

# Natural History in the City: Connecting People to the Ecology of their Plant and Animal Neighbors

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The world is becoming increasingly altered in ways that drastically affect habitat quality for wildlife (Seto et al. 2012). Moreover, the majority of people now live in urban and suburban areas (United Nations Population Fund 2007), so this is where primary interactions with nature and wildlife are occurring (Cook et al. 2012). Human society is also facing drastic losses of biodiversity and “extinction of nature experiences” in each generation (Dirzo et al. 2014, Soga and Gaston 2016).

Thus, the grand challenge for ecologists and conservationists is to understand how to share the places we live, work and play with biodiversity while simultaneously supporting the people who live there and inspiring them to care about nature as well. Programs that combine community science with natural history in urban areas can uncover new “stories” about local wildlife and provide valuable new ecological information and benefits for people, and inspire personal conservation action “at home.”

There are many opportunities to observe and interact with nature in cities, and often it is right in our own neighborhoods. From new species of leopard frogs in New York City (Feinberg et al. 2014), populations of endangered bumblebees in Minneapolis/St. Paul (e.g., Evans et al. 2019), rare plants in Sydney, Australia (Soanes et al. 2018), and even coyotes that steal newspapers off front porches in San Francisco (Heimbuch 2018), cities are filled with flora and fauna that can be experienced right in our yards without venturing into wilderness.

Yet, the ecological relationships of urban wildlife are surprisingly understudied. To borrow from Callaghan et al. (2018), I encourage ecologists and naturalists to embrace the “unnatural history” of urban areas to

uncover the new and updated stories of how plants and animals are adapting and reacting to a human-dominated world. For example, recent studies of birds have revealed new diet choices, nesting habitats, opportunistic behaviors, and species interactions (Callaghan et al. 2018). By enlisting the help of students and community scientists who live in urban and suburban areas, present-day ecology is ripe for new discoveries about common species that will advance both science and society’s ability to conserve biodiversity in novel environments.

Interacting with urban nature is also important for inspiring and enhancing the lives of people as well. The easiest and most accessible place for people to connect with nature is where they live (Cook et al. 2018). For example, as a child, I grew up in a city where I experienced nature not in any national park or wilderness area but in my own backyard. There, I learned about plants and animals that I could relate to because they lived in the same place as me.

Undoubtedly, that experience and accessibility is part of the passion that drove me to a career in ecology today. Recognizing the importance of access to nature and encouraging natural history observation in urban spaces is critical for reducing the gap of inclusivity in ecology, conservation, nature-based activities, and STEM education (Dunn et al. 2006). Moreover, access and interactions with nature can improve well-being, psychological/physical health, and quality of life, which may be disproportionately low in some urban and underrepresented communities (Miller 2005). By encouraging natural history observation as a means to connect with the natural world, the public may also be more likely to also engage in pro-environmental behaviors as well (Scannell and Gifford 2010, Byerly et al. 2018).

It is important to note that the value of natural history for community-based conservation is not a new idea; it is borrowed from indigenous knowledge, which has long recognized the importance for observing and appreciating nature. For native cultures, giving a living thing a name and story creates a sense of familiarity that encourages intimacy and ultimately empathy (Kimmerer 2003).

It may come as no surprise to hear that empathy is also essential to conservation, because if the public is not inspired to care, how can they be encouraged to do something? It behooves us to learn from the wisdom of indigenous people whose land we occupy and ensure that the names and stories of living things are not restricted to universities and journal articles but are shared with a wider community of people.

Community science (also called “citizen science”) is an ideal opportunity to use natural history to learn about urban biodiversity and encourage the public to intimately engage with the natural world (Bonney et al. 2009, Hansen et al. 2018). This became apparent during my dissertation research when I worked on a project called *Neighborhood Nestwatch* (Marra and Reitsma 2001, Evans et al. 2005, <https://neighborhoodnestwatch.weebly.com/>): a community science program administered through the Smithsonian Migratory Bird Center in Washington D.C.

Through *Neighborhood Nestwatch*, Smithsonian scientists collect data about birds in urban and suburban residential yards with the help of participating householders who also monitor birds on their own properties. This project simultaneously provides an opportunity for householders to learn about ecology and experience the process of science as well (Evans et al. 2005).

During my research, I asked two related questions with separate implications. First, an ecological question: “how do nonnative plants affect food webs?” And

second, a practical question for the householders themselves: “How should I garden if I want to create bird habitat?”

To answer these questions, I investigated the story of the Carolina Chickadee (*Poecile carolinensis*), a primarily insectivorous songbird that readily uses urban and suburban areas and is surprisingly understudied. Importantly, they are also charismatic, recognizable, and widely appreciated by the public. Anyone who has given a holiday card or shopped for winter season decorations has probably come across an image of a chickadee. Its widespread familiarity makes it a fantastic ambassador for wildlife, and its specialized diet makes it a great indicator species for the effects of nonnative plants on insectivorous birds.

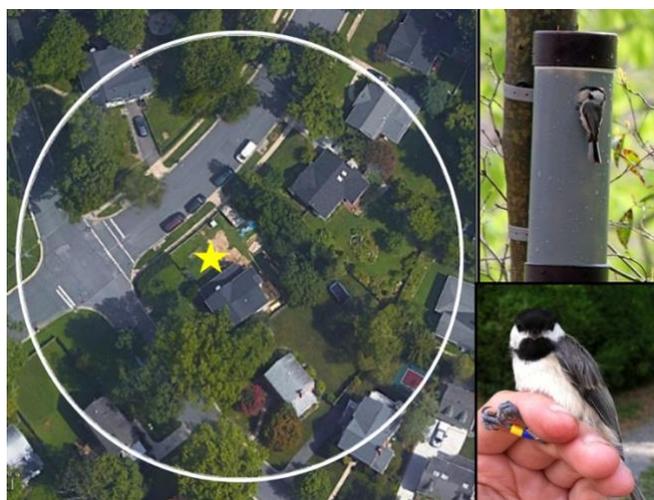


Figure 1. Clockwise from top left: example residential neighborhood study site; Carolina chickadee nest building in a nest box; color-banded chickadee.

Using this spritely bird, participants could observe “their chickadees” to learn about complex ecological concepts and evaluate how their decisions affect ecological restoration on privately-managed land. Field coordinators of *Neighborhood Nestwatch* set up nest boxes in yards and color-banded birds so unique individuals could be identified and followed (Figure 1). We asked participants to monitor their nest boxes for breeding activity and re-sight individuals using

their yard while I and a team of interns collected additional data. In this way, we gave names to individual chickadees and asked our participants to monitor their stories in real time.

With the help of our participants, we learned about which plants are important for insectivorous birds. In general, we found that when native plants make up the majority of plant biomass in a neighborhood, chickadees have more insect food to eat, they are more likely to nest, and the birds in these neighborhoods produce more young each year (Narango et al. 2018). We were then able to use data that our participants helped collect to give an explicit recommendation that householders and land stewards can use in their management and restoration.

By following individual chickadees, we also learned which native plant species chickadees preferred to forage on (Narango et al. 2017). Using these data, we made maps to illustrate that it really “takes a village” to raise a nest of chickadees and that specific plants could be strategically selected to improve bird habitat (Narango et al. 2017).

During the study, we also documented 51 different species of migratory birds using residential yards on their journeys north (Narango, unpublished data). Most of these species – primarily warblers, vireos, tanagers and thrushes – are not considered “backyard birds” and are typically unknown to the average homeowner.

By engaging in our project, participants learned the name and stories of these transient species and were encouraged to think about the role their yard could play in the full-annual cycle of birds, even if only for a few days out the year. Several participants shared that it was “eye-opening” to learn that a Swainson’s Thrush (*Catharus ustulatus*) that spent the winter in the Amazon rainforest was depending on the trees in their yard in order to make a successful migration to the Boreal forest of Canada to breed.

These conversations opened up new opportunities to talk about how everyone can participate in conservation action in their everyday lives, for example, by purchasing coffee and chocolate grown using sustainable Bird-friendly© agriculture practices (Smithsonian Migratory Bird Center 2019).

This research also shared the stories of caterpillars and other urban arthropods that live in these yards. We invited participants to join us during our arthropod sampling so that we could introduce them to the diversity of amazing species that are overlooked and underappreciated. Insects provide ecosystem services that are globally important ecologically, economically, and agriculturally (Losey

and Vaughan 2006), yet they often invoke gut reactions of fear, disgust, or apathy (Shipley and Bixler 2017).

For caterpillars, many participants were aware that monarch butterflies specialize on milkweed plants, but they were surprised to learn that *most* caterpillars are specialist feeders on one or a few plants (Foriester et al. 2015) and that planting host plants, in addition to nectar flowers, could positively affect butterfly and moth populations (Tallamy 2007). Participants were also surprised to learn that insects were critical for the development of baby songbirds (Martin 1987) and that plants included in gardens can be beautiful, colorful “bird feeders.” Using chickadees as a surrogate, we encouraged participants to better understand and appreciate the importance of conserving the “little things that run the world” (Wilson 1987).

Finally, this research shared the story of a scientist. Because we were following the chickadees around their

territories, we had the opportunity to meet many inquisitive neighbors. This opened up many spontaneous opportunities to share the project and the plants and animals we were studying. It also gave me an opportunity to share who I am, how I came to be a scientist and what a career in ecology is like.

For many people, I was told that this was their first chance to meet a scientist in person and that learning about our research changed the way they thought about their yard. Having these opportunities to interact with ecologists is critical for improving the public’s relationship with the natural world, as well as trust in science in general (Hansen et al. 2018).

After the conclusion of this study, the feedback I received from participants confirmed that they found the experience to be both enjoyable and informative.

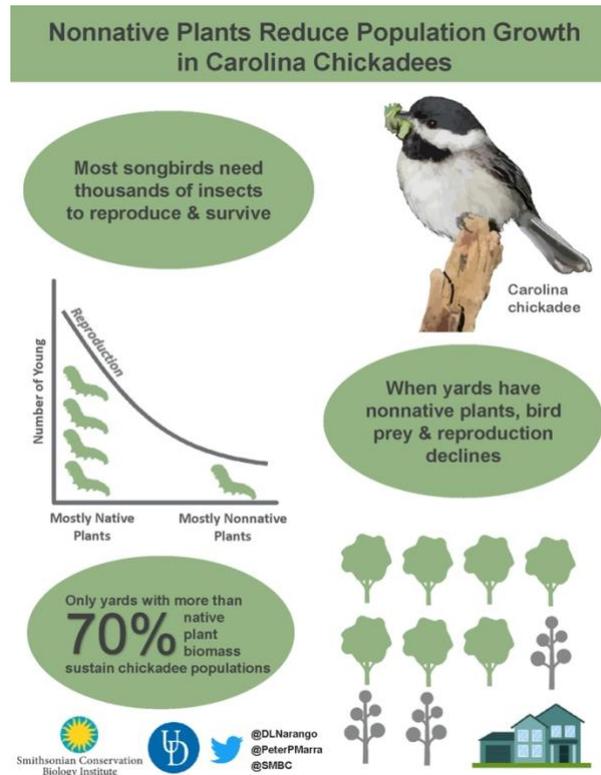


Figure 2. An infographic designed to share the results of our published study (Narango et al. 2018) with participants and on social media.

Participants were very excited to learn about the results from this project, which we shared in summaries and infographics after publication (Figure 2). Much of the informal feedback we received indicated that participants were considering birds, and the specific results of our study, in future landscaping decisions (e.g., planting native plants, keeping cats inside). The majority of the participants continue to be involved with *Neighborhood Nestwatch* by helping to collect long-term data collection for the project.

This continued, active interaction between participants, Smithsonian scientists, and involved peers provides encouragement for lasting engagement in natural history and stewardship behaviors (Byerly et al. 2018). There also appears to be a wide interest in more active, “hands-on” ecological projects like these. From the media exposure we received for this project, I regularly receive emails from around the country of people who are looking for similar opportunities or are hoping we could start a research hub in their hometown.

In the end, my project uncovered results that provided a clear answer to my ecological question: nonnative plants used in landscaping negatively impact habitat quality for birds. In addition, I used natural history observations to demonstrate that yards matter and that simple choices made in everyday landscaping can have far reaching implications for ecological interactions.

A community science project that invites householders to engage with the process of science – where the complex nature of food webs was distilled down to an easy-to-recognize story with names for the characters – can be used as a means to help people evaluate and appreciate their “backyard habitat.” With more programs like these that combine natural history, urban/suburban ecology, and community science, these stories can encourage people to care enough to do something about conserving biodiversity at home.

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