Water Quality Targets www.IN.gov/idem/nps/3484.htm

The IDEM Watershed Management Plan (WMP) Checklist (2009) requires groups to identify targets for water quality parameters of concern. A target is defined as the desired measured level of a water quality or habitat/ biological parameter that a group has decided streams in the watershed should meet.

Where an Indiana Water Quality Standard or TMDL exists for a parameter of concern, the watershed group must, at a minimum, set the target to meet the respective standard or the loading limit set in the TMDL. Groups obviously are welcome to set more stringent targets if they wish. **Table 1** shows water quality parameters watershed groups are often concerned with and which have an Indiana Water Quality Standard.

A complete list of Indiana's Water Quality Standards can be found in the Indiana Administrative Code (www.IN.gov/legislative/iac/T03270/A00020.PDF **; scroll down to Rule 6**).

Table 1

Parameter	Target	Reference/Other Information
Total Ammonia (NH3)	Range between 0.0 and 0.21 mg/L depending upon temperature and pH	Indiana Administrative Code (IAC)
Atrazine	Max: 3.0 ppb	U.S. EPA Drinking Water Standard
Dissolved Oxygen (DO)	Min. 4.0 mg/L Max: 12.0 mg/L	Indiana Administrative Code (IAC)
	Min: 6.0 mg/L in coldwater fishery streams	Indiana Administrative Code (IAC)
	Min: 7.0 mg/L in spawning areas of coldwater fishery streams	Indiana Administrative Code (IAC)
E. coli	Max: 235 CFU/ 100mL in a single sample	Indiana Administrative Code (IAC)
	Max: Geometric Mean of 125 CFU/ 100mL from 5 equally spaced samples over a 30-day period	Indiana Administrative Code (IAC)
Nitrate	Max: 10 mg/L in waters designated as a drinking water source	Indiana Administrative Code (IAC)
Nitrite	Max: 1 mg/L in waters designated as a drinking water source	Indiana Administrative Code (IAC)
Nitrate-N + Nitrate-N	Max: 10 mg/L in waters designated as a drinking water source	Indiana Administrative Code (IAC)
Temperature	Dependant on time of year and whether stream is designated as a cold water fisheries	Indiana Administrative Code (IAC)

Many of the water quality parameters; watershed groups are concerned with, do not have a standard. In these instances groups are free to set whatever target they deem appropriate, but that freedom can be overwhelming given the myriad of targets being used across the county. This guidance does not attempt to tell watershed groups what targets to choose, but rather, lists in **Table 2** several targets used by other watershed groups in Indiana and the source of those targets. IDEM hopes this information helps watershed groups wisely choose water quality targets for their specific watershed.

Table 2		
Parameter	**Target**	**Reference/Other Information**
Nitrate-nitrogen (NO3)	Max: 0.633 mg/L	U.S EPA recommendation *
	Max: 1.0 mg/L	Ohio EPA recommended criteria for Warm Water Habitat (WWH) headwater streams and Modified Warm Water Habitat (MWWH) headwater streams
	1.5 mg/L	Dividing line between mesotrophic and eutrophic streams (Dodd et al. 1998)
	10.0 mg/L	IDEM draft TMDL target
Ortho-Phosphate also known as Soluble reactive phosphorus (SRP)	Max: 0.005 mg/L	Wawasee Area Conservancy Foundation recommendation for lake systems
Suspended Sediment Concetration (SSC)	Max: 25.0 mg/L	U.S. EPA recommendation for excellent fisheries
	Range: 25.0-80.0 mg/L	U.S. EPA recommendation for good to moderate fisheries
Total Kjeidahl Nitrogen (TKN)	Max: 0.591 mg/L	U.S. EPA recommendation *
Total Phosphorus	Max: 0.076 mg/L	U.S. EPA recommendation
	Max: 0.07 mg/L	Dividing line between mesotrophic and eutrophic streams (Dodd et al. 1998)
	Max: 0.08 mg/L	Ohio EPA recommendation to protect aquatic biotic integrity in WWH
	Max: 0.3 mg/L	IDEM draft TMDL target
Total Suspended Solids (TSS)	Max: 80.0 mg/L	Wawasee Area Conservancy Foundation recommendation to protect aquatic life in lake systems
	Max: 30.0 mg/L	IDEM draft TMDL target
	Range: 25.0-80.0 mg/L	Concentrations within this range reduce fish concentrations (Waters, 1995)
	Max: 40.0 mg/L	New Jersey criteria for protection of fish/macroinvertebrate health
	Max: 46.0 mg/L	Minnesota TMDL criteria for protection of fish/macroinvertebrate health
Turbidity	Max: 25.0 NTU	Minnesota TMDL criteria for protection of fish/macroinvertebrate health
	Max: 10.4 NTU	U.S. EPA recommendation

** U.S. EPA recommended criteria are different for parts of southwest Indiana within Ecoregion IX. See Ecoregional Nutrient Criteria Documents for Rivers & Streams for more information.*

Geometric Mean: In mathematics, a type of mean or average, which indicates the central tendency or typical value of a set of numbers. It is similar to the arithmetic mean, which is what most people think of with the word "average," except that instead of adding the set of numbers and then dividing the sum by the count of numbers in the set, n, the numbers are multiplied and then the nth root of the resulting product is taken. A geometric mean, unlike an arithmetic mean, tends to dampen the effect of very high or low values, which might bias the mean if a straight average (arithmetic mean) were calculated. This is helpful when analyzing bacteria concentrations, because levels may vary anywhere from 10 to 10,000 fold over a given period.

Geometric Mean Formula:
Geometric Mean = ((X1)*(X2)*(X3)*.....(XN))1/N
where

X = Individual score
N = Sample size (Number of scores)

Geometric Mean Example:
Use the following set of values - 1, 2, 3, 4, and 5 to find the Geometric Mean.

Step 1: Find 1/N
a. N = 5, the total number of values
b. Using the above value, 1/5 = 0.2

Step 2: Calculate the Geometric Mean
a. ((1)*(2)*(3)*(4)*(5))0.2 = (120)0.2
b. Geometric Mean = 2.60517

The Indiana Administrative Code uses the Geometric Mean as a calculation for five evenly spaced samples of *E. coli* over 30-days in order to determine compliance with the water quality standard.

In Microsoft Excel, the equation for geomean is =Geomean(Xx:Yy)

Notes:

Useful Contacts

Regardless of which watershed you are working in, there are likely others in your area with similar interests and goals. Finding such persons and organizations can seem daunting at times. There are four regional Watershed Specialists at IDEM who can assist you in locating others with whom you may want to communicate and/or collaborate. A link to the Specialists is referenced here as primary contacts for you, in addition to a list of their respective watersheds that they support. Following that is a brief overview of other agencies who may be working in your area of interest. They may be monitoring streams. They may have funding for grants. And don't forget to look across state lines for others working in your watershed!

IDEM Watershed Specialists www.idem.IN.gov/nps/2359.htm		
Northwest Region:	Chicago	Middle Wabash-Little Vermillion
	Iroquois	Sugar
	Kankakee	Tippecanoe
	Little Calumet-Galien	Vermillion
	Middle Wabash-Deer	Wildcat
Northeast Region:	Auglaize	St. Marys
	Eel (Wabash R.)	St. Joseph (OH)
	Maumee	St. Joseph (MI)
	Mississinewa	Upper Wabash
	Salamonie	Upper White
Southwest Region:	Eel (WFWR)	Lower White
	Highland-Pigeon	Middle Wabash-Busseron
	Lower Ohio-Little Pigeon	Patoka
	Lower Wabash	
Southeast Region:	Blue-Sinking	Muscatatuck
	Driftwood	Silver-Little Kentucky
	Flatrock-Haw	Upper East Fork White
	Lower East Fork White	Upper Great Miami
	Lower Great Miami	Whitewater
	Middle Ohio-Laughery	

Indiana Conservation Partnership www.IN.gov/isda/2379.htm	Clean Water Indiana Program http://iaswcd.org/icp/
Indiana League of Resource Conservation & Development Councils http://inleaguercd.org/index.php	Indiana State Department of Health Laboratories www.state.in.us/isdh/22421.htm
Indiana Clean Lakes Program www.indiana.edu/~clp/	Local Health Departments www.state.in.us/isdh/24822.htm
DNR Healthy Rivers Initiative www.IN.gov/dnr/healthyriver/6580.htm	DNR List of River Organizations www.IN.gov/dnr/outdoor/4453.htm
Indiana Conservancy Districts and River Basin Commissions www.IN.gov/dnr/water/2459.htm#9	Navigable Waterways of Indiana www.IN.gov/nrc/2390.htm
Indiana Watershed Leadership Program https://engineering.purdue.edu/watersheds/tools.html	Indiana Water Quality Atlas www.idem.IN.gov/nps/pages/iwqa/index.html
Indiana Regional Water and Sewer Districts www.idem.IN.gov/6741.htm	U.S. Army Corps of Engineers www.idem.IN.gov/wetlands/files/map_us_corps_engineers.pdf

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