

## Section 8

# Conclusions and Recommendations

This section summarizes the major conclusions that were made based on the 2012 and the combined monitoring results from the first three years of TRWQMP implementation. Information is also presented regarding the monitoring activities planned for WY 2013 and additional adaptive management recommendations for the continued implementation of the TRWQMP. These modifications and recommendations are based on new opportunities for efficient data collection and collaboration with other groups, and on the results of the TRWQMP activities conducted to date. A summary of the conclusions that have been developed to date are also presented.

Overall, monitoring activities should be continued per the guidance in the TRWQMP and the adaptive management based modifications that have been made to the program over the initial three years. There is a continued need to develop more comprehensive and robust datasets that will help to identify specific areas of concern and evaluate SWMP performance. As the monitoring dataset is further developed, recommendations on watershed management activities, such as the location and prioritization of water quality improvement projects, can also be developed based on the monitoring results.

### 8.1 Continuous Turbidity Monitoring

Both the County and Town will install and operate continuous turbidity monitoring stations in WY 2013. The County stations will be installed adjacent to existing tributary level stations in West Martis Creek and Martis Creek (DST-MC4 and DST-MC5, respectively). The Town's stations will be located in the main stem of the Truckee River near the locations where the river enters and exits the Town boundary. The data collected at these stations will augment similar monitoring being conducted by the Truckee River Watershed Council (TRWC) in Trout, Coldstream and Donner Creeks which are each major tributaries entering the Truckee River within the Town limits. Over time, as results indicate, the location of one or more of these stations may be adjusted to provide an improved understanding of the sources and quantities of sediment entering, and being transported by, the Truckee River and its tributaries within the TRWQMP project area.

The overall goal of these new turbidity stations is to provide a means of estimating suspended sediment loads that are occurring at the monitored locations. The following objectives have been defined for these stations to aid in focusing the data collection, analysis and reporting activities and to provide a means of measuring the progress and effectiveness of the monitoring activities:

1. Collect turbidity and total suspended solids (TSS) data at the sites and develop correlations between these two parameters.



**Figure 8-1. Automated Water Quality Monitoring Stations in Placer County.**

2. Utilize available stream discharge data together with the turbidity: TSS correlation to calculate suspended sediment loads at the sites.
3. Integrate similar TRWC data into the overall analysis to characterize suspended sediment loads delivered to the Truckee River from Donner and Trout Creeks.
4. Conduct comparisons to suspended sediment load estimates presented in Truckee River TMDL and evaluate loads originating within Town boundary against TMDL defined load allocations.
5. Apply the newly developed turbidity: TSS correlation to available historic turbidity data collected by others to identify and evaluate past and ongoing trends in suspended sediment loads.
6. Where sufficient discharge data is available, develop and apply discharge: TSS relationships to be used as a second method of calculating suspended sediment loading, as well as to evaluate temporal trends in sediment generation and supply.

## 8.2 Rapid Assessment Methodology

### *Conclusions*

The results of the WY 2012 RAM indicate that Trout Creek, West Martis Creek, and Squaw Creek are of the highest concern based on the relative amount of fine sediment deposited on the bottom of the stream channel. The RAM results indicate that from WY 2010 to WY 2012, the percentage of fine sediment substrate in Squaw Creek and West Martis Creek increased by approximately 7 and 10 percent, respectively. The percentage of fine substrate in Trout Creek remained constant despite completion of a stream restoration project within the upper reaches of monitored stream segment. The restored reaches in Trout Creek were in good condition during the surveys, but large sediment loads are clearly being transported to these areas from upstream sources. The remaining streams showed decreased amounts of fine sediment substrate from WY 2010 to WY 2012 ranging from 2 percent less in the Truckee River to 10 percent less in the main stem of Martis Creek.

### *Recommendations*

The RAM results for the Truckee River do not appear adequate for identifying sources or trends relating to fine substrate. A new approach for analyzing and presenting data should be considered, possibly including a more focused analysis of existing data (i.e. presenting results from each individual transect as opposed to averages for an entire reach). This approach is presented through an initial evaluation in Section 5. With additional refinement, areas with high concentrations of sand and fines could be tracked over time with more localized data collection to determine whether conditions are improving or declining. Areas that do not contain sand or fines may not necessitate further monitoring.

Over time, rapid assessment observations within the tributaries to the Truckee River should also focus on areas of greater concern. The 150m long reaches provide good initial indications of problem areas, but surveying smaller areas with additional and more concentrated measurements would more accurately define specific areas where sediment accumulation is excessive and better enable the tracking of changes to its distribution and movement.

As patterns of fine sediment problem areas within the various stream and river channels emerge, increasing efforts should be made to identify the associated upstream sources of this excess fine sediment. Due to the dynamic nature of sediment transport in these water bodies, this challenging process will require a well developed approach. It is likely that data from the other assessment types will need to be considered, together with the rapid assessment results, to confidently identify source areas. More detailed watershed level field surveys of potential source areas, preferably during large precipitation events, will also provide valuable insight into the identification and prioritization of sediment sources and into the development of alternatives for remedial actions.

## 8.3 Bioassessment

### Conclusions

Eastern Sierra IBI scores can be ranked in tiers (Tiers 5 through 1) or grades (Grades A through F), which are designated as supporting (Tiers 5 and 4; Grades A and B), partially supporting (Tier 3; Grade C), or not supporting (Tiers 2 and 1; Grades D and F) regional water-quality objectives. Table 8-1 lists the thresholds for interpreting IBI scores, including the tier ranks or grades, designations for supporting water-quality objectives, and the rationale (statistical ranges) for these thresholds.

Using the thresholds identified in Table 8-1, two of the three Squaw Creek sites sampled in 2012 (site Bio-SC2 and Bio-SC3) in the middle and lower meadow would be designated as supporting regional water-quality objectives, while the upper meadow site (Bio-SC1) would be designated as not supporting regional water-quality objectives. Using the letter grading analogy, sites Bio-SC2 and Bio-SC3 receive a Grade of 'A' and site Bio-SC1 receives a 'D'. In Martis Creek, sites Bio-MC2, Bio-MC4, Bio-MC5, and Bio-MC6 would be designated as partially supporting regional water-quality objectives with a grade of 'C'. Martis Creek headwater sites Bio-MC1 and Bio-MC2 would be designated as supporting regional water-quality objectives with grades of 'A' and 'B', respectively.

**Table 8-1. Thresholds for Interpreting Eastern Sierra IBI scores: IBI Score Tier / Grade Designation Rationale**

IBI Score	Tier / Grade	Designation	Rationale
>85.5	5 / A	supporting	>50th percentile (median) reference condition
80.1 - 85.5	4 / B	supporting	25th-50th percentile reference condition
62.2 - 80.1	3 / C	partial supporting	5th-25th percentile reference condition
46 - 62.2	2 / D	not supporting	<5th percentile reference condition (impairment level)

### Recommendations

The bioassessment activities being conducted under this program are well developed and follow standardized protocols that are well suited for their purpose. The differences between the Squaw and Martis Creek data collection protocols can be effectively reconciled at the analysis and reporting stage and any significant adjustments to either field protocol are not warranted at this time.

The bioassessments provide a proven indicator of stream health and the results are valuable, especially when evaluated together with results from other assessment types. Bioassessment data collected by other groups, such as the TRWC, should be evaluated for compatibility with this program and appropriately integrated into the analysis and reporting.

## 8.4 Community Level Discrete Monitoring

The community level monitoring is an effective means of characterizing the water quality of stormwater runoff from various developed portions of the study area. The data also provides:

- a means of prioritizing these areas for water quality improvements,
- an important source of planning and design information, and
- justification for requests of grant funding for such projects.

### *Conclusions*

The data collected to date indicates that outfalls to the Truckee River within the Town Corridor, especially those that receive runoff from the downtown area and nearby high traffic roadways, are discharging the most sediment of all of the community monitoring locations.

Due to the much less intensive land uses in the upstream catchments, the results from the current Placer County community sites do not indicate significant problems. Erosion at the outlet of the Northstar infiltration basin and near the culvert on Skidder Trail has been identified as sediment source to West Martis Creek. It is likely that discharges from outfalls along Highway 89, or other high traffic areas, are more similar to the Town's sites in terms of sediment discharges.

### *Recommendations*

To reduce sediment discharges from the high sediment outfalls, the following recommendations should be considered by the Town and County as funding and other constraints allow.

1. Pave or otherwise stabilize the bare soil areas within the public Right-of-Way to limit pollutant sources.
2. Install curb and gutter or improve the storm drain system to keep concentrated runoff flows separated from the bare soil areas.
3. Install deterrents to prevent parking on dirt shoulders.
4. Install improvements to promote infiltration and reduce storm water runoff volumes.
5. Install treatment controls such as drain inlet inserts or sediment traps to promote settling and provide sediment storage.
6. Regularly clean drain inlets and storm drain pipes and track the amount of material removed.
7. Sweep streets frequently to remove excess traction sand. Given the limited resources for these types of activities, consider prioritizing high traffic areas, especially near the river and its tributaries.
8. The eroding earthen channel upstream of the County's Northstar Community Level site should be stabilized with rip rap or other similar measure.

New community level monitoring locations should be considered, especially when sufficient data has been collected to characterize existing sites.

An approach is also needed to develop pollutant load estimates from the community sites to assess their relative contributions to the total loads being transported by the receiving water bodies. This information could be combined with the load evaluations being conducted for the Truckee River and its tributaries to provide a more complete understanding of sediment generation and transport

processes within the study area. Load based evaluations require flow data which could either be collected by installing flow measurement devices, or flow data could be estimated by means of hydrologic modeling.

## 8.5 Tributary Level Water Quality Monitoring

The results of the first two years of tributary level water quality monitoring at the six Martis Creek sites are beginning to reveal information regarding the types of pollutants and their relative concentrations and loads at the various locations. Continued monitoring will provide the necessary volume of data for statistical analyses to test the significance of the differences and trends among the sites.

### *Conclusions*

After two years of monitoring, the data indicate that pollutant concentrations within Martis Creek and its tributaries are below the water quality objectives defined for total nitrogen and TKN within Martis Creek at its mouth. All sites had mean total phosphorus concentrations that were above the water quality objective for Martis Creek. This includes East Martis Creek which has a relatively undeveloped watershed, indicating that the phosphorus source may be natural rather than a result of fertilizers use on golf courses and landscaping.

### *Recommendations*

The mean concentrations and the load based evaluations are based on “worst-case” water quality data sampled from events likely to have caused higher than average pollutant mobilizations. The TRWQMP specified approach of sampling worst-case conditions is appropriate in addressing the objective of identifying problem areas in the watershed; however, it also leads to biased mean concentration values that do not consider pollutant concentrations occurring during lower, more typical, flows. This is apparent when comparing results from WY 2011 (wet) and WY 2012 (dry). Larger events were monitored during WY 2011 which resulted in significantly higher concentrations of particulate parameters such as TSS, turbidity, and total phosphorus. It is recommended to consider sampling a number of lower flow events to better represent the range of conditions in the calculated mean concentrations and pollutant loads.

## 8.6 Martis Creek Stream Gauge

### *Conclusions*

The stream gauge on Martis Creek has been in operation for two years and rating curves have been developed to calculate continuous flows for the majority of the monitored time period. The development and subsequent deterioration of a downstream beaver dam has complicated the discharge calculations, but the stream gauge remains effective in meeting its objectives.

### *Recommendations*

Discharge monitoring should continue at the stream gauge and the condition of the beaver dam should be monitored closely. Two additional stream gauges have been installed in association with the continuous turbidity stations on the West Martis and Martis main stem branches, and will provide additional discharge data for the Martis Creek watershed in WY 2013. These data will be used to refine the current approach used for calculating discharge and pollutant loads.