**What We Know About Brown's Creek and Brown Trout**

Brown's Creek is a designated trout stream managed by The Minnesota Department of Natural Resources, Division of Fisheries. It's one of the few trout streams in the Twin Cities Metropolitan area that support a fishable trout population. Compared to other fish species, trout need colder and cleaner water to survive. They also need a variety of stream habitats, including deep pools with overhead cover. The DNR has actively managed Brown's Creek since 1955. Over the years, the DNR has collected a lot of information about the stream and its trout population. It's also collaborated with several organizations and residents to help protect and improve Brown's Creek. This summary gives a brief history of the trout population in Brown's Creek and some of the past and more recent efforts to improve it.

In the past 48 years, DNR Fisheries has conducted 19 population assessments of the brown trout population in portions of the stream. Population assessments help the DNR track the health of the stream and manage the recreational fishery. Brown's Creek was first stocked with brown trout in 1955 and then annually from 1958 to present. Current management plans call for about 800 to 1,000 fingerling brown trout to be stocked each spring. Stocked fish typically average about 5 to 6 inches in length, although some can be as large as 12 inches. Brown trout stocked in Brown's Creek fare quite well, growing at fairly rapid rates. Fall electrofishing surveys by the DNR typically find many fish in the 10- to 12-inch range, and several as large as 18 to 20 inches (see photo on the left); it's no wonder Brown's Creek has been popular with trout anglers. Survey data also show that in many years adult trout successfully spawn and the young fish survive and grow to be part of the fishable population. This is known as natural reproduction. In some years, however, eggs and young fish do not survive, or survival is poor. If enough eggs were to survive and grow into mature fish the DNR would not have to stock the stream to ensure a viable brown trout fishery.

Recent years have been some of the best recorded for the brown trout population in Brown's Creek, Figure 1 gives an indication of changes in the trout population since 1966. As indicated in the caption, the methods and area surveyed varied from year to year, making direct numerical comparisons difficult. Part of the variation in surveys was due to the fact that the DNR historically didn't find trout upstream of the Highway 5 bridge (so they did not survey beyond the bridge). However, they now find trout over a mile upstream of the bridge, so sampling has been extended to include upstream habitat. This upstream expansion is directly linked to habitat improvement projects that are described later in this summary. The upstream expansion and overall increase in trout numbers is viewed by the DNR as a positive sign for Brown's Creek.

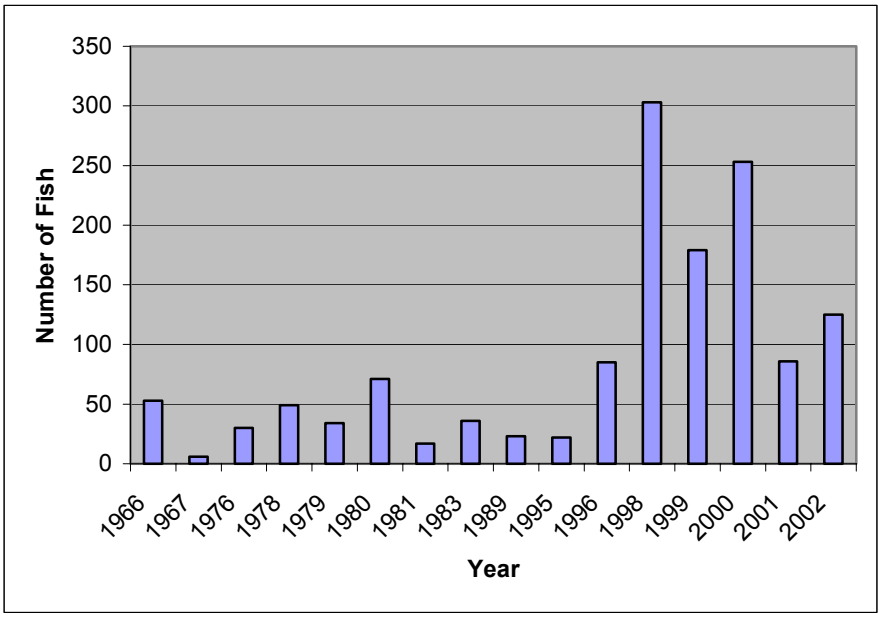


**Figure 1 - Historical electrofishing data (Source: DNR Fisheries). This graph represents the number of trout captured during fall surveys and includes all sizes of trout; the actual number of trout in the stream is higher, since not all fish are captured during surveys. The areas sampled varied from year to year, but would typically coincide with the sections of stream where trout were found. In some years the area was not very far upstream from the intersection of Highways 95 and 96. Some years were sampled twice, only fall samples are shown above.**

What's less clear is the long-term outlook for natural reproduction. Historically, brown trout have reproduced in Brown's Creek in fairly limited numbers. However, since the DNR did not survey Brown's Creek every year until the late 1990's, it's difficult to know what happened in the years they did not survey the stream. Natural reproduction is indicated by the presence of small brown trout, typically 4 or 5 inches at the time of fall surveys (see photo on the right). Fish biologists often refer to these small trout as 'young-of-the-year', because they haven't lived a full year. Stream surveys confirmed natural reproduction in 1966, 1976, 1989, 1998, 1999, 2000, and 2001. It's evident from the survey that 1998 was the best year for 'young-of-the-year trout', with 1999 not far behind. However, in 2001 and 2002, there was a noticeable lack of smaller fish, although the numbers of larger fish continued to be fairly high (Figure 2 shows more detailed information from the past five years).

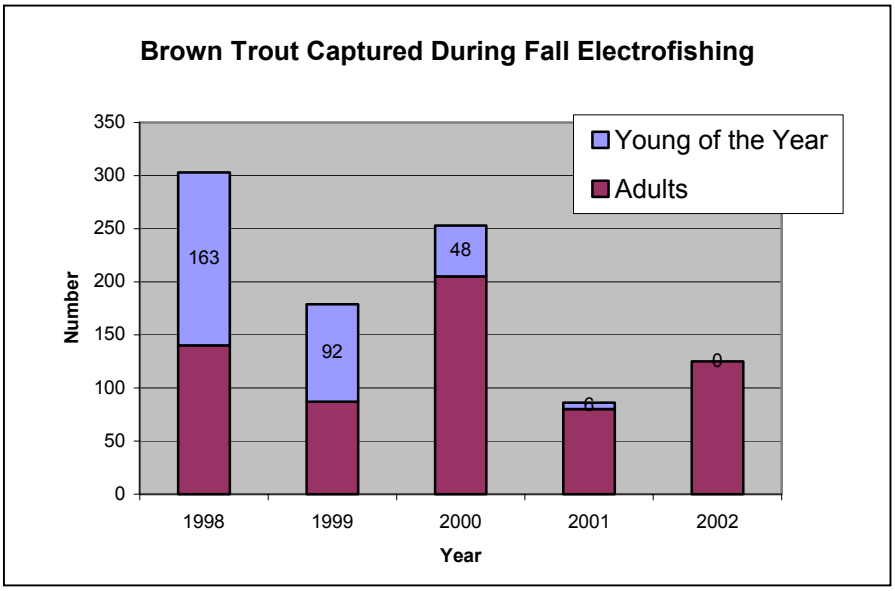


**Figure 2 - Electrofishing results for 1998 through 2002. Note fewer number of young-of-the-year trout in 2001 and 2002. Because they are smaller than the size of trout stocked, the presence of young-of-the-year trout indicates successful natural reproduction.**

Water quality, habitat quality and food availability are all factors that determine how well trout survive, grow, and reproduce. These factors vary from stream to stream, with each stream having a unique composition. Some streams are more subject to floods, others more prone to warm temperatures. In all trout streams, repeated periods of high streamflow and elevated water temperatures will take a toll on trout survival and reproduction. Year to year variability will result in a "bad" year now and then, but repeated bad years can really put a dent in trout populations. Brown trout spawn in the fall by burying their eggs in gravel. The eggs develop slowly over the winter and typically hatch in March and April. At these early stages in their life, trout are not very effective swimmers. High streamflows from snowmelt and rainfall can quickly sweep these small fry downstream and into the St. Croix River, essentially removing them from the population. Some fish will simply die or be consumed by larger trout or other predators. In Brown's Creek, the spring of 2001 and 2002 both had high streamflows (Figures 3 and 4), which may have contributed to poor egg and/ or fry survival.

Sustained periods of increased water temperatures can also be stressful and even lethal to trout, particularly smaller fish. Warm temperatures affect small fish more easily than larger ones. Water temperatures in a stream go up and down throughout the day. They are usually coolest in the early morning hours (about sunrise) and warmest in the late afternoon (about 5pm). Even during the warmest days, the cooler water during the night can serve as somewhat of a refuge for trout. Trout in Brown's Creek were exposed to much warmer water in 2001 and 2002 when compared to 1998 and 1999, even during the night and early morning hours when water temperatures are usually coolest (Figure 5). Both 2001 and 2002 had several days in which the

maximum daily water temperatures exceeded 25 degrees Celsius (77º F) at both McKusick Rd and Hwy 96. Although we don't know for certain, the recent lack of small trout may be due to increased water temperatures and streamflows in 2001 and 2002 (as described above). These periods of high temperatures coincided with high streamflows, possibly compounding stress on fish.

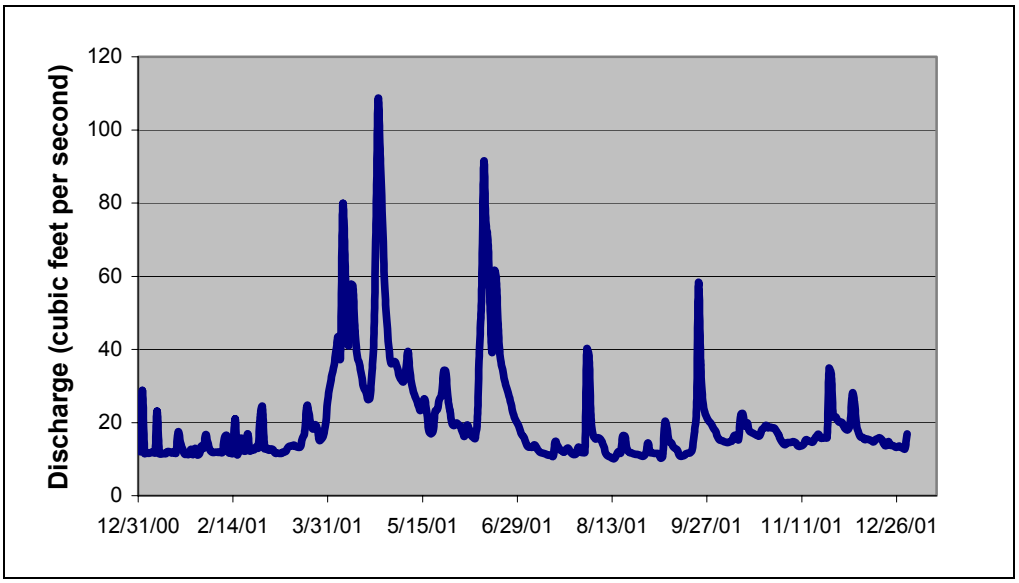


**Figure 3 - Daily streamflow in Brown's Creek at McKusick Road, in 2001 (Source: Brown's Creek Watershed District). Note two fairly large peaks in April and a third again in June.**

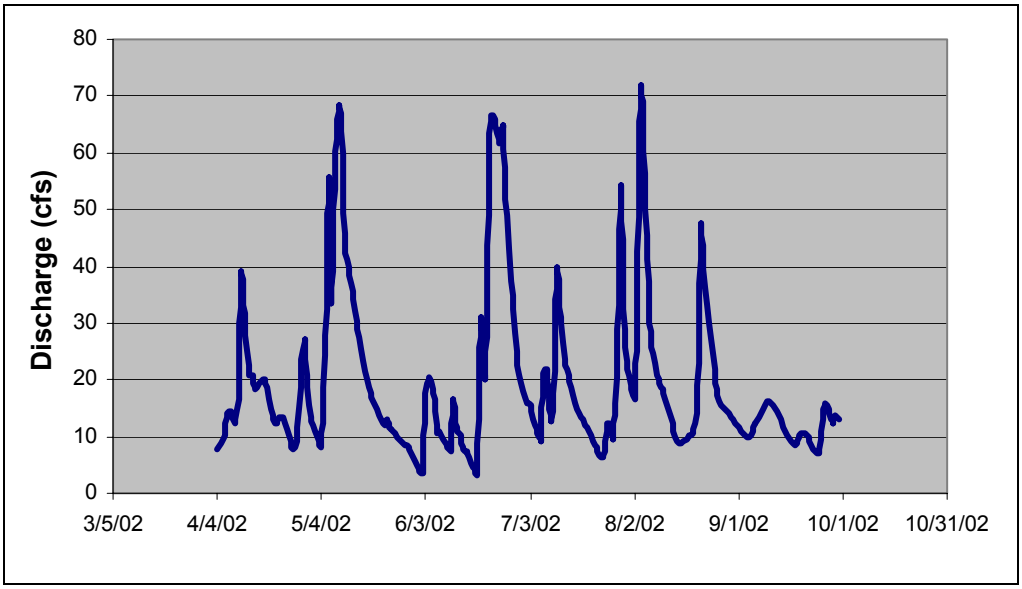


**Figure 4 - Daily streamflow in Brown's Creek at McKusick Road in 2002 (Source: Brown's Creek Watershed District). Note several large peak flows throughout spring and summer.**

Water temperatures in a stream are influenced by a number of factors, but two of the most prominent are air temperature and the amount of solar radiation or direct sunlight that reaches the water. As a rule of thumb, days in which air temperatures meet or exceed 90º F are typically the days when water temperatures are highest. The more days with air temperature at 90º F or above, the more stressful the conditions in the stream. Based on the past 63 years of record the average number of days at or above 90º F in Twin Cities is about 17.4 days a year. Figures 5 and 6 show the correlation between the number of warm days and warm stream temperatures. Both 2001 and 2002 had above average number of these "hot days" (Figure 6).

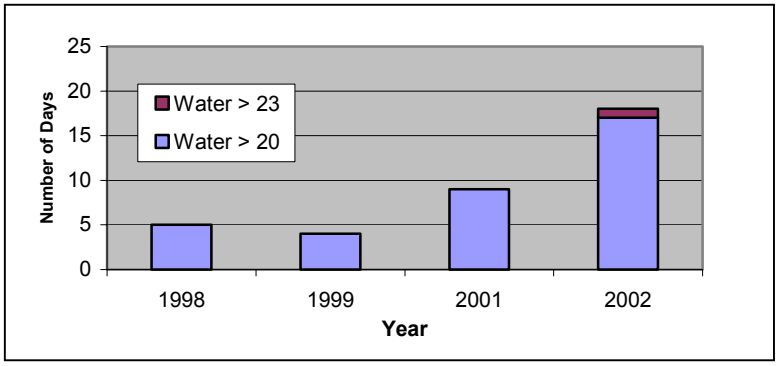


**Figure 5 - The number of days when the daily minimum water temperature of Brown's Creek was above 20 and 23 degrees Celsius at McKusick Road (Source: Browns Creek Watershed District). Daily minimum is the coldest the water was during a given 24-hour period. Sustained temperatures above 20 degrees Celsius (68 ºF) can be stressful for brown trout and temperatures above 23 degrees Celsius (73.5 ºF) can be lethal for small (young-of-the-year) brown trout.**

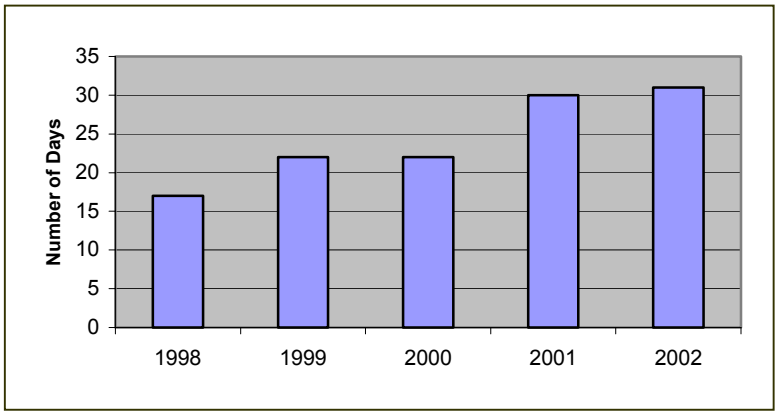


**Figure 6 - Days With Air Temperatures Over 90 Degrees Fahrenheit, Stillwater, MN (Source: National Weather Service). The average number of days above 90 is 17.4 for the Twin Cities area.**

At one time in its history, Brown's Creek was diverted into McKusick Lake, which supplied water to Stillwater residents. By 1955 fisheries managers recognized that warm lake water was putting a strain on the trout population in Brown's Creek. In an effort to reduce water temperatures for the benefit of trout, a dike was constructed to separate the stream from the lake and return the flow back to Brown's Creek. The dike still exists today.

Efforts to improve habitat and water quality continue. With the goal of further reducing water temperatures and improving trout habitat, the city of Stillwater and the Minnesota DNR collaborated to construct a new stream channel along the Minnesota Zephyr rail line and the Oak Glen Golf Course in 1999. This project created a new section of stream, 2,000 feet long (Figure 7), which replaces a 5,130 foot long section that flowed through the wetland just north of McKusick Lake and across the golf course (Figure 8). Water now moves through the new channel in about 30 minutes, compared with the 10 hours it took to flow through the wetland. This translates to cooler water, since it doesn't sit in the hot sun and warm up as it flows downstream. In addition, fish and insect habitat in the new channel is much better for than habitat in the old channel. So much better that brown trout are now found farther upstream than ever before. Even more recently the DNR and Trout Unlimited have worked with the golf course to improve trout habitat in what has been some of the poorest quality habitat for a number of years.

**Figure 7 - New channel along the golf course. This photo shows the much-improved habitat, with many native shrubs and trees growing along the banks.**

**Figure 8 - Old channel through golf course. Note lack of shade, and wide shallow channel.**

Trout aren't the only indicator of good water quality and good stream habitat. In fact one of the best-known indicators are aquatic macroinvertebrates. Macroinvertebrates are small animals without a backbone; some examples include caddisflies, stoneflies, mayflies, snails, and even crayfish. Macroinvertebrates serve as indicators of water quality because they have varying levels of tolerance to pollution. Students from Stillwater Area High School have monitored habitat and aquatic macroinvertebrates at two sites in Brown's Creek since 1998. Their data show that at both sites water quality is 'very good' to 'excellent' (as defined by Hilsenhoff's Family Level Biotic Index). See http://www.troutstreams.org/ for more information about the

monitoring project. In fact, the site just upstream of the U.S. Highway 96 crossing reported the best biotic index score of the six trout streams in the metro area that are currently monitored.

No one really knows what the future will hold for Brown's Creek, but the stream flow and water quality data, along with continued monitoring of the trout population and macroinvertebrates, will help everyone understand what's happening. This information will also help the Brown's Creek Watershed District (BCWD) to provide the best possible conditions for trout, and will allow the DNR to effectively manage the trout population in Brown's Creek.