**Emerging Issues Subcommittee White Paper Recommendations**

1. There needs to be greater scientific clarity on the role that ammonia plays in gas to particle ($PM_{2.5}$) conversion. Specifically, the USDA Agricultural Air Quality Task Force recommends that USDA conduct additional research on ammonia from agricultural sources, both cropland and animal and the role it plays in the formation of $PM_{2.5}$ in a timely manner, so as to assist states in the development of their $PM_{2.5}$ SIPs that may regulate agricultural production.

2. There is a substantial need to better understand the issue of dry deposition of gaseous ammonia and ammonium aerosols. The number of measurement studies on bidirectional exchange of ammonia are limited. The physiological basis for the uptake and deposition of ammonia/ammonium aerosol needs to be developed. The dry deposition models for estimating total deposition fluxes for use in air quality modeling framework are poorly parameterized in the U.S. The USDA Agricultural Air Quality Task Force recommends additional research be conducted on dry deposition of gaseous ammonia and ammonium aerosols.

3. Development of a process-based model for ammonia emissions from agricultural sources is critical, particularly as to certain animal species. While model development has begun for the dairy industry, no such model exists for the beef cattle, poultry or swine industry, nor does one exist for the application of ammonia-based fertilizers. In keeping with the National Research Council's recommendations in "Air Emissions from Animal Feeding Operations," USDA and other research dollars should be focused on developing process-based models as compared to emission factor research. Process-based models will be necessary in order to evaluate the efficacy of management changes and interventions in reducing ammonia emissions. It is the recommendation of the USDA Agricultural Air Quality Task Force that USDA establish process-based models for ammonia emissions for additional animal species that have not yet been addressed, and to conduct the necessary research for the development of the these models.