A BIOASSESSMENT SURVEY OF THE DIATOM FLORAS OF ONE SITE ON THE JORDAN RIVER AND ONE SITE ON BIG COTTONWOOD CREEK, SALT LAKE CITY, UTAH

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INTRODUCTION

Diatom species lists from Jordan River at 1700 South and Little Cottonwood Creek at Jordan River were obtained from Eric Duffin IN MID-December, 2006. A bioassessment survey of the diatom floras from these sites was performed.

NUMERICAL ANALYSIS

OMNIDIA

OMNIDIA software was developed by Catherine Lecointe to aid in taxonomic evaluation of diatom taxa, calculate water quality indices based upon diatom populations, and calculate selected ecological parameters as mirrored by diatom populations and assist in database management. Both diatom counts examined in this study were processed with OMNIDIA, results of which are included in the appendix.

Bioindices calculated by OMNIDIA are listed in the following table. A reference is provided for each index calculated.

CEE	Indice CEE (Descy et al. 1998)
DESCY	Descy (1979)
DI-CH	Hurlimann Suisse (2002)
EPI-D	Dell'Uomo A. (1996)
GENRE	Indice diatomique generique (Cemagref 1982 - 90)
IBD	Indice biologique diatomees (Lenoir & Coste 1995)
IDAP	Indice diatomique Artois Picardie (Prygiel et al. 1988)
IDP	Pampean diatom index (Gomez N. Licursi M. 2001)
IPS	Indice de pulluo-sensibilite (Cemagref 1982)
LMA	Leclercq et Maquet (1987)
LOBO	Lobo et al. Bresil (2003)
SHE	Steinberg et Schiefele (1988 - 91)
SID	Rott, E., G. Hofmann, K. Pall, P. Pfister & E Pipp Ind. saprobique (1997)
SLA	Sladecek (1986)
TDI	Trophic Diatom Index (Kelly & Whitton 1995)
TID	Rott, E., G. Hofmann, K. Pall, P. Pfister & E Pipp Ind. Trophique (1999)
WAT	Watanabe (1982 - 90)

Numeric values of the diatom bioindices are transformed in OMNIDIA from their original numeric index calculated values (which vary between 0-4 and 1-100) to an index range between 1 and 20 for ease of comparison. For the equation used to calculate the original index value, see the OMNIDIA references in the appendix and/or the above table. The table below summarizes the formulae used to transform the bioindices into the 1-20 scale in OMNIDIA.

Eutrophication/organic load or water quality estimates	Bioindex scale	OMNIDIA water quality Y/20 (V = initial index value)
CEE	0 (worst) to 10 (best)	Y = 1.9V+1
DESCY	1 (best) to 4 (worst)	Y = 4.75V-3.75
DI-CH	1 (best) to 8 (worst)	Y = 22.714 - 2.714V
EPI-D	0 (best) to 4 (worst)	Y = 20 - 4.75V
GENRE	1 (worst) to 5 (best)	Y = 4.75V - 3.75
IBD	1 (worst) to 7 (best)	Y = 4.75V - 8.5 (scale 2 - 6)
IDAP	1 (worst) to 5 (best)	Y = 4.75V - 3.75
IDP	1 (best) to 4 (worst)	Y = 20 - 4.75V
IPS	1 (worst) to 5 (best)	Y = 4.75V - 3.75
LMA	1 (worst) to 5 (best)	Y = 4.75V - 3.75
LOBO	1 (best) to 4 (worst)	Y = 6,33V - 5,333
SHE	1 (worst) to 7 (best)	Y = 3.167V - 2.167
SID	1 (best) to 3.8 (worst)	Y = 26,786 - 6,786V
SLA	0 (best) to 4 (worst)	Y = 20 - 4.75V
TDI	1 (clean) to 5 (most polluted)	Y = -4.75V + 24.75
TID	0.3 (best) to 3.9 (worst)	Y = 21,583 - 5,278V
WAT	0 (worst) to 100 (best)	Y = 0.190V +1

OMNIDIA also calculates select ecological values as indicated by diatom populations. These are summarized in the following table and a key to interpretation of these values is included in the following pages.

Ecolocigal values

Van Dam 1994	PH Salinity Nitrogen uptake Oxygen requirements Saprobity Trophic state Moisture
Lange-Bertalot 1979	Differential species
Hofmann 1994	Trophic state Saprobity
Håkansson 1993	pH classes
Index B and B' Renberg & Hellberg 1982	pH classes
Denys 1991	Habitat Current

Van Dam 1994

Classification of ecological indicator values
(Van Dam, Mertens & Sinkeldam 1994)

pH	Classes	pH range
1	acidobiontic	optimal occurrence at pH <5.5
2	acidophilous	mainly occurring at pH <7
3	circumneutral	mainly occurring at pH = aprox. 7
4	alkaliphilous	mainly occuring at pH > 7
5	alkalbiontic	exclusively ocurring at pH > 7
6	indefferent	no apparent optimum

Salinity		Cl- [mgl-1]	Salinity [%]
1	fresh	< 100	< 0.2
2	fresh brackish	< 500	< 0.9
3	brackish fresh	500 - 1000	0.9 - 1.8
4	brackish	1000 - 5000	1.9 - 9.0

Nitrogen Uptake Metabolism	
1	Nitrogen - autotrophic taxa, tolerating very small concentrations of organically bound nitrogen
2	Nitrogen - autotrophic taxa, tolerating elevated concentrations of organically bound nitrogen
3	Facultatievely nitrogern - heterotrophic taxa, needing periodicaaly elevated concentrations of organicaaly bound nitrogen
4	Obligately nitrogen - heterotrophic taxa, needing coninuously elevated concentrations of organiccaly bound nitrogen

Oxygen requirements	
1	continuously high [100% saturation]
2	fairly high [> 75 % concentration]
3	moderate [> 50 % saturation]
4	low [> 30 % saturation]
5	very low [10% saturation]

Saprobity		Oxygen sat.	BOD5 [mgl - 1]
1	oligosaprobous	> 85	< 2
2	mesosaprobous	70 - 85	2 -4
3	alpha-mesosaprobous	25 - 70	4 - 13
4	alpha - meso/polysaprobous	10 - 25	13 - 22
5	polysaprobous	< 10	> 22

Trophic State	
1	oligotraphentic
2	oligo-mesotraphentic
3	mesotraphentic
4	meso-eutraphentic
5	eutraphentic
6	hypereutraphentic
7	oligo to eutraphentic [hypereutraphentic]

Moisture	
1	never or very rarely occurrring outside water bodies
2	mainly occurring in water bodies, sometimes on wet places
3	mainly occurring in water bodies, also rather regularly on wet and moist places
4	mainly occurring on wet and moist or temporarily dry places
5	nearly exclusively occurring outside water bodies

Lange Bertalot 1979

Differntial Species

1	most pollution tolerant
2a	alpha-mesosaprobic a
2b	alpha-mesosaprobic b
2c	ecological questionable
3a	more sensitive (abundant)
3b	more sensitive (less frequent)

Hofmann 1994

Trophic conditions	
0	unknown
1	ot = Oligatrophic
2	ol-bmt = oligo - ß -mesotrophic
3	ol-amt = oligo - alpha -mesotropic
4	am-eut = alpha meso eutrophic
5	aeut = eutrophic
6	tol = tolerant
7	ind = indifferent
8	sap = saprotrophic

Saprobic conditions	
0	unknown
1	os = oligasoprob
2	os/bms = oligo - ß - mesosaprob
3	bms = ß - mesosaprob
4	bms/barns = ß - meso - ß - alpha mesosaprob
5	barns = ß - alpha mesosapron
6	barns/ams = ß - alpha - meso - alpha meso
7	ams = alpha mesosaprob
8	ams/ps = alpha - meso polysaprob
9	ps = polysaprob

Håkanson 1993

pH classes

Håkanson's 9 pH classes		
1	acidobiontic	(ACB)
2	acidobiontic to aciophilous	(ACP/ACB)
3	acidophilous	(ACP)
4	indifferent to acidophilous	(IND/ACP)
5	indifferent (nutral circumstance)	(IND)
6	alcaliphilous to indifferent	(AKP/IND)
7	alcaliphilous	(AKO)
8	alcaliphilous to alcalibiontic	(AKP/AKB)
9	alcalibiontic	(AKB)

Inferred pH (multiple regression Håkanson 1993):
pH=5.116+0.03121*AKB+0.03418*AKP*IND-0.0007765*ACP-0.05*ACB

Index B and Index B'

Renberg and Hellberg 1982

Ph = 9 Classes (Hakansson)

1	acidobiontic	(ACB)
2	acidobiontic to aciophilous	(ACP/ACB)
3	acidophilous	(ACP)
4	indifferent to acidophilous	(IND/ACP)
5	indifferent (nutral circumstance)	(IND)
6	alcaliphilous to indifferent	(AKP/IND)
7	alcaliphilous	(AKO)
8	alcaliphilous to alcalibiontic	(AKP/AKB)
9	alcalibiontic	(AKB)

Index B
Renberg and Hellberg 1982

$$\text{Index B} = \frac{\text{IND} + 5\text{ACP} + 40\ \text{ACB}}{\text{IND} + 3.5\ \text{AKP} + 108\ \text{AKB}}$$

$$\text{PH} = 6.40 - 0.85 \log \text{Index B}$$

Index B'

$$\text{Index B'} = \frac{\text{IND} + 5(\text{ACP} + \text{INAC}) + 10(\text{ACB} + \text{ACPB})}{\text{IND} + 3.5\ (\text{AKP} + \text{AKIN}) + 108\ (\text{AKB} + \text{AKPB})}$$

$$\text{PH'} = 6.40 - 0.85 \log \text{Index B'}$$

Denys 1991

Habitat - Lifeform	
0	unknown
2	euplanktonic
3	tychoplanktonic, epontic origin
4	tychoplanktonic, benthic origin
5	tychoplanktonic, both epontic and benthic origin
6	epontic
7	epontic and benthic
8	benthic

Current	
0	unknown
1	not relevant
2	rheobiontic
3	rheophilous
4	indifferent
5	liniophilous

RESULTS

Both the number of species and the diversity index in both samples were relatively high. Water quality is higher than expected, as indicated by the bioindices calculated by OMNIDIA. The flora is dominated by alcaliphilous taxa for both samples. The flora appears tolerant of somewhat elevated salinity. Most species demand high to moderate oxygen saturation. Most species in both samples are indicative of generally eutrophic conditions.

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APPENDIX

SLIDE N°	DATE	Site	JORDAN RIVER @ 1700 SOUTH
1	29/08/2000	Location	SALT LAKE CITY/UTAH

QUALITY NOTES / 20

IPS	SLA	DESCY	LMA	GENRE	CEE	SHE	WAT	IDAP	TDI	IBD	DI-CH	EPI-D
12.1	11.8	15.9	11.0	8.3	11.5	12.2	14.7	11.1	81.0	11.3	8.7	10.7

Number of species	65	Diversity	4.52
Population	708858	Evenness	0.75
Genera number	30	* : TAXON IBD	

IDP	LOBO	SID	TID
11.0	9.4	11.9	5.7

Number	%	Code	ou		Designation
1503	212.08	APED		*	Amphora pediculus (Kutzing) Grunow
1075	151.67	NINC		*	Nitzschia inconspicua Grunow
5102	71.98	RABB		*	Rhoicosphenia abbreviata (C.Agardh) Lange-Bertalot
4646	65.55	NFON		*	Nitzschia fonticola Grunow in Cleve et Möller
4373	61.70	AMIN	ADMI	*	Achnanthes minutissima Kutzing v.minutissima Kutzing (Achnanthidium)
2915	41.13	CPLI		*	Cocconeis placentula Ehrenberg var.lineata (Ehr.)Van Heurck
2004	28.28	NGRE		*	Navicula gregaria Donkin
2004	28.28	NAMP		*	Nitzschia amphibia Grunow f.amphibia
1822	25.71	NLAN		*	Navicula lanceolata (Agardh) Ehrenberg
1184	16.71	CMEN		*	Cyclotella meneghiniana Kutzing
1093	15.42	NCPR		*	Navicula capitatoradiata Germain
9111	12.85	GPAR		*	Gomphonema parvulum (Kützing) Kützing var. parvulum f. parvulum
9111	12.85	GOLI		*	Gomphonema olivaceum (Hornemann) Brébisson var. olivaceum
9111	12.85	NPAL		*	Nitzschia palea (Kutzing) W.Smith
9111	12.85	TWEI			Thalassiosira weissflogii (Grunow) Fryxell & Hasle
8200	11.57	NROS	NVRO	*	Navicula rostellata Kutzing
8200	11.57	NIAR		*	Nitzschia archibaldii Lange-Bertalot
7289	10.28	SSEM	NVDS	*	Sellaphora seminulum (Grunow) D.G. Mann
7289	10.28	NMIN	EOMI	*	Navicula minima Grunow
7289	10.28	FVAU	FCVA	*	Fragilaria vaucheriae (Kutzing) Petersen
7289	10.28	NSBM	ESBM	*	Navicula subminuscula Manguin
6378	9.00	TAPI		*	Tryblionella apiculata Gregory
5467	7.71	CPED		*	Cocconeis pediculus Ehrenberg
5467	7.71	NCIN		*	Navicula cincta (Ehr.) Ralfs in Pritchard
5467	7.71	NERI			Navicula erifuga Lange-Bertalot
5467	7.71	CBRD			Caloneis branderii(Hustedt) Krammer
4556	6.43	DVUL		*	Diatoma vulgaris Bory 1824
3645	5.14	NCRY		*	Navicula cryptocephala Kutzing
3645	5.14	HCAP		*	Hippodonta capitata (Ehr.)Lange-Bert.Metzeltin & Witkowski
3645	5.14	PLFR		*	Planothidium frequentissimum(Lange-Bertalot)Lange-Bertalot
3645	5.14	RPUS			Rossithidium pusillum (Grun.) Round & Bukhtiyarova
3645	5.14	GANG		*	Gomphonema angustatum (Kutzing) Rabenhorst
3645	5.14	SLEP	SSLE	*	Staurosirella leptostauron (Ehr.) Williams & Round
3645	5.14	NLIN		*	Nitzschia linearis(Agardh) W.M.Smith var.linearis
3645	5.14	NRCS		*	Navicula recens (Lange-Bertalot) Lange-Bertalot
3645	5.14	NPUS	COPU		Navicula pusilla W.Smith
3645	5.14	NTPT		*	Navicula tripunctata (O.F.Müller) Bory

SLIDE N°	DATE	Site	JORDAN RIVER @ 1700 SOUTH
1	29/08/2000	Location	SALT LAKE CITY/UTAH

2733	3.86	MVAR		*	Melosira varians Agardh
2733	3.86	NIPE			Nitzschia pellucida Grunow
1822	2.57	SUMI		*	Surirella minuta Brebisson
1822	2.57	SPUP		*	Sellaphora pupula (Kutzing) Mereschkowksy
1822	2.57	NRCH		*	Navicula reichardtiana Lange-Bertalot var. reichardtiana
1822	2.57	NCPL		*	Nitzschia capitellata Hustedt in A.Schmidt & al.
1822	2.57	PRAD		*	Puncticulata radiosa (Lemmermann) Håkansson
1822	2.57	FBIN	PBIF		Fragilaria brevistriata Grunow var.inflata (Pantocsek) Hustedt
1822	2.57	ENMI		*	Encyonema minutum (Hilse in Rabh.) D.G. Mann
1822	2.57	PTLA		*	Planothidium lanceolatum(Brebisson ex Kützing) Lange-Bertalot
1822	2.57	GNOD		*	Gyrosigma nodiferum (Grunow) Reimer
1822	2.57	NDIS		*	Nitzschia dissipata(Kutzing)Grunow var.dissipata
1822	2.57	NACI		*	Nitzschia acicularis(Kutzing) W.M.Smith
1822	2.57	ACOP		*	Amphora copulata (Kutz) Schoeman & Archibald
1822	2.57	APYR	ADPY	*	Achnanthes pyrenaica Hustedt
1822	2.57	EAUE			Encyonema auerswaldii Rabenhorst
1822	2.57	LMUT		*	Luticola mutica (Kützing) D.G. Mann
1822	2.57	DMON			Diatoma moniliformis Kutzing
1822	2.57	RSIN		*	Reimeria sinuata (Gregory) Kociolek & Stoermer
1822	2.57	MATO			Martyana atomus (Hustedt) Snoeijs
1822	2.57	NANT		*	Navicula antonii Lange-Bertalot
1822	2.57	CNDI			Cocconeis neodiminuta Krammer
1822	2.57	NVIR		*	Navicula viridula (Kutzing) Ehrenberg
911	1.29	DMES		*	Diatoma mesodon (Ehrenberg) Kutzing
911	1.29	SULN	UULN	*	Synedra ulna (Nitzsch.)Ehr.
911	1.29	AMON	PMTN		Achnanthes montana Krasske var. montana Krasske
911	1.29	BPAR	BPAX	*	Bacillaria paradoxa Gmelin
911	1.29	COCE		*	Cyclotella ocellata Pantocsek

Diatom Analysis - Ecological Factors
Jordan River at 1700 South
29/08/2000
Rushforth Phycology
Slide No 1

PREP. N°	1
Van Dam 1994	
PH	
1 acidobiontic	0
2 acidophilous	0
3 neutrophilous	138
4 alcaliphilous	815
5 alcalibiontic	22
6 indifferent	0
SALINITY	
1 fresh	4
2 fresh brackish	693
3 brackish fresh	263
4 brackish	17
N-Heterotrophie	
1 autotrophic sensibles	27
2 autotrophic tolerants	644
3 heterotrophic facultatifvely	247
4 heterotrophic obligately	26
Oxygen	
1 Continuously high100%sat)	89
2 fairly high (75% sat.)	420
3 O2 moderate (>50%)	330
4 O2 low (>30% sat.)	87
5 O2 very low(10% sat)	17
Saprobity	
1 oligosaprobous	17
2 ßmesosaprobous	523
3 alphamesosaprobous	326
4 alphameso ->polysabrobous	69
5 polysaprobous	13
Trophic state	
1 oligotraphentic	6
2 oligo mesotraphentic	0
3 mésotraphentic	6
4 meso-eutraphentic	94
5 eutraphentic	753
6 hypereutraphentic	28
7 oligo to eutraphentic	76
Moisture	
1 aquatic strict	132
2 aerophilous occas.	180
3 aquatic to subaerien	608
4 aerophilous strict	19
5 terrestre	0

PREP. N°	1
HOFMANN 1994	
TROPHIC CONDITIONS	
0 unknown	136
1 ot = Oligotraphent	0
2 ol-bmt = oligo-ß-mesotraphen	4
3 ol-amt = oligo alpha mesotra	0
4 am-eut = alpha meso-eutraphe	18
5 eut = eutraphent	481
6 tol = tolerant	323
7 ind = indifferent	3
8 sap = saprotroph	36
SAPROBIC CONDITIONS	
0 unknown	148
1 oligosaprob	0
2 ß-mesosaprob	6
3 ß-meso -ß-alpha meso.	3
4 ß-meso -ß-alpha meso.	73
5 ß-alpha mesosaprobt	577
6 ß-alpha-meso - alpha meso	3
7 alpha mesosaprob	130
8 alpha-meso polysaprob	12
9 polysaprob	49
LANGE-BERTALOT 1979	
1 most pollution tolerant	60
2a alpha-mesosaprobic a	102
2b alpha-mesosaprobic b	42
2c Ecological questionable	0
3a More sensible (abundant)	490
3b More sensible (less frequent)	15
Håkansson 1993 PH	
1 ACB => acidobiontic	0
2 ACPB => acidophilous to acidobiontic	0
3 ACP => acidophilous	0
4 INAC => indiff. to acidophilous	10
5 IND => indifferent	44
6 AKIN => alcaliphilous to indiff	71
7 AKP => alcaliphilous	573
8 AKPB=>alcaliphil. to alcalibion.	24
9 AKB => alcalibiontic	0
WATANABE 1990	
0 Indifferent	424
1 saprophile species	66
2 saproxene species	510

PREP. N°	1
Denys 1991	
LIFEFORM	
0 unknown	203
2 euplanktonic	39
3 tychoplanktonic epontic origin	602
4 tychoplanktonic, benthic origin	85
5 tychoplanktonic origine mixte	72
6 epontic	0
7 epontic and benthic	0
8 benthic	0
CURRENT	
0 unknown	225
1 irrelevant	0
2 rheobiontic	0
3 rheophilous	84
4 indifferent	692
5 limnophilous	0
Steinberg Schiefele 1988	
Trophication sensitivity	
1 most tolerant	28
2 st => highly tolerant	37
3 tt => tolerant	53
4 ws => less sensitive	175
5 eu => eutrophic	477
6 ss => sensitive	103
7 ol => oligosaprobic	3
o => unknown	125
ROTELISTE	
Lange-Bertalot & al. 1996	
0 disparu	0
1 menacé de disparition	0
2 fortement menacé	0
3 en danger	1
G risque existant	0
R très rare	3
V en régression	0
* risque non estimé	90
? non menacé	878
D données insuffisantes	13
• répandu	8

SLIDE N°	DATE	Site	LITTLE COTTONWOOD CREEK
2	28/08/2000	Location	SALT LAKE CITY/UTAH

QUALITY NOTES / 20

IPS	SLA	DESCY	LMA	GENRE	CEE	SHE	WAT	IDAP	TDI	IBD	DI-CH	EPI-D
11.9	11.9	14.1	10.5	10.1	10.7	12.3	14.1	11.6	65.6	11.3	9.3	11.4

Number of species	54	Diversity	4.68
Population	871574	Evenness	0.81
Genera number	31		

IDP	LOBO	SID	TID
11.4	10.2	12.1	6.3

* : TAXON IBD

Number	‰	Code			Designation
1523	174.79	NINC		*	Nitzschia inconspicua Grunow
1113	127.79	AMIN	ADMI	*	Achnanthes minutissima Kutzing v.minutissima Kutzing (Achnanthidium)
5859	67.23	ENMI		*	Encyonema minutum (Hilse in Rabh.) D.G. Mann
5712	65.55	NCPR		*	Navicula capitatoradiata Germain
4687	53.78	NPAL		*	Nitzschia palea (Kutzing) W.Smith
4687	53.78	NFON		*	Nitzschia fonticola Grunow in Cleve et Möller
4248	48.74	RABB		*	Rhoicosphenia abbreviata (C.Agardh) Lange-Bertalot
2050	23.53	FVAU	FCVA	*	Fragilaria vaucheriae (Kutzing) Petersen
1904	21.85	NDIS		*	Nitzschia dissipata(Kutzing)Grunow var.dissipata
1757	20.17	GPAR		*	Gomphonema parvulum (Kützing) Kützing var. parvulum f. parvulum
1611	18.49	CMEN		*	Cyclotella meneghiniana Kutzing
1611	18.49	NAMP		*	Nitzschia amphibia Grunow f.amphibia
1611	18.49	MVAR		*	Melosira varians Agard
1464	16.81	NLAN		*	Navicula lanceolata (Agardh) Ehrenberg
1464	16.81	AMON	PMTN		Achnanthes montana Krasske var. montana Krasske
1171	13.45	EAUE			Encyonema auerswaldii Rabenhorst
1171	13.45	APED		*	Amphora pediculus (Kutzing) Grunow
1171	13.45	NCTV			Navicula caterva Hohn & Hellerman
1025	11.76	BPAR	BPAX	*	Bacillaria paradoxa Gmelin
8789	10.08	GOLI		*	Gomphonema olivaceum (Hornemann) Brébisson var. olivaceum
8789	10.08	NCRY		*	Navicula cryptocephala Kutzing
8789	10.08	NERI			Navicula erifuga Lange-Bertalot
8789	10.08	NGRE		*	Navicula gregaria Donkin
8789	10.08	CBRD			Caloneis branderii(Hustedt) Krammer
8789	10.08	RPUS			Rossithidium pusillum (Grun.) Round & Bukhtiyarova
8789	10.08	AVEN		*	Amphora veneta Kutzing
5859	6.72	NROS	NVRO	*	Navicula rostellata Kutzing
5859	6.72	NTPT		*	Navicula tripunctata (O.F.Müller) Bory
5859	6.72	NCTY			Navicula cryptotenella - type in Kelly
5859	6.72	NBCO			Navicula biconica Patrick
5859	6.72	SUMI		*	Surirella minuta Brebisson
5859	6.72	TAPI		*	Tryblionella apiculata Gregory
5859	6.72	CPLI		*	Cocconeis placentula Ehrenberg var.lineata (Ehr.)Van Heurck
5859	6.72	CNDI			Cocconeis neodiminuta Krammer
5859	6.72	DMON			Diatoma moniliformis Kutzing

SLIDE N°	DATE	Site	LITTLE COTTONWOOD CREEK
2	28/08/2000	Location	SALT LAKE CITY/UTAH

5859	6.72	FVUL		*	Frustulia vulgaris (Thwaites) De Toni
5859	6.72	SULN	UULN	*	Synedra ulna (Nitzsch.)Ehr.
4394	5.04	TWEI			Thalassiosira weissflogii (Grunow) Fryxell & Hasle
4394	5.04	PRAD		*	Puncticulata radiosa (Lemmermann) Håkansson
4394	5.04	RSIN		*	Reimeria sinuata (Gregory) Kociolek & Stoermer
2930	3.36	APYR	ADPY	*	Achnanthes pyrenaica Hustedt
2930	3.36	PTLA		*	Planothidium lanceolatum(Brebisson ex Kützing) Lange-Bertalot
2930	3.36	PLEV			Pleurosira laevis (Ehrenberg) Compere f.laevis Ehrenberg
2930	3.36	SPUP		*	Sellaphora pupula (Kutzing) Mereschkowksy
2930	3.36	NSLQ	NZCV		Nitzschia siliqua Archibald
2930	3.36	CSOL		*	Cymatopleura solea (Brebisson) W.Smith var.solea
2930	3.36	CRAC		*	Craticula accomoda (Hustedt) Mann
2930	3.36	NLEN	FLEN	*	Navicula lenzii Hustedt
2930	3.36	FNAN			Fragilaria nanana Lange-Bertalot
2930	3.36	HARC	FARC	*	Hannaea arcus (Ehr.)Patrick
2930	3.36	HCAP		*	Hippodonta capitata (Ehr.)Lange-Bert.Metzeltin & Witkowski
1465	1.68	SBRE		*	Surirella brebissonii Krammer & Lange-Bertalot var.brebissonii
1465	1.68	NACI		*	Nitzschia acicularis(Kutzing) W.M.Smith
1465	1.68	PTDE		*	Planothidium delicatulum(Kutz.) Round & Bukhtiyarova

Diatom Analysis - Ecological Factors
Little Cottonwood Creek
28/08/2000
Rushforth Phycology
Slide No 2

PREP. N°	2
Van Dam 1994	
PH	
1 acidobiontic	0
2 acidophilous	0
3 neutrophilous	318
4 alcaliphilous	592
5 alcalibiontic	29
6 indifferent	0
SALINITY	
1 fresh	20
2 fresh brackish	662
3 brackish fresh	247
4 brackish	15
N-Heterotrophie	
1 autotrophic sensibles	40
2 autotrophic tolerants	471
3 heterotrophic facultatifvely	255
4 heterotrophic obligately	59
Oxygen	
1 Continuously high100%sat)	173
2 fairly high (75% sat.)	166
3 O2 moderate (>50%)	383
4 O2 low (>30% sat.)	86
5 O2 very low(10% sat)	22
Saprobity	
1 oligosaprobous	34
2 ßmesosaprobous	333
3 alphamesosaprobous	368
4 alphameso ->polysabrobous	55
5 polysaprobous	59
Trophic state	
1 oligotraphentic	27
2 oligo mesotraphentic	7
3 mésotraphentic	10
4 meso-eutraphentic	89
5 eutraphentic	513
6 hypereutraphentic	62
7 oligo to eutraphentic	158
Moisture	
1 aquatic strict	145
2 aerophilous occas.	156
3 aquatic to subaerien	528
4 aerophilous strict	17
5 terrestre	0

PREP. N°	2
HOFMANN 1994	
TROPHIC CONDITIONS	
0 unknown	156
1 ot = Oligotraphent	0
2 ol-bmt = oligo-ß-mesotraphen	67
3 ol-amt = oligo alpha mesotra	7
4 am-eut = alpha meso-eutraphe	10
5 eut = eutraphent	506
6 tol = tolerant	187
7 ind = indifferent	0
8 sap = saprotroph	67
SAPROBIC CONDITIONS	
0 unknown	156
1 oligosaprob	0
2 ß-mesosaprob	77
3 ß-meso -ß-alpha meso.	25
4 ß-meso -ß-alpha meso.	61
5 ß-alpha mesosaprobt	476
6 ß-alpha-meso - alpha meso	0
7 alpha mesosaprob	111
8 alpha-meso polysaprob	7
9 polysaprob	87
LANGE-BERTALOT 1979	
1 most pollution tolerant	94
2a alpha-mesosaprobic a	158
2b alpha-mesosaprobic b	84
2c Ecological questionable	7
3a More sensible (abundant)	289
3b More sensible (less frequent)	5
Håkansson 1993 PH	
1 ACB => acidobiontic	0
2 ACPB => acidophilous to acidobiontic	0
3 ACP => acidophilous	3
4 INAC => indiff. to acidophilous	0
5 IND => indifferent	166
6 AKIN => alcaliphilous to indiff	133
7 AKP => alcaliphilous	319
8 AKPB=>alcaliphil. to alcalibion.	13
9 AKB => alcalibiontic	0
WATANABE 1990	
0 Indifferent	462
1 saprophile species	79
2 saproxene species	459

PREP. N°	2
Denys 1991	
LIFEFORM	
0 unknown	261
2 euplanktonic	30
3 tychoplanktonic epontic origin	471
4 tychoplanktonic, benthic origin	111
5 tychoplanktonic origine mixte	128
6 epontic	0
7 epontic and benthic	0
8 benthic	0
CURRENT	
0 unknown	274
1 irrelevant	0
2 rheobiontic	0
3 rheophilous	52
4 indifferent	674
5 limnophilous	0
Steinberg Schiefele 1988	
Trophication sensitivity	
1 most tolerant	77
2 st => highly tolerant	24
3 tt => tolerant	27
4 ws => less sensitive	244
5 eu => eutrophic	281
6 ss => sensitive	156
7 ol => oligosaprobic	67
o => unknown	124
ROTELISTE	
Lange-Bertalot & al. 1996	
0 disparu	0
1 menacé de disparition	0
2 fortement menacé	0
3 en danger	20
G risque existant	0
R très rare	10
V en régression	3
* risque non estimé	109
? non menacé	797
D données insuffisantes	0
• répandu	24