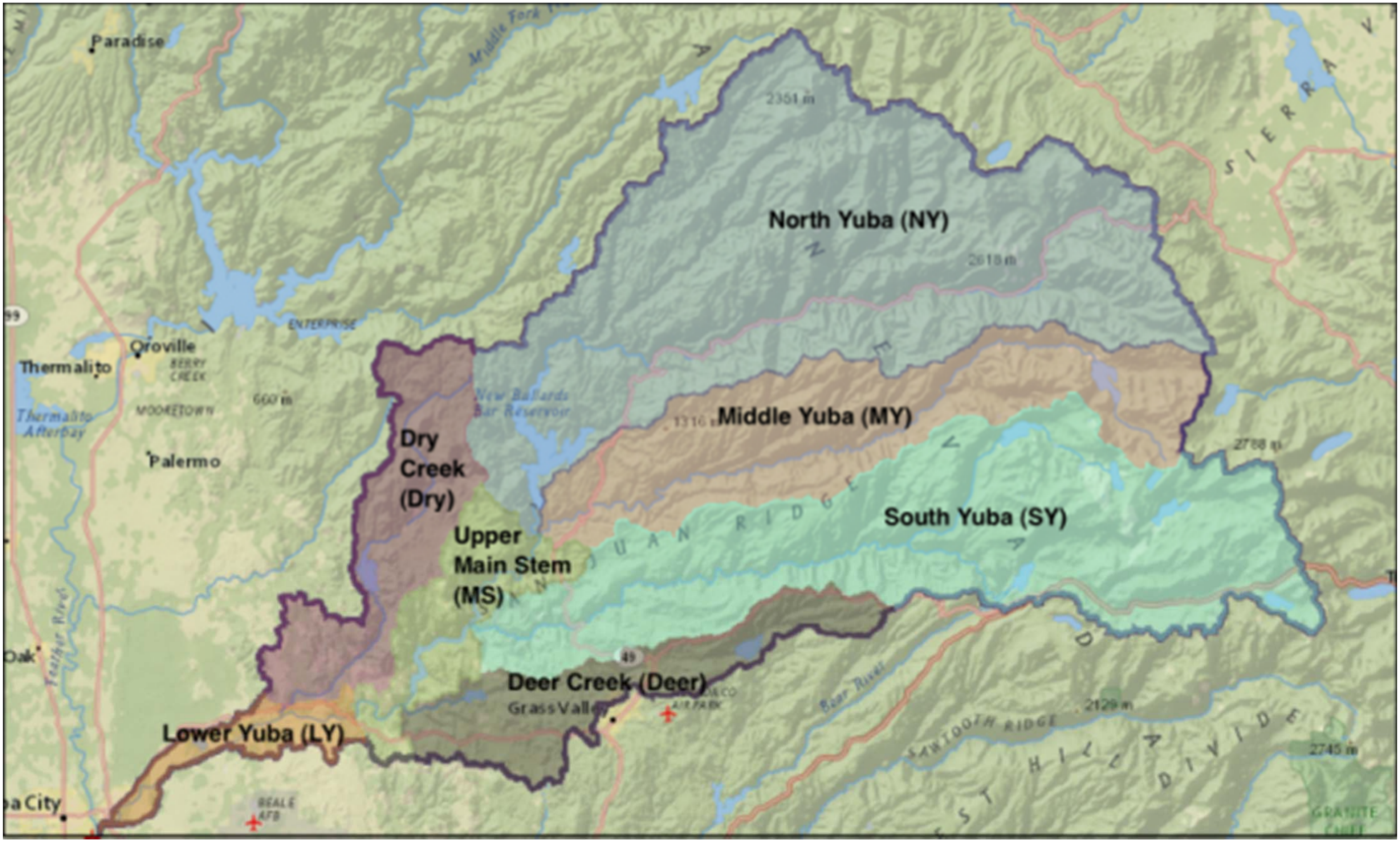
Evaluating the Effects of Spawning Bed Enhancement on Water Quality and Benthic Communities in Deer Creek, Nevada County, California

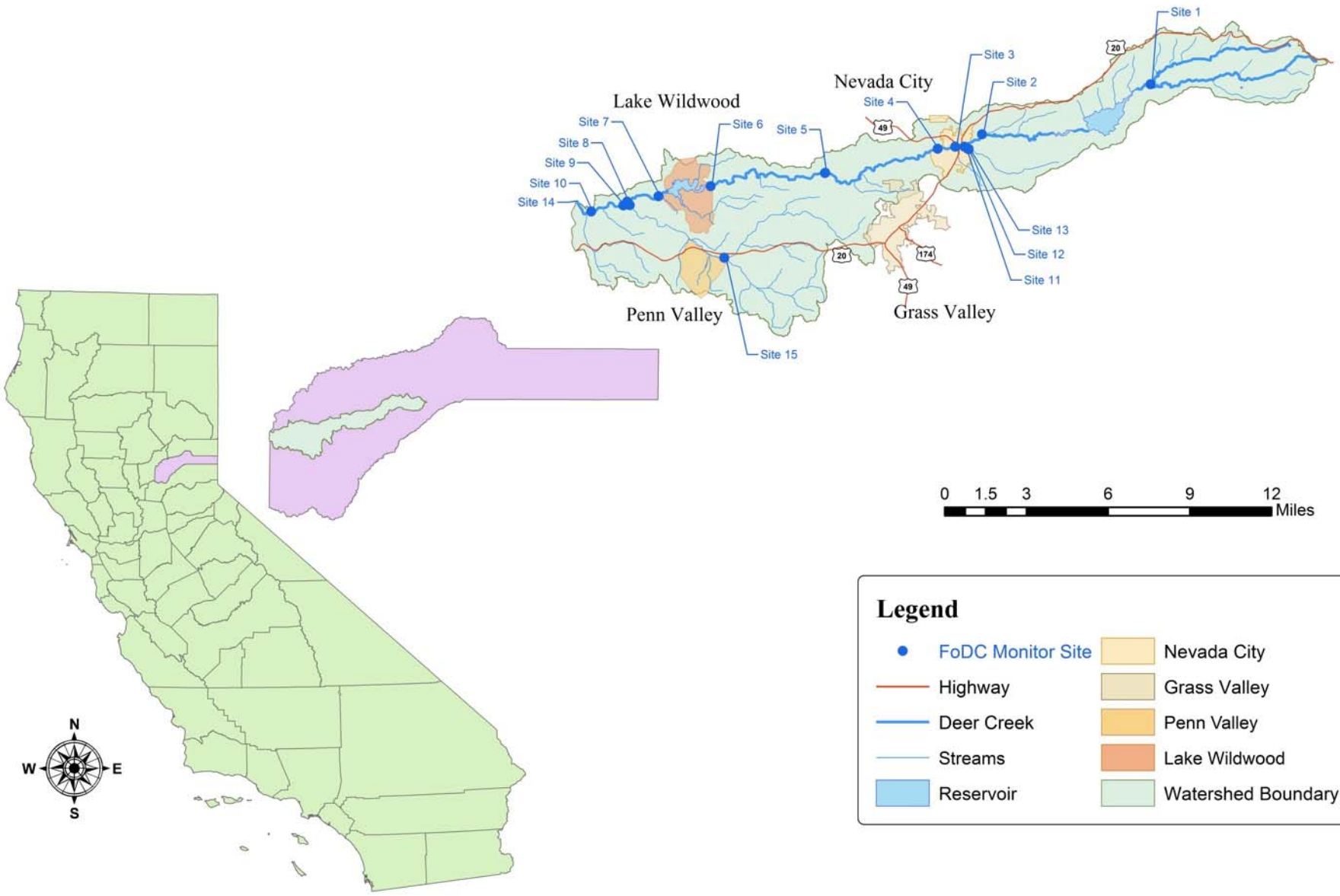
Justin Wood, Rachel Durben & Jeff Lauder
Sierra Streams Institute
Nevada City, CA

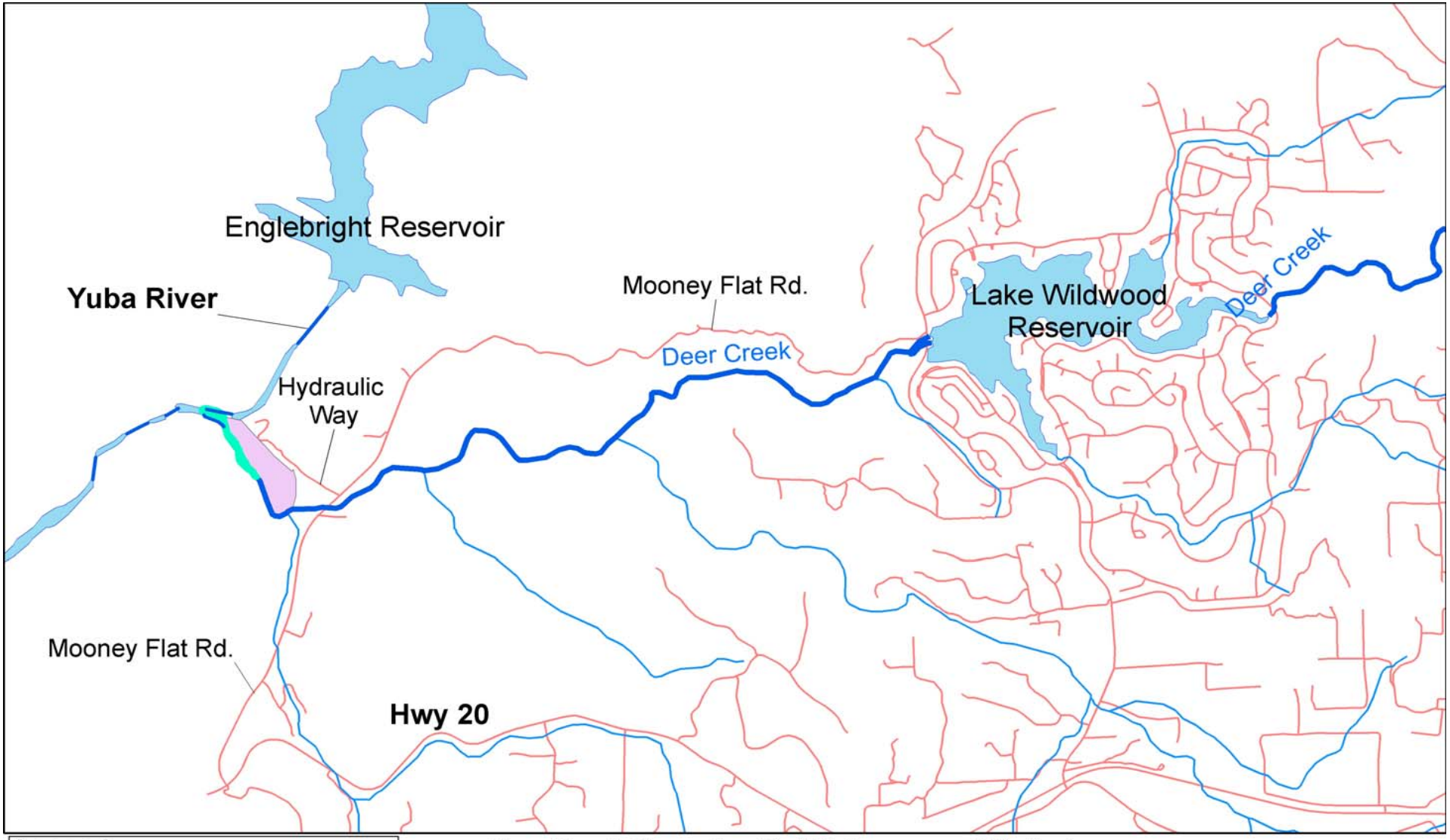
Where Are We???



North Yuba (NY)
Middle Yuba (MY)
South Yuba (SY)
Dry Creek (Dry)
Upper Main Stem (MS)
Deer Creek (Deer)
Lower Yuba (LY)
Paradise
Oroville
Thermalito
Palermo
Grass Valley

Deer Creek Watershed





Deer Creek Spawning Bed Enhancement Project
State of California Department of Fish and Game
Notification of Lake or Streambed Alteration

Deer Creek
Nevada County
Applicant: Joanne Hild-Sierra Streams Institute
7/23/2011
Smartville Quadrangle
Township 16N Range: 6E Section: (22, 23)

Figure 1 - Vicinity Map

Legend

- Stream Flow Transect Locations
- Gravel Tracer Transects
- Scour Chains
- Water Temperature Loggers

Piezometer Locations

- Pre
- Post

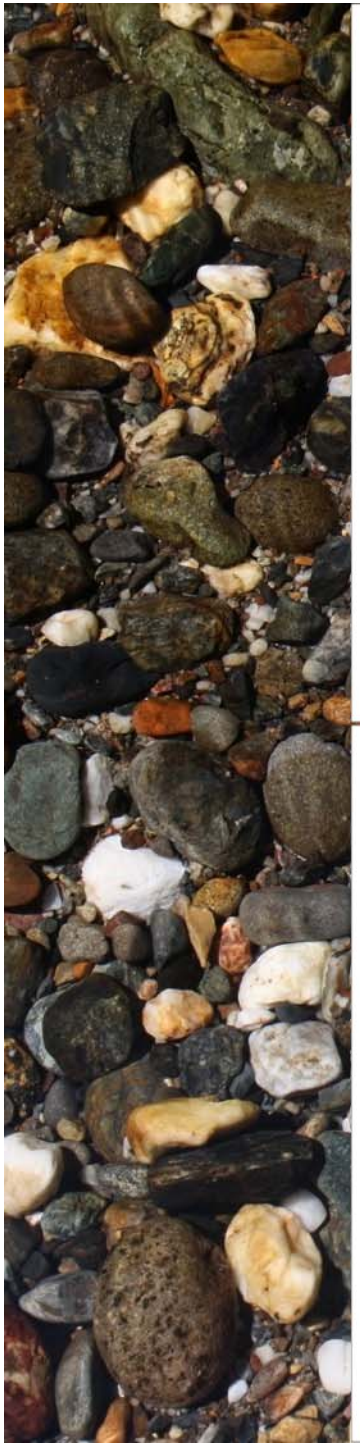
- Spawning Bed Enhancement Work Areas

Sierra Streams Institute
Spawning Bed Enhancement Project
Monitoring Location Map

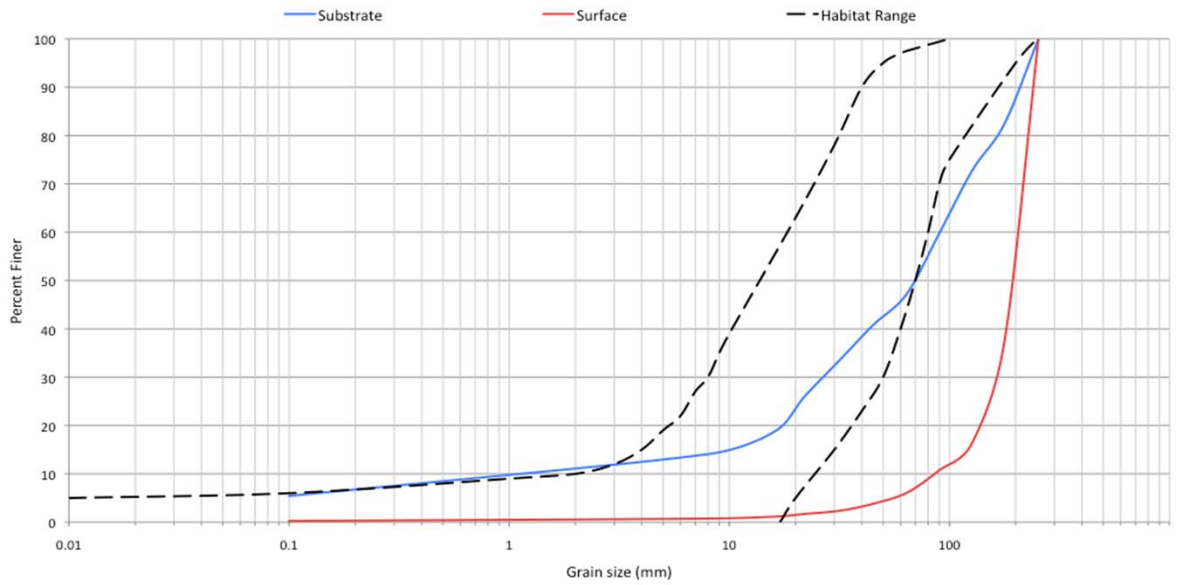
N

Miles

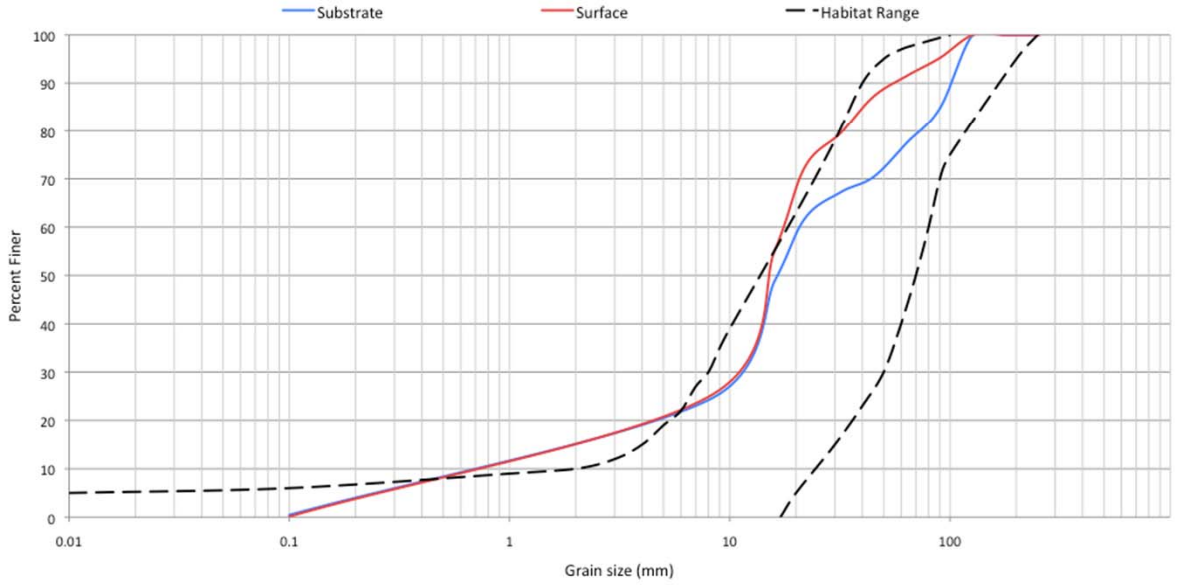
0 0.0125 0.025 0.05



Bulk Sample for Deer Creek
Before Restoration - Work Area 1
August 30, 2012



Bulk Sample for Deer Creek
After Restoration - Work Area 1
September 28, 2012



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Chinook salmon Redd Locations - 2012

Legend
- Salmon Redds

N

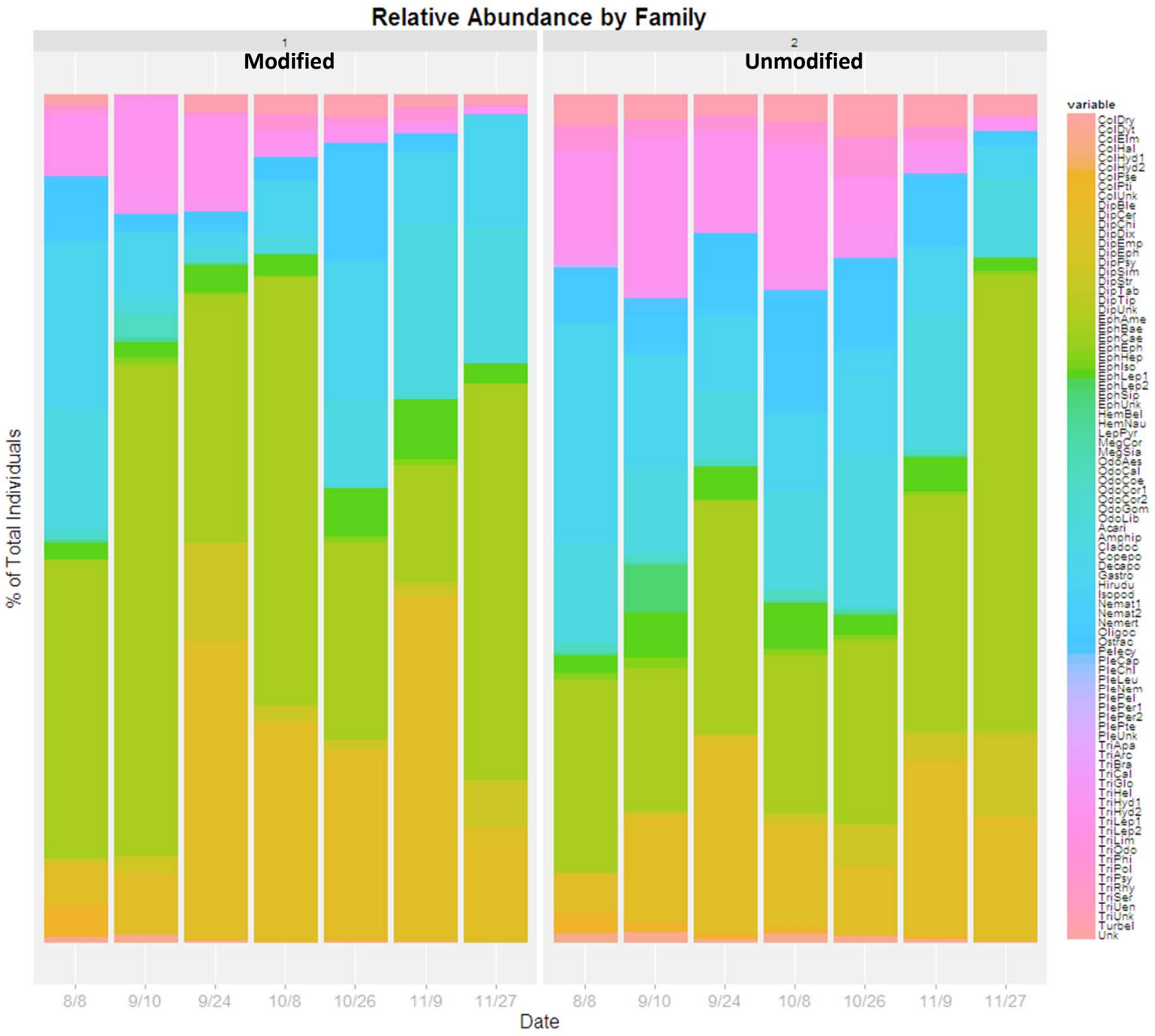
1 inch = 200 feet
Miles
0 0.015 0.03 0.06

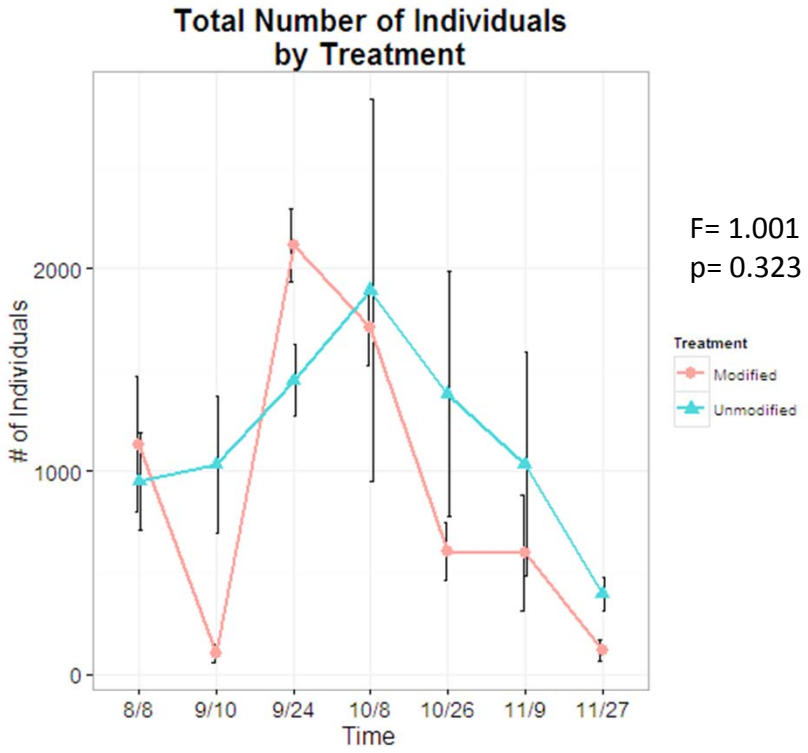
Inter-Gravel Water Quality

Inter-Gravel Water Quality Averages - 9/4/2012					
Work Area	DO (mg/L)	Conductivity (uS/cm)	pH	Water Temp (deg C)	Turbidity (NTU)
1	7.55	170.33	7.67	21.64	11.00
2	6.32	186.60	7.75	22.13	49.68
3	4.83	186.25	7.53	22.26	27.95

Inter-Gravel Water Quality Averages - 9/7 and 9/10, 2012					
Work Area	DO (mg/L)	Conductivity (uS/cm)	pH	Water Temp (deg C)	Turbidity (NTU)
1	8.12	177.17	8.14	21.30	2.98
2	7.30	187.83	7.98	20.37	3.98
3	8.12	175.17	8.25	20.19	4.07

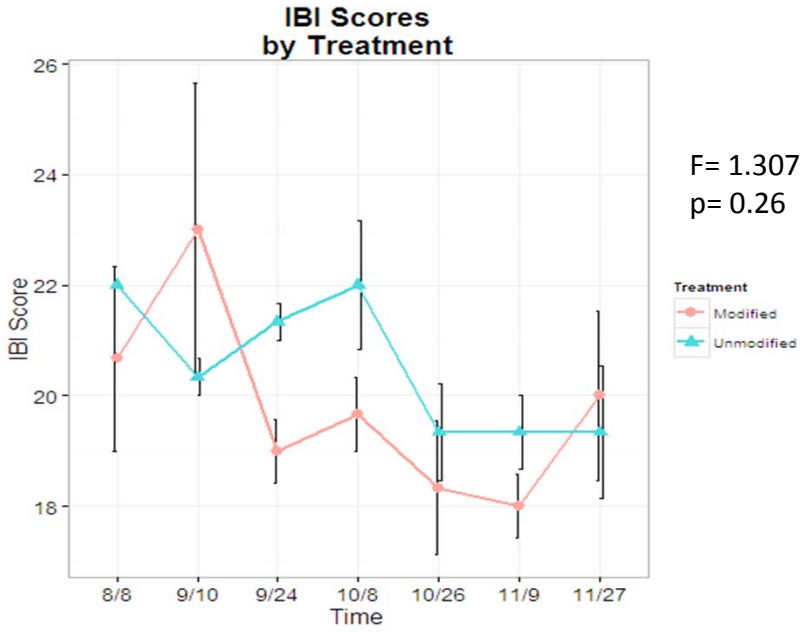
Inter-Gravel Water Quality Averages - 11/5/2012					
Work Area	DO (mg/L)	Conductivity (uS/cm)	pH	Water Temp (deg C)	Turbidity (NTU)
1	7.01	164.00	7.71	14.68	2.43
2	8.46	159.50	7.57	15.22	3.48
3	9.06	158.50	7.52	14.43	6.25


Relative Abundance by Family
1
Modified
2
Unmodified
% of Total Individuals
8/8
9/10
9/24
10/8
10/26
11/9
11/27
Date
variable
ColDry
ColEle
ColElm
ColHel
ColHyd1
ColHyd2
ColPse
ColPti
ColUnk
DipBle
DipCer
DipChi
DipDix
DipEmp
DipEph
DipPsy
DipSim
DipStr
DipTab
DipTip
DipUnk
EphAme
EphBae
EphCae
EphEph
EphHep
EphIso
EphLep1
EphLep2
EphSip
EphUnk
HemBel
HemNau
LepPyr
MegCor
MegSia
OdoAes
OdoCal
OdoCoe
OdoCor1
OdoCor2
OdoGom
OdoLib
Acari
Amphip
Cladoc
Copepo
Decapo
Gastro
Hirudu
Isopod
Nemat1
Nemat2
Nemert
Oligoc
Ostrac
Peleoy
PleCap
PleChl
PleLeu
PleNem
PlePel
PlePer1
PlePer2
PlePte
PleUnk
TriApa
TriArc
TriBra
TriCal
TriGlo
TriHel
TriHyd1
TriHyd2
TriLep1
TriLep2
TriLim
TriOdo
TriPhi
TriPol
TriPsy
TriRhy
TriSer
TriUen
TriUnk
Turbel
Unk

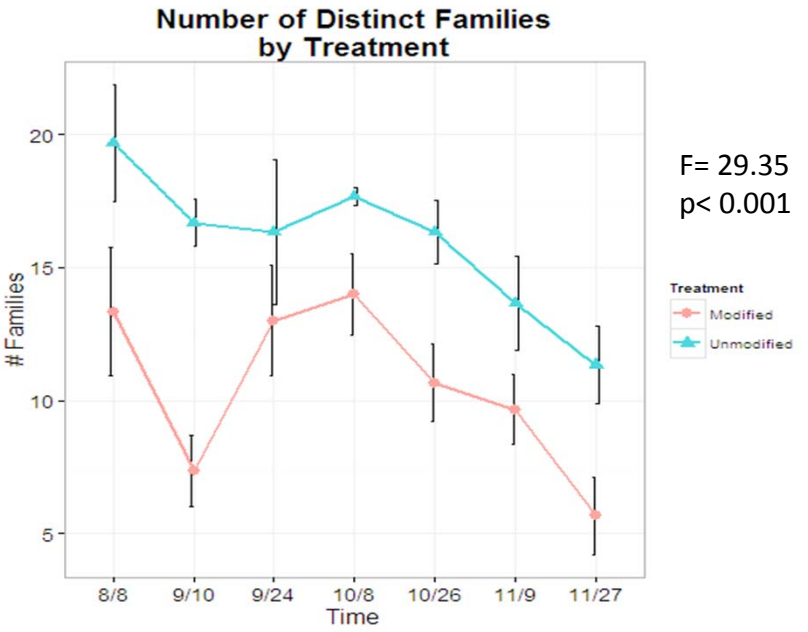


F= 1.001
p= 0.323

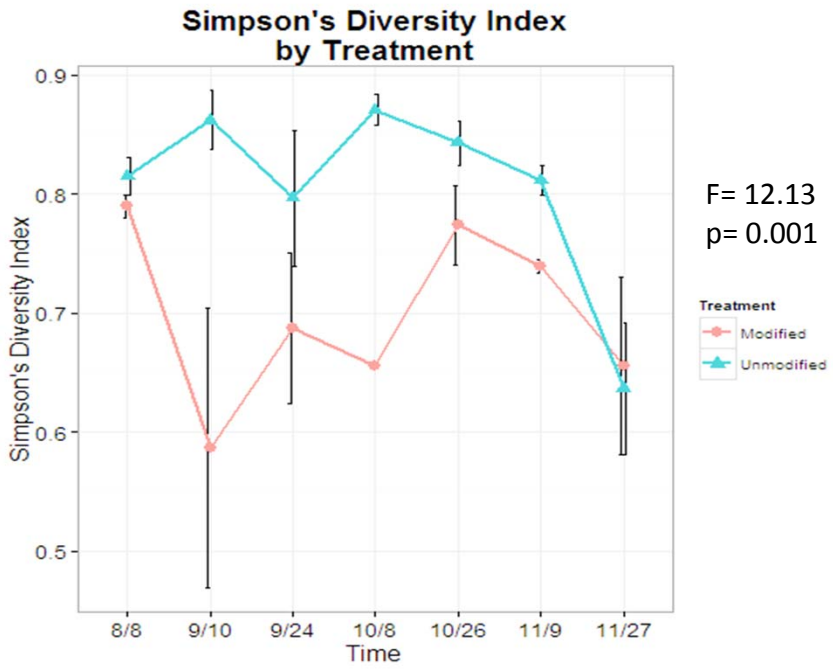
F= 16.81
p< 0.001



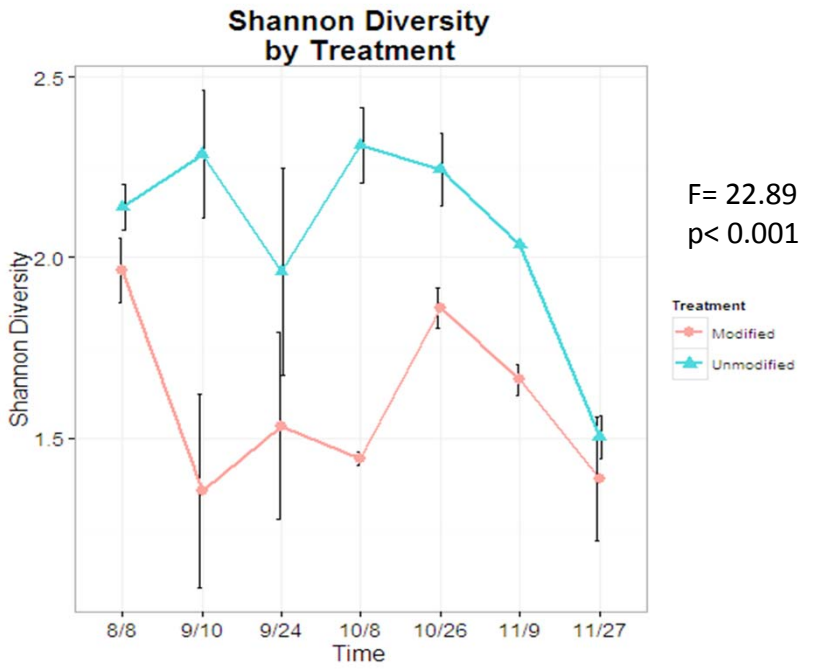
F= 1.307
p= 0.26



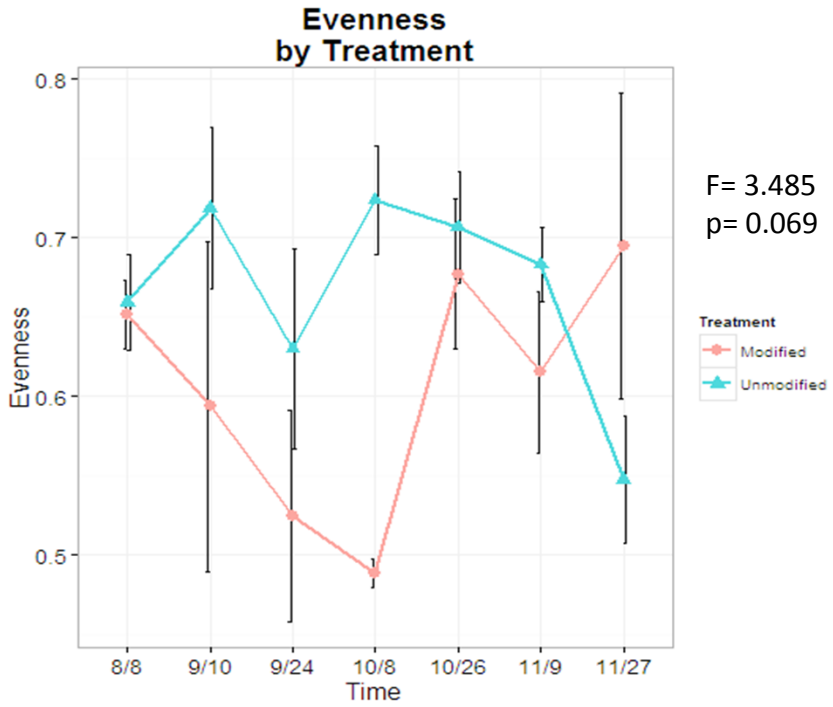
F= 29.35
p< 0.001



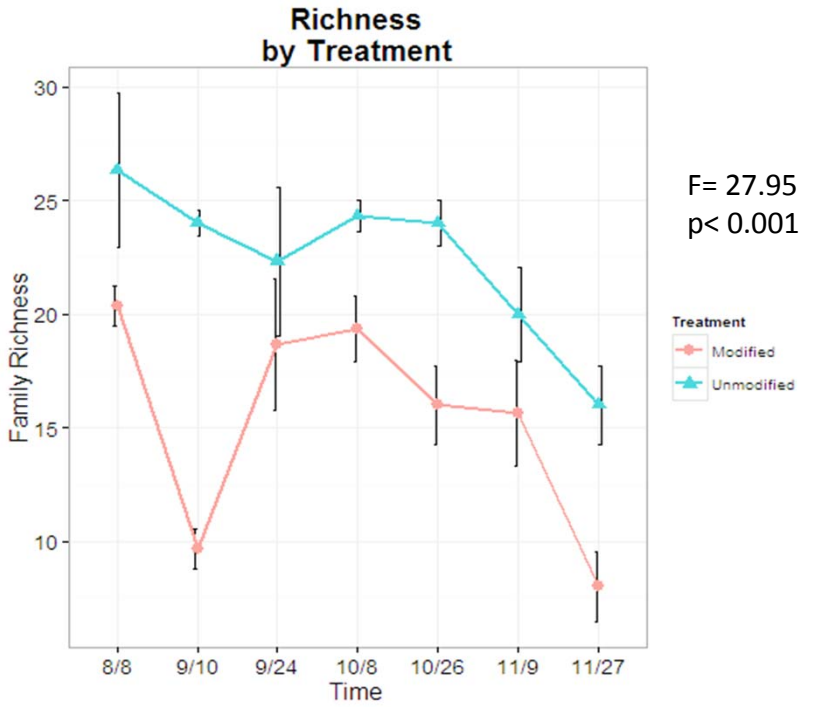
F= 12.13
p= 0.001



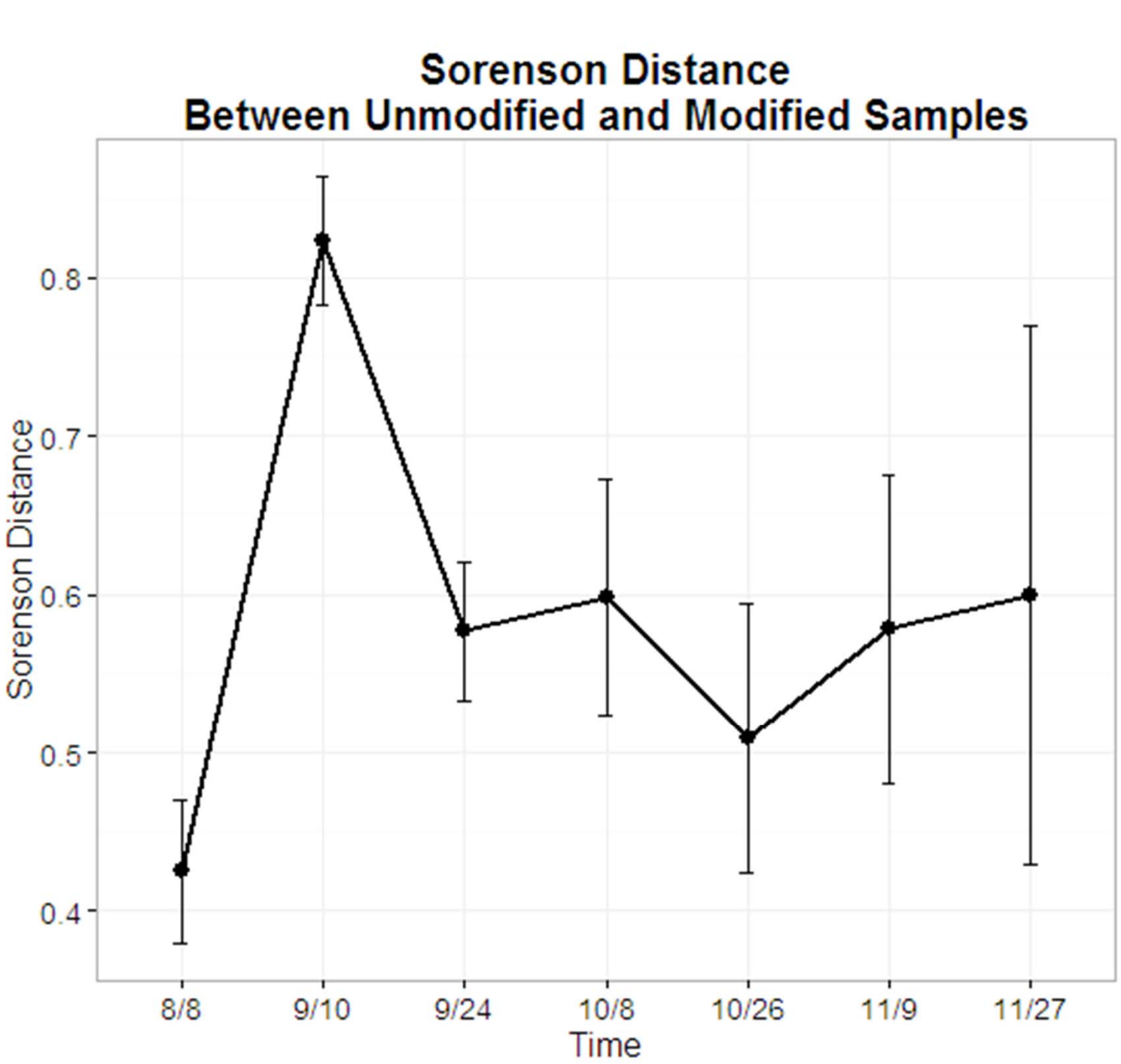
F= 22.89
p< 0.001

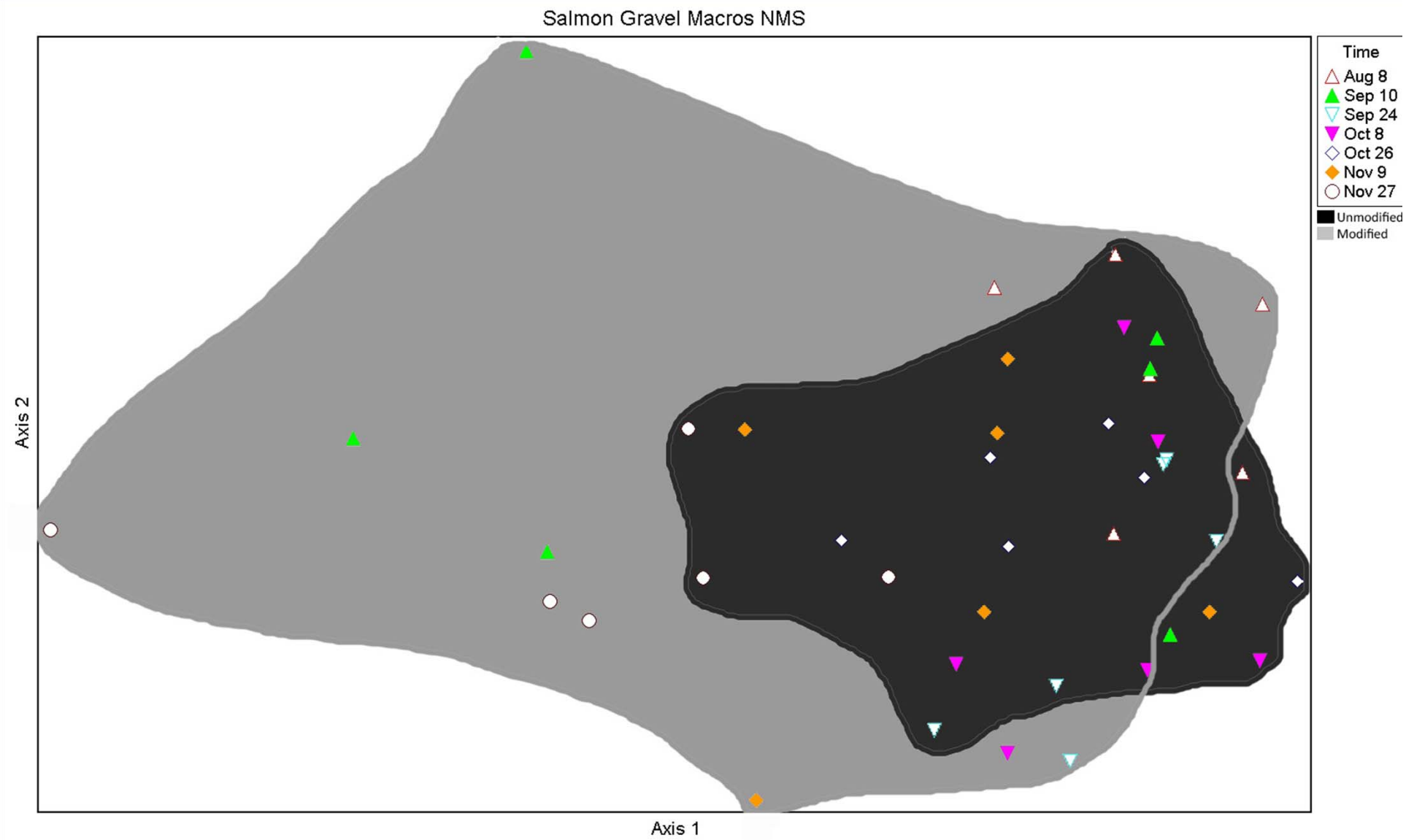


F= 3.485
p= 0.069



F= 27.95
p< 0.001


Sorenson Distance
Between Unmodified and Modified Samples
Sorenson Distance
0.8
0.7
0.6
0.5
0.4
8/8
9/10
9/24
10/8
10/26
11/9
11/27
Time


Salmon Gravel Macros NMS
Axis 2
Axis 1
Time
Aug 8
Sep 10
Sep 24
Oct 8
Oct 26
Nov 9
Nov 27
Unmodified
Modified

Conclusions and Next Steps

- Modified gravels integrated into system within first 3 samples (6 weeks) as seen in Merz and Chan 2005
- Future analyses to tease out random effects: from storm events, or communities drifting on their own after colonization?
- Long-term success dependent on obtaining stable funding
- 2013 work includes lots of additional data collection!

What we want from you:

- Suggestions for additional analyses

- Appropriateness of protocols for small samples and areas

- Suitability of using IBI…highly tolerant/intolerant taxa heavily influence scores in smaller sample sizes. Is there a different way that may be better?

- Suggestions/comments on making data amenable to future SWAMP-scale work, and vice-versa

Sierra Streams Institute

431 Uren St., Suite C

Nevada City, CA 95959

(530)265-6090

www.sierrastreams.org

Linking water, science, and people.