



# **Circular DEQ-13**

## **MONTANA'S POLICY FOR NUTRIENT TRADING**

**December 2012**



# MONTANA'S POLICY FOR NUTRIENT TRADING

## I. INTRODUCTION

Montana may soon adopt numeric criteria for nutrients (nitrogen and phosphorous) that will protect the beneficial uses of state surface waters.<sup>1</sup>

Implementation of the criteria is supported by legislation that allows for the adoption of an individual variance or the approval of a general variance<sup>2</sup> from the base numeric nutrient standards for a specific point source discharge due to: (1) substantial and widespread economic harm or (2) the limits of technology, or both.<sup>3</sup>

Obtaining a nutrient standards variance, as defined in 75-5-103(22), MCA, will allow a point source to commence or continue discharging in compliance with the terms of the variance for a defined period of time without significant and costly upgrades. Although a variance will provide interim goals and a time frame for point sources to begin reducing nutrient loading, the State's long-term goal is that each point source will reduce nutrient loading in the amount necessary to achieve compliance with the State's nutrient criteria as soon as feasible. This policy provides the framework for allowing point source discharges to use trading as a cost-effective method of achieving the State's numeric criteria for nutrients without delay and avoid the need for a variance. Trading under this policy is intended to provide a flexible and voluntary alternative to meeting the numeric nutrient criteria or, when applicable, a variance from those criteria. Although the policy does not provide for Department of Environmental Quality (DEQ) review and approval of nonpoint to nonpoint source trading, DEQ may consider such trades when needed.

Trading under this policy may take place under a variety of conditions that may arise after or before the adoption of numeric criteria for nutrients, including circumstances where trading is used to: (1) comply with an approved total maximum daily load (TMDL) for nutrients; (2) offset a new or increased discharge of nutrients; (3) comply with water quality-based effluent limits for nutrients; or (4) offset a new or increased discharge of nutrients into "high quality" waters. This policy allows point source to point source trading, point source to nonpoint source trading, and nonpoint to nonpoint source trading. All trades that involve point source discharges will be monitored and enforced under a Montana Pollutant Discharge Elimination System (MPDES) permit. DEQ will not allow the use of credits or trades that would cause an impairment of existing or designated uses, adversely affect water quality at an intake for drinking water supply, or that would exceed a cap<sup>4</sup> established under a TMDL.

---

<sup>1</sup> The terms "numeric criteria for nutrients" and "numeric nutrient criteria" are used interchangeably and have the same meaning as "base numeric nutrient standards" as defined in § 75-5-103(2), MCA.

<sup>2</sup> A variance, if adopted or approved by DEQ for a specific point source, provides a defined period of time in which a specific point source is not required to comply with the base numeric nutrient standards. A variance may not exceed 20 years.

<sup>3</sup> The term "limits of technology" will be defined in rulemaking.

<sup>4</sup> The cap that cannot be exceeded refers to a particular watershed's total load of nutrients established by a TMDL. Consequently, the prohibition against allowing trades that exceed a cap established by a TMDL does not prohibit trades that may result in an exceedance of an individual wasteload allocation, as long as the cap for the total load is not exceeded.

## 1. Purpose

The purpose of this policy is to facilitate trading among watershed stakeholders interested in participating in nutrient trading opportunities. Consistent with *EPA Water Quality Trading Policy*, DEQ encourages water quality trading when it does not result in adverse ecological consequences and supports one or more of the following objectives:

- To provide a cost-effective method for achieving compliance with Montana's base numeric nutrient standards or for achieving compliance with a nutrient standards variance approved or adopted by DEQ.
- To offset new or increased discharges resulting from growth in order to *maintain and improve* levels of water quality that support all designated uses.
- To establish economic incentives for *reductions* from all sources within a watershed.
- To reduce the cost of implementing nutrient TMDLs or water quality-based effluent limits for nutrients through greater efficiency and flexible approaches.
- To achieve greater environmental benefits than through the existing regulatory framework. For example, DEQ supports the creation of water quality trading credits that achieve ancillary environmental benefits beyond the required reductions of pollutant loads, such as the creation and restoration of wetlands and riparian habitat.

## II. DEFINITIONS

1. **Baseline:** The baseline for generating pollution reduction credits must be consistent with applicable water quality standards. The term pollution reduction credits ("credits"), as used in this policy, means pollutant reductions greater than those required by a regulatory requirement for nonpoint sources or established under a TMDL wasteload allocation or water quality-based effluent limit for point sources. For purposes of determining baseline, the term "water quality-based effluent limit" means an effluent limit that ensures compliance with the base numeric nutrient criteria. Examples of "baseline" for impaired waters where a TMDL has been approved or established and for waters where no TMDL has been established, including "high quality" waters,<sup>5</sup> are as follows:

- (a) **Impaired waters where a TMDL has been approved or established** - Where a TMDL has been established or approved, the applicable point source wasteload allocation would establish the point source's baseline for generating credits. In distinction, the baseline for nonpoint sources is the level of pollutant load associated with existing land uses and management practices that comply with applicable state, local, or tribal regulations. See §75-5-317(2)(a) and (b), MCA. A nonpoint source may generate credits by achieving greater nutrient load reductions than required by any statute or rule governing its nonpoint source activity. A nonpoint source may not, however, terminate an existing Best Management Practice (BMP) to reduce the baseline requirement in order to generate credits for future trading purposes.

---

<sup>5</sup> As used in this policy, "high quality" water is a waterbody with water quality that is better than the base numeric nutrient standards adopted by the Board of Environmental Review.

**(b) Waters where no TMDL has been established** - For trades that occur where the quality of water is better than the numeric nutrient standards (i.e., "high quality" waters), or in impaired waters prior to a TMDL being established, the baseline for point sources would be established by a water quality-based effluent limitation. In this instance, like the previous instance, the baseline for nonpoint sources is the level of pollutant load associated with existing land uses and management practices that comply with applicable state, local, or tribal regulations. A nonpoint source may generate credits by achieving greater nutrient load reductions than required by any statute or rule governing its nonpoint source activity. A nonpoint source may not, however, terminate an existing BMP to reduce the baseline requirement in order to generate credits for future trading purposes.

2. **Credit:** In general, a credit is a reduction in nutrient loads beyond baseline conditions. More specifically, it is a measured or estimated unit of pollutant reduction per unit of time adjusted to account for applicable trading ratios. A seller generates excess load reductions by controlling its discharge beyond what is needed to meet its baseline through controlling its flow and/or its discharge concentrations. A buyer compensates a seller for creating the excess load reductions that are then converted into credits by using trading ratios. Where appropriate, the buyer can use the credits to meet a regulatory obligation. Credits are expressed as pounds of nitrogen or phosphorous per applicable period of time that is delivered to surface waters in the watershed. Credits will need to be measured or estimated, verified, and accounted for according to that time period. Credits cannot be banked for a future time period, unless it can be demonstrated that an off-season reduction provides a water quality benefit within the applicable period of the standards.

**(a) Point source credits** - A point source may generate credits by achieving measured nutrient reductions greater than the wasteload allocation established for the point source under a TMDL or greater than a water quality-based effluent limitation for its discharge derived from the State's numeric nutrient criteria. A credit may not be generated by achieving nutrient reductions greater than required by a nutrient standards variance approved or adopted by DEQ for the point source.

**(b) Nonpoint source credits** - A nonpoint source may generate credits by achieving nutrient reductions greater than required by a regulatory requirement applicable to that source. For those nonpoint sources not subject to regulatory requirements, nutrient reductions achieved by changing existing practices or conditions will qualify for credits. Nonpoint source credits will be based upon a measured or estimated reduction of nutrients adjusted to account for applicable trading ratios. For example, such loads may be calculated by using watershed model delivery ratios that will be applied to edge-of-fields loads or may be calculated by a model used in a Department-approved TMDL. (See Appendix A)

3. **Nonpoint Source:** A "nonpoint source" is any source of diffuse runoff or discharge that is not a "point source," as defined in Montana's water quality laws, § 75-5-103, MCA. Examples of nonpoint sources include, but are not limited to, farming activities, cattle grazing, timber harvesting, unpaved roads, septic systems, and eroding stream banks.

4. **Nutrient Trading:** Trading is a market-based approach to achieving water quality standards in which a point source purchases pollutant reduction credits from another point source or a nonpoint source in the applicable trading region that are then used to meet the source's pollutant discharge obligations. To be creditable to the source purchaser, the credits must reflect an actual, pollutant

load differential below the credit seller's baseline. Under certain circumstances, a point source buyer may have to purchase more than one pound of pollutant reduction to equal a pound discharged at its outfall.

5. **Nutrient Reduction:** The difference in nutrient (total nitrogen or total phosphorus) discharges to surface waters achieved by activities such as best management practices or technical upgrades, compared to the applicable baseline after meeting eligibility requirements.
  6. **Total Maximum Daily Loads (TMDL):** A TMDL is "...the sum of the individual wasteload allocations for point sources and load allocations for both nonpoint sources and natural background sources established at a level necessary to achieve compliance with applicable water quality standards." § 75-5-103(37), MCA. In other words, a TMDL establishes the maximum amount of pollutant load that a waterbody can receive and still meet applicable water quality standards. A TMDL includes an allocation of pollutant loadings to point sources (wasteload allocations **WLAs**), an allocation on pollutant loadings to nonpoint sources or natural sources (load allocations **LAs**), and a margin of safety.
  7. **Trading Ratio:** Discount factors applied to pollutant reductions to account for delivery or uncertainty. The following are examples of trading ratios:
    - (a) **Delivery Ratios** - Delivery ratios apply discount factors to compensate for a pollutant's travel over land or in water (or both) and may be applied to point, as well as, nonpoint sources. Delivery ratios generally account for attenuation (i.e., the rate at which nutrients are reduced through natural processes, such as hydrolysis, oxidation, and biodegradation, on their way to the mainstem of the waterbody). The ratio may vary depending on the location of the source. Generally, the greater the distance the pollutant has to travel, the greater the pollutant loss will be. This ratio would work to equalize a trade between a source in the headwaters and one near the mainstem. This ratio is often referred to as the "location ratio." Delivery ratios will be based upon information from applicable and accepted data sources as reviewed and approved by DEQ. Delivery ratios may incorporate time-variable credits to account for delays between implementation of a load reduction (e.g. connecting a Wastewater Soil Disposal System (WSDS) to a permitted wastewater treatment plant) and the time that load reduction is actually realized in the receiving water.
    - (b) **Uncertainty Ratios** - Uncertainty ratios are intended to account for variation in the expected reliability and efficiency of the source or type of reduction being applied toward credit for another. They are calibrated to create a margin of safety or otherwise attempt to ensure that the credited practice provides a minimum level of reductions to ensure water quality is improved as a result of the trade, even if actual reduction efficiencies and units removed are on the low end of an expected range. In some instances uncertainty ratios will not be employed because they are already accounted for in quantification methods used in delivery ratios.
- Once a trading ratio has been established for a specific BMP DEQ cannot change the ratio unless the BMP is not maintained as originally proposed.
8. **Load Allocation (LA):** The portion of the receiving water's loading capacity that is allocated to one of its existing or future nonpoint sources of pollution or natural background sources.

9. **Wasteload Allocation (WLA)**: The portion of receiving water's loading capacity that is allocated to one or more of its existing or future point sources of pollution. WLAs implemented in discharge permits constitute a type of water-quality based effluent limit.
10. **Wastewater Soil Disposal System (WSDS)**: Any system that disposes of sewage effluent on top or beneath the soil surface such that the wastewater migrates downward below the soil surface.

### III. KEY PRINCIPLES

1. **All new or expanded point source nutrient loads must be fully offset on streams that are impaired by nutrients.**

To participate in trading, new point source dischargers with no allocation in the watershed or point source discharges requesting an increase in a wasteload allocation in the watershed must fully offset any increased point source loading.

2. **Trading in an impaired waterbody for which a TMDL has been approved or established must be consistent with the assumptions in the TMDL's WLA or any interim WLA.**

Nutrient trades must not exceed the total load imposed by the TMDL, except when a variance has been granted. There are two phased TMDLs currently existing (Lake Helena and Flathead Lake.), which provide interim goals that establish interim wasteload allocations. For these phased TMDLs, trading must comply with the interim wasteload allocations or a variance from the interim wasteload allocation approved by DEQ.

3. **All nutrient trades involving point sources will be implemented and enforced via MPDES permits.**

When trading involves a point source, the permit limits of the point source discharge will incorporate the nutrient trade. The permit will also provide the vehicle for enforcement of the trade condition. In the event of default by another source generating credits for a MPDES permittee, the MPDES permittee using those credits is responsible for complying with the effluent limitations that would have applied if no trade had occurred. The use of the discharge permit program will ensure that credits are accountable, reliable, and enforceable. When specific conditions of the trade need to be verified over time, the permit will require that the permittee submit an annual update to the Department verifying that the conditions of the trade are being complied with. The public will have an opportunity to comment on any permit conditions that allow trading during the public comment period on the draft permit. These conditions will be subject to the normal comment process and period for comment, along with all other conditions of the permit.

4. **What may be traded.**

DEQ supports the concept of trading and through this Policy seeks to specifically facilitate the trading of nutrient (total phosphorous and total nitrogen) credits. Such trades must involve comparable credits (e.g., total nitrogen traded for total nitrogen).

5. **Duration of Credits**

A point source discharger submitting a trading proposal must demonstrate that it has secured credits for at least the permit cycle (i.e., 5 years).

Other safeguards should be considered by the permittee and by the nonpoint source that is generating credits to ensure that the appropriate amount of credits are generated during the entire 5-year permit cycle. They may include such things as backup plans and alternative options to address failures by nonpoint sources to provide the contracted credits.

## IV. FUNDAMENTALS

### 1. Credit Funding Sources

Credits may be generated from point or nonpoint source discharges funded through a variety of sources such as the State Revolving Fund, local funds, or private funds. The cost of credits are determined by the market.

### 2. Who May Participate in Trading

- a) Point sources (e.g., sources required by law to obtain a Montana Pollutant Elimination Discharge (MPDES) discharge permit)
- b) Nonpoint sources (e.g., any source that is not required to obtain an MPDES permit, such as logging activities, agricultural activities, or septic systems)
- c) Third parties (e.g., county governments, nonprofits, aggregators, private brokers, etc.)
- d) Any combination of the above

### 3. Examples of Obtaining Nutrient Credits

Credits may be obtained by: a) implementing any of the options listed below: b) implementing a BMP described or referenced (see references to BMPs in other states) in Appendix A: or c) implementing other options that may be proposed on a case-by-case basis through the MPDES public participation process.

A person proposing to implement a BMP may calculate load credits using an applicable method described in Appendix A as guidance. Alternatively, a person may calculate load credits using any other method applicable to the site where a BMP will be implemented. DEQ will review each proposed load calculation during the application process prior to approving its use in a MPDES permit.

#### **Potential Sources of Nutrient Reduction Credits**

1. Retiring an existing WSDS with a demonstrated hydrologic connection to surface water by connecting to a permitted wastewater treatment facility. Where existing WSDS's are connected to DEQ permitted wastewater systems as part of a trading plan, the following elements, as a minimum, must be included:
  - (i) GIS mapping of septic system locations;
  - (ii) Annual nutrient loading at the edge of the WSDS discharge (including septic type if it is a significant factor in loading values); and
  - (iii) Nutrient delivery ratio and uncertainty ratio based on site-specific conditions.

2. Land application of wastewater with any applicable treatment and nutrient management controls;
3. Optimizing treatment operations;
4. Animal waste management (i.e., ponds, lagoons, holding tanks);
5. Conservation tillage (e.g., no-till, low-till);
6. Cover crops;
7. Retirement of highly erodible land;
8. Installation of new runoff or erosion control;
9. Installation of new stream protection;
10. Installation of new forest conservation or harvesting practices;
11. Enhanced storm water management;
12. Forested or grass buffers;
13. Other protection practices as approved by DEQ.

#### **4. Where Trading May Occur (Boundaries)**

Geographical boundaries for trading will be based on watershed boundaries. Other boundary conditions may exist in certain instances, such as when the stream passes through a reservoir, lake, or large wetland complex. Generally credits should be generated upstream in the watershed.

Certain site specific conditions may allow for downstream credit generation for downstream trading. Downstream trades will be structured to minimize increased loading to any portion of an impaired waterbody or to prevent exceedances of water quality standards on a non-impaired waterbody. DEQ may include increased trading ratios when approving a downstream trade to meet those objectives.

#### **5. Effect of Policy**

The policy and procedures outlined in this document are intended to supplement existing requirements established under Montana's Water Quality Act and rules implementing that Act. Nothing in the policy or procedures reduces or replaces these existing regulatory requirements.

DEQ's authority to allow MPDES permits to use trading is provided for under Montana's Water Quality Act, and rules implementing the State's MPDES program. This document establishes the framework for DEQ to exercise its administrative discretion when allowing nutrient trading in MPDES permits. Neither the load allocations established for both point and nonpoint sources under TMDLs nor the credits generated or purchased under this policy are a property right. For point sources, wasteload allocations and trading baselines will be implemented through MPDES permits.

## **V. IMPLEMENTATION**

This section describes the requirements and process for obtaining DEQ approval of nutrient trades in MPDES permits. DEQ will provide a pre-application process to work with any point source interested in trading to assist in determining the appropriate information needed to incorporate the trade in an MPDES permit and inform the permittee of any new permit conditions that will be required to implement the trade.

**1. Identifying Trading Partners**

Sources seeking to acquire or sell credits are responsible for finding trading partners. For example, trading partners may be identified by contacting individual sources that have been identified as contributors of nutrient loading in an approved TMDL or by contacting third-party stakeholder groups.

**2. Application Process and Documentation Procedures**

Point sources planning to enter into a trading agreement shall submit an application for approval of the trade. The application shall be composed of three parts: (1) specific details of the trade; (2) credit buyer documentation; and (3) credit seller documentation. The point source trading partner will be responsible for including the trade application information in any permit application or permit modification request.

**3. The Trading Application - Specific Details of the Trade**

The applicant proposing the trade shall provide specific information about the proposed trading arrangement. Depending on the details of the specific trade, the following information may be required:

- time period for the trading arrangement;
- the number of credits to be exchanged each year during this period;
- how the number of credits was determined;
- source of the credits;
- the general contractual arrangements;
- timeline for credit generation and use;
- need for the trade, including the wasteload allocation status, flow and load projections;
- the consistency of the trade with any approved TMDL;
- the eligibility of the facility to trade;
- the location of the facilities and any applicable watershed delivery factor;
- the credit acquisition plan;
- how the discharge credits will be generated;
- inspection and verification requirements; and
- any other relevant information requested by DEQ.

DEQ will review the application to trade and evaluate it based upon the requirements described in this policy. DEQ may approve the application, approve it with conditions, or deny the application. The approved trade will be included in a draft MPDES permit and public comment on the trade will be accepted during the formal public comment period required for all MPDES permits. DEQ approval is not final until the MPDES permit is issued incorporating the trade.

## APPENDIX A

### SUMMARY OF TRADE CREDIT CALCULATIONS FOR NONPOINT BMPs USED BY OTHER STATES

#### IDAHO

**Summary:** Have a list of 12 specific BMPs for phosphorus reduction with a pre-determined “Effectiveness” percentage and a pre-determined “Uncertainty” percentage. Prior to using those tables, applicant must determine the site-specific reduction in soil loss from the proposed BMP by using an NRCS program called Surface Irrigation Soil Loss (SISL) tool.

[http://www.deq.idaho.gov/media/488798-water\\_quality\\_pollutant\\_trading\\_guidance\\_0710.pdf](http://www.deq.idaho.gov/media/488798-water_quality_pollutant_trading_guidance_0710.pdf)

**Notes:**

- BMP list only applies to the Lower Boise Watershed. BMP effectiveness and uncertainty for other Idaho watersheds have not been determined yet.
- The SISL tool is designed for irrigated croplands.
- Pre-determined BMPs do not include effectiveness or uncertainty for nitrogen.
- BMPs not on the pre-determined list must go through a detailed monitoring program to determine the appropriate effectiveness percentages.

#### OREGON

**Summary:** Provides simple calculations for determining nitrogen and phosphorus reductions for 3 BMPs (grassy swales, vegetative buffers, and livestock fencing). Applicant only needs to provide annual precipitation value and land use area affected. Also includes trading ratios for the three BMP (ratios vary between 2.5 and 2.8)

<http://www.deq.state.or.us/wg/pubs/imds/wqtrading.pdf> (see Appendix D).

**Notes:**

- Calculations apply over the entire state.
- Does not address how to determine credits for any other BMPs.

#### USEPA

**Summary:** Uses the Spreadsheet Tool for Estimating Pollutant Loads (STEPL) model and the Region 5 model. Includes and describes 62 BMPs that can be used in the “BMP Efficiency Calculator for STEPL”. The BMP efficiency calculator requires the user to enter the state, county and nearest weather station (from a list provided) and the local soil hydrologic group (A, B, C or D).

<http://it.tetrattech-ffx.com/steplweb/>

**Notes:**

- Includes a list of simple, mid-range, and complex models that can be used to estimate sediment and nutrient loads before and after BMPs. STEPL and Region 5 models are considered “simple” models in this list.
- Region 5 model includes a detailed manual.

**OHIO**

**Summary:** Uses the Region 5 model described in the USEPA section. Also suggests use of the NRCS Revised Universal Soil Loss Equation (RUSLE), Version 1.

<http://www.dnr.state.oh.us/tabid/8856/Default.aspx>

**NRCS**

**Summary:** Has developed the Revised Universal Soil Loss Equation, Version 2 (RUSLE2) that includes more user friendly interface.

[http://fargo.nserl.purdue.edu/rusle2\\_dataweb/RUSLE2\\_Index.htm](http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm)

**MONTANA'S SEPTIC TRADING METHOD****Nitrogen**

**Table 1 – Nitrogen Attenuation Factors for Septic System Discharges to Groundwater**

Percent Nitrogen Load Reduction(1)	Soil Type @ Drainfield(2)	Soil Type within 100' of surface water(2)	Distance to surface water (ft)
0	A	A	0 – 100
10	B		101 – 500
20	C	B	501 – 5,000
30	D	C	5,001 – 20,000
50		D	20,001+
Data Source	NRCS Web Site / GIS STATSGO or SSURGO	GIS – County Records / State Cadastral	

**Notes:**

- (1) The total nitrogen reduction is the sum of the individual reductions for each column of the table. For example a drainfield that is in a type C soil (20%) that drains to a surface water with type B soil (20%) and is 200 feet from the surface water (10%) would reduce their nitrogen load to the surface water by 50% from what is discharged from the drainfield.
- (2) Soil descriptions are available via the NRCS web soil survey at: <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>. Once the Area Of Interest (AOI) has been defined information is accessed by clicking on following links: “Soil Data Explorer” – “Soil Properties and Qualities” – “Soil Qualities and Features” – “Drainage Class”. The NRCS soil survey has seven soil drainage classes that are correlated to the A, B, C and D designation in the table as follows:
  - A = excessively drained or somewhat excessively drained
  - B = well drained or moderately well drained
  - C = somewhat poorly drained
  - D = poorly drained or very poorly drained

Within the defined area of interest, the soil survey application provides the percent of soil types with these attributes. That feature provides a quick way to determine the percent of each soil type and therefore the percent reduction for each area of interest defined.

## Phosphorus

**Table 2 – Phosphorus Attenuation Factors for Septic System Discharges to Groundwater**

Percent Phosphorus Load Reduction(1)	Soil Type @ Drainfield(2,3) (CaCO <sub>3</sub> <= 1%)	Soil Type @ Drainfield(2,3) (CaCO <sub>3</sub> >1% and <15%)	Soil Type @ Drainfield(2,3) (CaCO <sub>3</sub> >=15%)	Distance to surface water (ft)
0	A	A	A	0 – 100
10			B	
20		B	C	
30	B		D	101 - 500
40		C		
60	C	D		501 - 5,000
90	D			
100				5,001 +
Data Source	NRCS Web Site / GIS STATSGO or SSURGO			GIS – County Records / State Cadastral

### Notes:

- (1) The total phosphorus reduction is the sum of the individual reductions for the soil type (only use one of the three soil columns) and the distance to surface water. For example a drainfield that is in a type B soil with less than 1% CaCO<sub>3</sub> (30%) and is 200 feet from the surface water (30%) would reduce their nitrogen load to the surface water by 60% from what is discharged from the drainfield.
- (2) Soil descriptions are available via the NRCS web soil survey at: <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> . Once the Area Of Interest (AOI) has been defined information is accessed by clicking on following links: “Soil Data Explorer” – “Soil Properties and Qualities” – “Soil Qualities and Features” – “Drainage Class”. The NRCS soil survey has seven soil drainage classes that are correlated to the A, B, C and D designation in the table as follows:
  - A = excessively drained or somewhat excessively drained
  - B = well drained or moderately well drained
  - C = somewhat poorly drained
  - D = poorly drained or very poorly drained

Within the defined area of interest, the soil survey application provides the percent of soil types with these attributes. That feature provides a quick way to determine the percent of each soil type and therefore the percent reduction for each area of interest defined.

- (3) CaCO<sub>3</sub> percent is available via the NRCS web soil survey at: <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> . Once the area of interest has been defined information is accessed by clicking on following links: “Soil Data Explorer” – “Soil Properties and Qualities” -- “Soil Chemical Properties” – “Calcium Carbonate (CaCO<sub>3</sub>)”. Within the defined area of interest, the soil survey application provides the percent of land with the percent of CaCO<sub>3</sub>. That

feature provides a quick way to determine the percent of area of different CaCO<sub>3</sub> percentages and therefore the percent reduction for each area of interest defined.