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The Iowa Nutrient Reduction Strategy farmer survey: Tracking knowledge, attitudes, and behaviors

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Background

In 2013, the state of Iowa released the Iowa Nutrient Reduction Strategy (NRS) (http://www.nutrientstrategy.iastate.edu). The NRS is a science and technology-based approach to guide actions that reduce the amount of nutrients delivered to Iowa waterways and the Gulf of Mexico. The NRS was developed through a collaboration between Iowa State University (ISU), the Iowa Department of Agriculture and Land Stewardship (IDALS), and the Iowa Department of Natural Resources, with support from the USDA Agricultural Research Serviceand the USDA Natural Resources Conservation Service (NRCS). The strategy outlines opportunities and recommendations for voluntary efforts to reduce nutrients in surface water from both point sources, such as wastewater treatment plants and industrial facilities, and nonpoint sources, including farm fields and urban areas. The NRS is engaging diverse private and public stakeholders from many sectors of urban and rural society, with a primary focus on helping municipalities, industry, and agriculture to reduce flows of nutrients into waterways. This report focuses on the agricultural sector. The NRS goal for Iowa nonpoint sources, mainly agriculture, is a 41 percent reduction in nitrogen loss and a 29 percent reduction in phosphorus loss.

Measurement of progress toward these goals is a central objective of the NRS. The measurement process is guided by a program logic model approach (Figure 1), which outlines measurable indicators of change. The domains in which changes are tracked are: inputs such as funding; the human actors whose actions can impact nutrient management such as farmers and private and public sector organizations; land use, nutrient management practices, and edge-of-field practices for nutrient load reduction; and, of course, the load of nutrients in Iowa watersheds. Iowa NRS partners are tracking changes in inputs, human dimensions, landscapes, and water quality that move Iowa toward NRS goals.

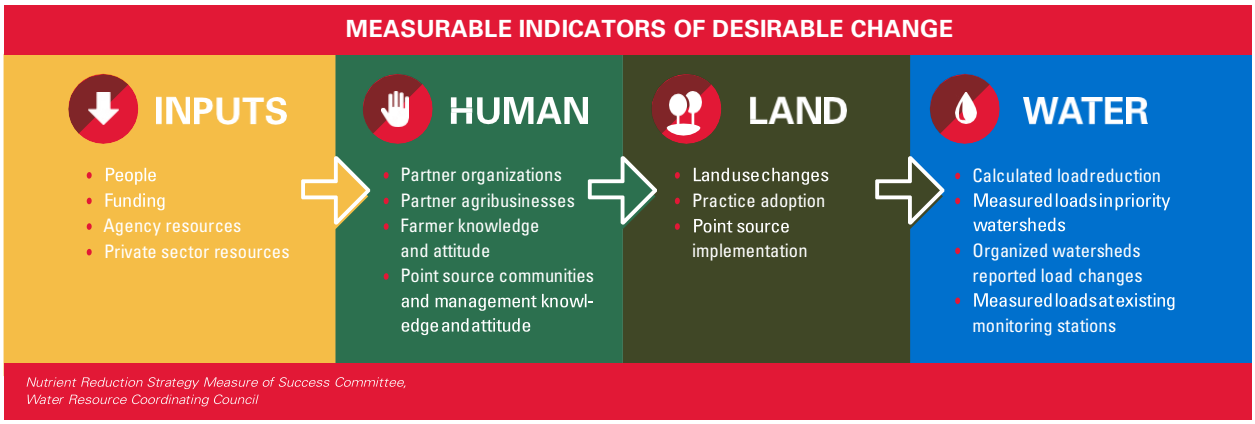

Figure 1. The program logic model that guides measurement of progress of the Iowa Nutrient Reduction Strategy.

This document reports a selection of 2017 results of a survey project that is focused on measuring changes in the human domain, mainly Iowa farmers' knowledge, attitudes, and behaviors related to reduction of nutrient losses. The project, which is funded by IDALS and conducted by the ISU College of Agriculture

and Life Sciences, is a five-year effort to collect data that will help stakeholders measure progress toward NRS objectives and to inform outreach and engagement strategies. The survey has three main objectives: measure farmer knowledge, attitudes, and behavior related to nutrient management and nutrient loss into waterways; identify barriers to and facilitators of behavior change that reduces nutrient loss; and measure change in these over time. The survey data will help to gauge progress toward NRS goals and help stakeholders to adjust and refine strategies for outreach and engagement activities that promote nutrient loss reduction on Iowa farms. Additional reports describing results from this five-year survey project are available at www.nutrientstrategy.iastate.edu/documents.

Methods

The farmer survey project is being implemented over a five-year period through an annual rotating longitudinal survey that will cover six hydrologic unit code-6 (HUC6) watersheds containing HUC 8 watersheds that have been identified as "priority watersheds" by the Iowa Water Quality Inititative. In 2017, the third year of the survey, three HUC6 watersheds were surveyed: the Des Moines HUC6, the Iowa HUC6, and the Upper Mississippi-Maquoketa-Plum HUC6 (figure 2). In this document, the Upper Mississippi-Maquoketa-Plum watershed will be referred to as "Upper Mississippi".

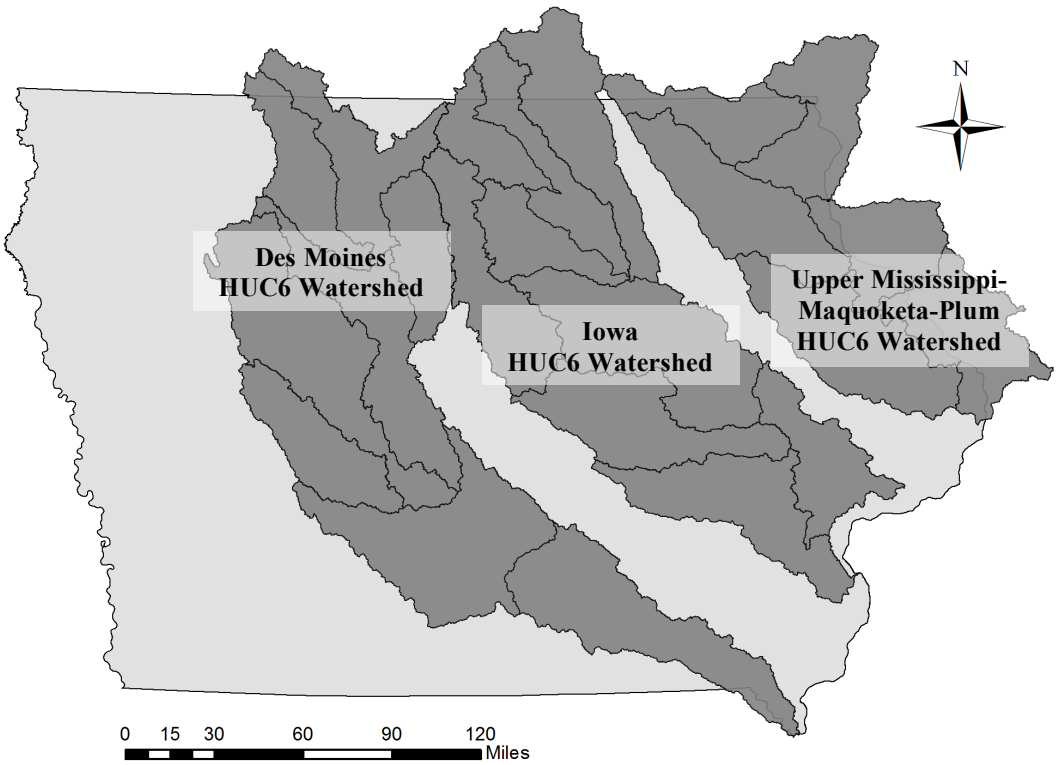

Figure 2. The watersheds (hydrologic unit code-6, or HUC6), that were surveyed in spring 2017.

The sample population is Iowa farmers who operated at least 150 acres of row crops in the year prior to the survey. A minimum acreage threshold was set because 1) nutrient reduction actions are most applicable to row crop farmers, and 2) operations that exceed 150 acres farm a majority of Iowa farmland. Samples for the survey are purchased annually from Survey Sampling International. Iowa State University's Center for

Survey Statistics and Methodology (http://www. cssm.iastate.edu/) is conducting the annual mail survey and data entry process, and assisting with data analysis. The third round of the survey, conducted in spring 2017, received a total response rate of 54 percent, with HUC6 response rates ranging from 39 to 80 percent (Table 1).

Table 1. Response rates associated with each HUC6 watershed that was surveyed in 2017.

HUC6 Watershed	Number of Respondents	Response Rate
Des Moines	769	39%
Iowa	486	67%
Upper Mississippi-Maquoketa-Plum	614	80%
Total	**1,869**	**54%**

Selected results

The following sections describe selected results from the 2017 round of the NRS Farmer Survey. More results will be shared in the ICM session that presents this project, with the aim of showing change over the first three years of the survey and additional comparisons between watersheds.

Farmer awareness of the Iowa Nutrient Reduction Strategy

The first objective of the survey was to measure farmers' awareness of the NRS. Prior to the first question, respondents were provided with the following introductory information:

> *The Iowa Nutrient Reduction Strategy is a plan to reduce the amount of nitrogen and phosphorus that enters Iowa's streams and rivers and eventually the Gulf of Mexico. It is designed to help reduce nutrients in surface water in a scientific, reasonable, voluntary, and cost-effective manner. The strategy sets goals for both "point sources"*

(e.g., water treatment plants) and "nonpoint sources" (e.g., agriculture) of nutrients. The goal for Iowa agriculture is that nutrient losses into waterways will be reduced by 41% for nitrogen and 29% for phosphorus.

Immediately following that introductory text, respondents were posed the question, "Before reading the description above, how knowledgeable were you about the Iowa Nutrient Reduction Strategy?" and asked to rate their knowledge on a five-point scale ranging from not at all knowledgeable to very knowledgeable. In the Upper Mississippi HUC6 watershed, about 5 percent of respondents reported that they were very knowledgeable, and 27 percent rated themselves as knowledgeable (figure 3). The largest category, at 41 percent, was somewhat knowledgeable. In the Iowa HUC6 watershed, seven percent responded that they are very knowledgeable, 23 percent reported that they are knowledgeable, and 47 percent rated themselves as somewhat knowledgeable. Finally, in the Des Moines HUC6 watershed, 4 percent, 25 percent, and 44 percent rated themselves as very knowledgeable, knowledgeable, and somewhat knowledgeable, respectively.

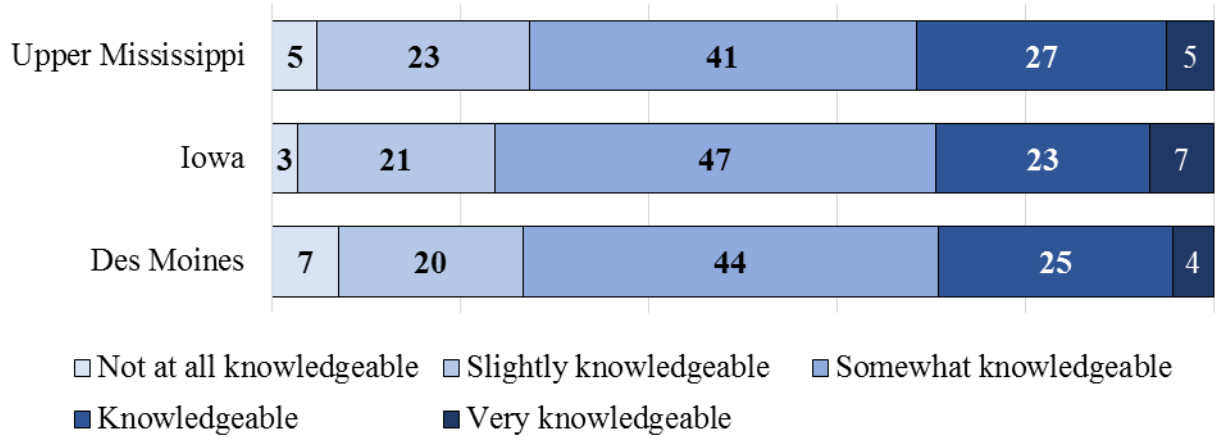

Figure 3. Response frequencies, in percent of respondents, to the question, "How knowledgeable are you about the Iowa Nutrient Reduction Strategy?" The responses range from "Not at all knowledgeable" (left side of chart) to "Very knowledgeable" (right side of chart). The respondents are displayed by watershed.

The next question sought to better understand the information channels through which farmers have learned about the NRS. Respondents were provided introductory text stating: "Information about the Nutrient Reduction Strategy has been publicized through many sources. Please indicate whether or not you have learned about it from the sources listed below," and asked to check any of the sources that applied. The farm press had informed 87 percent of 2017 respondents (figure 4). This was followed by 67 percent informed by the NRCS or Soil and Water Conservation Districts (SWCD); 60 percent were informed by Iowa State University Extension and 60 percent were also informed by commodity or farm organizations (e.g. Iowa Soybean Association, Iowa Farm Bureau Federation). The fewest respondents, at 31 percent, 21 percent, and 19 percent, had heard about the NRS from agricultural retailers, crop advisers, and seed company representatives, respectively. These results indicate that some information sources, particularly the farm press, had played a larger role in disseminating information about the NRS in the surveyed areas, while retailers and advisers played a smaller role.

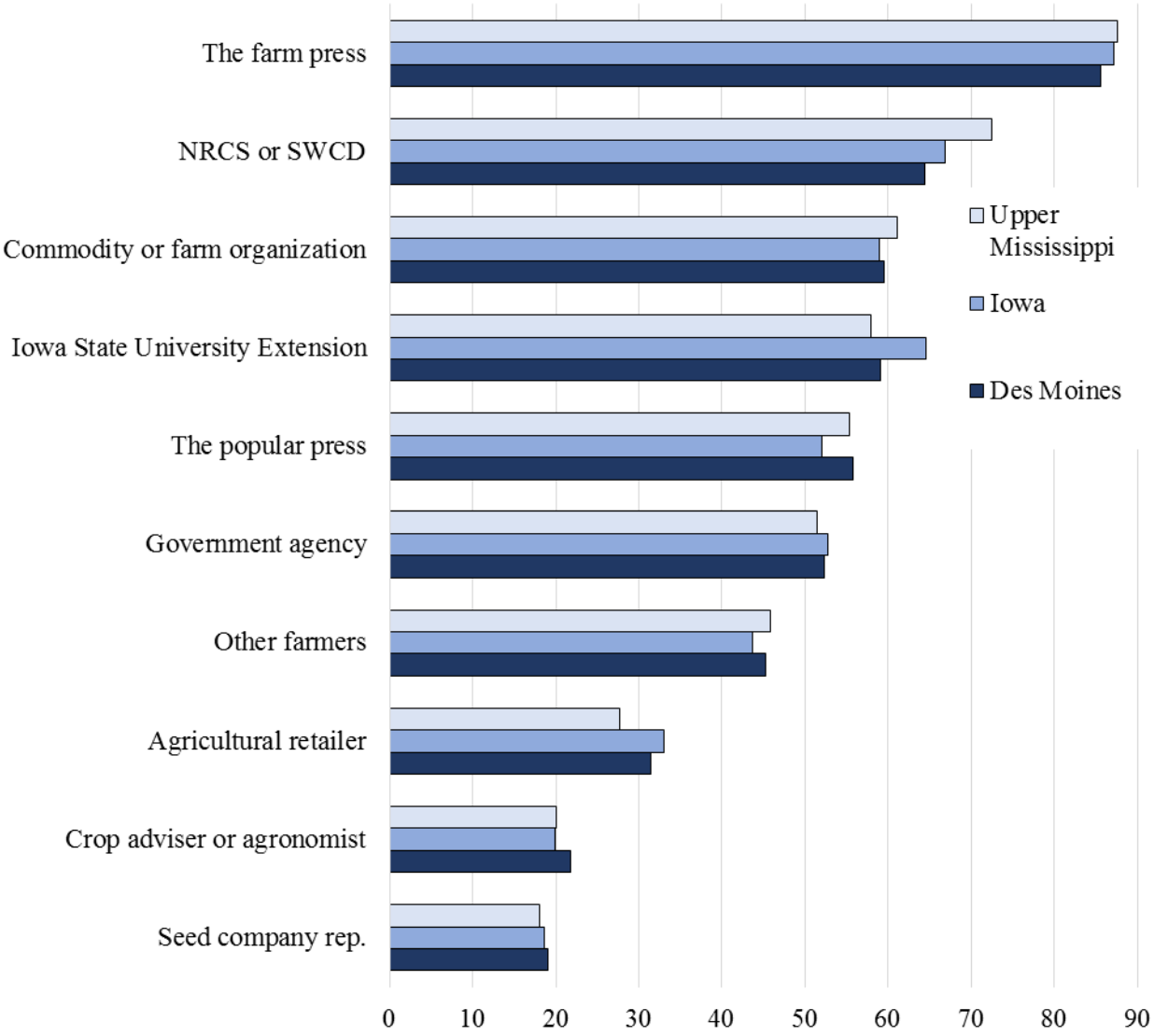

Figure 4. Response frequencies, in percent of respondents, to the statement, "Please indicate whether or not you have learned about [the Iowa Nutrient Reduction Strategy] from the [listed sources]." The bars represent the percent of respondents who indicated that they learned about the NRS from the respective sources. Respondents are displayed by watershed.

Farmers' use of selected conservation practices

Tracking shifts in farmers' conservation behavior is a major survey objective. Following the question set measuring farmer perspectives regarding the NRS, the survey explored survey respondents' use of three categories of conservation practices that are employed to manage nutrients and otherwise improve soil and water conservation outcomes on agricultural lands. The survey asked participants to report whether they had used any of 20 practices in their farm operation (owned or rented land) in the previous season. Respondents' use of practices fell into one of three categories: "Not used in 2014, no plans to use it," "Not used in 2014, might use it in the future," and "Used the practice in 2014."

In 2016, 37 percent of respondents located in the Upper Mississippi watershed and 36 percent in the Iowa watershed used cover crops (figure 5). At 18 percent, a smaller portion of respondents located in the Des

Moines watershed used cover crops. However, 35 percent, 34 percent, and 36 percent indicated that they might use cover crops in the future in these watersheds, respectively.

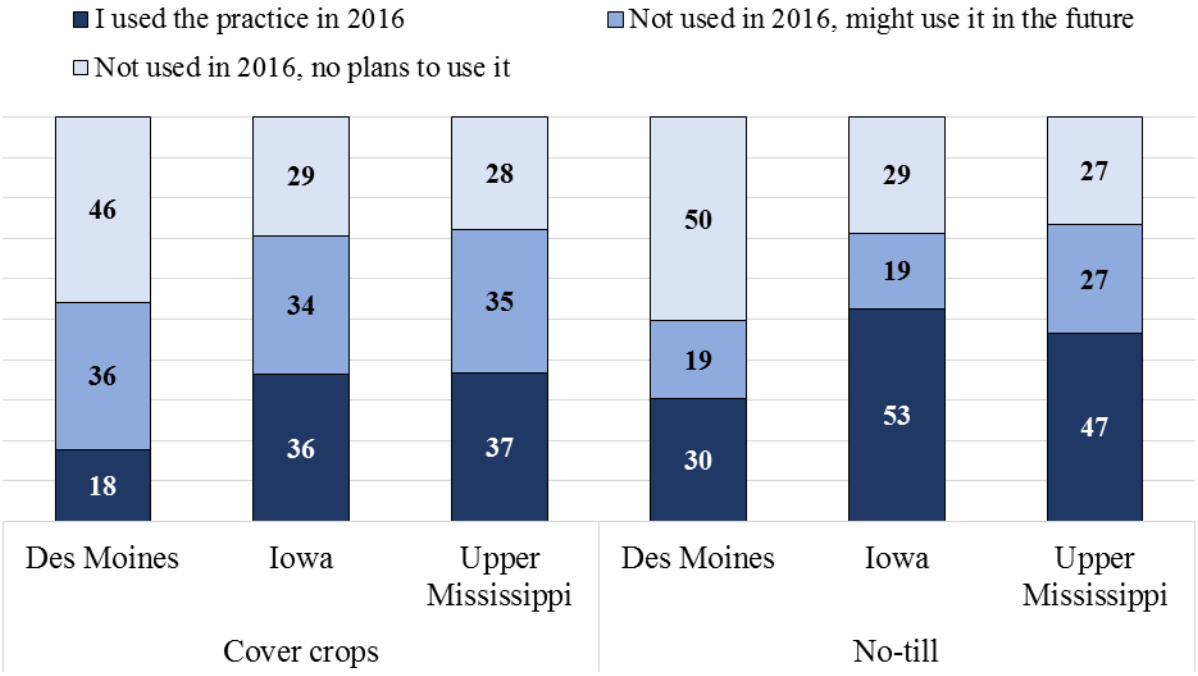

Figure 5. The percent frequencies of respondents who indicated their use of cover crops and no-till in 2016. Respondents indicated either that they used the practice, that they had not used the practice but might use it in the future, or that they had not used the practice and had no plans to use it in the future. Respondents are displayed by watershed.

The use of no-till in 2016 showed greater variation (figure 5). In the Iowa watershed, 53 percent of respondents used no-till, with 47 percent in the Upper Mississippi and 30 percent in the Des Moines. Among these watersheds, respectively, 19 percent, 27 percent, and 19 percent indicated that they did not use no-till in 2016, but that they might use it in the future.

The survey also asked about fertilizer management practices. A range of 25 to 27 percent of respondents used the Maximum Return to Nitrogen (MRTN) management practice in each watershed, with 35 to 39 percent indicating that they did not use MRTN in 2016 but that they might use it in the future (figure 6). Approximately half of respondents used nitrogen stabilizer in 2016, with 18 to 22 percent indicating that they did not use the product but that they might use it in the future.

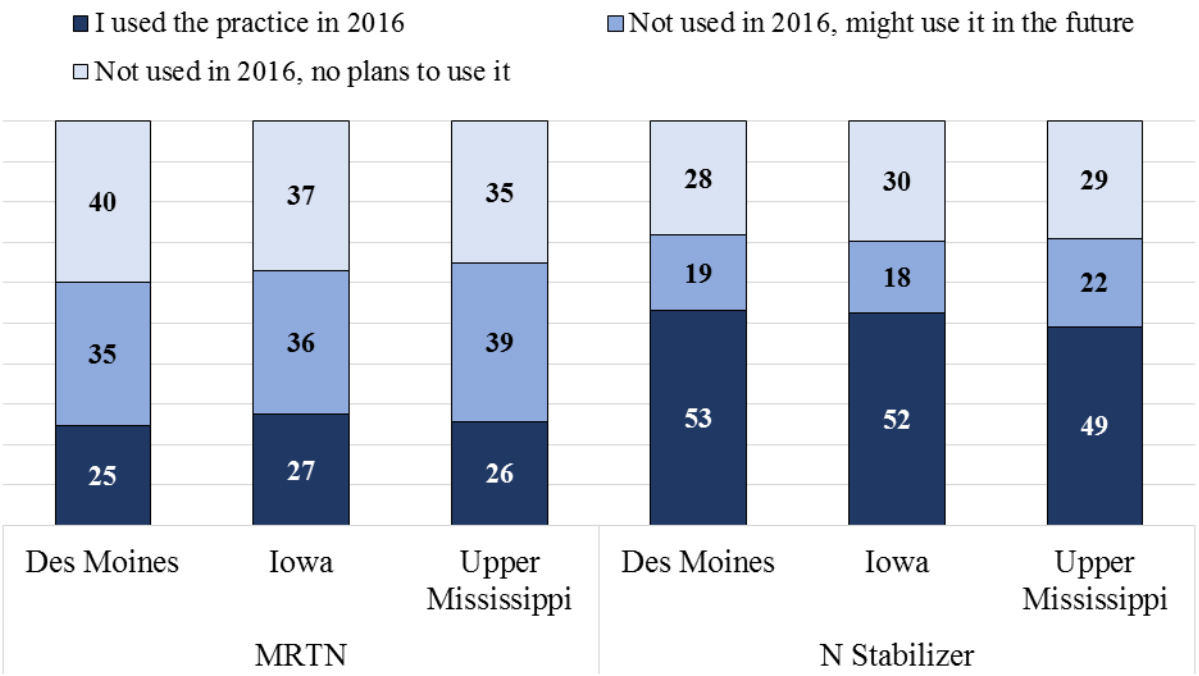

Figure 6. The percent frequencies of respondents who indicated their use of Maximum Return to Nitrogen (MRTN) fertilizer application technique and nitrogen (N) stabilizer in 2016. Respondents indicated either that they used the practice, that they had not used the practice but might use it in the future, or that they had not used the practice and had no plans to use it in the future. Respondents are displayed by watershed.

Influence on nutrient management decisions

Farmers can turn to many organizations, agencies, and individuals for information to help them make decisions about nutrient management. A better understanding of which entities are most influential in nutrient management decisions can point to potentially effective information dissemination and outreach pathways. The survey provided a list of agricultural stakeholders and asked farmers to rate "how much influence the following sources of information have on your decisions about nutrient management practices and strategies." Responses were recorded on a five-point scale from "no influence" (1) to "very strong influence" (5).

In all three watersheds, four information sources were rated as having the highest level of influence on farmers' nutrient management decisions: the USDA Natural Resources Conservation Service or county Soil and Water Conservation District, Iowa State University Extension, local agricultural retailers, and other farmers. A range of 18 to 32 percent of respondents rated these organizations as having strong or very strong influence.

Independent crop advisers were rated differently depending on the watershed. In the Des Moines watershed, 15 percent of respondents rated advisers as having strong or very strong influence. In the Iowa and Upper Mississippi watersheds, 14 percent and 11 percent rated advisers with this level of influence, respectively.