

**A social networks perspective on adoption of two-stage ditches in  
the Western Lake Erie Basin**

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## INTRODUCTION

A key challenge for environmental policy is to turn science-based recommendations into actions on the ground. Adoption of best management practices (BMPs) by private landowners, whose decisions are likely to be based on a variety of factors other than science, presents one such challenge. Recognition of the complexity of understanding adoption of BMPs has led to extensive scholarly work on this topic. For instance, a study wherein twenty-five years of literature on adoption of agricultural BMPs was reviewed, found that education levels, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness, and utilization of social networks were associated with higher adoption rates (Prokopy, et al., 2008). Another study found that local networks played a critical role in adoption of BMPs by means of facilitating diffusion of innovations, development of social capital, and cultural change (Lubell & Fulton, 2007). Viewing adoption as a social process, it has been argued in the literature that adoption behavior would be influenced by the personality of the decision maker and their social networks (Pannell, et al., 2006). In a recent scholarly work, meta-analysis of BMP adoption literature in the United States led to the finding that access to and quality of information, financial capacity, and connection to agency or local networks of farmers or watershed groups, are the variables with largest impact on adoption (Baumgart-Getz, et al., 2012). Much scholarly work has also been done on collaborative environmental planning wherein benefits of engaging stakeholders in generating knowledge has been highlighted, which in turn leads to a greater buy-in for adoption of BMPs (Campbell, et al., 2011; Bosch et al., 2013).

Thus, multiple factors have been identified in the literature which helps in understanding adoption of BMPs. This study focuses on one particular factor, social networks. Social networks

are the patterns of friendship, advice, communication or support that exists among the members of a social system (Valente, 1996). Although the role of social networks in adoption of BMPs have been widely recognized in the literature, especially from the perspective of landowners/farmers who eventually adopt a practice, there is a dearth of scholarly work on understanding adoption of BMPs as an interplay of social networks of landowners and governmental agencies. This interaction becomes more complex with the existence of multiple, overlapping governmental institutions which are very often responsible for promoting adoption of BMPs. Thus, adoption of BMPs by landowners, which as recognized earlier, is a key challenge for environmental policy, is likely to be influenced by the willingness of government agencies to promote them. Based on this premise, the objective of this study is to understand whether the social networks of key decision makers in governmental institutions can help in explaining variation in their willingness to promote adoption of a BMP.

## **STUDY AREA & RATIONALE**

The focus of this study is on one particular scientifically-identified BMP, two-stage drainage ditches. This practice has been shown to reduce nutrient runoff, and improve drainage and ecological functions, yet its adoption by landowners is uncertain (Witter, et al., 2011). This study examines adoption of two-stage ditches in the context of the Western Lake Erie Basin (WLEB), one of the most productive and intensively farmed regions of the world (USDA-NRCS, 2005). The basin is located in Indiana, Michigan, and Ohio, & covers an area of over 4.9 million acres (USDA-NRCS, 2005). In terms of area distribution, 76% of the basin is in the state of Ohio, followed by 17% in Indiana, and 7% in Michigan (WLEB, 2009).

Poor agricultural practices have led to excessive sedimentation and nutrients input in the basin (WLEB, 2009). In fact, sedimentation due to agriculture is a leading environmental and economic issue in the basin (WLEB, 2009). Due to extensive agriculture the basin is also being targeted as a major contributor of nonpoint source (NPS) water pollution into Lake Erie (Rousseau & Lawrence, 2013). Over the past three decades, numerous government programs have been encouraged among farmers in the basin to adopt practices that reduce water pollution (Forster & Rausch, 2002). However, NPS water pollution is currently the major contributor of nutrients into Lake Erie (Bosch, et al., 2013). BMPs, which are very often supported by government programs, and promoted by government agents, have been identified as an important mechanism by which NPS water pollution in Lake Erie can be reduced (Bosch, et al., 2013; Makarewicz, et al., 2009).

It is evident from the literature that NPS pollution resulting from agriculture and associated practices is a major problem in WLEB. It is also evident that adoption of BMPs holds promise in dealing with the problem of NPS pollution in Lake Erie. However, in order to make tangible impact on the environmental as well as economic wellbeing of the basin, and also reduce NPS pollution in Lake Erie, it is important that BMPs do not merely become policy prescriptions on paper. Rather, they should be adopted by landowners.

The interaction between landowners and government agencies is complex in the basin due to the existence of multiple, overlapping governmental institutions responsible for administration of drainage programs, and thus promoting adoption of two-stage ditches. For example, in the state of Ohio, the County Engineer Offices (CEOs) and Soil and Water Conservation Districts (SWCDs) are responsible for administering drainage programs. In fact, depending upon how drains have been maintained historically in a county, the authority of administering drainage

programs and thus promoting adoption of two-stage ditches could either lie with SWCD or CEO (Jonathan Witter, *personal communication*). In the state of Indiana, local surveyor's offices and drainage boards have this authority, whereas in the state of Michigan, drain commissions are responsible for administering drainage programs. The existence of multiple jurisdictions makes it important to understand the effects of these authority figures and the types of ties that they have, on their willingness to promote the adoption of two-stage ditches. Additionally, by analyzing social networks in detail the understanding of social learning in adoption decisions can be improved, which in turn can help policy makers to develop more targeted strategies to promote agricultural innovations (Matuschke & Qaim, 2009).

### **Why study adoption of two-stage ditches? – Exploring implications for environmental policy**

Two-stage ditch is an innovative, drainage ditch design which reduces nutrient runoff, provides benefits such as improved drainage and ecological function, and also requires little or no maintenance (Witter, et al., 2011). However, they need additional land area for construction, and also have a higher upfront cost of construction compared to traditional trapezoidal drainage ditch designs (Witter, et al., 2011).

An essential goal of environmental policy is to bring about behavior change, which requires breaking old habits (Stern, 2000). In the context of this study, the act of adopting an innovative drainage ditch design over a traditional one, by a landowner, can be considered to be the behavior change of interest. However, bringing about this change in behavior is not easy because of multiple reasons. Firstly, adoption of two-stage ditch requires high upfront cost and loss of land for the landowner. On the flipside, benefits in the form of reduced runoff, improved

ecological functions and less or no maintenance, accrue over time, and are difficult to quantify. Secondly, adoption of this innovation very often poses a problem of collective action. Everyone in the drainage area deriving benefit from a drainage ditch is assessed the cost of its maintenance. Adoption of a new, innovative ditch design, with high upfront cost of construction, by a landowner, would require cooperation among other landowners in the drainage area.<sup>1</sup> Last, but not the least, being a new ditch design, promoting its adoption would require provision of information.

Thus, adoption of two-stage ditches can be considered to be a type of environmental behavior which is difficult to adopt. This in turn makes the role of government agents, or the managers, who promote such innovations and also provide information about them, very crucial, for its subsequent adoption. Also, there is a knowledge gap about what factors affect how active government agents or managers are in promoting a BMP or an innovation.

## **RESEARCH METHOD & DATA COLLECTION**

The data for this study were collected through telephone semi-structured interviews with key decision makers, henceforth referred to as interviewees, about drainage ditches, one in every county in WLEB.<sup>2</sup> Depending upon the state in which the county is situated, the interviewee was selected from one of the government agencies identified earlier. The primary criterion for selection of an interviewee was based on their involvement in drainage improvement and maintenance in a county. The semi-structured interviews helped in collection of three types of data – (i), willingness to promote adoption of two-stage ditches; (ii), social networks of the

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<sup>1</sup> In the state of Ohio, there are three different processes by which a group drainage ditch improvement project can be carried out – Mutual Agreement, County Petition & Senate Bill 160.

<sup>2</sup> There are 27 counties in the basin. In total, 23 semi-structured interviews were conducted. Out of these 23 interviews, social network data was collected from 20 interviewees.

interviewees across the counties in WLEB; (iii), individual attributes of the interviewees, which could be helpful in understanding their willingness in promoting adoption of two-stage ditches among farmers. Collection of data on social networks, as well as individual characteristics, has been considered to be important in understanding diffusion of innovation in the literature (Coleman, et al., 1957).

A list of the names of 27 interviewees, one from each county, was generated. Firstly, using the free recall method, the interviewee was asked to identify their friendship, advice and discussion ties with respect to the designation/position they hold in their office (Wasserman & Faust, 1994). Secondly, by using the free recall method, the interviewee was asked to identify their advice and discussion ties specifically with respect to two-stage ditches. Identification of a tie involved the interviewee specifying the name of the person, his/her designation/title and the organization he/she came from. Interviewees were also asked to rank their willingness to promote adoption of two-stage ditches on a scale from 1 to 10.

The semi-structured interviews included the following questions:

Question for collecting data on the dependent variable – willingness to promote adoption of two-stage ditches:

- On a scale from 1 to 10, with 1 being not at all willing and 10 being very willing, how willing are you to promote adoption of two-stage ditches as a management practice?

Questions for collecting data on social networks –

- In your role as a (specify designation/position), who are you friends with?
- In your role as a (specify designation/position), who do you take advice from?

- In your role as a (specify designation/position), who do you discuss important matters with?
- In particular with respect to two-stage ditches, who do you take advice from?
- In particular with respect to two-stage ditches, who do you discuss important matters with?

Questions for collecting data on individual attributes –

- How long have you been working in the capacity of advising about agricultural drainage practices and other BMPs in this county?
- How familiar are you with an alternative drainage ditch design like the two-stage ditch?

## **DATA ANALYSIS & RESULTS**

The data analysis for this study was motivated by the primary question – what is it about the composition of networks of interviewees<sup>3</sup> that explains variation in their willingness to promote adoption of two-stage ditches. Another question of interest was, is individual willingness to promote adoption of two-stage ditches explained or not explained by individual attributes of interviewees.

Referring to table 1 below, the dependent variable, willingness to promote adoption of two-stage ditches, had a mean score of 5.73. The mean willingness to promote two-stage ditches for Ohio was 4.71. Whereas for Indiana and Michigan the mean willingness score was 8.75 and 6.75 respectively. In my sample, average number of years for which interviewees have been advising about agricultural drainage practices was found to be 19.8. Total network size, which is the total

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<sup>3</sup> In keeping with the terminology used in social network analysis, interviewees have been referred to as „egos“ and the actors they are connected to, are referred as „alters“.



number of alters (others) mentioned by egos (interviewees) in my sample, irrespective of the type of tie, had a mean score of 23.2. One thing to keep in mind is that a mean of approximately 23 does not indicate that on an average egos had a tie with 23 different alters, for example an alter mentioned for friendship as well as advice would be counted as 2 ties. The breakup of network size across the 5 different ties is described below. As shown in Table 1, network size of egos, for both advice and discussion about two-stage ditches, is smaller than network size for friendship, advice and discussion in general.

Table 1  
*Descriptive Statistics: Willingness\* measure, Number of years, & Network Size*

	Minimum	Maximum	Mean	Std. Deviation
Willingness to promote adoption of two-stage ditch	1.0	10.0	5.73	2.81
Number of years advising about agricultural drainage practices	1	45	19.76	14.06
Total Network Size	13	47	23.15	8.22
Friendship Network Size	2	17	5.85	3.91
Advice Network Size	1	13	6.25	3.43
Discussion Network Size	1	12	5.85	3.00
Advice two-stage Network Size	1	10	2.50	2.01
Discuss two-stage	1	10	2.70	2.25

\*Note. Willingness measured on a scale of 1 to 10, with 1 being not at all willing and 10 being very willing. N= 20

## Comparing role composition of ego’s total network versus two-stage ditch advice network

During the semi-structured interview, egos were asked to specify the designation/title of the person they identified their tie with. This enabled analysis of the role composition of ego’s network. Of particular interest in this analysis is the comparison between the role composition of ego’s total network and the role composition of ego’s two-stage ditch advice network.

Table 2 below provides information about the role composition of ego’s total network. It was found that about 33% of alters were either engineers or technicians. This was closely followed by directors/commissioners/administrators which comprised about 30% of ego’s role composition network.

**Table 2**

*Role composition of ego’s total network – Designation/Title*

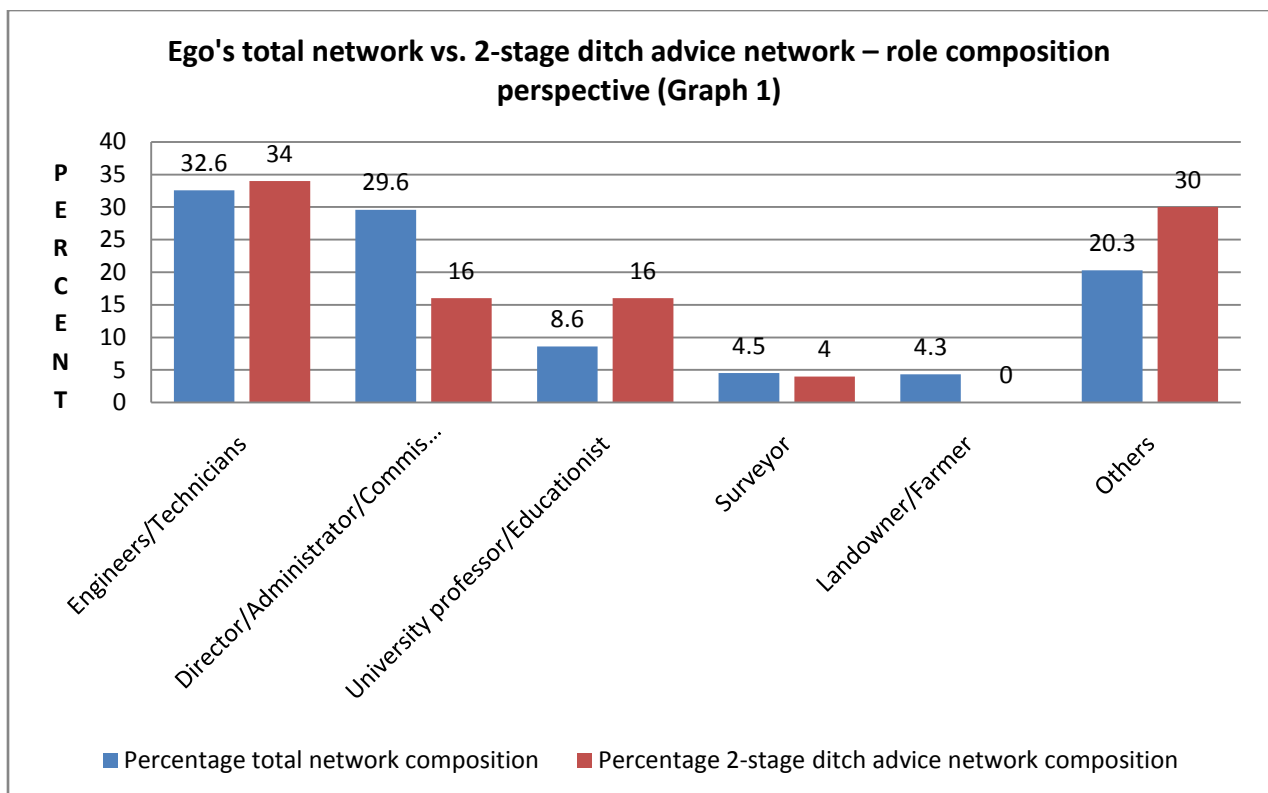
	Frequency	Percent
Engineers/Technicians	151	32.6
Director/Administrator/Commissioner	137	29.6
University/Professor/Conservationist	40	8.6
Surveyor	21	4.5
Landowner/Farmer	20	4.3
Others	94	20.3
<b>Total</b>	<b>463</b>	<b>100.0</b>

Table 3 on the next page, provides information about the role composition of ego’s two-stage ditch advice network. It was found that engineers/technicians continue to play an important role in ego’s two-stage ditch advice network. However, directors/administrators/commissioners are not as often a part of ego’s advice network on two-stage ditches.

**Table 3***Role composition of ego's two-stage ditch advice network – Designation/Title*

	Frequency	Percent
Engineers/Technicians	17	34.0
Director/Administrator/Commissioner	8	16.0
University/Professor/Conservationist	8	16.0
Surveyor	2	4.0
Others	15	30.0
<b>Total</b>	<b>50</b>	<b>100.0</b>

In order to draw a comparison between findings from table 2 and 3, percentage role composition of ego's total network was plotted against percentage role composition of ego's two-stage ditch advice network (Graph 1).



It was found that the role composition of ego's total network as well as two-stage ditch advice network is dominated by engineers/technicians. Given that egos in my sample are high status

players, this finding could suggest that engineers and technicians are held in high regard by them. Another important finding was that university extension offices, university professors, and educationists are very often source of advice on two-stage ditches. In fact, they were found to be the source of advice on two-stage ditches almost double the role composition of ego's total network size.

### **Comparing organizational composition of ego's total network versus two-stage ditch advice network**

During the semi-structured interview, egos were also asked to specify the organization their alters came from. This enabled analysis of the organizational composition of ego's network. Similar to the analysis done for designation/title of alters, of particular interest in this analysis was to compare organizational composition of ego's total network with organizational composition of ego's two-stage ditch advice network.

Table 4 on the next page, provides information about the organizational composition of ego's total network. It was found that SWCDs were most often the organization to which the alters belonged to, with a composition of about 32%. This was not surprising as SWCDs are very often involved with making drainage management decisions.

**Table 4***Organizational composition of ego's total network*

Organization (code) <sup>4</sup>	Frequency	Percent
County Engineers Office (1)	42	9.1
Soil & Water Conservation District (2)	147	31.7
University (3)	19	4.1
USDA (NRCS)/USEPA/ODNR (4)	84	18.1
Landowner/Farmers (5)	18	3.9
County/Drain Commissioners Office (6)	62	13.4
Surveyors Office (7)	23	5.0
The Nature Conservancy (8)	8	1.7
Others (9)	39	8.4
No Organization (10)	21	4.5
<b>Total</b>	<b>463</b>	<b>100.0</b>

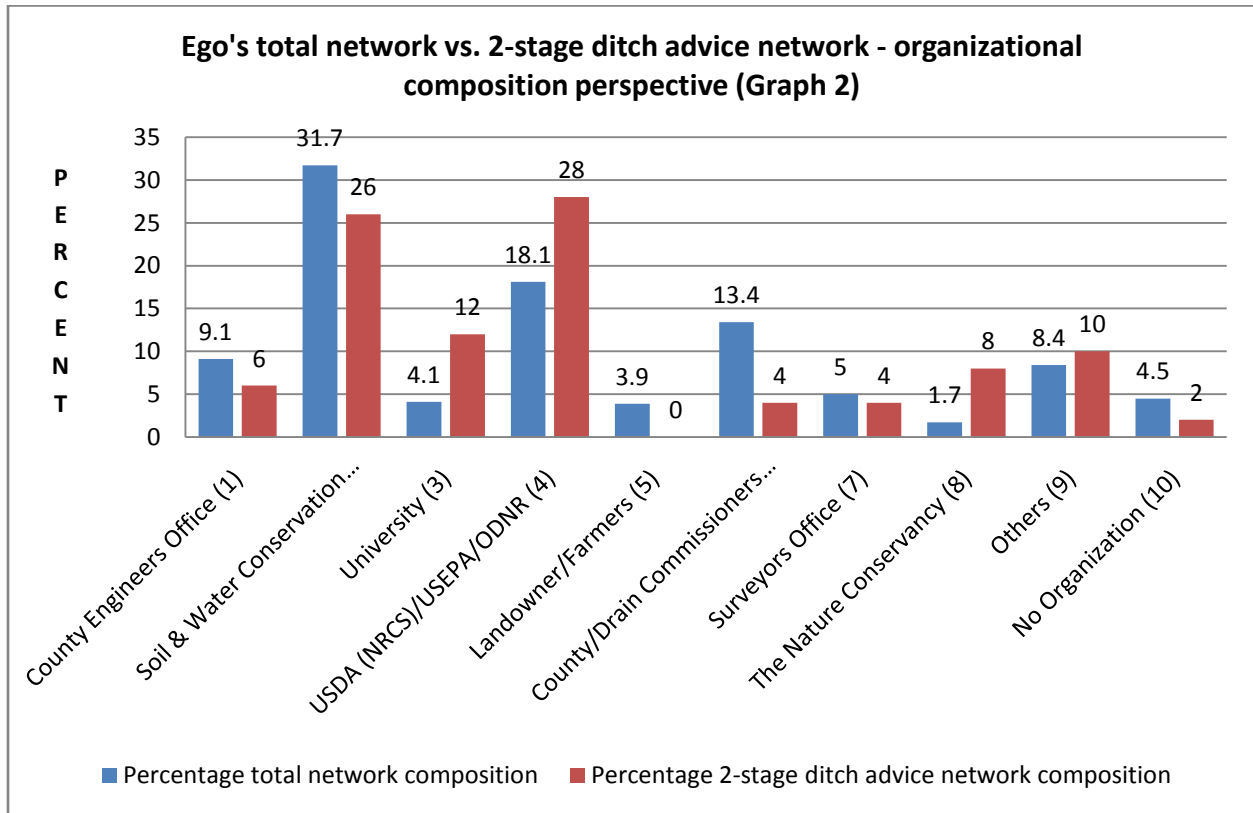
Table 5 below provides information about the organizational composition of ego's two-stage ditch advice network. One of the main findings was that government agencies such as USDA-NRCS/USEPA/ODNR played almost as important a role as SWCDs when it comes to seeking advice on two-stage ditches.

**Table 5***Organizational composition of ego's two-stage ditch advice network*

Organization (code)	Frequency	Percent
County Engineers Office (1)	3	6.0
Soil & Water Conservation District (2)	13	26.0
University (3)	6	12.0
USDA (NRCS)/USEPA/ODNR (4)	14	28.0
County/Drain Commissioners Office (6)	2	4.0
Surveyors Office (7)	2	4.0
The Nature Conservancy (8)	4	8.0
Others (9)	5	10.0
No Organization (10)	1	2.0
<b>Total</b>	<b>50</b>	<b>100.0</b>

<sup>4</sup> Organization codes will be used later for network analysis in the social network graph.

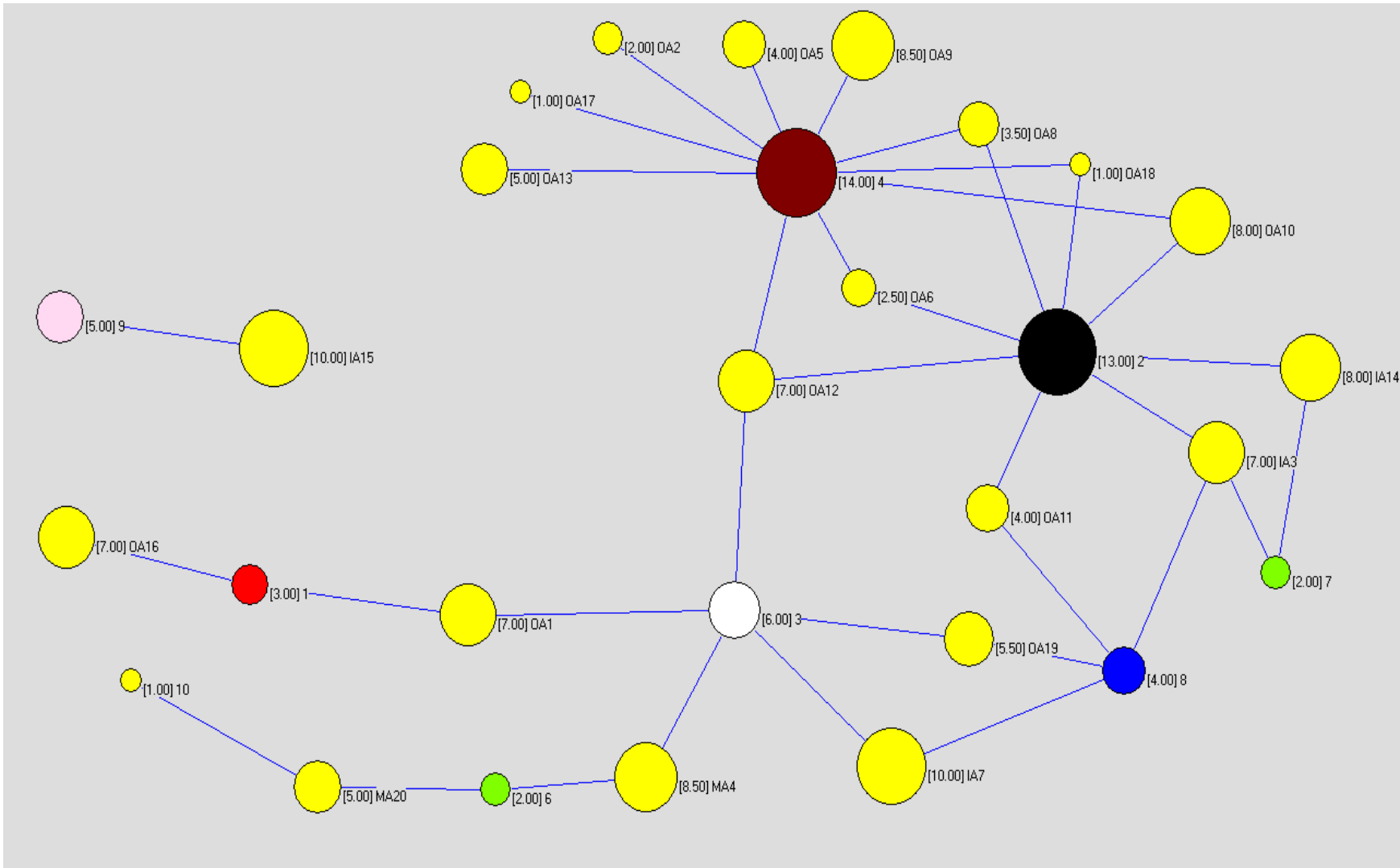
In order to draw a comparison between findings from table 4 and 5, percentage organizational composition of ego's total network was plotted against percentage organizational composition of ego's two-stage ditch advice network (Graph 2).



It was found that unlike organizational composition of ego's total network where SWCDs were most often the organization to which the alters belonged to, organizational composition of two-stage ditch advice network has a much more diverse composition. A diverse set of organizations such as universities, government agencies, and NGO's were found to be very often source of advice on two-stage ditches.

## **Organizational composition & willingness to promote two-stage ditches**

In order to understand the interplay between ego's network composition and their willingness to promote two-stage ditches, a social network graph was generated and visualized using Pajek, a program for analysis and visualization of large networks (de Nooy, et al., 2005). For this analysis, two-stage ditch advice network and willingness to promote them, was represented from an organizational composition perspective.



**Social Network Graph – Organizational composition of two-stage ditch advice network and willingness to promote them**



In the social network graph represented above, organizations have been represented using their respective codes (refer table 4 or 5) and shown using multiple colors. The number inside parenthesis shows how often alters belonged to the corresponding organization. Nodes have been sized based on how often advice from a particular organization was sought by the ego. The egos, or my interviewees, have been represented as „OA9“, where „O“ represents that the interviewee is from Ohio. Similarly „M“ represents that the interviewee is from Michigan and „I“ represents that the interviewee is from Indiana. „A9“ represents the code assigned to the interviewee. Nodes representing egos have been colored yellow, sized based on their willingness to promote adoption of two-stage ditches, and are shown in parenthesis.

It can be visualized from the network graph that maximum numbers of egos reach out to organizations such as SWCDs, USDA-NRCS, ODNR, Universities, and The Nature Conservancy to seek advice on two-stage ditches. However, it can also be visualized that seeking advice from one or more of these organizations alone is not able to explain variation in egos willingness to promote adoption of two-stage ditches. Thus, it can be said that organizational composition of egos two-stage ditch advice network by itself, is not able to explain variation in willingness to promote adoption of two-stage ditches.

### **Ego’s individual attributes – Familiarity with two-stage ditches**

In order to further understand the variation in egos willingness to promote two-stage ditches, the individual attribute – familiarity with two-stage ditches, was used. Based on the qualitative data generated about this attribute, major themes with regard to familiarity with two-stage ditches were generated. The findings have been summarized in Table 6 below.

<b>Major themes</b>	<b>Frequency</b>	<b>Effect on ego's willingness</b>
Have been to seminars/workshops/training about them/Seen presentations/read about them	9	+
I know the basics/I know little bit about them	8	-
Seen them but never designed	7	-
I haven't designed them	6	-
Yes, I am familiar with them	5	+
Just getting into them/discussion about them has begun	3	+
I am very familiar with them	2	+
We have constructed them (indicates involvement with the construction)	2	+
I am aware/I know they have been constructed in our county (but not involved with the construction)	2	-

**Table 6 – Ego's familiarity with two-stage ditches**

It is important to note that more than one theme could correspond to an ego. Thus, the numbers of times these themes appear do not add to the sample size of 20. Based on whether a theme had a positive or negative impact on ego's willingness to promote two-stage ditches, each theme was assigned a positive or a negative value. It was found that by itself, ego's familiarity with two-stage ditches was not able to explain variation in their willingness to promote adoption of two-stage ditches. For detailed analysis and scores assigned to individual egos, please refer appendix 1.

## **Explaining willingness as interplay between ego's network composition and individual attributes**

Based on the analysis so far, it was found that by itself, neither ego's network composition nor ego's attribute of familiarity with two-stage ditches, was able to explain variation in their willingness to promote adoption of two-stage ditches. However, when both these aspects were combined, it was found that willingness to promote adoption of two-stage ditches emerged as interplay between ego's organizational composition of two-stage ditch advice network and their current familiarity with two-stage ditches. Egos that sought advice on two-stage ditches from organizations such as USDA, The Nature Conservancy, SWCDs and University, and also indicated a higher level of familiarity with them, were more willing to promote its adoption. For detailed analysis, please refer appendix 2.

Findings from this study highlight the importance of where one seeks advice from, about two-stage ditches, and one's knowledge of two-stage ditches, as important factors explaining variation in willingness to promote them. However, there were a couple of cases where an ego scored high on familiarity with two-stage ditches and was also seeking advice from organizations which appear most frequently in two-stage ditch advice network, but had a low willingness to promote two-stage ditches. A possible explanation was ego's disapproval of how two-stage ditches are being promoted, as one interviewee said, "It is a shame how they are trying to set the tone for two-stage ditches". Another interviewee with a low willingness score mentioned that, "Sometimes ODNR and EPA give directions without giving us any options. This is bad attitude". Thus, although familiarity with a BMP and where one seeks advice from helps explain variation in a decision maker's willingness to promote it, one should also keep in mind the local context and an individual's experience with the existing governance mechanisms.

## DISCUSSION

Two-stage ditch is a new drainage ditch design. While it provides benefits such as improved drainage and ecological functions, and also requires little or no maintenance, it also needs additional land area for construction, and has a higher upfront cost of construction compared to traditional drainage designs (Witter, et al., 2011). So, it is not surprising that willingness of decision makers responsible for promoting them varies. From a social networks perspective, as found in this study, variation in willingness could be attributed to composition of decision maker's advice network combined with their familiarity with the BMP.

At a regional/geographical scale, willingness to promote two-stage ditches was higher in Indiana and Michigan when compared with willingness to promote them in Ohio. Higher willingness to promote two-stage ditches in Indiana could be attributed to two-stage ditches being an approved BMP for Indiana's Environmental Quality Incentive Program (EQIP), whereas in Ohio it was recommended for approval for Ohio's EQIP program in 2013. From a networks perspective, it was found that county surveyors in Indiana had a high level of familiarity with two-stage ditches, and there was also information sharing between the county surveyors, which emerged in their friendship and advice networks. Lower willingness to promote two-stage ditches in Ohio could be attributed to the fact that decision makers in Ohio are less familiar with two-stage ditches when compared with decision makers in Indiana and Michigan. Also, in Ohio, there appears to be a mismatch between a decision maker's familiarity with two-stage ditches and their organizational composition of two-stage ditch advice network, as egos that were familiar with two-stage ditches were often found to be not seeking advice from organizations such as USDA, The Nature Conservancy, SWCD and University.

## **LIMITATIONS & FUTURE RESEARCH**

The findings in this study are interesting, but there is scope for further exploration. The data analysis for this study was focused mainly on ego's total network and two-stage ditch advice network. I would like to further analyze these findings by including data from friendship and discussion networks. Another limitation of this study was that network data among alters could not be collected. In order to deal with this limitation, and to collect more network data, I am currently conducting a mailed survey of 1500 landowners in 3 counties in Ohio.

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**APPENDIX 1 – Familiarity with & willingness to promote two-stage ditches**

<b>Interviewee/Office/State</b>	<b>Familiarity with two-stage ditches</b>	<b>Score based on familiarity major themes</b>	<b>Interviewees' willingness to promote</b>
1/CEO/Ohio	Data not collected		7
2/SWCD/Ohio	Seen, never designed	-	2
3/SWCD/Adams, Indiana	Familiar with them; know the basics	+, -	7
4/Drain commission/Hillsdale, Michigan	Familiar with them	+	8 to 9
5/SWCD/Ottawa, Ohio	Been to some seminars; have limited understanding; haven't designed; have just been on a few tours and seen some of them	+, -, -	4
6/SWCD/Mercer, Ohio	Know a little bit about them; I have seen couple of them, never designed	-, -	2 or 3
7/County Surveyor's Office/Wells, Indiana	Very familiar; constructed 14-15 in our county	+, +	10
8/SWCD/Defiance, Ohio	Little bit familiar; know they have been constructed in our county	-, -	3 or 4
9/SWCD/Hancock, Ohio	Starting to get into them; discussion about them has begun	+	8 to 9
10/CEO/Lucas, Ohio	Familiar with them; seen them but haven't designed them yet	+, -	8
11/CEO/Fulton, Ohio	Become familiar with them over last couple of years; haven't designed them	+, -	4
12/CEO/Auglaize, Ohio	Seen several presentations about them	+	1 standard Ag. Drainage ;7 if extra capacity necessary

13/CEO/Wood, Ohio	Have seen three, two-stage ditches; never designed	+	No Response
14/SWCD/Paulding, Ohio	Heard about them; never designed	+, -	7
15/SWCD/Henry, Ohio	Familiar with them; haven't designed or seen; read about them	+, -, +	5
16/ County Surveyor's Office/DeKalb, Indiana	Studied a little bit about them; seen some, talked to people and contractors who have done them; haven't designed	+, +, -	8
17/ County Surveyor's Office/Steuben, Indiana	Very familiar; installed several in our county	+, +	10
18/SWCD/Van Wert, Ohio	Not very familiar; know the basics; have been to workshops	-, +	7
19/SWCD/Wyandot, Ohio	Been to many seminars; been part of a training course; seen lots of presentations; never seen one	+, -	1
20/CEO/Putnam, Ohio	Just read about them and discussed with local SWCD; didn't interest me	+, -	1
21/SWCD/Hardin, Ohio	Never designed; undergone training about them; trying to get one constructed by July, 2014	-, +, +	5 or 6
22/Drain Commission/Lenawee, Michigan	Know about them; seen them; observed a project	+, +	5
23/CEO/Sandusky, Ohio	Not very familiar at all; been to 1 day workshop	-, +	3

**APPENDIX 2 – Comparing willingness to promote two-stage ditches, familiarity, and two-stage ditch advice network’s organizational composition**

<b>Interviewee Code</b>	<b>Score based on familiarity major themes</b>	<b>Willingness to promote</b>	<b>Advice two-stage Network Size</b>	<b>Number of alters from university/USDA/SWCD/TNC/Surveyors Office</b>	<b>% Network composition*</b>
OA1	Data Not collected	7	4	2	50%
OA2	-	2	1	1	100%
IA3	+,-	7	3	3	100%
MA4	+	8.5	2	1	50%
OA5	+, -, -	4	2	2	100%
OA6	-, -	2.5	2	2	100%
IA7	+, +	10	2	2	100%
OA8	-, -	3.5	2	2	100%
OA9	+	8.5	2	2	100%
OA10	+, -	8	2	2	100%
OA11	+, -	4	2	2	100%
OA12	+, -	7	10	10	100%
OA13	+, -, +	5	1	1	100%
IA14	+, +, -	8	2	2	100%
IA15	+, +	10	5	0	0%
OA16	-, +	7	1	0	0%
OA17	+, -	1	1	1	100%
OA18	+, -	1	2	2	100%
OA19	-, +, +	5.5	2	2	100%
MA20	+, +	5	2	0	0%

\*Note. % Network composition = Number of alters who are either from university, USDA, SWCD, TNC or Surveyors Office, divided by the two-stage advice network size