Daley Creek Dye Trace Report

2009

Houston County, Minnesota

Minnesota Department of Natural Resources

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Introduction

A dye trace was conducted from a stream sink on Daley Creek in Houston County. Daley Creek is a state designated trout stream west of the City of Houston (Figure 1). This trace was run to begin to delineate springsheds in this area. The springs that form Daley Creek discharge from the St. Lawrence and Lone Rock Formations. The St. Lawrence springs are on the upper end of the stream and the Lone Rock springs are on the lower end. Dye trace sample packets were placed in springs on Daley Creek (Figure 1) and at other springs in adjacent valleys. Table 1 contains the dye input information and Table 2 summarizes the location information for the sample sites.

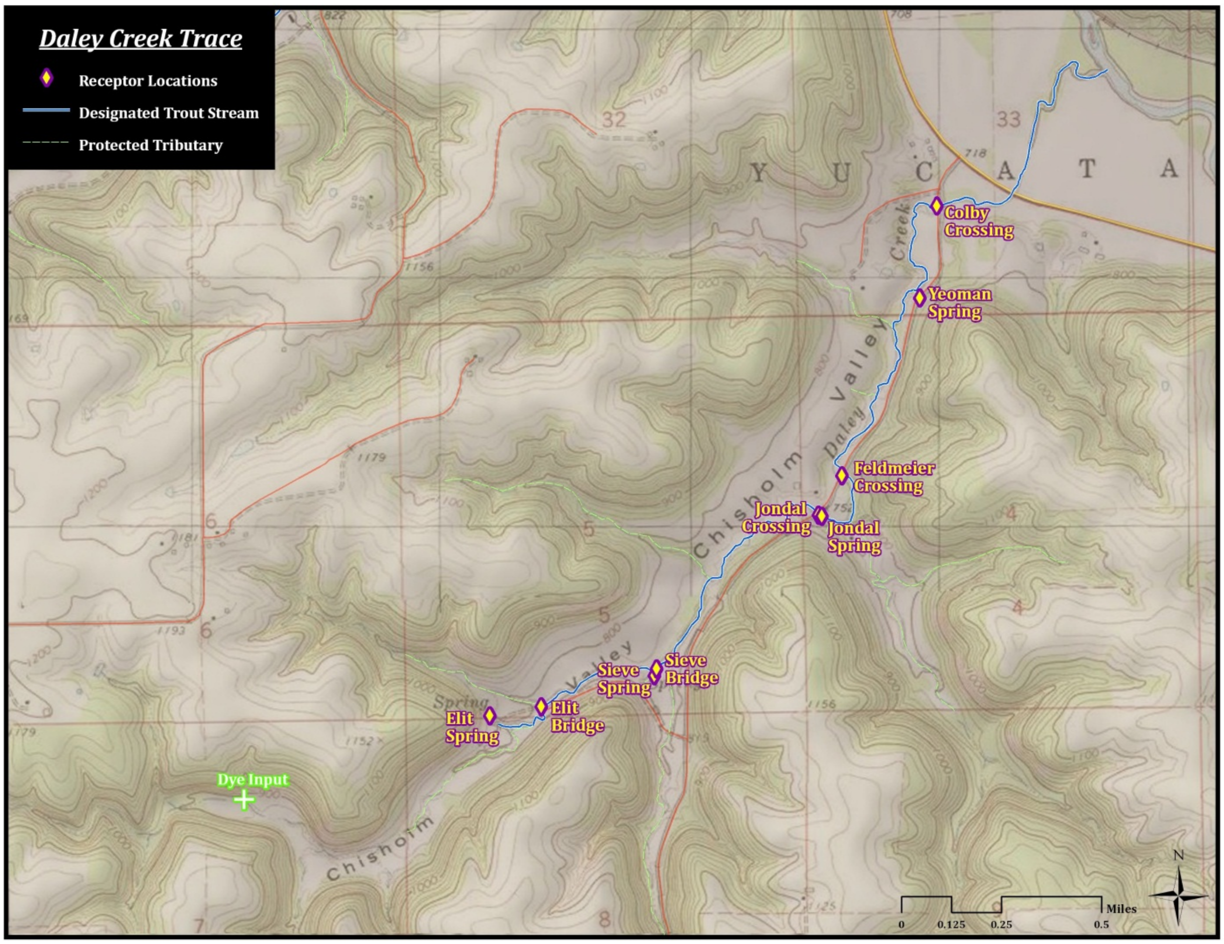


Figure 1. Dye trace sample sites on Daley Creek.

Dye tracing entails using fluorescent dyes to track groundwater flow directions and travel times. The dye is poured into a sinking stream or sinkhole; from there it flows through a conduit system until it re-emerges at a spring. All direct water samples and charcoal detectors used to trace groundwater flow were returned to the University of

Minnesota Geology & Geophysics Department Hydrochemistry Laboratory for analysis. There, the charcoal detectors were opened, the charcoal was removed, and using an eluent solution of 70% isopropyl alcohol, 30% deionized water, and 10g/L NaOH, the fluorescent materials were then extracted for analysis. The eluent solution was then run through the Shimadzu RF5000U scanning spectrofluorometer to detect and record the spectra. Direct water samples were also analyzed using the Shimadzu RF5000U scanning spectrofluorometer. Spectral components, including the background spectral components, were quantified using PeakFit software as described in Alexander (2005). E. Calvin Alexander, Jr., of the University of Minnesota Geology Department performed sample analysis and interpretation.

Table 1. Dye input information

Dye Input Point	Dye (type, quantity)	Time	Stream Flow (Est.)	Detect point
Stream Sink 28:B001	Uranine HS 1127.99 gm.	1131 hrs.	0.25 CFS	Elit Spring 28:A0031

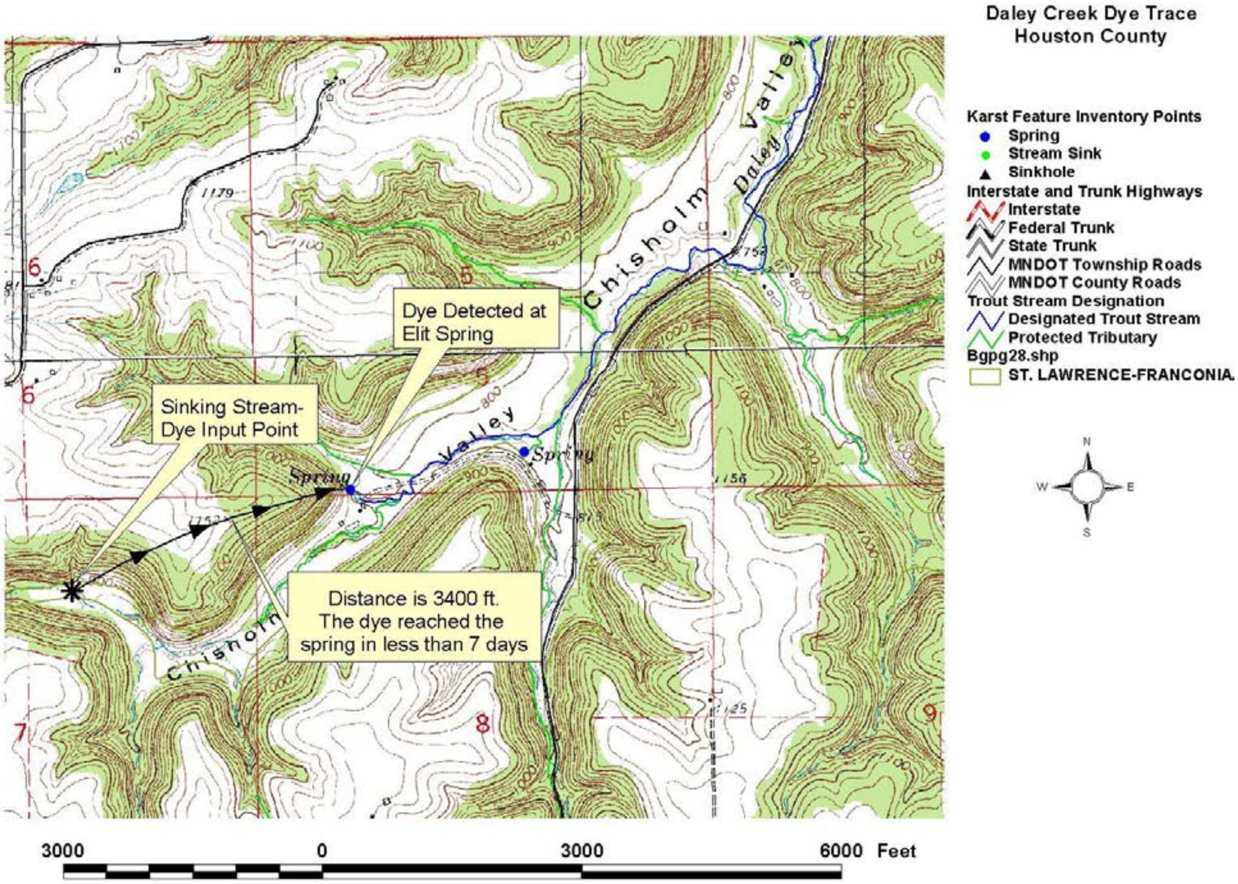
Table 2. Dye trace sampling locations

Feature	KFDB	Easting	Northing	Property Owner
Bridge Creek	28:X0005	607888	4839518	County Road Right-of-Way
South Fork Root	28:X0004	607846	4838929	County Road Right-of-Way
Rostvold Spring	28:A0073	607546	4839002	Diane Rostvold
Elit Spring	28:A0031	604178	4844439	Larry Elit
Elit Bridge	28:X0006	604386	4844475	County Road Right-of-Way
Sieve Spring	28:A0030	604841	4844600	Michael Sieve
Sieve Bridge	28:X0007	604850	4844628	Michael Sieve
Jondal Crossing	28:X0008	605501	4845246	Steven Jondal
Jondal Spring	28:A0074	605515	4845241	Steven Jondal
Fledmeier Crossing	28:X0009	605601	4845398	Gerald Feldmeier
Yeoman Spring	28:A0075	605942	4846122	Jerome Beranek
Colby Crossing	28:X0010	605978	4846487	Fred Engelhart

Results

The dye was detected at MN28:A0031, Elit Spring, which is the headwater spring of Daley Creek. The groundwater flow velocity based on this trace is over 500ft./day from the stream sink to Elit Spring. Subsequently, the dye was detected at the downstream sites that were stream road crossings. Figure 3 is a map view of the dye trace. The results are summarized in Appendix A. Appendix B has the scanned field notes for the dye input.

Figure 3. Dye Trace Vector



Acknowledgements

This trace could not have been possible without the cooperation of the landowners in the valley and area including Larry Elit, Michael Sieve, Steven Jondal, Gerald Feldmeier, Jerome Beranek, Fred Engelhart and Diane Rostvold.

Appendix A

Daley Creek Dye Trace (2009)

		DC1	DC2	DC3	DC4	DC5
KFDB #s	Site	Apr. 22-May 11, 2009	May 11-20, 2009	May 20-28, 2009	May 28-June 11, 2009	June 11-24, 2009
28:X0005	Bridge Creek			Eos (28 σ)*	nd	nd
28:X0010	Colby Crossing	Eos (12 σ)*	Eos (17 σ)*	uran	uran	uran
28:X0006	Elit Bridge	nd	nd	uran	uran	uran
28:A0031	Elit Spring	nd	nd	uran	uran	uran
28:X0009	Feldmeier Crossing	nd	nd	uran	uran	uran
28:X0011	Ferndale Creek		nd	Eos (16 σ)*	Eos (6 σ)*	uran (5 σ)
28:X0008	Jondal Crossing	Eos (18 σ)*	Eos (14 σ)*	uran	uran	uran
28:A0074	Jondal Spring	nd	nd	nd	nd	nd
28:A0073	Rostvold Spring			nd	nd	nd
28:X0007	Sieve Bridge	nd	nd	uran	uran	uran
28:A0030	Sieve Spring	nd	nd	nd	nd	nd
28:X0004	South Fort Root			Eos (10 σ)*	Eos (14 σ)*	Eos (9 σ)*
28:A0075	Yeoman Spring	nd	nd	nd	nd	nd

nd = no dye detected
lost = bug lost
uran = uranine dye detected
Eos* = Eosin that came from some other unknown source

Uranine poured May 20, 2009

Appendix B

5/20/09: Daley Creek Trace

New Receptors:

Bridge Creek - 4839518, 607888

South Fork Root - 4838929, 607846

Rostvold Spring - 4839002, 607546

Changed Receptors:

Colby Crossing	R/R	WS
Yeoman Spring	R/R	WS
Feldmeier Crossing	R/R	WS
Jondal Crossing	R/R	WS
Jondal Spring	R/R	WS
Sieve Bridge	R/R	WS
Sieve Spring	R/R	WS
Elit Bridge	R/R	WS
Elit Spring	R/R	WS

Dye Input:

Input Point - 4844094, 603150

Uranine HS, Chromatint Lot 092508

1127.99 grams at 1131

Flow estimated at 0.25 cfs and decreased as it met with the terminal sink at 603202, 4844096