream miles that improved in biological health from baseline to 2010 are shown in Figure 1. 18.4 miles were improved in the Raccoon Creek watershed and 5.3 miles improved in West Branch of Sunday Creek from 2005 to 2010.

Biological fish data collected from 2010 to 2015 suggest the following areas highlighted in green (Figure 1) may meet warm water habitat (30 miles in Raccoon Creek and 5 miles in Sunday Creek). These green highlighted areas are conditional and will be evaluated after more biological data is collected as part of the OEPA TMDL being conducted in Raccoon Creek 2016-2017. Additional macroinvertebrate and fish data in the West Branch of Sunday Creek will be collected to confirm the warm water habitat condition (Figure 2).

Other significant incremental water changes are also tracked and described in this report; for example, acid and metal loading reductions, pH and net alkalinity improvements. These incremental changes track progress toward the overarching goal of meeting targets. Incremental changes are tracked in the acid mine drainage project level reports and in the watershed level reports.


Raccoon Creek

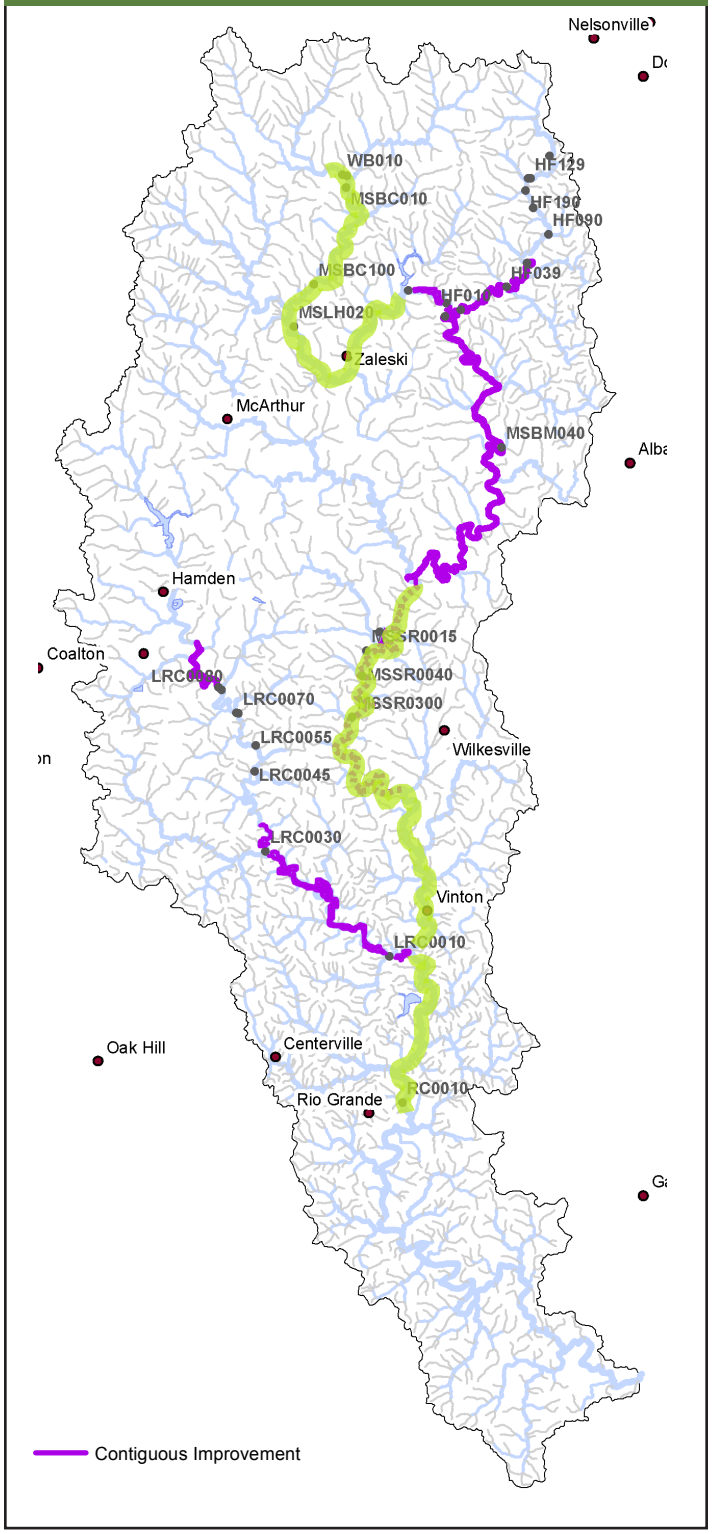

Sunday Creek


Huff Run


Monday Creek

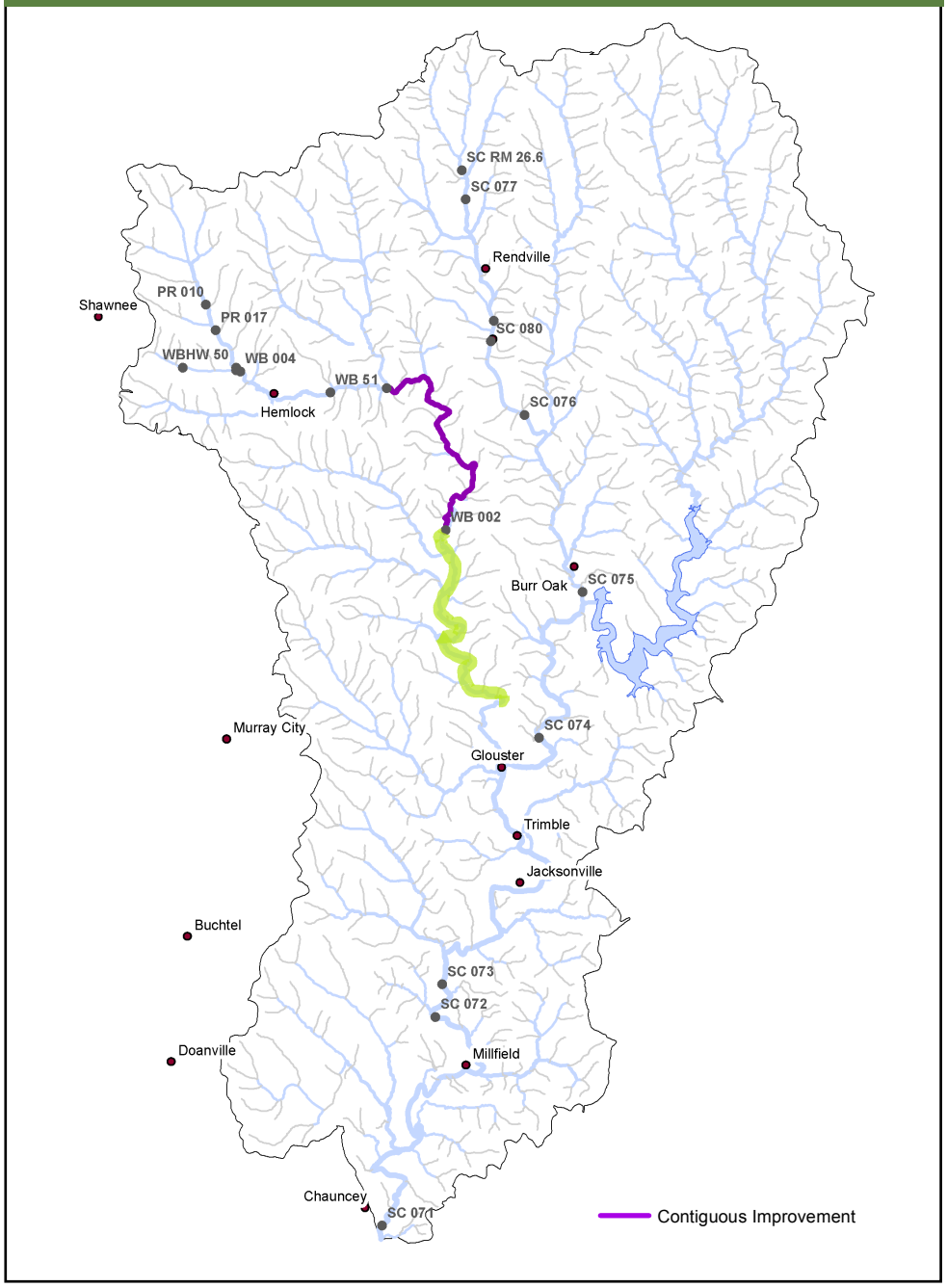

Leading Creek

Figure 1: Biological health improvements in Raccoon Creek from baseline (1997) to 2015.



Condititional improvement 2010-2015 in green highlight.

Figure 2: Biological health improvement in Sunday Creek West Branch from 2005 to 2015.



Conditional improvement 2010–2015 in green highlight.

Table 1. Summary of results for each of the five watersheds evaluated in 2005 to 2015: Raccoon Creek, Monday Creek, Sunday Creek, Huff Run, and Leading Creek.

Watershed	Total number of completed projects	Total costs	Total acid load reduction lbs/day	Total stream miles improved in 2005/2010 to meet IBI & MAIS Biological stream health targets	Stream miles that met the pH target	Total stream miles monitored
Raccoon Creek	20	$14,521,361	5,866	23.3/18.42 (41.7)	115	117
Monday Creek	18 (plus 5 subsidence projects, costs are not included)	$7,197,808	2,551	0/0	23	32
Sunday Creek	12 (7 of 10 are sub-sidence projects)	$2,618,273	352	0/5.26 (5.26)	15	15
Huff Run	14	$5,308,353	1,095	0/0	10	10
Leading Creek	2	$728,481	661	NA/0	9	9
Total	66	$30,374,277	10,173	23.3/23.7 (47.0)	172	183

Reductions

Total to date acid load reductions = 10,173 lbs/day

Costs

Total to date reclamation costs = $30,374,277