Evaluation of the Economic Costs of Reducing Nutrient Loads to the Gulf of Mexico: Review of the Topic 6 Report

EPA Science Advisory Board's Hypoxia Advisory Panel

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Objectives

- Evaluate the social and economic benefits of reducing nutrient loads in the Mississippi Basin to address hypoxia in the Northern Gulf of Mexico
- Identify relative costs and cost-effectiveness of different control options

Goals based on recommendations of Topic 5 report

15-20% reduction in nitrogen sources to the Gulf, achieved by:

- Reducing fertilizer applications by 20%
- Restoring or creating 24 million acres of riparian zones and wetlands

USMP Model

- USMP is a spatial and market equilibrium model designed for general-purpose economic and policy analysis of the U.S. agricultural sector
- USMP also estimates nutrient losses to surface runoff and leaching using parameters derived from the EPIC model

USMP Model Regions

Scenarios

- Parametric nitrogen loss reductions
  - 20%, 30%, 40%, 50%, 60%
- Fertilizer reductions
  - 20% and 45%
- Fertilizer tax of 500%
- Wetlands restoration
  - 1, 5, 10, and 18 million acres
- Riparian buffers
- Combined
  - 20% fertilizer reduction and 5 million acres of wetlands

Results – Costs in Basin

Scenario	N-loss reduction (%)	Unit cost ($/tonne)
N-loss reductions		
20%	20	883
30%	30	1,896
40%	40	3,370
50%	50	5,204
60%	60	7,480
Fertilizer reductions		
20%	10.7	690
45%	21.8	2,845
Fertilizer tax	21.8	14,539
Wetlands		
1 million acres	1.4	6,060
5 million acres	7.4	8,905
10 million acres	15.2	10,571
18 million acres	27.6	11,928
Buffers	14.7	26,032
Combined	18.7	5,501

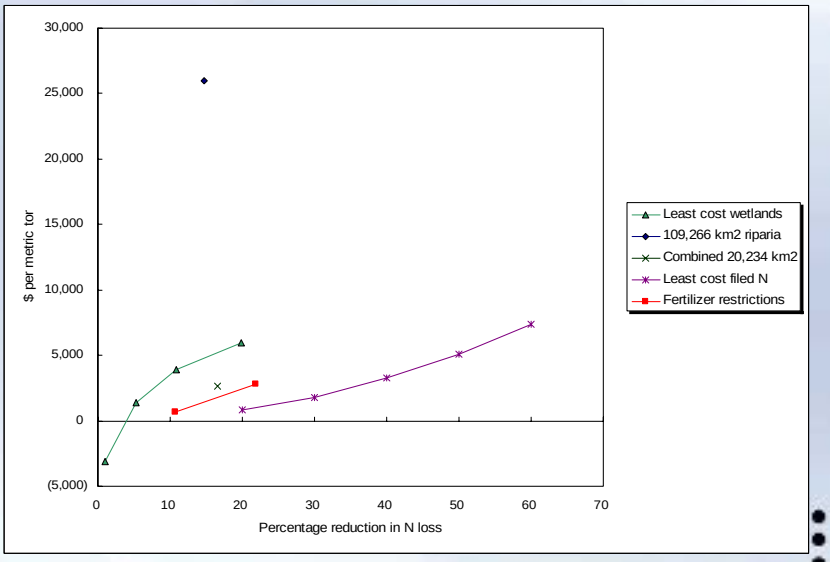
Impacts Outside Basin

Scenario	N-loss (%)	P-loss (%)	Erosion (%)
N-loss reductions			
20%	3.9	3.3	2.2
30%	8.4	6.7	5
40%	13.2	11.7	8.4
50%	18.6	16.7	12.1
60%	25	22.5	16
Fertilizer reductions			
20%	1.7	1.6	1.0
45%	7.6	5.8	4.6
Fertilizer tax	7.6	1.7	1.3
Wetlands			
1 million acres	0	0	0
5 million acres	0.3	0	0.2
10 million acres	0.8	0.8	0.5
18 million acres	1.8	0.8	0.9
Buffers	2.0	1.6	1.2
Combined	2.2	1.7	1.3

In-stream Benefits

Scenario	Erosion benefits	Wetland benefits
N-loss reductions		
20%	78	-
30%	136	-
40%	225	-
50%	300	-
60%	302	-
Fertilizer reductions		
20%	12	-
45%	39	-
Fertilizer tax	39	-
Wetlands		
1 million acres	3	550
5 million acres	15	2,751
10 million acres	28	5,502
18 million acres	56	9,904
Buffers	62	-
Combined	26	2,751

Net National Adjustment Costs



Conclusions

- Modest aggregate impacts on the agricultural sector for up to a 20% reduction in nitrogen loss
- Consumers and livestock producers bear higher commodity and feedgrain prices
- Wetland strategies are more expensive than fertilizer-reduction strategies to achieve the same N-loss reduction goal

Conclusions – cont'd

- Vegetative buffers are not very cost-effective
- A strategy that combines wetland restoration with fertilizer reductions could be the most cost-effective

Caveats

- Results based on estimates of wetland and buffer filtering that are crude at best
- We assumed percentage reductions in edge-of-field nitrogen lost translated into similar reductions to streams
- Nutrient reduction strategies in the model are limited