We measured N2-fixation using the acetylene reduction technique (Hardy 1968). At the beginning of each field season, from each plot, we collected one core with a mixture of Sphagnum angustifolium and S. magellanicum, approximately 8 cm deep and 7 cm in diameter, wrapped each core in mesh screening, and placed cores back into the peat, allowing for repeated measurements over a growing season. We measured N2-fixation in these cores 3 times in 2012, 5 times in 2013, 3 times in 2014, and 2 times in 2015, with all measurements made between June and August. For field incubations, we placed each moss core in a gas-tight 500 mL glass screw-top jar, injected 20 mL of acetylene, and reinserted jars into to the surface peat with the bottom of the jar facing upward to expose the moss capitula to sunlight. At 20 cm above each jar, we placed a 20-cm by 20-cm window screen mesh providing sufficient shade to prevent extremely high (> 40 C) temperatures within each jar. Using 10 mL syringes, we collected headspace samples at the beginning and end of each 24-hr incubation period. After each incubation, we removed the cores from the glass jars and returned them to their original locations in the peat.

We analyzed headspace samples for ethylene concentrations on a Shimadzu 2014 gas chromatograph. To convert ethylene production rates to N2-fixation rates, we used a conversion factor of 0.46 moles of ethylene produced per mole of N2 fixed, based on previous 15N2-fixation measurements in S. angustifolium moss cores in Alberta bogs.