

TECHNICAL NOTES

The Nitrogen Leaching Potential And User's Guide

Soil Data Viewer Rule Manager Interpretation Descriptions: AGR - Nitrate Leaching Potential, Nonirrigated (WA)

This interpretation is designed to evaluate the potential for nitrate-nitrogen to be transmitted through the soil profile below the root zone by percolating water under nonirrigated conditions. Leaching nitrates have the potential to contaminate shallow and deep aquifers used for drinking water. The ratings are based on inherent soil and climate properties that affect nitrate leaching, and do not account for management practices such as nitrogen fertilizer application rates and timing, or crop rotation.

Nonirrigated Soil and Climatic Factors

The following soil and climate factors are used in the interpretation criteria:

1. Mean annual precipitation minus potential evapotranspiration - this factor provides an estimate of the amount of water that is available to move through the soil profile on an annual basis. Potential evaporation is estimated from mean annual air temperature, using an algorithm developed by the National Soil Survey Center, using the Hamon potential evapotranspiration method.
2. Water travel time through the entire soil profile - this factor uses the saturated hydraulic conductivity (Ksat) and thickness of each soil horizon, to estimate the number of hours that would be required for a given volume of water to move through the entire soil profile. One advantage of this method for accounting for the rate of water movement is that the properties and thickness of each soil horizon are accounted for, rather than using an average saturated hydraulic conductivity for the entire profile. This method accounts for subtle differences between soils in texture, structure, horizon thickness, and depth to water-restricting layers.
3. Available water capacity - this factor accounts for the cumulative amount of water available to plants that the entire soil profile can hold at field capacity to a depth of 150 cm. The more water the soil profile can hold, the less water is available for deep leaching.
4. Depth and duration of water table - this factor uses a water table index based on the minimum average

depth to a water table, and the number of months that the water table is present during the months of April through October. It is used to account for the loss of nitrates to the atmosphere as nitrous oxide or nitrogen gas due to denitrification under anaerobic conditions caused by water saturation. The higher the water table and the longer it's duration, the larger the quantity of nitrates that would potentially be lost to the atmosphere, and therefore not be available for deep leaching.

5. Slope gradient adjusted for hydrologic soil group - the steeper the slope gradient, the higher the potential surface runoff, resulting in less water available to move through the soil profile. The following adjustments are made to the slope gradient by hydrologic group to account for potential surface runoff differences:

Hydrologic group A - slope % x 0.75

Hydrologic group B - slope % x 0.85

Hydrologic group C - slope % x 0.95

Hydrologic group D - no adjustment

Nonirrigated Rating Calculations

The ratings are both verbal and numerical. The ratings for Nitrate Leaching Potential, Nonirrigated are calculated as follows:

1. The Mean Annual Precipitation minus Potential Evapotranspiration sub-rule is weighted by multiplying by 0.60.
2. The Water Travel Time subrule is weighted by multiplying by 0.25.
3. The Available Water Capacity subrule is weighted by multiplying by 0.15.
4. The sum of these three weighted subrules results in a value between 0.00 and 1.00.
5. Adjustments are then made for water table depth and duration, and slope gradient adjusted for hydrologic group. The sum of the values from these subrules is subtracted from the sum in step 4 above. The maximum reduction is 0.50 for the water table index subrule, and 0.30 for the slope gradient subrule.

The ratings for the Nitrate Leaching Potential, Irrigated interpretation are calculated with different weighting factors than those above for the nonirrigated interpretation.

Nitrate Leaching Potential, Nonirrigated rating classes

The following Nitrate Leaching Potential, Nonirrigated rating classes are assigned based on the final calculation from the factors above:

Low: 0.00 - 0.25

Moderate: 0.26 - 0.50

Moderately high: 0.51 - 0.75

High: 0.76 - 1.00

The ratings indicate the potential for nitrate leaching below the root zone, based on inherent soil and climate properties. A "Low" rating indicates a low potential for nitrates to leach below the root zone. A "High" rating indicates a high potential for nitrates to leach below the root zone. The "Moderate" and "Moderately high" rating indicate intermediate potentials for leaching nitrate below the root zone. Management practices

are strongly encouraged to be applied to mitigate nitrate loss when ratings are above the “Low” level and at a minimum be focused on the limiting factors identified.

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Soil Data Viewer Rule Manager Interpretation Descriptions: AGR - Nitrate Leaching Potential, Irrigated (WA)

This interpretation is designed to evaluate the potential for nitrate-nitrogen to be transmitted through the soil profile below the root zone by percolating water under irrigated conditions. Leaching nitrates have the potential to contaminate shallow and deep aquifers used for drinking water. The ratings are based on inherent soil and climate properties that affect nitrate leaching, and do not account for management practices such as nitrogen fertilizer application rates and timing, crop rotation, and irrigation water management.

Irrigated Soil and Climatic Factors

The following soil and climate factors are used in the interpretation criteria:

1. Mean annual precipitation minus potential evapotranspiration - this factor provides an estimate of the amount of water that is available to move through the soil profile on an annual basis from precipitation. Potential evaporation is estimated from mean annual air temperature, using an algorithm developed by the National Soil Survey Center, using the Hamon potential evapotranspiration method.
2. Water travel time through the entire soil profile - this factor uses the saturated hydraulic conductivity (K_{sat}) and thickness of each soil horizon, to estimate the number of hours that would be required for a given volume of water to move through the entire soil profile. One advantage of this method for accounting for the rate of water movement is that the properties and thickness of each soil horizon are accounted for, rather than using an average saturated hydraulic conductivity for the entire profile. This method accounts for subtle differences between soils in texture, structure, horizon thickness, and depth to water-restricting layers.
3. Available water capacity - this factor accounts for the cumulative amount of water available to plants that the entire soil profile can hold at field capacity to a depth of 150 cm. The more water the soil profile can hold, the less water is available for deep leaching.
4. Depth and duration of water table - this factor uses a water table index based on the minimum average depth to a water table, and the number of months that the water table is present during the months of April through October. It is used to account for the loss of nitrates to the atmosphere as nitrous oxide or nitrogen gas due to denitrification under anaerobic conditions caused by water saturation. The higher the water table and the longer it's duration, the larger the quantity of nitrates that would potentially be lost to the atmos-

phere, and therefore not be available for deep leaching.

5. Slope gradient adjusted for hydrologic soil group - the steeper the slope gradient, the higher the potential surface runoff, resulting in less water available to move through the soil profile. The following adjustments are made to the slope gradient by hydrologic group to account for potential surface runoff differences:

Hydrologic group A - slope % x 0.75

Hydrologic group B - slope % x 0.85

Hydrologic group C - slope % x 0.95

Hydrologic group D - no adjustment

Irrigated Rating Calculations

The ratings are both verbal and numerical. The ratings for Nitrate Leaching Potential, Irrigated are calculated as follows:

1. The Water Travel Time subrule is weighted by multiplying by 0.60.
2. The Available Water Capacity subrule is weighted by multiplying by 0.40.
3. The sum of these two weighted subrules results in a value between 0.00 and 1.00
4. Adjustments are then made for water table depth and duration, and slope gradient adjusted for hydrologic group. The sum of the values from these subrules is subtracted from the sum in step 3 above. The maximum reduction is 0.50 for the water table index subrule, and 0.30 for the slope gradient subrule.
5. A final positive adjustment is made for the Mean Annual Precipitation minus Potential Evapotranspiration subrule. The maximum addition is 0.60.

The ratings for the Nitrate Leaching Potential, Nonirrigated interpretation are calculated with different weighting factors than those above for the irrigated interpretation.

Nitrate Leaching Potential, Irrigated rating classes

The following Nitrate Leaching Potential, Irrigated rating classes are assigned based on the final calculation from the factors above:

Low: 0.00 - 0.25

Moderate: 0.26 - 0.50

Moderately high: 0.51 - 0.75

High: 0.76 - 1.00

The ratings indicate the potential for nitrate leaching below the root zone, based on inherent soil and climate properties. A “Low” rating indicates a low potential for nitrates to leach below the root zone. A “High” rating indicates a high potential for nitrates to leach below the root zone. The “Moderate” and “Moderately high” rating indicate intermediate potentials for leaching nitrate below the root zone. Management practices are strongly encouraged to be applied to mitigate nitrate loss when ratings are above the “Low” level and at a minimum be focused on the limiting factors identified.

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

How to create Nitrate Leaching Potential Reports

1. Go to <http://websoilsurvey.nrcs.usda.gov/app/> To get started, Click on the Green Start button.
2. The first thing you have to do is digitize an “Area of Interest” in order to create maps or run soil reports. To navigate to the general area, you can use the **zoom tool** or use one the methods under the “**Quick Navigation**” bar. You can use the Address, State and County, PLSS, or Latitude and Longitude. You can also use the **Import AOI** function to bring in a shapefile created outside of Web Soil Survey for your Area of Interest. If you need further assistance on using WebSoilSurvey contact your local NRCS office.
3. When your area of interest is selected it will be outlined in a *blue hatched area*. Next click on the **Soil Map tab** and a soil map will appear of your Area of Interest.
4. The soil map will appear with orange soil lines and a map unit symbol is labeled inside the polygon. The **Map Unit Legend** is visible also with a listing of the map units and acres that make up your Area of Interest. You can click on these blue-colored **Map Unit Names** to see a map unit description. To get to the **Nitrate Leaching Reports** you have to click on the **Soil Data Explorer tab**.
5. Click on **Suitabilities and Limitations for Use** tab. Under the **Land Management** category, click on either the **Nitrate Leaching Potential, Nonirrigated or Irrigated condition (WA)** header and then click on **View Rating**. You should see a color coded map of the ratings with a table of the ratings below the map. Also included is a description of the report. Click on **Printable Version** bar to print map and table of ratings.
6. If you just want to run a table report without the map, click on the **Soil Reports** tab, then over on the left click on **AOI Inventory** header, then click on **Selected Soil Interpretations**. Check either or both the *nonirrigated or irrigated* AGR - Nitrate Leaching Report and then click **View Soil Report**. Click on Printable Version.
7. If you do not wish to print and want to save these to your computer, click on **Shopping Cart (Free)** and then click on **Check out** and you will have options to save maps and reports to your computer. (You can give your report a name or title here)

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