RESPONSIBLE NUTRIENT MANAGEMENT®

Responsible Nutrient Management Foundation

Certification Program

Soil Sampler Field Certification

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About this Certification

The RNMF Certification Program consists of 3 Certifications:

Soil Sampler Field Certification

The first section is a basic introduction to soil sampling procedures, collection methods and soil nutrients. Completion of the Soil Sampler Field Certification should provide soil samplers with the knowledge to provide consistent samples to their labs, therefore maximizing the value of results.

Applied Results and Recommendations Certification

The Applied Results and Recommendations Certification is a continuation of the Soil Sampler Field Certification, with the addition of crop recommendations. Applied Results and Recommendations Certified Samplers will know how to interpret test results and build recommendations to apply to the field.

Advanced Nutrient Management Certification

The Advanced Nutrient Management Certification focuses on proper long-term nutrient management to improve balances and the life of our soils.

Soil Sampler Field Certification

OBJECTIVES

There are three main objectives of the RNMF Soil Sampler Field Certification

1) To collect consistent soil samples in an efficient and cost effective manner

2) To present said samples to a lab for testing, per lab requirements

3) To present the lab results in a manner that promotes relevant and accurate recommendations for a crop.

Terminology

- **Grid** - a pattern of lines placed on a field that form a series of squares that divide your field for sampling (the grid is used as a guide)
- **Vertex** - the point where two lines of a grid intersect (plural: vertices)
- **Cell** - the area that exists between four vertices of a grid
- **Soil Core** - A single portion of the soil sample. Soil cores are collected with a soil probe. Generally speaking a sample is made up of several soil cores
- **Soil Sample** - a collection of soil used to represent a defined area for soil analysis purposes
- **Sampling Depth** - A selected depth to which soil cores are consistently pulled. Sampling depth should be consistent across all cores pulled in that field.
- **Soil Probe** - a device used to pull soil cores
- **VRA** - Variable Rate Application
- **Zone** - An area of a field defined by any number of agronomic characteristics (yield, soil type, topography, etc.) Zones are used to divide fields into smaller areas so they can be more easily analyzed.

Tools and Supplies

OVERVIEW

Soil sampling probes & augers

Core collection bucket

Handheld GPS device

Sample bags

Tools and Supplies

SOIL SAMPLING PROBES

Types of probes

- **Handheld push probe** - Basic soil probe, can be used in a variety of soil textures
  - Pros - Inexpensive, Light weight, versatile.
  - Cons - Difficult to use in compacted soils.
- **Handheld step probe** - Most common soil probe. Similar to the push probe, but with a step to help get it in the ground.
  - Pros - Inexpensive, lightweight, step makes it easier to use in many conditions.
  - Cons - Can not sample deeper than the step.
- **Handheld auger probe** - Best for use in tacky and/or compact soils.
  - Pros - Great for hard and tacky soils.
  - Cons - May require power drill and multiple batteries.
- **Auto Probe** - Often used by custom sampling companies; typically mounted on an ATV
  - Pros – Efficient when sampling thousands of acres.
  - Cons – Cost prohibitive for small areas. Mechanized, may break down.

Tools and Supplies

MORE ON SOIL SAMPLING PROBES

More Info on Soil Probes

- **Quick Hint:** Mark your probe at the appropriate depth to achieve consistent samples.
- Soil sampling probes should be chrome plated or stainless steel because other metals and materials can contaminate the soil sample. Chrome plating also encourages easy release of soil cores.
- Some soils will stick to a soil probe. If it is absolutely necessary, a release agent (lubricant) can be used. Check with the lab you intend to test with for a list of acceptable release agents. Not all labs approve of using release agents because of their potential to contaminate samples.

Tools and Supplies

ADDITIONAL TOOLS AND SUPPLIES

- **Core Collection Bucket**
  - Using a collection bucket makes sampling much faster.
  - The collection bucket allows for easy mixing of cores if necessary.
  - A smooth hard-plastic stall bucket promotes easy transfer of cores to sample bags.
  - Buckets that are made of other materials (particularly metals) can contaminate your samples.
- **GPS device**
  - Must be capable of displaying latitude/longitude coordinates for your sample locations.
  - Examples: Handheld devices from manufacturers such as Garmin, Magellan, Lowrance, etc.
- **Sample Bags**
  - Use bags from the lab you will be testing with.
  - Remember to order your bags in advance. Keeping an adequate supply of sample bags will ensure you are always ready to sample.
  - If you should run out of your lab's sample bags, other lab's bags or bags of similar construction, such as a quart sized plastic bag, can be used as a temporary solution. If you use a bag other than one provided by your lab, be sure to include the necessary information on the replacement bags.

Be Prepared

TAKE IT WITH YOU

Along with the basic tools and supplies that are required to sample, there are a few more that would be nice to have with you when you sample.

- First aid kit
- Chargers for electronic devices
- Cell phone/Radio
- Lunch and water
- Proper footwear (boots)
- Contact information
  - Land owner
  - Make sure somebody else knows where you are
- Extra Fuel
- Back-up equipment (extra soil probe)
- Rain protection for sample bags.

Be Prepared

LOOK THE PART

Be prepared to further your business as well. You never know who will stop in to see what you are up to.

- Business cards
- Agri-business dress
  - Polo with your logo
  - Jeans or khakis with no rips or holes
- Clean and well organized equipment
- Be polite and respectful

Common Sampling Methods

OVERVIEW

Point Grid
- Results can be used for VRA.
- Best foundation for compiling nutrient information and creating management programs.

Composite Grid
- Results can be used for VRA.
- Individual cells can be identified as specific area

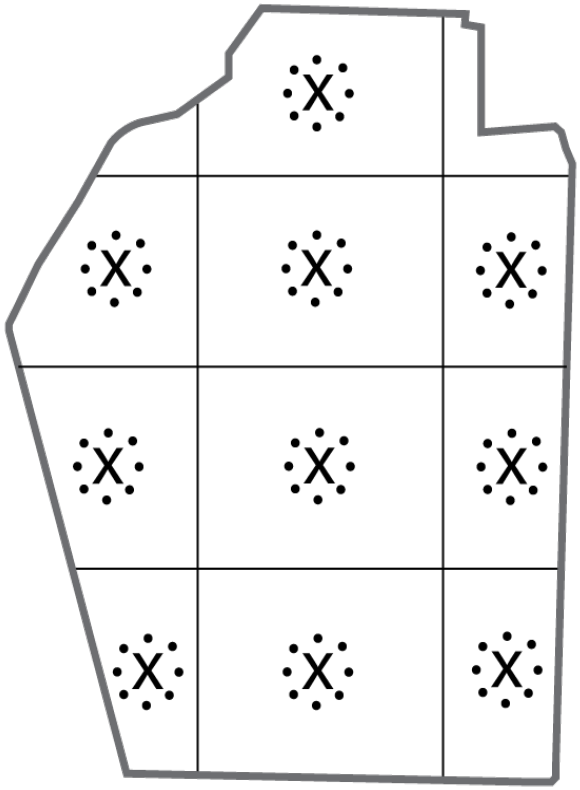
Gridded Zone
- Results can be used for VRA.
- Able to focus on specific problem areas in the field as determined by previously defined zones.

Composite Zone
- Results can be used for VRA.
- Inexpensive

Whole Field Composite
- Results can not be used for VRA.
- The cheapest of all methods.
- Smallest amount of data in return.

Common Sampling Methods

GRID POINT

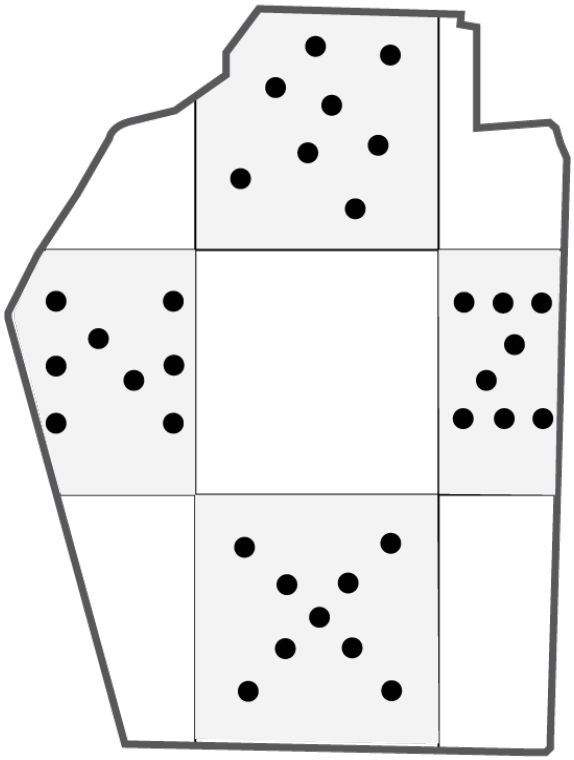


The intent of grid point sampling is to obtain a single representative sample from a focused area at a grid vertex or a point inside the cell of a grid.

- Choose the size of your grid and arrange it to best represent the field you are sampling.
  - Remember the grid you select is only a guide to promote regularity. You can pull the samples from wherever you want.
- Pull 6-10 cores throughout a focused area surrounding the sample point.

Common Sampling Methods

COMPOSITE GRID

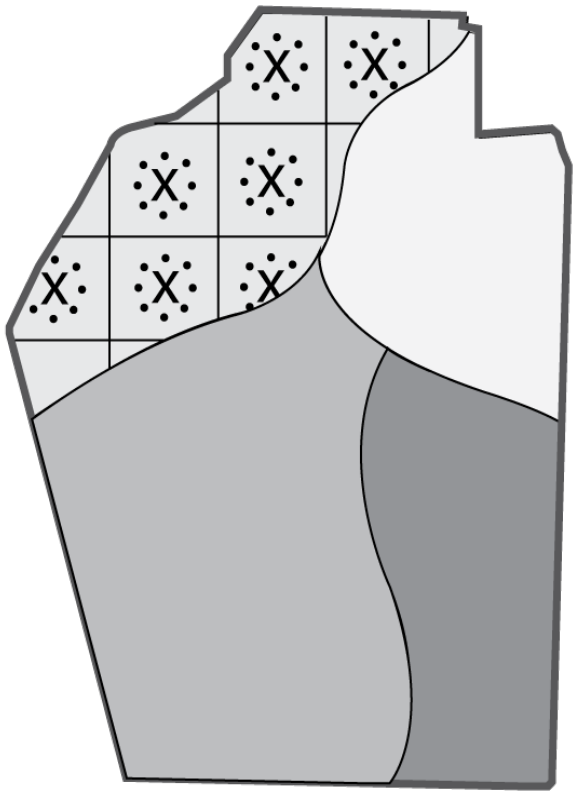


The intent of composite grid sampling is to obtain a single representative sample from the entire area of a cell. This is accomplished by pulling cores in a defined pattern or at random throughout an individual cell of the grid.

- Choose a grid size
  - Choose a grid size that best fits the field.
- Pull cores in a defined pattern or at random throughout the entire cell to compose the sample.
- The process of composite sampling may result in collecting more cores than needed to fill the sample bag. If so, thoroughly mix the cores before filling the sample bag to the fill line.
  - Pull at least 6-10 cores per sample so you have enough soil to fill the sample bag.

Common Sampling Methods

GRIDDED ZONE

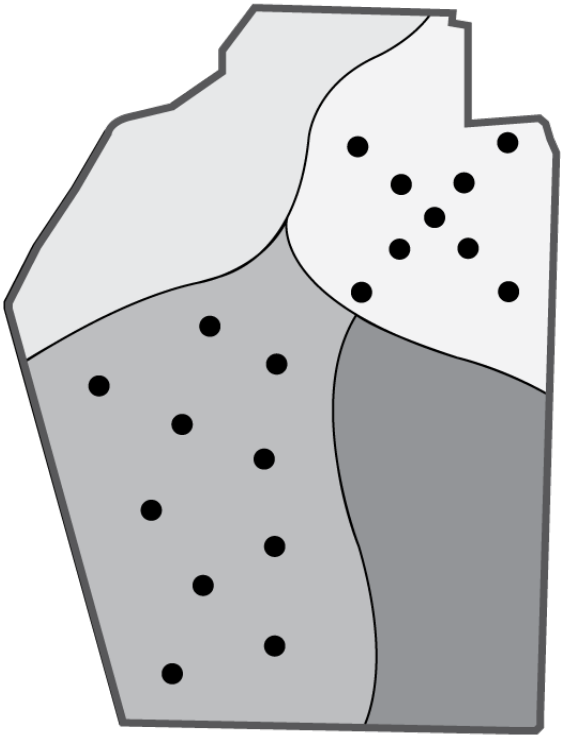


The intent of gridded zone sampling is to obtain a single representative sample from a focused area at a grid vertex or a point inside the cell of a grid, inside a zone.

- Make sure the collection of cores you pull are representative of the either the cell you wish to sample or the point you wish to sample.
- Composite or point
- Determining zones
  - Zones are commonly defined using:
    - Yield data
    - Soil test result data from grid sampling
    - Soil type/texture
    - Veris data

Common Sampling Methods

COMPOSITE ZONE

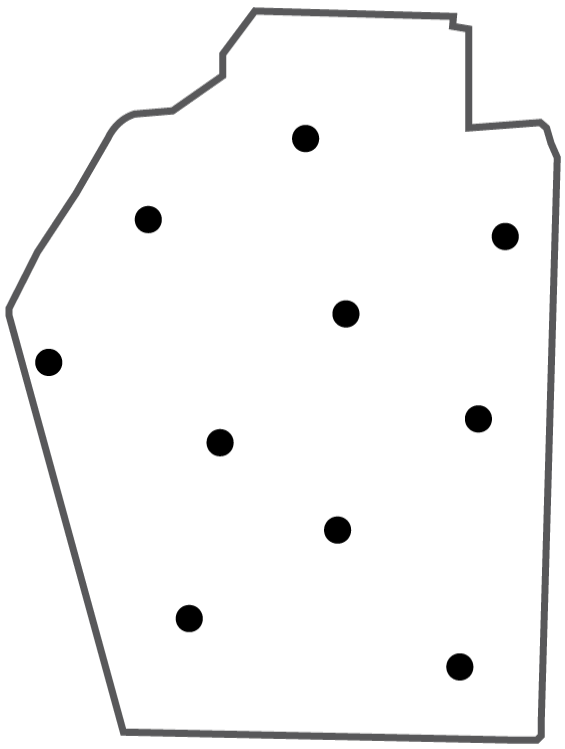


The intent of composite zone sampling is to obtain a single sample to represent the entire area of a zone. This is accomplished by pulling cores in a defined pattern or at random throughout the entirety of the zone and combining them into one sample.

- Make sure the collection of cores you pull are representative of the entire zone.
- Clean out any loose soil left over in your collection bucket. This will help prevent contamination between samples.

Common Sampling Methods

WHOLE FIELD COMPOSITE



The intent of whole field composite sampling is to obtain a single representative sample from an entire field. This is accomplished by pulling cores in a defined pattern or at random throughout the entirety of the field and combining them into one sample. Results from whole field composite sampling can **not** be used to create VRA files.

- Pull enough cores to fill the sample bag to the fill-line.
- Make sure the cores you pull are representative of the entire field.
  - Collect cores from several different locations across the field.
- If in order to collect a representative sample, you pull more cores than will fill the sample bag to the fill line, thoroughly mix the cores together before filling the sample bag.

How to Collect a Sample

STEPS 1 & 2

STEP 1

Determine sampling depth.

- Check with your lab for their recommendations on sampling depth.
  - **Many labs recommend:**
    - For conventional tillage, sample to a depth of 6 inches.
    - For no-till, sample to a depth of 4 inches.
- For special circumstances or questions, check with your lab.

STEP 2

Take the time before going into the field to plan ahead and set the grid on the field you intend to sample. This way when you get to the field all you have to do is start sampling.

How to Collect a Sample

STEPS 3 & 4

STEP 3

When you have determined where you want to pull a sample, indicate the location on a map of the field. In order to construct VRA files from your results, you must have latitude/longitude coordinates for each sample.

- Several software programs automate this process.
  - **Many labs recommend:** Soil Test Pro, Ag PhD Soil Test, SST, SMS, and Farm Works
- See Slide on Avoidance Areas (pg 24) to see better where not to sample.

STEP 4

If necessary, clear excess debris from the soil surface for as little soil disturbance as possible.

- Debris should not constitute a substantial portion of the core. The intent of a 4” core is to supply the lab with 4” of soil, not 1” of debris and 3” of soil.

How to Collect a Sample

STEPS 5 & 6

STEP 5

Place the soil probe straight up and down to the soil surface.

STEP 6

Push the probe down until the desired depth is reached.

How to Collect a Sample

STEPS 7 & 8

STEP 7

Pull the probe out and put the core into the collection bucket. A sharp smack on the side of the bucket should accomplish this.

STEP 8

Repeat steps 4-7 approximately 6 to 10 times or until you have pulled enough cores to represent the sample area. Be sure to collect enough cores to fill the sample bag to the fill line.

How to Collect a Sample

STEPS 9 & 10

STEP 9

Complete the information section on the soil sample bag. It is much easier to write on a bag before you fill it with soil.

- Make sure you have included the location information for each sample as discussed in step 2.

STEP 10

Carefully pour the entire contents of the collection bucket into the sample bag and close the bag securely.

- If you have acquired more soil in the collection bucket than is needed to fill the sample bag, you must thoroughly mix the soil in the collection bucket before filling the sample bag. The purpose is to present the lab with a representative sample of the cores in the bucket. If you pull the right number of cores needed to fill the bag correctly (approximately 6 to 10), placing the entire contents of the collection bucket in the bag without mixing will speed up your sampling process. The lab will blend all samples it receives. Heavy and wet soils are very hard to mix so, depending on your sampling method, try to only pull enough soil to fill your bag in these conditions.

How to Collect a Sample

STEPS 11 & 12

STEP 11

Along with all the paperwork, place the same filled bags in a box and ship or deliver to the lab.

STEP 12

Double check to make sure all samples and necessary paperwork are in the box. Match up the submittal forms for the lab with the samples included in the box.

How to Collect a Sample

AVOIDANCE AREAS

Avoidance areas - Areas of a field that may skew your results due to outlying factors. Don't pull samples from these places.

- Areas where lime, fertilizer, or other materials have been stockpiled in the past
- Areas used for manure or hay storage
- Areas used for livestock feeding or bedding
- Permanent waterways and other non-cropped areas
- Outlying areas or areas that are too small to represent the field
- Edge of field/zone
- Downhill from any of the above areas

Consistency

In order to compare soil results from year to year or sample point to sample point, it is important that all cores are collected in a consistent manner. If you have pulled six inch cores on a field in the past, then it is best to pull the new cores at six inches as well. However, if your farming practices change, you may need to alter your soil sampling practices as well.

- **Depth**
  - Consistent soil sampling depth is critical to good soil test results. If your intention is to sample a field at a 4” depth, then be sure to pull all cores at a 4” depth.
- **When to Sample**
  - Try to sample at consistent times during your farming cycle.
  - The primary purpose of soil sampling is to determine the nutrient need for your crop. So, sample before you apply fertilizer for the year.
  - Other factors can affect the results of a soil test such as cover crops. Cover crops can sequester soil nutrients, which means your soil test results will come back lower, causing you to spread more fertilizer. Be sure to take all agricultural practices into account when deciding the best time to sample.

Soil Nutrients

MACRONUTRIENTS

Macronutrients - Nutrients that are needed in relatively large amounts.

- **Primary Macronutrients**
  - These nutrients are often lacking in the soil. Fertilizer applications for these nutrients are usually necessary.
    - Nitrogen
    - Phosphorus
    - Potassium
- **Secondary Macronutrients**
  - These nutrients can be sufficiently present in soil and may not require fertilizer applications.
    - Calcium
    - Magnesium
    - Sulfur

Soil Nutrients

MICRONUTRIENTS

Micronutrients - Nutrients that are needed in very small amounts.

- Boron
- Zinc
- Iron
- Manganese (MAN-guh-nees)
- Copper
- Molybdenum (muh-LIB-deh-nem)

Soil Nutrients

COMMON SOIL NUTRIENTS CHART

Common Soil Nutrients				
	Element	Symbol	Found in	Role in the Plant
Macronutrients – Primary	Nitrogen	N	Ammonium Nitrate(NH_4NO_3), Urea(NG_2-CO-NH_2, Anhydrous ammonia(NH_3), UAN(Urea+NH_4NO_3+Water), Ammonium Sulfate$(NH_4)_2SO_4$, DAP[$(NH_4)_2HPO_4$], MAP($NH_4H_2PO_4$), Ammonium polyphosphate, Potassium nitrate(KNO_3)	Seed and fruit production, quality of leaf, rapid growth
Macronutrients – Primary	Phosphorus	P	DAP or diammonium phosphate [$(NG_4)_2HPO_2$], MAP or monoammonium phosphate ($NH_4H_2PO_4$), Ammonium polyphosphate, Triple superphosphate[$Ca(H_2PO_4)_2$	Seed and fruit production, root formation and growth, quality of crop
Macronutrients – Primary	Potassium	K	Muriate of Potash, Potassium Sulfate(K_2SO_4), Potassium nitrate(KNO_3), Potassium hydroxide, Sul-Po-Mag or K-Mag	Standability, disease resistance, seed and fruit quality
Macronutrients – Secondary	Calcium	Ca	Dolomitic Lime, Gypsum	Root growth, strength of plant
Macronutrients – Secondary	Magnesium	Mg	Dolomitic Lime	Photosynthesis, encourages nutrient uptake
Macronutrients – Secondary	Sulfur	S	Gypsum, Organic Material Aluminum Sulfate	Facilitates nitrogen uptake and use, root growth, seed formation
Micronutrients	Boron	B	Organic Material, Borax	Ability to produce pollen, seed production
Micronutrients	Zinc	Zn	Trace element in most fertilizers	Root development, rate of seed and stalk development
Micronutrients	Manganese	Mn	Manganese Sulfate, Manganese Chelate	Photosynthesis, nitrogen use
Micronutrients	Iron	Fe	Ferrous Sulfate, Iron HEDTA Chelate	Nitrogen use, plant metabolism
Micronutrients	Copper	Cu	Copper Sulfate Monohydrate, Cupric Oxide	Seed formation and production, prevents wilting
Micronutrients	Molybdenum	Mo	Sodium molybdate	Nitrogen use, phosphorus use