Soil Assessment and Improvements Demonstration (SAID)
Project Manager: Bryce F. Payne, Ph.D.
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Following 150 years of coal mining, the soils of Northeast Pennsylvania were ravaged. Because the work of the NEPA Urban Forestry Program was to revitalize the natural resources of this region, program managers wanted to understand the impact of the soil on new plantings and to identify soil improvement techniques.

Soil scientist, Bryce Payne implemented The Soil Assessment and Improvement Demonstration (SAID). The primary goals of this study were to analyze and record soil conditions at three sites that were funded in 1995 and 1997 and create a set of soil improvement and tree planting practices for future projects. From 1998 to 2000, Bryce Payne conducted the research.

Methods:
Since there were a finite number of plantings in the program when research began in late 1998, a traditional, randomized testing design could not be used. A simple, but effective plan was developed. Three trees were selected at each of three sites. Four 6 foot long and 18 to 24 inch deep radial trenches were excavated around the trees. Each trench was tested and then filled with one of four treatments: control, recyclables, conventional, and conventional with water treatment sludge cake.

The control treatment was simply the removal of stones larger than 1 to 2 inches during trench excavation. Recyclables was amendment materials available locally including: slurried, lagooned, dredged, and drained coal fly ash; commercial peat moss; dewatered, paper pulp sludge cake; and mulch. Conventional was the application of readily available and frequently used pelletized gypsum and granular lime. Conventional with water treatment sludge cake treatment used conventional fertilizers and soil amendments. The goal of this treatment was to see if a small amount of organic matter with commonly used materials could improve the soil. This modification would be the easiest for contractors to make.

Findings:
At all sites, treated trees improved in appearance and root development. Leaves were greener and more numerous. Prior to treatment, roots were limited to original planting holes and adjacent cultivated land. Post treatment, trees had larger root systems.

Several factors complicated the interpretation of results. Drought negatively impacted tree growth everywhere and thus impacted root development. In addition, weeds proliferated in the treated trenches impairing root growth. At one site, an untreated tree took advantage of the enriched soil of a treated tree. Several trees also showed symptoms of manganese toxicity; sample leaves confirmed the problem. As trees were treated and nitrogen uptake increased, it appeared that these trees were able to counter the effects.

Soil Recommendations:
- Vigorous treatment is essential in coal-impacted soils because of their aggressive leaching regimes.
- If contractors apply only one material, it should be lime. Roots only grew when neutralizing materials were used. Combining gypsum with lime can help the lime to deeply penetrate the soil.
- Materials with the slow release form of nitrogen should be used frequently with conventional fertilizers. Numerous applications of the materials will counter the leaching in the soil.
- Attempts to improve soil structure by adding processed coal fly ash should be made at a greater depth and at less volume (<10%) than used in this study. Broad and deep application would allow the water holding capacities of this treatment to be exploited.
- Organic amendments are a necessity. A 50-50 blend of organic matter at a rate of 20% of the total soil volume, with lime, nitrogen, sulfur and potassium modifications, is advisable.