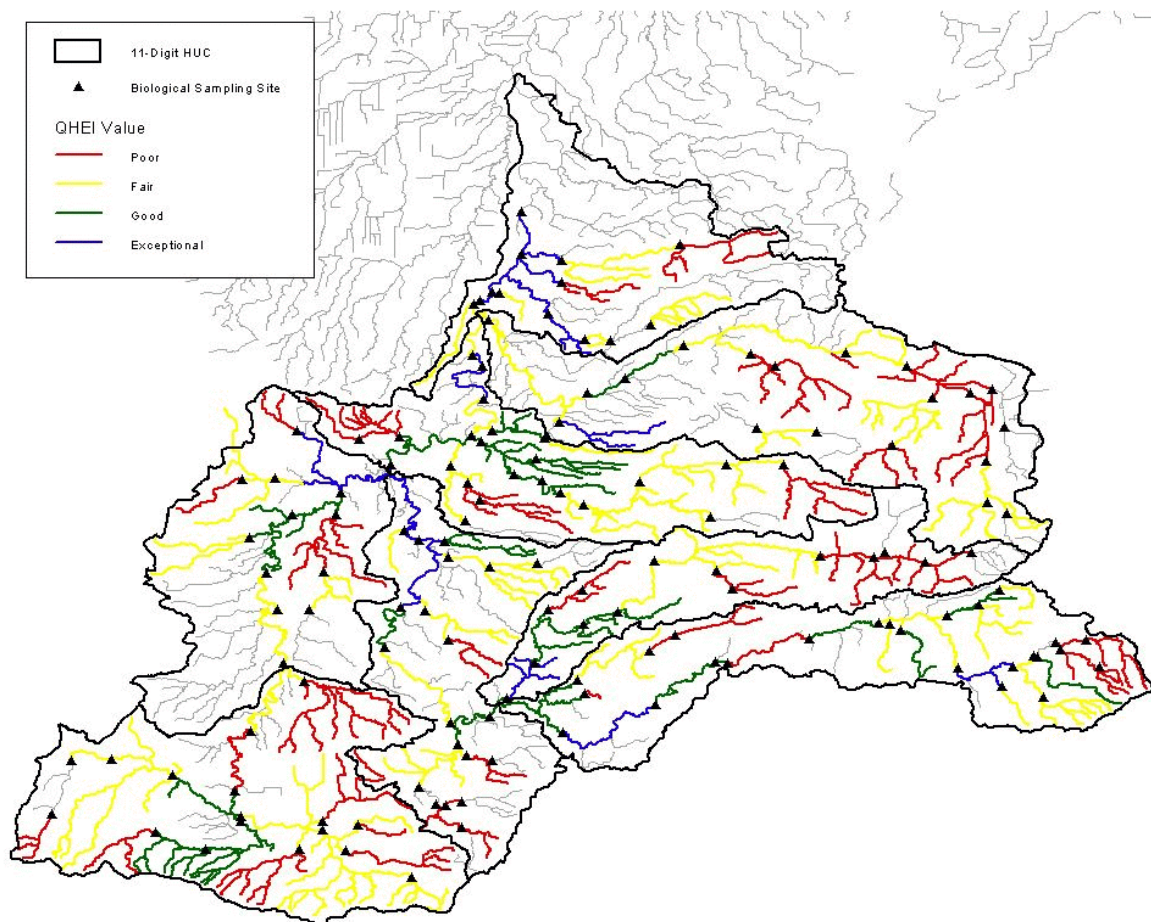


Appendix D. Comparison of Habitat Scores to Habitat Targets for Selected Streams in Each Assessment Unit



Habitat Index (QHEI) Description

The Qualitative Habitat Evaluation Index (QHEI), an index of stream macro-habitat quality, was developed by the Ohio EPA to provide a measure of habitat quality that generally corresponds to those physical factors that affect fish communities and which are generally important to other forms of aquatic life (e.g., invertebrates).

The QHEI is composed of an array of six “metrics” that qualitatively evaluate these physical factors. A stream reach is visually evaluated, each metric is scored individually and then summed to provide a total QHEI score. The maximum possible score for a QHEI site is 100. This appendix compares the total QHEI score to a desirable goal, according to the stream's use designation. Other appendices illustrate the scores for other “metrics”, and their geographic distribution. The six metrics are:

1. Substrate (mineral and organic material forming the bottom of a waterway or waterbody): Has 2 components (substrate *type* and substrate *quality*). The maximum score allowed for this metric is 20.

2. Instream Cover (Structural materials (boulders, logs, or stumps), channel features (ledges, vegetation), and water features (turbulence or depth) that provide protection for aquatic species): Has 2 components (instream cover *type* and instream cover *amount*). The maximum score allowed for this metric is 20.

3. Channel Quality : Has 4 components (*sinuosity, development, channelization and stability*).

Sinuosity - ratio of channel length between two points in a channel to the straight line distance between the same two points.

Development - the refers to the development of riffle/pool complexes

Channelization - the mechanical alteration of a stream usually by deepening and straightening an existing channel or creating a new channel to move water.

Stability - the ability of a stream channel to retain its shape and dimensions when exposed to high stream flows and varying temperature conditions.

The maximum score allowed for this metric is 20.

4. Riparian Zone/ Bank Erosion: Has 3 components (*riparian width, floodplain quality and bank erosion*).

Riparian zone - of, pertaining to, situated or dwelling on the margin of a river or other water body.

Floodplain - area adjoining a water body that becomes inundated during periods of overbank flooding and that is given rigorous legal definitions in regulatory programs.

Bank erosion - process of weathering or wearing away of stream banks and adjacent land slopes by water, ice, wind, or other factors.

The maximum score allowed for this metric is 10.

5. Pool/Glide and Riffle/Run Quality: Has 6 components (*Pool maximum depth, morphology, current velocity, riffle depth, run depth, riffle/run substrate stability and substrate embeddedness*). The maximum score allowed for this metric is 20.

6. Gradient:

Gradient - general slope, or change in vertical elevation per unit of horizontal distance, of the water surface in a flowing stream.

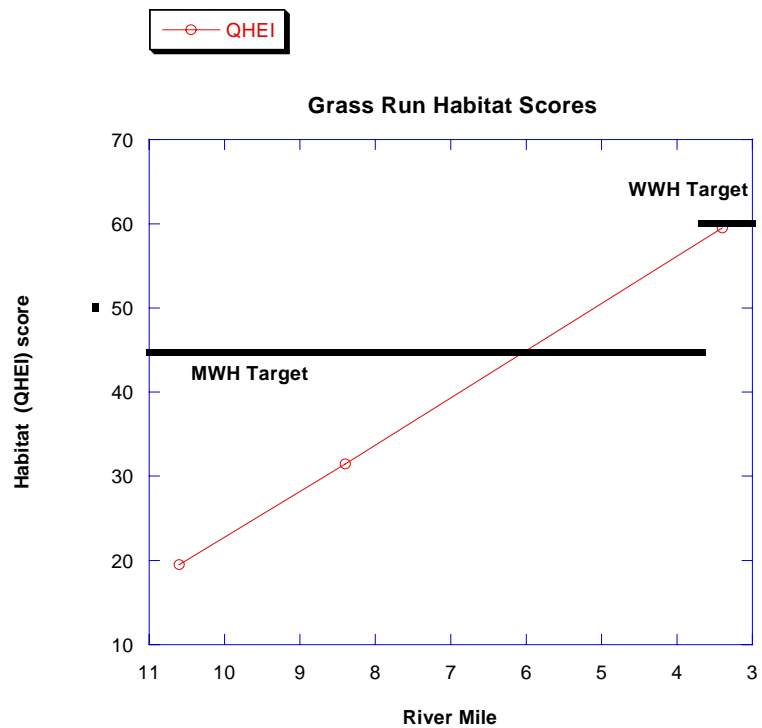
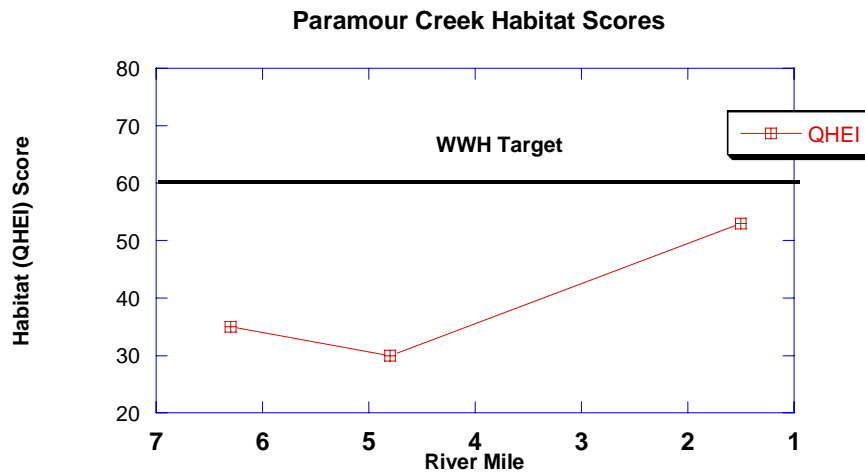
Scoring for ranges of stream gradient takes into account the varying influence of gradient with stream size. The score is based on a table (available from Ohio EPA) that assigns a score depending on the site's drainage area, average stream width, and average slope in the reach. The maximum score allowed for this metric is 10.

Desirable QHEI (Habitat Index) Targets

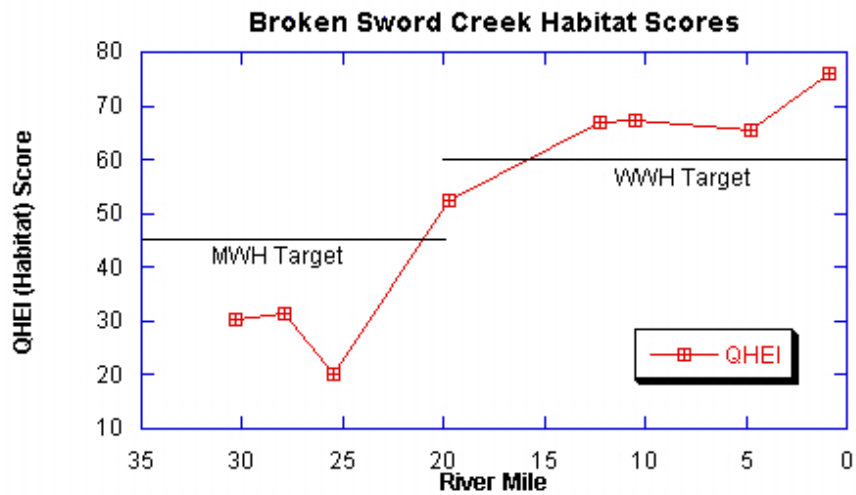
The table below shows QHEI values typically associated with each aquatic life use designation. Although there are exceptions, these values can be used as targets for habitat improvement for streams where habitat degradation is a major cause of impairment. The plots shown in this appendix use these values to compare against field-measured QHEI data.

Aquatic Life Use Designation	QHEI (Habitat Index) Typical Values
Exceptional	75 or more
Warmwater	60 - 75
Potential Warmwater	45 - 59
Modified Warmwater	Less than 45
Limited Resource Water	<3mi ² and ephemeral

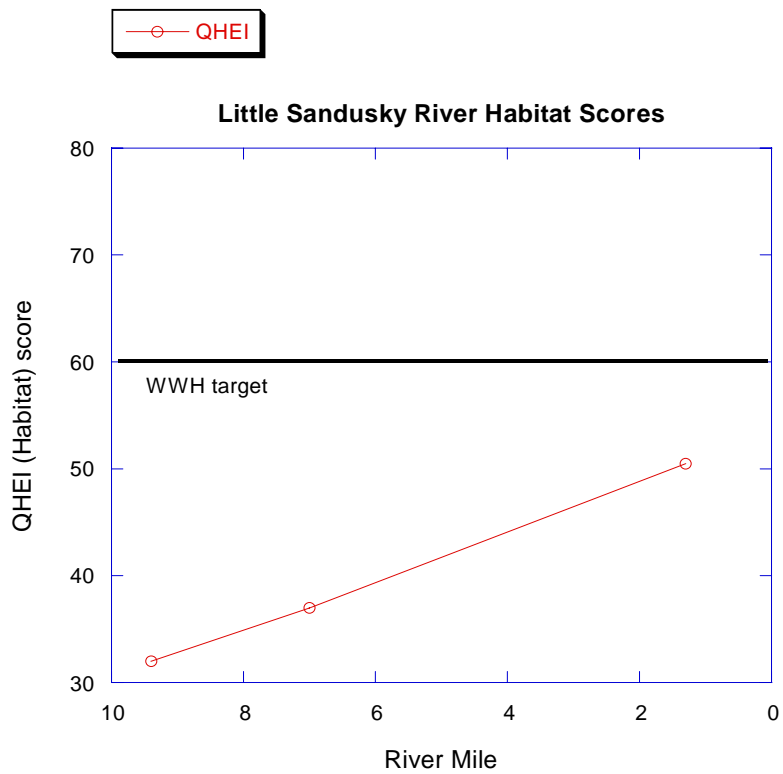
Bucyrus Assessment Unit (HUC 04100011- 020)



Broken Sword Creek Assessment Unit (HUC 04100011- 030)

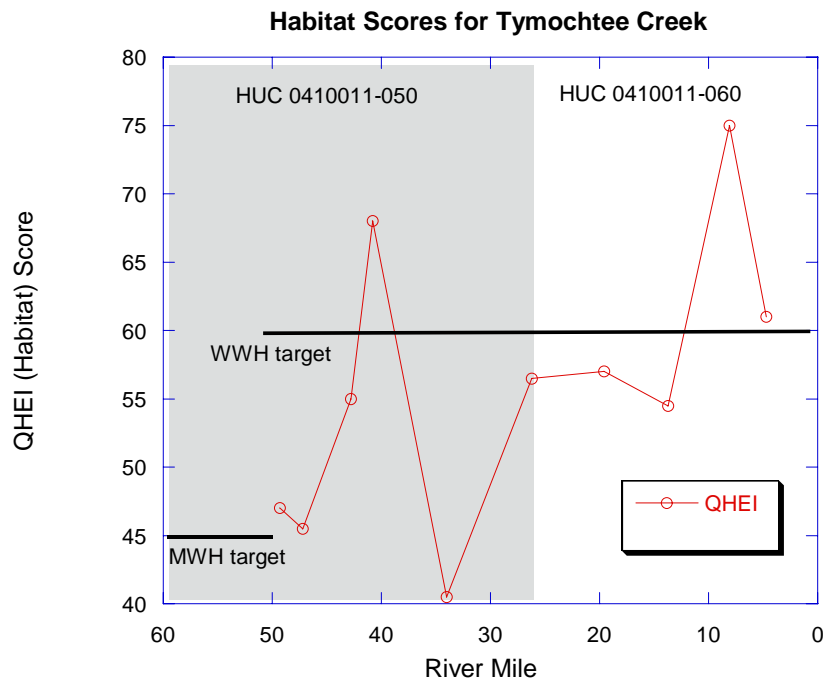
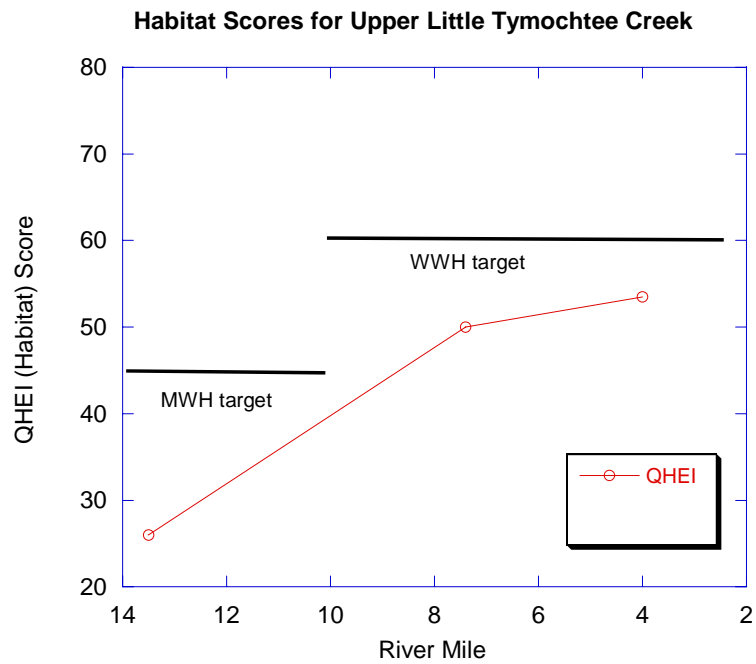


Upper Sandusky Assessment Unit (HUC 04100011- 040)

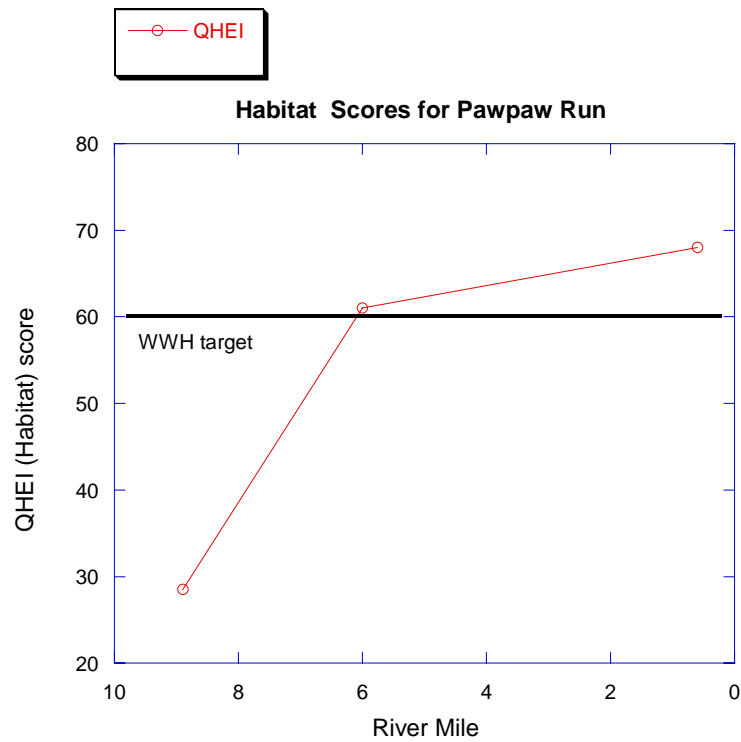


Upper

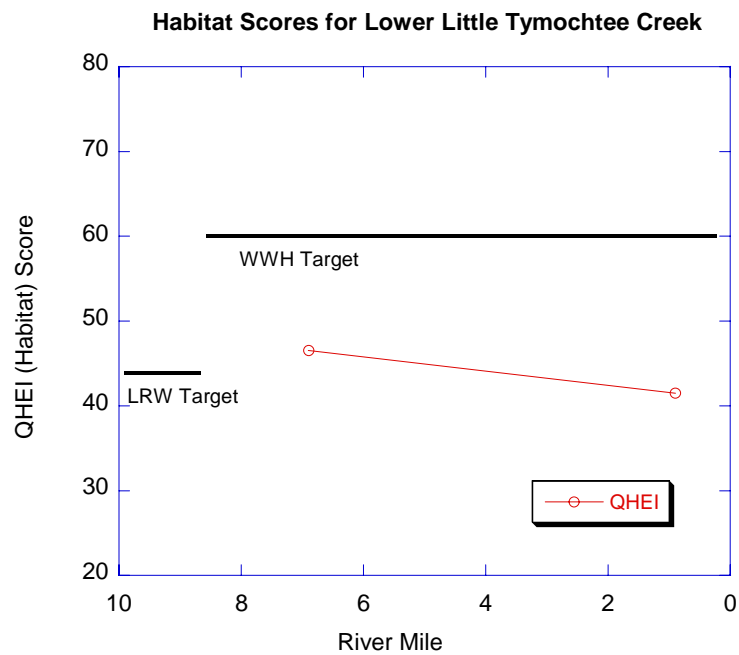
Tymochtee Creek Assessment Unit (HUC 04100011- 050)



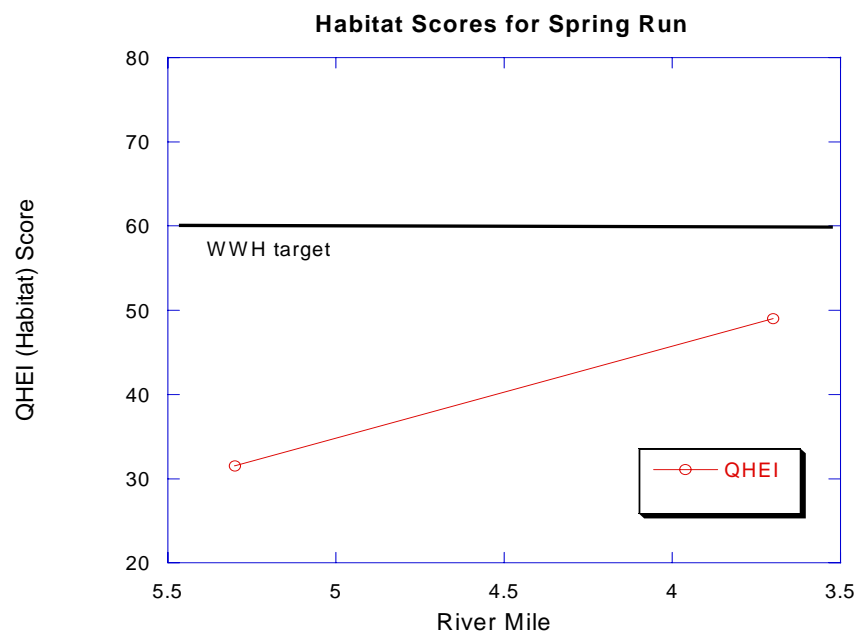
Upper Tymochtee Creek Assessment Unit (HUC 04100011- 050)



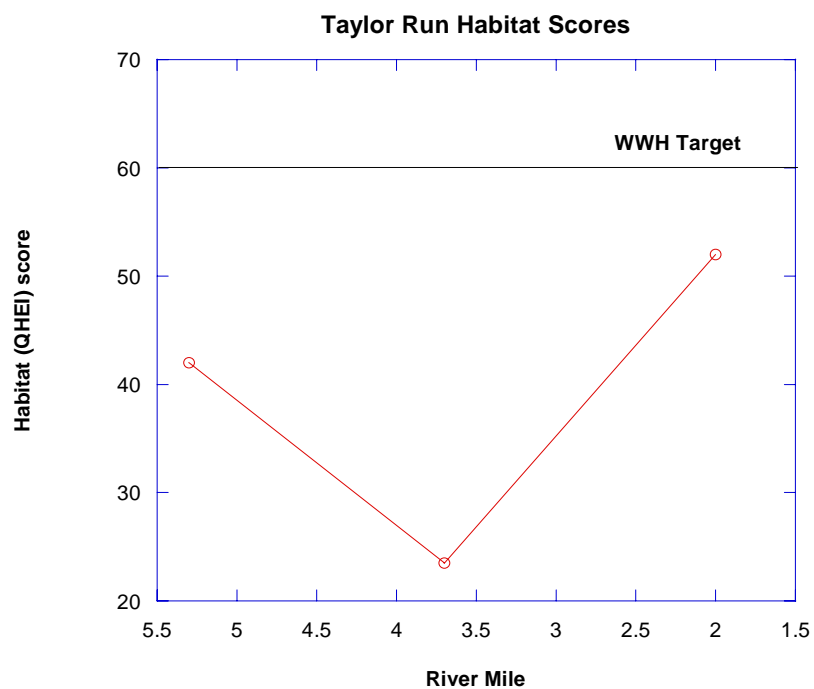
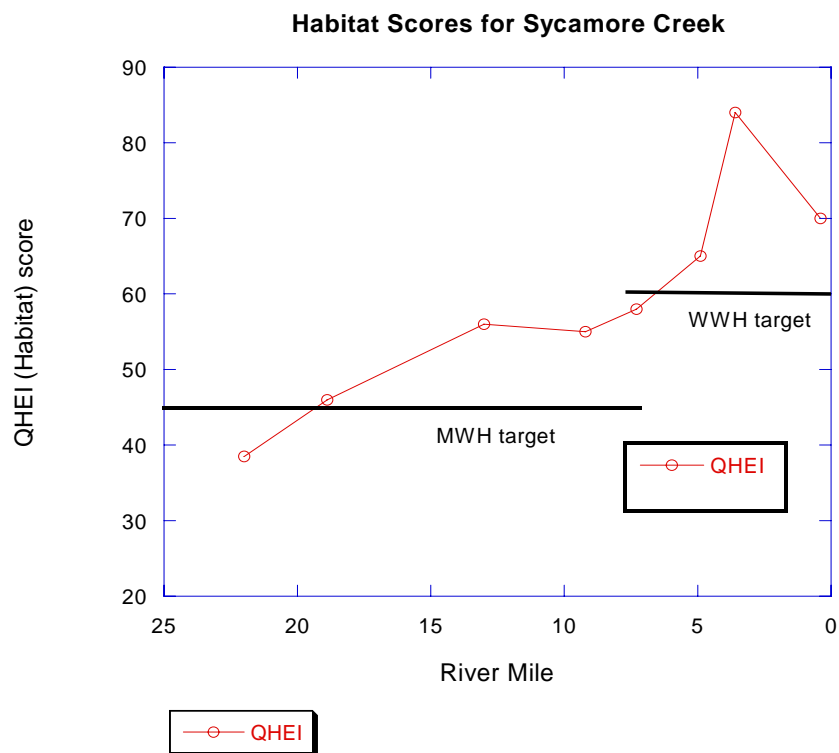
Lower Tymochtee Creek Assessment Unit (HUC 04100011- 060)



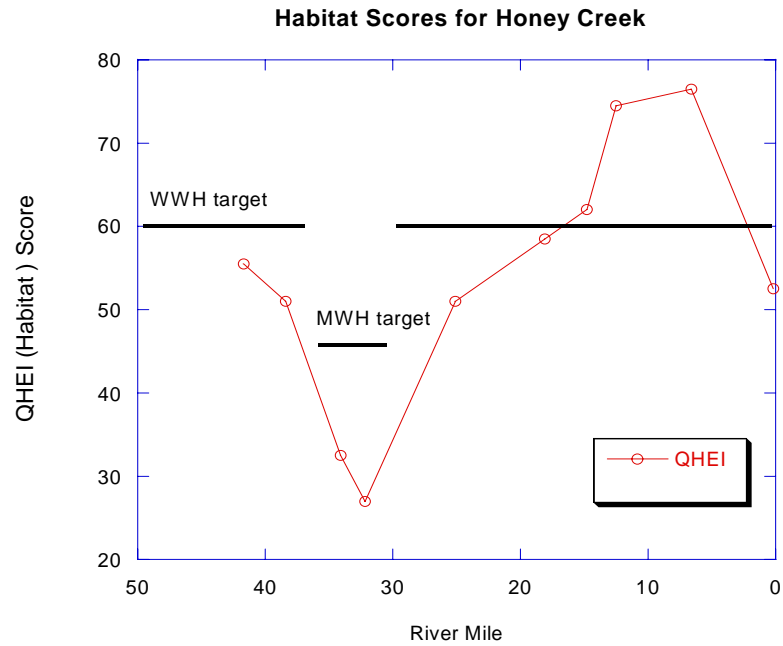
Lower Tymochtee Creek Assessment Unit (HUC 04100011- 060)



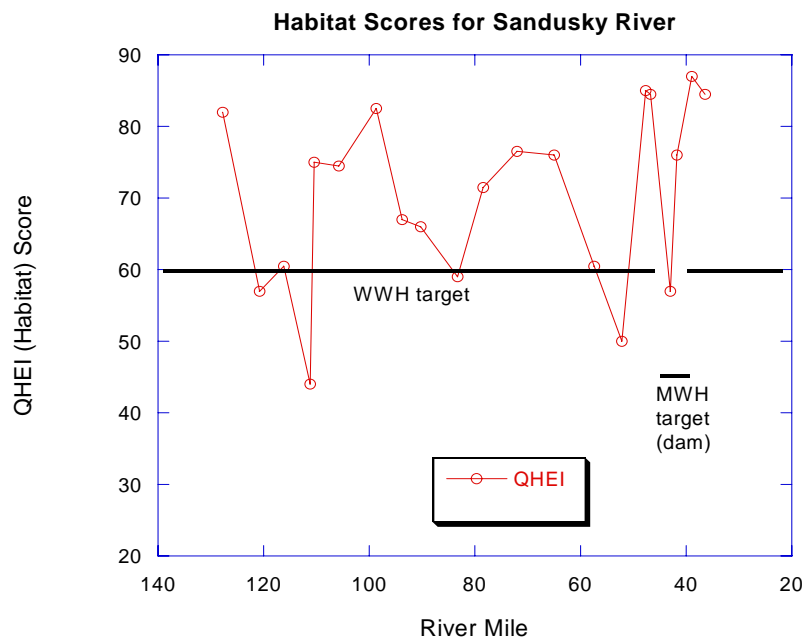
Sandusky River-Mexico Assessment Unit (HUC 04100011- 070)



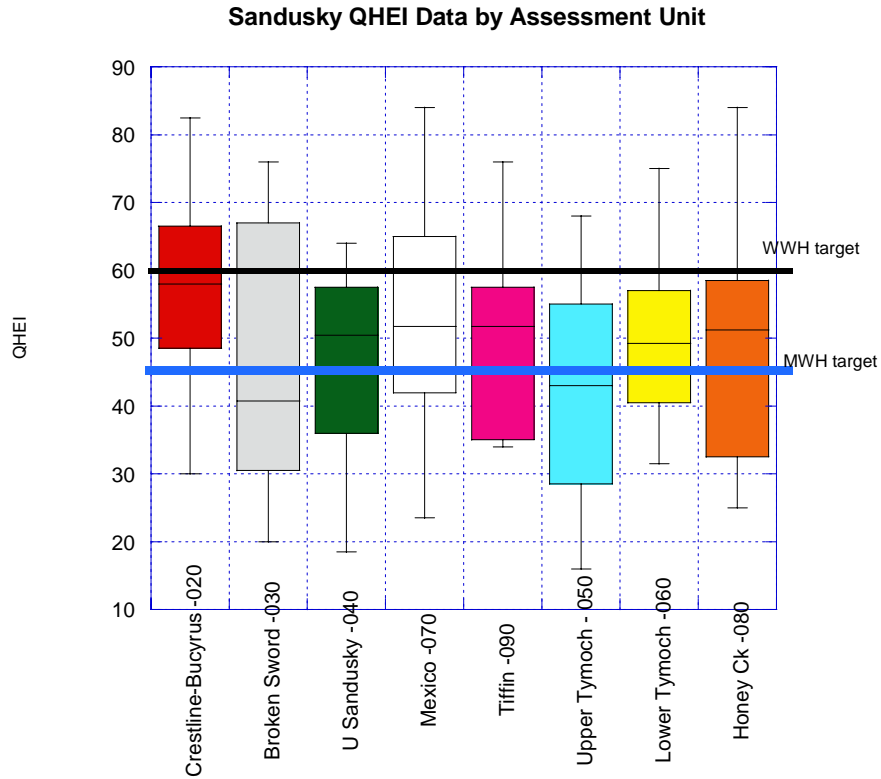
Honey Creek Assessment Unit (HUC 04100011- 080)



Habitat Scores for mainstem Sandusky River



Habitat Scores Arranged by Assessment Unit



This box & whisker plot shows the QHEI (habitat) scores observed in most of the Sandusky River assessment units during 2002, compared to a reasonable QHEI target score expected for WWH and MWH streams in full attainment.

Table 1 shows the individual metric scores for all the sites where QHEI was assessed. Due to space limitations, the gradient column lists the actual slope (ft/mile), not the gradient metric score, therefore that number can't be added to the other metrics to determine the QHEI score.

Upper Sandusky River Watershed TMDLs

Table 1. Detailed results of the QHEI (Habitat) Index Scores for each Monitored Site in the Upper Sandusky Watershed (2001)

Unit Code	Stream Name	RM	Use Des	QHEI	Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient	Drainage Area
1	Sandusky River	36.40	W	84.5	16.0	16.0	19.5	7.0	11.0	7.0	12.50	1031.0
1	Sandusky River	38.90	W	87.0	17.0	18.0	19.0	7.0	11.0	7.0	12.50	1008.0
1	Sandusky River	41.80	W	76.0	15.0	12.0	17.0	6.0	9.0	7.0	2.16	962.0
1	Sandusky River	43.00	M	57.0	11.0	14.0	11.5	6.5	8.0	0.0	0.10	957.0
1	Sandusky River	46.80	W	84.5	17.0	14.0	17.0	8.5	11.0	7.0	1.60	774.0
1	Sandusky River	47.70	W	85.0	15.5	16.0	17.0	8.5	11.0	7.0	1.72	774.0
1	Sandusky River	52.20	W	50.0	6.0	8.0	12.0	10.0	8.0	0.0	0.10	771.0
1	Sandusky River	57.40	W	60.5	10.0	13.0	14.0	6.5	9.0	0.0	0.93	761.0
1	Sandusky River	65.00	W	76.0	11.0	13.0	17.0	7.0	11.0	7.0	2.43	655.0
2	Sandusky River	72.00	W	76.5	16.5	12.0	17.0	7.0	7.0	7.0	5.68	341.0
2	Sandusky River	78.40	W	71.5	13.5	12.0	17.0	7.0	7.0	7.0	2.18	297.0
2	Sandusky River	83.30	W	59.0	10.0	13.0	14.0	5.0	9.0	0.0	2.22	290.0
2	Sandusky River	90.30	W	66.0	15.0	14.0	14.0	5.0	10.0	0.0	2.61	277.0
2	Sandusky River	93.80	W	67.0	15.0	14.0	15.0	5.0	6.0	2.0	6.45	137.0
20	Sandusky River	98.70	W	82.5	17.0	15.0	18.0	6.5	9.0	7.0	7.14	109.0
20	Sandusky River	105.8	W	74.5	15.5	14.0	17.0	8.0	9.0	5.0	3.79	95.0
20	Sandusky River	110.4	W	75.0	14.0	15.0	15.0	6.0	11.0	6.0	5.78	88.0
20	Sandusky River	111.2	W	44.0	6.0	6.0	13.0	7.0	5.0	-1.0	5.78	87.0
20	Sandusky River	116.2	W	60.5	13.5	15.0	14.0	6.0	8.0	0.0	2.16	80.0
20	Sandusky River	120.8	W	57.0	10.0	15.0	13.0	7.0	4.0	0.0	5.26	67.0
20	Sandusky River	127.8	W	82.0	18.0	15.0	18.0	10.0	6.0	5.0	14.29	35.0
20	Trib. to Sandusky R. (RM 122.09)	0.90	W	64.0	15.0	13.0	15.0	4.0	5.0	2.0	18.52	4.3
20	Trib. to Sandusky R. (RM 121.19)	0.20	W	55.5	15.0	7.0	14.0	4.0	4.0	1.5	27.03	3.9
20	Trib. to Paramour Creek (RM 2.88)	0.10	W	61.0	15.5	13.0	15.0	3.5	5.0	1.0	11.11	3.5
20	Trib. to Paramour Creek (RM 1.92)	0.20	W	66.5	13.5	13.0	16.5	9.5	6.0	2.0	9.26	7.0
20	Trib. to Paramour Creek (RM 1.92)	2.40	W	60.0	15.0	12.0	14.0	5.0	5.0	1.0	10.64	5.0
20	Trib. to Paramour Creek (5.13)	0.20	W	37.5	5.0	6.0	9.0	6.5	3.0	0.0	13.33	4.0
20	Trib. to Paramour Creek (5.13)	3.70	W	39.0	1.0	6.0	12.0	7.0	3.0	0.0	26.32	1.0
20	Trib. to Loss Creek (RM 2.98)	0.10	W	58.0	17.0	5.0	14.5	5.5	3.0	3.0	22.73	6.2
20	Paramour Creek	1.50	W	53.0	14.0	13.0	11.0	5.0	4.0	0.0	3.58	25.0
20	Paramour Creek	4.80	W	30.0	5.0	5.0	7.0	3.0	4.0	0.0	4.17	11.0
20	Paramour Creek	6.30	W	35.0	5.0	9.0	8.0	4.0	3.0	0.0	5.59	4.5
20	Loss Creek	1.00	W	75.0	18.0	14.0	17.0	10.0	5.0	3.0	20.41	13.7
20	Loss Creek	4.60	W	54.0	12.0	8.0	12.0	10.0	4.0	0.0	11.36	4.3
20	Gray Eye Run	1.30	W	45.0	5.0	7.0	14.0	10.0	4.0	-1.0	6.06	4.0
20	Grass Run	3.40	W	59.5	18.0	5.0	14.5	5.0	4.0	3.0	10.10	16.9
20	Allen Run	1.20	W	48.5	16.0	8.0	10.0	4.5	4.0	0.0	9.26	4.1

Upper Sandusky River Watershed TMDLs

Unit Code	Stream Name	RM	Use Des	QHEI	Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient	Drainage Area
20	Grass Run	8.40	M	31.5	6.0	6.0	7.0	2.5	4.0	0.0	6.80	7.7
20	Grass Run	10.60	M	19.5	5.0	3.0	5.5	2.0	0.0	0.0	4.98	5.2
20	Spring Creek	5.70	M	21.5	1.0	5.0	6.0	2.5	1.0	0.0	6.99	4.0
30	Broken Sword Creek	0.90	W	76.0	16.0	15.0	17.0	6.0	10.0	4.0	5.56	94.0
30	Broken Sword Creek	4.80	W	65.5	13.5	16.0	15.0	6.0	9.0	0.0	3.73	89.0
30	Broken Sword Creek	10.50	W	67.5	14.0	14.0	16.0	6.5	5.0	2.0	7.94	78.0
30	Broken Sword Creek	12.30	W	67.0	14.5	12.0	16.0	6.5	6.0	4.0	5.03	77.0
30	Broken Sword Creek	19.70	W	52.5	10.0	10.0	14.0	7.5	5.0	0.0	2.87	43.0
30	Indian Run	0.60	W	44.0	6.0	7.0	11.5	8.5	5.0	0.0	9.26	8.0
30	Indian Run	3.50	M	33.0	10.0	6.0	8.0	3.0	0.0	0.0	5.85	4.1
30	Broken Sword Creek	25.5	M	20.0	5.0							32.0
30	Broken Sword Creek	27.90	M	31.5	5.0	10.0	6.0	2.5	4.0	0.0	2.61	26.0
30	Broken Sword Creek	30.30	M	30.5	5.5	2.0	6.0	3.0	4.0	0.0	6.71	9.4
30	Brandywine Creek	1.60	M	27.5	5.0	5.0	7.0	3.5	1.0	0.0	6.13	8.7
30	Brandywine Creek	3.30	L	37.5	10.0	4.0	12.0	6.5	-1.0	0.0	5.62	4.0
40	Little Sandusky River	1.30	W	50.5	9.0	11.0	13.0	4.5	5.0	2.0	5.75	37.0
40	Little Sandusky River	7.00	W	37.0	0.0	5.0	13.0	10.0	3.0	0.0	4.55	17.0
40	Negro Run	0.50	W	57.5	14.0	7.0	12.0	6.0	6.0	2.5	12.66	13.3
40	Rock Run	0.90	W	57.0	12.0	6.0	16.0	10.0	3.0	2.0	19.23	10.5
40	Honey Run	0.70	W	43.0	3.0	11.0	9.0	7.0	5.0	0.0	10.75	8.2
40	Negro Run	2.90	W	59.0	13.0	8.0	15.0	5.5	6.0	1.5	20.41	7.0
40	Rock Run	4.00	W	36.0	5.0	7.0	9.0	4.0	3.0	0.0	11.76	4.5
40	Sugar Run	0.60	W	64.0	13.0	13.0	16.0	8.5	5.0	0.5	10.87	4.0
40	Layton Ditch	0.30	W	57.0	5.0	12.0	16.0	9.0	5.0	0.0	20.00	3.7
40	Little Sandusky River	9.40	M	32.0	1.0	11.0	7.5	4.5	4.0	0.0	3.08	6.7
40	Trib. to Little Sandusky (RM 8.93)	2.60	M	18.5	0.5	2.0	5.0	2.0	3.0	0.0	8.40	5.5
50	Tymochtee Creek	34.00	W	40.5	5.0	7.0	14.0	4.5	4.0	0.0	1.64	144.0
50	Tymochtee Creek	40.80	W	68.0	15.0	13.0	17.0	6.5	6.0	2.5	2.67	131.0
50	Tymochtee Creek	42.80	W	55.0	9.5	9.0	16.0	7.5	4.0	3.0	3.01	64.1
50	Tymochtee Creek	47.20	W	45.5	4.5	13.0	11.5	3.5	5.0	2.0	4.42	35.2
50	Tymochtee Creek	49.30	W	47.0	3.0	13.0	14.0	6.0	6.0	1.0	2.00	16.7
50	Pawpaw Run	0.60	W	68.0	15.0	13.0	16.0	7.0	7.0	0.0	7.25	17.4
50	Pawpaw Run	6.00	W	61.0	15.0	13.0	16.0	5.0	4.0	2.0	9.26	8.4
50	Pawpaw Run	8.90	W	28.5	1.0	7.0	9.5	5.0	0.0	0.0	6.06	4.0
50	Little Tymochtee Creek (RM 42.30)	4.00	W	53.5	14.0	5.0	17.0	7.5	0.0	0.0	11.63	35.0
50	Little Tymochtee Creek (RM 42.30)	7.40	W	50.0	16.0	8.0	14.0	5.0	1.0	0.0	3.18	15.6
50	Enoch Creek	1.60	W	36.5	5.0	5.0	9.5	6.0	4.0	-1.0	11.11	7.0
50	Thompson Ditch	1.50	M	16.5	0.0	2.0	5.0	3.5	2.0	0.0	1.77	4.4

Upper Sandusky River Watershed TMDLs

Unit Code	Stream Name	RM	Use Des	QHEI	Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient	Drainage Area
50	Little Tymochtee Creek (RM 42.30)	13.50	M	26.0	1.0	7.0	5.0	4.0	3.0	0.0	7.35	3.8
50	Warpole Creek	1.50	M	33.0	10.0	4.0	5.0	1.0	4.0	-1.0	6.58	19.7
50	Carroll Ditch	1.00	M	16.0	0.0	2.0	5.0	3.0	2.0	0.0	2.74	7.2
50	Prairie Run	1.00	L	32.0	5.0	5.0	8.0	4.0	4.0	0.0	6.85	7.9
60	Tymochtee Creek	4.70	W	61.0	11.5	15.0	14.0	5.5	7.0	0.0	3.98	264.0
60	Tymochtee Creek	8.10	W	75.0	17.0	13.0	14.0	6.5	9.0	5.5	7.46	230.0
60	Tymochtee Creek	13.70	W	54.5	6.0	15.0	14.0	5.5	8.0	0.0	1.45	205.0
60	Tymochtee Creek	19.60	W	57.0	8.0	13.0	14.5	5.5	10.0	0.0	1.23	198.0
60	Tymochtee Creek	26.20	W	56.5	6.5	12.0	15.0	6.0	9.0	0.0	2.23	172.0
60	Little Tymochtee Creek (RM 5.36)	0.90	W	41.5	10.0	7.0	13.0	2.0	4.0	-0.5	3.48	31.0
60	Little Tymochtee Creek (RM 5.36)	6.90	W	46.5	10.0	8.0	9.0	6.5	3.0	0.0	6.06	18.2
60	Spring Run	3.70	W	49.0	13.5	5.0	12.5	3.0	5.0	0.0	8.77	16.3
60	Spring Run	5.30	W	31.5	6.5	6.0	7.0	5.0	3.0	0.0	3.94	4.0
60	Lick Run	1.30	W	49.5	13.0	7.0	13.0	4.5	4.0	0.0	14.71	8.9
60	Poverty Run	3.00	W	40.5	11.5	6.0	10.0	2.5	4.0	0.5	5.88	8.4
60	No. 32 Ditch	0.20	W	33.0	6.0	6.0	8.0	4.0	3.0	0.0	7.63	5.2
70	Thorn Run	1.00	W	44.0	5.0	4.0	14.0	8.0	4.0	-1.0	17.86	10.4
70	Thorn Run	2.90	W	29.5	5.0	4.0	9.0	4.5	2.0	-1.0	9.71	3.6
70	Taylor Run	2.00	W	52.0	5.0	11.0	13.5	9.0	4.0	-0.5	11.36	17.5
70	Taylor Run	3.70	W	23.5	5.0	2.0	5.0	3.5	3.0	-1.0	9.62	7.5
70	Taylor Run	5.30	W	42.0	5.0	5.0	15.0	8.0	1.0	0.0	11.90	4.0
70	Mile Run	0.30	W	66.5	14.5	10.0	17.0	8.0	5.0	2.0	21.28	7.0
70	Mile Run	3.50	W	51.5	11.0	6.0	17.0	6.5	4.0	-1.0	13.33	3.4
70	Greasy Run	1.80	W	43.0	10.0	7.0	10.0	4.0	4.0	0.0	37.04	4.8
70	Sycamore Creek	0.40	W	70.0	13.0	13.0	16.0	6.0	10.0	2.0	11.36	67.5
70	Sycamore Creek	3.60	W	84.0	18.0	18.0	18.0	6.5	10.0	5.5	19.23	57.0
70	Sycamore Creek	4.90	W	65.0	18.0	8.0	15.0	9.0	4.0	3.0	6.67	56.0
70	Sycamore Creek	7.30	M	58.0	14.0	9.0	15.0	8.5	4.0	1.5	4.98	53.0
70	Sycamore Creek	9.20	M	55.0	16.5	3.0	14.0	8.5	2.0	3.0	13.33	51.0
70	Sycamore Creek	13.00	M	56.0	16.0	6.0	14.5	8.0	4.0	1.5	4.98	31.0
70	Sycamore Creek	18.90	M	46.0	14.0	10.0	8.0	2.0	5.0	1.0	5.18	16.5
70	Sycamore Creek	22.00	M	38.5	15.0	3.5	7.0	3.0	4.0	0.0	4.55	10.0
80	Slee Ditch	0.10	W	51.5	14.5	5.0	11.0	8.0	3.0	2.0	33.33	3.3
80	Silver Creek	7.70	W	46.5	5.5	9.0	14.0	6.5	6.0	-0.5	5.15	9.0
80	Silver Creek	4.10	W	31.5	5.0	4.0	7.0	7.5	2.0	0.0	3.30	16.0
80	Honey Creek	41.70	W	55.5	10.0	8.0	14.0	8.5	5.0	0.0	15.38	8.7
80	Honey Creek	38.40	W	51.0	9.5	7.0	10.0	6.0	9.0	-0.5	9.35	16.3
80	Honey Creek	25.10	W	51.0	5.5	12.0	15.0	8.0	6.0	0.5	2.36	89.0

Upper Sandusky River Watershed TMDLs

Unit Code	Stream Name	RM	Use Des	QHEI	Substrate	Cover	Channel	Riparian	Pool	Riffle	Gradient	Drainage Area
80	Honey Creek	18.10	W	58.5	17.5	7.0	15.0	3.0	4.0	2.0	8.62	113.0
80	Honey Creek	14.80	W	62.0	15.0	7.0	15.0	8.0	4.0	3.0	8.13	119.0
80	Honey Creek	12.50	W	74.5	18.5	15.0	17.0	6.5	6.0	3.5	12.50	154.0
80	Honey Creek	6.60	W	76.5	19.0	12.0	17.0	8.5	6.0	4.0	9.35	163.0
80	Buckeye Creek	2.70	W	58.0	15.0	11.0	12.0	3.0	6.0	1.0	21.74	4.4
80	Buckeye Creek	0.40	W	84.0	17.0	19.0	17.0	6.0	10.0	5.0	20.00	7.2
80	Aicholz Ditch	2.50	W	42.5	5.5	7.0	10.0	8.0	2.0	0.0	8.85	16.1
80	Van Meter Creek	1.70	M	47.0	15.0	6.0	7.0	3.0	4.0	2.0	20.00	3.8
80	Honey Creek	34.10	M	32.5	8.0	4.0	7.5	2.0	5.0	2.0	2.28	28.0
80	Honey Creek	32.20	M	27.0	1.0	5.0	6.0	3.0	8.0	0.0	2.28	63.0
80	Honey Creek	0.20	M	52.5	11.0	12.0	11.0	6.5	8.0	0.0	0.10	176.0
80	Brokenknife Creek	5.10	M	25.0	5.0	2.0	5.5	2.0	5.0	-0.5	7.46	7.9
80	Brokenknife Creek	1.00	M	56.5	11.0	12.0	16.0	4.5	6.0	1.0	3.51	16.5
80	Aicholz Ditch	3.90	M	28.5	5.0	5.0	7.5	6.0	1.0	0.0	3.38	8.1
90	Rock Creek	8.40	W	49.0	11.0	7.0	14.0	6.0	1.0	0.0	9.62	15.9
90	Rock Creek	4.00	W	76.0	15.5	13.0	17.5	8.0	9.0	3.0	9.43	31.0
90	Morrison Creek	2.40	W	55.0	10.5	8.0	13.5	8.0	4.0	1.0	13.51	17.7
90	Gibson Creek	0.30	W	46.0	8.5	7.0	9.5	5.0	4.0	2.0	17.54	3.3
90	East Branch Rock Creek	0.10	W	57.5	15.0	10.0	14.0	6.5	2.0	0.0	23.81	8.2
90	Bells Run	0.40	W	54.5	12.5	10.0	11.0	8.0	5.0	0.0	14.71	3.8
90	Willow Creek	3.00	M	35.0	12.0	5.0	5.0	3.0	4.0	0.0	9.90	3.7
90	Morrison Creek	9.40	M	34.0	9.5	1.0	6.0	3.5	4.0	0.0	8.62	10.4