Exploring the Economics of Agritourists: Customizing Travel Cost Methods to Evaluate Differences Across the Western US

Working Paper

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Introduction

American agriculture and the rural communities that principally rely on that industry have undergone a major shift in recent decades. As agriculture becomes relatively more capital intensive, rural communities have seen an increase in youth out-migration and decreases in employment opportunities. This shift in rural economies across the U.S. has motivated some farms and ranches to diversify their agricultural business and diversifying through agritourism is particularly interesting as a strategy to add an additional stream of revenue, offer employment for a family member, or educate the public. Over the past decade agritourism has grown over 60% in the U.S., and although much research has been conducted exploring the motivations for adopting agritourism, its economic impacts, and the demand for agritourism across the U.S, there are still opportunities to explore this emerging sector.

In the tourism sector, agriculture was not historically considered a key asset. But new public interest in food and connecting with the heritage of farm life has brought the two sectors together.   A common approach to examine the economics of tourism related to natural resources has been travel cost models. While a few travel cost studies have been conducted in an attempt to obtain demand and elasticity estimates for agritourism, they either do not take into account the multi-destination effect (Carpio et al. 2008), or are done for a specific region (Hill et al. 2014). Additionally, most of these papers lack information on the type of the agritourism site and other travel information specific to the agritourist.

Given previous work by this team, and information shared by Colorado communities on the nature of their visitors, this study will take into account the potential bias from multi-destination trips, potential differences arising from the type of agritourism activity and overall trip characteristics, and general preferences of the agritourists. Accounting for such factors allow for a more in-depth and comprehensive view of the size and type of role that agritourism in the West plays in rural economies, as well as advancing the literature with new methods of approaching trip valuation. It is the belief of this research team that by implementing a unique survey instrument specific to the purpose of estimating demand for various agritourism sites in the Western U.S., greater insights may be gained into the potential growth of the industry in certain regions and locales, as well as into the types of visitors who are partaking in this growing industry.

Preliminary results from a truncated negative binomial model imply that the demand for agritourism may differ significantly depending on the agritourism zone as well as on the type of agritourism activity. Further development of the model specification will be completed given initial results indicated that demand for agritourism and the potential for growth in the industry is heterogeneous across communities and farm types. Such specification detail will allow one to further delineate key factors in case such findings would inform how different development strategies should be used, for instance, depending on where the farm is located and what potential agritourism activities they have available to them. The paper proceeds by first reviewing the literature on agritourism and travel cost models relevant to this study followed by methods, empirical results, and conclusions and further research.

Literature Review

Over the past several decades farms and ranches in the United States have been increasing in size and decreasing in number enabling more farms to take advantage of economies of scale and driving down agricultural commodity prices. This pressure to scale up, together with globalization, have created a more competitive agricultural setting. Meanwhile, the need to explore competitive options besides scaling up has led small to medium sized agricultural businesses to diversify to remain successful or profitable in the evolving market (Veeck et al. 2006). Agritourism is one of these diversification strategies and incidence of agritourism in the U.S. grew over 60% between 2002-2012, demonstrating its perceivable importance and widespread adoption across farms and ranches (USDA, 2014; Sullins et al. 2010). Generally, agritourism is any revenue generating operation on a working farm or ranch where customers pay for some recreational or educational activity. Examples of this include hayrides, wine tastings, on-farm hunting and fishing, and many other activities that can be catered to either the type of agricultural operation or a popular type local recreation in the area (mountain biking, hunting, etc.), allowing agritourism to be a viable option for a wide array of agricultural businesses.

Much of the previous literature has focused on the potential benefits of agritourism in the U.S., both for the individual farm as well as for the surrounding community through surveys and regional case studies (Nickerson et al., 2001; McGehee and Kim, 2004; Tew and Barbieri, 2012). Smaller farms and ranches may benefit from increasing revenues, reducing risk that results from commodity ag market volatility, employing family members, and preserving rural lifestyles, while larger farms and ranches may also benefit relatively more from decreasing tax pressures due to urban sprawl and increasing land values (Nickerson et al., 2001; Philip et al., 2010; Tew and Barbieri, 2012; McGehee and Kim, 2004). Tew and Barbieri add that "agritourism appears as a convenient diversification strategy because it does not necessarily require excessive investments in farm infrastructure, labor or equipment." This diversity in benefits and motivations gives the impression that certain types of agritourism, as well as the share of farms and ranches with agritourism revenues, may vary across space depending on the local economic pressures, climate, and types of agricultural enterprises. Van Sandt et al. (2016) finds through a Local Indicators of Spatial Autocorrelation analysis that most hot spots of the share of farms and ranches utilizing agritourism exist primarily in the Rocky Mountain States, Texas, and the Northeast, and that "[t]he incidence of agritourism hot spots appear to be related to the travel distance to outdoor attractions, travel infrastructure, natural amenities, region, and local economic and farm/ranch characteristics." While Van Sandt et al. (2016) explores some of the drivers in the differences of agritourism incidence across the U.S., this paper seeks to investigate one of the key demand driver differences through exploration of visitor travel behavior and agritourism activity types across the Western U.S.

Travel cost models have been used extensively in the literature as a revealed preference technique in order to estimate demand curves and consumer surplus for policy recommendations or evaluations (Loomis and Walsh, 1997). As far as the authors are aware only two studies on agritourism have been conducted using the travel cost method (TCM). Carpio et al. (2008) utilized the 2000 National Survey on Recreation and the Environment and analyzed 1,524 farm visitors and 3,411 non-visitors in a two stage model starting with a probit model capturing the decision to visit the farm followed by a count data model estimating the number of trips taken. The authors estimate the consumer surplus of each trip to be $174.82 per person per trip and find area of residence, gender, and the importance of the rural landscape to be significant contributors to the number of trips taken. However, one caveat with this study is the failure to account for multi-destination trips leading to potential upward bias in the consumer surplus estimates (Haspel and Johnson, 1982; Parsons and Wilson, 1997; Loomis et al, 2000).

Hill et al. (2014) analyzed 2007 web-based survey data to perform a similar two stage analysis on agritourists in Colorado. The authors attempt to correct for multi-destination bias by including dummy variables designating whether the visitor was a primary purpose (PP) or multi-destination (MD) visitor and estimate consumer surplus for PP visitors to be $93 and consumer surplus for MD visitors to be $435 per person per trip. Hill et al. also find significant regional differences within Colorado indicating that the benefits of a trip differ depending on the location of the activity. Thus far in the literature this method of including dummy variables and dummy interaction terms seems to be the only technique to account for MD bias (Parsons and Wilson, 1997; Loomis et al, 2000; Hill et al, 2014). However, comparing this MD correction technique to a more basic model, Loomis et al. (2000) find no statistical difference in trip value differences, but do note that the differences could be significant from a policy standpoint.

Given the previous work in the area of estimating agritourism site benefits and overcoming MD biasness, this study attempts to improve on previous research by: 1) taking into account the heterogeneity of agritourism sites across space and activity types, and 2) correcting for MD bias by including survey questions that aim to obtain the partial travel time/mileage associated with a particular site. The next section describes the survey data in detail and outlines the methods used for empirical estimation in the sections to follow.

Data and Methods

The travel cost method is based on the concept that distance is a cost people take into account when making travel plans. Given two identical destinations, people will travel to the closer destination that minimizes cost. Therefore, if travelers are willing to go to destinations further away, there must be some additional welfare gain from that visit to offset the marginal cost of traveling there. This study applies the TCM to agritourism farms and ranches in the Western United States in order to sketch out demand curves for different agritourism activities across different regions. Estimating the demand for agritourism in the Western U.S. may assist community economic development practitioners and policy makers alike in gaining insights into the potential growth of the industry in certain regions and locales, as well as learn more about the types of visitors who are partaking in this growing activity.

The data for this research was distributed by Taylor Nelson Sofres (TNS), using their pre-recruited panels, to a stratified regional and national sample of travelers, with a focus on agritourists in the Western region. The Western region was defined as all states west of, and including, Montana, Wyoming, Colorado, and Texas, but excluding Alaska and Hawaii. This effort was part of a broader agritourism project funded by a United States Department of Agriculture (USDA) Agriculture and Food Research Initiative (AFRI) grant #2014-68006-21824, titled "Place-Based Innovation: An Integrated Look at Agritourism in the Western US." The survey was produced by the AFRI grant team and was administered in late April, 2015, by TNS via internet to participants in their established online panel after gaining an expedited review from CSU IRB approval.

The survey varied in length depending on whether the respondent was randomly selected to receive one of four versions, including versions that inquired about the: most recent trip involving agritourism, longest trip involving agritourism, most recent trip not involving agritourism, and longest trip not involving agritourism. More details on different versions will be discussed in greater detail below, but regardless of the survey version, the primary purpose of survey was to explore the travel behavior of agritourists and to determine how agritourists differ from other travelers. In general, questions in the survey asked for distances traveled, dollars spent, the primary purpose of the trip, agritourism activities participated in, and other agritourism or general travel related questions.

The benefits of using a research company and panel are two fold; a high response rate is achieved due to pre-recruitment and incentives, and it is more likely a balanced sample can be achieved due to TNS' large and established panel. The initial goal was to survey 1,600 travelers who specifically visited agritourism sites in the Western region (Texas, Colorado, Wyoming, Montana, and all states westward), however, TNS' initial screening showed too low an incidence of the participation in the specific definition of agritourism[1] among travelers in the panel (around 5% instead of the expected 10%) to meet the sample goal. Given this lower than

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[1] "Agritourism is any paid for educational or recreational activity that takes place on an operating farm nursery, or other agricultural production site. Examples of agritourism are wine tastings, a corn maze or dude ranch."

expected incidence, TNS had to both extend their potential sample. They chose to use their panel partners to achieve the desired quota of agritourists in the West, and make part of the sample based on national travelers who did not visit agritourism sites, hence the second two versions of the survey. In total, one thousand responses came from agritourists in the western region, while five hundred and one responses came from non-agritourists in the continental United States (50% incidence) totaling 1,501 responses in all.

In all, four versions of the survey were developed. The two main categories were surveys that targeted the respondent's most recent trip and surveys that targeted the respondent's longest trip in the past year, since both types of trips are of interest in understanding behavior. For example, the longest trip a family goes on is frequently in the summer due to relatively more available schedules, and may therefore only capture an agritourist's behavior during a specific season instead of their general travel behavior. The "longest" and "most recent" versions of the surveys were split 50-50 within the self-designated agritourist group, as well as within the non-agritourist group, resulting in four total survey versions. The added benefit of surveying the non-agritourists (national sample) is that analyses might be able to distinguish between agritourists' and non-agritourists' travel behavior, as well as differences in travel behavior between different regions in further studies. The non-agritourist survey had the same questions as the agritourist version, but just left out general agritourism language, and specific agritourism questions.

Through these survey components, a subset of questions was extracted to be included as, or to construct the variables necessary for the TCM. These variables can be seen in Table 1. While some variables such as demographics and type of agritourism site were taken directly from the survey results, other variables had to be constructed due to obstacles. For example, since TNS unexpectedly had to sample out of panel due to lower than expected incidence rate, the zip code of each respondent's residence was no longer guaranteed. The population within a zip code is commonly used in zonal travel cost models to construct a proxy for the quantity of trips an individual took to their destination zone (Loomis and Walsh, 1997), so without this piece of information a new proxy had to be developed. The final quantity of trips variable in the empirical model represents the number of trips an individual took to an agritourism site like the one they answered the survey questions on (direct sales, event or entertainment, outdoor recreation, education, or other), while on a trip (day or overnight) similar to the one for which they answered the survey questions. Several other variables such as total number of trips and hours traveled were cross checked to ensure the number of trips were consistent with the rest of the respondent's answers. Intuitively, the authors believe this proxy measuring like-visits on like-trips offers perhaps a better specification of the quantity of trips variable than the zip code proxy which makes seemingly strong assumptions about the representativeness of the traveler to their greater community.[2]

One major contribution this paper makes is its inclusion of multi-destination (MD) trips. While the previous literature, such as Loomis et al. (2000) and Parsons and Wilson (1997), have included dummy variables and dummy interaction terms to capture shifts in the demand curve, the actual additional mileage traveled off of the traveler's path to their primary destination has never been measured. Inquiring whether the agritourism visit was a primary, secondary, or

[2] In order to include travelers who indicated different modes of transportation, separate travel cost calculations were used for each mode of transportation. The six modes of transportation were private vehicle, rental vehicle, train, plane, motorcycle, and tour bus. These calculations are described in the appendix.

incidental stop as well as the additional miles traveled to the agritourism site, enables the researcher to disentangle the true travel cost incurred by the traveler to visit the site. For example, if a traveler were to see highway signage of an agritourism site five miles off their primary path of travel and incidentally decided to visit the site, just those five miles (10 miles round trip) should be included in the visitor's travel cost. Including any miles previously traveled would not accurately represent the opportunity cost of the traveler to visit the agritourism site, and if included may result in overestimating the consumer surplus of the site.

This paper also takes a novel approach at attempting to incorporate and take into account the heterogeneity of agritourism sites across space. Establishing destination zones in a travel cost model is done partly out of practicality and partly due to the nature of the research question. This study attempts to explore differences in consumer surplus across space and across agritourism activities, so it is clear that the Western U.S. needs to be subdivided into zones that each capture the heterogeneity of that particular zone. From the practicality standpoint, there need to be few enough zones to ensure there are enough degrees of freedom to achieve statistical significance in the multivariate regression analysis. In order to take this heterogeneity into account several variables noted to be correlated with agritourism in the literature (Hill et al, 2014; Van Sandt et al, 2016) were used in a principal components analysis to develop an "Agritourism Score" for each county. Mapping these scores as a choropleth map (Figure 1 in appendix) enabled the researchers to define zones based on the clustering of counties with "like-agritourism scores". While admittedly not perfect, the authors believe this method better takes into account the heterogeneity of agritourism enterprises across the Western U.S. than using a zonal specification based on states or census regions.

Table 1. Summary Statistics	**Observations:** 864			
Variable	**Mean**	**Standard Deviation**	**Min**	**Max**
Agritourism Trips	2.5567	4.4767	1	80
PP Travel Cost	76.6486	115.3156	0.08	1469.59
MD Travel Cost	11.8473	38.2650	0	358.40
Travel Time (minutes)	56.4366	76.0367	0	625.64
Primary Destination	0.7245	0.4470	0	1
Secondary Destination	0.1979	0.3987	0	1
Incidental Destination	0.0775	0.2676	0	1
Female	1.5694	0.4954	0	1
*Income**	4.1204	2.0671	1	8
Age	37.3113	14.0210	18	84
Agritourism Zones (Figure 2 in Appendix)	**Percent of Agritourism Sites Visited**			
Mountain	21.30%			
Southwest	25.35%			
Central	2.20%			
Northeast	7.41%			
Northern California	19.91%			
Northwest	12.27%			
Greater Texas	11.57%			
Agritourism Activities	**Percent of Agritourism Sites Visited**			
Direct Sales	33.91%			
Entertainment and Events	42.36%			
Outdoor Recreation	42.59%			
Education	32.75%			
**Income has 8 categories: 1=under $30k, 2=$30k-$40k, 3=$40k-$50k, 4=$50k-$75k, 5=$75k-$100k, 6=$100k-$125k, 7=$125k-$150k, 8=$150k and over*				

Exploration of Specifications

The strictly positive and discrete nature of the dependent variable indicates a count data model is in order for consistent estimation of the parameters. While Hill et al. (2014) and Carpio et al. (2008) use two stage models, the data used in this study does not include non-agritourists (since they were sampled separately) so a truncated model must be applied to account for the exclusion of this sub sample (Grogger and Carson, 1991; Martínez-Espiñeira and Amoako-Tuffour, 2007). Additionally, a significant likelihood ratio test for over dispersion suggests a negative binomial model is appropriate to avoid bias in the parameter estimates (Grogger and Carson, 1991). As a result the empirical model following this section makes use of the truncated negative binomial model for parameter estimation.

Given the dependent variable is the quantity of trips an individual takes to an agritourism site, one would expect both the PP travel cost and MD travel cost coefficients to be negative, indicating a downward sloping demand curve. Similarly travel time should share a negative relationship with the quantity of trips as it represents the opportunity cost of time spent traveling. While demand theory suggests that income should share a positive relationship with the quantity of trips Creel and Loomis (1990) note that negative income coefficients are common in travel cost models.

Empirical Estimation

Given this is a working paper, the authors are still tuning the specification of the model and thus the empirical results should be interpreted with caution. The primary goal of this study is to estimate demand curves, elasticities, and consumer surplus values for several agritourism types and across multiple regions, but in some regards this is a tall order given the relatively few number of observations in some zones and an unexpectedly high number of single visits. It is suspected that this lack of variation in the dependent variable has made the likelihood function relatively flat leading to issues with non-concavity of the likelihood function. Due to relatively few observations in the Central and Northeast zones, these zones were aggregated and treated as the reference group for estimation. Possible solutions the authors intend to pursue next include rescaling the data, changing the reference group, and simplification of the empirical specification. Table 2 below presents the preliminary results of the empirical model.

Table 2: Truncated Negative Binomial Regression on Quantity of Agritourism Trips
864 Observations

Variable	Coefficient	Robust Standard Error
PP travel cost	-0.0029	0.0024
MD travel cost	-0.0210*	0.0110
Travel time	0.0035**	0.0015
Primary destination	0.0666	0.3134
Secondary destination	-0.2813	0.2840
Female	-0.1147	0.1635
Ln(income)	-0.3985***	0.1484
Age	0.0165**	0.0073
Mountain zone	-1.2697**	0.5662
Southwest zone	-0.8553	0.5610
Northern CA	-1.0393*	0.5698
Northwest	-1.1075*	0.6401
Greater Texas	-0.6013	0.5669
*PP travel cost * Mountain zone*	0.0016	0.0029
*PP travel cost * Southwest*	-0.0021	0.0029
*PP travel cost * Northern CA*	-0.0037	0.0033
*PP travel cost * Northwest*	-0.0026	0.0040
*PP travel cost * Greater Texas*	-0.0011	0.0030
*MD travel cost * Mountain zone*	0.0292	0.0185
*MD travel cost * Southwest*	0.0180*	0.0108
*MD travel cost * Northern CA*	0.0220*	0.0132
*MD travel cost * Northwest*	0.0281	0.0310
*MD travel cost * Greater Texas*	0.0056	0.0137
Direct Sales	0.1470	0.2359
Entertainment and Events	-0.3419*	0.2032
Education	0.2668	0.2143
*PP travel cost * Direct Sales*	0.0027*	0.0014
*PP travel cost * Entertainment and Events*	0.0051***	0.0013
*PP travel cost * Education*	0.0021	0.0015
*MD travel cost * Direct Sales*	0.0054	0.0072
*MD travel cost * Entertainment and Events*	0.0082	0.0072

*MD travel cost * Education*	-0.0059	0.0062
Constant	-16.3423***	1.1007
Wald Chi-Squared: 89.07 P-value: 0.0001 Pseudo R^2: 0.0340		
**** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level*		

Despite the noted challenges in the data, the model is significant at the one percent level using a Wald test and converges after six iterations using the Newton-Raphson algorithm. However, the constant is unsettlingly high perhaps alluding to the relative lack in variation in the dependent variable as stated above. In accordance with a priori expectations, both of the travel cost variables are negative, but only MD travel cost is significant at the ten percent level. The coefficient for age is positive and significant at the five percent level which is consistent with the findings of both Hill et al (2014) and Carpio et al. (2008). The natural log of income is negative which is consistent with Creel and Loomis's (1990) comment regarding negative income coefficients in TCM models, however it may also be an indication that agritourism is an inferior good. Gascoigne et al. (2008) find in a cluster analysis of Colorado agritourists that the two clusters with the greatest interest in agritourism were comprised of more low-middle income households, which may be a coincidence of preferences but could also be evidence that agritourism is an inferior good relative to other travel substitutes.

Relative to the combined Central and Northeast reference group the Mountain, Northern California, and Northwest zones had negative coefficients indicating an inward shift in the demand curve for Outdoor Recreation based agritourism in these regions. A possible explanation for this is that the average farm sizes in the Central and Northeast zone are much larger than the average farm sizes in the Mountain, Northern California, and Northwest zones (USDA, 2014) leading the reference group farms and ranches to be more likely to adopt types of agritourism more conducive to larger farm/ranch sizes in more remote locations like Outdoor Recreation. Additionally, the interaction terms between the Southwest and Northern California zones with MD travel cost are both positive and significant at the ten percent level implying a relatively flatter demand curve for multi-destination agritourism trips involving outdoor recreation in these two zones.

Entertainment and Events is negative and significant at the ten percent level indicating that a shift inward of the demand curve for this type of agritourism activity relative to outdoor recreation. However, the interaction term between PP travel cost and Entertainment and Events is positive and significant at the one percent level implying that the demand curve for primary purpose travelers for this type of recreation in this zone may be flatter and less price sensitive than Outdoor Recreation activities. The interaction term of PP travel to Direct Sales agritourism activities is also positive but only significant at the ten percent level.

Conclusions and Further Research

The motivations to adopt agritourism have been well studied in the literature, but only two papers Hill et al. (2014) and Carpio et al. (2008) explore the behavior of agritourists and consumer surpluses of agritourism. This paper expands on these papers as well as the greater travel cost literature by investigating the relationships of traveler behavior across multiple types of agritourism across a heterogeneous landscape while more completely accounting for multi-destination bias. Other than the contributions this paper makes to the literature, the results of this paper may be of relevance to local economic development practitioners and potentially policy makers interested in taking advantage of this growing industry to stimulate rural economic development, diversify farm and ranch businesses, and preserve rural lifestyles.

While the model is significant and several variables follow a priori expectations, the authors believe it could still benefit from refining the model specification. The next steps the authors intend to take are to improve the model specification, compare the model with aggregate travel costs to the model with both PP and MD travel costs, and to calculate consumer surpluses and elasticities for different regions and agritourism activities.

Appendix

Calculations of Travel Costs

Due to the desire to include a comprehensive set of agritourists, respondents were not thrown out of the sample if they did not travel by vehicle as was done in Carpio et al. (2008). Instead respondents were asked what mode of transportation they traveled by and travel cost calculations were calculated for each.

The cost for private vehicles (620 observations) and rental vehicles (123 observations) were both calculated from the gasoline costs (AAA, 2016), except rental vehicles also faced a flat rental fee depending on which state the respondent was traveling in.

Motorcycle (7 observations) travel costs were calculated the same way as private vehicles but using the average mpg for motorcycles instead.

Tour bus (27 observations) travel cost calculations came from collecting data from several tour bus companies in the west and calculating their per day costs. Drivers were assumed to drive an average of 6hrs/day (legal maximum is 10hrs/day), giving the per hour cost which was then multiplied by the travel time to get the travel cost. This calculated per hour travel cost was compared with some day trip tours that explicitly gave the number of hours of travel, and the two were comparable.

Train (9 observations) travel costs were calculated by observing Amtrak prices for 15 major train routes in the west varying in distance from 88.7 miles to 649 miles. Per mile travel costs were simple calculated using an average of these commuter and cross country train route fares/mile.

Plane (65 observations) travel costs were calculated by first observing where the respondent was from, and where their destination was. Consulting the 2014 Domestic Airline Fares Consumer Report then gave us the average fares of the major airports in those states which were averaged to come up with the average airfare of that respondent. Any multi-destination miles traveled were assumed to be by private vehicle.

Travel time for each respondent was multiplied by one third the wage rate as is standard in the literature which was assumed to be the midpoint of each categorical income range.

Figures

Figure 1: Choropleth Map of "Agritourism Scores" from Principal Component Analysis

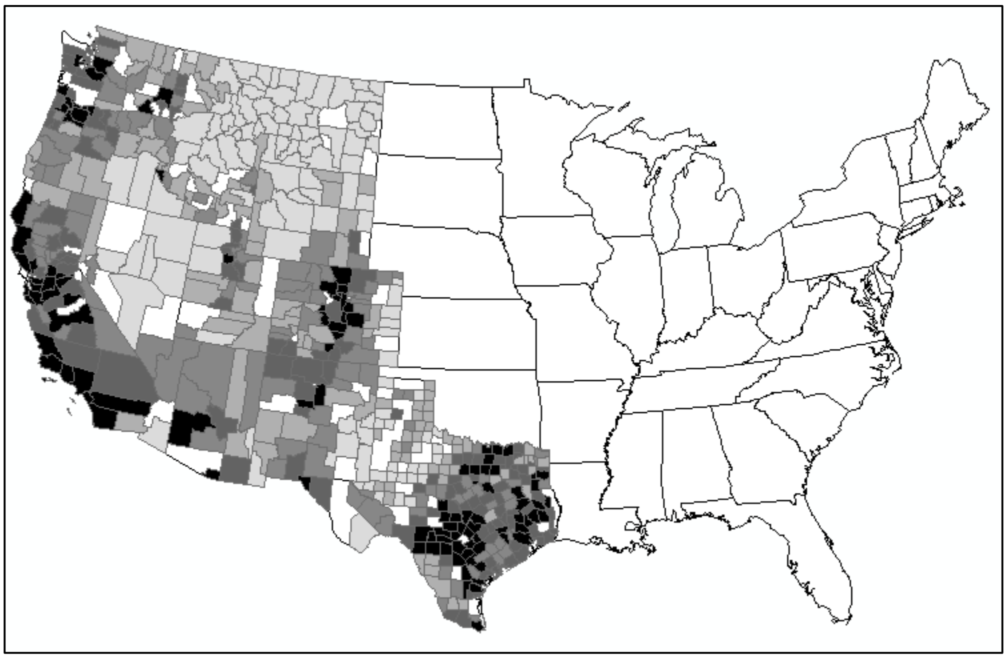
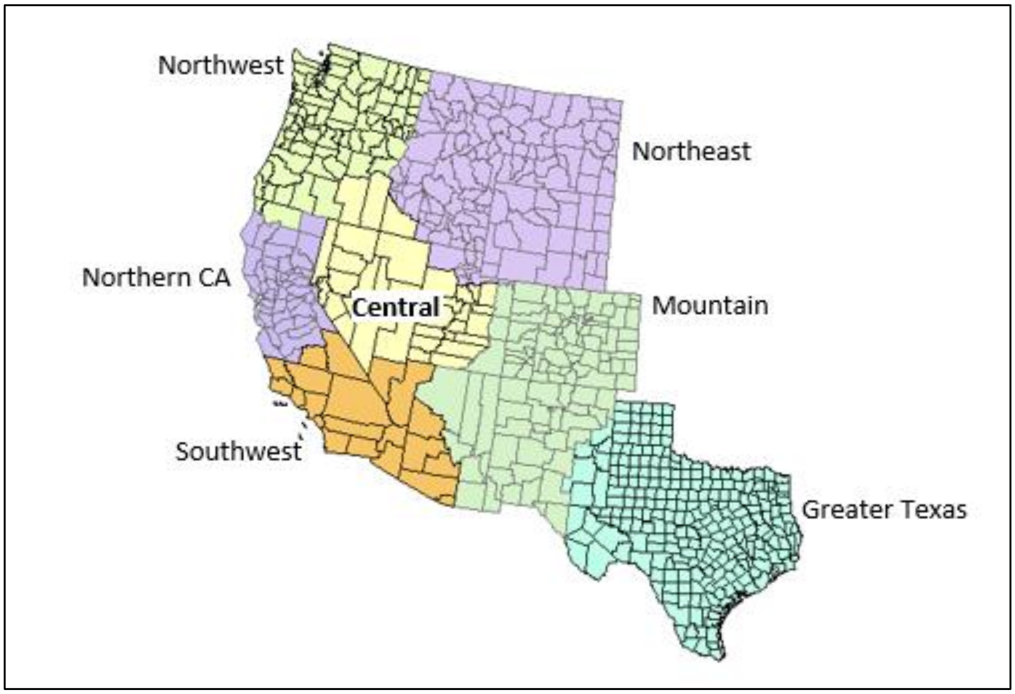


Figure 2: Agritourism Zones



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