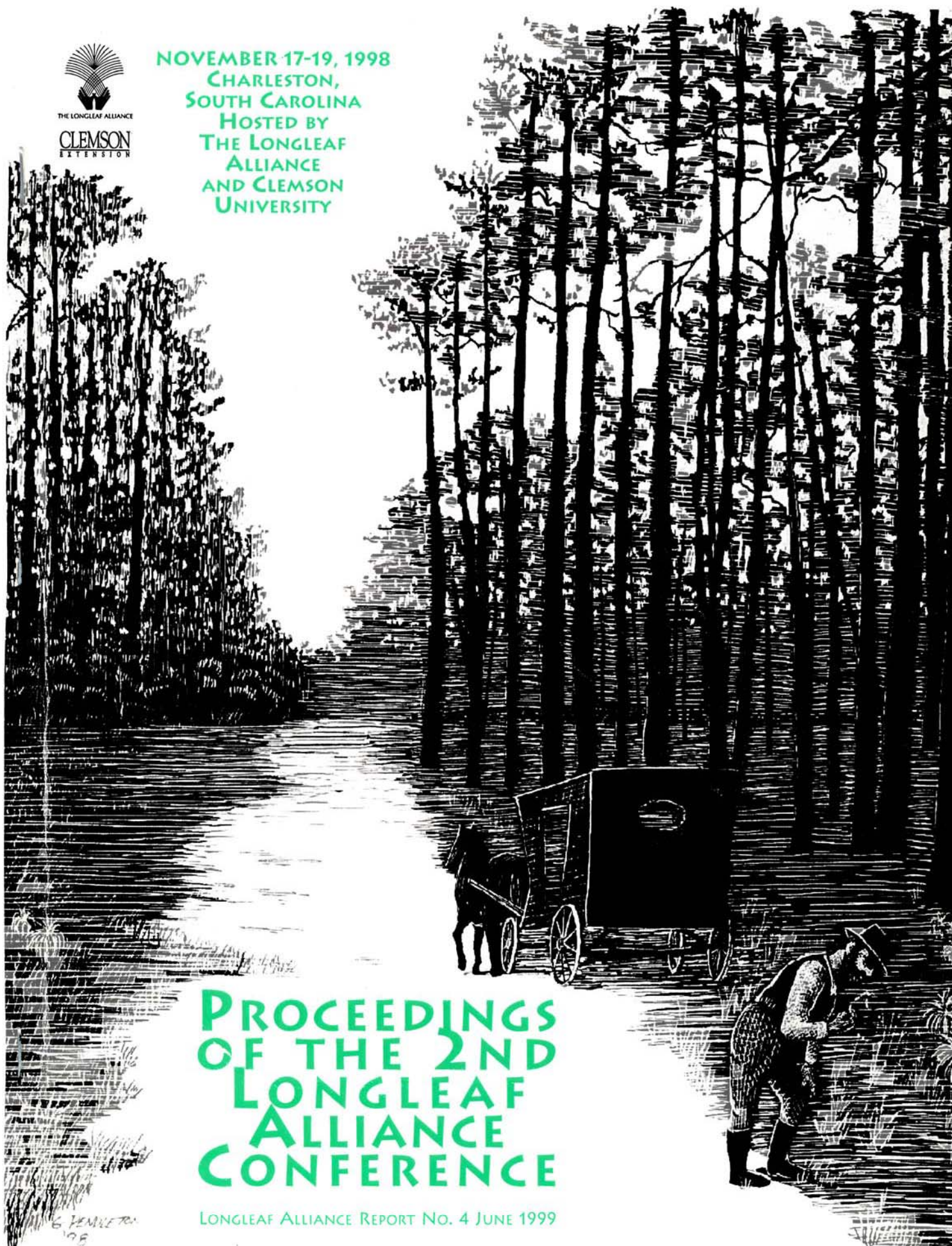




THE LONGLEAF ALLIANCE

CLEMSON
EXTENSION

NOVEMBER 17-19, 1998
CHARLESTON,
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PROCEEDINGS OF THE 2ND LONGLEAF ALLIANCE CONFERENCE

LONGLEAF ALLIANCE REPORT NO. 4 JUNE 1999

6 JUNE 1999

Regulation of ecosystem function across complex environmental gradients in longleaf pine-wiregrass savannas

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ABSTRACT: Understanding controls on productivity across landscapes is an important area of ecological inquiry. Longleaf pine-wiregrass (*Pinus palustris* Mill-*Aristida stricta* Michx.) savannas occupy sites ranging from deep, xeric sandhills to the edge of wetlands. Aboveground net primary productivity (ANPP) of the overstory and understory were determined across this complex environmental gradient for three replicate sites of three site types (xeric, intermediate and wet-mesic). Soil moisture (at 30 and 90 cm) and N-mineralization (*in situ* buried bag incubations) were measured through an annual cycle for three years. Soil CO₂ efflux and related environmental variables were measured for one year of the study.

Longleaf pine-wiregrass ecosystems varied by nearly two-fold in ANPP across complex gradients. Overstory and understory and total (overstory and understory) ANPP were positively correlated to soil moisture at 30 and 90 cm. The proportion of understory ANPP relative to the total ANPP did not increase across the environmental gradient as predicted by hypotheses that invoke niche differentiation in rooting habits of grasses and trees. Contrary to expectations, cumulative N-mineralization was negatively related to soil moisture. All ANPP estimates were significantly and negatively related to cumulative N-mineralization. N-mineralization varied across site and through a burning cycle of 3 years. Soil CO₂ efflux varied significantly across sites and followed similar patterns observed in overstory productivity. Soil CO₂ efflux was significantly related to soil temperature and soil moisture. Further work is needed to explore the mechanisms by which soil moisture regulates productivity across space, time, and for individual species. Additional experimentation through resource addition would allow for investigations into multiple resource limitations, and how these limitations vary depending on gradient position and their impact on ecosystem function.