

# **Conservation and the Agricultural Landowner**

## **Results of a Survey of Agricultural Landowners in the Sacramento River Corridor**

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All errors are the responsibility of the authors.

## **1. Introduction**

The 2015 Survey of Agricultural Landowners ('Survey') was conducted as a collaborative effort between the Sacramento River Forum, the Geographic Information Center, and economists at California State University, Chico.

A primary purpose of the Survey was to understand the attitudes of agricultural landowners towards permanent conversion of agricultural land to wildlife habitat in the Sacramento River Corridor ("Corridor"). Since the mid-80s government and non-government agencies have acquired several thousand acres of agricultural land in the Sacramento River Corridor for the explicit purpose of enhancing wildlife habitat. An important component of the broader effects of this land use change is how agricultural landowners in the region who did not participate in the agricultural sale and are currently actively farming are affected by this land use change. Landowners farming land adjacent or nearby acquired parcels may be directly or indirectly affected by these decisions. This Survey is the first comprehensive effort to collect data on these effects.

The purpose of this report is to document the survey instrument, sampling scheme, implementation, response rates, and basic summary statistics of the data especially those pertaining to the landowners' attitudes towards conservation. We specifically focus on landowner attitudes and perceptions about the regional effects of land use change. This information could help the agricultural community and policy makers develop insights into designing and developing programs, practices and messages that encourage broader participation in conservation programs within the agricultural community.

## **2. Methodology**

Our study area is the Sacramento River Corridor between Keswick Dam and the confluence with the Feather River at Verona, an area of about 284,619 acres (444.7 miles) which corresponds to about 1-mile corridor from the River center. The area lies

in Shasta, Tehama, Butte, Glenn, Sutter, Colusa, and Yolo counties. See Figure 1a. All current private agricultural landowners in this area make up the universe of this study.<sup>2</sup>

The research team pre-tested a draft of the survey with 5 different agricultural landowners in different counties, and revised the instrument according to the feedback received from landowners. We also solicited input from the pre-test participants regarding the best mode of survey delivery. It was decided that a mail survey that promised anonymity of the respondent would elicit the highest response from the widest range of landowners. Complete text of the survey instrument is attached at the end of this report.

A mailing list of all landowners within 1 mile of the River was compiled and surveys were mailed to the entire population of interest.<sup>3</sup> Since all privately owned agricultural parcels do not neatly fall into the 1-mile corridor—often property boundaries cross the 1-mile boundary -- we erred on the side of including more parcels in the mailing list than less. This resulted in several parcels included in the mailing list that had only a small portion in the 1-mile corridor. See Figure 1b. After receiving the surveys we used answers to the question regarding distance of the property from the river to remove respondents who were located more than 1 mile from the river.

The total design survey method was used (Dillman et al. 2014). First, a letter announcing the survey and its objective was mailed to the entire address list on March 4<sup>th</sup> 2015. This first letter was followed by the survey packet, which was mailed on March 10<sup>th</sup> 2015. The survey packet included a cover letter, the survey instrument, a pre stamped return envelope, and a flyer describing the study goals. Finally, a postcard reminding the respondents of the survey was mailed on March 17<sup>th</sup> 2015. Also, a web-version of the survey was put online on the Sacramento River Forum's website for respondents who might prefer to answer the survey questions online and a link to the survey was provided in the cover letter. The cover letter promised anonymity to all survey respondents.

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<sup>2</sup> We did not survey agricultural land that is being farmed by non-profit agencies.

<sup>3</sup> The process to generate the survey mailing list was as follows: We starting with 41,480 parcels in our study area and then sub-selected parcels that were greater than 5 acres in size (n = 5,709 parcels) in order to exclude residential properties. Of these, we extracted a list of unique owners and kept only those parcels that contained a valid mailing address (n = 2,562 parcels). We further excluded those addresses that were outside the 1-mile from the Sacramento River, which resulted in 2,088 unique addresses.

### 3. Response Rate and Response Bias

Response rates are calculated as the number of surveys mailed divided by the number of returned and completed surveys. In total, 2,088 surveys were mailed, and 399 responses were completed and returned by private landowners within 1 mile of the Sacramento River Corridor. As Table 1 shows, the average response rate across all counties was 19%, but response rates varied by county, with a high of 28% for Glenn County and a low of 15% for Shasta County.<sup>4</sup>

Before we discuss the results of the survey, we should assess how well our sample of 399 landowners represents the population of agricultural landowners in the survey “universe”. If certain type of landowners responded to the survey more than others, the average landowner in the sample would not correspond to the average landowner in the universe and we would be unable to determine whether survey responses are representative of all landowners in the survey universe.. Given the anonymity of the survey, we can only compare the universe and the sample in three ways: distribution of parcel size, total area in a particular land use (e.g., orchards), and total agricultural area reported.

Table 2 shows that the mean parcel area in the population is about 38 acres, whereas in our sample the mean parcel area reported is much larger at about 140 acres. Looking at the breakdown of parcel size across counties, in columns 1 and 2 in Table 2, we confirm that landowners with larger agricultural properties are more heavily represented in our sample than in the universe.

Table 3 compares land characteristics reported by landowners in our sample to the land use known to exist in the Sacramento River Corridor as of 2009, the most recent year satellite data are available. For example, 25.2% of the total area in the Corridor was in orchards, compared to 45% total orchard area on properties in our survey sample.

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<sup>4</sup> A total of 119 letters were returned due to various reasons such as an insufficient or non existing address, or because the addressee had moved without a forwarding address. We have not yet excluded these 119 cases from 2088 mailed surveys. Therefore our reported response rates should be viewed as slightly conservative.

Finally, we add up all land area owned by sample landowners and compare that to the total land area owned in the survey universe. Results are given in Table 4. Overall, our respondents own a sum total of 75,567 acres, of the total 170,977 acres in the Corridor, or 44% of the area in the universe. So, even though our landowner response rate was 19%, i.e., 19% of the landowners are reporting back, these 19% are reporting on 44% of the agricultural area in the Corridor. In other words, our ‘area response rate’ is higher—more than double-- the ‘farmer response rate’.

We conclude that our sample of 399 landowners has a greater representation of landowners with larger landholdings in the survey universe, meaning the typical agricultural landowner in our survey owns more land than the typical agricultural landowner in the corridor. The response rate may be higher for owners of larger parcels because these landowners are more concerned about the effects of conservation in the Corridor, as we will see in the following sections of this report, and may have a greater motivation to respond to our survey. In the next section we present the findings of the survey, while being cautious not to interpret findings as representing the views of the typical landowner in the Corridor.

#### **4. Summary Statistics of the Survey**

##### ***4.1. Demographics of Survey Respondents***

Average age of survey respondents is 66 years (minimum 32 years and maximum of 97 years), of which 73% are male. Regarding highest level of education completed: 21% reported having a post graduate degree, 30% a BA or equivalent, 29% reported to have ‘some college’ education, 16% a high school education and 3% reported not finishing high school. Survey participants were asked ‘If you work outside of farming your land, which category best describes your career or employment status’. Majority of the respondents (54%) reported that they do not work outside of farming, i.e., farming is their primary occupation. Of the rest, 53% reported that they were ‘self-employed’, 9% indicated ‘skilled trade’, 7% reported being employed in a government job, and 30% reported being in a ‘professional or management position’.

The distribution of respondents within the seven county study area is shown in Table 1. The highest number of sample respondents are in Tehama county and make up about 35% of the sample, followed by Shasta (21%), Glenn (15%), Colusa (14%), Sutter (10%), Butte (3%), and Yolo (1.5%).

#### ***4.2. Characteristics of Parcels: Location, Land Use, and Soil Type***

The average parcel size in the sample is 140 acres, with a minimum of 0.3 acres and maximum of 8500 acres. Table 2 shows the distribution of parcel size by county. Respondents with the largest parcels lie in Butte (847 acres), followed by Colusa (250 acres), Sutter (195 acres), Yolo (195 acres), and Glenn (145 acres). Shasta (68 acres) and Tehama (53 acres) have smaller parcels in the corridor.

We asked the survey respondents ‘As the crow flies, what is the shortest distance from this property to the Sacramento River?’ The responses are shown in Table 5: 26% of the respondents reported their property is located on the river, 12% reported the property is within  $\frac{1}{4}$  mile of the river, 28% reported their property is  $\frac{1}{4}$  to  $\frac{1}{2}$  mile from the river, 10% reported their property is  $\frac{1}{2}$  to  $\frac{3}{4}$  mile from the river, and 25% of the respondents reported their parcel  $\frac{3}{4}$  to 1 mile from the river. Disaggregating the size of the parcel by distance to the river we note that the largest properties are located on the river and the acreage of the property falls as the distance to the river increases. Figure 3 shows the distribution of parcel size at different distance from the river.

We asked survey landowners to report the three main land uses on their property. We aggregated the reported land uses by category and added up the acres in each land use. Figure 2 shows the distribution of acreage in each land use. The largest land use is orchards: 45% of the area reported is in orchards (~ 25,000 acres), followed by field crops (26% of the area reported, ~15,000 acres). Row crops are planted on 9% (~5,200 acres) of the area in the sample, and pasture is about 8% (~4,800 acres) of the area. The majority of sample landowners reported multiple land uses on their properties (e.g. walnuts were being grown with some area in pasture or tomatoes with sunflowers).

Figure 3 shows the distribution of acres in each soil type. The highest acreage by

far is in loamy soil, followed by clay, although there was a small acreage in rock, silt and sand.

Figures 5a and 5b shows most landowners do not use their property for hunting or fishing, or even for personal use. A very small percentage, 5% and 3%, reported unpermitted uses for fishing and hunting, respectively.

### **4.3. Flooding**

Flooding is an important consideration for farming in the Corridor. When asked ‘How often does your property flood?’ 7% of respondents reported ‘About once a year’, 3% reported ‘about once every 2 years,’ 7% reported ‘about once every 3 years’, 11% reported once every 5 years, and the rest (73%) reported flooding less often than once in 5 years.

One question asked landowners about levees and flood protection. 39% of respondents indicated their property was protected by a levee, with 11% of these landowners indicating the condition of the levee was ‘Poor’, 32% indicating it was ‘Inadequate,’ 45% indicating it was ‘good,’ and about 11% indicating that they ‘don’t know’ the condition of the levee. Only 16% responded ‘Yes’ to the question ‘Are you currently taking any flood protection measures?’ Table 6 shows a cross tabulation of these two questions—notice that although landowners in all conditions of levees are self-protecting against flood, the percentage of landowners taking some flood protection measures is higher if they report worse levee condition. For example, when levee condition is ‘Poor,’ 6/15 (40%) of landowners are self-protecting, compared to 12/46 (26%) when the levee condition is ‘Adequate’, and only 13/67 (19%) landowners are taking private flood protection measures when levee condition is ‘Good’. Self-protection measures such as flood and/or crop insurance and rock revetments are costly, and can range up to 35,000 dollars annually. Further, as we will see in subsequent analysis, not having levee flood protection affects landowners’ willingness to sell for conservation.



#### ***4.4. Current Wildlife Habitat Improvement Practices***

About 28% of the landowners reported that their land was enrolled in the Williamson Act. Only 2.6% reported that their land was certified organic. When asked whether the respondent was engaged in any habitat improvement practices on their property (Q#26), 26% reported 'Yes' and 74% reported 'No'. Those who reported 'No' were asked: 'How likely is it that if the right opportunity comes along, you would participate in wildlife habitat improvement on this property?' To this question, 9% reported that that it was 'Very likely', 16% reported that it was 'Likely', 32% indicated 'Unsure', 8% reported 'Unlikely' and the 34% indicated 'Very unlikely'.

#### ***4.5. Effects of Conservation***

Respondents were asked to indicate 'In which of the following ways has **your** property been impacted by the permanent conversion of agricultural land to habitat in your vicinity?'(Q#16) and were given the following categories:

- i. Large mammals,
- ii. Small mammals,
- iii. Human trespassing,
- iv. Weed growth,
- v. Fire hazard,
- vi. Honeybee population,
- vii. Groundwater levels,
- viii. Endangered species regulations,
- ix. Property values and
- x. Flooding

Respondents were asked to code their effects on a Likert Scale indicating the effect: 5 = Significant Increase, 4 = Increase, 3 = No Change, 2 = Decrease, 1 = Significant Decrease. One of the main findings from responses to this question is that the most

typical response for all of effects listed was '3 = No Change'. Table 7 shows that typical (median) and average (mean) response to all effects listed was '3= No Change'. In order to further explore how the responses were distributed around the '3 = No Change' option we plot histograms of the responses for each effect in Figures 6a-6j. Of all the effects, the large and small mammals on the property received the highest number of 'Significant Increase' and 'Increase', although the highest number of respondents still marked 'No Change'. Another effect that received a relatively higher number of 'Significant Increase', or 'Increase', was threat of endangered species regulations. Other effects show a rather symmetric distribution between increase and decrease, indicating that overall agricultural landowners in our sample do not have very strong feelings about these effects on their properties.

Another important finding is that the landowners who responded to the survey feel that the conservation of properties do not seem to have affected *their* property values. This is significant in that while some landowners do notice some effects on their properties, they are not captured by the market values of agricultural properties.

When the sample is limited only to properties reported to be adjacent to a converted property, the dominance of 'Increase' responses over 'Decrease' responses for these factors is more pronounced, and in several cases the number of respondents indicating 'Increase' or 'Significant Increase' is larger than the number indicating 'No change'. For example, 72% of adjacent respondents reported increased large mammals, compared to 24% and 4% reporting no change or decrease, respectively. The more pronounced responses from adjacent properties could reflect that adjacency to converted land increases the impacts, or it may indicate that respondents adjacent to converted properties felt more confident or more strongly about the question.

A follow up question (Q#17) was 'Have you taken any self protection measures against these effects?', to which an overwhelming majority responded 'No' (76%) and 23% marked 'Yes'. When prompted to describe the measures taken, 79 respondents, which is about 20% of the sample described a variety of measures e.g. fencing around property or cages around young trees, installing cameras or patrolling the property, extra

weed or rodent control, or reporting trespassers to authorities.<sup>5</sup> The next question was: ‘How much have you spent on these [self protection] measures in 2013-2014?’ to which 17 respondents reported an amount ranging from \$200 to \$50,000. In per acre terms, this is average expenditure of \$374 per acre, ranging from \$7.50 to \$4,375 per acre.

Another question in the survey (Q#42) was “In the last 20 years several lands along the Sacramento River have been retired from agriculture and permanently converted into wildlife habitat. How do you feel about the following statements regarding this change?” This question was distinct from Q#16 because it asked about overall perceptions. The options given included:

- i. It increases outdoor recreational opportunities (such as fishing, wildlife viewing, and hunting etc.),
- ii. It reduces agricultural production,
- iii. It harms the agricultural economy,
- iv. It reduces tax revenue for local agencies,
- v. It harms agricultural property values,
- vi. It harms agricultural property values,
- vii. Overall, it hurts the local economy,
- viii. It improves local water quality,
- ix. It improves local water supply,
- x. It improves local air quality

Respondents were asked to rate their response on a Likert Scale 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. Table 8 shows that the most common response was either ‘Neutral’ or ‘Agree’. Figures 7a -7i show the distribution of responses. While the most common response was ‘3 = Neutral’ but unlike responses to Q#16, it was not a clear winner; 43% of the respondents agreed or strongly agreed with

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<sup>5</sup> Here is a sample of descriptive responses received: ‘two gates installed to stop public access’, ‘surveillance camera, many calls to fish and game. Signs’, ‘Posting NO Trespassing Signs, Calling the Sheriff on Trespassers, Shooting the animals i.e. Coyote,..’ ‘Increased the use of fences and repellants to control deer damage on newly planted orchards’, ‘chicken wire around trees, plan on putting deer fence around orchard’...

this statement, 27% were neutral, and 29% disagreed or strongly disagreed. They clearly agreed strongly that conservation reduces agricultural production, although when inquired about the effects on the overall agricultural economy, the level of agreement became slightly weaker. This reflects that while landowners notice that conservation is taking land out of agriculture, there is some perception that this change is not entirely negative for the broader agricultural economy. The respondents also strongly felt that converting agricultural land into conserved sites reduces tax revenues to the local counties. There were no strong opinions about the effects of conservation on the environment, such as water quality, water supply or air quality. Responses were symmetrically distributed between ‘Disagree’ and ‘Agree’, and ‘Neutral’ being the most common response.

#### ***4.6. Attitudes Towards Selling for Conservation***

Q#31 in the survey was ‘Have you ever been approached to sell your property for permanent conversion into wildlife habitat?’ 11% reported ‘Yes’ and 89% reported ‘No’. Q#32 in the Survey asked respondents ‘How likely is it that if the right opportunity comes along, you would sell this property for permanent conversion to wildlife habitat?’ Respondents were asked to rate their responses on a Likert Scale of 1 = Very likely, 2 = Somewhat likely, 3 = Unsure, 4 = Somewhat unlikely, and 5 = Very unlikely. Figure 8 shows the distribution of responses. The majority of respondents, about 63%, indicated it was ‘somewhat unlikely’ or ‘very unlikely’ they would sell their property. About 13% indicated it was ‘very likely’ or ‘somewhat likely’ they would sell their agricultural property for conversion to wildlife habitat, and another 24% indicated they were ‘Unsure’.

We further explored whether the response to Q#32 varied by an actual offer to sell, and found that a large majority, 74%, of the landowners who had received an offer to sell for habitat (those who marked ‘Yes’ to Q#31) indicated that it was ‘Very unlikely’ that they would sell but there were 13% of the respondents who had previously received an offer who indicated that it was ‘Likely’ or ‘Very likely’ that they would sell if the ‘right opportunity’ came along. From this we can conclude that while some landowners are

simply not interested in selling their property, others—a much smaller percentage—are interested in selling their land for conservation. In order to better understand the underlying reasons why respondents chose different responses to this question, we investigate the strength of association of these responses with property and landowner characteristics in the next section.

Another question in the Survey (Q#33) was about landowners' succession plans. An overwhelming majority, 81%, chose 'Give to children or other family members', followed by an equal number, 9%, that chose 'Sell to another farmer' and 'Sell to a state agency or federal agency for conversion into habitat'. This confirms the information from the previous two questions. Less than 1% of the respondents indicated 'unsure' or 'no plan'.

## 5. Determinants of Willingness to Sell for Conservation

We hypothesize that *willingness to sell for conservation* ( $WTSC_i$ ) is a function of:

$$WTSC_i = f(Z_i, X_i, LO_i) \tag{1}$$

where  $Z_i$  are parcel  $i$ 's characteristics such as parcel size, soil type, distance from the river, have flood protection from a levee or not, neighbor's land use, county in which  $i$  is located, etc.  $X_i$  are current characteristics of the property such as current land use, home on the property, length of current ownership, etc.  $LO_i$  includes landowner  $i$ 's characteristics such as age, gender, education, total landholdings, etc. Since we only have data on one parcel for each landowner in the sample,  $i$  denotes both a parcel and its landowner.

We argue that elements of  $Z_i$  are exogenous i.e. cannot be changed by the landowner but elements of  $X_i$  are potentially endogenous. For example, farmer's  $WTSC_i$  can be affected by her current land use, but current land use would be a result of how the farmer feels about selling her land for conservation. If the farmer wants to sell her property, all else equal she is less likely to plant an almond or a walnut orchard, which is a sizeable investment upfront with rewards several years later. Similarly, farmer's

decision to live on the property can be influenced by how she feels about selling that property but the decision to sell the property could be affected by whether she lives there or not. So for variables grouped in  $X_i$  we acknowledge that the direction of causality cannot be settled by this regression and therefore in this discussion we do not claim to establish the direction of causality. The purpose of this regression is to understand the strength of association between  $WTSC_i$  and  $X_i$ ,  $Z_i$ , and  $LO_i$  holding all else fixed.

We use an ordinal logit model to estimate equation (1). A binomial logit is used to analyze a dependent variable that takes on two values. An ordinal logit model, which is an extension of the binomial logit, is useful when there are more than two categories taken on by the dependent variable, and these categories are inherently ordered. The results of the Ordinal Logit regression are given in Table 9. The dependent variable  $WTSC_i$  is the landowner  $i$ 's response to Q#32 which takes on values 1-5, 1 = very likely and 5 = very unlikely as described before. Column (1) shows the results of the model with only  $Z_i$ , Column (2) shows the results of  $X_i$ ,  $Z_i$  and column (3) adds all three groups of variable.

The main results of this analysis are as follows. All else equal,

1.  $Z_i$ : Area of the parcel does not significantly affect willingness to sell and conserve. Also we do not notice any statistically significant differences across counties in landowners' WTSC. We therefore dropped the county dummy variables in the column (2) and (3). Landowners with loamy soils were more likely to indicate not wanting to sell, but this result was not robust after controlling for landowner characteristics. Presence of a levee was significantly and negatively and associated with WTSC. Distance to the river did not affect WTSC although if a neighbor had sold for conservation it reduced the respondents' WTSC, although this effect was not robust when we added other variables.
2.  $X_i$ : Longer length of ownership of the land is significantly and negatively associated with willingness to sell for conservation (WTSC). Also having a home on the property is significantly and negatively associated with WTSC. While orchard growers did not indicate any different response than others, landowners

whose main land use was pasture were significantly and positively associated with higher willingness to sell for conservation.

3.  $LO_i$ : Male landowners were significantly more likely to sell for conservation--the gender dummy was negative and significant in all specifications indicating that all else equal compared to their female counterparts male landowners are more likely to sell for conservation. A partial explanation could be that women are slightly more likely to live on the property--85% of women completing the survey reported that they live on the property compared to 78% of men. Women have owned that land for longer: on average women's duration of ownership was 42 years relative to men's of 37 years. Another interesting finding is that a larger total landholding is positively associated with a higher WTSC. We calculated a variable 'this parcel relative to total landholding' which was proportion of area of the parcel being surveyed relative to total landholding of the owner reported. The coefficient of this variable was significant and positive indicating that if the landowner is likely less emotionally attached the parcel and considering selling if the 'right opportunity' came along.

## **5. Conclusion**

The Corridor is a diverse and productive agricultural area, with more than 20 different kinds of crops being planted. Orchards (almonds, walnuts, prunes) are currently the largest land use, which reflects a California-wide trend of increased nut production in response to higher global nut prices. Equally diverse are the landowners and how they feel about their property. Some landowners view this property as their home, have lived there several decades and are not interested in selling even if it is not protected by a levee. Others own a number of agricultural properties, see their property on the river as an investment, and would be willing to sell if the right offer is made. Although flooding intensity and frequency varies in the Corridor, the main drivers of willingness to sell for conservation is negatively associated with duration of ownership, having lived on that property, and not having levee protection.

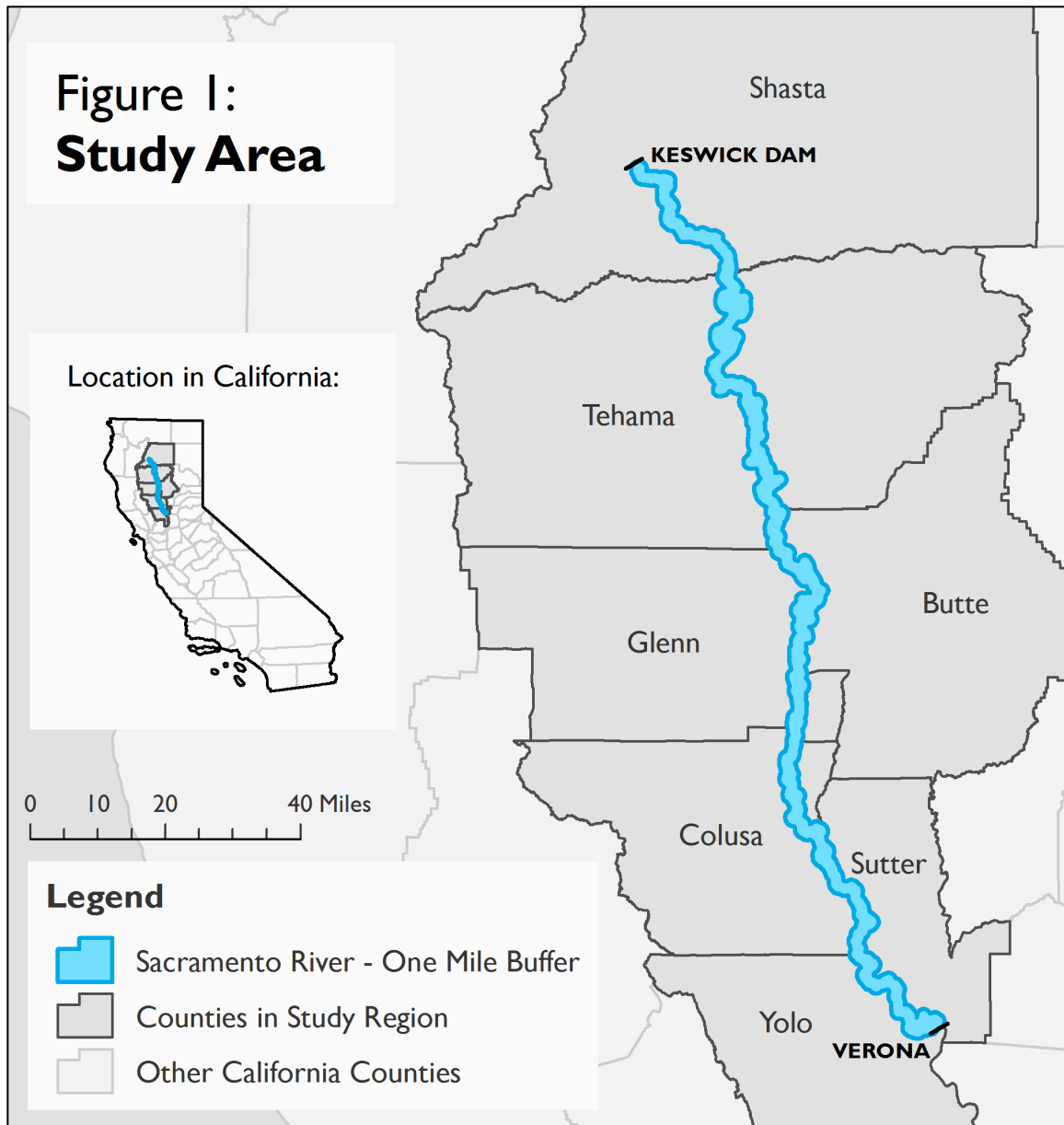
We noticed that attitudes towards conservation—the main objective of this survey-- range from ambivalent (83% or less of respondents) to vehemently opposed (22% or less of respondents), reflecting the diversity of landowners and land uses. This variation in attitudes could also be a result of differences in experiences that are shaped by spatial location and nature of the adjacent properties. A small percentage of our respondents have been negatively affected by conservation, and spending money to protect from those effects, and it seems clear that these effects are so local and ‘micro’ in nature that they will likely not be picked up by regional economic analyses but can play a large role in shaping local perceptions and attitudes towards permanent conversion of land use from agriculture to habitat.

**References:**

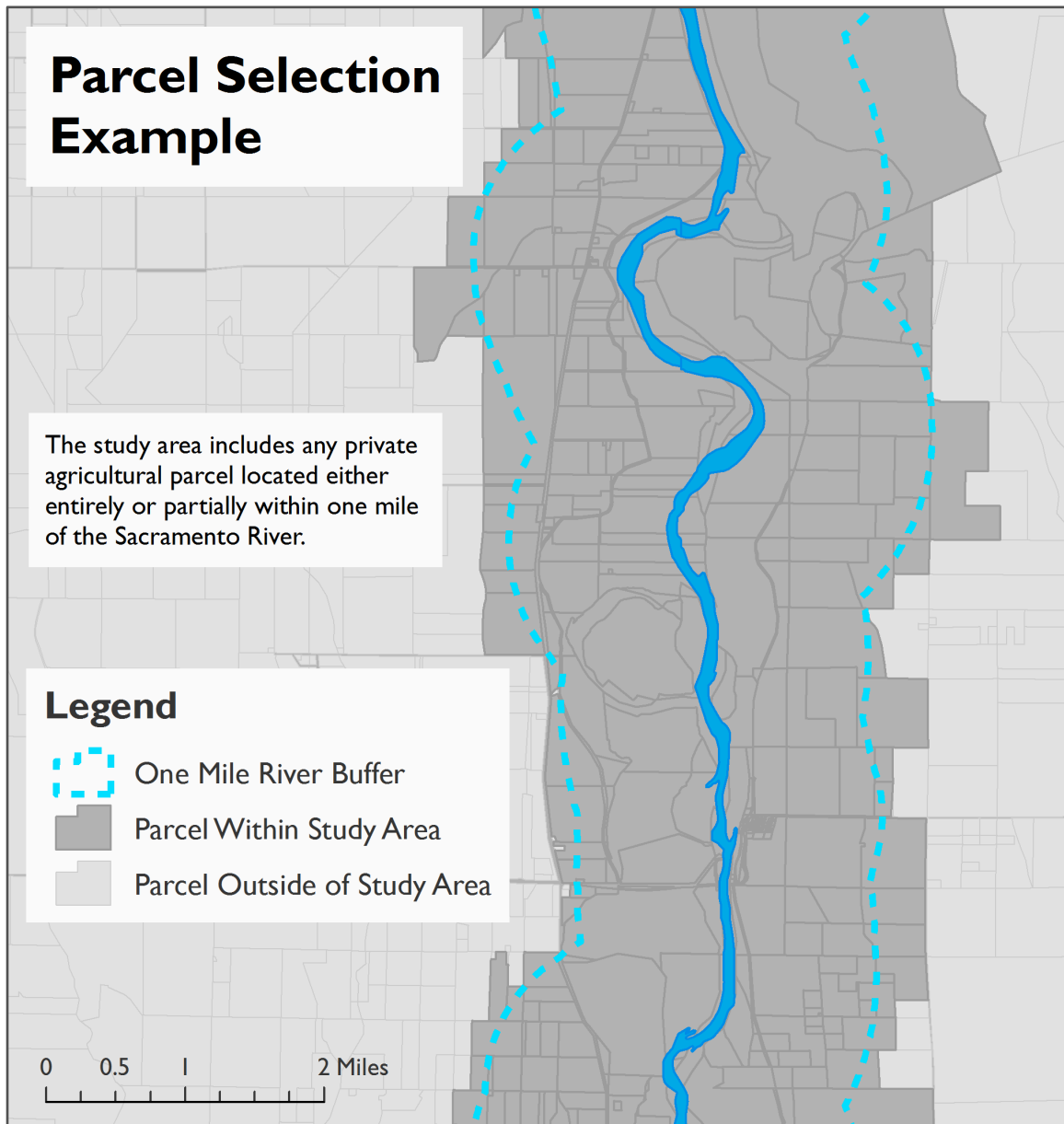
Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: the tailored design method*. John Wiley & Sons.



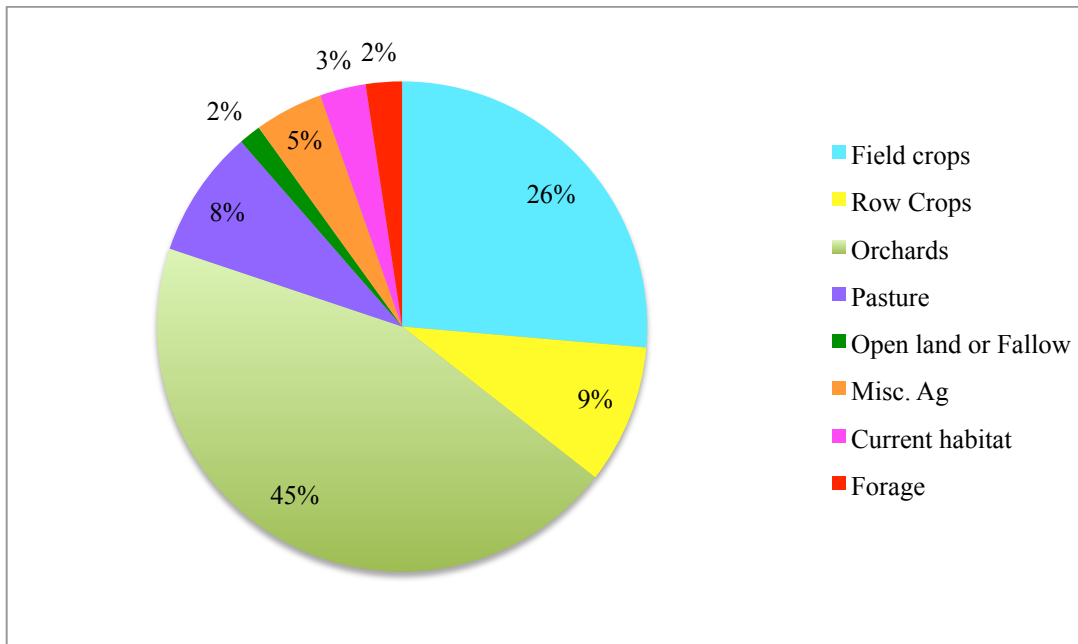
**Figure 1a: Study Area**



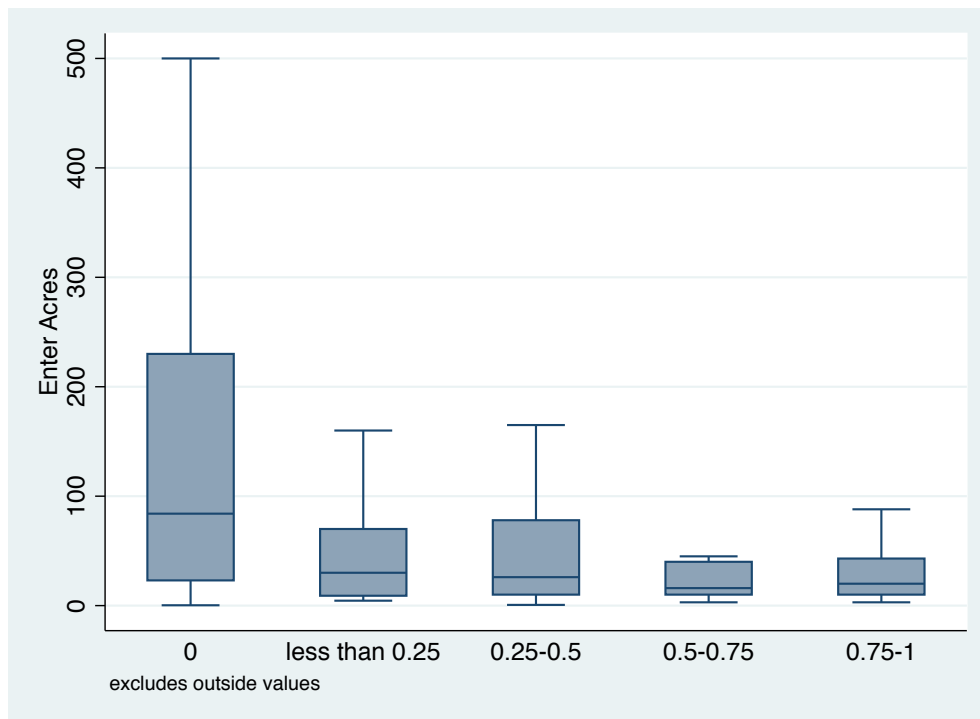
**Figure 1b: A view of Parcels located in the 1-mile Corridor**



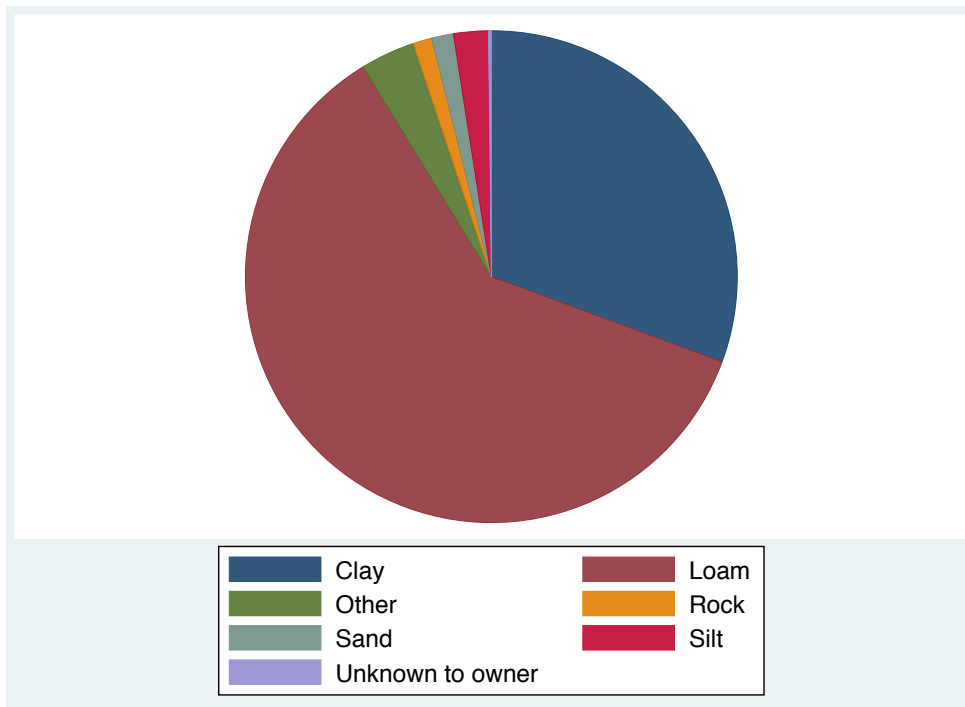
**Figure 2: Land Use by Acres**



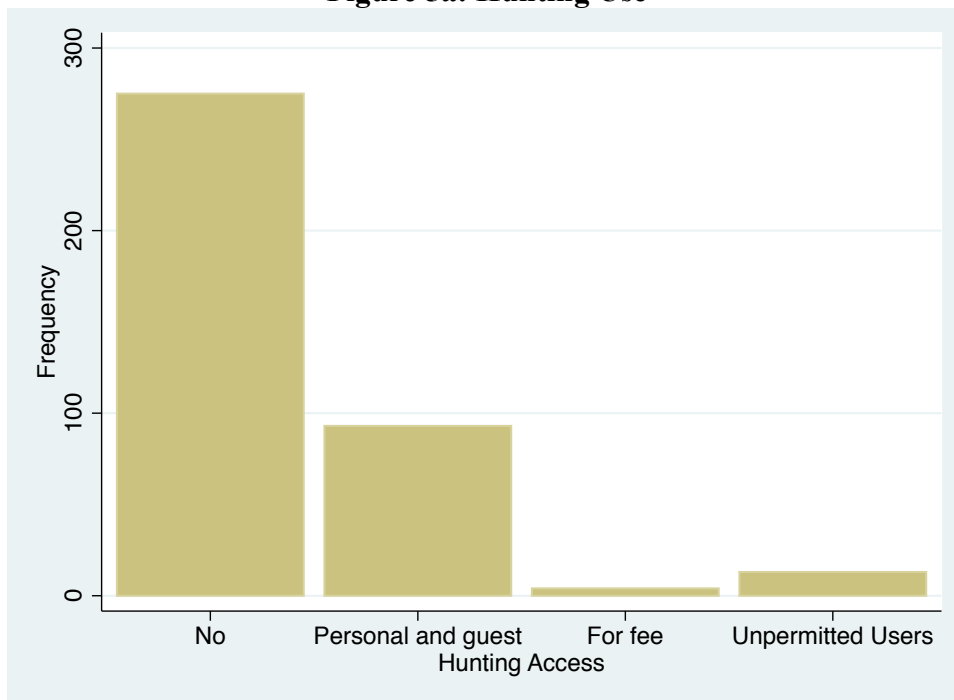
**Figure 3: Size of the Parcel by Distance to the River**



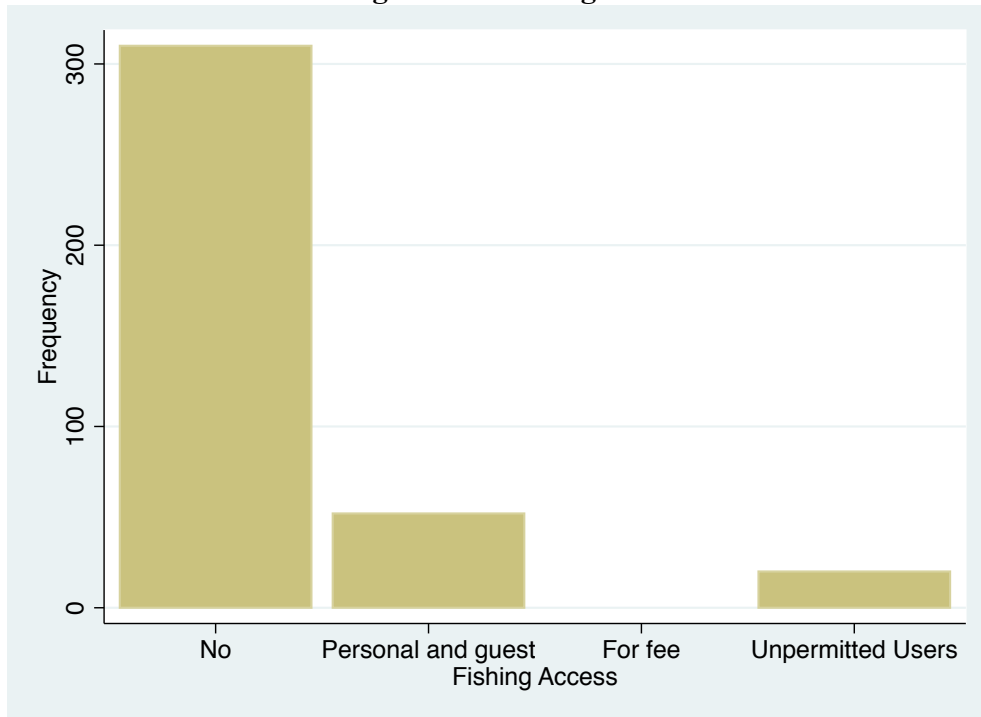
**Figure 4: Soil Type by Acres**



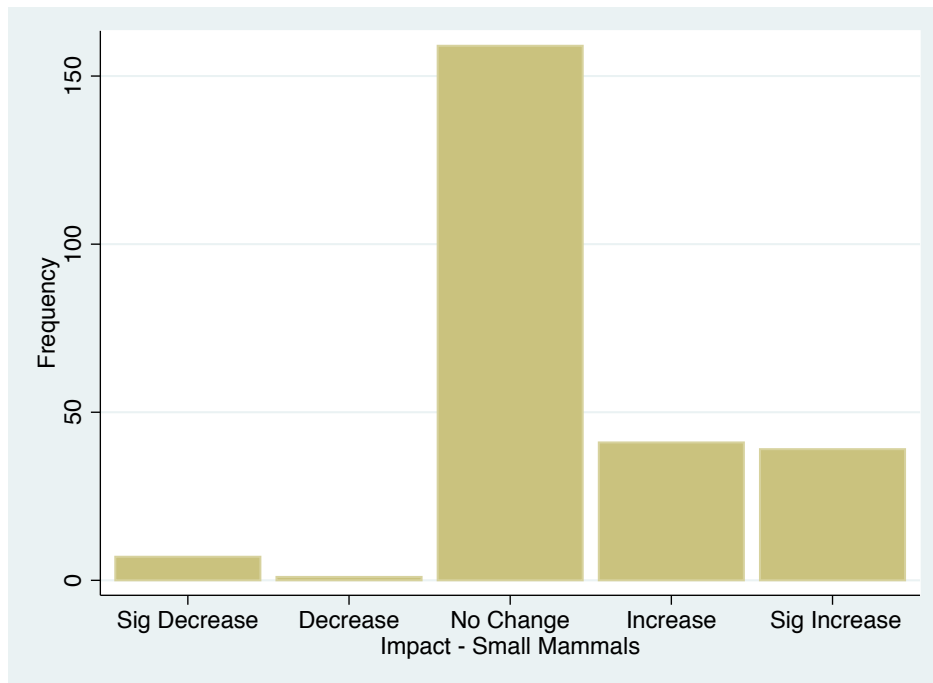
**Figure 5a: Hunting Use**



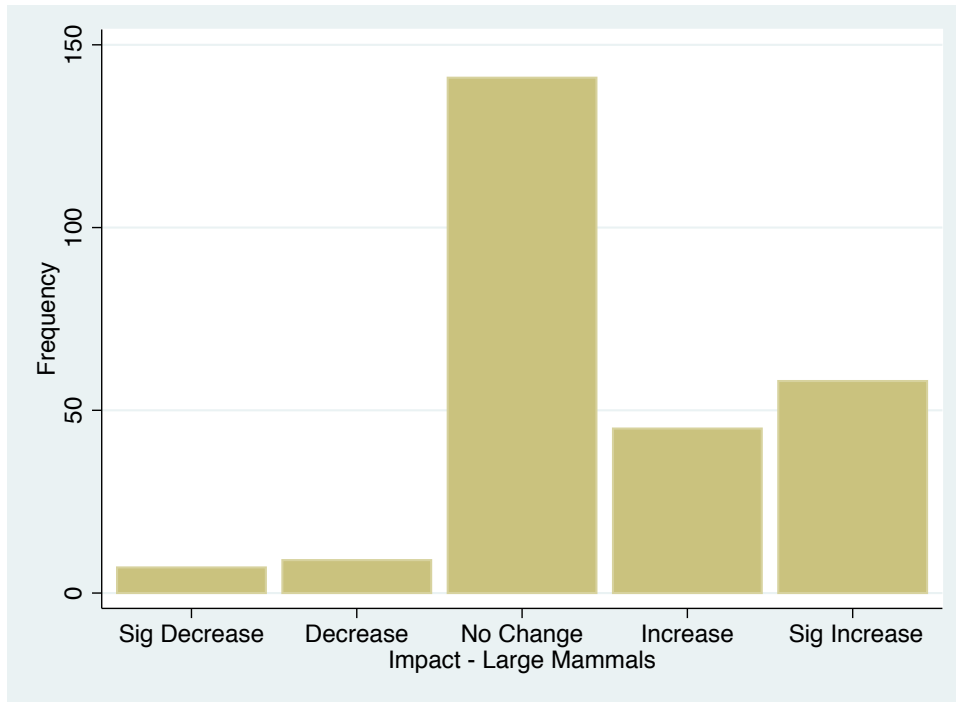
**Figure 5b: Fishing Use**



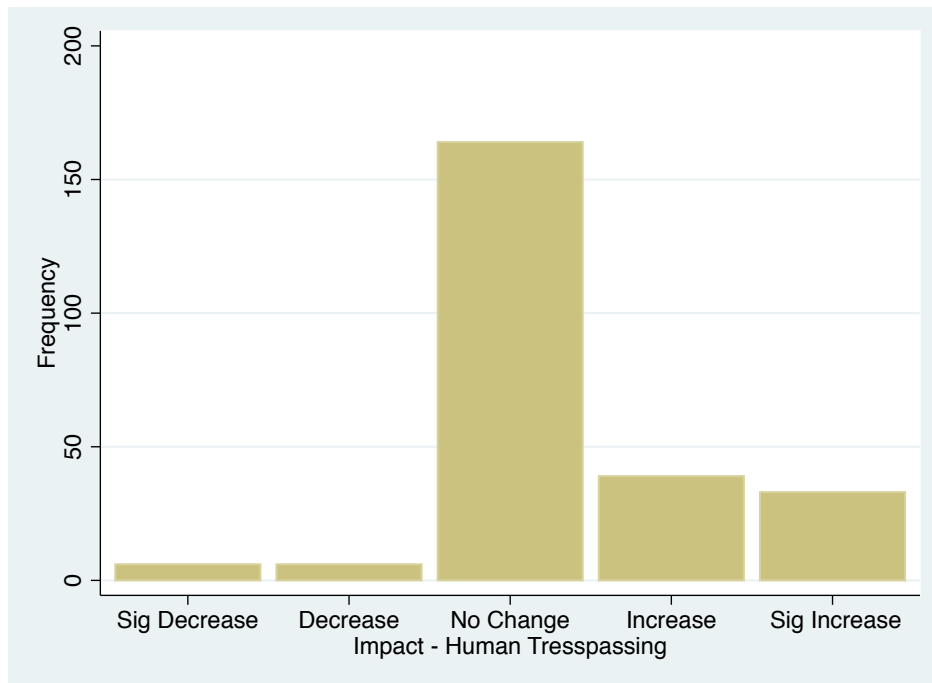
**Figure 6a: Effect of Conservation on Respondent's Property: Small Mammals**



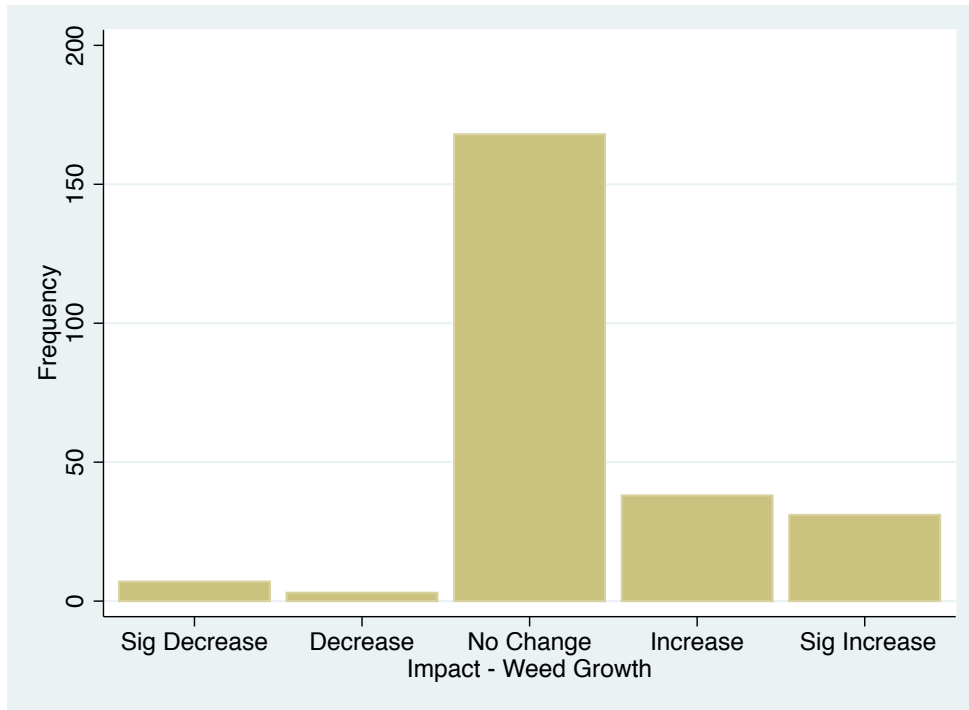
**Figure 6b Effect of Conservation on Respondent's Property: Large Mammals**



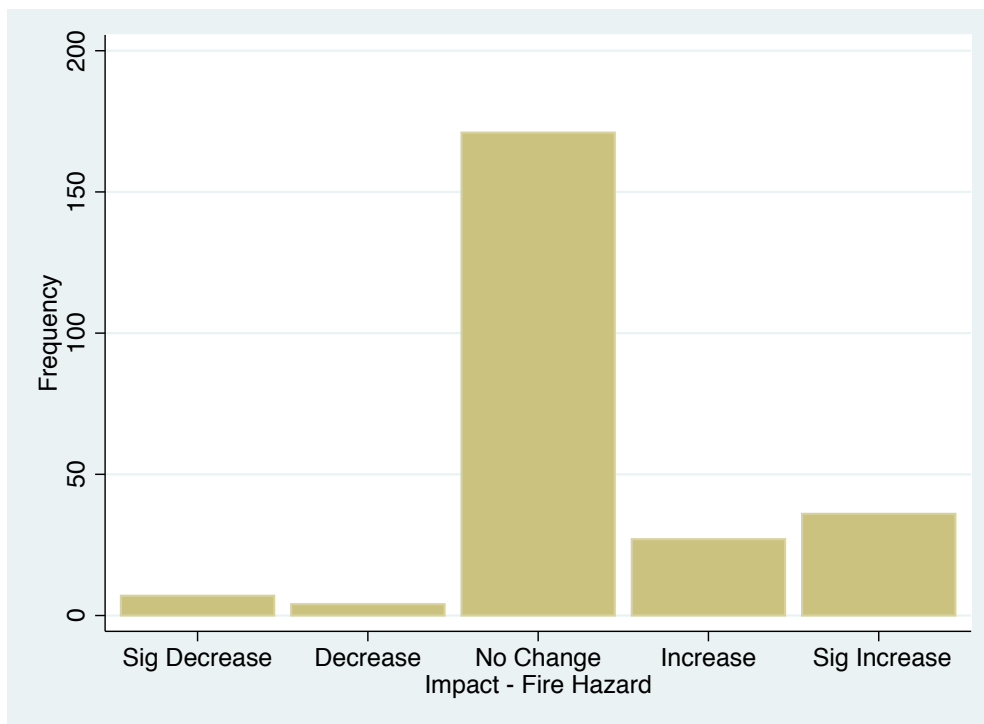
**Figure 6c: Effect of Conservation on Respondent's Property: Human Trespassing**



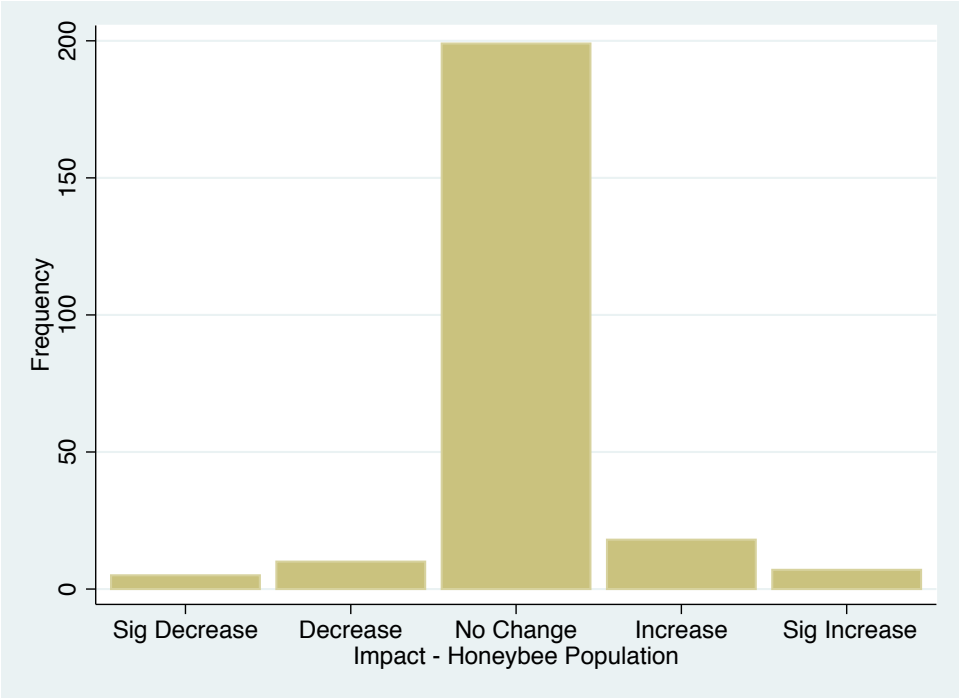
**Figure 6d: Effect of Conservation on Respondent's Property: Weed Growth**



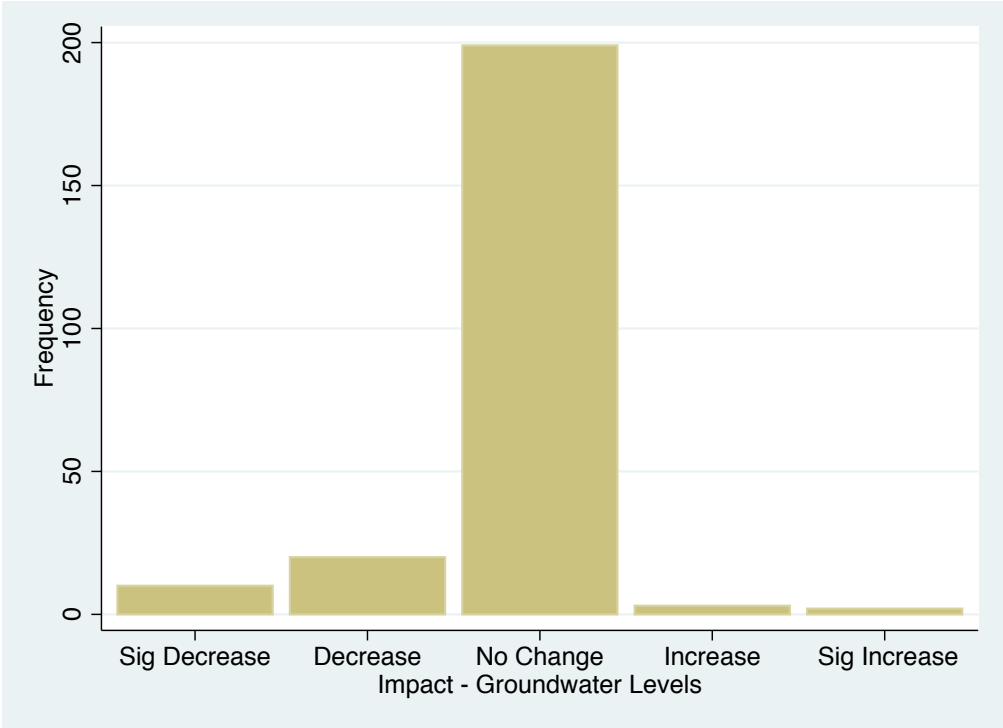
**Figure 6e: Effect of Conservation on Respondent's Property: Fire Hazard**



**Figure 6f: Effect of Conservation on Respondent's Property: Honeybee Population**

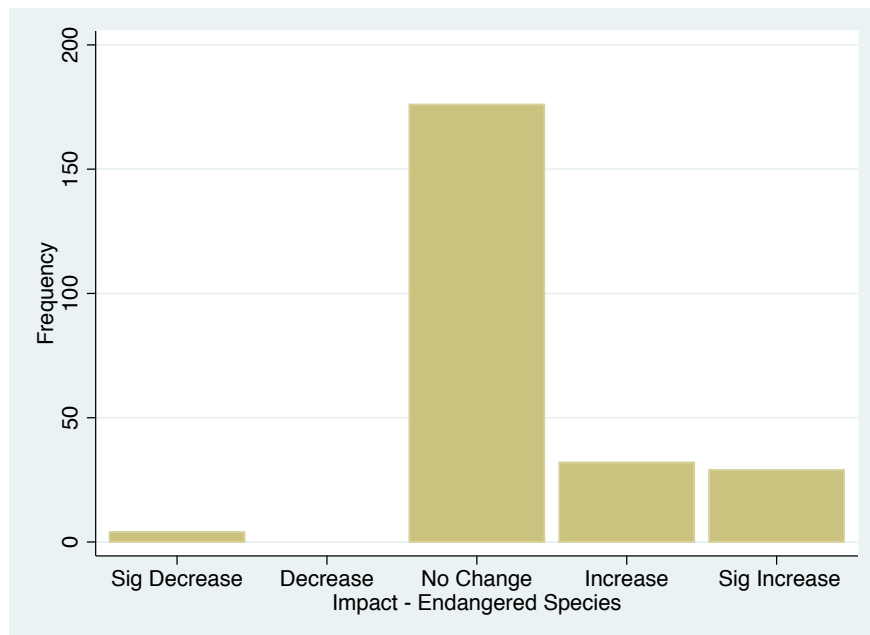


**Figure 6g: Effect of Conservation on Respondent's Property: Groundwater Levels**

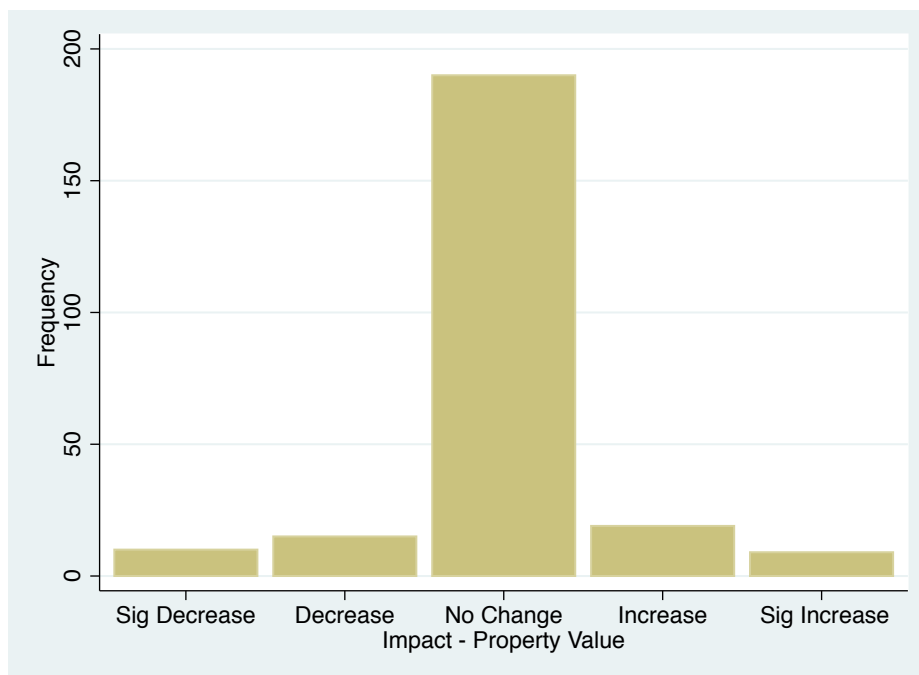




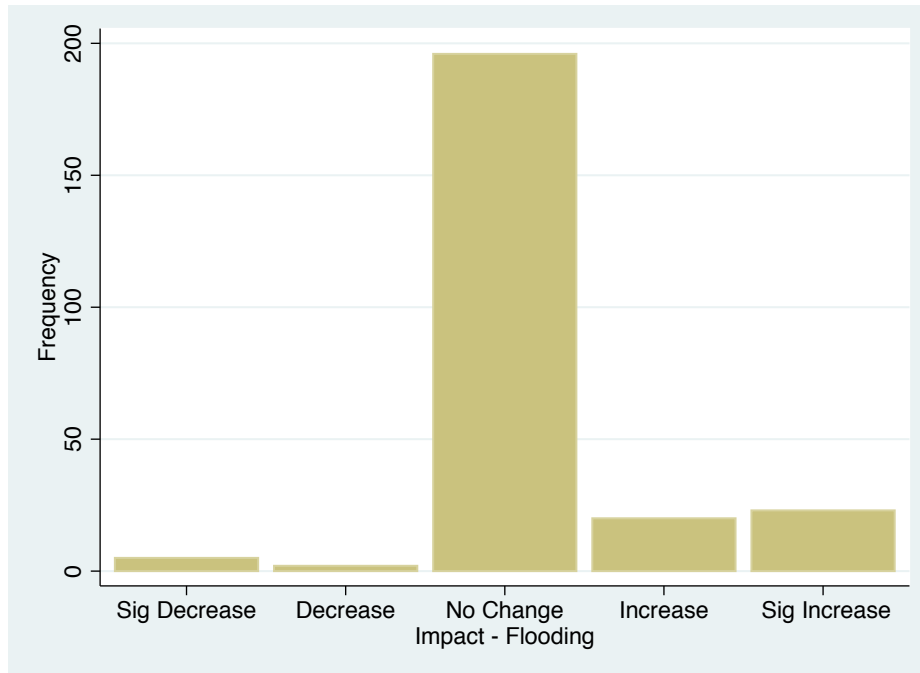
**Figure 6h: Effect of Conservation on Respondent's Property: Endangered Species**



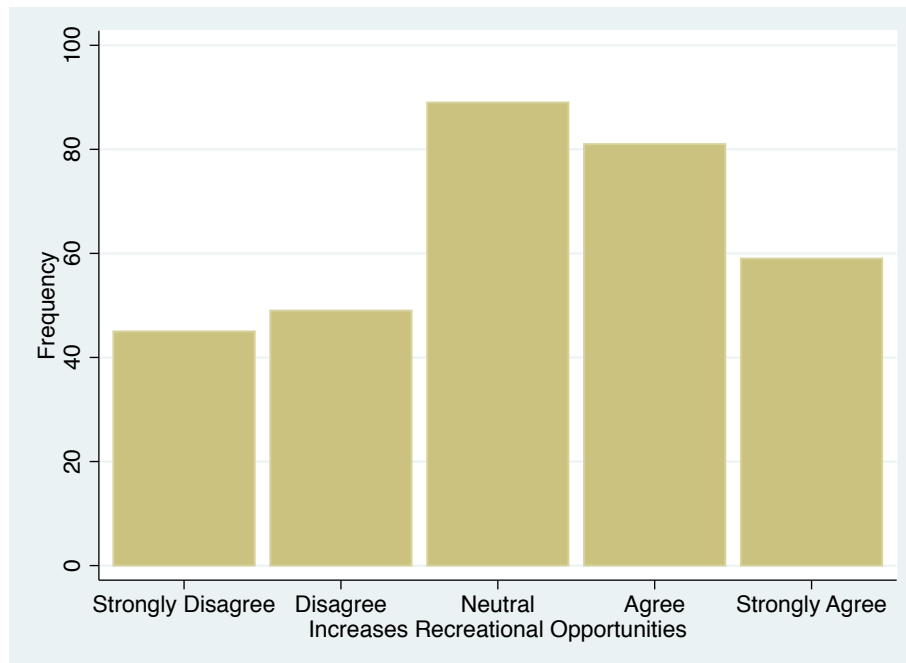
**Figure 6i: Effect of Conservation on Respondent's Property: Property Values**



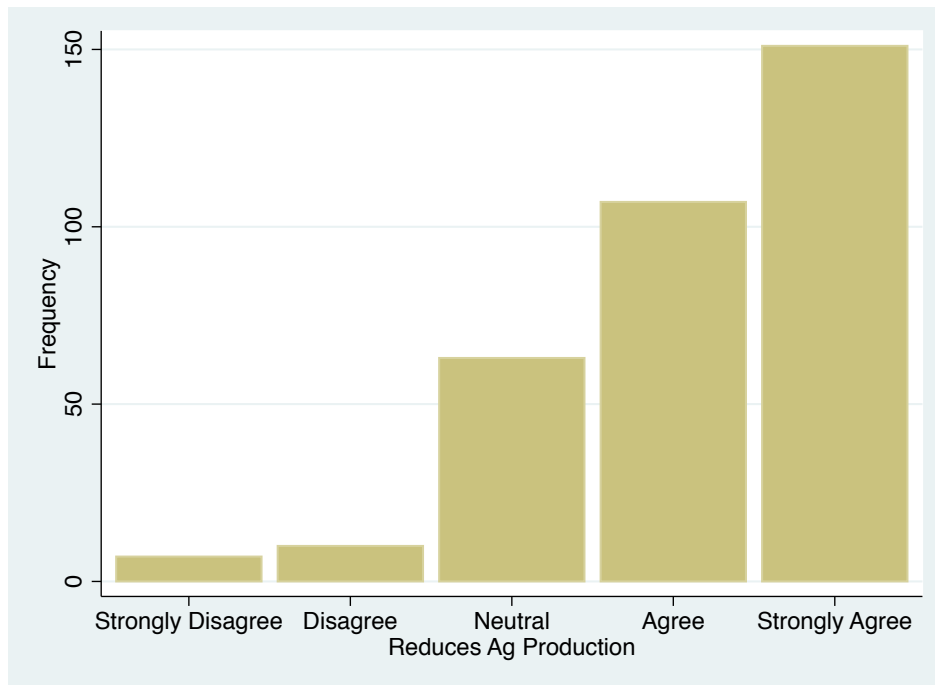
**Figure 6j: Effect of Conservation on Respondent's Property: Flooding**



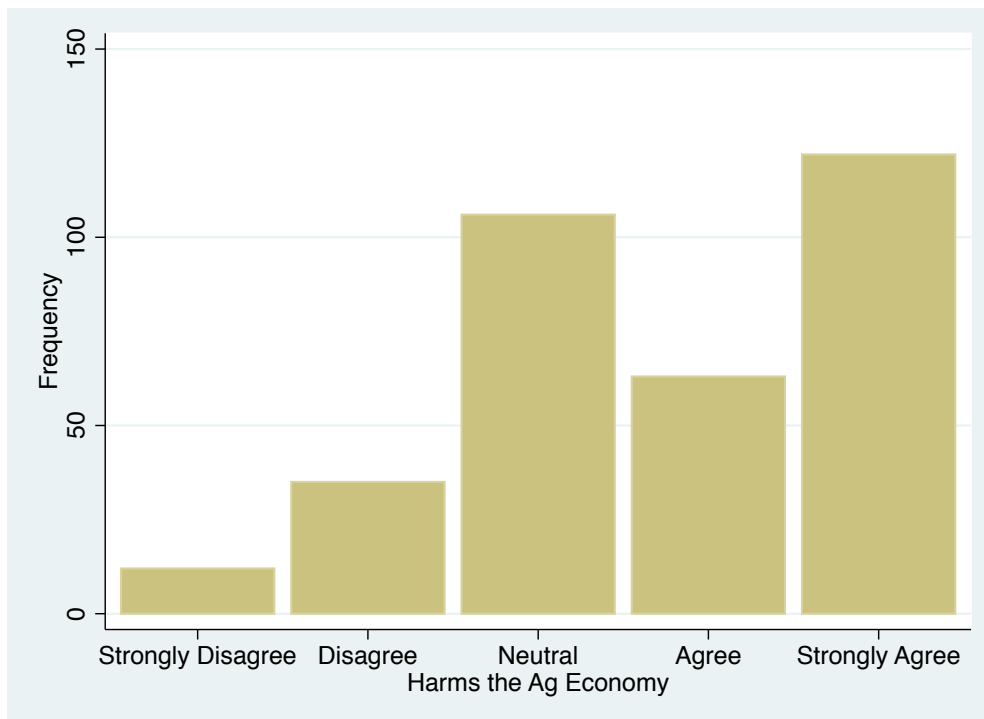
**Figure 7a: Overall Effect of Conservation: Increase in Recreational Opportunities**



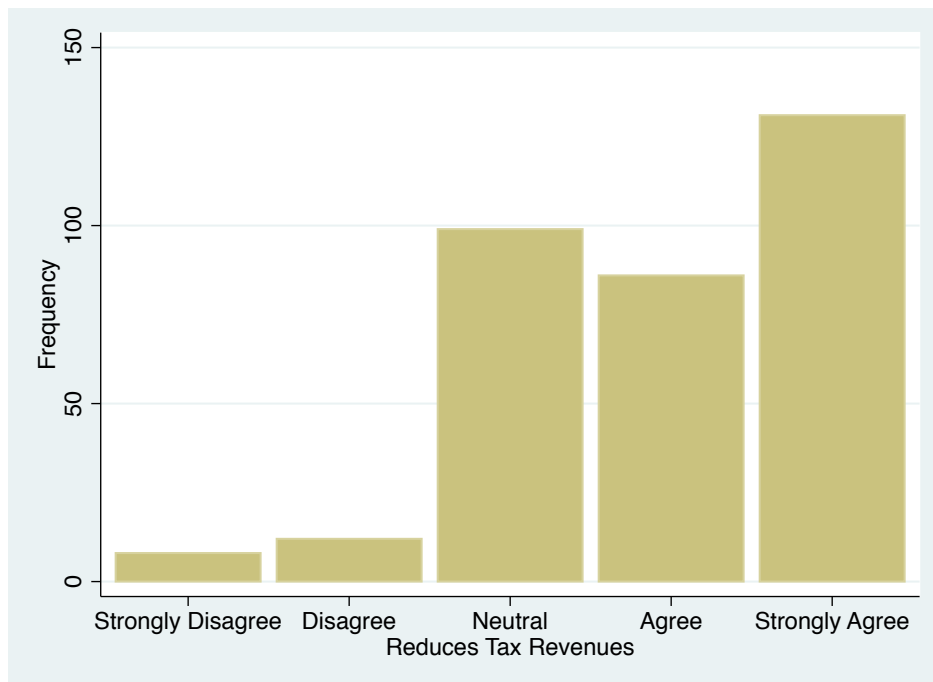
**Figure 7b: Overall Effect of Conservation: Reduction in Agricultural Production**



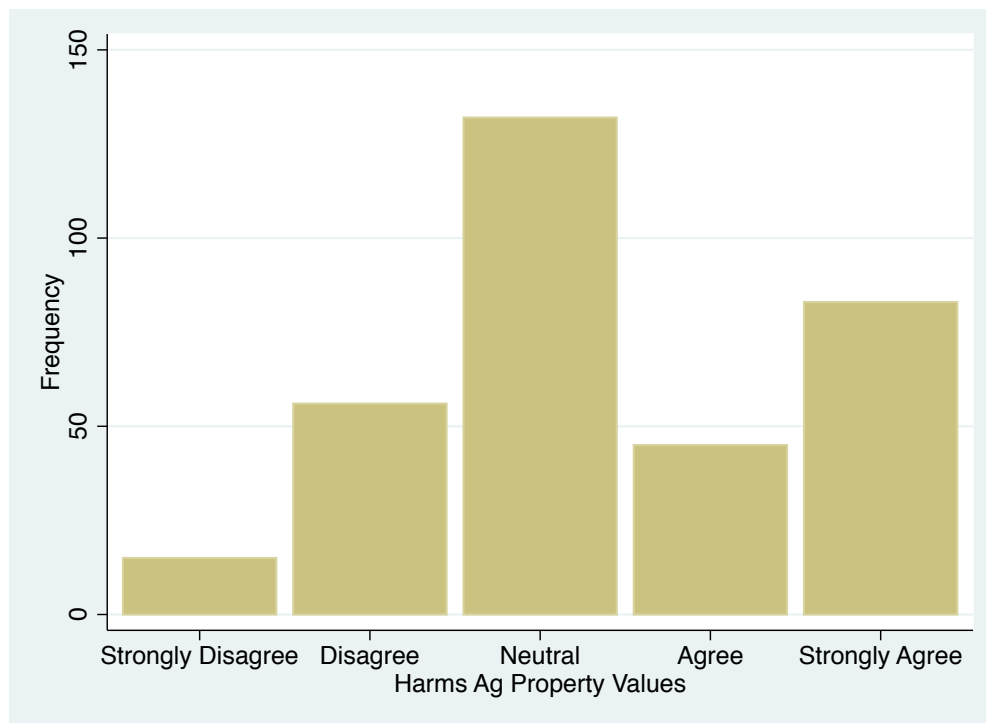
**Figure 7c: Overall Effect of Conservation: Harm to the Agricultural Economy**



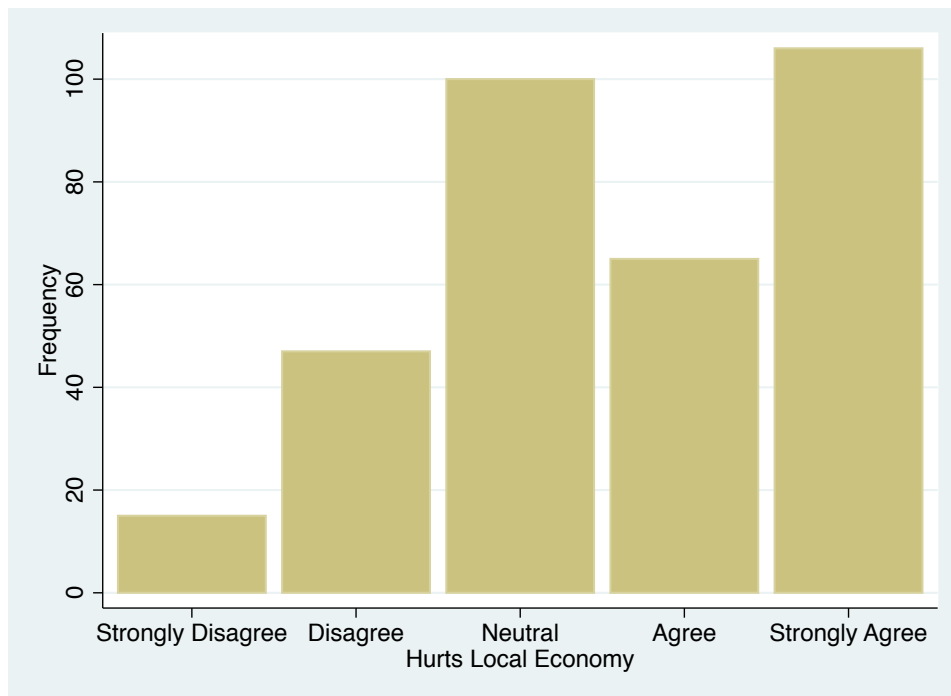
**Figure 7d: Overall Effect of Conservation: Reduction in Tax Revenue**



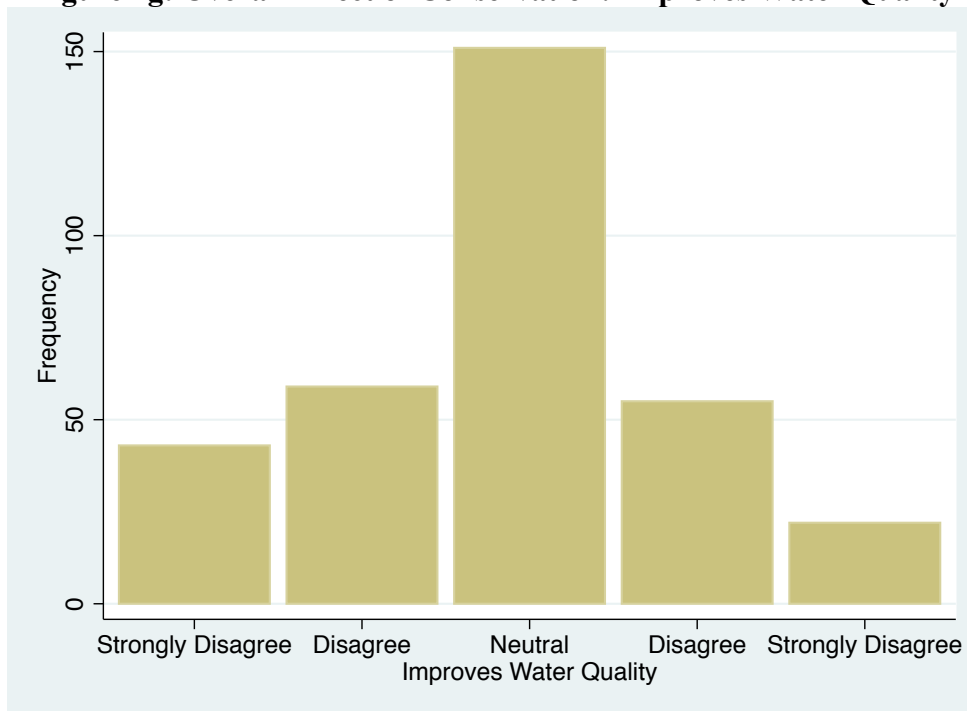
**Figure 7e: Overall Effect of Conservation: Harms Ag Property Values**



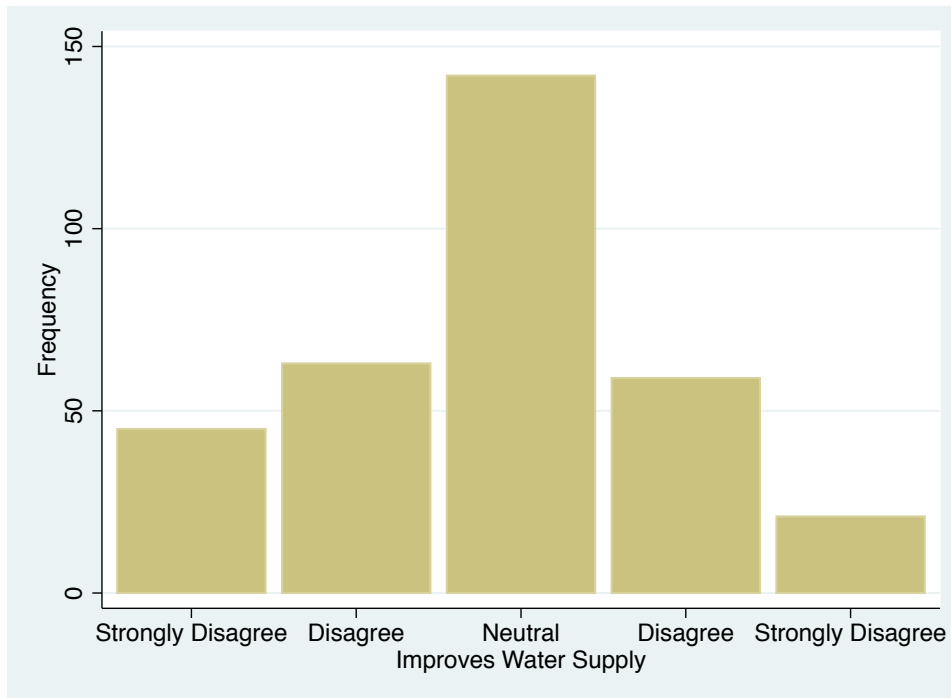
**Figure 7f: Overall Effect of Conservation: Hurts Local Economy**



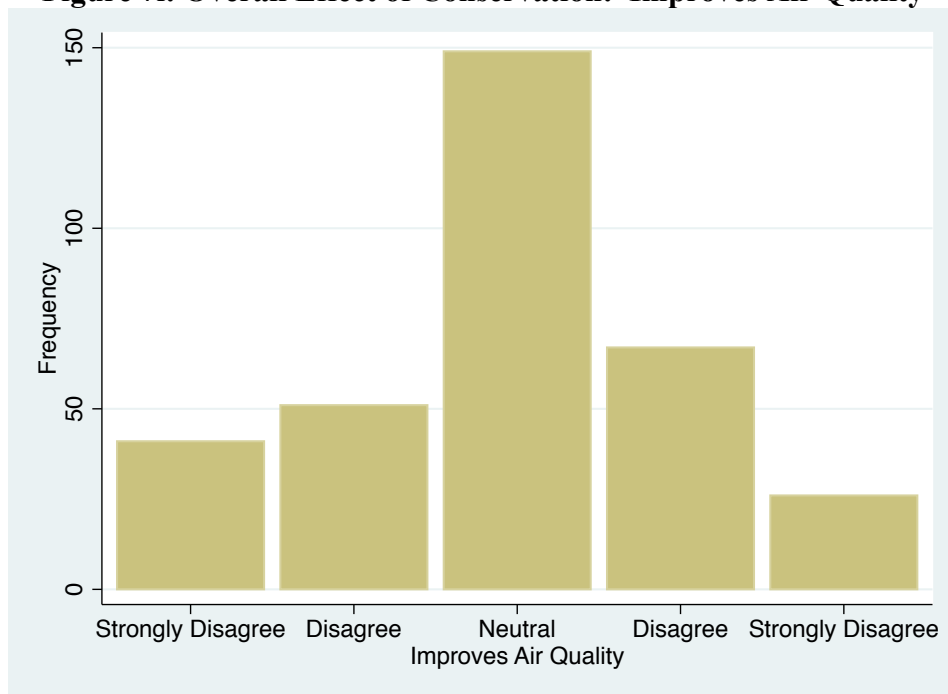
**Figure 7g: Overall Effect of Conservation: Improves Water Quality**



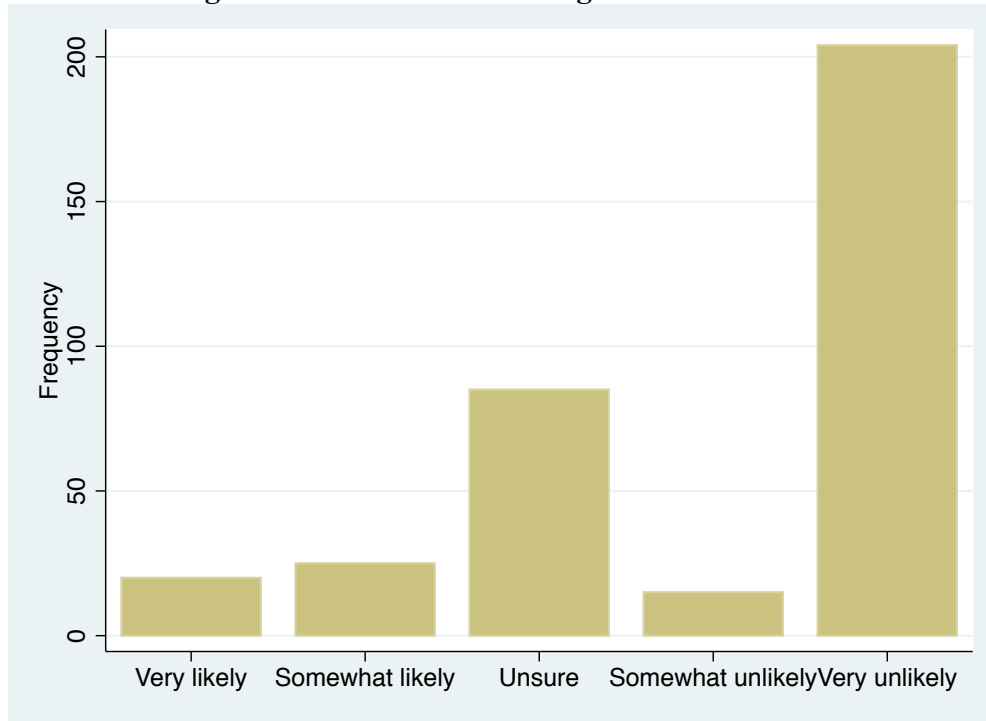
**Figure 7h: Overall Effect of Conservation: Improves Water Supply**



**Figure 7i: Overall Effect of Conservation: Improves Air Quality**



**Figure 8: Likelihood of Selling for Conservation**



**Table 1: Number of Surveys Mailed and Response Rates**

County	No. of Surveys Sent	No. of surveys received	Response Rate (%)
Shasta	588	83	14.1%
Tehama	791	138	17.4%
Glenn	217	61	28.1%
Colusa	221	54	24.4%
Butte	52	13	25.0%
Sutter	190	39	20.5%
Yolo	29	6	20.7%
<b>Total</b>	<b>2,088</b>	<b>394*</b>	<b>19%</b>

\* 5 respondents did not report county where agricultural land was located

**Table 2: Parcel Size Comparison in Sample and Universe by County**

County	Mean Parcel Area in the universe (acres)	Mean (Median) Parcel Area in the Sample (acres)	Std. Dev. of Parcel Acreage in the Sample	Minimum in the sample (acres)	Maximum in the sample (acres)
Shasta	16.97	68.30 (11)	259.39	0.3	2240
Tehama	28.22	53.52 (13.5)	162.629	0.5	1700
Glenn	56.30	143.94 (50)	188.40	0.64	790
Colusa	73.31	250.81 (71)	743.6958	5	5322
Butte	171.53	847.15 (190)	2306.441	20	8500
Sutter	68.85	195.74 (100)	457.3671	8	2800
Yolo	120.89	194.5 (180)	134.9	18	397
<b>Overall</b>	<b>37.9</b>	<b>139.72 (30)</b>			

\*Note: distances measured from the closest outside border of the parcel (not parcel centroids). "Conserved Land" includes only public lands currently managed by USFWS, BLM, DFW, or DPR



**Table 3: Characteristics of Parcel Universe**

County	Total Acreage Surveyed	Total AG Acreage with 2009 LU Data	% of land use in each category						
			Fallow	Acreage NA	Natural	Orchard	Pasture	Rice	Row Crop
Shasta	14,839	13,462.6	0.9%	21.7%	47.1%	8.0%	21.4%	0.0%	0.9%
Tehama	32,192	36,210.3	1.8%	5.6%	52.6%	23.3%	14.8%	0.7%	1.2%
Glenn	22,282	17,838.2	1.3%	6.0%	24.8%	40.2%	8.7%	9.4%	9.6%
Colusa	15,638	22,418.3	9.1%	2.9%	15.4%	21.2%	16.7%	15.8%	18.8%
Butte	28,273	10,052.5	12.2%	2.7%	24.6%	51.8%	2.9%	0.0%	5.9%
Sutter	46,682	21,331.5	2.3%	1.2%	10.3%	23.1%	12.8%	11.7%	38.6%
Yolo	11,071	5,461.9	14.4%	5.5%	38.8%	6.0%	26.3%	9.0%	0.0%
<b>Total</b>	<b>170,976</b>	<b>126,775</b>	<b>4.4%</b>	<b>5.9%</b>	<b>31.6%</b>	<b>25.2%</b>	<b>14.2%</b>	<b>6.7%</b>	<b>12.1%</b>

\*Note: distances measured from the closest outside border of the parcel (not parcel centroids)."Conserved Land" includes only public lands currently managed by USFWS, BLM, DFW, or DPR

**Table 4: Total Agricultural Area Comparison in Sample and Universe**

County	Total Agricultural Area in the universe (acres)	Total Agricultural Area reported in the survey (acres)	Agricultural area in the survey as percentage of total area in the universe
Shasta	14,839	6872.29	46.3%
Tehama	32,192	23118.47	71.8%
Glenn	22,282	8935.43	40.1%
Colusa	15,638	14554.78	93.1%
Butte	28,273	12483	44.2%
Sutter	46,682	7753.93	16.6%
Yolo	11,071	1322	11.9%
<b>Total</b>	<b>170,976</b>	<b>75,039.9</b>	<b>43.9%</b>

**Table 5: Distance to the River**

Shortest Distance from property to Sacramento River	Freq.	Percent
0 miles. This property is on the river 1	99	25.78
Less than ¼ mile = 2	45	11.72
Between ¼ to ½ mile = 3	107	27.86
Between ½ to ¾ mile = 4	37	9.64
Between ¾ to 1 mile = 5	96	25
Total	384	100

**Table 6: Cross Tabulation of Levee Condition and Private Flood Protection Measures**

Are you taking any flood protection measures?	Levee condition				Total
	1=Poor	2= adequate	3= Good	4 = I don't know	
0 = No	9	34	54	8	106
1 = Yes	6	12	13	5	36
Total	15	46	67	13	142

**Table 7: Effects of Conservation on Landowners' Own Parcels**

	Number of survey responses	Mean response	Median Response	Std. Dev.
Small mammals (rats etc.)	247	3.42	3	0.86
Large mammals (deer etc.)	260	3.53	3	0.96
Human trespassing	248	3.35	3	0.83
Weed growth	247	3.34	3	0.82
Fire hazard	245	3.33	3	0.85
Honeybee population	239	3.05	3	0.56
Groundwater levels	234	2.86	3	0.53
Endangered species regulations	241	3.34	3	0.75
Property value	243	3.01	3	0.67
Flooding	246	3.22	3	0.71

**Table 8: Perceptions of Overall Effects of Conservation**

Variable	Number of survey responses	Mean response	Median Response	Std. Dev.
It increases outdoor recreational opportunities (such as fishing, wildlife viewing, and hunting etc.)	333	3.17	3	1.30
It reduces agricultural production	348	4.10	4	0.99
It harms the agricultural economy	348	3.71	4	1.18
It reduces tax revenue for local agencies	347	3.90	4	1.05
It harms agricultural property values	342	3.35	3	1.18
Overall, it hurts the local economy	344	3.56	3	1.22
It improves local water quality	342	2.90	3	1.05
It improves local water supply	341	2.87	3	1.07
It improves local air quality	345	2.97	3	1.07

**Table 9: Results of Ordinal Logit Model for Q#32**

	(1)	(2)	(3)
Acres	0.000143 (0.00189)	0.000828 (0.00190)	0.00368 (0.00242)
This property is on the river	0.222 (0.303)	0.0965 (0.298)	-0.174 (0.374)
Neighbor has the same land use as mine	0.235 (0.278)	0.316 (0.293)	0.0789 (0.348)
Has a neighbor sold for conservation?	0.624* (0.375)	0.719* (0.369)	0.790 (0.490)
Is there a levee? (1 = Yes, 0 = No)	0.824** (0.322)	0.686** (0.270)	0.425 (0.350)
Gender (1 = Male, 0 = Female)	-0.995*** (0.274)	-0.927*** (0.277)	-1.239*** (0.337)
Clay soil	-0.340 (0.321)	-0.387 (0.322)	-0.441 (0.382)
Loam soil	0.580** (0.278)	0.373 (0.279)	0.557 (0.347)
Shasta	-0.523 (0.880)		
Tehama	-0.0732 (0.864)		
Glenn	0.826 (0.904)		
Colusa	-0.556 (0.869)		
Butte	0.0519 (1.113)		
Sutter	-0.501 (0.886)		
Years		0.0107** (0.00414)	0.0141** (0.00566)
Is there a home on the property? (1 = Yes, 0 = No)		0.780*** (0.299)	1.081*** (0.391)
Primary Land Use is Orchards		0.242 (0.298)	0.440 (0.385)
Primary Land Use is Pasture		-0.345 (0.323)	-0.694* (0.390)
Primary Land Use is Field Crops		0.0149 (0.529)	-0.422 (0.705)
How old are you?			-0.0105 (0.0115)
Level of Education			-0.279** (0.130)
This Parcel relative to total land holding			1.480** (0.742)
Observations	329	329	236

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

