Managing Soil Phosphorus

Practical Guide

Farming for a Better Climate

Phosphorus is an essential element in energy transfer within plants and animals. The production and utilisation of fertiliser releases greenhouse gases implicated in climate change and is a major polluter of freshwater systems. Therefore it is important that the correct rates and application methods are used to maximise its benefit to the crop grown and environmental protection.

Phosphorus is important for the roots when establishing grass and clover swards. Clover can fix inert nitrogen from the atmosphere and make it available within the soil, reducing the need for bagged fertiliser. However, clover requires good levels of soil phosphorous to establish and persist in the sward. In an arable situation phosphorus is important for grain ripening.

Phosphorus can also be a major pollutant in freshwater systems, for example it can cause algal blooms in watercourses and disrupt freshwater ecology, in extreme cases leading to fish kills. Therefore, it is important that we target applications based on soil analysis and crop need. In addition, new findings (discussed in SAC Technical Note TN 668) have shown that **soil type** has a role in optimum phosphorous management.

This guide will help you manage the phosphorus in your soils. It will help you understand the risk of phosphorus pollution and how you can reduce bagged fertiliser costs in grassland by incorporating nitrogen fixing clover in to your sward.

What is soil phosphorus sorption capacity (PSC)?

Regardless of the phosphorus levels in the soil, the soil type will have an effect on its availability. This capacity to hold phosphorus is described as the **phosphorus sorption capacity** (PSC) score. The availability of phosphorus depends on the soil type; some soils release it more readily than others. Soils classed as PSC 1 release it more readily than soils at PSC 3.

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The European Agricultural Fund for Rural Development: Europe investing in rural areas
Scottish Government Riaghaltas na h-Alba gov.scot
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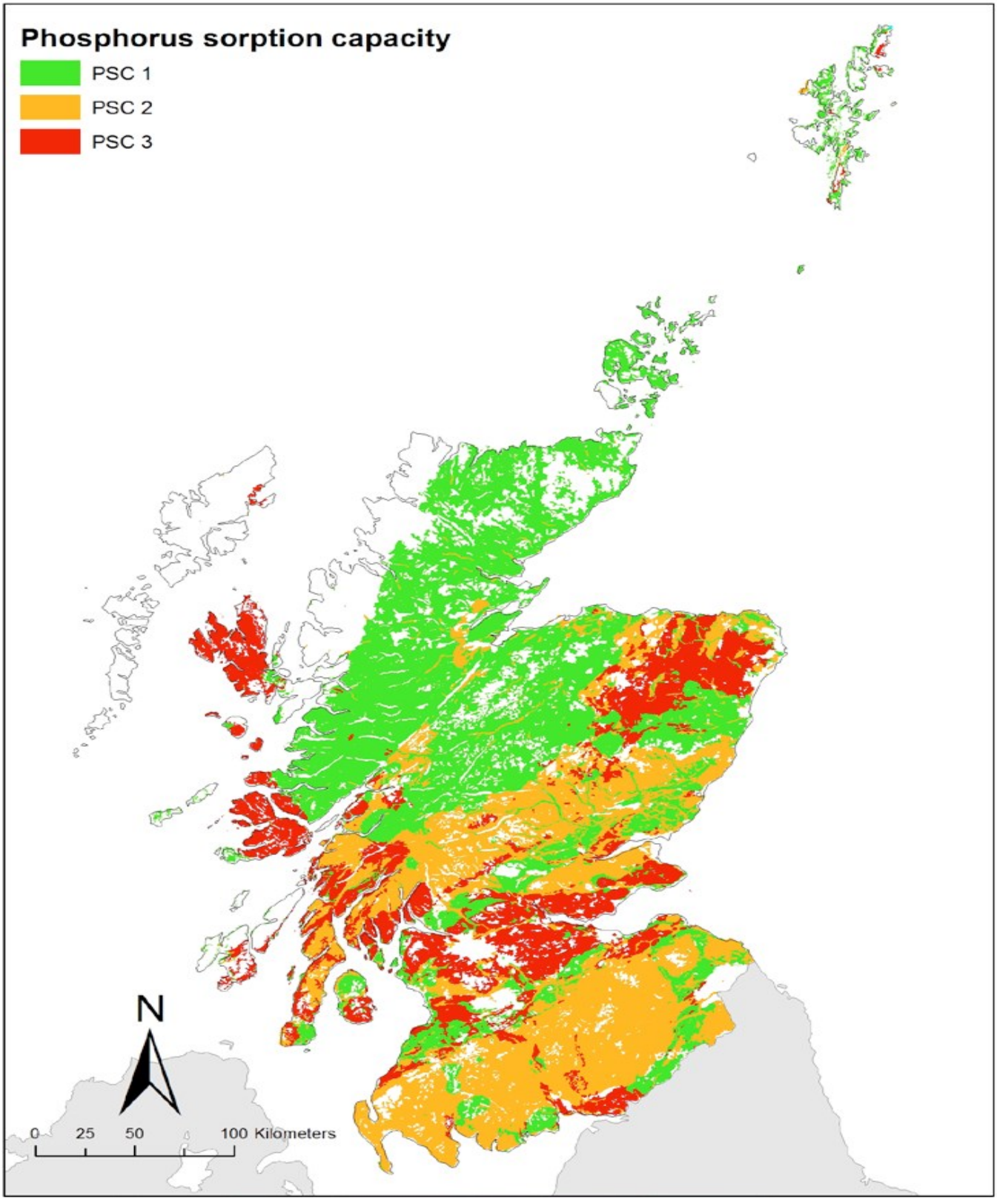
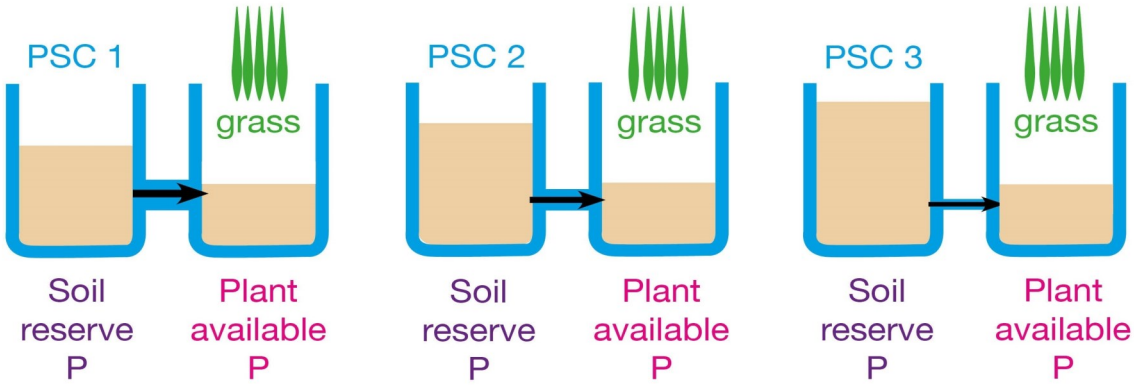
What PSC score does my croft or farm have?

The map shows the variation in PSC scores across Scotland. See SAC Technical Note TN 668 *Managing Soil Phosphorus* for more information.



An illustration of PSC

Visualise two linked containers; one is the 'soil phosphorus reserve' and the other is the 'plant available phosphorus'. As in the diagram below, the tube connecting them varies in width at various PSC scores. The width of the pipes illustrates that PSC 1 soils make phosphorus more readily available than PSC 3 soils, even if the levels of phosphorus are similar.



PSC 3 soils need a higher application of phosphorus fertiliser before they release it to the soil.

NEW recommendations—adjustments to recommendations found in Technical Note TN 652

The table below shows the effect of P sorption capacity on adjustments (kg P_2O_5/ha/year) to build -up or run-down soil P status. The Table is taken from the Technical Note TN 652.

P sorption capacity	Soil P status				
	Very low (VL)	Low (L)	Mod (M-)	Mod (M+)	High (H)
PSC 1	+40	+20	0	-10	-20
PSC 2	+60	+30	0	-20	-30
PSC 3	+80	+40	+20	0	-40

Therefore if re-seeding a PSC 3 soil with a low P status, you would need to apply an extra 40kg/ha P_2O_5 than if on a PSC 1 soil. This equates to an extra ~90kg/ha of 0:46:0 (Triple Super Phosphate), so its worth knowing your soils to maximise productivity and make best use of fertilisers.

Example 1 - Reseeding Fertilisers (mostly grass sward) in a low phosphate situation

Once background levels of phosphorus are raised, you should consider incorporating clover.

	Field 1	**Field 2**
Soil Analysis	pH 5.9 P_2O_5 low K_2O moderate +	pH 5.9 P_2O_5 low K_2O moderate +
PSC score	1 (green on map)	3 (red on map)
Nutrients required	N = 40 P_2O_5 =130* K_2O = 40	N = 40 P_2O_5 = 150* K_2O = 40
Fertiliser recipe	250 kg/ha 16:16:16 195 kg/ha 0:46:0	250 kg/ha 16:16:16 240 kg/ha 0:46:0

Example 2 - Reseeding Fertilisers (grass clover sward) in a high phosphate situation

This will prevent excess phosphorus being applied and perhaps becoming a pollution problem. It could also reduce the cost of the reseed.

	Field 1	**Field 2**
Soil Analysis	pH 5.9 P_2O_5 high K_2O high	pH 5.9 P_2O_5 high K_2O high
PSC score	1 (green on map)	3 (red on map)
Nutrients required	N = 20 P_2O_5 = 30* K_2O 40	N = 20 P_2O_5 = 10* K_2O 40
Fertiliser recipe	100 kg/ha of 20;10:10 45 kg/ha of 0:46:0 50 kg/ha of 0:0:60	100 kg/ha 20:10:10 50 kg/ha of 0:0:60

** Nutrient recommendations are taken from technical note TN 652 Fertiliser recommendations for grassland and adjusted using information in TN 668: Managing Soil Phosphorus.*

Top tips

- Regularly test your soils
- Find out your soils PSC score
- Adjust your applications of P accordingly
- Consider if higher levels of soil phosphorus would allow a more clover based
- system to be established
- Consult technical notes TN 668 Managing soil Phosphorus and TN 652 Fertiliser Recommendations for grassland.