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WETLAND CONSERVATION

# Ecological Awareness, Connection to Wetlands, and Wildlife Recreation as Drivers of Wetland Conservation Involvement

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## Abstract

Public involvement in conservation is driven by several factors, including individuals' ecological awareness, sense of connection to landscapes, and wildlife recreation participation. Efforts to increase conservation involvement would benefit from a deeper understanding of the relative strength of these factors in specific landscapes. This study examined these factors specifically in the context of wetland conservation, based on a 2017 survey of Missouri residents (n = 4076). We used multiple linear regression to analyze how wildlife recreation participation predicted awareness of wetland ecological benefits, as well as connection to wetlands. Then, we used logistic regression to analyze how demographic characteristics, wildlife recreation participation in wetlands, awareness, and connection predicted individual involvement in wetland conservation. 19% of respondents reported engaging in at least one wetland-related conservation behavior in the previous year. Compared to non-participants, we found that both wildlife viewers and waterfowl hunters were significantly more aware of wetland ecological benefits, more connected to wetlands, and more likely to be involved in wetland conservation. Connection to wetlands was a considerably stronger predictor of conservation involvement than was awareness of wetland ecological benefits. Our results suggest that promoting connection to wetlands, particularly through increased participation in wildlife recreation, may contribute to more widespread involvement in wetland conservation.

**Keywords** Wetlands · Conservation · Awareness · Connection · Recreation · Missouri

## Introduction

Wetlands cover over 1280 million hectares worldwide (Millennium Ecosystem Assessment 2005) and provide a wide range of ecosystem services (Clarkson et al. 2013). With over 35% of the world's wetlands lost since 1970, and 81% of inland wetland species declining in that time (Ramsar Convention on Wetlands 2018), conserving these lands is increasingly critical. Doing so effectively may require an increase in public involvement at the individual level, in the form of behaviors such as working on habitat improvement projects, joining conservation organizations, and voting for pro-conservation candidates or issues (Larson et al. 2015). These conservation behaviors, part of a wider range of pro-environmental behaviors (PEBs) which seek to reduce one's impact on the environment while improving environmental quality (Larson et al. 2015), are rarely studied specifically in the context of wetlands (see Ho et al. 2014; Wilkins et al. 2019). Our study thus sought to better understand why individuals get involved (i.e., participate) in wetland conservation behaviors, with a focus on three potential drivers: awareness of wetlands' ecological benefits, connection to wetlands, and wildlife recreation participation in wetlands.

Individuals' awareness of wetland ecological benefits may have an influence on their likelihood of conservation involvement. Indeed, the importance of educating the public about these benefits has received international recognition (see Ramsar Convention Secretariat 2010; North American Waterfowl Management Plan Committee 2012). Yet despite the number of studies that have documented public perceptions of such benefits (Azevedo et al. 2000; Kaplowitz and

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Kerr 2003; Manuel 2003; Das et al. 2014; Rojas et al. 2017), the relationship between ecological awareness and wetland conservation involvement has received little attention. In one of the few studies to analyze this relationship, Ho et al. (2014) found that knowledge of the natural environment predicted wetland conservation behavior in a sample of Taiwan 6th graders. Although they did not measure involvement in conservation behaviors, other studies have advanced the related argument that raising awareness of wetland ecosystem services is important to promoting public support for wetland conservation (Polajnar 2008; Scholte et al. 2016). However, these studies also suggested that being aware of ecosystem services may not be the same as finding them relevant or meaningful. Similarly, beyond wetlands-related literature, research consistently suggests that knowledge and awareness alone cannot comprehensively explain individuals' conservation involvement (Hungerford and Volk 1990; Kollmuss and Agyeman 2002; Schultz 2011; Ardoin et al. 2013).

Conservation involvement in wetlands may also be driven by individuals' feelings of connection to the environment they seek to conserve. "Connection to nature" is a broad term encompassing a variety of concepts that generally consider "nature" as either an abstract concept or a specific place (Restall and Conrad 2015; Ives et al. 2017). Numerous studies have shown that having a greater connection to nature in the abstract (i.e., the outdoors) is positively related to engagement in PEBs (Kals et al. 1999; Mayer and Frantz 2004; Nisbet et al. 2009; Whitburn et al. 2020). Other studies, in examining people's connection to nature on more localized scales, have found similar associations between "place attachment" (the affective bond between an individual and a place; Kudryavtsev et al. 2012) and PEBs (Vaske and Kobrin 2001; Stedman 2002; Lee 2011; Mullendore et al. 2015; Larson et al. 2018). However, measures of connection to nature on a landscape or ecosystem level (i.e., neither abstract nor place-based) are rare in the literature, and we are not aware of any study that has measured connection to wetlands. This concept may therefore represent a crucial, yet understudied, driver of wetland conservation behavior.

The final potential driver of wetland conservation involvement that we considered in this study was participation in wildlife recreation. There is ample evidence to suggest a positive relationship between outdoor recreation and conservation (e.g., Dunlap and Heffernan 1975; Theodori et al. 1998; Teisl and O'Brien 2003; Lee 2011; Cooper et al. 2015), especially in United States wetlands. Of the 59% of Americans who visited wetlands in 2016, 48% engaged in wildlife viewing, 33% engaged in angling, and 17% engaged in hunting (Wilkins and Miller 2018). These recreationists generally had higher rates of wetland conservation involvement than non-recreationists (Wilkins and Miller 2018; Wilkins et al. 2019). Waterfowl hunters, in particular, have strong historic ties to wetland conservation in the United States (North American Waterfowl Management Plan Committee 2012) which are manifested today in their conservation behaviors (Lessard et al. 2018; Schroeder et al. 2020). Yet as waterfowl hunting rates stagnate (Vrtiska et al. 2013; USDI et al. 2016), it is increasingly important to consider how other wildlife recreationists, such as birdwatchers, also contribute to wetland conservation (see Shipley et al. 2018). Furthermore, even as recreation participation is known to predict environmental awareness (Dunlap and Heffernan 1975) and connection to nature (Kellert et al. 2017; Larson et al. 2018; Szczytko et al. 2020), more research is needed to understand how it relates to these variables in the context of wetlands, which in turn may drive wetland conservation.

Although previous studies have provided insights about three potential drivers of wetland conservation involvement – awareness of wetland ecological benefits, connection to wetlands, and wildlife recreation participation in wetlands – their relative importance remains unclear. Our study addresses this gap in the literature by analyzing all three drivers together as predictors of conservation involvement. In the process, we also examine how wildlife recreation participation in wetlands relates to both awareness and connection. This approach was inspired in part by its relevance for wildlife organizations which have applied similar concepts to their wetlands management strategies. Notably, the 2012 North American Waterfowl Management Plan (NAWMP) and its 2018 update were developed around the premise that there are two primary drivers of wetland conservation involvement: emotional ties to wetlands developed through recreational experiences, and pragmatic ties to wetlands founded on awareness of the ecological services they provide (North American Waterfowl Management Plan Committee 2012, 2018). By investigating such paradigms empirically, we aimed to expand our understanding of what drives public involvement in wetland conservation. Our research questions and hypotheses were as follows:

Research Question 1: How is wildlife recreation participation in wetlands related to connection to wetlands and awareness of wetland ecological benefits?

Hypothesis 1: Participation in wildlife recreation in wetlands will predict higher degrees of both connection and awareness.

Research Question 2: How are awareness of wetland ecological benefits, connection to wetlands, and wildlife recreation participation in wetlands related to involvement in wetland conservation?

Hypothesis 2: Greater awareness, greater connection, and wildlife recreation participation will all predict a higher likelihood of involvement in wetland conservation.

## Methodology

### Study Area

Our study examined adult residents of Missouri, United States. Based on the Ramsar Convention's typology (Finlayson 2018), Missouri's wetlands consist of a variety of both inland and human-made wetlands (see Chapman et al. 2002; Nelson 2005; Missouri Department of Conservation 2015). Because Missouri is located at the confluence of the Missouri and Mississippi Rivers, many of these wetlands share similar characteristics to those found throughout these large river systems. As with its wetlands, Missouri's population also represents a diversity of demographic groups (United States Census Bureau 2017) and an intersection of northern and southern regional cultures (Dheer et al. 2014). Thus, Missouri's ecological and human diversity make it an ideal location for a case study of wetland conservation behaviors.

### Survey Design and Implementation

We (Andrew Raedeke) developed a mail survey consisting of questions regarding wetland-related outdoor recreation, personal identity and connection to wetlands, awareness of wetland ecological benefits, involvement in wetland conservation behaviors, and demographic characteristics (see Online Resource 1). The survey was reviewed by ten scientists and wetland managers from the Missouri Department of Conservation, as well as three social scientists who specialize in human dimensions of conservation. We administered this survey between April and July 2017 to a random sample of 20,000 Missouri adult residents whose addresses were purchased from Infogroup (now Data Axle, a company that compiles consumer data from publicly accessible records including tax assessments, utility connections, and voter registrations). We utilized four mailings according to the Tailored Design Method (Dillman et al. 2014). The first mailing (sent 21 April) included a letter informing recipients that they would be receiving a survey, the second mailing (postmarked 5 May) included a cover letter and the survey, the third mailing (postmarked 18 May) included a postcard, and the fourth mailing (postmarked 14 June) included a second copy of the cover letter and survey. We closed the survey on 26 July 2017. We assessed the representativeness of our sample by comparing its demographic composition and rates of wildlife recreation participation to those of the Missouri population (United States Census Bureau 2017; Rockville Institute 2020).

### Key Variables

#### Demographic Characteristics

We measured six demographic characteristics of our respondents: age (number of years), gender (Male, Female), education level (No College Degree, College Degree, Graduate Degree), residency (Urban, Suburban, Rural), ethnicity (Not Hispanic/Latinx, Hispanic/Latinx), and race. Given their relatively small proportions in our sample, we consolidated American Indian/Alaska Native, Asian, Black/African American, and Native Hawaiian/other Pacific Islander identities into a single category, thereby measuring race with a binary variable (White, non-White).

After assessing the demographic representativeness of our sample compared to the Missouri population (United States Census Bureau 2017), we weighted our sample for gender and age (see Results) and filtered out the 173 respondents who did not indicate these characteristics. All subsequent analyses were performed on this weighted and filtered dataset. Additionally, given that previous studies have shown that some demographic characteristics have a small but significant influence on wetland perceptions (Kaplowitz and Kerr 2003; Wilkins et al. 2019) and conservation behaviors (Cooper et al. 2015; Wilkins et al. 2019; Schroeder et al. 2020), we included all six of the above demographic variables as predictors in our logistic regression analyses (see Analysis, RQ2).

#### Conservation Involvement in Wetlands

We provided survey participants with the following definition of wetlands, based loosely on the Ramsar Convention's definition (Finlayson 2018), but kept deliberately informal to maximize comprehensibility: "Wetlands include marshes, swamps, fens, wet prairies, and some bottomland forests. They also include the shallow edges of streams, rivers, lakes, and ponds. These habitats are dynamic and can be wet for only part of the year, while others can be wet year round." We measured respondents' involvement in wetland conservation in the last 12 months through a total of eight items. On a five-point Likert scale from Never to Very Often, respondents indicated their frequency of involvement in six wetland conservation behaviors: working on land or improvement projects, attending meetings, volunteering personal time and effort, contacting elected officials or government agencies, voting for candidates or ballot issues, and advocating for political action. On a 4-point scale from Not Involved to Very Involved, respondents also indicated their degree of involvement in the last 12 months (regardless of membership) with organizations that support wetland conservation. Finally, respondents indicated how much money they had personally donated to wetland and/or waterfowl conservation in the last 12 months, with five options including $0, $1-25, $26-50, $51-250, and $251+. These eight conservation involvement items were based on similar items piloted by the Missouri Department of Conservation in a 2010 survey of Missouri waterfowl hunters, and they incorporated insights from later surveys of New York residents (Cooper

et al. 2015; Larson et al. 2015) and the United States population (Wilkins and Miller 2018). They were designed to encompass the following types of involvement in wetland conservation: human (land improvement, volunteering), social (meetings, organizations), political (contacting government, voting, advocating), and financial (donating).

Following similar methodology by Cooper et al. (2015), we recoded these items into eight binary variables of wetland conservation involvement, for which the reference value (0) represented Never/Not involved/$0 donated, and the other value (1) included any higher level of involvement. Using these binary variables, we determined the proportion of respondents who engaged in each type of wetland conservation behavior in the last 12 months. We also determined the extent to which respondents were involved in multiple conservation behaviors simultaneously. Among respondents who were involved in each conservation behavior, we calculated the proportion who were also involved in each of the other conservation behaviors, producing a matrix of multi-behavior involvement rates.

Finally, because involvement rates were relatively low for each individual behavior, we consolidated our eight binary variables into a single binary summary variable that indicated whether respondents were involved in at least one wetland conservation behavior in the past year. This became the response variable in our logistic regression analyses (see Analysis, RQ2).

### Connection to Wetlands

To measure respondents' degree of connection to wetlands, we developed a scale that included items to measure affective, cognitive, and behavioral dimensions of connection. Other researchers have focused on one or more of these dimensions to measure various types of connection to nature, including place attachment (Nisbet et al. 2009; Ives et al. 2017; Larson et al. 2018; Whitburn et al. 2020). Rather than including multiple items to capture each of these dimensions comprehensively, we used one or two items for each due to space constraints and the expectation that together they would provide a single measure of connection to wetlands. Additionally, given that some aspects of wetlands can be perceived negatively by members of the public (e.g., they are unattractive and contain mosquitoes; Nassauer 2004; Polajnar 2008; Carter 2015; Scholte et al. 2016), we included items to measure respondents' aversion to wetlands.

Respondents indicated their level of agreement with nine statements using a five-point Likert scale. Two of these statements assessed affective connection (personal and spiritual connections to wetlands), one measured cognitive connection (enjoyment of learning about wetlands), two measured behavioral connection (preference of visiting wetlands and importance of sustaining wetlands), and four measured aversion (unattractiveness of wetlands, concern about waterfowl/mosquitoes as disease vectors, threats from other visitors to wetlands; these items were reverse coded). We used Principal Axis Factoring (PAF) without rotation to assess the internal consistency of these items. After extracting factors based on eigenvalues (>1) and scree plot analysis, we used Cronbach's alpha (α) to further analyze the internal consistency of the factors, removing those for which $\alpha < 0.700$. This resulted in the removal of three of the four items associated with aversion to wetlands. We calculated the factor loadings of the remaining six items using unrotated PAF once again (rotation was ultimately not necessary because only one factor contained items with sufficient internal consistency). Finally, we created a five-point mean scale (1-5) from these items to measure respondents' degree of connection to wetlands.

### Awareness of Wetland Ecological Benefits

To measure awareness of wetland ecosystem services, we asked respondents to indicate whether they were Unaware, Somewhat Aware, or Very Aware of eight wetland ecosystem services, worded as "benefits wetlands can potentially provide". We focused specifically on the ecological benefits of wetlands, which included regulating, provisioning, and supporting ecosystem services (Millennium Ecosystem Assessment 2005). Given the potentially low threshold for a respondent to be Somewhat Aware of a wetland benefit, and the suggestion by Richards et al. (2017) that a mere surface understanding of ecosystem services may not affect habitat management preferences, we later recoded our items into binary variables that consolidated Unaware and Somewhat Aware into a single category. We then created a summative scale (0-8) to count the number of these services of which respondents were Very Aware; for easier comparison, we recalculated this scale to fit the same 1-5 scale as our connection scale.

### Wildlife Recreation Participation in Wetlands

Similar to Wilkins and Miller (2018), we asked respondents to indicate whether or not they had participated in four forms of wildlife recreation in wetlands in the last 12 months: wildlife viewing (defined as watching or photographing wildlife), fishing, waterfowl hunting, and other forms of hunting. Responses were binary, as we did not ask about frequency or intensity of participation.

## Statistical Analysis

Research Question 1: How is wildlife recreation participation in wetlands related to connection to wetlands and awareness of wetland ecological benefits?

We developed two multiple linear regression models to investigate how participation in wildlife recreation in wetlands predicts connection to wetlands and awareness of wetland ecological benefits. Predictors consisted of dummy variables for participation in wildlife viewing, fishing, waterfowl hunting, and other types of hunting. These models helped to set up our logistic regression models (see below) by providing insight into how the inclusion of recreation variables might affect the strength of other predictors. We used partial regression plots, tolerance values, and P-P plots to verify that our data met assumptions of linearity, multicollinearity, and normality respectively.

Research Question 2: How are awareness of wetland ecological benefits, connection to wetlands, and wildlife recreation participation in wetlands related to involvement in wetland conservation?

We developed five logistic regression models to investigate predictors of involvement in wetland conservation. Following similar methodology by Wilkins et al. (2019) in their analysis of concern for wetland ecosystem services, we developed a separate model for each of the following sets of predictors: demographic characteristics, connection to wetlands, awareness of wetland ecological benefits, and wildlife recreation participation in wetlands. Then, we developed a combined model with all predictors included, in order to account for the relationships among predictors themselves. We used tolerance values to verify that our data met assumptions of multicollinearity, and a Box-Tidwell procedure (Box and Tidwell 1962) to verify that each predictor was linearly related to logit(y). We found that the variable for awareness of ecological benefits violated this assumption of linearity. However, given that our goal was to examine drivers of conservation involvement and not to find the best-fitting model(s), we elected not to transform this predictor. This decision also ensured that the predictors in our models remained comparable.

## Results

### Descriptive Results

#### Demographic Characteristics

Our survey received 4076 responses with 3411 surveys returned as undeliverable, giving us a response rate of 24.6%. Before weighting, our respondents were 64.5% male, 71.9% above the age of 55, 1.9% Hispanic/Latinx, and 9.4% non-White (Table 1). Additionally, a majority of our respondents had at least a college degree, and a quarter lived in a rural area. To ensure our sample was representative, we weighted our sample for gender and age so that 48.4% of our respondents were male and 38.8% were at least 55 years old, equal to their proportions in the Missouri adult population in 2017 (United States Census Bureau 2017). We elected to divide our sample into two age brackets (< 54 years, 55 + years) for weighting because this ensured that the resulting four age/gender weight groups all contained enough respondents to ensure no more than 5% sampling error (see Vaske 2019). Although the distribution of education levels in our sample also differed from that of the Missouri population (Table 1), we did not weight for education because the US Census limits its education figures to individuals over the age of 25.

Compared to the Missouri population in 2017 (United States Census Bureau 2017), a significantly higher proportion of our weighted sample had at least a college degree (57.6% vs. 36.9%) and did not identify as Black, Indigenous, and/or people of color (97.9% vs. 95.8% non-Hispanic/Latinx, 90.3% vs. 82.0% White; Table 2). Although the age distribution between our weighted sample and the Missouri population was significantly different when measuring decadal age brackets, the proportions of respondents < 55 and 55+ were identical.

#### Conservation Involvement in Wetlands

Involvement in wetland conservation was uncommon among our respondents. In the 12 months before taking the survey, no more than 10% of respondents were involved in each of the wetland conservation behaviors we measured; being involved in a wetland conservation organization had the highest rate of involvement at 9.7% (Table 2). Overall, 18.8% of respondents had participated in at least one wetland conservation behavior. Of the six conservation behaviors for which frequency of involvement was measured, voting for candidates or issues to support wetland conservation had the highest mean frequency (2.39 on a scale of 1-5; Tables 2 and 3).

We observed a high degree of overlap among wetland conservation behaviors (Table 2); indeed, 52.7% of respondents who were involved in conservation participated in more than one behavior in the past year. In particular, among respondents who had worked on land projects, attended meetings, volunteered, contacted government officials, or advocated for wetland conservation causes, a majority had also participated in each of the other listed conservation behaviors except for donation. For example, of the 4.2% of respondents who had contacted government officials in the last year, 94.4% had voted to support wetland conservation. Despite higher rates of involvement in organizations and donation to wetland conservation causes, these were the two activities with the lowest degree of overlap with other conservation behaviors.

**Table 1** Demographic composition of our sample, with and without weighting for gender and age[a], compared to that of the Missouri population (United States Census Bureau 2017)

| Demographic | | Unweighted[b] | Weighted[c] | Missouri Pop | $\chi^2$ (Weighted)[d] |
|---|---|---|---|---|---|
| Gender | Male | 64.5% | 48.4% | 48.4% | 0.0 |
| | Female | 35.5% | 51.6% | 51.6% | |
| Education | No Degree | 49.6% | 42.3% | 63.1% | 768.2*** |
| | College Degree | 30.6% | 36.0% | 25.8% | |
| | Grad Degree | 19.8% | 21.6% | 11.1% | |
| Community Size[e] | Urban | 42.4% | 45.7% | n/a | n/a |
| | Suburban | 32.9% | 33.8% | n/a | |
| | Rural | 24.7% | 20.4% | n/a | |
| Ethnicity[f] | Not Hisp | 98.1% | 97.9% | 95.8% | 40.0*** |
| | Hisp/Lat | 1.9% | 2.1% | 4.2% | |
| Race[f] | White | 90.6% | 90.3% | 82.0% | 179.8*** |
| | Non-White | 9.4% | 9.7% | 18.0% | |
| Age | 18-24 | 0.5% | 1.1% | 12.2% | 857.8*** |
| | 25-34 | 5.6% | 12.9% | 17.2% | |
| | 35-44 | 9.8% | 21.5% | 15.4% | |
| | 45-54 | 12.2% | 25.7% | 16.4% | |
| | 55-64 | 23.2% | 12.3% | 17.4% | |
| | 65-74 | 26.5% | 14.1% | 12.4% | |
| | 75-84 | 15.4% | 8.4% | 6.4% | |
| | 85+ | 6.8% | 4.0% | 2.6% | |

Chi-squared goodness-of-fit test statistics show where significant differences exist between our weighted sample and the Missouri population

[a] Weights: Male <55 = 1.7808; Female <55 = 2.8097; Male 55+ = 0.3754; Female 55+ = 0.8582

[b] Unweighted sample sizes: $n_{gender} = 3972$, $n_{education} = 3708$, $n_{community} = 3919$, $n_{ethnicity} = 3840$, $n_{race} = 3922$, $n_{age} = 3919$

[c] Weighted sample sizes: $n_{gender} = 3903$, $n_{education} = 3692$, $n_{community} = 3848$, $n_{ethnicity} = 3802$, $n_{race} = 3843$, $n_{age} = 3903$

[d] * $p < .05$; ** $p < .01$; *** $p < .001$

[e] Urban population = 50,000 +; suburban population = 2500-50,000; rural population = < 2500. The 2017 American Community Survey did not include measures of community size equivalent to those in our survey

[f] Missouri population race/ethnicity proportions reflect all ages, whereas our survey only includes adults.

**Table 2** Proportion and number of Missouri residents (total n = 3903) who participated in each wetland conservation behavior (see Overall column), and proportion of overlap of involvement in different wetland conservation behaviors (row percentages are displayed)

| Behavior | Overall % (n) | Worked on land projects | Attended meetings | Volunteered | Contacted government | Voted | Advocated | Involved in organizations | Donated |
|---|---|---|---|---|---|---|---|---|---|
| Worked on land projects | 5.38% (209) | 100.00% | 65.05% | 80.13% | 53.69% | 82.05% | 72.48% | 60.29% | 42.51% |
| Attended meetings | 4.37% (169) | 80.23% | 100.00% | 85.81% | 65.80% | 88.76% | 83.30% | 68.82% | 45.84% |
| Volunteered | 5.26% (204) | 81.99% | 71.19% | 100.00% | 57.51% | 86.70% | 77.45% | 65.87% | 43.92% |
| Contacted government | 4.22% (164) | 68.51% | 68.08% | 71.71% | 100.00% | 94.42% | 88.22% | 64.33% | 45.57% |
| Voted | 7.92% (307) | 55.78% | 48.93% | 57.60% | 50.30% | 100.00% | 75.68% | 49.28% | 36.48% |
| Advocated | 6.36% (247) | 61.36% | 57.18% | 64.08% | 58.53% | 94.24% | 100.00% | 56.16% | 43.07% |
| Involved in organizations | 9.72% (377) | 33.41% | 30.92% | 35.67% | 27.94% | 40.17% | 36.76% | 100.00% | 44.26% |
| Donated | 8.45% (328) | 27.08% | 23.67% | 27.34% | 22.75% | 34.18% | 32.41% | 50.87% | 100.00% |

**Table 3** Descriptive statistics, Principal Axis Factoring component loadings, and reliability scores for variables in this study[a]

| Factor/Item | Scale | n | M (SD) | λ[b] | α[c] |
|---|---|---|---|---|---|
| *Conservation Involvement in Wetlands (last year)*[d] | 0, 1 | 3879 | 0.19 (0.391) | n/a | n/a |
| Worked on land or improvement projects related to wetland conservation | 1-5 | 3879 | 1.10 (0.487) | | |
| Attended meetings about wetland conservation | 1-5 | 3879 | 1.07 (0.370) | | |
| Volunteered my personal time and effort to conserve wetlands | 1-5 | 3879 | 1.10 (0.488) | | |
| Contacted elected officials or government agencies about wetland conservation | 1-5 | 3879 | 1.08 (0.419) | | |
| Voted for candidates or ballot issues to support wetland conservation | 1-5 | 3879 | 1.21 (0.773) | | |
| Advocated for political action to conserve wetlands | 1-5 | 3879 | 1.14 (0.612) | | |
| Please indicate your involvement with organizations that support wetland conservation in the last 12 months, even if you were not a member. (Not Involved - Very Involved) | 1-4 | 3813 | 1.14 (0.463) | | |
| Please indicate how much money you personally donated to the following causes in the last 12 months. ($0, 1-25, 26-50, 51-250, 251+) | 1-5 | 3796 | 1.15 (0.560) | | |
| *Connection to Wetlands*[e] | 1-5 | 3837 | 3.49 (0.801) | | 0.871 |
| I feel a personal connection to wetlands. | 1-5 | 3825 | 3.23 (1.071) | 0.828 | |
| I find wetlands are unattractive or otherwise unpleasant. | 1-5 | 3814 | 3.95 (1.008) | 0.507 | |
| I gain a sense of spiritual renewal when visiting wetlands. | 1-5 | 3810 | 3.24 (1.056) | 0.784 | |
| Wetlands are among my favorite places to visit. | 1-5 | 3811 | 3.10 (1.045) | 0.804 | |
| I enjoy learning about wetlands. | 1-5 | 3809 | 3.61 (0.992) | 0.747 | |
| It's important for me to help sustain wetlands. | 1-5 | 3813 | 3.79 (0.990) | 0.703 | |
| *Awareness of Ecological Benefits of Wetlands*[f] | 1-5 | 3790 | 2.34 (1.402) | n/a | n/a |
| Provide fish & wildlife habitat | 1-3 | 3776 | 2.45 (0.670) | | |
| Reduce flood damage | 1-3 | 3768 | 2.08 (0.742) | | |
| Improve water quality | 1-3 | 3744 | 1.99 (0.776) | | |
| Produce income for farmers | 1-3 | 3755 | 1.78 (0.747) | | |
| Sustain water supplies | 1-3 | 3745 | 2.02 (0.736) | | |
| Support biodiversity | 1-3 | 3748 | 2.13 (0.792) | | |
| Help the climate | 1-3 | 3757 | 2.06 (0.746) | | |
| Improve river/stream health | 1-3 | 3755 | 2.16 (0.732) | | |
| *Wildlife Recreation Participation in Wetlands (last year)*[g] | None | | | n/a | n/a |
| Watch/photograph wildlife, including birds/waterfowl | 0, 1 | 3857 | 0.36 (0.480) | | |
| Fish, including bowfishing | 0, 1 | 3857 | 0.32 (0.465) | | |
| Hunt waterfowl | 0, 1 | 3857 | 0.06 (0.232) | | |
| Hunt or trap species other than waterfowl | 0, 1 | 3857 | 0.09 (0.282) | | |

[a] All analyses in this study were weighted for gender and age to account for oversampling of male and older Missouri residents

[b] λ = Component loading from unrotated Principal Axis Factoring, used to develop a mean scale for Personal Connection to Wetlands

[c] α = Cronbach's alpha

[d] Unless otherwise indicated, component items rated on scale from Never (1) to Very Often (5). For each conservation behavior, the lowest value response (1) indicated non-involvement. Respondents with any higher value responses (>1) were considered involved in conservation. A binary summary variable was created, for which the mean represents the proportion of respondents who were involved in at least one wetland conservation behavior in the past 12 months

[e] Component items rated on scale from Strongly Disagree (1) to Strongly Agree (5). Based on PAF and reliability scores, 3 survey items were removed from this analysis: "I'm concerned that waterfowl using wetlands may spread bird flu," "I find wetlands threatening due to the dangers posed by other people who may be there," and "I'm concerned about the spread of disease from mosquitoes found in wetlands.". Summary variable represents a mean scale

[f] Component items rated on scale from Unaware (1) to Very Aware (3). No survey items were removed from this analysis. Summary variable represents the number of wetland benefits (0-8) of which respondents were Very Aware (3), recalculated to fit a 1-5 scale for consistency with other scales.

[g] Items are dummy variables; means thus represent proportions of respondents who participated in each recreation activity in the past 12 months.

### Connection to Wetlands and Awareness of Wetland Ecological Benefits

Based on Principal Axis Factoring without rotation, we extracted 2 factors related to respondents' connection to wetlands. The second of these factors contained 3 items that did not have sufficient internal consistency ($\alpha < 0.700$) and were hence removed. Six items remained from which we created a mean scale for connection. On this 1-5 scale, respondents' average degree of connection to wetlands was moderately high (3.49; Table 3). Also on a 1-5 scale, respondents' average level of awareness of wetland ecological benefits was 2.34 (Table 3).

### Wildlife Recreation Participation in Wetlands

Compared to recent estimates of Missourians' participation in wildlife recreation (Rockville Institute 2020), our sample (Table 3) had similar rates of wildlife viewing (36.1% vs. 34%) and hunting (5.7% waterfowl hunting and 8.7% other hunting vs. 8% any type of hunting), and higher rates of angling (31.7% vs. 18%). We note that our survey measured wildlife recreation participation specifically in wetlands; previous measures of participation were not limited in this way, which precluded statistical comparison. Nevertheless, our sample appeared to be fairly representative of the Missouri public in terms of wildlife recreation participation.

## Statistical Analysis

Research Question 1: How is wildlife recreation participation in wetlands related to connection to wetlands and awareness of wetland ecological benefits?

On average, respondents who had participated in wildlife viewing or hunting waterfowl in wetlands in the last 12 months reported a higher degree of connection to wetlands and a higher awareness of wetland ecological benefits (Table 4). Participation in either of these activities was associated with a ~0.5 unit increase (unstandardized β, measured on a 1-5 scale) in both degree of connection and level of awareness. To a lesser extent, participation in fishing in wetlands was also associated with higher awareness of wetland ecological benefits. Hunting species other than waterfowl in wetlands did not significantly predict either connection or awareness.

Participation in wildlife recreation in wetlands explained more of the variability in respondents' connection to wetlands (adj $R^2 = 14.4\%$) than in awareness of wetland ecological benefits (adj $R^2 = 5.7\%$; Table 4). Thus, despite the fact that fishing was not a significant predictor of connection, this model for connection had greater fit than that for awareness. We further note that our model for awareness did not have a normal distribution of residuals. However, we determined that our sample size was large enough to proceed with analysis (Cohen et al. 2013), meaning both models met all assumptions of linearity, multicollinearity, and normality.

Research Question 2: How are awareness of wetland ecological benefits, connection to wetlands, and wildlife recreation participation in wetlands related to involvement in wetland conservation?

Significant predictors of wetland conservation involvement remained generally consistent across all models, although odds ratios declined somewhat in the combined model (Model 5; Table 5; Fig. 1). Among demographic characteristics, being female and living in a suburban area were associated with a significantly lower likelihood of conservation involvement compared to being male and living in an urban area. With all predictors included together (Model 5), living in a suburban area was no longer a significant predictor, while having a graduate degree became significant.

**Table 4** Multiple linear regression models predicting connection to wetlands[a] (n = 3800) and awareness of wetland ecological benefits[b] (n = 3756) reported by Missouri residents. Both response variables were measured on a 1-5 scale

| | Connection to wetlands | | | Awareness of wetland ecological benefits | | |
|---|---|---|---|---|---|---|
| Predictors | B | SE | Sig | B | SE | Sig |
| Wildlife viewing | 0.550 | 0.026 | <0.001 | 0.470 | 0.048 | <0.001 |
| Fishing | 0.027 | 0.028 | 0.347 | 0.206 | 0.053 | <0.001 |
| Hunting waterfowl | 0.532 | 0.056 | <0.001 | 0.596 | 0.103 | <0.001 |
| Hunting other | -0.049 | 0.047 | 0.301 | 0.125 | 0.087 | 0.152 |
| (Constant) | 3.253 | 0.016 | <0.001 | 2.061 | 0.030 | <0.001 |
| Adj $R^2$ | 0.144 | | | 0.057 | | |

[a] Regression equation: $Y_{Connection} = (Constant) + B_{Wildlife\ Viewing}X + B_{Fishing}X + B_{Hunting\ Waterfowl}X + B_{Hunting\ Other}X + e$

[b] Regression equation: $Y_{Awareness} = (Constant) + B_{Wildlife\ Viewing}X + B_{Fishing}X + B_{Hunting\ Waterfowl}X + B_{Hunting\ Other}X + e$

Connection to wetlands and awareness of wetland ecological benefits were significant predictors in both separate (Model 2 and 3) and combined models (Model 5). Of these two predictors, connection to wetlands was considerably stronger. In Model 2, a 1 unit increase in connection (1-5 scale) was associated with more than 3 times greater odds of being involved in wetland conservation. By comparison, a 1 unit increase in awareness (Model 3; 1-5 scale) was associated with only 1.7 times greater odds of conservation involvement. Our model for connection to wetlands (Model 2) also had a higher Nagelkerke $R^2$ value and higher sensitivity than those for awareness of ecological benefits (Model 3), participation in wildlife recreation (Model 4), and demographic characteristics (Model 1). Model 3 had especially poor fit as demonstrated by its significant Hosmer Lemeshow test.

Wildlife viewers and waterfowl hunters were significantly more likely than those who did not participate in those activities to have engaged in wetland conservation. In our wildlife recreation model (Model 4), waterfowl hunting in wetlands was associated with a 4.6 times higher odds of engaging in wetland conservation; for wildlife viewing in wetlands, the odds was 3.1 times higher. Hunting non-waterfowl species was also a significant predictor of conservation involvement. Fishing was not a significant predictor in either type of model.

## Discussion

Our results provide a unique empirical perspective on three drivers of conservation involvement in wetlands: awareness of wetland ecological benefits, connection to wetlands, and wildlife recreation participation in wetlands. As hypothesized, we found that participation in wildlife recreation in wetlands was associated with greater awareness of wetland ecological benefits and a stronger sense of connection to wetlands. In turn, all three of these variables predicted a higher likelihood of engaging in wetland conservation behaviors, with connection and waterfowl hunting emerging as especially strong predictors. Although our results are only representative of Missouri adults, they offer insights that wetland managers around the world might consider as they seek to mitigate the threats facing wetland ecosystems.

Generally, our respondents' low rates of engagement in conservation behaviors underline the importance of promoting public involvement in wetland conservation behaviors. Less than one-fifth of our respondents were involved in any form of wetland conservation in the past year, and no single conservation behavior exceeded a 10% involvement rate. These figures, while specific to Missouri, are far lower than might be expected based on previous measures of wetland conservation in the United States (Wilkins and Miller 2018). But despite low involvement overall, many of our respondents who did engage in conservation did so through multiple avenues. For example, although respondents who had attended meetings or contacted government officials about wetland conservation were rare (<5% of our sample), a majority of them had also engaged in other wetland conservation behaviors under study. It is possible that individuals with the time and initiative to attend meetings and contact officials are both more aware of and more invested in wetland conservation opportunities. Yet contrary to this logic, involvement in a wetland conservation organization did not translate into widespread engagement in other conservation behaviors. Our results thus raise questions of how and why individuals become involved, or are constrained from becoming involved, in multiple conservation behaviors.

Consistent with our first hypothesis, wildlife recreation participation in wetlands was positively related to awareness of wetland ecological benefits and connection to wetlands. These findings support previous literature that has suggested associations between outdoor recreation and knowledge of environmental issues (Dunlap and Heffernan 1975), connection to nature in the abstract (Kellert et al. 2017; Szczytko et al. 2020), and place attachment (Larson et al. 2018). Consistent with our second hypothesis, we found that awareness, connection, and wildlife recreation were all associated with higher levels of wetland conservation involvement; indeed, even when controlling for the effects of other drivers, all of these variables were significant predictors. Thus, our study aligns with previous research that has shown that connection to nature in the abstract (Kals et al. 1999; Mayer and Frantz 2004; Nisbet et al. 2009; Whitburn et al. 2020), place attachment (Vaske and Kobrin 2001; Stedman 2002; Lee 2011; Mullendore et al. 2015; Larson et al. 2018), and outdoor recreation (Dunlap and Heffernan 1975; Theodori et al. 1998; Teisl and O'Brien 2003; Lee 2011; Cooper et al. 2015; Larson et al. 2018; Shipley et al. 2018; Wilkins et al. 2019; Schroeder et al. 2020) are all positively related to pro-environmental behaviors (PEBs). Our findings also complement those of Polajnar (2008) and Scholte et al. (2016), who suggested that wetland ecosystem service awareness leads to more public support for wetland conservation. Compared to the other predictors in our models, demographic differences were only weakly related to conservation involvement, which was also consistent with the literature (Cooper et al. 2015; Wilkins et al. 2019; Schroeder et al. 2020).

Although the results of our analyses largely support previous research, two aspects of our findings have received considerably less attention in the context of wetland conservation. First, some forms of wildlife recreation in wetlands (waterfowl hunting and wildlife viewing) were more strongly associated with wetland conservation involvement

**Table 5** Binary logistic regression models predicting the likelihood that Missouri residents were involved in any wetland conservation behavior in the past year

| | Model 1: Demographics[a] | | | Model 2: Connection to Wetlands[b] | | | Model 3: Awareness of Wetland Ecological Benefits[c] | | | Model 4: Wildlife Recreation in Wetlands[d] | | | Model 5: Combined[e] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predictors | Wald(sig) | SE | OR | Wald(sig) | SE | OR | Wald(sig) | SE | OR | Wald(sig) | SE | OR | Wald(sig) | SE | OR |
| Age (years) | 0.084 | 0.003 | 0.999 | | | | | | | | | | 9.180** | 0.003 | 1.010 |
| Gender: Female | 35.442*** | 0.088 | 0.592 | | | | | | | | | | 3.011** | 0.106 | 0.832 |
| Education (ref = No Degree) | 2.975 | | | | | | | | | | | | 4.183 | | |
| College Degree | 0.957 | 0.104 | 1.107 | | | | | | | | | | 0.489 | 0.119 | 1.087 |
| Graduate Degree | 2.933 | 0.119 | 1.225 | | | | | | | | | | 4.100* | 0.136 | 1.318 |
| Community Size (ref = Urban) | 9.985** | | | | | | | | | | | | 5.084 | | |
| Suburban | 4.319* | 0.103 | 0.808 | | | | | | | | | | 3.570 | 0.118 | 0.801 |
| Rural | 1.989 | 0.117 | 1.179 | | | | | | | | | | 0.186 | 0.137 | 1.061 |
| Ethnicity: Hispanic/Latinx | 1.014 | 0.363 | 0.694 | | | | | | | | | | 0.061 | 0.391 | 0.908 |
| Race: Non-White | 0.108 | 0.152 | 1.051 | | | | | | | | | | 0.711 | 0.173 | 1.157 |
| Connection to Wetlands | | | | 387.438*** | 0.064 | 3.541 | | | | | | | 111.169*** | 0.078 | 2.288 |
| Awareness of Ecological Benefits | | | | | | | 318.873*** | 0.030 | 1.700 | | | | 70.339*** | 0.037 | 1.361 |
| Wildlife Viewing | | | | | | | | | | 152.771*** | 0.091 | 3.072 | 43.833*** | 0.106 | 2.011 |
| Fishing | | | | | | | | | | 1.520 | 0.099 | 1.129 | 1.633 | 0.114 | 1.157 |
| Hunting Waterfowl | | | | | | | | | | 90.722*** | 0.161 | 4.627 | 31.235*** | 0.188 | 2.855 |
| Hunting Other | | | | | | | | | | 11.189** | 0.144 | 1.618 | 13.929*** | 0.170 | 1.883 |
| (Constant) | 44.132*** | 0.182 | 0.299 | 586.307*** | 0.254 | 0.002 | 849.198*** | 0.098 | 0.058 | 1000.30*** | 0.069 | 0.112 | 291.301*** | 0.373 | 0.002 |
| n | 3413 | | | 3798 | | | 3757 | | | 3811 | | | 3281 | | |
| Nagelkerke $R^2$ | 0.023 | | | 0.187 | | | 0.137 | | | 0.150 | | | 0.301 | | |
| Sensitivity | 0.0% | | | 13.0% | | | 0.0% | | | 10.6% | | | 30.1% | | |
| Specificity | 100.0% | | | 97.0% | | | 100.0% | | | 98.4% | | | 95.4% | | |
| Hosmer Lemeshow $\chi^2$ (df) | 13.83(8) | | | 10.56(8) | | | 24.54(6)*** | | | 3.65(4) | | | 14.92(8) | | |

* p < .05; ** p < .01; *** p < .001

[a] Logistic regression equation: $\text{logit}(Y_{\text{Conservation involvement}}) = (\text{Constant}) + B_{\text{Age}}X + B_{\text{Female}}X + B_{\text{College degree}}X + B_{\text{Graduate degree}}X + B_{\text{Suburban}}X + B_{\text{Rural}}X + B_{\text{Hispanic/Latinx}}X + B_{\text{Non-White}}X + e$

[b] Logistic regression equation: $\text{logit}(Y_{\text{Conservation involvement}}) = (\text{Constant}) + B_{\text{Connection}}X + e$

[c] Logistic regression equation: $\text{logit}(Y_{\text{Conservation involvement}}) = (\text{Constant}) + B_{\text{Awareness}}X + e$

[d] Logistic regression equation: $\text{logit}(Y_{\text{Conservation involvement}}) = (\text{Constant}) + B_{\text{Wildlife Viewing}}X + B_{\text{Fishing}}X + B_{\text{Hunting Waterfowl}}X + B_{\text{Hunting Other}}X + e$

[e] Logistic regression equation: $\text{logit}(Y_{\text{Conservation involvement}}) = (\text{Constant}) + B_{\text{Age}}X + B_{\text{Female}}X + B_{\text{College degree}}X + B_{\text{Graduate degree}}X + B_{\text{Suburban}}X + B_{\text{Rural}}X + B_{\text{Hispanic/Latinx}}X + B_{\text{Non-White}}X + B_{\text{Connection}}X + B_{\text{Awareness}}X + B_{\text{Wildlife Viewing}}X + B_{\text{Fishing}}X + B_{\text{Hunting Waterfowl}}X + B_{\text{Hunting Other}}X + e$

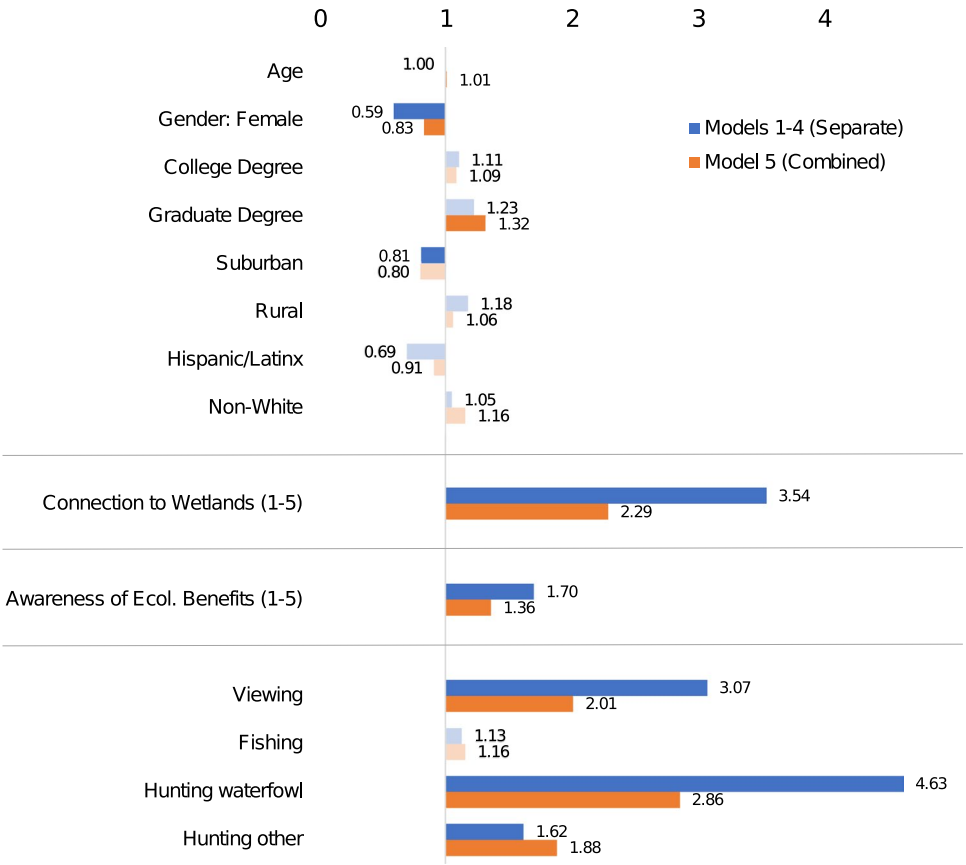


**Fig. 1** Odds ratios of significant predictors of wetland conservation involvement in Missouri, based on the logistic regression models presented in Table 5. Models 1-4 (separate models for demographic, connection, awareness, and recreation predictors) are shown in blue; Model 5 (combined model with all predictors included) is shown in orange

than others (other types of hunting and fishing). Some studies have suggested that participation in "appreciative" or "nonconsumptive" recreation activities (i.e., wildlife viewing) is more strongly associated with environmental concern and PEB than "consumptive" activities (i.e., hunting and fishing; Dunlap and Heffernan 1975; Tarrant and Green 1999). Yet we found no consistent difference in conservation involvement between these two classifications of recreationists, a result more in line with those of Teisl and O'Brien (2003), Cooper et al. (2015), and Wilkins and Miller (2018). Specifically, "nonconsumptive" wildlife viewers in our sample were more likely than "consumptive" non-waterfowl hunters to be involved in wetland conservation.

One possible explanation for this finding is that the importance of wetland ecosystems to a particular recreation activity plays a bigger role than the (non)consumptive nature of that activity in determining a recreationist's connection to, awareness of the ecological benefits of, and likelihood of being involved in conserving wetlands. For example, compared to other types of hunters, waterfowl hunters may have a greater proclivity for wetland conservation because their recreation activities are deeply tied to wetland habitat. As a result, waterfowl hunters may feel a sense of connection not only to the wetlands in which they hunt (i.e., place attachment; see Kudryavtsev et al. 2012), but to wetlands outside of their local areas on which waterfowl populations also depend. Our results therefore support calls for promoting greater recruitment and retention of waterfowl hunters to assist conservation efforts (Vrtiska et al. 2013; NAWMP 2018). Moreover, we suggest that promoting other wetland-based wildlife recreation activities (e.g., waterfowl viewing), and communicating the importance of wetlands to associated recreation experiences, may be an effective means of nurturing stronger connections, greater ecological awareness, and increased contributions to wetland conservation in a broader segment of the public.

The second notable finding from our analysis was that individuals' connection to wetlands predicted wetland conservation involvement more strongly than awareness of wetland ecological benefits. To borrow the language of the North American Waterfowl Management Plan (NAWMP 2012, 2018), our results suggest that individuals' emotional ties (i.e., connections) to wetlands are more predictive of wetland conservation behaviors than their pragmatic ties to wetlands (i.e., awareness of ecological benefits). Thus, we join other scholars in recognizing that an increase in environmental awareness is not sufficient to promote conservation involvement (Hungerford and Volk 1990; Kellert 2012); people's behaviors are influenced by

more complex and subjective factors (Kollmuss and Agyeman 2002; Ardoin et al. 2013).

Initiatives that encourage stronger connection to wetlands may be crucial to expanding public engagement in conservation behaviors. Our results, previous literature (Kellert et al. 2017; Larson et al. 2018; Szczytko et al. 2020), and wildlife managers (NAWMP 2018) point to recreation as a clear way to develop deeper individual connections with wetlands, and thereby promote wetland conservation. However, we emphasize that in our analyses, connection to wetlands and wildlife recreation participation in wetlands had independent effects on conservation involvement. Thus, pursuing other experiential strategies (see Ives et al. 2018) to connect people, including non-wildlife recreationists, to wetlands may also lead to greater involvement in conservation. Compared to these connection-oriented approaches, conservation initiatives that emphasize awareness of ecological benefits, including educational programs, may have a positive but lesser effect. Our results do not negate the utility of such strategies. However, given the relative importance of connection in driving wetland conservation, we caution against a singular focus on ecosystem services in pro-conservation communication strategies (Bekessy et al. 2018).

### Limitations and Future Research

This study explores some key drivers of conservation behaviors, but our understanding of public involvement in wetland conservation remains far from comprehensive. We propose that future studies could refine the variables we considered to provide additional insights to wetland managers. For example, measuring a wider range of conservation behaviors and wildlife recreation activities – as well as measuring their frequency and intensity – could yield a more nuanced analysis than was possible with our binary measures. Similarly, our scale for connection to wetlands could be adapted to more closely resemble existing scales for place attachment and place meaning (e.g., Stedman 2002; Kudryavtsev et al. 2012; Larson et al. 2018), as well as for connection to nature (e.g., Kals et al. 1999; Mayer and Frantz 2004; Nisbet et al. 2009), which would allow future studies of wetland conservation to build more directly off this established body of literature. However, this is not to diminish the value of measuring connection to an ecosystem or landscape, as we did with wetlands. Such an approach is currently rare in the literature, and we suggest that future research in this area could help bridge the existing concepts of place attachment and connection to nature in the abstract (see Ives et al. 2017). Finally, we did not distinguish between different types of wetlands in our analysis, although by our own survey's definition, wetlands include a vast diversity of natural areas. Following other case study approaches in wetlands (e.g., Polajnar 2008; Scholte et al. 2016; Rojas et al. 2017), future research could address this limitation by exploring how public perceptions drive conservation behaviors in specific wetlands, rather than wetlands more generally across an entire state or country.

## Conclusions

Public involvement in conservation provides a grassroots foundation for sustaining wetland ecosystems. Our study builds off the small body of literature that has previously examined individual conservation behaviors in wetlands (Lee 2011; Ho et al. 2014; Wilkins et al. 2019; Schroeder et al. 2020) by analyzing several potential drivers of involvement in these behaviors, including wildlife recreation participation, awareness of wetland ecological benefits, and connection to wetlands. All of these variables had significant associations with conservation involvement. In particular, wildlife viewers and waterfowl hunters were more likely to be involved in wetland conservation. We also underscore the importance of connection to wetlands, relative to awareness of ecological benefits, in predicting conservation involvement. These results could help guide agencies and organizations in deciding how to prioritize limited resources for wetland conservation. Specifically, they provide support for public engagement strategies that, beyond simply educating people about the importance of wetlands, encourage the development of connections to wetlands through wildlife recreation and other experiences.

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**Authors' Contributions** JR analyzed data, created the tables and figures, and wrote the original draft manuscript for this study. AD supervised the project. AR designed the survey and collected data. Both JR and AR curated data before analysis. Both AR and AD acquired funding. All authors contributed to study conceptualization, methodology, and editing of the manuscript.

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**Data Availability** The dataset used for this study is available from Andrew Raedeke (andrew.raedeke@mdc.mo.gov) on reasonable request.

**Code Availability** The SPSS code used for this analysis is available from the corresponding author on reasonable request.

## Declarations

**Conflict of Interest** The authors have no conflicts of interest to declare.

**Ethics Approval** Ethics approval for data analysis of our survey was waived by the Virginia Tech Institutional Review Board (protocol #20-068) because it was deemed not to be human subjects research.

**Consent to Participate** All respondents to the survey used for this study were adults who gave informed consent to participate in this research.

**Consent for Publication** All authors have read this manuscript and consent to its publication.

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