YUROK TRIBE

Macroinvertebrate Report: 2006

April 14, 2006 – June 22, 2006

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I. Introduction:

This report summarizes the methods and results of the macroinverebrate sampling conducted on tributaries to the Klamath River within the Yurok Reservation boundaries for the water year 2006.

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 .05mm 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 macroinvertabrate communities indicate physical and habitat characteristics that determine the stream integrity and ecological health.

Background:

1.1 Klamath River

The health of the Klamath River, its tributaries, 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.

1.2 The Yurok Indian Reservation

The current YIR consists of a 59,000-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 1-1). 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 the Green Diamond Resource Company), which are managed intensively for timber products. These land management practices contribute to sedimentation in the Lower Klamath tributaries. Sedimentation deposition fills pools used as habitat by fish and interstitial areas of riffle gravels used for fish spawning and living space for BMIs (Harrington and Born, 2000). A small portion of the YIR consists of public lands managed by Redwood National/State Parks, the United States Forest Service (USFS) and private landholdings.

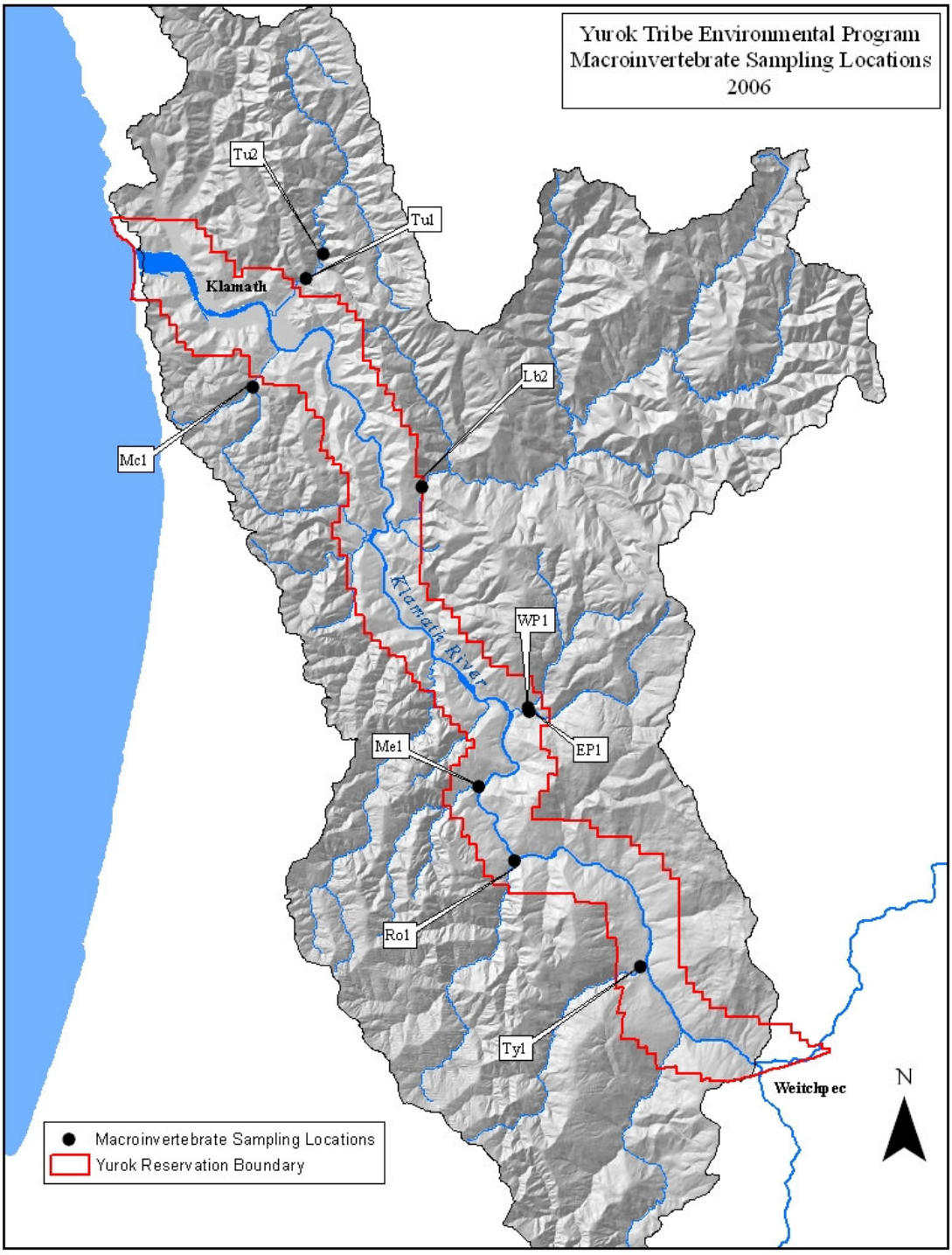

Figure 1-1 The Yurok Tribe Environmental Program macroinvertabrate sampling site locations, 2006

II. Site Selection:

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 were located in the lower reaches of watersheds that characterize the cumulative water quality and watershed health conditions within sub-watersheds and throughout the Lower Klamath. YTEP is in the process of developing baseline conditions to document the magnitude, duration and spatial characteristics of water quality impacts. Site selection criteria may change over time. Initial criteria were designated by current activities in the watershed. The following reasons were used as selection criteria for macroinvertebrate sampling:

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

2. *Activity Specific* -Sites located above and/or below herbicide applications or other known sources of potential toxicity such as spills 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 extraction and proposed resource development, such as housing development, domestic withdraw, hydropower, etc.

Table 2-1 Selection criteria priority matrix for 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	
EF Pecwan	Pecwan	EF Pecwan	EP1	1	4	
WF Pecwan	Pecwan	WF Pecwan	WP1	1	4	
Lower Blue	Blue	Lower Blue	LB	1	3	2
Tully	Tully	Tully	Ty1	1	4	2
Mettah	Mettah	Mettah	Me1	3	1	
Roaches	Roaches	Roaches	Ro1	1	3	

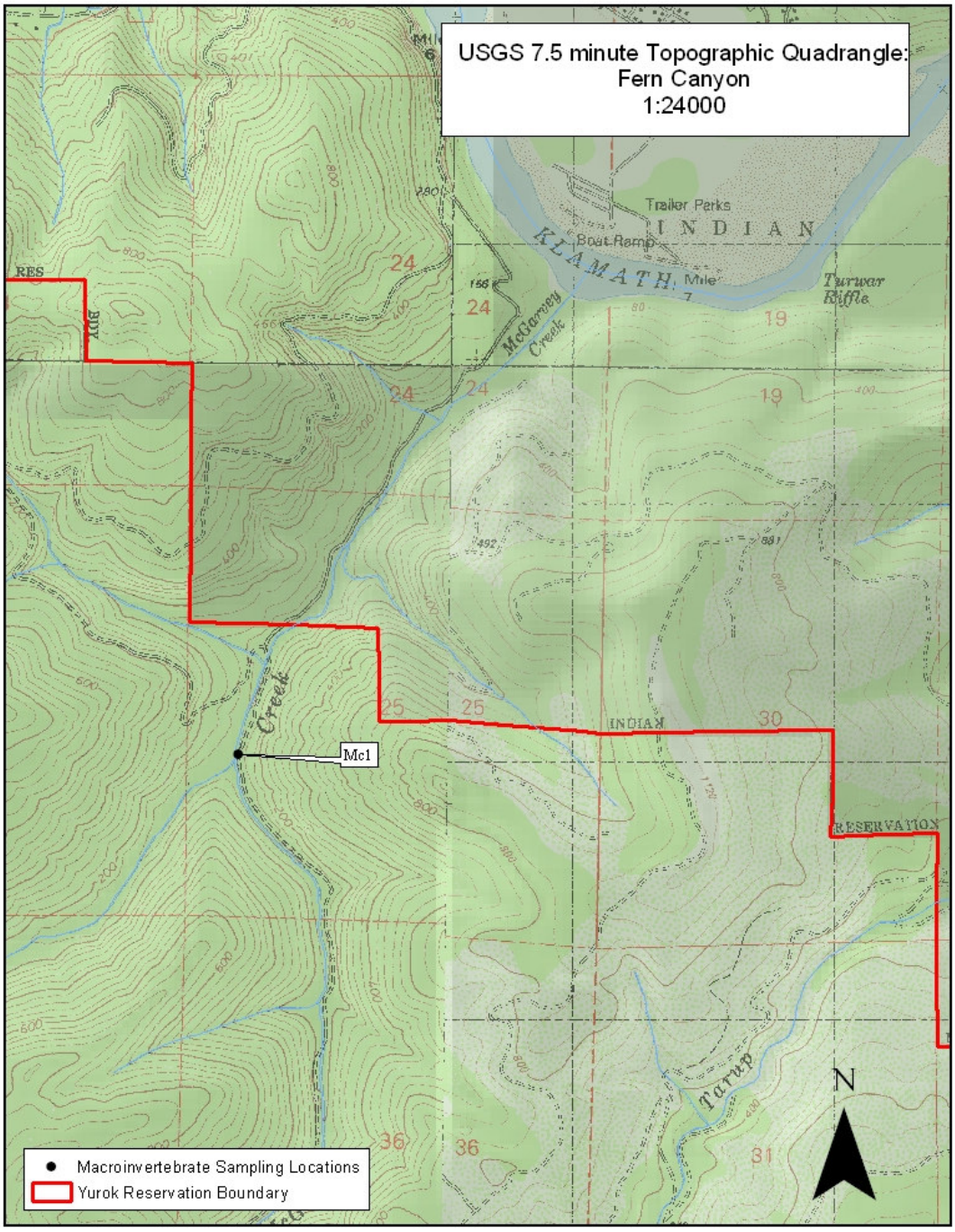

Figure 2-1 McGarvey Creek (Mc1) macroinvertebrate sampling site, WY06.

Figure 2-2 Photo of McGarvey Creek, (Mc1), WY06.

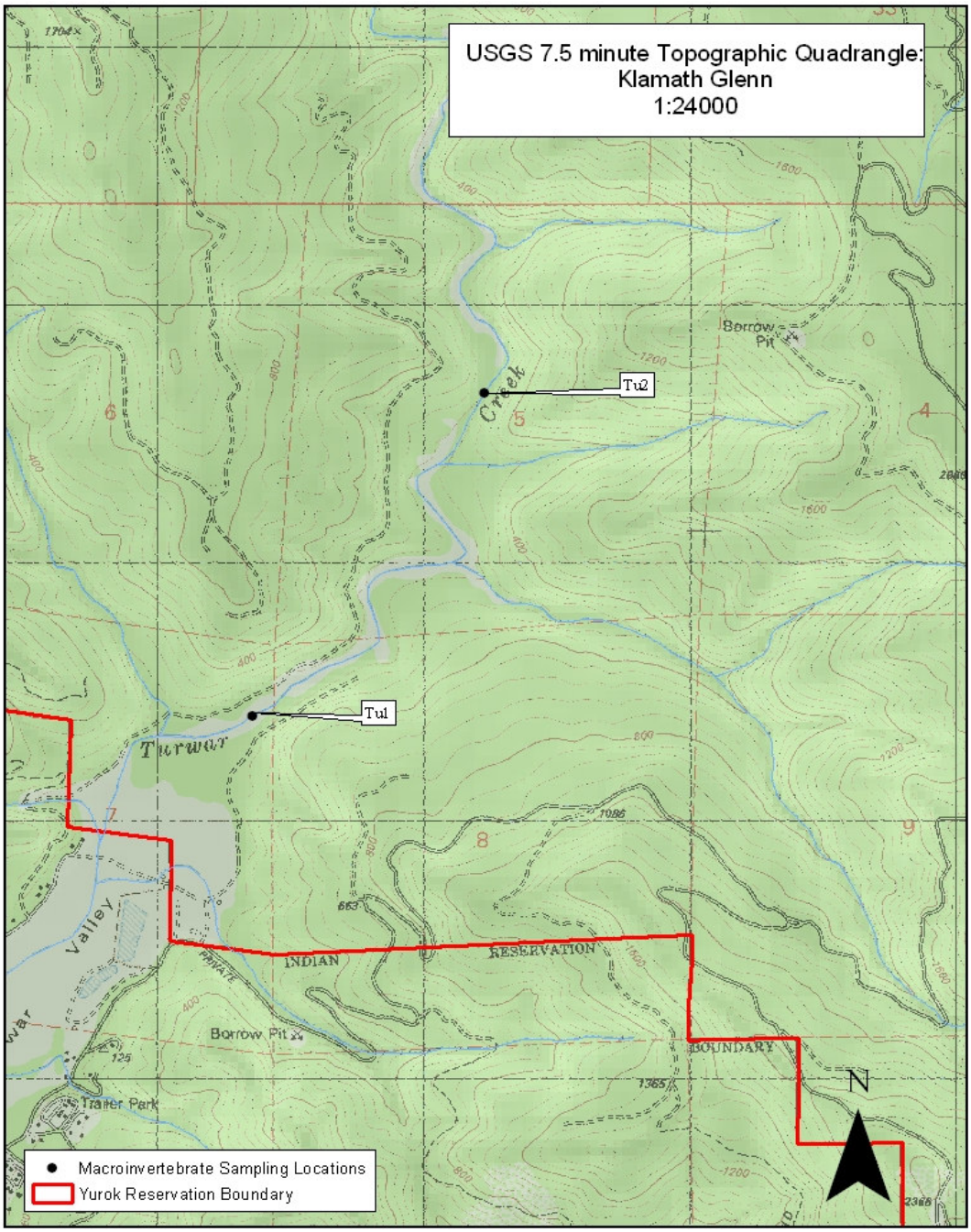

Figure 2-3 Upper Turwar Creek (Tu2) and Lower Turwar Creek (Tu1) macroinvertebrate sampling sites, WY06.

Figure 2-4 Photo of Upper Turwar Creek (Tu1), WY06.

Figure 2-4 Photo of Lower Turwar Creek (Tu2), WY06.

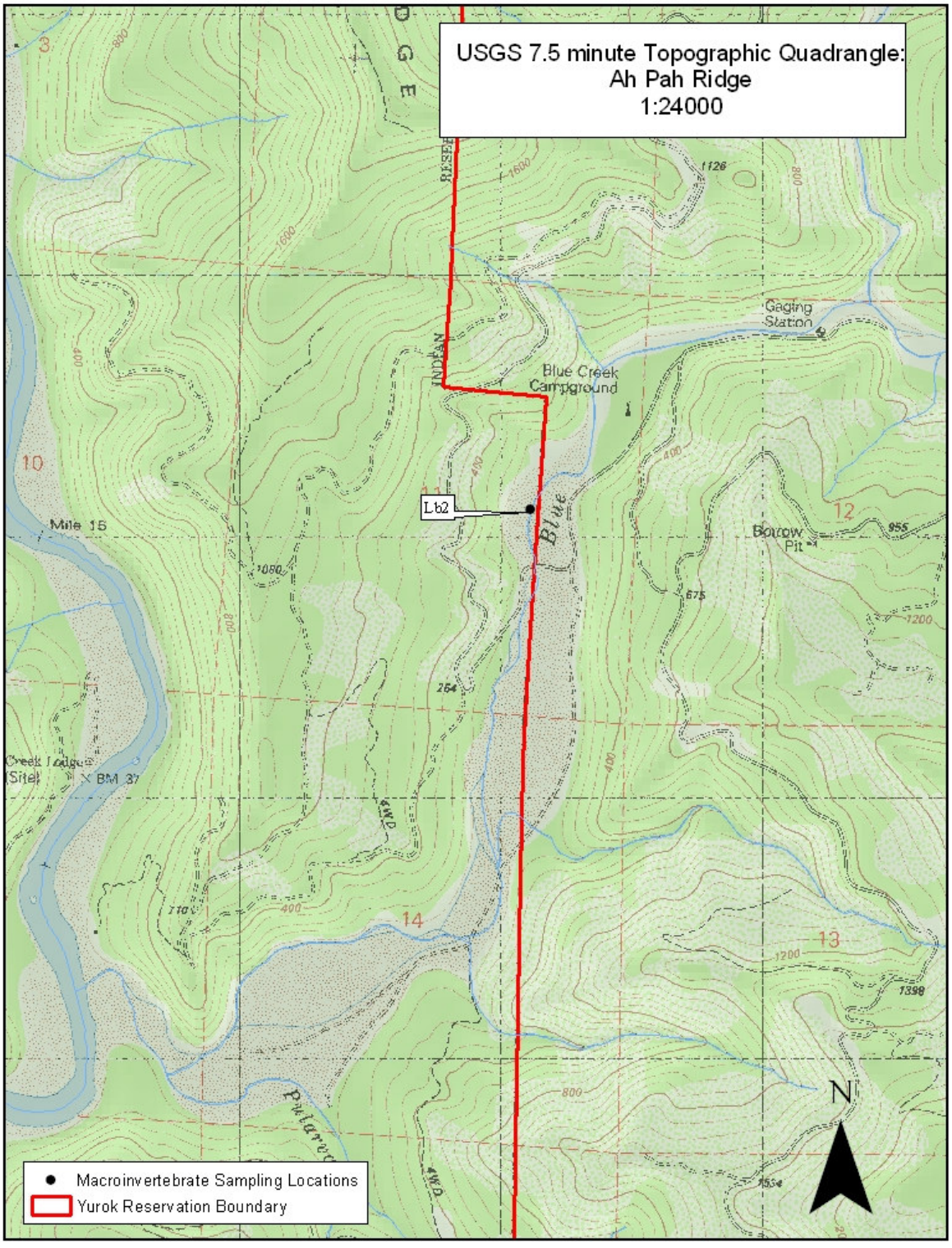

Figure 2-6 Lower Blue Creek (Lb2) macroinvertebrate sampling site, WY06.

Figure 2-7 Photo of Lower Blue Creek, WY06.

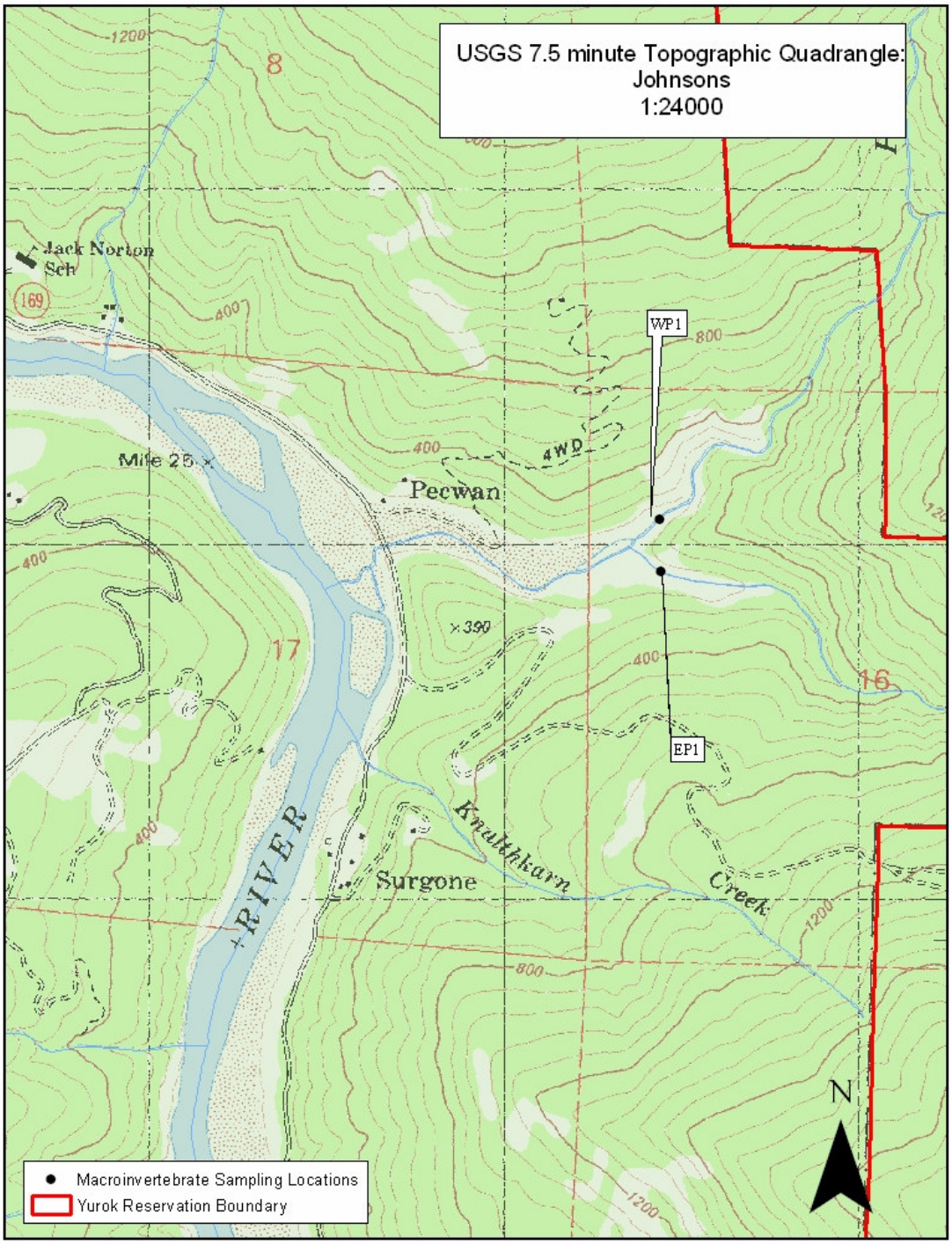

Figure 2-8 East Fork Pecwan and West Fork Pecwan (EP1 and WP1) macroinvertebrate sampling sites, WY06.

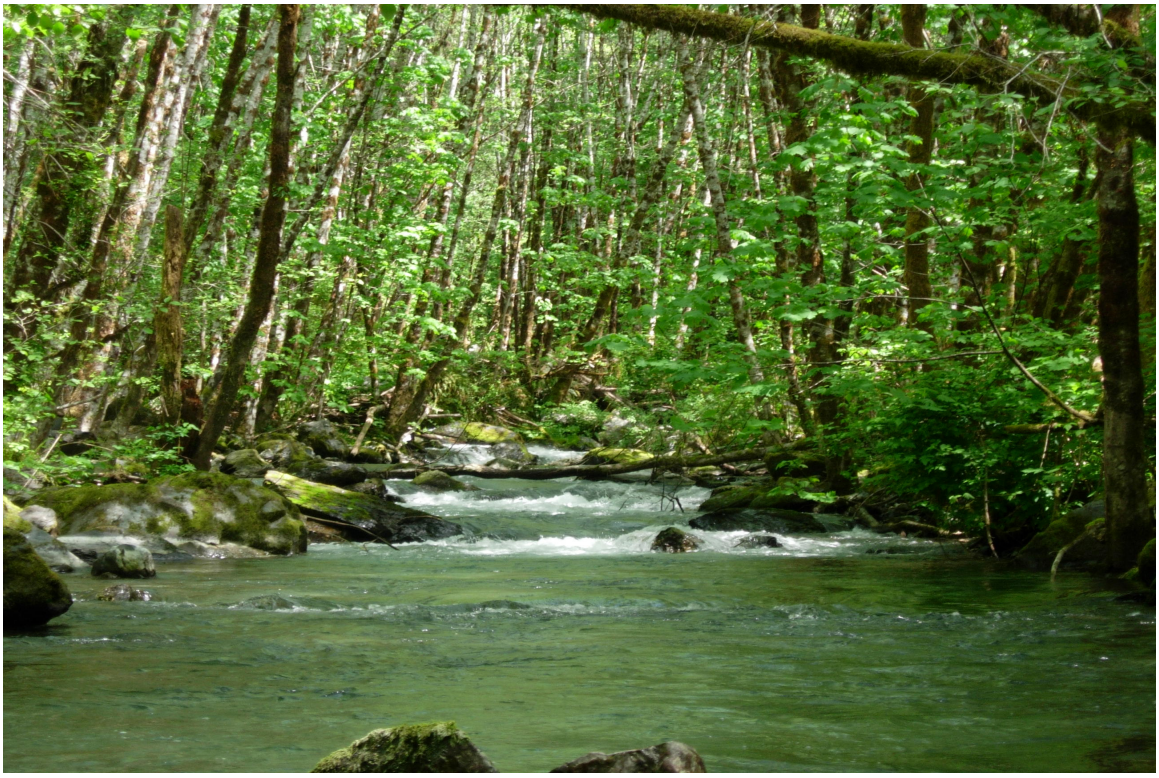

Figure 2-9 Photo of East Fork Pecwan, WY06.

Figure 2-10 Photo of West Fork Pecwan, WY06.

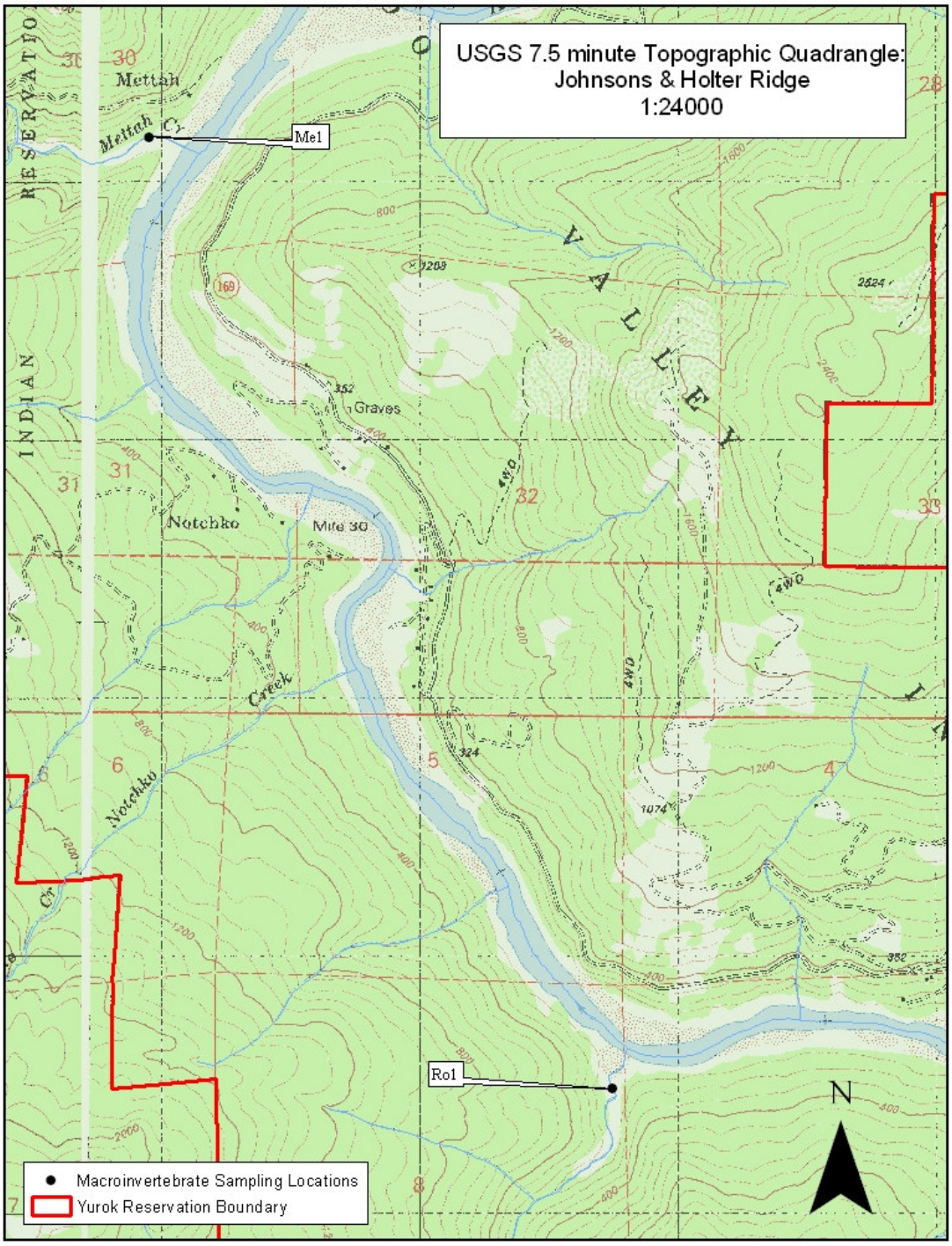

Figure 2-11 Mettah (Me1) and Roaches Creek (Ro1) macroinvertebrate sampling sites, WY06.

Figure 2-12, Photo of Mettah Creek, WY06.

Figure 2-13 Photo of Roaches Creek. WY06.

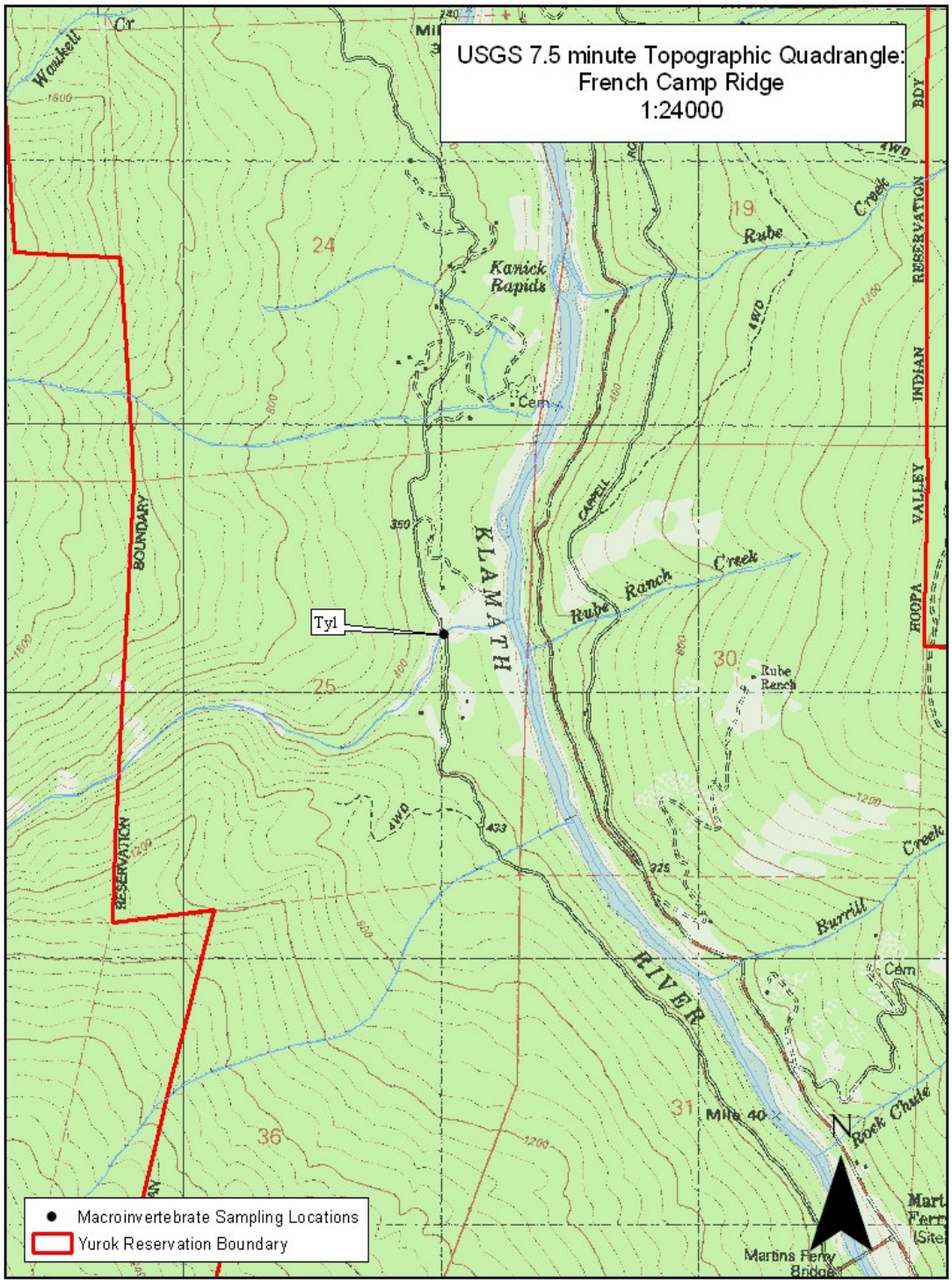

Figure 2-14 Tully Creek (Ty1) macroinvertebrate monitoring site, WY06

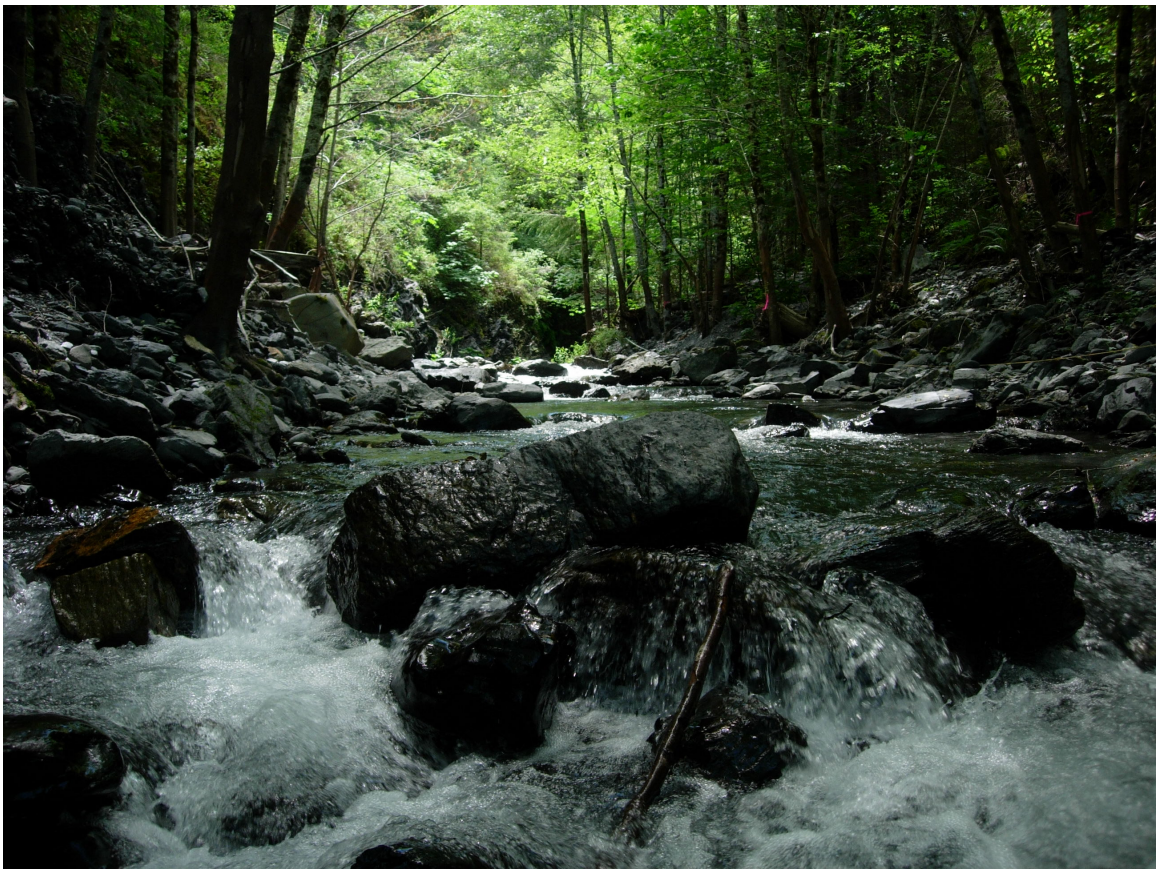

Figure 2-15 Photo of Tully Creek, WY06.

III. Methods:

YTEP sampled benthic macroinvertebrate populations in selected tributaries of the Lower Klamath River during the spring months. 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 2007* that the DFG has adapted from the US EPA's "Rapid Bioassessment Protocols of use in Streams and Rivers". Although this protocol was not finalized until February 2007 a draft version was available to YTEP and was used in the spring of 2006 to collect its macroinvertabrate samples. The methods used are identical to the ones laid out in the above mentioned 2007 protocol. 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:

- Epifaunal Substrate/Available Cover
- Embeddedness
- Instream Habitat Complexity
- Bank Stability
- Bankfull and wetted width
- Pebble Count
- Vegetative Protection
- Riparian Vegetative Zone Width
- Canopy Cover
- Stream Flow
- Physical water quality parameters

This protocol is located in Appendix A. The assistant director 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 quality control (QC) measures were undertaken in the macroinvertebrate sampling. Quality control is defined as the routine application of procedures to obtain prescribed standards of performance in the monitoring and measuring process (QAPP, 2001). 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. The outside of the container was labeled with the same information. The chain-of-custody forms 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 laboratory are reviewed by DFG prior to being released internally or to an outside agent. DFG data review of 2006 results reported that the taxonomists ID's are accurate and the data is acceptable. Laboratory processing is contracted to

Jonathan Lee, a qualified local California Stream Bioassessment Protocol (CSBP) taxonomist and California Bioassessment Laboratories Network (CAMLnet) member. The CSBP has three levels of Benthic Macroinvertabrate (BMI) identification. Level 3 is the professional level equivalent and requires identification of BMI's to a standard level of taxonomy, usually the genus and/or species.

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.

IV. Results:

Results for this study are presented in the following tables and graphs. These figures highlight important metrics when stream health is being assessed. Macroinvertebrate results are also presented for WY06 using the North Coast Index of biological integrity (IBI). The State of California Department of Fish and Game (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. We used this separate scoring system when we generated our metric to insure the greatest quality control. The results of this ranking method follow the more familiar metric graphs.

Table 4-1 Reported macroinvertebrate metrics for streams sampled in WY06

Sample I.D.	Riffle #	Sample Date	Total # of Specimens	Taxa Richness	EPT Taxa Richness	Sensitive EPT Index (%)	% Dominant Taxon	Tolerance Value	Shannon's DI	Est Relative Abundance
Upper Turwar	1	4/14/2006	501	41	24	52	22	2.62	2.8	1181
Lower Turwar	1	4/28/2006	502	26	17	27	64	3.82	1.51	2458
McGarvey	1	4/27/2006	507	40	24	30	20	3.58	2.73	1879
E.F. Pecwan	1	5/10/2006	503	40	22	45	24	2.95	2.71	764
W.F Pecwan	1	5/10/2006	503	46	25	43	39	2.93	2.25	1207
Blue	1	6/8/2006	511	38	21	23	42	4.22	2.11	1834
Tully	1	6/16/2006	515	39	18	14	55	4.67	1.86	2496
Mettah	1	6/22/2006	503	38	16	13	38	4.58	2.13	6108
Roaches	1	6/22/2006	523	44	17	11	44	4.79	2.12	3097

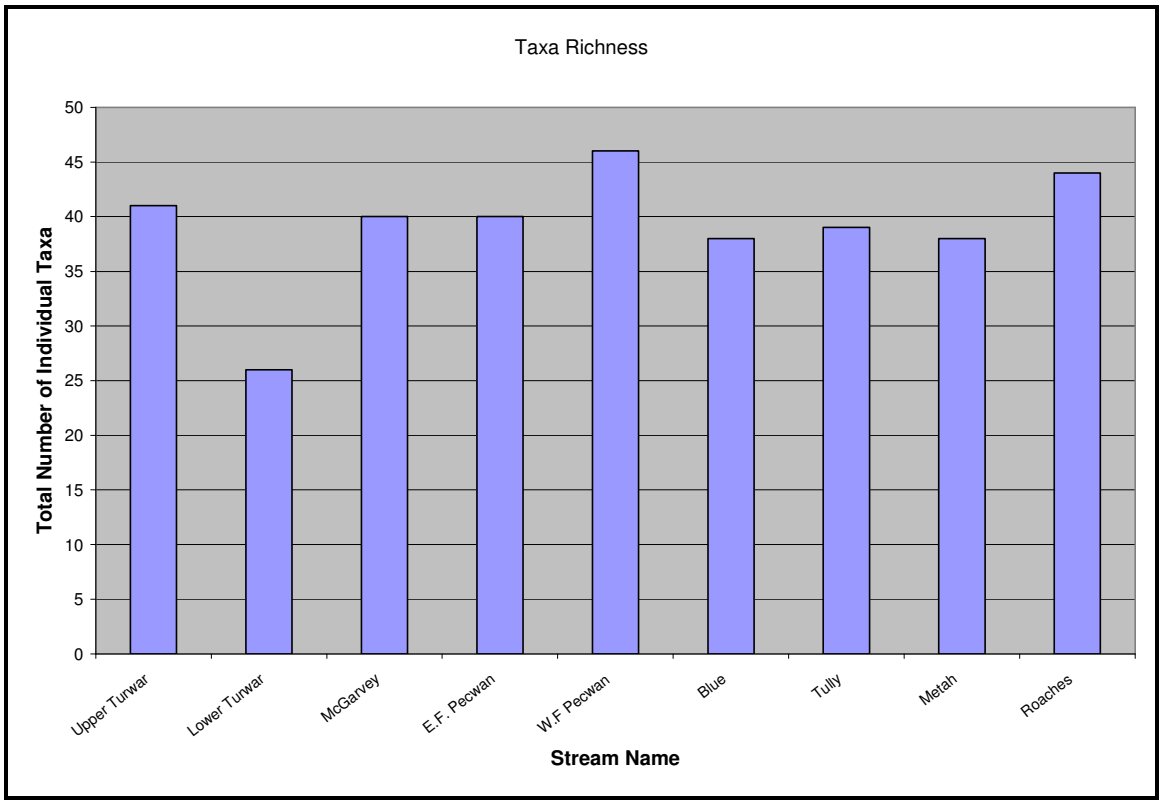

Figure 4-1 Taxa Richness

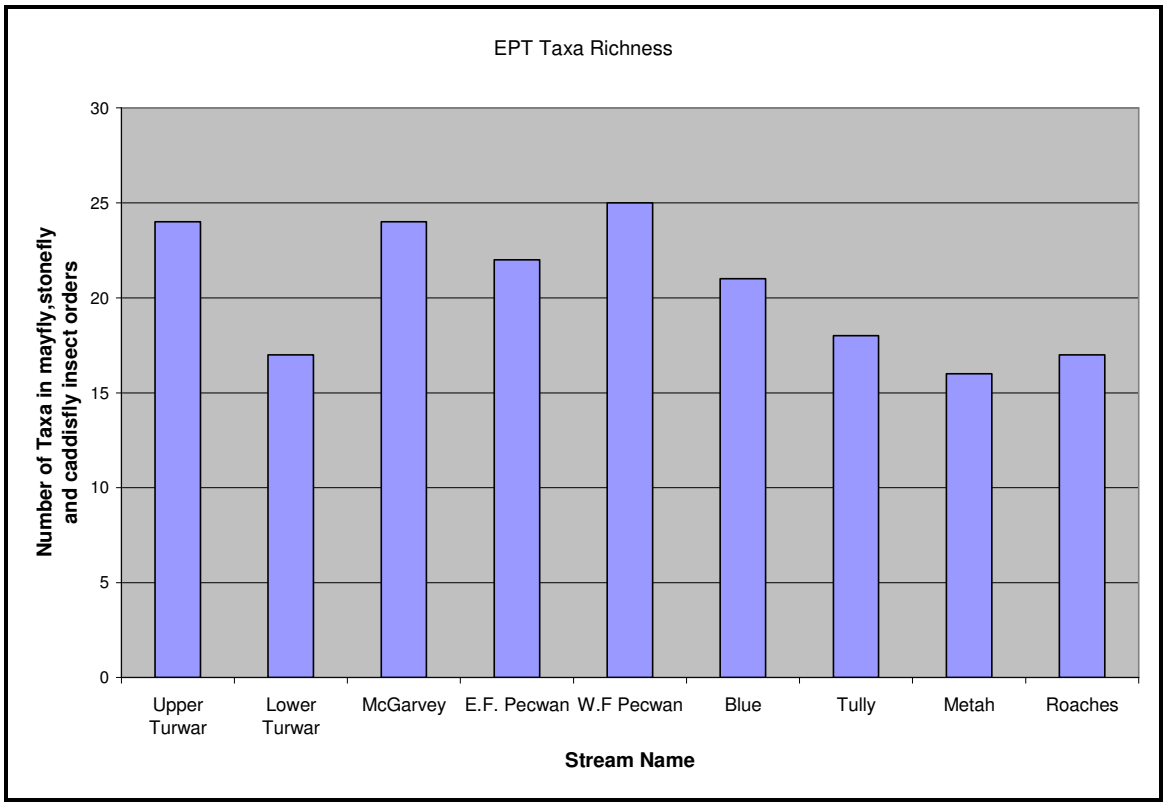

Figure 4-2 EPT Taxa Richness

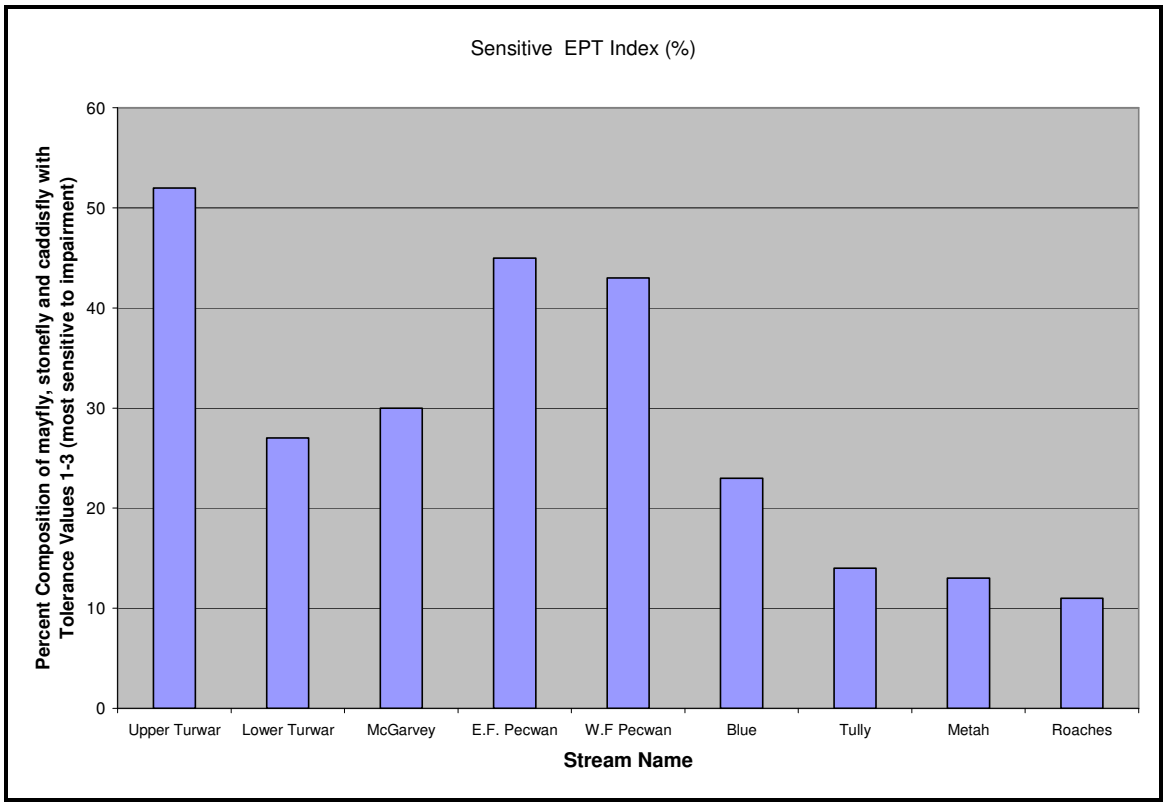

Figure 4-3 Sensitive EPT Index (%)

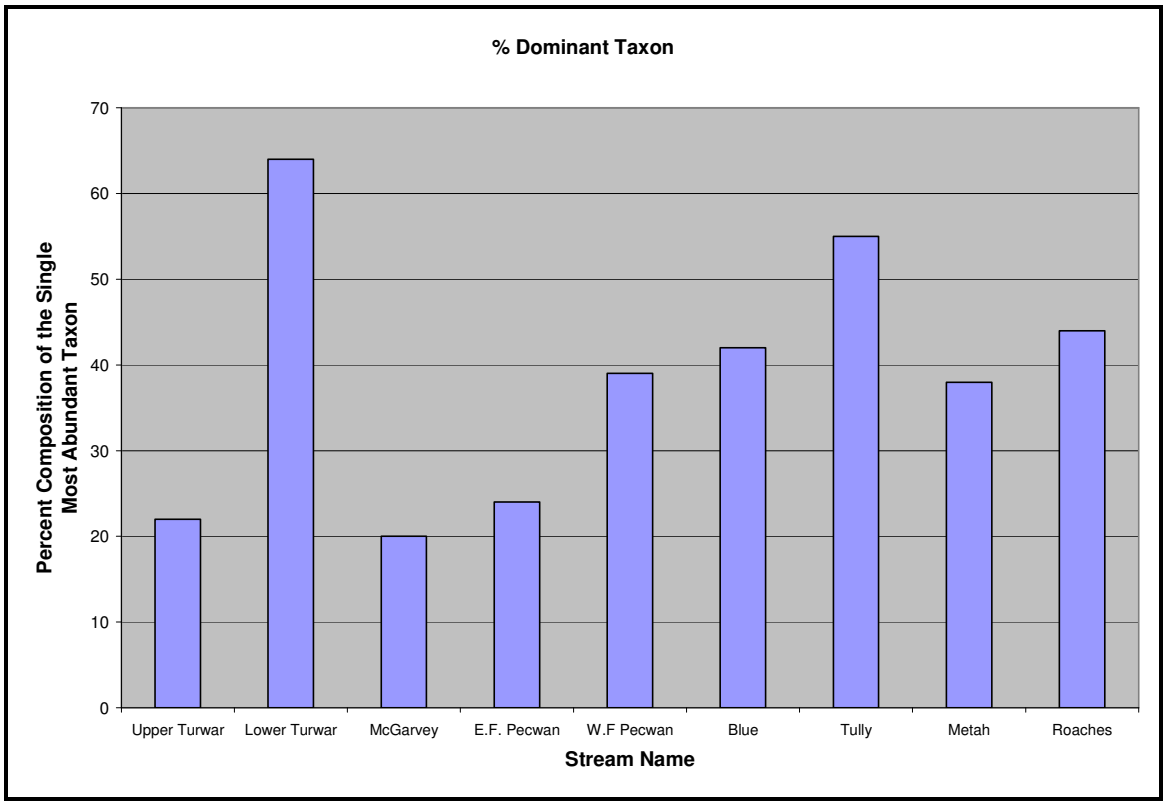

Figure 4-4 Percent Dominant Taxon

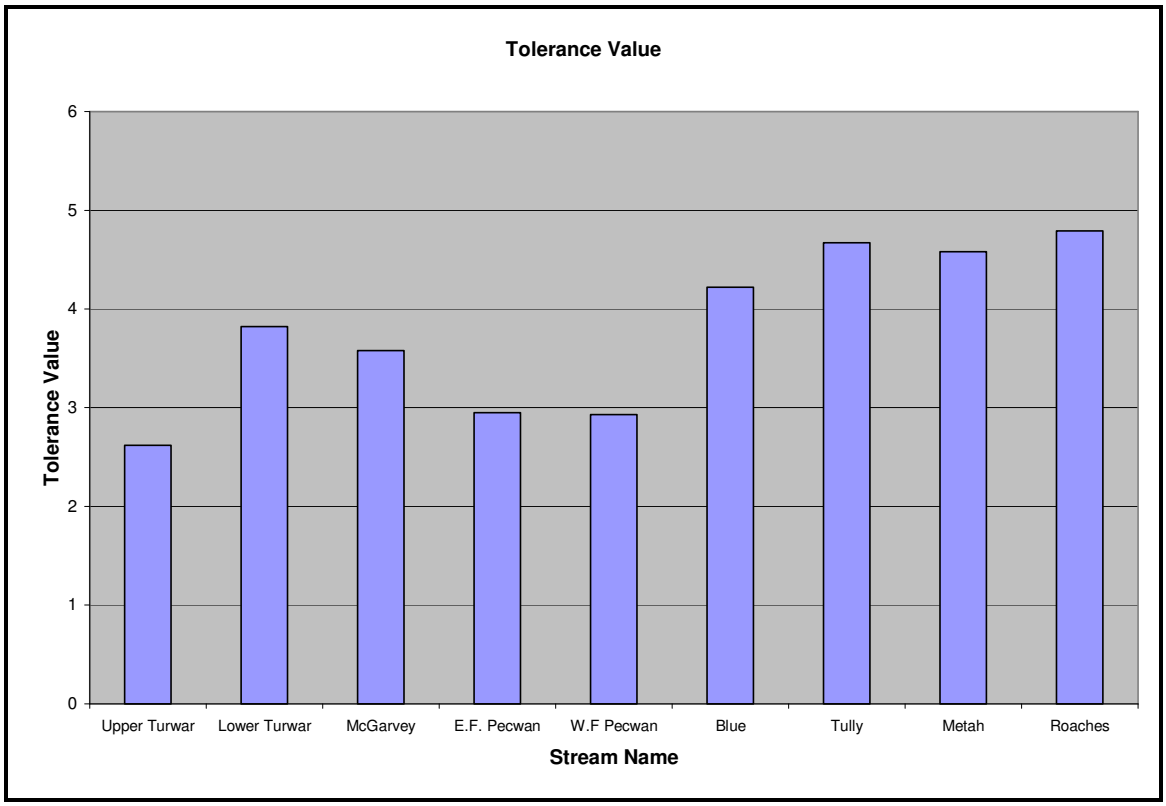

Figure 4-5 Tolerance Value

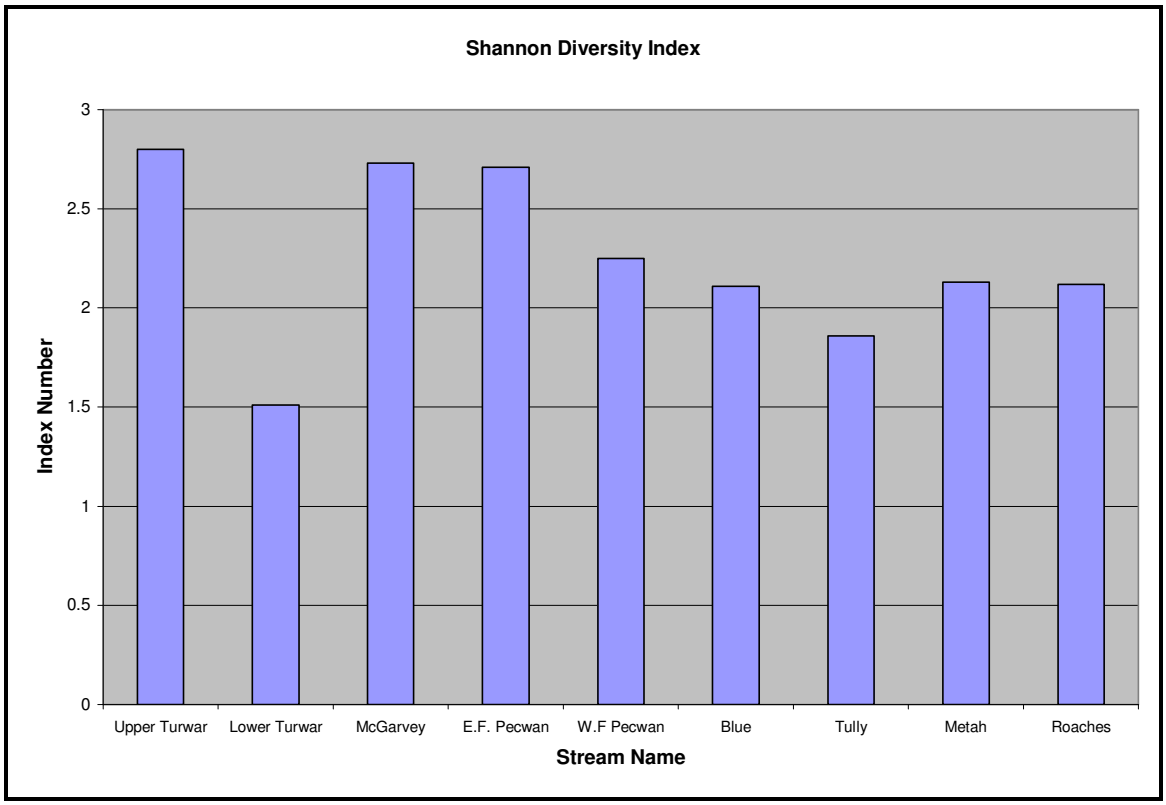

Figure 4-6 Shannon Diversity Index

Table 4-2 North Coast IBI metrics YTEP macroinvertebrate sampling project, WY06.

Site	EPT Richness	Coleoptera Richness	Diptera richness	%Intolerant Individual	Observed % Intolerant	Predicted % Intolerant	%Non Gastropoda Scraper Individuals	%Predator Individuals	% Shredder Individuals	%Non-Insecta Taxa	Totaled metric score	adjusted score to 100 scale
Roaches	6	9	9	3	0.0841	29.6	4	6	6	7	50	62.5
Tully	7	9	7	4	0.1573	29.6	2	4	6	8	47	58.75
WF Pecwan	9	7	6	10	0.4334	29.6	10	4	8	8	62	77.5
EF Pecwan	8	10	4	10	0.4573	29.6	10	2	4	8	56	70
Lwr.Turwar	6	1	3	7	0.259	29.6	5	5	0	9	35	43.75
Upp.Turwar	9	7	5	10	0.489	29.6	10	5	6	9	61	76.25
McGarvey	9	5	4	6	0.2959	29.6	10	9	9	8	61	76.25
Mettah	6	10	5	4	0.1312	29.6	4	7	3	7	46	57.5
Blue	8	7	5	6	0.2505	29.6	2	6	7	9	50	62.5

Table 4-3 IBI scoring key

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

V. Discussion:

It is important to note that no site in this sample set was recorded to yielded less than 300 total numbers of specimens. According to the CSBP a minimum of 300 total numbers of specimens is required to generate appropriate statistics for the stream. Giving us a statistically significant sampling set from which results were generated.

Overall one of the nine sites sampled were found to be in the 'un-impaired' range of the NC IBI index. The index defines impairment as a score of 52 or below. All of these sample sites exist in areas of either historic and or active logging operations. Lower Turwar Creek, which received the lowest score (43.75) of all the sites, is located in an area which is still being logged and is adjacent to pastures that are actively grazed. Furthermore, the portion of Lower Turwar Creek that is sampled has little to no canopy cover over the stream and the riparian zone in general has been impacted heavily by sedimentation.

Three of the nine sites sampled reported NC IBI scores in the "fair" range, these streams include Lower Turwar, Tully and Mettah Creeks. The other six streams that were sampled reported NC IBI scores in the "good" range, these streams include: Upper Turwar, McGarvey, Blue, East and West Fork Pecwan and Roaches Creeks. West Fork Pecwan Creek had the highest NC IBI score (77.5).

VI. References:

Barbour, M.T., J. Gerritsen, B.D. Snyder and J.B. Stribling. 1999. Revision to rapid bioassessment protocols for use in stream and rivers: periphyton, BMIs and fish. EPA 841-D-97-002. U.S. Environmental Protection Agency. Washington DC.

Harrington, J and Born, M. 2000 A methods Manual for Resource Profesionals, Citizen Monitors, and Natural Resource Students.

Kroeber, A. L., *Handbook of the Indians of California*, 1925, Chapter 1, Bureau of American Ethnology, Smithsonian Institute.

Ode, P.R., A.C. Rehn, and J.T. May. 2003. A benthic macroinvertebrate index of biotic integrity for southern coastal California. California Department of Fish and Game, Rancho Cordova, CA. (in prep).

Appendix 1:

To view the sampling protocol that YTEP employed in collecting its macroinvertabrate samples in 2006 please view the pdf titled “Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California”.