Chapter 2

Key Informant Survey to Understand What Farmers, Agency Personnel, and Stakeholders Think: National Institute of Food and Agriculture–Conservation Effects Assessment Project

A.E. Luloff, D.LK. Hoag, D.L. Osmond, B.R. Woods, J.S. Gordon, J. Gruver, K. Roka, C.M. Raboanarielina, C. Longmire, M. Ward, and J.L. Weigle

As part of our synthesis, two related tasks were undertaken at each National Institute of Food and Agriculture–Conservation Effects Assessment Project (NIFA–CEAP) site. The first task was a site visit that included discussions with project researchers concerning the technical aspects of each project. The focus of the second task consisted of extensive face-to-face interviews with key stakeholders living in and around the 13 NIFA–CEAP sites. The purpose of these stakeholder interviews was to supplement data collection in order to develop a broader, more systematic look at individual project results; to synthesize the meaning of individual project results; and to derive key principles for use in guiding future watershed management efforts.

This chapter synthesizes findings from a series of key informant interviews over a period of approximately 18 months (from spring 2008 through fall 2009). Key informants are people who, on the basis of their experiences, positions, decision-making capacities, and/or active participation in and knowledge of an area, are asked to describe events, actions, and beliefs, as well as their attitudes about them. Their insights, recollections, and experiences provide a useful place for the compilation of data about the social reality of a place (Tremblay 1957; Krannich and Humphrey 1986; Luloff et al. 1995; Jacob et al. 1997; Luloff 1999; Sherry 1999; Elmendorf and Luloff 2001). Individuals living in the NIFA–CEAP watersheds were interviewed in their home communities.

Due to the large number of interviews (sample size = 196) conducted across the 13 watersheds that were part of this assessment, this chapter is organized thematically and highlights similarities and differences noted by these key informants across each question asked. Following these highlights, an overall summary is provided, and possible implications are advanced.

Methods

The purpose of the key informant interviews was to conduct qualitative case studies at each site—especially to develop holistic descriptions from carefully selected and comparable residents in these watersheds. Such people are generally referred to as key informants, who

(c) SWCS. For Individual Use Only

because of their positions, reputations, and/or involvement in local decision making, are perceived as knowledgeable about the community. Moreover, attempts were made to ensure that those selected for interviews were broadly representative of local interest groups, factions, and social status levels. The use of this approach provided a needed balance of qualitative analysis in contrast to the more empirical, quantitative frame associated with the collection of technical data. In this qualitative analysis, the authors focused on the words the informants used to describe local conservation efforts and the larger community where they were occurring. This qualitative approach, then, is a constructivist as opposed to positivist approach; simply said, this survey avoided close-ended answers to questions best addressed with longer narratives.

Key informants from a variety of backgrounds were interviewed about their beliefs, attitudes, perceptions, and experiences regarding water quality and conservation practices in their respective watersheds. These interviews were held in a variety of settings across 13 watersheds, each representing a different state. Each interview generated unique ideas, which were then used by researchers to probe deeper in an attempt to uncover and understand the usefulness and practicality of conservation practice implementation and installation to protect water quality.

Table 2.1 shows the distribution of key informants by state and position. Across the 13 watersheds, 196 key informants were interviewed. The number of people interviewed varied from a low of six in Iowa and Utah to a high of 26 in Ohio. Across the 13 watersheds, the authors interviewed 34 farmers, 33 university/extension affiliates, 23 representatives of federal

Table 2.1
Number of key informants by state and category. Some key informants may have occupied both categories. In such instances, the key informant's most recent position is used for representative purposes.

State	Key informant position categories									
	State agency	University/ extension	Federal agency	Farmer	Local agency	Watershed association (environmental)	Local resident	Elected official	Local business/ newspaper	Total
Arkansas		1	2	5		1		1		9
Georgia		3	2	2			1	2	4	14
Idaho	2	1	1	1	3		2	1	3	14
Indiana	1	4	2	1	2	5	1		2	18
Iowa	2			3	1					6
Kansas	2	2	2	5	3	3			3	20
Missouri		3	3	3	2	2	1	2	2	18
Nebraska		5	2	3	3	2		1	2	18
New York			1	3	3	3	3	1	2	16
Ohio	3	4	2	4	4	3	2	3	1	26
Oregon		4	4	3	1	2			3	16
Pennsylvania		5	1	1	4	2	1		1	15
Utah		1	1		2	1			1	6

(c) SWCS. For Individual Use Only

agencies, 10 representatives of state agencies, 28 representatives of local agencies, 24 representatives of local businesses or newspapers, 11 local residents, and 11 elected officials.

In this study, the core key informant questionnaire, which was reviewed and approved by the Institutional Review Board of North Carolina State University, contained five basic questions:

1. Every agricultural region is a bit different. What makes the place and people where you live unique?
2. What are the most critical water quality concerns in your watershed?
3. Many factors make conservation practices work, or not work. Given your experiences, which conservation practices are being used in this watershed? Which ones work best? How would you measure the success of these practices?
4. What type of educational assistance is available to help people learn about appropriate conservation practices?
5. Were conservation practices being used before this project started? Have any new conservation practices been added?

The questions were presented in person, and responses were recorded for later analysis. Each interview took approximately 30 to 60 minutes to complete. Summaries of what was found for each question follow.

Results and Discussion

Question 1: Every Agricultural Region Is a Bit Different. What Makes the Place and People Where You Live Unique?

For most surveys, conversations were initiated by asking key informants to describe what made their respective areas unique. Across the 13 states, key informants tended to describe their communities and areas largely in terms of biophysical features, such as unique or identifiable landscape characteristics. These characteristics included descriptions of landforms, climate, agriculture, and historical changes in environmental quality (e.g., water pollution). After first describing these landscape characteristics, most key informants proceeded with descriptions of people, cultures, and/or social characteristics often related to factors associated with changes in local populations.

Regional descriptions provided by informants were often functions of perspectives associated with their jobs. Farmers, university personnel, watershed association and/or environmental employees, and federal agency employees, by greater than a two to one margin, described their watersheds in terms of landscape—topography, soils, cropping systems, water resources, and/or hydrology. Unlike most other groups interviewed, local agency personnel, as well as residents, routinely described both their watershed's landscape and the people living within it as unique. In addition, local agency personnel often referred to universities within or near the watershed as having an important influence (Arkansas, Idaho, Missouri, Ohio, Oregon, Pennsylvania, and Utah).

Local businessmen and women described the people slightly more than they described the landscape. Elected officials all described their watersheds in terms of development or changes (changes in business, electorate, etc.) that were occurring. These changes were often discussed in a watershed context, especially where such shifts were from agricultural uses to those associated with suburban uses. This was particularly the case in Arkansas, Indiana, Missouri, and Utah. Soil and Water Conservation District personnel gave inclusive descriptions of their watersheds and tended to focus on landscapes, people, and development.

(c) SWCS. For Individual Use Only

Some watersheds had distinct themes. For example, almost every respondent in Indiana discussed the changing landscape of the Eagle Creek Watershed as it moved from agricultural to urban uses. Likewise, most of the respondents in Arkansas discussed a shift in land use from agricultural to suburban. The farmers in Cheney Lake Watershed in Kansas had a relationship with each other to protect the reservoir. The Cheney Lake Watershed Association had a working relationship with farmers in the watershed and the City of Wichita. There were agreements in place for the City of Wichita to pay for conservation practices and other things to help the farmers protect the watershed. These relationships between the three groups in Kansas were more pertinent than either the landscape characteristics or information about the people living there. In both Nebraska and Ohio, increases in farm size were frequently noted as important watershed characteristics.

Many key informants noted the importance of farming to their communities or watersheds. An interviewee in Nebraska shared the following:

> Agriculture is a huge driver for the community here. Grand Island is built around it. Case International has its manufacturing center here. Swift has the meat packing plant, and even the Chamber of Commerce, we have an agricultural committee that deals with ag-related business issues. We try to facilitate recognition and awareness about agriculture to local schoolchildren and the public. We even organize an Agricultural Day; it's a local event to show appreciation for agriculture. We usually invite a speaker from a local ag business in the area to talk, and many ag corporations sponsor it.

Conversations about the importance of agriculture were also found in other states. For example, a farmer in Oregon noted that the state's climate allowed for a diverse range of crops to be grown, making his watershed "special." In contrast, almost everyone interviewed in the Iowa Project described the location as "typical agricultural corn belt" or as "corn and beans" farming systems.

In other areas, agriculture was still viewed as important but was being affected by recent trends often associated with urban sprawl and/or development related to rapidly growing populations. As a result of the population growth and accommodations, agriculture had begun to decline in importance and prominence in the community. A local agency official in Utah said,

> Agriculture is dying. Agricultural producers are retiring, and the next generation does not want to farm. Most farms are going into development because land is selling for US$15,000 to US$40,000 per acre. Population growth is mostly internal due to the large family size and children wanting to stay in area. There is also back migration of older children. Upper-end homes are being built due to research and development firms in valley.

Oregonians shared the idea that urban pressures were changing agriculture, as did everyone interviewed in Arkansas. However, this trend was not universal. While people in Iowa and New York mentioned some pressure, they still considered themselves agricultural populations.

Other developmental trends were associated with a decline in the number and viability of smaller farms. Such farms were being displaced by larger commercial farming enterprises. An Ohio farmer noted,

> [In the past] every farm had ten cows, and pigs, and so forth. And, due to economics and so forth, they've developed into larger and larger farms and fewer and fewer farmers, and the livestock operations that are left in the area, for the most part, are large operations. We farm about 1,200 acres over about 20 miles. I would call ours a large mid-sized farm. Then there are many around that are multiple thousands [of acres in

(c) SWCS. For Individual Use Only

> size], and then there is quite a few farmers that work in town and do two or three acres. Most farmers probably have another source of income. I'm probably one of the few who makes his whole income in farming.

Beyond descriptions of agriculture, key informants often talked about other place-based biophysical indicators. Most offered localized geographical descriptions. For example, in the New York Watershed, an elected official remarked about his location in the Catskill Mountains. He said,

> Well, we are kind of unique geographically, in that we seem to be in the middle of nowhere; we don't belong to one region. We are part of upstate New York. We are part of Catskill Mountains. We don't fit into southern tier, which only a small fraction of our county fits. We are the size of Rhode Island. We are unique in terms of agriculture and our natural resources base. We are a subsource for the Delaware River system; we are not the headwater for the Susquehanna, but some of the major tributaries in upstate New York feed into the Susquehanna system. [We are] heavily forested, with high quality native hardwoods. We also have quite bit of bluestone in the area … our extraction history goes back 100 years, and agriculture has a long history tied primarily to producing agricultural machines and milking Jersey cattle. However, many of the area farms have been in decline since the 1960s.

Such biophysical descriptions were sometimes tied to concerns about watershed conservation. For example, in Pennsylvania, the watersheds' Karst topography, while biologically rich, was also described as vulnerable to pollution or contamination. A respondent said,

> Physically/structurally, the Karst topography, is not totally unique, but it is special. It has its own issues and sets of problems. Some good things and bad things that people have to learn to deal with in different ways. Good things about Karst—[it] tends to produce streams that are groundwater dominant. They are very stable (chemically) and productive because of the limestone geology. Groundwater dominance tends to make them more drought tolerant. They have less flashy flows—higher base flows and lower peak flows, whenever you get storms. They tend to operate this way as long as the stream is not disrupted, but they are easily disturbed with land activity because of sink holes and quick connections—fractures in the rock that will produce things in the stream very quickly. If you make a disturbance here, things can travel like a river underground.

As conversations progressed and key informants were asked about their perceptions of people and culture, new descriptions emerged. In most areas, respondents relayed positive aspects of life. Some of the qualities key informants were quick to note were those usually associated with rural people or resource-dependent communities, including conservative, hard-working, traditional, friendly, supportive, religious, and close to family. In Missouri, a key informant captured some of these qualities. He said,

> I think you will find this is a pretty traditional, conservative community. It's a very family-oriented community. We have a lot of people who go away to school, work outside this area for a while, but when they decide to have children, they come back home to raise their children.

In some areas, life was affected by what one key informant in Oregon referred to as "a cornucopia of folks." In some watersheds, such as the one in Kansas, interviewees referred to

(c) SWCS. For Individual Use Only

historical settlements of nationalities that affected farming practices and attitudes. In Oregon, the "cornucopia of folks" referred to generations of Irish and German descendants, but a sizeable population also came from other states, such as California. In some areas experiencing growth, these new residents brought different beliefs and attitudes. Such differences had mixed impacts on life in these areas, especially in terms of views associated with natural resources. A local government representative in Missouri captured what he considered a problem with the influx of newcomers. He said,

> People are friendly, but bring in the city philosophy, and we have issues with newcomers. One guy built a large lake on his property, didn't get a permit, and he flooded the fields of his neighbor. Those people don't care; they think it's the wild west, and they can come here and do what they want. There are concerns with trespassing, people going on people's land without getting permission. The increase in land prices due to newcomers is a concern throughout the state, not just here.

A government employee from Nebraska noted similar issues about a growing immigrant population that had relocated to the area in search of employment. He said,

> There has been an influx of immigrant populations to the area for jobs at the meat-packing plant. The influx of immigrants to the area for jobs at Swift has been the case for 15 years. It has been a challenge, especially in schools, because of the language barrier. There has been an impact on crime. New people sometimes don't follow rules and laws, and that's a problem.

Similar views were found elsewhere. For example, in Utah, tensions between established residents and newcomers, especially Latinos, were increasing. An interviewee explained the situation by saying,

> There are some folks from outside the area, and those from the area have some concerns about that. Tensions are rising, there has been a large migration of Latinos to the valley. Many work at the meat-packing plant that suffered a big raid two years ago. Articles about Hispanics are not appreciated—even those that focus on academic achievements (like the valedictorian being Hispanic).

However, other interviewees in Utah noted that most of the population growth was fuelled by local, younger generations wanting to stay in the area. The majority of the population is Mormon, and population growth, in general, is high due to their large family sizes. One of the interviewees stated that the area's population growth was caused by "our own" children.

Question 2: What Are the Most Critical Water Quality Concerns in Your Watershed?

When asked their thoughts about the most critical water quality concerns in their watersheds, responses generally fell into one of two categories: sedimentation and chemical runoff due to agricultural production, and runoff from urban landscapes as well as the lack of sewage treatment facilities to accommodate rapid growth. The most frequently mentioned concerns arose from nonpoint source pollution associated with agricultural production. This is not surprising because most of the NIFA–CEAP sites selected were in predominantly agricultural watersheds. In such areas, the chemicals most often noted as being highly problematic by respondents included nitrogen, phosphorus, and in two watersheds, herbicides. When asked her thoughts

(c) SWCS. For Individual Use Only

about critical water quality concerns, a government official in Missouri provided insight into how difficult pollution source identification could be. She said,

> I was concerned that as a part of their [University of Missouri] research they [researchers] might identify something that the city was doing that was contributing to the degradation of the creek. That hasn't appeared to be the case. But, it seemed to me like very quickly the focus became fertilizers and pesticides, and therefore, it wasn't something that was coming from the city.

In watersheds, such as Cheney Lake, Kansas, Cannonsville Reservoir, New York, and Lincoln Lake, Arkansas, where cities were involved with watershed protection or where there was threat of a potential lawsuit, most interviewees understood the water quality problem(s) of concern better than in the other watersheds. For instance, in Kansas, all the farmers stated that sediment and phosphorus were the water quality problems of concern. These three watersheds have had highly focused, long-term efforts to protect water quality. Furthermore, two of these watersheds (Kansas and New York) were working closely with the cities (Wichita and New York City) that used the reservoirs for drinking water and were funding conservation practices in the watersheds. In addition, almost all key informants in Nebraska identified the pollutant of concern (nitrate) correctly because of a long-term, intense regulatory, educational, and research program designed to reduce nitrate in the groundwater. Mixed-use watersheds, such as Eagle Creek, Indiana, and Spring Creek, Pennsylvania, had the fewest number of people who could directly identify the primary pollutants of concern.

In some of the watersheds, active efforts were underway to identify the sources of the pollutants. Much of this work revolved around determining the pollutant source, such as agricultural lands, stream banks, or residential subdivisions. An interviewee in Indiana explained the research vital to pollutant source identification:

> It's a highly polluted system in terms of nutrients. We have big nutrient signals. We have a lot of nitrates coming out of ag land areas; we have a lot of phosphorus problems in the urban areas. We've been trying to isolate those signals. So we take water quality [tests] coming out of tile drains and agricultural fields. We've been taking water quality from storm retention ponds in residential areas, trying to get a handle on how storm water is influencing [water quality] and how we [can best] handle storm water. So definitely, [we have] a nutrient problem; and we have a huge *E. coli* problem. Most of the streams are listed for *E. coli*. But, I would say one of our bigger challenges is atrazine; it's a corn herbicide, and that comes down at some pretty high levels in the spring runoff that causes some concerns for the drinking water supplier.

While all the watersheds shared concerns associated with consistent and long-term nutrient losses to water resources, others mentioned improvements in water quality, resulting from management programs. Such programs helped farmers reduce, for example, the amount of fertilizers they used on their agricultural lands. A key informant from Nebraska, who worked for a federal agency, explained the reduction. He said,

> Nitrate levels in the groundwater have been a problem, but it hasn't been a problem for the last 20 to 30 years due to nutrient management and irrigation water management. Fertilizers and nitrates leach into the soil from the irrigation. That was a bigger issue 20 years ago when fertilizer was cheap, and irrigation techniques were based

(c) SWCS. For Individual Use Only

> on heavy flow. Now, the Nebraska Natural Resources District and the USDA Natural Resource Conservation Service to monitor nitrate levels in the soil. We have programs that correct the issue; we have several cost/share assistance programs with farmers to help monitor nitrate levels in the soil. Farmers report to us what they apply; we set the guidelines for ideal nitrate levels based on NRCS and University of Nebraska-Lincoln guidelines. See, they have certain phase areas where higher nitrates are a problem, and the guidelines for levels are based off of those phases.

Despite the efforts of management programs, in some of the watersheds, the perceived costs associated with using nutrient and pesticide management were seen as an impediment to farmers. A respondent in Missouri explained that it was easier for farmers to understand nitrogen management as the cost of fertilizer and yield benefits were more readily apparent than management of herbicides. Here's the quote this respondent used to explain:

> But the nitrogen issue is trying to be addressed and can be addressed better because its [a] cost-benefit—you know, and you want to get a yield. So, they're going to try to help put the nitrogen on. So, there's a little more cost incentive for farmers to do that. The pesticide, I think, is harder to work with because of this, you know, you put it on for weed control and even the farmers are thinking they're not using atrazine; it's atrazine, but it's mixed with other things, but it's still part of the mix. It's so cheap relative to the other alternatives and it's broad and it controls, covers a wide suite of weather conditions. The alternatives are more expensive and not as effective. You can get some bad years where you don't get weed control, so, of course, the manufacturers are going to package it.

Although conservation management programs had targeted nutrient reduction from agriculture in many watersheds, some watersheds determined nutrients affecting water quality were associated with rapid growth and development, rather than agricultural activities. In these places (Arkansas, Indiana, and Pennsylvania), ever-increasing numbers of new residents strained existing infrastructure and caused overload of existing sewage treatment facilities. In some watersheds, wastewater treatment facilities were very primitive and needed important upgrades. State personnel in Pennsylvania offered the following views on this phenomenon:

> Wastewater [is the] biggest issue, and long term, we don't have a big river to just dump things in. Instead, we have a high value stream, so we are limited by what we can discharge. The community is putting a lot of money in treatment. It's in the [news] paper that they are getting hit pretty good with increased cost. People will start to be charged a lot for wastewater around here, and it will only go up.

Elsewhere, growth and development led to sedimentation and runoff. For instance, a representative from the Agricultural Advisory Board in Utah noted problems associated with runoff from expansion of asphalt surfaces. "The water doesn't have anywhere to go. It can't seep into the ground," he said. In Ohio, the most critical watershed concerns were thought to originate from mixed causes. A project team member summed up this complexity. He noted,

> Hydrological patterns are different due to farming practices. Farmers have altered the way water runs off the land. Thus, sediment is a big problem and has worsened with human influence, even though heavy sedimentation was always a natural event. Now, nutrients and pesticides run off the farm fields, making these the most critical direct source of water quality problems. Second is bacteria—also a problem due to old septic

(c) SWCS. For Individual Use Only

> systems and systems that directly empty into the river. The septic issue is prevalent both in many towns as well as rural areas.

An interviewee in Indiana pointed to other pollutants of concern, especially those associated with inadequate infrastructure. She said,

> … I would say that *E. coli* is one of them, and of course, there's speculation on what the sources of that are. I think some of it is either failing septic systems or direct pipe to the ditch hookups. I think we have a number of wastewater treatment plants performing less than optimal.

Some watershed residents were more concerned about water quantity than water quality. This was particularly true in Utah and Oregon. In Oregon, a county employee noted State Measure 37 had resulted in increased development at the cost of water capacity. State Measure 37 reduced restrictions on private land use, which led to rapid development of previously undeveloped farm or forest land. This subsequent development allowed for increased water use.

Understanding of water quality problems differed dramatically across constituencies. Federal agency personnel understood the pollutants of concern and water quality problems better than any other group; 83% successfully identified the problem. Soil and Water Conservation District personnel were able to identify the problem correctly 67% of the time. Farmers, people working for watershed associations, and university personnel were similar in their understanding; 70% correctly identified the problem. Local agency personnel and local residents correctly identified the water quality problem at a level of 60%. The two groups that were under 50% identification of the correct water quality problem were local business men and women (41%) and local government representatives (17%).

Question 3: Many Factors Make Conservation Practices Work or Not Work. Given Your Experiences, Which Conservation Practices Are Being Used in This Watershed? Which Ones Work Best? How Would You Measure the Success of These Practices?

When asked about conservation practice use, participants spoke mostly about terraces, grassed waterways, conservation tillage, and improvement of local sewage treatment facilities. The most frequently mentioned conservation practice was no-tillage or conservation tillage. Historically, tilling and preparing a field for planting was a necessary task for farmers. One farmer even commented on how a sense of pride was associated with how well one prepared a field. As scientists became more aware of soil loss from wind and water erosion and technologies changed (e.g., no-tillage planters, new herbicides such as Roundup, and genetically modified seed), the USDA Natural Resources Conservation Service (NRCS) and others placed greater emphasis on farmers moving to adopt conservation tillage as a means of conserving soil. Key informants said that conservation tillage had been increasingly adopted by farmers. A farmer in Nebraska noted tillage trends in association with changes in irrigation practices:

> If we look at tillage, it's gone from disc chisel conventional tillage, basically, to ridge till. Now I'm seeing, with pivot irrigation coming in, there are some going to no-till situations. It's kind of followed the development of irrigation.

The benefits of conservation tillage were easily observed by farmers, who could see its benefits. A state employee in Ohio shared his observations on this trend:

(c) SWCS. For Individual Use Only

> The big, the million dollar practice in the watershed is obviously conservation tillage. And, by conservation tillage, I'm talking about practices that leave residue on the surface year round, and in some cases, it's a mulch tillage system which is used with a chisel plow which only buries a portion of the residue. In other cases, it's planting no-till directly into last year's crop. But probably over 70% of the watershed is in conservation tillage now, compared to almost nothing when Heidelberg [University] started monitoring in the late 70s.

For many farmers, visual indications of pollution abatement (e.g., less soil erosion) were important for increasing adoption of conservation practices. Because sediment is such a visible pollutant, many of the conservation practices found in these watersheds during the site visits focused on sediment and erosion control.

Other key informants, such as one in the Missouri Watershed, spoke of the multiple practices used in conservation in addition to conservation tillage; conservation practice systems are often critical to reducing a given pollutant. A district conservationist listed three distinct efforts used in erosion mitigation. According to him,

> Actually, I'd guess you'd say there's three. Grass waterways of course… those are used to halt gully erosion problems and also serve as terrace outlets. The second practices would be terraces that terrace a field and release the water into grass waterways once they are established. And the third practice we have in that area, and it showed on the map, would be the underground outlets. Those are also used in a terrace system to take the water out of the terrace channels, take it down to a lower elevation, and release it. So, those are three main ones. The grass waterways, once they have the big gully erosion problem solved, then they use the terraces to come in and solve the sheet and rill erosion. Then in combination, you'll have terrace systems—some of the water dumps into a grass waterway and then some of it goes into an underground outlet.

Several of the scientists working on the Missouri project noted, however, that the underground outlets did not reduce soluble nutrients or herbicides; in fact, they may have increased soluble chemical losses.

In watersheds with significant changes in elevation or wetland soils near streams, conservation practices, such as riparian buffers, stream fencing, and stream restoration were frequently used. In New York, a farmer spoke about some of these practices:

> On the stream program, we've done quite a few. We've planted some willow wattles, and we've done some shaping … willow wattles are willows that we lay down in bunches. And we've had varying degrees of success. We've tried planting them in the main structure of the river, and it was successful in one stretch of the river, but in another area they undercut and washed away before they had a chance to get well established. That river is going to move unless you can really get it the way you want it.

In several watersheds (Georgia, Kansas, and Ohio), however, interviewers heard almost identical responses from farmers concerning riparian buffers: "No one makes money on buffers because they take my most valuable land out of production." A farmer in Ohio decided not to rent land because so much of it had been placed in a riparian buffer program that the amount of farmland remaining was too small for his effort. In addition, it was noted that buffers take time to become established.

Besides riparian buffers, the second practice most often described in negative terms was nutrient management. Agency personnel in one watershed simply stopped writing plans because

(c) SWCS. For Individual Use Only

the project personnel knew the plans were not being followed. A farmer in Nebraska mentioned that farmers just hated to add too little nitrogen. An extension employee noted that manure management plans were hard to implement because farmers just could not see their benefit for the amount of work required.

In other watersheds, transitions to different and nontraditional methods of management were met with criticism. In Oregon, for example, a farmland ban on burning fields will be fully implemented, which will cause problems for farmers of grass seed who rely on this cultural practice to control diseases and insects. A car accident caused by a smoke plume from a field drove this decision at the highest level of state government—the governor. Education programs were offered to entice farmers to harvest the straw in their fields instead of burning them. There was little interest in conservation tillage, although this is the only alternative to hay production, and many feared that it would result in an addition of chemicals to prevent weeds and insects. Moreover, concern was raised by several of the informants over the level of dust associated with the spreading of chemicals and working of the fields required without burning. The key informants in this watershed were very skeptical of the value of such tradeoffs over the long-term.

The economic returns were perhaps the biggest determinant for which conservation practices were adopted. While farmers professed the importance of conservation, there was a strong, consistent message that it had to be cost effective and convenient. As one Oregon farmer put it, "Conservation competes with the time he [the farmer] could be using to make money." Many conservation practices were perceived as additional expenses, with no immediate chance of making a return. Most people expressed the need for the government to offer cost-sharing that covered a significantly larger share of the installation or implementation cost than was currently available. An environmental interviewee in Ohio spoke about this:

> One of things is always economics. That always hits the top of the list of everything I can think of. If the farmers don't see the economics behind it, then they're not prone to even give it a try. So that always has to be our first method of sale or at least we have to connect that with the other benefits.

One interesting complication was that high crop prices competed with conservation because farmers needed to focus their land and time on earning money when times were good. The study found that when commodity prices were high farmers tried to squeeze every penny out of every piece of land by applying more nitrogen or putting set-aside lands into production. This stood in stark contrast to another notion the NIFA–CEAP synthesis team heard—that farmers tended to implement more conservation practices when they had more money. Perhaps, it is a question of wealth versus income. A high price provides income, which needs to be seized when available. However, wealth is a long-term accumulation of income, which may be seen as more consistent with long-term investments, like conservation.

A local agency key informant noted that conservation practices were a business decision; therefore, cost share and technical assistance were insufficient if the practices did not help farmers financially or managerially. A businessman stated this differently: "Conservation practices fail because paperwork is frustrating, money runs out, and agencies want to replace a 'Chevy' with a 'Cadillac'."

Other difficulties in adoption resulted from farmers' views on guidelines. In Georgia, Idaho, Iowa, Kansas, and Oregon, for instance, USDA NRCS practices were seen as "too rigid" and overengineered, which discouraged adoption. One farmer mentioned that no-tillage leads to

(c) SWCS. For Individual Use Only

compaction 100% of the time, in addition to reduced yields. He wanted the USDA NRCS to be flexible and occasionally allow tillage. Nutrient management was the one conservation practice that was considered too rigid or time consuming by many farmers. As one watershed key informant said, "Nutrient management was a failure. Some folks cheated the system, and some just wouldn't sign up. Farmers want to brag about yields and not return on investments."

Beyond bureaucratic obstacles, public "buy-in" was also a concern. Many key informants provided understanding regarding problems surrounding public participation at educational events and the reluctance of adopting programs that offered no short-term observable changes. A key informant in Indiana offered insight into this situation for urban conservation practices:

> The town of Zionsville just passed, two months ago I believe, a wise-use water conservation ordinance. There are communities in Indiana and across the country that have fines for violating in times of drought. It's a very contentious issue. They tried to do that in Brownsville or Avon, and people just rose up and threw out the town council 'cause they weren't going to be told when they were going to use water and when they couldn't. And, the other thing that people don't understand is that when there's a drought, the pressure drops, and when you have a fire, the guy goes to hook up a hydrant, and he gets a trickle out of the hydrant, your house burns down. And people think we're crying wolf about this water thing, but well, it's going to land on their porch some day and it's not going to be pretty.

When asked about measuring success of conservation practices, participants pointed to how readily new practices were adopted—for example, conservation tillage practices. In Ohio, almost all farmers had adopted conservation tillage within two to three years of John Deere introducing the "green" no-tillage planter. The rapid adoption did not occur due to government programs or zeal about conservation tillage, but rather, because the farmers trusted the agricultural manufacturer's product.

In addition to the adoption of certain conservation practices, key informants also spoke of how certain conservation practices were monitored. For instance, in Nebraska, one state employee noted the importance of soil testing and repeated measurements on farm fields so that farmers had continuous records. In addition to these methods of monitoring conservation progress, he indicated there were regulations and certifications for operators and farmers. He said,

> Soil testing annually is important. Keeping good record of yields and applying some factor to increase yield potential. Fertigation is efficient as long as things are in place to be sure it's done properly. That is regulated because there is risk. Wells have to be equipped with backflow protection. Operator has to be certified. Any chemigation, the operator has to be certified. Water meters are another tool. Usually farmers put too much water on. Furrow irrigation was bad for that. The crop requirement might only be 15 to 20 inch per acre per year. Another tool is application uniformity.

In other areas, water resources were tested and monitored, providing a quantitative assessment of trends. In Ohio, information based on water quality data from the Water Quality Lab at Heidelberg University was disseminated to the public and was often cited to indicate improving trends. In addition to water quality data, some informants—particularly those working in the field as opposed to offices—used visual cues to measure success. For example, a state employee said,

(c) SWCS. For Individual Use Only

> I drove this watershed 20 miles to work every day for 36 years, so I was out there when the storm events hit, and I could see the runoff and the silt bands. Heidelberg [University] has the gage data, but I have the visual memories of having seen the effects of having cover on the soil and not having cover, so I am a 100 percent believer that conservation tillage is the most important thing that has happened to conservation in the last 30 years.

Several projects were located near universities. In these instances (Georgia, Idaho, Missouri, Oregon, and Pennsylvania), university personnel were credited with conservation practice education and increased implementation. As an example, key informants interviewed in Spring Creek Watershed routinely cited the role of the university (Penn State) in conservation and water quality monitoring. A key informant described this relationship:

> We have the university here, so people are always trying new things, people are interested in the issues. This watershed, Spring Creek, is the most instrumented watershed in the state. The Spring Creek Monitoring project started in '98 monitor[ing] surface [water], groundwater, and water quality in several places along the creek. It keeps an eye out for issues and offers early detection should there be a water quality concern or change.

Conservation planning organizations need to better understand the human dimensions of conservation practice implementation, usage, and maintenance. This is one of the most vexing and difficult questions to be assessed. As part of the questioning on conservation practice implementation, the authors asked key informants about factors that made conservation practices work or not work. The reasons they gave were numerous.

Answers from farmers were the most insightful because they are the end users. As one farmer from Kansas stated, "Farmers make conservation practices work, and if he [farmer] isn't interested, they won't work regardless of whether the land is owned or rented."

Farmers noted that conservation practice implementation was more a function of lease length than whether the land was leased. Farmers stated that conservation practice adoption depended on whether the practice could save time and money. Conservation tillage was often mentioned as an example because farmers believed it saved time, labor, and money. Further discussion of this concept indicated that farmers, too, wanted leisure time to fish (Utah), play golf (Idaho), and/or attend their children's sporting events (Iowa). A Nebraska farmer mentioned that if too much management was required, as is the case with moisture meters, farmers simply would not use the practice. An Idaho farmer, who strongly supported conservation efforts, was unable to change to conservation tillage and the reduced labor that went with the new tillage system because it would have meant firing his brother and neighbor. In urbanizing agricultural regions, such as Indiana, farmers were not installing conservation practices because they intended to sell their farms.

Another complaint encountered regularly revolved around the inconsistent and often conflicting messages and agendas that attended the range of government agencies involved in conservation practices. For example, participants in one region complained that the conservation tillage residue standard was not high enough, while residents in another region complained the conservation tillage standard was so high that farmers could not possibly attain the residue standard needed for cost sharing.

Other issues that reduced conservation practice implementation were insufficient technical assistance and insufficient funding. Multiple key informants, including farmers, government

(c) SWCS. For Individual Use Only

employees, Soil and Water Conservation District personnel, local business men and women, watershed association employees, and federal agency personnel cited these two factors frequently. A key informant working with a watershed associate noted that technical assistance needed to be local. Numerous key informants noted it was a local trusted official from extension, soil and water, or the USDA NRCS that made the difference in a farmer's willingness to adopt conservation practices. Unfortunately, retired local or federal key informants recognized that technical assistance was less available due to changes in funding and changes in the priorities of agencies. A retired citizen put it this way:

> I say that because a lot of the USDA programs became so program driven and administratively heavy—that's one of the reasons I retired. I didn't feel like I could continue to serve our customers with enough technical information because the agency was demanding so much administrative work, and I felt it was a waste of my time to be in front of the computer putting all this information in to making nice maps and not helping the customer. Now if you're selling insurance you got to continue to serve your customer. You got to take care of the paperwork but it's over board, unnecessary. The best conservation plan I ever wrote, I put a little map on one side, turn the sheet over, write what he was going to do, when he was going to do it, and put it in the folder. Give him a copy, and usually just a discussion there in his pickup truck or his house was enough to get him going. I had documented it, it was in the folder, we could record it as progress, and all that. Now you'd have to have a laptop and all that and be proficient in the programs. I want to emphasize that. It's overkill now. Like grass water. This guy wanted some grass water so we did it. And the contractor came in to construct it. Now you have to model everything first on the computer. And when you come out to meet with the contractor, he seldom needs it. He wants to know what the grade is, where's the center line. And all that and he takes off. There's too much of these internal needs, and its overkill. I'm not saying they're not nice. But they're just not always necessary with the limited resources and staff we have to work with our customers.

This same sentiment about the USDA NRCS was stated by a key informant linked to a watershed association: "Office of Management and Budget turned the NRCS into people that implement programs rather than solve problems."

Similarly, federal and local agency personnel stated,

> There's a problem working with NRCS because of their restrictive rules about data. This hinders discussions with peers. (You) cannot create good working relations with the rules. Further NRCS employees need more training to simplify the legal entities for farmer payment. NRCS should change the structure of its organization because the expertise of its employees is not being used.

Maintenance of current practices was recognized as problematic, as were changes in agricultural practices that led to a need to rethink particular conservation practices. A watershed coordinator stated that "[We] need to help people understand why they are doing what they are doing. If people don't have a buy-in to the practice, they will not maintain them."

(c) SWCS. For Individual Use Only

A university employee working in the same watershed gave a perfect example of why it was important that people understand these conservation practices:

> There's a disconnect between practice implementation and the use of the practice. For example, they put a sediment trap and buffer next to the stream between a feeder to trap the runoff. The farmer moved the feeder to the side and below the buffer so now there's no reason for the sediment basin and the cows are in the stream.

Lack of maintenance may have also stemmed from changes in who was managing the farm. A university employee noted,

> We have had some NRCS and soil and water people working here for the last 20 years. They worked with the original farmers when they started, but they have not come back to talk to the sons to determine whether they are keeping up other practices where the funding ran out. Funding for practices lasts 10 years and it's gone.

Some key informants mentioned that terraces needed to be reconfigured to accommodate larger machinery and that cost share should be available for this. In some regions, terraces and grassed waterways were being pulled out because conservation tillage was so effective.

A farmer in Idaho had a novel approach to conservation practice adoption:

> Contracts should be more flexible to increase conservation practices. For instance, a farmer can try a practice on a one-year trial on 100 acres. The risk should be shared with the farmers. If producers like the practice, they adopt, but if not, they don't. Let the farmer try the same practice several years later, and again, help pay for it. Reason for this is that sometimes producers try practices and if it doesn't work, producers don't have a chance to try again. Sometimes farmers try on a whim and it doesn't work.

The most revealing comment about adoption of conservation practices came from a farmer key informant who stated that "federal commodity support has also dampened adoption. It has kept people farming but hasn't made them change—either no pressure or lack of resources."

Question 4: What Type of Educational Assistance Is Available to Help People Learn about Appropriate Conservation Practices?

There was a great degree of variation across regions when it came to where people obtained information, probably reflecting the relative effectiveness of different government agencies charged with helping promote conservation. The positions held by the key informants also determined the sources of educational assistance.

Typically, when farmers were asked about educational sources related to conservation practices, the most frequent source of information was other farmers, either because of informal relations or implemented farmer-to-farmer programs. The USDA NRCS, Soil and Water Conservation Districts, and extension were sometimes mentioned as a key source of such assistance for farmers. Self-research, magazines, grower meetings, and demonstrations were also mentioned.

Many of the farmers no longer considered extension or the USDA NRCS to be credible sources of information nor did they generally find watershed groups helpful. However, there were two exceptions where watershed groups provided useful educational assistance: the Cheney Lake Watershed in Kansas and the New York City Watershed. These watershed organizations were farmer-led and were very well funded by Wichita (Cheney Lake Watershed) and

(c) SWCS. For Individual Use Only

New York City (New York City Watershed). Farmers' responses about the USDA NRCS ranged from, "NRCS is a hindrance," "NRCS does a good job of nutrient management plans, but not everyone knows they are supposed to use them," "NRCS people don't know the programs—they are more interested in showcasing special projects," and "Money and time would be better spent on local people to demo no-till drills, for example, than on expensive small projects."

Several farmers noted that extension was either no longer represented in agriculture or that the organization was behind the times. As one farmer put it, "Extension was good 10 years ago," and another said, "Extension no longer does ag; they do community outreach." Another farmer key informant put it this way:

> I think they [extension] have gone to groups now—one [agent] per four counties. The university had to cut that a lot. They used to have really good field days. Now none at all. I do miss that. Tough budget times and that's something they cut down on. I do miss that because it was practical information they would show us in those field days.

In Ohio, a farmer, who was an early adopter of conservation practices, explained that his three greatest influences regarding conservation were his father, his interest in science and the environment, and a Soil and Water Conservation District specialist. Many farmers expressed a similar sentiment, only replacing "soil and water district specialist" with "extension agent," or "NRCS staff." What remained the same in all locations was the one-to-one assistance shown by these state and federal employees.

Although occasionally farmers noted the importance of extension, in only two locations was extension extremely important: New York and Arkansas. Each of these extension offices was extremely well-funded and focused on water quality management relative to the farm community. New York City provided funds for projects in the study area because it houses much of the City's drinking water. The project in Arkansas had extra funds from grants due to a very public lawsuit over application of poultry manure. The study area was able to hire a dedicated extension agent to work with farmers to implement conservation practices. Everyone believed this agent was key to the success of the program.

Extension's ability appeared to be closely linked to funding. One exception stood out. The Oregon extension agent, now retired but still assisting in the area, was lauded by nearly everyone interviewed. His approach was to link farmer to farmer when an issue came up, where possible, rather than to rely on university experts. That is, if someone asked about conservation tillage, he sent them to talk to someone that already practiced it.

Private sector key informants listed many educational sources for conservation practices, ranging from extension to Future Farmers of America, soil and water districts, the USDA NRCS, and from farmer-to-farmer. A private sector manager in Missouri stated,

> I think most of it [conservation education] comes in the form of reading. Most guys get letters from NRCS. They are in the FSA offices two times a year, and you know those type of programs are then presented to them, I think, there. That and word of mouth are probably the two basic ways that education is done.

Another businessman said that "Extension is not funded well enough because the Deans of agricultural universities have their priorities screwed up." This sentiment was common among many key informants, who noted that university extension, facing ever tightening budgets, was no longer delivering effective conservation education. This may, in part, be because extension has traditionally delivered agronomic information, rather than water quality information

(c) SWCS. For Individual Use Only

and conservation practices. In Georgia, one key informant noted university extension had only recently begun addressing issues of conservation. There was a general sense from all groups that lack of funding and resources were significantly hurting the ability of extension and the USDA NRCS to deliver education on conservation practices. A citizen and retired USDA NRCS district conservationist noted the importance of adequate conservation professionals working with producers for

> technical assistance, a delivery system, and economic benefit. But I think the most important thing is having people out there in the watershed to build a one-on-one relationship with the land user to deliver those practices and assistance, and all those practices don't do any good if you don't have enough bodies on the ground knocking on doors and building relationships, and it takes a repeat relationship. It's not like you're selling a computer, where you put it in a box and ship it out and you're done.

Government personnel clearly saw their educational roles as pivotal for conservation practice adoption and listed Soil and Water Conservation Districts, the USDA NRCS, and extension most frequently. Some, though, mentioned the private sector, and one stated that "the private sector does a better job than agencies."

Federal agency personnel believed extension, Soil and Water Conservation Districts, the USDA NRCS, the US Environmental Protection Agency, and the Fish and Wildlife Service were instrumental in education, although farmers never mentioned the US Environmental Protection Agency or the Fish and Wildlife Service. One federal agency key informant stated that he did not think direct mail was useful and that the USDA NRCS did not have the time to educate farmers.

University employees cited extension, the USDA NRCS, and Soil and Water Conservation Districts most frequently, followed by private companies and farmer-to-farmer transmission of information. These key informants also mentioned a reliance on pamphlets, magazines, demonstrations, and/or mailed brochures as methods of conservation program delivery. When asked his thoughts about this issue, a hydrologist in Nebraska had this to say:

> They learn through extension. They learn from magazines. There is a young farmer program, which is a pretty good. They have a good attendance. It is a program for young farmers. They meet once a month in the evening, and they discuss things. We've been introduced to the class by the teacher and using the class to start talking to them.

In addition, a farmer certification program run through the University of Nebraska and Nebraska's Association of Natural Resources existed in Nebraska and was rated as being highly effective in providing education to farmers.

Local agency personnel, which also included Soil and Water Conservation District staff, most frequently stated that extension, Soil and Water Conservation Districts, and the USDA NRCS were critical for the delivery of information, although a surprising number of informants did not know who delivered the information. Some also listed crop consultants, fertilizer dealers, and the Internet as sources of information.

Informants, such as extension agents and nongovernmental organization representatives, discussed the importance of individual attention to landowners. In Ohio, an extension agent gave special one-on-one attention to the farmer for many years. The farmer felt delivery had changed: "To [extension personnel], it's an eight-hour job, and to me it's a way of life. This is my home; this is my land, so we work whenever we have to." This farmer preferred local

(c) SWCS. For Individual Use Only

programs, such as those offered by the county farm bureau, which he referred to as grassroots. Such attention was provided in Arkansas and New York, but few places have the funds to repeat these efforts. In Oregon, a much-beloved extension agent was effective because he provided group education for motivation, but more importantly, because he put farmers with questions in touch with farmers that had already dealt successfully with that question. This farmer-to-farmer education was very effective and was facilitated by the extension agent. In Arkansas, all of the farmers interviewed credited the extension agent who was hired exclusively to work with farmers as they learned about and implemented nutrient management.

There was a mixed response concerning the effectiveness of meetings or field days for transferring conservation practice information. Many key informants suggested that meetings were not very effective for farmers. Farming has changed; the operations are larger and require more time or farmers also work off the farm. There is simply no time for meetings or field days.

Personnel in watersheds continue to use workshops for educational purposes. Many of these are directed toward urban audiences and youth. An environmental interviewee in New York said,

> We have done septic maintenance workshops for homeowners. We do those every year or every other year. We've also done workshops for contractors on installations of septic systems. We did a class last year for contractors who were interested in peat filtration systems, which are gaining in favor and are fairly new in this area.

She continued and emphasized that focus had been placed on youth education as a preemptive conservation measure:

> Our biggest education thrust is school-aged students […]. We have a grant program [that] gives about, this year, about US$150,000 to 28 teachers and schools and nonprofit organizations. In New York City and here [the New York City Watershed]. So we're attempting to make the link between the people and the stewards. So we're trying to reach those children who will be leaders in 20 or 30 years.

The goal of the program was to teach the future stewards about conservation and watershed quality preservation.

The Eagle Creek Watershed Association of Indiana had an educational program targeting elementary schools. In this program, students received information about conservation practices in the watershed. One respondent noted the schoolchildren were given the opportunity to plant native plants and, on alternating years, they removed invasive species. The education committee was optimistic that this program would have a positive effect on future generations:

> One thing we do every year is a water quality awareness day with these 5th graders and work with our partners at DNR, and we put on this really cool educational program, and we've had to turn schools away because we get so much interest in it. And we pre- and post-test kids when they come in so we try to measure those social indicator things, where you ask them a series of water quality–related land-use questions, and they go through the five different stations, and then we post-test them. So we try to, as much as we can, quantify, but I tend to be more encouraged when I see some of those other general social successes instead of the numbers, but people like to see the numbers.

The Eagle Creek Watershed Association also collaborated with the water education for teachers or Project WET (Worldwide Water Education) to reach out to teachers and local youth. Although

(c) SWCS. For Individual Use Only

farmers were reluctant to participate in similar programs, it was hoped that Project WET would eventually have a "trickle-down effect" and educate harder to reach groups, including farmers.

One of the most effective educational programs discovered was in the Cheney Lake Watershed, Kansas. Farmers in this watershed started a partnership with the City of Wichita by forming the Citizens Management Committee, composed of eight farmers in the watershed. The City of Wichita pays for conservation practices and positions in the local soil and water office. The Citizens Management Committee provides conservation education to their neighbors. Because this is a sociologically mixed watershed—Mennonites, Amish, German-descent, and "cowboy" types—the Citizens Management Committee ensures the make-up of the committee constitutes all of these groups so that education was provided to farmers by a farmer or rancher with whom they could relate. This program has been highly effective in conservation practice implementation. The group has learned, however, that spatial distribution of conservation practices matter and that practices need to be implemented in areas that contribute the greatest amount of pollutant(s). As a consequence, they have changed their approach to outreach by funding conservation that targets these critical areas.

Question 5: Were Conservation Practices Being Used Before This Project Started? Have Any New Conservation Practices Been Added?

When asked about how conservation practices had changed, including discussions of practices used prior to the project beginning, informants described few practices that were completely new. This is not surprising because the NIFA–CEAP was a retrospective project. The majority of respondents said most techniques had been practiced in a limited fashion over the last several decades. The main difference in adoption was the rate at which the practices were being incorporated into farm management.

Most of the people who had lived in an area for a long time, some for their entire lives, noted that the general environment had improved since they were children. In general, creeks seemed clearer, and the soils seemed to be healthier.

One driver of change was the Section 319 Grant. In Indiana, respondents noted that the Section 319 program had invigorated efforts of the Indiana Department of Natural Resources and other government agencies by promoting various conservation practices, such as no-tillage, buffers, chemical management, conservation tillage, grass waterways, minimum tillage, forest and hay land management, two-stage drain systems, fencing cattle out of streams, manure management, rain gardens, and education for youth previously not worked with, such as those from urban areas.

Technology and communication of scientific information has been an important driver for increasing the rate of adoption. A greater understanding of the costs and benefits associated with conservation practices has driven their increased usage. An agency employee in Ohio commented,

> Farmers are using more technology; they are much more precise now in their farming as far as preparing the soil, pesticides, fertilizers, etc. The equipment has gotten much better, making conservation practices easier and more practical.

Another informant noted,

> I think, in our county, initially when soil and water started conservation practice, good drainage and crop rotation was key. And now conservation practices have changed so they still have good rotation and water, but they have conservation tillage, nutrient

(c) SWCS. For Individual Use Only

> management, [and] manure management where necessary. There's more management and skills required now to carry out conservation practices probably than in the past.

Such responses were common among respondents, regardless of the specific watershed but tended to differ by the watersheds' particular conservation and farming practices. An agency employee in Nebraska shared his thoughts about the impact associated with technological innovation:

> Precision agriculture, GPS, accurate soils maps, and tests. You can apply the nutrients based on soil type and nutrients available. Computer in tractor adjusts app[lication] rate as you go across the field. Precision farming is on the way. It is in its infancy. With center pivots now—farmer turns on his pivots from his computer. Rain monitors—shuts pivot off so as not to over irrigate. Tech is improving, and prices are coming down.

One response given by most key informants was the effect the NIFA–CEAP had on increasing awareness of conservation practices. As noted, most respondents did not indicate any completely new practices as a result of NIFA–CEAP; however, many noted the project's influence on raising the general awareness among farmers and others. In Georgia, an environmental interviewee had this to say about the attitudes of farmers: "Similarly, row crop farmers are willing to learn, and they leave meetings, conferences, etc., with confidence they have better understanding of what they need to do and why; but they come to meetings for money in their pockets; they are production driven."

Similar thoughts were also heard in Utah, where one key informant spoke of the project being very successful in educating the public. However, in Pennsylvania, one project staffer noted the program had not been successful in reaching nonagricultural users. He said,

> There hasn't been that much for non-ag landowners, at least that we've been able to tell. One of the other confounding factors that's a problem or wonderful factor, depending on how you want to interpret it, simultaneous to us doing our work there, was the emergence of a number of potential municipal-level ordinances on water quality protection. I think Harris Township—I think they passed one. I know Halfmoon Township at least introduced one, and so there was a fair bit of curiosity about that timing that we were sort of walking around asking questions about willingness to adopt certain practices at the same time there were some policy initiatives. Right now, I would suggest that that policy landscape is still really, really underdeveloped for the nonag landowner.

The final point captured by the environmental interviewee in Georgia highlighted another difficulty of implementing conservation practices—economic concerns have been, and continue to be, the main drivers of conservation practices. Without cost share or other subsidies to provide incentives, many farmers were reluctant to engage in conservation programs. One of the cooperators in New York, who was very positive when he spoke about the virtues of conservation practices he had learned, was quick to admit he would abandon all but a few that made him money if subsidies were discontinued. One small livestock farmer from Missouri shared his thoughts about economic concerns and their impacts on conservation:

> Well, there's [pause] I'm drawing a blank, it's been so long since I worried about conservation. They rotate crops. You don't grow any more than what you can sell or need because it costs so much fuel. Fuel enters into everything now. People are more and more, that I know, are cognizant of their spray carry over. Spray being carried to your neighbors, like your spraying [of] bean[s] and it goes next door to corn or wheat, some-

(c) SWCS. For Individual Use Only

> thing more susceptible. But I haven't heard of anything. Once in a while, you have a provider for the spray company, MFA or something like that, would contaminate and spray the wrong thing. But that's just human nature. That's not a practice.

More difficulties with farmer retention in the program arose as a result of the difficulty in determining agency responsibility. In Idaho, one key informant noted how outreach had been complicated and confused by state agencies that did not understand the local structure, along with difficulties because of USDA NRCS bureaucratic structures.

Most interviewees noted the slow change in conservation practices over time that was related to a consistent effort to implement more conservation practices. Only split application of atrazine (Missouri) and fencing of Conservation Reserve Program lands were new practices adopted during the NIFA–CEAP. The atrazine recommendation arose from prior research by Agricultural Research Service researchers, and the Conservation Reserve Program fencing was implemented because the City of Wichita included the practice in conservation payments. Conservation adoption is a slow and steady march.

Summary and Recommendations

During the analysis of interviews, some common themes frequently emerged and subsequently aligned with key informant categories, regardless of geographic location. For instance, when asked their thoughts about what contributed to conservation education, farmers often spoke of their direct efforts to improve conservation practices and farmer-to-farmer exchange of information. When this same question was posed to key informants affiliated with university/extension, federal, and/or local agencies, the dissemination of information through agencies, such as the USDA NRCS, Soil and Water Conservation Districts, or extension was frequently cited. On the other hand, local agencies and watershed and/or environmental organizations tended to emphasize local workshops provided to end-users as a conservation education tool. These findings suggest that providers of conservation information should look beyond their own assumptions and find out how their intended audience hears the message best.

The interviews provided a clear indication of these respondents' perceptions of the first question concerning their understanding of their locations. Clearly, most understood and valued the importance of the land as evidenced by the frequency with which the respondents described their watersheds in terms of biophysical characteristics. Moreover, these characteristics were often tied to location by distinctive or otherwise identifiable landscape features that respondents considered unique to their watersheds. Local agency personnel and local business men and women more frequently described their watershed in terms of the people—origins, religion, differences, and similarities. Some watersheds were in the process of shifting from an agriculturally driven economy and land base to a more urban context, and these changes were noted in the watersheds where this transformation was occurring (Arkansas, Indiana, Pennsylvania, and Utah).

Water quality concerns differed by location, respondents' backgrounds, and whether the watershed had or was experiencing rapid growth. Respondents who worked for federal agencies, Soil and Water Conservation Districts, universities, or watershed associations and farmers were able to identify the water quality problem of concern correctly at least 70% of the time. Other groups did not do as well. In many farming-intensive watersheds, overarching water quality concerns tended to be aligned with agricultural runoff associated with crop and livestock production—nitrates, phosphorus, sediment, and occasionally herbicides. In other areas, especially

(c) SWCS. For Individual Use Only

those experiencing rapid growth, sedimentation and urban runoff outstripped agricultural runoff as the main concerns. New home development and road construction often disturbed the soil, washing it into nearby streams. In some watersheds, including those in Indiana, Utah, and New York, inadequate infrastructure to support sewage treatment had elevated concerns about *E. coli* associated with untreated sewage entering the waterway. Most notably, those key informants in agricultural watersheds with concerted efforts to protect water resources (Arkansas, Kansas, Nebraska, and New York) had the greatest knowledge of the water quality problem of concern.

Across all 13 states, key informants noted conservation tillage (or no-tillage) as the most frequently used conservation practice. In the agriculturally intensive locations where soil loss was of great concern, terraces, grassed waterways, and conservation tillage were the most prevalent and widespread conservation practices adopted and recommended by farmers, watershed representatives, federal and local agencies, and conservation education representatives. Other practices mentioned in such watersheds included irrigation management, nutrient management, and stream-side practices, including riparian buffer installation and stream fencing in pastures. Buffers and nutrient management were the most widely disliked practices, however.

Among key informants in less agriculturally intensive watersheds, efforts to improve infrastructure were frequently mentioned as some of the efforts undertaken to mitigate water quality concerns. Practices included wastewater treatment plant upgrades, sediment and erosion control from building activities, and stream restoration.

When key informants were asked about the conservation practices that were not readily adopted, responses focused on economic concerns, over-engineered practices to meet USDA NRCS standards, and inadequate conservation metrics. For instance, some farmers believe that the streamside fencing standard over-engineers the practice by requiring too many wire strands and posts. Generally, farmers were seen as reluctant to participate in programs with no apparent or direct economic benefit and, at the same time, tended to place emphasis on short-term results, which were often unobservable. Also, because farmers are extremely busy, the conservation practices suggested and promoted needed to reduce the necessary management time if they were to be readily accepted.

When asked for their thoughts about the kinds of educational assistance available to help people learn about and understand conservation practices, key informant categories determined the responses. Farmers most frequently stated that the majority of information was transferred from one farmer to another or by simply trying practices on their farms. Federal and local agency personnel and university employees noted the most frequent method of delivery was from agencies such as Soil and Water Conservation Districts, extension, or the USDA NRCS. Many key informants acknowledged that the effectiveness of these organizations to deliver education on conservation practices had declined due to reduced budgets and focus. A final step used to heighten conservation efforts was undertaken in the form of youth education. In Indiana, for example, programs had been introduced in local schools with the dual goal of youth conservation recruitment, along with the extension of information to traditionally hard-to-reach farmers.

When key informants were asked their thoughts and experiences concerning conservation adoption since the NIFA–CEAP program had been in place, respondents were unequivocally quick to note that most programs had already been in use prior to CEAP's implementation. Many key informants could point to specific instances of conservation measures undertaken by farmers as far back as the early 1970s. This is not surprising in that NIFA–CEAP was a retrospective program and was not expected to deliver new conservation practices.

(c) SWCS. For Individual Use Only

Finally, this assessment project underscored the need for key informant interviews to better understand the human dimensions of water quality relative to conservation practice adoption. A program's success is dependent on the perception of those directly affected by its directives.

From our analysis, the major findings suggest that conservation education and implementation can be improved with the following changes:

1. Developing better incentives, including funding, flexibility, and ease of management; and developing more convincing ways to demonstrate benefits
2. Improving educational channels by encouraging more interpersonal contact between conservation agencies and farmers and respecting the need to include farmer-to-farmer contacts
3. Improving communication, coordination, and program effectiveness among federal, state, and local agencies, and watershed/environmental organizations
4. Allowing more local control over how conservation funds are allocated

Other important lessons include the following:

- Watersheds that had a clear water quality problem, that were under regulatory guidelines, that were threatened with legislative solutions, or that were concerned about litigation were more likely to have greater conservation practice implementation, in part because resources were available to affect change.
- The success of conservation practice education varied based on the constituency group surveyed. For farmers, the most effective educational programs derived from farmer-to-farmer activities or dedicated extension specialists or Soil and Water Conservation District personnel. Dedicated extension specialists or soil and water personnel generally required additional funding.
- Conservation practices aimed at reducing soil erosion were more widely used and were better appreciated than other practices, such as nutrient management, riparian buffers, and stream fencing. The perception of these other practices was that they were too costly or demanded too much management.
- Conservation practices were a business decision. Without cost share or other subsidies to provide incentives, many farmers were reluctant to engage in conservation programs. Cost share, however, was not sufficient. Growers responded to the following:
  - Being able to easily see the benefits of a conservation practice (e.g., terraces and grassed waterways)
  - A perceived need for practices (e.g., can they see the pollution?)
  - Cost-effectiveness of the practice
  - Ease of use
  - How well they trusted the company promoting the practice (e.g., no-tillage planters)
  - How flexible the conservation practice standards were
  - Other factors, such as community norms
- Many groups noted the declining capacity of federal and state organizations, such as the USDA NRCS, Soil and Water Conservation Districts, and extension to provide technical support and education for conservation practice implementation. Respect for these organizations by farmers was being lost because the conservation practice human resource structure is eroding.
- Federal assistance/subsidy programs routinely supported conflicting agendas and resulted in farmers' lack of confidence in federal, state, and local government conser-

(c) SWCS. For Individual Use Only

vation efforts. Federal price support program goals often competed with conservation program goals.

References

Elmendorf, W.F., and A.E. Luloff. 2001. Using qualitative data collection methods when planning for community forests. Journal of Arboriculture 27:139-151.

Jacob, S., L. Bourke, and A.E. Luloff. 1997. Rural community stress, distress, and well-being: A Pennsylvania assessment. Journal of Rural Studies 13:275- 288.

Krannich, R.S., and C.R. Humphrey. 1986. Using key informant data in comparative community research. Sociological Methods Research 14:473-493.

Luloff, A.E. 1999. The doing of rural community development research. Journal of Rural Society 9:313-327.

Luloff, A.E., L. Bourke, S. Jacob, and S. Seshan. 1995. Farm and Non-Farm Interdependencies at the Rural-Urban Interface. Final Report to the Pennsylvania Department of Agriculture. University Park, PA: Department of Agricultural Economics and Rural Sociology.

Sherry, S.T. 1999. Getting the Lay of the Land on Health: A Guide for Using Interviews to Gather Information (Key Informant Interviews). The Robert Wood Johnson Foundation, in partnership with Brandeis University's Heller Graduate School and the Collaborative for Community Health Development. Boston, MA.

Tremblay, M.A. 1957. The key informant technique: A nonethnographic application. American Anthropologist 59:688-701.

(c) SWCS. For Individual Use Only