

PUBLIC ATTITUDES AND PERCEPTIONS OF WIND ENERGY DEVELOPMENT WITHIN THE  
ROLLING PLAINS AND BREAKS ECOLOGICAL REGION

by

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A REPORT

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## **Abstract**

The Great Plains possesses one of the best sources of wind energy in North America. Based upon the need to diversify energy production domestically, wind energy's future in both the immediate and long term should be dynamic. The success of wide scale development of this potential will be largely determined by the perceptions of local residents, who are most affected by the siting and design of wind energy projects.

Currently, regulation of this natural resource is left largely to state and county governments. A majority of these entities in the Great Plains region have no regulations governing wind energy development or employ a patchwork of "borrowed" codes from across the nation. The system of regulation of natural resources by political boundary is archaic. It fails to recognize that there are high degrees of correlation between social, economic, and natural resources without respect for artificial political boundaries.

This study is the first in the Great Plains to examine public attitudes toward the development of wind energy and its relationship to the landscape based upon ecological regions rather than political boundaries. The analysis of collected data will provide a useful tool for local planners, policy makers, and the general public in understanding the prevalent issues involved with wind energy development in this region.

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My sincere thanks also go to Dr. Timothy Keane, Dr. Huston Gibson, and Dr. Stacy Hutchinson, who have provided inspiration, insight, and motivation. Their guidance has proven invaluable in the completion of this process and subsequently this project.



## **Dedication**

My greatest thanks and love to my wife Tracy. Without her constant support, insight, and advice this would not have been possible. I also must thank my children; Drake, Cassandra, and Duncan. They have all been inspiration and support during my entire time at Kansas State University. Finally, I must also dedicate this accomplishment to three friends who cannot be here to see the fulfillment of this goal. My great love to our two West Highland Terriers, Wesley and Daisy as well as our Rat Terrier Buddy. They too were sources of great support and affection many times when this was most needed.

## **Preface**

This project report is an original intellectual product of the author, Terry Tucker. The survey described in Chapters 3 was covered by Kansas State University IRB Certificate number 8021.

Furthermore, the work I am submitting for assessment contains no section copied in whole or in part from any other source unless explicitly identified in quotation marks and with detailed, complete and accurate referencing.

# Chapter 1 - Introduction

The perceptions and attitudes of the public are vital to the success of any public project (National Research Council, 2014). This topic is so important to the wind energy development industry that several resources are specifically aimed at “overcoming objections” from the public relating to aspects of wind energy development (European Wind Energy Association, 2010) (Energy, 2001).

The European Wind Energy Platform in their Strategic Research Agenda/Market Deployment Strategy from 2014 states that “*The perception of a wind farm’s impact... may play a greater part in shaping local acceptance than the actual physical impact.*”

The available research related to public perceptions of wind energy has been dedicated to examining the issue within a political boundary. This boundary varies according to study between the national and state scales. Political boundaries are arbitrary inventions and have little correlation to physical properties of the area in question; as such their relevance as a spatial definition should be questioned.

A more nuanced approach should be based upon ecological regions. Since wind energy is a resource influenced by the ecosystem components and these components also positively correlate in relation to the type of economic drivers, sociological factors, and governmental structure predominant within a chosen ecoregion, it is logical to base research at this scale.

## 1.1 - The Research Problem

Within the Great Plains region, the lack of regulation regarding the development of wind energy is an issue of great importance. At what scale these potential regulations are designed will have a huge impact on not only how well the industry is received by the public, but also how well the industry develops within this region.

The use of political boundaries to regulate natural resources has proven to be ill-equipped to address the expectations, fears, and concerns of the public when dealing with natural resource development. By basing regulatory boundaries upon ecological regions, developers and governmental and energy entities have the potential to address these community issues and

respond sensitively to the ecology of the region. This raises the following research question: Are ecological regions a preferable alternative to political boundaries when creating regulations for wind energy development?

## **1.2 - The Purpose of the Study**

The purpose of this study is to collect survey data which will be analyzed to determine the perceptions and attitudes toward wind energy and wind energy development within a selected Great Plains ecoregion.

From this analysis, it can be determined if the perceptions and attitudes addressed in the survey questions are highly correlated between locations within the ecoregion regardless of political boundaries. A strong correlation would suggest that ecological regions rather than political boundaries are an alternative on which to base wind energy development regulations.

## **1.3 - The Study Objectives**

The objectives of this study fall into both the qualitative and quantitative categories of research. Qualitatively, the hypothesis as developed states that there is a high degree of correlation between the perceptions of wind energy and wind energy development throughout areas within an ecological region regardless of political boundary. Quantitatively, perceptions and attitudes of the survey participants regarding wind energy and wind energy development will be analyzed. This will provide insight that should shape any policy regarding wind energy in the future for this region.

## **1.4 - The Research Questions**

There are two research questions this study will examine. Question One: Are the attitudes and perceptions related to wind energy within an ecoregion sufficiently correlated to use as a basis for wind energy development regulations? Question Two: What are the perceptions and attitudes towards wind energy and wind energy development within the survey areas?

## Chapter 2 - Literature Review

### 2.1 – A Brief History of Wind Energy

For thousands of years, humans have harnessed the power of wind to aid with daily tasks. The first recorded large scale usage of wind energy comes from the Babylonian Empire. Records indicate that wind energy was applied to irrigation projects in the 17<sup>th</sup> century B.C.E (Sathyajith, 2006). In the 1<sup>st</sup> century A.C.E., Heron of Alexandria, a Greek engineer, devised an organ powered by a wind wheel (Lohrmann, 1995). Since the 4<sup>th</sup> century A.C.E., wind powered “prayer wheels” has been implemented in China, India, and Tibet (Adam, 2006).

By the Middle Ages, wind energy technology and application has progressed significantly. In the Sistan region of what is now known as northern Iran, a horizontal windmill design (Panemone) was employed to move water and grind grains (al-Hasan, 1992). By this time period, the regions from central Asia to China and India were also applying forms of wind mills to aid agricultural production (Hill, 1991). Europe saw the introduction of wind energy technology much later than the Middle East and Asia. Sicily was an early location which applied wind energy to move sea water for salt harvesting at around 1100. Northern and Western Europe’s first record of a windmill was in 1185 located in Weedly, Yorkshire. This technology, however, was vertical rather than horizontal in design and was an independent innovation from those in the Middle East and Asia rather than a modification (White, 1964). In Holland, from the 15<sup>th</sup> to the 17<sup>th</sup> centuries, wind energy technology was applied to one of the greatest engineering feats in history, the draining of large inland pools and lakes to create “new” land behind constructed sea walls (Stokhuyzen, 1962). Over two centuries, the technology of wind mills evolved from simple devices capable of moving relatively small amounts of water, to the large formidable octagonal smock mill with revolving cap, the iconic symbol of the Netherlands yet today (Stokhuyzen, 1962). With the advent of the steam engine at the end of the 18<sup>th</sup> century, economic and social shifts resulted in the devaluation of wind energy as a commercial resource (Stokhuyzen, 1962).

In the mid to late 19<sup>th</sup> century, the American Midwest became the focus of wind energy development. Water was the limiting factor for settlement of the region; ground water, though plentiful, required a method of pumping and moving the water. The result was the development of a small, metal, vertical windmill platform. This design was effective for its purpose, as well as

being economically feasible for the farmers and ranchers to apply. It is estimated that in the years between 1900 and 1950, over six million small windmills of this type were constructed (Kaldellis, 2011). The first wind powered machine to generate electricity was created in Scotland by Professor James Blyth in July of 1887. This wind machine charged batteries to provide lighting to a small cottage. Blyth later built a wind machine which provided lighting for the Lunatic Asylum, Infirmary & Dispensary of Montrose. Despite his successful application of the technology, it failed to gain wide scale acceptance as it was deemed to be economically unfeasible (Price, 2005).

During the winter of 1887, in Cleveland, Ohio, Charles Brush installed the first large wind machine to generate electricity in the United States at his home (Kaldellis, 2011). Although massive in size (the rotor was 56 feet in diameter and mounted on a 60 foot tower), it only produced 12 kilowatts of electrical current used to charge a bank of batteries in his basement. Thus, even though it operated until 1900, this design also failed to become commercially viable for large scale energy production (Danish Wind Industry Association, 2015).

One of the most important developments in wind energy technology was achieved by Poul la Cour, in 1891. A major issue in making wind energy a viable source of power was the irregularity of the power supply, which depended on the wind speed. La Cour invented a regulator he named the Kratostate with which he was able to light an entire village (Price, 2005). From the beginning of the twentieth century through the early 1970s, wind energy technology advanced. The commercial application of wind energy diverged, however, between Europe and the United States. By the end of World War I, Denmark employed a series of 25 kilowatt wind machines; the United States saw the market for wind driven energy slowly collapse.

World War II resulted in shortages of fossil fuels and rising energy costs (Telsonet, 2015). As a result, European nations and Great Britain continued to develop wind energy technologies out of necessity. The largest of these projects was in Denmark. The 200 kilowatt, three-bladed Gedser Mill upwind rotor wind turbine operated successfully until the early 1960s, when lower fossil fuel prices made wind energy production no longer cost effective (Kaldellis, 2011). The first attempt at “utility scale” power generation occurred in the Soviet Union in 1931. The 100 kilowatt Balaclava wind generator was located on the shore of the Caspian Sea and could generate 20,000 kilowatts of electricity. Even without the pressures of a free market economy, the Balaclava location was in operation for only two years (Telsonet, 2015).

In the United States, new iterations of wind generators were devised based upon airplane propellers and wings (Kaldellis, 2011). Beginning in the 1920s, wind energy development appeared to be hitting its stride in rural America. Due to the lack of power grid infrastructure in these areas, small wind-powered electric generators were spreading rapidly. These small turbines produced between 5 to 25 kilowatts of electricity. This wind energy boom came to an abrupt end on May 11, 1935 when the United States Rural Electrification Administration was created. The goal of this agency was to provide electrical service to rural areas which existing commercial providers found not to be cost effective. When expansion of service arrived, the customers were able to have access to a more reliable energy source. This led to the rapid demise of the rural wind energy industry (Third Planet Windpower, 2015).

In 1941, the United States made an attempt at “utility scale” wind energy development. Located in Vermont, the Smith-Putnam machine was capable of producing 1.25 megawatts of current with two 175 foot diameter rotors. In 1945, after only several hundred hours of operating intermittently, one of the blades broke off from metal fatigue. The catastrophic failure would result in the end of large scale wind energy project in the United States for decades (Telsonet, 2015).

In Europe and Great Britain, however, the commitment to wind energy research continued to be strong. Major innovations included the development by Ulrich Hutter of airfoil-type fiberglass and plastic blades with high pitch. This meant that structural failures could be reduced by “shedding” the aerodynamic loads as opposed to “withstanding” them (Telsonet, 2015). In Denmark and Germany, research focused upon refinement of the Gedser Mill design. The increased efficiency obtained from the Germans would later be applied by developers in the United States (Kaldellis, 2011). Possibly the most important research in rotor design was derived from the work of G.J.M. Darrieus in the 1920s. However, serious research and development of the concept did not occur until Canadian researcher rediscovered and refined Darrius’ work in the 1960s. These rotors were slender, curved, airfoil-section blades attached to the top and bottom of a vertical tube (Telsonet, 2015).

Ultimately, it took a world political and economic crisis to again bring wind energy development to the forefront in the United States. In 1973, tensions in the Middle East over the Israel–Arab conflict resulted in the Organization of Petroleum Exporting Countries (OPEC) to

announce an embargo on the sale of oil to the United States. The severe effects the oil shortage caused the United States to reinvest in wind energy research and development. In the years between 1973 and 1986, the commercial wind energy market evolved from domestic and agricultural to an application of interconnected wind farms to the energy grid (Kaldellis, 2011). California led the nation in large scale wind energy development during this period. Between the years of 1981 through 1990, over 16,000 turbines were constructed. They ranged from 20 to 350 kilowatts for a total output of 1.7 gigawatts. This dramatic increase in development was largely due to federal investments and energy credits (Kaldellis, 2011). However, by the end of the 1980s many of these incentives were no longer available (Third Planet Windpower, 2015). In northern Europe, wind farm development increased steadily through the 1980s and 1990s, gaining more than 10,000 megawatts of capacity (Kaldellis, 2011) (Telsonet, 2015). The major factor for this increase was the higher cost of electricity and the excellent wind resources available. In fact, after 1990 most activity shifted to Europe and by the millennium, Europe was the world leader in wind energy construction and development (Kaldellis, 2011) (Telsonet, 2015). In the last twenty years wind energy has become the major form of alternative energy worldwide (Kaldellis, 2011). The dramatic increase in development is directly attributable to rising energy costs and continuing improvements in technology. Wind energy is on the cusp of becoming the second fastest growing energy industry, trailing only natural gas development (Third Planet Windpower, 2015). However, recent eliminations of alternative energy tax credits and subsidies may slow growth in the wind energy sector in the future.

## **2.2 – Public Perceptions of Wind Energy**

In any large scale energy development, the perceptions and input of the public are vital to the success of the project (National Research Council, 2014). Wind energy development faces the same challenges. This topic is so important to the industry that a search of literature shows several resources aimed at “overcoming objections” from the public relating to aspects of wind energy development (European Wind Energy Association, 2010) (Energy, 2001). In his 2004 work entitled *Local Politics of Renewable Energy*, Kahn concludes that “public consultation . . . has some important limitations that must be acknowledged.” However, his overall conclusions were based upon the importance of community input as a tool to limit objections to wind energy development.



The importance of public perceptions is effectively communicated by the European Wind Energy Platform in their Strategic Research Agenda/Market Deployment Strategy from 2014 which states:

*“The perception of a wind farm’s impact on the environment and the cost of renewables as well as the manner in which wind farms are developed may play a greater part in shaping local acceptance than the actual physical impact.”*

The European Wind Energy Association (EWEA) has found through research that public resistance, referred to as NIMBYism (Not In My Back Yard) is second only to governmental policy changes and ahead of cost feasibility in derailing wind energy development projects within the European Union (European Wind Energy Association, 2010).

This view of the impact of NIMBYism is not universal. Research has highlighted that the standard definition of NIMBYism as defined by Merriam Webster (2014) as “opposition to the locating of something considered undesirable in one's neighborhood” is lacking. A study in Greece (Botetzagias, 2015) has determined that NIMBYism, as defined, is not “the most important predictor of opposition.” Other factors such as “the perceived unfairness of the siting decision as well as the risks and costs associated” with development are deemed to be the primary reasons for the public opposition to wind farm projects

Landscape is the backdrop for all that humans perceive. Interacting ecological systems which repeat due to geology, landform, soils, climate, biota, and human activity define the physical parameters of landscapes (United States Department of Agriculture & United States Forest Service, 1995). Aesthetics is defined as the branch of philosophy that studies the principles of beauty (Oxford University Press, 2015). When applied to the discipline of scenery management, it refers to landscapes “that give visual and sensory pleasure.” Landscape aesthetics have traditionally been examined as a tool for scenery management (United States Department of Agriculture & United States Forest Service, 1995). The key to understanding landscape aesthetics lies in an analysis of the human perception of the landscape. Visually, this perception “translates and evaluates the landscape” making a cognitive connection to “previous experiences and expected images” (United States Department of Agriculture & United States Forest Service, 1995). Landscapes are considered to contain a collection of “landscape character attributes.” These attributes range from natural systems such as orchards,

grasslands, or ponds, to human interventions such as stone walls, barns, or fences. This crucible of character attributes cognitively forms the “image of an area” (United States Department of Agriculture & United States Forest Service, 1995). The public perception of landscape aesthetics, as related to wind energy, is predominately expressed in opinions of how well the site integrates into this image (Mattern, 1966) (Good, 2006) (Milton, 1982). Research in Scotland and Ireland finds “that aesthetic perceptions, both positive and negative, are the strongest single influence on individuals' attitudes towards wind power projects” (Warren, 2004).

There are some researchers who attempt to further refine the understanding of public objections even further. Based upon research, the two most prevalent of these categorizations are psycho-social factors and social and institutional factors. Each avenue will be briefly discussed as it relates to the public's perceptions of wind energy.

Within the psycho-social genre, the familiarity hypothesis has gained favor among those who study public attitudes toward wind farm development. Generally, the hypothesis formulated by Reder and Ritter states that an individual is more likely to judge that they know the answer to a question if they are familiar with its topic or terms and more likely to judge that they do not know the answer to a question which presents new or unfamiliar terms. The familiarity hypothesis as reworked for public perception study states that when people experience something (i.e. the development of a wind energy project) they generally become more favorable towards the experience. This has been confirmed in research by Wolsink (1994) as well as Krohn and Damborg (1999).

Other sociological factors based upon demographics have been studied as impacting perceptions of wind energy development. Landenburg in 2008 found correlations between public attitudes regarding wind farm development and factors such as age, gender, how the public uses the land, and overall familiarity with wind energy.

An intriguing line of exploration deals with the construct of public trust as a facilitator of public perception. Little research has been directed toward this line of inquiry. However, the small number of studies that have been completed indicate that, if the public trusts the source from which it initially hears about the project, they tend to have a favorable view of the project as a whole (Devine-Wright, 2004) (Poortinga W., 2006) (Eltham, 2008) (Slovic, 1993) (Poortinga, 2004).

The social and institutional umbrella is focused on observing how government and the public interact in areas of policy and planning. Many studies have dealt with the importance of engaging the public in matters of planning and policy. One key question in this research area is whether increased public participation in wind development planning increases public support for the project (Warren, 2004) (Wolsink, 2010). Studies by Wolsink (2007) and Eltham (2008) have shown that this type of “bottom up” interaction between the citizenry and government *does* increase public support, although sometimes conditionally, and decreases opposition to wind energy development projects.

The role of activist organizations as opposition actors in the wind energy development debate has become quite controversial. Many times these organizations are opposed to wind development in general or as it relates to a specific element of the development. Recent research shows the increasing influence such organizations wield in the planning and approval of wind energy development. In areas where such groups such are active in the process, there appears to be an increased level of distrust in both the project and the governmental agencies associated with the approval of the project (Eltham, 2008) (Ellis, 2006). This is especially true when the group is interacting at the state level and below (Bell, 2005) (Toke, 2005).

These studies enforce that whether labeled as simple NIMBYism or seen as some form of “perception” problem, public attitudes toward the development of wind energy are critical for the success of individual projects and the industry as a whole. This is so critical that International Energy Agency (IEA) Wind has listed “Social Acceptance” of wind energy as a priority in its 2014 Annual Report.

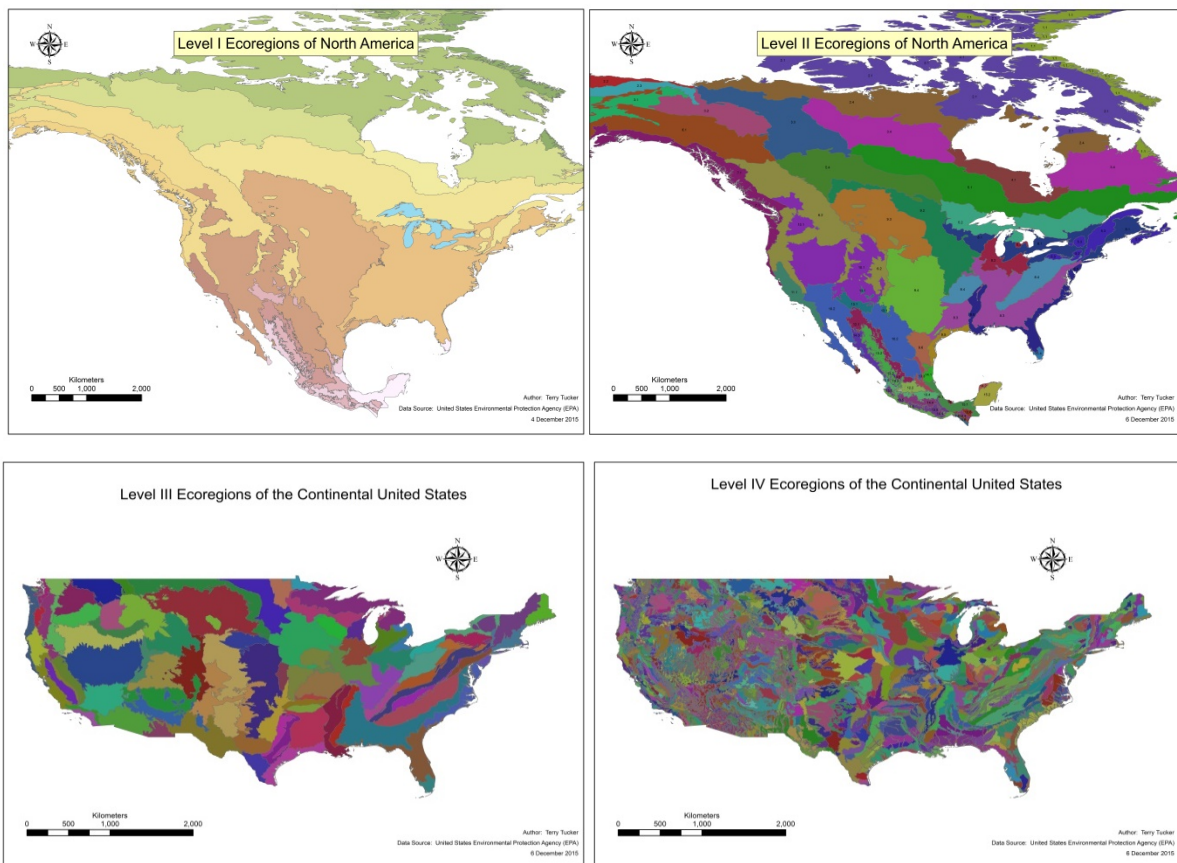
## **2.3 – Boundaries**

The available research related to public perceptions of wind energy has been dedicated to examining the issue within a political boundary. This boundary varies according to study between national and state scales. Because political boundaries are arbitrary inventions and have little correlation to physical properties of the area in question, their relevance as a spatial definition for such research should be questioned.

A more nuanced approach to define the spatial extent of this type of research area should be based upon ecological regions. Ecological regions are defined as areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. Ecoregions are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Ecological regions are separated into levels, beginning at I, the coarsest spatial reference, and culminating with IV, the most refined spatial reference (Bryce, 1999). Since wind energy is itself a resource influenced by the ecosystem components present in a landscape, it is logical to apply this spatial extent to such research endeavors.

**Figure 1**

Representations of the four levels of Ecoregions (after Omernik). Map by Author.



The Great Plains region of the United States is a Level I ecological region, covering the entirety and portions of 15 states (Figure 2). This region possesses some of the greatest wind

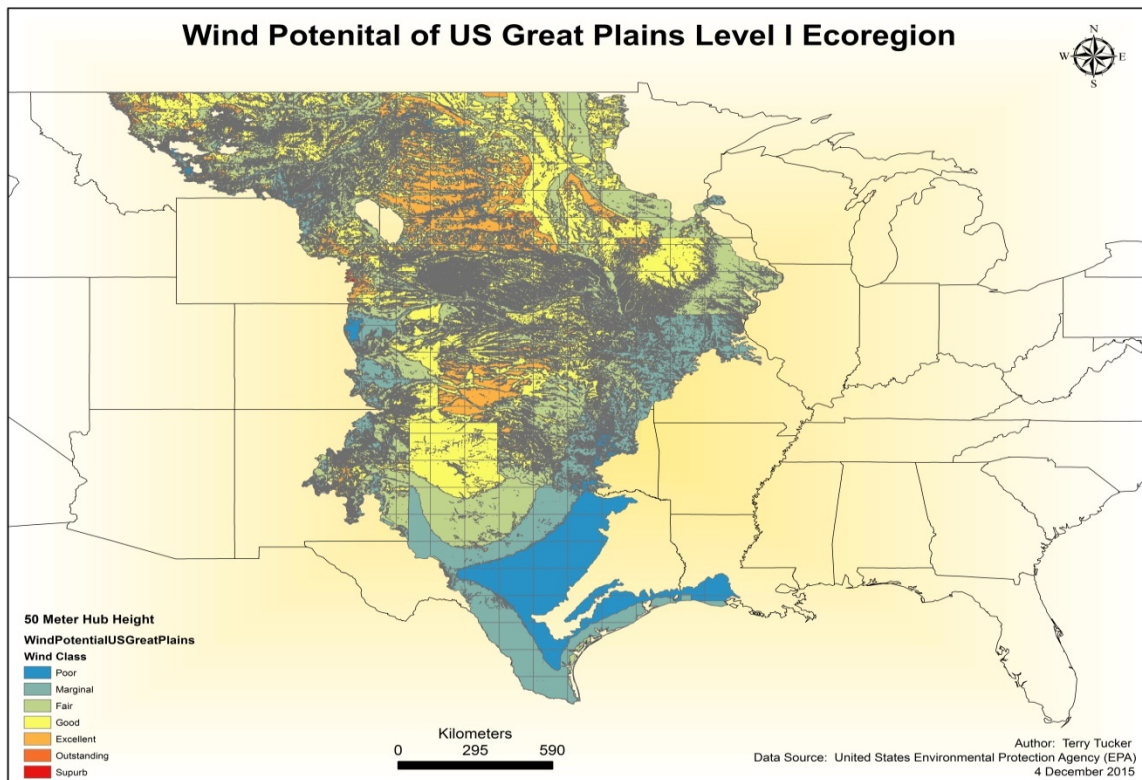
energy development potential in North America. Within this region, there is a lack of research involving public perceptions of wind energy and its development. This is specifically true for any research based upon nonpolitical boundaries.

For the purpose of this study, a Level IV ecological region will be selected as the area of investigation. At this level of refinement, ecosystem components are positively correlated in relation to the type of economic drivers, political leanings, and governmental structure which are predominant within a chosen ecoregion. This is clearly depicted within the Rolling Plains and Breakers Level IV ecological region.

The Rolling Plains and Breakers ecoregion is defined as an area of dissected plains with broad undulating to rolling ridge tops and hilly to steep valley sides. The land cover is described as being a mosaic of predominantly cropland and rangeland. The extents of this ecological region cover portions of central Kansas and south-central Nebraska (Figure 3).

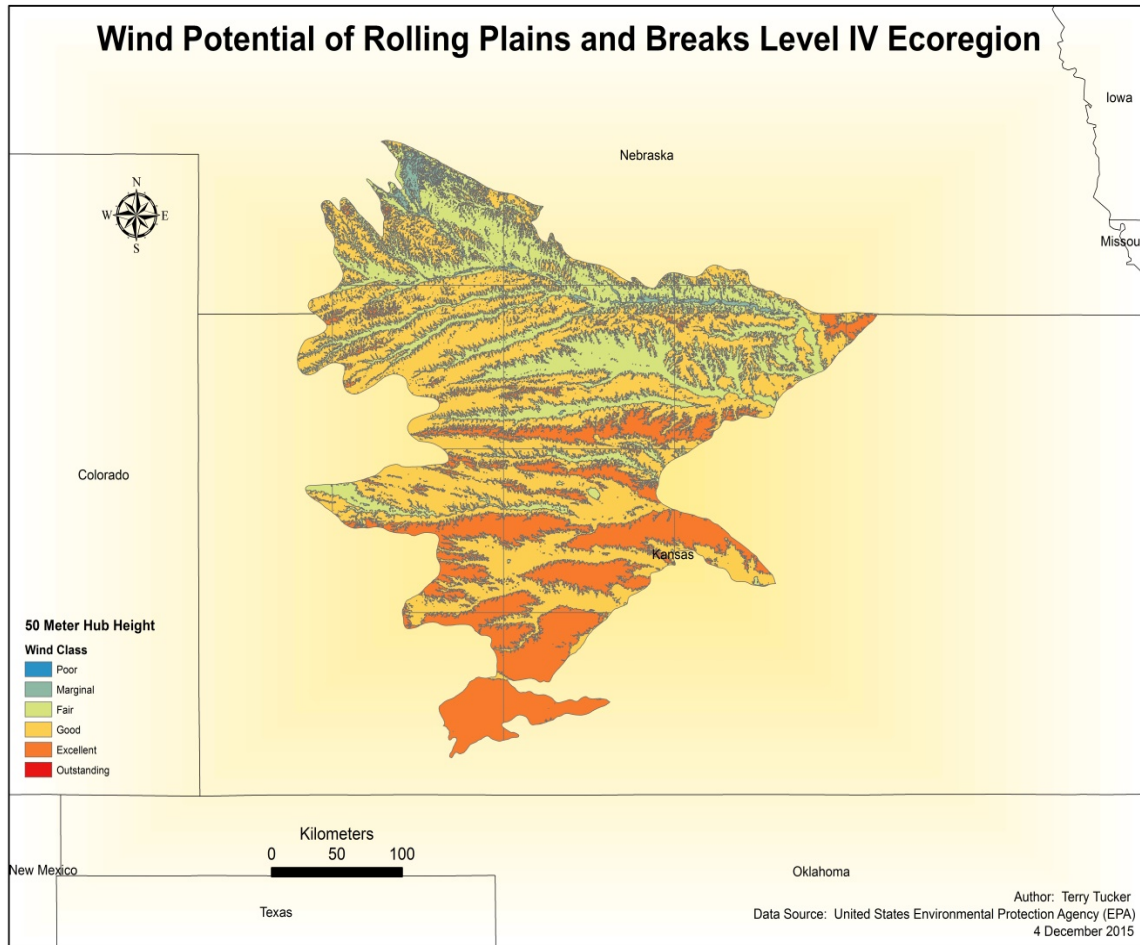
## Figure 2

Map of wind potential within US Great Plains Level I Ecoregion at 50 meter hub height. Map by Author



**Figure 3**

Map of wind potential within Rolling Plains and Breaks Level IV Ecoregion. Map by Author.



Both of these states have little in the way of original wind energy regulation; most codes are built from borrowed regulations from outside the respective states. No research at all could be located concerning the topic of public perceptions of wind energy development with respect to Kansas or Nebraska.

Winter wheat and grain sorghum are the major crops with large areas of corn in the north. Irrigated areas along the major rivers are planted with corn, alfalfa, and small grains. Rangeland is present on breaks areas (Bryce, 1999). Translated into economic terms, the areas within this

ecoregion see that agriculture generates more direct and indirect impacts than all other industry combined (United States Department of Agriculture, 2015).

The political leanings of an area can be an indicator of social preferences. Within the Rolling Plains and Breakers ecoregion, over 60 percent of all voters are registered as Republican with no county with less than 50 percent of registered Republicans (State of Kansas, 2015) (State of Nebraska, 2015). This indicates the population leans strongly toward the conservative end of the political spectrum which can infer conservative trends socially and economically.

In both Nebraska and Kansas, counties derive their powers from the state constitution and legislative action. The governmental form in all counties within the Rolling Plains and Breakers ecological region consists of a county board of supervisors. Nearly all county boards consist of three members, with the exception of three Nebraska counties which have larger boards and two Kansas counties with larger boards (National Association of Counties, 2009).

It is clear that the economic, social, and political structures within the counties that are contained within the Rolling Plains and Breakers ecological region are highly correlated. This indicates that there is a significant chance that the perceptions regarding wind energy and wind energy development will also be strongly correlated. If so, then it reasons that regulations regarding resource development should be created based upon the spatial extent of ecological regions rather than political boundary designations. The resulting regulations have the potential to reduce public objections to the development of wind energy while treating issues important to the common ethos of the region with respect.

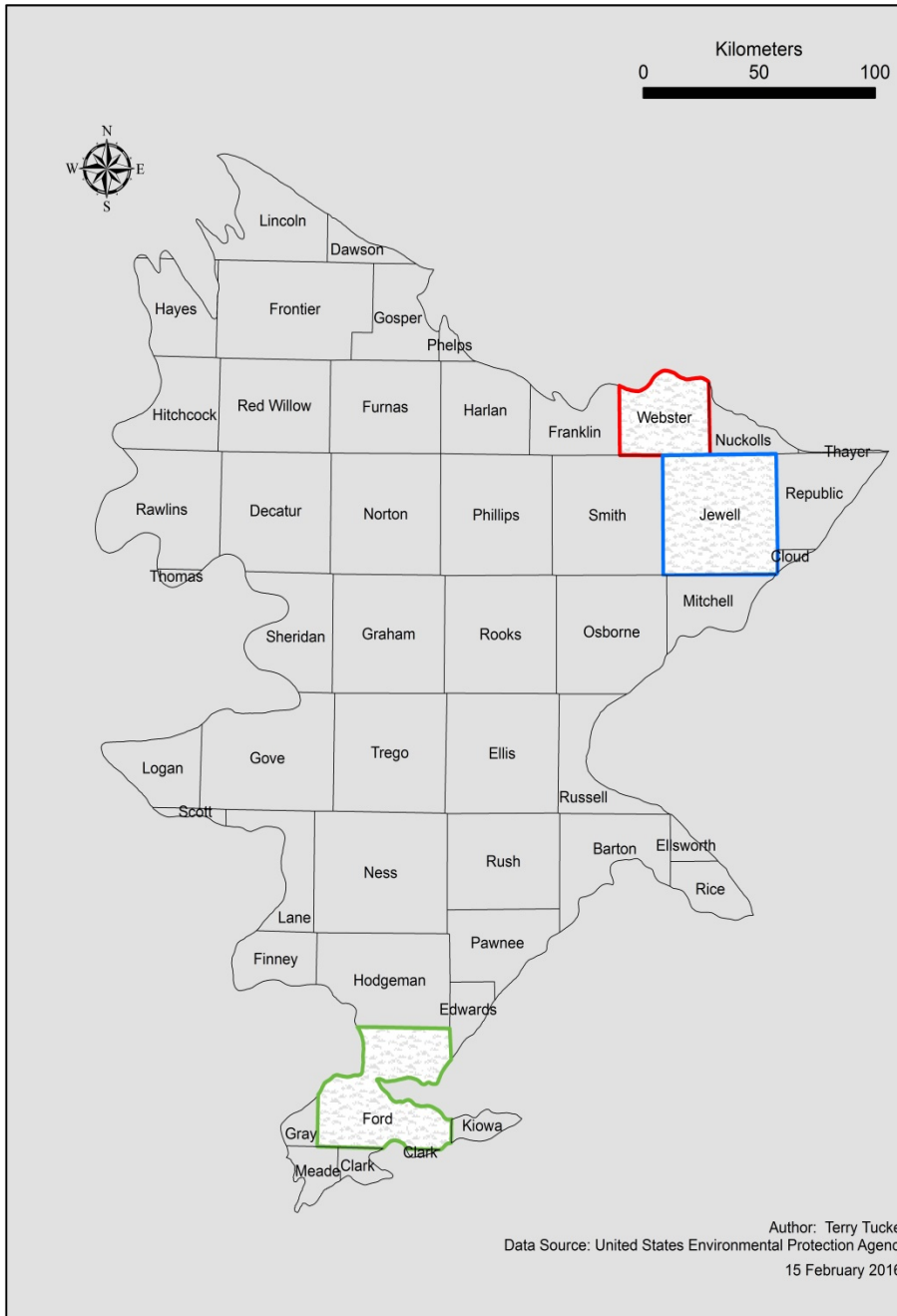
## **Chapter 3 - Methodology**

This study will collect and analyze data related to public perceptions of wind energy within the Rolling Plains and Breaks ecological region. Three counties within this ecological region will be the focus of this examination: Ford County, Kansas; Jewell County, and Kansas; Webster County, Nebraska (Figure 4). Each county is similar in economic, social, and governmental structure and has a distinct relationship to wind energy development: an operational wind energy development, no wind energy development proposed or planned, or wind energy development proposed and approved but not yet constructed.

**Figure 4**

Map of study locations within Rolling Plains and Breaks Level IV Ecoregion. Map by Author.

### Study Counties of the Rolling Plains and Breaks Level IV Ecoregion





A survey questionnaire will be administered within each designated county. The key objectives of this survey examine:

- Attitudes towards wind energy in general and wind energy development
- Public awareness of wind energy
- Public perceptions of wind energy impacts such as:
  - Visual
  - Environmental
  - Social
  - Economic
- Public perceptions of spatial extent and scale of turbines
- Public perceptions of expanded power grid integration lines
- Perceived effects of wind energy development
- The amount of public consultation prior to approval of the project
- How important consultation is to the public
- The amount of investment the public has or has been offered in the project
- The amount of perceived conflict due to the wind energy project
- The perceived amount of disruption of daily life due to the wind energy project

The resulting data will be analyzed to discover if public perceptions regarding wind energy within an ecological region are similar. If so, then the detailed analysis will be a valuable tool in the design of more effective wind energy development planning procedures and regulations.

### **3.1 – Research Design**

The research for this study is based upon a survey. This form of research is qualitative and exploratory in nature. The goal is to gain an understanding of the public perceptions of wind energy development within an area constructed as an ecological rather than a political boundary.

The hypothesis which will be tested in this study is that there is strong similarity between the public perceptions of wind energy development within the study's ecological region boundary.

The null hypothesis is then that there is not similarity between the public perceptions of wind energy development within the study's ecological region boundary.

### **3.2 – Sources of Data**

The data source for this study began as an original survey of residents of three counties within the Rolling Plains and Breaks ecological region. The original survey counties were Ford and Jewell Counties in Kansas, and Webster County in Nebraska (Figure 3). Due to low response rates, Ford County was dropped for the data analysis stage.

### **3.3 – Data Collection Techniques**

The survey measures public attitudes and perceptions of wind energy development. The survey was first administered online through Qualtrics and respondents were advised of the survey by post. Every residence within the study area's selected counties received notification of the survey through the United States Postal Services' Every Door Direct Mail service. This service was accepted as the most cost effective method of reaching the physical cross section of residents within the counties.

The online component, the physical survey, was also accepted as the most cost effective way to compile data from the respondents. The survey was based upon a series of carefully drafted questions which also employed select photo montages of wind development scenarios (Appendix A).

The notifications of the survey were delivered on 1 January 2016 to each residence in the selected counties (Appendix B). A follow-up notification ran in area newspapers and as a radio Public Service Announcement (PSA) on local radio stations on and around 15 January 2016 (Appendix D). The online survey was available to respondents by a link to the Qualtrics hosted survey beginning on 1 January 2016 and closing on 31 January 2016.

Due to the low response rates mentioned previously, an in person follow-up, treated as focus groups, was conducted two weeks after the conclusion of the internet based survey. Due to proximity and time constraints, only Jewell and Webster Counties were included in the second phase of data collection.

The online survey was printed out and manually completed by respondents. Two additional questions were added to the original survey in an attempt to glean potential reasons for the low initial response rates (Appendix D). The completed responses were then manually entered into new Qualtrics survey files. The original survey data and the follow-up data were then aggregated into one data set. The respondent pool consisted of “stakeholders” identified through different means for each county.

In Jewell County, the focus group was identified as members of the local Mankato, Kansas lunchtime senior citizen/ younger citizen interaction group. There were twenty nine individuals from this group who participated in the follow-up survey. In Webster County, the stakeholders consisted of members of a volunteer economic development panel located in Red Cloud, Nebraska. From this economic development panel, thirteen chose to participate in the follow-up.

### **3.4 – Issues of Reliability and Validity**

This study, as outlined, was designed to provide a high level of confidence in the ultimate findings. The survey design as well as the selection of the study’s pool of participants was meant to assure that it could be easily replicated and be consistent. This also attempted to insure that the results were based upon an accurate assessment of the public’s perceptions of wind energy development within the study area. This design maintained the highest degree of neutrality as to not contaminate the study by researcher bias.

The low response rate, well below one percent in each county, created an issue with the validity of the analysis results. To in some small way remediate this issue, a follow-up survey was conducted in two of the study counties. The aggregate data sets were then treated as focus group results. While still suspect, this technique provided a more robust result than the internet based survey alone.

The results of this study were meant to be easily transferable to other contexts such as the design of planning procedures and regulations regarding wind energy development within this area. It provides a base for further research within other ecoregions regarding the similarity of perceptions regarding wind energy development regardless of political boundaries.

### **3.5 – Sampling Techniques**

The original structure of this project required that a survey or polling be used for data collection rather than traditional sampling techniques. This is due to the delivery method required to notify the respondents of the survey.

The only cost effective method to reach an adequate number of potential respondents was deemed to be the implementation of the USPS Every Day Direct Mail service. This service delivers to every residence within a route. In rural areas such the counties in this study, all routes must be chosen to reach the physical extents of the counties.

In reality, there was a component of random sampling within the original data collection. Each residence does not ensure that each person in the residence was aware or responded to the survey. Thus, while there was complete coverage of all residences, there was no guarantee that the same could be concluded for all residents of the counties.

The follow-up survey employed a more traditional data collection technique of stakeholder populated focus groups. The selection of these groups, in this case, held a large amount of random chance. Due to time constraints, the group selected in Jewell County was a result of happenstance. An existing group was already meeting and willing to participate as stakeholders. In Webster County, again the group already existed and was amicable to participation in the follow-up.

The follow-up data collection, in this case, is not as robust as would be normally demanded for results of significance. The fact that there was some but limited discussion and that the formal survey was the main intent runs against the basic tenet of focus group study. This technique as applied does, however, provide more robust aggregated data sets for analysis than the internet based survey alone.

### **3.6 – Definitions of Key Terms, Concepts, and Variables**

Ecoregion: For the purpose of this study the Environmental Protection Agency (EPA) definition by Omernik will be applied as: Areas of similarity regarding patterns in the mosaic of biotic,

abiotic, aquatic, and terrestrial ecosystem components, with humans being considered as part of the biota.

Focus Group: A small number of people (usually between 4 and 15) brought together with a moderator to focus on a specific topic. The aim is discussion rather than individual responses to formal questions. This produces qualitative data that may or may not be representative of the general population.

Perceptions: For the purpose of this study, the Cambridge Dictionary definition will be applied as: A thought, belief, or opinion, often held by many people and based on appearances.

Utility Grid Integration: For the purpose of this study, the United States Department of the Interior definition will be applied as: Electricity from wind turbines is fed into a utility grid and distributed to customers, just as with conventional power plants.

Stakeholders: Organizations and individuals who work with or have an interest in a topic of research.

Wind Farms: For the purpose of this study, the United States Department of the Interior definition will be applied as: A wind farm is considered to be wind turbines grouped together into a single wind power plant generating bulk electrical power.

Qualtrics: A software suite built and used for market and academic research. This package possesses the ability to leverage over 100 question types, embed data, branching, display logic, quotas, email triggers, and randomization. The package is also mobile and offline compatible. For the purpose of this study, this package is used to build and service the data collection survey.

### 3.7 – Data Analysis and Interpretation

The data was compiled via Qualtrics. The data was downloaded as a .csv file and imported into Microsoft Excel for further analysis. All questions were analyzed as a percentage of the overall respondents except for those which required graduated responses.

Questions which refer to a choice of graduated responses such as extremely favorable or not favorable were converted using a Likert scale design. The options were converted to a range of 1-5. The Likert scale efficiently presents this type of data providing a composite score which reflects the overall preference of the respondents.

The analysis of data collected in a quasi-focus group format will hold to the restrictions of a focus group: the findings will be analyzed at the group level, and the results will only be generalized if groups have similar demographic characteristics.

The key statistical analysis was accomplished with the use of Minitab statistical software. The tools employed will include the Pearson's Correlation Coefficient ( $r$ ), the test statistic ( $T$  Value), and the P-test of the overall significance.

The confidence level assigned for this research project was 95% and the associated confidence interval was set at 5%. These preconditions mean that the overall study area sample size required to be statistically significant is 374 respondents.

The statistical confidence in an analysis is determined not just by the correlation coefficient but also by the number of pairs (Defined as when a single data point represents not just a single value, but an ordered pair of two values). If there are very few pairs then the coefficient of correlation is required to be very close to 1 or  $-1$  for it to be considered statistically significant. If the data set contains a large number of pairs then a coefficient of correlation nearer to 0 can still be considered to be highly significant.

The  $T$  value (test statistic) is vital in validating the results of the coefficient of correlation. This value is the calculated difference represented in units of standard error. The value of the test statistic lies is the question: How likely is it that a test statistic ( $t$ ) will be generated as

extreme as if the null hypothesis were true? From the calculated test statistic, the P-Value is obtained.

For this study, the P-Value threshold has been set as 0.05. Values which are above this will support the null hypothesis (the analyzed data sets show no strong evidence that an external influence has resulted in an effect and thus is not highly correlated). Values which are at or below the threshold will reject the null hypothesis and reflect that there is strong evidence that an external influence has resulted in an effect implying correlation between the analyzed data sets. In a situation where there is a conflict between the two tests, the P-Value will be given less weight due to the low rate of response for the overall internet based survey. The P-Value will be larger with a small response rate than in with larger response rates. Thus, as the sample size increases, the range of possible chance influences is reduced.

Visual representations of the analysis consist of pie charts for analysis of all data except that which requires graduated responses and bar graphs for more refined general analysis (Likert scale questions).

### **3.8 – Ethical Considerations**

The ethical considerations which must be addressed for this study are those of confidentiality and anonymity. It is important that the respondents feel confident that their responses remain confidential and are used only for the purpose of the survey. It is also vital that there be a level of anonymity maintained for the respondents. This will ensure that the respondents feel no pressure from any perceived potential ostracization for their responses to the survey from others within or outside the study area.

### 3.9– Work Plan

**Preceptions and Regulation of Wind Energy Development**  
 Eco Regional Scale Today's Date: 8/14/2015 Monday  
(vertical red line)

Project Lead: Terry Tucker  
 Start Date: 8/4/2015 Tuesday





## Chapter 4 - Survey Analysis Overview

### Public Attitudes and Perceptions within the Rolling Plains and Breaks Level IV Ecoregion

The confidence level assigned for this research project was 95% and the associated confidence interval was set at 5%. These preconditions mean that the overall study area sample size required to be statistically significant is 374 respondents. This level of response was not attained. The actual overall survey response rate was 33 respondents. Thus, the validity of any data analysis at this level of investigation would be highly suspicious. Examining the response levels at the county level showed the same issue. Ford County, Kansas required a response rate of 371 to reach statistical significance. The actual number of responses from Ford County was 5. The same number of actual responses was received from Jewell County, Kansas which also failed to reach the required 304 responses. Webster County, Nebraska produced the highest number of responses at 23. This still fell well below the required 308 responses to be considered significant.

Taking into consideration that internet surveys generally result in response rates 11% below those of traditional methods and that such surveys have seen response rates as low as 2% (Petchenik, 2011), this survey fails to meet significance. The response rates in terms of percentage for this study are respectively; .23% (overall), .05% (Ford County), .3% (Jewell County), and 1.48% (Webster County).

A follow-up was conducted within two weeks after the end of the internet survey. Jewell County, Kansas and Webster County, Nebraska were chosen due to their proximity and that both had significantly lower and similar population sizes. All further analysis of survey data related to this survey will only contain results from these two selected locations.

The follow-up took the form of small focus groups (29 persons in Jewell County and 13 persons in Webster County). In Jewell County, the focus group was identified as members of the local Mankato, Kansas lunchtime senior citizen/ younger citizen interaction group. In Webster County, the stakeholders consisted of members of a volunteer economic development panel located in Red Cloud, Nebraska. In each case, the stakeholders were individuals who did not take the internet based survey.

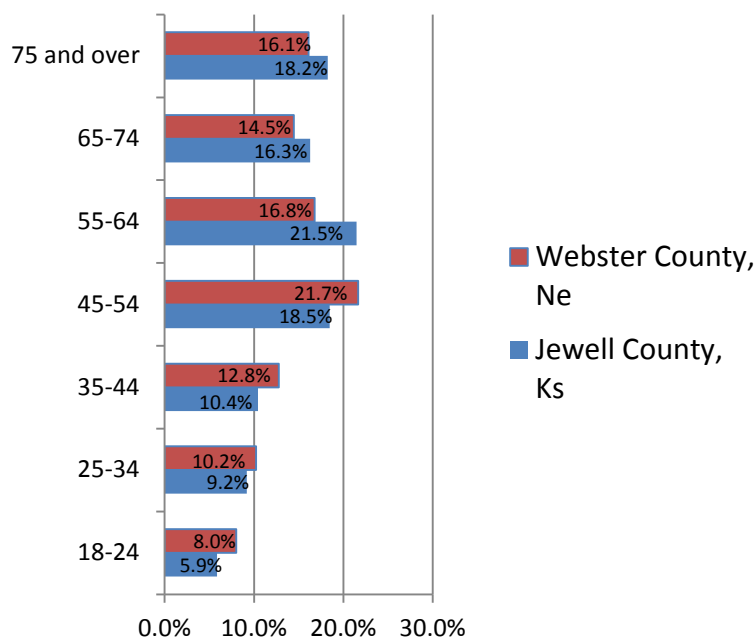
In the focus groups, these individuals took a printed version of the internet survey. Two additional questions were added at the end of the survey to attempt to understand potential reasons why the individuals did not choose to take the survey in its on-line format. Several individuals volunteered additional ideas as to why the internet survey was unsuccessful. The results these additional questions indicate that there were several factors which contributed to the failure of the internet based survey option.

An initial thought was that the avenue used to invite the target population to participate in the survey (post cards to all residences in the selected counties) might not be effective in modern society. This possibility appears to have validation as 42.9% of the focus group in Jewell County and 84.6% of those in Webster County indicated that they had no knowledge of the internet based survey. Further to this point, in Jewell and Webster Counties respectively, 53.6% and 46.2% of the focus groups indicated that they either did not read post cards at all or only read those form groups or individuals they immediately recognized. In retrospect, the design of the post card (Appendix B) should have more clearly indicated its educational intent and source.

Another potential factor which may have resulted in the low response rates is the large proportion of older residents within both Jewell and Webster Counties. In Jewell County and

**Figure 5**

United States Census 2014 Age Demographics



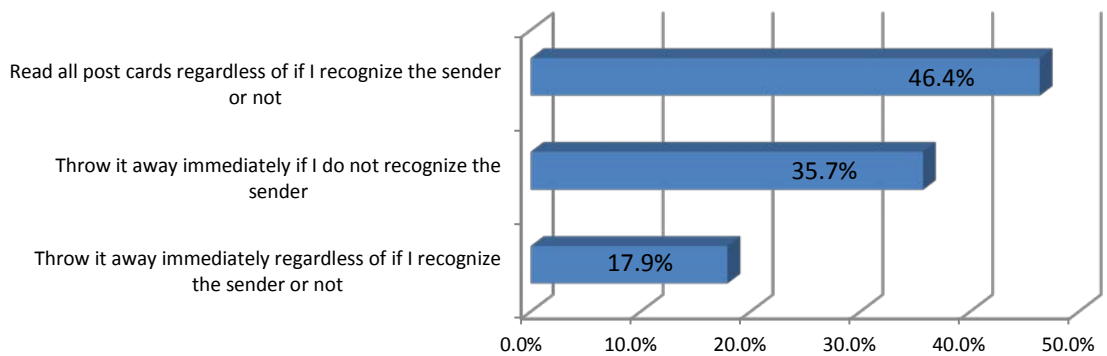
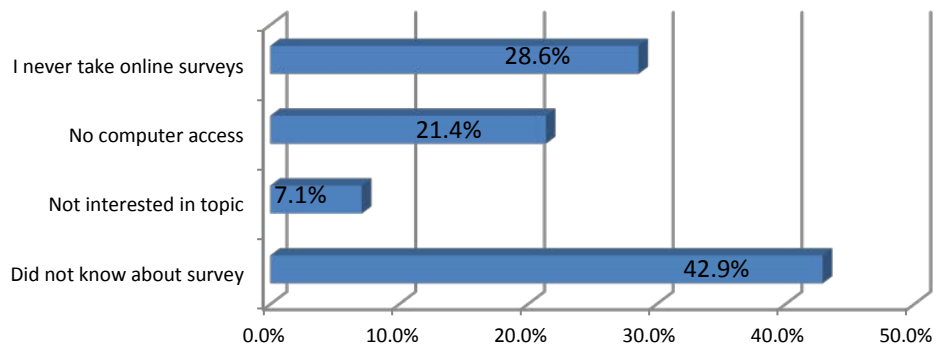
Webster Counties respectively, 35.5 % and 30.5% of residents are over the age of 65 years.

This age group seems to align with responses from focus group participants. Jewell County results show that 50% of those in the focus group either did not take online surveys or did not have internet access. Webster county results reflect that other than not knowing about the survey, all other members of the focus group (15.4%) had no computer access. Many

members of the focus groups volunteered that age and the associated inability to use of access to the internet was a large factor in the failure of residents to respond via the internet based survey.

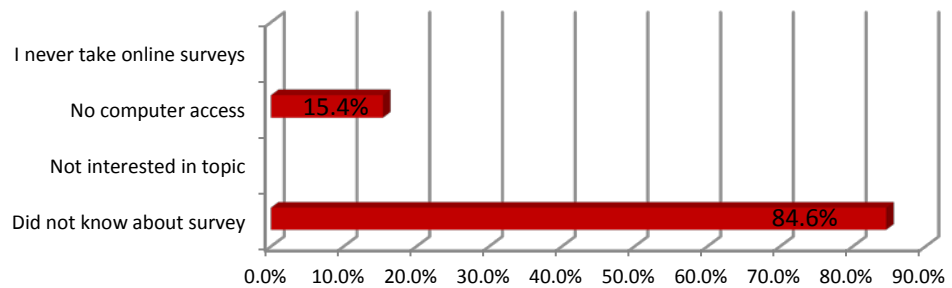
**Figure 6**

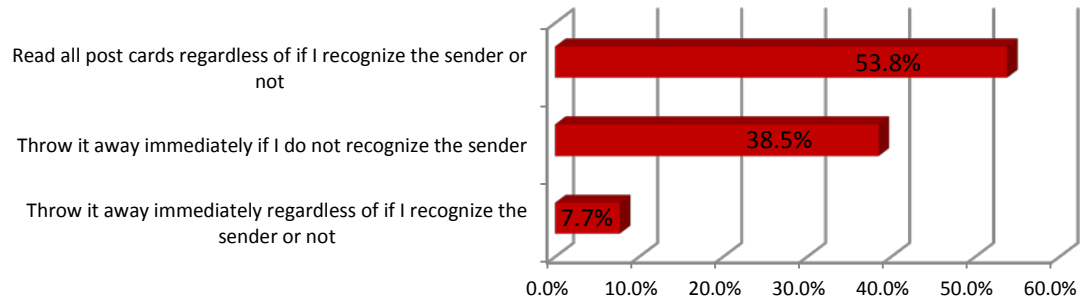
Jewell County, Kansas Follow-up Survey Responses  
2016



**Figure 7**

Webster County, Nebraska Follow-up Survey Responses  
2016





Due to the small number of respondents to the initial on-line survey, the decision was made to aggregate the data of this survey and the follow-up survey. Together, this data will be treated as a focus group. The analysis of this data will hold to the restrictions of a focus group: the findings will be analyzed at the group level, and the results will only be generalized if groups have similar demographic characteristics.

For those data sets which meet the generalization requirements, the following structure of analysis will be followed. The Pearson's coefficient of correlation methodology is applied to test for correlation between both the surveyed data set and the United States Census 2014 data set as well as between individual study counties. The test for correlation is analyzed based upon values ranging from 1 (positive correlation) to -1 (negative correlation) with 0 indicating no correlation.

The statistical confidence in an analysis is determined not just by the correlation coefficient but also by the number of pairs (Defined as when a single data point represents not just a single value, but an ordered pair of two values). If there are very few pairs then the coefficient of correlation is required to be very close to 1 or -1 for it to be considered statistically significant. If the data set contains a large number of pairs then a coefficient of correlation nearer to 0 can still be considered to be highly significant.

The T value (test statistic) is vital in validating the results of the coefficient of correlation. This value is the calculated difference represented in units of standard error. The value of the test statistic lies in the question: How likely is it that a test statistic (t) will be generated as extreme as if the null hypothesis were true? From the calculated test statistic, the P-Value is obtained.

For this study, the P-Value threshold has been set as 0.05. Values which are above this will support the null hypothesis (the analyzed data sets show no strong evidence that an external influence has resulted in an effect and thus is not highly correlated). Values which are at or below the threshold will reject the null hypothesis and reflect that there is strong evidence that an external influence has resulted in an effect implying correlation between the analyzed data sets. In a situation where there is a conflict between the two tests, the P-Value will be given less weight due to the low rate of response for the overall internet based survey. The P-Value will be larger with a small response rate than in with larger response rates. Thus, as the sample size increases, the range of possible chance influences is reduced.

# Chapter 5 - Survey Demographic Analysis

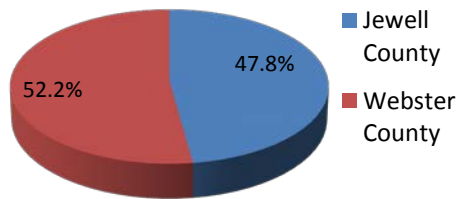
This chapter focuses upon the demographics of the survey respondents. The initial questions in the survey deal with general demographic information. The survey data will be analyzed at the county level and tested for correlation.

## 5.1 – County of Residence

This data provides insight into the location of respondents. Initially, there appears to be a high degree of correlation between the number of respondents of Jewell and Webster Counties (Figure 8) and the population distribution, based upon United States Census data (Figure 9). This is reflected in the correlation coefficient of +1.0. However, further analysis indicates a P-Value of 0.074. Considering the small sample size, while above the .05 arbitrary threshold the P-Value is still under 1.0, and the strong correlation coefficient value of +1.0, the data sets will be considered to be highly correlated.

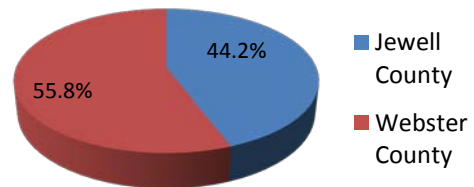
**Figure 8**

Residents by county  
United States Census Data 2014



**Figure 9**

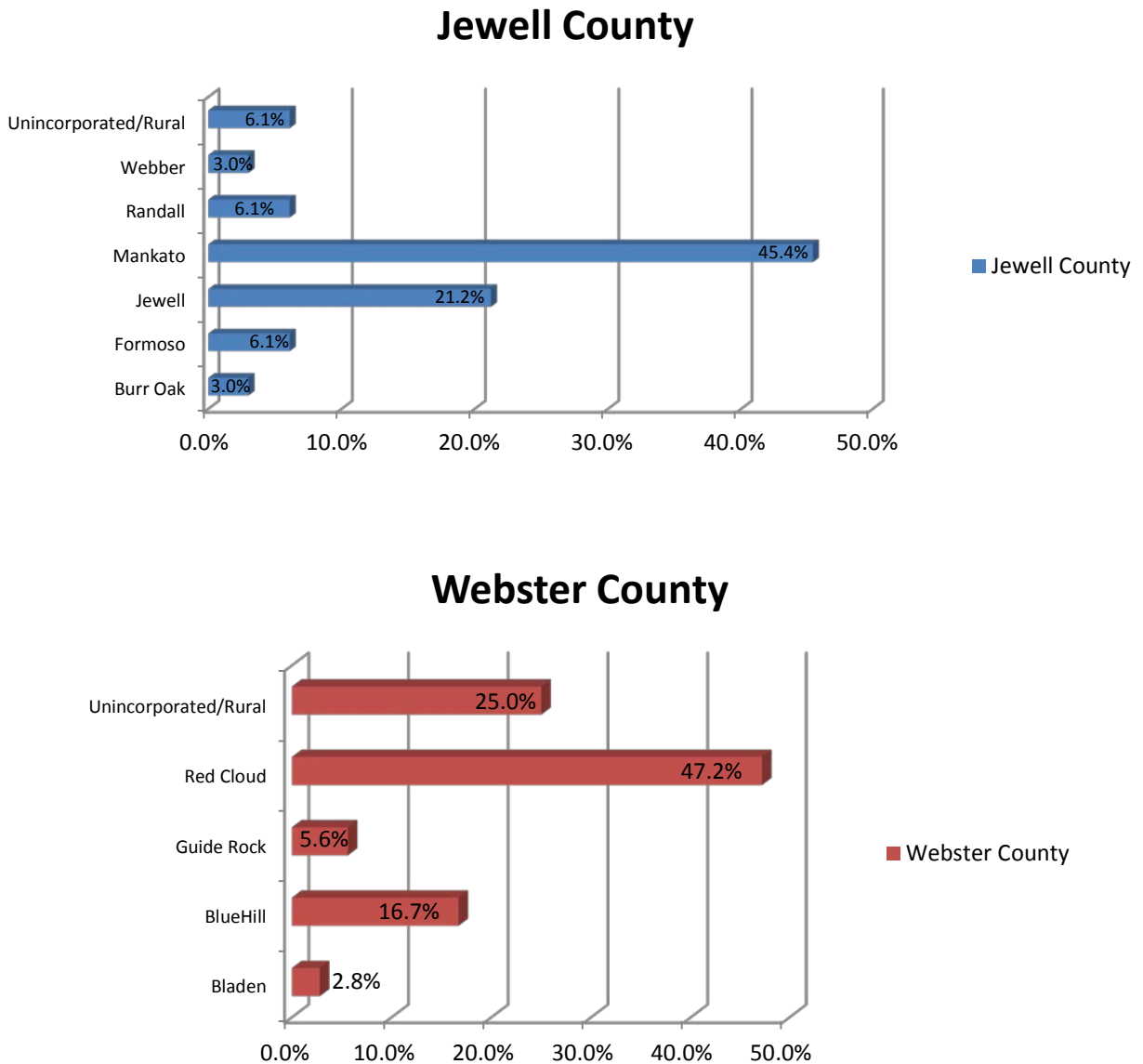
Respondents by county  
Survey Data 201



The locations of respondents show that in both counties a majority of the responses came from two major towns. In Webster County, a significant portion of responses (25%) originated from rural/unincorporated areas. This was not reflected in the Jewell County data, as rural/unincorporated areas made up only 6.1% of the responses.

**Figure 10**

Respondent locations by county  
 Survey Data 2016



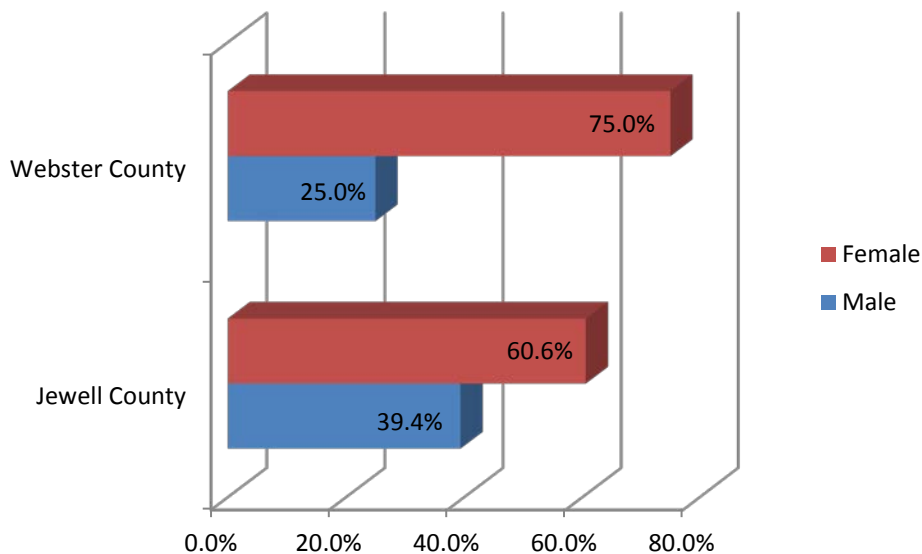
## 5.2 – Gender

A high degree of correlation appears to exist between the gender assignments of the Jewell County surveyed data set (Male: 39.4% Female: 60.6%) and the data set based upon United States Census data (Male: 47.8% Female: 52.2%). This is reflected in the correlation coefficient of +1.0. Analysis of the P-Value indicates a value of 0.029. This value is well below the arbitrary threshold value of .05 and thus indicates a strong correlation between the data sets. Thus the survey data is a strong representation of the gender assignments of Jewell County.

The Webster County surveyed data (Male: 25% Female: 75%) set shows a high degree of negative correlation in relation to the United States Census data set (Male: 51.2% Female: 48.8%). The correlation coefficient reflects this with a value of -1.0. Analysis of the P-Value indicates a value of .016; again well below the .05 threshold value. Thus, while these data sets are highly correlated, they are negatively correlated and the survey data is not an accurate representation of the gender assignments of Webster County.

**Figure 11**

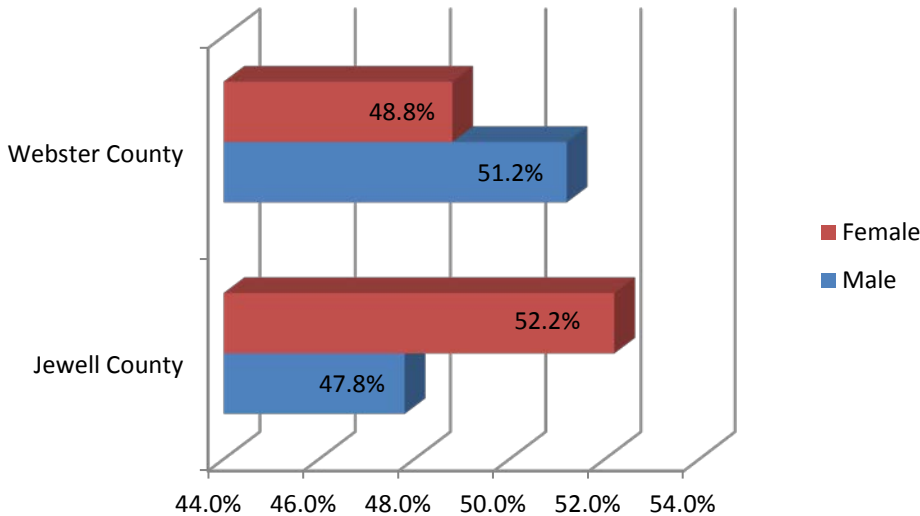
Gender assignment by surveyed county  
Survey Data 2016





**Figure 12**

Gender assignment by surveyed county  
United States Census Data 2014



### 5.3 – Education

The statistical analysis of the educational attainment data at the county level, applying the survey data for Jewell County and the United States Census 2014 (Figure 13) data set shows a high degree of correlation. This is based upon a correlation coefficient of  $+0.871$  and validated by a P-Value of  $.024$ . Thus there is a strong correlation between the two data sets.

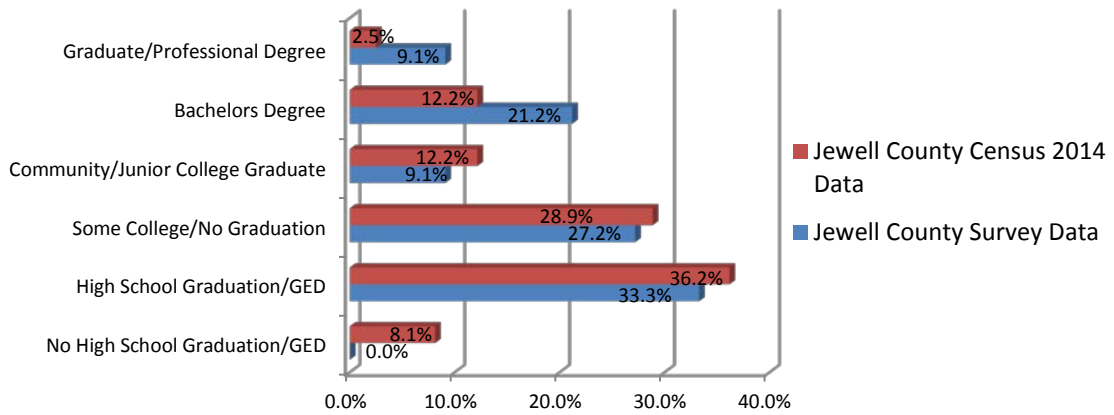
The only significant anomalies presented are a large percentage of individuals who have not attained high school graduation, and another large percentage of individuals who have attained a Bachelors or Professional degree as opposed to the reference data set.

The analysis of the Webster County surveyed data set and the United States Census 2014 data set shows possible positive correlation, however weaker than Jewell County (Figure 14). It appears that the upper and lower end of the educational attainment spectrum differ significantly from the reference data sets. On the lower end of the spectrum, the census data sets show significant percentages of individuals with no high school degree while the survey data set shows a much larger percentage of individuals who have completed high school or obtained a GED. The higher end of the educational attainment spectrum indicates much larger percentages of individuals with Bachelors and Professional Degrees than reflected in the reference data set. The coefficient of correlation value is  $+0.545$  which reflects a moderate

degree of correlation. The P-Value of .264 is significantly higher than the .05 arbitrary threshold. Due to the small sample size, the coefficient of correlation value will rule and the data sets will be assigned as having moderate positive correlation.

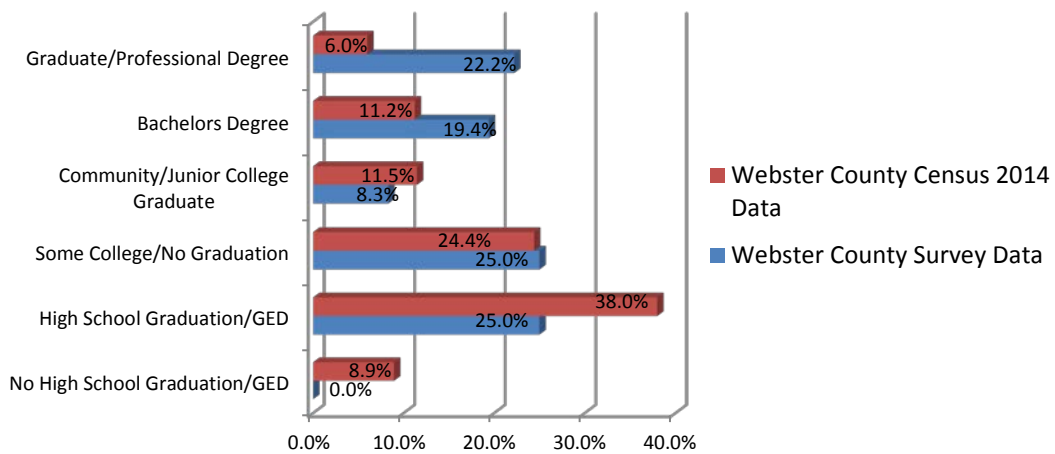
**Figure 13**

Educational status of Jewell County respondents' vs Jewell County 2014 Census Data



**Figure 14**

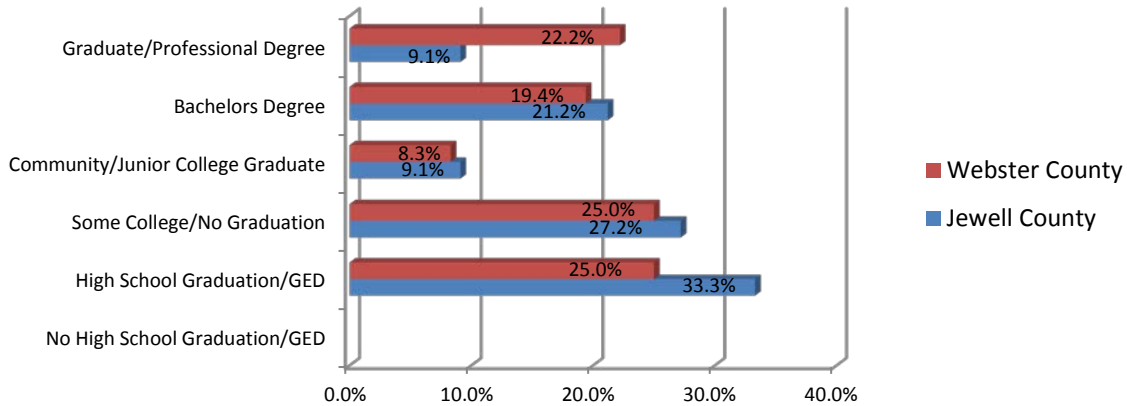
Educational status of Webster County respondents' vs Webster County 2014 Census Data



The analysis of the surveyed data set in respect to correlation between Jewell and Webster counties reflect a strong positive correlation (Figure 15). The correlation coefficient of +0.830 in conjunction with a P-Value of 0.041 reinforce the strong positive correlation between the counties data sets.

## Figure 15

Educational status of Jewell County respondents' vs Webster County respondents'  
Survey Data 2016



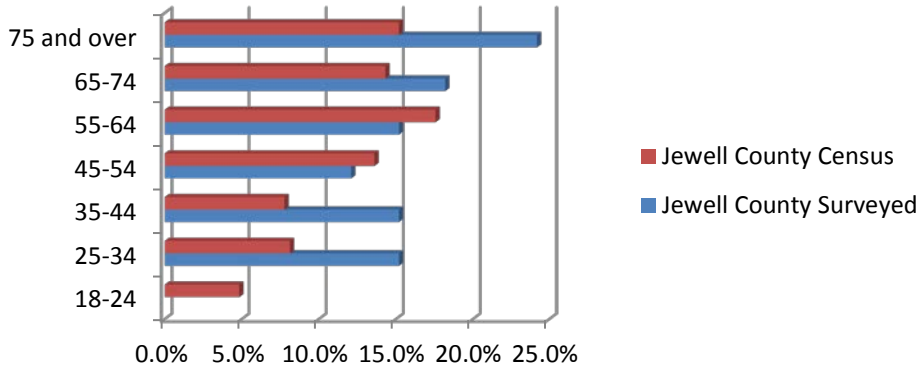
## 5.4 – Age

In analyzing the age demographic for Jewell and Webster Counties, initially each are compared to United States 2014 Census age demographic data sets for each county. The counties will then be analyzed against each other to test for potential correlation between the data sets.

The Jewell County analysis resulted in a correlation coefficient of +0.611. This indicates moderate positive correlation between the data sets. However, the P-Value generated is 0.198, well above the arbitrary .05 threshold. The overall trends of the data sets indicate an aging population with a majority over the age of 55 years. There appear to be areas of misalignment between the data sets. Specifically the survey data set shows larger percentages of individuals over the age of 65 years and between the ages of 35-44 years. In addition, the survey data has no individuals between the ages of 18-24 years. Taking into consideration that the extremely small sample size will create larger P-Values, the data set will be assigned as having a moderate degree of positive correlation to the reference data set.

**Figure 16**

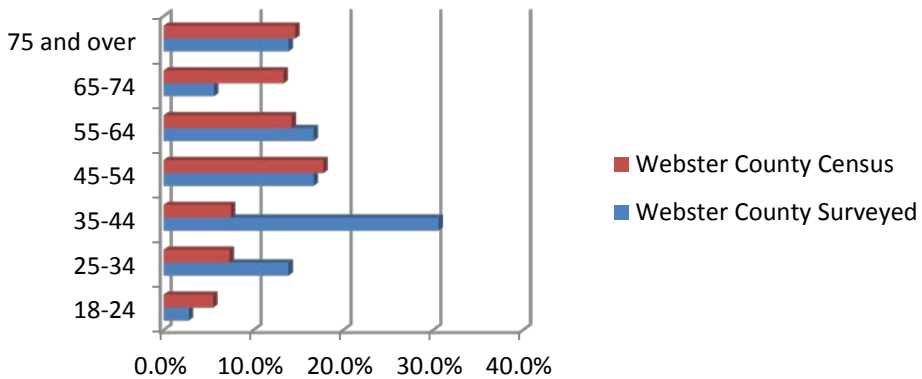
Age Distribution of Jewell County Survey Data vs Jewell County Age Distribution 2014 Census Data



The Webster County analysis resulted in a correlation coefficient of +0.046. This indicates a very slight degree of positive correlation between the data sets. The P-Value registered as 0.931, well above the arbitrary .05 threshold. There appears to be general agreement as to the overall trend of the age distribution data between the data sets. A majority of the population within the county is over the age of 45 years. There are several areas of misalignment between the data sets. The survey dataset severely over represents the age groups between 25-44 years, and under represents the groups between 18-24 and 65-74 years. Due to the very slight degree of positive correlation indicated by the correlation coefficient, the Webster County data set is assigned as having negligible correlation to the reference data set.

**Figure 17**

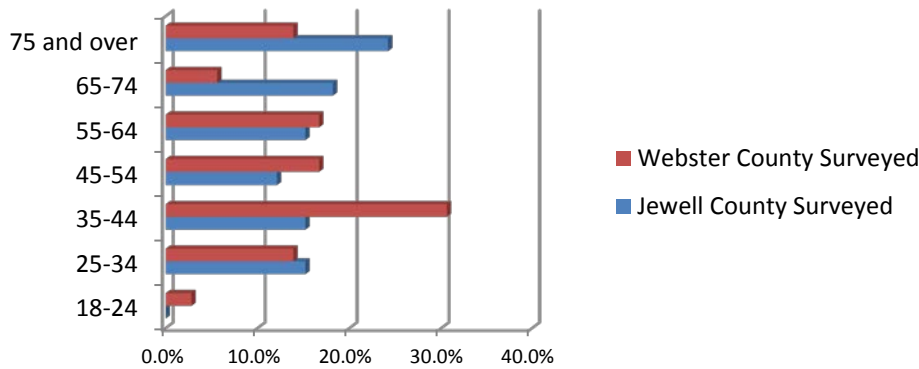
Age Distribution of Webster County Survey Data vs Webster County Age Distribution 2014 Census Data



The analysis of Jewell County age demographic data vs. Webster County age demographic data resulted in a correlation coefficient of +0.444. This indicates a moderate degree of positive correlation between the data sets. The P-Value of 0.377, however, negates this result as the value is well above the arbitrary .05 threshold. Considering the small sample sizes and the tendency for larger P-Values to be generated from such a sample size, the Jewell vs Webster County data sets will be assigned as having a moderate level of positive correlation.

**Figure 18**

Age Distribution of Jewell County vs Webster County Age Distribution Survey Data



## 5.5 – Summary

The importance of analyzing the demographic data for Jewell and Webster Counties lies in determining if the respective data sets show signs of correlation to the reference United States 2014 Census data set and to each other. The results of the demographic analysis reflect that the counties respective data sets indicate a moderate to strong positive correlation tendency with two exceptions. Both these exceptions occur with Webster County data sets. The gender assignment data set indicated a very strong negative degree of correlation to the reference data set. The age distribution data set indicated a negligible positive degree of correlation to the reference data set. Thus, with a majority of the data sets reflecting a moderate to strong degree of correlation, the major requirement of Focus Group analysis is satisfied.

## **Chapter 6 - Analysis of Attitudes vs. Experience**

### **Public Attitudes and Perceptions within the Rolling Plains and Breaks Level IV Ecoregion**

This chapter focuses upon the attitudes and opinions concerning wind energy development analyzed between the survey counties based upon Focus Group data sets. Each county has a specific relationship to wind energy development (i.e. proposed wind energy development (Webster County, Nebraska), or no active or proposed wind energy development (Jewell County, Kansas)).

This analysis ascertains the attitudes and perceptions and attitudes respondents expressed regarding awareness of wind energy development, the public attitude towards such development, if the counties are subject to the NIMBY effect, and aesthetics and scale . A comparison between attitudes and perceptions between the attitudes and perceptions between the study counties are also examined.

#### **6.1 – Awareness of Wind Energy Development**

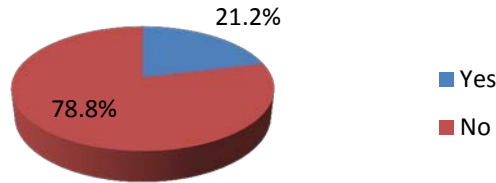
When the respondents were asked if they had any knowledge of wind energy development taking place in their region, 78.8% of Jewell County residents were not aware of any development while 91.4% of Webster County residents were aware of such development (Figure 19). The results in a large negative correlation coefficient value of -1.0 and P-Value of 0.00. Thus there is no useful correlation between the two data sets.

This large difference between awareness of wind energy development between the counties most likely is a result of their current relationship with such development. Jewell County has never and currently has no wind energy development planned. Webster County has a wind farm currently approved for construction.

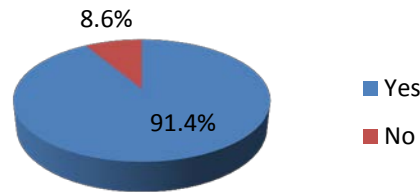
## Figure 19

Awareness of wind energy development within region  
Survey 2016

### Awareness of Wind Energy Development within Region (Jewell County)



### Awareness of Wind Energy Development within Region (Webster County)



## 6.2 –Attitudes Concerning the Development of Wind Farms

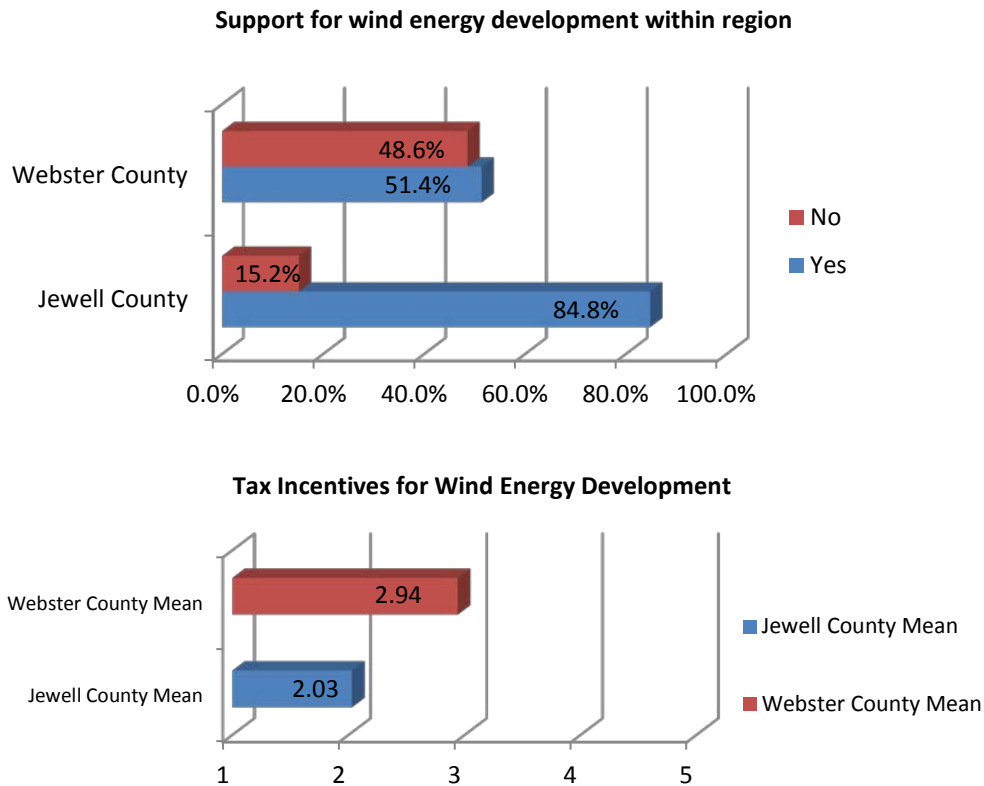
The attitudes toward wind energy development differ greatly between survey counties. 84.8% of Jewell County residents support wind energy development. That compares to 51.4% in Webster County.

Respondents were asked if they would support tax incentives for wind energy development (Figure 33). Answers were based on a 1-4 scale (1=Strongly Favor to 4=Strongly Against). The mean values again reflect the disparity of attitudes between the counties. Jewell County strongly favors tax incentives for wind energy development. Webster County shows slight disfavor for such support.

The analysis of the correlation coefficients and P-Values for the two data sets is inconclusive due to the type of data available to Mini-Tab for computation. Thus, no statistical evidence for correlation between these two data sets exists.

## Figure 20

Support for energy development within region  
Survey 2016



Respondents were asked to for their reasons for either being in favor of wind energy development within the region or opposed to development (Figure 32). The participants ranked the reasons for their position using a scale of 1-4 (1=Most Important to 4=Least Important). Of those who support wind energy development, in both Jewell and Webster Counties, overwhelmingly the most important reason for their support was the increase in scenic beauty the development would afford the region. Job creation was the next most important reason for support in both counties, significantly below scenic beauty. The data set for the two counties confirm a strong correlation with a strong correlation coefficient of +0.916 and a P-Value of .084.

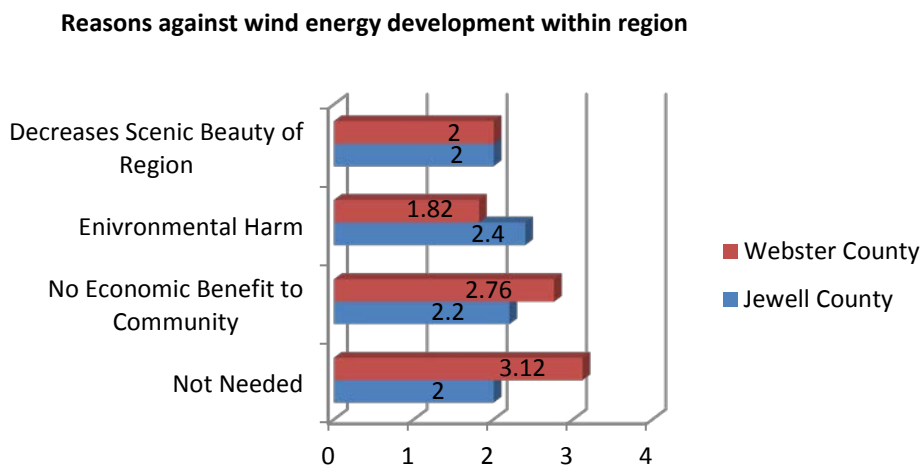
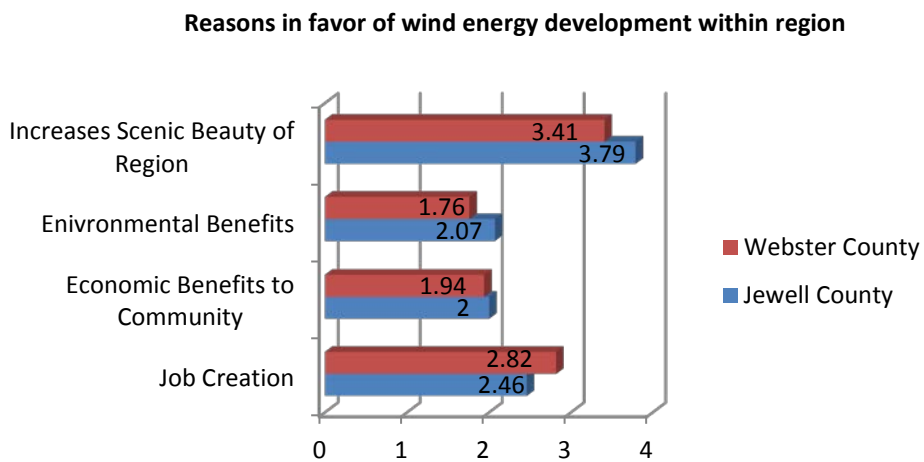
In contrast, reasons against wind energy development within the region differed greatly between counties. Jewell County respondent's reasons against development were virtually evenly split between the 4 options, with environmental harm slightly winning out as the most important reason to be against such development. Webster County respondents clearly chose the reasoning that such development was not needed. Not providing economic benefit to the



community was the next most important reason with a substantial number favoring this reason as well. Thus where support existed for development, aesthetic considerations and economics were the primary reasoning. However, where opposition to such development was voiced, wastefulness and economics were the most vital reasoning. Applying the weak negative correlation coefficient value of -0.494 and a P-Value of .506, no meaningful correlation is shown between the counties data sets.

**Figure 21**

Reasons for support of wind farm development and reasons not to support development  
 Survey 2016



### 6.3 – Analysis of the “Not In My Backyard” [NIMBY] Effect

In many cases, stakeholders find changes to their regional environment objectionable. It is often the case that they do not object to the specific type of development, but the fact that the development occurs in too close a proximity to their location. Three questions were asked to help determine the strength of this “Not In My Backyard” or “NIMBY” effect as applied to wind energy development vs other types of projects within the region. The respondents were asked to rank the projects in order of how they would the question would apply most to least (1=Most to 4=Least). The questions were phrased as follows:

Q1 (Figure 20) “It would disturb me if this were built nearby”

Q2 (Figure 21) “Which of the following would be most controversial?”

Q3 (Figure 22) “I would campaign against having this built nearby”

In both Jewell and Webster Counties, for all questions, the construction of cellular towers was considered to be least objectionable. Wind energy development was seen as the next least objectionable in both counties except for Q3 where Webster County respondents found wind development the second most likely type of development they would campaign against (only behind a power plant development project). The strong correlation between the first two data sets is reflected by the correlation coefficient values of +0.890 and +0.767 respectively as well as the P-Values of .110 and .233 (although above the arbitrary .05 threshold value, the strength of the correlation coefficient value negates this result) respectively. The third data set shows correlation indicators consistent with divergent opinions found between the counties for Q3. The correlation coefficient of +0.541 reflects only moderate positive correlation, while the P-Value of .459 is significantly above the arbitrary .05 threshold. Thus, this data set has little effective correlation between the two counties

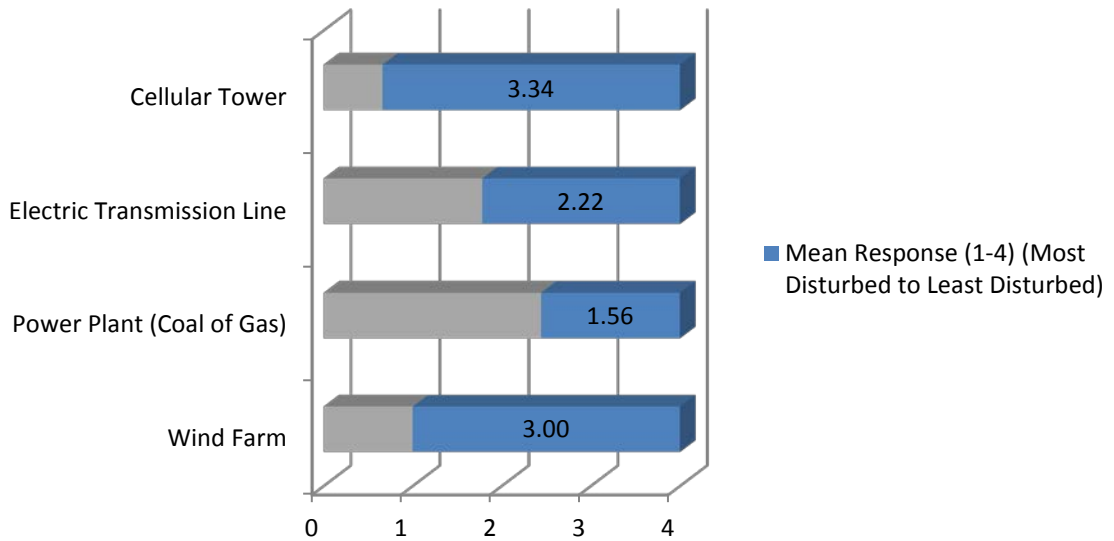
It appears that wind energy development has a relatively small NIMBY effect attached to it within the region. It is surprising for this to be the case in Webster County based upon the evenly split support for such development. Also interesting are the low numbers regarding whether a wind energy development would be disturbing and whether the same would be controversial, yet a high number indicated a willingness to campaign against such a development in Webster County. Normally if an individual is motivated to campaign against a

project, they would be disturbed and find it to be controversial. The depth of this study does not allow for further exploration of this anomaly.

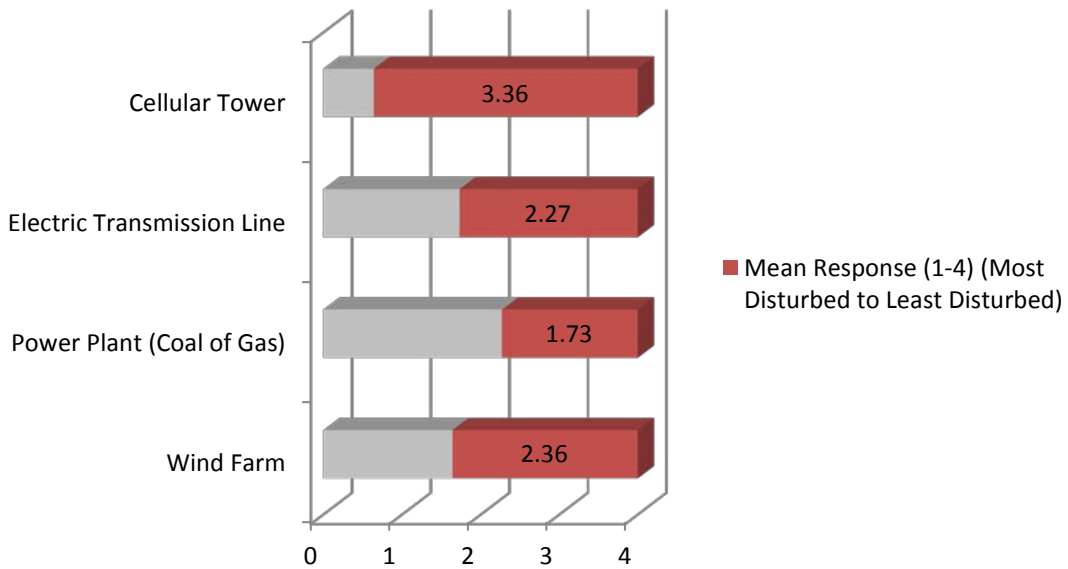
### Figure 22

It would disturb me if this were built nearby (Jewell and Webster Counties)  
Survey 2016

**It would disturb me if this were built nearby (Jewell County)**



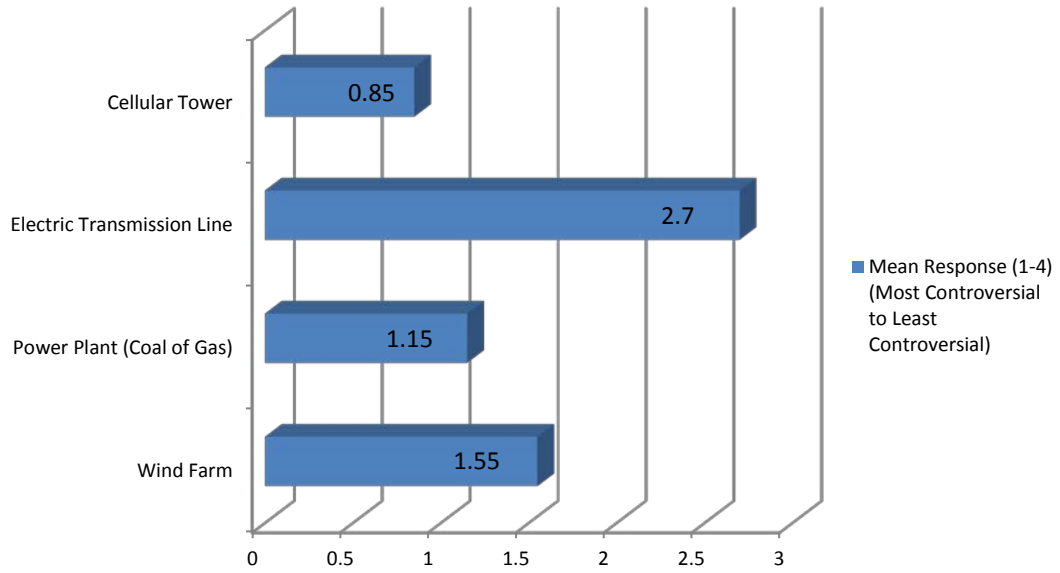
**It would disturb me if this were built nearby (Webster County)**



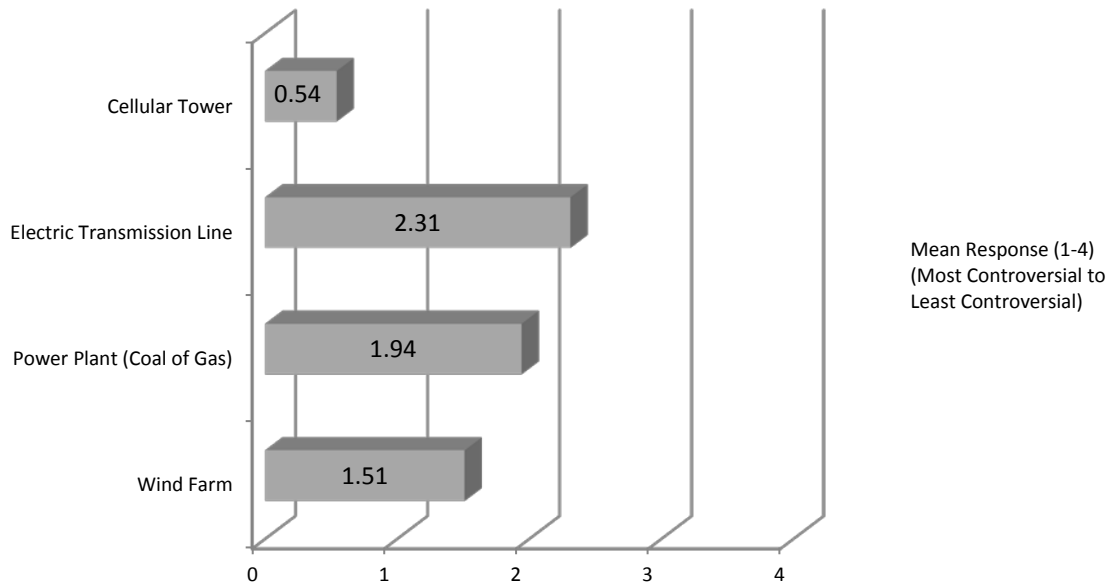
### Figure 23

Which of the following would be most controversial? (Jewell County and Webster Counties)  
Survey 2016

#### Which of the following would be most controversial? (Jewell County)



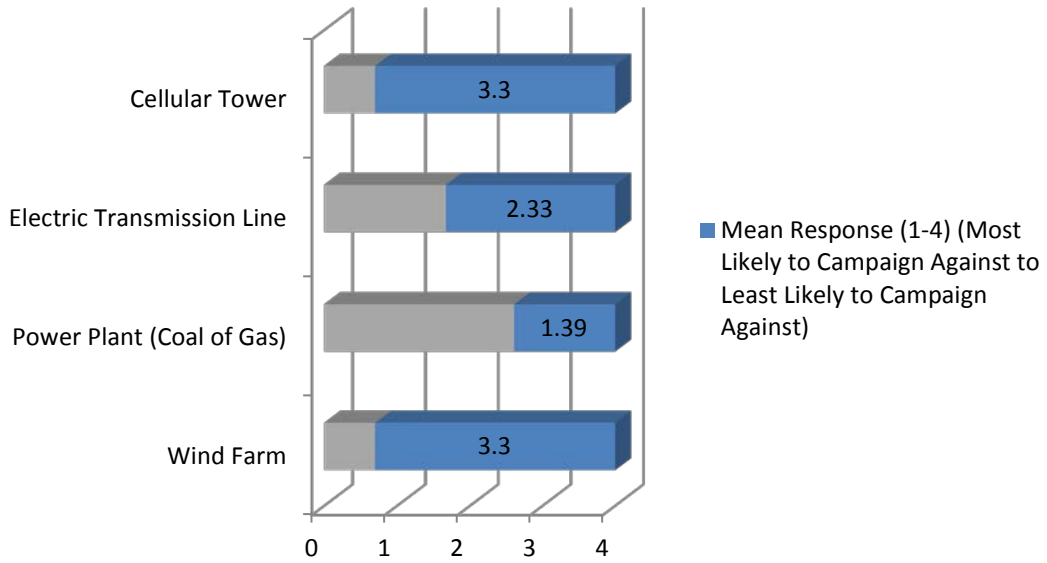
#### Which of the following would be most controversial? (Webster County)



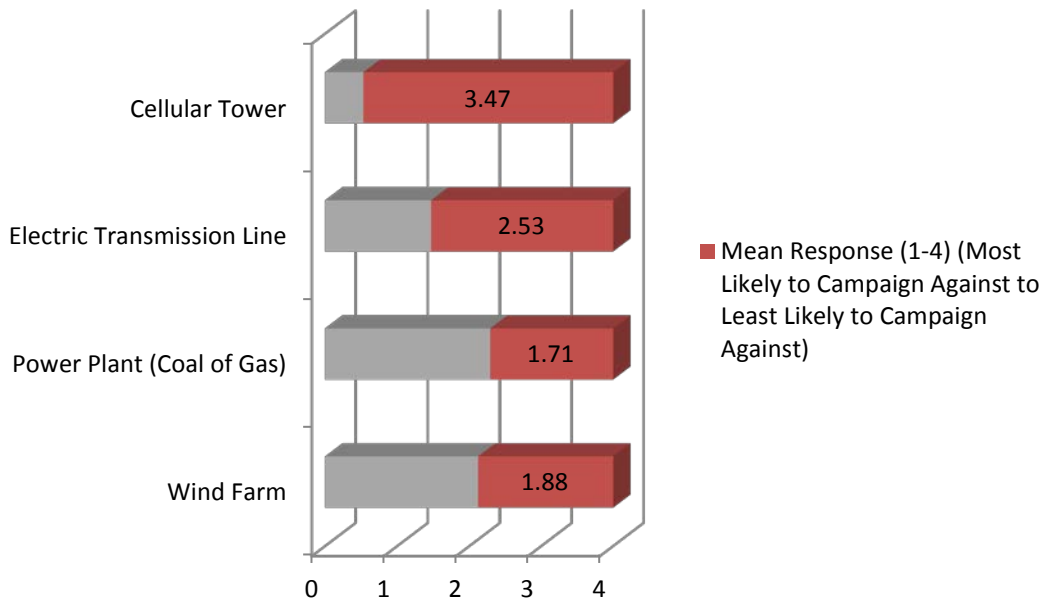
## Figure 24

I would campaign against having this built nearby (Jewell and Webster Counties)  
Survey 2016

### I would campaign against having this built nearby (Jewell County)



### I would campaign against having this built nearby (Webster County)



## 6.4 – Analysis of Aesthetics and Wind Energy Development

Photos were used to gauge the respondent's perception of the visual impact of a wind energy development. The respondents were instructed to select whether the impact was very negative, negative, neither positive nor negative, positive, or very positive (Figure 23).

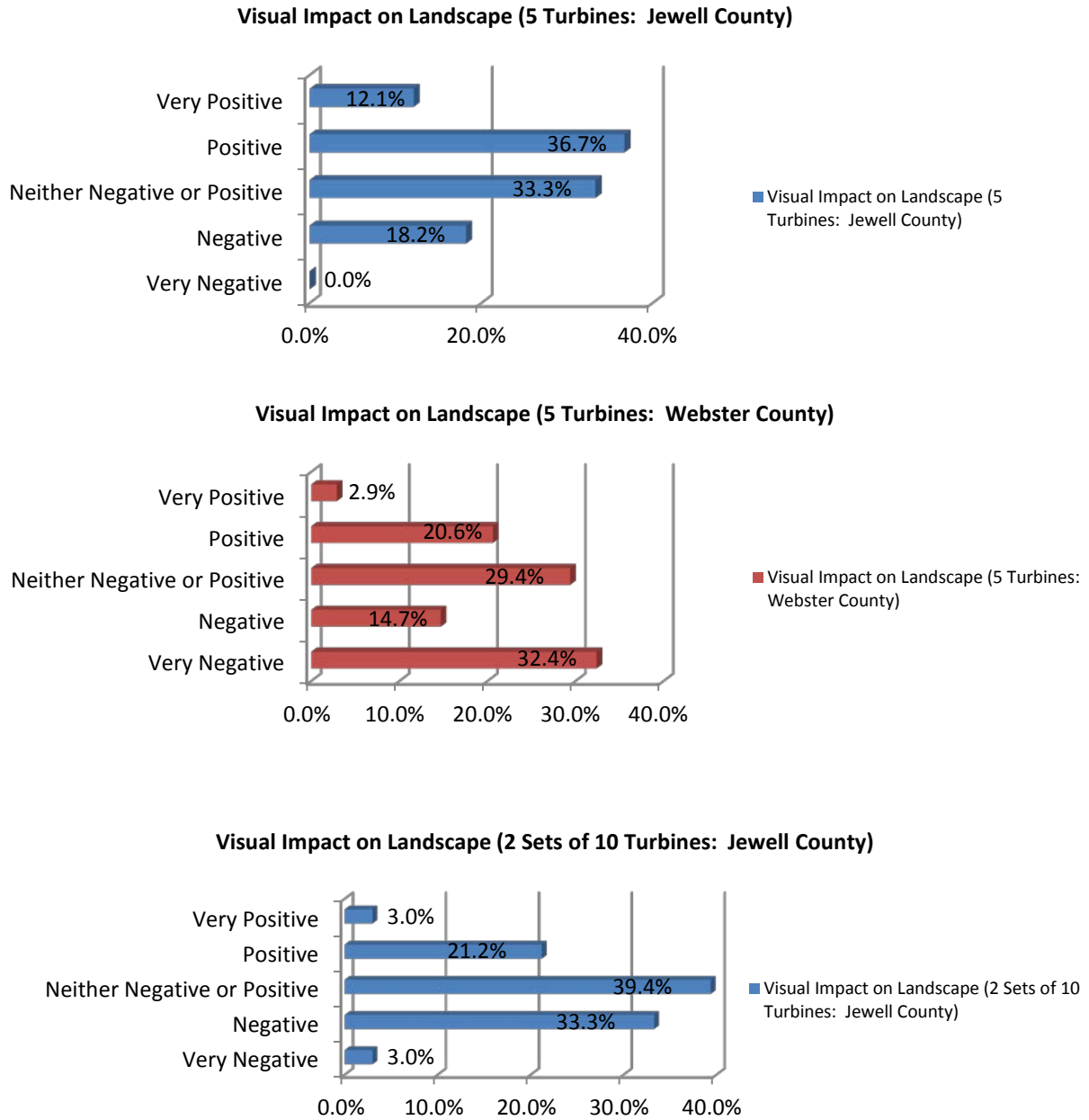
Initially, the respondents were shown a scene depicting five wind turbines in a similar landscape as their region. Next they were shown a scene depicting two groups of ten turbines. Finally, they viewed a scene depicting 25 turbines grouped in close proximity. None of these data sets reflect a strong correlation between the counties. The correlation coefficient values of +0.044, +0.186, and -0.103 all reflect a weak positive or negative correlation between the data sets. The P-Values of .944, .765, and .869 are all significantly above the arbitrary .05 threshold value.

Respondents in Jewell County indicated that the five turbine setting was a positive one receiving 36.7% of the votes, although there was a large portion of the respondents who believed the turbine produced no effect either way (33.3%) and only 18.2% viewed the effect as very negative. Webster County respondents, however, viewed the effect quite differently. 32.4% felt that the effect was very negative and again a large number (29.4%) thought there was no effect on the landscape. Only 20.6% has a positive view of this configuration.

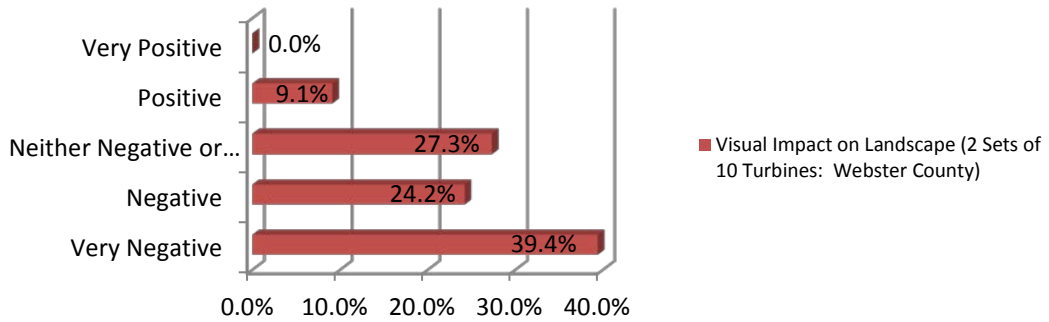
The perceptions respondents have about the effect turbines have upon the landscape become less favorable as the number of turbines increase. This is true for both Jewell and Webster Counties. Jewell County saw the percentage of respondents who perceived the effect as negative increase to 33.3% and 36.3% respectively. Webster County saw the percentage of individuals who perceived the effect as very negative increase to 39.4% and 47.1% respectively. Of particular note is that while the two groups of ten turbines were viewed less favorably by respondents in both counties, it was much more favorable than the single group of twenty five turbines. This seems to indicate that if the total number of turbines is grouped in small enough portions, the negative impact can be negated to a degree.

## Figure 25

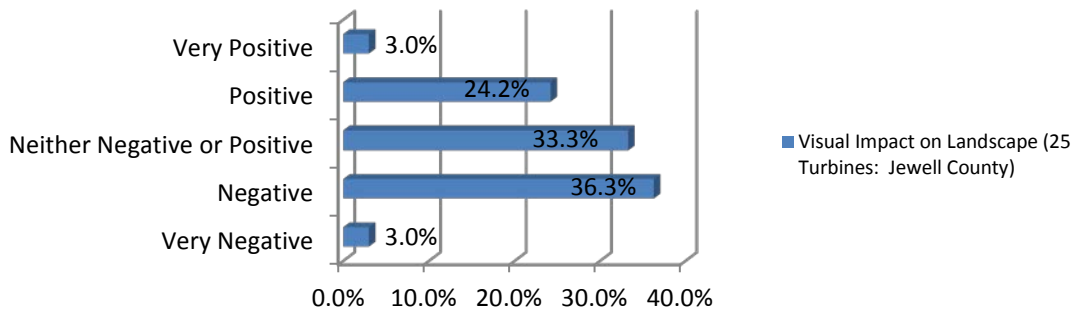
Effect of wind development design and scale on visual perception  
Survey 2016



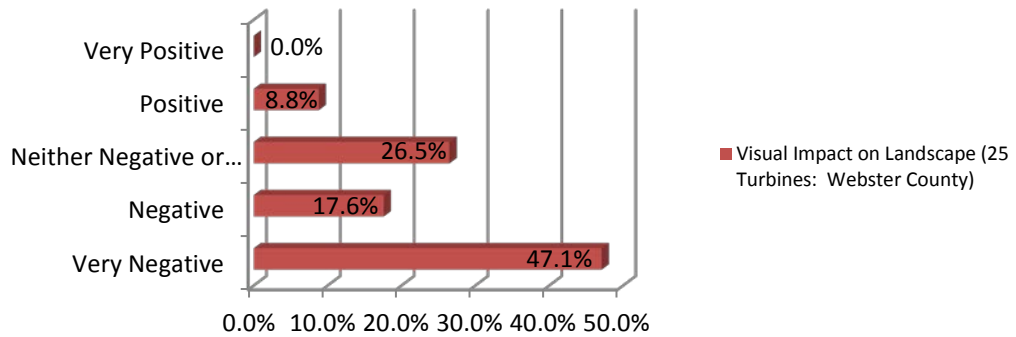
**Visual Impact on Landscape (2 Sets of 10 Turbines: Webster County)**



**Visual Impact on Landscape (25 Turbines: Jewell County)**



**Visual Impact on Landscape (25 Turbines: Webster County)**





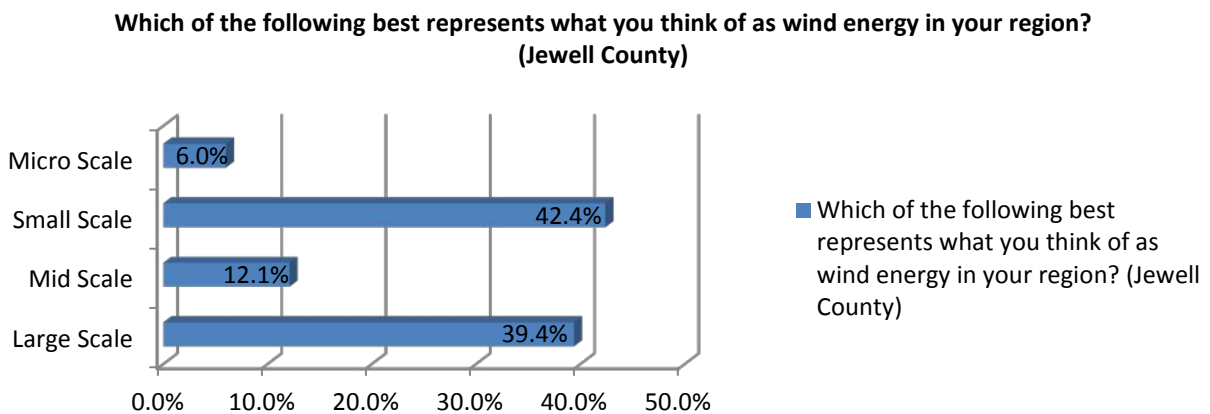
Jewell and Webster County respondents were asked two questions to ascertain attitudes and preferences regarding general aesthetics and scale. The respondents were shown a series of four photos (Appendix A). Each photo represented a different aesthetic in wind energy production as well as a different scale.

First the respondents were asked to choose which image correlated with what they thought of as wind energy in their region (Figure 26). Jewell and Webster Counties respondents were nearly evenly divided between the large scale (39.4%; 45.7%) and the small scale (42.4%; 42.9%) respectively. Next the respondents were asked to choose which image was most visually appealing (Figure 27). Jewell and Webster Counties selected the large scale conventional turbine as most visually appealing (63.6%; 77.1%) respectively. There was a strong positive correlation between the two data sets. Correlation coefficient values of +0.993 and +0.975 are strong indicators of this correlation. The P-Values of .007 and .025 add confirmation of this strong correlation.

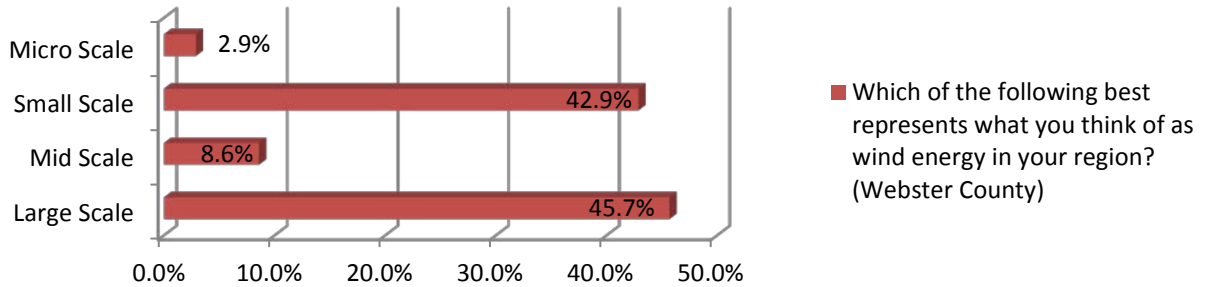
Analysis of the aesthetic data leads to the conclusion that in both counties respondents prefer large scale turbines in small numbers. Participants also appear to acknowledge the historical presence of the small scale traditional wind mills, however, prefer aesthetically the conventional large scale turbines.

**Figure 26**

Which image best represents wind energy in the region? (Jewell and Webster Counties)



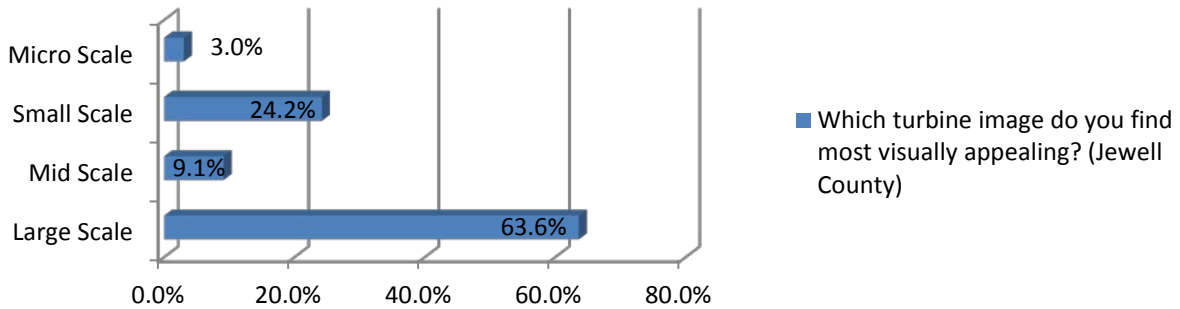
**Which of the following best represents what you think of as wind energy in your region?  
(Webster County)**



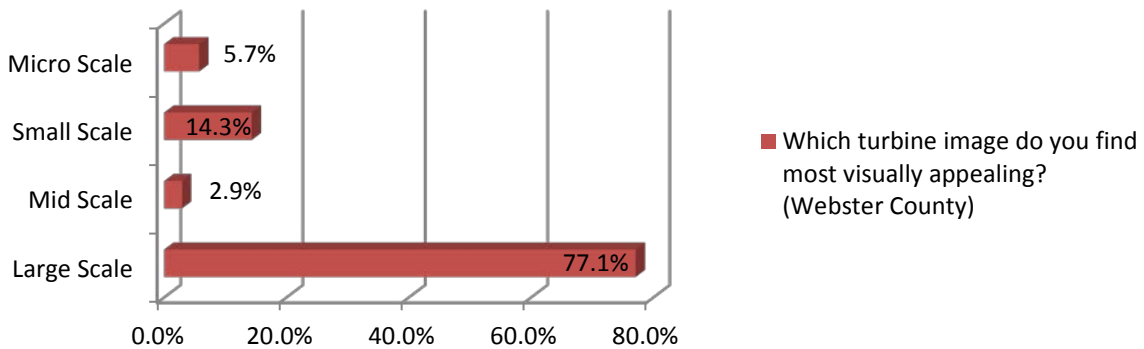
**Figure 27**

Which wind turbine image is most visually pleasing? (Jewell and Webster Counties)

**Which turbine image do you find most visually appealing? (Jewell County)**



**Which turbine image do you find most visually appealing? (Webster County)**



## 6.5 – Summary

There is a great deal of difference in the awareness of wind energy development between Jewell and Webster Counties, the former revealing a much lower level of awareness than the latter. This is juxtaposed with the much higher level of support for wind energy development and the associated tax credits in Jewell County than in Webster County. Those who support wind energy development in both counties do so for similar reasoning, while those who oppose such development have dissimilar reasoning.

There appears to be little evidence of a “Not In My Backyard” (NIMBY) effect towards wind energy development in either Jewell or Webster county. The exception is when respondents in Webster County were asked what type of construction they were most likely to campaign against. In this case, Webster County respondents choose only a gas or coal fired power plant ahead of a wind energy development.

The aesthetic preferences of both Jewell and Webster county respondents appear to be linked to the preference for a smaller scale of wind energy development. Respondents selected the large scale conventional turbines as their most visually appealing. Thus, respondents in both counties prefer larger turbines on a smaller scale development over smaller turbines on a larger scale development. Respondents in both counties acknowledged the traditional wind mills as being part of the current landscape, yet preferred the conventional wind turbine form.

Correlation between the data set of Jewell and Webster counties showed a great deal of variation with respect to topic. There was little correlation in the topic of awareness or development of wind energy. This is not the case for the topics of NIMBYISM and aesthetics, where for one exception; there was a high degree of positive correlation present.

## **Chapter 7 - Community Involvement**

This chapter is devoted to examining the views of the respondents in relationship to the level of community engagement expected (Jewell County) or attained (Webster County) during the approval process for a wind energy development project. Analysis of this data is admittedly based upon inference as one county has never been through such a process (Jewell) and the other has just completed such a process (Webster). However, a case can be made that the expectations of Jewell County respondents can be used as a baseline for the actual experiences and satisfaction level of Webster County respondents. Thus, if there proves to be a great disparity between expectations and reality, the satisfaction level can be inferred to have been effected by the lack of success in meeting these expectations.

### **7.1 – Community Consultation**

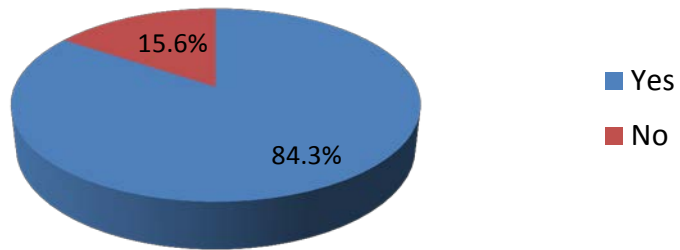
Jewell County respondents overwhelmingly believe (84.3%) that the community should be consulted prior to approval of wind energy development (Figure 28). Webster County, however, revealed 62.9% of the respondents reported that the community was not consulted prior to the approval of the wind energy project (Figure 29). Since the expectations of respondents who have no experience with such development favor heavily consultation prior to approval, the lack of prior consultation in Webster County points to a significant process failure and a potential reason for why many in this county do not approve of wind energy development within the region.

Expectations in Jewell County as to how the community should be consulted regarding wind energy development pointed to three areas of communication. 82.1% of the respondents felt that a public meeting was the correct form of consultation. The other forms mentioned were the local newspaper (14.3%), and mailings (3.6%). Webster County respondents who reported that they had been consulted (37.1%) indicated that several methods had been used for consultation. Public meeting was mentioned by the largest percentage of individuals (43.8%), followed by the local newspaper (37.5%), and mailings (18.8%). These results show that the areas are in agreement as to how the community should be consulted. The issue appears to lie in the effectiveness of communicating with the public about the consultation.

**Figure 28**

Should the community be consulted prior to wind energy development in the region (Jewell County)

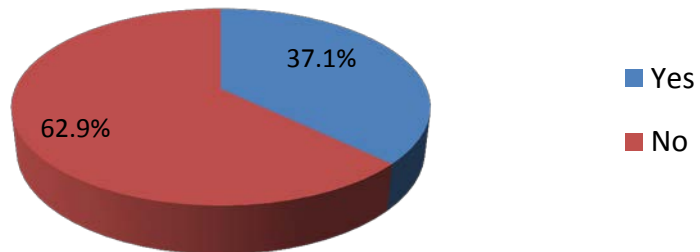
**Should the Community be Consulted Prior to Approval of a Wind Energy Development**



**Figure 29**

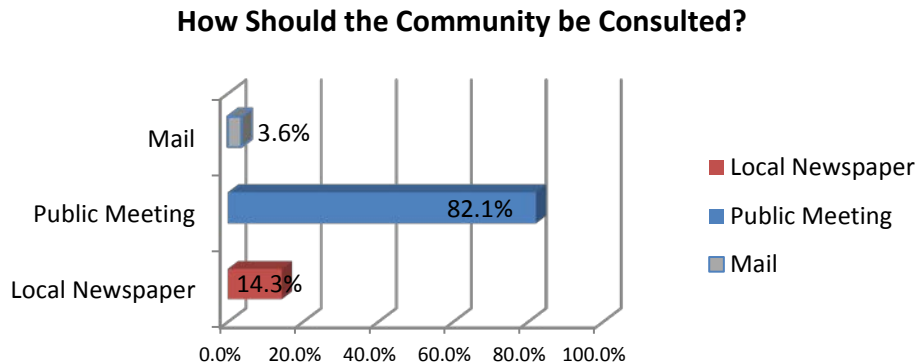
Was the community consulted prior to a wind energy development in the region (Webster County)

**Was the Community Consulted Prior to Approval of a Wind Energy Development**



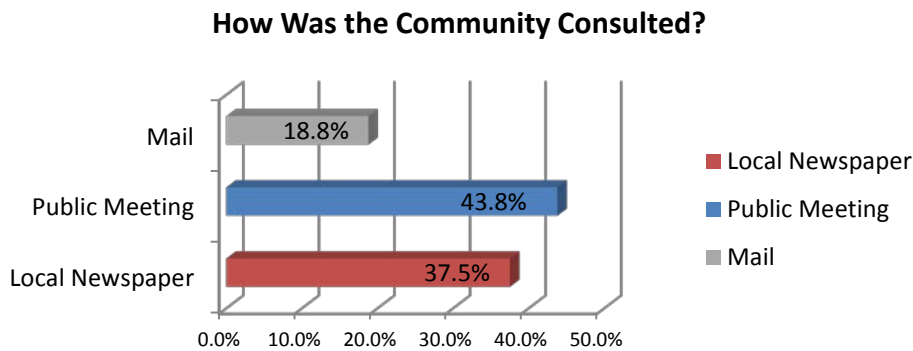
**Figure 30**

How the community should be consulted prior to a wind energy development in the region (Jewell County)



**Figure 31**

How the community was consulted prior to a wind energy development in the region (Webster County)



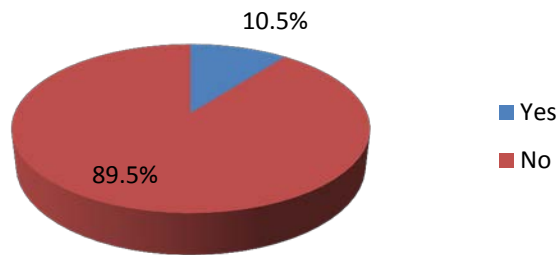
Interestingly, of those in Webster County who recalled a community consultation, 89.5% were dissatisfied with the consultation process. This could be directly linked to the amount of community involvement in the design/scaling of the project. While in Jewell County, 92.9% of respondents expected that the community should be involved in this part of the process (Figure 33), Webster County respondents indicated that 50% stated they had such input (Figure 34). Furthering this conclusion, Jewell County respondents, by a vast majority (85.7%), expected that the community should be given an opportunity to invest in the development (Figure 35). Only 5.3% of the Webster County respondents indicated they had been offered such an opportunity (Figure 36). Thus, the expectations are that the community should act as an active stakeholder in wind energy development. The fact that this appears to be absent in Webster County again ties into the dissatisfaction with wind energy development expressed in Chapter 6. Paradoxically, in Webster County, 73.7% of respondents indicated they did not formally oppose

planning permission for the development. Possible explanations are either apathy or a lack of knowledge surrounding the process.

**Figure 32**

Satisfied with the Community Consultation Process (Webster County)

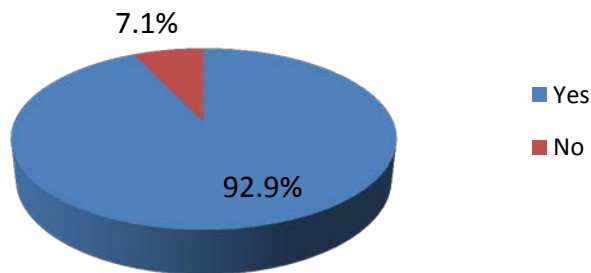
**Are You Satisfied with the Community Consultation Process?**



**Figure 33**

Should the community be offered an opportunity to comment on the design/Scale of the Wind Energy development? (Jewell County)

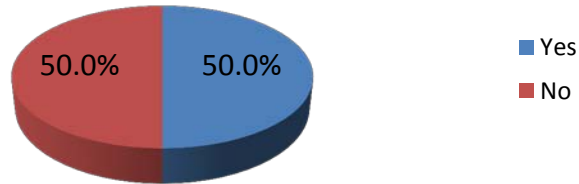
**Should the Community be Offered an Opportunity to Comment on the Design/Scale of the Wind Energy Development?**



**Figure 34**

Was the community was consulted about the design/scale of the wind energy development in the region? (Webster County)

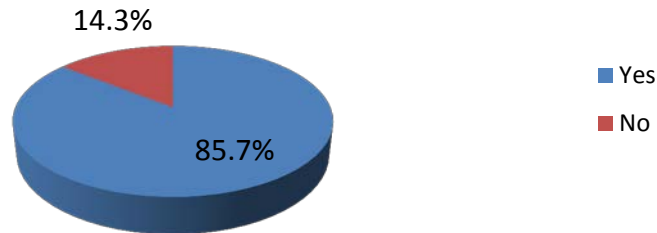
**Was the Community Offered an Oprotunity to Comment on the Design/Scale of the Wind Energy Development?**



**Figure 35**

Should the community be offered to invest in the wind energy development? (Jewell County)

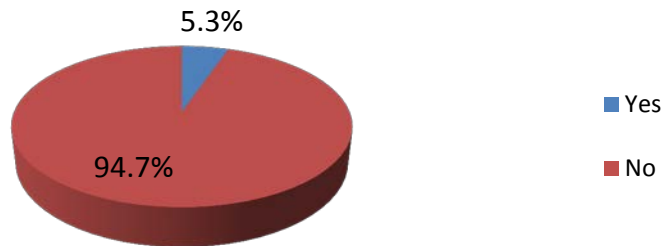
**Should the Community be Offered an Oprotunity to Invest in Wind Energy Development?**



**Figure 36**

Was the community offered to invest in the wind energy development? (Webster County)

**Was the Community Offered an Oprotunity to Invest in the Wind Energy Development?**

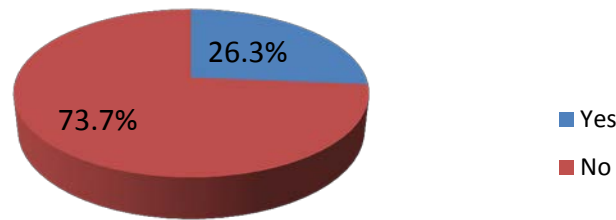




### Figure 37

Did you formally object to planning permission being granted to the project? (Webster County)

**Did you formally object to planning permission being granted to the project?**



## 7.2 – Summary

It appears clear through analysis of the data presented in this chapter that the expectations of citizens are of vital importance. The lack of communication which occurred in Webster County is in stark contrast to the expected level of communication in Jewell County. Webster County appears to have failed in recognizing and addressing these expectations in regard to community involvement during the approval process for the wind energy development project. This has resulted in a large number of respondents not supporting wind energy development in the region. It is also clear that the same citizens failed to express their displeasure by objecting formally to planning permission being granted to the project. Whether this was from lack of knowledge of the process or apathy generated by being engaged, it could only send a signal that the population supported the development.

## **Chapter 8 - Discussion and Conclusions**

The results of this research provide an insight for governmental entities, community activists, designers, and planners concerning the public's attitudes and perceptions of wind energy development at a level IV ecoregion scale. This study has proven to be limited in scope, however, it has provided evidence of correlation in the attitudes and perceptions of wind energy development within the Rolling Plains and Breaks ecoregion. This study should be considered a starting point for further, more exhaustive research, regarding the potential to regulate wind energy resources at the ecoregion scale.

### **8.1 – Discussion**

1. The confidence level assigned for this research project was 95% and the associated confidence interval was set at 5%. These preconditions mean that the overall study area sample size required to be statistically significant is 374 respondents. This level of response was not attained. Thus, the validity of any data analysis at this level of investigation would be highly suspicious. A follow-up was conducted within two weeks after the end of the internet survey. Jewell County, Kansas and Webster County, Nebraska were chosen due to their proximity and that both had significantly lower and similar population sizes. All analysis of survey data contains results from these two selected locations exclusively. The follow-up took the form of small focus groups (29 persons in Jewell County and 13 persons in Webster County). The participants were individuals who did not take the internet based survey. In the focus groups, these individuals took a printed version of the internet survey. Two additional questions were added at the end of the survey to attempt to understand potential reasons for the failure of the survey in its on-line format.
2. The results of the demographic analysis reflect that the counties respective data sets indicate a moderate to strong positive correlation tendency with two exceptions.

Both these exceptions occur with Webster County data sets. Even with these exceptions, with a majority of the data sets reflect a moderate to strong degree of correlation, satisfying the major requirement of Focus Group analysis. There is a great deal of difference in the awareness of wind energy development between Jewell and Webster Counties. Those who support wind energy development in both counties do so for similar reasoning, while those who oppose such development have dissimilar reasoning. There is little evidence of a “Not In My Backyard” (NIMBY) effect towards wind energy development in either Jewell or Webster County. Correlation between the data set of Jewell and Webster counties showed a great deal of variation with respect to topic. There was little correlation in the topic of awareness or development of wind energy. This is not the case for the topics of NIMBYISM and aesthetics, where for one exception; there was a high degree of positive correlation present.

3. Respondents in both counties prefer larger turbines on a smaller scale development over smaller turbines on a larger scale development. The aesthetics of the conventional wind turbine does not appear to negatively affect respondent's attitudes and perceptions of wind energy development.
4. It appears clear through analysis of the data that the expectations of citizens are of vital importance. These expectations are reflected in the general approval of wind energy resource development within the region.

## **8.2 – Conclusions**

1. The major conclusion of this study of the attitudes and perceptions of wind energy within the Rolling Plains and Breaks ecoregion supports the rejection of the null

hypothesis (that there is no correlation between the attitudes and perceptions of wind energy development within the ecoregion). While there were a small number of data sets which did not show a moderate or strong degree of positive correlation, the majority of the data sets did show such correlation. Thus, based upon this correlated relationship, the potential exists for regulation to be crafted at the ecoregion level regarding wind energy resource development.

2. An analysis of attitudes and perceptions voiced in this survey indicate a general approval of wind energy development within the ecoregion. While some indication of a willingness to campaign against wind energy development, when the opportunity arose to do so, a small proportion actually objected. There appears to be little evidence of a “Not In My Backyard” (NIMBY) effect within the region. The aesthetics of the conventional large scale wind turbine form does not appear to have a major impact upon attitudes or perceptions of such development. However, the spatial extent of such development does appear to have such an impact. A strong preference was shown for developments of five turbine configurations with moderate approval of configuration consisting of two sets of ten turbines. Strong disapproval was indicated for development consisting of groups of twenty five turbines.
3. Experience with wind energy development does appear to affect the amount of support for wind energy development. While still in favor of such development, respondents who have experienced the approval process show a much lower approval rate for development than those who have never experienced the process. This can be loosely correlated to the expectations of respondents to be active participants and stakeholders during the process with the reality of the situation which occurred during the approval process in Webster County. This dissatisfaction

with the amount of community involvement seems to directly influence the approval rate for wind energy development within this county.

4. The structure of the original survey was not adequately designed for the region. The use of post cards as an invitation device appears to be antiquated. A large number of individuals upon follow-up indicated they either do not read any post cards or only those which they recognize the sender. Even though the post card displayed the Kansas State University College of Architecture, Planning, and Design logo, it was not the prominent feature. This may have decreased the response rate among those who read cards from which they recognize the sender. The basic internet-based structure of the survey also appears to have been a misstep. Follow-up indicates that a large percentage of respondents either do not have internet access or do not take internet based surveys. This may be a result of the large percentage of individuals over 65 years, and of the inconsistent availability of reliable internet service within the region. A better structure for this survey would have been focus groups as the follow-up to the original survey showed respondents much more willing to participate.
5. Due to failure to reach a statistically significant response rate, the results of this survey and the analysis must be treated with a healthy degree of skepticism. However, the analysis does provide enough strong correlation in many areas to encourage further examinations into correlation of attitudes and perceptions regarding wind energy resource development within the ecoregion scale as well as the potential for regulation based on this spatial extent.

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# Appendix A - Qualtrics Survey

## Perceptions and Attitudes of Wind Energy and Wind Energy Development

This survey is available for participation from **1 January – 31 January 2015**

Completion of this survey should take approximately 15 **minutes**.

The purpose of this survey is to examine the perceptions and attitudes towards wind energy and its development within your region of the Great Plains. The result of this survey has the potential to impact regulation and planning of future wind energy development project in the region.

If you have any questions regarding this survey, please contact any of the following individuals:

**John Keller**

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**Terry Tucker**

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**Rick Scheidt**

Chair: Committee of Research Involving Human Subjects  
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University Veterinarian: Associate Vice President for Research Compliance  
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Manhattan, Kansas 66506  
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**Terms of Participation:** I understand this project is research, and that my participation is completely voluntary. I also understand that if I decide to participate in this study, I may withdraw my consent at any time, and stop participating at any time without explanation, penalty, or loss of benefits, or academic standing to which I may otherwise be entitled.

I verify that by selecting the >> box below that I have read and understand this consent form, and willingly agree to participate in this study under the terms described.

**Gender**

Male

Female

**Age**

18-24

25-34

35-44

45-54

55-64

65-74

75 and over

**Education**

High School Graduate

Some College

Community/Junior College Graduate

Bachelors Degree

Masters Degree

Professional or Doctorate Degree

**County of Residence**

Jewell County, Kansas

Ford County, Kansas

Webster County, Nebraska

**Ford County City/Town of Residence**

Bucklin

Dodge City

Ford

Spearville

Unincorporated/Rural

**Webster County City/Town of Residence**

Bladen

Blue Hill

Cowels

Guide Rock

Red Cloud

Unincorporated/Rural

**Jewell County City/Town of Residence**

Burr Oak

Esbon

Formoso

Jewell

Mankato

Randall

Unincorporated/Rural

**Are you aware of any wind energy development in your region?**

Yes

No

**What are your feelings about the following energy policies?**

	Strongly Favor	Favor	Neither Favor or Against	Against	Strongly Against
Development of Wind Energy Resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Development of Solar Energy Resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Development of Nuclear Energy Resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exploration of New Fossil Fuel Resources (Oil & Gas) Domestically	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Importation of Oil & Gas Resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tax Breaks for Businesses & Individuals Who Use Renewable Energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tax Incentives for Wind Energy Development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate Change as Scientific Fact	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**It would disturb me if this were built nearby (Please rank from 1 = most disturbed to 4 = least disturbed)**

- Cellular Tower
- Electric Transmission Line
- Power Plant (Coal or Gas)
- Wind Farm

**Which of the following would be most controversial? (Please rank from 1= most controversial to 4= least controversial)**

- Electric Transmission Line
- Wind Farm
- Power Plant (Coal or Gas)
- Cellular Tower

**I would campaign against having this built nearby (Please rank from 1= most likely to campaign against to 4= least likely to campaign against)**

- Wind Farm
- Cellular Tower
- Electric Transmission Line
- Power Plant (Coal or Gas)

Please select which choice best reflects your opinions of wind farms.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Wind farms are a non-polluting source of energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms can make a significant contribution to the domestic energy supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms are a reliable source of energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms will create jobs in my local area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms are a positive addition to the landscape	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms should not be placed in areas of scenic beauty and tourism	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farm noise is not an issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms disturb natural habitats and are a danger to birds and animals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms are an eyesore on the landscape in general	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms do not benefit local areas where they are constructed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms are controversial	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms negatively affect property values	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind farms are not dangerous and should not be regulated like other types of energy (coal or gas)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electric transmission lines do not have a negative effect on property values	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What is the visual effect of the wind turbines and electric transmission lines in the following images?



	Very Positive	Positive	Neither Negative Or Positive	Negative	Very Negative
Visual Effect on Landscape	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



	Very Positive	Positive	Neither Negative Or Positive	Negative	Very Negative
Visual Effect on Landscape	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



	Very Positive	Positive	Neither Negative Or Positive	Negative	Very Negative
Visual Effect on Landscape	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



	Very Positive	Positive	Neither Negative Or Positive	Negative	Very Negative
Visual Effect on Landscape	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Which of the following images best represents what you first think of as wind energy in your region?



C

D

Image A

Image B

Image C

Image D

Which wind turbine image do you find most visually pleasing?



A



B



C



D

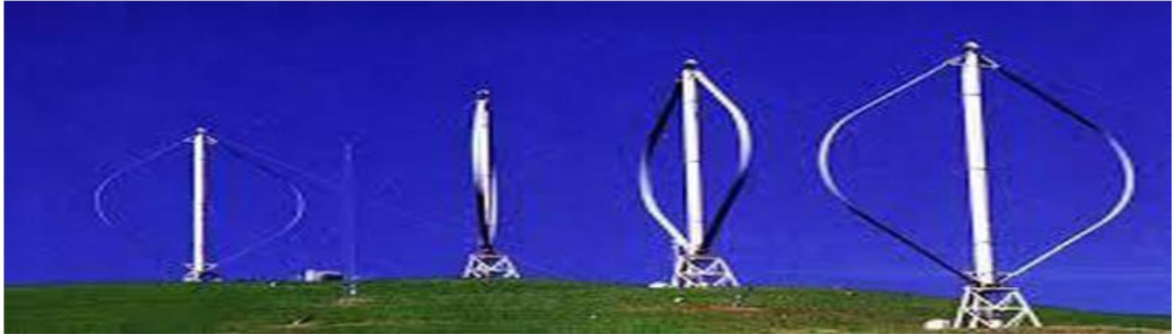
Image A

Image B

Image C

Image D

The following images are of alternative wind turbine designs. Please indicate a response based upon the question: This turbine form has the most positive/least negative effect on the landscape.



This turbine form has the most positive/least negative effect on the landscape.

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



This turbine form has the most positive/least negative effect on the landscape.

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



This turbine form has the most positive/least negative effect on the landscape.

Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



This turbine form has the most positive/least negative effect on the landscape.

Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



This turbine form has the most positive/least negative effect on the landscape.

Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



This turbine form has the most positive/least negative effect on the landscape.

Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>





	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
This turbine form has the most positive/least negative effect on the landscape.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Was the local community consulted prior to approval of the wind farm?**

Yes

No or Not Applicable

**How was the local community consulted?**

Local Newspaper

Public Meeting Radio

Television

Mail

**Are you satisfied with the consultation provided to the community?**

Yes

No

**Was the community offered an opportunity to comment on the design/layout of the wind farm?**

Yes

No

**Did the consultation include information regarding the route/design of new electric transmission lines?**

Yes

No

**Were you offered an opportunity to invest in the wind farm project prior to approval?**

Yes

No

**Did you formally object to planning permission being granted to the project?**

Yes

No

**Please select the choice which best reflects your opinion.**

	Very Disruptive	Disruptive	No Opinion	Slightly Disruptive	Not Disruptive
<b>How disruptive was the construction of the wind farm to the local area?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Very Positive	Positive	Neither Negative or Positive	Negative	Very Negative
<b>Has the wind farm had a positive or negative impact on the local area?</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Is the wind farm visible from your home?**

Yes

No

Please select the choice which best reflects your opinion.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
The wind farm has reduced pollution and provided cleaner energy for this area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The wind farm has created jobs and economic benefits for this area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The wind farm has damaged the scenic beauty of this area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The wind farm has lowered the value of property in this area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would support another wind farm in this area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would support and addition to the existing wind farm.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



**Do you support wind farm development in your area?**

Yes

No

**What are your reasons to support wind farm development in this area? (Please rank in order of importance: 1 = Most Important 4 = Least Important)**

Job Creation

Economic Benefits to the Community

Environmental Benefits

Increases Scenic Beauty of the Area

**What are your reasons to oppose wind farm development in this area? (Please rank in order of importance: 1 = Most Important 4 = Least Important)**

Not Needed

No Economic Benefit to the Community

Environmental Harm

Decreases Scenic Beauty of the Area

## Appendix B - Survey Invitation

### Survey Invitation Post Card Front



### Survey Invitation Post Card Text (Back)

You are invited to participate in a Graduate Research survey which examines the perceptions and attitudes towards wind energy and wind energy development within this region of the Great Plains. The survey is conducted online and all data collected will remain secure and anonymous. The survey will be accessible from 15 December – 15 January, 2015.

Your participation is important to the success of this research. The result of this survey has the potential to impact regulation and planning of future wind energy development project in the Great Plains.

To participate in this survey go to: <http://tinyurl.com/ksuwind>

We look forward to your assistance in this important research.

Thank you,

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## **Appendix C - Mid Survey Follow-up Contacts**

The following text was used for both newspaper and radio follow-up reminders.

You are invited to participate in a Graduate Research survey examining the perceptions and attitudes towards wind energy and wind energy development in Webster and Jewell Counties. Your participation is important to the success of this research. The result of this survey has the potential to impact regulation and planning of future wind energy development projects in the Great Plains. The survey is conducted online; all data collected will remain secure and anonymous. The survey will be accessible through **January 31, 2016**. Thank you!

**To participate in this survey go to: <http://tinyurl.com/ksuwind>**

## Appendix D - Survey Follow-up Questions

**What is the most important reason why you chose not to participate in the internet based survey?**

Did not know about survey

Not interested in topic

No computer access

I never take online surveys

**When I receive a post card in the mail I most often**

Throw it away immediately regardless of if I recognize the sender or not

Throw it away immediately if I do not recognize the sender

Read all post cards regardless of if I recognize the sender or not