

THESIS

COMPARING THE SOCIAL PSYCHOLOGICAL DRIVERS OF PERSONAL SPHERE,
SOCIAL DIFFUSION, AND CIVIC ACTION BEHAVIORS FOR NATIVE PLANT
GARDENING

Submitted by

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ABSTRACT

COMPARING THE SOCIAL PSYCHOLOGICAL DRIVERS OF PERSONAL SPHERE, SOCIAL DIFFUSION, AND CIVIC ACTION BEHAVIORS FOR NATIVE PLANT GARDENING

Protecting biodiversity and conserving water, especially in urban environments, are crucial facets of conservation efforts that can be supported by gardening with native plant species. However, native plant gardening at the individual or personal sphere level is not enough. There is also a need for citizens to participate in behaviors outside of the personal sphere, such as social diffusion and civic action, to influence the networks and social systems in which they are embedded to achieve more rapid, large-scale environmental change. Little is known, however, about whether the social-psychological drivers of behaviors outside of the personal sphere are distinct from the drivers of personal sphere action. To address this, we examined the factors influencing personal sphere, social diffusion, and civic action behaviors in the context of native plant gardening in the United States. Through a nationwide survey conducted in February 2023 ($n = 1,201$), we found that, while there was some overlap, each behavior type was motivated by distinct, often behavior-specific, variables. Personal sphere-specific self-efficacy and age predicted personal sphere behavior; social diffusion-specific dynamic norms (perceptions that the behavior of others is changing) and moral exporting (an individual's inclination to encourage others to embrace their moral position) predicted social diffusion behavior; introversion predicted civic action behavior; and behavior-specific personal norms predicted all three behavior types. We also examined the prevalence of each type of behavior and found that

personal sphere behaviors are the most commonly practiced, followed by social diffusion behaviors and then civic action behaviors. Our findings suggest that to motivate social diffusion and civic action behaviors, practitioners may have to design outreach interventions that target the unique social-psychological drivers of these behaviors.

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TABLE OF CONTENTS

ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iii
Chapter One: Introduction.....	1
Chapter Two: Case study.....	8
Chapter Three: Research Questions.....	10
Chapter Four: Methods.....	11
Chapter Five: Results.....	23
Chapter Six: Discussion and Conclusion.....	28
REFERENCES.....	33

CHAPTER 1: INTRODUCTION

For some time now, the natural sciences have lent insight into the actions needed to combat climate change, preserve biodiversity, protect fresh water, and adapt to the multitude of environmental challenges caused by human behavior (Amel et al., 2017; Steffen et al., 2015; Steg & Vlek, 2009). Despite this knowledge, individuals and the companies and governments they operate continue to engage in unsustainable practices. To generate the necessary sustainable transformation, individuals must be motivated to engage in widespread and consistent pro-environmental behavior change and alter the organizations, government systems, and social networks in which they are embedded (Amel et al., 2017).

A growing body of literature has examined how to encourage individuals to engage in pro-environmental behaviors (PEBs), such as recycling, conserving energy, riding public transit, and shopping sustainably (e.g. Brown et al., 2016; Desrochers & Mosher, 2017; Hanss & Böhm, 2013; Li et al., 2019). The majority of studied PEBs have been actions that an individual can take by themselves throughout their everyday life. This type of behavior is known as personal sphere behavior (Amel et al., 2017) or conservation lifestyle behavior (Larson et al., 2015). While personal sphere behavior changes are important, these changes alone are not occurring quickly enough or at a large enough scale to prevent large-scale environmental degradation (Jones & Niemiec, 2023).

To create more rapid, widespread change, people must also be motivated to participate in actions outside of their personal sphere that influence the broader social systems in which they are embedded. When individuals change broader social systems, such as the organizations or social networks they are a part of, these more sustainable systems can lead to positive impacts on

individual behaviors, creating cycles of pro-environmental ways of life (Amel et al., 2017; Fritsche & Masson, 2021; Jones & Niemiec, 2020, 2023). Amel et al. (2017) suggest that individuals can increase their effect by engaging in behaviors that impact four spheres of influence beyond their personal sphere. These spheres of influence are labeled social network, organizational, public, and cultural (Figure 1). This paper seeks to explore how to encourage behaviors in multiple spheres with a specific focus on personal sphere, social network, and public PEBs using the context of native plant gardening.

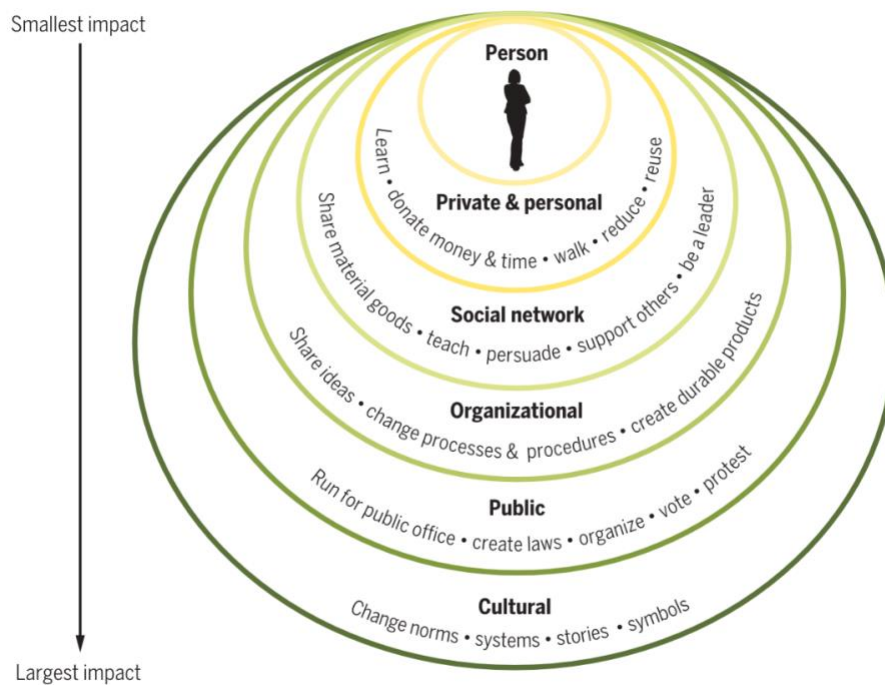


Figure 1. Spheres of influence from Amel et al. (2017)

The social network sphere of influence consists of behaviors that involve interpersonal interaction with people in one’s social network, such as teaching or persuading others about environmental issues, providing support or leadership, or sharing items or ideas (Amel et al., 2017). An example of a behavior type in this category is social diffusion, which involves an individual spreading information or behavior to others within their social network (Abrahamse &

Steg, 2013; Champine et al., 2022; Howell et al., 2015; Jones & Niemiec, 2020). This type of behavior has also been referred to as relational organizing (Divakaran & Nerbonne, 2017; Jones & Niemiec, 2023) and social environmentalism (Larson et al., 2015). Social diffusion behavior can be active, such as helping a friend start a compost pile, or passive, such as displaying a sticker supporting public transportation on a reusable water bottle (Jones & Niemiec, 2020, 2023). Social diffusion behavior has been found to effectively facilitate behavior change because it relies on the power of social influence (Abrahamse & Steg, 2013). Specifically, social diffusion behaviors can increase perceived social norms around a behavior in one's community, which can facilitate behavior change. Furthermore, research suggests that people are more likely to listen to information and change their behavior when they receive that information from someone they know (Sparkman & Attari, 2020). Social diffusion can help to spread information to new, less engaged audiences via social transmission of information, resources, and programs. This can help enhance the impact of the work of environmental groups and organizations that are often constrained by the challenge of continuously speaking to the same, already engaged audience (Ma et al., 2012; Mbaru & Barnes, 2017).

The public sphere of influence consists of behaviors that support governmental policy such as voting, running for office, protesting, and helping to create laws (Amel et al., 2017). In the environmental field, a behavior type that falls into this category is civic action. Civic action behaviors in the environmental sphere are defined as PEBs that support socio-political efforts and include behaviors such as contacting representatives, donating, or voting in ways that support environmental efforts (Larson et al., 2015). Civic action has also been referred to as collective action, environmental citizenship (Larson et al., 2015; Soopramanien et al., 2023), and public action (Amel et al., 2017). By taking civic action, individuals can work to influence the

policies of the communities in which they live, thereby helping to change the larger social systems that perpetuate environmental issues (Fritsche & Masson, 2021; Larson et al., 2015; Soopramanien et al., 2023). When policies are changed through the civic actions of individuals, these new policies can then help to spread PEBs more widely through education, incentive programs, and regulations (Moon & Cocklin, 2011), or by removing barriers to participation in specific PEBs (e.g., by making it easier to use public transportation (Kollmuss & Agyeman, 2002) or recycle (Li et al., 2019)).

Encouraging greater participation in civic action and social diffusion behaviors to achieve change in social network and public spheres of influence will require an understanding of the barriers and motivators that influence people's engagement in these behaviors. However, while a large body of literature has examined the factors influencing personal sphere behavior, fewer studies have examined whether there are similar or different drivers of public and social network sphere behaviors (Amel et al., 2017; Fritsche & Masson, 2021; Jones & Niemiec, 2023). There may be different drivers of these behaviors because, for example, behaviors that occur in the public sphere often involve engaging with others to encourage them to participate, meaning that group influences or social factors might play a larger role in participation. An emerging body of work has found evidence that there may in fact be unique social-psychological drivers of social diffusion behaviors (Champine et al., 2022; Collins et al., 2014; Jones & Niemiec, 2020, 2023; Larson et al., 2015; Niemiec et al., 2021; van Zomeren et al., 2008) and civic action behaviors (Collins et al., 2014; van Zomeren et al., 2008) compared to personal sphere behaviors.

Like personal sphere behavior, social diffusion behavior seems to be influenced by attitudes, or an individual's positive or negative evaluations, (e.g., Ajzen & Fishbein, 2000; Champine et al., 2022; Howell et al., 2015; Jones & Niemiec, 2020) and perceived norms, or

behaviors that others think are normal or will be approved of (e.g., Cialdini et al., 1991; Jones & Niemiec, 2020; Niemiec et al., 2019; Sparkman & Walton, 2017). For example, attitudes and personal norms were both found to predict whether a native plant gardener was likely to encourage someone within their social network to plant native plants (Champine et al., 2022). However, research has also begun to identify unique social-psychological drivers of social diffusion behavior. For example, one study found that social diffusion-specific self-efficacy, or an individual's belief that they can successfully share information with or convince others (Bandura, 1977; Geiger et al., 2017), is important for participation in the social diffusion of native plant gardening behaviors (Jones & Niemiec, 2020). Additionally, moral exporting, or an individual's inclination to encourage others to embrace their moral position (Maki & Raimi, 2017), is thought to be a unique driver of social diffusion (Jones & Niemiec, 2023). While this factor has been more commonly studied in political contexts (e.g. Peterson et al., 2009), Maki and Raimi (2017) found that individuals with higher levels of environmental moral exporting were more likely to actively participate in the social diffusion of PEBs.

The limited studies examining the drivers of civic action behavior in the environmental context have found that it is influenced by some of the same drivers as personal sphere and social diffusion behaviors, as well as some unique drivers (Collins et al., 2014; van Zomeren et al., 2008). Bamberg et al. (2015), for example, found that in communities working toward decreasing energy consumption, civic action behaviors such as protesting were influenced by identity, or a person's sense of who they are based on group membership (Stets & Burke, 2000). Additionally, while self-efficacy has emerged as a driver of personal sphere and social diffusion PEBs, collective efficacy, or an individual's feelings that the group they are a part of can achieve their desired outcomes (Bandura, 2000; Fritsche & Masson, 2021; van Zomeren et al., 2008),

appears to be a driver of civic action. For example, in the context of water conservation, Pradhananga and Davenport (2017) found a positive relationship between individuals with higher perceived collective efficacy and intention to participate in civic action.

While this small but growing body of literature has begun to lend insight into potential drivers of social diffusion and civic action behaviors, few studies have directly compared the social-psychological factors influencing different types of behaviors in the same context. Such a direct comparison is critical for developing communication and outreach strategies that can target the perceptions influencing each unique behavior. There is especially a dearth of research comparing the factors influencing participation in social diffusion and civic action behaviors, which may have distinct barriers and motivators. For example, when considering engaging in a social diffusion behavior, people may be concerned with the threat of social sanctions, or negative reactions from others, if they talk to a friend or neighbor about a PEB (Niemic et al., 2019). But this may not be as salient in civic actions, which might not involve directly confronting others. Alternatively, response efficacy, or the belief that an action will have positive outcomes (Hamann & Reese, 2020), may be a stronger barrier to engaging in civic action because, to be motivated to participate in the behavior, an individual must believe that their actions can make a difference in their government's policy. Understanding the potential differences in drivers of these behaviors is crucial to develop programs and outreach campaigns that reduce barriers and enhance motivators for specific types of behaviors.

This article attends to the above-mentioned gaps in the literature by examining the social-psychological drivers of participation in personal sphere, social diffusion, and civic action behaviors using native plant gardening as a case study. Through a nationwide survey of U.S. residents conducted in February 2023, we measured the prevalence of these behaviors and

compared the similarities and differences between the motivators and barriers to these behaviors. We focused on attitudes, efficacy, knowledge, identity, and perceived norms, given that these factors have been identified in prior studies as important influences on one or more of the three types of behaviors (e.g., Bamberg et al., 2015; Champine et al., 2022; Hamann & Reese, 2020; Howell et al., 2015; Jones & Niemiec, 2020; Pradhananga & Davenport, 2017). We also measured individual, personality level variables like moral exporting and introversion, which are also thought to impact behavior (e.g. Jones & Niemiec, 2023; Maki & Raimi, 2017; Poškus, 2020). The insight gained can assist in the real-world application of campaigns working to inspire PEBs in the private and personal, social network, and public spheres of influence.

CHAPTER TWO: CASE STUDY

Native plant gardening, or gardening with plants that evolved in a specific location (Richards et al., 1998), is an achievable conservation action that can be taken by individuals in any geographic location and by urban and rural residents alike. Planting native plants can help address a myriad of overlapping challenges facing the environment including biodiversity loss, drought, the detrimental effects of pesticides and pollutants, declines in pollinators, invasive species, habitat fragmentation, and climate change, among others (Beckwith et al., 2022; Berthon et al., 2021; Landis, 2014; Mumaw & Mata, 2022; Pardee & Philpott, 2014; Shelef et al., 2017). Native plant gardening is a PEB that can help to protect and restore habitat for plant and wildlife species, which is especially important in urban areas (Goddard et al., 2010; Segar et al., 2022).

In addition to the positive environmental effects that native plant gardening can have, research suggests that individuals participating in native plant gardening can see improvements in their well-being, such as increased self-esteem and mood or decreased stress and anxiety (Raymond et al., 2018). Native plant gardening can also create opportunities for socializing, community building, and volunteering via outreach and education programs or by creating a community of practice (Beckwith et al., 2022; Mumaw, 2017). Additionally, it can lead to increased levels of nature connectedness (Jones et al., 2021; Mumaw, 2017), which in turn can promote higher levels of participation in PEBs and land stewardship (Mackay & Schmitt, 2019; Mumaw & Mata, 2022), as well as increased well-being (Jones et al., 2021; Krols et al., 2022).

While participating in native plant gardening on one's own property can have positive environmental impacts, increasing the scale of native plant gardening is necessary to achieve larger-scale environmental goals like preserving biodiversity and increasing habitat (Mumaw,

2017; Segar et al., 2022). For example, one garden is often not large enough to contain a viable population for a species; thus, connecting habitats via close proximity or wildlife corridors is crucial for widespread and sustained conservation (Goddard et al., 2010). These corridors of connected habitat are particularly critical for migratory species (Landis, 2014). To achieve these large, connected areas of habitats in urban and suburban areas, there is a need for individual behaviors that go beyond simply planting native plants in one's own yard. For example, individuals can participate in social diffusion by encouraging neighbors to plant native plants and/or civic action by promoting policies that require native plants in parks, roadways, or other public spaces. This can increase the amount, proximity, and distribution of native plants, significantly supporting positive environmental effects.

CHAPTER THREE: RESEARCH QUESTIONS

Using native plant gardening as a case study, and building on previous native plant gardening behavior research by Jones and Niemiec (2020), Niemiec et al. (2021), and Champine et al. (2022), we examined the following research questions:

1. What are the prevalence of personal sphere, social diffusion, and civic action behaviors for native plant gardening among residents in the United States?
2. What are the social-psychological drivers of those personal sphere, social diffusion, and civic action behaviors for native plant gardening? How are the drivers similar and different across types of behavior?

CHAPTER FOUR: METHODS

Sample and Data Collection

This research used a survey to assess the social-psychological motivators and barriers to native plant gardening, specifically looking at knowledge, attitudes, norms, identity, moral exporting, and efficacy. The survey also examined structural and demographic variables that might influence behavior such as available gardening space, income, and age, among others. The survey was programmed and recorded in Qualtrics (Provo, Utah; www.qualtrics.com, 2023) and distributed by Prolific (Oxford, UK; www.prolific.co, 2023), a research web platform. Prolific has often been used to recruit participants for social science research, including environmental behavior research (e.g. Hopwood et al., 2022; Schmitt et al., 2019; Wyss et al., 2022). It has been found to be a viable and high functioning platform and comparable to similar programs such as MTurk (Douglas et al., 2023; Palan & Schitter, 2018). Via Prolific, we used quota sampling to gather data from a sample of U.S. residents ($n = 1,201$) that was representative of the population on key sociodemographic variables (age, sex, and race/ethnicity) according to the U.S. Census (U.S. Census Bureau, 2023). Completing the survey took an average of 10 minutes and participants were compensated monetarily for their time based on Prolific's protocol. The survey was conducted under Colorado State University IRB #19–8879H.

Survey Measures

Dependent Variables

Our dependent variables consisted of previous participation in the three types of behavior (personal sphere, social diffusion, and civic action). We chose to measure self-reported previous behavior rather than behavioral intention, as is often measured in social-psychological studies,

due to the intention-behavior gap, or the phenomenon where individuals are unlikely to follow through on participating in a behavior despite stating their intention to do so (Carrington et al., 2010). Champine et al. (2022) found the intention-behavior gap to be particularly strong for native plant gardening, prompting us to focus on previous behavior.

Our behavioral measures were adapted from questions regarding native plant gardening used by Jones and Niemiec (2020), Niemiec et al. (2021), and Champine et al. (2022). We measured previous personal sphere behavior by asking if participants had ever intentionally planted a native plant. We measured previous social diffusion behavior by asking if participants had ever encouraged someone else to plant a native plant. We measured previous civic action behavior by defining civic action as “involvement in community change efforts such as voting, signing a petition, volunteering, or organizing a protest” then asking participants if they had ever taken a civic action to increase native plants in their community. These questions had binary yes or no answer choices.

Independent Variables

The independent variables in our study expanded on previous research that examined the drivers of native plant gardening in a specific geographic location (Fort Collins, Colorado) with an engaged sample (Champine et al., 2022; Jones & Niemiec, 2020; Niemiec et al., 2021). Our study adapted their measures of possible social-psychological drivers of personal sphere and social diffusion behaviors, including efficacy, norms, attitudes, subjective knowledge, and sociodemographic variables. Using these as a template, we created measures for civic action behaviors by drawing on civic action literature (e.g., Hamann & Reese, 2020; Larson et al., 2015; Pradhananga & Davenport, 2017). We also added measures for identity, moral exporting, and introversion/extroversion based on the literature (e.g., Maki & Raimi, 2017; Poškus, 2020;

Stets & Burke, 2000; van Zomeren et al., 2008). Each social-psychological measure, with the exceptions of subjective knowledge and moral exporting, had a behavior-specific question for personal sphere, social diffusion, and civic action behavior. In other words, we asked three separate questions – one for each behavior type – for each variable (See Table 1 for all social-psychological concepts and corresponding survey questions).

We adapted questions from Jones and Niemic (2020) and Champine et al. (2022) to measure three types of efficacy, including self-efficacy, environmental response efficacy, and collective efficacy. Self-efficacy, or the belief in one’s capability of accomplishing a task (Bandura, 1977, 1997) is commonly studied in PEB research and has been found to influence social diffusion (e.g., Hamann & Reese, 2020; Howell et al., 2015). Specifically, higher levels of social diffusion-specific self-efficacy, or feelings of confidence in one’s ability to effectively encourage others, has been found to predict participation in social diffusion behavior for native plant gardening (Champine et al., 2022). Environmental response efficacy, or the belief that a behavior will create positive outcomes for the environment (Hamann & Reese, 2020), has been linked to higher levels of civic action in support of climate initiatives (Roser-Renouf et al., 2014) and social diffusion behavior promoting native plant gardening (Jones & Niemic, 2020). Collective efficacy, sometimes referred to as collective response efficacy, or an individual’s belief in a group’s ability to accomplish a task (Bandura, 2000), has been shown to motivate behavior in the environmental context. Specifically, collective efficacy has been demonstrated to increase climate action policy support, a type of civic action (Bostrom et al., 2019).

Attitudes, or a participant’s positive or negative evaluations of a subject or behavior (Ajzen & Fishbein, 2000), have been commonly researched in PEB literature. While they are important, they are often not enough to inspire PEB participation on their own (e.g., Nilsson et

al., 2020; Wheeler et al., 2022; Wyss et al., 2022). For instance, Champine et al. (2022) found that, while attitudes significantly predicted native plant gardening behavior, they were not the only significant predictor. Our attitude measures were adapted from Jones and Niemiec (2020) and Champine et al. (2022), which were originally adapted from Ajzen and Fishbein (2000). We also measured subjective knowledge, or the amount of information an individual feels that they have about a topic, because it has been found to be important to participation in diverse PEBs, including social diffusion (e.g., Champine et al., 2022; Howell et al., 2015; Niemiec et al., 2016).

We measured four types of norms, all with questions adapted from Niemiec et al. (2019), Jones and Niemiec (2020), and Champine et al. (2022). Injunctive norms are the beliefs that others will judge one's behavior as favorable or unfavorable (Matthies et al., 2012; Niemiec et al., 2018) and are commonly measured drivers of PEBs (Niemiec et al., 2019). Personal norms are feelings of moral obligation to participate in a behavior (Niemiec et al., 2020; Schwartz, 1977). Champine et al. (2022) found that social diffusion-specific personal norms, or an individual's feeling of moral obligation toward sharing information or ideas with others, was important for predicting social diffusion behaviors for native plant gardening.

Perceived descriptive norms, or perceptions of how others are behaving (Cialdini, 2003), have frequently been demonstrated to affect participation in PEBs in various spheres of influence. For instance, Gerber and Rogers (2009) demonstrated that descriptive norms were especially impactful in motivating civic action in individuals who did not often participate in the civic action of voting. Dynamic norms are perceptions of how others' behavior is changing (Sparkman & Walton, 2017). Jones and Niemiec (2020) found that dynamic norms regarding the increasing popularity of native plant gardening were significantly related to personal sphere and social diffusion behavior.

Moral exporting, or an individual's inclination to influence another's moral position, has been posited as a potential driver of social diffusion behavior (Jones & Niemiec, 2023). Moral exporting, which has been more commonly studied in the political sphere (e.g., Peterson et al., 2009), has recently been explored as an influence on social diffusion or persuasion behavior. For example, Maki and Raimi (2017) found that people with higher levels of moral exporting were more likely to have attempted to influence someone's behavior in the past. They also found that moral exporting was linked to certain personality traits and other demographic factors. More specifically, individuals with higher levels of moral exporting in environmental contexts were more extroverted and politically liberal.

Social identity has been demonstrated to be a factor influencing participation in PEBs (Amel et al., 2017) and collective action to support climate initiatives (Bamberg et al., 2015). While social identity has been examined in environmental research, a recent review of eight meta-analyses indicated that pro-environmental identity has been found to more positively influence PEBs and pro-environmental intentions than identities not related to environmental issues (Vesely et al., 2021). We included a measure for environmental identity, or how an individual labels themselves in the environmental context (Sparks & Shepherd, 1992; Vesely et al., 2021).

We also included measures of introversion and extroversion because we were interested in how personality, or other intrinsic factors, might affect which PEBs individuals would be willing to participate in. Previously, extroversion has been identified as a potential driver of social diffusion behavior in environmental contexts (Maki & Raimi, 2017). We adapted measures for self-reported introversion and extroversion from Woods and Hampson (2005) by

asking participants to read descriptions and rank themselves on 10-point scales from “not at all like me” to “very much like me.”

Finally, we asked participants about the amount of space they had available to plant native plants with the question, “how much space do you have to plant native plants around your home?” They answered on a 5-point scale from “none” to “too much.” We asked about their political identity with the question “generally speaking, do you think of yourself as a...” with the answer choices “republican,” “democrat,” “independent,” “libertarian,” “no party/not interested in politics,” and “other (please specify).” We gathered additional sociodemographic data such as education with the question “what is your highest level of education” and answers from “less than high school graduate” to “graduate degree or higher.” Income was measured on a scale from “less than \$15,000” to “over \$200,000.” Age, sex, and race/ethnicity were collected via Prolific’s stored data and were used as a part of the quota sampling method.

Table 1.
Social-Psychological Survey Measures

Construct	Survey Item	Response Scale	Question Adapted From	Variable Adapted From
Subjective Knowledge	How knowledgeable do you feel about planting native plants?	5-point scale from “not knowledgeable at all” to “extremely knowledgeable”	(Champine et al., 2022; Jones & Niemiec, 2020)	N/A
Attitude: personal sphere	Would you say your general attitude towards planting native plants is positive, negative, or neutral?	7-point scale from “extremely negative” to “extremely positive”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Ajzen & Fishbein, 1980, 2000)

Attitude: social diffusion	Would you say your general attitude towards encouraging others to plant native plants is positive, negative, or neutral?	7-point scale from “extremely negative” to “extremely positive”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Ajzen & Fishbein, 1980, 2000)
Attitude: civic action	Would you say your general attitude towards taking a civic action (ex. voting, signing a petition, volunteering) to increase native plants is positive, negative, or neutral?	7-point scale from “extremely negative” to “extremely positive”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Ajzen & Fishbein, 1980, 2000; Larson et al., 2015)
Self-efficacy: personal sphere	I have the skills and knowledge to plant native plants around my home.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Bandura, 1977, 1997)
Self-efficacy: social diffusion	I wouldn't be able to have a good discussion about planting native plants with my community members. (Reversed)	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Bandura, 1977, 1997; Hamann & Reese, 2020)
Self-efficacy: civic action	I have the skills and knowledge to take a civic action (ex. voting, signing a petition, volunteering) to increase native plants in my community.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Bandura, 1977, 1997)
Environmental response efficacy: personal sphere	If you planted native plants around your home, how much	5-point scale from “not at all” to “a great deal”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Hamann & Reese, 2020)

	would you help the environment?			
Environmental response efficacy: social diffusion	If you encouraged others to plant native plants, how much would you help the environment?	5-point scale from “not at all” to “a great deal”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Hamann & Reese, 2020)
Environmental response efficacy: civic action	If you took civic action to increase native plants, how much would you help the environment?	5-point scale from “not at all” to “a great deal”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Hamann & Reese, 2020; Larson et al., 2015)
Collective efficacy: personal sphere	If most people in the US planted native plants around their home, how much would it help the environment?	5-point scale from “not at all” to “a great deal”	(Champine et al., 2022; Jones & Niemiec, 2020; Maibach et al., 2009)	(Bandura, 2000; Bostrom et al., 2019)
Collective efficacy: social diffusion	If most people in the US encouraged others to plant native plants, how much would it help the environment?	5-point scale from “not at all” to “a great deal”	(Champine et al., 2022; Jones & Niemiec, 2020; Maibach et al., 2009)	(Bandura, 2000; Bostrom et al., 2019)
Collective efficacy: civic action	If most people in the US took civic action to increase native plants, how much would it help the environment?	5-point scale from “not at all” to “a great deal”	(Champine et al., 2022; Jones & Niemiec, 2020; Maibach et al., 2009)	(Bandura, 2000; Bostrom et al., 2019; Collins et al., 2014)
Injunctive norm (sanctioning): personal sphere	People I know in my community disapprove of me replacing lawn with native plants around my home.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Cialdini, 2003)
Injunctive norm	Most people would disapprove of me	7-point scale from “strongly	(Champine et al., 2022; Jones	(Cialdini, 2003)

(sanctioning): social diffusion	advocating for native plant gardening in my community.	disagree” to “strongly agree”	& Niemiec, 2020)	
Injunctive norm (sanctioning): civic action	Most people would disapprove of me participating in civic actions to increase native plants.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Cialdini, 2003)
Personal norm: personal sphere	Most people in my community have planted native plants around their homes.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Schwartz, 1977)
Personal norm: social diffusion	Most people in my community have encouraged others to plant native plants.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Schwartz, 1977)
Personal norm: civic action	Most people in my community have taken civic actions to increase native plants.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Schwartz, 1977)
Descriptive norm: personal sphere	Most people in my community have planted native plants around their homes.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Cialdini et al., 1991)
Descriptive norm: social diffusion	Most people in my community have encouraged others to plant native plants.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Cialdini et al., 1991)
Descriptive norm: civic action	Most people in my community have taken civic actions to increase native plants.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Cialdini et al., 1991)
Dynamic norm: personal sphere	In recent years, more people in my community have	7-point scale from “strongly	(Champine et al., 2022; Jones	(Mortensen et al., 2019; Sparkman &

	begun planting native plants around their homes.	disagree” to “strongly agree”	& Niemiec, 2020)	Walton, 2017)
Dynamic norm: social diffusion	In recent years, more people in my community have begun encouraging others to garden with native plants.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Mortensen et al., 2019; Sparkman & Walton, 2017)
Dynamic norm: civic action	In recent years, more people in my community have begun taking civic actions to increase native plants.	7-point scale from “strongly disagree” to “strongly agree”	(Champine et al., 2022; Jones & Niemiec, 2020)	(Mortensen et al., 2019; Sparkman & Walton, 2017)
Moral Exporting	I am willing to try to influence the behavior of my family and friends to more closely align with my own views on issues I care about.	7-point scale from “strongly disagree” to “strongly agree”	N/A	Maki & Raimi, 2017
Environmental Identity	How much do you agree with the following statements? -I feel connected to the climate movement. -I see myself as an environmentalist. -I consider myself a climate activist.	7-point scale from “strongly disagree” to “strongly agree”	(van Zomeren et al., 2008)	(Sparks & Shepherd, 1992; Thomashow, 1996; van Zomeren et al., 2008)
Introversion	How much do the following descriptions sounds like you? -Someone who is a reserved, private person, doesn't like to draw attention to	1-10 scale from “not at all like me” through “very much like me”	N/A	(Poškus, 2020; Woods & Hampson, 2005)

	themselves and can be shy around strangers			
Extroversion	How much do the following descriptions sounds like you? --Someone who is talkative, outgoing, is comfortable around people, but could be noisy and attention seeking.	1-10 scale from “not at all like me” through “very much like me”	N/A	(Poškus, 2020; Woods & Hampson, 2005)

Data Analysis

We used R to analyze our data (R Core Team, 2022). We calculated descriptive statistics to identify what percentage of respondents had previously planted a native plant, participated in social diffusion to promote native plants, or taken a civic action to support native plants in their community (Research Question 1). To understand the relationship between the social-psychological variables (independent variables) and our three behavioral variables (dependent variables), we ran three binary logistic regressions, one for each type of behavior, and determined statistical significance with a p value of .05 and we reported odds ratios for our effect sizes (Research Question 2).

Because we were interested in whether the same or different variables predicted our three different types of behaviors, we included variables specific to all three behaviors in all of the regressions. Due to the small amount of missing data (0.025%), we used complete case deletion in the regressions. Prior to running the regressions, we tested for multicollinearity using the variance inflation factor (VIF), which measured the presence and strength of correlations among the independent variables (Vaske, 2019). We removed variables with a strong correlation,

indicated by a VIF of greater than 5.0, starting with the highest VIF. We first removed social diffusion-specific collective efficacy because it had the highest VIF (6.89). We reran the test and found social diffusion-specific environmental response efficacy to have a VIF over 5.0 (5.05), which we then removed. We ran the test a third time and found all variables to be under the 5.0 threshold.

CHAPTER FIVE: RESULTS

Compared to the U.S. Census, our data were representative of the U.S. population on key sociodemographic variables (Table 2; U.S. Census Bureau, 2023). Additionally, we found that we had respondents from all 50 U.S. states and the District of Columbia.

Table 2.
United States Census Comparison

	Our Sample	U.S. Census
Median Adult Age (>18 years)	45	>38
% Male	49	50
% Asian	6	6
% Black	13	14
% Mixed Race/ethnicity	2	3
% Other Race/ethnicity	1	1
% White	78	76
% Homeowner	60	65
% Heterosexual	82	88

Of the total respondents, 47.2% indicated that they had previously intentionally planted a native plant, and 35.4% indicated that they had previously participated in social diffusion for native plant gardening. Civic actions to increase native plants within their community were less common, as only 13.7% of respondents reported having participated in such behavior.

Personal sphere Behavior

Regression results showed that there were multiple significant influences on personal sphere behavior. Subjective knowledge appeared to be the strongest predictor of personal behavior; specifically, those with greater subjective knowledge are more likely to have planted a native plant ($\beta = 1.19, p = <.001, \text{Odds Ratio} = 3.29, 95\% \text{ CI } [2.59, 4.22]$). Two personal sphere-specific factors also significantly predicted previous native plant gardening behavior including

personal sphere-specific self-efficacy ($\beta = 0.51, p = <.001$, Odds Ratio = 1.66, 95% CI [1.31, 2.10]) and personal sphere-specific personal norms ($\beta = 0.52, p = <.001$, Odds Ratio = 1.69, 95% CI [1.25, 2.29]). This means that those with higher confidence in their ability to plant a native plant and those who felt a moral obligation to plant a native plant were more likely to have done so in the past. Previously planting a native plant was also significantly predicted by the demographic variables of income ($\beta = 0.23, p = .01$, Odds Ratio = 1.26, 95% CI [1.07, 1.48]), age ($\beta = 0.33, p = <.001$, Odds Ratio = 1.40, 95% CI [1.18, 1.65]), having a political identity of “Independent” ($\beta = 0.42, p = .03$, Odds Ratio = 1.53, 95% CI [1.04, 2.25]), and being White ($\beta = 0.93, p = .01$, Odds Ratio = 2.53, 95% CI [1.24, 5.29]) or of Mixed race/ethnicity ($\beta = 1.46, p = .04$, Odds Ratio = 4.33, 95% CI [1.04, 17.47]). Attitudes and all norms, with the exception of personal sphere specific personal norms, were not predictive of personal sphere behavior at a p value of less than .05 (Table 3).

Table 3.
Personal Sphere, Social Diffusion, and Civic Action Regression Tables

	Personal Sphere			Social Diffusion			Civic Action		
	β	SE	p	β	SE	p	β	SE	p
Knowledge	1.19	0.12	<.001**	0.67	0.12	<.001**	0.68	0.14	<.001**
PS Attitude	0.16	0.12	.18	0.02	0.13	.88	-0.15	0.17	.37
SD Attitude	0.11	0.13	.38	0.46	0.14	.00*	0.02	0.2	.91
CA Attitude	-0.16	0.11	.14	-0.05	0.11	.69	0.35	0.18	.05
PS Self-Efficacy	0.51	0.12	<.001**	0.15	0.13	.25	-0.02	0.18	.93
SD Self-Efficacy	0.16	0.09	.09	0.19	0.10	.05	-0.15	0.13	.27
CA Self-Efficacy	0.00	0.11	.97	0.25	0.11	.02*	0.21	0.16	.18
PS Env Response Efficacy	-0.05	0.13	.71	0.09	0.12	.46	-0.06	0.16	.72
CA Env Response Efficacy	-0.15	0.13	.28	-0.23	0.14	.09	0.01	0.18	.96

PS Collective Efficacy	-0.05	0.14	.73	0.07	0.14	.60	0.21	0.2	.30
CA Collective Efficacy	0.15	0.14	.29	0.13	0.15	.38	0.22	0.21	.29
PS Injunctive Norm	0.18	0.10	.08	-0.07	0.10	.48	-0.13	0.13	.31
SD Injunctive Norm	-0.07	0.11	.53	-0.15	0.11	.17	-0.07	0.13	.58
CA Injunctive Norm	0.07	0.11	.53	0.00	0.11	.99	-0.2	0.14	.15
PS Personal Norm	0.52	0.15	<.001**	0.22	0.15	.15	-0.02	0.22	.92
SD Personal Norm	-0.08	0.15	.58	0.55	0.15	<.001**	0	0.2	.99
CA Personal Norm	-0.21	0.15	.18	-0.28	0.16	.08	0.57	0.22	.01*
PS Descriptive Norm	0.23	0.12	.06	0.17	0.13	.19	-0.12	0.17	.47
SD Descriptive Norm	0.05	0.13	.72	0.12	0.13	.37	0.02	0.16	.91
CA Descriptive Norm	-0.15	0.13	.26	-0.32	0.13	.01*	0.21	0.16	.19
PS Dynamic Norm	0.23	0.15	.14	0.03	0.15	.82	0.11	0.2	.60
SD Dynamic Norm	0.24	0.15	.10	0.43	0.14	.00*	0.19	0.2	.33
CA Dynamic Norm	-0.21	0.15	.16	0.03	0.15	.85	0.37	0.19	.06
Moral Exporting	-0.19	0.10	.07	0.24	0.11	.03*	-0.3	0.16	.06
Env Identity	0.07	0.11	.52	0.05	0.12	.67	-0.04	0.17	.83
Available Space	0.08	0.09	.36	-0.11	0.09	.20	-0.18	0.12	.13
Introversion	-0.06	0.09	.48	-0.08	0.09	.35	-0.28	0.11	.01*
Income	0.23	0.08	.01*	0.07	0.08	.38	0.18	0.11	.13
Age	0.33	0.09	<.001**	-0.17	0.09	.05	0.05	0.11	.62
Sex (Male)	-0.24	0.17	.14	-0.30	0.17	.07	0.07	0.23	.76
Political Identity (Ind.)	0.42	0.20	.03*	-0.09	0.20	.66	-0.11	0.27	.68
Political Identity (Other)	0.34	0.33	.30	-0.02	0.36	.95	-0.06	0.49	.90
Political Identity (Rep.)	0.21	0.24	.39	0.47	0.25	.06	-0.58	0.35	.10
Ethnicity (Black)	-0.1	0.44	.82	0.15	0.47	.75	0.42	0.67	.53

Ethnicity (Mixed)	1.46	0.72	.04*	2.37	0.68	<.001**	2.54	0.89	.00*
Ethnicity (Other)	0.97	0.72	.18	1.21	0.74	.10	0.79	1.05	.45
Ethnicity (White)	0.93	0.37	.01*	0.72	0.39	.07	0.98	0.6	.10
R ²	0.38			0.36			0.35		

PS = Personal-Sphere, SD = Social Diffusion, CA = Civic Action,

n = 1,190

β = Standardized Beta Coefficient, SE = Standard Error

* *p* < .05 , ** *p* < .001

Social Diffusion Behavior

Regression results showed that there were multiple significant *positive* influences on social diffusion behavior. An individual's level of subjective knowledge ($\beta = 0.67, p = <.001, Odds Ratio = 1.95, 95\% CI [1.56, 2.46]$) appears to have the strongest effect on whether they had previously encouraged someone to plant a native plant. Three social diffusion-specific variables significantly predicted if someone had participated in social diffusion including social diffusion-specific attitudes ($\beta = 0.46, p = .00, Odds Ratio = 1.58, 95\% CI [1.20, 2.10]$), social diffusion-specific personal norms ($\beta = 0.55, p = <.001, Odds Ratio = 1.70, 95\% CI [1.30, 2.32]$), and social diffusion-specific dynamic norms ($\beta = 0.43, p = .00, Odds Ratio = 1.54, 95\% CI [1.16, 2.04]$). This means that people who positively evaluated encouraging others to plant native plants, felt a moral obligation to encourage others to plant native plants, and believed it was becoming more common to encourage others to plant native plants were all more likely to have participated in social diffusion in the past. Participating in social diffusion was also predicted by civic action-specific self-efficacy ($\beta = 0.25, p = .02, Odds Ratio = 1.29, 95\% CI [1.03, 1.60]$), or the belief in one's ability to take a civic action to support native plants, and moral exporting ($\beta = 0.24, p = .03, Odds Ratio = 1.27, 95\% CI [1.02, 1.58]$), or one's willingness to exert their morals about native plants on another individual. The demographic factor of being of Mixed race/ethnicity (β

= 2.37, $p = <.001$, Odds Ratio = 10.72, 95% CI [2.88, 41.23]) was also a significant predictor of previous social diffusion. Civic action-specific descriptive norm ($\beta = -0.32$, $p = .01$, Odds Ratio = 0.73, 95% CI [0.56, 0.94]) was also a significant influence, but was negatively associated with the behavior (Table 3).

Civic Action Behavior

Significant predictors in our regression model with a *positive* association with civic action behavior included two social-psychological variables and one demographic factor. Previous participation in a civic action behavior to support native plants was predicted by subjective knowledge ($\beta = 0.68$, $p = <.001$, Odds Ratio = 1.98, 95% CI [1.51, 2.60]), civic action-specific personal norms ($\beta = 0.57$, $p = .01$, Odds Ratio = 1.78, 95% CI [1.16, 2.74]), and being of Mixed race/ethnicity ($\beta = 2.54$, $p = .004$, Odds Ratio = 12.68, 95% CI [2.19, 74.35]). This means that individuals were more likely to have participated in civic action if they felt they had enough knowledge about native plant gardening, felt a moral obligation to participate in civic action to support native plant gardening, or were of mixed race. Introversion ($\beta = -0.28$, $p = .01$, Odds Ratio = 0.76, 95% CI [0.61, 0.93]) was another significant predictor, but with a negative association with the behavior. In other words, a more introverted individual was less likely to have participated in civic action for native plants (Table 3).

CHAPTER SIX: DISCUSSION

Encouraging individuals to engage in PEBs beyond the personal sphere, such as social diffusion or civic action, can help to increase the scale of sustainable behavior change and, therefore, enhance progress toward conservation goals (Amel et al., 2017). To understand how to motivate behaviors that influence the broader systems within which individuals are embedded, a greater understanding of the potentially unique drivers of social diffusion and civic action behavior is needed. To address this gap, we examined participation in, and the social psychological drivers of, personal sphere, social diffusion, and civic action behaviors for native plant gardening.

Overall, we found that each behavior was predicted by a unique combination of variables, and there was little overlap in the variables that were important for each behavior. These findings suggest that outreach targeting perceptions related to personal sphere behavior alone will likely not automatically lead to increased social diffusion and civic action behavior. Rather, different outreach approaches will be needed to target these unique drivers to motivate the three different types of behaviors.

We found that subjective knowledge about native plant gardening was often one of the strongest predictors and was the only variable that predicted all three types of behavior. Knowledge is commonly found to be an important predictor of participation in many PEBs across diverse contexts (Champine et al., 2022; Hanss & Böhm, 2013; Howell et al., 2015; Niemiec et al., 2016). Our findings highlight the importance of providing community members with the necessary information about native plant gardening for them to engage in the behavior. However, while knowledge emerged as an important predictor, knowledge was not the only

driver. This supports prior work, which has suggested that knowledge alone is insufficient on its own to motivate behavior (Kollmuss & Agyeman, 2002).

Behavior-specific personal norms predicted all three corresponding behaviors with a moderately high effect size, meaning that personal sphere behavior was predicted by personal sphere-specific personal norms; social diffusion was predicted by social diffusion-specific personal norms; and civic action was predicted by civic action-specific personal norms. This demonstrates that feeling a moral obligation to plant a native plant does not automatically mean that an individual feels an obligation to participate in social diffusion or civic action behavior to support native plants. Rather, they may need to feel a specific personal norm to participate in that specific type of behavior. These findings suggest the importance of measuring behavior-specific variables (e.g., using a distinct personal norm measure for each type, or sphere, of behavior) in future research, which aligns with Fishbein and Ajzen's (2010) recognition of the importance of specificity and correspondence between measures and behavior.

Our findings regarding the importance of personal norms in predicting behavior continue to support evidence regarding the relationship between personal norms and PEBs. A meta-analysis by Niemiec et al. (2020) found that personal norms can be strong predictors of PEBs, even having more of an effect on intentions to participate in PEBs than subjective norms. Additionally, it could prove beneficial to survey the intended target audience to understand their personal norms regarding the topic or behavior before beginning the campaign to ensure they are the correct audience. Personal norms, particularly behavior-specific personal norms, are an important variable to include in future research exploring the drivers of PEBs.

We found self-efficacy to be a predictor of personal sphere and social diffusion behavior. Personal sphere self-efficacy predicted personal sphere behavior, again highlighting the

importance of variable-to-behavior alignment. These results support Hamann and Reese's (2020) finding that self-efficacy was better at predicting personal sphere sustainable consumption behavior than collective efficacy. In contrast to findings by Champine et al., (2022) we did not find social diffusion-specific self-efficacy to be a significant predictor of social diffusion. Instead, we surprisingly found civic action-specific self-efficacy to be a predictor of social diffusion behavior. This means that an individual who feels they have the capability to vote or send a letter to their representative is more likely to have previously participated in social diffusion for native plant gardening. This could be because if an individual feels that they have the skills to effectively participate in a civic action, they may also feel confident encouraging someone they know to plant a native plant. Further research is needed to understand the relationship between perceptions of efficacy and participation in civic and social diffusion action.

Social diffusion was significantly influenced by social diffusion-specific attitudes and moral exporting. Our finding that social diffusion-specific attitudes predicted participation in social diffusion behavior supports prior research on social diffusion for native plant gardening (Champine et al., 2022) while also supporting attitude-behavior theory more generally (Fishbien & Ajzen, 2010). To our knowledge, this is the first study applying moral exporting to native plant gardening behavior. We found that a person's level of moral exporting, or their inclination to attempt to influence the ideas or behaviors of others (Maki & Raimi, 2017), positively influenced previous participation in social diffusion for native plant gardening with a moderate effect size. This indicates that having an increased willingness to share your beliefs with others is important for social diffusion in this context. It could be that individuals unwilling to share their ideas or behaviors, or are low in moral exporting, could be concerned about judgement from

others (Maki & Raimi, 2017). It could be that moral exporting may prove more important in some domains as opposed to others. For example, it may be particularly relevant for native plant gardening because it has to do with effecting the look of an individual's home, something they may take pride in. Our findings suggest that encouraging individuals with low levels of moral exporting to participate in social diffusion could prove challenging or even fruitless. Because of this, it may be important for practitioners to survey their audience to assess their level of moral exporting before deciding what behaviors to target. If they find moderate to high levels of moral exporting, then encouraging social diffusion behavior could be advisable. If levels of moral exporting are low, it might prove beneficial to encourage another type of PEB or attempt to find a different audience.

Social diffusion-specific dynamic norms were another significant predictor of social diffusion behavior. In other words, an individual is more likely to encourage another person to plant native plants if they feel that the norm of encouraging others to plant native plants is becoming more popular. This means that an individual does not need to feel that it is already the norm to encourage others to plant native plants, but rather that it might soon be the norm. It is also important to note that, because the significant influence was social diffusion-specific dynamic norms, not personal sphere-specific dynamic norms, it is not enough that the behavior of planting native plants is becoming more common, but that the rate of encouraging others to plant native plants is increasing. Practitioners hoping to increase social diffusion native plant gardening behaviors can use campaigns that highlight how more people in their community are starting to participate in this behavior.

We found that civic action for native plant gardening was negatively associated with introversion. This means that introverts appear to be less willing to participate in civic action in

this context. Combined with our findings that moral exporting predicted social diffusion behavior, these results could indicate that participation in different types of PEBs is impacted by personality traits, or other intrinsic factors. While extroversion and moral exporting may appear to be similar, their differences are demonstrated by each predicting a different type of behavior. Social diffusion often requires interacting with others; however, these are usually known others in one's social network, such as neighbors, friends, and family. This might feel more comfortable for introverts than speaking to potentially unknown others, as might be required with civic action. On the other hand, social diffusion requires an individual to share their morals and opinions directly with other individuals they know in a way that civic actions do not; this could explain why higher levels of moral exporting might be required to participate in social diffusion.

Overall, our findings highlight that social diffusion and civic action behaviors may be tied to personality traits as well as perceptions. Future research should continue to explore the unique roles of moral exporting, introversion, and other personality traits in the context of PEBs. This could help to segment audiences that should be targeted for different types of behavior campaigns. This is especially important as our results suggest that creating greater engagement in PEBs may be as much about matching the correct behaviors with people with certain personality traits as it is about trying to change peoples' perceptions to get them to participate in a PEB.

Certain demographic factors also predicted participation in the different types of behavior we examined. Being of mixed race/ethnicity predicted all three types of behavior, with particularly high effect sizes for social diffusion and civic action. However, due to the small sample size of multiracial respondents ($n = 24$), this relationship should be further explored. Participants were more likely to have participated in personal sphere native plant gardening if they were white, had a higher income, or were older. This supports previous research indicating

that native plant gardeners tend to be older and wealthier (Champine et al., 2022). People who are older, more financially well-off, and White are more likely to own property on which to garden (Hermann, 2023). However, participants' self-reported available space to plant native plants was not found to be significant for our sample.

While Brick et al. (2017) found that having a pro-environmental identity was a stronger predictor of PEB than political identity, our results suggested otherwise. We found that having a political identity aligned with the Independent party was found to predict previous personal sphere native plant gardening participation, while having a pro-environmental identity was not found to predict native plant gardening of any type. Identity has been found to play a role in PEB participation, often with a pro-environmental identity increasing environmental concern (Lou & Li, 2021) and motivating participation in many, but not all, PEBs (Brick et al., 2017; Vesely et al., 2021; Whitmarsh & O'Neill, 2010). Given our findings and the mixed results of previous studies regarding the role of identity, this presents an important area for continued research. Additionally, exploring identities beyond environmental and political could provide further valuable information.

It is important to note that while we asked participants to report their previous behavior in an attempt to avoid the intention-behavior gap as found in native plant gardening by Champine et al. (2022), our data still relied on self-reporting as opposed to measures of actual behavior. There may be additional variables influencing behavior that were not included in our models and could be uncovered through exploratory qualitative research. Additionally, it is important to recognize that there may be other demographics, beyond those used in our sample design and models, which would be important to explore in future research. Furthermore, while it was not the focus

of this project, it is also important to recognize the structural and systemic barriers to participation in native plant gardening.

While our results were based on the specific PEB of native plant gardening, it is important to conceptualize when and how our results may or may not also apply to other domains or contexts. For example, knowledge was a key predictor in all three levels of behavior, and this may be because both gardening and promoting native plants might require a greater understanding of the topic than less complex PEBs such as reducing plastic use, biking or using public transport instead of driving, or turning down the air conditioning. Alternatively, we did not find having a pro-environmental identity to predict participation in any of the three behaviors. This identity may not be as important in this context because native plant gardening has benefits beyond environmental such as saving money by reducing household water use, matching a certain aesthetic beauty, and avoiding exposure to pesticides or other pollutants. It could be that individuals are planting native plants and encouraging others to do the same for these reasons as opposed to environmental reasons. This may be less true for other PEBs that have more direct, environmental benefits and fewer non-environmental benefits.

In addition to our findings regarding variation in the social-psychological drivers of behavior, we also found strong variation in participation in the three different spheres of native plant gardening behavior. Individuals were most likely to have participated in PEBs within their own personal sphere, with 47.2% of respondents reporting that they had previously intentionally planted a native plant. Champine et al. (2022) found that 68% of their sample from Fort Collins, Colorado, had planted a native plant on their property. The authors suggested that their random sample may have been more highly engaged than average due to response bias or issue salience;

however, combined with our results, these fairly high percentages could indicate that planting a native plant is a somewhat common behavior and may even be normative in some communities.

Fewer participants (35.4%) in our study reported that they had previously engaged in a social diffusion behavior for native plant gardening. The notable decrease compared to personal sphere behavior aligns with previous findings that social diffusion behaviors that support conservation are less common than personal sphere behaviors (Larson et al., 2015), including conservation behaviors on private land (Niemic et al., 2019). We found that an even lower percentage of people reported participation in civic action behavior (13.7%) compared to personal sphere and social diffusion native plant gardening behaviors. This trend was also observed by Larson et al. (2017) where participation in common, everyday PEBs such as recycling and choosing “green” shopping was reported by 81-94% of respondents, while civic actions such as writing to a representative about the environment was reported by only about 9%. Larson et al. (2017) did find a higher reported rate of voting about environmental issues (39%); however, that included all environmental issues, while we only looked at civic actions specific to native plant gardening. Overall, these findings highlight the need for outreach specifically designed to motivate civic action and social diffusion PEBs to help scale up conservation behavior change efforts.

Conclusion

We sought to understand the frequency of and the social-psychological motivators and barriers to participation in personal sphere, social diffusion, and civic action behaviors for native plant gardening. Our results demonstrate that the prevalence of each behavior type differs with personal sphere actions being most common. The rate of participation progressively decreases as the spheres of influence expand. Creating widespread pro-environmental change to combat a

myriad of environmental challenges being faced will require strong increases in behavior outside of the personal sphere. Additionally, we found that the social-psychological drivers of the three types of behavior are distinct, meaning that interventions hoping to inspire personal sphere versus social diffusion and civic action behaviors need to rely on different mechanisms. Our results suggest that unique outreach strategies will likely be needed for motivating behaviors within different spheres of influence. Therefore, it is imperative for research to continue to uncover the unique drivers to varying PEBs and for practitioners to ensure that they are not relying on drivers of personal sphere behavior when working to encourage social diffusion, civic action, or other non-personal sphere behaviors.

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