

The weight of water: values, civic engagement, and collaborative groundwater management on
the U.S. high plains

by

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B.S., Drake University, 2010
M.S./ MCRP, Iowa State University, 2013

AN ABSTRACT OF A DISSERTATION

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Department of Sociology, Anthropology, and Social Work
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Abstract

Rural communities in the U.S. High Plains rely on groundwater from the declining Ogallala aquifer. I apply the sociological concepts of social structure, culture, and agency to understand the relationships between farmers/producers and groundwater management. My mixed methods approach includes quantitative modeling of secondary data, a survey of producers across the Ogallala Aquifer region, interviews with producers in Western Kansas, and a case study of sustained civic engagement among the producers who formed the Wichita County Water Conservation Area (WCA).

My model of secondary data shows no association between groundwater extraction and human development at the county level. This suggests that the benefits of groundwater extraction are not being reinvested into local human and financial capitals. My interviews with producers provide support for a treadmill of production and for reinvestment into local cultural and social capitals. Consistent with a treadmill of production, producers described how investments in irrigation infrastructure make it costly for them to conserve groundwater. They described how irrigation increases cultural and social capital through higher populations, increased community cohesion, and maintaining their way of life.

My survey of producers indicates that an overwhelming majority (92%) agree that groundwater should be conserved, primarily to benefit future generations (86%), support local jobs and businesses (66%), provide insurance against drought (63%), and continue the economic viability of irrigated agriculture (60%). Most producers (72%) believe they are already doing all they can individually to conserve groundwater on their operations.

Interviews with producers indicate that those who become involved voluntary group conservation efforts find additional ways to conserve. Most producers (84%) are open to the

possibility that voluntary group conservation may be effective and that they might have something personally to contribute to such efforts, but few (7%) are currently involved. My interviews show that values, beliefs, and norms are important to their individual and collective groundwater management decisions. However, my model of survey data suggests that differences in producers' values, beliefs, and norms do not explain which producers are civically engaged in voluntary group conservation efforts.

I argue that civic engagement is contingent, in that structural and cultural factors must align in a particular community to enable producers to choose to pursue voluntary group conservation. My interviews with producers and case study of the Wichita County WCA support this explanation. Wichita County was primed for voluntary group conservation through structural and cultural factors, including a quantity of groundwater that made conservation efforts both urgent and promising, a single town that producers value and which economically relies on groundwater, and previous efforts that raised local awareness about groundwater conservation. The Wichita County WCA team sustained civic engagement through solidarity, developing a shared sense of meaning and purpose, and taking a diffuse and relational approach to leadership. They managed emotions such as fear, grief, despair, and frustration in a manner consistent with the Public Narrative model of social action. Key factors in their success included an early focus on teambuilding, diverse stakeholder representation, bringing in an outside facilitator, frequent and respectful community outreach, and partnering with state and local government. Voluntary group efforts are effective at conserving groundwater and merit support.

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Approved by:

Major Professor
Dr. Matthew R. Sanderson

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Dedication

To those who formed me, especially my siblings, parents, grandparents, and godparents.

And to the producers who trusted me with your stories. Thank you.

Chapter 1 - Introduction

I examine collaborative groundwater conservation of the Ogallala aquifer by Kansas producers¹ as a case of sustained civic engagement in a rural area. In doing so, I apply the basic sociological concepts of social structure, culture, and agency to the relationship between producers and groundwater management on the American High Plains.

Beginning with social structure, I use the community capitals framework (Flora et al., 2015) to determine whether groundwater extraction correlates with increased human development in High Plains counties. Moving to culture, I use the values-beliefs-norms theory of environmental action (Stern et al., 1999) to determine whether and why High Plains producers believe groundwater conservation is a priority and whether differences in values, beliefs, or norms are correlated with producer involvement in collaborative groundwater management. Finally, I explore the interactions of structure, culture, and agency through a case study of a collaborative groundwater management initiative by producers in Wichita County, Kansas.

My research provides insight into the motivations driving civic engagement, the processes through which civic engagement is sustained over time, and the role of values, beliefs and norms in driving civic engagement. In doing so, it provides immediate practical insights for water resource managers in rural Kansas and contributes to a sociological understanding of broad-based participation in environmental governance and rural development.

¹ In the 2014 Farm Bill (P.L. 113–79, Sec. 1111), the U.S. Congress defines a producer as “an owner, operator, landlord, tenant, or sharecropper that shares in the risk of producing a crop and is entitled to share in the crop available for marketing from the farm, or would have shared had the crop been produced.

The Problem

Agricultural production in the High Plains region of the United States is heavily dependent on groundwater from the Ogallala Aquifer (Smidt et al., 2016). Irrigated agriculture in the High Plains is two to four times more productive relative to dryland farming (Smidt et al., 2016). Beginning in the 1960s, access to Ogallala aquifer groundwater for irrigation transformed the High Plains region from dust-bowl to breadbasket (Opie et al., 2018).

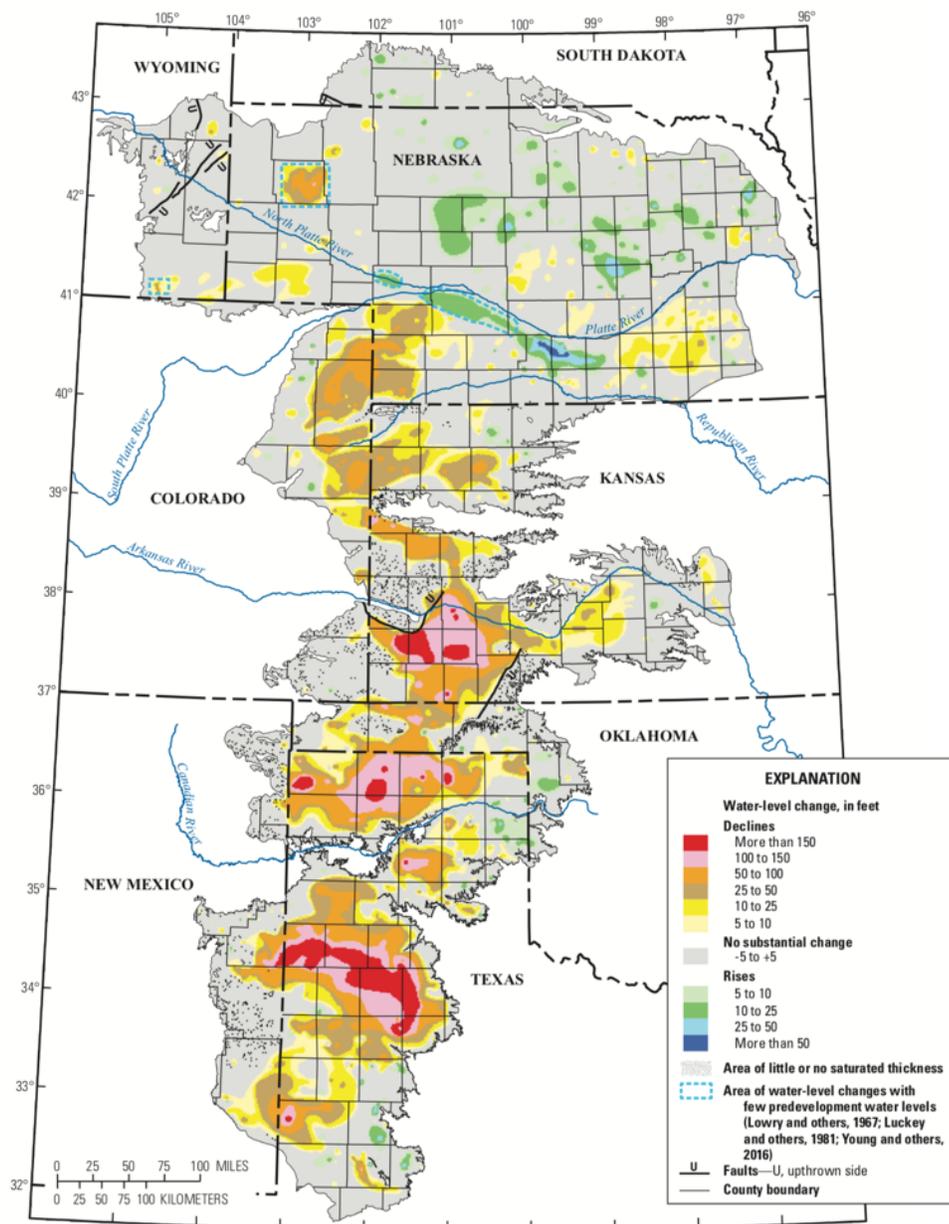
However, the Ogallala Aquifer is being unsustainably exploited (Figure 1). By the 1990s, widespread groundwater withdrawals for irrigation had depleted a third of the total water available (Opie et al., 2018). The Ogallala Aquifer recharges slowly, and while both the rate of recharge and saturated thickness – a measure of how much groundwater is available in storage – vary greatly across the High Plains region, continuing current rates of use would exhaust most groundwater supplies by 2070 (Smidt et al., 2016).

It is widely recognized that a sudden shift to dryland farming due to groundwater depletion could have profoundly negative consequences for agricultural livelihoods and rural communities in the region (Opie et al., 2018; Roberts & Emel, 1992; Sanderson & Frey, 2015). At the same time, policymakers and local residents know that the current system of irrigated agriculture cannot endure much longer (Opie et al., 2018).

Research into successful groundwater management efforts in the San Luis Valley, CO (Cody et al., 2015), in Australia (Kandasamy et al., 2014; Mitchell et al., 2014), and elsewhere (e.g. Neal et al., 2016) shows that cultural and moral values are threatened by a depleted aquifer. Groundwater management goals must align with people's feelings about fairness and respect farming as a way of life in the affected region.

Despite some research indicating that cultural and moral values are relevant for the Ogallala aquifer (e.g. Allen, 1997; Williams and Bloomquist, 1997; Gray and Gibson, 2013; White, 2014; Gibson and Gray, 2016), there has been little research into what exactly these values are and how important they are compared to other values such as agricultural profit (Lauer et al., 2018).

Figure 1. Changes in groundwater in the Ogallala Aquifer predevelopment-2013 (McGuire, 2017).



Recently, a number of civic engagement initiatives have emerged among producers in Kansas to improve groundwater management and sustain their communities and way of life. Such initiatives provide a unique opportunity to understand the cultural and moral values involved in Ogallala groundwater management decisions while advancing a sociological understanding of broad-based participation in environmental governance among rural communities.

Research Questions

1. Does groundwater extraction improve county-level human development in the High Plains / Ogallala Aquifer region?
2. What are the values and motivations underlying producers' groundwater management decisions in the High Plains / Ogallala Aquifer region?
3. How are some Western Kansas producers able to sustain voluntary collective action to address groundwater management challenges?

Outline of this Dissertation:

Sociology views society as emerging from the interplay between social structure, culture, and agency. Broadly speaking, social structure consists of enduring patterns of relationships between different groups and entities (Deji, 2011). Culture consists of “a group’s shared practices, values, and beliefs” (Keirns et al., 2018, p. 21). Agency is the ability of individuals and groups to make meaningful choices about how to behave. Agency is both enabled and constrained by the influences of culture and social structure (e.g. Lin, 2001). My research explains collaborative groundwater management of the Ogallala aquifer by Kansas producers through the interactions of structure, culture, and agency.

Structure

I examine the role of structure in groundwater management by applying the community capitals framework (Flora et al., 2015) to secondary data to model the associations between groundwater extraction and human development at the county-level. “Capitals” are assets that can be reinvested to generate additional assets. The Community Capitals Framework identifies seven types of capitals: natural, cultural, human, social, political, financial, and built. Each type of capital consists of both a stock of assets available to the community, and a flow component, whereby assets are drawn down and reinvested. A positive, significant association between groundwater pumping and county-level income, education, and health metrics, as captured by the Human Development Index (Lewis and Burd-Sharps, 2014), would indicate that the depletion of local natural capital through drawdown of Ogallala groundwater is being reinvested into local human and financial capitals.

However, I find that there is no association between groundwater extraction and human development at the county level. This finding can be explained in at least three ways, which are not mutually exclusive. First, the drawdown of natural capital in the form of groundwater use may not be reinvested locally, consistent with the theory of ecological unequal exchange, whereby transfers of ecological resources from a more peripheral area to a more core area are not fully compensated by transfers of resources from core to periphery (Bunker, 1985; Rice, 2007; Jorgenson 2009).

Second, a treadmill of production (Cochrane, 2003; Schnaiberg, 1980) may be operating in the region. A treadmill of production involves structural imbalances that encourage producers to debt-finance investments in infrastructure to increase their production capacity. This in turn forces producers to further deplete the natural resource stock to pay off the debt (Carolan, 2012;

Cochrane, 2003) through local reinvestment into built capital – a highly inefficient way of increasing local human and financial capital stocks.

Third, the local benefits from groundwater depletion may be primarily found in increased cultural and social capital through higher local populations, increased community cohesion, and the ability for producers to maintain their identities and way of life as irrigators.

Culture

I examine the role of culture in groundwater management using data from a quantitative survey of producers across the Ogallala aquifer region. I first use descriptive statistics to show the distribution of values, beliefs, and norms. I find that 92% of producers support groundwater conservation, primarily to benefit future generations and support their local communities. While 72% of producers believe that they are already doing everything they can to conserve groundwater individually, there appears to be an opportunity for voluntary group efforts to increase conservation. Despite producers' openness to the possibilities of voluntary group conservation, only 7% of producers are currently involved in leading or organizing such efforts.

I apply the values-beliefs-norms framework of environmental action to model the role of culture in differentiating the 7% of producers who are civically engaged from the 93% who are not. The values-beliefs-norms framework traces the influence of values through adherence to New Ecological Paradigm and beliefs about environmental concern and responsibility to the activation of personal pro-environmental norms and the pursuit of environmentally friendly behaviors (Stern et al., 1999). However, I find that the values-beliefs-norms framework has little explanatory power in predicting which producers are civically engaged in groundwater conservation. This line of research suggests that culture plays an important role in forming

producer attitudes towards groundwater conservation, but *individual* cultural variations do not explain which producers become civically engaged.

Agency

I describe the role of agency in groundwater management through a qualitative case study of the Wichita County Water Conservation Area (WCA), a voluntary, collaborative effort by a core group of 10 producers to extend the usable life of their portion of the Ogallala aquifer. Key elements of the success of the Wichita County WCA include diverse stakeholder representation, an early focus on team-building, hiring an outside facilitator, frequent, respectful community outreach, and partnering with state and local government.

I find that sustained civic engagement among the Wichita County WCA team is explained by their ability to cultivate solidarity through relationship building, develop a shared sense of meaning and purpose, and effectively implement a diffuse, relational approach to leadership.

Ganz (2011) describes public narrative as the process of intentional storytelling through which leaders communicate shared values and arouse emotions conducive to initiating and sustaining purposeful collective action. I find that Ganz' public narrative model of social action is helpful in understanding the Wichita County WCA team's ability to sustain civic engagement over time.

Interactions

Finally, I draw on all three lines of research to illustrate the interactions between structure, culture, and agency. I find support for the existence of a structural treadmill of production and for some of the value extracted through irrigation being reinvested locally to increase cultural and social capital.

Qualitative interviews provide context to show the interactions between structure, culture, and agency that producers navigate as they manage groundwater both as individuals and through voluntary group conservation efforts. Producers describe powerful collective structural incentives to conserve, but powerful individual structural incentives to continue pumping groundwater. They describe how structural elements, including the treadmill of production, concentration of agricultural wealth and the increasing rate of absentee landownership constrain their ability to conserve groundwater. Interactions between structure and agency are evident as producers describe how both of these structural elements influence their groundwater management decisions.

Producers seem to navigate this structural landscape using cultural values of stewardship, typically understood as leaving some positive legacy to future generations, community, fairness, and personal responsibility. The interactions between producer agency and cultural values are complex, with producers at different times explaining motivations to conserve or to continue pumping with reference to the same cultural values.

Producer agency is further shaped by interactions between structure and culture due producers' identities being tied to irrigation. The structural insecurity of the agricultural economy combines with producers' cultural identity as irrigators to create widespread fear of changing irrigation practices. Those producers who do decide to reduce or cease irrigating describe a process of grieving the loss of this important element of their identity.

Structure and culture interact with agency in shaping the social landscape in which voluntary group conservation efforts take place. The main structural barrier to participation in voluntary group conservation efforts is a lack of time. The main cultural barrier is the difficulty producers face in balancing between competing cultural values when writing voluntary group

conservation plans. Producers especially described difficulty coming up with plans that are fair enough to gain widespread community support.

Each of the key elements of the Wichita County WCA team's success is the result of interactions between structure, culture, and agency. For example, their exercise of agency in deciding to build a team with diverse stakeholder representation was supported by their pre-existing structural social networks through which diverse stakeholders were identified and by their adherence to cultural values of inclusion and efficiency.

Examined holistically, it appears that voluntary group conservation can be effective when producers exercise *collective* agency under local structural and cultural conditions that are conducive to success. This contingent explanation for voluntary group conservation is consistent with my survey finding that there is much room for voluntary group conservation efforts to grow. I recommend that local, state, and national policy-makers direct resources and support towards voluntary group conservation efforts as a promising new means of supporting regional groundwater conservation. I recommend that producers who are interested in potentially starting a voluntary group conservation effort carefully consider the key elements of the Wichita County WCA team's success and reach out to their state land grant institution early on for further assistance.

A Note to Readers:

In preparing this dissertation, I draw extensively from my previous articles and conference presentations:

- Lauer, S., Sanderson, M.R., Manning, D.T., Suter, J.F., Hrozenick, R.A., Guerrero, B., and Golden, B. (2018). Values and groundwater management in the Ogallala Aquifer region. *Journal of Soil and Water Conservation*. 73(5):593-600.

- Lauer, S., and Sanderson, M.R. (2019). Irrigated agriculture and human development: a county-level analysis 1980–2010. *Environment, Development and Sustainability*. 1-17.
- Lauer, S., and Sanderson, M.R. (2019). Producer attitudes towards groundwater conservation in the U.S. Ogallala-High Plains. *Groundwater*.
doi.org/10.1111/gwat.12940
- Lauer, S., & Sanderson, M. (2019, November). *Conserving Ogallala communities through voluntary, group efforts to manage groundwater*. Presentation to the Kansas Governor’s Water Conference, Wichita, KS. Retrieved from
<http://Bit.LY/KSGroundwater>
- Lauer, S., and Sanderson, M.R. (2020). *Ogallala water coordinated agriculture project resource guide series: Producer Attitudes Toward Groundwater Conservation (OWCAP-2020-RGS-Producer Attitudes)*. Retrieved from <http://ogallalawater.org/producer-attitudes>

Chapter 2 - Social Structure and Ogallala Groundwater

Social structure consists of enduring patterns of relationships between different groups and entities (Deji, 2011). I examine the role of structure in groundwater management by applying the community capitals framework to secondary data to model the associations between groundwater extraction and human development at the county-level.

Social Structure – Introduction and Literature Review

I use the community capitals framework (CCF) (Flora et al., 2015) to situate the relationship between groundwater depletion and Human Development Index (HDI) in the Ogallala Aquifer region. “Capitals” are assets that can be reinvested to generate additional assets. The CCF identifies seven types of capitals: natural, cultural, human, social, political, financial, and built. Each type of capital consists of both a stock of assets available to the community, and a flow component, whereby assets are drawn down and reinvested. One type of capital can be reinvested to increase a different type of capital, as when financial capital in the form of a community endowment fund is invested to provide entrepreneurial training for youth, thereby increasing the community’s human capital (Flora et al., 1997).

The CCF was initially developed to better understand how communities achieve sustainable development outcomes in rural areas and has since been applied widely throughout the world (c.f. Gasteyer and Araj, 2009; Gutierrez-Montes et al., 2009; Sseguya et al., 2009). Key insights include that some forms of capital reinvestment are more effective than others at generating sustainable development (Flora et al., 1997), that an over-emphasis on any one form of capital tends to decrease stocks of the other capitals thereby harming overall sustainability (Flora et al., 2015), and that a focus on reinvesting capitals within the community is conducive to sustainable development (Emery and Flora, 2006; Flora et al., 1997; Flora et al., 2015). A study

of rural communities in Nebraska suggests that properly mobilizing and reinvesting capitals locally can lead to a virtuous cycle, “spiraling up” toward a better future (Emery and Flora, 2006). On the other hand, an excessive focus on reinvesting capitals outside of the community tends to harm community viability over the medium to long term (Emery and Flora, 2006).

My research on social structure focuses on three types of capital: natural, human, and financial. The exploitation of the Ogallala Aquifer can be seen as a drawdown of a natural capital stock. The HDI aggregates indicators of human capital (health and education) and financial capital (income). If the drawdown of groundwater, a natural capital stock, is reinvested into local human and financial capitals, one would expect to see greater HDI scores in counties with higher rates of drawdown.

Research consistent with a positive relationship between groundwater depletion and HDI

There is empirical evidence supporting the proposition that groundwater drawdown is reinvested, in this sense, into local financial capital and local human capital. Regarding financial capital, most studies find that access to irrigation has a sustained positive impact on the agricultural economy within the High Plains region (Hornbeck and Keskin, 2015; Torell et al., 1990). Albrecht and Murdock (1986) find that irrigation increases gross farm sales and higher gross farm sales from irrigation increased population size, numbers of farms, farm energy use, and farm wage expenditures relative to areas with less irrigation among non-metro counties on the High Plains between 1940 and 1980. More recent research indicates that agricultural incomes and farm-sector jobs remain positively associated with access to irrigation in the Texas Panhandle (Almas et al., 2004) and throughout the High Plains region (Parton et al., 2007).

There is also evidence on the reinvestment of groundwater drawdown into local human capital, especially as it relates to the relationship between irrigated agriculture and population

growth. The most comprehensive inquiry into the relationship between irrigated agriculture and population growth on the High Plains was conducted in the early 1990s by geographer Stephen White.

White finds that the population of the High Plains aggregates in counties with access to groundwater for irrigated agriculture (White, 1992). Specifically, White finds a statistically significant correlation between irrigated acreage and population growth across the High Plains between 1980 and 1990 (White, 1992). Focusing on Kansas from 1980 to 1990, county-level population growth was most strongly positively correlated with the population size of the largest census place in the county, followed by a significant positive correlation with groundwater use per square mile (White, 1994). White (1992, 1994) argues that population in the High Plains is redistributing to “Ogallala Oases” with over 500 people, that depend on the benefits of groundwater exploitation in their hinterlands.

More recent research involving the entire High Plains region is consistent with White’s “Ogallala Oasis” hypothesis (Parton et al., 2007). Parton et al. (2007) find that population decreased from 1940 to 2000 in dryland, non-metro counties, but increased in irrigated, non-metro counties and in metro counties. The proportion of elderly residents over age 65 and over age 55 increased across all counties in the High Plains region between 1940 and 2000, but increased fastest in dryland, non-metro counties (Parton et al., 2007). An aging population is a challenge for policymaking due in part to the difficulty in accessing specialized medical care and handicap-accessible transportation in rural areas.

Research consistent with a negligible relationship between groundwater depletion and HDI

A negligible relationship between groundwater depletion and HDI could be indicative of at least three possibilities, which are not mutually exclusive. First, the drawdown of natural

capital in the form of groundwater may not be reinvested locally. Non-local, or extra-local, reinvestment is consistent with the theory of ecological unequal exchange, whereby transfers of ecological resources from a more peripheral area to a more core area are not fully compensated by transfers of resources from core to periphery (Bunker, 1985; Rice, 2007; Jorgenson, 2009).

There is evidence that ecological unequal exchange occurs not only across international income gradients (i.e., between countries of differing development levels), but that it also occurs across income gradients within countries (i.e., between rural and urban areas), and in the High Plains in particular. For example, Sanderson and Frey (2015) demonstrate that aggregate personal income in the rural counties of southwest Kansas remained stagnant from 1969 to 2011 in real terms, despite a dramatic increase in irrigated agricultural production. Furthermore, the gap in real aggregate personal income between southwest Kansas and urban Kansas increased significantly from 1969 to 2011 (Sanderson and Frey, 2015). Taken together, these findings indicate that residents in rural, agricultural regions of the High Plains may not be reaping the financial benefits of irrigated agriculture.

Second, the drawdown of natural capital in the form of groundwater might be reinvested locally but be a highly inefficient way of increasing local human and financial capital stocks. Prior research provides some evidence consistent with this hypothesis. Hornbeck and Keskin (2015) find no sustained benefit to the non-farm economy from increased access to irrigation. Indeed, there is some evidence that increased access to irrigation can be detrimental the non-farm economy over the long term, as resources and investments are shifted toward the farm economy (Hornbeck and Keskin, 2015).

Locally inefficient reinvestment is consistent with the treadmill of production theory (Cochrane, 2003; Schnaiberg, 1980). A treadmill of production involves structural imbalances

that encourage producers to debt-finance investments in infrastructure to increase their production capacity. This in turn forces producers to further deplete the natural resource stock to pay off the debt (Carolan, 2012; Cochrane, 2003).

Variants of treadmill theory have been applied to understand the context of farming and agriculture in the American Midwest (cf. Arbuckle and Kast, 2012; Gasteyer and Carrera, 2013; Gasteyer, 2008; Sanderson and Hughes, 2018). In a production treadmill, producers continually deplete a natural capital stock, increasing built capital while maintaining a constant level of human and financial capital (Carolan, 2012). This treadmill is further exacerbated by ecological unequal exchange (Sanderson and Frey, 2015) and supported by the farm subsidies (Sanderson and Hughes, 2018). The structure of federal farm subsidies encourages debt-financed investments into increasingly water-efficient irrigation infrastructure, which are then paid off through further groundwater extraction. The result is that groundwater depletion persists despite increased irrigation efficiencies, while farm incomes remain relatively stagnant, locking producers into in a continual effort to “get ahead” through technology adoption, which further depletes the resource base on which their incomes depend.

Third, the drawdown of natural capital in the form of groundwater might be reinvested locally into other forms of capital. For example, one would not necessarily expect a relationship between groundwater depletion and HDI if groundwater drawdown is primarily reinvested into increased cultural, social, or political capital².

² One might expect a positive relationship between social capital and HDI if social capital investments take place within an entrepreneurial social infrastructure (Flora and Flora, 1993; Flora et al., 1997). I suspect that this relationship may not hold true in the High Plains because of the complicated relationships between long-time residents and immigrants in the feedlot-driven economy. For example, increased social capital alongside entrepreneurial social infrastructure may enable some communities to retain or expand feedlots, which would in turn create demand for low-skilled, often immigrant labor. The addition of immigrants working in feedlots would initially reduce average incomes by adding lower-paid individuals to the population and may also reduce the education metric of HDI if a sufficient number of the new immigrants were over age 24 and lacked a high-school diploma. In this scenario, it might take a generation or two for the county’s HDI to increase as a result of the community’s earlier investments of irrigation into social capital.

A review of social science literature pertaining to irrigation from the Ogallala Aquifer (Lauer et al., 2018) suggests that the impact of Ogallala irrigation on “non-market values,” which include cultural, social, and political capitals, is understudied. Nevertheless, there is some evidence that groundwater drawdown has increased local social, cultural, or political capital, at least in certain areas. Regarding social capital, Williams and Bloomquist (1997, p. 283) find that groundwater irrigation in Haskell County, Kansas, between 1940 and 1993 provided a “more stable social environment” in which communities became socially “integrated.” These changes may be indicative of an increase in social capital in Haskell County.

Regarding cultural capital, Gray and Gibson (2013) find that producers in southwest Kansas see irrigation as a means of preserving the farm profitability on which their culturally valued rural lifestyle depends. Regarding political capital, Griggs (2017) demonstrates that groundwater irrigation has increased political clout among producers in areas with access to the Ogallala Aquifer, albeit at the expense of surface-water irrigators elsewhere in the High Plains.

These three explanations for a negligible relationship between groundwater depletion and HDI are not mutually exclusive. For example, a study of farm families in rural Iowa (Arbuckle and Kast, 2012) finds that subjective quality of life (a measure of cultural capital) is positively associated with community cohesion (social capital) and negatively associated with measures of exposure to a production treadmill. To the extent that irrigation improves community cohesion in the High Plains, one might speculate that a portion of the natural capital acquired from Ogallala groundwater in the High Plains is similarly invested into local social and cultural capital, while another portion is inefficiently invested into local built capital through a production treadmill.

Social Structure in the present study

High Plains residents are the most immediately impacted by the depletion of the Ogallala Aquifer and by changes to its management. At this point, transitioning away from the present system of widespread irrigation is unavoidable. As policies are implemented to manage this transition, it is important account for the impacts of irrigation on human development in the region.

I am not aware of any prior research that explicitly examines the relationship between irrigation and human development in the region. It is clear, however, that the previous research into the impacts of irrigation on *aspects of* human development in the region remains inconclusive. For example, the previous research indicates that irrigation provides a sustained benefit to the local agricultural economy, but only a temporary boost to the non-farm economy (Hornbeck and Keskin, 2014, 2015). While population growth concentrates in counties with access to irrigation, there is evidence that increased irrigation has not produced an increase in aggregate real personal income (Sanderson and Frey, 2015).

Given these inconclusive findings, there is need for additional research into the relationship between irrigated agriculture and wellbeing among High Plains residents. My research fills a gap in our knowledge about the impacts of Ogallala groundwater on human wellbeing by ascertaining the relationship between HDI and irrigated agriculture from 1980 through 2010 across the counties overlying the Ogallala Aquifer.

Social Structure – Research Methods

Research Question.

Is there a structural relationship between the prevalence of irrigated agriculture on the High Plains, as measured by the percentage of farm acres irrigated and the number of gallons of groundwater extracted, and county-level human development, as measured by the HDI?

Sample.

I begin with 235 counties in eight states that are underlain at least in part by the Ogallala Aquifer and its associated groundwater formations. These counties are obtained from the Natural Resources Conservation Service of United States Department of Agriculture (Golleson and Winston, 2013).

I exclude Oglala Sioux County in South Dakota from my analysis because it is located entirely within the Pine Ridge Indian Reservation. Due to the lingering effects of historic injustices, Oglala Sioux County follows a very different development trajectory from other counties in the Ogallala Aquifer region. Native American populations have the lowest HDI scores of any racial or ethnic demographic in the USA (Lewis and Burd-Sharps, 2010), and Native Americans in South Dakota have particularly low HDI scores (Lewis and Burd-Sharps, 2010).

While widespread irrigation began in the Ogallala region in the 1950s (Opie et al., 2018), data limitations constrain my analysis to the period from 1980 through 2010. Specifically, the 1980 census is the first to contain county-level data on a critical component of the HDI: life expectancy at birth.

My unit of analysis is the county. There are no missing data in my sample. I use publicly available secondary data that were originally collected by the US Census Bureau, the US

Geological Survey, and the US Department of Agriculture. I obtained access to these data through various database managers that contract with the Federal Government to clean and store the data. The specific source of each dataset is described in the Measures section below. After accessing the necessary datasets, I built a single, integrated database in MS Excel and imported it into the R statistical program for analysis.

Measures.

Human Development Index. The Human Development Index (HDI) provides a robust metric of the health, education, and economic welfare of populations around the world (UNDP, 2010; Zambrano, 2014). Debuted in 1990 by the United Nations Development Program, the HDI measures indicators of basic capabilities for living a good life (Stanton, 2007). The HDI focuses on health, education, and income as three of the most basic necessities for human development in all societies around the world. The HDI is a more comprehensive measure of development and is intended as a complement to more narrow measures of economic output, such as gross national product.

Pioneering work by the Social Science Research Council adapts and applies the HDI to states, counties, and congressional districts within the USA through the “Measure of America” initiative (Lewis and Burd-Sharps, 2014). “Measure of America” research was cited by the United Nations Development Program in their 2010 Human Development Report (UNDP, 2010). Except where noted otherwise, I follow the methods of the Social Science Research Council in calculating HDI.

I calculate HDI by taking the mean value of three indices measuring health, education, and income. The Social Science Research Council multiplies the mean by a constant of ten. I

instead multiply by a constant of 100 because the measure of irrigated farmland in my model is expressed as a percentage. The choice of scalar has no substantive impact on my results.

$$\text{Human Development Index}_i = 100 * \left(\frac{\text{Health Index}_i + \text{Education Index}_i + \text{Income Index}_i}{3} \right) \quad (1)$$

Health Index. The Health Index measures life expectancy at birth, scaled using the ratio of minimum and maximum values observed among Ogallala counties between 1980 and 2010

$$\text{Health Index}_i = \frac{\text{Life Expectancy}_i - \text{Life Expectancy}_{MIN}}{\text{Life Expectancy}_{MAX} - \text{Life Expectancy}_{MIN}} \quad (2)$$

County-level data on life expectancy at birth at the 1980, 1990, 2000, and 2010 US Censuses are acquired through the Institute for Health Metrics and Evaluation (IHME, 2017).

Education Index. The Education Index combines a sub-index measuring educational attainment, weighted at two-thirds, with a sub-index measuring educational enrollment, weighted at one-third. Educational attainment for each county is determined by dividing the population with at least a high-school diploma by the total population over the age of 25. Consistent with Social Science Research Council methodology, educational enrollment for each county is determined by dividing the total population of any age enrolled in school by the total school-age population of 3–24 years old (inclusive). Both sub-indices are scaled using the ratio of minimum and maximum values observed among all Ogallala counties between 1980 and 2010.

$$\text{Education Index}_i = \frac{2}{3} \left(\frac{\text{Attainment}_i - \text{Attainment}_{MIN}}{\text{Attainment}_{MAX} - \text{Attainment}_{MIN}} \right) + \frac{1}{3} \left(\frac{\text{Enrollment}_i - \text{Enrollment}_{MIN}}{\text{Enrollment}_{MAX} - \text{Enrollment}_{MIN}} \right) \quad (3)$$

County-level data on population with a high-school diploma, total population over the age of 25, population enrolled in school, and total school-age population of 3–24 years old at the 1980, 1990, 2000, and 2010 US Censuses are acquired through the National Historical Geographic Information System of the Minnesota Population Center (2011).

Income Index. I calculate the income index using the log of per-capita income, scaled using the minimum and maximum values observed in any county between 1980 and 2010. I use

the Bureau of Labor Statistics (2017) online tool to adjust income for inflation. My approach differs from the Social Science Research Council, which instead uses the log of median earnings as an indicator of economic welfare. Median earnings give greater weight to the economic welfare of individuals at the lower end of the income distribution and are arguably a better measure of the effect of income on human well-being (Lewis and Burd-Sharps, 2014). However, median earnings are not available at the county level for the year 1980. Per-capita income is used by the United Nations Development Program in their calculation of the HDI and is available at the county-level for all census years of interest. I believe that per-capita income is a justifiable measure of economic well-being but urge caution when comparing my results to the “Measure of America” project.

$$Income\ Index_i = \frac{Per\ Capita\ Income_i - Per\ Capita\ Income_{MIN}}{Per\ Capita\ Income_{MAX} - Per\ Capita\ Income_{MIN}} \quad (4)$$

Percent irrigated farmland. I obtain one measure of the prevalence of irrigated agriculture within each county by calculating the percentage of irrigated farmland acres relative to the total number of farmland acres in that county

$$Percent\ Irrigated\ Farmland_i = 100 * \left(\frac{Irrigated\ Farmland_i}{All\ Farmland_i} \right) \quad (5)$$

County-level data on the number of acres of irrigated farmland and the total number of acres of farmland are generated by the Census of Agriculture during the years 1978, 1987, 1997, and 2007. These data are acquired through the National Agricultural Statistics Service of the United States Department of Agriculture (NASS, 2017).

Groundwater extraction. I obtain a second measure of the prevalence of irrigated agriculture within each county by summing groundwater withdrawals in Mgal/d for irrigation and livestock at the county level in 1985, 1995, and 2005

$$Groundwater\ Extraction_i = (Irrigation\ Withdrawals_i + Livestock\ Withdrawals_i) \quad (6)$$

County-level data on groundwater withdrawals in Mgal/d for irrigation and for livestock are generated by the United States Geological Survey. These data are acquired through the United States Geological Survey online data repository (U.S. Geological Survey, 2018).

Population. I obtain US Census data on population at the county-level, in thousands, through the United States Geological Survey online data repository (U.S. Geological Survey, 2018). Because county-level population is not normally distributed, I use a log base ten transformation of county-level population in my model.

Analysis.

The purpose of this analysis is to clarify the relationship between HDI and irrigated agriculture from 1980 through 2010 across the counties overlying the Ogallala Aquifer, thereby determining whether the depletion of natural capital in the High Plains region is effectively reinvested, or transformed, into increases in local human and financial capitals. I use a path analysis model to predict county-level HDI scores for each decade using the most recent past measures of percent irrigated farmland and groundwater extraction for that county, controlling for each county's contemporary population, the state in which it is located, and its HDI score from the previous decade. While path analysis models are most often used with latent variables, they are also appropriate for models using only manifest variables (Kline, 2016). I use a path analysis model because it estimates all modeled parameters simultaneously, thereby reducing the likelihood of Type I errors (Kline, 2016). Models are estimated using the lavaan package in R (Rosseel, 2012).

Social Structure – Findings

The primary goal of the analysis is to examine the relationship between two measures of the prevalence of irrigated agriculture and HDI scores over time at the county level. Table 1 provides the means, standard deviations, and ranges of each study variable.

Table 1. Model Variables: Descriptive Statistics (N=234)

Variables	Unit	M	SD	Range	Skew	Kurtosis
HDI 1980	score	53.96	5.48	17.00 – 60.91	-1.44	4.91
HDI 1990	score	59.43	5.53	21.51 – 65.90	-1.34	4.73
HDI 2000	score	73.40	5.93	36.10 – 76.81	-1.08	1.98
HDI 2010	score	71.82	6.42	35.08 – 76.88	-0.94	1.22
Irrigated Farmland 1978	% total	12.35	23.12	1.34 – 88.81	1.59	2.15
Irrigated Farmland 1987	% total	11.21	22.10	1.20 – 84.65	1.46	1.76
Irrigated Farmland 1997	% total	13.09	19.64	0.88 – 78.72	1.49	1.95
Irrigated Farmland 2007	% total	14.39	17.95	2.21 – 78.33	1.70	2.85
Groundwater Extraction 1985	Mgal/d	70.71	79.40	0.12 – 401.24	1.68	2.63
Groundwater Extraction 1995	Mgal/d	74.20	88.98	0.11 – 543.88	1.84	3.99
Groundwater Extraction 2005	Mgal/d	76.60	87.69	0.17 – 421.08	1.60	2.27
Population 1980	Thousands	15.66	33.13	0.51 – 366.53	6.71	58.38
Population 1990	Thousands	15.90	36.60	0.46 – 403.66	6.75	58.42
Population 2000	Thousands	17.24	42.29	0.44 – 452.87	6.58	54.26
Population 2010	Thousands	18.58	48.83	0.46 – 498.37	6.30	48.02
Log Population 1980		0.87	0.48	-0.29 – 2.56	0.47	0.66
Log Population 1990		0.84	0.50	-0.34 – 2.61	0.54	0.71
Log Population 2000		0.84	0.52	-0.35 – 2.66	0.57	0.71
Log Population 2010		0.82	0.55	-0.34 – 2.70	0.62	0.72

I used a path model to determine how HDI scores changed over time. Figure 2 shows the results of the model. The model explains 47.7% of the variation in 1980 HDI scores ($R^2=.48$), rising to 85.4% in 1990 ($R^2=.85$), 86.2% in 2000 ($R^2=.86$), and 95.3% in 2010 ($R^2=.95$). The path analysis model has a good fit to the data: $\chi^2(36) = 89.51, p < .001$; CFI = .97; TFI = .94; RMSEA = .08 (90% confidence interval [.06, .10]); SRMR = 0.01. Although the model fit indicates a significant chi-square test, significant chi square tests often occur when utilizing large sample sizes (Hooper et al., 2008).

Figure 2. Unstandardized path coefficients for variables explaining Human Development Index (HDI) scores in counties underlain in part by the Ogallala Aquifer (N = 234). *p<.05 (two-tailed)

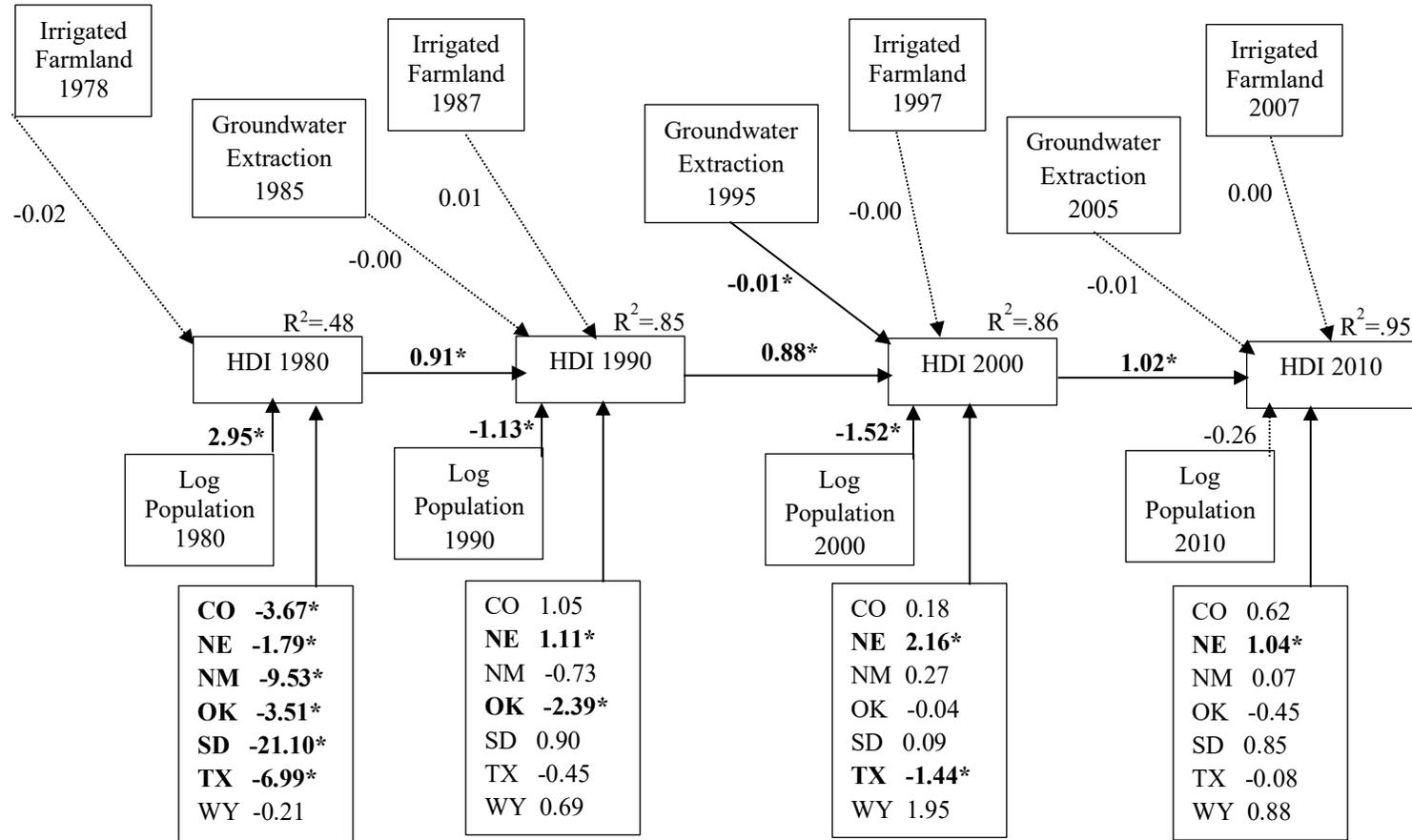


Table 2. Unstandardized, Standardized, and Significance Levels for Model in Figure 2 (Standard Errors in Parentheses; N = 234)

<i>Parameter Estimate</i>	<i>Unstandardized</i>	<i>Standardized</i>	<i>p</i>
Irrigated Farmland 1978 → HDI 1980	-.02	-.04	.49
Log Population 1980 → HDI 1980	2.95	.23	<.01
CO → HDI 1980	-3.69	-.15	<.01
NE → HDI 1980	-1.79	-.14	.02
NM → HDI 1980	-9.53	-.32	<.01
OK → HDI 1980	-3.51	-.11	.03
SD → HDI 1980	-21.10	-.55	<.01
TX → HDI 1980	-6.99	-.47	<.01
WY → HDI 1980	-.21	-.01	.91
Irrigated Farmland 1987 → HDI 1990	.01	.03	.48
Groundwater Extraction 1985 → HDI 1990	-.00	-.04	.29
HDI 1980 → HDI 1990	.91	.90	<.01
Log Population 1990 → HDI 1990	-1.13	-.09	<.01
CO → HDI 1990	1.05	.04	.13
NE → HDI 1990	1.11	.09	.02
NM → HDI 1990	-.73	-.02	.41
OK → HDI 1990	-2.39	-.08	<.01
SD → HDI 1990	.90	.02	.48
TX → HDI 1990	-.45	-.03	.39
WY → HDI 1990	.69	.02	.49
Irrigated Farmland 1997 → HDI 2000	-.01	-.01	.78
Groundwater Extraction 1995 → HDI 2000	-.01	.10	.01
HDI 1990 → HDI 2000	.89	.81	<.01
Log Population 2000 → HDI 2000	-1.52	-.12	<.01
CO → HDI 2000	.18	.01	.80
NE → HDI 2000	2.16	.16	<.01
NM → HDI 2000	.27	.01	.78
OK → HDI 2000	-.04	-.00	.97
SD → HDI 2000	.09	.00	.94
TX → HDI 2000	-1.44	-.09	<.01
WY → HDI 2000	1.95	.05	.07
Irrigated Farmland 2007 → HDI 2010	-.01	-.03	.28
Groundwater Extraction 2005 → HDI 2010	.00	.01	.61
HDI 2000 → HDI 2010	1.02	.95	<.01
Log Population 2010 → HDI 2010	-.26	-.02	.20
CO → HDI 2010	.62	.02	.18
NE → HDI 2010	1.04	.07	<.01
NM → HDI 2010	.07	.00	.90
OK → HDI 2010	-.45	-.01	.43
SD → HDI 2010	.85	.02	.25
TX → HDI 2010	-.08	-.01	.81
WY → HDI 2010	.88	.02	.19

Note: $\chi^2(36) = 89.51, p < .001$; CFI = .97; TLI = 0.94; RMSEA = .08; SRMR = 0.01

There is no statistically significant relationship between decadal county-level HDI scores and percentage of irrigated farm acres at the immediately preceding Census of Agriculture. Overall, there is no statistically significant relationship between decadal county-level HDI scores and measures of groundwater extraction taken five years prior. The sole exception is that HDI scores in 2000 had a statistically significant, negative relationship with groundwater extraction in 1995. This is an outcome with important theoretical and practical implications that I discuss later on.

Among the control variables, I find that county-level HDI scores in each decade have a positive, statistically significant relationship with that county's HDI score in the previous decade. This is an unremarkable finding, given that human and economic development tends to build upon itself over time.

I find that the log of county population in 1980 has a positive, statistically significant association with county-level HDI scores in 1980. One possible explanation for this association may be that counties with higher populations provide greater access to healthcare, educational opportunities, and a greater variety of employment options, thereby increasing HDI scores. Alternatively, counties with higher HDI scores may be more attractive destinations for people to live in, facilitating a higher population as more people are induced to move in and fewer leave. Because measures of HDI scores and of population were both taken at the time of the decennial census, I am not able to determine whether one causes the other. Furthermore, I find that the association between contemporaneous measures of population and HDI scores becomes statistically insignificant in subsequent decades.

Using Kansas as a reference state, I find that there are statistically significant differences in HDI scores among states in the region. Given differences in economic realities and legal and

regulatory structures, finding that HDI scores differ among counties in these states is not particularly surprising. Notably, in 1980, counties in Kansas had higher HDI scores than counties in all other states except Wyoming, where the difference was not statistically significant. Over time, however, there are fewer differences in HDI scores among states, and HDI scores in Kansas counties fall below HDI scores in Nebraska counties. By 2010, Nebraska counties have higher HDI scores on average than Kansas counties and this is the only significant difference among the states. This leads me to believe there has been some convergence, albeit at a lower level, among HDI among counties over time, except in Nebraska, where HDI scores tend to be higher than in Kansas. This might be due to increasing economic and regulatory convergence. It is also possible that the diminishing influence of the state variable is attributable to the increasing explanatory impact of previous decades' HDI scores as additional decades are incorporated into the model.

Social Structure – Discussion & Conclusions

My finding of a small, statistically non-significant relationship between human development and irrigated agriculture is consistent with earlier findings showing that irrigated agriculture is not associated with increases in aggregate incomes (Sanderson and & Frey, 2015), provides few long-term benefits to the non-farm economy (Hornbeck and Keskin, 2015), and that the benefits of irrigated agriculture for the agricultural economy (Hornbeck and Keskin, 2014, 2015; Parton et al., 2007) only weakly translate into measures of population-wide human development. This finding is also consistent with the hypothesis that groundwater drawdowns are not effectively translating into local human and financial capitals.

The mechanisms for ineffective reinvestment of natural capital declines into local human and financial capitals is a promising avenue for future research. I can only speculate here, as

these data do not allow more precise elaborations. I offer two such speculations. First, ineffective re-investment could be a result of inefficient local reinvestment into farm equipment and irrigation systems, a form of built capital that does not materially enhance human development to the degree that human and financial capitals do. Research that further explores, and perhaps even quantifies, the relative benefits of various human capitals in groundwater-dependent agricultural regions would be very useful, as such research is quite limited.

Second, I note that the community capitals framework and the treadmill of production theory have not been integrated before. One intriguing, but still unexplored, possibility is further synthesis of these two frameworks, which might help explain more precisely the lack of a stronger, more positive relationship between groundwater depletion and human development. Again, the community capitals framework views Ogallala groundwater as a stock of natural capital, and the HDI includes indicators of human capital (health and education) and financial capital (incomes). If the drawdown of the natural capital stock of groundwater is being effectively reinvested into local human and financial capitals, counties with a higher rate of drawdown should have larger HDI scores. If, however, an agricultural production treadmill dynamic is at work, it is reasonable to believe that higher rates of groundwater drawdown may actually limit human development gains.

There are two mechanisms driving an agricultural production treadmill in this region: a technology-irrigation infrastructure mechanism and an income-subsidy mechanism (Sanderson and Hughes, 2018). Either, or both in combination, might limit the extent to which capital can be effectively re-invested, or translated into, human development. As irrigation technology increases water use efficiency, producers use these gains to spread the water over more acres, increasing irrigation infrastructures in a rebound effect. Simultaneously, groundwater pumping

generates federal subsidies, which support farm incomes and exacerbate over-production and lower commodity prices. Either alone, or in combination, the existence of these dynamics could constrain the translation of natural capital drawdown (groundwater depletion) into human development. Underlying both of these dynamics is ecological unequal exchange stemming from the under-valuation of groundwater at the point of diversion (the well) and the ‘adding of value’ during the agricultural production process, which ensures that most of the financial gains from groundwater depletion are not captured locally, but are instead displaced into large, transnational corporations at the center of global agri-food commodity chains (Sanderson and Frey 2015, Sanderson and Hughes, 2018). Because groundwater is under-valued locally, because transnational agri-food corporations can capture ‘added value’ by transforming water into processed goods (beef, etc.), community natural capital is effectively being transferred out of the region, limiting local communities’ abilities to re-invest in capitals that could enhance human development. Along these lines, further research attempting to integrate treadmill theory with the CCF could be especially illuminating.

Future research could also focus on overcoming three main limitations of this study. First, work to collect data with higher spatial resolution would enable modeling of additional explanatory variables and potentially meaningful within-county variation in HDI scores. Second, research into possible spillover benefits to HDI from higher irrigation to lower irrigation counties would reveal the possible existence and magnitude of any human and financial capital reinvestments that are extra-local regarding county boundaries but still local to the High Plains region. Third, I anticipate theoretical and policy benefits from future research that determines which combinations of extra-local investment, inefficient local investment, and local investment

into cultural, social, or political capitals are responsible for my finding that groundwater extraction is not being invested into local human and financial capitals in the High Plains region.

Research to collect data with higher spatial resolution would overcome the biggest constraint facing this study: that comprehensive longitudinal data are not available at higher resolution than the county level. The Ogallala aquifer is highly spatially heterogeneous (Smidt et al., 2016) and I would expect to see large variations in access to irrigation within as well as between counties. A further limitation of county-level data is the fact that I am limited to a sample size of 234 counties. This sample size limits the number of explanatory variables that I am able to incorporate into the model. For example, I am unable to control for the percentage of population employed in agriculture when modeling changes in human development over time as a function of the prevalence of irrigated agriculture. This control would be theoretically meaningful given the differential impact of irrigation on the agricultural versus non-farm economies of the region (Hornbeck and Keskin, 2014, 2015). I therefore encourage future research to gather data with higher spatial resolution in order to capture within-county variation and model how theoretically meaningful variables such as percentage of agricultural employment, population density (White, 1994), racial composition (Solis, 2003), and age structure of the population (Parton et al., 2007) interact with irrigated agriculture to explain variations in human development among counties in the High Plains region.

There is also a need for additional research into the possibility that counties with less irrigation may be acquiring spillover benefits to HDI from irrigation in nearby counties. In particular, the larger and younger populations associated with irrigated “Ogallala Oases” (Parton et al., 2007; White, 1992, 1994) may support healthcare services, rural schools, workplaces, and cultural amenities that also serve people in nearby counties with less access to irrigation. Using

subjective quality of life rather than HDI as a measure of well-being, Arbuckle and Kast (2012) provide evidence for an association between population, community amenities, and subjective quality of life in rural Iowa. Further research is needed to untangle the complex social and economic connections that seldom follow county lines (Opie et al., 2018).

Finally, additional research into the precise reasons for the ineffective reinvestment of natural capital declines into local human and financial capitals is a promising avenue for future research. One opportunity to address this through future research may be a comparative-historical analysis of the governance differences between High Plains states in the context of the CCF.

Implications for Groundwater Management

I find that the prevalence of irrigated agriculture on the High Plains, as measured by the percentage of irrigated farmland and by groundwater withdrawals has an insignificant impact on county-level human development, as measured by the HDI. However, I caution against extending these findings to situations where insufficient groundwater remains to support residential and non-agricultural economic activities.

As a measure of human development, the HDI compliments economic indicators such as personal income and gross domestic product by considering health and education in addition to income. My findings indicate that the impact of irrigated agriculture on this broader measure of human development is very small. This suggests that policymakers may experiment with a range of strategies for managing irrigation withdrawals from the Ogallala aquifer without harming the immediate wellbeing of area residents. I recommend that policymakers focus first on collective groundwater management strategies that will avoid the economic shock of an abrupt collapse of irrigated agriculture brought on by a fully depleted local aquifer.

I further recommend that policymakers take a positive deviance approach (Green, 2016) to planning for an eventual future without widespread irrigation. By experimenting and learning from counties that currently have little irrigation but high scores on the HDI, policymakers can put the High Plains in the best position to harness the “next big thing” after irrigation. My finding that human development on the High Plains is resilient across varying levels of irrigated agriculture suggests that there is political space to take risks and dream big.

Chapter 3 - Culture and Ogallala Groundwater Management

Culture consists of “a group’s shared practices, values, and beliefs” (Keirns et al. 2018, p. 21). I use survey data, supplemented with quotations from my interviews with producers, to describe the distribution of values, beliefs, and norms held by High Plains producers. I then apply the Values-Beliefs-Norms theory of environmental action (Stern et al., 1999) to determine whether differences in values, beliefs, or norms explain producer involvement in collaborative groundwater management.

Culture – Introduction and Literature Review

Previous research on farm culture in the Ogallala Aquifer region

An understanding of values is crucial for understanding and encouraging pro-environmental behaviors. Effective scientific communication and public participation increasingly requires a rich understanding of the values that guide human thoughts and actions (Caldas et al., 2015; Dietz, 2013). Insight into values is important for informing social responses to environmental challenges from climate change (Hackmann et al., 2014) to water resources management (Morton, 2015), and for encouraging environmentally friendly behavior among the general public (Steg, 2016; Steg and Vlek, 2009) and specific stakeholders such as rural communities (Flora, 2004; Flora et al., 2015) and producers (Sanderson et al., 2017).

Unfortunately, relatively little research has been done to understand the role of values in producers’ management of Ogallala Aquifer groundwater (Lauer et. al., 2018). However, the research that has been done indicates that the Ogallala Aquifer and its depletion have played a large role in the culture of the Ogallala Region, particularly as it relates to the abundance and scarcity of natural resources. Williams and Bloomquist (1997) synthesize three case studies of

rural Haskell County, Kansas, conducted in 1940, 1965, and 1993, finding that irrigation from the Ogallala aquifer is the most critical driver of community changes since the 1940s.

Irregular precipitation is the main natural constraint on stability and economic development in Haskell County, and the homesteader program historically led to further instability by encouraging commercialized wheat monocultures on farms that were too small for the climate. Therefore, before widespread irrigation, drought thwarted early efforts to build communal relationships, and residents in the 1940s were characterized as having a “gambler’s psychology” (Williams and Bloomquist, 1997, p282).

Structural changes of increasing commercialization and mechanization continued throughout the twentieth century, but life in Haskell County was transformed by the stabilizing influences of widespread irrigation and federal farm subsidies. By 1965, attitudes of “business/economic rationality” (Williams and Bloomquist, 1997, p283) replaced the “gamblers mentality” and the more stable environment enabled the residents to form integrated communities in the towns of Santana and Sublette. By 1993, residents had supplemented their business mentality with a focus on maintaining community traditions.

By the 1990s, declines in the Ogallala aquifer and aging irrigation infrastructure made agriculture less stable and increased dependence on government programs compared to the 1960s. The declining aquifer and a decreasingly localized set of jobs, goods, and services in Haskell County began to reintroduce the uncertainty of earlier times.

Through in-depth, semi-structured interviews with 149 producers living in rural Kansas, White (2014) finds a general perception of loss and decay in rural communities. Producers living near towns that are smaller, in the High Plains region of the state, and with shrinking populations express greater pessimism. Most producers attribute the trajectory of their town to external

causes beyond local control. When asked about desirable changes that they wish to see in their communities, 46 spoke of adding businesses or amenities, 15 spoke of increasing population, and 23 spoke of changing attitudes among community residents. A quarter of the producers were unable to share any ideas for desirable change in their communities. White argues that community development initiatives must therefore focus on visioning and building rural communities' sense of efficacy in pursuing valued changes.

While small rural communities and those without abundant irrigation potential continue to hollow out, the Ogallala Oases are experiencing cultural changes associated with population growth (White, 1992, 1994). In southwest Kansas, these include in-migration of Latino and Asian immigrants who take low-skilled jobs at the local beef-packing plants (Solis, 2003). Observing that changes in the cultural composition of Liberal, Kansas have led to increasingly contentious power relations between different classes and ethnicities, Solis (2003) argues that conflict will continue as long as the region's political economy remains based on the exploitation of Ogallala water and meatpackers' labor.

Cultural change is not limited to urban areas of the region. Non-farming residents are moving into bedroom communities in the rural hinterlands of Ogallala Oases, bringing new cultural values that conflict at times with those of long-time residents and producers (White, 2014). Through surveys, focus groups, and interviews in the Middle Platte River region of Nebraska, Allen (1997) finds that priorities for the use of local water resources differ between long-time residents and those newer to the area. Older residents and those who have lived in the area for more than 15 years are more likely to believe that irrigation is the best use of Platte River water, while younger and newer residents are more likely to believe that the best use is for bird and wildlife habitat. All residents (producers and non-producers) shared strong values of

self-reliance and independence from interference in daily life. Overall, most residents would trade off environmental protection for additional jobs, especially residents who want their children to be able to find jobs in the area.

In sum, prior research on cultural characteristics of the Ogallala region indicates that the array of values held in the region is becoming more varied and complex. The original cultural values from the homesteading era include self-reliance, independence, a high tolerance for risk and the valorization of the extraction of commodities from the land. Irrigation has supplemented these original values with those of business rationality, place attachment and a respect for local history and traditions. I speculate that these newer values, rooted in the stability provided by irrigated agriculture, form the basis for widespread regional concern regarding the ongoing depletion of the Ogallala aquifer.

Values-Beliefs-Norms Theoretical Framework

The Values-Beliefs-Norms (VBN) theoretical framework is among the most popular frameworks for understanding the role of values in shaping pro-environmental behavior. Building on Schwartz' (1968) norms-activation theory, Schwartz's (1992) theory of personal values, and the New Ecological Paradigm theory of environmental worldviews (Dunlap et al., 2000), the VBN framework posits that a substantial amount of the variation in pro-environmental behavioral norms is explained by five clusters of personal values acting through the mediating beliefs of New Ecological Paradigm, environmental concern, and environmental responsibility (Dietz et al., 2005; Stern et al., 1999).

The VBN framework begins with five clusters of personal values that are adapted from Schwartz's (1992) theory of personal values. Values are seen as relatively stable and important aspects of personal identity that include beliefs about what is desirable in life (Dietz et al., 2005;

Stern et al., 1999). Humanistic values focus on the worth of other people and are expressed through altruism towards people (Dietz et al., 2005). Biospheric values emphasize the intrinsic worth of the natural environment and can be expressed as “altruism towards other species and the biosphere” (Stern et al., 1999, p. 85). Egoistic values focus on personal wealth, power, and status. Openness to change values emphasize the benefits of novelty and excitement in life. Finally, traditional values emphasize loyalty, duty, and belonging, and are associated with conservative political orientations in the United States (Stern et al., 1999).

The VBN framework posits that people who place a greater importance on biospheric, humanistic, and openness to change values and a lesser emphasis on traditional and egoistic values are more likely to adopt the New Ecological Paradigm as their worldview (Stern et al., 1999). The VBN framework follows Dunlap and colleagues (2000) in conceptualizing the New Ecological Paradigm as an enduring set of mutually-reinforcing beliefs about the relationship between people and the natural world that predispose adherents towards pro-environmental attitudes and actions. The VBN framework posits that people adhering to the New Ecological Paradigm worldview are more likely to be concerned about environmental problems and to feel responsible for contributing to them. Consistent with norm activation theory (Schwartz, 1968), the VBN framework posits that beliefs of concern over and responsibility for environmental problems lead to the activation of pro-environmental norms, whereby people feel morally obliged to engage in pro-environmental behaviors (Stern et al., 1999).

Thus, the VBN framework traces the influence of values through adherence to New Ecological Paradigm and beliefs about environmental concern and responsibility to the activation of personal pro-environmental norms and the pursuit of environmentally friendly behaviors (Stern et al., 1999).

Culture in the Present Study

I apply the VBN framework in both a descriptive and an explanatory sense to producers in the High Plains / Ogallala Aquifer region. First, I describe the distribution of values, beliefs, and norms held by High Plains producers. I then apply the VBN framework to determine whether differences in values, beliefs, or norms explain producer involvement in collaborative groundwater management.

Culture – Research Methods

Research Questions.

What are the values and motivations underlying producers' groundwater management decisions in the High Plains / Ogallala Aquifer region? Do differences in values, beliefs, or norms explain producer involvement in collaborative groundwater management?

Sample.

In January to June of 2018, my advisor and I surveyed producers in 227 counties in six states in the Ogallala aquifer region. The survey instrument was 12 pages long and contained about 175 items, designed to elicit producers' attitudes and perceptions towards groundwater conservation. We contracted with Iowa State University's Center for Survey Statistics and Methodology to manage the mailing of the survey.

The United States Geological Survey defines the Ogallala aquifer region to include counties in the states of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (McGuire, 2017). We excluded the states of South Dakota and Wyoming from our survey due to the low contributions of Ogallala groundwater to their agricultural economies relative to other states. We over-sampled from the 14 counties surveyed by Kromm

and White (1986) to enable comparisons across time. Our sample remained proportionately representative between states.

We began with a random sample of 8000 producers, purchased from Survey Sampling Inc. Producers with any number of planted acres and/or livestock were eligible for inclusion. Our survey has a margin of error of +/- 2.8% at a 95% confidence level. After excluding 288 responses from ineligible producers, we obtained a response size of 1226 producers, for a response rate of 15.9%. Response rates below 40% may raise concerns about nonresponse bias of findings (Schutt, 2012). Unfortunately, low response rates are becoming the norm among surveys of producers (Glas et al., 2019). Even the USDA-NASS survey is recording previously unheard of response rates of 60% (Johannson et al., 2017).

Davern (2013) suggests that response rates should be viewed as one indicator among several. Other indicators of possible nonresponse bias are respondent demographics differing from known population demographics and differences in responses among survey subgroups. While our 15.9% response rate raises concerns of possible nonresponse bias, our demographic and subsample comparisons help to mitigate those concerns. The responses of our subsample of 14 over-represented counties do not differ meaningfully from the subsample of the other 213 counties. Furthermore, a demographic profile of respondents shows that they are demographically representative of the target population as described by the 2012 USDA Agricultural Census.

Mean and median age of respondents is 64 years with a range of 26-96 years. 90% of respondents are male. 88% attained at least a high school education, while 34% attained the educational equivalent of a four-year degree. Median household income is in the \$75000-\$100000 range. 52% of respondents did not irrigate any land in 2017, while 48% did irrigate.

Mean dryland acres farmed in 2017 was 722 acres (median 240, range 0 to 43264). Overall, mean irrigated acres farmed in 2017 was 296 acres (median 0, range 0 to 7500). Among irrigators only, mean irrigated acres farmed in 2017 was 334 acres (median 617, range 4 to 7500).

Measures.

Values. I measure five values in accordance with the VBN theoretical framework of environmentalism (Stern et al., 1999). Each value is measured as a linear additive index of three survey items. Each survey item asks producers to “indicate how important each of the following is as a guiding principle in your life” using a 5-point scale (not at all important to very important).

Humanistic values. I use the following survey items to measure humanistic values: “social justice, correcting injustice, care for the weak”, “equality, equal opportunity for all”, and “a world of peace, free of war and conflict”. This scale has an alpha of 0.77, indicating high internal validity.

Biospheric values. I use the following survey items to measure biospheric values: “unity with nature, fitting into nature”, “respecting the earth, harmony with other species”, and “protecting the environment, preserving nature”. This scale has an alpha of 0.99, indicating high internal validity.

Egoistic values. I use the following survey items to measure egoistic values: “influential, having an impact on people and events”, “wealth, material possessions, money”, and “authority, the right to lead or command”. This scale has an alpha of 0.74, indicating high internal validity.

Openness to change values. I use the following survey items to measure openness to change values: “curiosity, interested in everything, exploring”, “a varied life, filled with

challenge, novelty, and change”, and “an exciting life, stimulating experiences”. This scale has an alpha of 0.84, indicating high internal validity.

Traditional values. I use the following survey items to measure traditional values: “self-discipline, self-restraint, resistance to temptations”, “family security, safety for loved ones”, and “honoring parents and elders, showing respect”. This scale has an alpha of 0.79, indicating high internal validity.

New Ecological Paradigm (belief). I measure the extent to which producers hold an ecological world view using the New Ecological Paradigm scale (Dunlap et al., 2000; Stern et al., 1999). The New Ecological Paradigm scale is a linear additive index of nine survey items. Each survey item asked respondents to “indicate how you agree with each statement about relationships between people and the environment” on a 5-point Likert scale (strongly disagree to strongly agree). The survey items used to construct the New Ecological Paradigm scale (Dunlap et al., 2000) are: “humans will always adapt to their natural environment”, “people are severely abusing the environment”, “people are meant to rule over the rest of nature” (reverse coded), “nature strong enough to cope with the impacts of modern industry” (reverse coded), “the earth is like a spaceship with limited room and resources”, “if things continue, we will soon experience a major ecological catastrophe”, “people have the right to modify the natural environment to suit their needs” (reverse coded), “the so-called ecological crisis facing us has been greatly exaggerated” (reverse coded), and “plants and animals have as much right as people to exist”. This scale has an alpha of 0.83, indicating high internal validity.

Is groundwater depletion a problem? (belief) Survey questions that assess whether producers perceive groundwater depletion as a problem include: “Should groundwater be saved or conserved?” (yes or no), “Groundwater should be used. Groundwater does no good in the

ground.” (five-point Likert scale), and “How serious of a problem is groundwater decline?” (five-point scale: not serious, neutral, somewhat serious, serious, very serious).

Is groundwater depletion an individual and/or a community problem? (belief)

Survey questions that assess whether producers perceive groundwater depletion as a problem for themselves individually or for their community include: “Groundwater levels are a problem for my farm/family/household.” (five-point Likert scale) and “Groundwater levels are a problem for my community.” (five-point Likert scale).

Personal capacity for more conservation (belief). Survey questions that assess whether producers perceive personal capacity for more groundwater conservation include: “I already limit my groundwater use as much as possible.” (five-point Likert scale) and “I should reduce or minimize my groundwater use” (five-point Likert scale).

Motives for groundwater conservation (norms). The survey asked producers to rank their level of agreement on a five-point Likert scale for each of five potential reasons:

Commodity Prices. “Groundwater should be conserved today so that it is available to producers if commodity prices are higher in the future.” This is a primarily self-interested motive for conservation.

Drought. “Groundwater should be conserved today so that it is available to producers if drought becomes more frequent in the future.” This is a primarily self-interested motive for conservation.

Farm profitability. “Groundwater should be conserved today so that irrigated agriculture remains profitable on other farms in my area in the future.” This is a primarily altruistic motive for conservation.

Community Jobs. “Groundwater should be conserved today so that jobs and business opportunities continue to be available in my community in the future.” This is a primarily altruistic motive for conservation.

Future Generations. “Groundwater should be conserved today so that future generations in my area can enjoy the benefits I have experienced.” This is an altruistic motive for conservation.

Barriers to producer participation in individual groundwater conservation efforts (outcomes). Producers were also asked to rank their level of agreement on a five-point Likert scale for each of nine potential barriers to conservation: “Most people do not save more groundwater because it takes too much effort to conserve groundwater.”, “Most people do not save more groundwater because environmental regulations are too strict.”, “Most people do not save more groundwater because they do not know what options exist to save groundwater.”, “Most people do not save more groundwater because water use regulations are not strict enough.”, “Most people do not save more groundwater because if they do not pump the water, someone else will.”, “Most people do not save more groundwater because they are self-interested/greedy.”, “Most people do not save more groundwater because it would require more expensive technology.”, “Most people do not save more groundwater because they do not want to change their irrigation practices.”, and “Most people do not save more groundwater because it would decrease their production.”

Participation in voluntary group efforts (outcome). The survey asks producers “Are you involved with leading, organizing, or advocating for any voluntary group efforts to conserve groundwater? For example: GMDs, LEMAs, or WCAs in Kansas, NRDs in Nebraska, or

Groundwater Conservation Districts in Texas.” Those producers who answer yes are asked how many years they have participated.

Barriers to producer participation in voluntary group conservation efforts

(outcome). Producers were also asked to rank their level of agreement on a five-point Likert scale for each of nine potential barriers to conservation: “I don’t get more involved with groups that are conserving water because voluntary group efforts are not effective in solving problems.”, “I don’t get more involved with groups that are conserving water because I don’t have anything worthwhile to contribute to a group.”, “I don’t get more involved with groups that are conserving water because There’s not enough time in the day.”, “I don’t get more involved with groups that are conserving water because travelling to group meetings is too burdensome.”, “I don’t get more involved with groups that are conserving water because I prefer to focus on other issues.”, “I don’t get more involved with groups that are conserving water because I need to avoid making too many commitments.”, “I don’t get more involved with groups that are conserving water because I need to prioritize success on my farm.”, and “I don’t get more involved with groups that are conserving water because I need to prioritize spending time with my family.”

Other Variables. I control for demographic variables that are plausibly associated with changes in New Ecological Paradigm. These included a respondent’s age in years (Dunlap et al., 2000), whether the respondent was male (Stern et al., 1995), married, had attained a high school or a college degree (Dunlap et al., 2000), and for approximate household income from all sources before taxes in 2017 (Dunlap et al., 2000). Because many Americans are hesitant to provide precise information about their income, I asked about income using an ordinal scale, in which a value of 1 applies to a household income range between \$0 and \$25,000, increasing in increments of \$25,000 until the value of 9, which is a household income of more than \$200,000.

Supplementary Semi-Structured Interviews.

Between 2017 and 2019, I conducted 41 semi-structured interviews of producers across Western Kansas. Semi-structured interviews initially focused on understanding participants' attitudes, outlooks, and perspectives on groundwater, and investigating how participants responded to questions that were considered for inclusion on the survey of High Plains producers.

Interviews were semi-structured and focused on producers' perceptions of groundwater and water conservation, the social, political, and economic factors that affect water use, and their awareness of and involvement in voluntary group efforts to manage groundwater. Interviews were most often conducted on-farm, but some were conducted in town if the producer preferred. I describe my interview research methods in more detail in the [Agency – Research Methods](#) section of this dissertation.

Analysis.

The purpose of this analysis is two-fold. First, to determine the prevalence of different values and motivations underlying producers' groundwater management decisions in the High Plains / Ogallala Aquifer region. Descriptive statistics run in R is sufficient for this purpose. I place these statistics in context by including quotations from my interviews with producers.

The second purpose of this analysis is to identify associations between the values, beliefs, and norms of High Plains producers and their involvement in collaborative groundwater management. I use a path analysis model to predict barriers to and involvement in collaborative groundwater management using values, beliefs, and norms while controlling for demographic variables and producer characteristics.

Culture – Descriptive Findings and Discussion

Values and motivations underlying producers' groundwater management decisions

Groundwater depletion is a problem. My findings establish that producers see groundwater depletion as a problem (Table 1). Asked “Should groundwater be saved or conserved?”, 92% of producers answer “yes”. No state has less than 80% of producers answering yes to this survey question. In contrast, when asked to rank their level of agreement with the statement “Groundwater should be used. Groundwater does no good in the ground.” on a five-point Likert scale, only 24% of producers agree or strongly agree. No state has more than 33% of producers in agreement. These findings suggest widespread agreement among producers that groundwater should be conserved rather than fully depleted.

Asked to indicate “How serious of a problem is groundwater decline?” on a five-point scale (not serious, neutral, somewhat serious, serious, very serious), the majority of producers see a problem. Overall, 81% of producers indicate that groundwater depletion in their area is at least somewhat serious, with 59% of producers indicating that it is a serious or very serious problem. A producer in northwest Kansas explains:

“I think about water all the time ... We're all doing our part to keep our families and traditions afloat, to maintain what we have and pass it on.”

Disaggregating by state, I find a clear difference between producers in Nebraska and the other states in the Ogallala region. Only 42% of producers in Nebraska indicate that groundwater depletion is a serious or very serious problem in their area. None of the other states has less than 67% of producers indicating that groundwater depletion is a serious or very serious problem in their area. One likely explanation for the different findings in Nebraska is that the Ogallala

aquifer in Nebraska has greater recharge, greater saturated thickness, and is less depleted than in more southern states (Smidt et al., 2016).

When limiting my analysis to the 14 counties surveyed by Kromm and White in 1986, I find that the same percentage of respondents – 87% in 2018 vs 87% in 1984 – viewed groundwater depletion as at least a serious problem. However, the percentage of respondents viewing groundwater as a very serious problem declined about 20% from 57% of respondents in 1984 to 38% of respondents in 2018. While striking, I caution that my findings are not directly comparable as I limited my sample to producers while Kromm and White included the general public in their survey sample.

Table 3. Producers view groundwater depletion as a problem

	Overall	NE	CO	KS	OK	NM	TX
<i>In your opinion, should groundwater from the Ogallala Aquifer be conserved, or saved?</i>	Yes 92% No 8%	Yes 83% No 27%	Yes 81% No 19%	Yes 90% No 10%	Yes 92% No 8%	Yes 94% No 6%	Yes 84% No 16%
<i>Groundwater should be used. Groundwater does no good in the ground.</i>	SA 5% A 20% N 29% D 24% SD 23%	SA 5% A 22% N 29% D 22% SD 21%	SA 5% A 28% N 23% D 27% SD 17%	SA 3% A 11% N 29% D 26% SD 32%	SA 2% A 17% N 34% D 26% SD 21%	SA 3% A 21% N 14% D 41% SD 21%	SA 6% A 23% N 34% D 19% SD 18%
<i>How serious of a problem is groundwater decline?</i>	VS 28% S 31% SS 14% N 22% NS 5%	VS 15% S 26% SS 19% N 30% NS 9%	VS 40% S 26% SS 10% N 21% NS 2%	VS 36% S 36% SS 11% N 13% NS 1%	VS 28% S 37% SS 5% N 13% NS 0%	VS 41% S 33% SS 5% N 5% NS 5%	VS 47% S 31% SS 4% N 10% NS 1%

SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree

VS = very serious, S = serious, SS = somewhat serious, N = neutral, NS = not serious

Primarily a community problem. A larger proportion of producers see groundwater depletion as a problem for their community than for themselves (Table 2). When asked to rank their level of agreement with the statement “Groundwater levels are a problem for my farm/family/household.” on a five-point Likert scale, 39% of producers agree. Disaggregating by state, there is a clear trend towards greater agreement among producers in southern states. Notably, 73% of producers in Texas agree that groundwater levels are a personal problem

compared with only 23% agreement in Nebraska. When asked to rank their level of agreement with the statement “Groundwater levels are a problem for my community” on a five-point Likert scale, 47% of producers agree. I again find a trend towards greater agreement among producers in southern states, ranging from 29% agreement in Nebraska to 80% agreement in Texas.

Producers in every state were in greater agreement that groundwater levels are a problem for their community than for themselves. A producer in west-central Kansas explains:

“If we’re completely dry, we lose what’s the bulk of our economic driver in this community. And I think without that we’ll slowly lose people which means we slowly lose the school and the hospital because we don’t have enough to support them. And so, it really becomes a slow drying up of our community.”

The gap between agreement that groundwater depletion is a community problem and agreement that it is a personal problem was smallest in Nebraska at only 6%, and largest in Kansas at 24%. Notably, there is no clear geographic trend in the size of the gap.

Table 4. Producers view groundwater depletion as primarily a community problem

	Overall	Nebraska	Colorado	Kansas	Oklahoma	New Mexico	Texas
<i>Groundwater levels are a problem for my farm / family / household</i>	SA 14% A 25% N 26% D 22% SD 13%	SA 6% A 17% N 29% D 30% SD 18%	SA 19% A 37% N 26% D 10% SD 9%	SA 17% A 30% N 28% D 16% SD 9%	SA 18% A 29% N 24% D 18% SD 10%	SA 24% A 38% N 17% D 21% SD 0%	SA 38% A 35% N 13% D 11% SD 3%
<i>Groundwater levels are a problem for my community</i>	SA 15% A 32% N 23% D 19% SD 10%	SA 7% A 22% N 27% D 29% SD 16%	SA 21% A 45% N 20% D 8% SD 6%	SA 19% A 41% N 22% D 12% SD 5%	SA 16% A 39% N 22% D 18% SD 4%	SA 34% A 41% N 17% D 3% SD 3%	SA 36% A 44% N 15% D 3% SD 2%
<i>Perception of community vs personal problem*</i>	8% more perceive community problem	6% more perceive community problem	11% more perceive community problem	24% more perceive community problem	8% more perceive community problem	15% more perceive community problem	9% more perceive community problem

SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree

* calculated by subtracting the percent agreeing or strongly agreeing that “groundwater levels are a problem for my farm/family/household” from the percent agreeing or strongly agreeing that “groundwater levels are a problem for my community”

Altruistic motives for conservation. When asked why groundwater should be conserved, there is strongest agreement among producers that groundwater should be conserved for altruistic reasons rather than as a matter of self-interest (Table 3). I asked producers to rank their level of agreement on a five-point Likert scale for each of five potential reasons. More than four out of five producers agree or strongly agree that groundwater should be saved for the benefit of future generations, while two thirds agree that it should be conserved for the future economic benefits to their community. Notably, very few producers expressed disagreement with altruistic reasons for groundwater conservation. A producer in west-central Kansas describes how:

“I used to think that water was mine and I could do with it as I pleased. And I still think the water under my land is mine, but I also believe in a greater sense that it's ours and we need to conserve it ... And I think it would be extremely selfish for us to use that water up and not save it for future generations.”

Turning to reasons of self-interest, there was high agreement among producers that groundwater should be conserved to protect producers against future droughts. An agricultural consultant in west-central Kansas describes how:

“This part of the country experiences extreme drought. Having that water provides enough of a level of security that you know you can carry on.”

By contrast, there was only modest agreement that groundwater should be conserved to help producers take advantage of future rises in commodity prices. One-in-ten producers disagreed that future droughts are a reason to conserve groundwater today while one-in-five producers disagreed that future commodity price rises are a reason to conserve groundwater now.

Table 5. Producers are in most agreement on altruistic motives for conservation.

Groundwater should be conserved today so that...	SA	A	N	D	SD	Difference*
it is available to producers if commodity prices are higher in the future.	11%	28%	39%	16%	6%	17% more agree than disagree
irrigated agriculture remains profitable for other farms in my area in the future.	14%	46%	29%	6%	5%	49% more agree than disagree
it is available to producers if drought becomes more frequent in the future.	16%	47%	26%	8%	3%	62% more agree than disagree
jobs and business opportunities continue to be available in my community in the future.	17%	49%	28%	4%	2%	60% more agree than disagree
future generations in my area can enjoy the benefits I have experienced.	33%	53%	12%	1%	1%	84% more agree than disagree

SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree

* calculated by subtracting the percent strongly disagreeing or disagreeing from the percent strongly agreeing or agreeing

Limited personal capacity for more conservation. I find that a majority of producers believe that they are already doing as much as they can personally to conserve groundwater on their operation (Table 4). When asked to rank their level of agreement with the statement “I already limit my groundwater use as much as possible” on a five-point Likert scale, 72% of producers agree or strongly agree. Only 7% perceive additional capacity for groundwater use reduction on their operation.

Producers were split when asked to rank their level of agreement with the statement “I should reduce or minimize my groundwater use” on a five-point Likert scale, 40% disagree or strongly disagree, 22% agree, and 38% are neutral. This finding is unsurprising given my finding that most producers believe they are already doing as much as they can do personally to conserve groundwater.

I also asked producers to rank their level of agreement on a five-point Likert scale for each of nine potential barriers to conservation. More than three-in-five producers agree or

strongly agree that “Most people do not save more groundwater because it would decrease their production.” and “...they do not want to change their irrigation practices.”. In contrast, fewer than two-in-five producers agree or strongly agree that “Most people do not save more groundwater because it takes too much effort to conserve groundwater”, “...environmental regulations are too strict”, and “...they do not know what options exist to save groundwater”. These findings suggest that merely increasing knowledge of options for water conservation may not be enough to address the perceived barriers to conservation among producers.

Table 6. Limited personal capacity and perceived barriers for more conservation.

	SA	A	N	D	SD
I already limit my groundwater use as much as possible	30%	42%	21%	4%	3%
I should reduce or minimize my groundwater use	5%	17%	38%	21%	19%
Most people do not save more groundwater because ...					
...it takes too much effort to conserve groundwater.	5%	16%	30%	36%	12%
...environmental regulations are too strict.	8%	19%	43%	21%	9%
...they do not know what options exist to save groundwater.	7%	31%	34%	23%	7%
...water use regulations are not strict enough.	13%	23%	38%	18%	8%
...if they do not pump the water, someone else will.	14%	35%	29%	15%	7%
...they are self-interested/greedy.	20%	32%	31%	11%	5%
...it would require more expensive technology.	12%	43%	30%	12%	3%
...they do not want to change their irrigation practices.	19%	46%	22%	10%	3%
...it would decrease their production.	26%	50%	14%	7%	3%

SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree

Limited participation in voluntary group efforts. Finally, I find that very few producers are participating in voluntary group efforts to conserve groundwater. Asked “Are you involved with leading, organizing, or advocating for any voluntary group efforts to conserve groundwater? For example: GMDs, LEMAs, or WCAs in Kansas, NRDs in Nebraska, or Groundwater Conservation Districts in Texas.”, only 7% of producers answered yes. However, those who are participating in voluntary group conservation efforts tend to stay involved for a long time, with the mean duration of participation being 19 years.

I asked producers to rank their level of agreement on a five-point Likert scale for each of eight potential barriers to participation in voluntary group efforts to conserve groundwater (Table 5). The primary barriers to participation appear to be structural, with more than a third of producers agreeing or strongly agreeing that “I don’t get more involved with groups that are conserving water because I need to avoid making too many commitments”, “I need to prioritize success on my farm” and “I need to prioritize spending time with my family”. These findings suggest that participation in voluntary group efforts to conserve groundwater might be expanded by making participation easier and less time-intensive.

Table 7. Barriers to producer participation in voluntary group conservation efforts.

I don’t get more involved with groups that are conserving water because:	SA	A	N	D	SD
Voluntary group efforts are not effective in solving problems	5%	11%	46%	27%	11%
I don’t have anything worthwhile to contribute to a group	4%	13%	50%	26%	8%
There’s not enough time in the day	7%	23%	49%	16%	5%
Travelling to group meetings is too burdensome	5%	21%	53%	17%	3%
I prefer to focus on other issues	5%	21%	57%	13%	3%
I need to avoid making too many commitments	6%	30%	49%	12%	3%
I need to prioritize success on my farm	5%	30%	51%	12%	3%
I need to prioritize spending time with family	10%	33%	45%	9%	2%

SA = strongly agree, A = agree, N = neutral, D = disagree, SD = strongly disagree

Culture – Path Analysis Findings and Discussion

Associations between the values, beliefs, and norms of High Plains producers and their involvement in collaborative groundwater management.

The purpose of this analysis is to determine whether there is a relationship between values, beliefs, and norms and civic engagement. I use two path models in this analysis, one uses data from producers who irrigate and the other uses data from producers who are solely dryland

producers. While path analysis models are most often used with latent variables, they are also appropriate for models using only manifest variables (Kline, 2016). I use path analysis because it estimates all modeled parameters simultaneously, thereby reducing the likelihood of Type I errors (Kline, 2016). Models are estimated using the lavaan package in R (Rosseel, 2012).

Both models use the same variables and follow the values-beliefs-norms framework (Stern, 1999), in which values predict beliefs, values and beliefs predict norms, and norms predict the outcome of interest. As is standard in the values-beliefs-norms framework, control variables are included along with values to predict beliefs.

Again, following standard practice (Stern, 1999), my models begin with five values (humanistic, biospheric, egoistic, openness, and traditional), which are used to predict belief in New Ecological Paradigm. I control for the effects on New Ecological Paradigm of age, gender, high school education, bachelor's degree, conservatism, and income.

I use New Ecological Paradigm to predict adherence to three norms: conservation for future generations (“Groundwater should be conserved today so that future generations in my area can enjoy the benefits I have experienced”), conservation for local jobs (“Groundwater should be conserved today so that jobs and business opportunities continue to be available in my community in the future”), and conservation for local farm profitability (“Groundwater should be conserved today so that irrigated agriculture remains profitable for other farms in my area in the future”). I chose to use these three norms because they were the top reasons that producers gave for conserving groundwater (Table 5, above).

While “Groundwater should be conserved today so that it is available to producers if drought becomes more common in the future” is the third most prevalent reason that producers gave for conserving groundwater, I chose to use conservation for local farm profitability as the

third norm in my model for two reasons³. First, farm profitability captures a broader range of future contingencies than simply drought. For example, farm profitability also captures varying commodity prices and the concern over land values, both of which, in addition to drought, were brought up by producers in my interviews. Second, while producers described weather patterns consistent with scientific models of climate change, they tended to focus more on cyclical patterns of moisture and drought. This suggests that an unknown proportion of producers who favor conservation “if drought becomes more common in the future” may simultaneously be of the opinion that drought will not become more common in the future. For example, a producer in west-central Kansas emphasizes that:

“You have to be pretty tough to live here because this [weather] comes and goes. I’ve got hand-written records back to nineteen eleven and this is more in line with that turn of the century weather that they had when my grandfathers were farmin’ – great grandfathers were farmin’ so this [is] nothin’ too unusual here. These cycles come and go ... but one thing that probably has changed as much as anything is that [inhales deeply] it used to be if we had a really warm spring like this the summer’d be cool but now we could be hot all summer so, that’s one thing that there is some difference in heat.”

Finally, I use each of the three norms to predict whether or not producers are civically engaged in voluntary group conservation efforts (“Are you involved with leading, organizing, or advocating for any voluntary group efforts to conserve groundwater? For example: GMDs, LEMAs, or WCAs in Kansas, NRDs in Nebraska, or Groundwater Conservation Districts in Texas?”).

³ Models including drought as a norm had worse fit and would not alter my conclusions.

Table 8 provides the means, standard deviations, and ranges of each study variable for producers who irrigate and for those who farm dryland only.

Table 8. Model Variables: Descriptive Statistics (Irrigators N = 417, Dryland N = 363)

Variable	Unit	Irrigators Mean	Irrigators Standard Deviation	Irrigators Range	Dryland Mean	Dryland Standard Deviation	Dryland Range
Civic Engagement	Binary	0.12	0.32	0 - 1	0.02	0.16	0 - 1
Conserve for future generations	Score	4.07	0.74	1 - 5	4.22	0.82	1 - 5
Conserve for local jobs	Score	3.79	0.80	1 - 5	3.68	0.91	1 - 5
Conserve for farm profits	Score	3.91	0.75	1 - 5	3.16	1.06	1 - 5
New Ecological Paradigm	Score	27.13	3.19	10 - 43	27.81	3.11	14 - 45
Humanistic values	Score	11.74	2.55	3 - 15	12.41	2.19	3 - 15
Biospheric values	Score	11.17	2.57	3 - 15	11.99	2.61	3 - 15
Egoistic values	Score	9.48	2.40	3 - 15	9.66	2.52	3 - 15
Openness values	Score	10.10	2.63	3 - 15	10.51	2.65	3 - 15
Traditional values	Score	13.57	1.57	3 - 25	13.75	1.51	8 - 25
Age	Years	61.38	13.25	26 - 96	65.35	13.13	27 - 95
Log Age		1.78	0.10	1.41 - 1.98	1.81	0.10	1.43 - 1.98
Male	Binary	0.96	0.20	0 - 1	0.87	0.33	0 - 1
High School	Binary	0.88	0.33	0 - 1	0.87	0.34	0 - 1
Bachelors	Binary	0.36	0.48	0 - 1	0.31	0.46	0 - 1
Conservatism	Score	5.36	1.24	1 - 7	5.26	1.30	1 - 7
Income	Score	4.60	2.48	1 - 9	3.99	2.28	1 - 9

I use path models to determine whether there is a relationship between values, beliefs, and norms and civic engagement. Table 9 shows the path coefficients for both the model for irrigators and the model for dryland producers.

Table 9. Parameter Estimates for Values-Beliefs-Norms Models

Parameter Estimate	Irrigators Coefficient	Irrigators Standard Error	P	Dryland Coefficient	Dryland Standard Error	P
Conserve for future generations → Civic Engagement	0.064	0.029	.024	0.012	0.010	.241
Conserve for local jobs → Civic Engagement	0.029	0.024	.227	0.003	0.010	.757
Conserve for farm profits → Civic Engagement	0.022	0.027	.401	0.003	0.008	.721
New Ecological Paradigm → Conserve for future generations	0.023	0.011	.032	0.007	0.013	.569
Humanistic Values → Conserve for future generations	-0.023	0.018	.201	-0.004	0.030	.898
Biospheric Values → Conserve for future generations	0.062	0.017	<.001	0.073	0.024	.002
Egoistic Values → Conserve for future generations	-0.082	0.019	<.001	-0.035	0.023	.121
Openness Values → Conserve for future generations	0.065	0.018	<.001	0.017	0.022	.433
Traditional Values → Conserve for future generations	0.128	0.023	<.001	0.071	0.030	.020

New Ecological Paradigm → Conserve for local jobs	0.017	0.012	.173	0.035	0.014	.015
Humanistic Values → Conserve for local jobs	-0.001	0.020	.950	-0.089	0.032	.006
Biospheric Values → Conserve for local jobs	-0.001	0.020	.950	0.051	0.026	.048
Egoistic Values → Conserve for local jobs	-0.060	0.022	.006	-0.007	0.025	.766
Openness Values → Conserve for local jobs	0.071	0.021	.001	0.021	0.024	.394
Traditional Values → Conserve for local jobs	0.141	0.026	<.001	0.093	0.033	.005
New Ecological Paradigm → Conserve for farm profits	0.008	0.012	.486	0.005	0.018	.769
Humanistic Values → Conserve for farm profits	-0.012	0.019	.533	-0.073	0.040	.065
Biospheric Values → Conserve for farm profits	0.044	0.019	.018	0.031	0.032	.332
Egoistic Values → Conserve for farm profits	-0.060	0.021	.004	0.121	0.030	<.001
Openness Values → Conserve for farm profits	0.055	0.020	.006	-0.075	0.030	.011
Traditional Values → Conserve for farm profits	0.095	0.025	<.001	0.004	0.041	.920
Humanistic Values → New Ecological Paradigm	0.040	0.085	.642	0.088	0.125	.481
Biospheric Values → New Ecological Paradigm	0.144	0.078	.063	0.009	0.095	.926
Egoistic Values → New Ecological Paradigm	-0.045	0.090	.615	0.218	0.092	.018
Openness Values → New Ecological Paradigm	0.236	0.086	.006	0.084	0.088	.339
Traditional Values → New Ecological Paradigm	0.071	0.107	.510	-0.078	0.128	.539
Log Age → New Ecological Paradigm	-3.153	1.431	.028	-3.095	1.788	.083
Male → New Ecological Paradigm	0.904	0.711	.203	0.089	0.539	.869
High School Degree → New Ecological Paradigm	-0.976	0.507	.054	-0.327	0.527	.535
Bachelor's Degree → New Ecological Paradigm	0.086	0.322	.789	-0.435	0.361	.262
Conservatism → New Ecological Paradigm	0.250	0.127	.048	0.259	0.140	.065
Income → New Ecological Paradigm	0.001	0.060	.988	0.053	0.074	.478

Bold paths are significant at $p < 0.05$

Figure 3 shows the results of the path model for irrigators ($n = 417$). The model has a good fit to the data: $\chi^2(30) = 62.266$, $p < .001$; CFI = .979; TLI = .915; RMSEA = .051 (90% confidence interval [.033, .069]); SRMR = .038. Although the model fit indicates a significant chi-square test, significant chi square tests often occur when utilizing large sample sizes (Hooper et al., 2008).

Among the irrigators, I find a statistically significant, positive association between the norm to conserve for future generations and civic engagement. Specifically, for each one point increase in an irrigator's score on the Likert scale of their agreement with the norm of conserving for future generations, they are 6.4% more likely to be civically engaged on groundwater issues. This finding is consistent with my interviews in which those producers who are civically engaged in voluntary group conservation efforts described their primary motivation as leaving a positive legacy for future generations. While statistically significant, the small magnitude of the association suggests that the primary explanations for irrigators' civic engagement lie elsewhere. Furthermore, neither the norm to conserve for local jobs, nor the norm to conserve for farm profits has a statistically significant association with the likelihood of an irrigator's being civically engaged on groundwater issues. These findings, in the context of only 7% of producers being civically engaged in voluntary group conservation efforts, suggest that producers' civic engagement has a more contingent explanation than variation in their support for cultural norms.

With one exception, the other statistically significant associations in the values-beliefs-norms model for irrigators are broadly consistent with previous research. For example, I find a statistically significant, positive association between New Ecological Paradigm and the norm to conserve for future generations, such that each one point increase in an irrigator's score in support of New Ecological Paradigm is associated with a 0.023 increase in their score in support of the norm to conserve for future generations. This finding is consistent with previous research that suggests that people who believe humans are part of the natural environment (as opposed to masters over the environment) are more likely to feel morally obligated to preserve it for the future (Dunlap et al., 2000).

While the significant, negative association between egoistic values and the norm to conserve for farm profitability may at first appear counterintuitive, recall that farm profitability asks producers about their agreement with the statement that “groundwater should be conserved today so that irrigated agriculture remains profitable for other farms in my area in the future [emphasis added].” It was necessary to build the model using this version of the farm profitability question to enable comparisons between irrigators and dryland producers, as the version of the question about “irrigated agriculture ... on my farm” isn’t relevant to the latter.

The one truly surprising finding in the path model for irrigators is the significant positive association between conservatism and New Ecological Paradigm, such that each one point increase in an irrigator’s political conservatism is associated with a 0.25 point increase in their adherence to the New Ecological Paradigm. Dunlap and colleagues (2000) suggest that there should be a negative association between conservatism and New Ecological Paradigm. I speculate on two possible, non-exclusive explanations for my contrary finding.

First, it may be that my survey design influenced the responses of conservatives in atypical ways. There is evidence that conservatives show more support for pro-environmental outcomes when they are presented as part of a past-focused (rather than future-focused) narrative (Baldwin and Lammers, 2016). I included the New Ecological Paradigm scale towards the end of my survey. Having just answered many questions about irrigation in the context of widespread groundwater depletion, it is possible that conservatives were in a past-focused state of mind, which may have led them to show unusually high alignment with New Ecological Paradigm.

Second, it may be that distinctions between different types of conservatives had an unusually large influence on my survey responses due to the near absence of liberal respondents. Producers in the region overwhelmingly identify as political conservatives, to the extent that only

6% identified as liberal in my survey. Given the near absence of liberals, the possible distinctions between different types of conservatives may be foregrounded in this population. For example, Stenner (2009) suggests that there are at least three types of political conservatives: those who favor stability over social change, those who favor limited government intervention in the economy, and those who favor obedience and conformity. To my knowledge, there has been little research looking at the associations between New Ecological Paradigm among different types of political conservatives.

Figure 3. Unstandardized path coefficients for variables explaining Civic Engagement among Irrigators (N = 417). *p<.05 (two-tailed)

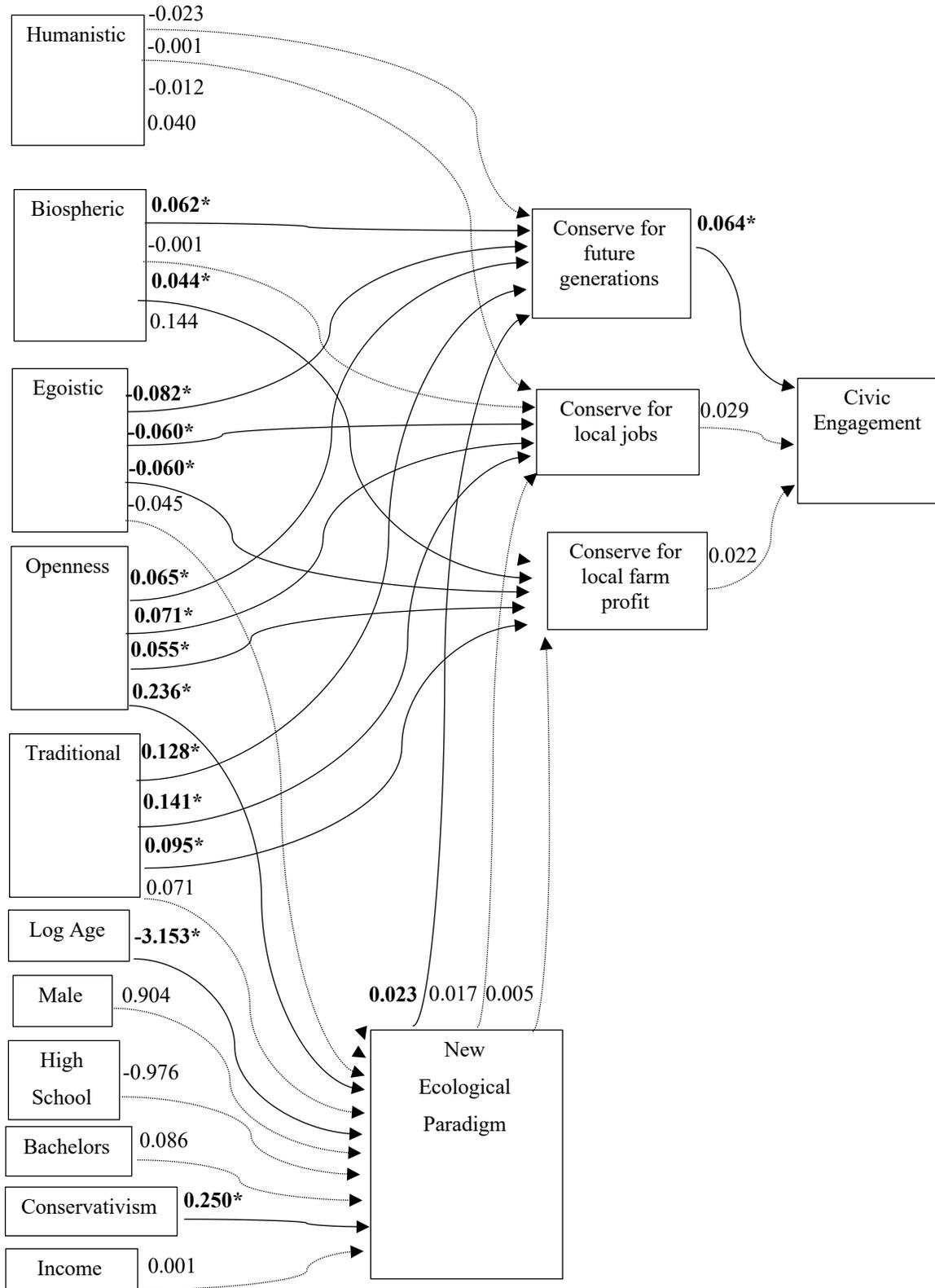
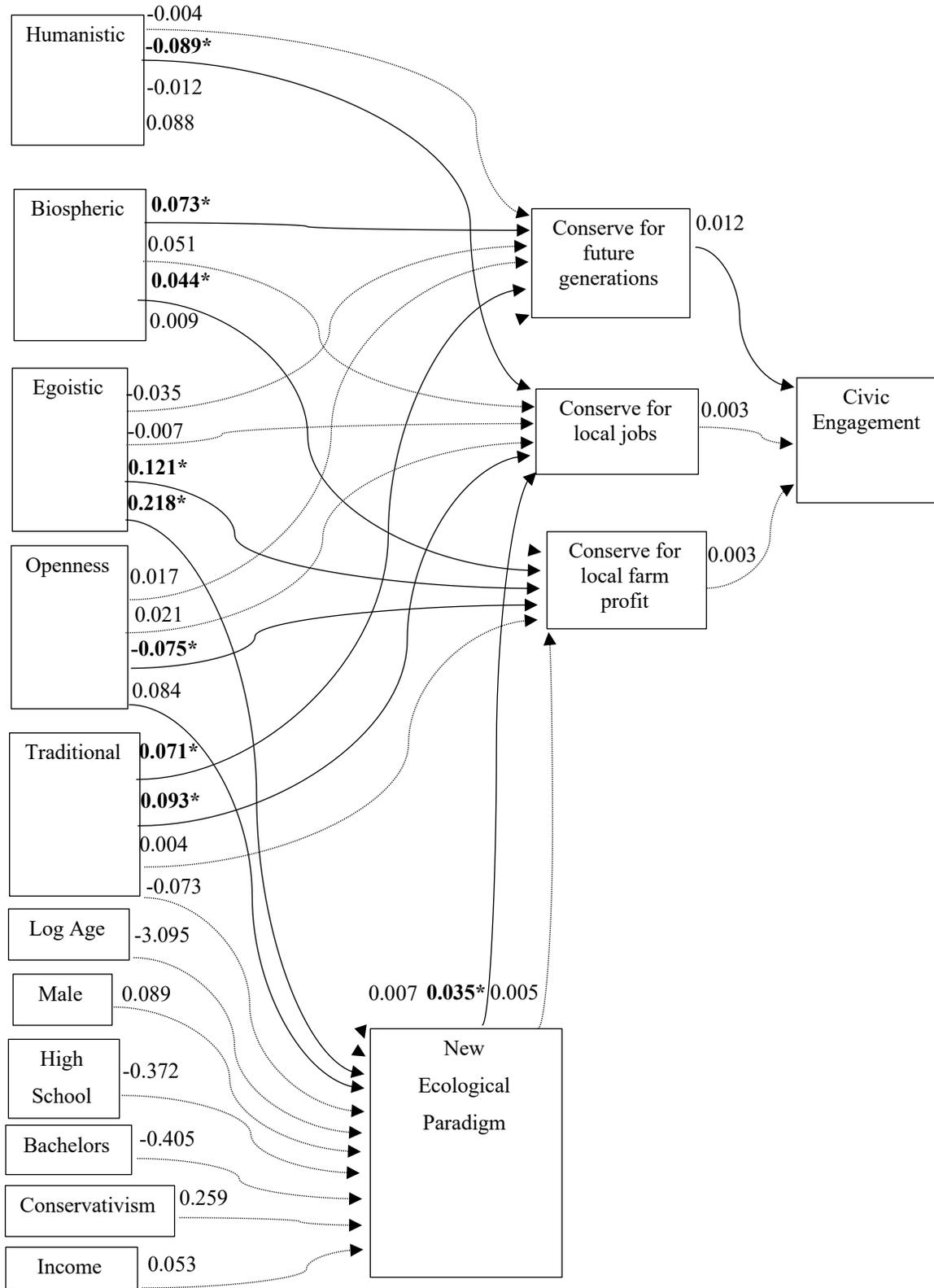


Figure 4 shows the results of the path model for dryland producers (n = 363). The model has good fit to the data: $\chi^2(30) = 36.315$, $p = 0.198$; CFI = .994; TLI = .977; RMSEA = .024 (90% confidence interval [.000, .049]); SRMR = .027.

Among dryland producers, I find no statistically significant relationships between norms and the likelihood that they will be civically engaged in voluntary group conservation of groundwater. This again suggests that producers' civic engagement has a more contingent explanation than variation in their support for cultural norms. I recommend caution in generalizing from the path model with dryland producers because only 12 dryland producers in my sample are civically engaged. With so few observations, the model has very little variation in civic engagement to apportion.

As with the path analysis model for irrigators, the statistically significant associations between values, beliefs, and norms are broadly consistent with theory and previous research, with two exceptions. First, there is a small but significant, negative association between humanistic values and the norm to conserve groundwater for local jobs. I have no explanation for this surprising finding. Second, there is a significant, positive association between egoistic values and the norm to conserve groundwater for farm profits. I speculate on two possible explanations for this unusual association. First, it may be that dryland producers have close relatives who are irrigators. Egoistic values may include the material wellbeing of immediate family. Second, it may be that dryland producers are economically tied to irrigators in their area, perhaps because they sell to the same feedlots that purchase silage from local irrigators. In that case, dryland producers could expect to benefit personally from the continued profitability of irrigated agriculture for local farms.

Figure 4. Unstandardized path coefficients for variables explaining Civic Engagement among Dryland Producers (N = 363). *p<.05 (two-tailed)



Culture – Conclusions

My survey findings show that a super-majority of High Plains producers believe that groundwater should be saved or conserved rather than fully depleted. Outside of Nebraska, with its more hydrogeologically resilient aquifer, a supermajority of producers perceives groundwater depletion to be a serious problem. This suggests that policymakers would have significant local political support for well-crafted groundwater conservation initiatives.

There is strong agreement among producers that they have limited personal capacity for more groundwater conservation, with the main barriers identified as perceptions that groundwater conservation leads to lower productivity, a reluctance to change irrigation practices, and the high costs of new conservation technologies. I note that these perceptions may not be entirely accurate. However, given limited resources and the long history of individually-targeted extension activities in the region, I believe that these perceptions indicate limited room for additional conservation impacts from policies and extension activities targeted at individuals.

Throughout the region, producers believe that groundwater depletion is more of a problem for their communities than for themselves personally, and there is a high level of agreement on altruistic reasons for groundwater conservation. This suggests that extension and policymakers should integrate groundwater conservation into broader rural community resilience initiatives and should channel support to group-based conservation efforts. Only a few producers are currently participating in these voluntary group conservation efforts, with lack of time as the main barrier to participation. This finding, combined with widespread altruistic motives for conservation, suggests the possibility of large conservation gains from policies, programs, and incentives to reduce the costs and increase the benefits of voluntary group conservation efforts.

While values and beliefs are clearly important to producers' attitudes towards groundwater conservation, findings from my path analysis model suggest that cultural variation is not the primary explanation for which producers are civically engaged in voluntary group conservation efforts. While levels of agreement with the norm to conserve groundwater for future generations is significantly positively associated with civic engagement among irrigators, the association is small in magnitude. Levels of agreement with norms to conserve for local jobs and local farm profitability are not significantly associated with civic engagement among irrigators, and none of the norms are significantly associated with civic engagement among dryland producers. In the context of only 7% of producers being civically engaged in voluntary group conservation efforts, this suggests that producers' civic engagement has a more contingent explanation than variation in their support for cultural norms.

It is clear, however, that a key aspect of producers' groundwater management is social rather than merely individual. I recommend that policy, research, and extension focus on identifying and promoting means of building social networks, capacities, and cultures of conservation in the region.

Chapter 4 - Agency and Ogallala Groundwater Management

Agency – Introduction and Literature Review

Sociologists recognize that agency is both enabled and constrained by social structure and by culture (e.g. Lin, 2001). At the same time, agency can feedback into changes in culture and social structure through the process of social change. I explore the role of agency in groundwater management through a case study of sustained civic engagement by producers in Wichita County, Kansas.

Importance of Sustained Civic Engagement

Those individuals who remain civically engaged over time have a disproportionate impact on the success of social movements (Ganz, 2009) and of civic associations (Andrews et al., 2010), and the need to better understand the processes leading to sustained civic engagement is widely recognized by leading scholars of volunteerism (Wilson, 2012), social movements (Viterna and Robertson, 2015), and civic associations (Andrews et al., 2010). My research addresses this need.

While most sociologists have focused on episodic civic engagement, the importance of a core group of committed people is widely recognized. For example, Klandermans and Oegema (1987) take the existence of a core group of organizers as a given when analyzing mobilization of participants in social movements. Ganz (2011) argues that social movements rely on such a core to develop the public narrative that gives meaning and identity to the movement as a whole. Nonprofit organizations have also traditionally relied on a committed core of long-term volunteers to achieve their prosocial missions (Musick and Wilson, 2007).

In their study of 343 local Sierra Club groups, Andrews and colleagues (2010) find that efficacy is highly correlated with the size of the core group of long-term, committed activists.

The core of committed activists facilitates internal determinants of success such as increased organizational capacity, strong programmatic activities, and higher mobilization potential.

Together, these internal determinants of success explain more of the variation in local group performance than do external factors such as a favorable political climate or easier access to financial resources in the community.

How long until civic engagement is “sustained”?

There is no easy answer to how long, in theory, a pattern of civic engagement must endure to provide these benefits. The precise duration required is likely an empirical question to be determined separately for each activity and context. However, there is evidence that the motivations and expectations of individuals change over the course of their first year or so of participation in volunteerism or activism.

For example, Chacon and colleagues (2007) study participation patterns among 300 weekly volunteers at 20 social service organizations to understand what predicts continuing engagement among volunteers. They find that over the first six months of regular volunteering, continued engagement is best predicted by the degree to which the volunteer’s initial motivations for participation are satisfied. Over the second six months, the best predictor of continued engagement becomes the degree to which the volunteer incorporates their participation into their own identity.

In developing their Volunteer Stages and Transitions Model, Haski-Leventhal and Bargal (2008) find that the process of socialization and emotional investment among volunteers at an Israeli children’s charity takes about one year in total, after which volunteers become “established” participants in their organization (p76). They caution, however, that such

“established volunteers” are liable to burn out or seek new opportunities after one or two additional years unless they have appropriate support and experiences of “renewal” (pp 92-93).

Kieffer’s Three Stage Model of Empowerment.

In his study of structurally disadvantaged Americans engaged in grassroots advocacy, Kieffer (1984) suggests that individuals develop full participatory competence over a considerably longer, three-year time-frame. During the “Era of Entry”, individuals begin to question and challenge their long-standing conceptions of power through reactive engagement. In this stage, they become aware of their own potential for participation in decisions that affect them. Kieffer finds that the era of entry is typically triggered by an immediate threat to deeply held values that shocks these individuals into action.

During the subsequent “Era of Advancement”, individuals become more proactive and intentional in their sociopolitical participation. Individuals move towards greater intentionality through engaging in an iterative cycle of action and reflection. Kieffer finds that key determinants of success at this stage include access to a mentor, supportive peer relationships within an organizational structure, and the resources to cultivate an increasingly critical understanding of sociopolitical relations through praxis.

Finally, during the “Era of Incorporation”, individuals learn how to resolve role-conflicts and social tensions that emerge as they balance their activist role against existing commitments to family, friends, and paid employment. Success in this stage depends on an individual’s ability to build a coherent and socially acceptable identity that includes an ongoing commitment to activism.

Given Kieffer’s focus on disadvantaged American activists, one might question the degree to which his findings are applicable to more privileged populations. Anecdotal

observations from my own experiences indicate that a similar, if less pronounced process occurs among some privileged American activists (see Lauer, 2013, pp 6-8). Eyler and Gyles (1999) study of service learning among college undergraduates provides further corroboration that Kieffer's findings may be applicable to more advantaged populations.

Based on the research literature, it seems prudent to determine the transition to sustained civic engagement empirically, through a focus on the evolving identity of the individuals involved, and to pay special attention to the period between six months and three years of ongoing participation.

Explanations for Sustained Civic Engagement.

The disparate sociological and social-psychological literatures on volunteerism, social movements, empowerment, intrinsic motivation, and public narrative converge on three broad and interconnected explanations for sustained civic engagement. Namely, sustained civic engagement is explained by interpersonal solidarity and a sense of meaning and purpose, both of which are facilitated by effective leadership.

The first explanation for sustained civic engagement is interpersonal solidarity. Individuals must feel a sense of membership and belonging to a group. This concept is expressed in the literature on volunteerism as "teamwork" (Wuthnow, 1994, 1995; Musick and Wilson, 2007), in social movement literature as "supportive social networks" (Klandermans and Oegma, 1987; Oegma and Klandermans, 1994; Munson, 2009; Viterna, 2013), in empowerment literature as "supportive peer networks" (Rappaport, 1981, 1987; Kieffer, 1984), in intrinsic motivation literature as "relatedness" (Ryan and Deci, 2000) or "membership" (Fry, 2003), and in public narrative as the spoken and lived "Story of Us" (Ganz, 2011).

The second explanation for sustained civic engagement is developing a sense of meaning and purpose. Individuals must feel that their actions are meaningful to others and consistent with their sense of integrity. This concept is expressed in the literature on volunteerism as “narrative construction” (Wuthnow, 1994, 1995), in social movement literature as “favorable identities” (Viterna, 2013; Munson, 2009), in empowerment as “participatory competence” and “coherent identity” (Kieffer, 1984), in intrinsic motivation as “autonomy and competence” (Ryan and Deci, 2000) or “calling” (Fry, 2003), and in public narrative as coherence between the “Story of Self” and the “Story of Now” (Ganz, 2011).

The third explanation for sustained civic engagement is effective leadership. Leaders and followers co-create each other (Ganz, 2009), and followers delegate primary responsibility for the facilitation of interpersonal solidarity and developing a sense of meaning and purpose to their leaders. The concept of effective leadership is implicit in the literature on volunteerism, as many of its practical recommendations are intended for volunteer coordinators. Effective leadership is less acknowledged in the literature on empowerment, which focuses more on “mentorship” (Kieffer, 1984), though the role of the professor in empowering service-learning experiences can approach that of true leadership (Eyler and Giles, 1999). By contrast, the literature on social movements (Andrews et al., 2010), intrinsic motivation (Fry, 2013), and especially on public narrative (Ganz, 2009, 2011) places a heavy emphasis on effective leadership, perhaps because it is a main determinant of the success or failure of social movement actions and civic associations (Andrews et al., 2010).

Ganz’s Public Narrative Model.

Ganz (2011) describes public narrative as the process of intentional storytelling through which leaders communicate shared values and arouse emotions conducive to initiating and

sustaining purposeful collective action. An effective public narrative helps initiate collective action by facilitating righteous indignation with the injustice of how the world is compared with how it ought to be and by providing a specific personal or group action that can be executed immediately. A good public narrative helps sustain collective action by celebrating small successes, harnessing value-symbols from shared secular and faith traditions and building relationships among activists.

Ganz (2011) argues that people experience values primarily through their emotions, which are in turn communicated through stories. Key storytelling elements include plot, character, moral, and setting. The plot demonstrates an exercise of agency through the elements of a challenge, a choice, and an outcome. The character(s) engage the listeners' emotions as they empathize with the protagonist. The moral communicates a set of values to the listeners. Finally, the skillful use of setting allows listeners to imagine themselves as part of the storyline, thereby vicariously sharing in the agency, emotions, and values communicated through the narrative.

Leaders use public narrative to arouse and sustain appropriate emotions through interweaving the "Story of Self", the "Story of Us" and the "Story of Now" (Ganz, 2011). The Story of Self communicates the values that motivate the leader to lead, including where they come from, why they act as they do, and where they think they're going. The Story of Us provides points of intersection between the leaders' and participants' personal stories of self and connections to shared cultural stories that communicate common values. The Story of Now inspires participation by articulating an urgent challenge, describing the choice that participants should make and its significance for their shared identities and values, and proposing an immediate, specific collective action that participants can take to move forward.

Drawing on his experiences organizing with Cesar Chavez, Ganz (2001) argues that storytelling through public narrative is essential to social movements, which use them to construct agency, shape identity and motivate action. Stories are both told and performed, for example Chavez and the Farm Workers Association enacted their new story and embodied their new identity through a march to Sacramento in 1962. Thus, Ganz writes that: “Social movements are not merely reconfigured networks and redeployed resources. They are new stories of whom their participants hope to become” (2001, p. 9).

Agency in the Present Study

I focus on agency through a case study of sustained civic engagement by producers in Wichita County, Kansas. I evaluate the extent to which existing explanations of interpersonal solidarity, a sense of meaning and purpose, and effective leadership describe the process of sustained civic engagement in Wichita County. I specifically address the applicability of Ganz’s (2011) model of public narrative and Kieffer’s (1984) three stage model of empowerment to the activities of producers in Western Kansas. In doing so, I move beyond questions of *who* is civically engaged on groundwater management to questions of *how* and *why* civic engagement is sustained among producers in Western Kansas.

Agency – Research Methods

Research Question.

How are some Western Kansas producers able to sustain voluntary collective action to address groundwater management challenges?

Data Collection.

I focus on participants who are active or involved in the Wichita County Water Conservation Area (WCA), a civic engagement initiative in western Kansas. I received their permission and secured IRB approval for a case study of the group.

Data collection involved semi-structured interviews with group members and other producers who are not involved in the Wichita County WCA, a review of Wichita County WCA meeting minutes and activity records, and observations of group meetings and events.

Semi-Structured Interviews.

Between 2017 and 2019, I conducted 41 semi-structured interviews of producers across Western Kansas. Semi-structured interviews initially focused on understanding participants' attitudes, outlooks, and perspectives on groundwater, and investigating how participants responded to questions that were considered for inclusion on the survey of High Plains producers. These interviews revealed that some Kansas producers are working together to manage groundwater by successfully balancing competing values and combining technological and policy solutions through voluntary group conservation initiatives.

After securing permission to do a case study on the Wichita County WCA, I selected a subset of 16 producer interviews to focus on for this case study. This subset consists of 14 interviews with producers active in Groundwater Management District 1, which includes Wichita County and 4 neighboring counties. Of these 14 producer interviews, 9 are of producers affiliated with the Wichita County WCA and 5 are of non-affiliated producers. I supplemented this subset with 2 interviews of producers who are not active in Groundwater Management District 1, but who have unique insights into the challenges of voluntary group efforts on groundwater conservation. Due to logistical constraints, I did not transcribe 1 interview with producers who

are on the very eastern margin of Groundwater Management District 1 and who have no involvement in and little awareness of the Wichita County WCA.

Interviews were semi-structured and focused on producers' perceptions of groundwater and water conservation, the social, political, and economic factors that affect water use, and their awareness of and involvement in voluntary group efforts to manage groundwater. Interviews were most often conducted on-farm, but some were conducted in town if the producer preferred. Overall, my 41 interviews ranged from 32 minutes to 167 minutes with a median duration of 70 minutes. Among the subset of 16 interviews that I focus on, duration ranged from 48 minutes to 128 minutes with a median duration of 71 minutes.

Observations.

During the summer fieldwork season of 2018, I adopted a full-information sampling strategy by attending every public meeting and every internal meeting that leadership would permit me to attend. I subsequently adopted a more intentional sampling strategy due to the cost of driving from Manhattan to locations in western Kansas. I prioritized those internal meetings that are focused on strategy and those public meetings that are likely to generate controversy among area producers. My focus on strategy and controversy is justified because both are fruitful opportunities to understand the role of values in decision-making.

My default role was as a spectator-observer, in that I typically did not volunteer to contribute ideas to internal or public meetings. However, I did contribute ideas and offer feedback whenever I was asked for it. I fully disclosed my role to the Wichita County WCA team and to the Groundwater Management District 1 board as part of the initial discussions in selecting a case-study. I also disclosed my role to anyone else who asked about me.

Observations took place on-site or through Skype. Given the difficulty of directly observing values and the fact that both power and emotions are highly embodied, my presence physically or over video was important to acquiring quality data.

Observations of internal meetings and public meetings focused on the processes whereby values were expressed, negotiated, and acted on. Given the difficulties in observing values directly, I used emotion and power as sensitizing concepts during my observations.

Displays of emotion during group meetings are a useful and fairly easily observable indication that producers are drawing upon values. Indicators of emotion include raising or lowering the voice, tearing up, the voice cracking, laughter, and smiling or frowning.

People are generally inclined to use the power at their disposal to defend and act upon their deeply-held values. Based on my earlier work in the nonprofit sector, indicators of a person with power include: sitting in the most desirable locations of the room, being near others with power, having ideas quickly placed into meeting records and minutes, a tendency to be less emotional in expressing opinions, having more speaking time, and being more likely to terminate a conversation than someone with less power.

Analysis.

I used a grounded theory approach to coding and pattern analysis (Berg and Lune, 2012; Patton, 2015). This involves a sequential, iterative process to coding that begins inductively. Grounded theory includes a rigorous analytical trail linking interviews to theoretical insights through coding, notes, and memos. I approach grounded theory abductively by drawing on my literature review “to formulate questions that act as a stepping off point during initial

observations and interviews” (Strauss and Corbin, 1998, p. 51).⁴ I follow the Straussian tradition of grounded theory in that I engage reflexively with the literature as well as the data during my initial coding. I follow the process that McCallin (2003, p. 64) describes in that I use “ literature to heighten theoretical sensitivity, all the while comparing and contrasting interpretations with occurrences in the data.”

I made extensive use of triangulation in order to enhance legitimacy and maintain rigor. Methodological triangulation included comparing case-study observations with semi-structured interviews and quantitative data from the survey. I pursued analytical triangulation by supplementing my grounded-theory approach to data analysis with several existing theoretical lenses. I evaluated the extent to which existing explanations of interpersonal solidarity, a shared sense of meaning and purpose, and effective leadership describe the process of sustained civic engagement in Wichita County. I specifically addressed the applicability of Ganz’s (2011) model of public narrative and Kieffer’s (1984) three stage model of empowerment to the activities of producers in Western Kansas.

For logistical reasons, I was the sole data collector and coder. This means that I do not have analyst triangulation. I mitigated this weakness by talking extensively with my advisor about the project as data collection and analysis unfolded.

Credibility and Reflexivity.

I come to this research with a background in community organizing (7 years as a volunteer organizer on issues of poverty with Oxfam America in Des Moines), nonprofit

⁴ There is a long history of debate regarding the role of a literature review in grounded theory research. Broadly speaking, Strauss suggests that the literature review can be used reflexively to inform grounded theory analysis while Glasser recommends a more purely inductive approach. For an overview of this debate, see e.g. McCallin, 2003; Dunne, 2011; Patton, 2015; Giles et al., 2013).

management (2 years as an education specialist and 3 years as a program coordinator with the World Food Prize in Des Moines), and international agricultural development (my masters' thesis was on learning and power in farmer-to-farmer exchange programs. My work with the World Food Prize also drew heavily on this area). These experiences motivate and inform my research into sustained civic engagement.

I also come to this research as a White American man from Des Moines, Iowa. My origins in a different state in the Midwest are ideal for this research project. I share general Midwestern culture and familiarity with agriculture, but I am not close enough to have a local history that might be seen as a threat. I know enough to develop rapport but not enough to come across as an expert. This is an ideal combination for conducting emotionally and politically sensitive research on groundwater management.

Most producers in Western Kansas share my race and gender. For this particular project, my race is a largely unqualified asset. Practically all irrigators in Western Kansas are White Americans, and almost every interview benefited from the comfort and easier rapport provided by our shared racial background. (There are significant and growing numbers of Hispanic, Asian, and African people in the region, but decision-making on large-scale, irrigated farms remains almost exclusively with White people).

My gender is also largely an asset, but this is more of a mixed bag. Farming in Western Kansas is a highly gendered occupation in which men are traditionally the decision-makers. I am thus able to relate to the traditional decision-makers "man-to-man", again increasing comfort and rapport. However, my access to women in agriculture is more limited. Unfortunately, I am not well positioned to even know how much I am missing. While there is very little previous research on the extent of women's influence on farm decision-making in western Kansas, we do

know that women are involved in many farm operations and there are some indications that women may have different perspectives regarding groundwater management decisions. This is an important limitation of my study and a promising area for future research.

Agency – The Context of the Case

Legal options for group-level groundwater conservation in Kansas

The state of Kansas provides three legal options for group-level groundwater conservation: Intensive Groundwater Use Control Areas (IGUCAs)⁵, Local Enhanced Management Areas (LEMAs)⁶ and Water Conservation Areas (WCAs)⁷ (Barfield, 2020).

The process for establishing an IGUCA may begin from the grassroots, with a petition to the Chief Engineer by the lesser of 300 or 5% percent of groundwater right holders in the area asking for an inquiry to be opened, or by a request from the local Groundwater Management District (GMD). Alternatively, the Chief Engineer may independently pursue an IGUCA if it is deemed to be in the public interest. Through the inquiry, the Chief Engineer makes findings as to the degree of groundwater depletion or impairment. Based on the findings of the inquiry, the Chief Engineer imposes corrective controls to remedy the depletion. IGUCAs are unpopular among producers because, once initiated, the proceedings are out of their hands. Due to a desire for local control and fear that remedies will be too economically painful, no IGUCA has been petitioned for in the Ogallala Aquifer region.

Due to the political unpalatability of IGUCAs, the Kansas legislature provided LEMAs as another option for group-level groundwater conservation in 2012. Like IGUCAs, LEMAs

⁵ K.S.A. 82a-1020 through 82a-1040

⁶ K.S.A. 82a-1041

⁷ K.S.A. 82a-745

include findings of depletion or impairment and a set of corrective controls that are legally binding on all producers within the geographic area covered. Unlike IGUCAs, LEMAs must be requested by the local Groundwater Management District and cannot be initiated through a direct petition or by the Chief Engineer's independent determination of necessity. The Groundwater Management District must also approve the final version of a LEMA before it enters into effect.

As local boards elected primarily by producers, Groundwater Management Districts have the incentive to ensure widespread support for a LEMA plan before allowing it to be enacted. As of February 2020, there have been two LEMAs approved in the Ogallala Aquifer region, both at the request of Groundwater Management District 4 in northwest Kansas. The Sheridan 6 LEMA, approved in 2012 and again in 2018, was driven from the grassroots by producers in Sheridan County. A new, district-wide LEMA in Groundwater Management District 4 was approved in 2019 and involved an extended period of public consultation. While there was no public vote on the district-wide LEMA plan, the 2018 election of representatives to the Groundwater Management District 4 board became a referendum on the LEMA. Approximately 2/3 of votes were in support of pro-LEMA board candidates.

The Groundwater Management District 1 board presented producers in their district with a LEMA plan in 2014. The board held a district-wide vote and required at least 2/3 of votes to be "yes" before moving forward with their LEMA plan. However, their 2014 district-wide LEMA plan failed to clear this threshold and was never implemented.

In 2015, the Kansas legislature provided WCAs as a third legal option for groundwater conservation. As with IGUCAs and LEMAs, WCAs are legally-binding plans that reduce groundwater use. Unlike IGUCAs and LEMAs, each producer decides individually whether to enroll in a WCA. As of February 2020, a majority of WCAs include just a single producer or

family operation. The Wichita County WCA was among the first in the state and is currently one of two that have been written to include a large group of producers. Unlike LEMAs, there is no requirement for the local Groundwater Management District to approve WCAs.

Table 10. Legal Options for Group-Level Groundwater Conservation

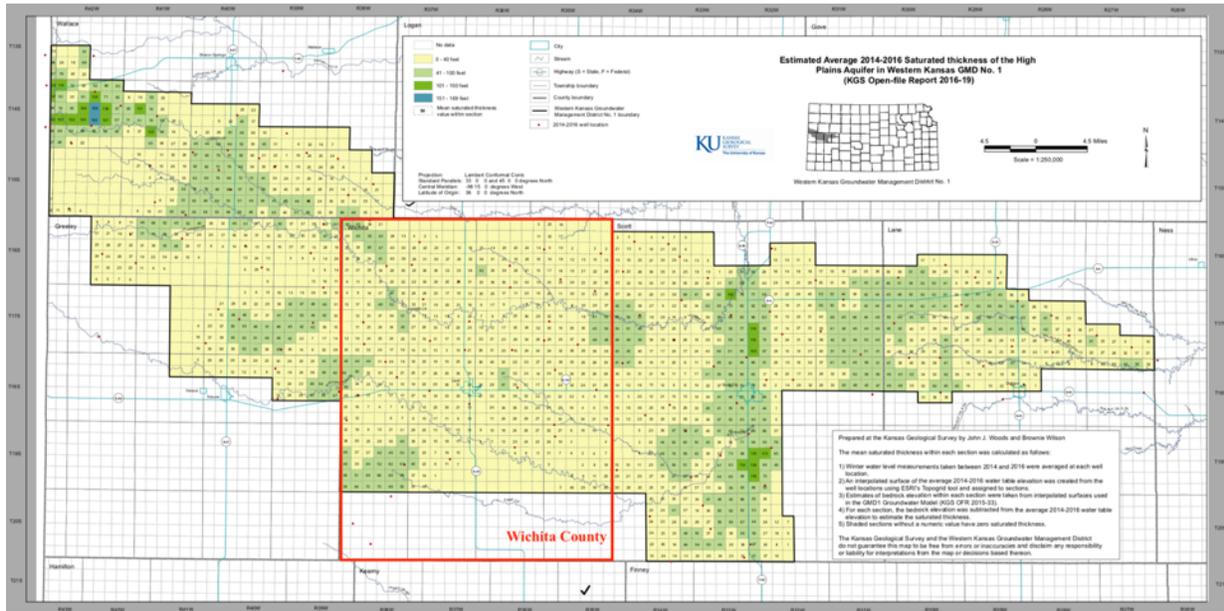
	Locally Initiated?	Locally Developed?	Voluntary?	Role of GMD
IGUCA	Sometimes, can be initiated by local petition, GMD board, or independently by the Chief Engineer	No, although the Chief Engineer holds hearings to gather local input.	No.	May be initiated by local GMD board.
LEMA	Yes, by the local GMD board.	Yes. The local GMD board writes it in consultation with the Chief Engineer.	Somewhat. While all producers in the area are bound, it is written by their local representatives on the GMD board.	The local GMD board requests, writes, and approves.
WCA	Yes, by an individual or a group of producers	Yes, the individual/s write it in consultation with the Chief Engineer	Yes, at the individual level.	None. They can choose to provide support.

About Wichita County

Wichita County is located in west-central Kansas, within Groundwater Management District 1. Wichita County had approximately 2105 residents in 2017, of whom 67.6% were non-Hispanic White and 29.9% were Hispanic (U.S. Department of Commerce, 2018). Median household income in 2017 was \$55,109 and GINI index was 0.46 (U.S. Department of Commerce, 2018). Wichita County has only one incorporated town, Leoti, which is the county seat and location of the school and hospital. Agriculture is an important contributor to the economy of Wichita County (U.S. Department of Commerce, 2018). Irrigation is required to sustain crop productivity, but producers are shifting cropland out of irrigation due to groundwater depletion (Harrington et al., 2007). At current rates of groundwater extraction,

irrigated agriculture will no longer be feasible in much of Wichita County within 25 years (Barfield, 2020).

Figure 5. Wichita County and GMD 1 (adapted from Woods and Wilson, 2016)

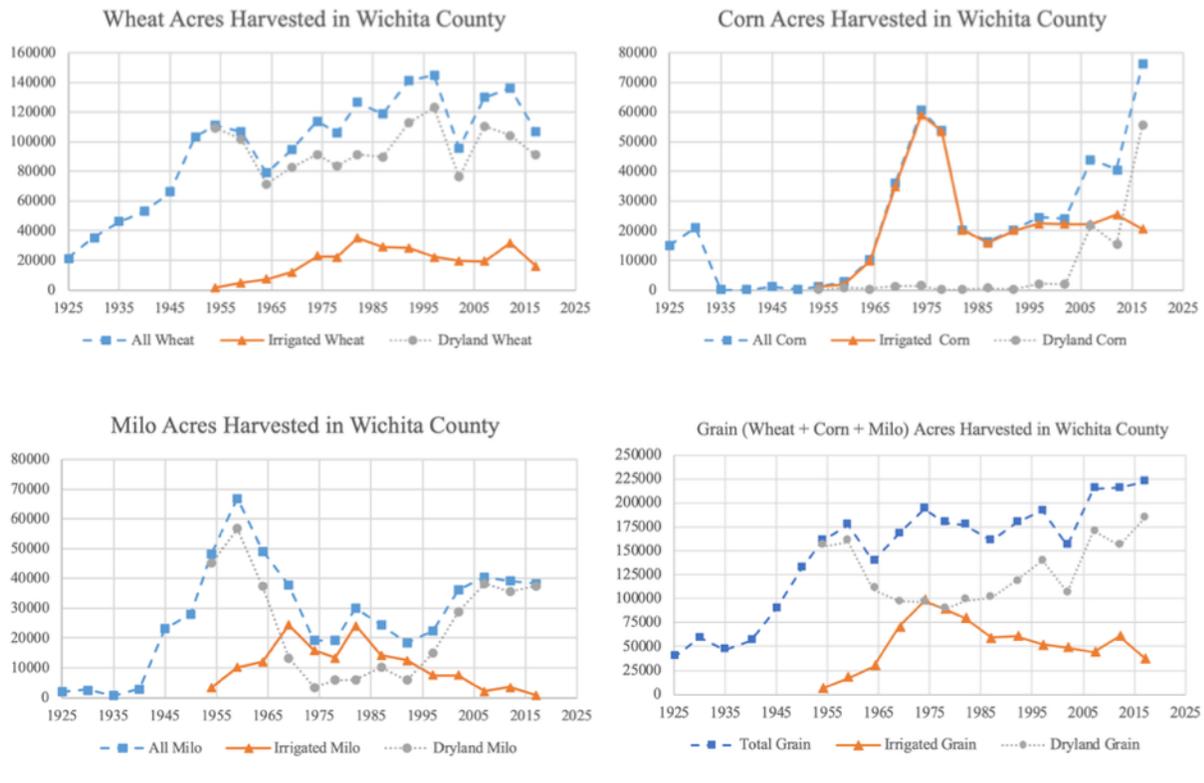


Cropping Patterns in Wichita County

I use data from the USDA Census of Agriculture to show how producers' cropping decisions have changed over time in Wichita County. The dominant crops grown in Wichita County are wheat, corn, and milo⁸. Irrigation has influenced producers' cropping decisions, especially by enabling them to shift acres from dryland milo rotations into irrigated corn.

⁸ Milo is a variety of sorghum grown for grain.

Figure 6. Trends in Crop Acres Harvested in Wichita County



The typical dryland rotations in the 1920s were either wheat-fallow or corn-wheat-fallow. During the dustbowl of the 1930s, the wheat-fallow rotation dominated dryland acres, presumably because it leaves less soil exposed to erosion than other rotations. Beginning in the 1940s and extending into the 1950s, producers shifted some of their dryland acres from the wheat-fallow rotation into a milo-wheat-fallow rotation. These two rotations dominated dryland acres until the 2000s, when producers began taking advantage of improved corn varieties on dryland acres through a corn-wheat-fallow rotation. The dominant dryland rotation in Wichita County is currently corn-wheat-fallow.

Producers manage irrigated land differently than dryland. As irrigation began in the 1950s, producers irrigated wheat, milo, and corn. Corn acres harvested in Wichita County were almost exclusively irrigated from 1955 through 2002. Typical irrigated rotations from the 1950s through the 1980s were corn-wheat or milo-wheat, the wheat being necessary to control weeds.

During the 1990s, many producers shifted to continuous corn on their irrigated acres, as transgenic corn enabled more aggressive chemical weed control and federal acreage restrictions were removed in the 1996 Freedom to Farm Act. Acres of irrigated wheat and milo decline from the 1990s onward in tandem with this shift. Harvested crop acres reported in the 2012 census of agriculture are anomalous due to the severe drought in Western Kansas, which led to a temporary spike in irrigated wheat acres and a temporary decline in dryland corn acres. Overall, irrigated acres in Wichita County peaked at the 1974 census of agriculture and have since been declining.

Agency – Findings and Discussion

The Wichita County WCA Plan

The Wichita County WCA is a voluntary group conservation plan that is open to any producer within Wichita County⁹. Producers joining the Wichita County WCA enter into a consent agreement with the state of Kansas to reduce their pumping by at least 29% from their historic average use during the period of 2009 through 2015, inclusive. Producers must commit to the Wichita County WCA for a seven-year term. Producers enrolled in the Wichita County WCA receive flexibilities in their water use, including the ability to move water rights between their fields. Producers may choose to pump extra water in dry years, as long as their total use over their seven-year term is below 71% of their historic average use and no single year exceeds the annual quantity authorized by their original water right.

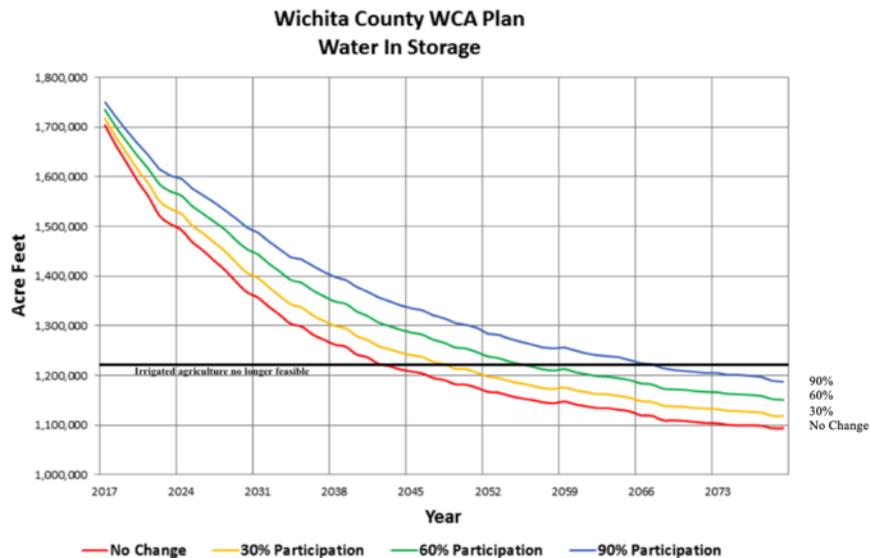
Unless they choose to opt out, producers are automatically re-enrolled in the Wichita County WCA at the conclusion of their seven-year term. The percent reduction from historic average use for (re)enrollees increases by 1% every year until 2031. Thus, for example,

⁹ The Wichita County WCA plan is available online through the Kansas Department of Agriculture, at: <http://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/wca/wichita-county-wca>

producers enrolling in a seven-year term starting in 2020 must reduce their pumping by 32% of their historic average use, and producers reenrolling in 2023 must reduce by 36%.

The Wichita County WCA is written to slow the rate of groundwater depletion, thereby extending the lifespan of irrigated agriculture in Wichita County. The Wichita County WCA team provided me with estimates from the Kansas Geological Survey that suggest that irrigated agriculture will no longer be feasible in Wichita County by 2042 without any WCA participation but could be extended to 2068 with 90% participation.

Figure 7. Conservation Impact of the Wichita County WCA Plan



The Wichita County WCA Team

The Wichita County WCA began as a series of conversations in 2014 and 2015 between three individuals: Todd¹⁰, Gilbert, and Glenn. Todd managed a feedlot north of Leoti. Gilbert farms with his brother in northwestern Wichita County and had recently retired from a job at the

¹⁰ All research subjects are referred to using pseudonyms, which I randomly selected from lists of the 200 most common male and female names registered with the Social Security Administration in the 1960s:

<https://www.ssa.gov/oact/babynames/decades/names1960s.html>

feedlot. Glenn had returned to Wichita County several years prior to manage a portion of the ranch that he grew up on. Gilbert and Glenn are neighbors.

Glenn has extensive experience helping rural communities come together to address their challenges. Upon returning to the ranch he grew up on, Glenn became alarmed by the scale of the challenges facing Wichita County.

“Over twelve years [I] worked in twenty-five counties [in Kansas] and two in Missouri [pause] and learned a lot about dysfunctional rural communities. [chuckles] And most of [laughing] them still are. [laughter in voice] [laughs] I had – I made a little dent, just a tiny little dent. [smile in voice] I’m not sure if it made much difference [pause] we’ll see. ... And then, three years ago, I said to myself [pause] ‘I’m gettin’ outta here [pause] because [pause] we’re dying rapidly, this county is dysfunctional, doesn’t have good leadership, where we’re chewing up our water – it’s gonna be gone. The town’s water – drinking water is unsafe, and the country [the United States] - we’re losing it.’”

In February of 2016, Glenn spoke with his neighbor Gilbert:

“I went to Gilbert ... we grew up one half mile apart from each other but ... I didn’t know him. I’d never met him until I moved back out here. [pause] His younger brother ... is actually my neighbor, Gilbert lives in town but they farm together and he ... was a long-time buyer for the feedlot so he knew every farmer in the county by virtue of buying corn from ‘em. So I went to him and I basically just said ‘Gilbert, this is my view of what’s happening in Wichita County [pause] I think we need to take ahold of the water issue, you know people and I understand process, but I can’t facilitate in my own community, I’m not neutral – and I wanna be in on this fight. So if you’ll join me, we can identify a dozen people from all over the county from all four sectors of the public

square' [business, education, government, and human services] – that was a new idea to him. He was also on the school board that was one of my reasons to talk to him.”

Meanwhile, Gilbert had been speaking separately with Todd about the challenges facing the feedlot. Todd recalls:

“When the WCAs were formed by the legislature [pause] we began to talk about [pause] having a WCA for the feedlot and maybe some surrounding farms to look at conserving water just in our area. And then one of the farmers [Gilbert] that produces a lotta silage for us - I was talking to him one day and he was wantin' to do one for his farm in the northwestern part of the county which is about eleven miles away from us. And so, when we got to talking, he said he'd like to do one for his whole township. [He felt like it] needs to be at least a township ... to make a difference. And so that grew to us talking together and saying 'well you know if you're gonna do one there and we're gonna do one here, why don't we just try to get the whole county involved? And simplify the process for everybody if they wanna join in.' And so that's kinda how the seed was planted and how the how it started growing.”

Glenn, Todd, Gilbert, and several others whom Gilbert recruited held an exploratory meeting on March 4, 2016 to discuss the challenges that groundwater depletion presents to Wichita County and determine whether there was interest in coming together to address it. The consensus at this first meeting was to move forward with some form of action. The group recognized the need to include additional people representing a diversity of stakeholders in Wichita County. They made a list of individuals to invite to a second exploratory meeting. Ralph recalls:

“Well we got together ... at the first meeting [and] we discussed how we thought we should proceed. And for a county-wide basis, we thought we needed to gain some representation from every area of the county. We discussed some potential people to ask if they would like to be involved [and] we divvied up who was gonna ask who. After that meeting, we went and asked those people. Some of them said ‘yeah I’m interested I’ll come to your next meeting’. Some of ‘em said ‘I don’t want anything to do with it, I’m too busy’.”

The second exploratory meeting was held on March 28, 2016. At this meeting, the group decided to hire an external facilitator and to move forward more formally as a team.

Significantly, they agreed that each team-member would contribute to paying the external facilitator. Overall, team members paid a third of the facilitator’s compensation, with the remainder being donated by the Kansas Corn Growers and the Kansas Livestock Association.

Ralph continues:

“At our second meeting we went through the same process. We talked about why we’re here, how we think we should proceed, and if we think there’s anybody else that should be at the table. And so, we did that again [pause] and we asked a few more people ... But at some point, in our discussion we were discussing how many was too many and how many was too few and someone made the comment that ‘Jesus had twelve disciples [smile in voice] and even one of them turned against him!’ [laughter in voice] And so the thought was that eleven or twelve was probably enough. And [there were] ten people from the community that were [pause] involved throughout the whole process. ... And then we had a facilitator that we hired to keep us movin’ down the path.”

A subcommittee put out a call for facilitators and hired Kerry, a minister living in Salina, as their external facilitator beginning at their first formal team meeting from 4:30pm to 6:30pm on April 18, 2016. Kerry focused initially on teambuilding and identifying common values and goals:

“The first time I met with them we spent about an hour just ... to help establish why each person was valuable to the group and what each one could contribute. ... What that did is it helped each person recognize that they see the world differently than every other person around the table. You know, each one it’s like havin’ a different pair of glasses on and it shapes how they see the world, how they interact [and] how they work. And so, it gave the team – everybody on the team permission to be different and permission to bring their natural talents to the group. ... So that was the foundation and I think that really got the team started on the right track.”

Todd recalls:

“The neatest thing I saw was when we started. When we all met together as a group of individuals [we] didn't have any idea of what we were doing or where we were going but ... our facilitator ... asked us all individually ... ‘Why are you here? [You’re] not gettin’ paid for this.’ And as we went around the room, I mean there was a really strong consensus of everybody [pause] and they wanted to be good stewards, you know? They wanted to be able to pass [pause] on this ability to irrigate and have strong economy in the area ... to the future generations. And we had that same type of philosophy from people that were thirty years old to people that were sixty years old. And I think that’s what helped us to meld as a group even though we were diverse. We weren’t all farmers and we had [pause] men and we had women and older people and younger people. We

all melded together because we all were at one mind on what we wanted to try to accomplish. I think it was a God thing that the group that was put together was there.”

Kerry recommended that each team member take the Strengths Finder assessment. During my interviews, Wichita County WCA members were unanimous in their recollection of the importance of the Clifton Strengths Finder¹¹ assessment in helping them gel as a team. Valerie recalls:

“When we hired Kerry, he encouraged us to do the Strengths Finder survey and when we got the results, we found out that all ten of us were high on the responsibility strength. We all felt like, you know, we hold ourselves responsible for things that happen and we also feel like we are responsible for if we say something then we have to do it because we said we would do it. We’re responsible for it. And of course, you get back your top five strengths and it varied pretty widely after that one on what everybody’s strengths were. But being able to go back to that and know that [pause] whoever is sitting across the table from me: ‘Oh yeah, that’s their strength. That’s why, they’re looking at it from that perspective. That’s why we have different views on this.’ It’s not about right or wrong but it really helped me to be able to see how the different personalities start coming out as we go through this work. ... And so now I’m just like ‘Everybody needs to do this’ [chuckles] Everybody needs to do Strengths Finder.”

Gilbert recalls being skeptical at first, but states that:

“The first thing Kerry had us do was go through [Strengths Finder] and when we did that I thought ‘this is the craziest thing I’ve ever heard of’. And yet I was wrong, because that really helped us to figure out what individuals’ strengths were, obviously, and we

¹¹ The Clifton Strengths Finder is available online at www.gallup.com/cliftonstrengths

could take off and go on different missions to try and achieve what we were trying to achieve. And clearly, we were all different as we figured out and it really helped us to do a better job.”

The second formal team meeting was held on May 23, 2016 from 7:30am to 10:00am. Kerry began this meeting by reviewing each of the team members top five strengths. Kerry continued to encourage team-building exercises:

“ [At the second meeting] we just basically started [determining] ‘what is the issue?’ ‘what are our goals?’ and that type of stuff, and reaching some unity on those foundational things, and [we] began building from that. So that’s really how I led it.”

The team made several key decisions early on regarding their process. First, all decisions were made by consensus. If someone objected to an idea, that person was responsible for proposing something different. In this way ideas were refined over several iterations, until a consensus decision was arrived at that everybody could live with. The team felt consensus decisions were important for group cohesion and to present a united message to other members of their community. Valerie recalls:

“[Making decisions by consensus] had to be pretty darn valuable because as a group we were cohesive. We knew that everybody agreed with that decision that we made. And it wasn’t an option of ‘Oh Gilbert and Ralph voted no; we know they don’t support this part of the plan.’ I mean there hasn’t been any of that. It’s been the whole group is in consensus [pause] we know why we did what we did and we all moved forward together. And that’s a huge part of it ‘cause there’s none of that naysaying or talkin’ behind people’s backs.”

Another early decision was to move forward more quickly by splitting into subcommittees that would work outside of team meetings on specific aspects of the conservation plan. Ralph describes the process of developing the plan:

“We started figuring out what aspects were needed and then we divided those up. We divided ourselves into subcommittees at two or three people. These two or three people would do this, and these two or three people would do that and whatever. So then when we had meetings, we could be a lot more productive because the two people that say worked with Brownie [Kansas Geological Survey staff] on the model, they came back and they reported on the model and then gave their recommendation, basically. And then there were two or three people that worked on flexibility and they got together and met and discussed flexibility and they brought it back to the group and made their recommendation. Then as all those [pause] recommendations were ratified by the group ... One individual was basically tasked with developing the management plan [by] putting all those pieces together. ... He drafted that plan and he’d put a draft out and we’d read it and [pause] make comments on it and we’d have a meeting and we’d go over things we’d change things ... So, it wasn’t like bam we have a plan [smile in voice] ... Every piece of it – and some of the pieces took way more time, way more discussion than others – but every piece of it was two or three people doin’ some research on it, makin’ a recommendation on it, the rest of the group making comments on it, adjusting it, tweaking it until all ten people in the room could say ‘this sounds good, this’ll work’.”

Kerry credits these subcommittees with substantially speeding up the process:

“The only reason we were able to get it done that quickly or get that far that quickly is the team members were committed to it and they bought in to it and they worked hard – I

mean, I gave assignments where we determined teams and we split up and they just did fantastic work.”

The team recognized early on that they needed outside expertise to better understand the groundwater situation in Wichita County and the impacts that different levels of conservation would have on extending the lifetime of the aquifer. The team partnered with the Kansas Geological Survey to bring in experts who developed and explained hydrogeological models. Warren describes how the team relied heavily on the expert knowledge of the Kansas Geological Survey in developing their conservation plan:

“This is what I think it’s all about [shows depletion chart]. Currently in two thousand seventeen supposedly Wichita County has one point seven million acre feet. And if we don’t do anything, the red line is that ... irrigation is done. ... With our WCA ... we could extend that [pause] almost thirty years. ... Brownie Wilson with [Kansas Geological Survey] – his computer model put this together for us when he was helping us with different scenarios.”

The team had three all-day meetings from 9:00am to 4:00pm on June 13, 2016, July 12, 2016, and July 25, 2016. Subcommittees continued to work on aspects of the plan in-between these meetings. They brought in members of the Groundwater Management District 1 board on July 25, 2016 to inform them of their progress. Groundwater Management District 1 would later provide incentives for producers to join the Wichita County WCA, including by prioritizing WCA joiners for cost share on water efficiency technologies.

The team held their first public meeting from 9:00am to 11:00am on August 15, 2016. At this meeting, the draft Wichita County WCA plan was presented to Wichita County producers.

Based on feedback at the public meeting, the team made changes to the draft Wichita County WCA plan, primarily by adding additional flexibilities. Michele recalls:

“We took some feedback from different public meetings, one in particular, and made some improvements to the plan when it comes to flexibilities. And it wasn't just a one-time ‘here’s a public meeting, if you didn’t hear it [pause] so what?’ [We had] township meetings, we’ve had the individual conversations it was [pause] all those man-hours [laughter in voice] if you add them up it was a lot of relationship building.”

The Wichita County WCA team held additional meetings on September 12, 2016 and October 10, 2016 from 8:00am to 11:00am. These meetings were primarily focused on developing a written document that could be approved by the Chief Engineer. Phillip took the lead in writing the Wichita County WCA plan due to his extensive previous experience working on the technical and regulatory aspects of groundwater rights in Kansas. Multiple team members described Phillip as essential to their success. Valerie recalls:

“Whoever decided to have Phillip join our group - that was a key decision. We had to have Phillip to make this happen. He knows the ins and the outs of WCAs like nobody else. And he was always our go-to guy [smile in voice] for any questions about it. He could explain it to anybody. He sat down in a meeting with, I don’t know, numerous producers and explaining the details of the plan. And we all knew the plan we all wrote it ... but Phillip is the one that put it all together for us. And if we were forgetting anything or we needed a reminder or whatever, it was always Phillip like ‘Oh and you need this, ‘Oh and DWR’s gonna ask you for this’ and things like that.”

Phillip had a unique role in the Wichita County WCA in that his time drafting the plan was donated by the Kansas Livestock Association, while the time he spent in team meetings was

as an individual volunteer. He recalls that there were no conflicts between the interests of his employer and the goals of the team:

“[The] Kansas Livestock Association and the Kansas Corn Commission were the primary private funding sources for our effort [pause] and part of that [was that] Kansas Livestock Association not only made monetary contributions to pay for our facilitator but also basically paid for my time for my technical assistance to the team. ... For what it’s worth the value of the technical assistance was about ten times the value of their monetary contribution because there were so many hours involved. So that’s how it was. KLA wanted to support a very good member [Todd’s feedlot] and also saw that [pause] in the future if we didn’t have a reasonable amount of water conservation, a lot of their membership was going to be hurt and decline. So, it was in their interest to support this effort, too.”

The Wichita County WCA team held a second public meeting on November 30, 2016, at which Kansas Governor Sam Brownback accepted an invitation to speak. The team organized a third public meeting from 8:30am to 4:00pm on March 9, 2017 to inform local producers about the plan. The Wichita County WCA was approved by the Chief Engineer on March 7th, 2017.

The team put a great deal of effort informing area producers about their public meetings. Kerry recalls:

“One [subcommittee] was a communication team ‘How do we get the word out? What’s the right way?’ And that included written communication - that’s the team that created a Facebook and a website page. That’s also the team that has worked with the Department of Ag. [The Kansas] Department of Ag offered ‘what can we do to help?’ and that team said, ‘do you have interns that can create material for us, add graphics and get the word

out?’ ... When we did [the] meeting with the governor we had [additional subcommittees] one was on the logistics of the buildings and one on food and then for our farm show we had a team of two or three that ... contacted the vendors to get ‘em to come [and] two or three that worked on the education part.”

Wichita County WCA Successes

There are at least two approaches to understanding the level of success of the Wichita County WCA. The first approach focuses on direct impacts: how many producers enrolled and how much groundwater has been conserved through enrollment in the plan. This direct approach has the benefit of being quantifiable, and the levels of enrollment and conservation can be measured against the stated goals of the Wichita County WCA team.

By this measure, the Wichita County WCA has made a substantial impact, but one that is much below the goals that the team set out for it. As of January 2020, the Wichita County WCA had 12,632 acres enrolled, representing 20% of the irrigated acres in Wichita County (Barfield, 2020). At this level of participation, the Wichita County WCA is conserving 2665 acre-feet of groundwater per year. While substantial, this is below the Wichita County WCA team’s goal of 25% participation in the first year and well below their goal of 80% participation in five years.

The second approach to understanding the level of success of the Wichita County WCA focuses on indirect impacts, such as increased knowledge of and support for groundwater conservation in Wichita County, increased civic engagement through the Wichita County WCA that strengthens the community in other ways, and the Wichita County WCA’s role influencing future conservation policies. While not quantifiable, I believe that these indirect impacts are likely to be more significant over time than the direct impacts of the Wichita County WCA.

The Wichita County WCA has increased knowledge of and support for groundwater conservation in Wichita County. I heard in multiple meetings that many producers in Wichita County have become more attentive to conserving groundwater due to the conversations convened through the Wichita County WCA. Valerie describes how the Wichita County WCA team has raised awareness about groundwater conservation among the largest irrigators in Wichita County:

I think throughout the course of the two years or whatever we've had in-person meetings with all of [the largest irrigators in Wichita County]. We've had phone call conversations; we've encouraged them as much as we can to attend the public meetings. And [pause] I think that was a very key thing even if they're not in the WCA, they're now thinking about water conservation.

There is substantial anecdotal evidence that attempts at voluntary group conservation change producers' farm management decisions by raising the profile of groundwater conservation in the community. This impact was brought up in my interviews by producers in all three communities in western Kansas where voluntary group conservation efforts had been implemented or discussed. Gerald in southwest Kansas nicely summarizes this effect:

"I think [efforts to begin voluntary group conservation] make a lotta difference. Even if we don't get a mandate or a voluntary thing. For myself, I am thinking more about conserving water than I ever was before. I think more water's been conserved in the last two years – after the LEMA talks have started – than was ever conserved before.

And I don't think it has to do so much with soil probes and some of this technology I think it has more just a state of mind. You know, I just go shut my wells off when it rains and then I go back and probe and check and see. And it just seems like more people are more

aware of the situation and they're just takin' it – it's stayin' in their mind more when these talks are going on. And everybody I'm talkin' to seems to be saving more water than they have in the past. [pause] Just by havin' the discussion.

Besides those who have joined the Wichita County WCA, a number of other Wichita County producers are watching with interest and waiting to join until the producers in the Wichita County WCA survive a drought. Indeed, producers across Groundwater Management District 1 are watching the Wichita County WCA with interest. Erik, a producer who serves on the Groundwater Management District 1 board, summarizes a common theory of change:

[The Wichita County WCA team] passed a countywide deal and it's voluntary. But [pause] I think as time goes on and people will realize 'yeah I think it'll work'. I think it's a very workable document. And I think as they get some people involved and people adjust their irrigation schedules or whatever accordingly to try to fit within their parameters people will look and say 'hey it can be done. They're doin' it. So, I wanna be a part of it'. ... It'll grow on itself, I'm sure.'"

A second indirect impact of the Wichita County WCA is increased civic engagement that benefits Wichita County in other ways. The relationships formed among the Wichita County WCA team and the success they've had on groundwater conservation has spilled over into action on other challenges facing the Wichita County community.

Valerie describes how the relationships formed among the Wichita County WCA team members have facilitated engagement on a variety of challenges facing the town of Leoti:

Relationships have been made stronger because of the WCA committee, within our group. And I think that helps a lot throughout our different work in the community. 'Cause ...

we've got full time jobs and we've got families and we've got fifty thousand other things going on [smile in voice] And it has helped form better relationships amongst ourselves.

And so, when we're in other board meetings or organizations or out in the public even someone ... that has been with us in the WCA, but they might be at that thing with us [and] they'll make a comment in the crowd or to the board they're talking to knowing full well that their supporting whatever we're there representing. Like they're like tryin' to give us a leg up on whatever it is we're doing. And it's because of this WCA Committee and the relationships we've formed that we're kind-of forming other allies, throughout the community in other positions that we do.

And so, if we hear somethin' on the street about one of our WCA Committee members that we've worked with and maybe we didn't know before this point and we know that's not true ... we will stand up for each other out in the community, shoot down rumors or be like: 'I think you better talk to them first. I don't know where you got your information, but go talk to that person, because knowin' from the work that I do with this group there is no way that person woulda' said that or done that.' ... Again, back to all those relationships that we formed and we want to sustain for the long term.

Glenn describes how in 2019 the Wichita County WCA team began intentionally reaching out to a diverse cross-section of residents in order to build relationships and tackle community challenges:

[Valerie went to a conference and] from that conference she had this insight about [long pause] we could save, we could save the water and still lose the community. And so in that meeting we went from [pause] and we didn't say it quite this way but 'the [Groundwater Management District 1's Wichita County] LEMA's now on the road' ...

'the LEMA is moving, the state is supportive, processes are getting in place [pause] now what? Well, what is - we need the younger generation involved in the future of this community. ...

In the same way that we needed to bring together the right group of people to work on water, we now need the right group, the right mix of people to work on the future of our community. And they do need to be savvy about water, but that's now one piece of the puzzle. And if we can give ourselves twenty-five years, because we get the water right, we have twenty-five years to get the community right' Now, we didn't put it quite that way but it really struck me that we just made this quantum shift in this meeting from water as one issue to the community as the collective issue.

Somewhere about then I said something about 'so let's start nominating people we think would be the ones we'd wanna convene.' And in less than forty-five minutes that group – not me – but that group had named fifteen people, five of whom were Hispanic. [long pause]

So that [is a] big deal shift. ... Starting and sustaining this next chapter will be a [pause] a very challenging issue. It will not be easy, 'cause it's not natural for this community to work together. Only at the fair, it's the only example. The Amusement Association and the county fair is an enormous source of pride in this community and everybody drops their ego and works together and we have a county fair that attracts people from a hundred miles. [Pause] It's phenomenal – and then we go back to bein' idiots [emotion in voice] the next morning. It's like we just drop it. ...

And [when] we had the first meeting of this new group? Six of these fifteen made it. They actually put out an email tryin' to get a time for all fifteen [and] only got six. But these

are the classic people that folks say can't – 'you can't get 'em involved', they're young families, they're busy, they've got kids in school, they're both workin'. And every rural community bemoans the fact that we can't get anybody between age twenty and forty involved in the community.

Well we had thirty-year-old's convening other thirty-year-old's saying [pause] 'Answer the question: what's your stake in the future of this community?' That's the same question I asked the first ten people about water: 'What's your stake in water and why?' Every one of 'em talked about legacy. It wasn't about how big a corn crop they were gonna get, it was about whether there would be a future. [Pause] Now we have thirty-year-old's. I don't know what could happen, it could be a miracle!

The third indirect impact of the Wichita County WCA is its role influencing future conservation policies. During my observations of Groundwater Management District 1 board meetings, I witnessed a number of interactions in which Wichita County WCA team members encouraged the board to adopt a county-wide LEMA with robust groundwater conservation measures. Todd describes how the Wichita County WCA was formed from the beginning with the intention of building support for a county-wide LEMA if voluntary enrollment was insufficient:

"The voluntary aspect [of the Wichita County WCA] is probably the most appealing thing in some ways. In other ways, there's some producers who don't like the fact that its voluntary because they don't want to get in if their neighbor doesn't get in. And so that's kind of an excuse not to join is they're afraid their water will get pumped out from under them by somebody that's not conserving. And they say, 'well let's just do a LEMA'.

And a LEMA might be the way to go if we don't get a high enough voluntary participation rate, and we're talking that probably we need eighty percent by year five to say this thing is working. But if we can't get there and this isn't the proper way to get there, there's a lotta people in the community that say 'well, this is a good effort that's voluntary. If it doesn't take off and people aren't willing to do it then let's do the LEMA that they're sayin' they would rather be in.' So, I think that's kind of the back-up plan."

Ralph agrees:

The WCA is – in my opinion, it's probably only gonna be effective to an extent. Because a' greed, basically. People don't voluntarily [pause] don't very often voluntarily agree to make less money. I think there are some people out there who see the benefit of [pause] having a water supply in the future, whether to their farm or to the community, etcetera that are voluntarily doing – that they're agreeing to reduce consumption in order to extend the life of the aquifer. But there's other people that just flat out – they want the money and so they're gonna keep usin' it. So yeah it [has] potential to transition into a LEMA, I suppose.

Key components of the Wichita County WCA's success.

One of my objectives in doing a case study of the Wichita County WCA was to identify key components that enabled the Wichita County WCA team to successfully implement a voluntary group conservation plan. Five key components of the Wichita County WCA's success are: an early focus on teambuilding, diverse stakeholder representation, bringing in an outside facilitator, frequent and respectful community outreach, and partnering with state and local government.

An Early Focus on Teambuilding

From the beginning, the Wichita County WCA focused on building a cohesive team. They identified common values and goals and began to build a shared public narrative of who they are as a team, where they are going with their conservation effort, and why their work is important. By building this foundation of team cohesion, Wichita County WCA members were able to fall back on their common sense of meaning and purpose in times of discouragement and frustration. The focus on teambuilding included their commitment to making decisions by consensus. Ralph describes their process of teambuilding through public narrative:

“For several of our first meetings we had to tell three things ... Tell everybody our name and everybody knew each other already but just in case [smile in voice] someone said [pause] ‘the name that you want to be called by not necessarily your name’ [smile in voice] And so we all went around the room and told that and why we were there. And [pause] so many of the [pause] answers to why we were there was ‘because of the community’. [voice softer] You know? [voice even softer].”

Michele attributes much of their success to relationships. She notes that building solid relationships within the team and the broader community enabled the Wichita County WCA team to confidently champion their voluntary group conservation plan:

“I think our [success] a lot of it had to do with the relationships we built and the time we spent building a good foundation. ... We didn’t just pick some numbers out of the sky and say, ‘here’s the plan, now everybody needs to do it.’ We worked with Brownie and had [Kansas Geological Survey] really help us evaluate what numbers are going to make a meaningful difference and then we tested it out on people ‘okay is this something, here’s what we came up with.’ And we took some feedback from different public meetings, one in particular, and made some improvements to the plan when it comes to flexibilities. And

it wasn't just a one-time 'here's a public meeting, if you didn't hear it [pause] so what?' [We had] township meetings, we've had the individual conversations. It was [pause] all those man-hours [laughter in voice] if you add them up it was a lot of relationship building. And I think sometimes our communities [pause] whatever the project [is] we forget that we're all just people and we all need to connect in that way. [pause] But we also we also stood our ground once we came up with a plan, we weren't gonna back down. [pause] We believed in the plan because we'd done the work and the research."

Diverse Stakeholder Representation

The Wichita County WCA team was intentionally formed to include a diverse selection of people in Wichita County. Everyone on the team spoke to me of the value of diversity in making sure that the voluntary group conservation plan furthers the common good without unduly burdening any particular group of individuals. They also stressed the importance of diverse perspectives in making the plan better than it would have been otherwise. Diverse stakeholder representation means including young and old, male and female, large irrigators, small irrigators, dryland producers, and town interests. Furthermore, the Wichita County WCA team's decision to include people from different social networks and community factions made public outreach easier and more effective.

Valerie notes that:

Everybody on our committee was hand-picked [to] get a variety of ... people from different factions in the community ... [we] have someone in economic development ... someone that's an elected official ... somebody who's an expert at [pause] the fine points of WCAs ... [Having] somebody who's been a facilitator in communities is helpful. 'cause even if we don't have our professional facilitator there, we've got someone who can play

that role and slip out of the committee participation if they need to. And we have more than one that can do that ... We had ... not just irrigation ... we had the manager of the feed-yard, somebody in industry who is familiar with water and water rights and has a different investment in it. You know, they still need the crops that are grown with all that water to keep their industry growing. [We have] somebody who's not irrigating as much. It's still important to have their input and they can give you that perspective of what the people are gonna say who only have one or two irrigated fields and how it might affect them. If you've got that on your committee, that helps balance out those who do have ten or fifteen wells or irrigate the most. ... It's not easy to put yourself in that place unless you are that person."

Michele recalls how she agreed to join the Wichita County WCA team in part because she agreed with their emphasis on including diverse perspectives:

"Glenn and I had visited previously about this [groundwater depletion] as a concern of ours and so when he first said, 'well we're looking into this, do you wanna be part of ... this committee?' I said 'yes' just because I knew again having – [pause] and I think we did a really good job of this – having representatives from not just the agriculture community but people who represented the school's interests in all this and really the support businesses' interest and how do we [pause] do what I think is the right thing in conserving and cutting back our usage of water but still maintain viability and be a thriving community?"

Glenn describes how the younger and older members of the Wichita County WCA team complement each-other:

“We have a mix of generations that’s essential. [long pause] I believe the old folks have blessed it and the young folks have driven it. [pause] If it weren’t for [the younger people] we for sure would not have the technical skill [pause] and the energy [pause] and the marketing sophistication – the energy, marketing, and technical [pause] to gather data to make decisions to get out the word, to be relatively professional in our presentation. The younger generation has greased the skids. And, their heart’s in the game because it’s their community. ... The value of the older people [is in] giving authority – transferring authority and blessing.”

Bringing in an Outside Facilitator

The Wichita County WCA team made an early decision to bring in an outside facilitator. Glenn, Michele, and Valerie each had experience as facilitators so they knew the value of having a trained individual help build team cohesion and manage the process of writing their voluntary group conservation plan. Selecting a facilitator from outside of the community provided a degree of detachment from small-town politics. As described earlier, the Wichita County WCA facilitator also introduced Strengths Finder as a means of building group cohesion by identifying each team member’s unique contributions to the group as a whole.

Kerry reflects on his role as the Wichita County WCA’s outside facilitator:

“One of the decisions that this group made ... I think it was a smart decision – was they didn’t want it to become a political thing. They basically decided to seek out a facilitator. Kind of a third party administrator [laughter in voice] or leader for the group. And my understanding is in addition to someone who has some experience in working with groups and helping them accomplish projects, they were looking for someone who lived at least fifty miles from Wichita county so that it wasn’t the banker’s cousin or the biggest

irrigator's son-in-law anything like that. ... My role has been just to design the process for them to work through the creation of this WCA [and] keep them on task."

Phillip expresses the consensus of the Wichita County WCA team:

"I think the fact that we used a facilitator was very helpful. And we used a facilitator who was not from the community [pause] and I think that kept things a little bit more objective and on track. I would certainly recommend that."

Gilbert remembers being skeptical at first, but quickly realized the value of an outside facilitator:

"So, ten of us in this county got together and sat down and had a meeting and said, 'how can we make this happen?' And the very first thing we did is out of our own pockets we hired a facilitator. Because we felt like we would struggle to be self-managed, and if we had somebody that had a completely outside approach, we could probably get more done. And at first, I was against that, I thought it didn't make sense. And I wasn't really radically against it, but I didn't think it'd work. And I couldn't 'a been more wrong, because it worked very well."

Frequent and Respectful Community Outreach.

Another key component of the Wichita County WCA's success was frequent and respectful community outreach. Team members realized that they needed to establish their public narrative early on to avoid misunderstandings and discourage misrepresentation by others in their community. As a voluntary effort, team members knew that the Wichita County WCA would only have the impacts they desire if most of the community knew about the plan.

The Wichita County WCA team undertook a labor-intensive effort to personally invite irrigators to their public outreach meetings. As volunteers from within the community, Wichita

County WCA members are uniquely positioned to reach out personally to area irrigators using multiple modes of communication. Valerie describes their process of community outreach:

“We sent postcards straight from [pause] the Kansas Water Office ... so they have our list that we gave them and it’s been ... gone through by Michele and me and Ralph ... and whoever to make sure that it’s going to the right people. ... Ralph creates ‘em ... and then we put our return address to the office here on them. So, if anything gets returned, Michele gets it in this mailbox. And then we go and update the spreadsheet that has all the addresses so we know for sure [chuckles] that people are getting the postcards or not. And if we can get an address for ‘em we do if we can’t then we just take them off the list ‘cause why send the postcard if it’s just going to get returned? [Pause] So through that whole process in the first year or so we found out a lot about how the water office or DWR really doesn’t have updated addresses. It is what it is.

But not only that we did our little calling tree kinda thing for our first public meeting. I think we each took ten names? Called them ‘cause Ralph determined that there’s [pause] ... seventy-two families basically that are controlling all the water. The irrigated water. And so, of those seventy two we made sure we made personal phone calls to every single one of them. And [pause] not only that, but if we had their cell phone numbers, we texted them the day before the meeting. So, yeah, it’s got that personal invitation it’s not just a random thing in the mail. We followed up and we followed up and we followed up like we [chuckles] we’re not gonna let this go. You know? But it makes a big difference. ...

But yeah that personal, you know, phone calls and texts. And all that has been a huge difference for when we try to get people to the meeting. So, and it’s just not the way the state offices operate and certainly not how the GMD board has ever operated. I will say

they did put an ad in the paper two weeks in a row, so maybe some people saw it, but [pause] it's still not a personal, you know? Like 'we think you need to be invested in this come and listen. Come and give your input' kinda thing."

Another important benefit of respectful community outreach for the Wichita County WCA team was that it enabled them to make changes to their draft plan based on the concerns of community members expressed at their August 2016 meeting. Ralph describes how:

"After our first community meeting, most of the people there basically said that 'we need this additional piece of flexibility in the plan'. So, then the flexibility group got back together and said, 'how do we make this work?' And then we drafted a new piece of flexibility and put it in the plan from some community involvement there."

Kerry describes how the Wichita County WCA team continued reaching out to their community as the plan was being finalized and after it was approved in order to answer questions and encourage participation:

"We had a public meeting on November thirtieth [2016] at the fairgrounds in Wichita County in Leoti. We've done three events there now. One was introducing it then we had this public meeting where we've basically presented it as it as it stood and [the governor] came and spoke at that ... kinda giving his blessing on it and the state's blessing and ... saying 'this is really setting the stage' and 'people are gonna look at this' and 'you are being leaders for conservation on the whole Ogallala aquifer'

... We had approval at that point, we had the blessing of the of the state, all of the agencies. Anybody who was interested at that point could sign up for a consultation to look at 'what would it look like?', you know, 'what would the exact numbers be on this

well if I signed up?’ ... And that’s where the working with the Department of Water Resources was valuable because they came in and provided those consultations for us... So, we were just the middleman of getting the irrigator with the right person at the state [smile in voice] to where they had the information they needed.

At that point [pause] we coulda’ stopped and said ‘okay we did it, now you guys [pause] everybody go sign up’, but [smile in voice] actually that was just the beginning because we realized ... as good as this plan is ... and I’m amazed – I think it’s an excellent product but if nobody signs up its worthless.”

Randy, a producer in Wichita County who is not currently part of the Wichita County WCA, believes that their public outreach was effective:

“I’ve thought about it [joining the Wichita County WCA] ... They’ve had several meetings and this one was developed by a group of farmers of Wichita County ... and I’ll have to say that it was pretty well put together ... [Wichita County WCA public meetings were] well organized and informative. [The Wichita County WCA] is probably a good [pause] uh [pause] alternative to the state comin’ in and makin’ it mandatory . To this point it’s voluntary.”

Partnering with State and Local Government

The Wichita County WCA team decided early on that they wanted a voluntary group conservation plan that would preserve their community by extending the life of their aquifer without causing economic collapse. They needed the expertise of state government agencies to understand the behavior of the Ogallala aquifer in Wichita County, how the aquifer would respond to different levels of conservation, and how to write a plan that would be consistent with Kansas law. The Wichita County WCA team also received assistance with publicity from the

Kansas Department of Agriculture, assistance with outreach to producers from the Kansas Water Office, cost-share incentives from Groundwater Management District 1, and the legitimacy provided by then Kansas Governor Sam Brownback’s public statements of support.

Todd describes the partnership with state agencies and Groundwater Management District 1:

“And we’ve had help, so much help from the state and the [Kansas] Geological Survey. That’s just been mind-blowing and they’ve been so positive and helped this thing through. And our Groundwater Management District - we need their support. ... Our GMD used to have a cloud seeding project and they had about a hundred thousand dollars a year allocated to do that and they quit last year. And so now they’ve turned around and they’ve offered that money this year – a hundred and forty thousand dollars – in a cost share program for moisture probes. ... I thought that was very generous of them and they’re gonna give priority to the WCA members. So those people that are conserving will have the first shot at the probes and they’ll get a little bit bigger uh cost share than producers that are not in it. ... So, I think that’s helpful.”

Kerry describes the importance of the Kansas Geological Survey:

“I think in our July meeting ... Brownie Wilson from the Kansas Geological Survey came and spent the entire morning just educating us on the Ogallala Aquifer, water rights, different pumping records and just cleared up a lotta misconceptions which was important.”

An important aspect of the Wichita County WCA team’s partnering with state and local government agencies was focusing on how they can work together on shared goals, rather than solely on areas of disagreement. This approach was most noticeable in the relationship between the Wichita County WCA team and the Groundwater Management District 1 board.

The Wichita County WCA team wanted to move forward rapidly with large reductions in groundwater pumping. Their extensive public outreach beginning in 2016 convinced them that most Wichita County producers were ready to commit to substantial reductions in groundwater extraction, provided that everyone in the county shared the pain.

The Groundwater Management District 1 board wanted to move forward more slowly with smaller reductions in groundwater pumping, at least at first. The board's experiences when their district-wide LEMA plan failed to secure a two-thirds majority in 2014 convinced them that a cautious, incremental approach to conservation was the most prudent course of action. Bob, a producer in Wallace County, describes the mindset of the Groundwater Management District 1 board in March of 2017:

"I think they got roughed up pretty good tryin' to get the LEMA through and I think they just had their fill of it. ... I think they're pretty disappointed that they put their best foot forward and didn't get it done. So, I think they're gonna, probably at some point they'll try to come back and do somethin'"

While the Wichita County WCA team did eventually engage in vigorous advocacy for their position, they mostly pursued a collaborative approach with the Groundwater Management District 1 board, making compromises in order to further their shared goal of groundwater conservation.

Valerie reflects on the Wichita County WCA's strategy for engaging with the Groundwater Management District 1 board:

"We are in this for the long haul. Wichita County needs conservation. [chuckles] ... We are working with our other producers who are telling us: 'Yes we will do it if our neighbor does it. We wanna conserve but we're still afraid that we're gonna lose our

water, like our neighbor's gonna take our water.' Because that is still another one of those myths that the water's gonna move [pause] a mile a year or something like that. Well it doesn't, it really does move slowly. I don't know how to prove it, but I know the Geological Survey is very adamant that it doesn't move that fast.

And so how do we get the board members to understand that Wichita County's ready for this? 'You don't have to start with the whole district again like what failed the first time. But just do Wichita County.' And somehow [chuckles] in the past year we've got them to vote moving that forward. 'We'll do a LEMA in Wichita County.' ...

From a WCA perspective is twenty percent [reduction in pumping proposed in the 2018 draft of the Groundwater Management District 1 Wichita County LEMA plan] enough to start with? From a WCA perspective? No. Our whole committee agrees on that. The Geological Survey numbers will tell you that. Twenty percent is not enough, but are they moving forward with at least with a county-wide LEMA? And can we still hope for more WCA enrollment which is a higher percentage [reduction in pumping]? And somewhere in the next ten years we'll get to a twenty percent somehow? Maybe. [chuckles] You know, so we're compromising. ... They're way further down the road [smile in voice] than they used to be. [chuckles]"

Solidarity, Meaning, and Leadership

Previous research (Rappaport, 1981, 1984, 1987; Kieffer, 1984; Klandermans and Oegma, 1987; Oegma and Klandermans, 1994; Wuthnow, 1994, 1995; Ryan and Deci, 2000; Fry, 2003; Musick and Wilson, 2007; Munson, 2009; Viterna, 2013; Ganz, 2011) suggests that one way of interpreting the ability of Wichita County WCA team members to sustain civic engagement is through solidarity, a sense of meaning and purpose, and effective leadership.

My research unambiguously supports the importance of solidarity and a sense of meaning and purpose. The support for effective leadership as an important component is more ambiguous. The Wichita County WCA had a diffuse leadership model, with different members of the team fulfilling leadership roles across different contexts. I will later argue that the diffuse leadership of the Wichita County WCA team is most consistent with Ganz' (2011) public narrative model of social action.

Solidarity

Everyone on the Wichita County WCA team communicated to me how important the rest of the team was to their ability to sustain their civic engagement over time. Kerry describes how solidarity was important in managing emotions during setbacks and frustrations, enabling them to remain civically engaged:

"I guess an obstacle was ... the feedback from those who weren't a part of it. So, you know there'd be discouragement, there'd be times when the team needed a pep talk ... or needed to hear some good news of something. ...

Oftentimes they would kinda do it [provide encouragement to each other] on their own, but I also was intentional about at times either doing it or trying to ask some questions and looking at 'what are some of our successes so far?'"

Valerie describes how solidarity among Wichita County WCA team members extended to defending each other from harmful misunderstandings and reputational attacks:

"Relationships have been made stronger because of the WCA committee, within our group. ... And so if we hear somethin' on the street about one of our WCA Committee members that we've worked with and maybe we didn't know before this point and we know that's not true ... we will stand up for each other out in the community, shoot down

rumors or be like: *'I think you better talk to them first. I don't know where you got your information, but go talk to that person, because knowin' from the work that I do with this group there is no way that person woulda' said that or done that.'* ... Again, back to all those relationships that we formed and we want to sustain for the long term."

Michelle summarizes the importance of solidarity in meeting shared needs for relationship and enabling the team to stand firmly in support of their plan:

"I think our [success] a lot of it had to do with the relationships we built and the time we spent building a good foundation. ... It was a lot of relationship building. And I think sometimes our communities [pause] whatever the project [is] we forget that we're all just people and we all need to connect in that way. [pause] But we also we also stood our ground once we came up with a plan, we weren't gonna back down. [pause] We believed in the plan because we'd done the work and the research."

Another way to understand the importance of solidarity for enabling sustained civic engagement is by contrasting the hopeful optimism of the Wichita County WCA team members with the burnout among individuals in other counties who were unable to find others who share their commitment to voluntary group conservation. Bob, a producer in Wallace County, describes a sense of burnout after ten years trying to encourage collective action on conservation without others to provide solidarity and support:

"There's a lotta things we could be doing, but we're choosing not to. ... there's no thought process as to what we could do to benefit ourselves. And it's extremely unfortunate. ...

I think everybody thinks about it, but I don't think – until you pull the handle on the pot and it don't flush – that you really realize what you've done. And too many people are

willing to go that far and we – we can't get anybody to – I've been at it for ten years and I can't get anywhere.

And I have rubbed everybody's nose in the carpet that I could tryin' to get somebody fired up and haven't had any success. Their biggest chance was the [district-wide] LEMA and we just lost by a little bit.”

Whereas the Wichita County WCA team holds onto an active hope that their community will thrive, Bob's hopes for the future are more passive. He hopes that at some point people will “wake up” and begin conserving. He believes that conservation will come too late for many in the community but takes comfort in the knowledge that his well is deep and that his family will be among those remaining in a lower-population, “back to the future” scenario:

“At some point people will get smart enough to wake up. I don't know what it'll take, [pause] but at some point, we'll get conservation someplace and make changes. We won't [conserve] this thing completely – like I say, I've got deep water. I'll have a well, not everybody can say that, but I can. [inhales deeply] so [pause] there will be – you know, what makes these places worth bein' is schools and neighbors and community and church and activities and things for the kids to do [inhales deeply] [clears throat] We're really kinda headed back to the future [pause] one room schools, they're gonna come back again – that's where I started.”

Sense of Meaning and Purpose

A sense of meaning and purpose was another critical element that enabled the Wichita County WCA team to sustain civic engagement over time. As Ganz (2011) suggests, this sense of meaning was closely tied to the solidarity among team-members. Todd emphasizes how the

team members bonded and supported each other in their common commitment to preserve their community and way of life for future generations:

“As we went around the room, I mean there was a really strong consensus of everybody [pause] and they wanted to be good stewards, you know? They wanted to be able to pass [pause] on this ability to irrigate and have strong economy in the area ... to the future generations. ... And I think that’s what helped us to meld as a group even though we were diverse. ... We all melded together because we all were at one mind on what we wanted to try to accomplish. I think it was a God thing that the group that was put together was there.”

Ralph describes the importance of having a shared conviction that developing and entering the Wichita County WCA was the morally good decision. For Ralph, the Wichita County WCA provides a collective framework of meaning in which to act on his belief that conservation is the morally right course of action:

“We’re working on enrolling in the Water Conservation Area ‘cause we believe it’s the right thing to do. And [pause] there are some other people out there who have a similar thought process to us that ... when you believe it’s the right thing to do you just do it because you believe it’s the right thing. And those are the people that are gonna [pause] voluntarily join the WCA right now [in early 2017]. ‘cause they have decided that it’s the right thing to do and they’re gonna do it because of that premise that it’s right.”

At one point, Valerie expresses the Wichita County WCA team's shared sense of meaning and purpose in religious language¹², noting how team members encouraged each other to persevere during times of frustration by focusing on the righteousness of their cause:

“I mean and there’s been texts amongst ourselves during GMD board meetings that, you know, ‘Please pray for a those of us that are at this GMD meeting because we’re about to lose it.’ [laughter in voice] And [laughs] you know Phillip’ll text back ‘done’ you know, ‘You’ve went to the Supreme Interventionist and He’s –you know – He’ll take care of it. He won’t let the wrong things happen.’”

Effective Leadership

The Wichita County WCA dispersed leadership functions across the team, rather than concentrating leadership in one or two individuals. For example, Glenn initially took on the role of convener and process-facilitator, but this role was passed on to the outside facilitator at the third team meeting. After Kerry completed his role as outside facilitator in spring of 2017, several members of the Wichita County WCA team shared the facilitator role.

Phillip exercised leadership in drafting the Wichita County WCA plan by virtue of his technical knowledge, but even then, his role was primarily to implement the decisions of the entire team rather than steering decisions in a particular direction. The Wichita County WCA team's dispersed leadership model is consistent with Ganz' (2009) suggestion that leaders and followers co-create each other, that leadership is about what leaders do in relationship with

¹² Most of the Wichita County WCA team members are religious people who are active in their churches. About half are members of the one local Catholic parish. The other half are members of several local Protestant congregations. Valerie describes a local history of good relationships between churches in Wichita County. However, I didn't find evidence of any formal efforts to manage groundwater through area congregations until after the Wichita County WCA effort began.

others on their team, and that individuals are often simultaneously leaders some ways and followers in others¹³. Overall, my research suggests that Ganz's Public Narrative model is the best way to understand how the effective leadership contributed to the ability of the Wichita County WCA team to sustain civic engagement.

Applicability of Ganz' Public Narrative model

My case study of the Wichita County WCA team provides support for the applicability of Ganz' public narrative model to sustained civic engagement in rural communities. Ganz (2011) argues that people experience values primarily through their emotions, which are in turn communicated through stories. Key storytelling elements include plot, character, moral, and setting. The plot demonstrates an exercise of agency through the elements of a challenge, a choice, and an outcome. The character(s) engage the listeners' emotions as they empathize with the protagonist. The moral communicates a set of values to the listeners. Finally, the skillful use of setting allows listeners to imagine themselves as part of the storyline, thereby vicariously sharing in the agency, emotions, and values communicated through the narrative.

Leaders use public narrative to arouse and sustain appropriate emotions through interweaving the "Story of Self", the "Story of Us" and the "Story of Now" (Ganz, 2011). The Story of Self communicates the values that motivate the leader to lead, including where they come from, why they act as they do, and where they think they're going. The Story of Us provides points of intersection between the leaders' and participants' personal stories of self and connections to shared cultural stories that communicate common values. The Story of Now

¹³ Flora and Flora (1993) report similar findings of dispersed, relational leadership in rural Kansas. They describe communities with networks of relationships conducive to this leadership style as having "entrepreneurial social capital".

inspires participation by articulating an urgent challenge, describing the choice that participants should make and its significance for their shared identities and values, and proposing an immediate, specific collective action that participants can take to move forward.

During my observations of the Wichita County WCA team at Groundwater Management District 1 board meetings, I noticed that Valerie, Michele and Gilbert each employed public narrative to encourage the Groundwater Management District 1 board to adopt a county-wide LEMA with substantial conservation impacts. Independently, Valerie provided me with an excellent example of public narrative in explaining her sustained civic engagement through the Wichita County WCA:

If somebody else doesn't do it, like if I don't do it, whose going to? [Pause] [tears up] [long pause] I want my kids to be able to live here if they want to. [Pause] [great sadness in voice] And I want it if they, you know, raise their families I want them to be able to raise their families here someday if they want to. And, you know just like the first meeting that we had in twenty-sixteen – everybody came around the table and said, 'Why do you wanna be here?' People would tear up when they're telling you why they wanna be here. And that's where I'm at right now. I'm still like invested because I wanna know that my now twelve-year-old can come back in ten years [sadness in voice] and have a bright future here if she wants to. You know, I'm not sayin' all three of my kids are comin' back 'cause chances are they're probably not. But she's the one that wants to go work with her dad right now. And she wants to work with cattle and she wants to be a vet and she wants to come home and open her own clinic.

And who am I to say to her 'There's not gonna be any water here, there's not gonna be any people here. You shouldn't come back here.' I can never say that to her. [Pause]

When she goes to college or whatever she does and she says ‘Mom, I wanna move back home’ I wanna be able to say ‘Yep, we worked hard to save the water here so that we know we have a way of life that we can sustain for years to come.’ You know they’re sayin’ their [groundwater depletion] models can’t predict way out into the future? But what if we turn that around? And we don’t even have to have models to predict way out into the future? [Pause] It’s never been done, but who says it can’t be done? And you know what a – there’s no better group that could make this possible than the group that we pulled together.

So, we have to try. We don’t have another choice. And I don’t know why [chuckles] our group feels that more urgently [smile in voice] than the rest of the population? But we do. [chuckles] And every one of ‘em, you know, has some similar story about [how] they want their families to be able to live here and have the kind of way of life that we enjoy right now. ‘Cause every one of us loves living here in Wichita County and can’t imagine living anywhere else. And if – if water is the reason that we’re here, than we’d better keep the water here.

Valerie’s narrative includes a “story of self”, communicating her identity as a mother who loves her family and is compelled to work for conservation so that her children have the opportunity to choose to live in Wichita County. She uses narrative to express her values through emotions of grief at the loss of groundwater and hope for a better future through conservation. Valerie connects her “story of self” to the team’s “story of us” by sharing how every member of the group has similar motivations for sustained civic engagement, rooted in their love for Wichita County and their desire for their families to continue living there. She highlights the

great importance the team places on these values by stating several times that their only choice is to take action to conserve groundwater.

Valerie communicates the Wichita County WCA's "story of now" by articulating the challenge of having to advise her daughter not to return home if depletion isn't addressed. She contrasts this challenge with the hopeful future of a community that doesn't have to worry about the accuracy of groundwater depletion models, and where those who love Wichita County can safely choose to remain. She concludes with groundwater conservation as a collective action that the community can take to reach the hopeful future.

The action that Valerie shared with me in our interview is not a specific and immediate one, probably because as an academic and an outsider there is no specific and immediate action that I can take. When she deployed public narrative at the Groundwater Management District 1 board meetings, Valerie always included a specific and immediate action in the form of changes to the LEMA plan that the board was writing.

Ganz' public narrative model suggests that sustained civic engagement is cultivated by managing emotions to replace action inhibiting emotions with action promoting ones. He focuses on replacing inertia with urgency, apathy with anger, fear with hope, isolation with solidarity, and self-doubt with a sense of self-efficacy. Michele describes how the Wichita County WCA team managed emotions to sustain civic engagement:

"I think [pause] figuring out hope. I think, small wins, seeing progress little by little helps keep people involved. [Pause] I just think that for myself, but I would hope for others just finding that one thing that they're really passionate about and knowing that by doing something [pause] change can happen. I think sometimes it gets lost that we each

have a role to play in the future of our communities. We can't just show up – it goes back to stewardship, kind of.

We can't just show up and expect everything to be given to us and done for us. We can't be leeches, in my opinion [chuckles] We have to find a way to give back using whatever time or talent we have to make the place we live a good place.

I'm gonna look something up 'cause it just dawned on me this lady from this book had a really nice way of saying that. ...I mean it was super, super simple: 'If you love your city, you should do what's good for it. Corollary, what's good for your community is usually good for you.' And so, I just think if we would love our town, we should act like people who love our town and do things that make it good. Or better."

Michelle's account is consistent with Ganz' model by focusing on hope, building self-efficacy through identifying small wins, emphasizing solidarity through the idea that each individual has a role to play in their community, and shifting from apathy to anger through the metaphor of leeches.

Citing Saul Alinsky, Ganz emphasizes that anger as an action motivator is not primarily about rage, but rather an unsettled awareness of the difference between "the world as it is and the world as it ought to be" (2011, p. 278). Glenn describes how the younger members of the Wichita County WCA team experienced the motivating power of anger, understood in this sense:

I think Valerie, probably in her body are more of the conflicts around this issue than any person in the room [pause] a combination of her family's irrigating history and the tension they've been through. [At one point] she said [pause] something to the effect 'this issue has caused more fights in my family, than anything in my life.' ... That really hit me.

And I thought 'holy cow, I'm riskin' nothin' compared to her' [pause] She has drug herself and her family through a knothole! ...

She captures the values conflicts of this group better than anybody and Ralph is next 'cause he's a good, thriving, risk-taking entrepreneur. He's also a farmer, and he's also tryin' to make it. [Pause] So he's connected hugely to the problem and sees the solution. Valerie has gradually figured out that she is a part of the problem and the solution. ...

So, I would say in those two is the anchor of [long pause] both the [pause] energy and the tension. [pause] Conflict is a great energizer. If you're torn up because you're caught in a conflict [long pause] that's also a source of energy [pause] because you wanna get out of that conflict. You're miserable, you can't sleep. [pause] So you can't just - you're not happier with the status quo. [pause] And I think that's the crux of where the energy comes from in this group.

And Michele also lives in the conflict of all the power groups in the community that don't work together. ... And she married in! My God – she's stuck! And she comes from a progressive community ... maybe one of the three most progressive rural counties in the state of Kansas. So, she knows what it looks like when it works. [chuckles]

A third way in which sustained civic engagement by the Wichita County WCA team is consistent with Ganz' public narrative model is the role of shared faith traditions. Ganz observes that activists draw upon faith traditions as sources of hope and solidarity. Valerie describes drawing on her faith as a source of hope and emotional support:

“I’ve prayed about this more times than I can count. Especially right before a public meeting or even before our committee meetings, things like that. I’ve got a fifteen minute drive to town. I can pray a whole Rosary before [chuckles] I get to town. ...

And, you know, having those fights and then goin’ and [pause] you know? [pause] askin’ the question ‘Should I even be involved in this?’ ‘This is too hard.’ ‘I don’t wanna do this anymore.’ ... And is water conservation even worth it? You know? What does the church – what do our churches teach about water conservation? And really making me dive deeper into that side of it.

And ‘Is this a worthy pursuit?’ Well, yeah ‘cause I’m still here. [chuckles] And every time I’d ask that question, I’d get a nudge or a sign or something that’s like ‘Yeah, I know, I’m still here. I will keep doin’ it. I don’t know why but [chuckles] I will keep doing it.’”

Glenn describes how his faith helps him remain civically engaged despite difficulties and setbacks:

“My faith [keeps me going]. My faith [long pause] I am hopeful no matter what. [long pause] I actually do have a - a very clear understanding of the resurrection [pause] not as a narrow event that is a statement of truth [pause] I believe in the grace of God first [pause] I am well taken care of I do not need to worry about my future ...

At the same time, I don’t – I don’t think that everybody makes it. No matter where – cities, towns, countries ... The United States ... we’re on the slide because we’ve lost our sense of identity. [Pause] It could be Wichita County is reclaiming an identity that I wouldn’t have guessed five years ago. [Pause] But even if we go down, this county, that’s

alright. We'll figure out some other [pause] some other connection [long pause] the entrepreneurs here are crossing county lines."

Later in our interview, Glenn returns to the same theme:

"I keep being surprised. I don't know what's going to happen. [pause] So that's why I'm hopeful. I – I do believe that when you get rid of the old - this is resurrection - and you're willing to go through the grief [pause] of letting go [long pause] it's amazing what may be resurrected out of that grave. [long pause] I'm almost talkin' myself into being hopeful, aren't I? [laughter in voice] [chuckles]"

As illustrated by Valerie and Glenn, members of the Wichita County WCA team draw on their religious faith as a source of hope in a manner consistent with Ganz' public narrative model. The faith of the Wichita County WCA team was also a source of solidarity, as illustrated by members praying for each other during frustrating conversations with the Groundwater Management District 1 board.

Applicability of Kieffer's Stages of Empowerment model

In contrast to the clear applicability of Ganz' public narrative model, my case study of the Wichita County WCA team does not clearly demonstrate the applicability of Kieffer's (1984) stages of empowerment model to sustained civic engagement in rural communities. This finding is not unexpected, as Kieffer developed his model by working with structurally disadvantaged Americans engaged in grassroots advocacy. The Wichita County WCA team members are not structurally disadvantaged to the extent that Kieffer's subjects were.

Kieffer (1984) suggests that individuals move through three stages as they develop full participatory competence, an "Era of Entry", an "Era of Advancement", and an "Era of Incorporation". During the "Era of Entry", individuals begin to question and challenge their

long-standing conceptions of power through reactive engagement. In this stage, they become aware of their own potential for participation in decisions that affect them. Kieffer finds that the era of entry is typically triggered by an immediate threat to deeply held values that shocks these individuals into action.

Among the Wichita County WCA team members, only Valerie describes her engagement with groundwater as beginning with such a shock:

“And the other part of my story was that we have a house well [pause] that is [pause] at the bottom. We only have inches of water left at home. [sadness in voice] And so, even in twenty sixteen we were already considering [pause] ‘What if we run outta water at home? What do we do? We have three small kids at home.’ You know? And it’s our home. We’ve been there since two thousand four and [pause] I don’t wanna move. ... But [laughs sadly] ‘Do we have a chance at digging another well?’ ‘Is there another well nearby?’ You know, there’s a lotta questions and so if my house well is running out and they’re already talkin’ about a water shortage in general [pause] why aren’t we doin’ something about it?”

During Kieffer’s subsequent “Era of Advancement”, individuals become more proactive and intentional in their sociopolitical participation. Individuals move towards greater intentionality by engaging in an iterative cycle of action and reflection. Kieffer finds that key determinants of success at this stage include access to a mentor, supportive peer relationships within an organizational structure, and the resources to cultivate an increasingly critical understanding of sociopolitical relations through praxis.

In some ways Glenn, with his extensive experience facilitating conversations across rural Kansas, provided mentorship to the younger members of the Wichita County WCA team. In

particular, Valerie and Ralph seem to have benefited from Glenn’s advice and support. Glenn hints at this aspect of his role when he talks about transferring authority and blessing:

“I believe the old folks have blessed it and the young folks have driven it. ... The younger generation has greased the skids. And, their heart’s in the game because it’s their community. ... The value of the older people [is in] giving authority – transferring authority and blessing.”

The Wichita County WCA team’s decision to expand the scope of their activities beyond groundwater by convening a larger team and addressing community challenges more holistically is consistent with Kieffer’s description of cultivating an increasingly critical understanding of sociopolitical relations through praxis. In particular, the dedicated effort of the Wichita County WCA team to recruit people of Hispanic ethnicity demonstrates increased political savvy.

Unfortunately, I am unable to discern whether this increased critical understanding of sociopolitical relations came about before or after the changes that Kieffer describes as following the “Era of Advancement”. Without a better understanding of timing, I am unable to argue that the reformulated team is unambiguously consistent with Kieffer’s three stage model of empowerment.

Finally, during Kieffer’s “Era of Incorporation”, individuals learn how to resolve role-conflicts and social tensions that emerge as they balance their activist role against existing commitments to family, friends, and paid employment. Success in this stage depends on an individual’s ability to build a coherent and socially acceptable identity that includes an ongoing commitment to activism. While I can speculate with some confidence that such rebalancing occurred among members of the Wichita County WCA team, I am unable to provide clear evidence in support of the applicability of this stage of Kieffer’s model.

In conclusion, some of my case study findings are consistent with the applicability of Kieffer's model of empowerment, but I am unable to demonstrate clear support for his model as I can with Ganz' public narrative model. I recommend that future research into the possible applicability of Kieffer's model among less disadvantaged Americans employ greater use of (auto)ethnographic methods to observe changes in real-time rather than attempting, as I have, to observe these changes retrospectively through interviews and document analysis.

Agency – Conclusions

My case study of the Wichita County WCA team demonstrates that solidarity and a sense of purpose are important for sustained civic engagement on groundwater conservation in rural Kansas. I demonstrate that effective leadership, understood as a set of roles that is both relational and distributed (Ganz, 2011), is also important. I find that Ganz' (2011) public narrative model of social action is helpful in understanding the Wichita County WCA team's ability to sustain civic engagement over time. I cannot unambiguously find Kieffer's (1984) three-stage model of empowerment to be helpful and suggest this as an area of further research.

The Wichita County WCA has been successful at conserving groundwater in Wichita County. So far, the direct impacts of the Wichita County WCA on conservation are modest. The indirect impacts are difficult to quantify but appear to be substantial through increased awareness of groundwater conservation, spillover benefits through civic engagement on other community challenges, and influencing the Groundwater Management District 1 board to move forward with a LEMA that mandates additional groundwater conservation.

I identify five key elements in the Wichita County WCA's success: an early focus on teambuilding, diverse stakeholder representation, bringing in an outside facilitator, frequent and respectful community outreach, and partnership with state and local government. I recommend

that others seeking to implement voluntary group conservation of groundwater give thoughtful consideration to how these elements might be applicable in their community.

Chapter 5 - Structure, Culture, and Agency

I now draw on all three lines of research to illustrate the interactions between structure, culture, and agency.

Structure, Agency, and Groundwater Conservation.

Structural Incentives for Conservation

There are powerful collective structural incentives to conserve groundwater. While my quantitative analysis shows that groundwater extraction does not have a statistically significant association with county-level measures of health, education, and income, producers recognize the relationship between groundwater depletion and depopulation. To the extent that producers value their communities, they have a collective structural incentive to conserve groundwater.

Ralph describes the impact that rapid depletion is likely to have in Wichita County:

“What’s it gonna do to the community when all of this, if all of this land is dryland farmed? Do we lose the feedlots, do we lose the hog farms? Like I was tellin’ someone the other day, there’s eight or nine crop insurance agencies in Wichita County. How many of those are necessary if everything’s dryland farmed? How many people are necessary?”

It just – without irrigation – we’re already experiencing population decline in rural areas and without irrigation it’s just gonna be greater.”

While few producers in Groundwater Management District 1 anticipate sustaining widespread irrigation indefinitely, many told me that they hope conserving groundwater now will provide time for producers and their communities to adjust to a future without widespread irrigation. Erik summarizes this line of thought:

“We’ve got [pause] to get that type of valuable [pause] information [on groundwater conservation] [pause] that’s been put together and [long pause] and instill it in our irrigation management and start a reduction. That maybe [pause] you well you all know it’s gonna have an economic impact, but [pause] once again I think you go back to that scenario of: you come out here and you see you’re kinda on the edge. If you taper that off over time [long pause] we as human beings are amazing [smile in voice] at adjusting if we have time to do it and we work with it as we go along. [pause] You could reduce irrigation pretty considerably ...

We think of all ill effects that it could cause but [pause] [clears throat] the positive side of that is dealin’ with that rationally and usin’ that kinda information an’ taperin’ that off over time so as time goes on the economy has time to adjust a little bit and with technology and everything comin’ [smile in voice] we can do more with [pause] the water than we’ve ever done before. [long pause]

And [pause] playin’ that [long pause] that scenario out versus just [pause] we’re just runnin’ headstrong towards a cliff. And I mean when it [pause] when it just completely goes on us, we can only imagine how dramatic the effect that is gonna have on the economies and everything else.”

Some highly depleted regions of Groundwater Management District 1 have an additional structural incentive to conserve in that they might otherwise run out of water for domestic wells and livestock. Erik continues:

“We can’t just live like we’ve lived in the past [pause] because there’s [speaking softly] just a lotta areas where, quite frankly, domestic just [pause] basic survival for [pause] for the towns and [pause] communities and stuff and [pause] houses in the country – I

mean they're just strugglin' to keep water for domestic use for themselves and their livestock, let alone irrigate.

There's areas in our district – and it's just a five county district, so it's not very big but – it's had it has a real effect on [pause] some of the people in our Management District [clears throat] here in this area where they've [pause] [speaking normally now] depleted. They didn't have the amount the volume a' water to begin with and they've depleted to a point that [pause] [speaking softly] it's – it's kinda sad. ...

A lotta people have moved off a' farmsteads and they've done it in this township [pause] which, that's not very many [pause] miles in a township and there's people that's had that effect on their homes here [sadness in voice] [sighs]”

Bob agrees that it is critical to conserve groundwater in order for there to be a future in Groundwater Management District 1:

“[sighs softly] Well, I understand the need for the use but I – I think we've gotta look at the future of this thing and realize that – my family homesteaded out here in the eighteen fifties. Would they have done so if there wasn't any water? No. You know? So, what's different today? Why would you wanna be here if there isn't any water? And we're – seventy percent of Wallace County is in drinking water depletion. It's serious.”

Structural Barriers to Conservation

While there are powerful collective structural incentives to conserve groundwater, individual producers face substantial structural barriers to groundwater conservation due to the economics of agriculture. Relative to dryland acres, irrigated agricultural land is more productive, has higher land values and is subject to increased rents and taxation. Each of these factors provides a structural barrier to an individual producer's decision to reduce irrigation.

Michele describes how economic consolidation and the capital intensiveness of agriculture is a barrier to groundwater conservation, especially among younger and beginning producers:

“I don’t know if this is a direct impact of the water but, you know the farms are getting bigger so we’re in a sense pushing out the smaller farms. And part of that’s just basic economics and supply and demand? But I do see [pause] that the water plays a huge, huge role in that. I did have a conversation – as we were calling different irrigators across the county – I had a conversation with a producer, a younger farmer who said, ‘I’m just getting started, I just spent all of this money on my equipment [pause] and you are telling us that I should voluntarily [chuckles] decrease what I’m using’. He goes ‘I agree with you, we need to do something. This is a moral issue, but from the economic side if I cut [pause] back on my use I’m not ever gonna get back ahead or make back what I spent.’ So, I think that’s the mindset, and it’s already hard enough for younger farmers to get into [pause] into the industry.”

Erik describes how the short-term economic benefits from groundwater pumping force producers to make difficult choices:

“Somebody actually told me - this is true, I’m not makin’ it up - when we were talkin’ about the [GMD1 district-wide] LEMA [in 2014] [pause] This one might be my best story. [laughs] It’s not funny but it is [laughter in voice]. I have to laugh so I don’t cry, but I was talkin’ to an irrigator who I felt just wasn’t gettin’ it ... I said, ‘you know [long pause] ‘eh which is more important to you your drinking water, or your irrigation well?’ [pause] and he’s [pause] a little younger than me, but he has a son that had just graduated from Kansas State [pause] probably five or six, seven years ago, and he’s comin’ back to help on the family farm. [Pause] [sighs] and I ask him that question because he was one of them

that was really against any reduction at all. And he said ‘well I’d have to say right now it’s irrigation because my son’s comin’ back and I want him to be able to do all the things that my family’s done’ ...

And I says ‘seriously? You stop and think about that. Is that more important than your drinking water?’ Because his mother lives about two miles from the irrigation well and they had to drill a new well about three quarters of a mile from their house because their house well went dry ...

And he said ‘yeah, it really is. Because my son I want him to enjoy irrigation like I have and my family have.’ And I said, ‘well at what point does drinking water become more important than irrigation?’ And he said, ‘well I guess if it came right down to it, I could move to town for my drinking water.’”

For the individual in this anecdote, enabling his son to come back to the farm was more important than his family having access to drinking water in rural areas. Erik struggles to reconcile the tension between his awareness of the urgency to conserve groundwater and the structural economic forces that compel him to continue irrigating. He continues:

“But [pause] to think that you could think - to me that’s – I can’t go there. I can’t think about that because I’d – if you ask me that question: drinking water? I’d shut that irrigation well off tomorrow if somebody tells me we’re gonna be outta drinkin’ water. But that’s where we’re headed. And I probably won’t shut that well off tomorrow, but somehow, we have to.”

While these structural barriers to conservation are important, they are not entirely deterministic of producers’ decisions. The most poignant example of this is a family in Wallace

County that decided to convert entirely to dryland as a lower external input, lower economic risk method of farming. Francis and Tommy describe their success in a manner consistent with moving off of a treadmill of production (Cochrane 2003; Schnaiberg 1980) through repeasantization (van der Ploeg, 2008):

Tommy: “As far as the economics of [dryland], we have a lot we have less risk in some ways than an irrigated farmer. We spend a lot less money growin’ the uh dryland corn than if we irrigated. [Pause] Now a mistake some people make if you look at it the standpoint of economics, they spend too much money growin’ their dryland corn. A lot of ‘em have been irrigators and they think in terms of ‘you gotta make over a hundred bushels to the acre in order to make any money’ And [when] we made the switch ... the way I analyzed it economically was ‘[dryland corn] needs to make five to seven bushels to the acre more than wheat’ because we were gonna spend the same amount of money growin’ a crop a’ corn as a crop a’ wheat.”

Francis: “And that’s what the mentality is if there’s no irrigation Western Kansas won’t exist. Well we’ve done pretty well I think for past twenty – what is it? – twenty-five years almost? Twenty years anyway. But I think a lot of it [pause] there’s a lotta money ... in irrigation that goes like this [circular gesture] and I think they think that if you don’t have that money that you [pause] won’t be able to survive. But I think you have to [pause] I guess [sighs] [pause] think about what [sighs] how much you end up with.”

Tommy: “And we end up with – after we quit irrigating, we ended up with about the same amount of cash that we did when we irrigated .”

Francis and Tommy go on to explain how they were able to transition to dryland farming without expanding their farm size:

Francis: “*They don't have to be huge! That's the – that's the thing I can't understand!”*

Tommy: “*Yeah, I think they – they wanna have the same dollars.”*

Francis: “*Yeah.*”

Tommy: “*They're not – I think that's the myth is that you have to have the same dollars but you're not spendin' the same dollars.”*

Francis: “*It's what you have left over that counts.*”

Tommy argues that the most important requirement for transitioning to dryland farming is to begin early:

“You need to figure – if you do it right – you think twenty years in advance. You make the transition in twenty years. And for most people [in Wallace County] it's already too late. but you set your spending plan, how you're gonna transition out, for a twenty year period and it doesn't cost you anything then. You're learning, you're not investing unnecessarily on irrigation equipment. If some 'in' breaks [pause] that's a hint that maybe you oughta start thinking about quitting. If your sprinkler turns over in a storm, take the insurance money and run. Things like that. If your well needs to be redone, forget it.”

While producers may manage a fairly painless transition to dryland farming with a twenty-year timeline, a widespread transition to lower-input, lower-output agriculture is anticipated to be harmful to towns, primarily due to a reduction in available jobs among input dealers, hired farmhands, and feedlot employees. Gerald, a producer in southwest Kansas, describes the disproportionate impact that a transition to dryland farming would have on towns:

“If I lost all my irrigation, I could get rid of half my equipment and still have too much equipment for my farm. If I got rid of all my irrigation, I could do it all with half or a third of the equipment. So, all of the equipment dealers would go out [of business] and they employ [pause] thousands of people in this community [of Garden City]. On that side of town. I mean, one business alone – American Implement – they’re several hundred people that work in that one place. Hydro Resources, you know, they employ [a] hundred plus people. Every one of them trickle down to other businesses in town. So, I think that’s the biggest thing we – we don’t know how it’s going to affect the economy when it happens. It’s gonna probably affect the farmers less than it’s gonna affect the people in town, to be honest with you. If you can believe that. But I really do believe that.

Another structural barrier to groundwater conservation is the disproportionate impact that large irrigators and absentee landowners have on groundwater management. Randy estimates that the largest 5 irrigators control approximately 75% of the groundwater in Wichita County:

“A WCA that is just my farm would probably constitute [long pause] oh, I don’t know [pause] the total amount of water pumped [on my family’s operation] [pause] may be as much as ten to fifteen percent of all the water pumped in Wichita County. [I have] thirty wells and I think there’s [pause] mm [pause] I’m not sure of the numbers. I guess I was thinkin’ like three hundred wells in Wichita County. And it would take [pause] you know it would really just take about [pause] uh [pause] maybe – maybe [pause] five to six individual [farm families] to constitute seventy-five percent of it. Sort of the [pause] sixty-forty rule or eighty-twenty [rule].”

Gerald suggests that large producers like himself have more inherent flexibilities than smaller producers which makes groundwater conservation both easier and less urgent for larger producers:

“The big guys, it seems like none of us really care. We figure if we take a fifteen percent or twenty percent cut it’s not gonna make any difference. If we’ve got flexibilities that we can continue to pump historical use out of these wells and then I shut off these five wells over here that are pumping three hundred gallon because of property taxes and equipment repair and everything. Well, we’re gonna keep pumpin if we can but if we have to reduce it won’t be that big a deal to let those five quarters, you know, just go to dryland and we’ll save that water and pump it over here.”

You know, even though we’re not increasing our use we’re just able to maintain our way of life the way we’ve always irrigated and not stress [about] anything. And so, we thought ‘well it’s not really gonna matter what happens, but when you do [pause] your cutting the ... [little] guys just don’t have flexibility when they have very few options.

You know if you got five cars sittin’ in the shed and they say ‘[we’re] gonna reduce our carbon footprint, and you gotta get rid of four cars’ The guy with one car’s like ‘well I gotta get rid of three fourths of my car or what?’ [chuckles] He can’t even drive, you know what I’m sayin’? It’s harder to make it work when you don’t have as much to work with.”

The Wichita County WCA team estimates that out of 72 farming families actively irrigating, the “big 7” families control the majority of the groundwater. Valerie describes the Wichita County WCA team’s strategy:

“We had to decide [long pause] if we were going to approach [long pause] what we called the ‘Big Seven?’ And those are the biggest irrigators in the county. And like for me it’s our extended family ... So [sighs softly] surprisingly to my family, we were included in the Big Seven. And we don’t see ourselves as a big farm, as big irrigators. So then it was like ‘Well who else are the big irrigators?’ Well the other six are bigger than we are. But we’re still in that number. And so, once the WCA group decided to [pause] target the Big Seven, that was a big decision. You know, ‘cause we were like ‘If we get them, everybody else will follow.’

And [pause] well we haven’t succeeded in getting all the Big Seven yet [laughter in voice]. But you know, we’re still working on it. But the idea was we had to decide ‘Do we go after these big irrigators, or do we just, you know, try to target the whole county, no matter how much irrigated land they have?’ And so, at one point it was, you know, we have to make sure we make phone calls to the Big Seven or we send the emails or we do extra to try to get them on board.

So, I think throughout the course of the two years or whatever we’ve had in-person meetings with all of them. We’ve had phone call conversations; we’ve encouraged them as much as we can to attend the public meetings. And [pause] I think that was a very key thing even if they’re not in the WCA, they’re now thinking about water conservation. And maybe they’re not thinking very hard about it, but like even with this LEMA meeting today – one of them was there. And they were askin’ the most questions. So, we’ve got them a little bit further down the road than they might have been had we not tried to give them more information about the WCA so many times.

And they know they have the option of a WCA now, if they don't like what the LEMA is proposing. So, if they haven't understood over this whole course what water conservation is about, they've sure had a lotta opportunities to understand. It's just that maybe they don't weren't ready or they don't want to."

As Valerie notes, the influence of large irrigators on conservation could be used to further groundwater conservation. Her family is an example of this approach. Of the Big Seven, three are heavily involved in groundwater conservation through the Wichita County WCA, while an additional two have entered small portions of their land as a sort of trial run. One of the later has since established their own WCA, inspired in part by the Wichita County WCA but with less stringent cuts to their pumping.

Glenn acknowledges the struggle that Valerie and her family have faced as they've become involved in groundwater conservation through the Wichita County WCA. However, he goes on to note that many large producers across Kansas are becoming increasingly disconnected from their communities:

"We have a huge problem. Every rural community I'm in the Ag players that are successful [pause] have consolidated the money in a few hands. They aren't at the public square, they aren't elected leaders, they don't want exposure, they don't want risk and they don't play. Somebody needs to convene those people statewide [pause] and get them talking about the future of their communities where these large businesses operate."

Glenn sees the influence of large producers as part of an ongoing concentration of wealth and power within agricultural economy drives depopulation and harms area communities:

“The challenge when I look at long-term [pause] the unknown, honestly is what’s this new economy? [Pause] The ag economy as we know it is literally killing us [pause] because the technology and the big operators are shrinking the population the wealth is contained in a few hands those hands aren’t at the public square – they aren’t shaping public policy; they aren’t contributing to the community. [Pause] So that whole phenomenon is at the diminishment [pause] of population and the separation of wealth from leadership.”

Absentee landowners are another barrier to groundwater conservation, as their disconnection from the land and the community leads many to demand maximum returns from the producers who rent from them regardless of the impact this has on groundwater decline. Erik provides an example the challenge:

“You know, we ran into that when we were talkin’ about [pause] the enhanced management area. [pause] We had a guy that owns the land [pause] [who] has a way different perspective than the guy that’s rentin’ it. The guy that’s rentin’ it is dealin’ with a non-resident landlord maybe who could care less if he pumps less water. [pause] And in some cases that would mean we’re gonna reduce your yield some to compensate, but from the conservation aspect that would be a good thing. [pause] But [pause] his landlord who is non-resident, doesn’t live here. He doesn’t care. He wants everything he [laughter in voice] you know it’s – it’s just human nature.”

Glenn describes heated conversations that he’s had with extended family members who are absentee landlords:

“They have all the money they need. They’re taking money from two-hundred bushel corn that’s raping the land. They don’t give a damn about what’s going on out here. That’s the

picture of all of rural America. The twenty-five counties that I worked in it was normal that more than fifty percent of the land in those counties are owned by people who do not live there. Huge problem. ... So, what do you have running the county? [Pause] Renters. They don't even own the place. Cowboys and renters. [pause] Same thing here, basically. ... And I said 'Why?' I said 'Do y'all know where – where this is goin'? Are you okay with just takin' money off the top that doesn't come back to the church, doesn't come back to the community? You don't shop on main street. If all we have is people like you – they're killing a community, have you ever thought of that?' Well they hadn't – didn't wanna think about it."

Gilbert agrees that absentee landlords are most often a barrier to local groundwater conservation, but he is careful to note that some are more connected to the community than others:

"I have a landlord and actually she's my aunt. She owns a quarter with a well on it on the section that that her dad bought. It would have been her dad that homesteaded it. And my brother also lives on that section. And she doesn't live here, she lives in Missouri. She understands what we're doing – the basics of it, but not the day to day details of it. So, when I called her to talk about this this WCA I told her upfront I said, 'there's a lot to this and it's kind of confusing, but I'll try to give you the short version of it.' And in about two minutes I explained to her what it was about and what we were trying to accomplish. And when she first spoke, she said 'well, [pause] probably initially it's going to cost some money out of my pocket from my income, right?' And I said 'yeah'. But she said – my brother lives on that section – and she said: 'If we don't accomplish anything other than saving that water so he always has drinking water that's what this is about.' She said,

'send me the paperwork and I'll sign it.' So that was huge to me, and to take a lady that's eighty-five years old that's not hands on day-to-day, to look past her pocketbook and look towards again the future generations, I thought was huge.

Now on what I would consider to be on the negative side, I've heard of others that have talked to their landlords - maybe they weren't relatives - and they've said 'pump it all out, I don't care. I'm never going to live there. I don't care what happens there.' And I think all they're looking at is their pocketbook

I think it's nearly sixty percent of the landowners in this in [Wichita] county ... that are non-resident landowners. And as that goes further down the generations, they become less attached to the land. We have a couple of landlords that if they drove here to Leoti today, I don't think could find their farm. We'd have to pick 'em up and take 'em and show 'em their farm because they don't know where it's at. And [sighs] we're about to skip into another generation. I don't know if they could find Leoti without a roadmap. So, they become less and less attached."

Later on, Gilbert provides a second example of an absentee landlord who is actively facilitating conservation on their properties:

"One of my favorite [stories] is the one I told about my Aunt – just that she could see past the short term financial gain. And I'll tell you she's not a lady that has a lot, and yet sees the water as being more important than money. I think there are several stories like that around. ...

Before this WCA ever started [one absentee landlord] told the guys farmin' his land that he wanted to see this last for his children and their children. ... He just said, 'I don't care

whether there's a water conservation effort or not, I wanna take my farm – you as the farmer to take my farm down to pumping no more than one acre-foot a year.' Which is actually a little under the WCA requirements on that farm, but I think he's going to sign it up for the WCA."

From these anecdotes, it appears that the absentee landowners who are willing to sacrifice rental income in order to conserve groundwater are rare and noteworthy. Some, like Gilbert's aunt, have family connections to the property. Others, like the second landlord Gilbert mentions, may not have family operating their property, but instead see the land as an asset that they want to maintain for their own heirs to benefit from.

Culture, Agency, and Groundwater Conservation

My path analysis model demonstrates that variations in cultural values, beliefs and norms of producers do a poor job of explaining who is civically engaged in groundwater conservation. However, the survey findings and interviews with producers demonstrate that these cultural aspects have important influences on producers' individual and collective decisions to conserve groundwater. Successful voluntary group conservation efforts must balance between competing values, and the effort of arriving at a suitable balance is the major cultural barrier to civic engagement.

Cultural Incentives for Groundwater Conservation.

Cultural incentives for groundwater conservation include values of stewardship, community, fairness, and personal responsibility. Producers shared varied definitions of stewardship, but they all include a sense of being accountable for the legacy they leave to the next generation by how they choose to manage their land and water. Todd describes stewardship as being unselfish and leaving a legacy for future generations:

“I would be very selfish just to ... I think it's a selfish attitude to think that that I own all that water under me even though I have the right to pump it. Because if we pump all that water away [pause] the community will – will die. You know, eventually the area would be really adversely affected. Future generations wouldn't be able to benefit from what I have. I hope to leave it in better shape than what was given to me. And that's almost impossible when we look at how much water is left in there, but hopefully I can leave more years' worth of water than if I hadn't [pause] done anything to try to help.”

Sandy describes how producers' identity as stewards is tied to providing food, a mission that is threatened by aquifer depletion:

“I think also if you completely deplete the water out here, there'll be no farming and most farmers are [pause] committed to producing food. So, if you're not producing food then just – then you've really failed at your mission.”

Michelle describes how producers attempt to balance between cultural value of community and their desire to continue working the land in the context of structural constraints:

“I think [pause] we're missing out on a lot if we think 'if we only use what's left to irrigate and just put the money in our pockets, we'll be fine' because you really can't have ... I would imagine it would be difficult to [pause] live in a place where you only have your job and be okay with the rest of the community – the businesses, the other key facilities and industries in the community just going away because you wanted to use all the water to make a dollar. [Pause]

And on the other side, I understand the draw of [pause] working on the land and [pause] being place attached and connected with that land. I think that's been an interesting thing in this whole process [being on the Wichita County WCA team] knowing I'm not an

irrigator, I'm not originally from here. [chuckles] But I also see that I can be connected to this place. And I wanna be connected to this place, but it's hard without that key natural resource.”

Ralph talks about how he values the rural lifestyle and wants to conserve groundwater in order to preserve opportunities for others to live in Wichita County:

“I was born and raised here. I enjoy the rural life. I don't wanna go live in the city. And I don't want anybody else to feel like that's the only opportunity. Because I think if we [pause] take some steps to [pause] slow that groundwater depletion, to allow it to be used for a longer time horizon, that we can maybe slow that population decline. Maybe some technology will come along and more people will decide that the rural lifestyle is of more interest to them than living in the city, too.”

Gilbert describes how his motivation for involvement in the Wichita County WCA is based on his desire to leave a positive legacy (values of stewardship and community) and meet the obligations he feels to the intergenerational family farm project (values of responsibility and fairness):

“Well, the motivation in my mind is the fact that every day we don't conserve water, we're getting closer to the end of it. And then my personal motivation is to pass on what was passed to me to the next several generations, with the thought that they'll do the same thing. And it again will be part of our family farm that is a way for us to extend our family and make a living in agriculture.

It's becoming less and less about me all the time, because I've been in it and I'm getting to the age where I'm going. I hope I farm 'till I'm ninety, but the truth is it's less and less

about me every day and its more and more about my kids and their kids and the future generations.”

Erik demonstrates how several cultural values are threatened by groundwater depletion:

“We had a person at one of our meetings [pause] that spoke up and [clears throat] it was in Wichita County. And I hadn’t no idea who the guy was. [speaking softly] A gentleman with three ladies with him and he spoke about havin’ to move [speaking normally again] to town to get a water source. And they moved off their homestead, or the ground that was homesteaded by some of their family members generations before [pause] [clears throat]

They lived there all that time [pause] and they were not in an area where they – they were just on the fringe of irrigation. Their ground was never developed but [pause] through I’m sure the direct [speaking quietly, waver in voice] result of irrigation in that area, they lost their house well. [Speaking normally again] Anyway after the meeting, he had a real heartfelt [very long pause, holding back tears] comment [voice cracks] [pause] to try to get across to people how that had affected them.

And then [pause] somebody said afterward [long pause] I don’t know –yeah, after we’d kinda [been] taking comments, there had been some conversation different – a lotta different people [long pause] about [pause] how it might affect them and how it had affected them and what their thoughts were as far as [pause] tryin’ to reduce use, but [pause] the comment was made by one person that that [pause] that that guy that made that comment earlier was pretty radical

And I [laughter in voice] said ‘you know, that guy’s not radical he’s a realist!’ And there’s a difference. I mean, you put yourself in his position: he moved off of a [pause]

ground that was in their family for generations and they could no longer even get a house well. [Pause] It wasn't cost effective I'm sure to try to go buy a water right somewhere or get some water and pump it X amount of miles.

And they were just a dryland farm anyway. And [pause] I think there's a lotta people who think ... 'well they don't irrigate so they don't understand' but [pause] yeah it affects us all the same, eventually will . But I – I just couldn't help but [long pause] I guess have [pause] a warm spot for that guy thinkin' what they have given up just for the sake a' someone else so they could [pause] pump some water out there and they could maybe raise a few bushels more a' crop or whatever they done. I don't know what [their] irrigation practices were but [pause] they do affect [pause] some people pretty drastically.”

Erik's story demonstrates how groundwater depletion threatens values of community, fairness, and personal responsibility. The value Erik places on community is demonstrated by his sadness and empathy for the family who was forced to leave their home when their well ran dry. Further evidence of the value of community is Erik's focus on how depletion impacts everyone, including dryland producers. Furthermore, that the harmed family were dryland producers who never benefited from irrigation goes against the value of fairness. The value of personal responsibility is threatened in this situation because the irrigators are not (and legally cannot be) held responsible for their choices that caused the dryland producers such harm.

Cultural Barriers to Groundwater Conservation.

While producers frequently explained their motivations for personal and group efforts to conserve groundwater using the values of stewardship, community, fairness, and responsibility, the latter three values were also invoked as barriers to group conservation efforts.

Randy, a producer in Wichita County, invokes the value of community in describing how the local economy would suffer and the towns depopulate if irrigation ceased:

“The reduction in [pause] GNP or you know what the [pause] what the land [pause] generates and provides to the economy is gone. I don’t know it [pause] for sure it’d be half or two thirds. You get a lot of rid of a lot of industry and a lotta [pause] lotta jobs and a lotta people when you’re not pumpin’ water so [very long pause] so I don’t think anybody’s willing to do that.”

Francis feels constrained from taking action to address his neighbors’ irrigation practices by the cultural norm of neighborliness, rooted in the value he places on community life. When I asked how he deals with the knowledge that his area is moving rapidly towards aquifer depletion, Francis describes a sense of helplessness.

“Basically, you just cry. [laughs] I don’t know how you deal with it. And you know you wanna do somethin’ about it, but anything you do is not neighborly, because theoretically if we would [long pause] if we wanted to make a beef about it we could try out the water law. But is that neighborly? [Pause] To say, you know? And I don’t even know if it would fly. I don’t wanna go there. I don’t think you should have to; I think people should have enough common sense to [pause] be worried about their grandchildren [hint of anger/frustration in voice]. Yeah, I don’t – I don’t think it’s a good practice to make your neighbors mad – intentionally make your neighbors mad. But we talk about it a lot.”

Gerald, a producer in Southwest Kansas who was involved in an attempt to form a local LEMA, draws on the value of community as he describes his concerns over the impact pumping reductions would have on Garden City:

“If we’d have been dry all summer and a hundred and five [degrees] and everybody said ‘let’s cut thirty percent of our water use’ [pause] everybody’s like ‘well we might as well just quit farmin’, you know? We’ll just completely shut all the irrigation down and plug the wells because everything’s gonna be toast out here. If you do that [pause] the co-op’s gonna collapse, all your implement dealers aren’t gonna sell anything, and all these people are gonna lose their jobs and then [pause] all the new development on the east side of town is not gonna get any income. So that’s the problem and I don’t have a good answer for you [laughs]”

Gerald goes on to invoke the value of fairness in describing how difficult it is to think about how groundwater conservation would work without unfairly helping some while harming others:

“We all wanna save [groundwater] we just don’t know how to do it and not affect everybody. And I don’t think too many farmers [pause] really [pause] if the whole area had to shut down – I’m talkin’ the whole western half of the state – we wouldn’t like it but it wouldn’t be as big a deal if everybody had to do it. ...

But [pause] our problem is we don’t know [pause] if you start shuttin’ down areas, then you’re puttin’ people at such disadvantages to their neighbors, you know? And even [if] Kansas shuts down, well you’re disadvantaged to Nebraska and Oklahoma. So [pause] I don’t know. We don’t know what to do. It’s our livelihood [laughs]”

Warren and Sandy, who farm in Wichita County and are enrolled in the Wichita County WCA, suggest that a common barrier to conservation is the belief that producers who choose not to pump groundwater will simply lose it to someone else – an outcome that would infringe on the values of fairness and personal responsibility by enabling others to free-ride:

Sandy: *Yeah, some of the arguments that you hear against cutting back voluntarily are: 'If I don't use it, somebody else will.'*

Warren: *Or, 'I would like to sign up for your WCA, but man my neighbors don't [want to]. They're gonna be using my water.'*

Sandy: *Yeah.*

Warren: *That's what we hear quite a bit.*

Sandy's response to these concerns is to encourage producers to focus instead on values of stewardship and the legacy they can leave to their children by choosing to conserve groundwater:

Sandy: *So, the answer to me, to those comments are, you know, 'if you don't use it, somebody else will, but perhaps it will be your son.'*

Warren: *Yeah.*

Sandy: *'Or your granddaughter who has the opportunity to use that water.'*

In addition to values, fear and grief are substantial cultural barriers to groundwater conservation. Both emotions are tied to producers' identities. Cultural pride in one's identity as a producer interacts with the structural insecurity of agricultural economy to make many producers afraid that changing their irrigation practices could lead to them losing the farm. Among those producers who do decide to reduce or refrain from irrigating, there is often a sense of grief in abandoning a part of their identity as irrigators – an identity which is typically shared with their fathers and grandfathers.

Michele describes how fear prevents many producers from committing to conserve groundwater on their farms:

“I think [pause] it’s a hard thing to step away from what’s [pause] made folks ...I’ll say a lot of money, understanding that looks differently for [different operations]. But having a pretty [pause] maybe self-reliant or self-sustaining economy, because you irrigate your corn and you know you have a market because Cargill or the other ... feed lots need that corn. And so that’s [pause] it’s hard to walk away from money knowing that [pause] that the money source might not always be there.”

Ralph agrees:

“I think what we don’t know, we don’t know is the most dangerous thing. ... and that’s probably another thing that keeps people from – from [pause] changing. Because they don’t know what the future holds. And [pause] they feel like the opportunity to use water is there today, and so they gotta use it today. Because who knows what might happen tomorrow?”

While none of the producers that I interviewed remembered the dust bowl of the 1930s, most of them grew up with family stories of loss and devastation. The older producers remember the extreme drought of the 1950s, which would have made dust bowl stories feel all the more immediate and threatening. Phillip suggests that the trauma many producers’ families experienced during the dust-bowl contributes to anxieties about limiting irrigation:

“I think people [outside the region] forget that [pause] the area we’re talkin’ about was the dust bowl back in the thirties. I mean, this area was devastated, had massive population loss. People, you know, it’s just a – it was a really tough condition. And when we had the technology and discovered the extent of the [groundwater] resource, it was a way to put this part of the country back on its feet ‘n make it kind of useful and inhabitable again. And just out of – you know, technological ignorance, you didn’t really

understand that the resource was all that limited, that it initially it looked like it was unlimited. And so, we, [pause] you know, we overdeveloped it. We got very comfortable with the [pause] production that it brought around and it was really hard to change that style when we started to see the depletion coming on. [long pause] I'm not at all against using the resource [pause] but I am – I guess I have enough of a conservation mindset [that] I wanna use it judiciously and try to extend it for as long as we can. 'cause I do want other generations to be able to have the same benefits that we've had."

Kerry explains how the fear producers face is directly tied to their identity as providers and to the value they place on personal responsibility and stewardship as leaving an intergenerational legacy. Notably, Kerry describes the value of legacy as encompassing commitments to ancestors as well as to descendants:

"I think [it is difficult to begin conserving] because of fear of the unknown ... you know, farming isn't just a – it's not just a business for these people. It's a lifestyle. A lot of these people are third, fourth, fifth generation, right? And nope, you don't wanna be the one in your family [speaking softly] who went bankrupt and lost the farm. You had to sell the farm. Because you've disappointed your father and your grandfather - you know. And so, there's pressure there with that."

Kerry goes on to describe how the Wichita County WCA team has exercised agency by reframing the narrative to emphasize how groundwater depletion is also a threat to the values of personal responsibility and stewardship as leaving an intergenerational legacy:

"What we've tried to encourage [is the recognition that] you also don't wanna be the one who's the last one because it's not feasible for your children and grandchildren to take over because a' how you farmed. ... There's a lotta pressure, you know, because you

have the weight of supporting your family but also just the expectations of different generations. Whether it's – whether it's realistic or not, I think a lot of the [pause] [speaking softly] farmers feel that. [speaking normally again] And I recognize that because, I mean, I'm not even farming our ground anymore but I still feel [emotion in voice] responsibility for it, you know?"

The decision to reduce irrigating may be a source of grief for producers who are giving up a valued part of their identity, often an identity that's been passed down through generations. Glenn describes the transition away from dryland farming as a process of grieving:

"I had a tenant who was a good friend of mine from high school loved to farm, loved to irrigate, loved corn. Took me five years to convince Marcus to shut off the water and that was ten years ago and our well was about three hundred gallon [per minute]. And people with a three hundred gallon well were still thinking 'Oh! I'm 'a still irrigate!' And I'm sayin' 'It was two thousand gallons when we drilled it. And you're okay still watering? Where the hell do you think this is going?' [pause]

And Marcus would say 'Glenn, I love to farm. I love to irrigate'. So literally he had to go through a five year grieving process. I mean, I came to understand what I was dealin' with was grief ... So, I had to spend five years sayin' to Marcus 'Marcus, I think we need to shut this off. I think we'll be okay actually. Look at what we're wasting in water for nothing in terms of production.' And we had a couple 'a terrible drought years [pause] so he shut it off."

Ralph concurs, adding that grief is commonly encountered even among producers who make a temporary commitment to reduce their irrigation:

“I guess [my relationship with groundwater] could be kinda complicated. You know, ‘cause I’m an irrigator. [Pause] I sell corn seed to a lot of other irrigators. And an interesting fact is that my great grandfather actually drilled the first irrigation well in Wichita county . So that’s – that’s kind of [pause] it’s in your blood.

It’s in all these guys’ blood, [smile in voice] that irrigatin’. ... The gal at NRCS told me – when I enrolled the well in the EQIP program to go to dryland – [pause] she told me – you know, I’m struggling with the decision and she said ‘Everybody that’s ever enrolled in this program struggles with the decision.’ She says ‘Ralph, it’s almost like [pause] I was asking ‘em for their firstborn child’ [voice gets softer] You know, because it’s just - it’s just a part of your life [emotion in voice]”

Voluntary group efforts such as the Wichita County WCA may be particularly effective in helping producers work through emotions of fear and grief by providing solidarity and a communal sense of meaning and purpose. Kerry describes how the Wichita County WCA provided team members with this support:

“But there is a [pause] it’s interesting, we talked about kind of a grieving pro- almost like losing [pause] [speaking softly] You know, when you when you lose a – a loved one? Yeah, one of the guys who had shut down the wells, he said it’s ‘there’s a grieving process because it’s not the way it used to be. There’s a new normal now’ [chuckles] You know? And there’s gonna be a new normal for these people. That’s the scary thing. So that’s part of it. ...

And it helped that one of the men on the team [pause] he and his – I think a brother or family member – someone he’d been workin’ with had already shut – they’ve gone totally dryland and had to work through that themselves. But it made it possible for us to

talk about that with others as well. But yeah, we addressed that quite a bit. We really did. So, his experience helped with that. And I think maybe [pause] maybe having somebody from outside the area, outside the group [as a facilitator] might have helped a little – I don't know – with that.”

In conversations with the Wichita County WCA team, Kerry helped reframe the narrative of loss to focus on the shared values of stewardship to help team members cope with the grief of changing aspects of their way of life. Kerry continues:

“There were some aspects [smile in voice] of my ministry role that did help with that. And looking at it from a stewardship perspective is really what this is about. How do we be good stewards of this land? This resource? Because that's really what the water is. It's a resource. But it's not an unlimited resource.”

Barriers to civic engagement

Lack of time.

Among the biggest barriers to civic engagement on groundwater conservation is the amount of time required. Erik describes how many producers aren't willing or able to volunteer enough of their time to become civically engaged on groundwater:

“I think quite frankly, part of [the problem] is a lot of people don't wanna take the time to get involved. Which is fine, I understand that. I've been involved long enough that I've actually tried to talk to other people – talk other people into takin' that position [on the Groundwater Management District 1 Board]. [sighs] [pause] so they [pause] they could [have access] to the kinda information that I've had just by serving in that capacity.”

Furthermore, producers must have sufficient motivation to overcome the initial learning curve and have the patience and persistence to figure out the best approach to conservation. Erik continues:

“As I got involved, initially like anything you get involved with there was a pretty big learning curve. But the more involved I got and the more information I got and research I’d done and was involved in, you realize we really can make a difference. We really can. [laughter in voice] And it’s just tryin’ to figure out the right avenue the right [pause] the right approach [pause] There is just so much information – and I alluded it to it earlier – that a lotta people just don’t get because maybe they aren’t [pause] [sighs] [pause] quite as involved or they don’t do the research. And I wouldn’t have either if I weren’t involved in a groundwater board. A lot of the information would have [pause] just been floatin’ around out there. ...

So just the education I’ve gained from it, the knowledge I’ve gained, has been – it’s just invaluable to me. And I just picked it up from volunteerin’ my time and bein’ involved. But [pause] there’s just a wealth of knowledge there that I’ve just [pause] [been] able to absorb over time that I sure wouldn’t have if I hadn’t have been involved.”

Todd, a Wichita County WCA team member, is amazed by the motivation that his team had to dedicate so much time to develop their conservation plan:

“Everybody on that committee that that tried to start this, we’ve put in hundreds of hours. I mean, it was incredible to see the motivation that they had too!”

As the main structural barrier to participation in voluntary group conservation efforts, I recommend that policymakers provide support to producers in order to reduce the time commitment as much as practical.

Difficulty balancing between competing values.

Another major barrier to civic engagement is the difficulty of balancing between competing values in developing a groundwater conservation plan.

Gerald describes the difficulties voluntary group conservation efforts have in arriving at a fair solution that conserves groundwater:

“We’re tryin’ to make it fair to where one person isn’t getting all the cuts. Cause if you just make the big guys take the cuts then that’s not fair either. Because what did they do wrong? We’ve never – the hardest thing is not one of these people that are pumping out here – I mean there’s an isolated few – but they’ve never broken a rule. You know, that’s the biggest thing. So, we don’t wanna penalize anybody for using their right to the fullest extent, even though I’ve – only a couple years have I ever pumped my allocation, my water right. I’ve never pumped the whole amount except for a year or two in the horrible drought and that was only on a few wells.

There’s guys that do it every year; they pump a hundred percent of their water every year. Even though I don’t agree with it, I can’t hold it against them really because that’s their right. I mean that’s permitted under their permit. So, they’re just using what they’re permitted for. So [pause] we – that’s our struggle. We’re tryin’ to make it so everybody takes an equal cut without being unfair to one side or the other, but then on the other hand everybody knows the reason we’re in this position is because people have pumped more water than is available. So, do you put more of that burden on the people that have pumped more water? Even though they didn’t break any rules? You see what I’m sayin’? You have a bowl a’ skittles an’ you say ‘take all you want’ and one guy eats three fourths of it and one guy eats a fourth of it and then you’re down to one skittle and – who gets the

last skittle? You know? Well, we said eat all you want! Do you cut it in half or do you give it to the guy that only ate a fourth? You know, which way is fair? So, it's an impossible situation. That's why nothing – I mean that's why we're moving forward slowly? Because we don't know the right answer. And I don't think anybody can really tell us what the right answer is.”

Gerald's story shows tensions between the values of stewardship and community on one hand and fairness and personal responsibility on the other. While the values of stewardship and community weigh on the side of significant groundwater conservation, his team is unable to come up with a plan that meets their commitments to fairness and personal responsibility. They are torn between valuing fairness as proportionality (giving the skittle to the person who took less to begin with) and valuing personal responsibility (splitting the skittle, because nobody broke the rules).

Like Gerald, Michele emphasizes that writing a voluntary group conservation plan requires taking time to listen to people's concerns and identify the deeper values that might enable the team to find common ground:

“I think [an important thing to do is] spending the time listening and learning the concerns someone can say ‘I'm absolutely not gonna [pause] stop irrigating. This is my land, this is my water’, but I think if we take the time to hear and dig deeper on the reasons why it's fear and fear of change or fear of loss is something that's probably driving that. ... Yeah, it's not gonna be quick, but taking that time to really connect with people on the reason why is important.”

Ralph emphasizes the emotional labor necessary to successfully balance competing values and arrive at a satisfactory voluntary group conservation plan:

“The discussions about water are [pause] emotional. And because of that there’s differences in opinion and in stuff like that. And [pause] there’s just a lotta work goes into a project like that that [speaking quieter, feeling in voice] [pause] unless you’re in the room, you never know about. Because even when it’s – when you’re outside of the room – or at least myself – I think about it all the time in between when we were meeting and things like that. And you know, there was times where I thought [pause] we were never gonna be successful at even getting the management plan completed. And if it’s difficult to get ten people to agree on something, it’s exponentially more difficult to get [pause] eighty, ninety, a hundred – however many irrigators there are that are qualified to participate in [the Wichita County WCA] to agree with it, you know? That’s kind of the overall [pause] how a process goes, I guess.”

I recommend that policy-makers support producers to identify and bring in outside facilitators to help them through the process of balancing competing values in developing conservation plans.

Factors supporting civic engagement in Wichita County

There are at least three factors in Wichita County that serve to encourage civic engagement on groundwater conservation. First, Wichita County has only one town, Leoti, that is the center of community life. On the one hand, this encourages civic engagement because everyone in Wichita County is part of the same schools, hospitals, and civic-life. On the other hand, this avoids the potential barrier to collective action that inter-town rivalry presents in places such as Haskell County, with its competing towns of Santana and Sublette (Williams and Bloomquest, 1997).

Second, Wichita County is on a timeline for depletion that favors action. Cody and colleagues (2015) found that civic engagement is encouraged when the time until depletion is soon enough to discourage procrastination without being so soon that action seems pointless.

Without conservation, Wichita County has enough groundwater remaining to allow approximately 25 more years of irrigated agriculture (Barfield, 2020). Procrastination is discouraged by the expectation that younger producers and the heirs of older producers will still be farming in 25 years. Erik describes how the aquifer depletion in Wichita County has been severe enough over time to motivate some producers there to take action:

“[Conservation has] been a real hard sell up here [in the part of Wallace County that he farms] [pause] because we sit in a pretty good area. Some other areas [like Wichita County] where [pause] they’ve dealt with it for the last twenty years and the decline’s just been [pause] really eatin’ away at ‘em, you know, those people are [pause] they’re steppin’ up sayin’ ‘wow we do need to do some’n’.”

On the other hand, despair is discouraged in Wichita County because 25 years is distant enough that producers have time for civic engagement to change the depletion trajectory before they become locked in economically by the 10-year capital depreciation schedule. Dean, a producer in Southwest Kansas highlights the salience of depreciation to groundwater conservation planning:

“If something happens, we need a [pause] long-term plan because everybody continues to invest in the infrastructure that’s based on what they can produce. ... Like, that bin site out there – if I cut my irrigation by fifty percent, my bins would be a way over-investment, you know? So, if we’re gonna do somethin’ it needs to be a long-term plan not ‘next year you’re gonna cut thirty percent’ type. Even if it’s voluntary or mandatory

[pause] [we] need to say, you know, 'in ten years we're gonna cut thirty percent.' Then we can stop investing in all this new equipment all the time."

Tommy and Francis, who farm in a largely depleted portion of Wallace County, describe the sense of collective helplessness among producers in areas with only ten years of irrigation water remaining:

Tommy: *"a LEMA up here would be pointless, because by the time it goes into effect, you're just naturally gonna be using less water than what the LEMA would let you use. I mean, the conditions would be such that you would get less water. So, it's pointless."*

Francis: *"I mean, 'whatever'. I mean, it's insignificant. It's still the same result, it's just how long do you take to get there? [laughs]"*

Tommy: *"and whether you agree to do it voluntarily or involuntarily. [laughter in voice] [laughs]"*

By contrast, producers in the Wichita County WCA are hopeful that groundwater conservation will enable their community to adapt. Todd explains how the Wichita County WCA was designed to keep water in place until technology advances enough to enable the local economy to thrive with minimal irrigation:

"A lot of wells have fifteen to twenty five foot [of saturated thickness remaining]. That tells you they're not gonna last very long. They won't last forever – I think no matter what we do, unless we just quit irrigating. And so our big-picture plan is that by taking these reductions [through the Wichita County WCA], we're gonna allow time for technology to catch up to us so that we can still raise crops out here on very little irrigation water maybe, say twenty years down the road. And we can do that through technology in

irrigation. I think also technology in these crop varieties that we have. If they can keep producin' corn varieties that use less water or do really well on dryland? 'cause thirty years down the road we might be dryland around here, but if we can still raise the crops then we can survive and these feedlots will stay around here. The feedlots are the economic engine."

Third, when the Wichita County WCA team began its work in 2016, producers in Wichita County had already been involved in discussions on groundwater conservation through the work the Groundwater Management District 1 board did in promoting their 2014 LEMA plan. While the plan failed to clear the 2/3 district-wide support threshold that the Groundwater Management District 1 board set for adoption, it did gain a majority of votes in Wichita County.

Todd describes how Groundwater Management District 1 laid a foundation for the Wichita County WCA through their earlier LEMA initiative:

"We already had a gone through the process of a LEMA about five years ago and tried to put it to a vote instead of the GMD just forcing it and the vote failed. We didn't get the LEMA. So that was the beginning of the education I guess on what we could do to conserve water in addition to what was already being done."

Key Components of the Wichita County WCA's Success

Each key component of the Wichita County WCA's success was influenced by the interactions between structure, culture, and agency. Their early focus on team building included their exercise of agency in deciding to make all decisions by consensus and to begin by finding shared values and establishing common goals. This exercise of agency was influenced by social structure in that several team members had past experience with values-based decision-making, which they were able to draw upon in the critical early stages of group formation. Furthermore,

an early emphasis on team building was facilitated by the team members' shared cultural values of sustaining community and passing on a legacy to the next generation.

Diverse stakeholder representation included an exercise of agency in deciding to reach out and include people from big and small farms, local industry, schools and economic development, and to expand the Wichita County WCA plan to cover the entirety of Wichita County. Social structure influenced the team's agency as they were able to tap into their pre-existing social networks when looking for team members. The modest population of Wichita County also encouraged the team to make a single plan with diverse stakeholder representation rather than several separate plans. The decision to have diverse stakeholder representation was shaped by the value that team members placed on inclusion and their common desire to have the whole community involved. Their preference for efficiency also encouraged them to choose a common effort in order to make the best use of their time.

The team exercised agency in their decision to bring in an outside facilitator, as well as their decision to follow his suggestion that they take the Strengths Finder survey and to contribute personal funds towards his salary. A primary reason the team needed an outside facilitator was cultural, in that conversations about groundwater raise strong emotions, and the facilitator helped keep the team on track. Social structure influenced their agency in that several team members had past experience with quality facilitators that they could draw upon in identifying a good fit for the group. Furthermore, team members were able to leverage pre-existing relationships and appeal to common interests of the Kansas Corn Growers and the Kansas Livestock Association in order to secure cost-share for the facilitator's compensation.

The team exercised agency in their decision to perform frequent and respectful community outreach by asking for and acting on feedback, holding 3 public meetings and many

one-on-one conversations, and by deciding to focus their outreach especially on the largest irrigators. Part of the need for frequent community outreach was due to the complexity of balancing their cultural desire for flexibility with their values-based goal of substantial groundwater conservation. They were able to benefit structurally from the earlier LEMA proposal that the Groundwater Management District board had put forward, as well as the financial support of local businesses to help cover the costs of their public outreach meetings.

Finally, the team exercised agency in their decision to partner with state and local government by choosing to act on areas of agreement rather than focusing on areas of disagreement, to search for win-win solutions, and to make necessary compromises. Their ability to form such partnerships was predicated on social structure insofar as state agencies and the local Groundwater Management District board had the necessary expertise and the political incentives to collaborate. Culture interacted with structure in that compromise was necessary because Wichita County WCA team wanted to move quickly to conserve groundwater, while Groundwater Management District board preferred a longer period of deliberation. On the other hand, compromise was possible because everyone shared the goal of conserving groundwater.

Table 11. Structure, Culture, Agency, and Key Wichita County WCA Decisions

Agency	Structure	Culture
An early focus on teambuilding		
<ul style="list-style-type: none"> - Chose to make all decisions by consensus - Decided to begin by finding shared values and establishing common goals 	<ul style="list-style-type: none"> - Several team members had past experience with values-based decision-making to draw on in the critical early stages of the WCA effort 	<ul style="list-style-type: none"> - Team members shared values of sustaining the community, leaving a legacy for future generations
Diverse Stakeholder Representation		
<ul style="list-style-type: none"> - Included people from: big and small farms, local industry, schools, economic development - Expanded the plan to cover the entire county 	<ul style="list-style-type: none"> - Pre-existing networks were available to tap into when looking for team members - Modest population in Wichita County facilitated a joint-effort 	<ul style="list-style-type: none"> - Team valued inclusion and wanted diverse perspectives - Team valued efficiency and determined that a common effort was the best use of resources
Hiring an Outside Facilitator		
<ul style="list-style-type: none"> - Chose to bring in an outside facilitator early on - Followed facilitator’s suggestion to take the Strengths Finder survey - Team members chose to contribute personal funds to the facilitator’s compensation 	<ul style="list-style-type: none"> - Several team members had past experience with quality facilitators to help them choose the outside facilitator wisely - The Kansas Corn Growers and Kansas Livestock Association helped to cost-share the facilitator’s compensation 	<ul style="list-style-type: none"> - Conversations about water raise strong emotions, such that the team benefited from a facilitator to manage the conversation and help keep the process going
Frequent and Respectful Community Outreach		
<ul style="list-style-type: none"> - Chose to ask for and act on feedback from the public - Held 3 public meetings and many one-on-one conversations - Chose to focus especially on the largest irrigators 	<ul style="list-style-type: none"> - Benefited from the awareness raised by the GMD 1 board’s earlier LEMA proposal - Received funding and support for their public meetings from area businesses 	<ul style="list-style-type: none"> - Community outreach needed partly because of complexity in balancing desire for flexibility and conservation with values of fairness, stewardship, community and responsibility
Partnering with State and Local Government		
<ul style="list-style-type: none"> - Chose to act on areas of agreement rather than focusing on differences - Searched for win-win solutions - Made necessary compromises 	<ul style="list-style-type: none"> - State agencies provided assistance and expertise in modeling the local aquifer and meeting legal requirements - The GMD 1 board provided incentives for producers to join 	<ul style="list-style-type: none"> - Compromise was possible because everyone shared the goal of conserving groundwater

Chapter 6 - Conclusions and Recommendations

I examined collaborative groundwater conservation of the Ogallala aquifer by Kansas producers as a case of sustained civic engagement in a rural area. In doing so, I applied the basic sociological concepts of social structure, culture, and agency to the relationship between producers and groundwater management on the American High Plains.

Summary of Findings

My quantitative analysis of secondary data finds no association between groundwater extraction and human development at the county level. This suggests that the benefits of groundwater extraction are not being reinvested into local human and financial capitals, likely due to some combination of unequal exchange, a treadmill of production, and reinvestment into local cultural and social capitals. My interviews with producers provide support for a treadmill of production and for reinvestment into local cultural and social capitals. Producers described how investments in irrigation infrastructure make it costly for them to choose to conserve groundwater, which is consistent with a treadmill of production. Producers also described how irrigation increased local cultural and social capital through higher populations, increased community cohesion, and by maintaining their identities and way of life as irrigators.

My survey of producers indicates that an overwhelming majority (92%) agree that groundwater should be conserved, primarily in order to benefit future generations (86%), support local jobs and businesses (66%), provide insurance against drought (63%), and for the continued economic viability of irrigated agriculture (60%). However, most producers (72%) believe they are already doing all they can individually to conserve groundwater on their operations.

My interviews with producers indicate that those who become involved in voluntary group efforts to conserve groundwater find additional ways to conserve that they hadn't thought

possible before. This suggests that voluntary group efforts are a promising approach to further increase groundwater conservation in the Ogallala aquifer region. Yet while most producers are open to the possibility that voluntary group conservation may be effective (84%) and that they might have something personally to contribute to such efforts (84%), very few (7%) are currently civically engaged in voluntary group conservation efforts.

While interviews with producers indicate that values, beliefs, and norms are important to their individual and collective groundwater management decisions, my path analysis model suggests that differences in producers' values, beliefs, and norms do not explain which producers are civically engaged in voluntary group conservation efforts.

I argue that civic engagement is contingent, in that structural and cultural factors must align in a particular community to enable producers to choose to become civically engaged. My interviews with producers and my case study of the Wichita County WCA support this contingent explanation of civic engagement. Wichita County was primed for voluntary group conservation through structural and cultural factors including a quantity of groundwater that made conservation efforts both urgent and promising, a single town which producers' value and which currently relies on groundwater to preserve its economy, and previous efforts that raised awareness about groundwater conservation with local producers. A group of ten producers exercised agency in this context by developing the Wichita County WCA, a voluntary group conservation effort that has met with some early successes. The members of the Wichita County WCA team were able to become and remain civically engaged through solidarity, developing a shared sense of meaning and purpose, and taking a diffuse and relational approach to leadership. They managed emotions such as fear, grief, despair, and frustration in a manner consistent with the Public Narrative model of social action.

Recommendations for Future Research

There are several intriguing findings that merit additional research. First, additional research would be helpful in further developing theoretical linkages between the Community Capitals Framework and the Treadmill of Production. My findings suggest that a theoretical synthesis may provide researchers with valuable insights into the social aspects of groundwater depletion in the Ogallala aquifer region. Over a longer period of time, research that collects data on human development at a finer spatial resolution would be helpful in building a fuller understanding of how groundwater extraction interacts with human development within counties and among subpopulations of different ethnicity, class, gender, and occupation.

Second, additional research is needed to better understand how the role of values, beliefs, and norms in shaping producers' individual and collective groundwater management decisions may differ across space and time. This could take the form of additional survey research or additional interviews with producers.

Additional survey research might enable comparisons between producers in Kansas and in other states across different years. My survey was sent out during a year with above average precipitation across the region, and a survey sent out during drought would provide a fascinating point of comparison. Researchers designing subsequent surveys may wish to assess political identity in a manner that enables comparisons between different types of conservatives in order to address my unexpected finding that conservatism is positively associated with New Ecological Paradigm. In the event that sufficient resources become available to future researchers, a longitudinal survey design would enable better inferences on causation and might uncover changes in values, beliefs, or norms over time. A longitudinal research design might

also enable a coupled human-natural systems approach to understand the relationships between producers and groundwater management in the region.

Additional interviews with producers could build on my research in several ways. First, additional interviews in states other than Kansas, or in the wetter portion of the Ogallala aquifer region within Kansas, would be helpful in clarifying which of my findings are relevant across the Ogallala aquifer region and which are contingent either to Kansans or to producers in the drier western third of Kansas. Second, there is a great need for interview research focused on how social differences and especially gender influences producers' individual and collective groundwater management decisions in the region. Future interview research might also focus on understanding the impacts of intersections of race, ethnicity, class, gender, and immigration status among producers, farm labor, and others who live in the region.

Finally, a comparative case study approach would yield additional valuable insights into how structure, culture, and agency influence civic engagement in voluntary group conservation efforts. Three possibilities come to mind. First, a comparative case study of the Wichita County WCA, the Sheridan 6 LEMA, the Groundwater Management District 4 District-wide LEMA, and possibly a future Wichita County LEMA and/or Kearny-Finney County LEMA would greatly enhance our understanding of civic engagement in voluntary group conservation in Kansas. In particular, a case comparison that includes the Groundwater Management District 4 District-wide LEMA would be helpful in understanding how larger conservation plans with less direct grassroots involvement might compare to the Wichita County WCA and other smaller conservation plans that were led from the grassroots.

Second, a comparative case study between voluntary group conservation efforts in Kansas and similar efforts in other states, particularly Natural Resource Districts in Nebraska,

would enable a detailed exploration of the roles of state government policy and differences in hydrogeology in shaping producers' decision-making. Third, a comparative case study including the Wichita County WCA and one or more voluntary group conservation efforts in other parts of the world could provide a detailed exploration of the roles of cultural differences in shaping how producers sustain civic engagement in natural resource management.

Recommendations for Policy

My research suggests that voluntary group efforts are effective at conserving groundwater and merit state support in order to help organizers succeed and to create a regulatory environment that is favorable to such efforts. In Kansas, this includes continued technical support and expertise from the Kansas Department of Agriculture, the Kansas Water Office, the Kansas Geological Survey, and K-State Cooperative Research and Extension. Particular attention should be given to helping producers overcome barriers to engagement by making participation less time-intensive and by providing facilitation to help them through the process of balancing competing values in developing conservation plans.

The Kansas legislature might also consider providing additional legal tools for voluntary group conservation. One possibility would be a legal structure similar to a LEMA, but that a supermajority of producers in a designated area can implement without the direct involvement of their local Groundwater Management District. This would take some of the burden off of Groundwater Management District boards in those local areas where there is widespread support for groundwater conservation, but a hesitancy to enter WCAs without a guarantee that the entire community will be committed to conservation. Policymakers outside of Kansas should consider whether the legal tools for voluntary group conservation in Kansas make sense for their states.

There are three policy implications of my findings that producers overwhelmingly support groundwater conservation, primarily for the sake of future generations and their local communities. First, my findings suggest that policymakers have a sufficient political mandate to take actions that encourage groundwater conservation. My interviews suggest that policies which are sensitive to local concerns, particularly regarding fairness and personal responsibility, will gain the most support.

Second, my findings suggest that policymakers should explicitly consider the role that local residents who are not producers ought to have in groundwater conservation. It may be that non-farming residents should have additional influence over how much local groundwater is extracted. However, I would caution that additional influence should be accompanied by additional responsibilities. For example, it would be unjust for the nonfarming community to be allowed to limit groundwater extraction without also adjusting the tax disparities between irrigated and dryland acres.

Third, my findings suggest that policymakers should more explicitly determine what people wish to conserve. For example, groundwater conservation policy in Wichita County should be vastly different if the goal is to ensure sustainable aquifer yield, to preserve the town of Leoti, or simply to enable the area to depopulate more gradually.

Lastly, my finding that irrigation does not have large impacts on county-level human development suggests that policymakers may experiment with a range of strategies for managing irrigation withdrawals from the Ogallala aquifer without immediately harming the wellbeing of area residents. I recommend that policymakers focus first on groundwater management strategies that will avoid the economic shock of an abrupt collapse of irrigated agriculture brought on by a fully depleted local aquifer. I further recommend that policymakers take a positive deviance

approach to planning for an eventual future without widespread irrigation by experimenting and learning from counties that currently have little irrigation but high scores on the human development index.

Recommendations for Voluntary Group Conservation Efforts

I recommend that producers who are interested in pursuing voluntary group conservation efforts carefully consider the experiences of the Wichita County WCA. In particular, I encourage emerging voluntary group conservation efforts to consider an early focus on teambuilding, diverse stakeholder representation, bringing in an outside facilitator, frequent and respectful community outreach, and partnering with state and local government.

Organizers of voluntary group conservation efforts should be aware of the challenges of balancing competing values and of addressing the fear, grief, and discouragement that may emerge over the course of sustained civic engagement on groundwater conservation. I

recommend that organizers consider taking a public narrative approach to social change. They may wish to read “Public Narrative, Collective Action, and Power” by Marshal Ganz, which is written accessibly and is available free of charge at www.bit.ly/KSgroundwater and

marshallganz.usmblogs.com/files/2012/08/Public-Narrative-Collective-Action-and-Power.pdf

Organizers may also wish to reach out to the Wichita County WCA team through their website at wichitacountywater.wordpress.com or www.facebook.com/WichitaCountyWCA.

Producers in Kansas who are unable to become involved in voluntary group conservation efforts can still contribute to increased groundwater conservation by forming a personal WCA on their own farm, or by providing input to their local Groundwater Management District board. I encourage interested producers to contact K-State Extension or the Kansas Water Office for more information about their options.

I remain deeply grateful to producers in Kansas and across the Ogallala aquifer region for trusting me with their stories. As always, I wish to give them the last word:

“I wanna be able to say [to my kids] ‘Yep, we worked hard to save the water here so that we know we have a way of life that we can sustain for years to come.’ You know they’re sayin’ their [groundwater depletion] models can’t predict way out into the future? But what if we turn that around? And we don’t even have to have models to predict way out into the future? [Pause] It’s never been done, but who says it can’t be done? And ... there’s no better group that could make this possible.

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