

# PROVING PHOSPHATE CLAIMS ON BIOSOLIDS-BASED PRODUCTS



# State Plant Food Control officials recognize slowly available phosphate claims in biosolids, compost, and other recycled organics products

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**A** new testing method and labeling guidelines have been approved to enable producers of biosolids-based products to measure and advertise the amount of phosphate in a carbon-based fertilizer that is readily water soluble (and slowly releasing). This measure is referred to as water extractable phosphorous (WEP).

Biosolids manufacturers can use these new tools to express to customers what differentiates their products from chemical fertilizers. Biosolids- and other carbon-based products typically have less WEP; therefore, the phosphate from these products is more likely to stay put where applied, rather than run off into nearby waters.

## Over-Application

The biosolids management sector, as well as farmers and turf managers who use its products, understand concerns regarding over application of phosphorus. Over-application not only has been caused by poor fertilization and waste management practices, but also by the fact that phosphorus is bound by the soil. This means much of what is applied is not absorbed by plants in a timely manner, and because most plants can tolerate the over-application of phosphorus (called “luxury” application), it does not harm their growth.

However, over-application of phosphorus, whether by biosolids, chemical fertilizer, manure, etc., is a major concern because the nutrient can migrate to various water resources. Addressing this issue protects drinking water, reduces surface water contamination (eutrophication), and keeps an important nutrient required for plant growth and food production in the soil where it belongs.

While phosphorus is bound tightly to finer textured soils, long-term over-application can lead to its leaching through the soil profile — that is, over-manuring — while soil erosion (as phosphorus is attached to soil particles) can lead to the migration of phosphorus into surface waters. The leaching of phosphorous through coarse- or sandy-textured soils is much more likely to occur during normal fertilization practices, than it is in finer or silt or clay-textured soils.

## Regulations

Concerns and actual damage caused to water resources has led to tighter state regulation over the use of phosphate-based fertilizers in many agricultural settings. This includes products containing phosphorus, such as biosolids and manure. Over the past decade, these regulations have expanded to encompass the use of phosphate fertilizers on turf and other “ornamental” applications.

Unfortunately, many states have been overzealous in their regulation. Some have gone so far that they almost eliminate even maintenance applications of phosphate fertilization on turf. Others have failed to deal with more significant causes of nutrient contamination, such as over-fertilization or over-manuring on agricultural land and lax enforcement of National Pollutant Discharge Elimination System (NPDES) Phase II regulations to control sediment during construction.

Sadly, most regulation has ignored certain aspects of relevant science. Instead, these rules treat all phosphate sources the same; they ignore the phosphate’s actual mobility.

In most states, Class A biosolids products are affected by these regulations, if the products are registered as fertilizers, which means the products make legal nutrient claims and sometimes even when they do not.

In response to this trend, the American Association of Plant Food Control Officials (AAPFCO) developed recommended language regarding “Fertilizer Restrictions for Urban Landscapes,” as well as other related Statements of Uniform Interpretation and Policy to assist states in developing science-based regulation. AAPFCO is an organization of officials from state departments of agriculture. Its voting members are the control officials who register and regulate the distribution of fertilizer, soil amendments, and liming agents in each of the U.S. states, territories, and Canada. (They sometimes oversee pesticides and animal feed, too.) The organization creates model laws and regulations to assist interstate commerce of these agricultural and horticultural staples. Its primary goals pertain to consumer protection, by requiring

## DEFINITIONS

- Phosphorus — A chemical element (symbol P) with an atomic number of 15, that exists in several allotropic forms.
- Phosphate — Any salt or ester of phosphoric acid.  
Available phosphate ( $P_2O_5$ ) — The sum of the water-soluble and the citrate-soluble phosphate, according to AAPFCO since 1993 ( $P_2O_5$  is the form in which phosphate is expressed on fertilizer labels).
- Water Extractable Phosphate — The amount of phosphate in a carbon-based fertilizer that is readily soluble, as determined by the Southern Extension & Research Activity-17 (SERA-17) test method, according to AAPFCO tentatively in 2020.

truth in labeling, and uniform regulation among states and territories.

AAPFCO also promotes the four Rs of fertilizer management:

- right source (type and form of the fertilizer or nutrient),
- right rate (suitable application rate),
- right timing (related to the growth pattern of the crop), and
- right placement (as close to the root zone as possible).

While it is understood that the proper usage of nitrogen and phosphate fertilizers must be regulated to appropriately protect the environment, it is equally important to understand that these nutrients must be utilized in agricultural settings to grow food and in ornamental applications to grow healthy plants and reduce soil erosion.

Further, as it relates to biosolids, compost, and other organic recycled products, there is a great need to apply carbon to the soil (even if it innately contains some slowly available nutrition) as a mean to ameliorate the effects of climate change and improve soil quality. Therefore, a more science-based (and maybe practical) approach to regulating phosphate application is required, and unfortunately, this may lead to more complicated best management practices related to their usage.

The U.S. Composting Council (USCC; Raleigh, North Carolina) having an Industry Liaison to AAPFCO, decided to try to address the phosphate

issue as it relates to carbon-based products. It also rallied several biosolids organizations to the cause, including the Water Environment Federation, California Association of Sanitation Agencies, Mid-Atlantic Biosolids Association, Northeast Biosolids & Residuals Association, and Northwest Biosolids.

## Defining & Measuring WEP

The group sought a way to illustrate the difference between phosphorus in biosolids and other carbon-based products and those found in many chemical fertilizers. Fortunately, extensive university research data shows that the phosphorus in most biosolids and other carbon-based products is naturally less water-soluble or water extractable than the forms found in typical chemical fertilizer products.

WEP is less mobile, which also means that it is less readily available to plants. To claim that carbon-based products contain lower amounts of WEP, an acceptable analytical testing method had to be identified. These efforts led to the identification and evaluation of the Southern Extension & Research Activity-17 WEP test method, called SERA-17. This method originally was developed for manure and biosolids products.

Researchers have been testing biosolids-based products for WEP content for several years, as have some Class A biosolids products manufacturers, especially those who are using their products in environmentally sensitive applications or locations. (See the table below.) Working with Penn State University (University Park) and Colorado State University (Fort Collins), USCC proposed both SERA-17 and a definition for WEP.

The importance of this claim relates not only to the potential negative environmental effects of highly soluble phosphate sources, but it also helps biosolids, compost, and other carbon-based product customers better manage nutrient addition for proper plant growth.

At the July 2021 AAPFCO meeting, the SERA-17 test method for WEP was found to be acceptable. The group added that sampling methods need to be further “fleshed out.” And at the February 2021 AAPFCO meeting, the group finalized the definition. The definition states “Water extractable

phosphorous — the amount of phosphate in a carbon-based fertilizer that is readily water soluble, as determined by the SERA (Southern Extension & Research Activity)-17 test method.”

## Products and Water Extractable Phosphate (WEP)

Phosphorus Source	WEP Content (as % of Total P)
Heat dried biosolids	Less than 2%
Biological Phosphate Removal – type biosolids	5% to 25%
Poultry manure	20%
Dairy manure	50%
Triple Super Phosphate (0-44-0 synthetic)	85%

Data provided by Dr. George O’Connor, University of Florida

## Labeling Changes

The final piece of this puzzle involves illustrating how testing for the WEP content could be used to make labeling claims on carbon-based products. State control officials were concerned that using the term *WEP* on the label would create confusion, because fertilizer phosphorus is expressed as “available phosphate.” Therefore, WEP testing will instead be used to illustrate “slowly available phosphate” on a label, similar to the way slowly available nitrogen is claimed.

This strategy enables the new phosphate claims to align more closely with existing labeling regulations and formats. The figure on the right shows how to note the amount of phosphate that is not water extractable; this portion is claimed as slowly available phosphate.

The slowly available phosphate claim can be a tool for biosolids product manufacturers who market registered fertilizer products. Not only can it educate customers and regulators about the characteristics of phosphorus in biosolids-based products, but it also may lead to more well-informed nutrient management practices.

Since the July 2021 AAPFCO meeting, some states already have approved labels where “slowly available phosphate” was claimed, and some have questioned it. Now is the time for the biosolids industry (perhaps starting with Class A biosolids product producers), where appropriate and deemed beneficial, to modify their fertilizer labels and include a slowly available phosphate claim. This will assist in instituting the allowance of this claim on a long-term basis.

## Using This Option

Now that testing for WEP is an acceptable method to make slowly available phosphate claims on biosolids and other carbon-based products, product manufacturers should consider how they will use this new option. Biosolids managers, who have been able to measure and claim that the lion’s share of nitrogen in their product is in slowly available form, can now do the same with phosphorus. Perhaps more biosolids managers will register their products as fertilizers, enabling them to make legal fertilizer (nutrient) claims. Companies producing dried and granulated biosolids (or manure) products, which almost always register them as fertilizers, could easily make the slowly available phosphate claim once testing is completed. Similar considerations will also exist for compost, anaerobic digestate, and biochar products.

In the near-term, biosolids product manufacturers can use this option in several ways:

- If their biosolids product is registered as a fertilizer, they can test for WEP and make a new claim.

## Example of New Labeling Language

<b>6-4-0</b>	
<b>GUARANTEED ANALYSIS</b>	
Total Nitrogen (N) .....	6.0%
5.5% Water Insoluble Nitrogen*	
0.5% Water Soluble Nitrogen	
Available Phosphate (P <sub>2</sub> O <sub>5</sub> )** .....	4.0%
Iron (Fe) .....	4.0%
Derived from biosolids	
*5.5% Slowly available nitrogen from biosolids	
**3.9% Slowly available phosphate from biosolids	

- If they are selling or distributing their product to farmers, turf managers, and other end users because of its nutrient content, this additional test data could assist them in better helping customers manage any additional nutrients that may need to be applied along with their the biosolids product.
- It could allow biosolids managers to better defend the application of their products where environmental concerns exist, related to nutrient addition.

With WEP test data in hand, it will be important for biosolids managers to discuss phosphate availability with customers in a slightly different way, but it may also allow them to make some related environmental claims. For instance, “The majority of nitrogen and phosphate nutrition in Super Fertilizer 6-4-0 is in ‘bound’ form and is slowly releasing. ... These types of nutrients significantly reduce the likelihood of nutrient leaching.”

These properties could help biosolids product manufacturers have more meaningful discussions with environmental regulators, as well as environmentally conscious customers. It may even lead to related conversations where the land application of dewatered Class B and A biosolids are applied.

The final question is this: Is it time for you to test your biosolids product for WEP content? 🐞

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