Analysis of Physical Habitat Quality and Limitations to Waterways in the Chicago Area

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Introduction

The Clean Water Act (CWA) act allows for states to set attainable goals (designated uses) for its waters. For aquatic life the CWA provides a long term goal of biological integrity and an interim goal of fishable waters that provides for the growth and propagation of fish and shellfish. For waters that cannot feasible attain the interim goal or better in the near future the CWA provides a mechanism (*i.e.*, a Use Attainability Analysis, UAA) to address set goals for such waters.

Ohio recognized the management and environmental protection advantages of creating a tiered system of aquatic life uses and has phased in a tiered series of aquatic life uses in its water quality standards over the past 25 years (Yoder 2001). This tiered series of aquatic life uses (Appendix 1) reflect a continuum of essentially physically mediated limitations that, for the lower uses, are not considered feasibly restorable in the near-term. The most protective aquatic life uses WWH and EWH protect to, and above the interim goal, respectively. The evolution of this aquatic life use system occurred along with the development of an intensive monitoring system, one of the functions of which was to support UAAs for streams around the state. A result of this effort was a robust linkage between aquatic life data, instream habitat measures and the system of tiered uses.

The goal of this study was to collect habitat data from selected rivers and canals in the Illinois waterways system and to examine the aquatic potential of these sites in the framework of aquatic life uses used in Ohio. UAA's for the lower Cuyahoga River and other larger rivers in Ohio are particularly appropriate examples.

Data

Habitat data in the form of the Qualitative Habitat Evaluation Index (QHEI, Rankin 1989, 1995, Ohio EPA 1989, 1990) was collected from March 29-April at 23 sites in the Illinois waterway system in the following waters: (Chicago River, North Branch Chicago River, North Shore Channel, Calumet River, Little Calumet River, Cal-Sag Channel, Des Plaines River, and the Chicago Sanitary and Ship Canal (CSSC). Sites were selected that had previous fish community data. Length of reaches assessed were designed to match length of previous sampled electrofishing zones (400m - 500m). We assigned a slope of 0.01 ft/mi and 9,999 sq mi drainage to all sites which resulted in a gradient score of 6, the lowest possible score for large rivers.

Results

Narrative ranges of the QHEI can be helpful in understanding and communicating the condition of the physical habitat and the ability of that habitat to support aquatic life, especially fish assemblages. Table 1 summarizes the general narrative ranges of the IBI.

Table 2 summarizes the QHEI and key metrics generally found to be most influential to aquatic life. Figure 1 is a box and whisker plot of QHEI scores by waterway along with the narrative ranges for context. Lower scores are to the left; highest to the right. It is clear that the Chicago River and the North Branch of the Chicago River are the most habitat limited of the waters we surveyed (Figure 1) followed by the CSSC. In general, the physical habitat quality of these waterways is reduced by lack of consistent flowing water habitats, straight morphology of waterways (reduces habitat heterogeneity) and the large scale of modifications throughout this system. This is above the influence of any additional chemical stressors due to discharges, overflow, or urban runoff events. Table 3 illustrates individual cover type scores for each sites. These scores are being collected as part of a planned revision to the QHEI. Each cover type is assigned a score of 0-3 where zero means the cover type is absent and a three indicates it is present in high quality and high amounts. No sites in any of these waters received a score of three, few received a two and most where absent or received a score of 1 (marginal quality or amounts). Even so, as illustrated in Figure 1 there is a range of habitat condition among the waterways that, in our estimation, would result in several different aquatic life uses under the Ohio system.

Table 1. Narrative ranges of the QHEI based on a general ability of that habitat to support aquatic life.

>=75 - Excellent
60-74 - Good
30-45 - Poor
< 30 - Very Poor

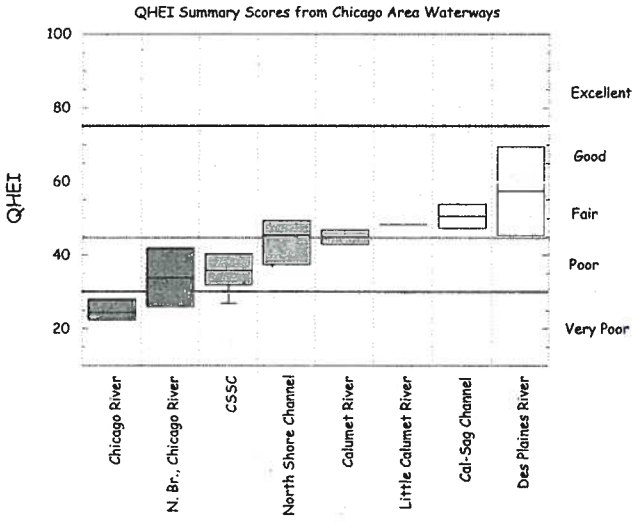

Figure 1. Box and whisker plots of QHEI scores for rivers and canals in the Chicago Area sampled during Mar-Apr 2004. Narrative ranges of the QHEI are listed on the right axis.

Decision Making Process for Assigning Aquatic Life Uses

The ultimate arbiter used in the designation of aquatic life uses under the Ohio system is the biological data. Attainment of biocriteria derived for each use is obvious evidence of ability to attain the use, and absent error or aberrant results it is the preferred arbiter or data used in the process. In many cases, however, because of the effects of often multiple stressors the biological results may underestimate the potential attainment that could be expected in the absence of such stressors. In these cases the QHEI and metric scores at a site, scores of nearby reaches, and accrual of important limiting habitat factors and the loss of positive habitat factors are used as evidence in support of a given aquatic

QHEI and Attributes for the Chicago Sanitary Ship Canal

River Mile	QHEI	Positive Habitat Attributes										High Influence Modified Attributes				Moderate Influence Modified Attributes										Total WWH Attributes	Total Moderate Influence WWH Attributes	Total High Influence WWH Attributes	Site Description
		No Channelization or Recovered	Boulder, Cobble, or Gravel Substrates	Silt Free Substrates	Good-Excellent Pool/Riffle Development	Intermittent-High Stability	Moderate-Extensive Cover	Fast Current & Eddies	Low-No Substrate Embeddedness	Max Depth > 40 cm	Low-No Riffle Embeddedness	Channelized or No Recovery	Silt/Muck Substrates	No Stability	Sparse-No Cover	Recovering from Channelization	Heavy-Moderate Silt Cover	Sand Substrates	Hardpan Substrate Origin	Poor-Fair Riffle-Pool Development	Low Stability	Only 1-2 Cover Types	No Fast Current	High-Moderate Overall Embeddedness	High-Moderate Riffle Embeddedness	No Riffle				
Chicago Sanitary Ship Canal																													
292.40	40.5									%		%		%	!		%	!	%	!	%		%	%		%	1	7	3	Lockport
296.50	27.0									%		%		%	%					%	%	!	%			%	1	5	2	Romeoville
307.90	40.5						!		!	%		%		%						!	%		%			%	3	4	1	Willow Springs Rd
314.10	38.5						!		!	%		%		%					%	!	%		%			%	3	6	2	Harlem Ave
317.50	33.5								!	%		%		%	!				%	%	%		%			%	2	5	2	Upstream Cicero
321.00	32.0									%		%	%	%	!		%		%	%	%		%	%		%	1	7	3	Damen Road
Des Plaines River																													
285.50	69.5		%				!	%	!	%	!	%		!						!	!						6	3	1	South Shore
280.70	45.5						!			%		%	!	!			!	!	%	!	!		%	!		%	2	8	3	Dstr Brandon
Chicago River																													
325.50	28.0									%		%		%	%					%	%		%			%	1	4	2	Chicago River Junction
325.80	22.5									%		%		%	%					%	%	%	%			%	1	5	2	Downtown
327.00	24.5									%		%		%	%					%	%	!	%			%	1	5	2	Inner Harbor
North Branch Chicago River																													
326.00	26.0									%		%		%	%					%	%	!	%			%	1	5	2	Dst Grand
328.90	42.0						!			%		%		%			!		%	!	%		%	!		%	2	7	2	Wilson Rd

North Shore Channel																																	
1.00	54.0																													4	7	2	Ust/Dst Sharon
2.00	47.5																													4	4	3	Ust Dempster
3.00	49.0																													4	7	1	Dst Touhy
4.00	49.5																													4	7	1	Dst Peterson
Calumet River																																	
326.50	43.0																													2	8	2	O'Brien Lock & Dam
326.10	47.0																													3	8	1	130th St
Little Calumet River																																	
320.00	48.5																													3	8	1	Halstead
324.60	48.5																													3	8	1	I-94
Cal-Sag Channel																																	
1.00	42.0																													2	7	3	Route 83
2.00	37.5																													2	7	3	Ust Cicero

Increasing fill in symbols for positive attributes indicates higher scoring attribute; for negative attributes more fill reflects a more severe condition.

Table 3. Individual cover metrics values of the QHEI from sites assessed in Mar-Apr 2004 in the Chicago area.

Site	QHEI	Undercut Banks	Over-Hanging Veget.	Shallows	Deep Pools	Rootwads	Rootmats	Boulders	Oxbows Side-channels	Aq. Plants	Logs	Cover Amount E	M	S	N	Cover Score
Chicago Sanitary and Ship Canal																
Lockport	40.5		1	1	2			2			1			X		9.0
Romeoville	27.0	1			1										X	4.0
Willow Springs Road	40.5		1		2			2					X			11.0
Harlem Avenue	38.5		1	1	1			2					X	X		10.0
Upstream Cicero Avenue	33.5			1	1			1						X		7.0
Damen Road	32.0	1		1	1	1	1	1						X		10.0
Des Plaines River																
South Shore upstream of Treats Island	45.5			1	2					2	2		X	X		10.0
Downstream Brandon Lock/Dam	69.5		1		2			2		2	1		X			13.0
Chicago River																
Chicago River Junction (Wolf Point)	28.0				1			1			1				X	5.0
Downtown between Wells/Lasalle	22.5				1										X	1.0
Downtown - Inner Harbor Area	24.5				2										X	3.0
North Branch Chicago River																
Downstream Grand Ave	26.0				1										X	3.0
Wilson Road	42.0	1	1		1	1	1				1		X	X		12.0
North Shore Channel																
Upstream/Downstream Sharon Road	42.0	1	1	1	1		1							X		9.0
Upstream Dempster Road	37.5	1	1		1	1	1				1		X	X		12.0
Downstream Touhy	49.0	1	2		1	1	1				2		X			14.0
Downstream Peterson	49.5	1	2		2	2	1				1		X			14.0
Calumet River																
O'Brien Lock & Dam	47.0			1	1	1	1	2			1		X			14.0
130th Street	43.0			2	1			1		2	1			X		9.0
Little Calumet River																
Halstead Street	48.5	1		1	1	1	1	1			2		X			15.0
Dst I-94 Bridge	48.5	1		1	1	1	1				2		X			14.0
Cal-Sag Channel																
Route 83	54.0	1			1			2			1		X			12.0
Upstream Cicero	47.5	1			1			2					X	X		9.0

life use along with knowledge of the feasibility of restoring the limiting factors. Figure 2, for example is a box and whisker plot of influential, positive habitat attributes for large rivers vs. IBI. Loss of these attributes (with concomitant accrual of negative attributes) is associated with limitations to the fish assemblage. It is important to note that the presence of impaired habitat may not result in a lowered use if these habitat features can be feasibly restored, but rather kept at an interim goal or higher use and considered impaired and requiring restoration.

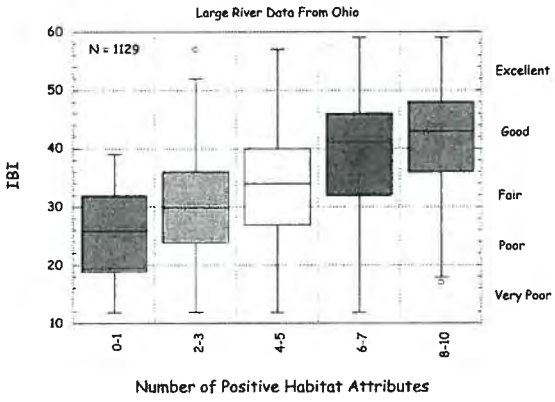

Figure 2. Box and whisker plot of positive habitat attributes vs. IBI for 1129 large river sites (> 500 sq mi) in Ohio.

Conversely, the information collected may indicate that habitat is degraded relative to reference conditions and the habitat conditions are not feasibly restorable in the short term due to factors such as ongoing activities that maintain the water in an altered state (e.g., channel maintenance for ag drainage, flood control) or some systemic limitation that will preclude recovery to a higher aquatic life use. The designation of a non-CWA goal is review able every three years and should not be used to preclude efforts to enhance habitats to achieve some long term aquatic benefits.

Effects of Scale of Disturbance

One of the factors we mentioned above as a factor to consider when examining limitations to aquatic potential is the scale of habitat disturbance. As an example, Figure 3 illustrates the relationship between median QHEI scores by subwatershed in Ohio vs. the 90th percentile IBI score as a measure of the best potential in a watershed. This relationship illustrates that watersheds with very degraded habitats are less able to support aquatic life consistent with the highest aquatic life uses. This suggests that local enhancements or restoration may not achieve desired ecological endpoints when degradation is systemic and widespread. This has important consequences for 1.) setting reasonable short-term goals related to aquatic life potential and 2.) efforts at protecting existing uses to ensure assemblages do not slide down the slope reflected in the regression line of Figure 3.

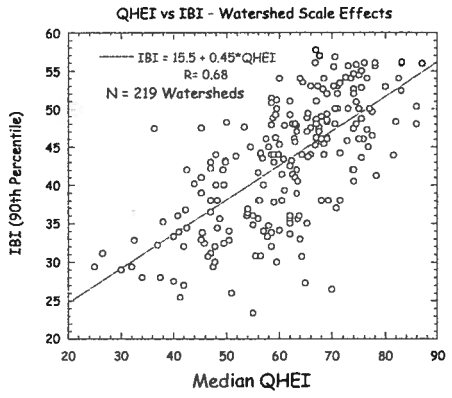

Figure 2. Median QHEI in Huc11 watersheds vs. 90th percentile IBI scores from Ohio streams.

In the following section we will examine each waterbody and summarize the physical limitations and the suggested tier under which it would fit in the Ohio model.

Chicago River [*Aquatic Potential – LRW*]
The Chicago River had the most limited habitat of all the reaches we examined. QHEI scores at all sites were very poor. Functional substrates were essentially nonexistent because of the depth of the channels. Cover or structure for organisms was also either nonexistent or non-functional. The site at the Chicago Rivers junction has a small amount of debris and cover along the north shore, however because of the limited amount and isolation would not support a very diverse or significant population of organisms. The only positive habitat attribute in this reach was water depths greater than 40 cm which are a weak attribute for large rivers. This reach is functionally similar to the Cuyahoga River ship channel which Ohio considered to have limited potential for aquatic organisms because of similar habitats.

Photo 1. Chicago River near confluence in Chicago.

North Branch of the Chicago River. [*Recommended Category: LRW, MWH-C*]
The site downstream of Grand Avenue was similar in nature to the Chicago River sites with deep pools and lack of any developed littoral areas. This aquatic potential of this lower reach was low and would be equivalent to a LRW aquatic life use. Like the Chicago River it had only 1 or 2 positive habitat attributes. We would expect it would not provide habitats for significant populations of sensitive species with most fish being transients or species adapted to pelagic type environments.

Photo 2. North Branch of the Chicago River in the vicinity of Grande Ave.

Upstream reaches of the North Branch Chicago River, however, were similar to the North Shore Channel rather than the Chicago River and had some more littoral areas, but still sparse structure, mostly in the form of overhanging vegetation. This reach provides more edge habitat and structure than the downstream reach. This should support a more permanent assemblage of fish and aquatic life, but still dominated by generalist and tolerant species and taxa. This aquatic potential of this upper reach should be able to support the equivalent of a Modified Warmwater - Channelized (MWH-C) aquatic life use.

Photo 3. North Branch of the Chicago River in the vicinity of Wilson Ave.

North Shore Channel [*Recommended Category: MWH-C*]

The North Shore Channel had poor to fair habitat conditions. Although some sites had some coarse substrates, most were associated with moderate levels of silty-muck and sand substrates and had severe embeddedness especially with distance from the shoreline. As with other reaches, lack of flow or current through and over habitats reduced their quality. A fairly intact, but narrow band of trees provided some cover in the form of overhanging vegetation and small quantities of woody debris although their quality was fairly low. Given the artificial nature of the channel we would expect that the potential of this waterway would be to be able to support a relatively tolerant assemblage of organisms adapted to non-flowing habitats and habitat generalists; species associated with high quality substrates and structure (i.e., warmwater sensitive taxa) would be absent or occur in low numbers. This aquatic potential of this waterway should be able to support the equivalent of a Modified Warmwater - Channelized (MWH-C) aquatic life use.

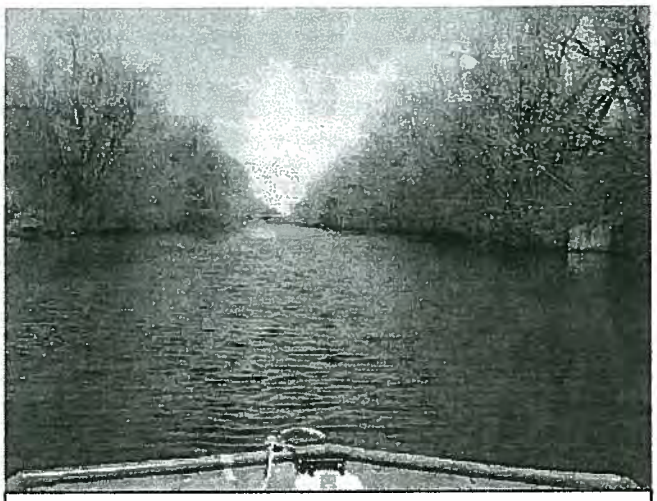

Photo 4. North Shore Channel.

Photo 5. North Shore Channel upstream of Touhy Ave.

Cal-Sag Channel [*Recommended Category: MWH-C*]
The Cal-Sag Channel had QHEI scores in the fair range, largely because of the limestone rubble and coarse materials left behind in the littoral areas from the construction of the channel. Unlike the Wolf Point site on the Chicago River, this littoral habitat is not isolated, but occurs along much of the shoreline. This waterway had four positive habitat attributes with the most important being the substrates and shoreline structure. The deep center region and lack of flowing still significantly limits the functions of offshore habitats.

Photo 6. Typical view of the Cal-Sag Channel

Chicago Sanitary and Ship Channel [*Recommended Category: LRW, MWH-C*]
Habitat in the CSSC ranged from poor to very poor. The sites at Lockport, Romeoville, and Willow Springs Road were canal-like in nature with steep sides and little functional cover or substrates. The site at Lockport was wider and had some littoral habitat, however, this were very limited in scope and were extremely embeddeded with silty mucks and sand that were of poor quality.

The CSSC widened out between Harlem and Cicero and gained some shoreline shallows that provide a bit more habitat likely to support a slightly better assemblage than in the narrower, more canal like reaches. These sites may be able to support a MWH-C

category of fauna – still mostly tolerant, but with sufficient habitat in a longitudinal direction to support such a community.

Photo 7. Chicago Sanitary Ship Canal in the vicinity of the electric fish barrier

Photo 8. Chicago Sanitary Ship Canal not far from its confluence with the Cal-Sag

Photo 9. Chicago Sanitary Ship Canal in the vicinity of Harlem Avenue.

Calumet River and the Little Calumet River [*Recommended Category: MWH-C/MWH-I*]

The habitat in the Calumet River and the Little Calumet River was generally in the lower range of fair with one site in the Calumet classified as poor. The site on the Calumet near the O'Brien Lock and Dam was barely had some coarse substrates although silt-sand mixes around the coarser substrates limited their functionality. The Calumet and the Little Calumet both had more variation in channel form than did some waterways such as the Chicago River and the CSSC. Both sites in the Little Calumet River had similar habitat quality. Both sites had moderate cover along the shorelines and 4-5 cover types although most were present were of fairly low quality (see Table 2). There were also some coarse substrates although there was also abundant silt/muck/sand substrates mixed in which became more prevalent with distance from shore. These reaches should be able to support a MWH-Channelized category and may be able to support the MWH-Impounded use which typically has larger populations of non-tolerant species (e.g., certain top carnivores).

Photo 10. Calumet River at 130th Street

Photo 11. Little Calumet River at Hallstead Street.

Des Plaines River [*Recommended Category: MWH-I, Other*]
Although modified and impounded in most reaches, one of the two sites on the Des Plaines had the highest quality of the sites we examined downstream of the Brandon Road Dam. The site downstream of this dam may not be typical of the downstream reaches, however in upper portion was a relatively high quality rapids area that was fairly extensive and if available to downstream and upstream reaches could harbor more sensitive taxa more typical of a natural larger river. Although impounded and subjected to barge and ship traffic the Des Plaines had a more "natural" shoreline morphology than did most of the other waterways we examined. It appeared that there were much more extensive shallows and cover along the edges, although the lack of flow throughout much of the reach we boated through would limit species and taxa dependent on flow. Based on the preliminary data we collected we suggest that the Ohio Modified Warmwater Habitat Use for impounded rivers (MWH-I) would be most appropriate category. The upper most site had habitat quality generally associated with a WWH river, however the isolation of this site (among impounded reaches) could influence the potential of that site.

Conclusions

The above conclusions were based on the QHEI data collected in a week in late March and early April in 2004. It was based on habitat data alone and for this draft I did not have access to any biological data. As mentioned in the introduction, the biological assemblages are the ultimate arbiter of aquatic life and can contribute useful insights into the potential of a site, even when affected by other stressors. Abundances and condition of organisms, even tolerant ones can provide insight into the magnitude of habitat resources. Given that caveat, the physical patterns in these watersheds are very strong and will have a predominant influence on the types of assemblages one might expect. Most of these watersheds have major commercial uses (e.g., barge traffic on the CSSC) that can add important limiting influences. In addition the systemic alteration and urbanization also contributes to the physical limitations we observed.

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Appendix I. Aquatic Life Uses in Ohio Water Quality Standards (Taken from Ohio EPA 2000) Ohio EPA has employed the concept of tiered aquatic life uses in the Ohio Water Quality Standards (WQS) since 1978. These tiers recognize that 1.) even under minimally impacted conditions, not all streams have the same inherent potential to harbor aquatic life, 2.) some streams have been, essentially, irretrievably altered (e.g., streams have been physically modified and are being maintained in this state for drainage or flood control) and cannot support the same diverse assemblage of aquatic life found in least impacted waters, and 3.) some of the variation in aquatic life expectation is related to underlying natural factors, partly explained through the partitioning of expectation by "ecoregions. Aquatic life uses in Ohio include the Warmwater Habitat (WWH), Exceptional Warmwater Habitat (EWH), Cold Water Habitat (CWH), Seasonal Salmonid Habitat (SSH), Modified Warmwater Habitat (three subcategories: channel-modified, MWH-C; mine affected, WWH MWH-A; and impounded, MWH-I), Limited Resource Water (LRW), and the now defunct Limited Warmwater Habitat (LWH) designations. Each of these use designations is defined in the Ohio WQS (OAC 3745-1).

Water quality standards constitute the numerical and/or narrative criteria that, when achieved, will presumably protect a given designated use. Chemical-specific criteria serve as the "targets" for wasteload allocations conducted under the TMDL (Total Maximum Daily Load) process. This is used to determine water quality-based effluent limits for point source discharges and, theoretically, load allocations for nonpoint source BMPs (Best Management Practices). Whole effluent toxicity limits consist of acute and chronic endpoints (based on laboratory toxicity tests) and are based on a dilution method similar to that used to calculate chemical-specific limits. The biological criteria are used to directly determine aquatic life use attainment status for the EWH, WWH, and MWH use designations as is stated under the definition of each in the Ohio WQS. The aquatic life uses are briefly described as follows:

EWH (Exceptional Warmwater Habitat) - This is the most protective use assigned to warmwater streams in Ohio. Chemical-specific criteria for dissolved oxygen and ammonia are more stringent than for WWH, but are the same for all other parameters. Ohio's biological criteria for EWH applies uniformly statewide and is set at the 75th percentile index values of all reference sites combined. This use is defined in the Ohio WQS (OAC 3745-1- 07[B][1][c]).

WWH (Warmwater Habitat) -WWH is the most widely applied use designation assigned to warmwater streams in Ohio. The biological criteria vary by ecoregion and site type for fish and are set at the 25th percentile index values of the applicable reference sites in each ecoregion. A modified procedure was used in the extensively modified HELP ecoregion. This use is defined in the Ohio WQS (OAC 3745-1-07[B][1][a]).

MWH (Modified Warmwater Habitat) - This use was first adopted in 1990 is assigned to streams that have had extensive and irretrievable physical habitat modifications. The

MWH use does not meet the Clean Water Act goals and therefore requires a Use Attainability Analysis. There are three subcategories: MWH-A, non-acidic mine runoff affected habitats; MWH-C, channel modified habitats; and MWH-I, extensively impounded habitats. The chemical-specific criteria for dissolved oxygen and ammonia are less stringent (and the HELP criteria are less stringent than other ecoregions) than WWH, but criteria for other parameters are the same. Biological criteria were derived from a separate set of modified reference sites. The biocriteria were set separately for each of three categories of habitat impact. The MWH-C and MWH-I subcategory biocriteria were also derived separately for the HELP ecoregion. The MWH-A applies only within the WAP ecoregion. This use is defined in the Ohio WQS (OAC 3745-1- 07[B][1][d]).

LRW (Limited Resource Waters) - This use is restricted to streams that cannot attain even the MWH use due to extremely limited habitat conditions resulting from natural factors or those of anthropogenic origin. Most streams assigned to this use have drainage areas <3 sq. mi. and are either ephemeral, have extremely limited habitat (with no realistic chance for rehabilitation), or have severe and irretrievable acid mine impacts. Chemical-specific criteria are intended to protect against acutely toxic or nuisance conditions. There are no formal biological criteria. This use is defined in the Ohio WQS (OAC 3745-1- 07[B][1][g]) and was formerly known as the Nuisance Prevention use designation, which is being phased out of the WQS.

LWH (Limited Warmwater Habitat) - This use was adopted in 1978 to act as a temporary "variance" mechanism for individual segments that had point source discharges that were not capable of meeting the 1977 Clean Water Act mandates. The process of phasing this use designation out of the WQS has been underway since 1985. Chemical-specific criteria were varied for selected parameters, otherwise the criteria for the remaining parameters were the same as for the WWH use. In 1985 all of the LWH segments were placed in a "reserved" status pending a Use Attainability Analysis for each segment.

SSH (Seasonal Salmonid Habitat) - This use designation was introduced in 1985 and is assigned to habitats that are capable of supporting the passage of Salmonids between October and May. Another use designation applies during the remaining months. Several tributaries to Lake Erie are so designated. This use is defined in the Ohio WQS (OAC 3745-1-07[B][1][e]).

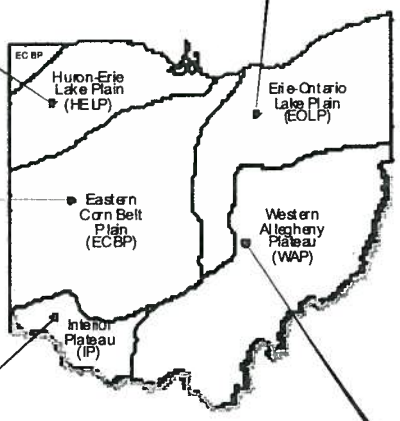
CWH (Coldwater Habitat) - This use includes streams that are capable of supporting cold water aquatic organisms and/or put-and-take Salmonid fishing. This use is defined in the Ohio WQS (OAC 3745-1-07[B][1][f]).

Huron Erie Lake Plain (HELP)

Use	Size	IBI	Mlwb	ICI
WWH	H	28	NA	34
	W	32	7.3	34
	B	34	8.6	34
MWH-C	H	20	NA	22
	W	22	5.6	22
	B	20	5.7	22
MWH-I	B	30	5.7	NA

Erie Ontario Lake Plain (EOLP)

Use	Size	IBI	Mlwb	ICI
WWH	H	40	NA	34
	W	38	7.9	34
	B	40	8.7	34
MWH-C	H	24	NA	22
	W	24	6.2	22
	B	24	5.8	22
MWH-I	B	30	6.6	NA



Eastern Corn Belt Plain (ECBP)

Use	Size	IBI	Mlwb	ICI
WWH	H	40	NA	36
	W	40	8.3	36
	B	42	8.5	36
MWH-C	H	24	NA	22
	W	24	6.2	22
	B	24	5.8	22
MWH-I	B	30	6.6	NA

Interior Plateau (IP)

Use	Size	IBI	Mlwb	ICI
WWH	H	40	NA	30
	W	40	8.1	30
	B	38	8.7	30
MWH-C	H	24	NA	22
	W	24	6.2	22
	B	24	5.8	22
MWH-I	B	30	6.6	NA

Western Allegheny Plateau (WAP)

Use	Size	IBI	Mlwb	ICI
WWH	H	44	NA	34
	W	44	8.4	34
	B	40	8.6	34
MWH-C	H	24	NA	22
	W	24	6.2	22
	B	24	5.8	22
MWH-A	H	24	NA	30
	W	24	5.5	30
	B	24	5.5	30
MWH-I	B	30	6.6	NA

Statewide Exceptional Warmwater Habitat (EWH) Biocriteria

Use	Size	IBI	Mlwb	ICI
EWH	H	50	NA	46
	W	50	9.4	46
	B	48	9.6	46

Map 1. Ohio Biocriteria.