

# **AMD&ART: Coal Country Challenge to Creativity**

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## **INTRODUCTION:**

The Appalachian Coal Country, actually hundreds of counties spread across a dozen states east of the Mississippi, is one of mainstream America's forgotten places and perhaps its largest forgotten ecosystem. Most often described and photographed as a land of overwhelming environmental and human desolation, this region stretches from northeastern and western Pennsylvania south, down the Appalachian Mountains through Maryland, Ohio, West Virginia, southwest Virginia, eastern Kentucky and Tennessee, and into central Alabama. Interior coal fields in parts of Oklahoma, Iowa, Indiana, and Illinois reflect a similar history and culture, a place where levels of hope match levels of income and environmental devastation can overwhelm human aspirations for a better, fuller, life.

Throughout this old coal country, dead orange-coated streams and vast black piles of waste rock called "bony" or "culm banks" or "gob piles" have come to symbolize this place. The broken remnants of company towns, "patch towns," or "coal camps" scattered by the scores throughout these mountains, contain the peoples still caught in the free-fall of globalization, mechanization, industrial decline, and an old company-town mindset that can seem passive in its acceptance. These are places where the number of families with children living in poverty too often exceeds fifty percent and where the surrounding environment only enforces a sense of overwhelming exploitation and abandonment. Not since World War II and its still-remembered spike in production, employment and human meaning (as well as the vast environmental consequences of winning the war with coal taken with little regard for the consequences), has there been much good news here.

Yet, here in this part of America may be (perhaps must be) where this nation can best confront – and overcome – its environmental and economic past, adding thousands of acres of reclaimed, healthy lands and waters – and peoples - to our national treasure. Within the conflicted history and ravaged landscapes of this region are the seeds of hope, improvement, sustainability, even healing. Here we have the opportunity to rescue a vast ecosystem that spreads across the eastern core of our nation, region by region, watershed by watershed, even person by person. Within this challenging process we can/must establish critical, civic roles for scientists, historians, artists and designers -- for all of us -- determined to engage in the 21st century civic healing that must follow the unmitigated greed (and environmental neglect) of American culture for much of the 19<sup>th</sup> and 20<sup>th</sup> centuries.

#### **ENGAGEMENT:**

While problems within this region are many and vast, Acid Mine Drainage is acknowledged by the EPA as the largest environmental problem. I would suggest it is also the most emblematic of environmental problems: engagement brings connections to the whole net of cultural and environmental issues in coal country. Acid Mine Drainage, AMD, is the ubiquitous and unstable acid-and-metals-laden water that seeps or gushes from abandoned coal mines, lining streambeds with orange sediment that kills the bottom of the food chain, leaving streams dead. In a larger human perspective, AMD is the orange, silent signature of dying communities, lost biodiversity, the emblematic color of slow death.

The surface expression of vast underground industrial activity (coal mining) now abandoned, one writer aptly described AMD as the “gangrenous puss of deep earth wounds.” Some watersheds may have one AMD discharge for every square mile in their watershed, a daunting prospect. But within the last twenty years, sustainable, environmentally rational approaches to treating AMD

have been developed. Termed “passive treatment,” these systems learned from nature, employing native plants and native limestone to neutralize the acid, drop out the metals, and release both clean water and new hope.

When I started AMD&ART, almost none of this existed, and what did exist I did not know about. No one was talking at national symposia on creativity about AMD and coal country, there were no artists engaged in helping to develop passive treatment systems, indeed passive treatment systems were just barely under development. When I started, I called the effort “the art thing” because I did not want to define it further, but I could define the challenges. We needed to find a way to engage many people in the largest environmental problem in the region, one so long-lived and ubiquitous that natives recalled thinking in their youth of the local streams as filled with orange juice and never once questioning the possibility of something better than those orange juice streams - - or “sulfur creeks” - - of their childhood. I learned a lot about the work of others in public art, thanks to a couple arts residencies, and I went looking for a team that could work with me on this quest. It would be necessarily and avowedly inter- and multi-disciplinary; it would create solutions that actually fixed the problem; and it would open the opportunity for enhanced civic engagement. And it could not fail: that had happened too often in this region already.

It’s working. Today, AMD&ART is a national model working with many partners in this region to effectively and strategically treat AMD and coal communities. We challenge the belief that treatment systems should be hidden away, just because we as a society are ashamed of the mess we have created. Rather, in this place-specific continuum of human habitation and industriousness, AMD&ART maintains that reclamation is celebration, a chance to artfully redeem a legacy now identified with mountains of boney, rust-coated streams, and economic depression. Treatment systems become Litmus Gardens as well as treatment systems, and wetlands become educational opportunities. AMD&ART turns industrial site remnants into historical reminders, “ghosts,” that invite reflection, and site exhibits reach the human spirit as well as nature. Once-

passive community members have become advocates for a new community place—a whole place that addresses the water and the people, bringing fresh perspectives and stronger communities.

I think AMD&ART is successful because it is art and people, because we all pledge to never compromise but always accommodate, because our structure stands on three legs for greatest stability – our design team consultants, our AmeriCorps staff of young professionals, and a deeply engaged community. We are an integrative, multidisciplinary approach that provides a new arena large enough to include the interests and concerns of an entire community and create a delightful and interesting public place. We bring individuals, organizations and funding agencies with diverse interests to work together as partners, bringing new energy and comprehensive solutions to AMD remediation in Appalachia.

This multi-disciplinary collaboration is already successful, building a 35-acre site in Vintondale by using over \$400,000 in funds – and easily as much in in-kind -- gathered from over a dozen sources, none of them traditional sources of AMD remediation funding. Partners as unlikely as the U.S. Environmental Protection Agency's Sustainable Development Program, the Vira I. Heinz Endowment, the Pennsylvania Department of Transportation (PennDOT), the Rockefeller Foundation and the Department of the Interior's Office of Surface Mining are working together to fund the creation of this place.

AMD&ART has developed a way to destabilize the typical negative expectations of this region of coal country with large-scale artful new public places that directly address both the problem of AMD and its social consequences. Over the past eight years, we've proven that bringing the perspectives of history to mix with the discipline of science, the healing accessibility and delight of innovative design, and the energy of community engagement, creates a productive pathway for action, a pathway that can lead to a way out of an array of problems that challenge the people of the entire Appalachian coal region.

## **PROCESS:**

The Borough of Vintondale, Pennsylvania is a small coal patch town in Cambria County, some 15 miles northeast of Johnstown, nestled deep in the Blacklick Creek Valley. Created by the Vinton Coal Company in the early 20<sup>th</sup> century, Vintondale is a community whose history was defined by underground mining and vast surface works, yet the tangible reminders of this once-proud past are beginning to fade away. In the 1950's, the last deep mine in Vintondale closed forever. As the procession of miners across the footbridge to the coal complex ceased, so did the sounds of the tippie, the smoke from the railroad, and the nighttime glow of the coke ovens. The buildings and structures began to crumble, bricks and cut stone were taken to build walls and repair houses in the community. By the 1980s, the site was the town dump.

Today, the riverbed is blanketed with orange sediment from acid mine drainage and some streets are lined with dilapidated houses. The population of 582 is a mere quarter of what it was at the height of the mining industry, and over 60% of those residents now live in poverty. The per capita income is \$10,957: that means for every one dollar earned by the average Pennsylvanian, the average Vintondale resident earns 48 cents. Not surprisingly, only 7.7% of the population over 25 have a college degree<sup>1</sup>. There is no sense of being special in Vintondale, no particular distinction to boast of, only constant decline for half a century – typical for much of coal country.

The Vintondale site is situated on 35 acres of now-reclaimed mine land that once hosted the heart of this small mining town—the Vinton Coalery plant with its half-dozen major buildings as well as the Pennsylvania Railroad line that connected Vintondale with the outside world. The northern edge of the site is the old railroad right-of-way, today known as the Ghost Town Rail Trail, which attracts approximately 75,000 users annually. The South Branch of Blacklick

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<sup>1</sup> 1990 Municipal Census Profiles, Census of Population and Housing, Pennsylvania State Data Center

Creek, a river severely impacted by AMD, carves out the eastern and southern boundaries of the park and separates it from the town.

Community involvement has been an integral component of the AMD&ART process from the beginning. The Vinton Coalery site was once central to life in Vintondale and many townspeople are still deeply connected to this central place, because of both its history and its future. More than 60 residents—10% of the population—turned out for two public design meetings to write down their ideas on site maps and to talk with AMD&ART team members – scientists, historians, artists - - and each other about their town, their concerns, their quiet hopes. The resulting design proposal, and ultimately the finished site, incorporates ideas from everyone that contributed, attracting wide community and agency support.

#### **DESCRIPTION:**

Community support is what is allowing the park to become a reality. Using an interdisciplinary team with me literally choreographing the entire process to assure that we incorporated ideas and suggestions from the community and many other sources, this immense swath of desolate land has become a place for recreation, historical reflection, and treatment of AMD. At the eastern end of the park, there is a sequence of large pools set within the topography that mark the beginning of the treatment system. The water flows through this series of wetland treatment cells and a Vertical Flow Pond (VFP) until it flows into the wetlands, cleansed of its metallic pollutants and neutralized to a healthy pH. Native plants, their Fall colors reflecting the increasing health of the water, transition from deep red to orange to yellow and then silver-green alongside the system in a Litmus Garden that will also create a reason for a fall festival celebrating the garden's peak color and the community's will to recover.

Where black boney, or waste coal, once barely supported scrubby grasses and stunted trees, a new marsh environment is attracting a variety of birds and wildlife. Within that environment, our History Wetlands, the foundation

footprints of the Vinton Colliery structures rise again to the surface, their forms outlined by Red Maples that will eventually assume the approximate scale of these massive structures. These are Mitigation Wetlands, created in partnership with PennDOT, and designed with assistance from the national Wildlife Habitat Council. The U.S. Army corps of engineers worked with us to create artificial soil for the entire seven acres and the proceeds of the sale allowed the creation of a trust fund at the local Community Foundation for perpetual operation and maintenance of the treatment system and wetlands - - while also creating some of the richest habitat in the region.

At its center we are working with the community to build an active recreation area, a place filled with baseball, horseshoes, volleyball, picnic tables, grassy places for little kids and their moms and more. Finally, looming over the entire site is a massive pile of boney that we hope will one day provide an excellent vantage point to overlook the park and think a bit about the resilience, determination and simple grit of the people that started the coal era and their kids that finished it, closing a circle of critical significance.

Visitors to the park walk on interpretive trails that draw together historical information, the science behind passive AMD treatment and the newly healed ecosystem that thrives in the wake of remediation. I hope residents and visitors alike will gain new perspective on the resilience of nature and the ability of humans to work with the environment in a healing process that creates a new community center. The physical presence of this energized place will symbolize the success of community residents in healing these waters, not only by finishing a job left unfinished by past generations, but also by creating a new asset for their own families and future. AMD&ART is working with the residents of Vintondale to extend interpretation of the natural and historical features of the site and to develop recreational amenities and a small community education center. The Vintondale site, once the bustling center of life in this company town, will again be a vital part of community life. Through this pilot project, AMD&ART has demonstrated that AMD treatment sites, creatively designed, have the

potential to re-instill a sense of place and pride, allowing community members to forge new connections to the local environment and their own proud history.

### **TECHNICAL:**

This treatment system is different from other passive systems in that aesthetics and historical context are an integral part of the design. The plant species are all native to Pennsylvania, selected to be practical (provide wildlife habitat) and to mimic water quality with color. The visible history of this site is gone, because all of the buildings that existed when it was a major coal producing facility have been demolished. The footprints of these buildings rise up out of the wetland area, and act as flow dispersion berms. The use of these artistic and historical elements as functional components of the treatment system is the essence of AMD&ART.

The discharge being treated at Vintondale is typical of older deep mine discharges on the lower Kittanning coal seam, as shown in the table below.

Date Sampled	Flow (GPM)	pH	Specific Conductance (micromhos per cm)	Alkalinity to pH 4.5 (mg/l as CaCO <sub>3</sub> )	Acidity to pH 8.2 (mg/l as CaCO <sub>3</sub> )	Fe (mg/l)	Mn (mg/l)	Al (mg/l)	Mg (mg/l)	Sulfate (mg/l)	Sus- pended Solids (mg/l)
21-Feb-97	408	3.1	2250	0	---	19.1	2.68	23.0	46.6	---	---
18-Apr-97	205	2.9	1380	0	280	14.5	2.45	---	---	580	< 5
14-May-97	141	3.5	1590	0	---	23.9	3.34	33.3	55.1	---	---
12-Jun-97	250	2.5	2080	0	---	21.6	2.92	25.3	50.1	---	---
7-Aug-97	59	4.0	2970	0	---	10.9	0.21	22.9	37.9	---	---
19-Aug-97	27	---	2710	0	---	16.0	0.56	36.3	51.2	---	---
18-Sep-97	49	4.0	1810	0	---	25.2	0.78	44.9	63.9	---	---
<b>AVG</b>	<b>163</b>	<b>3.3</b>	<b>2113</b>	<b>0</b>	<b>280</b>	<b>18.7</b>	<b>1.85</b>	<b>30.9</b>	<b>50.8</b>	<b>580</b>	<b>&lt; 5</b>

As usual, the biggest challenge is to treat the discharge with a limestone-based Vertical Flow Pond (VFP) without the system becoming plugged with aluminum. In this case the system was designed using wetland cells in advance of the VFP to attempt to try to raise the pH and remove some metal prior to the water reaching the primary treatment cell.

### **System Components:**

The first element of the system is the delivery pipeline that brings the discharge to the site. The pipeline begins on the other side of Blacklick Creek, and runs approximately due west until it encounters the Ghost Town Trail. At that point, it turns and parallels the trail in a southerly direction. The pipeline crosses Blacklick Creek using the existing bridge for support, and ends at the Acid Basin (Cell #1).

Cell #1 (Acid Basin) - Dimensions: 120' x 50'

Since this discharge will travel overland for a significant distance before entering the pipe, it will from time to time contain suspended solids that have been washed in by runoff. Cell #1 is in place to slow the water down, and allow the majority of this sediment to fall out of suspension before the discharge reaches the treatment system. This cell is also lined with limestone that is DESIGNED to armor up with iron, providing the rust-red color for the artistic interpretation of the site.

Cells #2, #3, & #4 (Treatment Wetland Cells)

Dimensions: #2 = 200' x 50' / #3 = 180' x 50' / #4 180' x 60'

Due to the distance that the discharge will travel, and the amount of fall it will have before it enters the pipeline, it will contain some dissolved oxygen (DO). In order to remove as much DO as possible before the discharge enters the VFP cell, three anaerobic wetland cells (#2, #3, and #4) were built after the Acid Basin. These cells also act as additional sediment traps, but more importantly, they are in place to try to help remove aluminum. Biological activity, especially in the form of sulfate-reducing bacteria, has been shown to generate alkalinity, resulting in metal precipitation. If the three wetland areas can raise the pH by 1 to 1.5 standard units, some of the aluminum will be precipitated in the wetland, and never reach the VFP.

#### Cell #5 (Vertical Flow Cell) - Dimensions: 210' x 70'

The main treatment cell is the Vertical Flow Pond (Cell #5). The VFP contains a standard pipe manifold to collect the water and deliver it to the settling pond, and to be used as the cleanout system to remove precipitate from the limestone bed.

#### Cell #6 (Settling Basin) - Dimensions: 180' x 100'

From there, the water is discharged to the settling pond (Cell #6), which does double duty as the flush pond due to site constraints. Water then leaves the settling pond and flows to the clarification marsh.

#### Cell #7 (Clarification Marsh)

The clarification marsh was designed to be the final component of the treatment system, but ended up as part of the mitigation wetland. It includes several berms that represent the locations of the old structures. These berms will help to disperse the flow throughout the marsh, thereby minimizing channeling, and increasing retention time. The vegetation in this part of the system will be typical of an emergent marsh, with cattails, rushes, and sedges dominating. We anticipate that the water quality will meet effluent limits at the discharge point.

#### Element #8 (Emergent Wetland)

The discharge from the clarification marsh flows into the emergent wetland. This area, combined with the clarification marsh, was sold to PennDOT as mitigation wetlands. Some of the money obtained from that sale will be used to pay for the maintenance of the treatment facilities.

#### Monitoring:

During the first year of operation, field parameters taken at the discharge from the Cell #6 indicated that the water had a pH of 6.5, and that the iron concentration was about 0.5 mg/l. The cell-by-cell monitoring program that we had originally planned couldn't be implemented due to financial and manpower

constraints. Since last fall, leaks have developed in the wetland cells that were originally holding water. Consequently, water is not getting to the VFP, and there is currently no discharge. An upgrade of the lining of these cells is planned for this year, and hopefully the system will be back in operation by some time next fall.

### **LESSONS:**

I think there are lessons in AMD&ART's successes in Vintondale, at both the watershed level and the project level, which can be applied much more broadly. Most importantly, restoring streams contaminated by AMD requires more than a technical fix. A lasting antidote to the complex problems of coal country must be cultural *and* environmental: it's just not the water alone. A scientific solution may clean the water, but a multidisciplinary solution has the power to both clean the water and heal surrounding communities. AMD&ART has demonstrated there is great potential to reclaim and restore this part of Coal Country, to bring the region greater environmental sustainability and economic prosperity. And I think we are establishing a new role for art, not as solitary and visionary, but as participant; not as some ultimately mystical or magical process, but as an important, critical perspective; not as arbitrator, but as co-worker, one among many disciplines equally necessary to the recovery and revitalization of this vast region and its peoples.

To heal our streams and our communities, we must engage the public in such a way that there will be widespread demand for environmental improvement and the better quality of life that a healthy place can provide. AMD&ART has demonstrated that attention will come to the problem of AMD through the construction of treatment systems that are integrated into artful, educational, engaging, even delightful, public places. To re-conceptualize AMD treatment in this way is to create a paradigm shift; we transform environmental liabilities into community assets and voters want them. In the coming years, AMD&ART hopes to bring the successful models developed in Vintondale and the Dark Shade Watershed to other groups.

Remarkably, quietly, there is new hope beginning. In spite of the seemingly overwhelming legacy of past despoliation and neglect of this vast ecosystem and its inhabitants, today there are small groups of determined citizens working – almost always as volunteers – to bring real change to Coal Country. State by state, watershed by watershed, partnership by partnership, these groups of volunteers are building on a deep tradition of hard work and close ties to community, to their land, and to a place, a watershed, they call home. These are the new stewards of America's most ravaged, yet perhaps its most important environmental frontier, maybe even a cultural frontier as well, a huge ecosystem of people, land and water waiting to be reclaimed, returned to environmental, economic and civic health health. This regional ecosystem is at the core of the eastern United States and these peoples share some of America's oldest regional cultures. These watershed groups are pioneering in a land of hardy mountain pioneers, their approach is grass roots at its smallest and strongest, and the consequences of their work reverberate deep in the local culture as well as the regional ecosystem.

These small heroes remind us that Coal Country need not be written off, abandoned while we work to save more pristine environments. Clean water inside this vast region could bring environmental and then economic recovery to hundreds of coal counties – and it could allow us as artists, designers and other disciplines a critical role in that recovery. Unfortunately, while thousands of miles of streams are coated with orange death, government agency and private foundation budgets are too often narrow in their focus, limited in their resources, slow and deeply frustrating to this new, local, watershed-focused determination to heal these old wounds, to create a legacy better than pollution. Congress knows too little about AMD and the press too often prefers Appalachian stereotypes of little value, but every new watershed group brings new awareness to their constituency and new perspective to their local press. Slowly and tenaciously, AMD&ART, the Dark Shade Brownfields Project and other groups

are working to create an environmentally rational and developmentally sustainable future in a region where “man” created the mess, and men and women are now working hard to fix it. As artists seeking the pathways of creativity in this new century, so deeply challenged on September 11, I think AMD&ART suggests some critical and deeply meaningful pathways to the civic engagement that is the hallmark of a healthy and creative society. As a nation, we cannot afford to allow this vast ecosystem and these determined peoples to be less than full participants in the environmental and economic benefits of the new century. As artists, we cannot afford to miss the opportunity to engage.

But there is a deeper mission here as well, one we as artists must understand, deeply understand. These are not localities in which a new and engaging public space artfully executed will be a pleasant amenity—these are peoples and places caught in the backwash of economic collapse and social distress. Escape from the orange-coated AMD streams and blighted environments of these places is no amenity, it is essential for survival, for creating a sense of hope and pride that is a part of our character as Americans. Any “art” must work on many, many levels – and again, failure is just not allowed

AMD&ART is bringing attention to the problem of AMD by designing and building artful, public places that incorporate passive AMD treatment systems, honor the history and contributions of coal towns, restore wildlife habitat, and provide opportunities for recreation and community gatherings. Ours is an unusual approach to environmental problems and an unprecedented approach to AMD treatment. Most passive treatment systems are fenced off and hidden behind the cover of trees. But AMD&ART believes that by treating AMD in the forefront of a public area, we can create educational opportunities, which in turn can help shape a more informed, involved public. At the same time, we are creating places that encourage visitors to reflect on the relationship between humans and the environment in the past and in the present; these are places that will instill hope for a healthier environment and a better future.

Passive treatment systems, designed using lessons from nature, are commonly used to remediate AMD. The typical passive treatment system consists of a series of settling ponds filled with native plants and limestone, where the pH of AMD is brought to a neutral, healthy level. As AMD flows through the ponds, metals drop out and the water is cleansed. Traditional passive treatment systems are fenced off, surrounded by trees, and hidden from the public. The end result is that very few people even realize that AMD treatment systems exist. AMD&ART has taken an entirely different approach to AMD remediation sites. We have brought community participation and interdisciplinary collaboration to the design of treatment systems, transforming an environmental liability into a community asset.

In each of our projects, our goal is to bring a holistic approach to the design and construction of AMD treatment systems. We believe that wide public participation is key to bringing abandoned mine lands back to life, honoring the history of coal towns, and restoring coal-impacted watersheds.

After extensive evaluation and public input, AMD&ART selected three sequential project sites east of Pittsburgh, Pennsylvania. Each site fulfills a specific role, progressing from a small pilot project, to a huge discharge, and finally to an entire watershed. Vintondale serves as AMD&ART's pilot site for a three-project set, which increase progressively in size and complexity. Vintondale offers a manageable AMD discharge central to the community, with high visibility due to the heavily traveled rail-trail that borders the site.

The Hughes Borehole, AMD&ART's second site, spews 4 tons of dissolved metals every day into the Little Conemaugh River. Imagine walking through a verdant green hemlock forest, when suddenly you encounter a stunning red-spectrum world of seeming total devastation. For hundreds of feet in any direction is a watery sea of orange muck and dead trees laced by streaks

of chartreuse, green, and yellow. The high flow discharge presents a more complex problem that requires different passive treatment science than was developed for Vintondale. The AMD&ART team is collaborating to design a site that can treat such a large source of pollution, protect and interpret the visually arresting Borehole, and reveal the history under the site. The proximity and visibility of both the consequences of AMD pollution and its remediation place significant science content in a novel, dramatic context, with ample education opportunities.