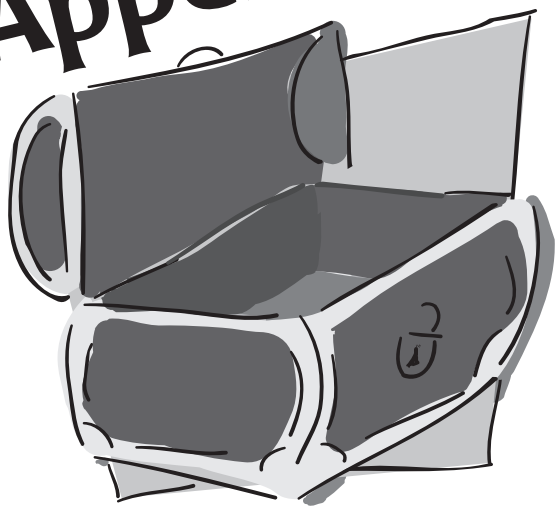
Appendix



Site Definition Sheet

Quality Control Procedure Data Sheet

Hydrology Investigation Data Sheet

Freshwater Macroinvertebrate Identification Data Sheet

Hydrology Site Map

Glossary

Hydrology Investigation
Site Definition Sheet

School name: _____ Class or group name: _____

Name(s) of Student(s) filling in Site Definition Sheet: _____

_____

Date: _____ Check one: ❑ New Site ❑ Metadata Update

Site Name: _____ (create a unique name that describes the location of your site)

Coordinates: Latitude: _____ ❑ N or ❑ S Longitude: _____ ❑ E or ❑ W

Elevation: ___ meter

Source of Location Data (check one): ❑ GPS ❑ Other _____

If Other, describe: _____

Name of Water Body: _____ (Name commonly used on maps)

Water Type:

❑ Salt (> 25 ppt) ❑ Brackish (2-25 ppt) ❑ Fresh (<2 ppt)

Moving Water:

❑ Stream, river or estuary

❑ Other _____

Approximate width of moving water: _____ meters

Standing Water:

❑ Pond ❑ Lake ❑ Reservoir ❑ Bay ❑ Ditch ❑ Ocean ❑ Estuary

❑ Other: _____

Size of Standing Water:

❑ Much smaller than 50 m X 100 m

❑ Roughly 50 m X 100 m

❑ Much larger than 50 m X 100 m

Approximate Area of Standing Water: _____ km^2

Average Depth of Standing Water: _____ meters

Sample Location:

❑ Outlet ❑ Bank ❑ Bridge ❑ Boat ❑ Inlet ❑ Pier

Can you see the bottom?:

❑ Yes ❑ No

Channel/Bank Material (Check all that apply):

❒ Soil ❒ Rock ❒ Concrete ❒ Vegetated bank

Bedrock (Check all that apply):

❒ Granite ❒ Lime stone ❒ Volcanics ❒ Mixed sediments ❒ Don't Know

Freshwater Habitats Present (Check all that apply):

❒ Rocky substrate ❒ Vegetated banks ❒ Mud Substrate ❒ Sand substrate

❒ Submersed vegetation ❒ Logs

Saltwater Habitats Present (Check all that apply):

❒ Rocky shore ❒ Sandy shore ❒ Mud flats/Estuary

Thermometer Probe

Manufacturer: _____

Model Name: _____

Electrical Conductivity Meter

Manufacturer: _____

Model Name: _____

pH Meter

Manufacturer: _____

Model Name: _____

Dissolved Oxygen Kit

Manufacturer: ❒ Lamotte ❒ Hach ❒ Other : _____

Model Name: _____

Dissolved Oxygen Probe

Manufacturer: _____

Model Name: _____

Alkalinity Kit

Manufacturer: ❒ Lamotte ❒ Hach ❒ Other : _____

Model Name: _____

Nitrate Kit

Manufacturer: ❒ Lamotte ❒ Hach ❒ Other : _____

Method: ❒ Zinc ❒ Cadmium

Model Name: _____

Salinity Titration Kit

Manufacturer: ❒ Lamotte ❒ Hach ❒ Other : _____

Model Name: _____

Comments: General description of your study site and metadata

_____

Hydrology Investigation

Quality Control Procedure Data Sheet

School name: _____

Student group: _____ Date: _____

Dissolved Oxygen Kits:

Temperature of distilled water: _____°C; Elevation of your site: _____ meters

Dissolved Oxygen for the shaken distilled water:

Observer 1: _____ mg/L Observer 2: _____ mg/L Observer 3: _____ mg/L Average: _____ mg/L

Solubility of oxygen in water for your temperature at sea level from Table HY-DO-1:		Calibration value for your elevation from Table HY-DO-2:		Expected value for DO in your distilled water:
_____ mg/L	x	_____	=	_____ mg/L

Salinity

Salinity of Standard: Observer 1: _____ ppt Observer 2: _____ ppt Observer 3: _____ ppt

Average Salinity: _____ ppt

Alkalinity

Standard used (check one): Baking soda standard: _____ Purchased standard: _____

Alkalinity of standard: _____ mg/L

For kits that read alkalinity directly:

Observer 1: _____ mg/L as $CaCO_3$ Observer 2: _____ mg/L as $CaCO_3$ Observer 3: _____ mg/L as $CaCO_3$

Average: _____ mg/L as $CaCO_3$

For kits in which drops are counted:

	Observer 1	Observer 2	Observer 3	Average
Number of drops:	_____ drops	_____ drops	_____ drops	_____ drops
Conversion constant for your kit and protocol:	x _____	x _____	x _____	x _____
Total Alkalinity: (mg/L as $CaCO_3$)	= _____ mg/L	= _____ mg/L	= _____ mg/L	= _____ mg/L

Nitrate-Nitrogen

Observer 1: _____ mg/L NO_3^- - N Observer 2: _____ mg/L NO_3^- - N Observer 3: _____ mg/L NO_3^- N

Average: _____ mg/L NO_3^- - N

Hydrology Investigation

Data Sheet

School name: _____

Class or group name: _____

Name(s) of Student(s) collecting data: _____

_____

Measurement Time:

Year: _____ Month: _____ Day: _____ Time: __:__ (UT) Time: __:__ (Local)

Name of Site :_____

Water State: (check one)

❒ Normal ❒ Flooded ❒ Dry ❒ Frozen ❒ Unreachable

Transparency

Cloud Cover (check one):

❒ no clouds
❒ clear (<10%)
❒ isolated clouds (10%-24%)
❒ scattered (25%-49%)
❒ broken (50%-90%)
❒ overcast (>90%)
❒ obscured

Enter data below, depending on whether you are using the Secchi Disk or the Transparency Tube method.

Secchi Disk

First Secchi Disk Test:

Distance from observer to where disk disappears _____ (m)

Distance from observer to where disk reappears _____ (m)

Distance from observer to water surface _____(m)

❒ Secchi Disk reaches the bottom and does not disappear.
If checked enter depth to the bottom of the water site _____ (m)

Second Secchi Disk Test:

Distance from observer to where disk disappears _____ (m)

Distance from observer to where disk reappears _____ (m)

Distance from observer to water surface _____(m)

❒ Secchi Disk reaches the bottom and does not disappear.
If checked enter depth to the bottom of the water site _____ (m)

Third Secchi Disk Test:

Distance from observer to where disk disappears _____ (m)

Distance from observer to where disk reappears _____ (m)

Distance from observer to water surface _____(m)

❒ Secchi Disk reaches the bottom and does not disappear.
If checked enter depth to the bottom of the water site _____ (m)

Transparency Tube

Note: If the image is still visible when the tube is full, input the length of the tube and check the "Greater than the depth of the turbidity tube".

Test 1(cm): Greater than depth of transparency tube? ❒
Test 2(cm): Greater than depth of transparency tube? ❒
Test 3(cm): Greater than depth of transparency tube? ❒

Water Temperature: Measured with (check one) __ alcohol-filled thermometer __ probe

Average:	Observer Name	Temperature °C
	1.	
	2.	
____ °C	3.	

Dissolved Oxygen Kits:

Average:	Observer Name	Dissolved Oxygen (mg/L)
	1.	
	2.	
____ mg/L	3.	

Salinity: _____ppt

Dissolved Oxygen Probe:

Average:	Observer Name	Probe Measure	X	Salinity Correction Factor	Dissolved Oxygen (mg/L)
	1.				
	2.				
____ mg/L	3.				

Note: Salinity correction factor is taken from the manufacturer's instructions for the probe.

Conductivity: Temperature of water sample being tested: ____°C

Average:	Observer Name	Conductivity (µS/cm)
	1.	
	2.	
____ µS/cm	3.	

Value of Conductivity Standard: ____ MicroSiemens/cm (µS/cm)

Water pH: Measured with: (check one) ❒ paper ❒ meter

Average:	Observer Name	If salt added, conductivity (µS/cm)	pH
	1.		
	2.		
____	3.		

Value of buffers used: ❒ pH 4 ❒ pH 7 ❒ pH 10 (Check all used.)

Salinity

Tide Information

Time of tide before measurement:_____ hours and minutes

Check one: ❒ High Tide: ❒ Low Tide Check one: ❒ UT ❒ Local time

Time of tide after measurement: _____ hours and minutes

Check one: ❒ High Tide: ❒ Low Tide Check one: ❒ UT ❒ Local time

Place where these tides occur: _____

Salinity (Hydrometer Method)

	Test 1	Test 2	Test 3
Temperature of water in 500 mL cylinder	_____ °C	_____ °C	_____ °C
Specific Gravity:	_____	_____	_____
Salinity of Sample:	_____ ppt	_____ ppt	_____ppt
Average Salinity: _____ppt			

Optional Salinity Titration

Salinity of Sample:	Test 1:_____ ppt	Test 2:_____ppt	Test 3:_____ ppt
Average Salinity: _____ppt			

Alkalinity: (For kits that read alkalinity directly)

Average:	Observer Name	Alkalinity (mg/L as $CaCO_3$)
	1.	
	2.	
_____ mg/L as $CaCO_3$	3.	

Alkalinity: (Hach kits or other kits in which drops are counted)

Observer Name	Number of Drops	x	Conversion constant for your kit	=	Total Alkalinity (mg/L as $CaCO_3$)
1.		x		=	
2.		x		=	
3.		x		=	

Average: _____mg/L as $CaCO_3$

Total Nitrate + Nitrite (NO_3^--N + NO_2^--N)

Average: Nitrate+Nitrite	Observer Name	Nitrate and Nitrite (mg/L NO_3^-N + NO_2^-N)
	1.	
	2.	
_____ mg/L	3.	

Nitrite-Nitrogen (NO_2^--N) (optional)

Average: NO_2^--N	Observer Name	Nitrite (mg/L NO_2^-N)
	1.	
	2.	
_____ mg/L	3.	

Freshwater Macroinvertebrate Identification

Data Sheet

School name: _____

Class or group name: _____

Name(s) of Student(s) collecting data: _____

_____

Date samples collected: Year : _____ Month: _____ Day : _____

Name of Study Site : _____

For a rocky bottom with running water site:

Riffles: Number of samples: ____

Runs: Number of samples: ____

Pools: Number of samples: ____

(Total samples = 3)

For a multi-habitat site:

Habitats	**Estimate of % Area**	**Number of samples (%Area X 20) / 100**
Submersed vegetation		
Vegetated banks, around logs, snags, roots		
Muddy bottom		
Gravel or sand		
Total	100%	20 samples

If you are recording taxon counts for all habitats combined, enter all counts on this page and check "All Habitat Types combined". If you are recording separate counts for each habitat type, make a copy of this page for each type and indicate the appropriate habitat type and counts.

❑ All Habitat Types combined
OR
Select Habitat Type (check one):
Rocky bottom with running water: ❑ Riffle ❑ Run ❑ Pool
Multi-habitat: ❑ Submersed vegetation ❑ Vegetated banks ❑ Muddy bottom ❑

Taxa Collected:

Phylum, Class or Order *	Family, Genus or Species (if known)	Common Name	Number: Total count OR >100	Did you sub-sample? Yes or No

* required to most detailed level possible of Phylum, Class or Order

If taxon is sub-sampled:

Total number of squares in grid:_____

Multiply by 0.2

Number of squares to sample:_____

Comments

_____

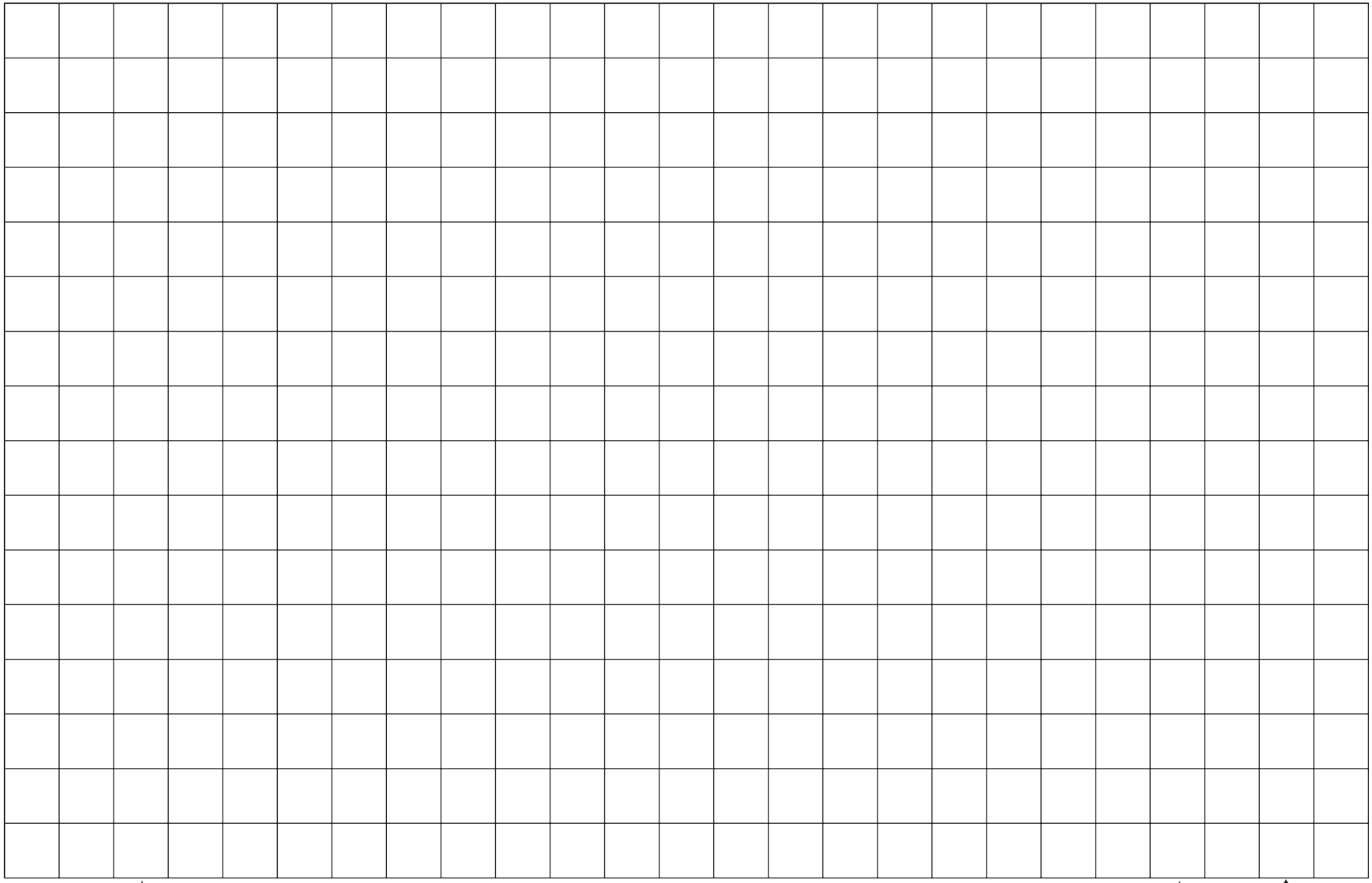
_____

Hydrology Site Map

Scale: 1:200

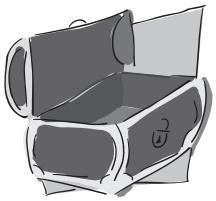
North Arrow

School Name _____ Site Name _____ Water Body Name _____ Date _____



Legend ☆ Hydrology Site Macroinvertebrate Sites △ vegetated ◇ rocky substrate ○ fine substrate ⇨ Direction of Flow **IN** inlet **OUT** outlet Trees House

Glossary



Abundance
The number of organisms in a sample or taxon

Accuracy
The closeness of a measured value to a true value (See *precision*)

Acid
Any substance that can donate a hydrogen atom or proton (H+) to any other substance.

Acid Rain
Rain characterized by pH values below 6

Acidic
Characterized by pH < 7

Acidity
1. The amount of strong base (e.g. Sodium Hydroxide) necessary to titrate a sample to a pH of around 10.3; measures the base neutralizing capacity of a water
2. An acid quality or state (Common Usage)

Aerosols
Liquid or solid particles dispersed or suspended in the air

Alkaline
Characterized by pH > 7

Alkalinity
The amount of strong acid (e.g. Hydrochloric Acid) necessary to titrate a sample to a pH of around 4.5. Measures the acid neutralizing capacity of a water and is often reprinted as ppm CaCO3.

Aqueous
Containing or contained in water

Background Concentration
The level of chemicals present in a water due to natural processes rather than due to human contribution

Base
Any substance that accepts a proton (H+) from another substance

Benthic
Pertaining to bottom dwelling water animals or plants

Biodiversity
The variety of organisms

Brackish Water
Water containing dissolved salts at a concentration less than seawater, but greater than fresh water. The concentration of dissolved salts is usually in the range 1000 - 10,000 ppm.

Buffer Solution
One that resists change in its pH when either hydroxide (OH-) or protons (H+) are added. The stable and known pH value of these solutions make them suitable for calibrating pH measuring devices.

Calibration
To set or check an instrument against an index or standard of known value through some type of proportional or statistical relationship.

Catchment Basin
1. The part of a river-basin from which rain is collected, and from which the river gets its water. Each catchment basin is with the boundary defined by the watershed. The term watershed is often incorrectly used to describe catchment basins.
2. The area drained by a river or stream

Chlorinity
The chlorine concentration of a solution

Colorimetric Method
Many procedures for measuring dissolved substances depend on color determination. The underlying assumption is that the intensity of the color is proportional to the concentration of the dissolved substance in question.

Conductivity
The ability of an aqueous solution to carry an electrical current. Depends upon the concentration of dissolved salts (ions), the type of ions, and the temperature of the solution. Typical units are microSiemens/cm or micromhos/cm. (These are equivalent).

Denitrification
The act or process of reducing nitrate to ammonia. Nitrite may be an intermediate product.

Density
The ratio of the mass of a substance to its volume

Dissolved Oxygen
The mass of molecular oxygen dissolved in a volume of water. The solubility of oxygen is affected non-linearly by temperature; more oxygen can be dissolved in cold water than in hot water. The solubility of oxygen in water is also affected by pressure and salinity; salinity reduces the solubility of oxygen in water.

Dissolved Solids
Solid particles that have become liquid by immersion or dispersion in a liquid (e.g. salts)

Electrode
In GLOBE, an electrode is usually the part on the probe through which electricity is able to flow.

Enrichment
Making a water more productive (e.g. by adding nutrients)

Eutrophication
A high level of productivity in a water body, often due to an increased supply of nutrients

Evaporation (of water)
Change from liquid to vapor at a temperature below the boiling point

Evenness
How equally abundant the taxa are in a sample

Hydrologic Cycle
The series of stages through which water passes from the atmosphere to Earth and returns to the atmosphere. Includes condensation to form clouds, precipitation, accumulation in soil or bodies of water and re-evaporation

Hypothesis
A tentative statement made to test its logical or empirical consequences

In Situ
Situated in its original natural place (Latin)

Lake
A large body of water entirely surrounded by land usually naturally formed, but can be artificially formed. Its original designation was to apply to a body of water large enough to form a geographical feature.

Lentic
Relating to, or living in standing water (lakes, ponds or swamps)

Logarithmic Scale
A scale in which each unit increment represents a tenfold increase or decrease

Lotic
Relating to, or living in actively moving water (streams or rivers)

Macroinvertebrates
Animals that have no backbone and are visible with the naked eye (>0.5 mm)

Meter
An instrument, usually used in combination with a probe, that translates electronic signals from the probe into units of interest (i.e. µS/cm or mg/L). A meter must be programmed with the proper calibration for the probe of interest before producing sensible results.

MicroSiemens/cm
Metric unit of measurement for conductivity. Equivalent to micromhos/cm

Micromhos/cm
Standard unit of measurement for conductivity. Equivalent to microSiemens cm

Molar
Unit of measurement for concentration (moles per liter of solution).

Molecule
The smallest fundamental unit (usually a group of atoms) of a chemical compound that can take part in a chemical reaction

Natural Waters
Systems that typically consist of the sediments/minerals and the atmosphere as well as the aqueous phase; they almost always involve a portion of the biosphere.

Neutral
Characterized by pH = 7

Nitrate
A salt of nitric acid (HNO3). Nitrates are often highly soluble and can be reduced to form nitrites or ammonia.

Nitrate-Nitrogen
Concentrations of nitrate (NO3-) are often expressed as mass of nitrogen per volume of water.

Nitrite
A salt of nitrous acid (HNO2). Nitrites are often highly soluble and can be oxidized to form nitrates or reduced to form ammonia

Nitrite-Nitrogen
Concentrations of nitrite (NO2-) are often expressed as mass of nitrogen per volume of water.

pH
The negative logarithm of the molar concentration of protons (H+) in solution

Photosynthesis
The process in which the energy of sunlight is used by organisms, esp. green plants to synthesize carbohydrates from carbon dioxide and water

Pond
A small body of still water formed artificially either by hollowing out of the soil or by damning a natural hollow

Pool
In a stream or river, a deeper region with slower-moving water and smaller sediments

ppm
Usually parts per million. (Equivalent to milligrams per Liter in GLOBE calculations)

ppm Chlorinity
By weight, equal to milligrams of chlorine per Liter, with the assumption that one Liter of water weighs one kilogram

ppt
Usually parts per thousand. (Equivalent to grams per Liter in GLOBE calculations)

Precipitation
1. The falling products of condensation in the atmosphere. e.g. rain, snow, hail
2. Separation in solid form from a solution due to chemical or physical change (e.g. adding a reagent or lowering the temperature)

Precision
A measurement for the degree of agreement between multiple analyses of a sample (See *accuracy*)

Probe
In GLOBE, an instrument used to measure voltage or resistance of a substance. Any small device, especially that holds an electrode, which can penetrate or be placed in or on something for the purpose of obtaining and relaying information or measurements about it. A probe along with a meter must be calibrated in order to produce sensible data.

Productivity
The formation of organic matter averaged over a period of time such as a day or a year

Proton
A positively charged elementary particle found in all atomic nuclei. The positively charged hydrogen atom (H+)

Reagent
A substance used to cause a reaction, especially to detect another substance

Reduce
In chemical terms, to change from a higher to a lower oxidation state (i.e. gain electrons)

Richness
The number of different taxa

Riffle
In a stream or river, a shallower area with faster-flowing water and larger sediments

River
A large stream of water flowing in a channel towards the ocean, a lake, or another river

Run
In a stream or river, an intermediate category between pool and riffle. A run does not have the turbulence of a riffle, but moves faster than in a pool.

Runoff
The component of precipitation that appears as water, flowing in a stream or river

Saline Water
Water containing salt or salts

Salinity
A measure of the concentration of dissolved salts, mainly sodium chloride, in brackish and salty water

Salts
Ionic compounds which in water solution yield positive (excluding H+) and negative (excluding OH-) ions ; the most common of which is sodium chloride, or "table salt"

Saturated Solution
A solution that contains the maximum amount of dissolved substances at a given temperature and pressure

Snag
A tree or branch embedded in the bed of the water body

Solubility
The relative capability of being dissolved

Solute
A substance that dissolves in another to form a solution

Solution
A homogeneous mixture containing two or more substances

Solvent
A substance that dissolves another to form a solution

Specific Heat
The heat in calories required to raise the temperature of one gram of a substance by one degree Celsius

Specific Gravity
The ratio of the density of a substance to the density of water (at 25°C and 1 atmosphere)

Standardization
To cause to conform to a standard

Standard
A measure with a value established through outside means for use in calibration; a known reference

Stream
A course of water flowing continuously along a bed on the Earth, forming a river, rivulet, or brook. Streams can be permanent meaning that water flows in the stream bed all year long; or streams can be intermittent/ ephemeral, meaning that the water stops flowing and may even disappear during certain times of the year.

Suboxic Water
Very low levels of dissolved oxygen; denitrification occurs (nitrate is converted to ammonia)

Supersaturated
The characteristic of a substance holding more of another substance that would be predicted under equilibrium conditions. Supersaturated is a term commonly used to describe gases dissolved in water (e.g. if there is a lot of photosynthesis occurring in a lake, the water can become supersaturated in oxygen during the day)

Suspended Solids
Solid particles in a fluid that do not dissolve or settle out

Suspensions
A mixture in which very small particles of a solid remain suspended without dissolving

Taxa
Plural of taxon

Taxon
A group of organisms of any particular rank (such as order, family, genus). Singular of taxa

Tides
The periodic rise and fall of the waters of the ocean and its inlets, produced by the attraction of the moon and sun. Occurs about every 12 hours.

Titrant
The reagent added in a titration

Titration
The process of ascertaining the quantity of a given constituent by addition of a liquid reagent of known strength, and measuring the volume of reagent necessary to convert the constituent through a given reaction

Topography
The surficial relief features of an area

Total Dissolved Solids
The total mass of solids remaining when a given volume of filtered water is evaporated to total dryness following an accepted protocol

Transparency
Having the property of transmitting rays of light through its substance so that bodies located behind can be distinctly seen. Transparency, when applied to water studies, refers to the distance that an object (e.g. a secchi disk) can be seen looking down through the water under ambient light conditions. Transparency is related to turbidity in that the amount of particles in the water and the characteristics of those particles will affect the distance that an object can be seen, but the two are not directly comparable.

Turbid
Not clear, or transparent due to stirred up sediment

Turbidity
Turbidity, when applied to water studies, refers to the degree that the particles in the water can scatter light sent through a water sample. Turbidity is related to transparency, but the two terms are not equivalent, and the relationship depends on the characteristics of a particular water sample. Therefore turbidity measurements cannot be used in place of transparency measurements and vice-versa.

Water Quality
A distinctive attribute or characteristic trait of water, described by physical, chemical, and biological properties

Watershed
The line separating the waters flowing into different rivers, river basins or seas; a narrow elevated tract of ground between two drainage areas.; see *catchment basin*

Water Vapor
Water in the gaseous phase