2012 Mill Creek Watershed
Habitat Assessment
Level 3 Project Study Plan Results

Cranberry Run

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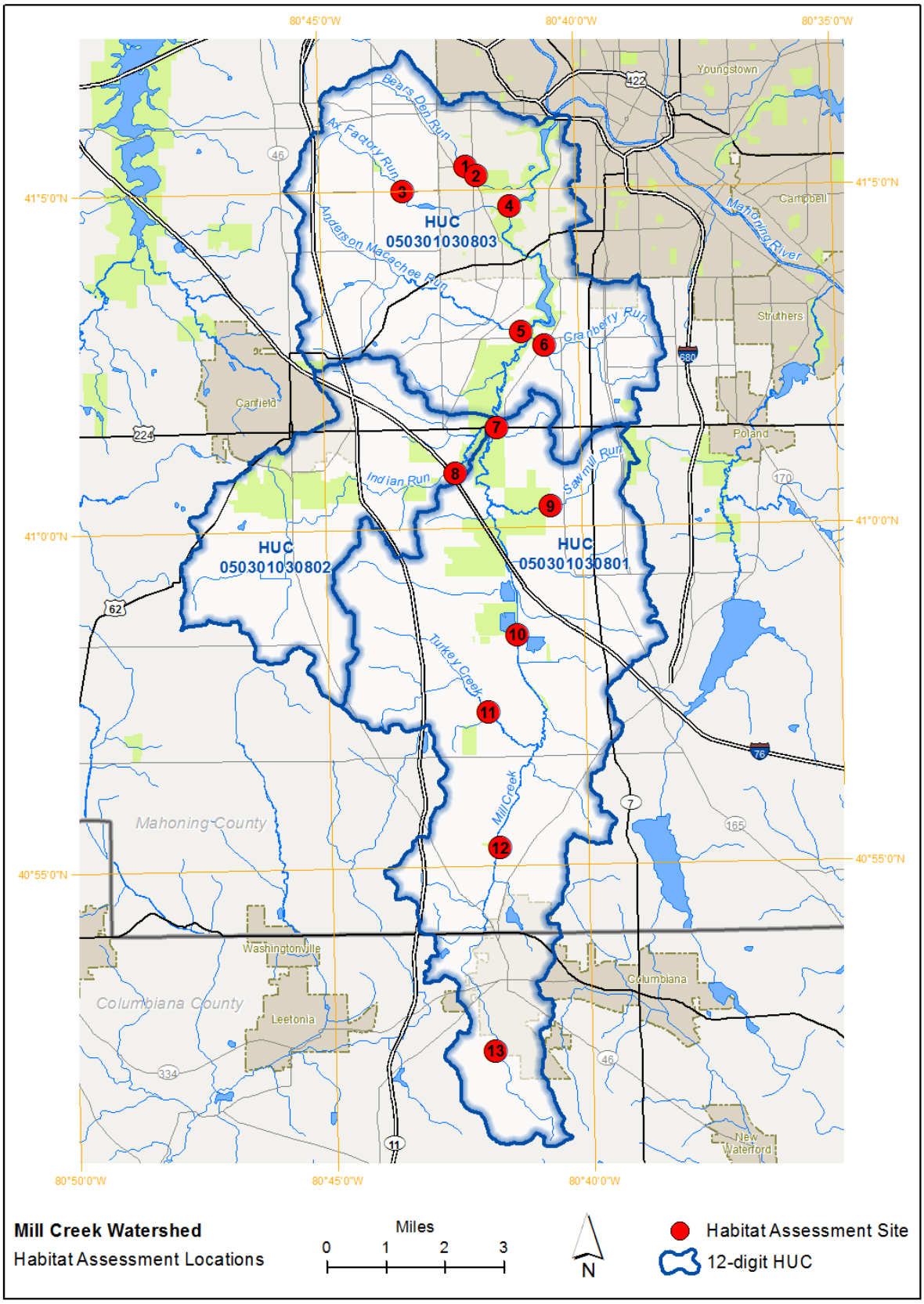
Eastgate and Mill Creek MetroParks assessed the habitat conditions of thirteen stream sites within the Mill Creek Watershed. Assessment locations (Table 1, Figure 1) were identified along the mainstem of Mill Creek, as well as Turkey Creek, Sawmill Run, Indian Run, Cranberry Run, Anderson Macachee Run, Ax Factory Run, and Bears Den Run. Several assessment sites locations were adjusted and moved downstream of their original locations due to lack of stream access and/or landowner contact information. Those sites are highlighted in Table 1. All locations, noted in Figure 1, were evaluated along a 200 meter reach using the Ohio EPA's Qualitative Habitat Evaluation Index (QHEI) assessment method. Assessments took place August through November of 2012, during normal flow conditions.

Table 1. List of QHEI Assessment Locations

Map ID	Location	River Mile
1	Bears Den Run @ Bears Den Rd	1.6
2	Bears Den Run @ McCollum Rd	1.35
3	Ax Factory Run @ New Rd	2.27
4	Ax Factory Run @ Cohasset Dr	0.02
5	Anderson Macachee Run @ Sheban Dr	0.17
6	Cranberry Run @ West Blvd	0.34
7	Mill Creek @ US224	7.82
8	Indian Run @ Huntington Woods	1.56
9	Sawmill Run @ Hitchcock Rd	1.43
10	Mill Creek @ Calla Rd	12.32
11	Turkey Creek @ New Buffalo Rd	1.48
12	Mill Creek @ Renkenberger Rd	16.78
13	Mill Creek @ Metz Rd	21.01

Figure 1. Map of QHEI Assessment Locations



Qualitative Habitat Evaluation Index

The Ohio EPA's Qualitative Habitat Evaluation Index (QHEI) is one of five factors determining the integrity of aquatic resources. The QHEI is a visual method of analyzing streams, correlates to the biological health of a stream, and is useful in determining aquatic life uses and causes of impairment. Unlike its chemical, biological, energy, and flow regime counterparts, QHEI is subjective.

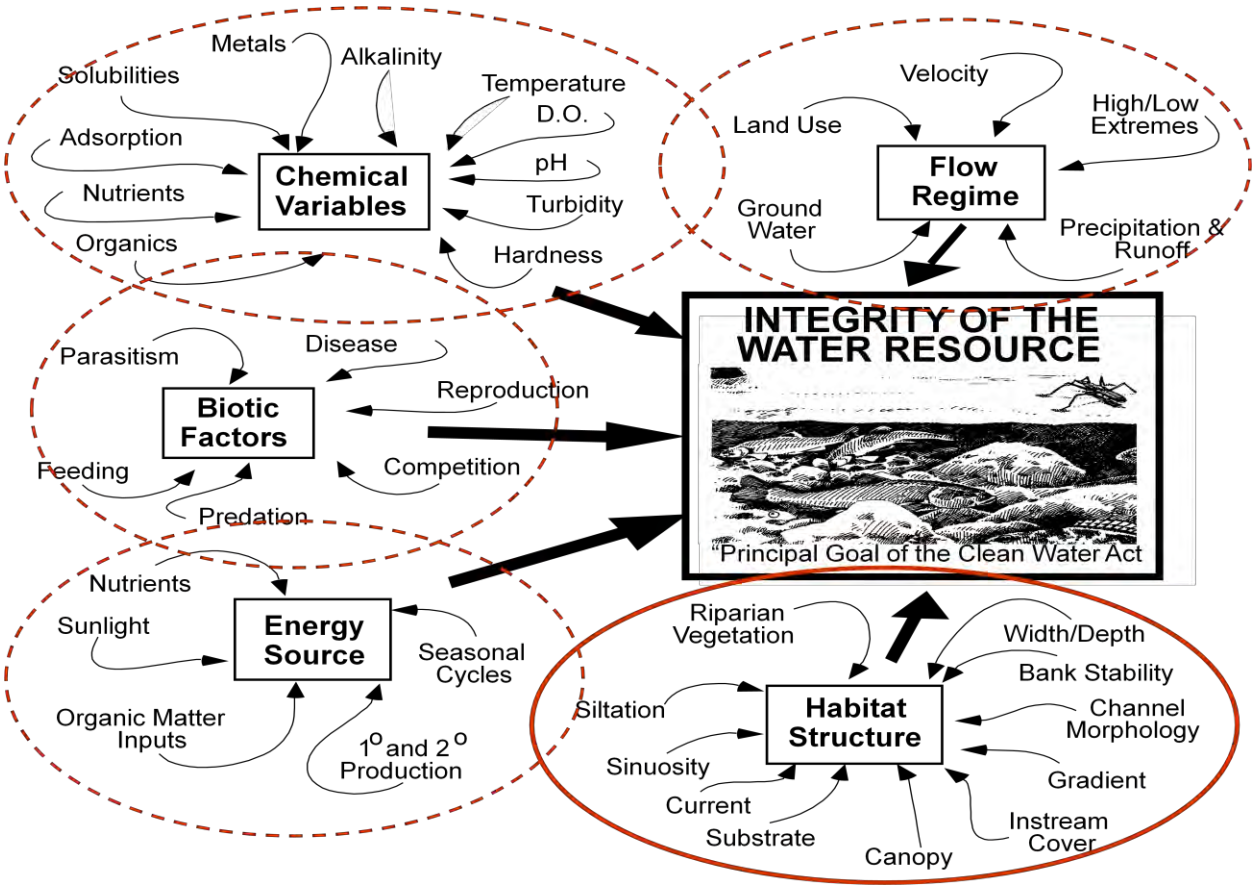


Diagram courtesy of the Ohio EPA

The QHEI assessment method uses six (6) metrics of various qualitative and subjective habitat measurements:

1. Substrate: rock types, origin, and quality;
2. In stream Cover: types and quantity;
3. Channel Morphology: sinuosity, development, channelization, and stability;
4. Bank Erosion and Riparian Zone: erosion, riparian width, and floodplain quality;
5. Pool/Glide and Riffle/Run Quality: depth, channel width, current velocity, substrate, and embeddedness; and
6. Gradient/ Drainage Area

Each metric is assigned a numerical value. All metric values are added to formulate a total for the metric. In the end, all individual metric scored are added up for a total QHEI score for each site. The total score can range anywhere from 0 (very poor) to 100 (excellent), the Metric Maximum Score. A general narrative range was developed by the Ohio EPA to the describe the total QHEI score (Table 2).

Table 2: QHEI Score Narrative

Narrative Rating	**QHEI Range**	
	Headwater stream (≤20 sq mi)	Larger Streams (>20 sq mi)
Excellent	≥70	≥75
Good	55 to 69	60 to 74
Fair	43 to 54	45 to 50
Poor	30 to 42	30 to 44
Very Poor	<30	<30

Mill Creek Watershed QHEI Assessment Results

Assessment results indicate habitat conditions within the Mill Creek Watershed range from fair to excellent. Table 3, Mill Creek Watershed QHEI Assessment Results, lists the total scores for each metric per site as well as the total QHEI score for each site.

Table 3. Mill Creek Watershed QHEI Assessment Results

Map ID	Location	River Mile	Substrate *(max 20)*	Instream Cover *(max 20)*	Channel Morphology *(max 20)*	Bank Erosion Riparian *(max 10)*	Pool/Glide And Rifle/ Run Quality *(max 12)*	Riffle *(max 8)*	Gradient *(max 10)*	Total QHEI Score
1	Bears Den Run Behind Mill Creek Maint. bldg.	1.6	19	8	12.5	4.5	4	3.5	8 Very High	59.5
2	Bears Den Run @ McCollum Rd	1.35	15.5	9	15	7.75	7	4.5	8 Very High	66.75
3	Ax Factory Run behind Wedgewood Park	2.27	17.5	14	13.5	5.75	4	2.5	10 High	67.25
4	**Ax Factory Run @ Cohasset Dr**	**0.02**	**19.5**	**18**	**20**	**10**	**7**	**7**	**8 Very High**	**89.5**
5	Anderson Macachee Run @ Sheban Dr	0.17	11.5	20	17	9	9	4	8 Very High	78.5
6	Cranberry Run @ West Blvd	0.34	16	20	17	8.75	11	5.5	8 Very High	86.25
7	Mill Creek Downstream low head dam	7.82	9.5	10	10.5	9	9	3.5	10 Moderate-High	61.5
8	Indian Run @ Huntington Woods	1.56	10	16	13.5	7.5	11	2.5	8 High	68.5
9	Sawmill Run @ Hitchcock Rd	1.43	17	20	14	9	11	3.5	10 High	84.5
10	**Mill Creek @ Calla Rd**	**12.32**	**4**	**13**	**7**	**9**	**5**	**0**	**10 Moderate-High**	**48**
11	Turkey Creek @ New Buffalo Rd	1.48	17	20	14	4	7	5	4 Very High*	71
12	Mill Creek @ Renkenberger Rd	16.78	11.5	9	12.5	5.75	9	3.5	6 Very High	57.25
13	Mill Creek @ Metz Rd	21.01	13.5	11	14	6.5	5	3.5	4 Very High*	57.5

*According to the Ohio EPA's QHEI manual, any site with a gradient greater than the upper bounds of the "very high" classification is assigned a score of 4.

Ax Factory Run at Cohasset Drive, located within Mill Creek MetroParks, had the highest overall QHEI score within the watershed. This site was the ranked high due to its high scores in six out of the seven metrics evaluated. Meanwhile, the mainstem of Mill Creek at Calla Road had the lowest QHEI score. This site is located outside of the MetroParks and in the rural portion of the watershed, which may have attributed to its low, overall score.

QHEI Results: Metric Breakdown

The following is a breakdown of the QHEI metrics that make up the Maximum Metric Score and the sites that scored the highest and lowest for each QHEI metric.

Substrate

The geology within Mill Creek MetroParks played and important role in elevating Ax Factory Run at Cohasset Drive in attaining the metric max score for substrate. Cobble and gravel were the dominant substrate types both within pool reaches and riffle areas. Other substrate types present included boulder/slabs, bedrock, and a small percentage of sand. With the exception of sand, the identified substrates provide excellent niches for fish and other macroinvertebrates to live and/or hide. Coupled with the fact the stream was silt free and the substrates were not embedded by finer materials (i.e. sand, silt), fish and other macroinvertebrates can utilize the void spaces between substrates to live, and/or lay their eggs.

Site: Ax Factory Run at Cohasset Dr

Unembedded cobble/ gravel substrate

Sand and silt were the dominate substrates in the mainstem Mill Creek at Calla Road and was a driving factor behind its low, overall QHEI score. This is due to the developing/transitional nature of the drainage area's rural characteristics. Gravel and detritus (dead, organic materials i.e. sticks, wood, and other partially or un-decayed coarse plant material) were present, but covered by the sand and silt. The quantity and thickness of the silt and sand layer caused the streambed to be extensively embedded. Therefore, the stream may have a reduced population of microinvertebrates and fish diversity.

Site: Mill Creek at Calla Rd.

Substrate embedded by an extensive layer of sand and silt

Instream Cover

The greater the quality and diversity of instream cover, the better it is for a stream to support diverse fish populations. Cover types such as undercut banks, root wads, root mats, logs or woody debris, overhanging vegetation, and aquatic vegetation are functional cover for fish. Anderson Macachee Run and Cranberry Run both scored the max value (20) for this metric.

Site: Anderson Macachee Run at Sheban Dr.

Site: Sawmill Run at Hitchcock Rd.

Site: Ax Factory Run behind Wedgewood Park

Site: Anderson Macachee Run at Sheban Dr.

Site: Bears Den Run at McCollum Rd.

Channel Morphology

This metric emphasizes the quality of the stream channel as it relates to the degree the channel meanders (sinuosity), pool/riffle development, channelization, and channel stability. Ax Factory Run at Sheban Drive received the maximum score for this metric because of its high sinuosity (has more than 2-3 well defined outside bends); excellent riffle/pool development (pools deeper than 1 meter and riffle and run depths greater than .5 meters); it showed no signs of being channelized; and exhibited high bank stability and substrates (little to no erosion or bedload). Mill Creek at Call Road scored the lowest due to its lack of sinuosity, poor stream development, and bank stability.

Site: Anderson Macachee Run at Sheban Dr.

Bank Erosion and Riparian Zone

The quality of a riparian zone and floodplain vegetation, in conjunction with the extent of bank erosion, are the focus of this metric. Ax Factory Run at Cohasset Drive, along with Anderson Macachee Run and Sawmill Run received high scores or this metric. Each site exhibited none to moderate erosion on both banks and had wide (> 50 meters) riparian widths. Furthering the streams' protection was the presence of forested floodplains. The mainstem of Mill Creek at Renkenberger Road scored the lowest QHEI score due to its moderate to severe erosion characteristics, very narrow riparian width, and its floodplain is fenced pasture (lacking vegetation).

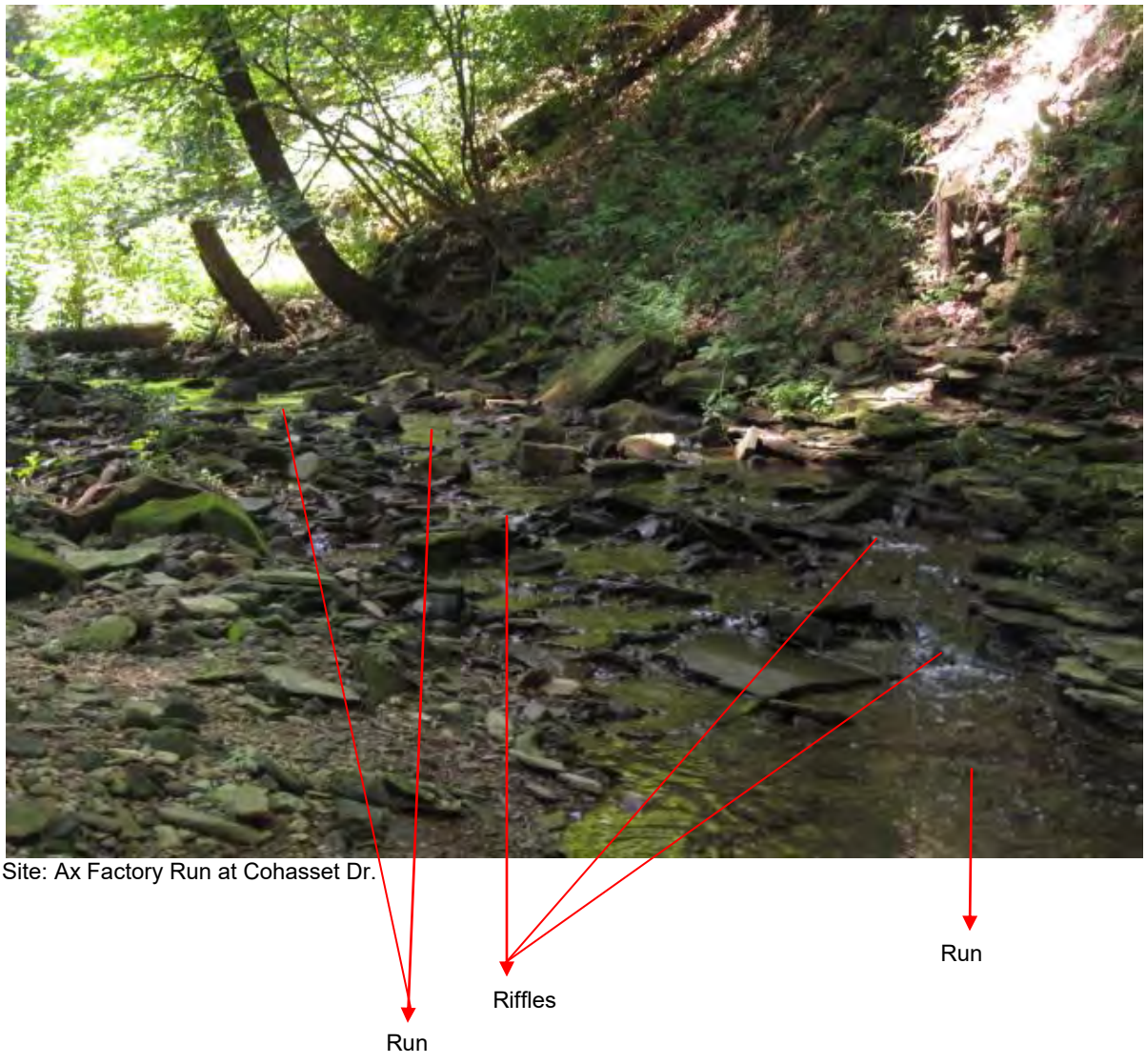
Site: Mill Creek at Renkenberger Rd.

Site: Sawmill Run at Hitchcock Rd.

Pool/Glide and Riffle/Run Quality

Pools provide important refuge for fish and other organisms during periods of dry weather. Any pool or glide maintaining a depth of 20 cm or more is considered functional (depths equal to or greater than 40 cm are optimal); those with a depth of less than 20 cm are considered to have lost their functionality. The maximum points awarded to a stream with pool depths greater than 1 meter is 6 points. A total of three (3) sites received the maximum points, while eight (8) sites contained pool depths greater than 40 cm, but measured less than 1 meter.

Riffle and Run transitions are important to aquatic life in that they mix and keep a steady flow of oxygen in the water. As water runs over course substrate (boulders, cobble, gravel) oxygen is readily mixed within the water. Riffles are a good place for macroinvertebrates such as mayflies, stoneflies, and caddisflies to live because they offer plenty of coarse substrate to hide in. A run is the area of water immediately following a riffle that exhibits a smooth surface and provide good feeding areas for fish and protection for some aquatic macroinvertebrates.



Site: Ax Factory Run at Cohasset Dr.

Gradient

Stream channel gradient refers to the downstream change in elevation of a stream and determines the potential energy for movement of bed and bank material throughout the stream channel. Coarse substrate materials remain in higher gradient, headwater streams while fine materials such as sand and silt are easily transported downstream where they finally settle. Typically, natural geomorphologic settings determine the gradient of a stream. However, surrounding land disturbances, erosion, and/or stream channelization will alter gradient. Due to the description of gradient, there is no best or worst category for this metric.