

T.M.D.L. DEVELOPMENT AND GEORGIA AGRICULTURE

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Abstract. Recently agricultural activities have become the target of perceptions, or some might say misperceptions. Agriculture is often portrayed as the country's most significant contributor of non-point source [NPS] pollution. Georgia's agricultural community is attempting to use recent debates over proposed swine facilities and confined animal feeding operations as an opportunity to increase partnerships between, and within, natural resource management individuals, groups, and agencies across the State. One aspect of this cooperative effort has been the development of a methodology for assessing agricultural contributions to water quality impairments, which is introduced. While agricultural operations can represent a potential environmental threat, the results of applying this methodology, to date, suggest that individuals, groups, and agencies assessing the source of water quality impairments in watersheds where agriculture exists should consider four foundational characteristics before quantifying agricultural non-point source pollution.

INTRODUCTION

Human behavior does not occur haphazardly, or at random. Behavior is a function of social standardization. Although many factors enter into our perceptions of the world, one of the most important factors is our interaction with social groups. Social influences affect, and significantly shape, our perceptions. These social influences bring us new ideas, reinforce our existing values, and extend individual power. And, because we often omit stimuli not making sense to us, one can argue that perceptions are selective.

Recently agricultural activities have become the target of perceptions. Agriculture is often portrayed as the country's most significant contributor of non-point source [NPS] pollution. This portrayal has led to many connotations about the impact that agricultural activities can, and do, have on our nation's water bodies. As a result, many agricultural operations may unfairly become targets of remediation efforts.

During the winter of 1998, there was a public outcry to prohibit proposed swine operations in Taylor and Tattnall Counties. In the summer and fall of 1998, the agricultural and environmental communities debated how to develop regulations for confined animal feeding operations. Some of the charges of agricultural pollution potential articulated as a

part of these discussions were clearly the product of social, rather than scientific, influences. Many of these social influences are also evident in natural resource management agencies as well. One of the negative aspects associated with perceptions is that they tend to lock individuals from different groups into different worlds creating an increased likelihood for conflict.

While it is true that an agricultural operation can be a significant environmental threat, the vast majority of operations are not. The Georgia agricultural community is attempting to use the recently manifested perceptions as an opportunity to increase partnerships between, and within, natural resource management individuals, groups, and agencies across the State.

The objectives of this paper are to discuss the social dynamics associated with agriculture and Total Maximum Daily Load [TMDL] development in Georgia, introduce a methodology to assess agriculture's contribution to water quality impairments at a watershed scale, share results of applying this methodology, and identify four fundamental characteristics needed to assess agricultural contributions to water quality impairments. The reader is strongly encouraged to understand that this paper does not negatively implicate the U.S. Environmental Protection Agency, Region IV [EPA] in any shape, form, or fashion. On the contrary, EPA is to be commended for their efforts to build partnerships and cultivate a consensus among natural resource interests across Georgia in developing Total Maximum Daily Loads [TMDLs].

BACKGROUND

Agricultural operations can, and some do, contribute to natural resource impairments. Even though the magnitude of those impairments continues to generate much debate, the Natural Resources Conservation Service [NRCS] and the Georgia Soil and Water Conservation Commission [GSWCC] work with individual landowners, and agricultural producers through local Soil and Water Conservation Districts, to implement best management practices that would help to abate some of these misconceptions.

Over the past decade, these two agencies have partnered to identify and prioritize potential water quality problems from agriculture across Georgia. Historically, these efforts have been undertaken to direct Federal cost-share dollars from the

United States Department of Agriculture [USDA] to areas needing it the most [i.e. biggest bang for the buck principle]. The product of this effort was a list of 11-digit watersheds considered to have a high potential for contributing to water quality impairments. On a biennial basis, the Georgia Environmental Protection Division [EPD] included this list as Appendix B of their 305[b] report to EPA. These watersheds have traditionally been referred to as "Ag. Waters" within Georgia's natural resource management community.

In their litigation against EPA on TMDL development in Georgia, the Sierra Club, having growing water quality concerns, specifically requested that EPA conduct monitoring activities on "Ag. Waters" to make a final determination as to whether or not these stream segments should be added to the State's 303[d] list. EPA satisfied this request by conducting monitoring activities in the summer of 1996. Specifically, EPA monitored stream segments in approximately 100 11-digit watersheds and found that 65 stream segments should be added to the 303[d] list.

TMDL DEVELOPMENT AND GEORGIA AGRICULTURE

Faced with having to develop TMDLs across Georgia, many of which were in rural portions of the State, EPA met with the GSWCC and NRCS on February 7, 1997, to request assistance with the agricultural data utilized to identify and prioritize the "Ag. Waters". The GSWCC and NRCS provided the requested data with additional ancillary material, and further offered to provide technical assistance with the interpretation and application of agricultural non-point source [NPS] data.

EPA requested a subsequent meeting with the GSWCC and NRCS on July 21, 1997. This meeting provided EPA with an opportunity to share limited information about 73 TMDLs that had been developed, 47 of which were calling for a reduction in agricultural NPS pollution [fecal coliform]. The GSWCC requested a copy of the basic data utilized to develop TMDLs, which allowed the GSWCC and NRCS to determine EPA's use of the agricultural NPS information provided in February. Reviews of the basic data revealed numerous questions regarding EPA's use of the GSWCC and NRCS agricultural NPS data. It became readily apparent that perceptions regarding agricultural activities were a major influence in decisions made. As a result, WaterStewards, which is a coalition of various representatives from Georgia's agricultural community, requested a series of meetings with EPD.

On November 11, 1997, the first meeting was held. EPD representatives listened to WaterStewards concerns and suggested that a methodology, which would augment TMDL development protocol, be developed. This methodology was developed by NRCS and the GSWCC, and presented to EPD and the WaterStewards on December 18, 1997. During this meeting, the WaterStewards [Georgia's Agricultural

Community] provided their concurrence with this methodology. The methodology gained EPD's informal concurrence during a meeting between EPD and the WaterStewards on January 21, 1998. One week later, EPA and NRCS met to discuss the proposed methodology. EPA concurred that the methodology significantly enhanced TMDL development and offered to re-evaluate TMDLs that had been developed to date with new data developed through the use of this methodology. EPA also requested NRCS assistance with the development of agricultural NPS data for future TMDL development in Georgia.

TMDL DEVELOPMENT MODEL

TMDLs are comprised of the sum of individual wasteload allocations [WLAs] for point sources, and load allocations [LAs] for both NPS and background levels for a given watershed. In addition, a margin of safety [MOS] is included, either implicitly or explicitly, that accounts for uncertainty in the relation between pollutant load and the quality of a receiving water body. The sum of these components may not result in the accedence of water quality standards for a given watershed. Conceptually, this definition is denoted by the equation:

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS.}$$

The interest of the Georgia agricultural community focused on LAs, which can be one of four land use categories – agricultural, urban, forested, and barren.

AGRICULTURAL METHODOLOGY

Initially developed for fecal coliform loading rates, the agricultural methodology currently contains a major focus on animal operations. However, as other agricultural NPS concerns are addressed for future TMDL development, this methodology will be modified to incorporate the constituent of concern.

Limited staffing resources mandate that the methodology be as efficient as is possible. Therefore, digital ortho-photography and applied research with empirical results for each type of agricultural operation are utilized in every watershed. The initial methodology is as follows:

1. Obtain, and print, ortho-digital-photography for the watershed in question.
2. Delineate the watershed in question using the following ancillary data:
 - A. TMDL basic data references,
 - B. 1:100,000 USGS Topographical Maps, and/or
 - C. Digital data from EPA.

3. Inventory the watershed:
 - A. Identify animal operations by type of operations [Dairy, Broiler, Swine, etc.] through remote sensing/photo interpretation using DOQs,
 - B. Identify agricultural land cover/use through remote sensing/photo interpretation using DOQs,
 - C. Meet with local agricultural agencies [NRCS, FSA, CES, etc.] to:
 - I. Ground truth photo interpretation,
 - II. Determine number of animal units associated with each type of operation, and
 - III. Determine the nature and extent of BMPs and BMP adoption rates.
4. Develop agricultural NPS pollution production rate and runoff characteristics by converting animal units to 1000 lb. live weight equivalents, and utilizing applied research with empirical results for each constituent within each type of agricultural operation.
5. Calculate agricultural NPS delivery ratios using applied research and empirical results where available.

There is one key assumption imbedded within this methodology: All of the pollutant produced within a TMDL watershed remains in that watershed. While animal wastes, and other potential sources of agricultural NPS, move readily across watershed boundaries, determining field scale applications, along with the sources of those applications, is beyond the scope of this method. The reader is reminded this methodology was developed with a limited assessment period and a watershed scale in mind.

RESULTS

To date, this methodology has been applied to 7 of the 47 TMDL stream segments for which a reduction in agricultural fecal coliform production are called. These results are displayed in Table 1 and show a substantial difference from original loading estimates of Ag. NPS made by EPA. Land use data, from satellite imagery, indicated a significant amount of agriculture was present for two of the seven watersheds [Big Creek and South Fork of Balus Creek]. The DOQs also indicated a number of poultry houses were present in these two watershed. However, ground truthing the remotely sensed and photo interpreted data revealed that land classified as agriculture was fallow, and awaiting commercial development. Additionally, none of the poultry houses identified on DOQs were in operation. In the five watersheds where agriculture was still an active industry, original fecal coliform production estimates ranged from 84 - 94 percent higher than unreasonably liberal agricultural fecal coliform

production estimates made by NRCS.

These results suggest that four fundamental characteristics be considered before TMDLs identifying agriculture as a source of impairment within a given watershed.

- a. Those developing the TMDL should have a solid understanding of specific agricultural management activities associated with each type of agricultural operation,
- b. Those developing the TMDL should have a solid understanding of specific agricultural best management practices, how they are incorporated into item a above, and the influence they have on altering the fate and transport of potential contaminants,
- c. Those developing the TMDL should have the most current data available on agricultural activities in the watershed from a variety of imagery, and other, data sources, and
- d. Those developing the TMDL should have, or be willing to make, sufficient agricultural contacts within the targeted watershed to acquire additional data not available from other sources, and to gain assistance with necessary ground truthing, agricultural management, and agricultural best management activities.

CONCLUSION

The purposes of this paper were to:

1. Discuss the social dynamics associated with water quality and agriculture in Georgia,
2. Introduce a methodology to assess agriculture's contribution to water quality impairments at a watershed scale,
3. Share results of applying this methodology, and
4. Identify four fundamental characteristics needed to assess agricultural contributions to water quality impairments.

Georgia's agricultural community stands ready, and willing, to assist with the natural resource management issues that influence agriculture. In fact, it is hoped that these issues will represent opportunities to bring together members of different social groups for the purpose of coordinating fair and equitable protection efforts. Individuals, groups, and agencies working to maintain, protect, and restore Georgia's natural resources have a common bond through their desire to enjoy a viable natural resource base for ourselves, our children, grandchildren, and future generations. Having a common bond is one of the first steps that bring individuals

**Table 1. Estimated Agricultural Fecal Coliform Loading Rates per Acre per Day
for Assessed TMDL Stream Segments.**

Stream Segment	Percent Agriculture ¹	EPA Estimated Ag. Fecal Loading ²	Ag. Methodology Est. Ag. Fecal Loading ³	Percent Difference
Big Creek	41	1.06E + 11	No Ag. Fecal Production	100
East Fork of Little River	43	1.06e + 11	6.73e + 9	94
Flowery Branch	25	1.06e + 11	1.47e +10	86
Greenbriar Creek	26	1.90e +10	1.32e +9	93
South Fork of Balus Creek	49	1.06E + 10	No Ag. Fecal Production	100
Sugar Creek	33	2.28e +10	3.44e + 9	85
West Fork of Little River	24	1.06e +11	1.65e + 10	84

Source: **Basic Data for TMDL Development, EPA, Region IV, Atlanta, Ga.; and USDA-NRCS, State Office, Athens, Ga.**

1 – Based on 1977-1980 Land Use Data.

2 – Fecal Coliform Colonies per Acre per Day. Assumes all Ag. Fecal Production within TMDL Watershed remains in Watershed.

3 – Fecal Coliform Colonies per Acre per Day. Assumes all Ag. Fecal Production within TMDL Watershed remains in Watershed.

and groups together for social interaction. Social interaction is the foundation upon which social groups are formed. If we purpose to work cooperatively, and not allow perceptions to hinder our efforts, we can be more successful as one large cohesive social group.

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