

Soil Sampling Guidelines for British Columbia

Soil testing is an important step in planning nutrient applications to agricultural land for optimizing crop growth, yield, and quality. For accurate soil test results, a composite soil sample must be created by taking samples from several locations that are representative of the entire sampled area. Failure to take a representative sample can lead to an under or over application of nutrients.

There are two main types of soil tests used in British Columbia:

1. **Basic soil fertility test** measures the pH and concentrations of phosphorus (P), potassium (K), and other plant nutrients in the upper 15 cm (6 in) of the soil.

2. **Post-harvest nitrate test (PHNT)** measures the amount of nitrate in the upper 30 cm (12 in) of the soil after crop harvest in the fall (September - November).

While each soil test has its own unique applications, the mechanics of taking each soil sample are the same, and in some cases, samples may be taken at the same time.

Sample timing and depth

Basic soil fertility test

A basic soil fertility test should be completed every one to three years before planting or before the growing season begins in spring. In regions of B.C. where soil conditions prevent timely sampling and analysis of soil before planting, then sampling and analysis may be completed

in the fall. In such a case, producers should note that pH, P, and K will increase over time from fall to spring, potentially leading to larger fertilizer recommendations. If soils are intensively managed, complete a basic soil fertility test at the same time every year to monitor changes in pH and nutrient concentrations.

Soil samples should be taken from the surface to 15-cm depth for basic soil fertility testing.

Post-Harvest Nitrate Test (PHNT)

Producers should complete a PHNT to a 30-cm depth after harvest but before fall precipitation leaches nitrate out of the soil sampling zone. Coarser soils (sand, loamy sand, and sandy loam) should be sampled before 75 mm of cumulative precipitation, while finer soils (loams, clay loam, and clay) should be sampled before 125 mm of cumulative precipitation. September 1 is the starting point for calculating cumulative fall precipitation. The [BC Soil Information Finder Tool](#) can be used to determine an area's soil texture if it is unknown.

Table 1 and **Table 2** contain dates by which sampling for post-harvest nitrate should be completed. The dates are based on climate normals (1981-2010) for when certain areas receive 75 mm and 125 mm of cumulative precipitation starting on September 1. The amount of cumulative precipitation referenced in the tables includes the snow-water equivalent, as snowmelt can leach residual nitrate

through the soil profile before sampling in the spring.

Table 1. Latest sampling dates on average for a 30-cm post-harvest nitrate sample on the South Coast & Vancouver Island.

Location	Sandy Soils	Other Soils
Abbotsford	Oct 1	Oct 15
Agassiz	Oct 1	Oct 15
Chilliwack	Oct 1	Oct 15
Courtenay	Oct 15	Nov 1
Duncan	Oct 15	Nov 1
Hope	Oct 1	Oct 15
Pitt Meadows	Oct 1	Oct 15
Richmond	Oct 15	Nov 1
Sidney	Nov 1	Nov 15
Victoria	Nov 1	Nov 15

Table 2. Latest sampling dates on average for a 30-cm post-harvest nitrate sample in the Interior & North.

Location	Sandy Soils	Other Soils
Cranbrook	Nov 15	Soil freezes
Creston	Nov 15	Dec 1
Fort Nelson	Soil freezes	Spring planting
Fort St. John	Dec 15	Spring planting
Kamloops	Soil freezes	Soil freezes
Kelowna	Dec 1	Soil freezes
Osoyoos	Dec 15	Soil freezes
Penticton	Dec 15	Soil freezes
Prince George	Oct 15	Nov 15
Quesnel	Oct 15	Soil freezes
Salmon Arm	Nov 1	Dec 15
Smithers	Oct 15	Nov 15
Vanderhoof	Nov 1	Soil freezes
Vernon	Nov 15	Soil freezes
Williams Lake	Dec 1	Soil freezes

What if sampling is not completed in time?

If soils are not sampled before the dates noted in the tables above, samples should be taken to a 60-cm (24-in) depth to capture post-harvest nitrate, which has moved lower into the soil profile.

On the South Coast and Vancouver Island, sampling to 60-cm must be completed within 14 days of the latest date shown for a given location in the above table, after which nitrate will be washed below the 60-cm depth (i.e. For Courtenay, a November 1 deadline shown in the table for a 30-cm sample becomes a November 15 deadline for a 60-cm sample). In other areas, sampling to 60-cm should be completed before spring planting.

How does harvest affect sample timing?

In some instances, samples will have to be taken before a final harvest. In forages, a soil sample should be taken after the latest guaranteed harvest, providing a valid report on nitrogen use up to that point in the season. Waiting to sample after a later potential harvest may require producers to sample to a 60-cm depth to have meaningful PHNT results.

Alternative to fall sampling for PHNT based on cumulative precipitation

In areas where there is a high likelihood of receiving less than 75 mm/125 mm of cumulative precipitation between September 1 and spring planting of the following year (such as Fort Nelson and Fort St. John), a spring pre-plant nitrate test can be completed instead of a post-harvest nitrate test. This is considered an equivalent test to the post-harvest nitrate test as they both measure the amount of nitrate in the same portion of the soil. It should be noted that the processes of

mineralization and nitrification of organic matter may cause nitrate values to be greater if soil samples are not taken in a timely manner in the spring.

Alternative sampling depth

In some instances, shallow soils cannot be sampled to the recommended depth. If this is the case, soils should be sampled as deeply as possible. Additionally, these samples should be taken before October 1 to ensure soil nitrate is not lost before sampling. Be sure to record final sampling depths for accurate reporting.

Soil sampling methods & tools

Before any sampling can begin, the following steps should be considered to ensure the sample is collected and analyzed correctly:

1. Obtain appropriate tools for field sampling
2. Divide fields and production areas into sampling zones
3. Determine sampling locations based on crop

Obtaining appropriate tools for field sampling

Probes used for soil sampling are designed to collect a uniform amount of soil at any given depth. Push probes, hammer probes, and bucket augers (**Figure 1**) are commonly used because they are capable of taking uniform samples with depth.

Along with a probe, a clean plastic bucket should be used. Ensure that the bucket is free of any debris and has not been used to collect or hold fertilizer, manure, or compost. Avoid using a metal bucket as it can interfere with test results.



Figure 1. Examples of soil sampling equipment: a soil push probe and a soil hammer probe.

Dividing fields and production areas into sampling zones

Fields and production areas should be divided or grouped into sampling zones that have the same soils, cropping systems, and management. Each sampling zone should be sampled independently to create a composite soil sample that will be representative of the entire sampling zone.

Identify areas with differences in topography, nutrient application rates, soil type or texture, or soil tillage practices to create sampling zones with uniform characteristics. A sampling zone is typically an entire field or production area, but differences in soil may require an area with the same crop and management to be split into different sampling zones. Some areas may be separated by a physical barrier, such as a ditch or road, or even be non-contiguous, but may be

considered one sampling zone if they have uniform characteristics.

Sampling zones for the basic soil fertility test should be limited to a 10-hectare (25-acre) size. Sampling zones measuring nitrate are not limited to a size when no other differences in soils, cropping system, or management exist. In situations where large areas need to be sampled, alternative sampling strategies, such as directed benchmark sampling, may be used.

Assign a unique identifier to each sampling zone, such as a name or number, to keep track of each year's sampling areas. By keeping a record of sampling zones and previous results, soil nutrient management practices can be compared from year to year.

Determine sampling locations based on crop

The sampling location within the sampling zone is dependent on the crop and method in which nutrients are applied. For all crops not mentioned specifically, use the 'General' sampling guideline. If soil sampling for the basic soil fertility test as well as for the post-harvest nitrate test at the same time, ensure samples from the 0-15 cm depth are kept separate from samples taken at lower depths by placing them in a separate mixing container.

For all sampling guidelines, avoid sampling areas that would not be considered representative of an area. This includes:

- land immediately adjacent to drainage ditches
- highly eroded areas
- areas close to trees, roads, and fences

- current or previous manure piles
- fertilizer storage areas
- livestock excrement in grazed areas
- small areas of the field that are known to have distinctly different soils due to depth or texture

General

If nitrogen (N) is broadcast applied, take 15-20 soil samples at random locations throughout the field. If N is banded and the band location is known, take 15-20 samples at random locations throughout the field while avoiding the band. If the band location is unknown, take 30-40 samples at random locations throughout the field.

Small grains and canola

Take 15-20 soil samples taken at random locations throughout the field. If known, locations where fertilizer was applied at seeding or band applied should be avoided. If unknown, 30-40 samples should be taken.

Forages

Random samples should be taken from 15-20 locations throughout the field in areas that are representative of the overall sampling area.

Tree Fruits, Grapes, and In-ground nursery stock

Take 15-20 samples at random locations throughout the field that are within the plant's dripline. The area that is innermost one-third of the distance from the trunk to the dripline should not be sampled as little N application and uptake normally occurs in this zone.

Raspberries

Take 10-15 pairs of samples (1) and (2)
(**Figure 2**)

- 1) The centre of the fertilizer band between the plants along the crop row
- 2) The centre of the cultivation/root mound between plants in the crop row

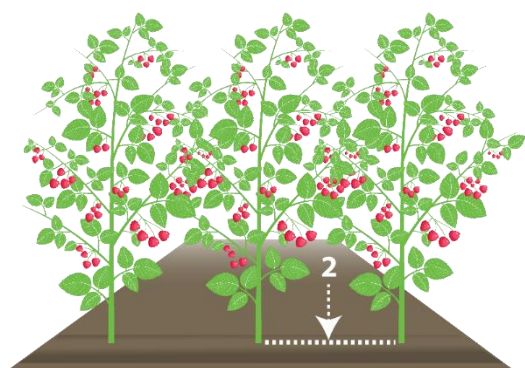


Figure 2. Soil sampling procedure for raspberries.

Blueberries

Take 10-15 pairs of samples (1) and (2)
(**Figure 3**)

- 1) Base of raised bed between plants and inter-row
- 2) Midway between plants in the row

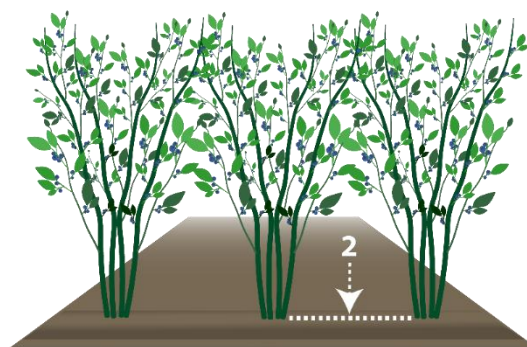
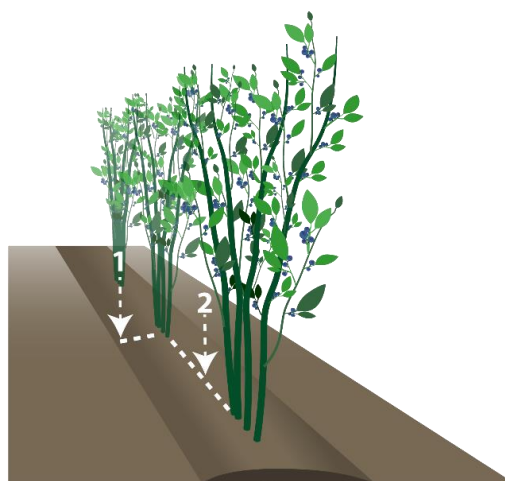


Figure 3. Soil sampling procedure for blueberries.

Sample handling, laboratory submission, and analysis

After collecting soil samples from one sampling zone, the samples should be mixed thoroughly to create one composite sample. If samples are still in cores from the sampling probe they should be broken up. Once the soil has been mixed, collect about 0.5 kg (1 lb) of soil place it in a container, such as a small bag, and label it with the sampling zone, depth, and date collected.

In the field, samples should be kept cool and out of direct sun. If nitrate ($\text{NO}_3\text{-N}$) analysis will be completed, samples should arrive at an analytical laboratory within 48 hours of sampling. If samples will not arrive at a laboratory within 48

hours, then they can be spread on paper to air dry for 2-3 days at room temperature before shipping. Samples for basic soil fertility testing do not require air drying and do not need to arrive at an analytical laboratory within 48 of sampling.

However, soil samples that are air dried may be stored at room temperature and kept long-term as reference samples that can be sent for analysis at a later date.

If samples were taken for a basic soil fertility test (0-15 cm), a general or basic soil analysis should be completed.

Depending on the laboratory, nitrate ($\text{NO}_3\text{-N}$) may or may not be included in basic soil analysis. A nitrate analysis should be requested for samples taken to the 15-30 or lower depths if sampling for post-harvest nitrate testing (**Figure 4**).

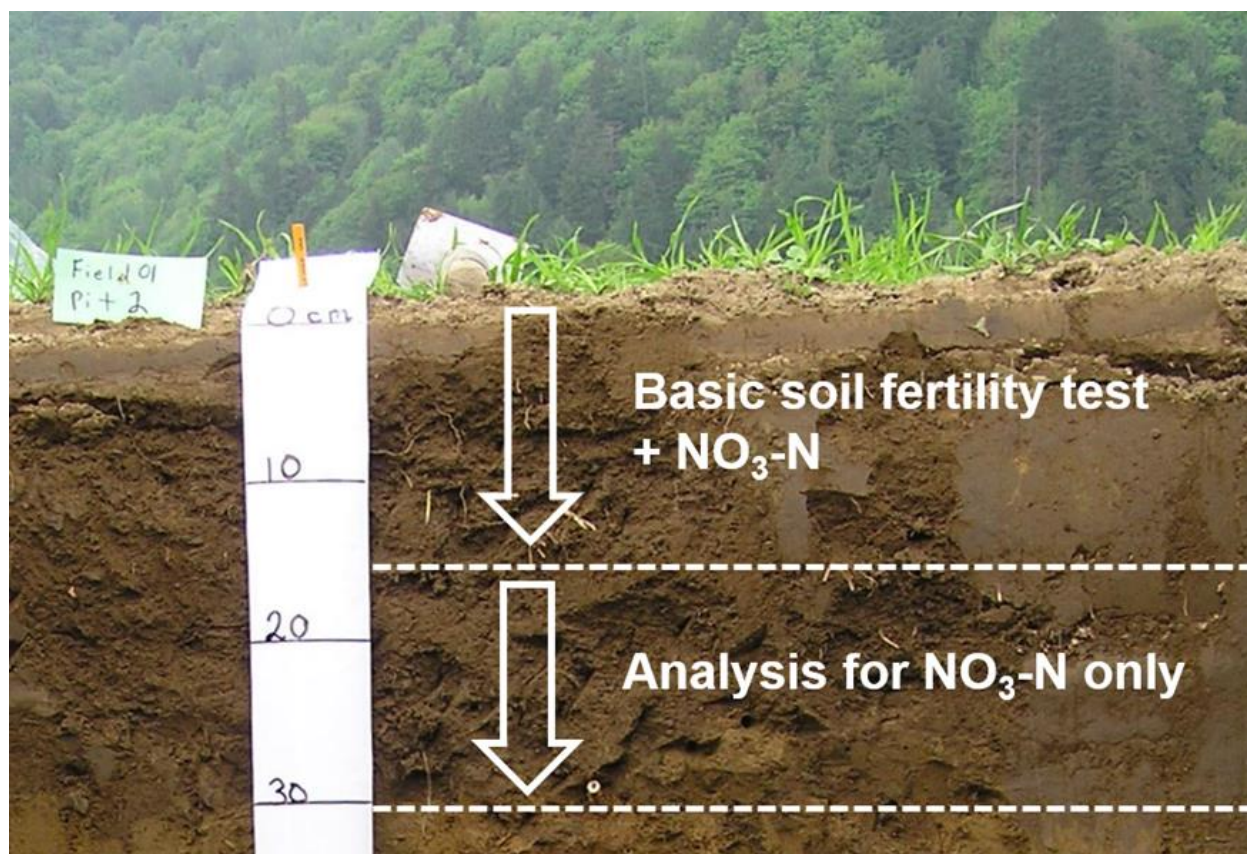


Figure 4. Soil testing packages to request if completing basic soil fertility and $\text{NO}_3\text{-N}$ analyses simultaneously.