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# The Relationship Between Change in Stress Level Due to Nature Exposure and an Individual's Nature Appreciation

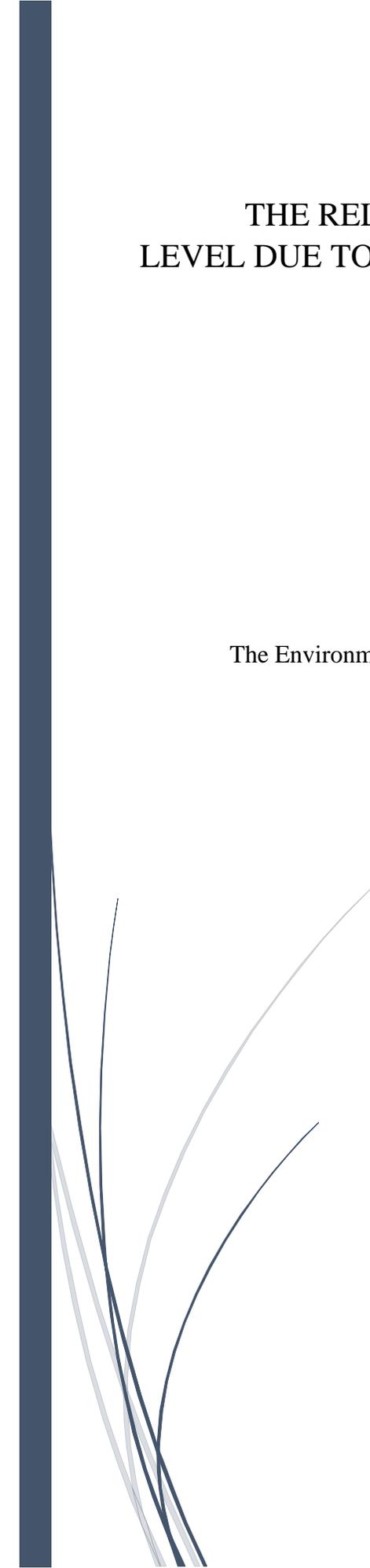
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THE RELATIONSHIP BETWEEN CHANGE IN STRESS  
LEVEL DUE TO NATURE EXPOSURE AND AN INDIVIDUAL'S  
NATURE APPRECIATION.

An Undergraduate Thesis

Presented to

The Environmental Studies Program at the University of Nebraska-Lincoln

In Partial Fulfillment of Requirements

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## **Abstract**

Many studies have focused on a connection between mental health, stress levels, and time in nature. These studies have found that, when individuals spend time in nature there is a strong chance that their stress levels have decreased (Ewert, 2016; Wells and Evans, 2003; Triguero-Mas et al., 2015). The focus of my research builds on these previous studies by attempting to incorporate Nature appreciation level to this change in stress level following nature exposure by assessing whether there is a decrease in stress levels after nature exposure, and whether an individual's Natural Nature appreciation may have an effect on the stress level change experienced. My measurement of Natural Nature appreciation was based on a survey developed by Stephen Kellert, a world-renowned author and professor at Hamline and Yale. Natural Nature appreciation refers to an individual's affinity or likeness towards the sights and sound nature provides (Kellert, 1996, 2012; Lyden, 2013). My survey was conducted at Pioneers Park, Lincoln, NE, it gathered respondents stress levels from before and after a visit and asked several questions calculating Natural Nature appreciation level. From the statistical analysis of the surveys there was evidence that stress levels decrease when a person is exposed to nature, there was no evidence found that a correlation exists between an individual's Natural Nature appreciation level and their stress level change.

## **Introduction**

Studies have researched the effect that nature has on mental health, and there is a consistent positive connection between time in nature and positive mental health (Ewert, 2016; Wells and Evans, 2003; Triguero-Mas et al., 2015). Research on the influence of nature exposure to mental health is fairly extensive indicating decreasing stress levels after nature exposure in the following groups: age (Wells and Evans, 2003; Barton and Pretty, 2010), cognitive ability (Barton and Pretty, 2010), gender (Triguero-Mas et al., 2015), and culture (Van den Berg et al., 2016). Wells and Evans (2003) observed that high levels of nature near children's homes led to lower stress levels and higher resiliency in the children during stressful life events. Elderly, over 70 years old, also experienced increases in mental health from nature exposure. Although the benefits did not rise as quickly for younger adults, they rose steadily following all lengths of green space exposure, five minutes to a whole day (Barton and Pretty, 2010). The greatest improvement in mental health was found in mentally handicapped individuals, regardless of age (Barton and Pretty, 2010). While women's stress levels dropped quicker than men's, both levels decreased significantly after exposure to nature (Triguero-Mas et al., 2015). Van den Berg et al. (2016) found that in four different European cultures (Barcelona (Spain); Doetinchem (the Netherlands); Kaunas (Lithuania); and Stoke-on-Trent (UK)) differing levels of increased mental health were present between the four cities, but each city's participant's mental health increased by a statistically significant amount after exposure to nature. Some studies have researched the connection between human stress levels and exposure to time in nature, in all time frames stress was shown statistically to decrease (Ewert, 2016; Wells and Evans, 2003; Triguero-Mas et al., 2015). In all of these studies when individuals were exposed to nature, all people improved in mental health and decreased in stress.

Quantitative and qualitative study approaches can be used to study mental health and nature exposure. However, most research assessing mental health and nature is quantitatively based, meaning that the methods emphasize objective measurements and numerical analysis of data. Examples of quantitative data would be collection of biological and physiological data from study participants or scales for participant answers to a specific question (e.g., Likert Scale). Ewert et al. (2016) tested cortisol levels in people following exposure to nature. Chemical cortisol levels in saliva are a good indicator of stress levels; the more cortisol in one's saliva, the higher the stress level of the individual. After even a short period of nature exposure in a municipal (city) park cortisol levels decreased (Ewert et al., 2016). Further, longer nature exposure decreased stress levels more than a short time of exposure. Qualitative research, on the other hand, is also sometimes used in this area of study and is primarily exploratory and descriptive. Wells and Evans, 2003, conducted qualitative research when they asked for feedback on behavior changes in the children they were studying. They coded the information and included the results in their discussion of the effectiveness of living near nature on children's stress levels.

This research builds on previous studies by comparing levels of self-described stress to the individual's level of nature appreciation. The purpose of this research was to determine if changes in stress levels after spending time in a Nebraska park is related to the individual's nature appreciation level. This study focused specifically on one of Stephen Kellert's basic values of nature - Natural Nature value. This nature appreciation can also be referred to as Aesthetic Nature appreciation. Kellert was a world renowned author as well as a professor at Hamline and Yale. Stephen Kellert at Yale University found that there are ten different nature-related values. Natural Nature appreciation refers to an individual's affinity or likeness towards

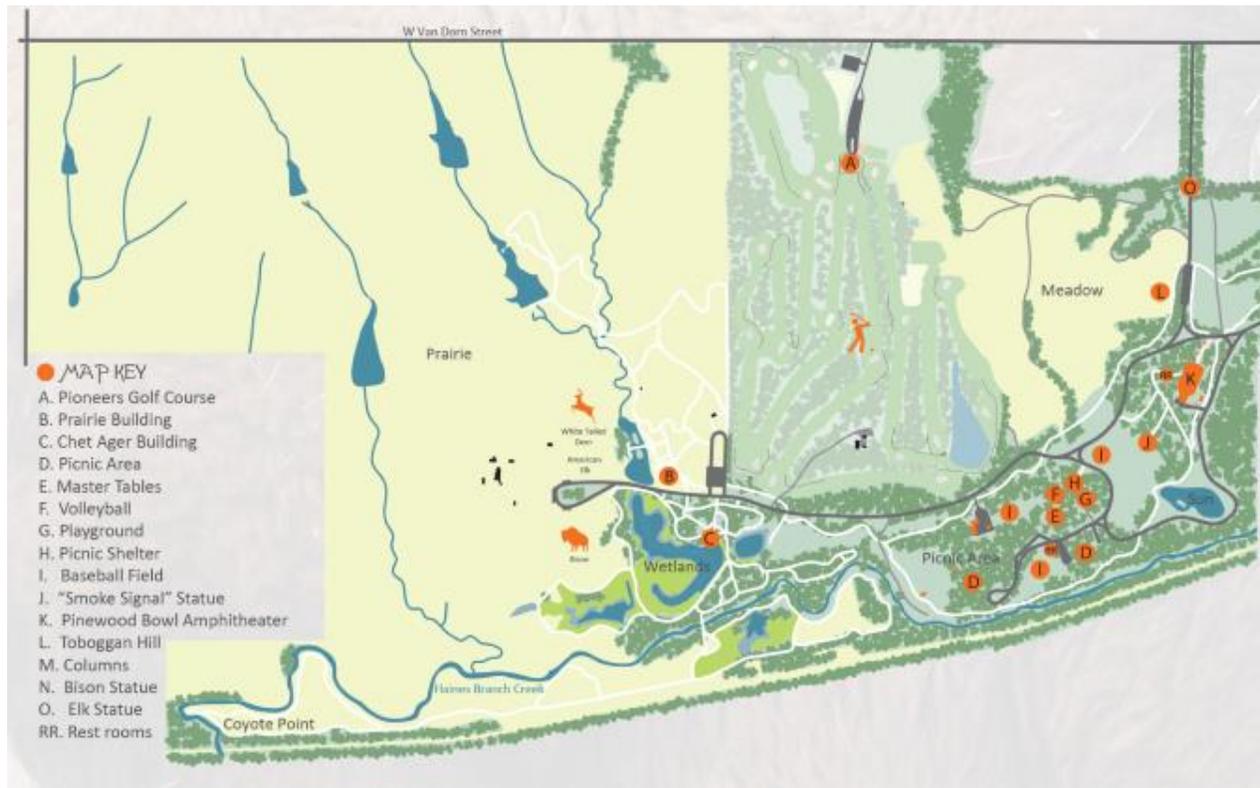
the sights and sound nature provides (Kellert, 1996, 2012; Lyden, 2013). This affinity is innate, but it also can be explored and expanded upon by learning more about nature and the processes of it (Carlson, 1995).

A hypothesis from this study was that stress levels will decrease after exposure to nature and change in stress level after exposure to nature will be significantly related to nature appreciation level. As nature appreciation increases, the decrease in stress will become greater. This hypothesis was tested by examining the correlation between change in stress levels nature appreciation levels following nature exposure. This study posits that stress levels will decrease in similarity to previous studies on this subject. This research is important because the results of this study can be used to inform the public of the health benefits that can be received from exposure to nature. By seeing more tangible health benefits the public can be encouraged to get out in nature more often and see the benefit for acting in ways that sustain the environment for the future. My research builds on these previous studies by informing the public of the extent that health benefits can be received from exposure to nature, especially when one has a higher appreciation for Natural Nature. Further, seeing that more tangible health benefits can be reached, people can be encouraged to act in ways that help sustain the environment for the future.

## **Methods and Materials**

I took training on human subjects' research through CITI training. In-person surveys were conducted with park goers at Pioneers Park in Lincoln, NE. Pioneers Park is a 668-acre park in southeast Lincoln that since its creation in 1963 has been used for environmental education and as wildlife sanctuary for the public. (Lincoln Parks, 2017). The surveys were taken on the 11<sup>th</sup> and 25<sup>th</sup> of February, both Saturdays. All weather on the dates of survey collecting

was noted. On February 11 surveys were taken at location B on the map below. On February 25 surveys were taken at location L on the map.



I used the software Snap (Snap Services Ltd., 2017) to construct a survey that could be administered on a tablet and consisted of 17 questions (Appendix A). The mental health of the participants in this research focused on personal stress levels and how one perceives their own stress level. The stress level was determined with a survey question that asked the individual to rate their stress level on a scale of one to ten, one question that asked them to think back to before their time in nature and one after. The number of questions was chosen because impromptu survey's much longer than 15 questions start to create a lack of focus in the survey taker and may influence results (Sitzmann & Wang, 2015). The survey was taken by park goers

as they were leaving the park. Each respondent answered a set of questions pertaining to perceived personal stress levels before and after the visit as well as questions that relate to Natural Nature appreciation. The questions that pertained to Natural Nature appreciation were modifications from Stephen Kellert's 'Basic Attitudes towards Wildlife' questionnaire (Kellert, 1984). I subtly modified the questions of Stephen Kellert to fit more of the situations I would encounter at Pioneers Park. The answers were scored from -3 to 3 depending on whether a Strongly Agree indicated a high or low nature appreciation with a possible range of nature appreciation levels from -21 to 21.

After these surveys were collected statistical analysis by performing t-tests comparing the different quantitative results from the survey was performed on the information gathered. These results will also be compared in significance with gender, age, and how often one frequents natural areas similar to the one the survey was given in. This was done to see if there was any significance in the results of the survey. Stress level changes were compared to the individual's Natural Nature appreciation with a paired t-test as well as a Pearson Correlation test. The questions were also analyzed and given a Cronbach's Coefficient as to how reliable the questions were.

## **Results**

A total of 32 completed surveys (one survey refusal) were collected on February 11 and 25, 2017. On February 11 the temperature was 50-61 degrees and the wind was an average of 11.3 miles per hour (Lincoln, NE, 2017). This day was the second warmest of the year. On February 25, the temperature was 29-34 degrees and the average wind speed was 8.1 miles per hour with

snow on the ground from a recent storm (Lincoln, NE, 2017). The accumulation of snow congregated people around the Pioneers Park sledding hill where many of the surveys were taken. On February 11, nineteen people were surveyed and on February 25, thirteen people were surveyed. In total there were 17 females and 15 males surveyed. The range of the nature appreciation in the individuals surveyed ranged from 3 (low appreciation) to 21 (high appreciation) (Table 1). Women and men had similar Natural Nature appreciation levels and there was no statistical significance in the T-test when compared ( $t = -0.054894$ ,  $df = 27.556$ ,  $p\text{-value} = 0.9566$ ) (Figure 1). The difference in the stress levels of males and females was also found to be statistically insignificant ( $t = 1.7103$ ,  $df = 27.627$ ,  $p\text{-value} = 0.09842$ ) (Figure 2). The only area that showed statistical significance was when I compared the stress levels before the time exposure in nature to those of the same individual after. I compared the stress levels using a paired T-test and  $p < 0.001$  ( $t = 5.1421$ ,  $df = 31$ ,  $p\text{-value} = 0.00001429$ ,  $P < 0.001$ ) (Figure 3). This was a significant change in the individual's stress levels. To test whether the stress level changes of the higher nature appreciation participants had a significant difference between the individuals with lower nature appreciation when exposed to time at the park I created a T-test on stress level changes from individuals with a Nature Appreciation level below 10 and compared that to the stress level changes in individuals with a Nature appreciation level above 10. 10 was chosen because it was in the middle of the range of Nature appreciation levels, so it separated low from high. There was no statistical significance between the two ( $t = 0.79101$ ,  $df = 16.637$ ,  $p\text{-value} = 0.4401$ ). A Pearson Correlation test was also performed to see if there was a correlation between Nature Appreciation levels and stress level changes (Table 2). There was no correlation within this data set, the Pearson Correlation significance was 0.964. A test was done to determine the reliability of the questions. This compared an individual's answers and

determined whether or not their answers were similar. Cronbach's coefficient was 0.588, a coefficient of at least 0.7 is needed to determine that the questions are reliable (Table 3). The Questions were found to be unreliable.

## **Discussion**

The goal of this research was to first identify if there is statistical significance in stress levels changes from before and after nature exposure at Pioneers Park. The second goal was to discover if there is a correlation in how much the stress level changed compared to their nature appreciation level.

From the results this study indicated a statistical significant change in the stress levels of before and after nature exposure. We can say that there is evidence to support the hypothesis that stress levels decrease when individuals are exposed to nature. All but six individuals reported a decrease in stress levels after their time in the park. Five out of the six reported no change in stress levels and only one reported an increase in stress levels after the nature exposure. There were multiple lengths of stay within this study the range was from 30 min to 4 hours. So exposure to nature within this time frame is highly likely that stress levels for an individual will decrease. This adds to the set of data that has also found decrease in stress levels due to nature exposure (Ewert, 2016; Wells and Evans, 2003; Triguero-Mas et al., 2015).

The second hypothesis of as nature appreciation levels increase the change in stress levels will increase (in a direction that shows reduced stress) was rejected within this study. There was no statistical significance when low nature appreciation levels were compared with high levels of nature appreciation when tested with a t-test. There was also no correlation between nature

appreciation levels and stress level changes when test with the Pearson Correlation test. This could largely have been due to the fact that the questions were found to be unreliable upon testing with the Cronbach's Coefficient. This also could have been because the people read the questions wrong, or the study size was too small. The average stress level to begin with could have been too low to see any significant change compared to their nature appreciation, and/or the range of the individual's nature appreciations could have been too small. There are many aspects of this study that could have contributed to the lack of correlation between nature appreciation levels and stress level changes due to nature exposure.

## **Conclusion**

It was found that a decrease in stress levels does happen in individuals when exposed to nature. This study also found no significance with relating Natural Nature appreciation to change in stress levels after outdoor exposure. For further research on this study one could conduct this study on a larger scale of individuals and time. If studied throughout all seasons of the year and/or on a larger scale different results may be found. If conducted in different parks and/or among individuals with a far greater range of Natural Nature appreciation different findings may also occur. Overall this research adds to previous studies that find a correlation between time in nature and decreased stress levels.

## Acknowledgments

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**Table 1:** Responses to the Nature Appreciation Survey questions conducted at Pioneers Park.

Survey Questions	Strongly Agree	Agree	Somewhat Agree	Neither Agree Nor Disagree	Somewhat Disagree	Disagree	Strongly Disagree	Sum
When walking in the outdoors, I feel comfortable in the natural surroundings.	23	8	1	0	0	0	0	32
It enhances my experience if I see animals while I'm at the park.	18	12	2	0	0	0	0	32
I have little desire to hike further into wild country where there are no people just to see more unusual animals.	2	4	0	2	5	7	12	32
I enjoy the sounds of nature, for example: birds singing, trees rustling.	25	7	0	0	0	0	0	32
I consider bird watching to be a boring hobby.	1	2	1	7	9	6	6	32
I am not opposed to getting my hands dirty when exploring the nature around me	13	10	2	1	2	2	2	32
I prefer to go camping in a tent because I feel closer to nature.	10	5	9	5	2	1	0	32

**Table 2:** The results of the Pearson Correlation test that determines whether there is a correlation between two sets of data.

<b>Correlations</b>			
		Nature Appreciation level	Stress level Difference
Nature Appreciation level	Pearson Correlation	1	.008
	Sig. (2-tailed)		.964
	N	32	32
Stress level Difference	Pearson Correlation	.008	1
	Sig. (2-tailed)	.964	
	N	32	32

Table 3: Cronbach's Coefficient to identify whether the Nature Appreciation survey questions were reliable.

<b>Reliability Statistics</b>	
Cronbach's Alpha	N of Items
.588	7

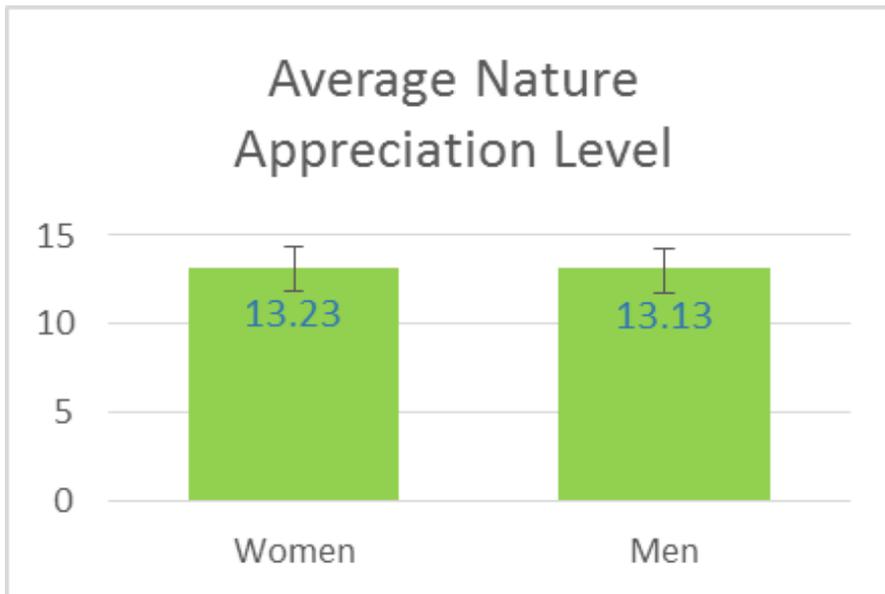


Figure 1: This represents the average Nature Appreciation level of Men and Women



Figure 2: This represents the average stress level change in Men and Women.

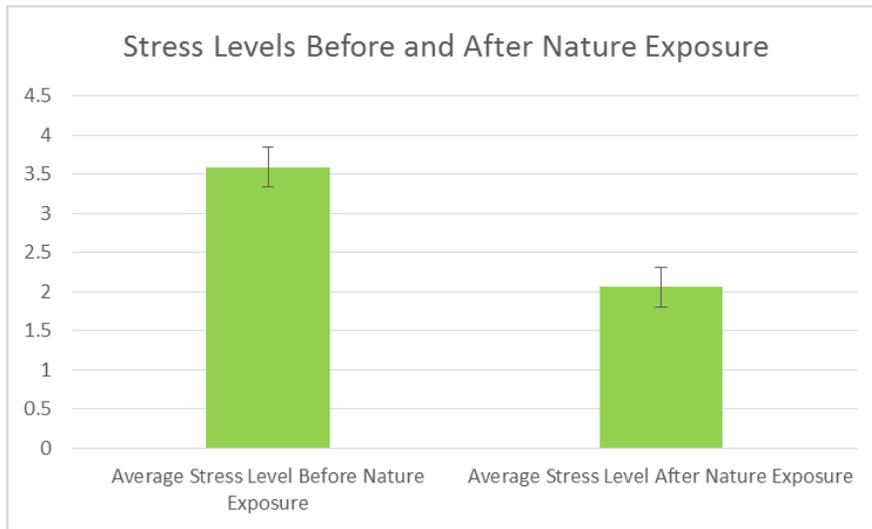
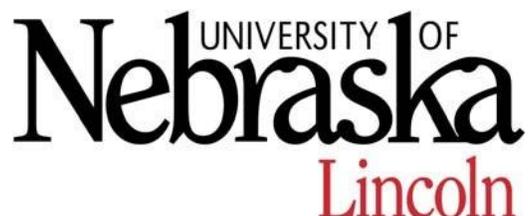


Figure 3: This graph depicts the average stress level of the individuals before and after their nature exposure.

## Appendix A

## Nature's Influence-Pioneers Park



This survey is for an undergraduate thesis project researching the effects of time in natural areas on the public. Be honest in your answers, the survey is completely voluntary and anonymous. The results will be reported in aggregate and no individual responses will be published.

Q1 Do you wish to participate in this survey?

- Yes  
 No

## Stress

Q2 How would you rate your stress level **prior** to arriving at the park today? 1 = lowest stress 10 = enormous stress

- 1  2  3  4  5  6  7  8  9  10

Q3 How do you rate your stress level now? 1=lowest stress 10=enormous stress

- 1  2  3  4  5  6  7  8  9  10

## Nature Appreciation

Q4 When walking in the outdoors, I feel comfortable in the natural surroundings.

- Strongly Disagree  Disagree  Somewhat Disagree  Neither Agree Nor Disagree  Somewhat Agree  Agree  Strongly Agree

Q5 It enhances my experience if I see animals while I'm at the park.

- Strongly Disagree  Disagree  Somewhat Disagree  Neither Agree Nor Disagree  Somewhat Agree  Agree  Strongly Agree

Q6 I have little desire to hike further into wild country where there are no people just to see more unusual animals.

- Strongly Disagree  
  Disagree  
  Somewhat Disagree  
  Neither Agree Nor Disagree  
  Somewhat Agree  
  Agree  
  Strongly Agree

Q7 I enjoy the sounds of nature, for example: birds singing, trees rustling.

- Strongly Disagree  
  Disagree  
  Somewhat Disagree  
  Neither Agree Nor Disagree  
  Somewhat Agree  
  Agree  
  Strongly Agree

Q8 I consider bird watching to be a boring hobby.

- Strongly Disagree  
  Disagree  
  Somewhat Disagree  
  Neither Agree Nor Disagree  
  Somewhat Agree  
  Agree  
  Strongly Agree

Q9 I am not opposed to getting my hands dirty when exploring the nature around me.

- Strongly Disagree  
  Disagree  
  Somewhat Disagree  
  Neither Agree Nor Disagree  
  Somewhat Agree  
  Agree  
  Strongly Agree

Q10 I prefer to go camping in a tent because I feel closer to nature.

- Strongly Disagree  
  Disagree  
  Somewhat Disagree  
  Neither Agree Nor Disagree  
  Somewhat Agree  
  Agree  
  Strongly Agree

## Nature Experiences

Q11 About how long was your visit at the park today?

- <30 minutes  
  2 - 3 hours  
 30 min - 1 hour  
  3 - 4 hours  
 1 - 2 hours  
  longer than 4 hours

Q12 About how many days in a year do you spend visting natural areas (city, state, national parks)?

- 1 - 5  
  41 - 50  
 11 - 20  
  51 - 60  
 21 - 30  
  Over 60  
 31 - 40

Q13 Did you see any water (lakes, rivers, streams) during your visit today?

- Yes  
 No  
 Not Sure

Q14 Is today your first EVER visit to Pioneers Park?

- Yes  
 No

## Demographics

Q15 What is your gender?

- Male  
 Female

Q16 In what year were you born?

Q17 What is the zip code of your primary residence?

Thank you for completing this survey, if you have any questions please let me know! My e-mail is:  
**Schwingmsr@aol.com**