Targeting for diverse ecosystem service outcomes in an agricultural matrix

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Row-crop agricultural landscapes are highly productive with respect to the production of provisioning ecosystem services (ES), but neglect to deliver other progressively more demanded regulating and cultural ES. This research investigates opportunities to help state and federal agencies explore options to enhance and diversify ES outcomes obtained from agricultural landscapes. Presently, conservation programs are voluntary, and as a result conservation programs have not been targeted to those fields that contribute disproportionately to enhancing regulating and cultural ES such as water quality. We hypothesize that by targeting parcels that contribute disproportionately to water quality concerns in the watershed and strategically implementing best management practices (BMPs) on those parcels, water quality can be improved while minimizing land-use tradeoffs and increasing ES delivery.

We use a two-stage modeling approach in a Central Iowa watershed to examine the concept. Using a new, innovative GIS-based targeted conservation protocol developed by USDA-ARS (the Agricultural Conservation Planning Framework), coupled with the Agricultural Policy/Environmental eXtender (APEX), we assess the effect on water quality from nutrient and sediment losses under current and alternative land management scenarios. Alternative land management scenarios were designed to assess land-use tradeoffs associated with efficient and cost effective ES production at varying levels of strategic adoption of BMPs (i.e., random placement or coordinated placement of BMPs based on fields with highest vulnerability).We predict that relatively large reductions in nutrient and sediment loss at the watershed level will be achieved by coordinated placement of conservation practices and management techniques on relatively few, high-contributing parcels (>10% area).