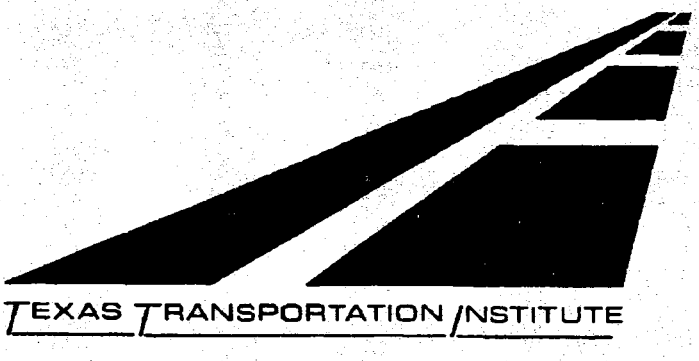

TEXAS TRANSPORTATION INSTITUTE

Interim report: Evaluations of Bio-barrier® in Specific Applications to Control Herbaceous Vegetation

Environmental Management Program
October 1994

INTERIM REPORT: EVALUATIONS OF BIO-BARRIER® IN SPECIFIC APPLICATIONS TO CONTROL HERBACEOUS VEGETATION

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Research Study Number
405141

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INTRODUCTION

This study evaluates the effect of Bio-barrier® on the growth of herbaceous vegetation when installed horizontally under specific conditions. Bio-barrier® is a geo-textile fabric fitted with nodules impregnated with the herbicidal agent, triflurian. The study is being performed by the Environmental Management Program of the Texas Transportation Institute at Texas A&M University. The objective of this study is to quantify the effect of soil type, temperature and installation depth will have on the effectiveness of the material to control grasses common to highway roadsides.

STUDY DESIGN

Bio-barrier® is being evaluated in three soil condition; clay, sandy loam, and crushed gravel. Plots are one meter square, formed with treated pine and are adjacent to a concrete paved surface. (See Figure 1.) The material is evaluated at depths in the soils of 2" and 4" in each soil type.

Three plots (one of each soil type) have the material installed at 1", 2", and 4" depth. These plots shall be used by Reemay Inc. to collect Bio-barrier® samples during the course of the study. Reemay will measure the residual herbicide in the nodules and thereby estimate the length of time the material may still be viable.

Each plot except the three plots provided for samples were seeded after the materials were installed. Each plot seeded was divided into half with the right half seeded in Bermudagrass and the left side seeded with Johnsongrass.

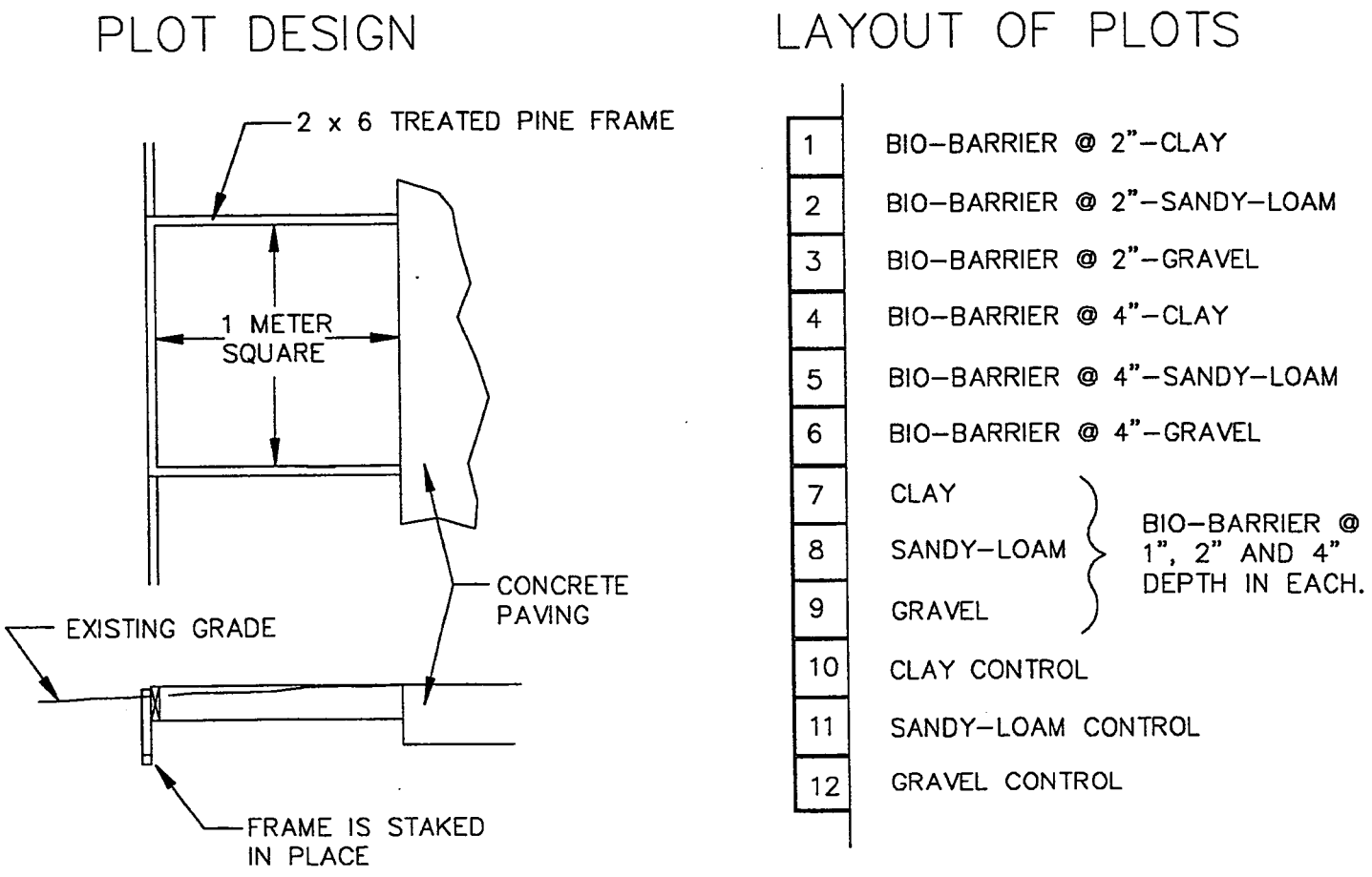

Figure 1. Design and layout of study plots.

CONSTRUCTION OF FIELD PLOTS

April was a wet month and we were not able to get a sufficiently long window of no rain until the first week of May. We completed construction of the plots, including installation of the soils on May 13th. (See Photos 1 through 8.)

Prior to installation of the soils and gravel, each was covered with plastic sheeting and treated with the herbicide methylbromide to kill any existing seeds. The soils were left undisturbed for 48 hours before installation. During installation the soils were hand-tamped as the Bio-barrier was installed. To facilitate data collection later we installed strands of galvanized wire across the plots in a 0.1 meter grid.

Plot numbers 1 through 6 and 10 through 12 were seeded. (Plots 10, 11, and 12 are the control plots.) We divided each plot in half and seeded the left half with Johnsongrass and the right half with Bermudagrass. The seed was applied with a salt-shaker to insure uniform application. The seed was weighed prior to application to ensure that a like amount was applied to each plot. Each seeded plot was then covered with a layer of sand to a depth of approximately 1/4 inch to prevent disturbance by winds and thoroughly hand-watered with a sprinkle can.

Because rain was forecast, a plastic tarp was laid over the plots and anchored with car tires. The ensuing thunderstorms were accompanied by very high winds and a portion of the tarp was lifted thus allowing runoff from the concrete paving to flood a few of the plots. Because of the disruption of the uniformity of the seeding we decided to re-sterilize the soil in all the plots (in-place) and reseed. This was completed by the end of May. The seeded plots were hand watered daily for one week. No supplemental watering was applied thereafter.

DATA COLLECTION

Data collection shall consist of annual photo-documentation of each plot and measure of vegetation growth. Each plot is divided into 0.1 meter square sample plots. Ten random samples are taken from each plot. The average height of the plants in each lot has been recorded. In addition, area temperature and rainfall data have collected. Soil temperatures at the depth of the materials were also recorded. Soil temperature readings were taken weekly beginning in June. Readings were taken at 2" and 4" depths in the centers of plots 7, 8 and 9 on each occasion. Temperatures were taken with a dial thermometer with a 4" stem and a range of 40 to 160 degrees Fahrenheit. The following charts are the records of soils temperatures taken on the dates indicated.

As the graphs indicate, the soil temperatures were quite high, even at the 4" depth. Sand had some of the highest temperatures but was more affected by soil moisture.

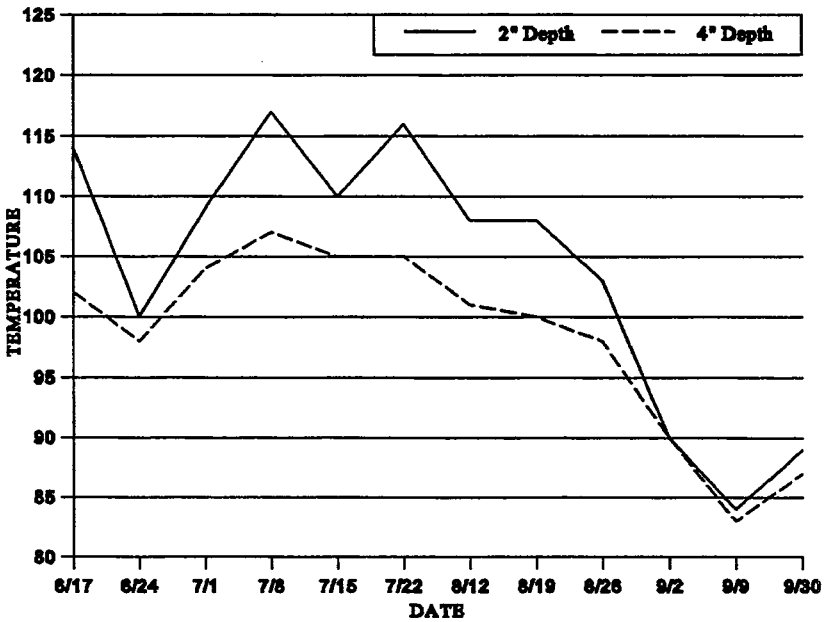

Figure 2. Soil Temperatures in Clay.

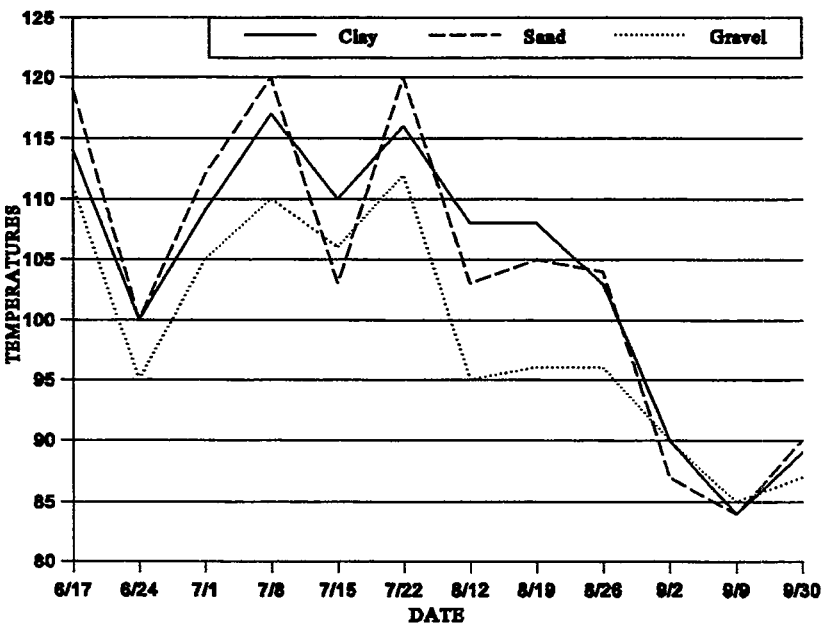

Figure 4. Comparisons of Soil Temperatures at 2".

The readings taken on 7/15 and 8/22, (see Fig..4), were in moist soil a day after a rainfall. Sand had the highest differences between depths, followed by clay and then gravel. This is likely due to the density of the soils.

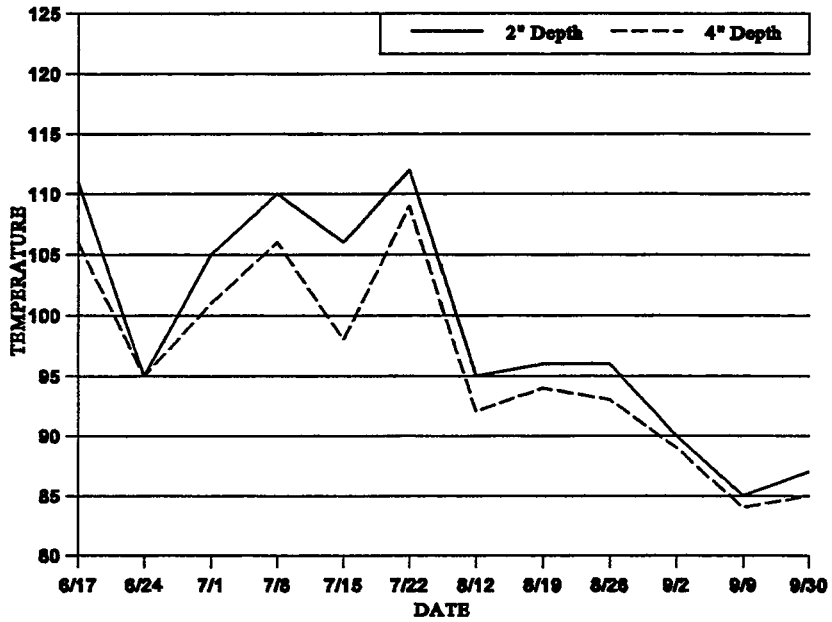

Figure 5. Soil Temperature in Gravel.

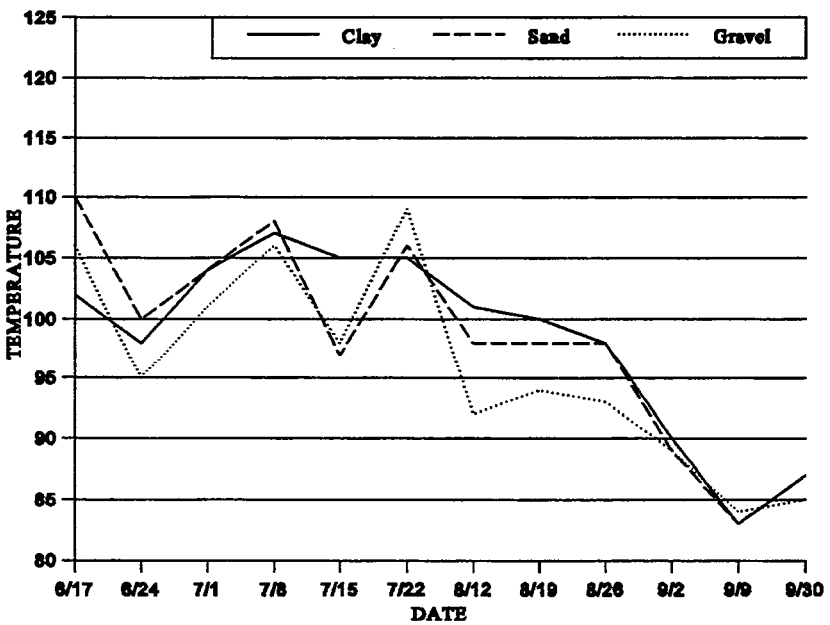

Figure 6. Comparison of Soil Temperatures at 4".

RESULTS OF RESEARCH

The plots are surrounded by grass field which is regularly mowed with tractor-drawn shredder. Litter from this mowing is frequently thrown onto the plots and some unseeded species are represented in the control plots. The only invasion to the treated plots is a strip of nutsedge (Photo 21) between the concrete paving and the 1" x 6" board edging the front of plots 1 through 6. As seen in the photos, some of the nutsedge has sent runners into plot 1. A photo of a plant, (Photo 22), is enclosed. I have decide to let the sedge continue to see how it develops. Other invaded vegetation includes a very low-growing herb, (Photo 12), in a few isolated locations.

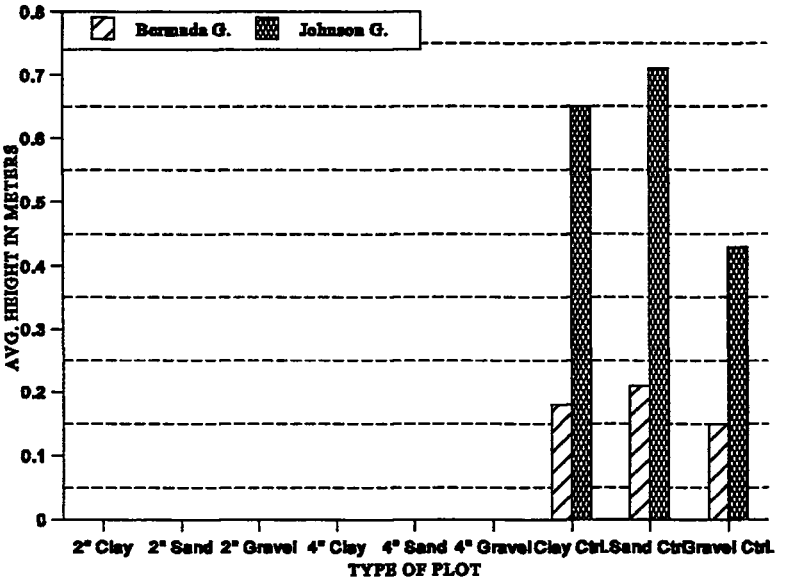

Figure 7. Grass Growth in Seeded Plots
(No seeded grass survived in Bio-barrier® treated plots.)

The results of this first round of data collection are represented in Figure 6. (See also photos 9 through 20.) As shown in the chart, neither Johnsongrass nor Bermudagrass survived in any plot containing Bio-barrier regardless of depth. Each grass variety in the treated plots exhibited adequate germination but died before any grass reached over 1" tall. The control plots however, exhibited quick germination and continued growth. This would indicated that high temperatures due to the season and lack of water were not significant factors affecting the growth of grass in the treated plots.

Overall appraisal of work

I had really expected to get some grass established in the treated plots. I had anticipated that we may have seen a gradation of grass heights based on the depth of the Bio-barrier. It maybe possible to install Bio-barrier greater depths and still get control. If the longevity of Bio-barrier is significantly affected by high soil temperatures, a deeper installation may be required. With this exception, the study is proceeding as anticipated.

Work planned for next phase

The plots will continue to be visually monitored through the winter and spring. We plan to re-seed the plots again in the spring to judge if an earlier seeding in cooler soils would have allowed some of the treated plots to establish. All plots will be cleaned and sprayed with the herbicide methylbromide before seeding. We hope to seed in the last week of April. In addition, I will install three more seeded test plots of clay, sand, and gravel with Bio-barrier installed 6" deep. We will include these plots in our temperature readings.

Photo 1. Frames newly installed.

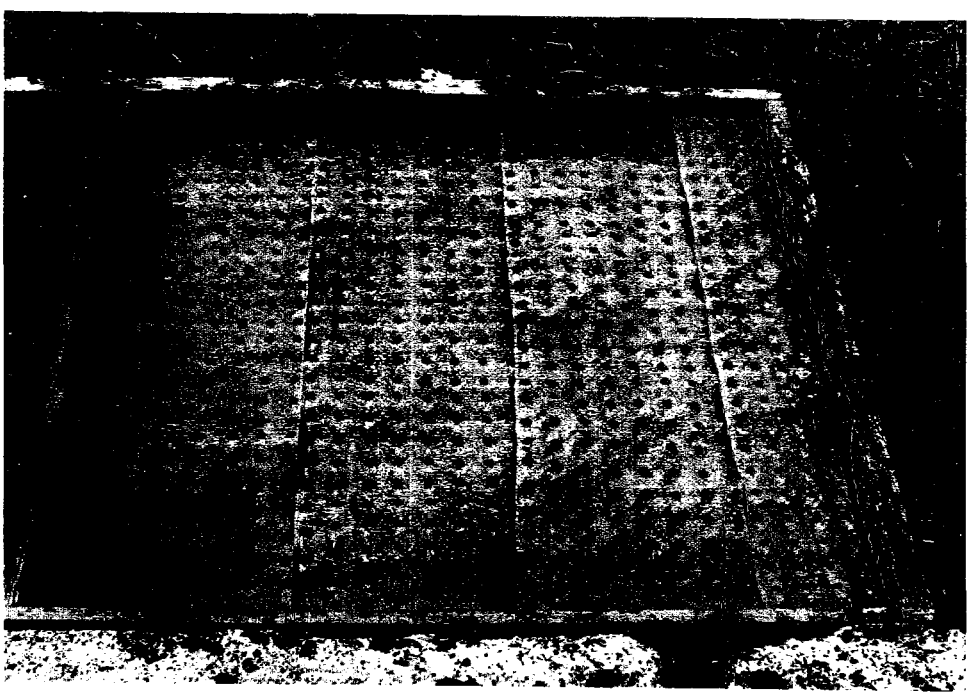

Photo 2. Bio-barrier installed in plot 1.

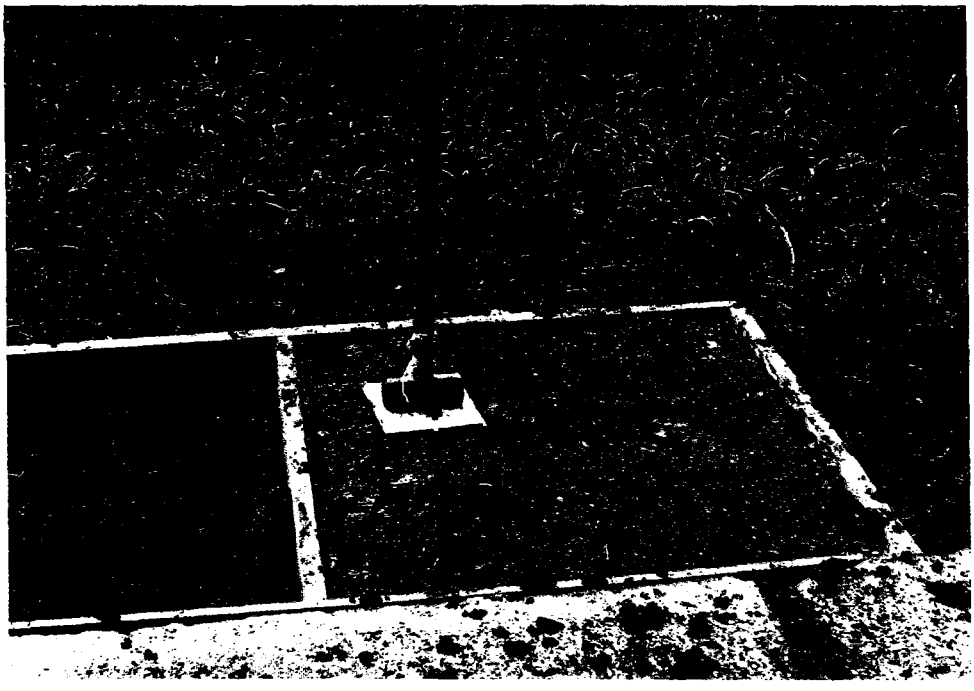

Photo 3. Soils are hand-tamped in place.

Photo 4. Bio-barrier at 1", 2" and 4" depths in plots 7, 8, & 9.

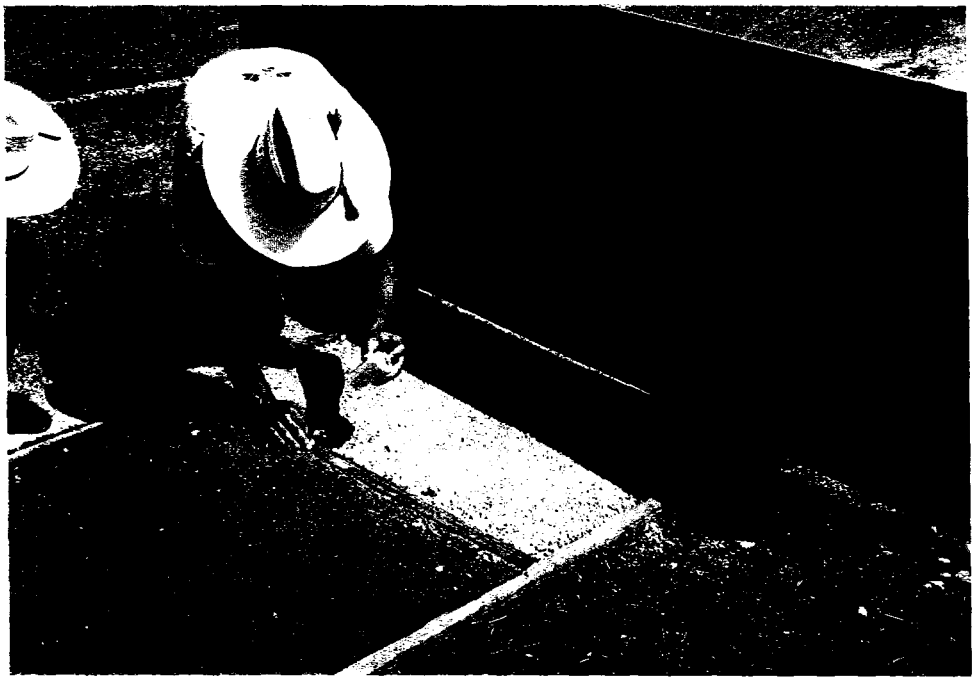

Photo 5. Plots are seeded. Plywood sheet protects against wind.

Photo 6. Sand is layered over seed.

Photo 7. Wire grid is installed on all plots.

Photo 8. Finished plots.

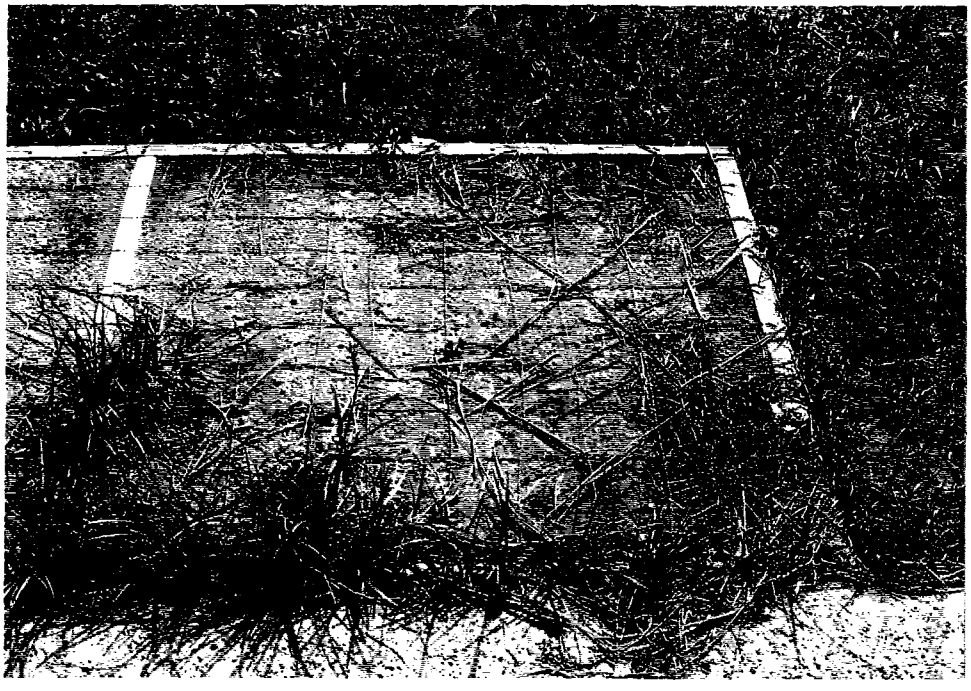

Photo 9. Bio-barrier @ 2"; Clay

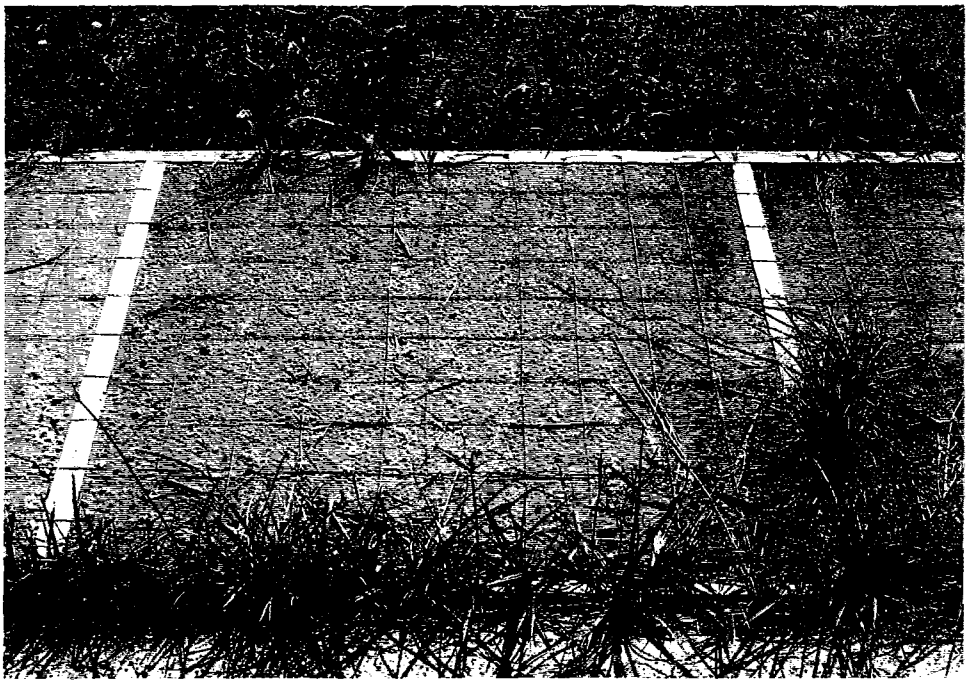

Photo 10. Bio-barrier @ 2"; Sand

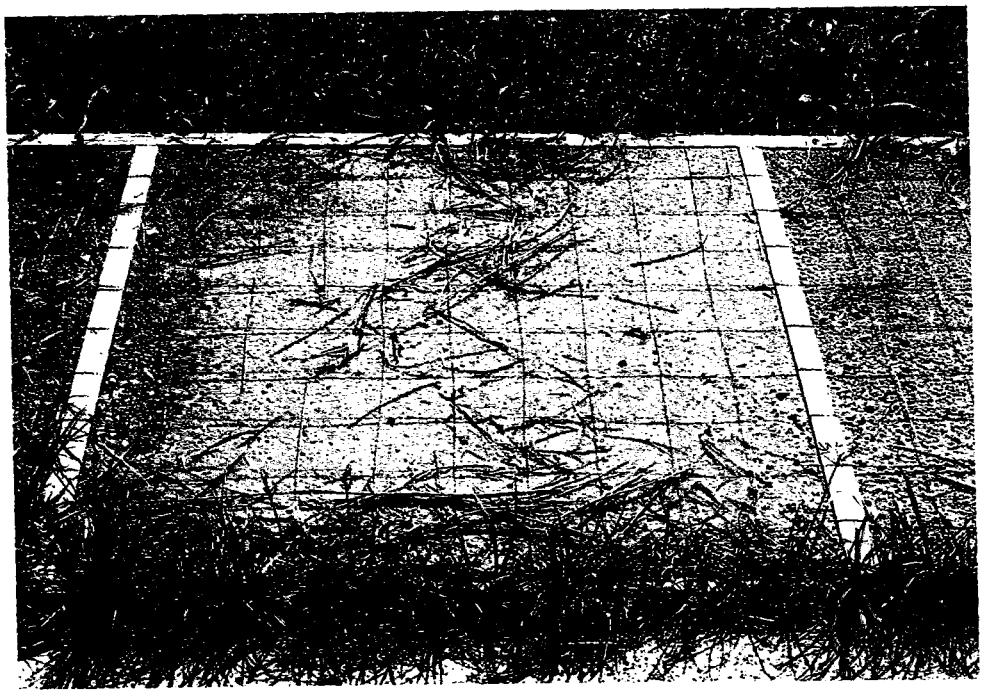

Photo 11. Bio-barrier @ 2"; Gravel

Photo 12. Bio-barrier @ 4"; Clay

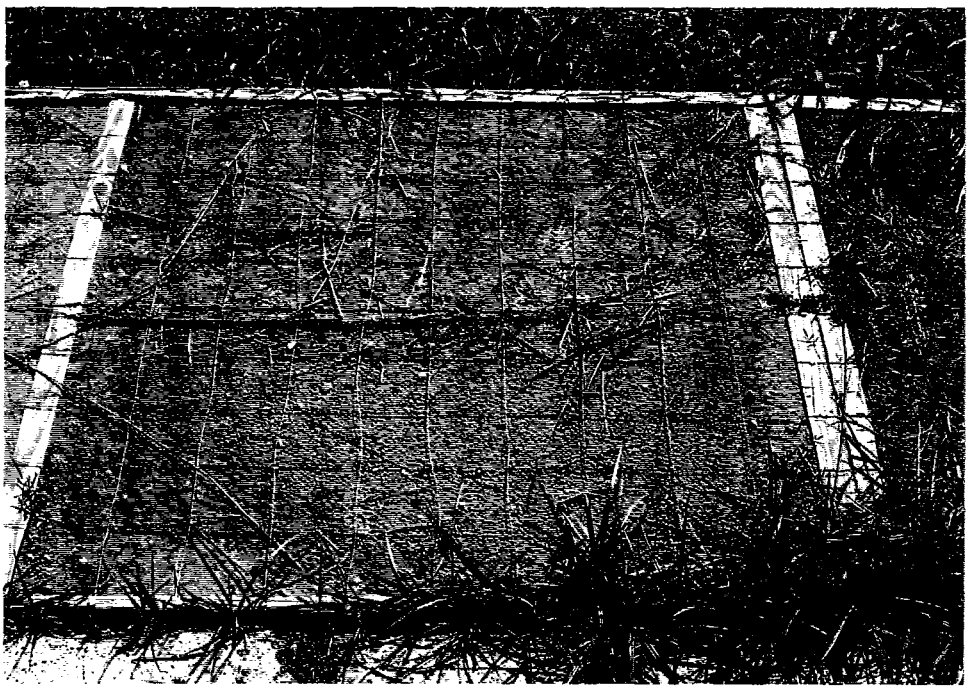

Photo 13. Bio-barrier @ 4"; Sand

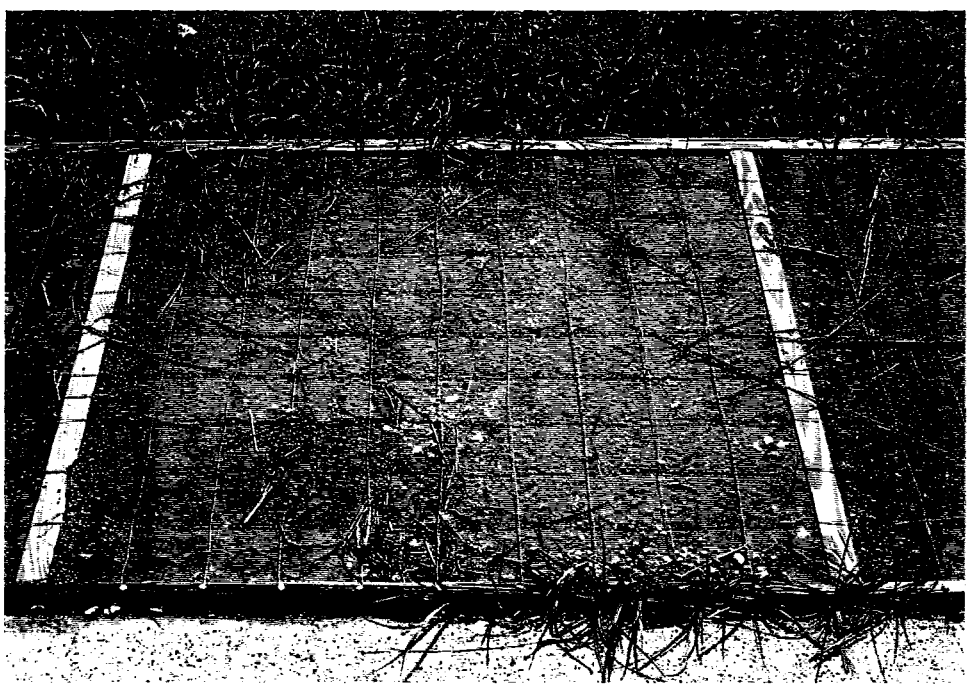

Photo 14. Bio-barrier @ 4"; Gravel

Photo 15. Bio-barrier @ 1", 2", & 4"; Clay

Photo 16. Bio-barrier @ 1", 2", & 4"; Sand

Photo 17. Bio-barrier @ 1", 2", & 4"; Gravel

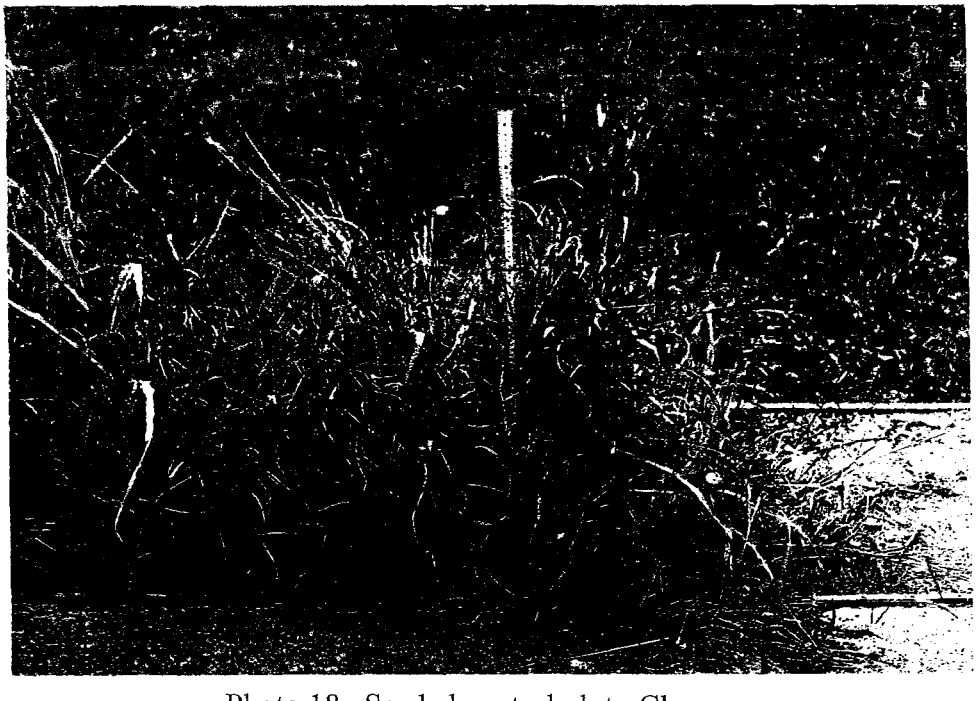

Photo 18. Seeded control plot; Clay

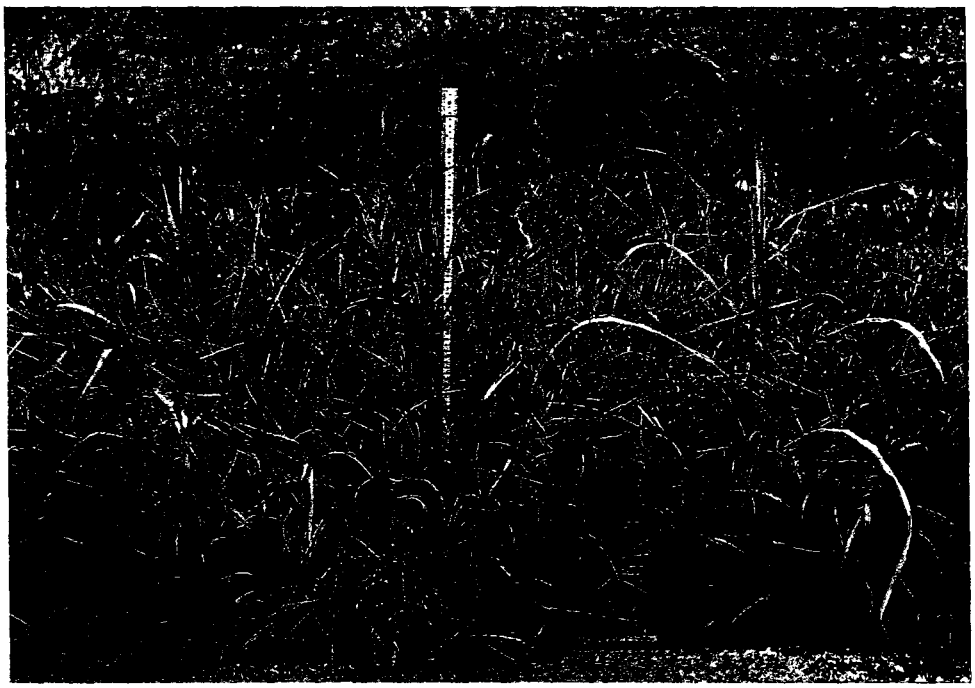

Photo 19. Seeded control plot; Sand

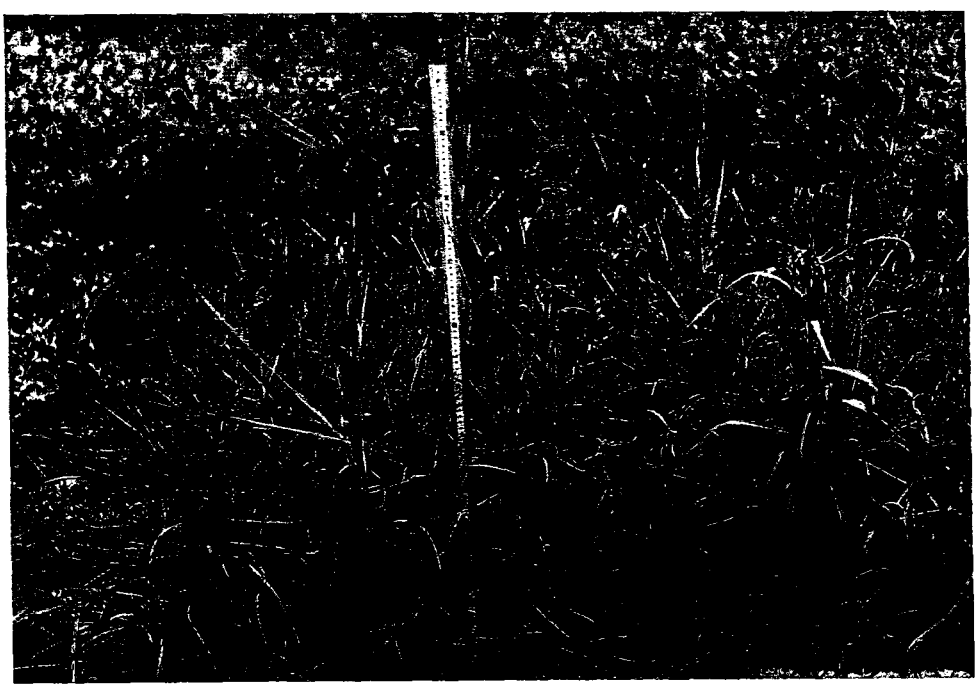

Photo 20. Seeded control plot; Gravel

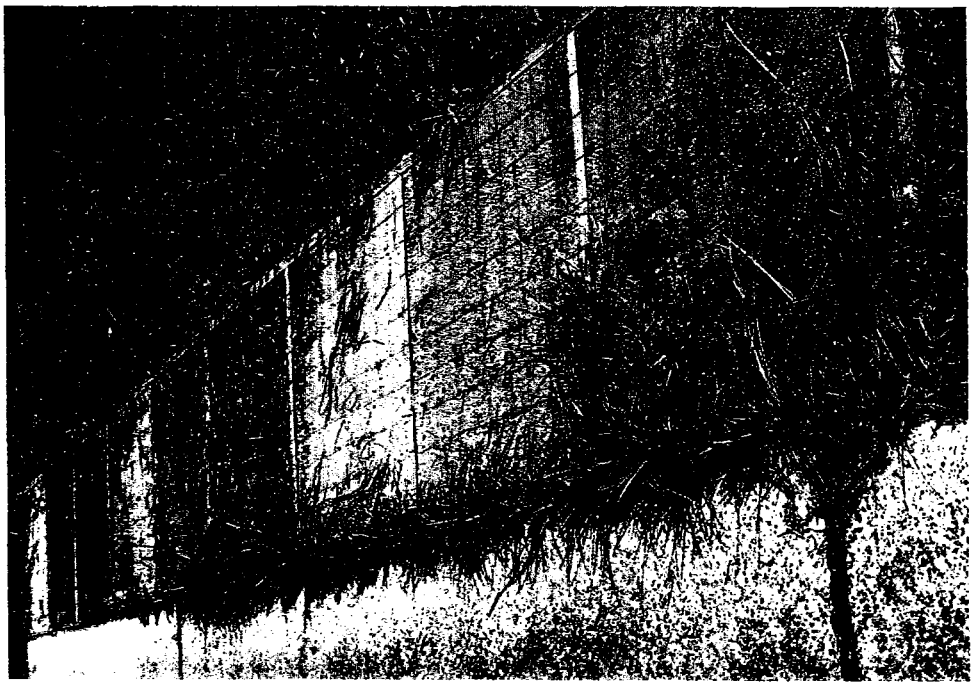

Photo 21. Nutsedge at edge of plots.

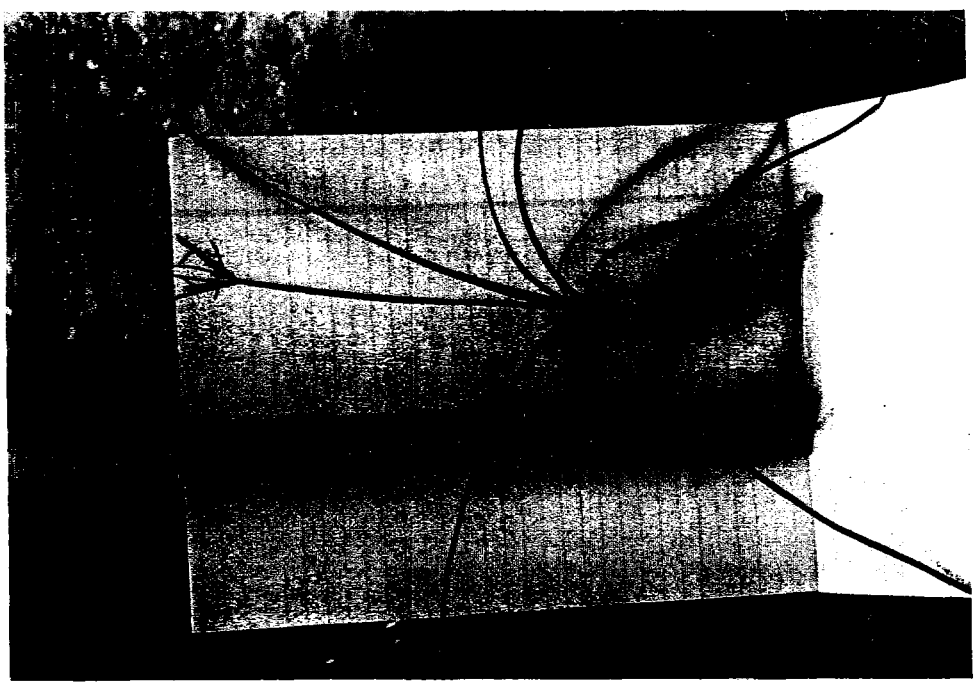

Photo 22. Nutsedge sample.