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Research Paper

Assessing preferences for growth on the rural-urban fringe using a stated choice analysis

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A B S T R A C T

Increasing the capacity of communities on the rural-urban fringe to accommodate sustainable growth is a key concern among resource management agencies. Decisions about the future of these landscapes involve difficult tradeoffs that underscore the importance of incorporating diverse stakeholder values and preferences into planning efforts. We assessed residents' preferences for exurban growth alternatives in two Midwestern U.S. counties – Jasper County, IA and Will County, IL – that have strong agrarian roots and lie at the fringe of rapidly-expanding metropolitan areas. Using a choice model, we identified how six landscape characteristics influenced respondents' stated choices for growth scenarios. Informed by previous research, focus groups, and pilot testing, our final model evaluated preferences for residential growth, protected grasslands, recreation, agriculture, bison reintroduction, and unemployment. Results from a county-wide survey mailed to 3000 residents (final N = 889) indicated that five of the six landscape-scale attributes significantly influenced residents' choices. Increased residential growth, more protected grasslands and agricultural lands, and greater access to recreation positively predicted choices for hypothetical growth scenarios while residents preferred future scenarios with low levels of unemployment. Further, the strength of preferences for these land use and economic conditions differed between Jasper and Will County residents. The study findings aid decision makers who face growth and urbanization pressures and provide insight on how to integrate preferences of current residents into planning decisions at a regional scale.

1. Introduction

Growth in historically rural areas can take different forms but often happens in a rapid and unplanned fashion. Areas along the fringes of large metropolitan centers, known as exurban or *peri*-urban areas, are especially ripe for unplanned development due to their close proximity to both urban amenities (i.e., city parks and public transit) and rural landscapes (Slemp et al., 2012). While exurban growth can counter the decline of small towns that previously relied on farming and other extractive industries (Krannich, Petrzelka, & Brehm, 2006), it has potential to diminish natural resource amenities (Albrecht, 2007), force long-term residents out through gentrification (Rigolon & Németh, 2018), and erase local symbols and identities (Tunnell, 2006). A variety of public policy efforts at local, regional, and state scales have been implemented to manage sprawling development patterns in the United States and other countries (Bengston, Fletcher, & Nelson, 2004) and have been most successful when stakeholders are involved in the planning process (Burby, 2003). Stakeholder participation for growth management and open space protection increases the likelihood that policies will reflect local values and conditions, facilitate a sense of ownership for community members, and minimize social and land use conflicts (Burby, 2003). A stronger understanding of residential values and preferences is especially critical for the rural-urban interface where landscape change is likely to occur (Soini, Vaarala, & Pouta, 2012).

Previous research has underlined the importance of including stakeholders in the decision-making process (Burby, 2003; Williams, Stewart, & Kruger, 2013). Stakeholders such as residents and business owners have been engaged using a variety of techniques, including participatory mapping (van Riper, Kyle, Sutton, Barnes, & Sherrouse, 2012), semi-structured interviews (Slemp et al., 2012; Valencia-Sandoval, Flanders, & Kozak, 2010), public forums and workshops (Burby, 2003), and stakeholder surveys (Aas, Haider, & Hunt, 2000; Lindberg, Veisten, & Halse, 2019). Within survey research traditions, stated choice modeling has been used to understand individual preferences for specific choice alternatives (Hensher, Rose, & Greene, 2005; Johnston et al., 2017; Louviere, Hensher, & Swait, 2000). In a stated choice experiment, an individual is asked to choose from a set of alternatives that are described by relevant characteristics or 'attributes.'

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While a large body of work is dedicated to using choice data in tandem with planning efforts (Audirac, 1999; Cadavid & Ando, 2013; Sayadi, Gonzalez-Rosa, & Calatrava-Requena, 2009), there is a strong need to understand tradeoffs among stakeholder preferences for future growth in the context of urbanization, particularly in changing landscapes on the rural-urban fringe. Research that applies choice modeling techniques is rapidly expanding and shows promise for quantifying growth preferences across a range of stakeholder interests in rural contexts.

This study assessed residents' preferences for future growth scenarios in two Midwestern U.S. counties–Jasper County, Iowa and Will County, Illinois–both of which face urbanization pressures from rapidly-expanding adjacent metropolitan areas while working to preserve their strong agrarian roots. As both counties are historically situated within a prairie ecosystem, conserving and restoring native grasslands is crucial for their ecological vitality. Grasslands provide a multitude of ecosystem services (Dissanayake & Ando, 2014) and counter the ecological impacts of development (Slemp et al., 2012). Similar to previous work (Dissanayake & Ando, 2014; Greiner, Bliemer, & Ballweg, 2014; Nassauer, Dowdell, & Wang, 2011; Rambonilaza & Dachary-Bernard, 2007; van Riper, Manning, Monz, & Goonan, 2011), we gauged preferences for conservation in future scenarios but distinguished between two relevant characteristics of Midwest prairie conservation, including protected grasslands and bison reintroduction, given that bison are integral to prairie ecosystems and being reintroduced into the American Midwestern landscape. Diverging from most planning-based stated choice experiments (see Arnberger & Eder, 2011 for exception), we assessed landscape-scale preferences through the use of attributes that reflected regional variation in land use and economic conditions. This research also transcended municipal boundaries to combat 'leapfrog development' and provided insight on the desirability of land uses and tradeoffs made by residents in the face of change (Bengston et al., 2004; Slemp et al., 2012).

2. Background

2.1. Rural-urban landscape trends

For the better part of the past century, many countries around the world have experienced rapid and expansive urbanization in lands surrounding large metropolitan centers. In the U.S., most of the land-use conversion fueling this urbanizing trend is in the form of suburban landscapes. Suburbs are markedly different than more established urban areas, characterized by low density development, homogenous or 'placeless' architecture, and affluence (Jackson, 1985; Salamon, 2007). In these areas, residents benefit from natural amenities in the hinterland while simultaneously maintaining employment in the city (Gosnell & Abrams, 2011). Given improvements in transportation technologies and infrastructure, suburbs are able to expand at rates that may be unsustainable for the region as a whole (Albrecht, 2007). Thus, as suburbs continue to experience growth in population and capital, cities and rural communities alike suffer from out-migration and loss of unique identities.

Growth in historically rural areas brings with it numerous social, economic, and environmental consequences. While changes to rural landscapes can enhance human capital, boost local organizations, and increase household incomes (see Lichter & Brown, 2011), growth can strain existing institutions and transform held cultures and traditions (Krannich et al., 2006). Referred to as the rural 'growth machine,' this new and growing amenity-based economy is viewed as inherently good by local leaders (Green, Marcouiller, Deller, & Erkkila, 1996; Kunstler, 1994). However, economic consequences of the rural growth machine model can include diminished agricultural livelihoods, increased vulnerability to national business cycles, increased lower wage service-based jobs, and displacement of long-term residents through gentrification (Krannich et al., 2006; Lichter & Brown, 2011). Rapid land conversion processes can also have adverse effects on environmental conditions such as increased storm-water runoff, habitat fragmentation, and air pollution (Haregeweyn, Fikadu, Tsunekawa, Tsubo, & Meshesha, 2012). Concerted planning at a regional scale has potential to address a range of challenges along the rural-urban fringe (Davis, Nelson, & Dueker, 1994), particularly if coupled with environmental social science research, grassroots community forums, and other mechanisms for eliciting stakeholder input to make decisions about preferences for the future (Lindberg & Wolsko, 2018).

2.2. Stated choice modeling

Individual preferences can be evaluated using a statistical technique referred to as "choice modeling." Choice models were first developed to address transportation-related problems involving individual preferences for private and public modes of travel (McFadden, 1974). Typically, a stated choice model presents pairs of hypothetical alternatives and asks respondents to choose the most preferable alternative (Louviere et al., 2000). The alternatives alone do not drive decisions, but rather the *characteristics* (or attributes) of the alternatives drive choices (Lancaster, 1966). Attributes are often arranged in a series of levels that encompass a realistic range of conditions. The researcher then assembles the attribute levels into paired comparisons of alternatives (i.e., choice sets) using an experimental design. These paired comparisons come in many different forms such as narratives describing the alternatives (Hoehn, Lupi, & Kaplowitz, 2010), tables that list each attribute level (Cadavid & Ando, 2013), or visual images illustrating different conditions (Arnberger et al., 2018; van Riper et al., 2011). To model choice data, variations of the multinomial logit (MNL) regression model are most commonly used (Hensher et al., 2005; McFadden, 1986). In particular, the random parameters logit (RPL) model has gained traction in the stated choice literature due to its ability to account for heterogeneity in preferences (Hensher & Greene, 2003; Train, 1998).

2.3. Choice modeling and planning

Stated preference models are commonly used in economics and marketing-based applications, but they have also been incorporated into community planning research (Audirac, 1999; Dissanayake & Ando, 2014; Hunt & McMillan, 1994; Johnston, Swallow, & Bauer, 2002). Researchers have investigated the types of future growth scenarios that residents desire (Lindberg & Wolsko, 2018). Audirac (1999), for example, examined whether residents of Florida would be willing to trade off the presence of a large yard for access to shared neighborhood amenities. Johnston et al. (2002) focused on specific types of land-uses by including protected open spaces, residential development, and recreational facilities in an assessment of scenarios for future growth in rural Rhode Island. Results from this study indicated that residents favored larger areas of preserved open space and smaller areas of developed land with lower housing densities. Recreational facilities were favored by some but were also seen to impact preserved natural areas (Johnston et al., 2002). Other researchers have focused on evaluating preferences for specific planning efforts, such as municipal storm water management (Cadavid & Ando, 2013), wetland valuation (Mahan, Polasky, & Adams, 2000), and prairie restoration (Dissanayake & Ando, 2014). This body of past research has indicated stated choice experiments carry relevance for landscape and urban planning and can be useful tools for informing decisions about growth and development.

A stated choice model was developed for this study to evaluate residents' preferences for changing landscape and economic conditions of Midwestern U.S. areas on the rural-urban fringe. Specifically, we employed a stated choice experiment in a county–wide survey sent to residents of Jasper County, Iowa and Will County, Illinois in Spring 2018. We were guided by two objectives: 1) determine the effects of the study attributes–residential growth, protected grasslands, recreation, agriculture, bison reintroduction, and unemployment–on preferences for

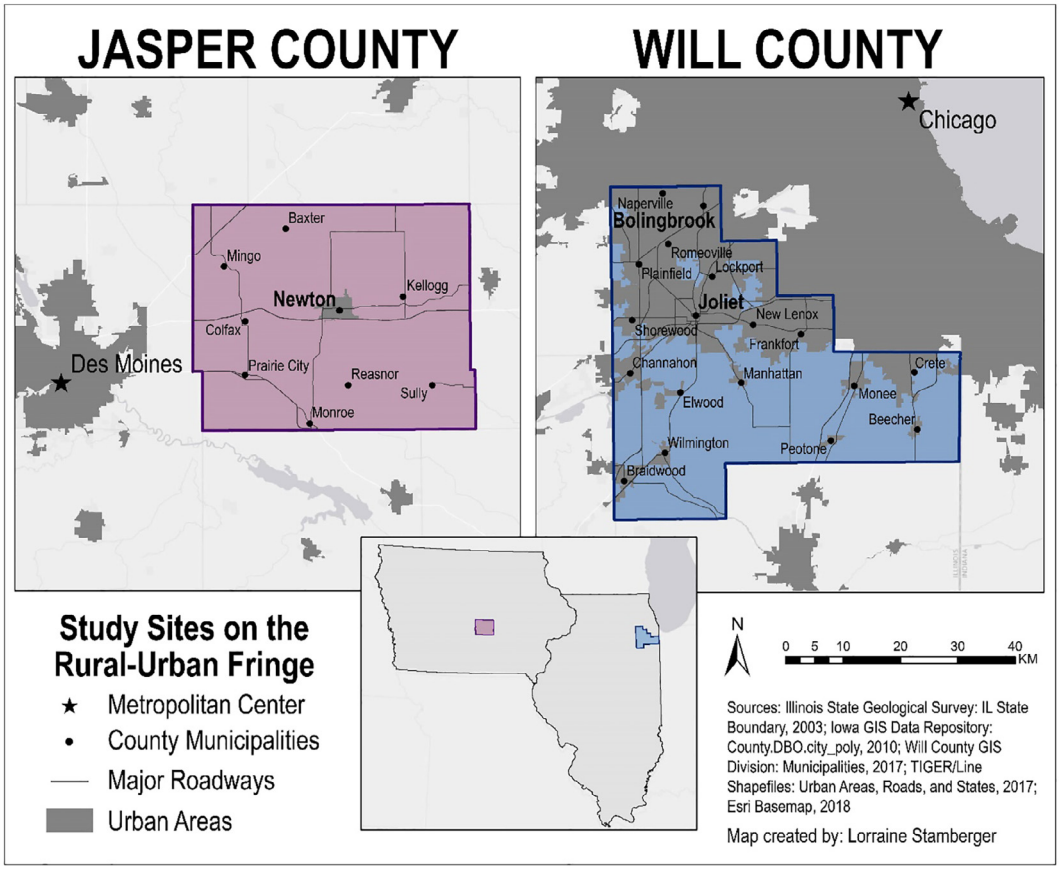

Fig. 1. Map of Jasper County, IA and Will County, IL in the context of urban sprawl.

future growth; and 2) compare growth preferences between Jasper and Will County respondents. This study provides insight on stakeholder preferences for planning at the regional level, which is rare in the stated choice literature. Given that planning decisions are predominately driven by elected leaders and developers (Green et al., 1996), understanding the growth preferences of diverse stakeholders, particularly vulnerable populations, will represent less powerful voices and democratize planning at the intersection of rural and urban life.

3. Methods

3.1. Study context

Our two case study sites, including Will County in Illinois and Jasper County in Iowa, are situated near Midwestern U.S. metropolitan centers (see Fig. 1). While both counties exhibit similarities in terms of urbanization pressures, the two diverge in population dynamics and economic conditions. Will County, located in the far southern part of the Chicago metropolitan region, is the fourth most populous county in the state of Illinois (Will County, 2018)). Its 700,000 residents are located primarily in the northern part of the county, which is characterized by growing suburban and exurban landscapes. From 2000 to 2010, Will County experienced a 35% population increase, the highest rate across Illinois during that time (U.S. U.S. Census Bureau, 2010). Although growth rates in the county have slowed since 2010, the past episodes of rapid growth have made providing ample transportation infrastructure and amenities such as schools and emergency services a challenge for Will County and local units of government. Economically, the CenterPoint Intermodal Center has remained a regional hub, employing a segment of the county (4.3%) in the transportation sector (Will County, 2018); Profile, 2018).

Jasper County is located in central Iowa and home to 36,700 residents (Jasper County, 2018). While growth and landscape change in Jasper County have been less evident than Will County, western portions of the county are experiencing urbanization pressures as the Des Moines metropolitan area expands outward. In 2016, the Des Moines Metro was the fastest growing area in the Midwest with a growth rate of 2% across a 12-month time period, outpacing Fargo, ND (1.9%), Sioux Falls, SD (1.5%), and Madison, WI (1.3%) (Aschbrenner, 2017). Recently, the economy in Jasper County has shifted as it recovers from a major industry, Maytag, leaving the area (Margolis, 2017). At the time this research was conducted, employment was primarily driven by the manufacturing sector but also supported by occupations in farming, fishing, and forestry (Jasper County, 2018).

A better understanding of regional preferences for future growth is strongly needed in landscapes spanning rural and urban contexts where land use change is widespread. Particularly in Will and Jasper Counties, there are uneven growth patterns outside of adjacent metropolitan centers, and agricultural lands are rapidly being converted to new uses. Amidst land use change, both counties have prioritized the protection of large tracts of land for conservation. Further, federal properties within Jasper and Will Counties initiated bison reintroduction in 1996 and 2015, respectively. Given these changing socio-cultural, economic, and environmental conditions, the future direction of Will and Jasper Counties could benefit from greater knowledge of stakeholder preferences for the future to promote growth that aligns with current interests. The challenges faced in these two case study sites motivated the present study to engage with county- and city-level planning and generate insights on the tradeoffs respondents were willing to make when considering their futures.

3.2. Survey and choice model design

We developed an experimental design for a stated choice model.

Table 1
Choice model attributes and levels for the survey instrument.

Attribute	Description	Levels
1. Residential Growth	The annual population growth rate in the county	2% decrease No growth 2% increase 4% increase 6% increase
2. Protected Grasslands	The percent change of county land designated as protected grasslands	No change 5% increase 10% increase
3. Bison Presence	The percent change in total number of bison in the county	No change 3% increase 5% increase
4. Access to Recreation	The distance to the nearest recreation area from the resident's home	20 miles 7 miles 1 mile
5. Agriculture	The percentage of land in the county used for agricultural production	30% land 50% land 70% land
6. Unemployment	The percentage of people unemployed in the county	2% unemployed 4% unemployed 8% unemployed

Mixed methods were employed to engage stakeholders early on in the research process and build from qualitative and quantitative data (Amaya-Amaya, Gerard, & Ryan, 2008; Dissanayake & Ando, 2014; Greiner et al., 2014; Johnston et al., 2017). The attributes of the choice model were conceptualized through informal interviews (n = 20) and focus groups (two groups with eight participants each) with community leaders, including planners, journalists, farmers, conservationists, tourism professionals, and economic development representatives to identify recent changes, key issues, and projected shifts in the region (Strauser, Stewart, Evans, Stamberger, & van Riper, 2018). All qualitative data were transcribed verbatim, thematically analyzed, and checked for inter-rater reliability. This process worked toward maintaining relevancy for local residents and ensuring realistic attributes were used in the experimental design (Greiner et al., 2014; Johnston et al., 2002). The focus groups and previous research (Bockstael, 1996; Johnston et al., 2002; Nassauer et al., 2011) aided in formalizing six attributes–residential growth, protected grasslands, bison presence, access to recreation, agriculture, and unemployment–that characterized how growth might occur in Will and Jasper Counties (see Table 1). Each attribute was assigned between three and five levels that encompassed a realistic range of conditions. Illustrative icons were then created to reflect the attributes and levels (Dissanayake & Ando, 2014; Johnston & Ramachandran, 2014) using Adobe Illustrator CC 2017 software.

Stakeholder preferences were assessed using the six attributes, and the hypothesized relationships among attributes were guided by evidence from the aforementioned interviews and focus groups (see Table 2). We first created a set of hypotheses for the pooled sample that included both Jasper and Will County respondents. We predicted residential growth would positively influence choices due to its potential to increase the county tax base. As evidenced by our focus groups, protected grasslands and bison presence were both important for their ecological roles and attracting tourists outside of the two counties (Strauser et al., 2018). Thus, we hypothesized these two attributes would positively influence respondent choices. Focus group participants also positively regarded access to recreation, primarily as a means to make their county more attractive to prospective residents, so we expected respondents would choose scenarios with increased access to recreation. Due to a strong agricultural presence in both counties, we hypothesized more land in agriculture would positively predict choices. Finally, findings from our focus groups indicated that low unemployment rates would be most desirable for the future of these counties, and therefore, we predicted that increases in unemployment would negatively influence respondents' choices. We also developed separate hypotheses for each study site because we believed some of the coefficient signs would differ between Jasper and Will County respondents. Specifically, we observed in the Will County focus group that protected grasslands were a less salient factor weighing into people's discussions about the future of the county. Thus, we predicted more grasslands would negatively influence choices made by Will County respondents.

Table 2
Expected signs of variables in the model.

Variable	Pooled Sample	Jasper County	Will County
1. Residential Growth	+	+	+
2. Protected Grasslands	+	+	–
3. Bison Presence	+	+	+
4. Access to Recreation	+	+	+
5. Agriculture	+	+	+
6. Unemployment	–	–	–

The initial survey instrument and choice model were refined in two different phases prior to data collection. First, the survey instrument was pre-tested with a convenience sample of students, faculty, and staff at the host institution (n = 8) following verbal protocol methods (Cahill & Marion, 2007; Johnston et al., 2002). Next, the survey was pilot-tested at county fairs in Jasper and Will Counties (n = 120) using intercept sampling of adult fair-goers who were residents in the two counties. These preliminary data provided insights on how best to revise the survey questionnaire and were used to generate prior estimates necessary for producing an efficient design (Johnston et al., 2017; Rose & Bliemer, 2013). That is, obtaining priors from previous knowledge (i.e., literature and pilot testing) enabled us to create an optimal design that minimized error (Rose, Bliemer, Hensher, & Collins, 2008; Scarpa, Campbell, & Hutchinson, 2007).

After refining our survey, the final experimental design consisted of 18 choice sets, and each respondent was asked to evaluate nine paired comparisons that were organized into two survey blocks. The ordering of paired comparisons was reversed for each of the survey blocks to minimize information order effects (Johnston et al., 2017). A one-page instructional sheet that included background information on each of the attributes was presented to respondents (see Appendix A), and the survey asked respondents to choose between two hypothetical scenarios (A, B) or to opt-out (C) if neither scenario was acceptable (see Fig. 2). In line with previous research (Dissanayake & Ando, 2014; Greiner et al., 2014), the opt-out or "no preference" choice was included in the model. The inclusion of a "no preference" choice did not pressure respondents into choosing either scenario (Johnston et al., 2017), and in doing so, maximized the fit of the model (Haaijer, Kamakura, & Wedel, 2001). NGene 1.1.2 software was used to generate the experimental design.

3.3. Survey administration

Two county-wide, mail-back residential surveys were administered during Spring 2018 to a random sample of 1500 residential addresses in each county. The survey was implemented using an adaption of the 'Tailored Design Method' established by Dillman, Smyth, and Christian (2014). There were five points of contact with potential respondents over a three-month period, including: 1) hand-signed introductory letter endorsed by local partners, 2) questionnaire, 3) thank-you reminder postcard, 4) second questionnaire to non-respondents, and 5) third questionnaire to the remaining non-respondents. A cover letter and postage-paid return envelope was included in each mailing. The survey process was administered by the Social and Economic Science Research Center at Washington State University in cooperation with the University of Illinois at Urbana-Champaign. Monetary incentives were included in the first mailing of the questionnaire with the inclusion of a $2 pre-incentive to increase the likelihood of response (Edwards et al., 2007). A total of 967 surveys were collected from respondents in Jasper

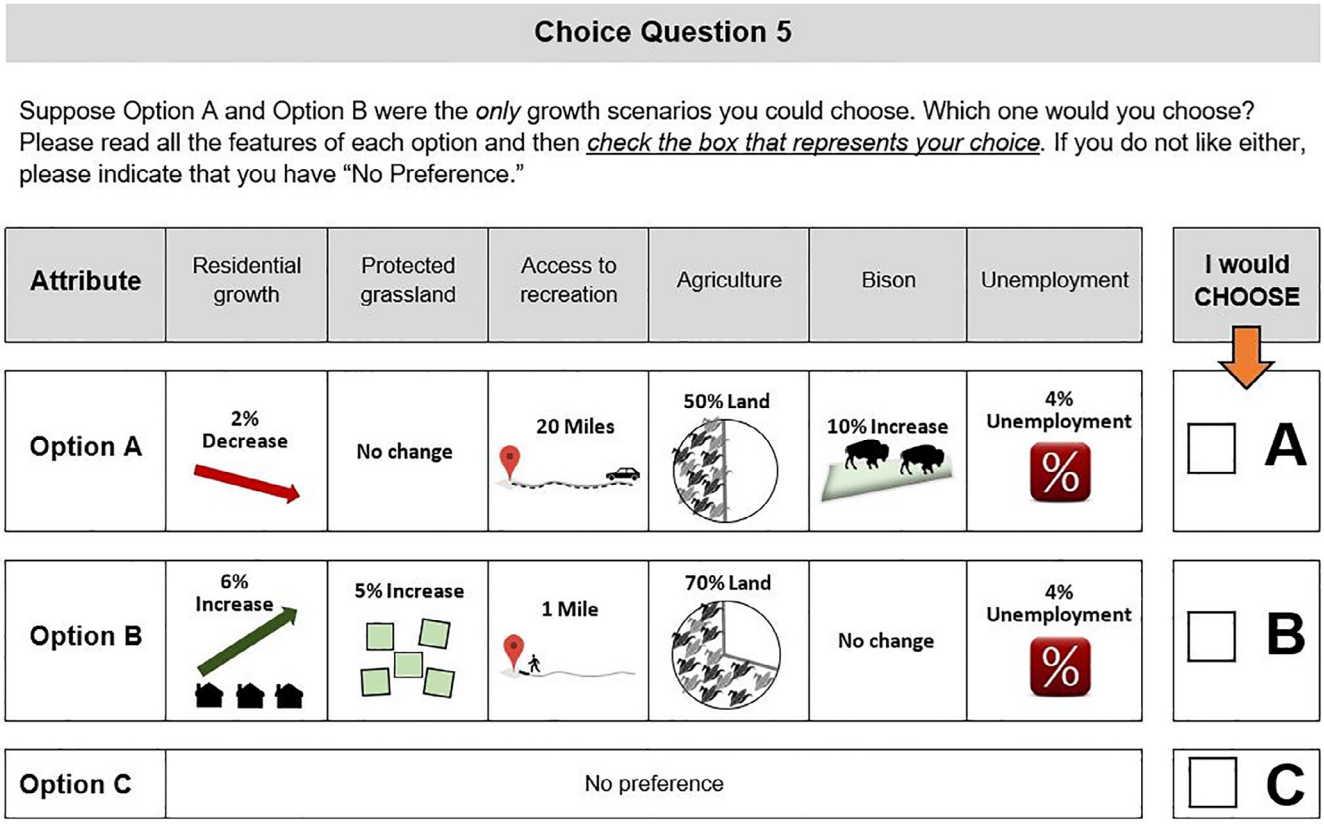

Fig. 2. Sample choice question used in the survey instrument.

and Will Counties, with a response rate of 37.3% in Jasper County and 30.6% in Will County.

3.4. Analysis approach

Discrete choice experiments are analyzed using a variety of logit models whereby individuals who are presented with several alternatives are assumed to choose the alternative that provides the greatest utility (Hensher & Greene, 2003; McFadden, 1978). Utility of a given alternative includes both deterministic (i.e., observed) and stochastic (i.e., unobserved) parts. Assuming stakeholders choose the alternative which maximizes utility, the individual's total utility (U) is given by:

$$U_{njs} = \beta_n X_{njs} + \varepsilon_{njs}$$

where individual n chooses alternative j from a specific choice situation, s. In the equation, $\beta_n X_{njs}$ denotes the observed individual-specific coefficient (β) for a given attribute vector (X), and ε_{njs} is the unobserved error term. The following utility function accommodates the main effects of our six model attributes and interaction effects of a binary county-of-residence variable:

$$\begin{aligned} U = {} & \beta_n \mathrm{GROW}_{njs} + \beta_n \mathrm{GRASS}_{njs} + \beta_n \mathrm{BISON}_{njs} + \beta_n \mathrm{REC}_{njs} + \beta_n \\ & \mathrm{AGRI}_{njs} + \beta_n \mathrm{UNEMP}_{njs} + \beta_n \mathrm{GROW}_{njs} * \mathrm{SITE} + \beta_n \mathrm{GRASS}_{njs} \\ & * \mathrm{SITE} + \beta_n \mathrm{BISON}_{njs} * \mathrm{SITE} + \beta_n \mathrm{REC}_{njs} * \mathrm{SITE} + \beta_n \mathrm{AGRI}_{njs} \\ & * \mathrm{SITE} + \beta_n \mathrm{UNEMP}_{njs} * \mathrm{SITE} + \varepsilon_{njs} \end{aligned}$$

where

GROW_j = population growth rate for alternative j (percent),
GRASS_j = change in land designated as protected grasslands for alternative j (percent),
BISON_j = change in total number of bison for alternative j (percent),
REC_j = distance to the nearest recreation area from individual n's place of residence for alternative j (miles),
AGRI_j = land used in agricultural production for alternative j (percent),
UNEMP_j = unemployment rate for alternative j (percent), and
SITE = 1 when respondent is from Will County and 0 when respondent is from Jasper County.

The multinomial (conditional) logit model (MNL) shows this relationship among the observed attributes of the choice scenarios, unobserved variables, and observed choice outcomes (Hensher et al., 2005; Louviere et al., 2000). Though widely used, the MNL model has been heavily critiqued on the basis of its restrictive assumptions (Amaya-Amaya et al., 2008; Johnston et al., 2017). Specifically, the model assumes that the attribute effects are identical across a sample population and uncertainty is identically and independently distributed (McFadden, 1986).

In recent decades, there has been a shift towards implementing more flexible models to predict stated preferences (Bliemer & Rose, 2013; Boxall & Adamowicz, 2002; Hensher et al., 2005; Johnston et al., 2017; Train, 1998). A mixed logit model is a generalized form of all possible choice models (McFadden & Train, 2000). Within this group, the random parameters logit (RPL) model allows heterogeneity to be accommodated in the estimation of each parameter as a random variable (Hensher et al., 2005; Hunt, 2005). The distributions of these random parameters are commonly assumed to be normal but can account for uniform, exponential, triangular, or other distributions as specified by the researcher (Bliemer & Rose, 2013; Hensher et al., 2005). The RPL model offers significant advantages over a traditional logit model, including the ability to account for (unobserved) preference heterogeneity and more complex error structures (Greiner et al., 2014; Hensher et al., 2005). Though the RPL model captures heterogeneity in preferences, it does not explain the variation among individuals (Hensher et al., 2005; Hunt, 2005). Previous research has

used unobserved segmentation (i.e., latent class analysis; Beardmore, Haider, Hunt, & Arlinghaus, 2013; Reichhart & Arnberger, 2010) and individual-specific variables (i.e., interaction of sociodemographic variables; Rambonilaza & Dachary-Bernard, 2007) to understand potential sources of preference heterogeneity.

In the present study, the choice data were analyzed using a RPL model. Main effects and main effects with interaction effects were calculated in two separate models using NLogit 6 statistical software. For the first model, all six parameters were specified as random with normal distributions for the first two 'unlabeled' alternatives (Option A and Option B). A constant represented the third no-preference alternative (Option C). Marginal willingness-to-accept higher unemployment rates was also calculated to understand the tradeoffs respondents were willing to make between unemployment and land use goods and services. Though willingness-to-pay (WTP) is a more common approach in choice experiments (see Colombo, Hanley, & Louviere, 2009; Dissanayake & Ando, 2014; Train, 1998), the inclusion of the county-wide unemployment was more relevant than a price attribute tied to each future growth scenario. In the second model, we incorporated a county-of-residence variable because we expected differences in growth preferences between study sites.

4. Results

4.1. Descriptive results

Of the 967 respondents that completed the survey, 889 completed some or all of the choice questions. A majority of respondents chose to mail back the questionnaire (n = 761; 85.60%) while 128 (14.40%) completed the online version. Table 3 describes the sample population's socio-demographic characteristics. A slight majority of respondents self-identified as female (54.50%). The survey captured a wide age range (min = 18 years; max = 104 years) with the average age being 57.70 years (SD = 15.50; SE = 0.53). In terms of education and income, just over half of respondents earned at least a college degree (51.10%), and respondents primarily reported annual household income to be within the middle-class income brackets. The majority of respondents racially identified as being White (89.80%), followed by Black or African American (2.80%) and Asian (2.70%). Household size was approximately three people, and respondents reported living in their current home 17.70 years (SD = 14.70; SE = 0.50).

4.2. Choice modeling results

Responses to the multiple choice sets presented in the survey yielded 7384 choice set observations. Respondents who marked 'Option C' for all nine choice questions were identified as 'protest voters' (n = 50; 5.2%) and were removed from the analysis (Colombo et al., 2009; Greiner et al., 2014). Two different models were estimated using the RPL model to address our study objectives (see Table 4). In Model 1, choice (among Options A, B, and C) for the pooled sample was explained by the six landscape-scale attributes. The impact of the attributes on respondents' choices is reflected in the coefficients, which showed the mean marginal utility estimate across the sample. All attribute coefficients, except for the bison presence attribute, were significant predictors of choice at the 99% confidence level. The probability of choosing an alternative increased with higher rates of growth (β = 0.024), more grasslands (β = 0.045), closer recreation areas (β = −0.060), and more land in agriculture (β = 0.031). The probability of choosing an alternative significantly decreased with higher

Table 3
Respondent socio-demographic characteristics of the survey sample compared to the characteristics of the Will County population.[+]

Variable		*SAMPLE*		*WILL COUNTY*	
		Mean (SD; SE)	N (%)	Mean	%
Gender					
	Female		467 (54.5)		49.7
	Male		388 (45.3)		51.3
Age (years)		57.7 (15.5; 0.53)		37.3 (median)	
Education[++]					
	Some high school		26 (3.0)		9.2
	High school graduate		227 (26.0)		26.9
	Some college		174 (19.9)		22.2
	Two-year college degree		99 (11.3)		8.3
	Bachelor's degree		164 (18.8)		21.5
	Some graduate school		52 (6.0)		–
	Graduate or professional degree		131 (15.0)		11.9
Annual Household Income					
	Less than $24,999		77 (9.3)		12.7
	$25,000–$99,999		469 (56.8)		50.4
	$100,000–$199,999		219 (24.6)		29.5
	$200,000 or more		60 (6.7)		7.5
Race					
	White		798 (89.8)		74.2
	Black or African American		25 (2.8)		11.2
	Asian		24 (2.7)		5.1
	Other		46 (5.2)		9.5
Household Size					
	Number of adults	1.9 (0.7; 0.02)		3.0[+++]	
	Number of children	1.2 (1.4; 0.06)			
Years Lived					
	In current home	17.7 (14.7; 0.50)			–
	In the county	29.2 (23.2; 0.80)			–

[+] Will County data were drawn from the American Community Survey 2016 Estimates, administered by the US Census Bureau.
[++] Will County data was estimated for persons 25 years and older.
[+++] Average household size estimate includes both adults and children.

Table 4
Estimated random parameters logit (RPL) models.[+]

Variables	MODEL 1: Attributes only		MODEL 2: Including interactions	
	Coeff. (SE)	SD (SE)	Coeff. (SE)	SD (SE)
Residential Growth	0.024*** (0.009)	0.174*** (0.011)	0.167*** (0.027)	0.165*** (0.011)
Protected Grasslands	0.045*** (0.010)	0.009 (0.026)	0.095*** (0.031)	0.023 (0.025)
Bison Presence	0.006 (0.005)	0.008 (0.013)	−0.011 (0.015)	0.019 (0.012)
Access to Recreation	−0.060*** (0.003)	0.047*** (0.005)	−0.024** (0.010)	0.049*** (0.005)
Agriculture	0.031*** (0.002)	0.028*** (0.002)	0.061*** (0.005)	0.029*** (0.002)
Unemployment	−0.394*** (0.016)	0.243*** (0.015)	−0.467*** (0.043)	0.249*** (0.016)
Constant	−1.929*** (0.139)	2.858*** (0.136)	1.737*** (0.401)	2.453*** (0.117)
Residential Growth * Will Co.[++]			−0.096*** (0.017)	N/A
Protected Grasslands * Will Co.			−0.032* (0.020)	N/A
Bison Presence * Will Co.			0.012 (0.009)	N/A
Access to Recreation * Will Co.			−0.023*** (0.006)	N/A
Agriculture * Will Co.			−0.020*** (0.003)	N/A
Unemployment * Will Co.			0.050* (0.027)	N/A
Constant * Will Co.			2.511*** (0.270)	N/A
	LL = −5852; AIC = 11,732; N = 7384; Pseudo R^2 = 0.279		LL = −5810; AIC = 11,663; N = 7384; Pseudo R^2 = 0.284	

Significance at 1% = ***, at 5% = **, and at 10% = *.
[+] LL = Log likelihood; AIC = Akaike information criterion.
[++] Binary-coded site-specific variable where 0 = respondent from Jasper County and 1 = respondent from Will County.

unemployment rates (β = −0.394). The standard deviation of the parameter distributions showed that preference for residential growth, access to recreation, agriculture, and unemployment exhibited significant heterogeneity ($p \leq 0.01$).

Tradeoffs between unemployment and the land use attributes were understood through respondents' willingness-to-accept higher unemployment rates for increases in a particular good or service (see Table 5). Marginal willingness-to-accept unemployment showed that respondents were willing-to-accept higher unemployment rates for increased residential growth rates (0.06%), more land in grasslands (0.11%) and agriculture (0.08%), and closer recreation areas (0.15%). Across the range of levels measured, respondents were most willing to accept higher unemployment rates for increases in agricultural land such that respondents would tradeoff higher unemployment rates by 3.20% to have land in agricultural production increase from 30% to 70%. Similarly, respondents would tradeoff increased unemployment rates by 2.85% to have the closest recreation areas change from 20 miles to one mile away from their place of residence.

In line with our second objective, Model 2 illustrated the differences in preferences between Jasper and Will County residents by interacting a site-specific variable with the six attributes (see Table 4). Similar patterns emerged between Models 1 and 2 when considering the main effects of the attributes, in that five of the six attributes were significant predictors of choice with the expected signs, and four attributes exhibited significant preference heterogeneity. The interaction effects in Model 2 showed how Jasper and Will County residents responded differently to future growth scenarios. Choices made by Will County residents were less influenced by increases in residential growth (β = −0.096), protected grasslands (β = −0.032), and agriculture (β = −0.020). Also, Will County residents were less sensitive to increased unemployment rates (β = 0.050). That is, they were willing to tradeoff higher unemployment rates for increases in the other attributes. Lastly, recreation (β = −0.023) was a stronger driver of choice in Will County, indicating that these residents preferred closer recreation areas to a greater extent than Jasper County residents.

Table 5
Marginal willingness-to-accept higher unemployment rates.

Variable	Marginal Willingness-to-Accept Unemployment[+]
Residential Growth	0.0609
Protected Grasslands	0.1140
Bison Presence	–
Access to Recreation	−0.1523
Agriculture	0.0787

[+] Values represent the percent unemployment per 1 unit increase in each of the variables.

5. Discussion

This study advanced knowledge of how residents in two rural Midwestern U.S. counties envisioned the future and made tradeoffs between competing landscape conditions. Results from a stated choice experiment presented growth preferences in relation to different landscape and economic conditions. Residents in Jasper County, IA and Will County, IL responded favorably to hypothetical scenarios that included higher residential growth rates, more grassland areas under protection, less distance between home and recreation areas, more land in agriculture, and lower unemployment rates. Additionally, the expanding presence of bison herds did not significantly influence respondent choices for future growth scenarios. Although the two study sites exhibited similar characteristics (e.g., strong agricultural ties, emphasis on conservation, historic reliance on industry), the attributes of our choice model were evaluated differently by residents in the two case study sites. Generally, residents from Jasper County responded more positively to growth than did residents in Will County.

Situating our results in the context of urbanization, this study offered insight on the preferences reported by residents living in changing landscapes on the rural-urban fringe (Soini et al., 2012). As both Jasper and Will Counties face pressure from adjacent, expanding metropolitan centers, decision makers are increasingly challenged to respond to the needs of their stakeholders. Our study showed that preferences for landscape change did not always align with changes that often accompany urbanization. For example, previous research has indicated urbanization is linked to less dependence on agriculture (Krannich et al., 2006; Lichter & Brown, 2011); however, our sample of residents preferred scenarios with more land in agriculture, in that 70% of county land in agricultural production was more preferable than 30% or 50%. Urbanization also has consequences for natural environments such as grasslands, and similar to the work of Slemp et al. (2012), respondents preferred increased protection of these natural landscapes in the future. In other words, respondents preferred both more agricultural lands and natural grasslands than the current conditions, suggesting that the views of residents in Jasper and Will Counties run counter to trends that are characteristic of urbanization. Therefore, stakeholder viewpoints need to be carefully considered by planners and land managers in the

Midwest to negotiate a growth trajectory that is representative of its residents.

Five out of six hypotheses for the pooled sample of respondents were supported. As expected, respondents were more likely to choose scenarios with increased agriculture, grasslands, and access to recreation (see Table 2). Previous studies have similarly demonstrated a desire for open space protection in communities experiencing growth and development (Lokocz, Ryan, & Sadler, 2011; Slemp et al., 2012). The effect of residential growth, also a positive predictor of preferred growth scenarios, was in accordance with qualitative findings in which leaders indicated a need to attract prospective residents to their county (Strauser et al., 2018). Additionally, greater unemployment rates were not preferred in future scenarios. The one hypothesis not supported by our findings was that residents would respond positively to growth of bison herds. We hypothesized that respondents would prefer future scenarios with more bison given positive sentiments expressed toward existing bison herds in each county, their importance as a symbol of American identity, and status as charismatic megafauna (Feldhamer, Whittaker, Monty, & Weickert, 2002). However, the bison attribute in our model was not statistically significant. It could be that the perceived benefits derived from the presence of bison may have been accounted for by the protected grasslands attribute. Alternately, county residents may have been unaware that bison existed in their county, in contrast to the key stakeholders and community leaders included in our qualitative research. An implication of this finding is for planners and managers at these sites to raise visibility of existing bison herds given potentially limited public awareness in Jasper and Will Counties.

Our comparison between study sites indicated that Jasper County residents had stronger preferences for growth, including residential growth rates and the percentage of agricultural lands and protected grasslands, than residents from Will County. Because Will County has experienced rapid growth in recent years, residents might have been more hesitant to support development and land-use changes. Stronger responses to changes in access to recreation were also observed, in that Will County residents exhibited stronger preferences for increased access to recreation areas in the future than Jasper County residents ($p \leq 0.01$). The amenity migration literature suggests that recreation and green space are natural amenities that attract people to places on the fringe of urban centers (i.e., Will County) where residents can benefit from both urban and rural amenities (Gosnell & Abrams, 2011; Tu, Abildtrup, & Garcia, 2016). With many residents living on the rural-urban fringe, Will County may have a greater demand for and capacity to support recreation opportunities compared to its more rural counterpart, Jasper County. Finally, although we did not find that increases in protected grasslands had a negative influence on Will County respondents' choices, as hypothesized, this attribute was significantly less important for residents in Will County, suggesting that the pooled sample of respondents preferred more grasslands in their futures but to a lesser extent than in Jasper County.

The methodological approach we adopted to carry out the choice experiment produced meaningful results. We inductively identified attributes for the experimental design (Dissanayake & Ando, 2014; Johnston et al., 2017), followed by pilot testing with a representative sample of residents to strengthen the design (Louviere et al., 2000; Rose & Bliemer, 2013). Future studies implementing choice experiments should similarly strive to ground elements of the design (i.e., attributes and levels) in site-specific contexts to maintain relevancy and credibility (Greiner et al., 2014). Given that we expected to test for preference heterogeneity, a traditional model with fixed parameters estimates (i.e., multinomial logit) was deemed unsuitable. The random parameters logit (RPL) model accounted for respondent heterogeneity and allowed parameter estimates to vary across individuals (Bliemer & Rose, 2013; Hunt, 2005). Though the RPL model was useful to assess preference heterogeneity, it did not provide insights into the reasons why respondents' preferences varied (Boxall & Adamowicz, 2002). Moreover, there may have been biases concerning actual preferences and shortcomings in the balance we struck between parsimony and complexity (Louviere et al., 2000). We explained some preference heterogeneity using respondents' county-of-residence; however, other variables such as income (Rambonilaza & Dachary-Bernard, 2007), gender (Hensher et al., 2005), age (Hunt, 2005), land ownership (Greiner et al., 2014), and distance to features (Dissanayake & Ando, 2014) may also have accounted for variation in landscape preferences.

5.1. Opportunities for future research

Our research was limited in several ways and thus created opportunities for future research. Previous research has emphasized the importance of providing an option for respondents to opt-out of a choice experiment (Dissanayake & Ando, 2014; Greiner et al., 2014). Although we included this option, we did not query why respondents opted-out instead of choosing a growth scenario. One possible explanation for respondents opting-out may have been related to the realism of the scenarios. While pilot testing, we observed respondents struggling with several of the attribute combinations (e.g., "how could unemployment go up if more land is being farmed?") but did not include any prompts to empirically assess this pattern. Further, the verbiage used for the opt-out option in this study–*No Preference*–was ambiguous, which may have introduced difficulties in interpretation. More specific wording (see Dissanayake & Ando, 2014) or inclusion of reference attributes and levels (see Lizin, Brouwer, Liekens, & Broeckx, 2016) is recommended for future research.

Three additional limitations were noted. First, potential biases may have been present despite taking steps (e.g., administering five survey waves, providing incentives, working with local sponsors) to minimize the likelihood that non-respondents were systematically different than respondents. When testing for differences between our sample and population demographics of Will County, we found higher educated and White individuals were overrepresented (see Table 3). Future research should evaluate non-response bias and continue the quest for maintaining high response rates and representative samples, especially in rural contexts (Coon, Morton, & Miller, 2018). Second, we did not consider attributes that may have been ignored by respondents when choosing between growth scenarios. This 'attribute non-attendance' could be empirically assessed in future work by asking respondents to state which attributes they did not consider when making choices (Greiner et al., 2014; Scarpa, Gilbride, Campbell, & Hensher, 2009). Finally, in our model comparison between Jasper and Will Counties, our coefficient values may have differed due to variance in the error terms from the two counties. Although our pilot data did not indicate we would observe different error variances, future work could test for this possibility following a procedure outlined by Swait and Louviere (1993). These limitations are important to keep in mind when interpreting our study findings.

6. Conclusion

Choice experiments are a useful tool for understanding stakeholder preferences and democratizing the planning process. We engaged residents in two Midwestern U.S. counties experiencing urbanization and land-use changes by implementing a choice experiment that represented local concern identified during an earlier, qualitative phase of this research. The study attributes represent local priorities, particularly around recreation, conservation, agriculture, and population growth, which warrant attention from resource planning and management agencies. We advanced the stated choice modeling literature through our use of regional-scale attributes and a cost variable quantified by hypothetical future unemployment rates. This research showed the tradeoffs stakeholders were willing to make between unemployment costs and county-wide benefits (e.g., greater access to recreation).

Our comparison between study sites illuminated preferences for growth in two different contexts, which broadened our ability to

generalize the findings of this research to other locales. With both of these U.S. Midwestern counties undergoing transitions in economies and lifestyles, the convergent results of this study reflect a future vision that if realized, would yield a distinctive landscape for exurban growth within a working agricultural context. Our results also contribute to a burgeoning literature that supports residents' ability to express regional preferences for landscapes. As resources and land uses on the rural-urban fringe continue to change, results from this research can be applied to enhance regional scale plans for addressing growth challenges and informing strategies for stakeholder involvement in decision-making.

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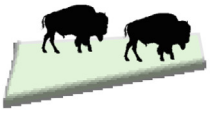
Appendix A

Introductory material for the choice questions in the survey instrument

Section 3 of 5: Future Growth Scenarios

Jasper County can grow and develop in different ways. We would like to understand what you would like to see in the future for your county. Please read through the material below to prepare for the rest of the survey. You will use these features to evaluate hypothetical scenarios of growth.
Please read this material carefully.

Residential Growth 	Annual residential growth is defined as *the change in population in Jasper County over one year*. Currently, the population is relatively stable. In this survey, the total number of people could decrease by 2%, remain unchanged, or increase by 2%, 4%, or 6% annually.
Protected Grassland 	Grasslands are a *type of native vegetation*, including tallgrass prairie that is found in your county. Although grasslands are now rare, there are small and large patches of land set aside in Jasper County. In this survey, protected grasslands may stay the same, increase by 3% or increase by 5%.
Access to Recreation 	Recreation access is measured as *the distance to a recreational area from your home*. Please consider the distance that you need to travel to visit a place for recreation. In this survey, recreational areas could be walking distance (i.e., less than one mile away), biking distance (i.e., seven miles), or driving distance (i.e., 20 miles) from your home.
Agriculture 	Agriculture is the *total amount of land set aside for agricultural production*. Jasper County currently has 79% of its land in agricultural production. In this survey, the total amount of land set aside for agriculture in Jasper County may change to 30%, 50% or 70%.
Bison 	Bison are *animals native to protected grasslands in the Midwest*. Jasper County currently has 70 bison living on 800 acres of prairie lands. In this survey, the total number of bison may stay the same, increase by 5% (4 animals) or 10% (7 animals).
Unemployment 	Unemployment rate is defined as the *percent of people who do not have jobs but are actively seeking work.* Over the past 30 years, the unemployment rate in Jasper County has ranged from 2-10%. The current unemployment rate is 4% and the U.S. average is 5%. In this survey, the rate may change to 2%, 4%, or 8%.

Now that you know what we will be asking, the following nine questions are about the conditions you would prefer to find in your county. Please choose between two potential future growth scenarios.

Appendix B

Split RPL models for the Jasper County and Will County samples. [+]

Variables	JASPER COUNTY		WILL COUNTY	
	Coeff. (SE)	SD (SE)	Coeff. (SE)	SD (SE)
Residential Growth	0.075*** (0.012)	0.175*** (0.016)	−0.031** (0.013)	0.181*** (0.017)
Protected Grasslands	0.066*** (0.014)	0.040 (0.036)	0.035** (0.015)	0.059** (0.027)

Bison Presence	0.004 (0.006)	0.002 (0.015)	0.013* (0.007)	0.028* (0.015)
Access to Recreation	−0.047*** (0.004)	0.038*** (0.007)	−0.072*** (0.005)	0.060*** (0.007)
Agriculture	0.042*** (0.002)	0.028*** (0.003)	0.028*** (0.003)	0.029*** (0.003)
Unemployment	−0.438*** (0.023)	0.254*** (0.020)	−0.163*** (0.023)	0.250*** (0.025)
Constant	−0.836*** (0.182)	2.807*** (0.167)	−3.762*** (0.245)	2.883*** (0.200)
	LL = −3131; AIC = 6290; N = 4455; Pseudo R^2 = 0.281		LL = −2609; AIC = 5247; N = 3780; Pseudo R^2 = 0.306	

[+] Significance at 1% = ***, at 5% = **, and at 10% = *; LL = Log likelihood; AIC = Akaike information criterion.

Appendix C

Comparison original RPL model ('Model 1') and RPL model including 'protest voters' (n = 50). [+]

Variables	Model 1		Model 1 with 'Protesters'	
	Coeff. (SE)	SD (SE)	Coeff. (SE)	SD (SE)
Residential Growth	0.024*** (0.009)	0.174*** (0.011)	0.030*** (0.009)	0.184*** (0.012)
Protected Grasslands	0.045*** (0.010)	0.009 (0.026)	0.051*** (0.010)	0.044* (0.023)
Bison Presence	0.006 (0.005)	0.008 (0.013)	0.007 (0.005)	0.005 (0.014)
Access to Recreation	−0.060*** (0.003)	0.047*** (0.005)	−0.056*** (0.003)	0.048*** (0.005)
Agriculture	0.031*** (0.002)	0.028*** (0.002)	0.032*** (0.001)	0.031*** (0.002)
Unemployment	−0.394*** (0.016)	0.243*** (0.015)	−0.381*** (0.015)	0.234*** (0.016)
Constant	−1.929*** (0.139)	2.858*** (0.136)	−1.813*** (0.153)	3.025*** (0.132)
	LL = −5852; AIC = 11,732; N = 7384; Pseudo R^2 = 0.279		LL = −6004; AIC = 12,036; N = 8703; Pseudo R^2 = 0.302	

[+] Significance at 1% = ***, at 5% = **, and at 10% = *; LL = Log likelihood; AIC = Akaike information criterion.

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