Atmospheric nitrogen oxides (NO\textsubscript{x} = NO + NO\textsubscript{2}) play key roles in atmospheric chemistry, air quality, and radiative forcing, and contribute to nitric acid deposition. Given the variety of sources of NO\textsubscript{x} (both natural and anthropogenic), their variability in space and time, and the relatively short lifetime of NO\textsubscript{x}, it is difficult to directly link variability in NO\textsubscript{x} concentrations or nitric acid deposition with emissions sources. NO\textsubscript{x} isotopic signatures offer a potentially valuable tool to trace source impacts on atmospheric chemistry and regional acid deposition. However, previous work on NO\textsubscript{x} isotopic signatures suggests large ranges in values, even from the same emission source, as well as overlapping ranges amongst different sources. These prior measurements have utilized a variety of methods for collection of NO\textsubscript{x}, and recent tests reveal inconsistencies in efficiency of collection, as well as issues related to changes in conditions such as humidity, temperature, and NO\textsubscript{x} fluxes. Our recently developed method accurately quantifies the nitrogen isotopic composition (δ\textsuperscript{15}N) of NO\textsubscript{x} (NO\textsubscript{x} = NO + NO\textsubscript{2}) after capturing the NO\textsubscript{x} in solution as nitrate. The method has been thoroughly laboratory and field tested, and efficiently collects NO and NO\textsubscript{2} under a variety of conditions. This new method is used to quantify the isotopic composition of NO\textsubscript{x} associated with different emission sources, including vehicles, microbial processes in agricultural soils, and biomass burning. The NO\textsubscript{x} collection system is optimized to allow for short collections in high concentration plumes, as well as under sporadic pulse-oriented fluxes such those associated with soil emissions. Using a consistent method, we test whether it is possible to distinguish the isotopic ranges associated with different emission sources, and compare and contrast laboratory-based and field-based collections.