

SPRING 2011

OFFICIAL PUBLICATION OF THE AMERICAN SOCIETY OF MINING AND RECLAMATION

reclamation *matters*



Badger State Pioneers Mine Reclamation
Lime Slurry for Acid Mine Drainage Treatment
28th Annual Meeting of ASMR – 2011 Conference Overview
Highwall Reclamation on the Kelley Estate in Clinton County, Pennsylvania



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Immediate Shared Challenges at ASMR

Kimery Vories, ASMR President

In President Obama's recent state of the union address, it is my interpretation that he tried to get the country to think proactively in a purposeful and positive way. In my interpretation of this vision, he tried to challenge us as a nation to "out-innovate" the rest of the world especially in the areas of environmental sustainability that would be economically positive. If my interpretation is correct, I would certainly applaud this vision.

Most ASMR members' whole life and career has been dedicated to making advances in just this area. It is my understanding, however, that there are many in the environmental community and some regulatory agencies that would question the benefit and credibility of the work performed by those in the field of disturbed land reclamation and specifically in ASMR. In response to this specific concern, the ASMR NEC is developing a revised set of guidelines for the preparation and review of papers published by ASMR. ASMR publications must clearly distinguish the levels of scientific method and review provided for all categories of papers that are beneficial to the ASMR membership. Unlike most other science-based societies, ASMR needs to provide the best possible

reclamation related information to a very wide audience. Our members have a need to learn from related fields through basic research, applied research, case studies, scientific demonstrations, and policy issues. Each of these categories of information has unique demands in terms of guidelines for preparation and review. It is the goal of the NEC to do everything in our power to enhance the credibility of papers published by ASMR while at the same time allowing for the presentation of all scientific information and experiences that will meet the needs of the entire ASMR membership. In order to implement this goal, the NEC plans to have dramatically improved guidance for papers prepared for ASMR in 2012. Anyone who would be interested in sharing your ideas should direct them to Dennis Neuman as the team leader of this effort.

I am very pleased to report that the financial status of ASMR is much better than that of the nation. It does not mean however that we need to be any less attentive to maintaining the financial health of the society during the powerful economic changes that are buffeting ASMR and the nation. If ASMR is to continue to maximize its impact to both the

membership and the nation, in terms of leading the country in advances in the field of disturbed land reclamation and restoration, investments must be made in the next generation of reclamation scientists as well as communicating these advances to the membership and to the nation at large. The challenge to the NEC for the foreseeable future will be to balance our ability to invest in the professional development of our membership with the financial assets at our disposal. ASMR is currently experiencing a reduction of income due to the dramatically lower interest rates available for our assets invested in Certificates of Deposit. It is still undetermined how much the society annual meetings will be impacted by the reduced financial ability of many of the members to attend or to obtain approval to attend by their employer. In response to this change in the economic environment, the NEC has commissioned a team to develop a much needed financial analysis for the society that will strive to provide the NEC with the level of financial information that will allow us to remain financially sound while maximizing our opportunities to invest in improvements.

Over the last year, the entire NEC has dramatically increased their efforts to rise to the challenges faced by ASMR. I am personally very appreciative of the positive and professional way in which each of the NEC members has contributed to the success of the society. My interpretation of the environmental challenges that we all face, however, suggests that even greater efforts will be required of all of us in the future. ■

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Tales from the Pits, The Tale of the Crazy Client

This article is reprinted with permission from Crops & Soils, January-February 2011: "Tales from the Pits, The Tale of the Crazy Client." Thanks are extended to Dawn Ferris and James Giese, American Society of Agronomy, Madison, WI. — Jeff Skousen, Ed.

If you have been in the consulting business long enough, you have figured out that your clients come in many types of personalities; some even seem to have several personalities unto themselves. This is the tale of one such client that I was lucky enough to have—lucky in that his company gave me a lot of work, especially in doing wetland delineations for housing and retail development projects. I enjoyed working with this particular client and his very competent staff. He did, however, have a hard time keeping his staff around long term due to his temper.

I had worked for this client on many projects and had heard about the infamous temper, but I never experienced it myself. The project in question was a large retail development with one large "box" store, a series of strip malls, and stand-alone restaurants. Retail developments often come with a lot of pressure for the developer to fill out lease space on the strip malls once the big box owner is under contract and then to make sure that the development moves forward in a timely fashion to meet the lease agreements. This was a particularly difficult site, characterized by sandy soils interspersed with wetlands and very little topographic relief. Add to that the difficulty in determining seasonal high-water tables in the soil profile and dealing with storm water issues and the downstream impacts, etc., and we had a recipe for a lot of attention from the regulatory agencies.

To make a long story much shorter, I finished the wetland delineations and succeeded in getting the Corps of Engineers to agree with them after changing the site plans several times to minimize wetland impacts. However, due to the complexity of the site, the agencies also decided mitigation needed to be completed at a higher ratio than normal, which of course did not make the client happy, but he agreed to it.

Some of the mitigation could be accomplished on site, and the remainder would need to be located offsite, but within the same watershed. It was not necessarily a huge issue, but it still meant some extra time and financial considerations for the developer.

I got the permit applications together, and the agencies wanted a joint meeting to go over the details. The client, who almost always sent his staff to these meetings, decided to attend this one. These meetings are typically spent with the agencies questioning (sometimes to a great extent) the data in the permit applications. This was not an exception, and I was prepared since I had held numerous field meetings with agency personnel and could refer to items we viewed/changed in the field that they were familiar with.

After the meeting had been going for a while, it became apparent that the questions got to be too much for my client since he thought he had already given up enough to put the permit applications together. First he started interrupting the conversation and then got red in the face and started yelling at the agency representatives. And then, and I kid you not, he jumped up on his chair and then on the table to lecture the agencies about regulations. What a wonderful spot to be put in by your client! I knew these project applications were going to move forward, and I had told him that before we walked into the meeting. Unfortunately it was a day when I got my client's alternative personality—the one with the temper—when he decided that his project should not be further scrutinized or questioned. This was not the personality I needed to show up that day!

After I got over my shock that my client was actually standing on the conference room table, I saw that something needed

to be done—and quickly—or we were going to be shown the door and told to never come back. I managed to get my client's attention and asked the agencies to please excuse us. We left the room, and then it was my turn to advise my client in no uncertain terms that while I was going back in the room to finish the meeting, he was not. This wasn't done with any emotional investment; I was completely calm (someone had to be!). He had some very loud and choice words to express his opinion of that, but I finally told him that if he didn't back down, the agencies would never listen to a project pitch from his company again. And given how much land he was planning to develop, he may as well find himself a different state to set up business or go bankrupt. OK, maybe this was a bit on the extreme side, but it got his attention. He finally agreed to leave, but he was not at all happy about it.

I walked back into the conference room and politely told the people sitting there that my client was sincerely sorry for the outburst and that he had felt it better to not participate in the rest of the meeting. I'm not entirely convinced that anyone bought that story, but we continued the meeting, and the permit applications subsequently went through with minor changes/compromises.

The message of the tale this time is to be prepared for anything and then stay calm. Deal with your emotion to the issue later because the time or place to do that isn't in the middle of a crisis. Learn to defuse the situation, not add to it. In this case, I was able to intervene and remove the client from the situation (who was definitely not helping), I was able to restore confidence from the agencies, and the client saw that the job was completed with the agencies. ■

Dr. Richard (Dick) Barnhisel

First of all, I hope all of you will consider coming to Bismarck, ND, June 12-16. We expect a good turnout and there is an excellent program planned, as can be seen in the accompanying program. This includes workshops and pre- and post-conference field trips or tours. The post-conference field trip is primarily for the early career members.

The election of officers took place in December and I would like to introduce these persons.

President Elect – Dr. Bruce Buchanan is our new president-elect. Bruce began his career as a scientist at New Mexico State University in 1971 as an Assistant Professor of Forest Soils. Within a few years his research and consulting became centered on reclamation issues mostly in New Mexico. In 1991, he retired from NMSU, formed Buchanan Consultants, Ltd., and expanded his consulting experience to Arizona, Colorado, Montana, Texas, Utah, and Wyoming. His work has mainly focused on reclamation for both surface coal and hard rock mines. He was President of ASMR in 2000 and served as the local host for the meetings in Albuquerque NM in 2001.

The Two NEC Board Members – These are Mr. James (Jim) Luther and Dr. Pete Stahl, who will officially assume their duties at the meetings in Bismarck.

Jim Luther graduated with a B.S. degree in range management, specializing in rehabilitation of drastically disturbed rangelands, from the University of Wyoming in 1978. While attending college, he worked on coal and uranium permitting and reclamation projects during the summer months. His primary responsibilities while consulting included conducting baseline vegetative surveys in Wyoming and Colorado. In 1996 he went

to work for BHP Billiton's Navajo Mine and eventually worked at all three of their mines in New Mexico in the environmental department. As Manager of Health, Safety, and Environment at BHP Billiton, New Mexico Operations, he currently is responsible for the environmental and safety programs. Jim received the ASMR 2010 Reclamationist of the Year award.

Dr. Peter D. Stahl earned his B.S. from Oklahoma State University, and M.S. and Ph.D. degrees from the University of Wyoming. He was appointed to the Department of Renewable Resources at University of Wyoming in 2000. Pete's research activities include investigation of soil and ecosystem recovery on lands disturbed by resource extraction, and sustainability of different land management practices on western rangelands and forestlands. He teaches among other courses Reclamation of Drastically Disturbed Lands.

Newly-designed ASMR web page – If you haven't visited the web page you need to do so. The address is www.asmr.us the same as our old one, but this one is on a different server. All announcements such as available positions and items that were in our Newsletters will be placed on this site. You will find the Membership Directory there as well. One feature is the NEWS page. Items will be placed here usually on a weekly basis. There is an archive section on the bottom of the NEWS page where older announcements will be moved when additional space is needed. We have Karrie Bernard of OSM Pittsburgh Office to thank for the many hours she spent, as well as Lois Uranowski for lending her to ASMR for this valuable service to our Society. ■



Dr. Bruce Buchanan



Jim Luther



Dr. Peter D. Stahl



Abbey Foster Wick

There are many exciting Early Career events planned for the ASMR meeting in Bismarck. First, we'll be having our annual social event on Tuesday, June 14 at Peacock Alley American Grill and Bar in the historic Patterson Building, downtown Bismarck. This social provides an opportunity to get to know other Early Career professionals, several "established" members in the industry, consulting, academia, regulatory agencies, and those currently involved with the ASMR National Executive Committee. Through contributions of our members, we can again have a reduced rate for the social event...further demonstrating the support we're receiving as a group within ASMR.

We are also hosting a post-conference field tour to the Agricultural Research Service-Northern Great Plains Research Laboratory on June 16. Historically this station has conducted various mined land reclamation experiments, with current research geared towards cover crops, rangeland management, soil microbial dynamics, biofuel production, trace gas fluxes and carbon sequestration. This station has also been selected to serve as the Northern Plains domain of the National Ecological Observation Network (NEON), a NSF funded research initiative. The tour will provide a good opportunity to make valuable connections and discover new ideas and techniques to advance the research of our members. This field tour is designed for research-oriented Early Career professionals and due to sponsorships by the ARS as well as the Early Career fund, this event is going to be free of charge (but the trip is limited to 20 people, so make sure you register early). Additional information on these events is posted online (www.asmr.us) and will be provided in meeting registration packets. If you have any questions, please email me at afwick@vt.edu.

As a group, we continue to develop and provide opportunities for our members to connect with each other and to become more involved in the society. Solid connections within the society facilitate collaboration among researchers, reclamationists, consultants and regulators to advance reclamation science. As we continue to raise money for our group, we will provide additional opportunities outside of the annual meetings, with the ultimate goal of supporting the reclamation community throughout the year. In Bismarck, we will be talking more about the type of support we would like to provide in the future. If you are interested in this aspect of the Early Career group, please let me know. ■

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28th Annual Meeting of the American Society of Mining and Reclamation

Reclamation: Sciences Leading to Success

June 11 - 16, 2011, Best Western Ramkota Inn, Bismarck, ND (USA)

Advanced Program & Registration Information

The 28th Annual Meeting of the American Society of Mining and Reclamation is scheduled for the week of June 11-16, 2011 in Bismarck, North Dakota. The conference includes sessions designed to discuss important reclamation technologies to improve reclamation technology in the western United States. A

full-day workshop will be presented on June 14th entitled "Challenges of Bond Release for Western US Coal Mining" to give some insight from the viewpoints of mining companies, consultants and state agencies to the problems with obtaining final bond release at western coal mines.

Bond Release Workshop Program Committee

BKS Environmental Associates, Inc.

Dr. Brenda Schladweiler (307-686-0800)

BSchladweiler@bksenvironmental.com

U.S. Office of Surface Mining and Reclamation

Mr. Henry Austin (303-293-5019) HAustin@osmre.gov

Wyoming Department of Environmental Quality

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Reclamation Division**

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ASMR Program Committee

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American Society of Mining and Reclamation

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Office of Surface Mining and Reclamation

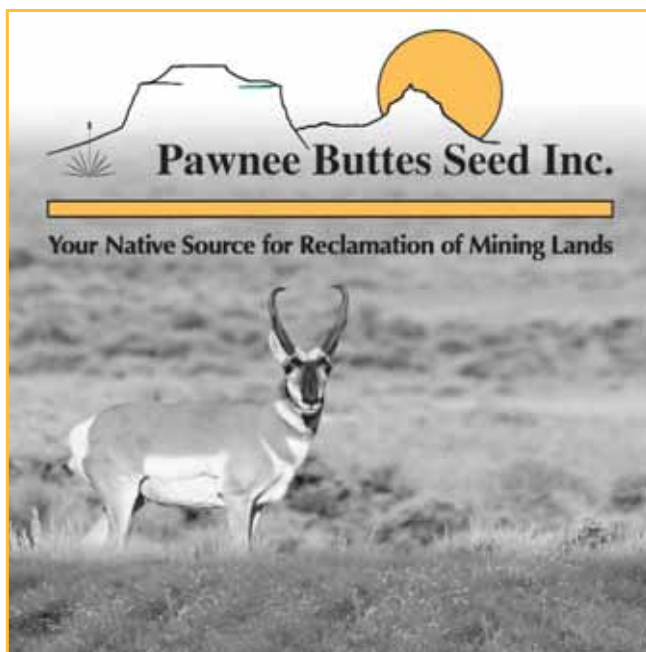
Mr. Henry Austin (303-293-5019)

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Travel and Lodging Information

Transportation

Bismarck, North Dakota is located near the center of North Dakota at the junction of Interstate 94 and U.S. Highway 83 and across the Missouri River from Mandan, North Dakota. The Bismarck Airport is served by three major carriers: Delta Airlines, United Express, and Allegiant Air. All vehicle rentals are available at the airport with the major national vendors.

The Best Western Ramkota Inn offers a complimentary shuttle service between the hotel and the airport. Courtesy phones for the shuttle are conveniently located near the baggage claim area or the hotel may be reached at 258-7700.

Other Travel Distances From Bismarck-Mandan (road miles)

- Denver - 700 miles
- Chicago - 850 miles
- Minneapolis - 430 miles
- Mount Rushmore, SD - 375 miles

Lodging and Meeting Venue

Best Western Ramkota Hotel
800 South Third Street
Bismarck, ND 58504

Reservations: 1-701-258-7700

(Reservations should be made under "ASMR," online hotel registration is not available at this time)

The Best Western Ramkota Hotel is located on the south end of Bismarck and will host all the Conference meetings, functions, and events. A block of rooms has been reserved for Conference participants at the rate of \$90/night (single, double, triple, or quad) plus sales tax (\$8.10). Also available are poolside rooms (\$125/night), executive suites (\$160/night), and whirlpool suites (\$200/night) plus sales tax (9%). **Government employees at prevailing Federal per diem rate is available with valid ID.**

Hotel services include free high speed internet access, complimentary coffee in all guest rooms, indoor water park, indoor fitness center, and complimentary parking at the hotel, plus much more. The hotel is conveniently located across the street from Kirkwood Mall, a large shopping center.

Other hotels within walking distance are shown below. **The Conference rate does not apply at these hotels.**

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2011 Conference Overview

SATURDAY — June 11, 2011

Pre-Conference Workshops

Workshop 1 RUSLE2

Pre-Conference Tours

Tour 1 Great Plains Synfuels Plant/ Freedom Mine tour, Beulah, ND

Tour 2 Abandoned Mine Land Reclamation/Wind Farm at Wilton, ND

Casino Night at Prairie Knights Casino (Dinner on your own at Feast of the Rock)

SUNDAY — June 12, 2011

ASMR NEC Meeting

Exhibitor Setup

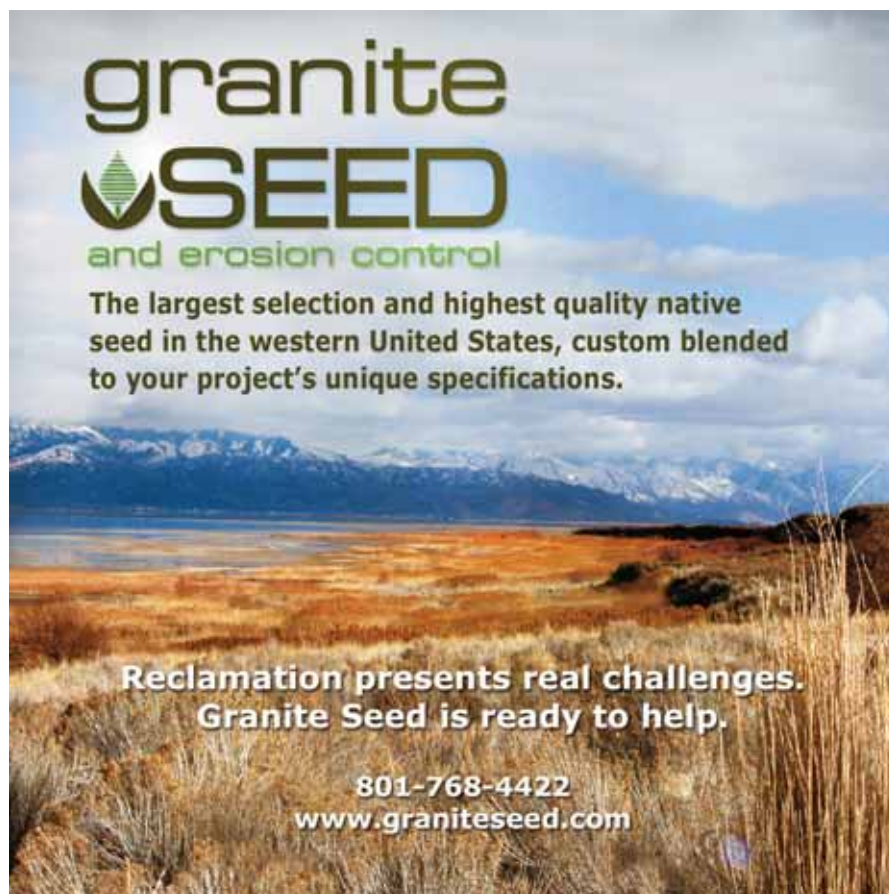
Poster Setup

Workshop 1 (cont) RUSLE2

Workshop 2 Improving Your Presentation

Tour 3 Lewis and Clark Museum/ Ft. Mandan, Washburn, ND

Welcome Reception (hors d'oeuvres & cash bar)



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MONDAY — June 13, 2011

- Continental Breakfast
- Welcoming Remarks
- Plenary Session — Various speakers
- ASMR Business Meeting
- Catered buffet luncheon
- Concurrent technical sessions
- Technical Division Meetings
- **Ft Lincoln Social Event**
Tours of the museum, Custer House,
etc., Pitchfork Fondue Dinner /
Entertainment

TUESDAY — June 14, 2011

- Continental Breakfast
- of Bond Release for Western
U.S. Coal Mining
- Catered buffet luncheon
- Poster Paper Judging
- Technical Division Meetings
- **Early Career Professional Social**

WEDNESDAY — June 15, 2011

- Continental Breakfast
- Concurrent technical sessions
- Catered buffet luncheon
- Western Regional Technology
Transfer Meeting
- Exhibitors teardown
- Technical Division Meetings
- Poster Paper Social
- **ASMR Awards Banquet**

THURSDAY — June 16, 2011

- Concurrent technical sessions
- ASMR NEC Meeting
- Poster Teardown
- **Tour 4 - Early Career Professionals
to Mandan ARS Lab**



Registration form of page 15



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Pre-Conference Workshops

WORKSHOP 1:

Title: Erosion Estimates for Mined Lands Using RUSLE 2

Date: Saturday, June 11, 9:00 AM to 5:00 PM

Sunday, June 12, 9:00 AM to 4:00 PM

Lead Instructor: Dr. Terry Toy

Number of Students: 10 (minimum) to 20 (maximum)

Cost: \$150.00

Description: The Revised Universal Soil Loss Equation, Version 2.0 (RUSLE 2), is the best practical method for soil-loss estimation for erosion control planning and plan evaluation for mined lands. RUSLE 2 has been updated and has been adapted for disturbed conditions including mine sites before and after reclamation. In this introductory course the student will receive a free copy of the RUSLE 2 program and course literature, learn where to find additional RUSLE 2 databases for their location, and how to tailor RUSLE 2 for erosion control planning and plan evaluations. The student will gain hands-on experience by loading the software onto a laptop computer and by working through several common erosion-control scenarios under the tutelage of the instructor. The NRCS has adopted the use of RUSLE 2 for conservation planning. Other federal agencies and several state regulatory agencies are also encouraging the use of RUSLE 2 for planning purposes. Students need to bring their own laptop computer.

WORKSHOP 2

Title: Communication and Presentation Improvement:
"Harness the Power of Words"

Date: Sunday, June 12, 9:00 AM to 4:00 PM

Lead Instructor: Mr. Adam Buchanan

Number of Students: 10 (minimum) to 25 (maximum)

Cost: \$50.00

Description: Refine your presenting skills by learning the dos and don'ts of public speaking and presenting information. Learn how to analyze your audience and be an efficient communicator. Learn PowerPoint skills to spice up your presentations without overloading the audience. Discuss the use of tables, fonts, text, graphics, etc. in slides.

Workshop focus points include organizing complicated information for easy digesting, avoiding distracting mannerisms, professional communication, improving office relations, and increasing efficiency. Get the most out of meetings and presentations. Obtain communication tools to cut the annoying stress out of your work life and overcome the fears of public speaking.

Poster Presentations

Posters will be on display from Monday, June 13th, through Wednesday, June 15th, in the Patterson Ballroom. Judging will be conducted on Tuesday, June 14th, and the poster social on Wednesday, June 15th.

Pre- and Post Conference Tours

TOUR 1

Title: Great Plains Synfuels Plant / Freedom Mine

Date: Saturday, June 11, Depart 8:00 AM - Return 4:00 PM

Attendance Limits: 30 (minimum) to 50 (maximum)

Cost: \$60/person (includes box lunch plus drink)

Description: Located 5 miles northwest of Beulah, North Dakota, the Great Plains Synfuels Plant is a massive complex of pipes, towers, and buildings on the rolling North Dakota prairie. The plant began operating in 1984 and today produces more than 145 million cubic feet of natural gas per day from approximately 18,000 tons of lignite supplied daily by The Coteau Properties Company's Freedom Mine located nearby. Other products produced that help to enrich the environment include ammonium sulfate and anhydrous ammonia fertilizers, phenol for resins in plywood production, naphtha for gasoline blend stocks, and krypton and xenon gases for the nation's lighting industry plus more. In addition, carbon dioxide captured during the process is sent via pipeline to Canadian oil fields for enhanced oil production.

The Coteau Properties Company's Freedom Mine began operating in 1983 and is located next to the Great Plains Synfuels Plant. This is the largest lignite mine in the United States in deliveries, supplying over 14 million tons of lignite per year. The mine supplies lignite not only to the synfuels plant but also to two power plants. The tour will include reclaimed wetlands and a reclaimed lake used for recreation, among other sites. Attendees should bring steel-toed boots.

TOUR 2

Title: Abandoned Mine Land Reclamation / Wind Farm Tour

Date: Saturday, June 11th, Depart 8:00 AM - Return Noon

Attendance Limits: 10 (minimum) to 20 (maximum)

Cost: No Charge

Description: Take a 20-mile trip north of Bismarck to Wilton to see the results of some reclamation of dangerous highwalls left from previous mining activities. Now reclaimed, these sites can be used for recreational purposes with little or no danger to the public as compared to their pre-reclamation state.

Once the AML tour is completed, the group will take a short drive to the Florida Power & Light / Next Era Company's shop building and get a tour of the monitoring system used to keep watch over the nearby wind farm. Once the tour of the shop is completed, the group will travel up close and personal with an operating wind tower. The tour will conclude back at the hotel around lunch time.

TOUR 3

Title: Lewis and Clark Interpretive Center / Ft. Mandan

Date: Sunday, June 12th, Depart 12:30 PM - Return by 5:00 PM

Attendance Limits: 10 (minimum) to 20 (maximum)

Cost: \$6.00/person (Center admittance fee)

Description: Step back into the time when Lewis and Clark were exploring the upper reaches of the Missouri River. *The multi-million dollar center was constructed with a cement/fly ash mixture used in the interior and exterior walls, plus even the floors and ceiling tiles have some fly ash in them. The fly ash came from the Coal Creek Station power plant several miles north.* The Center is filled with rare artifacts, displays, and interactive wonders. The gallery houses some of the rare works of Swiss artist Karl Bodmer, plus a wing dedicated to the story of Fort Clark. From the Center you will travel to Ft. Mandan which has been authentically reconstructed just like it was when Lewis and Clark were there. The guard posts, blacksmith shop, and even a primitive recreation room bring back the feeling that must have been present during the expedition.

TOUR 4

Title: Early Career Prof. USDA/ARS Northern Great Plains Research Lab

Date: Thursday, June 16th, Depart 1:00 PM - Return after 5:00 PM

Attendance Limits: 10 (minimum) to 20 (maximum)

Cost: No Charge

Contact: Abbey Wick (afwick@vt.edu; 540-231-0793)

Description: Meet the scientists and learn more about the latest research at the Agricultural Research Service-Northern Great Plains Research Laboratory located in Mandan, ND. Historically this station has conducted various mined land reclamation experiments, with current research geared towards cover crops, rangeland management, soil microbial dynamics, biofuel production, trace gas fluxes and carbon sequestration. This station has also been selected to serve as the Northern Plains domain of the National Ecological Observation Network (NEON), a NSF funded research initiative. Take this opportunity to make valuable connections and discover new ideas and techniques to advance your research! This field tour is designed for research-oriented Early Career Professionals.

Please dress appropriately to tour field sites (i.e. tennis shoes/boots, sun block, hat etc.). Water and BBQ for light lunch or supper provided.

For more information on the ARS-NGRPL, visit: <http://www.mandan.ars.usda.gov>

For more information about NEON, visit: <http://www.neoninc.org/>

Social Events

Saturday, June 11th

Casino Night at Prairie Knights Casino & Resort

Time: Leave at 5:00 PM - Return 11:00 PM

Cost: \$30/person

Attendance Limits: 30 (minimum) to 50 (maximum)

Description: Come join us for a relaxing evening at the casino.

After a scenic 40-mile bus ride, we will arrive at the casino where each guest will receive a Prairie Package blue coupon book containing a 20% off gift shop discount coupon, a coin voucher for \$10, one (1) \$2 Feast of the Rock Buffet coupon, one (1) \$3 match-play table game voucher, two (2) monthly prize drawing entries, and 1000 Club 7 bonus points. After a sumptuous meal at the Feast of the Rock, you can enjoy games of chance for several hours. Or, depending on the entertainment booked for the evening (not known at this time), you may enjoy an evening of entertainment in the Pavilion. Thus for a net cost of \$18 you may enjoy the hospitality of the Prairie Knights Casino & Resort.

Sunday, June 12th

Welcome Reception

Time: 6:00 PM - 8:00 PM

Description: This no-host affair, open to all attendees and their spouses, will be held in the Patterson Ballroom at the Ramkota Hotel. Hors d'oeuvres and a cash bar will be available for your enjoyment. Come and sit and chat with friends and colleagues that you have not seen for a while and catch up on old times. Or, mingle and meet new people with similar interests. The exhibitors and posters areas will be open also for visiting.

Monday, June 13th

Ft. Lincoln Social Event

Time: 5:00 PM - 10:00 PM

Cost: \$55/person

Attendance Limits: 50 (minimum) to 150 (maximum)

Description: Come join us as we take a trip back in time to a place well known among history buffs. We will travel to Fort Abraham Lincoln, just south of Mandan, ND from where General George Armstrong Custer and his 7th Cavalry left on their journey to the Yellowstone country and the Battle of the Little Bighorn. The cost includes all the entrance fees for the museum, the Commissary Storehouse, block houses, and the Custer House. The On-A-Slant Village has replicas of rebuilt Mandan Indian earthlodges on the site of an ancient village. The museum houses one of the nation's best display of the Mandan Indians, exhibits on Lewis & Clark and General Custer artifacts. The old Commissary Store stored rations for Fort Lincoln while the rebuilt Commissary has a gift shop and bookstore in the visitor's center. The hill above Fort Abraham Lincoln provides a great view of the Missouri River Valley.

Once done with the touring, we will feast upon a pitch-fork fondue supper at 7:00 PM consisting of a top sirloin steak, ranch fries, coleslaw and baked beans, garlic toast, and watermelon slices. Coffee and lemonade will be available to drink. Because of the restrictions placed upon having alcoholic beverages in the state park, none will be served. Following supper we will be entertained by a local folk musician as we enjoy the picturesque setting of the park and the fellowship of friends, both old and new.

Tuesday, June 14th

ASMR Early Career Professionals' Social

Time: 6:00 PM - 11:00 PM

Cost: \$15/ticket (includes transportation)

Location: Peacock Alley

Contact: Abbey Wick (afwick@vt.edu; 540-231-0793)

Description: Spend a night on the town with fellow Early Career Professionals on Tuesday, June 14 from 6-11 pm. This is an opportunity to get to know other members and non-members attending the meeting in a less formal setting. The event will be held at Peacock Alley American Grill and Bar in the historic Patterson Building, downtown Bismarck (<http://www.peacock-alley.com/>). Transportation to and from the event, a couple of drinks and heavy appetizers are included in the ticket price of \$15. This is a sponsored event, so you will also have a chance to meet several "established" members in the industry, consulting, academia, regulatory agencies, as well as those currently involved with the ASMR NEC. This event is geared toward those attending the meeting who are: (1) new to ASMR, (2) in a reclamation career for fewer than 10 yrs, (3) new faculty at a university, and (4) graduate students. **You must be 21 or older to attend the event.**

Wednesday, June 15th

ASMR Awards Banquet

Time: 7:00 PM - 9:00 PM

Location: Grand Pacific Ballroom

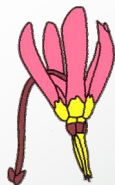
Cost: Included in the registration fee

Catered Events

All meal functions, except for the Awards Dinner, will be held in the Patterson Ballroom. Continental breakfast will be served Monday through Wednesday from 6:30 AM to 8:00 AM. Morning and afternoon breaks will have coffee, sodas, water, and snacks available. Lunches will be buffet style at noon Monday through Wednesday. If the meeting runs into Thursday, a continental breakfast and mid-morning break will also be served in the Patterson Ballroom. The cost of these events has been included in the registration fee.

Silent Auction

Be sure to remember to bring items that we use for our silent auction to bolster our Student Travel Grant fund. Bidding will begin on Monday and run through Wednesday afternoon. Bring items to the ASMR Exhibit Booth # 23.



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REGISTRATION FORM

In order to facilitate transportation, lodging, meal functions, and meeting room needs for the Conference, the Program Committee strongly encourages pre-registering for the Conference. Costs for registration, the various workshops and tours, plus other events are listed below.

Name _____ Company/Affiliation _____
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GENERAL AND TECHNICAL SESSIONS

	Number	Total
Monday-Thursday, June 13-16, 2011 Pre-registration (until May 9, 2011)	_____	\$ _____
Late Registration (after May 9, 2011)	_____	\$ _____
One Day Registration (Check Day) [] Monday [] Tuesday [] Wednesday	_____	\$ _____
Student Registration (Submit copy of student ID with the registration form)	_____	\$ _____

WORKSHOPS

	Number	Total
1. RUSLE2 - All day Saturday and Sunday, June 11 and 12	_____	\$ _____
2. Improving Your Presentation Sunday, June 12, 9 AM - 4 PM	_____	\$ _____

TOURS

(First Come, First Served)

	Number	Total
1. Great Plains Synfuels Plant / Freedom Mine	_____	\$ _____
Saturday, June 11, 8 AM - 4 PM (Box lunch and drink included) <u>Minimum 30 to Maximum 50</u>		
2. Abandoned Mine Land Reclamation / Wind farm	_____	\$ _____
Saturday, June 11, 8 AM - Noon <u>Minimum 10 to Maximum 20</u>		
3. Lewis and Clark Interpretive Center / Ft Mandan	_____	\$ _____
Sunday, June 12, 12:30 PM - 5:00 PM Entrance fee of \$6/person at museum <u>Minimum 10 to Maximum 20</u>		
4. Early Career Professionals USDA/ARS Northern Great Plains Laboratory	_____	\$ _____
Thursday, June 16, Time TBD <u>Minimum 10 to Maximum 20</u>		

OTHER FUNCTIONS

	Number	Total
1. Casino Night at Prairie Knights Casino & Resort	_____	\$ _____
Saturday, June 11, 5 PM - 11 PM <u>Minimum 30 to Maximum 40</u>		
2. Ft. Lincoln Social (Tours, pitch-fork steak fondue, music, transportation included)		
Monday, June 13, 4:30 PM - 10:00 PM <u>Minimum 50 to Maximum 150</u>		
3. Early Career Professionals' Social (2 drinks, appetizers, transportation)	_____	\$ _____
Tuesday, June 14, 6 PM - 11 PM <u>Minimum 50 to Maximum 150</u>		
4. ASMR Awards Banquet		
Wednesday, June 15 (free for all Conference registrants) I plan on attending [] Yes [] No		
Number of guests attending	_____	\$ _____

SUBTOTAL REGISTRATION AMOUNT (US DOLLARS) \$ _____

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Badger State Pioneers Mine Reclamation

By James Ludwig, Ph.D., Thomas Hunt, Ph.D., and Jack Broughton, Applied Ecological Services, Inc.



1966 – mine before restoration



2005 – after restoration.

Despite the image of its university mascot, Wisconsin's "Badgers" were not named for the ferocious burrowing weasel of the prairies. Rather, the state's nickname refers to its infamous miners who burrowed underground in the lead-zinc mines during the 1800s and early 1900s. In fact, the state's seal even shows a neat pile of lead ingots at the feet of a miner.

The storied tradition of mining in Wisconsin has led to a parallel evolution in mine reclamation techniques, beginning in the mid '70s with the passage of a landmark revision to the state's metallic mining code. Strict mine planning and operation requirements were established in response to the discovery of numerous metallic sulfide mine deposits in the Canadian Shield bedrock of the northern highland areas of Wisconsin. Wisconsin's mine reclamation standards have since been updated several times, in order to protect ground and surface water quality through proper construction of mining waste containment areas and long-term management requirements. One of these requirements was the use of native vegetation species for reclamation.

The net effect of the regulatory changes was to force the innovation of reclamation techniques. Early applications of these techniques were implemented in the late '70s at the Jackson County Iron Mine near Black River Falls, at two large groups of abandoned sites in the southwest lead-zinc district and in the underground red ore iron mining districts of northern Wisconsin.

Although more mining activity was anticipated, the Jackson County mine was the only active metallic mine in Wisconsin at the time. However, several orphaned lead-zinc mine and smelter sites had existed for years as acute sources of acid mine drainage and heavy metal pollution. Tailings piles at several sites were se-

rious sources of dust and air particulates which, in drier parts of the year, spread metallic pollutants off-site to adjacent farms and streams.

After repeated attempts to revegetate these sites with traditional reclamation strategies, Applied Ecological Services, Inc. (AES), was brought in to develop new techniques to stabilize many of these tailings piles. Using both hydroseeding and new native species seed drilling techniques, AES was able to successfully stabilize four of these sites with initial plantings of the more aggressive agronomic species, followed by a diversification using native prairie species.

Several experimental native species plantings were only qualified successes, but these provided a great deal of experimental data experience. For example, AES discovered that on these dry sites, warm season grasses grew well, but forbs required the presence of the native grasses to survive.

"Regulatory agencies were motivating the use of native plants in reclamation, and we learned that this initially appeared in conflict with quick stabilization," said Steven Apfelbaum, AES research and consulting ecologist. "However, our study provided the basis for a reclamation approach that involves a layered planting, and this has subsequently worked well on dozens of difficult project sites. Initial layers ameliorate and stabilize inhospitable, soil-less site conditions, and follow-up layers provide long-term native plant cover and structure.

"Discovering and perfecting this technique has saved thousands of dollars on many of our projects," Apfelbaum said. "Direct planting of natives may cost many times that of a typical



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'highway grass' mix, but this layered approach has brought most native plantings to a comparable cost level. Long-term, it has saved considerable funds by reducing the need for growing season management such as fertilizer, weed control or mowing that is often needed on sites planted with highway mixes."

Jackson County Iron Mine

Major successes with native species were realized at the Jackson County Iron Mine where AES began experimenting with native prairie species and with live-staking brushy species on tailings. AES restored the site's 312-acre tailings basin to a dry prairie community by seeding directly into the tailings. Nearly 620 acres of the waste rock dumps were shaped and hydroseeded with native species.

In all, 1,340 acres were restored to native prairie, making the former mine site the largest prairie restoration in the state of Wisconsin. The restoration plan allowed for gap phase invasion by native plants from the surrounding pine/oak barrens. And, in fact, the restoration has proven so attractive that the site has been transferred to county ownership and developed into the highly popular Lake Wazee recreational area which fills a need for high quality, water-based recreation in an area with few natural lakes.

The old mine pit is now a 114-acre, 385-foot deep lake with a productive trout fishery, a premier scuba diver training site and

swimming beaches, surrounded by hiking trails and wildlife areas on the restored mine.

Flambeau Mine Reclamation

More recently, the Flambeau Mine, an open pit copper mine near Ladysmith, Wisconsin, has become the only surface mine in decades that has been permitted, reclaimed and been given its Certificate of Completion by the Wisconsin Department of Natural Resources.

Following a rigorous permitting process, Flambeau Mining Co. was issued eleven permits to begin operation in 1993. The site, containing a small but relatively rich copper and precious metal deposit, was located near the edge of the Flambeau River, a popular fishing and canoeing stream. This proximity to the Flambeau River and concerns regarding groundwater protection had resulted in intense scrutiny of the project by the company, regulators, and environmental groups for nearly 20 years.

Once permitted, the mineral deposit was mined in slightly over four years, and AES was retained to refine the general reclamation plans that had been developed prior to Flambeau receiving its permits. Detailed reclamation plans and specifications were approved by the Wisconsin Department of Natural Resources, and Flambeau contracted with AES to conduct the installation, management and monitoring of the reclamation.

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At the Flambeau Mine, unlike all previous surface mines in Wisconsin, the waste rock excavated to reach the ore deposits was not disposed of in mining dumps. Rather, the waste rock was temporarily stockpiled within the 181-acre mine site in engineered areas that included impervious plastic liners and water treatment systems to minimize impacts to the environment. The waste rock was mixed with limestone and returned to the 34-acre open pit during closure. The limestone amendments buffered the groundwater, creating a neutral environment. Over five million cubic yards of stockpiled waste rock and soils, and over 35,000 tons of limestone, were backfilled into the 220-foot deep pit.

AES planted the site in various zones after the surface was reshaped to the gently rolling topography that existed before mining. Five small wetlands that existed previous to mining were replaced with a single 8.5-acre wetland. Watercourses and drainage were reestablished, meandered and live-staked with woody vegetation to mimic the original drainage of the site.

Most of the 181-acre mine site was restored to native prairie, woodland, savanna, wetlands and watercourses. Many innovative techniques, such as meandering watercourses, stream stabilizations with local rock, live stakes, and wetland biofilters, were designed and built for effective, high quality management of stormwater runoff.

Annual monitoring determined that the surface water quality exceeded permit requirements, vegetation systems were established to permit standards, and a Certificate of Completion was issued in 2007. In 2007, the Flambeau Mining Company also received the prestigious Wisconsin Business Friend of the Environment Award from Wisconsin Manufacturers & Commerce, an award annually bestowed on a select few Wisconsin companies that play a vital role in protecting the environment.

"We are proud of the reclaimed Flambeau Mine site, its strong environmental record and the fact that the site is a good example of how mining can and has been done in a responsible and successful manner," says Jana Murphy, environmental and reclamation manager.

Conclusions

During the evolution of mine reclamation in Wisconsin, the learning curve has been steep. However, the challenging opportunity to develop and test new reclamation strategies dominated by native species has brought its rewards. The Jackson County Iron Mine is now a valued recreational public park. The lead-zinc tailings piles in southwestern Wisconsin no longer pose a public health threat to local residents. And the Flambeau mine reclamation has become one of the most successful mine closures ever undertaken. It, too, now serves as a parkland for area residents' birding, hiking and cross-country skiing pleasure.

For more information, contact Jack Broughton, Applied Ecological Services, (608)897-8641, e-mail: jack.broughton@appliedeco.com, web site: www.appliedeco.com. ■



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Lime Slurry for Acid Mine Drainage Treatment

By Wendy Chevalier, W.K. Merriman

WK. Merriman, Inc. has been supplying cost effective, innovative alkalis to the steel, food, and power industries for over twenty years. In 2006, we began supplying the coal industry with manufactured lime slurry (calcium hydroxide) to both abandoned and active mine sites for pH adjustment and metals removal. Calcium hydroxide slurry is a low cost source of hydroxide alkalinity and has a proven track record of stable pricing. Price stability means that our customers can establish and manage operating budgets, both short and long-term.

Lime Slurry is easy-to-use and has high versatility. The use of this product can result in significant savings, in addition to increased performance and safety. To provide a low cost product, terminals are located in strategic locations from the Mississippi River to the East Coast, and the slurry is manufactured to specifications maintaining the solids between 30-40%. Our manufactured lime slurry is ready to use, easy to feed, monitor,

and control due to user-friendly product properties. Storage and feed systems are simple – an agitated tank is all that is required (Picture 1). Feed of lime slurry is reliable and no problems occur from bridged silos, plugged feeds, or fugitive dust, which are sometimes associated with hydrated lime or calcium oxide (Pictures 2-4). Associated maintenance costs, manpower, and processing time are significantly reduced equaling greater savings.

The following four steps help to ensure an improved wastewater treatment system:

Assessment: On-site surveys are conducted to fully understand the neutralization system including retention time, metal concentrations, and discharge limits.

Comparison: Laboratory testing helps to provide recommendations for the most cost-effective alternative.



Picture 1. Agitation tank for producing lime slurry at a trial unit.



Picture 2. Lime slurry being dispensed into acid mine drainage.



Picture 3. Lime slurry is dispensed in the upper center of the picture and water color changes rapidly due to pH adjustment.



Picture 4. Lime slurry treatment results in efficient metals removal in settling ponds.

Trial: Plant trials are arranged on any scale from totes to full truckloads.

Conversion: Once the benefits are determined, a plan is developed for a full-scale conversion to provide prompt deliveries, quality service, and ongoing technical assistance.

Water treatment systems at many active and inactive coal mines have been converted to lime slurry. After switching from caustic soda to lime slurry, a facility in West Virginia has seen not only cost savings, but also improved water quality in their

ponds. At another mine site in West Virginia, we documented cost savings and increased metals removal in their discharge after just one week. Another facility in Pennsylvania has improved their water quality by reducing TDS levels in their discharge.

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Comparing Total Dissolved Solids, Conductivity, and Major Ions as Potential Aquatic Life Stressors in Appalachian Coalfield Streams

By Anthony Timpano, Research Associate, Virginia Water Resources Research Center, Virginia Tech.

Carl Zipper, Associate Professor, Crop and Soil Environmental Sciences, Virginia Tech.

Stephen Schoenholtz, Director, Virginia Water Resources Research Center, Virginia Tech.

David Soucek, Ecotoxicologist, Illinois Natural History Survey.

Introduction

Total dissolved solids (TDS) are often elevated in streams below Appalachian coal mines. Most TDS originate from the natural dissolution of rocks and minerals that occurs when they are exposed to physical and chemical weathering processes. Pond and others (2008) found that benthic macroinvertebrate communities in streams below coal surface mine hollow fills differed from those present in unmined reference watersheds. The greatest differences in macroinvertebrate communities occurred in streams with highest specific conductance (SC), a water measurement that corresponds with TDS. The Clean Water Act requires that streams be able to support aquatic life. Thus, US EPA is applying new procedures in its evaluation of mine permits, intending to limit SC (and thus, TDS) in waters affected by Appalachian coal mines. Consequently, elevated TDS in streams has become a critical issue for the coal industry and for its regulating agencies.

We have been conducting research to better understand the relationship between benthic macroinvertebrate community composition and elevated TDS in central Appalachian coalfield streams. Our research questions include:

1. What is the ionic composition of TDS in headwater streams (unmined) of Virginia's Central Appalachian coalfield region?
2. How does benthic macroinvertebrate community composition respond to a gradient of TDS/ion concentration?
3. Which measure of water quality – aggregate measures or individual ions – is most related to macroinvertebrate community composition?

Research Methods

Our research is in Virginia's southwestern coalfields, which have geology and other characteristics similar to coal-bearing areas of eastern Kentucky and southern West Virginia. We identified 17 "test sites," streams where TDS concentrations were elevated, but other stressors to benthic macroinvertebrate communities were not evident. These streams had favorable water chemistry – except for TDS – and excellent habitat. They also lacked areas with residential homes, agriculture, industrial impacts other

than active or legacy coal mines, road crossings, or other impacts with potential to have negative influence on benthic macroinvertebrates. We also identified three reference sites which were minimally disturbed and low in TDS.

At each study site, benthic macroinvertebrates and water quality were sampled in March-May, 2009, using the single-habitat approach. Approximately 2 m² of riffle substrate were sampled using a D-frame kicknet. A single composite sample was collected at each site, preserved, and returned to the laboratory for sorting and identification. Habitat quality was assessed using Rapid Bioassessment Protocol (RBP) methods (Barbour and others 1999).

Temperature, dissolved oxygen, specific conductance, and pH were measured with a handheld meter. Water samples were collected in acid-rinsed bottles, and sub-samples of each were filtered in the field. Sub-samples for metals analysis were preserved with nitric acid. All samples were transported on ice and stored at 4° C. All biological and water samples were collected at base flow.

In the laboratory, each benthic macroinvertebrate sample was sub-sampled to obtain a 200 (±10%) organism count following RBP methods. Organisms were identified to the lowest practicable taxonomic level. Numerous metrics of benthic macroinvertebrate community composition (biotic metrics) were calculated, including measures of the sensitive taxonomic groups Ephemeroptera (mayflies, E), Plecoptera (stoneflies, P), and Trichoptera (caddisflies, T). Water samples were analyzed to measure dissolved major ions (Ca²⁺, Mg²⁺, K⁺, Na⁺, Cl⁻, SO₄²⁻ and CO₃²⁻/HCO₃⁻), metals (Cu, Zn, Mn, Se, Al, Fe), and TDS using APHA (1998) methods. Data were analyzed for correlation between measured water parameters and biological metrics, with non-normal metrics log-transformed prior to analysis.

Results and Discussion

Test streams were comparable to the reference streams in all respects except TDS. Habitat quality scores for all test sites were >85% of reference (Figure 1). Dissolved oxygen and pH were at favorable levels for all sites. Dissolved metals were below method detection limits for most samples.



Figure 1. Example reference (left) and test (right) sites in the Central Appalachian coalfields of Virginia. Reference sites are minimally disturbed; test sites were selected to resemble reference sites in all respects excepting TDS concentrations.

Among test sites, SO_4^{2-} was the most common ion based on mass, followed by HCO_3^- and Ca^{2+} (Figure 2). Ion composition generally conformed to this pattern across test sites (Figure 3). TDS, SC, and principal major ion concentrations were highly correlated (Table 1).

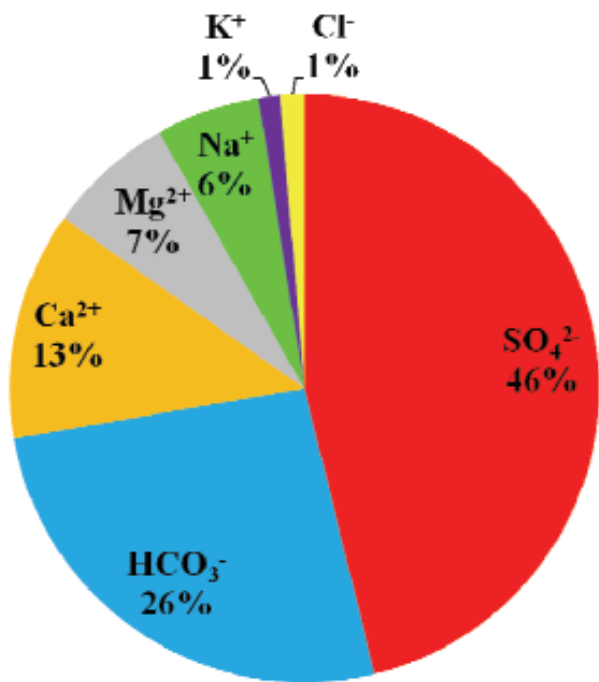


Figure 2. Mean relative proportions, by mass, of major ions at test sites.

The major ions Ca^{2+} , SO_4^{2-} , and Mg^{2+} were correlated with several biological metrics more strongly than TDS or conductivity (Table 2), but HCO_3^- and Na^+ were not significantly correlated with any biological metrics. Sulfate was the dominant ion in nearly all samples (Figures 2 and 3); its concentrations were

strongly correlated with Ca^{2+} and Mg^{2+} . Sulfate has been used as an indicator of mining activity (Pond and others, 2008). These findings suggest that SO_4^{2-} concentrations may be a suitable candidate for prediction of aquatic life condition in mining-influenced streams, although this preliminary finding is subject to further study.

TDS and related measures were most strongly correlated with biotic metrics involving sensitive groups of aquatic insects (E, P, and T, and combined EPT). This result echoes findings of other studies that also observed correlations of elevated TDS with reduced EPT taxa richness (e.g., Pond and others, 2008; Green and others, 2000).

We did not observe the Percent E (mayflies) metric to be correlated with any chemical variables, including TDS (Figure 4). Other studies of mining-influenced streams have observed negative correlations between relative abundance of mayflies and TDS or conductivity. In our data, mayfly richness (Number of E Taxa) was negatively correlated with TDS and related measures. As TDS increased across our study sites, the benthic macroinvertebrate community shifted to fewer mayfly taxa.

The benthic macroinvertebrate community metrics most strongly correlated with TDS and related parameters were measures of richness, or numbers of taxa present. Although family-level community richness declined with increasing TDS, relative abundance was less affected.

Conclusions

We were successful in locating mining-influenced stream reaches with elevated TDS that exhibited minimal influence from non-TDS stressors. Thus, we interpret our data as representing the influence of dissolved ions on benthic macroinvertebrate community composition.

The TDS in waters we sampled was dominated by SO_4^{2-} , HCO_3^- , Ca^{2+} by mass. Bicarbonate was not significantly correlated with any biotic metric. Sulfate was the water quality parameter

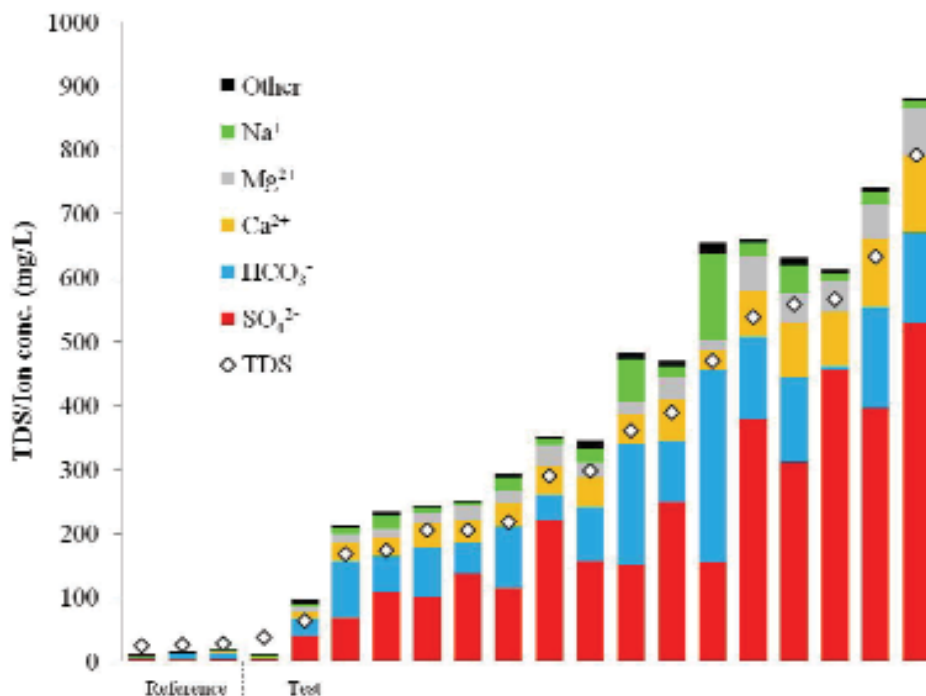


Figure 3. TDS and major component ion concentrations for all study sites.

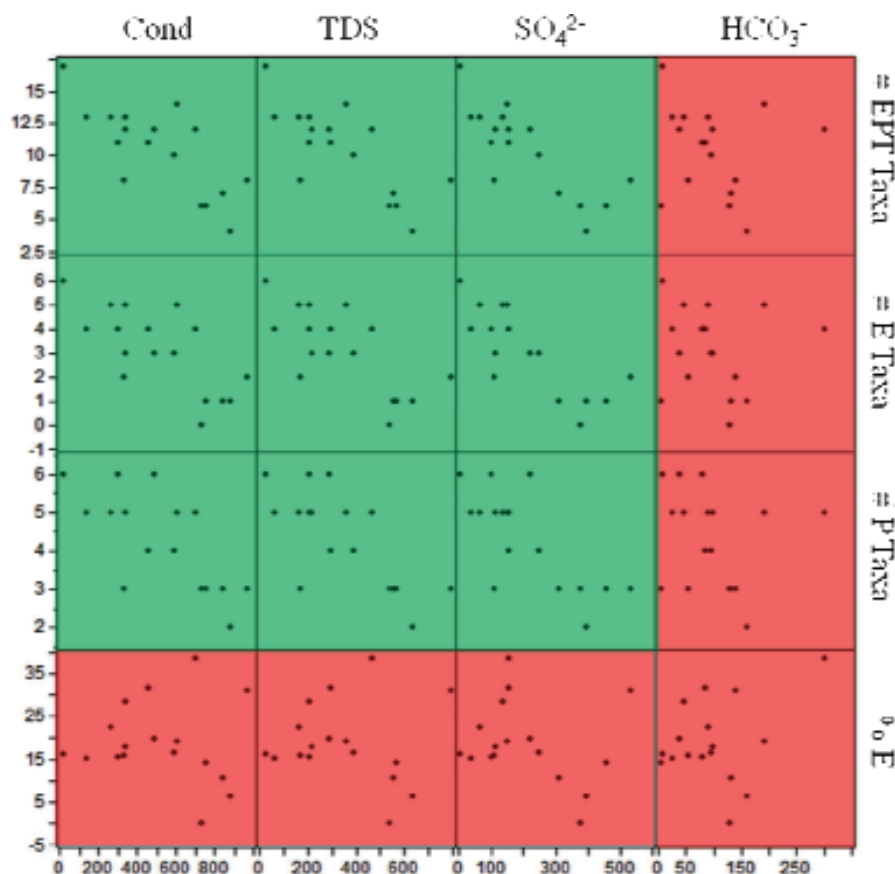


Figure 4. Scatter plot matrix of select chemical and biological parameters (test sites only, $n=17$). Units are mg/L except conductivity ($\mu\text{S}/\text{cm}$). All correlations are significant ($p < 0.05$) except those involving bicarbonate (HCO_3^-) and Percent Ephemeroptera (% E), which are not significant.

most highly correlated with biotic metrics. For these reasons, we suggest consideration of SO_4^{2-} concentration as a candidate for use as a single-parameter predictor of biological condition.

Biotic metrics that exhibited a significant negative correlation with TDS/ions were those of family-level community richness, especially those measuring richness of the generally sensitive insect orders of Ephemeroptera, Plecoptera, and Trichoptera (EPT).

These preliminary findings are an initial report from a larger study of relationships between TDS and biotic community composition that took place over a two-year period, extending from Fall 2008 through Spring 2010 (Timpano 2011). This article is a condensed version of research previously published as Timpano and others (2010).

Acknowledgements

This research was supported by Virginia Department of Environmental Quality, Virginia Department of Mines, Minerals, and Energy, and Powell River Project. The authors thank property owners and mine permittees for providing access to study sites. We also thank Jackie Carl, Amanda Eakins, Robert Northington, Trip Krenz, Mindy Forsyth, Caleb Parks, and Autumn Timpano for their invaluable assistance.

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Table 1. Coefficients of correlation for major ions, total dissolved solids (TDS), and conductivity (Cond) for the 17 test sites. All correlations shown are significant ($p < 0.05$).

	Ca ²⁺	SO ₄ ²⁻	TDS	Cond.	Mg ²⁺	K ⁺
SO ₄ ²⁻	0.96					
TDS	0.94	0.94				
Cond.	0.92	0.9	0.98			
Mg ²⁺	0.96	0.98	0.92	0.87		
K ⁺	0.76	0.7	0.85	0.87	0.69	
HCO ₃ ⁻		0.5	0.56			0.68

Table 2. Coefficients of correlation for biological metrics and water quality parameters (test sites only, n=17). All correlations are significant ($p < 0.05$).

Metric	Ca ²⁺	SO ₄ ²⁻	Mg ²⁺	TDS	Cond.	K ⁺
Number of EPT Taxa	-0.81	-0.81	-0.79	-0.76	-0.76	-0.64
Number of E Taxa	-0.75	-0.79	-0.77	-0.71	-0.71	-0.59
Number of P Taxa	-0.78	-0.75	-0.73	-0.72	-0.72	-0.6
Percent 5 Dominant Taxa	0.75	0.71	0.71	0.64	0.62	0.52
Number of Collector Taxa	-0.66	-0.71	-0.71	-0.61	-0.58	-0.55
Number of Taxa	-0.63	-0.56	-0.57	-0.5	-0.49	
Number of T Taxa	-0.52					

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Highwall Reclamation on the

Kelley Estate in Clinton County, Pennsylvania

By Jennifer Demchak and Michelle Merrow

Aerial photo of the Kelley Estate after reclamation. Photo by BAMR.

Introduction

There are approximately 200,000 acres of abandoned mine lands (AML) throughout Pennsylvania, including 252 miles of unreclaimed and dangerous highwalls and thousands of acres of mine spoil piles. In addition to impacts to health and safety, highwalls and spoil areas show lack of vegetative growth, impacts to wildlife, and adverse effects on both surface and groundwater quality. Through grant programs and successful partnerships, these AML lands can be restored to viable land uses, while at the same time improving water quality. The highwall reclamation project on the Kelley Estate (SGL-321) is a showcase of how cooperation from government agencies, non-profit groups and independent contractors can succeed in restoring our damaged lands.

The Kelley Estate, located in West Keating Township, Clinton County, was originally purchased by the Rocky Mountain Elk Foundation (RMEF) in 1997 with the intention to protect the 4042-acre tract of natural resources for the benefit of wildlife and humans alike. In 2001 the RMEF sold the Kelley Estate Property to the Commonwealth of Pennsylvania. Of the 4042 acres of the Kelley Estate, 3194 acres were purchased by the Pennsylvania Game Commission (PGC) and are being managed as State Game Land #321. The remaining 848 acres, which includes over one mile of river frontage along the West Branch of the Susquehanna River, is being managed as "Old Growth Forest" in the Sproul State Forest by the Department of Conservation and Natural Resources. Both parcels are open to the public for recreational activities.

RMEF initially became interested in this property as it showed the potential habitat for the relocation and establishment of an elk herd to this area. Through a partnership with the PGC, the site was used as an elk herd release in 2000, when 18 elk were trapped and relocated to the Kelley Estate. The elk are beginning to establish themselves and take residency on the property, along with expanding to the local Pottersdale area. It was believed that a restored Kelley Estate would someday offer an opportunity to experience wildlife viewing in a setting that resembles that of a mountain meadow in a western State.

Project Overview

A key to the protection of the natural resources and the encouragement of wildlife success on the Kelley Estate relies on restoration efforts to mitigate past mining activities. A Pennsylvania Growing Greener grant was awarded to the RMEF in 2002 to develop a restoration plan. Assessment efforts identified mine drainage discharges, along with highwall and spoil areas that needed to be mitigated. Historical research showed that the Kelley Estate was initially impacted by several deep mines located throughout the property. Additional impacts were caused by surface mining in the 1940s and 1950s. Subsequent remining under stricter environmental regulations brought improvements to the area, but the entire property was not remined and restored due to economically irretrievable coal in some areas. Still, mining features such as auger holes, deep mine entries and unvegetated spoil were all present in the project area.



Figure 1: Project location on the Kelley Estate.

The restoration plan identified our project area to be a top reclamation priority based on safety hazards to be eliminated, linear distance of highwall to be reclaimed, acreage to be seeded and planted, and water quality to be enhanced. Reclamation of the highwall and spoil areas would allow for additional food plots and habitat areas to be developed, while at the same time making the area safer for both humans and wildlife.

The project began with the award of a second Pennsylvania Growing Greener II Grant, which was administered by the Pennsylvania Bureau of Abandoned Mine Reclamation (BAMR) in 2005. The grant award was in the amount of \$1,360,048, which covered design, permitting, and construction costs.

The final project area of 135 acres involved the excavation of 637,870 cubic yards of earth to reclaim hazardous highwall areas. A length of 16,435 linear feet of highwall and lowwall were removed during the project, including multiple rows of nearly vertical wall. Of that area, 121 acres were disturbed for reclamation and reseeding activities, while 14 acres of mature forest remained untouched. Throughout the design phase, numerous grading concepts were developed to allow for the most highwall and spoil area to be reclaimed, while staying within the awarded budget. Construction began in May of 2009, and was completed in early June 2010.

Project Specifics



Project design and permitting and project oversight were provided by New Miles of Blue Stream (NMBS) and Alder Run Engineering, LLC (ARE). As part of the project review phase, it was deemed necessary to add waste lime to the backfill material. The addition of alkaline material compensated for overburden naturally deficient in neutralizing material and will minimize the production of acidic water and increase vegetative growth on the site. A total of 12,170 tons of lime were applied to the project site and mixed while grading.

Due to the lack of top soil at the site, it was decided to apply biosolids to the reclaimed area. Kyler Environmental Services of



Adjustable outlet structure on the no discharge sediment basins.

Somerset, PA, obtained the biosolids application permit and applied the biosolids. The tilled-in biosolids benefited the seeding and planting success of the area by providing a rich source of organic material and nutrients. The biosolids application permit encompassed most of State Game Land #321 including the project site. Biosolids application on other areas of the Kelley Estate site occurred prior to this project, and will occur on other areas after the completion of this project.

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Turnips growing successfully on site with biosolids application.



Elk using the reclaimed highwall area. Success! Photo by the PGC.

Due to the size of the area of disturbance, a substantial amount of erosion and sediment controls were required. A combination of silt fence, super silt fence, interceptor and diversion channels, and sediments basins were designed to provide adequate erosion and sediment control for the site. A unique aspect of the E&S controls was the flow distribution structures required by the PADEP as a permit condition. The structures were designed for each of the sediment basin outlets to control and distribute outflow from the basins so that there was no point source discharge from the basins. The design included a combination of piping and "soaker hoses" which could be moved over the ground surface during discharge events to distribute the flow, instead of saturating a discrete area creating a point source discharge. Basin discharge was controlled by perforated risers and adjustable outlet structures throughout the construction phase. There was no dis-

charge from the basins throughout the project.

The sediment basins were designed with adjustable outlet structures and were left in place following construction to provide wildlife habitat. There is little wetland or open water habitat on the Kelley Estate and those that do exist are impacted by acid mine drainage. The basins have been provided with permanent, adjustable water level control structures to allow the PGC to manage the basins as they see fit following construction to provide a variety of habitats ranging from open water to vernal pools and wetland habitat. Several species of birds have been observed using the settling basin habitat

Seeding Plan

Upon completion of the reclamation and the spreading of the biosolids, planting and seeding was done. Approximately 20 acres of elk mix, 10 acres of orchard grass, 45 acres of warm season

grasses and 4 pounds of aspen seed were spread on the reclaimed area. Additional seeding will occur in the spring 2011 using a combination of warm season grasses, elk mix and aspen seeds. So far, very few of the planted trees are succeeding, but some tree mortality is due to unseasonably cold weather during the spring of 2010 after the trees were planted. A promising observation, however, is a large patch of naturally regenerating aspen occurring on the back side and along the perimeter of the project.

The seeding plan was developed for vegetative success and erosion prevention, but also to create habitat for various wildlife on the site. Prior to reclamation, this portion of the Kelley Estate was not being used by wildlife due to lack of food and appropriate habitat. Since reclamation has been completed, wildlife such as the deer, elk, and turkey have taken residence on this site. E.M. Brown Inc., project contractors, also donated the placement of rock



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Figure 2: Table of Project Partners and Contributions

SOURCE	CONTRIBUTION
PA Growing Greener Program II	\$1,360,048
Pennsylvania Game Commission (PGC)	\$155,000, in-kind and cash (seeding, planting, lime)
Rocky Mountain Elk Foundation (RMEF)	Project Sponsor, Grant Administration
Kyler Environmental Services	\$452,000, in-kind (biosolids, roads, E&S)
Pennsylvania Bureau of Abandoned Mine Reclamation (PA BAMR)	Site Survey
E.M. Brown, Inc.	Wildlife Habitat Structures
Alder Run Engineering (ARE)	Project Development
New Miles of Blue Stream (NMBS)	Grant Preparation, Project Development

wildlife habitat structures to insure successful repopulation to this area.

Partnerships

Another important aspect of a successful project is the formation of partnerships (Figure 2). This project showcased the successes that can happen when partners from various agencies work towards a common goal of restoration. This project was completed through a partnership with the PA Game Commission, PA BAMR, RMEF, Kyler Environmental, E.M. Brown, ARE and NMBS.

The project began with the partnership of the RMEF and the PGC who were committed to restoring the Kelley Estate, with a focus on restoring elk habitat to this region. RMEF acted as the grant administrator and was involved with site visits and commenting on the final design plan. The PGC acted as landowners, developed the planting plan, donated funds, attended numerous site meetings, reviewed project plans, and were involved in every step of the project. The PGC donated \$152,000 in cash and in kind services for the success of this project.

Kyler Environmental was responsible for the application of the biosolids and donated \$452,000 of in kind services including improvement to existing roads and E&S controls. The earthwork and associated tasks of clearing and grubbing, roadway maintenance, and erosion and sediment control were performed by E.M. Brown, Inc., of Clearfield, PA. Project design and permitting was provided by NMBS of Mansfield, PA, and ARE of Osceola Mills, PA. These consultants were involved from the beginning of restoration efforts on the Kelley Estate and are anx-

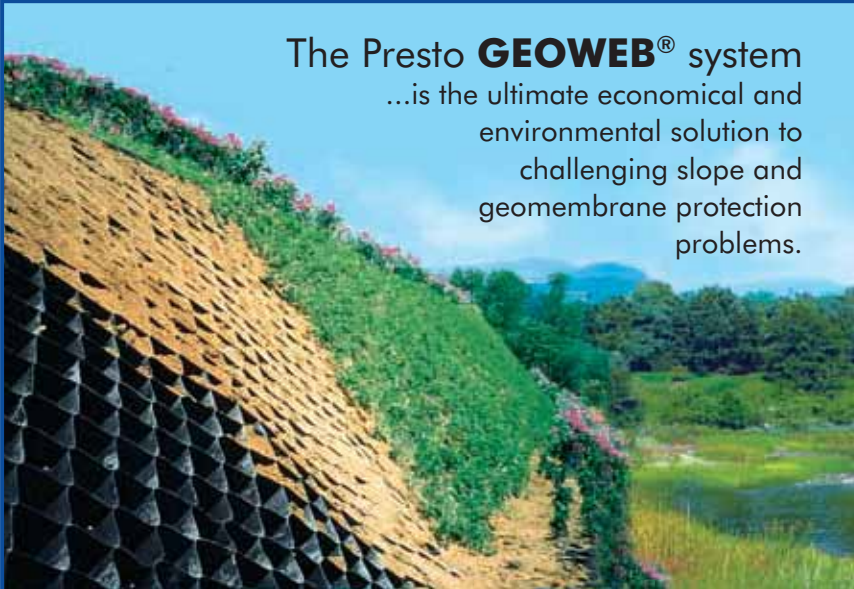
iously awaiting the day when newborn elk are using this restored area.

Conclusion


The reclamation of abandoned highwall areas is important for both public safety and watershed protection and the Kelley Highwall project demonstrated both. An additional feature included planting to promote wildlife habitat and will therefore attract hunters and wildlife enthusiasts to this area. Areas of mine spoil that remained unvegetated

for 50-plus years are now vegetated and providing habitat for wildlife such as elk, deer, and turkey.

It is difficult to determine the entire benefit of reclamation projects to wildlife in the area. In the past they avoided this part of the Kelley Estate, due to lack of food and suitable habitat. During monitoring over upcoming years, the true successes will be measured in the regeneration of aspen to the area and the sightings of elk and other large game using the site. ■



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Reforestation Appalachia

By Nancy M. Hood, ArborGen Inc.

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For the previous two years ArborGen has sent out Christmas cards saying “We are planting a tree in your honor.” Those aren’t just words – we really do plant trees. In fact, Geoff Hill, SuperTree Sales Manager, and I got to participate in something truly extraordinary, something that reminded both of us that our work is fundamentally about making the world a better place to live. We travelled to Perry County, Kentucky, one of the most impoverished and environmen-

tally degraded parts of the United States to help plant a mix of hardwoods and pines on an abandoned coal mine site.

Leading the planting was Patrick Angel, a member of a group called the Appalachian Regional Replantation Initiative (ARRI), who is responsible for identifying abandoned mine lands that were not reclaimed before 1977 or put back into a natural state by the coal companies. Today, reclamation work is required and

coal companies put up a significant bond to ensure they will restore the landscape.

To reclaim these abandoned areas, there are plenty of willing hearts, creative minds and strong backs wanting to make a difference. So under the leadership of ARRI, the citizens of the state of Kentucky find those sites, find the money to get the land prepared, encourage volunteers to donate seedlings, and find plenty of strong young college students to come in and spend a day or two planting trees. Everybody wins, and Patrick Angel makes sure everyone has a good time turning unproductive land into a future mixed forest.

At this particular planting, a group of about 30 students from Eastern Kentucky University and Berea College, as well as employees of the Kentucky Department of Forestry and the US Office of Surface Mining participated in the planting. Geoff Hill and I stayed with the group at the Pine Mountain Settlement School. The night before the planting, we witnessed the artistic talents of students from Berea and Eastern Kentucky as they sang around a campfire and learned to square dance. At the break of day, we awoke and planted trees all day. We made a difference in the world, as much through our dancing and singing as through our planting.

For more information about ArborGen, please contact Cathy L. Owens, ArborGen Inc., P.O. Box 840001, Summerville, S.C., 29484; (843) 851-4143 or clowens@arborgen.com, www.arborgen.com. ■

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21 (Pre Constr. Avg.)	3.0	498	0	51	21	27	1337
21 (2009 Average)	6.5	12	22	2	13	3	829

WATER QUALITY (AVERAGE)								
Point	Flow (gpm)	pH	Acid (mg/L)	Alk. (mg/L)	D. Fe (mg/L)	D. Mn (mg/L)	D. Al (mg/L)	SO ₄ (mg/L)
Raw	n.m.	2.8	1390	0	243	18	113	2822
Phase 1	n.m.	5.0	62	10	4	10	9	1506
Final	44	7.3	-181	307	<1	8	<1	1170

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