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Potential Agronomic Benefits of Wood Ash Application on Reclaimed Surface Mined Lands

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Department of Agronomy

Soil Science News & Views

Potential Agronomic Benefits of Wood Ash Vol. 16, No. 7, 1995 Application on Reclaimed Surface Mined Lands

D.C. Ditsch, J.H. Grove and W.O. Thom

Wood ash is a by-product generated by paper companies, lumber manufacturing plants and utilities that burn wood products, bark and papermill sludge as a means of disposal and/or energy production. Large quantities of wood ash are generated by these industries since wood generally contains 6 to 10% ash. Most of these ashes are land-filled or discarded in lagoons. However, the increasing expense of land-fill disposal has led to increased interest in the land application of industry generated wood ash.

Before commercial fertilizers and agricultural limestone were economically feasible and easily obtained, wood ashes were used to enhance crop production. In fact, the term "potash," which is commonly used today when referring to potassium (K) fertilizer, is derived from the use of wood ash as a source of K. This trend may be

reversing in some local areas where the economics of applying wood ash as a soil amendment make this practice more competitive.

The chemical characteristics of industry generated wood ash can be highly variable and are a function of tree species and the part of the tree burned. In general, wood ash has a Calcium Carbonate Equivalent (CCE) ranging from 35 to 85% and is used primarily as a liming amendment. Wood ash also contains variable amounts of many essential plant nutrients, such as phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), zinc (Zn), copper (Cu), manganese (Mn), sulfur (S), iron (Fe), and boron (B). Phosphorus (0.01-2%), Ca (0.58-70%) and K (0.3-20%) are the plant nutrients in wood ash that are commonly present in quantities large enough to be of agronomic importance. Nitrogen (N)

is also present in wood ash, but only at very low levels.

The land application of any industrial by-product is often regulated by its heavy metal content and potential environmental impact. In addition to the metals already mentioned as plant nutrients, wood ash may contain several other elements such as aluminum (Al), arsenic (As), nickel (Ni) and titanium (Ti). Researchers at Auburn University analyzed 19 boiler ash samples and did not find excessive levels of any metal present. In general, wood ash is always lower in heavy metals than coal fly ash. However, all wood ash samples should be analyzed for heavy metal content before land application.

The physical characteristics of wood ash may make handling the most difficult challenge if ash is to be used as an alternative to agricultural limestone. The small particle

size (65-100% passing a 60-mesh screen) and low bulk density of wood ash (average 0.52 g/cm³ or 0.44 tons/yd³) compared to ground limestone (2 g/cm³ or 1.7 tons/yd³) can be a positive attribute in terms of timely reactivity with the soil. However, the ability to uniformly apply wood ash with conventional spinner spreader equipment is limited. Also, depending upon the CCE of wood ash, the rates of material applied to the land may need to be adjusted to obtain the same neutralizing effect as agricultural limestone.

In the Appalachian coal fields of eastern Kentucky, Trus Joist MacMillan has recently constructed the largest single-product engineered lumber plant in the world. At this plant, small diameter yellow poplar (<12" diameter) will be processed into structural building materials using newly emerging technologies. Logs entering the plant are prepared for processing by first being debarked. The yellow poplar bark (referred to as "hog fuel") will be burned in a furnace as an energy source for numerous plant operations, resulting in approximately 6,000 tons of wood ash generated each year.

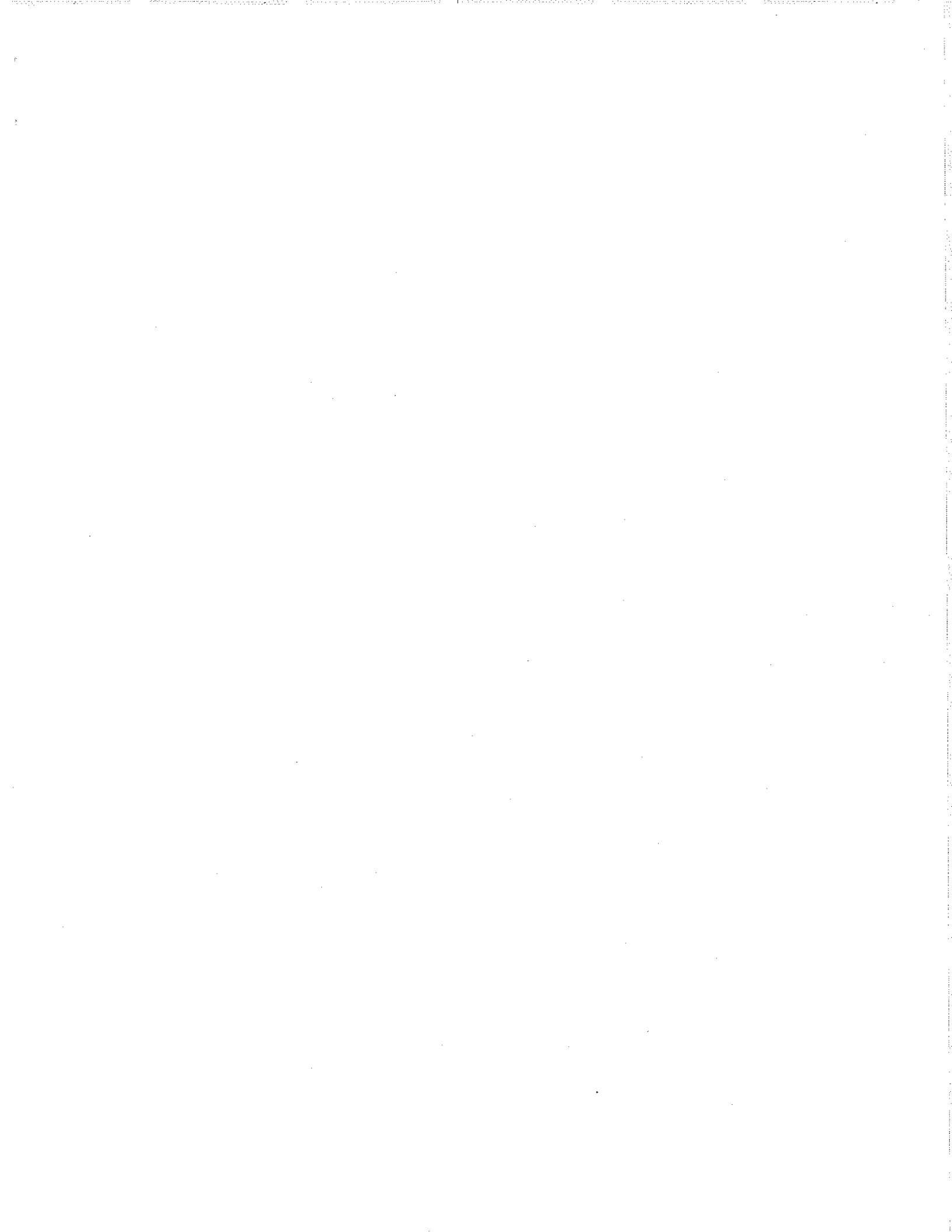
The Trus Joist MacMillan plant was constructed on a reclaimed surface mine site in Perry County, near many active coal surface mines. Reclaiming these mine sites typically requires the application of agricultural limestone and fertiliz-

ers to obtain vegetative cover and achieve the level of plant productivity required by state regulatory agencies. Unfortunately, the geology and remoteness of this coal mining region results in high quality liming materials being expensive because they must be hauled in. Thus, the availability of wood ash as a liming agent is of considerable local interest to the mining industry and to Trus Joist MacMillan as an economical and environmentally safe alternative to land-fill disposal.

To determine wood ash application rates necessary to adjust mine spoil pH, UK agronomists will initiate greenhouse and field studies in 1995 using mine spoil material from a potential land application site and yellow poplar wood ash generated by the Trus Joist MacMillan plant. Plant nutrient and heavy metal uptake, yield, and soil pH measurements will be made over a 2 year period to determine the agronomic benefit of wood ash as a soil amendment.

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