

River Monitoring and Water Resource Terms

Baseflow: River discharge or flow composed of ground water drainage and delayed surface drainage. Baseflow is typically characterized as that portion of river flow not related to precipitation-induced runoff. Baseflow is typically measured when the flow is consistent for a period of at least 7 days. Typically baseflow is measured in periods of "low flow" in the middle of winter (January, February) and late summer (August, September).

Benthic Organisms (Benthos): Organisms living in or on the bottom of a river, stream, or lake.

Best Management Practices (BMPs): Agricultural and urban land management practices that have been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources.

Biota: The animal and plant life in a particular area, such as the Kinnickinnic River.

Benthic Organisms (Benthos): Organisms living in or on the bottom of a river, stream, or lake.

Brown Trout Conditions: The complex set of biological and ecological factors that contribute to an environment suitable for sustaining a naturally reproducing brown trout population. Contributing factors include, but are not limited to, stream flow and flow fluctuations, type of stream bottom (substrate), water quality, aquatic vegetation, macroinvertebrate community, overhanging shoreline vegetation, in-stream habitat like woody debris, and a host of stream temperature variables, including the percent of time that stream temperatures are within the optimal ranges for survival (12.0-20.0°C) and growth (7.0-19.0°C), the duration of time periods when temperatures are outside these optimal ranges, and temperature extremes.

Class I Trout Stream: A high quality trout stream where trout populations are sustained by natural reproduction. A stream with naturally reproducing trout populations in excess of 1,000 fish per mile is generally considered to be excellent. The Kinnickinnic River within the North Kinnickinnic River Monitoring Project Area is a Class I Trout Stream.

Class II Trout Stream: A trout stream with some natural reproduction; but stocking is also needed to maintain a desirable trout fishery.

Class III Trout Stream: A trout stream with no natural reproduction; annual stocking of legal-sized fish is required to provide sport fishing.

Coldwater Community: The biological community supported by a spring-fed stream or river, including coldwater fish (often trout), macroinvertebrates, and other aquatic life. A healthy coldwater community also serves as a spawning area for coldwater fish species. A coldwater community can be designated as a Class I, Class II, or Class III trout stream.

Composite Sample: A combined water sample consisting of a series of discrete water samples taken over a given period of time and mixed according to a specified weighting factor such as river flow. A composite sample is often collected with the use of an automated sampler over the duration of a runoff event.

Conductivity: A measure of the ability of water to carry an electrical current, related to the amount of ions in the solution. Conductivity is typically used to measure the amount of salt (from road deicing) present in the water.

Conventional Pollutants: Water pollutants such as suspended solids, bacteria, and nutrients (phosphorus and nitrogen), which are common components of storm water runoff. Sources of these conventional pollutants in urban areas include construction site erosion, pet waste, and lawn fertilizer.

DNR: Wisconsin Department of Natural Resources.

Ecology: The interrelationships between an organism and its environment.

Ecosystem: The interacting system of biological communities and their nonliving surroundings.

EPT richness index: A biological index of stream health, expressed as the sum of the number of taxa in three aquatic insect orders: Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). These three insect orders are composed primarily of species considered to be relatively intolerant of pollution and environmental alterations. Variations of the EPT index include number of EPT taxa, percentage of EPT taxa, number of EPT individuals, and percentage of EPT individuals in a macroinvertebrate sample.

Flow: Stream or river flow, commonly expressed as cubic feet per second or "cfs".

Flow Weighted Mean Concentration: Similar to normalized yield, the "flow weighted mean concentration" (FWMC) of a water quality variable is calculated by dividing the total mass or load of that variable by the total river flow, for a given time period. The FWMC is mass normalized for flow, expressed as milligrams per liter (mg/L). Conceptually, a FWMC would be the same as routing all the river flow that passed by a monitoring site during a given time period into a big, well-mixed pool, and collecting and analyzing one sample from the pool to obtain an average concentration for the water quality variable of interest.

Grab Sample: A discrete water sample collected at a particular time and place. A grab sample is most often collected manually with appropriate sampling equipment.

Groundwater: Underground water, generally within the boundaries of an overlying watershed, which fills the internal passageways of porous geologic formations (aquifers). In response to gravity and pressure, aquifers release water through springs that create coldwater resources such as the Kinnickinnic River. Aquifers also serve as a water source for communities and industries.

Habitat: The place or type of site where an animal or plant naturally lives and grows.

Hilsenhoff Biotic Index: A biological index of stream health that measures macroinvertebrate tolerance of organic (nutrient) enrichment. The Hilsenhoff Biotic Index (HBI) is calculated and expressed on a 1-10 scale. An HBI value of 1 suggests the presence of a macroinvertebrate community that is most intolerant of organic enrichment, while an HBI value of 10 suggests the presence of a macroinvertebrate community that is most tolerant of organic enrichment.

Hydrograph: A graph of river flow during a given time period, often seasonal or annual. A hydrograph typically shows mean (average) daily stream flows, in cubic feet per second (cfs).

Impervious Surfaces: Hard surfaces (rooftops, sidewalks, driveways, streets, parking lots, etc.) that do not allow rain water to infiltrate into the ground. Instead, the rain water runs off these surfaces, picking up heat and other water pollutants that can be transferred to streams, rivers, and lakes, creating water quality problems. Furthermore, these surfaces prevent rain water from infiltrating into the soil to recharge the ground water aquifers that provide spring flow to the Kinnickinnic River.

Load: A "load" is the total amount or mass of a water quality variable passing through a river during a given time period, often seasonally or annually. A load reflects the combined contributions of surface runoff and ground water discharge from a specific watershed, as measured at the monitoring station.

Macroinvertebrate: An aquatic invertebrate animal large enough to be seen with the naked eye. Macroinvertebrates include insects, freshwater "shrimp", crayfish, clams, snails, and worms. An analysis of the types and numbers of macroinvertebrates present in a stream, often expressed as a biological "index", is a very useful indicator of water quality and habitat conditions.

Macrophyte: A rooted aquatic plant.

Milligrams per Liter (mg/l): A measure of the concentration of a substance in water. For most measurements of water quality pollutants, 1 mg/l is equivalent to 1 part per million.

MS4: Municipal Separate Storm Sewer System (also see NPDES and Storm Sewer)

Non-Point Source Pollution: Non-point source (NPS) pollution, unlike point source pollution from industrial and wastewater treatment plants, comes from many diffuse sources in urban and rural areas. NPS pollution is primarily caused when runoff from rainfall or snowmelt picks up natural and human-made pollutants from land surfaces and carries these pollutants into ground water, streams, rivers, lakes, and wetlands. Nonpoint source pollution often arises from impervious surfaces and construction sites in urban areas, and farmland and barnyards in rural areas.

Normalized Yield: To help account for spatial and temporal differences in precipitation, a yield can be further divided by the number of inches of water (water yield) contributed to the stream by the watershed during a given time period, providing a "normalized yield" expressed as pounds per acre per inch of water. For many water quality variables, the more precipitation that falls on a given watershed, the higher the stream loads and watershed yields will be.

NPDES: The National Pollutant Discharge Elimination System is a program enacted by the US Environmental Protection Agency and The Clean Water Act. Phase I of this program targeted large MS4s, those over 100,000. Phase II expands to small MS4s in urbanized areas and requires that municipalities over 10,000 in non-urbanized areas be evaluated for inclusion. (In Wisconsin, these municipalities over 10,000 in nonurbanized areas are being automatically included.) Phase II requires communities to prepare a Storm Water Pollution Prevention Plan (SWPPP) that outlines a communities' plan to minimize pollution to surface waters to "the maximum extent practicable".

NR216: Natural Resources Rule 216. This rule establishes criteria for the storm water discharges needing NPDES permits, called WPDES (Wisconsin Pollutant Discharge Elimination System). The goal of the rule is to minimize the discharge of pollutants carried by storm water runoff.

Phosphorus: Aquatic plants provide food, oxygen, and habitat for aquatic organisms. However, an excess of plant growth can lead to unsightly algae blooms which cause oxygen depletion and odor upon decaying, making the water unpleasant for recreational activities and unsuitable for aquatic life. Phosphorus, a common component of wastewater treatment plant discharges and urban and agricultural runoff, can stimulate excessive plant growth when phosphorus levels in surface waters are too high.

Plankton: Tiny (generally microscopic) animals and plants that live in water.

Point Source Pollution: Point source pollution comes from easily identifiable source, such as discharge from industrial and wastewater treatment plants.

Pollution: The presence of materials or energy whose nature, location, and/or quantity produces undesired environmental effects.

Rating Curve: A rating curve allows stage measurements (height of the water) to be converted to flows, thereby establishing a flow record (hydrograph) for a given time period. The rating curve is developed by pairing stage data with individual point-in-time discharge measurements. To properly develop a rating curve, discharge measurements should be made at a variety of water stages, from low to high. A continuous record of river discharge or flow (hydrograph) is established by developing a mathematical relationship between water stage, which is continuously measured at the monitoring station.

Riparian: Belonging or relating to the bank of a stream or river.

River Falls Storm Water Management Ordinance: In April 2002, the City of River Falls adopted a storm water management ordinance which is designed to protect the Kinnickinnic River from negative impacts of storm water runoff associated with new development. The goals of the ordinance are to prevent warm, polluted storm water from reaching the river; use the soil for removing and absorbing excess water, sediments, and contaminants; and promote groundwater recharge for protection of the springs that provide cold, clean water to the river. This ordinance is very progressive and requires developers of new homes and businesses to build best management practices (BMPs) that infiltrate all storm water

runoff from rain events of 1.5 inch or less. Examples of these infiltration BMPs are grass swales, rain gardens, and large-development scale networks of ponds and infiltration areas.

Runoff: Rainfall, snowmelt, or irrigation water that runs off the land into streams, rivers, lakes, and wetlands. Runoff frequently picks up natural and human-made pollutants from land surfaces and carries these pollutants into surface waters.

Runoff Event: The response of river flow to precipitation-induced runoff. After a precipitation event, a runoff event is characterized by an increase in flow from the baseflow condition as watershed runoff reaches the river, followed by a subsequent decrease in flow to the baseflow condition after watershed runoff passes through the river. One objective of the North Kinnickinnic River Monitoring Project is to sample the river during several runoff events each year, via composite sampling, to characterize concentrations and loads of key nonpoint source pollutants such as suspended solids and nutrients.

Sediment: Soil particles suspended in and carried by water as a result of erosion and/or runoff from impervious surfaces.

SEH: Short Elliott Hendrickson is the consultant hired to manage this project.

Species (Taxa) Richness: A biological index of river health, species (taxa) richness is the number of species or taxa present in a biological sample.

Stage: The level or height of the water surface, commonly measured in feet.

Storm Sewer: A system of street drains and underground piping that transports rain and snow (storm water) runoff. Historically, storm water runoff was transported directly to a stream, river, or lake. Today, it is highly recommended (and often required) that best management practices be used for storm water management and treatment. In NPDES permits, the storm sewer system is known as the Municipal Separate Storm Sewer System (MS4)

Storm Sewershed: The land area contributing storm water runoff to a storm sewer.

Storm Water: Rain and snow runoff from the urban landscape, primarily impervious surfaces. Storm water often transports water pollutants such as heat, bacteria, litter, suspended solids, nutrients, metals, and organic chemicals. Sources of these pollutants include warm pavement, pet waste, construction site erosion, road salt and sand, lawn fertilizer, shingles and gutters, gasoline, oil, and antifreeze. The quantity of storm water runoff from impervious surfaces is also a problem, causing stream bank erosion and destruction of habitat for fish and other stream biota.

Suspended Solids: Small particles of soil and organic matter suspended in water.

SWPPP: Storm Water Pollution Prevention Plan for a NPDES Phase II community

Taxon (plural Taxa): An identifiable taxonomic group of aquatic organisms. Common macroinvertebrate taxa, for instance, include class, order, family, genus, and species.

Thermal Pollution: When summer rainfall flows over warm impervious surfaces, it absorbs heat (thermal pollution). If this heated storm water is discharged directly through storm sewers to a coldwater stream or river like the Kinnickinnic River, a rapid and marked temperature increase occurs in the river at the beginning (first flush) of the runoff event. These rapid temperature increases (thermal spikes) may be particularly harmful to macroinvertebrates (aquatic insects), which serve as a critical food source for trout.

Thermograph: A graph of river temperature during a given time period, often seasonal or annual. The thermographs for the North Kinnickinnic River Monitoring Project show river temperatures, in degrees centigrade (°C), at 10-minute intervals.

TKN: Total Kjeldahl Nitrogen

TP: Total Phosphorus

TSS: Total Suspended Solids

Turbidity: A reduction in water clarity or a cloudiness caused by soil particles or organic matter in the water. These particles may harm aquatic life by decreasing light availability for plant growth, increasing water temperature, clogging the gills of aquatic organisms, and covering habitat. Low turbidity values (at or below 25 nephelometric turbidity units (NTU)) generally indicate good water quality.

UWRF: University of Wisconsin-River Falls

Watershed: The land area that contributes surface water drainage to a stream or river. The watershed of a larger river like the Kinnickinnic may encompass a number of smaller tributary subwatersheds, such as the one draining Sumner Creek.

Water Yield: The amount of water flowing through a river during a given time period divided by the watershed area, expressed as inches of water.

WDNR: Wisconsin Department of Natural Resources.

WPDES: Wisconsin Pollutant Discharge Elimination System. See NR216 and NPDES

Yield: One way to assess and compare the pollutant loads from watersheds of different sizes is to determine the "yield", or pollutant load per unit area of the watershed. Yield normalizes pollutant load on the basis of watershed area, allowing for more relative comparisons to be made between watersheds. Yield is calculated by dividing the total pollutant load for a given time period by the watershed area, and is commonly expressed as pounds per acre. Pollutant loads and yields are primarily a function of soil type, land use, landscape characteristics, and the amount, timing, and intensity of precipitation.