

WATER QUALITY STANDARDS IN OHIO SCIOTO BRUSH CREEK WATERSHED

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C1 Introduction

TMDLs are developed as a step towards achieving water quality standards (WQS) in waters where the standards are not being met. The purpose of WQS is to protect public health and wellbeing and ensure that public water resources can be utilized to their full potential.

The basis of water quality standards across the United States is the Clean Water Act (CWA). This legislation was passed by Congress in 1972 with the intent to address the growing need to restore and protect the country's deteriorated water resources. Its objective is to restore the quality of the nation's waters in terms of chemical, physical and biological integrity, ultimately protecting for recreation and the propagation of fish, shellfish, and wildlife.

Under the CWA, authority is extended to all states and tribal nations to develop their own set of WQS, which must be as protective of the use as the federal standards. Ohio has developed WQS that are consistent with the CWA.

WQS are made up of three basic parts: beneficial uses, water quality criteria, and antidegradation. Water resources are assigned beneficial **use designations** which reflect the kinds of activities or conditions that the waters can reasonably be expected to support. Examples include public water supplies, recreation, and supporting fish and other aquatic organisms. **Water quality criteria** are the "measuring stick" used to determine if each of the use designations are being met. When the criteria are violated there is impairment of the use. **Antidegradation** serves to restrict further degradation of water quality from current conditions.

C2 Use Designations

In Ohio the uses of surface waters are divided into three broad categories which deal with supply, recreation, and the support of aquatic life. Supply uses deal with direct human consumption of water, livestock watering, crop irrigation, or water use in some industrial or other process. For supply uses, the water resource is evaluated in terms of its chemical quality and the presence of microbial organisms. Recreation uses deal with the safety of the water for human contact where incidental ingestion may occur and/or direct contact with the skin, eyes, or other body parts. The presence of harmful microbes is the basis for evaluation. Aquatic life uses require taking a broader view of the water resource where not only water chemistry is relevant but also the physical nature of the system itself, namely the stream's habitat features and flow regime. Table C-1 lists each of Ohio's beneficial use designations and describes the defining features of the use category and a general assessment of the implications to its associated water quality criteria.

As conditions or circumstances change, sometimes it is appropriate to change a use designation. Examples might include a stream that recovers from past channelization and regains habitat suitable for a healthier aquatic community or streams that increase in the frequency of recreation use due to new boating opportunities. Determining the appropriate use designations for a water body uses a process called a use attainability analysis (UAA), which is based on the best information available. The factors to be considered include the physical, chemical, biological, and economic use removal criteria described in EPA's water quality standards regulation (40 CFR 131.10).

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Use designations for Ohio’s water bodies are codified in the Ohio Administrative Code (OAC) 3745-07 through 3745-32. Changing a use designation requires a rulemaking procedure which includes an opportunity for public review of the proposed action.

Table C-1. Water use designations applied to water bodies throughout Ohio.

Beneficial Use Designation	Key Attributes (or Why a Water Would be Designated the Beneficial Use)	Practical Impacts
<i>Designations for the Protection of Aquatic Life Uses (see Figure C-1 for distribution of use designations in Ohio)</i>		
Coldwater habitat - <u>Subcategories</u> - inland trout streams - native fauna	Native cold water or cool water species; put-and-take trout stocking	More stringent ammonia, cyanide, dissolved oxygen, phenol, pH, silver, and temperature criteria; may result in additional wastewater treatment requirements
Exceptional warmwater habitat	Unique and diverse assemblage of fish and invertebrates	More stringent temperature, dissolved oxygen, and ammonia criteria; may result in additional wastewater treatment requirements
Seasonal salmonid habitat	Supports lake run steelhead trout fisheries	More stringent ammonia, cyanide, dissolved oxygen, phenol, pH, silver, and temperature; slightly more restrictive chlorine disinfection practices
Warmwater habitat	Typical assemblages of fish and invertebrates, similar to least impacted reference conditions	Baseline regulatory requirements in line with Clean Water Act “fishable goal” expectations
Limited warmwater habitat	Temporary designations based on 1978 WQS and not subjected to use attainability analysis; being phased out	Exempt from TDS criteria and may also be exempt from pH, iron and zinc criteria as well
Modified warmwater habitat	Tolerant assemblages of fish and macro-invertebrates, but otherwise similar to WWH; irretrievable condition precludes complete recovery to reference condition	Less restrictive requirements for dissolved oxygen and ammonia; may result in less restrictive wastewater treatment requirements
Limited resource waters	Fish and macroinvertebrates severely limited by physical habitat or other irretrievable condition	Less restrictive aquatic life criteria for majority of pollutants; may result in less restrictive wastewater treatment requirements
<i>Designations for the Protection of Recreational Activities</i>		
Bathing waters	Bathing beach with lifeguards/bath house; greatest potential exposure to bacteria	Lowest risk of swimmer’s illness after exposure; greater disinfection of wastewater
Class A primary contact recreation	All lakes with publicly or privately improved access points; otherwise specifically designated in rule	Relatively low risk of illness from normal water recreation activities

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Beneficial Use Designation	Key Attributes (or Why a Water Would be Designated the Beneficial Use)	Practical Impacts
Class B primary contact recreation	All waters of the state receive this designation unless they meet the criteria for other recreation uses	Intermediate risk of illness from normal water recreation activities
Class C primary contact recreation	All historically channelized waterways that have a drainage area of less than 3.1 square miles; otherwise specifically designated in rule	Intermediate risk of illness from normal water recreation activities
Secondary contact recreation	Water depth precludes full body immersion; low proximity to residential areas; lowest potential exposure to bacteria	Greatest risk of swimmer's illness after exposure; slightly less disinfection of wastewater
<i>Designations for the Protection of Water Supplies</i>		
Public water supply	All waters within 500 yards of all public water supply surface water intakes, all publicly owned lakes and reservoirs, all privately owned lakes and reservoirs used as a drinking water source, all emergency water supplies	Maintain or improve potable water supplies, reduce water treatment costs; upstream dischargers may face more stringent limits in order to meet PWS criteria at point of water withdrawal
Agricultural water supply	Water used, or potentially used, for livestock watering and/or irrigation	Limited impact; as a practical matter other standards are generally protective of this use, except for a limited number of heavy metals in unique situations
Industrial water supply	Water used for industrial purposes	No impact; no criteria contained in rule; criteria may be established on case specific basis but as a practical matter this has never been needed because other standards are protective of this use.

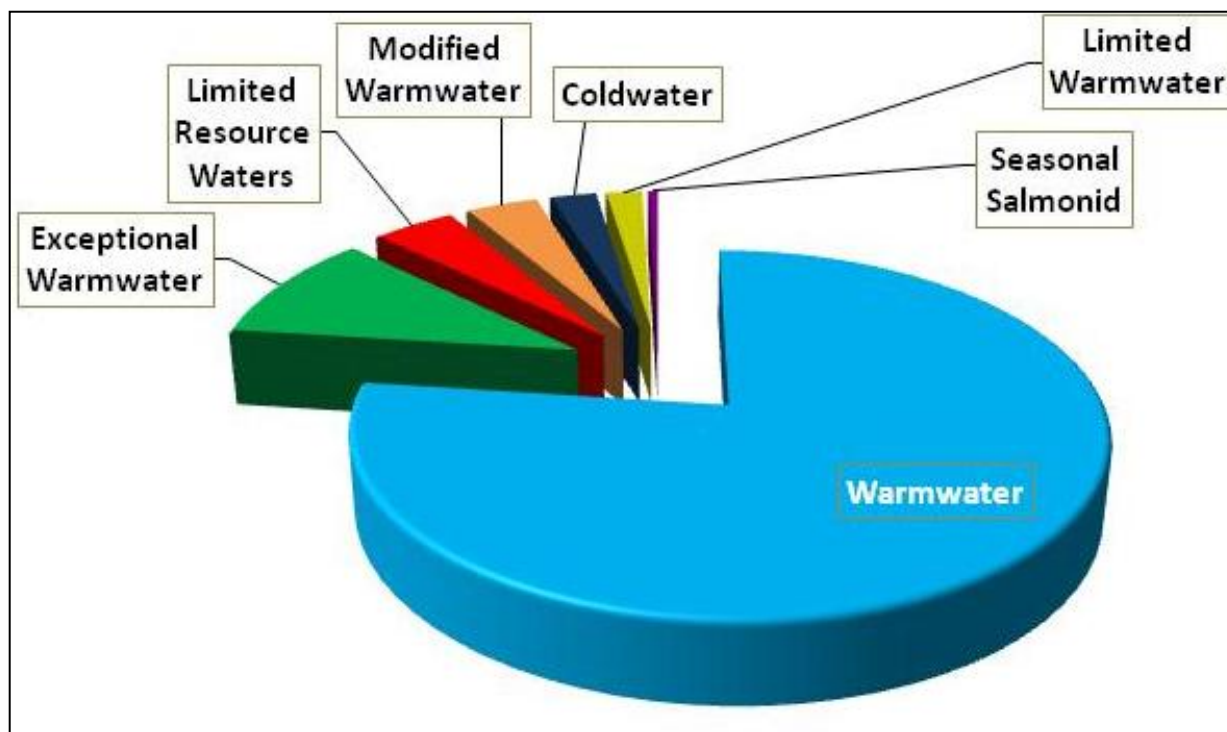


Figure C-1. Distribution of aquatic life use designations applied to Ohio water bodies.

C3 Water Quality Criteria

Water quality criteria are developed to define and protect a level of water quality that will sustain a water body's designated uses. When a violation of the criteria is observed, the designated use is not being met. Designated uses often have several different criteria established for their protection such as concentration limits for several different metal and organic compounds. Aquatic life uses are evaluated using three criteria based on biological indices. Use attainment decisions are predicated on the results of each of these metrics when the scores are available. A violation of some but not all of the biological criteria results in **partial attainment** of the use, while a violation of all of the biological criteria places the water body in a **nonattainment** category. When all of the applicable water quality biological criteria are met the water body is in **full attainment** of its use.

Ohio's water quality criteria are expressed both numerically and narratively. Numeric criteria are estimations of concentrations of chemicals and degree of aquatic life toxicity allowable in a water body without adversely impacting its beneficial uses. Although numeric criteria are applied to water bodies, they primarily are used to regulate dischargers through NPDES permits. The criteria are used to calculate how much of each pollutant is allowed in waste water. Table C-2 highlights the criteria established to protect recreation uses and Table C-3 displays the biological criteria to protect aquatic life uses.

Narrative "free froms," located in [rule 3745-1-04](#) of the OAC, are general water quality criteria that apply to all surface waters. These criteria state that all waters shall be free from sludge, floating debris, oil and scum, color and odor producing materials, substances that are harmful to human, animal or aquatic life, and nutrients in concentrations that may cause algal blooms. Much of Ohio EPA's present strategy regarding water quality based permitting is based upon

the narrative free from, “no toxics in toxic amounts.” Ohio EPA developed its strategy based on an evaluation of the potential for significant toxic impacts within the receiving waters. Very important components of this evaluation are the biological survey program and the biological criteria used to judge aquatic life use attainment.

C3.1 Recreation Criteria

Water bodies are held to recreation use criteria only during time of the year when people are most likely to be engaging in water activities such as swimming, wading, or boating. This recreation season has been defined as starting on May first and ending on October thirty-first.

Criteria are established to protect against disease causing organisms that may be ingested or introduced to the eyes, skin or other body parts during water recreation. The criteria are set for maximum concentrations of bacteria associated with human or animal wastes which serve as surrogates for a wide array of disease causing organisms that are much more difficult to detect due to their relatively low concentrations in the environment and the variety of methods needed to correctly identify them. Table C-2 displays the criteria for the various recreation use designations (from Table 7-13 of OAC 3745-1-07).

Table C-2. Water quality criteria established for recreation uses within water bodies throughout Ohio.

Recreation Use	<i>E. coli</i> (colony forming units per 100 ml)	
	Seasonal Geometric Mean	Single Sample Maximum ¹
Bathing water	126	235 ^a
Class A primary contact recreation	126	298
Class B primary contact recreation	161	523
Class C primary contact recreation	206	940
Secondary contact recreation	1030	1030

¹ Except as noted in footnote a, these criteria shall not be exceeded in more than ten per cent of the samples taken during any thirty-day period.

^a This criterion shall be used for the issuance of beach and bathing water advisories.

Water bodies with a designated recreation use of PCR “...are suitable for one or more full-body contact recreation activities such as, but not limited to, wading, swimming, boating, water skiing, canoeing, kayaking, and scuba diving” [OAC 3745-1-07 (B)(4)(b)]. There are three classes of PCR use to reflect differences in the potential frequency and intensity of use. Streams designated PCR class A support, or potentially support, frequent primary contact recreation activities. Streams designated PCR class B support, or potentially support, occasional primary contact recreation activities. Streams designated as PCR class C support, or potentially support, infrequent primary contact recreation activities. Streams designated as SCR use are rarely used for water-based recreation.

C3.2 Aquatic Life Biocriteria

Ohio uses biocriteria to determine if aquatic life uses are being met. Biological criteria are based on aquatic community characteristics that are measured both structurally and functionally. The biocriteria use three multi-metric indices that are each based on measures of the aquatic community (e.g., number of different species). The use of biocriteria is an exceptional way for determining if aquatic life uses are being met since the use is measured

directly instead of using less reliable surrogate measures. Investigations into the water quality problems that lead to impaired aquatic life uses is carried out through field observations and analysis of the water quality data collected. A weight of evidence approach is taken in linking the impaired biological community to specific environmental stressors such as a pollutant or poor habitat quality.

The three multi-metric indices used by Ohio EPA are the Index of Biotic integrity (IBI), the Modified Index of well being (MIwb) and the Invertebrate Community Index (ICI). These three indices are based on species richness, trophic composition, diversity, presence of pollution-tolerant individuals or species, abundance of biomass, and the presence of diseased or abnormal organisms. The IBI and the MIwb apply to fish; the ICI applies to macroinvertebrates. Ohio EPA uses the results of sampling reference sites to set minimum criteria index scores for use designations in water quality standards. Table C-3 displays the criteria for the various aquatic life use designations in different ecoregions of the state while Figure C-2 is a map of the ecoregion boundaries in Ohio.

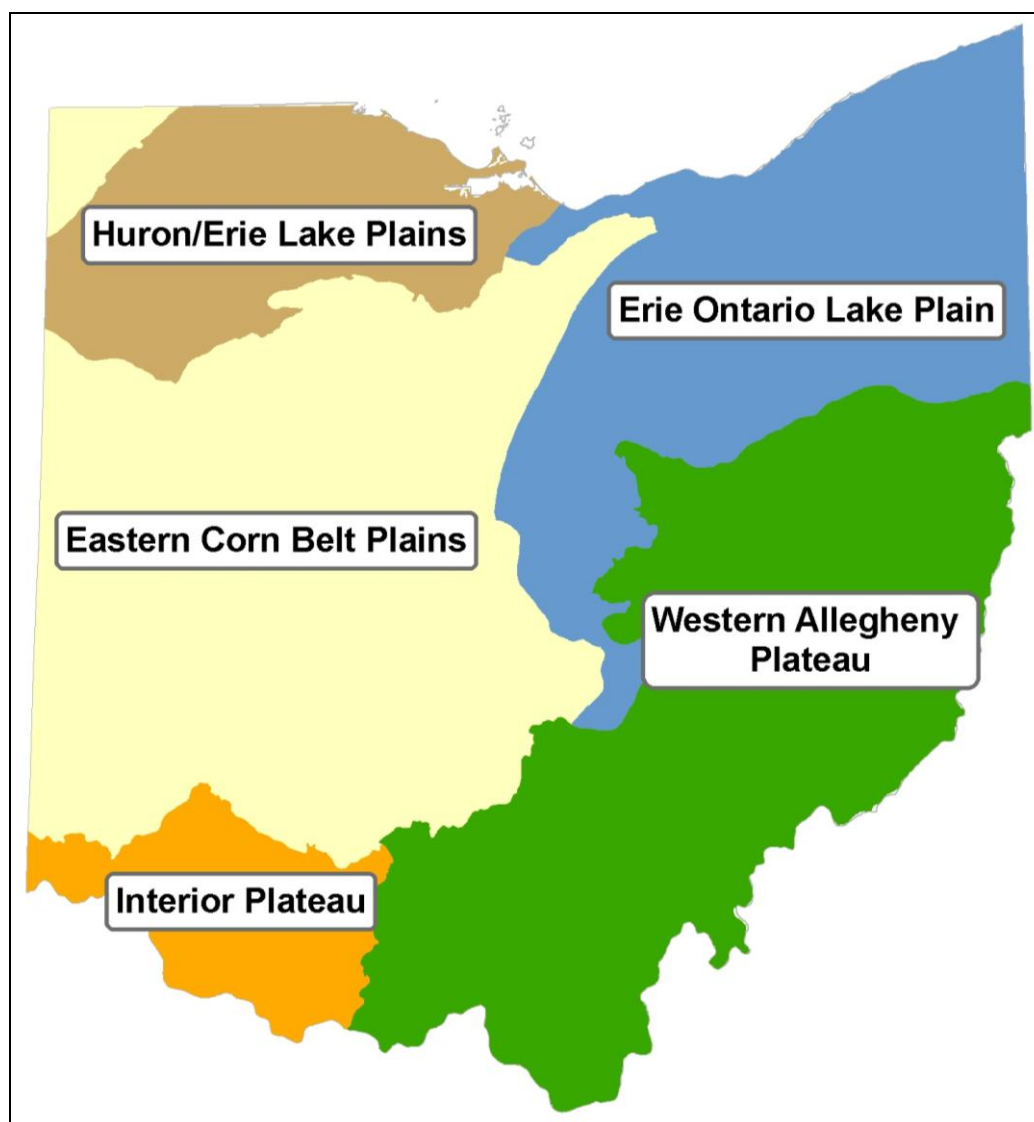


Figure C-2. Ecoregions of Ohio.

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Table C-3. Biological criteria applicable to rivers and streams throughout Ohio for three aquatic life use designations.

Note: Criteria are established based on ecoregion and assessment method.

Ecoregion	Biological Index	Assessment Method ^{2,3}	Biological Criteria for the Applicable Aquatic Life Use Designations ¹		
			WWH	EWH	MWH ⁴
Eastern Cornbelt Plains (ECBP)	IBI	Headwater	40	50	24
		Wading	40	50	24
		Boat	42	48	24 / 30
	MIwb	Wading	8.3	9.4	6.2
		Boat	8.5	9.6	5.8 / 6.6
ICI	All ⁵	36	46	22	
Erie-Ontario Lake Plains (EOLP)	IBI	Headwater	40	50	24
		Wading	38	50	24
		Boat	40	48	24 / 30
	MIwb	Wading	7.9	9.4	6.2
		Boat	8.7	9.6	5.8 / 6.6
ICI	All ⁵	34	46	22	
Huron-Erie Lake Plains (HELP)	IBI	Headwater	28	50	20
		Wading	32	50	22
		Boat	34	48	20 / 22
	MIwb	Wading	7.3	9.4	5.6
		Boat	8.6	9.6	5.7 / 5.7
ICI	All ⁵	34	46	22	
Interior Plateau (IP)	IBI	Headwater	40	50	24
		Wading	40	50	24
		Boat	38	48	24 / 30
	MIwb	Wading	8.1	9.4	6.2
		Boat	8.7	9.6	5.8 / 6.6
ICI	All ⁵	30	46	22	
Western Allegheny Plateau (WAP)	IBI	Headwater	44	50	24 // 24
		Wading	44	50	24 // 24
		Boat	40	48	24 / 30 / 24
	MIwb	Wading	8.4	9.4	6.2 // 5.5
		Boat	8.6	9.6	5.8 / 6.6 / 5.4
ICI	All ⁵	36	46	22 // 30	

¹ Coldwater habitats (CWH), limited warmwater habitat (LWH), resource waters (LRW) and seasonal salmonid habitat (SSH) do not have associated biological criteria.

² The assessment method used at a site is determined by its drainage area (DA) according to the following:

Headwater: DA ≤ 20 mi²; wading: DA >20 mi² and ≤ 500 mi²; boat: DA > 500 mi²

³ MIwb not applicable to drainage areas less than 20 mi².

⁴ Biocriteria depend on type of MWH. MWH-C (due to channelization) is listed first, MWH-I (due to impoundment) is listed second, and MWH-A (mine affected) is listed third (only applicable in the WAP).

⁵ Limited to sites with appropriate conditions for artificial substrate placement.

C3.3 Public Drinking Water Supply Criteria

The Public Drinking Water Supply (PDWS) beneficial use represents the intersection of the Clean Water Act and the Safe Drinking Water Act (SDWA). The goal is for Ohio public water systems to produce safe drinking water using only conventional treatment, resulting in reduced financial cost to communities and minimized risk to human health. Ohio applies the public drinking water supply use to all waters within 500 yards of an active public drinking water supply intake and all publically owned lakes. Ohio EPA has developed a set of water quality criteria for protection of the PDWS use and applies the criteria to water quality data collected in the raw source water.

The water quality standards for protection of the public drinking water supply use were developed with the acknowledgment that source waters undergo a certain amount of treatment and contaminant removal prior to human consumption. This baseline expectation of treatment was defined as “conventional treatment” and includes conventional filtration, coagulation, flocculation, sedimentation and disinfection. Source waters meeting these instream water quality standards could be treated with conventional processes only in order to comply with Safe Drinking Water Act (SDWA) standards for finished water. Therefore, instream standards for source water contaminants not effectively removed by conventional processes are based directly on the finished water SDWA standards.

Ohio is focusing on contaminants that pose the greatest risk to human health, impact treatment costs, and can be controlled within the watershed through source water protection efforts or existing permit programs. Initially, the focus is on nitrate, pesticides, microbial pathogens (*Cryptosporidium*) and other contaminants with established SDWA standards. Treatment options for these contaminants often exceed conventional measures and can be quite costly. Assessments in the future will be expanded as additional water quality standards are established.

C3.4 Human Health Criteria

Ohio has adopted human health WQS criteria to protect the public from adverse impacts, both carcinogenic and non-carcinogenic, due to exposure via drinking water (applicable at public water supply intakes, see Section C3.3) and to exposure from the contaminated flesh of sport fish (applicable in all surface waters). Specific criteria for pollutant concentrations to protect human health are found in [rule 3745-1-33](#) and [rule 3745-1-34](#) of the OAC.

The purpose of the non-drinking water criterion is to ensure levels of a chemical in water do not bioaccumulate in fish to levels harmful to people who catch and eat the fish. Ohio measures contaminants in fish tissue and uses the data in two comparisons: (1) to determine if the human health criteria are being violated, thus identifying the water for restoration through a TMDL or other action, and (2) to determine the quantity of sport fish that may be safely consumed with the water in the current condition.

Two common contaminants in fish tissue in Ohio are polychlorinated biphenyls (PCBs) and mercury. PCBs are currently banned from use in the U.S. and are expected to decrease in streams over time. Mercury is a ubiquitous contaminant in streams throughout the U.S. and its primary source is thought to be mercury deposited from the atmosphere. Mercury as a surface water pollutant is being addressed in a variety of ways outside of the traditional TMDL process, including limits on mercury emissions from air sources, mercury take-back programs, and legislation prohibiting the sale of most mercury-containing products. Unless there are known or

suspected local surface water sources, reducing the levels of these pollutants is more effectively accomplished via general source reduction than through individual watershed TMDLs.

Information regarding fish consumption advisories can be found at:
<http://www.epa.ohio.gov/dsw/fishadvisory/index.aspx>.

C4 Antidegradation

Antidegradation refers to provisions that must be followed before authorizing any increased activity on a water body that may result in a lowering of water quality including an increase in the discharge of a regulated pollutant, or activities that may significantly alter the physical habitat. The antidegradation rule is required by the Clean Water Act and federal regulations. Antidegradation must be a part of any state's water quality standards program. The antidegradation rule is the last of three elements required in a water quality standards program. The antidegradation rule must protect the existing use of the water body and allow a lowering of water quality only when it is necessary to support important social and economic development. Simply put, the antidegradation rule establishes a procedure to determine that a discharge is necessary before authorizing it.

The state's antidegradation rule establishes procedures and requirements to ensure that the concepts outlined by the federal regulations are met. These requirements include public participation activities, intergovernmental coordination, a determination of important social and economic development, an alternatives analysis and greater protection for exceptional quality streams. Table C-4 lists Ohio's antidegradation categories, key attributes of that category, and the associated practical impacts regarding activities involving that water resource.

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Table C-4. Antidegradation categories used for water bodies throughout Ohio.

Category	Key Attributes or Why a Water Would be Designated in the Category	Practical Impacts Bold = Stream Segments/Miles Classified in Rule
Outstanding national resources waters (Tier 3)	Water has unique attributes and has national significance; may not be adequately protected by beneficial use classification system	Very restrictive, no lowering of water quality permitted (exceptions allowed for short term disturbances) Zero miles
Outstanding state waters (exceptional <u>ecological</u> value) (Tier 2+)	Water is among the <u>very best within Ohio</u> ; supports very diverse aquatic life and endangered or threatened species	<u>70 % set aside</u> implemented to preserve water quality near existing condition; more stringent pollution controls for new sources; social/economic justification (SEJ) needed to lower water quality 36 stream segments, 1,113 miles
Outstanding state waters (exceptional <u>recreational</u> value) (Tier 2+)	Water body supports <u>highly valued or unique recreational usage</u>	Set asides are not in effect; all activities covered by the rule must comply with special provisions to ensure there is no increase in bacteriological pollution and to minimize floating debris and other aesthetic problems [OAC 3745-1-05(C)(6)(e)] 2 stream segments, 119 Miles
Superior high quality waters (Tier 2+)	Supports diverse aquatic life and endangered or threatened species	<u>35 % set aside</u> implemented to preserve water quality above the minimum standards required under beneficial use; more stringent pollution controls for new sources; SEJ needed to lower water quality 121 stream segments, 1,320 miles
State resource waters - general high quality waters (Tier 2)	Diversity of aquatic life unknown or typical of a warmwater community; water body listed in 1978 (or later) as SRW based on adjacent park or preserve	Must meet applicable standards, requires an SEJ and determination of need before water quality is lowered; special attention to review criteria in OAC 3745-1-05(C)(5)(d) is provided 487 stream segments from prior rule making designations
General high quality waters (Tier 2)	Supports typical aquatic life community	Must meet applicable standards, requires an SEJ and determination of need before water quality is lowered 57,970 miles
Limited quality waters	Waters with use attainability analysis completed with beneficial use designation assigned as limited resource water, limited warmwater or modified warmwater habitat; category one wetlands	Must meet applicable standards, but no SEJ review needed to lower water quality