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Bridging the Divide: Challenges and Opportunities for Public Sector Agricultural Professionals Working with Amish and Mennonite Producers on Conservation

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Abstract
As Amish and Old Order and Conservative Mennonite (i.e., Plain) farmers increase their presence in the agricultural sector, it is crucial for public sector agricultural professionals to effectively work with them to mediate nonpoint source pollution and address issues like the hypoxic zone in the Gulf of Mexico. However, there is a dearth of research on how public sector agricultural professionals can better work with Plain producers on environmental management. There are also few training resources for those working with this key, yet hard to reach, population. Additionally, due to their religious doctrines, Plain communities strive to live apart from the "world" and may be discouraged from working with government entities and attending non-Plain people events. This study analyzes interview data from 23 Amish farmers in one region of Indiana and 18 public sector agricultural professionals from a variety of backgrounds and geographies in areas of the U.S. with heavy Plain populations. Public sector agricultural professionals identified some key agronomic challenges on Plain farms related to issues like poor pasture and manure management as well as socio-cultural challenges such as restrictions on electronic and phone communication. Educators should design outreach strategies that take into consideration that faith convictions and conservation concerns may vary greatly based on the specificities of the particular Plain church group. By better understanding this population and how to work with them, public sector agricultural professionals can more effectively work towards addressing environmental problems with this under-served group.

Keywords Conservation practices · Plain · Amish · Best management practices · Agriculture

Introduction

> "I am here from the government, and I am here to help."
>
> Conservation Agent with a sense of humor introducing himself to Plain producers.

Plain farmers (people of conservative Anabaptist faith[1]-which include Mennonite and Amish)[2] are a growing segment of the agricultural sector in some key Midwestern and Northeastern states, due to their high birth rates and desire for rural enterprises, especially farming (Cross 2014; Cross 2015; Reid 2015). Therefore, it is important to establish effective methods for public sector agricultural professionals as they work with Plain farmers on increasing their adoption of soil and water conservation practices given the linkages between agricultural nonpoint source pollution and

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[1] Anabaptists are Christians who broke off from other key Protestant reformers based on their dedication to adult baptism and ideas of separation of church and state (viewed as an extension of "worldly" power).

[2] Much of the existing literature just focuses on the Amish but conservation and Extension public sector agricultural professionals also work with conservative Mennonites and experience overlapping challenges in working with them. Thus, we are including both in our discussions here despite the even greater lack of research on Mennonites.

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growing environmental problems like the hypoxic zone in the Gulf of Mexico. Currently, little information exists to guide public sector agricultural professionals such as Extension educators, county conservationists, Natural Resource Conservation Service (NRCS) district specialists, Soil and Water Conservation Extension agents (henceforth all are referred to as "public sector agricultural professionals" or "professionals") on how best to work with this growing and diverse population of farmers who are considered underserved by the USDA (Hoorman and Spencer 2001).

Literature Review

Theoretical Background

Extension has largely relied on adoption-diffusion theory to focus their outreach programming since the 1940's (Blackburn 1989; Rogers 1995). This theory describes how farmers adopt different innovations based on how the merits of these innovations are communicated by actors within a farmer's social network. There is evidence that producers with more social networks are more likely to adopt conservation practices (Baumgart-Getz et al. 2012; Prokopy et al. 2008). Consistent with this theory, the literature indicates that access to information for small landowners is important for practice adoption (Barbercheck et al. 2014; Perry-Hill and Prokopy 2015; Perry-Hill and Prokopy 2014; Prokopy 2011; Trauger et al. 2008).

In the case of Plain farmers, information access will likely be shaped by the more conservative groups' restrictions on modern communication (Bergefurd 2011), including the internet, which many conservation agencies use as a vehicle for communication. The Amish and Mennonites may be particularly difficult to reach (Perry-Hill and Prokopy 2015), as they have less access to electronic resources due to church regulations (Bergefurd 2011) and are often averse to working with governmental agencies. Plain people often have distinctly different social networks from non-Plain groups as their family, church, and work-life networks are often highly integrated and overlapping. Thus, while adoption-diffusion theory may provide some insights into Plain farmer behavior and how public sector agricultural professionals might better reach them, some key characteristics of this population and their social networks mean that its application may be limited.

Some people have criticized the adoption-diffusion model as a top-down linear style of communication that does not fully consider the context and ideas of individual farmers (Agunga 1997; Javier 1989). Additionally, adoption-diffusion theory tends to be applied to single dimension technologies rather than systems-based changes related to conservation and sustainability (Napier and Sommers 1994; Nowak 1987; Padel 2002; Pampel and van Es 1977; Perry-Hill and Prokopy 2014; Saltiel et al. 1994; Vanclay and Lawrence 1994). Thus, like Parker (2013), we depart from relying exclusively on predictive models focused on individual determinants for conservation use and instead explore the complexity of working with the Plain people on these key conservation decisions and likewise how farmers themselves approach these decisions. In this way, grounded theory[3] (Glaser and Strauss 1967) is relevant as there is very little research on how public sector agricultural professionals should work with Plain groups on complex conservation issues.

Plain Producers' Characteristics and Environmental Views

Some common characteristics of Plain farmers can shed light on various challenges that public sector agricultural professionals face when working with these populations to increase their uptake of conservation practices. For instance, due to their dedication to living apart from the "world," Plain communities strive to and may be discouraged from attending non-Plain people events. In general, Plain farmers seek to be separate from not only the general "world," but specifically from government, as their history of persecution in Europe has established a strong feeling in favor of separation between the Christian church and the state (Kraybill et al. 2013). This separation can make it challenging for them to practice best management practices (BMPs) as they are heavily intertwined with government programs.

Farmer decisions are embedded in the social and cultural identity of the farmer, which is particularly important when trying to conduct outreach to underserved groups like Amish and Mennonites (Brock and Barham 2015; Hockman-Wert 1998; Sommers and Napier 1993). Specifically for the Amish, their "Creation Care" ethic connects the environment to Christian principles (Brock and Reschly 2016; Hockman-Wert 1998; Vonk 2011). This ethic is not equivalent to environmentalism. For example, environmentalists are assumed to score high on the new environmental paradigm (NEP) developed by Dunlap and Van Liere (1978), which has been modified for different populations but is still commonly used to measure environmentalism (Anderson 2012; Dunlap and Van Liere 1978; Dunlap 2008). The Amish and Mennonites, as well as other Christians, have not scored well on this measure compared to non-Amish as they may tend to believe more in people

[3] Grounded theory denotes a kind of research where theory is generated through the systematic research (Glaser and Strauss 1967; Strauss and Corbin 1998).

having dominion over nature than environmentalists. This dominion idea stems from the Biblical idea of stewardship that requires that people take care and have responsibility over the land (Hockman-Wert 1998). It should be noted that a stewardship concept in the Plain context emphasizes humility and reliance on God rather than some sense of superiority due to domination (Brock and Barham 2015).

This Creation Care ethic of the Amish is lived out in a variety of ways. Historically, Amish farmers were cited as leaders in soil fertility and crop rotation in Europe and throughout their early settlement history in the U.S. (Brock and Reschly 2016). Agrarian writers (e.g., Berry 1981; Kline 2010; Logsdon 1988) have argued that Plain farmers are inherently sustainable, and some scholars have recognized how the smaller size and diversity of Amish farms can have biodiversity benefits. These studies found that Amish farms may have increased levels of pollinators and enhanced nutrient cycling (Blake et al. 1997; Parker 2013; Stinner 1989). Most of these observations, however, are based on anecdotal evidence and case studies.

Plain Farmers' and Conservation Practice Awareness and Usage

Some existing research has shed light on the attitudes and behaviors of Plain farmers suggesting that there may be a lack of awareness and understanding of conservation problems and the agencies who could work with them on these problems. A related study by (Ulrich-Schad et al. 2017) indicates that the majority of Old Order Amish farmers in the Berne settlement in Indiana did not view common agricultural water pollutants (e.g., phosphorus, nitrates, bacteria) or common concerns of the NRCS (e.g., soil erosion, manure management) as problems in their area. This same study indicated that the majority (about 60%) of Amish in the area were unfamiliar with the NRCS, Soil and Water Conservation Districts (SWCD), and Purdue Extension, important agencies that help spread awareness about environmental problems and solutions in the area. Increased familiarity with these organizations may aid in enabling farmers to adopt conservation practices (Ulrich-Schad et al. 2017). Other research has also found that non-Amish farmers may have more awareness of modern conservation techniques than the Amish farmers (Hockman-Wert 1998).

Some studies have indicated concern about how some Plain farmers manage their pastures, manure, and soil erosion. For instance, previous research on Extension agents who work with horse farmers in Indiana (many of whom are Plain farmers) indicated that overstocking and thus overgrazing leads to conservation concerns (Perry-Hill and Prokopy 2015). Manure management issues (i.e., excessive nutrients like phosphorus) can arise for the Plain and other farmers, when there are too many livestock on a small land base and/or the manure, is not spread or stored properly, especially if this takes place near a water body (Penn and Bryant 2006). Plain farmers who rely on horse-drawn equipment (i.e., Old Order Amish and some Old Order Mennonite groups) may be of particular concern because they are typically limited as to how far they can spread the manure (Kogelmann et al. 2006). Erosion may be assumed to be more of an issue for Plain farmers who use moldboard plowing, which cuts deep into the soil. However, a case study in Ohio found that because of increased organic matter on Amish farms, their tillage practices may not always result in higher levels of erosion (Jackson 1988).

There are also some modern contextual changes that make it more challenging to live out the Plain people's Creation Care ethic. Excessive nutrients can be especially problematic in heavily populated Plain communities where land availability is shrinking because of urban development, and there is an increasing number of Amish farmers on fewer acres (Kogelmann et al. 2006; Lanyon et al. 2006). Increased commodity price volatility and their smaller sized farms can also mean that Plain producers are trying to juggle other jobs to make ends meet. In some areas, Amish farmers may be more likely to rely on non-farm sources of income than more liberal Anabaptists and non-Anabaptist farmers (Brock and Barham 2009; Parker 2013; Stinner 1989). Off-farm income can be inversely related to conservation implementation among Plain farmers as conservation efforts require time and attention (Parker 2013).

Research Questions

There is a large body of work focused on non-Plain farmers and their usage of conservation practices (for a review, see Baumgart-Getz et al. 2012). However, there is a small, albeit growing, number of studies focused on Plain, mostly Amish, farmers' adoption of conservation practices. There remains a gap in understanding how public sector agricultural professionals should work with Plain farmers to increase conservation practice uptake. This study attempts to fill this gap by answering the following research questions: (1) What do public sector agricultural professionals view as conservation priorities when working with Plain farmers and what do they perceive as the challenges of working with them to achieve their priorities? (2) What are some of the structural limitations for public sector agricultural professionals at the agency level to achieving their priorities? (3) How do overall public sector agricultural professionals' conservation priorities align with the characteristics, attitudes, and behaviors of Amish farmers in one case study watershed? (4) What are some possible opportunities or existing models that public sector agricultural professionals working with Plain farmers across a variety of settings can draw upon?

Methods

The primary source of data for this paper is interviews with public sector agricultural professionals in areas with large Plain farming populations. Interviews with 18 public sector agricultural professionals working with Plain farmers were conducted by the first author during the summer of 2015.[4] These public sector agricultural professionals were purposefully selected because of their location in key Midwestern states that have concentrated populations of Amish and Mennonites. Some of the individuals were sampled based on professional and personal connections with the first two authors. The remainder of the public sector agricultural professionals were located through snowball sampling (i.e., asking at the end of the interviews if they know other public sector agricultural professionals are working with Plain people) and through strategic online searches on conservation and Extension offices in key areas with high Plain populations. The following types of public sector agricultural professionals were interviewed: County Extension agricultural educators ($N = 11$), county conservationist ($N = 1$), Amish liaison to a county conservation district ($N = 1$), state agricultural agency employee ($N = 1$), current NRCS district specialist ($N = 1$), a former NRCS employee ($N = 1$), county SWCD grazing specialist ($N = 1$), and a private consultant working in conservation who applied for grant-specific projects ($N = 1$). All of the public sector agricultural professionals who are not Extension agents will be referred to as conservation agents. The public sector agricultural professionals were from Iowa (three interviews), Ohio (two interviews), Indiana (four interviews), Missouri (three interviews), New York (two interviews), and Wisconsin (four interviews).

Interview questions focused on the scope of public sector agricultural professionals' conservation work with Plain producers and how that may differ from working with non-Plain farmers, their perceived barriers and motivators to conservation for Plain farmers, resources available for working with Plain farmers, challenges, and successes working with Plain farmers, and the nature of outreach and educational programming. Interviews were semi-structured so that themes could be elicited from the interviewees rather than the researcher, which can increase validity. Thus, coming in with a priori hypotheses based on highly defined theories would not enable the farmer and professional participants to truly voice their views in an open-ended way (Rust et al. 2017). This approach is particularly appropriate considering the exploratory nature of this research (Greenhalgh and Taylor 1997; Prokopy 2011; Rust et al. 2017), which is necessary given how little is known about public sector agricultural professionals' interaction with the Amish on conservation. The purpose of exploratory qualitative research is to identify themes that emerge in the data (Prokopy 2011). The validity of summarizing results quantitatively is limited (Prokopy 2011), but rather we will describe themes that arise from the interviews to highlight an under-researched area. In addition, it is important to note that the questions were not asked in the same way in each interview so the interests and views of the interviewees could be better highlighted.

One interview was conducted in person, and the remaining 17 interviews were conducted over the phone. Interviews lasted from 30 min to several hours. The majority of interviews (12 of the 18) were digitally recorded and transcribed. For the other interviews where digital recording was not possible because of technical difficulties and/or context and setting of the call, the primary researcher wrote down extensive notes during the interviews and filled in other details immediately thereafter. Although some of the interview notes were not verbatim, they were coded like all of the other interview transcripts. The primary author constructed a preliminary codebook that addressed key issues and then discussed these preliminary codes with the secondary author until they were in agreement.[5] The coding focused on the key themes covered in the interviews such as the conservation concerns of the public sector agricultural professionals, the specific challenges of working with Plain people, and the ways these challenges may be overcome. A subset of the interviews was coded electronically in NVivo by the first two authors to check for consistency as prescribed in previous research (Miles and Huberman 1994). The two main authors coded three interviews and achieved a Cohen's kappa coefficient agreement value of 0.72,[6] which is considered satisfactory (Bakeman and Gottman 1986; Gardner 1995) before the first author proceeded with further coding.

We also draw upon interviews conducted with Amish farmers in one settlement in Indiana.[7] The NRCS identified this area as one of the key sources of increased phosphorus and algal blooms in surface water in Lake Erie, and considerable conservation funding has been targeted to work with producers in this area on nutrient management as part of the Western Lake Erie Basin Initiative. This research was

[4] The researchers obtained permission from the Institutional Review Board at Purdue University to conduct this research.

[5] After some preliminary joint coding had been conducted, the number of codes were consolidated as there is a tendency of researchers to create more codes than is necessary for rigorous assessment given the ease of creating codes in NVivo (Welsh 2002).

[6] For description of kappa coefficient see (Cohen 1960; Viera and Garretr 2005). The two main authors jointly analyzed three out of the eighteen interviews (i.e., 16% of the sample), which is higher than recommended as (Miles and Huberman 1994) recommends <10% of the sample.

[7] For more details about the interview and survey data collection methods, please see (Ulrich-Schad et al. 2017).

a unique effort to gain information on how to more effectively work with the Amish in the area on increasing their adoption of conservation practices. The Amish farmers who participated in this part of the study were concentrated in the St. Mary's watershed, which is often referred to as the Berne settlement.[8] Berne is one of the oldest and largest Swiss Amish settlements in the U.S. with settlers arriving as early as 1844 (Nolt and Meyers 2007). Swiss Amish[9] have similar rules to Old Order Amish using horses for transportation and farm field work.

Semi-structured interviews were conducted with 23 Amish farmers in the area through a combination of purposive and snowball sampling. Interview questions focused on characteristics of the farmer and farm operation, attitudes and awareness around water quality, attitudes and usage of conservation practices, and possible connections between water quality issues and farmer behavior. These interviews were transcribed and coded primarily by the second author, but otherwise, the analysis procedure was similar to that of the professional interviews.

Findings

Priorities and Challenges

Agronomic priorities and challenges

The most common area of emphasis for public sector agricultural professionals working with Plain livestock farmers was on pasture management. All of the ten public sector agricultural professionals who worked with livestock producers mentioned pasture management as a conservation challenge. These public sector agricultural professionals described Amish/Mennonite pastures in certain areas as being over-grazed, with low-quality grasses like lawn grass (Kentucky bluegrass) and clover. One professional discussed Plain farmers as "pound[ing] the heck of out their pastures." Some public sector agricultural professionals expressed that Plain farmers have an outdated view of pasture as a place to keep their cattle using the "worse piece of the land on their farm where everything else on their farm is devoted to crops." Another professional said: "You drive by, and they're 1-acre, 2-acres and a lot of them are just mud lots." These problems may arise because some Plain farmers tend not to actively rotate their livestock, maintain quality pasture grasses and plan for the ideal mixture and number of livestock in their pastures. Many public sector agricultural professionals who focus on pastures also mentioned how the inclusion of horses (which Old Order Plain groups also use for transportation and to pull farm equipment) may lead to conservation challenges because horses graze lower to the ground than cattle. For example, as one professional states.

> Typically what happens is, the animals are just left to run within the pasture area. There is no management associated with it, and the next thing you know, they have the pasture eaten down in certain areas, and the grasses are more mature, and so it's clumpy. You'll have an area that horses won't eat because the grass is too mature, and so they continue to eat where it's growing rapidly, and then they eat that to the exclusion of the other. And then where they're eating, those plants die or are stunted and so quality of pasture declines. And then, if that happens to be in an area where the water is running off rapidly, it'll create some erosion. Or it may be next to a stream, and so we have soil washing in the stream.

In contrast, managed grazing is promoted by many conservation and Extension public sector agricultural professionals. Managed grazing involves active rotations of livestock, which can vary from twice a day to once a week during the growing season.[10] Managed grazing increases pasture yields in the context of a low-cost system, thus potentially increasing profitability (Franzluebbers et al. 2012; Rotz et al. 2008). Managed grazing can reduce grain requirements, therefore, potentially decreasing soil erosion and chemical use (Franzluebbers et al. 2012) and improving soil health (Boeni et al. 2014; Mogensen et al. 2005).

Regarding all farm types, the vast majority of public sector agricultural professionals (15 out of 18) discussed nutrient/manure management practices of Plain farmers' in the interviews. Public sector agricultural professionals were concerned that smaller farms may have a lack of awareness about nutrient management. A professional described the concern of excess manure due to too many livestock in small spaces on some of the Amish farms: "A number of those are on smaller tracks [with] 23,000–24,000 birds [i.e., ducks] on 40 acres that material has to go somewhere." In the Berne Indiana area, in particular, an increasing number of Amish producers were contracting to do duck farming.

[8] The scope was limited to one specific area partly because it can be an involved process to research an underserved group who are harder to reach through contemporary communication channels (i.e., phone and email) (e.g., Bergefurd 2011; Brock and Barham 2009; Hoorman and Spencer 2001). Because this is a case study and the Amish are very diverse between different churches, this Berne study was not meant to be entirely replicable (an indicator of reliability) to other Amish communities.

[9] Swiss Amish are sometimes considered more conservative than Old Order Amish because of their use of open buggies and their strict application of church discipline (Nolt and Meyers 2007).

[10] Definitions vary as to how many rotations are necessary for it to be considered managed grazing.

One professional expressed that some Amish producers would operate just barely under the limit where the farm would not officially be considered a CAFO (concentrated animal feeding operation) and thus not be subject to state regulations. As noted by this professional in the Berne area: "We have E. coli in our waters that are off the charts…. Well, they're [Plain producers are] taking note of that, and they're getting pretty worried." As indicated, like non-Plain farmers, Plain farmers are wary of regulations and will sometimes adjust practices to avoid them.

About half of the public sector agricultural professionals in the study also mentioned soil erosion as a conservation concern, and sometimes it was related to poor pasture management and there were a few other issues of concern to conservation and extension agents. The degree to which soil erosion was a concern was related to if the public sector agricultural professionals were working in an area of highly erodible land. Comparisons were drawn between Plain and non-Plain farmers in their land management practices that can contribute to erosion. One professional stated that "soil erosion does tend to be higher with Amish in some cases because here with our steep land, pretty much the only option for Amish is to use the [moldboard] plow, which is considered very high on causing erosion, as opposed to the no-till option." Another professional resonates with this statement, again focusing on the tilling methods that Amish in his area tend to use and are reluctant to move away from: "The tilling the soil with the horses and such seems to be pretty ingrained." Other areas of concern and interest include integrated pest management (IPM), no-till/conservation tillage, and pesticide handling and management. One professional also discussed broader-based management principles like holistic management. The emphasis on certain conservation issues is based on factors such as the geographic region, the foci of the institution and the expertize of the individual professional.

Socio-economic challenges

There are a number of reasons public sector agricultural professionals use to explain why Plain producers have had relatively low rates of adoption of BMPs, including costs and resistance to change. In terms of costs, some Plain farmers seem particularly reluctant to try different conservation practices if they are making a profit with their current farming system and/or just because of a general reluctance to change according to the public sector agricultural professionals. Some of these professionals indicated that it was challenging to convince Plain farmers in some areas to do soil testing because of costs, which to them seems rather modest:"It costs $10 to do a soil sample. I can't [get] these guys to spend $10 to do a soil sample. They just don't want to put the money out." This problem may be portrayed as a cost concern by non-Plain farmers, but in reality, it may be more closely related to Plain farmers' reluctance to change their practices due to their emphasis on humility and their conformity with their churches' explicit and implicit norms. It can sometimes be difficult to distinguish to what degree a norm is explicit and implicit given Plain people are a non-doctrinal Christian society. Hence most of their beliefs are not written down. As one professional states, "But also, they have to have trust that you're not there trying to get them to change things that are ingrained in their society that they don't think needs to be changed." Some public sector agricultural professionals say that Plain farmers may have a reluctance to try new things even if it is related to conservation, which may to some degree relate to informal norms such as respect of elders and their practices. As another professional stated, "Some will listen but a lot of them won't. Grandpa did it this way; Dad did it this way, [so] I'm going to do it this."

In terms of explicit norms within Plain farmers that affect conservation, public sector agricultural professionals and Plain farmers indicated technology restrictions could make it more challenging to adopt practices like conservation tillage since many Plain people farm with horses. For example, managed intensive rotation grazing is considered easier to do with portable electric fencing, which not all communities allow even if they are solar powered. Another example is that usage of horses instead of more modern equipment makes it difficult to move manure far from barns.

Almost all of the public sector agricultural professionals discussed Plain farmers' reluctance to work with organizations that they associate with the government and how this could affect their efforts towards working with producers on conservation. It should be noted though that it was not 100% clear what entities Plain people associate with explicitly with government. For example, Plain farmers in the Berne area seemed to have neutral to positive responses to mentions of Purdue University and did not indicate that they associated Purdue University with government. However, they seemed to connect more explicitly any public sector agricultural professionals who distribute conservation cost-share as being explicitly associated with the government.

It is a fairly explicit norm that the Plain people will avoid working extensively with government, although the application of this norm may vary between communities and individuals. A few public agricultural professionals simply stated that Plain producers would not accept any government assistance at all, as illustrated by the following response to the question of what are the challenges of working with Plain producers: "For one, the financial incentives that we have, they don't care about. They won't accept them. So that is by far the number one hold up. Your focus has to be, well, is this going to work?" According to

public sector agricultural professionals in the Berne Amish settlement, there may also be some concern amongst the Amish in the area that their long-held exemption to Social Security would be questioned if they signed a contract for conservation cost-shares. Some of these public sector agricultural professionals are trying to work with the internal revenue service (IRS) to get this cleared up, but little headway has been made in this pursuit.

Structural Limitations for Public Sector Agricultural Professionals

In addition to the cultural and faith-based challenges of working with Plain producers, there are also challenges related to the structure of the conservation and Extension offices themselves. Public sector agricultural professionals were aware of some of these challenges and articulated them in the interviews. One of the biggest perceived limitations is that there has not been enough focus on Plain farmers as they are considered an underserved group by the USDA. As one Extension agent states,

> We have been working with the Amish only for very small time. So a barrier… that our experience is very less with them and they have a very less experience with Extension. So that is one of the barriers, getting more time to understand each other over the years to come.

Perhaps the lack of experience is due to challenges working with them. But this lack of focus on Plain producers may, in turn, perpetuate the difficulty working with them.

Conservation agents (all public sector agricultural professionals except for Extension) may be more focused on larger operations because major conservation issues like manure spills are more relevant for these types of operations. As one conservation agent stated,

> Working with Amish on conservation, to be proactive about it definitely comes into the kind of '"extra" category or "if you have time" kind of category, and unfortunately, that category, it's just pretty rare to wake up one morning and say,"Oh, I've got nothing to work on today. I'm going to drive around the Amish community and see what's going on". It's much more likely to wake up in the morning and have a message about a big manure spill or a big issue that's occurring that needs to be addressed.

This attitude of some of the public sector agricultural professionals seems to agree with the Amish farmer sentimentality that they are too small to matter for conservation impact. Although this is less of a theme with Extension agents, even they may be encouraged to make an impact by acreage as one agent states, "you work with one guy on 80 acres, you're not going to get as many acres accomplished as if you work with one guy on 3000…"

Public sector agricultural professionals are often recognized and rewarded based on the number of contracts for cost-share programs that they can get farmers to sign. As one conservation professional states:

> There's a mentality here, and I understood it when I was in that role, that we kind of measure progress by how much money we can spend sometimes. And the Amish are extremely reluctant to participate in anything that's going to take any kind of federal funding.

As another professional states, "They only keep track of what they do through contracts that they generate" and Plain farmers do not usually participate in these kinds of programs so, therefore, public sector agricultural professionals may not get much credit for working with them.

Another issue with agencies working with the Amish is the personal nature in which they operate and the issue of staff turnover in the agencies. It can take a significant amount of time to develop relationships with Plain producers, and thus a retirement or movement of a trusted agency representative can be a major loss regarding conservation progress in a particular Plain community. Some public sector agricultural professionals felt that it took a long time to build up trust with the Plain communities and considering that these professionals do not always have long tenures in each position, this can be especially challenging. For example, one professional said that she had heard it could take around 3 years to establish strong enough relationships where she could make headway regarding conservation. Below is a quote from another professional that helps illustrate some of the time investment needed to establish relationships with some of the Plain producers:

> For me to check in on them, the ones I've worked with, is quite a commitment and kind of risky time commitment, where I could travel all the way out there and then they're not even there, which means I'm less likely to do it if I already have a lot going on, which is always the case. So time constraints mixed with the difficulty in contacting them. And then just there is a trust factor. The ones that have worked with me are very comfortable with me, but all of that takes a lot of time, years and years. And a lot of these positions are fairly high turnover, and these conservation positions have quite a demand on them for time

also. So those things together just kind of make it tough.

Limited resources and reduced support for public sector agricultural professionals were also listed as significant constraints and other reasons why conservation agents may focus on larger producers as they become responsible for covering larger areas. The area surrounding and including the Berne Amish settlement is an exception to this climate of limited resources because of the targeted focus on cleaning up Lake Erie. However, bringing in new personnel comes with challenges, and integrating new staff into the communities takes time.

Alignment of Public Sector Agricultural Professionals' and Farmers' Conservation Concerns and Priorities

The main conservation concerns of Amish producers in Berne seemed to be agricultural chemicals, genetically modified organisms (GMOs) as connected to soil and human health, and the impact of larger non-Plain producers in the area. Fifteen out of the 23 Berne Amish producers who were interviewed mentioned GMOs, and 12 out of 23 mentioned chemicals, which gives a rough approximation of the importance of these topics.

Although there are some public sector agricultural professionals who may be working on helping producers reduce pesticide use (e.g., through promoting IPM, pesticide safety trainings), there are not any public sector agricultural professionals who are working on eliminating pesticides in totality. GMOs were never even mentioned by public sector agricultural professionals, whereas it seems to be a big concern for some the Amish producers in the Berne area. While some agencies do focus more on large producers, all the public sector agricultural professionals still felt it was important to work with smaller producers on conservation. Amish farmers in Berne and elsewhere may or may not be using chemicals and GMOs just like non-Amish producers. However, at least among the Berne Amish, there appeared to be growing concern about their use among themselves and other farmers.

A quote from an Amish farmer illustrates some of the concerns of the Amish farmers in the Berne settlement around chemicals, bigger non-Plain farms in the Berne area, and the possible connections to human health issues:

> We've seen a lot of small children with cancerous tumors and such and pass away. There's enough big farmers around here, a lot of times I'll find people spraying where I don't think they should be. I have a family. That's why I talk anti-chemical spray.

As one can see from this quote, Berne Amish producers were connecting health problems within members of their local community because of the use of agricultural pesticides. One professional was particularly frustrated because the concern of some of the Berne Amish about chemicals conflicted, in his view, with responsible pasture management. As he describes,

> This yellow creeping buttercups that's all over the pastures. It's toxic to their horses. I tell them that. I try and tell them that. I preach to them, like, okay, it's toxic. Kill the crap. … Spray it. Well, then you tell them to spray it, and they're like, "'what do you spray?'" Well, spray 2–4D. Well, then they start worrying about, well, how long do I have to keep my horses out because of the 2–4D? And I'm like, okay, you have toxic weeds out there, and you're perfectly fine with that.

This professional is expressing a direct conflict with the Plain concerns with pesticide use and other conservation as well as production goals. Not only did the professional feel that the buttercup issue was irresponsible pasture management, he also felt that it was a negative drain on their pasture yields.

A number of the Berne Amish were also very concerned about GMOs and Roundup (Glyphosate).

Although, these farmers did not make the connection between GMOs and Roundup, one can deduce the connection may be that Roundup Ready Soybeans, a GMO, are genetically engineered and originally patented by Monsanto to be resistant to Roundup. One farmer stated this about GMOs: "Yeah. That was one of the worst things that ever come in farming. I used to use Roundup. I would never do it again." Some farmers expressed concerns about connections with GMOs and Roundup to human health and soil health. Some producers discussed how your weeds might "come back faster every year" after you use it and another talked about Roundup being in the soil for 20–30 years.

A couple of Berne Amish farmers expressed how the promotion of no-till by public sector agricultural professionals does not always align with their conservation priorities, especially given Amish specific technological restrictions. One farmer alludes to the benefits of moldboard plowing as opposed to no-till farming:

> They'll say that [moldboard] plow is a no-no. But then there's some people that say the microbial population just explodes when you go out there with a [moldboard] plow and turn it up, you know. They say it's a good thing, but then some people don't, so I don't know. I consider that's one thing I'd consider may be

> using a chisel plow or something, but there's really not that, too many options out there for a horse farmer, with a chisel plow or something. And I've thought about doing some no-till, but that's tough with horses, to do no-till.

This quote reveals that the farmer sees some conservation benefits associated with plowing, so it makes him less motivated to counter the presumed conservation challenges associated with no-till drilling. Another farmer states, "In my opinion, a lot of people are really pushing no-till. No-till and cover crops. And that really works. But in my opinion, the gain that you get planting cover crops is lost if you use chemistry to spray again. Because that green is a lot of good if it's turned under." This farmer indicates in the overall interview that he is not comfortable with the chemicals he sees typically coupled with no-till and that you need the green manure from the cover crop for it to be effective. Another Amish farmer expressed how the no-till drill made it impossible to manage weeds organically because the no-till drill rows were narrow.

Another agronomic concern of Amish farmers is soil health and the need for additional amendments/alternatives to synthetic fertilizers. This concern did not mesh with public sector agricultural professionals' concerns, and, to the contrary, a few of these professionals discussed how some of the Plain communities, in their view, may rely too much on information about agriculture that is not necessarily scientific. The professionals felt that these amendments that were popular among the Berne Amish may not be worth the costs. These amendments generally do not have much credence with University Extension. In the view of these professionals, if some influential people in the community believe that something like this is helpful, then the rest of the Plain community will often also implement the practice despite the lack of scientific evidence of its effectiveness. Interestingly, upon reading this manuscript, another professional who was interviewed mentioned that both public and private sector agricultural professionals have been using this model of using influential farmers to demonstrate and to spread information about certain agricultural practices for many decades.

Another interesting socio-economic disconnect when comparing themes in professional and Amish interviews was how farmers seem to mention time and cost as constraints in not adopting conservation practices. These issues were brought up to some degree by public sector agricultural professionals, but it was more apparent of a dimension in the Berne Amish interviews. In the Berne Amish settlement, some of the growers were working construction jobs for 8 h a day that were more than an hour away. Although only four of the 21 farmer interviews made the connection between time availability and conservation directly, the role of outside jobs was important for many of the farmers. The farmers who did make the connection discussed how working outside jobs can mean less time for conservation efforts given farming is usually restricted to evening hours or they are focused on maintaining the large-scale livestock operation, as indicated by this farmer who states that he does not explore conservation because it takes time. He states "to find answers because I'm involved in this business so I have more than I can do outside. Plus, I have a hog operation, and that keeps me pretty busy." Another farmer states, "they can't afford to take a day off from work to do it." Even attending informational meetings was limited for some because of their off-farm work.

Conservation Models and Opportunities

Conservation models

A couple of the public sector agricultural professionals provided positive examples of Amish conservation practices that were related to their smaller diversified farms, which can have nutrient, biodiversity, and pollinator benefits. Another professional said that they are more naturally minded, which can mean that they use less pesticides. As this professional states:

> Their lifestyle is very conservation practice-oriented, a lot of what they do. They have [] buffer areas around their place. They've got set aside for having pasture for a lot of their livestock. They do a lot of things, which work well for conservation in general so that when you try to ask them to do more, [it] seems almost fake. They're already doing a lot.

One farmer discusses how taking care of the earth "is actually written in the Bible" and "we should take care of it more. Well, you know God didn't invent the chemicals."

Despite the challenges, public sector agricultural professionals felt that Plain producers have diverse levels of awareness and behavior when it comes to conservation issues. Some Plain producers may be more open to conservation assistance than non-Plain producers. For example, a number of the Berne Amish farmers seemed particularly open and interested in cover crops as indicated by the farmer interviews. Another professional stated that Plain farmers commonly rotate their crops. In contrast to the view that the Amish do not manage their pasture well, it is important to realize that in some places Plain farmers are leaders in the area of managed intensive grazing. For example, according to a professional interview in upstate New York, the Plain group there is about 80% organic farmers who also practice managed grazing, and these farmers are somewhat aware of conservation issues. Both

New York public sector agricultural professionals who were interviewed stated that they were close enough to Chesapeake Bay that there was more awareness among Plain producers of pollution issues. The Chesapeake Bay has been a targeted water body for quite some time due to excess nutrients and sediments. Because there are many Plain producers who farm in watersheds, which drain into this estuary, the NRCS, and other organizations have been trying to work with them on conservation for quite some time. This same sentiment is likely to reflect those public sector agricultural professionals working with the Amish in Pennsylvania. Given that there are significant numbers of Plain producers in Lancaster, Pennsylvania that the NRCS has worked with, one of the New York public sector agricultural professionals stated that "what happens in Lancaster has repercussions for other Plain communities," so the networks between Plain communities may be helpful for facilitating information exchange on conservation. Even promoting no-till conservation practices is possible in some areas. For example, the Holmes County, Ohio Old Order Amish, used a no-till drill for horses for a low (subsidized) fee with the Soil and Water District as far back as 1984.

Plain farmers are highly communal, and implicit as well as explicit norms within each church leads to some distinct patterns of conservation adoption between groups; however, there are still variations among individuals within churches. As one professional states, "you have your early adopters, you have your laggards…all [the] same whether it's Amish, Mennonite, or English folks [i.e. non-Plain], you have the same people in all communities. We always have Amish and Mennonite farmers that are out there adopting new technology have or before the universities are even looking at it." This professional is pushing back on the idea that Plain people are always resistant to change as expressed earlier, and it may be very productive to work with the earlier adopters among the Plain people on conservation.

Government/agency workarounds

Public sector agricultural professionals expressed how they potentially counter issues and apprehensions that Plain producers may have with taking money from government entities. As discussed earlier, there is a formal norm against receiving what are perceived as government "handouts". However, taking money from the government is not as black and white of an issue as the earlier conservation/agriculture agent's quote would indicate. In sum, there may be a few, albeit rare cases, when they do accept some kind of government assistance, which will be discussed in the final section of the results.

Many Plain farmers prefer just to be told about conservation problems through written brochures, so they can try to solve these issues themselves. This sentiment is also illustrated by the following quote from an Amish producer in the Berne area: "I think the best way would be to somehow just make us aware of it. Tell us what's happening…" A few of the public sector agricultural professionals were accustomed and aware of this sentiment but as one professional states, "what we've tried to get across is, sometimes there's costs to doing those things that's kind of above and beyond what most folks can handle," but the public sector agricultural professionals say there is a continual reluctance to participate.

It seems that charging a small fee can sometimes alleviate concerns Plain farmers may have with taking government funds. For instance, the conservation unit in Adams County (near the Berne Amish settlement) charged a small fee for the use of a conservation-based no-till drill that can be pulled by horses. Sometimes these small fees can help it seem like it is not a complete "give away" to the Plain producer, but at the same time, the price is small enough not to be cost-prohibitive. In other words, when Plain producers feel that they are receiving something for nothing, they are generally not open to taking these resources.

Another way to make conservation progress with Amish farmers is to focus on conservation goals that are not tied to conservation BMPs. For example, a few of the public sector agricultural professionals indicated that there are many ways to do conservation without the focus on cost-share conservation programs. Rather than spending money, it is much more important, as one professional stated, to "change their heart and soul" so that long-lasting change can be implemented. It should also be noted that the Amish are implementing conservation practices commonly used such as crop rotations or diversified farming as indicated by farmer interviews. Thus, rather than relying on cost-share programs that are limited to a few specific techniques, a couple of the public sector agricultural professionals suggested that it may be much more effective to get to know the Plain farmers and figure out the best ways to achieve conservation success within the context of their values and culture.

The Extension and SWCD public sector agricultural professionals working with the Amish did not cite the same constraints as NRCS public sector agricultural professionals since their work does not really involve government cost-share dollars. In fact, some Extension agents in heavily populated Amish areas admitted that they spend more time with Plain farmers than other farmers. Thus, public sector agricultural professionals who have more flexibility in their jobs and are not rewarded based on contracts may be more likely to work with Plain producers. Some agencies like Extension may even reward work with underrepresented groups like the Plain people, and some Extension public sector agricultural professionals said that they tried to highlight their underserved nature when they were reporting

on their work progress to higher authorities within Extension.

Communication technology workarounds

Public sector agricultural professionals find they need to consider technology limitations of Plain producers when publicizing and holding an educational event for them. Typically public sector agricultural professionals find that outreach with Plain producers should not be done via the Internet, but rather through posting announcements in public places, distributing paper newsletters, and through sending letters and return postcards so that producers can easily respond through the mail. The Plain people are different from non-Plain people since many of them are more likely to read something that comes in the mail than from some other source, as indicated by at least six public sector agricultural professionals and a few of the Amish. As one producer illustrated when he said that, rather than going to meetings, "If something comes in the mail, I probably look at it. Just some informational stuff."

Public sector agricultural professionals discuss how word of mouth is also a slow but sure way professionals can distribute information to individuals and groups of Plain producers according to interviews. An Amish farmer was asked how to better publicize for a conservation meeting that had poor attendance. He responded "Well, I just know what I know what I've seen on my farm and spread the word. That's the best way. Word of mouth is your best advertisement." A few public sector agricultural professionals also discuss how it can be a challenge for horse and buggy groups to attend workshops and farm visits that are more than a few miles away, so it can be helpful if agencies arrange vans to transport the producers to the workshops. There is an incredible amount of diversity between Plain communities regarding their characteristics, beliefs, and attitudes. Much of their church rules are not written down but are known and understood so that they can be interpreted in a variety of ways. For example, the aversion to working with the government is a commonly understood guideline, but the specifics on how this aversion plays out may not be clearly delineated, even to the members of the community themselves. The diverse nature of community values means that outreach and programming efforts need to consider the unique character of each Plain community.

Public sector agricultural professionals discussed how they need to consider the specific norms on presentation technology within each Plain community. For example, some Plain communities do not mind when professionals present material using PowerPoint and videos, but others will not participate in the meetings if those techniques used. One professional talked about how another professional used a PowerPoint for a workshop, and the Amish attendees turned their back to the presentation. Sometimes printing out the slides or information from the Internet can be more appropriate depending on the restrictions of the particular Plain community. On the other hand, in the Berne area, one farmer who was well-regarded in the community expressed an interest in presentations with visual media because they did not have the chance to use such a device in their personal lives.

As with other farmers, public sector agricultural professionals find that they need to consider the time of the year for Plain farmers (e.g., not during planting season or harvest) and the time of day when planning events. Some of the public sector agricultural professionals recommend combining workshops on conservation with something else that the farmers have to do such as a pesticide training or auditor food safety training, as Plain farmers are busy and sometimes averse to attending additional meetings. What may be unique to Plain farmers is that they have community and church events that may occur at unexpected times like the middle of the week. For example, weddings traditionally took place on Thursdays, and still do in many communities. Some Plain producers say there are too many competing meetings and things to do with their church and other farmer groups. As one farmer states,

> I have always wanted to go [to informational meetings], but I have never……[bad timing] or I don't find when they are at until when they are. Or I forget about it. Typical farmer. Always on the go. I've got so many irons on the fire, so to speak.

Therefore, public sector agricultural professionals suggested it was helpful to figure out meeting and community event patterns in their local area.

For most Plain groups, public sector agricultural professionals stated it is helpful to keep training practical and hands-on and to keep the language at an eighth-grade reading level given the Plain groups' de-emphasis on formal education and "book learning." For example, the Amish limit formal schooling to eight grades and de-emphasize the process of science. It is also important to not use acronyms and keep terms simple (e.g., do not use terms like sedimentation, and silt). We found through farmer interviews that some of the producers were not familiar with the term tillage, but were familiar with the term plowing. As one Berne Amish farmer stated, Amish school children "have to learn the English language … But our home language is German. And yeah, we're a lot more simple. Probably be better off drawing pictures may be for us." Some of the public sector agricultural professionals had picture books to explain pesticide safety, and that can be very useful. Other professionals said that it is helpful to have demonstrations

and farm visits and that pasture walks were especially popular, as depicted by the following quote by a producer:

> [I] started hearing about it and had an opportunity to go, and after that, I didn't want to miss any of the pasture walks that they had. I really enjoy the pasture walks.

Agency interviews revealed how having farmers demonstrate management techniques on their farm were the most successful form of education. Public sector agricultural professionals indicated how they thought it was ideal if they could get a Plain producer for a model, but there were challenges convincing Plain farmers to volunteer, possibly because of their strong ethic of humility.

Relationship building and flexibility with plain producers

Public sector agricultural professionals found that establishing relationships and making inroads with the community is often vital in working with Plain communities successfully on conservation. Personal connections may matter more for the Amish than for other farmers so they can see the professional as a person rather than just an agent of the government. This is how the introductory quote could occur despite the apprehension to working with the government. This gentleman who introduced himself by saying "I am from the government and am here to help" was well known in the community so that he could joke around with the producers. The Amish farmers who were interviewed would typically refer to the public sector agricultural professionals by their first names rather than by their title or the agency that they represent. For example, one professional was referred to in six different interviews by his first name, which is a lot considering the open-ended nature of the interviews.

There are multiple ways to make inroads with the Amish community, but they all take time and the avenues to develop relationships may vary by community. A few of the public sector agricultural professionals discussed how for them it was essential to be present at community events like produce auctions and get to know the community before they try to reach out with any programming. This is a large time investment for time-strapped public sector agricultural professionals. A couple of the public sector agricultural professionals said that it was helpful to work with the bishops (church leaders) and several other professionals thought that it was helpful to work with the younger folks and thought leaders in the community as they tended to be more open about issues of conservation. One professional said you should just find the "one of 50" who is a "mover and shaker." Two other public sector agricultural professionals discussed how instrumental it was to have a Plain farmer liaison or a board of Plain farmer liaisons who could communicate the needs of the community to the professional(s). Sometimes key people who work with the Plain people such as cheese factory leaders, dairymen, or other agribusiness people can be useful entry points as was the case for the researchers involved in these studies. A local city leader was instrumental for writing a letter of support for the study with the Amish settlement in Berne, Indiana.

It is important to remember that in some instances, Plain groups may be more willing to accept information than non-Plain groups. As stated earlier, they are more likely to remember and identify with a name than an agency. Those few Amish farmers who did recognize Extension were trusting of the organization and open as stated by one farmer:

> That's why he's [professional] there, and it's free service. I know it's from the government. We know that. But it's service that is very; we can use, so to speak. Even though we use a lot from the feed mills and the chemicals, they do a lot of consulting as well because they sell the product. But the thing we don't like about them is they will just give us what they sell. They'll recommend what they sell.

Additionally, some agency folks felt that Plain farmers may be more open to working with agency staff who are not technically affiliated with the government but instead are a private consultant or associated with a nonprofit agency or business. Interestingly, this observation counters what other public sector agricultural professionals said about some of the Plain people relying on outside businesses who were selling things that were not scientifically sound, illustrating that there are rarely universal results for any of these observations. One successful example of the private sector working on conservation was in Holmes County, Ohio where the SWCD collaborated with the local cheese factory. As described by one of the public sector agricultural professionals, the cheese factory needed to reduce its excess nutrient flow from cheese manufacturing. It turned out to be cheaper and more efficient to compensate farmers to implement conservation practices rather than institute a system that would reduce nutrient flow from the cheese factory. This seemed to be the most efficient way to meet necessary environmental standards.[11] Another idea that a few Adams County Conservation agents (near the Berne Amish settlement) are trying to develop is a revolving fund. No interest loans could be given out for conservation

[11] A professional who was interviewed for this study discussed the efficiency of this cheese factory compensating farmers to implement conservation practices. This case study is discussed more extensively in (Parker et al. 2009)'s publication.

projects, and the Amish could repay the funds. They are not sure how to work out some of the details with the IRS, but it could be that the fund could pay the contractors directly. As a result, the Amish would not have to handle the funds directly and would not have to sign a contract with the government.

The public sector agricultural professionals advised being flexible, working around these technology restrictions, and being aware of this diversity in how technology gets adopted. Some specific church technology restrictions can make it difficult for Plain farmers to adopt certain conservation practices. For example, as discussed earlier, some churches cannot use portable electric fences even if they are solar powered. The public sector agricultural professionals who work in areas where portable fences are not allowed stated that they needed to adjust their ideals about how the concept of management intensive grazing always equates to the farmers rotating their livestock twice daily, as that will likely not happen with permanent fencing. As one professional states about trying to do intensive grazing with permanent fencing, "It can also make it more difficult to adopt an intensive style of managed grazing without electric fencing, but that managed grazing can be done just with a lower level of intensity." The no-till drill adapted for horses is another example of flexibility around technology.

Conclusions and Recommendations

As Plain farmers continue to comprise a larger fraction of the farming sector (Donnermeyer et al. 2013; Cross 2015) and agricultural market economy (Lutz 2017), they will have an increasing role to play in addressing nutrient loading issues in water bodies abutting large Plain populations, i.e., Lake Erie and the Chesapeake Bay. Although many Plain producers have Creation Care ethics and have historically been leaders in some areas of land stewardship (Brock and Reschly 2016), these ethics may not necessarily be lived through adoption of common conservation BMPs. In fact, awareness levels of water quality concerns and conservation practice adoption were lower for the Amish in Berne, Indiana than the non-Amish for every conservation BMP except cover crops (Ulrich-Schad et al. 2017). Awareness of conservation issues and adoption of conservation practices can sometimes be lower on smaller farms (Parker 2013; Perry-Hill and Prokopy 2015). The conservation literature illustrates the important role access to relevant information and connections to agencies have in conservation awareness and practice implementation (Baumgart-Getz et al. 2012). Thus, this study was an important contribution to the scant literature on Plain conservation awareness and adoption, as it focused on information exchange of public sector agricultural professionals working with Plain producers.

Public sector agricultural professionals working with Plain farmers across a variety of settings focusing on nutrient, manure, and pasture management concerns counter numerous challenges. According to public sector agricultural professionals, some of the Plain farmers had issues such as too many livestock units in a small area creating excess manure and nutrient management problems as well as worn down pastures, which confirms other research (Penn and Bryant 2006); Perry-Hill and Prokopy 2015; (Kogelmann et al. 2006). Public sector agricultural professionals discussed how technological restrictions, costs and reluctance to change could be inhibiting factors to adoption of conservation practices. Farmer interviews highlighted these same issues with perhaps more emphasis on the lack of time as juggling non-farm jobs can be a constraint to adopting conservation practices (Parker 2013). According to survey results in the same area forty-five percent of farmers indicated that time was a challenge for nutrient management plans. Cost (38%) and lack of equipment/technology (40%) were also barriers for nutrient management plans (Ulrich-Schad et al. 2017).

There are also a variety of socio-economic constraints that create challenges for public sector agricultural professionals working with Plain producers. Like many other farmers, Plain farmers have an aversion to government interference and are especially concerned about increased regulation (Prokopy et al. 2014). Since most public sector agricultural professionals work for agencies affiliated with the government this makes it difficult for public sector agricultural professionals to make inroads with Plain producers. There are church restrictions on formal education after the eighth-grade and certain communication technologies like the Internet (Bergefurd 2011), which both mean that typical communication strategies and language used by conventional extension and conservation agencies may not work for Plain people. Similar to Perry-Hill and Prokopy (2014)'s findings, interviews with public sector agricultural professionals in this study revealed that producers with smaller farm were reluctant to spend money on conservation. For the Plain farmers, in particular, this reluctance may be connected to a strong sense of frugality.

The structure of the agencies themselves can also create more constraints on effective educational outreach with Plain producers, and there has been a historic lack of attention on the Amish and Mennonites from these agencies. NRCS employees are rewarded for cost-share contracts focused on specific BMPs, which can make it difficult to work with Plain farmers who are not interested in financial contracts with the government that focus on such BMPs. High staff turnover can be particularly problematic as Plain

people tend to be more comfortable working on conservation with agents after a relationship has been established.

In addition, public sector agricultural professionals and farmers may not always agree on environmental priorities (Perry-Hill and Prokopy 2015; Vanclay 2004). As discussed earlier, public sector agricultural professionals were mostly focused on BMPs that help to address water quality concerns as well as pasture, manure, and nutrient management concerns. In contrast, Berne Amish farmers were concerned with conservation issues like soil, plant, and human health consequences of farm chemicals and GMOs. This concern about agricultural chemical use among Amish producers was confirmed with another case study project in Ohio (Sommers and Napier 1993). This disconnect between public sector agricultural professionals and farmers argues for a more participatory approach to Extension rather than a top-down application of the conventional adoption-diffusion approach (Vanclay 2004). A participatory model would mean that public sector agricultural professionals would try to understand producer goals and concerns address those as much as possible.

The participatory model may have contributed to the model examples of public sector agricultural professionals engaging with Plain producers on conservation. It is important to play into Plain farmer values as much as possible so they can have more ownership over their ideas (Cates 2014; Jepsen and Mann 2015). For example, the Berne Amish concerns about soil health may play into their use of cover crops. The Amish in Berne actually were more likely to use cover crops than non-Amish farmers (40% vs. 20% adoption (Ulrich-Schad et al. 2017). Plain farmers may also be using practices that are not prioritized by the NRCS like crop rotations, which affirm research by Parker (2013) and Jackson (1988). Thus, it seems like Amish may adopt conservation practices that are more appropriate to their concerns; a number were exploring organic, biological, low-spray management systems. A few of the agency staff did not think that focusing explicitly on conservation BMPs was always the best way to achieve conservation goals associated with water quality anyway so perhaps these other avenues are a promising direction.

A few public sector agricultural professionals made a direct attempt to work with Plain producers to understand their concerns by consulting with Amish advisory panels and Amish liaisons to help determine their values and priorities and work with them towards achieving these goals. This kind of collaboration is in the vein of a participatory model (Franz et al. 2010). There are structural issues with the agencies themselves which make it difficult to practice a participatory model. Extension and soil and water conservation agencies may be more able to cater to Plain producer values than conservation agencies such as the NRCS as they are not as focused on specific programs. For example, the Amish in some areas like Missouri use Extension materials on topics like Integrated Pest Management (Piñero et al. 2015).

There are also diverse and creative ways that conservation challenges are currently being faced by agency staff in specific locales that might be replicated to some degree in other Plain communities. Relationship building with the Plain communities and individuals seem to be a theme of successful programming. Many of the agents interviewed developed a rapport so that the Plain farmers think of the public sector agricultural professionals as individuals rather than a representative of a certain agency. Rogers (1995), who developed the adoption-diffusion theory, also recognized the importance of public sector agricultural professionals creating these kinds of trusting relationships. Relationship building can also involve understanding the larger context of the farmers' lives, which confirms previous research on how conservation practice education may need to be integrated with broader farm and quality of life concerns (Parker 2013; Perry-Hill and Prokopy 2015). It also may help to do hands-on workshops like pasture walks where farmers in the area share information directly with each other that is locally relevant (Singh et al. forthcoming). These hands-on ways of learning may be appropriate than other learning venues such as information distributed over the Internet or through written material that may not be completely accessible because of specialized terminology.

This research suggests conservation efforts should be tailored to local issues especially given the diversity of Plain communities and the local specificity of environmental issues (Parker et al. 2009). All of the public sector agricultural professionals said that there were very few resources on how to work with the diverse groups of Plain farmers and that they had to learn about this local specificity with "on-the-job" learning. Agency staff discussed the importance of connecting their broader conservation agenda to the Plain farmers' local specific concerns in culturally appropriate ways. It is possible that the scope of some Plain producers is too "local" to recognize connections beyond the farm level, which may explain lower levels of awareness of broader water quality issues (Parker 2013), as well as in the study sample in Adams County.

The local specificity is partly attributed to the structure and diversity of Plain churches. Plain people are organized by church districts of 20–30 families, and there is often minimal structure between groups (Kraybill et al. 2013). This can be very challenging for agency staff to decipher as most of the specific church regulations around technology adoption related to farming and other venues are locally determined. As one of the public sector agricultural professionals indicated, it is challenging to distinguish the different Plain groups, so a guidebook for support people would be very useful so that public sector agricultural

professionals have some sense of specific technological and cultural restrictions that may apply to conservation management practices. It was beyond the scope of one publication to begin to parse out the diversity of Plain producers. The diversity of these conservative Anabaptist groups is so extensive and locally specific that a book would likely be more appropriate than a journal article.

In the context of declining budgets at the federal, state and local levels and heightening environmental concerns, conservation personnel must work strategically and learn from each other by creating specialized resources and networks of public sector agricultural professionals. One takeaway is that some of the Amish are tuned into to certain kinds of contemporary agricultural/conservation concerns. Future research should explore more how Plain producers acquire and share information between each other. The development of more networking opportunities, research, resources, and publications such as this article hopefully will assist conservation and Extension agents as they work with Plain producers in practicing conservation and try to work with local concerns and technological restrictions. There is a need for more of this type of research at the local community level.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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