CHAPTER SEVEN

Responses: Technologies and Practices

Appendix 7.6 Toward a Unified Monitoring Strategy for California's N Cascade

Lead Authors:

T.S. ROSENSTOCK

Contributing Authors:

S. BRODT, M. BURGER, H. LEVERENZ, D. MEYER

This is an appendix to Chapter 7 of *The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment*. Additional information about the California Nitrogen Assessment (CNA) and appendices for other chapters are available at the Agricultural Sustainability Institute website: asi.ucdavis.edu/nitrogen

Suggested citation:

TS Rosenstock, S Brodt, M Burger, H Leverenz, and D Meyer. "Appendix 7.6: Toward a Unified Monitoring Strategy for California's N Cascade." Online appendices for California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment. TP Tomich, SB Brodt, RA Dahlgren, and KM Scow, eds. Agricultural Sustainability Institute at UC Davis. (2016). asi.ucdavis.edu/nitrogen.

7.6 Toward a Unified Monitoring Strategy for California's N Cascade

A comprehensive monitoring network and information system is needed to understand and shape California's nitrogen (N) cascade. The primary function would be to provide information in practical and useable formats on the status of N stocks and flows, ecological and human health impacts, and feedback information to assess the efficacy of policy interventions.

Fortunately, California has the makings of a robust monitoring network already in place. Regulatory agencies operate monitoring stations with the capacity to detect major N compounds and their derivatives. The most developed monitoring network is for air quality, with more than 100 monitoring sites operated by CARB and the 13 regional air basins cataloging ambient ozone, $PM_{2.5}$, and nitrogen dioxide concentrations. Deposition of N compounds (NH_3, NO_x), however, is less well observed. Less than twenty active monitoring stations, sparsely distributed throughout the state, catalog dry and wet deposition of N species through the EPA Clean Air Status and Trends Network and the National Atmospheric Deposition Program. In addition, water quality programs, including ones headed by the US Geological Survey, State Water Resources Control Board, Regional Water Quality Control Boards, the CA Department of Public Health, and concerned citizen groups, monitor NO_3^- concentrations at wellheads, in freshwater streams and lakes, groundwater, and coastal regions. Monitoring activities of the numerous agencies identified provide a sound basis for assessing conditions and change in N species.

Tracking sources of N is more difficult. This is largely because the majority of N emissions are non-point source by nature. Observing both the extent and intensity level of non-point source activities is almost impossible on a large scale. Fertilizer use is a prime example. Whilst CDFA collects data on fertilizer sales, it provides little reputable information about when, where, and how much N is used, all factors that decidedly determine the impacts on the environment. Even when the necessary information is collected, it may not be made available publically. The Dairy General Order requires producers to report the N applied by field, but the information resides on hard copies within the board's office and is not public record at this time. By contrast to non-point sources, data are widely available on point sources, including emitters like industry (e.g., food processors) and wastewater treatment plants. Even with point sources, however, access is still limited by the fact that data often reside in disparate locations and difficult-to-access forms.

Development of a unified, transparent knowledge management system to integrate information from the monitoring networks would be an important step to developing technical and policy response strategies. State and national programs collect information without

synthesizing it, despite the multi-source and multi-impact nature of the N cascade. Development of mechanisms that allow exchange and synthesis of data will facilitate the development of targeted multi-media response strategies. With data more easily accessible as well as assessable to decision-makers, new insights on priorities may be generated. Researchers would benefit as well. A comprehensive data management system would provide easy access to historical and current public records. When coupled with an assessment of environmental and human health impacts, a comprehensive data system facilitates identification of clear research gaps and areas of concern. Development of a unified strategy that integrates monitoring and data management would foster novel insights and support informed decisions for managing the N cascade.