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Estimation of National Economic Benefits Using the National Water Pollution Control Assessment Model to Evaluate Regulatory Options for Concentrated Animal Feeding Operations

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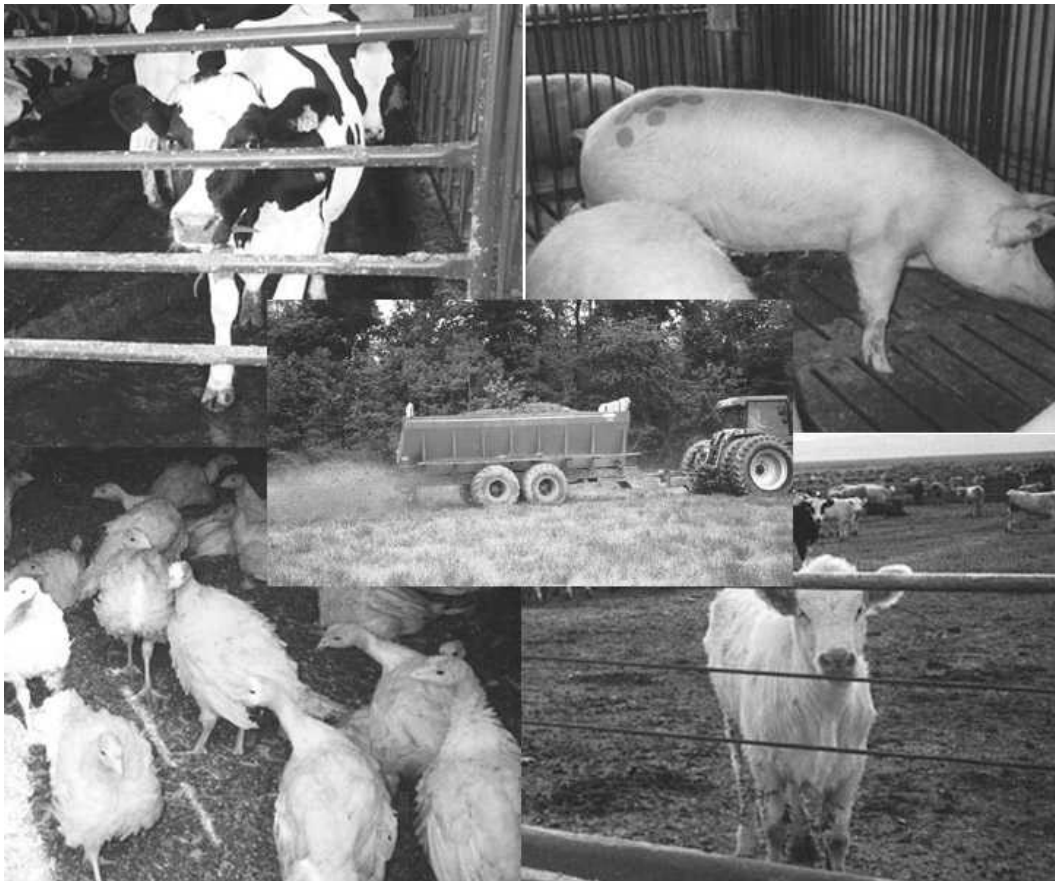

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Estimation of National Economic Benefits Using the National Water Pollution Control Assessment Model to Evaluate Regulatory Options for Concentrated Animal Feeding Operations

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Table of Contents

Table of Contents (continued)

Section **Page**

List of Figures

Figure

List of Tables

Table

List of Tables (continued)

Table

Executive Summary

One goal of the Clean Water Act (CWA) is to improve water quality conditions of the nation's waters to attain "fishable and swimmable" status nationwide. In support of this goal, the U.S. Environmental Protection Agency (EPA) is revising the National Pollutant Discharge Elimination System (NPDES) program regulations and the effluent limitation guidelines (ELGs) for concentrated animal feeding operations (CAFOs). Changes to the NPDES regulations affect which animal feeding operations (AFOs) are considered CAFOs and are therefore subject to the NPDES permit program. Changes to the ELG determine what technology-based requirements apply to CAFOs.

RTI applied the National Water Pollution Control Assessment Model (NWPCAM) to estimate national economic benefits to surface water quality resulting from implementation of new regulations for CAFOs (including revision of NPDES permit regulations and the ELGs for CAFOs). NWPCAM is a national-scale water quality model for simulating the water quality and economic benefits that result from various water pollution control policies. NWPCAM is designed to characterize water quality for the nation's network of rivers and streams and, to a more limited extent, its lakes. NWPCAM is able to translate spatially varying water quality changes resulting from different pollution control policies into terms that reflect the value individuals place on water quality improvements. In this way, NWPCAM is capable of deriving economic benefit estimates for scenarios for regulating CAFOs.

Economic benefits associated with the various AFO/CAFO scenarios are calculated using two estimation methods. The first is based on the Vaughn Water Quality Ladder (WQL), which calculates changes in water quality use-support (i.e., boatable, fishable, swimmable) and the population benefitting from the changes. The second method uses a six-parameter Water Quality Index (WQI6), which represents a composite measure of water quality. Benefits are calculated for each state at the local and nonlocal scales. Local benefits represent the value that a state population is willing to pay for improvements to waters within the state. Nonlocal benefits represent the value that a state population is willing to pay for improvements to waters in all other states in the conterminous 48 states.

Based on the WQL estimation method, the sum of local and nonlocal benefits represented a total willingness to pay (WTP) of $102 to $166 million (2001 dollars). Using the WQI6 estimation method, the sum of local and nonlocal benefits represented a total WTP of $182 to $298 million (2001 dollars).

1.0 Introduction

1.1 Background

Enactment of PL 92-500 in 1972, known as the Clean Water Act (CWA), established a national water pollution control policy based on technology-driven effluent standards for industrial wastewaters and a minimum level of secondary treatment for municipal wastewaters discharged to surface waters. The goal of the CWA was to improve water quality conditions of the nation's waters to attain "fishable and swimmable" status nationwide. The CWA requires that all point sources (PSs) discharging pollutants into U.S. waters obtain a permit under the National Pollutant Discharge Elimination System (NPDES) program. The purpose of the NPDES program is to protect human health and the environment by controlling the types and amounts of pollutants that can be discharged into U.S. waters. NPDES permits implement a multifaceted approach to protecting water quality. At the core of these permits is a two-pronged pollution control strategy that incorporates both technology-based effluent limitation guidelines (ELGs) and more stringent site-specific limits based on water quality considerations.

The U.S. Environmental Protection Agency (EPA) is revising the NPDES regulations for concentrated animal feeding operations (CAFOs) and the ELGs for feedlots. Although similar changes are being considered regarding both regulations, the effects of such changes are different under each. Proposed changes to the NPDES regulations for CAFOs affect which animal feeding operations (AFOs) are considered CAFOs and are therefore subject to the NPDES permit program. Changes to the ELG regulations for feedlots determine the technology-based requirements that apply to CAFOs.

1.2 Focus of Report

This report presents the findings of modeling efforts conducted by RTI that were designed to estimate national economic benefits to surface water quality resulting from implementation of various rulemaking scenarios for regulating CAFOs. These scenarios include revision of both NPDES permit regulations and ELG regulations for CAFOs. Regulatory scenarios assessed include the following:

Baseline - **Current regulations** (AFOs are considered CAFOs if certain criteria are met.)

RTI Scenario 1 - **ELG P–based, >1,000 animal units (AU)** (AFOs with > 1000 AU are considered CAFOs, whereas AFOs with < 1000 AU are not affected. CAFOs are subject to 100 ft setback for manure application and phosphorus-based requirements, as necessary.)

RTI Scenario 2 - **ELG N-based, > 1,000 AU** (AFOs with > 1000 AU are considered CAFOs, whereas AFOs with < 1000 AU are not affected. CAFOs are subject to 100 ft setback for manure application and nitrogen-based requirements, as necessary.)

The National Water Pollution Control Assessment Model (NWPCAM) version 1.6 was used to conduct the water quality and economic benefits analyses. NWPCAM version 1.5 was used during the CAFO proposed rulemaking process. Modifications made to NWPCAM 1.5 for the CAFO proposed rule application are described in EPA (2000). Changes made to NWPCAM 1.6 since the proposed rulemaking process are described in Section 2 of this report. Changes to the model since proposal include

- Revisions to the methodology used to distribute AFO/CAFO loadings to agricultural land use cells;
- New reach network for in-stream modeling of pollutants;
- New methodologies for estimating hydraulic parameters;
- Updated inventories of point source and nonpoint source loadings; and
- Enhanced water quality kinetics.

1.3 Report Overview

Section 2.0 contains a detailed description of the NWPCAM 1.6 modeling system. Section 3.0 outlines the processes associated with the AFO/CAFO modeling process. Section 4.0 presents results from the AFO/CAFO modeling process. Section 5 describes measures taken to reduce the errors and uncertainties in the AFO/CAFO analysis. Section 5 describes measures taken to reduce the errors and uncertainties in the AFO/CAFO analysis.