Rock Creek Advisor

Conservancy District

Rock Creek Water Monitoring Project

February 2008 Volume 9 Number 1

Why include the macro invertebrates in the testing of water quality? There are many reasons. First, macro invertebrates are easy to find and study. Second, invertebrates are very important, they account for 70% of all known species of living organisms-microbes, plants, and animals. Freshwater invertebrates play significant roles in the communities and ecosystems of which they are part. Their best known role is serving as food for other organisms, especially fish, amphibians, and water birds. However, they are also intricately involved in ecological process such as the breakdown and cycling of organic matter and nutrients, much like the role of earthworms in soil. Freshwater invertebrates are used more often than any other group of freshwater organisms to assess the health of freshwater environments. Some kinds are very sensitive to stress produced by pollution, habitat modification, or natural events, while others are tolerant of some types of stress. Taking samples of freshwater invertebrates and identifying the organisms present can reveal whether a body of water is healthy or ill. It can also reveal the cause of the problem if one exists. This process, known as biomonitoring, has become a significant activity for biologists, consulting companies, and universities, as well as volunteers trained for sampling water. There are four groups to divide the invertebrates into: group (1)-intolerant, (2)moderately intolerant, (3)fairly tolerant, (4)very tolerant. More points are given to the intolerant invertebrates, meaning higher water quality.

Here is a sample biological monitoring data chart in which the pollution tolerance index (PTI) is tracked. The macro invertebrates index is divided into pollution tolerance groups. These PTI groups represent the different levels of pollution tolerance. The higher the group number, the higher the pollution tolerance level. The number of macro invertebrates found at each site is recorded.

PT Group 1 Intolerant		PT Group 2 Moderately Intolerant		PT Group 3 Fairly Tolerant		PT Group 4 Very Tolerant	
Stonefly Nymph	4	Damselfly Nymph	0	Midges	0	Left-Handed Snails	3
Mayfly Nymph	2	Dragonfly Nymph	1	Black Fly Larvae	0	Aquatic Worms	20
Caddis Fly Larvae	0	Sowbug	0	Planaria	0	Blood Midge	12
Dobsonfly Larvae	0	Scud	1	Leech	5	Rat-tailed Maggot	0
Riffle Beetle	0	Crane Fly Larvae	0				
Water Penny	0	Clams/Mussels	6				
Right-Handed Snail	0						

The next row is the number of Taxa. Insects that have the same body shape belong to the same taxa. To find the total number of taxa for each pollution tolerance group add the number of types of organisms. A lot of times when collecting invertebrates you will have groups with zero, giving your score a zero. Make sure not to add the numbers of organisms together, and only total each invertebrate as one instead of how many were found at that site; wether ten or two are found, it only counts as one. Each group is worth a different number of points. Now, the groups from the chart above have been added to figure the total PTI below.

# Of Taxa	2	# Of Taxa	3	# Of Taxa	1	# Of Taxa	3
Weighting factor x 4= 8		Weighting factor x 3=9		Weighting factor x 2=2		Weighting factor x 1=3	

Add the final index values for each group to get the Pollution Tolerance Index Rating for the site. In this example, the total = **22**

Pollution Tolerance Index Rating of 23 or more equals excellent, 17-22 has a rating of Good, 11-16 Fair, and 10 or less is Poor. The PTI rating from the Rock Creek Channel from 11/10/2007- 9/04/2006 has a rating from good to poor.

The Charts below, show the macro invertebrates added up for each site. Sites one thru five, and sites six thru 10. The charts display the data collected between 9/02/2002-11/10/2007 on the Rock Creek Channel.
A rating of 23 or more is excellent, 17-22 good, 11-16 fair, 10 or less poor.

	Site 1	Site 2	Site 3	Site 4	Site 5
Site Index Rating 11/10/07	Site1=0 Poor	Site2= 10 Poor	Site3= 13 Fair	Site4= 13 Fair	Site5= 10 Poor
Site Index Rating 09/03/07	Site1=3 Poor	Site2= 4 Poor	Site3= 15 Fair	Site4= 15 Fair	Site5= 11 Fair
Site Index Rating 08/23/07	Site1=4 Poor	Site2= 7 Poor	Site3= 15 Fair	Site4= 1 Poor	Site5= 8 Poor
Site Index Rating 07/07/07	Site1=0 Poor	Site2= 15Fair	Site3= 17 Good	Site4= 11 Fair	Site5=17 Good
Site Index Rating 6/8/07	Site1=1 Poor	Site2= 4 Poor	Site3= 4 Poor	Site4= 3 Poor	Site5=8 Poor
Site Index Rating 4/2/07	Site1=8 Poor	Site2= 12 Fair	Site3= 18 Good	Site4= 16 Fair	Site5=15 Fair
Site Index Rating 12/17/06	Site1=5 Poor	Site2= 16 Fair	Site3= 18 Good	Site4= 5 Poor	Site5=14 Fair
Site Index Rating 10/28/06	Site1=4 Poor	Site2= 7 Poor	Site3= 12 Fair	Site4= 17 Good	Site5=12 Fair
Site Index Rating 09/04/06	Site1=5 Poor	Site2= 7 Poor	Site3= 12 Fair	Site4= 17 Good	Site5=12 Fair
Site Index Rating 09/04/06	Site1=5 Poor	Site2= 9 Poor	Site3= 17 Good	Site4= 13 Fair	Site5=10 Poor
Site Index Rating 06/17/06	Site1=11 Fair	Site2= 12 Fair	Site3=13 Fair	Site4= 8 Poor	Site5=10 Poor
Site Index Rating 04/08/06	Site1=3 Poor	Site2= 10 Poor	Site3= 5 Poor	Site4= 8 Poor	Site5= 16 Fair
Site Index Rating 11/26/05	Site1=1 Poor	Site2= 10 Poor	Site3=11 Fair	Site4= 9 Poor	Site5=7 Poor
Site Index Rating 9/06/05	Site1=4 Poor	Site2= 7 Poor	Site3=16 Fair	Site4= 9 Poor	Site5=16 Fair
Site Index Rating 7/14/05	Site1=8 Poor	Site2=15 Fair	Site3=26 Excellent	Site4= 22 Good	Site5=10 Poor
Site Index Rating 5/16/05	Site1= 15 Fair	Site2=14 Fair	Site3=10 Poor	Site4=14 Fair	Site5=11 Fair
Site Index Rating 12/4/04	Site1=1 Poor	Site2=13 Poor	Site3=15 Fair	Site4=18 Good	Site5=11 Fair
Site Index Rating 9/6/04	Site1=4 Poor	Site2=10 Poor	Site3=21 Good	Site4=15 Fair	Site5=11 Fair
Site Index Rating 06/21/04	Site1=4 Poor	Site2=15 Fair	Site3=8 Poor	Site4=14 Fair	Site5=8 Poor
Site Index Rating 04/09/04	Site1=15 Fair	Site2=19 Good	Site3=25 Excellent	Site4=10 Poor	Site5=7 Poor
Site Index Rating 12/7/03	Site 1=5Poor	Site 2=4 Poor	Site 3=8 Poor	Site4=7 Poor	Site 5=5 Poor
Site index rating 9/6/03	site 1=1 Poor	site 2 = 3 Poor	site 3 = 1 Poor	site 4 = 4 Poor	site 5 = 0 Poor
Site Index Rating 6/10/03	Site 1=4Poor	Site 2=12Fair	Site 3=19Good	Site 4=9 Poor	Site 5=3 Poor
Site Index Rating 4/18/03	Site 1=1Poor	Site 2=11Fair	Site 3=17Good	Site 4=4 Poor	Site 5=9 Poor
Site Index Rating 12/16/02	Site1=2 Poor	Site2=13 Fair	Site3=13 Fair	Site4=7 Poor	Site5=6 Poor
SITE INDEX RATING 5/4/02	Site1=10 Poor	Site2=14 Fair	Site3=16 Fair	Site4=13 Fair	Site5=8 Poor
Site Index Rating 6/13/02	Site1= 8 Poor	Site2=16 Fair	Site3=17 Good	Site 4=20 Good	Site 5=11 Fair
Site Index Rating 9/02/02	Site 1= 4 Poor	Site 2= 4 Poor	Site 3= 9 Poor	Site 4 =0 Poor	Site 5 = 10 Poor
Greater than 23 excellent	17-22 Good	16-11 Fair	<10 Poor		

	Site 6	Site 7	Site 8	Site 9	Site 10
Site Index Rating 11/10/07	Site6= 8 Poor	Site7= 8 Poor	Site8= 18 Good	Site9=7 Poor	Site10= 7 Poor
Site Index Rating 09/03/07	Site6= 11 Fair	Site7= 18 Good	Site8= 18 Good	Site9=16 Fair	Site10= 8 Poor
Site Index Rating 08/23/07	Site6= 15 Fair	Site7= 13 Fair	Site8= 16 Fair	Site9=15 Fair	Site10= 11 Fair
Site Index Rating 07/07/07	Site6= 8 Poor	Site7= 11 Fair	Site8= 10 Poor	Site9=14 Fair	Site10= 10 Poor
Site Index Rating 6/8/07	Site6= 10 Poor	Site7= 8 Poor	Site8= 7 Poor	Site9=12 Fair	Site10= 7 Poor
Site Index Rating 4/2/07	Site6= 4 Poor	Site7= 12 Fair	Site8= 6 Poor	Site9=8 Poor	Site10= 9 Poor
Site Index Rating 12/17/06	Site6= 4 Poor	Site7= 14 Fair	Site8= 9 Poor	Site9=7 Poor	Site10= 10 Poor
Site Index Rating 10/28/06	Site6= 4 Poor	Site7= 19 Good	Site8= 14 Fair	Site9=22 Good	Site10= 8 Poor
Site Index Rating 09/04/06	Site6= 4 Poor	Site7= 19 Good	Site8= 14 Fair	Site9=22 Good	Site10= 8 Poor
Site Index Rating 09/04/06	Site6=10 Poor	Site7= 12 Fair	Site8= 18 Good	Site9=11 Fair	Site10= 10 Poor
Site Index Rating 06/17/06	Site6=5 Poor	Site7= 4 Poor	Site8= 8 Poor	Site9=13 Fair	Site10= 7 Poor
Site Index Rating 04/08/06	Site6=5 Poor	Site7= 15 Fair	Site8= 16 Fair	Site9=10 Poor	Site10= 18 Good
Site Index Rating 11/26/05	Site6=4 Poor	Site7=9 Poor	Site8= 13 fair	Site9=13 Fair	Site10= 4 Poor
Site Index Rating 9/06/05	Site6=10Poor	Site7=8 Poor	Site8= 16 fair	Site9=16 Fair	Site10=12 Fair
Site Index Rating 7/14/05	Site6=6Poor	Site7=17 Good	Site8= 15 fair	Site9=14 Fair	Site10=11 Fair
Site Index Rating 5/16/05	Site6=16 Fair	Site7=11 Fair	Site8=19 Good	Site9=14 Fair	Site10=11 Fair
Site Index Rating 12/4/04	Site6=13 Fair	Site7=22 Good	Site8=10 Poor	Site9=17 Good	Site10=9 poor
Site Index Rating 9/6/04	Site6=0 Poor	Site7=1 Poor	Site8=14 Fair	Site9=21 Good	Site10=10 poor
Site Index Rating 06/21/04	Site6=0 Poor	Site7=1 Poor	Site8=6 Poor	Site9=5 Poor	Site10=15 Fair
Site Index Rating 04/09/04	Site6=4 Poor	Site7=6 Poor	Site8=7 Poor	Site9=16 Fair	Site10=15 Fair
Site Index Rating 12/7/03	Site 6=3 Poor	Site 7=5 poor	Site 8=12 Fair	Site 9=19 Good	Site 10=18 Good
Site index rating 9/6/03	site 6 = 0 Poor	site 7 = 0 Poor	site 8 = 11 Fair	site 9 = 18 Good	site 10 = 11 Fair
Site Index Rating 6/10/03	Site 6=5 Poor	Site 7=4 poor	Site 8=18 Good	Site 9=15 Fair	Site 10=7 Poor
Site Index Rating 4/18/03	Site 6=0 Poor	Site 7=9 poor	Site 8=22 Good	Site 9=20 Good	Site 10=10 Poor
Site Index Rating 12/16/02	Site6=10 Poor	Site7=12 Fair	Site8=8 Poor	Site9=14 Fair	Site10=7 Poor
SITE INDEX RATING 5/4/02	Site6=5 Poor	Site7=8 Poor	Site8=15 Fair	Site9=19 Good	Site10=11 Fair
Site Index Rating 6/13/02	Site 6=5 Poor	Site7=4 Poor	Site8=12 Fair	Site9=22 Good	Site 10=16 Fair
Site Index Rating 9/02/02	Site 6 = 3 Poor	Site 7 = 7 Poor	Site 8 =11 Fair	Site 9 = 14 Fair	Site 10=11 Poor

Site Locations- Site one (1000 S. between 100 E. & 200 E.) Site two (700 S. between 200 E. & 250 E.) Site three (500 S. on Hoosier Hwy) Site four (400 S. between 100 W. &200 W.) Site five (300 S. between 200 W. & 300 W.) Site six (200 S. between 200 W and 300 W.) Site seven (400 W. between 100 S. & IN 124) Site eight (100 N between 400 W. & 500 W.) Site nine (200 N. between 400 W. & 500 W.) Site ten (on St RD 3 in Huntington County).

Another method used to measure the water body's health is habitat assessment. The condition of the substrate and the land within and adjacent to the stream channel is critical to the health of the stream and its ability to support aquatic life. The Citizens Qualitative Habitat Evaluation Index (CQHEI) utilizes land use, substrate, flow rate, depth, shape, riparian vegetation, and erosion to provide a measure of stream habitat that affects fish and other aquatic life. The purpose of the index is to provide a measure of the stream habitat and riparian health that generally corresponds to the physical factors affecting fish and other aquatic life, such as macroinvertevrates. The CQHEI was designed to be used primarily in wade-able streams. Maximum total points for the CQHEI is 114. If the score is over 100 it is considered a exceptional high-quality stream. A set of ranges for excellent, medium, poor, very poor has not yet been developed for this index, but scores over 60 are found to be generally conducive to the existence of warm water fauna.

Rock Creek Channel Citizens Qualitative Habitat Evaluation Index										
CQHEL totals										
	Site 1	Site 2	Site 3	Site4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
9/2/2002	10	23	21	20	24	38	34	39	37	39
12/16/2002	10	23	21	20	24	38	34	39	37	38
6/13/2002	9	25	30	30	28	38	34	39	37	38
6/10/2003	9	25	34	32	34	39	36	48	49	55
9/6/2003	14	29	35	35	38	35	35	54	51	56
12/7/2003	15	26	34	34	35	36	36	48	48	55
4/9/2004	28	36	40	43	44	37	40	48	48	48
6/21/2004	29	36	49	44	54	57	47	54	71	38
9/6/2004	23	27	40	40	38	48	35	53	34	36
12/4/2004	29	36	49	44	54	57	47	54	71	55
5/16/2005	20	27	40	40	40	50	36	54	47	36
7/14/2005	15	26	30	30	25	32	34	36	36	37
9/6/2005	18	21	48	49	43	41	35	73	73	51
11/26/2005	29	40	44	40	43	43	45	47	55	37
4/8/2006	19	25	29	29	32	38	26	29	38	30
6/17/2006	39	37	57	41	49	51	45	58	58	41
9/4/2006	26	41	47	47	45	49	35	51	43	41
10/28/2006	28	36	49	44	54	57	47	54	47	48
12/17/2006	26	37	48	49	40	57	45	58	47	37
4/2/2007	33	34	46	43	49	60	41	55	55	56
6/8/2007	23	36	42	40	45	51	35	48	48	37
7/7/2007	18	34	42	43	40	48	41	51	54	41
8/23/2007	23	36	42	40	45	51	45	58	48	56
9/3/2007	28	31	39	48	41	37	33	39	31	40
11/10/2007	26	29	34	35	34	38	35	36	38	37

Rainfall totals data was collected at the official Bluffton station, Indiana State Climate Office, Purdue University. Rain fall flows play a large role in water quality, along with many others factors that influence water quality, from the water bodies sampled.

1999	2000	2001	2002	2003	2004	2005	2006	2007
Jan. 3.68	Jan.1.23	Jan .69	Jan. 2.08	Jan. 1.24	Jan, 2.7	Jan 6.96	Jan. 2.29	Jan 4.46
Feb. 1.85	Feb. 1.72	Feb. 2.91	Feb. 2.93	Feb. 1.92	Feb. .42	Feb. 7.11	Feb. 2.17	Feb 1.52
Mar. 1.55	Mar. 2.31	Mar. 1.05	Mar. 3.35	Mar. 1.68	Mar. 1.87	Mar. 7.23	Mar. 2.22	Mar 3.98
April .96	April 1.95	April 3.79	April 3.47	April 2.75	April 1.2	April 7.11	April 5.33	April 4.69
May 3.29	May 4.26	May 4.29	May 4.27	May 8.97	May 5.92	May1.95	May 6.38	May .63
June 1.65	June 7.04	June 3.2	June 3.25	June 3.32	June 6.38	June 2.37	June 4.86	June 1.65
July 1.26	July 1.72	July 4.15	July 4.56	July 6.74	July 4.38	July 3.89	July 3.67	July 3.17
Aug.5.9	Aug. 4.93	Aug. 3.5	Aug. 3.15	Aug 3.58	Aug 6.77	Aug 3.45	Aug 2.65	Aug 8.7
Sept. 1.95	Sept. 2.89	Sept. 4.41	Sept. 2.43	Sept 7.61	Sept 1.23	Sept 5.31	Sept. 3.69	Sept. 2.12
Oct. 1.96	Oct. .93	Oct. 6.99	Oct. 2.37	Oct. 1.57	Oct 2.35	Oct .98	Oct. 3.82	Oct 2.11
Nov. 1.17	Nov. 1.51	Nov. 2.73	Nov. 2.6	Nov. 2.49	Nov 3.81	Nov 4.35	Nov. 1.58	Nov 3.54
Dec. 2.1	Dec. 1.27	Dec. 2.58	Dec. 1.82	Dec. 2.61	Dec .96	Dec 1.67	Dec. 5.6	Dec. 3.36
Total 27.32	**Total 30.25**	**Total 40.29**	**total 36.28**	**total 44.50**	**total 40**	**total 52.4**	**total 44.3**	**total 39.93**

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Stream flow calculations are the last measurement conducted on the Rock Creek Channel. This measurement is important because it influences other physical, chemical, and biological factors in the stream. A high discharge rate may indicate recent rainfall or snowmelt events. When a large amount of rain runs off the land, it often carries sediments and nutrients into the stream. Very low discharge rates may indicate dry conditions, which also affect water quality and aquatic life. The discharge rate is obtained by multiplying the average width, depth, and velocity of the stream to get the discharge amount (volume) of water flowing in the stream per second.

Stream Flow Calculation for Rock Creek Channel

	site 1	site 2	site 3	site 4	site 5	site 6	site7	site 8	site 9	site 10
6/10/2003	0.76	2.35	6.24	7.9	26.4	23.5	16.5	23.4	19.5	36.8
9/6/2003	0.37	2	10.25	30.6	76	43.2	43	32	61.3	62.2
12/7/2003	0.58	4.1	18	16	26.3	29.6	36	27.2	52	75.3
4/9/2004	0.88	1.56	4.13	5.87	12.5	11.7	10.9	13.4	18	17
6/21/2004	0.98	9.86	16.88	50.4	114	61.88	125	168	186	158
9/6/2004	0.86	4.3	11.25	14.3	19.5	27	20.5	26	45	78
12/4/2004	3.09	14	16	24	31	62	76	158	165	180
5/16/2005	0.39	3	12	33	43	46	48	37	58	69
7/14/2005	0.36	2.1	6.3	6.9	19.8	11.5	17	24	18.3	17.4
9/5/2005	0.3	2	5	6	17	14	18	23	17	16.8
11/26/2005	1.35	2.83	5.32	13.09	8.52	11.91	16	21.7	24	32
4/8/2006	0.85	3.38	31.95	39.7	41	44	47	52	63	74
6/17/2006	2	3.97	10.1	11	17	21	31	53	64	74
9/4/2006	0.87	1.3	3.38	3.6	5.6	12.6	5.9	16	24	32
10/28/2006	3	15	17	24	32	64	128	170	192	220
12/17/2006	3.5	10	18	25	36	41	63	95	120	148
4/2/2007	5.48	11.09	32.3	46	52	65	78.5	120	134	158
6/8/2007	1.15	5.3	3.9	20	25	40	45	52	58	78
7/7/2007	0	0.75	3.8	12.3	21	28	32	47	53	65
8/23/2007	0.39	0.72	1.8	3.8	5.7	18.6	22.4	42	48	64
9/3/2007	0.31	0.77	1.05	5.08	5.4	12.5	14	17	41	62
11/10/2007	0.25	0.52	0.97	4.3	4.7	8.2	9.8	12.3	22	38

The Rock Creek Channel has been monitored by the Rock Creek Conservancy District since 1999 starting out with a 319 IDEM grant. The district began by monitoring chemicals in the channel, like herbicides, phosphorus, nitrogen, T-coli form, E. coli. , then added biological monitoring along with the chemical testing. To get an accurate picture of the stream's water quality, the district sampled on a regular basis over the years . Without long term continued monitoring the data has limited uses, and random one time sample provides a limited picture of the water quality and leaves the testing to a small time table which can mislead one on how the water quality is on a seasonal account, and overall quality. The district stopped the chemical monitoring because of expense, and feel the biological monitoring will show the creeks overall heath , better by sampling for macro invertebrates, which have a limited movement in the stream, and are highly sensitive to a change in the water quality.

If you have questions or want past data reports please contact the Rock Creek Conservancy District Clerk, Stacia Henderson or Water Quality Project Coordinator, Mark Grimm at 260-824-0624 ext.3.