



production levels (Fig. 2).

Analysis of the soil samples collected 36 months after plot establishment show addition of fertilizer resulted in the expected increase in P, K, Ca, and Mg levels (Fig. 3). Additional fertilizer applications are warranted as a result of harvesting and removing substantial quantities of shoot biomass.

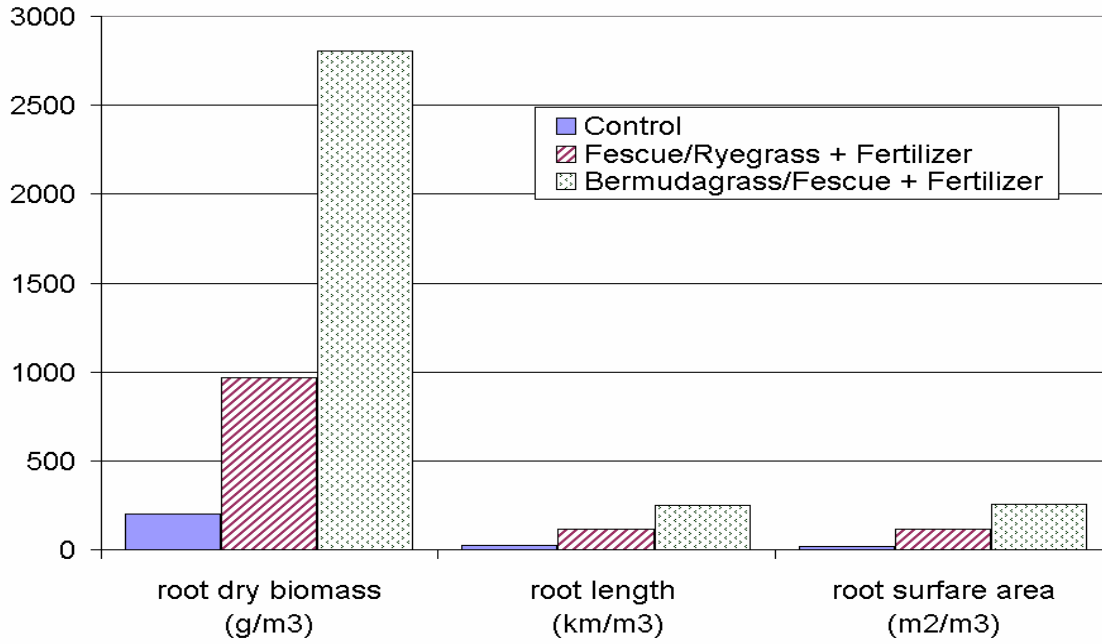


Fig. 1. Root dry biomass, root length, and root surface area for samples collected 36 months after plot establishment at the El Dorado field site. The control treatment was not fertilized and vegetation was eliminated. The fescue and bermudagrass plots received fertilizer and lime to facilitate plant growth.

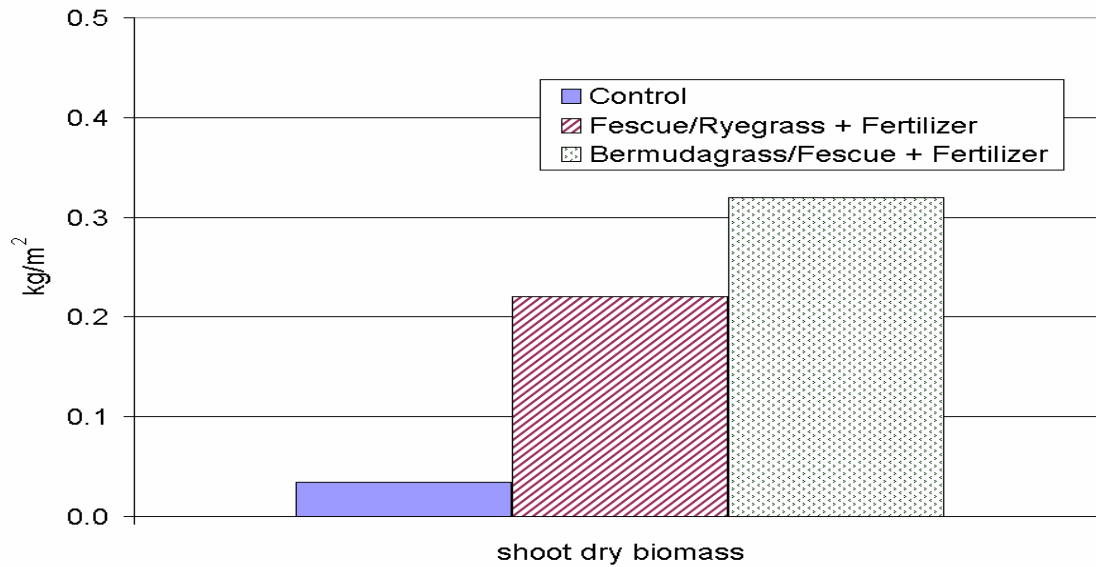


Fig. 2. Shoot dry biomass for samples collected 36 months after plot establishment at the El Dorado field site. The control treatment was not fertilized and vegetation was eliminated. The fescue and bermudagrass plots received fertilizer and lime to facilitate plant growth.

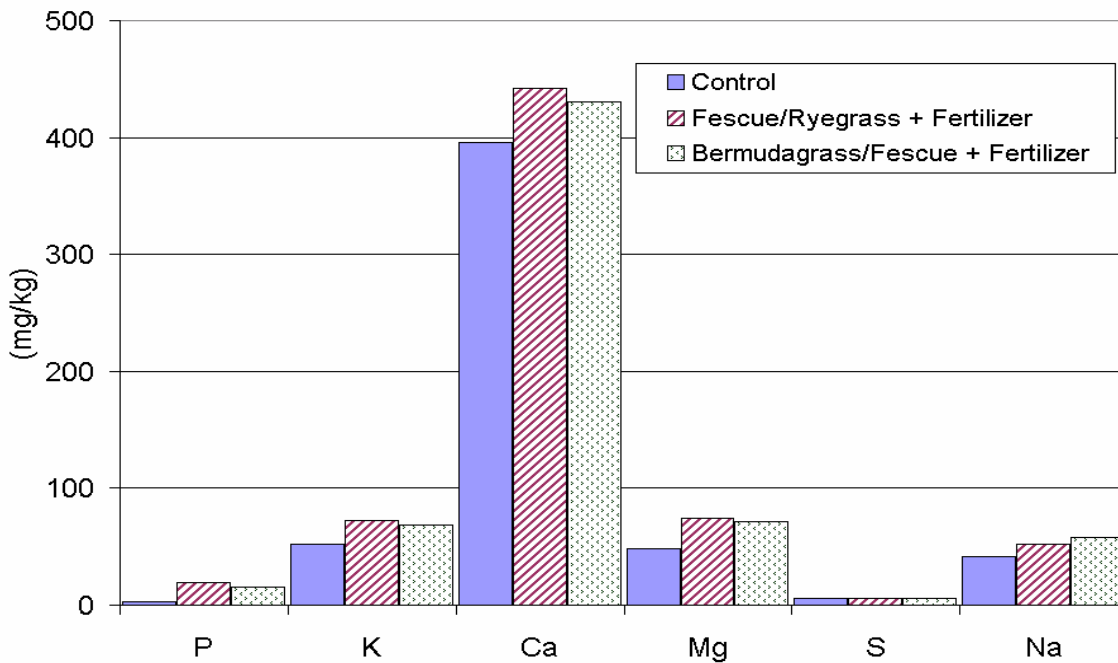


Fig. 3. Selected soil chemical values for the three treatments at the El Dorado field site for samples collected 36 months after plot establishment.

## **Publications/Presentations:**

Abstracts and titles of poster or oral presentations given during this quarter include:

Abstracts and titles that have been submitted for presentation as posters or presentations in the future include:

Greer, K.M., P.M. White, Jr., D.C. Wolf, G.J. Thoma, and S.E. Ziegler. 2003. Evaluation of field scale phytoremediation of crude oil-contaminated soil. *In* 87<sup>th</sup> Annual Meeting of Arkansas Academy of Science. 4-5 April 2003. Fayetteville, AR.

Greer, K.M., S.E. Ziegler, P.M. White, Jr., G.J. Thoma, and D.C. Wolf. 2003. Dynamics of biological components during phytoremediation of crude oil-contaminated soil. *Soil Sci. Soc. Am.* 2-6 November 2003. Denver, CO.

S.E. Ziegler, P.M. White, Jr., and D.C. Wolf. 2003. Tracking the utilization of bioavailable substrates by soil microorganisms using stable isotopes. *Soil Sci. Soc. Am.* 2-6 November 2003. Denver, CO.

Manuscripts published or accepted for publication:

Gentry, T.J., D.C. Wolf, C.M. Reynolds, and J.J. Fuhrmann. 2003. Pyrene and phenanthrene influence on soil microbial populations. *Bioremed. J.* 7:(in press).

Thoma, G.J., T.B. Lam, and D.C. Wolf. 2003. Modeling phytoremediation for petroleum contaminated soil: Model development. *Int. J. Phytoremed.* 5:41-55.

Thoma, G.J., T.B. Lam, and D.C. Wolf. 2003. A mathematical model of phytoremediation for petroleum contaminated soil: Sensitivity analysis. *Accepted Int. J. Phytoremed.*

White, Jr., P.M., D.C. Wolf, G.J. Thoma, and C.M. Reynolds. 2003. Influence of organic and inorganic soil amendments on plant growth in crude oil-contaminated soil. *Accepted Int. J. Phyto.*

Manuscripts submitted:

White, Jr., P.M., D.C. Wolf, G.J. Thoma, and C.M. Reynolds. 2003. Evaluation of field scale phytoremediation of crude oil-contaminated soil. *Submitted to Environ. Sci. Technol.*

## **Future Activities:**

Our initial findings suggest that phytoremediation does reduce contaminant levels through the action of microbial communities associated with the rhizosphere. It is therefore important to develop successful agronomic management strategies that exploit this understanding. However, our detailed knowledge of the microbial ecology of the rhizosphere is lacking. We plan to use carbon-13 isotopic labeling of specific contaminants coupled with phospholipid fatty acid (PLFA) analysis to identify specifically which class of microbes are responsible for the degradation. We will continue to investigate the modes of action of a phytoremediation system; while keeping in mind that the ultimate

goal remains site cleanup.

The mathematical model will be extended to include climatic effects (specifically temperature and moisture level effects on kinetic degradation rate constants), so more site specific screening can be simulated.

**Supplemental Keywords:**

Rhizosphere; rhizodegradation; species selection; Arkansas; South Central United States

**Relevant Web Sites:**

Remediation Technologies Development Forum: [www.rtdf.org](http://www.rtdf.org); IPEC: [ipec.utulsa.edu](http://ipec.utulsa.edu)