

# Nutrient Management Downloadable Spreadsheet

## Technical Guideline: Spreadsheet Overview

Virginia Department of Conservation and Recreation — Division of Soil and Water Conservation

### Overview

The Nutrient Management Downloadable Spreadsheet (NMDS) is an alternative tool for viewing and writing a Nutrient Management Plan (NMP) in conjunction with DCR's Conservation Application Suite (CAS). The NMDS is a Microsoft Excel-based application that exports NMP data from CAS and populates a spreadsheet template, which can then be used to complete the NMP on the user's desktop. Once finalized, the NMDS is imported back into CAS to finish the plan-writing process.

Key capabilities of the NMDS include:

- Instant nutrient balance calculations in a familiar spreadsheet format.
- No internet connection required after the initial download.
- Access to phosphorus assessment tools such as the P-Index without delay.
- Support for spreadsheet features like filtering and drag-down entry to streamline nutrient applications.

This guide provides detailed instructions on how to use the NMDS spreadsheet to complete an NMP. It assumes that the user is familiar with creating and writing an NMP in CAS, and has basic knowledge of Microsoft Excel (desktop, latest versions). For step-by-step instructions on the Export/Import process, refer to the *Technical Guide: NMDS Export/Import Process*.

### Technical Notes and Contacts

#### Access & Training

The NMDS is not a stand-alone application — CAS login credentials are required. For access and training, contact Stephanie Dawley, NM Training and Certification Coordinator: [Stephanie.Dawley@dcr.virginia.gov](mailto:Stephanie.Dawley@dcr.virginia.gov).

#### CAS Technical Support

For technical issues related to CAS, contact the CAS Help Desk: [dswc-cas-help@dcr.virginia.gov](mailto:dswc-cas-help@dcr.virginia.gov).

#### NMDS-Specific Issues

For issues specific to the NMDS, contact Joe Tesauro, Business Systems Analyst: [Joe.Tesauro1@dcr.virginia.gov](mailto:Joe.Tesauro1@dcr.virginia.gov).

#### File Compatibility

The NMDS downloads as a .xlsb file and requires a desktop installation of Microsoft Excel. The NMDS is NOT compatible with Microsoft 365 Online Excel or Google Sheets.

## Section 1: Process Overview

The following is a brief overview of how data flows between the NMDS and CAS. For step-by-step guidance on Export/Import procedures, refer to the *Technical Guide: NMDS Export/Import Process*.

### How the NMDS Shares Data with CAS

**Core** NMP data can only be entered and edited within CAS. When the user triggers the Export NMDS function in CAS, an NMDS file is created and core NMP data is populated into worksheets within the spreadsheet. The user then uses the NMDS to apply nutrients to the NMP. The Import NMDS function then brings that new data back into CAS to finalize the process.



Figure 1 — NMP Export/Import (NMDS) Workflow

■ **Key Concept**

While **Core** NMP data is only editable within CAS, both CAS and the NMDS can be used to enter nutrient application and phosphorus assessment data. Users can work back and forth between the two platforms as needed.

Once an NMDS has been exported, CAS edits are locked until the export is either cancelled or the import is completed. If further edits to core data are needed in CAS, the export must first be cancelled. A fresh NMDS can then be exported that reflects those changes.

Any nutrient application or phosphorus assessment data entered in CAS will carry over into the NMDS each time a fresh copy is exported. These values can be edited or deleted within the NMDS, and the updated values will be written back to CAS when the import is completed.

■ **Important**

Due to rounding and formulaic differences between the NMDS and CAS, nutrient balance and other NMP data may not match identically between the two platforms. In the event of minor discrepancies, CAS values should be considered correct and final. All reports generated from CAS will reflect these correct values, regardless of whether the NMDS was used in the plan-writing process.

If a user encounters significant discrepancies that interfere with NMP creation, contact Joe Tesauro for technical assistance: [Joe.Tesauro1@dcr.virginia.gov](mailto:Joe.Tesauro1@dcr.virginia.gov).

## Section 2: General Spreadsheet Use

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The NMDS should be thought of as a nutrient application calculator that enables the user to quickly apply nutrients and see real-time crop needs, nutrient balance, and organic use calculations. The NMDS also provides useful visibility into key plan components — such as soil tests and phosphorus assessment results — so it may be worthwhile to export an NMDS during the plan-writing process simply to gain a better overview of the NMP, even before making inputs.

### Editable Data in the NMDS

The following non-core NMP data can be added or edited within an exported NMDS:

- Field-by-field phosphorus assessment strategy (Soil Test Needs, PET, or P-Index)
- Commercial Nutrient Applications (up to 3 per season)
- Organic Nutrient Applications (up to 2 per season)
- Biosolids Nutrient Applications (up to 2 per season)
- Application Notes
- Lime Applications

### User Permissions

Spreadsheet permissions are in place to protect formula integrity and prevent data corruption. The table below summarizes what users can and cannot do within the NMDS:

Users CAN	Users CANNOT
• Enter data in designated input columns	• View or edit formulas and formatting rules
• Hide columns not needed for their view	• Enter data in non-designated columns
• Resize columns to better display content	• Delete, insert, or resize rows
• Filter on designated columns (indicated by a ▼ icon next to a column header)	• Make hidden columns visible
	• Filter on non-designated columns
	• Sort data

### Hidden Export/Import Tabs

The NMDS contains hidden tabs used to map data between the spreadsheet and CAS. While spreadsheet permissions technically allow these tabs to be unhidden, they are locked against editing to prevent data corruption. Tampering with these tabs may cause the NMDS to malfunction or the import to fail.

### Copying and Renaming the NMDS File

The NMDS .xlsb file can be copied and/or renamed at any point during the NMP-writing process. The unique ID embedded in the file — which is used to match the NMDS to the correct NMP in CAS during import — is preserved in copied files. However, only a file with that intact ID can be imported back into CAS. Refer to the *Technical Guide: NMDS Export/Import Process* for a complete explanation of version integrity during the Export/Import process.

## Section 3: Spreadsheet Tabs

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The NMDS is organized into the following tabs. Read-only tabs display core NMP data exported from CAS; editable tabs allow the user to enter and modify nutrient application data.

### 1 Crop Summary

The **Crop Summary** tab displays core NMP data related to Crop Rotation and Yield inputs. This is a read-only tab, with filtering options to display data by Field ID/Name, FSA IDs, Plan Seasons/Years, and Crop.

#### Column Notes:

#### VALUES Yield

Displays user-modified yield values from CAS where applicable; otherwise displays VALUES-derived yield estimates.

#### Net N Need

Displays user-modified nitrogen needs from CAS where applicable; otherwise displays default crop nitrogen needs derived from crop yield.

#### Crop Productivity Rating

An *estimated* rating that does not account for yield reduction factors such as slope, erosion, or rock outcroppings. The definitive Productivity Rating can be found in the Crop Rotations tab within CAS.

### 2 Soil Test Summary

The **Soil Test Summary** tab displays core NMP data related to Soil Test inputs. This is a read-only tab, with filtering options to display data by Field ID/Name, FSA IDs, Plan Seasons/Years, and Crop.

#### Column Notes:

#### P Value / K Value

The actual numerical values entered from the Soil Lab report for each field.

#### P MI ppm Value / K MI ppm Value

Converts the P Value and K Value inputs into the Mehlich I ppm standard used in DCR's Nutrient Management standards.

#### P Rating / K Rating

L–VH rankings for P and K nutrients, correlated to Virginia Tech's soil testing lab standards.

#### Soil Test Allowed P

Indicates the allowed phosphorus defined by *crop need* as determined by soil test data. Fields below VH P ratings display 'N-Based'; VH P rating fields display 'Zero-P'.

#### PET Allowed P

Indicates the allowed phosphorus as determined by soil test data and DCR's Phosphorus Environmental Threshold (PET) method.

### P-Index Allowed P

Indicates the allowed phosphorus as determined by soil test data and DCR's Phosphorus Index (P-Index) method. If P-Index calculations were run in CAS prior to the NMDS export, this column displays those results. Otherwise, it displays P-Index results calculated within the NMDS. NMDS-derived values are not definitive unless the user selects the P-Index method in the **P Assessment** tab and enters all required inputs. A 'Need Inputs' designation indicates that the P-Index was not run in CAS and that further inputs are required in the **P Assessment** tab.

## 3

### Balance Sheet

The **Balance Sheet** tab displays all current nutrient applications and crop/field balances, updating in real-time as applications are added or edited in the NMDS. This is a read-only tab, with filtering options to display data by Field ID/Name, FSA IDs, Plan Seasons/Years, and Crop.

Non-relevant columns can be hidden to simplify the view — for example, if the NMP does not include multiple nutrient applications per season, or if it is not a biosolids plan.

#### Column Notes:

#### N-P-K Balance

The running balance of all nutrient credits and applications from all sources. The current balance displays for each season/row in a rotation — the final crop nutrient balance appears in the last row for each crop, and the final field nutrient balance appears in the last row for each field. This column highlights **red** when:

- Total nitrogen supplied (including residuals) exceeds crop need by more than 10 lbs.
- Total phosphorus supplied exceeds the total allowed for a field (as determined by the currently selected P-Assessment tool) by more than 10 lbs.

#### P Method

Displays the current P-Assessment tool rating for each field. This can be edited in the **P Assessment** tab.

#### Crop Productivity Rating

An *estimated* rating that does not account for yield reduction factors such as slope, erosion, or rock outcroppings. The definitive Productivity Rating can be found in the Crop Rotations tab within CAS.

## 4

### P Assessment

The **P Assessment** tab is an editable interface for viewing and editing P-Assessment tools for each field in the NMP. Filtering options are available by Field ID/Name and FSA IDs. Columns with a color background are non-editable; non-colored columns become editable depending on user input.

#### Column Notes:

#### Module P Assessment

Displays the most current P-Assessment rating calculated within CAS at the time of the NMDS export.

#### Module P Method

Displays the most current P-Assessment tool used within CAS at the time of the NMDS export.

#### New P Method

Editable dropdown to select a new P-Assessment tool within the NMDS. Using this feature overrides the P-Assessment method and rating imported from CAS.

**P-Index: RUSLE2 (if known) / Distance to Stream / Riparian Buffer Width**

Optional editable fields to refine P-Index calculations made in the NMDS. Inputs here override any values entered in CAS prior to export. Yellow highlighting indicates optional fields. If left blank, the NMDS applies the following defaults:

- a. **RUSLE2 (if known):** Ignored — calculations default to the Erosion Risk Assessment estimated soil loss, calculated automatically within the NMDS.
- b. **Distance to Stream:** Assumed value is 0 feet.
- c. **Riparian Buffer Width:** Assumed value is 0.

**P-Index: Pasture Ground Cover**

Editable dropdown that activates when the P-Index method is selected for any field where Acreage Category = Pasture. This input is required for P-Index pasture fields; without it, the P rating displays as 'Need Inputs'.

**P-Index: Contour Planting / Strip Cropped / Installed Terraces / Conservation Tillage**

Optional editable fields to refine P-Index calculations for fields where Acreage Category = Crop. These override any values entered in CAS prior to export. Yellow highlighting indicates optional fields. If left blank, the NMDS defaults to 'No' for each.

**New P Assessment**

The calculated result of whichever P-Assessment tool the user selects in the NMDS. If this column is blank (no new P-Assessment method is chosen for a field), CAS values are retained upon import. If required data is missing when using the P-Index (New P Assessment = 'Need Inputs'), CAS values are also retained upon import.

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**Organic Applications**

The **Organic Applications** tab is an editable interface for viewing and applying nutrients from organic sources. Organic sources must first be entered through CAS as part of the core data required before the NMDS can be exported. Filtering options are available by Field ID/Name, FSA IDs, Plan Seasons/Years, and Crop. Users may make up to two organic nutrient applications per season.

If organic nutrient applications were previously entered through CAS or carried over from a prior NMDS import, those applications will pre-populate when a new NMDS is exported. They can be edited or deleted within the NMDS as needed.

**Column Notes:****Commercial Applications**

Read-only display of any nutrient applications entered in the **Commercial Applications** tab.

**P Method**

Displays the current P-Assessment rating for the field, as determined in the **P Assessment** tab. 'N' indicates the field is nitrogen-based, with no phosphorus restrictions.

**P Removal Credit**

Running total of phosphorus removal credit per field. Displays even for nitrogen-based fields.

**N-P-K Balance**

Running balance of all nutrient credits and applications from all sources (see **Balance Sheet** tab for a full description). Highlights red when nitrogen or phosphorus limits are exceeded by more than 10 lbs.

**New Organic App 1/2**

Dropdown options displaying all organic nutrient sources exported from CAS into the NMDS. Selecting a source will erase and override any existing organic applications from CAS, but will not commit a new application unless an application method and rate are also entered.

**New Method 1/2**

Dropdown options for the organic application method. If a source and rate are selected but no method is chosen, the NMDS defaults to '>7 days'.

**New Rate/Acre 1/2**

Numerical input for the application rate. The unit of application (tons or kGals) for each organic source can be referenced in the **Organic Summary** tab.

**New Note 1/2**

Dropdown options for application notes defined in the **Notes** tab.

**Committed Rate, Source, Method, Note 1/2**

Displays the application inputs for each field/season/crop that will be committed to the NMP upon import into CAS. If empty, no application will be committed. Pre-populates with applications carried over from CAS; these can be edited or deleted.

**Committed NPK 1/2**

The committed N-P-K values per acre for each organic application, based on the Committed Rate, Source, Method, and Note values.

### **Delete CAS Application 1/2**

Selecting 'Delete CAS' erases the organic application for that field/season/crop that was imported from CAS. Clearing this column restores the original application. Note that existing CAS applications are also overridden when a new organic application is committed in the NMDS.

### **N Crop Rate / P Crop Rate / P Rotation Rate / P Max Rate**

Suggested application rates for the selected organic source. These columns populate once a New Organic App and New Method are entered. Definitions:

- a. N Crop Rate:** Rate to meet the nitrogen need of the crop, after all other nitrogen inputs (residuals and other applications) are deducted from the net need.
- b. P Crop Rate:** Rate to meet the phosphorus need of the crop as determined by Soil Test-derived crop needs, minus any existing phosphorus applications on the field.
- c. P Rotation Rate:** Rate to meet the phosphorus need of the field's crop rotation as determined by Soil Test-derived crop needs, minus any existing phosphorus applications.
- d. P Max Rate:** The maximum rate allowed to supply the total permitted phosphorus for the field based on the current P-Assessment method. 'N' indicates no phosphorus limitations; otherwise, this is the allowed P-removal factor (0P, 1P, 1.5P, or 2P) multiplied by the sum P-removal credit for the field, minus any existing phosphorus applications.

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**Commercial Applications**

The **Commercial Applications** tab is an editable interface for viewing and applying nutrients from inorganic (commercial) sources. Filtering options are available by Field ID/Name, FSA IDs, Plan Seasons/Years, and Crop. Users may make up to three commercial nutrient applications per season.

If commercial applications were previously entered through CAS or carried over from a prior NMDS import, those applications will pre-populate when a new NMDS is exported. They can be edited or deleted within the NMDS as needed.

**Column Notes:****Organic Applications**

Read-only display of any nutrient applications entered in the **Organic Applications** tab.

**N-P-K Balance**

Running balance of all nutrient credits and applications from all sources (see **Balance Sheet** tab for a full description). Highlights red when nitrogen or phosphorus limits are exceeded by more than 10 lbs.

**New N/P/K Application 1/2/3**

Numerical inputs to apply specified nutrients to a crop. Entering values in any of these columns will erase and override any commercial applications exported from CAS. If values are entered in some columns but not others, blank columns default to 0.

**New Application Method 1/2/3**

Dropdown options for the inorganic application method. If any New N/P/K Application value is entered but no method is chosen, the NMDS defaults to 'Broadcast'.

**New Note 1/2/3**

Dropdown options for application notes defined in the **Notes** tab.

**Variable Rate 1/2/3**

Dropdown Yes/No options for variable application rate. If no selection is made, no value will be imported into CAS.

**Committed NPK Application / Method / Note 1/2/3**

Displays the application inputs for each field/season/crop that will be committed to the NMP upon import into CAS. If empty, no application will be committed. Pre-populates with applications carried over from CAS; these can be edited or deleted.

**Delete CAS Application 1/2/3**

Selecting 'Delete CAS' erases the commercial application for that field/season/crop that was imported from CAS. Clearing this column restores the original application. Existing CAS applications are also overridden when any new N/P/K Application value is committed.

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**Lime Applications**

The **Lime Applications** tab is an editable interface for viewing and applying lime. Filtering options are available by Field ID/Name, FSA IDs, Plan Seasons/Years, and Crop. Users may make one lime application per season.

If lime applications were previously entered through CAS or carried over from a prior NMDS import, those applications will pre-populate when a new NMDS is exported. They can be edited or deleted within the NMDS as needed.

**Column Notes:****Biosolid Lime Applied**

Lime credited to the field through an application of a lime-stabilized biosolid source.

**Lime Balance**

Calculated lime need for the field minus any existing applications.

**New Lime Application**

Numerical input to apply lime to a field. Entering a value will erase and override any lime application exported from CAS.

**New Note**

Dropdown options for application notes defined in the **Notes** tab.

**Variable Rate**

Dropdown Yes/No options for variable application rate. If no selection is made, no value will be imported into CAS.

**Committed Lime Application / Note**

Displays the lime application inputs for each field/season/crop that will be committed to the NMP upon import into CAS. If empty, no application will be committed. Pre-populates with applications carried over from CAS.

**Delete CAS Application**

Selecting 'Delete CAS' erases the lime application for that field/season/crop imported from CAS. Clearing this column restores the original application. Existing CAS applications are also overridden when a new lime application is committed.

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**Notes**

The **Notes** tab allows the user to enter application notes that can be attached to nutrient applications across all application tabs — organic, commercial, lime, and biosolids. Up to 25 unique notes can be entered in a single NMDS.

If application notes from CAS are exported to the NMDS, they pre-populate in this tab and are available for selection while writing the NMP. Any blank rows are available for new entries.

**Saving Commonly Used Notes**

Application notes saved in CAS cannot currently be exported to the NMDS. However, users may wish to maintain a notes template on their computer and copy commonly used notes into the NMDS as needed.

## Organic Summary

The **Organic Summary** tab displays core NMP data related to organic inputs, including both on-farm generated and imported sources. This is a read-only tab; all data is only editable through CAS prior to the NMDS export.

The tab consists of two sections:

- a. Manure Storage and Animal Data from core NMP inputs in CAS.
  - b. Manure usage totals, calculated and updated in real-time as organic applications are committed in the NMDS.
- The **Balance** column is the **Produced** quantity for a given source minus **Exported** minus committed **Used** for a particular year.
  - The **Balance** column highlights red when the balance exceeds +/- 10% of the **Produced** quantity for a given source and year.
  - A usage total row is only created for a source/year when committed applications for that source/year have been made in the NMDS.

## Biosolid Applications

The **Biosolid Applications** tab is an editable interface for viewing and applying nutrients from biosolid sources. Biosolid sources must first be entered through CAS as part of the core data required before the NMDS can be exported. Filtering options are available by Field ID/Name, FSA IDs, Plan Seasons/Years, and Crop. Users may make up to two biosolid nutrient applications per season.

If biosolid nutrient applications were previously entered through CAS or carried over from a prior NMDS import, those applications will pre-populate when a new NMDS is exported. They can be edited or deleted within the NMDS as needed.

### Column Notes:

#### Commercial Applications

Read-only display of any nutrient applications entered in the **Commercial Applications** tab.

#### Organic Applications

Read-only display of any nutrient applications entered in the **Organic Applications** tab.

#### P Method

Displays the current P-Assessment rating for the field, as determined in the **P Assessment** tab. 'N' indicates the field is nitrogen-based, with no phosphorus restrictions.

#### P Removal Credit

Running total of phosphorus removal credit per field. Displays even for nitrogen-based fields.

#### N-P-K Balance

Running balance of all nutrient credits and applications from all sources (see **Balance Sheet** tab for a full description). Highlights red when nitrogen or phosphorus limits are exceeded by more than 10 lbs.

#### New Biosolid App 1/2

Dropdown options displaying all biosolid nutrient sources exported from CAS into the NMDS. Selecting a source will erase and override any existing biosolid applications from CAS, but will not commit a new application unless an application method and rate are also entered.

#### New Method 1/2

Dropdown options for the biosolid application method. If a source and rate are selected but no method is chosen, the NMDS defaults to 'BC  $\geq$  7 day'.

#### New Rate/Acre 1/2

Numerical input for the application rate. The unit of application (tons or kGals) for each biosolid source can be referenced in the **Biosolid Summary** tab.

#### New Note 1/2

Dropdown options for application notes defined in the **Notes** tab.

#### Committed Rate, Source, Method, Note 1/2

Displays the application inputs for each field/season/crop that will be committed to the NMP upon import into CAS. If empty, no application will be committed. Pre-populates with applications carried over from CAS; these can be edited or deleted.

#### Committed NPK 1/2

The committed N-P-K values per acre for each biosolid application, based on the Committed Rate, Source, Method, and Note values.

### Delete CAS Application 1/2

Selecting 'Delete CAS' erases the biosolid application for that field/season/crop imported from CAS. Clearing this column restores the original application. Existing CAS applications are also overridden when a new biosolid application is committed.

### N Crop Rate / P Crop Rate / P Rotation Rate / P Max Rate

Suggested application rates for the selected biosolid source. These columns populate once a New Biosolid App and New Method are entered. Definitions are identical to those described in the **Organic Applications** tab above.

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## Biosolid Summary

The **Biosolid Summary** tab displays core NMP data related to biosolid inputs. This is a read-only tab; all data is only editable through CAS prior to the NMDS export.

The tab consists of two sections:

- a. Biosolid source data from core NMP inputs in CAS.
  - b. Biosolid usage totals, calculated and updated in real-time as biosolid applications are committed in the NMDS.
- The **Balance** column is the **Available Amount** for a given source minus **Used** for a particular year. If the **Available Amount** displays 'FALSE', no quantity has been specified in CAS for that source.
  - The **Balance** column highlights red when the balance exceeds +/- 10% of the **Available Amount** for a given source and year.
  - A usage total row is only created for a source/year when committed applications for that source/year have been made in the NMDS.

## Section 4: Finalizing an NMP with the NMDS

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After all necessary nutrient applications have been committed in the NMDS, the .xlsb file must be imported into CAS to complete the plan-writing process. Before importing, it is strongly recommended that the user review the **Balance Sheet** tab carefully to verify that all inputs are accurate — once the file is imported, those values are committed to the NMP.

For step-by-step import instructions, refer to the *Technical Guide: NMDS Export/Import Process*.

Once imported, a plan completion date should be added to the NMP in CAS to move it from Develop stage into Review/Active. NMP reports can be generated at this time.

If further edits to the NMP are needed after import, the user can copy the plan for Amendment, Modification, or Revision as appropriate. Edits can then be made directly in CAS, or a fresh NMDS can be exported — containing all current NMP data — edited, and reimported to update the plan.