

Article

Testing the Likeable, Therefore Abundant Hypothesis: Bird Species Likeability by Urban Residents Varies Significantly with Species Traits

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Abstract: The urbanization of landscapes filters bird communities to favor particular species traits, driven in part by the changes that homeowners make to the amount and quality of habitat in yards. We suggest that an ultimate driver of these proximate mechanisms underlying bird community change with respect to urbanization is the likeability of species traits by urban residents. We hypothesize that bird species likeability, modulated by species traits, influences the degree to which homeowners alter the availability and quality of habitat on their properties and thereby affects species population sizes in urbanized landscapes. We refer to this new hypothesis as the Likeable, therefore Abundant Hypothesis. The Likeable, therefore Abundant Hypothesis predicts that (1) bird species likeability varies with species morphological and behavioral traits, (2) homeowners use trait-based likeability as a motivator to modify habitat availability and quality on their properties, and (3) residential habitat availability and quality influences species populations at landscape scales. We tested the first prediction of the Likeable, therefore Abundant Hypothesis using a survey of 298 undergraduate students at the University of North Carolina at Charlotte who were asked to rank their preferences for 85 forest generalist and edge/open country songbird species grouped according to 10 morphological and behavioral traits. Survey respondents preferred very small, primarily blue or black species that are insectivorous, aerial or bark foragers, residents, and culturally unimportant. On the other hand, respondents disliked large or very large, primarily yellow or orange species that forage on the ground and/or forage by flycatching, are migratory, and are culturally important. If the Likeable, therefore Abundant Hypothesis is true, natural resource managers and planners could capitalize on the high likeability of species that are nevertheless negatively affected by urbanization to convince homeowners and residents to actively manage their properties for species conservation.

Keywords: environmental attitudes; residential landscapes; wildland–urban interface; wildlife management; urban wildlife; yards



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1. Introduction

Residential development is the dominant form of urbanization in the US [1,2] and often results in the loss and fragmentation of forest [3–6]. For example, in the North Central US, residential development replaced 15% of conifer and 23% of hardwood forest between 2001 and 2011, leading to losses of core forest area (forest more than 100 m from an edge) of as much as 71% [6]. The intermingling of houses and wildland vegetation such as forest defines a wildland–urban interface where the interactions between human activities and non-human species dynamics are concentrated [7,8].

The urbanization of landscapes leads to marked changes in the community composition of wildlife, such as birds. Bird species that are more common in urbanized landscapes tend to be those that have larger body sizes, wingspans, and brain sizes; are resident; are

omnivorous, granivorous, or frugivorous; nest in cavities or have medium to high nesting heights; exhibit sociality and/or biparental involvement in nest construction; and have larger clutch sizes, more fledglings per clutch, multiple clutches per year, and spend longer in the nest after hatching [9–17]. The specific mechanisms underlying this filtering of the bird community by urbanization have not been tested but likely include the changes that homeowners make to the amount and quality of habitat in their yards, such as providing bird feeders and nest boxes, maintaining large areas of lawn with irrigation and pesticides, favoring seed- and fruit-producing ornamental plants and trees, and owning domestic cats (e.g., [18,19]).

We suggest that an ultimate driver of these proximate mechanisms underlying bird community change with respect to urbanization is the likeability of species traits by urban residents. By likeability, we mean the degree to which residents prefer some morphological or behavioral traits over others. We hypothesize that bird species likeability, modulated by species traits, influences the degree to which homeowners alter the availability and quality of habitat on their properties and thereby affects species population sizes in urbanized landscapes. We refer to this new hypothesis as the Likeable, therefore Abundant (LTA) hypothesis. The processes described by the LTA hypothesis are likely to be most pronounced at the Wildland Urban Interface where homeowners and species populations are in close proximity and private open space abounds.

The LTA hypothesis predicts that (1) bird species likeability varies according to species morphological and behavioral traits, (2) homeowners use trait-based likeability, consciously or unconsciously, as a motivator to modify the availability and quality of habitat for liked or disliked species on their properties, and (3) residential habitat availability and quality influences species populations at landscape scales. Below, we present evidence in support of the first two predictions. The third prediction is widely supported in the literature [19–22] and we do not discuss it further here.

Likeability varies among bird species [23–27]. For example, in three southern English towns, residents found certain garden bird species, such as the robin (*Erithacus rubecula*) and the blue tit (*Cyanistes caeruleus*), to be much more visually appealing than others, such as the woodpigeon (*Columba palumbus*) and the magpie (*Pica pica*) [26]. Variable likeability is in part a product of the morphological traits of bird species, including body size and shape, and plumage lightness, pattern, and color [24,25,27]. Human preference for bird species may also be influenced by species behavior or life history characteristics. Belaire et al. [28] reported a marked dislike among residents of Chicago for two types of bird behavior: defecating on outdoor furniture or cars and nesting in or on houses. Given these lines of evidence, it seems reasonable to suggest that likeability of bird species be conditioned on morphological and behavioral traits such as body size, foraging height, and dietary habit.

It also seems reasonable to suggest that homeowners regularly modify their local environment to attract or repel species with particular morphological or behavioral traits. Human preference for species is in the large part driven by emotional responses [29], and these seem to be tied to species morphological and behavioral traits, e.g., happiness when viewing the color green [30] or being worried by potential predation by cats or hawks at bird feeders [31]. Affect and emotion are recognized as key components influencing human decision-making and behaviors related to wildlife [32–35]. For example, anger towards house sparrows had a large significant effect on the likelihood of citizen science nest monitors supporting lethal management of the species [35], and being worried about a diseased bird or angered by a potential depredation event was significantly associated with the likelihood that bird watchers took actions such as providing shelter or removing bird feeders in response [31]. Thus, the likeability of species based on their traits elicits human emotional responses that may lead to wildlife management actions.

Evidence supporting the link between species trait likeability and private property management is beginning to accumulate in the literature. In Chicago, the value that residents place on birds, based on morphological and behavioral characteristics such as the pleasantness of their songs and appearance, whether they control pests such as insects

and rodents, and whether they congregate in groups, explains a significant proportion of the variation in the number of wildlife resources in yards, such as birdfeeders, birdhouses, and vegetation planted to attract birds [36]. The provision of specific bird food or bird feeders to attract species with particular dietary or feeding habits is likely a common activity. Twenty-two percent of the US population feed birds at home and up to 48% of residents elsewhere do so [37–40]. Additionally, people who feed birds offer different foods, such as bread, seeds, nectar, suet, fruit, and mealworms, presumably in order to attract different types of species [39,41]. We posit that many other activities intended to benefit or disadvantage species with particular traits also occur with some regularity, such as the provision (or not) of certain types and heights of vegetation and water features such as ponds; the provision of artificial nests or conversely, the removal of cavities used for nesting; the preservation or removal of dead wood; and the restriction (or not) of domestic animals that predate ground foraging or nesting species. Estimates that hint at the prevalence of these practices include: 31% of New Zealanders plant trees for birds on their properties, whether or not they also feed birds [39]; approximately half of homeowners in Southeastern Michigan, USA provide bird houses and/or plant or maintain vegetation for birds on their properties [42]; approximately two-thirds of respondents in Canada and the United States who fed birds provided special plantings for birds and/or had a bird house [41]; and 10% of UK households have a pond and 16% have at least one nest box [38].

In this paper, we tested one of the predictions of the LTA hypothesis, namely that species likeability varies with species traits. To our knowledge, the only evidence that this is the case exists with respect to the morphological traits of species, no study having investigated whether human preference for behavioral traits such as foraging behavior also occurs. We assessed the likeability of species traits using a survey of nearly 300 undergraduate students, representing residents of landscapes containing a mix of urban development, forest, and farmland. Respondents ranked their preferences for 85 forest generalist and edge/open country songbird species occurring in North Carolina, grouped according to 10 morphological and behavioral traits. We tested for significant differences in preference for species traits and calculated an aggregated likeability score for each species that could be used in subsequent analyses to better understand the mechanisms underlying variation in species population sizes with respect to urbanization.

2. Materials and Methods

2.1. Bird Species Traits

We focused on eighty-five forest generalist and edge/open country songbird species that occur in North Carolina (Table S1) as the suite of species most likely to be encountered by potential survey respondents, i.e., residents of urbanized landscapes in the central portion of the state that typically contain urban development, forest, and active or abandoned farmland. Species habitat associations were empirically determined from abundance-forest amount relationships as part of a previous study [43]. Specifically, forest generalist species were defined as those associated with forest but that occurred in landscapes with a wide range of forest amounts and edge/open country species were defined as those most abundant in landscapes with little forest.

We classified each species according to its primary color, secondary color, number of colors, body size, dietary habit, foraging behavior, foraging height, habitat association, migratory behavior, and cultural importance (Table S1). In order to classify species' primary color, secondary color, and number of colors, we used color photographs of perching adult males of each species obtained from the Cornell Lab of Ornithology's All About Birds website and Audubon's online Guide to North American Birds [44,45]. For species that are rarely seen perching, we used photographs depicting species in the poses most commonly observed by people. For example, the Chimney Swift (*Chaetura pelagica*) was depicted as flying overhead. In September 2017, a focus group of ten undergraduate students who did not participate in the preference survey grouped photographs by consensus according to their perceptions of the primary color, secondary color, and number of colors of species.

The focus group considered primary color to be the color that occupied the greatest body surface area and/or the first color one thought of when viewing the species. Secondary color was the color occupying the second greatest body surface area. Primary color was categorized as brown, black, white, gray, blue, green, yellow, red, or orange. Secondary colors were the same as primary colors with the omission of green. The number of colors of species' plumage varied between one and six.

We collected data on the body size, dietary habit, foraging behavior, foraging height, habitat association, and migratory behavior of each species from The Birds of the World database [46] and respected guides [47,48]. We averaged body size values across sexes and grouped species into five body size categories: very small (<12.0 g); small (12.1–18.0 g); medium (18.1–27.0 g); large (27.1–52.0 g); and very large (52.1–468.0 g). Dietary habits were categorized as granivorous, insectivorous, nectarivorous, frugivorous, and omnivorous. Foraging behaviors were foliage gleaner, ground forager, bark forager, flycatching, aerial forager, or hovering. We classified foraging heights as ground, lower canopy, upper canopy, above canopy, or floral hoverer. Habitat association was forest generalist or edge/open country and migratory behavior was resident or migratory.

Finally, we estimated the cultural importance of species as a measure of people's general familiarity with species, which is known to positively impact preference [26,49]. We estimated cultural importance as the number of results from a Google search for each species' common name in quotation marks (e.g., we used "northern cardinal" as a search term). We carried out searches in September, 2017 and used the count of all search results to categorize species as not important (<153,000 results); slightly important (153,001–266,000 results); fairly important (266,001–409,000 results), important (409,001–455,000 results); or very important (455,001–12,500,000 results).

2.2. Preference Survey

In the fall of 2017, we surveyed undergraduate students at least 18 years of age and enrolled in ESCI 1101 Earth Sciences—Geography. The survey protocol and instrument were approved by our institution's Institutional Review Board (Study #17-0299). All survey respondents consented to being a part of the study prior to their participation.

The survey focused on ten questions, one for each species trait. Each question asked respondents to rank by preference photographs of songbird species representing trait categories. We used the same photographs in the survey as those used to categorize species by color traits (see above). In order to minimize the likelihood that preference for trait categories was confounded with preference for individual species, we randomly selected a representative species for each trait category. We also created ten versions of the survey, each with a different, randomly selected assortment of species, and we omitted trait categories represented by a single species. Thus, trait likeability scores represented respondents' preferences for trait categories, not individual species. In fact, we assumed that respondents did not know the identities of all of the bird species in the survey. Rather, we assumed that respondents ranked trait categories based on morphological characteristics visible in the photographs, such as primary color; their experience of species with particular morphological characteristics visible in photographs, such as a relatively long narrow beak, or pictured perching on particular structures, such as a tree trunk, behaving in certain ways, e.g., flycatching or eating insects; and their familiarity with some species compared to others. Although we chose only bird species that occurred where respondents lived, we did not inform respondents of this fact prior to administering the survey. Additionally, it should be noted that respondents' ranking of trait categories were not independent: a respondent's ranking of a trait category necessarily limits the possibility of other categories having the same rank.

The survey also included questions about respondent age, gender, race, ethnicity, annual household income, undergraduate major, year of study, and residence zip code. Finally, we asked respondents to indicate their bird watching frequency and whether or not

they fed birds at home. A randomly selected version of the survey was sent to participants using Qualtrics [50].

2.3. Analyses

In order to more accurately describe the biogeographic context of survey respondents' home environments, we measured the land cover composition of respondent zip codes using the 2016 National Land Cover Database [51], Zip Code Tabulation Areas [52], and ArcGIS 10.4.1 [53].

We tabulated survey responses to each trait question as the count of responses for each combination of trait category and rank. For example, seventy respondents ranked 'very small' as their most preferred body size category (rank 1). For each trait category, we used G-tests to compare the observed number of responses across ranks to the expectation that the number of responses would be equal among ranks. Since this approach resulted in a large number of significance tests, we used a Bonferroni-corrected α of 0.001, i.e., we labelled G-statistic values as significant only if their associated p -values were <0.001 . The results of the G-tests identified trait categories that were ranked in a non-uniform way by respondents, but did not provide any information on the shape of these patterns. In consequence, for each trait category, we plotted the percent of responses for that category in each rank and focused our interpretation of the results on those trait categories that had a significant G-test result and qualitatively exhibited a clear pattern of percent responses among ranks, e.g., a monotonic decline from the most to the least preferred rank. For each significant trait category, we also tested whether the difference between proportions in rank 1 and each of every other rank was statistically significant using a Bonferroni-corrected α of 0.0003 and the COMPARE2 program of WINPEPI [54].

We used a general linear mixed effects model to explore the effects of species traits on likeability by associating each rank a respondent assigned to a species' photograph with each of the species' trait categories (respondent and species were random effects). We considered this analysis exploratory because likeability was biased by the fact that we combined ranks across all questions in the survey and questions varied in their range of possible ranks. Thus, a species' trait categories could be assigned a rank that simply represented the number of trait categories in the question in which the species' photograph was included. Nevertheless, we thought that this analysis might identify the particularly strong effects of some traits, although we interpreted the results with abundant caution.

We created an aggregate likeability index of all songbird species using a principal component analysis. Input variables were the weighted preference ranks of species for each trait for which at least one G-test indicated a significant preference (or dislike) for a category. Preference ranks were weighted by proportion of responses. Specifically, for each trait with at least one significant G-statistic value, the weighted preference rank for a species was the sum of ranks, each multiplied by the proportion of respondents who chose the rank, for the trait category represented by the species. For example, if 20 respondents ranked the tree swallow (*Tachycineta bicolor*), an insectivore, as 1, 30 respondents ranked the species as 2, and 50 respondents ranked the Tree swallow as 3, the species' weighted preference rank for the dietary habit trait was calculated as 2.3 ($1 \cdot 0.20 + 2 \cdot 0.30 + 3 \cdot 0.50$). We assigned the average of the weighted preference ranks of species representing each trait category in survey versions to species not included in the survey (recall that species were randomly chosen to represent trait categories in ten versions of the survey). We carried out the principal component analysis using scaled input variables and the `prcomp` function in the stats package of R [55], after having inspected pairwise plots of input variables to verify the linearity of relationships.

3. Results

Two hundred and ninety-eight undergraduate students responded to the survey in whole or in part (75% responded to $\geq 75\%$ of the survey). Half of respondents were male, 49% were female, and 1% identified as other. The average age of respondents was 20 years

and the plurality were sophomores (45%), white (69%), and/or not Latino/Hispanic (91%). Approximately half of respondent annual household incomes were USD 25,000 or less (24%) or USD 100,001 or more (30%). On average, respondent zip codes were $24 \pm 27\%$ SD Developed, $45 \pm 19\%$ SD Forested, and $19 \pm 13\%$ SD agricultural (Pasture/Hay and Cultivated Crops land cover classes). Forty-six percent of respondents or a member of their households put out bird feeders at their homes but the large majority (71%) never went bird watching.

Respondent preference varied significantly for each of the primary and secondary colors we evaluated (Tables S2 and S3, Figure 1a,b). Respondents preferred primarily black or blue songbirds (e.g., Blue Jay (*Cyanocitta cristata*)) (e.g., absolute difference between proportions in rank 1 and rank 5 (hereafter DIFF1-X) for black: 0.16 ± 0.03 (SE), $p < 0.0003$), disliked primarily yellow or orange songbirds (e.g., Baltimore oriole (*Icterus galbula*)) (e.g., DIFF1-8 for yellow: 0.08 ± 0.02 (SE), $p < 0.0003$), and expressed either a strong preference or strong dislike for primarily red songbirds (e.g., northern cardinal (*Cardinalis cardinalis*)) (e.g., DIFF1-3: 0.17 ± 0.03 (SE), $p < 0.0003$) (Figure 1a). Preferred songbird secondary colors were black and brown (e.g., American goldfinch (*Spinus tristis*)) (e.g., DIFF1-3 for black: 0.27 ± 0.04 (SE), $p < 0.0003$) and disliked secondary colors were white and yellow (e.g., brown thrasher (*Taxostoma rufum*)) (e.g., DIFF1-7 for white: 0.14 ± 0.03 (SE), $p < 0.0003$) (Figure 1b).

Respondent preference also varied significantly for each of the body size categories we evaluated (Tables S2 and S3, Figure 1c). Respondents preferred very small songbirds (e.g., Carolina chickadee (*Poecile carolinensis*)) (e.g., DIFF1-4: 0.23 ± 0.04 (SE), $p < 0.0003$) and disliked large, and especially very large (e.g., northern flicker (*Colaptes auratus*)) (e.g., DIFF1-5: 0.36 ± 0.04 (SE), $p < 0.0003$), songbirds.

Significant differences in preference were observed for insectivorous and omnivorous species and species that are aerial, bark, or ground foragers or employ flycatching (Tables S2 and S3, Figure 2a,b). Respondents preferred insectivorous songbirds (e.g., eastern phoebe (*Sayornis phoebe*)) (e.g., DIFF1-3: 0.19 ± 0.04 (SE), $p < 0.0003$) and either strongly liked or strongly disliked omnivorous songbirds (e.g., common grackle (*Quiscalus quiscula*)) (e.g., DIFF1-2: 0.22 ± 0.04 (SE), $p < 0.0003$), and preferred aerial or bark foragers (e.g., white-breasted nuthatch (*Sitta carolinensis*)) (e.g., DIFF1-4 for aerial forager: 0.15 ± 0.03 (SE), $p < 0.0003$) whilst disliking flycatching (great crested flycatcher (*Myiarchus crinitus*)) (e.g., DIFF1-4: 0.22 ± 0.04 (SE), $p < 0.0003$), and especially ground foraging (e.g., eastern towhee (*Pipilo erythrophthalmus*)) (e.g., DIFF1-5: 0.40 ± 0.03 (SE), $p < 0.0003$), species.

Resident songbirds (e.g., song sparrow (*Melospiza melodia*)) were significantly preferred and migratory songbirds (e.g., house wren (*Troglodytes aedon*)) significantly disliked by respondents to our survey (DIFF1-2: 0.28 ± 0.06 (SE), $p < 0.0003$) (Tables S2 and S3, Figure 2c). Finally, we also observed significant differences in preference for each of the cultural importance categories we evaluated, except for 'fairly important' (Tables S2 and S3, Figure 2d). Respondents liked species that were considered 'not important' or 'slightly important' (e.g., alder flycatcher (*Empidonax alnorum*)) (e.g., DIFF1-2 for not important: 0.20 ± 0.04 (SE), $p < 0.0003$), disliked species that were 'important' (e.g., Carolina wren (*Thryothorus ludovicianus*)) (e.g., DIFF1-4: 0.17 ± 0.04 (SE), $p < 0.0003$), and either strongly liked or strongly disliked 'very important' songbird species (e.g., house finch (*Haemorhous mexicanus*)) (e.g., DIFF1-2: 0.21 ± 0.04 (SE), $p < 0.0003$).

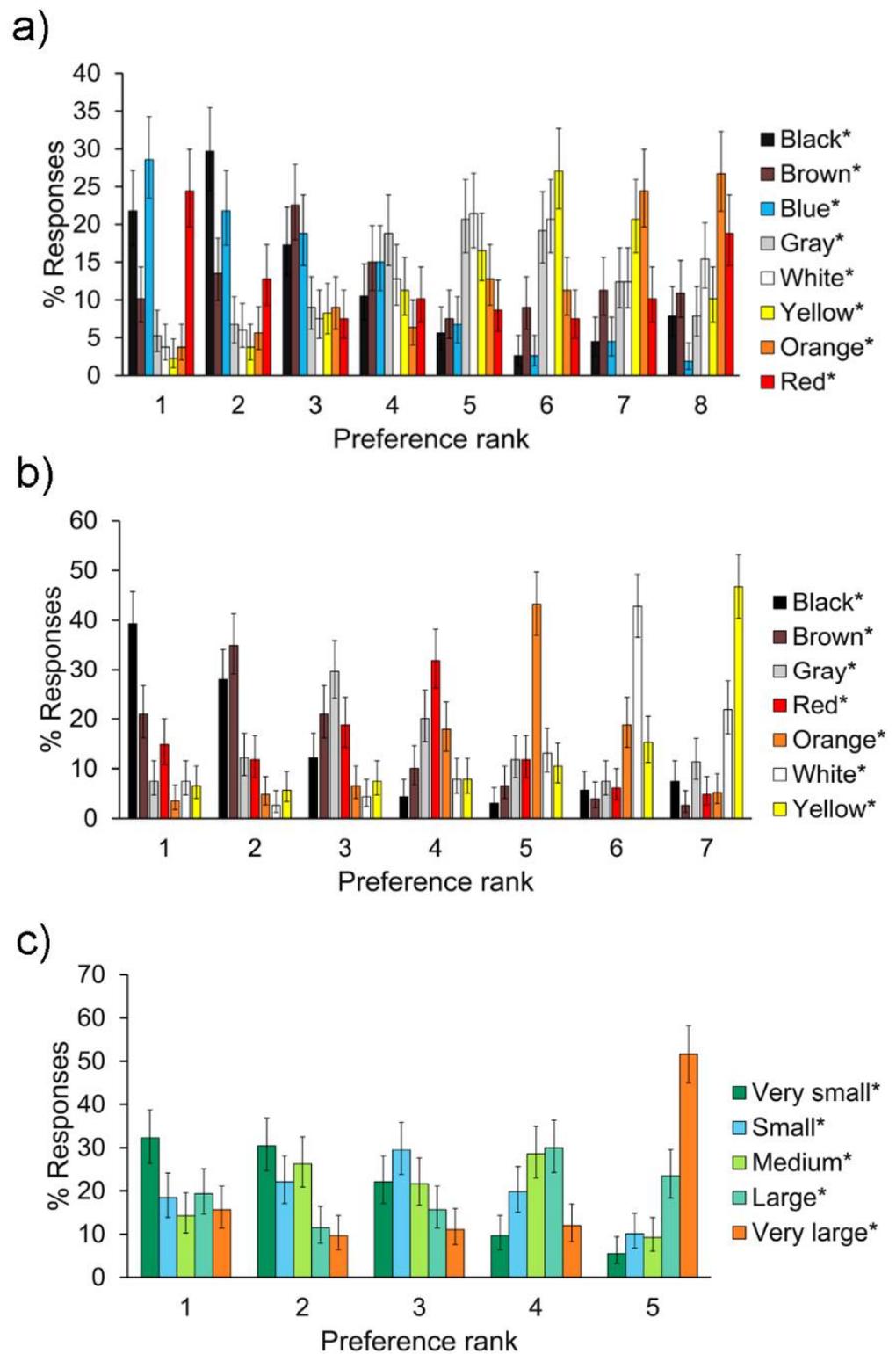


Figure 1. Human preferences (% responses \pm 95% CI (Wilson score)) for the primary color (a), secondary color (b), and body size (c) of forest generalist and edge/open country songbird species. Preference rank varied from most (1) to least (5 or 7) preferred. Asterisks indicate that, for a given trait category, the distribution of the number of responses across ranks differed significantly ($p < 0.001$) from the expectation that all ranks had an equal number of responses.

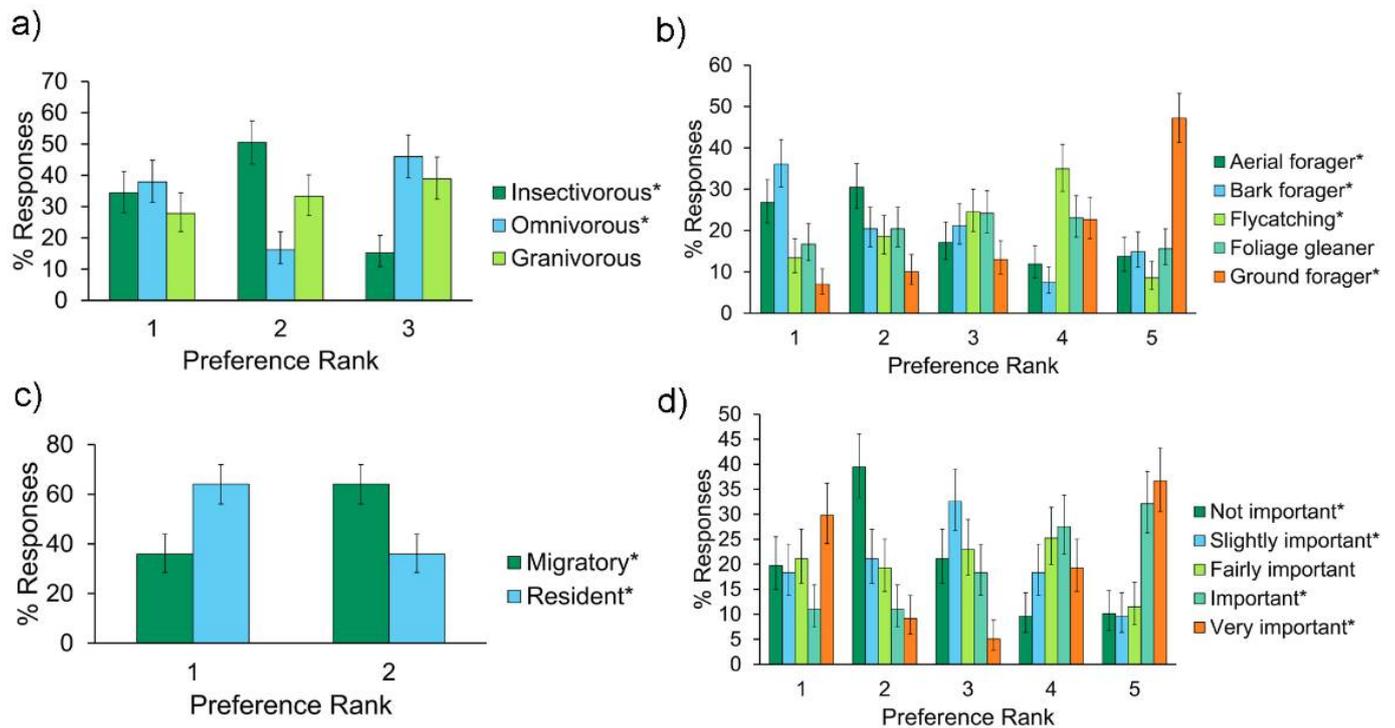


Figure 2. Human preferences (% responses \pm 95% CI (Wilson score)) for the dietary habit (a), foraging behavior (b), migratory behavior (c), and cultural importance (d) of forest generalist and edge/open country songbird species. Cultural importance was measured as the number of results from a Google search for each species' common name in quotation marks. Preference rank varied from most (1) to least (2–5) preferred. Asterisks indicate that, for a given trait category, the distribution of the number of responses across ranks differed significantly ($p < 0.001$) from the expectation that all ranks had an equal number of responses (note that the significance indicated for resident species is wholly dependent on that for migratory species).

We found no significant differences in preference for the number of colors in songbird plumage, the foraging height of species, or the habitat association of species (Table S2).

The general linear mixed effects model included a significant positive effect of the primary color blue on likeability and a significant negative effect of the primary color orange (Table S4). No other trait effects were significant.

Just over half of the variation in respondent preferences across songbird species traits was explained by the first two components from a principal component analysis (Figure 3). The most preferred species, according to their scores on the first principal component, were the tree swallow, yellow-throated warbler (*Setophaga dominica*), and indigo bunting (*Passerina cyanea*) (Figure 4). The least preferred songbird species were the northern mockingbird (*Minus polyglottos*), mourning dove (*Zenaida macroura*), and American crow (*Corvus brachyrhynchos*) (Figure 4).

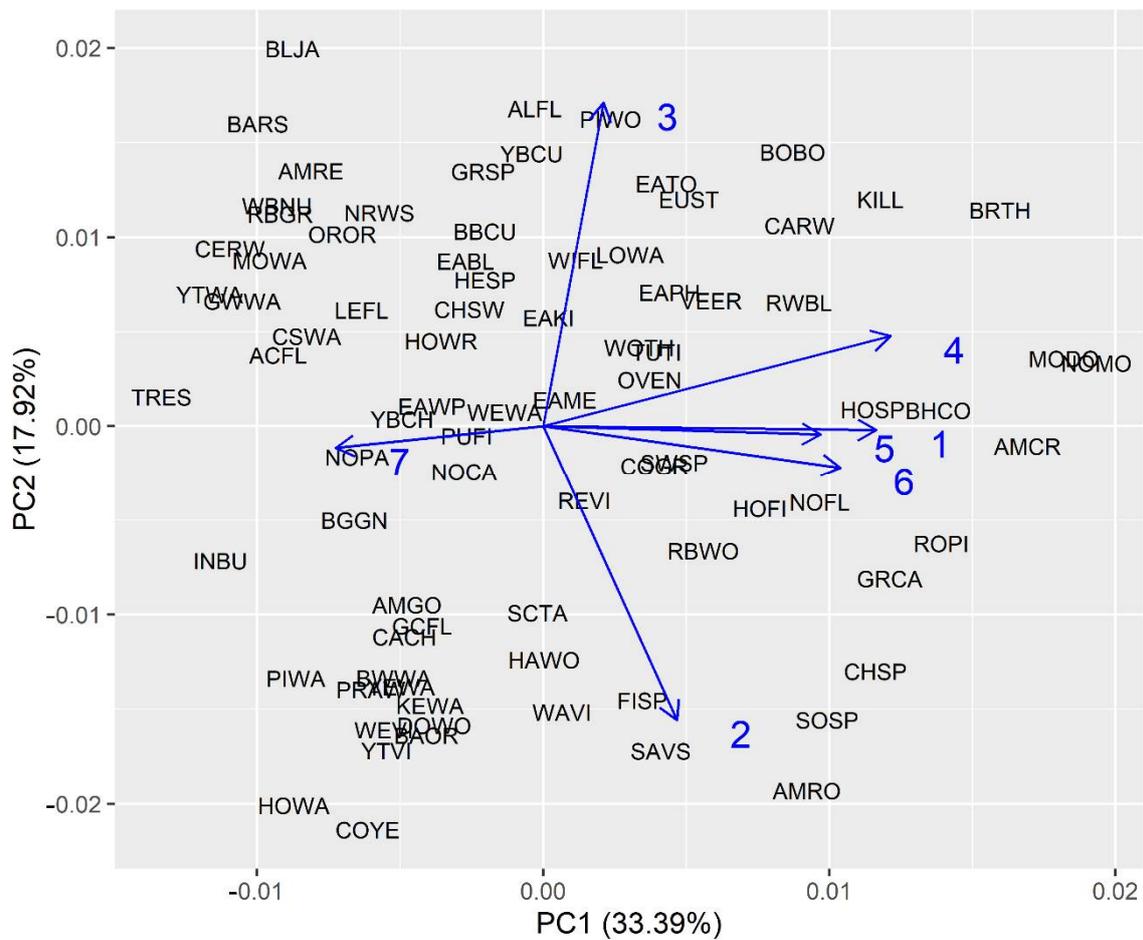


Figure 3. Distance biplot of the first and second principal components describing human preferences for the traits of forest generalist and edge/open country songbird species. Species are labelled by their alpha code [56,57] (Table S1). Variables are foraging behavior (1), primary color (2), secondary color (3), body size (4), dietary habit (5), cultural importance (6), and migratory behavior (7).

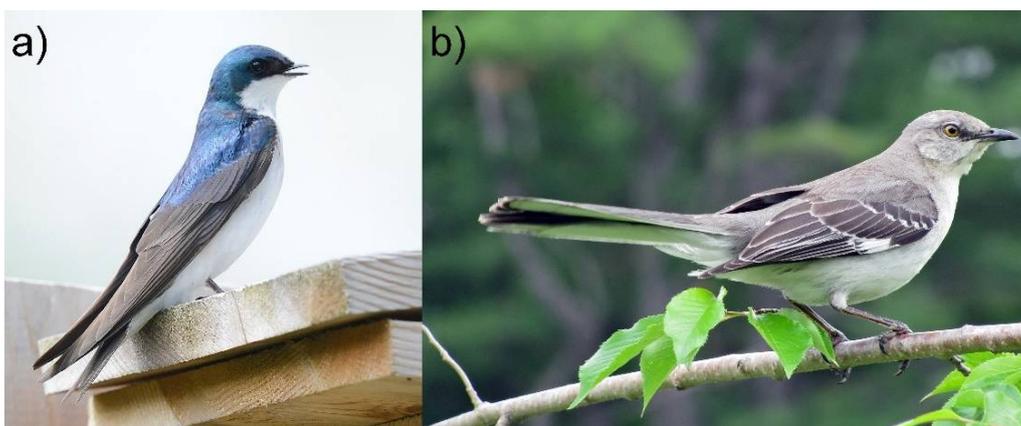


Figure 4. The most (a) and least (b) preferred songbird species, ranked according to their traits. (a) tree swallow (*Tachycineta bicolor*) (VJAnderson, License CC-BY-SA, <https://creativecommons.org/licenses/by-sa/4.0/deed.en>, accessed on 29 April 2021). (b) northern mockingbird (*Mimus polyglottos*) (Captain-tucker, License CC BY-SA 3.0, <https://creativecommons.org/licenses/by-sa/3.0>, accessed on 29 April 2021).

4. Discussion

Our survey of residents of landscapes at the wildland–urban interface revealed significant preferences for the morphological and behavioral traits of songbirds, lending support to the first prediction of the LTA hypothesis. Survey respondents preferred very small, primarily blue or black species that are insectivorous, aerial or bark foragers, residents, and culturally unimportant. On the other hand, respondents disliked large or very large, primarily yellow or orange species that forage on the ground and/or forage by flycatching, are migratory, and are culturally important. In the following, we discuss the possible mechanisms underlying these results and their implications for further testing of the LTA hypothesis.

Survey respondents favored a primary color of blue in songbirds more than other colors (blue was ranked most preferred (1) by a greater proportion of respondents than other colors). Blue is often associated with positive emotions such as calmness, hope, and happiness, as well as positively associated objects such as the sky and the ocean [30]. Primarily blue birds are also highly ranked in preference studies [24,25,27]. Orange was the least preferred primary color in songbirds. Orange is often viewed as distressing or upsetting [58]. In other words, our results indicate that humans prefer blue songbirds that may give them a sense of relaxation and comfort and dislike orange songbirds that may make them feel uneasy, possibly as a result of an association between a bright color such as orange and toxicity.

Black was the most preferred secondary color. The color black has a mixed association of positive and negative emotions and depends on the person's perception of and history with the color [30]. Yellow was the least preferred secondary color. Yellow also has somewhat mixed positive and negative associations. The color reminds some people of happiness and cheerfulness while giving others a feeling of anxiety [30]. The dislike of yellow as a secondary color in our results may be due to its association with another disliked characteristic: eight of nine species with yellow as a secondary color were migratory. Future research should aim to discover the mechanisms underlying human preference, or lack thereof, for black and yellow as secondary colors in birds, whether this be due to emotional responses to the colors themselves or due to these colors being associated with other species traits.

With respect to body size, survey respondents' most preferred size was very small (<12.0 g) and least preferred size was very large (>52.0 g). Small birds are well-liked by urban residents [59] and humans in general [60]. This could be due to humans thinking smaller birds are "cuter" because their head-to-body size ratio is larger [61]. The same principle can be applied to why those surveyed disliked very large songbirds. Their head-to-body size ratio is smaller so they are perceived as less attractive. Very large songbirds also tended to be ground foragers (71% of very large species foraged on the ground), a trait category strongly disliked in this study.

Omnivory was either the most preferred or the least preferred dietary trait category. This multimodal pattern suggests that the likeability of other traits coincident with omnivory was at play. All of the omnivorous species in this study were also ground foragers and either large or very large, characteristics that were disliked by survey respondents. At the same time, omnivorous songbirds were either primarily blue, black, or brown, which were the first, second, and third, respectively, most preferred primary colors. Finally, all omnivorous species were also residents, a trait category preferred by respondents. Survey respondents also significantly preferred insectivorous songbirds, possibly due to a perceived positive association between insectivory and pest control. In Chicago, Belaire et al. [28] reported a high level of agreement by residents with the statement "I value birds in my neighborhood because they control pests such as insects and rodents", lending support to this possibility.

For foraging behavior, respondents preferred bark and aerial foragers and disliked ground foragers. All bark and aerial foraging species were insectivorous, so preference for these songbirds may represent preference for the insectivorous dietary habit. Ground

foragers may have been disliked due to a perceived association between these species and property damage, although this remains to be tested. Anecdotal remarks from audience members following a presentation of study results suggested that ground foragers were strongly associated with causing damage to lawns and landscaping. Many ground foraging songbirds in our study were also large or very large and the dislike of larger birds could have contributed to the low likeability of ground foragers.

Species likeability may in part be due to the familiarity of species to humans [26]. Our results show that respondents strongly preferred resident songbirds over migratory species. Familiarity with residents simply due to their presence year-round may be a reason for this pattern. In the UK, Cox and Gaston [26] reported that familiarity with common garden birds, measured as respondents' knowledge of species names, had a significant positive association with species likeability. We posit that bark foragers may have been preferred in our study for this very reason, in addition to their insectivorous dietary habit. Bark foragers, particularly woodpeckers and nuthatches, are noisy and/or visually conspicuous species, resulting in people being more familiar with this group and its high likeability in our results.

Contrary to our expectation, cultural importance, measured as the number of results from a Google search of each species' common name and intended to represent the familiarity of species to humans, was not consistently positively associated with species likeability. Very important songbirds were either highly preferred or highly disliked, whereas species classified as not important were generally preferred and those classified as important were generally disliked. The pattern of preference for very important songbirds was likely driven by the most liked species having the preferred primary color of blue, e.g., the barn swallow (*Hirundo rustica*), and the most disliked species being less preferred large or very large ground foragers, e.g., the house sparrow (*Passer domesticus*). However, many of the most disliked very important species, such as the house sparrow and the killdeer (*Charadrius vociferus*), as well as the most disliked important species, such as the American crow (*Corvus brachyrhynchos*) and the Carolina wren, are abundant or conspicuous in urban and suburban areas and may be considered pest or nuisance species [62]. These characteristics would simultaneously result in high familiarity as measured by cultural importance, i.e., a large number of Google search results, and strong dislike by our respondents. Species that were not important yet liked were overwhelmingly small or very small birds and probably elicited high preference ranks due to their "cuteness".

Our results should be interpreted in the context of the human sample from which they came. The age, gender, race, and ethnicity of human respondents may shape respondent preferences for bird species and their traits. Bird species likeability increases with age [26] and differs between males and females [24,27], although the latter effect is small [25,26]. Gender influences the bird species traits preferred by respondents. In a study investigating Australians' preference for bird species traits, female respondents were more likely to prefer colorful small- or medium-sized birds with a melodious song, whereas male respondents were more likely to prefer endangered birds that did not have a harsh call or were not readily approachable [60]. We are not aware of any study on bird species likeability that investigated the effect of respondent race or ethnicity, nor any that report these characteristics of respondents, yet race and ethnicity may play important roles in shaping human preference for species and their traits in landscapes at the wildland–urban interface [63].

Our results are a first step in testing the LTA hypothesis. Future work should continue to investigate the likeability of species traits, particularly those that we did not test here but that have been found to be associated with positive responses to urbanization, such as cavity nesting (e.g., [17]), and/or are likely to elicit management actions by residents of the wildland–urban interface. The crux of testing the Likeability so Abundant Hypothesis will lie in testing the prediction that species likeability drives property management. This relationship could vary in magnitude depending on the degree of likeability of a given trait and the degree to which preferred or disliked traits co-occur in investigated species. The third

prediction of the LTA hypothesis, namely a positive association between species likeability, mediated by property management, and population size in landscapes at the wildland–urban interface, also needs to be tested. Species responses in urbanized landscapes are a product of multiple environmental, socioeconomic, and biotic drivers that interact with species occurrence and behavior at a variety of spatial scales [64]. Consequently, the effect of species likeability on population size may be swamped by other, stronger predictors. In other words, the LTA hypothesis will likely be a major explanation for species abundances in urbanized landscapes for some species, but not all.

5. Conclusions

In conclusion, the LTA hypothesis, if true, opens up an interesting conservation opportunity. Natural resource managers and planners could capitalize on the high likeability of species that are nevertheless negatively affected by urbanization to convince homeowners and residents to actively manage their properties for species conservation. Organizations and programs that encourage and facilitate the installation of nest boxes for eastern Bluebirds (*Sialia sialis*), e.g., The North American Bluebird Society, may turn out to be an example of just such an approach. Alternatively, recent research reporting positive effects of witnessing nest usurpations by invasive house sparrows and European starlings (*Sturnus vulgaris*) and residents' perceptions of the threat posed by invasive species on the likelihood of residents engaging in management activities that protect native species [62] suggests that disliked species may be just as strong a motivator as strongly preferred species. Future research should explicitly examine the role of human preference in shaping bird populations at landscape scales.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/land10050487/s1>, Table S1: Species traits, Table S2: Results of G-tests comparing responses among ranks for each trait category, Table S3: Results of comparisons between proportions in rank 1 and each of every other rank for each significant trait category, Table S4: Results of a general linear mixed effects model of likeability in relation to species traits

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