LOWER CANNON AT DUNDAS

Lower Cannon River at Highway 3 near Dundas (LCD-16)

Location:
- River mile: 46
- U.S.G.S. quad: Northfield; 44093-D2
- Township: T111N R20W S15
- Lat./Long: 44°25'/93°12'30"
- Other info.: near Highway 3

Type: Small River
Stream Order: 5
Drainage area: 917
Riparian: Old field, Forest
Instream: Cobble and gravel in the riffle; sand, and silt in pool
Gradient: 43.33 ft/mi

QUALITATIVE HABITAT EVALUATION INDEX (QHEI) SCORING FORM

Date 6/14/95 River Mile 46 Watershed Number _____
Location LCD-16 U.S.G.S. quad Northfield
Township T11N R20W Section 15 Lat./Long. 44°25′/93°12′30″

72 Total QHEI

1. SUBSTRATE (Check ONLY two substrate TYPES). % Pool/Riffle substrates optional.

Type	Pool	Riffle
☐ ☐ Boulder (7)		
☐ ☒ Cobble (6)		
☐ ☐ Hardpan (3)		
☐ ☐ Silt (3)		
☐ ☐ Muck (2)		

Type	Pool	Riffle
☐ ☐ Gravel (5)		
☐ ☐ Sand (4)		
☐ ☒ Bedrock (3)		
☐ ☐ Detritus (2)		
☐ ☐ Sludge (1)		

Quality
Check all that apply:
☒ Silt covered (-1)
☒ Silt free (1)
☒ Boulders as slabs (1)
☐ Embedded (-2)

10 Substrate

Comments _____

2. INSTREAM COVER

Type *(Check ALL that apply)*
☐ Undercut banks (1)
☒ Overhanging vegetation (1)
☒ Shallows (in slow water) (1)
☐ Logs or woody debris (1)
☒ Deep pools (1)
☐ Oxbows (1)
☐ Boulders (1)
☐ Aquatic macrophytes (1)

Amount (Check ONLY one)
☐ Extensive (7)
☐ Moderate (5)
☐ Sparse (3)
☐ Nearly absent (1)

6 Cover

Comments _____

3. CHANNEL MORPHOLOGY *(Check ONLY one under each category)*

Sinuosity
☐ High (4)
☒ Moderate (3)
☐ Low (2)
☐ None (1)

Development
☐ Excellent (4)
☒ Good (3)
☐ Fair (2)
☐ Poor (1)

Channelization
☒ None (4)
☐ Recovered (3)
☐ Recovering (2)
☐ Recent or no Recovery (1)

Stability
☐ High (3)
☒ Moderate (2)
☐ Low (1)

Other
☐ Impound
☐ Islands
☐ Leveed

12 Channel

Comments _____

4. RIPARIAN ZONE AND BANK EROSION *River right looking downstream*

*(Check single most predominant, **on each bank**, under each category)*

Riparian Width

L	*R*	
☐	☐	Extensive >100m (3)
☐	☒	Wide 50-100m (4)
☐	☐	Moderate 10-50m (3)
☒	☐	Narrow 5-10m (2)
☐	☐	Very Narrow 1-5m (1)
☐	☐	None (0)

Flood Plain Quality

L	*R*		*L*	*R*	
☐	☐	Open pasture (1)	☐	☒	Forest, swamp (3)
☐	☐	Fenced pasture (2)	☐	☐	Shrub (4)
☒	☐	Old field (3)	☐	☐	Residential, Park (2)
☐	☐	Rowcrop (1)	☐	☐	Urban
☐	☐	Conservation tillage (2)			

Bank Erosion

L	*R*	
☐	☐	None (5)
☒	☒	Little (4)
☐	☐	Moderate (3)
☐	☐	Heavy (2)
☐	☐	Severe (1)

10 Riparian

Comments _____

5. POOL/GLIDE AND RIFFLE/RUN QUALITY

Maximum Depth *(Check 1)*
☒ > 1m (3)
☐ 0.7-1m (2)
☐ 0.4-0.7m (1)
☐ < 0.4m (0)
☐ No Pool

Pool Cover *(Check 1)*
☐ Extensive (3)
☒ Moderate (2)
☐ Sparse (1)
☐ Nearly absent (0)

Overall Current Velocity *(Check ALL that apply)*
☐ Torrential (-1)
☐ Intermittent (-2)
☒ Fast (1)
☒ Eddies (1)
☒ Moderate (1)
☐ Interstitial (-1)
☒ Slow (1)

Morphology *(Check 1)*
☐ Pool width> riffle width (2)
☒ Pool width = riffle width (1)
☐ Pool width < riffle width (0)

15 Pool/ Riffle

Riffle/Run Depth *(Check 1)*
☐ Generally <10cm (1)
☐ Generally >10cm Max <50 (2)
☒ Generally >10cm Max >50 (3)
☐ No riffle (0)

Riffle/Run Substrate *(Check 1)*
☒ Stable (cobble, boulder) (1)
☐ Unstable (gravel, sand) (0)

Riffle/Run Substrate Quality *(Check 1)*
☐ Embedded (0)
☒ Not embedded (1)

Comments _____

6. GRADIENT

(ft/mi) 43.3

4 Gradient

7. DRAINAGE AREA

(square mile) 917

15 Drainage Area

QUALITATIVE HABITAT EVALUATION INDEX (QHEI) SCORING FORM

Date 6/12/96 River Mile 46 Watershed Number _____
Location LCD-16 U.S.G.S. quad Northfield
Township T11N R20W Section 15 Lat./Long. 44 24.55N 93 12.25W

71 Total QHEI

1. SUBSTRATE (Check ONLY two substrate TYPES). % Pool/Riffle substrates optional.

Type	Pool	Riffle
☐ ☐ Boulder (7)		
☐ ☒ Cobble (6)		
☐ ☐ Hardpan (3)		
☐ ☐ Silt (3)		
☐ ☐ Muck (2)		
☐ ☐ Gravel (5)		
☐ ☐ Sand (4)		
☐ ☒ Bedrock (3)		
☐ ☐ Detritus (2)		
☐ ☐ Sludge (1)		

Quality
Check all that apply:
☒ Silt covered (-1)
☒ Silt free (1)
☒ Boulders as slabs (1)
☐ Embedded (-2)

10 Substrate

Comments _____

2. INSTREAM COVER

Type *(Check ALL that apply)*
☐ Undercut banks (1)
☒ Overhanging vegetation (1)
☒ Shallows (in slow water) (1)
☐ Logs or woody debris (1)
☒ Deep pools (1)
☐ Oxbows (1)
☒ Boulders (1)
☐ Aquatic macrophytes (1)

Amount (Check ONLY one)
☐ Extensive (7)
☐ Moderate (5)
☒ Sparse (3)
☐ Nearly absent (1)

7 Cover

Comments _____

3. CHANNEL MORPHOLOGY *(Check ONLY one under each category)*

Sinuosity
☐ High (4)
☒ Moderate (3)
☐ Low (2)
☐ None (1)

Development
☐ Excellent (4)
☐ Good (3)
☒ Fair (2)
☐ Poor (1)

Channelization
☒ None (4)
☐ Recovered (3)
☐ Recovering (2)
☐ Recent or no Recovery (1)

Stability
☒ High (3)
☐ Moderate (2)
☐ Low (1)

Other
☐ Impound
☐ Islands
☐ Leveed

12 Channel

Comments _____

4. RIPARIAN ZONE AND BANK EROSION *River right looking downstream*

*(Check single most predominant, **on each bank**, under each category)*

RiparianWidth

L	R	
☐	☐	Extensive >100m (5)
☐	☐	Wide 50-100m (4)
☒	☒	Moderate 10-50m (3)
☐	☐	Narrow 5-10m (2)
☐	☐	Very Narrow 1-5m(1)
☐	☐	None (0)

Flood Plain Quality

L	R		L	R	
☐	☐	Open pasture (1)	☐	☐	Forest, swamp (3)
☐	☐	Fenced pasture (2)	☒	☒	Shrub (4)
☐	☐	Old field (3)	☐	☐	Residential, Park (2)
☐	☐	Rowcrop (1)	☐	☐	Urban
☐	☐	Conservation tillage (2)			

Bank Erosion

L	R	
☐	☐	None (5)
☒	☒	Little (4)
☐	☐	Moderate (3)
☐	☐	Heavy (2)
☐	☐	Severe (1)

11 Riparian

Comments _____

5. POOL/GLIDE AND RIFFLE/RUN QUALITY

Maximum Depth *(Check 1)*
☒ > 1m (3)
☐ 0.7-1m (2)
☐ 0.4-0.7m (1)
☐ < 0.4m (0)
☐ No Pool

Pool Cover *(Check 1)*
☐ Extensive (3)
☐ Moderate (2)
☒ Sparse (1)
☐ Nearly absent (0)

Overall Current Velocity *(Check ALL that apply)*
☐ Torrential (-1)
☐ Intermittent (-2)
☒ Fast (1)
☐ Eddies (1)
☒ Moderate (1)
☐ Interstitial (-1)
☒ Slow (1)

Morphology *(Check 1)*
☐ Pool width> riffle width (2)
☒ Pool width = riffle width (1)
☐ Pool width < riffle width (0)

12 Pool/ Riffle

Riffle/Run Depth *(Check 1)*
☐ Generally <10cm (1)
☒ Generally >10cm Max <50 (2)
☐ Generally >10cm Max >50 (3)
☐ No riffle (0)

Riffle/Run Substrate *(Check 1)*
☒ Stable (cobble, boulder) (1)
☐ Unstable (gravel, sand) (0)

Riffle/Run Substrate Quality *(Check 1)*
☐ Embedded (0)
☒ Not embedded (1)

Comments _____

6. GRADIENT

(ft/mi) 43

4 Gradient

7. DRAINAGE AREA

(square mile) 917

15 Drainage Area

SITE **LCD-16** Location LOWER CANNON 1/2 MILE UPSTREAM OF DUNDAS

	1994	1995	1996
SUBSTRATE	10	10	10
INSTREAM COVER	6	6	7
CHANNEL MORPHOLOGY	13	12	12
RIPARIAN	10	10	11
CHANNEL QUALITY	14	15	12
GRADIENT 4			
DRAINAGE 15			
QHEI	1994 **72**	1995 **72**	1996 **71**

EXTENT OF CHANGE IN LOCATION
No change in location.

RAPID HABITAT BIOASSESSMENT 1995 **205**

FISH COVER	18
MACRO COVER	17
EMBEDDEDNESS	19
VELOCITY\DEPTH	17
CHANNEL	20
SEDIMENT	16
RIFFLES	10
CHANNEL FLOW	17
BANK EROSION	17
VEGETATION	18
GRAZING	18
RIPARIAN	18

LOWER CANNON RIVER (LCD-16)

Minnesota Highway 3 near Dundas
Riparian: Forest, highway right of way, and old field
Instream: Beddrock, cobble, gravel, sand, and silt

Macroinvertebrate Metrics

Metric	1994	1995	1996	Average	Overall Impact
QHEI	72	72	71	71.7	
ICI	29	24	33	28.7	Slight
Richness	11.5	13	21	15.2	Moderate
Diversity	2.1	2.0	2.0	2.0	Slight
Equitability	0.6	0.33	0.26	0.40	Slight
Scraper/Filterer Ratio	0.78	4.3	0.24		
Tolerance Range	2-8	2-6	2-8	2-6	

Macroinvertebrate Taxa and Numbers of Individuals

[#] = Tolerance Values (Source is Illinois Environmental Protection Agency)

	June 94	July 94	June 95	July 95	June 96	July 96
Amphipods						
Gammarus [3]	-	-	16	-	9	1
Hyalella [5]	-	-	-	-	27	-
Stoneflies						
Perlesta [3]	35	-	12	-	75	9
Pteronarcys [2]	10	-	10	104	-	32
Acroneuria [1]	-	-	-	-	3	-
Beetles						
Optioservus [4]	2	-	-	-	15	1
Stenelmis [7]	5	-	-	-	9	-
Macronychus [2]	2	-	9	-	-	5
Sperchopsis [?]	-	-	1	-	-	-
Hemiptera						
Corixidae [?]	-	-	-	-	-	1
Microveliinae [?]	-	-	-	-	-	1
Mayflies						
Baetis [4]	-	7	1	4	33	57
Heptagenia [3]	80	8	209	-	24	50
Stenacron [4]	-	-	-	-	-	1
Stenonema [4]	18	44	3	24	81	294
Isonychia [3]	21	5	15	-	-	38
Pseudocloeon [4]	-	-	-	-	9	-
Caenis [6]	-	1	-	-	-	-
Tricorythodes [5]	-	-	-	-	9	24
Leucrocuta [?]	-	-	-	-	-	1
Caddisflies						
Cheumatopsyche [6]	90	26	1	329	42	105
Hydropsyche [5]	436	187	6	1071	780	1395
Pycnopsyche [3]	1	-	-	-	-	-
True Flies						
Simulidae [4-6]	-	-	-	-	6	-
Atherix [4]	3	-	-	28	-	3
Odontomyia [?]	-	-	1	-	-	-

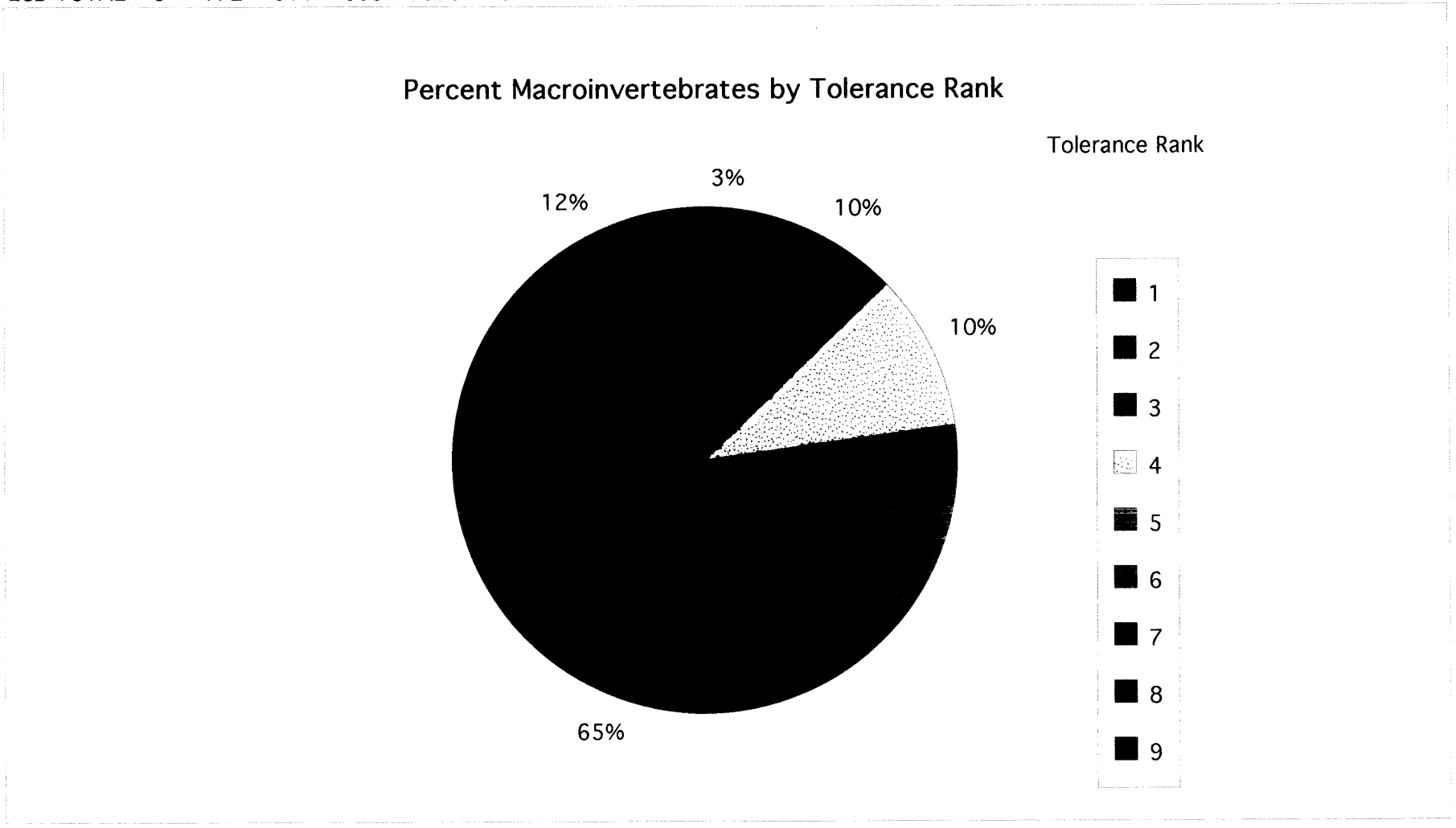
LOWER CANNON RIVER (LCD-16) page 2

Midges

Brillia [?]	-	-	-	-	3	-
Cricotopus [8]	-	-	-	-	3	15
Microtendipes [6]	-	-	3	-	-	-
Polypedilum [6]	1	-	13	-	15	108
Eukiefferiella [4]	-	-	1	24	12	3
Rheotanytarsus [6]	-	-	1	-	-	-
Parametriocnemus[4]	-	-	-	-	3	-
Thienemannimyia[6]	-	-	3	-	-	6
Rheocricotopus [6]	1	-	-	-	3	-
Endochironomus [6]	-	-	1	-	-	-
Stenochironomus [3]	-	-	-	-	-	3
Harnischia [6]	-	-	1	-	-	-
Cryptochironomus[8]	-	-	1	-	-	-

Lower Cannon near Dundas (LCD-16)

Site	NUMBER OF INSECTS BY TOLERANCE RATING										PERCENT IN TOLERANCE RANK								
	1	2	3	4	5	6	7	8	9	TOTAL	1	2	3	4	5	6	7	8	9
LCD 1994	0	12	150	12	623	119	5	0	0	921	0%	1%	16%	1%	68%	13%	1%	0%	0%
LCD 1995	0	123	252	85	1077	352	0	1	0	1890	0%	7%	13%	4%	57%	19%	0%	0%	0%
LCD 1996	3	37	209	512	2199	286	9	18	0	3273	0%	1%	6%	16%	67%	9%	0%	1%	0%
LCD TOTAL	3	172	611	609	3899	757	14	19	0	6084	0%	3%	10%	10%	64%	12%	0%	0%	0%



LOWER CANNON SOUTH OF DUNDAS [LCD]

DATE	JULY 1994	JULY 1995	JUNE 1996	JULY 1996
SURFACE WATER				
NITRATE NITROGEN	1.37	1.82	4.3	2.9
AMMONIA NITROGEN	0.04	LB	0.06	0.05
KJELDAHL NITROGEN	2.16	2.75	6.43	6.23
ORTHOPHOSPHATE	0.049	0.124	0.131	0.2
TOTAL PHOSPHORUS	0.086	0.19	0.26	0.24
PORE WATER				
NITRATE NITROGEN	0.354	0.147	----	----
AMMONIA NITROGEN	2.37	2.66	----	----
KJELDAHL NITROGEN	8.77	3.66	----	----
ORTHOPHOSPHATE	0.354	0.14	----	----
TOTAL PHOSPHORUS	0.446	0.221	----	----
STREAM LOAD				
TURBIDITY	----	----	18	7
TOTAL SUSPENDED SOLIDS	----	----	29.34	27.21
TOTAL VOLATILE SOLIDS	----	----	7.68	8.01
CONDUCTIVITY	0.643	0.682	----	0.602
OTHER				
pH	8.7	9.1	8.4	8.4
ALKALINITY	----	----	200	260
TEMPERATURE	23.8	28.9	31	24.2

LOWER CANNON AT DUNDAS

The Lower Cannon at Dundas is a 5th order stream that drains 917 square miles. The sample site is located at river mile 46 just upstream from the highway 3 bridge. There is a riffle in the river at this location as the river flows over a limestone shelf. Just below the shelf the substrate is composed of cobble and gravel. In the backwater of the shelf the substrate is mostly silt. The QHEI score at this site is 71 which is the highest of the Lower Cannon mainstem sites. No flow was determined at this site because during most of the year it is not possible to cross the channel.

The macroinvertebrates that dominate this site are the caddisflies. Over 70% of the macroinvertebrates collected at this site were net spinning caddisflies. The number of insects collected at this site increased each year during the study with over 3000 identified during the 1996 period. Mayflies, midges and stoneflies made up the largest population after the caddisflies. The ICI, Diversity, and Equitability Indices were in the slight impact range and the Richness was in the moderate impact range. The scraper - filterer ratio favored the filterers in 1994 and 1996, however in 1995 scrapers outnumbered filterers 4 to 1. Nearly 65% of the macroinvertebrates collected were ranked 5 in tolerance. Three percent were in tolerance rank 2. The majority were in tolerance ranks 2 - 6.

Nitrate values are below 5.0 mg/L and total nitrogen values are less than 6.5 mg/L. It should be noted that the nitrogen values are very low at the Upper Cannon River at Morristown and increase at the Cannon River at Dundas and continue to increase slightly higher at the Cannon River near Randolph. The increase could be a response to the higher nitrogen concentration of the Straight River flowing into the Cannon River at Faribault. The nitrogen concentration at Faribault does not show the increase because the site where the sampling was done is only about 100 feet downstream from where the Straight River and Cannon River come together. We sampled on the Cannon River side of the stream and it is likely that mixing had not yet taken place. Phosphorus values are above .20 mg/L at this site. The Straight River has concentrations of .30 mg/L or higher. During high flow the concentration remains high all the way down stream, however, during low flow the values get lower as you go downstream. Whenever water slows, as in a reservoir behind a dam, some of the phosphorus begins to settle out and the phosphorus values begin to decrease. The dam at Northfield appears to have some of this effect, however the Lake Byllesby Reservoir has a much longer retention time and seems to remove more phosphorus. The TSS and TVS values were lower than expected at this location, however this may be due to the fact that the flow was low and the river was carrying little runoff at the time of either sampling. The substrate in the calm water below the riffle, however, was covered with a layer of silt that had settled out at this location indicating that sediment load is a problem at this site. Alkalinity and pH values indicate there are no problems with acidity at this site.