Investigating the Spatial Relationship Between Sense of Place and Community-Based Organizations: Do Community-Based Organizations Influence Volunteering in the Indian River Lagoon, Florida?

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INVESTIGATING THE SPATIAL RELATIONSHIP BETWEEN SENSE OF PLACE AND COMMUNITY-BASED ORGANIZATIONS: DO COMMUNITY-BASED ORGANIZATIONS INFLUENCE VOLUNTEERING IN THE INDIAN RIVER LAGOON, FLORIDA?

by

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B.S. Stetson University, 2015

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ABSTRACT

Sense of place has been used among the literature as a framework for understanding pro-environmental behavior, such as volunteering, and connections to specific areas. It is also noted that sense of place can be fostered through Community-Based Organizations. However, there is limited research specific to the Indian River Lagoon (IRL), FL, on the potential influence Community-Based Organizations (CBOs) have on volunteering in the IRL. I examined secondary geographic data collected through the CNH-L: Restoration and Resilience in Coupled Human-Natural Systems: Reciprocal Dynamics of a Coastal 'Lagoon in Crisis' project funded by the National Science Foundation Grant Award Abstract No. 1617374. The sample includes 1,005 sense of place participant responses from community members, organizations, and citizen scientists of the IRL. I examined the spatial relationship between participants' interest to volunteer relative to twenty selected CBOs to determine if these interests are higher in areas with an environmental community presence (i.e., CBO) in the IRL using the Multiple Ring Buffer Analysis tool in ArcGIS Pro. Out of 1,005 total responses, 731 sense of place points, or 73% of points, were within 10-miles of CBOs in the IRL. A Two-Sample t-Test assuming Unequal Variances and Regression analysis were conducted to compare future volunteering responses, yes or no, within the 10-mile buffer radius. Results indicate that there is not a statistically significant spatial relationship between the participants’ interest to volunteer relative to CBO locations. Statistically significant results from the Chi-Square Goodness-of-Fit Test comparing past and future volunteer responses suggest a relationship between past experiences and future interest. Therefore, recommendations for future studies include modifying the survey questions to investigate the participants’ motivation to volunteer in addition to integrating the participant’s
reason for selecting the sense of place location with the analysis to further understand the participants’ connection to the area.
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CHAPTER 1: INTRODUCTION

Why do people protect a particular location or ecosystem? Studies have focused on answering this question from various perspectives and frameworks ranging from researching individual characteristics, behaviors, and, more recently, attachments to a location, also referred to as sense of place. Sense of place has become popular among the literature as a framework for understanding pro-environmental behavior and connections to specific areas as it focuses on the human-nature relationship. According to Tuan's explanation of sense of place, space is abstract until a person gives meaning to that place (Tuan, 1977). These meanings may be influential in how a person views a location and acts to preserve that space. In the literature, sense of place can be cultivated through various ways, including experiences, Community-Based Organizations (CBOs), and has been linked to pro-environmental behaviors such as volunteering and participating in restoration. Therefore, understanding the relationship between sense of place and pro-environmental behaviors may provide a fundamental understanding of conserving North America's most ecologically diverse estuary, the Indian River Lagoon (IRL), which has been experiencing a decline in quality over the last 50 years (Sigua et al., 2000; Sigua & Steward, 2000).

The Indian River Lagoon (IRL) is home to 2,100 plant species and 2,200 animal species and serves as a nursery and spawning ground for both oceanic and lagoon species of fish (St. Johns River Water Management District & Indian River Lagoon National Estuary Program, 2007). Threats to the Indian River Lagoon's quality include pollution from both point and non-point sources, changes or disruption to the lagoon's water circulation, and changes to the inflow of freshwater to the lagoon (Sigua et al., 2000). Excess nutrient pollution has been a focus as it
has been found to result in eutrophication, harmful algal blooms, fish kills, and changes to water clarity (St. Johns River Water Management District & Indian River Lagoon National Estuary Program, 2007; Lapointe et al., 2015). Consequently, wildlife and vegetation may experience health issues that contribute to the decline of populations and vegetation coverage that negatively impacts the ecosystem. The degradation of the Indian River Lagoon not only impacts the natural inhabitants of the estuary but has social implications for stakeholders, too.

According to the Indian River Lagoon Economic Valuation Update (2016), in 2014, the economic output value for the IRL was about $7.6 billion per year generated by various industries tied to the IRL. Additionally, these industry groups support nearly 72,000 jobs generating an annual wage of more than 1.2 billion dollars (East Central Florida Regional Planning Council & Treasure Coast Regional Planning Council, 2016). Therefore, preserving the Indian River Lagoon has economic and social benefits for those connected to or dependent on the IRL. Declining water quality can negatively impact tourism, fishing opportunities, and recreational activities tied to the Indian River Lagoon's aesthetic beauty. Thus, it is crucial to mitigate anthropogenic factors' impacts on the IRL for all stakeholders involved.

To mitigate anthropogenic impacts, restoration projects and activities along the Indian River Lagoon focus on various aspects of the lagoon's health. Some of these efforts are organized through Community-Based Organizations. Community-Based Organizations have been reported among the literature as contributing to creating a sense of place within a community as they provide opportunities to volunteer and participate in research projects (Thomas et al., 2008; Dresner et al., 2015; Ellery & Ellery, 2019; Wimmer & Walters, 2019; Toomey et al., 2020). However, there is limited research specific to the Indian River Lagoon on the potential influence Community-Based Organizations have on volunteering in the IRL.
The purpose of this study is to investigate the participants’ interest in volunteering in the IRL in relation to the distance of the participants’ sense of place locations from CBOs. This study aims to contribute to the growing literature regarding pro-environmental behavior, specifically interest in volunteering, and sense of place specific to the Indian River Lagoon. An additional focus is to understand if organizations can help increase volunteer and restoration efforts in the IRL to preserve the lagoon for future generations. Therefore, the research question is: do Community-Based Organizations influence an individual's interest to volunteer within the IRL?

I evaluated secondary sense of place data collected through the CNH-L: Restoration and Resilience in Coupled Human-Natural Systems: Reciprocal Dynamics of a Coastal' Lagoon in Crisis' project funded by the National Science Foundation Grant Award Abstract No. 1617374. I used the Multiple Ring Buffer Analysis in ArcGIS Pro to assess the spatial relationship between the individual's selection of sense of place paired with the individual's response to interests in participating in volunteer restoration efforts to determine if these interests are higher in areas with a strong environmental community presence (i.e., CBO) along the Indian River Lagoon. The Two-Sample t-Test assuming Unequal Variances and Regression analysis were conducted to compare future volunteering responses, yes or no, within the 10-mile buffer radius to investigate this relationship.

To analyze the sense of place connections within the community and CBOs, I used an integrative framework grounded in the social-ecological system (SES) perspective and sense of place to guide the study. The social capital theory will serve as a complementary theory to analyze the research question at hand. I hypothesize that sense of place point data near Community-Based Organizations will result in a higher interest to volunteer. The null hypothesis
is that there is no statistically significant difference between the participants’ interest to volunteer relative to CBO locations.

**Theory**

Social-ecological systems indicate a closer look into the complex relationships between people and place (Kibler et al., 2018). The interaction between people and nature is a complex feedback system composed of positive and negative feedback loops created through human-nature interactions (Kibler et al., 2018). The use of the area or contribution of pollution resulting from humans would be considered a negative feedback loop resulting in the degradation of the IRL (Kibler et al., 2018). Restoration of the lagoon would be considered a beneficial feedback loop as it would restore the natural ecological services produced by the IRL (Kibler et al., 2018).

However, as Kibler et al. (2018) discuss, complexity arises when the restoration of an area results in a negative feedback loop of degradation by beautifying the area and attracting human usage or development. Ironically, beautifying an area through restoration may increase the area's usage, which results in degradation or harm caused to the ecosystem down the line. However, the restoration may also increase awareness and interest in the area, which increases protection and changes in human behavior to preserve and protect the area. Consequently, resulting in a beneficial feedback loop as this interest may result in additional restoration projects and protect the area and ecosystem. Identifying sense of place in this regard is important to understand how people use this area and the meanings associated with the location (Kibler et al., 2018).

Among the literature, social capital theory has been described as the reciprocal connection of networks and resources, or relationships, among a community (Manero et al., 2018).
Kittinger et al. (2013) explain that "social capital and social networks provide mechanisms through which human actors exchange information and knowledge, and organize collective action around natural resources and initiatives" and is integral for collective action within a community (Kittinger et al., 2013, p. 11). For example, in their study, the researchers found that word of mouth was the main method for individuals to become involved in the project (Kittinger et al., 2013). Therefore, the individuals used their social connections to become involved in the project within the community. Social capital also extends beyond the individual level to neighborhood connections and "culture of democratic communitarianism," which is the value placed on a "community and on working collectively to improve it" (Manzo and Perkins, 2006, p. 342)

Social capital can also “encourage a sense of shared responsibility through civic engagement” and decision-making within a community to address the “‘local’” needs of the community regarding decision-making from the bottom-up (Manero et al., 2020, p. 13). There may also be investments in social capital that produce a monetary gain for the participating groups based on the reciprocal nature of the networks (Manero et al., 2020). Similarly, social capital is the "investment in social relations with expected returns in the marketplace" (Lin, 2001, p. 19). Lin (2001) explains the success of social capital in "enhancing the outcomes of action" due to the following reasons (Lin, 2001, p. 19):

1. There is a flow of information, such as bringing awareness to potential opportunities or choices available to a person (Lin, 2001).

2. Some social networks may influence a decision-making process if the individual holds a degree of power (Lin, 2001).
3. An individual's access to resources through certain relationships may be possible as a form of social credentials that can provide additional resources to the organization (Lin, 2001).

4. Reinforcement benefits the individual as it provides recognition and acknowledgment of one's "worthiness" as a member of a group (Lin, 2001, p. 20). It is also "essential for the maintenance of mental health and the entitlement to resources" (Lin, 2001, p. 20).

Therefore, collective action may be explained through social capital and the network of organizations within the Indian River Lagoon, encouraging volunteer activity near these areas. Coupling a social-ecological systems framework focused on sense of place with social capital theory supports the basis of my hypothesis that participants' interest to volunteer may be higher in areas closer to Community-Based Organizations.
CHAPTER 2: LITERATURE REVIEW

Sense of Place

Understanding sense of place's role in environmental sustainability and stewardship is a growing framework to study the relationship between people and the environment, exemplified by the following literature review. Sense of place or place-based relationships are essential to understand and consider when it comes to conservation and protection of a place as it helps to understand how people relate to their environments (Lin and Lockwood, 2014). Sense of place has also gained favorability in discussing the relationship between people and places as there is a complicated, reciprocal relationship between the two. Not only do humans impact their environment through development and activities, but humans can also experience impacts from the environment (Qazimi, 2014; Kibler et al., 2018).

Throughout the literature, there are various approaches to understanding human-environment relationships. Focuses on place identity, place attachment, placemaking, and emotional connections, to name a few, are further explored in the context of environmental sustainability. Some studies approach the topic from a psychological or social construct of place on the individual. For example, Qazimi (2014) explores the connection between sense of place and place identity. According to Qazimi, place identity is made up of one's "observations and interpretation" of the environment, including memories, thoughts, and settings (Qazimi, 2014, p. 307). Therefore, some studies focus specifically on sense of place based on an individual's identity or attachment as "senses of place are also very personal" (Qazimi, 2014, p. 309).

Rather than focusing on the construct of identity or personality, Brehm et al. (2013) emphasize the importance of understanding place attachment and meaning to determine
environmental concerns regarding changes to landscapes. Place meaning focuses on the individual's perception of their connection to nature in a specific location, while place attachment focuses on an emotional response. Specific to the Newfound Lake watershed, place meaning was statistically more significant than place attachment for predicting the participants' environmental concern about the watershed (Brehm et al., 2013). Brehm et al. (2013) discuss that their findings are different from the literature focusing solely on attachment. Place attachment may be statistically significant alone, but when compared to place meaning, it does not show significance as an independent variable (Brehm et al., 2013). Hence, studies should look further into the meaning than an emotional attachment when considering environmental conservation.

Some of the literature shifts the focus to the influence of the physical location on sense of place. Instead of focusing on social ties or connections, Sebastien (2020) focused on the physical location to understand the "people-place interaction" (Sebastien, 2020, p. 204). While interviewing the participants in the Forez plain, the results indicated conflicting place attachments. Some participants valued preserving nature while other participants valued preserving their quality of life and activities relating to the same area. Therefore, there can be a diversity in place attachments based on the reasoning for the attachment, whether that is preserving nature for ecological or recreational reasons (Sebastien, 2020). Similarly, Masterson et al. (2017) explain that individuals may be strongly attached to a place but not for the same reason. Consequently, it is essential to consider that the same environment may have a diversity of meanings, depending on the individual (Masterson et al., 2017).

Alternatively, as Stedman (2003) found, the physical landscape itself can contribute to an individual's meaning ascribed to a particular place. Property owners in the Northern Highlands Lake District of Northern Wisconsin were interviewed to study place attachment and
satisfaction. The results indicate that the property owners had their view of what the area meant to them, referred to as 'up north.' Some participants viewed the area as a pristine escape from civilization, while others viewed the area as a recreational area to be used. Development of the area would negatively impact the perspective of participants that viewed the area as an escape. In contrast, those who viewed the area recreationally would not experience such an impact (Stedman, 2003). As Stedman (2003) explained, the development might not impact the person's attachment to the area, but it could "dramatically change what kind of place the setting represents" (Stedman, 2003, p. 683). It is crucial to understand the cognitive components behind areas and of the individuals because "meanings put the 'sense' into sense of place" (Stedman, 2002, p. 577).

Sense of place is not limited to residents of an area. Non-local residents can also have a sense of place or place an attachment to a location. While using case studies of two Tasmanian protected areas, Lin and Lockwood (2014) found from the qualitative interviews that there was a non-localized sense of place for visitors to the location due to functional attachment and emotional attachment. Meaning, some visitors preferred the location due to the recreational activities that were supported there. These activities can be found elsewhere in similar locations and have a similar sense of place for locations that allow these types of activities, referred to as functional attachment. The emotional attachment for some participants was linked to the area's history, which could also be found in other areas with similar historical values. The participants were more attached to the values than the physical place. However, they would repeatedly return to the area for these particular values, indicating a more generalized sense of place of protecting values the participants are attached to (Lin & Lockwood, 2014).
Typically, studies focus on the negative, anthropogenic factors resulting in the degradation of the environment. However, the surrounding environment can influence people, as viewed in the literature review. The scope of this study is not to choose one method over the other. Instead, to look at one's general sense of place or connection to the Indian River Lagoon to determine how it relates to organizations along with the IRL and choice to volunteer or not. For this study, sense of place refers to the attachment to a physical place mapped within the IRL. Since the study reviews secondary data, it is challenging to determine the reason for each individual's connection specific to a location, emotional attachment, or activity within the IRL. Thus, sense of place will be used in the broader context here as a social-ecological connection.

**Sense of Place and Fostering Pro-Environmental Behavior**

Pro-environmental behavior is described as any behavior that reduces negative impacts on the environment due to a person's actions (Kollmuss & Agyeman, 2002). To address the literature gap regarding answering why people act pro-environmentally, Kollmuss & Agyeman (2002) reviewed the literature to assess different theoretical frameworks and models attempting to address this topic. Kollmuss and Agyeman (2002) concluded that there is no definitive explanation as the topic is too complex to narrow down the answer to a single framework or model (Kollmus & Agyeman, 2002). However, sense of place has been observed in studies attempting to understand pro-environmental behavior and fostering environmental stewardship.

Mayer and Frantz (2004) validated the connectedness to nature scale (CNS), which measures an individual's feelings of being connected to nature emotionally, to demonstrate how one's connection to nature can be a predictor of ecological behavior and well-being. Their analysis showed a "moderately strong positive relationship between the CNS and eco-friendly
actions” (Mayer & Frantz, 2004, p. 512). As Mayer & Frantz (2004) explain, the more an individual feels connected to nature, the less likely they are to damage the environment as it would be like harming themselves. It is important to note that the researchers acknowledge this statement's limitations as certain behaviors may be self-destructive. Sometimes, people behave in a way without knowing the negative consequences their behaviors have on the environment. An additional limitation of these findings discussed is that it indicates a relationship, not causation. Therefore, further studies are needed to determine if feelings of connection lead to, or cause, eco-friendly actions (Mayer & Frantz, 2004).

Along the lines of Mayer and Frantz (2004), Nisbet et al. (2009) created and validated the Nature Relatedness Scale, a tool used to describe the connection between an individual and the natural world. They found that time spent in nature was correlated with nature-relatedness. Thus, participants with a higher Nature-Relatedness scale had more of a concern regarding the environment and self-reported pro-environmental behavior. Similar to Mayer and Frantz (2004), the authors explain that knowledge and concern of issues do not predict pro-environmental behavior. More studies are needed to understand additional variables regarding why people care for or are concerned about the environment (Nisbet et al., 2009).

An additional common theme among the literature is that sense of place and pro-environmental behaviors are specific to the location. As Stedman (2002) discusses, place attachment promotes place-protective behaviors because individuals are more willing to advocate for locations related to identities and the symbolic meanings given to a location threatened by change. Specific to the study, if an individual perceives the lake as an escape from civilization, they are more willing to defend the place from development, unlike the individuals that perceive the lake as a social area (Stedman, 2002).
Junot et al. (2018) discuss the difference between general pro-environmental behavior and local pro-environmental behavior. The authors found that general pro-environmental behavior and place identity was negatively related. Place identity is related to the specific place, so people may protect the local area, as discussed in Stedman (2002), but they might not expand these behaviors to the general environment. Conversely, there is a positive relationship between the individual’s dependence on the place for activities and resources, or place dependence, and general pro-environmental behavior (Junot et al., 2018). Therefore, attachment or connection to place does not necessarily equate to global conservation, which is an important consideration for this study and the lack of generalizability outside of the Indian River Lagoon.

Discussion of sense of place also extends to the community level, indicating attachments to the community. Concerning a farmer's capacity to adjust to change and adapt in the field of irrigation agriculture, Eakin et al.'s (2016) study found that farmers' place, occupational, and community attachment could explain the farmer's ability to adapt to ongoing changes. Farmers may work independently, but survey responses mentioned that their success is linked to others' success in the community. Due to their perception of community, the farmers tend to communicate with one another and share information and monitor the resources based on their commitment to community (Eakin et al., 2016). Therefore, feeling a sense of community may contribute to communal resource management and awareness of ecological issues relating to social capital theory.

Some studies approach sense of place by looking at the physical activities offered and experience for the community. According to Tuan's experiential perspective, the individual assigns meaning through experience, either directly through the senses or indirectly through symbolization (Tuan, 1977). As Tuan (1975) discusses, environments are constructed based on
experiences through the senses and abstractly through the mind on a subconscious level. It is important to note that this process requires time and involvement in a location (Tuan, 1975). Additionally, certain activities or experiences may encourage sense of place for an individual or community since "place activities contribute to place meaning, which eventually causes sense of place" (Piyapong et al., 2019, p. 503). For example, Andersson et al. (2007) found a positive correlation between ecological knowledge and sense of place. The gardener’s “local ecological knowledge” may be gained through their experience on the allotment garden or from other gardeners (Andersson et al., 2007, p. 1271).

Contrary to some of the literature discussing experiences and emotional attachment, Gurney et al.’s (2017) results indicate that direct experience does not always lead to an emotional attachment to a place. Concerning the Great Barrier Reef, the group with the second-highest level of place identity and indirect place dependence included tourists, national residents, and some international residents (Gurney et al., 2017). Therefore, people can form bonds to an area without continual interaction with the place like the residents of an area. However, the researcher cautions not to disregard local levels of community attachment in light of these findings. With a modernizing world and the increase of travel and access to areas worldwide, it is crucial to consider how to preserve the environment beyond the local level (Gurney et al., 2017). Since the Indian River Lagoon is also a tourist destination, considering the attachment of non-locals should be investigated to preserve the area.

Typically, studies focus on a particular level of attachment. However, Manzo and Perkins (2006) discuss viewing both an individual level and community level perspective because individuals make up a community with their "histories, values, identities, and attachments" (Manzo & Perkins, 2006, p. 344). Looking at both perspectives provides a "holistic
understanding of how to create and develop successful communities" (Manzo & Perkins, 2006, p. 347). Thus, suggesting that approaches should integrate both levels to understand "values of community" (Manzo & Perkins, 2006, p. 347). Understanding sense of place at the individual and community levels can also play a role in preserving the environment by including the citizens in community affairs and decision-making.

The scope of this project is to investigate sense of place and interest in volunteering in the Indian River Lagoon in connection to environmental Community-Based Organization presence. Volunteering can be considered pro-environmental behavior as restoration projects and activities can help restore the areas and ecosystem services produced by the IRL. Therefore, this study intends to contribute to the literature regarding sense of place and pro-environmental behavior. Sense of place is studied because it is "considered as a motivation for stewardship and actions to care for the environment" (Masterson et al., 2017, p. 49). Sense of place should be looked into as a "potential leader of actions" for pro-environmental behavior and place-protective actions (Sebastien, 2020, p. 214).

Based on the literature reviewed, it is important to consider the sense of place within a community for the Indian River Lagoon as both a residential and recreational place. Individuals connected to or dependent on the estuary are impacted by the lagoon’s degradation both socially and economically.

**Community-Based Organizations and Volunteering**

Participating in volunteer efforts can add to sense of place and encourage environmental stewardship within the community. Regarding volunteer literature, understanding the motivations of volunteers has been explored to investigate pro-environmental behavior further.
Among the literature, volunteering is described as creating a sense of place or place meaning through interactions such as individuals talking with or teaching others about the environment, which also creates an “environmental steward” identity (Amsden et al., 2013; Bleam, 2018, p. 76). Additionally, the studies demonstrate that attachment can occur through participation in the restoration activity itself (Kibler et al., 2018). Involving the community in the activities and the planning and decision-making process of restoration may also contribute to sense of place (Ellery & Ellery, 2019 & Kibler et al., 2018). Therefore, it is essential to look at Community-Based Organizations in the IRL to understand these organizations' roles in volunteer activities.

Investigating why people volunteer is essential to understanding how people may use or become involved with these organizations in the community. Studies have investigated volunteers' characteristics and individual motivations to learn more about how to motivate people to act pro-environmentally or foster environmental stewardship. Typically, restoration or citizen science activities are considered as a group activity encouraging community; however, some of these programs have projects requiring data input on an individual level. In the case of Maund et al. (2020), individuals input data via technological methods. The study found that volunteers participate due to their "intrinsic value" for wanting to help with the research efforts and their care for the environment, as well as to learn (Maund et al., 2020, p. 1).

Furthering the area of intrinsic motivations, Mowen and Sujan (2005) investigated why individuals participate as a volunteer using a "hierarchical model of motivation and personality" approach (Mowen & Sujan, 2005, p. 170). The results indicate that altruism and an individual's need for activity and learning were indicators of engagement in volunteering (Mowen & Sujan, 2005). Contrary to Mowen and Sujan's (2005) findings, Krasny et al. (2014) found that there may be other motivators for volunteers besides altruism. In the case of oyster gardeners in New
York City, the motives to volunteer were attributed to their experience caring for the oyster gardens as well as the "memories, meanings, and sense of place" associated with these experiences (Krasny et al., 2014, p. 16). The participants placed social meaning on their work by considering how the oyster connected to the people of New York City rather than solely considering the species' ecological importance (Krasny et al., 2014). Krasny et al.'s (2014) study differs from some of the citizen science and restoration literature focusing on the social connections between people, as these projects are more individualistic than group restoration at a common location. Participants care for individual gardens, so different motivations are reported here than in other studies (Krasny et al., 2014).

Moving to a zoological setting of volunteer activities, Bixler et al. (2014) sought to investigate volunteers' and docents' motives for the Cleveland Metroparks Zoo. The results from the mail-back questionnaire indicate that volunteers were motivated socially by interacting with other "like-minded individuals" (Bixler et al., 2014, p. 57). Similar to Mowen and Sujan (2005), individuals also reported motivation to teach others and learn about the wildlife themselves (Bixler et al., 2014). Interestingly, the studies indicate an increase in conservation behavior reported by the docents after volunteering for the zoo (Bixler et al., 2014). Bixler et al. (2014) discuss that the volunteers' participation in a conservation organization can increase their interest in wildlife conservation. However, it is essential to note that initial interest already existed within the volunteers (Bixler et al., 2014).

Volunteer literature also discusses the benefits of organizations relating to increased social networks within the community and people. According to Dresner et al. (2015), volunteer activities provide individuals an opportunity to work with others, which may lead to a more "resilient community" (Dresner et al., 2015, p. 991). Though, activities contributing to place
meaning are not always physical restoration projects. Citizen science, for example, involves the public in scientific research either through data collection or input methods (Toomey et al., 2020). Similarly, citizen science helps create "collective meanings" shared within the community and social network (Toomey et al., 2020, pp. 5-6).

Thomas et al. (2008) sought to understand the roles organizations play in developing a sense of place in the community through a Place Based Network theoretical framework. Based on the organizations' responses, it can be said that an organization's culture is vital in constructing community sense of place (Thomas et al., 2008). According to Thomas et al. (2018), "Sense of place is created out of a social network of ideas, concepts, and meanings about the community and environment that are embedded in the community's culture, as expressed by their activities: symbolic, language, rituals, and everyday living" (Thomas et al., 2008, p. 43). There is a collaboration between the community and these organizations to create sense of place (Thomas et al., 2008). Hence, the focus of this study to look at both Community-Based Organizations and individuals.

Added benefits of Community-Based Organizations include an increase in awareness of conservation issues and projects. Participants mentioned how coral restoration in Maunalua Bay, O'ahu, encouraged a discussion among the community regarding the bay's condition, which resulted in increased community awareness of the bay and environmental stewardship (Kittinger et al., 2013). In Winton and Evans' (2016) study, organizations increased awareness of the ongoing policy. They provided an opportunity for the public to learn about the decisions being made by the public and how it would affect individuals (Winton & Evans, 2016). Community-Based Organizations also conduct research, which "reflect their organizational purposes" (Winton & Evans, 2016, p. 21). For two of the study's organizations, their research aimed to
improve the community by "influencing policy at the local level" (Winton & Evans, 2016, p. 21). Community-Based Organizations also involve family and citizens as "policy actors and researchers" (Winton & Evans, 2016, p. 22). Just as including the public in citizen science can provide benefits for the environment, engaging the local community in the discussion of policy and research can be instrumental in encouraging pro-environmental behavior.

Community-Based Organizations may also bridge the gap between the public and governing agencies. As Abrams et al. (2017) demonstrate, one of the added benefits of Community-Based Organizations is their connection between the local level and higher governing agencies. These organizations can have an impact on the local level of restoring a specific area. However, to overcome challenges, they can receive help from higher governing agencies or use their "network of allies" (Abrams et al., 2017, p. 294). These higher-ups can help with the challenges to make a change within a community allowing the organizations to implement change from the bottom-up (Abrams et al., 2017). Additionally, volunteering provides opportunities for people to become involved in the "decision-making and problem-solving," which benefits the community and the environment (Gooch, 2005, p. 18). Therefore, community sense of place can involve local stakeholders to make improvements within the community, including conserving the environment locally.

Specific to the Indian River Lagoon, Wimmer and Walters (2019) sought to study the role volunteers play in restoration success. Referencing Kibler's identity-visualize-create framework, the final part of the framework "is the creation of opportunities where sense of place can be realized through restoration work by explaining how particular projects are related to individual's attachment to the area" (Wimmer & Walters, 2019, p. 50). In this case, the Marine Discovery center was mentioned to be a source of restoration opportunities in the IRL for most
participants (Wimmer & Walters, 2019). Therefore, focusing on the IRL organizations may provide insight into sense of place and Community-Based Organizations that provide volunteer and restoration opportunities to understand volunteer efforts. These opportunities may increase the pro-environmental behavior of residents and non-locals attached to the area, which may increase the community's resiliency to help mitigate the anthropogenic factors negatively impacting the IRL. Thus, contributing to the understanding of how to encourage volunteer efforts within the Indian River Lagoon to restore and preserve the estuary.

This project's scope is not to prove a sense of place among individuals in the IRL. The study's purpose is to view sense of place data within the IRL to spatially analyze connections and interest to volunteer near these organizations to further the literature on sense of place and the importance of Community-Based Organizations within the IRL. As mentioned by Wimmer and Walters (2019), "It is important to understand why community members only participate in restoration projects but continue to volunteer with the same programs as it can provide insight on how community members fulfill their place identity and their volunteer identity" (Wimmer & Walters, 2019, p. 50).

In summary, CBOs help foster a sense of place within the community by providing opportunities for individuals to participate in these activities. Sense of place may encourage pro-environmental behavior and conservation of an area through the physical act of restorations or activities in an area. Therefore, based on the literature reviewed and theoretical frameworks, I would expect to see that sense of place point data located closer to environmental Community-Based Organizations will result in a higher interest to volunteer.
CHAPTER 3: METHODOLOGY

Data Collection

This study evaluated secondary data collected through the CNH-L: Restoration and Resilience in Coupled Human-Natural Systems: Reciprocal Dynamics of a Coastal ‘Lagoon in Crisis’ project funded by the National Science Foundation Grant Award No. 1617374. The original sample included 1,052 participant responses from community members, organizations, and citizen scientists of the Indian River Lagoon. The research team cleaned up the sample by removing extraneous points outside of the study area, resulting in a sample total of 1,005 responses used in this study. The de-identified data has been made available by the original research team through the Indian River Lagoon Coastal Connections Public Map (Citizen Science GIS, 2018). The University of Central Florida Internal Review Board deemed this study as exempt and not involving human subjects. IRB approval is located in Appendix A for reference.

Data Analysis

The sense of place point shapefile contains the participants' sense of place location identified as a point on the map. Each point on the map represents a participant’s sense of place selection where the individual felt connected to within the IRL. The individual also answered a few survey questions regarding their sense of place connection to the area. Each point contains attribute data with the participants' responses to various survey questions. This study's focus is on the participants' response to having an interest in volunteering in the future, which is coded as a 1 for “yes” and 2 for “no” responses. To compare the responses relative to the distance from CBOs, I used the Select Layer by Attribute tool in ArcGIS Pro to create two individual point
shapefiles of the sense of place points color-coded by “yes” and “no” responses to their interest in volunteering in the future.

Community-Based Organizations located in the Indian River Lagoon were selected according to the following criteria: physical address locations located within the five counties (Volusia, Brevard, Indian River, St. Lucie, and Martin Counties) and the organization's mission or goals indicate "community engagement" or "outreach" within the community. For this reason, organizations with P.O. Box addresses were excluded from the list. Organizations were selected from the One Lagoon "Volunteering for the Lagoon" and Brevard Indian River Lagoon Coalition sites (Brevard Indian River Lagoon Coalition, 2020; One Lagoon, 2021). Twenty organizations in total were used for the analysis and are listed in Table 1 for reference.
Table 1: List of the twenty selected Community-Based Organizations used in the analysis.

<table>
<thead>
<tr>
<th>Name of CBO</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brevard Zoo</td>
<td>Brevard</td>
</tr>
<tr>
<td>Environmental Learning Center</td>
<td>Indian River County</td>
</tr>
<tr>
<td>Florida Oceanographic Society</td>
<td>Martin County</td>
</tr>
<tr>
<td>Florida Wildlife Hospital</td>
<td>Brevard</td>
</tr>
<tr>
<td>Friends of the Enchanted Forest, Inc.</td>
<td>Brevard</td>
</tr>
<tr>
<td>Harbor Branch Oceanographic Institute</td>
<td>Indian River County</td>
</tr>
<tr>
<td>Hubbs-SeaWorld Research Institute</td>
<td>Brevard</td>
</tr>
<tr>
<td>Hundred Acre Hollows, Inc.</td>
<td>Brevard</td>
</tr>
<tr>
<td>Indian River Lagoon National Estuary Program</td>
<td>Indian River County</td>
</tr>
<tr>
<td>Keep Brevard Beautiful</td>
<td>Brevard</td>
</tr>
<tr>
<td>Keep Ft. Pierce Beautiful</td>
<td>St. Lucie County</td>
</tr>
<tr>
<td>Keep Martin Beautiful</td>
<td>Martin County</td>
</tr>
<tr>
<td>Keep Port St. Lucie Beautiful</td>
<td>St. Lucie County</td>
</tr>
<tr>
<td>Keep Volusia County Beautiful</td>
<td>Volusia</td>
</tr>
<tr>
<td>Marine Discovery Center</td>
<td>Volusia</td>
</tr>
<tr>
<td>Marine Resources Council</td>
<td>Brevard</td>
</tr>
<tr>
<td>Oxbow Eco-Center</td>
<td>St. Lucie County</td>
</tr>
<tr>
<td>Pelican Island Audubon Society</td>
<td>Indian River County</td>
</tr>
<tr>
<td>Recycle Brevard</td>
<td>Brevard</td>
</tr>
<tr>
<td>Sea Turtle Preservation Society</td>
<td>Brevard</td>
</tr>
</tbody>
</table>

The CBO addresses were geocoded from an Excel table in ArcGIS Pro to create a point shapefile layer. Both the sense of place and CBO point locations were overlayed on top of the ArcGIS Pro world topographic base map.

I used the Multiple Ring Buffer Analysis tool in ArcGIS Pro to analyze the spatial relationship of volunteer interest using a 10-mile radius buffer zone in increments of 0.5-mile rings from the individual CBO point locations. The 10-mile radius was an attempt to account for individuals placing the points near locations that might not be accurately reflected by position while also considering not all of the restoration or volunteer efforts are held at that particular
point location. I opted for a Multiple Ring Buffer analysis over a simple Buffer analysis as an additional parameter to analyze the responses within the 10-mile buffer distance. Additionally, I used a Natural Breaks (Jenks) classification method with five classes to symbolize the Multiple Ring Buffer Analysis distances.

To focus on the data within the 10-mile buffer radius, I used the Intersect tool to create an additional shapefile for both “yes” and “no” response point data within the buffer zone. The Dissolve tool was then used to aggregate the features in the buffer zone to count the number of points per distance band. The shapefiles were then added to the map to display the data specifically within the distance bands.

For statistical analyses, a Two-Sample T-test assuming Unequal Variances and Regression analysis were conducted to compare future volunteering responses, yes or no, within the buffer zones. As an additional follow-up analysis, I repeated the Selected Layer by Attributes methods to create separate shapefile points of a participants' past volunteering response and likelihood to volunteer in the future to assess if volunteering in the past related to future volunteering within the 10-mile radius of the CBO. A Chi-Square Goodness-of-Fit was conducted to analyze the relationship between past volunteer responses and future volunteer responses within the Multiple Ring Buffer zones.

The combination of mapping and inferential statistics will reduce subjectivity in the analysis to determine if there are patterns associated with volunteering, Community-Based Organizations, and sense of place in the Indian River Lagoon (Esri, n.d.a).
CHAPTER 4: RESULTS

The Multiple Ring Buffer Analysis, sense of place points, and participant responses within the Indian River Lagoon are displayed in Figure 1.

Figure 1: Multiple Ring Buffer Analysis of future volunteer responses relative to CBO location.

Out of the total responses of 1,005 sense of place points, 514 participants responded “yes” regarding interest in volunteering in the future compared to 491 participants responding “no.” In general, 51% of the responses indicated a “yes” in interest to volunteer. However, once
the 10-mile Multiple Ring Buffer Analysis was completed, 49% of the responses indicated a “yes” to volunteering in the future. Out of 1,005 total responses, 731 sense of place points, or 73% of points, were within 10-miles of CBO point locations in the IRL. It is critical to note that Figure 1 can appear misleading due to overlapping responses since the “yes” responses layer is overlayed over the “no” responses layer on the map. However, according to the data, 376 participants responded “no” regarding having an interest in volunteering compared to 355 participants that responded “yes” to having an interest in volunteering in the future. The t-Test results comparing the participants’ responses to volunteer or not in the future within 10 miles of CBOs are displayed in Table 2.

Table 2: Results of the t-Test comparing future volunteer responses within a 10-mile radius of CBOs.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>17.75</td>
<td>18.8</td>
</tr>
<tr>
<td>Variance</td>
<td>123.4605263</td>
<td>217.6421053</td>
</tr>
<tr>
<td>Observations</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Hypothesized Mean Difference</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>t Stat</td>
<td>-0.254250469</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) one-tail</td>
<td>0.400394954</td>
<td></td>
</tr>
<tr>
<td>t Critical one-tail</td>
<td>1.689572458</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) two-tail</td>
<td>0.800789908</td>
<td></td>
</tr>
<tr>
<td>t Critical two-tail</td>
<td>2.030107928</td>
<td></td>
</tr>
</tbody>
</table>
The P-value of 0.80 is greater than 0.05, therefore there is not a statistically significant difference between the participants’ interest to volunteer in the future within the 10-mile buffer zones.

A regression analysis was conducted to compare the “yes” and “no” responses to volunteering in the future per 0.5-mile distance band within the Multiple Ring Buffer zones. As observed in Figure 2, there appears to be a higher count of responses closest to the CBO compared to further away.

![Count of Volunteering in the Future Responses per 0.5 Mile Distance Band](image)

Figure 2: Linear regression of participants’ interest to volunteer in the future responses within 10 miles of the Twenty Selected CBOs.

The results of the regression analysis are displayed in Table 3 assessing the relationship between the participants’ interest to volunteer per 0.5-mile distance band. An R Square value of
0.12 indicates a weak, positive relationship between the responses per 0.5-mile within the 10-mile radius.
Table 3: Linear regression analysis results comparing counts of participant responses per 0.5-mile distance band.

<table>
<thead>
<tr>
<th>Regression Statistics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
<td>0.351089558</td>
</tr>
<tr>
<td>R Square</td>
<td>0.123263877</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.074556315</td>
</tr>
<tr>
<td>Standard Error</td>
<td>10.68904881</td>
</tr>
<tr>
<td>Observations</td>
<td>20</td>
</tr>
</tbody>
</table>

**ANOVA**

<table>
<thead>
<tr>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>Significance F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>289.1462406</td>
<td>289.1462406</td>
<td>2.530692802</td>
<td>0.129060504</td>
</tr>
<tr>
<td>18</td>
<td>2056.603759</td>
<td>114.2557644</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>2345.75</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Coefficients**

<table>
<thead>
<tr>
<th></th>
<th>Standard Error</th>
<th>t Stat</th>
<th>P-value</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
<th>Lower 95.0%</th>
<th>Upper 95.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>distance</td>
<td>-1.318796992</td>
<td>0.829007068</td>
<td>-1.59081514</td>
<td>-3.060476212</td>
<td>0.422882228</td>
<td>-3.06047621</td>
<td>0.422882228</td>
</tr>
</tbody>
</table>
When looking at the participants’ responses to volunteering in the future compared to if the participants volunteered in the past within 10-miles of CBOs, a total of 238 participants volunteered in the past. Out of the 231 responses, 158 participants, or 66%, would volunteer again in the future compared to 80 participants, or 34%, that would not. For the 493 participants that have not volunteered in the past, 197 participants, or 40%, indicated likely to volunteer in the future compared to 296 or 60% would not. A Chi-Square Goodness-of-Fit was conducted to compare the relationship between past and future volunteer participant responses. As observed in Table 4, a P-value of $2.098 \times 10^{-11}$ is less than 0.5, indicating a statistically significant relationship between volunteering in the past and the response to volunteer in the future.
Table 4: Chi-Square Goodness-of-Fit Test results comparing past volunteer to interest to volunteer in the future responses within 10-mile buffer of CBO location.

<table>
<thead>
<tr>
<th></th>
<th>Yes (Future)</th>
<th>No (Future)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (Past)</td>
<td>158</td>
<td>80</td>
<td>238</td>
</tr>
<tr>
<td>No (Past)</td>
<td>197</td>
<td>296</td>
<td>493</td>
</tr>
<tr>
<td>Total</td>
<td>355</td>
<td>376</td>
<td>731</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Yes (Future)</th>
<th>No (Future)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (Past)</td>
<td>115.581395</td>
<td>122.418605</td>
<td>238</td>
</tr>
<tr>
<td>No (Past)</td>
<td>239.418605</td>
<td>253.581395</td>
<td>493</td>
</tr>
<tr>
<td>Total</td>
<td>355</td>
<td>376</td>
<td>731</td>
</tr>
</tbody>
</table>

p-value 2.098E-11

Figure 3 displays a cluster of points near Canaveral National Sea Shore and Merritt Island National Wildlife Refuge not included in the analysis. These points were not included in the Multiple Ring Buffer Analysis as the location of the points from the Community-Based Organizations exceeds a distance of 10 miles. Therefore, there may be an underlying relationship between the sense of place points and this particular location not addressed by the analysis.
Figure 3: Cluster of sense of place points not captured by the spatial proximity to CBO in the IRL.
CHAPTER 5: CONCLUSION

In conclusion, I failed to reject the null hypothesis. Overall, there is no statistically significant spatial relationship between the participants’ interest in volunteering in the future relative to CBO locations in the Indian River Lagoon, Florida. There are higher counts of sense of place points near CBOs. However, it does not correspond to volunteering based on the weak positive relationship between the counts of points and responses to volunteering in the future, as observed in Figure 2. More information needs to be considered beyond the physical distance of sense of place data points from the CBO locations.

In Figure 3, there seems to be a cluster of points outside of the 10-mile buffer zones unexplained by the data. Recommendations for future studies include mapping polygons of the CBOs restoration sites to see if this would explain some of the Canaveral National Seashore and Merritt Island National Wildlife Refuge area points not included in the analysis. Relating to the sense of place and social-ecological systems frameworks, there may be other factors to consider and investigate to understand the meanings of the connections to the area not captured by the analysis. A limitation of my study is that I did not evaluate the participants’ reasons for their connections to the areas. According to Tuan’s experiential perspective, assigning meaning to an area requires time and involvement in a location (Tuan, 1975). Therefore, modifying the survey questions to investigate the time the individual has spent in the area may be essential to understanding their sense of place connections to the area.

Regarding pro-environmental behavior and motives to volunteer, some of the literature discusses the characteristics and intrinsic motivations of the individuals to understanding pro-environmental behavior. Thus, an additional limitation of my study is not integrating
sociodemographic information of the participants for a more in-depth study of the characteristic relationship of volunteer interest in the area. Concerning CBOs and social capital theory, while the literature discusses the roles of CBOs in increasing social networks, an improvement of my study is to determine how involved the CBOs are within the community. Simply fitting the criteria may not be an indicator of the influence the CBO has on the area. Therefore, I would reframe the survey questions to focus on evaluating the level of involvement the individual has with the CBO, how the individual interprets the influence of the CBOs on the area, and their personal level of involvement with the projects.

Results of the Chi-Square Goodness-of-Fit test indicate a statistically significant relationship between the participants’ response to volunteering in the past and the likelihood to volunteer in the future. Thus, future studies may investigate this relationship further within the Indian River Lagoon to determine motives for volunteering in the IRL. As discussed previously, motivation to volunteer in the literature includes altruism, need for learning and activity, and social interactions with others (Mowen & Sujan, 2005; Bixler et al., 2014). Therefore, future studies should investigate the participants’ motives for volunteering to understand how individuals may become involved with the Community-Based Organizations in the IRL.

While the analysis failed to reject the null hypothesis, it demonstrated more connections to investigate further to understand how to encourage pro-environmental behavior specific to the Indian River Lagoon, FL.
NOT HUMAN RESEARCH DETERMINATION

December 18, 2020

Dear Erica Edmonston:

On 12/18/2020, the IRB reviewed the following protocol:

<table>
<thead>
<tr>
<th>Type of Review</th>
<th>Initial Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of Study</td>
<td>Investigating the Spatial Relationship Between Sense of Place and Community-Based Organizations: Do Community-Based Organizations Influence Volunteering in the Indian River Lagoon, Florida?</td>
</tr>
<tr>
<td>Investigator</td>
<td>Erica Edmonston</td>
</tr>
<tr>
<td>IRB ID</td>
<td>STUDY00002560</td>
</tr>
<tr>
<td>Funding</td>
<td>Name: Natl Science Fdn (NSF), Grant Office ID: 0000006247, Funding Source ID: 1617374</td>
</tr>
<tr>
<td>Grant ID</td>
<td>0000006247:</td>
</tr>
<tr>
<td>Documents Reviewed</td>
<td>• HRP-251 Faculty Advisor Scientific-Scholarly Review Form, Category: Faculty Research Approval; • HRP 250 Form_Erica Edmonston, Category: IRB Protocol; • Sense of Place Attribute Data Key, Category: Other; • Sense of Place Attribute Table Data, Category: Other;</td>
</tr>
</tbody>
</table>

The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations.

IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities are research involving human in which the organization is engaged, please submit a new request to the IRB for a determination. You can create a modification by clicking Create Modification / CR within the study.
If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Racine Jacques, Ph.D.
Designated Reviewer
LIST OF REFERENCES


