UNDERSTANDING USER PREFERENCES AND VISITOR NUMBERS AT MINNESOTA WILDLIFE MANAGEMENT AREAS[1]

Kelsie LaSharr, Louis Cornicelli, and John Giudice

SUMMARY OF FINDINGS

The Wildlife Management Area (WMA) land classification was created as part of the Outdoor Recreation Act of 1975 (Minnesota Statutes MS 86A). They were established "to protect lands and waters that have a high potential for wildlife production, to develop and manage these lands and waters for the production of wildlife, public hunting, fishing and trapping, and other compatible outdoor recreational uses". The WMA system is administered by the Minnesota Department of Natural Resources (MNDNR), Section of Wildlife and is currently comprised of about 1,440 units totaling over 1.3 million acres. Given the breadth of the WMA system, DNR staff were interested in understanding how people use these lands, which activities they enjoy pursuing, and the number of individuals recreating during peak hunting seasons. WMAs are used most frequently during fall hunting seasons for both big and small game. To achieve our research goals, we 1) intercepted hunters in the field during the 2015-2016 fall hunting season, and 2) solicited respondents through small game license and pheasant stamp sales. This research summary provides background information, methods, and some preliminary study results.

INTRODUCTION

Wildlife management agencies are tasked through the public trust doctrine to protect, conserve, allocate, and control wildlife and their habitat for the benefit of the public (Jacobson et al. 2010). Managers must understand ecology and anthropogenic interests, and be willing to integrate both in order to achieve socially desirable benefits associated with wildlife (Forstchen and Smith 2014; Organ et al. 2014). One important public benefit is wildlife-based recreation opportunities, such as hunting, fishing, and viewing (Driver 1985). Spending time outdoors, through wildlife-related activities, has been shown to have many economic, environmental, and social benefits, as well as providing satisfaction on multiple levels for the individual participant. Specifically, being in nature has well-documented short-term and long-term effects on both the psychological and physiological aspects of human life (Wolf et al. 2014; Mayer et al. 2009, Haluza et al. 2014). While demand and interest in some recreational activities has reached all-time highs (e.g., birdwatching; Cordell 2008, Outdoor Foundation 2014), hunter numbers nationally are declining (U.S. Department of the Interior 2012, Vrtiska et al. 2013). Hunting has been shown to be an important beneficial activity sought by the public (Hammitt et al. 1990; Decker et al. 1980; Brown et al. 1977; Hendee 1974; Driver 1985), and it is important to understand which barriers, such as lack of access to land, may be pressuring hunters to drop-out of the activity.

Publicly accessible properties provide a crucial resource for protecting wildlife habitat and providing recreational opportunities. Hunting opportunities on publicly-owned state land are

[1] Several all-day "correction factor" shifts were conducted at a limited number of sites to determine the difference in visitation between morning and afternoons at single WMAs.

especially important in the east and Midwest United States, where the majority of lands are in private ownership. Publicly restricted hunting, such as opportunities on private lands, continues to decline as these properties are parceled, sold, and otherwise fragmented (Larson et al. 2014). Land that is owned in a checkerboard pattern also becomes problematic for hunters when barriers to quality habitat are formed by unpassable private property. As such, it is important to maintain public land for hunters to use, especially when private land is otherwise not available. Wildlife management agencies can ensure the public obtains benefits from publicly managed, wildlife-producing lands by better understanding desired outcomes and motivations of hunters (Schroeder et al. 2006, Hayslette et al. 2001; Decker et al. 1980; Hammit et al. 1990). In turn, these agencies can help ensure hunters are recruited, retained, and reactivated for generations to come (Larson et al. 2014).

OBJECTIVES

The overall goal of this research was to improve the understanding of visitor use at MNDNR WMAs. Specifically, our objectives were to:

1. Characterize WMA users through an increased understanding of beliefs, values, and satisfactions they associate with using WMAs.
2. Determine participation levels by estimating visitor usage during fall hunting seasons (September through December).

METHODS

Study Area and WMA Selection

Our study area covered 43 counties located in the prairie pothole region of western Minnesota and contained 1,061 WMAs. We divided the study area into 2 regions (northwest and southwest) based on the abundance of WMAs found in these areas (Figure 1). The northwest study area is best characterized by larger counties, and fewer but larger WMAs. Conversely, the southwest study area has smaller counties and more, albeit smaller WMAs (Table 1). Using ArcMap 10.2, we created a sampling grid for each region, with grid size being a function of average county size within each region (Figure 1). Within each of the 21 grid blocks we randomly selected 1 WMA and the 9 nearest neighbors to create a cluster of WMAs for sampling visitor usage. Cluster size was modified in some cases because of access issues and to ensure equal sampling effort. The final sample consisted of 228 WMAs organized into 21 driving routes (clusters of WMAs).

Field Observations

To estimate visitor use, we used methods adopted from Fulton and Anderson (2003), modified from techniques recommended by Gregoire and Buyoff (1999) and Watson et al. (2000). Sampling occurred on weekend days (Saturday and Sunday) over an 11-week period from September 26, 2015 (waterfowl opener) to December 6, 2015. Observers drove a specified route over a set time period of four hours, with each sample WMA being surveyed once per weekend day. This resulted in a point-in-time sample of observed WMA user groups. We also surveyed a subset of WMAs intensively (repeated visits from sunrise to sunset) to estimate probability of intercept, which we defined as the average proportion of total user groups per site-day that we intercept at a random point in time. We then used the probability of intercept to convert observed counts (point-in-time) to expected total user groups per site-day.

Visual observations of vehicles (parties) at each WMA were recorded using unique identifying information (license plate numbers), and in addition, field surveyors left intercept letters on all intercepted vehicles. The letters briefly explained the project, a future mail survey, and invited WMA visitors to record their party information (ages of visitors, time spent at individual sites,

date), as well as contact information for that future survey work. Accompanying the intercept letters were self-addressed stamped envelopes for visitors to return their invitations to the researchers. Returned intercept letters were used to create a database of WMA visitors who were later sent surveys in spring 2016.

Because sample WMAs were organized into driving routes, efforts were taken to ensure the same WMAs were not sampled at the same time of day each week. Technicians alternated driving routes forwards and backwards from week to week, as well as the order that assigned routes were visited each weekend. This ensured the same WMAs were not repeatedly observed early in the morning or later in the afternoon when traffic was likely to be reduced. A survey protocol was developed to record vehicle counts and license plate information in order to count unique visitors. Each technician (n = 18) surveyed 2 routes per weekend (1 route per day) for a minimum of 4 hours per route.

Visitor Estimate Analyses

For each of the 1,061 WMAs within our study area, we determined a series of site attributes using GIS data layers obtained from MN Geospatial Commons, with data processing accomplished using ArcGIS 10.3. We obtained information on WMA name, county locality, area, nearest town, species present (including deer, small game, forest upland birds, sharptailed grouse, pheasants, waterfowl, turkey, and doves), managed parking areas, dominant cover types, perimeter length, and easting/northing vectors. We also determined how far each WMA was from various points of interest via Euclidian distance: US Fish and Wildlife Service Wildlife Production Areas (WPAs), other WMAs, major roads, and towns of various densities.

We used a linear mixed-effects to explore the relationship between average car counts/WMA/day and WMA attributes, with the goal of predicting expected mean user groups per weekend day for all WMAs in our sampling frame.

Mail Surveys

Data were collected using mail-back surveys following a process adapted by Dillman (2008) to increase response rates. Respondents were sent questionnaire-booklets with personalized cover letters, and included a business-reply envelope to return their responses. Potential respondents were sent multiple contacts 4 times between March 2016 and July 2016. The cover letter explained the purpose of the study and requested respondents to complete and return the survey. The back of the personalized cover letter contained a map of all of the counties in Minnesota, to help respondents address questions in regards to where they specifically hunted during the 2015-2016 hunting season. About 5 weeks after the first mailing, a second mailing (identical to the first) was sent to individuals with valid addresses who had not yet returned their survey-booklets. A third mailing was sent approximately 4 weeks after the first mailing, containing identical information as a final attempt to elicit responses from those who had not participated in the study yet. Any surveys returned after July 1st were not included in the results. Surveys were collected and double-entered into an Excel template. At the end of July 2016, a shortened 1 page, two-sided survey and a business reply envelope was sent to individuals who had not responded by July 1st to identify any non-response bias within the sample. Any respondents who returned their non-response surveys after August 31st were not included in the results.

Data were double-entered into Excel 2010 and comparisons between databases were completed in Excel to look for discrepancies. Further data cleaning and manipulation was completed in Program R (version 3.2.5). Statistical analyses and tables were completed in Program R. Mail survey responses were analyzed in the aggregate. Analysis of the mail survey

focused on descriptive statistics, including reporting frequencies, average responses, chi-square test statistics, and F-statistics from an analysis of variance, when appropriate.

RESULTS

Field Observations

Technicians stopped 2,493 times over the field season, where they observed 2,093 vehicles at our selected WMAs. This resulted in an average 0.83 cars seen at each stop (averaged over all sites throughout the entire field season). The average size of an observed WMA was 274.9 acres, which is comparable to the average size for all WMAs in our study area, 278.8 acres. Returned intercept letters from hunters indicated that the average party size for each car was 1.9 people, and they stayed for 3.9 hours, on average. We utilized wildlife managers' experience and knowledge about WMA users to investigate potential trends in visitor use based on site attributes. Our best-supported predictive model for mean user groups/day included positively correlated fixed effects for the presence of pheasants, distance to a major road, and WMA size.

Analysis is on-going; final results will be presented in a future report.

Mail Surveys

We distributed 2,046 invitations during our field season and 405 were returned (20% invitation return rate), which yielded 443 individuals who provided information to receive a WMA visitor survey. Given the small sample population (n = 443), we opted to recruit additional respondents into the study using individuals who purchased both a small game license and pheasant stamp. We randomly selected 5,000 people from the MNDNR ELS database and sent them an invitation letter that explained the study, asked if they hunted WMAs, and if they would they be willing to participate in the WMA user study. Each mailed intercept letter included a postcard that could be returned with an affirmation they had hunted a WMA during the past hunting season and were willing to participate. In total, 88 were undeliverable and 932 were returned, which brought our effective sample population to 1,375.

Of the 1,375 full-length surveys that were sent out, 11 were undeliverable and 1 requested not to participate due to his guardian's concerns for his status as a minor. This resulted in 1,363 viable surveys, of which 593 were returned during the first wave, 267 were returned after the second wave of mailing, and 95 were returned after the third and final wave of mailing (Cut-off date was July 1st, 2016). This resulted in 949 surveys returned, a 70% return rate. This can be further broken down by respondent type. For respondents who were contacted in the field, 288 out of 443 respondents completed the original survey (65%). For respondents who were contacted with a mailed letter due to their status as a pheasant stamp and small game license holder, 661 out of 932 completed the original survey (71%). Non-response surveys were sent to 418 respondents, of which 4 were undeliverable. Of the 414 viable surveys, 141 were returned on or before August 31st, a 34% return rate (Table 2).

Only 2 demographic questions demonstrated a statistical difference between the field-intercepted and the postcard-recruited respondents, and these were Education ($p = 0.045$) and Income ($p = 0.011$) (Table 3). Satisfaction and participation in regards to individual species/seasons was similar between the 2 groups. Overall, 58% of field-intercepted respondents indicated they hunted pheasants, as compared to 70% of postcard-recruited respondents. This outcome was expected given we recruited individuals who purchased a small game license and a pheasant stamp; however, it is unlikely this difference influenced overall survey results. Results of the shortened non-response survey indicate that respondents who did not respond to the original mailing followed similar trends in terms of hunting on a WMA during the 2015-2016 hunting season.

The average user in this study was a 51 year old, white male. We found respondents had the highest interest in pheasant hunting (80%), followed by duck hunting (37%) and firearm deer hunting (31%). Over half of respondents (55%) recorded being moderately to extremely satisfied with their WMA overall experiences and 64% were “Extremely Likely” to return to a WMA. However, 63% of WMA hunters did not use WMAs for any activity outside the hunting season. Strikingly, 38% of users indicated that they use Private Land “None” of the time, demonstrating the importance of having public land available for hunting use in Minnesota.

We found a majority of respondents agreed that the number of WMAs should be increased (86%). More than half of the respondents agreed WMAs provide high quality hunting experiences (63%); however, they feel that WMAs are too crowded (62%) and there are not enough WMAs located near them (61%). We found the biggest constraints to hunting WMAs fell into the following categories: 1) Not enough game, 2) Lack of time, and 3) Family/relationship responsibilities. Two sources of information were found to be “Moderately to Extremely Important” for more than half of respondents 1) spotting WMA signs in the field (60%) and using WMA boundary maps (58%). Finally, about half of respondents indicated that they never use lead shot on WMA properties.

ACKNOWLEDGMENTS

We thank the Minnesota Cooperative Fish and Wildlife Research Unit, MNDNR, and the Wildlife Restoration (Pittman-Robertson) Program for providing funding for this project. We thank D. Fulton for his guidance, advice, feedback, and comments on this master’s project. We thank MNDNR area staff and wildlife managers for their feedback on presentations of this work, and especially thank N. Mullendore, R. Hier, C. Vacek, and B. Welsh for assisting with survey development. Thanks go to E. Walberg for initial GIS work and we thank H. Saloka for her administrative efforts in hiring technicians. Finally, we thank A. Grams, H. Morris, S. Guida, J. Colbaugh, E. Erickson, M. Ocasio, R. Schlesiger, J. Anderson, B. Burke, C. Shladweiler, K. Cevallos, R. Eller, Z. Dickhausen, M. Esterl, M. Diamond, M. Rodriguez, K. Rich, S. Kline, Q. Huber-Heidorn, and T. Klinker for their effort with field work, data collection, and data entry.

LITERATURE CITED

Brown, P., Hautaluoma, J., & McPhail, S. (1977). Colorado Deer Hunting Experiences. Forest Management Faculty Publications. Paper 44.

Cordell, H.K. (2008). The Latest on Trends in Nature-Based Outdoor Recreation. Forest History Today: 4-11.

Decker. D.J., Brown, T., & Gutierrez, R. (1980). Further Insights into the Multiple-Satisfactions Approach for Hunter Management. Wildlife Society Bulletin. 8(4): 323-331.

Dillman, D.A. (2008). Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method. New York: John Wiley & Sons, Inc

Driver, B.L. (1985). Specifying What is Produced by Management of Wildlife by Public Agencies. Leisure Sciences, 7(3): 281-295.

Forstchen, A.B., & Smith, C.A. (2014). The Essential Role of Human Dimensions and Stakeholder Participation in States’ Fulfillment of Public Trust Responsibilities. Human Dimensions of Wildlife. 19(5): 417-426

Fulton, D., and D.H. Anderson (2003). Estimating Visitor Use Levels at Waterfowl Productions Areas in Minnesota. Minnesota Cooperative Fish and Wildlife Research Unit, Department of Fisheries, Wildlife, and Conservation Biology. University of Minnesota, St. Paul, MN 55108

Gregoire, T.G. and Buhyoff, G.J. 1999. Sampling and estimating recreational use. USDA Forest Service, Pacific Northwest Research Station. General Technical Report PNW-GTR-456.

Haluza, D., Schönbauer, R., & Cervinka, R. (2014). Green Perspectives for Public Health: A Narrative Review on the Physiological Effects of Experiencing Outdoor Nature. International Journal of Environmental Research and Public Health. 11: 5445-5461.

Hammitt, W., McDonald, C., & Patterson, M. (1990). Determinants of Multiples Satisfaction for Deer Hunting. Wildlife Society Bulletin 18(3): 331-337.

Hayslette, S.E., Armstrong, J.B., & Mirarchi R.E. (2001). Mourning Dove Hunting in Alabama: Motivations, Satisfactions, and Sociocultural Influences, Human Dimensions of Wildlife, 6:2, 81-95.

Hendee, J.C. (1974). A Multiple-Satisfaction Approach to Game Management. Wildlife Society Bulletin. 2(3): 104-113.

Jacobson, C., Organ, J., Decker, D., Batcheller G., & Carpenter L. (2010). A Conservation Institution for the 21st Century: Implications for State Wildlife Agencies. Journal of Wildlife Management. 74(2): 203-209.

Larson L.R., Stedman R.C., Decker D.J., Siemer W.F., & Baumer M.S. (2014). Exploring the Social Habitat for Hunting: Toward a Comprehensive Framework for Understanding Hunter Recruitment and Retention. Human Dimensions of Wildlife. 19(2): 105-122.

Mayer, F.S., Frantz, C.M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is Nature Beneficial? The Role of Connectedness to Nature. Environment and Behavior. 41(5): 607-643.

Organ, J.F., Daniel, D., Stevens, S., Lama, T., & Doyle-Capitman, C. (2014). Public Trust Principles and Trust Administration Functions in the North American Model of Wildlife Conservation: Contributions of Human Dimensions Research. Human Dimensions of Wildlife 19(5): 407-416

Outdoor Foundation. (2014). Outdoor Participation Report 2014. Washington D.C: The Outdoor Foundation.

Schroeder, S.A., Fulton, D.C., & Lawrence, J.S. (2006). Managing for Preferred Hunting Experiences: A Typology of Minnesota Waterfowl Hunters. Wildlife Society Bulletin. 34(2): 380-387.

U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. (2012), 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Vrtiska, M.P., Gammonley, J.H., Naylor, L.W., & Raedeke A.H. (2013). Economic and Conservation Ramifications from the decline of waterfowl hunters. Wildlife Society Bulletin. 37: 380-388

Watson, A.E., Cole, D.N., Turner, D.L., and Reynolds, P.S. 2000. Wilderness recreation use estimation: A handbook of methods and systems. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-GTR-56.

Wolf, I.D., Sticker, H.K., & Hagenloh, G. (2014). Outcome-focused national park experience management: transforming participants, promoting social well-being, and fostering place attachment. Journal of Sustainable Tourism. 23(3): 358-381.

Table 1. Study Area Differences from a survey of wildlife management area users in Minnesota, 2015-2016.

	Northwest region	Southwest region
Number of counties	14	29
Total Area (mi^2)	13,836	19,931
Average county size (mi^2)	988	687
Total WMAs per region	315	809
Average WMA size (mi^2)	0.58	0.33
Proportion of WMAs with RNPH[1]	0.345	0.929

[1]Ring-necked Pheasants

Table 2. Survey Response Rates from a survey of wildlife management area users in Minnesota, 2015-2016.

Sample type	Surveys administered (n)	Surveys returned (n)	Survey response rate (%)	Non-response surveys administered (n)	Non-response surveys returned (n)	Non-response rate (%)
Field intercept	443	288	65%	149	69	46%
Postcard	932	661	71%	269	72	27%
Total	1,375	949	70%	418	141	34%

Table 3. Demographic differences between sample populations of wildlife management area users in Minnesota, 2015-2016.

Demographic variable	Field-intercept mean	Postcard-recruited mean	p-value
Average age	51.5 years	50.5 years	0.289
Age at first hunt	13.7 years	14.4 years	0.500
Income[1]	$72,654	$82,228	0.011
Miles driven	98.3 miles	101.0 miles	0.710
Male	96%	97%	0.336
Took a dependent	45%	46%	0.874
Took a spouse/partner	18%	18%	0.860
Proportion of pheasant hunters	58%	70%	<.001
Percent duck hunters	37%	29%	0.012
Percent firearm deer hunters	38%	22%	<.001
Percent archery deer hunters	15%	11%	0.09
Percent muzzleloader deer hunters	12%	7%	0.016
Education	5.7 (out of 10)	6.1 (out of 10)	0.006

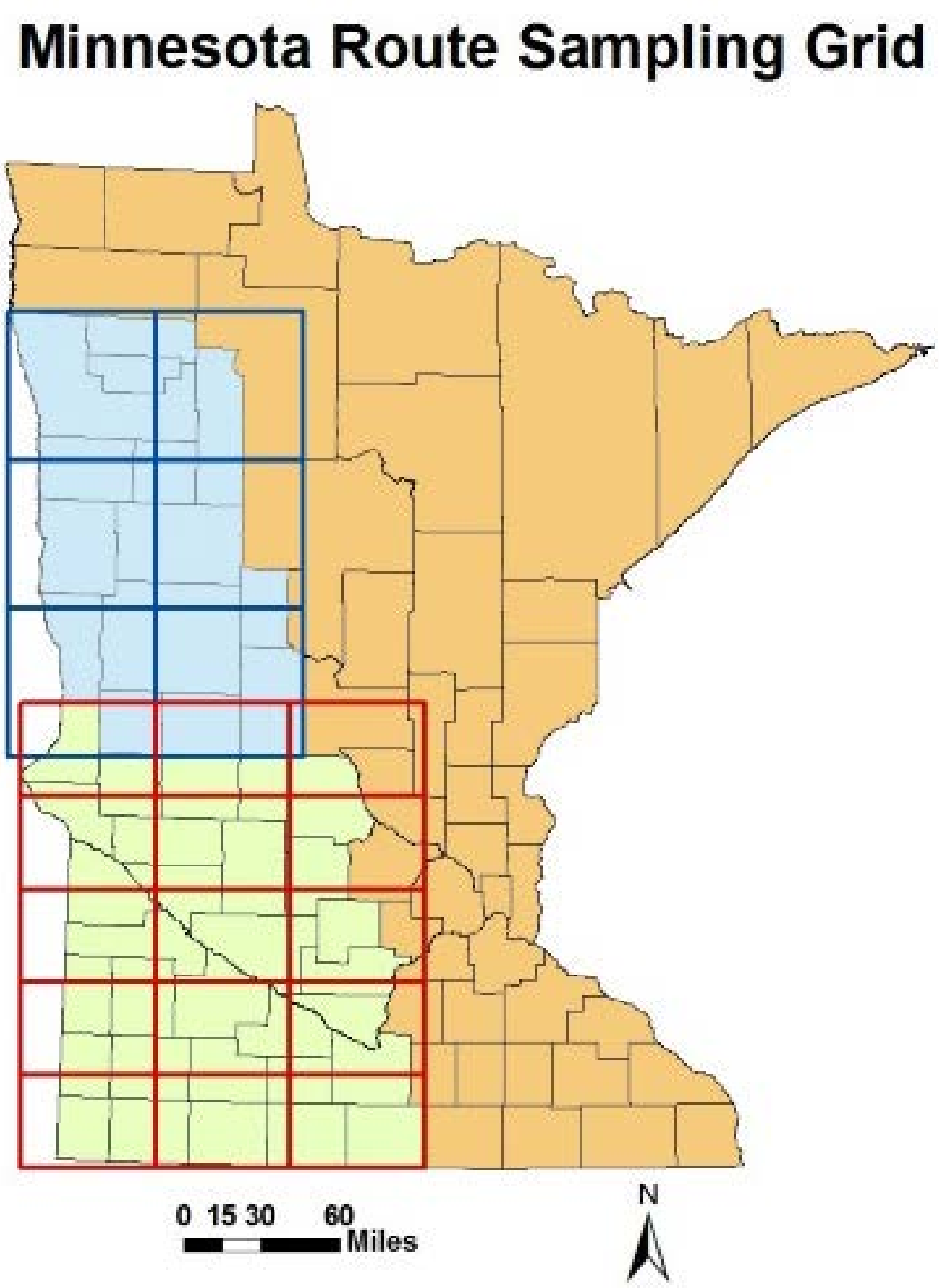

Figure 1. Overlay of northwest and southwest grid blocks on corresponding Minnesota counties, 2015-2016. Note the larger counties in the northwest were sampled with larger, fewer grids, while the smaller counties in the southwest were sampled using a higher number of smaller grids.