Sample Statement of Purpose and Relevancy

Rain-Impact Controls on Erosion and Chemical Transport in Watersheds and Agricultural Land

The ultimate goal of this project is to improve our understanding about how pollutants are transported between the landscape and the nation's lakes, rivers, and water supply reservoirs. Despite more than 70 years of research aimed at understanding the processes involved, sediment, phosphorus, nitrogen, and agro-chemicals continue to negatively impact our water quality. Improved understanding of the mechanisms moving these pollutants provides a basis upon which scientists, managers, and producers can develop better land-management practices for maintaining good water quality.

Current pollution risk tools do not consider the roles that raindrop impacts have on detaching soil and entraining chemicals into runoff even though the importance of this process was hypothesized 40 years ago. Only within the past few years has research meaningfully elucidated exactly how raindrops influence soil detachment and how we can mathematically describe the process.

We propose to extend this research to include chemicals in soil-water and bound-to-soil particles. We plan to extend the theoretical basis of the new rain-impact equations to account for chemicals dissolved in soil water and bound-to-soil particles. We will then test our theory using controlled laboratory experiments in which we will simulate rainfall over small containers of contaminated soil and collect and analyze the runoff. We will revise the theory and retest as needed. Once we are satisfied with our laboratory results, we will test our model in the field. Ultimately, we anticipate that our results will be incorporated into regionally and nationally recognized pollution assessment tools and will be used as a new basis for the next generation of related research.

Because polluted agricultural runoff is identified as a primary contributor to the impairment of rivers, lakes, and reservoirs, our work will help achieve improved harmony between agriculture and the environment and be useful in the development/enactment of erosion control measures by resource agencies and local and state legislative bodies. This could translate into diminished socio-political stress in regions where substantial dairy production coexists within primary municipal water supply watersheds.