

South Branch Root River – Physical Stream Assessment and Stream Classification

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Introduction:

As part of the overall stream and watershed assessment for the South Branch Root River Phase 1 project, we undertook an initial assessment of selected reaches of the river to provide selected physical data and a preliminary stream classification. This information can be considered with other assessment information to more fully describe the current river system conditions.

Other sources of possible relevant information on the South Branch Root River include research on buried soils and opal phytoliths (Gross 1973), and an unreviewed flood study completed for the Minnesota Historical Society site at Forestville.

Methods:

A “Level II” stream inventory was conducted at three reaches according to methods of Rosgen (1996). The stream segments that we surveyed were selected by project coordinators and were in the direct vicinity of the three stream monitoring sites on the South Branch Root River.

Table 1. Physical Stream Assessment - Stream Segments, South Branch Root River

General Site Location	Date Surveyed	Drainage Area (Acres)
Upper Watershed	29 Nov '00	9232
Middle Watershed	29 Nov '00	29042
Lower Watershed	20 Aug '01	73983

Field work involved the identification of bankfull elevations (Harrelson 1994) using such indicators as pointbars, changes in vegetation, or changes in bank slope. A bankfull stage indicators checklist was completed at each stream reach assessed. A cross sectional

survey was then conducted in a representative riffle section. Data collected included bankfull depth, current water surface elevation, stream slope, and floodprone elevation. The term “bankfull” is used to convey the channel-forming flow, and does not mean a water surface elevation or flow up to the top of the present streambanks. This channel-forming flow has been shown to occur, on average, every 1.5-2.0 years.

Detailed pebble counts were not done with this assessment, but bed materials were estimated qualitatively throughout the surveyed reach.

The following statistics were then generated from the collected data, and used in making the preliminary stream classification:

Entrenchment ratio	Floodprone width / bankfull width
Width / Depth ratio	Bankfull width / mean depth @ bankfull

Relative survey elevations were then plotted into a stream cross section for each site. (See Attached)

Results:

The following tables summarizes the physical assessment data and provides a stream type classification.

Table 2. South Branch Root River Physical Stream Assessment Data and Stream Types

<u>Site</u>	<u>Entrenchment Ratio</u>	<u>Bankfull Width</u>	<u>Depth</u>	<u>W/D Ratio</u>	<u>Stream Type</u>	<u>Drainage Area (acres)</u>
Upper	1.70	20.4	1.70	12.0	B4c	9232
Middle	3.12	30.0	1.85	16.2	C4c	29042
Lower	1.10	62.0	2.18	28.4	F3	73983

Table 3. Stream Classification Parameters and Values (Adapted from Rosgen, 1996)

Stream Type	General Description	Entrenchment Ratio	W/D Ratio	Sinuosity	Slope	Landform/ Soils/Features
B	Moderately Entrenched, moderate gradient, riffle dominated channel, with infrequently spaced pools. Very stable plan and profile. Stable Banks.	1.4 To 2.2	>12	>1.2	0.02 To 0.039	Moderate relief, colluvial deposition, and/or structural. Moderate entrenchment and W/D ratios. Narrow, gently sloping valleys. Rapids predominate w/scour pools.
C	Low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad, well defined floodplains.	>2.2	>12	>1.4	<0.02	Broad Valleys w/terraces, in association with floodplains, alluvial soils. Slightly entrenched with well-defined meandering channels. Riffle/pool bed morphology.
F	Entrenched meandering riffle/pool channel on low gradients with high width/depth ratio.	<1.4	>12	>1.4	<0.02	Entrenched in highly weathered material. Gentle gradients, with a high width/depth ratio. Meandering, erosion rates. Riffle/pool morphology.

The Upper S.B. Root River stream site is just below a channelized stream reach. The reach we assessed was about 1/8 mile downstream of the monitoring station. There were no point bars at this site to use as bankfull indicators, so the bankfull elevation estimate was determined with a change in bank slope along the stream. We observed similar “benches” above the current water surface elevation. This resulted in a moderately entrenched channel, with channel materials consisting of gravel as well as finer materials.

The assigned stream type, “B4c,” means a single-thread channel, with moderate entrenchment, W/D ratio, and sinuosity, with a lower slope value (see attached Figure 5-3 – Classification key for natural rivers, Rosgen).

The Middle Watershed site was assessed just upstream of the SB-3 monitoring site, at the concrete bridge. The cross section was surveyed in the lower portion of the first upstream riffle. Bankfull indicators at this site included the lower limit of perennial vegetation and undercut banks where perennial vegetation formed a root mat or “line.”

The stream in this vicinity is slightly entrenched, with a moderate to high W/D ratio, and high sinuosity. The channel materials consisting of mostly gravel materials, with some larger rocks present, the classification category is “C4c.”

The Lower Watershed Site was assessed about 1/8 mile upstream from the monitoring site bridge within Forestville State park. This is a straight stretch of river adjacent to the

picnic shelter building. Channel materials include mostly larger cobbles with coarse sand deposits noticed in small eddies. Bankfull indicators included changes in vegetation, top of pointbar, and a change in bankslope. The stream in this reach is entrenched, with a high W/D ratio and moderate sinuosity, with a classification of "F3."

Discussion:

A review of the stream cross-sectional plots and stream classifications indicates that the South Branch Root River ranges from a slightly entrenched to an entrenched stream channel. The individual stream reaches surveyed vary from a relatively stable section with lower sediment supply at the Upper cross section to a moderate to high sediment supply stream type at the Lower site. This variation in classification along a stream is not atypical of streams, but rather individual reaches do show unique characteristics related to the watershed and land use.

References:

Gross, Edward R. 1973. Buried soils of the drainage ways in the driftless area of the upper Mississippi River Valley. University of Minnesota PhD. Thesis.

Harrelson, C., Rawling, C. and Potyondy, J. 1994. Stream Channel Reference Sites: An illustrated guide to field technique. U.S.D.A. Forest Service, General Technical Report RM-245.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology Consultants. Pagosa Springs, CO.

