BRITISH COLUMBIA | Ministry of Agriculture

Reducing the risk of nutrient loss in runoff with nutrient application setbacks

July 2020

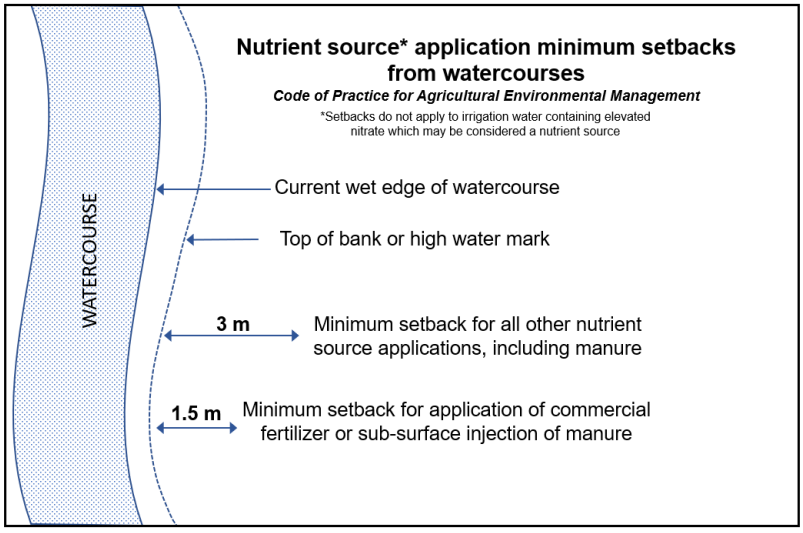
Runoff from agricultural fields can carry nutrients and other contaminants over land and eventually to surface water. As water moves over the soil it may transport particles of manure and fertilizer from the surface, or the soil itself, which contain nutrients, such as phosphorus, that can harm aquatic environments. Aside from the particles themselves, water moving over soils with high phosphorus levels can pick up dissolved nutrients. Elevated concentrations of nutrients in water bodies can reduce water quality and lead to algal blooms. Beneficial management practices, including nutrient application setbacks, can limit the risk of nutrient loss to surface water.

A **setback** is a distance between an agricultural practice, in this case an application of manure or commercial fertilizer, and a drinking water source, a watercourse, or a property boundary.

The *Code of Practice for Agricultural Environmental Management (AEM Code)* includes minimum setbacks for the application of nutrient sources – which includes manure and fertilizers – that must be respected to protect water quality.

- Application near drinking water sources such as a well or surface water diversion point:
  - 30 m setback for manure
  - 3 m setback for commercial fertilizer
- Application near watercourses:
  - 3 m for surface applied manure
  - 1.5 m for commercial fertilizer or injected manure

As a beneficial management practice during nutrient source application, larger setbacks may be used in locations or at times when there is greater risk of runoff. The minimum setbacks required by the AEM Code can be considered a starting point in determining an appropriate setback distance.



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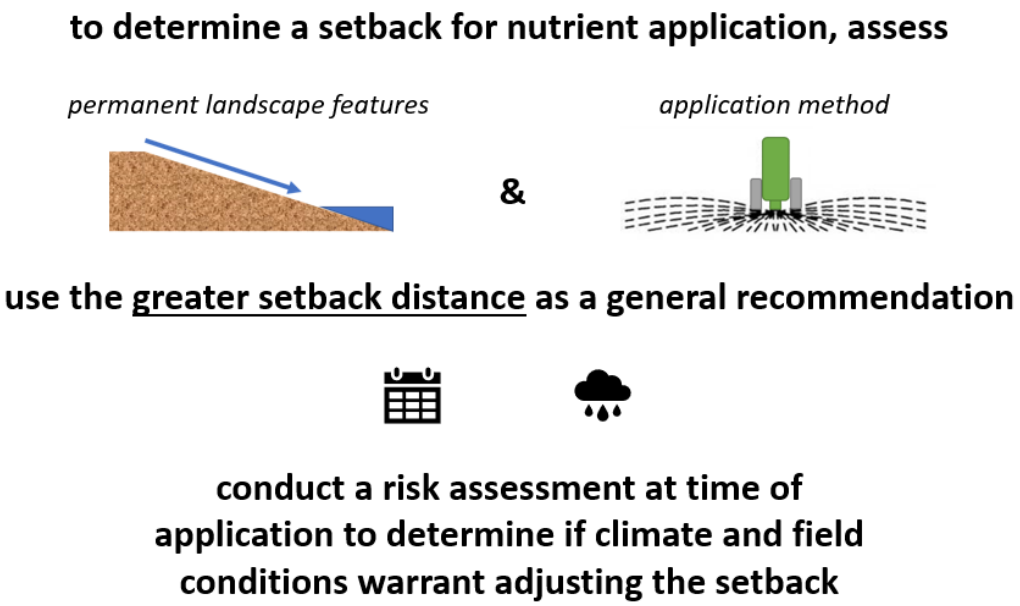
Factors used to determine setback distances

There are three main factors to consider when determining an appropriate setback distance:

1. Permanent landscape features that will not change
2. Nutrient application methods
3. Field conditions and short-term weather conditions that can change throughout the year

The first two factors, permanent landscape features and nutrient application methods, can typically be assessed well in advance of any nutrient applications as they are both relatively constant factors. After considering these factors, the *greater setback distance* of the two should be used as the general recommendation for a particular field or production area. The third factor, a quick assessment of field and weather conditions, is done immediately prior to nutrient application.



Before nutrient application begins, producers and nutrient applicators should assess field conditions, such as soil moisture and field cover, and forecasted precipitation to determine if those conditions affect the risk of nutrient loss. In some cases this may require farmers to either adjust their setback distance or delay application to reduce the short-term risk of nutrient loss.

Regardless of the result of an assessment of these factors, farmers are required to use at minimum the setback distances noted for nutrient source application in the AEM Code.

Permanent landscape features

Permanent landscape features are fixed elements of the landscape that, unlike cropping or tillage practices, are not easily changed through management and are typically the most significant contributors to the risk of runoff and erosion.

Runoff risk depends primarily on two permanent landscape features:

- slope, and
- soil drainage

As slope increases, the risk of runoff at or following the time of application increases, as does the risk of soil erosion that can carry phosphorus into surface water. Soils with lower soil drainage capacity have greater risk of surface runoff. As soil drainage improves, there is less likelihood of water remaining on the surface and moving over land as runoff.

Poorly drained soils with steep slopes have a relatively high likelihood of runoff and would warrant a greater setback. A well-drained soil with a low to moderate slope would have a lower risk of nutrient loss and may require a smaller setback.

The following table estimates the risk of surface runoff based on soil drainage classification and slope grade. A field with a "High" risk of surface runoff would need a greater setback distance of approximately 12 m (40 ft), while the minimum setback of 3 m (10 ft) would suffice for a field with a "Low" or "Very Low" risk of surface runoff.

Table 1. Risk of surface runoff based on soil drainage classification and slope grade.

	Maximum Field Slope within 500 ft (150 m) of Top of Bank of Surface Water			
Soil Drainage class	Low (< 3%)	Moderate (3 - < 6%)	High (6 - < 9%)	Very High (9 - 12%)
Very rapidly, rapidly, & well drained	Very Low	Very Low	Low	High
Moderately well drained	Very Low	Low	Moderate	High
Imperfectly drained	Low	Moderate	High	Very High
Poorly & very poorly drained	Moderate	High	High	Very High

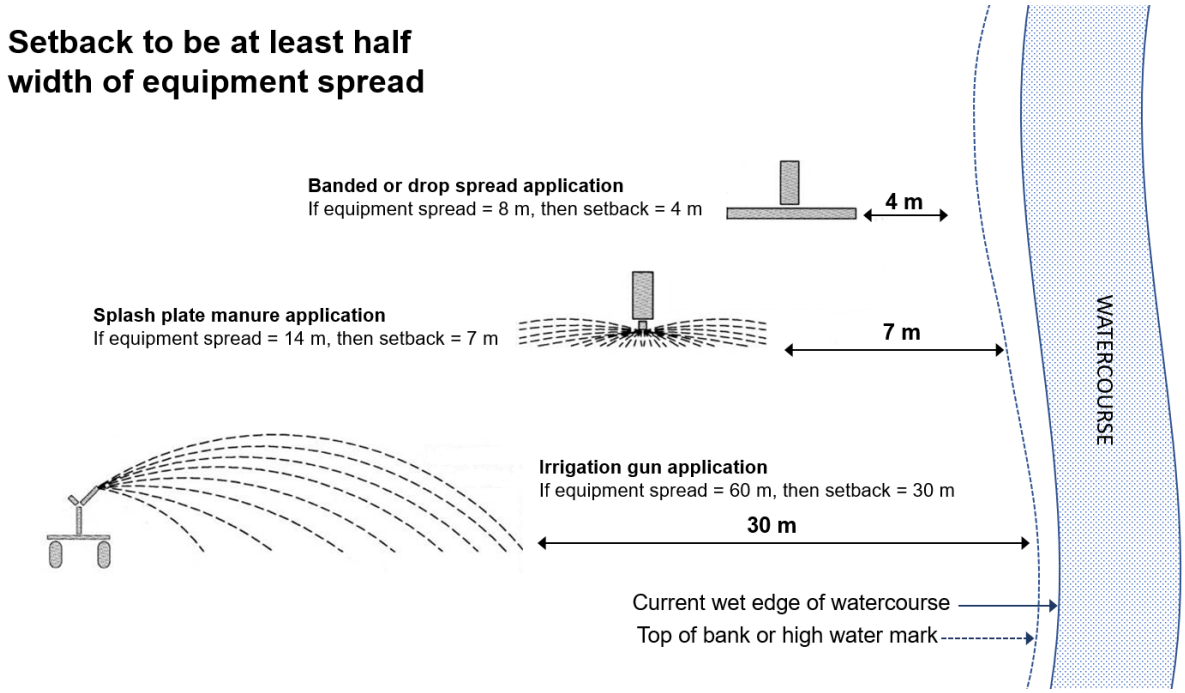
To use the table, slope should be determined within 150 metres (500 ft) of the top of the bank of any surface water. Soil drainage classifications based on soil survey data can be viewed using the Soil Information Finder Tool. However, survey information should be confirmed in person while assessing slopes in order to confidently evaluate runoff risk.

Nutrient Application Methods

Another important factor to consider for setback distance recommendations is nutrient application equipment and the method used to apply nutrient sources to crops. The nature and method of nutrient application and its associated equipment varies widely - some equipment is capable of precise nutrient placement while other equipment broadcasts manure and fertilizer in large swaths to increase coverage and reduce the amount of time needed to make an application.

When considering setback distances and nutrient application, a setback distance that is *at least half the width of the equipment spread* is recommended. Therefore, application equipment which places manure accurately and directly on the soil surface will require a narrower setback than, for example, equipment that distributes manure into the air.

For example, a piece of equipment that bands or drop-spreads manure or fertilizer at a width of 8 m should have a setback of at least 4 m. A splash plate used for manure application that has a spreading witdth of 14 m should have a setback of at least 7 m.



Field conditions and incoming precipitation

Immediately prior to nutrient application, the farmer or nutrient applicator should assess field conditions and consider upcoming rainfall to determine the risk of runoff for a given day. Depending on the risk, it may be best to skip applying on that particular day or increase the setback to reduce the overall runoff risk.

Fields that will receive significant amounts of rainfall, are near their water holding capacity, and have poor soil cover are at a very high risk of runoff and should either have an increased setback distance or not receive nutrient applications until conditions improve. Farmers can use an online worksheet to evaluate their field conditions prior to nutrient application.

In high-precipitation areas, such as the Lower Mainland or Vancouver Island, a risk assessment must be documented prior to applications in October, February, and March. The B.C. Application Risk Management (ARM) Tool can be used to check the short-term weather forecast for precipitation, assess field conditions and generate a record of the assessment.