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 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). We examined the effects of N addition on cellulose, peat, and mixed vegetation placed in the fen from 2012-2015 and collected after 5 and 17 months. Decomposition of cellulose filter paper increased with increasing N addition; the slopes of the responses did not differ between years, although decomposition was faster for filter paper placed in the field in 2014 than in either 2012 or 2013. In contrast, decomposition of Sphagnum moss was unaffected by N addition. Vascular plant litter decomposition decreased with N addition in 2015, but not 2014, Water addition alone had no significant effect on cellulose decomposition k values in any of the three years (p > 0.26) or on vascular plant litter mass in either year (p = 0.81). However, Sphagnum mass loss was significantly higher in the control treatment than in 0 kg N ha-1 yr-1 treatment (p = 0.0046) averaged over the two years of decomposition. Assessment of decomposition and its controls may be especially important in peatlands, as the development and persistence of peat depends on an excess of NPP over decomposition throughout the peat profile. There is evidence that increasing N deposition/availability stimulates cellulose decomposition in surface fen peat, as we found previously at Mariana Lake Bog, however, bog material decomposition appears to be more complicated.