

**INTERIM REPORT: FISHERIES SURVEY OF PRAIRIE  
CREEK WATERSHED**

Prepared for

**Parks Canada Agency  
Nahanni National Park Reserve  
and  
Department of Fisheries and Oceans Canada  
Fish Habitat Management Western Arctic Region**

by

**Neil J. Mochnacz**  
Natural Resources Institute  
University of Manitoba  
303-70 Dysart Road  
Winnipeg, Manitoba  
R3T 2N2

August 30, 2001

12/10

## Introduction

Bull trout (*Salvelinus confluentus*), a native char of North America, is currently listed as “threatened” within the coterminous United States and “sensitive” in Alberta, British Columbia, and the Yukon Territory (U.S. Fish and Wildlife Service 1999; Canadian Endangered Species Conservation Council (CESCC) 2001). Bull trout are considered a species that could be at risk of extinction or extirpation in the Northwest Territories (NWT) and are candidates for a detailed risk assessment in the Northwest (Government of the Northwest Territories, Department of Resources, Wildlife and Economic Development 2000\*). Despite confirmation of self-sustaining bull trout populations in the NWT (Reist et al. accepted; Mochnacz et al. submitted), very little is known about distribution, life history and habitat requirements in the region.

To expand knowledge of bull trout distribution and habitat requirements in the NWT, fisheries surveys of Prairie Creek and four tributaries near the proposed Prairie Creek mine site were conducted from August 13 to 14, 2001.

## Methods

Fish sampling was conducted in Fast, Funeral, Galena, and Harrison Creeks, which are all in close proximity to the mine. Several locations were fished upstream and downstream of the mine site in Prairie Creek. Angling, backpack electrofishing, and seining were used to capture fish at each site. Bull trout voucher specimens were retained for biological sampling, aging, and genetics work. Voucher specimens were compared to known bull trout specimens at the Department of Fisheries and Oceans in Winnipeg to confirm the presence of this species in the sampling area. All other bull trout captured were keyed out and identified to species before they were released. Fork length and weight were recorded for all bull trout caught and Floy-tags were placed below the dorsal fin of released individuals for future identification. Adipose fin and pelvic fin rays were taken for genetics and non-lethal aging.

Habitat assessments were performed at Fast Creek and Funeral Creek. Habitat assessments included identification and documentation of habitat types and physical parameters for each type. In each stream reach habitat was partitioned into pools, runs, and riffles similar to the procedure described by (Arend 1999). Once habitat was categorized depth, water velocity, substrate, temperature, and cover were recorded at nine equally spaced points throughout each habitat type. Each reach of the stream sampled was approximately 100 m long. The presence of bull trout at each habitat type was documented throughout the sampled reaches and all other species captured were recorded.

## Results

Arctic Grayling (*Thymallus arcticus*), Sculpin (*Cottus* sp.), and bull trout were found at different locations during the two-day sampling period. Twenty Arctic Grayling were angled in the lower section of Prairie Creek downstream of the mine site (61° 14'57.5"N, 124° 24'28.9"W). Sculpin were captured and observed in Fast (61°

36°49.5"N, 124° 48'08.6"W), and Funeral Creek (61° 36'37.5"N, 124° 44'12.3"W). One bull trout was captured from Galena Creek at the confluence of Prairie Creek (61° 32'43.3"N, 124° 47'03.2"W). Fifteen bull trout were captured from Funeral Creek approximately 1 km upstream of the mouth (61° 36'22.9"N, 124° 48'28.8"W) and sixteen bull trout were captured approximately 3 km from the headwaters (61° 36'37.5"N, 124° 44'12.3"W) (Table 1). Age determination of voucher specimens confirmed that several different age classes of bull trout are present in Funeral Creek (Table 1). The average wetted width of Funeral Creek during sampling was 3 m.

## **Discussion**

### ***Biology***

Bull trout, Arctic grayling, and sculpin occur within the Prairie Creek watershed. Arctic grayling were found downstream of the mine site in Prairie Creek and appear to have a large proportion of good quality habitat available throughout the river. Grayling have the opportunity to use this habitat throughout the year as many of the pools that they were observed or angled from were relatively deep (i.e., > 2.5m) and would not freeze in the winter. Sculpin were observed in Fast and Funeral Creeks, which are upstream of the mine site and may reside year round in these creeks if flow and depth prevent freezing in the winter.

Bull trout have been reported to occur in Prairie Creek upstream and downstream of the mine site (Rescan 1994), however only one bull trout was captured in Prairie Creek at the mouth of Galena Creek during summer sampling. Sampling later in the summer revealed that bull trout also occur throughout the South Nahanni River, which suggests that fluvial (river-dwelling) bull trout populations could use Prairie Creek as a corridor to spawning tributaries entering Prairie Creek. Furthermore, populations may reside in both Prairie Creek and the South Nahanni River year round, as both rivers do not completely freeze in the winter because of depth and significant flow (Doug Tate per. comm. 2001).

Bull trout caught in Funeral Creek represented several age classes between years 1 and 11 (Table 1). Several individuals with parr marks were caught that were likely 1 – 5 year old fish based on comparison to the size of the fish aged. Many of the smaller individuals (65-80mm) were captured upstream of several impassable barriers (e.g., plunge pools) which suggests that these fish were spawned and hatched well upstream of the confluence. Confirmation of bull trout age 1 – 5 in this stream, especially in the upper reaches, indicate that adults use this stream for spawning as juvenile bull trout remain in their natal stream for 3 – 5 years before joining adults from the spawning population. Furthermore, bull trout appear to be annual residents in this stream suggesting that sufficient high quality habitat must exist for both spawning and rearing. The population occurring in Funeral Creek may exhibit a fluvial or stream-resident life history strategy. Fluvial populations spawn and rear in small tributary streams, such as Funeral Creek and overwinter in larger rivers. Stream-resident populations spend their entire lives within their natal stream despite having access to larger tributaries with suitable habitat, such as Prairie Creek. Adults from stream-resident populations are usually slower growing and smaller than individuals from fluvial populations. The bull trout captured from Funeral Creek are likely part of a stream-resident population as the larger individuals (250-330 mm) that were aged (i.e., fish 47265 and 47268) were relatively old for their size (Table

1). Individuals the same age (7 – 11) from a fluvial population would be much larger (e.g., 500 – 600mm).

### ***Habitat***

From the mine site to the confluence of the South Nahanni River, Prairie Creek appears to have a large proportion of good quality habitat for bull trout and Arctic grayling with no impassable barriers to impede migratory movements. Suitable spawning tributaries were observed throughout the watershed however some of the smaller tributaries such as Galena Creek could not be large enough to prevent complete freezing during winter unless groundwater infiltration is present. Such tributaries may provide rearing habitat for bull trout and associated species throughout the summer months.

Funeral Creek appears to be a tributary that does provide year round habitat for bull trout in the watershed. Funeral Creek is a relatively small creek flowing into Prairie Creek. The creek is composed of numerous intermediate plunge pools followed by cascading riffle habitats and few runs. Many of the larger plunge pools are likely impassable for small juveniles (e.g., 50-80 mm) but not for larger adults. Large boulders, intermediate cobble, depth, and turbulence provide sufficient cover for juveniles and adults. The stream has relatively fast flow given its size however instream cover provides ample opportunity for smaller fish to seek refuge during high flow periods in the spring. Funeral Creek possesses all of the physical habitat requirements that typically characterize high quality bull trout spawning and rearing habitat. The substrate in the creek is dominated by cobble (16 – 65 mm diameter) which is generally ideal spawning substrate for bull trout. The creek also appears to have groundwater upwellings based on the clarity, temperature and velocity, which provides an ideal incubation environment that increases egg to juvenile survival. Bull trout spawning populations have demonstrated a distinct habitat preference to areas that have groundwater infiltration (McPhail and Baxter 1996).

Based on in-stream sampling and aerial observations it appears that Prairie Creek has a large proportion of suitable habitat for both bull trout and Arctic Grayling. Furthermore, because this river does not freeze completely during winter it can be considered as year round fish habitat. Consequently, bull trout and grayling populations may use this watercourse for the following: 1) migratory corridor to spawning sites, 2) year round habitat for spawning, feeding and rearing, or 3) seasonal feeding habitat.

### ***Impacts***

Bull trout is a species that is extremely vulnerable to impacts that compromise habitat quality and availability, especially spawning and rearing habitat. Increased sedimentation, flow alteration, addition of contaminated/harmful materials, alteration of bank vegetation, and alteration of natural flow (e.g., blockage by culverts) are impacts that can negatively impact bull trout populations. The most profound impacts on trout populations are caused by increased sedimentation (Eaglin and Hubert 1993; McPhail and Baxter 1996; Baxter et al. 1999). Bull trout egg survival decreases significantly when sediment is introduced over spawning redds (Shepard et al. 1994). Given that bull trout populations generally spawn in non-consecutive years and are extremely vulnerable to such impacts, any development that may occur in or around water bodies containing bull

trout should be avoided if possible. Minimal impacts to spawning and rearing habitat could significantly impact early developmental success rendering small populations at risk of extirpation. Tributaries such as Funeral Creek should be considered critical habitat (i.e., spawning and rearing sites) and identified as an area where potential and existing impacts to habitat should be minimized through appropriate mitigation.

### **Literature cited**

- Arend, K. K. 1999. Macrohabitat identification. *In* Aquatic habitat assessment: common methods. *Edited by* M. B. Bain, and N. J. Stevenson. American Fisheries Society, Bethesda, Maryland. pp. 75-93.
- Baxter, C. V., C. A. Frissell, and F. R. Hauer. 1999. Geomorphology, logging roads, and the distribution of bull trout spawning in a forested river basin: implications for management and conservation. *Transactions of the American Fisheries Society* 128:854-867.
- Canadian Endangered Species Conservation Council (CESCC). 2001. Wild Species 2000: The general Status of Species in Canada. Ottawa: Minister of Public Works and Government of Services Canada.
- Eaglin, G. S. and W. A. Hubert. 1993. Effects of logging roads on substrate and trout in streams of the Medicine Bow National Forest, Wyoming. *North American Journal of Fisheries Management* 13:844-846.
- Government of the Northwest Territories, Department of Resources, Wildlife and Economic Development. 2000. NWT Species 2000: General Status Ranks of Wild Species in the Northwest Territories. Government of the Northwest Territories, Department of Resources, Wildlife and Economic Development.
- McPhail, J. D., and J. S., Baxter. 1996. Bull trout spawning and rearing habitat requirements: summary of the literature. Fisheries Technical Circular No. 98, Dept. of Zoology, University of British Columbia, 25p.
- Mochnac, N. J., J. D. Reist, G. Low, and K. Ditz. Submitted. Capture of bull trout, *Salvelinus confluentus*, in three new locations within the central and southwestern Northwest Territories. *Canadian Field Naturalist*.
- Reist, J. D., G. Low, J. D. Johnson, and D. McDowell. Accepted. Range extension of bull trout, *Salvelinus confluentus*, to the central Northwest Territories, with notes on char identification and distribution in the western Canadian Arctic. *Arctic*.
- Rescan Environmental. 1994. Prairie Creek mine fisheries and aquatic studies. Report prepared for Canadian Zinc Corporation.

Shepard, B., S. Leathe, T. Weaver, and M. Enk. 1984. Monitoring levels of fine sediment within tributaries to Flathead Lake and impacts of fine sediment on bull trout recruitment. Proceedings of the Wild Trout III Symposium. Mammoth Hot Springs, Yellowstone National Park, Wyoming. Sept. 24-25, 1984.

U. S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and plants; determination of threatened status for bull trout in the coterminous United States; Final Rule. Federal Register 64(210):58910-58933.

Table I: Collection and biological data for bull trout caught in the Prairie Creek watershed  
August 13 and 14, 2001

Fish Number	Date D/M/Y	Location	Fork Length (mm)	Weight (g)	Age (years)	Floy-tag #	Comments
34	13/08/01	<b>Funeral Creek - Site #1</b>	180	60			Juvenile - parr marks
35		61° 36' 22.9" N	142	30			Juvenile - parr marks
36		124° 48' 28.8" W	179	55			Juvenile - parr marks
37			155	40			Juvenile - parr marks
38			180	70			Juvenile - parr marks
39			170	50			Juvenile - parr marks
40			208	100		MC0017	Juvenile/Adult?
41			281	360		MC0026	Juvenile/Adult?
42			292	280		MC0029	Juvenile/Adult?
43			329	360		MC0030	Juvenile/Adult?
44			302	370		MC0031	Juvenile/Adult?
47267			168	56	4+		Juvenile - parr marks
47268			266	204	7+		Adult
47269			354	506			Juvenile/Adult?
47270			185	72	5+		Juvenile - parr marks
45	14/08/01	<b>Funeral Creek - Site #2</b>	273	220		MC0032	Juvenile/Adult?
46		61° 36' 37.5" N	307	315		MC0033	Juvenile/Adult?
47		124° 44' 12.3" W	370	500		MC0034	Juvenile/Adult?
48			70	1.0			Juvenile - parr marks
49			78	0.9			Juvenile - parr marks
50			70	0.9			Juvenile - parr marks
51			70	0.7			Juvenile - parr marks
52			75	0.5			Juvenile - parr marks
53			75	0.9			Juvenile - parr marks
54			80	0.9			Juvenile - parr marks
55			75	0.8			Juvenile - parr marks
56			80	1.0			Juvenile - parr marks
47263			72	2.8	1+		Juvenile
47264			65	2.3	1+		Juvenile
47265			323	397	11+		Adult
47266			289	297			Juvenile/Adult?
57	14/08/01	<b>Galena Creek - Site #1</b>	321	350		MC0035	Juvenile/Adult?
		61° 32' 43.3" N					
		124° 47' 03.2" W					