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). Resin tubes filled with mixed-bed ion exchange resin were swapped in and out at each collection/deployment date (mid-May and mid-October of each year). Upon collection, resins were extracted with 1M KI and analyzed for inorganic N concentrations. Over all ion exchange resin tube collection dates, deposition of NH4+-N, NO3--N, and dissolved inorganic N (DIN; NH4+-N + NO3--N) averaged 240 ± 29, 318 ± 27, and 557 ± 41 µg m-2 da-1, values that are equivalent to 0.87 ± 0.10, 1.16 ± 0.10, and 2.03 ± 0.15 kg N ha-1 yr-1. While NH4+-N deposition was higher in the growing season than in non-growing season (p = 0.0006), NO3--N deposition was higher in non-growing season than during the growing season (p = 0.0052), with the net result being no seasonal difference in DIN deposition (p = 0.6428).