The status of Coldwater fish in Dunka River, a protection-priority stream in northern Minnesota

Why is the stream reach being reviewed?

The Rainy River Headwaters Stressor Identification (SID) report Minnesota Pollution Control Agency (MPCA), 2019 identified a need to improve the understanding of the cold-water aquatic community, with an emphasis on Brook Trout, in the downstream Assessment Unit ID (AUID 09030001-987) of the Dunka River. The reach passed the general-use threshold for Northern Coldwater Streams in the 2017 Watershed Restoration and Protection Strategy (WRAPS) assessment. Based on biology and chemistry, a classification change from 2B (Warmwater) to 2A (Coldwater) was proposed for the reach. The stream is not currently listed in statute (Minn R. 6264.0050) as a "designated trout stream." Biological station (14RN006) scored above the F-IBI for each of four separate samples collected in years 2014 and 2015. Several sensitive species were sampled including a small number of adult Brook Trout that ranged in size from 128-370mm. Brook Trout had not been stocked in the area since the 1970s, therefore biologists suspected that the species was both natural reproducing and self-sustaining. Young-of-year trout were not sampled, but habitat and water chemistry data collected during the Stressor Identification (SID) phase of WRAPS suggested rearing may occur further downstream from the existing biological monitoring station. In September 2019, the stream was sampled for fish at station 19RN001, located 1.5 miles downstream. The results are reported below.

What are the future challenges to stream health?

Future land use pressures in the watershed include increased mining and forestry activity as the amount of School Trust Lands are expected to increase in the watershed. There is potential to mine for copper-nickel just upstream of the proposed Coldwater reach. Current mining discharges from an existing taconite-ore facility in the watershed are to Langley Creek and unnamed tributaries to the Dunka River from Northshore Mining and to Dunka River from the Dunka Mine. These discharges can be at variable flow rates or even intermittent in nature. For example, under normal operations, discharges may typically be at one third of the permitted limit, but depending on mine plans, could increase to a larger sustained flow rate up to the permitted rate if needed. A mine closure plan for the existing facility, projected for sometime around 2070, would change the hydrology of the Dunka River from current conditions. Depending on the final configuration and approval of the closure plan, changes could include a 32% increase in flows to the Dunka River, a 60% decrease of flows to tributary Langley Creek, and a 500% increase in flows to an unnamed tributary (Barr, 2008). Predicted changes in stream temperature, sheer stress on the channels, sediment transport, and conductivity have not been reported. The SID report recommended additional models to predict potential changes in these parameters be added to the mine-closure plan.

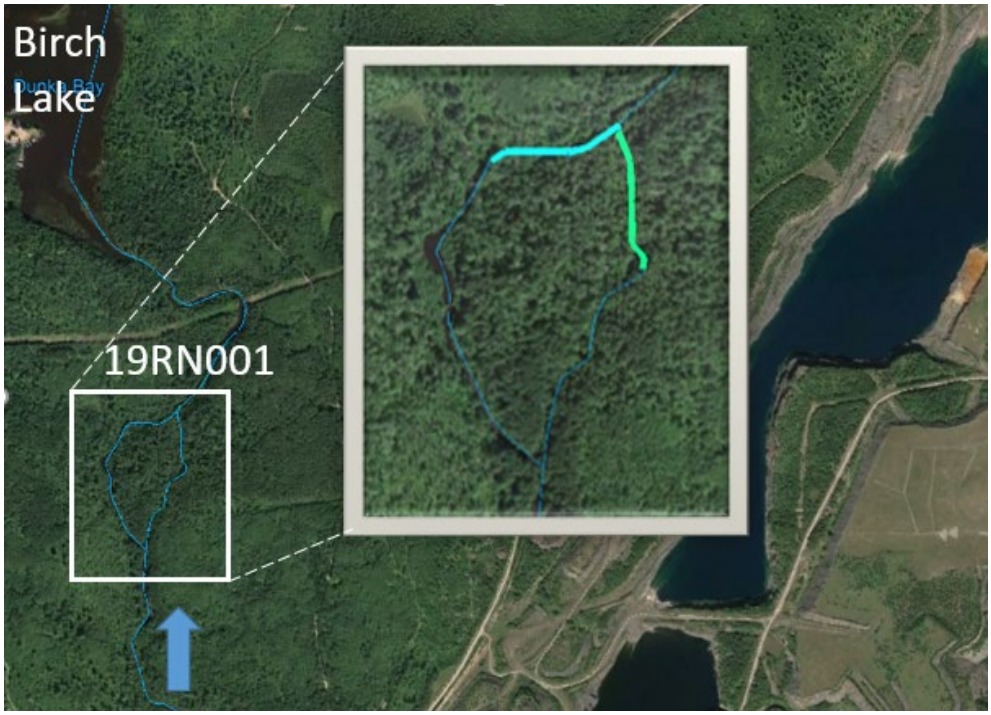
What types of new data were collected and where?

New biology and habitat data were collected September 13, 2019. MPCA, Minnesota Department of Natural Resources, and U.S. Forest Service jointly sampled a downstream reach that was suspected to support increased numbers of Brook Trout and greater variety in age class compared to the existing biological station. The new station (19RN001) was located in a segment where the stream split (Figure 1) around an island forming a river-right (right side facing downstream) and river-left. Backpack shockers were used to sample fish.

Sample methods were inconsistent with typical sample protocol due to the split in the channel, but the results were helpful in describing the fish community in relation to water quality and habitat conditions. These data will be used to support other existing and future assessment data for this AUID.

Site Map

Figure 1: Fish were samples at station 19RN001, in a split-channel section of the Dunka River. Mine pits are located on both sides of the channel upstream of the station. The stream flow in a northern direction (blue arrow) to Birch Lake. The reach was sampled on the river-right (green line) and river-left (blue line). Latitude/Longitude: 47.71078/-91.87025



How healthy is the biological community?

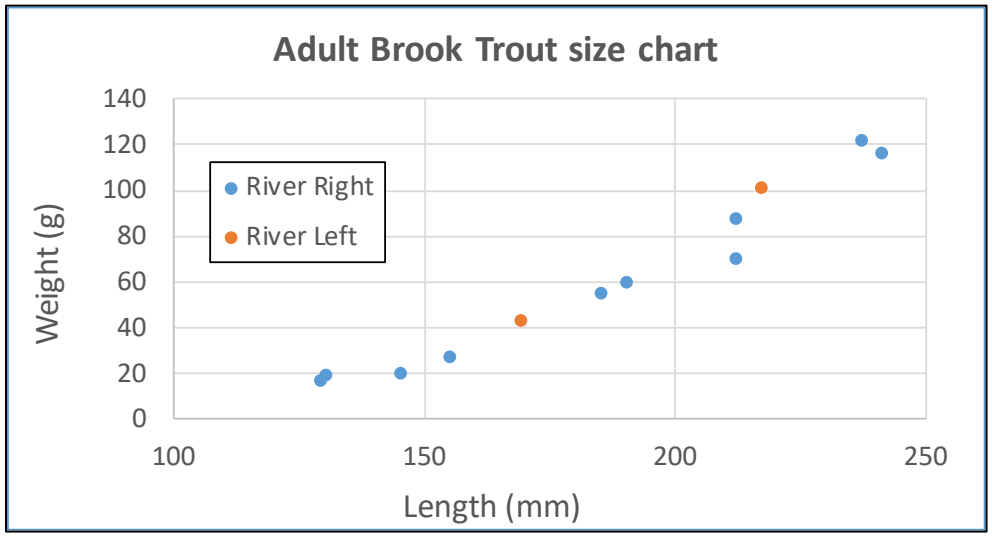
This reach of the Dunka River meets the biological criteria for Northern Coldwater streams. Four fish samples and two macroinvertebrate samples collected at the upstream biological station (14RN006) scored above the respective F-IBI and M-IBI threshold for the initial assessment that was based on data collected during years 2014 to 2015. The more recent 2019 fish sample, collected at downstream station 19RN001, scored 51.2, also above the impairment threshold (F-IBI = 35) and within the range of scores (40.5 - 57.1) previously collected at 14RN006.

Ten fish species (Table 1) were sampled at biological station 19RN001. Cold/Coolwater species accounted for over 73% of the individuals, which included Brook Trout, Sculpin, Longnose Dace, and Blacknose Dace. Both adults and young-of year Brook Trout were captured with the majority found in the river-right channel where the stream width was narrower, pools were deeper, and cover (canopy and instream) was extensive. The presence of both young-of-year and adult Brook Trout is evidence that the species is both natural reproducing and self-sustaining in this reach. Adult Brook Trout ranged in size; distributions are shown in Figure 2. Sculpin, another sensitive Coldwater species, were sampled only on the river-right. Smallmouth Bass, a Warmwater species not typically sampled in the described community, accounted for less than 5% of the sample and were only captured on the river-left. All bass were young-of-year, likely present in the stream due to the close proximity to Birch Lake.

Table 1: Fish sample results with number of species captured listed for each side of the split (river-braid)

Species	River Braid	Length (mm)	Count	Comment
Brook Trout	River Left	169-217	2	
Brook Trout	River Right	74-241	23	13 YOY, 12 adult
Johnny Darter	River Left	45-45	1	
Johnny Darter	River Right	38-71	5	
White Sucker	River Left	104-235	9	
White Sucker	River Right	53-282	13	
Logperch	River Left	83-114	7	
Logperch	River Right	87-100	4	
Creek Chub	River Left	44-179	32	
Creek Chub	River Right	39-164	48	
Longnose Dace	River Left	42-131	37	
Longnose Dace	River Right	47-122	7	
Blacknose Dace	River Left	37-99	11	
Blacknose Dace	River Right	36-99	11	
Smallmouth Bass	River Left	57-96	11	YOY only; river left
Common Shiner	River Left	41-139	26	
Common Shiner	River Right	34-139	11	
Sculpin Sp.	River Right	46-83	2	river right only

Figure 2: Size distribution of adult Brook Trout captured at 19RN001. Colors indicate location of capture, river-right or river-left.



How is the fish habitat in this reach?

The fish habitat at this site is good, scoring 76.9 out of 100. The score was based on combined characteristics of the two braids (Figure 3 and Figure 4). Five categories contributed to the total score; they are land use, riparian, substrate, cover, and channel morphology. Land use scored fair, receiving half of the five possible points, because mining activities are adjacent to the otherwise forested/wetland environment. The stream riparian scored well (13/14) due to extensive buffer widths, intact banks, and moderate to heavy shading. The substrate scored well (22/28) due to an adequate variety of sizes including coarser sand, gravel, cobble, and boulders to finer materials such as silt and detritus. Little to no embeddedness of the coarser substrates by finer particles was observed which infers good substrate conditions for Brook Trout spawning. Instream cover was overall

moderate when considering the two branches together; although cover on the river-right was more extensive. Instream cover included overhanging vegetation, deep pools, logs, boulders, shallows, and macrophytes. Channel morphology was good (26/35) with deep pools, high channel stability, various stream velocity types (slow/eddies to fast), fair sinuosity, and good channel development contributing to the score. Beneficial aquatic vegetation included sedge, arrowhead, and wild celery.

Figure 3: Station 19RN001, River-right. Narrower braid with areas of fast (left) and slow (right) water velocities, good cover, and deep pools. Twenty-three Brook Trout were sampled and included both young-of-year and adult age classes.

Figure 4: Left image: Station 19RN001, River-left. Wider braid with less in-channel cover than the right braid. Two adult Brook Trout sampled. Right Image: Brook Trout sampled at 19RN001

How suitable is the water quality for trout?

Temperature

Temperatures were in a range that regionally have shown to support Brook Trout if other habitat and water chemistry conditions are suitable. Stream temperature was measured continuously (15-minute intervals) at a site located 0.20 miles downstream of 19RN001 between June 1 and August 30, 2017. The monitored time-period represents summer conditions when temperatures are typically warmest in Minnesota streams. Temperatures were in the growth range for Brook Trout 72% of the summer record and in the stressful range 28%. The summer average temperature was 18.6 degrees Celsius. It is suspected that temperature may be cooler at the exact location of biological sampling (19RN001), particularly in the river-right where stream canopy was excellent and pools were deepest. The MPCA is proposing to continue monitoring temperature in this AUID, with additional loggers placed in the right and left channels of station 19RN001.

Dissolved oxygen

Dissolved oxygen (DO) was at optimum levels (>7 mg/L) for the growth of Brook Trout and other Coldwater species for 98% of the time measured. DO was measured continuously (15-minute intervals) at a site located 0.20 miles downstream of 19RN001, June to mid-August 2017. DO was maintained above 7mg/L longer there than at any other measured location in the watershed. It was much improved from levels recorded at the upstream biological station (14RN006); there DO levels were greater than 7 mg/L for 65% of the record.

Where do we go from here?

Watershed restoration and protection strategies are currently under development in the Rainy River Headwaters Watershed as part of the MPCA's watershed approach to restoring and protecting water quality. A core team of regional resource professionals is guiding the selection of appropriate strategies that will steer future implementation planning to protect high quality waters and restore impaired waters.

The Dunka River is a protection-priority stream in the Rainy River Headwaters Watershed. Communication and outreach regarding its current state, a trout stream with high-quality habitat, and its vulnerability to future land use and hydrological changes will be critical for its protection. Increased forest harvest, new mining activities, and mine closure impacts are a few land use changes that have the potential to change the state of the watershed if not managed with a protection-based focus.

In addition to helping develop protection and restoration strategies, the MPCA proposes to continue biological sampling as well as temperature and flow monitoring of the Dunka River and its tributaries as funding is available. Longer data records will help evaluate water quality trends and monitor potential changes over time.

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