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Surveying Pollinator Conservation Attitudes & Behaviors in Western North Carolina

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Abstract

The biodiversity of pollinating insects is declining at an alarming rate due to pesticide use, urban expansion, and agricultural intensification. Pollinators are essential for maintaining functional ecosystems, and their decline poses serious risks to ecological stability and agricultural productivity. As pollinator decline is largely driven by human activity, addressing this issue requires attention to its psychological and behavioral dimensions. This study examines pollinator conservation in Western North Carolina through the lens of conservation psychology. A regionally distributed survey assessed public attitudes towards pollinators, beliefs about pollinator decline, and behavioral engagement. Results indicated that involvement in pollinator-friendly behaviors was common among participants, and most rated pollinator decline as an extremely or very important issue. Participants also reported substantial concern about the consequences of pollinator decline, particularly regarding its impact on future generations. In contrast, familiarity with local conservation initiatives was relatively low, suggesting expressed concern does not always translate into community-level engagement. Significant positive correlations were observed between pollinator identification accuracy, nature connectedness, and perceived importance of pollinator conservation, indicating noteworthy connections between ecological knowledge, connection to the natural environment, and pro-conservation attitudes. Together, these findings will inform the development of more effective communication and outreach strategies aimed at increasing broader community support and participation in conservation efforts.

Introduction

An Overview of Pollinator Decline

Around the world, insect biodiversity is plummeting— and humans are the reason why. Global insect abundance is reduced by an estimated 1-2% annually, with projections suggesting up to 40% of species could face extinction in the coming decades (Sánchez-Bayo & Wyckhuys, 2019; Wagner et al., 2021). Consistent with this trend, numerous pollinating insects have undergone substantial population declines. A recent assessment of North American pollinators determined 22.6% are currently at an elevated risk of extinction, including 19.5% of butterflies and 16.1% of moths (Cornelisse et al., 2025). Bees appear to be particularly vulnerable, with approximately 34.7% of species facing elevated risk (Cornelisse et al., 2025). Even the American Bumble Bee (*Bombus pensylvanicus*), once thought to be among the most common and widespread bumblebee species in North America, has declined by as much as 89% in some regions, and a similar trend has been observed in other species (Center for Biological Diversity, 2021).

There are multiple factors contributing to pollinator decline. As the world becomes increasingly urbanized land is developed at the expense of diverse, preexisting ecosystems. Extensive habitat loss introduces resource scarcity as the availability of nesting sites and food sources becomes limited (Devkota et al., 2024). The remaining habitat is often fragmented, restricting movement and isolating pollinator populations. Similarly, agricultural intensification has led to widespread conversion of native habitats to monoculture crop fields, decreasing floral diversity and limiting foraging opportunities for pollinators (Sánchez-Bayo & Wyckhuys, 2019). Monoculture farming relies heavily on synthetic fertilizers and pesticides, which contaminate the environment and increase the mortality rate of native bees. The use of pesticides is not limited to agriculture. Applications are also common among residential and commercial landscapes. In the United States over one billion pounds of pesticides are applied annually (Alavanja, 2010). Pesticide exposure has wide-ranging effects that impact both target and non-target species. Even in the absence of direct mortality, sublethal exposure causes physiological and behavioral impairments, compounding the effects of other stressors such as disease, rising temperatures, and changing climatological patterns (Sánchez-Bayo, 2021). Collectively, these factors threaten pollinators across both urban and rural environments.

Pollinators have sustained Earth's ecosystems for millions of years, supporting the web of life long before humans existed. Over 75% of flowering plants are dependent on them for reproductive success (Katumo et al., 2022). Plants are primary producers at the base of food webs and serve a number of important ecological functions by producing oxygen through photosynthesis and absorbing carbon dioxide from the atmosphere. As pollinators

decline, so will plant biodiversity, which will disrupt the interconnected processes that maintain functional ecosystems. We also depend on pollinators agriculturally, as many crops are pollinated by bees. Agricultural production of fruit, vegetables, and nuts is already decreasing due to insufficient pollination (Smith et al., 2022). This trend is expected to continue as pollinator biodiversity declines, which will lead to increased costs, food shortages, and reduced nutrition (Devkota et al., 2024). The importance of conservation extends beyond pollinators, as even non-charismatic insects play vital ecological roles as decomposers of organic material and sources of energy and nutrition for vertebrates (Kellert, 1993).

Although pollinator decline is a global issue, its consequences are particularly significant in regions with high levels of biodiversity. Western North Carolina, as part of the Southern Appalachian Mountains, is located within one of the most biodiverse temperate regions in the world, making it an important site for conservation research. As the impact of pollinator decline reverberates through ecosystems, the cascading effects will pose both environmental and agricultural risks to local communities. Early warning signs are already visible: pollinator species that were once common in the region have become increasingly rare, and some appear to have disappeared entirely. For example, the critically endangered Rusty Patched Bumble Bee historically occurred in Western North Carolina, yet there has not been a verified sighting since the early 2000s.

An Overview of Conservation Psychology

Flagship megafauna species, such as pandas and tigers, often dominate the subject of conservation due to their broad public appeal. There is a general awareness of the challenges faced by these animals, but the struggles of less charismatic species receive less attention. Insects in particular are underrepresented in conservation research and outreach despite their ecological significance and disproportionate decline (Kellert, 1993; Sánchez-Bayo & Wyckhuys, 2019). This discrepancy is unsurprising given the prevalence of negative attitudes towards insects (Fukano & Soga, 2021). Public perception of insects is characterized by aversion, dislike, and fear (Kellert, 1993). However, pollinating insects are an exception to this. Public awareness of their decline is high, and pollinator species are viewed more favorably than other insects (Hall & Martins, 2020). Pollinators' aesthetic and practical value to humans contributes to their positive public image (Kellert, 1993). As a result, insect conservation efforts mainly focus on pollinators, although the non-native Western honeybee (*A. mellifera*) serves as the primary flagship species for a significant number of these campaigns (Hall & Martins, 2020).

Pollinator conservation, and insect conservation more broadly, is faced with a distinct set of challenges. Three societal dilemmas have been identified in the scientific, public,

and political realms (Cardoso et al., 2011). Invertebrate research is largely an unprioritized and underfunded area of science, resulting in limited information regarding species distribution, behavior, and ecology. Public knowledge of insects, their ecological role, and the essential services they provide also remains limited. Additionally, policymakers and stakeholders are largely unaware of the material and economic risks posed by declining insect biodiversity. These dilemmas can make it difficult to formulate conservation strategies, as it is challenging to address a problem when basic information is lacking across the board.

Although research into the environmental causes, challenges, and potential solutions has increased in recent years, research into the human dimensions of pollinator decline and conservation remains limited. Ultimately, pollinator decline is a human-driven issue with direct consequences for human wellbeing, and if human behavior is the problem, then understanding that behavior is essential to the solution. Humanity's current relationship with the natural world is unsustainable, and the consequences are increasingly evident (Ripple et al., 2017). The question remains: how do we change this? Humans are better motivated to act in response to immediate, tangible issues rather than a distant, complex problem like declining biodiversity (Simaika & Samways, 2018). Given that individuals are more likely to care about issues with direct personal relevance, raising awareness about the tangible impacts of pollinator decline on local communities is crucial.

Numerous studies highlight the need for an interdisciplinary approach to conservation research, which is typically grounded in the biological sciences (Burns et al., 2021; Hall & Martins, 2020; Katumo et al., 2022; Kidd, Garrard, et al., 2019; Saunders, 2003; Simaika & Samways, 2018). As the scientific study of the brain and behavior, psychology provides a useful framework for exploring the human aspects of pollinator decline and conservation. Conservation psychology investigates the relationship between humans and nature to identify the psychological factors that promote sustainable behavior (Saunders, 2003). For example, research shows a strong connection with the natural world promotes pro-conservation behavior (Richardson et al., 2019). However, people are experiencing less direct contact with nature in their daily lives, leading to declines in ecological literacy and concern for the natural world (Simaika & Samways, 2018).

It is also known that people who are more familiar with insects, either through general knowledge or direct exposure, typically have more positive attitudes towards them (Fukano & Soga, 2021; Hall & Martins, 2020). The knowledge-deficit model of communication, which aims to change behavior by increasing public knowledge, has long dominated conservation messaging (Kidd, Garrard, et al., 2019). Although providing information to unfamiliar audiences can help dispel fear-based misconceptions and encourage curiosity, relying solely on the knowledge-deficit model is insufficient for encouraging widespread adoption of pro-conservation behaviors due to the complexity of

motivational factors (Kidd, Garrard, et al., 2019). A systematic review of conservation messaging literature published in 2019 identified the need for strategically designed messages tailored to specific audiences (Kidd, Garrard, et al., 2019). To do so, it is first necessary to identify our audience and understand who they are.

This survey established a regional baseline for attitudes and behaviors related to pollinator decline and conservation in Western North Carolina. These findings will help local conservation organizations refine their communication strategies by clarifying the factors that influence public awareness, concern, and engagement. By identifying both motivations and barriers to participation, the results can guide more effective, targeted outreach efforts that foster greater community support and involvement in conservation initiatives across the region.

Methods

Participants

Participants were recruited through printed flyers, social media platforms, and targeted email lists with support from U.S. Fish and Wildlife Service, Bee City Asheville, and The Big Asheville Science Salon. Printed flyers were posted on community bulletin boards at public libraries and on the campus of University of North Carolina Asheville. Participants were given no incentive to participate in the study. Eligibility criteria included being at least 18 years old and residing in one of the following counties in North Carolina: Alleghany, Ashe, Avery, Buncombe, Burke, Caldwell, Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Madison, McDowell, Mitchell, Polk, Rutherford, Surry, Swain, Transylvania, Watauga, Wilkes, and Yancey (Fig. 1).

A total of 109 participants completed the initial eligibility screening. Of these, 16 were excluded for not meeting eligibility criteria, leading to a sample size of $n = 93$. The residential area classification of participants was 47% suburban, 29% urban, and 24% rural. The majority (85%) were permanent residents of Western North Carolina, while 8% were native to the region and 7% were temporary residents. The age distribution of respondents was as follows: 38% were 65 years old or older, 17% were 55-64, 17% were 45-54, 8% were 35-44, 5% were 25-34, and 15% were 18-24.

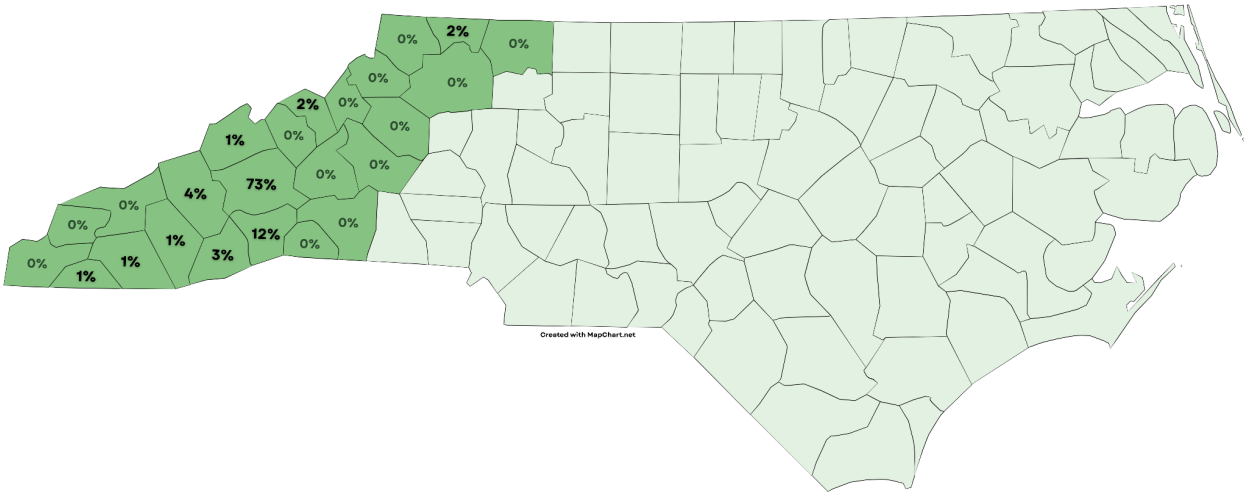

Figure 1: Percentage of survey participants from each eligible county in Western North Carolina.

Survey Development

A 21-item questionnaire was developed to assess pollinator conservation attitudes and behaviors in Western North Carolina. Collected demographic information included age, county of residence, nature of residency (temporary, permanent, or native to the region), and current residential area classification (rural, suburban, or urban). The survey investigated a multitude of factors related to participants' attitudes and behaviors. Behavior related questions included self-reported engagement in pollinator-friendly conservation actions and identification of potential barriers to participation. Participants also reported their familiarity with local pollinator conservation initiatives and the frequency with which they had thought about pollinator conservation prior to the survey. Questions assessing attitudes inquired about how worried participants felt about pollinator decline, the personal importance of pollinator conservation, and the extent to which they believed pollinator decline would negatively affect themselves and future generations. These questions were adapted from the Global Warming's Six Americas screening tools, which are used as a basis for climate change communication research worldwide and identifies audience segments based on existing typology (Lin et al., 2024; Maibach et al., 2011).

The survey also examined how message framing influences emotional response, interest, and willingness to support conservation efforts. There is ongoing debate over whether optimistic or pessimistic messages are more effective in motivating conservation behaviors (Kidd, Bekessy, et al., 2019). Participants were asked to evaluate two contrasting pollinator conservation messages. One message was positive and optimistic ("Join the buzz! Communities across the country are making public spaces more pollinator friendly") while the other was negative and pessimistic ("We are losing pollinators at an alarming

rate. Ecosystems will collapse if we don't act now"). Participants rated the extent to which each message made them feel hopeful or discouraged and the extent to which the message increased their interest in or willingness to support the cause on a five-point Likert scale ranging from *strongly disagree* to *strongly agree*.

Nature connectedness refers to an individual's sense of connection with the natural world, and high connectedness has been linked to pro-conservation behaviors and improved mental well-being (Richardson et al., 2019). The Nature Connection Index was used to investigate a potential link between nature connectedness and pollinator conservation (Richardson et al., 2019). The NCI demonstrates strong reliability and validity based on factor analysis and comparison to established measures of nature connectedness.

To explore the relationship between ecological knowledge and pollinator conservation attitudes, participants' accuracy in identifying pollinator species was measured. They were shown five color images of common pollinators and asked to identify each from a list of seven species names. Two additional response options were provided: "I do not know" and "I'm familiar with this pollinator, but unable to identify its species." Species were selected from the top ten most frequently documented pollinators in the region, as determined by iNaturalist observations. Images were used under a Creative Commons license, and credit was provided at the end of the survey. Images were selected to highlight key identifying features to aid differentiation. Identification questions were designed for both novice and experienced participants. For example, the two bumblebee species listed as possible responses (the Common Eastern Bumblebee and the Perplexing Bumblebee) were included because, while bumblebee species are generally difficult to differentiate, these two can be more reliably distinguished based on abdomen color. Participants' ability to accurately identify the key factors contributing to pollinator population decline was also assessed.

Procedure

The study was advertised as a voluntary online survey assessing attitudes towards pollinators and pollinator conservation, with an estimated time commitment of 10 minutes. Recruitment materials included a brief description of the study, eligibility criteria, and a link to the informed consent form and survey. The survey was administered via Qualtrics. Screening questions ensured that participants met eligibility requirements and affirmed their informed consent before beginning the questionnaire. After providing demographic information participants responded to the Nature Connection Index (Richardson et al., 2019) and answered a series of questions assessing attitudes, behaviors, and identification accuracy.

Data Analysis

Descriptive statistics were obtained from Qualtrics Stats iQ to examine general patterns in the data. Composite scores were computed for Nature Connection Index and pollinator identification accuracy. Statistical analysis comparing participant responses to the optimistic and pessimistic conservation messages were conducted using Jamovi.

Results and Discussion

Pollinator Conservation Attitudes

Participants overwhelmingly placed high personal importance on pollinator conservation, with 59% describing it as *extremely important* and 31% as *very important* (Table 1). Consistent with this, 59% of participants indicated they had thought *a lot* about pollinator conservation prior to the survey, while 30% thought about it *some* and 11% *a little*. Participants expressed considerable concern about pollinator decline and its long-term impacts, particularly on future generations. Most reported being *extremely* (51%), *very* (37%), or *somewhat* (11%) worried about pollinator population decline, with only 1% indicating they were not worried at all (Table 1). When asked about the personal impact of pollinator decline, participants most often anticipated it would cause *a great deal* (51%) or *moderate amount* (41%) of harm, while 5% expected it to cause *very little* harm. However, nearly all participants (94%) believed that pollinator population decline would cause *a great deal* of harm to future generations. These results, which are presented in Table 2, align with previous research demonstrating widespread public awareness of pollinator decline and its consequences. Although there was near consensus that pollinator decline will cause a great deal of harm to future generations, participants anticipated less personal harm within their own lifetimes. This perception of pollinator decline as a future problem may reduce the sense of urgency to act; however, there is still strong recognition that the effects will be felt within our lifetime.

Participants largely attributed pollinator decline to *pesticide use* (96%), *agricultural intensification* (96%), and *urbanization* (94%), aligning with scientific consensus and indicating a relatively high awareness of the primary drivers of decline. Other commonly cited factors included *climate change* (88%), *herbicide usage* (86%), and *other causes* (14%). This awareness of key threats presents an opportunity for conservation organizations to motivate action, particularly through political and community engagement. For instance, general recognition of agricultural intensification as a major driver could be leveraged to build public support for policies promoting sustainable agricultural practices that benefit pollinators. Similarly, widespread awareness of

pesticide and herbicide impacts could encourage advocacy for reduced use and stricter regulations. Land use policies could be changed to integrate pollinator-friendly practices into development, mitigating the negative impacts of urbanization. If urban planning and development regulations encouraged or required the inclusion of native plant gardens, green corridors, or other habitat-supporting features it could help maintain functional ecosystems in urban areas. Such an initiative would also increase daily exposure to nature, fostering stronger connections with the natural world and promoting pro-conservation behaviors among residents. Framing these issues in a way that clearly links known drivers with feasible actions could help conservation organizations encourage policy-oriented engagement, which is useful for addressing the systemic causes of pollinator decline.

How important is the issue of pollinator conservation to you personally?		**How worried are you about pollinator population decline?**	
Extremely important	59%	*Extremely worried*	51%
Very important	31%	*Very worried*	37%
Somewhat important	9%	*Somewhat worried*	11%
Not too important	1%	*Not very worried*	0%
Not at all important	0%	*Not at all worried*	1%

Table 1: Participant ratings of pollinator conservation importance and decline-related worry.

How much do you think pollinator population decline will harm:	**You personally**	**Future generations**
A great deal	51%	94%
A moderate amount	41%	4%
Only a little	5%	0%
Not at all	0%	0%
Don't know	3%	2%

Table 2: Summary of participant ratings of expected personal and future-generational harm from pollinator population decline.

Support for Conservation Practices and Policies

Participants expressed strong support for a variety of pollinator-friendly policies and practices, including *establishing pollinator gardens in public spaces* (99%), *legislation to protect pollinator habitats* (93%), *increased funding for conservation efforts* (89%),

regulations to reduce pesticide use (86%), and *relaxed lawn maintenance rules during spring* (78%) (Table 3). Notably, there was no strong opposition to any of these policies. These findings suggest that community members are open to structural efforts to support conservation. Public approval could facilitate collaborations between local governments, businesses, community groups, and conservation organizations, increasing the likelihood of collaborative efforts to protect pollinators in the region. By leveraging this support, initiatives such as habitat protection, restoration, and regulatory measures could be advanced by policymakers with community endorsement.

	Strongly oppose	Somewhat oppose	Somewhat support	Strongly support
Establishing pollinator gardens in public spaces	0%	0%	1%	99%
Relaxed lawn maintenance rules during spring	0%	2%	20%	78%
Increased funding for conservation efforts	0%	0%	11%	89%
Legislation to regulate/reduce pesticide use	0%	4%	10%	86%
Legislation to protect pollinator habitats	0%	2%	5%	93%

Table 3: Summary of participant responses indicating levels of support or opposition to the listed pollinator conservation policies.

Pollinator Conservation Behaviors

Individual engagement with conservation was high, with 95% of participants reporting prior involvement in at least one pollinator-friendly behavior. On average, participants reported engaging in 5.76 out of the 10 listed behaviors ($SD = 2.69$). The most common actions were those easily implemented at home, including *planting beneficial native plants* (87%), *reducing pesticide use* (78%), *creating pollinator gardens* (75%), *reducing herbicide usage* (70%), *minimizing lawn areas* (60%), *reducing lawn mowing frequency* (59%), and *providing nesting sites for pollinators* (57%). Less common activities included *donating to pollinator conservation efforts* (42%), *volunteering with pollinator organizations* (33%), and *other actions* (14%). These findings suggest strong potential for encouraging personal adoption of pollinator-friendly behaviors. Broad implementation of these practices could provide cumulative benefits for pollinators, alleviating the pressures of limited food and nesting resources, reducing chemical exposure, and ultimately supporting the resiliency of local pollinator populations.

Despite high personal engagement in pollinator-friendly behaviors, familiarity with local conservation initiatives was notably lower, indicating that awareness does not necessarily translate into engagement at the community-level. While 17% of participants reported no familiarity with local pollinator conservation efforts, the majority were *slightly* (31%) or *moderately* (28%) familiar, with fewer being *very* (19%) or *extremely* (4%) familiar. This suggests that although general concern for pollinators is high, there is an opportunity to raise awareness of local conservation organizations, their initiatives, and avenues for community participation.

Barriers to Engagement

When asked about potential barriers to participation in pollinator conservation, most participants indicated they already take part (57%) or that none of the listed factors would prevent their involvement (33%). The most common barriers were *financial limitations* (19%), *uncertainty about where to begin* (14%), and *lack of time* (11%). Fewer participants cited *reluctance to spend money* (8%), *the perception that conservation is too much effort* (5%), *believing their actions would have little impact* (3%), and *considering it an inconvenience* (1%). No participants selected *I don't think it's important* or *I have an aversion to insects*.

Barriers may limit broader participation in conservation efforts, so addressing them is important to increasing the adoption of pollinator-friendly behaviors in the community. Barriers like financial limitations and time restraints could be addressed by increasing awareness of low-cost, accessible actions. In the fall the Leave the Leaves movement, which encourages leaving fallen leaves rather than raking them, offers an easy, no-cost way to provide shelter to overwintering pollinators while also saving time that would otherwise be spent raking. Outreach materials could also focus on empowering individuals who do not know where to begin by providing clear guidance on how to take the first steps toward participating in pollinator conservation, and emphasizing the tangible impact of these actions.

Messaging Tone

Messaging plays a key role in shaping how the public understands and engages with conservation efforts. Understanding the influence of tone can inform communication strategies. A paired T-test was conducted to examine the difference in interest and support for pollinator conservation in addition to feelings of hope and discouragement when exposed to an optimistic or pessimistic message. Message framing significantly influenced emotional responses. When viewing the optimistic message participants reported feeling more hope ($M = 4.47, SD = 0.62$) relative to the pessimistic message($M = 2.11, SD =$

$1.22); t(92) = 17.322, p < .001, d = 1.796$. Regarding discouragement, participants felt less discouraged after viewing the optimistic message ($M = 1.55, SD = 0.79$) than after viewing the pessimistic message ($M = 3.42, SD = 1.25$); $t(92) = -12.41, p < .001, d = -1.29$. Conversely, message framing had no significant effect on interest or support.

In summary, the optimistic pollinator conservation message elicited greater feelings of hope, whereas the pessimistic message increased feelings of discouragement. Despite these emotional differences, both messages were similarly effective in maintaining interest and willingness to support pollinator conservation. This result was unexpected. It may be that supporting pollinator conservation almost necessitates a commitment to remain engaged despite discouraging information. Although the ongoing decline of pollinator populations may sometimes evoke a sense of futility regarding conservation efforts, the sustained support observed here reflects resilience in participants' commitment to the cause despite adversity. While pessimistic messages have their place in conveying urgency, emphasizing hope in conservation messaging may be more effective for fostering optimism and strengthening belief in our collective capacity to address pollinator decline.

Pollinator Identification

Participants correctly identified an average of 2.86 out of 5 pollinator species ($SD = 1.6$), suggesting a moderate level of ecological knowledge related to common species identification. Most participants accurately identified the Monarch Butterfly (*Danaus plexippus*, 91%), Eastern Tiger Swallowtail (*Papilio glaucus*, 60%), and Western Honeybee (*Apis mellifera*, 55%). High recognition of the Monarch butterfly suggests that public outreach, including national campaigns and early education initiatives, has successfully enhanced public awareness of this pollinator. Given the link between identification accuracy and conservation attitudes, similar outreach focused on other native pollinators may promote greater support for their conservation. Fewer than half accurately recognized the Common Eastern Bumblebee (*Bombus impatiens*, 46%) or Eastern Carpenter Bee (*Xylocopa virginica*, 33%).

Previous research suggests individuals feel more positively toward insects they're familiar with. Consistent with this, a significant positive correlation was found between identification accuracy and the perceived personal importance of pollinator conservation, $r(91) = 0.23, p = 0.026$. Those who correctly identified more pollinator species were also more likely to view pollinator conservation as personally important. Enhancing ecological knowledge, such as the ability to identify common pollinator species, may have practical value for promoting their conservation.

The Eastern Carpenter Bee was the most frequently misidentified species (31%), most often mistaken for the Common Eastern Bumblebee (19%). This is an easy mistake to

make due to their similar appearances. The abdomen is the key differentiating feature, which is fuzzy for bumblebees and smooth and shiny for the Eastern Carpenter Bee. The Common Eastern Bumblebee was misidentified by 15% of participants, typically as the Perplexing Bumblebee (*Bombus perplexus*, 10%). The Eastern Tiger Swallowtail was most frequently confused with the Spicebush Swallowtail (*Papilio troilus*, 6%), whereas the Monarch Butterfly exhibited the lowest rate of misidentification (4%). These misidentification patterns suggest a reliance on general visual cues and species categorization rather than specific identifying traits.

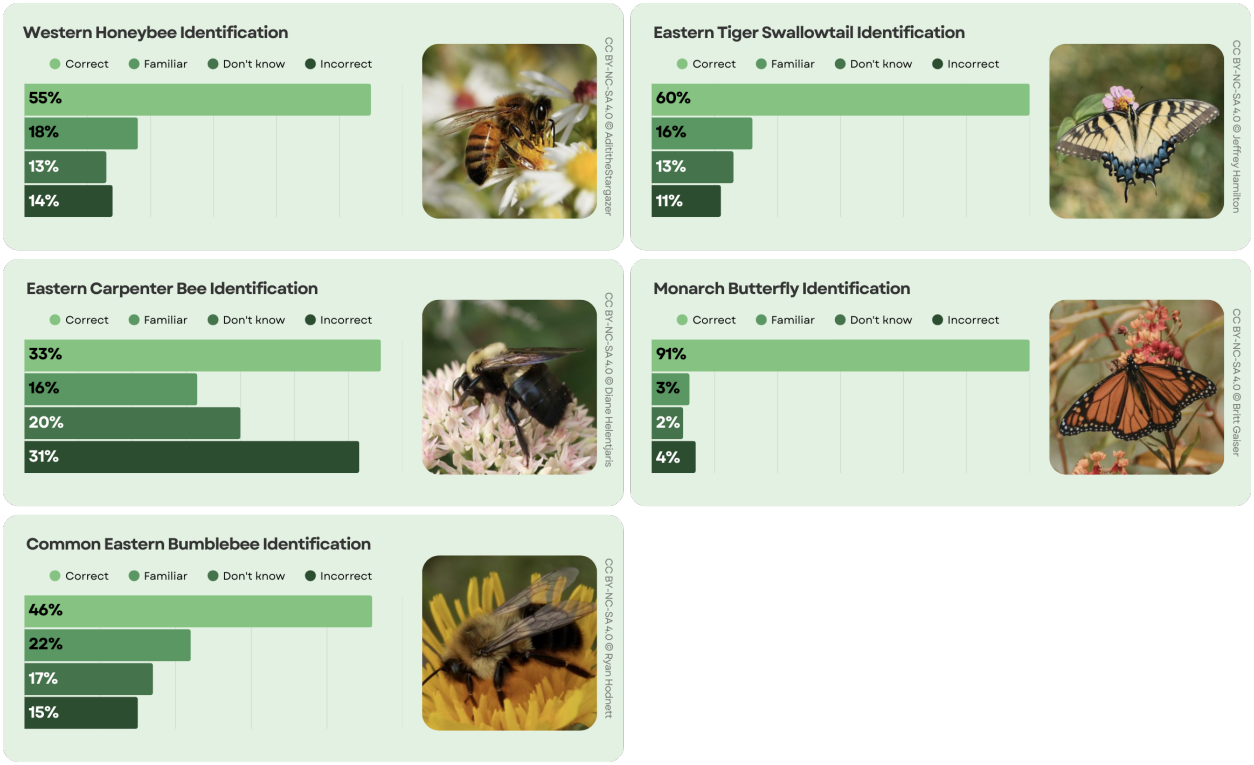

Figure 2: Visual summary of participant identification accuracy for each species in the pollinator identification task, with corresponding stimulus images.

Nature Connectedness

An increased sense of connection with the natural world, known as nature connectedness, has been linked to pro-conservation behaviors (Richardson et al., 2019). On average, participants had an NCI score of 77.6 out of a total score of 100 ($SD = 25.8$). A significant positive correlation was found between Nature Connectedness and the perceived personal importance of pollinator conservation, $r(92) = 0.27, p = 0.009$. This highlights the relationship between connection to nature and pollinator conservation

attitudes. Encouraging meaningful engagement with the natural world could serve as a pathway to increased support for conservation.

Limitations

Due to the exploratory nature of this research, the small and regionally concentrated sample limits the extent to which these findings can be generalized beyond Western North Carolina. The results may also overrepresent positive attitudes, as individuals who choose to participate in pollinator-focused research may be more informed and more concerned about the issue than the general population. In addition, because responses were self-reported, the data may reflect participants' perceptions or socially desirable answers rather than their actual behaviors. Even with these limitations, this study provides an initial foundation for future work and offers a valuable next step toward developing a more comprehensive understanding of pollinator conservation psychology.

Conclusion

As pollinator populations continue to decline, ecological stability and agricultural productivity are increasingly at risk. Addressing this crisis requires a deeper understanding of the human factors that shape conservation. To effectively confront the root causes of decline, conservation efforts must extend beyond ecological interventions to include the psychological and behavioral dimensions of the issue. This exploratory study examined attitudes and behaviors related to pollinator decline and conservation in Western North Carolina. Overall, the results indicate high levels of awareness, concern, and involvement among participants. Most recognized the severity and long-term consequences of pollinator decline, accurately identified its primary causes, and expressed strong support for pollinator-friendly policies. Notably, opposition to these policies was minimal, suggesting that public sentiment may be in favor of advancing conservation-focused legislation and community initiatives. Although individual engagement in pollinator-friendly practices was widespread, community-level participation was comparatively limited. While these results reflect substantial attitudinal and behavioral engagement among individuals already interested in pollinator conservation, achieving widespread adoption of conservation behaviors will require outreach strategies that also reach audiences who are less engaged with the issue. Future research could examine the motivational factors that influence participation among disengaged audiences.

The results of this study confirm the effectiveness of existing outreach practices and offer new directions for the future. In Western North Carolina, communication strategies should focus on translating existing concern into action by providing clear pathways to participation. Barriers such as time, cost, and knowledge can be addressed through low-

cost, beginner-friendly actions and simple guidance on how to get started. Individuals appear more likely to adopt personal and household level pollinator-friendly practices, which can produce meaningful cumulative benefits for pollinators. Strong public support for policy-level solutions could be leveraged to advance community-wide conservation initiatives, and future research could assess support for specific policies, such as native plant requirements in new developments, green corridors, and habitat-friendly urban planning.

Participants who demonstrated stronger connections to nature and greater accuracy in identifying pollinator species were more likely to assign high personal importance to conservation. This aligns with prior research showing that ecological knowledge and nature connectedness are key predictors of pro-environmental attitudes and behaviors. Programs and resources that encourage direct engagement with local ecosystems, such as identification tools, guided walks, and educational materials, can strengthen ecological knowledge and nature connectedness. Expanding outreach beyond well-known species may also help cultivate broader familiarity with local pollinators. Future research should continue to investigate the social, motivational, and behavioral dimensions of conservation outreach to inform increasingly effective, evidence-based communication strategies. A deeper understanding of these dynamics would contribute to a more comprehensive framework for promoting widespread participation and support for pollinator conservation.

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