

End of cycle root samples and soil respiration at a Virginia Piedmont site

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INTRODUCTION

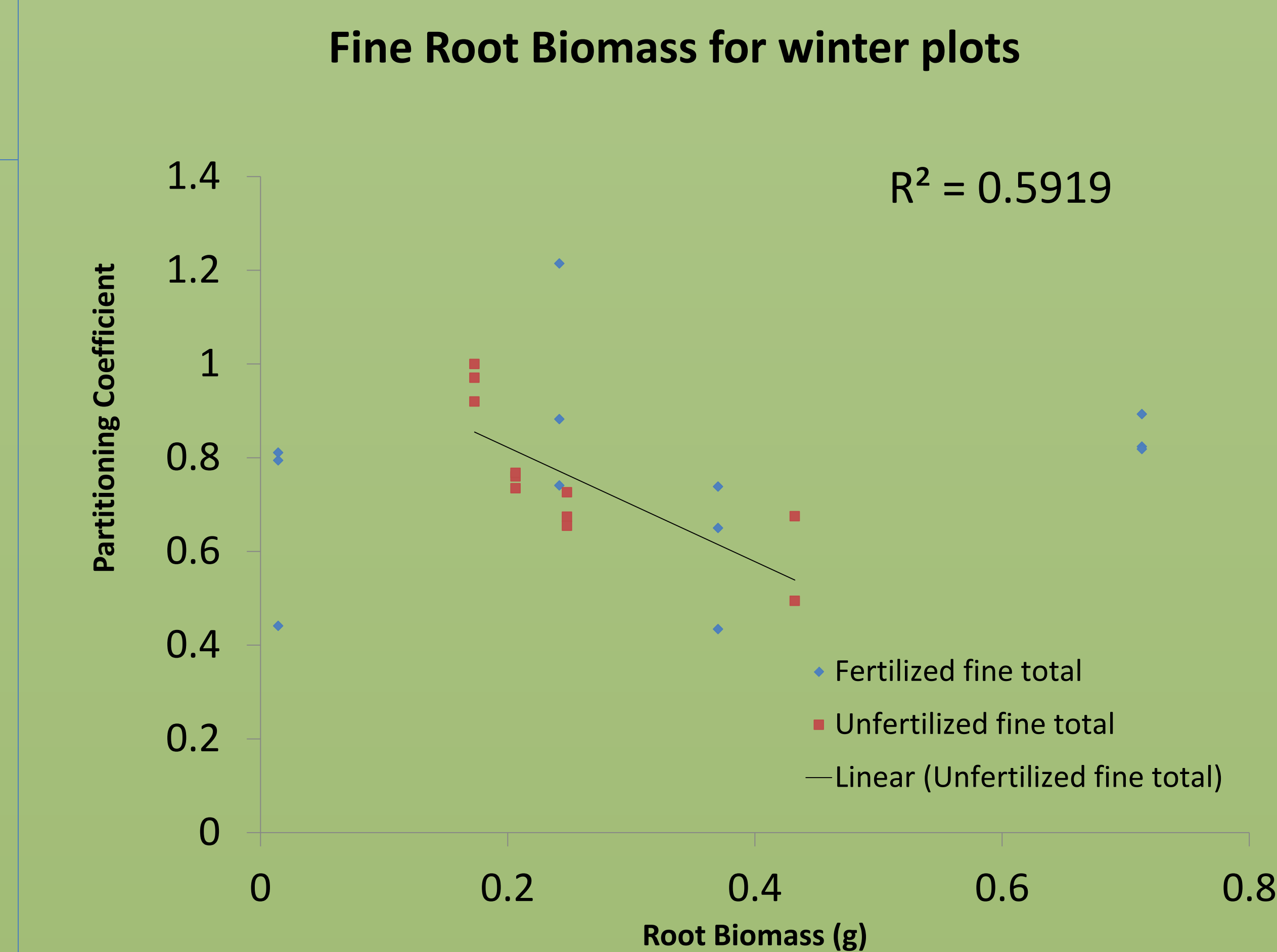
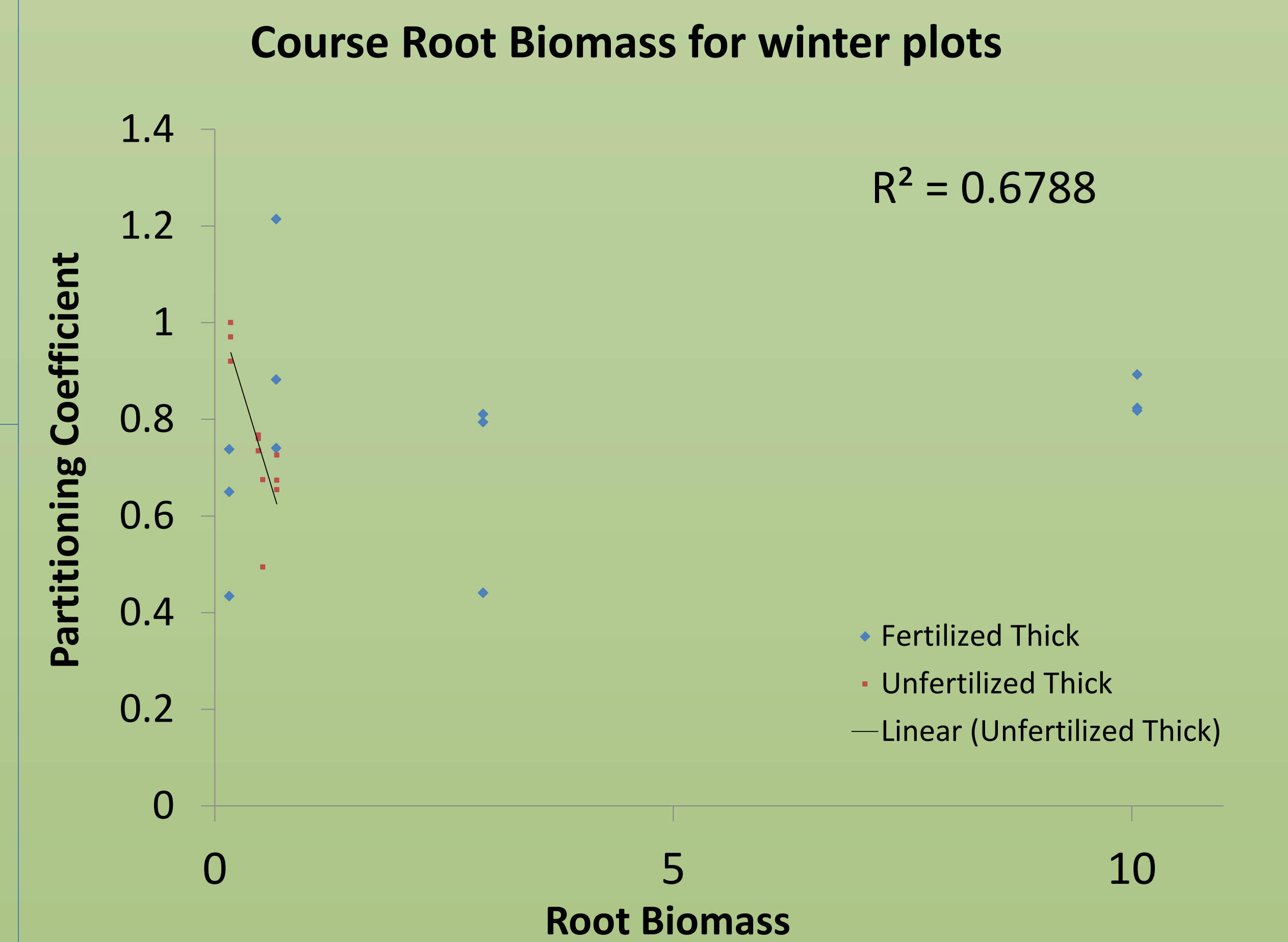
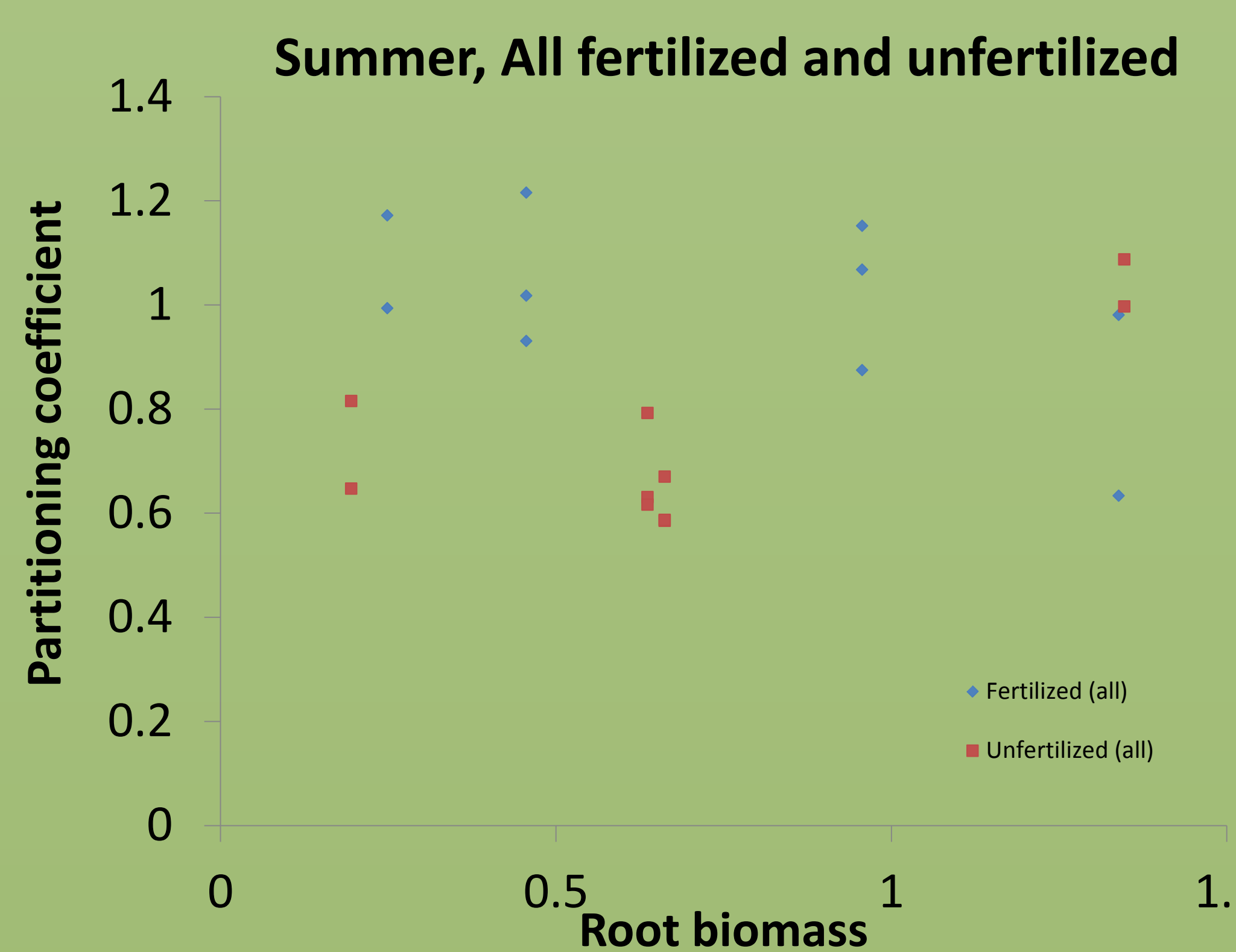
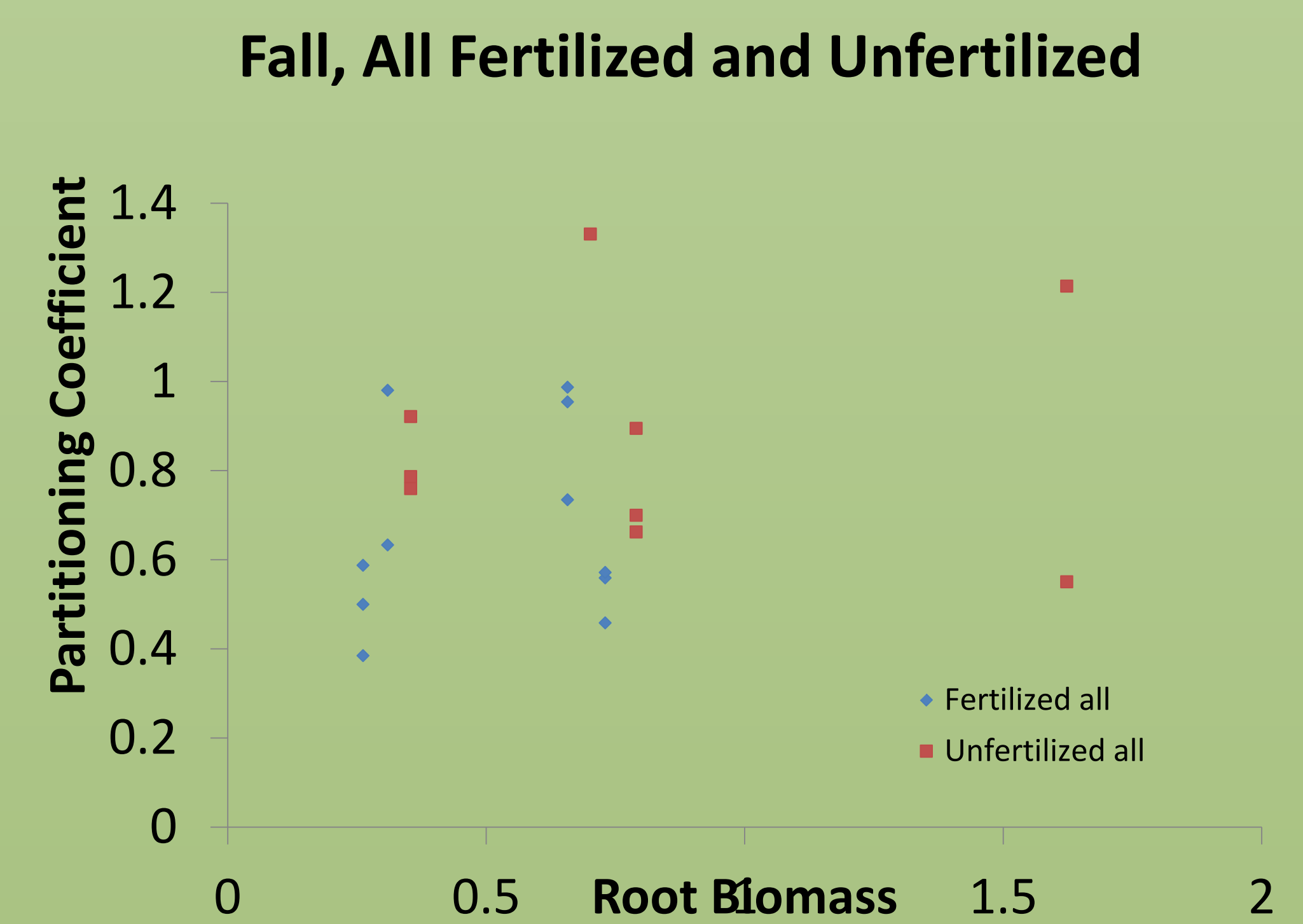
Pine Forests contribute to about 80% of planted forests in the Southeast and are a major source of revenue for states in the area. In order to improve forest health and understanding of how best to sustain forests, we have to understand how they cycle and function. One important aspect of forests' contribution to the environment is through the carbon cycle. Two pools, autotrophic and heterotrophic respiration, have been identified as major contributors to carbon emissions. Methods to separate these pools have been developed, but exact contributions of each source to total carbon emissions are not confirmed. The purpose of this study is to explore the relationship between root biomass and soil respiration partitioning coefficients (the contribution of soil organisms to soil respiration). We also will be able to support what we know about root function due to biomass totals.

METHODS

Our site was located in Meherrin, Virginia, a location with predominantly clayey soils. The site had a total of two treatments (fertilized and unfertilized) with four replications of each. Deep collars (designed to eliminate root respiration) were PVC tubes 35 cm in length and hammered into the ground and the shallow collars rested on the surface and served as our control. Collars were also installed in different seasons, summer, fall, and winter, in order to test the seasonal differences as well. Soil respiration measurements were recorded throughout the year using an LI-8100. Soil samples were then taken and fine and coarse roots were removed and weighed from each sample. By calculating the partitioning coefficients (the contribution of soil organisms to soil respiration; deep collar values divided by the control values) and comparing them to root biomass, we could quantify the contribution of roots to soil respiration.

Table 1- Coarse and Fine root biomass in grams by treatment

Treatment	Coarse	Sieved	Fine	Total
Fertilized	17.06	2.88	0.16	20.11
Unfertilized	5.31	3.65	0.24	9.22



RESULTS

Fertilized plots had a larger root biomass total than the unfertilized plots (Table 1). The unfertilized plots, however contained a larger number of fine roots than the fertilized plots, while the opposite is true for the coarse roots. Summer and fall season had no effect on the partitioning coefficients (Figures 1, 2). In winter, root biomass was significantly negatively correlated with the partitioning coefficients for both coarse ($R^2=0.68$) and fine ($R^2=0.59$) roots (Figures 3, 4).

CONCLUSION

Given what we know about root functions, the biomass results in table one are as expected given the known functions of roots. The negative trends shown in winter are unexpected as we expect the partitioning coefficients to increase with root biomass. These results may be attributed to human error because the soil samples were collected many months later than the last measurement allowing for more decomposition. Lastly, because of the type of soil in VA, a significant portion of the soil is rock which may contribute to the low partitioning coefficient levels.

Acknowledgments

Special thanks to Wen Lin and Asko Noormets for their assistance on this project, the team at EFETAC for their support and their wonderful office space, and to the Pine Integrated Network: Education, Mitigation, and Adaptation project (PINEMAP) is a Coordinated Agricultural Project funded by the USDA National Institute of Food and Agriculture, Award #2011-68002-30185 for the opportunity.



Figures 1 & 2 (left two graphs)- 1. Root biomass against the partitioning coefficient for the fall measurements and both treatments, 2. Root biomass against the partitioning coefficients for the summer measurements and both treatments. Figures 3 and 4- 3. Coarse root biomass against the winter partitioning coefficients, both treatments. Figure 4 - Fine root biomass against the winter partitioning coefficients, both treatments