

In September 1985 a train derailment caused several thousand gallons of sulfuric acid to be spilled into the Medina River in southwest Bexar county, Texas.

The acid spill and the application of lime (to neutralize the acid) negatively impacted approximately 29 miles of river below the spill site.

In order to determine the degree of rejuvenation that has occurred, electrofishing, seine and benthic samples were collected from six sites along the Medina River, Figure 1.

Data from the sample sites above the spill (1-3) was compared to data from the derailment site and the two downstream stations (4-6).

The sites above the spill had a higher species diversity and significant differences were found in the mean number of species from both electrofishing and seine samples (Tables 1-2). A significant difference was also found in the mean number of fish from electrofishing data.

Species diversity of benthic organisms was somewhat higher at sites above the spill site but no significant differences were found for mean number of organisms or families (Table 3-4).

It appears the benthic organisms are recovering more rapidly than the fish population .

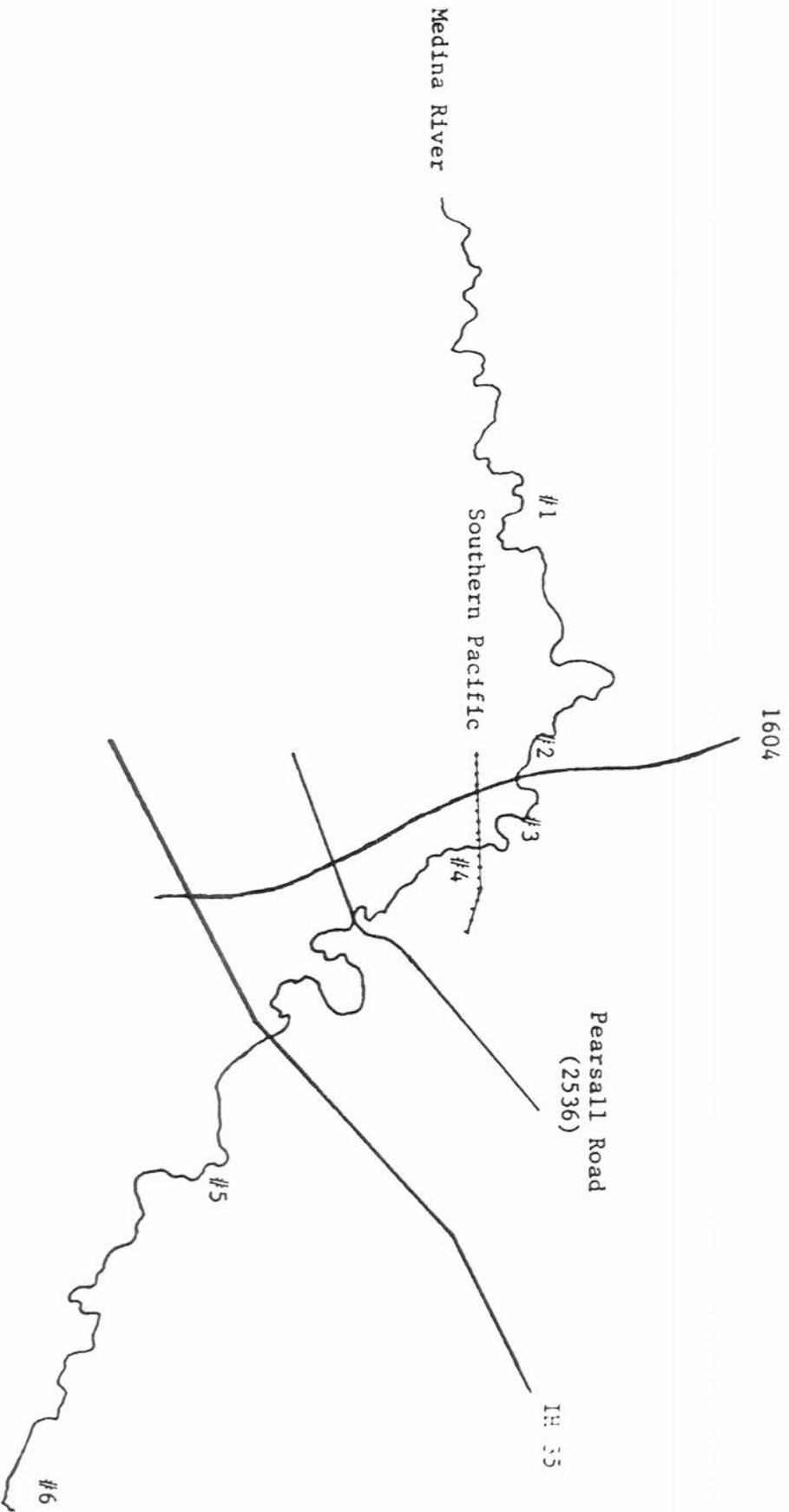


Figure 1. Sampling sites on the Medina River, Texas, February 2-4, 1986.

Table 1 . Electrofishing statistics, six stations, Medina River Texas,
January-February 1986.

Stations	1	Above Spill 2	3	Spill 4	5	Below Spill 6
Species						
Mexican tetra	-	-	-	1	1	-
Speckled chub	-	1	2	-	-	-
Blacktail shiner	1	3	-	-	-	-
Red shiner	-	2	-	-	-	-
Sand shiner	-	1	-	-	-	-
Stoneroller	16	7	3	-	-	-
Channel catfish	-	-	1	-	-	-
Tadpole madtom	-	-	1	-	-	-
Blackstriped topminnow	-	1	-	-	-	-
Gambusia	1	7	2	1	1	1
Sailfin molly	9	10	29	12	2	-
Spotted bass	1	4	1	-	-	-
Warmouth	-	-	1	-	-	-
Green sunfish	-	13	11	-	5	-
Spotted sunfish	3	-	-	-	-	-
Bluegill	2	13	1	4	-	1
Redbreast sunfish	3	2	-	-	-	-
Longear sunfish	-	4	6	-	-	-
Logperch	2	1	-	1	1	-
Rio Grande cichlid	1	3	1	4	-	-
Total	40	74	62	27	15	2
Number species	10	15	12	6	5	2

Table 2. Seine sampling statistics, six stations, Medina River, Texas, January 1986.

Stations	Above Spill		Spill Site		Below Spill	
	1	2	3	4	5	6
Species						
Mexican tetra	-	-	-	-	-	2
Speckled chub	1	1	-	5	-	-
Blacktail shiner	10	7	32	-	-	-
Red shiner	4	-	14	-	-	5
Bullhead minnow	-	1	4	-	-	-
Largemouth bass	-	-	-	1	-	-
Bluegill sunfish	-	1	-	-	-	-
Longear sunfish	3	1	-	-	-	-
Tadpoles	-	-	1	-	-	1
Crawfish	-	-	-	-	-	1

Table 3 . Benthic sampling statistics collected with a surber sampler from six sites on the Medina River, Texas, January-February, 1986.

Sites	1	Above Spill 2	3	Spill Site 4	5	Below Spill 6
Family						
Tendipedidae	16	32	5	21	16	30
Baetidae	10	13	2	23	99	6
Hydropsychidae	4	2	1	9	42	1
Coenagrionidae	-	-	-	-	1	-
Daphnia	-	-	1	-	-	-
Ecdyuriidae	3	2	1	10	1	2
Potamanthidae	22	13	3	22	1	-
Libellulidae	-	1	-	-	-	1
Psephenidae	6	-	-	-	1	-
Simuliidae	1	-	-	1	50	4
Dixidae	-	-	2	2	-	-
Siphonuridae	-	-	-	3	3	-
Tipulidae	3	-	-	28	-	-
Naucoridae	-	-	2	-	1	-
Physidae	3	-	-	-	1	-
Sphaeriidae	3	-	-	-	2	-
Ephemeridae	39	2	4	4	-	-
Elmidae	18	-	1	-	2	4
Hydroptilidae	17	8	3	2	-	-
Total number	145	73	25	125	223	18
Number Families	13	8	11	11	13	7

Table 4 . Benthic sampling statistics collected with an Ekman Dredge (total number organisms) from six sites on the Medina River, Texas, January-February, 1986.

Sites	Above Spill			Spill Site	Below Spill	
	1	2	3	4	5	6
Total Number	240	55	156	518	299	28

Species Diversity Analysis - Medina River

Electrofishing Results

Species	Above Spill Site			At or Below Spill Site			Totals
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
Channel catfish			1				1
Blacktail shiner	1	3					4
Tadpole madtom			1				1
Gambusia spp.	1	7	2	1	1	1	13
Mexican tetra				1	1		2
Logperch	2	1		1	1		5
Sailfin molly	9	10	29	12	2		62
Stone roller	16	7	3				26
Bluegill	2	13	1	4		1	21
Spotted sunfish	3						3
Redbreast sunfish	3	2					5
Spotted bass	1	4	1				6
Rio Grande cichlid	1	3	1	4			9
Longear		4	6				10
Green sunfish		13	11		5		29
Warmouth			1				1
Red shiner		2					2
Speckled chub		1	2				3
Sand shiner		1					1
Blackstriped topminnow		1					1
Totals	39	72	59	23	10	2	205
Number of species	10	15	12	6	5	2	20
Species Diversity (Shannon Index)	0.77	1.03	0.73	0.59	0.59	0.30	1.00

Statistics

	Above Spill Site	At or Below Spill Site	t Test * calculated t
Mean number of fish	56.67	11.67	3.96 sign. **
Mean number of species	12.33	4.33	4.23 sign. **

* For df = 4, alpha = 0.05, one-tailed test, critical t = 2.132

CONCLUSIONS

There are statistically significantly more fish and numbers of fish species above the spill site than at or below the spill site. Species diversity is also consis-

Species Diversity Analysis - Medina River

Seining Results

Species	Above Spill Site			At or Below Spill Site			Totals
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
Mexican tetra						2	2
Speckled chub	1	1		5			7
Blacktail shiner	10	7	32				49
Red Shiner	4		14			5	23
Bullhead minnow		1	4				5
Largemouth bass				1			1
Bluegill		1					1
Longear	3	1					4
Totals	18	11	50	6	0	7	92
Number of species	4	5	3	2	0	2	8
Species Diversity (Shannon index)	0.49	0.50	0.37	0.20	0.00	0.26	0.59

Statistics

	Above Spill Site	At or Below Spill Site	t Test * calculated t
Mean number of fish	26.33	4.33	1.80 not sign.
Mean number of species	4.00	1.33	3.03 sign. *

* For df = 4, alpha = 0.05, one-tailed test, critical t = 2.132

CONCLUSIONS

There are statistically significantly more species of fish above the spill site than at or below, but there is no significant difference in number of fish. This is due to wide variations in number of fish taken in seine hauls across all sites. Species diversity is much greater at the above spill sites.

Species Diversity Analysis - Medina River

Surber and Eckman Sampling Results

Surber Results

Taxa	Above Spill Site			At or Below Spill Site			Totals
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
Tendipedidae	16	32	5	21	16	30	120
Baetidae	10	13	2	23	99	6	153
Hydropsychidae	4	2	1	9	42	1	59
Coenagrionidae					1		1
Daphnia spp.			1				1
Ecdyuriidae	3	2	1	10	1	2	19
Ptotamanthidae	22	13	3	22	1		61
Libellulidae		1				1	2
Psephenidae	6				1		7
Simuliidae	1			1	50	4	56
Dixidae			2	2			4
Siphonuridae				3	3		6
Tipulidae	3			28			31
Naiadoridae			2		1		3
Ptysidae	3				1		4
Sphaeriidae	3				2		5
Ephemeraeidae	39	2	4	4			49
Elmidae	18		1		2	4	25
Hydroptilidae	17	8	3	2			30
							0
Totals	145	73	25	125	220	48	636
Number of taxa	13	8	11	11	13	7	19
Taxon Diversity (Shannon Index)	0.94	0.68	0.98	0.87	0.65	0.55	1.00

Eckman Results

Individuals Total	240	55	156	518	299	28
Statistics	Above Spill Site			At or Below Spill Site		t Test *
						calculated t
** Surber **						
Mean number of individuals	81.00			131.00		.823 not sign.
Mean number of taxa	10.67			12.33		.118 not sign.
** Eckman **						
Mean number of individuals	150.33			281.67		.708 not sign.

* For df = 4, alpha = 0.05, two-tailed test, critical t = 2.776

Heart of the Hills Research Station
Texas Parks and Wildlife Department
Junction Star Route 62
Ingram, TX 78025

Copy to
Palafox

February 7, 1986

Texas Parks and Wildlife Department
4200 Smith School Road
Austin TX 78744

ATTN: Phil Durocher, Inland Fisheries *PPS*

Dear Phil:

Enclosed is a second set of data and analysis from benthos data collected by Jimmy Dean. Note that only a single table presents results from both Surber and Eckman dredge samples. Only total number of individuals is reported for each station for Eckman samples.

These results indicate that there is no significant difference in number of individuals or number of taxa between the above spill sites and the "at or below spill" sites. The diversity index indicates that there is somewhat more diversity at the "above" sites, but this is largely due to more "evenness" in the spread of individuals among the taxa present at each site. Note also that the particular taxa present differ between the above and below sites; since we do not have species identifications, it would be difficult to comment on the relative sensitivities, hardiness, or re-establishment capabilities of these taxa.

I hope that these results will be of use to you in the Medina River assessments. Let me know if I can be of further assistance.

Sincerely,

Michael Childress

Michael Childress

wmc

Species Diversity Analysis - Medina River

Surber and Eckman Sampling Results

Surber Results

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	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
	Tendipedidae	16	32	5	21	16	
Baetidae	10	13	2	23	99	6	153
Hudropsychidae	4	2	1	9	42	1	59
Coenagrionidae					1		1
Daphnia spp.			1				1
Ecdyuriidae	3	2	1	10	1	2	19
Totamanthidae	22	13	3	22	1		61
Libellulidae		1				1	2
Psephenidae	6				1		7
Simuliidae	1			1	50	4	56
Dixidae			2	2			4
Siphonuridae				3	3		6
Tipulidae	3			28			31
Navcoridae			2		1		3
Thysidae	3				1		4
Sphaeridiidae	3				2		5
Ephemeridae	39	2	4	4			49
Elmidae	18		1		2	4	25
Hydroptilidae	17	8	3	2			30
							0
Totals	145	73	25	125	220	48	636
Number of taxa	13	8	11	11	13	7	19
Taxon Diversity (Shannon index)	0.94	0.68	0.98	0.87	0.65	0.55	1.00

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