

AN INTRODUCTION TO PHOSPHORUS



BENEFICIAL MANAGEMENT PRACTICES

INTRODUCTION

Phosphorus is an essential nutrient for crop growth. Alberta soils are generally deficient or low in phosphorus for optimum crop production (<60 ppm). Successful crop production requires the addition of phosphorus in the form of fertilizer or manure. However, the loss of phosphorus from the landscape can negatively impact water quality. Phosphorus can move with eroded soil or be dissolved in runoff water and carried to nearby surface water bodies. Too much phosphorus in lakes, reservoirs, rivers and streams can speed up aquatic plant and algae growth. This process is called eutrophication, which can lead to oxygen depletion, release of toxins, degraded water quality, fish deaths and odours.

When Beneficial Management Practices (BMPs) are used in the management of phosphorus, losses are minimized and crops receive maximum benefit.

In agricultural settings, phosphorus can be commonly found in the following:

SOIL

MANURE

FERTILIZER

FEED ADDITIVES

SEPTIC EFFLUENT

MILK HOUSE AND BARN WASH WATER

To learn more about phosphorus management, phosphorus risk assessment or how to adapt any of the management practices identified in this publication please contact your local Agricultural Fieldman, Rural Extension Staff, applied research or forage association, or one of Alberta Agriculture and Rural Development's (ARD) regional technical staff through the Ag-Info Centre at 310-FARM (3276).

In water, elevated phosphorus levels can cause eutrophication. This can impair municipal and private drinking water supplies (increasing the cost of the treatment) impede the flow of irrigation water, and foul beaches and lakes for recreation use.



PHOSPHORUS AND BMPs ON AGRICULTURAL LANDSCAPES

REDUCE THE MOVEMENT OF PHOSPHORUS TO WATER BY ADOPTING BMPs



1. Issue: Broadcast Application of Manure or Fertilizer

Exposed manure or fertilizer on the surface increases the chance of the material negatively affecting surface runoff.

2. BMPs

Direct injection or incorporation of the manure will help retain more nutrients in the soil and reduce the amount of phosphorus exposed on the surface to runoff from rainfall or snowmelt.



3. Issue: Nutrient Application or Storage Close to Water Bodies

Storage or application of manure or fertilizer in close proximity to water bodies increases the risk of phosphorus runoff reaching the water body.

4. BMPs

When applying manure or fertilizer close to water bodies, maintain a setback, appropriate for the method of application, that meets or exceeds the regulations. Establish and maintain a grassed buffer zone around water bodies and do not apply manure or other fertilizers to the buffer. Buffers help filter nutrients from runoff.





5. Issue: Over Application or Accumulation of Nutrients

If nutrients are applied at rates greater than the crop requires, i.e. if manure is spread on the same site repeatedly, the risk that excess nutrients are lost in the surface water runoff increases.

6. BMPs

Know your soil and manure nutrient levels. Soil and manure testing is the basis of a sound phosphorus management program. The "right rate" approach balances nutrient applications and soil nutrient availability with crop needs. Calibrate all nutrient application equipment to ensure the desired rate is applied. Increase the amount of hectares receiving manure to avoid nutrient buildup.

Phosphorus in Soil

Soil tests are required to determine how much crop-available phosphorus is present in the soil, so that the proper amount of phosphorus is applied. Phosphorus soil test levels give a measure of the capacity of the soil to supply phosphorus to the soil solution. The soil test does not measure the total amount of phosphorus in the soil, because the amount of phosphorus available to the plants is much less than the total amount.



7. Issue: Application of Manure on Snow or Frozen Ground

Winter application of nutrients poses a risk for runoff to surface water because of the decreased ability for frozen ground to absorb runoff from the melting snow. Eighty percent or more of the runoff in Alberta comes from snowmelt. So, spring is the time of the year with the highest runoff risk.

8. BMPs

Ensure your manure storage is sized to contain all the manure that is produced so that application of manure on snow or frozen ground is not necessary. Temporarily stockpile solid manure in areas with low runoff risk until it can be applied in the spring. Spring application of nutrients after snow melt will reduce the risk of runoff.



DO IT RIGHT

RIGHT SOURCE RIGHT RATE



9. Issue: Topography and Ground Cover

Steep sloping, tilled, and bare land have the highest risk for surface runoff of nutrients and erosion.

10. BMPs

A no-till or direct seeding system, where the crop stubble remains anchored going into winter, helps reduce soil erosion and runoff. Plant crop rows across slopes (not up and down) to reduce the risk of runoff and erosion. Seed the waterway to a perennial to reduce erosion by slowing water flow, which helps trap sediments and other contaminants.



11. Issue: Unhealthy Riparian Areas

Riparian vegetation stabilizes the stream bank, helping it resist the erosion from stream flow. The riparian area also helps slow runoff flow and filter nutrients and sediment from upslope. Overgrazing, chemical drift or tillage can damage the health of the plants and ground cover, which reduces the riparian area's ability to function, leading to increased erosion and nutrient loss.

12. BMPs

Delay spring grazing in the riparian area until soils have dried after spring moisture. Limit the amount of time livestock are allowed to graze in these areas. Use portable shelters, salt and mineral licks, oilers, fencing and offsite waterers to encourage animals to spend time outside the riparian area.



RIGHT TIME RIGHT PLACE

ENVIRONMENTAL PROTECTION



13. Issue: Poor Site Selection

Not every site is suited for manure application or livestock feeding. Sites that are susceptible to flooding or have channeled surface water runoff pose a greater risk for nutrient loss.

14. BMPs

Do a risk assessment of the site to determine the environmental risk. Risk Assessment tools such as the Wintering Site Assessment Tool, the Environmental Farm Plan and the Alberta Phosphorus Management Tool can help producers evaluate a site and identify actions to minimize nutrient loss.

OPTIMUM YIELDS



15. Issue: Runoff from Livestock Corrals and Feeding Areas

Water flowing through livestock feeding areas can carry manure, dissolved and particulate phosphorus to neighbouring surface water bodies.

16. BMPs

Relocate the livestock corral or feeding area away from the drainage areas and surface water bodies. Construct a berm or diversion to prevent upslope water from running into the corrals or livestock feeding area. Construct a berm or diversion to divert runoff away from surface water bodies. Construct a catch basin to capture, collect and store runoff water. Ensure it is designed to hold the anticipated runoff from the site. Empty the catch basin as soon as possible after a significant runoff event.



SUSTAINABLE PRODUCTION



17. Issue: Nutrient Accumulation from Feeding Systems
Repeated bale grazing or processed feed delivered on the ground can deposit a huge amount of nutrients onto a site, resulting in the accumulation of nutrients and increasing the risk of nutrient loss in surface runoff.

18. BMPs
Have soils analyzed to determine nutrient levels. Move feeding areas around. For example, place the bales in a different location every year. Do not use a site more than once every 4 to 5 years. Use feeders instead of placing processed feed directly on the ground. Use and move portable windbreaks to encourage animal movement and manure distribution around the site.



THE RISK OF PHOSPHORUS ENTERING SURFACE WATER



19. Issue: Improper Septic System Design or Management
Grey water from domestic laundry, kitchens and bathrooms contains soap and detergent-based phosphorus. Black water from toilets is a source of organic phosphorus. Improperly functioning septic systems or illegal systems hooked to pipes that discharge to rivers, ponds or lakes are a point source of phosphorus for surface water.



20. BMPs
Inspect your septic tank for sludge and scum buildup on a regular basis (every 3 to 5 years). Clean the tank when a third of the tank is full of sludge and scum. Look for signs of septic failure such as slow drainage, septic smells, spongy beds, and sewage backups and breakouts. Update old systems to ensure you have a properly functioning system.

FROM AGRICULTURAL SOURCES CAN BE REDUCED WITH BMPs

AGRICULTURAL OPERATION PRACTICES ACT (AOPA)

AOPA is provincial legislation that sets manure management standards for all operations in Alberta that handle manure. The BMPs outlined in this guide are to meet or exceed the regulations set by AOPA.

Producers need to be aware of the regulations around the following practices:

INCORPORATION

APPLICATION OF MANURE

NITROGEN AND SALINITY LIMITS

RECORD KEEPING REQUIREMENTS

SETBACKS FOR MANURE APPLICATION

SPREADING MANURE ON SNOW AND FROZEN LAND

SITING OF WINTERING SITES AND LIVESTOCK CORRAL

SITING OF TEMPORARY AND PERMANENT MANURE STORAGES

For more information on the regulations you can check the ARD website www.agriculture.alberta.ca/aopa or contact an ARD extension specialist or the Natural Resources Conservation Board, who is responsible for the administration of the act.

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FOR MORE INFORMATION

If you would like more information, you can email duke@gov.ab.ca or call the Ag-Info Centre toll free at 310-FARM (3276).

To obtain more copies of this factsheet contact Alberta Agriculture and Rural Development Publications Office at 1-800-292-5697 or you can download a pdf version at www.agriculture.alberta.ca/manure.