Received: 22 February 2024 | Revised: 25 October 2024 | Accepted: 11 November 2024

DOI: 10.1111/csp2.13287

Conservation Science and Practice
A journal of the Society for Conservation Biology
Open Access
WILEY

CONTRIBUTED PAPER

Motivating conservation action in the Upper Midwest: Source attention, information seeking and sharing, and farmers' land management decisions

Dara M. Wald[1] | **Miguel Diaz-Manrique**[1] | **Laura Witzling**[2] | **Jaqueline Comito**[3]

[1]School of Public and International Affairs, Virginia Tech, Blacksburg, Virginia, USA

[2]Formerly at the Greenlee School of Journalism and Communication, Iowa State University, Ames, Iowa, USA

[3]Iowa Learning Farms-Agriculture and Biosystems Engineering, Iowa State University, Ames, Iowa, USA

Correspondence
Dara M. Wald, School of Public and International Affairs, Virginia Tech, 263B Steger Hall, Blacksburg, VA 24061, USA.
Email: dwald@vt.edu

Funding information
Iowa Nutrient Research Center, College of Agriculture and Life Sciences, Iowa State University, Grant/Award Number: 2019-1

Abstract

Adoption of on-farm conservation strategies, such as edge-of-field practices, has the potential to reduce nutrient runoff, promote greater biodiversity, and improve water quality. To date, adoption rates among farmers are extremely low. Communication with farmers has been identified as a vital strategy to encourage the voluntary adoption of these practices and policies that promote on-farm conservation. Yet little is known about which information sources shape farmers' concerns about conservation practices, perceptions of the risks and benefits of conservation practices, and ultimately, adoption behaviors. Using the Social Amplification of Risk Framework, the Risk Information Seeking and Processing Model, and a cross-sectional survey, we examined farmers' concerns about nitrate loss and water quality, perceptions of the risks and benefits of conservation practices, attention to messages and information sources, and communication behaviors. We received $N = 474$ completed surveys. Attention to agricultural associations was associated with decreased concern about nitrates and diminished perceptions of the benefits of edge-of-field practices. Farmers paying greater attention to non-agricultural and social media sources were more likely to share and seek information. Attention to interpersonal sources was associated with greater adoption behaviors. This work highlights the importance of farmers' social networks, exposure to multiple information sources, and the need to identify new strategies for engagement and direct communication with hard-to-reach audiences. We conclude with a discussion of the implications of this work for conservation communication and land management practices to promote environmental health.

KEYWORDS

audience segmentation, biological diversity, communication, environmental behavior, land managers, perceptions, nutrient runoff

1 | INTRODUCTION

In most US states, more than 50% of the land is privately owned. Thus, conservation efforts across the United States require buy-in from land owners, managers, and farm operators. On agricultural lands like forests, farms, and ranches, practices such as prairie strips, saturated buffers, and terraces provide critical habitat that enhances biodiversity (Le Cœur et al., 2002) and reduce nutrient runoff (Munn et al., 2018). Research on these "edge-of-field" practices shows promise for enhancing biodiversity (Deere et al., 2022; Hietala-Koivu et al., 2004; Schulte et al., 2017). However, adoption is low due to barriers like farmers' perceptions of risks to profits (Christianson et al., 2018; DeLong et al., 2021). Higher adoption rates link to access to information, extension training, conservation organizations, and financial incentives (Baumgart-Getz et al., 2012; Liu et al., 2018; Prokopy et al., 2019). Communication is a key antecedent for conservation adoption. Understanding sources and messages encouraging voluntary conservation by farmers is crucial (Witzling et al., 2021) since few states regulate these practices (Porter et al., 2015).

Previous research suggests that farmers broadly support practices promoting clean water, wildlife habitat, and open space protection (Baumgart-Getz et al., 2012; Bonnie et al., 2020). Yet agricultural audiences have also criticized policies or programs encouraging these practices (Bonnie et al., 2020). Understanding farmer perceptions and media habits can inform communication strategies for educators, as attitudes often precede behavior change (Shaw, 2009). This research aims to understand drivers of support for voluntary conservation practices, aiding practitioners in engaging farmers about conservation benefits. Additionally, it examines environmental risk perceptions shaping farmers' behavior, including concerns about nitrate loss and water quality, perceptions of edge-of-field practices, attention to media messages, and information usage. This work expands theoretical understanding of risk information seeking and sharing among hard-to-reach audiences, which has implications for other conservation issues such as human–wildlife conflicts or invasive species management.

1.1 | Study context

In 2023, the Gulf of Mexico "dead zone" was predicted to be 4100 square miles, still far over the 2035 federal target of 1900 square miles (Wendland, 2023). In the dead zone, dissolved oxygen levels are too low to support many aquatic species (USEPA, 2017). Excess nutrients from farmland that travel via the Mississippi River are a primary contributor (Boehm, 2020; USEPA, 2017). Algae consume these nutrients, and when they die, decomposition reduces oxygen levels (USEPA, 2017). Excess nutrients can contaminate drinking water and accelerate toxic algae growth, posing health risks (USEPA, 2017). Communities in the Gulf face cultural, ecological, and economic consequences from nutrient runoff (Boehm, 2020; USEPA, 2017).

Iowa is a significant nutrient contributor to the Gulf, and to address this challenge, they adopted the Iowa Nutrient Reduction Strategy in 2013 (Northey & Gipp, 2013). The strategy calls for agricultural conservation practices, including edge-of-field practices, to mitigate nutrient-rich farm runoff (IDALS, 2017). There is a diversity of opinion in Iowa about whether to continue voluntary conservation or adopt stronger regulation. This issue has led to high-profile lawsuits and media discussion (Witzling et al., 2022).

Given the media's role, we examined several communication variables in our models. We built on Witzling et al. (2020), who examined demographics, affect, and risk/benefit perceptions on environmental regulation support. We expanded this by exploring these variables in a different context and adding communication behavior measures (Prokopy et al., 2019; Witzling et al., 2021). Our model is presented in Figure 1.

1.2 | Theoretical frameworks: Social amplification of risk and risk information seeking and processing model

Underlying our model is the social amplification of risk framework (SARF). In 1988, Kasperson et al. proposed SARF to describe how the strengthening, weakening, and filtering of risk signals impact individuals' risk perceptions (Kasperson et al., 1988). Risk events represented by risk signals are filtered through sociocultural and institutional channels. Individual heuristics and values, social relationships, signal value, and stigma provide the framework within which risk information is evaluated, amplified, or attenuated. This process encourages individuals or groups to accept, ignore, tolerate, or change their exposure to risk. Risk perceptions and actions then spread from the individual to the community, through stakeholder groups, and eventually throughout society (Kasperson et al., 1988).

Previous scholars have applied SARF and reported evidence for amplification and attenuation in high-profile cases of environmental risk such as the Exxon Valdez oil spill (Leschine, 2002) and wildfires (Brenkert-Smith et al., 2013). The media has been identified as an important amplification/attenuation station that filters risk

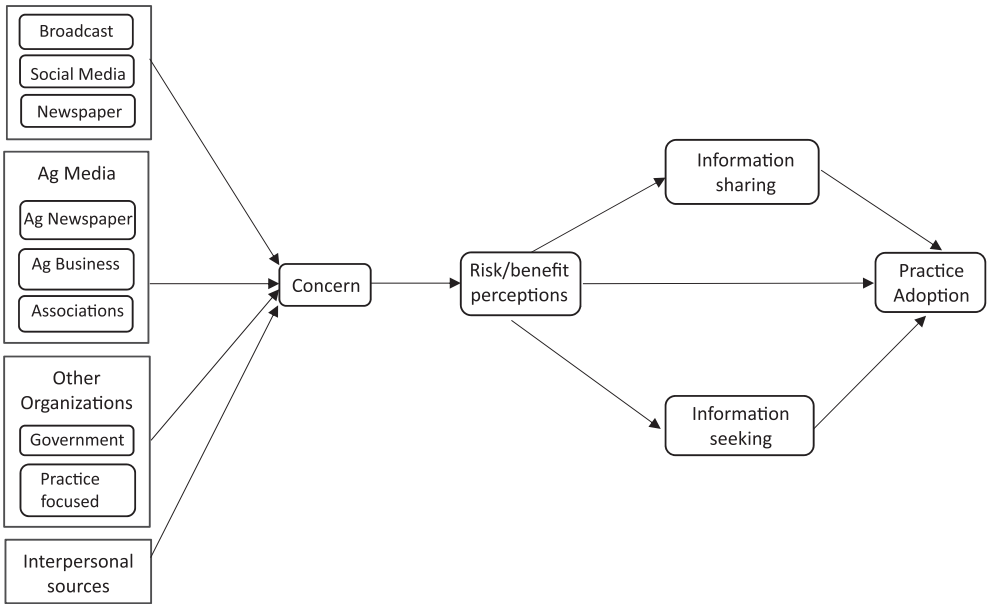

FIGURE 1 Schematic diagram of the proposed model.

signals, processes risk events, attaches social values to risk information, amplifies or attenuates the event, and passes this information on to social groups or individuals, influencing responses (Renn & Levine, 1991). Traditional media coverage has been strongly associated with amplified public perceptions of mad cow disease (Lewis & Tyshenko, 2009) and genetically modified foods (Frewer et al., 2002).

Social media also shapes public perceptions of risk. Chung (2018) found a correlation between online media stories and social media discussions on a high-speed rail project in Korea. Social media exposure was associated with amplified public perceptions of environmental health risks in Singapore (Ng et al., 2018). To date, questions remain about social media's role in amplifying or attenuating risk information in hard-to-reach communities, and little is known about social media use and sharing as a source of conservation information for land managers and farmers (Witzling et al., 2021).

Drawing on previous research, we assume different sources of conservation information provide different content. Witzling et al. (2022) identified differences between Iowa news outlets in nutrient runoff coverage, themes, and sources quoted. Differences in language use across agency and university sources targeting farmers (Coberley, 2020) and between agricultural and mainstream newspapers (Dobelbower, 2018) have also been found. Drawing on previous work, we assume that media usage and attention are strongly connected to perceived environmental risks. UK farmers reported that media exposure and sustainable farming framing by agricultural media shaped their awareness of on-farm conservation behaviors (Rust et al., 2022) and their willingness to adopt sustainable practices. Kahlor et al. (2004) found news coverage frequency and intensity raised awareness about cryptosporidium contamination. Here, we expand SARF by considering amplification and attenuation across multiple source types.

In this study, we highlight the interplay between emotion, media, and risk and benefit perceptions. Affect, or emotional response to stimuli, is increasingly recognized as an important factor in individuals' evaluations of risk (Slovic, 2016). Emotions play a role in "perfecting the function that risk perceptions play as rational expressions of value" (Kahan, 2008). People with positive feelings about something (e.g., birth control) tend to view it as less risky and more beneficial (Cooper & Nisbet, 2016). Conversely, more concerns or negative affect about a hazard (e.g., pesticides) increase concerns about its risks (Slovic, 1999). Slovic et al. found that affective responses to nuclear power or nuclear waste were strongly associated with individuals' attitudes, perceptions, and policy preferences (Slovic, Flynn, & Layman, 1991; Slovic, Layman, et al., 1991). Cooper and Nisbet (2016) established that negative affect and amplified risk perceptions are associated with increased support for policies regulating genetically modified organisms and hydraulic fracturing. Witzling et al. (2020) reported a significant association between media attention and emotions, which were strongly associated with perceived risks and benefits of inland aquaculture.

Negative affect and risk perceptions together have been identified as critical factors in individuals' desire to seek and share information about risk (Griffin et al., 2008; Yang et al., 2011). The Risk Information Seeking and Processing Model (RISP) assumes

information-seeking behavior emerges in the context of risk when people feel threatened by or concerned about potential harm (Yang et al., 2014) and uncertain about how to mitigate these harms (McComas, 2006). Previous work applying the RISP model has found that people seek information when concerned about potential risks (Yang et al., 2011), particularly in environmental contexts. For example, Ng et al. (2018) found support for a direct, positive association between perceived risks and negative emotions; negative emotions and information seeking and sharing; and finally, information seeking and sharing and increased protective health behaviors to mitigate exposure to air pollution and zoonotic diseases. With RISP in mind, individuals seeking information about the risks or benefits of environmental or agricultural practices could plausibly turn to the media and other relevant sources of information.

1.3 | Hypotheses

Drawing on prior research, we developed hypotheses related to the relationships between affect (using concern to represent affect), risk/benefit perceptions, information seeking/sharing, and the adoption of edge-of-field practices. This study also informs a larger understanding of the theoretical connections between SARF and RISP by applying both to a new context. While SARF suggests that interpersonal sources are important, less is known about how these actors amplify or attenuate risk, particularly in agricultural contexts. Previous research using SARF has relied on a simplified role of network actors in risk interpretation, debate, and evaluation (Murdock et al., 2003). We add to SARF by examining multiple sources, including interpersonal communication with friends and farmers.

Previous research established that farmers often rely on news media to learn about environmental topics (Bonnie et al., 2020; Jackson-Smith et al., 2018; Perry-Hill & Prokopy, 2014; Witzling et al., 2015). Yet news coverage of conservation differs between rural and urban outlets and agricultural and non-agricultural sources (Church et al., 2020; Corbett, 1995; Witzling et al., 2022). Research suggests agricultural trade publications attenuate climate risks to agriculture (e.g., financial risk, weather risk) by focusing on direct steps farmers could take (Abrams & Meyers, 2010; Asplund et al., 2013; Church et al., 2017). Non-agricultural outlets more frequently quote environmental group representatives discussing conservation practices that reduce farm nutrient runoff (Witzling et al., 2022). Moreover, non-agricultural sources are more likely to address health risks of nutrient runoff (e.g., contaminated drinking water) (Witzling et al., 2022). Increased media coverage of risks is often associated with amplified perceptions of risk and environmental concern (Brulle et al., 2012; Frewer et al., 2002). We hypothesized that non-agricultural sources serve as risk amplification stations, while agricultural sources serve as attenuation stations, reducing perceived concerns about nitrate runoff risks.

> **H1.** Attention to non-agricultural media sources will be associated with greater concern about excess nitrate in waterways.

> **H2.** Attention to agricultural media and associations will be associated with less concern about excess nitrate in waterways.

A large body of scholarship has documented the importance of interpersonal contacts in farmer networks (Bonnie et al., 2020; Inman et al., 2018; Joffre et al., 2020; McKitterick et al., 2019; Rust et al., 2022). Other farmers, family members, and friends are important sources of agricultural information for farmers (Bonnie et al., 2020). In other risk contexts, informal sources and peer interactions are critically important. For example, homeowners' perceptions of wildfire risks were impacted by formal/informal information sources and interactions with neighbors (Brenkert-Smith et al., 2013). We expect interpersonal sources to influence farmers' perceptions of Iowa's water quality, the risks/benefits of edge-of-field practices, and willingness to adopt them. Yet we are unaware of any studies that have examined whether these sources serve to amplify or attenuate risk perceptions. Thus, we offer a non-directional hypothesis:

> **H3.** Greater attention to interpersonal sources will be associated with concern about excess nitrate in waterways.

In other contexts, farmers have identified government, universities, and research institutions as important sources of information related to conservation (Witzling, Williams, et al., 2023; Witzling, Shaw, et al., 2023). Coberley (2020) found that extension publications frequently use the verb "produce" while describing positive outcomes of on-farm conservation practices. They hypothesized that using this term may amplify perceptions of conservation practice benefits, particularly when extension messages focus on the potential for these practices to increase yields or profitability. In addition, they found that extension publications used more positive framing about farmers than traditional media, and that this positive framing might appeal to farmers and increase their positive

perceptions of Extension-recommended conservation actions (Coberley, 2020). Here, we test this hypothesis:

> **H4.** Attention to information from university/government and practice-focused organizations will be associated with more positive perceptions of the benefits of edge-of-field practices.

Following the RISP model structure, we hypothesize that environmental concern is an antecedent of perceived risks. Previous research suggests that farmers' perceptions of risk influences information processing (seeking-sharing) and increased adoption behavior (Kreiter, 2023). Thus, we posit the following:

> **H5.** Greater concern about nitrates will be positively associated with greater perceived benefits of edge-of-field practices, more information seeking and sharing, and greater adoption of edge-of-field practices.

> **H6.** Greater perceptions of risks will be negatively associated with information seeking and sharing and adoption of edge-of-field practices.

2 | METHODS

2.1 | Sample

To increase understanding of the drivers of farmers' support for edge-of-field practices and the kinds of media sources that shape agricultural audiences' perceptions and behaviors, we distributed a cross-sectional survey to Iowa land managers. Our sample was collected in collaboration with Iowa Learning Farms, an initiative of Iowa State University Extension and Outreach. Our target sample included farmers who had participated in at least one face-to-face field day with Iowa Learning Farms between 2017 and 2019 or farmers who had attended at least one virtual field day in 2020. We sent a mail survey to farmers who had attended face-to-face field days and an email survey to farmers who had attended the virtual field day. We discuss how we controlled for differences and response bias (due to potentially different demographic groups across these formats) that might affect our survey results in the following section. A total of 1143 potential participants were contacted by mail (there was an initial mailing, postcard reminder, and second mailing), with $n = 411$ returned for a response rate of 36%. We distributed $N = 329$ virtual questionnaires (with reminders to match the paper mailing sample) and received $n = 76$ completed surveys for a response rate of 23%. The email survey list was crosschecked with the paper mail survey to remove duplicates to ensure individuals were sent only one version of the survey. Both paper and virtual surveys were identical in their question wording and order; thus, the responses are combined here for analysis. After removing duplicates and questionnaires returned empty or with mostly blank answers, we had $n = 474$ complete survey responses.

2.2 | Measures

We designed our questionnaire after reviewing previous studies that included farmer surveys (Witzling et al., 2021) and added questions about emotion following Witzling et al. (2020). To ensure face and content validity, we elicited feedback from agricultural education experts in extension and at Iowa Learning Farms. Variables used in this analysis are described below. Reliability scores, scale endpoints, and means are reported in Table 1. According to Hair et al. (2013), Cronbach's alpha values of .6 are acceptable in exploratory research. Thus, due to the exploratory nature of this work and the new scales used, we treat values >.60 as acceptable (Hair et al., 2013; Nunnally, 1978).

2.2.1 | Media attention

We assessed media attention using the statement, "How much attention do you pay to information about agriculture from the following sources..." Multiple source types were listed as separate items. Using theory and reliability estimates, we condensed the source types into nine groups, including: (a) broadcast media; (b) social media; (c) mainstream newspapers; (d) agricultural news; (e) agribusiness sources; (f) agricultural associations; (g) university/government organizations; (h) practice-focused organizations; and (i) interpersonal sources. Responses used a 5-point Likert scale ranging from 1 = "None," 2 = "Very little," 3 = "Some," 4 = "Quite a bit," and 5 = "A great deal."

2.2.2 | Concern

Affect was measured by assessing participants' feelings about excess nitrate in different regions using five questions on a 5-point Likert scale ranging from 1 = not at all concerned to 5 = extremely concerned. After confirming reliability with a Cronbach's α of .94, these items were combined into a single item.

TABLE 1 Descriptive statistics and scale reliabilities for independent variables.

Independent variable	Mean	Standard deviation	Scale endpoints	Cronbach's α/Spearman–Brown's[a]
Media attention				
How much attention did you pay to information from:				
(a) Broadcast media	3.0	0.9	1–5	.74
(b) Social media	2.1	0.9	1–5	.77
(c) Newspaper	1.4	0.6	1–5	.63
(b) Social media	2.1	0.9	1–5	.77
(d) Agricultural newspaper	3.1	1.1	1–5	.81
(e) Agribusiness sources	3.2	1	1–5	.80
(f) Agricultural associations	2.7	1	1–5	.86
(g) University/government organizations	3.5	0.7	1–5	.81
(h) Practice-focused organizations	2.9	1.1	1–5	.69
(i) Interpersonal sources	3.4	0.7	1–5	.76
Concern				
How concerned are you about:				
(a) Excess nitrate in your county's waterways?	3.6	1.1	1–5	.94
(b) Excess nitrate in your county's drinking water?	3.5	1.2	1–5	
(c) Excess nitrate in Iowa's waterways?	3.7	1.1	1–5	
(d) Excess nitrate in Iowa's drinking water?	3.6	1.2	1–5	
(e) Excess nitrate in the Gulf of Mexico?	3.8	1.1	1–5	
Perceived risks				
To what extent do you agree with the following statements about edge-of-field practices:				
(a) Installing them is costly	5.0	1.2	1–7	.80
(b) Maintaining them is costly	4.3	1.2	1–7	
(c) They are difficult to install	4.3	1.3	1–7	
(d) They are difficult to maintain	4.1	1.2	1–7	
(e) They can reduce yield	3.4	1.2	1–7	
Perceived benefits				
To what extent do you agree with the following statements about edge-of-field practices:				
(a) They can increase yield	4.1	1.1	1–7	.62
(b) They can improve soil health	5.1	1.3	1–7	
(c) They can improve water quality	5.9	1.1	1–7	

[a]Reliability for scales with only two items was measured using Spearman–Brown's coefficient (Eisinga et al., 2013). Reliability for all other scales was estimated using Cronbach's α. Because this is exploratory research, we treat values >0.60 as acceptable (Hair et al., 2013; Nunnally, 1978).

2.2.3 | Perceived risks and benefits

Participants' perceptions of the risks of edge-of-field practices were measured using four items: "installing them is costly," "maintaining them is costly," "they are difficult to install," "they are difficult to maintain," and "they can reduce yield." This question was placed in the survey after the practice adoption question, so participants were aware of the 10 practice types we identified prior to answering this question. After confirming Cronbach's $\alpha = .80$ (see Table 1), we created the composite item perceived risks by averaging these items together. To assess perceived benefits, we used three items: "they can increase yield," "they can improve soil health," and "they can improve water quality." Together, these items had a Cronbach's α of .62 and were combined into a composite measure called perceived benefits. Both scales were measured on a 7-point Likert scale with 1 = strongly disagree and 7 = strongly agree.

As dependent variables, two communication behavior variables were examined: information seeking and sharing. These questions focused broadly on communication about water quality rather than nutrients alone, as these topics are frequently linked in news coverage of agricultural issues (Altaweel & Bone, 2012). Information seeking was assessed by asking participants how often they "ask other farmers questions about water quality" and "search for information about water quality." After establishing reliability with a Spearman–Brown coefficient of .74, the two items were condensed into a composite item called information seeking. Three additional items were used to assess information-sharing behavior: "I share my views about water quality with farmers," "I share information about water quality with farmers," and "I post on social media about water quality." The final information-sharing item had a Cronbach's α of .75. All items were measured on a 5-point Likert scale ranging from 1 = never true to 5 = always true.

Practice adoption was also a dependent variable and was measured by asking: "On your farm, do you currently use the following conservation practices?" Ten practices were then listed. Response options were 1 = No, 2 = Not sure, and 3 = Yes. During the analysis, we excluded four practices because farmers were infrequently using these practices or confusing them with other practice types. We treated not sure responses as "No." Next, we coded each practice as (1 = using or 0 = not using) and created an additive item for practice use. To create the item, we summed the total number of practices each participant indicated they had adopted. This new item represented the extent to which a participant was adopting practices on a scale ranging from 0 = low adopter to 6 = high adopter.

We included demographic information as controls in the model. Respondents were asked to report their age (open-ended question), political ideology (1 = Strong Conservative to 5 = Strong Liberal, 6 = Prefer not to say), education level (from 1 = Some high school or less, to 7 = Graduate or professional degree), and household income (with options ranging from 1 = Less than $34,999 to 4 = $150,000 or more, and 5 = Prefer not to say). The "prefer not to say" items were all removed before running the regression model. The survey instrument also included questions about participants' race/ethnicity (1 = White, 2 = African-American, 3 = Latina/Latino, 4 = Asian, 5 = Native American, 6 = other) and gender (1 = Male, 2 = Female).

2.3 | Data analysis

Hierarchical regression models were designed to analyze the data. After checking the reliability of the variables, we created composite scales. All item scores were added and divided by the number of questions per scale (Hair et al., 2013). After that, we created ordinary least square regression models with blocks, each addressing a different factor described previously. The baseline block included the demographic variables (education, political ideology, income, and age). Block 2 was composed of the items regarding attention to sources of information. Block 3 included affect. Block 4 included information regarding perceptions of the risks and benefits of the conservation practices.

This research was approved by the Institutional Research Board of Iowa State University IRB ID: 20-500.

3 | RESULTS

3.1 | Descriptive analysis

Participation reflected demographic trends common among agricultural groups in this region, with a majority of male (90.5%) and white participants (98%). Mean age was 63.48, with a range from 24 to 72 years. Regarding political ideology, participants leaned conservative, though moderately so (M = 2.69, SD = 1.35). Less than a quarter (15.8%) identified as "strong conservative," followed by "conservative" (37.9%) and "independent" (26.4%). A minority identified as "liberal" (9.3%), "strong liberal" (3%), and "prefer not to say" (7.6%). Regarding education, more than a quarter completed a 4-year degree (31.7%), followed by a graduate/professional degree (18.3%), a 2-year degree (15.1%), a completed degree (14.3%), some college (13.4%), some graduate/professional school (0.6%), and some high school or less (0.6%). According to the survey, 40.8% of respondents had a household income of $75,000 to $149,999 before taxes in 2020. The greatest proportion of respondents are currently using terraces (54%), followed by strategically placed prairie or perennials (48%), ponds (36%), and riparian buffers (35%). Preliminary analysis revealed that gender and race were non-normally distributed, with skewness and kurtosis values far above the recommended range of +1.5 and −1.5 (Tabachnick & Fidell, 2013). This reflects the lack of diversity in the population, with only 2% of the participants identifying as Black, Indigenous, People of Color (BIPOC) and less than 10% women in the sample, rather than something that could be transformed or addressed by removing outliers. Thus, we removed these variables before running the regression model. We address this sample limitation in the discussion.

3.2 | Model results

In this section, we described our results for each block of the model (Table 2). Results from the demographics

TABLE 2 Regression models predicting affect, perceptions of risk/benefits, information behaviors, and practice adoption.

	Concern			Perceived benefits			Perceived risks			Information seeking			Information sharing			Practice adoption		
Variables	***B***	**(SE)**	***β***	***B***	**(SE)**	***β***	***B***	**(SE)**	***β***	***B***	**(SE)**	***β***	***B***	**(SE)**	***β***	***B***	**(SE)**	***β***
Block 1: Demographics																		
Age	.01	(.00)	.18***	.00	(.00)	.07	.00	(.00)	−.07	.00	(.00)	.04	.00	(.00)	−.04	−.00	(−.01)	.02
Political ideology[a]	.07	(.04)	.09	.00	(.04)	.00	−.05	(.04)	−.08	.03	(.04)	.04	−.01	(.03)	−.01	−.03	(.06)	−.02
Education	.10	(.03)	.16**	.03	(.03)	.06	−.04	(.03)	−.07	.05	(.03)	.08	.03	(.03)	.05	.11	(.05)	.12*
Income	−.07	(.05)	−.08	.01	(.04)	.02	.02	(.04)	.03	−.03	(.04)	−.03	.01	(.04)	.01	.02	(.07)	.01
Adjusted R^2 (%)	6.50			−.20			.90			.20			−.50			.40		
*F*Δ	7.87***			.76			1.87			1.19			.48			1.38		
Block 2: Media attention																		
Broadcast	.10	(.06)	.09	.11	(.06)	.11	−.09	(.06)	−.10	−.01	(.05)	−.01	.06	(.05)	.06	−.09	(.10)	−.06
Social media	.04	(.06)	.04	−.04	(.06)	−.04	.04	(.06)	.04	.15	(.05)	.15**	.21	(.05)	.24***	−.10	(.10)	−.06
Newspaper	.15	(.08)	.09	.03	(.08)	.02	−.07	(.09)	−.05	.18	(.08)	.11*	.11	(.07)	.08	.05	(.14)	.02
Ag newspaper	−.05	(.05)	−.05	−.02	(.05)	−.02	.04	(.05)	.04	−.09	(.05)	−.10	−.08	(.04)	−.10	.14	(.09)	.10
Ag business	−.06	(.06)	−.06	.00	(.06)	.01	.01	(.06)	.01	.06	(.05)	.06	−.04	(.05)	−.04	−.13	(.10)	−.08
Ag associations	−.39	(.07)	−.37***	−.17	(.07)	−.19**	.12	(.07)	.12	.01	(.06)	.01	.11	(.05)	.12	−.02	(.11)	−.01
University/government	.21	(.09)	.15*	.30	(.09)	.23**	−.06	(.09)	−.04	.37	(.08)	.27***	.20	(.07)	.16**	.29	(.16)	.13
Practice-focused	.22	(.06)	.23***	.02	(.06)	.02	−.06	(.06)	−.07	.17	(.05)	.19**	.15	(.05)	.18**	.08	(.10)	.06
Interpersonal	.21	(.07)	.16**	.03	(.07)	.02	.03	(.07)	.02	.14	(.06)	.11*	.13	(.06)	.11*	.26	(.12)	.12*
Adjusted R^2 (%)	27.3			4.60			0.10			30.0			29.0			3.40		
*F*Δ	11.6***			3.23***			1.87			19.5***			19.1***			2.36*		
Block 3: Affect																		
Concern				.13	(.05)	.15**	−.03	(.05)	−.03	.25	(.04)	.26***	.10	(.04)	.12*	−.19	(.09)	−.13
Adjusted R^2 (%)				6.10			0.80			35.1			29.9			4.40		
*F*Δ				7.18**			0.31			31.0***			6.05*			4.91*		
Block 4: Perceptions																		
Risks										−.06	(.04)	−.05	−.09	(.04)	−.09	.02	(.08)	.01
Benefits										.07	(.05)	.06	.02	(.04)	.03	.15	(.09)	.09
Adjusted R^2 (%)										35.4			30.4			4.60		
*F*Δ										1.91			2.45			1.42		

Note: *B* is the unstandardized regression coefficient and *β* is a standardized regression coefficient (final) all for blocks. *$p < .05$, **$p < .01$, ***<.001. Significant *p*-values and *F*Δ values are indicated with asterisks (*).
Significance levels: *$p < .05$, **$p < .01$, ***<.001.

[a]Higher scores on political ideology reflect stronger liberal views.

indicated a positive association between farmers' age and concern, suggesting that the older the farmer, the more concerned they are about nitrates in drinking water and waterways ($\beta = .18$, $p < .001$). There was also evidence of a positive association between education level and concern ($\beta = .17$, $p < .001$) and between education level and adoption of edge-of-field practices ($\beta = .12$, $p < .05$).

3.3 | Source attention

The first set of hypotheses (H1–H3) explored the relationship between attention to different sources of information and concern. In the case of H1, we found no significant relationship between attention to non-agricultural media sources on concern. H1 was rejected. The second hypothesis examined the relationship between attention to agricultural media and concern. We found partial support for H2 as attention to associations was negatively associated with concern ($\beta = -.37$, $p < .001$), meaning individuals who paid more attention to information from agricultural associations also expressed less concern about excess nitrates in water. For H3, results indicated a positive, significant association between interpersonal sources and concern ($\beta = .16$, $p < .01$). Specifically, information received from interpersonal sources was associated with an increase in concerns about nitrates. While not related to any specific hypothesis, we also found evidence of a positive relationship between attention to university/government ($\beta = .15$, $p < .05$) and practice-focused organizations ($\beta = .23$, $p < .001$) and concern about nitrates in drinking water and waterways.

3.4 | Antecedents of perceived risks and benefits

As hypothesized (H4), there was a positive, direct, and significant relationship between those paying greater attention to university/government sources and perceived benefits from edge-of-field practices ($\beta = .23$, $p < .01$). While not initially expected, the association between the farmers' attention to agricultural associations and their perceived benefits of edge-of-field practices was negative and statistically significant ($\beta = -.19$, $p < .01$). We found evidence of a positive and significant relationship between farmers' perceptions of the benefits of edge-of-field practices and greater concern about excess nitrates ($\beta = .13$, $p < .01$), signaling support for H5. While the association between perceived risks and information seeking and sharing was in the expected direction (negative), there was no significant association. Therefore, we did not find evidence to support H6.

3.5 | Factors associated with information seeking, sharing, and practice adoption

Attention to social media sources had a positive association with information seeking ($\beta = .15$, $p < .01$) and information sharing ($\beta = .24$, $p < .001$). Attention to newspaper sources was positively associated with information seeking behavior ($\beta = .11$, $p < .05$). Attention to information from university/government sources had a positive association with information seeking ($\beta = .27$, $p < .001$) and information sharing ($\beta = .16$, $p < .01$). Attention to messages from practice-focused organizations was also positive for both seeking ($\beta = .19$, $p < .01$) and sharing information ($\beta = .18$, $p < .01$). Attention to interpersonal sources had a positive association with information seeking ($\beta = .11$, $p < .05$) and information sharing ($\beta = .11$, $p < .05$). We found additional support for H5, with a significant, positive association between concern and information seeking ($\beta = .26$, $p < .001$) and information sharing ($\beta = .12$, $p < .05$). Contrary to our hypothesis (H5), there was no evidence of a significant association between concern and practice adoption. However, there was a positive, significant relationship between attention to interpersonal sources and the adoption of conservation practices ($\beta = .12$, $p < .05$). Indeed, education and attention to interpersonal sources were the only variables significantly associated with adoption behaviors.

4 | DISCUSSION

On agricultural lands, edge-of-field conservation practices such as riparian buffers, prairie strips, and terraces can provide multiple conservation benefits and ecosystem services (Deere et al., 2022; Schulte et al., 2017). The purpose of this research was to increase understanding of the drivers of farmers' support for these conservation practices and policies. We found that attention to agricultural associations was associated with decreased concerns about nitrates in drinking water and waterways, while attention to university/government, practice-focused associations and interpersonal sources was associated with increased concerns. Farmers' perceptions of the benefits of edge-of-field practices were more positive if they paid attention to the latter groups and more negative among those who paid more attention to agricultural associations. We found broad support for SARF, with a significant correlation between greater concerns about nitrates (affect), positive perceptions of edge-of-field practice benefits, and information seeking and sharing. Individuals paying greater attention to non-agricultural

sources, social media, and interpersonal sources were also more likely to share and seek information about edge-of-field practices. Engagement with interpersonal sources of information was associated with greater adoption behaviors.

Previous scholarship has identified that extension educators and agribusiness sources are important trusted sources of information about conservation practices (Arbuckle & Roesch-McNally, 2015). Other scholarship suggests that many Midwest farmers still rely heavily on radio, agricultural news, and broadcast news (Witzling, Shaw, et al., 2023; Witzling, Williams, et al., 2023). Here, we extend this work by identifying other sources of information that farmers pay attention to, including interpersonal sources, university/government sources, and agricultural associations. Results suggest multiple sources matter for farmers' information seeking and sharing, and attention may shape affect, perceived benefits, perceived risks, and information seeking and sharing. Given that farmers get their information from multiple, sometimes conflicting sources, future research should explore the potential interactions between these sources. Interestingly, interpersonal contacts appear to be a critical information source significantly associated with greater adoption of edge-of-field practices. This work points to the need to better understand networks of farmers and land managers and the multiple ways agricultural communities of practice meet, share ideas, and co-create knowledge.

We identified different patterns of attention between agricultural associations and university/government sources associated with different levels of concern about nitrates, perceptions of edge-of-field practice risks and benefits, and information seeking and sharing. Attention to associations was associated with fewer concerns about nitrates, and attention to non-agricultural news sources was associated with greater concerns about nitrates. This aligns with previous findings that agricultural trade publications attenuate risk (Abrams & Meyers, 2010; Asplund et al., 2013; Church et al., 2017). Abrams and Meyers (2010) suggested that agricultural trade publications attenuate risk by reporting on actions farmers could take to mitigate risks. Church et al. (2017) suggested that readership characteristics may drive risk attenuation. For example, if the readership is skeptical of conservation benefits or nutrient runoff risks, agricultural news sources may avoid these topics to prevent backlash. Previous literature has found that agricultural/rural news outlets are less likely to use frames highlighting environmental risks and uncertainty compared to urban newspapers (Witzling et al., 2022) and that Extension and academic articles use different words and frames compared to traditional news outlets (Coberley, 2020). Thus, it is possible that by covering health-related risks of nutrient runoff more frequently, non-agricultural news sources raise audiences' awareness of the issues and the perceived benefits of edge-of-field practices. While the non-experimental nature of this work makes it difficult to explain these findings, this work highlights the need to understand how messages about environmental policies and conservation practices are described by different sources, to identify messages that appeal to multiple audiences, and to encourage more experimental work on how framing, context, source type, and communication behavior shape conservation practice adoption.

Our results provide theoretical support for SARF. Adding to this framework, our findings highlight the potential for different influence types attributed to agricultural and non-agricultural media outlets, interpersonal sources, and university/government sources of information. Education and age, which were identified as components of SARF, appeared important here as they were associated with greater concern about nitrates in drinking water and waterways, and education was significantly associated with greater adoption of edge-of-field practices. While political ideology is often an important predictor of perceived environmental risks and benefits, this work did not identify any association between participants' self-reported political ideology and the outcome variables we examined. We are careful not to draw too many conclusions regarding this variable and other socio-demographic variables we measured, given the lack of diversity in race and gender within this population.

Concern (or affect) was strongly associated with information seeking and sharing behaviors. In previous work, affect has been tied to individuals' perceptions of risks and benefits (Finucane et al., 2000) and their pro-social or pro-environmental behavioral intentions (Chatelain et al., 2018; Wald et al., 2021). This finding adds to mounting calls for greater attention to the role of affect and emotion in shaping environmental behavior (Brosch et al., 2014). Previous work in the context of wildlife acceptance, water conservation, and health has also highlighted the importance of perceived benefits in motivating action (Kim & Kim, 2020; Shahangian et al., 2022; Wald & Jacobson, 2014). While we did not find a direct association between perceived benefits and information seeking or behavior, we did find that individuals more concerned about nitrates expressed more positive attitudes about the benefits of conservation practices, and those with less concern had attenuated perceptions of risk. To date, the literature on conservation practices has yet to deeply explore how best to leverage perceived benefits as a motivation for action. Previous scholarship using the health belief model has repeatedly found that emphasizing perceived benefits, minimizing practice

obstacles, and encouraging positive perceptions of self-efficacy can influence individuals' commitment to desirable health behaviors. In a study of farmers in Iran, the health belief model, which includes perceived benefits, outperformed the theory of planned behavior in predicting farmers' intentions to use green pesticides (Ataei et al., 2021). Future research should examine how the perceived benefits of conservation action and obstacles to adoption may intersect, particularly how non-monetary benefits to farmers, such as decreased time in the fields, improved soil health, and improved water quality, may also motivate action.

A more representative sample of agricultural audiences would be necessary to draw more generalizable conclusions from this work. Despite this limitation, our findings align with previous scholarship identifying the importance of networks of self-organizing farmers in disseminating and sharing information about coffee and other commodities (Eise et al., 2021; Lugo-Morin, 2013) and implementing vegetated riparian buffers (Pape & Prokopy, 2017). Previous work on SARF and RISP has suggested direct and indirect relationships between many factors in our model. We did not find these effects in our study, possibly due to the population studied here. It is also possible these effects were fully mediated by information-seeking behaviors. Future work could explore this possibility using a mediation model or a structural equation model capturing both direct and indirect effects.

5 | CONCLUSIONS

Among land managers in the United States, "it is not a contradiction to be both pro-environment and antienvironmental policy" (Bonnie et al., 2020, p. 7). Understanding the antecedents of farmers' perceptions of conservation action and policy is critically important because farmers may be open to some policy tools or voluntary pro-environmental action over others. This is particularly vital in US states like Iowa, where ~95% of the land is privately owned. With much of that land managed for agriculture, land managers' adoption of conservation practices can significantly impact state-wide biological diversity and conservation outcomes. Media exposure and farming practice framing by farming media outlets in the UK shaped farmers' awareness of on-farm conservation behaviors and their willingness to adopt sustainable practices (Rust et al., 2022). Communication campaigns targeting farmers also have the potential to increase awareness of conservation-oriented farming events, which are a popular strategy used by extension educators and farming advocacy groups. Yet not all communication campaign strategies will be equally effective with farmer audiences, however, as outreach specialists might see differential results based on message choices. For example, in a study examining the impact of differently themed Facebook ads to promote field days about conservation practices, researchers found that ads using the theme of business were the most cost-effective relative to obtaining clicks, where ads framed with science or stewardship themes gained more engagement among women (Witzling, Shaw, et al., 2023; Witzling, Williams, et al., 2023). Thus, better understanding of how media use, interpersonal sources, and farmer associations shape Iowa farmers' perceptions and conservation behaviors can influence state-wide conservation outcomes in the Midwest and other states with similar land use patterns (e.g., Texas, Michigan). This work highlights potential pathways for more effective communication and engagement with farmers to promote edge-of-field practices as one promising form of on-farm conservation.

Previous work identified that agricultural stakeholders care about land stewardship and express a strong connection to the natural world (Bonnie et al., 2020). Many participants in this study, were concerned about water quality issues affecting drinking water and waterways. Yet, we identified an inverse relationship between attention to agricultural associations and concerns about excess nitrate in water. In the previous section, we discussed several reasons for this finding, including different types of messages, message frequency, or framing of risk across agricultural and non-agricultural information sources. Receiving contradictory messages from important information sources may create challenges for farmers in deciding if, how, or when to adopt conservation practices. The apparent polarized concerns about nitrates in water and the perceived risks and benefits of edge-of-field practices may also suggest patterns of selective exposure. Scholarship in public policy and political science has documented polarized communication behavior, with people's political ideology associated with their exposure to and reliance on different news sources (Stroud, 2008). Our findings may indicate a similar pattern of selective media exposure among farmers, likely related more to farming identity than political ideology. If true, further work is necessary to examine beliefs motivating media use patterns regarding conservation information and how farmer identity shapes beliefs and media consumption behaviors in this context.

While this study focuses on a population of farmers in the Midwest, it is relevant for other US agricultural regions. Strategies to promote greater adoption of conservation practices should include novel techniques that empower and engage agricultural stakeholders as partners in conservation management and policy. Our results

suggest that while knowledge of the perceived risks and benefits of edge-of-field practices are important in raising concern and may motivate information seeking and sharing, interpersonal communication with trusted sources was the only factor significantly associated with edge-of-field practice adoption. Thus, efforts to promote water quality and environmental conservation must move beyond engagement and outreach strategies that seek to "raise awareness" and focus more on strategies that build relationships and trust with land managers and their trusted interpersonal sources. One promising avenue to motivate conservation action within agricultural communities is to develop opportunities to co-create knowledge and engage with farmer leaders who have already adopted edge-of-field practices. Previous research suggests that receiving information from peers is critically important when it comes to the adoption of practices that conserve land and species. Researchers found that farmers in Indiana who received support and information through a farmer network were more likely to adopt vegetative riparian buffers (Pape & Prokopy, 2017). Similarly, Comito et al. (2017) suggested in-person events such as field days are important when it comes to conservation practice adoption as farmers can receive information from trusted peers (Comito et al., 2017). Future research could build on these findings and examine how information sharing among interpersonal networks occurs and when and how these networks could be leveraged to encourage desirable environmental behaviors. Greater understanding of these dynamics could help federal agencies and others better identify additional non-monetary levers to encourage farmers to adopt conservation practices that increase yield, promote biodiversity, and improve water quality.

AUTHOR CONTRIBUTIONS

All the authors made a substantial contribution to the conception, design, data analysis, and interpretation of the data. DMW was the lead author, contributing to writing, data analysis, and editing. MDM led the data analysis and interpretation of data and contributed to the final writing of the discussion and introduction. LW led the conception and design of this study and contributed to the interpretation of data and multiple drafts of editing. JC contributed substantially to the conception of this study, to the recruitment of participants, to the interpretation of data, and to the drafting of this manuscript.

ACKNOWLEDGMENTS

This work was supported by the Iowa Nutrient Research Center (award #2019-1).

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study will be shared in the Iowa State Digital Repository with a unique DOI.

ORCID

Dara M. Wald https://orcid.org/0000-0001-5576-2836

REFERENCES

Abrams, K., & Meyers, C. (2010). Conversations with gatekeepers: An exploratory study of agricultural publication Editors' decisions to publish risk coverage. *Journal of Applied Communications*, *94*(1), 1–13. https://doi.org/10.4148/1051-0834.1183

Altaweel, M., & Bone, C. (2012). Applying content analysis for investigating the reporting of water issues. *Computers, Environment, and Urban Systems*, *36*(6), 599–613. https://doi.org/10.1016/j.compenvurbsys.2012.03.004

Arbuckle, J. G., & Roesch-McNally, G. (2015). Cover crop adoption in Iowa: The role of perceived practice characteristics. *Journal of Soil and Water Conservation*, *70*(6), 418–429. https://doi.org/10.2489/jswc.70.6.418

Asplund, T., Hjerpe, M., & Wibeck, V. (2013). Framings and coverage of climate change in Swedish specialized farming magazines. *Climatic Change*, *117*(1), 197–209. https://doi.org/10.1007/s10584-012-0535-0

Ataei, P., Gholamrezai, S., Movahedi, R., & Aliabadi, V. (2021). An analysis of farmers' intention to use green pesticides: The application of the extended theory of planned behavior and health belief model. *Journal of Rural Studies*, *81*, 374–384. https://doi.org/10.1016/j.jrurstud.2020.11.003

Baumgart-Getz, A., Prokopy, L. S., & Floress, K. (2012). Why farmers adopt best management practice in the United States: A meta-analysis of the adoption literature. *Journal of Environmental Management*, *96*(1), 17–25. https://doi.org/10.1016/j.jenvman.2011.10.006

Boehm, R. (2020). *Reviving the Dead Zone|Union of Concerned Scientists*. Retrieved from https://www.ucsusa.org/resources/reviving-dead-zone

Bonnie, R., Pechar, E., & Rowe, E. (2020). *Understanding rural attitudes toward the environment and conservation in America*. Nicholas Institute for Environmental Policy Solutions, Duke University. Retrieved from https://nicholasinstitute.duke.edu/publications/understanding-rural-attitudes-toward-environment-and-conservation-america

Brenkert-Smith, H., Dickinson, K. L., Champ, P. A., & Flores, N. (2013). Social amplification of wildfire risk: The role of social interactions and information sources. *Risk Analysis*, *33*(5), 800–817. https://doi.org/10.1111/j.1539-6924.2012.01917.x

Brosch, T., Patel, M. K., & Sander, D. (2014). Affective influences on energy-related decisions and behaviors. *Frontiers in Energy Research*, *2*. https://doi.org/10.3389/fenrg.2014.00011

Brulle, R. J., Carmichael, J., & Jenkins, J. C. (2012). Shifting public opinion on climate change: An empirical assessment of factors influencing concern over climate change in the U.S., 2002–2010. *Climatic Change*, *114*(2), 169–188. https://doi.org/10.1007/s10584-012-0403-y

Chatelain, G., Hille, S. L., Sander, D., Patel, M., Hahnel, U. J. J., & Brosch, T. (2018). Feel good, stay green: Positive affect

promotes pro-environmental behaviors and mitigates compensatory "mental bookkeeping" effects. *Journal of Environmental Psychology*, *56*, 3–11. https://doi.org/10.1016/j.jenvp.2018.02.002

Christianson, R., Christianson, L., Wong, C., Helmers, M., McIsaac, G., Mulla, D., & McDonald, M. (2018). Beyond the nutrient strategies: Common ground to accelerate agricultural water quality improvement in the upper Midwest. *Journal of Environmental Management*, *206*, 1072–1080. https://doi.org/10.1016/j.jenvman.2017.11.051

Chung, I. J. (2018). Dynamics of media hype: Interactivity of the media and the public. In *Dynamics of media hype: Interactivity of the media and the public* (pp. 211–228). Amsterdam University Press. https://doi.org/10.1515/9789048532100-012

Church, S. P., Bentlage, B., Weiner, R., Babin, N., Bulla, B. R., Fagan, K., Haigh, T., Carlton, J. S., & Prokopy, L. S. (2020). National print media vs. agricultural trade publications: Communicating the 2012 Midwestern US drought. *Climatic Change*, *161*(1), 43–63. https://doi.org/10.1007/s10584-019-02630-3

Church, S. P., Haigh, T., Widhalm, M., de Jalon, S. G., Babin, N., Carlton, J. S., Dunn, M., Fagan, K., Knutson, C. L., & Prokopy, L. S. (2017). Agricultural trade publications and the 2012 Midwestern U.S. drought: A missed opportunity for climate risk communication. *Climate Risk Management*, *15*, 45–60. https://doi.org/10.1016/j.crm.2016.10.006

Coberley, D. (2020). *Encouraging soil health practices: The influence of identity, norms, and language on soil health behaviors of Iowa farmers*. Retrieved from https://dr.lib.iastate.edu/handle/20.500.12876/94260

Comito, J., Haub, B. C., & Stevenson, N. (2017). Field day success loop. *Journal of Extension*, *55*(6), 29.

Cooper, K., & Nisbet, E. (2016). Green narratives: How affective responses to media messages influence risk perceptions and policy preferences about environmental hazards. *Science Communication*, *38*(5), 626–654. https://doi.org/10.1177/1075547016666843

Corbett, J. B. (1995). When wildlife make the news: An analysis of rural and urban north-central US newspapers. *Public Understanding of Science*, *4*(4), 397–410. https://doi.org/10.1088/0963-6625/4/4/004

Deere, N. J., Bicknell, J. E., Mitchell, S. L., Afendy, A., Baking, E. L., Bernard, H., Chung, A. Y., Ewers, R. M., Heroin, H., Joseph, N., Lewis, O. T., Luke, S. H., Milne, S., Fikri, A. H., Parrett, J. M., Payne, M., Rossiter, S. J., Vairappan, C. S., Vian, C. V., … Struebig, M. J. (2022). Riparian buffers can help mitigate biodiversity declines in oil palm agriculture. *Frontiers in Ecology and the Environment*, *20*(8), 459–466. https://doi.org/10.1002/fee.2473

DeLong, C., Lindahl, C., & Johnson, K. (2021). Leading at the edge: A roadmap to advance edge of field practices in agriculture. *Journal of Soil and Water Conservation*, *76*(2), 41A–43A. https://doi.org/10.2489/jswc.2021.0226A

Dobelbower, S. E. (2018). *Framing the future of the ogallala: A comparative content analysis of agricultural and mainstream media publications*. Texas Tech University. Retrieved from https://hdl.handle.net/2346/82072

Eise, J., Lambert, N. J., & Wiemer, E. C. (2021). Leveraging communities' network strengths to support climate change adaptation information-sharing: A study with coffee farmers in Risaralda, Colombia. *Climatic Change*, *168*(1), 12. https://doi.org/10.1007/s10584-021-03206-w

Eisinga, R., Grotenhuis, M., & Pelzer, B. (2013). The reliability of a two-item scale: Pearson, Cronbach, or Spearman–Brown? *International Journal of Public Health*, *58*(4), 637–642. https://doi.org/10.1007/s00038-012-0416-3

Finucane, M. L., Alhakami, A., Slovic, P., & Johnson, S. M. (2000). The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making*, *13*(1), 1–17. https://doi.org/10.1002/(SICI)1099-0771(200001/03)13:1<1::AID-BDM333>3.0.CO;2-S

Frewer, L. J., Miles, S., & Marsh, R. (2002). The media and genetically modified foods: Evidence in support of social amplification of risk. *Risk Analysis*, *22*(4), 701–711. https://doi.org/10.1111/0272-4332.00062

Griffin, R. J., Yang, Z., Huurne, E., Boerner, F., Ortiz, S., & Dunwoody, S. (2008). After the flood: Anger, attribution, and the seeking of information. *Science Communication*, *29*(3), 285–315. https://doi.org/10.1177/1075547007312309

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate data analysis*. Pearson Education Limited.

Hietala-Koivu, R., Lankoski, J., & Tarmi, S. (2004). Loss of biodiversity and its social cost in an agricultural landscape. *Agriculture, Ecosystems & Environment*, *103*(1), 75–83. https://doi.org/10.1016/j.agee.2003.10.015

IDALS. (2017). *Iowa nutrient reduction strategy: A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico*. Retrieved from https://www.nutrientstrategy.iastate.edu/documents

Inman, A., Winter, M., Wheeler, R., Vrain, E., Lovett, A., Collins, A., Jones, I., Johnes, P., & Cleasby, W. (2018). An exploration of individual, social and material factors influencing water pollution mitigation behaviours within the farming community. *Land Use Policy*, *70*, 16–26. https://doi.org/10.1016/j.landusepol.2017.09.042

Jackson-Smith, D., Ewing, S., Jones, C., Sigler, A., & Armstrong, A. (2018). The road less traveled: Assessing the impacts of farmer and stakeholder participation in groundwater nitrate pollution research. *Journal of Soil and Water Conservation*, *73*(6), 610–622. https://doi.org/10.2489/jswc.73.6.610

Joffre, O. M., De Vries, J. R., Klerkx, L., & Poortvliet, P. M. (2020). Why are cluster farmers adopting more aquaculture technologies and practices? The role of trust and interaction within shrimp farmers' networks in the Mekong Delta, Vietnam. *Aquaculture*, *523*, 735181. https://doi.org/10.1016/j.aquaculture.2020.735181

Kahan, D. M. (2008). *Cultural cognition as a conception of the cultural theory of risk* (SSRN Scholarly Paper 1123807). Retrieved from https://papers.ssrn.com/abstract=1123807

Kahlor, L., Dunwoody, S., & Griffin, R. J. (2004). Predicting knowledge complexity in the wake of an environmental risk. *Science Communication*, *26*(1), 5–30. https://doi.org/10.1177/1075547004267231

Kasperson, R. E., Renn, O., Slovic, P., Brown, H. S., Emel, J., Goble, R., Kasperson, J. X., & Ratick, S. (1988). The social amplification of risk: A conceptual framework. *Risk Analysis*, *8*(2), 177–187. https://doi.org/10.1111/j.1539-6924.1988.tb01168.x

Kim, S., & Kim, S. (2020). Analysis of the impact of health beliefs and resource factors on preventive behaviors against the

COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, *17*(22), 22. https://doi.org/10.3390/ijerph17228666

Kreiter, L. (2023). *A model of risk, communication, and environmental behavior* (Doctoral Dissertation), University of Minnesota. Retrieved from https://hdl.handle.net/11299/258780

Le Cœur, D., Baudry, J., Burel, F., & Thenail, C. (2002). Why and how we should study field boundary biodiversity in an agrarian landscape context. *Agriculture, Ecosystems & Environment*, *89*(1), 23–40. https://doi.org/10.1016/S0167-8809(01)00316-4

Leschine, T. M. (2002). Oil spills and the social amplification and attenuation of risk. *Spill Science & Technology Bulletin*, *7*(1), 63–73. https://doi.org/10.1016/S1353-2561(02)00050-6

Lewis, R. E., & Tyshenko, M. G. (2009). The impact of social amplification and attenuation of risk and the public reaction to mad cow disease in Canada. *Risk Analysis*, *29*(5), 714–728. https://doi.org/10.1111/j.1539-6924.2008.01188.x

Liu, T., Bruins, R. J. F., & Heberling, M. T. (2018). Factors influencing Farmers' adoption of best management practices: A review and synthesis. *Sustainability*, *10*, 2. https://doi.org/10.3390/su10020432

Lugo-Morin, D. R. (2013). El capital social en los sistemas territoriales rurales: Avance para su identificación y medición. *Estudios Sociológicos de El Colegio de México*, *31*, 91. https://doi.org/10.24201/es.2013v31n91.122

McComas, K. A. (2006). Defining moments in risk communication research: 1996–2005. *Journal of Health Communication*, *11*(1), 75–91. https://doi.org/10.1080/10810730500461091

McKitterick, L., Quinn, B., & Tregear, A. (2019). Trust formation in agri-food institutional support networks. *Journal of Rural Studies*, *65*, 53–64. https://doi.org/10.1016/j.jrurstud.2018.11.008

Munn, M. D., Frey, J. W., Tesoriero, A. J., Black, R. W., Duff, J. H., Lee, K., Maret, T. R., Mebane, C. A., Waite, I. R., & Zelt, R. B. (2018). Understanding the influence of nutrients on stream ecosystems in agricultural landscapes. In *U.S. Geological Survey circular 1437* (pp. 1–80). U.S. Geological Survey. https://doi.org/10.3133/cir1437

Murdock, G., Petts, J., & Horlick-Jones, T. (2003). After amplification: Rethinking the role of the media in risk communication. In N. Pidgeon, P. Slovic, & R. E. Kasperson (Eds.), *The social amplification of risk* (pp. 156–178). Cambridge University Press. https://doi.org/10.1017/CBO9780511550461.008

Ng, Y. J., Yang, Z. J., & Vishwanath, A. (2018). To fear or not to fear? Applying the social amplification of risk framework on two environmental health risks in Singapore. *Journal of Risk Research*, *21*(12), 1487–1501. https://doi.org/10.1080/13669877.2017.1313762

Northey, B., & Gipp, C. (2013). *Nutrient reduction strategy key to keeping Iowa a national leader in conservation|Iowa Nutrient Reduction Strategy*. Retrieved from https://www.nutrientstrategy.iastate.edu/news/130110

Nunnally, J. C. (1978). *Psychometric theory*. McGraw-Hill. Retrieved from http://archive.org/details/psychometrictheo00nunn

Pape, A., & Prokopy, L. S. (2017). Delivering on the potential of formal farmer networks: Insights from Indiana. *Journal of Soil and Water Conservation*, *72*(5), 463–470. https://doi.org/10.2489/jswc.72.5.463

Perry-Hill, R., & Prokopy, L. S. (2014). Comparing different types of rural landowners: Implications for conservation practice adoption. *Journal of Soil and Water Conservation*, *69*(3), 266–278. https://doi.org/10.2489/jswc.69.3.266

Porter, P. A., Mitchell, R. B., & Moore, K. J. (2015). Reducing hypoxia in the Gulf of Mexico: Reimagining a more resilient agricultural landscape in the Mississippi River Watershed. *Journal of Soil and Water Conservation*, *70*(3), 63A–68A. https://doi.org/10.2489/jswc.70.3.63A

Prokopy, L. S., Floress, K., Arbuckle, J. G., Church, S. P., Eanes, F. R., Gao, Y., Gramig, B. M., Ranjan, P., & Singh, A. S. (2019). Adoption of agricultural conservation practices in the United States: Evidence from 35 years of quantitative literature. *Journal of Soil and Water Conservation*, *74*(5), 520–534. https://doi.org/10.2489/jswc.74.5.520

Renn, O., & Levine, D. (1991). Credibility and trust in risk communication. In R. E. Kasperson & P. J. M. Stallen (Eds.), *Communicating risks to the public: International perspectives* (pp. 175–217). Springer. https://doi.org/10.1007/978-94-009-1952-5_10

Rust, N. A., Stankovics, P., Jarvis, R. M., Morris-Trainor, Z., de Vries, J. R., Ingram, J., Mills, J., Glikman, J. A., Parkinson, J., Toth, Z., Hansda, R., McMorran, R., Glass, J., & Reed, M. S. (2022). Have farmers had enough of experts? *Environmental Management*, *69*(1), 31–44. https://doi.org/10.1007/s00267-021-01546-y

Schulte, L. A., Niemi, J., Helmers, M. J., Liebman, M., Arbuckle, J. G., James, D. E., Kolka, R. K., O'Neal, M. E., Tomer, M. D., Tyndall, J. C., Asbjornsen, H., Drobney, P., Neal, J., Van Ryswyk, G., & Witte, C. (2017). Prairie strips improve biodiversity and the delivery of multiple ecosystem services from corn–soybean croplands. *Proceedings of the National Academy of Sciences of the United States of America*, *114*(42), 11247–11252. https://doi.org/10.1073/pnas.1620229114

Shahangian, S. A., Tabesh, M., Yazdanpanah, M., Zobeidi, T., & Raoof, M. A. (2022). Promoting the adoption of residential water conservation behaviors as a preventive policy to sustainable urban water management. *Journal of Environmental Management*, *313*, 115005. https://doi.org/10.1016/j.jenvman.2022.115005

Shaw, B. (2009). Using temporally oriented social science models and audience segmentation to influence environmental behaviors. In *Communicating science*. Routledge.

Slovic, P. (1999). Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk Analysis*, *19*(4), 689–701. https://doi.org/10.1023/a:1007041821623

Slovic, P. (2016). The perception of risk. In *Scientists making a difference: One hundred eminent behavioral and brain scientists talk about their most important contributions* (pp. 179–182). Cambridge University Press. https://doi.org/10.1017/CBO9781316422250

Slovic, P., Flynn, J. H., & Layman, M. (1991). Perceived risk, trust, and the politics of nuclear waste. *Science (New York, N.Y.)*, *254*(5038), 1603–1607. https://doi.org/10.1126/science.254.5038.1603

Slovic, P., Layman, M., Kraus, N., Flynn, J., Chalmers, J., & Gesell, G. (1991). Perceived risk, stigma, and potential economic impacts of a high-level nuclear waste repository in Nevada. *Risk Analysis*, *11*(4), 683–696. https://doi.org/10.1111/j.1539-6924.1991.tb00658.x

Stroud, N. J. (2008). Media use and political predispositions: Revisiting the concept of selective exposure. *Political Behavior*, *30*(3), 341–366. https://doi.org/10.1007/s11109-007-9050-9

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson.

USEPA. (2017). *Mississippi River/Gulf of Mexico Watershed Nutrient Task Force*. Retrieved from https://www.epa.gov/sites/default/files/2017-11/documents/hypoxia_task_force_report_to_congress_2017_final.pdf

Wald, D. M., & Jacobson, S. K. (2014). A multivariate model of stakeholder preference for lethal cat management. *PLoS One*, *9*(4), e93118. https://doi.org/10.1371/journal.pone.0093118

Wald, D. M., Johnston, E. W., Wellman, N., & Harlow, J. (2021). How does personalization in news stories influence intentions to help with drought? Assessing the influence of state empathy and its antecedents. *Frontiers in Communication*, *5*. https://doi.org/10.3389/fcomm.2020.588978

Wendland, T. (2023). Gulf "dead zone" predicted to be twice the size of national goal. Again. *Mississippi Today*. Retrieved from http://mississippitoday.org/2023/06/07/gulf-dead-zone-predicted-to-be-twice-the-size-of-national-goal-again/

Witzling, L., Shaw, B., & Amato, M. S. (2015). Incorporating information exposure into a theory of planned behavior model to enrich understanding of proenvironmental behavior. *Science Communication*, *37*(5), 551–574. https://doi.org/10.1177/1075547015593085

Witzling, L., Shaw, B. R., Comito, J., Wald, D. M., Ripley, E., & Stevenson, N. (2023). Promoting agricultural conservation on Facebook: An exploration of the performance of farmer identity frames across age and gender. *Sustainability Science*, *18*, 2677–2689. https://doi.org/10.1007/s11625-023-01416-y

Witzling, L., Shaw, B. R., Yang, S., Runge, K. K., Hartleb, C. F., & Peroff, D. M. (2020). Predictors of environmental policy support: The case of inland aquaculture in Wisconsin. *Environmental Communication*, *14*(8), 1097–1110. https://doi.org/10.1080/17524032.2020.1770308

Witzling, L., Wald, D. M., & Williams, E. (2021). Communicating with farmers about conservation practices: Lessons learned from a systematic review of survey studies. *Journal of Soil and Water Conservation*, *76*(5), 424–434. https://doi.org/10.2489/jswc.2021.00145

Witzling, L., Wald, D. M., & Williams, E. (2022). Conservation in the news: Comparing news coverage of nutrient reduction in agricultural and non-agricultural news outlets in Iowa. *Journal of Applied Communications*, *106*(2), 5. https://doi.org/10.4148/1051-0834.2426

Witzling, L., Williams, E., Wald, D. M., Comito, J., & Ripley, E. (2023). Virtually the same? Understanding virtual and F2F farmer audiences. *Journal of Extension*, *61*(1), 19. https://doi.org/10.34068/joe.61.01.19

Yang, Z. J., Aloe, A. M., & Feeley, T. H. (2014). Risk information seeking and processing model: A meta-analysis. *Journal of Communication*, *64*(1), 20–41. https://doi.org/10.1111/jcom.12071

Yang, Z. J., McComas, K. A., Gay, G., Leonard, J. P., Dannenberg, A. J., & Dillon, H. (2011). Information seeking related to clinical trial enrollment. *Communication Research*, *38*(6), 856–882. https://doi.org/10.1177/0093650210380411

How to cite this article: Wald, D. M., Diaz-Manrique, M., Witzling, L., & Comito, J. (2025). Motivating conservation action in the Upper Midwest: Source attention, information seeking and sharing, and farmers' land management decisions. *Conservation Science and Practice*, *7*(1), e13287. https://doi.org/10.1111/csp2.13287