APPENDIX F - Diatom Data

1. Diatom Metrics 2013
2. Diatom Species in Topanga Creek, Spring 2013
3. Diatom Metrics 2014
4. Diatom Species in Topanga Creek, Spring 2014

Diatom Metrics

Metric Group	Definition	Reference
Pollution Tolerance Class	Tolerance to organic pollution according to Lange-Bertalot 1979; 1=most tolerant of pollution; 2=tolerant of pollution; 3=sensitive to pollution	Lange-Bertalot 1979
Habitat	A = aerophile; P = planktonic	
pH	1 acidobiontic, optimum pH <5.5; 2 acidophilous, pH <7; 3 circumneutral, pH ~7; 4 alkaliphilous, mainly pH >7; 5 alkalibiontic, exclusively pH >7; 6 indifferent, no apparent optimum	
Salinity	1 fresh; 2 fresh brackish; 3 brackish fresh; 4 brackish; 5 marine (see Van Dam et al. 1994 for criteria)	Van Dam et al. 1994
Nitrogen Uptake Metabolism	1 nitrogen autotroph tolerating very small concentrations of organic nitrogen; 2 nitrogen autotroph tolerating elevated concentrations of organic nitrogen; 3 facultative nitrogen heterotroph; 4 obligate nitrogen heterotroph	
Oxygen Requirements	1 continuously high (~100% saturation); 2 high (>75%); 3 moderate (>50%); 4 low (>30%); 5 very low (~10% saturation)	
Saprobity	1 oligosaprobous; 2 beta-mesosaprobous; 3 alpha-mesosaprobous; 4 alpha-meso-/polysaprobous; 5 polysaprobous (see Van Dam et al. 1994 for criteria)	Van Dam et al. 1994
Trophic State	1 oligotraphentic; 2 oligo-mesotraphentic; 3 mesotraphentic; 4 meso-eutraphentic; 5 eutraphentic; 6 hypereutraphentic; 7 oligo- to eutraphentic (variable); 8 dystrophic	
Moisture	1 rarely occurs outside water bodies; 2 mainly in water but sometimes on wet places; 3 mainly in water but regularly on wet or moist places; 4 mainly on wet, moist, or temporarily dry places; 5 occurs almost exclusively outside water bodies	
Motility	H = highly motile; M = moderately motile (diatoms with raphes but not highly motile); N = not motile; V = variable motility (source: Jan Stevenson)	Jan Stevenson
Distribution	N = North American endemics; C = cosmopolitan in temperate regions, broad ecological niche, generally aggressive and opportunistic species that develop large populations in response to disturbance and may exclude native species (**, Lange-Bertalot 1996)	
Rare Taxa	M = Mountains Rare Taxa; P = Plains Rare Taxa; C = Mountains and Plains Rare Taxa	
Mountains	C = Common Increaser; S = Sediment Increaser; N = Nutrients Increaser; M = Metals Increaser; O = Other	
Plains	C = Common Increaser; S = Sediment Increaser; N = Nutrients Increaser	
Metal Tolerance	percent relative abundance species known to be tolerant to metal (ref?)	

Metrics Report

Community Structure

Shannon H (log2) – Shannon Diversity Index (Weber, 1973) using log base 2 (Bahls, 1992; Teply and Bahls, 1995)

Species Richness – Total number of species counted (during proportional count)

Native Taxa Percent – Percent relative abundance of species native to Montana (230 spp.)

Cosmopolitan Taxa Percent – Percent relative abundance of cosmopolitan species (242 spp.)

Mountains Rare Taxa Percent – Percent relative abundance of diatom species occurring in greater than 2 percent in at least one sample and present in less than 10 percent of stations in MDD (??)

Plains Rare Taxa Percent - Percent relative abundance of diatom species occurring in greater than 2 percent in at least one sample and present in less than 10 percent of stations in MDD (??)

Dominant Taxon Percent – Percent relative abundance of the dominant species counted

Sediment

Siltation Taxa Percent – Percent relative abundance of *Navicula* (Cavinula + Craticula + Diadesmis + Dickieia + Fallacia + Geissleria + Hippodonta + Luticola + Navicula + Placoneis + Sellophora + Proshkina + Kobayasiella + Aneumastus) + *Nitzschia* (Nitzschia + Simonsonia + Tryblionella) + *Surirella* (Bahls, 1992; Teply and Bahls, 2005)

Motile Taxa Percent – Percent relative abundance of highly motile and moderately motile diatom taxa (with raphes, but not highly motile)

Mountains Brackish Taxa Percent – Percent relative abundance of brackish and brackish fresh diatom species

Plains Brackish Taxa Percent – Percent relative abundance of brackish diatom species

Organic Nutrients

Pollution Index - Aggregate index based on pollution tolerance, with three classes: species most tolerant to pollution (1), species tolerant of pollution (2) and species sensitive to pollution (3) (Lange-Bertalot, 1979) (Bahls, 1992).

Nitrogen Heterotroph Taxa Percent – Percent relative abundance of facultative heterotrophs and obligate nitrogen heterotrophs

Polysaprobous Taxa Percent – Percent relative abundance of alpha-mesosaprobous, alpha-meso/polysaprobous, and polysaprobous diatoms

Low DO Taxa Percent – Percent relative abundance of low and very low oxygen demand diatoms

Inorganic Nutrients

Nitrogen Autotroph Taxa Percent – Percent relative abundance of nitrogen autotroph (tolerates small concentrations of organic N) and nitrogen autotroph (tolerates elevated concentrations of organic N)

Eutraphentic Taxa Percent – Percent relative abundance of eutraphentic and hypereutraphentic diatoms

Rhopalodiales Percent – Percent relative abundance of *Epithemia* and *Rhopalodia* species

Metals

Disturbance Taxa Percent – Percent relative abundance of *Achnanthidium minutissimum* (new name) or *Achnanthes minutissima* in a sample

Acidophilous Taxa Percent – Percent relative abundance of acidobiontic and acidophilous diatoms

Metals Tolerant Taxa Percent – Percent relative abundance of species known to tolerate elevated concentrations of heavy metals

Abnormal Cells Percent – Percent relative abundance of cells exhibiting teratogenic effects

Increaser/Decreaser Taxa

Montana Discriminant Functions

Mountains General Increasers Taxa Percent (Probability)

Mountains Metals Increasers Taxa Percent (Probability)

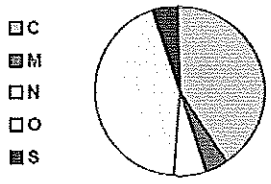
Mountains Nutrient Increasers Taxa Percent (Probability)

Mountains Sediment Increasers Taxa Percent (Probability)

Plains General Decreasers Taxa Percent (Probability)

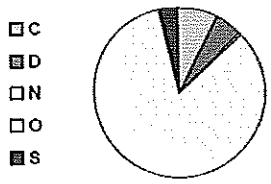
Plains General Increasers Taxa Percent (Probability)

Mountains



C = Common Increaser Taxa
M = Metals Increaser Taxa
N = Nutrient Increaser Taxa
O = Other Taxa
S = Sediment Increaser Taxa

Plains



C = General Increaser Taxa
D = General Decreaser Taxa
N = Nutrient Increaser Taxa
O = Other Taxa
S = Sediment Increaser Taxa

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Delivered: August 29, 2013

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Diatom Metrics 2013

Group	Metric	TC3200	TC5000
Abnormality	Abnormal Cells Percent	0.00	0.00
Autotrophism	Nitrogen Autotroph Taxa Percent	73.67	70.67
Disturbance	Disturbance Taxa Percent	0.00	0.00
Diversity	Shannon H (log2)	4.73	4.87
	Species Richness	64	61
Dominance	Dominant Taxon Percent	16.00	16.17
Heterotrophism	Nitrogen Heterotroph Taxa Percent	14.67	10.17
Metals Tolerance	Metals Tolerant Taxa Percent	2.83	1.83
Motility	Motile Taxa Percent	59.17	59.67
Oxidation	Low DO Taxa Percent	9.83	8.50
Pollution	Pollution Index	2.56	2.58
Rhopalodiales	Rhopalodiales Percent	3.17	3.67
Saprobity	Polysaprobous Taxa Percent	29.33	26.33
Siltation	Siltation Taxa Percent	35.67	35.00
Trophic State	Eutraphentic Taxa Percent	75.50	47.33

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Delivered: August 29, 2013

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Diatom Abundance May 2013

Phylum	Class	Species	TC3200 Count	TC5000 Count
Heterokontophyta	Bacillariophyceae	Achnanthidium minutissimum	1	5
		Planothidium	1	
		Planothidium delicatulum	4	6
		Planothidium frequentissimum	11	12
		Planothidium lanceolatum	2	
		Platessa conspicua		2
		Cocconeis pediculus	22	14
		Cocconeis placentula	19	6
		Cocconeis placentula var lineata	96	27
		Cocconeis pseudolineata	2	1
		Bacillaria paradoxa	31	24
		Nitzschia		8
		Nitzschia acicularis		2
		Nitzschia amphibia		2
		Nitzschia angustatula		2
		Nitzschia archibaldii	2	10
		Nitzschia dissipata	8	11
		Nitzschia dissipata var media		1
		Nitzschia fonticola		4
		Nitzschia inconspicua	49	41
		Nitzschia microcephala	12	2
		Nitzschia palea	2	1
		Nitzschia paleacea	3	3
		Nitzschia perminuta	13	14
		Nitzschia pura		4
		Nitzschia pusilla		2
		Nitzschia recta	4	
		Nitzschia supralitorea	4	3
		Nitzschia vermicularis		3
		Simonsenia delognei	3	1
		Tryblionella apiculata	1	8
		Placoneis placentula	2	
		Rhoicosphenia abbreviata	24	10
		Pseudostaurosira parasitica	2	
		Eolimna minima	7	
		Hippodonta capitata	2	

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Delivered: August 29, 2013

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Diatom Abundance (continued)

Phylum	Class	Species	TC3200 Count	TC5000 Count
		Hippodonta hungarica	1	
		Mayamaea	1	
		Mayamaea atomus	3	1
		Navicula		1
		Navicula antonii	2	
		Navicula cari	1	
		Navicula caterva	5	
		Navicula cryptocephala		1
		Navicula cryptotenelloides		2
		Navicula densilineolata	2	
		Navicula goersii	2	
		Navicula gregaria	13	22
		Navicula peregrina	1	
		Navicula radiosa	1	6
		Navicula recens		2
		Navicula salinicola	4	2
		Navicula tenelloides	2	
		Navicula tripunctata	42	17
		Navicula veneta	4	2
		Caloneis bacillum	1	2
		Gyrosigma acuminatum		2
		Pleurosigma delicatulum	1	
		Fallacia	3	2
		Fallacia monoculata	2	
		Fallacia pygmaea	3	4
		Fallacia sublucidula	10	17
		Sellaphora		2
		Sellaphora pupula		7
		Denticula	2	
		Epithemia adnata	1	4
		Epithemia sorex	10	10
		Epithemia turgida	2	
		Rhopalodia acuminata	1	
		Rhopalodia gibba	5	8
		Cymatopleura elliptica		2
		Amphora copulata	1	2

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Delivered: August 29, 2013

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Diatom Abundance (continued)

Phylum	Class	Species	TC3200 Count	TC5000 Count
		Amphora inariensis	26	58
		Amphora pediculus	61	35
		Halamphora veneta		1
	Coscinodiscophyceae	Melosira varians	1	2
		Cyclotella meneghiniana	2	
		Pleurosira laevis	1	
	Fragilariophyceae	Diatoma moniliforme	8	
		Fragilaria mesolepta		2
		Fragilaria vaucheriae		4
		Staurosira construens var binodis		31
		Staurosira construens var venter	33	97
		Staurosirella pinnata	2	10
		Synedra ulna	2	
		Tabularia fasciculata	11	13

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Delivered: August 29, 2013

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Soft Algae Abundance Abundance 2013

Algae Type	Phylum	Class	Species	Unit	TC3200	TC5000
Epiphyte	Chlorophyta	Chlorophyceae	Characium pringsheimii	Count	12	27
			Oedogonium sp 1	Count	1	
	Cyanobacteria	Cyanophyceae	Xenococcus sp 1	Count	5	
			Heteroleibleinia	Count	84	78
Macroalgae	Chlorophyta	Ulvophyceae	Cladophora glomerata	um3/cm2	1628106255	7633247643
Microalgae	Chlorophyta	Chlorophyceae	Oedogonium sp 1	um3/cm2		12189982
			Scenedesmus communis	um3/cm2	24186	
			Scenedesmus dispar	um3/cm2	5296	
		Ulvophyceae	Cladophora glomerata	um3/cm2		16814197379
	Cyanobacteria	Cyanophyceae	Cyanophyceae 5	um3/cm2		11352
			Homoeothrix janthina	um3/cm2	215030	
			Komvophoron	um3/cm2		157910
			Oscillatoria limosa	um3/cm2	14191066	
			Phormidium sp 1	um3/cm2	2222162	3454135
			Phormidium sp 2	um3/cm2	152622	
			Heteroleibleinia	um3/cm2		306900
			Leptolyngbya sp 1	um3/cm2	4502054	
	Rhodophyta	Florideophyceae	Chantransia sp 1	um3/cm2	2855514	
	Streptophyta	Zygnematophyceae	Mougeotia sp 1	um3/cm2		1806947786

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Delivered: August 29, 2013

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Qulaitative Algae: Present (P), Absent (A) 2013

Phylum	Class	Species	TC3200	TC5000
Chlorophyta	Ulvophyceae	Cladophora glomerata	P	P
Cyanobacteria	Cyanophyceae	Oscillatoria sp 1	P	
Streptophyta	Zygnematophyceae	Mougeotia sp 1	P	
		Spirogyra sp 1	P	

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Delivered: August 29, 2013

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Ash Free Dry Mass & Chlorophyll a Results 2013

Metric	Method	Unit	TC3200	TC5000
Ash Free Dry Mass	SM 2540	mg/cm2	10.85	7.81
Chlorophyll a	SM 10200 H	ug/cm2	13.26	8.63

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Sample Date (s): May 5 and 6, 2014
Delivered: August 13, 2014

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Diatom Metrics May 2014

Group	Metric	TC3200	TC5000
Abnormality	Abnormal Cells Percent	0.00	0.00
Autotrophism	Nitrogen Autotroph Taxa Percent	73.67	70.67
Disturbance	Disturbance Taxa Percent	0.00	0.00
Diversity	Shannon H (log2)	4.73	4.87
	Species Richness	64	61
Dominance	Dominant Taxon Percent	16.00	16.17
Heterotrophism	Nitrogen Heterotroph Taxa Percent	14.67	10.17
Metals Tolerance	Metals Tolerant Taxa Percent	2.83	1.83
Motility	Motile Taxa Percent	59.17	59.67
Oxidation	Low DO Taxa Percent	9.83	8.50
Pollution	Pollution Index	2.56	2.58
Rhopalodiales	Rhopalodiales Percent	3.17	3.67
Saprobity	Polysaprobous Taxa Percent	29.33	26.33
Siltation	Siltation Taxa Percent	35.67	35.00
Trophic State	Eutraphentic Taxa Percent	75.50	47.33

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Sample Date (s): May 5 and 6, 2014
Delivered: August 13, 2014

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Diatom Abundance May 2014

Phylum	Class	Species	TC3200 Count	TC5000 Count
Heterokontophyta	Bacillariophyceae	Achnanthidium exiguum	2	2
		Achnanthidium minutissimum	2	
		Adlafia minuscula	1	
		Amphora copulata	2	2
		Amphora inariensis		4
		Amphora pediculus	71	78
		Bacillaria paradoxa	13	9
		Caloneis bacillum	6	
		Caloneis silicula	2	
		Cocconeis pediculus	1	5
		Cocconeis placentula	11	12
		Cocconeis placentula var lineata	50	32
		Denticula subtilis	4	
		Diploneis oblongella		2
		Diploneis ovalis		2
		Encyonopsis microcephala	2	2
		Eolimna minima	8	6
		Epithemia sorex	3	3
		Fallacia cryptolyra		6
		Fallacia lenzii	1	
		Fallacia pygmaea	2	6
		Fallacia tenera	8	14
		Frustulia vulgaris	2	
		Gomphonema micropus		2
		Gomphonema parvulum		2
		Halamphora acutiuscula	2	
		Hippodonta hungarica	2	31
		Mayamaea atomus	5	7
		Navicula	2	3
		Navicula angusta	1	
		Navicula antonii	1	2
		Navicula caterva		5
		Navicula cryptotenella		6
		Navicula cryptotenelloides	11	4
		Navicula erifuga	2	
		Navicula goersii		5

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Sample Date (s): May 5 and 6, 2014
Delivered: August 13, 2014

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Diatom Abundance (continued)

Phylum	Class	Species	TC3200 Count	TC5000 Count
		Navicula gregaria	13	18
		Navicula phyllepta	4	
		Navicula tripunctata	5	13
		Navicula veneta	4	4
		Navicula viridulacalcis subsp viridulacalcis		3
		Nitzschia	9	5
		Nitzschia angustatula	2	
		Nitzschia archibaldii	6	2
		Nitzschia bryophila	2	2
		Nitzschia dissipata	15	4
		Nitzschia fonticola	2	2
		Nitzschia frustulum		4
		Nitzschia heufleriana	2	
		Nitzschia inconspicua	58	31
		Nitzschia liebethruthii	5	2
		Nitzschia linearis	2	
		Nitzschia microcephala	17	8
		Nitzschia nana	1	
		Nitzschia palea	2	2
		Nitzschia paleacea	2	1
		Nitzschia perminuta	4	4
		Nitzschia pura	4	
		Nitzschia recta	1	2
		Nitzschia sociabilis	1	
		Nitzschia valdestriata		3
		Placoneis placentula		1
		Planothidium delicatulum	10	6
		Planothidium frequentissimum	37	20
		Planothidium lanceolatum	6	
		Pseudostaurosira brevistriata	12	15
		Reimeria uniseriata		1
		Rhoicosphenia abbreviata	17	
		Rhopalodia brebissonii	1	2
		Rhopalodia constricta		2
		Rhopalodia gibba	6	5
		Rhopalodia operculata	2	

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Sample Date (s): May 5 and 6, 2014
Delivered: August 13, 2014

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Diatom Abundance (continued)

Phylum	Class	Species	TC3200 Count	TC5000 Count
		Simonsenia delognei	7	9
		Stauroneis smithii		1
		Tryblionella apiculata	7	
		Tryblionella gracilis		2
		Tryblionella hungarica	2	
	Coscinodiscophyceae	Cyclotella atomus		1
		Cyclotella meneghiniana	7	2
		Melosira varians	1	1
		Thalassiosira	1	
	Fragilariophyceae	Fragilaria		2
		Staurosira construens	2	2
		Staurosira construens var venter	103	164
		Tabularia fasciculata	1	2

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Sample Date (s): May 5 6, 2014
Delivered: August 13, 2014

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Soft Algae Abundance Abundance May 2014

Algae Type	Phylum	Class	Species	Unit	TC3200	TC5000
Epiphyte	None	None	None	None	ND	ND
Macroalgae	None	None	None	None	ND	ND
Microalgae	Heterokontophy	Xanthophyceae	Ophiocytium sp	um3/cm2		4829
	Chlorophyta		Chlorophyta 9	um3/cm2	6209	
			Chlorophyta 1	um3/cm2		18834
			Chlorophyta 5	um3/cm2		149385
			Chlorophyta 6	um3/cm2		18222
			Chlorophyta 7	um3/cm2		1509328
			Chlorophyta 8	um3/cm2		8159
		Chlorophyceae	Microspora sp	um3/cm2	17149	
			Scenedesmus sp	um3/cm2	76	
			Desmodesmus communis	um3/cm2		1047
			Oedogonium	um3/cm2		1215766
			Scenedesmus circumfusus	um3/cm2		155
			Scenedesmus sp 1	um3/cm2		80
			Stigeoclonium sp	um3/cm2		83450
		Ulvophyceae	Cladophora glomerata	um3/cm2		14231525
	Cyanobacteria	Cyanophyceae	Heteroleibleinia	um3/cm2	836	2778
			Leptolyngbya	um3/cm2	7	
			Nostocales 1	um3/cm2	1835	
			Oscillatoriales 6	um3/cm2	391	143
			Oscillatoriales 8	um3/cm2	12274	
			Calothrix sp 2	um3/cm2		28031
			Calothrix sp 3	um3/cm2		166509

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Sample Date (s): May 5 6, 2014
Delivered: August 13, 2014

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Soft Algae Abundance Abundance (continued)

Algae Type	Phylum	Class	Species	Unit	TC3200	TC5000
			Leibleinia sp	um3/cm2		499
			Leptolyngbya sp 1	um3/cm2		416
			Oscillatoriales 1	um3/cm2		38389
			Oscillatoriales 2	um3/cm2		10021
			Oscillatoriales 3	um3/cm2		67815
			Oscillatoriales 4	um3/cm2		13003
			Oscillatoriales 5	um3/cm2		1933
			Oscillatoriales 7	um3/cm2		1002
			Pseudanabaena sp	um3/cm2		115
	Streptophyta	Zygnematophyceae	Mougeotia	um3/cm2	85622	
			Spirogyra	um3/cm2	3396882	
			Mougeotia sp 1	um3/cm2		1079256
	Euglenozoa	Euglenophyceae	Phacus sp	um3/cm2	55057	
			Heteronema sp	um3/cm2		17521
	Rhodophyta	Florideophyceae	Chantransia sp	um3/cm2		18325
Qualitative	None	None	None	None	ND	ND

Client: RCD of the Santa Monica Mountains
Project: Topanga Canyon Creek
Analysis: Algae Taxonomy
Sample Date (s): May 5 and 6, 2014
Delivered: August 13, 2014

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Ash Free Dry Mass & Chlorophyll a Results May 2014

Metric	Method	Unit	TC3200	TC5000
Ash Free Dry Mass	SM 2540	mg/cm2	6.11	2.76
Chlorophyll a	SM 10200 H	ug/cm2	3.39	4.76