

## Excerpts from the Yakima Air Winter Nitrate Study (YAWNS)

<https://ecology.wa.gov/DOE/files/a6/a67789dd-aed4-461e-b138-e77537dd1952.pdf>

The YAWNS concludes on page 111:

*Episodes of elevated particulate nitrate in the Yakima Valley during winter result from a combination of factors. The wintertime meteorology of the region drives gas-particle equilibrium of ammonium nitrate strongly toward the particle phase, and high relative humidity enhances this effect. High ammonia emissions from agricultural sources in the area lead to elevated atmospheric concentrations of the pollutant. This excess ammonia drives virtually all available nitric acid into the particulate phase, forming particulate nitrate, and leads to a condition where any additional nitric acid production would lead directly to greater particulate nitrate levels. The production of particulate nitrate precursors is complicated and sensitive to the varying meteorological and chemical conditions in the valley. Given the backdrop of excess gaseous ammonia, there is usually sufficient reactive nitrogen in the valley to produce elevated levels of particulate nitrate if the right meteorological conditions take hold.*

Ammonia emissions in the Yakima Valley are mostly from animal agriculture as depicted in a pie chart on page 99 of the study:

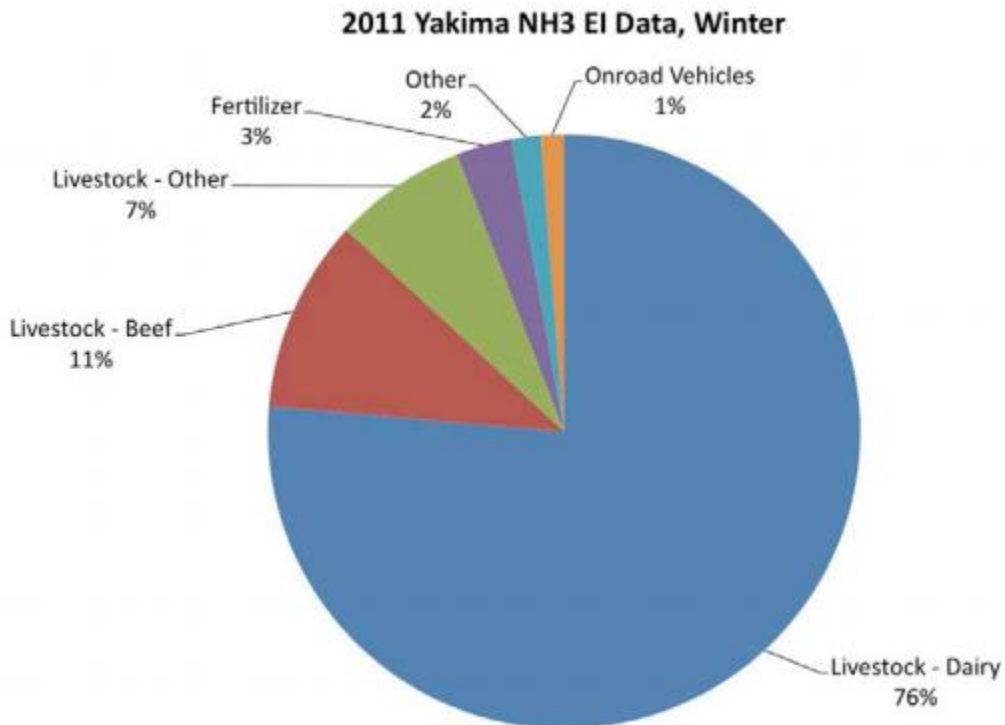


Figure 8.28. Winter season NH<sub>3</sub> emissions contributions by source for Yakima County, from the 2011 Washington Comprehensive Emissions Inventory.