



The Elkhorn Creek Diesel Spill

It's Effects on the Benthic Macroinvertebrate Communities

**A study by Trout Unlimited: Kanawha Valley Chapter and
the WV Save Our Streams Program**

Elkhorn Creek Gold



Around 1970 rainbow trout fingerlings were accidentally introduced into the upper end of Elkhorn Creek because the hatchery truck broke down. The rainbows started reproducing and browns also started reproducing after WVDNR stocked fingerlings in the early 1990's.



Background

Elkhorn Creek begins its journey near the Mercer-McDowell County line on Rt. 52 and follows Rt. 52 through many small, mostly unincorporated towns and enters the Tug Fork River in Welch. The Norfolk Southern railroad follows the stream for much of its length. There are a few large springs at the upper end of the watershed and many others add to the flow as you go downstream, as well as many other tributaries. The springs flow out of the underground reservoirs that have collected in the abandoned coal mines. This water is cool and the alkalinity is high, usually above 120 ppm.

Elkhorn Creek has not been flowing in a truly natural stream channel since serious coal mining started in the region. The stream was moved in many stretches to accommodate roads, railroads, houses, towns and coal mines. In several stretches one or both banks of the stream is a rock wall, a concrete wall, a timber crib wall, or a railroad embankment consisting of rock, gravel and other materials. In many sections the stream bank is a gob pile and coal fines are piled everywhere.

After the major floods of 2001 and 2002 the residents and local politicians insisted that the streams be dredged. About \$5,300,000 was secured for “stream cleaning” projects, which consisted of gabion walls between the stream and several houses, bank repair with large rocks and major dredging. The work was completed around the latter part of September 2002; more than 5 miles of stream has been dredged or severely altered by heavy equipment.

-- courtesy of **Ernie Nester** of the Kanawha Valley of Trout Unlimited



9-9-07

Spill kills fish across four miles of Elkhorn

By CHARLES OWENS
Bluefield Daily Telegraph

NORTHFORK — Health officials in McDowell County were still working Thursday to determine the extent of a fish kill in the Elkhorn River following a tractor-trailer crash and large diesel spill on U.S. Route 52.

The tractor-trailer crashed early Wednesday morning after approaching a curve and overturning on its side. The tanker on the tractor-trailer was ruptured in several spots losing an estimated 7,400 to 7,500 gallons of diesel, Cpl. L.S. Noe, of the county sheriff's department, said.

Noe said officials with the Department of Natural Resources, the Department of Environmental Protection and the U.S. Fish and Wildlife Resources were still working Thursday to determine the extent of the fish and aquatic wildlife kill.

"We can replace the dirt," Noe said. "It's hard to replace the stream and our fish. Some of the fish in there that I've seen that were destroyed I know for a fact were 10 years old."

The fish kill extended more than four miles from the Powhattan to Eckman communities, Mark Scott, a fishery biologist with the District 4 offices of the Department of Natural Resources in Beckley, said.

"It wasn't a complete kill, but it did kill quite a few," Scott said. "I've found both rainbow and ground trout that were dead. They ranged in size from 4 inches to 24 inches. Where the kill started is where the impact is worse. The further you go down stream, I was finding more and more live fish. Toward the end down there you just find one or two dead fish."

Scott said fish may be returning to the area of the diesel spill in two or three weeks.

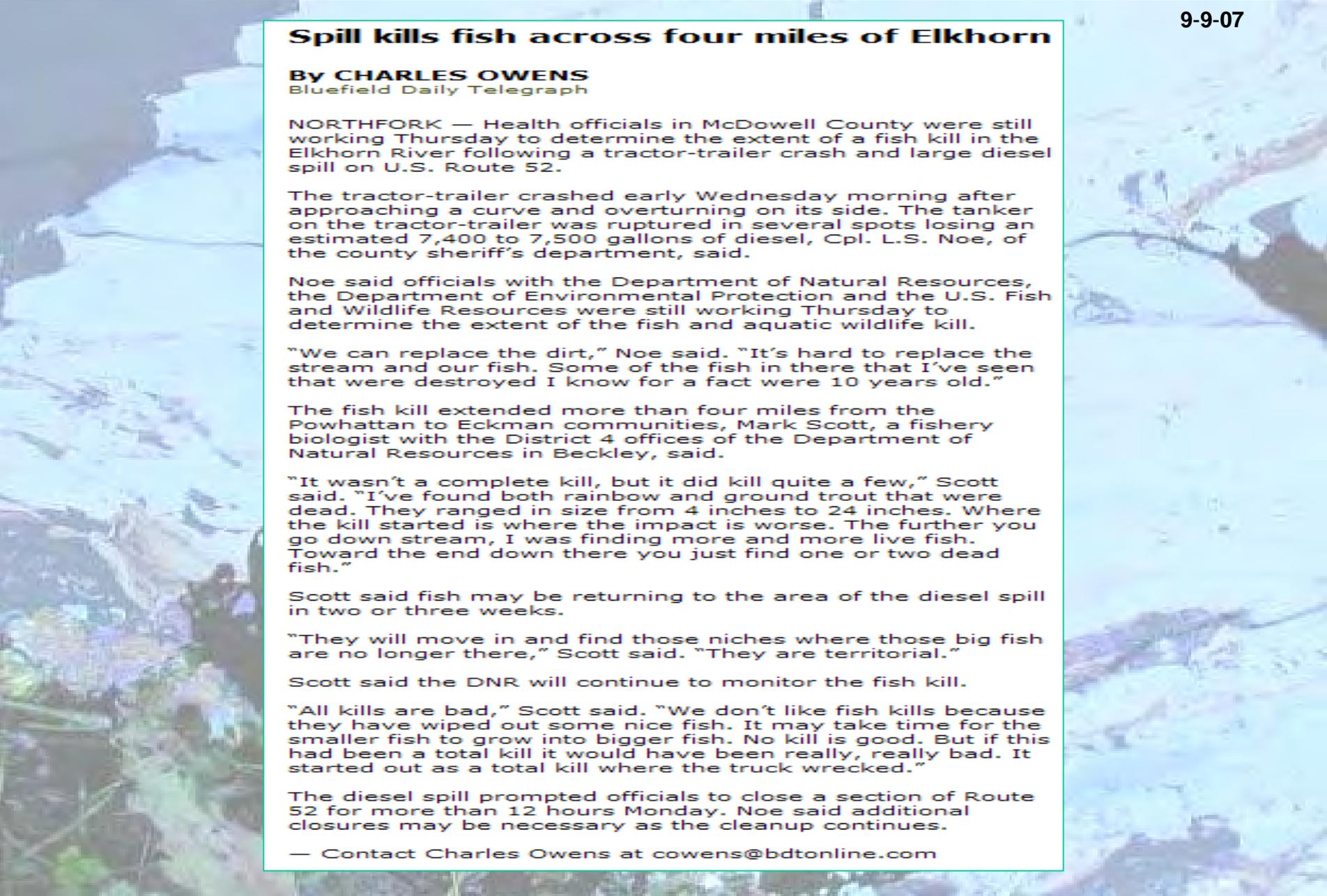
"They will move in and find those niches where those big fish are no longer there," Scott said. "They are territorial."

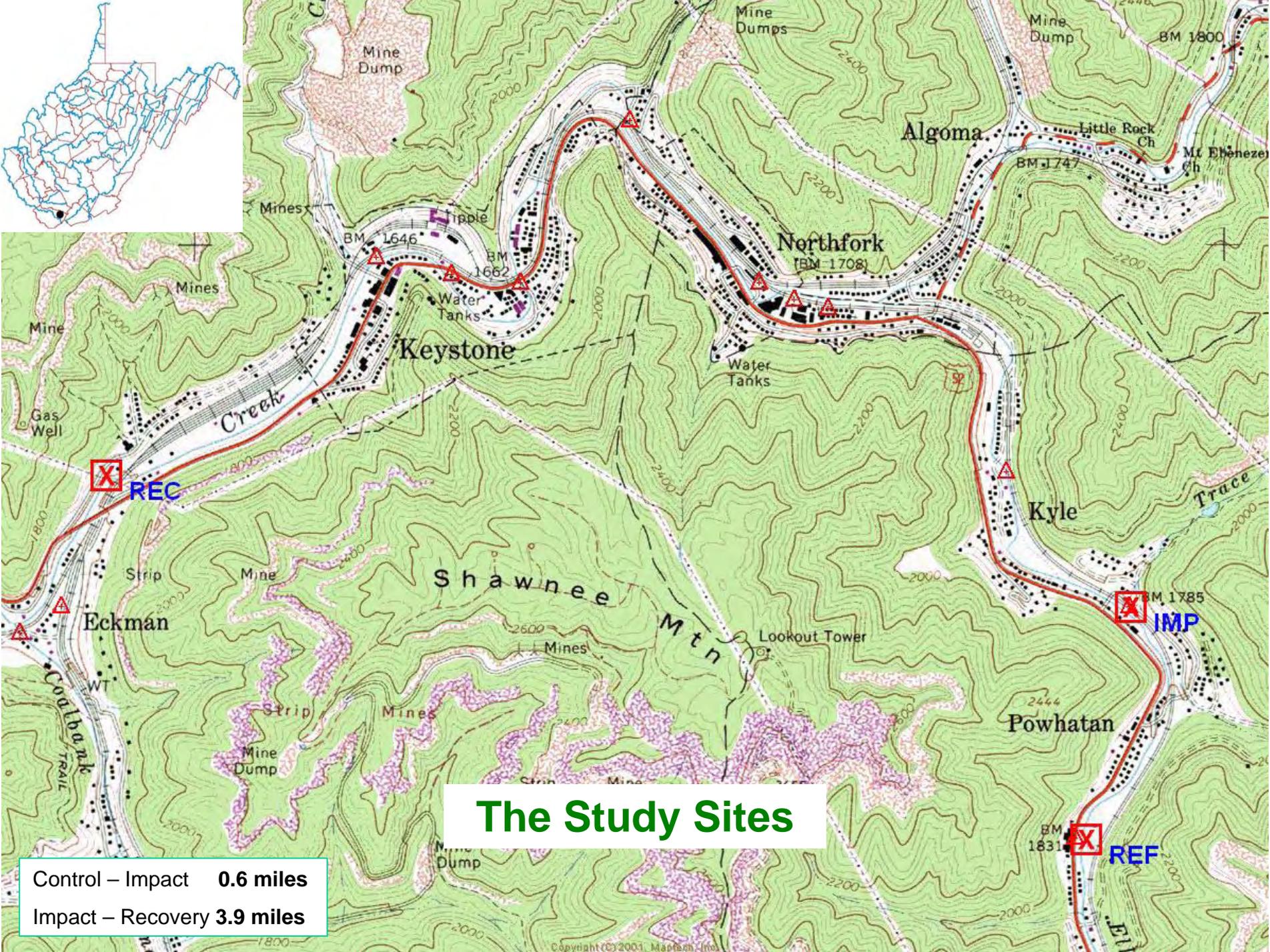
Scott said the DNR will continue to monitor the fish kill.

"All kills are bad," Scott said. "We don't like fish kills because they have wiped out some nice fish. It may take time for the smaller fish to grow into bigger fish. No kill is good. But if this had been a total kill it would have been really, really bad. It started out as a total kill where the truck wrecked."

The diesel spill prompted officials to close a section of Route 52 for more than 12 hours Monday. Noe said additional closures may be necessary as the cleanup continues.

— Contact Charles Owens at covens@bdtonline.com





The Study Sites

Control – Impact **0.6 miles**
Impact – Recovery **3.9 miles**

Standard Operating Procedures



West Virginia Save Our Streams Program's Advanced Standard Operating Procedures Manual

This manual describes the standard operating procedures for level two and three bioassessment surveys.

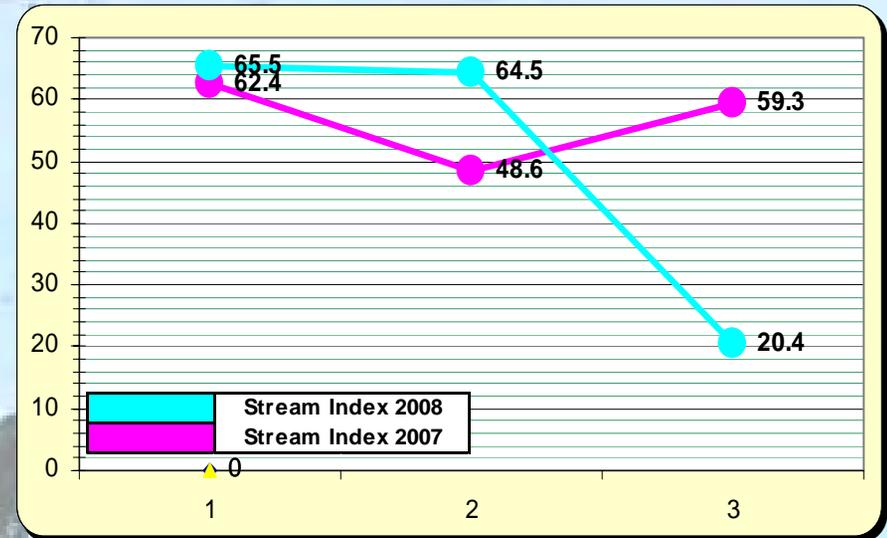
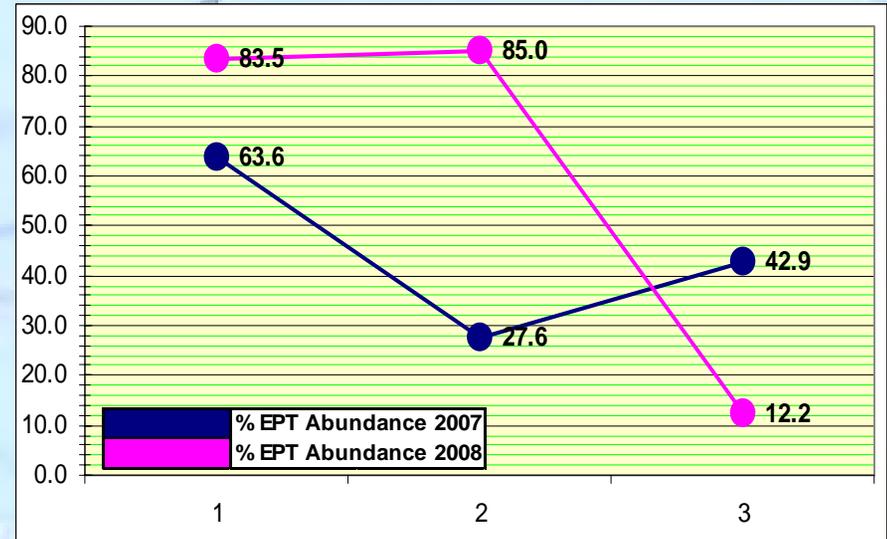
A level three WV Save Our Streams bioassessment was performed at each site, which includes an assessment of 10 habitat conditions, observations of current physical conditions, and discharge measurements using a Global Flow Probe velocity meter. Water chemistry was analyzed using the **WV Save Our Streams Field Kit (XX01245)**. The water chemistry kit consists of the following: Dissolved Oxygen (**5860**), Alkalinity (**4491-DR**), Acidity (**7182**) and Iron (**3318**). Additionally field attributes of pH, Conductivity, Temperature, and Total Dissolved Solids was measured using a LaMotte Tracer Meter (**1766**). Clarity was estimated using a simple turbidity tube.

Macroinvertebrate samples will be collected using a modified **surber style kick-net**, which is 18" high x 9" wide x 10" deep. The net's mesh is a 500-micron Nytex. Six kicks were collected at each station from riffles. The macroinvertebrate samples were preserved on-site and identified to family level. A full count was performed to the extent possible. West Virginia Save Our Streams will identify the samples using facilities at DEP's Kanawha City Headquarters.

Benthic comparisons

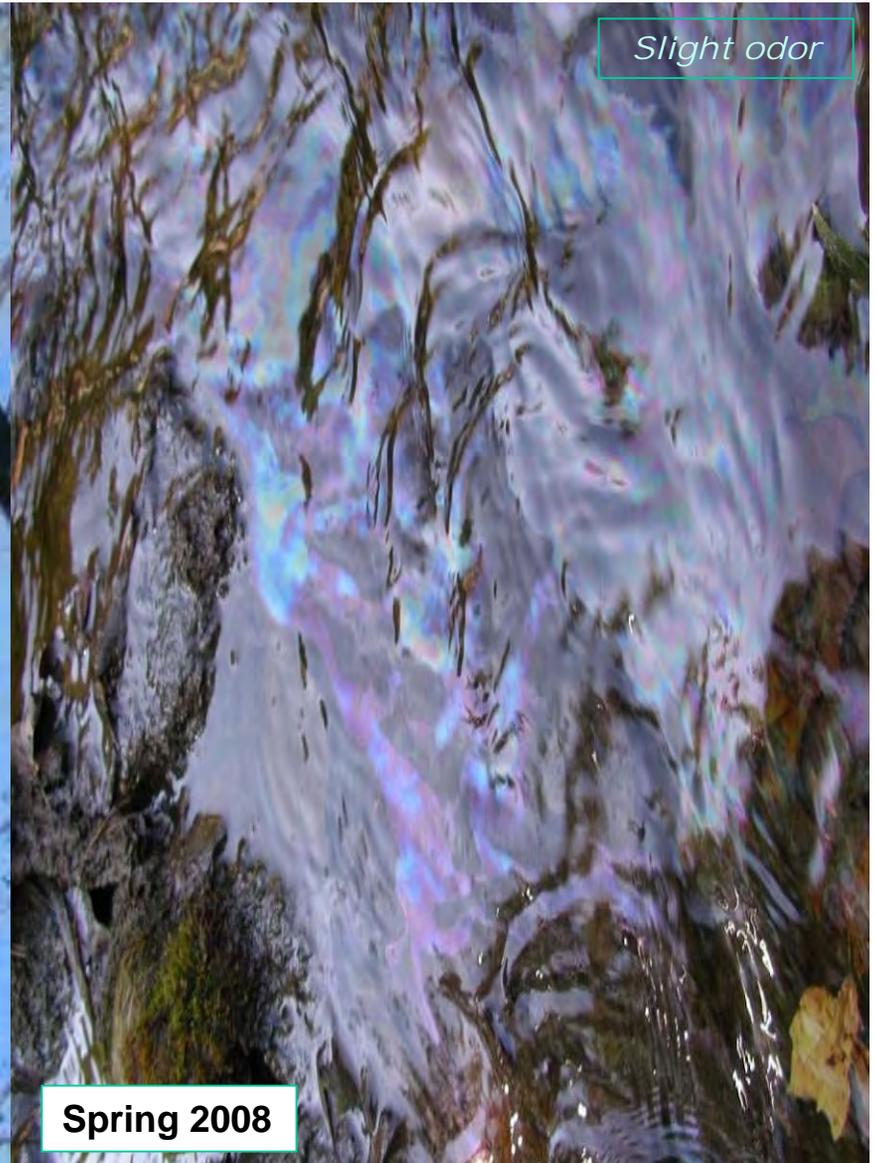
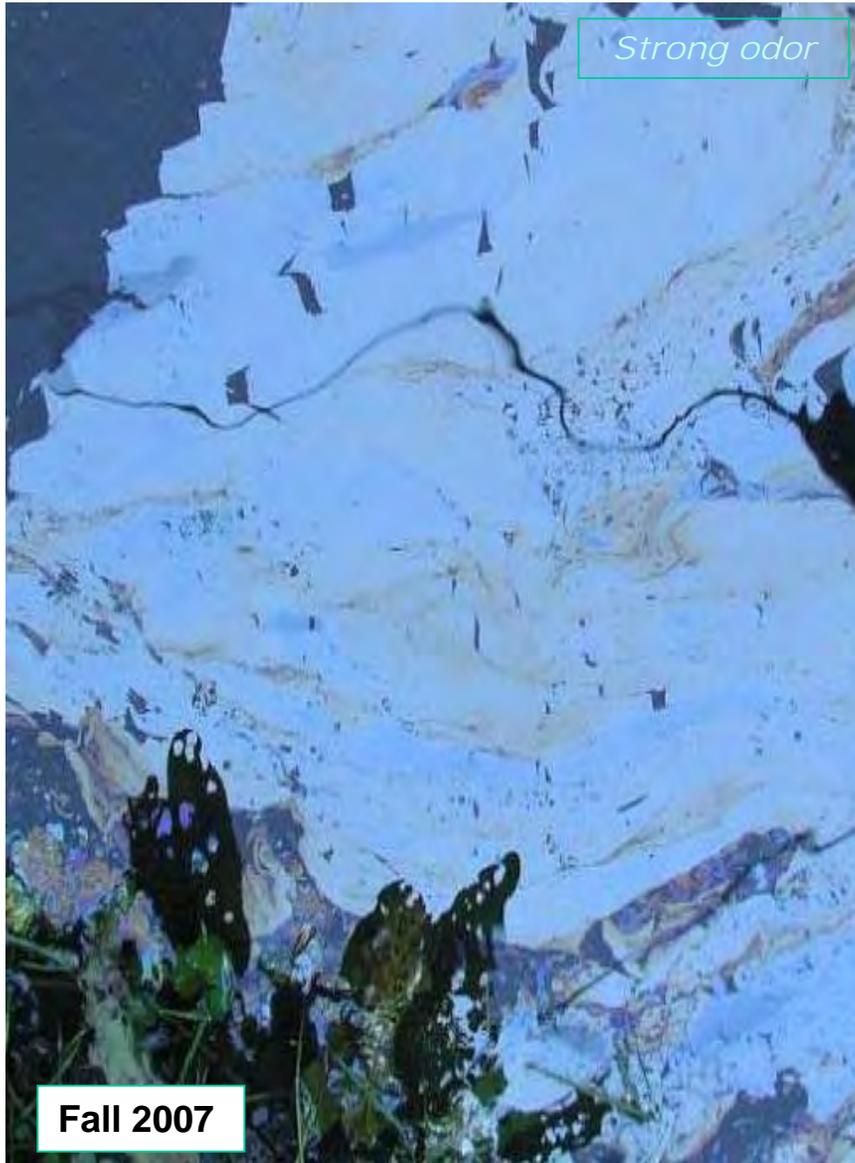
				Relative % Difference	
Sep-07	Reference	Impact	Recovery	Impact	Recovery
Count	385	29	77	171.98	188.19
Total Taxa	12	8	10	40.00	20.00
EPT Taxa	4	2	3	66.67	33.33
Biotic Index	5.57	6.38	5.22	13.56	6.12
% EPT	63.6	27.6	42.9	78.95	46.31
% Tolerant	29.1	41.4	29.9	34.89	2.39
% Chironomidae	15.1	10.3	9.1	37.80	52.17
% Dominant	33.8	24.1	18.2	33.51	61.50
% Top 2 Dominant	60.0	44.8	33.8	29.01	56.71
Evenness	73.2	90.5	93.8	21.14	24.00
Stream Index	62.4	48.6	59.3	24.86	5.46
				Relative % Difference	
Apr-08	Reference	Impact	Recovery	Impact	Recovery
Count	406	187	222	73.86	67.73
Total Taxa	11	8	5	31.58	75.00
EPT Taxa	4	3	2	28.57	66.67
Biotic Index	4.48	3.95	7.52	12.57	57.18
% EPT	83.5	85.0	12.2	1.78	118.37
% Tolerant	9.1	3.2	85.6	95.93	234.42
% Chironomidae	0.4	2.7	83.3	148.39	287.85
% Dominant	35.5	62.6	83.3	55.25	79.05
% Top 2 Dominant	52.6	84.0	90.1	45.97	49.63
Evenness	79.6	52.5	41.2	41.03	66.47
Stream Index	65.5	64.5	20.4	1.54	89.96

Indicates a significant difference



Dramatic decline in density downstream from spill; some recovery seven months later.

Oil sheen at impact site



Physiochemical comparisons

PHYSICOCHEMICAL CONDITIONS	Sep-07	Sep-07	Sep-07	Apr-08	Apr-08	Apr-08
	REFERENCE	IMPACT	RECOVERY	REFERENCE	IMPACT	RECOVERY
PHYSICAL CONDITIONS						
OIL SHEEN	NONE	HEAVY	SLIGHT	NONE	SLIGHT	NONE
DIESEL ODOR	NONE	HEAVY	MODERATE	NONE	SLIGHT	NONE
WATER CLARITY	CLEAR	CLEAR	CLEAR	MURKY	MURKY	MURKY
WATER COLOR	NONE	NONE	NONE	BROWN	BROWN	BROWN
WATER ODOR	NONE	CHEMICAL	MUSKY	NONE	CHEMICAL	NONE
STREAMBED COLOR	BROWN/BLACK	BROWN/BLACK	BROWN/BLACK	BROWN	BROWN	BROWN
ALGAE COLOR	DARK GREEN	DARK GREEN	DARK GREEN	BROWN	BROWN	BROWN
ALGAE ABUNDANCE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	HEAVY
ALGAE HABIT	HAIRY	HAIRY	HAIRY	EVEN COAT	EVEN COAT	EVEN COAT
FOAM	NONE	NONE	NONE	NONE	NONE	SLIGHT
SHADE	POOR	GOOD	MODERATE	POOR	GOOD	POOR
WATER LEVEL	NORMAL	NORMAL	NORMAL	HIGH	HIGH	HIGH
AVERAGE DEPTH (FT)	0.58	0.56	0.75	1.03	1.02	1.28
WIDTH (FT)	17.2	18.0	23.4	20.5	23.4	37.5
CROSS SECTIONAL AREA (FT ²)	10.0	10.1	17.6	21.1	23.9	48.0
DISCHARGE (CFS)	25.5	20.0	36.3	43.1	50.7	117.1
HABITAT CONDITIONS						
SEDIMENT DEPOSITION	18	15	12	14	16	18
EMBEDDEDNESS	9	9	13	18	18	20
RIFFLE FREQUENCY	18	18	15	10	10	9
ATTACHMENT SITES	14	16	16	19	15	17
VELOCITY/DEPTH	10	10	14	14	15	4
CHANNEL FLOW STATUS	19	15	10	18	15	18
CHANNEL ALTERATIONS	14	15	13	9	9	7
BANK PROTECTION	19	15	12	19	15	7
BANK STABILITY	20	17	11	20	17	7
BUFFER WIDTH	13	8	13	9	8	4
TOTAL HABITAT SCORE	154	138	129	150	138	111
HABITAT INDEX	77.0	69.0	64.5	75.0	69.0	55.5
WATER CHEMISTRY						
TEMPERATURE	16.5 C	16.9 C	18.7 C	12.6 C	11.7 C	11.6 C
PH	8.2	8.4	8.8	8.1	8.2	8.7
CONDUCTIVITY	457	434	455	453	420	427
TOTAL DISSOLVED SOLIDS	229	217	228	226	209	215
IRON	ND	ND	ND	ND	ND	ND
ACIDITY	< 5	< 5	< 5	< 5	< 5	< 5
ALKALINITY	160	140	124	140	126	150
DISSOLVED OXYGEN	9.2	9.0	9.4	8.8	8.6	9.8
AQUATIC LIFE COMMENTS						
OTHER AQUATIC LIFE	YES	NO	NO	YES	YES	YES
FISH OBSERVED	YES	YES	YES	YES	YES	YES
DEAD ANIMALS OBSERVED	NO	YES	YES	NO	NO	YES

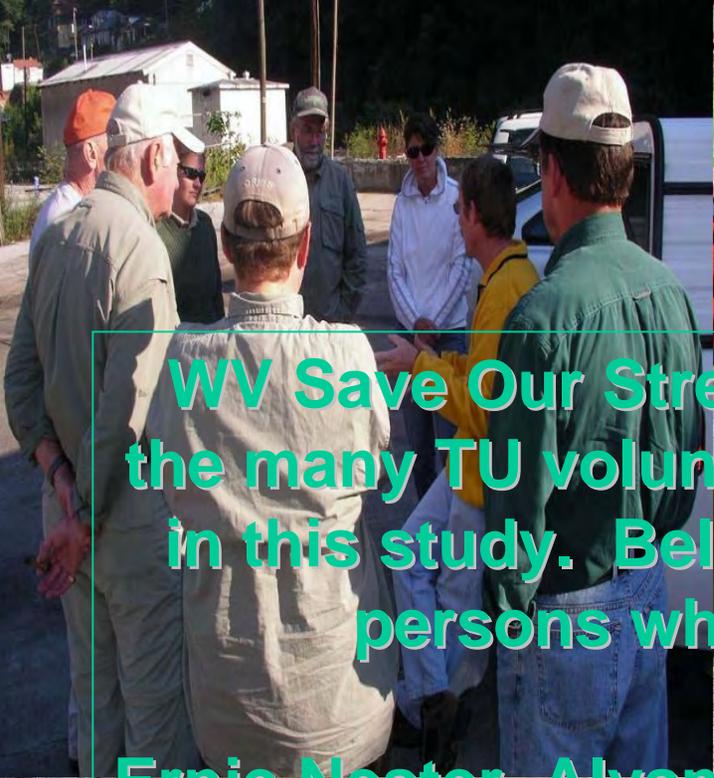
Results and discussion

We assessed the effects of a 7500-gallon diesel fuel spill on the macroinvertebrate fauna of a trout stream in southern WV. To determine the spatial extent of the spill we sampled two locations (downstream of the spill) and a reference site (upstream of spill). Sampling was repeated twice over a 7-month period and at least one more round of samples will occur within the next 5-months to assess temporal recovery.

1. Eight days after the spill, invertebrate density at all locations below the spill was significantly lower than reference density. Seven months after the spill, density had increased but was still less than the reference site, suggesting that invertebrates had recovered somewhat numerically. Taxonomic richness below the spill was less than the reference taxonomic richness, but not significantly.
2. We concluded that the diesel fuel spill significantly reduced the density of invertebrates and taxonomic richness to some extent, at least 4-miles downstream. The density recovered somewhat within seven months but was still less than the reference site. The community at the impact site to a limited extent, but especially at the recovery site was species poor and over-represented by a single dominant taxon, suggesting that seven months was not sufficient for full community recovery from the oil spill.
3. There were significant differences between reference and recovery site after seven months, but we feel these differences could not be attributed to the oil spill. We suspected major physical changes were at least in part, responsible for the differences.

WV Department of Environmental Protection
WV Save Our Streams Program
601 57th Street, SE
Charleston, WV 25304

Web page: <http://www.dep.wv.gov/sos>
E-mail: timothy.d.craddock@wv.gov



WV Save Our Stream's would like to acknowledge the many TU volunteers and others who participated in this study. Below is a partial list of some of the persons who contributed to the effort.

Ernie Nester, Alvan Gale, Jennifer Dupree, Jack Williams, Larry Orr, Randy Augustine, Dawn Doud, Steve Sattler, Steve White, B.J. Amos, several local volunteers and many others.

