YUROK TRIBE

FINAL
Macroinvertebrate Report: 2010
April 2010 – June 2010

Yurok Tribe Environmental Program
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I. Introduction

This report summarizes the methods and results of macroinvertebrate sampling conducted on selected tributaries of the lower Klamath River within the Yurok Indian Reservation (YIR) boundaries for water year 2010 (WY10). The Yurok Tribe Environmental Program (YTEP) collected macroinvertebrate samples at nine tributary sites starting in April and ending in June in an effort to assess physical/habitat, chemical and biological conditions of selected tributaries during the sampling period. This data was added to previous years' macroinvertebrate data as part of an endeavor to build a multi-year database on the Lower Klamath River. This summary is part of YTEP's comprehensive program of monitoring and assessment of the chemical, physical, and biological integrity of the Klamath River and its tributaries in a scientific and defensible manner.

II. Background

The Klamath River Watershed

The Klamath River system drains much of northwestern California and south-central Oregon (Figure 1). Thus, even activities taking place on land hundreds of miles off the YIR can affect water conditions within YIR boundaries. For example, upriver hydroelectric and diversion projects have altered natural flow conditions for decades. The majority of water flowing through the YIR is derived from scheduled releases of impounded water from the Upper Klamath Basin that is often of poor quality with regards to human needs as well as the needs of fish and wildlife.

Some historically perennial streams now have ephemeral lower reaches and seasonal fish migration blockages which may be influenced by inadequate dam releases from water diversion projects along the Klamath and Trinity Rivers. The releases contribute to lower mainstem levels and excessive sedimentation which in turn causes subsurface flow and aggraded deltas. Additionally, the lower slough areas of some of the Lower Klamath tributaries that enter the estuary experience eutrophic conditions during periods of low flow. These can create water quality barriers to fish migration when dissolved oxygen levels are inadequate for migrating fish. The Klamath River is on California State Water Resource Control Board's (SWRCB) 303(d) List as impaired for temperature, dissolved oxygen, and nutrients and portions of the Klamath River were recently listed as impaired for microcystin and sedimentation.

The basin's fish habitat has also been greatly diminished in area and quality during the past century by accelerated sedimentation from mining, timber harvest practices, and road construction, as stated by Congress in the Klamath River Act of 1986. Management of private lands in the basin (including fee land within Reservation boundaries) has been, and continues to be, dominated by timber harvest for the last 100 years.

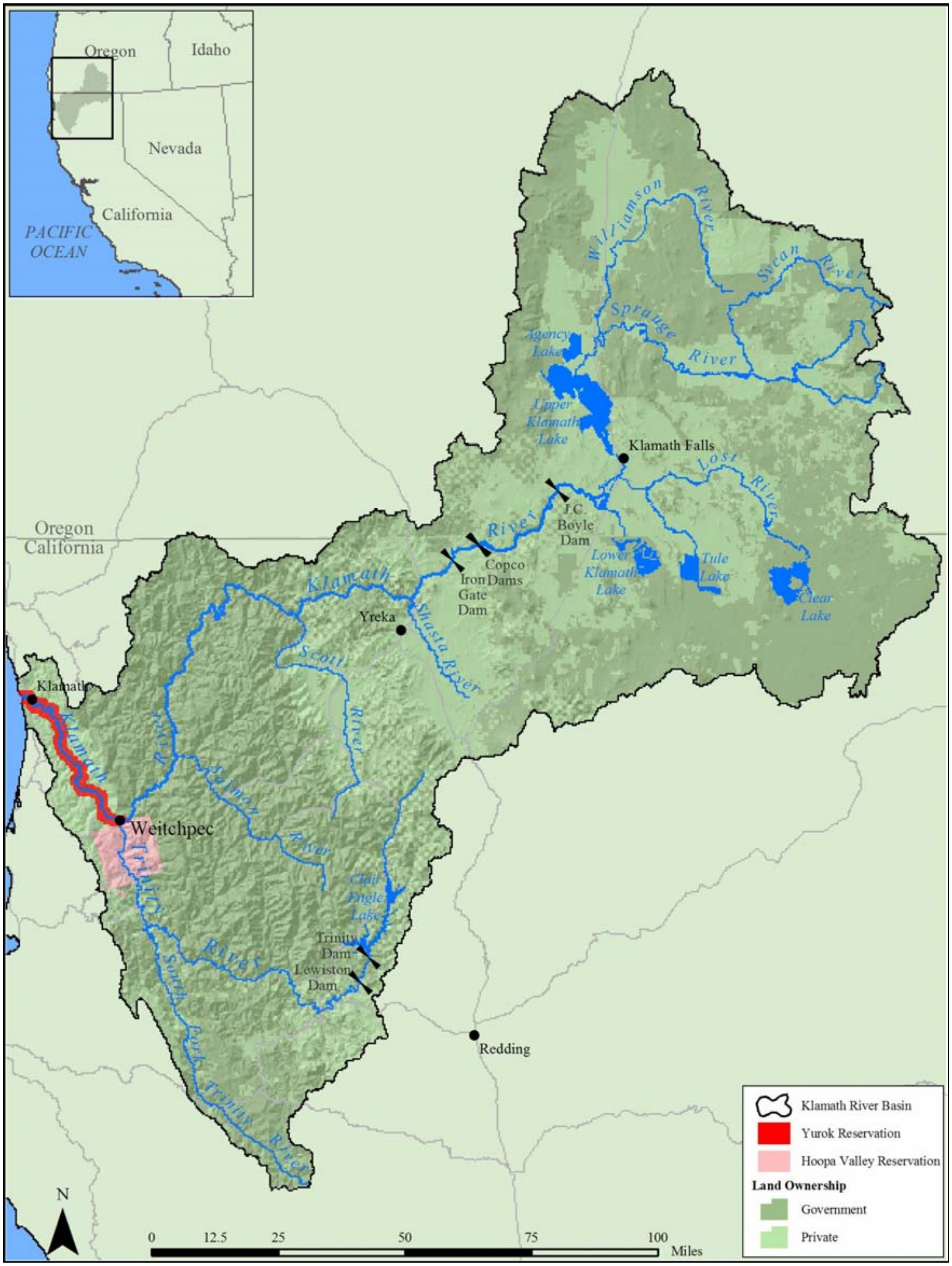

Figure 2-1. Klamath River Basin

The Klamath River

The health of the Klamath River and associated fisheries has been central to the life of the Yurok Tribe since time immemorial fulfilling subsistence, commercial, cultural, and ceremonial needs. Yurok oral tradition reflects this. The Yurok did not use terms for north or east, but rather spoke of direction in terms of the flow of water (Kroeber 1925). The Yurok word for salmon, *nepuy*, refers to "that which is eaten". Likewise, the local waterways and watershed divides have traditionally defined Yurok aboriginal territories. Yurok ancestral land covers about 360,000 acres and is distinguished by the Klamath and Trinity Rivers, their surrounding lands, and the Pacific Coast extending from Little River to Damnation Creek.

The fisheries resource continues to be vital to the Yurok today. The September 2002 Klamath River fish kill, where a conservative estimate of 33,000 fish died in the lower Klamath before reaching their natal streams to spawn, was a major tragedy for the Yurok people.

The Yurok Indian Reservation

The current YIR consists of a 56,000-acre corridor extending for one mile from each side of the Klamath River from the Trinity River confluence to the Pacific Ocean, including the channel (Figure 2). There are approximately two dozen major anadromous tributaries within that area. The mountains defining the river valley are as much as 3,000 feet high. Along most of the river, the valley is quite narrow with rugged steep slopes. The vegetation is principally redwood and Douglas fir forest with little area available for agricultural development. Historically, prevalent open prairies provided complex and diverse habitat.

The majority of the lands in the YIR are fee lands, (mostly owned by Green Diamond Resource Company), which are managed intensively for timber products. A small portion of the YIR consists of public lands managed by Redwood National/State Parks (RNSP), the United States Forest Service (USFS) and private landholdings.

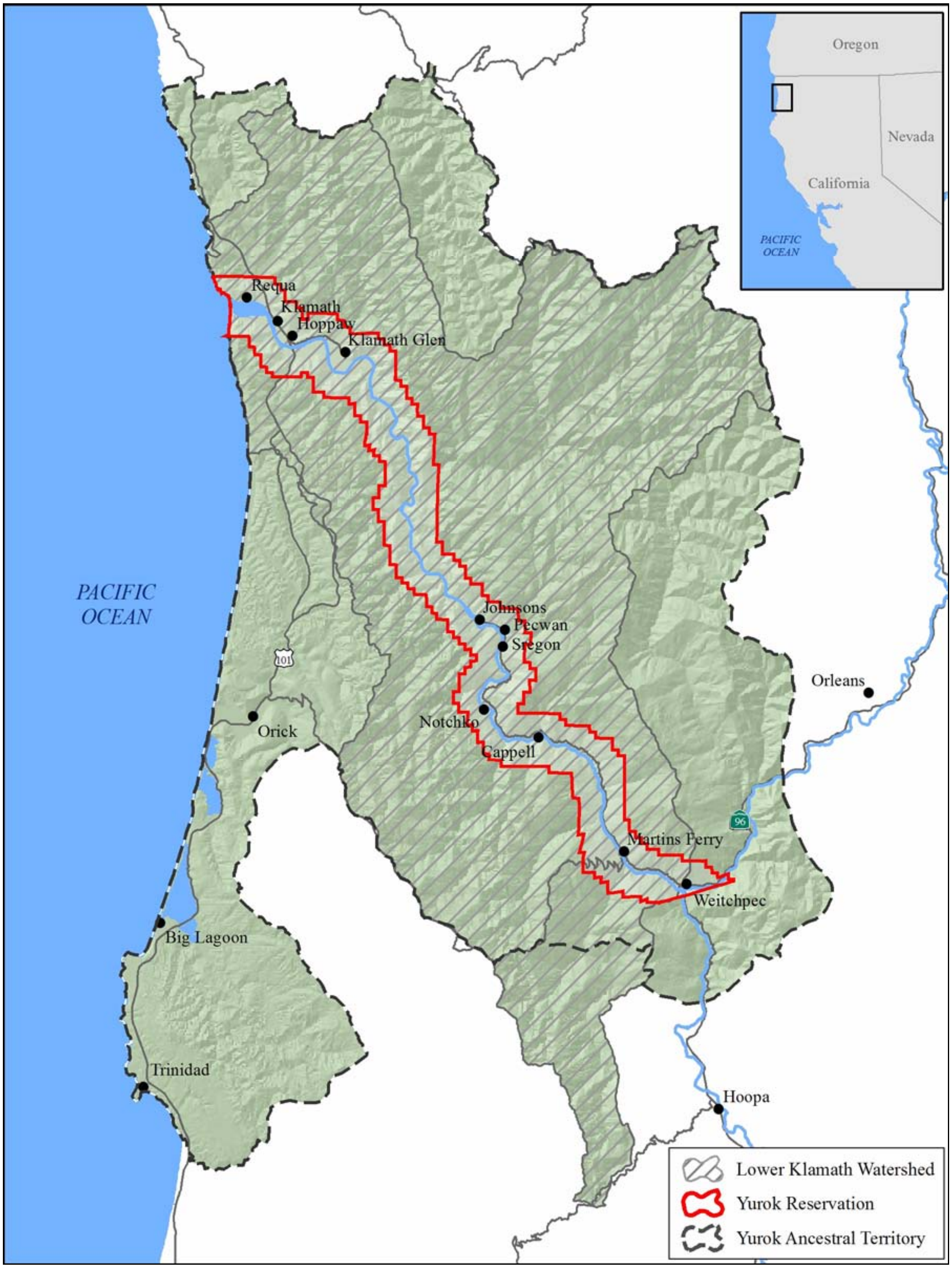

Figure 2-2. Yurok Indian Reservation and Yurok Ancestral Territory

Yurok Tribe Water Monitoring Division

In 1998, YTEP was created to protect and restore tribal natural resources through high quality scientific practices. YTEP is dedicated to improving and protecting the natural and cultural resources of the Yurok Tribe through collaboration and cooperation with local, private, state, tribal, and federal entities such as the Yurok Tribe Fisheries Program (YTFP), US Fish and Wildlife Service (USFWS), the United States Environmental Protection Agency (USEPA), Green Diamond Resource Company, the North Coast Regional Water Quality Control Board (NCRWQCB), and the United States Geological Survey (USGS). Funding allocated under the Clean Water Act Section 106 primarily funds YTEP's water monitoring activities.

Macroinvertebrate Sampling

Evaluating the biological community of a stream or river through assessments of macroinvertebrates provides a sensitive and cost effective means of determining stream condition. Macroinvertebrates, being greater than 0.5mm in size (invertebrates large enough to be seen with the naked eye) are fairly stationary, and are responsive to human disturbances. In addition, the relative sensitivity or tolerances of many macroinvertebrates to stream conditions is well known. Sampling of stream macroinvertebrates for biological assessments is an essential component of any comprehensive stream condition evaluation. The objective of studying macroinvertebrate communities is to monitor the general health and water quality conditions of tributaries to the Klamath River. According to the California Stream Bioassessment Procedure (CSBP) developed by the California Department of Fish and Game (DFG), benthic macroinvertebrate communities indicate physical and habitat characteristics that determine the stream integrity and ecological health.

III. Site Selection

Tributaries

Site selection criteria for macroinvertebrate sampling include spatial distribution, herbicide application activity, watershed restoration activities, proposed future development, and other concurrent water quality monitoring activities. Sites are located in the lower reaches of watersheds that characterize water quality and watershed health condition. YTEP is in the process of developing baseline conditions to document the magnitude and duration of water quality impacts. The following parameters were used as selection criteria for macroinvertebrate sampling:

1. *Spatial Distribution* - Sites located in the lower reaches of watersheds that characterize water quality and watershed health condition. Areas chosen to monitor baseline and long-term trends.

2. *Activity Specific* -Sites located above and/or below herbicide applications and other activities that may potentially impact water quality.

3. *Watershed Restoration Activities*- Sites located in watersheds and sub-watersheds that have active or proposed restoration activities. Sites are selected to monitor the long-term trends by tracking the watershed's recovery.

4. *Proposed Future Development*- Sites near locations of resource and proposed resource development.

Nine tributary locations (Table 3-1, Figure 3-1) were chosen as meeting these requirements. They are: Lower Turwar (Figures 3-2, 3-3), Upper Turwar (Figures 3-2, 3-4), McGarvey (Figures 3-5, 3-6), Lower Blue (Figures 3-7, 3-8), West Fork Pecwan (Figures 3-9, 3-10), East Fork Pecwan (Figures 3-9, 3-11), Mettah (Figures 3-12, 3-13), Roaches (Figures 3-12, 3-14), and Tully (Figures 3-15, 3-16).

Table 3-1. Selection criteria priority matrix for tributary macroinvertebrate sampling*

Creek	Watershed	Sub watershed	Site ID	Primary Criteria	Secondary Criteria	Other
Lower Turwar	Turwar	Turwar	Tu1	1	3	2
Upper Turwar	Turwar	Turwar	Tu2	1	3	2
McGarvey	McGarvey	McGarvey	Mc1	3	1	
Lower Blue	Blue	Lower Blue	LB1	1	3	2
W.F.Pecwan	Pecwan	WF Pecwan	WP1	1	4	
E.F.Pecwan	Pecwan	EF Pecwan	EP1	1	4	
Mettah	Mettah	Mettah	Me1	3	1	
Roaches	Roaches	Roaches	Ro1	1	3	
Tully	Tully	Tully	Ty1	1	4	2

*These criteria may change over time, this is an initial criteria designation based on current activities.

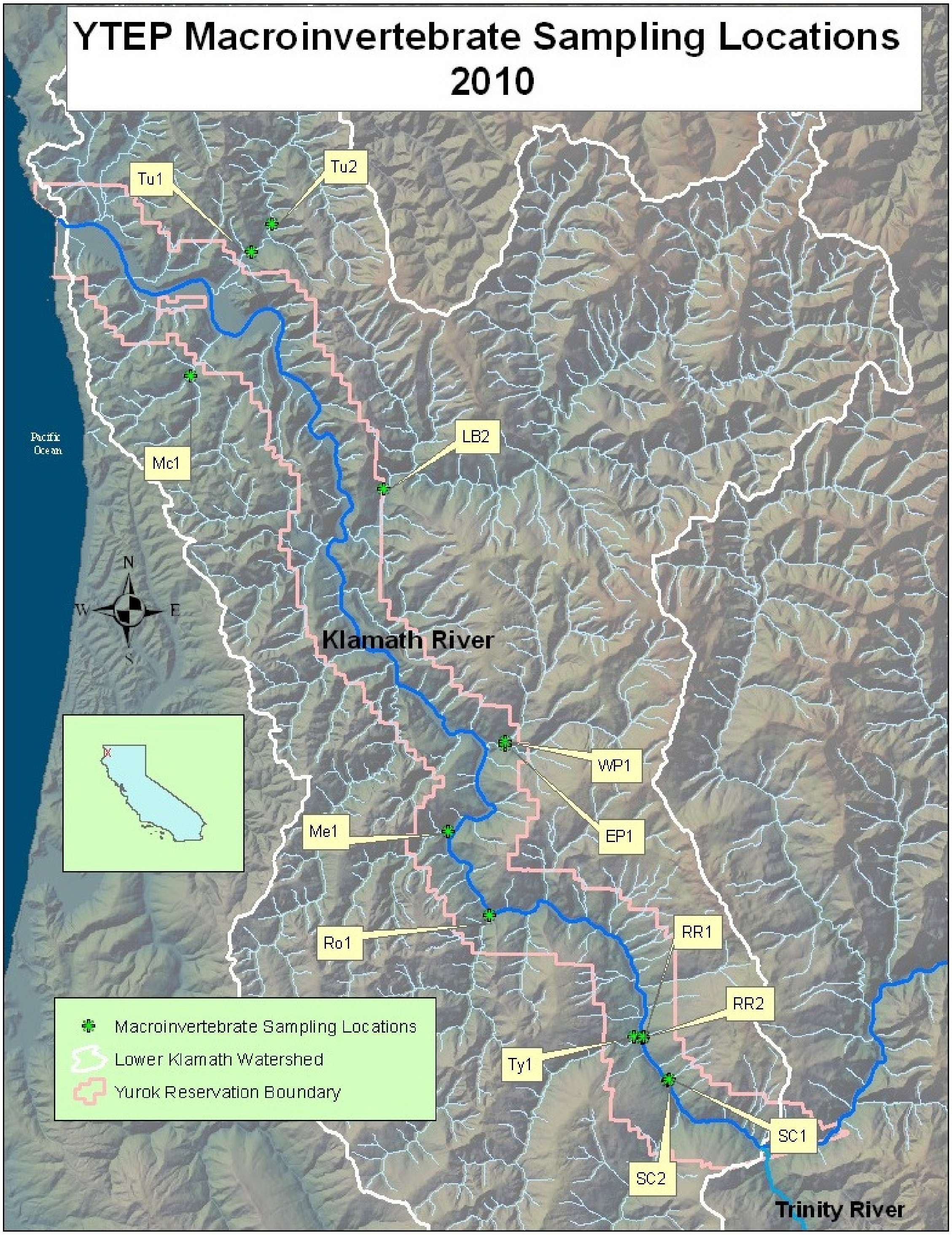

Figure 3-1. Yurok Tribe Environmental Program macroinvertebrate sampling site locations, WY 10

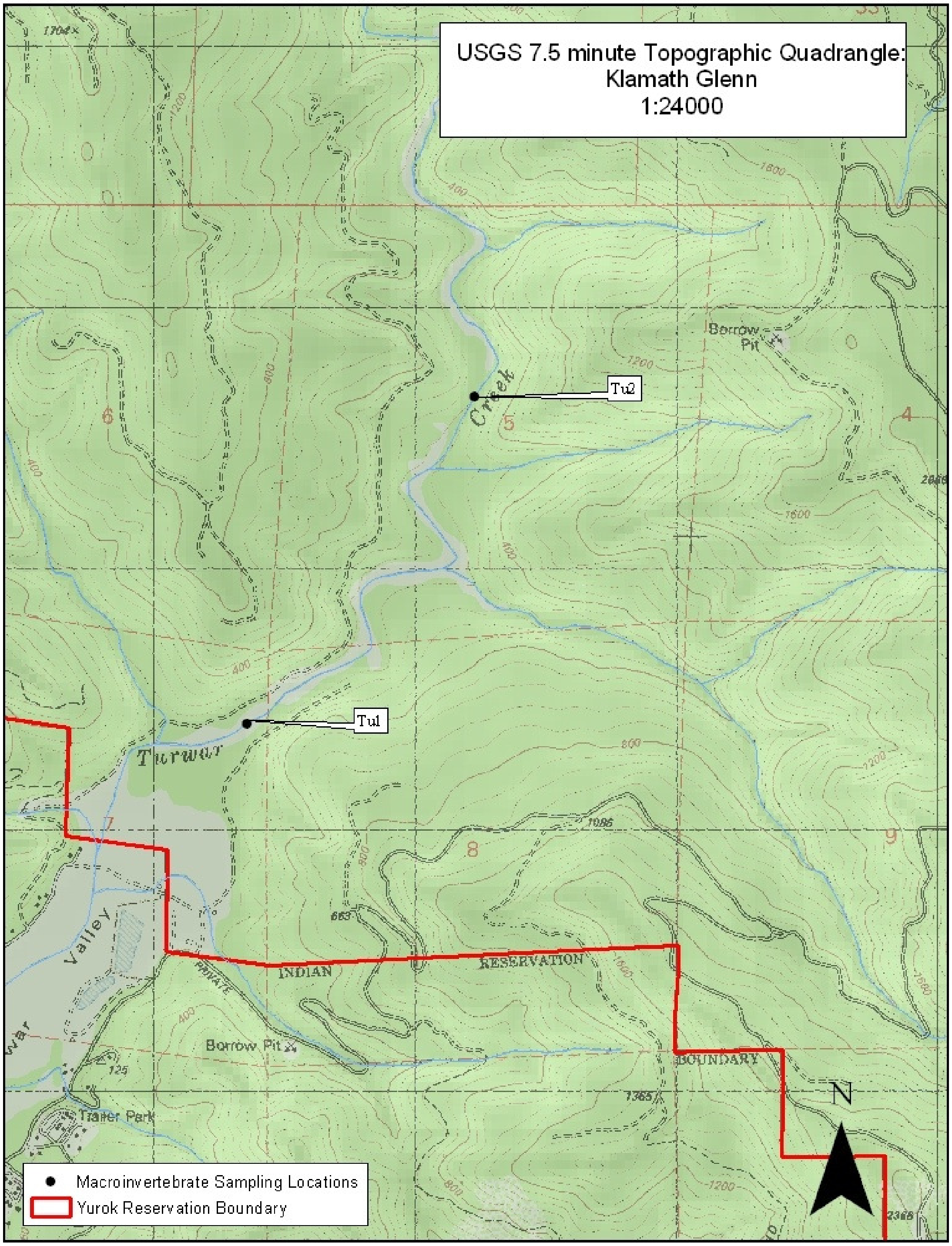

Figure 3-2. Lower (Tu1) and Upper (Tu2) Turwar Creek Sampling Location Map, WY 10

Figure 3-3. Photo of Lower Turwar Creek (Tu1) Sampling Location, WY 10

Figure 3-4. Photo of Upper Turwar Creek (Tu2) Sampling Location, WY 10

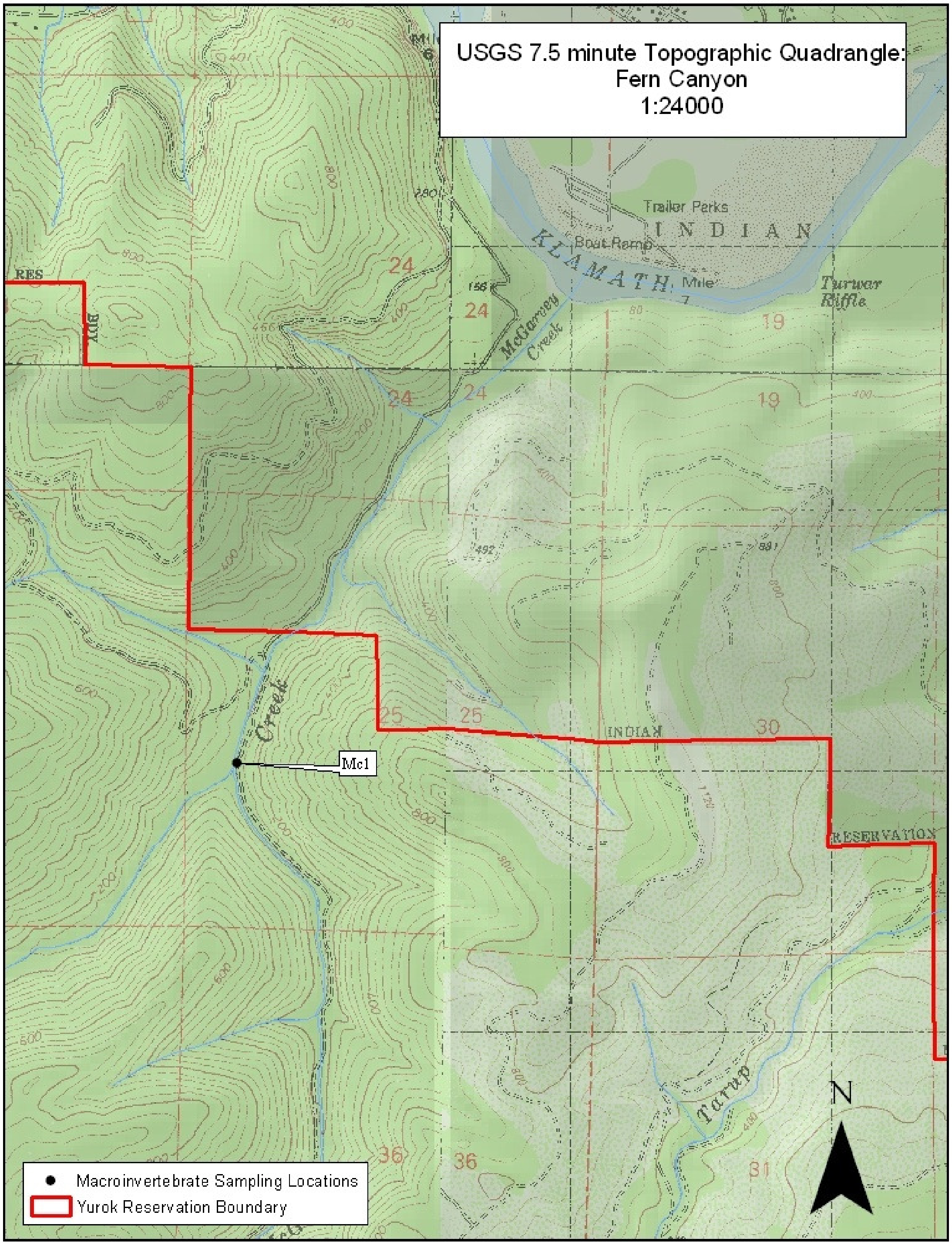

Figure 3-5. McGarvey Creek (Mc1) Sampling Location Map, WY 10

Figure 3-6. Photo of McGarvey Creek (Mc1) Sampling Location, WY 10

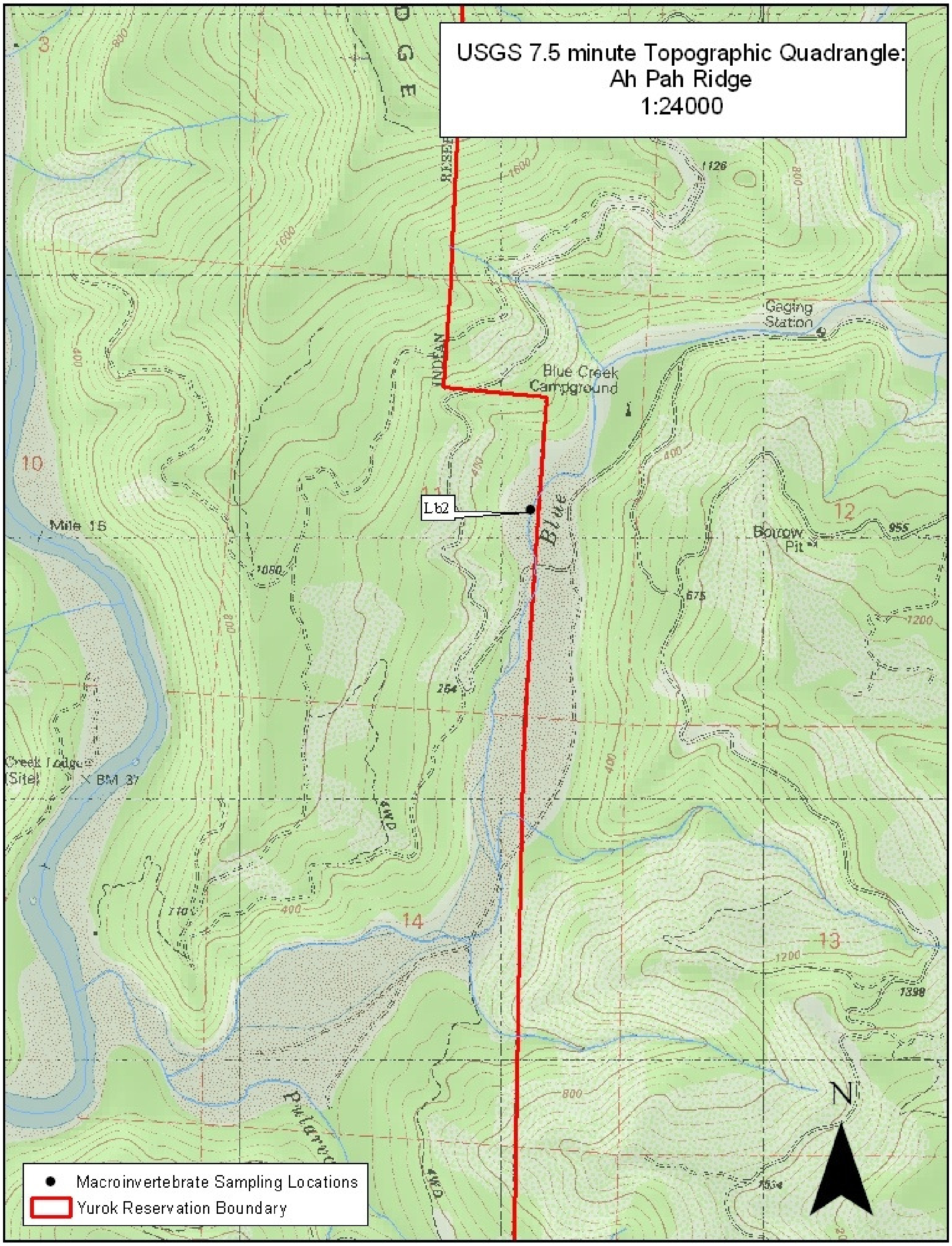

Figure 3-7. Lower Blue Creek (Lb1) Sampling Location Map, WY 10

Figure 3- 8 Photo of Lower Blue Creek (Lb1) Sampling Location, WY 10

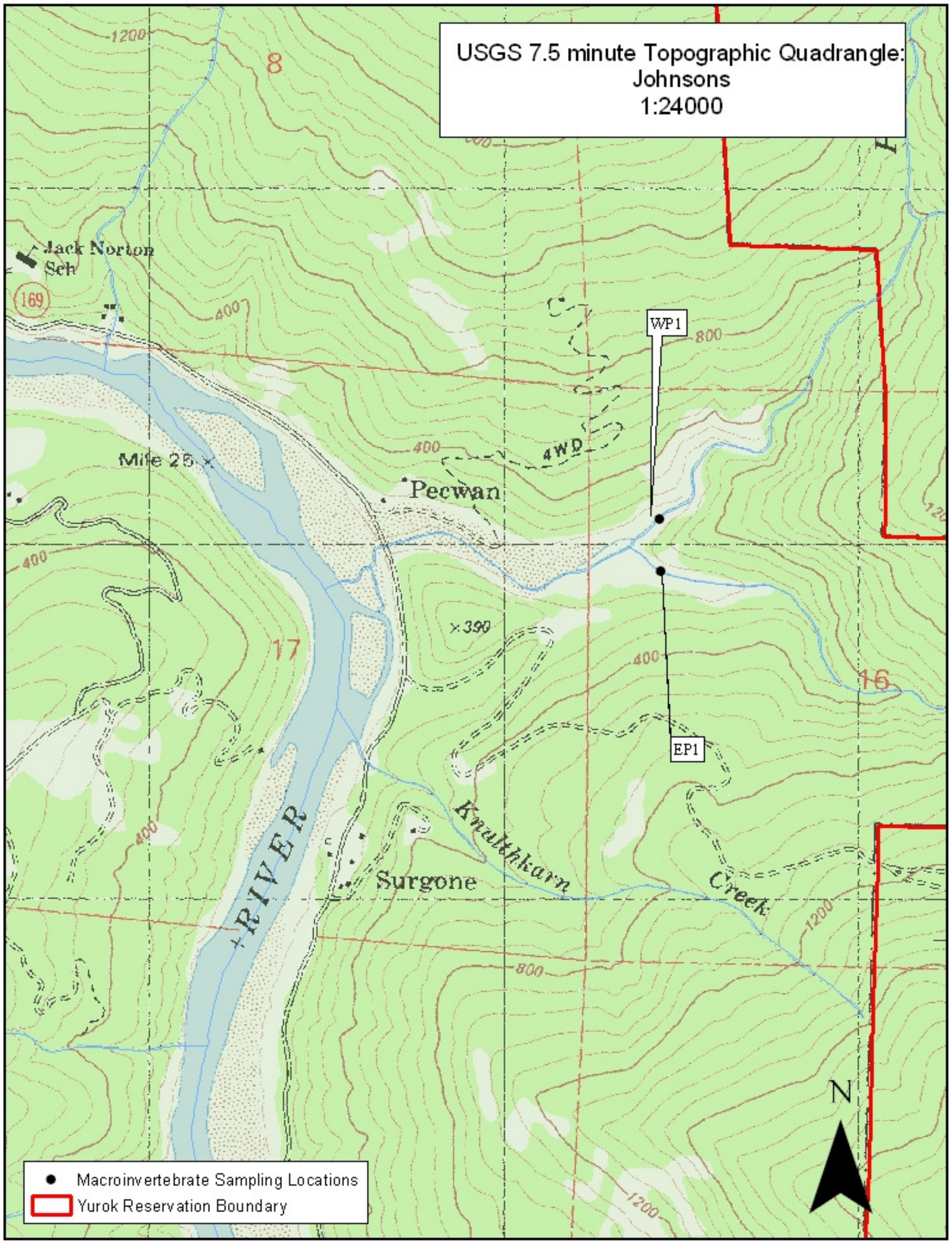

Figure 3- 9. WF Pecwan (WP1) EF Pecwan (EP1) Sampling Locations Map, WY 10


Figure 3-10. Photo of WF Pecwan Creek (WP1) Sampling Location, WY10


Figure 3-11. **Photo EF Pecwan Creek (EP1) Sampling Location, WY 10**

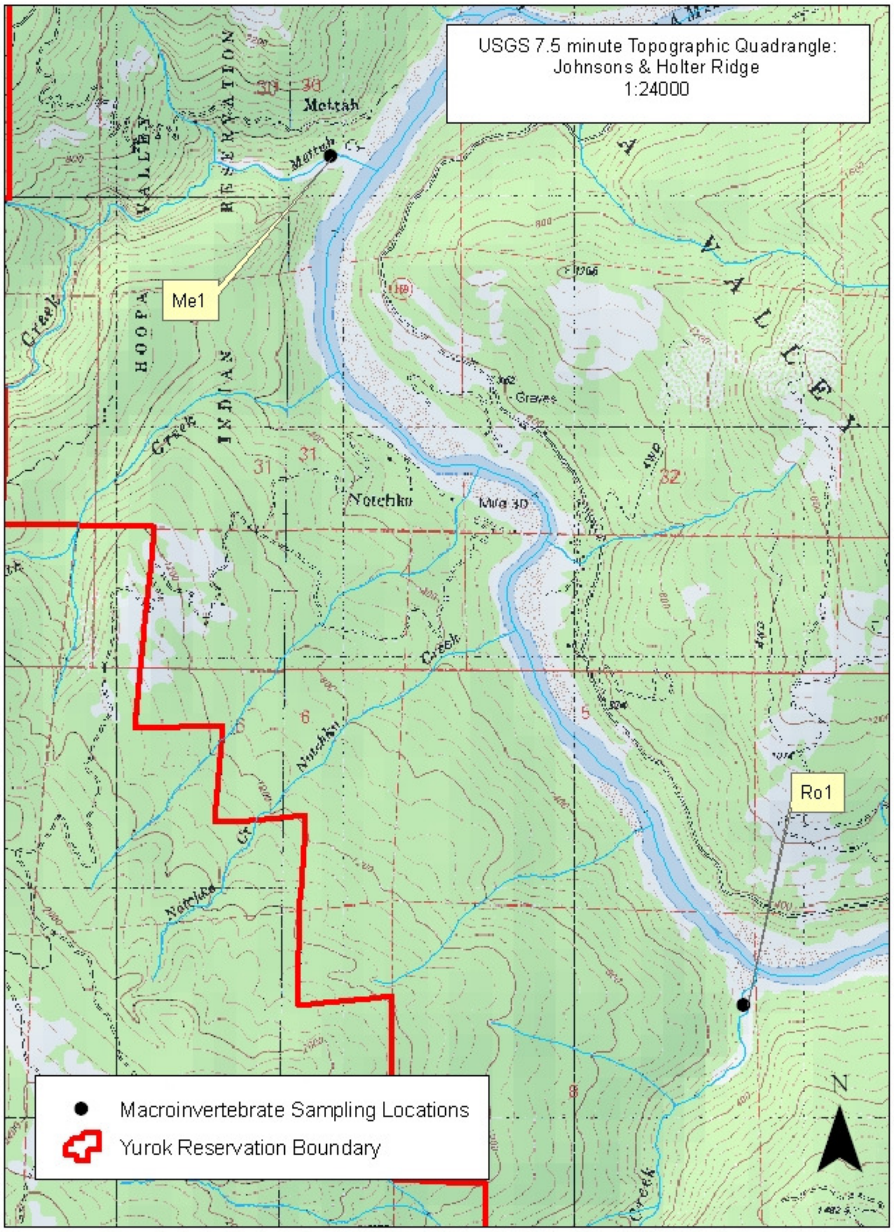

Figure 3-12. Mettah Creek (Me1) and Roaches Creek (Ro1) Sampling Map, WY 10

Figure 3-13. Photo of Mettah Creek (Me1) Sampling Location, WY 10

Figure 3-14. Photo of Roaches Creek (Ro1) Sampling Location, WY 10

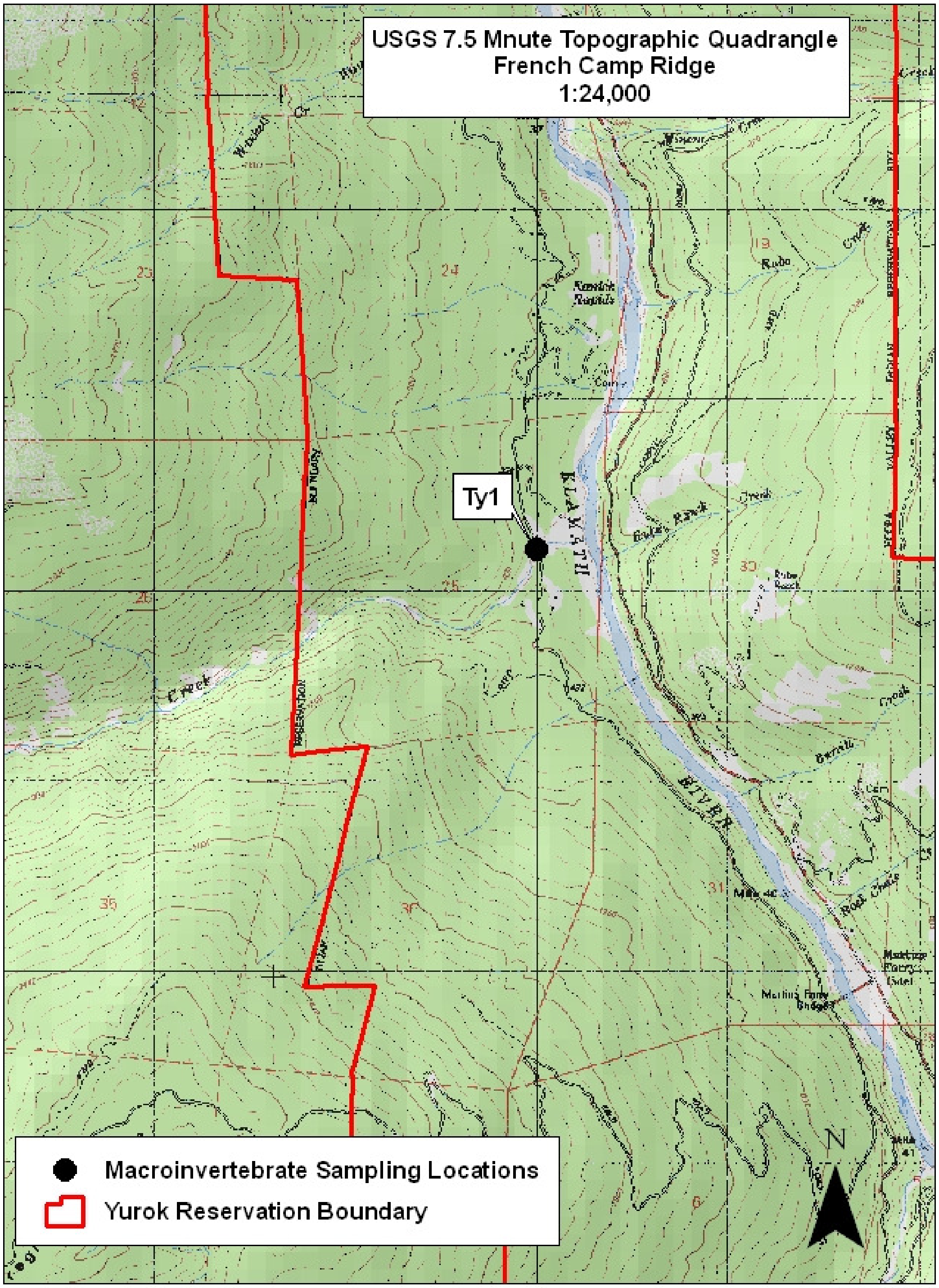

Figure 3-15. Tully Creek (Ty1) Sampling Location Map, WY 10


Figure 3-16. Photo of Tully Creek (Ty1) Sampling Location, WY 10

IV. Methods

YTEP sampled benthic macroinvertebrate populations in selected tributaries of the Lower Klamath River during the spring and summer of 2010. Sampling was performed using the multi-habitat methods located in the State of CA Surface Water Ambient Monitoring Program (SWAMP) *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California February 2010* that the DFG has adapted from the US EPA's "Rapid Bioassessment Protocols of use in Streams and Rivers". This protocol is located in Appendix A. This protocol also includes the collection of water quality parameters and physical habitat conditions in the channel and the riparian zone. This report does not contain this information. The parameters measured include:

- Stream Chemistry
- Instream Habitat Complexity
- Canopy Cover
- Human Influence
- Substrate Size Class
- Cobble Embeddedness
- Riparian Vegetation Classes
- Bank Stability
- Depth Regimes
- Bankfull Width
- Microalgae Thickness
- Macroalgae (Attached, Unattached)
- Macrophytes
- Coarse Particulate Organic Matter
- Epifaunal Substrate/Cover
- Sediment Deposition
- Channel Alteration

The Hydrologic Specialist and two AmeriCorps members collected specimens which were sent to a lab where a certified taxonomist identified and calculated the number and types of species.

A variety of QC measures were undertaken in the macroinvertebrate sampling. Sample labels were properly completed, including the sample identification code, date, stream name, sampling location, and collector's name and placed into the sample container. Chain-of-custody forms, when needed, included the same information as the sample container labels. After sampling had been completed at a given site, all nets, pans, etc. that had come in contact with the sample were rinsed thoroughly, examined carefully, and picked free of organisms and debris. The equipment was examined again prior to use at the next sampling site.

Data generated in the field and laboratory is reviewed prior to being released internally or to an outside agent. Laboratory processing is contracted to Jonathan Lee, a qualified local taxonomist and Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) member. The identification of macroinvertebrates has three levels of benthic macroinvertebrate (BMI) identification. Level 3 is the professional level equivalent and requires identification of BMIs to a standard level of taxonomy, usually the genus and/or species. If questionable macroinvertebrates are encountered, the CDFG Aquatic Bioassessment Laboratory is used as a reference to verify the specimens. Past review of macroinvertebrate results by DFG have shown that all identifications and counts are accurate.

After processing the samples, the biological matrices are received from the taxonomist in an Excel spreadsheet format identifying the sample ID and the breakdown of BMI species into standard taxonomic levels.

V. Results

Metric scores calculated using the identified specimens can be used to describe macroinvertebrate community structure and determine disturbance status of a stream habitat.

What follows is a brief description of metrics calculated for the YTEP samples which have proven to be useful in the Pacific Northwest (Fore et al. 1996; Karr and Chu 1999) and northern California (Harrington et al. 1999) and the results obtained from WY10 sampling.

- *Taxa Richness:* A richness measure. The total number of distinct taxa in a sample. Reflects health of the community through measurement of the variety of taxa present. Generally increases with increasing water quality, habitat diversity, and/or habitat suitability (Plafkin et al. 1989) (Tables 5-1 and 5-3, Figure 5-1)

- *EPT Taxa Richness:* A richness measure. The total number of Ephemeroptera (Mayfly), Plecoptera (Stonefly), and Trichoptera (Caddisfly) taxa present. These orders are considered generally sensitive to disturbance. Expected to decrease with human induced disturbance (Tables 5-1 and 5-3, Figure 5-2)

- *Percent Sensitive EPT Index:* A composition measure. Proportion of sample composed of Ephemeroptera, Plecoptera and Trichoptera taxa which have been assigned a tolerance value of 0 to 3. Expected to decrease with degraded habitat (Tables 5-1 and 5-3, Figure 5-3)

- *Percent Dominant Taxon:* A Tolerance/Intolerance measure. Percent contribution of the most numerous taxon present in a sample. A community dominated by relatively few taxa would indicate environmental stress (Plafkin et al. 1989). Expected to increase with stress (Tables 5-1 and 5-3, Figure 5-4).

- *Tolerance Value:* A tolerance/intolerance measure. A biotic index which evaluates tolerance of benthic macroinvertebrate to organic enrichment. Taxa tolerant of organic enrichment are also generally tolerant of warm water, fine sediment, and heavy filamentous algal growth (Wisseman 1996). Scale is 0 through 10, 0 being highly intolerant and 10 being highly tolerant of organic enrichment. The tolerance value is calculated as: $TV=\_(n_i t_i)/N$, where n_i is the number of individuals in a taxon, t_i is the tolerance value for that taxon, and N is the total number of individuals in the sample. Value expected to increase with stressed environment. Tolerance values are from California Department of Fish and Game (2003) listed values, however are subject to modification as more data is gathered (Tables 5-1 and 5-3, Figure 5-5).

- *Shannons Diversity Index (H):* A diversity index is a mathematical measure of taxa diversity in a community. Shannons index accounts for both abundance and evenness of the taxa present. The proportion of taxa *i* relative to the total number of taxa (p_i) is calculated, and then multiplied by the natural log of this proportion ($\ln p_i$). The resulting product is summed across taxa, and multiplied by -1: $\boldsymbol{H}=-\_p_i \ln p_i$; Diversity is expected to decrease with disturbance (Tables 5-1 and 5-3, Figure 5-6)

Karr and Chu (1999) consider relative abundance to be a poor candidate for use in stream monitoring because of the great natural variation that can occur. Low relative abundance during rapid flow may, in fact, be related to sediment input. The primary disturbance within the study streams is expected to be an increase in fine sediment. Fine sediment reduces the area of substrate available for colonization by macroinvertebrates. Areas of fine sediment in running water are unstable and do not allow a foothold for macroinvertebrates. Fine sediment also fills in areas around cobble substrates reducing usable habitat. Lenat et al. (1981), in North Carolina streams, found that during high flows the addition of sediment simply reduced the available habitat and therefore invertebrate density. Exposed cobble/rubble substrates act as refugia but the number of exposed surfaces is reduced by sediment input. Reduced species richness were an artifact of reduced sample size.

Lenat et al. (1981) also noted a stable sand community which developed during low flow conditions. This consisted of tolerant small grazers capable of rapid colonization and reproduction which utilized increased periphyton growing on the stable sand. Relative abundance and tolerance values would increase in stable sand.

Table 5-1. Reported macroinvertebrate metrics for lower Klamath tributary sites sampled in WY10

Sample I.D.	Sample Date	Total # of Specimens	Taxa Richness	EPT Taxa Richness	Sensitive EPT Index (%)	% Dominant Taxon	Tolerance Value	Shannon's DI	Est Relative Abundance
Lower Turwar	6/28/2010	511	31	15	18.79	34.83	4.61	2.17	1485
Upper Turwar	7/12/2010	505	39	20	21.58	31.49	4.20	2.64	1347
McGarvey	6/29/2010	520	46	28	33.85	32.50	4.02	2.82	2818
Blue	8/6/2010	511	36	19	19.96	42.66	4.61	2.25	4816
W.F.Pecwan	8/2/2010	508	39	22	37.60	33.86	3.43	2.40	728
E.F.Pecwan	8/2/2010	522	41	24	34.29	23.75	3.56	2.62	1230
Mettah	7/8/2010	502	49	23	12.55	28.29	4.71	2.64	6320
Roaches	7/23/2010	513	44	19	11.89	41.52	5.05	2.44	3493
Tully	7/15/2010	508	43	21	24.41	17.72	3.98	2.90	1016

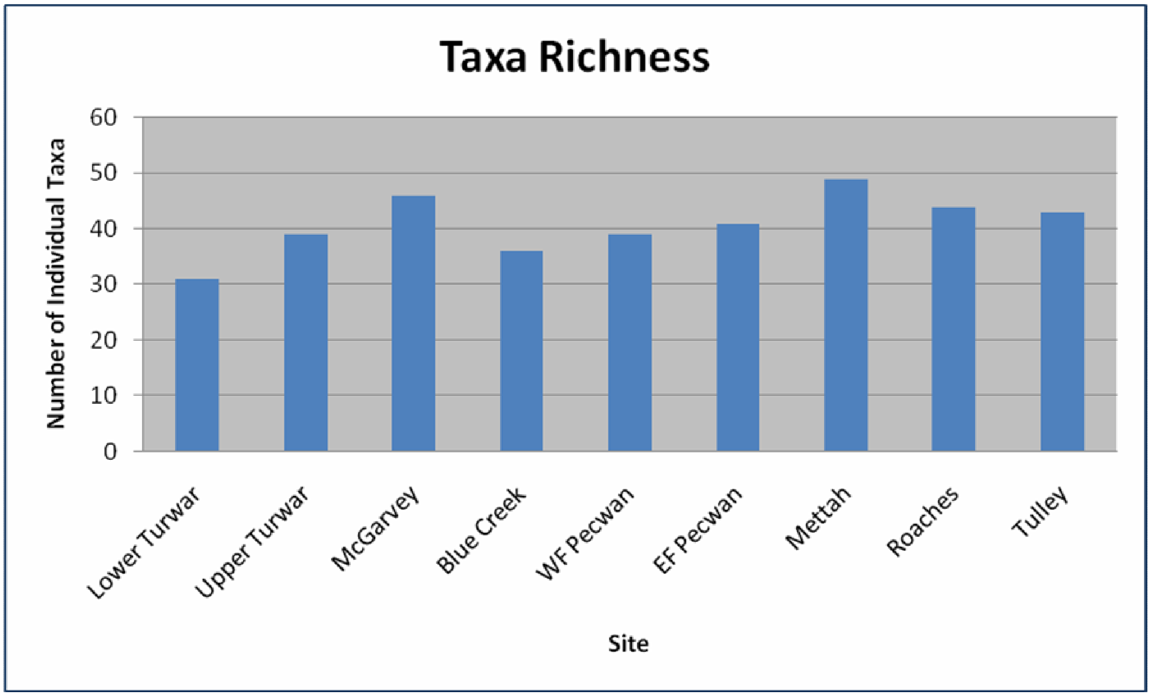

Figure 5-1. Taxa Richness for Klamath River Tributaries WY10

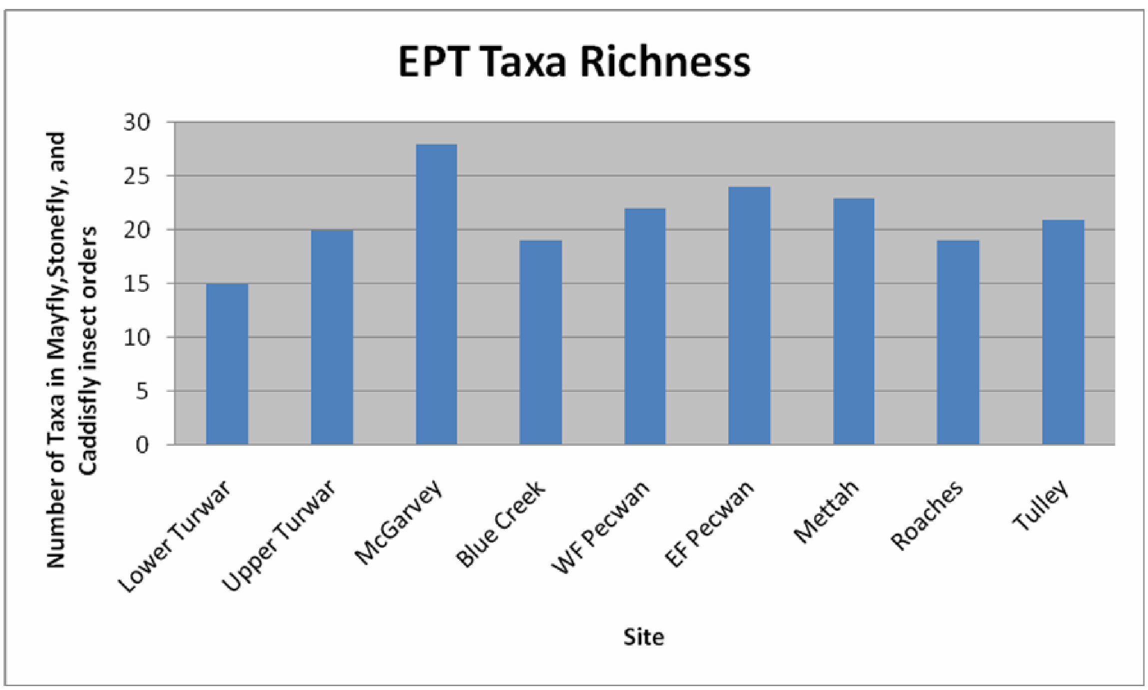

Figure 5- 2. EPT Taxa Richness for Klamath River Tributaries WY10

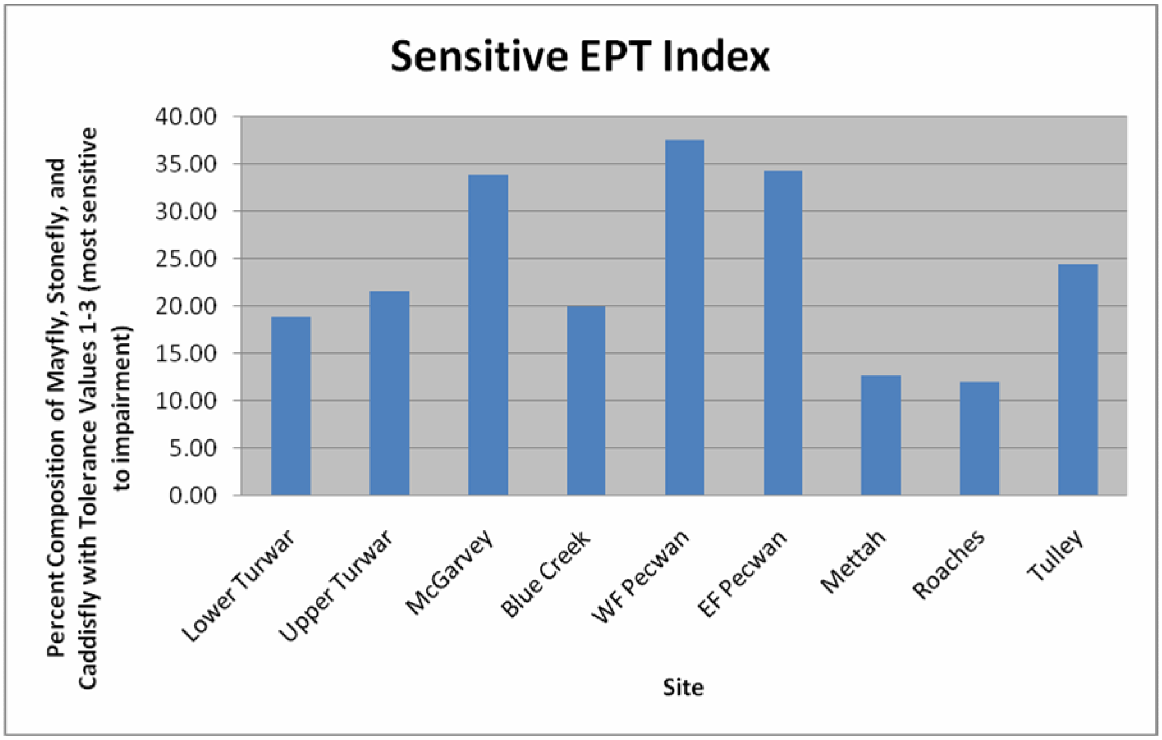

Figure 5- 3. Sensitive EPT Index (%) for Klamath River Tributaries WY10

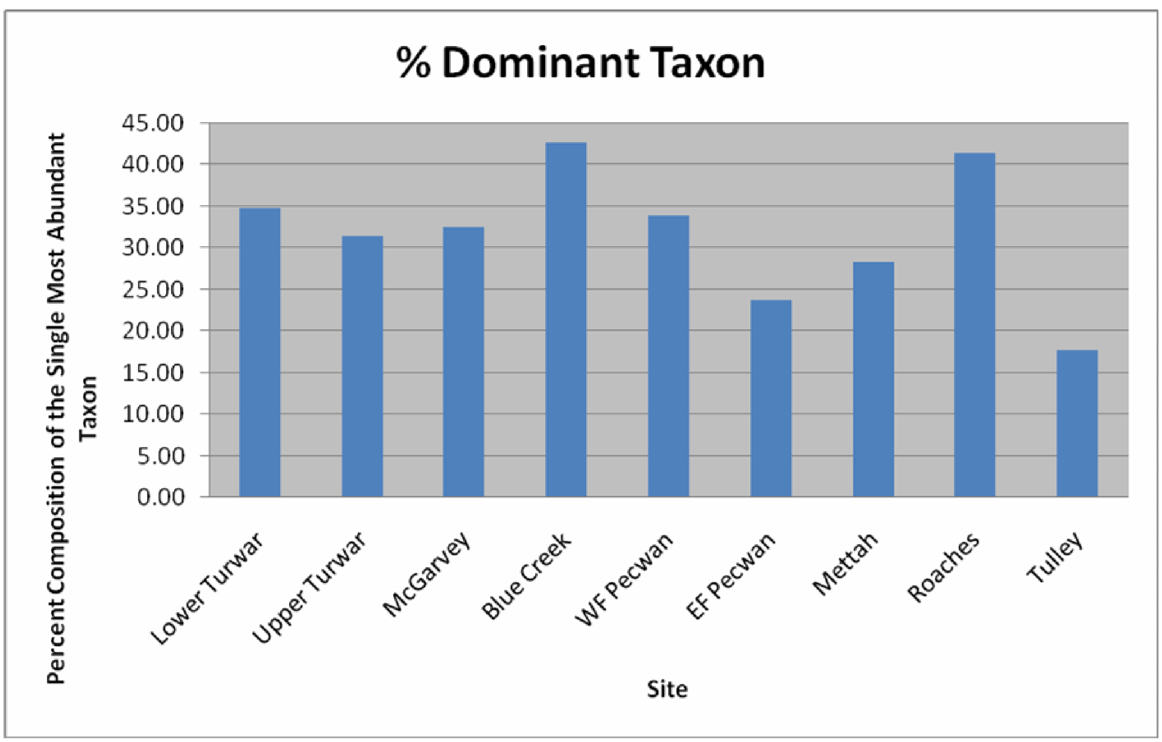

Figure 5- 4. % Dominant Taxon for Klamath River Tributaries WY10

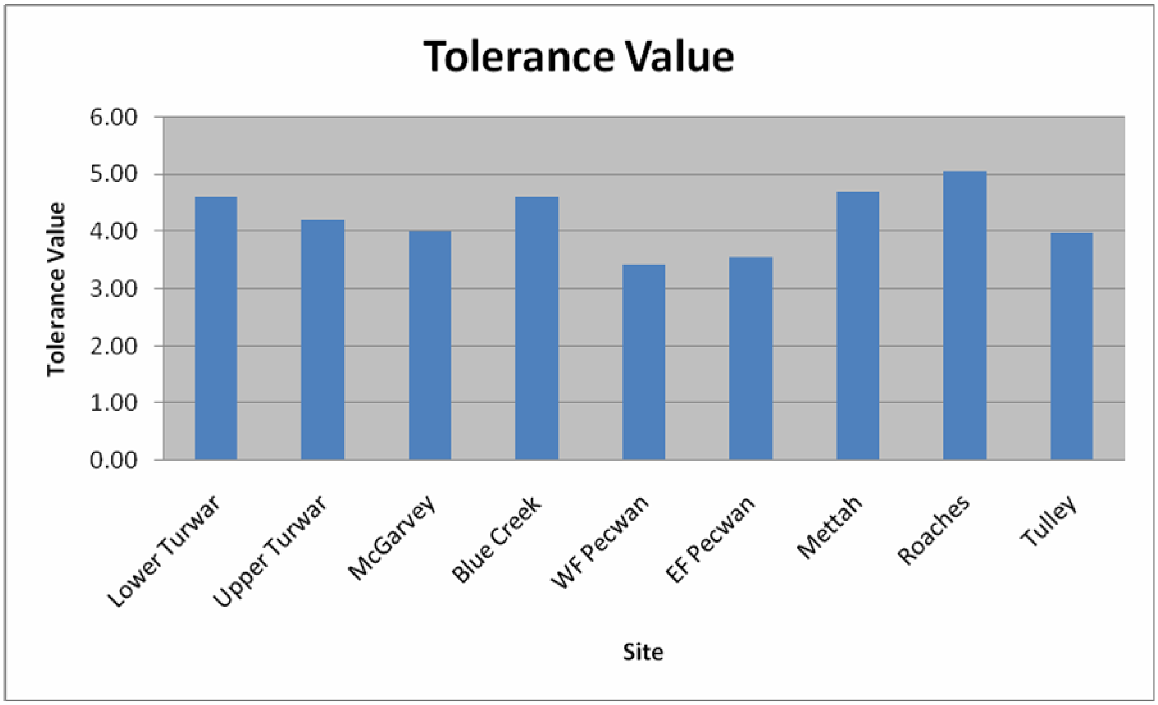

Figure 5- 5. Tolerance Values for Klamath River Tributaries WY10

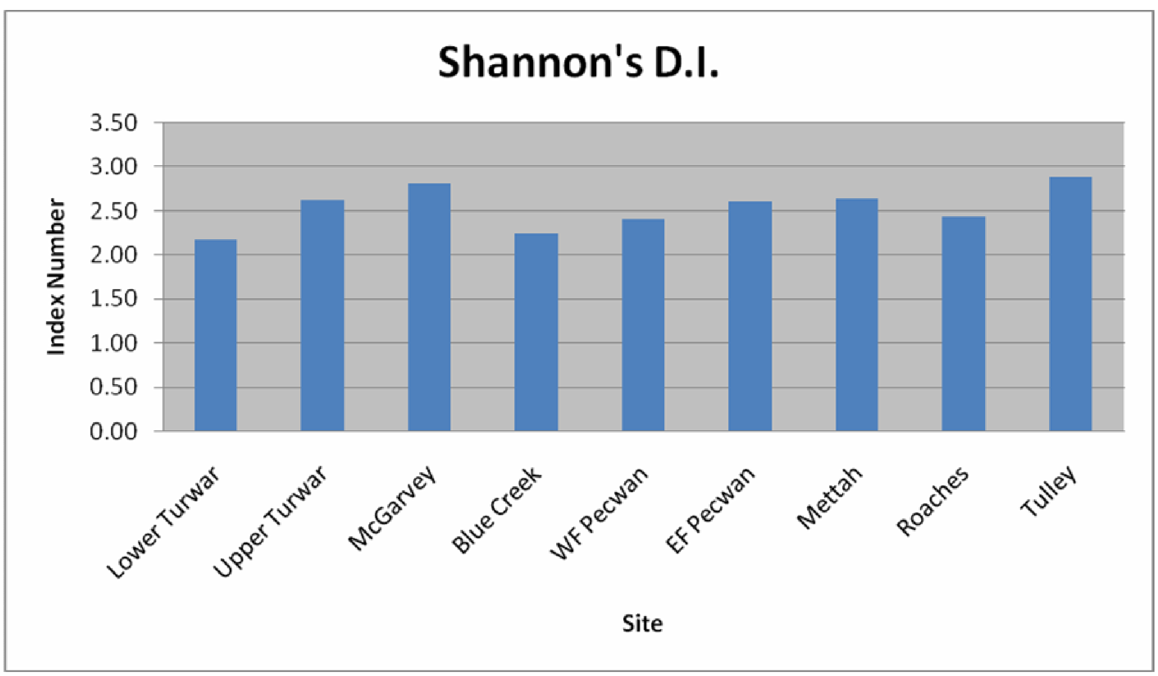

Figure 5- 6. Shannon Diversity Index for Klamath River Tributaries WY10

Macroinvertebrate results are presented for WY10 using the North Coast IBI. DFG developed the North Coast IBI to generate a single value to gauge stream health. Among the metrics used, 6 of the 8 were statistically different than the reference sites in early development of the IBI index for the Klamath region. A separate scoring scale was created to correct these statistical differences. In order to insure the greatest quality control, this separate scoring system was used when generating the metric for WY10. The results of this ranking method are as follows, along with the IBI scoring key.

Table 5- 2. IBI Scoring Key

Total metric score	Value
0-20	very poor
21-40	poor
41-60	fair
61-80	good
81-100	very good

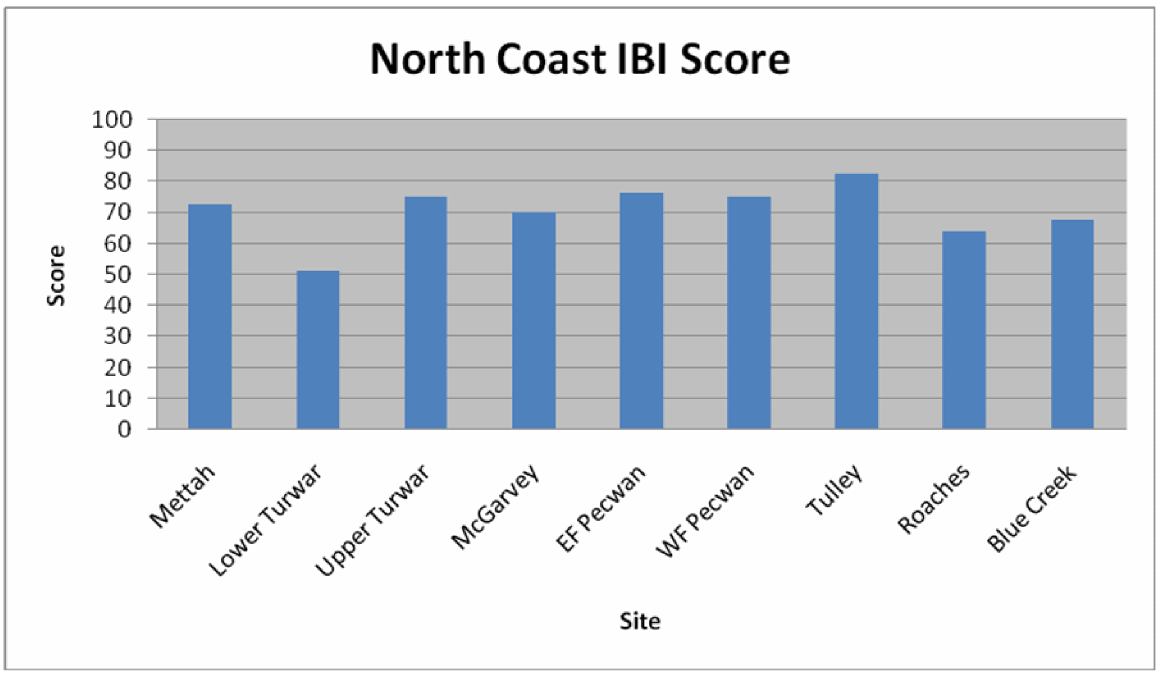

Figure 5- 7. North Coast IBI Scores for Klamath River Tributaries WY10

Table 5- 3. North Coast IBI Scores for Klamath River Tributaries WY10

Site	Date	EPT Richness	Coleoptera Richness	Diperta Richness	%Intolerant	%Non-Gastropod	%Predator	%Shredder	%Non -insect	Score Total
McGarvey	6/29/2010	10	7	6	7	3	10	5	8	70
Mettah	7/8/2010	9	10	8	3	5	7	8	8	72.5
Upper Turwar	7/12/2010	7	10	5	6	9	10	5	8	75
Lower Turwar	6/28/2010	5	5	5	5	4	6	4	7	51.25
Tully	7/15/2010	8	10	8	6	10	7	9	8	82.5
EF Pecwan	8/2/2010	9	10	4	9	10	5	6	8	76.25
WF Pecwan	8/2/2010	8	10	5	9	10	4	6	8	75
Roaches	7/23/2010	7	10	7	3	8	4	6	6	63.75
Lower Blue	8/6/2010	7	7	5	6	5	10	7	7	67.5

VI. Discussion

YTEP strides to collect the most credible data possible, to accomplish this YTEP follow the SWAMP protocol. This protocol requires a minimum of 450 total numbers of specimens to generate appropriate statistics for the stream, giving us a statistically significant sampling set from which results were generated. All sampling sites for the WY 10 yielded a minimum of 450 total species. All data for Klamath River tributaries is compared to assess the overall health of the Klamath River Watershed for the water year 2010.

With the all the sites coming in with a "good or very good" rating on the IBI scores (with one exception) shows that there has been a very good year for macroinvertebrates in these streams. Lower Turwar was the only stream with an IBI score of "fair".

Lower Turwar Creek was found to have the most impaired stream health based on the final tallied metric score, with a summed IBI value of 51.25. When looking back through table 5-3 there appears to be no single factor that brought the score for Lower Turwar down, it seems to be spread out equally through all the categories. There have been multiple restoration projects around Lower Turwar over the past couple of years, making the development of this stream important to monitor.

Roaches and Mettah sites had the lowest Sensitive EPT Index (%). With both numbers coming under 13%, is showing that they are significantly lower than other sampling sites. These sensitive taxa are the first to go once streams start to degrade, making these streams important to keep an eye on through the next years.

All of the nine tributary sites sampled were found to be in the 'un-impaired' range apart from Lower Turwar. The index for IBI scores defines 'impaired' as a score of 52 or below. However, the Tully site was the only site to score in the "very good" range. All of these sample sites exist in areas of either historic and or active logging operations.

VII. Past Years Results

The graphs below display the Northern California IBI scores from the past years for all sites YTEP studied this year. This is an easier way to see some of the trends over time with the different sites.

One of the most notable changes is the difference between Upper and Lower Turwar. Where Upper Turwar has stayed fairly consistent through the past years, you can see how Lower Turwar has had quite large changes in its macroinvetebrate. The large swings shown in Lower Turwar's score could be because of the restoration projects that have been taking place there for the past few years.

On average all the sites are doing well, since the beginning of our monitoring there has never been a site that was considered to be "poor" based on the IBI scoring. In 2005 most of the sites scored lower than the other years. No sites are consistently degrading over time, just small fluctuations from year to year.

Table 7- 1. IBI Scoring Key

Total metric score	Value
0-20	very poor
21-40	poor
41-60	fair
61-80	good
81-100	very good

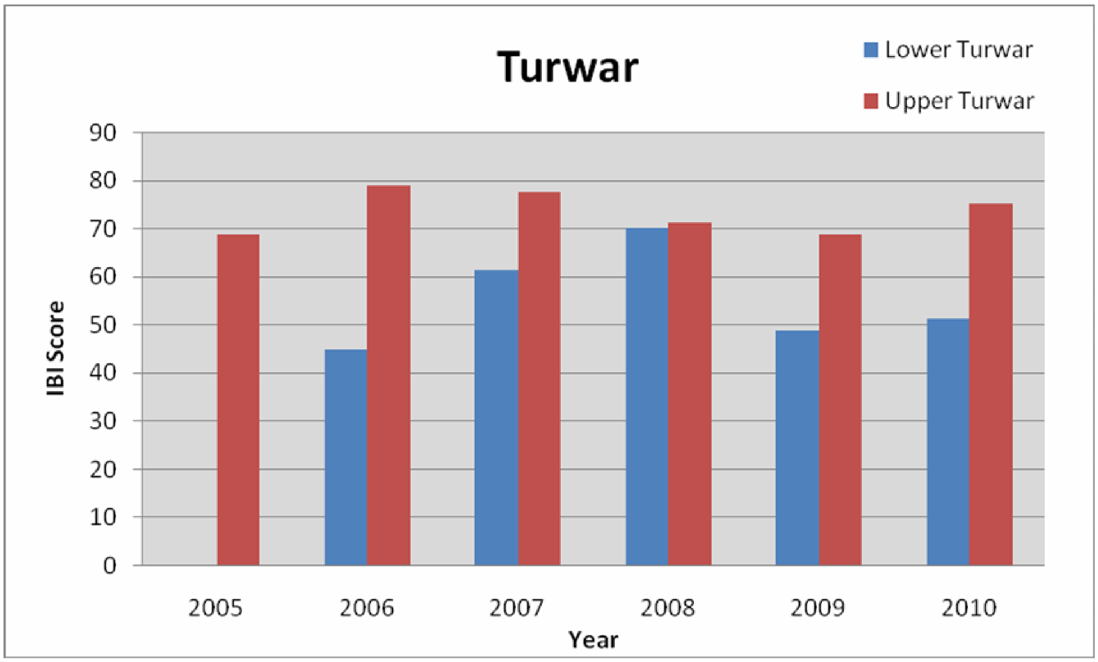

Figure 7-1. IBI scores for Lower & Upper Turwar 2005-2010

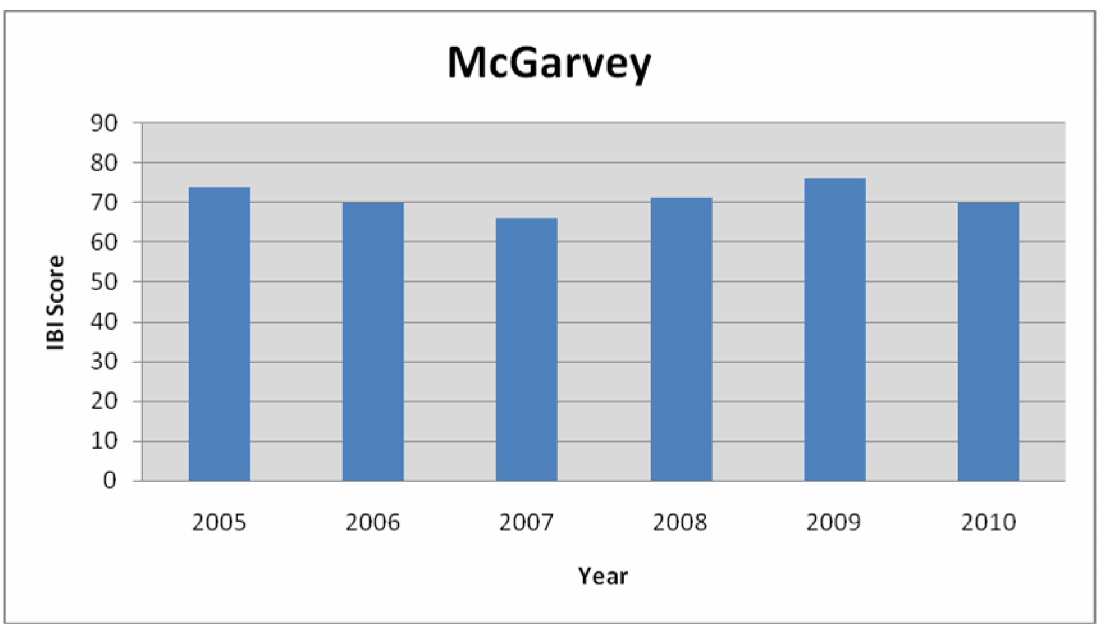

Figure 7-2. IBI scores for McGarvey Creek 2005-2010

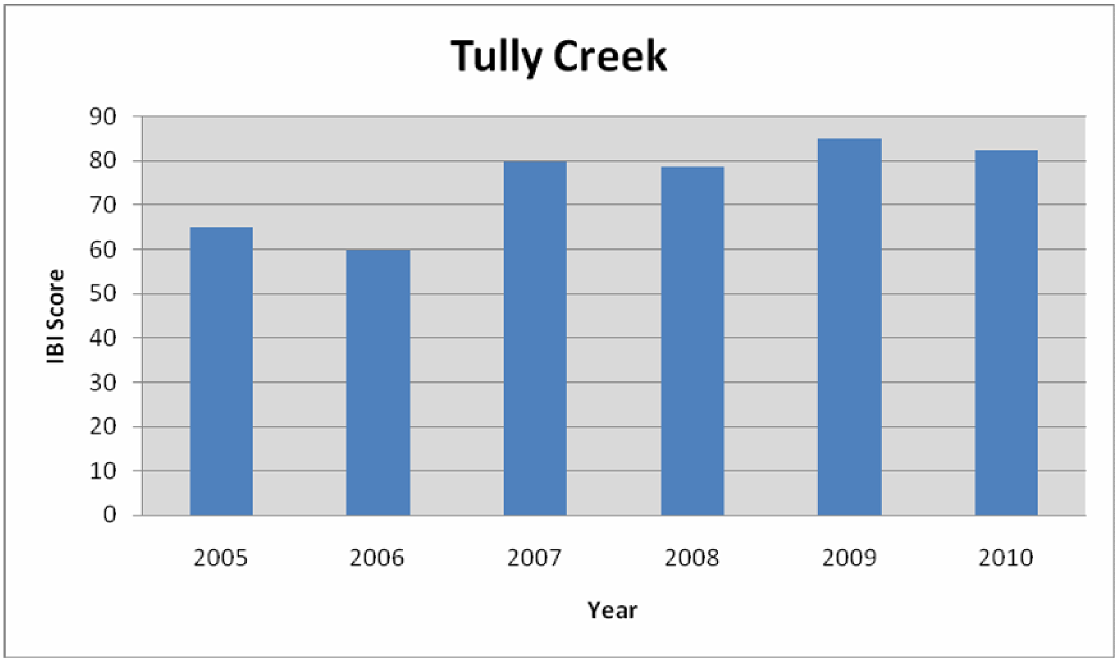

Figure 7-3. IBI scores for Tully Creek 2005-2010

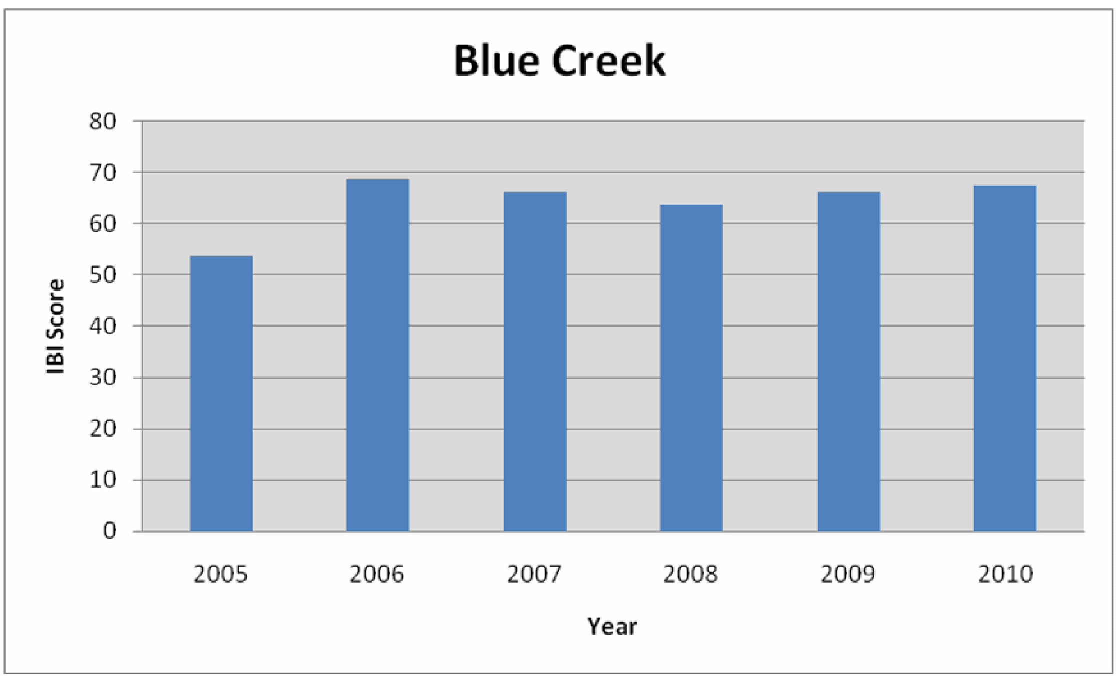

Figure 7-4. IBI scores for Blue Creek 2005-2010

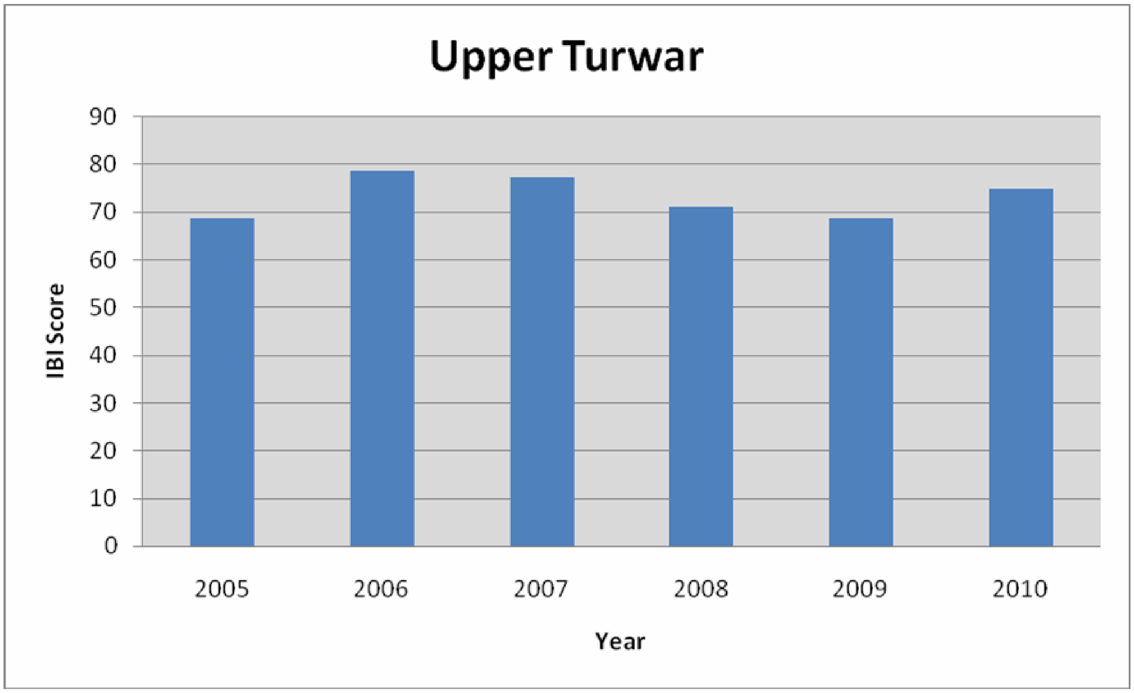

Figure 7-5. IBI scores for Upper Turwar 2005-2010

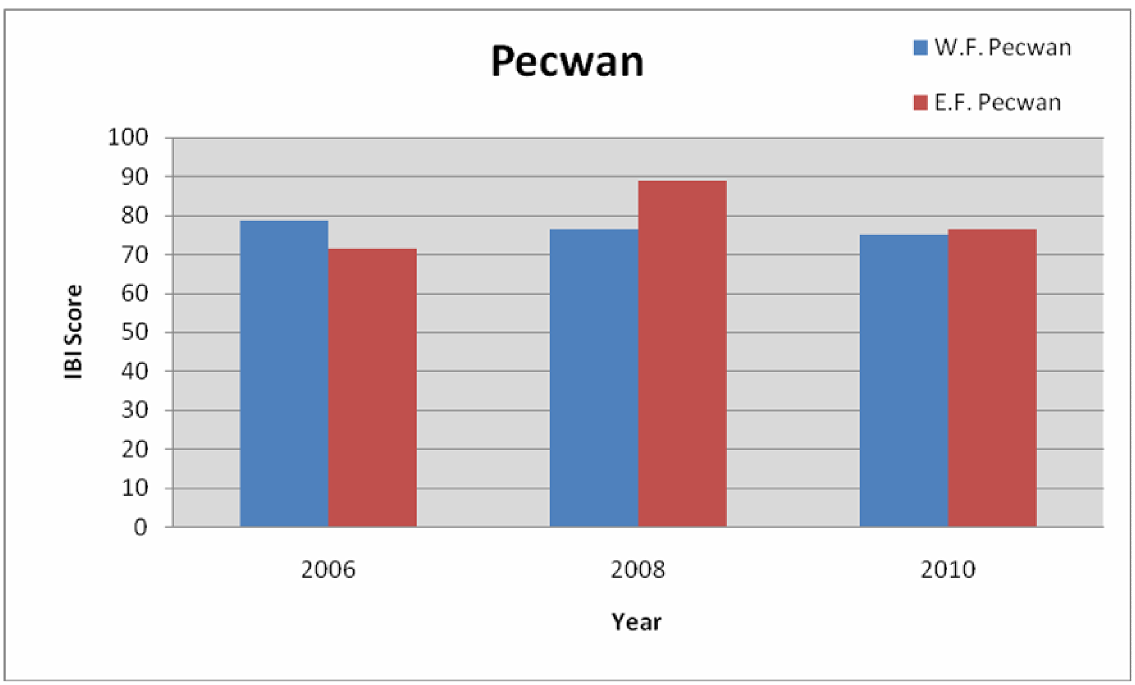

Figure 7-6. IBI scores for E.F. & W.F. Pecwan 2006, 2008, 2010

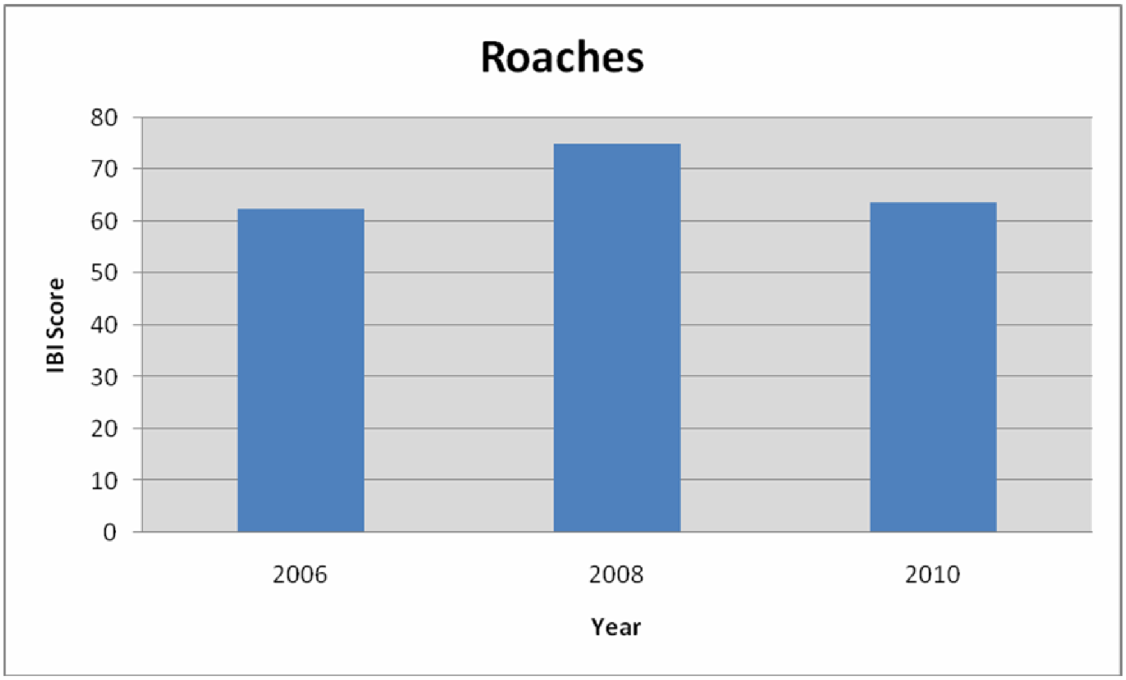

Figure 7-7. IBI scores for Roaches 2006, 2008, 2010

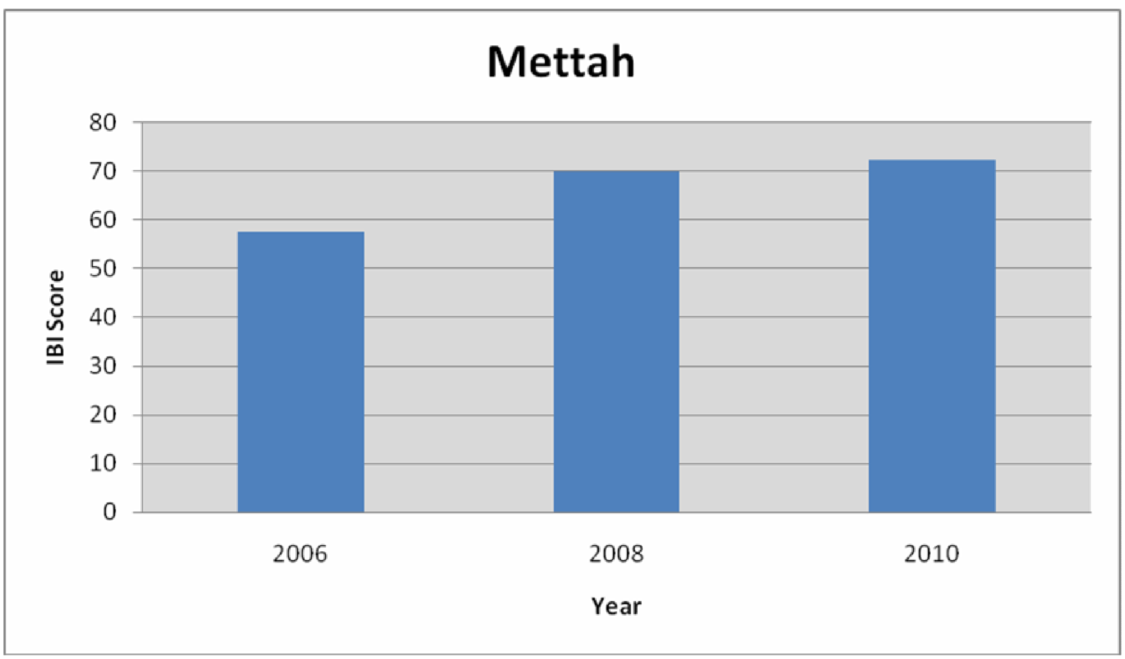

Figure 7-8. IBI scores for Mettah 2006, 2008, 2010

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Appendix A

Water Quality Permitting Macroinvertebrate Report WY10

I. Introduction

This report summarizes the methods and results of macroinvertebrate samplings conducted on select tributaries of the Klamath River that are having bridge construction conducted above them by California Department of Transportation (Cal Trans). The tributaries this construction project will influence are Rube Ranch Creek and School Creek. It was required for Cal Trans to take macroinvertebrate samples upstream and downstream of the bridges on which they will be working prior to construction. They hired qualified professionals to perform a pre construction macroinvertebrate sampling and they will be using the same group to do a post construction sampling. This monitoring effort will help to determine the amount of environmental impact caused by their bridge construction.

II. Site Selection

These sites were selected in order to see how well Cal Trans' construction crews perform, when trying to have a minimal effect on the environments in which they work. The sites where bridge construction is going to take place are both Rube Ranch Creek and Little Martins Ferry School Creek. The sites were sampled upstream and downstream of the exiting bridges and will be tested again after construction is finished. These streams are both un-suitable for salmon habitat because of their steepness, but are both tributaries to the main stem of the Klamath River, making it important to monitor their progress.

The sections above and below the bridges were both started from the base of the bridge then heading in their respective directions, up or down stream. The sections surveyed were not their normal length of 100 meters along the stream, due to the steepness of the stream and over grown vegetation. School Creek went 25 meters up and down stream where as Rube Ranch Creek went 30 meters up and down stream.

Figure A-1: Rube Ranch Creek DS (downstream)

Figure A-2: Rube Ranch Creek US (upstream)

Figure A-3: School Creek DS (downstream)

Figure A-4: School Creek US (upstream)

III. Methods

CalTrans' consultant sampled benthic macroinvertebrate populations in selected tributaries of the Lower Klamath River during May of 2010. Sampling was performed using the multi-habitat methods located in the State of CA Surface Water Ambient Monitoring Program (SWAMP) *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California February 2010* that the DFG has adapted from the US EPA's "Rapid Bioassessment Protocols of use in Streams and Rivers". A link to this protocol is located in Appendix B. This protocol also includes the collection of water quality parameters and physical habitat conditions in the channel and the riparian zone. This report does not contain this information. The parameters measured include:

- Stream Chemistry
- Instream Habitat Complexity
- Canopy Cover
- Human Influence
- Substrate Size Class
- Cobble Embeddedness
- Riparian Vegetation Classes
- Bank Stability
- Depth Regimes
- Bankfull Width
- Microalgae Thickness
- Macroalgae (Attached, Unattached)
- Macrophytes
- CPOM
- Epifaunal Substrate/Cover
- Sediment Deposition
- Channel Alteration

A qualified professional collected specimens which were sent to a lab where a certified taxonomist identified and calculated the number and types of species.

A variety of QC measures were undertaken in the macroinvertebrate sampling. Sample labels were properly completed, including the sample identification code, date, stream name, sampling location, and collector's name and placed into the sample container. Chain-of-custody forms, when needed, included the same information as the sample container labels. After sampling had been completed at a given site, all nets, pans, etc. that had come in contact with the sample were rinsed thoroughly, examined carefully, and picked free of organisms and debris. The equipment was examined again prior to use at the next sampling site.

Data generated in the field and laboratory is reviewed prior to being released internally or to an outside agent. Laboratory processing is contracted to Jonathan Lee, a qualified local taxonomist and Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) member. The identification of macroinvertebrates has three levels of benthic macroinvertebrate (BMI) identification. Level 3 is the professional level equivalent and requires identification of BMIs to a standard level of taxonomy, usually the genus and/or species. If questionable macroinvertebrates are encountered, the CDFG

Aquatic Bioassessment Laboratory is used as a reference to verify the specimens. Past review of macroinvertebrate results by DFG have shown that all identifications and counts are accurate.

After processing the samples, the biological matrices are received from the taxonomist in an Excel spreadsheet format identifying the sample ID and the breakdown of BMI species into standard taxonomic levels.

Table A-1. Cal Trans Reported macroinvertebrate metrics for Rube Ranch Creek and School Creek WY10

Site	Date	Total # of Specimens	Taxa Richness	EPT Richness	Sensitive EPT:	% Dominant Taxon	Tolerance Value	Shannon's D.I.	Estimated Rel. Abundance
Rube Ranch Creek - DS	5/12/2010	512	55	25	30.47	26.17	3.95	2.98	1267
Rube Ranch Creek - US	5/12/2010	545	57	29	24.40	21.47	4.30	2.87	1680
School Creek- DS	5/12/2010	522	42	20	25.67	33.72	4.43	2.63	2626
School Creek - US	5/12/2010	519	44	24	18.69	32.95	5.06	2.49	2324

Table A-2. Cal Trans, North Coast IBI Scores for Rube **Ranch Creek and School Creek WY10**

Site	Date	EPT Richness	Coleoptera Richness	Diptera Richness	% Intolerant Individuals	% non-Gastropod Scrapers	% Predator Individuals	% Shredder Taxa	% non-Insect Taxa	NorCal B-IBI Score
Rube Ranch Creek - DS	5/12/2010	9	10	10	7	10	5	10	8	86.25
Rube Ranch Creek - US	5/12/2010	10	10	10	6	6	5	10	8	81.25
School Creek- DS	5/12/2010	7	0	10	6	10	3	10	7	66.25
School Creek - US	5/12/2010	9	3	10	5	6	3	9	8	66.25

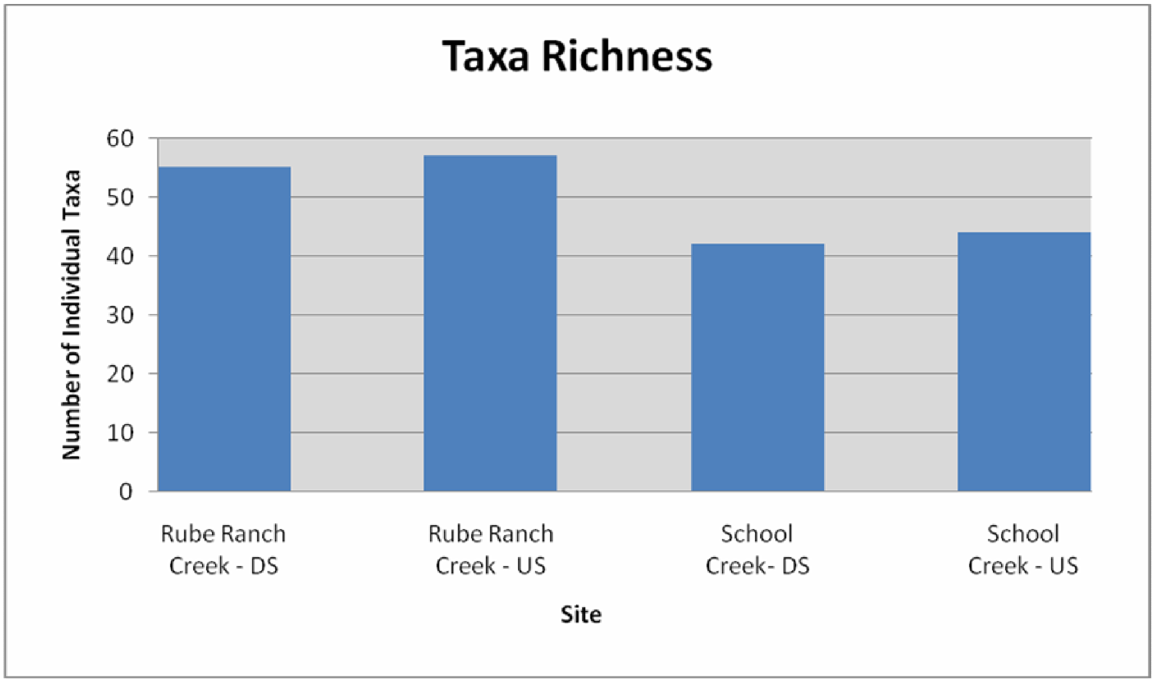

Figure A-5: Taxa Richness for Cal Trans streams (Pre Construction) 5/12/2010

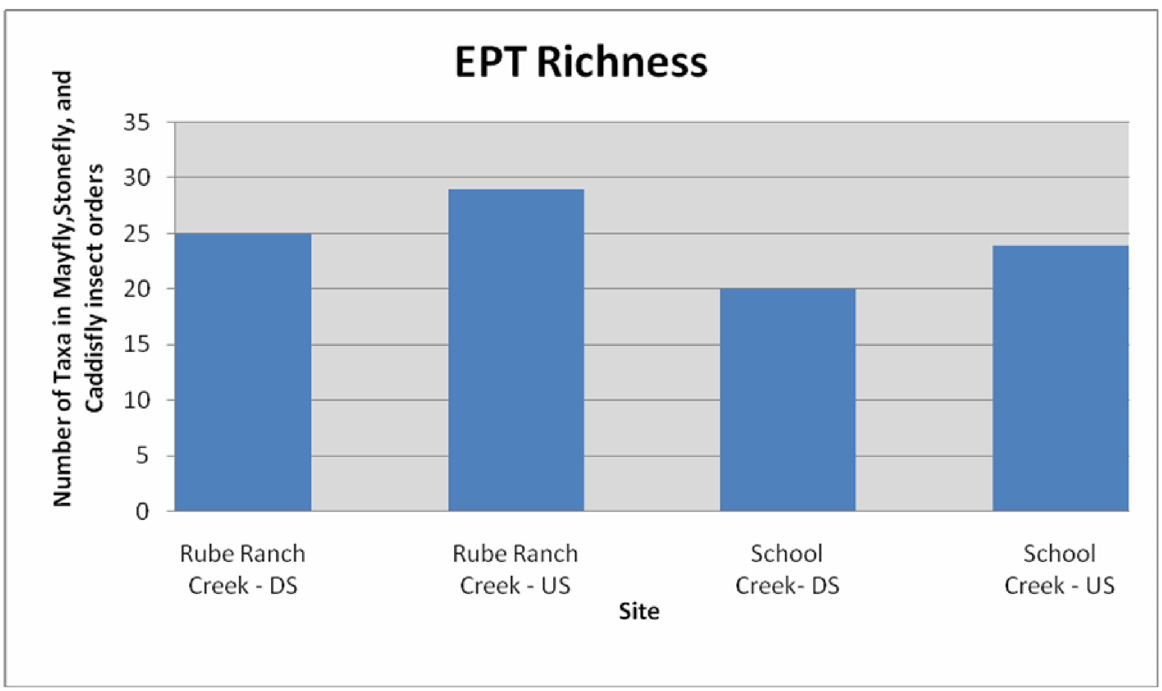

Figure 7-6: EPT Richness for Cal Trans streams (Pre Construction) 5/12/2010

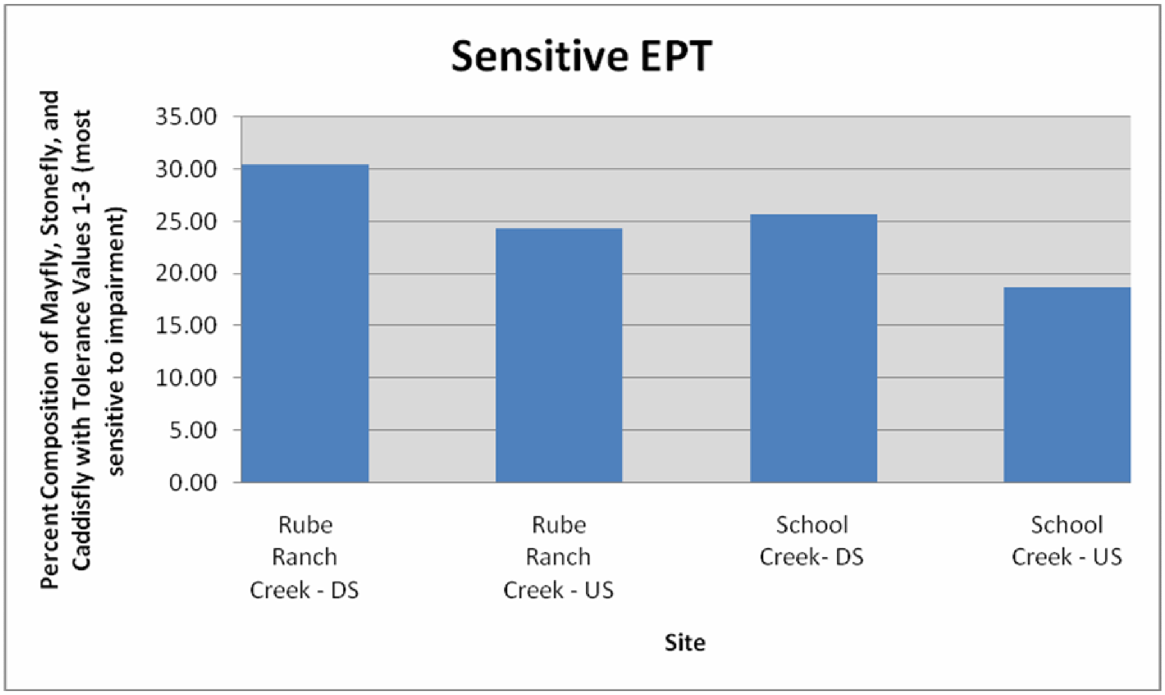

Figure A-7: Sensitive EPT for Cal Trans streams (Pre Construction) 5/12/2010

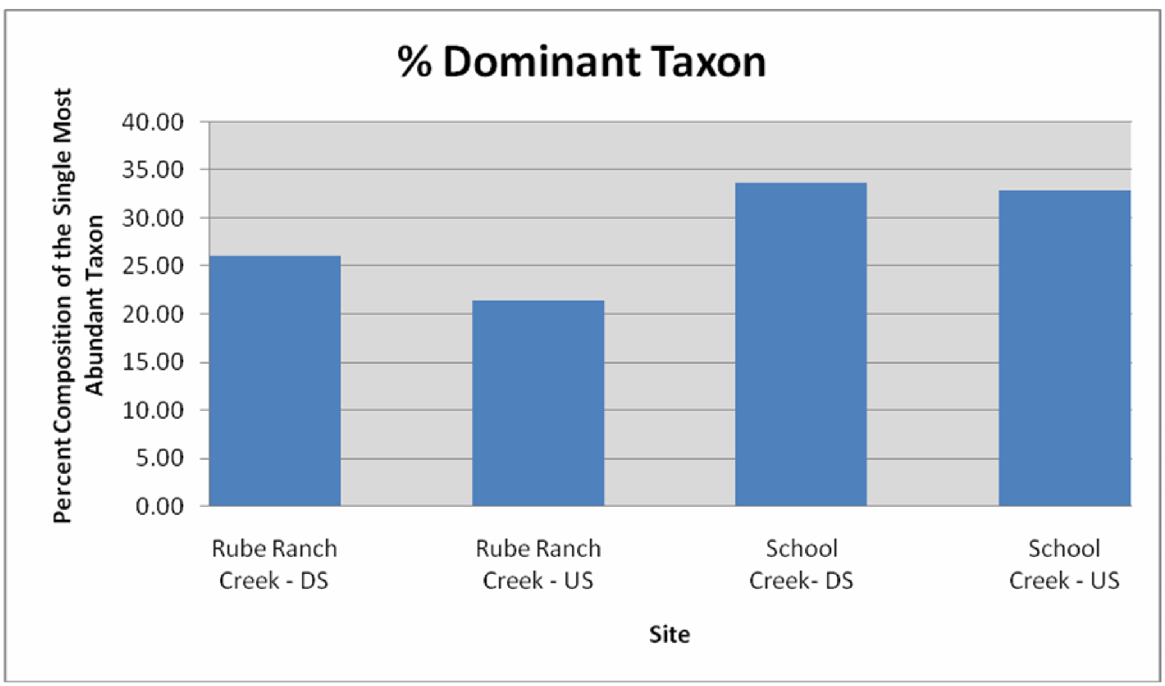

Figure A-8: % Dominant Taxon for Cal Trans streams (Pre Construction) 5/12/2010

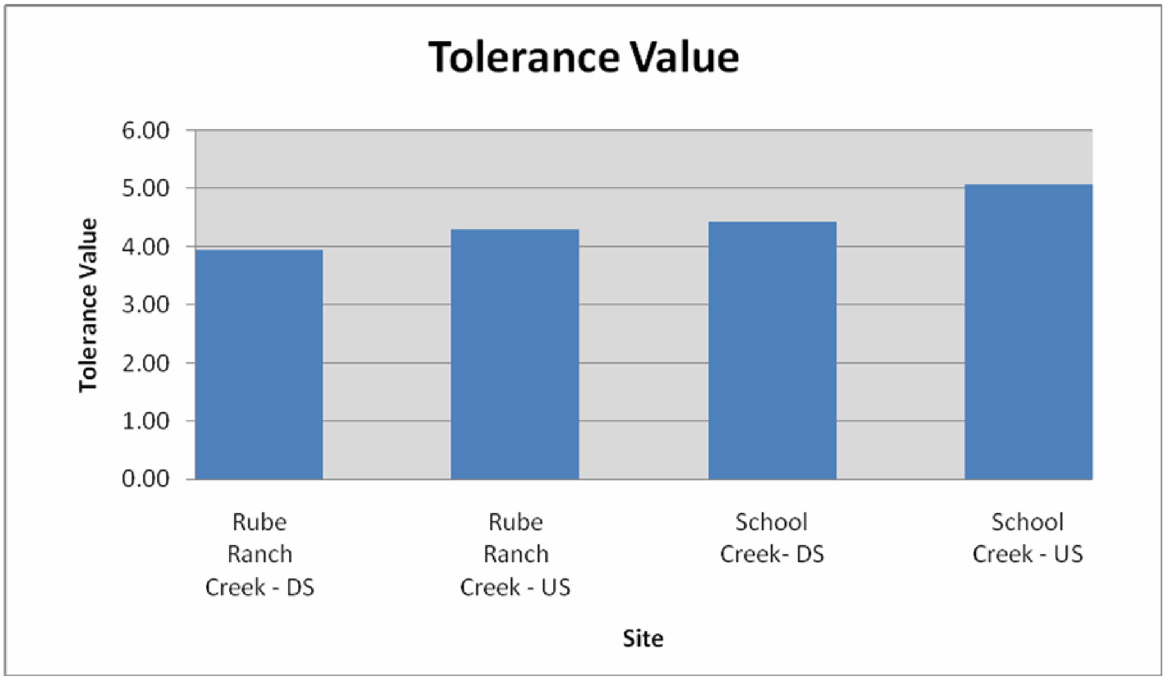

Figure A-9: Tolerance Value for Cal Trans streams (Pre Construction) 5/12/2010

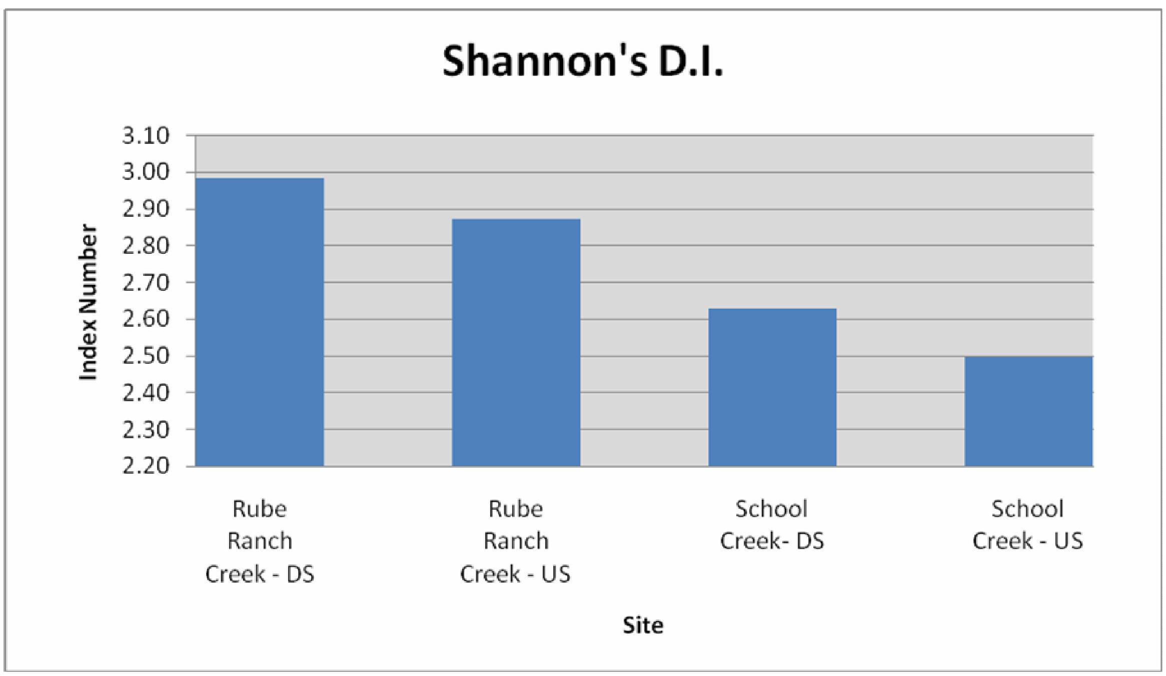

Figure A-10: Shannon's D.I. for Cal Trans streams (Pre Construction) 5/12/2010

Table 7-3. IBI Scoring Key

Total metric score	Value
0-20	very poor
21-40	poor
41-60	fair
61-80	good
81-100	very good

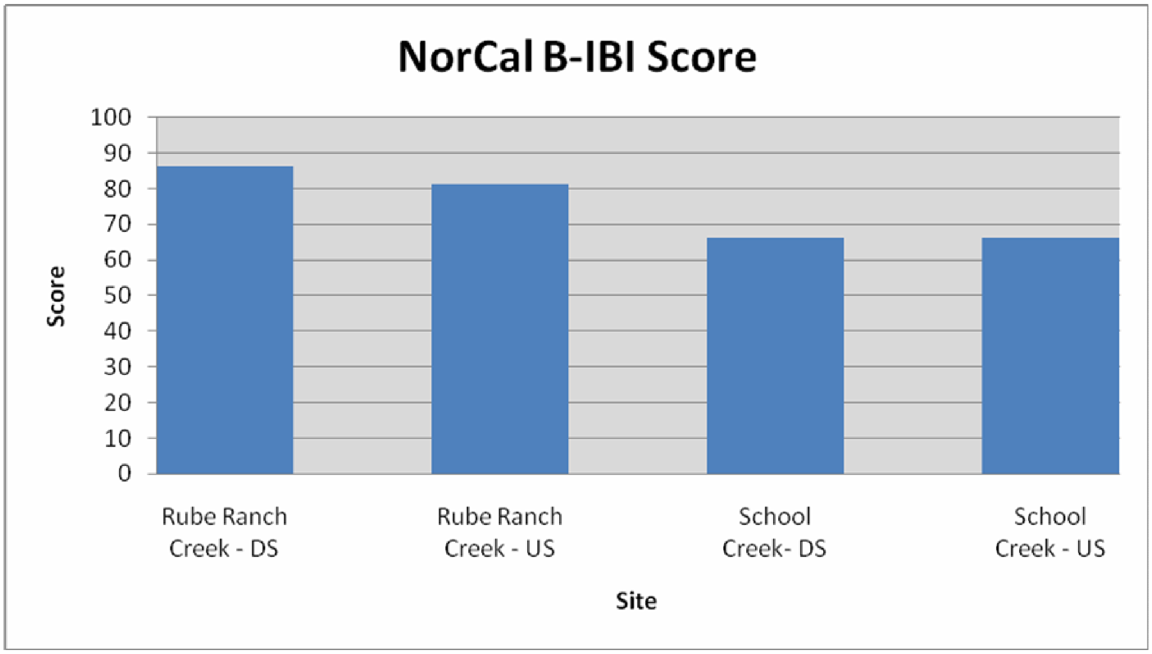

Figure A-11: NorCal B-IBI Scores for Cal Trans streams (Pre Construction) 5/12/2010

VI. Discussion

As indicated by the North Coast IBI scores, Cal Trans will be starting construction above and around two tributaries that are healthy. Both upstream and downstream of Rube Ranch Creek had IBI scores of 81 or above, making there macroinvertebrate health in the "very good" category. School Creek also scored very well for being a very small and steep stream.

In order to not have the rainy season flush sediment from the construction into the streams, they are being worked on during the dry season (Summer 2011).

Appendix B

To view the sampling protocol that YTEP employed in collecting its macroinvertabrate samples in 2010 please view the pdf titled "Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California". Or follow link:
http://swamp.mpsl.mlml.calstate.edu/wp-content/uploads/2009/04/swamp_sop_bioassessment_collection_020107.pdf