Assessment of Brook Trout Habitat Conditions within the Dwaas Kill Nature Preserve

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Eastern Brook Trout (photo credit David Hersimtschuk / Freshwater Illustrated)

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SUMMARY

The eastern brook trout (Salvelinus fontinalis) is a member of the Salmon family of the order Salmoniformes. Although it is closely related to "true" species of trout, the brook trout is a member of the char family, along with lake trout and bull trout. The brook trout is an important "indicator species", so its presence in a stream, or the presence of suitable habitat, indicates a healthy ecosystem (1). In August of 2018, Boy Scout Troop 6 of Clifton Park conducted an assessment of streams within the Dwaas Kill Nature Preserve to assess their suitability as habitat for brook trout. Our project's fieldwork was focused in the Dwaas Kill and one of its tributaries, the Cooley Kill. It has been reported by amateur fisherman who frequent these streams that brook trout have been sighted or caught in the Dwaas Kill (2) The purpose of this study was to produce compelling data that would either support or refute the notion the Dwaas Kill or the Cooley Kill provide suitable habitat for brook trout. After first researching the topic of brook trout habitat assessment, including review of materials provided by Trout Unlimited, we developed our methodologies and a list of environmental parameters, including stream temperature, water chemistry (e.g., pH, nitrate levels, phosphate levels), physical features of the stream, and other fish species present. In addition, we were directed by the town of Clifton Park to determine whether small fish that had been reported in the stream were species of minnow or might in some cases be juvenile brook trout. Our data indicate that parts of the Dwaas Kill and Cooley Kill are indeed suitable to brook trout habitat, with some parts of the Cooley Kill in particular possibly being suitable habitat to support breeding. In addition, our team identified several species of minnows, some of which had been reported previously (2). Since some of these species represent potential competitors of brook trout (e.g., creek chubs), their identification provides important information to assess habitat suitability. The findings from our study provide a platform to formally assess the suitability of the Dwaas Kill and Cooley Kill habitats for brook trout, and they can be used as the basis for informed decisions by organizations such as Trout Unlimited, the Department of Environmental Conservations (DEC), and the Town of Clifton Park regarding maintenance of the Dwaas Kill Nature Preserve, including stocking its streams with brook trout.

INTRODUCTION

The purpose of this study was to collect and analyze data to assess the suitability of habitat within the Dwaas Kill Nature Preserve for the eastern brook trout (*Salvelinus fontinalis*). By extension, evaluation of fish species that are present in the Dwaas Kill and its tributaries, the habitat properties that were associated with their presence, were also addressed in this study. Results from this project may be used as an additional reference for the town of Clifton Park as it manages the Dwaas Kill Nature Preserve as a valuable natural resource for its residences, and for all who wish to learn more about the Preserve and its habitat. In addition, the research conducted in this project will hopefully provide useful information for future projects to build on, including the possibility of establishing and maintaining a stable population of brook trout in the streams of the Dwaas Kill Nature Preserve.

MATERIALS AND METHODS

Site Selection for data collection

The fieldwork for this project was carried out on three consecutive weekends in August, which is one of the hottest months of the year and may present the most challenging conditions for brook trout. Each field workday consisted of about two hours, from approximately 10:00 am to noon. Weather conditions and air temperature were recorded for each workday. On each workday a different site of the preserve was assessed. Three main sites were selected based on their different physical and ecological features, broad distribution across the preserve, and accessibility to the research team (Fig. 1). Distinct subsites were assessed at each of Sites 2 and 3, designated as subsites a, b or c based on their respective positions from upstream to downstream. Data described below were recorded on a data collection sheet for each subsite (see Appendix A for template of data collection sheet).



Figure 1. Map of the Dwaas Kill Nature Preserve showing the locations of three data collection sites, designated as Sites 1, 2 and 3, indicated by white stars. Map reproduced from Dwaas Kill Nature Preserve 2009 Concept and Management Plan (1).

Assessment of site characteristics

With permission from the town of Clifton Park, we completed a series of tests and measurements at each site. Habitat evaluation included assessment of physical properties of the stream, bank and surrounding habitat as recommended on the "Brook Trout Checklist", available through Trout Unlimited (http://www.troutintheclassroom.org/BTHP). Assessment of physical properties included canopy cover/shaded area, bank erosion, stream width, stream depth, streambed composition and color, water clarity, and water movement. Some of these assessments were done by eye, since they are based on descriptive observation. Physical properties of the stream were measured in English units using either a tape measurer or a yard stick. Water temperature (°F) was measured onsite using a standard thermometer.

Assessment of water chemistry

Water chemistry is an important factor in assessing the health of an aquatic environment. Assessment of water chemistry included pH, nitrate levels, and phosphate levels. Individual water samples were collected from each site and stored in a 50 ml polypropylene tube (Celltreat Scientific Products) until measurements could be made at a later time. One site was sampled twice on separate days, in order to confirm that water chemistry did not vary when collected from the same site on different days. Water chemistry tests were performed using a combination of laboratory equipment (Dr. DiPersio's laboratory at Albany Medical College) and store-bought kits (API). A laboratory grade pH meter (Hanna Instruments, model HI-2210) was used to measure the pH of each sample. The concentration of nitrates and phosphates in each sample was determined using nitrate and phosphate API test kits by an experienced user (Mathieu DiPersio, employee, Benson's Pet Center). These data were recorded on the data collection sheet for each site.

Assessment of fish species

To assess different fish species at each site we used a collection method known as seining. Prior to data collection, we obtained a *Scientific Collectors Permit* from the New York State Department of Environmental Conservation (DEC), Division of Fish, Wildlife and Marine Resources. To seine the stream, a seine net (4-foot height; expandable to 12-foot width; 1/8-inch mesh; weighted on the bottom) was dragged slowly through the stream site in an upstream direction by two volunteers on opposite sides of the net, then closed at a predesignated end point often downstream of a natural barrier, such as small waterfall or beaver dam, to maximize fish capture (Fig. 2A, B). Some stream sections were seined more than once. Specimens were transferred from the seine net into a holding bucket filled with stream water (Fig. 2C, D). Each fish was then transferred by hand to a whiteboard for identification (Fig. 2E), quickly photographed alongside a mounted ruler (Fig. 3), then placed in a recovery bucket before release back into the stream at the site of capture. No fish casualties were observed during this procedure. Each species was identified onsite using the *Audubon Society Field Guide to North American Fishes, Whales & Dolphins*, with subsequent confirmation from photographs by David Reynolds (MS, biology), a

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Shenendehowa CSD biology teacher and professional sports fisherman. For each site, the number of different species caught, the number caught for each species, and approximate lengths (inches) of specimens were recorded on the data sheet.



Figure 2. (A, B) A seining technique was used to capture fish species at each site. (C) A blacknose dace is transferred from the seine net. (D) Holding bucket for specimens before measurement. (E) Use of a whiteboard with mounted rulers and a field guide to identify and measure specimens.



Semotilus atromaculatus

Rhinichthys atratulus

Luxilus cornutus

Figure 3. Examples of fish identification and measurement.

RESULTS

According to information from the Trout Unlimited Brook Trout Habitat Project (3), the optimal habitat for survival of eastern brook trout (Salvelinus fontinalis) requires cool, clear, clean streams with >60% shading and a clean gravel stream bottom with minimal fine sediment and an assortment of rock sizes, which provides spawning sites as well as habitat for insects on which brook trout prey. Suitable brook trout streams must also meet strict water quality criteria. Brook trout cannot tolerate sustained

temperatures above 77°F, and they require temperatures below 68°F for normal metabolism. Reproduction requires water temperatures between 55°F and 65°F. Although adult brook trout can tolerate a pH as low as 5 (high acidity) and as high as 9 for short periods, they cannot function at these extreme pH levels. The ideal pH range for brook trout is 6-8, with an optimal pH of about 7. Nitrates and phosphates are necessary nutrients in all rivers and streams because they control rates of photosynthesis and growth of plants, but in excess they can cause extreme underwater plant growth that is problematic to brook trout. Normal, healthy levels of nitrates and phosphates are below 0.1 ppm. These optimal conditions must be present for most of the year to sustain a healthy population of brook trout.

Using these optimal habitat conditions as a baseline, we assessed habitat suitability for brook trout at three different stream sites within the Dwaas Kill Nature Preserve (Fig. 1; Sites 1, 2 and 3). Sites 2 and 3 were divided into subsites of different habitat qualities. Riparian buffer width was ideal at all three sites, which each showed >40 feet of undisturbed vegetation on each bank, with the exception of Site 3b of the Dwaas Kill just downstream of the Pierce Road overpass, where the north bank abuts residential property and the south bank abuts town property with a riparian buffer of 10-15 feet on each bank. Data for other criteria were collected using a separate data collection sheet for each site/subsite, and the results are summarized below. Using the seining method described above, we also sampled fishes at each site. Although brook trout were not among the species captured, this method allowed us to determine the presence of species that may compete with brook trout, or that may have been mistaken for brook trout in previous reports of visual sightings. Taking into account all parameters, we assigned a rating of excellent, good, marginal, or poor to each site with regard to its suitability as brook trout habitat. It should be noted that these ratings are subjective assessments based on our findings.

<u>SITE 1 – Portion of the Cooley Kill above the confluence with the Dwaas Kill.</u>

Site 1 (Fig. 4) covered a stream stretch of about 50 yards that runs along the site of the "Future Trail" at the west end of the Dwaas Kill Nature Preserve, approximately ¹/₄ mile from where the Cooley Kill passes beneath Carlton Road (Fig. 1). It is in a heavily wooded and (currently) less accessible portion of the Preserve.

Date of site visit:	August 25, 2018
Weather conditions:	Clear and sunny
<u>Air temperature</u> :	72°F
<u>Water temperature</u> :	68°F (optimal range, 55-68°F)
Water chemistry:	pH: 7.85 / 7.73, duplicate readings (optimal range, 6-8)
	Nitrates: 0 (optimal, <0.1 ppm)
	Phosphates: 0 (optimal, <0.1 ppm)
Physical conditions:	This portion of the stream had a width



ranging from 3 to 15 feet, and central depth ranging from a few inches to 2 feet. Percent shaded area was estimated at 80-95%. Banks showed some evidence of erosion. Water movement was generally slow in deeper pools, which were separated from one another by natural debris (logs, stones) and/or short stretches of shallow, faster moving water. Water was clear with no odor. Occasional litter (e.g., tires, plywood) was observed along stream banks or in the stream. The streambed was dark brown in color and consisted of fine, gritty sediment with areas of fine gravel and larger rocks or wood debris.

Overall rating as brook trout habitat: excellent

Fish species collected: Three species were collected from Site 1 (Table 1). However, greater numbers of these species were observed in the stream than were successfully captured (especially blacknose dace).

Table 1		
Species	number	size range
creek chub (Semotilus atromaculatus)	8	2.0-4.0 inches
blacknose dace (<i>Rhinichthys atratulus</i>)	3	1.5-3.0 inches
tessellated darter (Etheostoma olmstedi)	3	1.0-1.5 inches

<u>Note</u>: Crayfish were abundant throughout Site 1.

SITE 2 – Portion of the Dwaas Kill West above the confluence with the Cooley Kill.

Site 2 (Fig. 5) lies on the Dwaas Kill West, about 500 feet from the south border of the Dwaas Kill Nature Preserve (Fig. 1). It is in an area of wooded swamp and thick brush that is accessible from Kinns Road via the "Seasonal Trail".

<u>Date of site visit</u> :	August 19, 2018
Weather conditions:	Partly cloudy
<u>Air temperature</u> :	76°F
<u>Water temperature</u> :	71°F (optimal range, 55-68°F)
<u>Water chemistry</u> :	pH: 7.87 (optimal range, 6-8) Nitrates: 0.3 (optimal, <0.1 ppm) Phosphates: 0 (Site 2a) 0.25 (Site 2b) (optimal, <0.1 ppm)

Site 2a – Deep pool upstream of a small beaver dam.

<u>*Physical conditions*</u>: This portion of the stream had a width of approximately 12 feet and a central depth of $2\frac{1}{2}$ feet. Percent

shaded area was estimated at 0%, and the banks showed no



Figure 5. Representative areas of Sites 2a (top) and 2b (bottom).

evidence of erosion. There was no detectable water movement

due to a small beaver dam at the end of the pool. Water clarity was murky with no odor. The streambed consisted of soft, deep mud.

Overall rating as brook trout habitat: poor

Fish species collected: Three species were collected from Site 2a (Table 2).

Table 2		
Species	number	size range
creek chub (Semotilus atromaculatus)	2	4.5 inches, 7 inches
common shiner (Luxilus cornutus)	6	1-2.5 inches
white sucker (Catostomus commersonii)	1	1 inch

Site 2b – Pool lying between a fast riffle running from below the beaver dam and another fast riffle.

<u>*Physical conditions*</u>: This portion of the stream had a width of approximately 9 feet and a central depth of about 20 inches. Percent shaded area was estimated at 10-30%, and the banks showed no evidence of erosion. Water movement was moderately fast, as water exited the beaver dam into a pool. Water clarity was turbid with no odor. The streambed was brown in color and consisted of fine sediment and soft mud.

Overall rating as brook trout habitat: marginal/poor

Fish species collected: One species was collected from Site 2b (Table 3).

Table 3		
Species	number	size range

SITE 3 - Exit of the Dwaas Kill from the east end of the Nature Preserve (Pierce Road overpass).

Site 3 (Fig. 6) lies where the Dwaas Kill exits the east border of the Dwaas Kill Nature Preserve, at the intersection of Pierce Road and Kinns Road where there is marked public access to the Preserve via the "Existing Trail" (Fig. 1). Here, the Dwaas Kill abuts developed and residential areas once it exits the Preserve.

Date of site visit:	August 11, 2018.
Weather conditions:	Light rain with full cloud cover.
Air temperature:	71°F
Water temperature:	66°F (Site 3a) / 68°F (Site 3b)
	(optimal range, 55-68°F)
Water chemistry:	pH: 8.11 (Site 3a, upstream)
	7.77 (Site 3a, downstream)
	7.96 (Site 3b)
	(optimal range, 6-8)
	Nitrates: 0.2 (Site 3a)
	0.3 (Site 3b)
	(optimal, <0.1 ppm)
	Phosphates: 0 (optimal, <0.1 ppm)



Figure 6. Representative areas of Sites 3a (top) and 3b (bottom).

Site 3a – Immediately upstream of the Pierce Road overpass.

Physical conditions: This portion of the stream had a width of approximately 20-22 feet and a central depth ranging from 1-3 feet. Percent shaded area varied, ranging from 10% to 60%. Banks showed some evidence of erosion in places. Water movement was slow due to a dam of brush and natural debris just before the overpass. Water clarity was somewhat murky with no odor, but the bottom was visible. The streambed was light brown and consisted of fine, gritty sediment or mud, with no gravel and few rocks.

Overall rating as brook trout habitat: good

Fish species collected: One species was collected from Site 3a (Table 4).

Table 4		
Species	number	size range
common shiner (Luxilus cornutus)	12	1-2 inches

Site 3b – Immediately downstream of the Pierce Road overpass.

Physical conditions: This portion of the stream had a width of approximately 26 feet and a central depth of about 3 feet, 2 inches. Percent shaded area was estimated at 40%, and the banks showed some evidence of erosion. Water movement was fast, as water exited a shallow rocky area underneath the

overpass into a deep hole. Water clarity was turbid with no odor. The streambed was brown in color and consisted of fine, gritty sediment with some rocks.

Overall rating as brook trout habitat: good

Fish species collected: Two species were collected from Site 3b (Table 5).

Table 5		
Species	number	size range
creek chub (Semotilus atromaculatus)	3	1-2 inches
common shiner (Luxilus cornutus)	21	1-2 inches; one was 4 inches

CONCLUSIONS & DISCUSSION

After careful consideration of the results collected from this project, we can conclude that suitable habitat for eastern brook trout exists along portions of the streams within the Dwaas Kill Nature Preserve. Consistently, it has been reported that brook trout have been caught or sighted by anglers in the Dwaas Kill and its tributaries (1). Overall, all three of the sites examined in this study may be suitable habitat for brook trout survival. Studies suggest that water temperature for brook trout survival should be between 52-68°F, with possible mortality at temperatures above 75°F (4). Data for all sites showed temperature within the tolerable range, as well as pH that was well within the lethal limits for brook trout (between 3.5 and 9.8) (5). It is worth noting that these sites were surveyed in the hottest month of the year, so temperature is likely to be in the lower range during the cooler months of the spring and fall.

Of the three sites studied, Site 1 along the Cooley Kill provided the most promising results and is clearly the most suitable brook trout habitat among the three sites studied. Located inside a lush forest that is heavily shaded by a canopy comprised mostly of pine trees, the stream at Site 1 is relatively cool and shallow and flows into a series of connected pools with fine gravel sediment. Stream temperature was approximately 68°F (optimal temperature for brook trout is 55-68 °F). Although there was some litter observed in this site, the water samples showed optimal chemical conditions as both the nitrates and phosphates were read at 0 ppm, and the pH (7.73-7.85) was well within the optimal range of 6-8.

Analysis of the species that we captured at each site using a seining method provides additional information about habitat. According to the Dwaas Kill Nature Preserve 2009 Concept and Management Plan, species of fishes reported to occur in the Dwass Kill include the brook trout (*Salvelinus fontinalis*), creek chub (*Semotilus atromaculatus*), blacknose dace (*Rhinichthys atratulus*), pumpkinseed sunfish (*Lepomis gibbosus*), fathead minnow (*Pimephales promelas*), redfin pickerel (*Esox americanus americanus*); tessellated darter (*Etheostoma olmstedi*), and white sucker (*Catostomus commersonii*). Of these, we collected creek chub, blacknose dace, white sucker, and tessellated darter, in addition to the common shiner (*Luxilus cornutus*). Our failure to capture some previously reported species may reflect their relative rarity or ability to evade the seine net more effectively. In particular, it should be noted that our failure to capture brook trout should not be interpreted as evidence of their absence, since they are a

particularly wary species known to stay tight to cover and structure in areas of streams that cannot be easily seined. Indeed, there have been reports of brook trout being taken by anglers in the Dwaas Kill. Importantly, however, those species that we did successfully collect by seining provide valuable information about the presence of invasive or competing species, or of species that prefer habitat suitable for brook trout, as discussed below.

The blacknose dace is a prey species of brook trout that thrives in a small stream environment with cool water, pools, and a gravelly bottom, which are also characteristic of optimal brook trout habitat (6). Consistently, we captured/sighted this species primarily at Site 1 on the Cooley Kill, which most closely matches the ideal brook trout habitat among the three sites sampled. Interestingly, results of a recent study in Adirondack streams showed that blacknose dace were more sensitive than native brook trout to some environmental stresses (7). Our observation that there is a thriving population of blacknose dace in this portion of the Cooley Kill, which lies above the confluence with the Dwaas Kill, provides a strong indication that it may also provide good habitat for brook trout.

The creek chub was collected at all three sites, indicated that this hardy species thrives throughout the Dwaas Kill under a variety of conditions. While the creek chub does not normally pose a competitive threat to brook trout populations, one interesting study did show that creek chubs may become competitively dominant over brook trout at warmer temperatures around 75°F (8), which is a factor worth considering for warmer portions of the Dwaas Kill such as Site 2. Given that some creek chub specimens were quite large (4-7 inches), it is possible that this large minnow accounts for some reports of brook trout sightings along portions of the Dwaas Kill or Cooley Kill.

Specimens of the common shiner were captured only at sites 2 and 3. The common shiner is a popular bait among anglers, raising the possibility that some of these fish represent released bait at sites 2 and 3 since both are readily accessible angling sites on the Dwaas Kill.

In summary, our findings suggest that specific portions of the Dwaas Kill and Cooley Kill within the Dwaas Kill Nature Preserve provide suitable habitat for brook trout. In particular, a portion of the Cooley Kill towards the western border of the Preserve (Site 1) appeared to be excellent brook trout habitat, showing optimal conditions for a number of important parameters. Our data suggest that conditions are suitable for stocked brook trout to survive in the streams of the Preserve. In addition, some sections of the Cooley Kill might be suitable habitat to maintain a breeding population of brook trout. It is important to point out that we were not able to sample all parts of the streams and tributaries within the Preserve, so there may be additional brook trout habitat along the Cooley Kill and Dwaas Kill. To our knowledge, our study represents the first formal assessment of brook trout habitat within the Dwaas Kill Nature Preserve. We hope that our findings are useful as the Town of Clifton Park considers future plans to stock manage the Preserve and stock its streams with brook trout.

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Appendix A: Dwaas Kill Project – Data Collection Sheet

SITE #: Date:	Time: _		
Today's weather conditions:		Air temperature:	
Stream properties:			
Stream depth <i>(range)</i> :	Stream wid	dth <i>(range)</i> :	
Water movement:	Water clarity:	Water odor:	
Streambed color:	Streambed composition	n (cobble>gravel>fine):	
Percent of Stream that is shaded:	(idea	al for brook trout is >60%)	
Stream bank stability (evidence of	erosion?):		
Water temperature: <i>(idea</i>	l for brook trout is 55°F-	-65°F / 12.8°C-18.3°C)	
Water chemistry (samples collected	for offsite analysis):	- /	
Nitrates: (ideal for b Phosphates: (ideal for Was seining performed at this site to Fish species collected (list genera and individu	rook trout is <0.1 ppm) r brook trout is <0.1 ppr day? Were th ted from previous repor yal lengths in inches)	m) ere any known mortalities? ts for the Dwaas Kill; record numbers	
Creek Chub			
Blacknose Dace			
Pumpkinseed Sunfish			
Fathead Minnow			
Redfin Pickerel			
Tessellated Darter			
White Sucker			
Brook Trout			
Salvelinus fontinalis Other:			

NOTES: _____