

Gas Injury to Trees

Identification and Treatment

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Gases in the soil have been damaging trees and shrubs along streets ever since the first illuminated gas transmission lines were installed in Pall Mall, England during the early 1800's. However, it was only recently recognized that gases from landfills can migrate into the soil covering the garbage and into adjacent properties killing trees, shrubs and turf.

GAS KILL ALONG STREETS

Natural gas is comprised primarily of methane (CH₄) but other combustible and non-combustible components can account for 2-5% of the gas volume. This gas can leak from underground pipes and move vertically and horizontally into the soil surrounding the leak causing root asphyxiation in the contaminated area. Gas usually reaches the surface in an unpredictable manner.

PLANT SYMPTOMS

Gas injury symptoms range from slow decline and chlorosis to necrosis and death. Affected plants may have tiny leaves if the leak is small and has been

there for several months during the growing season. The tree may decline quickly, over a period of one to three weeks, if a large quantity of gas is leaking under a lot of pressure. Frequently, the grass and weeds in the area will be affected if the gas reaches the soil surface. They will become chlorotic and then necrotic or will quickly dry up in a few days to a week.

DIAGNOSIS

Proper diagnosis of a gas kill problem should combine a soil and plant investigation. After the plant symptoms previously mentioned are observed in an area, use Table I to check for the typical changes in soil characteristics. To do this dig three to four eighteen inch (18") deep holes around the drip line of the tree. If these changes are observed in soil suspected of being contaminated by comparing with normal soil from the same property, then the gas company should be called out to check for gas. They will usually respond within several hours. If gas is found, then the likely cause of the plant's poor health has been confirmed.

Table 1. Soil Characteristics in Normal and Gas-Contaminated Soil			
	Normal Soil (Aerobic)		Contaminated Soil (Anaerobic)
Odor	Pleasant		Septic
Color	Light	-relative to-	Dark
Texture	Not Sticky	-relative to-	Sticky
Moisture	Low	-relative to-	High

GAS KILL ON LANDFILLS

Many landfills throughout the United States have been converted into parks, golf courses and recreation areas because of increased land pressure. Thin cover soil over the garbage, poor quality soil, low organic content soil, soil compaction, lack of irrigation facilities and poor plant selection are contributing factors to poor plant growth on these reclaimed sites; however, gas contamination of the root zone is one of the more important factors responsible for poor tree growth in these areas. The problem is caused by one or more of the following factors: (a) lack of oxygen in the root zone; (b) toxicity of carbon dioxide to the roots or; (c) anaerobic conditions of the soil permitting metals such as iron, manganese and zinc to become available to the vegetation in toxic concentrations.

In some cases, even though the trees died, the shallower rooted ground vegetation and shrubs continued to live. Generally when landfill gases are present in the surface soil, the concentration increases at deeper soil layers. Diffusion of ambient air into the soil and diffusion of landfill gases out of the solid frequently result in the soils nearest the surface (top several inches) remaining in an aerobic condition, whereas the levels where the deepest roots are present can be anaerobic.

The methods of diagnosing plant problems on landfills are more complex than on non-landfill areas; however, the same general diagnosis procedures apply here as in gas damage along streets. Consult the Bartlett Tree Research Laboratory before diagnosing plant problems or drawing recommendations for landfills.