

and Wonders

(wetland) n. 1. Shallow water teeming with birds. 2. A unique ecosystem known for wet, soggy soils and pungent, marshy water. 3. A flood control and filtering device. 4. Home to turtles, herons, frogs, and dragonflies.

(wetland) n. 1. A mosquito and snake infested area. 2. A useless, swampy wasteland. 3. Stagnant water causing malaria and other diseases. 4. A murky, eerie place.

Wetlands mean different things to different people. Which way do you see wetlands?



Natural wetlands quietly perform essential services for wildlife and us. They act as sponges and filters, cradles and rest stops, supermarkets and treatment plants, and even playgrounds. They are varied, valuable, and full of life.

- Wetlands capture racing storm water, filter sediment and pollutants, and slowly release it to our streams and groundwater.
- Wetlands are natural nurseries for nesting wildlife.
- More than 80 percent of Pennsylvania's threatened and endangered wildlife depend on wetlands for all or part of their lives.
- Wetlands offer safe havens for migratory birds to rest and eat during their long, exhausting journey.
- Birders, boaters, hikers, and photographers are lured to wetlands to explore, discover, learn, and play.

Over half of Pennsylvania's original wetlands are gone, and today, we recognize that wetlands are a vital part of our environment and are working to protect them.

- Dragonfly
- Pickerel Frog Tadpoles
- Eastern Newt
- Scuds
- Pickerel Frog
- Sedge
- Northern Shoveler
- Great Blue Heron
- Bulrush
- Mink
- Eastern Painted Turtle
- Canada Goose
- Fresh Water Insects
- Red Winged Blackbird
- Cattail
- Black Duck
- Pickerelweed
- Damselfly
- Water Strider
- Reed Grass
- Eastern Cottontail
- Meadow Vole

Problems, Future Solutions

continues to offer ideas. Constructed such as these were gaining. While they ve acid mine their effectiveness ited. Though they

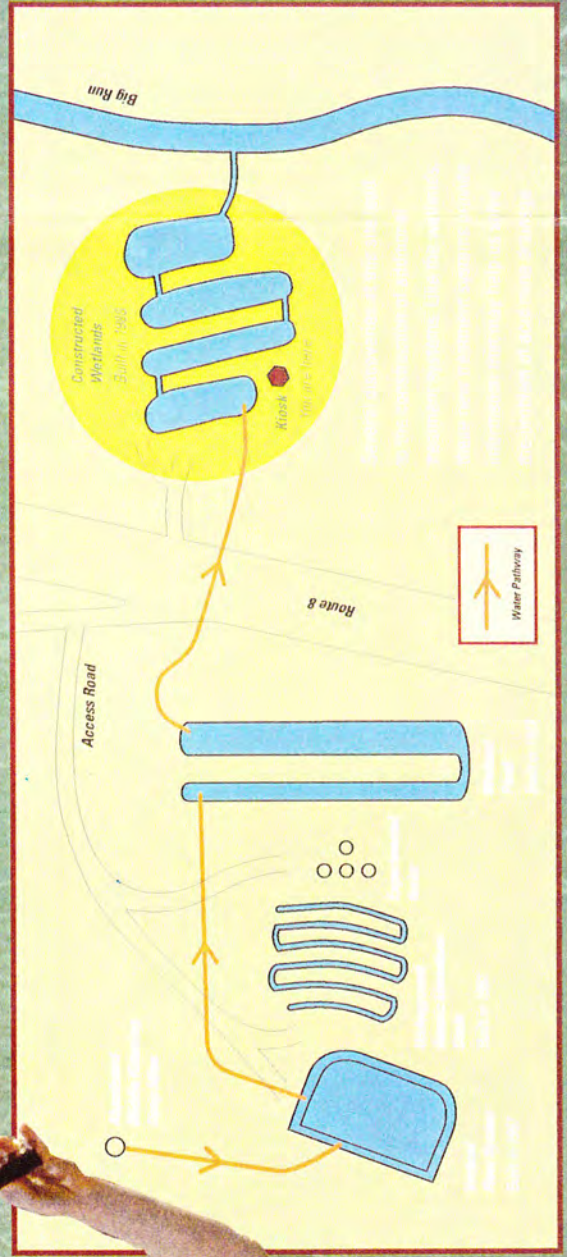
could not solve the problem here, these wetland systems were catalysts for the development of new types of passive treatment.



Promoting future solutions through education

This site serves as a living laboratory where students investigate new technologies and their benefits to the stream environment.

If the legacy of past land use brought us problems and pollution, perhaps our legacy to the future will bring promise and solution.

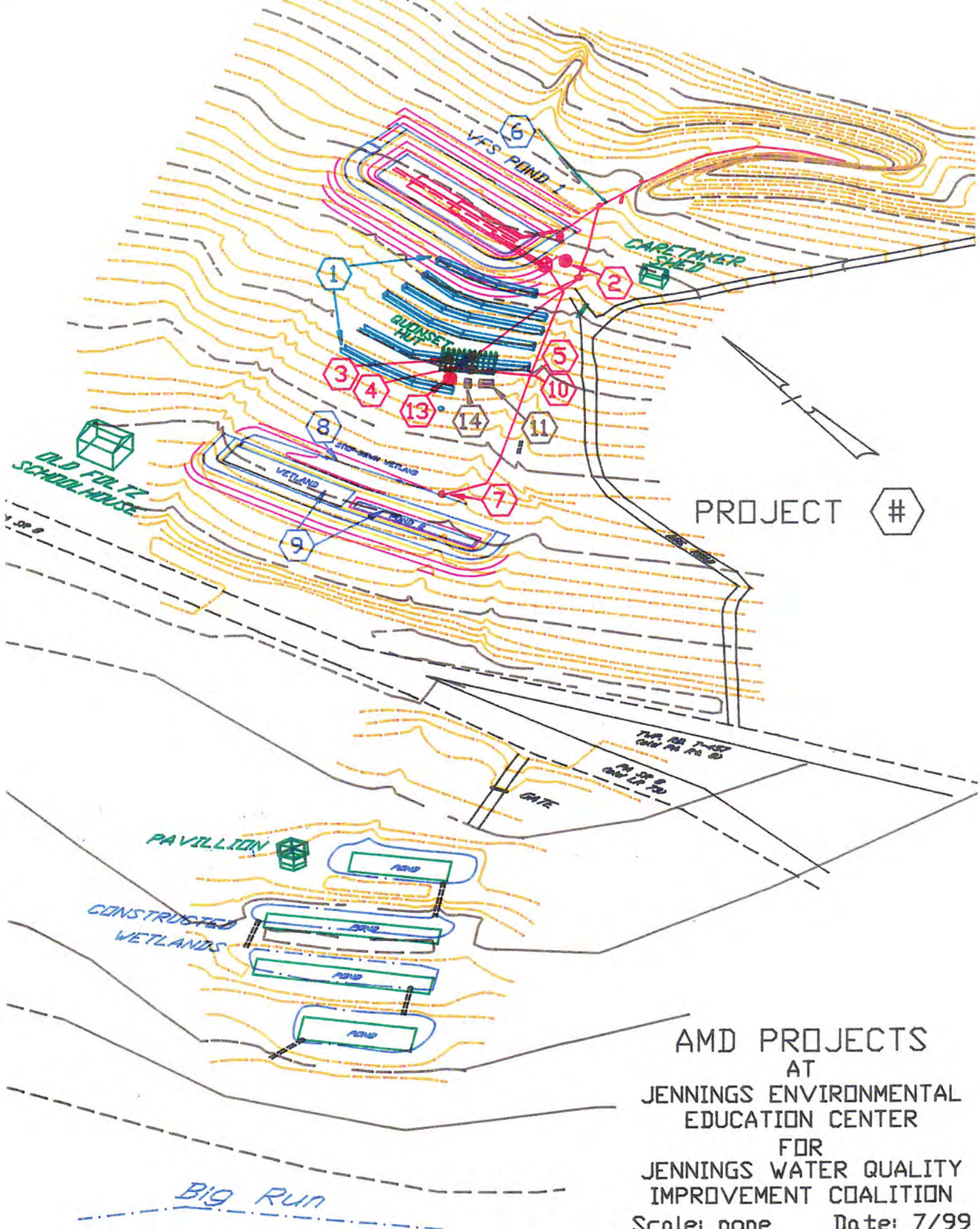


LIST OF EXPERIMENT / DEMONSTRATION PROJECTS
at
Jennings Environmental Education Center
for
Jennings Water Quality Improvement Coalition

July, 1999
(WP12/447PROJ)

<u>PROJECT NO.</u>	<u>PROJECT DESCRIPTION</u>
1	<u>Anoxic Limestone Drain ("ALD")</u> . A 650 ± foot horizontal flow "serpentine" ALD, 3' ± wide X 3.5' ±, deep constructed in 12/92. Water quality improved dramatically for several months until the ALD plugged with aluminum.
2	<u>Successive Alkalinity Producing System ("SAPS")</u> . A 4' ± W X 7.5' ± H tank constructed in 9/94 having 30" ± mushroom compost over 1' ± limestone. The tank was to replicate a proposed full scale system to solve the aluminum plugging problem. The initial results were dramatic, but SAPS tank effluent degenerated and went acid in 13 months. However, the PVC perforated pipe underdrain never plugged.
3	<u>Vertical Flow System ("VFS")</u> . A 5' ± diameter tank installed in 5/96 containing 1.7' ± of mushroom compost blended with fine (#9 special) limestone @ 75% by weight of compost over 6" ± #57 gravel. The design had a "water cap", with perforated pipe overdrain and underdrain. The system went acid in approximately 1 year with accelerated flow. The system was intended to replicate revised proposed full scale system.
4	<u>Anoxic Limestone Vertical Flow System ("ALVFS")</u> . A 5' diameter tank installed in 6/96 containing 1.7' of #3 limestone in a companion to Project No. 3. It had a "water cap", with perforated pipe overdrain and underdrain. The system went acid in 1 year ±, but never plugged - the aluminum simply flushes out bottom drain.
5	An experiment conducted using limestone with a common plant weed to remove aluminum. Reportedly did not work.
6	<u>Full scale VFS pond</u> containing a blend of 300 tons mushroom compost with 380 tons of #9 special fine limestone over an 8" #57 gravel bed with perforated pipe overdrain and underdrain completed circa 8/97. VFS currently removing coal mine water pollutants. Overdrain hole perforations plugging with bacteria-iron accumulations. Permeability decreasing as indicated by rising water "head" pressure, controlled at Outlet Control Box, necessary to "push" water vertically through Pond 1.
7	<u>The "Peckerator"</u> - the first in a possible series of experimental aerators to oxygenate the effluent water of Project 6 for more effective iron & metal precipitation.

- 8 A "step down" wetland having four cells, with a synthetic economical "soil" blend of Butler Area Sewage Authority ("BASA") sewage sludge and sand. Planted with wetland plants circa 8/1997.
- 9 Wetland Pond 2-1 (shallow wetland) and Pond 2-2 (deeper wetland). Originally intended to provide "clean", unpolluted water for use on the site. Currently duck weed predominates in the ponds, possibly a result of high nutrient levels.
- 10 A 5' diameter tank duplicating Project 3 above. Installed by Grove City College biology students and operational in 3/98. Bentonite used between compost-limestone blend and tank wall to attempt to stop water from "piping" down sides of smooth tank.
- 11 Test Bed Wetland ("TBW") - an extendable, modular plywood test wetland intended, in conjunction with an improved version of the "Flow Control Box" (FCB), to test various soil and plant configurations, individually or comparatively with companion TBWs, under carefully controlled conditions. Currently the project was designed and the prototype TBW constructed with primary effort by Grove City College students. Eventually, the TBWs might be used to "calibrate" designs at individual coal mine drainage sites when adequate technology is developed.
- 12 Dilutional Effects of Pollutive Coal Mine Discharges. This is a proposed, extended statistical study of pollutive "loading" in an effort to more accurately characterize the "baseline" pollution being caused by a given discharge. If pollutional loading is demonstrated to have a lognormal distribution, which the accompanying 1986 paper by Charles Cooper indicates, then more easily determined and accurate conclusions, and therefore designs, can be anticipated in the future using simple logarithmic / exponential conversions of the monitoring data. These conversions are generally available even on any scientific pocket calculator.
- 13 Compost Vertical Flow System Tank - pilot system using composted "biosolids", with Butler Area Sewage Authority (BASA) treated sludge as the primary organic component with added limestone. An objective is to develop an economical alternative to the use of spent mushroom compost, in addition to a productive use of the sludge.
- 14 Internal Tank Anoxic Limestone Vertical Flow System currently under construction will have large diameter limestone aggregate in an internal tank with a screened bottom raised above the primary outer tank floor. This design is intended to allow precipitate aluminum and other pollutants to settle to the bottom of the primary tank to be periodically flushed. This design is partly an outgrowth of the research of Project 4 above.



AMD PROJECTS
 AT
 JENNINGS ENVIRONMENTAL
 EDUCATION CENTER
 FOR
 JENNINGS WATER QUALITY
 IMPROVEMENT COALITION
 Scale: none Date: 7/99

Award dinner dazzles and celebrates

With all of the fanfare and imagery of the Academy Awards, 10 environmental award recipient recently were chosen for their environmental and conservation contributions in the Western Pennsylvania region.

The 6th Annual Three Rivers Environmental Awards, co-sponsored by the Pennsylvania Environmental Council and Duquesne Light, honored winners in 10 categories from a group of 29 finalists. Finalists and guests were treated to the now-famous dazzling award presentation June 1 at the Pittsburgh Hilton and Towers. It featured spectacular video and photographic images of the natural beauty and resources of Western Pennsylvania, as well as an indoor light show.

The 1999 finalists were chosen by an independent panel of judges from more than 100 nominations received from the 29-county award region. The purpose of the program is to celebrate the achievements of the finalists and winners, while promoting innovative environmental and conservation accomplishments and enhancing quality of life.

The Slippery Rock Watershed Coalition received the Community Award for Environmental Organizations for its innovative and world-class efforts to eliminate acid mine drainage in the Slippery Rock Creek watershed. The coalition—a partnership of academia, businesses, nonprofits and government—has constructed the greatest number of diverse passive treatment systems at DCNR's Jennings Environmental Center, Butler County, than any other site in the nation. Margaret Dunn accepted the award on behalf of the coalition, her second time to do so, since the coalition's project was honored last year as well.

"This is a testament to the fantastic and respected work being done at Jennings," said DCNR Secretary John C. Oliver. "We're very proud of DCNR staff involvement in this and other projects honored at this awards ceremony."



Other winners include:

- Hampton Rotary Club for restoration of a community park;
- Patricia W. Hare for her lifetime work as an environmental advocate;
- Blooming Valley Borough Council of Meadville for its innovative plan to improve the efficiency of the community's sewage system;
- Pollution Prevention Partnership, Environmental Responsibility in Erie (P3ERIE) for its advocacy in reducing mercury pollution of Presque Isle Bay;
- Pruett-Schaffer of Pittsburgh for its efforts to produce "environmentally friendly" paint and coatings;
- Wastebusters of Pittsburgh for increasing public awareness of the benefits of recycling;
- The Center for Economic and Environmental Development, Allegheny College, Meadville for its efforts to educate others on environmentally responsible economic development;
- Community Lead Education and Reduction Corps in Pittsburgh for its education programs on the dangers of lead poisoning; and
- James Rutkowski of Strong Vincent High School in Erie for his hands-on teachings about environmental protection.

For more information on the Three Rivers Environmental Awards, call Dusque Light at (412) 393-4060. ♦

The Jennings Environmental Education Center is leading the way in developing new technologies to deal with an old form of pollution.

PIONEERING

New Solutions to Pollution

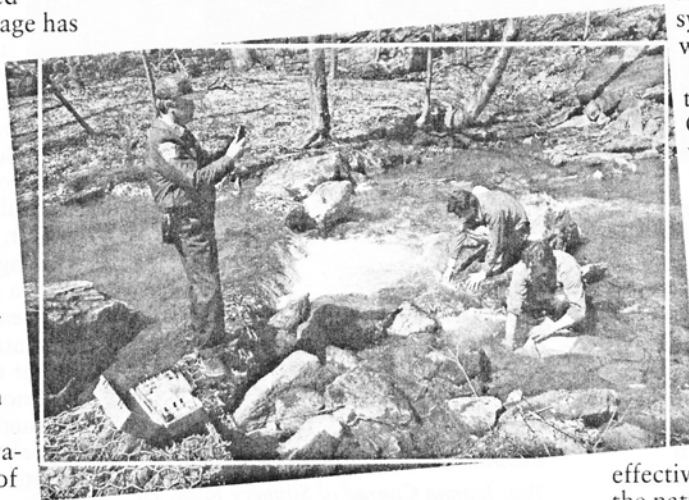
When the seal of an abandoned deep coal mine in northern Butler County gave way in 1985, a torrent of water as acidic as vinegar spewed into the main waterway of the Jennings Environmental Education Center, essentially killing almost all life in the stream. It was an environmental disaster to be sure, but also an opportunity to learn more about dealing with the number one source of water pollution in Pennsylvania – acid mine drainage. Finding effective ways to treat the Jennings Center’s polluted water and convey the associated environmental education message has been an on-going learning process for all those involved.

An unfortunate legacy of coal mining, acid mine drainage occurs when coal seams containing pyrite are exposed to air and water. Through a series of naturally occurring chemical reactions, sulfuric acid and a number of other environmentally degrading by-products, such as the slimy, stream-suffocating “yellow boy” are produced. In spite of model strip mine legislation enacted in Pennsylvania in the 1960s and millions of dollars per day spent by the mining industry, government and concerned citizen groups, the problem persists. Finding new ways to effectively treat acid mine drainage is becoming increasingly imperative as treatment costs continue to rise.

At the Jennings Environmental Education Center, a number of experimental “passive” treatments are being tried. As opposed to “active”

systems requiring large inputs of labor and materials, passive systems are designed to work with natural processes and require minimum input and maintenance. The system at Jennings was designed from the outset as a working educational model to reach the public at several levels – to educate the center’s visitors about coal extraction and acid mine drainage, to provide the opportunity for secondary and college students to participate in water quality monitoring projects, to serve as a model for others involved in the actual construction of passive systems and to provide overall watershed education.

The first stage of the passive treatment system at the Jennings Center was a constructed wetland which served as a “biofilter” for the polluted water. Also known as wetland treatment systems or WTSs, these human-made wetlands are now commonly accepted technology that evolved from the realization that natural wetlands improved the quality of degraded water flowing through them. It has been estimated that WTSs could be effective in solving about 20 percent of the nation’s acid mine drainage problem. There are limitations, however, that became apparent at Jennings. While the WTS effectively reduced the iron content of the water and improved the acidity to some degree, it did not prove effective in removing the high levels of aluminum present in the polluted water, which also occurs in about 80 percent of mine water discharges statewide.



by Jill Shankel

This led to further research that indicated another technology, an anoxic limestone drain or ALD (anoxic meaning "without oxygen") might be effective. An ALD is essentially a sealed underground ditch filled with limestone through which the polluted water is channeled to decrease acidity and remove heavy metals. The ALD at the Jennings site was designed to enhance the performance of the existing constructed wetlands. And for several months after construction, it did just that. The acidic content of the water improved almost a hundredfold and the metal concentration was greatly decreased. However, the system was again foiled, if you'll pardon the pun, when aluminum plugged the ALD, markedly decreasing the quality of the water entering the wetlands.

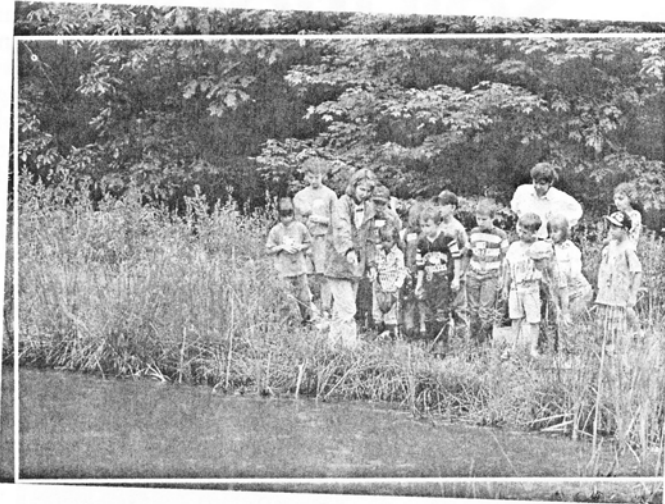
The newest technology to be implemented at the Jennings Environmental Education Center is a Successive Alkalinity Producing System. In this system, the mine water filters through a layer of organic material before contacting a layer of limestone underneath, resulting in the removal of aluminum and an increase in the alkalinity of the water. The drainage can then be piped through the other existing parts of the system to further improve the water's quality. In theory, treating highly acidic mine water with a series of successive systems is much more cost-effective than any single current passive treatment alternative. The results at the Jennings Center will be closely monitored by local, state and federal agencies involved in watershed restoration and protection programs.

The passive acid mine treatment system at the Jennings Environmental Education Center is unique in many ways. Through 12 years of environmental education effort, it has the longest history of continual recorded sampling data of any mine site in Pennsylvania. Each phase of the system has been incorporated through cooperation from a diverse coalition

of people. In addition to the full-scale projects designed specifically for the Jennings site, several experimental stations have been set up to test methods and materials that might be more readily available in other areas. The site was experimentally re-seeded with warm season grasses – native species such as big bluestem – that are very effective in erosion control and also provide excellent food and cover for wildlife, as opposed to the grass mixes that have been traditionally used at old mine sites. With the entire project geared toward learning and teaching, the site essentially serves as an outdoor laboratory where cutting-edge research is made publicly available.

Of the more than 160,000 annual visitors to the Jennings Environmental Education Center, many are school students who have the opportunity to learn firsthand about the issues involved with energy extraction. While visiting the degraded mine site, the students are taught the history of coal mining and its effects on the environment. They then sample and test the water at the various stages throughout the treatment system. The information they collect is often used for on-going water quality projects back in their classrooms. A number of college students in various fields

have also served internships at the center. Even elementary students visiting the constructed wetlands leave with a greater sense of environmental awareness. Through this on-going education and research, we are much closer to finding effective "soft technologies" that will be applicable throughout Pennsylvania and the Appalachian coal fields. How appropriate that environmental education is leading the way!



Left: David Johnson, center manager of Jennings Environmental Education Center, directs graduate-level students sampling stream water to test the success of the center's passive acid mine drainage treatment system. Photo from the Jennings Environmental Education Center Files.

Top: Joanna Conrad of Slippery Rock, PA and Ayesha Navagamua of Sri-Lanka, both Environmental Geoscience interns from Slippery Rock University, cooperatively obtain plant samples to study biodiversity of the constructed wetland. Photo by Jill Shankel.

Bottom: Elementary school-aged children visit the wetlands as part of "Habit-Hikers," an Environmental Discovery Program sponsored by the Pennsylvania Department of Conservation and Natural Resources, Bureau of State Parks. Photo by Jill Shankel.

Jill Shankel is a graduate of Slippery Rock University's Environmental Studies Program. She received the Governor's Award for Volunteer Service in a State Park in 1992 and the Bluebird Monitor of the Year Award in 1994 for her work at the Jennings Environmental Education Center.

CONSERVATIONIST HONORED FOR WATERSHED RESTORATION

Margaret Dunn, a founding member of the Jennings Water Quality Improvement Team and the Slippery Rock Watershed Coalition, was recently honored by state Sen. Mary Jo White (R-Clarion Co.) for her "unwavering commitment to the restoration of degraded water resources," particularly those polluted by acid mine drainage.

In a citation signed by White, Dunn was described as a "role model for the citizens of the community, particularly young women," as she leads "cooperative efforts between government, private sector and informed citizenry."

Dunn is a partner in CDS Associates, an environmental consulting firm in Rochester. Dunn was also a recipient of a Three Rivers Environmental Award from the Pennsylvania Environmental Council.

↔ For more information, contact Robert Dolence at 717 783-5338 or e-mail dolence.robert@a1.dep.state.pa.us.

resources

A publication of the Pennsylvania Department of Conservation and Natural Resources

Jennings: leading the way with cutting-edge technology

Dozens of environmental partners participated in a celebration at Jennings Environmental Education Center on October 9 near Butler to recognize a coalition and volunteer effort that is gaining international standing.

According to engineer and volunteer leader Margaret Dunn, Jennings' Director, David Johnson, has assembled at the center both the greatest number, and variety, of passive treatment systems for acid mine drainage at any single site in the world, with the possible exception of one in England. The center also maintains the longest record of chemical and hydrological data of any such system in the country.

Much of the recent advances in passive treatment at the center are due to large EPA "319" grants, which allowed the coalition to construct a series of field test models that demonstrated the accuracy of certain treatment theories, and eventually the full-scale treatment projects constructed to test them.

The effort to control acid mine drainage at Jennings began in 1985, when the seal on a local abandoned mine was destroyed by a storm and spewed severely polluted water into the center's watershed. Since then, a highly motivated partnership and volunteer effort with local companies and individuals has resulted in the successful coalition (which in 1993 became the Slippery Rock Watershed Coalition) cel-

ebrated at the gathering at Jennings in October.

"We are here today to recognize the efforts and achievements of a partnership of government agencies and the private sector," said DCNR Secretary John Oliver at the celebration. "This project is an outstanding example of multiple partners coming together to solve not only a state park problem, but a larger Commonwealth problem as well."

DEP Deputy Secretary Robert Dolence also attended the celebration to talk about acid mine drainage problems in Pennsylvania.

"Acid mine drainage pollutes 2,400 miles of Pennsylvania's streams, making it one of the single largest water pollutants in the Commonwealth. DEP spends more than \$31 million annually to clean up land and water polluted by past coal mining," Mr. Dolence said.



In fact, there are over 220,000 acres of abandoned coal mine land in Pennsylvania, an unfortunate blight on a state known for its spectacular scenery and forests.

There is, however, a glimmer of hope for these lands. According to David Aloe of Aloe Mining, a partner in the coalition, re-mining abandoned coal mines is profitable and environmentally beneficial as well, and is slowly gaining in popularity. Deputy Secretary Dolence emphasized DEP's recent efforts to grant re-mining permits that include requirements for site remediation by the mining

INSIDE

Volunteers win awards...	2
Stream ReLeaf plan published...	3
Sizerville educator awarded...	4
Chestnuts grow at Moshannon...	4
Grass program rolled out...	6
Memorial for firefighters...	7
Geologist lands award...	9
Calendar...	11
Diversity Diary...	12
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November 1998	
Vol. 2 Issue 7	

continued on page 2

continued from page 1

company; to date these efforts have been about 95 percent successful, resulting in reduced pollution, thousands of acres of reclaimed land, and a savings to the Commonwealth of millions of dollars in remediation costs.

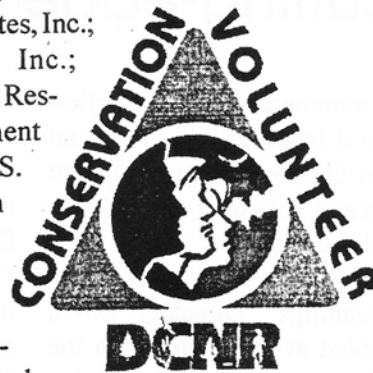
Recognized at the celebration and tour were dozens of individual volunteers from the local community and the partners in the project at Jennings, including Allegheny Mineral Corporation; Amerikohl Mining; ARMCO; Chester Engineers; CDS Associates; Hedin Environmental; Jesteadt Excavation; Quality Aggregates, Inc.; Scrubgrass Generating, Inc.; Shalston Trucking; Stream Restoration Inc.; fellow government agencies including the U.S. Environmental Protection Agency; the U.S. Department of Energy; and both the Pennsylvania Game and the Fish and Boat commissions. Grove City College and Slippery Rock University students, and a local Girl Scout troop were also recognized.

Also noted at the celebration were the other factors contributing to Jennings' success as an environmental center: easy access, classrooms, parking, conference facilities and an educational program of services, displays and materials available to students of all grade levels.

DCNR has three other environmental education centers—King's Gap in Cumberland County, Nolde Forest in Berks County, and Jacobsburg in Northampton County. DCNR's well-established environmental education program, while historically based at the four centers and 52 other state parks, is now expanding to include all of the DCNR field staff.

For more information about the Jennings Environmental Education Center, call (724) 794-6011, e-mail the center directly at jennings.sp@a1.dcnr.state.pa.us. *

* *Contributed by Josh First, DCNR's director of environmental education & information. (717) 772-9104.* *



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resource



Joe Appel/Tribune-Review archive

CDS Associates' Margaret Dunn, a geologist, and Charlie Cooper, an engineer, were instrumental in the formation of the Jennings Water Quality

Improvement Coalition. The coalition is successfully cleaning up acidic mine drainage using passive treatment systems in Slippery Rock, Butler County.

Eureka! Group successful in cleaning Butler County mine drainage

By Lynne Glover
STAFF WRITER

An all-natural "outdoor laboratory" that uses no chemicals or electricity is having success in treating the huge problem of acidic mine drainage.

This was cause for a celebration Friday, as about 70 people attended the dedication of the innovative, passive treatment system at the Jennings Environmental Education Center on Prospect Road in Slippery Rock, Butler County.

The special network of ponds and wetlands is removing pollutants from water that otherwise would flow into Slippery Rock Creek.

"We're celebrating a very significant event," said John Oliver, secretary of the state's Department of Conservation and Natural Resources. "Government agencies, corporations and nonprofit groups have all come together for a very worthy cause."

That goal is repairing the nearly 2,500 miles of Pennsylvania streams polluted by acidic drainage from long-abandoned mines.

Restoring the streams will cost billions of dollars, according to the Pennsylvania Department of Environmental Protection. The DEP

'The coalition of partnerships with different talents to solve these problems is not such a nice thing; it's an essential thing. It's the only way we are going to address these problems in the future.'

— David Johnson

CENTER MANAGER OF JENNINGS ENVIRONMENTAL EDUCATION CENTER

already spends \$31 million annually to clean up land and water polluted by past coal operations.

Solving the problem is beyond any single governmental or regulatory agency, and beyond individuals and private organizations, said David Johnson, center manager at Jennings.

"The coalition of partnerships coming together with different talents to solve these problems is not such a nice thing; it's an essential thing. It's the only way we are going to address these problems in the future," Johnson said.

Formed in 1994, the Jennings Water Quality Improvement Coalition includes as many as 60 "partners" — including local Girl Scouts. Academic institutions such as Slippery Rock University and Grove

City College have incorporated the outdoor lab into their environmental programs.

Here's how the system works: Water contaminated by the former Brydon Coal Mine near Slippery Rock flows into a pond 150 feet long by 50 feet wide, lined with 300 tons of mushroom compost and 380 tons of limestone.

The material screens and neutralizes much of the metal deposits from the water, which then flows into a wetlands.

Wetlands contain bacteria that act as a natural filtration system, and by the time the water reaches a settling pond it is clean enough to support life.

"When we first started, for the first time in my life I saw regulators, coal operators, people from all over

working together to solve this problem," said Margaret Dunn, whose firm, CDS Associates Inc. of Coraopolis, won a Three Rivers Environmental Award in May for its work at Jennings.

The Jennings site is the only one in the country that combines all the current passive treatment technologies. About seven acres of the 320-acre park are devoted to treating mine drainage.

Thanks to a "vertical flow system" engineered by CDS' Charlie Cooper, about 68 pounds of acidity is removed each day from the drainage site.

The pH level of the runoff before treatment is very low, only 3, indicating a strong acid content. That level is raised to a healthy 7 after passing through the ponds.

"It has restored four miles of Slippery Rock Creek," Dunn said. "Before, this section has not had bass in it. And now people are seeing some bass."

Robert Dolence, DEP deputy secretary, said the Jennings project will be used as a model when the state introduces "Reclaim PA," a future campaign to educate the public and encourage incentives to clean up the environment.

The winners were selected from various educational institutions, public awareness organizations,



tions, community environmental groups and planning, design and development com-

missions. James Seif, Secretary of the Pennsylvania Department of Environmental Protection, gave the keynote address at the May ceremony.

The winners include:

Community:

Environmental Organizations:

- Mill creek Coalition of Clarion and Jefferson Counties (Clarion)

Social Organizations:

- Neville-Green (Neville Island)

Planning, Design, and Development:

- CDS Associates, Inc. (Coraopolis)

Government:

- Bernard J. Spozio, Natural Resources Conservation Service (Clarion)

Business:

Environmental Stewardship (tie):

- National Forge Company (Irvine)
- U.S. Steel Clairton Works (Clairton)

Environmental Products or Services:

- Franklin Brine Treatment Corporation (Franklin)

Public Awareness:

- SW PA Ozone Action Partnership (Pittsburgh)

Education:

Higher Education:

- Nine Mile Run Greenway Project, STUDIO For Creative Inquiry, Carnegie Mellon University (Pittsburgh)

Community or Continuing Education:

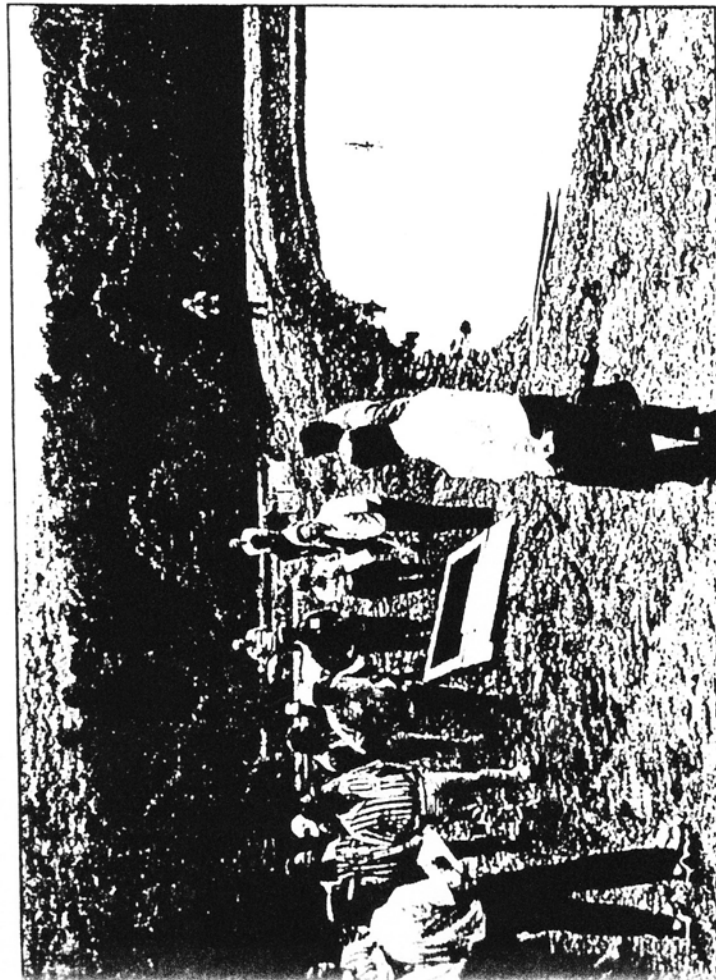
- Jennings Environmental Education Center (Slippery Rock)

Primary or Secondary Education:

- Junior Landscaper Program, National Aviary and "Cities in Schools" (Pittsburgh)

Eleven Environmental Awards presented

The fifth annual Three Rivers Environmental Awards were handed out in Pittsburgh in front of over 600 environmental, business and civic leaders. Eleven winners were selected from 31 finalists, which in turn came from over 100 nominations. The awards, in the form of a \$1,000 donation to a nonprofit environmental organization of the winner's choice, were presented by the Pennsylvania Environmental Council and Duquesne Light Company.



Checking it out: Interested environmentalists look over a pond at a passive water treatment site at Jennings Mental Education Center south of Slippery Rock Friday. (Allied / F. Petro)

EPA conferees tour Jennings, see mine drainage cleanup system

► 'Passive' system an example of new wave of technology for dealing with water problems

By Felicia Petro
Allied News Writer

About 75 environmentalists met at Jennings Environmental Education Center Friday to witness its new system to clean waters tainted by deep mine drainage.

Called a "vertical flow wetland," the system is "passive" — it does not need maintenance. It was finished this summer by a collaborative effort of the Jennings Water Quality Improvement Coalition and the Slippery Rock Watershed Coalition (SRWC), according to Tim Gillen, a hydrogeologist with the Department of Environmental Protection (DEP).

"We're all the same people but you have to have an (official) name in order to get (government) grants," said Margaret Dunn, who leads the SRWC. She is part owner of C.D.S. Associates

Inc., Coraopolis, a firm of consulting engineers and geologists.

The Environmental Protection Agency awarded a grant for the Jennings system, she said, which will be used for scientific testing and educational purposes.

In general, passive water systems are a new technology, Gillen said, but are being sought after by other watershed and environmental groups. They are gaining popularity as an alternative to chemical water systems, which need continuous maintenance.

The SRWC has been ahead of the game in using passive water systems. "There are a handful of systems in the state," Gillen said, and SRWC has helped get three vertical flow wetlands built, including the one at Jennings.

The vertical flow wetland is built on the east side of Route 8, near the park's recreation center, to treat water coming from an old deep mine with particularly high concentrations of aluminum and iron, Gillen said.

The mine was one of several deep mines in Pennsylvania that was sealed through a governmental effort in the 1970's called "Operation Scarlit." However, it eventually broke under the force of water pressure, he said.

The other problem with the mine water is its acidity, Gillen said. Combined with the heavy metals, it effects aquatic life, he added.

The goal in treating the water is to make it alkaline and to drop out the heavy metals before it flows into streams, he said.

The water flow from the system at Jennings naturally moves at about 30 gallons per minute, Dunn said. However, a slower water speed is manipulated by the system in order to retain some of the toxins in the water, she added. It will help to show the differences between good and bad water for educational purposes, she said.

Through pipes, the treated water flows to a wetland on the west side of Route 8, which was built in 1988, Dunn said. The wetland has four ponding areas with cattails and other vegetation to further drop out the metals from the water, Gillen said.

From there, the water flows to Big Run, a stream further west through the wooded property of Jennings. Gillen said aquatic life from the stream, like bugs and other invertebrates, are being biologically assessed at Slippery Rock University for educational purposes — to see how the tainted water, now combined with treatment, is affecting them.

Big Run is part of the Slippery Rock Watershed, which is a 300-square-mile area where water eventually flows into Slippery Rock Creek, through streams, groundwater, wells, or rainfall.

It is not one of the target cleanup areas for the SRWC, however; the group is focusing on a 27-square-mile area of northeastern Butler County.

In the target area, the DEP and the SRWC finished two passive water systems near Boyers this summer; the first is showing some promising results. "The water is become alkaline," Gillen said. "It's just the beginning, so we're being cautiously optimistic."

This fall, the DEP and the SRWC will begin the first of 25 planned projects at a surface mine drainage area at Seaton Creek. Designs will also be drawn up for areas in Higgins Corners, Hilliards and Argenteur this year.

The group that went on a tour of the Jennings system was about half of 150 people from Pennsylvania, Ohio and West Virginia involved in a three-day Third Annual Mine Drainage Conference-Workshop, held at the Holiday Inn in the Pittsburgh International Airport.

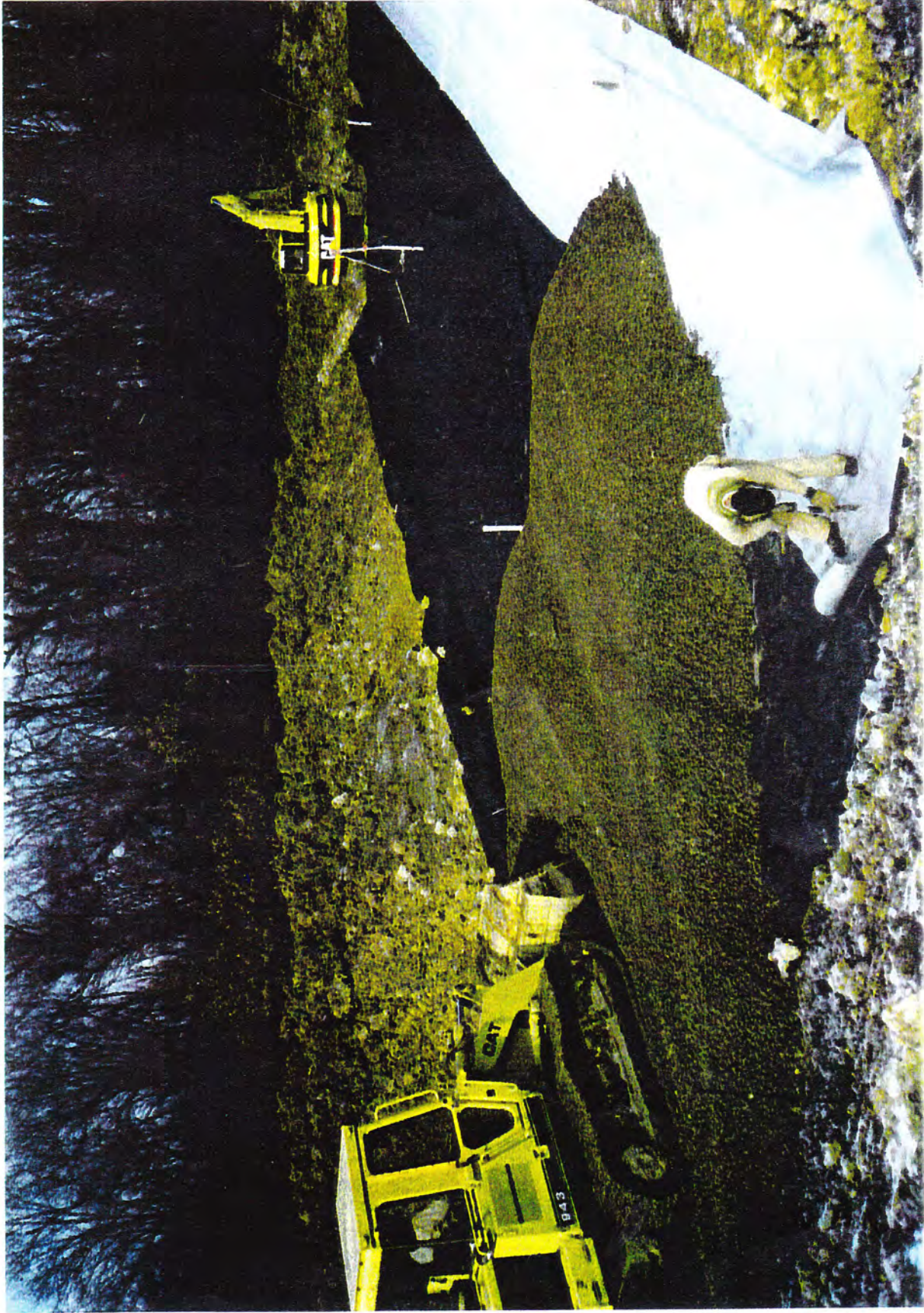
The group was brought to Jennings on chartered buses to spend about an hour viewing the system; first-hand



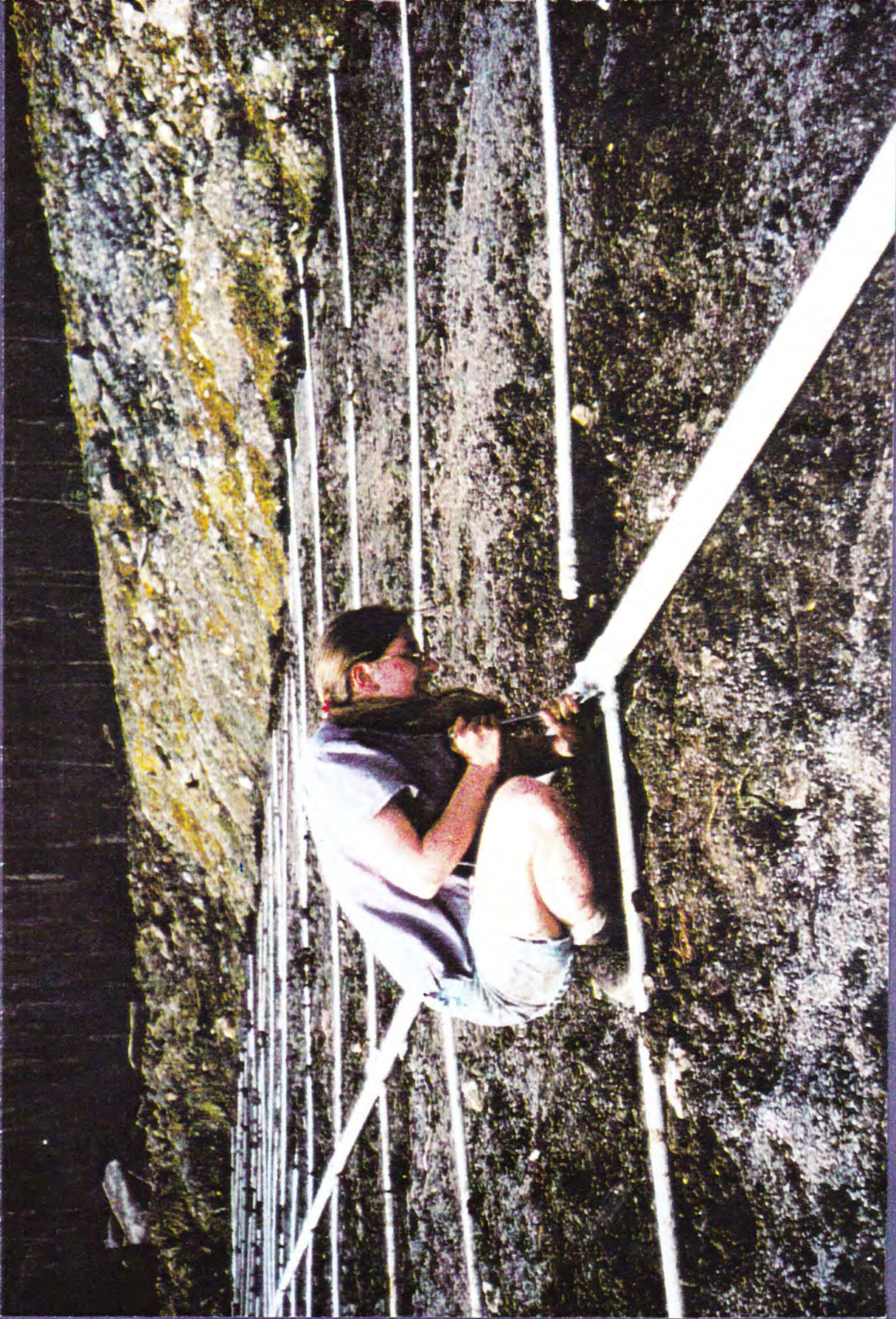
AERIAL PHOTO (winter 1992) showing installation of anoxic limestone drain and established wetlands (upper right corner); (Photo provided by PA DEP, Knox District Mining Office)



BEFORE CONSTRUCTION (6/11/92) showing sparse vegetation; coal refuse from an underground mine which ceased operations in mid-1940s



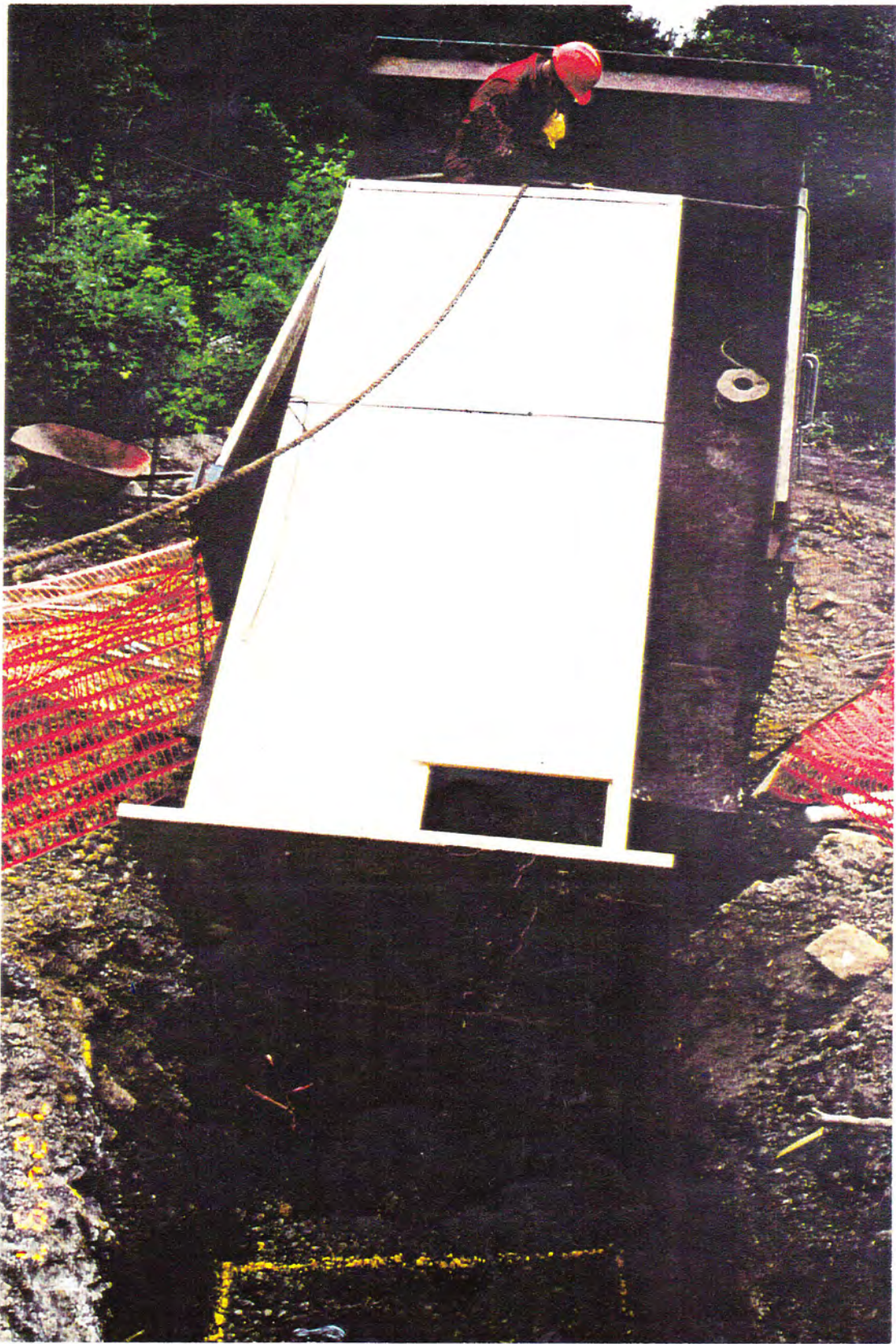
DAVID MACURAK OF JESTEADT EXCAVATING installs an underdrain, part of the vertical flow system constructed at the Jennings Environmental Education Center (**PA DCNR**). (11/96)



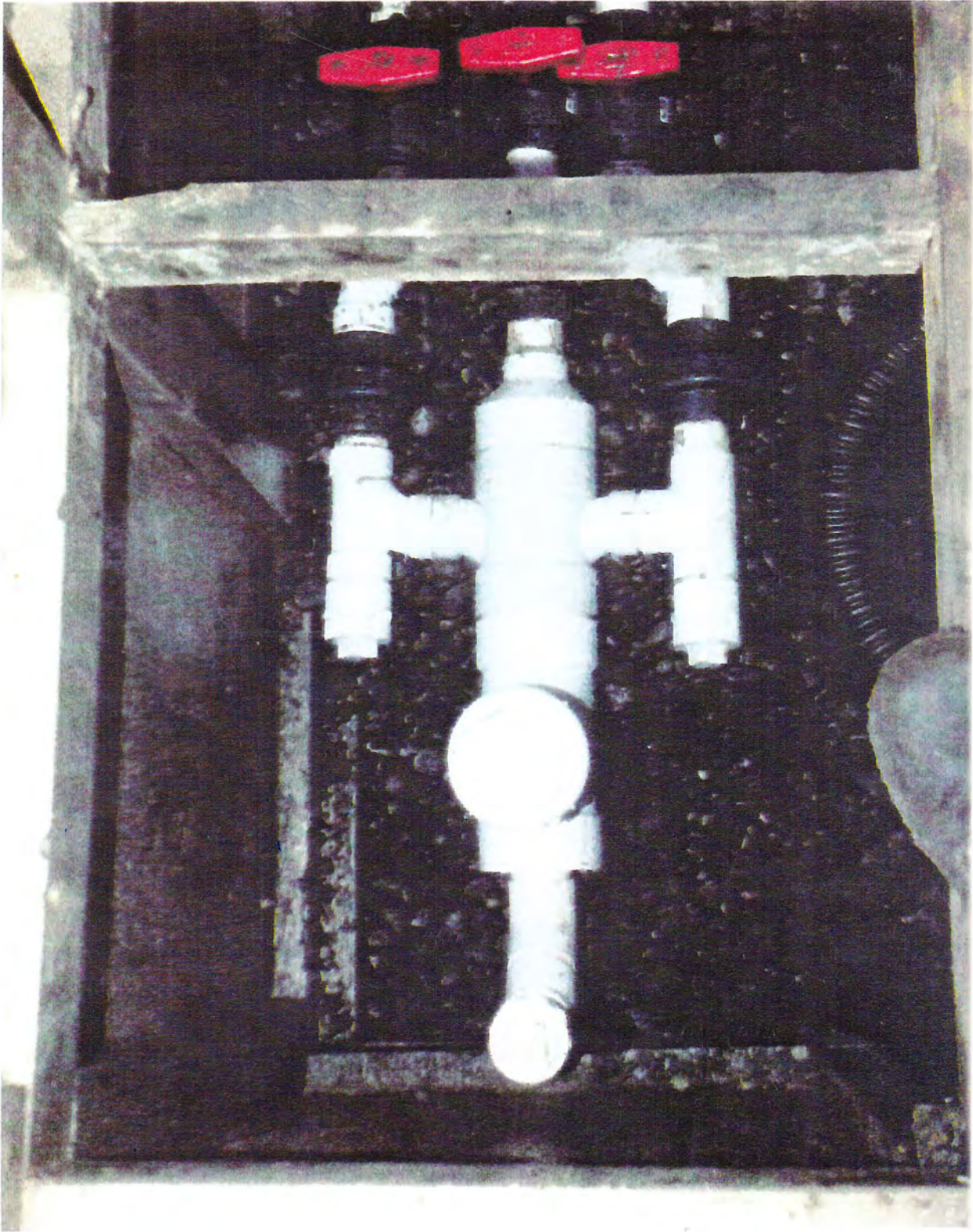
OVERDRAIN ASSEMBLY (5/97) by Slippery Rock University student
Jodi Cerminara



CROSS SECTIONAL VIEW of the full-scale vertical flow system at Jennings Environmental Education Center. Slippery Rock University students are finalizing the installation of the overdrain by leveling the 3/4" laterals which are used to evenly distribute the discharge over the entire area of the spent mushroom compost and limestone treatment media. (c. 5/97)



OUTLET CONTROL BOX PLACEMENT (7/24/97) Charles Cooper, PE (C D S Assoc., Inc.) with Jennings maintenance staff.



OUTLET MANIFOLD Part of the unique design of the full-scale vertical flow system at Jennings which allows for continued evaluation and control of the system. (c. 8/97)



MANUAL PLACEMENT OF FLOW SPLITTER BOX MANHOLE used to house a specially designed flow control device which delivers the flow to an overdrain system evenly distributing the aluminum and iron-laden discharge over the spent mushroom compost and limestone treatment media. (c. 8/97)



SAMPLING PORT INSTALLATION Two sets of sampling ports placed at varying depths within the treatment media of the full-scale vertical flow system at Jennings Environmental Education Center. Samples can be obtained to investigate the changes in water quality as it passes through the ~2' of treatment media. (c. 7/97)



FULL SCALE VERTICAL FLOW SYSTEM AT JENNINGS ENVIRONMENTAL EDUCATION CENTER (PA DCNR). A mixture of spent mushroom compost and limestone is used to treat an aluminum and iron-laden discharge. (4/14/99)



VOLUNTEER KITTY PEART participating in a dye test to study the effectiveness of the water distribution system at the Jennings Environmental Education Center. Home school students and volunteers have conducted these tests to study the innovative techniques used for the passive treatment of abandoned mine drainage at Jennings.



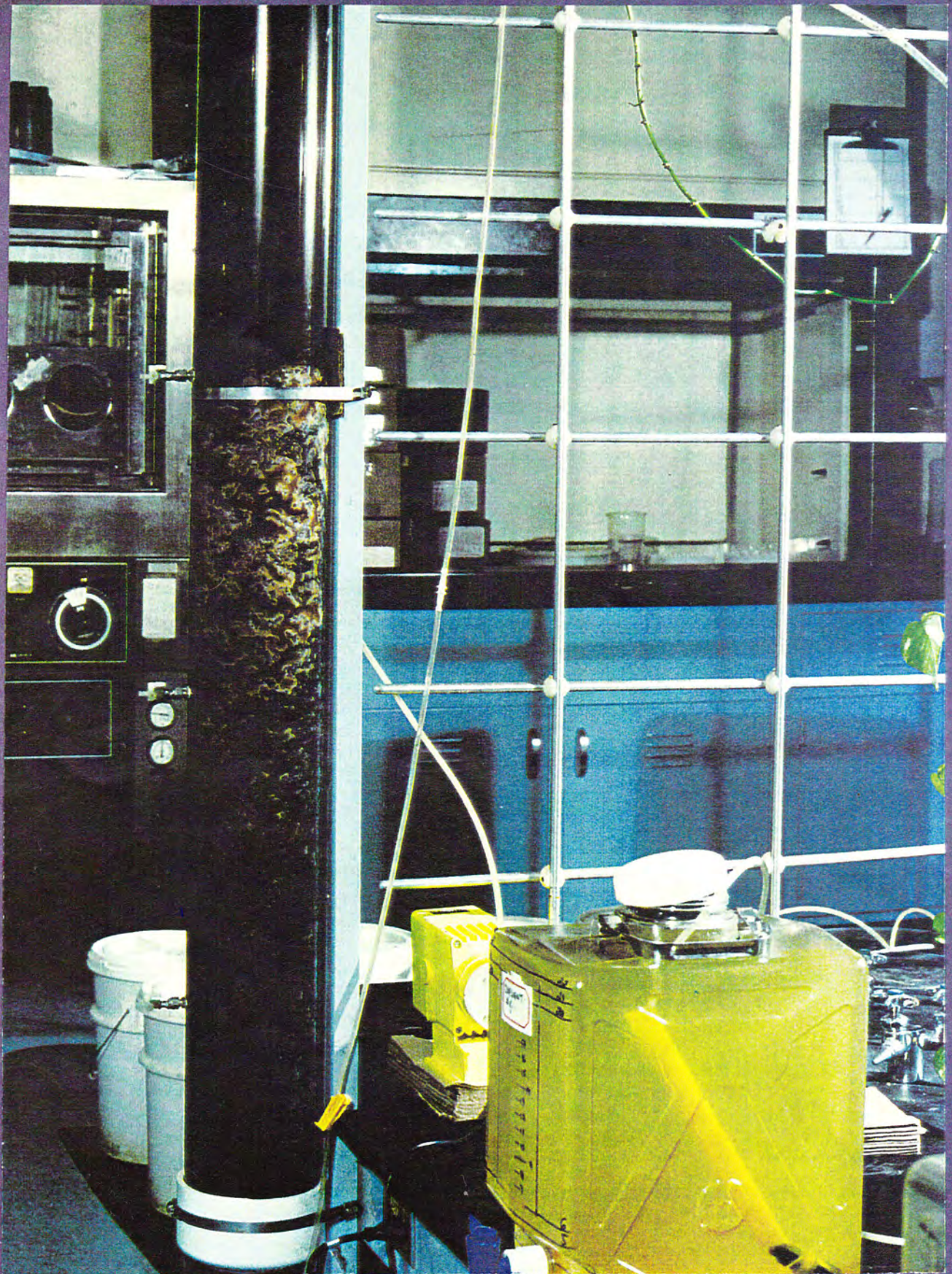
CONTINUED EVALUATION OF PASSIVE TREATMENT SYSTEM DESIGN is being conducted by design engineer Charles Cooper, PE and Darcy and Kitty Peart on a volunteer basis to monitor the success of innovative water distribution systems at Jennings Environmental Education Center.



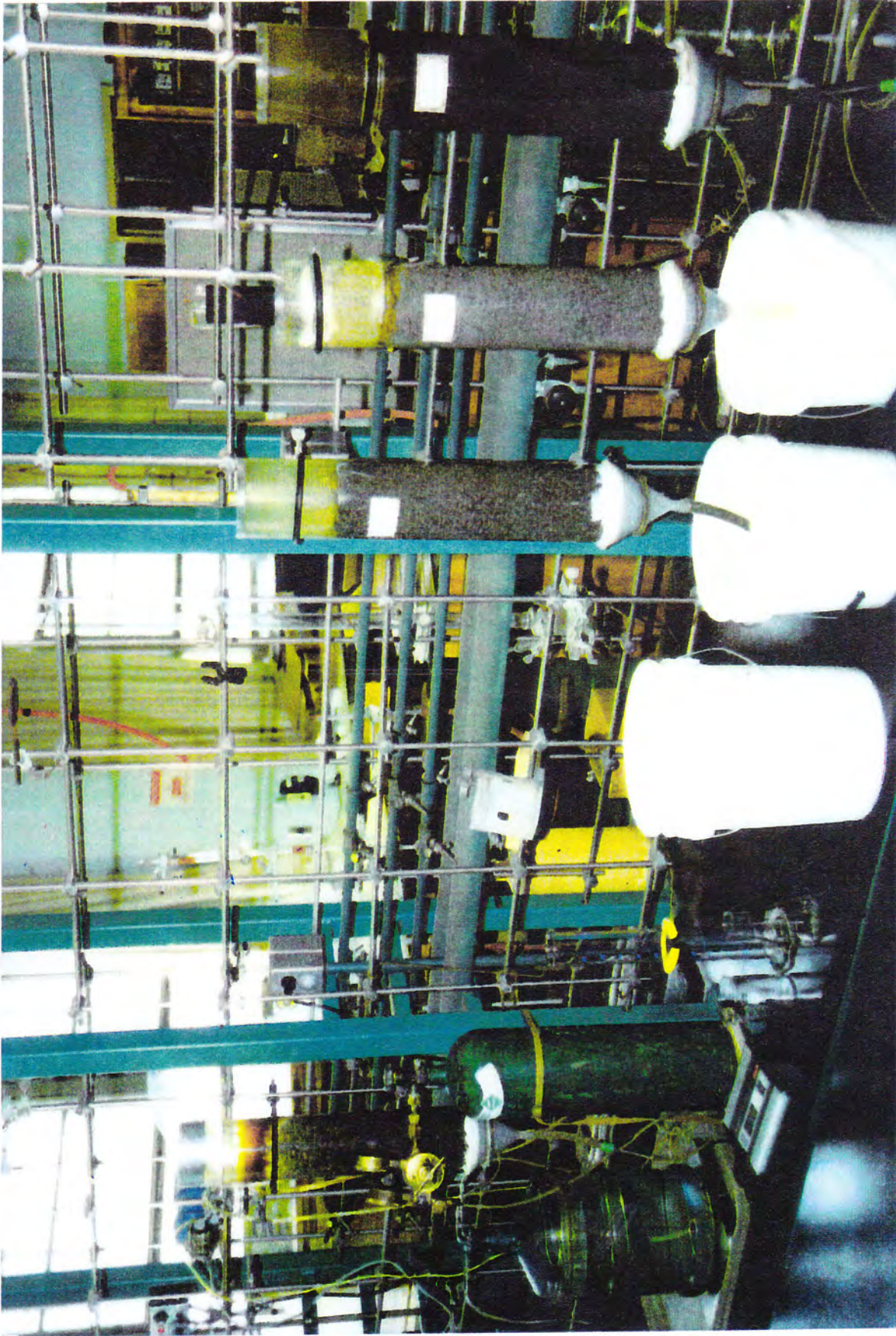
BEFORE PLANT ESTABLISHMENT A mixture of Composted Biosolids and Pond Cleanings (silt) are saturated with treated acid mine drainage shortly after the collection channel wetland was seeded with a mixture of 24 different wetland plant species. Jennings Environmental Education Center, Butler Co., PA (8/97)



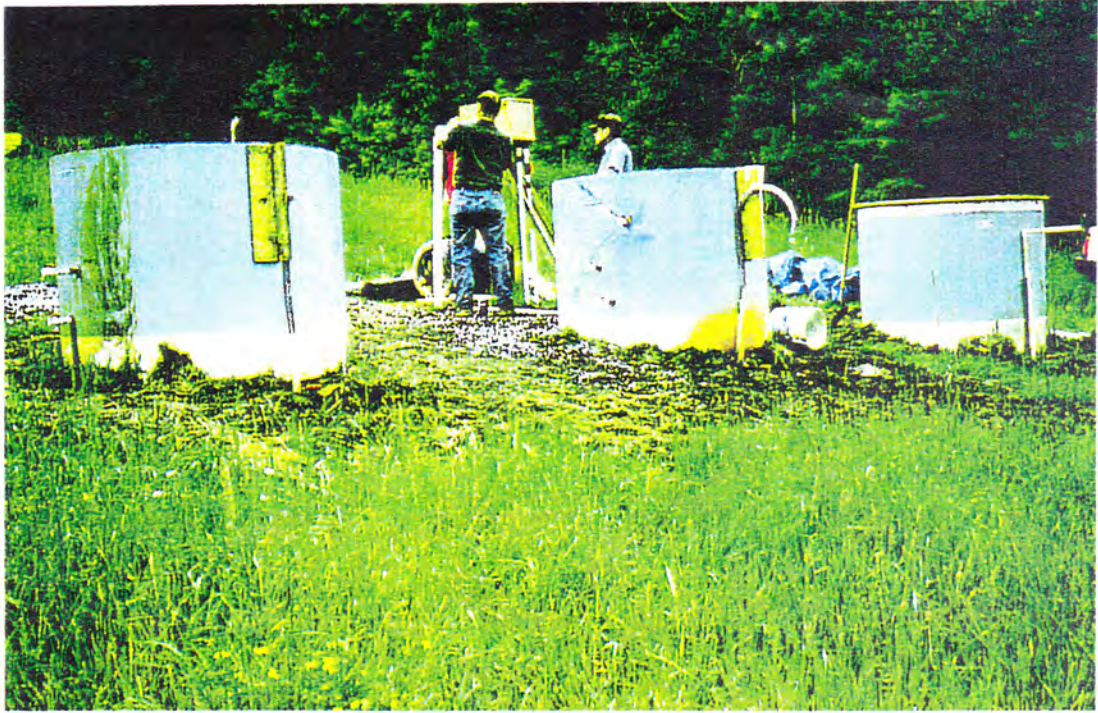
SECOND GROWING SEASON The channel wetland constructed at Jennings Environmental Education Center using a mixture of Composted Biosolids and Pond Cleanings (silt) to demonstrate the effectiveness of using a fabricated substrate for the establishment of wetland vegetation. (6/9/99)



U.S. DEPARTMENT OF ENERGY LABORATORY RESEARCH AT FEDERAL ENERGY TECHNOLOGY CENTER (PITTSBURGH) (5/1996) lab-scale limestone-only, down flow system; essentially all aluminum (white), iron (orange), and manganese (black) precipitates within column; operational for year¹; effluent storage in carboy in forefront; water collected at Jennings (research by George Watzlaf, Proj. Eng.)



LABORATORY COLUMNS (8/97) evaluating chemical processes and effectiveness of various treatment media. Dr. Michael Stapleton, Department of Environmental Geosciences, Slippery Rock University. Untreated water is collected at Jennings Environmental Education Center by SRU students and taken to the lab providing education opportunities and essential data for developing passive technology.



DEMONSTRATION TANKS used to evaluate treatment media on a pilot-scale; Timothy VanDyke, Supervisor, and James Plesakov, MCI, PA DEP, Knox DMO, monitoring systems. Continued efforts in passive treatment technology are spurred by the success of the full-scale vertical flow passive treatment system at Jennings Environmental Education Center. (7/3/96)



QUONSET HUT, TEST BED WETLANDS AND PILOT-SCALE TANKS are part of the on-going educational and scientific efforts at the Jennings Environmental Education Center. The quonset hut allows for demonstration systems to be evaluated year-round.



“LEARN-WORK” YOUTH PROGRAM relating to the hands-on passive treatment systems discussed by Girl Scouts and home-school students at dedication event (10/9/98). Jennings Water Quality Improvement Coalition, Jennings Environmental Education Center, PA Department of Conservation and Natural Resources.



DARCY PEART, LISA AND DANIELLE DUNCAN learning field surveying techniques with the help of **CHARLES COOPER, C D S ASSOC., INC.**, at Jennings Environmental Education Center.



WORKSHOP for master's candidates in Sustainable Systems at Slippery Rock University. Innovative programs at Jennings Environmental Education Center incorporate the passive treatment technology utilized for the design of the installed full scale system. (11/96)



HIGH SCHOOL STUDENTS participate in a stream study that demonstrates the impact of acid mine drainage on Big Run. Students identify the source of discharge and perform hands-on field tests to evaluate the effectiveness of the full-scale vertical flow system at Jennings. (3/26/98)



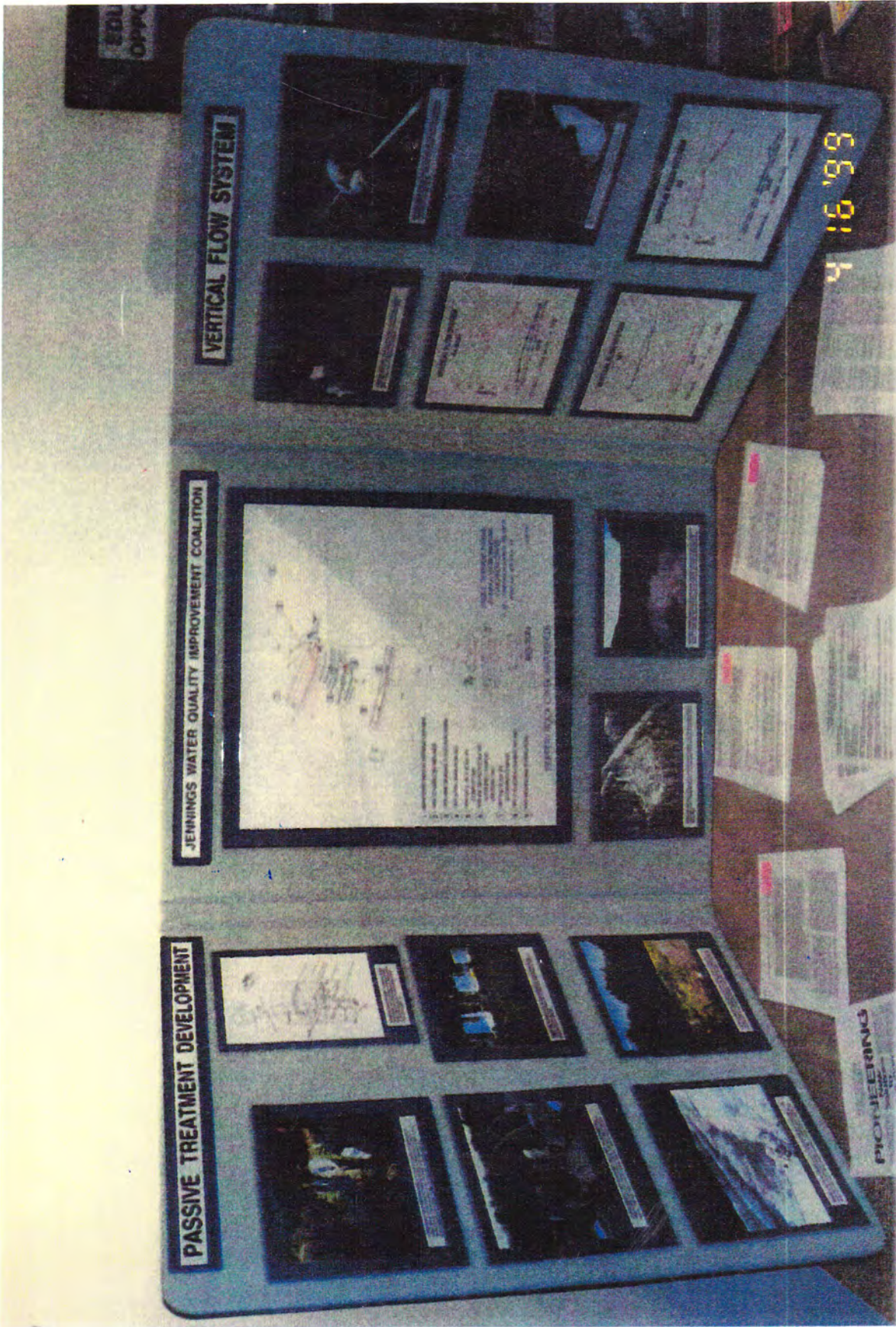
4th ANNUAL WATERSHED COALITION SYMPOSIUM BEING HELD AT JENNINGS. Part of a joint effort between the Jennings Water Quality Improvement Coalition and the Slippery Rock Watershed Coalition where high school, college and graduate students present the work being done at Jennings and throughout the watershed. (4/16/99)



MARY JO CLARK shakes hands with **PA DCNR Secretary JOHN OLIVER** as she accepts a Certificate of Appreciation during the site dedication for the full-scale vertical flow system at Jennings Environmental Education Center. (10/9/98)



JENNINGS ENVIRONMENTAL EDUCATION STAFF AND C D S ASSOCIATES, INC., (JENNINGS WATER QUALITY IMPROVEMENT COALITION) pose with both of their Three Rivers Environmental Awards for the work being done at Jennings related to abandoned mine drainage abatement and education. (5/26/98)



INCREASING PUBLIC AWARENESS using continually updated posters which explain the numerous and varied efforts based at the Jennings Environmental Education Center. Posters like this one are used at local, regional and national conferences and symposia, community events, learn-work programs, volunteer days and site tours to explain the extensive work being done by the Jennings Water Quality Improvement Coalition. (4/16/99)