

**Competitive Research Grant Program****Economic, agronomic, and ecological costs/benefits of field border management practices in agricultural systems of Mississippi**

Investigators: L. Wes Burger, Jr., Wildlife and Fisheries

**Project Goals:**

The goals of this project are to:

1. build upon work by Stull et al. 2000 and Bromley (1998) by quantifying real economic costs of field border establishment for producers in rowcrop production systems in Mississippi, and
2. provide producers, resource conservationists and policy makers with information and training to move farming toward sustainability.

**Project Objectives:**

1. Assess opportunity costs of participation in field border management programs by yield mapping fields in relation to crop type, proximity to edge, buffer establishment and

landscape context (adjacent plant community type).

2. Use crop budget calculators and economic models to estimate the break-even yields and subsidies required to incentivize establishment of conservation buffers in the Black Prairie physiographic region.
3. Produce a semi-technical publication for landowners describing the situations in which conservation buffers make economic sense.

**Synopsis of research activities per objective:**

We used GPS georeferenced yield monitor data from 150 fields in the Black Prairie Physiographic region of Mississippi to determine the effect of proximity to field margin and adjacent plant community on crop yields in soybean and corn production

systems. We combined this data with economics information on production costs, commodity prices, subsidy payments, and incentive payments associated with Continuous Conservation Reserve Practice CP33 – Habitat Buffers for Upland Birds in a partial crop budget, break-even economic analysis to evaluate the real opportunity costs associated with participation in USDA conservation programs. We developed an economic decision support tool in Excel to assist producers in comparing alternate cropping/conservation program participation scenarios.

### **Significant findings/results per objective to date:**

Conservation buffers are a suite of conservation practices that are subsidized under numerous USDA farm bill programs to provide wildlife habitat, erosion control, agrichemical retention, and water quality enhancement. However, producer perceptions of buffer communities as sources of weeds, pest insects, and lost production may inhibit adoption. Adoption of conservation practices may depend on knowledge the farmer has regarding environmental benefits, lost opportunity and availability of conservation programs. To address these sources of uncertainty, we examined effects of one conservation buffer practice, field borders, on opportunity costs and crop yield in a production agriculture system in the Black Prairie Physiographic region of Mississippi from 2000-2002. Native

herbaceous field borders are an upland habitat conservation buffer subsidized under a new Continuous Conservation Reserve Program practice, CP33-Habitat Buffers for Upland Birds. To characterize opportunity costs of this practice, we estimated average crop yields for corn and soybeans in relation to proximity to field margin and adjacent plant community type (APC: crop, herb, and wood) relative to interior yields from 104 corn and 56 soybean fields in the Black Belt region, during 2000-2003. Corn yield was more influenced by proximity to edge and edge type than soybean yield. Corn yield was substantially reduced (13 – 38%) immediately adjacent to all types of plant communities (swaths 1 and 2), relative to yield from the field interior. As expected, greatest yield reductions occurred next to wooded field margins. Soybean yield was only moderately reduced (6 – 14%) immediately adjacent to all types of plant communities, relative to yield from the field interior. Both corn and soybean yields were only slightly reduced by the third (48 – 73') and fourth (74 – 96') combine swaths adjacent to all types of plant communities, relative to yields from the field interiors. Partial budgets were used to develop break-even analyses on profitability with and without CP33. The results of the break-even analyses illustrated that a number of factors influenced whether CRP CP33 – Upland Habitat Buffers were more profitable than cropping the same

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acreage. The most important factors included the type of plant community adjacent to the crop (expected yield reduction), the county CRP Soil Rental Rates, expected crop yield, and expected commodity prices. On average, if soil rental rates are \$59.00/ac, production costs are \$320/ac, corn price is \$4.00/bu, and expected yield < 150 bu/ac, it would be economically beneficial to enroll up to 30' in CP33 – Habitat Buffers for Upland Birds. If expected yields were below 125 bu/ac, it may be economically beneficial to enroll 60' in this buffer practice. Because soybeans exhibited less yield reduction at the edge, there was less difference in swaths 1 – 4. In soybeans, assuming \$150/ac production costs and \$8.00/bushel commodity price, CP33 buffers 30 – 100' wide could be more profitable than cropping if expected yields were less than 32 bu/ac. Optimal buffer width is wider next to woods than other crop or herbaceous communities, and increases as yields or commodity prices decline or soil rental rates increase.

**Applications or broader impacts of significant findings, including economic impacts or projected impacts:**

Information obtained through this research is being made available through national USDA technical bulletins, peer-reviewed scientific journals, popular media articles, and

presentations at local, state, regional, and national meetings of interest. Technical notes will be developed for distribution through the NRCS-Wildlife Habitat Management Institute. Study sites have and will continue to serve as demonstration areas for continuing education/extension outreach efforts. Conservation provisions of federal farm policy are being developed and delivered through various programs at an ever increasing rate. Congress is increasingly requiring empirical demonstration of perceived environmental benefits of conservation provisions. Information on ecological and economic effects of land management practices is essential in order to determine the desirability of adopting or promoting such conservation practices by landowners/ producers, NRCS personnel, and policy makers. The desired outcome of this project is that landowners/producers, NRCS personnel, and policy makers will have the quantitative, science-based information needed to judge effects of field borders on farm profitability, agricultural sustainability, and ecological integrity of agricultural ecosystems. Products developed from this project will in all probability be used by policy makers to develop, validate, and refine implementation of conservation provisions of federal farm policy. Additional deliverable products from this research include USDA technical bulletins, peer-reviewed scientific journals, popular media articles, and presentations at



local, state, regional, and national meetings of interest.

### Project success relative to original objectives:

This project has accomplished all original objectives.

### List post-docs and graduate students with title of thesis or dissertation, if completed, and estimated graduation date:

Smith, M.D. 2004. Wildlife habitat benefits of field border management practices in Mississippi. Dissertation, Department of Wildlife and Fisheries, Mississippi State University.

Barbour, P. 2005. Ecological and economic effects of field borders in row crop agriculture production systems in

## Fund Leveraging

Mississippi State University's NASA Remote Sensing Technology Center, USDA Natural Resources Conservation Service Wildlife Habitat Management Institute, USDA Sustainable Agriculture Research and Extension, Mississippi Department of Wildlife, Fisheries, and Parks, and Monsanto.

\$758,235

Mississippi. Dissertation, Department of Wildlife and Fisheries, Mississippi State University.