

G

Slimy Sculpin Metals Data for Red Devil Creek Used to Develop Benthos-to-Sculpin Trophic Transfer Factors



**G Slimy Sculpin Metals Data for Red Devil Creek Used to Develop Benthos-to-Sculpin
Trophic Transfer Factors**

This page intentionally left blank

Appendix G

Slimy Sculpin Metals Data for Red Devil Creek Used to Develop Benthos-to-Sculpin Trophic Transfer Factors

This appendix presents the slimy sculpin (*Cottus cognatus*) metals data for Red Devil Creek (see Tables G-1 and G-2). The fish were collected by the United States Department of Interior Bureau of Land Management (BLM) in 2010 and 2011. The EPCs developed from the sculpin data (see Table G-3) were used in the BERA Supplement to develop benthos-to-sculpin trophic transfer factors (see Appendix I).



**G Slimy Sculpin Metals Data for Red Devil Creek Used to Develop Benthos-to-Sculpin
Trophic Transfer Factors**

This page intentionally left blank

Table G-1. Sculpin Metals Data from Red Devil Creek Used in Baseline Ecological Risk Assessment (BERA, E&E 2014) and BERA Supplement.

| Sample Month-Year | LabID | Client Samp ID | Sb (mg/kg) | | As (mg/kg wet) | | Ba (mg/kg wet) | | Be (mg/kg) | | Cd (mg/kg wet) | | Cr (mg/kg) | | Cu (mg/kg wet) | | Pb (mg/kg wet) | | Mn (mg/kg wet) | | Hg (mg/kg) | | Ni (mg/kg wet) | | Se (mg/kg) | | V (mg/kg wet) | | Zn (mg/kg) | |
|-------------------|------------|----------------------|------------|---|----------------|---|----------------|---|------------|---|----------------|---|------------|---|----------------|----|----------------|----|----------------|---|------------|---|----------------|---|------------|---|---------------|---|------------|----|
| | | | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q | Result | Q |
| June 2010 | 253 | RD 4/Slimey Sculpin | 1.513 | | 2.352 | | 3.341 | | 0.025 | U | 0.025 | U | 0.039 | | 1.965 | J | 0.025 | J- | 9.423 | | 0.09 | | 0.045 | | 1.127 | | 0.132 | | 20.657 | J- |
| June 2010 | 255 | RD 7/Slimey Sculpin | 2.173 | | 3.029 | | 2.688 | | 0.025 | U | 0.025 | U | 0.046 | | 2.263 | J | 0.025 | UJ | 11.292 | | 0.09 | | 0.050 | | 0.986 | | 0.095 | | 19.812 | J- |
| June 2010 | 256 | RD 8/Slimey Sculpin | 0.399 | | 1.132 | J | 2.405 | | 0.025 | U | 0.052 | | 0.028 | | 0.720 | J- | 0.025 | U | 8.955 | | 0.05 | | 0.039 | | 1.291 | | 0.122 | | 18.718 | J- |
| June 2010 | 257 | RD 9/Slimey Sculpin | 0.615 | | 1.439 | | 2.82 | | 0.025 | U | 0.047 | | 0.035 | | 0.816 | J- | 0.025 | U | 13.854 | | 0.06 | | 0.044 | | 0.834 | | 0.206 | | 26.846 | J- |
| June 2010 | 258 | RD 10/Slimey Sculpin | 0.479 | | 1.098 | J | 2.008 | | 0.025 | U | 0.027 | | 0.057 | | 0.885 | J- | 0.025 | U | 9.76 | | 0.07 | | 0.044 | | 0.851 | | 0.102 | | 17.129 | J- |
| June 2010 | 259 | RD 11/Slimey Sculpin | 1.374 | | 2.554 | | 2.602 | | 0.025 | U | 0.025 | U | 0.062 | | 1.016 | J- | 0.025 | U | 9.502 | | 0.13 | | 0.069 | | 1.43 | | 0.123 | | 21.938 | J- |
| June 2010 | 260 | RD 12/Slimey Sculpin | 4.044 | | 3.387 | | 3.066 | | 0.025 | U | 0.059 | | 0.069 | | 0.969 | J- | 0.026 | | 8.562 | | 0.63 | | 0.095 | | 1.199 | | 0.161 | | 23.009 | J- |
| June 2010 | 261 | RD 13/Slimey Sculpin | 1.496 | | 4.493 | | 4.347 | | 0.025 | U | 0.103 | | 2.431 | | 1.149 | J- | 0.025 | U | 15.994 | | 0.23 | | 0.113 | | 1.052 | | 0.359 | | 30.716 | J- |
| June 2010 | 262 | RD 15/Slimey Sculpin | 1.151 | | 2.63 | | 3.067 | | 0.025 | U | 0.037 | | 0.053 | | 1.693 | | 0.025 | U | 8.442 | | 0.09 | | 0.064 | | 0.912 | | 0.136 | | 22.158 | J- |
| Aug 2010 | 530 | 2-RD-1-SC | 18.692 | | 9.645 | | 3.794 | | 0.025 | U | 0.025 | U | 0.074 | | 0.907 | | 0.035 | J | 11.099 | | 2.2593 | | 0.105 | | 2.975 | | 0.16 | | 24.836 | |
| Aug 2010 | 531 | 2-RD-2-SC | 12.303 | | 13.222 | | 5.402 | | 0.025 | U | 0.030 | | 0.062 | | 0.940 | | 0.029 | J | 21.275 | | 1.8515 | | 0.160 | | 1.836 | | 0.214 | | 29.581 | |
| Aug 2010 | 532 | 2-RD-3-SC | 14.224 | | 8.231 | | 3.609 | | 0.025 | U | 0.025 | U | 0.053 | | 0.720 | | 0.029 | J | 9.044 | | 1.5268 | | 0.083 | | 1.596 | | 0.152 | | 20.634 | |
| Aug 2010 | 533 | 2-RD-4-SC | 22.281 | | 11.785 | | 3.103 | | 0.025 | U | 0.025 | U | 0.104 | | 0.917 | | 0.040 | | 6.653 | | 3.7009 | | 0.119 | | 2.025 | | 0.195 | | 22.897 | |
| Aug 2010 | 534 | 2-RD-5-SC | 23.668 | | 20.099 | | 4.097 | | 0.025 | U | 0.025 | U | 0.13 | | 1.383 | | 0.046 | | 10.345 | | 3.1578 | | 0.231 | | 2.414 | | 0.243 | | 22.666 | |
| Aug 2010 | 535 | 2-RD-6-SC | 10.482 | | 14.878 | | 2.829 | | 0.025 | U | 0.029 | | 0.105 | | 1.105 | | 0.031 | | 9.831 | | 1.35536 | | 0.211 | | 2.223 | | 0.22 | | 28.516 | |
| Aug 2010 | 536 | 2-RD-7-SC | 17.199 | | 18.099 | | 3.884 | | 0.025 | U | 0.025 | U | 0.097 | | 0.973 | | 0.039 | | 9.836 | | 1.74736 | | 0.183 | | 2.252 | | 0.266 | | 27.254 | |
| Aug 2010 | 537 | 2-RD-8-SC | 38.1 | | 24.06 | | 5.15 | | 0.025 | U | 0.032 | | 0.188 | | 1.164 | | 0.079 | | 11.712 | | 3.6834 | | 0.263 | | 2.234 | | 0.317 | | 26.68 | |
| Aug 2010 | 538 | 2-RD-9-SC | 10.145 | | 9.314 | | 3.156 | | 0.025 | U | 0.025 | U | 0.155 | | 0.761 | | 0.027 | | 10.888 | | 0.68364 | | 0.151 | | 2.423 | | 0.182 | | 27.235 | |
| Aug 2010 | 539 | 2-RD-10-SC | 18.29 | | 14.624 | | 4.471 | | 0.025 | U | 0.038 | | 0.106 | | 0.943 | | 0.045 | | 17.558 | | 1.9511 | | 0.225 | | 1.825 | | 0.276 | | 35.373 | |
| Aug 2010 | 540 | 2-RD-11-SC | 6.512 | | 6.864 | | 3.308 | | 0.025 | U | 0.056 | | 0.038 | J | 0.882 | | 0.025 | U | 11.192 | | 0.8909 | | 0.137 | | 1.852 | | 0.21 | | 29.254 | |
| Aug 2010 | 541 | 2-RD-12-SC | 17.486 | | 12.339 | | 3.514 | | 0.025 | U | 0.025 | U | 0.071 | | 0.911 | | 0.029 | | 10.351 | | 2.80423 | | 0.115 | | 1.533 | | 0.211 | | 26.177 | |
| June 2011 | 1110258-01 | RDSS1-1 | na | | 5.81 | | 4.56 | | 0.057 | U | 0.03 | | 0.05 | U | 1.41 | | 0.034 | | 22.40 | | 0.273 | | 0.171 | | 0.68 | | 0.038 | U | 32 | |
| June 2011 | 1110258-02 | RDSS1-2 | na | | 4.51 | | 1.93 | | 0.057 | U | 0.044 | | 0.05 | U | 1.13 | | 0.003 | U | 7.46 | | 0.269 | | 0.015 | U | 0.92 | | 0.038 | U | 26.1 | |
| June 2011 | 1110258-03 | RDSS1-3 | na | | 1.62 | | 4.83 | | 0.066 | U | 0.066 | | 0.06 | U | 1.1 | | 0.004 | U | 19.20 | | 0.161 | | 0.018 | U | 0.98 | | 0.044 | U | 33.5 | |
| June 2011 | 1110258-04 | RDSS1-4 | na | | 6.07 | | 1.60 | | 0.066 | U | 0.026 | | 0.06 | U | 1.01 | | 0.004 | U | 9.17 | | 0.123 | | 0.018 | U | 0.78 | | 0.044 | U | 26.3 | |
| June 2011 | 1110258-05 | RDSS1-5 | na | | 9.11 | | 3.21 | | 0.063 | U | 0.037 | | 0.05 | U | 1.02 | | 0.004 | U | 22.70 | | 0.142 | | 0.017 | U | 0.64 | | 0.041 | U | 20.3 | |
| June 2011 | 1110258-06 | RDSS1-6 | na | | 7.78 | | 2.29 | | 0.058 | U | 0.031 | | 0.05 | U | 1.08 | | 0.003 | U | 16.40 | | 0.159 | | 0.016 | U | 0.9 | | 0.038 | U | 26.1 | |
| June 2011 | 1110258-07 | RDSS1-7 | na | | 2.49 | | 3.94 | | 0.059 | U | 0.033 | | 0.05 | U | 1.12 | | 0.004 | U | 14.20 | | 0.102 | | 0.016 | U | 0.92 | | 0.039 | U | 24.4 | |
| June 2011 | 1110258-08 | RDSS1-8 | na | | 1.98 | | 1.79 | | 0.06 | U | 0.026 | | 0.05 | U | 1.09 | | 0.004 | U | 14.00 | | 0.0858 | | 0.016 | U | 0.96 | | 0.040 | U | 21.3 | |
| June 2011 | 1110258-09 | RDSS1-9 | na | | 4.95 | | 3.49 | | 0.065 | U | 0.054 | | 0.06 | U | 1.01 | | 0.004 | U | 8.27 | | 0.279 | | 0.018 | U | 0.76 | | 0.043 | U | 24.5 | |
| June 2011 | 1110258-10 | RDSS1-10 | na | | 2.9 | | 5.14 | | 0.06 | U | 0.076 | | 0.05 | U | 1.07 | | 0.039 | | 40.70 | | 0.135 | | 0.016 | U | 1.05 | | 0.040 | U | 30.3 | |
| June 2011 | 1110258-11 | RDSS1-11 | na | | 3.13 | | 3.90 | | 0.066 | U | 0.049 | | 0.06 | U | 1.02 | | 0.004 | U | 14.00 | | 0.131 | | 0.018 | U | 0.59 | | 0.043 | U | 26.7 | |
| June 2011 | 1110258-12 | RDSS1-12 | na | | 7.89 | | 3.49 | | 0.064 | U | 0.033 | | 0.05 | U | 1.08 | | 0.004 | U | 17.10 | | 0.158 | | 0.018 | U | 0.61 | | 0.042 | U | 24.1 | |
| Sept 2011 | 1110264-01 | RDSS2-1 | na | | 12.2 | | 4.63 | | 0.065 | U | 0.003 | U | 0.06 | U | 1.23 | | 0.004 | U | 12.50 | | 0.219 | | 0.155 | | 1.18 | | 0.043 | U | 21.9 | |
| Sept 2011 | 1110264-02 | RDSS2-2 | na | | 6.94 | | 3.74 | | 0.059 | U | 0.003 | U | 0.05 | U | 0.99 | | 0.004 | U | 10.20 | | 0.0998 | | 0.016 | U | 0.58 | | 0.039 | U | 22 | |
| Sept 2011 | 1110264-03 | RDSS2-3 | na | | 3.66 | | 0.99 | | 0.061 | U | 0.062 | | 0.05 | U | 1 | | 0.004 | U | 3.49 | | 0.114 | | 0.017 | U | 0.94 | | 0.040 | U | 20.6 | |
| Sept 2011 | 1110264-04 | RDSS2-4 | na | | 45.9 | | 6.96 | | 0.061 | U | 0.003 | U | 0.05 | U | 1.52 | | 0.053 | | 23.00 | | 0.504 | | 0.274 | | 1.19 | | 0.33 | | 26.3 | |
| Sept 2011 | 1110264-05 | RDSS2-5 | na | | 11.1 | | 1.36 | | 0.059 | U | 0.036 | | 0.05 | U | 1.56 | | 0.003 | U | 14.20 | | 0.336 | | 0.155 | | 1.34 | | 0.039 | U | 26.1 | |
| Sept 2011 | 1110264-06 | RDSS2-6 | na | | 15.2 | | 4.84 | | 0.061 | U | 0.03 | | 0.05 | U | 1.23 | | 0.004 | U | 8.81 | | 0.239 | | 0.178 | | 1.28 | | 0.040 | U | 15.9 | |
| Sept 2011 | 1110264-07 | RDSS2-7 | na | | 17.7 | | 1.66 | | 0.067 | U | 0.003 | U | 0.06 | U | 1.38 | | 0.004 | U | 9.67 | | 0.153 | | 0.108 | | 0.61 | | 0.044 | U | 16.4 | |
| Sept 2011 | 1110264-08 | RDSS2-8 | na | | 40.5 | | 2.59 | | 0.065 | U | 0.003 | U | 0.06 | U | 1.61 | | 0.004 | U | 23.50 | | 0.427 | | 0.3 | | 1.01 | | 0.043 | U | 21.1 | |
| Sept 2011 | 1110264-09 | RDSS2-9 | na | | 25 | | 2.97 | | 0.065 | U | 0.033 | | 0.05 | U | 1.07 | | 0.004 | U | 30.30 | | 0.181 | | 0.258 | | 1.34 | | 0.43 | | 26.9 | |
| Sept 2011 | 1110264-10 | RDSS2-10 | na | | 22.3 | | 1.63 | | 0.058 | U | 0.003 | | 0.05 | U | 1.8 | | 0.052 | | 19.40 | | 0.341 | | 0.503 | | 1.35 | | 0.31 | | 23.6 | |
| Sept 2011 | 1110264-11 | RDSS2-11 | na | | 12.3 | | 1.95 | | 0.063 | U | 0.06 | | 0.05 | U | 1.27 | | 0.004 | U | 11.60 | | 0.223 | | 0.115 | | 1.48 | | 0.042 | U | 24.9 | |
| Sept 2011 | 1110264-12 | RDSS2-12 | na | | 9.27 | | 2.11 | | 0.063 | U | 0.022 | | 0.05 | U | 1.18 | | 0.055 | | 9.11 | | 0.999 | | 0.132 | | 0.67 | | 0.042 | U | 19.7 | |

Key:
 J = estimated value; na = not analyzed; Q = qualifier; U = not detected (listed value is method detection limit).



**G Slimy Sculpin Metals Data for Red Devil Creek Used to Develop Benthos-to-Sculpin
Trophic Transfer Factors**

This page intentionally left blank

Table G-2. Sculpin Methylmercury and Total Mercury Data from Red Devil Creek Used in the Baseline Ecological Risk Assessment (BERA, E&E 2014) and BERA Supplement for the Red Devil Mine Site.

| Sample Month-Year | LabID | Client Samp ID | Methyl Hg (mg/kg wet) | | Total Hg (mg/kg wet) | | Fraction Methyl Hg |
|----------------------|------------|----------------|--------------------------|------------|-------------------------|-------|-----------------------|
| | | | Result | Q | Result | Q | |
| | | | June 2010* | 1007189-40 | RD 5, 6, 14 | 0.312 | |
| Aug 2010 | 1009071-04 | 2-RD-9-SC | 0.16 | | 0.684 | | 0.23 |
| June 2011 | 1110258-01 | RDSS1-1 | 0.114 | | 0.273 | | 0.42 |
| June 2011 | 1110258-02 | RDSS1-2 | 0.164 | | 0.269 | | 0.61 |
| June 2011 | 1110258-03 | RDSS1-3 | 0.0501 | | 0.161 | | 0.31 |
| Sept 2011 | 1110264-01 | RDSS2-1 | 0.135 | | 0.219 | | 0.62 |
| Sept 2011 | 1110264-02 | RDSS2-2 | 0.0827 | | 0.0998 | | 0.83 |

0.50 Average

* Composite sample of 3 sculpin

Key:

na = not available

Table G-3. ProUCL Output Summary for Sculpin Metals Data from Red Devil Creek Used in Baseline Ecological Risk Assessment (BERA, E&E 2014) and BERA Supplement.

| Data Set | Analyte | Units | Number of Observations | Number of Detections | Mean of Detected | SD of Detected | Maximum Detected | Distribution (detects only) | UCL Statistic | 95% UCL | EPC | EPC Source |
|----------|---------------|-----------|------------------------|----------------------|------------------|----------------|------------------|-----------------------------|------------------------------|---------|--------|------------|
| Sculpin | Antimony | mg/kg wet | 21 | 21 | 10.6 | 10.18 | 38.1 | Gamma | 95% Approximate Gamma UCL | 17.06 | 17.06 | 95% UCL |
| Sculpin | Arsenic | mg/kg wet | 45 | 45 | 10.35 | 9.642 | 45.9 | Gamma | 95% Approximate Gamma UCL | 12.98 | 12.98 | 95% UCL |
| Sculpin | Barium | mg/kg wet | 45 | 45 | 3.295 | 1.243 | 6.96 | Normal | 95% Student's-t UCL | 3.606 | 3.606 | 95% UCL |
| Sculpin | Beryllium | mg/kg wet | 45 | 0 | -- | -- | -- | -- | -- | -- | -- | -- |
| Sculpin | Cadmium | mg/kg wet | 45 | 30 | 0.042 | 0.0193 | 0.103 | Not Discernable | 95% KM (Chebyshev) UCL | 0.0456 | 0.0456 | 95% UCL |
| Sculpin | Chromium | mg/kg wet | 45 | 21 | 0.191 | 0.515 | 2.431 | Not Discernable | 95% KM (t) UCL | 0.199 | 0.199 | 95% UCL |
| Sculpin | Copper | mg/kg wet | 45 | 45 | 1.157 | 0.324 | 2.263 | Lognormal* | 95% CLT UCL* | 1.236 | 1.236 | 95% UCL |
| Sculpin | Lead | mg/kg wet | 45 | 18 | 0.0396 | 0.0138 | 0.079 | Normal | 95% KM (t) UCL | 0.0228 | 0.0228 | 95% UCL |
| Sculpin | Manganese | mg/kg wet | 45 | 45 | 13.71 | 6.84 | 40.7 | Lognormal* | 95% CLT UCL* | 15.39 | 15.39 | 95% UCL |
| Sculpin | Mercury | mg/kg wet | 45 | 45 | 0.731 | 1.007 | 3.701 | Not Discernable | 95% Chebyshev (Mean, Sd) UCL | 1.386 | 1.386 | 95% UCL |
| Sculpin | Methylmercury | mg/kg wet | 7 | 7 | 0.145 | 0.0841 | 0.312 | Normal | 95% Student's-t UCL | 0.207 | 0.207 | 95% UCL |
| Sculpin | Nickel | mg/kg wet | 45 | 33 | 0.153 | 0.0955 | 0.503 | Normal | 95% KM (t) UCL | 0.142 | 0.142 | 95% UCL |
| Sculpin | Selenium | mg/kg wet | 45 | 45 | 1.281 | 0.584 | 2.975 | Gamma | 95% Approximate Gamma UCL | 1.432 | 1.432 | 95% UCL |
| Sculpin | Vanadium | mg/kg wet | 45 | 24 | 0.215 | 0.0878 | 0.433 | Normal | 95% KM (t) UCL | 0.181 | 0.181 | 95% UCL |
| Sculpin | Zinc | mg/kg wet | 45 | 45 | 24.51 | 4.36 | 35.37 | Normal | 95% Student's-t UCL | 25.61 | 25.61 | 95% UCL |

Key:

- CLT = Central limit theorem
- EPC = Exposure point concentration
- KM = Kaplan-Meier
- SD = Standard deviation
- UCL = Upper confidence level

Note:

* Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.