#5 Griffith et al 1982

EXHIBIT C

A BASELINE BIOLOICAL STUDY OF THAT PORTION OF GROVE CREEK (BLAINE COUNTY, IDAHO) INCLUDED IN THE McMAHAN EASEMENT

by

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27 July 1982

INTRODUCTION

The purpose of this report is to present the results of monitoring designed to collect baseline biological data for the establishment of the current condition of portions of property owned by William McMahan, in accordance with a Conservation Easement in favor of The Nature Conservancy. The property consists of riparian zones contiguous to approximately 605 m of Grove Creek, a tributary of Silver Creek, Blaine County, Idaho, and to a shorter portion of Silver Creek proper that is not discussed in this report.

Data were collected during the summer of 1982 on:

a. species composition, abundance and approximate size of fish, and
b. composition of riparian vegetation.

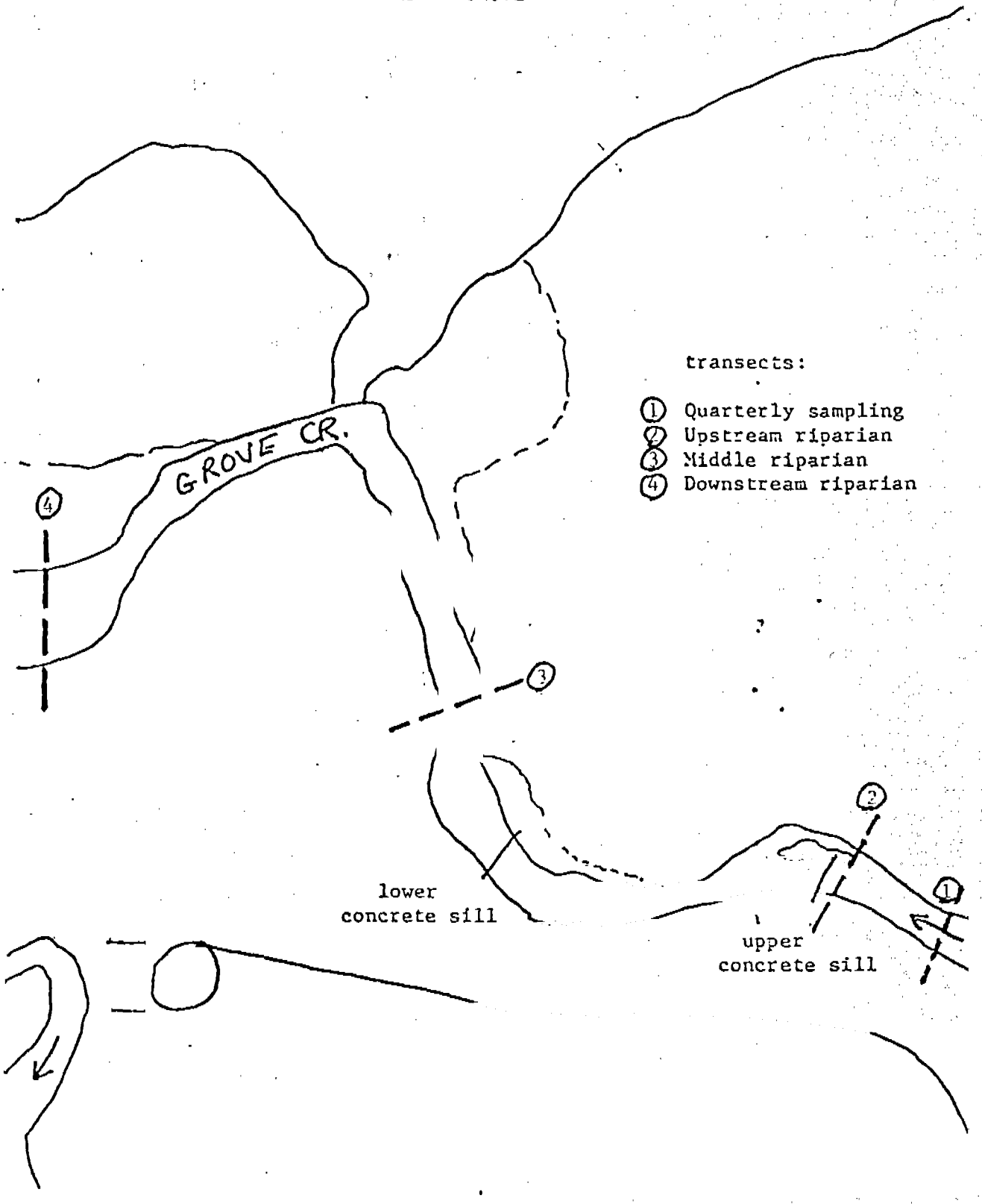
Data were collected quarterly for a 1-year period (June, August and November 1981 and May 1982) on:

a. sediment depth,
b. composition of submerged aquatic vegetation, and
c. composition and abundance of aquatic macroinvertebrates.

The study area is shown in Figure 1.

(GROVE)

ASPEN GROVE



METHODS

Quarterly sampling was done on 6 June, 18 August, and 7 November 1981 and on 15 May 1982. A transect was established approximately 15 m below the upper fence crossing the Creek on the property (Fig. 2).

Summer sampling to assess fish populations and riparian vegetation was done on 25 June and 26 June, respectively. For the latter, three transects were established perpendicular to the stream channel. The upper transect was located 3 m upstream from the upper concrete sill in the stream, the middle transect was 80 m downstream from the lower concrete sill, and the lower transect was parallel to the downstream-most fence on the property and 20 m upstream from the fence.

Fish Populations

Fish population assessment was done by underwater observation utilizing three experienced observers equipped with wet suits and snorkels. Divers spaced themselves across the channel and counted fish observed between them and the diver to their immediate left. The entire length of the study section was floated in this manner.

Riparian Vegetation

At each transect a measuring tape was stretched along the transect and for each 1-m interval the percent ground cover (to nearest 5%) by genus of flora observed was recorded.

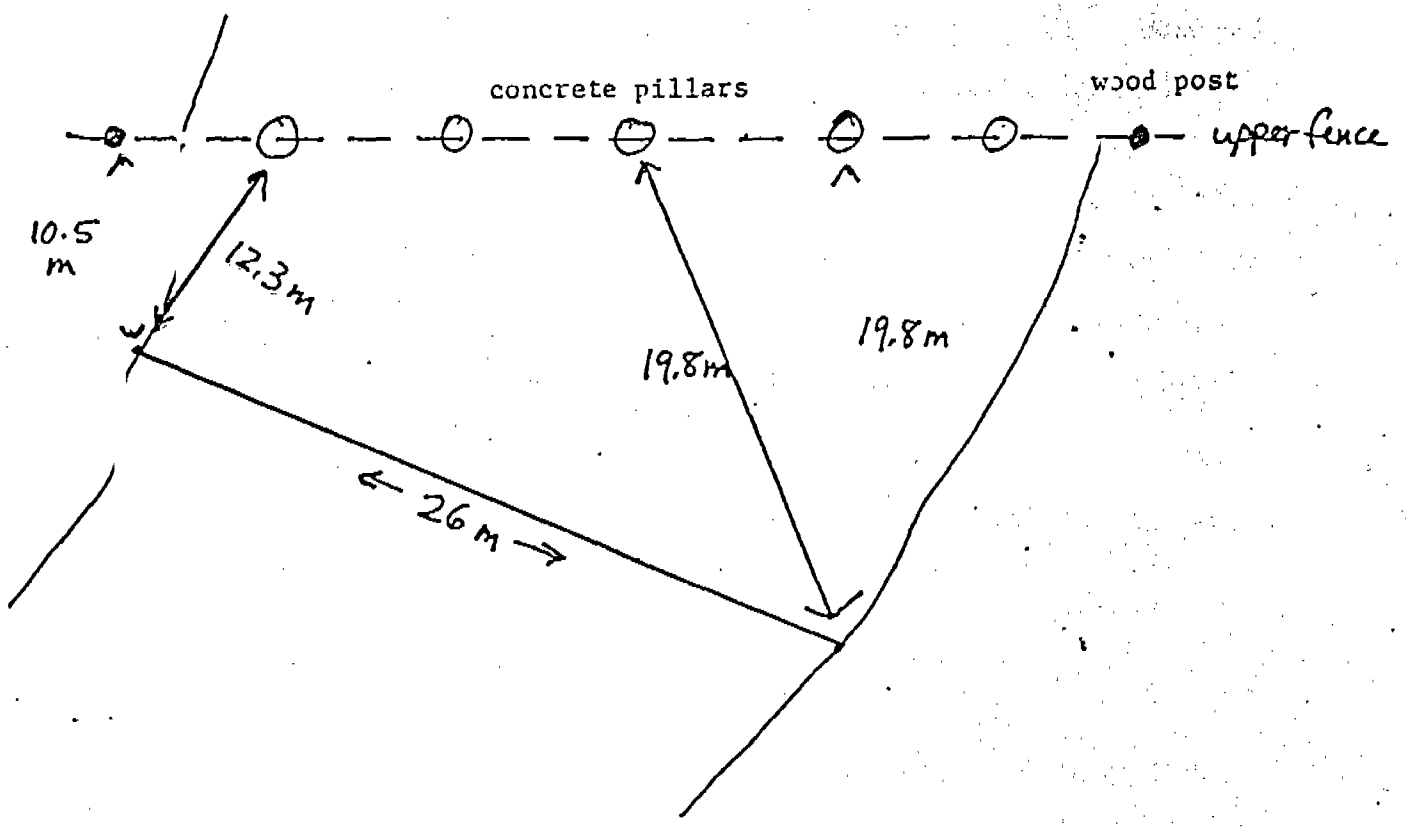


Figure 2. Location of transect for quarterly sampling, Grove Creek.

Sediment Depth and Aquatic Vegetation

Two series of 10 equally-spaced measurements were taken at the transect, one series on a line 1-m above the transect and the second 1-m below the transect. At each of these 20 points, total depth (water surface to firm stream bottom), sediment depth, and height of submerged aquatic vegetation were recorded to the nearest centimeter using a probe.

Aquatic Macroinvertebrates

A series of four 1/16 m^2 Hess net samples (mesh size 0.39 mm) were taken across the transect on each sampling date. The net sampled the upper 8 cm of the substrate. Samples were preserved with 10% alcohol in the field. In the laboratory, they were sorted to separate debris from invertebrates, and organisms were identified to genus level where feasible and counted.

RESULTS

Fish Populations

A total of 208 rainbow trout (Salmo gairdneri) larger than 10 cm were counted (Table 1). About half of these fish ranged in length from 10 - 20 cm. Fifteen trout longer than 40 cm (16 in) were counted, and two of these were judged to weigh approximately 2.3 kg (5 lb).

Five brook trout (Salvelinus fontinalis) were also observed, as well as a few bridgelip suckers (Catostomus columbianus) and longnose dace (Rhinichthys cataractae, Table 1).

These counts probably underestimate the number of fish present in this portion of Grove Creek since the divers were not able to cover the entire width of the stream. The vast majority of the trout were distributed in the two deep (to 3 m) holes below the concrete sills. Of the rainbow trout, 111 (53% of total) were found in these two locations, and all trout longer than 40 cm were also there. Since we were able to effectively count essentially all of the fish in these two holes, this underestimation of actual population size is reduced.

Since the area of the study portion of the Creek was 1.57 hectares (3.9A) we estimate the trout population present to be about 200 fish/hectare, or about 80 kg/hectare. These are good population levels, but are dependent largely upon the presence of the two deep holes.

Table 1. Abundance of fish counted by underwater observation in Grove Creek (between fencelines on McMahan property) 25 June 1982. Fish smaller than 10 cm not counted.

Section	Rainbow trout; size class, cm				Other species
	10 - 20	20 - 30	30 - 40	>40	
upper fence to upstream concrete sill	7	2	1	0	1 brook trout, 32 cm
hole below upstream concrete sill	35	22	13	10	2 suckers
to downstream concrete sill	49	20	4	0	4 brook trout, 15 cm 12 dace 11 suckers
hole below downstream concrete sill	11	8	7	5	none
to lower fence	13	1	0	0	1 sucker
TOTAL	115	53	25	15	

Grand Total 208 rainbow trout

Riparian Vegetation

A total of 24 genera of flora was recorded in the three transects (Table 2). All are common local genera.

The upstream transect was dominated by Juncus and Carex (see attached data sheets). A total of 14 species were present, providing a dense low-level ground cover but taller woody species such as willow or riverbirch were almost totally absent.

The middle transect was similaralthough Poa was more abundant and a patch of willow was present along the west margin of the stream. Fifteen species were found.

The downstream transect was considerably longer (56 m) and dominated by Juncus, Carex, Poa and Potentilla. Eighteen species were present. Some willow was present along the west bank. As with the other transects, several changes in plant community were evident along the transect as available moisture changed.

Aquatic Macroinvertebrates

A total of 41 taxa were collected in Hess net samples (Table 3). Caddisflies were the group richest in numbers of genera with 11, followed by mayflies with 7. The number of taxa was relatively stable throughout the year, reflecting the relative constancy of the Grove Creek environment.

Numerically, two groups of mayflies (Baetis and Ephemerella) and the midge (Chironomidae) larvae and tubificid worms predominated. Total numbers declined in August as considerable emergence had occurred prior to that time.

Table 2. Genera of riparian vegetation, Grove Creek, June 1982.

Genus	Common name
Achillea	yarrow
Agoseris	false dandelion
Agropyron	blue bunch grass
Carex	sedge
Cirsium	thistle (bull and Canadian thistle present)
Equisetum	horsetail
Fragaria	wild strawberry
Geranium	wild geranium
Hippurus	mare's tail (emergent)
Iris	wild iris
Juncus	rush
Lemna	duckweed
Poa	blue grass
Polygonum	snake weed or snake grass
Potentilla	cinquefoil
Rorippa	watercress
Rosa	wild rose
Salix	willow
Scirpus	bullrush
Smilacina	false Solomon's seal or lily of the valley
Solidago	goldenrod
Taraxacum	dandelion
Trifolium	clover
Veronica	American speedwell (emergent)

Sediment Depth and Aquatic Vegetation

Total depth at the transect was about 40 cm, and only a limited amount of sediment (2-11 cm) was present (Table 4). Sediment depth increased in spring 1982 as a narrow pocket of sediment up to 44 cm deep built up at one side of the transect.

Chara was the dominant vegetation, with some Potamogeton and Veronica present. A relatively high proportion of gravel (10-50%) was exposed during the year.

Stream Grove Cr. - McMahan
Date 26 June 1982

RIPARIAN VEGETATION

Transect upstream
Transect length 24 m
east to w

SPECIES — % COVER BY 1 m. INTERVAL

Scientific name - common name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Agropyron - wheatgrass																									
Cirsium - thistle				15	15															10	15				
Equisetum - horsetail																						5		10	
Juncus - rush				15	20				5	15	15	20	10	30	20	10	10	10							
Poa - bluegrass	50	5																					15	40	
Potentilla - cinquefoil																						30	10	30	
Rosa - wild rose	90	85	100	50		70															20	15	5		
Smilacina - false Solomons seal	5	10		20	20	20																			
Solidago - goldenrod				20	30	20																			
Carex - sedge						15	90	40	35	15	15		30	40	40	30	30	60	60	50					
Scirpus - bullrush						10		5	40			15													
Lemna - duckweed								5	5																
Salix - willow												10													
Geranium - geranium																					15	10	15		
Iris - wild iris																							10		

Grove Creek

DETRITUS													50			50	30			20					
WATER SURFACE						10	50	20	80	70	60	50		30			30	30	30	20					
BARE GROUND	75			5	15																50	90	95	20	

Table 4. Depths of channel, sediment, and aquatic plants in Grove Creek, 1981-82. Ranges given in parentheses.

Date	Cross-section	Depth, cm Total	Sediment	Plant	% gravel
June 1981	A	37.6	5.1 (0-16)	16.9 (0-45)	10
	B	35.0	2.3 (0-13)	2.2 (0-12)	50
August 1981	A	42.6	5.1 (0-13)	6.5 (0-28)	20
	B	42.8	4.8 (0-10)	9.5 (0-30)	40
November 1981	A	40.1	3.9 (0-12)	8.3 (0-30)	10
	B	33.4	2.7 (0-7)	9.8 (0-24)	20
May 1982	A	39.4	10.8 (0-44)	1.5 (0-5)	20
	B	40.2	7.3 (0-15)	3.2 (0-20)	30

Stream Grove Cr. - McMahan
Date 7/8 June 1982

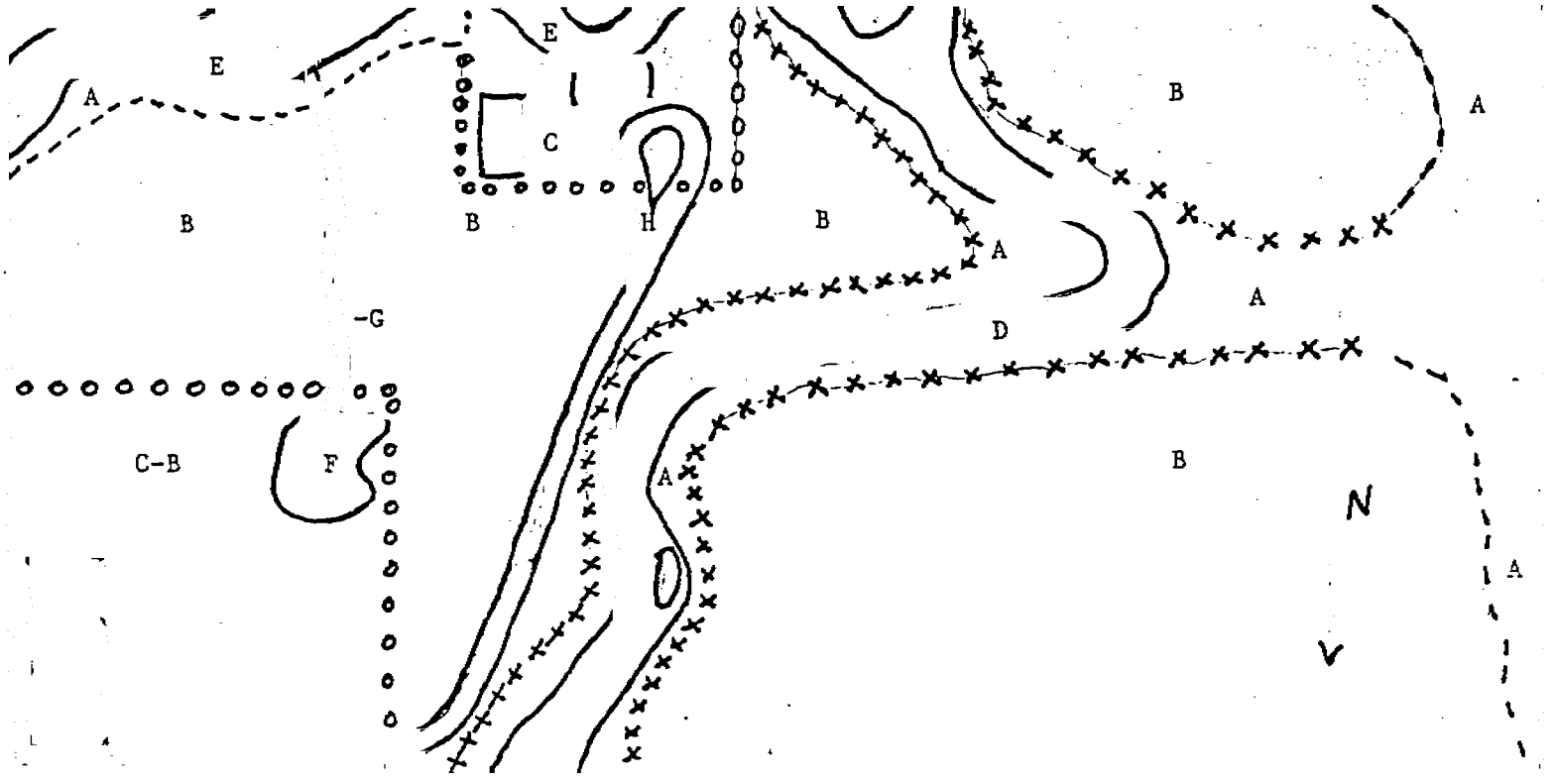
RIPARIAN VEGETATION

Transect middle
Transect length 17 m
east to west

SPECIES Scientific name - common name	% COVER BY 1 m. INTERVAL																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Agropyron - wheatgrass	15																								
Cirsium - thistle					10	20	10																		
Equisetum - horsetail			10		10								5												
Juncus - rush						15				15	10	25	10												
Poa - bluegrass	35	25	25	40	25	20	20						20	40	40	55	30								
Potentilla - cinquefoil														15	35	20	60								
Rosa - wild rose																									
Agoseris - false dandelion	15	45														10	10								
Achillea - yarrow	15	15	20	10																					
Smilacina - false Solomon seal			15		30		15						10												
Iris - wild iris				15		10																			
Carex - sedge						25	55	10	10	60	50	40	15												
Scirpus - bulrush								10	10																
Ranunculus - watercress									10																
Salix - willow										15	10	25	30												
Fragaria - wild strawberry														15	10										
DETRITUS										10	30	10		30	15	15									
WATER SURFACE								80	70																
BARE GROUND	20	15	30	35	25	10																			

Grove Creek

EXHIBIT D



McMahan Conservation Easement

A- Natural Zone
B- Agricultural Zone
C- Residential Zone
D- Grove Creek
E- Silver Creek
F- Pond
G- Drainage Ditch
H- Driveway

xxx- Natural zone boundary without existing fence

--- Natural zone boundary with existing fence

ooo-Boundaries of residential zones

Table 3. Density of macroinvertebrates (extrapolated to numbers/m^2) collected in Grove Creek, 1981-82.

Class or Order	Family	Genus	sampling date			
			June	August	November	May
Ephemeroptera (mayflies)	Baetidae	Baetis	5596	4128	1272	512
		Centroptilum	0	0	80	12
	Ephemerellidae	Ephemerella inermis/infrequens	4504	92	1240	4528
		grandis	4	4	0	4
	Tricorythidae	Tricorythodes	0	292	520	24
	Leptophlebiidae	Parateptophlebia	180	508	80	0
	Heptageniidae	Cinygmula	12	0	0	4
Plecoptera (stoneflies)	Nemouridae	Nemoura	0	4	0	0
	Perlodidae	Isoperla	188	0	20	8
	Perlidae	Hesperoperla	4	0	4	0
Trichoptera (caddisflies)	Brachycentridae	Brachycentrus	304	428	224	40
	Leptoceridae	Oecetis	8	0	92	32
	Limnephilidae	Limnephilus	0	0	0	0
	"	genus A	120	0	0	0
	"	genus B	0	0	24	0
	Hydroptilidae	Hydroptila	94	16	668	52
		Oxyethira	280	0	0	0
	Helicopsychidae	Helicopsyche	424	184	392	56
	Hydropsychidae	Hydropsyche	322	4	0	4
	Rhyacophilidae	Rhyacophila	44	4	0	4
	Lepidostomatidae	Lepidostoma	4	4	0	0

dragonflies)						
Coleoptera (beetles)	Elmidae	Cleptlmis	8	32	12	0
	"	Optioservus	160	56	16	16
	"	Lara	4	0	0	0
Hemiptera (true bugs)	Corixidae	Hesperocorixa	4	0	0	0
Diptera (flies)	Ceratopogonidae		324	12	16	4
	Chironomidae		9632	1448	2620	4376
	Tabanidae	Chrysops	40	0	0	0
	Empididae		16	4	20	4
	Stratiomyidae	Euparyphus	56	8	48	36
	Simuliidae	Simulium	40	36	56	0
Lepidoptera (aquatic butterfly larvae)			4	0	0	0
Amphipoda (shrimp)	Gammaridae	Gammarus	516	560	212	412
Hydracarina (mites)			12	72	120	52
Oligochaeta	Tubificidae		2992	524	1348	4376
Hirudinea (leeches)			212	360	516	124
Ostracoda (seed shrimps)			48	496	604	620
Gastropoda (snails)	Lymnaeidae	Lymnaea	0	0	8	0
	Physidae	Physa	0	0	4	0
	Sphaeriidae	Pisidium	72	84	88	172
	Amnicolidae	Amnicola	4	12	36	52
	number of taxa		34	27	29	26
	number of individuals		26,432	9,356	10,368	15,536