

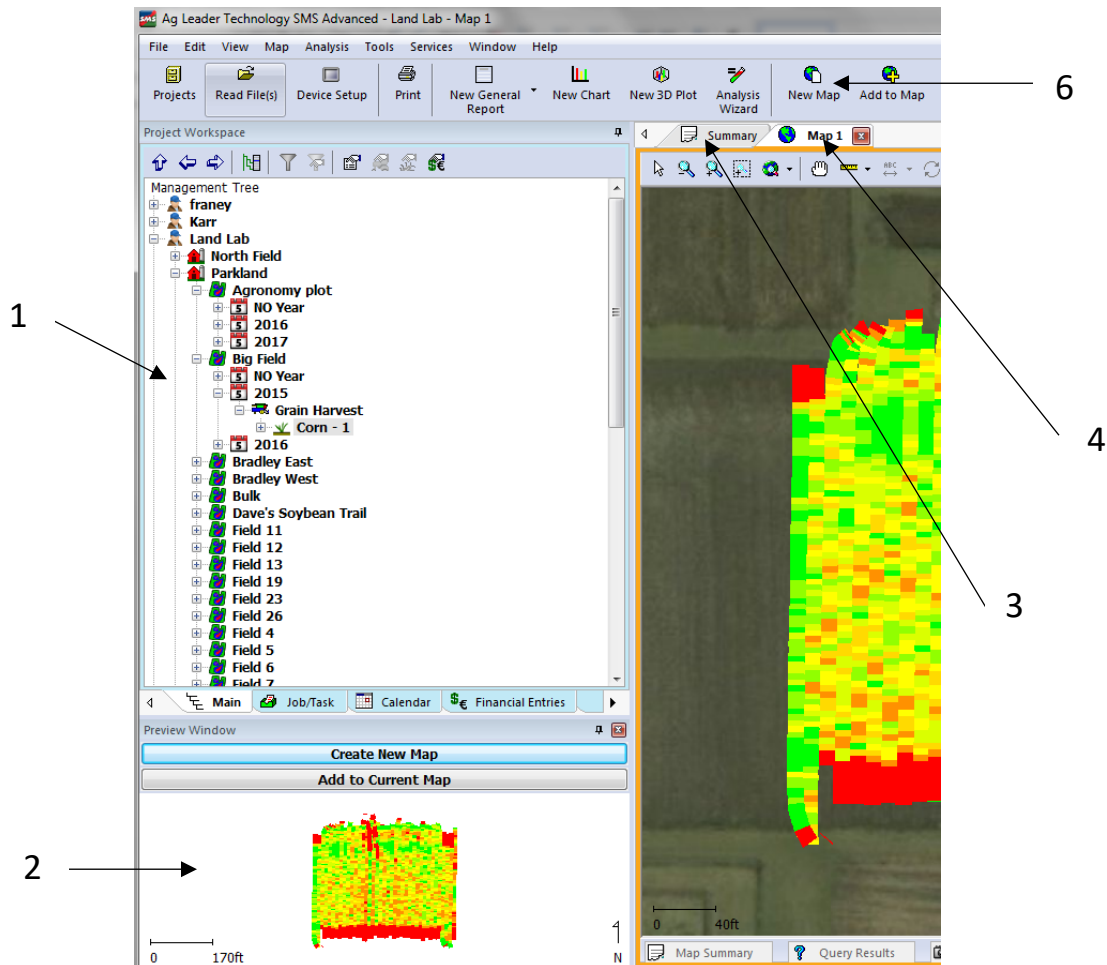
# Understanding Spatial Data

CLARK STATE COMMUNITY COLLEGE  
AG TEACHER WORKSHOP

## Lesson 1 - Getting to Know AgLeader SMS Advanced software

SMS is a precision agriculture software program for displaying maps, analyzing data to answer and provide solutions to complex questions and produce maps/charts that make analysis persuasive. SMS software will be utilized throughout this course therefore a thorough understanding of how to navigate through the software is important.

SMS application window consists of: management tree, preview window, summary tab, workspace maps, map settings toolbar and a main toolbar.



1. **Management tree** – location for all maps and information currently in software, as the tree is expanded, more detailed information is show on the map and in the summary tab.
2. **Preview map** – (optional) will show a small map for the selected items in the management tree.
3. **Summary** – shows a text version of currently selected items on the management tree.
4. **Workspace Maps** – toggles between displayed maps a summary information.
5. **Map settings toolbar** – displayed in many different screens, all icons can be found in the drop-down menus on the top of the screens as well.
6. **Main Toolbar**- quick links to software operations.

Within the management tree, there are 8 different branches:

**Grower** – usually the grower of the operation

**Farm** – grouping of fields

**Field** – an area that a crop is planted or harvested. Ideally, it has a field boundary that does not change from year to year.

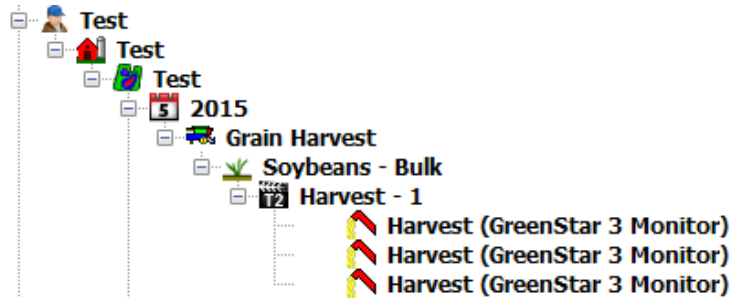
**Year** – the year the data was recorded/created

**Operation** – used to differentiate the different operations that occur during the year (i.e. harvest, planting, spraying, soil sampling)

**Product** – item that was either applied to or collected from the field (i.e. hybrids)

**Operational instance** – used when the same Operation/Product combination occurred in the same year.

**Dataset** – sub-portion of a field. Depending on the monitor from which the data was collected is often referred to as Tasks, Loads, or Regions.



The other Management Tree Tabs and Toolbar can be explored on your own.

## Displaying Spatial Data

In this exercise, you will learn to display data in SMS and navigate the software to get information about features/attributes.

### Exercise 1a

1. Open SMS software. When SMS opens, the SMS Project dialogue box opens. All data is saved to a specific project. Verify there is an Ag Teacher Workshop project.
2. Click on project name and click on **Open – Ag Teacher Workshop** in the bottom of the dialogue box to open the current project.
3. In the management tree, locate the Grower – Farm – Field for **Test Grower – Test Farm – Field Name** by expanding the “+” for each.



List the Years and Operations for data that is available in the management tree for Test Grower.

Field Name	Year	Operation(s)
Jam S 57		
Field Name	Year	Operation(s)
Sidell W		



Why is it important for data to be separated by year in the management tree?

4. Select the Boundary operation.



Using the Summary tab, how many acres are in each field?

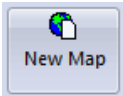
Field Name	Acres
Jam S 57	
Sidell W	

## Creating Maps

In this exercise, you will learn how to create a map, change the map type and changed mapped attributes/properties for a given dataset.

### **Exercise 1b**

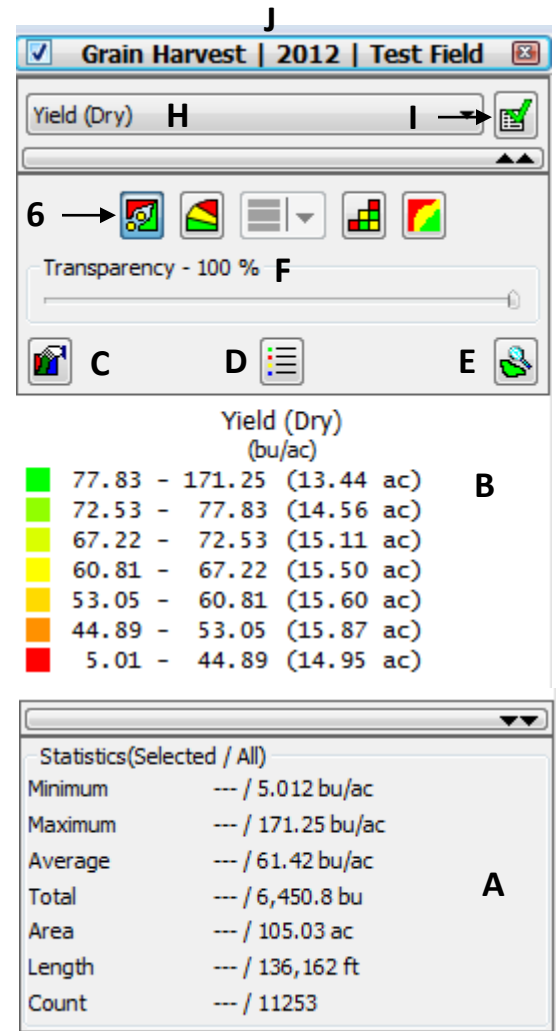
To create a map in the software, follow the steps below:

1. In the data management tree, select the “+” to expand the Test Field to show all operations.
2. Navigate to the appropriate Crop-Product and select it by left-clicking on it. For this exercise: **Test Grower – Test Farm – Jam S 57 – 2016 – Soil Sampling**
3. To create a map to display in the workspace maps area, click on one of the following:
  - File – New – Map
  -  New Map icon in the toolbar above the management tree
  - The **Create New Map** button below the management tree

Now with the map in the display window of workspace maps (i.e. Map 1 tab), there are several different map types that can change the way the maps are displayed. There are also several other buttons that can be used to display content related to the map.

- A. **Quick statistics** – provides details about the currently mapped layer
- B. **Legend Display** – displays the map in various colors and ranges of the currently mapped layer
- C. **Edit Layer Options** – allows the modification of tooltips, query options, label, display and drawing options, grid and interpolation settings and directional arrows/grid settings
- D. **Edit legend** – change the ranges and display colors
- E. **Zoom Map to Layers Extent** – zoom the map back to the default zoon level

- F. **Transparency** – show the map in varying levels of opaqueness. This is helpful when multiple layers are mapped
- G. **Map Type** – the software can display 5 different map types:
- **Base Map** – data is mapped at points
  - **Swath Map** – data (points) are mapped according to the size of the swath
  - **Section/Row Map** – points are displayed as each individual section/row that was recorded
  - **Grid Map** – points are displayed in squares with some smoothing
  - **Contour Map** – points are displayed in polygons with further smoothing
- H. **Attribute list** – pick list shows the different items that can be mapped.
- I. **Selectable Mappable Attributes/Properties** – defines the attributes and/or properties shown in the attribute list
- J. **Layer Display Menu** – can be used to make a copy of the map in the display window. Can also be used to rename the layer.



4. Drop down the attribute list (H – Attribute list in the example above).



**What are the attributes for this data layer? (Hint: think about the information available to be mapped)**

5. Click on the Selectable Mappable Attributes/Properties (I – above) icon. Remove all of the attributes except: Feature ID, Name, Soil bpH, Soil CEC, Soil P1, Soil K, Soil OM, Soil pH.
6. Drop down the attribute pick list and select Soil CEC.



**How is the data displayed in the mapping window for soil CEC?**

7. Click on the Grid Map  icon.



**How is the data displayed?**

8. Click on the Contour Map  icon.



**How is the data displayed?**



**How does the map type change the visual interpretation of the data?**

9. Define the following using the quick stats window:

Min –

Max –

Ave. –

Count –



**What is the difference between the quick stats window and the information displayed under the Summary Tab?**

## Importing Data into Software

Field boundaries are essential for spatially joining collected data to maintain the correct spatial aspect of a given dataset. Boundaries are used for clipping purposes, prescriptions, spatial sorting and split load/region. Field boundaries collected directly in the field with a field mapping display are more accurate than hand drawn boundaries and should be representative of the actual field area. A field boundary can be imported prior to importing any data (i.e. harvest, planting, soil sampling, soil survey, etc) or you can create a field boundary based on data already imported.

## Importing Field Boundaries

For this exercise, you will simulate a precision agriculture specialist working for a local retail company. You will import 2 field boundaries for a grower.

### Exercise 1c

Import the following field boundaries for the grower below:

- Jarrod Dyer

The boundaries are located in the Lesson 1 boundaries folder on the desktop.

To begin to import a field boundary, click on **File – Read Files** in the upper right corner of the main menu toolbar. (Boundaries are generally from a third-party software and are in shapefile format).

1. To read the individual shapefiles, click on the option **Import from a Generic Source** and **Start Importing Generic Files**.
2. Within the Select File Import Method box, select **Shapefile – Select Files to Import**.
3. Browse to the folder (Lesson 1 boundaries) where the shapefiles are stored. Select the **EnglumW\_fld.shp** file and click Next until you reach the Select Import Type dialogue box.
4. Change the Import Data Type to **Boundary** and check **Set as Frozen Field Boundary**. Click Next and Next again.
5. Import clipping options can be set as **No Clipping – Import Entire File**. You are assuming the entire field boundary is correct and ready to import. Click Next.
6. Click on Add New for grower and enter the growers name (Jarrod Dyer).
7. Click on Add New for farm and enter the farm name (Dyer Farms).
8. Click on Add New for field and enter the field name (name of shapefile is the field name).
9. Change the Year to No Year. Verify Operation is Boundary before clicking Next. Click Finish.

The grower, farm and field for the first field you imported should be visible in the Management Tree. Expand the “+” for the G/F/F to verify the boundary has been corrected imported.

## Importing Soil Sample Points

In this exercise, you will import soil sampling locations (points) for where the soil was pulled. Soil sampling points can be imported as shapefiles from a third-party software. Importing those files follow the same guidelines as importing field boundaries except the field boundaries allow for spatial intersect when the field boundary is frozen.

### Exercise 1d

Import the soil test sampling locations for each of the fields located in the Lesson 1 Soil Tests folder located on the desktop.

1. To begin to import a field boundary, click on **File – Read Files** in the upper right corner of the main menu toolbar.
2. To read the individual shapefiles, click on the option **Import from a Generic Source** and **Start Importing Generic Files**.
3. Within the Select File Import Method box, select **Shapefile – Select Files to Import**.
4. Browse to the folder where the shapefiles are located (field name\_ss.shp) and select the first file to import (**EnglumW\_ss.shp**). Click Next on the Import Preview dialogue box.
5. Change the Import Data Type to Soil Sampling. Click Next.
6. In the Assign Columns to Import window, select the file column **Object\_ID** and click on Assign Column.
7. Click on **Use as Attribute**.
8. Attribute Group = Soil Sampling
9. Attribute(s) = Soil Sample ID (scroll down until you find Soil Sample ID in the pick list)
10. Click Next and Next again.
11. Select the grower, farm and field for the soil sample locations you are importing.
12. Select Year = the year of which the soil samples were pulled (the year of the folder indicates when the soil was sample and tested).
13. Verify Operation = Soil Sampling.
14. Click Next and Finish.



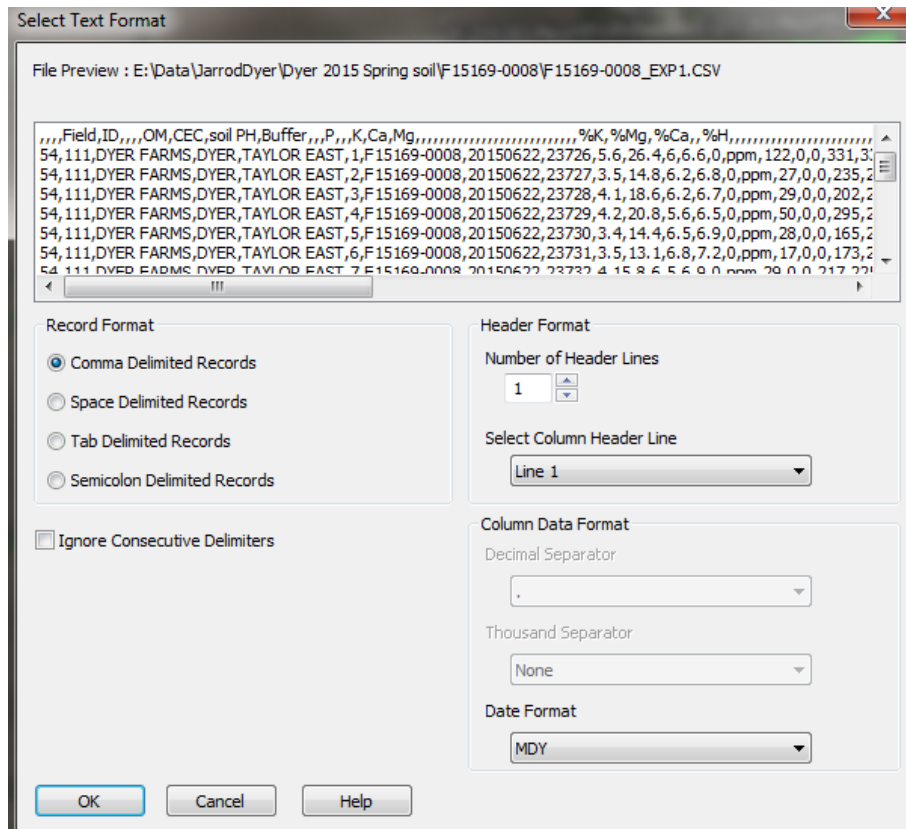
## Importing Lab Results

After the samples have been pulled and sent to the lab for analysis, labs will then send the electronic results which can be imported into SMS. The results are merged with the original soil sample sites so this information can be used to create nutrient maps, lime recommendations and fertilizer recommendations.

### Exercise 1e

Utilize the .csv (non-spatial text files) located in the 2015 soil test folder (Lesson 1 Soil Tests) for this exercise.

1. Go to **File – Read Files – Import a Field from a Generic Source – Non-spatial Files (Lab Results)...Select File(s) to Import.**
2. Select the appropriate files for Jarrod Dyer's soil test results. You will need to select **F15169-0109\_Exp1.CSV** which are results for the \_\_\_\_\_ field.
  - You must first determine which file contains the appropriate field(s) results prior to merging with soil sample locations. Open the file by double clicking on the file. The FIELD column contains the name of the field.
3. Click **Open.**
4. **File Preview Window** – displays the name of the file being imported and a sample of the contents in the file. This allows for an easy way to visually judge what the format settings for the file should be.



5. Select the correct Record Format type for the .csv (non-spatial text) file. Choose **Common Delimited Records**.
6. **Number of Header Lines** – select the number of header lines that the file contains. The **number of header lines in the .csv file is 1**.
7. **Select Column Header Line** – select the specific header line that contains the column header names to use as reference when assigning the column of data in the import file to attributes in the system. The column header line in the .csv file is Line 1.
8. **Date Format** – select the formatting of date information, if your import files contain date values. Leave the format as is unless told otherwise.
9. Click **OK**.
10. Select **Soil Sampling – Jarrod Dyer – 2015** to match the field that was grid sampled.
11. The **Edit Data Filter Results** dialog box now shows the Soil Sampling layers that were found from the filter on the previous screen. Click **Finish**.
12. Select the Field Name Column option that best fits the need. For this activity, choose **Select Field Name Column** and choose **Field** from the picklist.
  - Always verify the actual name of the field listed in the .csv column matches the field name column.
13. Click **Next**.
14. Link the Fields by highlighting the appropriate name of the field under Available Fields and click **Add**.
15. Click **Finish**.
16. Select the linking attribute. For this activity, use **Feature ID**.



The linking attribute is what the software uses to link “Point 1” in the soil sampling layer with “Point 1” in the electronic lab results.



**Why is this an important step (step 16) when importing non-spatial soil sample results?**

17. Click Next.
18. On the Select Column Attributes dialog box, each column must be individually selected and liked with the appropriate attribute in the software. Start by looking under the Require Attributes to Import tab and assign the Item of **Feature ID** to **ID** under File Column.

Ag Teacher Workshop  
UNDERSTANDING SPATIAL DATA

Column Name	Column_0	Column_1	Column_2	Column_3	Field	ID	Column_6	Column_7	Column_8	OM	CEC	soil PH
Attribute Name						Feat						
Units For												
Sample row	54	111	DYER FARMS	DYER	TAYLOR EAST	1	F15169-0008	20150622	23726	5.6	26.4	6
	54	111	DYER FARMS	DYER	TAYLOR EAST	2	F15169-0008	20150622	23727	3.5	14.8	6.2
	54	111	DYER FARMS	DYER	TAYLOR EAST	3	F15169-0008	20150622	23728	4.1	18.6	6.2



The rest of the attributes can be found under the Attribute Group called Soil Sampling (Optional items to Import tab). Also, when selecting the Units, these are the units of measure reported in the lab results from the electronic file.

19. Next click on Optional Items to Import tab and highlight another attribute to link. **Select Item - Assign Column – Use as Attribute – Attribute Group (Soil Sampling)**. For this activity, select the following:

- OM linked with Soil OM
- CEC linked with Soil CEC
- Soil pH linked with Soil pH
- Buffer linked with Soil BpH
- P linked with Soil P1
- K linked with Soil K

20. Next click on **Save Template** and type in “A&L Lab 2015” for the template name and Click **Save**.

21. Click **Finish**.

All of the attributes have now been successfully brought into the software and linked to the set of soil sample points imported from a third-party software.