Development of the oil sands has led to increasing atmospheric N deposition, with values as high as 17 kg N ha-1 yr-1; regional background levels <2 kg N ha-1 yr-1. To examine responses to N deposition, over five years, we experimentally applied N (as NH4NO3) to a poor fen near Mariana Lake, Alberta, at rates of 0, 5, 10, 15, 20, and 25 kg N ha-1 yr-1, plus controls (no water or N addition). In July of 2015 we measured PLFA markers in two depths in each plot. Fungal abundance increased at N addition levels above 16.6 kg N ha-1 yr-1 and total bacterial abundance also increased at N addition levels above 17.1 kg N ha-1 yr-1, such that the fungal:bacterial ratio was not significantly affected by N addition. Total microbial, gram-negative bacterial, and actinomycete abundance also showed an apparent threshold responses to N addition at 16-17 kg N ha-1 yr-1 addition levels.It may be that more sensitive/targeted techniques, such as high-throughput pyrosequencing, 16s RNA clone library analysis and rRNA-targeted fluorescence in situ hybridization (FISH) or whole genome shotgun sequencing may be required to reveal detailed fen microbial community responses to N loading.