Using Trace Element Compositions of Juvenile Westslope Cutthroat Trout Scales to Determine Stream Origin in the North Fork Flathead River, Montana[AFS]

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We used laser ablation inductively coupled mass spectrometry to quantify Mg:Ca, Mn:Ca, Sr:Ca, and Ba:Ca levels in scales from juvenile westslope cutthroat trout (*Oncorhynchus clarki* lewis)i collected from five streams of the North Fork Flathead River during summer 2001. We also determined Mg:Ca, Mn:Ca, Sr:Ca, and Ba:Ca levels in the water throughout the North Fork Flathead River drainage during the summer of 2001. The chemical compositions of trout scales were related to Sr:Ca and Ba:Ca levels in the water. Multivariate elemental signatures of the scales differed significantly among streams, and a canonical discriminant analysis revealed that streams were significantly separated in discriminant space. A forward stepwise discriminant function analysis was used to classify individual fish back to their natal stream. Overall classification accuracy was 91 percent, and ranged from 83 percent for Langford Creek to 100 percent for Camas Creek and Sage Creek. Finally, the trace element levels at the focus and edge of individual scales were significantly correlated, suggesting that the sampled fish were rearing in their respective natal tributary. These data indicate that trace element signatures may be used as natural tags to identify natal stream origin of cutthroat trout. In the future, this technique may be used to 1) monitor the effectiveness of habitat and passage programs, 2) identify and protect important populations, and 3) determine life history.