Self-determination in citizen science: Diagnosing the applicability and implications for mutually beneficial settings

by

Paul Waters

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Approved by:

Major Professor
Jeffrey Skibins

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Abstract

Citizen science is a method of carrying out scientific research with the help of untrained citizens. Citizen science carries multiple potential benefits for scientific inquiry, but in order to be effective must facilitate mutually beneficial settings. The most prevalent use of citizen science has been in ornithology. Bird based citizen science projects have been highly successful and have facilitated mutually beneficial projects. The field of citizen science is changing with the onset of new technologies. These technologies may expand the opportunities of citizen science, but it is important that a mutual benefit is maintained. This study uses self-determination theory, a theory of human psychological needs and motivations, to address motivational factors of bird based citizen science participation to provide a framework by which to maintain the necessary mutual benefit. This study consists of responses from an online survey administered to subscribers of birding listservs across the country. Analysis of the responses found that the need for relatedness is most consistently related to participants' motivations. The suggestion is made that future citizen science efforts focus on the community building aspects of participation. Other nuances of the data and ideas for further research are discussed.

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Chapter 1 - Introduction

Citizen science is a method of scientific inquiry that relies upon volunteers to collect and analyze large amounts of data, which provides increased feasibility for projects of large geographic or time scales (Bonney, Cooper, et al., 2009; Dickinson et al., 2012). Since its beginnings in the early 20th century with activities such as the Christmas Bird Count, citizen science has grown to a global level (Wiersma, 2010). Citizen science projects have been carried out in many different disciplines such as ecology (Cooper, Dickinson, Phillips, & Bonney, 2007), astronomy (Méndez, 2008), mathematics (Cranshaw & Kittur, 2011), and archaeology (Silvertown, 2009), but all are focused on the concept of using the public to address practical, hands-on problems, for example repeatedly inspecting milkweed plants to determine long term trends of Monarch migration numbers (Cohn, 2008; Dickinson, Zuckerberg, & Bonter, 2010).

Citizen science has been used most significantly in the ecological sciences, where the temporal and spatial access it provides can provide maximum impact (Conrad & Hilchey, 2011; Dickinson et al., 2012; Haywood, 2014). Examples include distribution studies such as the Great Annual Fish Count or eBird (Couvet, Jiguet, Julliard, Levrel, & Teyssedre, 2008), environmental studies focused on elements such as weather or water quality (Dickinson et al., 2012), and broad phenological studies (Sullivan et al., 2009). The long-term and adaptive opportunities afforded by citizen science are a key element of current ecological research, allowing for the study of macro-ecology, which can shed new light on large scale subjects such as climate change (Devictor, Whittaker, & Beltrame, 2010; Dickinson et al., 2012; Lindenmayer & Likens, 2009).

Those opportunities have been expanded through the use of digital technologies such as the internet and smart phones (Bhattacharjee, 2005; Dickinson et al., 2012; Silvertown, 2009). Volunteers from around the world are now able to contribute to citizen science projects. For

example, Galaxy Zoo, a galaxy classifying project uses the internet to include participants form 170 countries, thereby allowing scientists to ask and answer long-term monitoring or distribution questions they otherwise could not (Danielsen, Burgess, & Balmford, 2005; Haywood, 2014; Newman et al., 2012; Raddick et al., 2009).

However, the expanded opportunities of citizen science are still reliant upon the participation of volunteers. Citizen science can provide internal benefits (e.g. satisfaction or self-expression (Lawrence, 2006) to its participants; this approach has been proposed as a way to increase scientific knowledge or understanding, ecological identity, and engagement in participants (Bonney, Cooper, et al., 2009; Haywood, 2014; Jordan, Ballard, & Phillips, 2012). Volunteers are in most cases internally or self-motivated to participate in citizen science projects (Nov, Arazy, & Anderson, 2011), but in some cases, such as eBird, a project that maps bird distribution, tangible or external rewards such as personal list management are used to engage participants (Sullivan et al., 2009). While the motivations of (e.g. interest and curiosity or a sense of purpose) and benefits to (e.g. community building or increased learning) participants in citizen science projects have been explored (Bonney, Ballard, et al., 2009; Jordan et al., 2012; Nov et al., 2011; Raddick et al., 2013; Sullivan et al., 2009), the interplay and relative importance of internal and external motivations in engaging participants has not been as thoroughly developed in citizen science literature. Understanding the interplay of these motivations will help future projects better engage participants (Rotman et al., 2012), helping ensure that projects benefit the participants, a necessary step for increased and continued participation (Rotman et al., 2012; Sullivan et al., 2014).

Self-determination theory (SDT) is a theory of motivational and psychological well-being that has been used in sport or competition (L. G. Pelletier et al., 1995; Reeve & Deci, 1996),

work place (Gagné & Deci, 2005), and cultural settings (Chirkov, Ryan, Kim, & Kaplan, 2003; Deci et al., 2001). This theory, if applied to citizen science, can provide insight into the interactions of participant motivations (Deci & Ryan, 2008a).

This study will apply SDT to bird based citizen science in order to quantify, assess, and evaluate hypothesized outcomes (satisfaction, engagement, motivation). The use of citizen science to study birds is perhaps one of the best examples of the unique capabilities of citizen science as a scientific method. The Cornell Lab of Ornithology has spearheaded a large part of the citizen science movement, managing a large variety of citizen science projects (Bonney, Cooper, et al., 2009). These citizen science projects have allowed researchers to record more accurate range data, track disease, and measure environmental impacts to nesting success (Greenwood, 2007; Wiersma, 2010), and the data from these Cornell based projects has spread beyond ornithology through collaboration with other disciplines such as landscape ecology and computer science (Sullivan et al., 2014). Considering the success of citizen science in the realm of ornithology, birders give us an excellent window by which to study the interactions of participants' motivations and the role of participatory benefits.

Birdwatching, or birding, is most simply the act of watching birds for pleasure. Birders are typically considered more dedicated than bird watchers, the former distinguished by their maintaining of lists of bird sightings (Prior & Schaffner, 2011). Birders tend to be more passionate individuals that will go out of their way to see unique or rare birds (Cordell, Hernert, & Pandolfi, 1999).

Citizen science relies on voluntary participation to advance scientific inquiry and, therefore, relies upon successful engagement and motivation of volunteers. This study will look at citizen science birding as an example and use SDT to study participant motivations in an

attempt to provide a framework or frameworks by which project managers or developers can create settings that benefit the participant, thereby effectively engaging those participants.

Problem Statement

Motivational literature in the field of citizen science has discussed different motivational factors that influence participation in citizen science projects. Absent form this literature, however, are theory driven approaches that analyze or explain the interactions of different motivational factors. In order for citizen science project developers to develop the most effective projects, it is important that the interactions of these motivations are understood. This study will use self-determination theory to address these motivational interactions and determine how they influence participants' psychological well-being.

Purpose Statement

Citizen science can provide excellent opportunities for the advancement of scientific knowledge on large scales and can be an important method for continued scientific learning. A mutually beneficial relationship between the scientific projects and the volunteers participating in them is important for the continued success of citizen science as a methodology. This study will use citizen science birding projects to apply self-determination theory to the area of citizen science in order to better understand the interactions of motivational factors among participants. By doing so, this study will operationalize concepts of psychological well-being, allowing project developers to create projects that can better ensure a benefit to the participant and, therefore, ensure continued participation.

Chapter 2 - Manuscript

Abstract

Citizen science is a method of carrying out scientific research with the help of untrained citizens. Citizen science carries multiple potential benefits for scientific inquiry, but in order to be effective must facilitate mutually beneficial settings. The most prevalent use of citizen science has been in ornithology. Bird based citizen science projects have been highly successful and have facilitated mutually beneficial projects. The field of citizen science is changing with the onset of new technologies. These technologies may expand the opportunities of citizen science, but it is important that a mutual benefit is maintained. This study uses self-determination theory, a theory of human psychological needs and motivations, to address motivational factors of bird based citizen science participation to provide a framework by which to maintain the necessary mutual benefit. This study utilized the responses from an online survey administered to subscribers of birding listservs across the country. Analysis of the responses found that the need for relatedness is most consistently associated with participants' motivations. It is recommended that future citizen science efforts focus on the community aspect of citizen science projects. The relatedness provided by citizen science projects will help ensure continued participation.

Introduction

Citizen science is a method of scientific inquiry that relies upon volunteers to collect and/or analyze large amounts of data, which provides increased feasibility for projects of large geographic or time scales (Bonney, Cooper, et al., 2009; Dickinson et al., 2012). Citizen science provides an opportunity for scientists. Engaging the public to further scientific knowledge can be tremendously successful. In order to capitalize upon this opportunity, however, it is important

that project developers understand the motivations of the volunteers on which they rely. Understanding the interplay of internal and external motivators can allow citizen science project developers to tailor their projects to their volunteers, encouraging further participation.

Self-determination Theory (SDT) is a theoretical framework that allows for research into the internal and external motivations of a citizen science participant. SDT identifies three innate needs, the need for autonomy, competence, and relatedness that together relate to a participants' motivation and psychological well-being (Ryan & Deci, 2000b). SDT can be used as a tool to identify components of participants' motivations (Vansteenkiste, Ryan, & Deci, 2008). This could allow for future citizen science projects to capitalize on these motivations to increase participation.

Birding is an activity that historically has fit well with citizen science and there are currently multiple successful bird based citizen science projects (Bhattacharjee, 2005; Wiggins, 2011). It is possible, however, that citizen science is changing the activity of birding (Cottman-Fields, Brereton, & Roe, 2013). The potential successes showcased by bird based citizen science as well as importance of understanding participant motivations in a changing discipline make birding an excellent field in which to look deeper into the role of motivations in citizen science.

Literature Review

Citizen Science

Citizen science is a method of collecting data that utilizes large numbers of amateur observers, citizens, to record data that can be used to further scientific knowledge (Bhattacharjee, 2005). It is a methodology that has developed out of a culture of public participation in science, especially in the ecological sciences (Miller-Rushing, Primack, & Bonney, 2012). Some citizen science projects use public involvement to increase the temporal or spatial capabilities of a

needed study, while others attempt to act as a conduit to increase stakeholders' involvement (Haywood, 2014; Newman et al., 2016).

Citizen science is not a new methodology. In 1900 the Audubon Christmas Bird Count involved citizens in recording bird sightings, followed by projects from the Cornell Lab of Ornithology in 1950 (Bhattacharjee, 2005; Cohn, 2008). Recently, citizen science has seen expansion to fields such as astronomy, biology, and archaeology (Raddick et al., 2009; Silvertown, 2009; Wiggins & Crowston, 2011). Projects have attempted to map the spread of invasive plant species (Bonney, Ballard, et al., 2009), measured mammal populations (Cohn, 2008), and generated water quality data (Bonney, Cooper, et al., 2009), creating scientifically valuable results.

Within ecology, citizen science has been spearheaded by the Cornell Lab of Ornithology, engaging volunteers to study everything from acid rain impacts on reproductive success of birds, to mapping the spread of avian disease, to simply providing more accurate range information (Bhattacharjee, 2005; Bonney, Ballard, et al., 2009; Sullivan et al., 2014). eBird, one of Cornell's largest projects, has used technology to create a vast network of observers leading to more ubiquitous bird sighting records than would have otherwise been possible (Sullivan et al., 2009). The internet and app-based project gathers bird presence and abundance data submitted by volunteer birders around the world (Sullivan et al., 2009). The data that is collected has been used to better understand migrations, to inform conservation decisions, and for education (Sullivan et al., 2014). These benefits are reciprocated to the volunteers; eBird is designed to provide tools such as list management and alerts for rare birds (Sullivan et al., 2014).

Citizen science projects carry scientific value, but also, like eBird, benefit the volunteer participants of a project, as well as society (Foster-Smith & Evans, 2003; Haywood, 2014).

Citizen science projects help to educate volunteers about the subject of the study and can lead to an increased understanding of the scientific process (Bonney, Cooper, et al., 2009; Jordan et al., 2012). Broader public benefits include the role of citizen science in informing public policy and encouraging public involvement in decision making (Haywood, 2014). This learning starts with simply exposing members of the public to the subject of research, but can also be planned for and included as one of the outcomes of the research (Cohn, 2008). Citizen science has also been proposed to increase scientific literacy and lead to better conservation decision making (Newman et al., 2016). This benefit to the participants and the public creates a mutually beneficial relationship that can fuel scientific as well as social change.

It is not clear, however, if the participatory benefits of citizen science are actually achieved. One study suggests that although basic knowledge may increase, a corresponding change in attitude is not a guaranteed result (Brossard, Lewenstein, & Bonney, 2005). The lack of clarity of the social impacts of citizen science projects is confounded by the changing landscape in which the methodology operates.

The recent growth of citizen science projects has been primarily driven by three factors: the advancement of technology that has allowed for easier dissemination of information (Bhattacharjee, 2005; Dickinson et al., 2012), the realization by the scientific community that citizen science can be an economically advantageous tool (Cohn, 2008; Danielsen et al., 2005), and the increased significance placed on scientific outreach (Silvertown, 2009). The technologies that citizen science has harnessed will continue to evolve, continuing to change the possibilities of citizen science (Newman et al., 2012).

In the rapidly changing field that is reliant on visitor participation, it is important that the motivations and wants of volunteers are understood (Rotman et al., 2012; Sullivan et al., 2014),

doing so will allow projects to engage and benefit, further motivating, the participants, helping to retain those participants (Raddick et al., 2013). In most situations, volunteers are intrinsically motivated to participate in citizen science projects, and willingly go out of their way to participate in projects that interest them (Nov et al., 2011). The Galaxy Zoo project, a website that allows visitors to view and classify previously unclassified galaxies, for instance, capitalized on participants' internal motivation to be a part of new discoveries (Raddick et al., 2009).

In the case of the most prevalent use of citizen science, birding, however, the intrinsic motivation cannot be as easily assumed. Participants of bird based citizen science projects, especially those like eBird, are not engaging in a new activity, but rather modifying one they already carry out (Sullivan et al., 2009). The success of projects such as this in fact rely on capitalizing upon users that are already carrying out an activity (Sullivan et al., 2014). Furthermore, in the case of eBird, the project is designed to serve as a tool for birders, serving as an external motivator for participation (Sullivan et al., 2009).

Understanding the interplay of participants' motivations will allow for better engagement of those participants (Raddick et al., 2013), and for the assurance of a benefit to the participant, helping further the scientific efforts of citizen science through increased participation (Rotman et al., 2012; Sullivan et al., 2014). The participatory benefit and effective engagement that can be pursued by understanding the interactions of participant motivations can allow citizen science to continue developing and achieve more of its potential.

Self-determination Theory

Self-determination theory (SDT) is a theoretical framework that provides both a method of understanding motivational interactions as well as a path to increasing engagement by explaining how those motivational interactions impact a participant's psychological well-being.

SDT is a research-based method of studying people's motivations and development and how those motivations influence well-being (Vansteenkiste et al., 2008). The theory identifies psychological needs, links the satisfaction of those needs with the promotion of psychological well-being, and proposes settings that are conducive to the satisfaction of those needs.

The framework was developed by differentiating motivation into autonomous (coming from within) and controlled (coming from without) motivation, and considering the impact of the types, rather than amounts, of motivation (Ryan & Deci, 2000a, 2000b). Through this motivational research, the presence of psychological needs for competence, relatedness, and autonomy were identified. The needs for competence, relatedness, and autonomy are considered to be innate, ubiquitous psychological needs of all people (Ryan & Deci, 2000b).

The theory moves on to express the importance of the attainment of competence, relatedness and autonomy due to the direct impact that the satisfaction of those needs has on a person's psychological well-being (Van Den Broeck, Vansteenkiste, Witte, Soenens, & Lens, 2010). Individuals who satisfy these psychological needs develop an autonomous orientation toward their environment, which is related to better psychological health as well as effective behavioral outcomes, while those that do not satisfy their need for autonomy develop a controlled orientation resulting in lessened overall well-being (Deci & Ryan, 2008b). Individuals that meet none of the three psychological needs develop an impersonal orientation that is associated with worsened functioning and even psychological illness (Deci & Ryan, 2008a). The attainment of the psychological requirements outlined by SDT are important for healthy individuals and an active, engaged population.

The framework first distinguished intrinsic and extrinsic motivation, considering them to be interactive rather than simply additive (Deci & Ryan, 2008b). Intrinsic motivation is typified

by interest and curiosity in the activity, and by positive feelings that result from the activity (Ryan & Deci, 2000b). Extrinsic or controlled motivation, meanwhile, refers to motivation that comes from an external consequence, be it positive or negative, that comes from an activity, but not from the activity itself (Deci, Ryan, & Koestner, 1999). Extrinsic motivation is typified by rewards and punishments. The framework considers intrinsic and extrinsic motivation to be interactive, but they do not interact uniformly (Reeve & Deci, 1996).

The non-uniformity of interactions between external and internal motivations is explained by focusing on the individual being motivated. The differences can be accounted for by understanding the differences in an individual's internalization of external regulations or motivators (Deci & Ryan, 2000; Ryan, 1995). External motivators do not interact with internal motivation in the same way because different individuals internalized the same external motivators in different ways.

SDT identifies three degrees of internalization or regulation that influence how an external motivator interacts with a person's internal motivation: introjection, identification, and integration (Ryan & Deci, 2000b). Introjection refers to a type of internalization in which an individual takes in an external control but still allows it to control themselves, a so-called partial internalization; introjection is characterized by implicit pride or guilt that could accompany an activity, the control is internalized but still controlling (Ryan & Deci, 2000b). Identification is a type of regulation in which a person realizes the importance of an activity and willingly self-regulates to achieve the activity; identification involves the individual feeling more autonomy over the activity rather than pressure (Ryan & Deci, 2000b). The third degree of regulation presented by self-determination theory is integration. Integration is a state at which an activity is integrated into a person's sense of self, fully changing extrinsically motivated activities to self-

determined ones (Ryan & Deci, 2000b). These three types of internalized regulation, along with un-internalized external regulation serve to differentiate extrinsic motivations and explain how external motivators can impact a person in different ways (Deci & Ryan, 2008b).

As shown in Figure 1 (Ryan & Deci, 2000b), the types of motivation, as well as the regulatory styles that correspond to degrees of internalization, exist on a continuum ranging from nonself-determined to self-determined behavior. Importantly, more self-determined behaviors, those driven by more internalized motivations, are more conducive to the attainment of the psychological needs for competence, relatedness, and autonomy and therefore more conducive to psychological well-being (Deci & Ryan, 2008b).

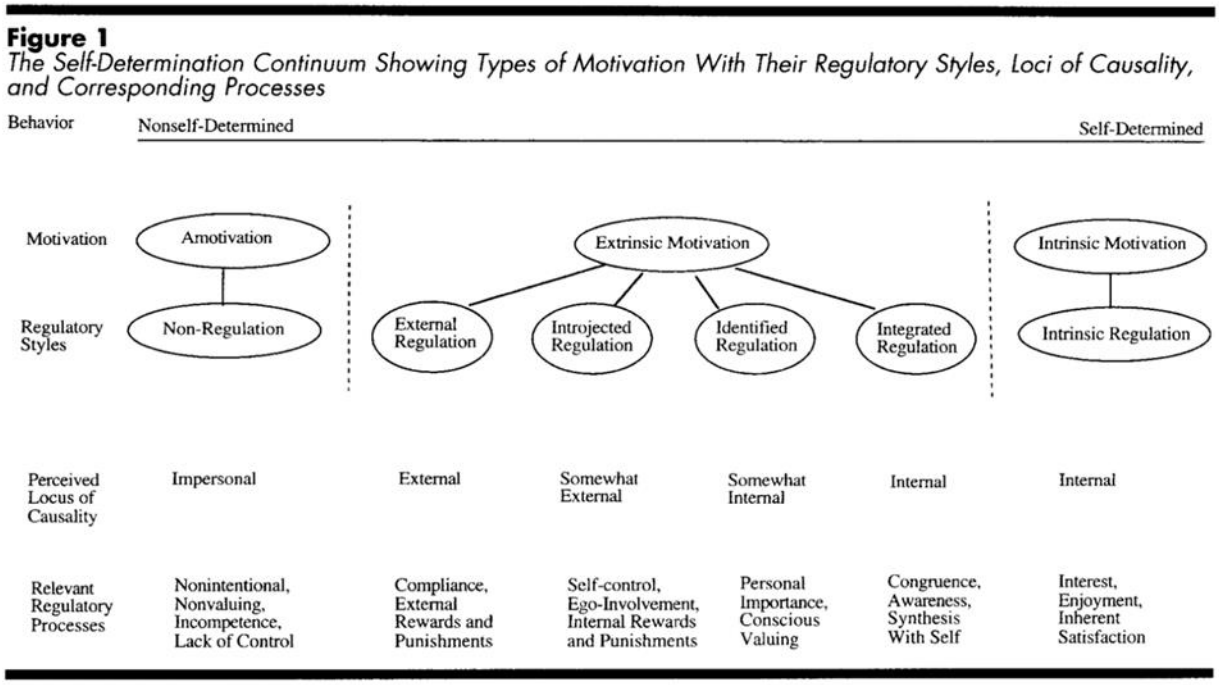

Figure 1 SDT Continuum (Ryan & Deci, 2000b)

By outlining how different motivations and regulatory styles impact an individual's psychological well-being, this framework provides a method by which to create settings more conducive to psychological well-being. The framework explains that feeling involved with a group, feeling competent and the support of autonomy facilitate the internalization of motivators

and the corresponding psychological benefits. Providing rationale, minimizing pressure, and supporting choice or autonomy have all been shown to increase self-determined behavior (Deci & Ryan, 2008a). This makes SDT an excellent framework by which to study the impacts of motivators for participation in citizen science projects and can help engage participants and ensure that a mutually beneficial relationship is offered by citizen science.

While SDT has not been used explicitly in the outdoor recreation field, it has been beneficial in sport and other leisure activities. A study of the applicability of SDT to the field of exercise found that the principles of the theory were applicable in that domain (Edmunds, Ntoumanis, & Duda, 2006). The study found that more self-determined motivation regulations significantly predicted exercise behavior, providing knowledge of the most effective ways to motivate people to exercise (Edmunds et al., 2006). Another study used the regulatory forms of extrinsic motivation outlined by SDT to develop a scale measuring motivation in sports (L. Pelletier & Sarrazin, 2007). Finally, SDT has been used to study the motivations underlying the growth of participation in video games, shedding light on how participation satisfied players psychological needs for competence, relatedness, and autonomy (Ryan, Rigby, & Przybylski, 2006). By applying SDT to these varied disciplines, these studies have enlightened developers, managers and trainers, helping them facilitate motivations that carry positive outcomes for participants.

SDT provides a framework through which settings can be designed to be conducive to psychological well-being. As previously discussed, it is vital to the continued success of citizen science projects that a mutually beneficial relationship exist between planners and participants and that projects are able to engage with volunteers (Raddick et al., 2013; Rotman et al., 2012; Sullivan et al., 2014). SDT identifies the underlying components of an individual's attainment of

psychological needs and, when those components are correlated to motivational components, enlightens planners to be able to facilitate the achievement of those needs, increasing the well-being of the participant, thereby increasing participation and benefiting the scientific outcomes of citizen science projects.

Birding

Birdwatching, or birding, is a field of outdoor recreation that can take on many identities. From enjoying songbirds in a backyard, to crossing continents to find the rarest of species, the activity encompasses a broad range of user commitment, investment, and skill (Wiggins & Crowston, 2011). Birding falls within outdoor recreation, serving as a restorative leisure activity for the participants (Plummer, 2009). The activity can be most simply defined as the act of observing birds for recreation, but is in reality more complicated.

Birdwatching, birding, birders, and bird identification all designate some, potentially overlapping, subsets of the activity (Cordell et al., 1999). The birdwatching-birding distinction generally divides along a line of the commitment of participant, birdwatching being more casual, and birding more committed. Kellert (1985) defined casual birdwatchers as individuals that could identify less than 10 species and committed birdwatchers as those that could identify more than 40. Prior and Schaffner (2011) use birdwatching in reference to participants with aesthetic appreciation motives and distinguish birders as birdwatchers that also focus more on species differentiation and listing. Listing, the practice of maintaining lists of species seen and details of location and number, provides the most concrete separation between the two subsets of the activity. This study will primarily focus on participants who maintain some sort of lists and therefore will reference birders and birding.

Birding as an activity has grown from small beginnings and undergone significant change. Bird clubs created in the early 1900s generated a foundation of participants in the Northeastern U.S. (Cordell & Herbert, 2002). The activity grew slowly, until technology such as field guides and binoculars developed to the point of being accessible to the general public. Capitalizing upon these advancements, birding grew extensively in the latter half of the 20th century; between 1983 and 2001 birding participation grew by 232 percent to include 33 percent of all Americans (Cordell & Herbert, 2002). Organized bird tours from the US and UK to places around the world began in the 1970's (Biggs, 2013). The improvement and availability of tools such as binoculars and scopes allowed birders to be more successful in finding and recording bird sightings, growing the activity into a global pastime. This growth continued into the 21st century, fueled again by access to new tools, in this case digital. By 2016, 45 million Americans were qualified as birders by the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (Service, 2017). Globally, birding tours have expanded to be offered by hundreds of different companies across the globe (Biggs, 2013). Increased access to and development of the tools of birding have grown and revolutionized the activity.

One of the most impactful changes is that birding can now be brought out of the field (Cottman-Fields et al., 2013). The prevalence of and access to digital cameras, in much the same way as binoculars, brings the birder closer to the bird. Identification no longer needs to be done in the field, but can be done through pictures after the fact (Eubanks, 2007). This allows for more successful birding outings as well as for assistance from afar by those with more expertise. The digital camera is only one new technology, however. Bird books can now be entirely contained on smartphones, allowing for the use of location filters and search bars that make finding bird information in the field faster ("All About Birds," 2017). Bird calls can be stored on

portable devices and used while birding to attract birds to the birder, rather than the birder being required to search out the bird. When connected to the internet, apps such as Cornell's Merlin allow users to input the characteristics they can distinguish and provides a list of potential birds based on location, time of year, color and behavior ("Merlin All About Birds," 2017). Even when birders are not in the field, the ease of transmission of information allows for access to up to date databases and bird lists for specific locations (Sullivan et al., 2009). The combined influence of digital technology has revolutionized the practice of birding, making it accessible to the masses.

The adoption of digital technologies makes birding an almost perfect fit for modern citizen science projects. Birding has historically been loosely connected to citizen science (the Christmas Bird Count has been conducted since 1900 and represents one of the first organized citizen science endeavors) (Cohn, 2008; Wiggins & Crowston, 2011). As technology has grown birding into the 21st century, the activity's ties to citizen science have grown with it. Projects such as the aforementioned eBird, as well as numerous other projects, have been orchestrated by leading bird conservation groups (Bhattacharjee, 2005). eBird, since its start in 2002, grew to reach more than 140 million observations by 2013 (Sullivan et al., 2014). This continued relationship of birders and science has been nourished by the applicability of the activity to citizen science.

As these technologies allow birding and citizen science to grow globally, however, they may also be changing the character of the activity itself. What was once a skill based, natural activity is changing to meet the demands of a 21st century recreationist. Eubanks (2007) warns that birders may be less skilled because of the imposition of technology into birding and encourages "intuitive birding" without the use of a camera or even binoculars. Qualitative

birding research has also discussed this digital shift and warns that birding may no longer establish a connection between the birder and the ecological context of their experience, birding becoming "devoid of life, agency, or intrinsic value" (Watson, 2011, p. 797). The infusion of digital technologies to birding have allowed for both growth and a marriage to citizen science, but may simultaneously be diminishing the recreational value of the activity.

Citizen Science literature identifies this shift, discussing the extension of birding into a virtual realm and the replacement of leisure by science (Cottman-Fields et al., 2013; Wiggins, 2011). This shift may threaten the mutually beneficial relationship necessary for citizen science. Birding based citizen science uniquely relies upon participants already carrying out an activity rather than recruiting new participants (Sullivan et al., 2009). As such, changing the nature of the activity may discourage participants from shifting their behaviors to fit with citizen science projects. Also unlike other areas, birding based citizen science provides a reward back to the participant. Projects such as eBird function as tools for birders, providing a framework within which they can keep organized lists of their sightings, as well as a database of what birds they are likely to see at different locations (Sullivan et al., 2009). Birders can use the information collected by citizen science projects to know what species they are likely to encounter in a certain area or to seek out rare or elusive birds. It is not clear, however, how these changes and benefits interact.

The unique relationship of birding and citizen science, combined with the changing dynamic of both, makes birding an excellent window through which to study the motivational interactions of citizen science volunteers. The success of bird based citizen science projects highlight the method's potential while simultaneously demonstrating the need for a better understanding of participants' motivations. Using SDT and prior citizen science motivational

research, this study sheds light on those motivations allowing citizen science to create mutually beneficial settings and move forward successfully in changing circumstances.

Study Framework

This study will use SDT to inform citizen science birding. The psychological needs outlined by SDT run parallel to identified motivations of citizen science participation. The objectives of this study are to assess the interactions of those needs and motivations and to inspect whether or not the attainment of those needs differ among different types or levels of participant, with the intent of providing a framework for future citizen science efforts to use those motivations to confer the psychological benefits of SDT to participants. Expected outcomes include a better understanding of the relative importance of SDT needs and an understanding of which of those needs are most informative for increased participation. The study will use independent variables of need for citizen science, social pressure to participate in citizen science, and intrinsic and extrinsic rewards of participation in citizen science and dependent variables of autonomy, competence, and relatedness.

Methods

The data for this study consists of electronic survey responses from subscribers to state birding listservs from across the U.S., providing access to a wide geographic range of birders. Surveys were distributed to listervs of states whose lists could be openly posted in or states whose litsowners were responsive to requests to post the survey. Responses were gathered from Arkansas (77 responses), Delaware (28), Florida (5), Georgia (3), Illinois (2), Iowa (41), Kansas (62), Maine (26), Maryland (9), Massachusetts (4), Michigan (1), Minnesota (80), Mississippi (2), Missouri (58), Montana (16), Nevada (17), New Hampshire (25), New Jersey (38), New York (7), North Carolina (4), North Dakota (24), Ohio (49), Pennsylvania (11), South Carolina (18), South Dakota (6), Tennessee (1), Texas (6), Virginia (5), Washington (3), West Virginia (17), and Wyoming (21). The survey was conducted with the use of Qualtrics and consisted of Likert scale style responses. The survey was posted to each listserv, which distributed the post as an e-mail to each subscriber to the listserv. Participants responded to the survey by following a link contained within the e-mail that connected to the survey on the Qualtrics platform. Surveys were collected in September of 2017, the survey was left open until 1,000 responses were collected. Multiple questions were asked regarding each variable to allow for the development of composites. Demographic and descriptive questions were also asked in order to understand the responses within the context of a wide range of listserv subscribers.

Variables

Independent Variables:

Need for citizen science

Need for citizen science is an aspect of a participant's motivation to participate (Nov et al., 2011; Raddick et al., 2009, 2013; Rotman et al., 2012). Raddick (2013) discusses a desire to

contribute to scientific research as a primary motivation of volunteers, while Nov et al (2011, p. 251) discusses "the importance attributed to the project's objectives." For the purposes of this study, the degree of need for citizen science is defined as the degree to which a volunteer finds citizen science important for the scientific outcomes, not for him or herself.

Social pressure for participation in citizen science

Social pressure for participation in citizen science is an aspect of a participant's motivation to participate (Nov et al., 2011; Raddick et al., 2009, 2013; Rotman et al., 2012). Nov (Nov et al., 2011, p. 250) identifies "a sense of obligation to contribute" as a motivational factor and Raddick (2013) identifies community based motivational factors. For the purposes of this study, degree of social pressure for participation in citizen science is defined as the degree to which a volunteer finds citizen science important due to community factors rather than personal or scientific factors.

Intrinsic reward of participation in citizen science

The reward of participation in citizen science is an aspect of a participant's motivation to participate (Nov et al., 2011; Sullivan et al., 2009, 2014). Nov et al. (2011) cites personal improvement or status motives. For the purposes of this study, the intrinsic reward of participation in citizen science is defined as the value placed by the participant on factors that serve to internally benefit him or herself rather than scientific or community factors.

Extrinsic reward of participation in citizen science

The reward of participation in citizen science is an aspect of a participant's motivation to participate (Nov et al., 2011; Sullivan et al., 2009, 2014). Rotman (2012) addresses extrinsic motivation by considering egoism. Sullivan (2009, p. 2283), meanwhile, state that citizen science serves as a "tool" for birders, providing tangible services to the volunteer. For the

purposes of this study, the external reward of participation in citizen science is defined as the value placed by the participant on factors that serve to externally benefit him or herself rather than scientific or community factors.

Dependent Variables:

Competence

Competence is outlined by SDT as an inherent psychological need (Ryan & Deci, 2000b). Competence is defined as "feeling effective in one's interactions with the social and physical environments" (Vansteenkiste et al., 2008, p. 7). This study defines the degree of attainment of competence as the degree to which a participant feels like an effective birder and citizen science contributor.

Relatedness

Relatedness is outlined by SDT as an inherent psychological need (Ryan & Deci, 2000b). Relatedness is defined as "caring for and feeling cared for by others" (Vansteenkiste et al., 2008, p. 7). For the purposes of this study, the degree of attainment of relatedness is defined as the degree to which a participant feels like part of a community due to citizen science participation.

Autonomy

Autonomy is outlined by SDT as an inherent psychological need (Ryan & Deci, 2000b). Autonomy is defined as "feeling volitional and fully endorsing one's own actions" (Vansteenkiste et al., 2008, p. 7). For the purposes of this study, the degree of attainment of autonomy is defined as the degree to which a participant feels like he or she participates by his or her own accord.

Results

A total of 1,030 responses were received. Data were cleaned for missingness, eliminating any case that was missing more than half of the responses per composite variables (Skibins, Powell, & Hallo, 2013); 211 cases were eliminated. Data were then cleaned for univariate outliers, removing any case more than three standard deviations from the mean; no cases were removed. Finally, data were cleaned for multivariate outliers using Mahalanobis distances; 67 cases were eliminated ($p=.001$, $df=75$, $chi^2=118.599$). After cleaning, 752 usable responses remained.

The resulting sample consisted of 53% (n=391) male respondents and 47% female respondents (n=347). The ages of the respondents were as follows: 20% (n=141) of the sample were between age 18 and 50, 22% (n=158) were between 51 and 60, 38% (n=272) were between 61 and 70, and 20% (n=142) were 71 or older. 60% (n=450) most often went birding alone. 22% (n=164) went birding every day, 45% (n=340) went birding between two and six times per week, and 33% (n=245) once or less per week. 48% (n=354) of the sample did not have a post-graduate degree, while 52% (n=388) had at least one post-graduate degree.

Respondents were asked if they considered themselves as birders and for how long they identified themselves as such. The questions were posed to allow the respondent to define whether or not they considered themselves a birder rather than whether or not they met a specific definition. A total of 98% (n=729) identified as a birder with a mean of 25 years of identity. Respondents were asked if they identified themselves as citizen scientists and for how long they identified as such. A total of 75% (n=562) identified as a citizen scientist with a mean 15 years of identity. Complete sample demographics are found in Table 2.

Composite variables were formed for each of the six latent constructs. Means and Cronbach alpha scores were generated for each composite and were as follows: need for citizen science (4 items; 1.40; .88); social pressure for participation in citizen science (3 items; 3.85; .82); extrinsic reward value (3 items; 2.45; .71); intrinsic reward value (3 items; 2.42; .83); Autonomy (3 items, 2.45, .71); Competence (3 items; 2.02; .91); and Relatedness (5 items; 2.36; .84) (Table 1).

Linear regressions were performed to uncover relationships between the composite variables (Table 3). Perceived need was shown to significantly predict levels of Competence ($F=115.41$, $p < .001$, $R^2 = .13$, $\beta = .64$, $p < .001$) and Relatedness ($F = 102.90$, $p < .001$, $R^2 = .12$, $\beta = .56$, $p < .001$). Social Pressure was shown to significantly predict Autonomy ($F=249.97$, $p < .001$, $R^2 = .25$, $\beta = -.47$, $p < .001$), Competence ($F=11.69$, $p < .05$, $R^2 = .015$, $\beta = .12$, $p < .05$), and Relatedness ($F = 42.69$, $p < .001$, $R^2 = .054$, $\beta = .21$, $p < .001$). Extrinsic Reward was shown to significantly predict Autonomy ($F = 6.16$, $p < .05$, $R^2 = .01$, $\beta = -.075$, $p < .001$), Competence ($F = 97.56$, $p < .001$, $R^2 = .115$, $\beta = .29$, $p < .001$) and Relatedness ($F = 33.77$, $p < .001$, $R^2 = .043$, $\beta = .16$, $p < .001$). Intrinsic Reward was shown to significantly predict Competence ($F = 296.95$, $p < .001$, $R^2 = .284$, $\beta = .49$, $p < .001$) and Relatedness ($F = 83.84$, $p < .001$, $R^2 = .10$, $\beta = .27$, $p < .001$).

Mean comparisons were run to determine differences in dependent variable outcomes based on demographics and categorical variables. ANOVAs with Tukey's HSD post hocs (a conservative post hoc test) were run using Birding Frequency, Reporting Frequency, Years Birding, and Age as grouping variables (Vaske, 2008). Significant differences were found among birding frequency and relatedness ($df_1 = 2$, $df_2 = 746$, $F= 18.69$, $p<.001$), reporting frequency and competence ($df_1 = 2$, $df_2 = 746$, $F=30.94$, $p<.001$) and relatedness ($df_1 = 2$, $df_2 =$

746, F=79.43, p<.001), years birding and competence ($df_1 = 2$, $df_2 = 749$, F=18.54, p<.001) and age and competence ($df_1 = 3$, $df_2 = 709$, F=2.98, p<.05).

T-tests were run to compare means between different group sizes, consideration to be a citizen scientist, use of citizen science to maintain a life list, gender, and education level. Further differences were found among self-reported consideration to be a citizen scientist and autonomy (df=743, t=3.01, p<.01), competence (df=743, t=-7.50, p<.001), and relatedness (df=743, t=-13.95, p<.001). Differences were found among those that do or do not use citizen science to maintain a life list and competence (df=598, t=-6.95, p<.001) and relatedness (df=598, t=-6.43, p<.001) as well as gender and relatedness (df=736, t=-2.67, p<.01). No differences were found among group size or education level. These mean comparisons can be found in Table 4.

Table 1

Composite variable items

Item	M ± SD	α	n
Need for Citizen Science	1.40 ± .52	.88	746
Citizen Science is important for science to be successful	1.51 ± .69		
The world needs the information learned from Citizen Science	1.32 ± .55		
Science needs the information learned from Citizen Science	1.35 ±.57		
Citizen Science helps scientists understand the world	1.42 ± .61		
Social Pressure for participation	3.85 ± .93	.82	750
I feel peer pressure from other birders to participate in citizen science	3.71 ± 1.10		
I participate in citizen science because all of the other birders I know do	3.88 ± 1.07		
I feel socially obligated by those that I bird with to participate in citizen science	3.96 ± 1.10		
Extrinsic Reward Value	3.05 ± 1.06	.87	747
I would pay for the list management tools provided by citizen science	3.01 ± 1.17		
I would pay for the identification tools provided by citizen science	2.99 ± 1.19		
I would pay for the sighting records provided by citizen science	3.18 ± 1.21		
Intrinsic Reward Value	2.42 ± .99	.83	749
I enjoy birding more because of the list management tools that citizen science provides	2.50 ± 1.18		
I enjoy birding more because of the identification tools that citizen science provides	2.59 ± 1.19		
I enjoy birding more because of the sighting records that citizen science provides	2.18 ± 1.06		
Autonomy	2.45 ± .88	.88	752
I participate in Citizen Science projects because I feel like I should	3.28 ± 1.20		

I feel like I am expected to participate in citizen science projects	2.27 ± 1.12		
I feel pressure to participate in Citizen Science projects	1.80 ± 1.01		
Competence	2.02 ± .91	.91	749
Participating in citizen science makes me a better birder	1.88 ± .93		
I feel like a better birder because I participate in citizen science	2.13 ± 1.04		
Citizen science projects help me be a more successful birder	2.05 ± .99		
Relatedness	2.36 ± .83	.84	748
I have formed relationships with other citizen science participants	2.14 ±1.06		
I identify as a citizen science participant	2.13 ± 1.11		
I feel like other birders see me as a citizen science participant	2.63 ± 1.07		
I feel a sense of belonging because I am a citizen science participant	2.50 ± 1.02		
I feel like I play a role in citizen science	2.42 ± 1.06		

Notes: Scale 1-Strongly Agree to 5-Strongly disagree

Table 2

Demographics (categories created post-survey)

Demographic	**Categories**	**N(%)**
Birding Frequency	Everyday	164 (22%)
	2-6 times/week	340 (45%)
	Once or less/week	245 (33%)
Reporting Frequency	Every or almost every time birding	319 (38%)
	Some of the time birding	272 (36%)
	Rarely or never	158 (21%)
Group Size	Alone	450 (60%)
	With others	294 (40%)
Years birding	1-15	279 (38%)
	16-35	246 (34%)
	36+	200 (28%)
Education level	No post-graduate degree	354 (48%)
	Post-graduate degree	388 (52%)
Age	18-50	141 (20%)
	51-60	158 (22%)
	61-70	272 (38%)
	71+	142 (20%)

Table 2 (continued)

Demographics

Demographic	**Categories**	**N%**
Frequency of use of Citizen Science information	Every time birding	40 (5%)
	Almost every time birding	144 (19%)
	Some of the time birding	433 (58%)
	Rarely	112 (15%)
	Never	17 (2.3%)
Birding level (self-reported of those that consider themselves a birder)	Novice	4 (1%)
	Beginner	49 (7%)
	Intermediate	486 (67%)
	Expert	190 (26%)
Citizen science level (self-reported of those that consider themselves a citizen scientist)	Novice	24 (4%)
	Beginner	102 (18%)
	Intermediate	335 (60%)
	Expert	99 (82%)
Maintenance of a life list	Maintain life list	601 (80%)
	Do not maintain life list	144 (20%)
Use of citizen science to maintain life list	Use citizen science	340 (57%)
	Do not use citizen science	260 (43%)
Use of the internet for birding	Before or after birding	633 (84%)
	While birding	212 (28%)
	Do not use internet	48 (6%)
Gender	Male	391 (53%)
	Female	347 (47%)

Table 3

Single Regressions

Independent	**Dependent**	**R^2**	**β**	***p***
Perceived Need	Autonomy	.003	-.089	NS
	Competence	.13	.64	< .001
	Relatedness	.121	.56	< .001
Social Pressure	Autonomy	.25	-.47	< .001
	Competence	.015	.12	< .05
	Relatedness	.054	.21	< .001
Extrinsic Reward	Autonomy	.008	-.075	< .05
	Competence	.115	.29	< .001
	Relatedness	.043	.16	< .001
Intrinsic Reward	Autonomy	.005	-.061	NS
	Competence	.248	.49	< .001
	Relatedness	.101	.27	< .001

Table 4

Multiple Regressions

	Independent Variable				
Dependent Variable	Perceived Need	Social Pressure	Extrinsic Reward	Intrinsic Reward	**R^2**
Autonomy	NS	β=-.48 $p < .001$	NS	NS	.25
Competence	β=.42 $p < .001$	NS	NS	β=.40 $p < .001$	.34
Relatedness	β=.45 $p < .001$	β=.15 $p < .001$	NS	β=.17 $p < .001$	.20

Table 5

Mean Comparisons

		Autonomy		**Competence**		**Relatedness**	
Independent	n	m±SD	eta	m±SD	eta	m±SD	eta
Birding Frequency							
Everyday	164	NS		NS		2.12±.73[a]	.22
2-6 times/week	340					2.29±.82[b]	
Once or less/week	245					2.35±.83[c]	
Reporting Frequency							
Every or almost every time birding	319	NS		1.79±.82[a]	.28	2.05±.70[a]	.42
Some of the time birding	272			2.03±.88[b]		2.35±.77[b]	
Rarely or never	158			2.47±.98[c]		2.98±.85[c]	
Years Birding							
1-15	279	NS		1.79±.74[a]	.22	NS	
16-35	246			2.05±.91[b]			
36+	200			2.27±1.03[c]			
Consider self to be a citizen scientist							
Yes	562	2.51±.88	.11	1.87±.82	.29	2.12±.68	.50
No	183	2.28±.86		2.49±1.02		3.09±.85	
Use CS to maintain life list							
Yes	340	NS		1.77±.75	.28	2.12±.76	.26
No	260			2.29±1.00		2.57±.90	

Notes: Scale 1-Strongly agree to 5-Strongly disagree, increase in numeric value corresponds to decrease in attainment of variable

Discussion

The survey successfully targeted birders consistent with birding literature. A mean age of 60.2 (n=713) with 60% of respondents between 51 and 70 is consistent with the expected demographics of birders (Cordell et al., 1999). This survey was responded to by slightly more males than females, while the population of birders would be expected to be a slight majority female (Cordell et al., 1999). Interestingly, while 98.1% of respondents considered themselves to be a birder, only 80.7% maintained a life list, suggesting that maintenance of a life list may not be an entirely accurate measure of birding seriousness. The respondents also represented a highly educated sample with more than half of respondents holding a post-graduate degree, higher than expected for birders (Cordell & Herbert, 2002). This could indicate that birding listservs are more frequented by a more educated audience, or that a more educated audience is interested in citizen science compared to general birders, or simply that those with a post-graduate degree were more likely to respond to a survey for academic research.

This study applied motivational factors of citizen science birding participation to all three psychological needs identified by SDT, but found that attainment of all three of those needs were not explained by participants' motivations. This indicates that within the specific setting of citizen science birding participation, the three SDT needs are not equally relevant.

Attainment of the need for autonomy was the least explained by participants' motivation to participate. This indicates that, while a majority of respondents bird alone, citizen science birding participation does not function as a solitary activity but as a group activity. Birders may still feel autonomous in their participation, but their motivation to participate does not significantly relate to that autonomy.

Corresponding to the lack of significance of autonomy in relation to participants' motivations, relatedness was the SDT need whose attainment was most explained by variations in participants' motivations. This again reflects that citizen science birding should be considered a group activity and that future citizen science projects should focus on the community aspects of participation.

External reward did not significantly explain any variance in the attainment of SDT needs, indicating that it is not a significant part of participants' motivation. This reflects the role of both birding and citizen science participation as a hobby. The internal rewards are more significant to participants. This indicates that future citizen science projects should focus on those internal rewards, in the case of bird based citizen science this means facilitating community and helping participants feel like better birders.

Combined, the relationships found between participants' motivational factors and attainment of SDT needs indicate that relatedness is the need that can be most influenced by participants' motivation. Future citizen science projects can use this information to encourage future participation as well as benefit participants by keying on relatedness. By creating settings that facilitate communication and a sense of community, citizen science projects can create a mutually beneficial relationship that will ensure continued participation.

The mean comparisons of this study also found interesting results. Most notable were that differences in both group size while birding and education level made no difference in the attainment of SDT needs. Considering the findings of the relationships discussed earlier, the lack of differences in these two areas is logical. Group size while birding does not explain the relatedness that comes from sharing sightings after the act of birding or the relatedness that comes from considering oneself to be a part of a citizen science community. Similarly,

education level does not impact one's ability to be a member of the community. It is notable, however, that differences in education level did not correspond to significant differences in the attainment of the need for competence.

Other mean comparisons yielded expected results. Increases in both birding and reporting frequency corresponded to increases in relatedness while an increase in reporting frequency also increased competence. Those that did not consider themselves to be citizen scientists reported a higher degree of attainment of autonomy, but those that considered themselves to be citizen scientists reported more attainment of both competence and relatedness. This is consistent with the outcomes of the regressions, indicating that the attainment of the need for relatedness is most influenced by participation in citizen science birding.

For citizen science project developers this means two things. First, relatedness is a key factor to citizen science participation. Projects should do everything possible to facilitate relatedness. For example, allowing participants to share their results amongst each other and communicate openly about interesting findings could increase the sense of community within a project. Second, citizen science projects do not need to key in on the education level of participants. Participants across education levels can still contribute to a sense of community regardless of their contribution to the scientific data.

Future research within citizen science birding participation could compare these findings to those from a different audience of citizen science birders. This study surveyed only those citizen science participants that are members of birding listservs. Future studies could uncover whether or not the importance of relatedness is amplified for those that subscribe to a listserv, or is indicative of all citizen science birders. That future research could also delve deeper into the variable of relatedness to explore different factors affecting its' attainment.

Furthermore, future research could expand these findings beyond the realm of bird based citizen science. Relatedness may be such a significant factor in this case because of the relatedness present within the birding community. If, however, relatedness is equally as important in other citizen science activities, it could provide a path forward for increased participation in new applications of citizen science.

Conclusion

It is important for the success of citizen science projects that the projects facilitate a benefit for both the scientific community and the participants. Self-determination Theory provides a framework that allows studies to promote psychological well-being and increased motivation. This study measured factors of participants' motivation to participate in citizen science and attainment of SDT needs among bird listserv subscribers. The study found that citizen science birding, though often done alone, should be treated as a social activity. The attainment of the need for relatedness is most consistently influenced by differences in participants' motivations to participate. The attainment of the need for autonomy, meanwhile, was not consistently influenced by participants' motivations. This means that to ensure mutually beneficial settings, citizen science projects should focus on the attainment of relatedness for its participants.

Extrinsic rewards as a motivational factor were found to not influence the attainment of SDT needs. Group size and education level also had no influence on the attainment of SDT needs. Future research could further explore underlying factors of relatedness as well as extend these findings to other citizen science venues.

Chapter 3 - Conclusion

This chapter is intended to reflect on the entire process and findings of this thesis. This thesis represents the culmination of two years of work and countless hours of literature review, thinking, researching, and writing. I am glad to have gone through the process and glad that it is nearly completed. I think that I have learned invaluable skills regarding the undertaking of large-scale projects.

The most significant thing that I learned was the complexity of the process from idea to thesis. This thesis originated from an interest in the psychological benefits of outdoor recreation and the influences of various factors on those benefits. Searching for literature on this subject was a daunting task because of the breadth of such an undefined idea. I narrowed the original idea to focus on the influences of technology on the psychological benefits of interacting with nature. In order to be able to have an operable research question, I settled on the realm of citizen science birding; an area where a traditionally outdoor activity was being influenced in new ways by technology, and the potential for psychological benefits and well-being outlined by SDT.

From this point, the research question and thesis took on a life of its own. I feel like I was unable to preserve the original idea or intent of the thesis within these boundaries. They were necessary, yes, but I feel they robbed this project of its original intent. It is possible, and even likely, that no thesis ever lives up to its original idea. It is a first attempt and practically must be constrained. I still feel, however, that my work has done nothing to answer or inform my original question. That being said, I do think the thesis successfully informs future citizen science birding projects.

All things considered, I am pleased with the results of the thesis. I think that it does effectively answer questions for the realm of citizen science and can contribute ideas to future

research. I also believe that this thesis represents a successful attempt at academic research and that I was able to demonstrate an ability to form a framework and survey instrument from theoretical constructs. I was able to produce and analyze valid statistical results to make informed conclusions.

I am also pleased with the grad school experience that completing this thesis provided. I was given the opportunity to form hopefully lasting friendships with my cohort of students as well as the opportunity to be exposed to the world of academic research. The Park Management and Conservation program at K-State has provided me with excellent opportunities to make connections and to learn from bright and knowledgeable professors, as well as provided me with exposure to top-tier research in the field.

Chapter 4 - References

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Appendix A - Survey Instrument

Citizen Science Birding

Start of Block: Block 11

Q110 Hello! Thank you for your participation in this research study. Before starting please review the following information:

Participation in this survey is voluntary. The survey will take about 15 minutes to complete. You must be 18 to take the survey. Participation in this survey will help the researchers learn about the motivations of bird based citizen science participants. There are no anticipated risks associated with taking this survey and no identifying information will be collected.

Research project information:
Researchers: Dr. Jeffery Skibins and Paul Waters, Kansas State University
IRB Exemption#: 8866
Contact: pwaters@ksu.edu

Please select one of the following:

- ○ Yes, I agree to participate and am at least 18 years of age. (1)
- ○ No, I do not agree to participate. (2)

End of Block: Block 11

Start of Block: Survey

Q101 This survey will ask you questions regarding your opinions of birding and citizen science. Please think about your participation in any form of bird based citizen science, examples include eBird, the Christmas bird count, the Merlin or eBird app, participation in a listserv and others.
The following statements regard the importance of citizen science, please indicate your level of agreement with each statement.

Q1
Citizen science is important for science to be successful.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q7 The world needs the information learned from citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q8 Science needs the information learned from citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q9 Citizen science helps scientists understand the world.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q10 Citizen science is effective.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q11 Citizen science is legitimate science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q12 Citizen science is something that I need to do.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q13 Citizen science is something that I want to do.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q14 Citizen Science is something that I should do.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q15 I participate in citizen science because I enjoy it.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q16 I think everyone should participate in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q17 I feel important when I participate in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q102 The following statements regard social aspects of participating in citizen science, please indicate your agreement with each.

Q18

I would feel left out of my birding community if I didn't participate in citizen science projects.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q19 I feel peer pressure from other birders to participate in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q20 I participate in citizen science because all of the other birders I know do.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q21 I feel socially obligated by those that I bird with to participate in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q22 I wouldn't fit in with other birders if I didn't participate in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q23 Every birder I know participates in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q24 I think participating in citizen science is important to other birders.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q25 Citizen science helps me connect with other birders.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q26 I enjoy the relationships with other birders that I have developed through citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q27 Other birders would look down on me if I didn't participate in citizen science.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q28 I have created friendships with other birders through citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q29 I feel pressure from the scientific community to participate in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q103 The following statements regard the benefits of participation in citizen science, please indicate your agreement with each. Benefits of citizen science participation include list management, sighting record distribution, and identification help.

Q30

Participating in citizen science is useful to me.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q31 I participate in citizen science because it provides tools to help me be more successful.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q32 I wouldn't be successful at birding without citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q33 I rely on information from citizen science to find birds.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q34 The benefits of participating in citizen science projects are the main reason I participate.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q35 Feeling like a good birder is important to me.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q36 I would find it difficult to go birding without using the identification help provided by citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q37 I would find it difficult to go birding without using the sighting records provided by citizen science.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q38 I would pay for the list management tools provided by citizen science if necessary.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q39 I would pay for the identification tools provided by citizen science if necessary.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q40 I would pay for the sighting records provided by citizen science if necessary.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q41 I enjoy birding more because of the list management tools that citizen science provides.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q42 I enjoy birding more because of the identification tools that citizen science provides.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q43 I enjoy birding more because of the sighting records that citizen science provides.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q44 I have changed the way I bird in order to get the benefits of participating in citizen science projects.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q104 The following statements regard your motivation to participate in citizen science, please indicate your level of agreement with each.

Q45

I participate in citizen science because I want to.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q46 I choose whether or not to participate in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q47 I am free to participate in citizen science in whatever way I want.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q48 I participate in citizen science projects because I am curious about the information they provide.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q49 I feel like I can give meaningful feedback to citizen science project designers.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q50 I feel like I can go birding without participating in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q51 I don't need citizen science to go birding.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q52 I view participating in citizen science and birding as two separate activities.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q53 Citizen science projects limit my freedom while birding.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q54 I participate in citizen science projects because I feel like I should.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q55 I feel like I am expected to participate in citizen science projects.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q56 I feel pressure to participate in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q105 The following statements regard your personal motivation to participate in citizen science, please indicate your agreement with each.

Q57

I enjoy the personal challenge that participating in citizen science provides.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q58 Citizen science projects help me achieve personal goals.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q59 I feel a sense of accomplishment from participating in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q60 I feel like I can make a meaningful contribution to citizen science projects.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q61 Participating in citizen science makes me a better birder.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q62 I feel like a better birder because I participate in citizen science.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q63 Citizen science projects help me be a more successful birder.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q64 I take pride in participating in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q65 I feel capable of participating in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q66 The information I provide citizen science is valuable.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q67 Participating in citizen science makes birding more difficult.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q68 Participating in citizen science while birding makes birding less enjoyable.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q106 The following statements regard social aspects of your participation in citizen science, please indicate your agreement with each.

Q69

Participating in citizen science makes me feel part of a group.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q70 I have formed relationships with other citizen science participants.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q71 I identify as a citizen science participant.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q72 I would lose friends if I stopped participating in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q73 Participating in citizen science makes me feel connected to other birders.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Page Break

Q74 I feel like other birders see me as a citizen science participant.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q75 I care about the relationships with other birders that I have formed through citizen science participation.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q76 I feel a sense of belonging because I am a citizen science participant.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q77 I feel like I play a significant role in citizen science.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q78 I identify more as a citizen scientist than as a birder.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q79 I can relate to other citizen science participants.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

Q80 It is important to me to know other people with interests similar to mine.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Page Break

End of Block: Survey

Start of Block: Block 1

Q107 Please answer the following questions regarding your personal birding habits.

Q81

How often do you go birding?

- Everyday (1)
- More than once per week, but not everyday (2)
- Once per week (3)
- Once per month (4)
- Less than once per month (5)

Page Break

Q82

How often do you report your sightings for citizen science?

- ○ Every time you go birding (1)
- ○ Almost every time you go birding (2)
- ○ Some of the time you go birding (3)
- ○ Rarely (4)
- ○ Never (5)

Page Break

Q83

How often do you use citizen science information before or while birding?

- ○ Every time you go birding (1)
- ○ Almost every time you go birding (2)
- ○ Some of the time you go birding (3)
- ○ Rarely (4)
- ○ Never (5)

Page Break

Q84 Most of the time you go birding do you go:

- ○ Alone (1)
- ○ In a small group (2-3 people) (2)
- ○ In a larger group (4+ people) (3)

End of Block: Block 1

Start of Block: Block 72

Q85 Do you consider yourself to be a birder?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Do you consider yourself to be a birder? = Yes

Q86 What level of birder do you consider yourself to be?

- ○ Novice (1)
- ○ Beginner (2)
- ○ Intermediate (3)
- ○ Expert (4)

Display This Question:

If Do you consider yourself to be a birder? = Yes

Q87 How many years have you considered yourself to be a birder?

_____

End of Block: Block 72

Start of Block: Block 70

Q88 Do you consider yourself to be a citizen scientist?

- Yes (1)
- No (2)

Display This Question:

If Do you consider yourself to be a citizen scientist? = Yes

Q89 What level of citizen scientist do you consider yourself to be?

- Novice (1)
- Beginner (2)
- Intermediate (3)
- Expert (4)

Display This Question:

If Do you consider yourself to be a citizen scientist? = Yes

Q90 How many years have you considered yourself to be a citizen scientist?

_____

End of Block: Block 70

Start of Block: Block 69

Q91 Do you maintain a life list?

- Yes (1)
- No (2)

Display This Question:

If Do you maintain a life list? = Yes

Q92 How long have you maintained a life list? (In years)

_____

Display This Question:

If Do you maintain a life list? = Yes

Q93 Do you use a citizen science project to help you maintain your life list?

- Yes (1)
- No (2)

End of Block: Block 69

Start of Block: Block 68

Q94 Please indicate whether you use any of the following tools for birding:

Q95 The internet

- [ ] Before or after birding (1)
- [ ] While birding (2)
- [ ] I don't use the internet for birding (3)

Display This Question:

If The internet != I don't use the internet for birding

Q96 Please select which of the following you use:

- [ ] eBird.org (1)
- [ ] Birding listserv (2)
- [ ] Other internet tool (3)

End of Block: Block 68

Start of Block: Block 67

Q98 A smartphone or tablet based app

- ☐ Before or after birding (1)
- ☐ While birding (2)
- ☐ I don't use a smartphone or tablet based app (3)

Display This Question:

If A smartphone or tablet based app != I don't use a smartphone or tablet based app

Q99 Please select which of the following you use:

- ☐ eBird app (1)
- ☐ Merlin app (2)
- ☐ Other (3)

End of Block: Block 67

Start of Block: Block 66

Q100 A speaker with bird calls

- ○ Before or after birding (1)
- ○ While birding (2)
- ○ I don't use a speaker with bird calls (3)

Page Break

Q102 A camera or pictures

- Before or after birding (1)
- While birding (2)
- I don't use a camera or pictures for birding (3)

Page Break

End of Block: Block 66

Start of Block: Block 65

Q103 Please answer the following demographic questions:

End of Block: Block 65

Start of Block: Block 63

Q104 What year were you born?

_____

End of Block: Block 63

Start of Block: Block 63

Q105 What is your gender?

- ○ Male (1)
- ○ Female (2)

Page Break

Q109 What is the highest level of education you have completed?

- ○ High school (1)
- ○ Some college (2)
- ○ College degree (3)
- ○ Post graduate degree (4)

Q108 What is your zip code?

_____

End of Block: Block 63

Appendix B - IRB Approval

KANSAS STATE UNIVERSITY | University Research Compliance Office

TO: Dr. Jeffrey Skibins
Horticulture and Natural Resources
2021 Throckmorton Hall

Proposal Number: 8866

FROM: Rick Scheidt, Chair
Committee on Research Involving Human Subjects

DATE: 07/05/2017

RE: Proposal Entitled, "Self-determination Theory in Citizen Science"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written – and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

203 Fairchild Hall, Lower Mezzanine, 1601 Vattier St., Manhattan, KS 66506-1103 | 785-532-3224 | fax: 785-532-3278
comply@k-state.edu | k-state.edu/research/comply