

URBAN COMMUNITIES, THRIVING ECOSYSTEMS

A Story About Connecting Urban Biodiversity



TOGETHER
BAY AREA

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TOGETHER Bay Area is a coalition working for climate resilience and equity. Our member organizations collaborate across our 10-county region for a just and equitable society where we live in relationship with the land that sustains us now and will sustain future generations.

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1442A Walnut Street, #421, Berkeley, CA 94709

www.TogetherBayArea.org

Cover photo credits: Together Bay Area (aerial view), Merav Vonshak (hummingbird), YES! Nature to Neighborhoods (3 community scientists), Rebecca Johnson (urban waterway), Rebecca Johnson (community scientists on trail), Taylor Ellis (California buckeye), Michael Warner (wavy-leaf soap plant).



LAND ACKNOWLEDGEMENT

Every inch of land is Indigenous land.

For millennia, Native Americans have lived in harmony with these lands that are now known as the San Francisco Bay Area. We recognize the impact that the arrival of and colonization by the Spanish, Mexicans, and Americans have had on the lands and Native peoples. We respect Native peoples living here today, their ancestors both past and future, and their connection to the land. And we are honored to be in relationship with local Native American Tribes and Native-led organizations to go beyond land acknowledgements for healthy lands and communities.

Learn about what TOGETHER Bay Area is doing to [go beyond land acknowledgements](#).

AN INVITATION TO CONNECT

Dear Reader,

On November 7, 2019, over 100 people gathered at the Gordon and Betty Moore Foundation in Palo Alto for an event to announce the second version of the Conservation Lands Network (CLN). The CLN is a regional strategy that sets goals, tracks progress, provides tools, and catalyzes on-the-ground land conservation in the San Francisco Bay Area. The CLN 2.0 included a map of the Bay Area that highlighted in bright colors the lands that are essential and important for conservation and those that are already conserved. The map created a vibrant, visual representation of conservation opportunity and value. But not all Bay Area lands were included: Urban areas had been grayed out. In the dominant paradigm in conservation planning at the time, urban areas were considered to have little to no conservation value. In terms of conservation planning, urban spaces were literally left off the map.

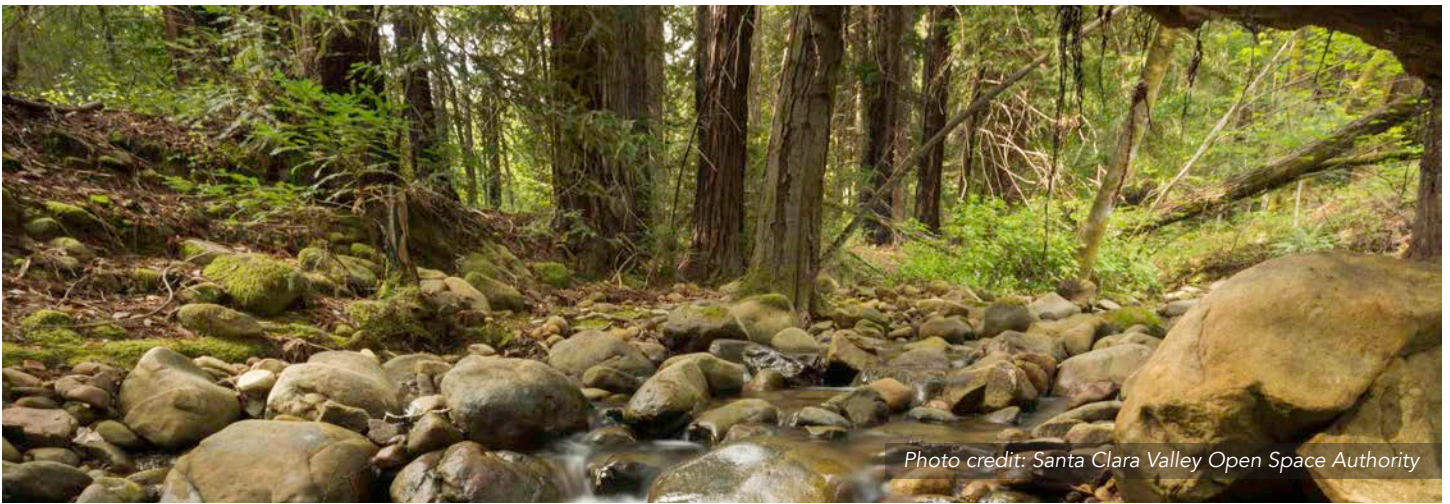
At the reception that day, Dr. Rebecca Johnson asked: Could community science illuminate the value of urban areas for biodiversity conservation?

A month later, Rebecca and her colleague Alison Young at the California Academy of Sciences began exploring the idea for a collaboration with Tom Robinson and Annie Burke of TOGETHER Bay Area. Rebecca and Alison had worked for years to mobilize people across the region to collect biodiversity data using iNaturalist where they live—in cities, suburbs, along the bay, and across the ridgelines. They saw with their own eyes and in millions of species observations a rich tapestry of flora and fauna living in the grayed out areas of the CLN 2.0 map.

At this same time, Annie and Tom, along with many others, were in the process of building TOGETHER Bay Area on a foundation of principles that were different from the dominant conservation planning paradigm. TOGETHER's principles include an appreciation that human beings are a part of nature, not apart from it. We need to live in relationship with the lands that sustain us. And all lands — urban, rural, natural, and working — need to be stewarded and cared for. Street trees have value just as the old-growth redwood forests do.

With support and encouragement from Moira McEnespy at the State Coastal Conservancy, we developed a plan to connect concepts, communities, and datasets that had not been explicitly connected before in the Bay Area. We wanted to know: How might community science from the grayed-out areas on the CLN 2.0 map change the story we tell, shift on-the-ground conservation efforts, and reimagine the region's conservation priorities?

The Connecting Urban Biodiversity project was born. In a partnership between TOGETHER Bay Area and the California Academy of Sciences, between 2021–2024, the project explored how we can better integrate urban areas into regional conservation planning and action. The project demonstrates how people living in urban areas, particularly in underserved communities*, can collect data in their own neighborhoods that informs



conservation science and modeling. Such information, in turn, can feed into decision-making processes at municipalities and public agencies responsible for the state and condition of urban greenspaces and urban forests. By doing so, we can create a positive cycle of community engagement, science, and on-the-ground action that benefits both people and the biodiversity of nature in our urban landscapes.

Over the years, more people joined the project team. We welcomed the skills and experiences that Dr. Gio Rapacciuolo, Olivia VanDamme, Laura Rosenthal, and Dr. Avery Hill brought to this exploratory endeavor. We met regularly, challenged each others' thinking, discussed ideas, and learned a lot at the strategic and tactical levels. We also learned a lot about ourselves and about each other.

We invite you to learn about the Connecting Urban Biodiversity project by exploring the following pages. We invite you to bring your curiosity and an open mind. And we invite you to connect with us. What questions did this report raise for you? What ideas did it spark? We would love to hear from you. Send us an email at community@togetherbayarea.org.

We are grateful for everyone who contributed to this project. And we look forward to the ongoing opportunities for learning, connecting, and collaborating in support of flora, fauna, and folks wherever they may live.

The Connecting Urban Biodiversity team:

- Annie Burke (she/her), TOGETHER Bay Area
- Dr. Avery Hill (he/they), California Academy of Sciences
- Dr. Rebecca Johnson (she/her), California Academy of Sciences
- Tom Robinson (he/his), TOGETHER Bay Area
- Laura Rosenthal (she/her), TOGETHER Bay Area
- Olivia VanDamme (she/her), California Academy of Sciences
- Alison Young (she/her), California Academy of Sciences

**A note about community definitions: Funding for this project, provided by the State Coastal Conservancy, came from Proposition 68, which uses the Severely Disadvantaged Communities definition. A severely disadvantaged community is defined as a community with a median household income less than 60 percent of the statewide average (PRC § 80002[n]). For the purpose of this report, we choose to use the term underserved communities to accurately reflect that the deficits are in the system, not the community itself.*

BACKGROUND

Given the increasingly dire and interrelated impacts of the climate crisis, the biodiversity crisis, and systemic social inequities and injustices, it no longer serves us to think and act within the historical silos we have operated within to date. Climate change affects all species and all people – those living in rural, urban, natural, and working lands – with a disproportionate impact on systemically oppressed communities, particularly people of color. This is a project that integrates and incorporates multiple approaches to work across urban-rural lines, disciplines, jurisdictions, and scientific frameworks in order to design tangible solutions to the threats our region faces today.

Urban Nature

The biodiversity of urban centers is increasingly becoming recognized as a rich and valuable resource for addressing the climate and biodiversity crises and strengthening environmental conservation efforts where people live. Urban areas are not devoid of nature but are integral parts of our regional ecosystem. This is especially true in the Bay Area, where urban areas encircle much of the bay, forming critical connection points between baylands and uplands and serving as vital corridors for wildlife.

Traditionally, conservation planning has directed priorities away from human development. However, this approach misses important habitats within urban areas that support some species populations and maintain connectivity between larger

natural areas. It also overlooks the green spaces within urban areas where humans live and benefit from nature daily. Many of the same species targeted for conservation in exurban areas also use urban areas for their survival. And some species have evolved to live solely within environments where our cities are located.

A long-standing challenge in conservation planning within urban areas has been the lack of biodiversity data and the species distribution models built on these data, both of which are needed to support the prioritization of cities and metro areas for biodiversity conservation. Community science conducted within urban environments is changing that. It provides information about habitats and species health in urban areas that can inform conservation planning.

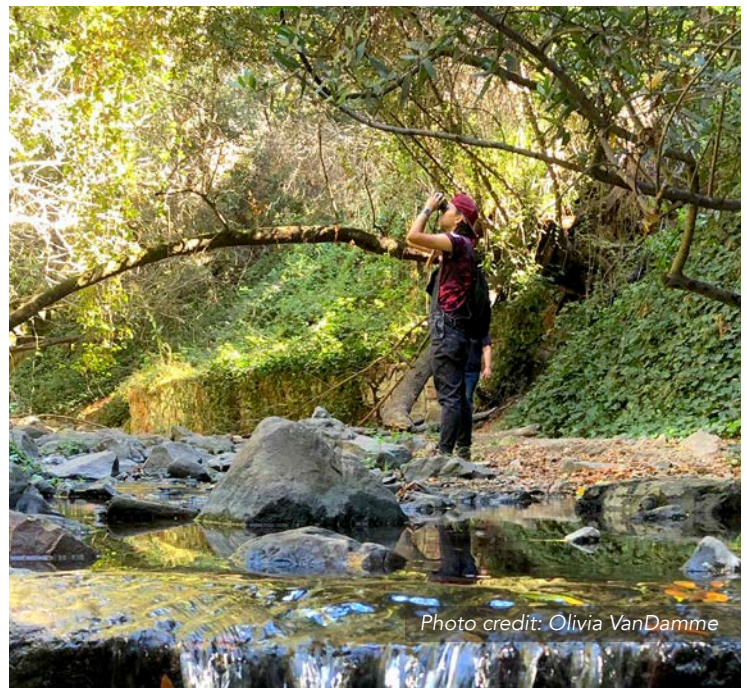


Photo credit: Olivia VanDamme

Traditional conservation paradigms are evolving to address inequities in how the benefits of urban nature are distributed across the urban landscape. As Max Lambert and Christopher Schell highlight in their book, *Urban Biodiversity and Equity: Justice-Centered Conservation in Cities*, justice-centered approaches recognize that urban biodiversity conservation must include not only ecological priorities but also social equity. The paradigm is shifting to ensure all communities have access to the benefits of nature and are active participants in shaping conservation strategies. Activities like bioblitzes — communal efforts to record as many species as possible within a designated location and time period — not only collect valuable data but also deepen participants' understanding of the biodiversity in their communities, serving as a bridge that connects residents to their local environment and each other.

This work also aligns with emerging research on the interconnectedness of strong social communities and healthy lands. As Dr. Vivek Murthy, the U.S. Surgeon General, points out in his book, *Together: The Healing Power of Human Connection in a Sometimes Lonely World*, social connection is a fundamental human need and an area of modern life that has seen a decline in recent years. Our physical environments, and natural environments in particular, play a crucial role in fostering stronger connections with each other and with the natural world. Urban forests, parks, shorelines, beaches, and yards provide opportunities for connection to place, community gathering, shared experiences in nature, and collaborative conservation efforts — all of which contribute to both social and ecological health.

Regional Conservation Goals

Since 2005, the Bay Area land conservation community has collaborated for biodiversity conservation through a project called the Conservation Lands Network (CLN). The CLN is a regional strategy that sets goals, tracks progress, provides tools, and catalyzes on-the-ground land conservation in the San Francisco Bay Area. The CLN articulates two types of science-based and community-driven goals: a set of five overarching regional conservation goals and a much larger set of habitat-specific goals. To facilitate the conservation community's ability to achieve the goals, the CLN project provides and regularly updates online tools that support strategic investments in land protection and stewardship. These tools aim to focus conservation in areas that represent the region's biodiversity and support ecological function across the nearly 5 million acres that comprise the 10 Bay Area counties (Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, Santa Cruz, San Mateo, and San Francisco).

Launched in 2006 by the Bay Area Open Space Council, the CLN project is currently facilitated by TOGETHER Bay Area and driven by the large and diverse CLN community of practitioners, scientists, researchers, consultants, and experts. Members of the CLN community share expertise, offer thought leadership, and provide peer review input and feedback on the CLN's tools. All of this is done on a voluntary basis and clearly demonstrates the broader conservation community's commitment



Photo credit: Santa Clara Valley Open Space Authority

to regional coordination. In addition to the active CLN community, there are hundreds of CLN users who download reports from the CLN Explorer, access the GIS database, integrate the CLN into their planning processes, incorporate the CLN into their articles and papers, and reference the CLN in grant applications.

The first version of the CLN, a ground-breaking effort for a region of the Bay Area's size and complexity, was released in 2011. The people who contributed to CLN 1.0 created a culture of strategic conservation planning in the Bay Area, and this sparked the creation of county-level conservation plans in Napa and Santa Cruz counties. Three years later, in 2014, the CLN 1.0 Progress Report was released to help the region track its progress towards the habitat goals set in 2011. It laid out new ways to evaluate conservation actions at a regional level, focusing on people and the vital roles of land stewardship and public access. Then, in 2019, the CLN 2.0 was released, reflecting new and updated data and incorporating the importance of habitat connectivity for wildlife movement and climate resilience. It was in version 2.0 that the CLN community set the goal for conserving 50% of the Bay Area's 5 million acres by 2050. Progress towards the regional goals was measured and described in the CLN 2.0 Progress Report, which was published in December 2024.

The CLN has a broad reach. Local land conservation organizations and land use agencies use it to identify areas essential for the Bay Area's biodiversity to thrive into the future and also to communicate the regional significance of their on-the-ground projects to the public, government officials, and funders. One example is the common practice of including a CLN Conservation Portfolio Report (a self-serve custom report function at www.bayarealands.org) in funding proposals to the SF Bay-specific programs of both the State Coastal Conservancy and the Gordon and Betty Moore Foundation. Another example is its use in regional infrastructure and land use planning. Regional entities such as the Metropolitan Transportation Commission, the Bay Area's regional housing and transportation planning agency, utilize the CLN to identify areas that should be protected from significant urban growth. At a broader level, the CLN serves as a model for strategic regional coordination which supports California's goal to conserve 30% of the State's lands and coastal waters by 2030.

Two characteristics of the CLN are important to highlight that, until recently, have reflected the dominant approach to biodiversity conservation planning. First, the CLN currently directs priorities away from urban areas with the exception of urban streams (see the next section). This decision reflects the longstanding notion in conservation biology that more human activity and infrastructure means less suitability for native plants and animals. Second, the CLN relies solely on observations submitted by professional biologists for its land prioritization mapping. Professional biologists — who are trained in species surveying and proper handling — are critical to understanding species' occurrences, distributions, and population health. This is especially true for sensitive, threatened, or endangered species. At the same time, mobile applications that allow any user to record and share observations of species, and have the accuracy of those observations “crowdsourced” by an active community of enthusiasts, are greatly expanding our ability to understand species distributions, and have profound implications for regional conservation planning.

Baylands to Uplands

The ecological connection between Baylands and Uplands in the San Francisco Bay Area is critical for fostering biodiversity, enhancing climate resilience, and addressing socio-ecological inequities. Historically, regional conservation assessments have often overlooked urban areas, yet these areas surrounding the Bay provide unique — and often the only — opportunities to connect Baylands and Upland ecosystems. Urban streams are the only components in the current Conservation Lands Network (CLN) that extend conservation priorities into urban environments. The CLN largely neglects the ecological value of urban forests, backyard habitats, parks, and waterfronts that link the baylands and to the uplands. The Connecting Urban Biodiversity project aims to fill critical data gaps and redefine the role of urban habitats in regional biodiversity strategies.

Commitment to Equity and Inclusion

TOGETHER Bay Area and the California Academy of Sciences are deeply committed to advancing equity and inclusion through their work. This partnership aims to integrate the principles of social equity into conservation by centering community voices, building authentic relationships, and ensuring that projects are co-designed with local input. Together, they strive to expand opportunities for underrepresented groups to participate in and benefit from environmental stewardship, fostering a sense of shared responsibility and ownership in conservation initiatives. This commitment reflects a broader understanding that inclusive conservation is not only an ethical imperative but also a practical necessity for achieving long-term ecological resilience. It recognizes the strengths and unique cultural, social, and ecological assets these communities bring to conservation efforts. By centering their experiences and expertise, we affirm communities as co-creators of solutions, fostering equitable access to nature and ensuring that conservation strategies are relevant, effective, and sustainable.

An Opportunity

As communities and conservationists deepen their understanding of urban ecosystems, the need to protect and preserve urban biodiversity through smart land-use planning comes into greater focus. Urban greening strategies that introduce natural features and vegetation into urban areas to create healthy, sustainable, and active public spaces are increasingly recognized as critical to supporting biodiversity conservation, climate hazard mitigation, and human health. Efforts to conserve and steward nature-filled open spaces in urban areas ensure habitat protection for various species while also improving air quality, reducing urban heat island effects, and enhancing mental and physical wellbeing for human residents. These efforts recognize that healthy ecosystems in urban areas are not just beneficial for wildlife but are essential for creating resilient, livable cities in the face of climate change.

At the same time, how might an understanding of environmental racism and environmental justice reshape our approach to urban greening? Many low-income Black and Latino neighborhoods, historically redlined and systematically excluded from investments in parks, trees, and green spaces, continue to face environmental inequities. What can we learn from the past — about where trees, parks, and watersheds were planted, constructed, and conserved — that could guide us toward more equitable investments? By asking these questions and exploring the systemic exclusions of the past, we can open new pathways for creating urban spaces that reflect the needs and strengths of all communities, ensuring they benefit equitably from conservation and greening efforts.

We invite you to join us as we explore how community science, regional conservation planning, and local decision-making can work together to create more biodiverse, resilient, and equitable urban environments. We explore how the observations made by community members in their neighborhoods can inform larger conservation strategies, and how this participatory approach to science can strengthen the bonds between people and the nature that surrounds them every day. And we explore the paradigm shift that acknowledges the nature in cities and emphasizes its conservation.

“ There is growing evidence that cities not only harbor a significant fraction of the world’s biodiversity, but that they can also be made more livable and resilient for people, plants, and animals through nature-friendly urban design. ”

~ *Making Nature’s City:*
A science-based framework for building
urban biodiversity. San Francisco
Estuary Institute, 2019.

PROJECT DESCRIPTION

The primary goal of the Connecting Urban Biodiversity project was to increase the capacity of the Bay Area conservation community to acquire, conserve, and steward natural areas within urban centers, in collaboration and partnership with underserved communities in order to realize maximum benefit for those communities. To do this, the project:

- 1. Conducted an analysis to identify two urban creeks in the Bay Area** where there are: a) severely disadvantaged communities*, b) opportunities for protection and stewardship of parks and natural areas, and c) data gaps in the Conservation Lands Network (CLN) and iNaturalist.
- 2. Co-designed and convened two bioblitz events** — one at each urban creek identified in the first step above — in partnership with community-based organizations and land conservation organizations.
- 3. Shared the outcomes and outputs from the analysis and bioblitzes** on the CLN's website (bayarealands.org), in the creation of a Storymap, through social media outreach, a webinar, and authoring this report.

The Connecting Urban Biodiversity project also addressed critical questions about effectively integrating urban areas into regional conservation planning and action. It highlighted a pathway for residents of urban neighborhoods who collect nature observations within their own communities to contribute to regional conservation science and modeling. This locally gathered information can influence decision-making by municipalities and public agencies responsible for managing urban greenspaces and urban forests. By fostering this cycle of community engagement, scientific data collection, and accessible conservation information tools, the project sought to benefit both urban biodiversity and the people living in the Bay Area.

This iterative and inclusive process brought together science, community priorities, and conservation planning, providing a replicable model for equitable and effective urban biodiversity conservation. And it provided the project team with many opportunities to learn.

Build Relationships

Rather than taking a transactional or extractive approach to the project, we prioritized relationships and aimed to honor people and the land. Our intention was to move at the speed of trust and build partnerships based on reciprocity. Throughout this project, we intentionally centered relationships with the land, community partners, the CLN community, and conservation organizations.

**A note about community definitions: Funding for this project, provided by the State Coastal Conservancy, came from Proposition 68, which uses the Severely Disadvantaged Communities definition. A severely disadvantaged community is defined as a community with a median household income less than 60 percent of the statewide average (PRC § 80002[n]). For the purpose of this report, we choose to use the term underserved communities to accurately reflect that the deficits are in the system, not the community itself.*

The Land

The land itself played a critical role in this project. We spent time observing the plants and the animals, listening to the sounds of the creeks, feeling the wind on our skin, and feeling the simple yet profound connection to place. We gathered at Alvarado Park next to Wildcat Canyon Regional Park in Richmond for the first bioblitz event on February 25, 2023. Oak and eucalyptus trees towered overhead and Wildcat Creek flowed vigorously nearby. For the second bioblitz event, we gathered at Dimond Park in Oakland on September 7, 2024. The park hummed with human activity: folks playing basketball, young children taking swim lessons, and elders chatting and laughing as they strolled along the paved paths. Sausal Creek, which starts in the Oakland Hills and ends in the Oakland Estuary, quietly flowed downhill in the dry landscape of late summer.

These two locations were strategically selected to incorporate the different goals of the project. We looked for places that included all of the following criteria:

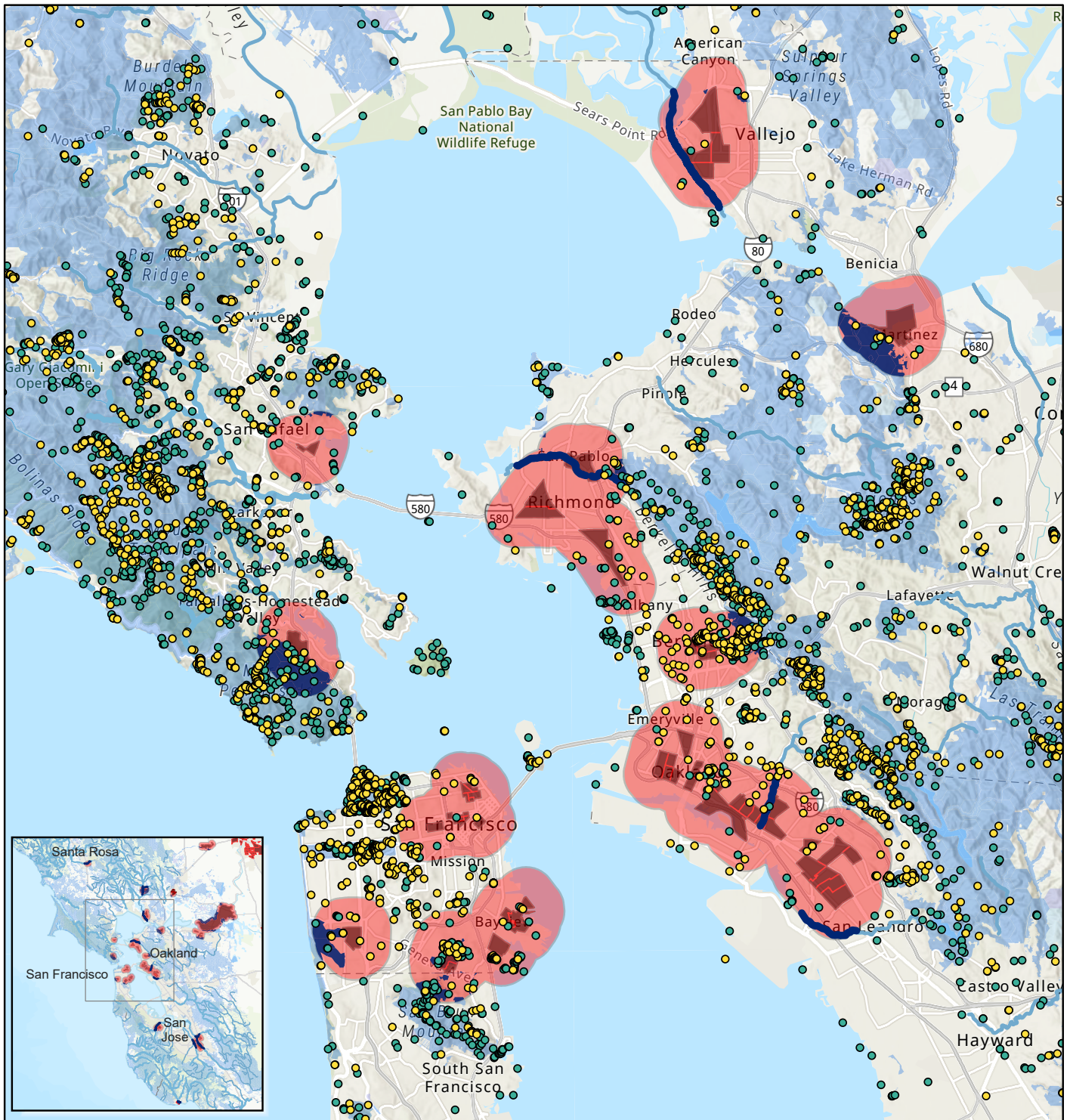
- Severely disadvantaged communities as defined in Proposition 68
- CLN priority areas and streams as identified in CLN 2.0
- Existing occurrences of CLN conservation target species in iNaturalist

We used a GIS overlay analysis to map areas that met all three criteria. The analysis showed 16 potential sites throughout the Bay Area (Figure 1).



Photo credit: Salted Roots

Figure 1. Co-location of underserved communities and Conservation Lands Network priority areas.



Underserved Communities, iNaturalist, & the Conservation Lands Network

Community Economic Status (Proposition 84 Definition)

- Severely Disadvantaged Community (SDAC)
- Within 1 mile of Severely Disadvantaged Comm.

Conservation Lands Network 2.0 Priorities within Severely Disadvantaged Community

- Priority Stream (48 miles within 1 mile of SDACs)
- Priority Lands (i.e., part of the Network) (20,000 acres within 1 mile of SDACs)

Other CLN 2.0 Priorities

Streams

- Rank 1
- Rank 2

Lands

- Essential
- Important

iNaturalist Occurrences (a sampling)

- Amphibia
- Reptilia

As noted earlier, the CLN 2.0 lacks a good understanding of biodiversity across urban habitats and underserved communities and, therefore, of the importance of these areas for biodiversity conservation. This gap can be filled by leveraging the growing body of volunteer-contributed biodiversity information shared on iNaturalist stemming from community science efforts. Many local community science campaigns have long focused on documenting nature across urban areas, including the City Nature Challenge. The ultimate goal for this task is to identify the importance of urban areas for biodiversity conservation and the role of disadvantaged communities in identifying conservation and stewardship priorities for their own neighborhoods.

Once we narrowed down the general location through the criteria above, we identified potential community-based organizations to partner with. We initiated conversations with potential partners and then engaged in a collaborative process to select the exact location for a bioblitz that would be meaningful to the community members.

Community Partners

Collaboration with community-based organizations was a cornerstone of this project. It enabled us to foster authentic community participation by incorporating local priorities and local expertise into the design and execution of activities. One step toward making conservation efforts more inclusive was partnering with community-based organizations to co-create events and activities and ground our community science in community trust and engagement. We wanted to do this intentionally and with a lot of care.

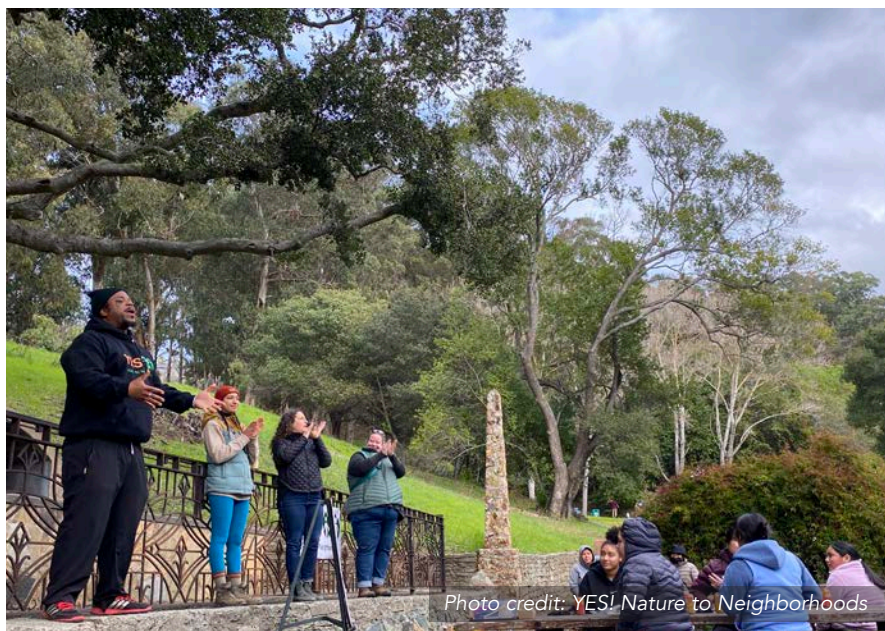
Before approaching a community-based organization, the project team considered the following criteria for a potential partner:

- A nonprofit organization
- Working with a severely disadvantaged community.
- Had a connection to a community located near or in the overlap area of a CLN priority stream
- Had established and active engagement with community members

And we established these principles to guide our partnership:

- Relationships are more important than transactions
- Listen deeply
- Embrace a multi-benefit, multi-dimensional approach
- Commit to equity and inclusion
- Recognize that conservation done in solidarity is critical
- Ability to move up, move back
- Be humble
- Be honesty

The relationships built with community-based organizations were a highlight of the project for the project team. We intentionally built relationships with trust, shared learning, and mutual respect. Over the course of months or even years, we built relationships with YES! Nature to Neighborhoods, Salted Roots, and



Friends of Sausal Creek (FOSC). Clear and frequent communication, coupled with intentional time for trust-building, laid the foundation for success — our initial meeting with YES! occurred over a year before the bioblitz. We established shared roles and responsibilities to reduce administrative burdens, co-created events by adapting the Academy's bioblitz format with partner feedback, and incorporated youth leaders to help lead small groups.

Partners were compensated with stipends for their time and expertise, and we provided food to foster a sense of care and community. The Academy honored partners' lived experiences and deep knowledge of their communities, ensuring meetings were well-documented and inclusive. Pre- and post-event sessions supported reflection and improvement, while all engagement was framed as invitations, welcoming questions and input. These partnerships exemplified authentic collaboration, creating impactful events and strengthening relationships that elevated both community and conservation outcomes.

Even though we built meaningful partnerships in Oakland and Richmond, we experienced challenges in other areas. For example, when considering the location and community partners for the second bioblitz, we were excited by the prospect of working in Solano County. We contacted TOGETHER Bay Area members in Solano County to inquire about community-based organizations that could potentially partner with us on the project. Yet, through a series of conversations, we were unable to identify a community-based organization that had the mission or capacity to engage with us during the timeline of this project. This highlighted how critical organizational capacity is for building partnerships. It also demonstrated the value of leveraging social networks and building on existing partnerships if we are to ensure that a project like this can have an impact on regional resilience across all 10 Bay Area counties.

CLN Urban Biodiversity Focus Team

Critical to the CLN project are the more than 100 biologists, botanists, and ecologists who contributed their knowledge about the distributions and health of Bay Area's flora and fauna in the development of CLN 2.0 in 2016-2019. Their contributions shaped the regional and habitat-specific goals. The accuracy and credibility of the CLN's goals, tools, and deliverables — including the selection of priority streams that were critical for the Connecting Urban Biodiversity project — depend on these individuals' contributions.

For this project, we convened a focus team of CLN advisors and urban ecologists (see below) to help the project team think through how we might begin to adapt the CLN to urban areas. Through an online survey and two remote meetings, the focus team helped us identify a set of 24 suitable urban-dwelling native species (see page 20).

CLN Urban Biodiversity Focus Team

- Alison Young: Co-Director, Community Science at the California Academy of Sciences.
- Rebecca Johnson, PhD: Co-Director, Community Science at the California Academy of Sciences.
- Olivia VanDamme: Community Science Coordinator at the California Academy of Sciences.
- Avery Hill, PhD: Scientist, Community Science at the California Academy of Sciences.
- Lew Stringer: Associate Director of Natural Resources at Presidio Trust.
- Stu Weiss, PhD: Chief Scientist at Creekside Center for Earth Observation.
- Morgan Gray, PhD: Conservation Analyst at Pepperwood Preserve
- Bill Merkle: Wildlife Ecologist at the Golden Gate National Recreation Area.
- Karen Swaim: Principal Biologist at Swaim Biological, Inc.
- Steve Rottenborn, PhD: Senior Wildlife Ecologist at H. T. Harvey & Associates.
- Esther Marika Cole Adelsheim, PhD: Conservation Program Manager, Stanford University.
- Eric Smith: Senior Biologist/GIS Specialist at Vollmar Natural Lands Consulting.
- Leslie Koenig: Senior Biologist at Swaim Biological, Inc.
- Yiwei Wang, PhD: former Executive Director at the San Francisco Bay Bird Observatory.
- Erica Spotswood, PhD: Lead Scientist at the San Francisco Estuary Institute.
- Robin Grossinger: Senior Scientist at the San Francisco Estuary Institute.

Conservation Organizations and Municipalities

With this project, we hoped to catalyze on-the-ground conservation, restoration, and stewardship of Bay Area lands in urban settings. To that end, we planned to engage local conservation organizations and agencies that could potentially acquire, manage, and steward land at the locations we focused on. We hoped to learn from them about their goals and master plans, and refine the project's understanding of the need for an integrated approach to urban conservation.

While also building relationships with community based organizations, we initiated conversations with colleagues at the East Bay Regional Park District and the City of Oakland to discuss the project with them. While they were interested in the project's goals and activities, and eager to help, they were tracking urban management and conservation issues in different ways. The conversations were informative and interesting, and they highlighted a learning that municipalities should have been engaged in this project from the start. The conversations were interesting, but they did not turn into site-specific partnerships.

We are curious about why this happened and what we could have done differently. In particular, we wonder:

- What are effective ways of building multiple kinds of relationships across multiple seemingly siloed sectors?
- What are the areas of common ground between community organizations and conservation organizations, and how do we identify them while also honoring their differences?

These are questions that we will ask ourselves as we move forward into future projects.

Convene Bioblitz Events

Bioblitzes are events at which people gather, often in local parks and open spaces, to explore nature and make and share observations of the plants and animals living around them. Bioblitzes are inherently inclusive and can be structured in different ways to engage communities who have historically not been included in conservation efforts. Participants work together to identify and document as many different species as possible, which in turn builds community around local nature. Bioblitzes not only help land managers build a species list and atlas for the places they manage and provide invaluable data for research, the events also highlight for participants the incredible biodiversity found all around us and help them get to know their local area in a new way.

We worked in partnership with the community-based organizations to co-design the two bioblitzes in their communities. Working with community-based organizations allowed us to listen to the biodiversity and nature-related concerns of the community and design the bioblitzes to not only gather data needed for the CLN, but also to help inform potential local restoration and conservation projects. In order to respect each community's needs and culture, the project built upon the core bioblitz model and co-created events that met the project goals,

met community-based organization goals, and worked best for local communities to provide training and development opportunities for youth.

In this project, we developed relationships with three community-based organizations— [YES! Nature to Neighborhoods](#), [Salted Roots](#), and [Friends of Sausal Creek](#) — that engage urban communities in different parts of the East Bay — Richmond and Oakland. These organizations are leaders in connecting their respective communities to the natural spaces that surround them in order to build a greater sense of identity, community, and care for the environment and their place in it. They also embody the idea that access to nature is not only essential for physical and mental health but also a matter of equity, and fighting for more nature in urban areas ensures that all communities can experience these benefits.

These organizations each work with an underserved community that has a waterway running through it that connects the baylands and uplands (as categorized by the State of California as “Severely Disadvantaged Communities”) and connect baylands and uplands, making these creeks a priority focus for our work. We designed and developed the bioblitz events, together with our community partners, to engage each community in collecting biodiversity data in a local urban park they cared about, and providing opportunities for participants to share their knowledge and deepen their connections to these places and the species found within them. As part of the bioblitzes, we held pre-event iNaturalist trainings to make sure participants felt confident in making observations and knowing how the data they collected were going to be used, and post-event results discussions, where we talked about what we all found together, highlighted interesting observations, and went over reasons to continue using iNaturalist and documenting biodiversity in our everyday lives.

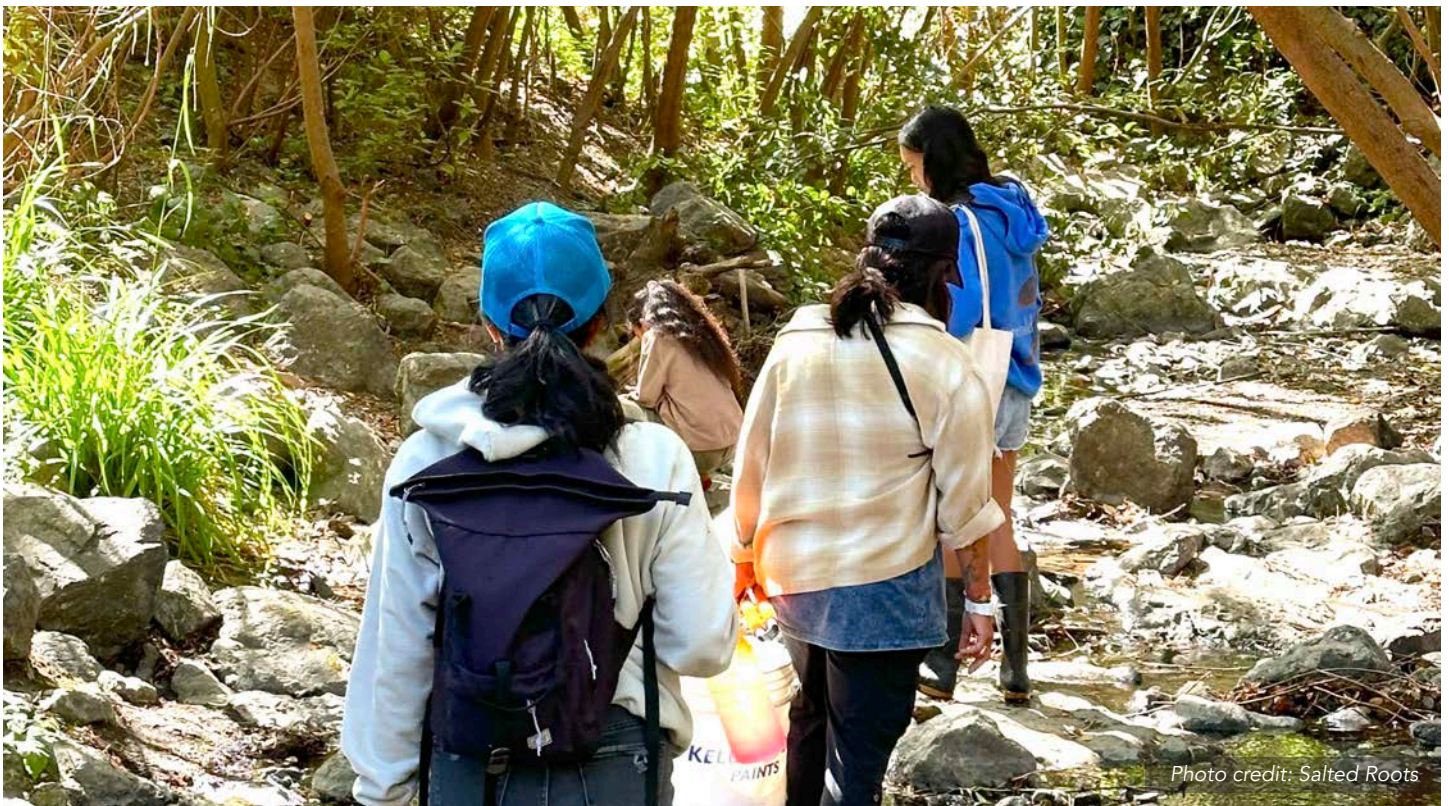


Photo credit: Salted Roots

YES! Nature to Neighborhoods Bioblitz on February 25th, 2023

- Goal: Engage youth leaders (Camp-to-Community Fellows)
- Location: Alvarado Park and Wildcat Creek in Richmond (a Conservation Lands Network Priority 1 stream)
- Over 40 participants, with 21 making 280 iNaturalist observations of 99 species
- February 24, 2023: pre-event iNaturalist training, hybrid on Zoom and at YES! Nature to Neighborhoods office with families, Camp-to-Community Fellows, and YES! staff
- March 29, 2023: post-event debrief on Zoom, data sharing and discussion with youth and families who participated in the bioblitzes



Salted Roots and Friends of Sausal Creek Bioblitz on September 7th, 2024



- Goal: Engage youth leaders (Rising Leaders Youth Program)
- Location: Dimond Park and Sausal Creek in Oakland (Conservation Lands Network Priority 1 stream)
- Over 40 participants, with 30 making 497 iNaturalist observations of 187 species
- Friends of Sausal Creek was a key partner in the planning and implementation of this bioblitz.
- September 5, 2024: pre-event iNaturalist training session at Salted Roots office and hybrid on Zoom in Oakland with the Rising Leaders Youth Program and Salted Roots staff
- September 21, 2024: post-events results session at California Academy of Sciences with the Rising Leaders Youth Program and Salted Roots staff

Efforts to document and conserve urban biodiversity present powerful opportunities for individuals and communities to take an active role in shaping the health and resilience of their neighborhoods as well as the wider regions that encompass them. They offer opportunities to build relationships with and between communities who have been historically and systemically excluded from conservation efforts, a first step in helping to right injustices and inequalities while addressing the pressing challenges of climate change and biodiversity loss. Such work can be both rewarding and joyful, fostering a sense of connection between people and the natural world that surrounds them, especially in the heart of our cities. Everyone deserves access to nature and thriving native species where they live. Moreover, urban spaces filled with native species are essential to mitigating the impacts of climate change, providing critical ecosystem services like carbon sequestration, cooling, and flood mitigation.

Identify Urban-Dwelling Native Species

Not all native species currently thrive in urban environments. But for species that do thrive, those habitats can serve as “sources” for species propagation in other, less stable habitats or “sinks.” Urban areas have historically been considered sinks for most native plant and animal species. However, for some species, urban areas act as sources, supporting species proliferation in rural environments and promoting the stabilization and flourishing of habitats across the extended ecosystem. This relatively recent understanding is bringing urban landscapes into more focus for conservation prioritization efforts.

In the development of CLN 2.0, the CLN community of biologists, botanists, and ecologists identified approximately 1,000 native plant and animal species of particular importance for conservation in the San Francisco Bay Area (see CLN 2.0 Report Appendix C). These “CLN conservation targets” are species that are either rare, are specialized, serve as indicators of ecological health of the region, or play an outsized role in key habitat types within the region. The conservation target species were selected through expert consultation and scientific analysis during the development of the CLN and its update (CLN 2.0).

For this project, the CLN Urban Biodiversity Focus Team drew from the larger conservation targets list and recommended species that likely utilize urban areas as sources of cover and food. From this shorter list of recommended species, we developed a set of 24 focal species or groups for this project (see page 21), taking into consideration the organisms that might be most easily documented through community science efforts.

Conservation Lands Network Conservation Target Genera chosen for this project:

Mammals

Coyote (*Canis latrans*)
North American river otter (*Lontra canadensis*)
Tree Squirrels (Genus *Sciurus*)

Birds

Acorn Woodpecker (*Melanerpes formicivorus*)
Black-crowned Night Heron (*Nycticorax nycticorax*)
California Quail (*Callipepla californica*)
California Scrub-jay (*Aphelocoma californica*)
Hummingbirds (Family *Trochilidae*)
Western Bluebird (*Sialia mexicana*)
White-crowned Sparrow (*Zonotrichia leucophrys*)

Reptiles

Garter Snakes (Genus *Thamnophis*)
Western Alligator Lizards (Genus *Elgaria*)
Western Pond Turtle (*Actinemys marmorata*)

Amphibians

Arboreal Salamander (*Aneides lugubris*)
Slender Salamanders (Genus *Batrachoseps*)

Invertebrates

Bumble Bees (Genus *Bombus*)
Shoulderband Snails (Genus *Helminthoglypta*)
Monarch Butterfly (*Danaus plexippus*)
Swallowtail Butterflies (Subfamily *Papilioninae*)

Plants

California Buckeye (*Aesculus californica*)
Milkweeds (Genus *Asclepias*)
Northern California Black Walnut (*Juglans hindsii*)
Oaks (Genus *Quercus*)
Wavy-leafed Soap Plant (*Chlorogalum pomeridianum*)



Bay Area Urban Species Search

In addition to the two focused place-based bioblitzes, we conducted the Bay Area Urban Species Search, a campaign to engage the entire Bay Area region in a large-scale, two-week search for the species on the Connecting Urban Biodiversity project focal list and document them using iNaturalist. The campaign – held March 17–31, 2023 – sought to encourage making observations specifically in urban areas, including backyards, local creeks, schoolyards, and neighborhoods. Marketing materials were distributed widely through social media to reach people throughout the Bay Area. This included promoting the Search to community-based organizations and to TOGETHER Bay Area member organizations with the invitation that they encourage their communities. It also included support for organizations who wanted to host their own observation event or bioblitz over the course of the two weeks. We are grateful to YES! Nature to Neighborhoods, Keep Coyote Creek Beautiful, Trust for Public Land, and San Jose City College — all of whom invited residents to observe and document nature in their neighborhoods.



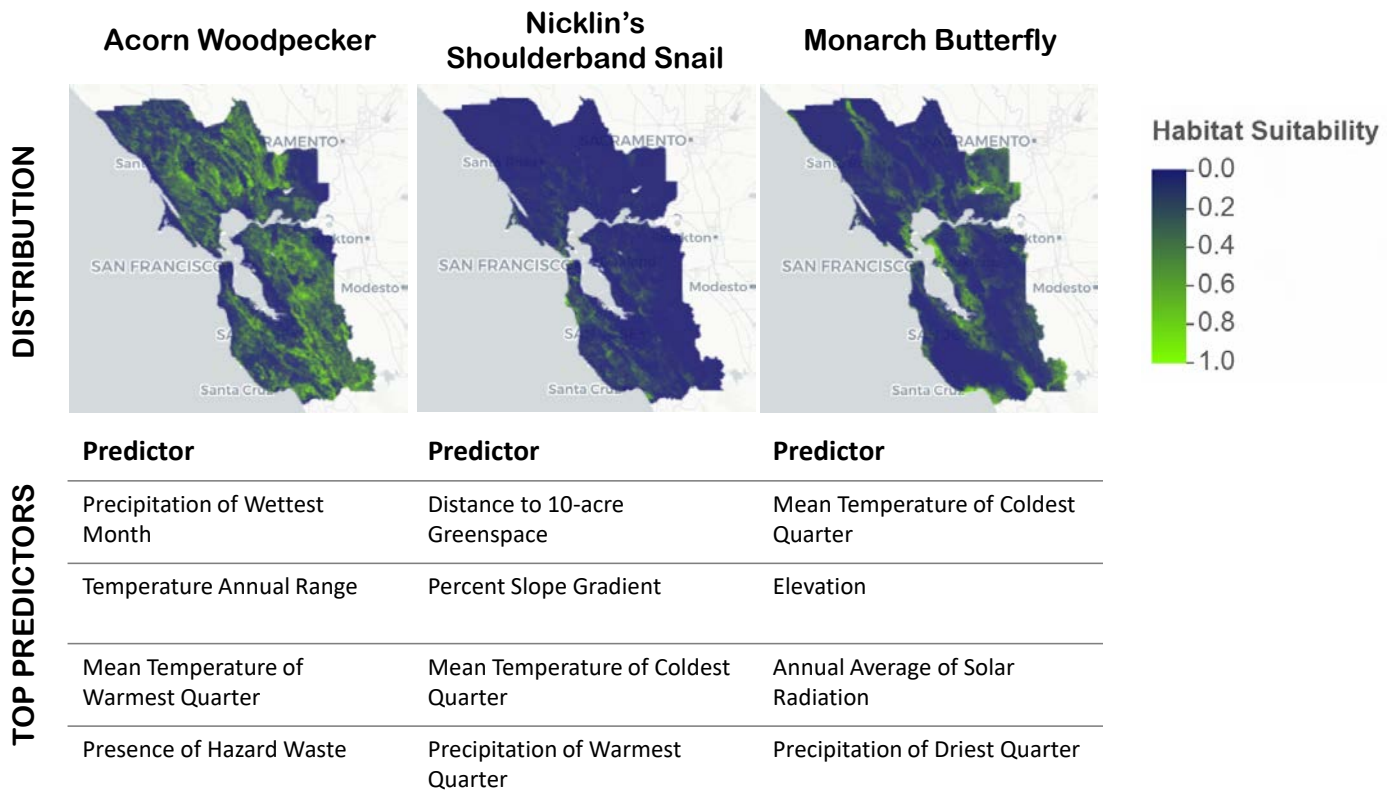
Over the course of the two weeks of the Search, participants made over 2,200 observations and found all 24 target species and species groups. Notably, approximately half of these observations occurred within the urban boundary of the Bay Area, as defined in the Conservation Lands Network Explorer Tool, highlighting the importance of urban spaces for biodiversity. Among the most significant findings, the California Slender Salamander emerged as the most-observed species overall, while the Anna’s Hummingbird topped the list within urban areas. Additionally, observations of the Nicklin’s Shoulderband Snail within the urban boundary increased by an impressive 50%, filling critical gaps in regional biodiversity data. These results demonstrate the power of community science to enhance our understanding of urban ecosystems while fostering greater awareness and appreciation for local biodiversity.

Species Distribution Models

Urban areas host a mix of native and non-native species. To help identify suitable habitat areas for native species and explore the possibilities of prioritizing areas for conservation or restoration efforts, even within heavily modified landscapes, we conducted species distribution modeling (SDM). Species distribution modeling is a way to estimate the geographic distribution of species, typically based on environmental conditions and occurrence data. We produced species distribution models for 19 of the 24 previously selected CLN conservation targets using R, the SDM package Maxent, iNaturalist occurrences, and 18 environmental variables (see details on page 23).

The SDM maps revealed that proximity to substantial green spaces, access to bodies of water, and urban tree canopy density are critical environmental elements for species persistence and distribution in urban areas. These findings underscore the importance of integrating urban planning with conservation strategies to enhance habitat connectivity and support native species. In some ways, the map results challenged traditional views of urban spaces as unsuitable for biodiversity, showing that the urban-dwelling Conservation Lands Network target species may be making effective use of habitat within urban areas (Fig. 2).

Figure 2. Species distribution models for three urban-dwelling CLN conservation target species and their top distribution environmental variable predictors.



Species Distribution Modeling Methods: We trained SDMs of 19 species in the bay area using R (v4.3), MaxEnt, iNaturalist occurrences, and 18 environmental variables at 10m resolution. We sourced all research-grade iNaturalist records for the target species in the 9 bay area counties on May 22, 2024 via GBIF. We used the CoordinateCleaner R package to filter problematic occurrence records. To reduce sampling bias in the input occurrence data, we spatially thinned iNaturalist records and used iNaturalist observation density to weight samples of 10,000 background/pseudo-absence points.

The species distribution model incorporated environmental predictors including elevation, slope grade, solar irradiation, vegetation and land cover classes, tree cover percentage, proximity to freshwater and greenspaces, traffic intensity, a regional environmental impact score, and bioclimatic variables derived from sources like USGS, USDA, WorldClim, and CalEnviroScreen. A complete list with links to data sources can be found in the [sdm webapp](#).

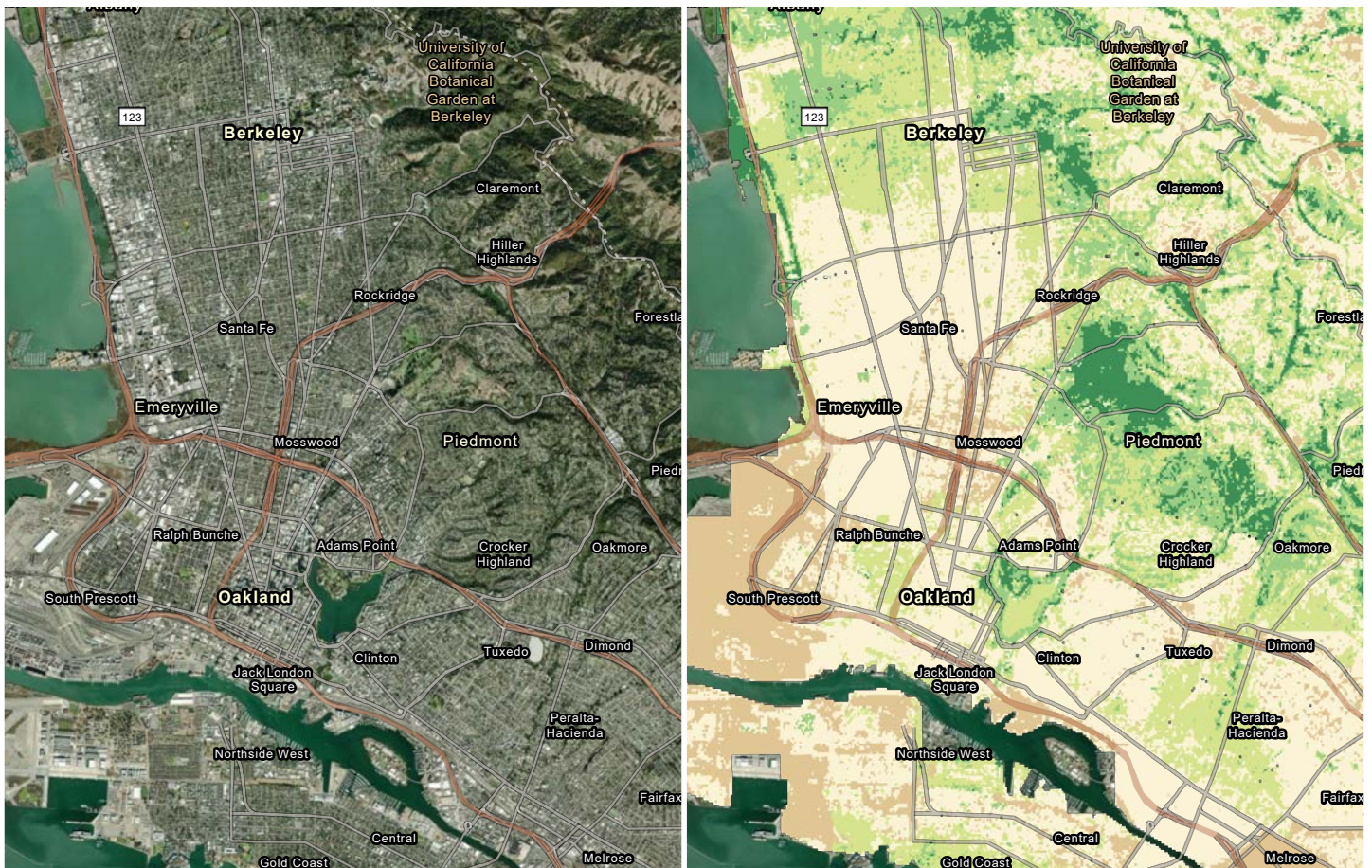
The SDMs were trained and evaluated with the SDMTune R package. For evaluation, we calculated AUC and TSS using k-fold cross-validation with spatial-blocking from the blockCV package, with 5 folds for each species and a block size of 50x50km. We made the composite species richness map by thresholding the continuous habitat suitability values into 'presence' and 'absence.' We chose the threshold for each species that maximized TSS accuracy scores and then stacked the resulting presence-absence rasters for all 17 species.

We shared the distribution models with the CLN Urban Biodiversity Focus Team (see page 16) and received valuable feedback. Generally, the focus team members were supportive of the modeling results, but they shared the following feedback:

- The results show so-called “last chance species,” such as the Black-crowned Night Heron, where their natural distribution coincides nearly completely with what is now urban development, and they do not occur outside of those urban areas.
- The results show the places that are highly suitable but do not have species occurrences (Fig. 3). These areas could be used to inform both future observation campaigns and ecological restoration.
- Recommended next steps for the science component of this project is to investigate the ecological implications of differences between the regional and the urban modeling results.

Figure 3. Estimated “richness” of urban-adapted CLN conservation target species.

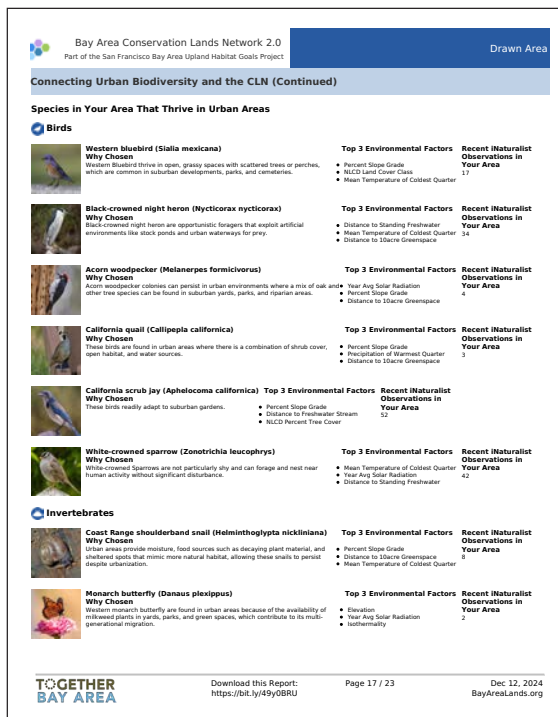
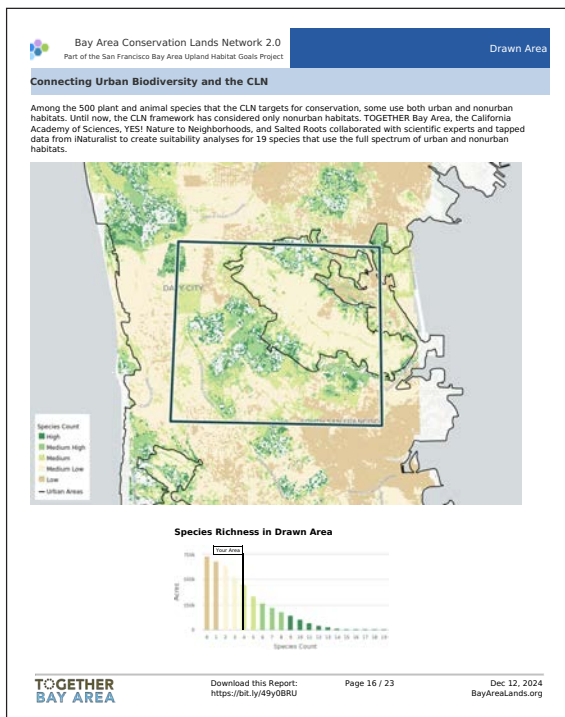
The color corresponds to the number of target species for whom suitable habitat is present. This is a “hotspots” map, where the greener the area, the more species may be present.



Community Science Integration into the CLN

As a result of this project, we have added new urban biodiversity pages to the Conservation Lands Network reporting tool called the CLN Explorer. Users of the CLN Explorer (at www.bayarealands.org) generate Conservation Portfolio Reports that contain a host of biodiversity information specific to their area of interest. Among other things, they use the information in the reports to weigh the benefits of potential conservation projects. The new pages provide a first look at the CLN conservation target species that coexist in rural and urban areas or bridge Baylands and Uplands. They show where, within urban areas, these species are found in abundance (existing hotspots) and where they are not (urban greening opportunity areas). They also show the number of recent iNaturalist observations that exist in a user's area of interest through a dynamic link to the ever-growing iNaturalist database. These additional pages mark a significant step towards integrating urban biodiversity into conservation planning.

Here's what the additional pages look like. See the satellite image on the left and "hotspots" map of the same area on the right where the greener the area, the more species may be present.



Through place-based community-focused bioblitzes, expert consultation, community science, and species distribution modeling, the Connecting Urban Biodiversity project has created a dynamic framework for understanding, documenting, and conserving biodiversity in urban areas. By bringing together community science and advanced modeling techniques, we are on our way to building a more comprehensive picture of the Bay Area's ecological landscape, one that recognizes the vital role of urban ecosystems in supporting regional biodiversity and, equally important, one that includes community members in the process.

LESSONS LEARNED

Lesson 1: Collaboration and Local Expertise are Essential

Collaboration lies at the heart of effective conservation, especially in urban settings. Working with local communities and community-based organizations is not just beneficial — it is critical. Local residents hold valuable expertise about their environments, including knowledge of biodiversity, land ownership, and local politics. Building relationships takes time, but it is a necessary investment. CBOs serve as trusted connectors to their communities, and their involvement ensures that conservation efforts address local priorities, needs, and concerns. This project highlighted the importance of engaging with local knowledge to address systemic environmental injustices and demonstrated that regional conservation efforts must be grounded in place-based approaches. While we leveraged years of connections through TOGETHER Bay Area and the California Academy of Sciences, we also learned that gaps remain — particularly in areas like Solano County — underscoring the need for continued outreach and relationship-building over time.

Lesson 2: Nature Thrives in Cities — Recognize the Role of Urban Biodiversity

Urban areas are often underestimated in conservation planning, yet our work reinforced that cities can provide essential habitats for native species. Through the project, we identified 19 Conservation Lands Network (CLN) target species, such as the Western Bluebird, wavy-leafed soap plant, and Monarch butterfly, that thrive in urban spaces. These findings challenge traditional and outdated notions of cities as “ecological deserts” and emphasize the adaptability of biodiversity to urban environments. Cities act as vital connectors, bridging natural areas and supporting diverse species. Recognizing urban spaces as having value for biodiversity is tied to creating more inclusive conservation strategies. Moving forward, incorporating urban areas into conservation planning is not just an opportunity — it is a necessity.

Lesson 3: Community Science is a Powerful Tool for Urban Conservation

Community science proved invaluable for gathering data in fragmented urban habitats where scientists and biologists often lack access, such as backyards, schoolyards, and small green spaces. Traditional conservation practices remain focused on natural, rural areas, but urban landscapes are vital to understanding and supporting biodiversity. By embracing and promoting community science, we can generate critical data while engaging residents directly in conservation efforts. This project demonstrated that empowering communities to observe and contribute to biodiversity research builds deeper connections to local nature and fills critical gaps in conservation knowledge.



Lesson 4: Species Distribution Modeling Can Guide Urban Biodiversity Efforts

Our species distribution modeling revealed key environmental factors that support urban biodiversity, including proximity to substantial green spaces, access to water, and urban tree canopy density. These findings offer a roadmap for urban planners and conservationists, providing clear pathways for enhancing biodiversity in cities. However, we also learned that our species selection relied heavily on the availability of existing data for CLN target species. In future projects, a model-driven approach incorporating expert input earlier in the process could improve species selection and expand the scope of the analysis. By combining data-driven approaches with expert knowledge, we can achieve more comprehensive and impactful conservation outcomes.

Lesson 5: Cities are Complex Landscapes — Engage Municipalities Deliberately

Navigating conservation in cities presents unique challenges due to the patchwork of public and private lands, overlapping management responsibilities, and governmental complexities. Unlike in more rural settings, there is no single department — or even a consistent structure across cities—that intersects with urban biodiversity. In one city, the logical partner might be the public health department, while in another, it could be public works or parks and recreation. Local partners are invaluable for navigating these complexities, as they possess a deeper understanding of relationships, rules, and local systems. A key lesson learned is that regional conservation goals must be adapted to fit local urban contexts if they are going to gain traction, and municipalities should be brought into the process early as essential partners. Future efforts must address the complexities of urban landscapes with humility and a willingness to learn, ensuring that conservation strategies are practical, inclusive, and reflective of local needs.

Partnerships

At the core of these learnings is a deeper understanding of the invaluable role that community-based organizations play in supporting biodiversity conservation. Our partnerships with local groups like YES! Nature to Neighborhoods, Salted Roots, and Friends of Sausal Creek proved to be the cornerstone of our engagement efforts. These organizations, deeply rooted in their communities, opened doors to individuals who might otherwise not have a seat at the table to advance conservation initiatives. Their ability to organize and educate within their neighborhoods created a bridge between scientific endeavors and community action, fostering a sense of connection, agency, and stewardship among residents.

Community science platforms and the ways we use these platforms have democratized data collection, leading to a growing enthusiasm for community science. The success of our bioblitz events and the Bay Area Urban Species Search demonstrated that, with support and engagement, community members can become valuable contributors to science while deepening their connection to their local environment. In addition to gathering data, we hosted iNaturalist trainings and data debrief workshops to equip participants with the tools and skills needed to use this information for advocacy at the local level, empowering communities to identify priorities, influence decision-making, and advocate for their environments. By partnering with community-based organizations, conservation planners can meaningfully include local knowledge and expertise in their work. Ultimately, these efforts reflect a commitment to equity and sharing power, ensuring that community voices are central to shaping conservation outcomes that are both just and impactful.

At the intersection of social justice and environmental justice lies an opportunity to address the systemic inequities that have shaped access to nature and conservation efforts. This project highlighted the importance of recognizing how historical and ongoing injustices—rooted in race, class, and place—impact communities' relationships with their environments. Intersectionality reminds us that environmental degradation disproportionately affects communities of color and underserved neighborhoods, often those excluded from decision-making processes. By intentionally partnering with community-based organizations and centering local knowledge, conservation efforts can begin to dismantle these barriers, creating pathways for more inclusive, equitable solutions that honor the interconnectedness of social, racial, and environmental justice.

Better integrating municipalities into urban conservation efforts is an important partnering opportunity that emerged from this project. Unlike the rural and open-space landscapes where TOGETHER Bay Area's coalition has historically focused its efforts, cities present a far more complex tapestry of land management, ownership, politics, and relationships. Municipal departments — from public works to public

health to parks and recreation — play diverse and often overlapping roles, yet they exist largely outside our coalition’s traditional networks. As we look ahead with curiosity, we ask: What does it take to meaningfully engage municipalities as partners in urban biodiversity conservation? How can regional organizations like TOGETHER Bay Area better understand and navigate these external systems, build trust, and identify shared goals to support conservation outcomes? Exploring these questions will be critical to advancing a more integrated and effective approach to conservation in urban settings.

Conservation Lands Network 3.0

This project has served an important role in expanding the framework and geographic scope of the CLN. It demonstrated the effective use of observations submitted by community members through the iNaturalist platform, broadening the scope and inclusivity of data collection. In addition, using these community-collected biodiversity data, urban areas that were previously grayed out of Conservation Lands Network prioritization maps now have mapped estimates of suitable habitat for urban-dwelling native species. As we embark on the multi-year process to set regional and habitat goals for what will become CLN 3.0, we will build on the relationships that have been built, the lessons that have been learned, and the paradigm shift that this project is contributing to.

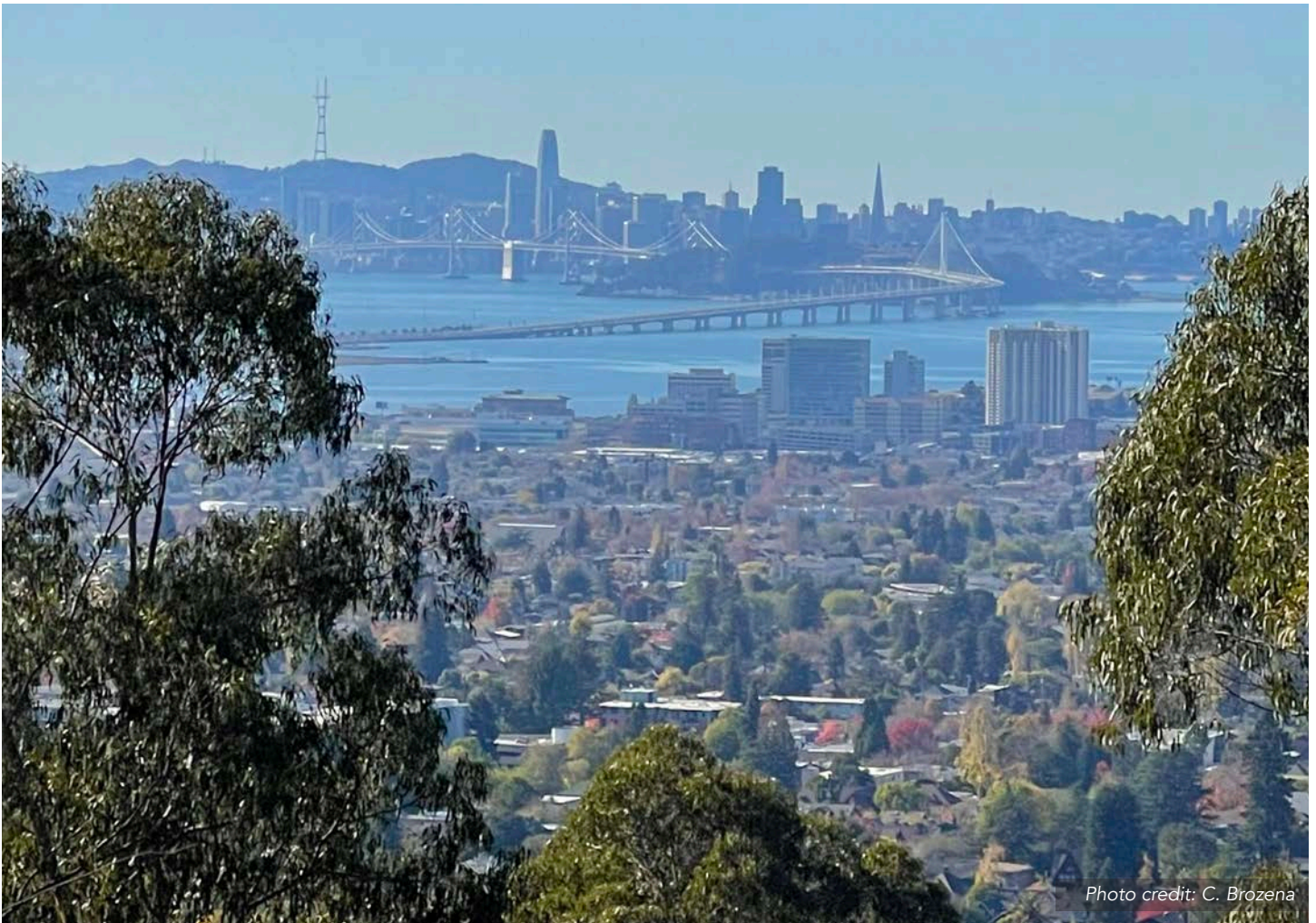


Photo credit: C. Brozena

CONCLUSION

This holistic approach provides a more complete view of the Bay Area's ecological tapestry, recognizing the interconnectedness of urban and natural landscapes.

The Connecting Urban Biodiversity project has illuminated a path forward for conservation that recognizes the vital role of urban ecosystems in supporting regional biodiversity in the Bay Area. Our findings demonstrate that we can and should integrate urban areas into comprehensive conservation strategies, leveraging the power of communities, community science, and advanced modeling techniques to create a more complete picture of our ecological landscape.

The use of community science is on the rise, and platforms like iNaturalist are changing the game. iNaturalist and similar tools are allowing individuals from all walks of life to contribute meaningfully to our understanding of all ecosystems, including urban ones. However, it's not just about the platform itself — it takes dedicated programs, training, and campaigns to effectively gather data on specific species in the place where those data are needed most. Organizations like community-based organizations, the California Academy of Sciences, and TOGETHER Bay Area member groups play a crucial role in bringing people together, providing relevant reasons that connect biodiversity documentation to their lives, and ensuring the data are put to use. This includes answering local questions, addressing community priorities, and demonstrating how documenting biodiversity can drive meaningful conservation outcomes.

The enthusiasm we've witnessed during our bioblitz events and the Bay Area Urban Species Search underscores the potential for widespread community engagement in conservation efforts. This work builds on over a decade of experience from the California Academy of Sciences team, which has consistently demonstrated the power of community science to connect people with local biodiversity. What we learned through this project is that the data collected can play a critical role in informing conservation planning, providing valuable insights that help guide decisions and address both regional and local priorities.

The Conservation Lands Network, a cornerstone of regional conservation planning, has been enriched by this project. By incorporating urban biodiversity data and expanding its scope to include city landscapes, the CLN is now better equipped to guide conservation efforts across the full spectrum of Bay Area habitats. This evolution demonstrates how established conservation tools can adapt to embrace new understandings and methodologies.

Perhaps most notably, this project reinforces the fundamental truth that people are a part of nature, not apart from it. By engaging urban communities in the process of scientific discovery and conservation planning, we're not just collecting data. We're fostering a deeper connection between people and the natural world that surrounds them.

As we collaborate for healthy lands and communities, we offer these invitations:

- Encourage people to observe nature in all settings, especially urban areas, to ensure a more comprehensive and equitable understanding of regional ecosystems. Increase efforts to engage communities, particularly in areas that have historically been excluded from conservation efforts.
- Build stronger connections between community-driven biodiversity data and urban planning and conservation efforts. This could be a gamechanger in helping cities and municipalities develop land-use strategies that ensure better habitat protection and mitigate the impacts of a changing climate.
- Increase our understanding of the legacy of systemic racism in land use and conservation. Urban biodiversity conservation efforts — including building relationships between communities and conservation organizations — can help to counter systemic racism by leveraging community science, valuing community-supplied observations, and building more equitable access to nature and its benefits with people of all races and backgrounds.

The Connecting Urban Biodiversity project represents a significant



step towards a more inclusive, holistic approach to conservation. It challenges us to see our cities not as concrete jungles devoid of nature, but as complex ecosystems teeming with life and possibility. As we move forward, we can carry this expanded vision with us, working together — scientists, community organizations, policymakers, and residents — to create urban environments that nurture biodiversity and enrich the lives of all who call them home.

In doing so, we not only contribute to the resilience of our ecosystems but also to the strength of our communities. By fostering a shared sense of stewardship for our urban nature, we build stronger connections — to our environment, to our neighborhoods, and to each other. This is the promise of urban biodiversity conservation: a future

where cities are not just places we inhabit, but living, thriving ecosystems that strengthen all facets of life.

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Friends of Sausal Creek

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- Elena Stenger (she/her), Education and Outreach Manager

Report Authors

Catherine Brozena and the Connecting Urban Biodiversity project team

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Catherine Brozena of ColorThisWorld Communications



Photo credit: Together Bay Area

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**T^oGETHER
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