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The Role of Agritourism in Western States: Place-Specific and Policy Factors Influencing Recreational Income for Producers

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Abstract

While public investment in conservation such as the Conservation Reserve and Wetlands Reserve Programs have improved the environmental state of the lands, they have not provided an institutional means for production and profit expansion for the same acreage. This type of public investment places constraints on the lands agriculturally and in return provides rents to land owners. As a complement to this income, CRP and WRP may also contribute to a series of recreational opportunities outside of the generalized uses for farmland. The research question proposed is: *does public investment in natural resources pay off through expanded opportunities in agritourism?* Agritourism includes recreational activities such as hunting, fishing, and wildlife viewing. This research explores the viability of operating such alternative uses for agricultural lands while maintaining the integrity of the conservation program in which the same acreage is coincidentally enrolled. Ultimately three econometric models were generated in attempt to explain the influence of various explanatory variables on recreational services revenue. In addition to the econometric analysis, ArcGis 9.0 was implemented to assess geo-spatial factors influencing the dependent variable.

Keywords: Conservation reserve program; Agritourism revenues; GIS

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1. INTRODUCTION

Public investments in farmland-based conservation such as the Conservation Reserve and Wetlands Reserve Programs (CRP and WRP, respectively) have improved the environmental state of many lands. While doing so, they have placed constraints on the use of lands, thus limiting the potential rents to land owners. CRP and WRP were initiated to remove fragile, marginal land from crop production by requiring enrolled producers to convert marginal acreages to perennial vegetation or to restore wetlands for a specified period. In short, these programs offer landowners incentives to establish long-term conservation covers and wildlife habitat while serving the supply control objectives of U.S. farm policy.

With the 2002 Farm Security and Rural Investment Act (2002 Farm Act), policy-makers substantially increased conservation funding, especially on lands used for crop production and grazing. Between 1985 and 2004, over 34.9 million acres of land were enrolled in both programs combined, contributing \$1.69 billion in annual rental payments to producers (ers.usda.gov/publications/arei/eib16/Chapter5/5.1). CRP expenditures grew from \$1.79 to \$1.94 billion between 2002 and 2005 (an 8.4 percent increase), while WRP expenditures declined from \$284 to \$268 million over the same period. At the same time, working lands conservation programs such as the Environmental Quality Improvement Program had substantial increases in funding as well, increases in conservation title programs that are expected to continue in the Farm Bill emerging for the 2007 session. These programs create a policy means of supporting farm income while putting into place production constraints that provide environmental benefits. However, the long-term implications for producers' financial returns and, in a broader context, the economic activity of communities in which these farms operate, receive less attention and scrutiny.

We posit that CRP and WRP may contribute to a new farm income stream based on the enhanced recreational opportunities perceived by tourists on farmland that has richer wildlife and fish habitat or is simply in a more natural state of development. The research question proposed is: *does public investment in natural resources pay off indirectly to the full set of producers in a country through expanded opportunities as measured by aggregate agritourism revenues?* For this study, we follow the 2002 Ag Census definition of agritourism that defines recreational activities as hunting, fishing, and wildlife viewing.¹ We also limit the analysis to the western United States as we expect that there will be significant structural differences between USDA production regions, but this analysis can motivate future analysis of other regions.

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¹ As stated in section 16 of the 2002 Census of Agriculture, respondents are asked to report "Income From Farm-Related Sources - Report amount received before taxes and expenses in 2002"; question 4 of section 16 asks for "Recreational services, such as hunting, fishing, etc." (USDA Form Number: 02-A0201).

2. LITERATURE REVIEW

Since the introduction of the Conservation Reserve Program in the 1985 Farm Bill, a wide array of analyses have been conducted regarding the effects of such programs on the economic state of U.S. agriculture. The initial objective of CRP was to reduce soil erosion. In its preliminary stages, CRP was questioned with regard to its cost effectiveness and narrowly defined objectives. Since the first sign-up in 1986, program costs have been estimated at \$1.8 billion per year (Hoag, Hughes, and Nipp 1995). Cost effectiveness was improved in 1990 with the implementation of the Environmental Benefits Index (EBI), which broadened the scope of the program by including multiple criteria as CRP objectives and providing more structure to the bidding process (Hoag 1999). Some of the new criteria include wildlife habitat, water quality, and air quality benefits. Since the introduction of EBI in CRP regulations, secondary benefits relating to the new criteria are receiving greater interest.

The EBI is a scoring system for enrolling lands in CRP. Our original intent was to use county-level EBI averages as an explanatory variable in the econometric models because it provides an evaluation criterion for enrolled acreage. But the Farm Service Agency (FSA) maintains this information and has not granted access to the public. After re-thinking the model, the USDA-Economic Research Service (ERS) Natural Amenity Scale was integrated instead to control for unique land-environment characteristics because they impact some of the perceived quality to hunters and may lessen the potential for collinearity, which was expected between CRP enrollment, level of CRP investment, and the EBI. The natural amenity scale measures the physical characteristics of a county that enhance its desirability as a place to live (ers.usda.gov/Data/NaturalAmenities/). The scale appears to play a significant role in explaining population growth (and is appropriate for statistical analysis due to its bell-shaped distribution (McGranahan 1999)). For this research, it is interesting to note that the majority of regions rich in natural amenities lie in the western United States (Figure 1).

The Wetlands Reserve Program was mandated under the 1985 Farm Bill and is a voluntary program through which land owners can receive payments for the removal of sensitive wetlands from agricultural production (nrcs.usda.gov/programs/farmbill/2002/). Reauthorized under the 2002 Farm Bill, WRP currently has 1,470,998 acres enrolled with a maximum of 2.275 million acres authorized. The cost effectiveness of converting productive agricultural lands into protected wetlands was estimated in previous ERS research, and results suggest that direct benefits from wetland restoration are comparable to the costs of restoring and enrolling those lands into conservation programs (Heimlich 1994).

Although closely related, CRP and WRP are separately run programs. WRP is administered by the Natural Resources Conservation Service (NRCS), which also oversees other conservation programs such as Wildlife Habitat Incentives Program (WHIP), the Conservation Security Program (CSP), and the Environmental Quality Incentives Program (EQIP). Meanwhile, the Farm Service Agency administers the Conservation

Reserve Program (Vandever 2005). For the purpose of this analysis, CRP and WRP will be referred to jointly, as the 2002 Census of Agriculture combines data on both programs into one variable.

Since the appearance of CRP under the U.S. Farm Bill, a great deal of research has been undertaken to examine direct and indirect impacts of the program. Taylor, Dhuyvetter, and Kastens (2003) used percent CRP acres to estimate cropland and pastureland values in Kansas and surrounding states. Their results suggest that CRP enrollment has a negative influence on both cropland and pasture land values, suggesting that CRP is accounting for general land characteristics. This is counter-intuitive to our prior assumptions that improved conservation may help enhance alternative revenue streams.

In a study conducted by Feather and Hellerstein (1997), a two-stage discrete-count demand model was used to estimate the benefit function of CRP. The study found “the national benefit measures themselves indicate that erosion reductions ... have generated large recreational benefits,” and that water-based benefits attributable to CRP are approximately \$39.58 million (Feather and Hellerstein 1997). These benefits are attributed only

FIGURE 1. Natural Amenities Scale

to erosion reduction and do not take into account the wildlife benefits associated with CRP that would more likely impact this study's hypothesis. In a study conducted by Hansen, Feather, and Shank (1999), a random utility model was used to estimate consumer surplus of pheasant hunters, and benefits attributable to CRP were estimated to be \$80 million per year. Prior research conducted to determine recreational value associated with CRP primarily focus on behavior models similar to the one used by Hansen, Feather, and Shank (1999).

Of particular interest to this analysis of CRP are its economic implications for rural communities. According to the USDA, two possible consequences of CRP on rural areas have been determined. CRP may have added to the quality of life in rural areas and helped support growing recreation and agritourism activities but also weakened local economies by taking farmland out of production and reducing the demand for farm services (Sullivan et al. 2004). We will focus on establishing whether there are positive impacts from CRP to the aggregate produce community of each western county through expanded opportunities for agritourism in rural areas.

3. DATA AND METHODS

The objective of this research is to determine the influence of conservation program investment on recreational services revenue, i.e., do CRP and WRP have unintended benefits in the form of new income streams to producers in rural areas where CRP investments are found? Theory suggests that such income streams from increased wildlife-based recreation may emerge due to the increased ecological and wildlife benefits associated with the policies. In order to test this theory, econometric methods were used to estimate gross recreational service income as a function of several relevant explanatory variables. The geographic focus is on the western region, including Montana, Wyoming, Colorado, Arizona, New Mexico, Utah, Nevada, Oregon, Washington, Idaho, and California (413 counties). The dependent variable for each model, recreational services revenue per county, includes supplemental farm income from hunting and fishing services provided—a new data series starting with the 2002 Census, meaning it has received little prior attention from researchers.

3.1 Data and Variables

The relevant explanatory variables fall into three categories: unique place aspects of each county to control for natural amenity quality differences and ease of access to the visitor, size of agriculture (defined by sales or acreage) in the county, and the level of CRP/WRP investment. As previously mentioned, the USDA jointly reports CRP and WRP data, and they are standardized by acres enrolled to arrive at an average investment.

The Natural Amenities Index serves as a scaled index value of multiple environmental characteristics such as topography, water, temperature, and humidity. To account for the influence of metropolitan forces and ease of access on the dependent variable, the county-level urban influence codes developed by USDA-ERS are used in these models

(ers.usda.gov/briefing/rurality/UrbanInf). The urban influence continuum varies from 1 and 2 for small and large metro areas to 3 through 7 for smaller areas adjacent to metro areas, to 8 through 10 for smaller cities, and 11 and 12 for fairly rural areas with sparse population densities. Other explanatory variables include total sales, total sales per acre, and farmland acres, all reported by the 2002 Census of Agriculture at the county level.

Due to inconsistencies within the data, our sample size was reduced from 413 counties down to 211. The USDA data is subject to nondisclosure protection where reporting may cause concern about the release of private information (if only one or two entities report). Since enrollment may exist in those regions, it would have been unreliable to assume those counties as having zero activity. Therefore, counties with inconclusive data were omitted from the sample, but values were extrapolated for these counties to run spatial models.

Figure 2 shows the total reported recreational income reported by state. Colorado leads the western states with recreational income of \$10.1 million. Montana, California, and Wyoming follow with \$6.3, \$5.3, and \$5.3 million, respectively. On a county level, Table 1 lists the top 20 counties for gross farm recreational income. Colorado again stands out as the state leader, with five out of the top six and eight of the top 20 counties. Wyoming has the second most counties on the list, with four appearing in the top 20. Reported alongside gross farm recreation income in Table 1 is recreational income indexed by total farm acres as well as total farm sales as two different methods to standardize gross revenue levels. The income per farm acre and share of total sales show no real pattern, but both are small among the counties with one exception. Pitkin County, CO (which includes Aspen) stands out with a recreational income to total farms sales ratio of .50, suggesting that recreational income is one of the few remaining sources of farm revenues in that county. Although Pitkin County is not highly influenced by CRP and WRP investments, it likely benefits from its high natural amenities and possibly from program contributions in surrounding regions.

3.2 Empirical Models

Ultimately three econometric models were produced to reflect the influence of CRP and WRP on recreational services. Table 2 provides definitions and unit explanations for the variables included in all three econometric models.

The first defines gross recreational services revenue in 2002 as a function of a constant, urban influence code, natural amenity index, CRP and WRP payments, farmland acres, total sales (2002), and CRP/WRP payments squared, all gross measures to examine the absolute levels of activity. The squared term is included to account for any non-linearities in the effects from program investment. Model 1 is represented by the following equation:

$$(1) \quad \text{Gross Recreational Income} = \alpha_1 + \alpha_2 \text{ Urban Influence} + \alpha_3 \text{ Natural Amenity Scale} + \alpha_4 \text{ CRP/WRP Investment} + \alpha_5 \text{ Farmland Acres} + \alpha_6 \text{ Total Sales} + \alpha_7 \text{ CRP/WRP Investment}^2.$$

FIGURE 2. Total Reported Recreational Income by State

TABLE 1

Top 20 Counties by Gross Farm Recreational Income

State and County	Farm Recreation Income (\$1,000)	Recreation Income per Total Farm Acres	Recreation Income per Total Farm Sales
Colorado/Moffat	\$1,347	\$0.0013	\$0.07
Colorado/Rio Blanco	1,058	0.0028	0.08
Colorado/Routt	963	0.0021	0.04
Colorado/Grand	804	0.0037	0.11
Arizona/Cochise	781	0.0008	0.01
Colorado/Garfield	682	0.0017	0.03
Wyoming/Johnson	597	0.0003	0.02
Montana/Custer	558	0.0003	0.01
California/Humboldt	546	0.0009	0.01
New Mexico/Rio Arriba	546	0.0004	0.05
Wyoming/Campbell	514	0.0002	0.02
Wyoming/Crook	503	0.0003	0.01
California/Sonoma	474	0.0008	0.00
Colorado/Mesa	471	0.0012	0.01
Wyoming/Carbon	455	0.0002	0.01
New Mexico/Catron	422	0.0003	0.05
Colorado/Montrose	407	0.0012	0.01
Washington/Spokane	393	0.0006	0.00
Colorado/Pitkin	375	0.0157	0.50
Montana/Park	371	0.0004	0.02

TABLE 2

Variable Definitions		
Variable	Units	Description
Recreational Services Revenue per County	\$1,000s	Supplement farm income from hunting and fishing services
Urban Influence	Coded from 1-12	Counties are grouped according to their metro status
Natural Amenity Scale	> 3 high amenities < 0 low amenities	Measure physical characteristics of a county
Total Sales	\$	Total amount of agricultural goods sold per county
Total Sales per Acre	\$/acre	Average amount of agricultural goods sold per acre
Farmland Acres	acres	Total farmland in county
CRP/WRP Investments	\$1,000s	Total amount of payments from CRP and WRP per county
CRP/WRP Acres Enrolled	acres	Total enrollment in CRP and WRP per county

In model two, the dependent variable, recreational services income, is indexed by land value to account for return on assets from a new income stream. To measure land value, average values per acre were multiplied by total acres. In this model, program investments are divided by acres enrolled to control for the relative value of land integrated into conservation programs (similar to a return on asset measure). A quadratic term is included again to account for non-linearity in CRP/WRP influences. The model is as follows:

$$(2) \quad \text{Recreational Income/Land Value} = \beta_1 + \beta_2 \text{Urban Influence} + \beta_3 \text{Natural Amenity Scale} + \beta_4 \text{Total Sales} + \beta_5 (\text{CRP/WRP Investment})/(\text{Acres Enrolled}) + \beta_6 ((\text{CRP/WRP Investment})/(\text{Acres Enrolled}))^2$$

Lastly, the third model divides recreational services income by gross sales to account for the relative importance of this enterprise in the farm's/ranch's "portfolio" as follows.

$$(3) \quad \text{Recreation Income/Gross Sales} = \gamma_1 \text{Urban Influence} + \gamma_2 \text{Natural Amenity Scale} + \gamma_3 \text{Total Sales} + \gamma_4 (\text{CRP/WRP Investment})/(\text{Acres Enrolled}) + \gamma_5 ((\text{CRP/WRP Investment})/(\text{Acres Enrolled}))^2$$

3.3 Correcting for Spatial Dependence in the Models

Observations of recreation income generated in the respective counties examined in this study are potentially not independent of one another. Anselin (1988a) presents two primary reasons for this spatial dependence. First, data collection of observations associated with spatial units such as zip codes, counties, states, and census tracts might reflect measurement error. This would occur if the administrative boundaries used to collect the information do not accurately reflect the nature of the underlying process generating the sample data. A second, and maybe more important, reason to expect spatial dependence is that “neighboring” observations may truly be non-independent of one another, and unique spatial characteristics may be present in the data.

Because counties are not independent observations from one another, a key assumption of ordinary least squares (OLS) regression is violated. Common methods employed to conduct spatial regression analysis include spatially specified maximum likelihood estimation, instrument variable methods, and generalized methods of moments estimation (Anselin and Bera 1998). However, due to the number of missing observations in this data, such analysis is infeasible. To correct for this, the missing values were imputed using STATA 9.0’s “impute” function. Although this method is suboptimal, it is the only means of obtaining the required data. After imputing values for all three models, spatial dependence was only found in Model 1; therefore, this was the only model where the imputed values were ultimately used in the reported regression. Additionally, the results of all models did not differ substantially between those using the imputed values and those not using them.

Spatial dependence can be manifested in one of two primary ways: 1) through a spatial error process that arises from issues such as measurement error, geographical boundaries that are arbitrary unit scales relative to the relationship being modeled, or through unmeasured factors that are correlated across space and 2) through a spatial lag process where the dependant variable in one location is affected by the values of the dependent variables in neighboring locations.

The Moran’s I test is commonly employed to test for the presence of spatial dependence in econometric models (Anselin and Bera 1998). This test statistic is similar to the Durbin-Watson test for time series autocorrelation and is calculated as follows.

$$I = (N / S_0) \left(\frac{e' W e}{e' e} \right)$$

where e is the vector of OLS residuals and W is the spatial weighting matrix. The term (N/S_0) is a standardization factor that disappears when the weighting matrix W is row standardized so that the sum of any row vector is one. In the absence of spatial dependence, the Moran’s I statistic will approach zero and perfect spatial dependence would yield a Moran’s I statistic of one. While the Moran’s I has been widely used and has been shown to consistently provide the best available estimates of the presence and degree of

spatial dependence (King 1981; Kelejian and Robinson 1998), it does not provide insight into the nature of the spatial dependence of what model to use to correct the problem.

Lagrange multiplier tests have been developed to test for the presence of spatial error dependence (Burridge 1980), spatial lag dependence (Anselin 1988b), and joint spatial error/lag model (Anselin 1988b). The Lagrange multiplier tests provide insight into both the presence of spatial dependence and the appropriate alternative specification.

The Moran's I statistic for Model 1 with recreational income as the dependent variable was found to be significant with a coefficient of 0.27, indicating the presence of spatial dependence. The results of the Lagrange multiplier tests confirmed the presence of spatial dependence and indicated that the spatial error model was the correct specification. After dividing by the values of land and sales respectively in Models 2 and 3, the spatial dependence was broken and neither the Moran's I nor the Lagrange multiplier tests were found to be significant. Thus the second and third models were estimated using ordinary least squares regression. However, the presence of spatial error dependence in Model 1 necessitated the use of the spatial error maximum likelihood estimation equation developed by Ord (1975).

4. EMPIRICAL FINDINGS AND DISCUSSION

The underlying theory of this research is that public investment in natural resources pays off indirectly to producers through expanded opportunities in agritourism, but it should be noted that the west is not a "major player" with regard to Conservation Reserve and Wetlands Reserve Programs (Figure 3). The 11 western states included in this study account for just over 20 percent of total program investment, while the remaining nearly 80 percent remains in the rest of the United States, primarily in the central U.S. "corn belt." Of those 11 states, over half of the enrollment occurs in Montana and Colorado. Therefore the influence of these conservation programs on recreational services income may be more pronounced outside of our study region and should be explored in future research.

4.1 Summary Statistics and Correlations

In an attempt to discern a pattern between recreational services revenue and CRP/WRP investments, county averages by state are plotted against each other in Figure 4. According to our theory, Montana should have the highest recreational services revenue of the 11 states under consideration simply due to the fact that it exceeds all other states in program investments. Yet, Colorado's relationship is more consistent with our theory in that it exhibits the second highest recreational income per county and is the third highest in program investments. However, Wyoming has the highest average recreational income per reporting county, but reports low CRP and WRP investments relative to surrounding states.

FIGURE 3. Each State's Share of the Total CRP/WRP Investment Received by Western States

FIGURE 4. Average Recreational Income and CRP/WRP Investment per Reporting County by State

Previous research suggests that “in counties with higher productivity and thus higher per acre returns, the rental rate is not high enough to encourage enrollment in the CRP” (Fleming 2004). Figure 5 provides a graphical representation of the average payments per acre across states. The state of Washington has the highest investment per acre reported at \$55.31. This may be due to highly productive wheat crops in the eastern part of the state and/or high timber values near the coast. Nevada and Arizona report the lowest rental payments per acre (\$0 and \$3.10, respectively), but this may be misleading given a low level of reported recreational income among counties in those states.

Montana and Washington dominate the west for total acre enrollment and per acre investments, respectively. Tables 3 and 4 further support this notion by reporting the top 20 counties in the west for total investments and total acre enrollment in CRP and WRP. Counties located in Montana and Washington appear most frequently, which is not surprising considering the averages reported in Figure 2, and it should be noted that all but one county from Table 3 reappears in Table 4. Interestingly enough, there is no overlap of counties between Table 1 and Tables 3 or 4 (i.e., counties generating the most recreational services income do not appear to be counties of high enrollment in CRP and WRP). Thus summary statistics for the data do not support the hypothesis that program enrollment contributes to recreational services income. But an econometric model may better explain this relationship by controlling for interrelationships.

FIGURE 5. Average CRP/WRP Investment per Acre Enrolled by State

TABLE 3
Top 20 Counties by Gross CRP/WRP Investments

State and County	Investments		Average \$/Acre
	(\$1,000s)	Acres Enrolled	
Montana/Hill	9,713	309,910	31.34
Montana/Chouteau	9,137	274,748	33.26
Washington/Whitman	9,016	148,654	60.65
Washington/Adams	7,793	198,693	39.22
Colorado/Weld	5,947	200,069	29.72
Washington/Douglas	5,924	166,832	35.51
Montana/Valley	5,622	216,384	25.98
Montana/Teton	5,472	159,980	34.20
Colorado/Washington	5,322	166,719	31.92
Washington/Franklin	5,249	129,928	40.40
Montana/Toole	5,200	176,265	29.50
Oregon/Umatilla	4,524	110,413	40.97
Montana/Phillips	4,502	159,810	28.17
Colorado/Baca	4,464	193,995	23.01
Oregon/Morrow	4,442	104,810	42.38
Montana/Sheridan	3,984	161,113	24.73
Montana/Daniels	3,723	144,279	25.80
Colorado/Lincoln	3,687	142,459	25.88
Montana/McCone	3,554	135,085	26.31
Montana/Pondera	3,329	86,838	38.34

4.2 Econometric Models

The first model explains absolute recreational activity by estimating gross recreational income as a function of urban influence, the natural amenity scale, CRP/WRP investments, CRP/WRP investments squared, farmland acres, and total sales. Table 5A reports the statistical results for Model 1. Unfortunately, no significant relationship exists between program investments and recreational income. Not surprisingly, the natural amenities index is positively related to recreational income and is significant at the 99 percent level. This relationship is logical given that improved environmental characteristics of a county should increase the level of recreational activity.

The coefficient on farmland acres was found to be significant in Model 1. It makes sense that the greater the volume of farmland acres in a county, the greater the ability to generate recreational services revenue simply due to the fact that there is more opportunity to offer such agritourism services when private land is in greater proportion and the opportunity to recreate on public lands is reduced.

The total sales variable is not statistically significant in the first model, and farmland acres are a significant and negative influence on recreational services income. Therefore,

TABLE 4

Top 20 Counties by Total Acre Enrollment in CRP and WRP

State and County	Acres Enrolled	Investments	
		(\$1,000s)	Average \$/Acre
Montana/Hill	309,910	9,713	31.34
Montana/Chouteau	274,748	9,137	33.26
Montana/Valley	216,384	5,622	25.98
Colorado/Weld	200,069	5,947	29.72
Washington/Adams	198,693	7,793	39.22
Colorado/Baca	193,995	4,464	23.01
Montana/Toole	176,265	5,200	29.50
Washington/Douglas	166,832	5,924	35.51
Colorado/Washington	166,719	5,322	31.92
Montana/Sheridan	161,113	3,984	24.73
Montana/Teton	159,980	5,472	34.20
Montana/Phillips	159,810	4,502	28.17
Washington/Whitman	148,654	9,016	60.65
Montana/Daniels	144,279	3,723	25.80
Colorado/Lincoln	142,459	3,687	25.88
Montana/McCone	135,085	3,554	26.31
Washington/Franklin	129,928	5,249	40.40
Montana/Richland	113,551	3,268	28.78
Oregon/Umatilla	110,413	4,524	40.97
Oregon/Morrow	104,810	4,442	42.38

the more land under production in a county, the lower the opportunity (or need) to generate recreational income. In short, farming/ranching and recreational income appear to be substitute enterprises rather than complementary in nature.

In the second model, recreational services income is indexed by land value to account for return on assets from a new revenue stream. Table 5B reports the econometric results from the OLS estimation. The natural amenity scale has a positive impact on the dependent variable and is significant at the 90 percent level. The urban influence code is also significant and positively related to recreational income. Recall that an increasing urban influence scale means that the distance from urban regions is relatively greater for larger values. This suggests that recreation opportunities improve further away from urban locations, suggesting a “get away” effect rather than a benefit for easy access from metro areas as one might expect.

This suggests a greater return to land value with respect to recreational income in higher amenity areas further from urban interfaces (even accounting for increased values due to natural amenities). A parameter estimate of .000108 for the natural amenity scale implies that a one unit increase in scale will generate \$.000108 more recreational income per dollar value of land. Similarly the results suggest that a one unit increase in the urban influence code will allow for a \$.00011 increase in recreational income per dollar value

of land. The similarity in the levels of these two effects is a little surprising and may motivate the need for more research on the “place based” factors influencing recreational income and its potential for rural development. Again, total sales are insignificant as a factor determining recreational income in relation to land value.

In the second model, CRP/WRP payments per acre enrolled and the squared term are significant at the 99 percent and 90 percent levels, respectively. Interestingly, the model estimates a negative relationship between program payments per acre enrolled and recreational income, a finding that is counter-intuitive to our hypothesis. However, the relationship becomes positive when further considering the squared term. This implies that relatively higher enrollment in CRP and WRP positively impacts the ability to generate recreational income. With this model we can conclude that enrollment in conservation programs does influence recreational income at the county level but that the gains are dependent on having a sufficient investment to make an impact through either scale or quality (a function of the average investment per acre).

Turning to the third model, recreational income is indexed by total sales to account for the share of total income from recreational revenue streams (see Table 5C). Again, natural amenities and urban influence are significant at the 90 percent level and are positively related to recreational income divided by total sales. In addition to further reinforcing the importance of location when considering recreational services as an alternative business strategy, it shows how it increases the relative importance of this revenue stream among a county’s portfolio of farmland-based enterprises.

Similar to Model 2, conservation reserve and wetlands reserve payments per acre and the squared term are significant at the 99 percent level. This further supports the theory that a relatively more significant CRP/WRP enrollment suggests a greater importance of alternative income streams through hunting and fishing services relative to a county’s other economic activity derived from farm or ranch land.

4.3 Identifying Outliers through Spatial Analysis

One further application using the three models developed is identifying outlying counties from the geo-spatial assessment of model residuals. Since model outliers are those counties significantly over- or under-performing their potential in regard to recreational services revenue generated, they may help some counties realize opportunities that could be targeted with well-planned tourism or conservation strategies. To conduct this analysis, residuals for all three models were calculated and county level data mapped using Geographical Information Systems (GIS) software. The majority of counties outperforming their expected revenue are in the Rocky Mountain states (not shown), a bit surprising since the models already account for the influence of natural amenities and urban adjacency.

TABLE 5A

Model 1, Spatial Lag ML Regression Results

Variable	Parameter Estimate	z-statistics	Standard Error
Constant	-45.51301	-0.693	65.65168
Urban Influence	2.19311	0.607	3.61195
Natural Amenity Scale	20.00181	4.390	4.556189
CRP/WRP Investments	0.002093355	0.161	0.01300471
Farmland Acres	66.51772	5.11	13.01805
Total Sales	-0.002576839	-0.701	0.003678357
(CRP/WRP Investments) ²	-1.264616	-0.793	1.59407
Log-Likelihood	-2,581.765	N = 413	

TABLE 5B

Model 2, OLS Regression Results

Variable	Parameter Estimate	t-statistics	Standard Error
Constant	0.000501	0.64	0.0007834
Urban Influence	0.00011	1.66	0.0000664
Natural Amenity Scale	0.000108	1.64	0.0000659
Total Sales per Acre	-0.000000183	-0.68	0.000000268
CRP/WRP Payments per Acre			
Enrolled	-0.000048	-2.39	0.00002
(CRP/WRP Payments per Acre			
Enrolled) ²	-0.000000402	1.82	0.000000221
F-statistic	3.71	N = 210	
RMSE	0.00212		

TABLE 5C

Model 3, OLS Regression Results

Variable	Parameter Estimate	t-statistics	Standard Error
Urban Influence	0.004848	1.87	0.0025968
Natural Amenity Scale	0.005127	1.81	0.0028346
Total Sales per Acre	-0.00000156	-0.52	0.00000299
CRP/WRP Payments per Acre			
Enrolled	-0.00228	-2.62	0.000876
(CRP/WRP Payments per Acre			
Enrolled) ²	0.0000194	20.3	0.00000956
F-statistic	3.93	N = 211	
RMSE	0.09286		

5. CONCLUSIONS AND IMPLICATIONS FOR RURAL COMMUNITIES

Ultimately the results from the research were somewhat unexpected. Our theory predicted that public investments in CRP and WRP would positively influence recreational income and that this would spill over to producers through increased opportunities for agritourism. Counter to our theory, program investments proved to have a negative impact on recreational income when indexed by land value and total sales. However, when investments are sufficiently large, CRP and WRP do have a positive relationship with recreational income.

From past research it is clear that conservation programs of all kinds have positively affected the ecological and environmental quality of the lands involved. This in turn has bolstered wildlife populations and increased the enjoyment and availability of wildlife-based recreation. The relationship is not as clear as was originally expected, but these findings motivate the need for further research with the USDA ARMS data focusing on individual farm enterprises. And, at the other extreme, some regional surveying and modeling could be used to assess the full community impacts from farm-based recreational services. The ERS estimates that the outdoor recreation benefits from CRP are in excess of \$700 million per year. They further suggest that CRP creates recreation-related jobs but suggest that more research is needed to confidently assess these contributions to local economies.

As public lands open to hunting and fishing become scarcer and more crowded, demand for these types of services on private land should continue to increase. Based on this assumption, the opportunity for secondary revenue streams from agritourism is expected to increase steadily over the long run. We feel that analysis of the situation at the micro level is the next step to making accurate estimations of the benefits spilling over from conservation programs onto individual producers. Undoubtedly, the results from this type of analysis will be most informative to producers and communities speculating as to the economic benefits associated with recreational business endeavors taking place on lands protected from agricultural development.

What information do the three models explained above indicate to rural communities looking to improve current economic conditions through expanded recreational services revenue? First of all, counties with higher amenity values generate more recreational services income, holding all else constant. Similarly, in all three models, urban influences are positively related to recreational income, suggesting that there is a “getting away” effect related to the fishing/hunting population’s preference for spending time in less densely populated or traveled areas of the west. This is encouraging news for the most rural of counties because the potential economic development opportunities for remote counties are generally more limited. Moreover, if conservation investments from federal farm programs continue to expand, western counties may want to have a bigger role in securing more payments for western producers since western counties may have some nice complementary natural amenities that will leverage the benefits from conservation programs.

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