“If you don’t measure it, you can’t know it, and ultimately, you can’t manage for it.”
Roger Wolf
Director of Environmental Programs
Iowa Soybean Association

Paired Micro-watershed Studies | definition
The Iowa Soybean Association (ISA) is investing effort in an applied evaluation technique called “paired micro-watershed studies” to gather data on the impact field scale agricultural practices have across the landscape and in the water. The goal is to accumulate, analyze, and use the information collected to better understand which practices can improve water quality in specific agricultural landscapes.

ISA has started paired micro-watershed analysis in similar micro-watersheds (of less than 2,000 acres) in north-central Iowa and intends to evaluate the environmental performance of differing management strategies, such as:

- conservation tillage,
- controlled drainage,
- nitrogen management optimization,
- cover crops,
- other locally identified practices.

Paired Micro-watershed Studies | function
The approach requires two or more micro-watersheds (approximately 600-2,000 acres) that are similar in size and characteristics. One of the micro-watersheds serves as a “control,” in which the management of the land remains unchanged. Others in the study serve as “treatment” micro-watersheds, in which management of the land is altered. Water monitoring data collected on control and treatment watersheds are compared, and the impacts of management changes in the water are evaluated over time.

The process begins with a period of “calibration.” During calibration, all the micro-watersheds involved in the study are monitored before changes in management are introduced. This sets a baseline of information on how the micro-watersheds behave in relation to each other before any change in management is implemented.

After calibration, ISA works with farmers to advise and evaluate management changes locally identified as potential water quality solutions. At the same time, ISA conducts water monitoring at the outlet of each micro-watershed. Multiple years of monitoring and analysis may be needed to validate management practice changes for water quality outcomes.

Paired Micro-watershed Studies | purpose
The goal is to compare management in micro-watersheds to determine what changes in management will consistently result in measurable water quality response, and yet allow the farmer to maintain profitable farming practices.

The land-water interface has rarely been examined at this scale. Over the past nine years, ISA has identified...
environmentally-oriented farming practices that perform agronomically and economically. Now, the goal is to measure and evaluate their environmental impact — to begin to understand the response of natural systems in dynamic environments.

The ultimate goal is to find ways to keep farming productive and profitable, while reassuring farmers and public stakeholders that effective management practices on the farm can have a measurable, positive impact on water quality.

**Paired Micro-watershed Studies | location**
ISA is implementing its first paired watershed design in the Lyons Creek watershed near Webster City. Three micro-watersheds were identified there for comparison.

ISA will be analyzing both surface (creeks) and subsurface flow (tile lines), capturing data on as much water flowing out of the watershed as possible and connecting it back to changes in management on the landscape.

**Paired Micro-watershed Studies | more information**

**Selection of Micro-watersheds**
- Watersheds should be similar in size, slope, location, soils, and land cover
- Watersheds should be small enough to make the same management changes throughout most of the watershed
- Watersheds should have a stable outlet for monitoring
- Each watershed should be in a “steady-state” — have consistent land use patterns

**Benefits of Paired Micro-watershed Studies**
- Climate and hydrological differences are minimized
- Change in water quality can be attributed to treatment
- Watersheds need not be identical
- Study can be completed in shorter time frames than trend studies
- Cause-effect relationships can be indicated

**Challenges for Paired Micro-watershed Studies**
- Response to treatment could be gradual over time, which influences variance
- Study is vulnerable to disastrous weather
- Shorter calibration time frames may result in missed weather events
- Only minimal change in the control watershed is permitted throughout the study
- Requires similar watersheds in close proximity

For more detailed information on conducting a paired micro-watershed study see:

Watershed Planning | why a watershed approach is needed

Some eighty-eight percent of Iowa’s landscape is used for agriculture and farming. The management of nutrients for crop production, tile drainage, stream bank erosion and channel modification, and cropping system changes have all been identified in studies as contributors to excess nitrogen and phosphorous in Iowa’s waters, the Mississippi River, and the Gulf of Mexico. Public scrutiny of agricultural non-point source nutrient losses to water has increased, locally, regionally, and nationally.

Many programs have been developed in response to these issues. But most have been limited by political boundaries — delivered within county, state, and multi-state borders. Watersheds cross these political boundaries, so an approach geared to watershed boundaries is more likely to succeed.

Watershed Planning | developing performing solutions

Farmers, agronomists, environmentalists, and policy makers all need a better understanding of the complex land-water interface and how agricultural management practices actually impact the water under local conditions. Practices that perform in one watershed may not work in another. When it comes to watersheds, farms, and fields, one size does not fit all, and a whole suite of solutions, working together, need to be implemented over time to achieve watershed goals and producers’ individual goals.

After considering local needs and conditions, the Iowa Soybean Association (ISA) organizes and develops specialized technical assistance and leadership services tailored to the watershed and focused on helping watershed farmers improve their environmental performance.
while maintaining or improving profitability. The Iowa Soybean Association:

- provides leadership and coordination for farmers and local watershed organizers.
- provides technical assistance based on sound science.
- uses emerging technology and site-specific monitoring and evaluation to define complex biological systems and get a better understanding of the local land-water interface.
- helps individual watershed farmers document, evaluate, and improve their management practices and new practices they might want to test in their operation — all with the goal of optimizing agronomic, economic, and environmental outcomes.
- works with groups of farmers in a watershed to maximize their learning from each other, facilitate shared resources and group projects, and coordinate individual and watershed planning for the best results.
- leads by empowering the local stakeholder group with data and technical resources.

**Watershed Planning | the watershed planning process**

ISA utilizes watershed planning protocols and guidelines developed by the Iowa Department of Agriculture and Land Stewardship (IDALS) and the Iowa Department of Natural Resources (IDNR) as part of their multiple step planning process.

The plan serves as a road map. It’s written so that stakeholders can know where they are, determine where they want to go, and draft a route to get them there.

The planning process starts with data — but for most Iowa watersheds, very little water quality data exists. Baseline data is needed in order to determine where areas of highest priorities are, evaluate the effectiveness of implemented solutions and develop a viable strategic plan.

Gathering data is just one stage of a multilevel process of watershed inventorying and data analysis to help focus efforts and target resources in the watershed plan. ISA’s role includes examining existing land use, soil characteristics and crop rotations, conducting stream-based RASCAL assessments, and more.

It’s all part of locally-led conservation planning to identify resource concerns and locally-acceptable solutions to these concerns. Experience has proven that this is the most effective approach to solving natural resource problems on the watershed scale. Farmers and other stakeholders who are involved in identifying the resource concerns and developing strategic solutions will be more likely to apply conservation practices voluntarily.

**Watershed Planning | a multilevel process**

- Identification of concerns and objectives — By gathering data and identifying baseline conditions throughout the watershed, a watershed group, aided by technical experts, can build local interest and participation, determine what resource concerns are top priority and begin the planning process.

- Plan development — Based on the data gathered, a group of stakeholders, with technical assistance, creates a workable plan tailored for the watershed.

- Plan implementation and evaluation — The watershed organization and partners seek financial and technical resources, identify willing participants in key locations, and help constituents implement the plan.

- Plan evaluation and maintenance — ISA, other technical advisors, and participants evaluate the effectiveness of the implementation strategies and help the watershed organization adjust the plan over time to improve the likelihood of success.

**Iowa’s farmers | leading watershed stakeholders**

Iowa’s farmers are multilevel stakeholders in Iowa’s watersheds. They are directly affected by water quality as well as by the efforts to improve it.

- They are Iowa’s frontline consumers of water.
- They are the leading stewards of Iowa’s land resources.
- They are taxpayers and entrepreneurs.
- Many are lifelong conservationists.
- They take pride in developing and providing solutions.
Watershed Program

Delivering innovative programs providing farmers with service and support

to meet agronomic and environmental objectives

PROGRAM OVERVIEW

Our goal
To provide leadership, scientific, and technical services to advance agriculture’s environmental performance in organized watersheds through applied evaluation and adaptive implementation.

Our Role
This program oversees or provides technical assistance for strategic and tactical planning, program and funding development, implementation, evaluation, and quality control for several agricultural watershed/water quality projects in Iowa, with potential for outreach, replication, and consultation in other Upper Mississippi River Sub-basin states.

Our Approach
The Watershed Program’s data-driven approach is built on principles of adaptive management for continual improvement, applied evaluation (data collection) at multiple scales employed in a feedback loop, local planning and targeting for results, integrated solutions tailored to each watershed, collaboration among stakeholders for coordinated resources and leadership, and technical assistance provided to a critical mass of producers in each watershed.

A three-phase approach to watershed organization and water monitoring is employed, though ISA Watershed Programs may become engaged at any phase of a watershed project’s development.

- **Phase I** involves baseline data collection through water monitoring and analyses of land use and management, demographics, and economic, political and social resources (typically at the HUC-8 scale, 450,000 acres to over 1.25 million acres). These data inform a regional watershed assessment (RWA), which provides a basis for later area-wide watershed planning. Watershed stakeholders, with technical assistance from ISA, local RC&Ds or conservation professionals and commissions, university and agency scientists, and ag and environmental nonprofits, participate in this process.

- **Phase II** incorporates increased local involvement in the area-wide watershed planning process at various scales, identifying resource concerns and prioritizing locations (typically HUC-12 watersheds, 10,000-40,000 acres).

Targeted water monitoring identifies optimal areas for resource and program investment to achieve environmental performance outcomes, and local outreach identifies opportunities for working with land owners and operators. Watershed plans with goals, objectives, and strategies are developed.
- **Phase III** executes the watershed plan’s implementation strategies in targeted watersheds and employs water monitoring, soil sampling and other measurements. Water monitoring focused on evaluation of implemented strategies is employed and may follow a paired micro-watershed design, in which water monitoring, soil testing, and yield data are collected for control and treated areas (600–2000 acres each) over time.

Each treated micro-watershed employs a management change (such as conservation tillage, cover crops, nitrogen management optimization, or others) expected to reduce nutrient loss. Monitoring water and soil in treated and control areas helps watershed organizers understand which solutions perform best in the local landscape and climate. Adjustments are made to watershed strategies based on the performance reports derived from paired micro-watersheds and other applied evaluations conducted in the field and in water bodies.

**Where We Work**

Resource concerns, opportunities, and partnerships help determine the watersheds in which this program becomes involved. Baseline water monitoring data contribute to this decision. Local stakeholders may begin the watershed organization process and seek our assistance. By the end of 2009, we expect to be working at some level of this approach in nine HUC-8 (see map below) and 10 HUC-12 Iowa watersheds.

![Map of Iowa showing various watersheds](image)

The Iowa Soybean Association oversees and provides technical assistance for several agricultural watersheds in Iowa. Resource concerns, opportunities and partnerships help determine the watersheds in which this program becomes involved.