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Willits Highway 101 Bypass Project: Multi-year Aquatic Bioassessment of ht Non-Perennial North Coast Strea Challenges and Opportunities

California Aquatic Bioassessment Workgroup
19th Annual Meeting

November 8, 2012

oduction / Outline

ckground/Objectives

atershed Characteristics

thods

Challenges and Opportunities

sults/Discussion

mmary

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ect Background

nstruction of Willits Bypass project, a new s
U.S. Highway 101 to improve traffic circulation

merous mitigation components (onsite vs offs

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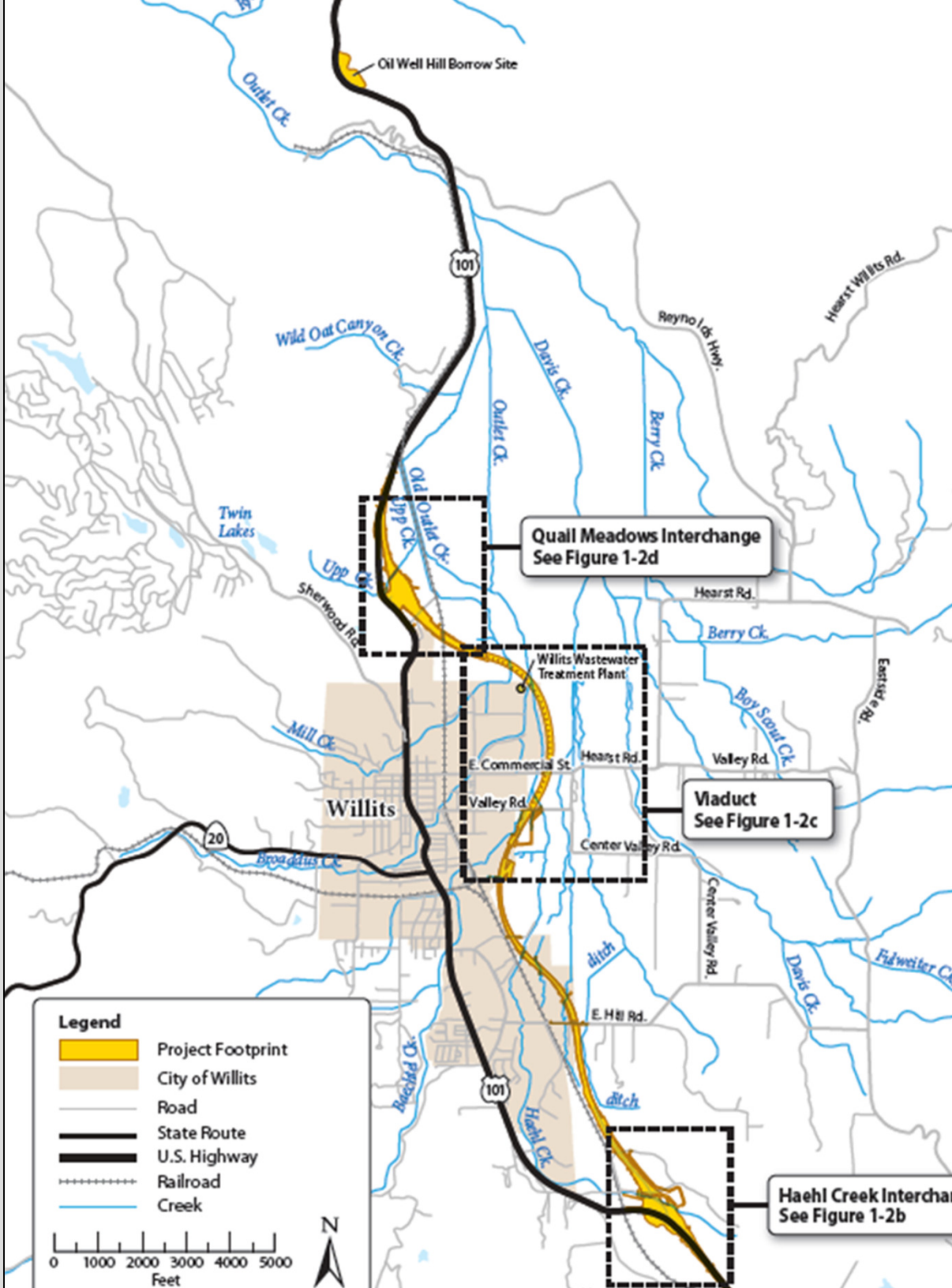
Relocation



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ect Objectives

vide RWQCB with baseline conditions

ess changes in stream ecosystems as result of p
struction and mitigation activities

ess changes to biological integrity of streams unc
ect's mitigation and monitoring program

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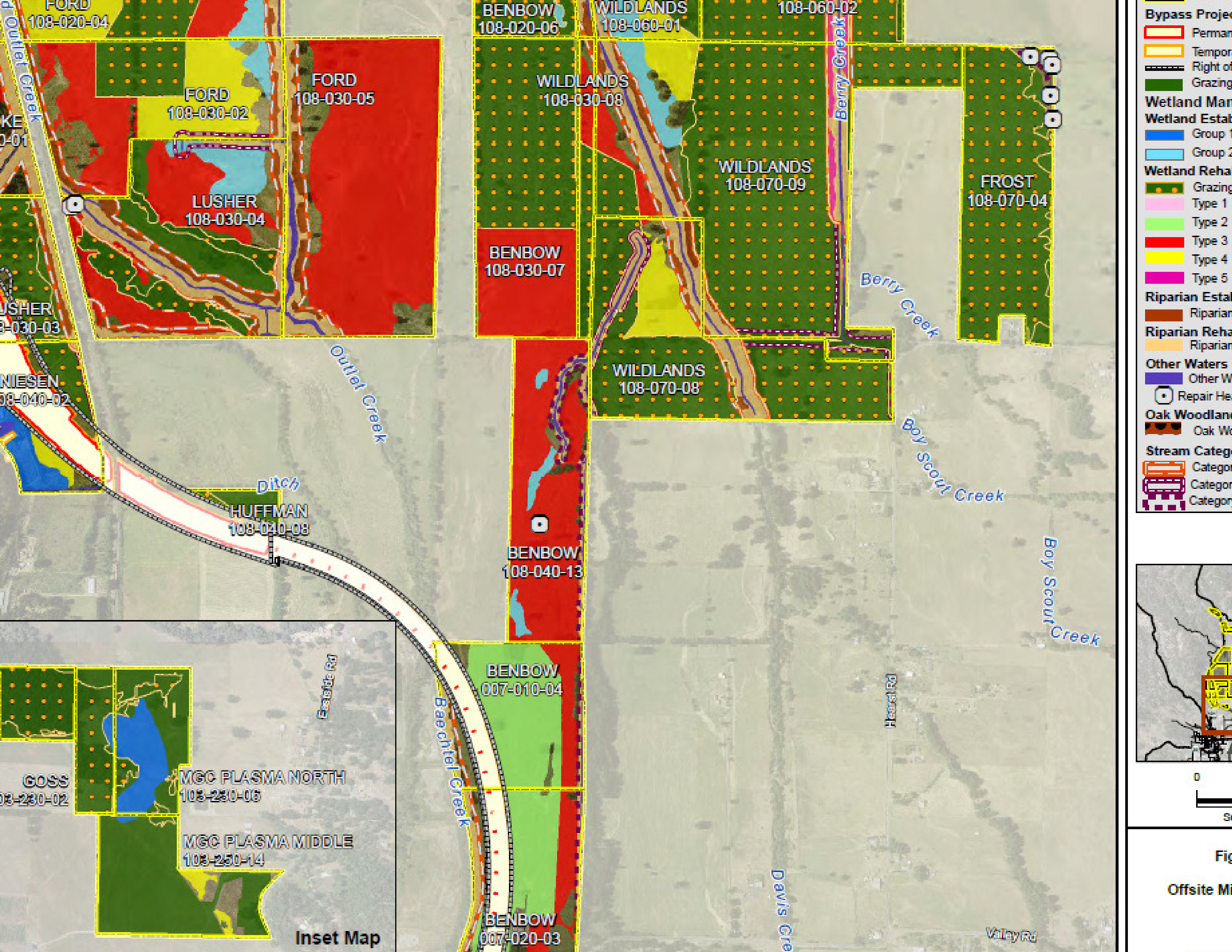
FORD
108-020-04
Outlet Creek
FORD
108-030-02
FORD
108-030-05
LUSHER
108-030-04
USHER
8-030-03
NIESEN
08-040-02
Ditch
HUFFMAN
108-040-08
Outlet Creek
BENBOW
108-020-06
WILDLANDS
108-060-01
108-060-02
WILDLANDS
108-030-08
BENBOW
108-030-07
WILDLANDS
108-070-09
Berry Creek
FROST
108-070-04
Berry Creek
WILDLANDS
108-070-08
Boy Scout Creek
BENBOW
108-040-13
Boy Scout Creek
BENBOW
007-010-04
Baechtel Creek
BENBOW
007-020-03
Davis Cre
Hearst Rd
Valley Rd
GOSS
03-230-02
MGC PLASMA NORTH
103-230-06
MGC PLASMA MIDDLE
103-250-14
Inset Map
Bypass Projec
Perman
Tempor
Right of
Grazing
Wetland Man
Wetland Estab
Group 1
Group 2
Wetland Reha
Grazing
Type 1
Type 2
Type 3
Type 4
Type 5
Riparian Estal
Riparian
Riparian Reha
Riparian
Other Waters
Other W
Repair He
Oak Woodlan
Oak Wo
Stream Categ
Categor
Categor
Categor
0
Fig
Offsite Mi

ershed Characteristics

ainage basin 67 sq miles (43,063 acres)

named streams in project area!

rmer lacustrine setting

ermittent/ephemeral

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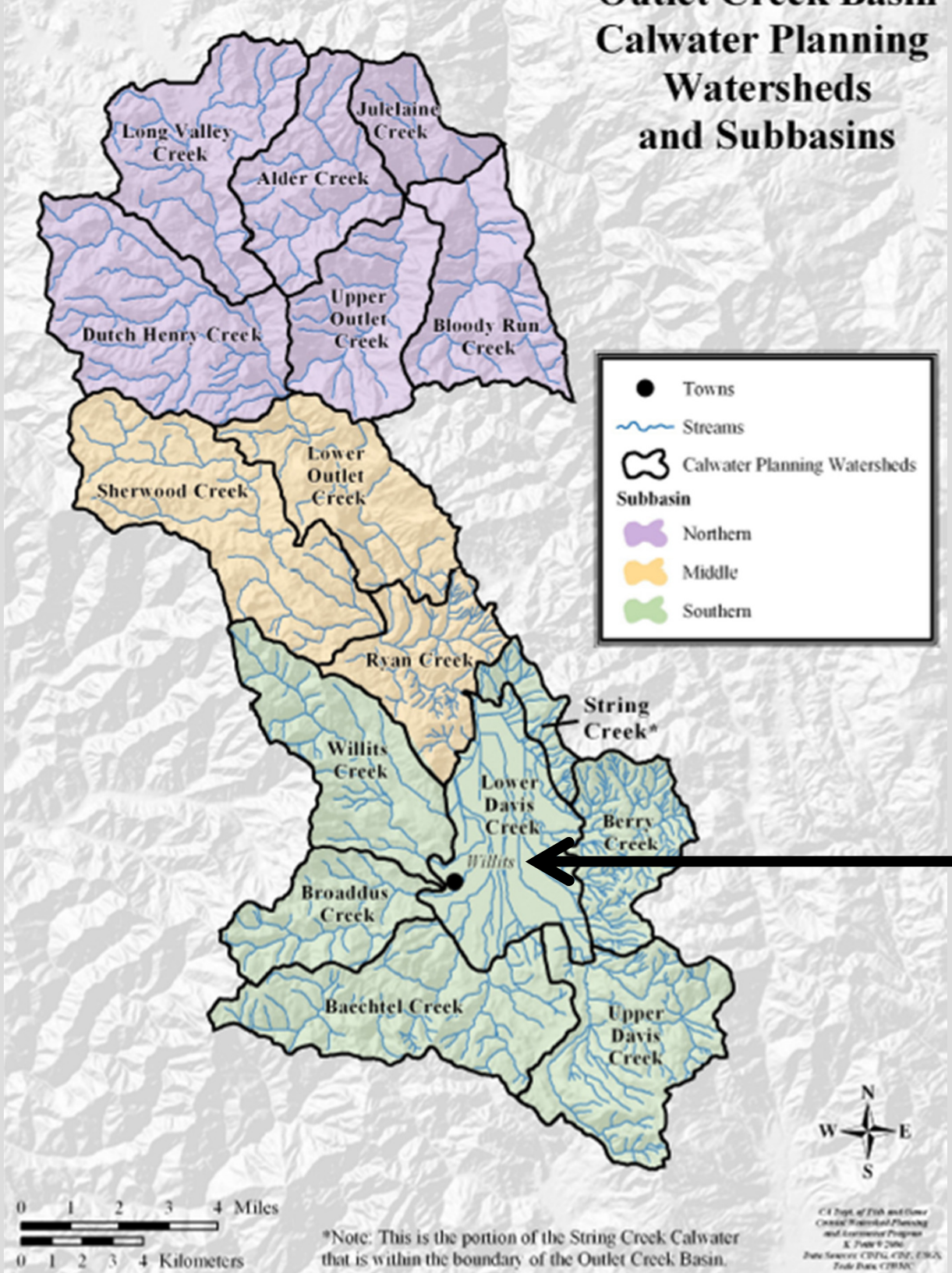

Outlet Creek b
w/in Little Lak

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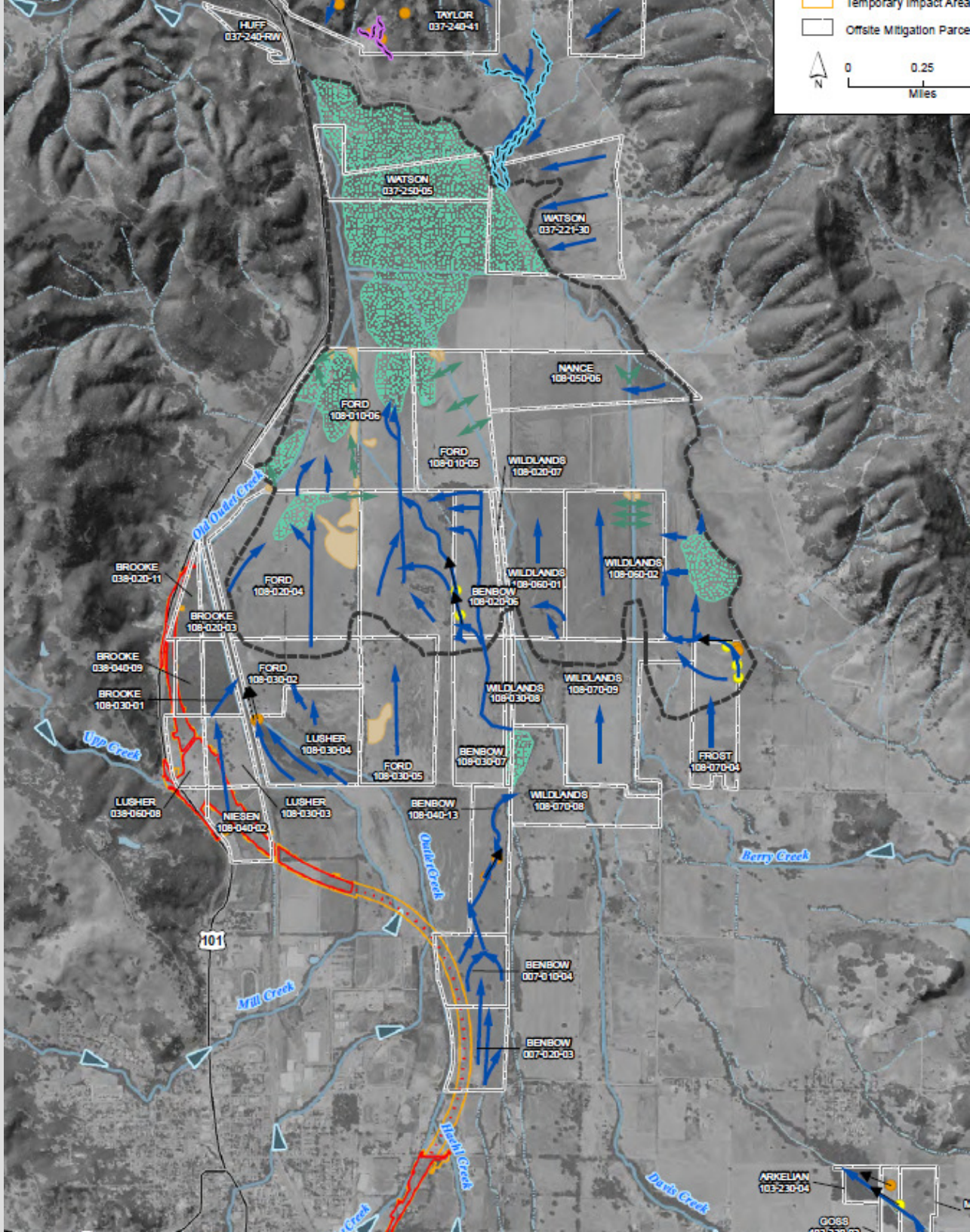
w patterns

annels

ake



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March 26, 2011

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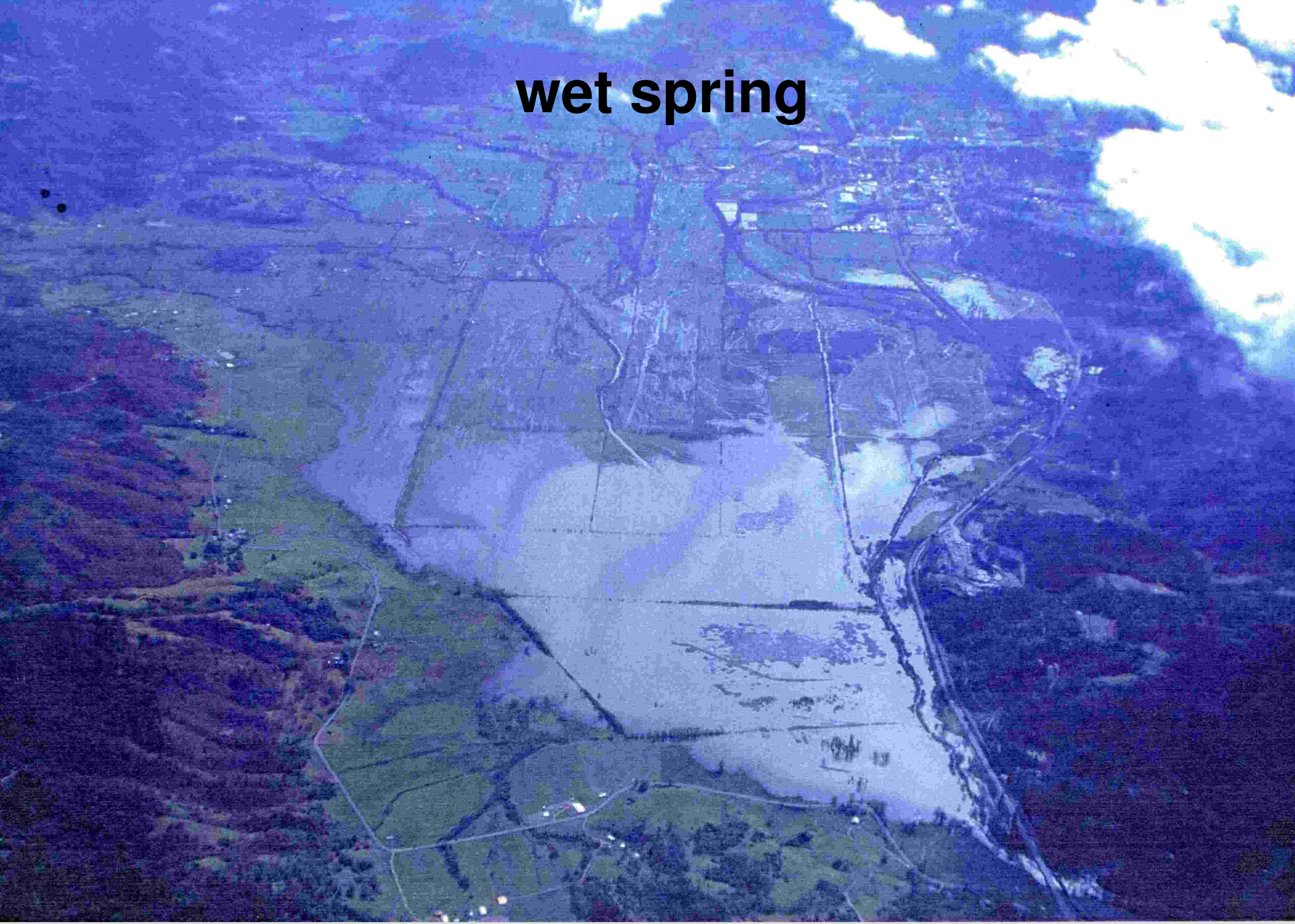
wet spring



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wet spring

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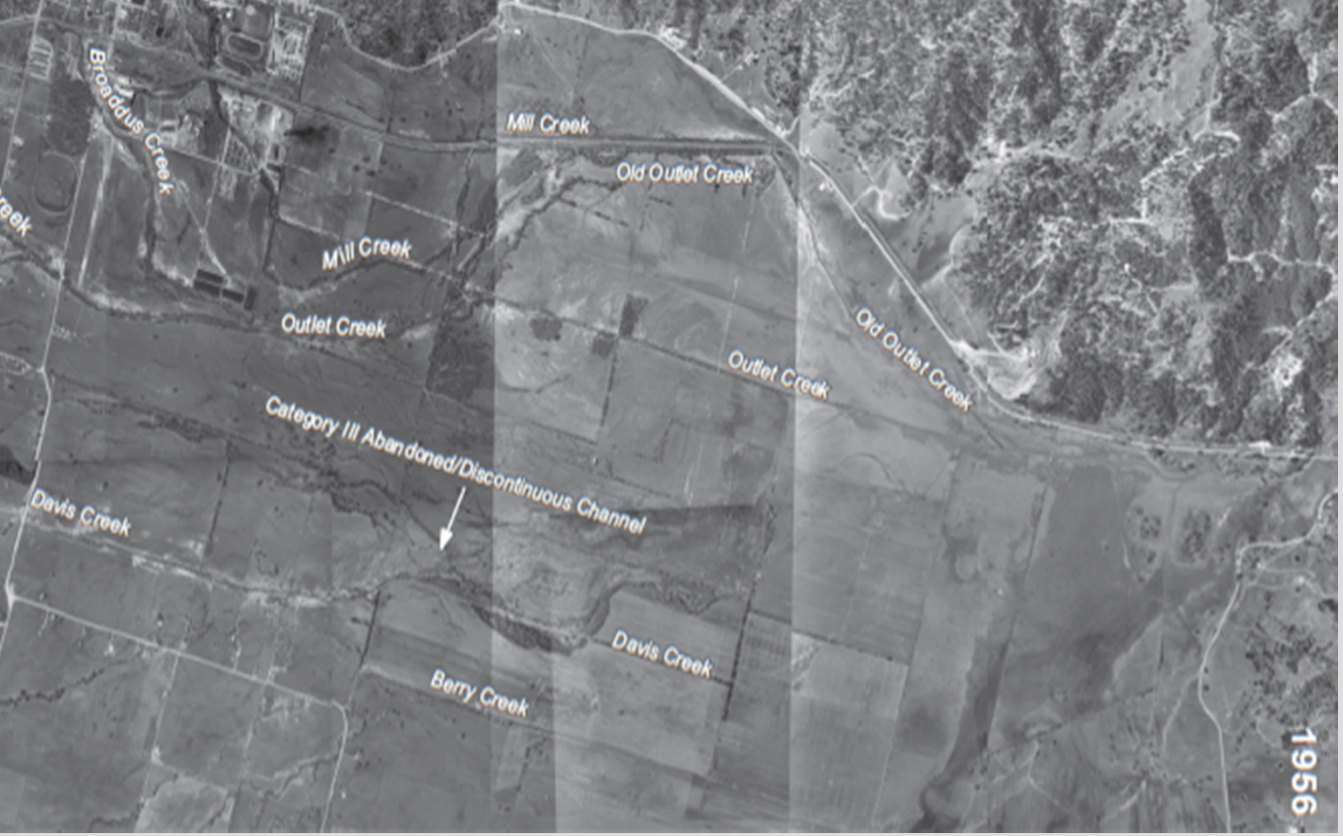

1956

2005

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Haeh
Baechtel Creek

Creek

Consulting, Inc.
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B Data

ndard methods

Q

ach conditions

pe

P habitat parameters

in/inner transects

REACH DOCUMENTATION — Standard Reach Length (wetted width ≤ 10 … Alternate Reach Length (wetted width …

Project Name: Willits Bypass Bioassessment — Date: 07/ 2…

Stream Name: Baechtel Creek — Site Name/ Descript… below conflue…

Site Code: BA-4 — Crew Members: A Hamp…

Latitude (actual – decimal degrees): °N 39.412408036 — datum: NAD83 — GPS Dev…

Longitude (actual – decimal degrees): °W -123.340185102 — other: WGS 84

AMBIENT WATER QUALITY MEASUREMENTS — turbidity and silica are optional; calibration date required

Temp (Deg C)	18.2	pH	7.5	Alkalinity (mg/L)	68	Turbidity (ntu)	0.4…
12:58		cal date	7/12/11			cal date	7/12/1…
Dissolved O² (mg/L)	8.46	Specific Conduct (uS/cm)	187.5	Salinity (ppt)	0.1	Silica (mg/L)	/
cal date	7/12/11	cal date	7/12/11	cal date	7/12/11	cal date	/

DISCHARGE MEASUREMENTS — check if disc… (e…

1st measurement = left bank (looking downstream)

VELOCITY AREA METHOD (preferred) — cal. date 7/21/11 — Transect Width (m): 2.1

	Distance from Left Bank (cm)	Depth (cm)	Velocity (ft/sec)		Distance from Left Bank (cm)	Depth (cm)	Velocit… (ft/sec)
1	11	3	0.02	11	121	6	0.58
2	22	5	0.05	12	132	8	0.45
3	33	6	0.09	13	143	6	0.35
4	44	6	0.20	14	154	6	0.27
5	55	6	0.24	15	165	7	0.31
6	66	6	0.34	16	176	8	0.43
7	77	6	0.25	17	187	8	0.35
8	88	6	0.38	18	198	7	0.10
9	99	8	0.33	19	209	4	0.01
10	110	8	0.66	20			

NOTABLE FIELD CONDITIONS (check one box…

Evidence of recent rainfall (enough to increase surface runoff)	NO
Evidence of fires in reach or immediately upstream (<500 m)	NO
Dominant landuse/ landcover in area surrounding reach	Agricultu… / Urban/ Industria…

ADDITIONAL COBBLE EMBEDDEDNESS MEASURES (carry over from transect forms if needed to attain target count of 25; measure in %)

1	2	3	4	5	6	7	
75	40	55	35	0	5	40	4…
14	15	16	17	18	19	20	
90	0	30	5	0	25	0	4…

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ssment Site
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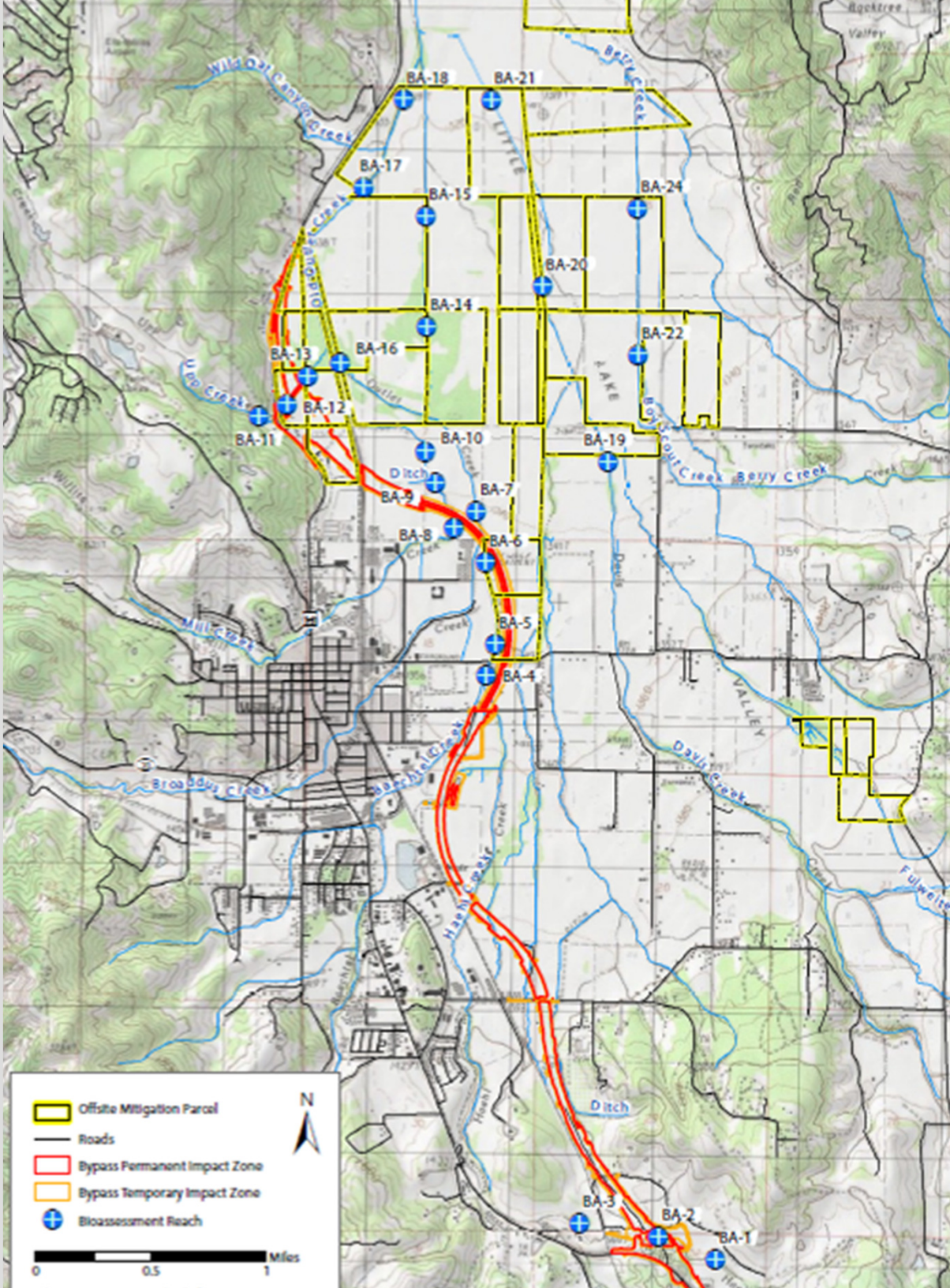

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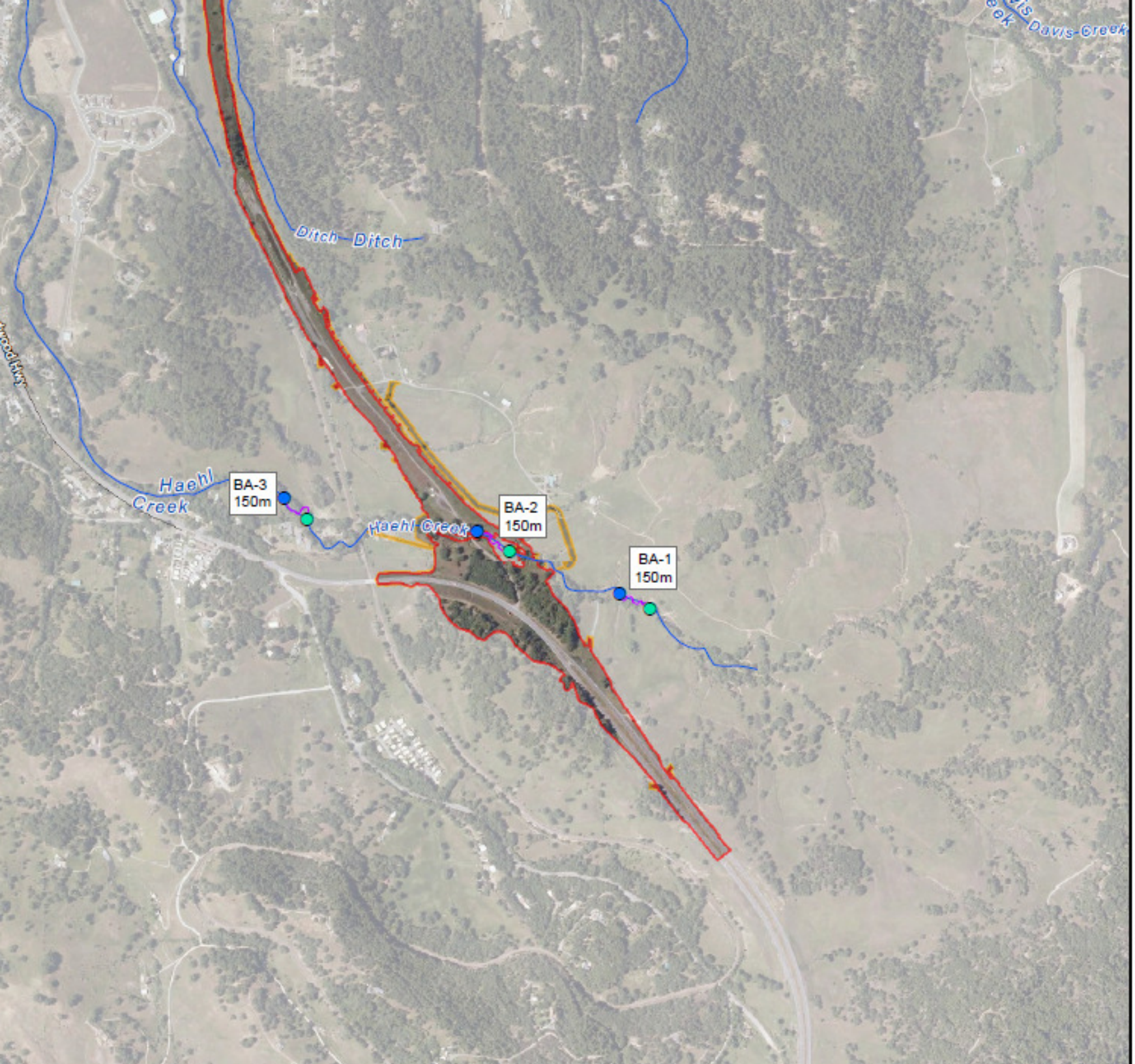
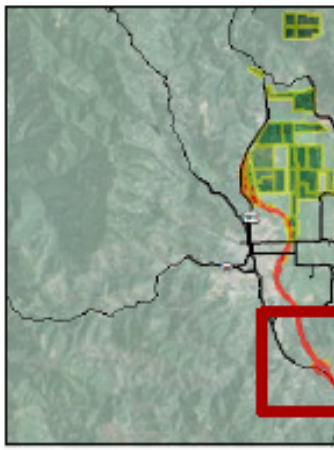


Offsite Mitig
Permanent
Temporary
Streams
Bioassessment Site
Bioassessm
Downstream
Upstream P
BA-1
150m
Bioassessm
and Length



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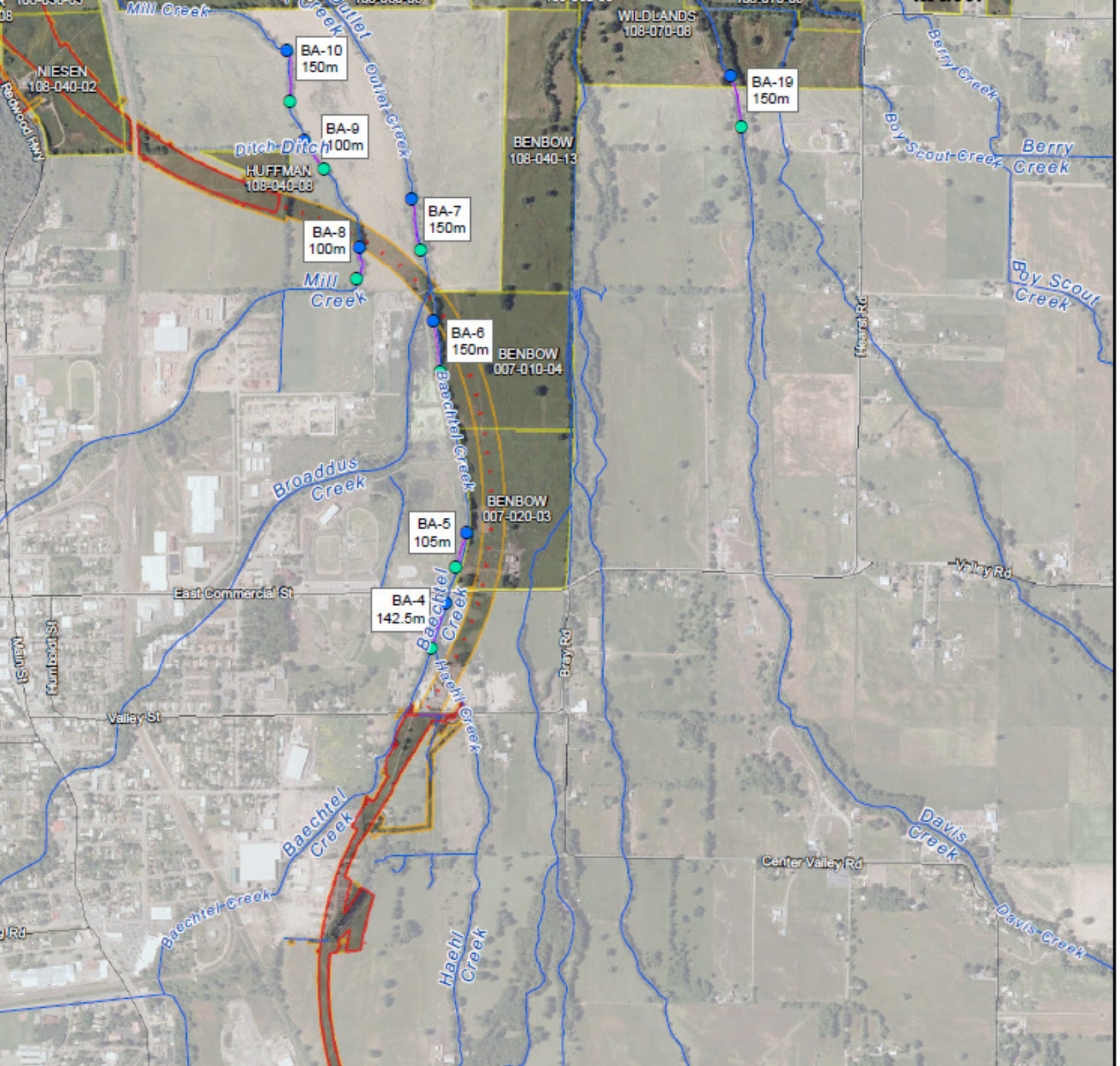
0

Scale In Fe

Figure
Bioassessme
Willits Bypass

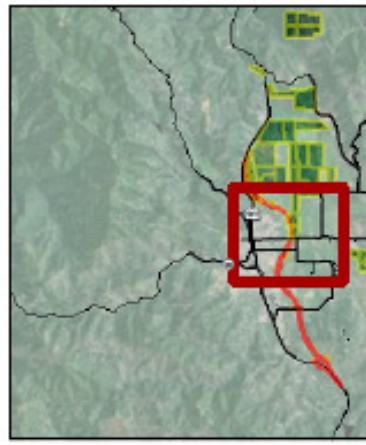


Offsite Mitigatio
Permanent Imp
Temporary Impa
Streams

Bioassessment Site

Bioassessment
Downstream Po
Upstream Point

BA-1
150m
Bioassessment
and Length (Me



N

0

Scale In Feet

Figure 2b

Bioassessment
Willits Bypass P

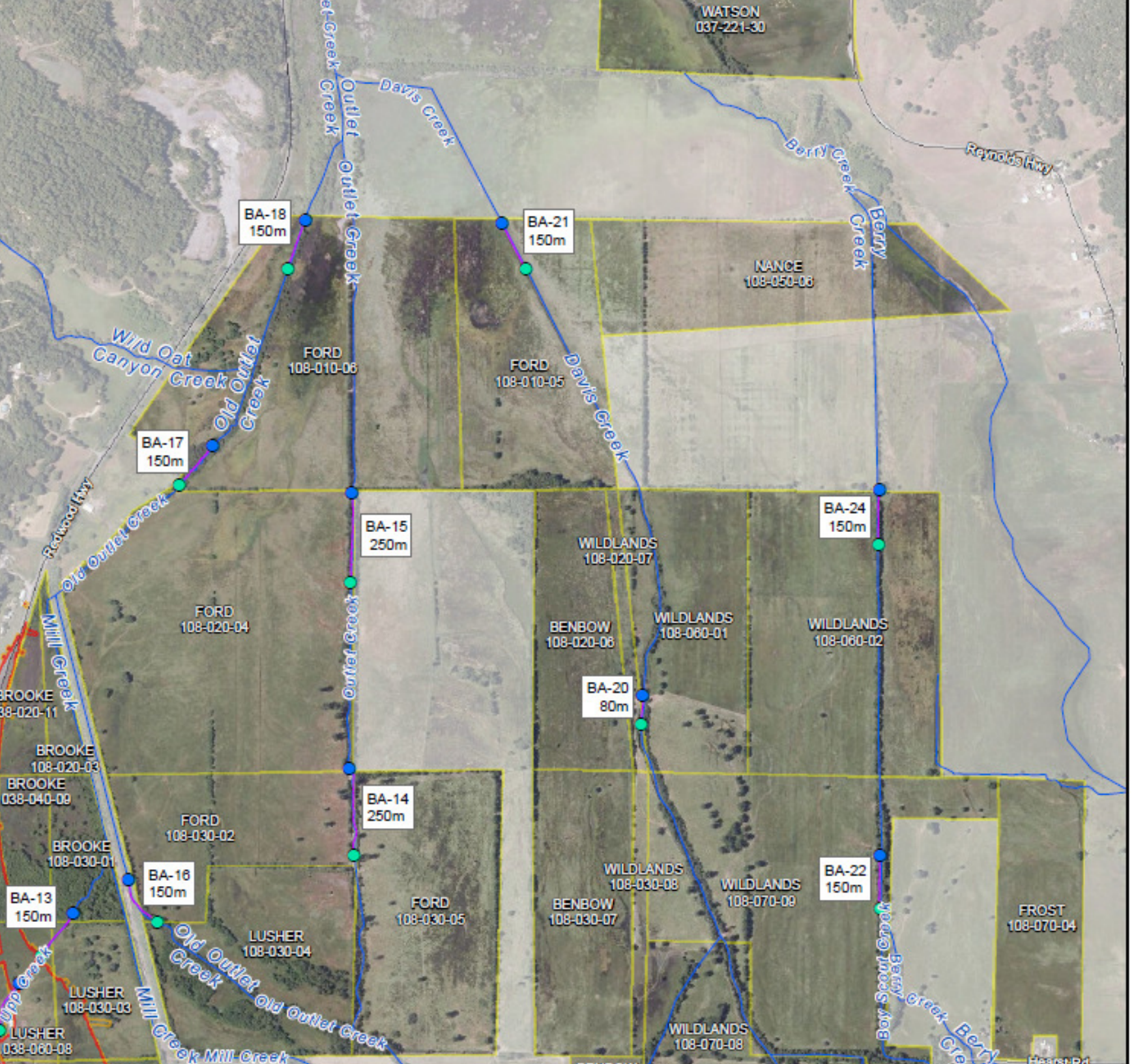


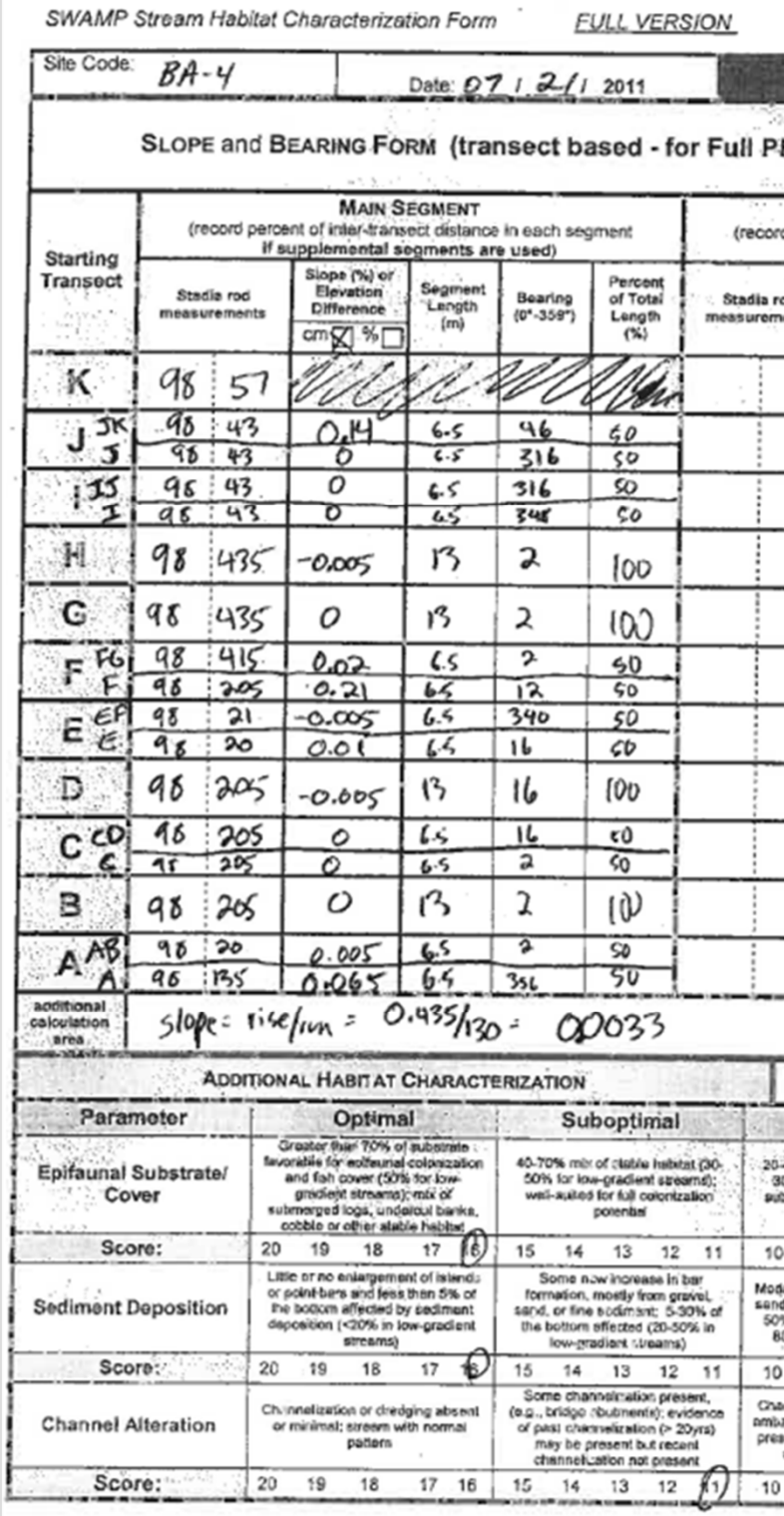
Figure 2
Bioassessme
Willits Bypass

3 Results

cal low-gradient (< 1%) valley
streams that flow through
sitional substrates

y channelized/incised

substrates and homogenous
ats (plane-bed)



SWAMP Stream Habitat Characterization Form — FULL VERSION

Site Code: BA-4 Date: 07/21/2011

SLOPE and BEARING FORM (transect based - for Full P

Starting Transect	MAIN SEGMENT (record percent of inter-transect distance in each segment if supplemental segments are used)						(recor
	Stadia rod measurements		Slope (%) or Elevation Difference cm ☒ % ☐	Segment Length (m)	Bearing (0°-359°)	Percent of Total Length (%)	Stadia measurem
K	98	57					
JK	98	43	0.14	6.5	96	50	
J	98	43	0	6.5	316	50	
IJ	98	43	0	6.5	316	50	
I	98	43	0	6.5	348	50	
H	98	435	-0.005	13	2	100	
G	98	435	0	13	2	100	
FG	98	415	0.02	6.5	2	50	
F	98	205	0.21	6.5	12	50	
EF	98	21	-0.005	6.5	340	50	
E	98	20	0.01	6.5	16	50	
D	98	205	-0.005	13	16	100	
CD	98	205	0	6.5	16	50	
C	98	205	0	6.5	2	50	
B	98	205	0	13	2	100	
AB	98	20	0.005	6.5	2	50	
A	98	135	0.265	6.5	336	50	
additional calculation area	slope = rise/run = 0.435/130 = .0033						

ADDITIONAL HABITAT CHARACTERIZATION

Parameter	Optimal					Suboptimal					
Epifaunal Substrate/ Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover (50% for low-gradient streams); mix of submerged logs, undercut banks, cobble or other stable habitat					40-70% mix of stable habitat (30-50% for low-gradient streams); well-suited for full colonization potential					
Score:	20	19	18	17	16	15	14	13	12	11	10
Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition (<20% in low-gradient streams)					Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected (20-50% in low-gradient streams)					
Score:	20	19	18	17	16	15	14	13	12	11	10
Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern					Some channelization present, (e.g., bridge abutments); evidence of past channelization (> 20yrs) may be present but recent channelization not present					
Score:	20	19	18	17	16	15	14	13	12	11	10

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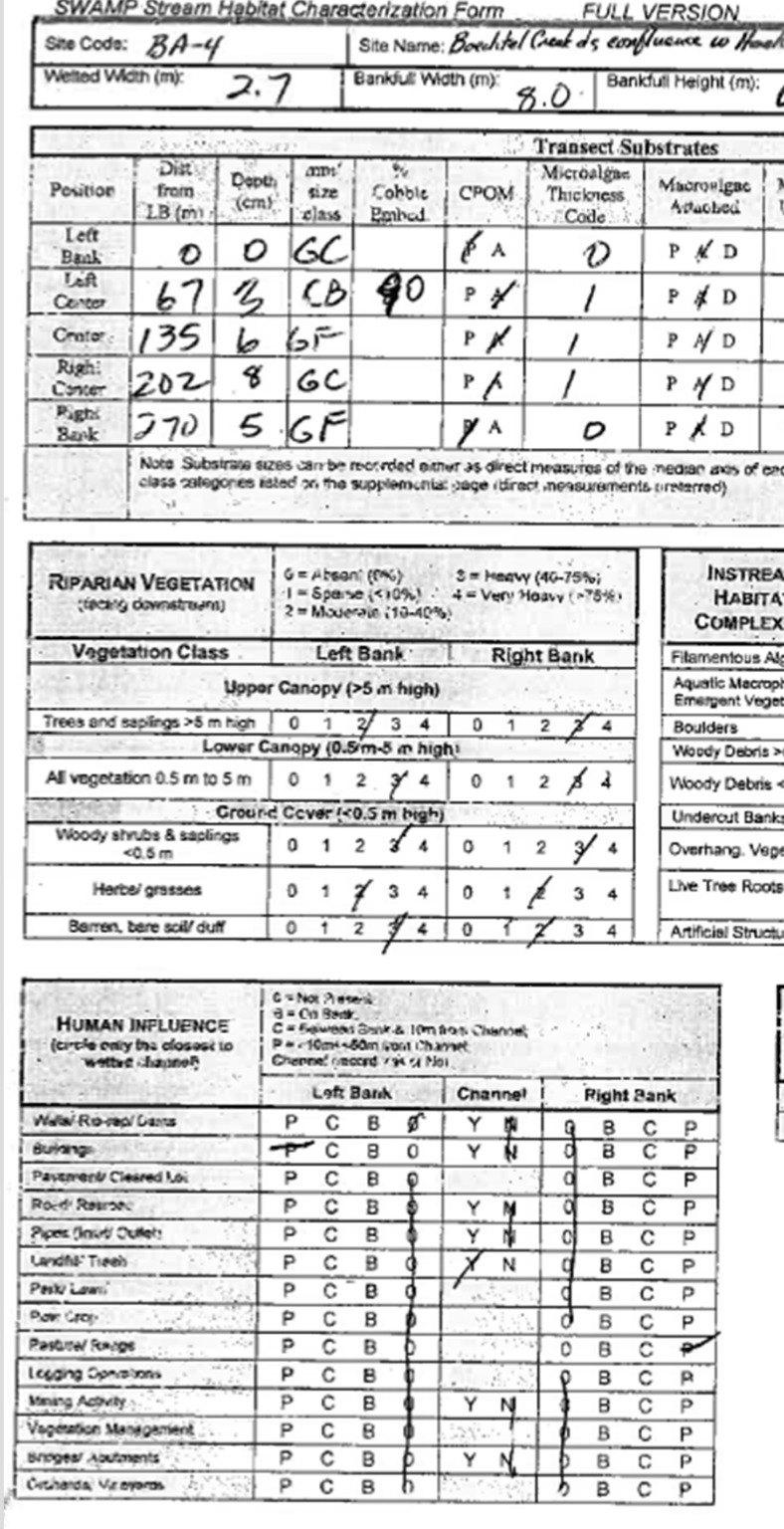
B Results

ing…sediment easily
lized

rian veg cover varies but
rally high

habitat parameter scores
rally low

hy" regime



SWAMP Stream Habitat Characterization Form — FULL VERSION

Site Code: BA-4	Site Name: Bouldtel Creek d/s confluence w Hewl
Wetted Width (m): 2.7	Bankfull Width (m): 8.0

Transect Substrates

Position	Dist from LB (m)	Depth (cm)	mm size class	% Cobble Embed	CPOM	Microalgae Thickness Code	Macroalgae Attached
Left Bank	0	0	GC		P A	0	P A D
Left Center	67	3	CB	90	P A	1	P A D
Center	135	6	GF		P A	1	P A D
Right Center	202	8	GC		P A	1	P A D
Right Bank	270	5	GF		P A	0	P A D

Note: Substrate sizes can be recorded either as direct measures of the median axis of eac class categories listed on the supplemental page (direct measurements preferred)

RIPARIAN VEGETATION (facing downstream)

0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)

Vegetation Class	Left Bank	Right Bank
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs & saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

INSTREAM HABITAT COMPLEXITY

Filamentous Alg
Aquatic Macrop
Emergent Veget
Boulders
Woody Debris >
Woody Debris <
Undercut Banks
Overhang. Vege
Live Tree Roots
Artificial Structu

HUMAN INFLUENCE (circle only the closest to wetted channel)

P = >10m<50m from Channel; Channel (record yes or No)

	Left Bank	Channel	Right Bank
Walls/ Rip-rap/ Dams	P C B 0	Y N	0 B C P
Buildings	P C B 0	Y N	0 B C P
Pavement/ Cleared Lot	P C B 0		0 B C P
Roads/ Railroads	P C B 0	Y N	0 B C P
Pipes (Inlet/ Outlet)	P C B 0	Y N	0 B C P
Landfill/ Trash	P C B 0	Y N	0 B C P
Parks/ Lawns	P C B 0		0 B C P
Row Crop	P C B 0		0 B C P
Pasture/ Range	P C B 0		0 B C P
Logging Operations	P C B 0		0 B C P
Mining Activity	P C B 0	Y N	0 B C P
Vegetation Management	P C B 0		0 B C P
Bridges/ Abutments	P C B 0	Y N	0 B C P
Orchards, Vineyards	P C B 0		0 B C P

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et Creek

2010 ↑
2012 →

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3 Results and Canopy Cover Task

6. Comparison of Canopy Cover Solar Pathfinder Results to
ioassessment Sampling Reach Densiometer Results.

ssment g Reach	Reach-Wide (Average) Densiometer Reading (%)	Effective Shade (%)	
		July	August
	82.1	86.79	87.98
y applicable bioassessment sampling reach for comparison)			
	87.9	81.99	84.81
	66.0	91.22	90.03
	82.5	82.3	94.1
y applicable bioassessment sampling reach for comparison)			
-13[b]	27.4/32.3	7.83	8.48
y applicable bioassessment sampling reach for comparison)			
y applicable bioassessment sampling reach for comparison)			
	89.8	98.74	98.19
	64.2	63.25	60.04
	84.5	86.03	87.06
y applicable bioassessment sampling reach for comparison)			
y applicable bioassessment sampling reach for comparison)			
	48.6	72.86	74.44
	50.3	67.55	66.09
y applicable bioassessment sampling reach for comparison)			
y applicable bioassessment sampling reach for comparison)			
y applicable bioassessment sampling reach for comparison)			
y applicable bioassessment sampling reach for comparison)			
	29.5	41.88	46.17
y applicable bioassessment sampling reach for comparison)			
	29.3	60.21	58.79
	0	0	0
	0	0	0.05
	0	0	0
	0	0	0
	68.9	86.72	82.62
y applicable bioassessment sampling reach for comparison)			
	96.5	89.6	88.33
y applicable bioassessment sampling reach for comparison)			

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3 Results and Canopy Cover Task

rian veg cover varies but
rally high (densiometer)

rian veg cover varies but
rally high (solar pathfinder)

MP WORKS

Lower

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B Results and Geomorphology Task

trate composition and eddedness

full width and depth

e

osity

MP WORKS

Wild Oat Ca

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Creek

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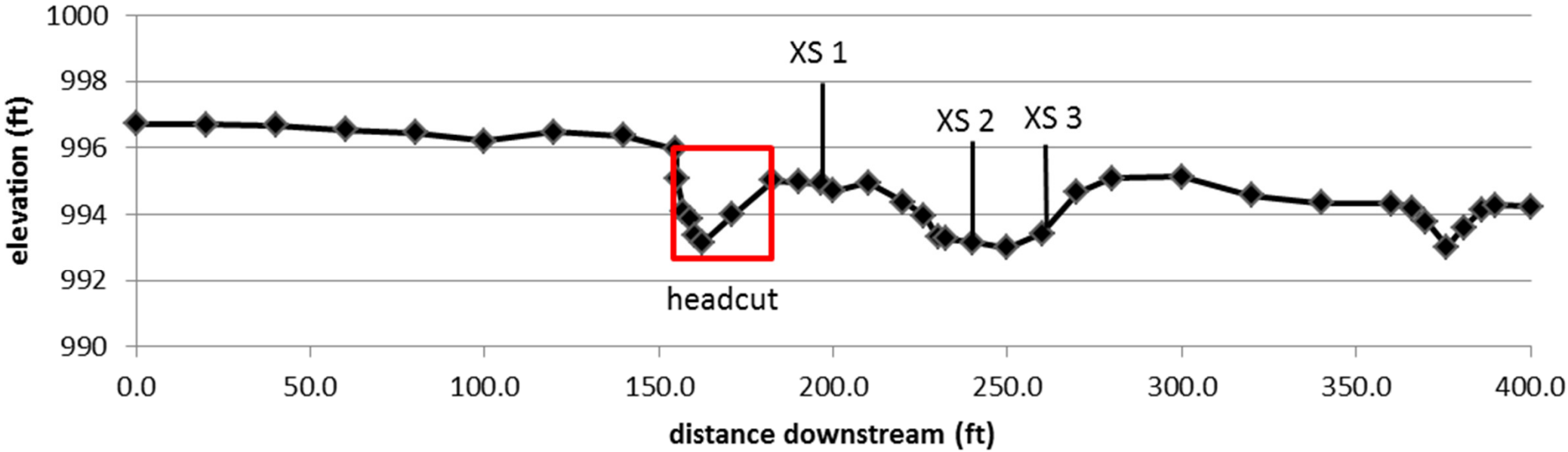
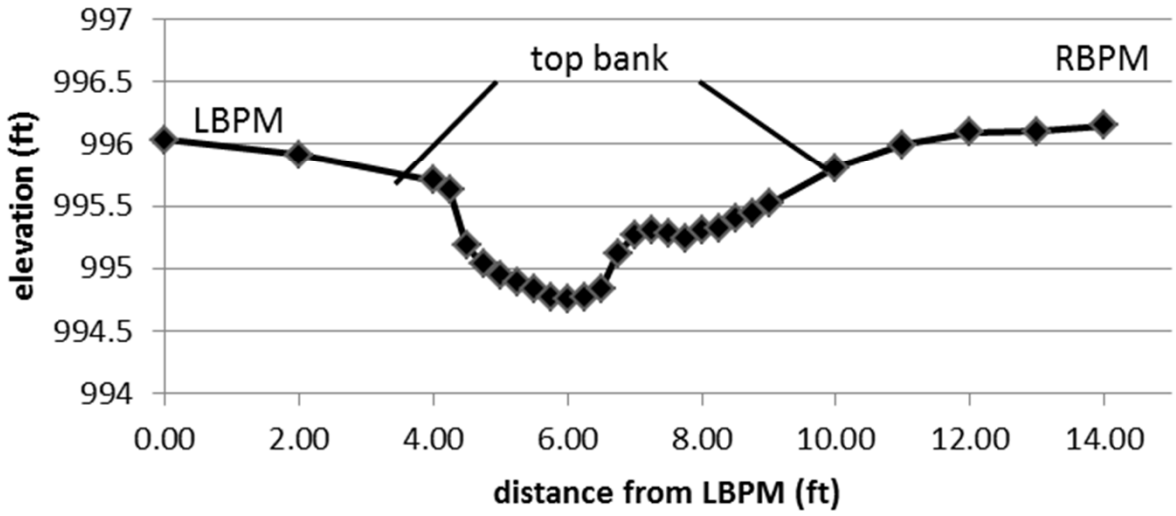
Benbow 108-040-13_3
slope = 0.0062, 40x VE



Benbow 108-040-13_3
XS 1, 5x VE



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ods

d Collections

23 Reaches on Eight Non-Perennial Streams Surveyed in 20

- Spring and Summer Survey Periods

SWAMP Protocols – BMI (Ode 2007)

- Reach Adjustments/Non-Wadeable Habitats
- PHAB

SWAMP Protocols – Algae (Fetscher, *et al* 2010)

oratory Processing

ECORP Laboratory/EcoAnalysts

QC

CDFG – Chico Laboratory

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hods

AMP Database Input

a Analyses

BMI

- **Selection of Appropriate B-IBI(s) – Nor-Cal? / So-Cal?**
- **Use of Selected Un-Modified Community Metrics**
  (Based on initial summer results)
  - SDI, Simpson Index
  - % Diptera
  - % Oligochaetes
  - Tolerance Indices
  - % Dominant Taxa
  - % Chironomidae
  - Tolerance Value
  - Functional Feeding Groups

ods

lgae

- **Selection of Analysis Tools**
- **Use of Selected Metrics** (Based on Initial Summer Data Results)
  - Community Composition : Soft Bodied Algae vs. Diatoms
  - Quantitative Diatom Metrics
    - SDI
    - % Dominant Taxa
    - % Pollution Tolerant (Based on Pollution Class)
    - % Motile (Siltation Index)
    - Eutraphentic Species (Based on Trophic Class)
  - Chlorophyll a and AFDM
  - Quantitative Soft-Bodied Algal Collections
  - Qualitative Collections

lts/Discussion

AB - BMI - Algae

ches and Seasons Surveyed and Evaluated

- 3 Reaches in Spring (wet)
- 6 Reaches in Both Summers (wet)
  - PHAB Data Only Collected at Dry Sites

ected Results for 6 Reaches on 5 Non-Perennial Streams

el Creek / Outlet Creek, Old Outlet Creek, Davis Creek, Upp Cre

Representative of Range of:

- Stream Habitats
- Channel Characteristics / PHAB
- Potential Sources of Effects on Habitat and Biota
- Utilization by Anadromous Salmonids

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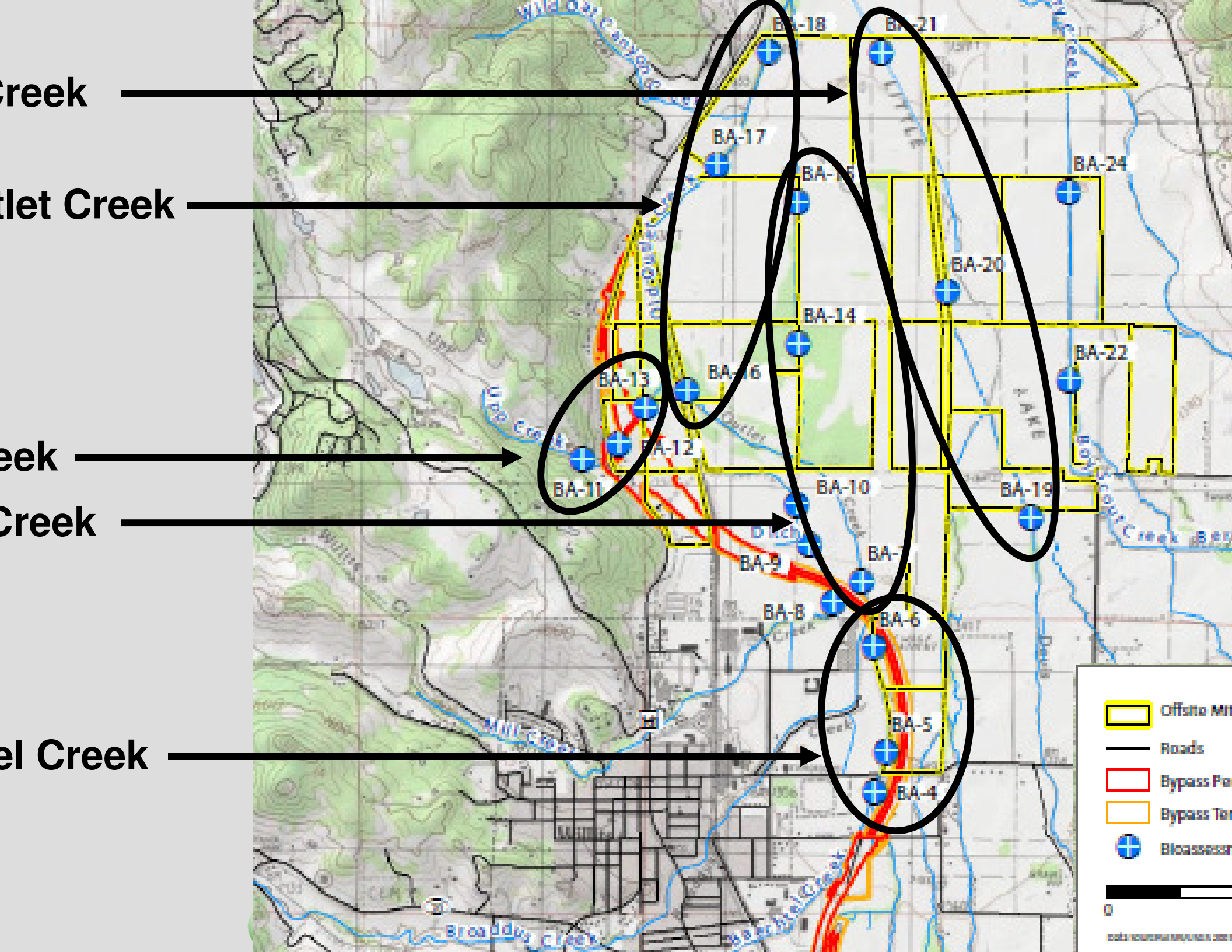
Creek
tlet Creek
eek
Creek
el Creek
BA-18
BA-21
BA-17
BA-15
BA-24
BA-20
BA-14
BA-22
BA-13
BA-16
BA-12
BA-11
BA-10
BA-19
BA-9
BA-8
BA-6
BA-5
BA-4
Offsite Mit
Roads
Bypass Pe
Bypass Ter
Bioassessr
0

lts/Discussion

sults Presented by Reach

Comparison of PHAB, BMI, and Algae

BMI Data Provided for:

- B-IBIs
  - Nor-Cal
  - So-Cal
- Selected Un-Modified Metrics:
  - SDI
  - % Dominant Taxa / % Chironomidae / % Oligochaeta
  - Tolerance Value
  - Tolerance Indices

lts/Discussion

Data Provided for:

Quantitative Diatoms (metrics based on initial summer sampling r

- SDI
- % Dominant Taxa
- % Motile / % Eutraphentic
- % Pollution Tolerant

Quantitative Soft-Bodied Algae

- % of community

Chlorophyll a

lts/Discussion

Diatoms

- Valuable indicators of stream ecosystem conditions
- Respond quickly and predictably to changes in stream chemistry habitat quality
- Species' sensitivities and tolerances to environmental conditions consistently and reliably related to gradients of human disturbanc
- Taxonomically diverse and geographically ubiquitous
- Sensitive to substratum conditions and pollutants
- Excellent indicators of water quality conditions, sensitive to:
  - Nutrient and organic enrichment – Nitrogen / Phosphorus
  - Water temperature, conductivity
  - Water velocity
  - Dissolved oxygen, pH, and more

lts/Discussion

echtel Creek (Reach BA-4)

Migration Corridor for
Anadromous Salmonids

Adjacent to Horse Pasture,
City Corporate Yard

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ntel Creek (BA-4)

Flow	BMI - Summer	2010	2011	Algae - Summe
trates:	Nor-Cal B-IBI	42	48	Diversity: high 2010, moderate
sand	So-Cal B-IBI	43	46	Dominant Taxon: *Nitzschia inc*
tat:	Both IBIs in 'Fair Condition'			Motile species: 57%
	Dominant Taxa: *Sigara* sp./*Gumaga* sp. (caddisfly) 40%			Eutraphentic species: 80%
	2010 Low SDI / high Simpson's Index			% Pollution Tolerant species: l
	2011 Higher SDI / increased TR			
	Tolerant Organisms: ~ 25% both summers			

Flow	BMI - Spring	2011	Algae - Spring
trates:	Nor-Cal B-IBI	58	Diversity: moderately low
sand	So-Cal B-IBI	59	Dominant Taxa: *Nitzschia* sp. 6
	Both IBIs in upper 'Fair Condition'		Motile species: > 90%
	Co-Dominant Taxa:		Eutraphentic species: 50%
	Unidentified stonefly 24% and Unidentified mayfly 14%		% Pollution Tolerant species: l
	Increased SDI – more balanced community		
	Tolerant Taxa 15%, Intolerant Taxa 28%		

lts/Discussion

tlet Creek (Reach BA-7)

Migration Corridor for
Anadromous Salmonids

Adjacent to City of Willits
Wastewater Treatment
Facility and Outfall

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t Creek (BA-7)

w	BMI - Summer	2010	2011	Algae - Summer
ates:	Nor-Cal B-IBI	30	40	Diversity: High 2010, moderately low
vel	So-Cal B-IBI	37	43	2010 Dominant Taxa: *Nitzschia* sp.
t:	IBIs 'Poor Condition' 2010, 'Fair Condition' 2011			2010 Motile species: 50%, eutraphe
	Dominant Taxa:			2011 Dominant Taxon: *Nitzschia inc*
1 cfs	2010 Chironomidae 81%, *Micropsectra* / *Tanytarsus* sp.			2011 Motile species: 60%, eutraphe
	2011 Chironomidae 43%, Oligochaeta / *Tanytarsus* sp.			% Pollution Tolerant species: low
	SDI high 2010, decreased value in 2011			

w	BMI - Spring	2011	Algae - Spring
ates:	Nor-Cal B-IBI	41	Diversity: high and fairly evenly distr
vel	So-Cal B-IBI	53	Co-Dominant Taxa:
	IBI in 'Fair Condition'		*Nitzschia inconspicua* & 3 species of
	Dominant Taxa:		Motile species: 60%, eutraphentic sp
	Oligochaeta 57%, Chironomidae 23%		% Pollution Tolerant species: >8%,
	Low SDI		Chlorophyll a: highest value (128 mg

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lts/Discussion

tlet Creek (Reach BA-14)

Migration Corridor for
Anadromous Salmonids

Adjacent to Pasture Land/
Cattle Grazing (cattle not
excluded from stream)

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t Creek (BA-14)

Flow	BMI - Summer	2010	2011	Algae - Summe
trates:	Nor-Cal B-IBI	32	19	Diversity: Moderate - high 2010,
hardpan	So-Cal B-IBI	37	23	2010 Dominant Taxa:
tat:	IBI in 'Poor Condition'			~20% non-motile and motile sp
	2010 Rep 2 for SoCal IBI in 'Fair Condition'			2010 Motile species: 45%, eutra
s - < 1 cfs	Dominant Taxa:			2010 % Pollution Tolerant specie
	2010 Oligochaeta 33%			2011 Dominant Taxa: *Nitzschia*
	2010 Chironomidae 42% of community			2011 Motile species: 80%, eutra
	2011 Chironomidae 54% of community			2011 % Pollution Tolerant specie
	SDI moderately low in both summers			Chlorophyll a slightly elevated (7

Flow	BMI - Spring	2011	Algae - Spring
trates:	Nor-Cal B-IBI	45	Diversity: high and evenly distrib
rdpan	So-Cal B-IBI	54	Dominant Taxon: *Navicula anton*
	IBI in 'Fair Condition'		Motile species: 60%, eutraphent
	Dominant Taxa: Oligochaeta 57%, Chironomidae 11%		% Pollution Tolerant species: 8%
	SDI low - decreased from summer values		Chlorophyll a slightly elevated (5

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lts/Discussion

Outlet Creek (Reach BA-18)

Salmonids not Observed

Adjacent to Pasture Land/ Cattle Grazing (cattle not excluded from stream)

utlet Creek (BA-18)

t/Flow	BMI - Summer	2010	2011	Algae - Summer
rates:	Nor-Cal B-IBI	24	19	Diversity: High in 2010, moderate
	So-Cal B-IBI	29	20	Co-Dominant Taxa: *Navicula* sp. a
at:	IBIs in 'Poor Condition' 2010, 'Very Poor' 2011			Motile species: 50%; eutraphentic
	Dominant Taxa:			% Pollution Tolerant species: low
	2010 Chironomidae 83%, *Tanytarsus* sp.			
	2011 Chironomidae 75%, *Tanytarsus* sp.			
	Oligochaeta ~ 15% both summers			
t/Flow	**BMI - Spring**		**2011**	**Algae - Spring**
rates:	Nor-Cal B-IBI		11	Diversity: Moderate
an	So-Cal B-IBI		16	Dominant Taxon: *Nitzschia incons*
ayed sampling)	IBIs in 'Poor Condition'			Motile species: 77%; eutraphentic
	Dominant Taxa:			% Pollution Tolerant species: low
	Chironomidae 73%, *Tanytarsus* sp.			Chlorophyll a slightly elevated (28
	Lowest Taxa Richness, highest Simpson's Index			

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lts/Discussion

vis Creek (Reach BA-19)

Migration Corridor for
Anadromous Salmonids

Within Cattle Ranch (cattle
not excluded from stream)

Creek (BA-19)

Flow	BMI - Summer	2010	2011	Algae - Summer
trates:	Nor-Cal B-IBI	54	59	Diversity: Moderate to high, relatively
	So-Cal B-IBI	76	79	2010 Dominant Taxa: *Achnanthes min*
at: glide	IBIs 'Fair Condition' and 'Good Condition'			2010 Motile species : 33%, eutraphent
	Dominant Taxa: Chironomidae 47% - 50%			2011 Dominant Taxa: *Rhoicosphenia a*
	Similar SDI, Simpson's Index			2011 Motile species: 34%, eutraphenti
				% Pollution Tolerant species: low both
Flow	**BMI - Spring**		**2011**	**Algae - Spring**
trates:	Nor-Cal B-IBI		63	Diversity: Moderately high
	So-Cal B-IBI		76	Dominant Taxa: *Nitzschia inconspicua*
	IBIs in 'Good Condition'			Motile species: 55%, eutraphentic spe
	Dominant Taxa: Unidentified mayfly 34%			% Pollution Tolerant species: low
	Chironomidae < 1%			

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lts/Discussion

o Creek (Reach BA-12)

Migration Corridor/Rearing/
Spawning(?) for Anadromous
Salmonids

Adjacent to Pasture Land/
Cattle and Horse Grazing

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Creek (BA-12)

tat/Flow	BMI - Spring	2011	Algae - Spring
strates:	Nor-Cal B-IBI	56	Diversity: Moderately low, uneven
avels and hardpan	So-Cal B-IBI	70	Dominate Taxon: *R. abbreviata* 36
itat:	IBIs in 'Fair Condition' and 'Good Condition'		Motile species: 13%: eutraphentic
l glide	Dominant Taxa: Oligochaeta 19%		% Pollution Tolerant species: low
	Mayfly taxa: 33% of community		Chlorophyll a: low
	Moderate SDI, most balanced community		

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Benthic Macroinvertebrates

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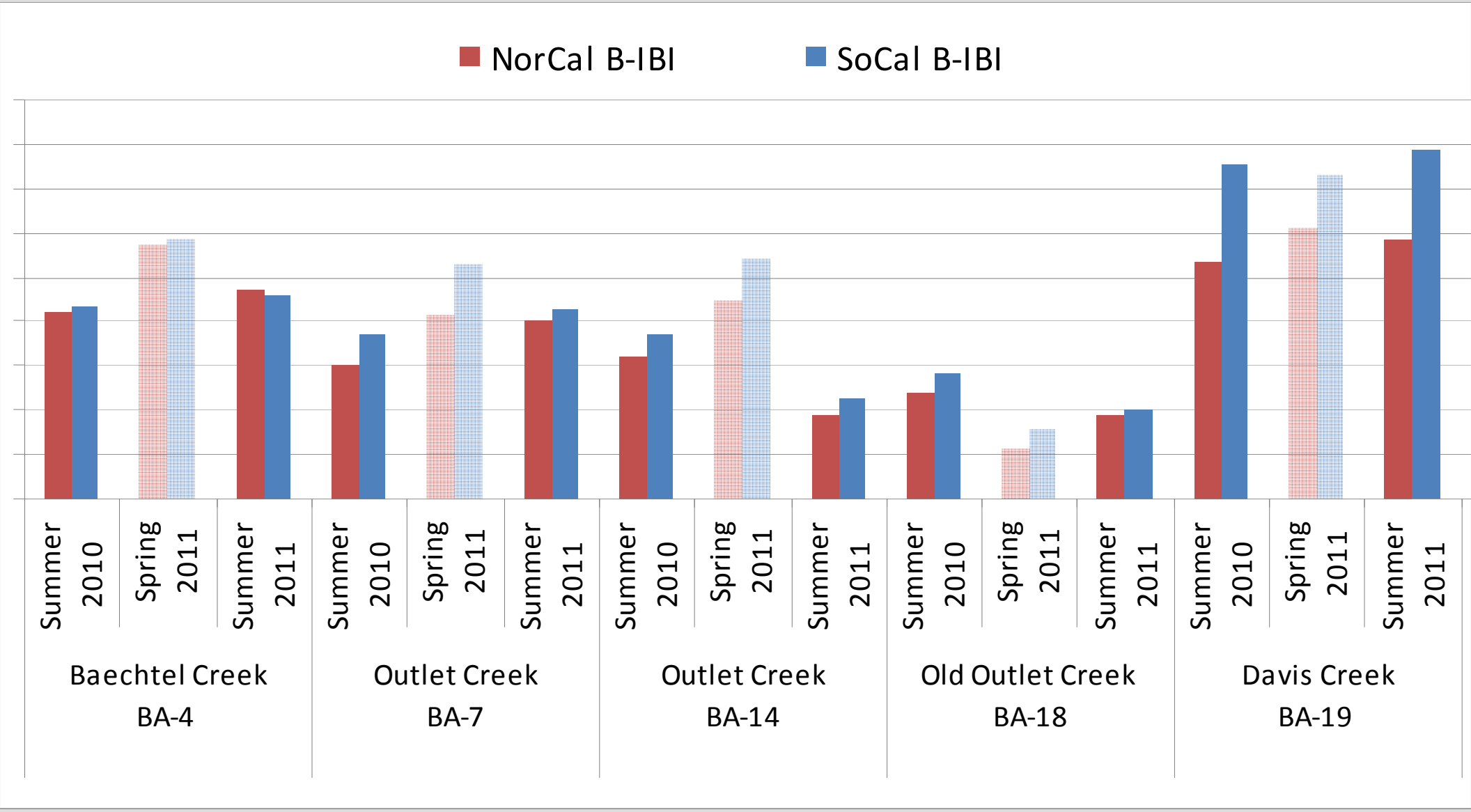
ices of Biological Integrity



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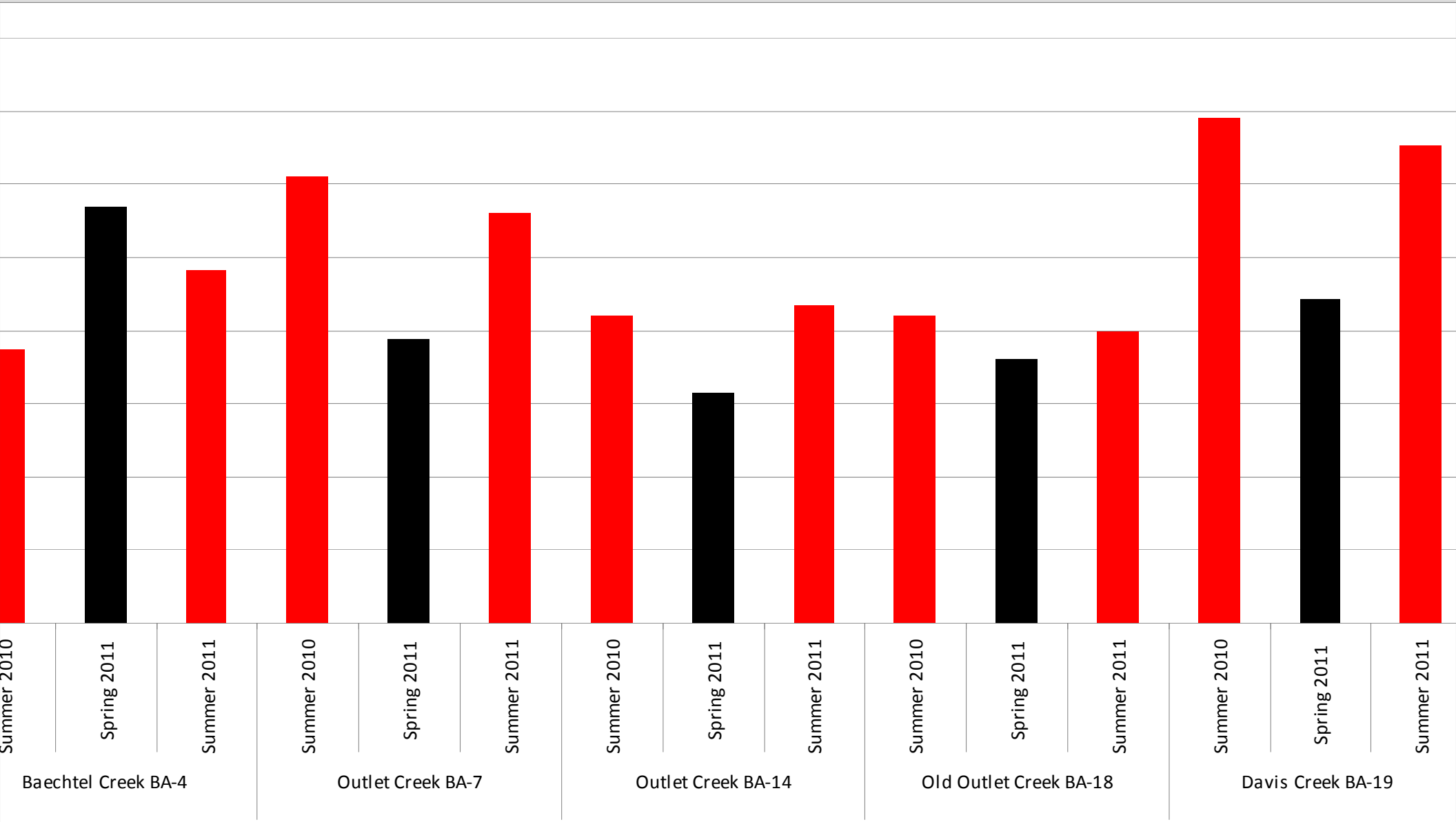
nnon Diversity Index



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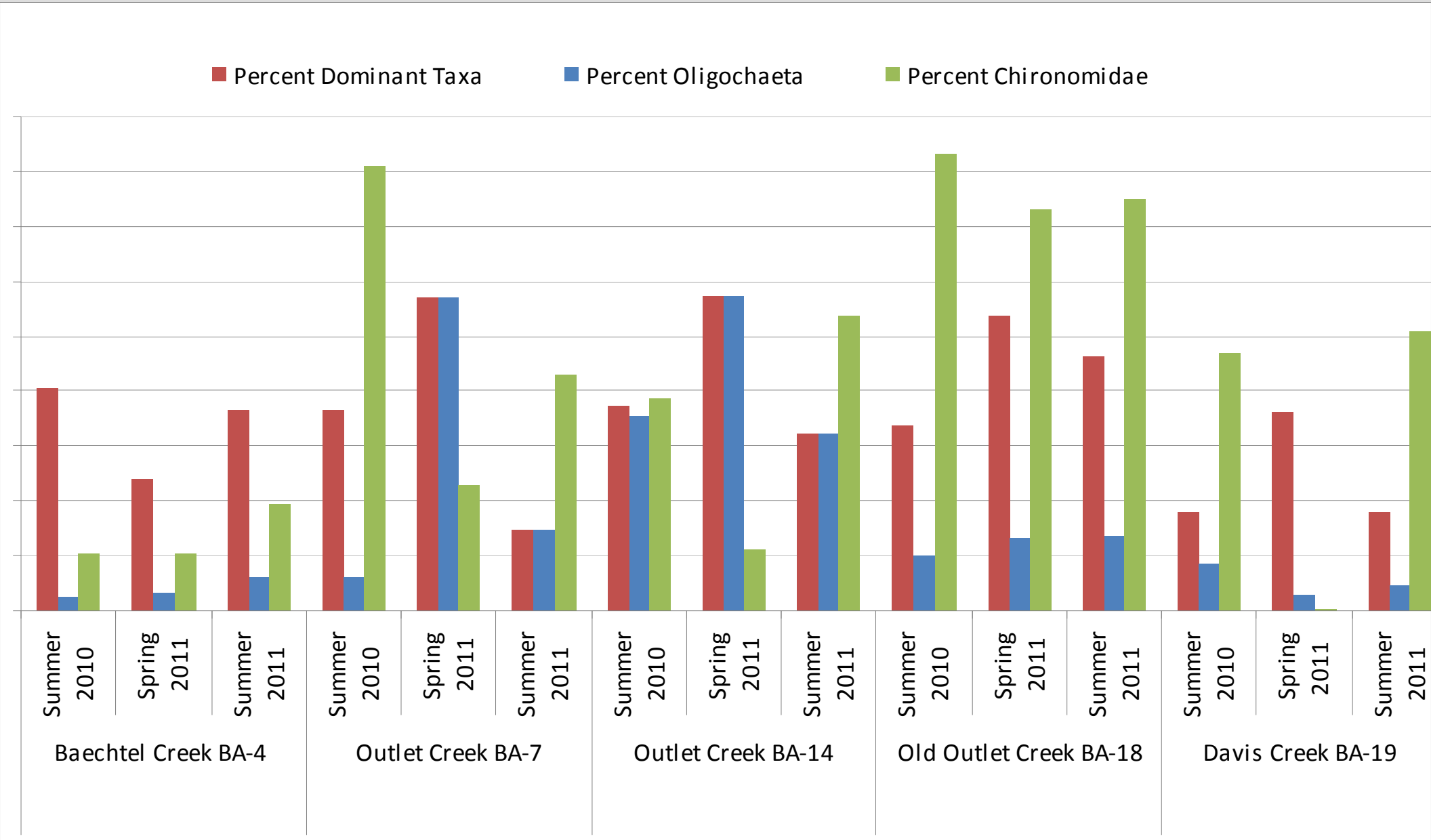
minant Taxa, Oligochaeta and Chironomidae



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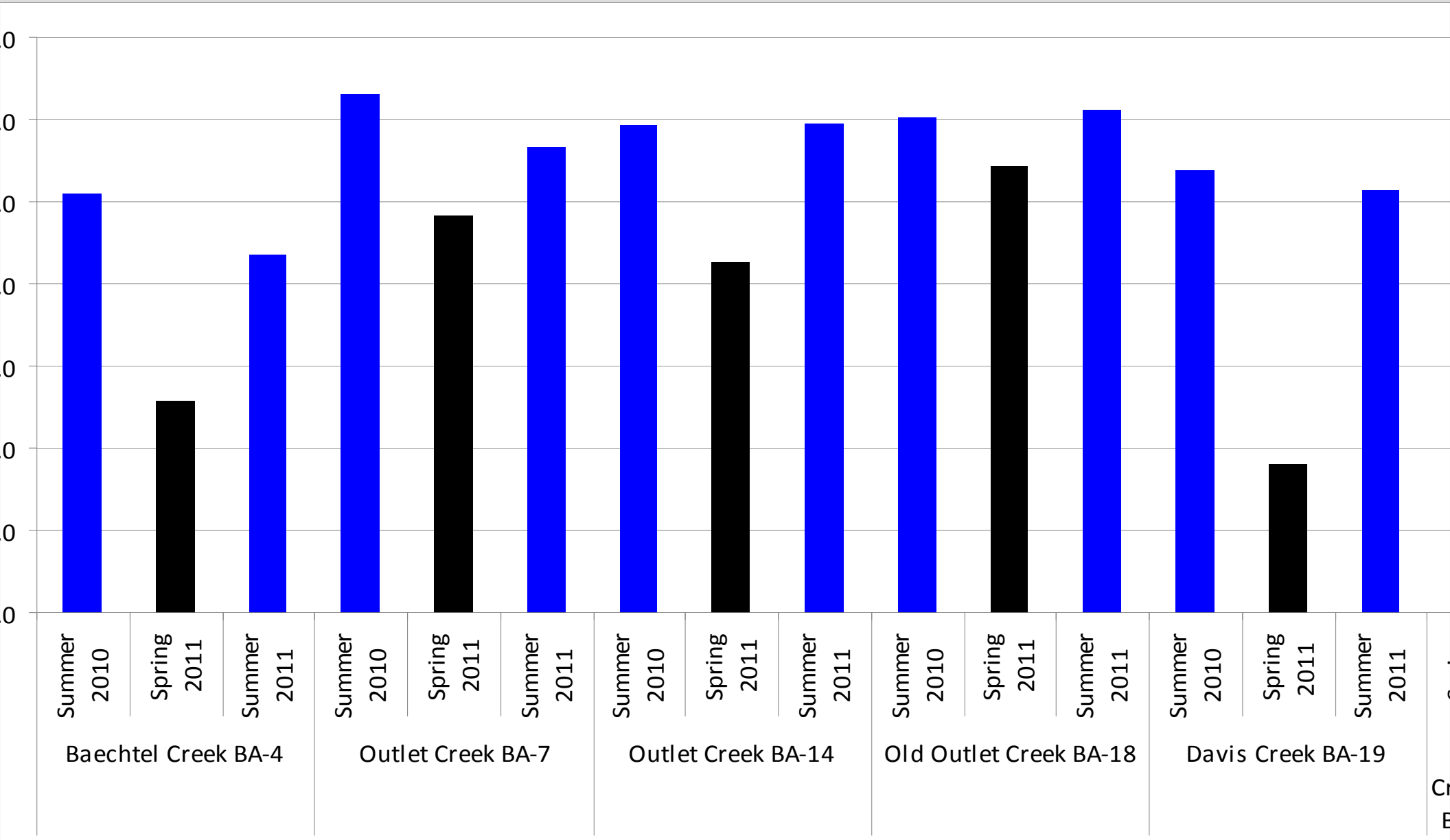
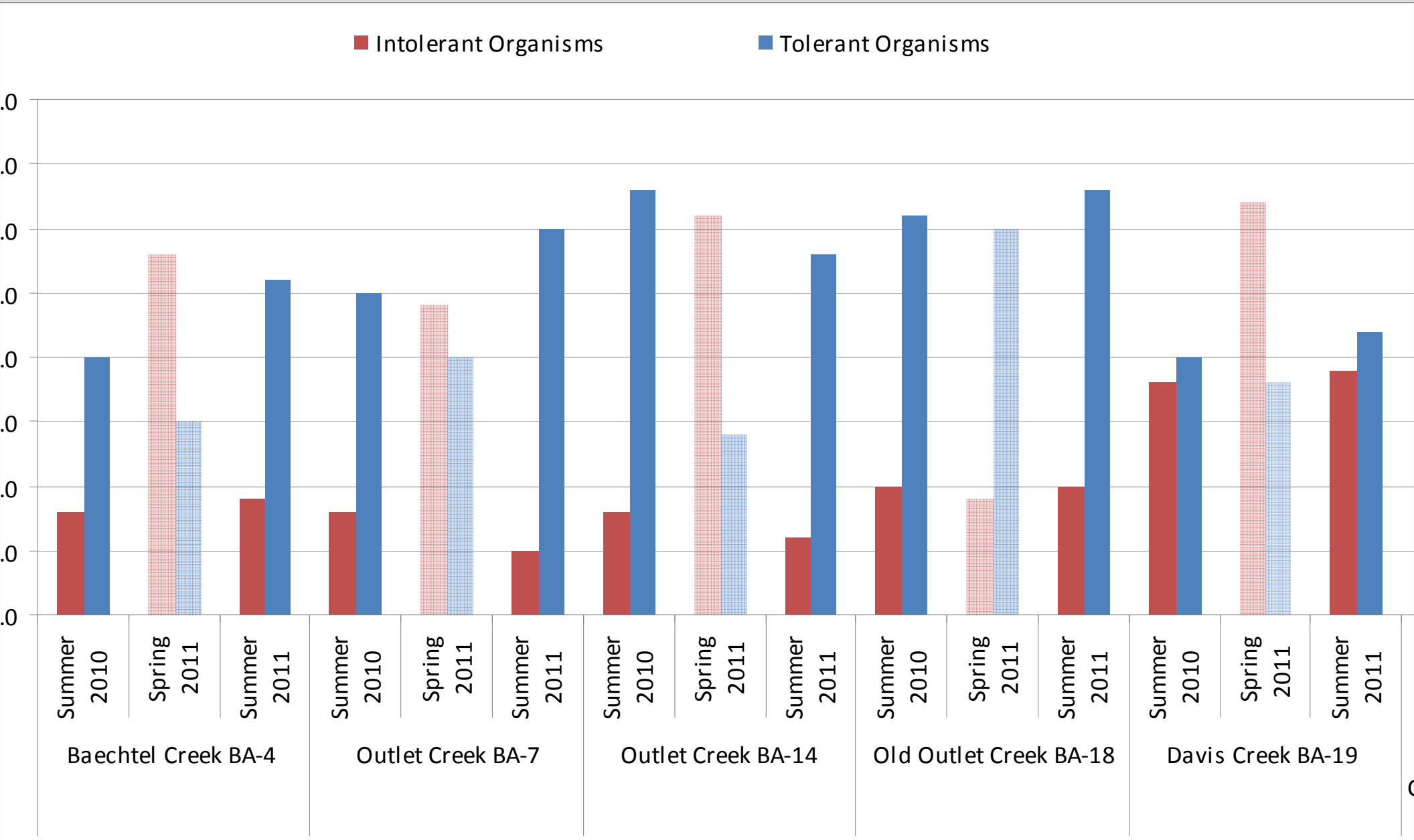
lerance Value



lerance Indices



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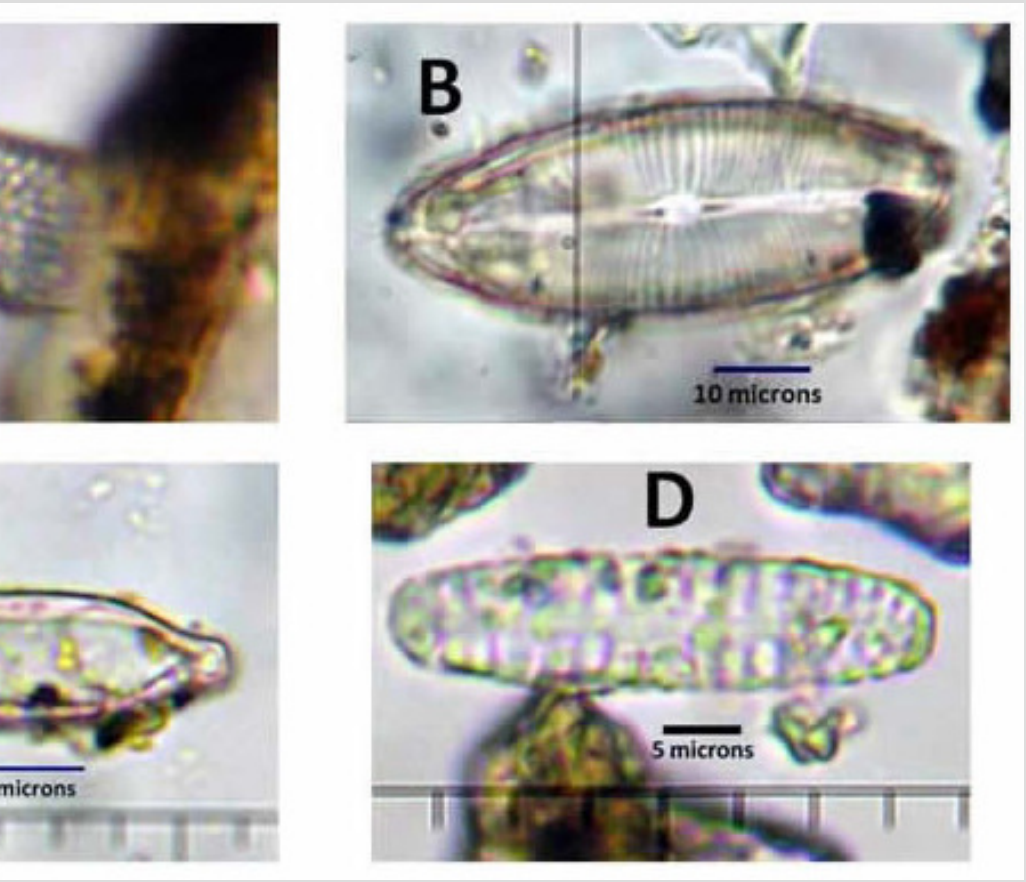
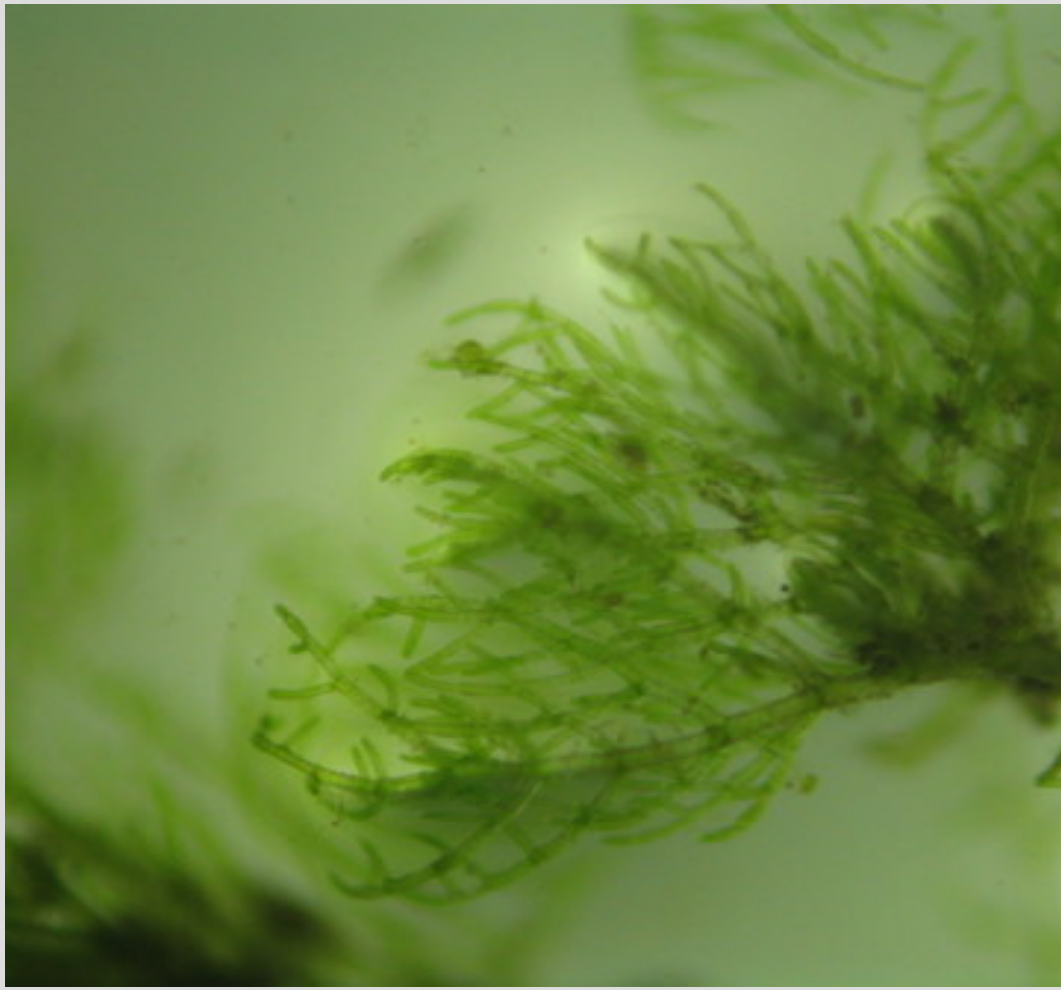
Freshwater Algae



B. Navicula; C. Nitzschia; and D. Rossithidium



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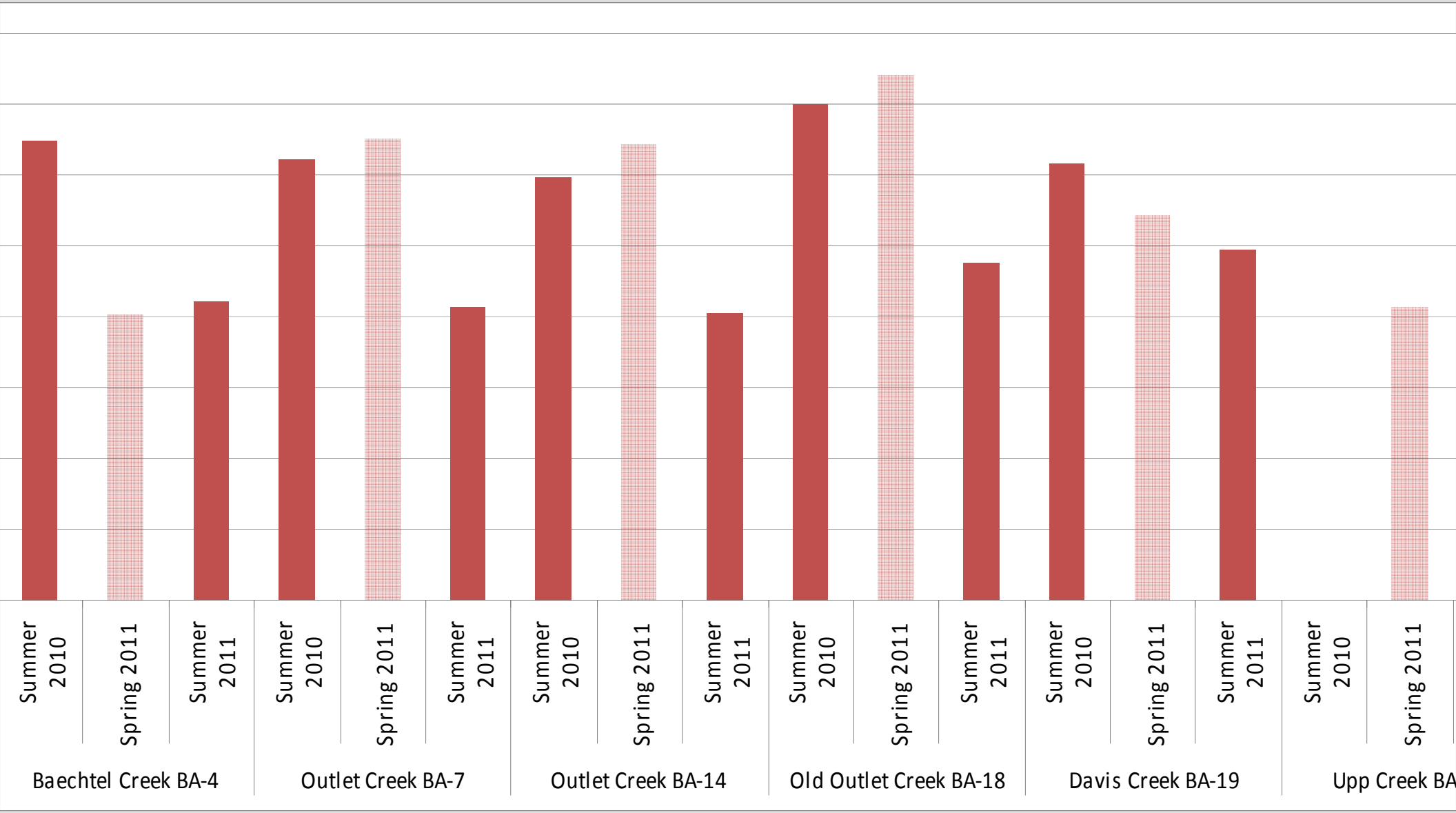
tom Shannon Diversity Index*

sed on 600 count



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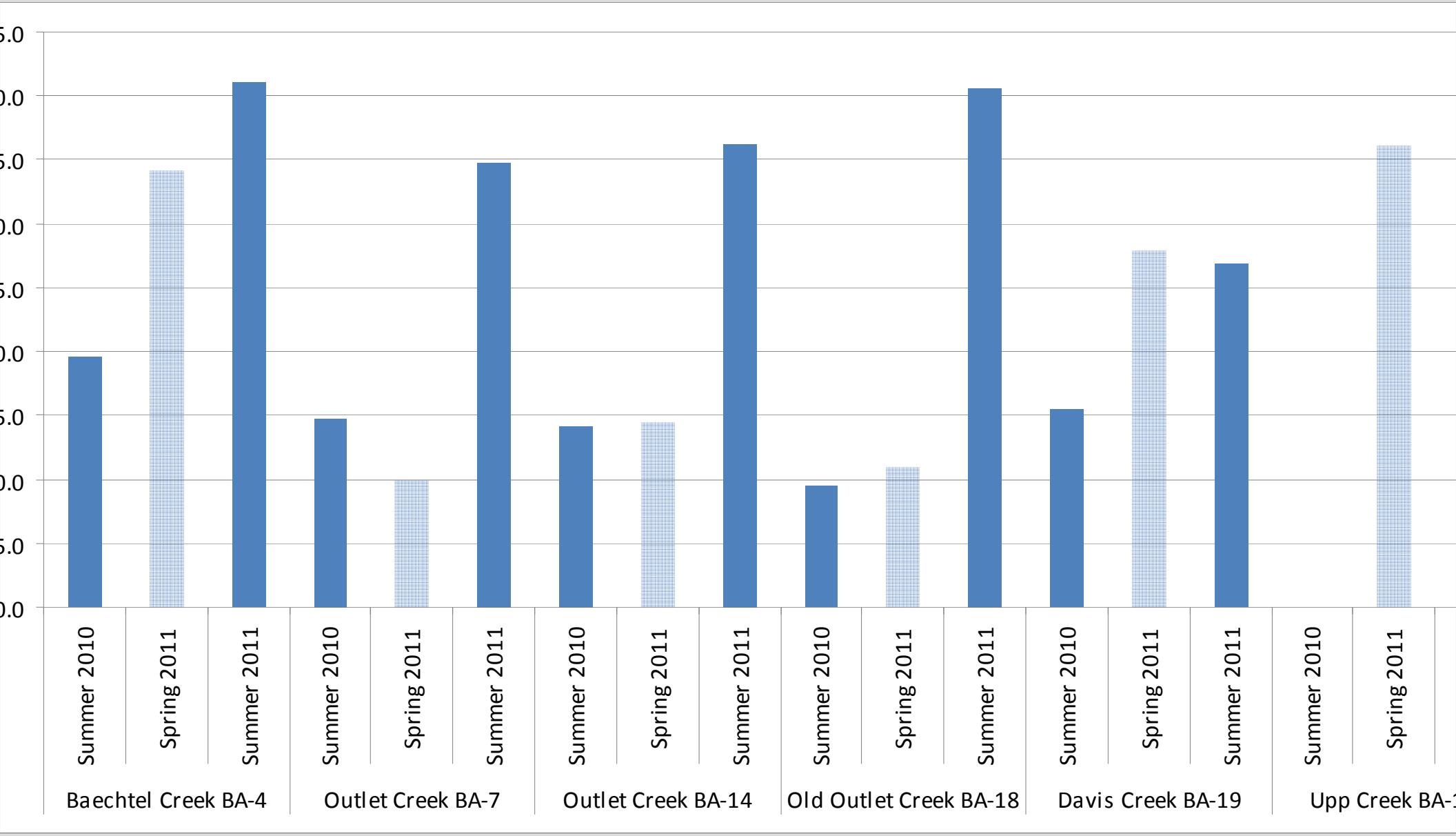
iatom Percent Dominant Taxon*

Based on 600 count



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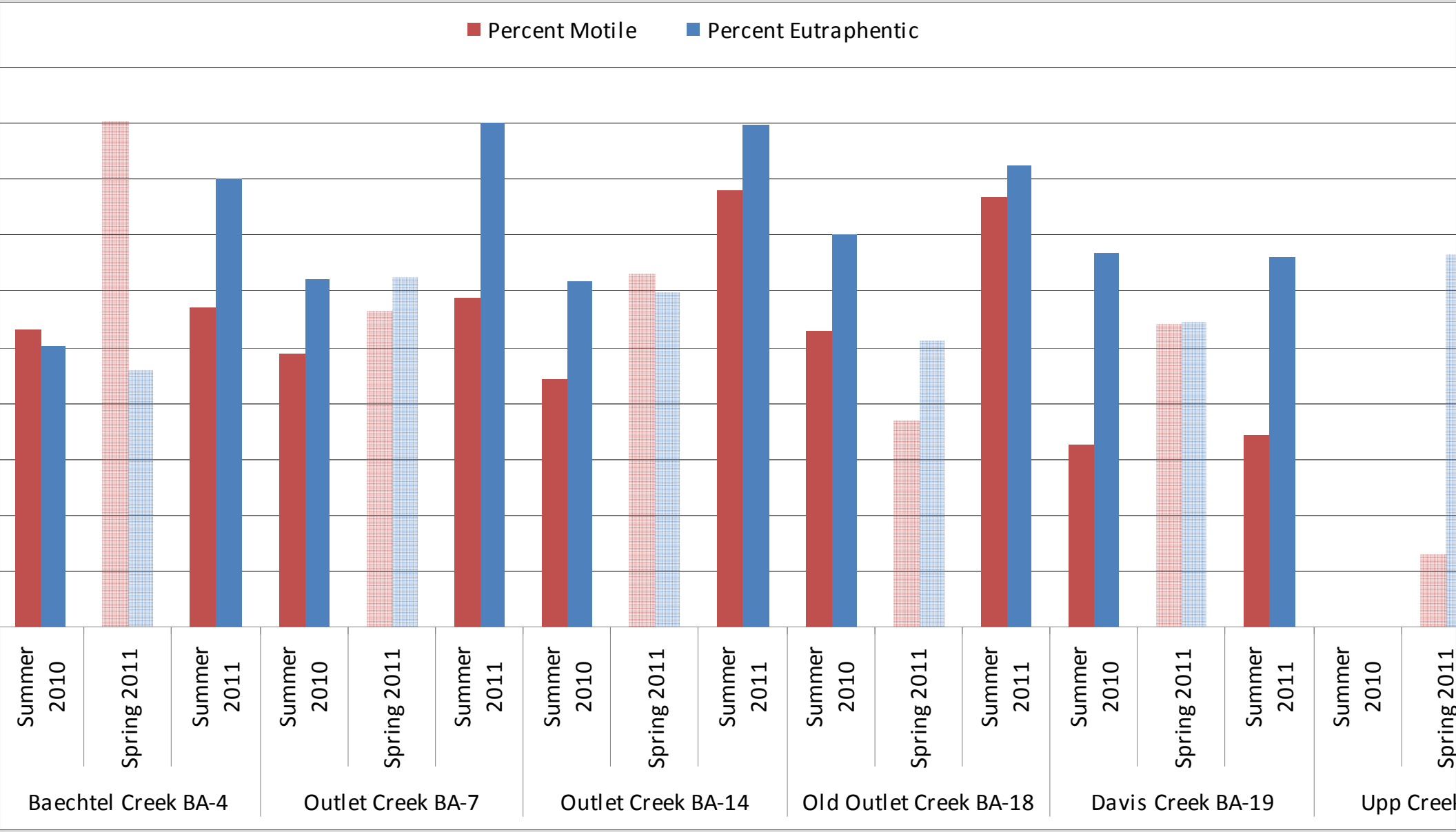
cent Motile and Percent Eutraphentic Diatom

ed on 600 count



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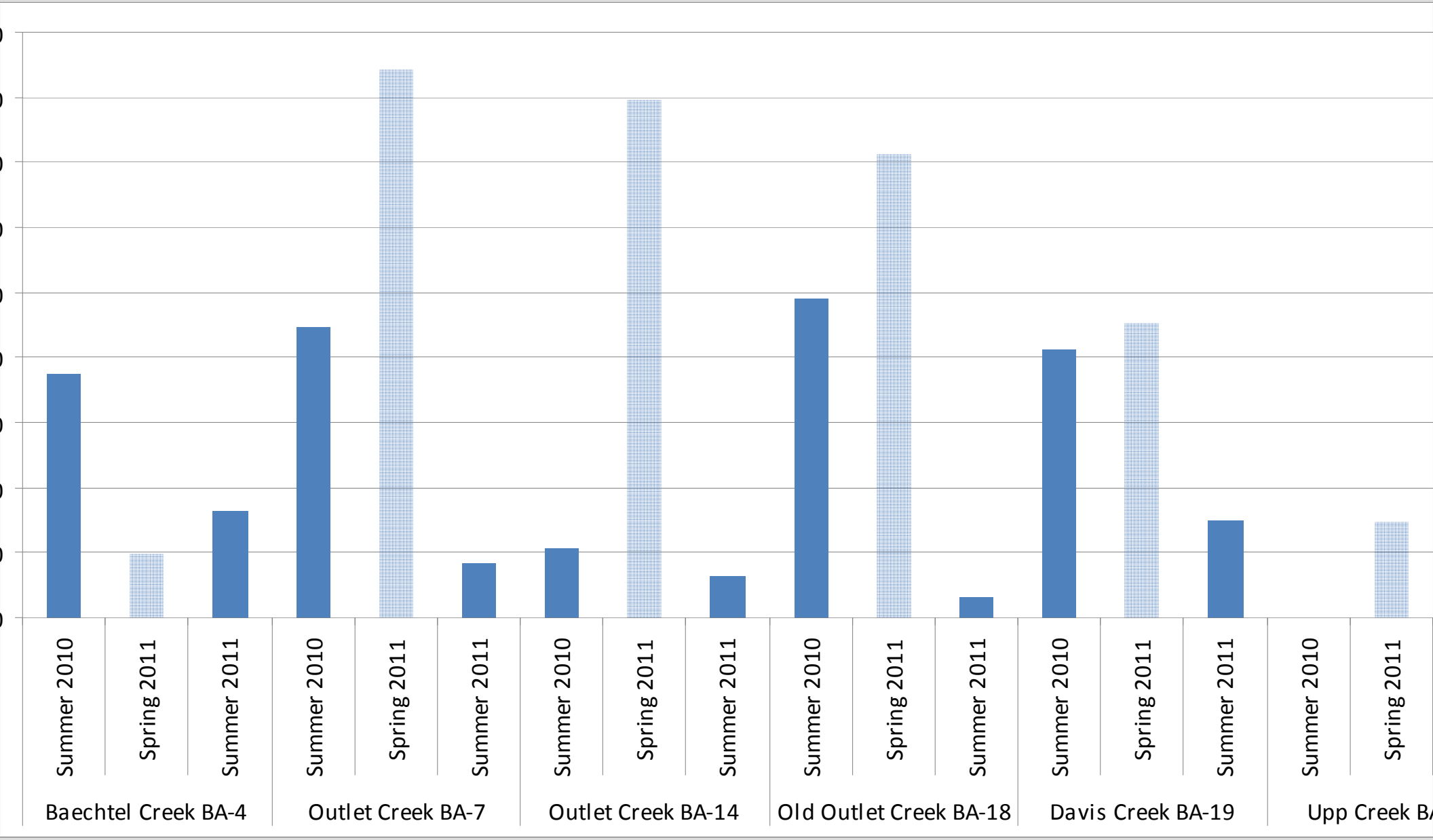
rcent Pollution Tolerant Diatoms*

sed on 600 count



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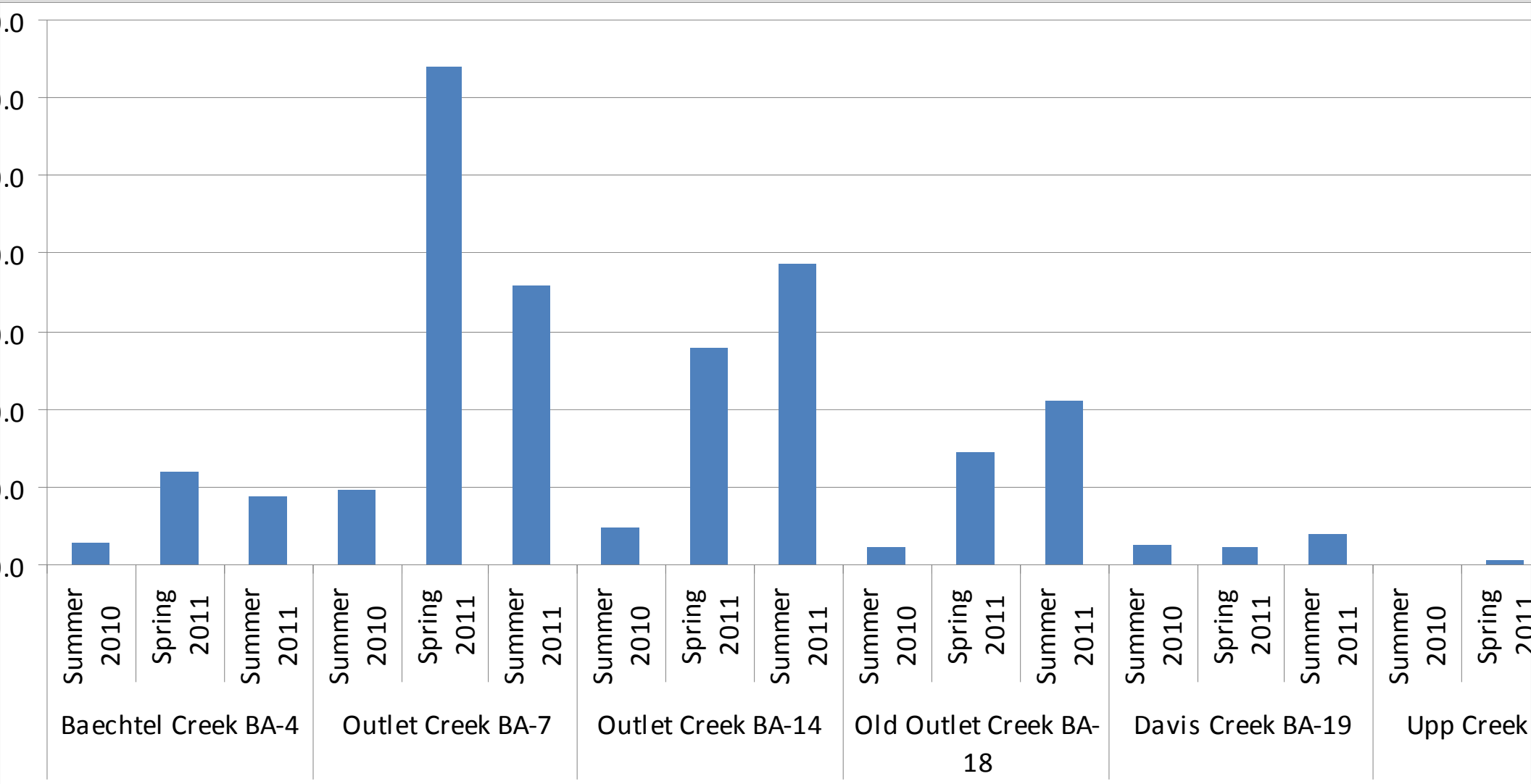
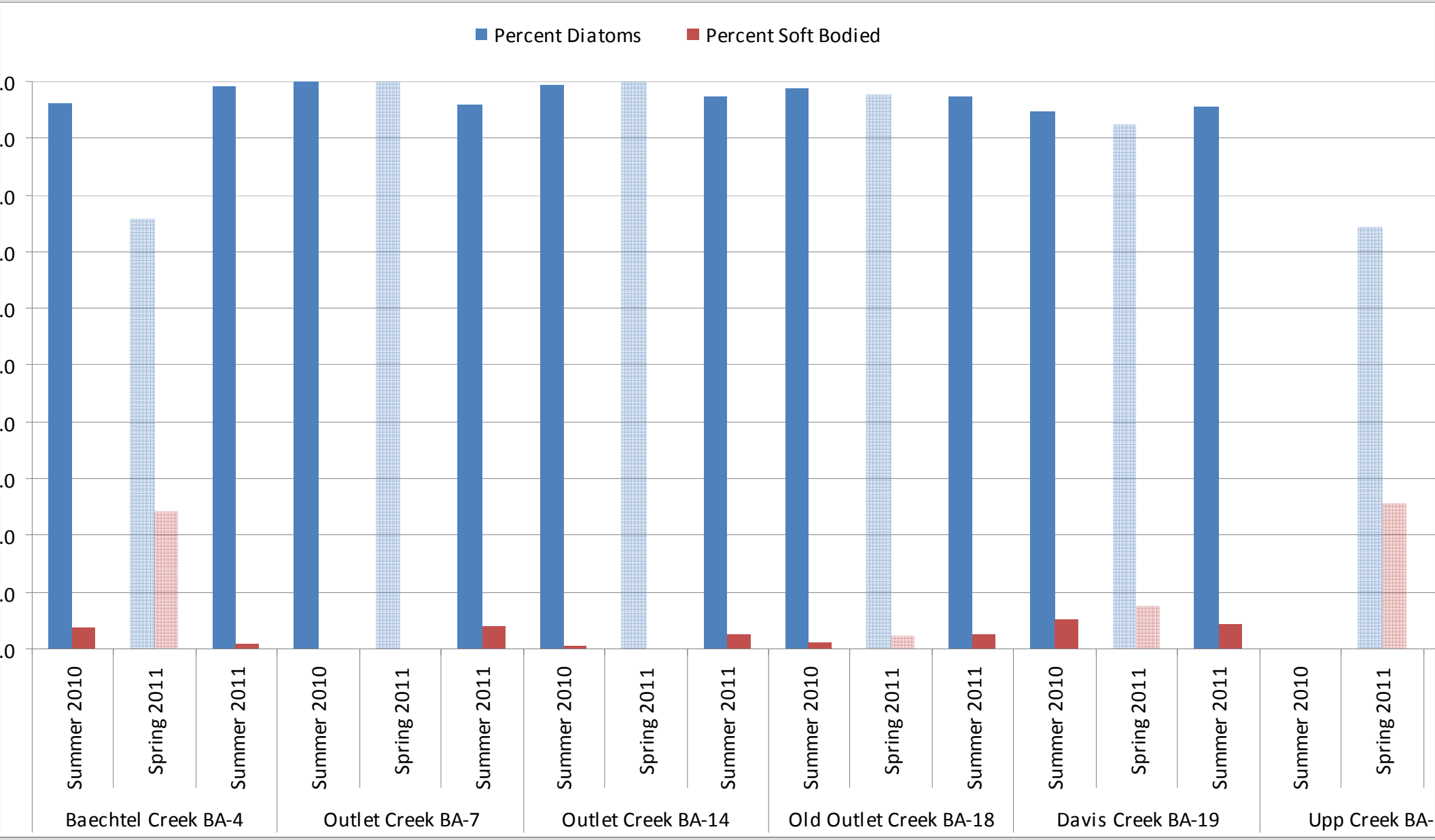
orophyll a values*

mg/m2 = unenriched (Lohman, et. al., 1992)
mg/m2 = moderately enriched (Tetra Tech, 2006)
mg/m2 = highly enriched



uantitative Soft-Bodied Algae Sample Results

sed on 300 count



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mary

ng summer, substrate composition, streamflow pattern, and
t were the primary characteristics influencing benthic communitie

Substrates composed primarily of fine gravel, sand, fines

er summer 2011 flows = improved community metrics relative to sum
, except for reaches with active grazing

So-Cal B-IBI appeared to better represent seasonal benthic communities: i
f non-perennial streams, Percent Tolerant Taxa metric (high at most reache

lor-Cal and So-Cal B-IBIs more similar at reaches with singular habitat type
lide), increased flows, low-velocities

Un-modified metrics provided additional information relative to community
omposition not reflected in the IBIs, non-distinct taxa excluded

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mary

e (summer)

oms dominated most communities

Most reaches dominated by tolerant taxa adapted to unfavorable conditions

Reaches with easily mobilized substrates dominated by motile diatom gener
- Associated with degraded stream conditions & poor water quality

Reaches with coarser substrates had higher % of non-motile taxa

Reaches with nutrient input (livestock grazing, wastewater treatment facility
igh % of eutraphentic diatoms

Pollution Tolerant species present at many reaches – generally lower % in s

Soft-bodied algae – low TR, low #s – species tolerant of degraded condition

Chlorophyll a values generally highest at most reaches during summer 2011
ssociated with increased nutrient input during spring runoff

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mary

ng spring, increased streamflow (relative to both summers), trate mobility, and water quality - appear to be the primary acteristics influencing benthic communities

Both B-IBI values generally improved

Substantial increases in Percent Intolerant Organisms

Percent Tolerant Organisms generally decreased

SDI values at reaches downstream of nutrient input areas were lower t ummer values

Chironomids decreased / oligochaetes increased at most reaches

Un-modified metrics provided additional information relative to commu omposition not reflected in B-IBIs

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mary

e (spring)

- Diatoms dominated communities at all reaches
- Percent Motile species variable, lowest values recorded at some
- Percent Dominant Taxa values variable relative to summer
- Percent eutraphentic diatoms generally elevated at most reaches
- Highest Chlorophyll a values recorded at most reaches, some val elevated
- Soft-bodied algae more numerous, Taxa Richness similar to sum

wledgements

y Fetscher	SCCWRP
rington	CDF&G (W?)
igala	Moss Landing
we	ICF
Humphreys	ICF
rown	ECORP
na Hadden	Caltrans

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