# Sarah Waldo

*B.A., Environmental Science, Chemistry Concentration
(Colorado College)*
*PhD Student in Engineering Science*
*Advisor: Brian Lamb*

The NSPIRE IGERT Program is a multidisciplinary student doctoral training program designed to create a new generation of scientists with broad and rigorous training in nitrogen cycling who seamlessly integrate nitrogen cycle science for effective communication with public policy makers.

## Research title: Agricultural and Feedlot Emissions of Nitrogen to the Atmosphere

Sarah's research is focused on emissions of reactive nitrogen (nitrous oxide, nitrogen oxides, and ammonia) from agricultural and feedlot operations. Crop land is a significant source of nitrogen oxides ($NO_x$) and nitrous oxide ($N_2O$), as they are produced as intermediates of nitrification and denitrification in soil. In the United States, feedlots are the primary source of ammonia ($NH_3$), an animal byproduct. $NO_x$ and $NH_3$ both degrade local air quality, and $NO_x$ also enhances the impact of ozone which is a greenhouse gas. $N_2O$ from agricultural sources is a large contributor to the global greenhouse gas budget with a warming potential 300 times that of carbon dioxide. The emission rates of $N_2O$ and $NO_x$ exhibit high spatial and temporal variability, leading to considerable uncertainty in model estimates. Sarah will work to develop measurement methods that help characterize emissions, and to incorporate emissions of all three nitrogen species into regional atmospheric models. This research will help inform management techniques such as timing and rate of fertilizer application to simultaneously minimize emissions and improve efficiency.

*Contact information*:
Dept of Civil and Environmental Engineering, Laboratory for Atmospheric Research
Office: 340 Dana Hall / Washington State University / Pullman, WA 99164
Tel: 509-335-7205 – Email: sarah.waldo@email.wsu.edu – Web link: http://igert.nspire.wsu.edu/