

# TRIP REPORT

**State of Alaska  
Department of Fish and Game**

*Field Date(s):* July 7-14, 2022

*Location(s):* **Red Dog Mine / Anarraaq Prospect**

*Objective(s):* Periphyton, aquatic invertebrate, and sediment sampling

*Participant(s):* Chelsea Clawson and Lauren Yancy

*Weather:* Sunny, partly cloudy with temperatures ranging from 45°F to 70°F

*Access:* Pick-up truck and AS350 (A-Star) helicopter

---

On July 7, we flew out of Fairbanks to the Anchorage airport to catch an Alaskan Airlines charter flight to Red Dog Mine. The objectives for this annual trip were to 1) collect aquatic invertebrate and periphyton samples; 2) survey for aquatic mussel presence; 3) collect sediment samples, 4) record water quality; and 5) collect turbidity measurements at our sample sites. We also tested use of the iPad for recording site specific data and observations. For the duration of our trip, the weather was mostly cooperative with sunny to partly cloudy skies that allowed for helicopter access to the sites. Stream discharge as measured by the USGS gauge #15747000 on the Wulik River below the Tutak confluence was slightly above or equal to the historic median daily discharge values. The majority of our sites had normal to slightly low water levels which was conducive for aquatic sampling. The environmental helicopter that was designated for our use had a mechanical malfunction on the first day of our sampling; therefore, we used exploration's two helicopters when their schedule allowed.

## **Aquatic Invertebrates and Periphyton**

Twenty-seven sites were visited and sampled for aquatic invertebrates and periphyton (Table 1; Figure 1). The method used for aquatic invertebrate sampling was changed to a Hess sampler after comparison of drift net and Hess sampler results in 2021 found that Hess samples contained fewer terrestrial invertebrates and unwanted debris than the drift net samples, and were a more accurate measure of the in-situ conditions at each site. Periphyton samples were conducted with the same methods as previous years.

## **Aquatic Mussels**

A total of eight sites were surveyed for the presence of freshwater mussels (Table 1). At each location we visually surveyed for evidence of mussel presence in slow moving water. No evidence of live or dead mussels was observed at the sites.

### Sediment Samples

Grab samples of fine sediment and/or precipitate were collected at all Anarraaq program sample sites to develop a more comprehensive dataset on baseline conditions in the deposit area. These samples will be analyzed for metals at an independent lab.

**Table 1.** List of sites sampled for aquatic invertebrates (AI), periphyton (P), mussels (M), and/or sediment (S), July 2022.

| Sample Site                                | Sample Program* | Station # | Samples     |
|--|-----------------|-----------|-------------|
| Upper Competition, upstream of Sourdock    | Anarraaq        | 203       | AI, P, S    |
| Sourdock Creek                             | Anarraaq        | 204       | AI, P, S    |
| Competition Creek, upstream of mouth       | Anarraaq        | 202       | AI, P, S    |
| Warf Creek                                 | Anarraaq        | 233       | AI, P, S    |
| West Fork Ikalukrok Creek                  | Anarraaq        | 205       | AI, P, M, S |
| Ikalukrok Creek u/s of West Fork Ikalukrok | Anarraaq        | 206       | AI, P, M, S |
| Ikalukrok Creek d/s of West Fork Ikalukrok | Anarraaq        | 230       | AI, P, S    |
| Ikalukrok Creek d/s Cub Creek              | Anarraaq        | 207       | AI, P, M, S |
| East Fork Ikalukrok                        | Anarraaq        | 208       | AI, P, M, S |
| Grayling Junior Creek 1**                  | Anarraaq        | N/A       | AI, P, S    |
| Grayling Junior Creek                      | Anarraaq        | 209       | AI, P, M, S |
| Noa Creek                                  | Anarraaq        | 210       | AI, P, S    |
| Moil Creek                                 | Anarraaq        | 211       | AI, P, S    |
| Sled Creek                                 | Anarraaq        | 212       | AI, P, S    |
| Upper North Fork Red Dog 1**               | Anarraaq        | N/A       | AI, P, S    |
| Upper North Fork Red Dog                   | Aqqaluk Pit     | N/A       | AI, P, M, S |
| Ikalukrok Creek u/s Red Dog                | APDES/WMP       | 9         | AI, P       |
| North Fork Red Dog                         | APDES/WMP       | 12        | AI, P, M    |
| Middle Fork Red Dog                        | WMP             | 20        | AI, P       |
| Mainstem Red Dog                           | APDES/WMP       | 10        | AI, P, M    |
| Volcano Creek                              | Anarraaq        | N/A       | AI, P, S    |
| Upper Volcano Creek**                      | Anarraaq        | N/A       | AI, P, S    |
| Bons Creek, u/s Bons Pond                  | WMP             | N/A       | AI, P       |
| Bons Creek, below Bons Pond                | WMP             | 220       | AI, P       |
| Buddy Creek, u/s haul road                 | WMP             | 221       | AI, P       |
| Buddy Creek, below falls                   | WMP             | N/A       | AI, P       |
| Ikalukrok Creek, d/s mouth of Dudd Creek   | WMP             | 160       | AI, P       |

\* APDES – Alaska Permit Discharge Elimination System; WMP – Waste Management Plan

\*\* New sites



**Figure 1.** Map of July 2022 sample sites at Red Dog Mine, Alaska.

### **Water Quality**

New to Red Dog sampling parameters in July 2022, water quality was recorded at each site with a multiparameter YSI unit. Water chemistry parameters such as pH were highly variable among sites- for example, pH was as low as 3.65 and 3.66 at Moil and Warf Creek, and as high as 8.32 at Buddy Creek below the falls (Table 2). Low pH values often coincided with many of the metal-heavy, red-stained, smaller creeks. Solid precipitate (often white in color) was found at

several sample sites (Figure 2), and was previously observed in the July 2020 trip report at the confluence of West Fork Ikalukrok Creek. Solid precipitate forms as low pH waters mix with circumneutral waters, potentially explaining our sightings.

**Table 2.** List of pH values recorded at sample locations, July 2022.

| Sample Site                                | Station # | pH   |
|--|-----------|------|
| Upper Competition, upstream of Sourdock    | 203       | 4.78 |
| Sourdock Creek                             | 204       | 7.40 |
| Competition Creek, upstream of mouth       | 202       | 5.55 |
| Warf Creek                                 | 233       | 3.66 |
| West Fork Ikalukrok Creek                  | 205       | 5.17 |
| Ikalukrok Creek u/s of West Fork Ikalukrok | 206       | 7.30 |
| Ikalukrok Creek d/s of West Fork Ikalukrok | 230       | 6.49 |
| Ikalukrok Creek d/s Cub Creek              | 207       | 5.80 |
| East Fork Ikalukrok                        | 208       | 8.20 |
| Grayling Junior Creek 1**                  | N/A       | 8.05 |
| Grayling Junior Creek                      | 209       | 8.09 |
| Noa Creek                                  | 210       | 3.73 |
| Moil Creek                                 | 211       | 3.65 |
| Sled Creek                                 | 212       | 7.68 |
| Upper North Fork Red Dog 1**               | N/A       | 7.97 |
| Upper North Fork Red Dog                   | N/A       | 7.86 |
| Ikalukrok Creek u/s Red Dog                | 9         | 7.59 |
| North Fork Red Dog                         | 12        | 8.03 |
| Middle Fork Red Dog                        | 20        | 7.43 |
| Mainstem Red Dog                           | 10        | 7.80 |
| Volcano Creek                              | N/A       | 7.70 |
| Upper Volcano Creek**                      | N/A       | 7.57 |
| Bons Creek, u/s Bons Pond                  | N/A       | 7.72 |
| Bons Creek, below Bons Pond                | 220       | 8.12 |
| Buddy Creek, u/s haul road                 | 221       | 8.03 |
| Buddy Creek, below falls                   | N/A       | 8.32 |
| Ikalukrok Creek, d/s mouth of Dudd Creek   | 160       | 8.09 |

\*\* New sites

### Turbidity

Turbidity has been a concern at many of the creeks, and this year we observed similar water conditions as in July 2020 and July 2021. Notably, Ikalukrok Creek downstream of Dudd Creek and Mainstem Red Dog Creek appeared to be less milky than previous years. Ikalukrok Creek upstream of the West Fork confluence was reported clear this year which differs from the past two years of milky/blueish water, especially when stream levels were lower in July 2020 (Figure 3). This year we used a portable turbidity meter which may prove useful in the future for quantifying comparisons of turbidity measurements.



**Figure 2.** West Fork Ikalukrok Creek (left) mixing with Ikalukrok Creek forming a white solid precipitate and milky waters. Solid white sediment/precipitate found at the mouth of Noa Creek (right).



**Figure 3.** Ikalukrok Creek upstream of the West Fork Ikalukrok Creek mouth in July 2020 (left) and July 2022 (right).

### New Sites

Three additional sites in the upper North Fork Red Dog (NFRD), Grayling Junior, and Volcano creeks were visited. NFRD 1 and Grayling Jr 1 were minnow trapped in August 2021. Upper NFRD 1 had similar habitat characteristics as Upper NFRD with clear water, but appeared to be a slightly higher gradient (Figure 4). One Dolly Varden was observed at Upper NFRD 1 while collecting invertebrates and periphyton. Grayling Jr 1 was upstream of a tributary that was

stained orange (Figure 5). Orange staining occurred all over the narrow riparian area on the incoming tributary. There was also orange stained aufeis near our sample site, shown in the bottom corner of Figure 5. Grayling Jr 1 had meandering channels along gravel bars with clear water. Upper Volcano Creek site had a steeper gradient with large moss-covered boulders (Figure 6).



**Figure 4.** Upper North Fork Red Dog 1 downstream (left) and upstream (right).



**Figure 5.** Downstream of Grayling Junior 1 site showing a mineral-rich, orange incoming tributary (left) and the upstream view of the sample site (right).



**Figure 6.** Dense shrubbery along Upper Volcano Creek (left) and moss-covered boulders and large cobble (right).