TRUCKEE RIVER WATERSHED COUNCIL

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January 20, 2006

303 (d) Deadline: 1/31/06

TO: Selica Potter, Acting Clerk to the Board
State Water Resources Control Board
Executive Office
1001 I Street, 24th Floor
Sacramento, CA 95814

FR: Beth Christman, Chair, Truckee River Aquatic Monitors

RE: 303(d) List updates – De-listing of Bear Creek, Truckee River Watershed, Lahontan Region.

CC: Chuck Curtis, Lahontan RWQCB Staff
Amy Horne, Lahontan RWQCB Board
Eric Sandel, Lahontan RWQCB Board
Harold Singer, Lahontan RWQCB Staff

Dear Ms. Potter,

Thank you for the opportunity to comment on the proposed revisions of the 303(d) list. These comments are submitted on behalf of the Truckee River Aquatic Monitors (TRAM), a subcommittee of the Truckee River Watershed Council. TRAM conducts bioassessment monitoring on streams within the Truckee River watershed through collection of benthic macroinvertebrates. We have been collecting data since 1999.

We are concerned about the proposed de-listing of Bear Creek. Data collected by our group since 2002 indicates there is reason to believe that water quality in Bear Creek is impaired. Samples collected particularly in 2002 and 2003 indicate a compromised benthic stream community, whereas 2004 showed some improvement. Several graphs of our data are included to demonstrate the types of impairment we have observed.

We are requesting that:

- Bear Creek remain on the 303(d) list
- Further water quality assessments are conducted in Bear Creek
- A comprehensive water quality monitoring plan be developed and put into place for the Truckee River watershed so that sufficient data are being collected to aid in future listing or de-listing decisions.

Bear Creek – Evidence of Impairment

The rationale for de-listing Bear Creek is based on three lines of evidence:

1) turbidity measurements

2) a single year bioassessment study (2001; referred to in the SWRCB de-list Fact Sheet as Chan, 2001), and
3) a separate bioassessment study that covered two years (2000-2001; Herbst, 2002).

We are requesting that the Regional Board reconsider de-listing Bear Creek based on three additional years of bioassessment data (2002-2004) collected by the Truckee River Aquatic Monitors (TRAM), a committee of the Truckee River Watershed Council. **The data collected by TRAM indicates a substantial drop in biological condition in Bear Creek from 2000 to 2002 and later.**

Bear Creek was classified as a reference stream in the Herbst study (2002) that was conducted in support of the Squaw Creek sediment TMDL. **Comparing many of the same metrics, we found that Bear Creek consistently came out as highly impaired in 2003.** We were not able to directly compare 2002 data due to differences in lab techniques. However, **these data also indicated impairment.** Differences between the data sets are explained below.

Because the SWRCB is using bioassessment data as one of the primary reasons to de-list Bear we feel that it is appropriate to use the same type of data, collected at the same sampling location from subsequent years to show that further study is required before Bear Creek is removed from the 303(d) list. We recognize the limitations of our data, but we are presenting them here to show that there is a strong indication of impairment in Bear Creek and that removal from the 303(d) list is premature.

Data Contained In This Comment

Two sets of graphs are contained in this comment. The first set of graphs is a comparison of Bear Creek for the years 2000 – 2004. These data were collected by two different groups and analyzed by three different labs. There are differences in some of the methods, which are explained below.

The second set of graphs includes data taken entirely by TRAM during 2002 for several different streams in the Truckee River watershed.

Variation in Collection Techniques between Studies

Data shown here from 2000 and 2001 were collected by Dr. David Herbst of U.C. Santa Barbara for a study conducted in support of the Squaw Creek TMDL (Herbst, 2002). Data collected in 2002, 2003, and 2004 were collected by TRAM. The collection methods and lab analyses are slightly different. Dr. Herbst followed a collection protocol developed by his lab. The QAPP for this procedure was accepted by the State Water Resource Control Board (Herbst, 2001). TRAM followed the California Stream Bioassessment Protocol developed by the California Department of Fish and Game (DFG; Harrington and Born, 2000). A QAPP for TRAM protocols has also been approved by SWRCB.

Recently, extensive work has been done on the comparability of the two methods. The conclusions have indicated that although the methods will not yield exactly the same results, they are reasonably close (see presentation about comparability on-line at:
http://www.swrcb.ca.gov/swamp/docs/cabw2004/14_bioassessmethods_snarl.pdf).

The Herbst method samples more riffles and a greater area than the DFG method, so it is likely that more different types of organisms will be collected.

All samples were collected from the same location in Bear Creek, just upstream from the confluence with the Truckee River (see attached map).

The differences we have found in the data from different years are so large, however, that we conclude we are seeing true impairment and not merely an artifact of different collection and subsampling methods.

Variation in Taxonomic Analysis

The taxonomy of the samples was completed by three groups: Herbst, DFG, and Desert Research Institute – University of Nevada Reno (DRI).

Taxonomic effort for all samples collected was almost identical – primarily CSBP Level 2 (http://www.dfg.ca.gov/cabw/csbp_2003.pdf). The 2000 and 2001 samples were processed by Herbst, and the 2003 and 2004 samples were processed in the laboratory by the DFG – Aquatic Bioassessment Laboratory. There were a few differences in identification levels of midge larvae (family: Chironomidae), with the Herbst data identified to species in some cases where DFG data were not. In these cases, the Herbst data were collapsed to fit into the less precise taxonomic categories used by DFG.

The taxonomy for the 2002 TRAM sample was initially completed by TRAM volunteers to a much less precise level (family for insects, order or higher for other organisms). In order to make these data more comparable, taxonomy for the 2002 subsample was re-done by DRI to the same taxonomic level as the other samples. The 2002 data are still not directly comparable to the other data because of differences in subsample size, however (see below).

Variation in subsample size

The three sets of data differ in the subsample size. The Herbst (2001) method calls for identification of 250-500 organisms per riffle (5 riffles sampled). The CSBP Level 2 calls for identification of 300 organisms per riffle (3 riffles sampled), and the CSBP protocol for volunteers call for identification of 100 organisms per riffle (3 riffles sampled).

The Herbst and DFG data sets (2000-2001 and 2003-2004) will be more comparable to one another because the total number of organisms sampled is relatively similar. Richness values will be higher for the Herbst data than the DFG identified data.

The biggest difference in data comparability will be between the 2002 TRAM/DRI data and the other data sets due to the great difference in subsample size. We believe it is important to include these data however, because of the strong indication of impairment even when the differences in subsample size are taken into account. Some metrics are more strongly affected than others by the subsample size difference, all of which is explained below.

Collection Dates

Seasonality affects bioassessment results, so this must also be taken into account when comparing data from different years. The collection dates for the samples are as follows:

Collection Year	Date	Collector
2000	Aug. 30	Herbst
2001	Jul. 10	Herbst
2002	Jul. 22	TRAM
2003	Jul. 26	TRAM
2004	Jul. 27	TRAM

The samples taken by TRAM fall between the sampling dates for the Herbst data. However, seasonality could have played a role in the differences observed in the Bear Creek stream community.

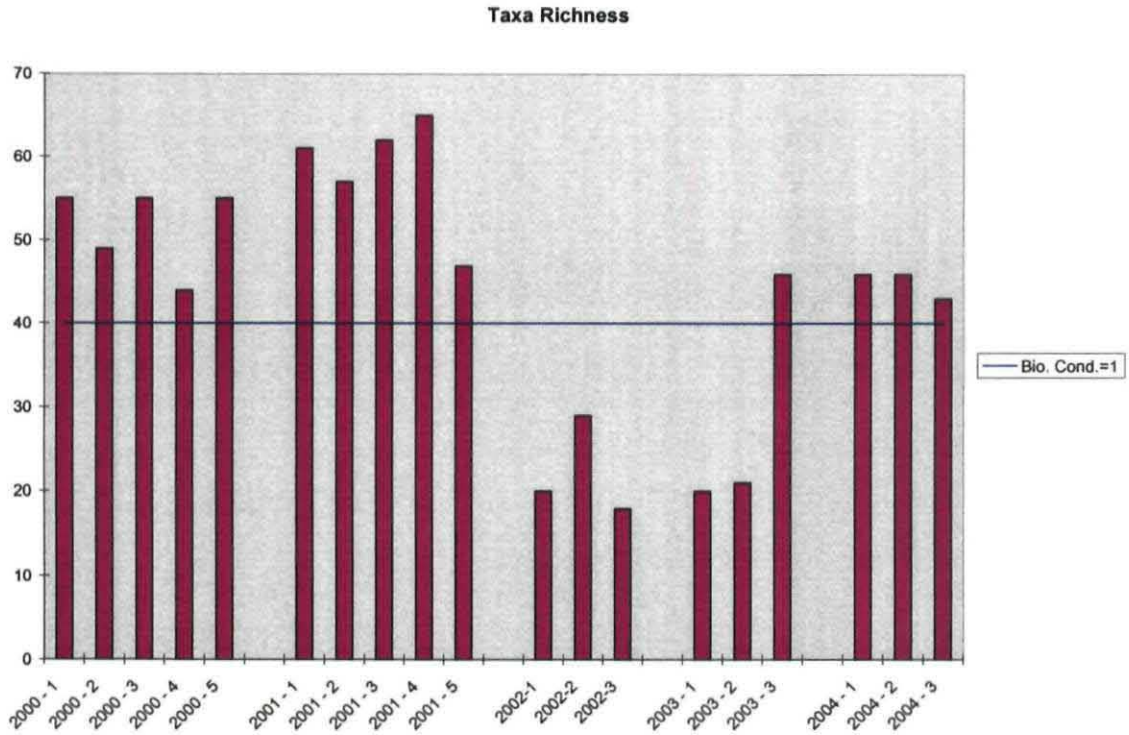
Comparison of Bear Creek data 2000-2004

The first series of graphs presented below show the data collected for the Herbst (2002) study – 2000 and 2001 and data collected by TRAM between 2002 and 2004. The data are shown grouped by year – each separate bar represents the data from one riffle. The Herbst (2001) protocol requires sampling from 5 riffles per stream reach, whereas the CSBP protocol requires sampling 3 riffles (Harrington and Born, 2000). These data are analyzed to the same taxonomic level so are relatively comparable.

We have compared the data sets for 6 of the 7 metrics used in Herbst, 2002. For each of these metrics, Biological Condition Scores were determined by Herbst. A Biological Condition Score of 5 indicates a very healthy stream ecosystem, a score of 3 indicates some impairment, and a score of 1 indicates loss of biological integrity for that particular metric. Streams that are "reference streams" mostly score 5 for metrics measured. Streams that show a loss of biological integrity that is greater than 50% score, on average, lower than 3 for each metric.

In the graphs presented below, the columns show data collected in different years, and the line indicates the value that corresponds to a Biological Condition Score of 1.

Figure 1. Taxonomic richness



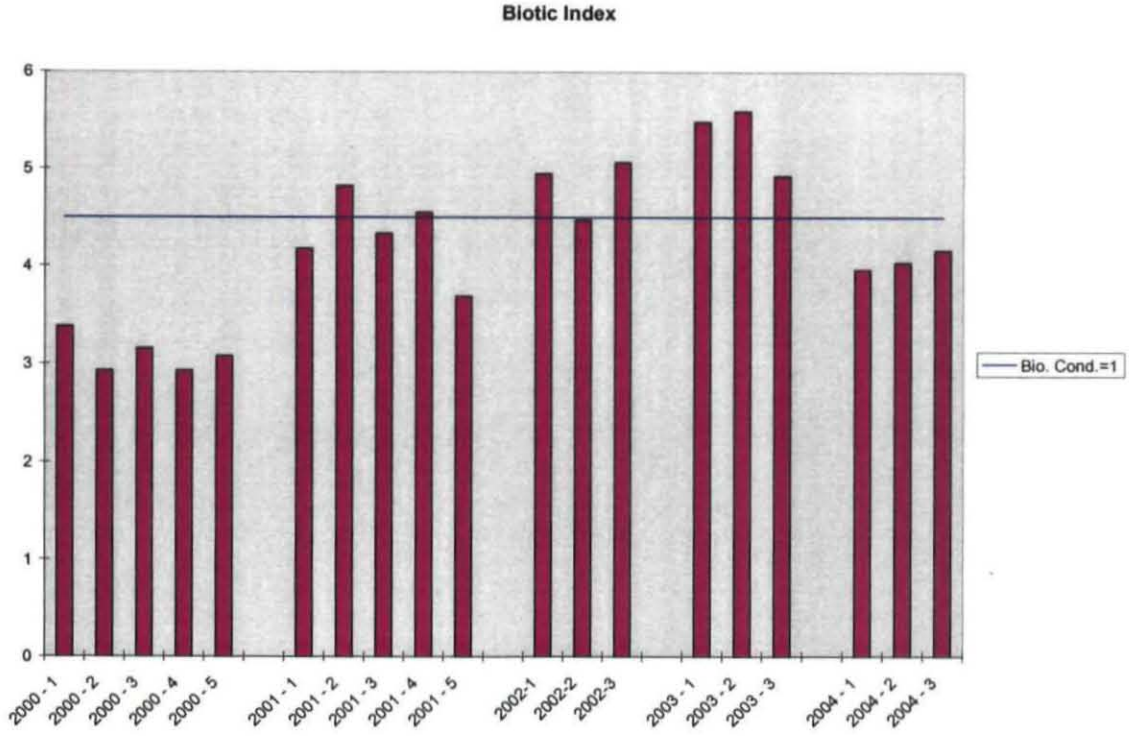
Explanation: This figure shows taxonomic richness, or how many taxa were found in each riffle sampled in each year. Most organisms were identified to species level and some taxa are identified to genus. High values of richness are indicative of a healthy stream ecosystem. Table 1 shows the Biological Condition scores assigned to metric value ranges in the Squaw Creek sediment TMDL study (Herbst, 2002). These values were determined based upon streams in the entire Truckee River watershed.

Table 1. Biological condition scores from Herbst, 2002

Biological Condition Score	5	3	1
Taxa Richness	>50	40-50	<40

As can be seen from Figure 1, **the values from 2003 and 2004 all fall below the 50 species mark (Score = 3), with two of the riffles from 2003 falling far below the 40 species mark indicating a biological condition of 1.** The values from 2002 are also well below the 40 species mark, but this metric is strongly affected by differences in subsample size. Some of the difference shown here is likely due to differences in collection and subsampling counts.

Figure 2. Biotic Index or Community Tolerance



Explanation: The biotic index is a composite measure of community tolerance to pollution. Each taxon is assigned a "tolerance value" that indicates the ability of that species to tolerate pollution. The values used here can be found in at: www.dfg.ca.gov/cabw/**camlnet**ste.pdf. A high tolerance value means that a particular taxon can live under poor water quality conditions, a low tolerance value means that a taxon is intolerant of poor water quality. Thus for this metric, a high value indicates greater impairment of the stream community and a low value indicates less impairment.

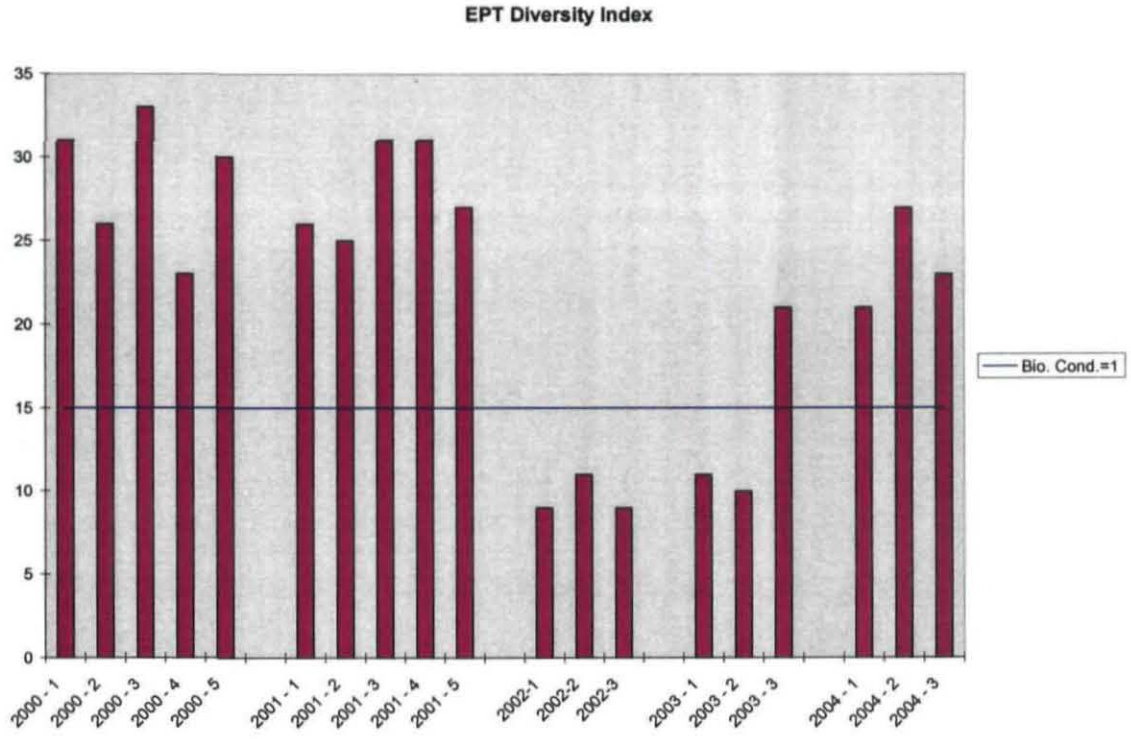
Table 2 shows biological condition scores determined from streams in the entire Truckee River watershed.

Table 2. Biological condition scores from Herbst, 2002

Biological Condition Score	5	3	1
Biotic Index	<3.5	3.5-4.5	>4.5

According to the biological condition scores determined by Herbst (2002), **samples from 2001, 2003, and 2004 all have a biological condition of 3 or lower. All the samples from 2002 and 2003 have a biological condition score of 1.** This metric is less affected by differences in subsample size than taxa richness.

Figure 3. EPT Diversity Index – the number of different species of mayflies, stoneflies, and caddisflies (Ephemeroptera, Plecoptera, and Trichoptera).



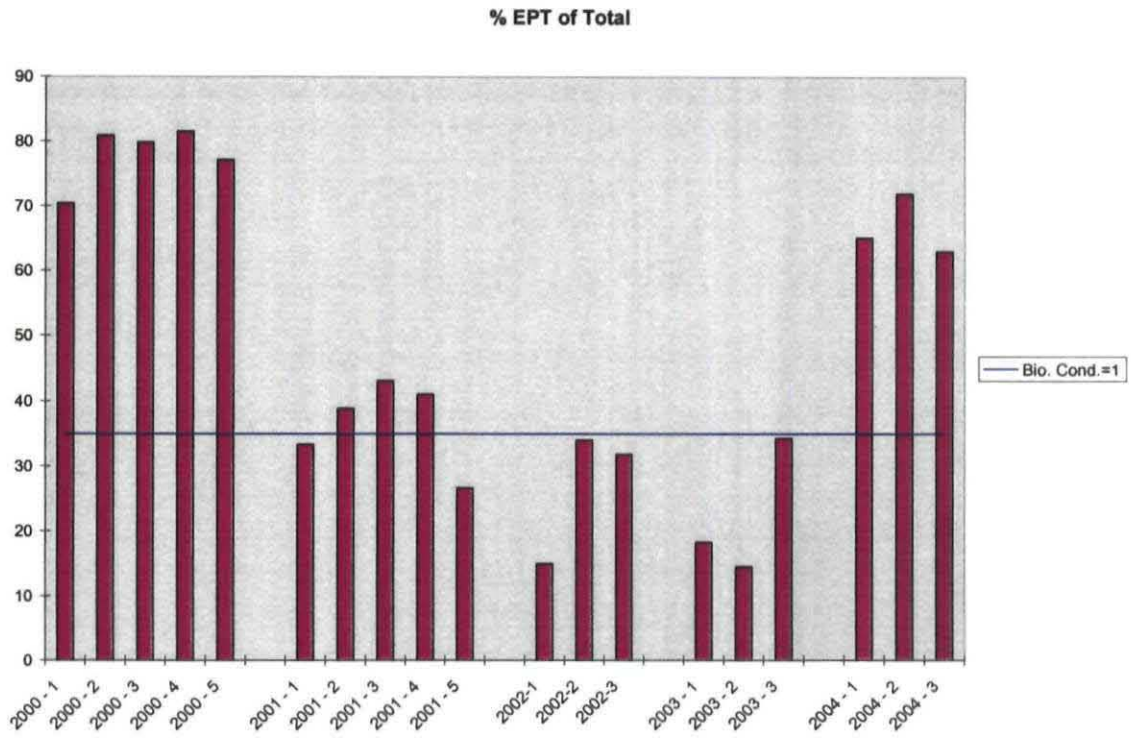
Explanation: this graph shows the number of different taxa found within the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies)- collectively known as "EPT". Organisms in these orders tend to be less pollution tolerant than other types of organisms. Table 3 contains the biological condition scores for different values of this metric.

Table 3. Biological condition scores from Herbst, 2002

Biological Condition Score	5	3	1
EPT Diversity Index	>20	15-20	<15

The data from 2002 and 2003 show some impairment in this metric. However, there is likely to be a bias towards detecting more taxa in the 2000 and 2001 samples due to the differences in collection technique as compared to 2003 and 2004. There is a stronger bias towards detecting fewer taxa in 2002 due to the lower subsample count compared to either of the other data sets.

Figure 4. %EPT of total



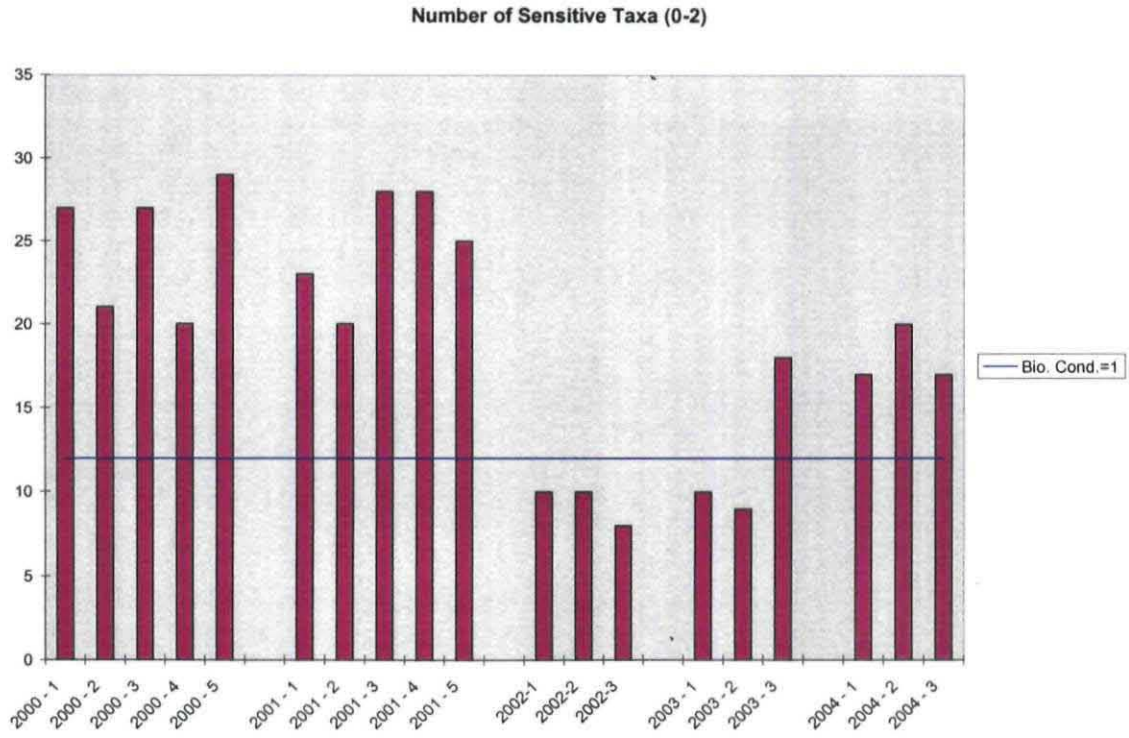
Explanation: this graph shows the percent of the sample that is composed of EPT organisms. This metric reflects abundance of these taxa, whereas the last metric reflected the variety of these taxa. Table 4 contains the biological condition scores corresponding to different values of this metric.

Table 4. Biological condition scores from Herbst, 2002

Biological Condition Score	5	3	1
% EPT of Total	>50%	35-50%	<35%

The values for this metric for 2002 and 2003 fall under the threshold for a Biological Condition score of 1, and the values for 2001 all score 3 or 1. This metric is fairly comparable between years.

Figure 5. Number of Sensitive Taxa



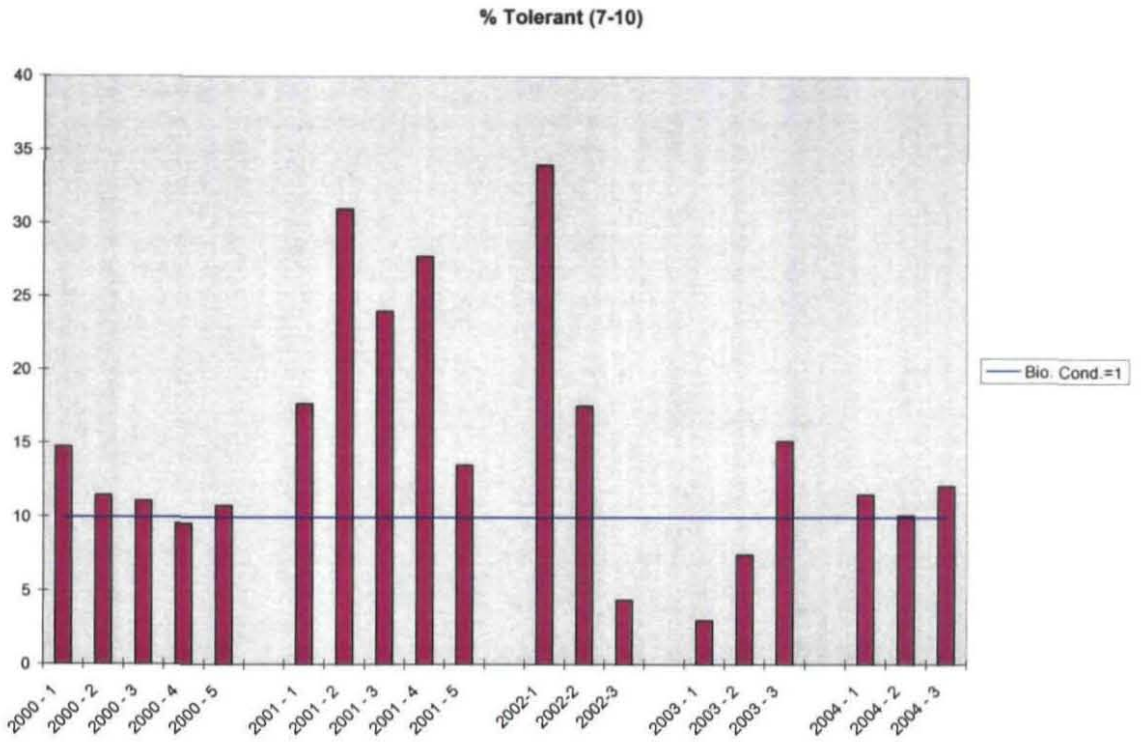
Explanation: This graph shows the number of taxa present in each sample that have pollution tolerance values of 0, 1, or 2. These types of organisms are less tolerant of pollution so values should be high in high quality waters and low in low quality waters. Table 5 shows the biological condition scores for the metric value ranges.

Table 5. Biological condition scores from Herbst, 2002

Biological Condition Score	5	3	1
No. of Sensitive Taxa	>18	12-18	<12

Except for the data from one riffle – 2004-2, the data from 2003 and 2004 receive a biological condition score of 3, and two riffles from 2003 receive a biological condition score of 1. All data from 2002 show a sensitive taxa rating of 1 – although this metric will be affected by the lower subsample size.

Figure 6. % Tolerant (7-10)



Explanation: This graph shows the percent of the sample that is composed of organisms with tolerance values of 7, 8, 9, or 10. These organisms are relatively tolerant of pollution. Table 6 shows the biological condition scores for the metric value ranges.

Table 6. Biological condition scores from Herbst, 2002

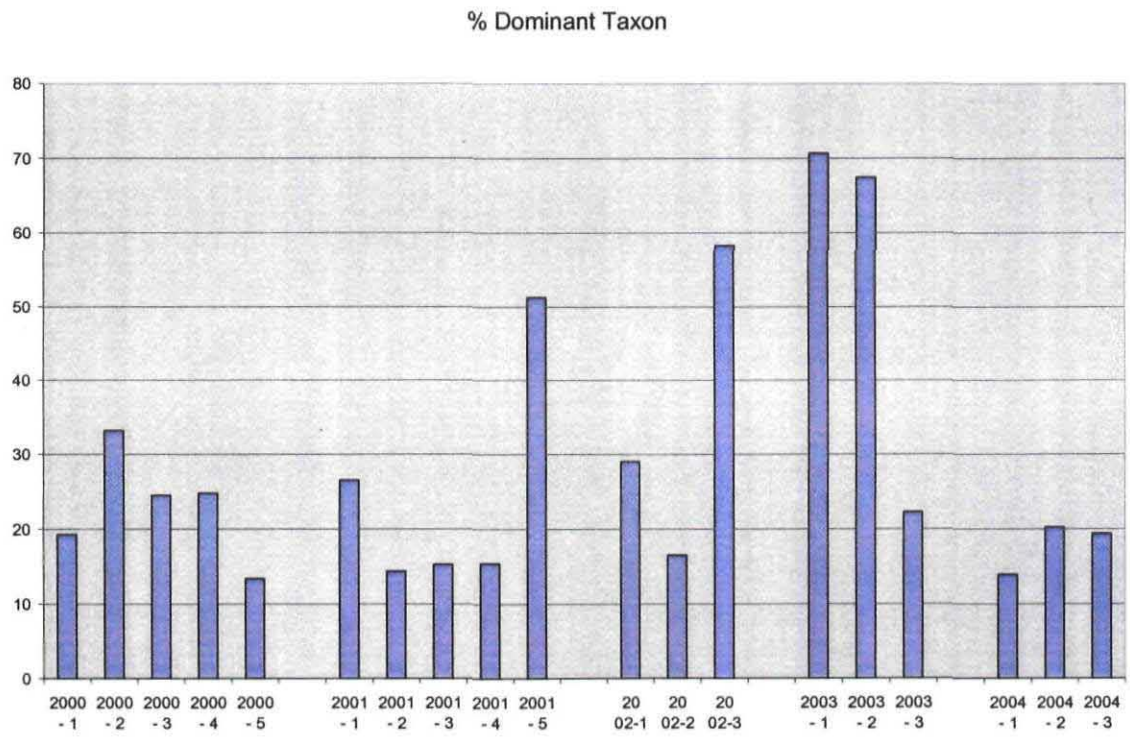
Biological Condition Score	5	3	1
% Tolerant Taxa	<5%	5-10%	>10%

In each year sampled, one or more riffles are assigned a biological condition score of 1 for this metric. The values for riffles 1 and 2 from 2002 are extremely high, indicating impairment. This metric is fairly comparable between years.

Additional metrics not used in Herbst, 2002

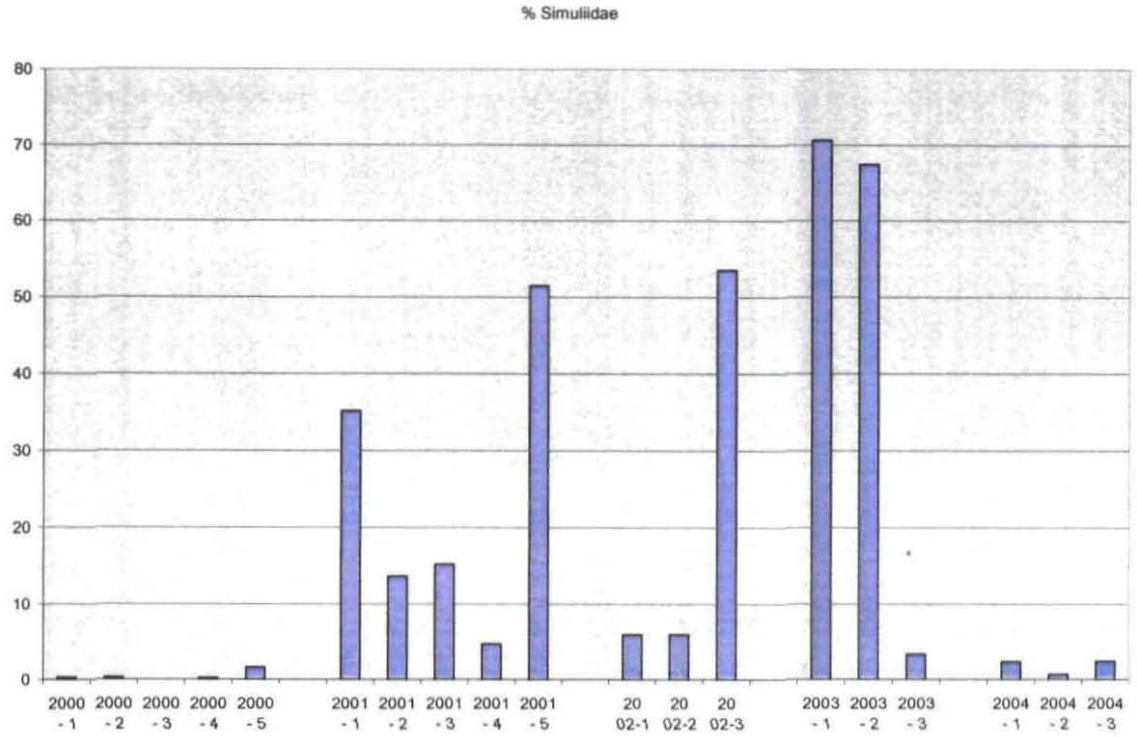
No thresholds are shown in the following two graphs because Biological Condition Scores were not calculated for these additional commonly used metrics.

Figure 7. % Dominance



Explanation: This graph shows the percentage of the organisms in the sample that belong to the most dominant taxon. A high value of this metric shows resource imbalance in the stream ecosystem. **Some of the values for 2002 and 2003 are quite high, indicating a potential impairment in ecosystem function.**

Figure 8. % Simuliidae



Explanation: This graph shows the percent of the samples from each year that is composed of organisms in the family Simuliidae. **These are black fly larvae and can indicate elevated nutrient levels in a stream (http://www.epa.gov/bioindicators/html/blackflies.html).**

Summary of Bear Creek data 2000-2004

If the Biological Condition Scores are summed for Bear Creek in the year 2003, the total score is 8 for 6 of the 7 metrics used by Herbst (2002). Even if the Biological Condition Score for the 7th metric was 5, the sum of the scores would be 13 at the highest. **This is below the threshold of 15 which indicates a stream that is greater than 50% impaired.** Data from 2002 are similar to 2003. The 2004 data are more encouraging, the sum of the Biological Condition Scores would be 25 if the value of the 7th metric was 5. This ranks at the lower end of what was determined to be reference condition.

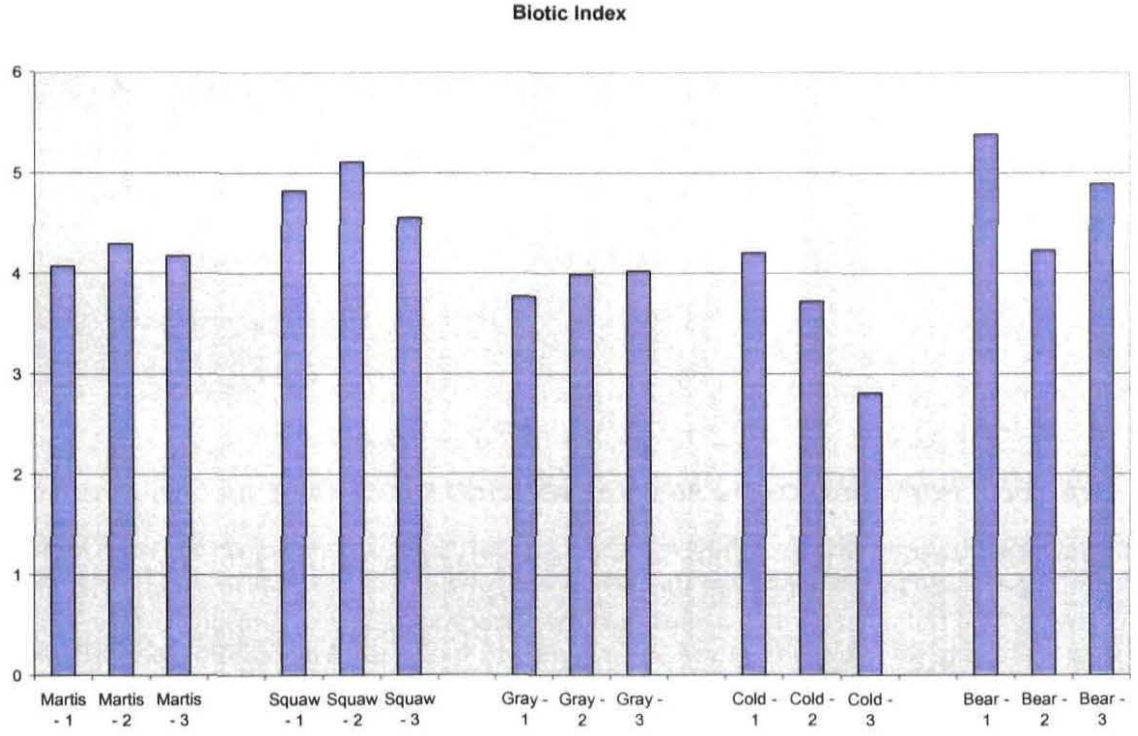
These data have been presented as a general comparison – due to differences in collection and subsampling techniques we are not stating that these data sets are exactly comparable. **However, we think that these data illustrate a strong suggestion of a decline in water quality in Bear Creek after the year 2001.**

Comparison of All TRAM 2002 Data (Bear Creek and Other Water Bodies)

The next set of data is TRAM data collected during 2002. There is often between-year variation, so these data are presented to show that Bear Creek showed evidence of being impaired as compared to the other streams sampled in that water year. The samples from Bear, Cold Stream, and Gray Creek were all identified by TRAM volunteers. The samples from Squaw Creek and Martis Creek were identified by DFG – so the laboratory methods are not exactly the same. All the data have been interpreted at the same taxonomic level – primarily family for insects, order for other organisms. The total count is different however. Bear, Cold, and Gray are 100 count per riffle (300 organisms total). Martis and Squaw are 300 count per riffle (900 organisms total).

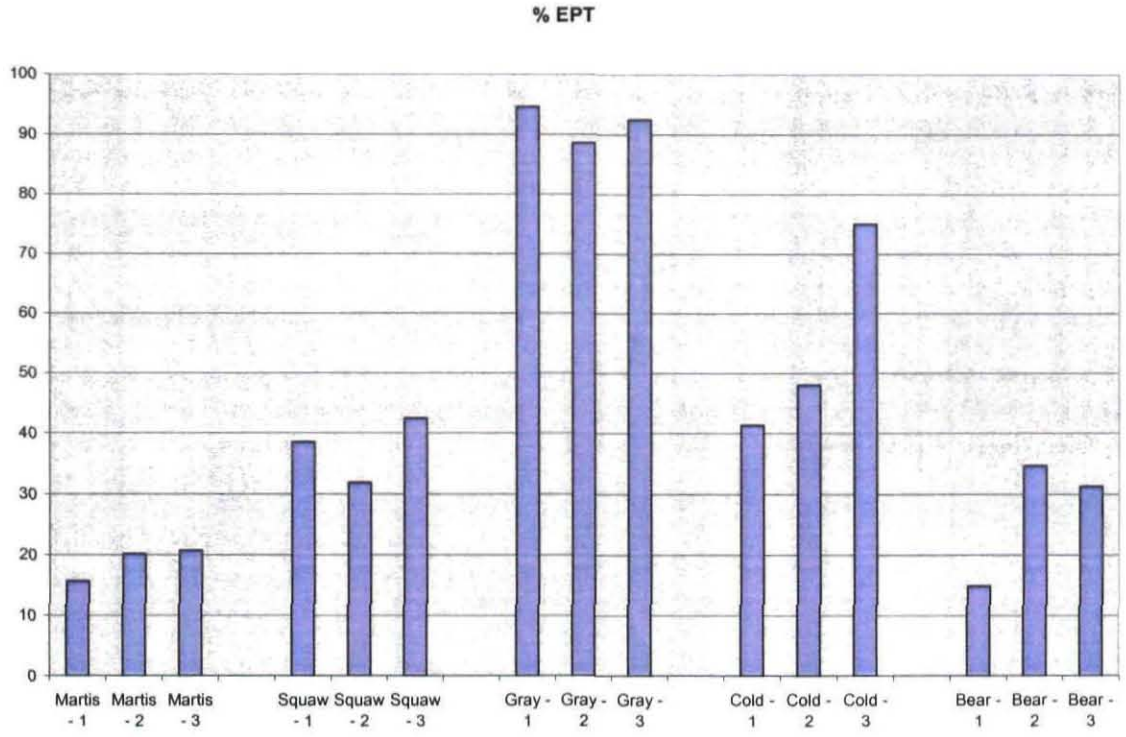
Gray Creek and Squaw Creek are currently included on the 303(d) list for excess sediment. Cold Stream is a relatively undisturbed watershed (Cold Stream drains to the Upper Little Truckee River) and should be the closest to "reference" conditions for the metrics shown here.

Figure 9. Biotic Index



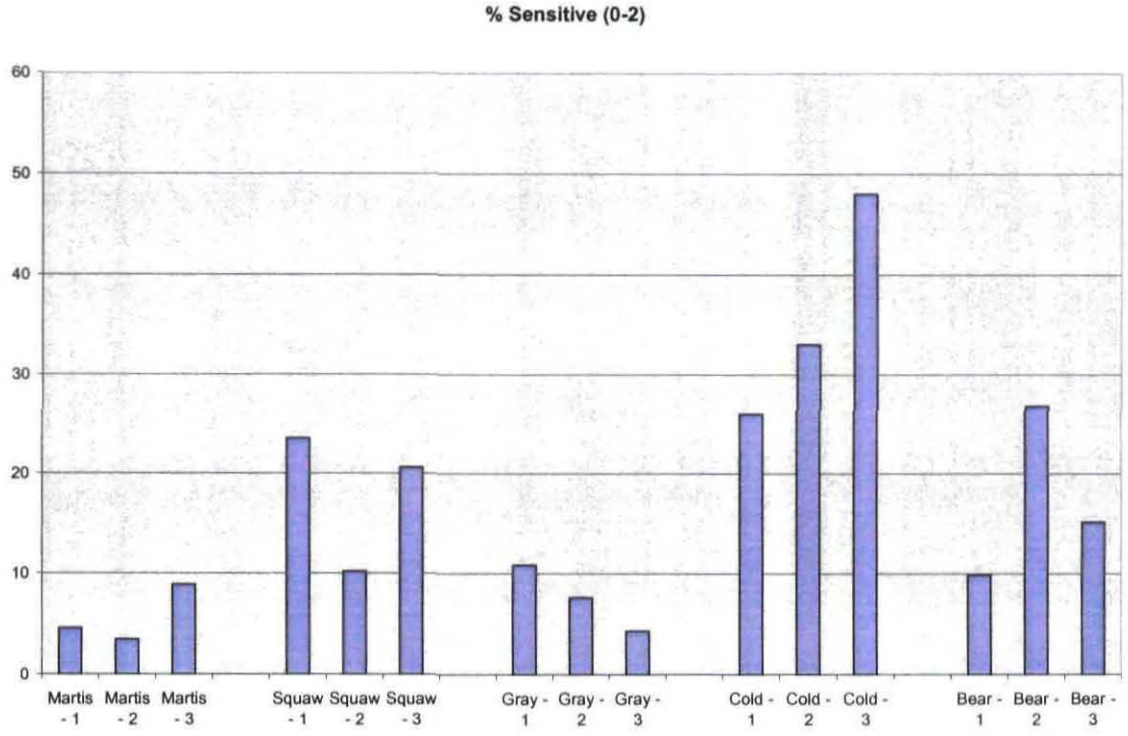
Explanation: This shows the biotic index – a composite measure of the community tolerance to pollution. Higher values indicate a biological community that is more tolerant of pollution. **As can be seen, the samples from Bear Creek are similar to those for Squaw Creek, a stream that is listed as impaired for sediment on the 303(d) list.**

Figure 10. % EPT of total sample



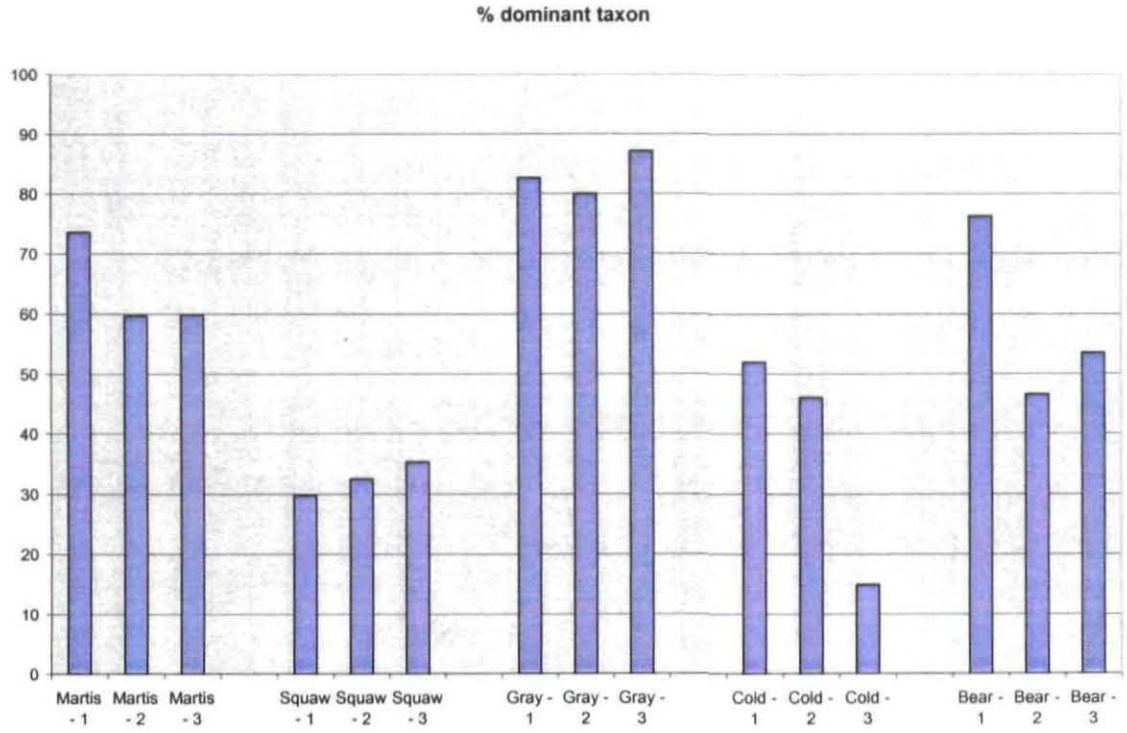
Explanation: This graph shows the percent of each sample composed of organisms belonging to the orders Ephemeroptera, Plecoptera, and Trichoptera. A higher value for this metric generally indicates better water quality. **Bear values are lower than those for Squaw (a listed stream), although higher than Martis Creek.**

Figure 11. % Sensitive Taxa (0-2)



Explanation: This graph shows the percent of the sample composed of organisms with tolerance values of 0, 1, or 2. These are organisms that are very intolerant of pollution. **Values for Bear Creek are higher (indicating better water quality) than those for Martis or Gray Creek, and are similar to Squaw Creek.**

Figure 12. % Dominant Family



Explanation: This graph shows the percent of the sample composed of the single most dominant family of organisms. A high value of this metric indicates resource imbalance in the stream ecosystem. **Bear Creek comes out intermediate for this value. Compared to the two other streams sampled in 2002 that are listed as impaired for sediment, Bear shows more imbalance than Squaw Creek and less imbalance than Gray Creek.**

Overall Conclusions

1) Bear Creek 303(d) listing

Based upon TRAM's sampling efforts, there is sufficient evidence to call for further study of water quality impairment in the Bear Creek watershed. We acknowledge that there is uncertainty in our results, including the points that between-year differences in stream flow can strongly affect benthic communities, the timing within a year when sampling is conducted can affect communities, and the differences in collection technique between the initial study (Herbst, 2002) and TRAM's sampling. However, de-listing Bear Creek at this time is premature as data from 2002 and 2003 indicate that further study of impairment is warranted.

Our data showed that Bear Creek may have recovered somewhat in 2004, but making listing decisions should not be based upon data from a single year, or even a single study.

Further study of excess sediment in Bear Creek should be undertaken, as should a study of nutrient levels in the creek.

2) Comprehensive Water Quality Monitoring for Truckee River watershed

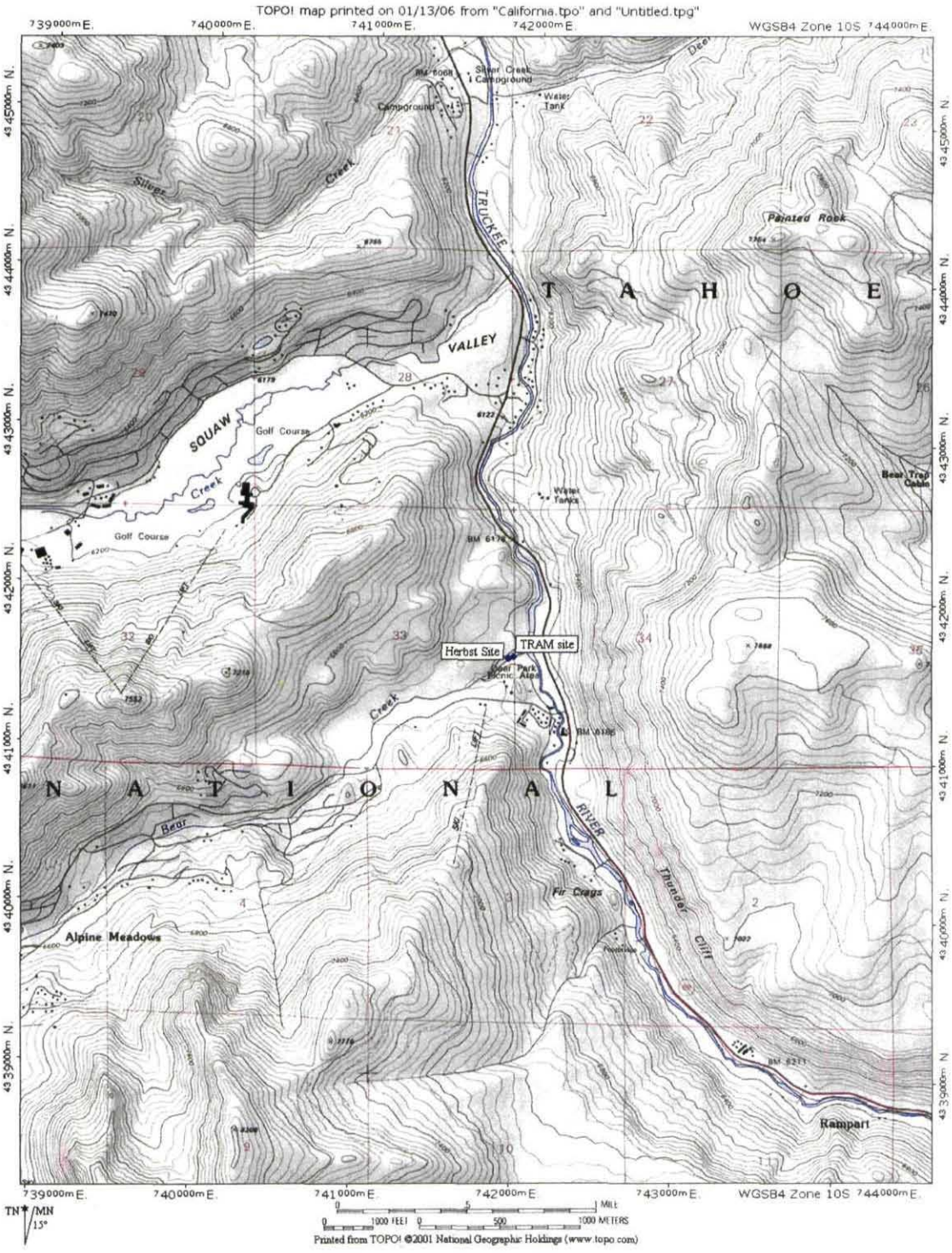
A comprehensive water quality monitoring plan needs to be developed and implemented for the Truckee River watershed. Many streams within our watershed are not regularly monitored, so sufficient data are not available to make informed decisions regarding listing or de-listing. By implementing such a program, future listing or de-listing decisions will be based on robust data.

References

Harrington, J. and Born, M. 2000. Measuring the Health of California Streams and Rivers: A Methods Manual for Water Resource Professionals, Citizen Monitors, and Natural Resources Students. 2nd Edition. Sustainable Land Stewardship International Institute, Sacramento, CA.

Herbst, D.B. 2001. Quality Assurance Project Plan – Aquatic invertebrate bioassessment monitoring in the Eastern Sierra Nevada [California State Water Resources Control Board, Lahontan Region]. Download: http://www.swrcb.ca.gov/swamp/docs/appxg_ucsnarlswampbio.pdf

Herbst, D.B. 2002. Development of Biological Water Quality Targets for Assessment of Total Maximum Daily Load (TMDL) of Sediment in the Squaw Creek Watershed (Placer County, California) [California State Water Resources Control Board, Lahontan Region]. Download: http://www.waterboards.ca.gov/lahontan/TMDL/Squaw/Squaw_TMDL_Bioassessment_Report.pdf


TOPO! map printed on 01/13/06 from "California.tpo" and "Untitled.tpg"
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VALLEY
SQUAW
Creek
Golf Course
Water Tanks
Bear Trap Cable
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Herbst Site
TRAM site
Bear Park Picnic Area
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