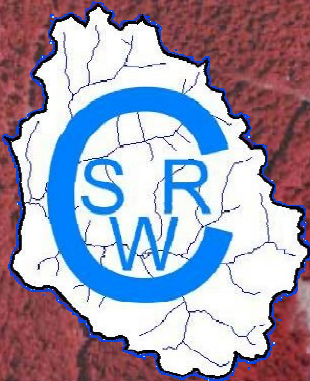


Passive Treatment in Pennsylvania Watersheds: Erico Bridge Restoration Area – A Case Study

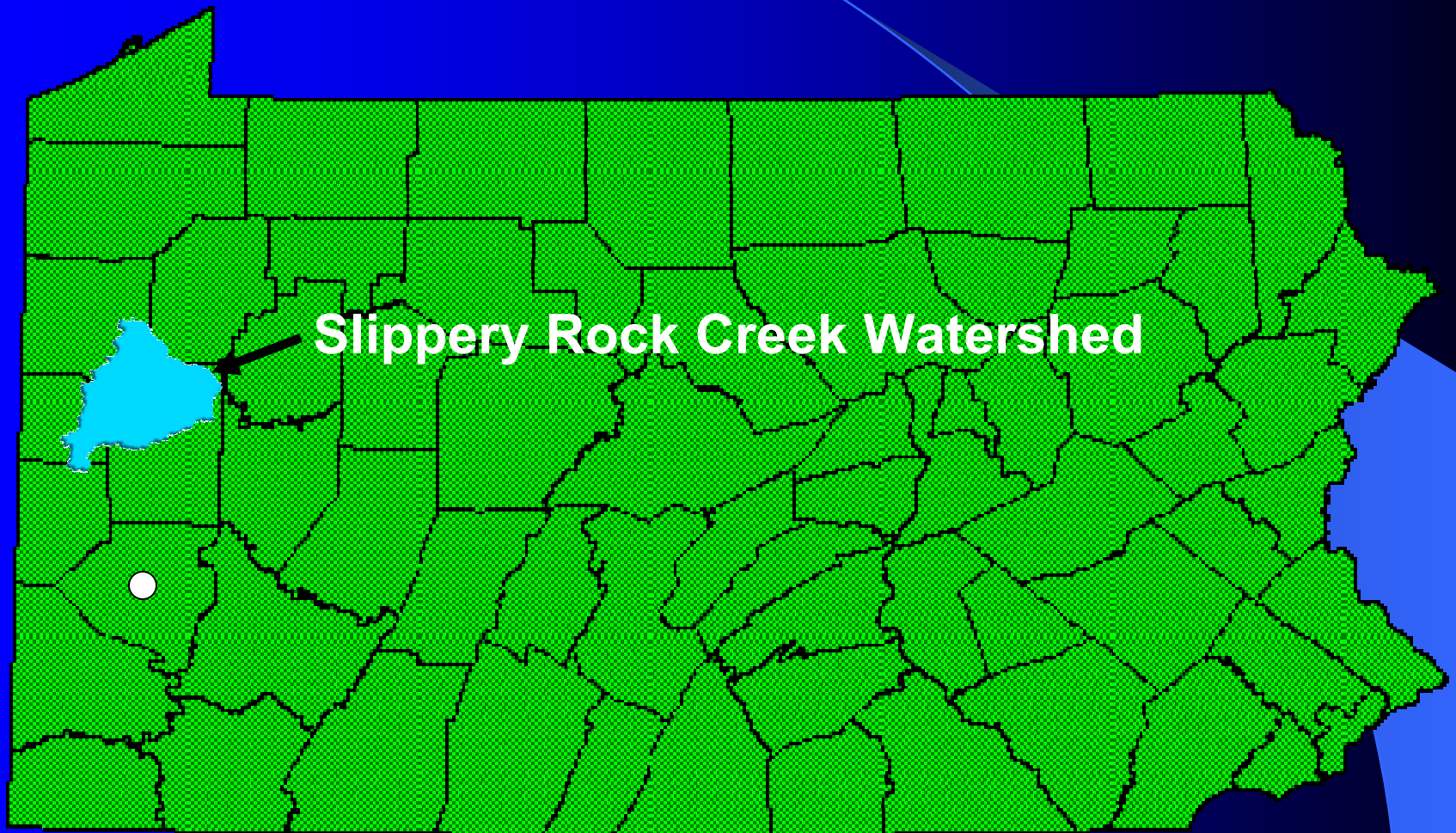


West Virginia Mine Drainage Taskforce Symposium

April 20, 2005

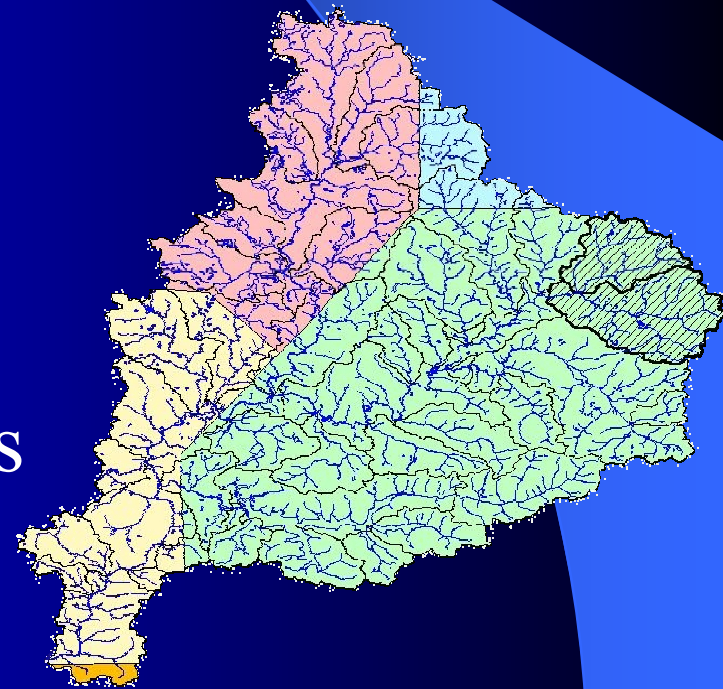
**Margaret H. Dunn, PG; Tim Danehy, QEP; Shaun Busler, GISP;
Cliff Denholm, Env. Scientist**

Location Map



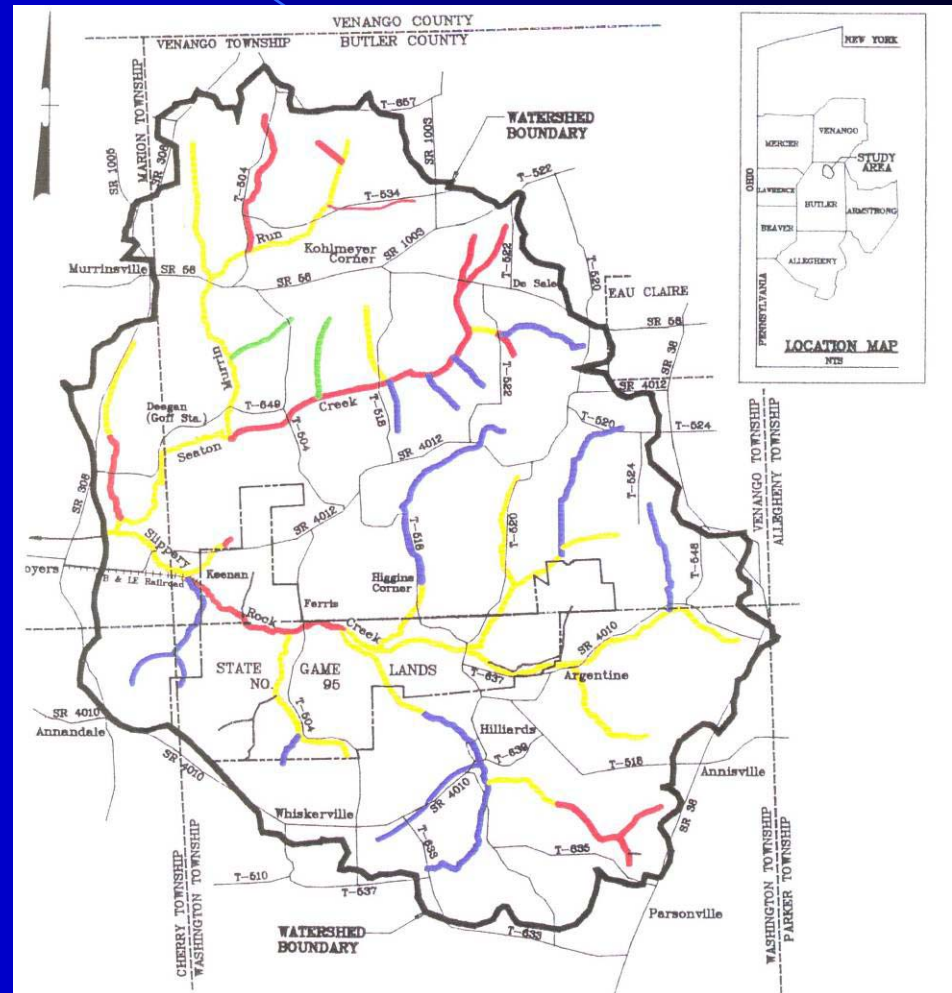
Slippery Rock Creek Watershed

- Entire watershed 410 square miles
- Focused on 27-square mile headwaters area due to severity of AMD
 - 15% PA Game Lands 95
 - 85% private property
- Non-point pollution impacts entire watershed



SRWC Headwaters Area

- 27 square miles
 - 4000 acres with underground mine workings
 - 8000 acres permitted for surface mining
- Color Code:
 - Blue - Good
 - Green - Acid Sensitive
 - Yellow - AMD impacted
 - Red - Polluted



Slippery Rock Watershed Coalition Goals



SRWC Goals

1. Restore the headwaters to a viable fishery



SRWC Goals

2. Develop public-private partnership efforts not only to reclaim abandoned mine sites but also to demonstrate the multiple benefits associated with watershed restoration



SRWC Goals

3. Develop and improve treatment systems and land reclamation techniques that are environmentally-friendly, low cost, low maintenance, and long term or sustainable

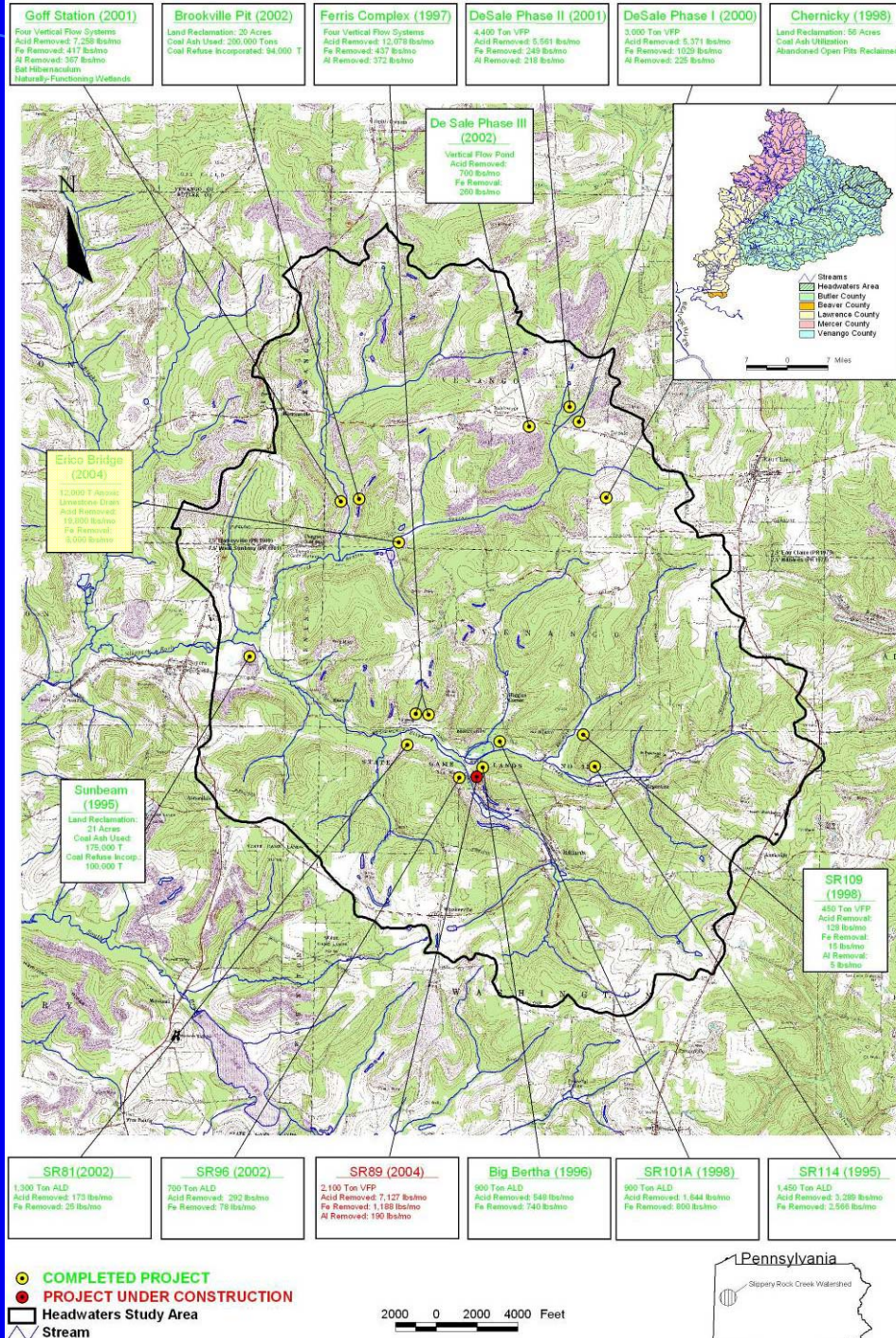


SRWC Goals

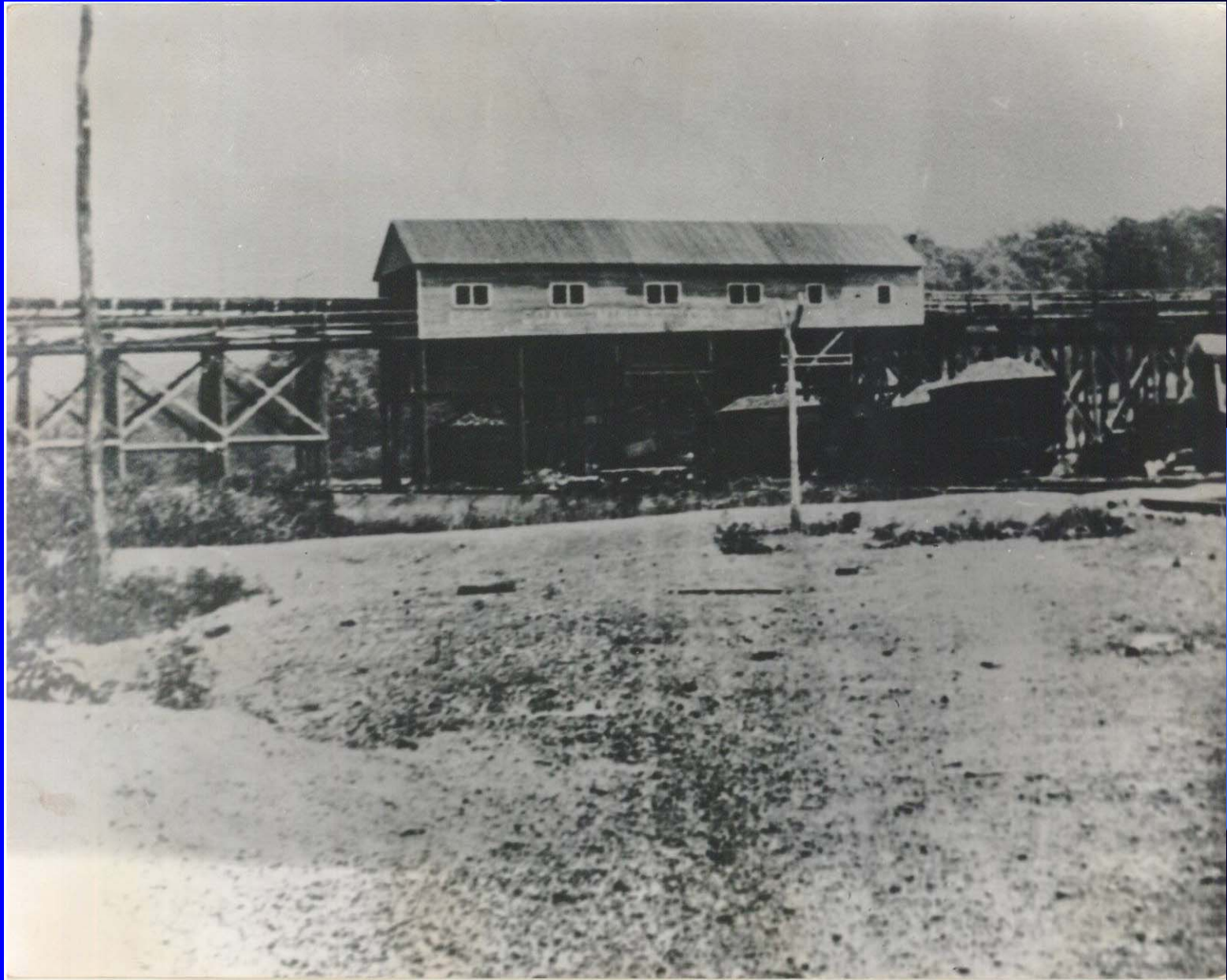
4. Provide educational opportunities at all levels to all age groups interested in abandoned mine restoration



SRWC TARGET AREA



The Ghost Town of Erico

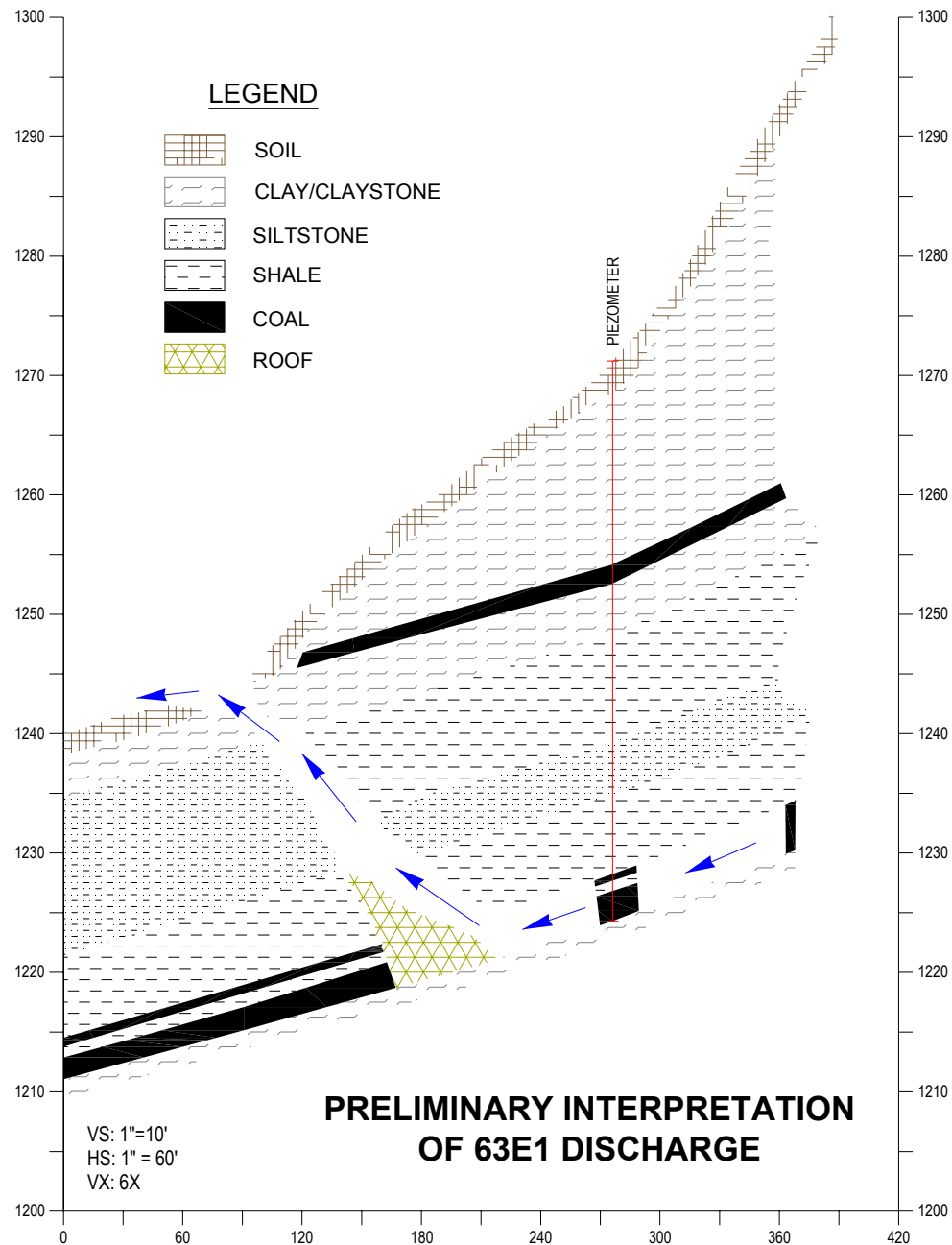


Erico Bridge Restoration Area



Coal Refuse Removal and Neutralization





Fact Sheet

- Date online: 2003
- Flow rate: 500 gpm
- Maintenance to date: NA

- Components: ACS(3), ALD(3), SP(4), WL(3), HFLB
- Construction time: 12 months

Parameter	Raw	Effluent
pH	5.7	7.2
alkalinity	50	112
acidity	154	-58
Fe	62	2
Mn	31	<3
Al	<1	<1



FISH !!!



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Passive Treatment System



As-Built

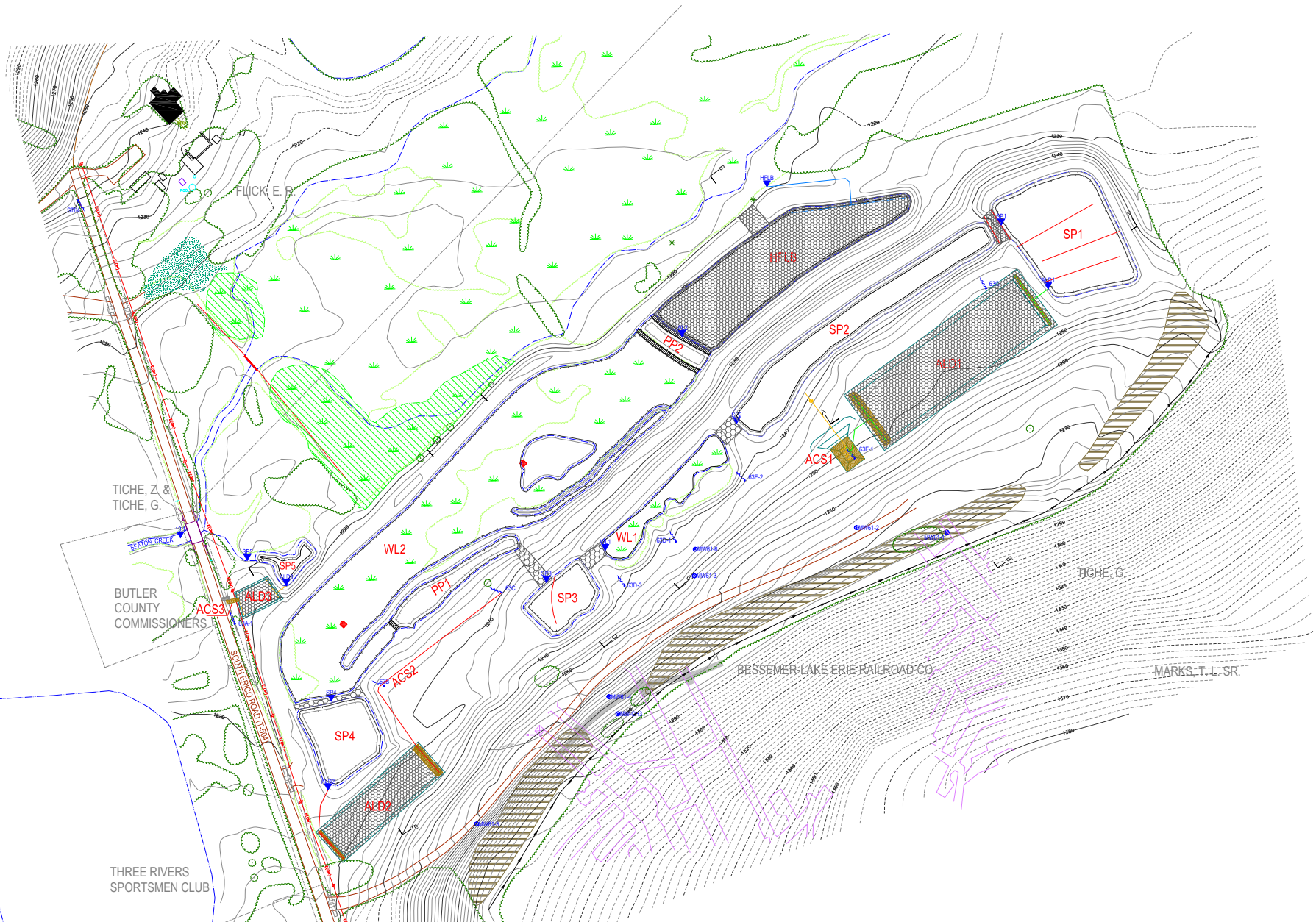


Table 2: Discharge Characteristics Through the Erico Bridge Passive Treatment Complex

Component	Flow	pH (field/lab)	Alkalinity (field/lab)	Acidity	DFe	DMn	DAI	DO
ALD1	363	6.5/6.4	234/190	-12	71	27	<1	0
SP1	NM	6.7/6.4	187/111	-36	46	24	<1	1
SP2	NM	6.8/6.6	147/104	-45	24	23	<1	6
WL1	NM	6.9/6.7	131/99	-17	17	24	<1	6
SP3	NM	7.0/6.8	118/98	-37	11	23	<1	7
ALD2	63	6.6/6.5	256/213	-41	68	18	<1	0
SP4	NM	6.7/6.6	162/114	-64	31	17	<1	3
WL2	NM	6.9/6.7	76/75	-18	6	18	<1	8
HFLB (major final effluent)	479	7.2/7.0	111/112	-60	1	3	<1	3
ALD3	15	6.5/6.4	220/148	3	81	16	<1	0
SP5 (minor final effluent)	NM	6.5/6.3	118/69	-5	26	15	<1	4
Composite Final Effluent (weighted value)	494	7.2/7.0	112/111	-58	2	3	<1	3

Average values; flow in gpm; flow measured at ALD1, ALD2, ALD3, and HFLB outlet pipe; other flows assumed; lab and field pH not averaged from H-ion concentrations; alkalinity, acidity, dissolved metals, and dissolved oxygen expressed in mg/L; Composite Final Effluent for general description only---monitoring events and frequency not coincident; n (See attached sample analyses.)

Table 3: Pre-Construction Loadings Analysis for Discharges ST63A-ST63E

Component	Alkalinity (lab)	Acidity (net)	TFe	TMn
ST63A	11	34	14	4
ST63B	28	71	31	4
ST63C	61	136	62	24
ST63D	2	6	2	1
ST63E	85	374	152	47
Total	187	620	261	79

Average loading values in pounds per day; Fe and Mn loadings calculated from total concentrations; pre-construction loading values limited due to lack of flow measurements for much of the data sets;

Table 4: Loading Analysis for the Erico Bridge Passive Treatment Complex

Component	Alk (field)	Alk (lab)	Acd (net)	TFe	Fe Removal Rate	TMn	Mn Removal Rate
ALD1	1025	620	-105	317		117	
SP1	834	491	-157	242	109	112	Neg
SP2	667	460	-207	182	98	106	Neg
WL1	592	413	-170	140	201	104	Neg
SP3	530	433	-173	105	177	103	Neg
ALD2	194	118	-40	54		14	
SP4	123	86	-48	29	84	13	Neg
WL2	423	373	-164	52	42	95	11
HFLB (final effluent)	594	559	-443	10		23	
ALD3	39	18	-1	15		3	
SP5 (final effluent)	21	11	-3	7	112	3	Neg
Total Final Effluent	615	570	-446	17		26	

Average effluent loading values in lbs/day; Removal Rate in lbs/ac/day; Fe and Mn loadings calculated from total concentrations; Total Final Effluent sum of HFLB and SP5 loadings; not shown but included in removal rate calculations are the loadings for the seep in WL2 of 17 lbs/day Fe and 5 lbs/day Mn



What Has The Coalition Accomplished?

Validation of Partnership Approach – Positive Results

- About 500 people annually visit our projects
- Newsletter - monthly mailing 10(1995) to 1243 (2005)
- 1999 3 Rivers Environmental Award - Community Organization
- 2001 Governor's Award - Watershed Stewardship
- 2002 Governor's Award - Environmental Excellence
- 2002 Dominion Foundation Award - Community Impact
- 2004 US Dept. Of Interior - Take Pride In America Award
- 11 miles of stream improved
- Fish documented in stream segments after 100 years!
- 150 acres reclaimed to productive farmland or wildlife habitat
- 6 abandoned oil wells plugged with 4 scheduled for plugging

Partners

- 
- Allegheny Mineral Corporation
 - Aloe Charitable Foundation
 - Amerikohl Mining, Inc.
 - Aquascape Wetland & Env. Services
 - Bessemer & Lake Erie Railroad
 - BioMost, Inc.
 - Boyers Sportsman Club
 - Butcherine's Distributor, Boyers, PA
 - Butler County Commissioners
 - Butler County Env. Quality Board
 - Butler County Planning Commission
 - CDS Associates, Inc.
 - Dominion Foundation
 - Env. Innovative Solutions, LLC
 - Epiphany Catholic Church
 - Grove City College
 - Jennings Env. Education Center
 - Landowners
 - Liberty Township Supervisors
 - Marion Township Supervisors
 - McClymonds Supply & Transit Co.
 - New Media Design
 - PA Dept. of Environmental Protection
 - Pennsylvania Game Commission
 - Quality Aggregates Inc.
 - Scrubgrass Generating Plant
 - Shalston Enterprises
 - Slippery Rock University
 - Slippery Rock Watershed Coalition
 - Stream Restoration Inc. (non-profit)
 - The Flick Family
 - The Tiche Family
 - 241 Computers
 - Urban Wetland Institute (non-profit)
 - US Department of Energy
 - US Dept. of Interior
 - US Environmental Protection Agency
 - Venango Township Supervisors
 - Washington Township Supervisors
 - Waste Management of North America
 - Western PA Watershed Program
 - Westminster College
 - WOPEC

Questions???

