# Missouri Nitrogen Leaching Index

The potential for nitrate nitrogen to leach through an agricultural soil depends on several factors, including soil properties that affect rate of water movement through the soil and rate of surface runoff, rainfall, and the amount and type of nitrogen fertilizer being applied to the field. Soil infiltration rate, the ease with which water moves into and through the soil, is by far the best indicator of leaching potential. This permeability is determined by factors such as soil texture, soil structure, bulk density and depth to restrictive layers such as bedrock and fragipans (hard pans). Different soil map unit components have been categorized into different soil hydrologic groups, where soils with different runoff and infiltration potential are grouped into one of the following four groups:

- **Group A**. Well drained soils with a high infiltration rate and thus a high potential for leaching nitrate.
- **Group B**. Moderately well-drained soils with a moderate infiltration rate and thus a moderate potential for leaching nitrate.
- **Group C**. Somewhat poorly drained soils with a slow infiltration rate and thus a low potential for leaching nitrate.
- **Group D**. Poorly drained soils with a very slow infiltration rate and thus a very low potential for leaching nitrate.

Another important aspect to know is whether the field is in an area that has karst topography. Karst topography is formed in limestone, gypsum or other soluble rocks by dissolution. It is characterized by closed depressions, sinkholes, caves or underground drainage. Missouri is well known for its areas of karst topography such as the Salem Plateau, Springfield Plateau and the Lincoln Hills. If the field is in an area that potentially has karst topography, then the potential risk of nitrate leaching maybe higher.

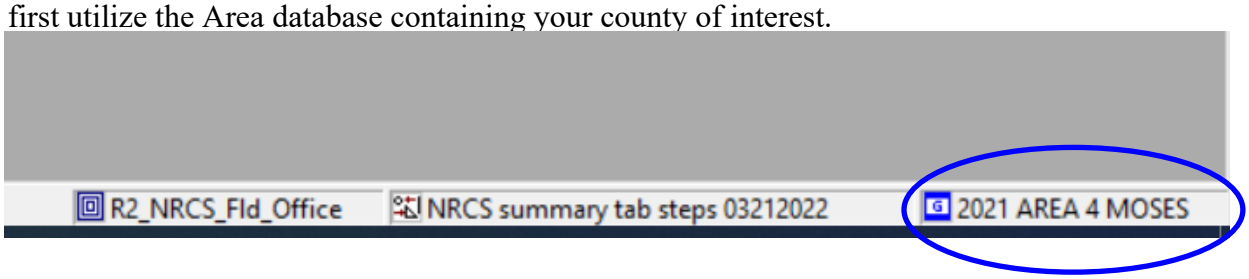


## Assessing Leaching Potential and Leaching Index Rating

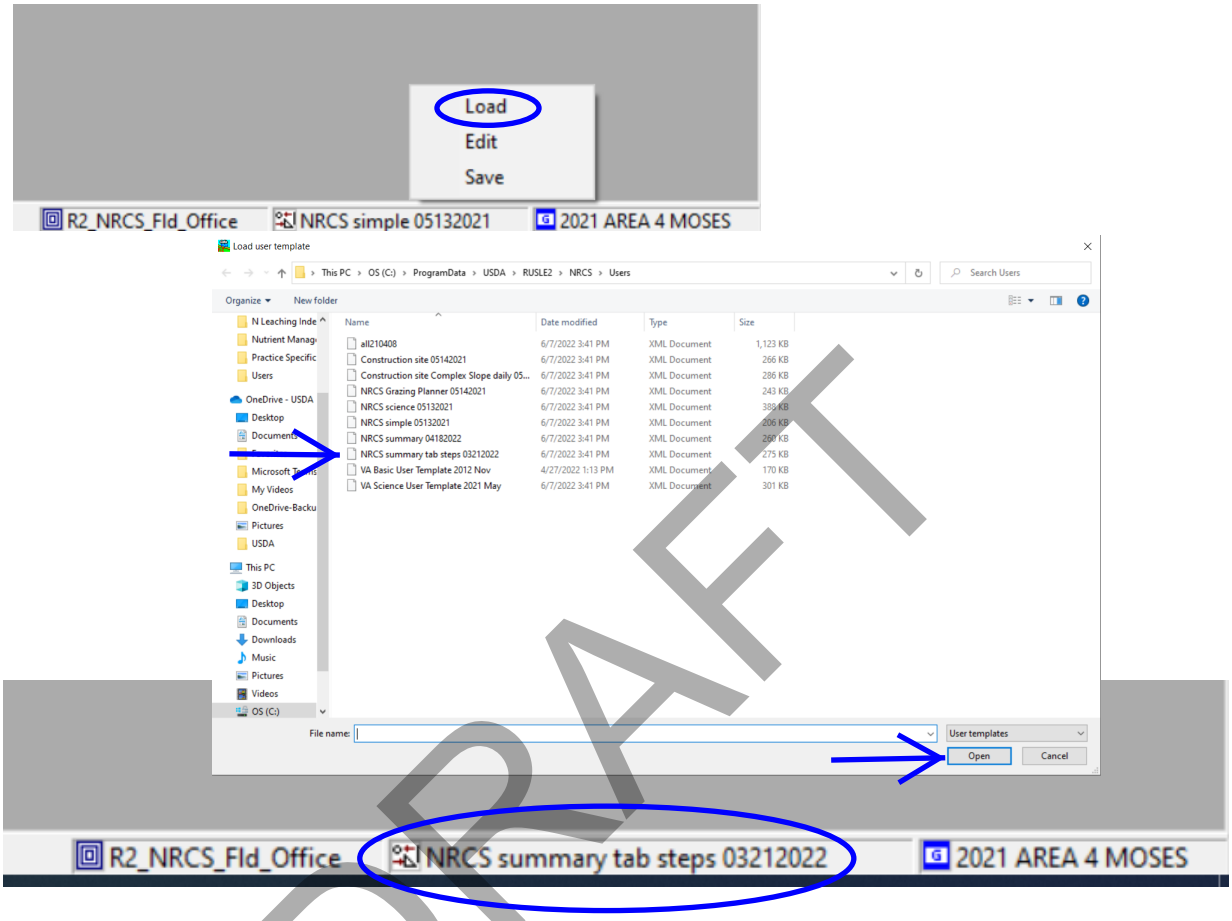
In order to assess the potential for nitrate nitrogen to leach from a field, follow the four-step process outlined below:

### Step 1: Identify the dominant soil map unit in the field and enter into RUSLE2.

The RUSLE 2 program calculates the Nitrogen Leaching Index (N-LI) rating by using the county climate and selected soil type information. To determine the N-LI using RUSLE2, first utilize the Area database containing your county of interest.

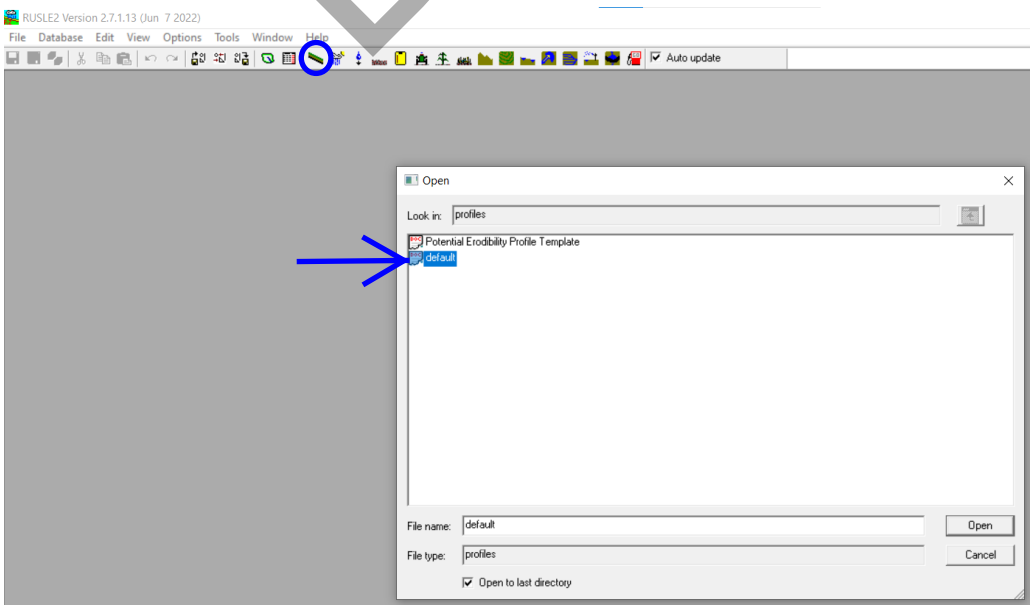


Next, change the template to NRCS summary tab steps 03212022 by right clicking on the current template and selecting load from the pop-up menu. The Load user template menu will appear. Select the NRCS summary tabs steps 03212022 and then select "open".

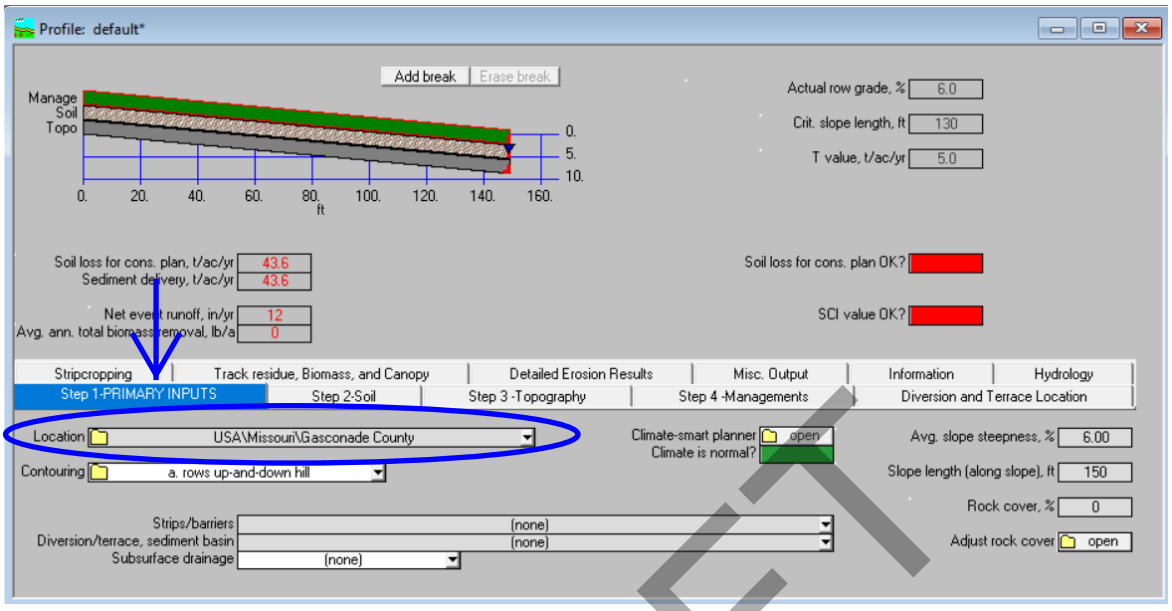




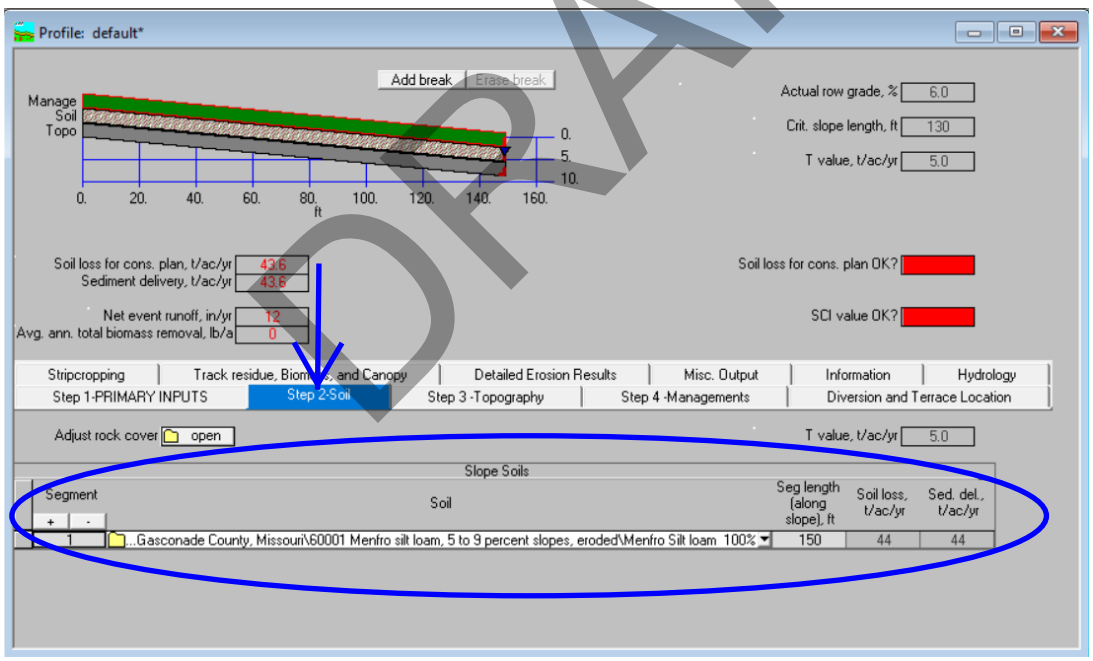

Next, open a profile in the menu bar and select the default option.



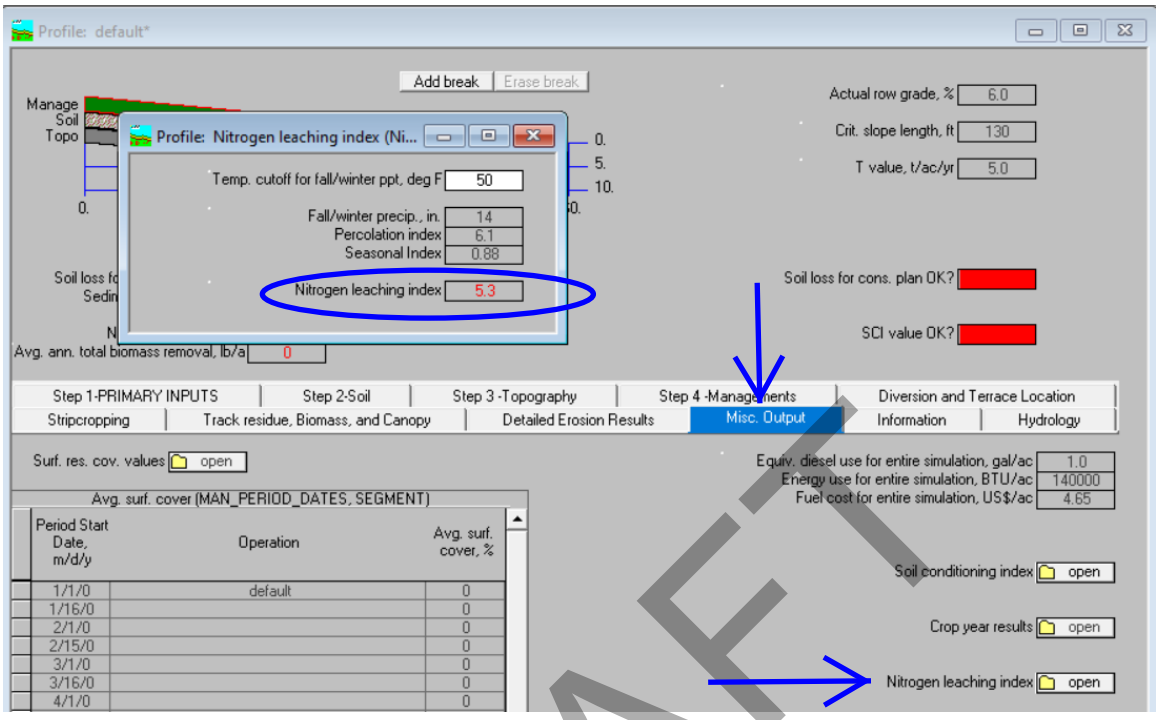
As a conservation planner, you only need to enter two items to determine the N-LI by selecting the county location and the dominant soil map unit for the field. RUSLE2 runs the N-LI equation using both the climate and hydrologic soil group information to determine the N-LI rating. To enter to the location, select the "Step 1-Primary Inputs" tab and enter the county.




Next, enter the soil information by selecting "Step 2-Soil" tab.



To locate the N-LI rating from the profile screen, select the tab "Misc. Output". From that screen, locate the N-LI on the right side of the screen. This will open the Nitrogen Leaching Index window where you can view the rating.






## Step 2: Interpreting your Nitrate Leaching Index Rating.

The leaching index rating score will determine whether the field has a high, medium or low risk of nitrate leaching. Use the table below to determine if the field is at a low, medium or high risk of nitrate leaching.

| Index Rating | Risk of Leaching |
|---|---|
| < 5 | Low |
| 5 to 10 | Medium |
| > 10 | High |

If the risk score is greater than 10; or the field has karst topography; or is furrow irrigated, the field has a high risk of leaching nitrate. Implement best management practices that are appropriate for the specific field operations to minimize soil nitrate leaching losses.

# Best Management Practices to Reduce Nitrate Leaching

For fields with a **medium** risk of nitrate leaching (risk score 5 to 10), implement a Nutrient Management Plan (Code 590) **AND** one or more management techniques **OR** conservation practices listed below to reduce the amount of nitrogen that could be leached as nitrate.

For fields with a **high** risk of nitrate leaching (risk score >10), implement a Nutrient Management Plan (Code 590), **AND** one or more management techniques, **AND** one or more of Conservation Practice Standards (CPS) listed below.

Management Techniques:

- Apply nitrogen fertilizer close to plant uptake, ideally within a few days of planting, or if possible, after germination and crop emergence.
- Utilize a pre-plant soil nitrate testing (PPNT) to adjust corn nitrogen recommendation. Guidance for PPNT is provided in UMC Extension Guide Sheet G9177 *Preplant Nitrogen Test for Adjusting Corn Nitrogen Recommendations*. Soil samples taken to the 2-ft depth are used as a credit to a nitrogen fertilizer recommendation when soil test nitrate is greater than 50 pounds nitrogen/acre.
- Split application of nitrogen when growing such crops as corn, grain sorghum, and wheat. Apply no more than 50% of the annual nitrogen recommendation preplant or at planting with the remainder applied any time after the crop is established. **For wheat only**, apply no more than 40 pound of nitrogen preplant or at planting with the remainder of nitrogen applied before jointing.
- When applying urea fertilizer, consider using a urease inhibitor. Apply at planting or no earlier than 30 days prior to the anticipated planting date.
- Consider applying controlled- or slow-release nitrogen fertilizer to reduce nitrogen losses. Apply at planting or no earlier than 45 days prior to anticipated planting date.
- When fall applying anhydrous ammonia, use a nitrification inhibitor when the 6-inch depth soil temperature falls below $40^0$F. NOTE: Do not apply anhydrous ammonia with a nitrification inhibitor before 6-inch depth temperature reaches $50^o$F.



Conservation Practices:

- Alley Cropping (Code 311)
- Conservation Cover (Code 327) - when converting annual crop to perennial cover
- Conservation Crop Rotation (Code 328)
- Cover Crop (Code 340) - select species that will scavenge residual nitrogen
- Drainage Water Management (Code 554)
- Irrigation Water Management (Code 449)
- Pasture and Hay Planting (Code 512)
- Prescribed Grazing (Code 528)

# MO Nitrogen Index Leaching

| | |
|---|---|
| **Landowner:** | **Tract/Field Number:** |
| **County:** | |
| **Predominate Soil Map Unit:** | |

**Nitrogen Leaching Index Score:**

☐ **Low (< 5)** ☐ **Medium (5 to 10)** ☐ **High (> 10)**

**For a Medium Nitrogen Leaching Index Score:** implementation a Nutrient Management Plan (Code 590) **AND** at least one of the following management techniques **OR** conservation practices listed below (check all that apply).

**For a High Nitrogen Leaching Index Score:** implementation a Nutrient Management Plan (Code 590), **AND** at least one of the management techniques listed, **AND** at least one of the Conservation Practice Standards (CPS) listed below (check all that apply).



## Management Techniques:

- ☐ Apply nitrogen fertilizer close to plant uptake, ideally within a few days of planting, or if possible, after germination and crop emergence.
- ☐ Use a pre-plant soil nitrate testing (PPNT) to adjust corn nitrogen recommendation.
- ☐ Split apply nitrogen when growing such crops as corn, grain sorghum, and wheat.
- ☐ Use a controlled- or slow-release nitrogen fertilizer at planting or no earlier than 45 days prior to anticipated planting date.
- ☐ Use an urease inhibitor when applying urea or urea ammonium nitrate (UAN). Apply at planting or no earlier than 30 days prior to the anticipated planting date.
- ☐ Use a nitrification inhibitor when apply anhydrous ammonia.

## Conservation Practices:

- ☐ Alley Cropping (Code 311)
- ☐ Conservation Cover (Code 327)
- ☐ Conservation Crop Rotation (Code 328)
- ☐ Cover Crop (Code 340) to scavenge residual nitrogen
- ☐ Drainage Water Management (Code 554)
- ☐ Irrigation Water Management (Code 449)
- ☐ Pasture and Hay Planting (Code 512)
- ☐ Prescribed Grazing (Code 528)
- ☐ Other conservation practice standard(s) that meet the quality criteria for reducing nitrogen leaching (list):