Minnesota Field Office Technical Guide – Section V
Glossary and Explanation

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The glossary contains the following: special terminology, rating effects, and column heading definitions and explanation.

Special Terminology

Adsorption: The process by which materials are held or bound to the surface in such a manner that the chemical is only slowly available. Clay and high organic soils tend to adsorb pesticides in many instances.

Benthic: This refers to the bottom of any water body. Benthic organisms would be those organisms associated with the bottom of the water body.

Biomagnification: The active concentration of a given chemical such as DDT or DDE in living issue, in excess of the prevailing media concentration, through a trophic web (food chain)

Component levels: This concept means that Federal, State, or local laws and regulation may establish component contaminant levels in units such as mg/1, ppm, tons/acre, tons/year or waste load allocations.

Crops grown cover or green manure; or applied manure, litter, mulch, and other organics: These action may be considered as soil improving practices to provide residue amounts to meet or exceed that need for the maintenance of soil tilth and erosion reduction.

Enrichment ratio: This is the chemical fraction of a nutrient chemical or practical size in offsite sediment, divided by the chemical fraction of the same component in an equal mass of in place soil.

Essential practice: A practice that singly, or in combination with other practices or management measures, is required to solve the identified or anticipated resource problems to the quality criteria established in Section III of the FOTG, or that is required for a system to meet its intended purposes.

Eutrophication: The natural or artificial process of nutrient enrichment where by a water body becomes filled with the aquatic plants resulting in low oxygen content.

Facilitating practice: Practices that may be companion with or support other practices necessary to achieve a desired treatment, such as a fence. Mainly associated with management practices but can be used to support structural practices. Some of these practices may stand-alone. The effects of facilitating practices are described generally in reference to the main practice (management and structural) being supported.

High residue producing crops: This refers to those crops typically producing adequate amounts of residue that can be managed for erosion control and soil tilth under the local soils and climate conditions.

Interflow: Water which infiltrates the soil surface and moves laterally and vertically through the soil profile or vadose zone until it enters a stream channel, or seeps from the soil or vadose zone as a spring. This has also been called subsurface storm flow and represents water that moves more slowly than the runoff water, to the stream channel or seep after a storm.

Metabolite: A compound derived by chemical action upon the chemical within a living organism (plant, insect, higher animal, etc.). The action varies (oxidation, reduction, etc.) and the metabolite may be either more toxic or less toxic than before. The same derivative may in some cases develop upon exposure of the chemical outside a living organism.

Partition coefficient: This is a measure of the distribution of a solute between two liquid phases in which it is soluble.

Potentiometric (piezimoetric) surface: An imaginary surface representing the total head of ground water and defined as the level to which water rises in the penetrating well of a confined aquifer. The water table is a particular potentiometric surface for confined aquifers.

Scoured areas: The scoured areas under the column heading of "road banks, construction sites, and scoured areas" refers to areas where out of streambank flow scours the flood plains.

Sediment delivery ratio: This is the percentage relationships between the sediment yield at a specified measuring point in a watershed and the gross or total erosion occurring in the watershed upstream from that point.

Sediment porewater: This is the water occupying the pore space between grains in a sediment deposit.

Sediment yield: The quantity of sediment arriving at a specific location. Usually expressed per unit area.

Soil depleting crops: This refers to those crops that do not produce adequate amounts of residue needed for the maintenance of soil tilth and erosion control.

Soil improving crops: This refers to those crops producing sufficient residue amounts needed for the maintenance or improvement of soil tilth and control of erosion. Soil improving crops include deep-rooted plants or legumes.

Surface water: Surface water in the CPPE refers to perennial, intermittent, and ephemeral streams, and to water bodies.

Synergistic effect: The total effect is greater than the sum of the effects taken independently.

Vadose zone: This is the unsaturated zone above the water table. It includes, by some definitions, the entire unsaturated zone above the saturated zone. In other words it will include: (1) soil root zone; (2) any intermediate region of unconsolidated material, or rock, where the moisture content remains at an unsaturated condition; and (3) the capillary fringe zone above the water table. If the water table is close to the surface, the capillary fringe above the water table and the soil moisture zone may overlap.

In contrast, commonly in conservation planning, the vadose zone has only been considered to be that area between the root zone and the water table. Therefore, a clear distinction of how vadose zone is defined is importance for understanding interpretations of effects of vegetative treatments.

Water table: The top surface of the zone of water saturation. This is also defined as the surface of a body of an unconfined ground water at which the pressure is equal to that of the atmosphere. If a well penetrates a confining layer, water will rise to the potentiometric level, the artesian equivalent of the water table.

RATINGS EFFECTS DEFINITIONS AND EXPLANATIONS

Not Applicable (N/A): The conservation practice being evaluated has no relationship (i.e. there is no effect) on the conservation problem identified.

Facilitated: The conservation practices begin evaluated helps to alleviate the conservation problem in conjunction with other conservation practices.

Negligible (NEG): There is an effect of the practice on the problem of concern, but the effect is insignificant.

Situational: There is an effect but it is dependent on the situation and is therefore left up to the planner discretion.

Slight (SLI): Three is some nonmeasurable effect (increase or decrease) of the practice on the resource problem of concern, but not enough to influence the decision to select the practice to solve the problem.

Moderate (MOD): There is a measurable effect (increase or decrease) of the practice on the resource problem which would have a major influence on the selection of the practice in CMS options.

Significant (SIG): There is a major measurable effect (increase or decrease) of the practice on the resource problem which would have a major influence on the selection of the practice in CMS options. When evaluating systems, ratings of N/A, NEG, and SLI are not used to assess when that system meets quality criteria.

Range of Effects: The effect of a single practice on a given resource concern as shown in the CPPE Matrix may vary depending on the local conservation treatment unit, climate, topography, geology, soils, vegetation and hydrologic conditions. Therefore, a range of possible effects is presented. The range of effects, both increasing and decreasing are as follows: negligible to slight, negligible to moderate, negligible to significant, slight to moderate, slight to significant, and moderate to significant. The range of effects shown in the CPPE Matrix applies on a national basis to a conservation treatment unit. However, when used by a field office, the proper effects or range of effects apply to a conservation treatment unit (CTU) that has specific topography, soils, hydrology, plants and animals.

There are significant cumulative or synergistic effects on the resource problem of concern by treating several CTUs. For example, if the cumulative effects in a watershed of several CTUs are evaluated through the use of the CPPE Matrix, then the slight offsite effect of a practice in a CTU on a component like sediment could increase to a cumulative moderate or significant effect. However, there was no attempt to reflect cumulative effects in the CPPE Matrix prepared on a national basis.

COLUMN HEADING EXPLANATION AND DEFINITIONS:

Each column heading in the CPPE Matrix represents an identified or predictable resource concern that needs to be treated.

1. General Onsite – Offsite Effects.

Onsite versus offsite column headings usually show a similar explanation, except for the degree of effect. Generally, the onsite sediment effects are higher because of closeness to the erosion source with high sediment yield (i.e. high sediment delivery ratio). The offsite sediment effects are smaller because of the further distance from the site of the problem, and because additional drainage area is included that may not have the problem, therefore the effect is diluted.

However, for some situations, such as safety problems, the offsite sediment (i.e. off CTU) effects are higher because a larger number of people are being affected off the farm (i.e. at the county road or other road arterial) compared to within the farm boundary. In a field situation of the offsite sediment effect on a conveyance system or water body may be significant if the source of the problem is right next to the water body (i.e., has very high sediment yield because of a high sediment delivery ratio). In addition, if the source of the erosion is the conveyance, which has a high sediment delivery ratio, the offsite sediment effects may be as significant as or more significant than onsite.

2. Water effects (surface water)

The physical and chemical properties of streams are varied as are climate, geology, soils, plants and animals of the localities where the streams are located. This is especially true for intermittent streams, which are more variable than perennial streams, because they contain less water per unit area, and are closely linked to the climate, topography, geology, soils and vegetation of the area. Increasing the flow of an intermittent stream to that of a perennial stream tends to reduce some of the variability. However, the reducing of flow in a perennial or intermittent stream to a flow condition close to where the stream dries up has the effect of increased concentration of contaminants, and will cause severe effects on the stream biota.

3. Excess runoff

The physical effects evaluated can apply to onsite or offsite conditions.

4. Sediment effects (surface water deposition and concentration)

Practices that reduce sediment delivery ratio decrease sediment storage impacts on water bodies, streams, and water conveyances. Reduced sediment delivery ratio also decreases habitat impacts from sand and fine particle size classes that degrade spawning areas, as well as enrichment ratios of nutrients, and total organic carbon associated with the intruded sediment.

5. Offsite sediment deposition damage

This column needs to be viewed in two ways. Sediment yield (usually expressed in volume per unit area) from any given conservation treatment unit of land, is usually diluted offsite because of the inclusion of more drainage areas that contribute water and sediment. Offsite sediment effects may be less severe than onsite. Conversely, sediment yield offsite from a CTU may be combined with sediment delivered from other sources, by the same storm, and cause more severe offsite deposition problem.

6. Small water conveyance

Any channel within the CTU that does not contain perennial flow is treated as a small water conveyance for evaluation.

7. Ground water and surface water range of effects

The information presented in the CPPE Matrix reflects a range of effects, depending on field conditions. Soil and vadose zone texture, structure porosity, and permeability affect the ability of the material to retain or transmit water and entrained compounds. Coarser textured soils have higher infiltration rates than finer textured soils. Therefore, they have less surface area for adsorption and a higher potential for subsurface flow. However, macropores (organism tunnels, shrink-swell cracks, differential settlement fractures, joints and landslide and fault fractures) can allow rapid infiltration in any fluid material).

8. Pesticide (ground water and surface water resources)

The word pesticide is an all-inclusive term including a number of individual chemical compounds designed specifically for the control of certain pests. All but six of these generic words and the suffix “cide” mean to kill or to be a killer. The majority of pesticides names (insecticides, herbicides, fungicides, etc.) are specific to the pest for which they are intended to control. Table 1 shows the 21 pesticides categorized by generic terms for each specific purpose.

The term “pesticides”, as defined by Federal and State laws, also includes chemical compounds that stimulate or retard growth of plants (or regulators); chemical compounds that speed the drying of plants (or desiccants, which are used as an aid in mechanical harvesting of cotton, soybeans, and other crops); and chemicals that remove leaves (or defoliants, which aid in the harvesting of potatoes and certain other crops). Table 1 shows a classification of pesticides by target species. However, some pesticides may have multiple uses.

The term “pesticide” also applies to compounds used for repelling, attracting, and sterilizing insects. Some pesticide groups do not fit the original definition since they are not “cides” but rather they are included only because they fit the legal definition of pesticides.

Other “cide” terms include “adulticide”, “larvicide”, “aphicide”, and “ovicide.” These are all terms that refer to the use of insecticides. The use of insecticides that are more effective at certain stages of insect growth gives rise to the terms of “adulticide” and “larvicide.” An insecticide that is more specific or best for aphid control might be referred to as an “aphicide.” Although there are few insecticides specifically designed to destroy insect eggs, the existing insecticides are referred to as “ovicides.”

Some pesticides, such as DDT and its derivatives, are residual in the soil profile from past use. DDE, a metabolite of DDT, has a stability equal to or greater than DDT (i.e. resistance to complete breakdown by enzymes present in soil microorganisms and higher organisms). When soils erode, residual pesticides, such as DDT and DDE, are transported with sediment and have detrimental effects on benthic organisms and the associated biomagnification in the food chain.

Pesticide properties which affect their potential for leaching include solubility, adsorption (degree to which they are bound to soil particles), volatility, and persistence. Pesticides are primarily absorbed on soil organic matter surfaces, but some positively charged pesticides (i.e. diquat and paraquat) are strongly absorbed into both the organic and clay fraction.

Plant uptake, degradation, and volatile losses of agricultural pesticides will reduce pesticide pollution loads to surface water and groundwater. Sediment bound pesticide pollution loads to surface water and groundwater. Sediment bound pesticides that generally have high partition coefficients expend all or a portion of their half-life by increased residence time caused by conservation practices. The increased residence time occurs because the erosion control practices reduce the timing and amount of pesticides that are eroded to move with the sediment, or the increased resident time can be caused by practices causing sediment deposition. Those practices, such as sediment debris basins and storage terraces that store sediment, will have more effect on trapping sediment and allowing pesticides to expend their half-life than those practices such as filter strips that only reduce runoff velocities so that some sediment will deposit.

Soluble pesticides with generally low partition coefficients also minimally expend a portion of their half-life, particularly through volatilization, because of increased residence time caused by conservation practices. Time of pesticide application, pesticide form, rainfall time, amount, intensity and distribution, depth to water table, type of aquifer, and proximity to the problem area all cause variable conditions for pesticide effects.

Table 1: Pesticides Classified by their Target Species

Acaricide	Mites, ticks
Algaecide	Algae
Attractant	Insects, birds, other vertebrates
Avcide	Birds
Bactercide	Bacteria
Defoliant	Unwanted plant leaves
Desiccant	Unwanted plant tops
Fungicide	Fungi
Growth regulator	Insect and plant growth
Herbicide	Weeds
Insecticide	Insects
Miticide	Mites
Molluscicide	Snails, slugs
Nematicide	Nematodes
Piscide	Fish
Predicide	Vertebrates
Repellents	Insects, bird, other vertebrates
Rodenticide	Rodents
Silvicide	Trees and woody vegetation
Slimicide	Slime, molds
Sterilants	Insects, vertebrates

9. Nutrients (groundwater and surface water resources).

All applied plant nutrients are to be reflected in the CPPE Matrix with an emphasis on nitrogen and phosphorus compounds. Positively charged nutrient ions such as calcium, magnesium, potassium, sodium, and ammonium are strongly absorbed by both the clay and organic fraction of soils. Negatively charged ions like nitrate and chloride are not readily absorbed on soil organic matter and clay surface. These soluble ions will readily move through both surface and subsurface water regimes.

The ranges of nutrient effects are variable because of (1) time and method of application; (2) rainfall time, amount, intensity, and distribution; and (3) nutrient form. In addition, the following soil and vadose zone factors cause variable effects: (1) organic matter; (2) texture; (3) structure; (4) microprobes; (5) depth to water table; and (6) type of water table.

Rainfall effects are quite variable. For example, a pollution problem could be caused by surface applications of nutrients and manure in the spring just prior to heavy rainfall or runoff. In contrast, a problem could be caused by fall application of a form of nitrogen that is sufficiently soluble to infiltrate and leach out of the soil profile.

Method of application is also important, because of the difference in potential runoff. For example, for the same soil a surface broadcast or sprayed nutrient will be more likely to runoff, than a nutrient that has been injected or placed below the soil surface in the root zone.

Soils and vadose zones that are coarse textured or that have fractures, contribute much of the variability in infiltration and runoff effects. Runoff of nutrient and organic compounds also depends on adsorption of the compounds of nutrient and organic compounds also depend on adsorption of the compounds to the soil or vadose zone particles. Tightly bound and complex nitrogen, including ammonia nitrogen and various organic nitrogen compounds, increases with an increase in the organic matter of soil. Soils with greater clay and fine silt adsorb more ammonia.

The inorganic forms of nitrate and nitrite are completely soluble and move with water. Various conservation practices will reduce the amount of nutrients moving offsite in surface water. The relative amount of nutrient movement is usually reflected by an enrichment ratio. A decrease in the amount of a given nutrient or enrichment ratio signifies a decrease in eutrophication or other offsite nutrient impacts that affect diversified aquatic habitat suitability.

10. Salinity (ground water and surface water resources).

If there is a high water table and saline aquifer, practices that reduce seepage and deep percolation reduce salts to ditches, canals, streams, and to the ground water. Practices such as grass crops in rotation that utilize sufficient water to lower the water table will decrease salt buildup in the soil profile and decrease dissolved salt removal, inter flow, and deep seepage directly to water table. Effects are variable because of rainfall and types of vegetation, applications, kinds of salt, as well as, soil and vadose zone factors of organic matter, texture, structure, macropores, depth to water table, and type of aquifer. Any practice that reduces sediment yield and sediment delivery ratio will result in longer residence time for sediment containing salts, and increase the time for salts in the sediments to convert to a soluble form to infiltrate.

11. Pathogens (ground water and surface water).

Pathogens include bacteria, viruses, protozoans, helminths (parasite worms), and fungi (molds, mildews, rusts, smuts). Pathogen microorganisms are subject to mutation and evolution, allowing for adaptation to change in the environment. In addition, pathogens can be transported in both the soluble and particulate (sediment) form. The population changes in pathogens are assessed on the basis of time, moisture content, and presence of nutrient and soil organic matter, as well as, on temperature and other physical and chemical factors.

12. Metals (ground water and surface water).

Natural and man-induced metals may be transported with sediment or in a soluble form. Natural trace metals are less biodegradable than developed soluble form and developed compounds. Some metal compounds such as lead arsenic have been banned for 40 to 50 years. However, the past use of lead arsenic on crops such as apples has resulted in residual buildup in the soil profile. As these soils erode, the lead and arsenic compounds are transported with the sediment, and have detrimental effects on the benthic organisms and the associated food chain.

13. Dissolved oxygen (surface water).

Dissolved oxygen is the quantity (parts per million or milligrams per liter) of oxygen in water. Dissolved oxygen concentration is primarily dependent on the amount of organic loading and water temperature. An increase of organic loading and/or water temperature in a given quantity or flow of water will result in lowered dissolved oxygen. Organic material is frequently transported in fine sediment. Therefore, a reduction in sedimentation will frequently contribute to an increase in dissolved oxygen.

For example, a reduction of sediment deposition (particularly sediment containing organics) in fish spawning areas, will result in increased dissolved oxygen and improved fish egg survival. This occurs because the reduced organic materials in the sediment will result in less consumption of oxygen from the decomposition process. Hence, more oxygen is available for incubating eggs. In addition, reduced sediment intrusion will also allow better water flow through the gravel.

14. General airborne sediment effects.

Airborne sediment and smoke particles causing safety problems are generally more significant offsite than onsite because more people, vehicles, etc. will be impacted offsite by the blowing particles or smoke than onsite.

15. Airborne sediment (health, machinery and structure).

The column, Airborne Sediment causing Health Problems and/or Machinery and Structure Damages, is generally more significant onsite in the conservation treatment unit, where effects occur 24 hours a day, than offsite, along the roads and adjacent fields. However, if a large concentration of people, such as farm workers picking a crop, are affected offsite, or there is a subdivision immediately offsite, then the offsite health effects of airborne sediment may be more significant than onsite because of the impact on a larger number of people.