INTRODUCTION

In Oregon, we are blessed with abundance. Water, soil, agricultural productivity, natural beauty, natural resources, and a full spectrum of social networks that integrate everyone from agriculturists and artists to zoologists. All of us benefit from the abundance of natural beauty of our state and all of us share in the responsibility for enhancing and maintaining that natural beauty and the natural resources that supply it.

This report addresses the concern that our renewable supply of high-quality freshwater is being contaminated with excessive nitrate. Nitrate is an ionic chemical that is readily dissolved in water and is easily transported through groundwater and surface waters. At very low concentrations in freshwater, nitrate poses no threat to human health or the environment. At elevated concentrations, however, there are definite human health risks (e.g., birth defects) and environmental health risks (e.g., eutrophication). Nitrate is naturally produced in the soil primarily by bacteria that oxidize various nitrogen-containing compounds. Contamination of our freshwater is occurring because there is an over-abundance of nitrogen-containing compounds in the soil. This excess is the direct result of human activities, especially crop fertilization. Fortunately, there are a variety of ways that we can successfully address this concern that not only improve our water quality, but that, in fact, simultaneously improve our soil, improve our agricultural productivity, and improve our standing as a national leader in effective conservation and environmental stewardship.

This report offers a suite of recommendations that can help to:

- replenish the renewable stock of high-quality freshwater in the state of Oregon
- maintain and grow the state's vibrant agricultural economy
- protect human health
- protect environmental health
- ensure that there are abundant and high-quality natural resources available for future generations of Oregonians

Each recommendation contains a set of suggested strategies aimed specifically at understanding, balancing, and naturally integrating human activities into the Earth's nitrogen cycle. The immediate goal of these recommendations is to reduce the risks to human and environmental health that are associated with reactive nitrogen.[1] The long-term goal of these recommendations is to enhance agricultural productivity and profitability while simultaneously conserving natural resources for future Oregonians.

In developing the recommendations and their associated strategies, this report takes a systems-based approach derived from the perspective of sustainability. The report's recommendations acknowledge that the wise use of natural resources is a necessary condition for economic, social, and environmental sustainability. The report also recognizes and applauds human creativity, ingenuity and practicality at the local level. The report acknowledges that human activities are a legitimate subset of natural processes within the larger set of nature's complex adaptive systems. The report thus offers both research and educational opportunities for the enhanced understanding of the elements and relationships within these complex adaptive systems as well as suggestions for direct system modification and control.

This report is organized as follows. Section I defines reactive nitrogen and briefly discusses the sources, properties, and transformations of reactive nitrogen within the context of the Earth's nitrogen cycle. Section II examines the human health concerns associated with reactive nitrogen and Section III does the same for reactive nitrogen's impact on environmental health. Section IV details the recommendations.

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1 Reactive nitrogen is discussed in detail in Section I of this report.