

**Supporting Wildlife Recreationists in Virginia:  
Survey report to inform the Virginia Department of Wildlife Resources' Wildlife Viewing  
Plan**

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DEPARTMENT OF  
**WILDLIFE RESOURCES**  
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## EXECUTIVE SUMMARY

### Introduction

In support of its mission to **conserve** and manage wildlife populations and habitat for the benefit of present and future generations; **connect** people to Virginia’s outdoors through boating, education, fishing, hunting, trapping, wildlife viewing, and other wildlife-related activities; and **protect** people and property by promoting safe outdoor experiences and managing human-wildlife conflicts (DWR, 2020), the Virginia Department of Wildlife Resources (DWR) has embarked on an “R3 initiative” to increase recruitment, retention, and reactivation of participants in hunting, fishing, recreational shooting, boating, and wildlife viewing. In an effort to improve engagement with Virginia’s wildlife recreationists, DWR commissioned social science research to better understand the activities, attitudes, and experiences of hunters, anglers, birders, and other wildlife viewers in the Commonwealth. Surveys and focus groups conducted as components of that study provided insights that can improve R3 planning for all four recreation groups. This report focuses on survey findings that will inform the development of a ten-year Wildlife Viewing Plan, the agency’s first comprehensive plan for engaging with and supporting Virginia recreationists who participate in wildlife viewing. While DWR’s relationships with hunters and anglers are long-standing, an analysis conducted by agency staff and stakeholders at an R3 workshop in August 2017 identified limited engagement between wildlife viewers and the agency as a threat to DWR’s ability to achieve its R3 objectives and overall mission (DWR, n.d.). The analyses in this report can help the agency make strategic and data-driven decisions about how to better support the recreation activities of this growing constituency, understand how they relate to those who identify as other recreation types, and engage viewers in supporting DWR’s conservation work. This report is organized by the four goals of the Wildlife Viewing Plan:

- **Goal 1:** Connect diverse segments of the public to wildlife and wildlife viewing in Virginia
- **Goal 2:** Provide a variety of wildlife viewing opportunities accessible to all in the Commonwealth
- **Goal 3:** Promote wildlife and habitat conservation through wildlife viewing
- **Goal 4:** Connect broader constituencies to the Virginia Department of Wildlife Resources through wildlife viewing

### Methods

We developed a survey for **two samples of wildlife recreationists in Virginia**. The first sample included recreationists with some level of involvement with DWR (hereafter, “**DWR-affiliated**”), including purchasers of Virginia hunting and fishing licenses, subscribers to wildlife updates from DWR’s “*Notes from the Field*” newsletter, and contributors to the DWR-sponsored 2nd Virginia Breeding Bird Atlas (VABBA2), a citizen science project. The survey was administered to this sample electronically, using Qualtrics (an online survey platform). The second sample was drawn from a random sample of Virginia household addresses (hereafter, “**Public**”). The survey for this sample was administered using a mixed-mode approach consisting of two mailings of a push-to-web postcard, which invited recipients to complete the survey online, and one mailing of a printed version of the survey.

The **survey questionnaire** was developed based on insights from focus groups conducted in an earlier phase of this study (Grooms et al. 2019), feedback from the Stakeholder and Technical Advisory Committees of the Wildlife Viewing Plan, and past research on the survey topics. The survey broadly explored the recreation, conservation, and agency experiences of four groups of wildlife recreationists - hunters, anglers, birders, and wildlife viewers. Definitions were provided for each recreation group, and respondents were asked to indicate the extent to which they identify as each kind of recreationist. Given that birders represent a substantial portion of the wildlife viewing community, we distinguished those whose viewing activities specifically focused on birds from other wildlife viewers. For both samples, the survey included questions focused on the following:

- Self-identification as a birder, wildlife viewer, hunter, and angler, based on provided definitions
- Duration, location, and focus of their recreation activities
- Participation in conservation behaviors
- Familiarity with DWR and perceptions of the agency's roles
- Engagement in and satisfaction with DWR programs and services
- Interest in supporting DWR and how DWR can better support their recreation activities
- Preferred modes for receiving communication from DWR
- Demographic characteristics

For this report, we conducted **survey analyses** to inform the development of objectives and strategies for the four goals of DWR's Wildlife Viewing Plan. For survey items related to Goals 1 and 2, we compared responses of all viewers (i.e., anyone who identified as a birder or wildlife viewer) between the DWR-affiliated and Public samples. For survey questions specific to individual recreation activities (e.g., frequency, duration, or location), analyses were conducted separately for respondents who identified as birders and respondents who identified as wildlife viewers. For survey items related to Goals 3 and 4, we developed a typology (i.e., categorization) of wildlife recreationists based on the strength of respondents' identification as birders, wildlife viewers, anglers, and hunters. The four resulting types of recreationists captured multiple recreation identities, for example, "Birder-viewers" and "Birder-viewer-hunter-anglers." We then compared responses among the four recreation types.

## Results

### *Respondent demographics*

We received a **total of 3626 completed surveys**; this includes 2610 responses from the DWR-affiliated sample (response rate = 20.4%) and 1016 responses from the Public sample (response rate = 7.7%). For both samples, the majority of respondents were male (DWR-affiliated: 80.2%; Public: 55.1%), above the age of 60 (DWR-affiliated: 54.4%; Public: 54.7%), White (DWR-affiliated: 97.1%; Public: 93.5%), and non-Hispanic/Latinx (DWR-affiliated: 99.1%; Public: 96.6%). The majority of respondents also had a Bachelor's degree or higher (DWR-affiliated: 62.1%; Public: 62.7%) and a total annual income of at least \$100,000 per year (DWR-affiliated: 35.9%; Public: 35.5%). Relatively few lived in urban areas (DWR-affiliated: 10.3%; Public: 16.4%).



### **Goal 1. Connect diverse segments of the public to wildlife and wildlife viewing in Virginia**

The objectives under Goal 1 of the Wildlife Viewing Plan focus on increasing participation in wildlife viewing by under-represented groups and youth and families; supporting wildlife viewers with little or no experience so they form enduring connections to wildlife and viewing; and connecting other outdoor recreation groups, such as paddlers and campers, to wildlife viewing. The following analyses provided insights into wildlife recreationists in Virginia, which groups are under-represented in wildlife viewing, and how the agency might support their activities.

**Virginia wildlife viewer characteristics.** The majority of respondents in both the Public and DWR-affiliated samples identified as wildlife viewers (DWR-affiliated: 78.7%; Public: 77.8%) and birders (DWR-affiliated: 62.5%; Public: 63.2%). Because birding is a form of wildlife viewing, we **grouped wildlife viewers and birders together as all viewers**, for many analyses in Goals 1 and 2. All viewers represented a total of 77.2% of respondents in the DWR-affiliated sample (n = 2015) and 68.2% of respondents in the Public sample (n = 693). While 26.3% and 50.6% of respondents from the Public sample identified as hunters and anglers, respectively, the DWR-affiliated sample was composed of 61.4% hunters and 76.1% anglers. In both samples, the majority of hunters (DWR-affiliated: 78.2%; Public: 84.1%) and anglers (DWR-affiliated: 80.4%; Public: 84.1%) also identified as birders and/or wildlife viewers and are thus included among all viewers.

**Under-represented groups.** Our survey indicated that, compared to their representation within Virginia's population, people who are non-White, Hispanic/Latinx, or are women; those who have less formal education than a Bachelor's degree; and people residing in urban or suburban areas are under-represented among wildlife viewers in the state. Additionally, people under the age of 54 and who earn less than \$50,000 a year were under-represented among viewers in the state.

**Youth and families.** In response to a question about what DWR could do to better support their wildlife recreation activities, 41.1% of all DWR-affiliated viewers and 42.0% of all Public viewers indicated that they would like to see the agency provide more opportunities for youth to learn how to participate in wildlife recreation. Among all viewers who had engaged with DWR outreach programs for schools and clubs (Public n = 243; DWR-affiliated n = 218), approximately 80% were 'somewhat' or 'extremely satisfied' with the experience.

**Less experienced viewers.** The majority of self-identified birders and wildlife viewers in our Public sample had more than 10 years of experience with birding or wildlife viewing, respectively. For both birding and wildlife viewing, years of experience was positively related to strength of identity as a birder or wildlife viewer. Experience was also positively related to the mean number of days respondents participated in birding and wildlife viewing over the last year and the percent of days that they travelled away from home to view birds and other wildlife. Finally, experience also played a role in the ways in which birders and wildlife viewers felt DWR could support their recreation activities. Less experienced birders expressed more interest than more experienced birders in more DWR programming for youth, viewing events, recruitment opportunities, and hunting access.

## **Goal 2. Provide a variety of wildlife viewing opportunities accessible to all in the Commonwealth**

Objectives under Goal 2 of the Wildlife Viewing Plan are oriented towards increasing opportunities for all viewers to experience wildlife at destinations across the state and close to home. In the following analyses, we explored how all viewers currently use public and private lands and how DWR might enhance access to wildlife viewing in these locations.

**Viewing on Agency lands and waters and Virginia Bird and Wildlife Trail sites.** Between 29 and 40% of all viewers indicated that DWR could support them by providing more access to locations for seeing birds and other wildlife. Wildlife viewers and birders reported using Wildlife Management Areas (WMAs) and Virginia Bird and Wildlife Trail (VBWT) sites less than other public lands, including other state-managed areas as a whole (e.g., state parks, state forests, boat landings, Natural Area Preserves, etc.). Comparing use of WMAs and VBWT sites, wildlife viewers and birders in both samples reported visiting WMAs more for their activities than VBWT sites.

However, because many WMAs and other public lands are listed as VBWT sites, low rates of reported use of the VBWT may reflect limited awareness of its breadth. Among all viewers who did not use WMAs and VBWTs, the most common perceived constraint, particularly in the Public sample, was a lack of awareness of the location of access points to these lands. Constraints related to respondents' physical limitations (e.g. age, health, mobility) were also commonly written-in. Other write-in responses from viewers expressed constraints related to the use of WMAs by hunters, and the lack of visibility and consistency of management at VBWT sites. Almost half of all Public and DWR-affiliated viewers thought DWR could better support their viewing activities by providing more information about accessing VBWT sites and WMAs, and more information about where to go to see birds and other wildlife.

We found that all DWR-affiliated viewers preferred electronic modes of communication commonly used by DWR, especially email updates, e-newsletters, and the DWR website, while all Public viewers preferred communication via printed materials. Overall, there was low interest in social media communications, but Facebook and Instagram were more popular among viewers under 35 years old than viewers older than 35. Importantly, this younger age bracket was under-represented among viewers in both samples.

**Viewing from or close to home.** The majority of all viewers had participated in birding and wildlife viewing around their home. Compared to all Public viewers, all DWR-affiliated viewers more often reported using DWR programs and resources that support wildlife viewing around or close to home, including DWR wildlife cameras and assistance from DWR for improving wildlife habitat. Although all Public viewers had lower participation in DWR programs and services that support wildlife viewing around or close to home, those who had participated had similarly high satisfaction levels in those programs as all DWR-affiliated viewers.

### **Goal 3. Promote wildlife and habitat conservation through wildlife viewing**

Goal 3 of the Wildlife Viewing Plan seeks to maximize the connection between wildlife-related recreation and wildlife and habitat conservation. Objectives under this goal aim to increase the participation of wildlife viewers in various forms of conservation and also ensure that wildlife viewing activities are consistent with, and do not undermine, the conservation of wildlife and habitats. The analyses below examined the current and intended conservation behaviors of wildlife recreationists, which capture their overlapping identities as hunters, anglers, birders, and wildlife viewers.

**Types of wildlife recreationists in Virginia.** Given the substantial overlap between recreation identities, we determined four intersectional types of wildlife recreationists in Virginia, based on survey respondents' self-identification as birders, wildlife viewers, hunters, and anglers. These groups were **Hunter-anglers** (Public n = 104, DWR-affiliated n = 300), **Birder-viewers** (Public n = 352, DWR-affiliated n = 534), **Viewer-hunter-anglers** (Public n = 270, DWR-affiliated n = 1076), and **Birder-viewer-hunter-anglers** (Public n = 81, DWR-affiliated n = 436).

Individuals in the four recreation types differed in expected ways in terms of the average amount of time they spent birding, wildlife viewing, hunting, and fishing over the past year and over their lifetimes. Recreation types with a birder identity component (i.e., Birder-viewers and Birder-viewer-hunter-anglers) spent the greatest amount of time in the past year and over their lifetimes birding, having spent, on average, 154 - 180 days a year and 25 - 31 years birding. Recreation types with a birder component also had some of the highest participation in wildlife viewing among the recreation types, having spent, on average, 115 - 160 days a year and 30 - 40 years wildlife viewing. Viewer-hunter-anglers also had high participation in wildlife viewing, spending an average of 84 days within the past year and 33 years over their lifetimes wildlife viewing.

The four recreation types were characterized by a few notable differences in socio-demographics. The vast majority of Hunter-anglers, Viewer-hunter-anglers, and Birder-Viewer-hunter-anglers were male, while for Birder-viewers, the majority were female. Birder-viewers also had the most formal education among the recreation types.

**Wildlife viewers and conservation.** We measured five broad categories of conservation behavior among wildlife recreationists, including: 1) *informing or teaching others about wildlife conservation*; 2) *improving habitat on public or private lands*; 3) *advocating or voting related to wildlife conservation*; 4) *collecting data on wildlife or habitat to contribute to science or management*; and 5) *contributing to fundraising efforts for wildlife conservation*. Compared to other forms of conservation, recreationists across all recreation types most often reported participating in *improving habitat on public or private lands*.

For all five conservation behaviors measured in our survey, recreation types that included a birder identity component had higher levels of participation compared to recreation types that lacked a birder identity component. A smaller percent of Hunter-anglers participated in conservation behaviors overall, but Hunter-anglers who did participate spent a comparable

number of days to recreationists of other types engaged in *informing or teaching others about wildlife conservation, advocating or voting related to wildlife conservation, and contributing to fundraising efforts for wildlife conservation.*

We also explored the factors that motivated or constrained participation in conservation activities among recreationists. ‘Benefiting wildlife’ was the top motivator for all five conservation behaviors, followed closely by ‘accomplishing something important’ and, for some behaviors, ‘doing something enjoyable’. In contrast, recreationists who did not participate in conservation behaviors most often indicated that not having enough time was an ‘extremely’ or ‘very important’ barrier to their participation.

The majority of Birder-viewers and Birder-viewer-hunter-anglers reported that they were likely to support DWR within the next 12 months through all five conservation behaviors. Hunter-anglers and Viewer-hunter-anglers less often reported being likely to engage with DWR on all five conservation behaviors in the next year, but the majority are likely to support DWR through *improving habitat* and *advocating or voting*. Almost 75% of the recreationists who had participated in each conservation behavior within the past year are likely to participate in the same activities with DWR to contribute to the agency’s efforts.

#### ***Goal 4. Connect broader constituencies to the Virginia Department of Wildlife Resources through wildlife viewing***

The final goal of the plan focuses specifically on fostering mutual understanding and support between viewers and DWR. Objectives under this goal aim to increase wildlife viewers’ awareness of DWR and its relevance to their activities; promote two-way dialogue and trust between viewers and the agency; and increase financial connections between wildlife viewers and DWR’s conservation work.

**Awareness and relevance of DWR.** Our survey asked respondents to indicate how familiar they are with the agency from ‘not at all familiar’ to ‘extremely familiar.’ As expected, wildlife recreationists in our DWR-affiliated sample were more familiar with the agency than recreationists in the Public sample. Birder-viewers were least familiar with the agency, compared to other recreation types, with Birder-viewers from the Public sample reporting that they were ‘slightly’ to ‘not at all familiar’ with the agency, on average. Additionally, respondents from all four recreation types thought that DWR currently gives higher priority to hunters and anglers than birders and other wildlife viewers, on average. Respondents from all four recreation types also thought DWR should give higher priority to serving each of the four wildlife recreation groups than is currently given, on average. The only exception was that Birder-viewers believed the agency should provide lower priority to serving hunters and anglers compared to what it currently does.

**Relationships between DWR and recreation types.** We measured respondents’ levels of three types of trust in DWR, including affinitive trust (perception of shared values with agency personnel), rational trust (perception of the agency’s competence and past experience), and systems-based (perception that the agency’s procedures are fair and equitable). All four



recreation types had high levels of mean trust in the agency across the 3 trust types. Compared to other recreation types, Birder-viewer-hunter-anglers had the highest mean levels of trust.

Among the recreation types, Birder-viewers had the highest rates of participation within the past five years with visiting VBWT sites, volunteer research and wildlife data collection, and wildlife organizations sponsored by DWR (e.g., Virginia Master Naturalists). All recreation types generally expressed high levels of satisfaction in all DWR programs they had used.

In response to what DWR could do to better support recreationists activities in Virginia, the majority of Birder-viewers desired access to more places to go birding and wildlife viewing, as well as more information about accessing WMAs and sites along the VBWT. A greater percentage of all four recreation types expressed interest in DWR allocating more funds to the protection of habitat, compared to allocating more funds to the conservation of game or nongame wildlife species.

**Financial support for DWR's conservation work.** Among the recreation types, Birder-viewers were least likely to have purchased any Virginia hunting, angling, or sportsman licenses within the past year for their recreation activities; 30 - 40% of all other recreation types had purchased each type of license within the same timeframe. Although few survey respondents had purchased a DWR Restore the Wild Membership (0.6 - 2.4%), respondents indicated much higher interest in purchasing the DWR Restore the Wild membership in the future, especially recreation types with a birder component. Further, between 73 - 93% of recreationists who contributed financially to DWR through a given mechanism last year also reported that they are likely to contribute through that same mechanism next year.

### **Next Steps**

The results of this report were presented to the Stakeholder and Technical Advisory Committees during a series of web-based meetings in summer 2020. At each web-meeting, participants used the results of the survey to guide their suggestions for strategies that can be used to achieve each objective and goal of the Wildlife Viewing Plan. Following a public input period and endorsement by the Virginia Board of Wildlife Resources, the final Wildlife Viewing Plan will guide DWR's efforts to support and engage wildlife recreationists across Virginia for the next 10 years.

## Table of Contents

Acknowledgements	1
EXECUTIVE SUMMARY	2
List of Tables	10
List of Figures	11
List of Appendices	14
INTRODUCTION	15
METHODS	15
Sampling scheme	16
Survey questionnaires	17
Survey administration	17
Non-response survey administration	18
Survey analysis	18
Non-response survey analysis	20
ORGANIZATION OF THE REPORT	20
RESULTS and DISCUSSION	21
Survey response	21
Respondent demographics	21
Non-response vs. response comparisons	22
Goal 1: Connect diverse segments of the public to wildlife and wildlife viewing in Virginia	24
Goal 2: Provide a variety of wildlife viewing opportunities accessible to all in the Commonwealth	48
Goal 3: Promote wildlife and habitat conservation through wildlife viewing	55
Goal 4: Connect broader constituencies to the Virginia Department of Wildlife Resources through wildlife viewing	68
NEXT STEPS	84
LITERATURE CITED	85
APPENDICES	87

## List of Tables

<b>Table 1.</b> Demographic characteristics of the DWR-affiliated and Public samples, as well as Virginia’s total population. All data for Virginia’s total population were from the 2018 American Community Survey (USCB, 2018), except for rural residency, which was drawn from the 2010 Decennial Census (USCB, 2010).....	22
<b>Table 2(a, b).</b> Composition of samples showing the overlap of respondents who identify as either or both birders and wildlife viewers in the DWR-affiliated sample (A) and the Public sample (B). Numbers outlined in red indicate all viewers. ....	24
<b>Table 3.</b> Experience levels of birders and wildlife viewers in the Public sample, based on their number of years participating in birding and wildlife viewing, respectively.....	38
<b>Table 4.</b> Percent of wildlife recreationists compared to non-viewers in the DWR sample and Public sample.....	47
<b>Table 5.</b> Percent of wildlife viewers and birders that used each location within the past 12 months for their wildlife viewing and birding activities, respectively, by sample .....	49
<b>Table 6.</b> Recreation types based on the LCA analysis with definitions.....	56
<b>Table 7.</b> Mean (median) number of days spent participating in birding, viewing, hunting, and angling within the past 12 months for each recreation type by sample.....	58
<b>Table 8.</b> Mean (median) number of years spent participating in birding, viewing, hunting, and angling for each recreation type by sample .....	58
<b>Table 9.</b> Summary socio-demographic variables for each recreation type by sample .....	59

## List of Figures

<b>Figure 1.</b> Percent of all viewers per sample by what wildlife they are ‘extremely interested’ or ‘very interested’ in seeing (‘not interested at all’ through ‘moderately interested’ are not reported) .....	25
<b>Figure 2.</b> Percent of birders belonging to birding clubs and wildlife viewers belonging to viewing clubs by sample .....	26
<b>Figure 3.</b> Percent of all viewers per sample by race and ethnicity, compared to Virginia’s population. Total percentages for each sample exceed 100% because multiracial respondents belonged to multiple groups.. .....	27
<b>Figure 4.</b> Percent of all viewers per sample by gender compared to Virginia’s population (USCB, 2018).. .....	28
<b>Figure 5.</b> Percent of all viewers per sample by annual personal income compared to annual household income of Virginia’s population. ....	29
<b>Figure 6.</b> Percent of all viewers per sample by education level, compared to Virginia’s population.....	30
<b>Figure 7.</b> Percent of all viewers per sample by community size, compared to Virginia’s population.....	31
<b>Figure 8.</b> Percent of all viewers per sample by age, compared to Virginia’s population .....	32
<b>Figure 9.</b> Percent of all viewers per sample that participated in DWR programs and services within the past 5 years .....	33
<b>Figure 10.</b> Percent of all viewers who were ‘very’ to ‘somewhat’ satisfied with their participation in DWR programs and services, within the past 5 years, per sample. ....	34
<b>Figure 11.</b> Percent of all viewers per sample by what they think DWR could do to better support their recreation activities (n = 2286).. .....	35
<b>Figure 12.</b> Mean (median) number of years wildlife viewing or birding, by strength of self-identification as a wildlife viewer or birder, respectively. ....	37
<b>Figure 13.</b> Mean (median) number of days that wildlife viewers and birders in the Public sample spent wildlife viewing or birding (respectively) within the past year.....	38
<b>Figure 14.</b> Percent of days that birders in the Public sample traveled >1 mile away from home for their birding activities, by experience level.....	39
<b>Figure 15.</b> Percent of days that wildlife viewers in the Public sample traveled >1 mile away from home for their wildlife viewing activities, by experience level. ....	40
<b>Figure 16.</b> Percent of birders in the Public sample by experience level, by where in Virginia they participated in their birding activities within the past 12 months.....	41
<b>Figure 17.</b> Percent of wildlife viewers in the Public sample by where in Virginia they participated in their wildlife viewing activities within the past 12 months.....	42
<b>Figure 18.</b> Percent of birders by what they think DWR can do to better support their recreation activities, by experience level. ....	43
<b>Figure 19.</b> Percent of wildlife viewers by what they think DWR can do to better support their recreation activities, by experience level.....	44
<b>Figure 20.</b> Percent of all viewers per sample that participate in non-wildlife recreation activities, by sample (DWR-affiliated n = 1894; Public n = 674).....	46



<b>Figure 21.</b> Percent of all viewers per sample by what constrains them from accessing Virginia Bird and Wildlife Trail sites. ....	50
<b>Figure 22.</b> Percent of all viewers per sample by what constrains them from accessing Virginia Wildlife Management Areas.....	50
<b>Figure 23.</b> Percent of all viewers per sample by preferred communication mechanisms for receiving information from DWR about wildlife recreation and conservation opportunities. ....	52
<b>Figure 24.</b> Percent of millennial (age <35) all viewers per sample that prefer using Facebook or Instagram .....	53
<b>Figure 25.</b> Distribution of samples across recreation types. ....	57
<b>Figure 26.</b> Percent of each recreation type that participated $\geq 1$ day(s) in each conservation behavior .....	60
<b>Figure 27.</b> Mean (median) number of days each recreation type participated in each conservation behavior. Medians represent respondents who participated $\geq 1$ day(s) in each conservation behavior within the past 12 months .....	61
<b>Figure 28.</b> Percent of recreationists that ranked each motivation as ‘extremely’ or ‘very important’ to their participation in each conservation behavior. Development of the motivation response options were informed by Decker et al., 1987 and McFarlane 1994.....	62
<b>Figure 29.</b> Percent of recreationists in all four recreation types that ranked each constraint as extremely to very important to their participation in each conservation behavior. Development of the constraint response options were informed from work by Crawford and Godbey, 1987. ....	63
<b>Figure 30.</b> Percent of each recreation type that have used DWR programs and services within the past 5 years. ....	64
<b>Figure 31.</b> Percent of each recreation type that was ‘somewhat’ or ‘very likely’ to participate in each conservation behavior in order to support the work of DWR over the next 12 months. ....	65
<b>Figure 32.</b> Percent of all recreationists (across all recreation types) that currently participate in conservation behaviors and who are likely to participate in each conservation behavior to support DWR over the next 12 months .....	66
<b>Figure 33.</b> Recreationists’ mean (median) level of familiarity with DWR by each sample within each recreation type. ....	69
<b>Figure 34.</b> Mean perceived priority level that DWR currently gives to serving birders, viewers, hunters, and anglers, compared to mean desired priority level.....	70
<b>Figure 35.</b> Mean (median) agreement (scale: 1 = strongly disagree to 5 = strongly agree) for recreationists’ affinitive, rational, and systems-based trust in DWR by recreation type.....	72
<b>Figure 36.</b> Percent of each recreation type per method DWR could use to better support their wildlife recreation activities. Percentages per recreation type are in <b>Appendix VIII.</b> .....	75
<b>Figure 37.</b> Percent of each recreation type that purchased fees and permits related to their wildlife recreation activities within the past 12 months. Percentages per recreation type are in <b>Appendix VIII.</b> .....	79
<b>Figure 38.</b> Percent of each recreation type that is likely to contribute to conservation through DWR within the next 12 months. Percentages per recreation type are in <b>Appendix VIII.</b> .....	81
<b>Figure 39.</b> Percent of all recreation types that purchased Virginia licenses and permits within the past 12 months that plan to purchase the same Virginia licenses and permits within the next 12 months. ....	82

**Figure 40.** Percent of all recreation types that did not purchase Virginia licenses and permits within the past 12 months that plan to purchase the same Virginia licenses and permits within the next 12 months ..... 83

## List of Appendices

<b>Appendix I:</b> Online version of the mixed-mode survey questionnaire instrument. ....	87
<b>Appendix II:</b> Paper version of the mixed-mode survey questionnaire. ....	107
<b>Appendix III:</b> Non-response survey questionnaires sent to non-respondents of the DWR-affiliated sample (A) and Public sample (B). ....	115
<b>Appendix IV:</b> Push-to-web postcards used to invite participants from the Public sample to complete the survey questionnaire either online or by hand. ....	125
<b>Appendix V:</b> Initial and follow up email invitations to recruit DWR-affiliated individuals to participate in the survey. ....	127
<b>Appendix VI:</b> Cronbach’s alpha reliability measures and scales for dimensions of trust in DWR (adapted from Stern & Baird, 2015). ....	131
<b>Appendix VII:</b> Comparisons between respondents and non-respondents for the DWR-affiliated and Public samples. Asterisks note statistically significant differences at $\alpha = 0.05$ between respondents and non-respondents for each sample. ....	132
<b>Appendix VIII:</b> Percent of each recreation type that responded to questions shown in Figures 36, 37, 38. ....	133

## INTRODUCTION

The Virginia Department of Wildlife Resources (DWR) is guided by a mission to **conserve** and manage wildlife populations and habitat for the benefit of present and future generations; **connect** people to Virginia's outdoors through boating, education, fishing, hunting, trapping, wildlife viewing, and other wildlife-related activities; and **protect** people and property by promoting safe outdoor experiences and managing human-wildlife conflicts (DWR, 2020). In support of this mission, the agency has embarked on an R3 initiative to increase public engagement with Virginia's outdoors by recruiting, retaining, and reactivating participants in hunting, fishing, recreational shooting, boating, and wildlife viewing. DWR's relationships with hunters, anglers, and sport shooters are long-standing, rooted in both agency management of opportunities for hunting, fishing, and shooting and the contributions these activities make to the agency through excise taxes and license purchases. Relationships between DWR and the estimated 2.1 million wildlife viewers in Virginia (US DOI, 2016) are less established. An analysis conducted by agency staff and stakeholders at an R3 workshop in August 2017 identified limited outreach and engagement with wildlife viewers and a perception that the agency is not an advocate for these constituents as threats to DWR's ability to achieve its R3 objectives and overall mission (DWR, n.d.).

To help wildlife agencies meet the needs of new and diverse constituencies, the Association of Fish and Wildlife Agencies (AFWA) and Wildlife Management Institute (WMI) released the *Fish and Wildlife Relevancy Roadmap: Enhanced Conservation through Broader Engagement* in 2019. This guidance document describes 19 barriers that currently limit the relevance of and support for wildlife conservation among the public and strategies, tactics, and specific steps for overcoming each of them. For many of these barriers, the Relevancy Roadmap points to the need for agencies to conduct and apply social science to identify, understand, and plan for engagement with groups outside of the hunting and angling communities they have traditionally served (AFWA & WMI 2019). Consistent with the recommendations of the Relevancy Roadmap, DWR commissioned a social science study to better understand the behaviors and interests of the growing number and diversity of wildlife recreationists throughout the Commonwealth of Virginia. This mixed-methods study included focus groups (Grooms et al., 2019) and a survey conducted with birders, other wildlife viewers, hunters, and anglers.

This report presents survey findings on the activities, attitudes, and agency experiences of Virginia's wildlife recreationists, with a focus on wildlife viewers. While the survey collected data on multiple recreation groups, this report is intended to inform the development of DWR's Wildlife Viewing Plan, the agency's first comprehensive plan for engaging with and supporting wildlife viewers. It thus centers on analyses that can help the agency make strategic and data-driven decisions about how to better engage with and support the recreation and conservation activities of this growing constituency.

## METHODS

Building on results from focus groups conducted in Spring/Summer 2018 (Grooms et al., 2019), we developed and conducted a statewide survey to better understand wildlife recreationists across Virginia. The survey sought to broadly explore the recreation, conservation, and agency



experiences of four groups of wildlife recreationists - hunters, anglers, birders, and wildlife viewers - in order to inform agency R3 efforts to increase engagement in outdoor recreation and with the agency. Because birders represent a substantial portion of the wildlife viewing community (US DOI, 2016) and DWR has multiple long-standing programs focused on bird-related recreation and conservation, we distinguished those whose viewing activities specifically focused on birds from other wildlife viewers.

### Sampling scheme

We used two samples for the survey: 1) the public of Virginia (hereafter, “Public”), and 2) wildlife recreationists currently affiliated with DWR in some capacity (hereafter, “DWR-affiliated sample”). The first sample allowed for generalizability of the results to the Virginia public, while the other was a convenience sample that allowed us to explicitly explore the recreation and conservation behaviors of wildlife recreationists who are already connected to the agency.

**For the Public sample**, we contracted with the Cornell Survey Research Institute to purchase a random sample of 13,000 mail addresses for Virginia households, based on publicly available records. Using expected response rates of Virginia birders, wildlife viewers, hunters, and anglers based on other surveys conducted in the state, and their respective proportions of the Virginia population (Rockville Institute, 2020), we sampled 13,000 Virginia addresses. This sample size was chosen to ensure at least 400 responses per recreation type (specifically for wildlife viewers), which allowed generalizing to the Virginia population at the 95% confidence level, assuming a  $\pm 5\%$  sampling error (Vaske, 2008).

**For the DWR-affiliated sample**, we used email addresses from four different databases to generate a sample that would include hunters, anglers, wildlife viewers, and birders. The agency’s Human Dimensions Specialist provided us with email addresses from the ‘GoOutdoors’ Virginia (GOV) license system for individuals who purchased a resident hunting, fishing, or combination (Sportsman) license or updated their GOV license information between July 2015 and August 2019. We excluded licenses that did not have an associated email address and included only one license for each unique ‘CustomerID’ and email address. We also only included individuals aged 18 to 80 years old. A stratified random sample of 2,750 email addresses was selected from among hunting license records, and 4,351 email addresses were selected from fishing license records, with half of Sportsman licenses counted as hunting licenses and the other half counted as fishing licenses. In order to increase sampling among younger hunters and anglers, we stratified these samples as follows: age 18-29 = 35%, age 30-42 = 30%, age 43-55 = 20%, and age 56-80 = 15%. We sampled a larger number of email addresses from fishing licenses in the database due to a history of low response rates to agency surveys among anglers. In order to include wildlife viewers and birdwatchers in the sample, we included all 4,968 email addresses subscribed to wildlife updates of DWR’s online newsletter, *Notes from the Field*. These email addresses were also provided to us by DWR’s Human Dimensions Specialist. Finally, we included individuals who have contributed to the 2nd Virginia Breeding Bird Atlas (VABBA2), a citizen science project sponsored by DWR. We worked with the VABBA2 Coordinator to identify publicly available email addresses for volunteers who submitted data to the project’s eBird portal. After excluding VABBA2

contributors who do not live in Virginia, this added 1,059 email addresses to our DWR-affiliated sample.

Once we combined the four email databases for the DWR-affiliated sample, we removed email addresses that were invalid (e.g., incomplete) or belonged to agency personnel or members of the Stakeholder Advisory Committee for the Wildlife Viewing Plan. We also removed duplicates – email addresses that were sampled from multiple DWR databases – so that individuals were included in the sample only once. After cleaning, the DWR sample included 13,000 individuals.

### Survey questionnaires

We initially developed a single survey questionnaire for both the Public and DWR-affiliated samples (**Appendix I**). The survey included both closed- and open-ended questions, with defined response options or a box for writing-in a response, respectively. These questions were developed based on insights from focus groups conducted in an earlier phase of this study (Grooms et al., 2019), feedback from the Stakeholder and Technical Committees of the Wildlife Viewing Plan, and scholarship in the human dimensions of wildlife conservation. Survey questions for wildlife recreationists focused on their:

- Self-identification as a birder, viewer, hunter, and angler
- Duration, location, and focus of their recreation activities
- Participation in conservation behaviors
- Familiarity with DWR and perceptions of the agency's role
- Engagement in and satisfaction with DWR programs and services
- Interest in supporting DWR and how DWR can better support their recreation activities
- Preferred communication mechanisms
- Demographic characteristics

The survey questionnaire was entered into Qualtrics for online survey administration. Due to a low initial response rate to the online survey among the Public sample, we also developed a printed version of the survey that omitted several survey items and response options from the original survey questionnaire, due to space constraints (**Appendix II**). Additionally, we developed a non-response survey questionnaire with select survey questions for both samples (**Appendix III**).

### Survey administration

We pre-tested the survey questionnaire and conducted follow-up interviews with 15 wildlife recreationists in Virginia to receive feedback on the survey. The survey was also pilot-tested with students in the Human Dimensions of Fisheries and Wildlife course at Virginia Tech (n = 72) and reviewed by DWR staff, members of the Technical and Stakeholder Advisory Committees for the Wildlife Viewing Plan, wildlife conservation professionals, and other social scientists (n = 23). From October 10, 2019 to January 13, 2020, we administered surveys using a modified Dillman approach, consisting of an initial invitation and up to three reminders (Dillman et al., 2014). All research activities were approved by and conducted in compliance with the requirements of the Virginia Tech Institutional Review Board (Protocol #17-754).

**For the Public sample**, we used mixed-mode implementation, including push-to-web postcards and a printed mail survey (**Appendix IV**). We initially mailed an invitation push-to-web postcard, which contained a unique, 6-character alphanumeric code for each participant and both a URL and QR code to access the survey questionnaire online via Qualtrics. Due to low initial response to the survey, reminder mailings sent to non-respondents included a full invitation letter, printed version of the survey questionnaire, and a postage-paid return envelope (**Appendix II**). The final reminder for non-participants consisted of a push-to-web postcard that invited participants to complete either the printed or online survey (**Appendix IV**).

**For the DWR-affiliated sample**, the survey was completely administered online, using Qualtrics. We sent an initial email invitation through the Qualtrics platform with information about the purpose of the survey and a link to access the survey online (**Appendix V**). Up to three email reminders were automatically sent by Qualtrics to non-respondents; these reminders were scheduled to be delivered every 8 or 9 days, with variability to avoid weekends.

### Non-response survey administration

We conducted non-response surveys for both samples to determine whether or not survey respondents differed significantly from wildlife recreationists who received the survey but did not complete it. **For the DWR-affiliated sample**, we invited all non-respondents to complete a shortened version of the survey through Qualtrics from December 5, 2019 - February 3, 2020 (**Appendix III**). **For the Public sample**, we sent a 1-page, printed survey (**Appendix III**) to 4,000 randomly selected addresses of non-respondents from February 18, 2020 - May 5, 2020.

### Survey analysis

This report presents survey analyses conducted to inform the development of objectives and strategies for the four goals of DWR's Wildlife Viewing Plan. We have separated Goals 1 & 2 from 3 & 4 below and throughout the report, given their focus on analyzing different aspects of our survey sample.

**For survey items related to Goals 1 and 2**, we explored the responses of survey participants who self-identified as either wildlife viewers or birders. Because the Plan is focused on wildlife viewing across all wildlife taxa, we created a separate variable named all viewers that included all individuals who responded as "very like me" or "somewhat like me" to either the wildlife viewer or birder recreation types. We used Shapiro-Wilk tests and histograms to check normality assumptions and used t-tests (Mann-Whitney tests when normality assumptions were violated) or chi-square tests of independence to compare responses of all viewers. Medians are shown in figures and tables for which nonparametric statistics were run. Additionally, we used chi-square goodness-of-fit tests to explore differences in demographic composition between our samples and the Virginia population, using data publicly available online from the U.S. Census Bureau's 2018 American Community Survey (USCB, 2018) and 2010 Decennial Census (USCB, 2010; for urban/rural data only). Where significant differences existed, we compared the extent to which certain demographic groups of wildlife viewers are underrepresented relative to their proportions in the Virginia population.

For several questions pertinent to Goals 1 and 2, we were also interested in comparing birders and wildlife viewers with different experience levels. We grouped birder and wildlife viewer experience levels into two categories based on the number of years respondents reported being involved in birding or viewing: “less experience” (1 - 10 years), and “more experience” ( $\geq 11$  years). Ten years reflects the first quartile of experience with wildlife viewing and had more practical utility in understanding viewers with less experience than the second quartile, which was 25 years.

***For survey items related to Goal 3 and Goal 4***, we used latent class analysis (LCA) to develop a typology of recreationists, based on participant responses to the recreation self-identity survey item (**Appendix I**). LCA is a maximum likelihood-based approach that organizes respondents into hypothesized latent classes (i.e., categories). Compared to other segmentation analyses, a maximum likelihood-based approach is useful in its ability to incorporate and describe uncertainty to identify the most probable classes of respondents based upon the survey data (Ehrlich et al., 2017). Additionally, model selection criterion can then be used to compare different hypothesized numbers of classes among respondents. We used Bayesian information criterion (BIC) over other model selection criterion given its effectiveness in dealing with false positives (Ehrlich et al., 2017; Hagenaars & Halman, 1989).

We tested a range of models that hypothesized 2 - 10 latent classes, based on responses to the recreation self-identity question (**Appendix I**). Given restrictions in LCA, respondents who left any portion of the self-identification question unanswered were not included in the models. These analyses were conducted using the DWR-affiliated sample, and the selected model was then applied to the Public sample. This approach allowed us to conduct validity checks, because the databases from which DWR-affiliated respondents were sampled gave us some insight into their expected identities (e.g., we expected those drawn from the hunter license database to identify as hunters). We also checked the validity of the LCA classes by comparing the average number of days within the past year and overall years that individuals in each class had participated in each recreation activity. We used package *poLCA* (Drew & Lewis, 2011) in R (2017) to conduct the LCA analysis. We also used SPSS (2017) to run Shapiro-Wilk tests and histograms to check normality assumptions, and run one-way ANOVAs (Kruskal Wallis tests with Dunn’s multiple comparison post-hoc tests when normality assumptions were violated) and chi-square tests to compare the recreation types that emerged from the model. Again, medians are shown in figures and tables for which nonparametric statistics were run.

Most of the analyses across the four goals were based on response frequencies to individual survey questions. For one construct - trust in DWR - we created scales to reflect three types of trust (affiliative, rational, and systems-based; Stern & Baird, 2015). Scales were calculated as the mean of responses to three survey items, with the requirement of 2 respondent-provided answers for each person to be included in the scale (**Appendix VI**). Cronbach’s alpha, a measure of reliability, was used to assess the quality of these scales.



## Non-response survey analysis

To analyze the non-response surveys, we used one-way ANOVAs and chi-square tests to compare questions about respondents' participation in wildlife recreation and conservation behaviors, familiarity and trust in the agency, and sociodemographic characteristics to those of non-respondents (**Appendix VII**). We also compared respondent demographics for both samples to data for the Virginia population from the U.S. Census and 50-State Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

## ORGANIZATION OF THE REPORT

This report is organized by the 4 goals of the Wildlife Viewing Plan for Virginia DWR (hereafter, "Plan"). These goals were developed collaboratively by a Stakeholder Advisory Committee (SAC; composed of 19 stakeholders representing organizations and agencies invested in wildlife viewing in the Commonwealth) and a Technical Advisory Committee (TAC; composed of 18 DWR staff representing various divisions of agency). The goals are:

- Goal 1: Connect a diversity segments of the public to wildlife and wildlife viewing in Virginia
- Goal 2: Provide a variety of wildlife viewing opportunities accessible to all in the Commonwealth
- Goal 3: Promote wildlife and habitat conservation through wildlife viewing
- Goal 4: Connect broader constituencies to the Virginia Department of Wildlife Resources through wildlife viewing

Each goal section is further organized by the objectives that have been drafted by the SAC and TAC to guide and evaluate progress towards Plan goals. This report was written while the Wildlife Viewing Plan was still being developed, so these objectives may not be completely consistent with the final objectives incorporated into the Plan.

We have employed the following color schemes and symbols throughout the report to clarify which samples and recreation groups are referenced in figures.



The **Public sample** (in orange)



Respondents who identified as **Wildlife viewers** (excluding birders)



The **DWR-affiliated sample** (in blue)



Respondents who identified as **Birders**



The **population of Virginia** (USCB, 2018)



Respondents who identified as **Hunters**



Respondents who identified as **Anglers**

## RESULTS and DISCUSSION

### Survey response

We received a total of 3626 completed surveys: 2610 from the DWR-affiliated sample (response rate = 20.4%) and 1016 from the Public sample (response rate = 7.7%).

### Respondent demographics

**DWR-affiliated sample:** The majority of respondents in the DWR-affiliated sample were White (97.1%), non-Hispanic/Latinx (99.1%), male (80.2%), college-educated (Bachelor's degree or higher; 62.1%), and above the age of 60 (54.4%; **Table 1**). Additionally, 35.9% of these respondents had an income of at least \$100,000 per year, and only 10.3% lived in urban areas. The proportion of respondents in this sample who identified with each of these demographic characteristics was significantly different from that of Virginia's total population (USCB, 2010, 2018). These differences were not unexpected. This sample was a convenience sample drawn from databases of individuals affiliated with DWR, and was not intended to be a representative, random sample of the Virginia population. The demographic characteristics of this sample would be expected to more closely reflect those of wildlife recreationists in Virginia. Indeed, the age, ethno-racial, education and income distribution of this sample is generally consistent with that observed for wildlife recreationists in Virginia in other samples (Rockville Institute, 2020).

**Public sample:** As in the DWR-affiliated sample, the majority of respondents in the Public sample were White (93.5%), non-Hispanic/Latinx (96.6%), male (55.1%), college-educated (Bachelor's degree or higher; 62.7%), and above the age of 60 (54.7%) (**Table 1**). Additionally, 49.9% had an income of at least \$75,000 per year, and 16.4% lived in urban areas. Compared to the DWR-affiliated sample, the Public sample was more similar to Virginia's population for most demographic characteristics; however, the differences between the Public sample and Virginia's population were still statistically significant. This sample was a random sample of Virginia residential addresses. Thus, the demographic differences between our Public sample and Virginia's population likely reflect bias in survey response due to the survey topic and messaging on survey recruitment materials (**Appendices IV & V**). Like the DWR-affiliated sample, the demographic characteristics of this Public sample (i.e., age, ethno-racial, education and income distribution) are more similar to those of wildlife recreationists in Virginia, as measured in other studies (Rockville Institute, 2020).

While not unexpected, these differences provide important context for the remainder of our analyses. Under Goal 1, Objective 1, we discuss in greater detail how the demographic composition of viewers in both samples compared to that of Virginia's population.

**Table 1.** Demographic characteristics of the DWR-affiliated and Public samples, as well as Virginia’s total population. All data for Virginia’s total population were from the 2018 American Community Survey (USCB, 2018), except for rural residency, which was drawn from the 2010 Decennial Census (USCB, 2010). Asterisks (\*) note significant differences (chi-square) between our samples and the Virginia population at  $\alpha = 0.05$ .

Demographics	DWR-affiliated sample	Public sample	Virginia’s total population (2018)
Race (% white)	97.1%*	93.4%*	71.0%
Ethnicity (% non-Hispanic)	99.1%*	96.6%*	90.5%
Gender (male)	80.2%*	55.1%*	48.6%
Gender (female)	19.9%*	44.9%*	51.4%
Education (B.A. or higher)	62.1%*	62.7%*	36.1%
Age (>60 years old)	54.4%*	54.7%*	27.8%
Income (\$100,000+)	35.9%*	35.5%*	35.8%
Residency (rural)	47.3%*	33.4%*	24.6%

### Non-response vs. response comparisons

For the DWR-affiliated sample, we compared 2610 respondents to 451 non-respondents (4.7% response rate), and for the Public sample, we compared 1016 respondents to 111 non-respondents (2.8% response rate). For both samples, there were no significant differences between respondents and non-respondents in terms of the proportion of respondents identifying as birders, viewers, or hunters; mean years spent birding or angling; participation in conservation behaviors, with the exception of data collection; level of familiarity with the agency; level of rational trust in the agency; and gender distribution (**Appendix VII**). For the DWR-affiliated sample only, there were no significant differences between respondents and non-respondents in terms of their engagement in wildlife recreation within the past year, their identification as anglers, years spent recreating, and engagement with DWR’s Conservation Police Officers. For the Public sample only, there were no significant differences between respondents and non-respondents in terms of their participation in data collection, use of the Virginia Bird and Wildlife Trail, systems-based trust in the agency, ethnicity, and race.

***DWR-affiliated sample:*** Compared to respondents, non-respondents spent a fewer number of days participating in data collection, used DWR Wildlife Management Areas (WMAs) and Virginia Birding and Wildlife Trail sites (VBWT) more, were slightly younger (by ~3 years), and more often identified as Hispanic or Asian (**Appendix VII**).

***Public sample:*** Compared to respondents, fewer non-respondents participated in wildlife recreation in Virginia, and more non-respondents identified as anglers. Non-respondents had spent fewer years wildlife viewing and more years hunting and had used DWR WMAs and interacted with Conservation Police Officers more than respondents. Non-respondents were also slightly older (by ~3 years), and less often had an annual income of  $\geq$  \$100,000 or a Bachelor's degree or higher, when compared to respondents (**Appendix VII**).

## Goal 1: Connect diverse segments of the public to wildlife and wildlife viewing in Virginia

**Note:** Most of the analyses presented under Goals 1 and 2 compare survey responses from all viewers (i.e., anyone who identified as a birder or wildlife viewer; **Table 2a, b**) between the survey samples (DWR-affiliated and the Public). For survey items that were asked specific to individual recreation activities (e.g., frequency, duration, or location of birding), analyses were conducted separately for respondents who identified as birders or respondents who identified as wildlife viewers. Additionally, for several questions, we compared different experience levels of birders and wildlife viewers through two experience levels: “less experience” (1 - 10 years), and “more experience” (≥11 years).

*To what extent do wildlife recreationists in Virginia identify as wildlife viewers?*

Among respondents from the DWR-affiliated sample, 62.5% identified as birders, 78.7% identified as wildlife viewers, 61.4% identified as hunters, and 76.1% identified as anglers. The Public sample consisted of similar proportions of birders (63.2%) and wildlife viewers (77.8%) but fewer hunters (26.3%) and anglers (50.6%). As these percentages indicate, many individual recreationists identify with multiple recreation activities. Within the DWR-affiliated sample, 78.2% of hunters identified as a viewer, and 80.4% of anglers identified as a viewer. Within the Public sample, 84.1% of both hunters and anglers identified as viewers.

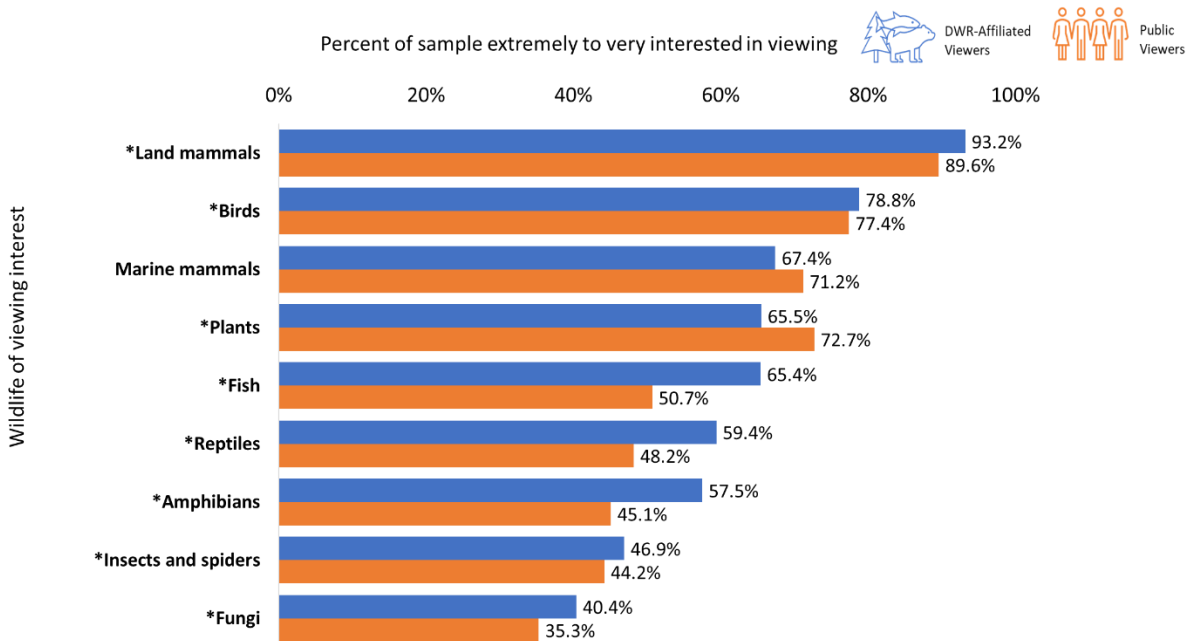
Because birding is a form of wildlife viewing, we grouped these respondents together and refer to them simply as all viewers for many of the following analyses, particularly under Goals 1 and 2. Considered together, 77.2% of respondents in the DWR-affiliated sample (n = 2015) and 68.2% of respondents in the Public sample (n = 693) indicated that they were ‘very’ or ‘somewhat like’ a birder or wildlife viewer (**Table 2 a, b**). In both samples, the majority of all viewers identified as *both* a birder and wildlife viewer (DWR-affiliated sample: 67.9%, n = 1369; Public sample: 67.0%, n = 464).

**Table 2(a, b).** Composition of samples showing the overlap of respondents who identify as either or both birders and wildlife viewers in the DWR-affiliated sample (A) and the Public sample (B). Numbers outlined in red indicate all viewers.

		DWR-affiliated		Public	
		n = 2610		n = 1016	
		Birder		Birder	
		Yes	No	Yes	No
Wildlife viewer	Yes	1369 (52.5%)	507 (19.4%)	464 (45.7%)	172 (16.9%)
	No	139 (5.3%)	595 (22.8%)	57 (5.6%)	323 (31.8%)

*What are wildlife viewers interested in seeing when they go wildlife viewing?*

Our survey asked respondents who identified as wildlife viewers to indicate their level of interest, on a 7-point scale, in seeing various types of wildlife when wildlife viewing in Virginia. Overall, wildlife viewers in both samples expressed high levels of interest in all wildlife taxa included in the survey. Based on responses of ‘extremely interested’ and ‘very interested’, land mammals (~90% interested) and birds (~80% interested) were the two most popular types of wildlife among wildlife viewers in both samples, while insects and spiders (~45% interested) and fungi (~40% interested) were the least popular. Compared to wildlife viewers in the Public sample, DWR-affiliated wildlife viewers generally reported higher levels of interest in seeing all wildlife taxa, except for marine mammals and plants (**Figure 1**). The largest differences in interest between the two samples were in seeing freshwater and saltwater fish, reptiles, and amphibians, with DWR-affiliated wildlife viewers indicating more interest in seeing these types of wildlife.



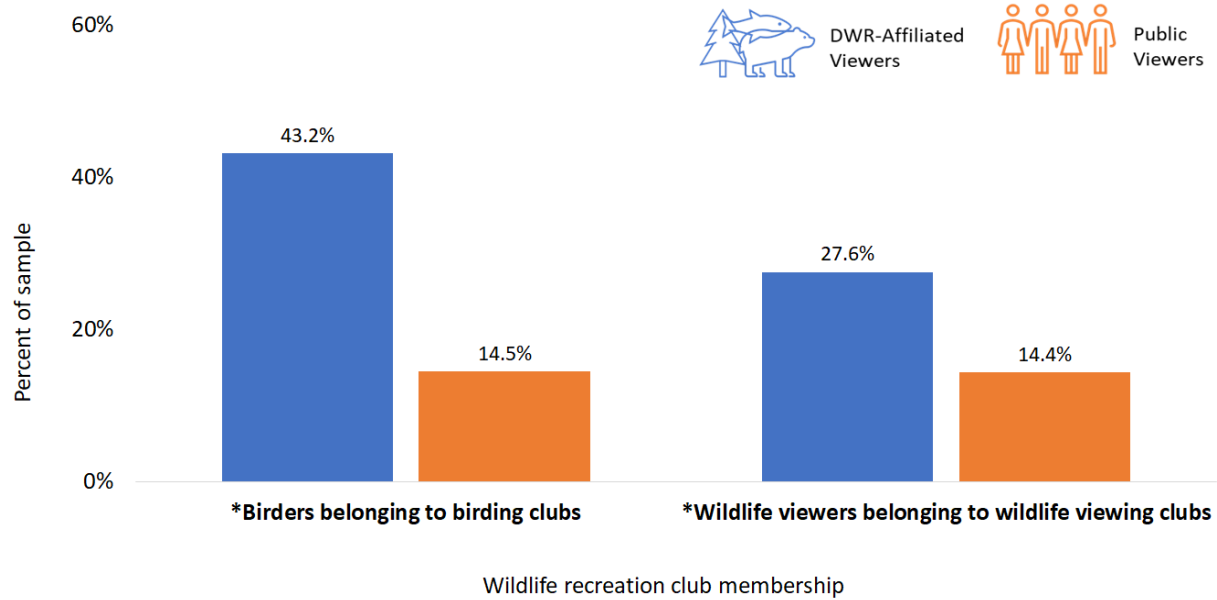
**Figure 1.** Percent of all viewers per sample by what wildlife they are ‘extremely interested’ or ‘very interested’ in seeing (‘not interested at all’ through ‘moderately interested’ are not reported) (DWR-affiliated n = 1782 - 1855; Public n = 625 – 632). Asterisks (\*) note statistically significant differences between DWR-affiliated and Public samples at  $\alpha = 0.05$ . Chi-square tests showed that viewing interest in all wildlife (except marine mammals), differed significantly between all DWR-affiliated and Public viewers ( $\chi^2 = 5.57 - 61.3$ ,  $p < 0.001 - 0.234$ ).

*To what extent are viewers connected to viewing organizations through memberships?*

Membership in birding or wildlife viewing organizations was more common among recreationists in the DWR-affiliated sample than in the Public sample. In the DWR-affiliated sample, 43.2% of birders belonged to birding clubs and 27.6% of wildlife viewers (who view wildlife other than



birds) belonged to wildlife viewing clubs (**Figure 2**). In the Public sample, 14.5% of birders and 14.4% of wildlife viewers belonged to clubs serving those recreation groups.



**Figure 2.** Percent of birders belonging to birding clubs and wildlife viewers belonging to viewing clubs by sample (DWR-affiliated: birders in birding clubs  $n = 1325$ , wildlife viewers in viewing clubs  $n = 1569$ ; Public: birders in birding clubs  $n = 470$ , wildlife viewers in viewing clubs  $n = 585$ ). Chi-square tests showed that both birders belonging to bird clubs ( $\chi^2 = 145.1$ ,  $p < 0.001$ ) and wildlife viewers belonging to wildlife viewing clubs ( $\chi^2 = 77.8$ ,  $p < 0.001$ ) differed significantly between the samples. Asterisks (\*) note statistically significant differences between DWR-affiliated and Public samples at  $\alpha = 0.05$ .

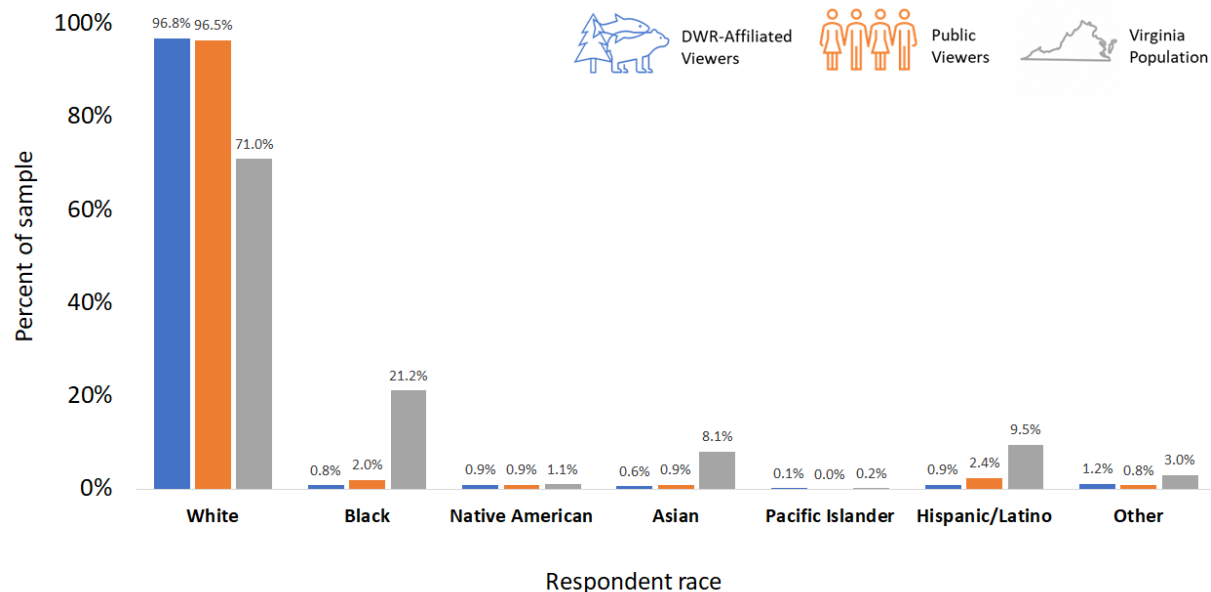
**In summary:**

- The majority of respondents in both samples identified as either a birder or wildlife viewer, with the majority of these all viewers identifying as *both*.
- For both samples, the types of wildlife of greatest interest to wildlife viewers were land mammals and birds.
- Compared to the Public sample, DWR-affiliated wildlife viewers indicated higher levels of interest in seeing most wildlife taxa; these differences were greatest for freshwater and saltwater fish, reptiles, and amphibians. Wildlife viewers in the Public sample expressed greater interest in marine mammals and plants than the DWR-affiliated sample.
- Wildlife viewers in the DWR-affiliated sample were more connected to organizations and clubs that support wildlife viewing than in the Public sample. Less than 15% of Public wildlife viewers were members of wildlife viewing or birding organizations.

**Objective 1: Increase participation by under-represented gender, ethno-racial, and socio-economic groups in wildlife viewing events, programs, and activities led by DWR and partners.**

*What groups are underrepresented in Virginia’s wildlife viewing community?*

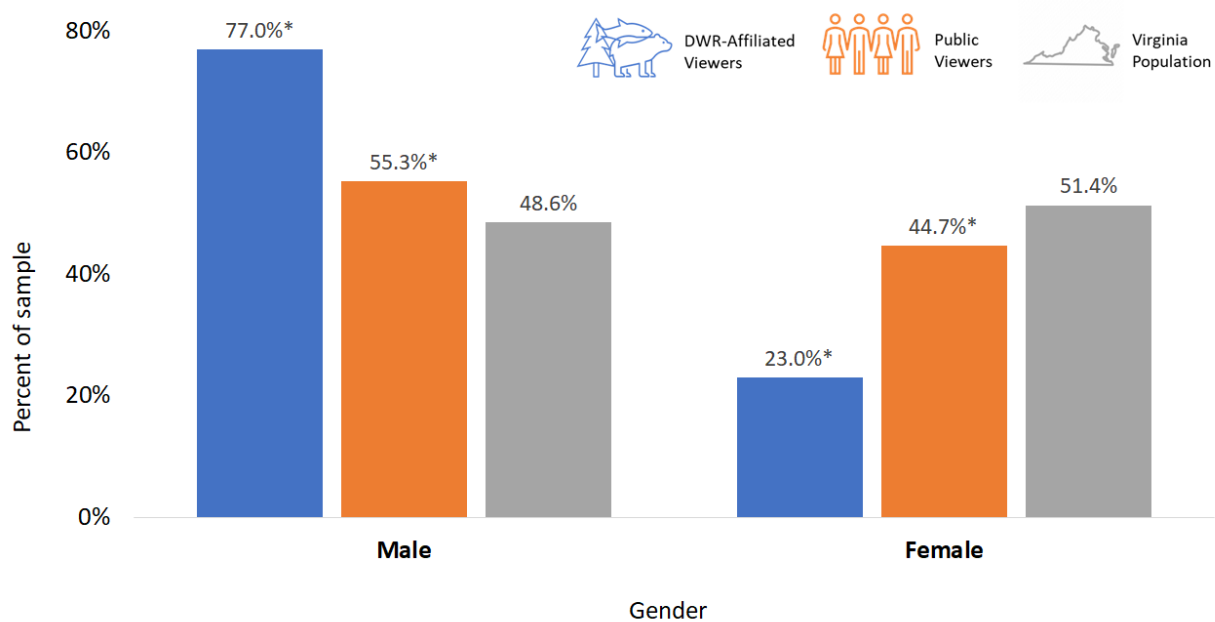
In order to determine which demographic groups are underrepresented among wildlife viewers in Virginia, we compared the demographic characteristics of all viewers to those of Virginia’s general population (USCB, 2018). We found that a higher proportion of all viewers were White, male, and college educated. Almost 97% of all viewers were White, compared to only 71% of Virginia’s population; all non-White racial and ethnic groups were correspondingly underrepresented among all viewers. For example, while Virginia’s population is 21.2% Black, less than 1.0% of all DWR-affiliated viewers and 2.0% of all Public viewers were Black (**Figure 3**).



**Figure 3.** Percent of all viewers per sample by race and ethnicity, compared to Virginia’s population (Race: DWR-affiliated n = 1641, Public n = 651, VA Population n = 8.5 million; Ethnicity: DWR-affiliated n = 1612, Public n = 630, VA Population n = 8.5 million). Total percentages for each sample exceed 100% because multiracial respondents belonged to multiple groups. Chi-square goodness-of-fit tests showed that the racial and ethnic distributions of both all DWR-affiliated viewers (Race  $\chi^2 = 652.8$ ,  $p < 0.001$ ; Ethnicity  $\chi^2 = 138.5$ ,  $p < 0.001$ ) and all Public viewers (Race  $\chi^2 = 240.3$ ,  $p < 0.001$ ; Ethnicity  $\chi^2 = 37.4$ ,  $p < 0.001$ ) were significantly different from that of the Virginia population (for these tests, multiracial respondents were classified separately).

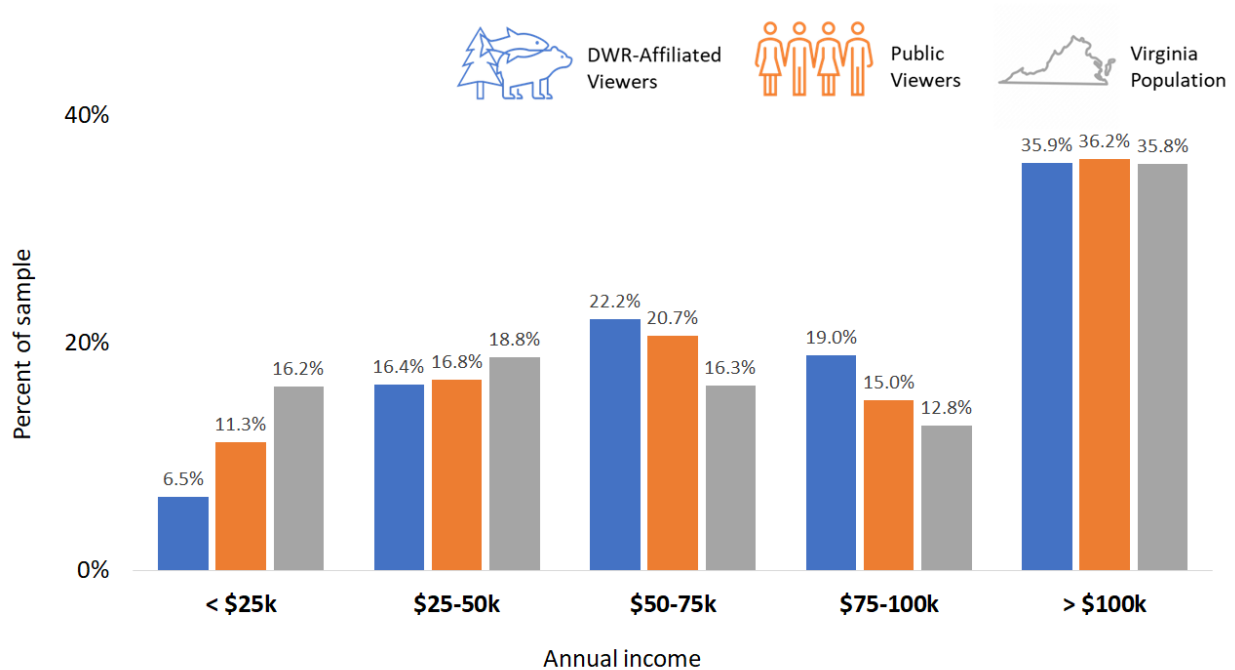
Considering differences in gender ratios, the Public sample had a lower percentage of women (44.7%) compared to Virginia’s population (51.4%). This underrepresentation of women, though significant, was far more pronounced in the DWR-affiliated sample, where women comprised

only 23.0% of all DWR-affiliated viewers (**Figure 4**). No other demographic characteristic we analyzed in this section had such a large difference between the two survey samples.



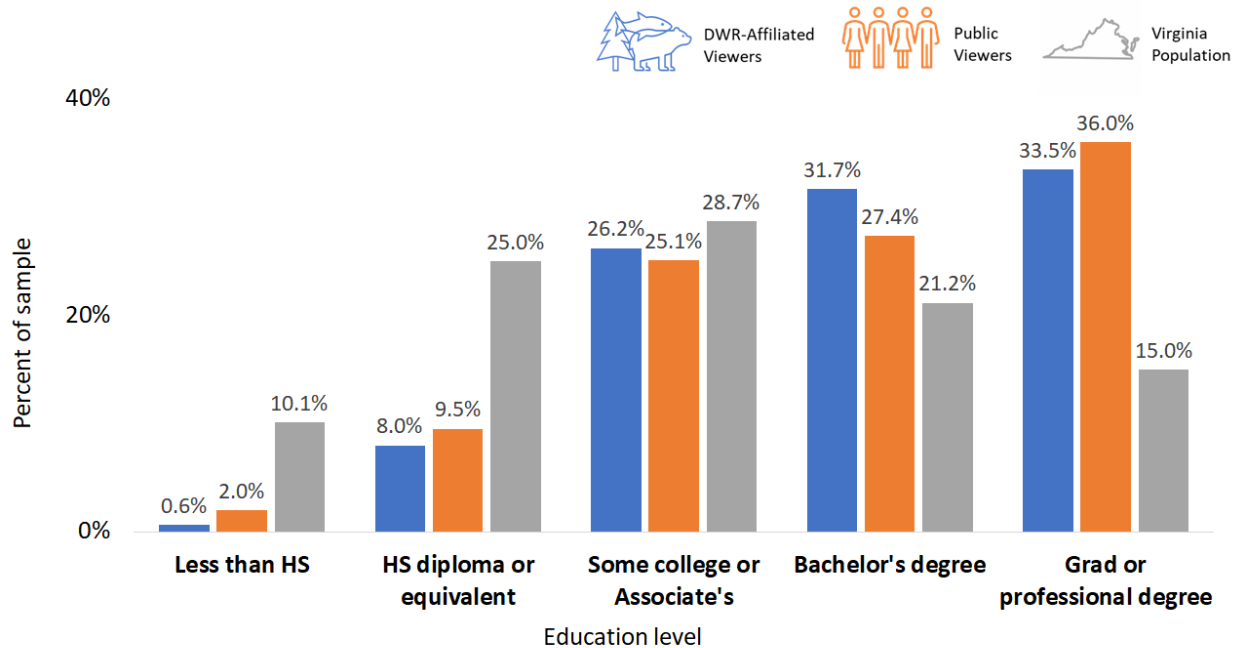
**Figure 4.** Percent of all viewers per sample by gender compared to Virginia’s population (USCB, 2018) (DWR-affiliated n = 1657, Public n = 658, VA Population n = 8.5 million). Chi-square goodness-of-fit tests showed that the gender distributions of all DWR-affiliated viewers ( $\chi^2 = 534.5$ ,  $p < 0.001$ ) and all Public viewers ( $\chi^2 = 11.8$ ,  $p = 0.001$ ) were significantly different when compared to the Virginia population data from the 2018 census. Asterisks (\*) note statistically significant differences at  $\alpha = 0.05$ .

The personal income distribution of all viewers was similar to the household income distribution of Virginia’s population, with about 36% of all viewers and Virginians earning over \$100,000 per year. A higher proportion of all viewers earned \$50,000-100,000 per year, and a lower proportion earned below \$50,000 than Virginians in general. Underrepresentation was most pronounced in the <\$25,000 income bracket, which included only 6.5% of all DWR-affiliated viewers, compared to 11.3% of all Public viewers and 16.2% of Virginia’s population (**Figure 5**).



**Figure 5.** Percent of all viewers per sample by annual personal income compared to annual household income of Virginia’s population (DWR-affiliated n = 1510, Public n = 594, VA Population n = 3.2 million). Chi-square goodness-of-fit tests showed that income distributions of all DWR-affiliated viewers ( $\chi^2 = 170.0$ ,  $p < 0.001$ ) and all Public viewers ( $\chi^2 = 19.4$ ,  $p = 0.001$ ) were significantly different from that of the Virginia population.

Finally, we observed large differences in education between all viewers and Virginia’s population. A majority of all viewers had a Bachelor’s or graduate degree, compared to only 36% of Virginians in general. Conversely, less-educated groups (those attaining no higher than a high school diploma) were clearly underrepresented among all viewers. This pattern was slightly more pronounced in the DWR-affiliated sample, less than 1% of which had not finished high school (**Figure 6**).



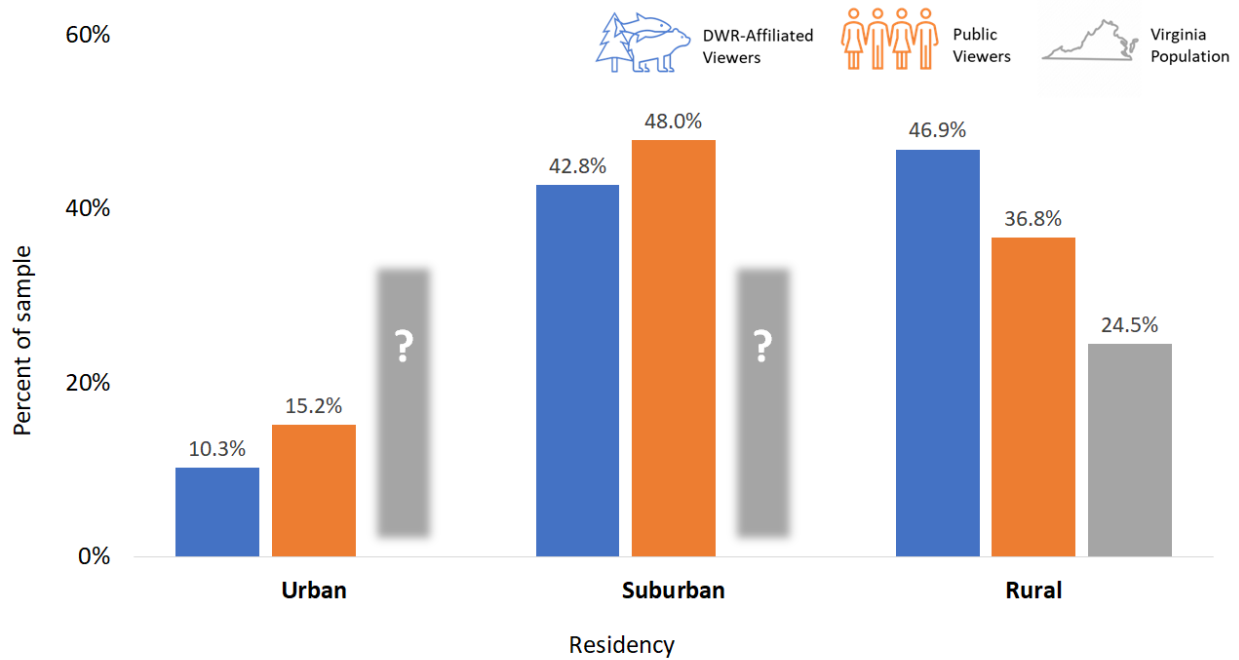
**Figure 6.** Percent of all viewers per sample by education level, compared to Virginia's population (DWR-affiliated n = 1666, Public n = 661, VA Population n = 6.6 million). Chi-square goodness-of-fit tests showed that the education levels of all DWR-affiliated viewers ( $\chi^2 = 816.1$ ,  $p < 0.001$ ) and all Public viewers ( $\chi^2 = 317.7$ ,  $p < 0.001$ ) were significantly different from that of the Virginia population.

We also asked survey respondents to classify their current community size as urban, suburban, or rural. Relative to their proportion in the Virginia population, rural residents were overrepresented among viewers in our study. A higher proportion of all DWR-affiliated viewers lived in rural areas, compared to all Public viewers of whom a higher proportion lived in suburban areas. Although the 2010 Decennial Census (USCB, 2010) did not include comparable classifications of urban and suburban populations, we infer that, considered together, these groups were underrepresented among all viewers (**Figure 7**).

**In summary:**

- Compared to Virginia data from the 2018 American Community Survey, Black, Hispanic/Latinx, and women respondents were underrepresented among all viewers.
- Those who made less than \$25,000 a year, and those who were not college-educated were also underrepresented among all viewers.

**Objective 2: Increased engagement of urban populations in activities that connect people to wildlife and wildlife viewing.**



**Figure 7.** Percent of all viewers per sample by community size, compared to Virginia’s population (DWR-affiliated n = 1644, Public n = 650, VA Population n = 8.0 million; no comparable census classifications of urban and suburban). Chi-square goodness-of-fit tests showed that distributions community size distributions of all DWR-affiliated viewers ( $\chi^2 = 443.5$ ,  $p < 0.001$ ) and all Public viewers ( $\chi^2 = 52.4$ ,  $p < 0.001$ ) were significantly different from that of the Virginia population (for these tests, urban and suburban were classified together).

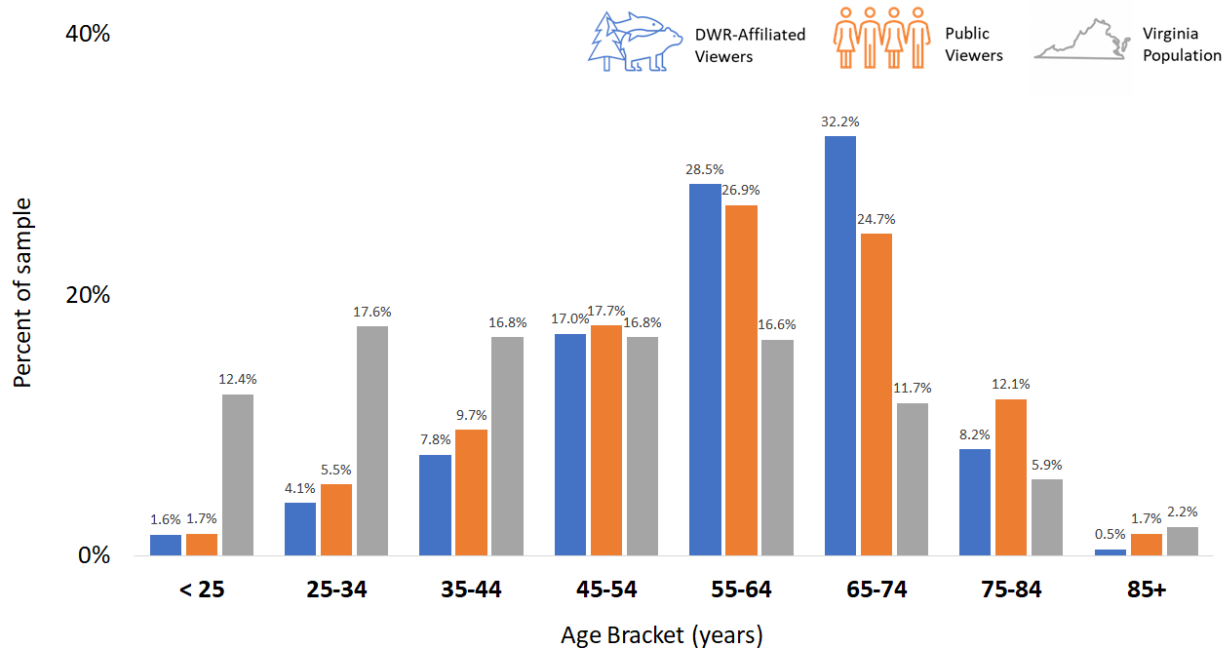
**In summary:**

- Respondents currently living in rural areas were over-represented among all viewers, compared to Virginia data from the 2010 Decennial Census. Although there was no comparable measure for urban and suburban areas in the census data, our findings suggest that when considered together, these community sizes were under-represented among all viewers.

**Objective 3: Increase awareness of wildlife and opportunities for participating in wildlife viewing among youth and families.**

*Are younger demographics currently represented in Virginia’s wildlife viewing community?*

The majority of all surveyed viewers from both samples were between the ages of 55 and 74 years old; only 28% of Virginia’s population is within this age bracket. Younger age brackets (below 45 years) were correspondingly underrepresented among all viewers. This pattern intensified with decreasing age. Less than 2% of all viewers were under the age of 25 years, while 12% of Virginia’s population (excluding minors) is within this age bracket (**Figure 8**). We note that hunters and anglers above the age of 80 were not included in our DWR-affiliated sample (per selection criteria used by the agency to develop the sample), although birders and wildlife viewers of this age were. This likely explains the low proportion of all DWR-affiliated viewers (blue bars) in the oldest two age brackets but does not change our aforementioned finding that younger viewers are underrepresented.



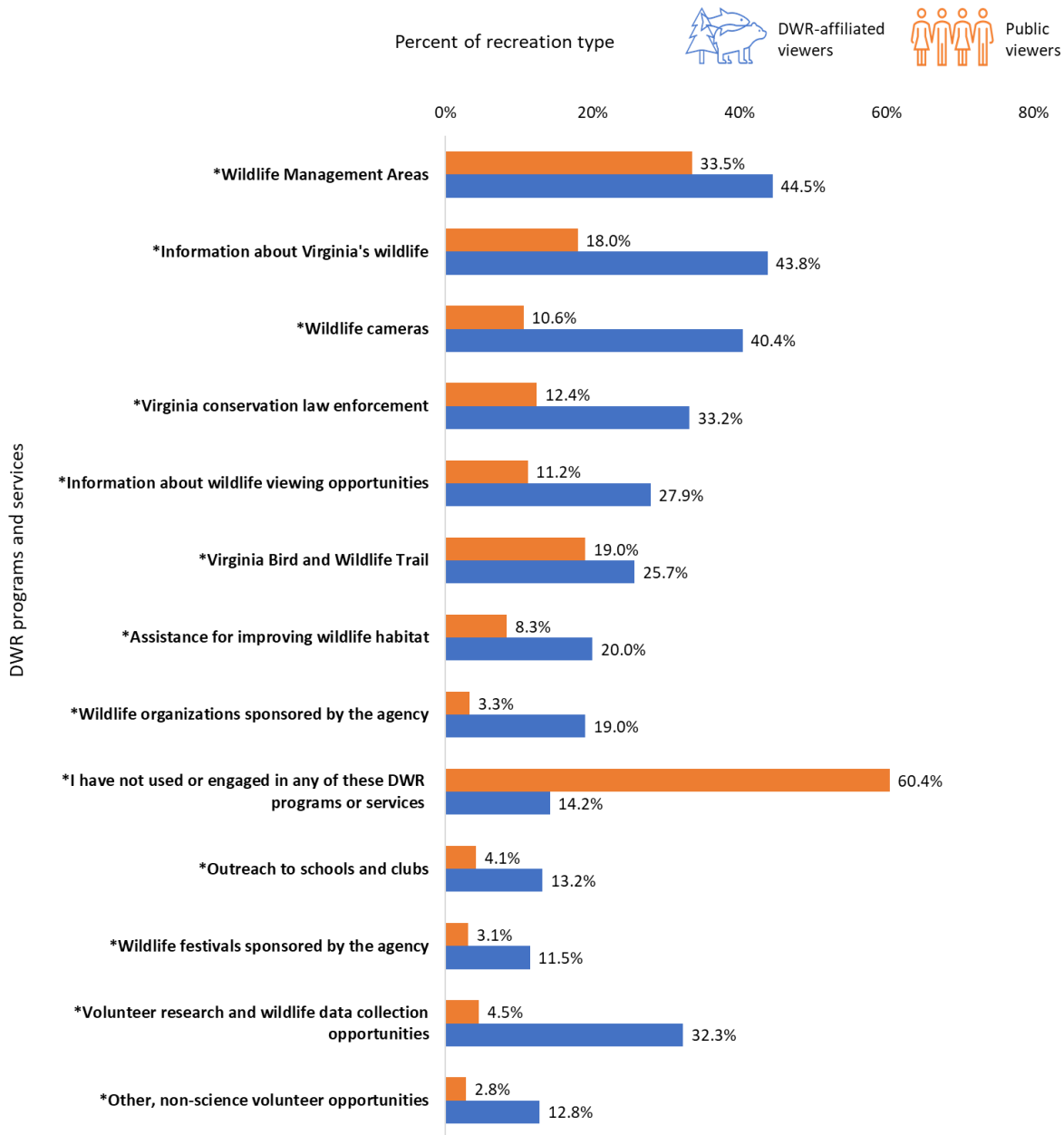
**Figure 8.** Percent of all viewers per sample by age, compared to Virginia’s population (DWR-affiliated n = 1661, Public n = 639, VA Population n = 8.5 million). Chi-square goodness-of-fit tests showed that the age distributions of all DWR-affiliated viewers ( $\chi^2 = 1200.6$ ,  $p < 0.001$ ) and all Public viewers ( $\chi^2 = 317.3$ ,  $p < 0.001$ ) were significantly different from that of the Virginia population.

*Do wildlife viewers engage in DWR programming for youth?*

Our survey included several items that contained response options related to youth programming. When asked to indicate which DWR programs and services they had participated

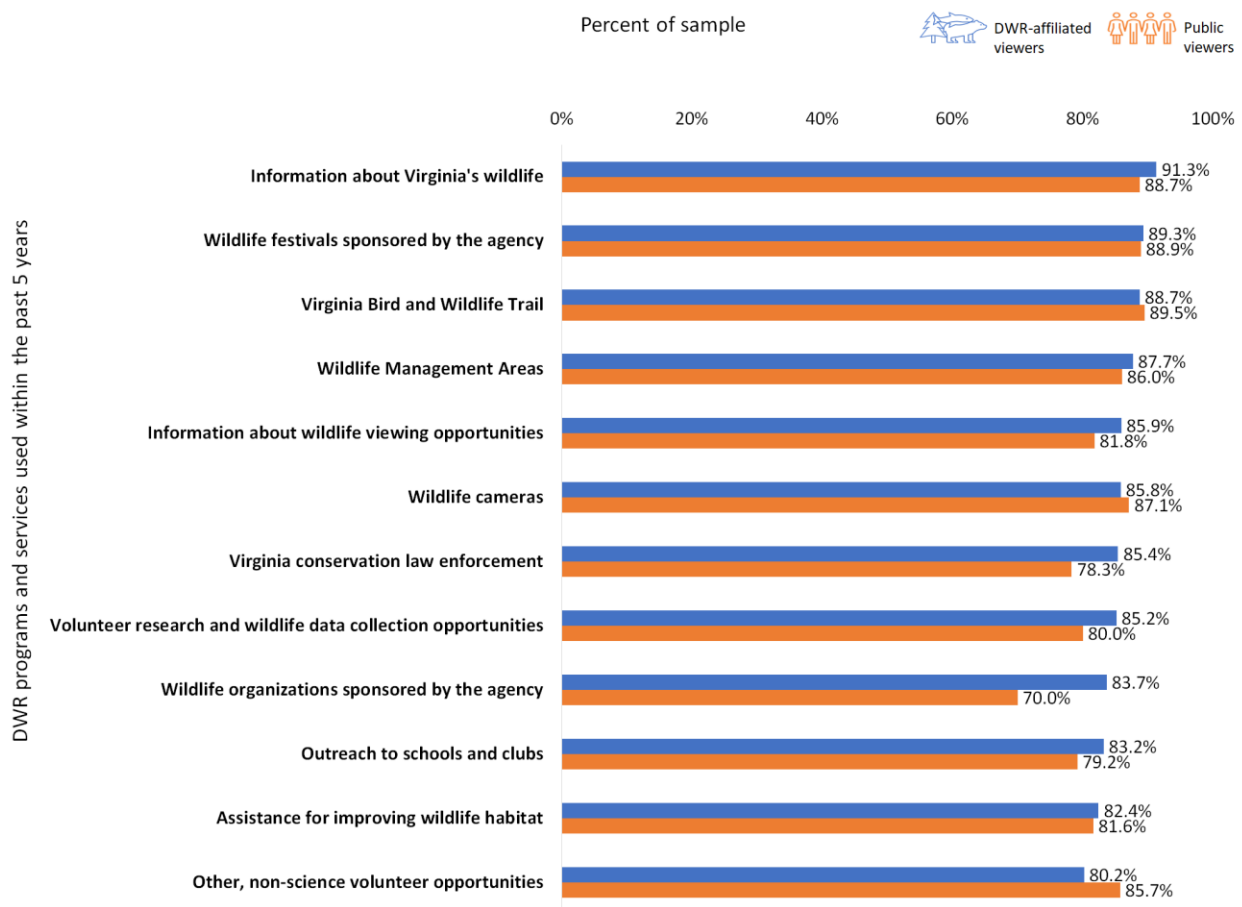


in within the past 5 years, 13.2% of all DWR-affiliated viewers and 4.1% of all Public viewers reported engaging with DWR outreach to schools and clubs (**Figure 9**). This percentage may be an underestimation of true engagement in youth programs within the state, however, since the survey did not ask respondents to report on programs that their children (if they have any) have engaged in. Furthermore, many school programs sponsored by DWR, such as Project WILD, are delivered by DWR volunteers or trainees and thus may not be attributed to the agency.

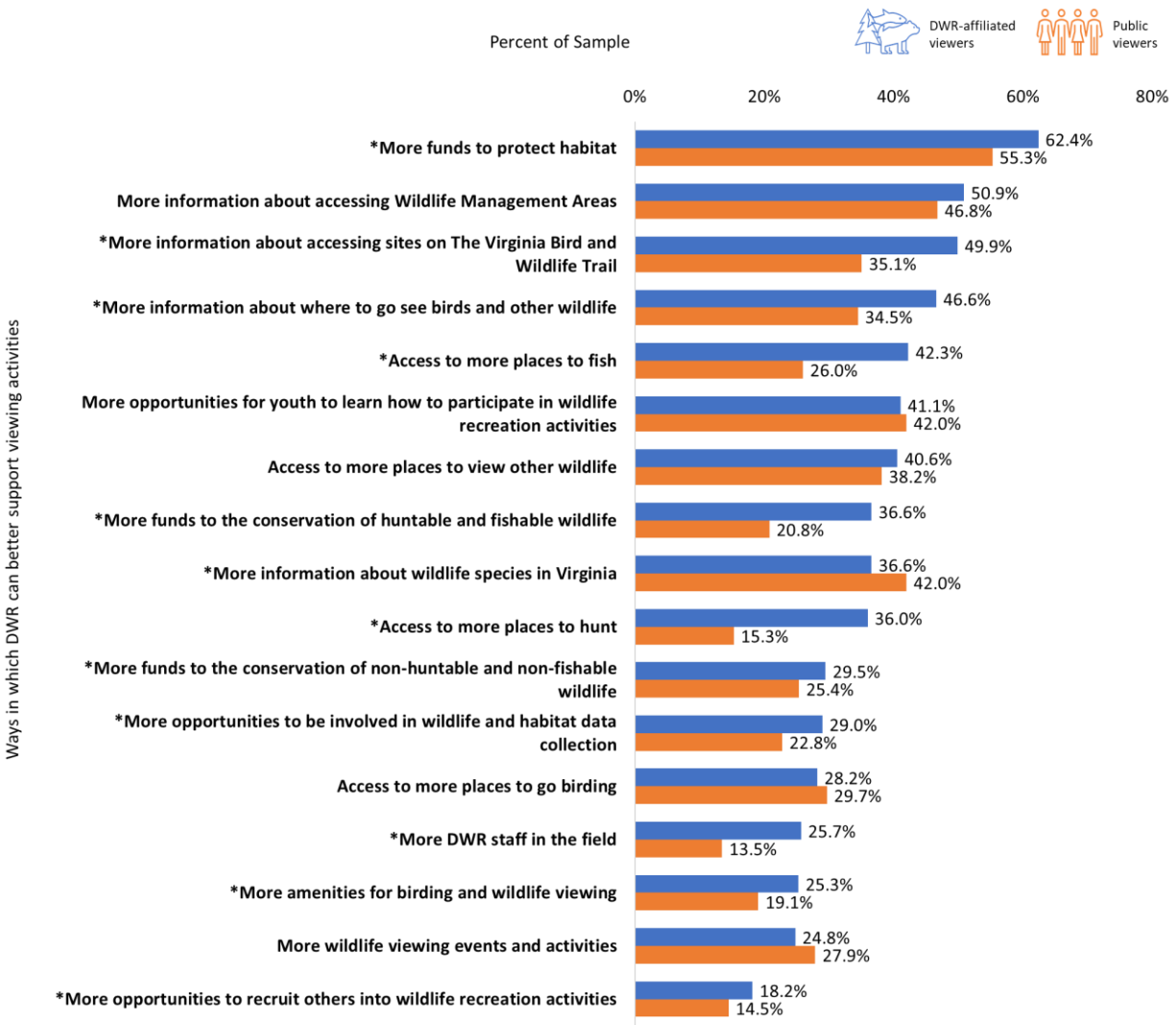


**Figure 9.** Percent of all viewers per sample that participated in DWR programs and services within the past 5 years (DWR-affiliated n = 1646; Public n = 605). Chi-square tests showed that participation in all programs differed significantly between the DWR-affiliated and Public samples ( $\chi^2 = 10.5 - 484.9, p < 0.001$ ). Asterisks (\*) note statistically significant differences at  $\alpha = 0.05$ .

Despite relatively low engagement rates in DWR programs and services within the past 5 years, there was high general satisfaction with existing outreach programs, as 79 - 83% of all viewers who engaged with DWR outreach programs to schools and clubs were ‘somewhat’ or ‘extremely satisfied’ with their experience (**Figure 10**). Further, in response to a question about what DWR could do to better support their wildlife recreation activities, 41.0% of all DWR-affiliated viewers and 42.0% of all Public viewers indicated that they would like to see the agency provide more opportunities for youth to learn how to participate in wildlife recreation (**Figure 11**).



**Figure 10.** Percent of all viewers who were ‘very’ to ‘somewhat’ satisfied with their participation in DWR programs and services, within the past 5 years, per sample.



**Figure 11.** Percent of all viewers per sample by what they think DWR could do to better support their recreation activities (n = 2286). Asterisks (\*) note statistically significant differences (chi-square) between the DWR-affiliated and Public samples at  $\alpha = 0.05$ .

**In summary:**

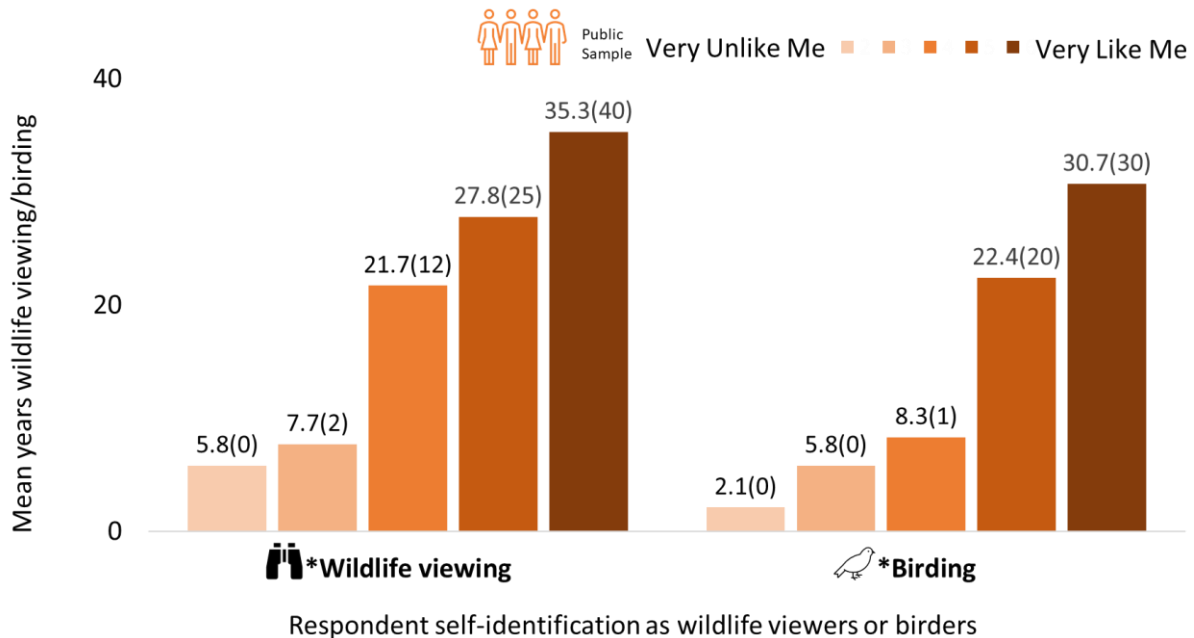
- Compared to Virginia data from the 2018 American Community Survey, individuals under age 45 were underrepresented among all viewers.
- Rates of participation in DWR outreach to schools and clubs were quite low among all viewers in our study, but over 80% of all viewers who have engaged with DWR's outreach programs in schools or clubs were satisfied with those programs.
- Over 40% of all viewers indicated that DWR could support their recreation activities by providing more opportunities for youth to engage in wildlife recreation.

**Objective 4: Develop resources to help viewers with little or no experience progress from initial awareness of recreational opportunities to continued participation and identification as a wildlife viewer.**

**Note:** The analyses under Goal 1, Objective 3 were conducted using only the Public sample. Additionally, rather than using all viewers, as is done in other objectives under Goals 1 and 2, all but the first analysis (**Figure 12**) for this objective were conducted separately for birders (respondents who indicated that “birder” is ‘somewhat’ or ‘very like me’) and wildlife viewers (respondents who indicated that “wildlife viewer” is ‘somewhat’ or ‘very like me’), since the survey questions pertinent to this section were specific to respondents’ participation in birding and other wildlife viewing.

*How is experience related to identifying as a wildlife viewer or birder?*

We considered this question by calculating the mean number of years that individuals with varying levels of self-identification as wildlife viewers and birders reported participating in wildlife viewing and birding, respectively. This included all respondents, including those who did not identify as a birder or wildlife viewer. We found that experience was positively related to the strength of identity for both activities. However, respondents who did not identify as wildlife viewers or birders still had substantial experience with those activities, on average. We note that respondents who identified as birders (describing a birder as “somewhat” or “very like me”) had at least 13 years more experience on average than those who were neutral about their identity as a birder; this difference was only 6 years for wildlife viewers (**Figure 12**). The reason for this difference is unclear, but possible explanations include potential variations in cultural perceptions of these activities, and specialization implications of identifying as a birder compared to identifying as a wildlife viewer.



**Figure 12.** Mean (median) number of years wildlife viewing or birding, by strength of self-identification as a wildlife viewer or birder, respectively (wildlife viewing  $n = 730$ ; birding  $n = 711$ ). Kruskal-Wallis tests with Dunn’s pairwise post-hoc tests showed that the median number of years wildlife viewing ( $\chi^2_4 = 160.3, p < 0.001$ ) and the median number of years birding ( $\chi^2_4 = 321.1, p < 0.001$ ) differed significantly among self-identification levels as wildlife viewers and birders, respectively.

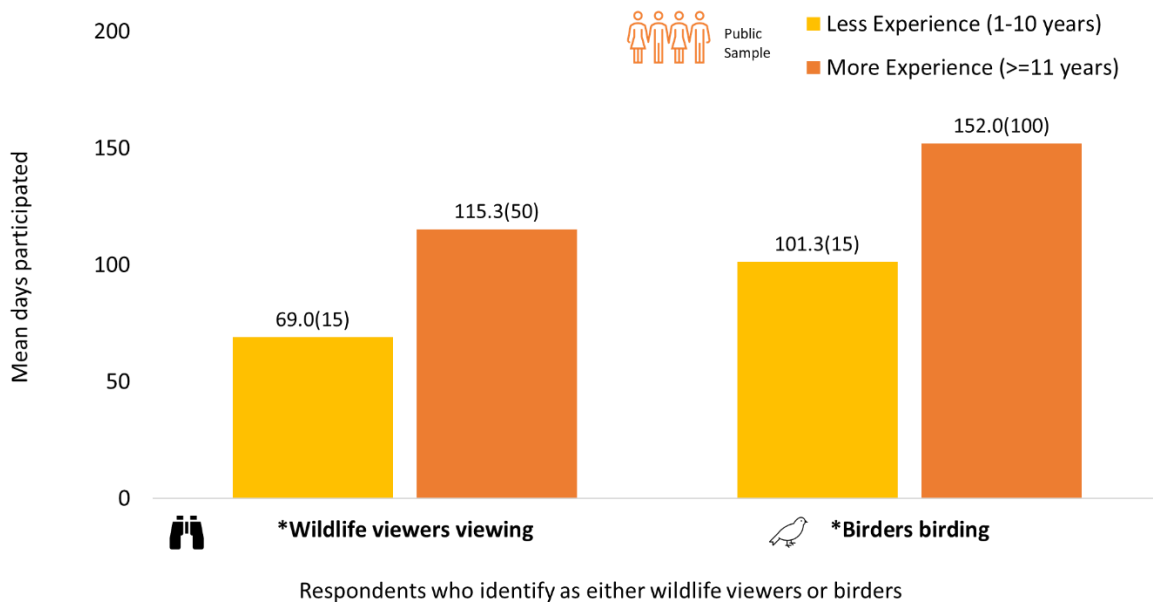
*How do the wildlife viewing activities of viewers with less and more experience compare?*

As **Figure 12** indicates, the mean number of years that respondents in our study had participated in birding and wildlife viewing was very high. In order to explore differences in the birding and wildlife viewing activities between viewers with more and less experience, we divided respondents into two groups, based on the first quartile of experience with birding among respondents who identified as birders. Those who identified as a birder and reported birding for 10 or fewer years were considered to have ‘less experience’ ( $n = 117$ ) and those who had been birding for 11 or more years were considered to have ‘more experience’ ( $n = 350$ ). For consistency, we used the same cut-off value (10 years) to distinguish between wildlife viewers with more ( $n = 476$ ; 82.5%) and less experience ( $n = 101$ ; 17.5%) with wildlife viewing (**Table 3**).

**Table 3.** Experience levels of birders and wildlife viewers in the Public sample, based on their number of years participating in birding and wildlife viewing, respectively (birders n = 467, wildlife viewers n = 577).

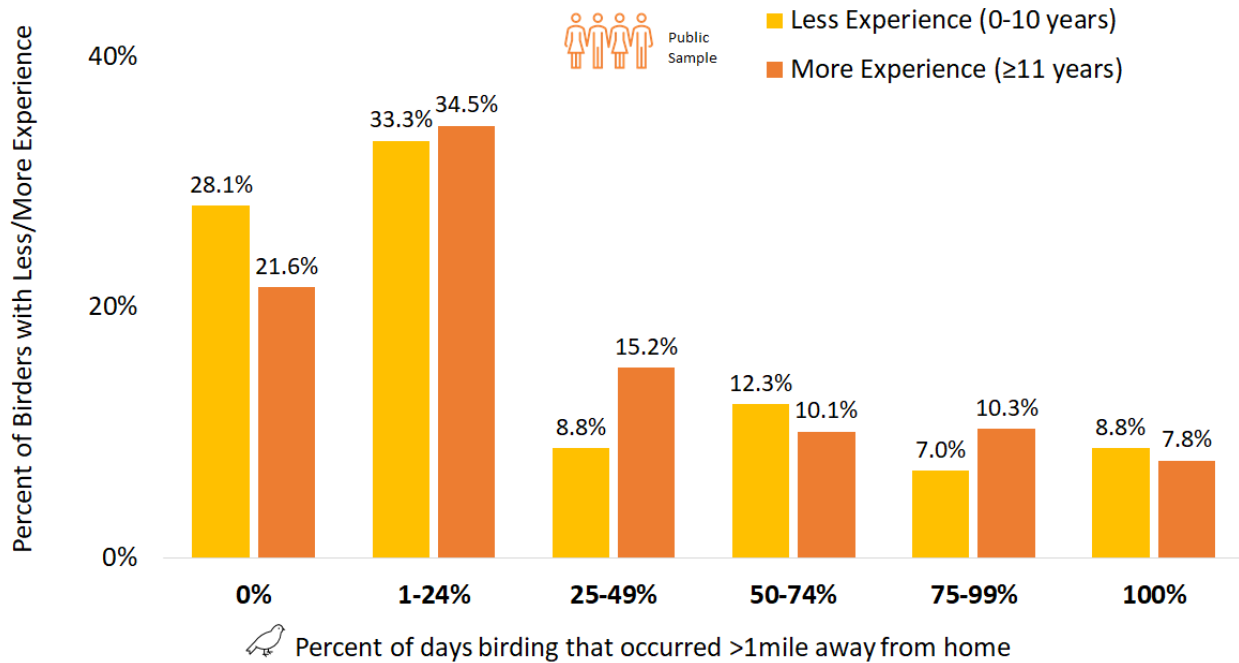
	Less experience (1 - 10 years)	More experience (≥11 years)
<b>Birding (n = 467)</b>	117 (25.1%)	350 (74.9%)
<b>Wildlife viewing (n = 577)</b>	101 (17.5%)	476 (82.5%)

On average, birders participated in birding for more days in the past year than wildlife viewers participated in wildlife viewing. For both activities, more experience was related to a higher number of days participated in the past year. More experienced birders participated an average of ~50 more days than less experienced birders, and more experienced wildlife viewers participated an average of ~45 more days than less experienced wildlife viewers (**Figure 13**).



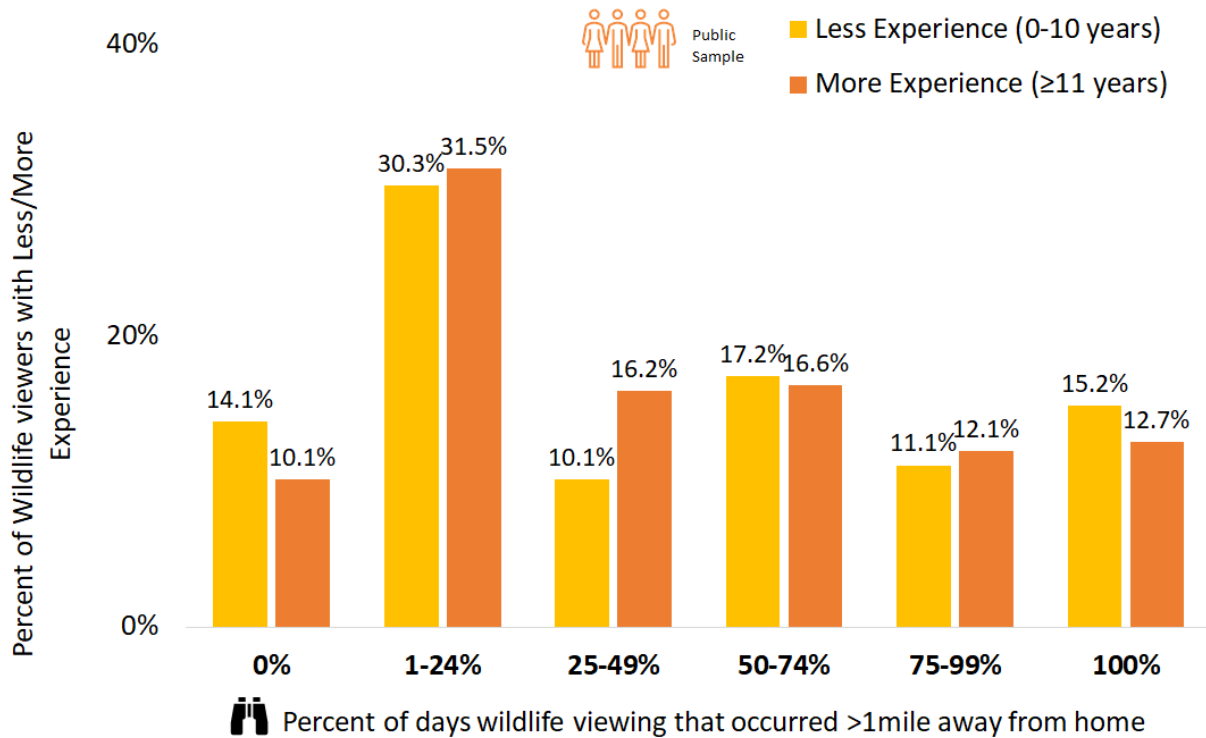
**Figure 13.** Mean (median) number of days that wildlife viewers and birders in the Public sample spent wildlife viewing or birding (respectively) within the past year (wildlife viewers n = 636, birders n = 530). Mann-Whitney U tests showed the median days spent wildlife viewing ( $U = 29762.5, p < 0.001$ ) and median days spent birding ( $U = 25478.0, p < 0.001$ ), differed significantly between less and more experienced wildlife viewers and birders, respectively.

Our survey asked respondents to specify what percent of these days they travelled more than a mile away from their home to participate in their wildlife recreation activities. Regardless of experience level, birders (**Figure 14**) more often than wildlife viewers (**Figure 15**) participated in their activity exclusively around their home, as opposed to away from home. However, most birders and wildlife viewers did not participate away from home on more than 50% of the days they participated. For both activities, there was no significant association between experience level and percent of days travelled away from home.



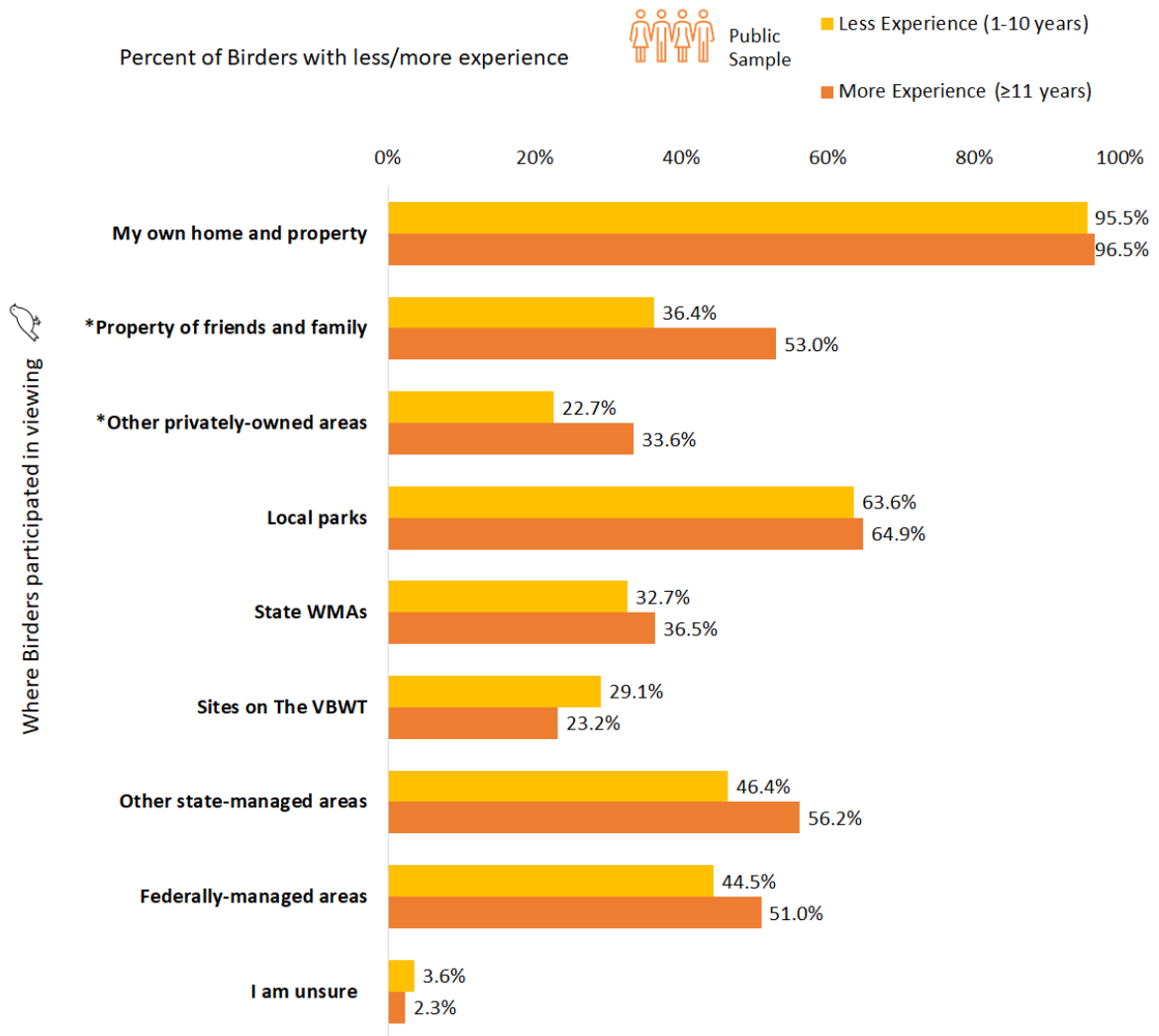
**Figure 14.** Percent of days that birders in the Public sample traveled >1 mile away from home for their birding activities, by experience level (Less experience n = 114; More experience n = 348). There was no significant association (chi-square) between experience level and percent of days travelled away from home for birding ( $\chi^2 = 7.123$ ,  $p = 0.310$ ).



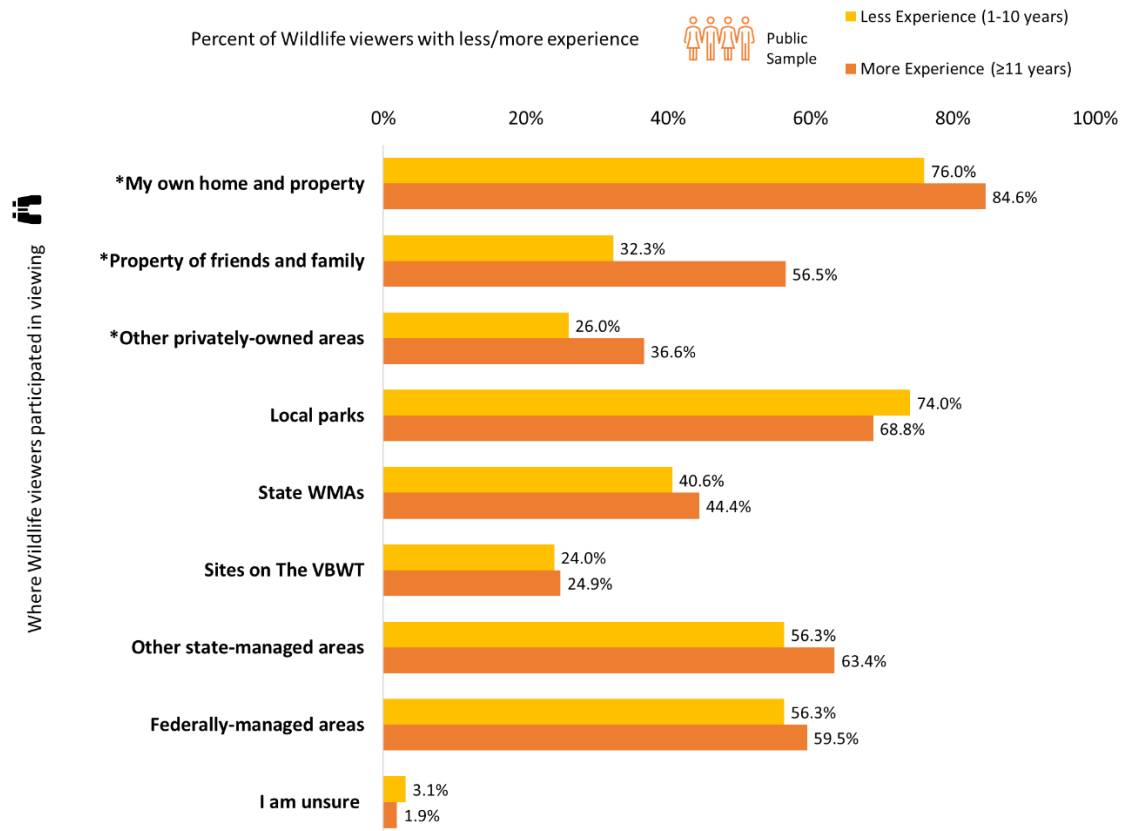


**Figure 15.** Percent of days that wildlife viewers in the Public sample traveled >1 mile away from home for their wildlife viewing activities, by experience level (Less experience n = 99; More experience n = 464). There was no significant association (chi-square) between experience levels and percent of days participated away from home ( $\chi^2 = 4.708$ ,  $p = 0.582$ ).

Our survey also asked respondents who identified as birders and wildlife viewers where in Virginia they had gone birding or wildlife viewing, respectively, in the past year. There were significant differences between more and less experienced birders in three locations: respondents' own home or property, the property of friends and family, and other privately-owned areas (**Figure 16**). More experienced birders were more likely to have done their birding activities at each of these locations than less experienced birders. Compared to birders, wildlife viewers displayed similar patterns in their past viewing locations (**Figure 17**), with one notable exception: while 85% of more experienced wildlife viewers and 76% of less experienced wildlife viewers reported viewing wildlife around their own home and property in the past year, over 95% of all birders in our sample, regardless of level of experience, had participated in birding around their own home or property.



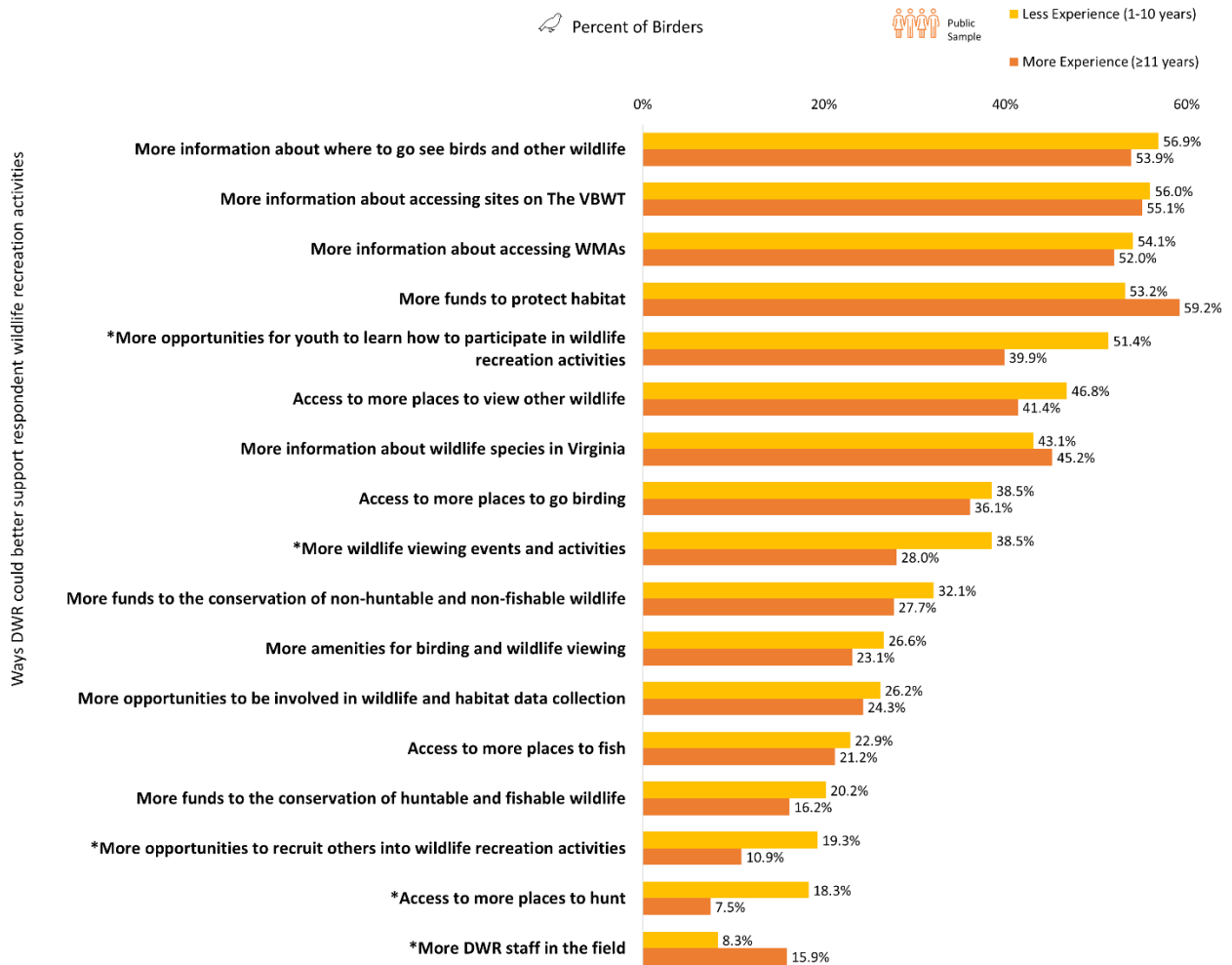
**Figure 16.** Percent of birders in the Public sample by experience level, by where in Virginia they participated in their birding activities within the past 12 months (Less experience n = 110, More experience n = 345). Asterisks (\*) note statistically significant differences (chi-square) between more and less experienced birders at  $\alpha = 0.05$ . Significant ( $\chi^2$ , p): property of friends/family (9.286, 0.002), other private areas (4.630, 0.031).



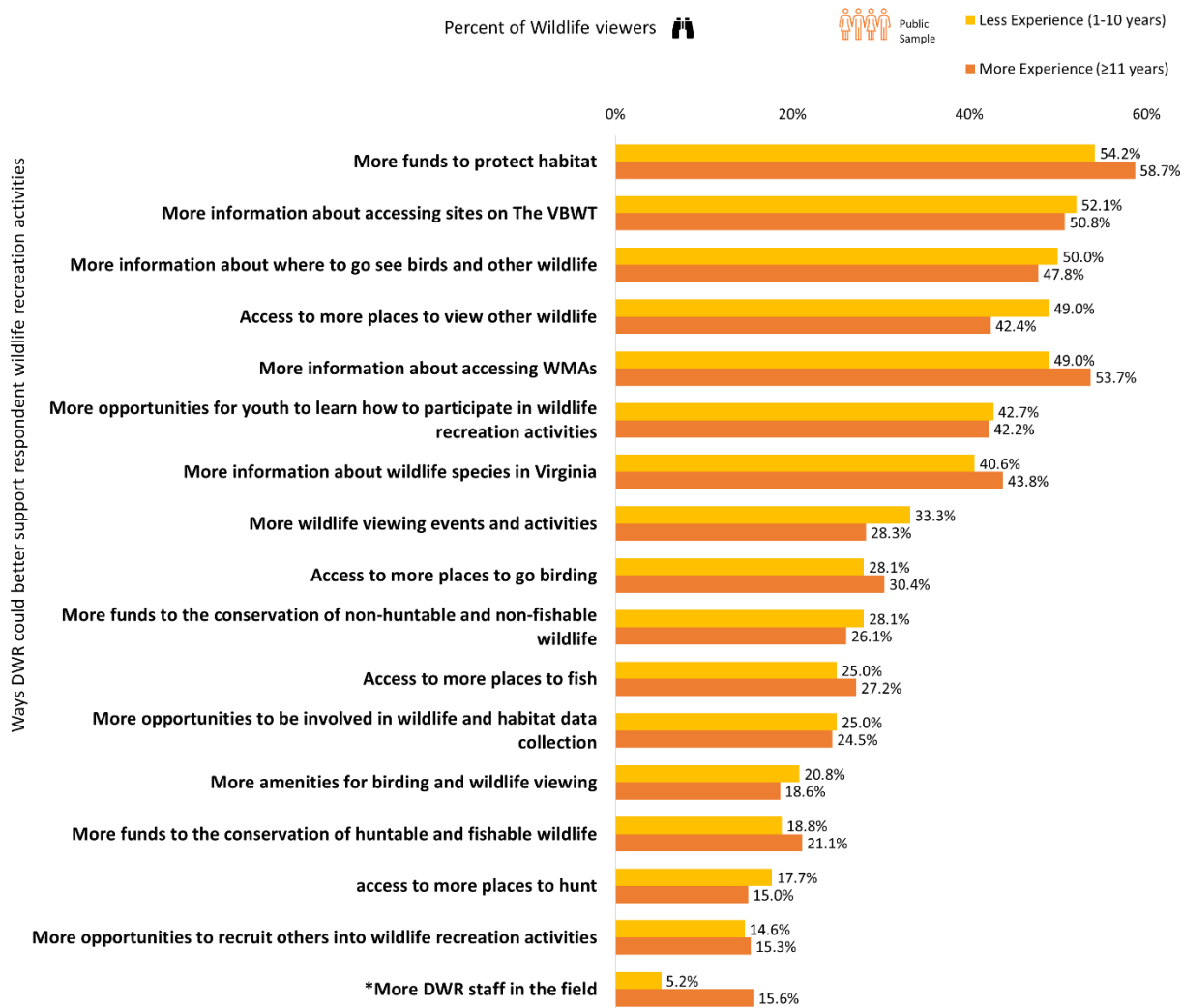
**Figure 17.** Percent of wildlife viewers in the Public sample by where in Virginia they participated in their wildlife viewing activities within the past 12 months (Less experience n =96, More experience n = 462). Asterisks (\*) note statistically significant differences (chi-square) between more and less experienced wildlife viewers at  $\alpha = 0.05$ . Significant ( $\chi^2$ , p): own home (4.187, 0.041), property of friends/family (18.663, 0.000), other private areas (3.892, 0.049).

*How can the DWR support wildlife viewing for viewers with a range of experience levels?*

When birders were asked how the DWR could better support their wildlife recreation activities, less experienced birders were significantly more likely than more experienced birders to desire support in four areas: opportunities for youth, wildlife viewing events, recruiting others to wildlife recreation, and access to more places to hunt (**Figure 18**). Of these, opportunities for youth was the most often selected, with 51% of less experienced birders indicating this as an area for better support. For both birders and wildlife viewers, more experienced participants were significantly more likely than less experienced participants to indicate a desire for more DWR staff in the field. This was the only form of support with a significant difference between more and less experienced wildlife viewers (**Figure 19**).



**Figure 18.** Percent of birders by what they think DWR can do to better support their recreation activities, by experience level (Birding: Less experience n = 109, More experience n = 321). Asterisks (\*) note statistically significant differences (chi-square) between more and less experienced birders at  $\alpha = 0.05$ . Significant ( $\chi^2$ , p): Hunting places (10.471, .001), Recruit Others (5.024, .025), Youth (4.396, .036), Viewing Events (4.213, .040), DWR staff (3.946, .047).



**Figure 19.** Percent of wildlife viewers by what they think DWR can do to better support their recreation activities, by experience level (Wildlife viewing: Less experience n = 96, More experience n = 441). Asterisks (\*) note statistically significant differences (chi-square) between more and less experienced wildlife viewers at  $\alpha = 0.05$ . Significant ( $\chi^2$ , p): DWR staff (7.229, 0.007).

### In summary:

- The majority of self-identified birders and wildlife viewers in our Public sample had more than 10 years of experience with birding and wildlife viewing, respectively.
- For both birding and wildlife viewing, years of experience was positively related to strength of identity as a birder or wildlife viewer, respectively. Experience was also positively related to the mean number of days participated in the last year and percent of days participating away from home.
- A higher percentage of more experienced than less experienced birders and wildlife viewers had participated in their recreation activities on private lands.

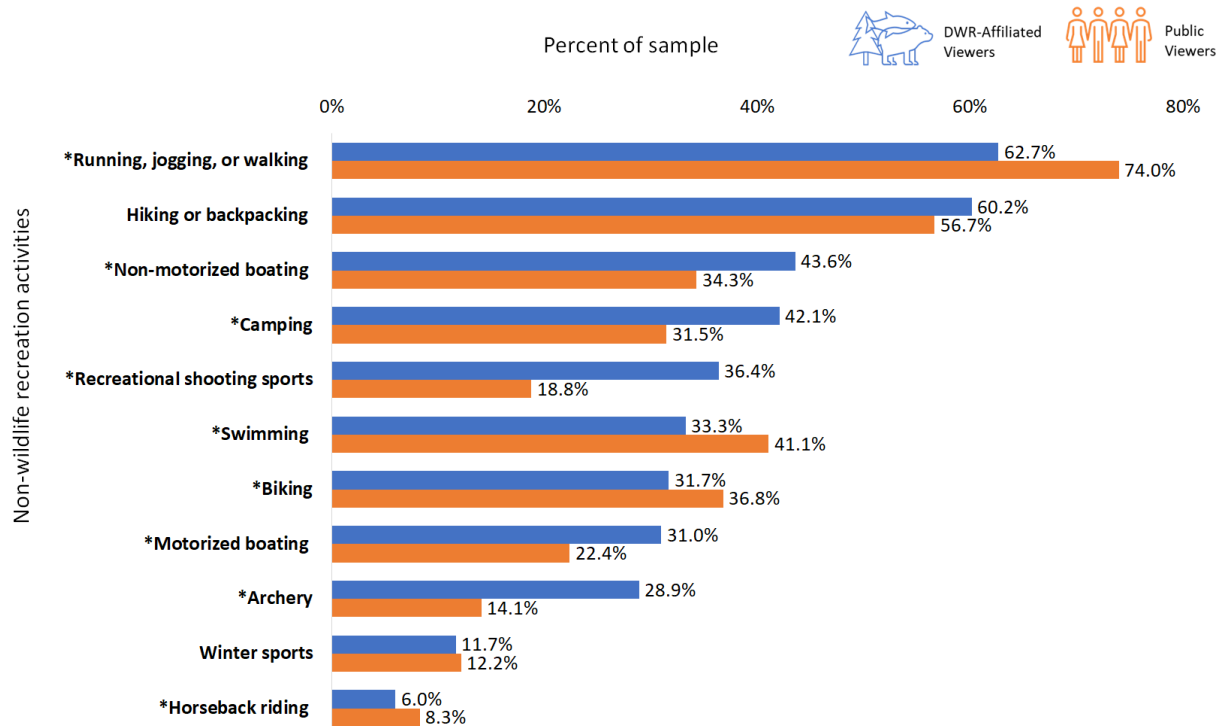
- Less experienced birders expressed more interest than more experienced birders in more DWR programming for youth, viewing events, recruitment opportunities, and hunting access.

**Objective 5: Raise awareness of wildlife viewing among groups that participate in other forms of outdoor recreation, in order to enrich their outdoor experience and introduce a new and related activity.**

*Which types of non-wildlife-related recreation do wildlife viewers participate in?*

Among all viewers, running, jogging, or walking was the most popular non-wildlife-related activity, with 74% of all Public viewers and 63% of all DWR-affiliated viewers participating. Over half of all viewers also reported participating in hiking or backpacking (DWR-affiliated: 60.2%; Public: 56.7%). These responses may provide some insight into other outdoor activities that are compatible with birding and wildlife viewing. Comparing all DWR-affiliated and Public viewers, swimming and biking were more popular among all Public viewers. In contrast, all four of the listed activities for which opportunities are managed by the Virginia DWR – non-motorized boating, motorized boating, recreational shooting, and archery – were more popular among all DWR-affiliated viewers than all Public viewers (**Figure 20**). In both samples, winter sports and horseback riding were the least popular of the activities listed.





**Figure 20.** Percent of all viewers per sample that participate in non-wildlife recreation activities, by sample (DWR-affiliated n = 1894; Public n = 674). Asterisks (\*) note statistically significant differences between DWR-affiliated and Public samples at  $\alpha = 0.05$ . Chi-square tests showed that all viewers differed significantly between both samples for all non-wildlife recreation activities ( $\chi^2 = 2.62 - 57.9$ ,  $p < 0.001 - 0.04$ ), except for hiking or backpacking, and winter sports.

*Which types of non-wildlife-related recreation do wildlife recreationists participate in?*

For this analysis, we compared the wildlife recreationists in both samples to the non-recreationists in both samples (non-viewer = any respondent who did not participate in any form of wildlife recreation). In the DWR-affiliated sample, running/jogging/walking, hiking/backpacking, and non-motorized boating were more popular among wildlife recreationists (**Table 4**). In the Public sample, wildlife recreationists were more likely than non-viewers to participate in every activity listed, with notably large differences in hiking/backpacking and non-motorized boating (**Table 8**). No more than 10% of public non-viewers participated in the aforementioned DWR-managed activities.

**Table 4.** Percent of wildlife recreationists compared to non-viewers in the DWR sample and Public sample. Asterisks (\*) note statistically significant differences (chi-square) between viewers and non-viewers at  $\alpha = 0.05$  within both samples.

Non-wildlife recreation activities	DWR-affiliated sample (n = 2418)		Public sample (n = 942)	
	Wildlife recreationists	Non-wildlife recreationists	Wildlife recreationists	Non-wildlife recreationists
Running, jogging, or walking	58.7%*	43.5%	72.0%*	57.6%
Hiking or backpacking	56.3%*	31.3%	54.5%*	30.5%
Non-motorized boating	42.3%*	26.1%	33.3%*	9.40%
Camping	41.9%	38.3%	31.4%*	10.3%
Recreational shooting sports	37.8%	37.4%	19.1%*	6.4%
Swimming	33.2%	29.6%	40.3%*	25.1%
Biking	30.6%	26.1%	36.8%*	20.2%
Motorized boating	32.1%	35.7%	22.6%*	9.90%
Archery	30.7%	28.7%	13.3%*	3.00%
Winter sports	11.7%	6.1%	11.8%	6.40%
Horseback riding	6.10%	1.70%	8.30%*	4.90%

**In summary:**

- For both samples, there were high rates of participation in non-wildlife focused recreation among wildlife recreationists, especially in running, jogging, and walking and hiking and backpacking.
- DWR-affiliated wildlife recreationists had greater participation in running, jogging, and walking, hiking, and backpacking, and non-motorized boating compared to non-viewers. However, participation in other non-wildlife focused activities were comparable between DWR-affiliated wildlife recreationists and non-viewers.
- In the Public sample, wildlife recreationists had higher participation in all non-wildlife recreation activities compared to non-viewers. However, over a quarter of non-viewers reported participating in running, jogging, and walking, hiking, and backpacking, biking, and camping.

## Goal 2: Provide a variety of wildlife viewing opportunities accessible to all in the Commonwealth

**Note:** As in Goal 1, most of the analyses presented under Goal 2 compare survey responses from all viewers (i.e., anyone who identified as a birder or wildlife viewer; **Table 2a,b**) between the survey samples (DWR-affiliated and the Public). For survey items that were asked specific to individual recreation activities (e.g., frequency, duration, or location of birding), analyses were conducted separately for respondents who identified as birders or respondents who identified as wildlife viewers.

*To what extent do viewers desire more access to viewing locations?*

In answering our survey question about how the DWR could better support their wildlife recreation activities, ~30% of all viewers indicated that the DWR could provide access to more places to go birding (**Figure 11**). A slightly higher proportion (~40%) desired access to more places to view other wildlife. We did not observe significant differences between DWR-affiliated and Public respondents for either of these items. In response to the same question, 25% of all DWR-affiliated viewers and 19% of all Public viewers desired more amenities for birding and wildlife viewing (such as viewing platforms, blinds, and signs).

**Objective 1: Encourage increased wildlife viewing on Agency lands and waters through habitat management and communications about these properties.**

*and*

**Objective 2: Increase use of Virginia Bird and Wildlife Trail sites for wildlife viewing activities.**

Birders and wildlife viewers in our survey visited a variety of locations to engage in birding and wildlife viewing activities, respectively. Public lands that are not managed by the DWR, including other state-managed areas, federally managed areas, and local parks, were visited in the past year by a higher proportion of birders and wildlife viewers than were VBWT sites and WMAs (**Table 5**). Between those two land categories, more wildlife viewers and birders in both samples reported visiting WMAs for their activities than VBWT sites.

**Table 5.** Percent of wildlife viewers and birders that used each location within the past 12 months for their wildlife viewing and birding activities, respectively, by sample. Asterisks (\*) note statistically significant differences (chi-square) between the DWR-affiliated and Public sample at  $\alpha = 0.05$ .

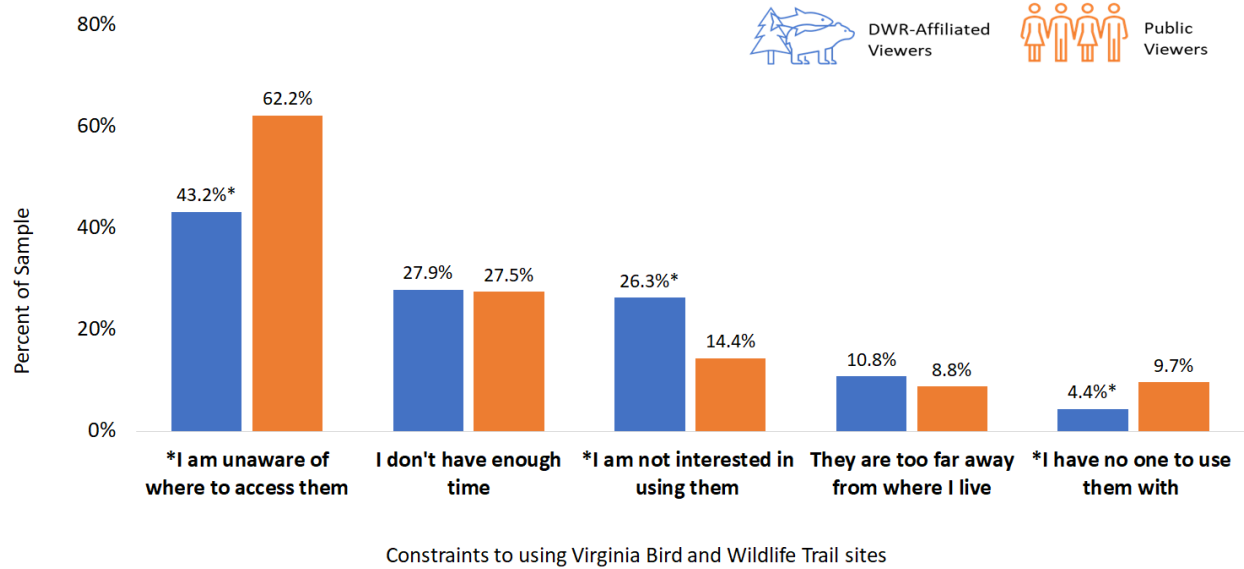
Public lands visited in the past 12 months	Wildlife viewers viewing (n = 2212)		Birders birding (n = 1832)	
	DWR-affiliated (n = 1631)	Public (n = 581)	DWR-affiliated (n = 1358)	Public (n = 474)
<b>Sites on VBWT</b>	29.4%*	24.6%	40.1%*	24.7%
<b>State WMAs</b>	51.7%*	43.5%	49.6%*	35.7%
<b>Other state-managed areas</b>	59.0%	61.4%	60.9%*	53.6%
<b>Federally-managed areas</b>	62.2%	57.8%	61.8%*	48.5%
<b>Local parks</b>	60.2%*	68.8%	64.9%	63.9%
<b>My own home or property</b>	85.8%*	82.3%	96.3%	96.0%
<b>Property of friends or family</b>	54.6%	51.6%	48.2%	47.7%
<b>Other privately-owned areas</b>	41.6%*	34.4%	37.5%*	30.6%

A separate question asked respondents to indicate which DWR programs and services, including WMAs and the VBWT, they had used in the past five years. Overall, 41.7% of all viewers (including birders and wildlife viewers) reported having visited a WMA in the past five years; 24.0% reported having visited sites on the VBWT (**Figure 9**).

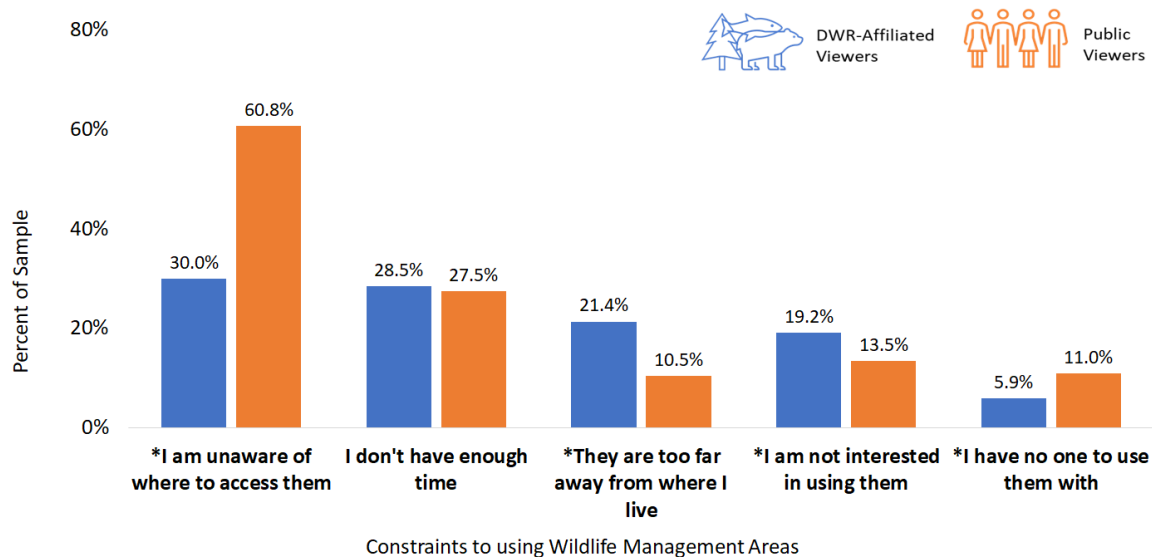
*What are the perceived constraints to WMA and VBWT use among viewers who do not use these public lands?*

Those who indicated that they had not visited a VBWT or WMA in the past five years were asked to specify which of five constraints to public lands visitation prevented them from doing so. For both VBWTs (**Figure 21**) and WMAs (**Figure 22**), limited awareness of where to access these lands was the most common constraint to using them among all viewers, especially for all Public viewers; over 60% of all Public viewers responded as being constrained from visiting both areas by a lack of awareness of their location. In contrast, no more than 30% of respondents to this question felt constrained by time, distance, interest, or social connection. In the open-ended “Other” field for this question, some of the all viewers indicated that they were

unaware of the existence of WMAs or the VBWT altogether. This was written into the open-ended “Other” field as a constraint to accessing these public lands 14 times for VBWT sites and 10 times for WMAs. For example, one respondent wrote, “I am familiar with and have used WMAs but not the bird/wildlife trail.”



**Figure 21.** Percent of all viewers per sample by what constrains them from accessing Virginia Bird and Wildlife Trail sites (DWR-affiliated n = 1233; Public n = 487). Asterisks (\*) note statistically significant differences (chi-square) between the DWR-affiliated and Public samples at  $\alpha = 0.05$ .



**Figure 22.** Percent of all viewers per sample by what constrains them from accessing Virginia Wildlife Management Areas (DWR-affiliated n = 908; Public n = 400). Asterisks (\*) note statistically significant differences (chi-square) between the DWR-affiliated and Public samples at  $\alpha = 0.05$ .

Open-ended responses to the survey question about constraints to WMA and VBWT usage revealed that respondents often perceived constraints that did not fall under those that we pre-specified. One commonly written-in constraint to VBWT and WMA use among all viewers who had not visited those areas in the past five years was physical limitation. Constraints related to sickness, disability, and age were mentioned frequently in early responses to the survey among respondents from the DWR sample, so we added it as a closed-ended response option before administering the online survey to the Public sample. Between open- and closed-ended responses, physical limitations to WMA or VBWT usage were indicated 192 times. For example, one respondent wrote: “I am unsure of the wheelchair accessibility on the bird and wildlife trail.”

Of all viewers who had not visited a WMA in the past five years, 15 wrote of their perception that WMAs are only for hunters, and 13 wrote that they were disinclined to purchase a permit or license to access those lands. Nine respondents indicated that they thought WMAs were overcrowded, and seven respondents, some of whom also wrote about hunting and overcrowding, perceived WMAs as being unsafe. For example, one wildlife viewer wrote,

“I am... concerned about my safety because of hunting that may be taking place on these properties. I don't feel like it is very easy to access information on when these properties are open ONLY for wildlife viewing.”

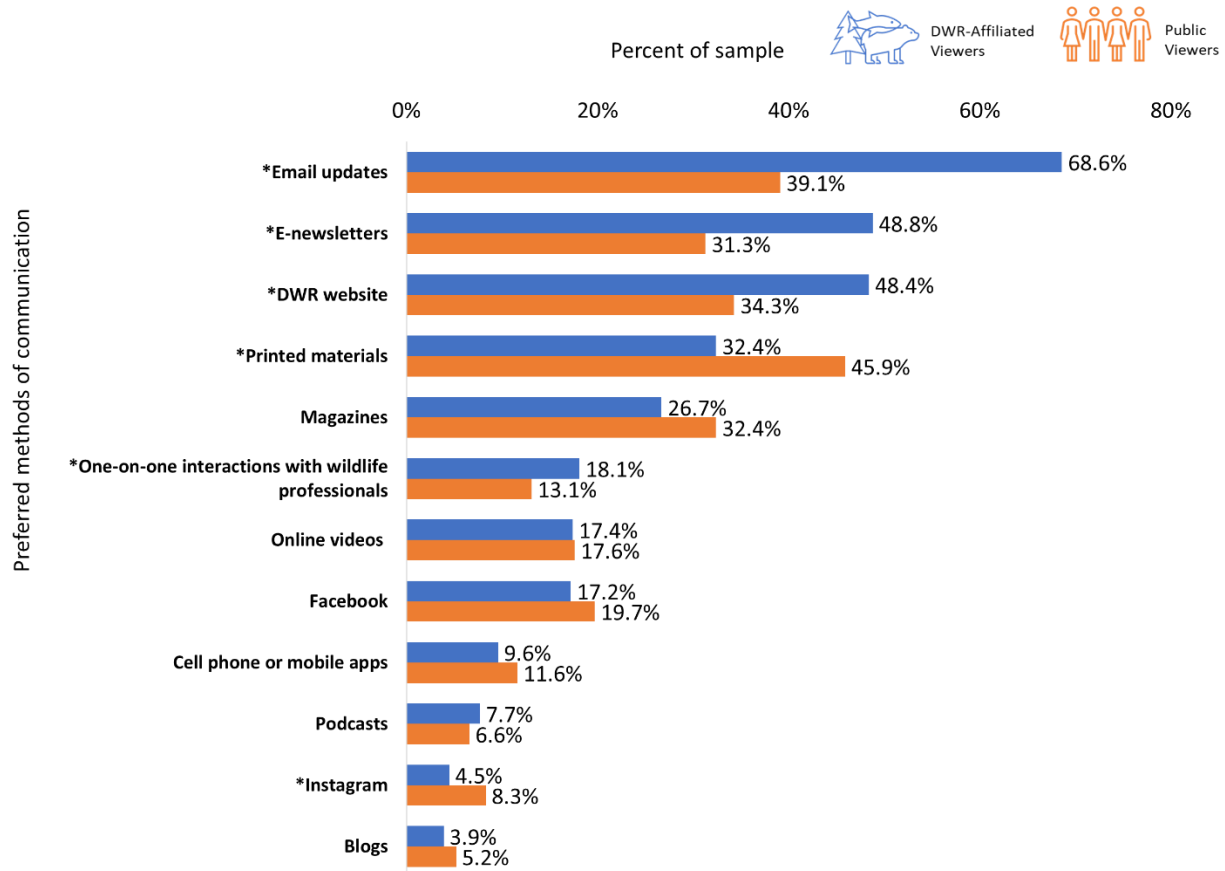
Another 8 respondents across our combined survey samples indicated that issues of visibility and consistency of management constrained their use of VBWT sites. One all viewer elaborated on this further, saying,

“Many [VBWT sites] are located at odd locations such as on private properties with uncertain access... For the most part there is no available information on the properties other than a single brown sign with the [former] VDGIF logo and the birding and wildlife trail identifier.”

*What kinds of communication about viewing opportunities on WMAs and the VBWT are of interest to viewers?*

About 50% of all Public viewers indicated that DWR could support their viewing activities by providing more information about accessing WMAs and sites on the VBWT (**Figure 12**). Almost half of all Public viewers were also interested in general information from the agency about where to go to see birds and other wildlife. While the level of interest in information about accessing WMAs was similar among all DWR-affiliated viewers (46.8%), interest in information about the VBWT and general information about viewing locations was slightly lower (35.1% and 34.5%, respectively). Although all viewers expressed interest in more information about viewing locations from the agency, only 27.9% of all DWR-affiliated viewers and 11.2% of all Public viewers reported using DWR information about wildlife viewing opportunities (e.g., information about where to view wildlife) in the past 5 years (**Figure 10**).

Our survey asked respondents to select their preferred method(s) of receiving information about wildlife recreation and conservation opportunities from DWR. We found that all DWR-affiliated viewers preferred the electronic communication methods commonly used by DWR, especially email updates (68.6%), e-newsletters (48.8%), and the DWR website (48.4%). In contrast, all Public viewers most often indicated an interest in communication via printed materials (45.9%), followed by electronic communication and magazines (Figure 23).

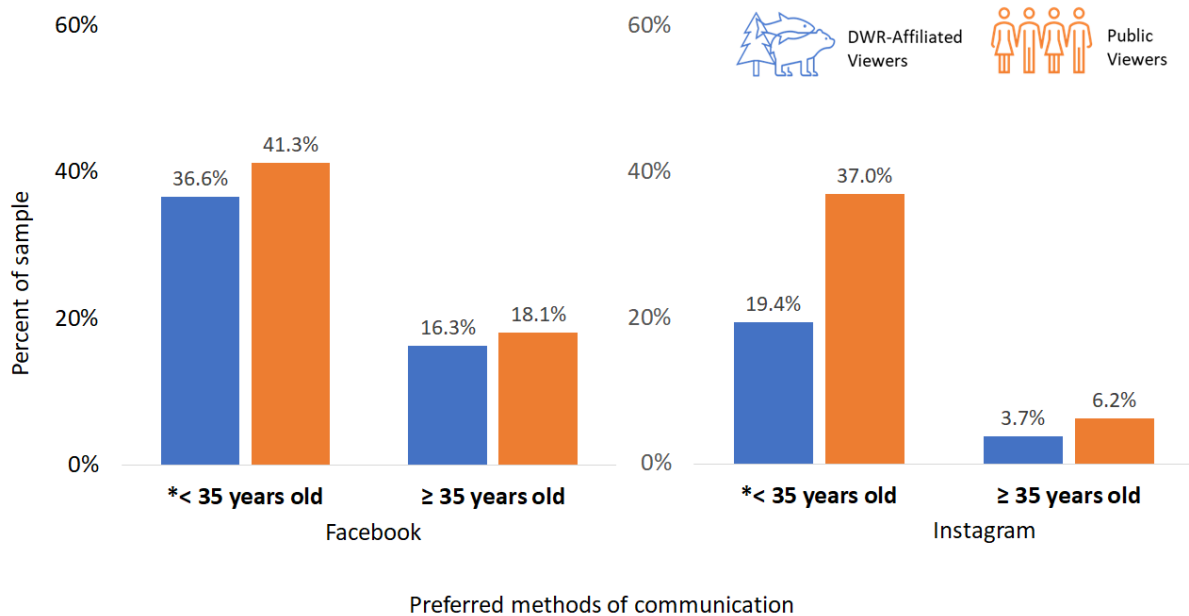


**Figure 23.** Percent of all viewers per sample by preferred communication mechanisms for receiving information from DWR about wildlife recreation and conservation opportunities (DWR-affiliated n = 1669; Public n = 654). Asterisks (\*) note statistically significant differences between the DWR-affiliated and Public samples at  $\alpha = 0.05$ .

Although a relatively small proportion of all viewers preferred social media communication methods (e.g., Facebook and Instagram), preference for these communication platforms was higher among all younger viewers, defined here as “millennials” (under 35 years old). Compared to all older viewers, a significantly higher percentage of all younger viewers preferred receiving information from the agency via Facebook and Instagram (Figure 24). These patterns were similar across both the DWR-affiliated and Public sample, with differences in preferences



between age brackets especially large for Instagram among all Public viewers. Importantly, individuals under age 35 were underrepresented among all viewers.



**Figure 24.** Percent of millennial (age <35) all viewers per sample that prefer using Facebook (Millennials: DWR-affiliated n = 93, Public n = 46; Non-millennials: DWR-affiliated n = 777, Public n = 190) or Instagram (Millennials: DWR-affiliated n = 93, Public n = 46; Non-millennials: DWR-affiliated n = 252, Public n = 105) for receiving information from DWR about recreational opportunities. Asterisks (\*) note statistically significant differences (chi-square) between the DWR and Public samples at  $\alpha = 0.05$ .

**In summary:**

- Between 30 and 40% of all viewers indicated that DWR could support them by providing more access to locations for seeing birds and other wildlife. Less than a quarter of all viewers expressed a desire for more viewing amenities (e.g. platforms, blinds, signs).
- WMAs and VBWT sites were used by fewer wildlife viewers and birders than other public lands, including other state-managed areas (e.g., state parks, state forests, boat landings, and Natural Area Preserves), for their wildlife viewing and birding activities.
- VBWT sites and WMAs were used in the past year by a greater proportion of DWR-affiliated wildlife viewers and birders than those in the Public sample. More wildlife viewers and birders in both samples reported visiting WMAs for their activities than VBWT sites.
- Among all viewers who did not use WMAs and VBWTs, the most common perceived constraint (especially in the Public sample) was a lack of awareness of the location of access points to these lands. Constraints related to physical limitations were commonly written-in.
- Other open-ended responses from all viewers expressed constraints related to the use of WMAs by hunters and the visibility and consistency of management at VBWT sites.

- Almost half of all Public and DWR-affiliated viewers desired more information from DWR about accessing VBWT sites and WMAs.
- Use of information from DWR about wildlife viewing opportunities among all viewers in the past five years was relatively low, especially among all Public viewers.
- All DWR-affiliated viewers preferred receiving online communication materials; all Public viewers preferred receiving printed materials.
- Overall, there was low interest in social media communications, but Facebook and Instagram were more popular among all viewers under 35 years old than all viewers older than 35. Importantly, this younger age bracket was underrepresented among all viewers.

### **Objective 3: Increase access to wildlife viewing opportunities at or close to home.**

*To what extent do viewers watch wildlife around their homes?*

We found that over 90% of birders and over 80% of wildlife viewers from both samples had participated in their respective activities at their own home or property in the past year (**Table 5**).

*To what extent do viewers use DWR's resources that support viewing at home?*

A far higher proportion of all DWR-affiliated viewers than all Public viewers had used DWR wildlife cameras (e.g., the Richmond falcon cam, elk cam, and shad cam) in the past five years (40.4% vs. 10.6%). Similarly, a higher proportion had used DWR's resources for improving wildlife habitat, which includes recommendations and resources for landowners on establishing habitat on their private property. While 20.0% of all DWR-affiliated viewers had used these DWR resources in the past five years; only 8.3% of all Public viewers reported using these materials (**Figure 9**).

#### **In summary:**

- The majority of birders and wildlife viewers in both samples watched birds and other wildlife, respectively, around their home.
- Compared to all Public viewers, all DWR-affiliated viewers more often reported having used DWR wildlife cameras and assistance from DWR for improving wildlife habitat.

### Goal 3: Promote wildlife and habitat conservation through wildlife viewing

**Note:** Most of the analyses presented under Goal 3 compare survey responses across the four recreation types identified through our latent class analysis: Hunter-anglers, Birder-viewers, Viewer-hunter-anglers, and Birder-viewer-hunter-anglers (**Table 6**). In some cases where differences across the recreation types were minimal, these recreationists are combined to simplify the presentation and interpretation of the data. Additionally, unlike data described for other goals, the following analyses generally do not account for survey samples; instead, recreationists from the DWR-affiliated and Public samples are grouped together as a single sample.





#### *What types of wildlife recreationists are in Virginia?*

As noted in Goal 1, our survey revealed considerable overlap among hunters, anglers, birders, and wildlife viewers. For example, the majority of respondents who identified as hunters and anglers also identified as wildlife viewers and/or birders. In order to further explore the intersection of recreational identities among survey respondents, we conducted a latent class analysis (LCA), which groups individuals based on their responses to survey questions.

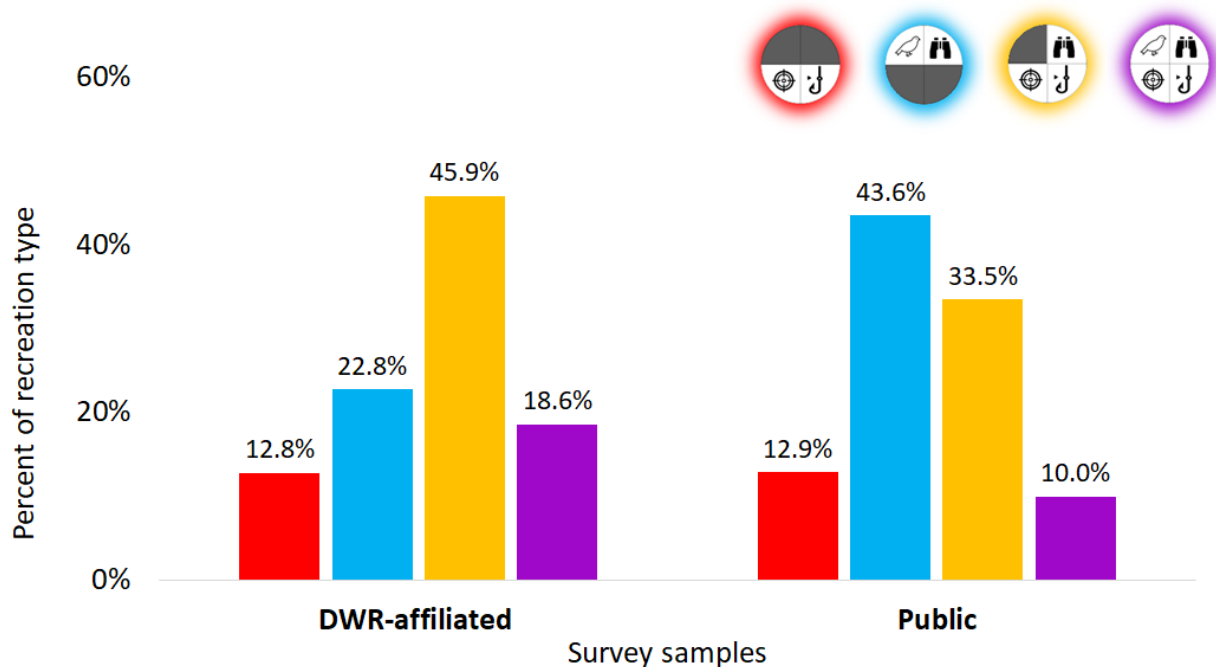
We estimated latent class models for up to 10 classes, based on the strength of respondent's self-identification as a hunter, angler, birder, and wildlife viewer. During model development and testing, we also considered other predictors beyond self-identification, including days within the past year spent participating in each recreation activity. The number of days participated in the last year has been used in previous studies to identify specialization levels in wildlife recreationists (McFarland, 1994); however, inclusion of this variable in our models resulted in typologies with recreation types that were either not representative of the spectrum of consumptive and non-consumptive activities, or too nuanced in the avidity of the recreation activity. Further, by using self-identity as our model predictor, our recreation types may better capture respondents who participate in multiple recreation types but have not participated in those activities recently due to various life constraints. When the LCA model for the DWR-affiliated sample was applied to the Public sample, similar patterns of recreation identity were observed, indicating that the typology was useful for understanding recreationists from both samples.

Based on the lowest BIC value, 4 latent classes were identified (hereafter, "recreation types"; **Table 6**). We labelled these recreation types by the recreational identities that were most consistently and strongly reported by individuals in that class; these types include: Hunter-anglers, Birder-viewers, Viewer-hunter-anglers, and Birder-viewer-hunter-anglers.

**Table 6.** Recreation types based on the LCA analysis with definitions.

Recreation types	Icon	Descriptions
<b>Hunter-anglers</b>		Strongly identify as hunter and anglers, strongly do not identify as birders or viewers.
<b>Birder-viewers</b>		Strongly identify as birders and viewers, strongly do not identify as hunters or anglers
<b>Viewer-hunter-anglers</b>		Strongly identify as hunters and anglers, somewhat identify as viewers, and no defining identity as birders.
<b>Birder-viewer-hunter-anglers</b>		Strongly identify as birders, viewers, hunters, and anglers

In comparing the distribution of the recreation types within each survey sample, the Viewer-hunter-angler type comprised almost 46% of wildlife recreationists in the DWR sample, with the other 3 types collectively representing 64%, while the Public sample consisted of almost 44% Birder-viewers (**Figure 25**).



**Figure 25.** Distribution of samples across recreation types (DWR n = 2346, public n = 807).

While respondents' levels of identification as each kind of recreationist was used to build these recreation typologies, the four recreation types also differed in terms of the amount of time spent recreating and their sociodemographic characteristics. As expected, the three recreation types containing a birder or viewer component spent more days, on average, engaged in wildlife viewing or birding than Hunter-anglers, while the recreation types that contained a hunter or angler component spent more days, on average, engaged in hunting and fishing than Birder-viewers (**Table 7**). Recreation types with a birder component spent, on average, between 154 - 180 days birding and between 115 - 159 days wildlife viewing in the past year, compared to types without a birder component, that had between 4 - 45 days birding and 13 - 84 days wildlife viewing, on average. Overall, the average number of days recreationists spent birding (4 - 180 days) and wildlife viewing (13 - 159 days) were substantially higher than the average number of days recreationists spent hunting (1 - 27 days) and fishing (3 - 27 days); this is likely due, in part, to the stronger seasonal and geographic limitations that apply to hunting and fishing.

**Table 7.** Mean (median) number of days spent participating in birding, viewing, hunting, and angling within the past 12 months for each recreation type by sample. Numbers with different superscripts denote significant differences in medians at  $\alpha = 0.05$  within each recreation activity ( $\chi^2_3 = 1039.7$ ,  $p < 0.001$ ).

Recreation type	Birding (n = 268 - 1141)	Wildlife viewing (n = 276 - 1185)	Hunting (n = 352 - 1226)	Angling (n = 355 - 1246)
Hunter-anglers	3.88 <sup>a</sup> (0)	13.5 <sup>a</sup> (0)	21.7 <sup>acd</sup> (6)	27.1 <sup>acd</sup> (10)
Birder-viewers	154.1 <sup>b</sup> (100)	115.1 <sup>b</sup> (50)	0.94 <sup>b</sup> (0)	3.02 <sup>b</sup> (0)
Viewer-hunter-anglers	44.9 <sup>c</sup> (5)	84.3 <sup>c</sup> (30)	26.8 <sup>c</sup> (10)	28.8 <sup>c</sup> (12)
Birder-viewer-hunter-anglers	179.8 <sup>d</sup> (150)	159.3 <sup>d</sup> (100)	16.4 <sup>d</sup> (2)	22.0 <sup>d</sup> (10)

The average number of years individuals in each recreation type spent participating in each recreation activity also generally followed expected patterns, based on the components of each recreation type, with recreation types containing a birder component reporting the greatest experience with birding and wildlife viewing among recreation types, on average (**Table 8**). Birder-viewer-hunter-anglers had the highest participation, on average for all four recreation activities among the types (28 - 40 years). Additionally, Birder-viewer-hunter-anglers had noticeably high participation in birding and wildlife viewing, having spent 31 - 40 years, on average, participating. Birder-viewers also had, on average, high participation in birding (~25 years), while Viewer-hunter-anglers had spent the second highest number of years, on average, wildlife viewing.

**Table 8.** Mean (median) number of years spent participating in birding, viewing, hunting, and angling for each recreation type by sample. Numbers with different superscripts denote significant differences in medians at  $\alpha = 0.05$  within each recreation activity ( $\chi^2_3 = 648.1$ ,  $p < 0.001$ ).

Recreation type	Birding (n = 258 - 1126)	Wildlife viewing (n = 267 - 1197)	Hunting (n = 352 - 1238)	Angling (n = 355 - 1251)
Hunter-anglers	2.10 <sup>a</sup> (0)	10.2 <sup>a</sup> (0)	27.3 <sup>a</sup> (21)	34.0 <sup>a</sup> (35)
Birder-viewers	24.6 <sup>b</sup> (20)	29.5 <sup>b</sup> (30)	1.60 <sup>b</sup> (0)	8.53 <sup>b</sup> (0)
Viewer-hunter-anglers	16.7 <sup>c</sup> (10)	33.0 <sup>c</sup> (35)	29.2 <sup>a</sup> (30)	37.7 <sup>c</sup> (40)
Birder-viewer-hunter-anglers	30.8 <sup>d</sup> (30)	40.0 <sup>d</sup> (45)	27.9 <sup>a</sup> (27)	39.6 <sup>c</sup> (45)

Considering the socio-demographic characteristics of the recreation types (**Table 9**), Hunter-anglers and Viewer-hunter-anglers were, on average, about five years younger than Birder-

viewers and Birder-viewer-hunter-anglers, with all types averaging over 55 years old. The majority of Hunter-anglers, Viewer-hunter-anglers, and Birder-Viewer-hunter-anglers were primarily male (>80% for all types). The majority of Birder-viewers were women; however, gender was more evenly distributed within this recreation type, with women representing 60.8% of Birder-viewers. All four recreation types were predominantly White (between 91 - 98%). The majority of individuals in all recreation types had a Bachelor's degree or higher educational attainment. Birder-viewers had the most formal education, with 86.1% holding a Bachelor's degree or higher. Annual income levels were also similar across recreation types and samples, with a majority of respondents making over between \$75,000 - \$99,999 per year, on average.

**Table 9.** Summary socio-demographic variables for each recreation type by sample. Numbers with different superscripts denote significant differences in medians age  $\alpha = 0.05$  ( $\chi^2_3 = 92.1$ ,  $p < 0.001$ ). Asterisks (\*) note statistically significant differences between recreation types (chi-square) at  $\alpha = 0.05$  for gender, race, and education. There was no significant difference for annual income.

Recreation type	Hunter-anglers (n=308-324)	Birder-viewers (n=678-789)	Viewer-hunter-anglers (n=1011-1096)	Birder-viewer-hunter-anglers (n=425-455)
Age (mean years)	56.1(57) <sup>a</sup>	61.2(64) <sup>b</sup>	56.3(58) <sup>a</sup>	61.2(63) <sup>b</sup>
*Gender – percent male	88.7%	39.2%	90.4%	81.3%
*Race – percent white	91.9%	97.4%	96.2%	96.9%
*Education – percent with a Bachelor's degree or higher	65.1%	86.1%	62.6%	72.3%
Annual income <sup>1</sup> – (mean response)	3.93 (~\$50,000-\$99,999)	3.81 (~\$50,000-\$99,999)	3.84 (~\$50,000-\$99,999)	3.72 (~\$50,000-\$99,999)

<sup>1</sup>Annual income was asked on a scale from 1 to 6 where 1 = <\$24,999, 2 = \$25,000 - \$49,999, 3 = \$50,000 - \$74,999, 4 = \$75,000 - \$99,999, 5 = \$100,000 - \$124,999, and 6 = \$125,000+

**In summary:**

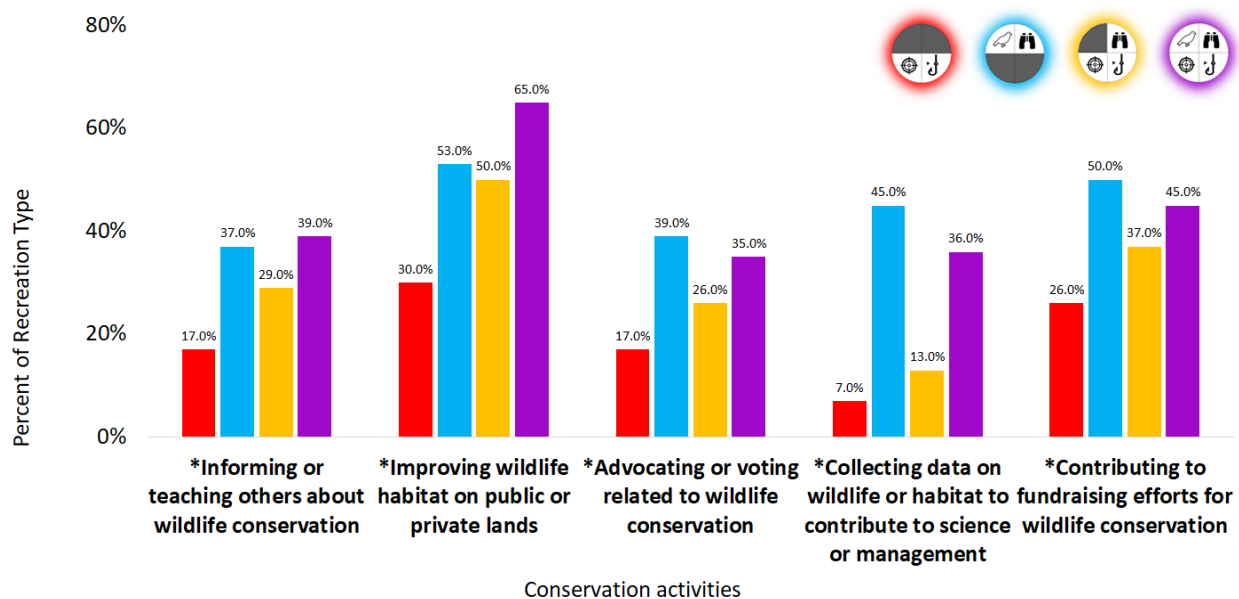
- We identified four recreation types that capture overlapping recreational identity among recreationists in Virginia: Hunter-anglers, Birder-viewers, Viewer-hunter-anglers, and Birder-viewer-hunter-anglers.
- Recreation types with a birder component spent the greatest amount of time in the past year and over their lifetimes birding compared to the other recreation types, having spent, on average, 154 - 180 days and 25 - 31 years birding.
- Recreation types with a birder component had some of the highest participation in wildlife viewing among the recreation types, having spent, on average, 115 - 160 days and 30 - 40 years wildlife viewing.
- Birder-viewers had the highest formal education of any recreation type and were primarily women. The other recreation types were primarily male, and all four recreation types were primarily white.



**Objective 1: Increase volunteer engagement by connecting wildlife viewers to conservation opportunities.**

*What conservation behaviors do wildlife recreationists participate in?*

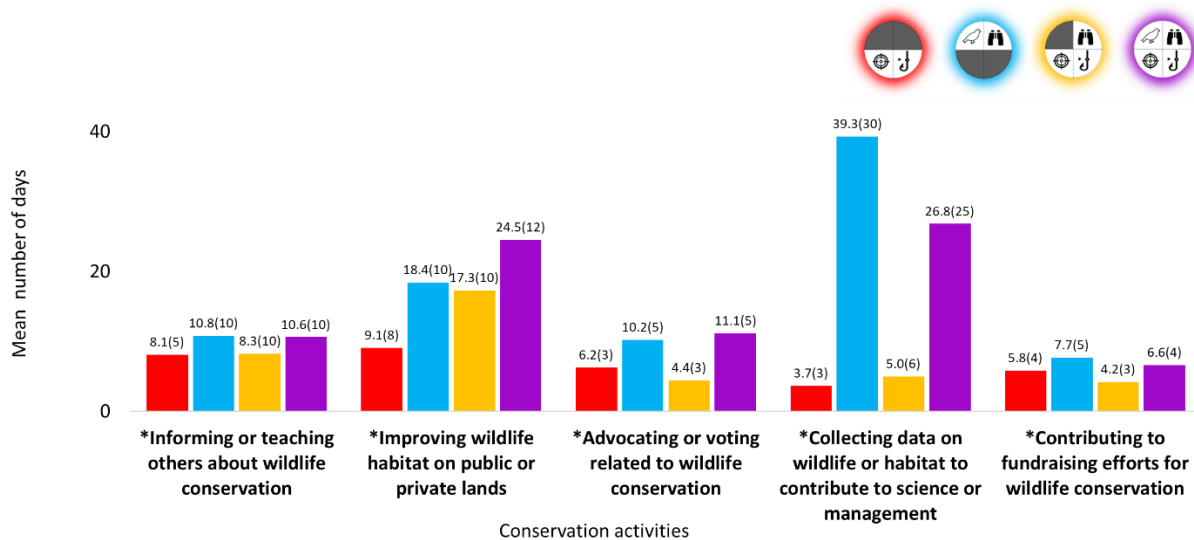
We measured five broad categories of conservation behavior among wildlife recreationists, including: 1) informing or teaching others about wildlife conservation; 2) improving habitat on public or private lands; 3) advocating or voting related to wildlife conservation; 4) collecting data on wildlife or habitat to contribute to science or management; and 5) contributing to fundraising efforts for wildlife conservation (Cooper et al., 2015; Larson et al., 2015). For all five conservation behaviors measured in our survey, recreation types that included a birder identity component had higher levels of participation compared to recreation types that lacked a birder identity component (**Figure 26**). For example, 50.0% of Birder-viewers and 45.0% of Birder-viewer-hunter-anglers reported contributing to fundraising at least once within the past 12 months, compared to 37.0% of Viewer-hunter-anglers and 26.0% of Hunter-anglers. Participation in all five conservation behaviors was consistently reported by fewer Hunter-anglers than recreationists in the other three recreation types. *Improving habitat on public or private lands* was the most popular behavior across all recreation types.



**Figure 26.** Percent of each recreation type that participated  $\geq 1$  day(s) in each conservation behavior (Hunter-anglers  $n = 297$ , Birder-viewers  $n = 779$ , Viewer-hunter-anglers  $n = 1028$ , Birder-viewer-hunter-anglers  $n = 423$ ) within the past 12 months. Asterisks (\*) note statistically significant differences (chi-square) among recreation types at  $\alpha = 0.05$ .

In addition to binary participation, we explored differences in the frequency of participation in conservation behaviors by calculating the mean number of days that each recreation type spent participating in each conservation behavior. This analysis only included recreationists who

participated in these activities at least one day in the past 12 months. Overall, all types of recreationists spent the fewest days *informing or teaching others* and *contributing to fundraising*. Birder-viewers had the highest mean number of days *collecting data*, spending an average of ~35 more days collecting data than the two recreation types without a birder component (**Figure 27**), while Birder-viewer-hunter-anglers spent the highest average number of days *improving wildlife habitat*. A smaller percent of Hunter-anglers participated in conservation behaviors overall (**Figure 26**), however, Hunter-anglers who did participate spent a comparable number of days engaged in *informing or teaching others*, *advocating or voting*, and *contributing to fundraising efforts* as recreationists of other types.



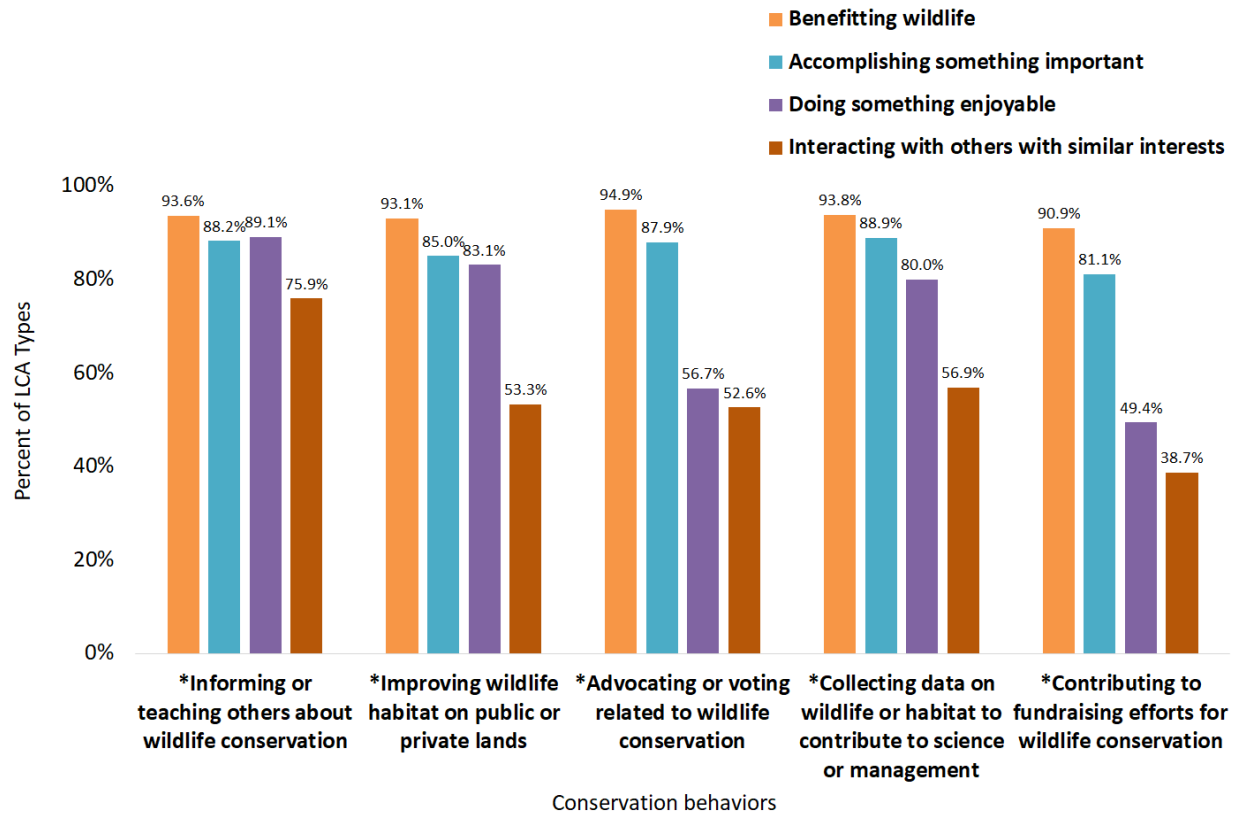
**Figure 27.** Mean (median) number of days each recreation type participated in each conservation behavior. Medians represent respondents who participated  $\geq 1$  day(s) in each conservation behavior within the past 12 months (Hunter-anglers  $n = 297$ , Birder-viewers  $n = 779$ , Viewer-hunter-anglers  $n = 1028$ , Birder-viewer-hunter-anglers  $n = 423$ ). Asterisks (\*) note significant differences in medians at  $\alpha = 0.05$  within each recreation activity ( $\chi^2_3 = 20.8, p < 0.001$ ).

### *What motivates and constrains wildlife recreationists' participation in conservation behaviors?*

For each of the five conservation behaviors, our survey asked respondents who *had* participated in that behavior at least one day in the past year about the factors that motivated their participation. Similarly, we asked respondents who *had not* participated in these conservation activities about the factors that prevented their participation. Below, we present analyses of these questions for all recreation types combined, both for ease of interpretation and because we found few meaningful differences among the four recreation types.

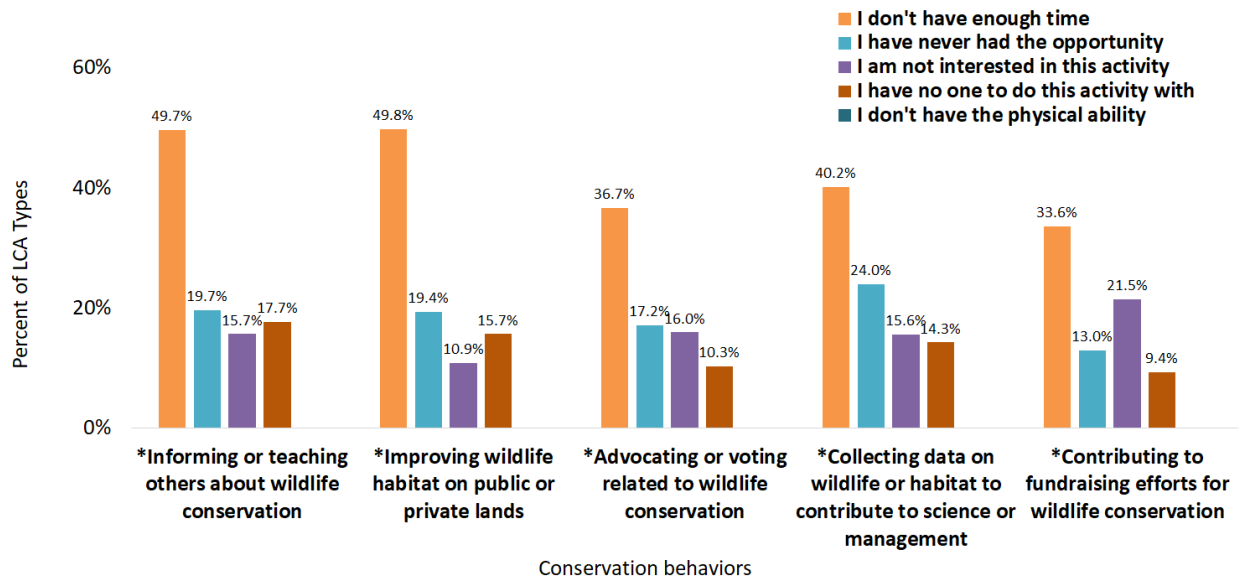
Among recreationists who had participated in these conservation behaviors, 'benefiting wildlife' was the top motivator for all five conservation behaviors; over 90% of recreationists considered this an 'extremely' or 'very important' motivator for their activity (**Figure 28**). 'Accomplishing

something important' was an important motivator for all five conservation behaviors for over 80% of recreationists. 'Doing something enjoyable' was similarly important for over 80% of recreationists who *informed or taught others about wildlife conservation, improved wildlife habitat, or collected data*. Overall, recreationists were least likely to indicate that 'interacting with others with similar interests' was an important motivator for all conservation behaviors.



**Figure 28.** Percent of recreationists that ranked each motivation as 'extremely' or 'very important' to their participation in each conservation behavior (Informing or teaching n = 736-741, improving habitat n = 1133-1135, advocating or voting n = 680-687, collecting data n = 631-636, contributing to fundraising n= 903-909). Development of the motivation response options were informed by Decker et al., 1987 and McFarlane 1994. Asterisks (\*) note statistically significant differences (chi-square) among motivations for each conservation behavior at  $\alpha = 0.05$ .

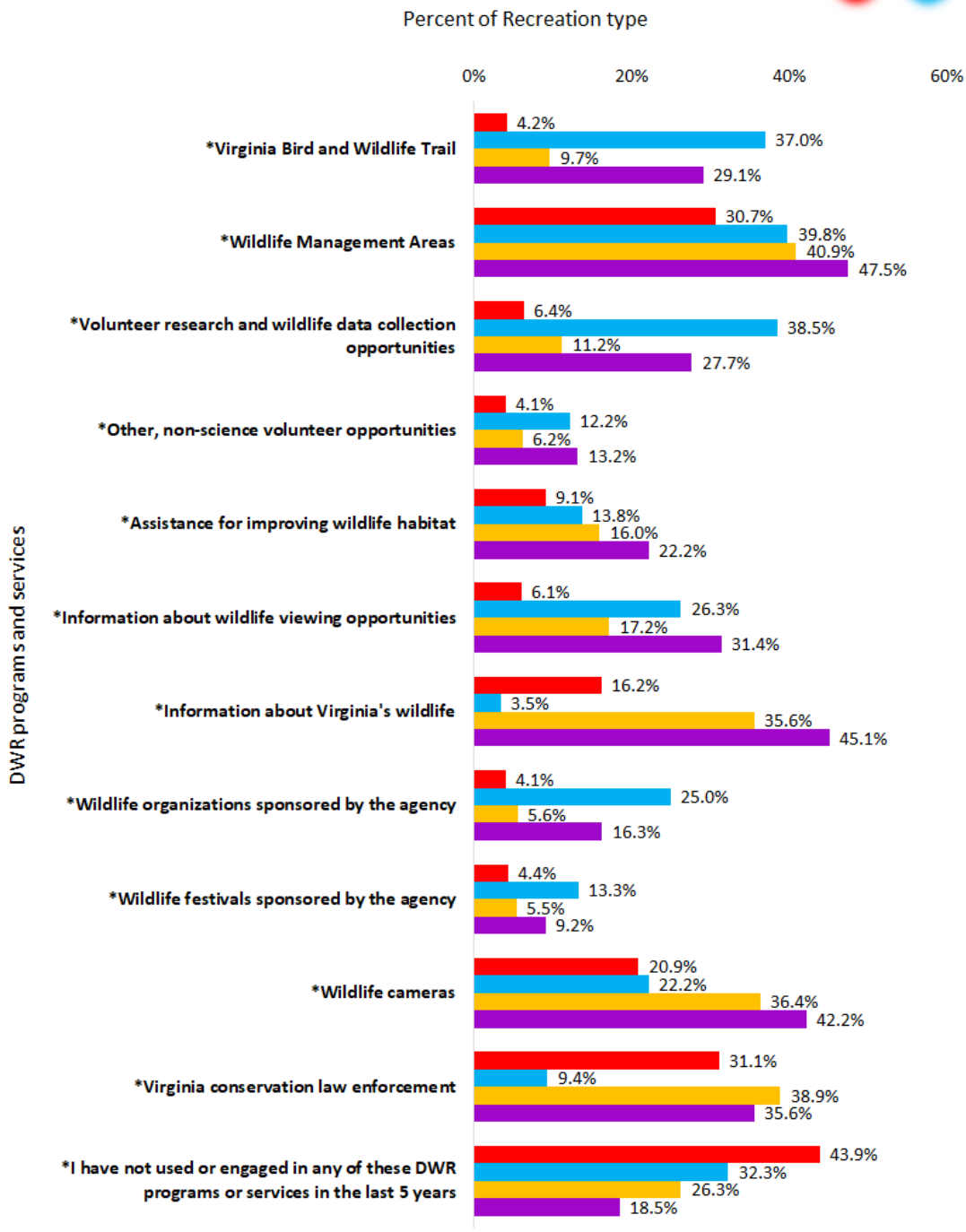
Overall, compared to the motivations described above, fewer recreationists indicated that the constraints provided as response options in our survey were 'extremely' or 'very important' in their conservation behavior (range of 28.7% - 94.9% for motivations vs. 9.4% - 49.8% for constraints; **Figure 29**). Lacking enough time was consistently the top factor preventing engagement in all conservation behaviors.



**Figure 29.** Percent of recreationists in all four recreation types that ranked each constraint as extremely to very important to their participation in each conservation behavior (Informing or teaching n = 1433-1506, improving habitat n = 1026-1102, advocating or voting n = 1385-1464, collecting data n = 1444-1500, contributing to fundraising n= 1156-1233). Development of the constraint response options were informed from work by Crawford and Godbey, 1987. Asterisks (\*) note statistically significant differences (chi-square) among constraints to each conservation behavior at  $\alpha = 0.05$ .

*To what extent do wildlife recreationists participate in volunteer opportunities available through DWR?*

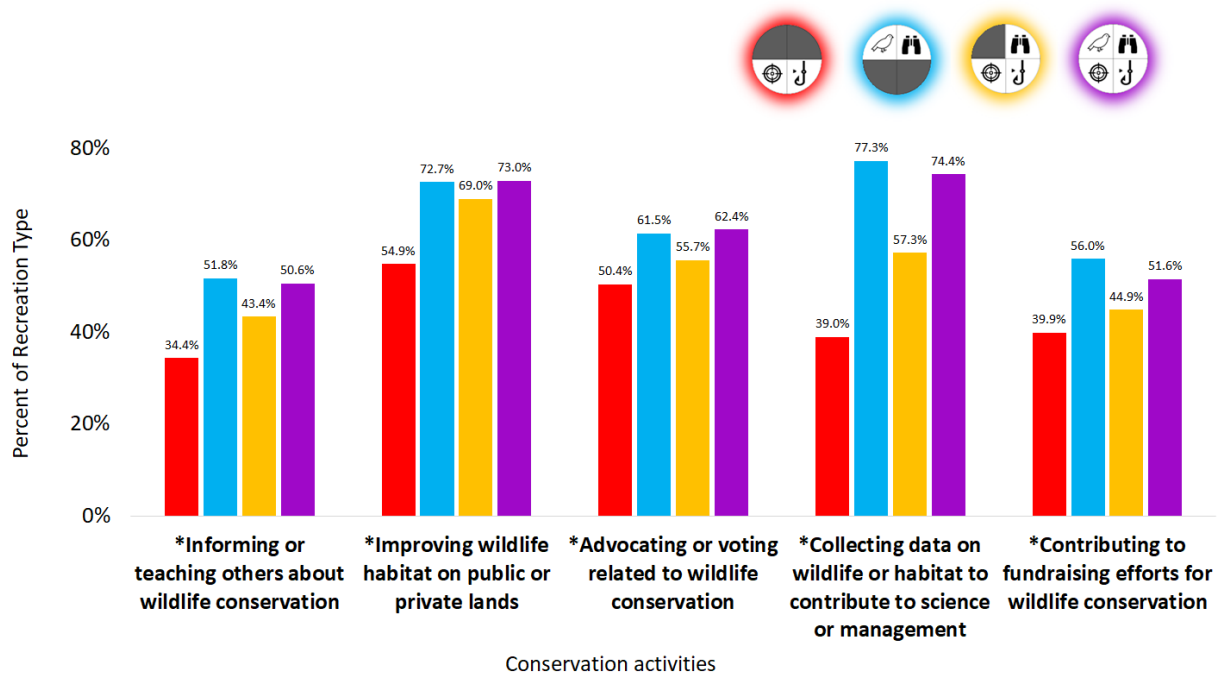
Our survey asked respondents about their participation in DWR programs and services within the past 5 years. Two response items directly related to volunteering through DWR: 1) experience with volunteer research and wildlife data collection opportunities, and 2) experience with other, non-science volunteer opportunities. Birder-viewers and Birder-viewer-hunter-anglers (the two recreation types with a birder component) more often reported participating in both of these DWR volunteer opportunities than other recreation types (**Figure 30**). Higher rates of participation among these types in DWR-related data collection may partially be explained by our survey sampling methodology, since birders in the DWR sample were drawn from contributors to the Virginia Breeding Bird Atlas, a DWR citizen science project. All four recreation types had low participation in other, non-science volunteer opportunities offered by the agency (<15% for each recreation type).



**Figure 30.** Percent of each recreation type that have used DWR programs and services within the past 5 years. Asterisks (\*) note statistically significant differences (chi-square) among recreation types at  $\alpha = 0.05$ .

*How likely are wildlife recreationists to contribute to the work of DWR by participating in conservation behaviors in the future?*

The survey also asked recreationists how likely they were to participate in the same five conservation behaviors to support DWR over the next 12 months, given the time and opportunity to do so (**Figure 31**). Over a third of recreationists in all recreation types indicated that they would be ‘somewhat’ or ‘very likely’ to support DWR through each of the five conservation behaviors. A majority of Birder-viewers and Birder-viewer-hunter-anglers were likely to participate in each of the 5 conservation behaviors in order to support DWR. Hunter-anglers and Viewer-hunter-anglers were less likely than Birder-viewers or Birder-viewer-hunter-anglers to engage with DWR on all five conservation behaviors, but the majority were likely to support DWR through *improving habitat* (54.9% and 69.0%, respectively) and *advocating or voting* (50.4% and 55.7%, respectively). Birder-viewers and Birder-viewer-hunter-anglers most often indicated that they would be likely to *collect data* (77.3% and 74.4%, respectively) and *improve habitat* (72.7% and 73.0%, respectively) to support the work of DWR.

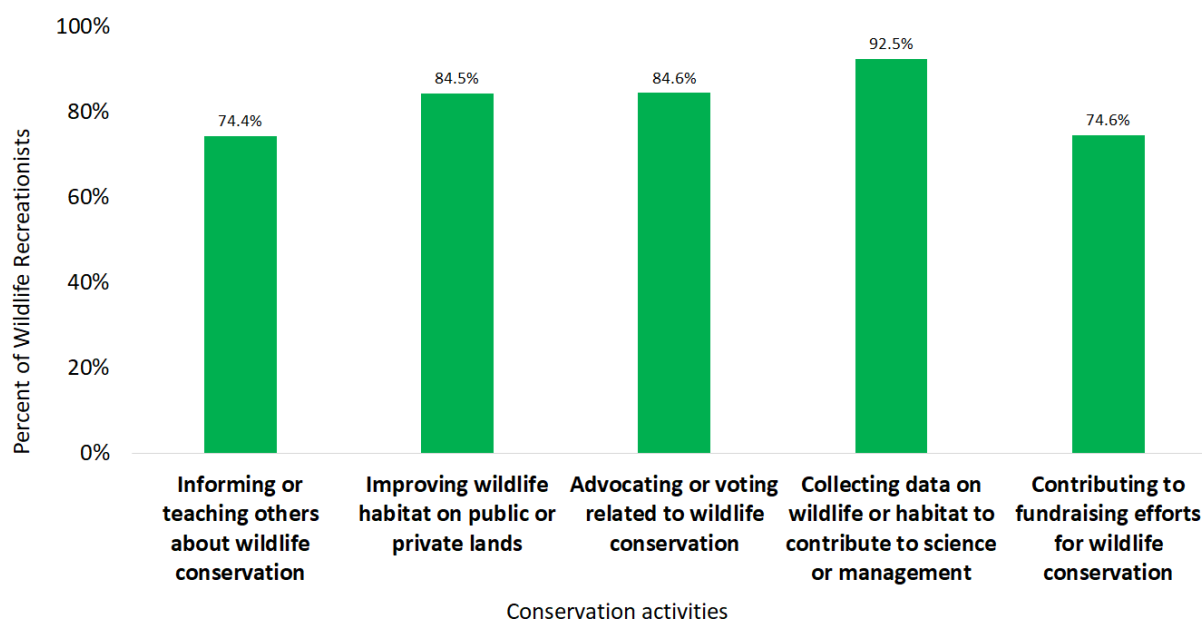


**Figure 31.** Percent of each recreation type that was ‘somewhat’ or ‘very likely’ to participate in each conservation behavior in order to support the work of DWR over the next 12 months (Hunter-anglers n = 131 - 138; Birder-viewers n = 490 - 503; Viewer-hunter-anglers n = 680 - 697; Birder-viewer-hunter-anglers n = 346 - 355). Asterisks (\*) note statistically significant differences (chi-square) among recreation types at  $\alpha = 0.05$ .

*How does current participation in conservation relate to interest in supporting DWR through these behaviors?*

We also explored how current participation in conservation behaviors is related to the likelihood that recreationists will participate in those same behaviors to support DWR. To do so, we developed binary variables from our survey questions related to current conservation behaviors (participation vs. no participation) and the likelihood of future participation in those behaviors with DWR (likely vs. unlikely to participate). This analysis was conducted for all recreation types combined, rather than for each recreation type individually.

Current participation in conservation behaviors was strongly related to the likelihood to participate in those behaviors for DWR. Across all recreation types, between 75% - 92% of recreationists that currently participate in each of the conservation behaviors were likely to engage in the same behaviors to support DWR (**Figure 32**). Recreationists who already *collect data* most often indicated that they were likely to collect data to support the conservation and management work of DWR in the future.



**Figure 32.** Percent of all recreationists (across all recreation types) that currently participate in conservation behaviors and who are likely to participate in each conservation behavior to support DWR over the next 12 months (n = 1050 - 1078).

**In summary:**

- Compared to other forms of conservation, recreationists across all recreation types most often reported *improving habitat on public or private lands*.
- Recreation types that included a birder identity component (Birder-viewers and Birder-viewer-hunter-anglers) had higher levels of participation in all five conservation

behaviors measured in our survey, compared to recreation types that lacked a birder identity component.

- A smaller percent of Hunter-anglers participated in conservation behaviors overall, but Hunter-anglers who did participate spent a comparable number of days engaged in *informing or teaching others about wildlife conservation, advocating or voting related to wildlife conservation, and contributing to fundraising efforts for wildlife conservation* as recreationists of other types.
- Across recreation types, the highest frequency of conservation behavior was reported by Birder-viewers, who, on average, spent over 39 days in the last year *collecting data on wildlife or habitat to contribute to science or management*.
- All four motives for conservation behavior listed in the survey were considered 'extremely' or 'very important' for the majority of recreationists who participated in those behaviors. 'Benefiting wildlife' was the top motivator for all five conservation behaviors, followed closely by 'accomplishing something important' and, for some behaviors, 'doing something enjoyable'.
- Recreationists who did not participate in conservation behaviors most often indicated that not having enough time was an 'extremely' or 'very important' barrier to their participation. This was the only constraint listed in the survey that was important for over a quarter of recreationists who had not participated in the conservation behaviors.
- Participation in DWR opportunities for volunteer research and data collection was highest for recreation types that included a birder component (Birder-viewers and Birder-viewer-hunter-anglers). They were also more likely than other recreation types to participate in other, non-science volunteer opportunities with DWR, although participation in these opportunities was relatively low among all recreation types.
- The majority of Birder-viewers and Birder-viewer-hunter-anglers were likely to support DWR through all five conservation behaviors. Hunter-anglers and Viewer-hunter-anglers were less likely than Birder-viewers or Birder-viewer-hunter-anglers to engage with DWR on all five conservation behaviors, but the majority were likely to support DWR through *improving habitat* and *advocating or voting*.
- Almost 75% of the recreationists who had participated in each conservation behavior within the past year were likely to participate in the same activities with DRW to contribute to the agency's efforts. Over 92% of recreationists who currently participate in data collection were likely to collect wildlife or habitat data for the agency.

## **Objective 2. Foster a culture of responsible wildlife viewing.**

*The Wildlife Recreation Survey did not contain any questions directly pertinent to this objective.*



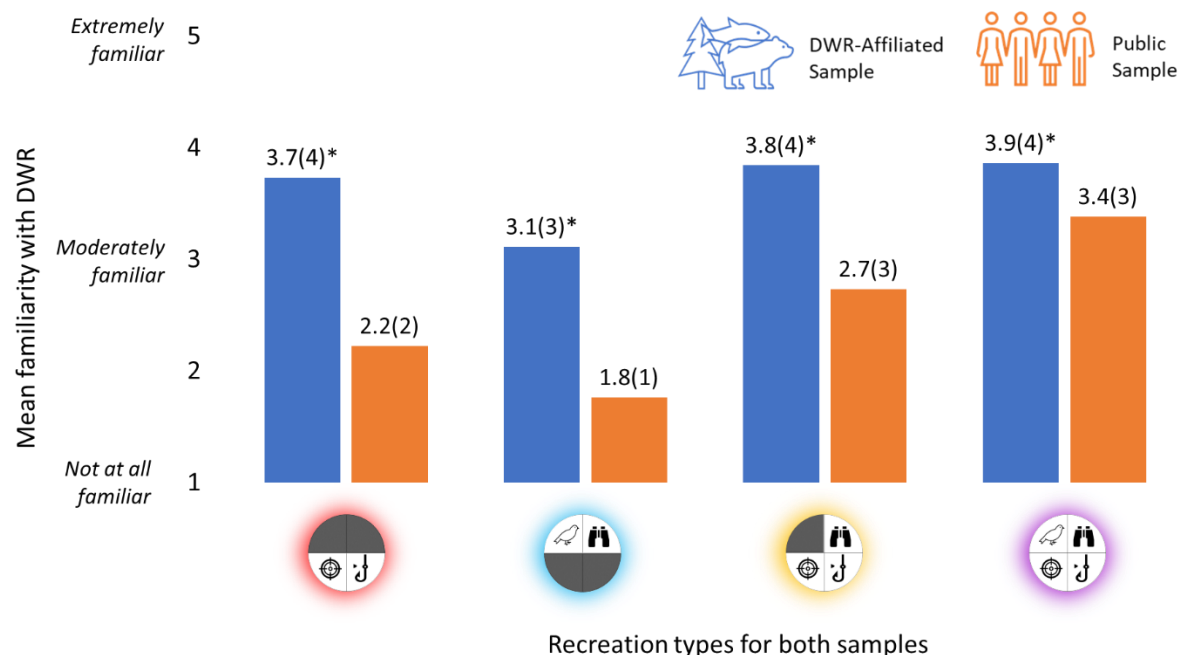
## Goal 4: Connect broader constituencies to the Virginia Department of Wildlife Resources through wildlife viewing

**Note:** Most of the analyses presented under Goal 4 compare survey responses across the four recreation types identified through our latent class analysis: Hunter-anglers, Birder-viewers, Viewer-hunter-anglers, and Birder-viewer-hunter-anglers (**Table 6**). Additionally, with the exception of the first analysis below, the following analyses generally do not account for survey samples; instead, recreationists from the DWR-affiliated and Public samples are grouped together as a single sample.

### Objective 1: Increase awareness of the scope of DWR's mission and its relevance to wildlife viewing.

*How familiar are wildlife recreationists with DWR?*

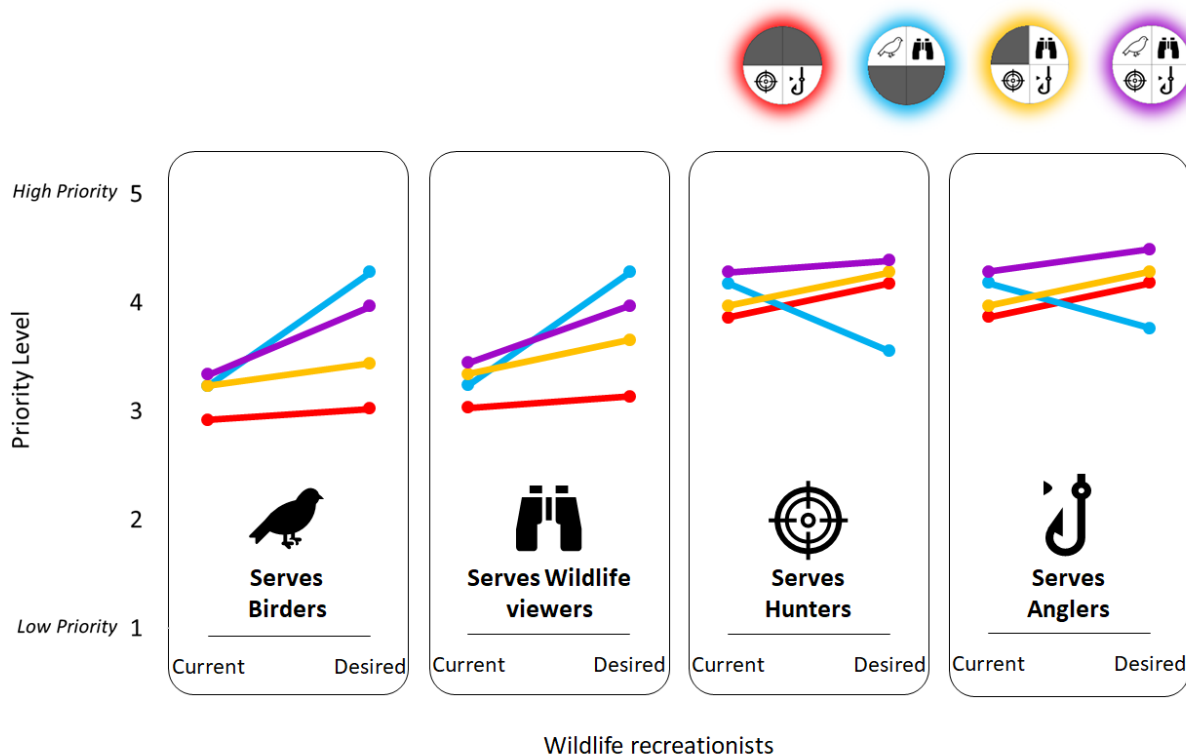
Our survey asked respondents to indicate how familiar they are with the agency on a five-point scale from 'not at all familiar' to 'extremely familiar.' Because we expected recreationists in the DWR-affiliated sample to be more familiar with the agency, we divided recreationists in each recreation type by survey sample. For all four recreation types, wildlife recreationists in our DWR-affiliated sample were indeed more familiar with the agency than recreationists in the Public sample; on average, DWR-affiliated recreationists reported being moderately to very familiar with DWR, while recreationists in the Public sample were moderately familiar or less (**Figure 33**). The difference between samples was greatest for Hunter-anglers and Birder-viewers, and in both samples, Birder-viewers were least familiar with the agency, compared to other recreation types. On average, Birder-viewers from the Public sample reported that they were between 'slightly' and 'not at all familiar' with the agency.



**Figure 33.** Recreationists’ mean (median) level of familiarity with DWR by each sample within each recreation type (DWR-affiliated n = 171 - 902, Public n = 76 - 333). Asterisks (\*) note significant differences in medians at  $\alpha = 0.05$  within each recreation activity ( $U = 19167.5 - 170895.5, p < 0.001$ ).

*To what extent do different wildlife recreationists believe the DWR serves their needs?*

We explored perceptions of DWR’s role in two related questions. First, we asked respondents to indicate what priority level they thought DWR currently gives to serving birders, other wildlife viewers, hunters, and anglers. Then, we asked respondents to indicate the priority level they thought DWR *should* give to each of those recreation groups. On average, respondents from all four recreation types thought that DWR currently gives higher priority to hunters and anglers than birders and other wildlife viewers (**Figure 34**). For most recreation types, average desired priority levels were higher than average perceived current priority levels for all four wildlife recreation activities, as indicated by lines with a positive slope in **Figure 34**. The only exception was that Birder-viewers thought hunters and anglers should receive less priority than they currently receive from the agency (as indicated by the blue lines with a negative slope). Birder-viewers also had the greatest difference between their average perception of current priority levels and their desired priority levels for birders and wildlife viewers, compared to other recreation types. Notably, Hunter-anglers thought the agency currently gives less priority to serving birders and wildlife viewers than Birder-viewers did; Hunter-anglers also felt that serving birders and other wildlife viewers should remain a lower priority for the agency, compared to serving hunters and anglers.



**Figure 34.** Mean perceived priority level that DWR currently gives to serving birders, viewers, hunters, and anglers, compared to mean desired priority level (what priority level DWR *should* give each recreation group), by recreation type (Hunter-anglers n = 311 - 330, Birder-viewers n = 765 - 778, Viewer-hunter-anglers n = 1102 - 1128, Birder-viewer-hunter-anglers n = 470 - 474).

Variation in beliefs about whom DWR should serve was commonly reflected in comments to a general open-ended question that allowed respondents to provide general feedback on the survey or survey topics. For example, one Birder-viewer-hunter-angler said, “I view this [survey] as an attempt to justify using hunter/fisherperson purchased lands for certified persons who only disturb and trample the wildlife habitat and the wildlife.” One Birder-viewer’s comment revealed a different perspective: “There appears to be too much emphasis on hunting and fishing, and not enough on birdwatching, photography, and preserving natural areas for the wildlife.”

**In summary:**

- As expected, wildlife recreationists in our DWR-affiliated sample were more familiar with the agency than recreationists in the Public sample.
- Of the four recreation types, Birder-viewers were, on average, the least familiar with DWR.
- All four recreation types perceived that birders and wildlife viewers currently receive less priority from DWR than hunters and anglers.
- On average, respondents from all four recreation types also thought DWR should give higher priority to serving each of the four wildlife recreation groups than is currently given. Birder-viewers were the one exception; the mean priority levels Birder-viewers

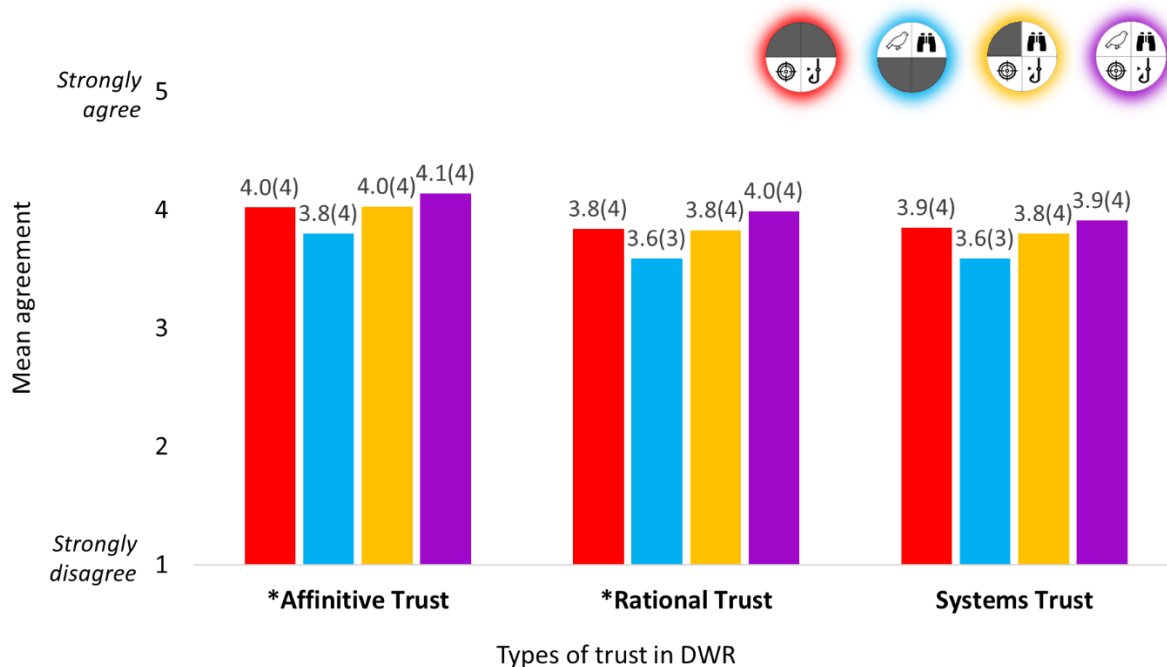
believed the agency *should* give to serving hunters and anglers were less than the average priority levels this group believed the agency *currently* gives to serving hunters and anglers.

- On average, Hunter-anglers thought the agency currently gives less priority to serving birders and wildlife viewers than Birder-viewers did. Hunter-anglers also felt that serving birders and other wildlife viewers should remain a lower priority for the agency, compared to serving hunters and anglers.

## **Objective 2: Increase dialogue and recognition between the Agency and wildlife viewers to cultivate improved relationships.**

*To what extent do wildlife recreationists trust DWR?*

Our survey asked respondents to rate their level of agreement with 9 statements reflecting their trust in the DWR (e.g. “DWR shares my values”). We consolidated these statements into measures of 3 types of trust: affinitive (perception of shared values; Cronbach’s  $\alpha = 0.79$ ), rational (perception of competence and past experience; Cronbach’s  $\alpha = 0.83$ ), and systems-based (perception that procedures are fair and equitable; Cronbach’s  $\alpha = 0.86$ ) (Stern & Coleman, 2015). All four recreation types had positive mean levels of affinitive, rational, and systems-based trust in the agency. Compared to other recreation types, Birder-viewers had lower mean levels of trust for each trust type, while Birder-viewer-hunter-anglers had the highest mean levels of trust (**Figure 35**).



**Figure 35.** Mean (median) agreement (scale: 1 = strongly disagree to 5 = strongly agree) for recreationists' affinitive, rational, and systems-based trust in DWR by recreation type (Hunter-anglers n = 710, Birder-viewers n = 483, Viewer-hunter-anglers n = 710, Birder-viewer-hunter-anglers n = 358). Asterisks (\*) note significant differences in medians at  $\alpha = 0.05$  within each recreation activity ( $\chi^2_3 = 49.3, p < 0.001$ ).

*To what extent do wildlife recreationists engage with DWR programs and services?*

We asked respondents to indicate which DWR programs and services they had engaged with in the past five years (items from this question have been discussed in the context of viewers only under previous goals). We also asked respondents to indicate how satisfied they were with the DWR programs and services they had used. For this goal, we split the question into sub-categories of DWR programs, including public lands, volunteer opportunities, information and outreach, and wildlife-related services (**Figure 30**).

*Public lands.* DWR lands covered in the survey included Wildlife Management Areas (WMAs), which are owned by the agency, and sites on the Virginia Bird and Wildlife Trail (VBWT), which is coordinated by the agency. Overall, more recreationists in each recreation type had used WMAs than the VBWT. This was particularly true for Hunter-anglers and Viewer-hunter-anglers; while 30.7% of Hunter-anglers and 40.9% of Viewer-hunter-anglers had visited WMAs in the past year, only 4.2% and 9.7%, respectively, had visited the VBWT (**Figure 30**). VBWT usage was highest among Birder-viewers (37.0%) and Birder-viewer-hunter-anglers (29.1%).

*Volunteer opportunities.* Relative to Hunter-anglers and Viewer-hunter-anglers, a higher percentage of Birder-viewers and Birder-viewer-hunter-anglers had engaged with both volunteer data collection and non-science volunteer opportunities, which may partially reflect the 407

VABBA2 contributors included in our DWR-affiliated sample (**Figure 30**). Compared to 38.5% of Birder-viewers and 27.7% of Birder-viewer-hunter-anglers, only 6.4% of Hunter-anglers and 11.2% of Viewer-hunter-anglers had participated in data collection opportunities with the agency.

*Information and outreach.* Compared to other recreation types, Birder-viewer-hunter-anglers most commonly reported having used information from DWR about Virginia's wildlife, wildlife viewing opportunities, and improving wildlife habitat (**Figure 30**). Notably, while 26.3% of Birder-viewers had used DWR information about viewing opportunities, only 3.5% had used information from DWR about Virginia's wildlife. Less than 13.0% of all four recreation types reported having experience with DWR outreach to schools and clubs in the last five years; this was lowest among Birder-viewers at 1.9%. As discussed in Goal 1, while outreach included programming conducted with clubs, experience with outreach may have been underestimated if parents were unaware of the outreach that their children experienced at school, or if the respondents did not have children.

*Other wildlife-related services.* A higher percentage of Birder-viewers and Birder-viewer-hunter-anglers were more likely than other recreation types to report involvement with wildlife organizations sponsored by the agency. Participation in wildlife festivals was low across all four recreation types, with a high of 9.2% of Birder-viewer-hunter-anglers participating in these DWR-sponsored events. Wildlife camera usage rates were highest for Viewer-hunter-anglers and Birder-viewer-hunter-anglers. Unlike other DWR programs and services under this objective, rates of engagement with conservation law enforcement were highest among recreation types that included hunters, and lowest for Birder-viewers. This may reflect the fact that this survey question generally did not include programs geared toward hunters and anglers (**Figure 30**).

*Satisfaction with programs and services.* For each of the aforementioned programs, we asked respondents who had participated in them to indicate their level of satisfaction with their experience. Respondents reported similarly high levels of satisfaction for all programs as observed in **Figure 10**, even those with low levels of usage: 78-89% of users indicated that they were extremely or somewhat satisfied with each program.

*How do wildlife recreationists believe DWR can better support them?*

We also asked respondents to indicate ways in which DWR could support their wildlife recreation activities. For this goal, we grouped response options into subcategories including more access, more information, more funds, and more opportunities, volunteer opportunities, information and outreach, and wildlife-related services (**Figure 36**).

*More access.* Desire for access to certain areas was clearly associated with recreationists' identities. Not unexpectedly, over half of Birder-viewers and very few Hunter-anglers indicated that DWR could support them by providing access to more places to go birding and viewing (**Figure 36**). Similarly, about half of Hunter-anglers and Viewer-hunter-anglers, and very few

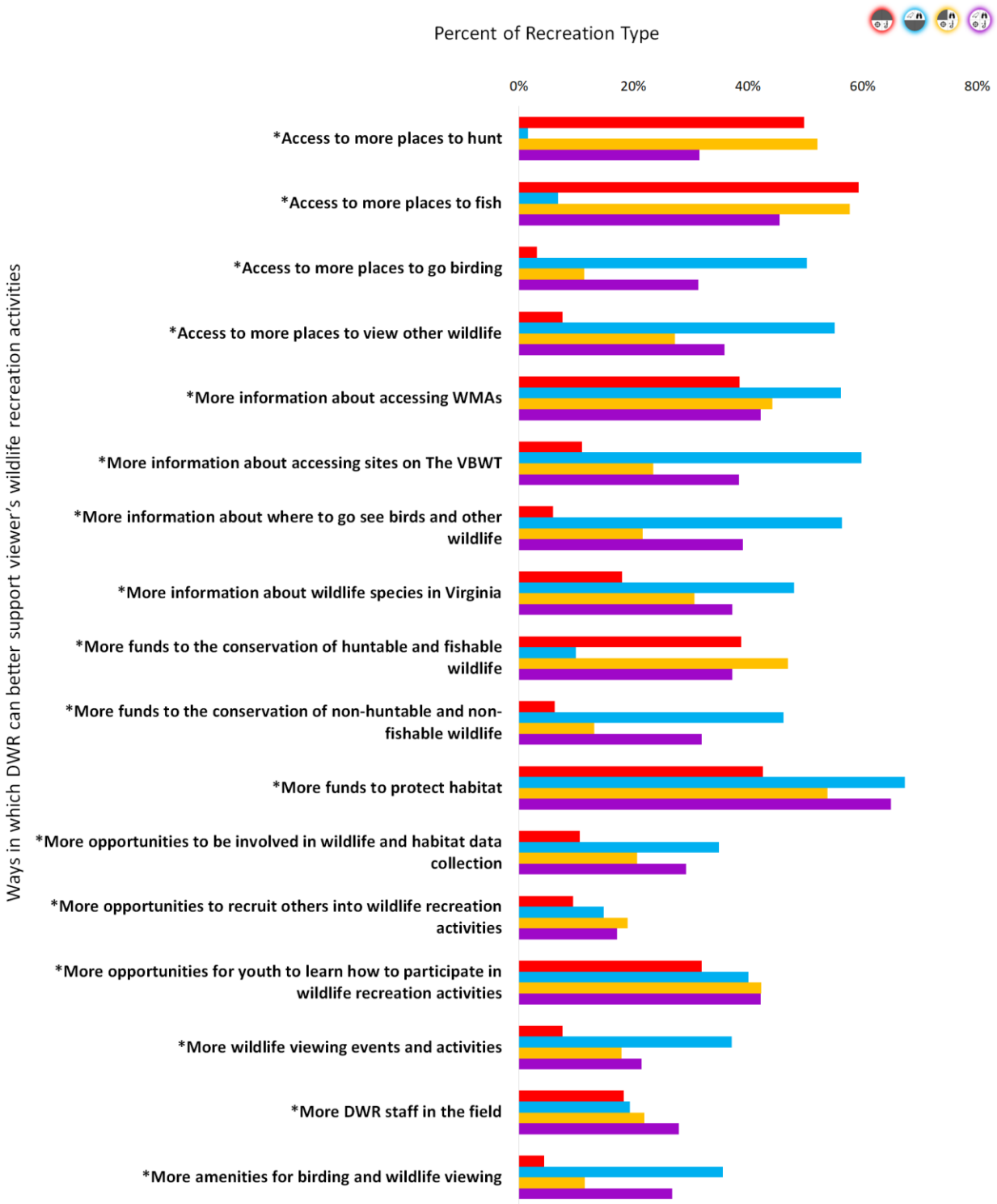
Birder-viewers, would like access to more places to hunt and fish. About a third of Birder-viewer-hunter-anglers expressed an interest in access to more places for all four activities, with the most interest (45.5%) in more places to fish.

*More information.* As discussed in Goal 2, many viewers in our sample would like DWR to provide them with more information about accessing WMAs and sites on the VBWT, as well as general information about Virginia's wildlife species and where to see birds and wildlife. When these responses were examined across recreation types, a higher percentage of Birder-viewers than any other recreation type desired each kind of information from DWR (**Figure 36**).

*More funds.* Compared to Hunter-anglers and Viewer-hunter-anglers, a higher percentage of Birder-viewers and Birder-viewer-hunter-anglers desired more funds for the conservation of nongame wildlife species (**Figure 36**). Similarly, more Hunter-anglers and Viewer-hunter-anglers were interested in the agency allocating more funds for the conservation of huntable and fishable wildlife species. A greater proportion of all four recreation types expressed interest in DWR allocating more funds to the protection of habitat, relative to their interest in DWR allocating more funds to the conservation of game and nongame wildlife species.

*More engagement opportunities.* Across the four recreation types, interest in more opportunities for youth to learn about wildlife recreation was relatively consistent and greater than levels of interest in other forms of engagement, including opportunities to collect data, recruit others into wildlife recreation, or attend wildlife viewing events and activities (**Figure 36**). Birder-viewers and Birder-viewer-hunter-anglers had the highest rates of participation in data collection opportunities with DWR over the past five years (**Figure 30**); these two recreation types also had the highest percentage of respondents who were interested in more opportunities to be involved in data collection with DWR. As expected, more Birder-viewers and Birder-viewer-hunter-anglers expressed interest in more DWR wildlife viewing events and activities than other recreation types.

*Other.* Two other items reflected structural changes DWR could make that would impact the field experiences of wildlife recreationists: more staff in the field and more amenities. Interest in having more DWR staff in the field was consistently low (less than 28%) across the four recreation types (**Figure 36**). Meanwhile, over 35% of Birder-viewers were interested in more amenities for birding and wildlife viewing, followed by 26.8% of Birder-viewer-hunter-anglers, with less interest in this service from other recreation types. We also note that ~10% of Hunter-anglers and ~5% of respondents from each of the other recreation types were not interested in any of the support-related items offered in this survey question.



**Figure 36.** Percent of each recreation type per method DWR could use to better support their wildlife recreation activities. Percentages per recreation type are in **Appendix VIII**. Asterisks (\*) note statistically significant differences among recreation types at  $\alpha = 0.05$ .



### **In summary:**

- All four recreation types had positive mean levels of affinitive, rational, and systems-based trust in the agency.
- Compared to other recreation types, Birder-viewers had lower mean levels of each type of trust, while Birder-viewer-hunter-anglers had the highest mean levels of trust.
- Compared to other recreation types, a higher percentage of Birder-viewers and Birder-viewer-hunter-anglers had visited VBWT sites; participated in data collection and non-science volunteer opportunities; used information about wildlife viewing opportunities and engaged with wildlife organizations sponsored by the agency. However, a lower percentage of Birder-viewers had used information from DWR about Virginia's wildlife.
- The majority of respondents who had engaged with DWR programs were satisfied with their experiences.
- Over half of Birder-viewers desired access to more places to go birding and wildlife viewing, and over half of Hunter-anglers and Viewer-hunter-anglers desired access to more places to go hunting and angling.
- Compared to all other recreation types, more Birder-viewers expressed interest in information about accessing WMAs and sites on the VBWT, as well as general information about Virginia's wildlife and where to go to see birds and other wildlife.
- A greater proportion of all four recreation types expressed interest in DWR allocating more funds to the protection of habitat, relative to their interest in DWR allocating more funds to the conservation of game and nongame wildlife species.
- Across all recreation types, interest in other programs and services listed in the survey, such as opportunities to be involved in data collection, opportunities to recruit others to wildlife recreation, and having more DWR staff in the field was lower than levels of interest in more access, more information, and more funding for habitat conservation.
- Interest in more opportunities for youth to learn how to participate in wildlife recreation activities was relatively consistent across the four recreation types.
- Less than 37% of Birder-viewers, and less than 28% of all other recreation types were interested in more wildlife viewing events and activities and more amenities (e.g., platforms, ramps, ADA-accessibility) for birding and viewing.

### **Objective 3: Increase monetary contributions of wildlife viewers to support DWR's work with wildlife and habitat conservation.**

*What current funding sources for DWR do recreationists contribute to?*

Our survey asked respondents to indicate which fees and permits they had purchased in the past 12 months related to their wildlife recreation activities. Below, we describe responses to this survey question by grouping types of purchases. All fees and permit purchases are displayed in **Figure 37**.

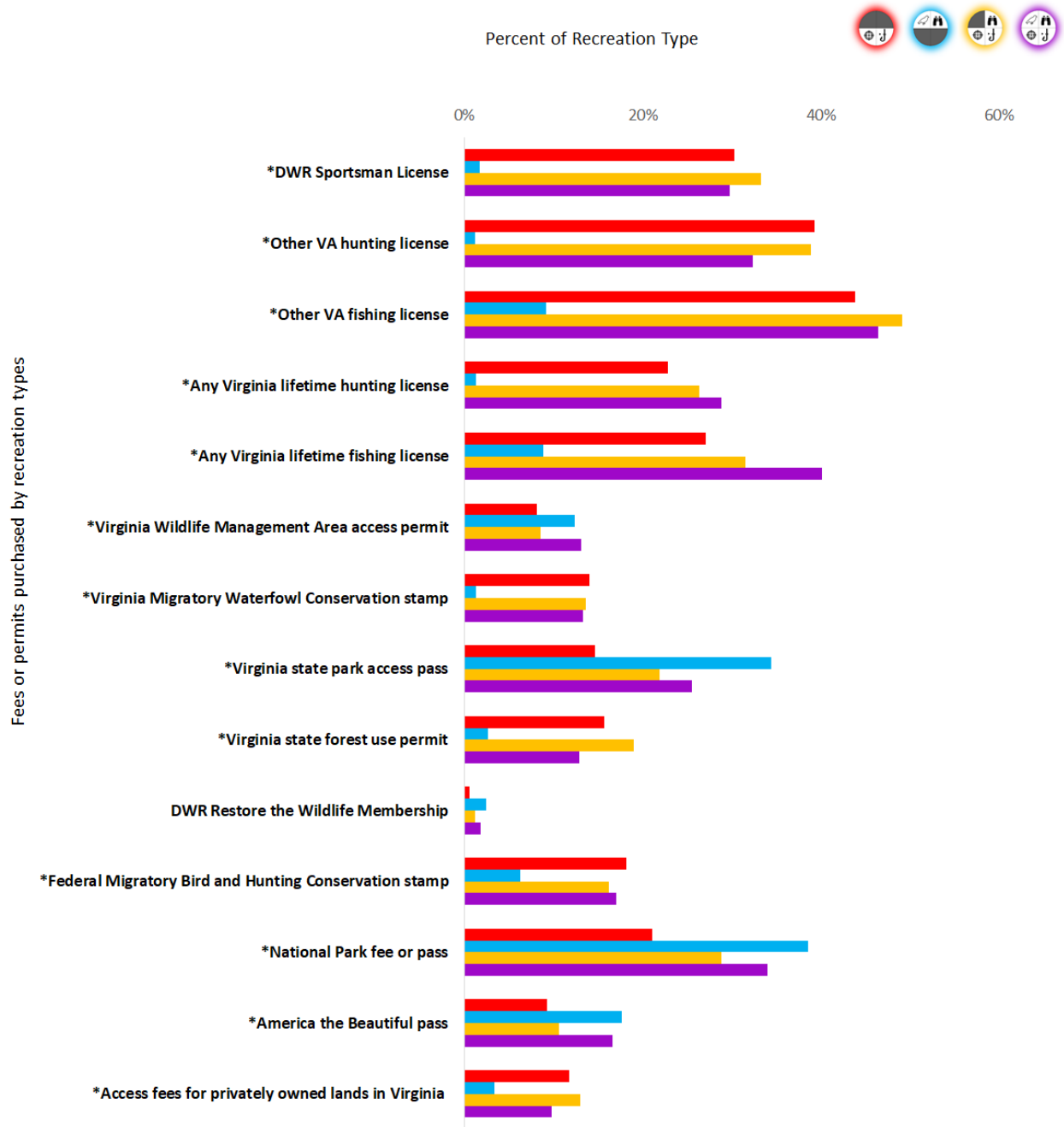
*Virginia licenses.* Very few Birder-viewers had purchased a Virginia Sportsman license, hunting license, or fishing license, or had ever purchased a lifetime hunting or fishing license (**Figure 37**). Less than 2.0% and 10.0% of Birder-viewers had purchased any hunting or fishing license, respectively. In contrast, between 30.0% and 49.0% of all other recreation types (in which identity as a hunter or angler was strong) purchased each type of temporary hunting and fishing license. All temporary licenses were most often purchased by Hunter-anglers and Viewer-hunter-anglers, while more Birder-viewer-hunter-anglers than any other recreation type had purchased lifetime hunting or fishing licenses. Fifty-nine percent of respondents who had ever purchased a Virginia lifetime hunting license had also purchased a temporary hunting license in the past year. Similarly, 46% of respondents who had ever purchased a Virginia lifetime fishing license had also purchased a temporary fishing license in the past year. This overlap is expected, since lifetime license holders are still required to purchase temporary licenses for some activities, such as trout or saltwater fishing or hunting big game (i.e. bear, turkey, or deer); a separate license is also required to hunt during archery season. Purchases of a Virginia Migratory Waterfowl Conservation stamp, which allows hunting migratory waterfowl, were low across all recreation types; only 1.3% of Birder-viewers and about 14% of each other recreation type had purchased a stamp in the last 12 months.

*Virginia permits/passes.* Compared to other recreation types, a slightly higher percentage of Birder-viewers and Birder-viewer-hunter-anglers purchased WMA access permits (**Figure 37**). For Birder-viewers, this likely reflects very limited purchases of hunting licenses, which confer access to WMAs. Across recreation types, Birder-viewers most often reported having purchased a Virginia state park access pass in the last 12 months; however, they least often reported purchasing a state forest use permit in that timeframe. Less than 3.0% of any recreation type in our survey had purchased a DWR Restore the Wild Membership, although these memberships were slightly more popular among Birder-viewers and Birder-viewer-hunter-anglers. This is likely at least partially a result of the age of the program (~8 months) at the time of our survey's distribution. Birder-viewers were also least likely among recreation types to have paid access fees for private lands in Virginia.

*Federal permits/passes.* As with state licenses and stamps, a higher percentage of recreation types that identified as hunters or anglers had purchased a federal duck stamp, compared to Birder-viewers (**Figure 37**). In contrast, National Park passes, and America the Beautiful passes had more often been purchased by Birder-viewers, followed closely by Birder-viewer-hunter-

anglers. *Note: Due to space constraints on the printed mail survey, only online survey respondents were asked about federal permit purchases.*

Overall, 40.0% of Birder-viewers did not pay for any fees, permits, or licenses in the past year. Comments at the end of the survey revealed awareness of this trend among both Birder-viewers and other recreation types, with differing perspectives on its significance for agency efforts and expenditures. One Viewer-hunter-angler said, "I am totally against using money from hunting and fishing licenses for bike and birding trails. [Bikers and birders] need to pay to play also. The price goes up each year for us hunters." One Birder-viewer defended the apparently low contributions of viewers, saying, "[Birding] draws millions of dollars to the state annually. I feel like this fact is often overlooked by the agency because it may be harder to identify than those dollars spent on licensing fees and the like."



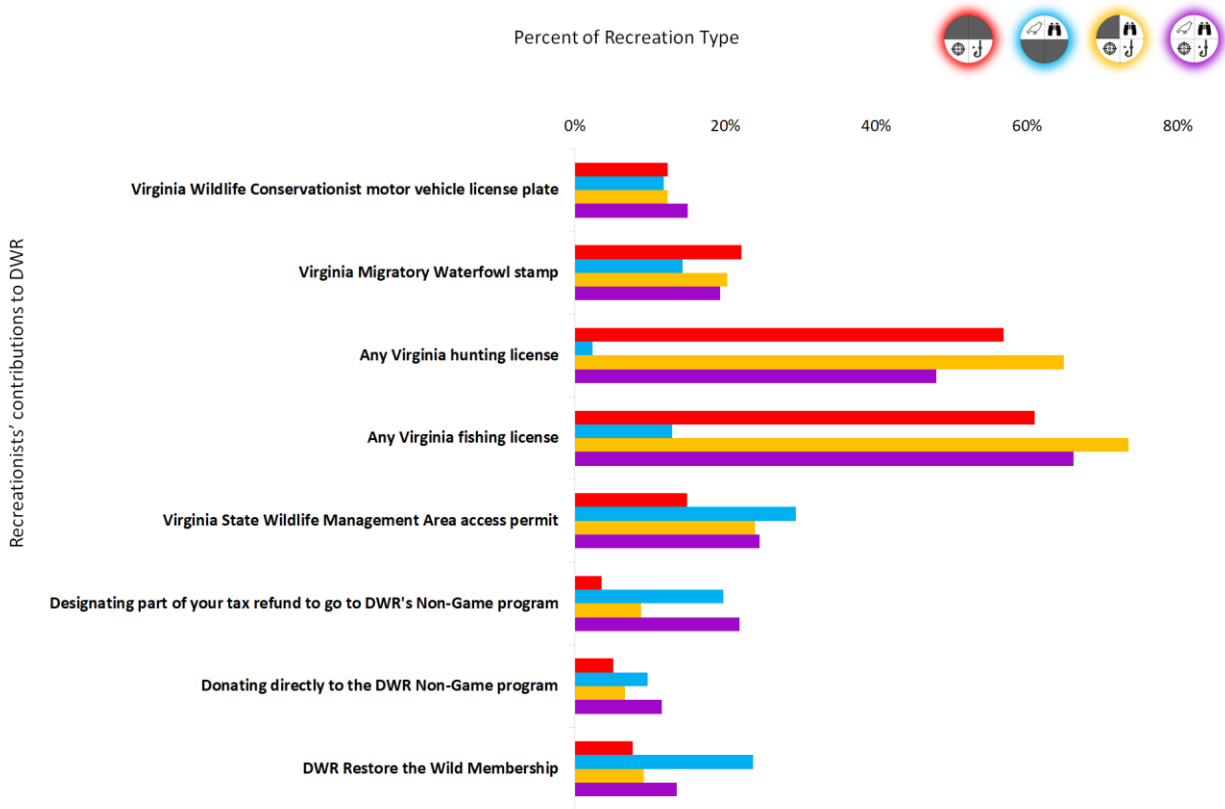
**Figure 37.** Percent of each recreation type that purchased fees and permits related to their wildlife recreation activities within the past 12 months. Percentages per recreation type are in **Appendix VIII**. Asterisks (\*) note statistically significant differences (chi-square) among recreation types at  $\alpha = 0.05$ .

*How are wildlife recreationists likely to financially contribute to the DWR in the future?*

Our survey also asked respondents to indicate which financial contributions they were likely to make in the next year that support wildlife conservation in Virginia through DWR. Around 33% of Birder-viewers, more than any other recreation type, indicated that they do not intend to financially contribute to DWR in the next year; still, two-thirds of this recreation type intend to contribute in some way, including purchases of DWR licenses and permits and other memberships and donations (**Figure 38**).

*Virginia licenses/permits.* Overall, survey responses indicate that more wildlife recreationists in our sample are likely to financially contribute to DWR next year than did this year. As with previous purchases, a higher percentage of Hunter-anglers, Viewer-hunter anglers, and Birder-viewer-hunter-anglers intend to purchase hunting and angling licenses and stamps, and a higher percentage of Birder-viewers intend to purchase WMA access permits. Compared to purchases in the past year, a higher number of all recreation types, particularly Birder-viewers and Birder-viewer-hunter-anglers, intend to purchase a DWR Restore the Wild membership next year (**Figure 38**); this is a promising finding for the program as it enters its second year.

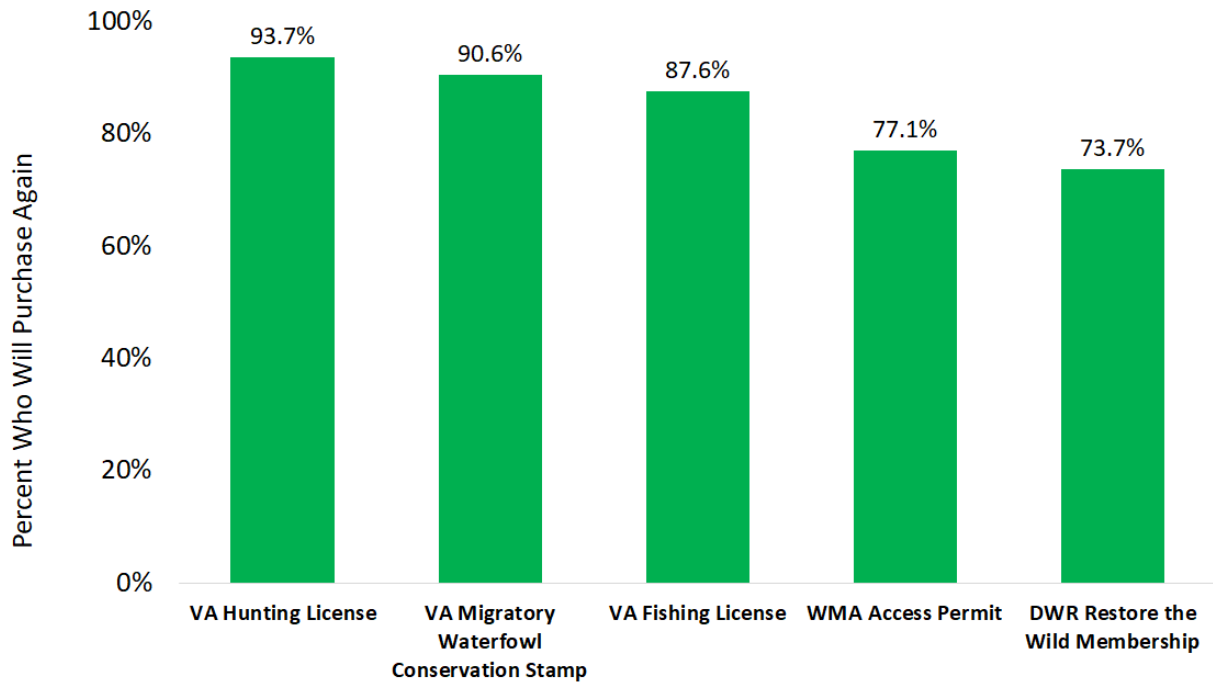
*Other purchases.* There were minimal differences among recreationist types in terms of intent to purchase a wildlife conservationist license plate in the next year (**Figure 38**). A higher percentage of Birder-viewers and Birder-viewer-hunter-anglers reported being likely to designate a portion of their tax refund to DWR's Non-game Program or to donate directly to this program. These recreation types also expressed the most interest in the allocation of additional funding for non-game conservation by the agency (**Figure 36**).



**Figure 38.** Percent of each recreation type that is likely to contribute to conservation through DWR within the next 12 months. Percentages per recreation type are in **Appendix VIII**. Asterisks (\*) note statistically significant differences (chi-square) among recreation types at  $\alpha = 0.05$ .

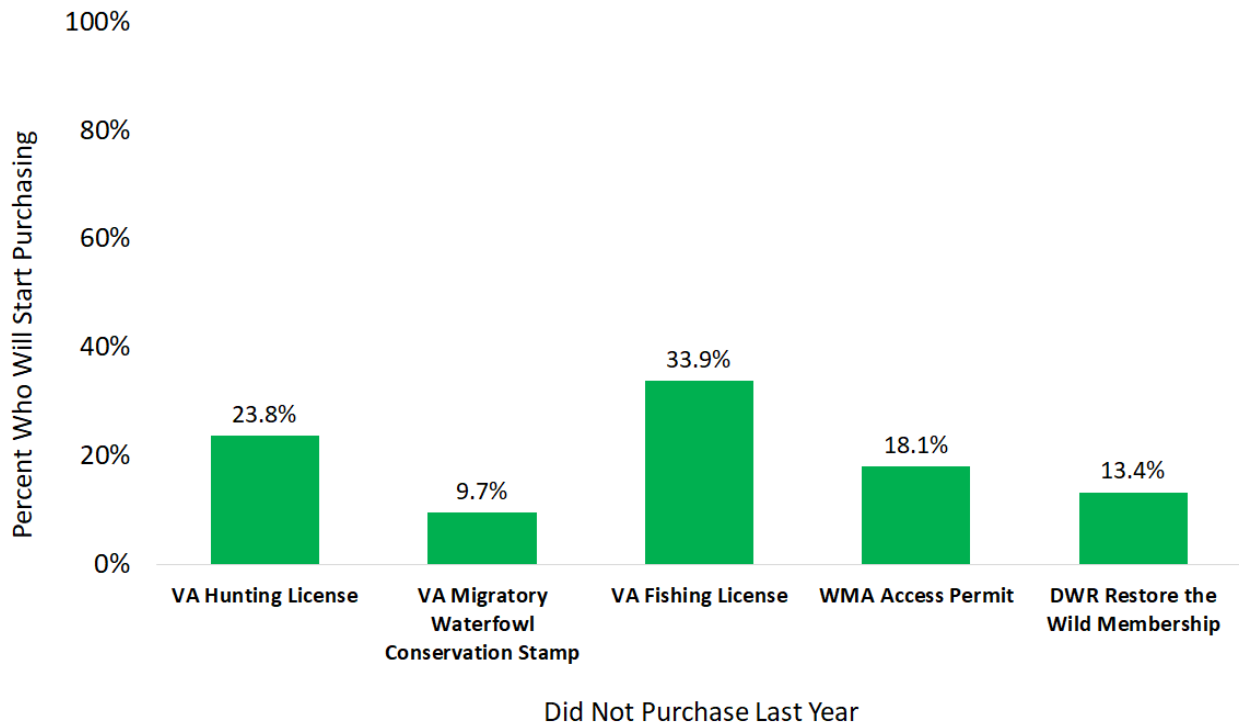
*How do past financial contributions relate to future financial contributions?*

By comparing respondents' purchases in the past year to their likely purchases next year, we found that the majority of respondents who contributed financially to DWR through a given mechanism last year were likely to contribute through that same mechanism next year (**Figure 39**). For example, 93.7% of respondents who bought a hunting license last year were likely to purchase one again next year. Among respondents who did not contribute to DWR through those mechanisms last year, fewer intended to start contributing next year. However, these percentages were still positive, indicating a potential increase in DWR funding from wildlife recreationists in the future (**Figure 40**). These differences were largest for fishing licenses; 33.9% of recreationists who had not purchased a fishing license in the past year indicated that they would be likely to purchase a fishing license next year.



Virginia licenses purchased last year

**Figure 39.** Percent of all recreation types that purchased Virginia licenses and permits within the past 12 months that plan to purchase the same Virginia licenses and permits within the next 12 months (VA Hunting license n = 538, VA Migratory Waterfowl stamp n = 223, VA Fishing license n = 724, WMA access permit n = 245, DWR Restore the Wild membership n = 38).



**Figure 40.** Percent of all recreation types that did not purchase Virginia licenses and permits within the past 12 months that plan to purchase the same Virginia licenses and permits within the next 12 months (VA Hunting license n = 1485, VA Migratory Waterfowl stamp n = 1800, VA Fishing license n = 1299, WMA access permit n = 1778, DWR RtW membership n = 1985).

**In summary:**

- Overall, 40% of Birder-viewers did not pay for any of the fees, permits, or licenses listed in the survey in the past year. However, two-thirds of individuals in this recreation type reported being likely to contribute financially to DWR in some way next year.
- Compared to other recreation types, a higher percentage of Birder-viewers purchased state park access passes, WMA access permits, DWR Restore the Wild memberships, national park fees, and America the Beautiful passes.
- Compared to Birder-viewers, a higher percentage of other recreation types (whose identities encompassed hunting/angling) purchased state licenses and stamps, Federal Duck Stamps, and access fees for private lands.
- We observed similar patterns for predicted purchases next year.
- The majority of respondents who contributed financially to DWR through a given mechanism last year were likely to contribute through that same mechanism next year.



## **NEXT STEPS**

The results of this report were presented to the Stakeholder and Technical Advisory Committees during a series of web-based meetings in summer 2020. At each web-meeting, the participants then applied the results of the survey in making suggestions for strategies that could be implemented to achieve each objective and goal of the Wildlife Viewing Plan. Following a public input period and endorsement by the Virginia Board of Wildlife Resources, the Wildlife Viewing Plan will guide the DWR's efforts to support and engage wildlife recreationists across Virginia for the next 10 years.

The results of the Wildlife Recreation Survey are also part of a larger research effort, which will provide insight into how the agency's traditional constituents (i.e., hunters and anglers) compare with birders and other wildlife viewers. These data will be used to inform the agency's current R3 effort (i.e., recruit, retain, reactivate) by providing insight into strategies to recruit new constituents to agency programs and conservation, as well as how to reactivate those individuals who have interacted with the agency in the past, but no longer do so.

## LITERATURE CITED

- AFWA, & WMI. (2019). Fish and Wildlife Relevancy Roadmap: Enhanced Conservation Through Broader Engagement (v1.0). In A. Dunfee, E. Forstchen, E. Haubold, M. Humpert, J. Newmark, J. Sumners, & C. Smith (Eds.). Washington, D.C.: Association of Fish and Wildlife Agencies and The Wildlife Management Institute.
- Cooper, C., Larson, L., Dayer, A., Stedman, R., & Decker, D. (2015). Are wildlife recreationists conservationists? Linking hunting, birdwatching, and pro-environmental behavior. *Journal of Wildlife Management*, 79(3), 446–457.
- Crawford, D. W., & Godbey, G. (1987). Reconceptualizing barriers to family leisure. *Leisure Sciences*, 9(2), 119-127.
- Decker, D. J., Brown, T. L., Driver, B. L., & Brown, P. J. (1987). Theoretical developments in assessing social values of wildlife: Toward a comprehensive understanding of wildlife recreation involvement. *Valuing wildlife: Economic and social perspectives*, 76-95.
- Dillman, D.A., Smyth, J.D., & Christian, L.M. 2014. Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method. Wiley & Sons.
- Drew A. Linzer, Jeffrey B. Lewis (2011). polCA: An R Package for Polytomous Variable Latent Class Analysis. *Journal of Statistical Software*, 42(10), 1-29. URL <http://www.jstatsoft.org/v42/i10/>.
- Ehrlich, O., Bi, X., Borisova, T., & Larkin, S. (2017). A latent class analysis of public attitudes toward water resources with implications for recreational demand. *Ecosystem Services*, 28, 124-132.
- Grooms, B. P., Dayer, A. A., & Peele, A. (2019). *Wildlife recreationists in Virginia: Focus group results*. Virginia Tech. <http://hdl.handle.net/10919/98666>.
- IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.
- Hagenaars, J. A., & Halman, L. C. (1989). Searching for ideal types: The potentialities of latent class analysis. *European Sociological Review*, 5(1), 81-96.
- Larson, L. R., Stedman, R. C., Cooper, C. B., & Decker, D. J. (2015). Understanding the multi-dimensional structure of pro-environmental behavior. *Journal of Environmental Psychology*, 43, 112–124.
- McFarlane, B. (1994). Specialization and motivations of birdwatchers. *Wildlife Society Bulletin*, 22, 361-370.
- Virginia Department of Wildlife Resources. (n.d.) *An R3 philosophy*. <https://dwr.virginia.gov/wp-content/uploads/media/DGIF-R3-Plan.pdf>.

- Virginia Department of Wildlife Resources (2020). *DGIF's New Vision, Mission, and Goal Statements*. <<https://dwr.virginia.gov/blog/dgifs-new-vision-mission-and-goal-statements/>>.
- R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <<https://www.R-project.org/>>.
- Rockville Institute. 2020. Bridging the 50-State Surveys of Fishing, Hunting, and Wildlife-Associated Recreation with Previous National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Trends. Final Methodology Overview: Virginia.
- Stern, M. J., & Baird, T. D. (2015). Trust ecology and the resilience of natural resource management institutions. *Ecology and Society*, 20(2).
- U.S. Department of the Interior, U.S. Fish and Wildlife Service, U.S. Department of Commerce, & U.S. Census Bureau. (2016). *2016 National Survey of Fishing, Hunting, and Recreation Director's Message*.
- U.S. Census Bureau (USCB) (2010). *2010: Decennial Census Summary File 1*. Retrieved from <<https://data.census.gov/cedsci/table>>.
- U.S. Census Bureau (USCB) (2018). *2018: ACS 1-Year Estimates Subject Tables*. Retrieved from <<https://data.census.gov/cedsci/table>>.

## APPENDICES

### Appendix I: Online version of the mixed-mode survey questionnaire instrument.

**Introduction + age and residency**



COLLEGE OF NATURAL RESOURCES AND ENVIRONMENT  
**FISH & WILDLIFE CONSERVATION**  
VIRGINIA TECH.

**Thank you for logging in to participate in our survey!**

Virginia Tech is conducting a study in collaboration with the Virginia Department of Game and Inland Fisheries (DGIF) to learn more about the wildlife-related experiences of people in Virginia. This survey is an opportunity for DGIF to hear from you and will help the agency understand how to best serve people in Virginia. Your responses will also be summarized, along with those of others around the state, in academic papers.

Before we begin, are you 18 years of age or older?  
(Please select yes or no.)

Yes  
 No

Are you a current resident of Virginia?  
(Please select yes or no.)

Yes  
 No

**Consent**

Great! We expect this survey will take approximately 15 - 30 minutes to complete. There are no known risks to participating in this study and your responses will remain anonymous. You can leave the survey at any time, for any reason.

**IF YOU HAVE ANY QUESTIONS**

The researchers conducting this study are Dr. Ashley Dayer, Dr. Jessica Barnes, Dr. Ashley Peele, and Bennett Grooms of Virginia Tech. If you have any questions, concerns, or complaints about the survey, please contact Bennett Grooms by email at [wildlifesurvey@vt.edu](mailto:wildlifesurvey@vt.edu) or by phone at 540-231-0961.

This research has been approved by Virginia Tech's IRB committee (protocol #17-754).  
If you have any questions regarding your rights as a subject in this study, you may communicate with the Virginia Tech Institutional Review Board (IRB) at 540-231-3732 or at [irb@vt.edu](mailto:irb@vt.edu).

Many Thanks,

Dr. Ashley Dayer  
*Assistant Professor*

Dr. Ashley Peele  
*Research Scientist*

Dr. Jessica Barnes  
*Research Associate*

Bennett Grooms  
*Graduate student*

Do you consent to participate in this research study?  
(Please select yes or no.)

- Yes, I consent to take part in this study
- No, I do not consent to take part in this study

We're sorry, but since you have not provided your consent to participate in this study, we are unable to proceed with the survey questions.

Although we cannot accept your offer of help at this time, we are very grateful people like you are willing to assist our research. We thought you might like some of the following resources to learn more about the Virginia Department of Game and Inland Fisheries (DGIF) and to help your wildlife recreation activities in Virginia.

**Information about the Department of Game and Inland Fisheries**

For more information about the DGIF, what they do, and the opportunities they provide for hunters, anglers, birders, wildlife viewers, and other recreationists, visit: <https://www.dgif.virginia.gov/>

**The Virginia Bird and Wildlife Trail**

For more information about opportunities to walk a nature trail, paddle a river, or enjoy a scenic overlook along The Virginia Bird and Wildlife Trail, visit: <https://www.dgif.virginia.gov/vbwt/>

**DGIF Wildlife Management Areas**

To visit one of DGIF's 46 wildlife management areas, open for a variety of outdoor recreational opportunities, visit: <https://www.dgif.virginia.gov/wma/>

**Wildlife in Virginia**

To learn more about the diversity of wildlife and habitat in Virginia, visit: <https://www.dgif.virginia.gov/wildlife/>



Screen for wildlife recreation

**ABOUT THIS STUDY**

In this survey, we will be asking you about your wildlife recreation activities.

By "**wildlife recreation**" we mean activities that you do for enjoyment outside of work. The purpose of these activities may include observing, photographing, feeding, collecting data about, or harvesting wildlife.

**Wildlife** refers to all animals, such as birds, fish, insects, mammals, amphibians, and reptiles, that are living in natural or wild environments. Wildlife **does not** include animals living in aquariums, zoos, and other artificial surroundings or domestic animals such as farm animals or pets.



Have you ever participated in any kind of wildlife recreation in Virginia?  
(Please select yes or no.)

- Yes
- No

**Wildlife ID**

**First, we would like to know more about your involvement in different kinds of wildlife recreation in Virginia.**

To what extent do you feel that each of the following describes you?  
(Please respond for each recreationist type.)

	Very like me	Somewhat like me	Neither like or unlike me	Somewhat unlike me	Very unlike me
<p><b>birder</b> someone who intentionally observes, photographs, feeds, or collects data <b>specifically about birds</b>, including birding, birdwatching, and feeding birds</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p><b>wildlife viewer</b> someone who intentionally observes, photographs, feeds, or collects data about wildlife (<b>other than birds</b>) or visits parks and natural areas because of wildlife</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p><b>hunter</b> someone who participates in hunting or trapping, with a license or exempt from a license, using any legal method to harvest wildlife</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p><b>angler</b> someone who participates in fishing, in either freshwater or saltwater areas, to harvest and/or catch-and-release fish</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When wildlife viewing in Virginia, how interested are you in seeing any of the following?  
 (Please select one per statement.)

	Extremely interested	Very interested	Moderately interested	Slightly interested	Not interested at all
<b>When wildlife viewing, I am _____ in seeing</b>					
<b>Insects and spiders</b> (such as butterflies, dragonflies, beetles, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Freshwater and saltwater fish</b> (such as sea bass, sunfishes, darters, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Amphibians</b> (such as frogs, salamanders, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Reptiles</b> (such as turtles, snakes, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Birds</b> (such as songbirds, waterfowl, birds of prey, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Land mammals</b> (such as deer, bears, elk, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Marine mammals</b> (such as whales, seals, dolphins, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Plants</b> (such as wildflowers, trees, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Fungi</b> (such as mushrooms, lichen, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Wildlife Rec Characteristics**

Next, we would like to know about your participation in different types of wildlife recreation activities in Virginia. Please keep in mind the following definitions when choosing your responses.

- **Birding:** Intentionally observing, photographing, feeding, or collecting data specifically about birds, including birding, birdwatching, and feeding birds.
- **Wildlife viewing:** Intentionally observing, photographing, feeding, or collecting data about wildlife (other than birds) or visiting areas because of wildlife.
- **Hunting:** Hunting or trapping, using firearms, archery equipment, traps and snares, or other methods to harvest wildlife.
- **Angling:** Fishing, in either freshwater or saltwater areas, to harvest and/or catch-and-release fish.

For about how many years have you participated in each of the following wildlife recreation activities?  
 (Please fill in your best estimate for each wildlife recreation activity. If you have never participated in an activity, please fill in 0.)

- Birding
- Wildlife viewing
- Hunting

Angling

Now thinking about the past 12 months, about how many days did you spend participating in any of the following wildlife recreation activities in Virginia? Please count multiple activities done in a single day separately.  
(Please fill in your response as a number between 0 and 365, providing the best estimate you can. If you have not participated in an activity, please fill in 0.)

Birding

Wildlife viewing

Hunting

Angling

About what percent of those days in the past 12 months did you travel more than 1 mile away from your home but still remained in Virginia?

(Please select one per wildlife recreation activity.)

	0%	1-24%	25-49%	50-74%	75-99%	100%	I do not participate in this activity
Birding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wildlife viewing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Angling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

We would like to know where in Virginia you like to go to participate in your wildlife recreation activities. Please select all of the locations where you have participated in your wildlife recreation activities in the past 12 months.  
(Please select all locations that apply for each wildlife recreation activity.)

	Birding	Wildlife viewing	Hunting	Angling
My own home and property	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Property of friends or family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other privately-owned areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local parks (e.g., regional, city, town, or county parks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
State Wildlife Management Areas (WMAs; wild areas managed by DGIF for the benefit of Virginia citizens)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



	Birding	Wildlife viewing	Hunting	Angling
Sites on The Virginia Bird and Wildlife Trail ( <i>an organized network of outdoor sites, highlighting the best places to see birds and wildlife in Virginia</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other state-managed areas ( <i>e.g., state parks, state forests, boat landings, and Natural Area Preserves</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Federally-managed areas ( <i>e.g., National Parks, National Wildlife Refuges, and National Forests</i> )	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am unsure of what kind of areas I do my recreation activities on.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Are you **currently** a member of any organizations or clubs related to each of the following wildlife recreation activities? This may include attending events, receiving newsletters, or contributing to the organization in some way.

*(Please select yes or no for each wildlife recreation activity.)*

	Yes	No
Birding	<input type="radio"/>	<input type="radio"/>
Wildlife viewing	<input type="radio"/>	<input type="radio"/>
Hunting	<input type="radio"/>	<input type="radio"/>
Angling	<input type="radio"/>	<input type="radio"/>

#### Non-wildlife focused recreation

We are also interested in your participation in other kinds of non-wildlife focused outdoor recreation activities. Which of the following non-wildlife focused **outdoor activities** have you participated in within the past 12 months in Virginia?

*(Please select all that apply.)*

- Archery
- Biking
- Camping
- Hiking or backpacking
- Horseback riding
- Motorized boating
- Non-motorized boating (*such as kayaking or canoeing*)
- Swimming
- Recreational shooting sports
- Running, jogging, or walking
- Winter sports

Other

I do not participate in any of these activities.

Even though you may not have participated in any wildlife recreation activities within the past 12 months, we are also interested in your participation in other kinds of non-wildlife focused outdoor recreation activities. Which of the following non-wildlife focused **outdoor activities** have you participated in within the past 12 months in Virginia?

*(Please select all that apply.)*

Archery

Biking

Camping

Hiking or backpacking

Horseback riding

Motorized boating

Non-motorized boating  
*(such as kayaking or canoeing)*

Swimming

Recreational shooting sports

Running, jogging, or walking

Winter sports

Other

I do not participate in any of these activities.

#### **Fees and Permits**

Which of the following fees or permits have you purchased in **Virginia (VA)** within the past 12 months related to your wildlife recreation activities?

*(Please select all that apply.)*

##### **State level**

DGIF sportsman license *(combination hunting and fishing license)*

Any other VA hunting license

Any other VA fishing license

VA state Wildlife Management Area (WMA) access permit

VA Migratory Waterfowl Conservation Stamp

VA state park access pass

VA state forest use permit

DGIF Restore the Wild Membership  
*(membership whose funds are earmarked for wildlife habitat projects and includes access to DGIF properties)*

##### **Federal level**

Federal Migratory Bird Hunting and Conservation Stamp *(i.e., Federal Duck Stamp)*

- National Park fee or pass (such as access to Shenandoah National Park)
- America the Beautiful pass (access to National Parks, National Forests, and other federal lands)

**Other**

- Access fees for privately owned lands in VA

**None**

- I have not purchased or paid for any permits or fees

Have you ever purchased any of the following **Virginia Lifetime Licenses**? (licenses that are valid for the license holder's entire life)  
(Please select all that apply.)

- Any VA lifetime hunting license
- Any VA lifetime fishing license
- I have not purchased any VA lifetime licenses

**Conservation PEB**

**Next, we would like to know more about any wildlife conservation activities in which you may have participated.**



Approximately how many days within the past 12 months have you participated in the following wildlife conservation activities **on a voluntary basis in Virginia**? Specifically, we are interested in activities you do outside your work. These can include activities you have done individually, with your family, or as part of a group.

- For example, if you went out once a week for an activity, you would fill in 52 days.
- Please fill in your response as a number between 0 and 365, providing the best estimate you can.
- If you have not participated in an activity, please fill in 0.

- Informing or teaching others about wildlife conservation (such as wildlife-related education and outreach)
- Improving wildlife habitat (the place or environment where wildlife live and grow) on public or private lands (such as planting trees or installing nest boxes)
- Advocating (such as signing petitions and calling policy makers) or voting related to wildlife conservation
- Collecting data on wildlife or habitat to contribute to science or management (such as participating in citizen science projects)
- Contributing to fundraising efforts for wildlife conservation (such as donating money or participating in fundraising events)

**Conservation PEB MOTIVES**

**We would like to know more about why you engage in certain wildlife conservation activities.**

How important were the following to your involvement in **informing or teaching others about wildlife conservation** in the past 12 months?  
(Please select one per statement.)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
Interacting with others with similar interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doing something enjoyable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accomplishing something important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Benefiting wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important were the following to your involvement in **improving wildlife habitat on private or public lands** in the past 12 months?  
(Please select one per statement.)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
Interacting with others with similar interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doing something enjoyable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accomplishing something important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Benefiting wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important were the following to your involvement in **advocating or voting related to wildlife conservation** in the past 12 months?  
 (Please select one per statement.)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
Interacting with others with similar interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doing something enjoyable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accomplishing something important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Benefiting wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important were the following to your involvement in **collecting data on wildlife or habitat to contribute to science or management** in the past 12 months?  
 (Please select one per statement.)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
Interacting with others with similar interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doing something enjoyable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accomplishing something important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Benefiting wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important were the following to your involvement in **contributing to fundraising efforts for wildlife conservation** in the past 12 months?  
 (Please select one per statement.)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
Interacting with others with similar interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doing something enjoyable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accomplishing something important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Benefiting wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Conservation PEB CONSTRAINTS**

**We would like to know more about what may have prevented your involvement in certain wildlife conservation activities.**

How important were the following in preventing you from **informing or teaching others about wildlife conservation** in the past 12 months?  
 (Please select one per statement.)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
I don't have enough time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have the physical ability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not interested in this activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have no one to do this activity with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have never had the opportunity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important were the following in preventing you from **improving wildlife habitat on public or private lands** in the past 12 months?  
 (Please select one per statement.)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
I don't have enough time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have the physical ability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not interested in this activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have no one to do this activity with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have never had the opportunity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important were the following in preventing you from **advocating or voting related to wildlife conservation** in the past 12 months?  
 (Please select one per statement.)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
I don't have enough time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have the physical ability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not interested in this activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have no one to do this activity with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have never had the opportunity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important were the following in preventing you from **collecting data on wildlife or habitat to contribute to science or management** in the past 12 months?  
 (Please select one per statement.)

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
I don't have enough time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have the physical ability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
I am not interested in this activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have no one to do this activity with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have never had the opportunity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important were the following in preventing you from **contributing to fundraising efforts for wildlife conservation** in the past 12 months?  
*(Please select one per statement.)*

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
I don't have enough time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have the physical ability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not interested in this activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have no one to do this activity with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have never had the opportunity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**DGIF intro and knowledge**

**In this section, we would like to know about your experiences with your state fish and wildlife agency, the Virginia Department of Game and Inland Fisheries (DGIF).**

Everyone is likely to have different levels of familiarity with the agency, and that's okay.

Regardless of your level of familiarity, we look forward to hearing your thoughts!



How familiar would you say you are with DGIF?  
*(Please select one.)*

- Extremely familiar
- Very familiar
- Moderately familiar
- Slightly familiar
- Not familiar at all

### DGIF Roles

**Regardless of how familiar you are with DGIF, we are interested in your thoughts about how DGIF prioritizes the needs of various recreation groups.**

First, on a scale from one to five, with one being the highest priority and five being the lowest, what priority level do you think DGIF, as your state fish and wildlife agency, **currently** gives to each of the following?  
(Please select one per statement.)

	High priority	2	3	4	Low priority
	1	2	3	4	5
Serving the needs of birders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of other wildlife viewers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of hunters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of anglers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Now, considering the same options, what priority level do you think DGIF **should** give to each of the following?  
(Please select one per statement.)

	High priority	2	3	3	Low priority
	1	2	3	4	5
Serving the needs of birders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of other wildlife viewers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of hunters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of anglers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### DGIF Programs and Services

The Department of Game and Inland Fisheries offers a variety of programs and services to Virginia recreationists, some of which you may have encountered without knowing that they were provided by DGIF. Below is a list of just some of these programs and services. Which of the following (if any) have you engaged with or used in the past 5 years?

(Please select all that apply.)

- Volunteer research and wildlife data collection opportunities**  
(such as the VA Breeding Bird Atlas or other citizen science projects)
- Other, non-science volunteer opportunities**  
(such as volunteering to be an educator)
- The Virginia Bird and Wildlife Trail**  
(an organized network of outdoor sites coordinated by DGIF, highlighting the best places to see birds and wildlife in Virginia)
- State Wildlife Management Areas (WMAs)**  
(wild areas managed by DGIF for the benefit of Virginia citizens)
- Assistance for improving wildlife habitat**  
(such as recommendations and resources for landowners)
- Information about wildlife viewing opportunities**  
(such as information about where to view wildlife)



- Information about Virginia's wildlife**  
(such as current research, identification, and management)
- Outreach to schools and clubs**  
(such as DGIF staff speaking to groups or leading classes)
- Wildlife organizations sponsored by the agency**  
(such as the VA Master Naturalists)
- Wildlife festivals sponsored by the agency**  
(such as *The Winter Wildlife Festival*, *The Great Dismal Swamp Birding Festival*, and *The Eastern Shore Birding and Wildlife Festival*)
- Wildlife cameras**  
(such as the *Richmond falcon cam*, *elk cam*, and *shad cam*)
- Virginia conservation law enforcement**  
(formerly known as game wardens)
- Other**
- I have not used or engaged in any DGIF programs or services in the last 5 years

**Even though you may not currently engage with any DGIF programs and services, the agency would still appreciate your feedback about how it can better serve the people of Virginia.**

How satisfied were you with the DGIF programs and services you have experience with?  
(Please select one per statement.)

	Extremely satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Somewhat dissatisfied	Extremely dissatisfied
Volunteer research and wildlife data collection opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other, non-science volunteer opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Virginia Bird and Wildlife Trail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
State Wildlife Management Areas (WMA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assistance for improving wildlife habitat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information about wildlife viewing opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information about Virginia's wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Outreach to schools and clubs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wildlife organizations sponsored by the agency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wildlife festivals sponsored by the agency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wildlife cams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Virginia conservation law enforcement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

DGIF is particularly interested in learning more about the public's use of their **Wildlife Management Areas (WMAs)** and **The Virginia Bird and Wildlife Trail**.

Which of the following (if any) prevent you from using sites along **The Virginia Bird and Wildlife Trail**?  
 (Please select all that apply.)

- I don't have enough time
- They are too far away from where I live
- I am unaware of where to access them
- I am not interested in using them
- I have no one to use them with
- Other

Which of the following (if any) prevent you from using **Wildlife Management Areas (WMAs)**?  
 (Please select all that apply.)

- I don't have enough time
- They are too far away from where I live
- I am unaware of where to access them
- I am not interested in using them
- I have no one to use them with
- Other

**Trust**

We would like to know how you feel about DGIF, as your state fish and wildlife agency. To what extent do you agree with each of the following statements about DGIF?  
 (Please select one per statement.)

	Strongly agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Strongly disagree
<b>DGIF...</b>					
...employs genuinely good people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has expertise in wildlife management, conservation, and research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...shares my values	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has a consistent track record of excellent performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...can be relied upon to ensure quality recreation opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has an effective system to address problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...employs people just like me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has systems in place to ensure fair treatment of VA residents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Strongly disagree
...treats all wildlife recreation groups fairly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Wildlife Rec Support DGIF**

**Now, we are interested in your thoughts about supporting DGIF wildlife conservation, management, and research efforts.**

How likely would you be to contribute to the work of DGIF with the following activities within the next 12 months, if you had the ability and opportunity to do so?  
(Please select one per statement.)

	Very likely	Somewhat likely	Neither likely nor unlikely	Somewhat unlikely	Very unlikely
<b>I am _____ to work with DGIF on...</b>					
...Informing or teaching others about wildlife conservation (such as wildlife-related education and outreach)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...Improving wildlife habitat (the place or environment where wildlife live and grow) on public or private lands (such as planting trees or installing nest boxes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...Advocating (such as signing petitions and calling policy makers) or voting related to wildlife conservation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...Collecting data on wildlife or habitat to contribute to science or management (such as participating in citizen science projects)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...Contributing to fundraising efforts for wildlife conservation (such as donating money or participating in fundraising events)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The ability of DGIF to manage and conserve wildlife, provide wildlife recreation opportunities, and conduct wildlife research in the state of Virginia depends in part on funds it receives from the people it serves.

Below are a variety of ways people can financially contribute to wildlife conservation in Virginia **through DGIF**. Please indicate which of the following contributions you are likely to make within the next 12 months.  
(Please select all that apply.)

- Purchasing a VA Wildlife Conservationist motor vehicle license plate
- Purchasing a VA Migratory Waterfowl Conservation Stamp
- Purchasing any VA hunting license
- Purchasing any VA fishing license
- Purchasing a VA State Wildlife Management Area (WMA) access permit
- Designating part of your tax refund to go to DGIF's Non-Game Program
- Donating directly to the DGIF Non-Game Program

- Purchasing a DGIF Restore the Wild Membership  
(membership whose funds are earmarked for wildlife habitat projects and includes access to DGIF properties)
- Other
- I am unlikely to financially contribute to wildlife conservation in Virginia through DGIF within the next 12 months

**DGIF support Wildlife Rec**

Now, we are interested in your thoughts about how DGIF can best meet the needs of wildlife recreationists in Virginia.

Which of the following things do you think DGIF could do to better support your wildlife recreation activities in Virginia?  
(Please select all that apply.)

**DGIF can better support my wildlife recreation activities by providing...**

- ...access to more places to go birding
- ...access to more places to view other wildlife
- ...access to more places to hunt
- ...access to more places to fish
- ...more information about accessing Wildlife Management Areas (WMAs)
- ...more information about accessing sites on The Virginia Bird and Wildlife Trail
- ...more information about where to go see birds and other wildlife
- ...more information about the wildlife species in Virginia
- ...more funds to the conservation of non-huntable and non-fishable wildlife (nongame species)
- ...more funds to the conservation of huntable and fishable wildlife (game species)
- ...more funds to protect habitat
- ...more opportunities to be involved in wildlife and habitat data collection
- ...more opportunities to recruit others into wildlife recreation activities
- ...more opportunities for youth to learn how to participate in wildlife recreation activities
- ...more wildlife viewing events and activities
- ...more DGIF staff in the field
- ...more amenities for birding and wildlife viewing (such as viewing platforms, blinds, signs)
- Other
- I am not interested in any of these options

**DGIF communication**

DGIF would also like to know how to best reach residents of Virginia with information about recreational opportunities and conservation issues.

Which of the following methods do you prefer for receiving this kind of information? Your responses are for data collection only, and DGIF will not receive your response nor contact you as a result of this survey.  
(Please select all that apply.)

***I would prefer to receive information from DGIF through...***

- ...email updates
- ...e-newsletters
- ...the DGIF website
- ...Facebook
- ...Instagram
- ...cell phone or mobile apps
- ...blogs
- ...magazines
- ...printed materials (such as brochures and maps)
- ...online videos
- ...podcasts
- ...one-on-one interactions with wildlife professionals
- Other
- I would prefer not to receive information from DGIF.

**Demographics**

**This is the final section of the survey. Now, we have a few quick questions about you...**

For about how many years have you lived in Virginia?  
(Please fill in your response, providing the best estimate you can.)

In what year were you born?  
(Please choose a date from the drop down box.)

Year

What gender do you identify as?  
(Please select one.)

- Male
- Female
- Other
- Prefer not to respond

What is your ethnicity?

*(Please select one.)*

- Hispanic
- Non-Hispanic

What is your race?

*(Please select all that apply.)*

- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Other

What was your total income during the past 12 months?

*(Please select one.)*

- Less than \$24,999
- \$25,000 - \$49,999
- \$50,000 - \$74,999
- \$75,000 - \$99,999
- \$100,000 - \$124,999
- \$125,000 or more

What is the highest degree or level of school you have completed?

*(Please select one.)*

- Less than high school
- High school diploma or equivalent
- Some college, no degree
- Associate's degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate degree

Which of the following best describes where you live now compared to where you lived most of your time growing up?

*(Please select one per statement.)*

- |       |                          |                                |
|-------|--------------------------|--------------------------------|
| Urban | Where I live now         | Where I lived while growing up |
|       | <input type="checkbox"/> | <input type="checkbox"/>       |

	Where I live now	Where I lived while growing up
Suburban	<input type="checkbox"/>	<input type="checkbox"/>
Rural	<input type="checkbox"/>	<input type="checkbox"/>

**Conclusion**

**Thank you so much for completing this survey! If you have any additional comments about wildlife recreation in Virginia, please add them in the box below.**

**TO FINISH: Please be sure to click the >> button to submit.**

Powered by Qualtrics

**Appendix II: Paper version of the mixed-mode survey questionnaire instrument.**



Department of Fish and Wildlife Conservation  
310 West Campus Drive  
Cheatham Hall, RM 113  
Blacksburg, Virginia 24061  
P: (540) 231-1473  
vtwildliferec@gmail.com

Dear Virginia Resident,

Our research group at Virginia Tech recently sent you a postcard inviting you to take an online research survey about your outdoor and wildlife-related experiences in Virginia, and we still want to hear from you! Even if you have little experience with or knowledge of wildlife in Virginia, your views are still important to us! You are part of a select sample that has been chosen to participate in the survey, and your input will help the Virginia Department of Game and Inland Fisheries, your state wildlife agency, better connect people to Virginia's unique and diverse natural resources.

We hope the enclosed, printed version of the survey will make it easier for you to respond. The survey should take about 15 - 30 minutes to complete. This survey is completely voluntary and confidential, and there are no risks associated with your participation. The researchers conducting this study are Dr. Ashley Dayer, Dr. Jessica Barnes, Dr. Ashley Peele, and Bennett Grooms of Virginia Tech. This research has been approved by Virginia Tech's Institutional Review Board (IRB) (protocol #17-754). If you have any questions regarding your rights as a subject in this study, you may communicate with the Virginia Tech IRB at 540-231-3732 or at [irb@vt.edu](mailto:irb@vt.edu).

This is the only time we will send you a printed copy of the survey, so please complete it at your earliest convenience. When you are finished, please place your completed survey in the enclosed addressed and postage-paid envelope, and mail it back to us as soon as possible. If you have any questions about the survey, please contact Bennett Grooms at 540-231-0961 or at [wildlifesurvey@vt.edu](mailto:wildlifesurvey@vt.edu).

Thank you for your time!

Sincerely,

A handwritten signature in black ink that reads 'Ashley Dayer'.

Ashley Dayer  
Assistant Professor  
Virginia Tech

A handwritten signature in black ink that reads 'Bennett Grooms'.

Bennett Grooms  
Graduate Student  
Virginia Tech





Please have the adult (age 18 or older) in your household with the most recent birthday complete this survey.

Before we begin, are you 18 years of age or older? (Please check yes or no)	<input type="radio"/> Yes	<input type="radio"/> No
Are you a current resident of Virginia? (Please check yes or no)	<input type="radio"/> Yes	<input type="radio"/> No

→ If you are NOT 18 or older or NOT a Virginia resident, please skip the rest of the survey and mail it back using the postage paid envelope. Thanks!

In this survey, we will be asking you about your wildlife recreation activities. By “wildlife recreation” we mean activities that you do for enjoyment outside of work. The purpose of these activities may include observing, photographing, feeding, collecting data about, or harvesting wildlife.  
 “Wildlife” refers to all animals, such as birds, fish, insects, mammals, amphibians, and reptiles that are living in natural or wild environments. **Wildlife does not** include animals living in aquariums, zoos, and other artificial surroundings or domestic animals such as farm animals or pets.

---

**Q1. First, we would like to know more about your involvement in different kinds of wildlife recreation in Virginia. Have you ever participated in any kind of wildlife recreation in Virginia?** (Please check yes or no.)  Yes  No

→ If you marked “No” for Q1, please skip to Q11.

---

**Q2. To what extent do you feel that each of the following describes you?** (Please respond for each recreation type.)

	Very like me	Somewhat like me	Neither like nor unlike me	Somewhat unlike me	Very unlike me
<b>birder:</b> someone who intentionally observes, photographs, feeds, or collects data <u>specifically about birds</u> , including birding, birdwatching, and feeding birds.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>wildlife viewer:</b> someone who intentionally observes, photographs, feeds, or collects data about wildlife ( <u>other than birds</u> ) or visits parks and natural areas because of wildlife.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>hunter:</b> someone who participates in hunting or trapping, with a license or exempt from a license, using any legal method to harvest wildlife.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>angler:</b> someone who participates in fishing, in either freshwater or saltwater areas, to harvest and/or catch-and-release fish.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

→ If you selected “somewhat like me” or “very like me” for **wildlife viewer**, please proceed to Q3; if not, please skip to Q4.

---

**Q3. When wildlife viewing in Virginia, how interested are you in seeing any of the following?** (Please select one per statement.)

When wildlife viewing, I am _____ in seeing	Extremely interested	Very interested	Moderately interested	Slightly interested	Not interested at all
Insects and spiders (such as butterflies, dragonflies, beetles, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Freshwater and saltwater fish (such as sea bass, sunfishes, darters, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amphibians (such as frogs, salamanders, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reptiles (such as turtles, snakes, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Birds (such as songbirds, waterfowl, birds of prey, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Land mammals (such as deer, bears, elk, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Marine mammals (such as whales, seals, dolphins, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plants (such as wildflowers, trees, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fungi (such as mushrooms, lichen, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

**Q4. Next, we would like to know about your participation in different types of wildlife recreation activities in Virginia. Please keep in mind the definitions from Q2 when choosing your responses. For about how many years have you participated in each of the following wildlife recreation activities?** (Please fill in your best estimate for each wildlife recreation activity. If you have never participated in an activity, please fill in 0.)

	# years		# years
Birding		Wildlife viewing	
Hunting		Angling	

**Q5. Now thinking about the past 12 months, about how many days did you spend participating in any of the following wildlife recreation activities in Virginia? Please count multiple activities done in a single day separately. (Please fill in your response as a number between 0 and 365, providing the best estimate you can. If you have not participated in an activity, please fill in 0.)**

	# days		# days
Birding		Wildlife viewing	
Hunting		Angling	

---

**Q6. About what percent of those days in the past 12 months did you travel more than 1 mile away from your home, but still remained in Virginia? (Please select one per wildlife recreation activity.)**

	0%	1-24%	25-49%	50-74%	75-99%	100%	I do not participate in this activity
Birding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wildlife viewing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Angling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

**Q7. We would like to know where in Virginia you like to go to participate in your wildlife recreation activities. Please select all of the locations where you have participated in your wildlife recreation activities in the past 12 months. If you do not participate in a specific wildlife recreation activity, please leave that column blank. (Please select all locations that apply for each wildlife recreation activity.)**

	Birding	Wildlife viewing	Hunting	Angling
My own home and property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Property of friends or family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other privately-owned areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local parks (e.g., regional, city, town, or county parks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
State Wildlife Management Areas (WMAs; wild areas managed by DGIF for the benefit of Virginia citizens)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sites on The Virginia Bird and Wildlife Trail (an organized network of outdoor sites, highlighting the best places to see birds and wildlife in Virginia)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other state-managed areas (e.g., state parks, state forests, boat landings, and Natural Area Preserves)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Federally-managed areas (e.g., National Parks, National Wildlife Refuges, and National Forests)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am unsure of what kind of areas I do my recreation activities on.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not participate in this activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

**Q8. Are you currently a member of any organizations or clubs related to each of the following wildlife recreation activities? This may include attending events, receiving newsletters, or contributing to the organization in some way. (Please select yes or no for each wildlife recreation activity.)**

Birding	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> I do not participate in this activity
Wildlife viewing	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> I do not participate in this activity
Hunting	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> I do not participate in this activity
Angling	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> I do not participate in this activity

**Q9. Which of the following fees or permits have you purchased in Virginia (VA) within the past 12 months related to your wildlife recreation activities? (Please select all that apply.)**

	Purchased		Purchased
DGIF sportsman license (combination hunting and fishing license)	<input type="radio"/>	VA Migratory Waterfowl Conservation Stamp	<input type="radio"/>
Any other VA hunting license	<input type="radio"/>	VA state park access pass	<input type="radio"/>
Any other VA fishing license	<input type="radio"/>	VA state forest use permit	<input type="radio"/>
VA state Wildlife Management Area (WMA) access permit	<input type="radio"/>	DGIF Restore the Wild Membership (membership whose funds are earmarked for wildlife habitat projects and includes access to DGIF properties)	<input type="radio"/>
I have not purchased or paid for any permits or fees <input type="radio"/>			

---

**Q10. Have you ever purchased any of the following Virginia Lifetime Licenses? (licenses that are valid for the license-holder's entire life; Please select all that apply.)**

	Purchased
Any VA lifetime hunting license	<input type="radio"/>
Any VA fishing license	<input type="radio"/>
I have not purchased any VA lifetime licenses <input type="radio"/>	

---

**Q11. We are also interested in your participation in other kinds of non-wildlife focused outdoor recreation activities. Which of the following non-wildlife focused outdoor activities have you participated in within the past 12 months in Virginia? (Please select all that apply.)**

	Have participated in		Have participated in
Archery	<input type="radio"/>	Non-motorized boating (such as kayaking or canoeing)	<input type="radio"/>
Biking	<input type="radio"/>	Swimming	<input type="radio"/>
Camping	<input type="radio"/>	Recreational shooting sports	<input type="radio"/>
Hiking or backpacking	<input type="radio"/>	Running, jogging, or walking	<input type="radio"/>
Horseback riding	<input type="radio"/>	Winter sports	<input type="radio"/>
Motorized boating	<input type="radio"/>	Other (please explain): _____	<input type="radio"/>
I do not participate in any of these activities <input type="radio"/>			

---

**Q12. Next, we would like to know more about any wildlife conservation activities in which you may have participated. Approximately how many days within the past 12 months have you participated in the following wildlife conservation activities on a *voluntary basis in Virginia*? Specifically, we are interested in activities you do outside of your work. These can include activities you have done individually, with your family, or as part of a group. (Please fill in your response as a number between 0 and 365, providing the best estimate you can. If you have not participated in an activity, please fill in 0.)**

	# days
A. Informing or teaching others about wildlife conservation (such as wildlife-related education and outreach)	
B. Improving wildlife habitat (the place or environment where wildlife live and grow) on public or private lands (such as planting trees or installing nest boxes)	
C. Advocating (such as signing petitions and calling policy makers) or voting related to wildlife conservation	
D. Collecting data on wildlife or habitat to contribute to science or management (such as participating in citizen science projects)	
E. Contributing to fundraising efforts for wildlife conservation (such as donating money or participating in fundraising events)	

---



In this section, we would like to know about your experiences with your state fish and wildlife agency, the Virginia Department of Game and Inland Fisheries (DGIF). Everyone is likely to have different levels of familiarity with the agency, and that's okay. Regardless of your level of familiarity, we look forward to hearing your thoughts!

**Q13. How familiar would you say you are with DGIF? (Please check one.)**

<input type="radio"/> Extremely familiar	<input type="radio"/> Very familiar	<input type="radio"/> Moderately familiar	<input type="radio"/> Slightly familiar	<input type="radio"/> Not familiar at all
--	-------------------------------------	---	---	---

Q14. Regardless of how familiar you are with DGIF, we are interested in your thoughts about how DGIF prioritizes the needs of various recreation groups. First, on a scale from one to five, with one being the highest priority and five being the lowest, what priority level do you think DGIF, as your state fish and wildlife agency, currently gives to each of the following? (Please select one per statement.)

	High priority				Low priority
	1	2	3	4	5
Serving the needs of birders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of other wildlife viewers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of hunters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of anglers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

Q15. Now, considering the same options, what priority level do you think DGIF should give to each of the following? (Please select one per statement.)

	High priority				Low priority
	1	2	3	4	5
Serving the needs of birders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of other wildlife viewers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of hunters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serving the needs of anglers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

Q16. The Department of Game and Inland Fisheries (DGIF) offers a variety of programs and services to Virginia recreationists, some of which you may have encountered without knowing that they were provided by DGIF. The agency is particularly interested in learning more about the public's use of their Wildlife Management Areas (WMAs) and The Virginia Bird and Wildlife Trail. Have you used The Virginia Bird and Wildlife Trail or Wildlife Management Areas (WMAs) in the past 5 years? If yes, please indicate how satisfied you were with your experience. (Please select one per statement.)

Programs	Have used	Satisfaction with DGIF programs (if you select "have used" please mark your level of satisfaction)				
		Extremely satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Somewhat dissatisfied	Extremely dissatisfied
The Virginia Bird and Wildlife Trail (an organized network of outdoor sites coordinated by DGIF, to see birds and wildlife in Virginia)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
State Wildlife Management Areas (WMAs) (wild areas managed by DGIF for the benefit of Virginia citizens)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have not used either of these DGIF sites in the last 5 years. <input type="radio"/>						

→ If you have used **BOTH** the Virginia Bird and Wildlife Trail and the Wildlife Management Areas (WMAs) in the past 5 years, please skip to Q18.  
 → If you have **NOT** used **EITHER** or **BOTH** The Virginia Bird and Wildlife Trail or Wildlife Management Areas (WMAs) in the past 5 years, please proceed to Q17.

---

Q17. Which of the following (if any) prevent you from using sites along The Virginia Bird and Wildlife Trail or Wildlife Management Areas (WMAs)? (Please select all that apply.)

	The VA Bird and Wildlife Trail	Wildlife Management Areas (WMAs)
I don't have enough time	<input type="radio"/>	<input type="radio"/>
They are too far from where I live	<input type="radio"/>	<input type="radio"/>
I am unaware of where to access them	<input type="radio"/>	<input type="radio"/>
I am not interested in using them	<input type="radio"/>	<input type="radio"/>
I have no one to use them with	<input type="radio"/>	<input type="radio"/>
Other (please explain): _____	<input type="radio"/>	<input type="radio"/>

**Q18.** Below is a list of some additional programs and services provided by DGIF. Which of the following (if any) have you engaged with or used in the past 5 years? (Please select all that apply.) For those programs and services you have used, please indicate how satisfied you were with your experience. (Please select one per statement.)

Programs	Have used	Satisfaction with DGIF programs (if you select "have used" please mark your level of satisfaction)				
		Extremely satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Somewhat dissatisfied	Extremely dissatisfied
Volunteer research and wildlife data collection opportunities (such as the VA Breeding Bird Atlas or other citizen science projects)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other, non-science volunteer opportunities (such as volunteering to be an educator)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assistance for improving wildlife habitat (such as recommendations and resources for landowners)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information about wildlife viewing opportunities (such as information about where to view wildlife)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information about Virginia's wildlife (such as current research, identification, and management)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Outreach to schools and clubs (such as DGIF staff speaking to groups or leading classes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wildlife organizations sponsored by the agency (such as the VA Master Naturalists)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wildlife festivals sponsored by the agency (such as The Winter Wildlife Festival, The Great Dismal Swamp Birding Festival, and The Eastern Shore Birding and Wildlife Festival)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wildlife cameras (such as the Richmond falcon cam, elk cam, and shad cam)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Virginia conservation law enforcement (formerly known as game wardens)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please explain): _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have not used or engaged in any of these DGIF programs or services in the last 5 years. <input type="radio"/>						

→ If you selected "I have not used or engaged in any of these DGIF programs or services in the last 5 years," please skip to Q21.

---

**Q19.** We would like to know how you feel about DGIF, as your state fish and wildlife agency. To what extent do you agree with each of the following statements about DGIF? (Please select one per statement.)

DGIF...	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
...employs genuinely good people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has expertise in wildlife management, conservation, and research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...shares my values	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has a consistent track record of excellent performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...can be relied upon to ensure quality recreation opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has an effective system to address problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...employs people just like me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has systems in place to ensure fair treatment of VA residents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...treats all wildlife recreation groups fairly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



**Q20. Now, we are interested in your thoughts about supporting DGIF wildlife conservation, management, and research efforts. How likely would you be to contribute to the work of DGIF with the following activities within the next 12 months, if you had the ability and opportunity to do so? (Please select one per statement.)**

<i>I am _____ to work with DGIF on...</i>	Very likely	Somewhat likely	Neither likely nor unlikely	Somewhat unlikely	Very unlikely
...informing or teaching others about wildlife conservation (such as wildlife-related education and outreach)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...improving wildlife habitat (the place or environment where wildlife live and grow) on public or private lands (such as planting trees or installing nest boxes)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...advocating (such as signing petitions and calling policy makers) or voting related to wildlife conservation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...collecting data on wildlife or habitat to contribute to science or management (such as participating in citizen science projects)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...contributing to fundraising efforts for wildlife conservation (such as donating money or participating in fundraising events)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

**Q21. The ability of DGIF to manage and conserve wildlife, provide wildlife recreation opportunities, and conduct wildlife research in the state of Virginia depends in part on funds it receives from the people it serves. Below are a variety of ways people can financially contribute to wildlife conservation in Virginia through DGIF. Please indicate which of the following contributions you are likely to make within the next 12 months. (Please select all that apply.)**

	Likely to make		Likely to make
Purchasing a VA Wildlife Conservationist motor vehicle license plate	<input type="radio"/>	Designating part of your tax refund to go to DGIF's Non-Game Program	<input type="radio"/>
Purchasing a VA Migratory Waterfowl Conservation Stamp	<input type="radio"/>	Donating directly to the DGIF Non-Game Program	<input type="radio"/>
Purchasing any VA hunting license	<input type="radio"/>	Purchasing a DGIF Restore the Wild Membership (membership whose funds are earmarked for wildlife habitat projects and includes access to DGIF properties)	<input type="radio"/>
Purchasing any VA fishing license	<input type="radio"/>	Other (please explain): _____	<input type="radio"/>
Purchasing a VA State Wildlife Management Area (WMA) access permit	<input type="radio"/>	I am unlikely to financially contribute to wildlife conservation in Virginia through DGIF within the next 12 months	<input type="radio"/>

---

**Q22. Now, we are interested in your thoughts about how DGIF can best meet the needs of wildlife recreationists in Virginia. Which of the following things do you think DGIF could do to better support your wildlife recreation activities in Virginia? (Please select all that apply.)**

DGIF can better support my wildlife recreation activities by providing...			
...access to more places to go birding	<input type="radio"/>	...more funds to the conservation of huntable and fishable wildlife (game species)	<input type="radio"/>
...access to more places to view other wildlife	<input type="radio"/>	...more funds to protect habitat	<input type="radio"/>
...access to more places to hunt	<input type="radio"/>	...more opportunities to be involved in wildlife and habitat data collection	<input type="radio"/>
...access to more places to fish	<input type="radio"/>	...more opportunities to recruit others into wildlife recreation activities	<input type="radio"/>
...more information about accessing Wildlife Management Areas (WMAs)	<input type="radio"/>	...more opportunities for youth to learn how to participate in wildlife recreation activities	<input type="radio"/>
...more information about accessing sites on The Virginia Bird and Wildlife Trail	<input type="radio"/>	...more wildlife viewing events and activities	<input type="radio"/>
...more information about where to go see birds and other wildlife	<input type="radio"/>	...more DGIF staff in the field	<input type="radio"/>
...more information about the wildlife species in Virginia	<input type="radio"/>	...more amenities for birding and wildlife viewing (such as viewing platforms, blinds, signs)	<input type="radio"/>
...more funds to the conservation of non-huntable and non-fishable wildlife (nongame species)	<input type="radio"/>	Other (please explain): _____	<input type="radio"/>
I am not interested in any of these options.	<input type="radio"/>		

**Q23. DGIF would also like to know how to best reach residents of Virginia with information about recreational opportunities and conservation issues. Which of the following methods do you prefer for receiving this kind of information? Your responses are for data collection only, and DGIF will not receive your response nor contact you as a result of this survey. (Please select all that apply.)**

I would prefer to receive information from DGIF through...	Preferred method	Preferred method
...email updates	<input type="radio"/> ...magazines	<input type="radio"/>
...e-newsletters	<input type="radio"/> ...printed materials (such as brochures and maps)	<input type="radio"/>
...the DGIF website	<input type="radio"/> ...online videos	<input type="radio"/>
...Facebook	<input type="radio"/> ...podcasts	<input type="radio"/>
...Instagram	<input type="radio"/> ...one-on-one interactions with wildlife professionals	<input type="radio"/>
...cell phone or mobile apps	<input type="radio"/> Other (please explain): _____	<input type="radio"/>
...blogs	<input type="radio"/> I would prefer not to receive information from DGIF.	<input type="radio"/>

---

**This is the final section of the survey. Now, we have a few quick questions about you.**

<b>Q24. For about how many years have you lived in Virginia?</b> (Please fill in your response, _____ years providing the best estimate you can.)	<b>Q25. In what year were you born?</b> (Please fill in your response.) _____												
<b>Q26. What gender do you identify as?</b> (Please select one.) <input type="radio"/> Male <input type="radio"/> Female <input type="radio"/> Other <input type="radio"/> Prefer not to respond	<b>Q27. What is your ethnicity?</b> (Please select one.) <input type="radio"/> Hispanic <input type="radio"/> Non-Hispanic												
<b>Q28. What is your race?</b> (Please select all that apply.) <input type="radio"/> White <input type="radio"/> Black or African American <input type="radio"/> American Indian or Alaska Native <input type="radio"/> Asian <input type="radio"/> Native Hawaiian or Pacific Islander <input type="radio"/> Other	<b>Q29. What was your total income during the past 12 months?</b> (Please select one.) <input type="radio"/> Less than \$24,999 <input type="radio"/> \$25,000 - \$49,999 <input type="radio"/> \$50,000 - \$74,999 <input type="radio"/> \$75,000 - \$99,999 <input type="radio"/> \$100,000 - \$124,999 <input type="radio"/> \$125,000 or more												
<b>Q30. What is the highest degree or level of school you have completed?</b> (Please select one.) <input type="radio"/> Less than high school <input type="radio"/> High school diploma or equivalent <input type="radio"/> Some college, no degree <input type="radio"/> Associate's degree <input type="radio"/> Bachelor's degree <input type="radio"/> Master's degree <input type="radio"/> Professional degree <input type="radio"/> Doctorate degree	<b>Q31. Which of the following best describes where you live now compared to where you lived most of your time growing up?</b> (Please select one per statement.) <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Where I live now</th> <th>Where I lived while growing up</th> </tr> </thead> <tbody> <tr> <td>Urban</td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> <tr> <td>Suburban</td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> <tr> <td>Rural</td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> </tbody> </table>		Where I live now	Where I lived while growing up	Urban	<input type="radio"/>	<input type="radio"/>	Suburban	<input type="radio"/>	<input type="radio"/>	Rural	<input type="radio"/>	<input type="radio"/>
	Where I live now	Where I lived while growing up											
Urban	<input type="radio"/>	<input type="radio"/>											
Suburban	<input type="radio"/>	<input type="radio"/>											
Rural	<input type="radio"/>	<input type="radio"/>											

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**Thank you so much for completing this survey! If you have any additional comments about wildlife recreation in Virginia, please add them in the box below.**

**When you finish, please place your completed survey in the enclosed addressed, postage-paid envelope, and mail it back to us as soon as possible.**

**If you have any questions about this survey, please contact Bennett Grooms:  
Phone: 540-231-0961 Email: [wildlifesurvey@vt.edu](mailto:wildlifesurvey@vt.edu)**

**If you misplace your return envelope, the survey can be sent to:**  
 Bennett Grooms  
 Department of Fish and Wildlife Conservation (MC0321)  
 Cheatham Hall, RM101, Virginia Tech  
 310 West Campus Dr.  
 Blacksburg, VA 24061

For more information about DGIF and the opportunities the agency provides for hunters, anglers, birders, wildlife viewers, and other recreationists, please visit: <https://www.dgif.virginia.gov/>.



[CODE]

**Appendix III:** Non-response survey questionnaires sent to non-respondents of the DWR-affiliated sample (A) and Public sample (B).

**Appendix III A) DWR-affiliated sample version**

**Introduction + consent**



**Thank you for logging in to participate in our survey!**

We recently invited you to share your opinions on outdoor and wildlife-related recreation in Virginia. To make it easier to respond, we now have a very short version of the survey, which **should only take about 5 minutes to complete**. There are no known risks to participating in this study and your responses will remain anonymous. You can leave the survey at any time, for any reason.

**IF YOU HAVE ANY QUESTIONS**

The researchers conducting this study are Dr. Ashley Dayer, Dr. Jessica Barnes, Dr. Ashley Peele, and Bennett Grooms of Virginia Tech. If you have any questions, concerns, or complaints about the survey, please contact Bennett Grooms by email at [wildlifesurvey@vt.edu](mailto:wildlifesurvey@vt.edu) or by phone at 540-231-0961.

This research has been approved by Virginia Tech's IRB committee (protocol #17-754).

If you have any questions regarding your rights as a subject in this study, you may communicate with the Virginia Tech Institutional Review Board (IRB) at 540-231-3732 or at [irb@vt.edu](mailto:irb@vt.edu).

Many Thanks,

Dr. Ashley Dayer  
*Assistant Professor*

Dr. Ashley Peele  
*Research Scientist*

Dr. Jessica Barnes  
*Research Associate*

Bennett Grooms  
*Graduate student*

Do you consent to participate in this research study?  
*(Please select yes or no.)*



- Yes, I consent to take part in this study  
 No, I do not consent to take part in this study

Before we begin, are you 18 years of age or older?  
(Please select yes or no.)

- Yes  
 No

Are you a current resident of Virginia?  
(Please select yes or no.)

- Yes  
 No

#### Wildlife viewing

##### ABOUT THIS STUDY

In this survey, we will be asking you about your wildlife recreation activities.

By **"wildlife recreation"** we mean activities that you do for enjoyment outside of work. The purpose of these activities may include observing, photographing, feeding, collecting data about, or harvesting wildlife.

**Wildlife** refers to all animals, such as birds, fish, insects, mammals, amphibians, and reptiles, that are living in natural or wild environments. Wildlife does not include animals living in aquariums, zoos, and other artificial surroundings or domestic animals such as farm animals or pets.



Have you ever participated in any kind of wildlife recreation **in Virginia**?  
(Please select yes or no.)

Yes

No

### Wildlife ID

To what extent do you feel that each of the following describes you?

(Please respond for each recreationist type.)

	Very like me	Somewhat like me	Neither like nor unlike me	Somewhat unlike me	Very unlike me
<b>birder</b> <i>someone who intentionally observes, photographs, feeds, or collects data <b>specifically about birds</b>, including birding, birdwatching, and feeding birds</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>wildlife viewer</b> <i>someone who intentionally observes, photographs, feeds, or collects data about wildlife (<b>other than birds</b>) or visits parks and natural areas because of wildlife</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>hunter</b> <i>someone who participates in hunting or trapping, with a license or exempt from a license, using any legal method to harvest wildlife</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>angler</b> <i>someone who participates in fishing, in either freshwater or saltwater areas, to harvest and/or catch-and-release fish</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Wildlife Rec Characteristics

For about how many years have you participated in each of the following wildlife recreation activities?

(Please fill in your best estimate for each wildlife recreation activity. If you have never participated in an activity, please fill in 0.)

- Birding
- Wildlife viewing
- Hunting
- Angling

**Conservation PEB**

**Next, we would like to know more about any wildlife conservation activities in which you may have participated.**



Approximately how many days within the past 12 months have you participated in the following wildlife conservation activities **on a voluntary basis in Virginia**? Specifically, we are interested in activities you do outside your work. These can include activities you have done individually, with your family, or as part of a group.

- For example, if you went out once a week for an activity, you would fill in 52 days.
- Please fill in your response as a number between 0 and 365, providing the best estimate you can.
- If you have not participated in an activity, please fill in 0.

**Informing or teaching others about wildlife conservation** (such as wildlife-related education and outreach)

**Improving wildlife habitat** (the place or environment where wildlife live and grow) **on public or private lands** (such as planting trees or installing nest boxes)

**Advocating** (such as signing petitions and calling policy makers) **or voting related to wildlife conservation**

**Collecting data on wildlife or habitat to contribute to science or management** (such as participating in citizen science projects)

**Contributing to fundraising efforts for wildlife conservation** (such as donating money or participating in fundraising events)

#### DGIF intro and knowledge

Next, we would like to know about your experiences with your state fish and wildlife agency, the Virginia Department of Game and Inland Fisheries (DGIF).

Everyone is likely to have different levels of familiarity with the agency, and that's okay.

Regardless of your level of familiarity, we look forward to hearing your thoughts!



How familiar would you say you are with DGIF?  
(Please select one.)

- Extremely familiar
- Very familiar
- Moderately familiar
- Slightly familiar
- Not familiar at all

**Trust**

We would like to know how you feel about DGIF, as your state fish and wildlife agency. To what extent do you agree with each of the following statements about DGIF?  
*(Please select one per statement.)*

	Strongly agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Strongly disagree
<b>DGIF...</b>					
...shares my values	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has a consistent track record of excellent performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has systems in place to ensure fair treatment of VA residents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**DGIF Programs and Services**

The Department of Game and Inland Fisheries offers a variety of programs and services to Virginia recreationists, some of which you may have encountered without knowing that they were provided by DGIF. Below is a list of just some of these programs and services. Which of the following (if any) have you engaged with or used in the past 5 years?  
*(Please select all that apply.)*

- The Virginia Bird and Wildlife Trail**  
*(an organized network of outdoor sites coordinated by DGIF, highlighting the best places to see birds and wildlife in Virginia)*
- State Wildlife Management Areas (WMAs)**  
*(wild areas managed by DGIF for the benefit of Virginia citizens)*
- Virginia conservation law enforcement**  
*(formerly known as game wardens)*
- I have not used or engaged in any DGIF programs or services in the last 5 years

**Demographics**

**Now, we have a few quick questions about you...**

In what year were you born?

*(Please choose a date from the drop down box.)*

Year

What gender do you identify as?

*(Please select one.)*

- Male
- Female
- Other
- Prefer not to respond

What is your ethnicity?

*(Please select one.)*

- Hispanic
- Non-Hispanic

What is your race?

*(Please select all that apply.)*

- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Other

What is the highest degree or level of school you have completed?

*(Please select one.)*

- Less than high school
- High school diploma or equivalent
- Some college, no degree
- Associate's degree

- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate degree

What was your total income during the past 12 months?  
(Please select one.)

- Less than \$24,999
- \$25,000 - \$49,999
- \$50,000 - \$74,999
- \$75,000 - \$99,999
- \$100,000 - \$124,999
- \$125,000 or more

#### Conclusion

Thank you so much for completing this survey! If you have any additional comments about wildlife recreation in Virginia, please add them in the box below.


**TO FINISH:** Please be sure to click the >> button to submit.

If you have any questions about this survey, please contact Bennett Grooms:  
Phone: 540-231-0961 Email: [wildlifesurvey@vt.edu](mailto:wildlifesurvey@vt.edu)

For more information about DGIF, what they do, and the opportunities they provide for hunters, anglers, birders, wildlife viewers, and other recreationists, visit: <https://www.dgif.virginia.gov/>


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## Appendix III B) Public sample version



COLLEGE OF NATURAL RESOURCES AND ENVIRONMENT  
**FISH & WILDLIFE CONSERVATION**  
VIRGINIA TECH.

Even if you have little experience with or knowledge of wildlife in Virginia, your views are still important to us!



---

*Please have the adult (age 18 or older) in your household with the most recent birthday complete this survey.*

---

Before we begin, are you 18 years of age or older? *(Please check yes or no)*

Are you a current resident of Virginia? *(Please check yes or no)*

*If you are NOT 18 or older or NOT a Virginia resident, please skip the rest of the survey and mail it back using the postage paid envelope. Thanks!*

Yes  No

Yes  No

---

**In this survey, we will be asking you about your wildlife recreation activities.**

By "wildlife recreation" we mean activities that you do for enjoyment outside of work. The purpose of these activities may include observing, photographing, feeding, collecting data about, or harvesting wildlife.

**Wildlife** refers to all animals, such as birds, fish, insects, mammals, amphibians, and reptiles, that are living in natural or wild environments.

**Wildlife does not** include animals living in aquariums, zoos, and other artificial surroundings or domestic animals such as farm animals or pets.

First, we would like to know more about your involvement in different kinds of wildlife recreation in Virginia.

**Q1.** Have you ever participated in any kind of wildlife recreation in Virginia? *(Please check yes or no)*

→ If you marked "no" for Q1, please skip to Q4.

---

**Q2.** To what extent do you feel that each of the following describes you? *(Please respond for each recreation type.)*

	Very like me	Somewhat like me	Neither like nor unlike me	Somewhat unlike me	Very unlike me
<b>birder:</b> someone who intentionally observes, photographs, feeds, or collects data <u>specifically about birds</u> , including birding, birdwatching, and feeding birds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>wildlife viewer:</b> someone who intentionally observes, photographs, feeds, or collects data about wildlife ( <u>other than birds</u> ) or visits parks and natural areas because of wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>hunter:</b> someone who participates in hunting or trapping, with a license or exempt from a license, using any legal method to harvest wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>angler:</b> someone who participates in fishing, in either freshwater or saltwater areas, to harvest and/or catch-and-release fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---

Q3. Next, we would like to know about your participation in different types of wildlife recreation activities in Virginia. Please keep in mind the definitions from Q2 when choosing your responses.

For about how many years have you participated in each of the following wildlife recreation activities? *(Please fill in your best estimate for each wildlife recreation activity. If you have never participated in an activity, please fill in 0.)*


	# years		# years
Birding		Wildlife viewing	
Hunting		Angling	

---

Q4. Next, we would like to know more about any wildlife conservation activities in which you may have participated.

Approximately how many days within the past 12 months have you participated in the following wildlife conservation activities on a voluntary basis in Virginia? Specifically, we are interested in activities you do outside of your work. These can include activities you have done individually, with your family, or as part of a group. *(Please fill in your response as a number between 0 and 365, providing the best estimate you can. If you have not participated in an activity, please fill in 0.)*

	# days
A. Informing or teaching others about wildlife conservation <i>(such as wildlife-related education and outreach)</i>	
B. Improving wildlife habitat <i>(the place or environment where wildlife live and grow) on public or private lands (such as planting trees or installing nest boxes)</i>	
C. Advocating <i>(such as signing petitions and calling policy makers) or voting related to wildlife conservation</i>	
D. Collecting data on wildlife or habitat to contribute to science or management <i>(such as participating in citizen science projects)</i>	
E. Contributing to fundraising efforts for wildlife conservation <i>(such as donating money or participating in fundraising events)</i>	



In this section, we would like to know about your experiences with your state fish and wildlife agency, the Virginia Department of Game and Inland Fisheries (DGIF).

Everyone is likely to have different levels of familiarity with the agency, and that's okay. Regardless of your level of familiarity, we look forward to hearing your thoughts!

Please continue on back



Q5. How familiar would you say you are with DGIF? (Please check one.)

<input type="radio"/> Extremely familiar	<input type="radio"/> Very familiar	<input type="radio"/> Moderately familiar	<input type="radio"/> Slightly familiar	<input type="radio"/> Not familiar at all
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Q6. The Department of Game and Inland Fisheries offers a variety of programs and services to Virginia recreationists, some of which you may have encountered without knowing that they were provided by DGIF. Below is a list of just some of these programs and services. Which of the following (if any) have you engaged with or used in the past 5 years? (Please select all that apply.)

	Have used
The Virginia Bird and Wildlife Trail (an organized network of outdoor sites coordinated by DGIF, to see birds and wildlife in Virginia)	<input type="radio"/>
State Wildlife Management Areas (WMAs) (wild areas managed by DGIF for the benefit of Virginia citizens)	<input type="radio"/>
Virginia conservation law enforcement (formerly known as game wardens)	<input type="radio"/>
I have not used or engaged in any DGIF programs or services in the last 5 years.	<input type="radio"/>

→ If you selected "I have not used or engaged in any DGIF programs or services in the last 5 years," please skip to Q8.

Q7. We would like to know how you feel about DGIF, as your state fish and wildlife agency. To what extent do you agree with each of the following statements about DGIF? (Please select one per statement.)

DGIF...	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
...shares my values	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has a consistent track record of excellent performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has systems in place to ensure fair treatment of VA residents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Now, we have a few quick questions about you.

<p>Q8. In what year were you born? (Please fill in your response.)</p> <p>_____</p>	<p>Q9. What gender do you identify as? (Please select one.)</p> <p><input type="radio"/> Male</p> <p><input type="radio"/> Female</p> <p><input type="radio"/> Other</p> <p><input type="radio"/> Prefer not to respond</p>
<p>Q10. What is your ethnicity? (Please select one.)</p> <p><input type="radio"/> Hispanic</p> <p><input type="radio"/> Non-Hispanic</p>	<p>Q11. What is your race? (Please select all that apply.)</p> <p><input type="radio"/> White</p> <p><input type="radio"/> Black or African American</p> <p><input type="radio"/> American Indian or Alaska Native</p> <p><input type="radio"/> Asian</p> <p><input type="radio"/> Native Hawaiian or Pacific Islander</p> <p><input type="radio"/> Other</p>
<p>Q12. What was your total income during the past 12 months? (Please select one.)</p> <p><input type="radio"/> Less than \$24,999</p> <p><input type="radio"/> \$25,000 - \$49,999</p> <p><input type="radio"/> \$50,000 - \$74,999</p> <p><input type="radio"/> \$75,000 - \$99,999</p> <p><input type="radio"/> \$100,000 - \$124,999</p> <p><input type="radio"/> \$125,000 or more</p>	<p>Q13. What is the highest degree or level of school you have completed? (Please select one.)</p> <p><input type="radio"/> Less than high school</p> <p><input type="radio"/> High school diploma or equivalent</p> <p><input type="radio"/> Some college, no degree</p> <p><input type="radio"/> Associate's degree</p> <p><input type="radio"/> Bachelor's degree</p> <p><input type="radio"/> Master's degree</p> <p><input type="radio"/> Professional degree</p> <p><input type="radio"/> Doctorate degree</p>

Thank you for completing this survey! If you have any additional comments about wildlife recreation in Virginia, please add them in the box below.

When you finish, please place your completed survey in the enclosed addressed, postage-paid envelope, and mail it back to us as soon as possible.

If you have any questions about this survey, please contact Bennett Grooms:  
Phone: 540-231-0961 Email: wildlifesurvey@vt.edu

If you misplace your return envelope, the survey can be sent to:

Bennett Grooms  
Department of Fish and Wildlife Conservation (MCD321)  
Cheatham Hall, RM101, Virginia Tech  
310 West Campus Dr.  
Blacksburg, VA 24061

For more information about DGIF and the opportunities the agency provides for hunters, anglers, birders, wildlife viewers, and other recreationists, please visit: <https://www.dgif.virginia.gov/>.




**Appendix IV:** Push-to-web postcards used to invite participants from the Public sample to complete the survey questionnaire either online or by hand. Postcards include the initial invitation postcard (A), and the final reminder postcard (B).

(A)

Bennett Grooms  
Department of Fish and Wildlife Conservation (MC0321)  
Cheatham Hall, RM101, Virginia Tech  
310 West Campus Dr.  
Blacksburg, VA 24061

2 ways to go online to take this survey:

Type this link in a browser: <http://bit.ly/vtwildlife>  
**OR**  
Hold your smartphone camera over the box below and click the pop-up link.



Your unique ID is {#####}

Please have the adult (age 18 or older) in your household with the most recent birthday complete the survey.

**We want to hear from you!**

Researchers at Virginia Tech, in collaboration with the Virginia Department of Game and Inland Fisheries (DGIF), are conducting a research survey to understand the outdoor and wildlife-related experiences of Virginians. Your input will help the agency better connect people to Virginia's unique and diverse natural resources.



**VT** COLLEGE OF NATURE, RESOURCES, AND ENVIRONMENT  
**FISH & WILDLIFE CONSERVATION**  
VIRGINIA TECH

**Please help improve outdoor and wildlife-related experiences for everyone in Virginia!**

**Questions?**  
For any questions about this survey, please contact:  
Bennett Grooms  
(540)-231-0961  
vtwildlifesurvey@vt.edu

The survey should take about 15 - 30 minutes to complete. Your responses are completely voluntary and confidential.

Only a small number of Virginia households have been invited to participate in this survey. Your voice is important!

See other side for how to access the survey →

(B)

Bennett Grooms  
Department of Fish and Wildlife Conservation (MC0321)  
Cheatham Hall, RM101, Virginia Tech  
310 West Campus Dr.

**2 ways to take this survey:**

**Online:**  
Type this link in a browser: <http://bit.ly/vtwildlife>  
**OR**  
Hold your smartphone camera over the box  
below and click the pop-up link.



Your unique ID is {#####}

**By Mail:**  
Complete the printed survey you received and  
return it using the postage-paid envelope

Please have the adult (age 18 or older) in your household with  
the most recent birthday complete the survey.



**Don't miss the opportunity to be heard!**

Recently, our research group at Virginia Tech invited you to take a research survey about your outdoor and wildlife related experiences, and you still have a chance to share your opinions! Your input will help the Virginia Department of Game and Inland Fisheries (DGIF) better connect people to Virginia's unique and diverse natural resources.



**VT** COLLEGE OF NATURE, RESOURCES, AND ENVIRONMENT  
**FISH & WILDLIFE CONSERVATION**  
VIRGINIA TECH

**This is your last reminder to complete the survey and help improve outdoor and wildlife-related experiences for everyone in Virginia!**

**Questions?**  
For any questions about this survey, please contact:  
Bennett Grooms  
(540) 231-0961  
[vtwildlifesurvey@vt.edu](mailto:vtwildlifesurvey@vt.edu)

The survey should take about 15 - 30 minutes to complete. Your responses are completely voluntary and confidential.

Only a small number of Virginia households have been invited to participate in this survey. Your voice is important!



See other side for how to access the survey →

**Appendix V:** Initial and follow up email invitations to recruit DWR-affiliated individuals to participate in the survey.

**Initial email**



**Subject:** Virginia Tech Survey: We Want to Hear from You!

Researchers at Virginia Tech, in collaboration with the Virginia Department of Game and Inland Fisheries (DGIF), are conducting a research survey to understand the outdoor and wildlife-related experiences of Virginians. You are part of a select sample that has been chosen to participate in the survey, and your views are important to us! Your input will help the agency better connect people to Virginia's unique and diverse natural resources.

The survey should take about 15 - 30 minutes to complete, and your responses are voluntary and confidential. To begin the survey, simply click on the link below:

**Begin survey** -> {*Qualtrics unique survey link*}

If you have any questions about this survey, please contact Bennett Grooms at 540-231-0961 or [wildlifesurvey@vt.edu](mailto:wildlifesurvey@vt.edu).

Thank you, in advance, for sharing your thoughts and experiences with us!

**Bennett Grooms**

Graduate Research Assistant

**Ashley A. Dayer, Ph.D.**

Assistant Professor

**Ashley Peele, Ph.D.**

Research Scientist

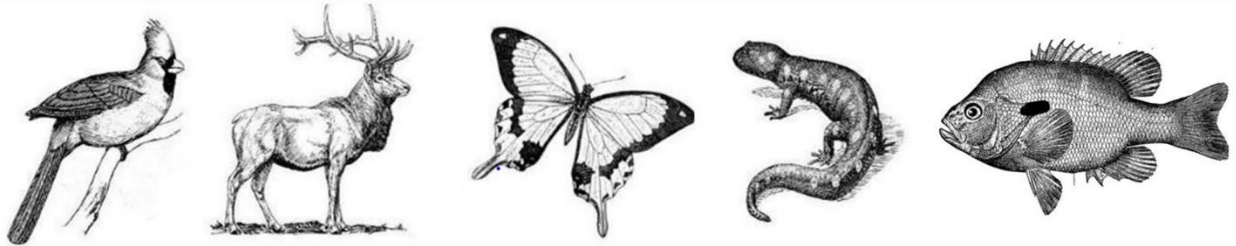
**Jessica Barnes, Ph.D.**

Research Associate

**Second email**

**WE STILL WOULD LIKE TO HEAR FROM YOU!**

Please help improve outdoor and wildlife-related experiences for everyone in Virginia!



**Subject:** Virginia Tech Survey: We Still Would Like to Hear from You!

We recently invited you to share your opinions on outdoor and wildlife-related recreation in Virginia, and **we still want to hear from you!**

Researchers at Virginia Tech, in collaboration with the Virginia Department of Game and Inland Fisheries (DGIF), are conducting a research survey to understand the outdoor and wildlife-related experiences of Virginians. You are part of a select sample that has been chosen to participate in the survey, and your views are important to us! Your input will help the agency better connect people to Virginia's unique and diverse natural resources.

The survey should take about 15 - 30 minutes to complete, and your responses are voluntary and confidential. To begin the survey, simply click on the link below:

**Begin survey** -> {Qualtrics unique survey link}

If you have any questions about this survey, please contact Bennett Grooms at 540-231-0961 or [wildlifesurvey@vt.edu](mailto:wildlifesurvey@vt.edu).

Thank you for your time!

**Bennett Grooms**

Graduate Research Assistant

**Ashley A. Dayer, Ph.D.**

Assistant Professor

**Ashley Peele, Ph.D.**

Research Scientist

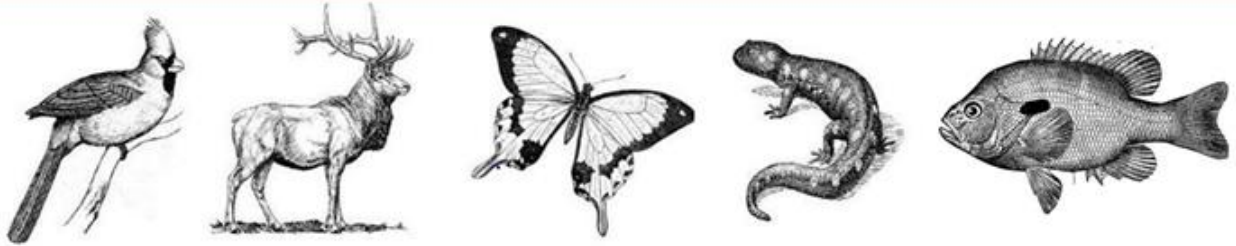
**Jessica Barnes, Ph.D.**

Research Associate

**Third email**

**THERE IS STILL TIME TO VOICE YOUR OPINIONS!**

Please help improve outdoor and wildlife-related experiences for everyone in Virginia!



**Subject:** Virginia Tech Survey: There is Still Time to Voice your Opinions!

Recently, we invited you to take a research survey about the outdoor and wildlife-related experiences of Virginians, and you **still have a chance to share your opinions!**

The survey should take about 15 - 30 minutes to complete, and your responses are voluntary and confidential. To begin the survey, simply click on the link below:

**Begin survey** -> {Qualtrics unique survey link}

If you have any questions about this survey, please contact Bennett Grooms at 540-231-0961 or [wildlifesurvey@vt.edu](mailto:wildlifesurvey@vt.edu).

Thank you for your consideration to participate!

**Bennett Grooms**

Graduate Research Assistant

**Ashley A. Dayer, Ph.D.**

Assistant Professor

**Ashley Peele, Ph.D.**

Research Scientist

**Jessica Barnes, Ph.D.**

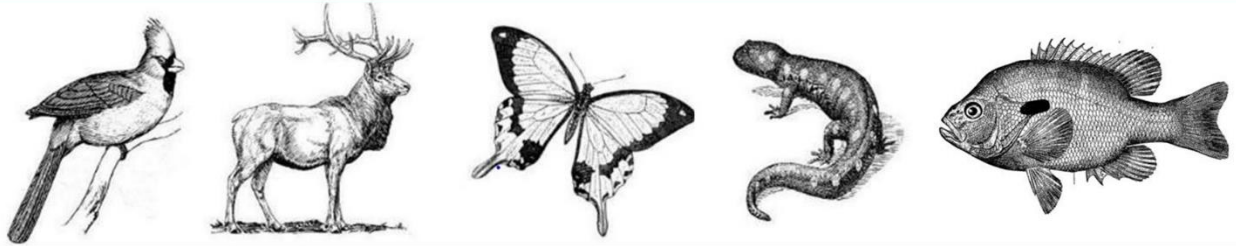
Research Associate



**Fourth/final email**

**DON'T MISS YOUR OPPORTUNITY TO HAVE YOUR VOICE HEARD!**

**This is your opportunity to share your opinions to help improve outdoor and wildlife-related experiences for everyone in Virginia!**



**Subject:** Virginia Tech Survey: There is Still a Chance to Help!

This is a **final reminder** to participate in a research survey on outdoor and wildlife-related recreation in Virginia!

Click here to begin the survey now: {*Qualtrics unique survey link*}

This research impacts all Virginians and will help your state fish and wildlife agency, the Department of Game and Inland Fisheries, better connect people to Virginia's unique and diverse natural resources. You were part of a select sample that has been chosen to complete the survey and your views are still important to us!

The survey should take about 15 - 30 minutes to complete, and your responses are voluntary and confidential. If you have any questions about this survey, please contact Bennett Grooms at 540-231-0961 or [wildlifesurvey@vt.edu](mailto:wildlifesurvey@vt.edu).

Thank you again for considering our request!

Sincerely,  
**Bennett Grooms**  
Graduate Research Assistant  
**Ashley A. Dayer, Ph.D.**  
Assistant Professor  
**Ashley Peele, Ph.D.**  
Research Scientist  
**Jessica Barnes, Ph.D.**  
Research Associate

**Appendix VI:** Cronbach's alpha reliability measures and scales for dimensions of trust in DWR (adapted from Stern & Baird, 2015).

Dimensions of trust (DWR...)	Item Total Correlation	Alpha if Deleted	Cronbach Alpha
<b>Affinitive Trust</b>			<b>0.79</b>
...employs genuinely good people	0.62	0.73	
...shares my values	0.66	0.44	
...employs people like me	0.62	0.38	
<b>Rational Trust</b>			<b>0.83</b>
...has expertise in wildlife management, conservation, and research	0.60	0.84	
...has a consistent track record of excellent performance	0.74	0.71	
...can be relied upon to ensure quality recreation opportunities	0.73	0.71	
<b>Systems based Trust</b>			<b>0.86</b>
...has an effective system to address problems	0.71	0.83	
...has systems in place to ensure fair treatment of VA residents	0.76	0.78	
...treats all wildlife recreation groups fairly	0.74	0.81	



**Appendix VII:** Comparisons between respondents and non-respondents for the DWR-affiliated and Public samples. Asterisks note statistically significant differences at  $\alpha = 0.05$  between respondents and non-respondents for each sample.

Non-response comparisons	DWR-affiliated sample		Public sample	
	Respondents (n = 2610)	Non-respondents (n = 451)	Respondents (n = 1016)	Non-respondents (n = 111)
Participation in recreation in Virginia (%)	95.4%	96.0%	78.7%*	65.7%
Identify as a birder (mean)	2.49	2.45	2.54	2.56
Identify as a wildlife viewer (mean)	1.99	1.94	2.14	2.43
Identify as a hunter (mean)	2.51	2.46	3.85	3.51
Identify as an angler (mean)	1.98	1.94	2.98*	2.59
Years birding (mean years)	20.8	17.4	19.4	18.0
Years wildlife viewing (mean years)	32.3	33.1	27.8*	19.9
Years hunting (mean years)	25.1	24.5	10.9*	30.3
Years angling (mean years)	33.1	33.0	20.1	25.6
Days spent informing or teaching others about wildlife conservation (mean days)	8.70	13.9	2.78	5.00
Days spent improving wildlife habitat (mean days)	14.5	19.2	11.2	11.6
Days spent advocating or voting related to wildlife conservation (mean days)	6.91	7.97	2.59	5.32
Days spent collecting data on wildlife or habitat to contribute to science or management (mean days)	20.2*	14.5	1.76	0.46
Days spent contribute to fundraising efforts for wildlife conservation (mean days)	5.00	8.06	2.27	1.44
Familiarity with DWR (mean)	2.36	2.29	3.80	3.83
Engagement with the Virginia Bird and Wildlife Trail (%)	22.0%*	36.0%	16.8%	24.5%
Engagement with Wildlife Management Areas (%)	43.0%*	66.0%	28.0%*	40.2%
Engagement with Virginia conservation law enforcement (%)	34.1%	37.5%	10.1%*	24.5%
Have not engaged with DWR programs or services (%)	16.8%	19.6%	66.7%*	53.5%
Affinitive trust (mean)	1.93*	1.81	2.20*	1.82
Rational trust (mean)	2.08	2.01	2.30	2.13
System-based trust (mean)	2.25*	2.01	2.37	2.16
Age (mean age)	58.9*	56.3	59.2*	63.8
Gender identity – male (%)	80.1%	81.3%	54.1%	55.0%
Gender identity – female (%)	19.9%	18.8%	44.0%	43.8%
Ethnicity (% Hispanic)	0.9%*	2.4%	3.40%	4.90%
Race – white (%)	96.5%	95.6%	92.6%	91.7%
Race – black or African American (%)	0.94%	1.05%	4.37%	2.80%
Race – American Indian or Alaska native (%)	1.01%	1.00%	0.87%	0.93%
Race – Asian (%)	0.60%*	1.60%	1.75%	1.87%
Race – Native Hawaiian or Pacific islander	0.10%	0.00%	0.00%	0.00%
Total income (% making \$100,000 +)	35.9%	33.6%	35.4%*	22.0%
Education level (% Bachelor's degree +)	62.1%	62.0%	62.6%*	42.5%

**Appendix VIII:** Percent of each recreation type that responded to questions shown in Figures 36, 37, 38.

Response options	Hunter-anglers	Birder-viewers	Viewer-hunter-anglers	Birder-viewer-hunter-anglers
*Access to more places to hunt	49.8%	1.60%	52.10%	31.5%
*Access to more places to fish	59.3%	6.90%	57.80%	45.5%
*Access to more places to go birding	3.2%	50.3%	11.4%	31.3%
*Access to more places to view other wildlife	7.6%	55.1%	27.3%	35.9%
*More information about accessing Wildlife Management Areas	38.5%	56.20%	44.30%	42.2%
*More information about accessing sites on The Virginia Bird and Wildlife Trail	11.0%	59.80%	23.50%	38.4%
*More information about where to go see birds and other wildlife	6.0%	56.40%	21.60%	39.1%
*More information about wildlife species in Virginia	18.0%	48.10%	30.70%	37.3%
*More funds to the conservation of huntable and fishable wildlife	38.8%	10.00%	47.00%	37.3%
*More funds to the conservation of non-huntable and non-fishable wildlife	6.3%	46.20%	13.20%	31.9%
*More funds to protect habitat	42.6%	67.40%	53.90%	65.0%
*More opportunities to be involved in wildlife and habitat data collection	10.7%	34.90%	20.70%	29.2%
*More opportunities to recruit others into wildlife recreation activities	9.5%	14.80%	19.00%	17.2%
*More opportunities for youth to learn how to participate in wildlife recreation activities	31.9%	40.10%	42.30%	42.2%
*More wildlife viewing events and activities	7.6%	37.20%	17.90%	21.4%
*More DWR staff in the field	18.3%	19.40%	21.90%	27.9%
*More amenities for birding and wildlife viewing	4.4%	35.60%	11.50%	26.8%

**Figure 36.** Percent of each recreation type per method DWR could use to better support their wildlife recreation activities. Asterisks (\*) note statistically significant differences among recreation types at  $\alpha = 0.05$ .

Response options	Hunter-anglers	Birder-viewers	Viewer-hunter-anglers	Birder-viewer-hunter-anglers
*DWR Sportsman License	30.3%	1.7%	33.3%	29.8%
*Other VA hunting license	39.3%	1.2%	38.9%	32.4%
*Other VA fishing license	43.8%	9.2%	49.1%	46.4%
*Any Virginia lifetime hunting license	22.8%	1.3%	26.3%	28.8%
*Any Virginia lifetime fishing license	27.1%	8.8%	31.5%	40.1%
*Virginia Wildlife Management Area access permit	8.1%	12.4%	8.5%	13.1%
*Virginia Migratory Waterfowl Conservation stamp	14.0%	1.30%	13.60%	13.3%
*Virginia state park access pass	14.6%	34.40%	21.90%	25.5%
*Virginia state forest use permit	15.7%	2.60%	19.00%	12.9%
DWR Restore the Wildlife Membership	0.6%	2.40%	1.20%	1.8%
*Federal Migratory Bird and Hunting Conservation stamp	18.2%	6.30%	16.20%	17.0%
*National Park fee or pass	21.1%	38.60%	28.80%	34.0%
*America the Beautiful pass	9.3%	17.70%	10.60%	16.6%
*Access fees for privately owned lands in Virginia	11.8%	3.40%	13.00%	9.8%

**Figure 37.** Percent of each recreation type that purchased fees and permits related to their wildlife recreation activities within the past 12 months. Asterisks (\*) note statistically significant differences (chi-square) among recreation types at  $\alpha = 0.05$ .

Response options	Hunter-anglers	Birder-viewers	Viewer-hunter-anglers	Birder-viewer-hunter-anglers
Virginia Wildlife Conservationist motor vehicle license plate	12.30%	11.80%	12.30%	15.00%
Virginia Migratory Waterfowl stamp	22.1%	14.3%	20.2%	19.3%
Any Virginia hunting license	56.9%	2.4%	64.9%	48.0%
Any Virginia fishing license	61.0%	12.90%	73.50%	66.2%
Virginia State Wildlife Management Area access permit	14.9%	29.30%	23.90%	24.5%
Designating part of your tax refund to go to DWR's Non-Game program	3.60%	19.70%	8.80%	21.90%
Donating directly to the DWR Non-Game program	5.10%	9.70%	6.70%	11.60%
DWR Restore the Wild Membership	7.7%	23.70%	9.20%	13.5%

**Figure 38.** Percent of each recreation type that is likely to contribute to conservation through DWR within the next 12 months. Asterisks (\*) note statistically significant differences (chi-square) among recreation types at  $\alpha = 0.05$ .