

Glossary and References for nec08@ieca-nechapter presentation

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Evaluating Water Quality Impacts from Non-point Sources

Glossary: *The following glossary has been compiled from various sources including Kadlec and Knight, 1996; Hoepfel, 1974, Lombardo, 2006, the internet, and other sources to assist the reader who is not familiar with the terminology used in the letter report.*

- **Actinomycetes** - *literally "ray fungi", filamentous bacteria, typically are saprobes that produce several antibiotics and give soil its earthy smell; intermediate between bacteria and fungi, and classified as either.*
ppathw3.cals.cornell.edu/glossary/Defs_A.htm;
library.thinkquest.org/25368/e_glossary.html
- **Adsorption** – The formation of a two dimensional structure on the surface of a mineral involving the combination of phosphate , PO₄ with iron (Fe) and Aluminum (Al) in acidic soils (low pH) and calcium (Ca) in alkaline (high pH) soils.
- **Aerobic** – In the presence of oxygen, typically found in unsaturated soils.
- **Anaerobic** - In the absence of oxygen, typically found in saturated soils (i.e., wetlands).
- **Biological Nitrogen Fixation** – The conversion of elemental nitrogen (N₂) to ammonium (NH₄⁺) by some bacteria, actinomycetes, fungi, and blue-green algae.
- **Denitrification** – The transformation of nitrate and nitrite by facultative anaerobic bacteria and some fungi under saturated soil conditions (anaerobic) to form nitrogen and nitrous oxide gases, which are liberated to the atmosphere.
- **Nitrification** – The biochemical transformation of ammonium (NH₄⁺) by oxidation to nitrite (NO₂⁻) and then nitrate (NO₃⁻) by autotrophic soil bacteria (principally Nitrosomonas, Nitrobacter) or by the transformation of nitrogenous organic compounds and ammonia (NH₃) by heterotrophic bacteria and fungi under aerobic conditions.
- **Nitrogen Inorganic Forms:**
 - a) **Ammonia Nitrogen** – (NH₃) Un-ionized form of ammonia, preferred form of nitrogen for plant and microbial uptake; readily oxidized in water leading to increased oxygen demand, toxic to aquatic life in concentrations above 0.2 mg/l.
 - b) **Ammonium Nitrogen** – (NH₄) Ionized form, predominant in wetlands.
 - c) **Total Ammonia Nitrogen** – Sum of un-ionized (NH₃) and ionized (NH₄) forms of Ammonia.
 - d) **Nitrite Nitrogen** – (NO₂⁻) Intermediate form of nitrogen between ammonia (NH₃) and nitrate (NO₃⁻), chemically unstable in the environment, elevated concentrations indicate anthropogenic (man-made) pollution, toxic to infants.

e) **Nitrate Nitrogen** – (NO_3^-) Chemically stable form of nitrogen found in wetlands and watercourses, essential nutrient for plant growth, can be toxic to infants in concentrations above 10 mg/l (methyglobanemia, “blue babies”), groundwater and drinking water standard 10 mg/l, major contributor to surface water eutrophication (enrichment), limiting nutrient in saline environments.

f) **Dinitrogen** - (N_2) An inert gas, significant portion of atmosphere (78%), not a contributor to eutrophication.

g) **Nitrous Oxide** - (N_2O) An inert gas, an intermediate product of microbial denitrification ($\text{NO}_3^- + \text{anaerobic microbes} = \text{N}_2\text{O} + \text{N}$), not a contributor to eutrophication.

f) **Nitric Oxide** - (NO_2 , N_2O_2) Water soluble forms of nitrogen, combines with ammonia and water to form soluble nitrate (NO_3^-) and ammonium (NH_4^+).

- **Nitrogen Organic Forms**

a) **Amino Acids** – Main components of proteins.

b) **Urea and Uric Acid** – Ammonia is produced by cellular respiration in mammals. This waste is toxic and converted to a non-toxic form, urea which is excreted by mammals in their urine. Uric acid is a waste similar product produced by insects and birds. Both forms are readily converted (hydrolyzed) chemically and by microbes to produce ammonia, which is then available for plant uptake.

c) **Purines** and **Pyrimidines** – The building blocks of nucleotides that make up DNA.

d) **Total Kjeldahl** (pronounced Kel-Dall) **Nitrogen** (TKN) - The sum of organic nitrogen and ammonia nitrogen.

e) **Organic Nitrogen** - The amount of TKN minus the amount of Ammonium (NH_4^+). In wetlands, the nitrogen is predominantly found as soluble and insoluble organic nitrogen found in decomposing organ matter (detritus), the soil matrix and biological tissue (live plants and animals).

Total Nitrogen – The sum of the TKN (organic and ammonia nitrogen), nitrate (NO_3^-) and nitrite (NO_2^-).

Nonsymbiotic Nitrogen Fixation – The use of molecular nitrogen (N_2) by heterotrophic and autotrophic bacteria. Species include Azobacter, Clostridium. Blue green algae contain heterocysts (resting cells) that fix nitrogen.

Symbiotic Nitrogen Fixation – The use of molecular nitrogen through an endophyte-host relationship, (i.e. a microorganism and a higher plant). Fixation is accomplished through nitrogen fixing nodules in the roots of the host plant. Legumes fix nitrogen via symbiosis with Rhizobium bacterium species and non-legumes form relationships with actinomycetes.

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