

UPPER CANNON AT MORRISTOWN



Upper Cannon River at Morrystown (UCM-21)

Location:

River mile: 70

U.S.G.S. quad: Morrystown; 44093-B4

Township: T109N R22W S23

Lat./Long: 44°14'/93°26'

Other info.: One and a half miles downstream from Morrystown dam

Type: Large Stream

Stream Order: 4

Drainage area: 245

Riparian: Flood plain covered with tall grasses

Instream: Cobble and gravel in faster current; sand and silt in slow current

Gradient: 2.61 ft/mi



QUALITATIVE HABITAT EVALUATION INDEX (QHEI) SCORING FORM

Date 6/17/95 River Mile 70 Watershed Number _____
 Location UCM-21 U.S.G.S. quad Morristown
 Township T109N R22W Section 23 Lat./Long. 44°14'93"26'

70.5
Total QHEI

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

Type	Pool	Riffle	Type	Pool	Riffle	Quality
<input type="checkbox"/> Boulder (7)	_____	_____	<input checked="" type="checkbox"/> Gravel (5)	_____	_____	<i>Check all that apply:</i> <input type="checkbox"/> Silt covered (-1) <input type="checkbox"/> Silt free (1) <input type="checkbox"/> Boulders as slabs (1) <input type="checkbox"/> Embedded (-2)
<input checked="" type="checkbox"/> Cobble (6)	_____	_____	<input type="checkbox"/> Sand (4)	_____	_____	
<input type="checkbox"/> Hardpan (3)	_____	_____	<input type="checkbox"/> Bedrock (3)	_____	_____	
<input type="checkbox"/> Silt (3)	_____	_____	<input type="checkbox"/> Detritus (2)	_____	_____	
<input type="checkbox"/> Muck (2)	_____	_____	<input type="checkbox"/> Sludge (1)	_____	_____	
Comments _____						

11
Substrate

2. INSTREAM COVER

Type (Check ALL that apply)	Amount (Check ONLY one)
<input checked="" type="checkbox"/> Undercut banks (1)	<input type="checkbox"/> Extensive (7)
<input checked="" type="checkbox"/> Overhanging vegetation (1)	<input type="checkbox"/> Moderate (5)
<input checked="" type="checkbox"/> Shallows (in slow water) (1)	<input type="checkbox"/> Sparse (3)
<input checked="" type="checkbox"/> Logs or woody debris (1)	<input type="checkbox"/> Nearly absent (1)
<input type="checkbox"/> Deep pools (1)	
<input type="checkbox"/> Oxbows (1)	
<input checked="" type="checkbox"/> Boulders (1)	
<input type="checkbox"/> Aquatic macrophytes (1)	
Comments _____	

8
Cover

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

Sinuosity	Development	Channelization	Stability	Other
<input type="checkbox"/> High (4)	<input type="checkbox"/> Excellent (4)	<input checked="" type="checkbox"/> None (4)	<input type="checkbox"/> High (3)	<input type="checkbox"/> Impound
<input checked="" type="checkbox"/> Moderate (3)	<input type="checkbox"/> Good (3)	<input type="checkbox"/> Recovered (3)	<input checked="" type="checkbox"/> Moderate (2)	<input checked="" type="checkbox"/> Islands
<input type="checkbox"/> Low (2)	<input checked="" type="checkbox"/> Fair (2)	<input type="checkbox"/> Recovering (2)	<input type="checkbox"/> Low (1)	<input type="checkbox"/> Leveed
<input type="checkbox"/> None (1)	<input type="checkbox"/> Poor (1)	<input type="checkbox"/> Recent or no Recovery (1)		
Comments _____				

11
Channel

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

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

Riparian Width	Flood Plain Quality	Bank Erosion
L R	L R	L R
<input type="checkbox"/> Extensive >100m (3)	<input type="checkbox"/> Open pasture (1)	<input checked="" type="checkbox"/> Forest, swamp (3)
<input checked="" type="checkbox"/> Wide 50-100m (4)	<input type="checkbox"/> Fenced pasture (2)	<input checked="" type="checkbox"/> Shrub (4)
<input checked="" type="checkbox"/> Moderate 10-50m (3)	<input type="checkbox"/> Old field (3)	<input type="checkbox"/> Residential, Park (2)
<input type="checkbox"/> Narrow 5-10m (2)	<input type="checkbox"/> Rowcrop (1)	<input type="checkbox"/> Urban
<input type="checkbox"/> Very Narrow 1-5m (1)	<input type="checkbox"/> Conservation tillage (2)	
<input type="checkbox"/> None (0)		
Comments _____		

12.5
Riparian

5. POOL/GLIDE AND RIFFLE/RUN QUALITY

Maximum Depth (Check 1)	Pool Cover (Check 1)	Overall Current Velocity (Check ALL that apply)	Morphology (Check 1)
<input checked="" type="checkbox"/> > 1m (3)	<input type="checkbox"/> Extensive (3)	<input type="checkbox"/> Torrential (-1)	<input type="checkbox"/> Pool width > riffle width (2)
<input type="checkbox"/> 0.7-1m (2)	<input checked="" type="checkbox"/> Moderate (2)	<input checked="" type="checkbox"/> Fast (1)	<input checked="" type="checkbox"/> Pool width = riffle width (1)
<input type="checkbox"/> 0.4-0.7m (1)	<input type="checkbox"/> Sparse (1)	<input checked="" type="checkbox"/> Moderate (1)	<input type="checkbox"/> Pool width < riffle width (0)
<input type="checkbox"/> < 0.4m (0)	<input type="checkbox"/> Nearly absent (0)	<input checked="" type="checkbox"/> Slow (1)	
<input type="checkbox"/> No Pool			
Comments _____			

11
Pool/
Riffle

Riffle/Run Depth (Check 1)	Riffle/Run Substrate (Check 1)	Riffle/Run Substrate Quality (Check 1)
<input type="checkbox"/> Generally <10cm (1)	<input checked="" type="checkbox"/> Stable (cobble, boulder) (1)	<input checked="" type="checkbox"/> Embedded (0)
<input type="checkbox"/> Generally >10cm Max <50 (2)	<input type="checkbox"/> Unstable (gravel, sand) (0)	<input type="checkbox"/> Not embedded (1)
<input type="checkbox"/> Generally >10cm Max >50 (3)		
<input checked="" type="checkbox"/> No riffle (0)		
Comments _____		

6. GRADIENT
(ft/mi) 2.6

4
Gradient

7. DRAINAGE AREA
(square mile) 245

13
Drainage Area

QUALITATIVE HABITAT EVALUATION INDEX (QHEI) SCORING FORM

Date 6/12/96 River Mile 70 Watershed Number _____
 Location UCM-21 U.S.G.S. quad Morristown
 Township T109N R22W Section 23 Lat./Long. 44°14.17N 93°25.50W

67.5
Total QHEI

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

Type	Pool	Riffle	Type	Pool	Riffle	Quality
<input type="checkbox"/> Boulder (7)	_____	_____	<input checked="" type="checkbox"/> Gravel (5)	_____	_____	Check all that apply: <input type="checkbox"/> Silt covered (-1) <input type="checkbox"/> Silt free (1) <input type="checkbox"/> Boulders as slabs (1) <input type="checkbox"/> Embedded (-2)
<input checked="" type="checkbox"/> Cobble (6)	_____	_____	<input type="checkbox"/> Sand (4)	_____	_____	
<input type="checkbox"/> Hardpan (3)	_____	_____	<input type="checkbox"/> Bedrock (3)	_____	_____	
<input type="checkbox"/> Silt (3)	_____	_____	<input type="checkbox"/> Detritus (2)	_____	_____	
<input type="checkbox"/> Muck (2)	_____	_____	<input type="checkbox"/> Sludge (1)	_____	_____	
Comments _____						

11
Substrate

2. INSTREAM COVER

Type (Check ALL that apply)	Amount (Check ONLY one)
<input checked="" type="checkbox"/> Undercut banks (1)	<input type="checkbox"/> Extensive (7)
<input checked="" type="checkbox"/> Overhanging vegetation (1)	<input type="checkbox"/> Moderate (5)
<input checked="" type="checkbox"/> Shallows (in slow water) (1)	<input checked="" type="checkbox"/> Sparse (3)
<input checked="" type="checkbox"/> Logs or woody debris (1)	<input type="checkbox"/> Nearly absent (1)
<input type="checkbox"/> Deep pools (1)	
<input type="checkbox"/> Oxbows (1)	
<input checked="" type="checkbox"/> Boulders (1)	
<input type="checkbox"/> Aquatic macrophytes (1)	
Comments _____	

8
Cover

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

Sinuosity	Development	Channelization	Stability	Other
<input type="checkbox"/> High (4)	<input type="checkbox"/> Excellent (4)	<input checked="" type="checkbox"/> None (4)	<input type="checkbox"/> High (3)	<input type="checkbox"/> Impound
<input checked="" type="checkbox"/> Moderate (3)	<input type="checkbox"/> Good (3)	<input type="checkbox"/> Recovered (3)	<input checked="" type="checkbox"/> Moderate (2)	<input checked="" type="checkbox"/> Islands
<input type="checkbox"/> Low (2)	<input checked="" type="checkbox"/> Fair (2)	<input type="checkbox"/> Recovering (2)	<input type="checkbox"/> Low (1)	<input type="checkbox"/> Leveed
<input type="checkbox"/> None (1)	<input type="checkbox"/> Poor (1)	<input type="checkbox"/> Recent or no Recovery (1)		
Comments _____				

11
Channel

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

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

Riparian Width	Flood Plain Quality	Bank Erosion
L R	L R	L R
<input type="checkbox"/> Extensive >100m (5)	<input type="checkbox"/> Open pasture (1)	<input type="checkbox"/> None (5)
<input checked="" type="checkbox"/> Wide 50-100m (4)	<input type="checkbox"/> Fenced pasture (2)	<input checked="" type="checkbox"/> Little (4)
<input type="checkbox"/> Moderate 10-50m (3)	<input type="checkbox"/> Old field (3)	<input type="checkbox"/> Moderate (3)
<input type="checkbox"/> Narrow 5-10m (2)	<input type="checkbox"/> Rowcrop (1)	<input type="checkbox"/> Heavy (2)
<input type="checkbox"/> Very Narrow 1-5m (1)	<input type="checkbox"/> Conservation tillage (2)	<input type="checkbox"/> Severe (1)
<input type="checkbox"/> None (0)		
	<input checked="" type="checkbox"/> Forest, swamp (3)	
	<input type="checkbox"/> Shrub (4)	
	<input type="checkbox"/> Residential, Park (2)	
	<input type="checkbox"/> Urban	
Comments _____		

11.5
Riparian

5. POOL/GLIDE AND RIFFLE/RUN QUALITY

Maximum Depth (Check 1)	Pool Cover (Check 1)	Overall Current Velocity (Check ALL that apply)	Morphology (Check 1)
<input type="checkbox"/> > 1m (3)	<input type="checkbox"/> Extensive (3)	<input type="checkbox"/> Torrential (-1)	<input type="checkbox"/> Pool width > riffle width (2)
<input checked="" type="checkbox"/> 0.7-1m (2)	<input checked="" type="checkbox"/> Moderate (2)	<input type="checkbox"/> Fast (1)	<input checked="" type="checkbox"/> Pool width = riffle width (1)
<input type="checkbox"/> 0.4-0.7m (1)	<input type="checkbox"/> Sparse (1)	<input checked="" type="checkbox"/> Moderate (1)	<input type="checkbox"/> Pool width < riffle width (0)
<input type="checkbox"/> < 0.4m (0)	<input type="checkbox"/> Nearly absent (0)	<input checked="" type="checkbox"/> Slow (1)	
<input type="checkbox"/> No Pool		<input type="checkbox"/> Intermittent (-2)	
		<input checked="" type="checkbox"/> Eddies (1)	
		<input type="checkbox"/> Interstitial (-1)	
Comments _____			

9
Pool/
Riffle

Riffle/Run Depth (Check 1)	Riffle/Run Substrate (Check 1)	Riffle/Run Substrate Quality (Check 1)
<input type="checkbox"/> Generally <10cm (1)	<input checked="" type="checkbox"/> Stable (cobble, boulder) (1)	<input checked="" type="checkbox"/> Embedded (0)
<input type="checkbox"/> Generally >10cm Max <50 (2)	<input type="checkbox"/> Unstable (gravel, sand) (0)	<input type="checkbox"/> Not embedded (1)
<input type="checkbox"/> Generally >10cm Max >50 (3)		
<input checked="" type="checkbox"/> No riffle (0)		
Comments _____		

6. GRADIENT
(ft/mi) 2.6

4
Gradient

7. DRAINAGE AREA
(square mile) 245

13
Drainage Area

SITE **UMC-21** Location UPPER CANNON 1 MILE EAST OF MORRISTOWN

	1994	1995	1996
SUBSTRATE	10	11	11
INSTREAM COVER	8	8	8
CHANNEL MORPHOLOGY	11	11	11
RIPARIAN	12	12.5	11.5
CHANNEL QUALITY	11	11	9
GRADIENT 4 DRAINAGE 13	QHEI 1994 69	QHEI 1995 70.5	QHEI 1996 67.5

EXTENT OF CHANGE IN LOCATION
No change in location.

RAPID HABITAT BIOASSESSMENT 1995 **207**

FISH COVER	15
MACRO COVER	14
EMBEDDEDNESS	17
VELOCITY\DEPTH	13
CHANNEL	20
SEDIMENT	18
RIFFLES	11
CHANNEL FLOW	20
BANK EROSION	19
VEGETATION	20
GRAZING	20
RIPARIAN	20

UPPER CANNON RIVER (UCM-21)

One mile downstream from Morristown dam

Riparian: Tall grasses and woods

Instream: cobble, gravel, sand, and silt

Macroinvertebrate Metrics

<u>Metric</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>Average</u>	<u>Overall Impact</u>
QHEI	69	70.5	67.5	69	
ICI	19	24	29	24	Moderate
Richness	11.5	13.5	21	15.3	Moderate
Diversity	1.5	1.9	2.7	2.0	Moderate
Equitability	0.31	0.33	0.44	0.36	Moderate
Scraper/Filterer Ratio	0.02	0.06	0.11		
Tolerance Range	3-10	2-10	2-10	3-10	

Macroinvertebrate Taxa and Numbers of Individuals

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

	<u>June 94</u>	<u>July 94</u>	<u>June 95</u>	<u>July 95</u>	<u>June 96</u>	<u>July 96</u>
Leeches						
Erobdella [8]	-	-	-	-	-	2
Placobdella [8]	-	-	-	-	-	1
Amphipods						
Gammarus [3]	-	-	5	-	-	-
Hyalella [5]	-	-	-	-	1	80
Gastropoda						
Physa [9]	-	8	-	-	1	66
Stagnicola [7]	-	-	-	-	1	-
Isopoda						
Asellus [6]	-	-	-	-	-	4
Stoneflies						
Perlesta [3]	1	-	16	-	10	-
Pteronarcys [2]	-	-	1	-	-	-
Mayflies						
Baetis [4]	-	-	-	3	7	-
Heptagenia [3]	1	-	16	-	6	-
Stenacron [4]	-	-	2	150	15	118
Stenonema [4]	2	16	6	18	31	58
Isonychia [3]	1	-	-	-	-	2
Pseudocloeon [4]	-	-	-	-	3	-
Tricorythodes [5]	15	10	-	51	-	354
Dannella [2]	-	-	-	-	1	-
Caddisflies						
Cheumatopsyche [6]139	-	382	255	1635	417	770
Hydropsyche [5] 944	-	384	24	198	582	272
Pycnopsyche [3]	-	-	-	-	-	4
Nectyopsyche [3]	-	-	-	3	-	4
Ceraclea [3]	-	-	-	-	2	22
True Flies						
Simulidae [4-6]	2	-	-	-	4	-
Hemerodromia [6]	-	-	-	6	-	-

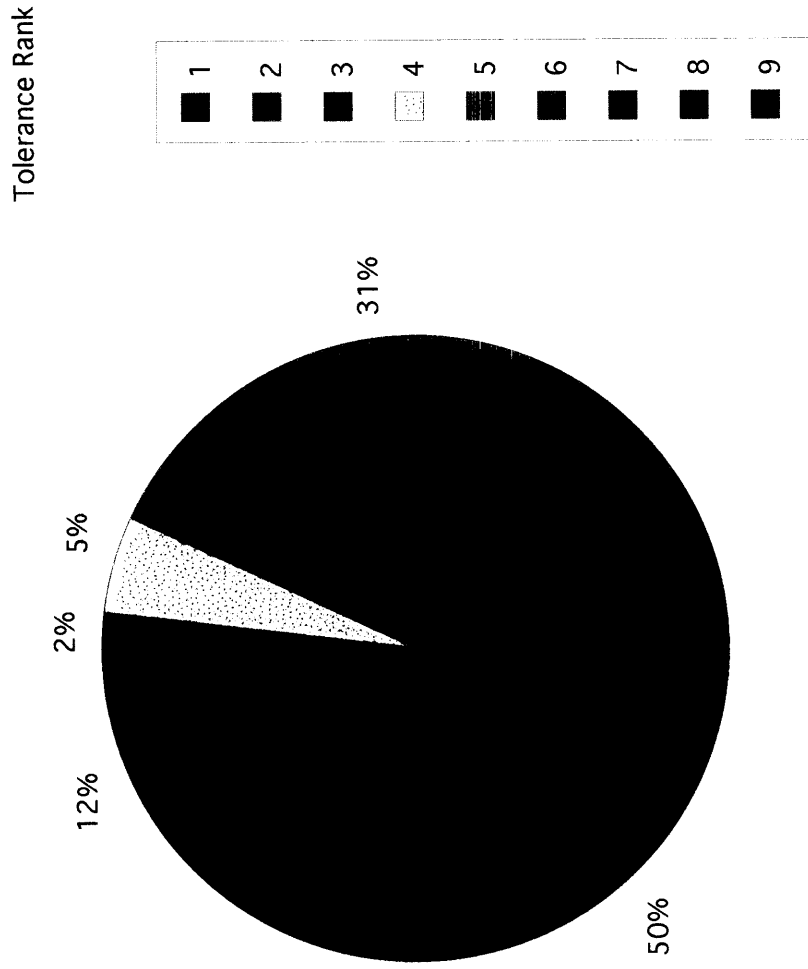
Midges

Brillia [?]	-	-	-	-	5	-
Cricotopus [8]	-	1	-	-	-	-
Glyptotendipes [10]	-	8	12	398	-	580
Polypedilum [6]	32	60	211	60	123	167
Rheotanytarsus [6]	-	-	-	-	113	11
Thienemannimyia [6]	2	1	48	12	26	33
Microtendipes [6]	5	9	8	-	-	-
Rheocricotopus [6]	1	-	-	-	-	-
Zaurelimyia [8]	-	1	-	-	-	-
Pentaneura [3]	-	-	4	-	-	67
Xenochironomus [4]	-	-	-	-	-	11
Endochironomus [6]	-	-	24	-	-	56
Stenochironomus [3]	-	-	-	-	-	23
Cladopelma [?]	-	-	-	-	-	11

Upper Cannon near Morristown (UCM-21)

Site	NUMBER OF INSECTS BY TOLERANCE RATING									TOTAL	PERCENT IN TOLERANCE RANK								
	1	2	3	4	5	6	7	8	9+		1	2	3	4	5	6	7	8	9
UCM 1994	0	0	3	18	1353	631	0	2	16	2023	0%	0%	0%	1%	67%	31%	0%	0%	1%
UCM 1995	0	1	40	179	273	2259	0	0	410	3162	0%	0%	1%	6%	9%	71%	0%	0%	13%
UCM 1996	0	1	140	288	1289	1724	1	3	647	4093	0%	0%	3%	7%	31%	42%	0%	0%	16%
UCM TOTAL	0	2	183	485	2915	4614	1	5	1073	9278	0%	0%	2%	5%	31%	50%	0%	0%	12%

Percent Macroinvertebrates by Tolerance Rank



UPPER CANNON EAST OF MORRISTOWN [UCM]

DATE	JULY 1994	JULY 1995	JUNE 1996	JULY 1996
SURFACE WATER				
NITRATE NITROGEN	0.639	0.437	1	0.7
AMMONIA NITROGEN	0.195	0.191	0.122	0.121
KJELDAHL NITROGEN	2.11	2.31	3.05	2.79
ORTHOPHOSPHATE	0.058	0.128	0.201	0.198
TOTAL PHOSPHORUS	0.141	0.232	0.262	0.258
PORE WATER				
NITRATE NITROGEN	0.017	0.166	----	----
AMMONIA NITROGEN	1.9	0.63	----	----
KJELDAHL NITROGEN	14.1	2.05	----	----
ORTHOPHOSPHATE	0.307	0.055	----	----
TOTAL PHOSPHORUS	1.02	0.096	----	----
STREAM LOAD				
TURBIDITY	----	----	16	22
TOTAL SUSPENDED SOLIDS	----	----	58.39	47.21
TOTAL VOLATILE SOLIDS	----	----	14.73	11.23
CONDUCTIVITY	0.505	0.497	0.22	0.486
OTHER				
pH	8.3	8.7	8.5	8.1
ALKALINITY	----	----	----	220
TEMPERATURE	24.7	29	26	23.8

UPPER CANNON RIVER DOWNSTREAM OF MORRISTOWN

The Upper Cannon flows through a number of lakes and reservoirs before joining the Straight River in Faribault to form the Lower Cannon. This site is about a mile downstream of the reservoir in Morristown. At this location the Upper Cannon is a 4th order stream that drains about 245 square miles of glacial end moraine dotted with many lakes and wetlands. There is no riffle at the location, just a run which has a gradient of 2.6 feet/mile. The substrate in the faster current is cobble and gravel with silt and fine sand where the current slows. The QHEI score at this site is 67.5 which is in the median range of all the sites monitored. The riparian zone score is high at this location, however instream cover is limited and brings down the overall score. The flow at this location is greater than that of any of the tributaries with a flow of 223 cubic feet per second in June and 63 cubic feet per second in July when water levels were very low. In contrast the flow of the Straight River above Owatonna was 69 cubic feet per second in June and 31 cubic feet per second in July.

The dominant taxa collected at this site was caddisflies with over 6000 collected over the course of the study. This number represented over 65% of the total insects collected at the site. Midges made up the second largest population followed by mayflies. The number and diversity of the community increased during each year of the study. All four metrics were in the moderate impact range and the filterers outnumbered scrapers by about a 10 to 1 margin over all 3 years. The tolerance range was from 3 to 10 with 12% of the population in rank 9 and 10, 50% in rank 6 and 31% in rank 5. The midges *Glyptotendipes* have a tolerance rank of 10, nearly 1000 of these were in the population sampled.

Nitrate (below 1.0 mg/L) and total nitrogen (below 3.0 mg/l) values were the lowest of all streams sampled, however, phosphorus values were quite high (above .2) in 1995 and 1996. During late June and early July the Upper Cannon River at this location has a very heavy algae bloom. It is not known if the bloom begins in the stream or the lakes and reservoir upstream and just flows through this part of the stream. TSS and TVS values were very high at this site, especially considering the Morristown dam is only a half mile upstream of this sample site. The dam and lakes upstream would account for the high water temperatures that were measured at this site. The alkalinity at 220 mg/L was one of the lowest recorded of all the sites, however it is still well above the 120 mg/L considered adequate for buffering acid rain.

The riparian zone along this part of the stream has little human impact with forest and natural grasses lining the banks. However, this site is sandwiched between a series of natural lakes and reservoirs that have phosphorus loading problems and the water quality of the stream is directly affected by the problems upstream in the lakes and reservoir. The suspended solids even appear to be mostly organic material that is in part the result of the high phosphorus levels.