



## 2011 Macroinvertebrate Study Summary

Biomonitoring, the use of an indicator species or community to assess biological integrity, provides a valuable tool that can be used to evaluate the quality and condition of aquatic ecosystems over time (Plafkin et al. 1989, Barbour et al. 1999, Paul et al. 2005). Benthic macroinvertebrates, aquatic insects large enough to be seen without a microscope, are an ideal bioindicator because of their limited mobility, relatively long aquatic life stage, high population densities, and sensitivity to disturbance (Herricks 1995, Ward et al. 2002). In the fall of 2011, the Roaring Fork Conservancy (RFC) teamed up with the Water Quality Control Division (WQCD) of the Colorado Department of Public Health and Environment (CDPHE) to select and sample twenty sites in the Roaring Fork Watershed, collecting macroinvertebrates to assess overall stream health in the Roaring Fork Valley. RFC worked with Timberline Aquatics, Inc to analyze these data and produce a report.

It is beneficial to use several biotic indices, or metrics, when analyzing collection data because certain taxa survive and sometimes thrive in the presence of various contaminants. To better understand both healthy and adversely impacted sites, an analysis of multiple metrics was used along with comparisons to other study sites and past results at the same site. In the fall of 2010, the CDPHE published guidelines specific to the state of Colorado for benthic macroinvertebrate sampling and analysis using a Multi-Metric Index (MMI). MMI provides a rating of overall stream health based on presence, absence, and abundance of specific macroinvertebrates. Reference sites throughout the state provide guidelines for ideal conditions on which to compare each stream based on ecological conditions such as elevation, gradient, and geology. Each metric is assigned a threshold for attainment and impairment; stream reaches falling between these thresholds require additional analysis.

This assessment of stream health found that most streams sampled in the Roaring Fork Watershed met or surpassed the MMI standards for healthy aquatic conditions. Of the twenty sites sampled, only two sites are considered impaired (Cattle Creek site 12719 and Roaring Fork site 12783) while one site (Roaring Fork site 12784) fell in the gray area between healthy and impaired. The highest MMI score in biotype 1 was registered at Thompson Creek (site 12799c), a tributary to the Crystal River, and the second highest score occurred within upper Cattle Creek (site 12725). In biotype 2, the highest MMI score was recorded at the Crystal River (site 12731b). These sites contained some of the best aquatic conditions for macroinvertebrates, a good indicator of overall stream health.

Although 2011 produced strong results for Roaring Fork Rivers, the story does not end here. Continued monitoring is essential over time to evaluate changes in the ecosystem such as increasing water demands, or changes in land use practices. A long term monitoring program would also provide a better understanding of the impact of human disturbances on both healthy and impaired streams. Continued collections at pristine sites, with minimal human impact, provide a valuable standard to compare natural yearly variations in all streams. Likewise, persistent studies in impaired areas are necessary to identify the sources of stress and potential means of mitigation. Biomonitoring with benthic macroinvertebrates provides a valuable glimpse into the complexity of long- and short-term stream health, and based on these metrics, the Roaring Fork Watershed shows an abundance of thriving aquatic conditions.

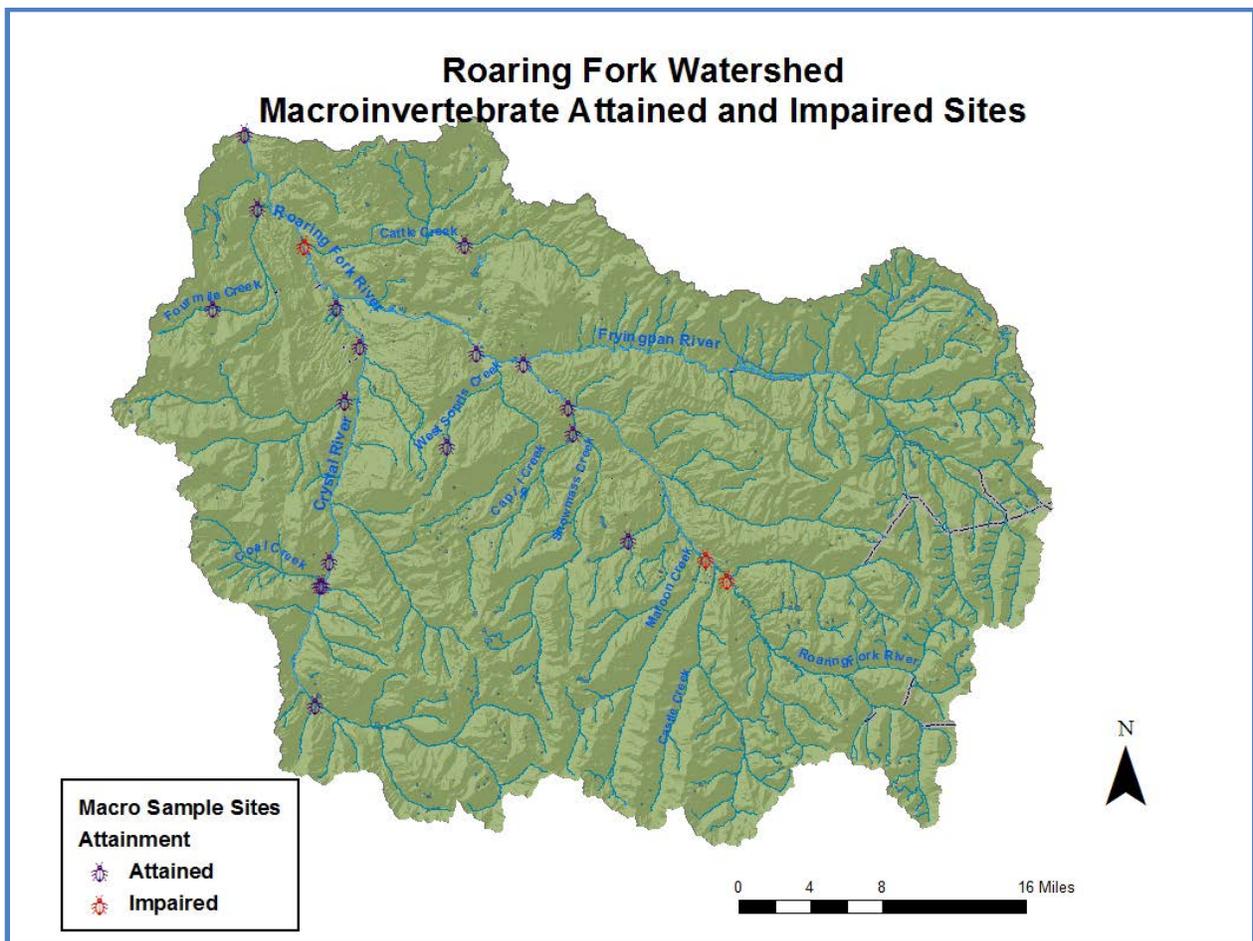


Figure 1. 2011 Macroinvertebrate Study Results

Biotype 1: MMI Scores (Fall 2011)

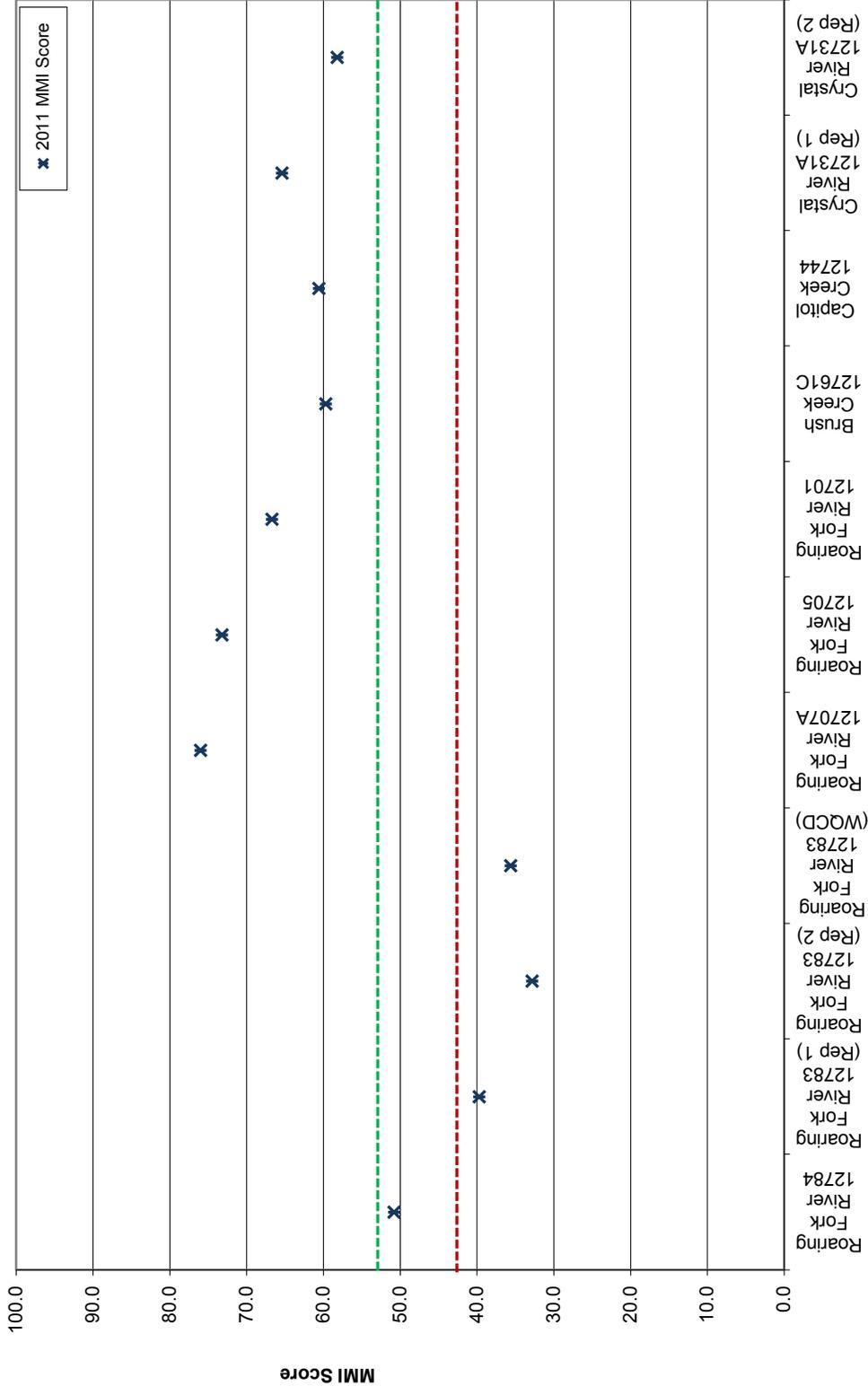


Figure 2: MMI scores for sites in Biotype 1 (additional sites from Biotype 1 are included in Figure 3). The threshold for aquatic life use attainment is represented by the green dashed line, and the threshold for impairment is represented by the red dashed line.

Biotype 1: MMI Scores (Fall 2011)

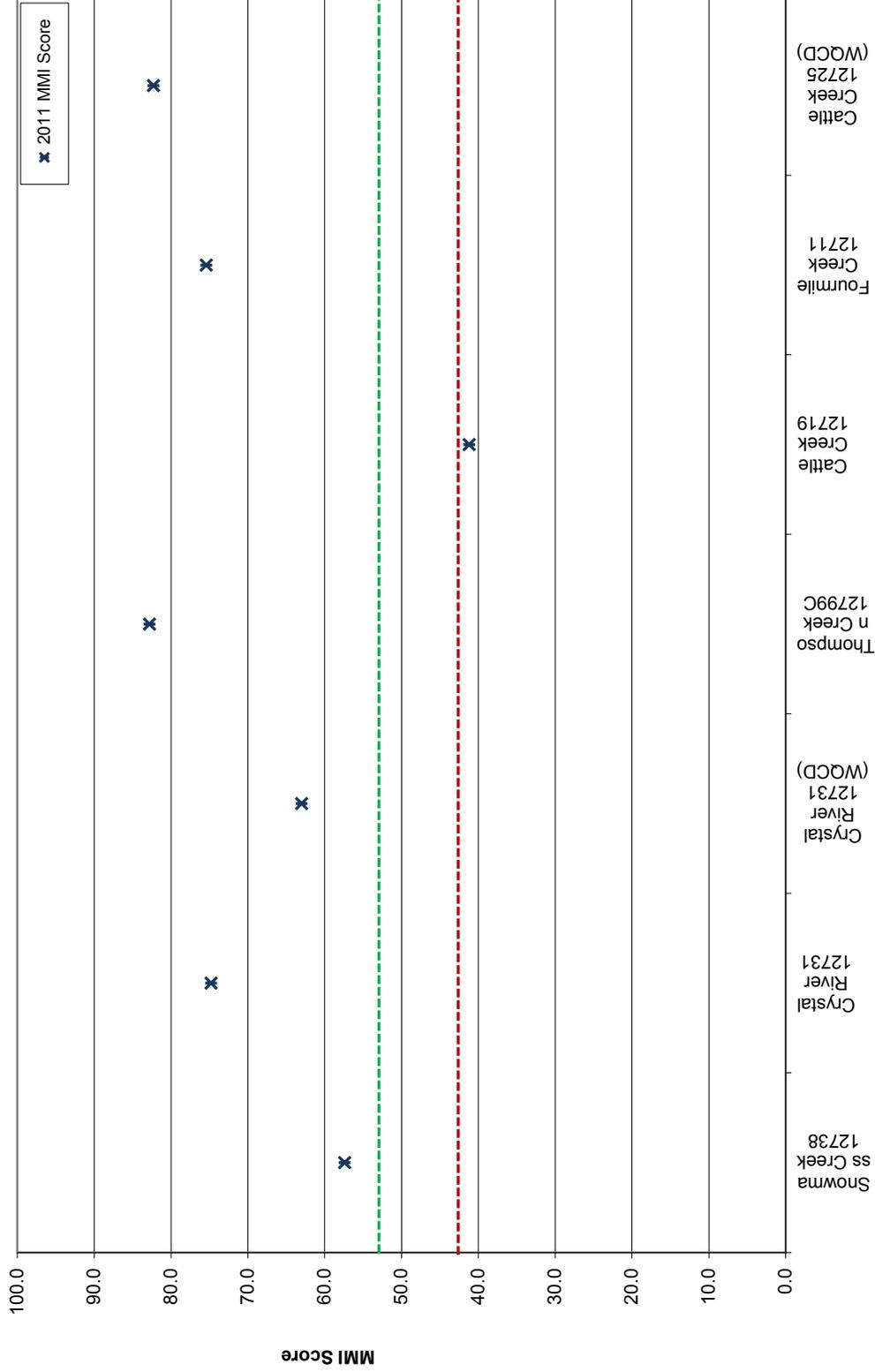


Figure 3: MMI scores for Biotype 1 sites (additional sites from Biotype 1 are included in Figure 2). The threshold for aquatic life use attainment is represented by the green dashed line, and the threshold for impairment is represented by the red dashed line.

Biotype 2: MMI Scores (Fall 2011)

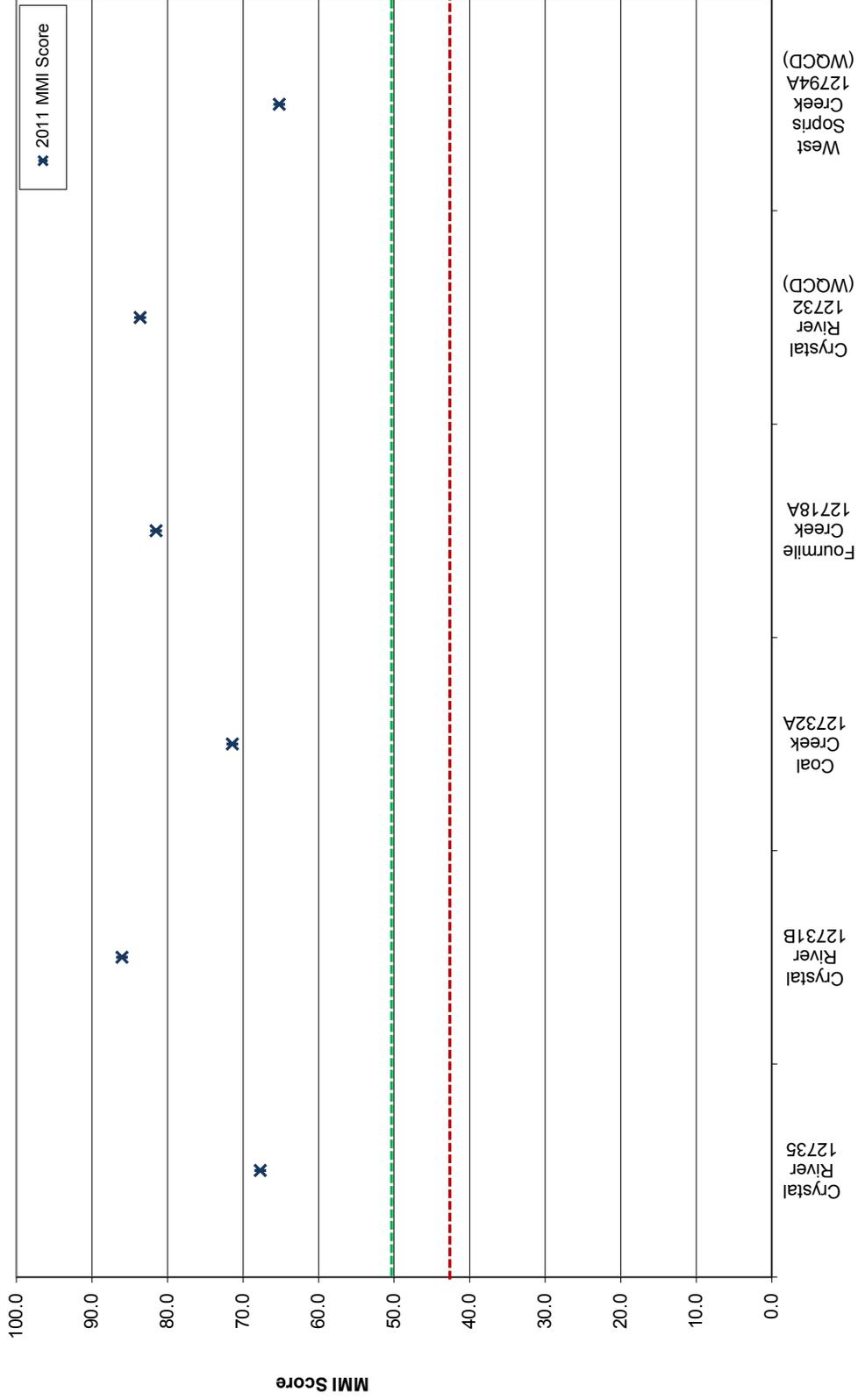


Figure 3: MMI scores for Biotype 2. The threshold for aquatic life use attainment is represented by the green dashed line, and the threshold for impairment is represented by the red dashed line.

