Biofuels derived from biomass crops such as switchgrass (Panicum virgatum L.) are proposed as possible alternatives to fossil fuels. Nitrogen (N) fertilizer, required for high biomass yields, has known environmental impacts - including post-application emission of the greenhouse gas nitrous oxide (N2O) and nitrate leaching. We examined the impact of N nitrogen provided to switchgrass as inorganic fertilizer, or supplied via intercropping with nitrogen-fixing alfalfa, on N2O emissions, crop yields, and the abundance of ammonia oxidizing archaea (AOA) and ammonia oxidizing bacteria (AOB). Replicated field plots were established in 2010 at the Washington State University experiment station in Prosser, WA. Switchgrass (cv. Blackwell, an upland ecotype) N treatments included no N (control), 224 kg/yr of inorganic N (agronomic rate), and N derived from intercropped alfalfa (Medicago sativa L.). Plots were sampled during the 2012 and 2013 growing seasons. Nitrous oxide fluxes were measured at monthly intervals using static chambers from April through October in both 2012 and 2013. Soil samples were simultaneously collected and assayed for AOA and AOB abundance via quantification of the ammonia monooxygenase (amoA) gene. The N2O fluxes were elevated (maximum flux=12.5 g N2O-N/ha/d) immediately after fertilization and irrigation compared to the unfertilized control plots (average=0.75 g N2O-N/ha/d). Intercropping with alfalfa resulted in a significantly smaller N2O flux than the fertilized treatments (maximum flux ~4 g N2O-N /ha/d). Nitrous oxide emissions were higher immediately following irrigation compared to dry soils. The average 2-year biomass yield from were higher in fertilized plots (24.5±1.2 Mg/ha/yr) and intercropped plots (16.8 ±1.1 Mg/ha/yr) relative to the control plots (10.5±1.1 Mg/ha/yr). The AOA abundance was greater than the AOB abundance in soils from all treatments. AOA were more abundant in the intercropped treatments than the control and fertilized treatments. The AOB abundance was positively correlated with N2O emissions, but AOA abundance did not correlate with flux of this greenhouse gas. We conclude that intercropping switchgrass with alfalfa does enhance yields (relative to control plots) with concomitant reduction in N2O emissions (relative to plots receiving inorganic nitrogen) from AOB.