A study of residents surrounding the Kaskaskia River: Understanding preferences for landscape change

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1. Executive Summary

1.1. Project Overview

Maintaining resilient and sustainable agricultural watersheds depends on the integration of knowledge from multiple disciplines to inform decisions made about agricultural practices and natural resources in the Kaskaskia River Watershed. With about 82% of the watershed devoted to farming, and of this portion, 63% covered with crop agriculture, farming and rural communities play significant roles in the sustainability of the Kaskaskia agro-ecosystem. To enable decision-makers to adopt more sustainable practices and build the capacity of communities in the Kaskaskia River watershed to cope with changes to social-ecological systems, this project brought together an interdisciplinary group of researchers from agricultural engineering, fisheries management, conservation psychology, and community planning. Our collective research was designed to support evidence-based decisions being made about the Kaskaskia River Watershed by developing a framework to integrate hydrologic, ecosystem, and socio-cultural models that show the effects of changes brought about by environmental and social stressors on agro-ecosystems. The scope of this technical report is limited to the social science findings associated with the people and communities of the Kaskaskia watershed.

We engaged residents and stakeholders in discussions about perceptions and preferences for landscape change, and their connections to various places within the Kaskaskia River watershed with an eye toward representing the public interests of residents and stakeholders. The social science team applied a mixture of methods that complemented one another in overlapping phases of research and are disseminated in this report. Each of these phases was integrated and conducted in collaboration with our interdisciplinary research team to develop a unified central theme of **understanding landscape change through place-based research involving public engagement and human behavior**. Specifically, we embarked on three phases of research. First, we engaged stakeholders to build relationships and develop an in-depth understanding of forces that influenced landscape change in the region, as well as shaped the perceived meanings of places and understanding of how the community was adapting to change. Second, we sought to understand the benefits and threats of the Kaskaskia River watershed through a sequential assessment of expert stakeholder beliefs and a participatory mapping exercise that spatially located these belief systems. Thirdly, we examined residents' preferences for future growth of the region, their perspectives and experiences in the region, and their pro-environmental behaviors which contribute to the sustainability of the region. Ultimately in this final phase we sought to understand how residents' experiences and sense of place within the Kaskaskia River Watershed shape behavioral intentions to reduce or mitigate negative impacts on environmental quality of the region.

1.2. Key Results

1.2.1. Landscape change and the meanings of places

- We initiated this research by interviewing farmers and other residents from Fall of 2017 - Summer of 2020 to understand perceptions of landscape change, farmers' land use practices, and relationships among landscape change and farming practices.
- Decisions made about farming and land use practices were influenced by a desire to maintain family legacy and ensure that family farms could be passed down to future generations. However, pressure from agricultural intensification, changes in rural populations, and resistance to change threatened these commitments and, at times, discouraged adoption of sustainable practices.
- Farmers prioritized efficiency in their adoption of land management practices, as illustrated by their interest in new farming technologies and maximizing profits while reducing costs. However, changes in markets, technology, and climate influenced decisions to enhance efficiency and led to more complicated thinking about short- and long-term innovations.
- An appreciative dialogue centered on the unique qualities of places and residents' way of life in the region was shared.

1.2.2. Benefits and threats in the Kaskaskia River watershed

- We convened an expert panel of stakeholders in 2018 (n = 24) to participate in a four-wave iterative survey that quantified the importance of benefits, threats, and land use practices within the region.
- Findings of this research suggested the Kaskaskia Watershed provided a multitude of services to local communities, including crop production, opportunities and access for recreation, wildlife habitat, water supply, and values associated with farming lifestyle and rural heritage.
- Multiple threats posed a perceived risk to the ability of the Kaskaskia Watershed to sustain benefit provision, especially erosion, run-off, siltation, and habitat fragmentation.
- Mitigation of agricultural intensification such as adopting reduced tillage practices, use of cover crops, and installation of grass waterways was perceived as the most important land use practices across agricultural landscapes, lakes, rivers, and forests in the watershed
- Results from participatory mapping exercises conducted across the four reaches of the watershed in 2019 spatially located the distribution of benefits and threats throughout the watershed.
- Key perceived benefits were recreation, erosion protection, and crop production, whereas erosion, sedimentation, and increased flooding were the central threats mapped by respondents.
- Threats were more spatially dispersed but clustering occurred throughout.
- Both benefits and threats overlapped and were clustered around the main stem of the Kaskaskia River whereas threats originated elsewhere

- Highest density of benefits and threats occurred around Lake Shelbyville, Carlyle Lake, and around the lowest reach of the Kaskaskia River Watershed.

1.2.3. Preferences for landscape change and factors that shape human behavior

- The final stage of our research involved a regional survey to understand resident's preferences for landscape change in the region. Specifically, we examined residents' preferences for future landscape conditions, their experiences with nature and connections to the region, and their intention to engage in pro-environmental behaviors.
- Respondents stated their preferences for the future by evaluating hypothetical changes to the landscape. They were most likely to select a desired future with more acres farmed using sustainable agriculture practices, more fish variety, and higher water quality. Fewer costs and less distance to recreation areas were also important drivers of respondents' choices.
- Preferences for future landscape changes did not differ between respondents based on their knowledge, experiences, or other sociodemographic such as age or gender.
- Respondents were willing to pay the most for improvements in fish variety and acres farmed using sustainable agriculture practices.
- Respondents "occasionally" to "frequently" intended to engage in behaviors that would benefit the environment in the next 12 months.
- Respondents indicated they had participated in outdoor recreation activities such as watching wildlife and hiking more often than activities such as hunting and fishing in 2019.
- Moderate to low levels of agreement with statements about connections to nature were reported.
- The reasons why the watershed was considered important were variable and included outdoor living, agricultural pride, farming lifestyles, small-town feelings, family legacy, and nature conservation.
- Respondents' connections to nature, frequency of childhood and adolescence experience with environmental education and media, and participation in outdoor recreation in 2019 explained intentions to engage in behavior. In contrast, attachment to places and meanings associated with those places were less strongly associated with intentions to engage in pro-environmental behavior.
- Differences in behavioral intentions also differed among respondents based on their self-reported knowledge of natural resource challenges in the region, but intentions did not differ between respondents based on other sociodemographic information such as age, gender, or based on residence in an urban or rural area.

1.3. Research team & cknowledgements

This research was supported by a University of Illinois, College of Agricultural, Consumer and Environmental Sciences, Future Interdisciplinary Research Explorations seed grant [number ILLU-741-380], a USDA-NIFA grant [number 2018-68002-27918], a USDA-NIFA Hatch project [accession number 1012211], and two National Great Rivers Research & Education Center grant [number NGRREC-IP2018-19 and NGRREC-IP2019-01]. Thanks are extended to Drs. Maria Chu, Cory Suski, and Jeff Stein for their contributions to our larger project. Dana Johnson, Kimmy Chuang, Mandira Panta, David Nguyen, Ava Traverso, and Jikai Wang also provided assistance with data collection. We also express gratitude to the members of the Kaskaskia Watershed Association for their partnership and support of this research.

Cite this report as:

Shipley, N., Shin, S., Sharma, S., Leitschuh, B., Ware, H., Stewart, W., & van Riper, C.J. (2022). *A study of residents surrounding the Kaskaskia River: Understanding preferences for landscape change*. Report prepared for the Kaskaskia River Watershed Association.

This report is available electronically at: **http://dx.doi.org/10.5281/zenodo.5851726**

Table of Contents

1. *Executive Summary* i
2. *Historical Background of Change and Development in the Kaskaskia River Watershed* 1
   - 2.1. Historical Background 1
   - 2.2. Land Use and Agriculture in the Kaskaskia Watershed 1
   - 2.3. Landscape Change and Development in the Kaskaskia Watershed 2
3. *Landscape Change and Meanings of Places* 6
   - 3.1. Overview and Data Collection 6
   - 3.2. Findings 6
4. *Benefits and Threats in the Kaskaskia River Watershed* 9
   - 4.1. Assembling a Panel of Experts 9
   - 4.2. Understanding Expert Opinion 9
   - 4.3. Extending Knowledge of Benefits and Threats 14
   - 4.4. Key Results 14
5. *Preferences for Landscape Change and Factors that Shape Human Behavior* 17
   - 5.1. Overview and Data Collection 17
   - 5.2. Demographics 17
   - 5.3. Choice Experiment and Preferences for Landscape Change 18
   - 5.4. Knowledge, Adoption of Sustainable Practices, and Intentions to Engage in Pro-environmental Behavior 23
   - 5.5. Experiences in Nature and Connection to Places 27
   - 5.6. Relationships among Experiences in Nature, Connections to Places, and Pro-environmental Behavior 35
6. *Concluding Remarks* 38
7. *Literature Cited* 40
8. *Appendix* 42
   - 8.1. Appendix A: Questions Used during Interviews in the First Phase of Research 42
   - 8.2. Appendix B: Measurement Instrument used during Second Phase of Research 44
   - 8.3. Appendix C: Residential Survey used during Third Phase of Research and Summary of Response Frequencies 47

List of Tables

Table 5.2.1. Socio-demographic characteristics of respondents 18
Table 5.3.1. Marginal willingness-to-pay for changes to each study attribute 21
Table 5.4.1. Number of years respondents have been adopting sustainable practices within their line of work 23
Table 5.4.2. Respondents self-reported knowledge about sustainable agriculture 24
Table 5.4.3. Respondents self-reported knowledge about water quality 25
Table 5.4.4. Respondents self-reported knowledge about fisheries 25
Table 5.4.5. Respondents self-reported knowledge about recreation 26
Table 5.4.6. Reported intentions to engage in pro-environmental behavior in the next 12 months 27
Table 5.5.1. Recreation participation frequency of residents in 2019 28
Table 5.5.2. Reported early-life nature experiences: Childhood 30
Table 5.5.3. Reported early-life nature experiences: Adolescence 30
Table 5.5.4. Mean response and standard deviations for nature relatedness scale 31
Table 5.5.5. Mean response and standard deviations for place meanings scale 33
Table 5.5.6. Mean response and standard deviations for place attachment scale 34
Table 5.6.1. Correlations between experiences in nature and pro-environmental behavior 35
Table 5.6.2. Correlations between place attachment and meanings with pro-environmental behavior 36
Table 5.6.3. Correlations between knowledge with pro-environmental behavior 37

List of Figures

Figure 2.3.1. Construction of the Carlyle Dam, 1967 2
Figure 2.3.2. Median household income overtime 3
Figure 2.3.3. Employment overtime between rural and metro counties within the Kaskaskia 3
Figure 2.3.4. Number of farms and average farm size in Illinois over time 4
Figure 2.3.5. Acres of corn and soybeans farmed in Illinois over time 5
Figure 2.3.6. Harvesting hybrid corn in Illinois, 1939 5
Figure 2.3.7. Combine harvesting corn in Illinois, 2019 5
Figure 4.2.1. Mean values and standard errors for the perceived importance of benefits in the Kaskaskia River Watershed 10
Figure 4.2.2. Mean values and standard errors for the perceived significance posed by threats in the Kaskaskia River Watershed 12
Figure 4.2.3. Mean values and standard errors for the perceived effectiveness of land use practices in the Kaskaskia River Watershed 13
Figure 4.4.1. Average value points assigned across (A) 18 benefits and (B) 14 threats to the Kaskaskia River Watershed 15
Figure 4.4.2. Digitized spatial distribution of benefits and threats across the Kaskaskia River Watershed 15
Figure 4.4.3. Densities of mapped benefits and threats 16
Figure 5.2.1. Bar graph showing percentage of respondents in each employment sector *17*
Figure 5.3.1. Five features represented in choice experiment with descriptions of feature levels 19
Figure 5.3.2. Example paired comparison that was used in the residential survey 20
Figure 5.3.3. Probability that a respondent would choose an alternative future scenario over no change 22
Figure 5.4.1. Bar graph showing respondents reported number of years adopting sustainable practices plotted against total number of respondents 24
Figure 5.4.2. Bar graph showing the four resource management challenges in the Kaskaskia River Watershed alongside corresponding knowledge 26
Figure 5.5.1. Recreation participation of Kaskaskia residents in 2019 29
Figure 5.5.2. Early-life nature experiences 31

2. Historical Background of Change and Development in the Kaskaskia River Watershed

2.1. Historical Background

The Kaskaskia River is the second largest river in the state of Illinois and stretches over 292 miles in length (IDNR, 2021). The river originates in Champaign County and converges into the Mississippi river. The Kaskaskia River Watershed is the region that feeds into the Kaskaskia River and covers roughly 10% (3,677,785 acres or 5,746 square miles) of the land surface area of Illinois, spanning across 22 out of the total 102 counties in the state (RC&D Inc., 2002). This region was shaped by geological and human impacts. The geological forces that shaped the region include the Wisconsian glacial era (about 20,000 years ago) which affected the upper region of the watershed, and the Illinoisian glacial era (about 100,000 years prior) which defined the flat topography on the lower portion in the watershed (RC&D Inc., 2002).

Up until the 18th century, the Kaskaskia watershed was the territory of the indigenous Illinois peoples who made their livelihoods within a rich diversity of flora and fauna found in integrated ecosystems such as forests, grassland, prairie, and wetlands (Shackelford, 2008). The early European settlers from England, France and Germany starting from 1800's were predominantly farmers who built their houses along riverbanks and used the Kaskaskia River as their primary mode of transportation. Later, settlers expanded into the prairies, grasslands, and forested areas and drastically modified those lands into farming. In doing so, they cut down the forests to be used as building materials, plowed the prairies, and drained the swamps and wetlands (RC&D Inc., 2002). The years and decades that followed were mostly dominated by building infrastructure such as road networks, railroads, connecting small cities and towns surrounding Kaskaskia alongside construction of flood-control structures such as dams, reservoirs, and a navigation channel, leading to significant changes in the hydrology and structure of the river, as it is today.

2.2. Land Use and Agriculture in the Kaskaskia Watershed

In the Kaskaskia watershed, about 82% of land is devoted to agricultural use which is slightly higher than the whole state of Illinois (78%). Out of the remaining land, about 19% is covered by grassland, less than 1% is wetland, and about 11 acres of native prairie remains at present, which is a small fraction of what once originally existed (KWA Inc., 2017). Of the farmland, about 63% is cropland, mostly corn and soybean including some wheat, sorghum, and oats. The rest of the agricultural land is devoted to livestock production that includes dairy, swine, poultry, beef cattle, and other specialty crops including fruits and vegetables. Most farmers are above 50 years old, and own family farms passed on to them from earlier generations. Roughly half of the farmers are also engaged in off-farm jobs, relegating farming as their secondary occupation (IDA, 2021). Most farmland soils are tilled using conventional farming methods, typical of industrial agricultural practice, so agricultural runoff causes

significant loss of topsoil and nutrients (especially nitrogen and phosphorus) contributing to downstream pollution and sedimentation (Sloan, Corcoran & Murtaugh, 2018).

2.3. Landscape Change and Development in the Kaskaskia Watershed

Over the last 70 years the Kaskaskia River watershed has experienced many changes in the physical landscape. In the 1960s, two major dams and accompanying reservoirs were built along the Kaskaskia River at Carlyle and Shelbyville, resulting in major alterations to the hydrologic system. While primarily built for flood control, the reservoirs now provide additional community benefits such as municipal drinking water and recreational opportunities. Additionally, wetlands, while experiencing dramatic declines up until the 1970s, have increased in acreage since the 1980s. However, a 2010 study noted that although wetlands have seen increases in most counties in the state, most of the gains have come in the form of wetlands classified as open water, which includes retention ponds and other areas with low ecological value (Ducks Unlimited, 2010). The forested areas of Illinois have followed a similar pattern as wetlands, experiencing dramatic losses starting with European settlement followed by an increase in acreage in the last 50 years. However, data presented in the State of Illinois Forest Action Plan (2018) showed that most of the state's forests are heavily fragmented, degraded by invasive species, and transitioning from the formerly predominant oak and hickory forest type to one dominated by maples. The loss of oak dominated woodlands and savannas has have major impacts on the diversity of wildlife and understory vegetation as many species rely on oak forests for food and shelter as well as the light provided by a relatively open canopy (McShea et al., 2007; Hanberry & Nowacki, 2016).

Figure 2.3.1. Construction of the Carlyle Dam, 1967

Although Champaign County and those surrounding St. Louis have experienced gradual and consistent annual population growth, most communities of the watershed have seen little population growth since 1950. As reflected in the U.S. Census interim reporting, 20 out of the 22 counties that comprise the watershed are projected to have lost population since 2010. The average median

household income of the watershed counties continues to fall well short of the median for the state of Illinois (Figure 2.3.2). According to the U.S. Bureau of Labor Statistics, only half of the watershed counties have median household incomes that have kept pace with the rate of inflation since 1989. Additionally, the region has only experienced modest job growth since 2000, primarily occurring in the metropolitan regions of Champaign-Urbana, Decatur, and St. Louis (Figure 2.3.3).

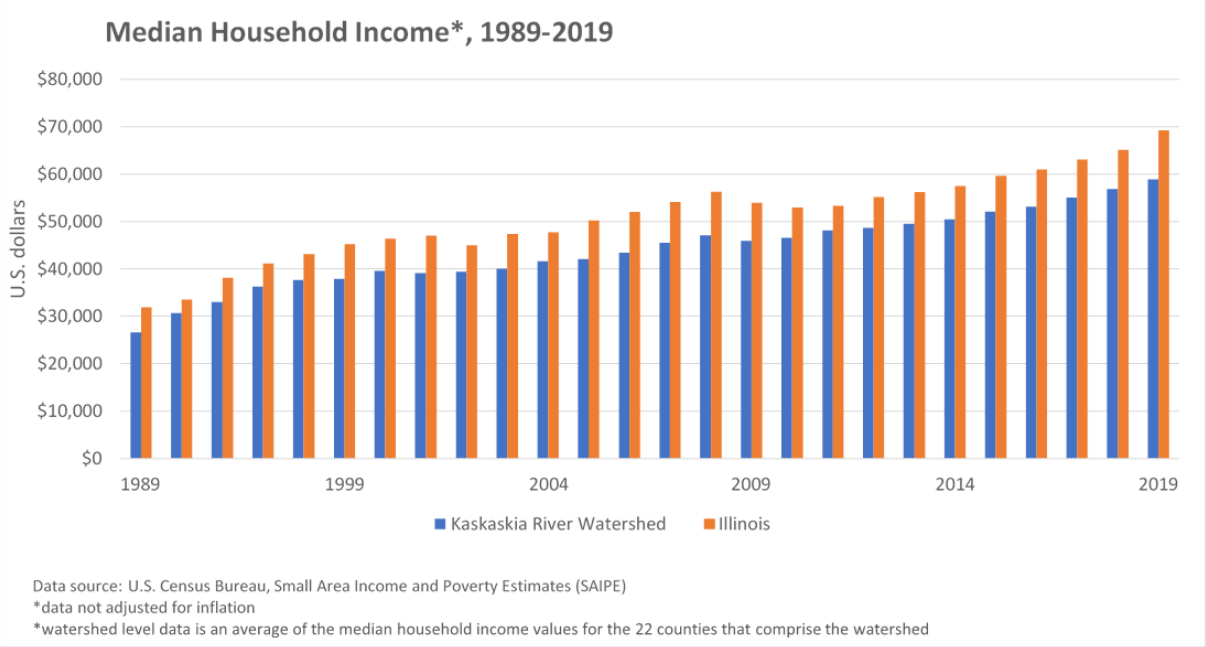


Figure 2.3.2. Median household income overtime

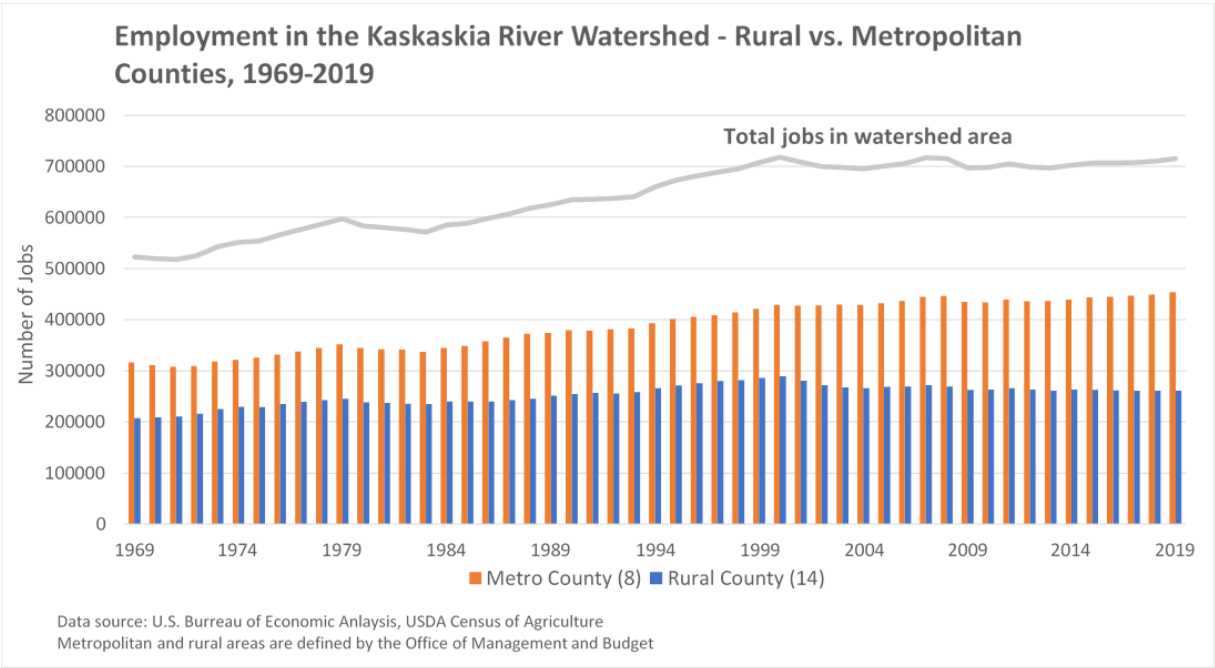


Figure 2.3.3. Employment overtime between rural and metro counties within the Kaskaskia

The agricultural landscape has also undergone many changes since 1950. Though agriculture has remained the predominant land use of the Kaskaskia River watershed and Illinois in general, the number of farms and their management practices have changed dramatically in the past 70 years. In the period between 1950 and 2017 the number of Illinois farms decreased by 60 percent, but the total amount of land being farmed only decreased by 12 percent (Figure 2.3.4). While there is no one single reason for the precipitous decline in the number of farms in Illinois and elsewhere in the U.S., the farms that survived took advantage of an increased economy of scale and grew in acreage due to the ever-increasing efficiency of agricultural technology.

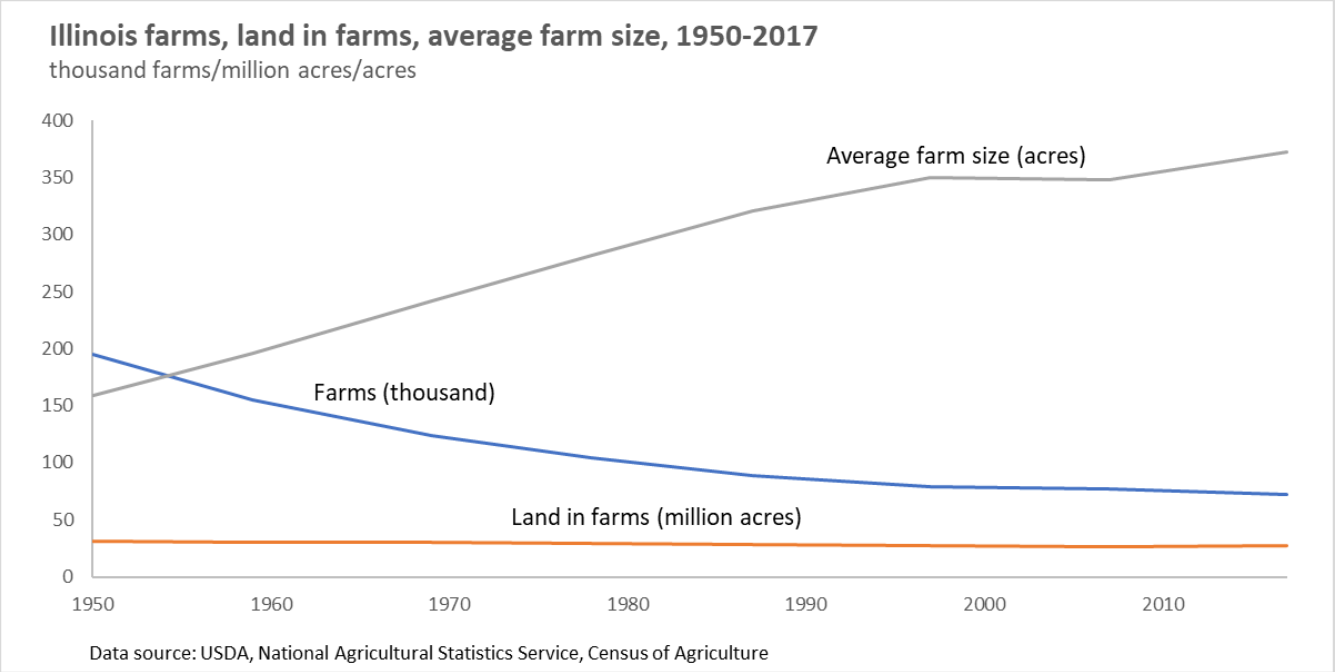


Figure 2.3.4. Number of farms and average farm size in Illinois over time.

The makeup of crops in production has also changed since the 1950s. Corn continues to be the main crop grown in Illinois as well as the Kaskaskia Watershed and the acres planted have remained stable apart from a surge during the ethanol boom in the early 2000s. In contrast, the number of acres of soybean harvested rose sharply from 1950 to 1980 and has since remained the second largest crop in the state (Figure 2.3.5).

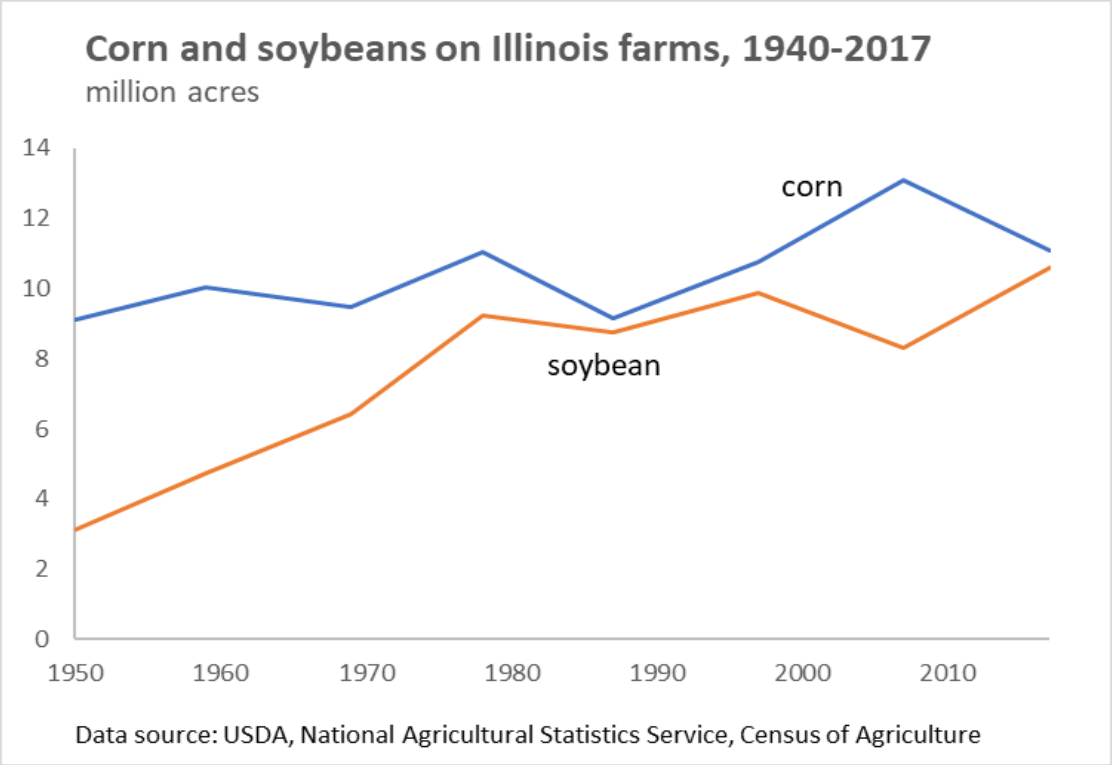


Figure 2.3.5. Acres of corn and soybeans farmed in Illinois over time

Figure 2.3.6. Harvesting hybrid corn in Illinois, 1939

Figure 2.3.7. Combine harvesting corn in Illinois, 2019

3. Landscape Change and the Meanings of Places

3.1. Overview and Data Collection

The purposes of the interviews were to engage stakeholders, build relationships, develop an in-depth understanding of drivers of landscape change in the region, and understand how the community has adapted to these changes. We also were interested in coming to develop an appreciative understanding of the places in the region that were important to people in an effort to deepen our understanding of what makes these places special and unique.

During the period from spring of 2018 to spring of 2020, the research team conducted 19 separate interviews with a total of 25 participants. Of the total participants, 18 were farming full or part-time or were retired farmers at the time of the interview. The seven non-farmers represented private and public interests in the land management of the study area. Many of the non-farming participants were directly involved in the agricultural industry in a regulatory or advocacy capacity. Some farmers also represented multiple interests either through their family, employment, or volunteering.

The interviews were structured around four sets of questions related to land management practices, perceptions of landscape change, identifying important places in the region, and understanding the relationship between perceived change and management practices. Each interview lasted between one and two hours and often included a tour of the farm operation and property. While each interview participant had unique life circumstances and understandings about the watershed, we were able to identify some reoccurring themes that occurred across the interviews. Discussed below are recurrent themes that participants used to explain their farming practices and anticipate future developments, with two illustrative quotes that connect with each theme.

3.2. Findings

Family legacy

When discussing land management practices on their own property or elsewhere in the watershed, many participants reflected on the contributions of past generations. The participants often expressed pride in being a descendant of a farm family and related that to a duty to maintain the legacy started by their ancestors.

> *"Some might say 'why are you keeping it, why don't you just convert it cash or do something' but that is really that family heirloom is how farmers think about their land." – farmer participant*

> *"But most fathers that farm, that teach their children how to be good stewards of the land, protect the land, leave it in better shape than what they got it and this, that and the other. But then, somebody can take this interview and say, 'well, he's still trying to farm the way his dad did*

back in the 50s.' Well, that would be a proud thing for you to say to make this about - my dad was trying to do good back in the 50s." – farmer participant

Keeping the farm in the family

In addition to looking to the past generations when talking about managing the land, participants also thought about the future. When interviewers asked about why thoughtful land management and farming practices were so important, farmers often brought up the need to pass along a business and landscape that would be viable for the next generations.

"We've always practiced and been good stewards, good conservationists because we want to have the farm in better shape to give our kids than when our parents or grandparents gave it and passed it down the generations- not that they did a poor job!" – farmer participant

"…you bought the farm or you had the farm given to you by your parents or grandparents, and as I said, you want to give it to your kids and your heirs that they can continue the legacy that's been laid out in front of you." – farmer participant

Efficiency

Participants frequently spoke about how a drive to increase efficiency in agricultural practices has led to changes in the physical and social landscape. The discussion of efficiency in land management often had to do with adoption of new farming technology as well as making sure land was being used in the most productive way.

"Overall, the management practices and better equipment, productivity should be going up 1% a year between the better seeds and better farming management practices along with the equipment in the long run. And, that also means hedge rows are getting removed, fence lines are getting removed. Um, I can remember in high school we did go out pull fence rows and take down all the pecan trees, etcetera. So, that is the definite goal- the least amount of turnarounds, the least amount of partial rows, that's the ultimate goals." -farmer participant

"And, as farms get bigger, I think they, its, its more efficient for large farmers to only have two crops rather than three or four or whatever it may be. So, I think that is trend that we are, we are seeing as well." – non-farmer participant

Profit-making

While related to efficiency, we identified the drive to make the highest profit possible as a distinct major theme when participants discussed motivations of agricultural practices. When asking about conservation-based strategies that some farmers use on their lands, participants discussed the potential reduction in farm revenue as a barrier to adoption of these practices. Participants also noted how global market fluctuations and thin profit margins make many farmers risk-averse.

> *"We have all tenant farmers and it comes down to profitability. They're all trying to maximize their profits and minimize their costs." – farmer participant*

> *"So if, the, if the money is in corn and beans and, there is no programs to support buffer strips or no till or cover crops or anything like that, they are making more money conventional tillage, I mean, they got to eat." - farmer participant*

Land ethic

Though less common than the previously identified themes, a land ethic or caring for place was noted in several interviews. This land ethic was often used to describe the moral imperative for farmers to care for their land in a way that is independent of other motivations of management. The land ethic was sometimes related to maintaining a viable farm for the next generation, but with a stronger emphasis on the moral obligation of stewardship of the land.

> *"Well to me it is the overall idea that industrial farming building our farming on the industrial model which has to do with production. The assembly line and all that thinking that can be applied to agriculture is wrong. It isn't that isn't the way we need to farm. So that is why I say in the long run that's not sustainable." – farmer participant*

> *"And it's always important that you leave the farm in better conditions than when it was given to you. There's a lot of pride in a farmer's mind to do what's right. To do what's best. And then it's, but it's a great balancing act between what's affordable and what can you do."*
> *– farmer participant*

4. Benefits and Threats in the Kaskaskia River Watershed

4.1. Assembling a Panel of Experts

The second phase of our project focused on identifying the benefits and threats across four reaches of the Kaskaskia River Watershed. Because of the diverse landscapes that exist in this region, we sought to identify benefits of different landscape types including agricultural landscapes (i.e., cultivated landscapes such as cropland or pastures), built environments (i.e., cites, towns and communities), lakes and rivers (i.e., surface water such as reservoirs, rivers and streams), and forested areas (i.e., areas predominately covered with trees). We initiated this process in 2018 assembling a panel of 27 experts. These individuals represented diverse interest groups across the watershed including professions related to farming (n=11), conservation (n=7), tourism (n=2), economic development (n=2), biology (n=1), engineering (n=1), media (n=1), and teaching (n=1). This panel was predominantly white (85%), educated (83% holding a Bachelor's degree or higher), mostly male (85%), and had on average 23 years of experience in their profession.

All study participants were invited to participate in a four-round interactive survey. During the first survey, experts were asked to respond to open-ended questions that asked to list reasons why various landscapes across the watershed were important. After completing surveys, findings were analyzed and collated into categories that were then sent back to experts in subsequent surveys. In the following surveys, experts were asked to rate each benefit that was identified on a seven-point Likert scale (1 for "Extremely unimportant" to 7 for "Extremely important"). These findings were then collated, average scores for each benefit were summarized and sent back to experts for a final evaluation. The final evaluation included presenting group average scores for each benefit back to experts then asked each to re-rate the importance of the benefits in light of the average group rating. We followed a similar process for identifying threats. At the end of the process, we then invited all experts to a focus group where findings were further deliberated. This focus group involved the summarizing of study findings, discussion on what was found, and further discussion on what was missing or could be adjusted. Through this iterative process we sought to promote deliberation on the benefits and threats, so as to identify those most pertinent to the Kaskaskia Watershed.

4.2. Understanding Expert Opinion

Based on our iterative survey and focus groups, we identified multiple benefits and threats associated with diverse landscapes across the Kaskaskia Watershed. Overall, experts identified 24 benefits associated with the watershed, nine were associated with agricultural landscapes, ten with built environments, six with forest landscapes, and nine with lakes and rivers. Multiple benefits were deemed important across different landscapes. Crop production was important for agricultural landscapes, whereas other benefits including recreation and wildlife habitat were universally valued across landscapes. A list of these benefits and their average ratings of importance can be found in Figure 4.2.1.

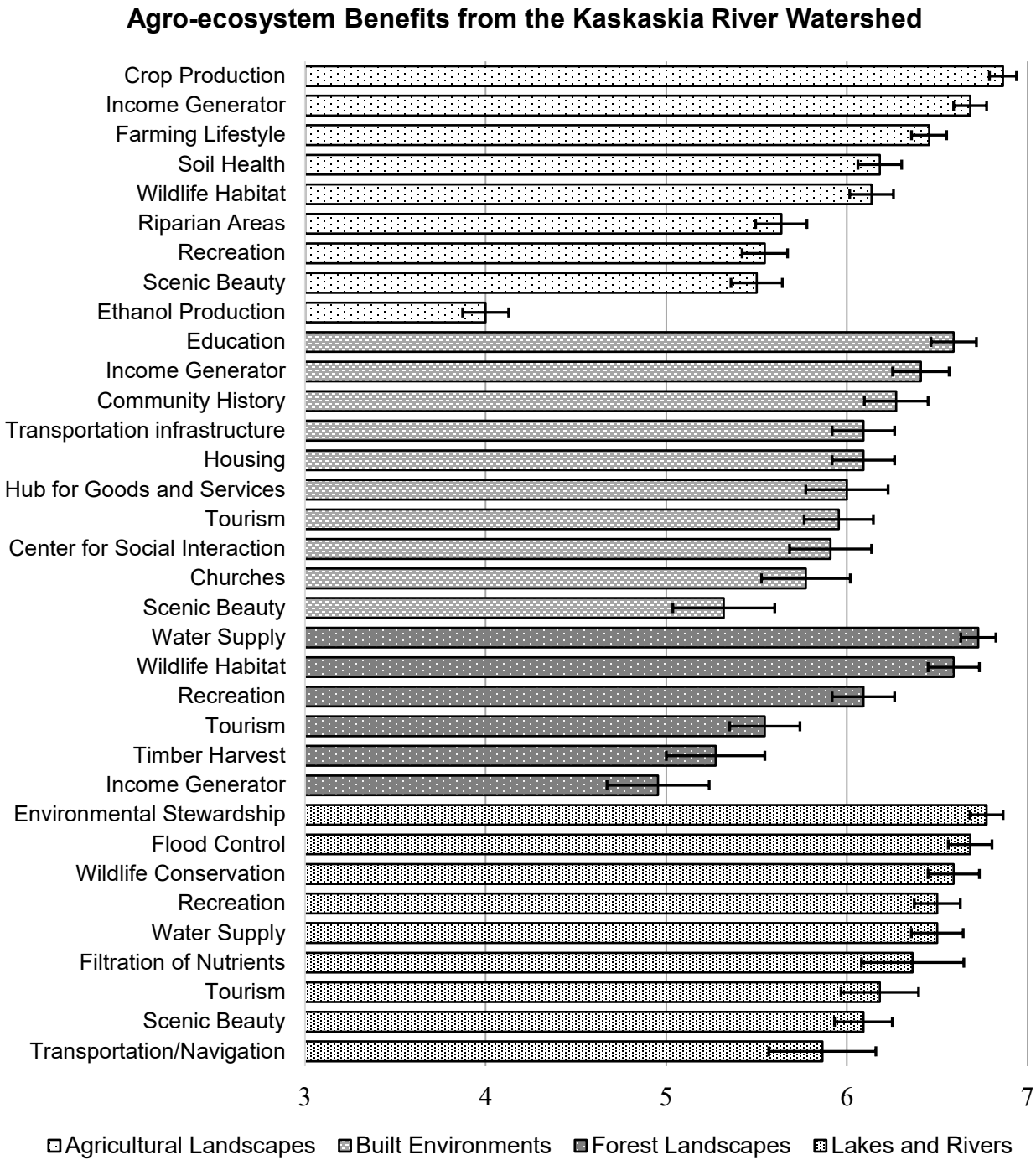


Figure 4.2.1. Mean values and standard errors for the perceived importance of benefits across four landscape types in the Kaskaskia River Watershed. All services were evaluated on a seven-point Likert scale ranging from 1 "Extremely Unimportant" to 7 "Extremely Important." (n=24). Drawn from Shipley et al. (2020).

Participants identified 21 threats facing the Kaskaskia River Watershed. Of the identified threats, 13 were associated with agricultural landscapes, nine with built environments, seven with forest landscapes, and eight with lakes and rivers. Erosion and run-off were the most commonly identified threats to the watershed. Most threats were believed to be detrimental to the provision of benefits, but the rating of these threats varied between and within different landscapes. For example, erosion was problematic for agricultural landscapes, while also posing danger to forests, lakes and rivers. Threats evaluated as most harmful for agricultural landscapes included unstable fertilizer and herbicide application, lack of conservation practices and removal of environmental buffers. A list of these threats and average threat ratings can be found in Figure 4.2.2.

Participants identified 29 land use practices that had the capacity to minimize future threats facing the Kaskaskia River Watershed. Of all identified land use practices, 12 were associated with agricultural landscapes, nine with built environments, ten with forests, and ten with lakes and rivers. Land use practices that were evaluated as being most effective in agriculture landscapes were practices that reduced or mitigated erosion. Practices most effective for lakes and rivers were mostly practices that would be implemented on land to reduce erosion and run-off. Invasive species removal was indicated as effective for lakes and rivers and forest landscapes. Similarly, timber stand improvement and technical assistance was perceived to be effective for forest landscapes. A list of all practices and average effectiveness ratings can be found in Figure 4.2.3.

Findings from this iterative survey and focus group were collated into a final list of benefits associated with agroecosystems in the context of the Kaskaskia River Watershed. These findings were further used to inform multiple aspects of subsequent research conducted as part of this project, including providing the list of benefits measures in our participatory mapping study, informed future scenarios used in a multicriteria decision analysis tool to project future impacts of land management alternatives, and informed multiple aspects of questions used in the survey summarized later in this report.

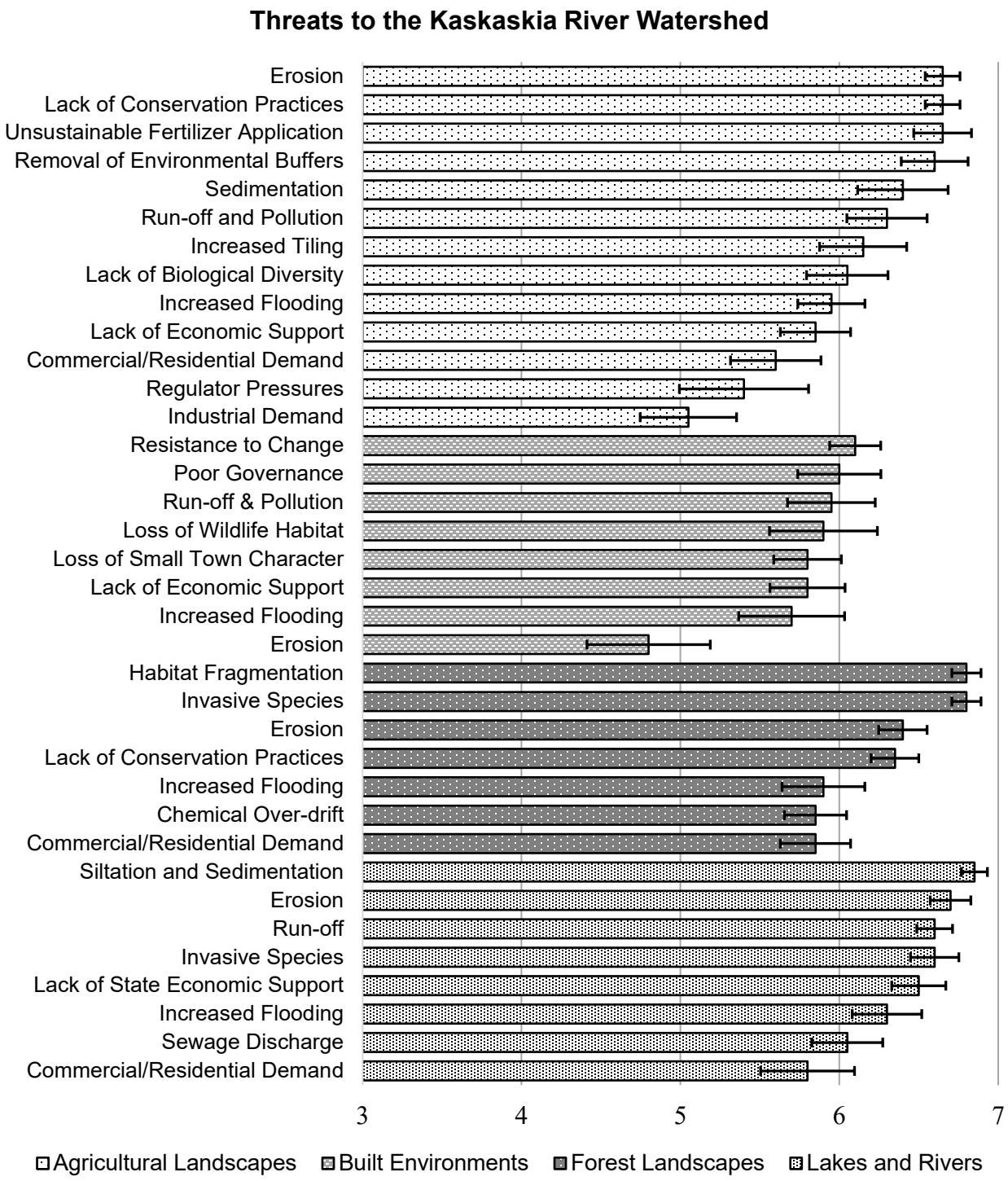


Figure 4.2.2. Mean values and standard errors of the perceived significance posed by threats across four landscape types in the Kaskaskia River Watershed. All threats were evaluated on a seven-point Likert scale ranging from 1 "Extremely Insignificant" to 7 "Extremely Significant." (n=22). Drawn from Shipley et al. (2020).

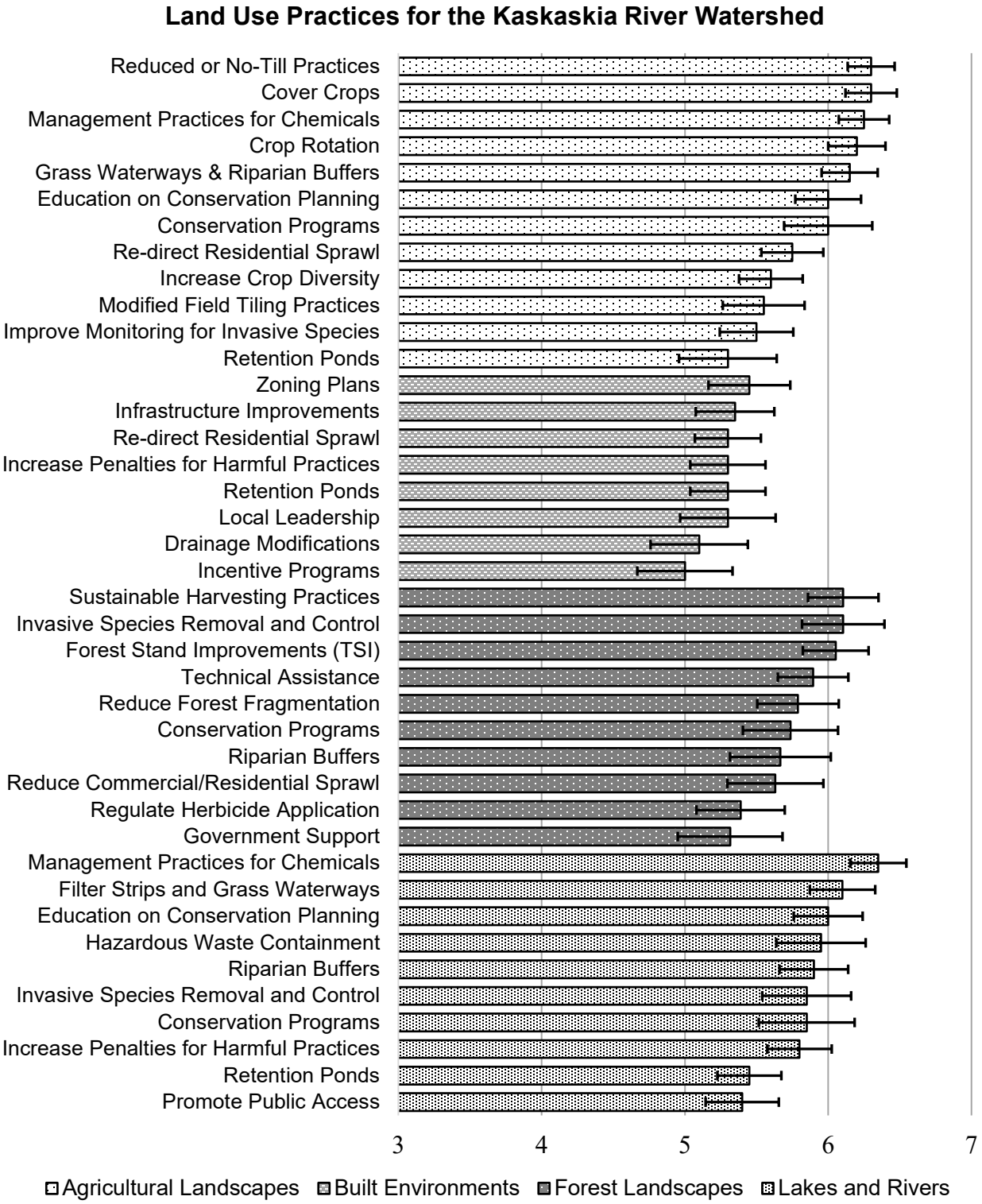


Figure 4.2.3. Mean values and standard errors for the perceived effectiveness of land use practices across four landscape types in the Kaskaskia River Watershed. All practices were evaluated on a seven-point Likert scale ranging from 1 "Extremely Ineffective" to 7 "Extremely Effective." (n = 20). Drawn from Shipley et al. (2020).

4.3. Extending Knowledge of Benefits and Threats

Experts from the region were next invited to participate in four focus groups held in 2019 to better understand the benefits and threats of agro-ecosystem services in relation to a combination of diverse environmental and social stressors in the Kaskaskia River Watershed. We conducted focus groups in each of the four reaches of the watershed to ensure that each region of the watershed was represented in our assessment. To conduct these focus groups, we partnered with members of the Upper Kaskaskia Ecosystem Partnership in the first, Carlyle Lake Association in the second, OKAW River Basin Coalition in the third, and Lower Kaskaskia Stakeholders in the fourth reach. Participants in each focus group were asked to rank the benefits and threats of agro-ecosystem services in the watershed on an individual basis, as well as engage in larger group discussions to spatially locate those benefits and threats on a map of the watershed (n = 52). Specifically, the individual mapping exercise included two steps. First, participants were asked to rank a list of 18 benefits and 14 threats to the sustainability of the watershed. The two typologies presented to participants were derived from previous research in the region (Shipley et al., 2020). The ranking exercise required that participants allocate 100 value points across the benefits and 100 points across the list of threats to reflect the relative importance of each category. We calculated mean scores (and standard deviation values) to determine the relative importance of the benefits and threats across the entire watershed and also across the four reaches (subsections).

The second step in the exercise involved participants assigning both the benefits and threats to specific places within the watershed. In the focus group, participants assigned the benefits and threats to specific locations on a paper map of their respective watershed reach using points, lines, and polygons and discussed the reasons why the places carried positive and negative values. The points, lines, and polygons were then systematically digitized using ArcMap 10.6 to generate a spatial layer of benefit points and another of threat points in the watershed. Prior to spatial analysis, a kernel density map was created as an exploratory step to illustrate the spatial distribution of the data points. Next, we applied the K-function in R to test for global clustering of both the benefits and threats and tested for local clustering using SaTScan to identify the most likely point clusters within specific places of the watershed. The third objective was carried out using a cross K-function which tested if the benefits and threats were clustered near each other.

4.4. Key Results

Results showed the relative importance of the 18 benefits and 14 threats evaluated by stakeholders across the watershed (see Figure 4.4.1). The three most salient benefits associated with the Kaskaskia Watershed were Recreation, Erosion Protection, and Crop Production, whereas the three most salient threats associated with the Kaskaskia Watershed Erosion, Siltation and Sedimentation, and Increased Flooding.

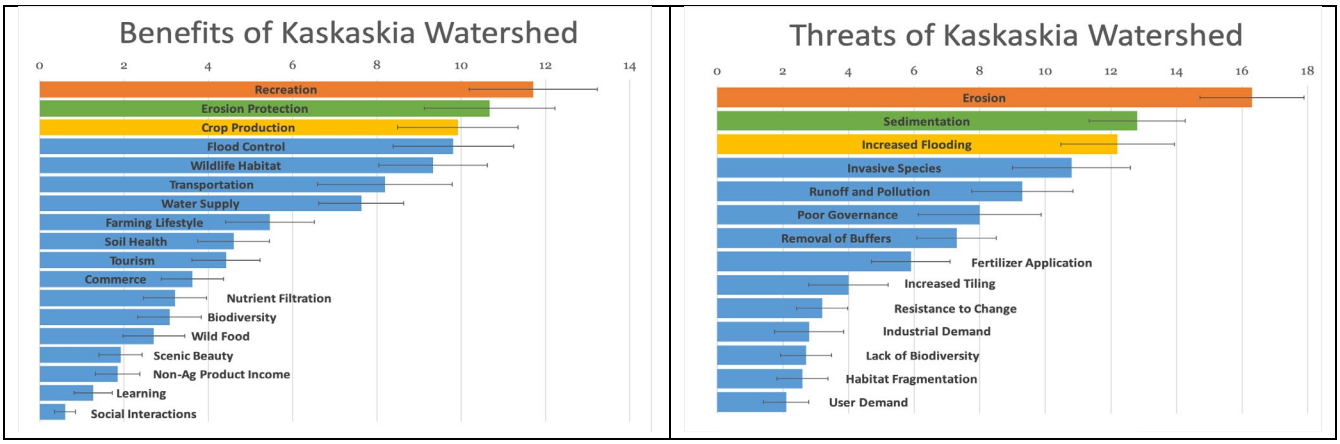


Figure 4.4.1. Average value points assigned across (A) 18 benefits and (B) 14 threats to the Kaskaskia River Watershed.

Our understanding of the benefits and threats in the watershed was enhanced with explanations from participants about their decision-making process. For example, one participant discussed the benefits they reaped from recreational activities: "We have over 300 slips in the marina and probably 150 of them are houseboats. People will come down every weekend. We have people that have been coming down from Chicago renting boats for 40 years." (Participant from Reach 1). Another described the threats from erosion, "For me it's always the erosion [protection] because that affects the farming, the livestock, the lake, the recreation, all the above." (Participant from Reach 2). Many of the participants who ranked erosion as the most pressing issue in the watershed, related this threat to farming practices by stating, "Everything is related to farming. That's got to be the main moneymaker." (Participant from Reach 3).

We also generated a density map as a visual depiction of the spatial distribution of the benefits and threats that stakeholders assigned to places within the watershed (Figure 4.4.2). We tested for global clustering (clustering across the watershed) of both the benefits and threats using a K-function and tested for local clustering (clustering within specific places of the watershed) of both the benefits and threats using Sat-Scan. Results indicated that benefit points were more densely clustered than the threats, but significant clustering throughout the watershed occurred for both benefits (NN ratio = 0.479, z-score = -21.637) and threats (NN ratio = 0.667; z-score = -11.427) ($p<0.001$).

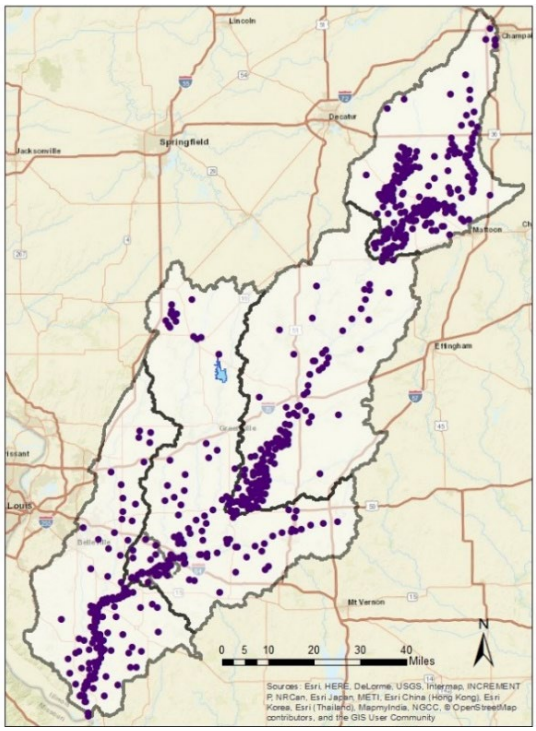


Figure 4.4.2. Digitized spatial distributions of benefits and threats across the Kaskaskia River Watershed

We also tested for spatial clustering between the mapped benefits and the mapped threats data layers and used the cross K-function to determine if different types of points (benefits vs threats) are clustered near each other. Kernel density maps showed high density areas located along the Kaskaskia River with the densest area of both benefit and threat points located in Reach 4. High density areas for both benefits and threats were located in the southern half of Reach 1, the southwestern corner of Reach 2, and the middle region of Reach 4 (see Figure 4.4.3).

We compared both benefits and threats to biophysical conditions in an agricultural watershed in Illinois, US. This analysis revealed three areas of high density in reaches 1, 2 and 4. Engagement with these landscapes generated both positive and negative associations with places, which were effectively captured through our participatory methods. These areas provide insight on how to target regions where policy interventions would be most important from the perspectives of expert residents. This process could aid local decision-makers in balancing competing interests, prioritizing resources, and incorporating public opinion in the decision-making process.

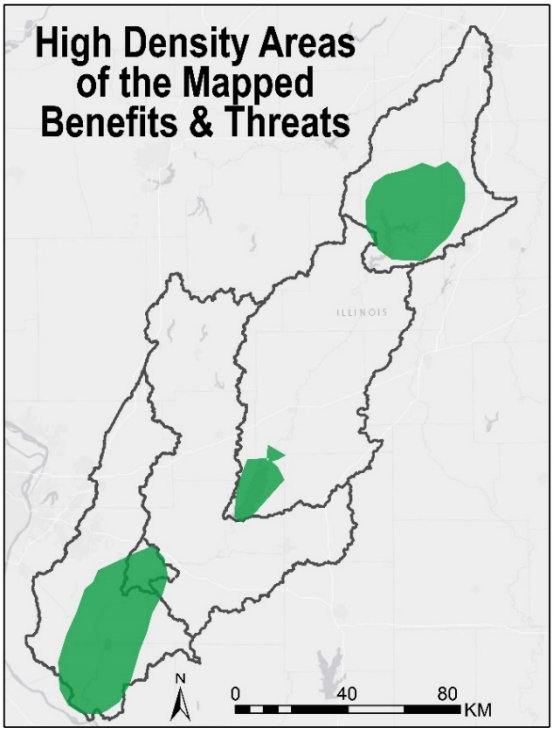


Figure 4.4.3. High density areas of benefits and threats

5. Preferences for Landscape Change and Factors that Shape Human Behavior

5.1. Overview and Data Collection

The final phase of our research focused on understanding resident's preferences for future growth and understanding factors shaping adoption of behaviors that reduce or mitigate negative impacts on the environmental quality of the Kaskaskia River Watershed region. Data for this study were collected during the summer and fall of 2020 through an online survey administered to residents living in the Kaskaskia. The questionnaire was sent to a panel of respondents aggregated by the online survey company Qualtrics. Demographic quotas for age, gender, and race were applied to the aggregated panel to help ensure the sample was representative of residents in the study region.

The initial sample obtained from Qualtrics consisted of 786 respondents. Of the initial sample, 128 responses were removed as duplicate responses according to the location and sociodemographic characteristics of respondents. Additionally, 41 completed surveys were invalid responses due to completion time and illegitimate data patterns. This resulted in a final sample size of 617 residents.

5.2. Demographics

Our final sample was predominantly White (83.1%), female (65.3%), with an average age of 41 (SD = 15.6). Most respondents had an income less than $100,000 (77.7%) and had some form of college education (70.7%). A majority of respondents indicated they considered where they lived to be rural (61.0%) while a minority indicated they owned farmland in the watershed (12.6%). Employment among respondents was varied and these distributions can be found in Figure 5.2.1. Summaries of the socio-demographic make-up of our final sample of respondents can be found in Table 5.2.1.

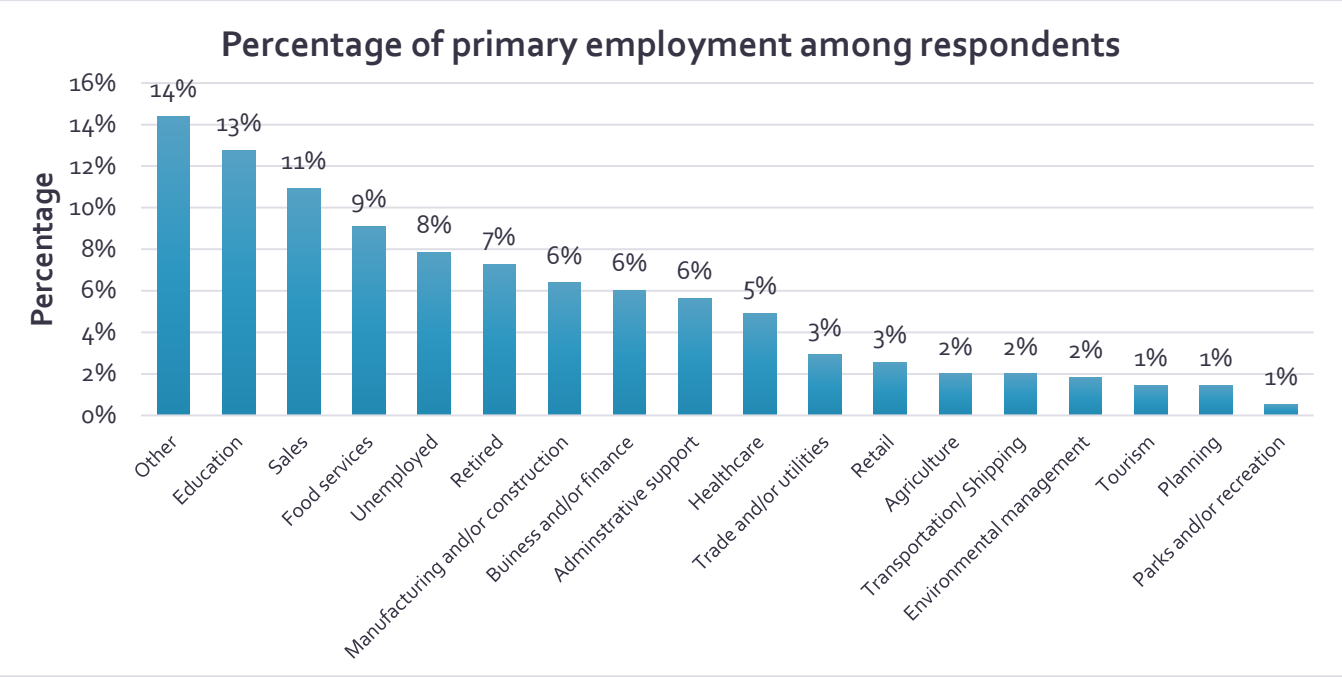


Figure 5.2.1. Bar graph showing percentage of respondents in each employment sector

Table 5.2.1. Socio-demographic characteristics of respondents

	Percentage
Gender	
Female	65.3
Male	34.7
Race	
American Indian	2.4
Asian	2.4
White	83.1
Black or African American	12.5
Hispanic	3.7
Educational attainment	
No degree	2.1
High school graduate or GED	27.2
Some college	38.6
Bachelor's degree	18.7
Post-graduate degree	13.4
Annual Household Income	
Less than $49,999	50.1
$50,000-$99,999	27.6
$100,000-$199,999	12.9
Over $200,000	1.8
Prefer not to answer	7.7
Consider where live to be rural	
Yes	61.0
No	39.0
Own farmland	
Yes	12.6
No	87.4
Age (M, SD)	41.3 (15.6)
Number of adults in household (M, SD)	2.4 (1.2)

5.3. Choice Experiment and Preferences for Landscape Change

In this section of the survey, respondents were asked to evaluate a series of hypothetical future scenarios and indicate their preferences for the future (Louviere et al., 2000). Within each scenario, five "features" that represented possible changes to current landscape conditions were presented to

respondents. The selection made indicated which features were most important in evaluating the future of the Kaskaskia River Watershed (Shipley et al., 2020). The levels of each feature were identified using available data about existing conditions along with feedback from project partners. A description of the five features and their levels are shown below (Figure 5.3.1). To evaluate choices respondents were shown paired comparison scenarios that depicted possible future levels of each landscape feature (Figure 5.3.2).

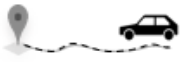
Acres of Sustainable Agriculture 	Agriculture is the most dominant land use in the region surrounding the Kaskaskia River. **Currently, half of all land that is farmed for corn and soybean is planted using sustainable agricultural practices** including cover crops and reduced tillage. The adoption of more sustainable farming practices is expected to change in the future. The change in acres of sustainable agriculture that may occur **over the next 30 years** is set at three levels: **1. Decrease in acres of farmland planted using sustainable practices by 25%** **2. Maintain current acres of farmland planted using sustainable practices** **3. Increase in acres of farmland planted using sustainable practices by 25%**
Water Quality 	The water quality of rivers and lakes in the region surrounding the Kaskaskia River is affected by different forms of nitrogen that affect human health and environmental conditions. Over the last five years, **the amount of nitrogen has exceeded the Mississippi River and Gulf of Mexico Nutrient Task Force's recommended target levels** for meeting water quality standards. Water quality in the lakes and rivers that may **occur in the next 30 years** is set at three levels: **1. 0% increase in water quality** **2. 25% increase in water quality** **3. 50% increase in water quality**
Distance to Public Recreation Areas 	Distance to a public recreation area refers to the miles required to travel in order to access public land from your home. **Currently, people living in the region surrounding the Kaskaskia River can recreate near their home or travel to nearby recreation areas.** These settings provide opportunities for activities such as boating, camping, hunting, fishing, sailing, and hiking. The distance to recreation from your home is set at three levels: **1. Less than one mile to travel from your home to access public recreation areas** **2. 25 miles to travel from your home to access public recreation areas** **3. 50 miles to travel from your home to access public recreation areas**
Fish Variety 	The rivers and lakes in the region surrounding the Kaskaskia River are home to a variety of native fish species. The total variety of **native fish species has been decreasing over the past 40 years** in the region. The change in native fish variety that may occur **over the next 30 years** is set at three levels: **1. Decrease in native fish variety by 15%** **2. Maintain current levels of native fish variety** **3. Increase in native fish variety by 15%**
Conservation Fund 	To benefit the current and future generations of all residents living in the region surrounding the Kaskaskia River, we would like to know how much you would be **willing to pay for all of the features** described on this page by contributing to a hypothetical Kaskaskia River Management Conservation Fund. This kind of fund would be administered by a local organization and required for every household surrounding the Kaskaskia River. An annual conservation fund is set at five levels ranging from **$0 to $40 per year over the next 30 years**

Figure 5.3.1. Five features represented in choice experiment with descriptions of feature levels

Future Scenario 1

Suppose Option A and Option B were the *only* options available besides "No change" over **the next 30 years**. Which would you choose? *Please select the option that represents your choice.*

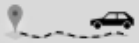
Attribute					$	I would choose 
Option A	25% Increase	25% Increase	50 Miles Away	15% Increase	$60	❒ A
Option B	0% Change	25% Increase	<1 Mile Away	15% Decrease	$0	❒ B
Option C	No change					❒ C

Figure 5.3.2. Example paired comparison that was used in the residential survey. Respondents were asked to select from three options, where Option A and B represented hypothetical future changes to landscape features. Respondents could also selection Option C to indicate they did not prefer either hypothetical future over the existing landscape conditions.

To understand preferences for landscape features we analyzed 3324 sets of observations, which represented the total number of choices made across our sample of respondents, using a mixed multinomial logistic regression. We found that all five features of the hypothetical changes in the landscape influenced choices made by the survey respondents. Specifically, we found the likelihood a respondent would select an alternative scenario increased with more acres of sustainable agriculture, higher water quality, and increases in native fish variety. We also found that respondents were less likely to prefer a future scenario that included higher distances to public recreation areas and increases in payments to a conservation fund increased. We explained nearly one quarter (24%) of the variability in people's decisions through this model, and found heterogeneity in preferences across each feature. However, we did not find evidence that preferences differed among respondents based on their levels of reported knowledge, their levels of attachment to places and nature, or other socio-demographic information (including age, gender, duration living in Illinois, owning farmland, or between residents based on residing in an urban or rural area).

To further interpret findings from our choice experiment, we converted the regression coefficients which are calculated as logits and transformed these values into predicted probabilities. We then graphed the changes in predicted probability that an alternative scenario was selected based on the changes in levels of each feature that we measured. Changes in probability that an alternative scenario was selected over no change for the four landscape features are shown in Figure 5.3.3. Additionally, we calculated a marginal willingness-to-pay for each feature to understand the relative cost that respondents would be willing to pay to for changes in each landscape feature (Table 5.3.1). We learned that respondents saw fish variety and acres of sustainable agriculture as most valuable, as compared to water quality and distance to recreation.

Table 5.3.1. Marginal willingness-to-pay for changes to each study attribute

Variable	Willingness to Pay per unit change
Acres sustainable agriculture	$4.40
Water quality	$2.80
Distance to public recreation	$1.40
Fish variety	$5.00
Conservation fund	-

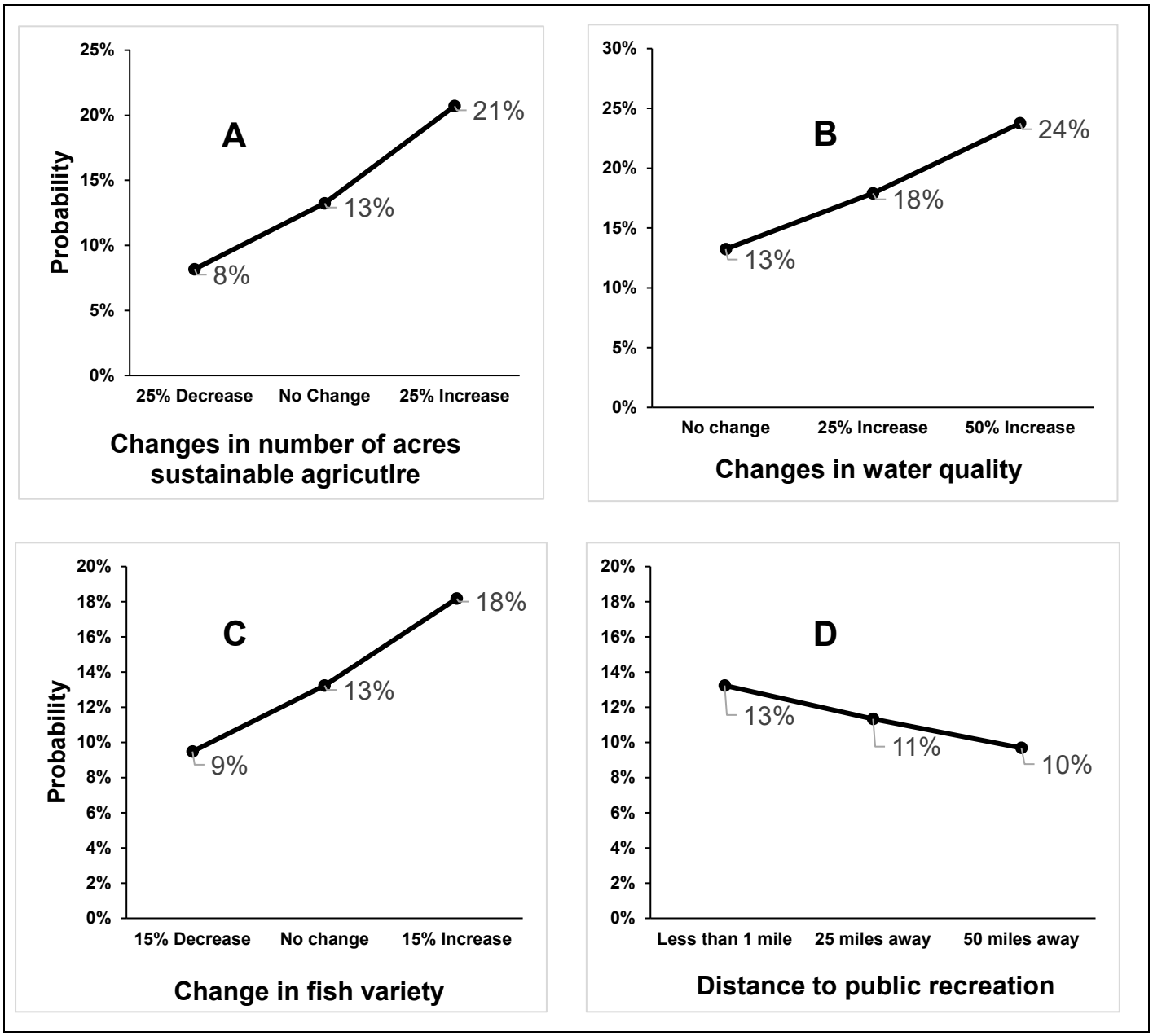


Figure 5.3.3. Probability that a respondent would choose an alternative future scenario over no change with changing levels of A) acres of sustainable agriculture, B) water quality, C) changes in fish variety, and D) distance to public recreation in the watershed.

5.4. Knowledge, Adoption of Sustainable Practices, and Intentions to Engage in Pro-environmental Behavior

Understanding respondent's knowledge of resource management challenges, behavior related to adoption of sustainable practices, and intention to engage in future behaviors that mitigate negative harm to the environment provides insight of land use and resource management in the region, as well as potential interventions needed to attain sustainability goals in the future. Our survey results revealed that approximately 31% of respondents have not yet adopted sustainable practices in their line of work. Of those who adopted sustainable practices, 48.1% had done so ranging from anywhere from 1 to 10 years. Approximately 14% of respondents had adopted sustainable practices in between 11 and 20 years. About 4.5% of respondents had adopted sustainable practices since the last 21 to 30 years. A small percentage (2.7%) of respondents had adopted sustainable practices for more than 30 years and beyond that period (Table 5.4.1, Figure 5.4.1).

Table 5.4.1. Number of years respondents have been adopting sustainable practices within their line of work

Number of years respondents adopting sustainable practices	*Frequency*	*Percent*
Not adopted yet (0 years)	189	30.6
1 – 10 years	297	48.1
11 – 20 years	86	13.9
21 – 30 years	28	4.5
31 – 40 years	11	1.8
41 – 50 years	2	0.3
51 – 60 years	2	0.3
61 – 65 years	2	0.3
Total	617	100.0

Note: Mean: 1.03, Variance: 1.038, SD: 1.019, Skewness: 1.814, Kurtosis: 5.87, SE Mean: 0.041, Missing: None

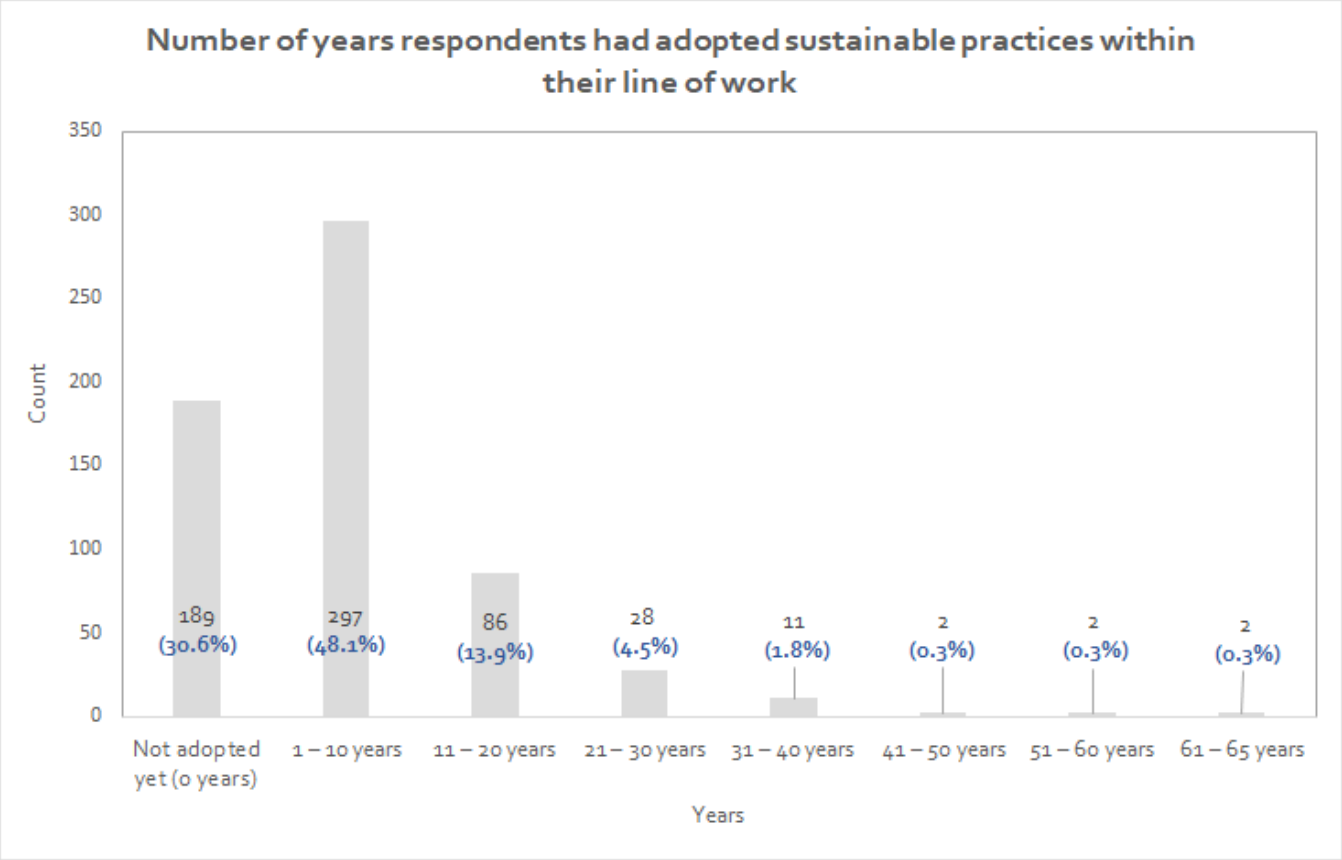


Figure 5.4.1. Bar graph showing respondents who reported number of years they had adopted sustainable practices (categorized in cohorts of 10, in X-axis) plotted against total number of respondents (Y-axis)

Just over one third (34%) of respondents reported they had "No knowledge" of sustainable agriculture (Table 5.4.2). Only a tiny fraction (4.1%) reported that they had "High knowledge" and the remaining 62% indicated they had "Slight knowledge" (26.1%), "Some knowledge" (25.6%), or "Moderate knowledge" (10.2%).

Table 5.4.2. Respondents self-reported knowledge about sustainable agriculture

Knowledge about Sustainable Agriculture	*Frequency*	*Percent*
No knowledge	210	34.0
Slight knowledge	161	26.1
Some knowledge	158	25.6
Moderate knowledge	63	10.2
High knowledge	25	4.1
Total	617	100.0

Note: Mean: 2.24, Variance: 1.31, SD: 1.15, Skewness: 0.58, Kurtosis: -0.54, SE Mean: 0.046, Missing: None

As compared to their knowledge level about sustainable agriculture, 8.9% of respondents had knowledge about water quality. Still, one-quarter (25.1%) indicated that they had "No knowledge" about water quality, whereas only 4.4% said they had "High knowledge." The rest (70.4%) fell in between "Slight knowledge" (27.2%), "Some knowledge" (28.5%) and "Moderate knowledge" (14.7%), as shown in Table 5.4.3.

Table 5.4.3. Respondents self-reported knowledge about water quality

Knowledge about Water Quality	*Frequency*	*Percent*
No knowledge	155	25.1
Slight knowledge	168	27.2
Some knowledge	176	28.5
Moderate knowledge	91	14.7
High knowledge	27	4.4
Total	617	100.0

Note: Mean: 2.46, Variance: 1.31, SD: 1.14, Skewness: 0.33, Kurtosis: -0.76, SE Mean: 0.046, Missing: None

Regarding fisheries, a significantly large (42.2) percentage of respondents reported that had "No knowledge," while a small percentage (5.3) said they had "High knowledge". The remaining 52.3% of respondents have mentioned "Slight knowledge" (23.5%), "Some knowledge" (17.5%), and "Moderate knowledge" (11.3%) related to the fisheries sector (Table 5.4.4).

Table 5.4.4. Respondents self-reported knowledge about fisheries

Knowledge about Fisheries	*Frequency*	*Percent*
No knowledge	260	42.2
Slight knowledge	145	23.5
Some knowledge	108	17.5
Moderate knowledge	70	11.3
High knowledge	33	5.3
Total	616	99.8

Note: Mean: 2.14, Variance: 1.52, SD: 1.23, Skewness: 0.78, Kurtosis: -0.49, SE Mean: 0.05, Missing: 1 (0.2%)

With regards to knowledge of recreation, as shown in Table 5.3.4., a significantly higher percentage (8.3) of respondents indicated they had "High knowledge" of the sector. On the other hand, still close to one-quarter (24%) reported they had "No knowledge." The rest (67.7%) of respondents fell in between the different knowledge levels of "Slight knowledge" (19.3%), "Some knowledge" (26.7%), and "Moderate knowledge" (21.7%).

Table 5.4.5. Respondents self-reported knowledge about recreation

Knowledge about Recreation	*Frequency*	*Percent*
No knowledge	148	24.0
Slight knowledge	119	19.3
Some knowledge	165	26.7
Moderate knowledge	134	21.7
High knowledge	51	8.3
Total	617	100.0

Note: Mean: 2.71, Variance: 1.62, SD: 1.27, Skewness: 0.096, Kurtosis: -1.093, SE Mean: 0.051, Missing: None

A comparative view of the respondents' knowledge levels corresponding to the four identified resource management challenges in the Kaskaskia watershed is shown in Figure 5.4.2.

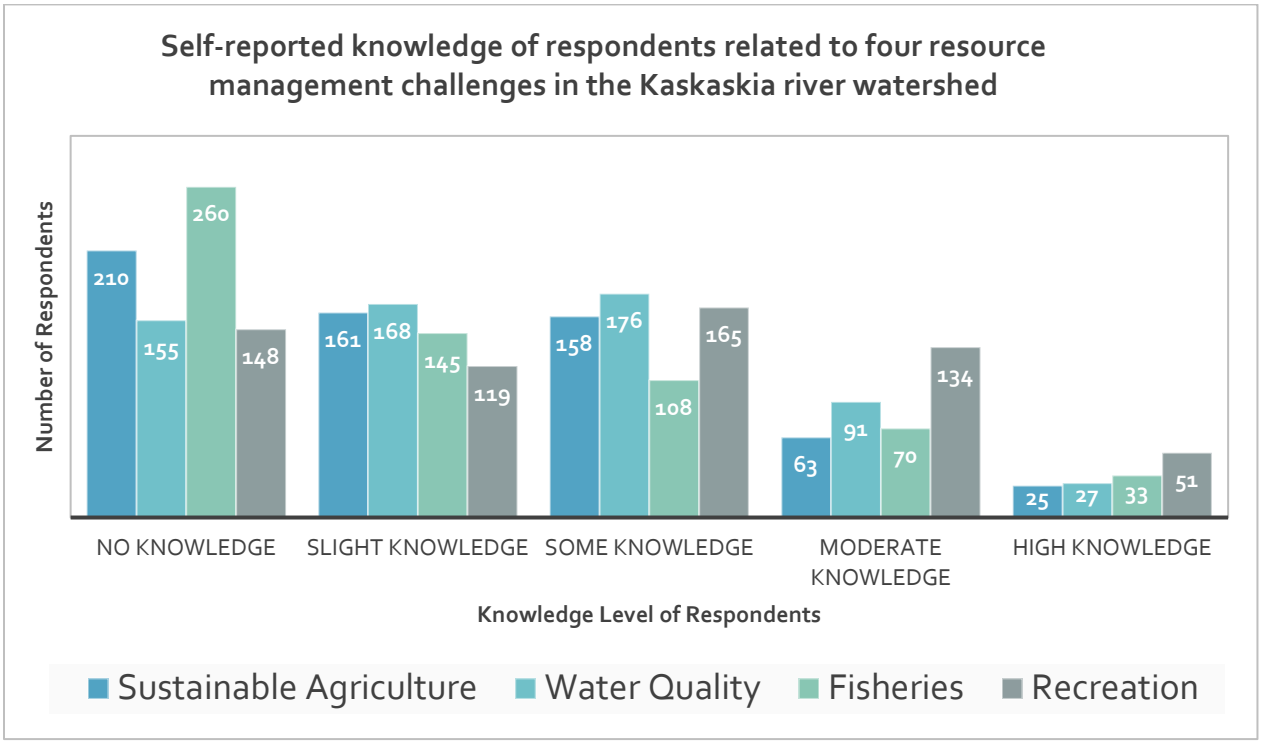


Figure 5.4.2. Bar graph showing the four resource management challenges in the Kaskaskia River Watershed alongside the corresponding knowledge

We examined "pro-environmental behaviors" that are actions performed with the intention of benefited the environment of the Kaskaskia River Watershed. We drew on previous research (van Riper et al. 2019) and asked survey respondents multiple questions to understand three different types of pro-environmental behaviors. First, we asked about behaviors in the private sphere that were called, "conservation lifestyles" and defined as everyday actions such as water and energy conservation and recycling. Second, we asked about behaviors in the public sphere called

"environmental citizenship" and defined as environmental activism such as voting, signing petitions, or donating money. Finally, we asked about behaviors in the social sphere called "social environmentalism" and defined as actions associated with engaging other people in social or educational settings.

Respondents intended to engage in all three types of pro-environmental behaviors occasionally to frequently over the next 12 months. On average, respondents indicated they intended to engage in social sphere behaviors the least (M = 3.16), followed by public sphere behaviors (M = 3.48) then private sphere behaviors (M = 3.94). This finding suggests that people in the region intend to most frequently engage in lifestyle actions that occur in everyday contexts, followed by socio-political behaviors, with the least engagement in those actions that directly engage in social relationships (see Table 5.4.6).

Table 5.4.6. Reported intentions to engage in pro-environmental behavior in the next 12-months

Question	*Mean*	*SD*
Conservation lifestyle (alpha=0.84)	**3.94**	**0.89**
Recycle paper, plastic, and metal in the area where I live	4.07	1.07
Conserve water or energy in the area where I live	3.96	0.97
Buy environmentally friendly and/or energy efficient products	3.79	1.01
Environmental citizenship (alpha=0.79)	**3.48**	**0.96**
Donate money to support environmental protection in the area where I live	3.12	1.17
Sign a petition about an environmental issue in the area where I live	3.57	1.16
Vote to support a policy or regulation that supports environmental protection in the area where I live	3.75	1.11
Social environmentalism (alpha=0.88)	**3.16**	**1.06**
Participate as an active member in an environmental group in the area where I live	3.03	1.19
Work with others in the area where I live to address an environmental problem or issue	3.26	1.12
Talk to others in the area where I live about an environmental problem	3.20	1.19

[1]5-point scale: Very Rarely (1), Rarely (2), Occasionally (3), Frequently (4), Very Frequently (5)

5.5. Experiences in Nature and Connections to Places

Residents in the Kaskaskia Watershed benefit from the local environments that provide a variety of experiences in nature. Understanding residents' experiences in nature can enhance our knowledge about the patterns of human-environment interaction in the Kaskaskia region. Similarly, residents may form attachments and connections to landscapes in the region. Understanding residents' connections to the region or the "sense of place" associated with the area they live can further deepen

understanding of human-environment connections. We evaluated respondents' experiences in nature, including current recreation participation, previous experiences related to nature, and emotional connection to nature. We also evaluated respondent's sense of place by measuring their strength of attachment to their place as well as the diverse meanings they ascribed to the same place.

Participation in outdoor recreation activities is an important basis for understanding residents' interactions with nature as well as their well-being and behaviors. To understand people's level of engagement in outdoor recreation, we asked respondents to indicate their level of engagement in a variety of outdoor activities in 2019. The frequency of participation in each type of outdoor activity was assessed on a scale ranging from 1 (very rarely) to 5 (very often). The recreation activities included trail hiking, outdoor biking, wildlife watching, camping, hunting, and fishing. These activities can be categorized based on their degrees of environmental impacts (Thapa, 2010). On the one hand, recreation activities such as hiking, biking, wildlife watching, and camping are characterized as appreciative activities which have minimal impacts on natural resources. On the other hand, hunting and fishing are grouped as consumptive activities which directly affect resources. Table 5.5.1 summarizes the survey results for recreation participation. On average, respondents indicated a somewhat low level of engagement in overall outdoor recreation (*M* = 2.40). Among the activities, residents participated in wildlife watching most frequently (*M* = 3.30). The lowest level of engagement was in hunting which respondents on average rarely participated in (*M* = 1.62). An overview of residents' recreation participation trend is shown in Figure 5.5.1.

Table 5.5.1. Recreation participation frequency of residents in 2019

Question	*Mean*	*SD*
Participation in recreation activities (alpha = 0.79)	**2.40**	**0.88**
I hiked on trails	2.64	1.22
I biked in the outdoors	2.08	1.21
I watched wildlife (e.g., birds)	3.30	1.25
I camped	2.37	1.32
I hunted	1.62	1.12
I fished	2.41	1.40

Note. alpha = Cronbach's reliability coefficient, *M* = mean, *SD* = standard deviation.

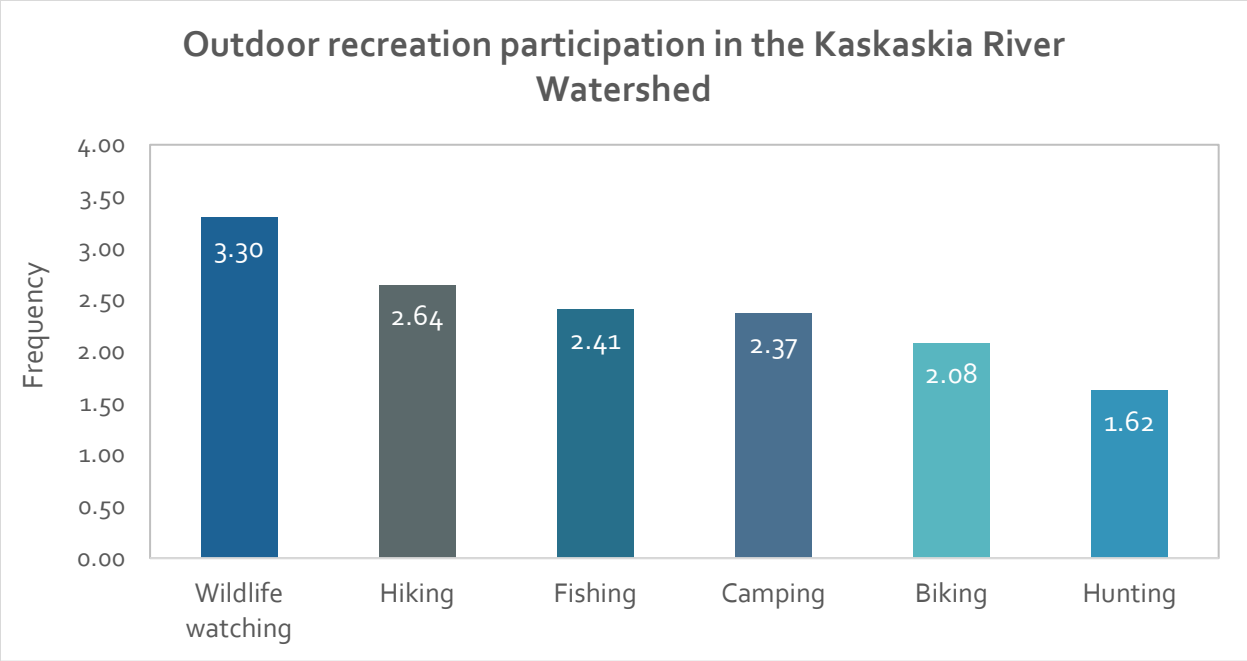


Figure 5.5.1. Recreation participation of Kaskaskia residents in 2019

Regarding recreation activity types, including appreciative activities (i.e., wildlife watching, hiking, camping, biking) were more commonly performed (mean frequency of the four activities was 2.60) than were consumptive activities (i.e., fishing and hunting; mean frequency of the two activities was 2.01). Therefore, respondents engaged more actively in outdoor recreation activities that focused on enjoying nature without directly affecting natural resources, compared to those that involved direct environmental impacts.

Experiences related to nature help people better understand and emotionally connect with outdoor environments. Such experiences during early stages in life can foster one's environmentalism that persist later in adulthood. Early-life nature experiences identified by previous studies (Cheng & Monroe, 2012) can be broadly grouped into two types. One of these types is nature-based outdoor recreation which represent leisure activities in nature such as hiking, birdwatching, and fishing. The other type of experiences is educational experiences such as environmental education and media exposure that facilitate environmental awareness. For example, learning about the environment at school or through books exemplifies this type of experience. To assess residents' early-life experiences with nature, survey questions were adapted from previous studies tapping into the different types of childhood experiences (Cleary et al., 2018). Three questions were asked to evaluate each category of outdoor recreation and educational experiences. To gauge how the pattern of nature experiences might have changed over time, we asked respondents to assess their experiences during childhood and adolescence separately as shown in Tables 5.5.2 and 5.5.3.

Table 5.5.2. Reported early-life nature experiences: Childhood

Question	*M*	*SD*
Outdoor recreation (alpha = 0.71)	**2.96**	**1.06**
I hiked, camped, or watched wildlife	3.13	1.30
I hunted or fished	2.72	1.39
I was involved in gardening	3.02	1.31
Educational experiences (alpha = 0.78)	**3.13**	**1.05**
I learned about the environment at school	3.29	1.21
I learned about the environment through media (e.g., books, television)	3.06	1.22
I participated in organized outdoor programs (e.g., nature camps, field trips)	3.04	1.33

[1]5-point scale: Very rarely (1), Rarely (2), Occasionally (3), Often (4), Very often (5)

Table 5.5.3. Reported early-life nature experiences: Adolescence

Question	*M*	*SD*
Outdoor recreation (alpha = 0.72)	**2.82**	**1.07**
I hiked, camped, or watched wildlife	3.08	1.27
I hunted or fished	2.60	1.40
I was involved in gardening	2.78	1.33
Educational experiences (alpha = 0.79)	**2.99**	**1.07**
I learned about the environment at school	3.14	1.22
I learned about the environment through media (e.g., books, television)	3.04	1.27
I participated in organized outdoor programs (e.g., nature camps, field trips)	2.79	1.34

Five-point scale: Very rarely (1), Rarely (2), Occasionally (3), Often (4), Very often (5)

Respondents indicated that on average they had engaged in environmental education and media exposure (*M* = 3.13) slightly more often than outdoor recreation activities (*M* = 2.96) during childhood. A similar pattern emerged in adolescence with higher reported levels of engagement in environmental education and media exposure (*M* = 2.99) than outdoor activities (*M* = 2.82). This suggests that respondents on average had more experiences with nature through school and media than through nature-based recreation activities, although the differences are marginal. Respondents had lower scores on all questions about adolescence when compared childhood, suggesting that the frequency of experiences with nature declined as they grew up (Figure 5.5.2).

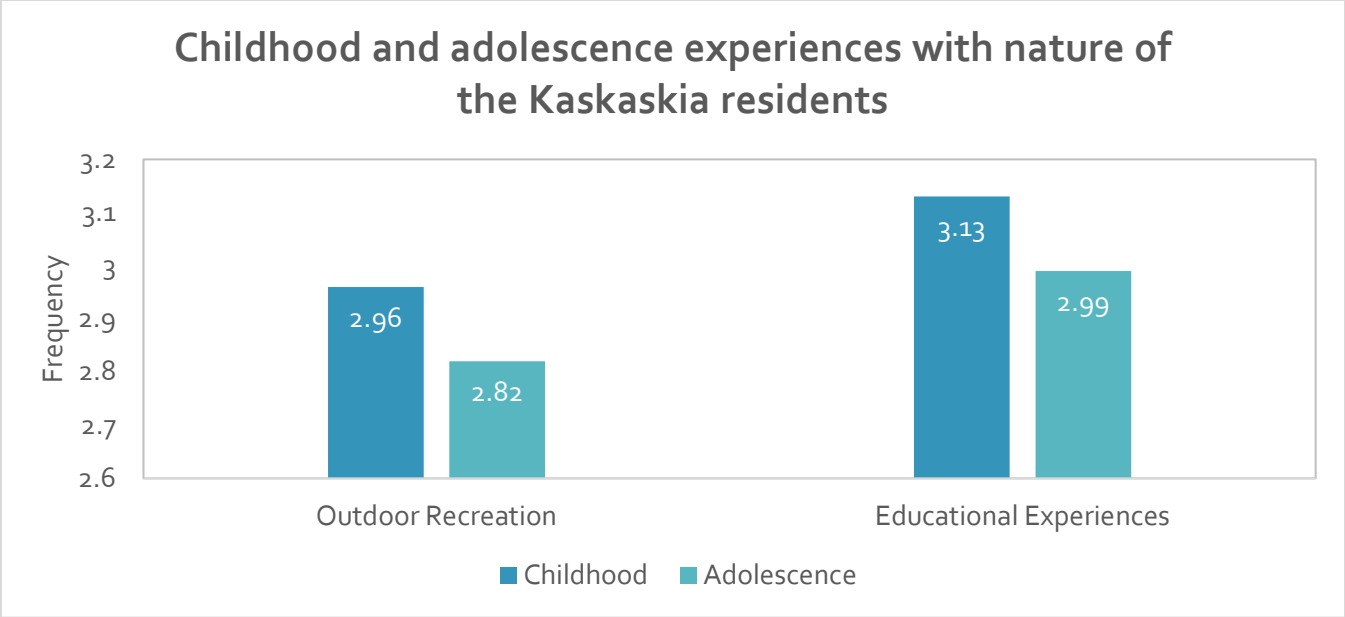


Figure 5.5.2. Early-life nature experiences

Humans are believed to have inherent needs to form a close relationship with nature. Connection to nature is an important part of understanding people's intentions to protect the environment. We assessed respondents' feelings of connection to nature using a shortened form of Nature Relatedness Scale (Nisbet & Zelenski, 2013). We evaluated nature connection by asking six questions (Table 5.5.4).

Table 5.5.4. Mean response and standard deviations for nature relatedness scale

Question	*M*	*SD*
Nature Relatedness (alpha = 0.89)	**3.69**	**0.82**
My ideal vacation spot would be a remote, natural area	3.71	1.11
I always think about how my actions affect the environment	3.67	0.97
My connection to nature and the environment is a part of my spirituality	3.49	1.09
I take notice of natural environments wherever I am	3.97	0.89
My relationship to nature is an important part of who I am	3.63	1.03
I feel very connected to all living things and the earth	3.67	1.02

Five-point scale: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5)

We found that on average, respondents had a moderate to high level of connection to nature in the Kaskaskia River Watershed (*M* = 3.69). This finding indicates that respondents have strong relationships with nature in general. For example, they may notice nature around them and be spiritually connected to nature. Understanding the reasons why people value their places and believe them to be special and distinct can reveal helpful insights on their perceptions and behaviors. We

assessed the meanings that respondents associated with the area where they live in the watershed. Multiple questions were asked to assess: agricultural pride, family legacy, farming lifestyle, nature conservation, outdoor living, and small-town feel. These meanings of places were adapted from previous research (Evans, 2019) and further modified to fit the regional context.

Agricultural pride referred to the distinctiveness of the region for the richness of farmland, the fertile soil, and the agricultural products produced in the region. Family legacy were meanings associated with the region as an ideal place to raise a family and offers opportunities to create and perpetuate a family legacy. That is, the region was unique because it offered opportunities to create strong family bonds that last for generations in the region. Meanings associated with farming lifestyle represented the uniqueness of the region for the lifestyle associated with being a farmer and agriculturalist, such as a deep sense of responsibility for the land, stewarding the land, and being independent as well as working in the place you live. Nature conservation referred to the distinctiveness of the region for the presence of conservation lands and other public lands that promote fish and wildlife conservation. Meanings related to outdoor living referred to the region being unique for the presence of rural landscapes that contrast with the city and urban areas, marked by a greater abundance and access to outdoor activities and open spaces. Small-town feel referred to the uniqueness of the region for the tightly knit-social fabric and feeling of being connected to the community. That is, the region was unique for the shared history, identity, and culture in the region.

We found that survey respondents agreed with all statements that measured meanings associated with their favorite places in the Kaskaskia River Watershed (see Table 5.5.5). Of the six meanings, meanings of nature conservation received the lowest rating (M = 3.57) indicating that compared to the other meanings, people did not as strongly associate the meanings of protected natural areas with the region. Both meanings of family legacy and small-town feel received similar and higher ratings than nature conservation (M = 3.75 and M = 3.78), indicating that people associated the region more with the social and familiar meanings of the watershed. Lastly, three meanings received similar and high ratings farming lifestyle (M = 3.81), agricultural pride (M = 3.88), and outdoor living (M = 3.91). These findings indicate that respondents believed the Kaskaskia watershed region was most unique for the opportunities to pursue a farming lifestyle, experience the outdoors, and the community related to agricultural pride.

Table 5.5.5. Mean response and standard deviations for place meanings scale

Question	*Mean*	*SD*
Outdoor living (alpha=0.83)	**3.91**	**0.87**
Outdoor recreation opportunities	3.83	1.00
Rural landscapes	3.90	1.03
Opportunities to experience nature	4.01	0.97
Agricultural pride (alpha=0.91)	**3.88**	**0.91**
Fertile soils for growing crops	3.96	0.99
Agricultural innovation	3.69	0.98
Farmland productivity	3.98	1.00
Farming lifestyle (alpha=0.82)	**3.81**	**0.82**
Freedom to work independently	3.83	0.93
Ability to work hard to make a living where you live	3.85	0.93
A sense of responsibility for the land	3.73	1.00
Small-town feel (alpha=0.87)	**3.78**	**0.89**
Shared community history and culture	3.70	0.97
Local community where residents know each other	3.92	0.98
Close personal relationships in the community	3.72	1.05
Family legacy (alpha=0.85)	**3.75**	**0.91**
Ability to continue a way of life that is valued by my family	3.74	0.99
Opportunities to create a legacy that supports future generations in my family	3.58	1.05
A good place to raise a family	3.94	1.06
Nature conservation (alpha=0.84)	**3.57**	**0.92**
Forests and other wooded areas	3.59	1.10
Natural conservation areas	3.63	1.03
Protected fish and wildlife areas	3.49	1.04

[1]5-point scale: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5)

The strength of connections between a person and place is known as "place attachment." We asked respondents to agree or disagree with multiple statements about the area where they lived in the watershed to understand three types of place attachment (Kyle et al., 2004). First, we evaluated "place dependence" as the degree to which the watershed afforded residents specific and irreplaceable features that were necessary to achieve their goals. That is, people develop place dependence when there is no substitute for the types of activities and experiences that they desire. Second, we asked questions about "place identity" that we defined as how respondents' sense of self, or personal identity, was defined in relation to the watershed. An individual may see a place as a resource for satisfying goals and at the same time see the place as a part of his or herself. Finally, we

evaluated "social bonding" that encompassed a sense of attachment based not only a physical setting but also a social element. That is, physical settings served as backdrops to social and cultural experience.

We found that survey respondents agreed with all statements that measured their attachment to places in the Kaskaskia (see Table 5.5.6). Among the types of attachment, social bonding received the lowest level of agreement (M = 3.45), indicating that respondents felt the places in the region were less important for building meaningful relationships with the friends and family. Place dependence received a higher score on average (M = 3.58) compared to social bonding but was lower than place identity (M = 3.73). This finding indicates that places in the region are more important for their uniqueness compared to the social relationships, but less important than the sense of self that is associated with the region, which was rated as the most important basis of attachment to places.

Table 5.5.6. Mean response and standard deviations for place attachment scale

Question	*Mean*	*SD*
Place identity (alpha=0.89)	**3.73**	**0.99**
The area where I live means a lot to me	3.87	1.05
I am very attached to the area where I live	3.70	1.12
I identify strongly with the area where I live	3.63	1.11
Place dependence (alpha=0.93)	**3.58**	**1.02**
I enjoy living here more than any other area	3.41	1.18
Living here is more important than living in any other place	3.20	1.19
I get more satisfaction out of living here than living in any other place	3.32	1.20
Social bonding (alpha=0.85)	**3.45**	**1.06**
I have a lot of fond memories with other people in the area where I live	3.89	1.12
I bring my family and friends to the area where I live	3.74	1.08
I have a special connection to the area where I live and the people who live here	3.77	1.12

[1]5-point scale: Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5)

5.6. Relationships among Experiences in Nature, Connections to Places, and Pro-environmental Behavior

People's nature experiences and connections to places can shape their care for the natural landscape and intentions to act pro-environmentally. We examined how Kaskaskia residents' intentions to perform pro-environmental behavior were correlated with their outdoor recreation participation, early-life experiences with nature, connection to nature, place attachment, and place meanings.

The bivariate Pearson correlation coefficients using the mean scores of pro-environmental behavioral intentions and the subscales of experiences in nature are presented in Table 5.6.1. All correlation coefficients were statistically significant ($p < 0.001$) and were considered meaningful to interpret.

Table 5.6.1. Correlations between experiences in nature and pro-environmental behavioral

Variable (correlated with pro-environmental behavior)	*r*	Strength
Outdoor recreation participation in 2019	0.39	Moderate
Early-life nature experiences – childhood outdoor recreation	0.32	Moderate
Early-life nature experiences – childhood educational experiences	0.43	Moderate
Early-life nature experiences – adolescence outdoor recreation	0.36	Moderate
Early-life nature experiences – adolescence educational experiences	0.40	Moderate
Connection to nature (measured as Nature Relatedness)	0.54	Strong

r = Pearson's correlation coefficient. The strength of correlations was interpreted as small ($r < 0.3$), moderate ($0.3 < r < 0.5$), or strong ($0.5 < r$).

All variables of experiences in nature were positively correlated with the pro-environmental behavioral intentions of Kaskaskia residents. Specifically, residents who participated in outdoor recreation also were more likely to indicate stronger intentions. Residents who had participated in outdoor recreation and had more environmental educational experiences more frequently during their childhood or adolescence were also more likely to indicate stronger pro-environmental behavioral intentions. Lastly, those who feel more strongly connected to nature also indicated stronger intentions to engage in behavior. The strength of correlations with intentions was moderate for all variables ($r = 0.32–0.43$) except for connection to nature which had a strong correlation ($r = 0.54$) with pro-environmental behavioral intentions.

The bivariate Pearson correlation coefficients using the mean scores of pro-environmental behavioral intentions and the subscales of place attachment and place meanings are presented in Table 5.6.2. All correlation coefficients were statistically significant ($p < 0.001$) and were considered meaningful to interpret.

Table 5.6.2. Correlations between place attachment and meanings with pro-environmental behavior

Variable (correlated with pro-environmental behavior)	*r*	Strength
Place attachment – place identity	0.25	Small
Place attachment – place dependence	0.18	Small
Place attachment – social bonding	0.26	Small
Place meaning – nature conservation	0.34	Moderate
Place meaning – outdoor living	0.30	Moderate
Place meaning – agricultural pride	0.26	Small
Place meaning – farming lifestyle	0.30	Moderate
Place meaning – small town feel	0.30	Moderate
Place meaning – family legacy	0.28	Small

r = Pearson's correlation coefficient. The strength of correlations was interpreted as small ($r < 0.3$) or moderate ($0.3 < r < 0.5$)

Place attachment and place meanings were positively correlated with pro-environmental behavioral intentions. Residents who indicated they more strongly identified with, were more dependent upon, or where more social connected to the area where they live were more likely to indicate stronger intentions to engage in pro-environmental behavior. Similar relationships existed between resident's place meanings and intentions to engage in future pro-environmental behaviors. Among the types of place attachment and meanings, five had small effects with behaviors ($r = 0.18–0.23$) while four had moderate effects ($r = 0.30–0.34$).

We also found that respondents with higher self-reported knowledge of natural resource management challenges in the Kaskaskia River Watershed indicated stronger intentions to engage in pro-environmental behavior (Table 5.6.3.). Levels of knowledge for water quality had a moderate relationship with behavior ($r = 0.30$), while knowledge about sustainable agriculture, recreation, and fishers had a small relationship with behavior ($r = 0.24–0.28$).

Table 5.6.3. Correlations between knowledge with pro-environmental behavior

Variable (correlated with pro-environmental behavior)	*r*	Strength
Knowledge about sustainable agriculture	0.28	Small
Knowledge about water quality	0.30	Moderate
Knowledge about recreation	0.24	Small
Knowledge about fisheries	0.27	Small

r = Pearson's correlation coefficient. The strength of correlations was interpreted as small ($r < 0.3$) or moderate ($0.3 < r < 0.5$).

Lastly, we found that there was no relationship among intentions to engage in pro-oenviroental behaviors and sociodemographic information (including age, gender, duration living in Illinois, owning farmland, or between residents based on residing in an urban or rural area).

6. Implications and Concluding Remarks

The Kaskaskia River Watershed is an important region that provides multiple and diverse benefits such as farming and livelihoods for residents. However, this region is also experiencing change that can reduce the ability of this system to sustainability provide diverse benefits. To strive towards maintaining a resilient and sustainable agroecosystem it is it is important to develop evidence-based decisions that integrate social and ecological perspectives. The central theme of this work was to leverage social science research to understand resident's perceptions and preferences of landscape change in the region, as well as to deepen our understanding of human behaviors and drivers of these behaviors using a place-based approach to conservation.

Through three phases of mixed methods research we developed relationships with local experts and community stakeholders, deepened our understanding of the unique forces of change occurring in the Kaskaskia River Watershed region, and sought to develop empirical insight of resident's preferences for future landscape conditions of the region and explain drivers of behaviors which contribute to the sustainability of the region.

First, through interviews with farmers and other residents, we developed an appreciate dialogue around the unique qualities of places and ways of life. We also found that farmers framed their decisions through two narratives, with the first connecting decisions to their family legacies, and desires to ensure family land could be passed along to future generations. The second narrative identified by our analyses connecting decisions to notions of efficiency in order to maximize profits.

Second, through an expert panel and series of participatory mapping focus groups we found that experts associated multiple and diverse benefits with the Kaskaskia River Watershed region, including crop production, but also opportunities and access for recreation, wildlife habitat, and values associated with farming lifestyle and rural heritage. We also found that experts associated multiple threats as posing a risk to the watershed, including erosion, run-off, and siltation. Results from focus groups indicated that benefits and threats were clustered around the Kaskaskia River as well as clustered around both Lake Shelbyville and Carlyle Lake.

Lastly, through a survey of residents we found that respondents preferred future landscape conditions including increases in the number of acres farmed using sustainable agriculture practices, as well as changes that lead to an increase in water quality. Respondents also indicated they intended to engage in future behaviors that would minimize harm to the environmental quality of their local places in the region. We found that residents felt connected to their local areas in the region and that they associated diverse place meanings with their places. Similarly, we found that residents felt connected to nature in their region and had multiple outdoor recreation experiences. Our final results indicated that respondent's intentions to engage in behavior was most strongly associated with their strength of connection they felt towards nature.

Overall, through our research we found that residents value the Kaskaskia River Watershed for the many diverse benefits and meanings that the region provides. Across all three phases of research, we found that farmers, residents, and other diverse local expert stakeholders valued the watershed for the provision of agricultural products. It was also clear from our survey that while the provision of crop production is important, residents also indicated a preference to see an increase in the number of acres of agriculture land that is farmed using sustainable agriculture practices. Additionally, our results suggest the importance that family values, rural community heritage, and emotional connections to places plays in decision making and preferences for the future. Decision-makers should seek to continue to recognize the importance that these intangible values and meanings associated with places in the region play in individual and community preferences, decisions, and behaviors. Lastly, evidence from this research suggests that opportunities for outdoor recreation is also highly valued. Recreation was indicated as an important value by expert stakeholders, was preferred by residents in our survey, and much of our work pointed to Lake Shelbyville and Carlyle Lake as being important places in the watershed to provide recreation opportunities, however; as indicated by our mapping results, many threats were also aggregated around these locations. Therefore, decision-makers should continue to identity mechanisms that enhance opportunities for outdoor recreation.

7. Literature Cited

Cheng, J. C.H., & Monroe, M. C. (2012). Connection to nature: Children's affective attitude toward nature. *Environment and Behavior, 44*(1), 31–49.

Cleary, A., Fielding, K. S., Murray, Z., & Roiko, A. (2018). Predictors of Nature Connection Among Urban Residents: Assessing the Role of Childhood and Adult Nature Experiences. *Environment and Behavior*, *52*(6), 579-610.

Ducks Unlimited (2010). Updating the National Wetlands Inventory (NWI) for Illinois. State Wildlife Grant Program, Project #T-52-D-1. Report submitted to the Illinois Department of Natural Resources, Springfield, IL, USA

Evans, N. M. (2019). Social-ecological systems resilience in changing rural landscapes of the midwestern United States. (Doctoral dissertation).

Hanberry, B. B., & Nowacki, G. J. (2016). Oaks were the historical foundation genus of the east-central United States. *Quaternary Science Reviews*, *145*, 94-103.

IDA, Illinois Department of Agriculture (2021). Facts about Illinois Agriculture. Retrieved from https://www2.illinois.gov/sites/agr/About/Pages/Facts-About-Illinois-Agriculture.aspx

IDNR, Illinois Department of Natural Resources. (2021). Illinois Rivers and Streams. Retrieved from https://www2.illinois.gov/dnr/education/Pages/ILRiversStreams.aspx

Illinois Forestry Development Council (2018). Illinois forest action plan: A statewide forest resource assessment and strategy. Retrieved from http://ifdc.nres.illinois.edu/reports

Kaskaskia Watershed Association (KWA), Inc (2017). http://www.cooperativeconservation.org/viewproject.aspx?id=919

Kyle, G., Graefe, A., Manning, R., & Bacon, J. (2004). Effect of activity involvement and place attachment on recreationists' perceptions of setting density. *Journal of leisure Research, 36*(2), 209-231.

Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). *Stated choice methods: analysis and applications.* Cambridge university press.

McShea, W.J., Healy, W.M., Devers, P., Fearer, T., Koch, F.H., Stauffer, D. and Waldon, J. (2007), Forestry matters: Decline of oaks will impact wildlife in hardwood forests. *The Journal of Wildlife Management, 71*(5), 1717-1728. https://doi.org/10.2193/2006-169

Nisbet, E. K., & Zelenski, J. M. (2013). The NR-6: a new brief measure of nature relatedness. *Frontiers in Psychology, 4,* 813.

RC&D Inc. Southwestern Illinois (2002). Kaskaskia River Watershed: An Ecosystem Approach to Issues & Opportunities. Funding provided by IDNR U.S. Army Corps of Engineers.

Shackelford, A. G. (2008). The Illinois Indians in the confluence region: Adaptation in a changing world. In R.D. Edmunds (Ed.), *Enduring nations: Native Americans in the Midwest* (pp. 15-36). University of Illinois Press.

Shipley, N. J., Johnson, D. N., van Riper, C. J., Stewart, W. P., Chu, M. L., Suski, C. D., ... & Shew, J. J. (2020). A deliberative research approach to valuing agro-ecosystem services in a worked landscape. *Ecosystem Services, 42*, 101083.

Sloan, J.J., Corcoran, J.M., & Murtaugh. A. R. (2018). Final Project Report. Kaskaskia River Basin Feasibility Study Report. Agreement No. KRBFS1701. Submitted to: the State of Illinois Environmental Protection Agency Bureau of Water By: HeartLands Conservancy (Mary Vandevord, President & CEO). Retrieved from: http://www.ngrrec.org/uploadedFiles/Pages/Research_Program/Floodplain_Forests_and_Water_Quallity(1).pdf

Thapa, B. (2010). The mediation effect of outdoor recreation participation on environmental attitude-behavior correspondence. *The Journal of Environmental Education, 41*(3), 133–150.

van Riper, C., Winkler-Schor, S., Foelske, L., Keller, R., Braito, M., Raymond, C., ... & Johnson, D. (2019). Integrating multi-level values and pro-environmental behavior in a US protected area. *Sustainability Science, 14*(5), 1395-1408.

8. Appendix

8.1. Appendix A: Questions Used during Interviews in the First Phase of Research

The tone of the interview will be conversational and relaxed. The questions do not need to be asked in the order below. Prior to interview: (a) provide an introduction to the study, and (b) walk through the "consent form," and ask if they would mind if the interview be audio-recorded.

1. **Identify key issues pertaining to agricultural production and conservation (e.g., erosion control, wetland conservation, water quality/quantity).**

    a. What are the current agricultural practices in the region? What practices are related to conservation? If practiced, what are the effects?

    b. What factors do you consider in your farming practice? When making decisions about tilling, planting, caring, and harvesting? Cost-benefits? Caring for land? Downstream effects? Adjacent land-owners? Global markets? Kinds of seeds or crops planted?

    c. Farmers often have a deep knowledge and care for the lands they farm. Could you talk about what you've learned about your land from your many years of farming? What are you doing differently now due to something you've learned over the years?

    d. Do you think about your farm as being part of the Kaskaskia River watershed? If so, in what ways? If not, in what ways do you think your farming practices and outputs connect with other farmers and those who live nearby your farm?

2. **Identify drivers of change that are impacting the special places, benefits, and stressors in the watershed.**

    a. What changes has the farming community experienced over the past 10 years? Do these changes have consequences for land-use practices? How have these changes affected your practice?

    b. When I think about changes in Midwestern ag, things like urban encroachment, global markets, more intense rainfall events, or extremes in weather temperatures come to mind. To what extent has this area experienced such changes? If so, what do you think causes these changes? What are consequences of these changes?

3. **Identify special places in the region.**

    a. Are there any places in the Kaskaskia River region that are important to you? Your family? Your community? Your nation/state?

    b. What has been a highlight for you when you think about or visit this place?

c. Are there any times you recall where you went out of your way to protect your meaningful place? Do you do anything to support that place to ensure it is around in the future? What are these actions?

d. How long have you farmed your land? You've purposely chosen to farm this land, in ways that many others would have moved on. Could you talk about your care about this place? What makes this place special/unique? Talking points for conversation would be public/private land distinction, or one's own land as distinct from public places in the region.

e. Do you ever take your family or friends to these places? Where? Why? When people come to visit your farm, what do you want them to remember when they leave? What relationship between you and your farm would you like others to know about?

f. We'd like to better understand the feelings you might have experienced in these places. Please read over this list of feelings and emotions and talk about times you can recall experiencing these emotions in the region.

4. Identify places that provide benefits or are stressors in the region.

a. Are there "hot spots" of change in the Kaskaskia watershed? What/where are these places? Is this change good/bad – characterize your thoughts on the landscape change.

b. Are there places in the watershed that have not changed over time? Where are these places? Do you see them changing in the future, or is there pending change on the horizon?

c. What are the effects of landscape change in the watershed on your farming practices? Quality of life? For society?

d. To what extent would other farmers agree with some of your thoughts about landscape change, and caring for the land?

5. Final question

a. Did miss we anything? Anything we did not talk about? Are there things that are essential to agricultural or conservation that we have not mentioned?

b. What do you think are the most pressing needs for people in the community and watershed? In what ways are agriculture and conservation interconnected?

c. Any questions for us? About our study? For future, would you be interested in participating further with this study?

8.2. Appendix B: Measurement Instrument used during Participatory Mapping Exercise as part of the Second Phase of Research

SECTION A: Benefits

This is a three-part activity sheet. In Section A, we would like to understand the benefits you associate with the Kaskaskia River Watershed

Imagine you could distribute $100 to ensure the watershed kept its existing set of benefits. You might assign 100 dollars to one benefit and zero to all the others, or assign $50 to one, $25 to another and $25 to yet another. Please allocate $100 among the 18 benefits listed on this page in a way that expresses the reasons why you personally think the watershed is important.

_____ **Crop production (CROP)**: Food sources, livestock products, and ethanol produced by the local landscape

_____ **Farming lifestyle (FARM)**: A way of life that appeals to small-scale farmers and represents community history (e.g., traditions tied to one's culture, industrial use)

_____ **Recreation (REC)**: Improvements on quality of life for residents who engage in activities such as hunting, boating, and fishing

_____ **Tourism (TOUR):** Opportunities for generating income from out-of-town visitors to the Kaskaskia

_____ **Scenic beauty (SCENIC)**: Pleasing features that show pastoral landscapes, peaceful and relaxing settings

_____ **Erosion protection (EP)**: Agricultural practices (e.g., cover crops, buffer strips) and riparian areas that stabilize soil

_____ **Soil health (SOIL):** The quality of soil that regulates clean air and water, provides physical stability and support, and sustains plant and animal life

_____ **Filtration of nutrients (FILT):** Places where nutrients are stored, transformed, and cycled in the soil

_____ **Biodiversity (BIO):** The variety of plant, animal and fish species found in the watershed

_____ **Places for wildlife (WILD)**: Habitat that provides food, shelter and corridors for wildlife and nongame species

_____ **Learning (LEARN)**: Opportunities for acquiring new information, skills, values, and education

_____ **Commerce (COM)**: Businesses and economic support required for modern living; hubs for goods and services

_____ **Transportation (TRANS)**: The practice of moving goods and services, especially along waterways and navigation channels in the watershed

_____ **Water supply (WS):** Provision and quality of water supplies provided by the watershed

_____ **Flood control (FLD)**: The reduction or prevention of impacts on local communities from flood waters

_____ **Places for social interaction (SOC)**: A sense of community facilitated by manmade structures (e.g., community centers, houses of worship, schools)

_____ **Income from non-agricultural products (NON-AG)**: Resources (e.g., timber harvesting, manufacturing, conservation) that provide income for local communities

_____ **Wild food harvest (FOOD)**: fishing and hunting for food, harvesting (e.g., berries, mushrooms), and trapping for food

_____ **TOTAL = $100**

SECTION B: Threats

In this section, we would like to understand the threats that you associate with the Kaskaskia River Watershed.

Imagine you could distribute $100 to address the different threats facing the watershed. Similar to the exercise above, please allocate $100 among the 14 threats listed on this page in a way that expresses how they should be prioritized in the future.

_____ **Erosion (ERO)**: The removal of fertile soil from the landscape.

_____ **Increased Flooding (FLOOD)**: The increased occurrence of water overflowing the river and stream banks.

_____ **Industrial Demand (ID)**: Increasing use of resources by industrial users.

_____ **Poor Governance (GOV):** Failure of government officials to meet the needs of the public.

_____ **Lack of Biological Diversity (DIV)**: A decrease in the number of species across wildlife and other aquatic, terrestrial, and plant species.

_____ **Invasive Species (INVS)**: Non-native species that pose danger to environment or economy.

_____ **Run-off and Pollution (ROP):** Drainage of excess storm water, often carrying debris, chemicals, and other pollutants.

_____ **Commercial and Residential Demand (CRD):** Increasing use of resources by commercial and residential users.

_____ **Siltation and Sedimentation (SISD)**: Increasing concentration and deposition of suspended sediments in lakes, rivers, and streams.

_____ **Increased Tiling (TILE)**: Increasing installation and use of tile drainage.

_____ **Removal of Environmental Buffers (BUFF)**: The removal of vegetation, such as grass waterways, riparian strips, or windbreaks.

_____ **Unstable Fertilizer and Herbicide Application (FERT)**: Application of excess fertilizer and herbicide beyond the necessary limit.

_____ **Habitat Fragmentation (HAB)**: Breaking up large tracts of uniform habitat into smaller chunks.

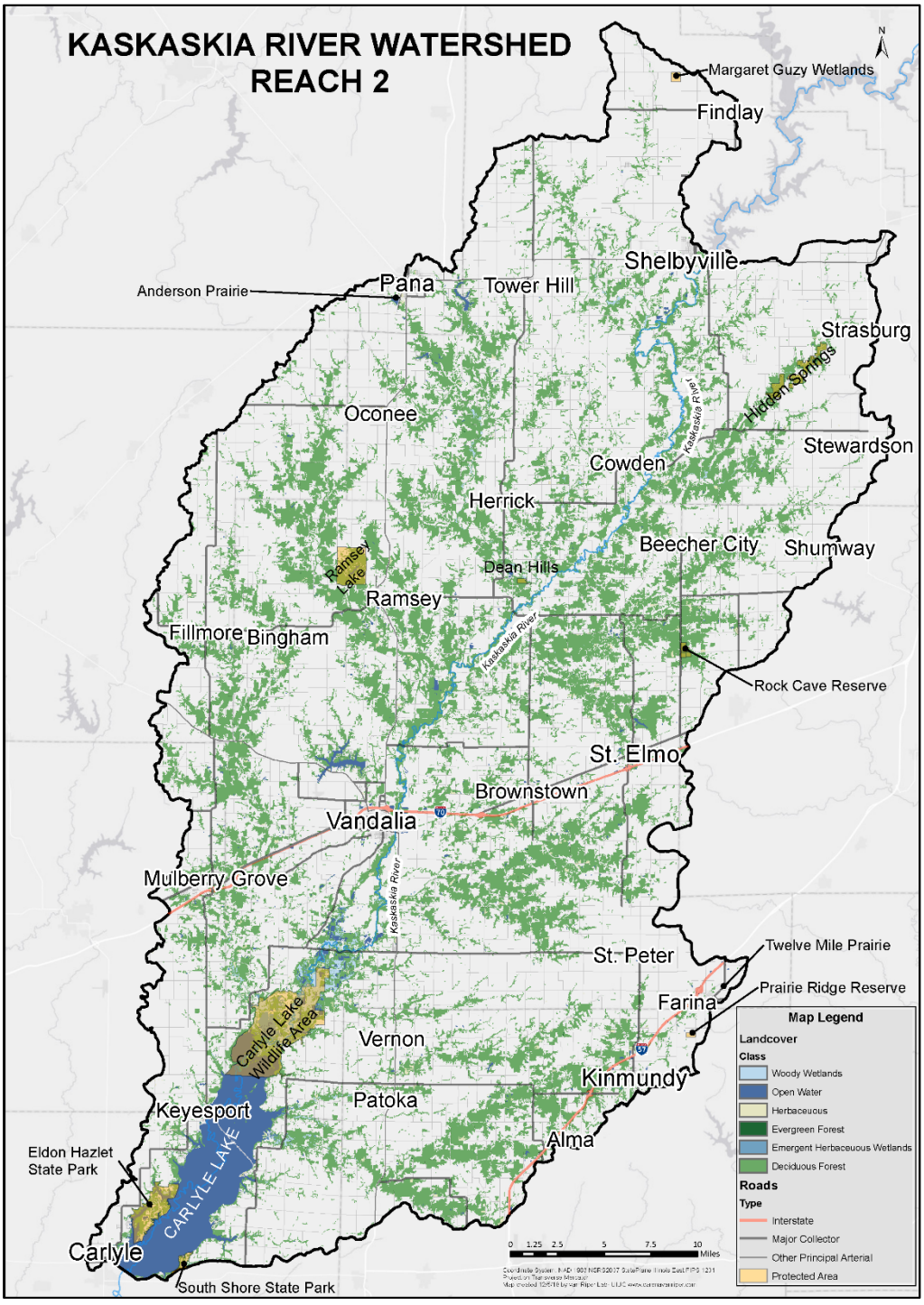
_____ **Resistance to Change (CHANGE)**: Lack of support regarding community development.

_____ **TOTAL = $100**

SECTION C: Mapping benefits and threats

In the previous section you told us which benefits and threats were important to you as an individual. Next, please identify the places that provide those benefits and are threatened on the map below.

Considering the benefits and threats identified in the previous section, which places reflect those qualities? Using the map below: (1) Identify up to five places that you associate with each of the benefits to which you assigned dollars in the previous question. Use the abbreviations to identify which benefit is associated with your marks. Please draw dots or shapes with the **black pen** to locate the benefit. (2) Use the **red pen** to identify the sources of threats that are impacting the benefits of places in the watershed. Remember to use the abbreviations to identify which threats are associated with your marks.



8.3. Appendix C: Residential Survey used in the Third Phase of Research and Summary of Response Frequencies

A study of residents surrounding the Kaskaskia River: Understanding your preferences for landscape change

You are one of a small number of people chosen to participate in this study because you live in one of 22 counties in Illinois that are part of the region surrounding the Kaskaskia River. This region is a great place to live, yet there are many changes influencing the landscape. To understand how residents like you are responding to these changes, the University of Illinois is partnering with local organizations to learn more about your opinions and experience. Your response is important to us. Results from this research will be made publicly available and shared with local residents, community leaders and decision-makers.

All personal information will be kept confidential and your participation is voluntary. If you decide to participate, you are free to withdraw at any time. If for any reason you prefer not to participate, you may exit now. By clicking "next," you are agreeing to participate in this study. Please answer each question carefully and save any additional comments for the final page. This questionnaire will take about 20 minutes to complete.

If you have questions or concerns about your rights as a participant please contact the University of Illinois at Urbana-Champaign Office for the Protection of Research Subjects at 217-333-2670 or via email at **irb@illinois.edu**. If you have any questions about the study, please contact the project leader, Carena van Riper at **cvanripe@illinois.edu**. You can find more information about the project at the website link below.

https://publish.illinois.edu/kaskaskia/

Screening Questions

What is your gender?

65.3%	34.7%
Female	Male

What is your age? Mean = 41.32, Standard deviation = 15.57

With which racial group(s) do you identify? (Please ✓all that apply)

2.4%	2.4%	83.1%	12.5%	0%
American Indian and Alaska Native	Asian	White	Black or African American	Pacific Islander

1.6%	1.1%
Other	Prefer Not to Answer

Do you consider yourself to be Hispanic, Latino or Latina? (Please ✓ one)

3.7%	96.3%
Yes	No

Section 1 of 6: Your Background

In this section, we ask you to provide some information about you and the members of your family, your knowledge, and experiences in the outdoors.

1. **How many <u>years,</u> including this one, have you been living in Illinois?** Mean = 32.51, SD = 18.42

2. **How many <u>years</u> have you been living in your current residence?** Mean = 9.72, SD = 10.49

3. **Are you or the members of your family employed in any of the following sectors?** (*Please ✓all that apply*)

13.2%	Sales	8.2%	Business and/or Finance
16.0%	Food Services	4.0%	Trade and/or Utilities
2.3%	Parks and/or Recreation	2.2%	Planning
1.6%	Tourism	6.2%	Agriculture
7.9%	Administrative support	14.5%	Manufacturing and/or construction
20.5%	Education	84.7%	Other
1.6%	Environmental Management		

3b. From the above list, which sector aligns closest to the one in which you work?

3c. Sustainability is increasingly considered important. We define sustainability as a desired state of existence that meets the needs of current generations without compromising future generations. How many <u>years</u> have you been adopting sustainable practices within your line of work?

Mean = 7.13

SD = 9.91

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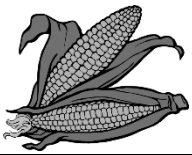
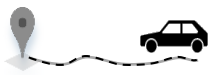
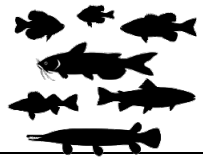
4. The places in the region surrounding the Kaskaskia River are changing, particularly around the four topical areas listed below. How would you rate your knowledge of these topics?	No knowledge	Slight knowledge	Some kNowledge	Moderate knowledge	High knowledge
a. Sustainable agriculture	34.0%	26.1%	25.4%	10.2%	4.1%
b. Water quality	25.1%	27.2%	28.5%	14.7%	4.4%
c. Recreation	24.0%	19.3%	26.7%	21.7%	8.3%
d. Fisheries	42.1%	23.5%	17.5%	11.3%	5.3%

Section 2 of 6: Future Scenarios

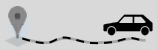
Landscapes in the region surrounding the Kaskaskia River are changing in ways that affect residents. In this section, we provide background information about possible changes that may occur **over the next 30 years**. For each question in the next section, please indicate your preferences for the future by choosing between two hypothetical scenarios or the current condition. Each scenario includes five "features" that represent possible conditions in the future. These features are described below. *Please read this material carefully.*

Acres of Sustainable Agriculture 	Agriculture is the most dominant land use in the region surrounding the Kaskaskia River. **Currently, half of all land that is farmed for corn and soybean is planted using sustainable agricultural practices** including cover crops and reduced tillage. The adoption of more sustainable farming practices is expected to change in the future. The change in acres of sustainable agriculture that may occur **over the next 30 years** is set at three levels: **1. Decrease in acres of farmland planted using sustainable practices by 25%** **2. Maintain current acres of farmland planted using sustainable practices** **3. Increase in acres of farmland planted using sustainable practices by 25%**
Water Quality 	The water quality of rivers and lakes in the region surrounding the Kaskaskia River is affected by different forms of nitrogen that affect human health and environmental conditions. Over the last five years, **the amount of nitrogen has exceeded the Mississippi River and Gulf of Mexico Nutrient Task Force's recommended target levels** for meeting water quality standards**.** Water quality in the lakes and rivers that may **occur in the next 30 years** is set at three levels: **1. Increase in water quality by 0%** **2. Increase in water quality by 25%** **3. Increase in water quality by 50%**
Distance to Public Recreation Areas 	Distance to a public recreation area refers to the miles required to travel in order to access public land from your home. **Currently, people living in the region surrounding the Kaskaskia River can recreate near their home or travel to nearby recreation areas.** These settings provide opportunities for activities such as boating, camping, hunting, fishing, sailing, and hiking. The distance to recreation from your home is set at three levels: **1. Travel less than one mile from your home to access public recreation areas** **2. Travel 25 miles from your home to access public recreation areas** **3. Travel 50 miles from your home to access public recreation areas**
Fish Variety 	The rivers and lakes in the region surrounding the Kaskaskia River are home to a variety of native fish species. The total variety of **native fish species has been decreasing over the past 40 years** in the region. The change in native fish variety that may occur **over the next 30 years** is set at three levels: **1. Decrease in native fish variety by 15%** **2. Maintain current levels of native fish variety** **3. Increase in native fish variety by 15%**
Conservation Fund 	To benefit the current and future generations of all residents living in the region surrounding the Kaskaskia River, we would like to know how much you would be **willing to pay to improve all of the features** described on this page by contributing to a hypothetical Kaskaskia River Management Conservation Fund. This kind of fund would be administered by a local organization and required for every household surrounding the Kaskaskia River. An annual conservation fund is set at five levels ranging from **$0 to $60 per year over the next 30 years**

Each scenario below is independent and includes three options. Please select the option that you would prefer for the region surrounding the Kaskaskia River.

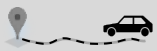
Future Scenario 1

Suppose Option A and Option B were the *only* options available besides "No change" over **the next 30 years**. Which would you choose? *Please select the option that represents your choice.*

Attribute						I would choose 
Option A	**25% Increase**	**25% Increase**	**50 Miles Away**	**15% Increase**	**$60**	❒ A
Option B	**0% Change**	**25% Increase**	**<1 Mile Away**	**15% Decrease**	**$0**	❒ B
Option C	**No change**					❒ C

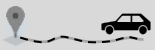
Future Scenario 2

Suppose Option A and Option B were the *only* options available besides "No change" over **the next 30 years**. Which would you choose? *Please select the option that represents your choice.*

Attribute						I would choose 
Option A	**0% Change**	**50% Increase**	**<1 Mile Away**	**15% Decrease**	**$30**	❒ A
Option B	**0% Change**	**0% Change**	**50 Miles Away**	**15% Increase**	**$5**	❒ B
Option C	**No change**					❒ C

Future Scenario 3

Suppose Option A and Option B were the *only* options available besides "No change" over **the next 30 years**. Which would you choose? *Please select the option that represents your choice.*

Attribute						I would choose 
Option A	**25% Decrease**	**50% Increase**	**<1 Mile Away**	**15% Decrease**	**$15**	❒ A
Option B	**25% Increase**	**0% Change**	**50 Miles Away**	**15% Increase**	**$15**	❒ B
Option C	**No change**					❒ C

Future Scenario 4

Suppose Option A and Option B were the *only* options available besides "No change" over **the next 30 years**. Which would you choose? *Please select the option that represents your choice.*

Attribute						I would choose 
Option A	**0% Change**	**0% Change**	**50 Miles Away**	**15% Decrease**	**$15**	❒ A
Option B	**25% Decrease**	**50% Increase**	**<1 Mile Away**	**15% Increase**	**$15**	❒ B
Option C	**No change**					❒ C

Future Scenario 5

Suppose Option A and Option B were the *only* options available besides "No change" over **the next 30 years**. Which would you choose? *Please select the option that represents your choice.*

Attribute						I would choose 
Option A	**0% Change**	**50% Increase**	**25 Miles Away**	**15% Increase**	**$0**	❒ A
Option B	**0% Change**	**0% Change**	**25 Miles Away**	**15% Decrease**	**$30**	❒ B
Option C	**No change**					❒ C

Future Scenario 6

Suppose Option A and Option B were the *only* options available besides "No change" over **the next 30 years**. Which would you choose? *Please select the option that represents your choice.*

Attribute						I would choose 
Option A	**25% Decrease**	**0% Change**	**25 Miles Away**	**15% Increase**	**$5**	❒ A
Option B	**25% Increase**	**50% Increase**	**25 Miles Away**	**15% Decrease**	**$30**	❒ B
Option C	**No change**					❒ C

Section 3 of 6: Experience with Places

In this section, we would like you to think about your "sense of place" in the area where you live. Sense of place is defined as the characteristics that make an environment special and distinct. There are many ways a place could be considered distinctive.

5. Please use the space below to describe why, if at all, the area where you live is special.

_____

6. We would like to understand how strongly you feel about the area where you live. Please rate how much you agree with these statements.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. The area where I live means a lot to me	3.9%	4.9%	23.8%	34.5%	32.4%
b. I am very attached to the area where I live	4.4%	10.2%	25.1%	31.3%	28.7%
c. I identify strongly with the area where I live	4.2%	11.3%	27.7%	30.6%	26.1%
d. I enjoy living here more than any other area	6.8%	15.6%	28.8%	27.9%	20.9%
e. I get more satisfaction out of living here than living in any other place	8.1%	15.6%	32.6%	23.2%	20.4%
f. Living here is more important than living in any other place	8.8%	20.6%	29.2%	25.3%	16.2%
g. I have a lot of fond memories with other people in the area where I live	5.5%	5.8%	17.7%	36.0%	34.8%
h. I have a special connection to the area where I live and the people who live here	4.7%	9.1%	21.1%	35.0%	30.1%
i. I bring my family and friends to the area where I live	4.9%	6.6%	25.3%	36.0%	27.2%

7. Below is a list of statements that describe the reasons why the area where you live is special and distinct. Please rate how much you agree that each of these statements describes the area where you live.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Forests and other wooded areas	4.2%	13.6%	22.9%	37.1%	22.2%
b. Natural conservation areas	3.4%	9.7%	28.4%	37.1%	21.4%
c. Protected fish and wildlife areas	4.2%	12.2%	30.3%	37.0%	16.2%
d. Outdoor recreation opportunities	3.6%	6.3%	19.3%	45.1%	25.6%
e. Rural landscapes	2.9%	6.8%	20.4%	37.4%	32.4%
f. Opportunities to experience nature	2.1%	6.0%	15.4%	41.3%	35.0%
g. Farmland productivity	2.4%	5.3%	20.1%	36.3%	35.8%
h. Fertile soils for growing crops	2.1%	6.0%	20.1%	37.8%	34.0%
i. Agricultural innovation	2.6%	6.3%	33.4%	34.4%	23.2%

j. A sense of responsibility for the land	2.9%	7.5%	26.6%	39.5%	23.5%
k. Freedom to work independently	2.3%	4.7%	25.4%	42.6%	25.0%
l. Ability to work hard to make a living where you live	1.6%	5.0%	26.6%	40.0%	26.7%
m. Local community where residents know each other	1.6%	7.1%	20.7%	38.6%	31.9%
n. Shared community history and culture	1.6%	8.3%	32.1%	35.0%	23.0%
o. Close personal relationships in the community	3.1%	9.6%	25.4%	36.3%	25.6%
p. Opportunities to create a legacy that supports future generations in my family	4.2%	9.4%	31.6%	33.7%	21.1%
q. Ability to continue a way of life that is valued by my family	3.1%	7.0%	26.4%	40.0%	23.5%
r. A good place to raise a family	3.1%	6.5%	21.2%	31.8%	37.3%

Section 4 of 6: Experiences in Nature

In this section, we would like to learn more about your current and previous experiences in nature.

8. This question will help us understand your recreation activities. How often did you do the following <u>in 2019</u>?

	Very rarely	Rarely	Occasionally	Often	Very often
a. I hiked on trails	24.2%	17.9%	34.7%	15.6%	7.5%
b. I biked in the outdoors	44.8%	21.0%	20.0%	9.2%	4.9%
c. I watched wildlife (e.g., birds)	12.2%	12.2%	28.0%	28.0%	19.1%
d. I camped	36.5%	19.7%	23.8%	10.7%	9.3%
e. I hunted	69.5%	13.7%	7.2%	4.6%	5.1%
f. I fished	39.8%	14.7%	22.4%	11.3%	11.8%
g. Other	7.9%	2.2%	19.1%	24.7%	46.1%

8b. Which of the following recreation activities do you prefer the most?

24.6%	Hiking on trails	21.6%	Watching wildlife
16.9%	Camping	3.4%	Hunting
16.2%	Fishing	9.9%	Biking on trails
6.6%	Other		

Periods: Age 7-11

9. This question will help us understand your early-life experiences with nature. How often did you do the following when you were between the ages of 7 and 11, and between the ages of 12 and 18.	Very rarely	Rarely	Occasionally	Often	Very often
a. I hiked, camped, or watched wildlife	16.3%	21.1%	31.3%	22.8%	17.6%
b. I hunted or fished	29.2%	13.6%	25.9%	18.4%	12.8%
c. I was involved in gardening	17.9%	14.7%	30.7%	20.9%	15.8%
d. I learned about the environment at school	11.8%	10.8%	31.0%	29.6%	16.8%
e. I learned about the environment through media (e.g., books, television)	14.9%	14.4%	33.4%	24.4%	12.9%
f. I participated in organized outdoor programs (e.g., nature camps, field trips)	17.9%	15.9%	27.4%	21.8%	17.0%

Period: Age 12-18

	Very rarely	Rarely	Occasionally	Often	Very often
a. I hiked, camped, or watched wildlife	16.6%	11.9%	33.2%	23.4%	15.0%
b. I hunted or fished	33.0%	14.9%	22.9%	17.5%	11.8%
c. I was involved in gardening	23.9%	16.9%	30.6%	15.1%	13.6%
d. I learned about the environment at school	13.5%	13.3%	32.7%	26.4%	14.1%
e. I learned about the environment through media (e.g., books, television)	16.4%	15.2%	31.1%	22.6%	14.7%
f. I participated in organized outdoor programs (e.g., nature camps, field trips)	23.8%	17.9%	27.1%	17.8%	13.4%

10. This question is about your connection with nature. How strongly do you agree with the following statements?	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. My ideal vacation spot would be a remote, natural area	5.5%	8.0%	22.9%	37.2%	26.3%
b. I always think about how my actions affect the environment	4.1%	6.2%	25.7%	46.7%	17.4%
c. My connection to nature and the environment is a part of my spirituality	5.7%	10.9%	31.3%	33.4%	18.7%
d. I take notice of natural environments wherever I am	2.6%	2.8%	17.4%	49.4%	27.8%
e. My relationship to nature is an important part of who I am	3.6%	8.8%	30.3%	35.3%	22.0%
f. I feel very connected to all living things and the earth	3.9%	6.8%	29.3%	38.1%	21.8%

Section 5 of 6: Environmental Threats, Behavior, Feelings, and Values

In this section, we would like to learn more about your perspectives on governance, perspectives on changes that are occurring in the area where you live, your responses to those changes, your feelings about these behaviors, and the things you care about most.

11. The area where you live may be threatened by environmental changes. Please indicate how much of a problem that environmental change will have on each of the following features of the area where you live.	Not at all a problem	A minor problem	Somewhat a problem	A serious problem	A very serious problem
a. Soil health and fertility of the land	12.8%	18.8%	36.8%	20.7%	10.9%
b. Farmland productivity	18.0%	15.9%	31.5%	23.7%	10.9%
c. Farming lifestyle and livelihood	17.0%	16.1%	31.0%	23.7%	12.2%
d. Opportunities for future generations	13.4%	13.4%	29.0%	27.9%	16.4%
e. Personal relationships with community members	25.7%	23.6%	31.6%	13.8%	5.2%
f. Community history and culture	28.2%	22.3%	30.1%	14.2%	5.2%
g. Water quality	15.3%	17.2%	24.4%	27.6%	15.4%
h. Fish and wildlife habitat	17.6%	15.5%	29.0%	25.1%	12.7%
i. Beauty of natural landscapes	21.1%	18.2%	28.3%	19.8%	12.5%

12. We would like to better understand your intentions for responding to changes that threaten the area where you live. How likely are you to engage in the following actions to improve the environmental quality of the area where you live over the next 12 months?	Very unlikely	Unikely	Neither unlikely nor likely	Likely	Very likely
a. Recycle paper, plastic, and metal in the area where I live	4.1%	4.6%	16.0%	30.8%	44.5%
b. Conserve water or energy in the area where I live	3.4%	3.9%	17.1%	44.5%	31.0%
c. Buy environmentally friendly and/or energy efficient products	3.7%	5.4%	24.7%	40.3%	26.0%
d. Work with others in the area where I live to address an environmental problem or issue	8.9%	13.5%	34.2%	30.0%	13.5%
e. Participate as an active member in an environmental group in the area where I live	13.2%	18.1%	32.5%	24.5%	11.7%
f. Talk to others in the area where I live about an environmental problem	11.5%	14.5%	30.2%	29.9%	13.8%
g. Signed a petition about an environmental issue in the area where I live	7.6%	8.5%	26.2%	34.6%	23.1%
h. Vote to support a policy or regulation that supports environmental protection in the area where I live	6.0%	5.9%	23.2%	36.9%	28.1%
i. Donate money to support environmental protection in the area where I live	12.7%	13.7%	34.3%	28.0%	11.4%

13. To what extent do you think the COVID-19 pandemic will affect your participation in the actions included in the previous question?

21.2%	21.9%	26.6%	19.2%	11.0%
None	A little bit	Moderately	Quite a bit	Extremely

14. The following questions are about how you would expect to feel about your own actions that impact the environmental quality of the area where you live.

14a. If you performed actions that <u>improved environmental quality</u>, to what extent would you anticipate feeling each of the following emotions?	Not at all	Only a little	To some extent	Rather much	Very much
a. Proud	3.4%	9.3%	35.1%	23.1%	29.1%
b. Accomplished	4.1%	9.9%	31.1%	28.5%	26.5%
c. Satisfied	3.9%	9.0%	30.8%	26.1%	30.3%
d. Worthwhile	4.4%	10.3%	30.1%	26.0%	29.1%
e. Confident	4.6%	12.8%	33.6%	23.0%	26.1%

14b. If you performed actions that <u>harmed environmental quality</u>, to what extent would you anticipated feeling each of the following emotions?	Not at all	Only a little	To some extent	Rather much	Very much
a. Guilty	14.5%	10.3%	19.6%	23.3%	32.3%
b. Remorseful	13.7%	10.8%	21.4%	23.9%	30.2%
c. Sorry	13.4%	10.1%	21.3%	20.6%	34.5%
d. Ashamed	16.4%	9.2%	22.0%	18.9%	33.4%
e. Bad	16.4%	9.0%	21.1%	21.6%	31.9%

15. This question is about your obligation and ability to improve environmental quality around the area where you live. How strongly do you agree with the following statements?	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I feel a moral obligation to protect the environment in the area where I live	3.4%	3.7%	25.0%	41.6%	26.2%
b. I feel that I should protect the environment in the area where I live	2.6%	3.4%	20.4%	44.7%	28.9%
c. Because of my own principles, I feel an obligation to behave in an environmentally-friendly way in the area where I live	2.9%	2.9%	23.2%	43.0%	27.9%
d. My own actions influence the conditions of the area where I live	2.8%	5.7%	26.5%	41.0%	24.1%
e. I have the ability to limit environmental impacts on the area where I live	4.6%	8.0%	32.6%	38.3%	16.6%
f. There are many ways I can help benefit the environment in the area where I live	2.8%	3.9%	31.0%	43.4%	19.0%

16. This question is about your personal values. Please rate the extent to which you consider each value to be a <u>guiding principle in your life.</u>	Unimportant	Of Little Importance	Moderately Important	Important	Very Important
a. **Protecting the environment**: preserving nature	2.1%	5.1%	22.5%	38.1%	32.2%
b. **Unity with nature**: fitting into nature	2.1%	11.5%	29.1%	32.5%	24.8%
c. **A world of beauty**: beauty of nature and the arts	1.5%	7.0%	22.1%	34.9%	34.5%
d. **Equality**: equal opportunity for all	2.0%	3.7%	16.9%	27.0%	50.3%
e. **Social justice**: correcting injustice, care for others	2.8%	6.2%	18.9%	27.7%	44.4%
f. **A world at peace**: free of war and conflict	1.5%	4.6%	14.8%	30.4%	48.8%
g. **Authority**: the right to lead or command	6.5%	15.8%	32.1%	28.5%	17.0%
h. **Social power**: control over others, dominance	27.8 %	28.6%	22.4%	12.0%	9.1%
i. **Influential**: having an impact on people and events	6.7%	16.4%	36.3%	25.4%	15.2%
j. **Fulfilment of desire**: food, fun, pleasure	2.6%	7.6%	29.8%	35.9%	24.1%
k. **Enjoying life**: pursuing hobbies, leisure, socializing	1.3%	5.2%	20.4%	38.2%	34.8%
l. **Reducing worries**: seeking comfort and relaxation	1.5%	4.2%	17.0%	39.3%	38.0%
m. **Personal growth**: development of new skills, learning, or gaining insight into something	1.5%	4.7%	20.9%	33.7%	39.2%
n. **Pursuit of excellence**: attaining a personal ideal in life	2.1%	5.2%	27.7%	37.8%	27.2%
o. **Autonomy**: deciding your own future and doing what you believe in	1.8%	2.9%	20.6%	37.6%	37.1%
p. **Satisfaction with life**: finding meaning, value, and relevance to a broader context	0.7%	4.2%	21.4%	33.7%	40.0%

Section 6 of 6: About You

Our final questions are about your socio-demographic characteristics. Please enter only the information that you are comfortable sharing.

17. How many people are in your household?

Number of Adults:
Mean=2.4; SD =1.2

18. Do you consider the area where you live to be rural?

61%	39%
Yes	No

19. Do you own farmland in Illinois?

12.5%	87.5%
Yes	No

20. What is your annual household income before taxes? (Please ✓one)

25% [Less than $24,999]	25.1% [$25,000-$49,999]	15.8% [$50,000-$74,999]
11.7% [$75,000-$99,999]	6.4% [$100,000-$124,999]	3.9% [$125,000-$149,999]
1.8% [$150,000-$174,999]	0.8% [$175,000-$199,999]	1.8% [Over $200,000]
7.7% [Prefer not to answer]		

21. What is the highest level of education you have completed? (Please ✓one)

2.1% [No degree]	27.2% [High school graduate or GED]	38.6% [Some college]
18.7% [Bachelor's degree]	13.4% [post-graduate degree]	

Thanks for your participation!

Use the space below to share any additional thoughts about this study and indicate whether you would like a copy of our final report.

If you have any questions, please contact:

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Institutional Review Board Approval: 18453
Expiration Date: January 8th, 2023