

The AMD Avengers Vs. The Pollution Posse



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Pyrite O'Brian

He tells the tales of past mining practices and enjoys taking people on tours of the Abandoned Mines.

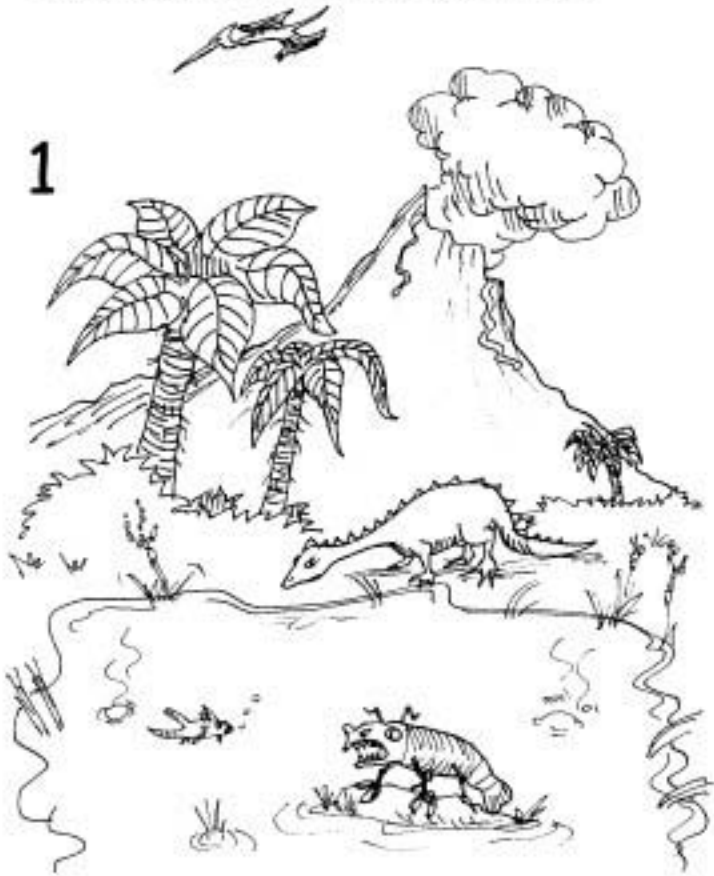
He explains how Abandoned Mine Drainage becomes a threat to the environment once coal companies stop mining and the mines fill up with water.



How Coal Was Formed

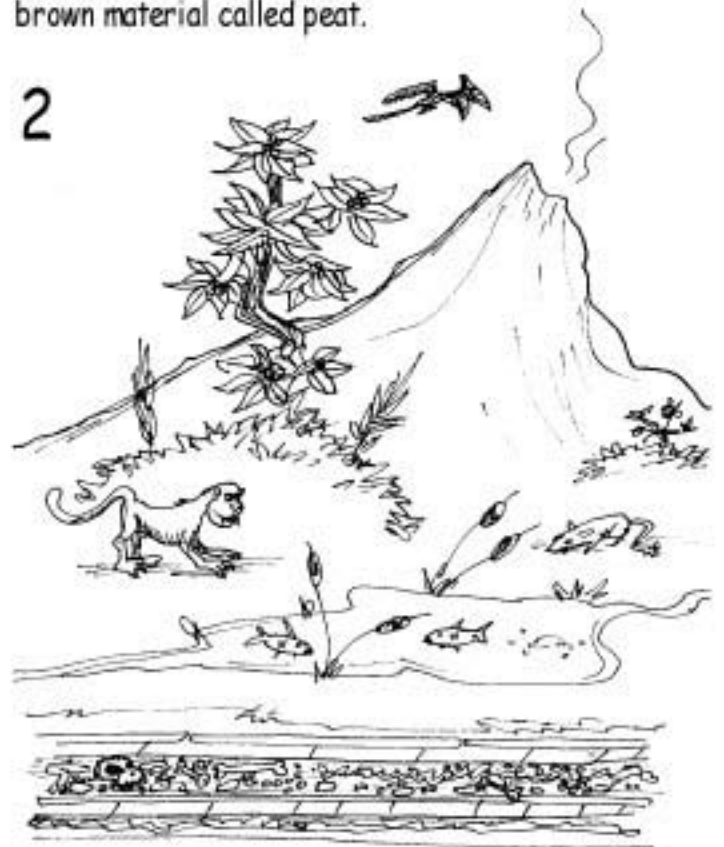
Vegetation and Dinosaurs lived in swamps in Pennsylvania about 300 million years ago.

1



The prehistoric plants and animals fell in the swamp, died and accumulated on the bottom. Then sediments piled up on top of the debris and formed a spongy brown material called peat.

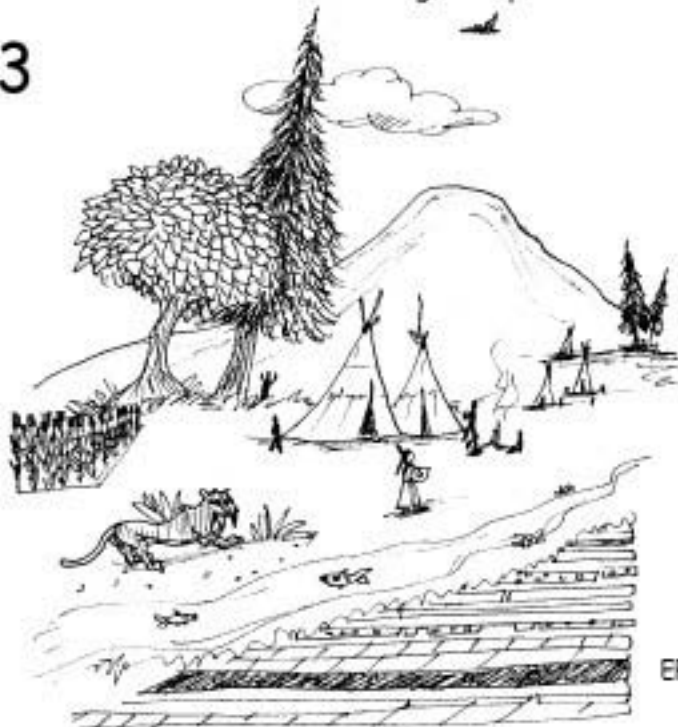
2



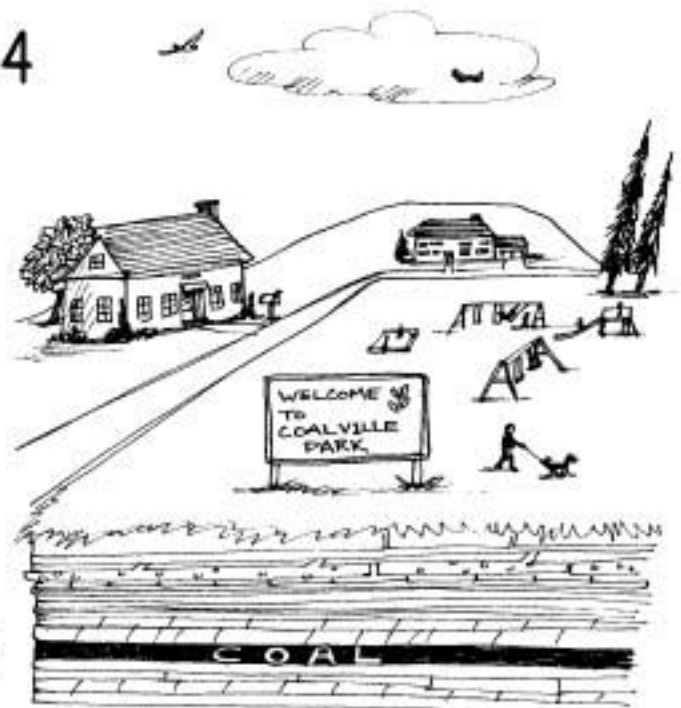
Geologic forces continue to bury the peat under the earth's surface. Pressure from the rocks above and heat from the earth's core change the peat into coal.

Coal was formed after millions of years under the ground. The greater the pressure and heat, the harder the coal. Anthracite Coal is the hardest and purest form of coal.

3



4



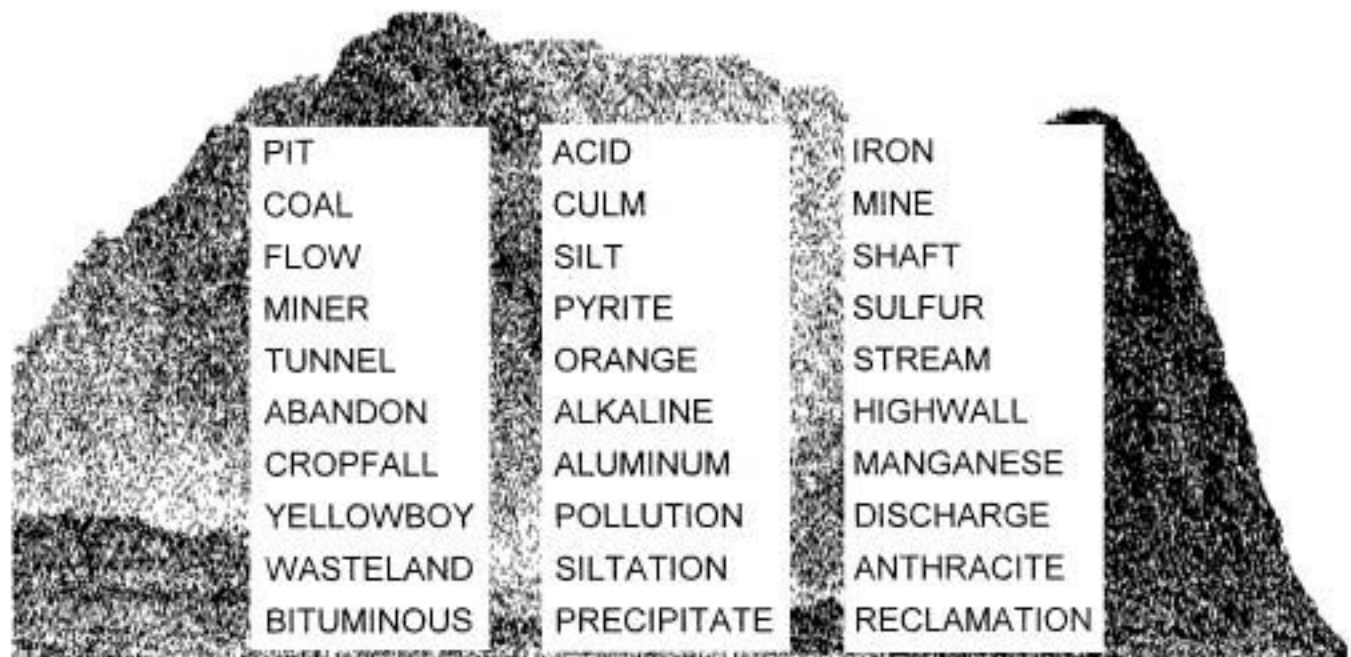
Gobba 'da Pile

This large lazy oaf has been around before mining laws were introduced and is seen as an "eye sore" in the local community. He is made of coal waste and other rocks like shale, pyrite and quartz. He can catch on fire if campfires or illegal garbage are burned too close to his banks. Trees that can tolerate acidic soil like birch and black locust grow on his back.



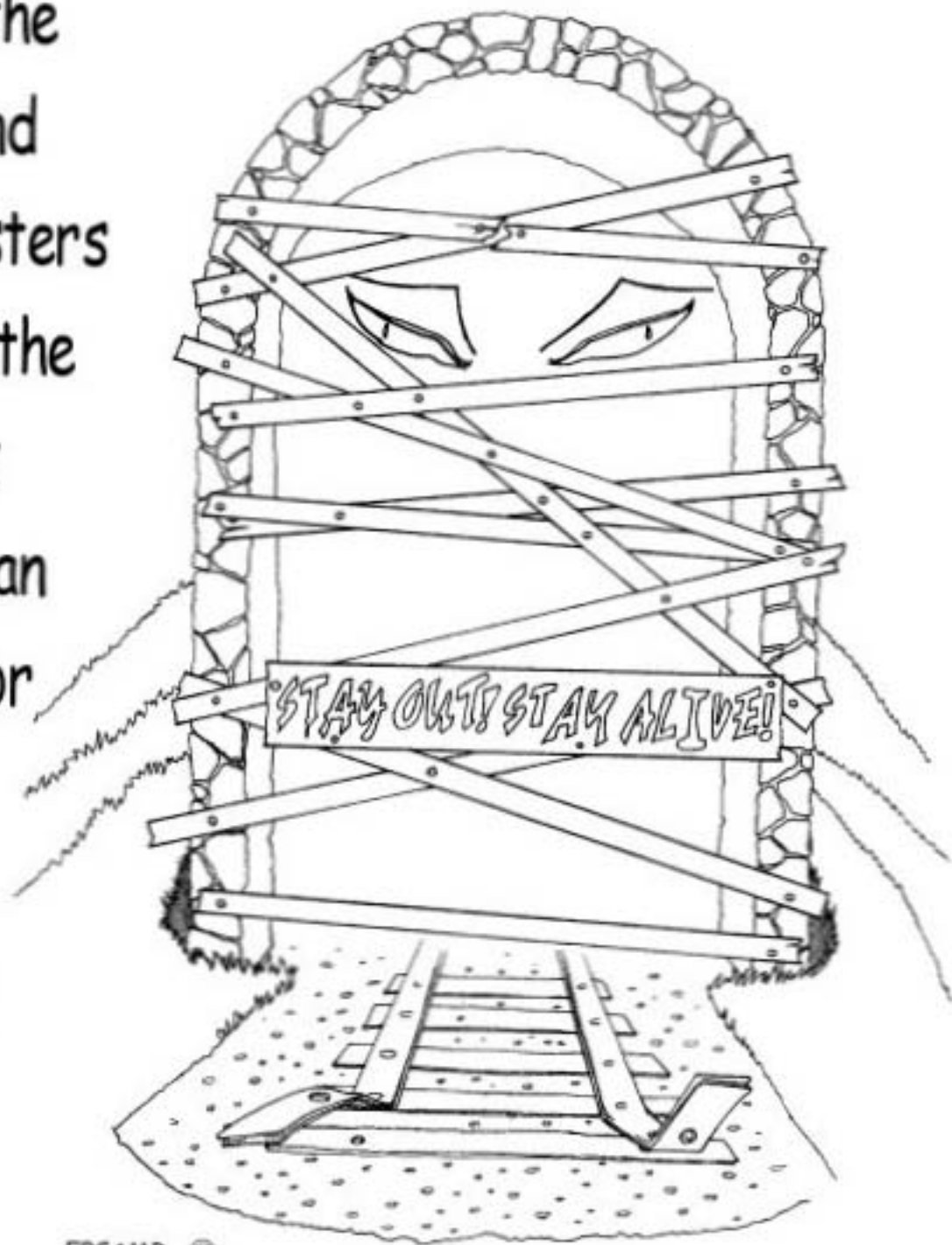
Abandoned Mine Reclamation Word Search

M	P	A	M	B	I	T	U	M	I	N	O	U	S	P	N	T	V	C	N
L	X	B	D	G	M	D	N	A	L	E	T	S	A	W	E	S	A	E	K
U	C	I	M	J	E	I	U	Y	E	Y	Y	A	T	E	S	P	T	N	I
C	C	A	A	I	K	L	N	T	H	U	B	Y	T	U	Q	H	N	I	I
A	U	I	L	R	S	X	I	E	H	O	I	I	L	B	H	O	O	L	Z
C	O	A	L	Z	E	C	N	E	R	M	R	F	R	U	I	G	D	A	U
Z	W	F	E	P	A	C	A	M	J	Y	U	H	M	T	G	V	N	K	C
W	E	P	U	R	T	E	L	G	P	R	D	S	T	F	H	J	A	L	T
F	S	J	H	E	U	I	T	A	P	Y	M	Y	Y	A	W	Y	B	A	A
Z	E	T	D	G	W	C	P	A	M	O	O	U	C	H	A	K	A	M	N
S	N	E	M	I	N	E	M	I	T	A	L	B	N	S	L	A	R	S	D
A	A	W	Z	E	F	N	S	E	V	I	T	L	W	I	L	C	P	P	C
G	G	N	Q	G	A	O	T	Q	C	L	P	I	U	O	M	W	O	L	F
Y	N	L	Q	R	N	I	R	X	O	T	A	I	O	T	L	U	R	X	A
A	A	G	O	A	W	T	E	Z	A	F	U	R	C	N	I	L	L	O	D
Q	M	G	J	H	T	A	A	X	S	I	F	N	F	E	F	O	E	A	H
S	I	M	P	C	X	T	M	L	K	N	S	N	N	P	R	L	N	Y	X
M	I	B	A	S	R	L	L	V	R	O	M	T	Y	E	Q	P	P	J	J
J	N	L	T	I	H	I	R	H	C	R	O	P	F	A	L	L	T	C	I
E	D	A	T	D	J	S	H	T	L	I	O	R	A	N	G	E	Q	T	R



Coal Face

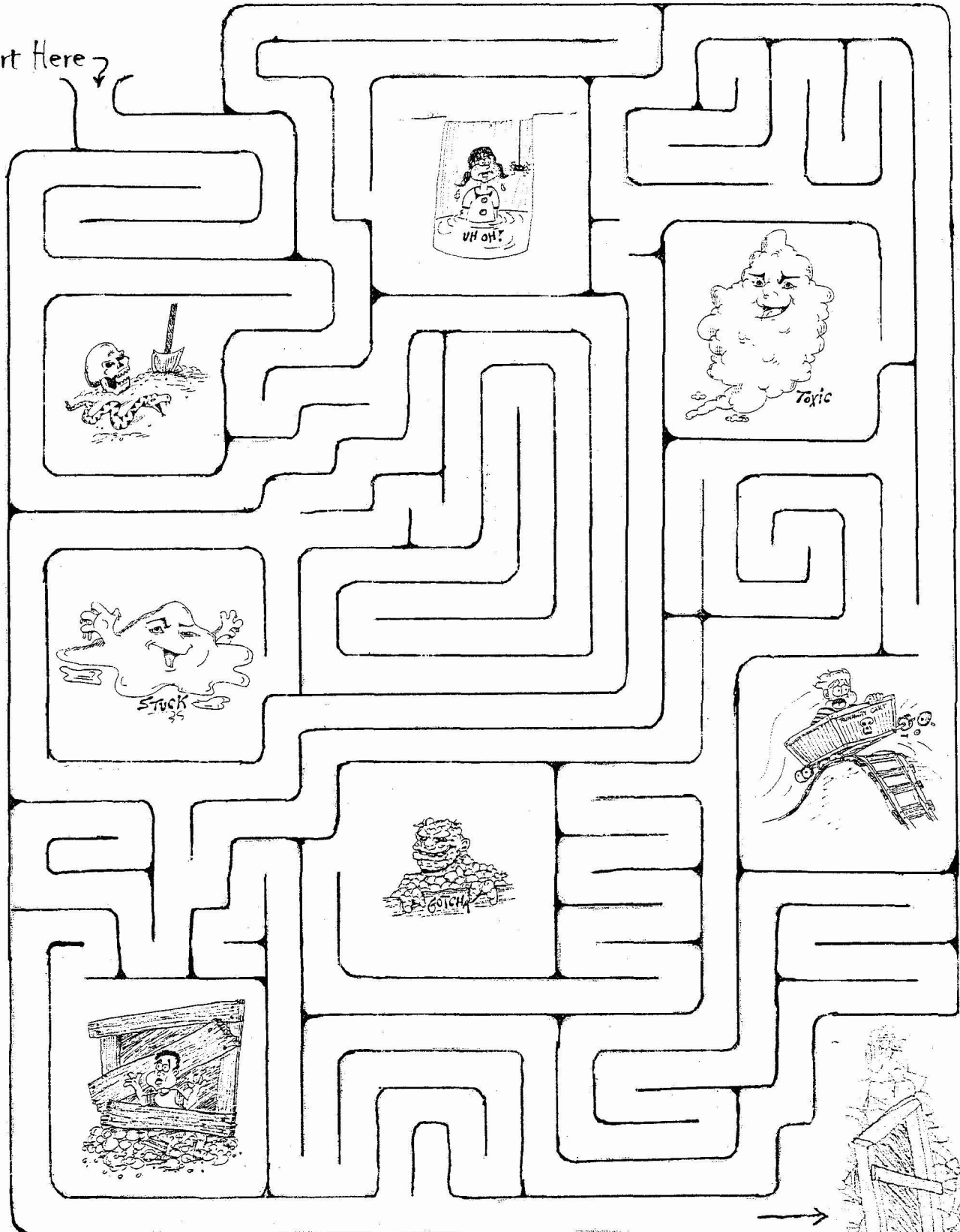
This dark phantom enjoys terrorizing the community and luring youngsters to come into the mine complex where they can become lost or hurt if they fall into a shaft or pool of water.



Abandoned Mine Maze

Try to get out of the maze without getting trapped!

Start Here ?



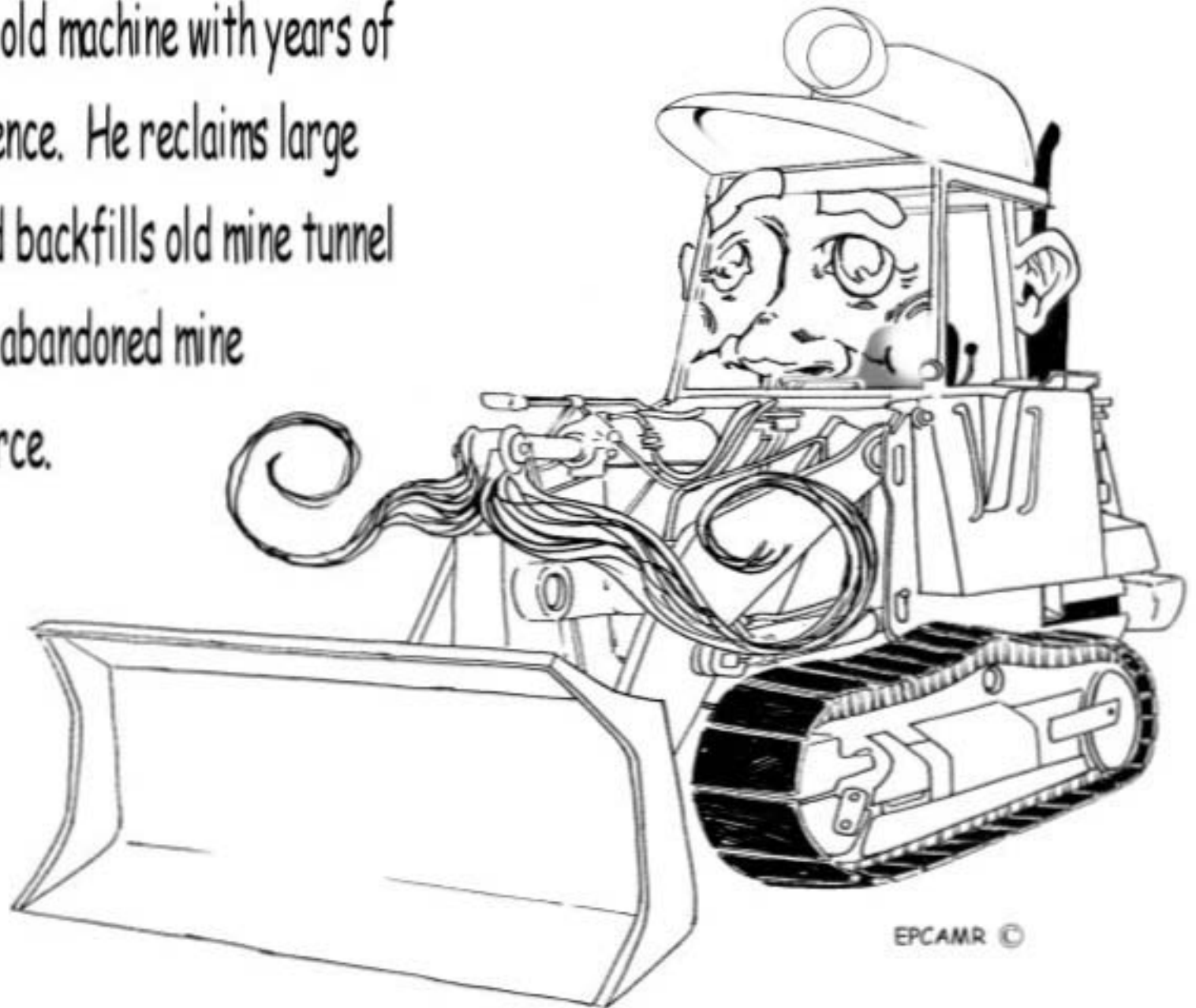
EPCAMR (C)

You Made It !

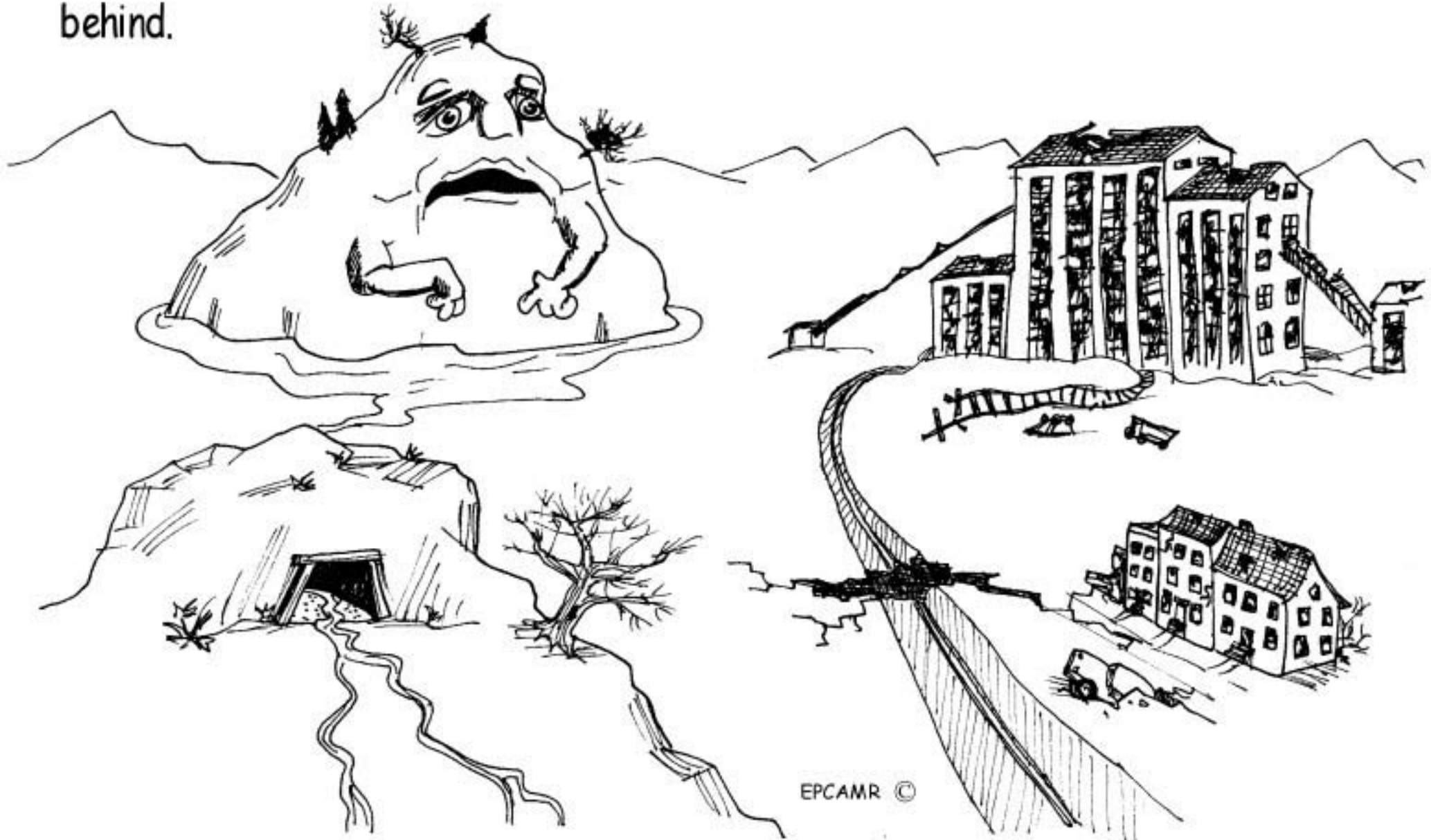


D-9

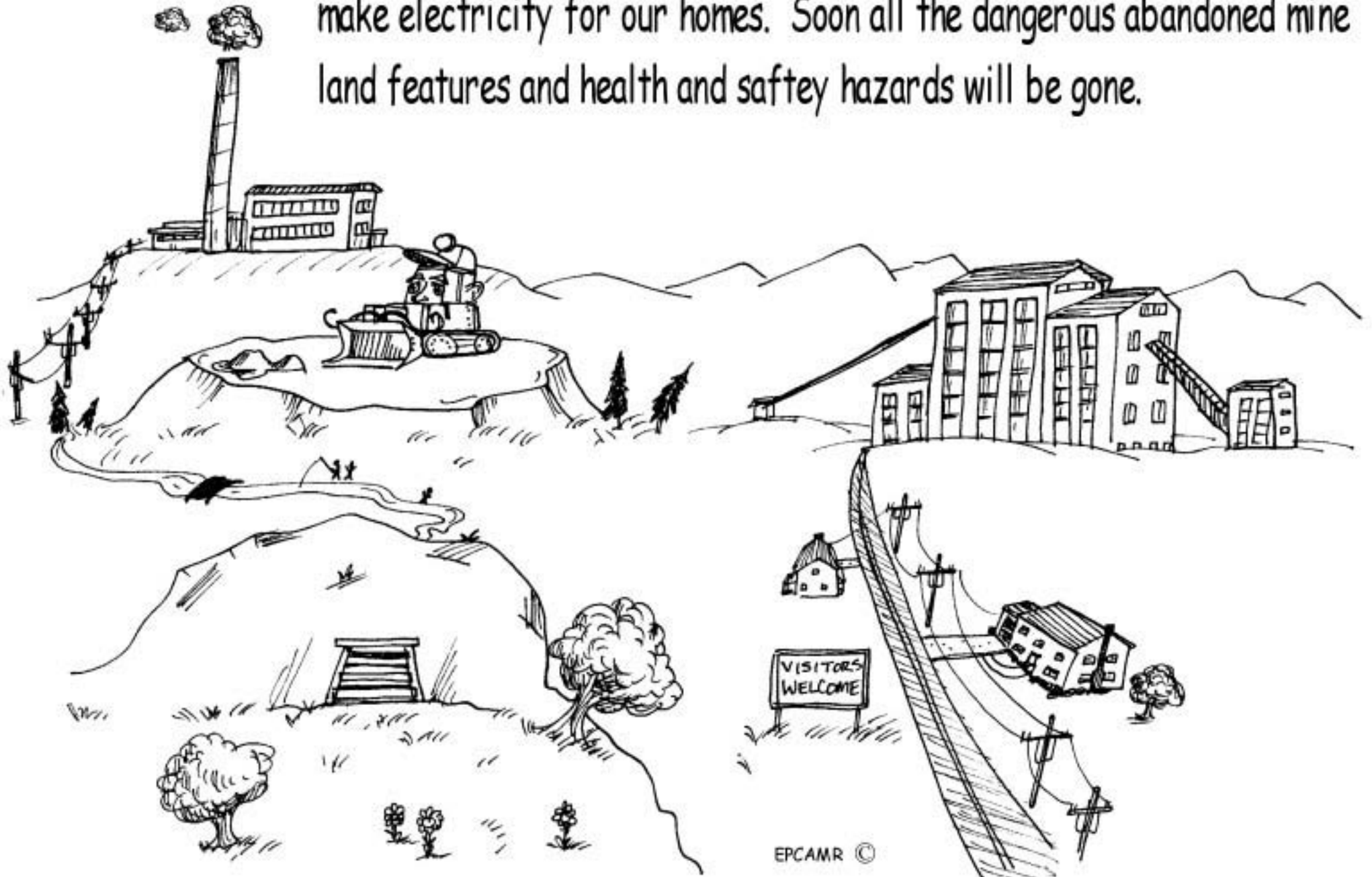
He is a dependable old machine with years of reclamation experience. He reclaims large coal waste piles and backfills old mine tunnel entrances reducing abandoned mine drainage at the source.



Gobba da' Pile and Coal Face used to rule the landscape. After coal mining occurred, many dangerous features like old equipment, run down "company homes" and coal breakers, open mine shafts, cropfalls, and huge mountains of coal waste were left behind.



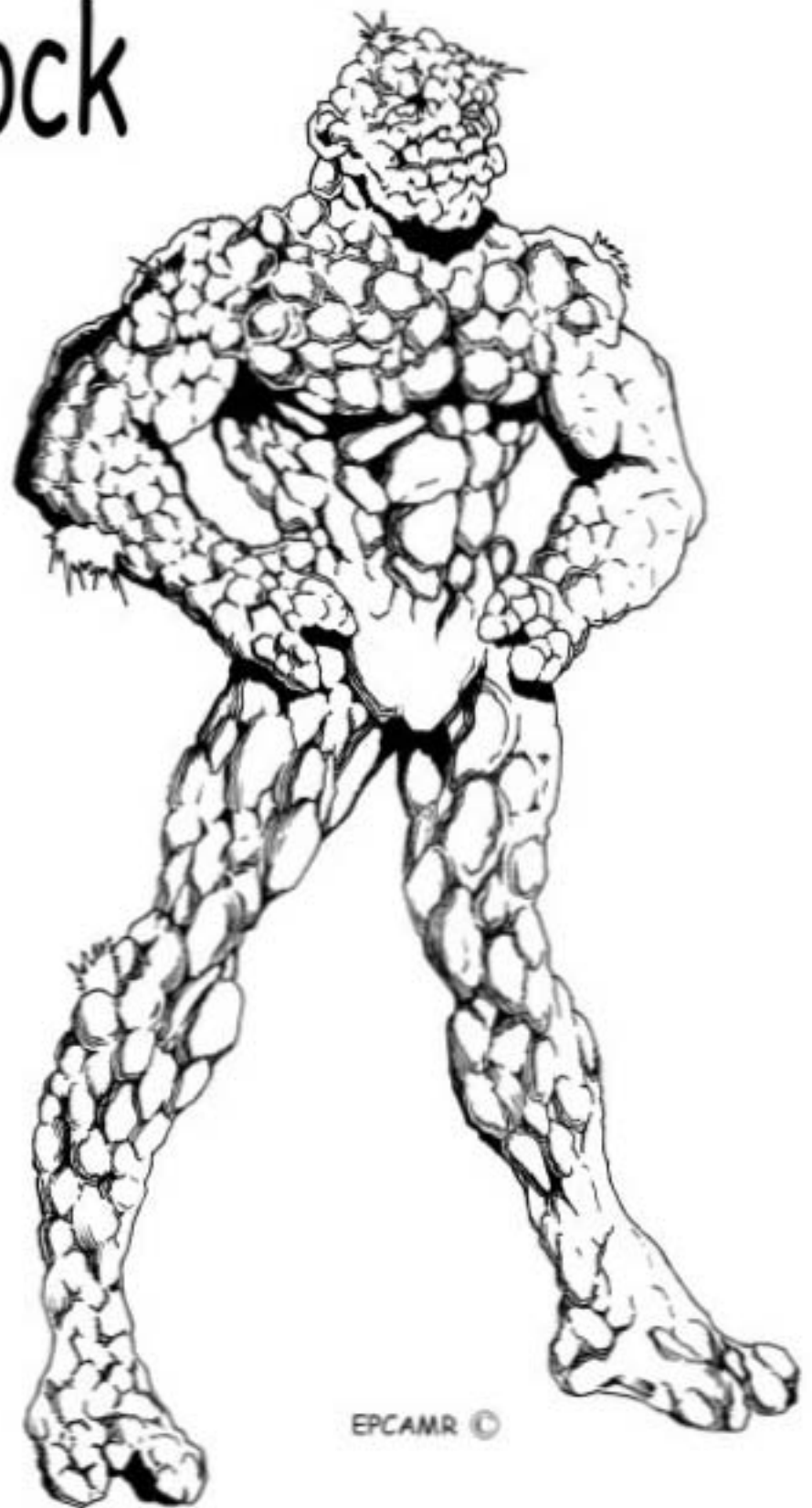
But now, mining companies, State & Federal agencies, and non-profit groups like EPCAMR use equipment like D-9 to reclaim culm from Gobba's piles and burn it in co-gen plants to make electricity for our homes. Soon all the dangerous abandoned mine land features and health and safety hazards will be gone.



Toxicity

Fe Rock

He sneaks out of water filled mines and coats the stream bottom with a thick layer of orange rust which keeps aquatic bugs and fish from living a healthy life.



EPCAMR ©

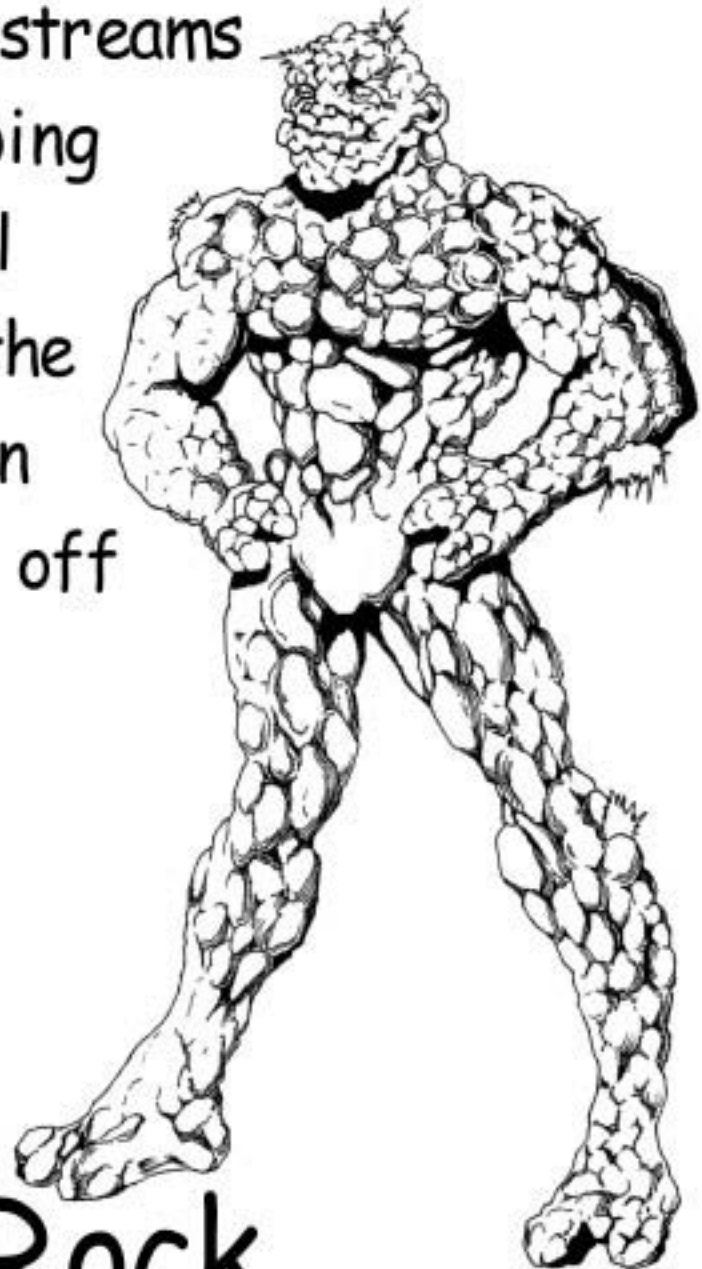
Trio

Mang Rock



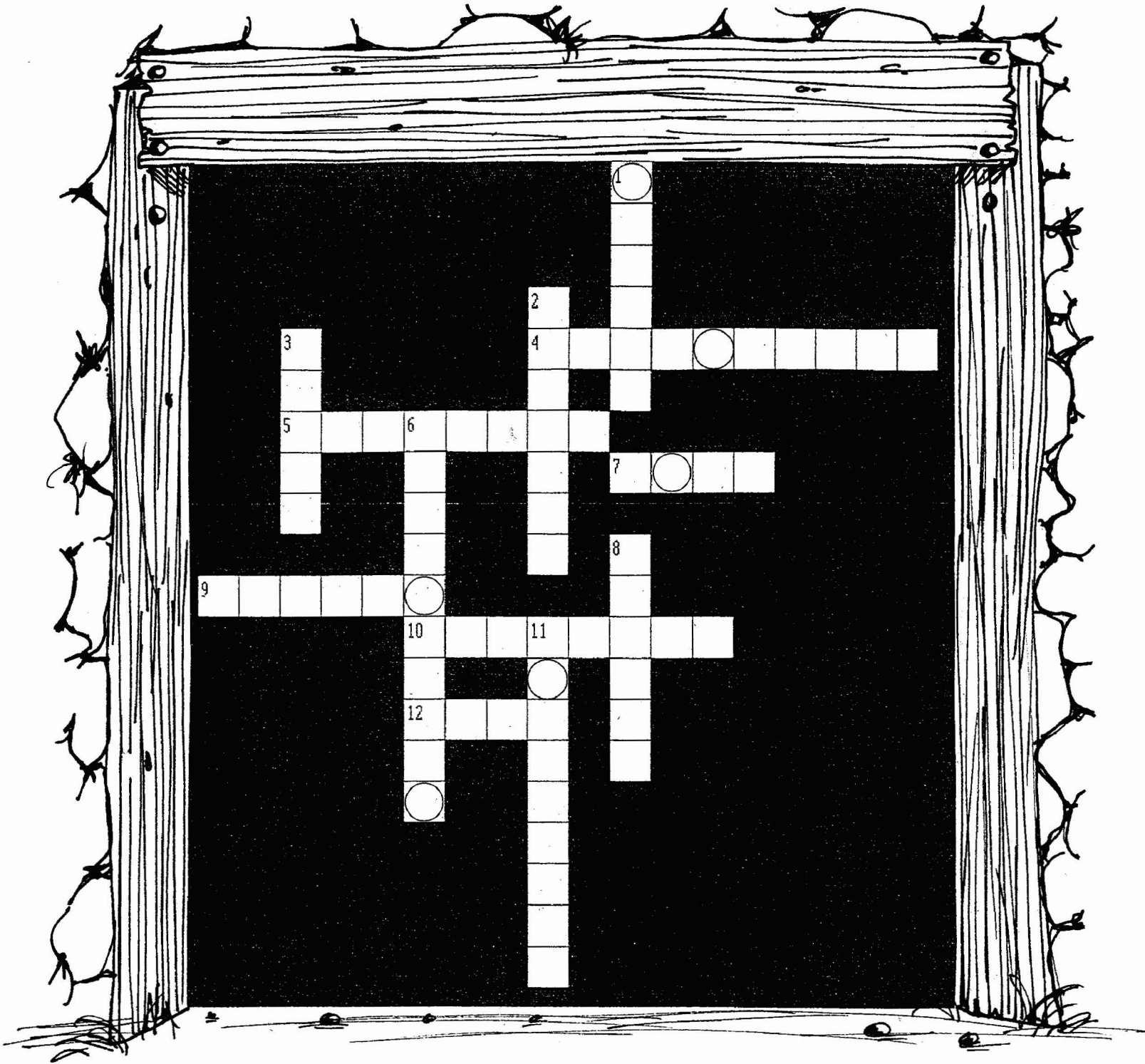
EPCAMR ©

Like Fe Rock, Mang Rock coats the streams with a purple-ish black goo and Silt Rock degrades streams by dropping black coal fines into the water when he erodes off Gobba's Banks.



Silt Rock

Abandoned Mine Drainage Crossword Puzzle



Use the letters in the circles from the Abandoned Mine Drainage Crossword Puzzle to fill in the secret word below (Hint: The name of the organization that made this coloring book.)

Abandoned Mine Drainage Crossword Puzzle Clues and Word Match

Match the clue on the right to a word on the left, and then fill in the Crossword Puzzle on the previous page.

Across Clues

4. A type of coal that is semi-soft and blocky in form; contains a lower percentage of carbon and a higher percentage of metals and impurities.

_____ SULFUR

5. A type of mine drainage that is relatively high in pH; turns litmus paper blue

_____ ABANDON

7. A type of mine drainage that is relatively low in pH; turns litmus paper red

_____ BITUMINOUS

9. Acid producing mineral that is often found within or near coal and smells like rotten eggs

_____ ALUMINUM

10. A metal that is often found within or near coal; leaves a white deposit in streams affected by abandoned mine drainage

_____ IRON

12. A metal that is often found within or near coal; leaves an orange deposit in streams affected by abandoned mine drainage

_____ ANTHRACITE

Down Clues

1. Acid producing mineral that is often found within or near coal; also known as 'Fool's Gold'

_____ ALKALINE

2. To give up maintaining or mining for coal on a piece of land

_____ MANGANESE

3. A tunnel connecting to the underground mine complex to allow for fresh air circulation; mine drainage often flows from them when the mines are abandoned

_____ PYRITE

6. A type of coal that is very hard, contains a high percentage of carbon and a low percentage of metals and impurities

_____ ACID

8. A horizontal entrance into the underground mine complex from which miners enter and coal is hauled out by mine cars; mine drainage often flows from them when the mines are abandoned

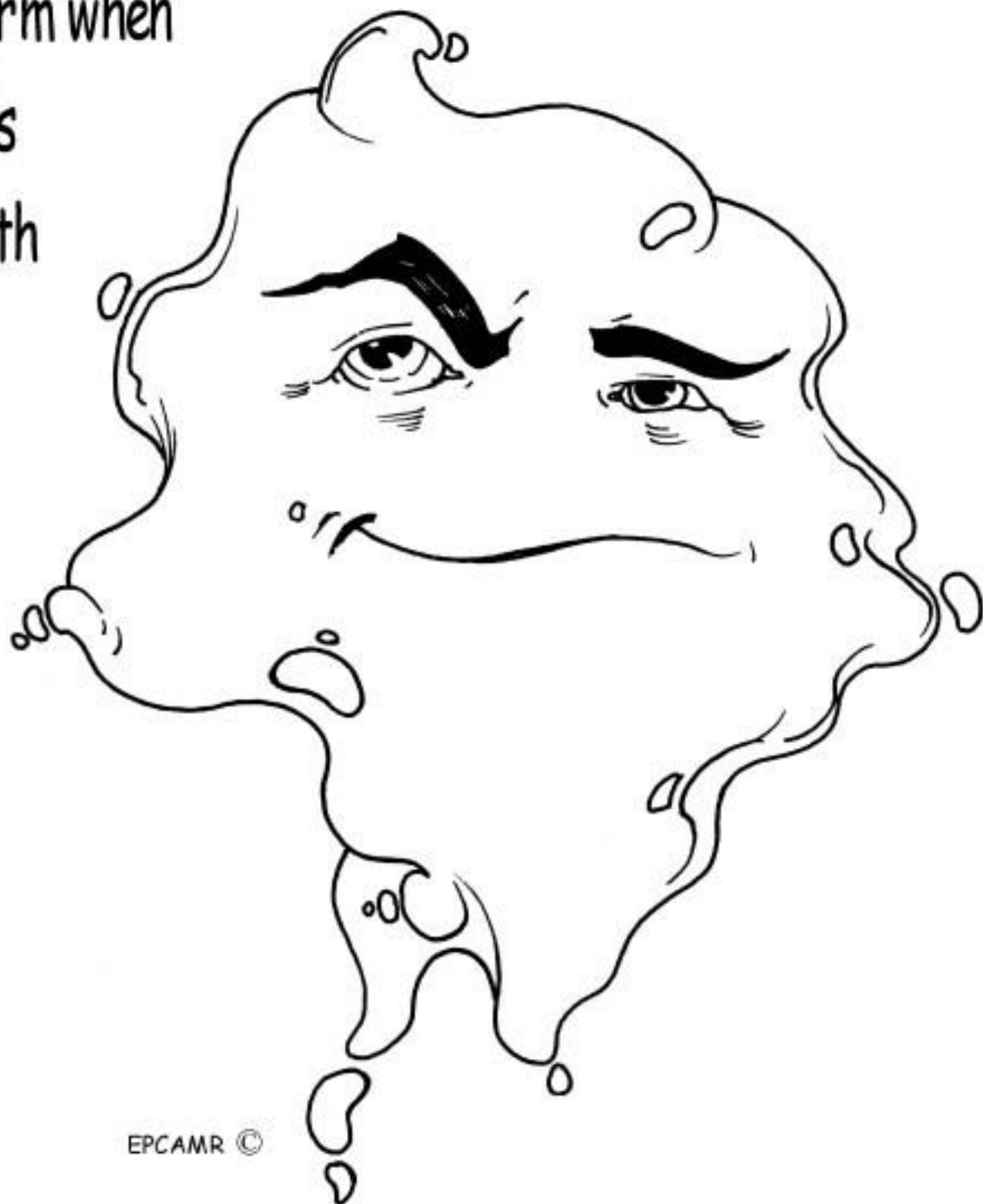
_____ SHAFT

_____ TUNNEL

11. A metal that is often found within or near coal; leaves a black deposit in streams affected by abandoned mine drainage

Al Flocc

His aluminum goo coats fishes gills and suffocates them.
He is invisible at low pH in acid mine water but shows
his true form when
the AMD is
treated with
limestone.



Typical Cross Section of the Geology in the Anthracite Coal Region.

6. Today, mining operators re-mine abandoned mine sites with newer equipment and reclaim the land at the same time.

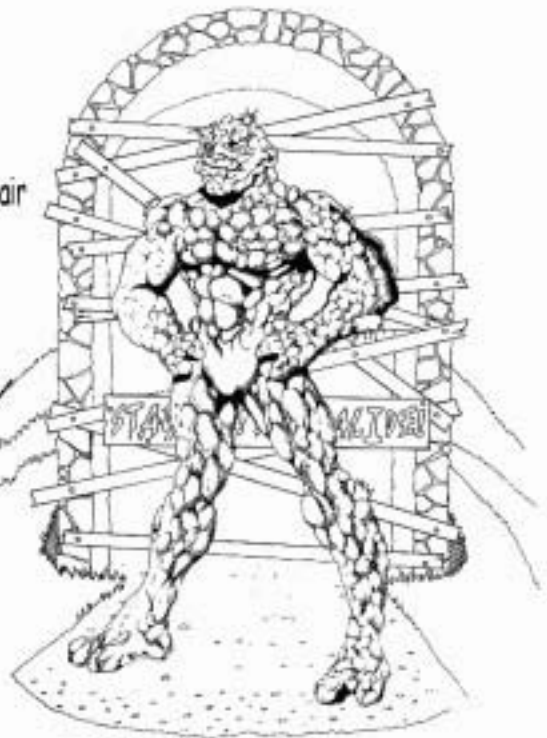
4. Fan houses were built to provide fresh air to the miners so they did not get sick with "The Black Lung"

5. Bootleg miners often ventured into the mines to "rob the pillars"

2. Groundwater fills up here in the mine pool complex.

1. Tunnels were drilled into the mountains and the valleys to get at the coal underground. Abandoned Mine Drainage flows out of them now.

3. Bore Holes were drilled to pump water out of the mines, so workers could reach the coal and not get wet.



Swampy & Wart



EPCAMR ©

Armed with an arsenal of cattails, he hops through the coal fields creating wetlands to trap metals using plants as a filter to improve stream water quality.

Color the ponds below to help Swampy and Wart show where metals, like iron, drop out in the aerobic wetland.

1. Color this pond Red.
This is where the most
iron will drop out.

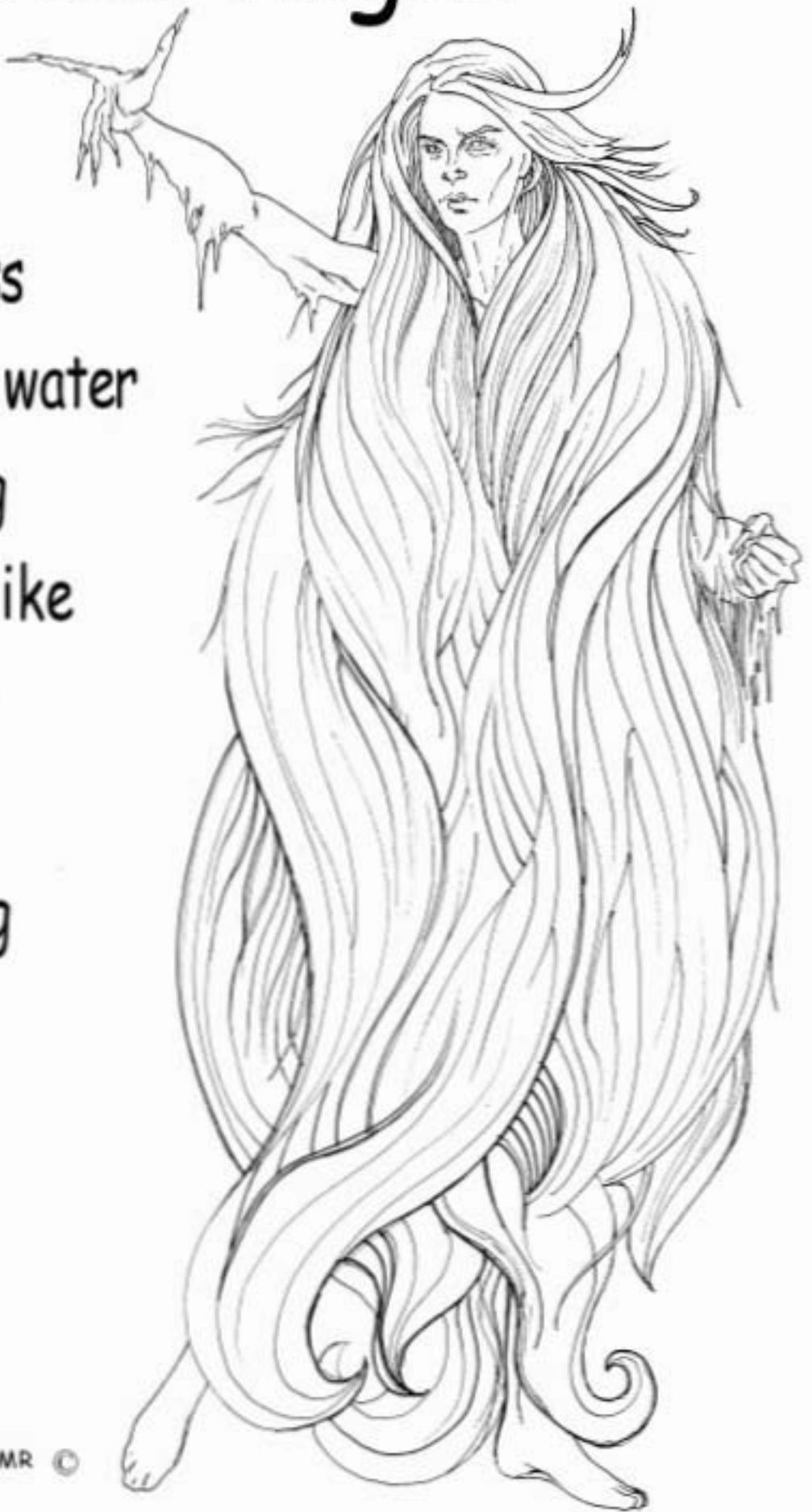
3. Color this
pond Yellow.
Even less iron
will be found
here.

4. Color this pond Blue.
No more Iron is found here.
The water coming out of this
pond is clean!

2. Color this pond Orange.
Some more iron will drop
out here.

Filamentous Algae

This evil villainess thrives in acidic water and uses her long strands of hair-like algae to smother out oxygen in the water making it difficult for fish to breathe.





The pH Scale

Color the boxes below with the color that is mentioned above it. When you are done you will see what color pH testing paper will turn when it is dipped in the substances represented by the pictures below.

Bad Water &
Not Many Fish

Good Water &
Happy Fish

Bad Water &
No Fish

ACID

NEUTRAL

BASE

ORANGE

YELLOW

GREEN

AQUA

BLUE

INDIGO

PURPLE



1 2 3 4 5 6 7 8 9 10 11 12 13 14



Battery Acid



Lemon Juice



Vinegar



Acid Rain



Normal Rain



Drinking Water



Baking Soda



Hand Soap



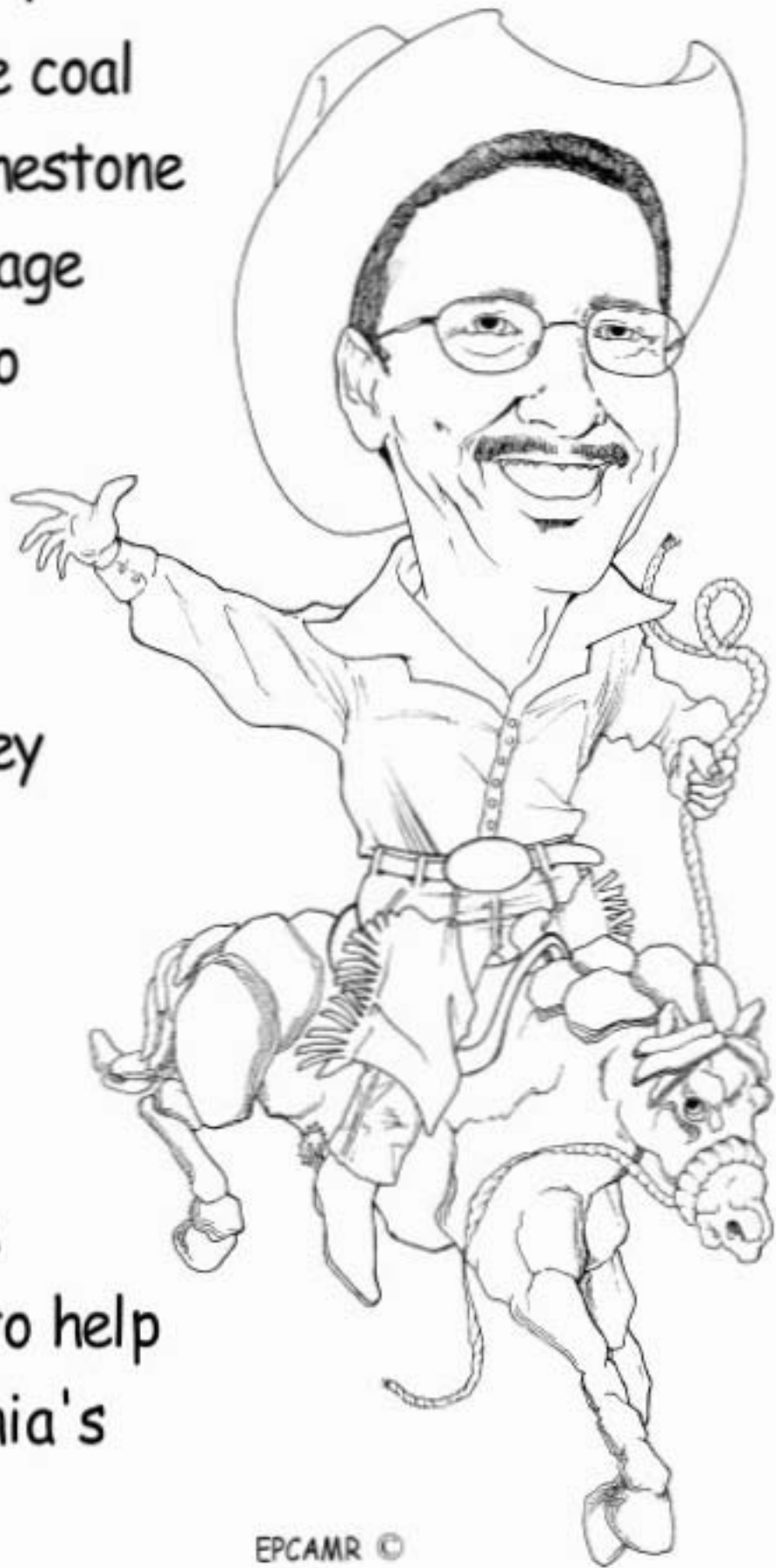
Bleach



Lye

Limestone Cowboy & Dolomite

He rides around the coal fields and drops limestone in Acid Mine Drainage impacted streams to raise the pH and improve water quality. He also lassos in grant money and coordinates reclamation and abandoned mine drainage projects in partnership with community groups to help clean up Pennsylvania's environment.

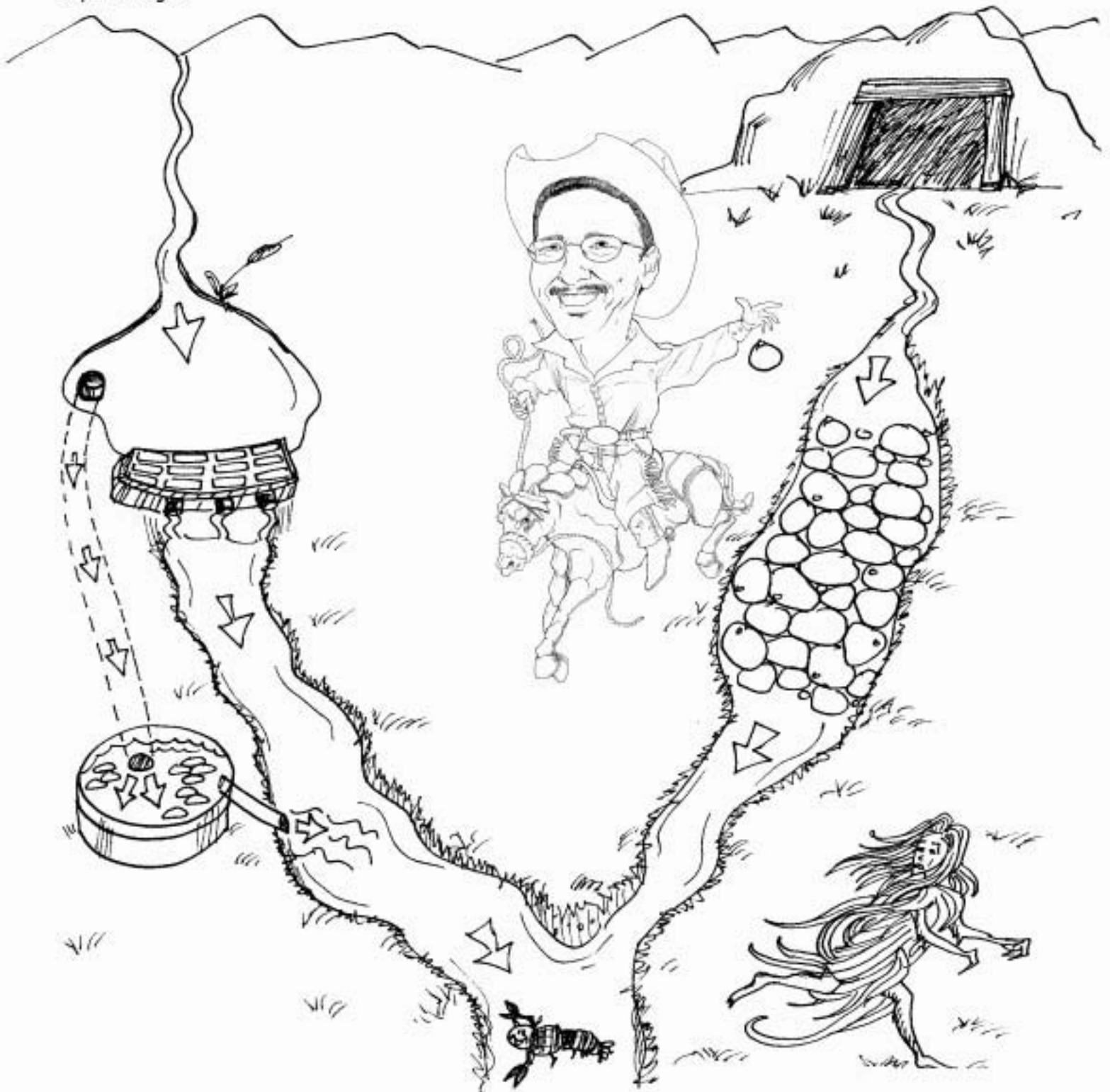


This picture shows 2 different types of Limestone Based Passive Treatment Systems.

Limestone is used in these streams to raise the pH of Abandoned Mine Drainage in the stream.

The system below is called a Diversion Well. The water is taken from a dam upstream and is run through a well filled with limestone. The water that comes from a diversion well is much cleaner and better for fish and aquatic bugs.

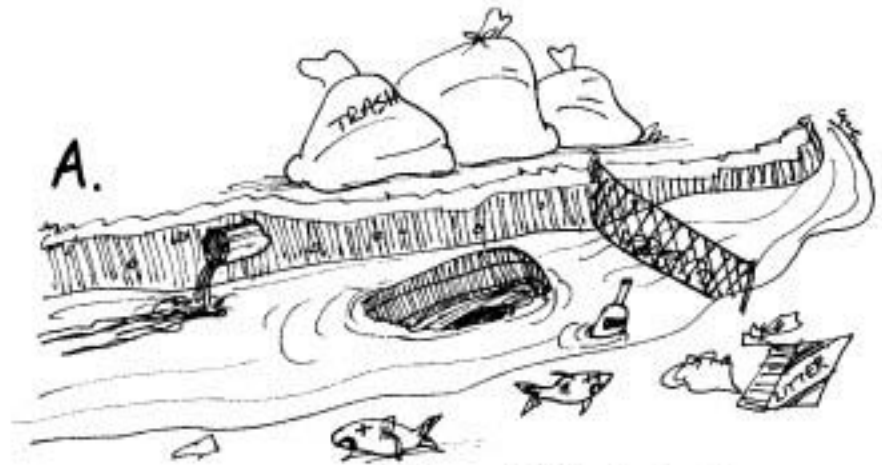
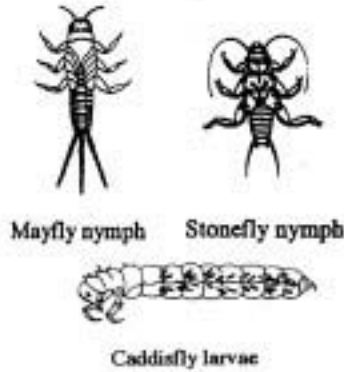
This system is called an Open Limestone Channel. The water flows through large pieces of limestone rock, and the water that comes out will also have a pH that is closer to neutral.



Match the Aquatic Bugs to the type of Stream they can live in.

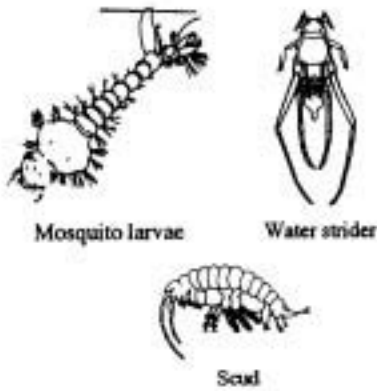
Draw a line from the group of bugs on the left to the appropriate stream on the right.

Group 1: These bugs cannot live in water with low pH or Metals.



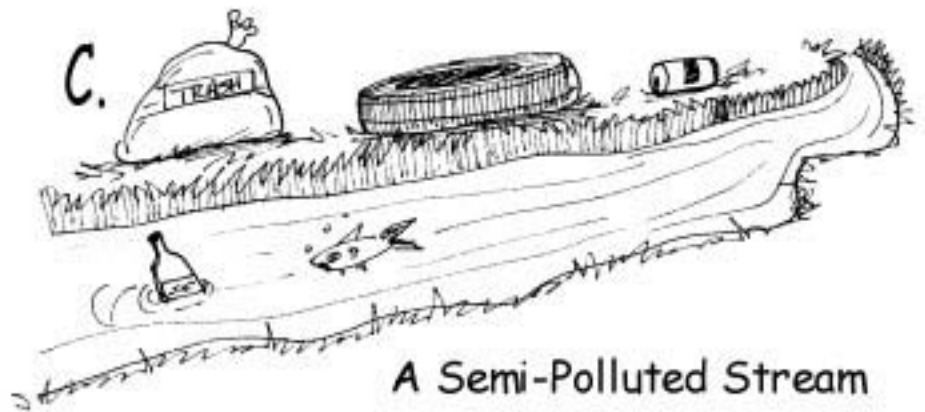
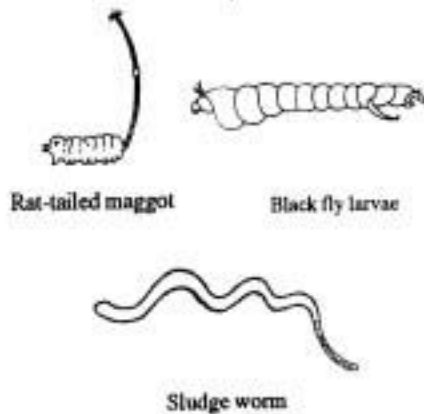
A Very Polluted Stream.

Group 2: These bugs can tolerate water with low pH or Metals.



A Very Clean Stream.

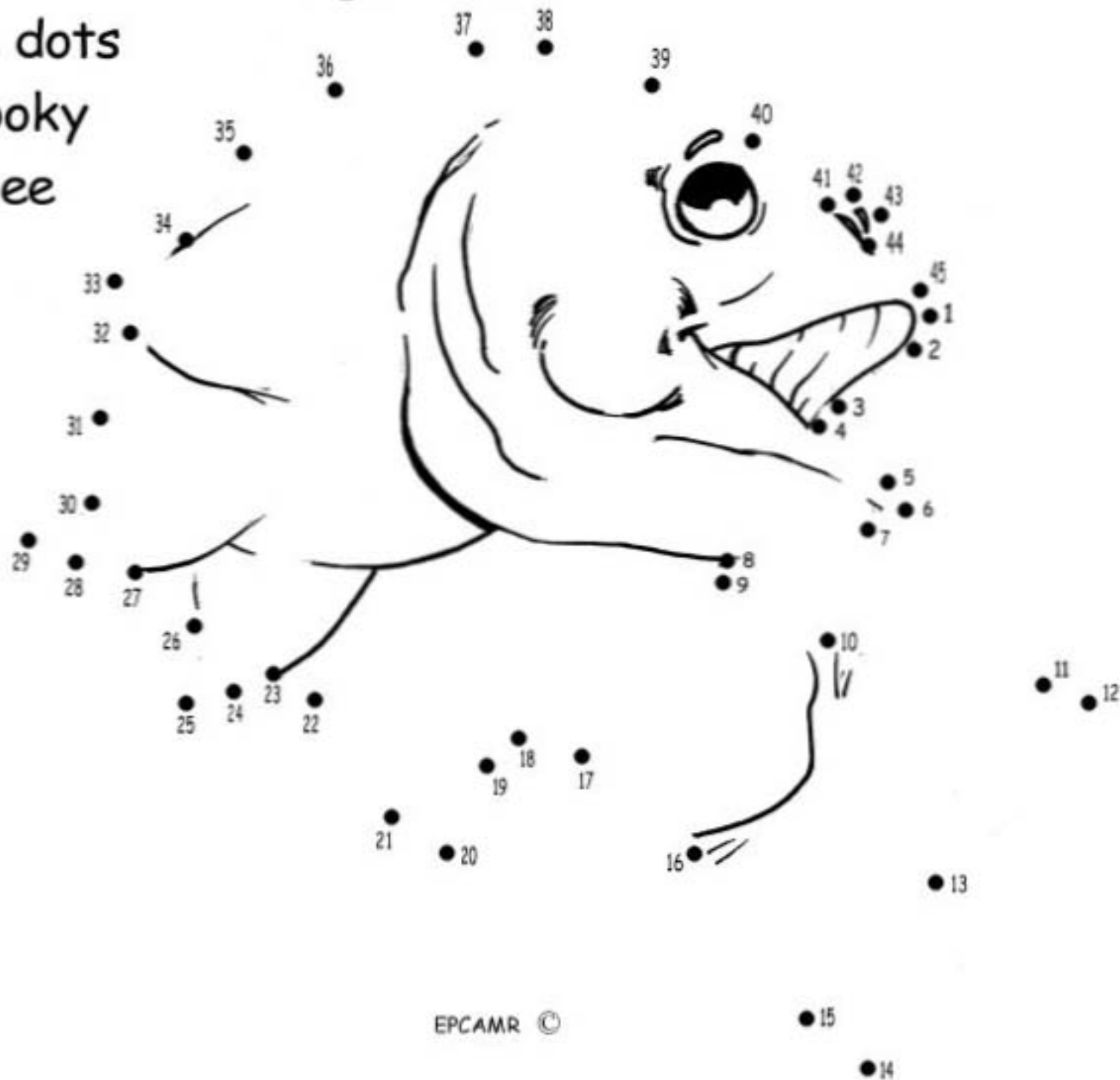
Group 3: These bugs thrive in water with low pH or Metals.



A Semi-Polluted Stream

You can be an AMD Avenger too!

Connect the dots
to make Brooky
pollutant free
and healthy
again.



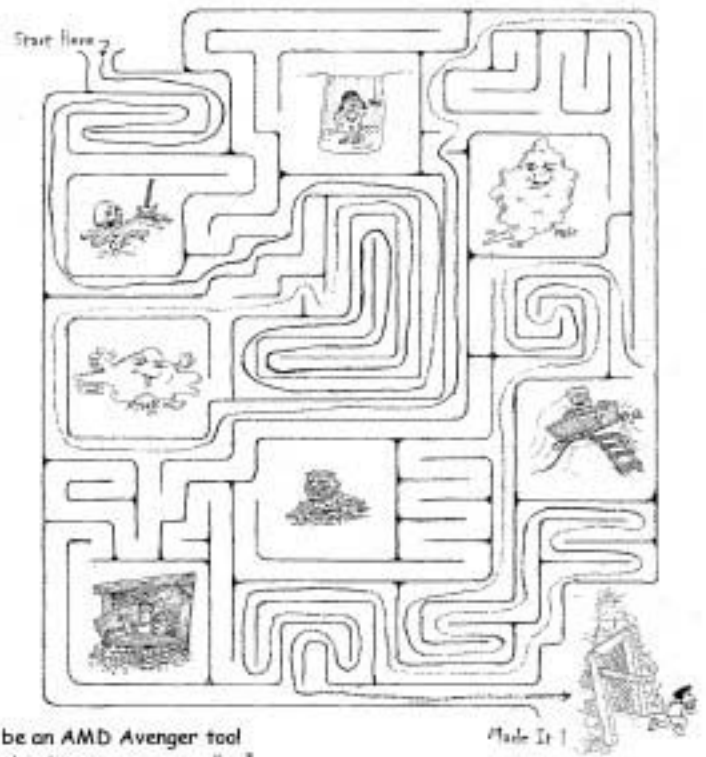


EPCAMR's Mission Statement: "Reclaim Abandoned Mine Lands through Partnerships Today, for a Cleaner Environment Tomorrow"

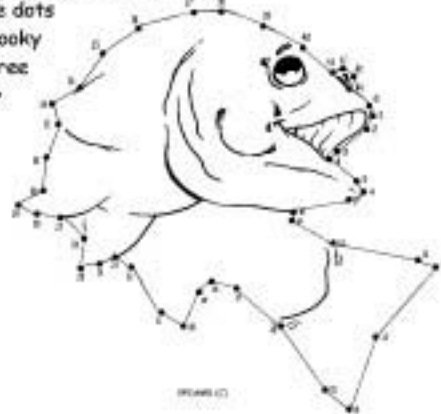


Abandoned Mine Maze

Try to get out of the maze without getting trapped!



You can be an AMD Avenger too!
Connect the dots to make Brooky pollutant free and healthy again.



Match the Aquatic Bugs to the type of Stream they can live in.

Draw a line from the group of bugs on the left to the appropriate stream on the right.

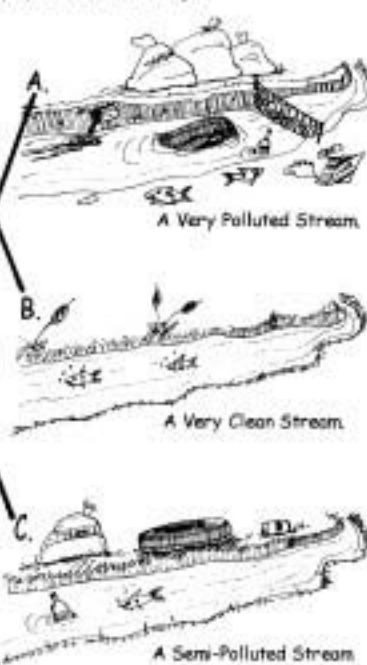
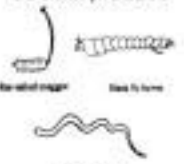
Group 1: These bugs cannot live in water with low pH or Metals.



Group 2: These bugs can tolerate water with low pH or Metals.



Group 3: These bugs thrive in water with low pH or Metals.



Abandoned Mine Drainage Crossword Puzzle Clues and Word Match

Match the clue on the right to a word on the left, and the PT to the Crossword Puzzle on the previous page.

Across Clues

- 9. SULFUR
 - 2. ABANDON
 - 4. BITUMINOUS
 - 10. ALUMINUM
 - 12. IRON
 - 6. ANTHRACITE
 - 5. ALKALINE
 - 11. MANGANESE
 - 1. PYRITE
 - 7. ACID
 - 3. SHALT
 - 8. TUNNEL
- 4. A type of coal that is soft and sticky in form, contains a lower percentage of carbon and a higher percentage of metals and impurities.
 - 5. A type of mine drainage that is relatively high in pH, forms brown paper float.
 - 7. A type of mine drainage that is relatively low in pH, forms brown paper float.
 - 5. Acid producing mineral that is often found within or near coal and smelt, like rosen eggs.
 - 11. A metal that is often found within or near coal, leaves a white deposit in streams affected by abandoned mine drainage.
 - 12. A metal that is often found within or near coal, leaves an orange deposit in streams affected by abandoned mine drainage.
- ### Down Clues
- 1. Acid producing mineral that is often found within or near coal, also known as 'fool's gold'.
 - 2. To give up maintaining or mining for coal on a piece of land.
 - 3. A tunnel connecting to the underground mine complex to allow for fresh air circulation, mine drainage often flows from them when the mines are abandoned.
 - 6. A type of coal that is very hard, contains a high percentage of carbon and a low percentage of metals and impurities.
 - 8. A horizontal entrance into the underground mine complex from which miners enter and coal is hauled out by mine cars, mine drainage often flows from them when the mines are abandoned.
 - 11. A metal that is often found within or near coal, leaves a black deposit in streams affected by abandoned mine drainage.

EPCAMR



*Eastern PA
Coalition for
Abandoned Mine
Reclamation*

For More Information on AMD/AML
efforts in PA and how you can get involved
with restoring your watershed please contact:

EPCAMR

101 South Main Street
Ashley, PA 18706

or on the web at:

www.epcamr.org