



# LA BIODIVERSITY INDEX BASELINE REPORT

2022

# FOREWORD



As the Director and General Manager of LA Sanitation & Environment (LASAN), I am thrilled to present the LA Biodiversity Index Baseline Report. LASAN is honored to lead the City's biodiversity efforts to protect and enhance the diverse array of native plants and animals that call Los Angeles home.

While much of the current work to protect biodiversity across the globe is happening at the international, national, and state level, I believe that local agencies and municipalities have a vital role to play in protecting biodiversity. This is all the more important in Los Angeles, as the City is part of the California Floristic Province, one of only 36 globally recognized biodiversity hotspots.

Our distinction as a biodiversity hotspot is complex. It means that Los Angeles is home to an incredible array of plants and animals, but also that our biodiversity is under threat from habitat loss, climate change, and pollution. It is our responsibility as Angelenos, to address these threats and ensure that ecosystems are protected, enhanced, and restored

and that the City of Los Angeles is resilient and biodiversity-friendly for generations to come.

This report presents the first official measurement of the LA City Biodiversity Index. While the Index is a technical tool that our Department has designed to measure progress on Citywide biodiversity goals, it is also an important educational tool. It can be used to raise awareness on biodiversity issues and engage new stakeholders and stewards to participate in activities to protect biodiversity.

Each of the 25 metrics scored in this report has a list of management implications that serve as goals and targets which can be used to guide the City's next steps. It is LASAN's role to lead the City's efforts to enact these recommendations and ensure that we are taking meaningful steps to provide habitat for the diverse organisms that call Los Angeles home. While many of the actions are specific to City Departments, there are also a variety of actions that individual Angelenos can take to steward biodiversity and make Los Angeles a more resilient and biodiversity-friendly City.

While many of the goals in this baseline report are ambitious, they are absolutely necessary if we are to slow, and ultimately reverse, biodiversity loss. A paradigm shift of this magnitude will require each and every Angeleno to recognize the importance of biodiversity and ecosystem health to their personal well-being, inspiring them to take action. The City family, residents, and young people alike, need to understand what is at stake, to get involved, and to serve as agents of change to solve the predicament of biodiversity collapse.

Only when we work collectively will we be able to ensure that ecosystems are protected, enhanced, and restored, environmental and public health benefits are maximized and equitably shared by all, and that Los Angeles is a resilient, biophilic City for generations to come.

A handwritten signature in black ink that reads "Barbara Romero".

Barbara Romero  
Director and General Manager  
LA Sanitation and Environment

# ACKNOWLEDGEMENTS

This report was prepared by the LA Sanitation & Environment Biodiversity Team under the direction of Dr. Mas Dojiri, Assistant General Manager. The report was written and prepared by Michelle Barton, Environmental Supervisor. Current members of the LASAN Biodiversity Team, namely Jon Ball, Susie Santilena, and Hassan Rad, and former members of the team, namely Melinda Bartlett, Isaac Brown, Deborah Deets, and Peggy Nguyen were integral to the index measurement and report writing process. We would also like to thank Irina Koroleva, LASAN's Climate Action Corps 2021-22 Fellow, who assisted with data analysis, graphic creation, and GIS work and is responsible for creating many of the beautiful maps and charts presented in this report, Adam Pingatore, LASAN's Climate Action Corps 2022 Fellow, who assisted with editing and design, and Abigail Drood, Project Assistant who assisted with document editing.

While this is technically an LASAN report, we fully acknowledge that it would not be possible without the incredible partners that have generously contributed to this work. Thank you to Mayor Eric Garcetti and LA City Councilmember Paul Koretz of Council District 5 for providing outstanding leadership in the field of urban biodiversity. In particular, we would like to thank Victoria Simon, Director of Operations for LA Mayor Garcetti's Sustainability Office, and Andy Shrader, Director of Environmental Affairs, Water Policy & Sustainability for Councilmember Koretz, for being such great advocates for biodiversity issues.

Thank you to all Biodiversity Expert Council Members and Interdepartmental Biodiversity Team members who provided indispensable guidance throughout and feedback on the baseline assessment of the LA City Biodiversity Index and helped shape this report. A special thank you to members of the Expert Council who participated in the April 2021 metric refinement workshops. A full list of Expert Council and Interdepartmental Team members is included below. A list of contributors to the measurement, analysis, and interpretation of individual metrics is included at the end of this report. We are truly grateful for their dedication and contributions.



Griffith Park (Photo: Michelle Barton)

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We acknowledge that what is now the City of Los Angeles is located on land that has long been a center for Native peoples. This area is the traditional homeland of the Chumash, Tongva, and Kizh Peoples. We acknowledge all Native peoples who came before us and continue to contribute to the stewardship of biodiversity in the region.

Mule fat (*Baccharis salicifolia*)  
(Photo: Graham Montgomery)



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[Final LA City Biodiversity Index Methods & Scoring Table](#)

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# EXECUTIVE SUMMARY

The LA Biodiversity Index Baseline Report (2022 Biodiversity Report), builds on the biodiversity work presented by LA Sanitation & Environment in the 2018 and 2020 Biodiversity Reports, which measured the Singapore Index on Cities' Biodiversity for Los Angeles and presented the customized LA City Biodiversity Index (2018, LASAN; 2020, LASAN).

This report presents the first official benchmark assessment of the LA City Biodiversity Index, a tool that was designed to monitor progress toward the no-net loss target presented in LA's Green New Deal. The topics covered in the Index comprehensively assess not only what is happening to habitats and how well connected various habitats are, but how well the City is engaging with students and the larger community on the topic of biodiversity and how the City itself is working to protect endangered species and manage threats, like invasive species, via action plans and policies. The body of the report provides detailed information on the assessment of all 25

metrics in the LA City Biodiversity Index. Background information, metric scores, measurement results, a brief discussion of results, and a list of management implications are presented for each metric. The results of the exercise are summarized in the table below.

For the baseline assessment of the Index, the City received a score of 37 out of a possible 110 points, with an average metric score of 1.7/5 points. Please note that detailed methods that explain how individual metrics were calculated are included in [Appendix II](#).


























It is our hope that the baseline index results presented in this report will serve as a call to action to help focus future conservation priorities and engage the City family, stakeholders, and all Angelenos to prevent future biodiversity loss in the City of Los Angeles.



Santa Monica Mountains  
(Photo: Michelle Barton)

## LA CITY BIODIVERSITY INDEX - BASELINE ASSESSMENT RESULTS

METRIC SCORE RANGE = 0 - 5

1.1a	1.1a: % Natural Areas	3	
1.1b	Habitat Quality of Urban Landscapes & Open Space	2	
1.1c	Habitat Quality of Streams	0	
1.1d	Connectivity of Natural Areas	2	
1.1e	Connectivity of Urban Landscapes & Open Space	2	
1.1f	Connectivity of Streams and Riparian Areas	2	
1.2a	% Open Space with Charismatic Umbrella Species	3	
1.2b	Native Species Presence in Urban Areas	2	
1.2c	Species of Conservation Concern Gained or Lost	N/A	
1.3a	Urban Edge Effects on Natural Areas	2	
1.3b	Presence & Spread of Invasive Plants	2	
1.3c	Wildfire Frequency	2	
2.1a	Access to Natural Areas	3	
2.1b	Neighborhood Landscape / Tree Canopy Footprint	2	
2.2a	School (K-12) Biodiversity Topics	2	
2.2b	Off-Campus Biodiversity Educational Visits	0	
2.2c	Campus Nature Education Gardens	2	
2.3a	Community Scientist Activities and App Utilization	N/A	
2.3b	# Certified Biodiversity-Friendly Areas	N/A	
3.1a	Biodiversity Vision/Action Plan	0	
3.1b	% Departments with Biodiversity Programs & Policies	3	
3.2a	% Protected Natural Areas	1	
3.2b	Protected Natural Areas Management and Monitoring	1	
3.2c	Management of Invasive Species & Pests	0	
3.2d	Management of Species of Conservation Concern	1	

**2022 ASSESSMENT TOTAL: 37 / 110**



Mountain lion (*Puma concolor*)  
(Photo: Robert Martinez)

# INTRODUCTION

## REVERSING BIODIVERSITY DECLINE

There is broad recognition that reversing biodiversity loss is important for food security, climate stability, and public health. In the [2022 Global Risks Report](#), the World Economic Forum reports that biodiversity loss is one of the three most severe threats to global prosperity. The World Wildlife Foundation's [Living Planet Index](#) indicates that mammal, bird, fish, amphibian, and reptile populations are declining globally at unprecedented rates – 68% since 1970. The situation is so dire that scientists believe that we are in the midst of a sixth mass extinction. Unless significant, transformative action is taken, it is estimated that one million species will go extinct in the next few decades (IPBES, 2019). Climate change is only expected to worsen the problem. Climate change experts predict a future increase in the risk of extreme heat waves, uncontrolled fires, and the destruction of natural ecosystems, increasing threats to global biodiversity.

Fortunately, leaders around the globe are taking action. In late 2022, the [UN Biodiversity Conference \(COP 15\)](#) will convene governments from around the world to set new biodiversity goals that will dictate actions for the next decade. COP 15 will build on the [Convention on Biological Diversity's Post-2020 framework](#) to work towards the ambitious vision of living in harmony with nature by 2050. Leaders are also coalescing around the 30 by 30 initiative (30 x 30), a bold goal to protect at least 30% of earth's cover by 2030. President Biden and Governor Newsom have both signed executive orders committing to 30 x 30. California's 30 x 30 commitment also establishes a new California Biodiversity Collaborative.

Locally, leaders are also taking action to protect biodiversity and conserve natural lands. In an effort to mitigate the causes of climate change, reduce environmental pollutants, and build a more resilient Los Angeles, Mayor Eric Garcetti signed [Executive Directive No.7](#) in 2015 and introduced the Sustainable City pLAN. In 2019, the pLAN was updated and rebranded as [LA's Green New Deal](#). Mayor Garcetti's Green New Deal is an innovative document that exceeds initiatives put forward by leaders, advocates, and policy makers in cities around the nation. The pLAN calls for ambitious biodiversity goals, including to:

- Achieve and maintain 'no-net loss' of native biodiversity,
- Set biodiversity targets and pilot LA's first wildlife corridor,
- Complete the first biodiversity assessment using the LA-specific index,
- Build up the City's Biodiversity Program to improve internal practices,
- Monitor biodiversity and natural areas,
- Collect data and map urban biodiversity to identify key areas to enhance or protect,
- Protect and restore sensitive habitats,
- In partnership with LA County, get LA into the top three cities/counties in the City Nature Challenge by 2025,
- Develop strategies to increase community science app users, especially in data-poor areas,
- Increase observations of LA's biodiversity indicator species, and
- Host an annual bioblitz using community science apps such as iNaturalist or eBird.

In addition, in 2017 Councilmember Koretz introduced the [Biodiversity Motion](#) that called for a variety of actions to protect and enhance biodiversity in LA. Specifically, the motion calls for policies and projects that aim to enhance biodiversity to consider:

- Where communities currently lack access to natural areas and open space,
- Where linkages between habitats can be restored, created, or strengthened, and
- Where biodiversity provides a particular benefit to larger ecosystem functions and services.

Lastly, in 2021, Mayor Eric Garcetti signed the C40 Cities Urban Nature Declaration. This is a commitment to establish ambitious nature targets and develop living, climate-ready, and crisis-prepared cities. The declaration includes a commitment to support skills-building programs for green jobs, "set ambitious targets to restore, conserve and increase equitable access to nature," and conduct a gap analysis of where new greening is needed.

## ***BIODIVERSITY IN LOS ANGELES***

The City of Los Angeles is located within the California Floristic Province, one of 36 global biodiversity hotspots (i.e., regions rich in endemic biodiversity, yet facing severe threats). The California Floristic Province has 2,125 endemic plant species, but estimates suggest that half of these species are currently threatened, and that the combination of climate change and increased development may lead to the loss of as many as two thirds of California's endemic plant and animal species by 2100. These estimates highlight the urgent need for informed conservation strategies to address these challenges.

The LA City Biodiversity Index, presented in the [2020 Biodiversity Report](#), is tailored specifically to the Los Angeles context and is designed to monitor progress toward the no-net loss target presented in LA's Green New Deal (LASAN, 2020). The LA City Biodiversity Index was crafted with the guidance of project stakeholders and an Expert Council of local practitioners, landscape architects and designers, non-governmental organizations (NGOs), scholars, educators, and City staff. It is intended to be institutionalized within municipal environmental management practices as a central tool in implementing future biodiversity guidelines and in steering long-term management and monitoring of biodiversity stewardship. It includes three core themes of urban biodiversity: 1) conservation of native biodiversity, 2) social justice aspects of biodiversity with a focus on equity, and 3) governance and management activities.

## ***LA SANITATION & ENVIRONMENT'S BIODIVERSITY PROGRAM***

LA Sanitation & Environment (LASAN) leads the City's [Biodiversity Program](#) and is working diligently with the Biodiversity Expert Council, the Biodiversity Interdepartmental Team, and Biodiversity Stakeholders to achieve the biodiversity goals in the Green New Deal and in the Biodiversity Motion. Ultimately, the Biodiversity Team is strategically working to achieve the goals outlined in the program's newly released Biodiversity Vision Statement.



## **BIODIVERSITY VISION STATEMENT:**

*“Los Angeles is a City where all Angelenos value biodiversity, honor and respect nature, and steward the natural world, ensuring that ecosystems are protected, enhanced, and restored, environmental and public health benefits are maximized and equitably shared by all, and that Los Angeles is a resilient, biophilic City for generations to come.”*



## **BASELINE MEASUREMENT OF THE LA CITY BIODIVERSITY INDEX**

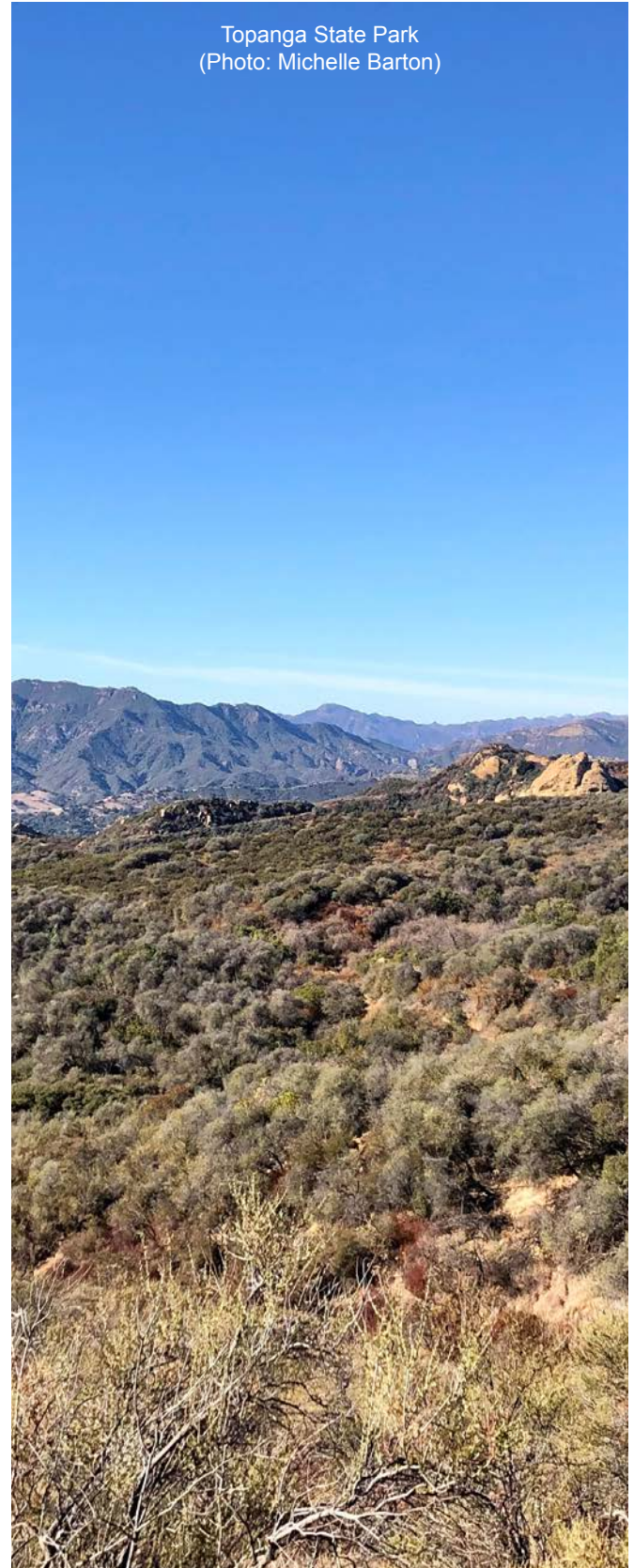
LASAN is proud to present the results of the first “benchmark assessment” of the LA City Biodiversity Index. Major benchmark assessments of the biodiversity index, like this one, will take place once a decade. In the interim, monitoring assessments will occur approximately every three years to gauge progress on biodiversity metrics. The 25 metrics in the LA City Biodiversity Index cover an array of topics and rely on a variety of data sources, some of which have discrete updates, and others of which are updated continuously. For metrics that rely on data that is continuously updated, the benchmark assessment of the LA City Biodiversity Index covers the years 2017-2020. The anticipated data date ranges for future assessments are outlined in the table below:

<b>Assessment</b>	<b>Years Covered</b>
Benchmark Assessment 1 (Baseline)	2017 - 2020
Monitoring Assessment 1	2021 - 2023
Monitoring Assessment 2	2024 - 2026
Benchmark Assessment 2	2027 - 2030

This approach ensures that index measurements always have a current snapshot and that, collectively, index assessments provide comprehensive, continuous information. As the approach to many metrics shifted or has been refined since the LA City Biodiversity Index and Preliminary Methods were published in [2020](#), updated details on the final LA City Biodiversity Index, methods, and scoring are summarized in tabular form in [Appendix I](#).

It is our hope that the baseline index results presented in this report will build capability in biodiversity conservation, help focus conservation priorities, and assist the City in implementing the Post-2020 Global Biodiversity Framework.

Topanga State Park  
(Photo: Michelle Barton)



## **DOCUMENT STRUCTURE**

The body of this report provides detailed findings for the baseline assessment of all 25 metrics in the LA City Biodiversity Index. Each metric report includes an official score, background information, results discussion, and management implications. The length of each metric section varies considerably, with metrics with higher scores typically yielding longer, more detailed sections. Contributors and data sources for individual metrics are acknowledged in a comprehensive table that follows the body of this report. Please note that detailed methods and data sources are included in [Appendix II: Methods](#). The document wraps up with next steps and a conclusion that sets the stage for actions that will continue to propel this work forward.



## METRIC FINDINGS

### THEME 1: NATIVE SPECIES PROTECTION & ENHANCEMENT

Great egret (*Ardea alba*)  
(Photo: Graham Montgomery)

# 1.1A % NATURAL AREAS

**Score: 3 points - 20%**

Points	% Natural Areas
0	< 1%
1	1% – 5%
2	5% – 10%
<b>3</b>	<b>10% – 30%</b>
4	30% – 50%
5	> 50%

City of LA Classification	Number of Vegetation Alliances
Agricultural	5
Bare Soil	1
Degraded Natural Areas	3
Natural	35
Non-native Perennial Grasses (e.g., non-native annual grasses and forbs)	1
Non-native Shrubs and Trees	5
Urban	1
Water (e.g., reservoirs, natural water bodies, etc.)	4

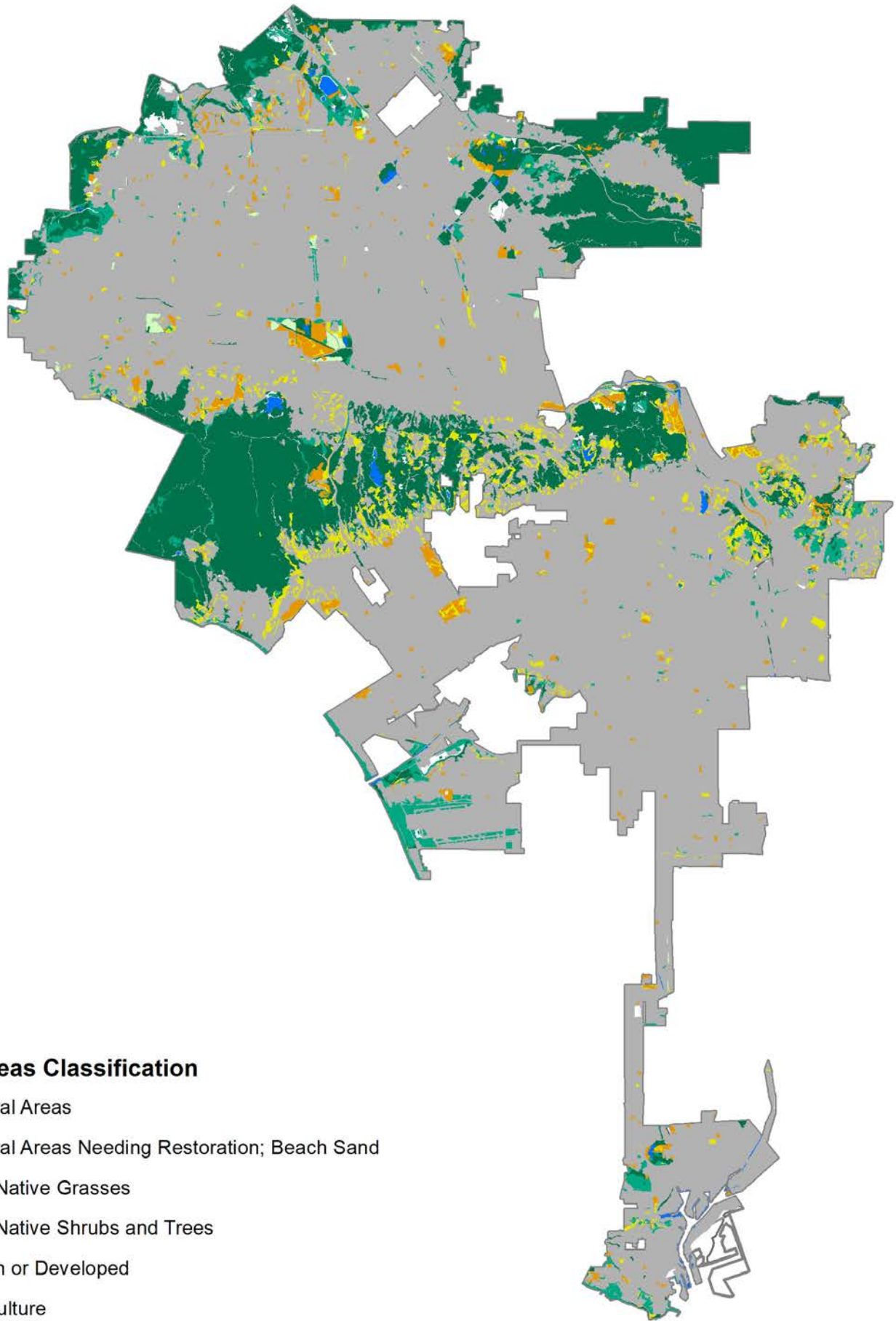
## Background:

This metric aims to show how the percentage of land in the City of Los Angeles considered to be “natural” increases or decreases over time. The CALVEG 2000-2010 dataset was used to estimate natural areas in the City. The dataset relies on satellite remote sensing to estimate vegetation alliances and is the only complete, uniformly sampled dataset covering the entire City of Los Angeles. Vegetation alliances were classified as “natural” based on consensus of the Expert Council when this metric was assessed in 2018 as part of the Singapore Index assessment for Los Angeles (LASAN, 2018). Unfortunately, CALVEG data has not been updated for the Southern Coast Section of California since 2010. The U.S. Forest Service (USFS) which manages the statewide data reports that it is in the process of updating the mapping protocol and hopes to have the updated protocol available soon. See [Appendix II](#) for additional detailed methods and data discussion.









## Results Discussion:

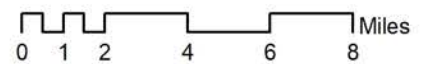
Just over 20% of the City of Los Angeles is classified as natural (95.48 square miles out of 470.85 square miles in the City). Most of these areas are concentrated in large, high-quality open spaces in the Santa Monica and San Gabriel Mountains. The breakdown of how the 55 CALVEG alliances in the City were classified is included in the table below:

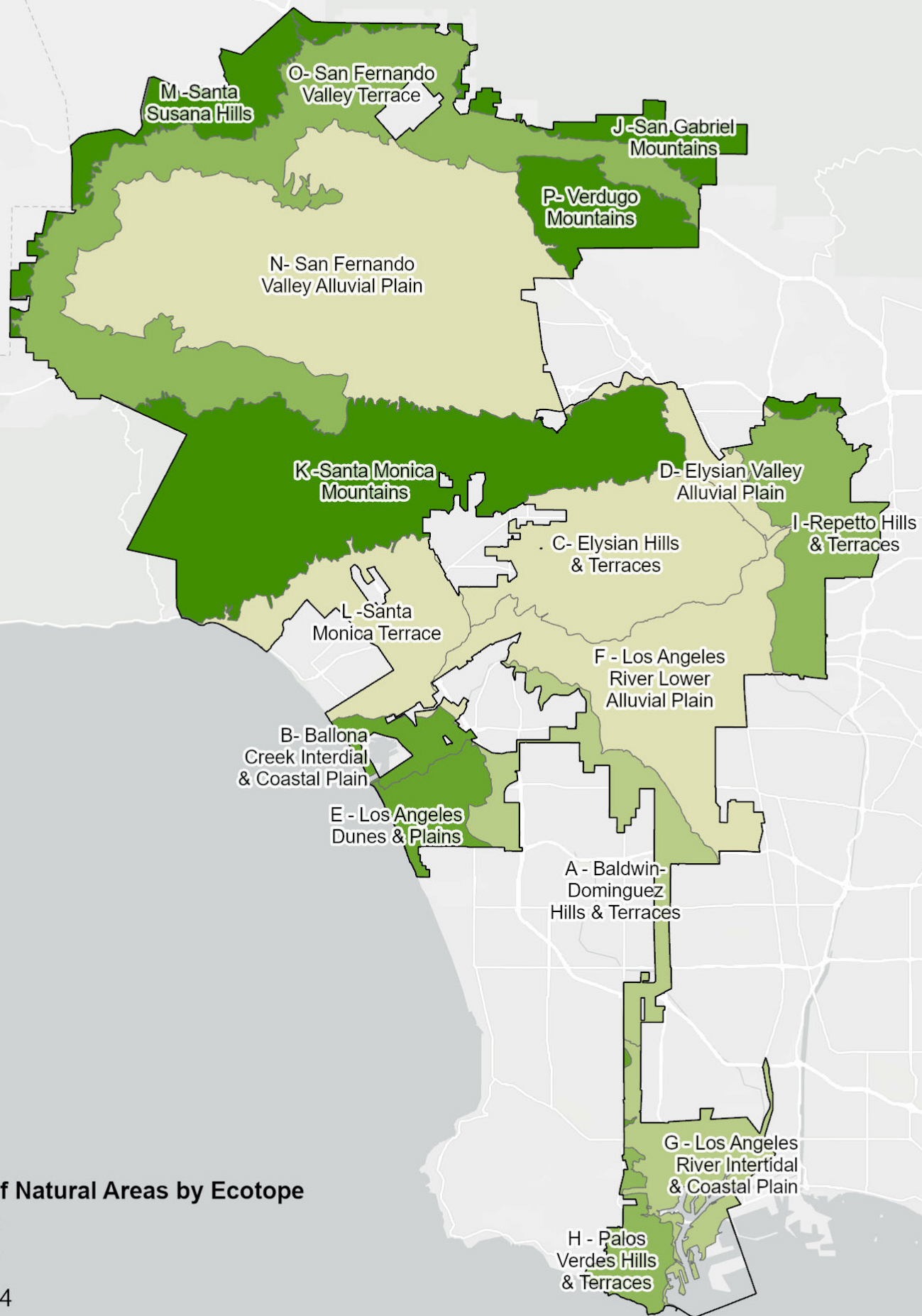
This remotely sensed data is not able to capture smaller urban natural areas and it is thought that there is some level of error in original classifications. Further, since this data was collected around 2000, a variety of changes, disturbances, and projects may have altered and further degraded ground conditions. Fires, developments, and other disturbance events have likely reduced the proportion of areas that would be considered natural in the City or degraded their quality. On the flip side, restoration activities and beneficial changes that have occurred to revitalize degraded urban or non-natural areas have also occurred that would likely increase the areas that would be classified as natural today. In addition to understanding how the overall proportion of natural areas in the City changes over time, when new CALVEG data is released it will be important to assess and track how the proportion and location of specific vegetation alliances have shifted in the City and in individual ecotopes over time.



### Natural Areas Classification

-  Natural Areas
-  Natural Areas Needing Restoration; Beach Sand
-  Non-Native Grasses
-  Non-Native Shrubs and Trees
-  Urban or Developed
-  Agriculture
-  Water, Seasonal Water
-  City of LA Boundary





**Legend**  
**Percent of Natural Areas by Ecotope**

- 0 - 3
- 4 - 7
- 8 - 14
- 15 - 22
- 23 - 90
- City of LA Boundary



San Gabriel Mountains  
(Photo: Michelle Barton)



### ***Management Implications:***

- Since the CALVEG dataset is roughly 20-years old, updated, comprehensive, high-resolution data is sorely needed to provide an accurate characterization of the current vegetation conditions and makeup across the City.
- Urban areas and non-natural areas can be classified and evaluated for native biodiversity value.
- A ranking system to better differentiate the gradient of natural to non-natural alliances, and their relative biodiversity value, should be pursued.
- As the U.S. Forest Service (USFS) has indicated that they plan to both update statewide data and overhaul the protocol used to create CALVEG maps that will focus more on the rate of change in vegetation communities over time, the City of Los Angeles should keep in touch with the USFS team and try to ensure that planned updates will better enable urban biodiversity analyses.

Non-native fountain grass in Griffith Park  
(Photo: Michelle Barton)



# 1.1B HABITAT QUALITY OF URBAN LANDSCAPES AND OPEN SPACE

**Score: 2 points - 2**

Points	Weighted Average Score
0	0
1	1
<b>2</b>	<b>2</b>
3	3
4	4
5	5

## Background:

With dire predictions that over 1 million species worldwide are threatened with extinction over the next few decades (IPBES, 2019), immediate actions are needed to conserve the world’s biodiversity. Cities, typically associated with land conversion, habitat fragmentation, and environmental disruptions are often seen as drivers of species loss. However, as the world continues to urbanize, urban places have an important role to play in stewarding biodiversity. Cities have the potential to shift the narrative and live in harmony with nature. Cities like Los Angeles that are located in global biodiversity hotspots can, and should, become biophilic havens for native species, providing refuge for species, including habitat, adequate food/prey, and shelter.

This metric aims to capture the current availability and quality of habitat across the City at a fine scale (10-foot grid) resolution. When tracked over time, City staff will be able to use habitat quality data to assess where projects and management actions have enhanced habitat and where new development has degraded it. In addition to identifying trends in habitat restoration or degradation, this metric can help identify areas that lack habitat/biodiversity and would benefit from habitat enhancement, restoration, creation of new parks, tree planting, and/or nature-based solutions.

## Results Discussion:

Measuring habitat quality for urban biodiversity is a valuable tool for stewardship decision making and an important first step in connectivity modeling. Despite intensive development of flat, valley areas, the City of Los Angeles has large, important natural areas (e.g., Griffith Park), rugged mountain areas (e.g., the San Gabriel foothills), and wetlands (e.g., the Ballona Wetlands) that have high quality habitat and support a variety of rare and endemic species. The score received for this metric (2 out of 5) suggests that the City has huge potential to increase habitat quality at a variety of scales. Restoring degraded habitats in large open spaces, creating habitat in previously paved or barren urban areas, and enhancing the tree canopy and landscape makeup throughout the urban matrix all have the potential to boost the City’s score. As this metric is measured in 10-foot pixels, even small actions on private property have the ability to contribute meaningfully to future change.

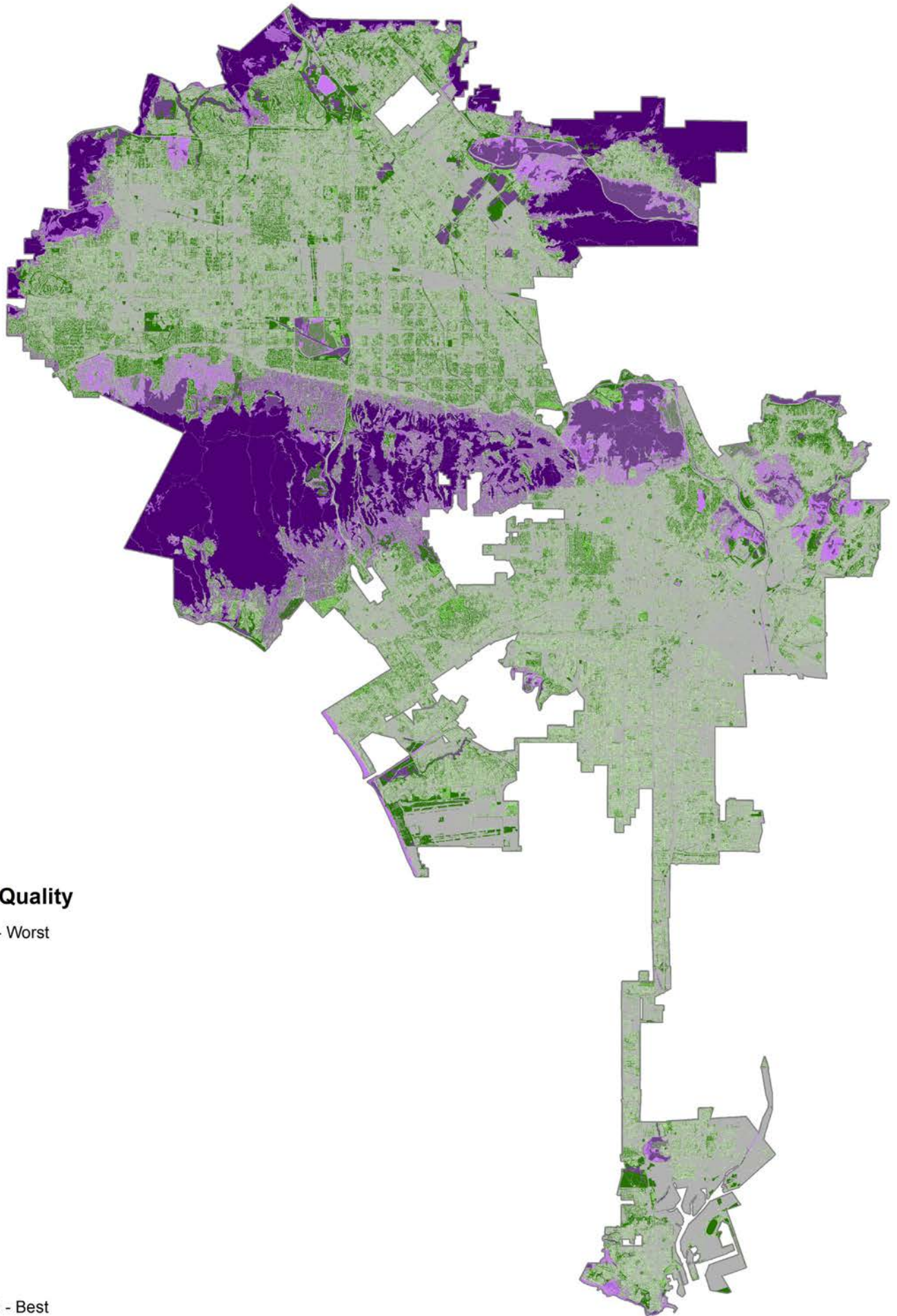
## Management Implications:

- Since the CALVEG dataset that provides the backbone of the habitat quality data layer is roughly 20-years old and very outdated, updated, high-resolution data is needed to provide an accurate characterization of the habitat quality across the City. As mentioned for metric 1.1a, LASAN’s Biodiversity Team should continue to advocate to the U.S. Forest Service for more frequent updates to this valuable dataset.
- Alternative data sources, such as [Landscape Cover Analysis and Reporting Tools](#) (LandCART) should be explored and utilized to track changes in natural areas and vegetation over time.
- These spatially-explicit results can, and should, support decision making to protect, enhance, and equitably distribute biodiversity. Areas of the City with low habitat quality (shown in gray on the map) should be prioritized for public greening activities, such as street tree plantings.
- The City of Los Angeles should continue to engage with [Biophilic Cities](#), [CitiesWithNature](#), the [National Wildlife Federation](#), and other local, national, and international organizations that promote biophilic design, harmonious coexistence with wildlife, and land stewardship.

- The Federal and State 30 x 30 initiatives may provide important opportunities to conserve, protect, enhance, or restore habitat in the City of Los Angeles or in surrounding areas that can enhance both habitat quality and connectivity. Participation in these initiatives is vital to ensuring that the biodiversity interests of Los Angeles are adequately addressed in these plans.
- As there are unprecedented sums that have been budgeted by the State of California for climate resilience, nature-based solutions, and biodiversity, the Interdepartmental Biodiversity Team should pursue funding that will enable the restoration of degraded habitat and/or the creation of new habitat to support biodiversity.
- This metric is connected to so many other metrics in the index (e.g., 1.3a Urban Edge Effects on Natural Areas, 1.1d-1.1f Connectivity, 3.2c Management of Invasive Species & Pests, etc.) and meaningful action on them will yield progress on this metric as well.
- The City can take action to protect against future developmental change (i.e., habitat loss and/or degradation) through zoning changes, regulations, and ordinances.
- Biodiversity Design Guidelines should be developed to provide guidance to public and private landholders on how to best design projects and sustainably manage properties in order to improve habitat quality and enhance local biodiversity. Guidelines should be designed in a way so that they are applicable to a variety of land uses and scales. Examples from around the world (e.g, [City of Surrey](#)) can be used as inspiration.












Red-shouldered hawk (*Buteo lineatus*) on an urban telephone pole  
(Photo: Nurit Katz)




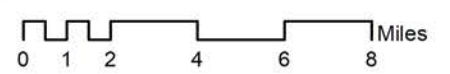


**Legend**

**Habitat Quality**

-  0 - Worst
-  1
-  2
-  3
-  4
-  5
-  6
-  7
-  8
-  9
-  10 - Best

 City of LA Boundary



# 1.1C HABITAT QUALITY OF STREAMS

**Score: 0 points - CSCI < 0.62**

Points	Average California Stream Condition Index (CSCI) for the City* <i>*the higher scores also incorporate data from the Algal Index of Biotic Integrity for Streams</i>
0	≤ 0.62 (very likely altered)
1	0.63 – 0.79 (likely altered)
2	0.80 – 0.91 (possibly altered)
3	≥ 0.92 (likely intact)
4	≥ 0.92 (likely intact) and ASCI > 10th percentile
5	≥ 0.92 (likely intact) and ASCI > 30th percentile

## Background:

The California Stream Condition Index (CSCI) is a biological index that was developed by the State Water Resources Control Boards to assess communities in rivers and streams. The CSCI is a “biological scoring tool that helps aquatic resource managers translate complex data about benthic macroinvertebrates found living in a stream into an overall measure of stream health. The CSCI communicates whether, and to what degree, the ecology of a stream is altered from a healthy state. Direct measures of ecosystem health like the CSCI are preferable to those based on chemical or physical measurements for many management questions. Living organisms integrate the effects of multiple stressors, such as sedimentation, nutrient enrichment, and riparian disturbance, over both space and time” (Mazor et al., 2016, Rehn, et al., 2015). CSCI scores, obtained for specific points, can be used to model and categorize streams based on the thresholds reported in Mazor et al. 2016. Traditionally, CSCI scores range from about 0.1 to 1.4. For the purposes of making statewide assessments, three thresholds have been established based on the 30th, 10th, and 1st percentiles of CSCI scores at reference sites.

These three thresholds divide the CSCI scoring range into 4 categories of biological condition as follows:

- ≤0.62 = very likely altered condition;
- 0.79 to 0.63 = likely altered condition;
- 0.91 to 0.80 = possibly altered condition;
- ≥0.92 = likely intact condition (Renh, et al., 2015).

The CSCI provides an appropriate mechanism to assess the habitat quality of streams in the City of LA. To measure metric 1.1c, the [flow ecology stream class data with predicted CSCI scores](#) for streams within the City of LA were analyzed. If the average predicted CSCI score for the City of LA increases as measurement of this metric continues over time, it will indicate that the habitat quality of local streams is improving.

LA’s Green New Deal has many initiatives related to the LA River including a target to complete or initiate restoration identified in the Federal LA River Ecosystem Restoration Plan (‘ARBOR’ Plan) by 2035. Planned restoration and revitalization efforts will, hopefully, bolster the habitat quality of the LA River as well as other major streams and rivers in the City, including Ballona Creek, in the future.

## Results Discussion:

The average predicted CSCI score for the City was calculated and categorized according to the thresholds listed in the table below. The average CSCI score for the stream segments in the City of LA is 0.61 (very likely altered). The highest recorded score within the City limits is 1.05 and the lowest recorded score is 0.26. One segment, the Burbank Western Chanel, was not assessed and thus was filtered out of calculations. The average CSCI score for areas considered to be “natural” based on the analysis performed for LA City Biodiversity Index metric 1.1a (% natural areas) is 0.65 (likely altered), slightly higher than the score for streams in non-natural conditions across the City. Overall, streams in the City of LA, regardless of whether they are in urban or natural areas, are altered and of degraded quality.

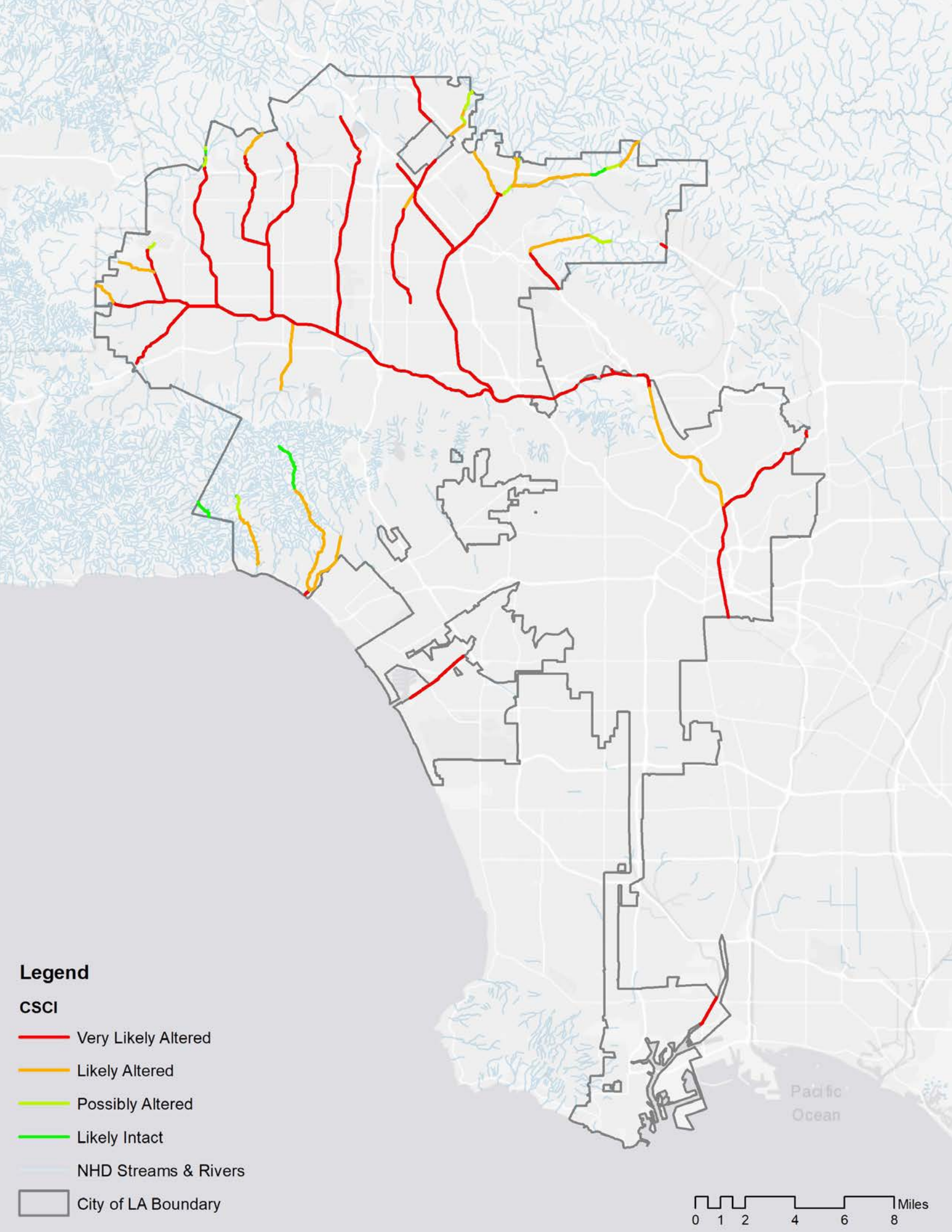
Classifications of Streams in the City of Los Angeles:

<b>Score</b>	<b>CSCI Score</b>	<b># of Assessed Segments</b>	<b>% of Assessed Segments</b>
0 (very likely altered)	<0.62	49	52.7%
1 (likely altered)	0.63-0.79	26	28.0%
2 (possibly altered)	0.80-0.91	11	11.8%
3 (likely intact)	>.92	7	7.5%

This means that 80.7% of streams in LA City are very likely altered or likely altered and only 7.5% of streams are likely intact. In contrast, the Ecosystem Health Sustainability Report Card for Los Angeles County reports that in LA County, 57% of sites are likely or very likely altered and 24% of streams are likely intact (Reid-Wainscoat et al., 2021).

Riparian habitat along the Glendale Narrows, LA River  
(Photo: Michelle Barton)





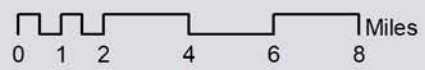
**Legend**

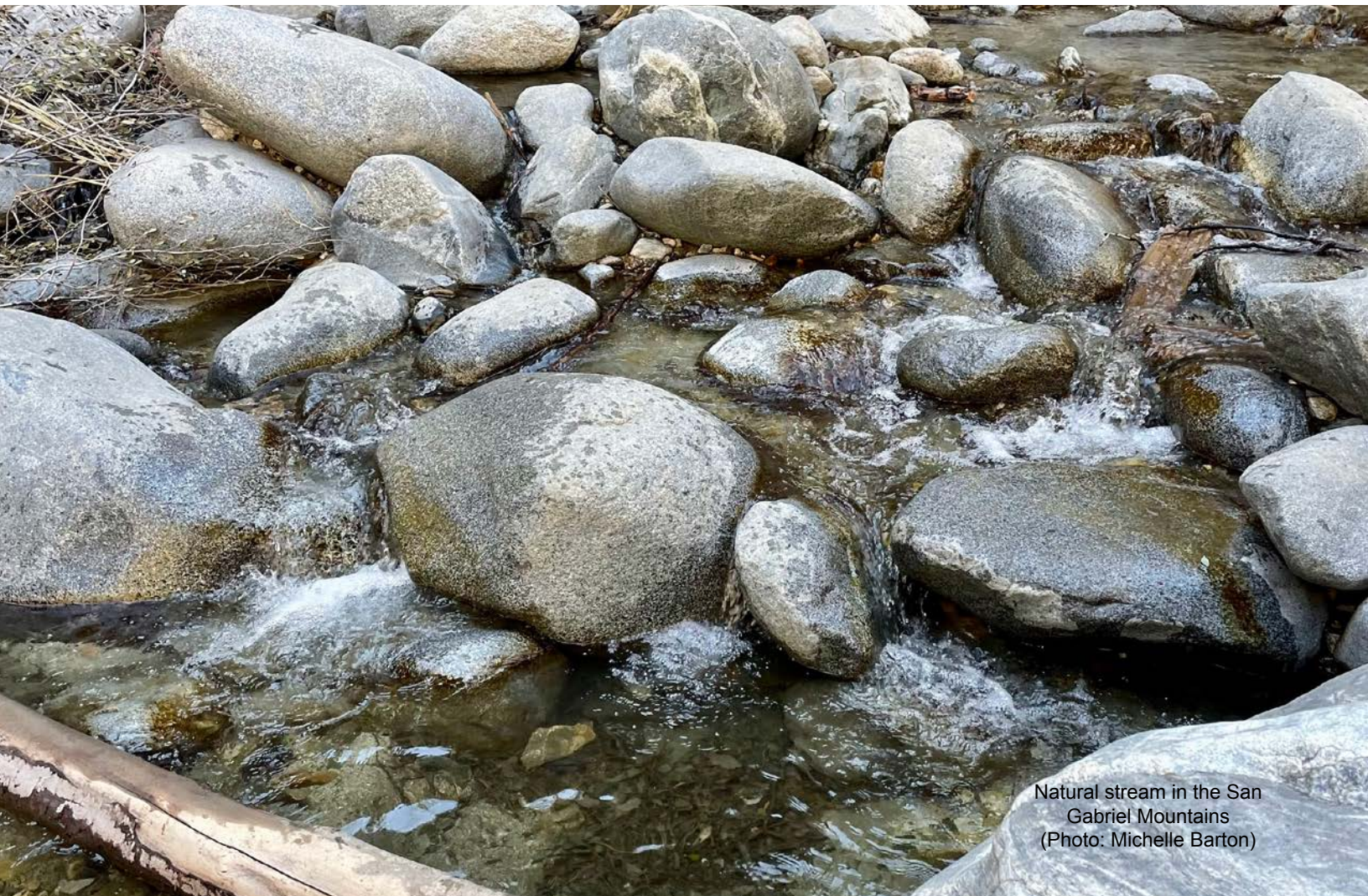
**CSCI**

- Very Likely Altered
- Likely Altered
- Possibly Altered
- Likely Intact

— NHD Streams & Rivers

City of LA Boundary





Natural stream in the San Gabriel Mountains  
(Photo: Michelle Barton)

### ***Management Implications:***

- Continue to compare scores in LA City to those in LA County and the greater Southern California region via the Stormwater Monitoring Coalition's Stream Survey to understand how the City compares to the rest of the region and to better contextualize results.
- In the future, additional metrics, such as the [Stream Quality Index](#), which unlike the CSCI includes data on chemical and physical stressors, could be assessed in tandem with the CSCI for a more holistic approach.
- Increasing the number of CSCI assessment sites would provide better spatial coverage and increasing the frequency with which scores are measured could provide more trends on how stream quality in the City is changing over time.
- Integrated, multi-disciplinary efforts to improve the state of streams, rivers, and riparian habitats across the City are needed to improve stream condition and increase the score for this metric.
- Planned improvements under the ARBOR plan along the LA River, and other initiatives to restore riparian habitats and improve river and stream condition, such as the Westwood Greenway project, could improve this score in the future and serve as a model for other targeted restoration work.
- SCCWRP is currently conducting research to better understand factors that affect conditions within modified stream channels. Incorporating the results in future analysis could be beneficial, given the extent of modified channels within the City.
- Riverfront projects focused on social amenities should be designed intentionally to improve, rather than degrade, stream quality.

# 1.1D CONNECTIVITY OF NATURAL AREAS

**Score: 2 points - 738 hectares**

Points	Effective Mesh Size (hectares)
0	< 200 ha
1	200 – 500 ha
<b>2</b>	<b>501 – 1,000 ha</b>
3	1,001 – 1,500 ha
4	1,500 – 2,000 ha
5	> 2,000 ha

## Background:

This metric aims to assess the connectivity of natural areas by measuring effective mesh size. Measuring effective mesh size ( $m_{\text{eff}}$ ) is an accepted method to assess landscape fragmentation as it provides a useful measure of the overall pattern of natural areas in a City. Effective mesh size is based on the probability that two points in a landscape are connected to each other (i.e., if the points are in the same patch) (EEA, 2011). Lower  $m_{\text{eff}}$  values suggest a more fragmented landscape and higher values indicate greater connectivity. To analyze  $m_{\text{eff}}$  and understand patterns of landscape fragmentation, the spatial relationships of relevant landscape elements (e.g., roads, man-made barriers, etc.) must be analyzed. It should be noted that this calculation does not take the movement patterns of specific species into account. Rather, it is a general assessment of connectivity between natural area patches.

The revised [Handbook on the Singapore Index](#) updates recommendations on this metric (Chan, et. al., 2021). Rather than simply reporting  $m_{\text{eff}}$ , the handbook recommends taking the calculation one step further to calculate coherence, to better account for the physical size of individual cities. The City will calculate both effective mesh size and coherence, but will score this metric based on effective mesh size.

Coherence = Effective Mesh Size/Total Area of Natural Areas

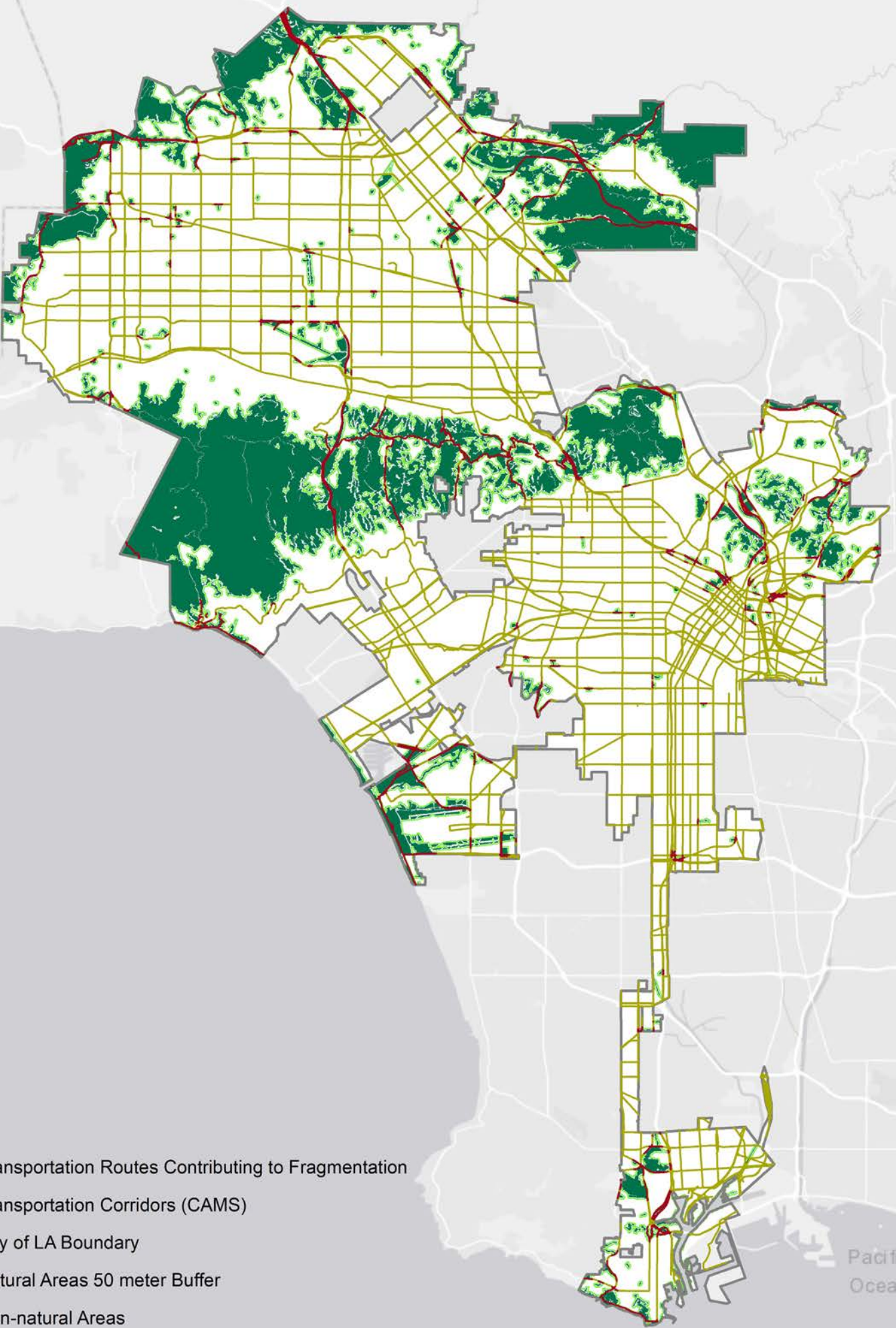
## Results Discussion:

The City of LA received a score of 2 points for this metric as effective mesh size was calculated to be 738 hectares. As the data inputs for this metric have not been updated since the City of LA calculated and published effective mesh size results in the 2018 Biodiversity Report, the previously reported results still stand (LASAN, 2018). Effective mesh size does not fully address configuration of ecological networks, only total connectivity. As the LA City Biodiversity Index has three connectivity metrics (1.1d - 1.1f), each of which examines a different aspect of connectivity, the metrics should be looked at collectively to understand how connectivity patterns are changing over time. Additionally, assessing connectivity metric results and data layers, will help identify areas to prioritize for restoration, preservation, and enhancement.

Coherence was calculated to be 3% for the City (Coherence =  $738 / 24,731 = 3\%$ ).

## Management Implications:

- As previously mentioned, regular updates to CALVEG data are crucial to understanding and analyzing temporal change. Efforts should continue to coordinate with the U.S. Forest Service and push for immediate and regular updates to this dataset to enable additional calculations.
- To move the needle in a substantive way on effective mesh size, the City, the County, and the Biodiversity Expert Council will need to work to both increase the size of natural area patches through restorations and/or conservation easements and to reduce connectivity barriers between patches.
- Large-scale, integrated planning across jurisdictional boundaries is needed to create real change when it comes to landscape-level connectivity. Numerous regional initiatives are underway to evaluate and plan for connectivity, such as the National Park Service's Rim of the Valley Corridor, which should contribute positively to all three connectivity metrics over time.



**Legend**

- Transportation Routes Contributing to Fragmentation
- Transportation Corridors (CAMS)
- City of LA Boundary
- Natural Areas 50 meter Buffer
- Non-natural Areas
- Natural Areas

Pacific Ocean

0 1 2 4 6 8 Miles

# 1.1E CONNECTIVITY OF URBAN LANDSCAPES & OPEN SPACE

**Score: 2 points - 1.9 / 5**

Points	Average Pixel Connectivity Score for Area of Interest
0	Impermeable barriers, average pixel connectivity score = <0.5
1	Impeded, average pixel connectivity score = 0.5-1.5
<b>2</b>	<b>Pinch-points, average pixel connectivity score = 1.5- 2.5</b>
3	Channeled, average pixel connectivity score = 2.5 - 3.5
4	Intensified, average pixel connectivity score = 3.5 - 2.5
5	Diffuse, average pixel connectivity score = 4.5+

## Background:

Preserving and enhancing the connectivity of urban landscapes and open space is vital for biodiversity. Landscape-level connectivity allows movement between patches of suitable habitat, increases the chance of survival for small populations, and enables gene flow across patchy landscapes. Connecting ecosystems through urban areas is essential to enhancing biodiversity, addressing climate change, and providing general “resilience” on a global scale. As a megacity located in one of 36 Global Biodiversity Hotspots, Los Angeles is uniquely positioned to have a significant impact on the health and resilience of ecosystems and biodiversity in southern California and beyond. Cities, such as Los Angeles, can set a precedent for how to address some of the most essential conservation strategies, such as enhancing ecological connectivity, within the most developed parts of the world.

There are many different efforts underway across the region and state to identify and address the need for more connected landscapes that enhance urban biodiversity. Linkage designs have been mapped within the Southcoast Ecoregion, but currently do not identify corridor opportunities in the Los Angeles area. Wildlife, including the California State-listed

mountain lion, live and move through Los Angeles, and depend upon connections to disperse, find mates, etc. In order to accurately and efficiently create such connections, a map identifying priority ecological connectivity areas in Los Angeles must be created.

Metric 1.1e uses [Omniscape](#), modeling software that produces maps of omni-directional habitat connectivity, to measure connectivity of all landscape types, including both natural and non-native landscapes, spatially, at a 30' grid resolution using a ½ mile moving window. Please see Chapter 3 of the 2020 Biodiversity Report, as well as [Appendix II](#) of this report, for additional details regarding Omniscape and the inputs (e.g., source and resistance layers) that have been developed for this metric (LASAN, 2020; Brown, 2019).

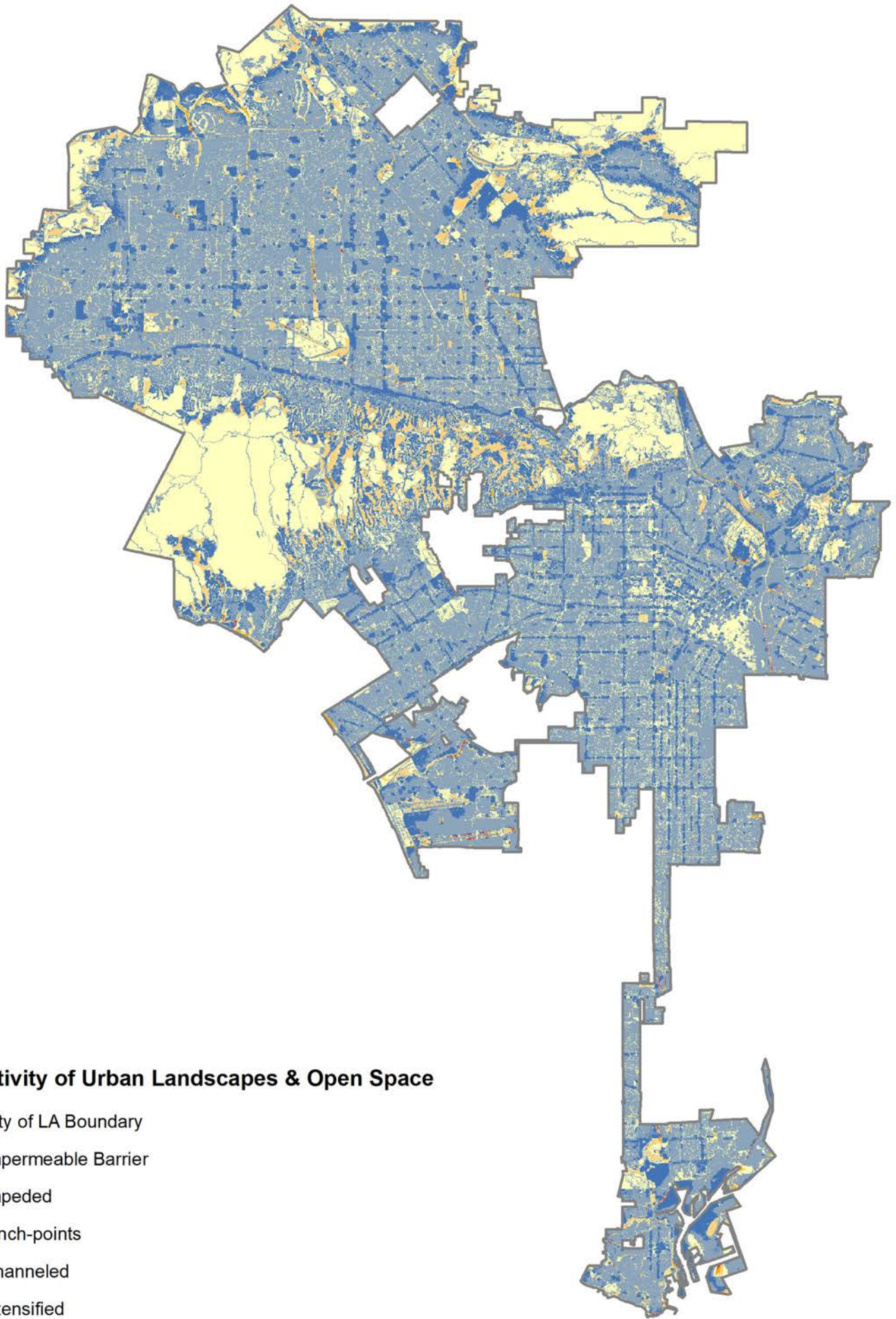
## Results Discussion:

The mean connectivity pixel score for this metric was 1.9, yielding an overall metric score of 2. These results are the first published assessment of wall-to-wall connectivity for the City of Los Angeles at 30' resolution. The normalized current flow from Omniscape shows expected patterns with the most urban, developed areas having low-flow channeled around natural barriers, like highways, airports, and dense development (McRae et al., 2016). All pixels in the normalized flow output have been classified as:

- Impermeable Barriers,
- Impeded,
- Pinch-points,
- Channeled,
- Intensified, and
- Diffuse.

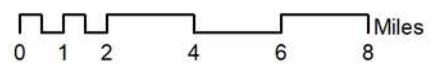
See [Appendix II](#) for additional details on classification definitions/values.

While the publication of these initial connectivity results is groundbreaking, we recognize that the resulting map is not perfect, but is a work in progress. There are certain areas, like the Fashion District in Downtown LA, which are largely classified as diffuse, when in reality they are heavily paved, heavily developed areas that provide limited habitat value. The classification of areas like the Fashion District as diffuse suggests that in some cases the connectivity results presented here may be overly rosy, inflating the overall Citywide connectivity score. Future assessments should use LiDAR, or other imagery, to obtain up-to-date building footprints, and weigh them more heavily, to develop more accurate resistance layers. In the future, finer-scale results (e.g., 10' resolution) would enhance the value of a connectivity product and help users hone in on opportunities to



### Connectivity of Urban Landscapes & Open Space

-  City of LA Boundary
-  Impermeable Barrier
-  Impeded
-  Pinch-points
-  Channeled
-  Intensified
-  Diffuse



enhance wildlife movement. Re-running the analysis with a larger moving window (e.g., 5-miles), would allow better assessment of long-range connectivity, essential for species like the mountain lion.

It should be noted that this baseline assessment was dictated by the following factors:

- Input layer resolution
  - The source layer resolution was 10', but the resistance layer resolution was 30', limiting the output resolution to 30'.
- Computing power
  - Running Omniscape at 10' resolution or with a larger moving window requires extensive computing power, which appears to exceed the capabilities of City GIS computers.

Initial interpretations of the normalized flow output suggest that notable pinch-points exist along various stretches of the LA River, near the Van Nuys Airport, and on the southwest side of Elysian Park/ Dodger Stadium. These pinch-points, and others, would benefit from connectivity improvements and enhancements. The map also identifies areas in underserved communities where there are opportunities to enhance connectivity and access to biodiversity. Areas that are shown as impenetrable or impeded would benefit from tree planting, green infrastructure, and new community parks.

Additional interpretation of the resulting connectivity layer, as well as comprehensive planning to enhance Citywide connectivity, is needed and will, hopefully, follow the publication of this report. Potential interpretations may include creating an essential linkage map for the City or creating a prioritized list of connectivity interventions/improvements. However, it should be noted that interpretations of the output and planned implementation actions will vary site-by-site and require additional evaluations and ground-truthing. While the focus of planning should be to connect ecological communities, initiatives like the [Connecting Wildlands & Communities](#) project, which is exploring how connected landscapes support the resilience of ecosystems and communities in Southern California, demonstrate the importance of an integrated regional planning framework. As implementation projects to forge new connections or enhance existing ones proceed, considerations for how projects may increase equitable access to nature/parks should be included.

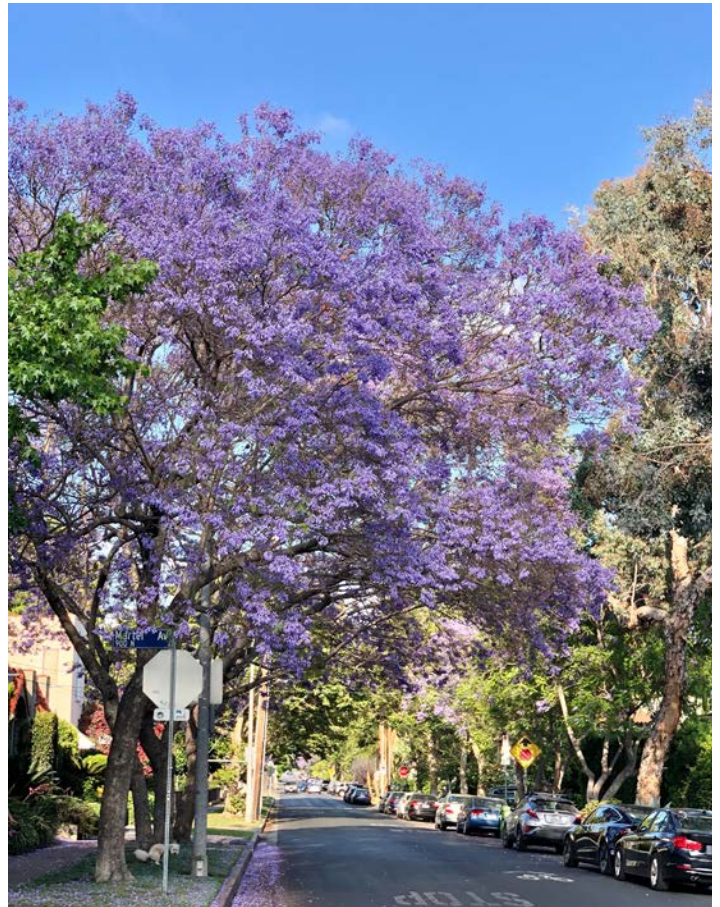
It should also be noted that this connectivity assessment does not address climate change and that maintaining biodiversity and connectivity in the face of climate change requires dynamic modeling and adaptive management approaches. As dynamic, climate-sensitive connectivity modeling advances

(e.g., The Conservation Ecology Lab at SDSU) the City should consider refining its modeling approach to incorporate the range of potential changes in habitat availability and location anticipated under various climate change scenarios (Jennings et. al., 2019, McRae et. al., 2016).

While there are still many ways this assessment can be improved and further assessed, the publication of this high-resolution, wall-to-wall connectivity map for the City of Los Angeles is a fantastic start and is a science-based methodology for mapping connectivity in urban areas that can be replicated in other cities across the nation and around the world.

### ***Management Implications:***

- As there are a variety of groups and initiatives working on connectivity issues in greater LA (e.g., Arroyos & Foothills Conservancy, the Emerald Necklace Initiative) regularly convening the Southern California Wildlife Habitat Connectivity Group, a regional connectivity working group to coordinate connectivity needs, agree upon maps, and identify projects across the region that can be collectively pursued to enhance regional connectivity, will be key to success.
- As feasible, future connectivity assessments should include climate change considerations.
- Unlike other metrics, metrics 1.1e and 1.1f require intensive computing power and specialized GIS experience. When these metrics are reassessed in ten years, there will be a need for dedicated staff and/or a skilled subcommittee to assist in the creation of the input layers (source and resistance), Omniscape processing, and interpretation of results. Resources may be needed to access cloud computing and/or for consultant assistance.
- Additional, targeted efforts to interpret the results of this connectivity assessment are needed to analyze results and make recommendations on how this output can contribute to project design, planning considerations, and more.
- Future restoration, conservation, and connectivity planning should hinge on this map, or future iterations of this map.
- These baseline results should not be seen as static or final, rather they should serve as a launching point for future evaluations, refinements, and updates as tweaks to scoring and other refinements will help advance strategic planning and implementation projects that broadly improve landscape-level connectivity.
- Updates to scoring, analysis, and interpretation of metric 1.1e should be done in tandem with updates to metric 1.1f.



Urban landscapes in LA. Clockwise from top left: urban garden at a local elementary school, an outdoor classroom at Walgrove Elementary, a DTLA freeway interchange, LA streetscape. (Photos: Michelle Barton)

# 1.1F CONNECTIVITY OF STREAMS AND RIPARIAN AREAS

**Score: 2 points - 1.7 / 5**

Points	Average Pixel Connectivity Score for Area of Interest
0	Impermeable barriers, average pixel connectivity score = <0.5
1	Impeded, average pixel connectivity score = 0.5-1.5
<b>2</b>	<b>Pinch-points, average pixel connectivity score = 1.5- 2.5</b>
3	Channeled, average pixel connectivity score = 2.5 - 3.5
4	Intensified, average pixel connectivity score = 3.5 - 2.5
5	Diffuse, average pixel connectivity score = 4.5+

## Background:

This metric measures the connectivity of streams and riparian areas. Streams and riparian areas provide core habitat for aquatic, partially aquatic, and terrestrial species. Spatial mapping of connectivity along streams and in riparian areas can provide a useful tool for measuring, monitoring, and managing changes to connectivity across the urban environment. Further, spatial assessment can help identify stream/river segments and/or riparian areas that would benefit from restoration and enhancement activities to improve connectivity and to capture the impacts of projects that aim to enhance or restore connectivity.

Enhancing riparian and stream connectivity is an important consideration and high-priority goal across the region. Many plans, including LA’s Green New Deal and the [LA River Master Plan](#) have goals to enhance riparian and stream connectivity in the LA region. For example, supporting healthy, connected ecosystems is one of nine major goals presented in the LA River Master Plan. The plan outlines six actions, ranging from using the river corridor as a living laboratory to creating a connective network of habitat patches to facilitate wildlife movement,

that can be followed to create healthy connected ecosystems and to advance this goal. As there are currently many major and minor projects planned for the LA River and beyond, quantifying the benefits of restoration projects along stream corridors can demonstrate their value towards achieving connectivity targets.

Like metric 1.1e, metric 1.1f uses Omniscape to measure the connectivity of streams and riparian areas spatially, at a 30' grid resolution. As a first step, a stream network was designed using data from the [National Hydrography Dataset \(NHD\) Plus High Resolution \(HR\) dataset](#) and the County of Los Angeles [stormwater drainage system](#). The resulting stream network was buffered to account for adjacent riparian zones. Stream naturalness and riparian zone naturalness was defined and ranked from 1 to 5. Areas that are more natural with higher scores are assumed to provide greater habitat values for species. The composite naturalness layer served as the “source layer” for Omniscape analysis. A “resistance layer” was constructed for the network based on land use, building footprints, and other barriers to movement in stream and riparian corridors. Please see the [Technical Memorandum from Stillwater Sciences](#), as well as [Appendix II](#) of this report for additional details regarding the Omniscape modeling and the inputs (e.g., source and resistance layers) that have been developed for this metric.

## Results Discussion:

The mean connectivity pixel score for this metric was 1.7, yielding an overall metric score of 2. To arrive at this score, results of Omniscape modeling were interpreted and converted to a metric score on the standard five point scale. Pixels were classified based loosely on McRae et al. (2016) into the following categories: highly impeded, impeded, pinch-points or highly channeled, channeled, intensified, or diffuse, with intensified and diffuse classifications being the most desirable. Classifications are summarized in the table below and outlined in more detail in [Appendix II](#) and the [Stillwater Sciences Technical Memorandum](#).

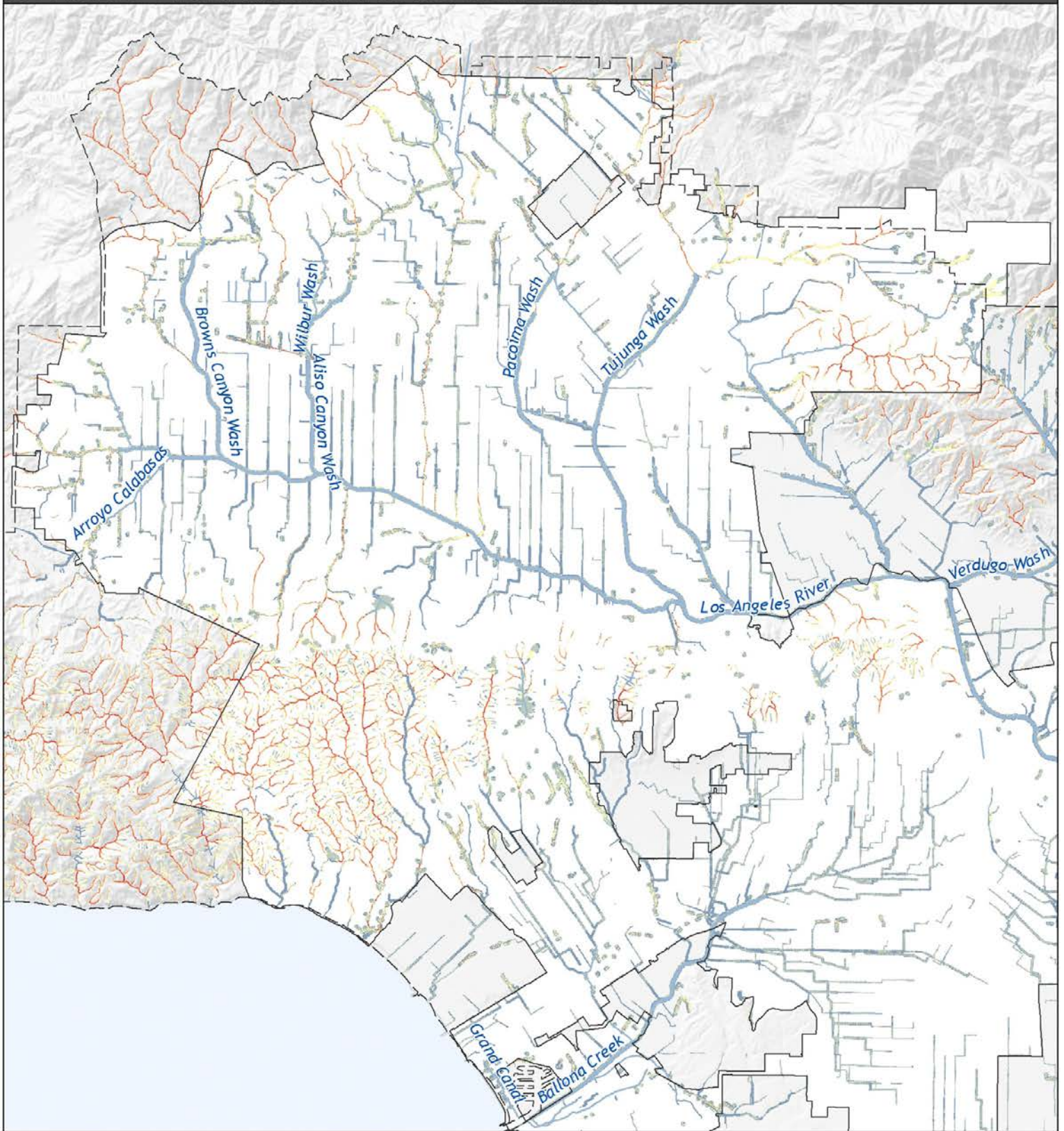
<b>Metric 1.1f Score</b>	<b>Connectivity Category</b>	<b>Category Description</b>
0	Highly Impeded	Highly impeded areas are largely defined by built features that are assumed to have a limited role in connectivity.
1	Impeded	Impeded areas provide limited value to connectivity and typically consist of built features or lower value landscapes. As these areas are often near high biodiversity value resources, they can be key for restoration work.
2	Pinch-points / Highly Channeled	Pinch-points are concentrated areas of connectivity within impeded or channeled zones. These areas often consist of vegetation, open-water, or streams surrounded by dense development.
3	Channeled	Channeled areas are concentrated areas of connectivity that are relatively constrained by surrounding urban land uses.
4	Intensified	Intensified areas are of relatively high connectivity value that consist of a mix of high-value habitat and built structures.
5	Diffuse	Diffuse areas are of the highest connectivity value. Diffuse areas provided connected stream and riparian corridors through high-value vegetation or water.

Generally, higher metric 1.1f scores reflect greater connectivity and more potential for species movement. However, riparian corridors naturally have relatively concentrated, or channeled, connectivity conditions along narrow ecological features.

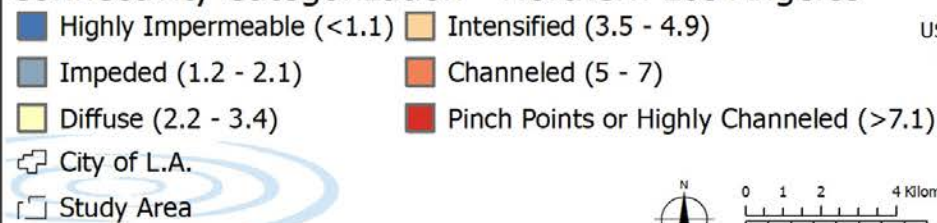
Therefore, even scores of two or three that occur within high quality natural stream corridors are of high value, despite falling in the middle of the scoring range. Changes, or projected changes, in 1.1f scores over time are key to monitoring connectivity change. Locations that see scores decline or improve over time should be inventoried and underlying causes for changes should be examined to better understand the overall health and connectivity of our stream and riparian corridors.

These results are the first published assessment of wall-to-wall connectivity for a buffered stream and riparian network in the City of Los Angeles at 30' resolution. To better understand how to interpret and utilize the results, modeling will be performed to assess the impact of planned channel enhancements via the ARBOR LA River Ecosystem Project and the LA River Fish Passage and Habitat Structures Design Project. Changes will be made as needed to ensure that the modeling and scoring approaches are appropriately quantifying connectivity changes.

# LOS ANGELES STREAM AND RIPARIAN AREA CONNECTIVITY

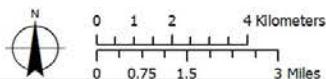
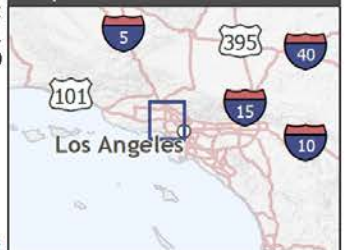


## Connectivity Categorization - Northern Los Angeles



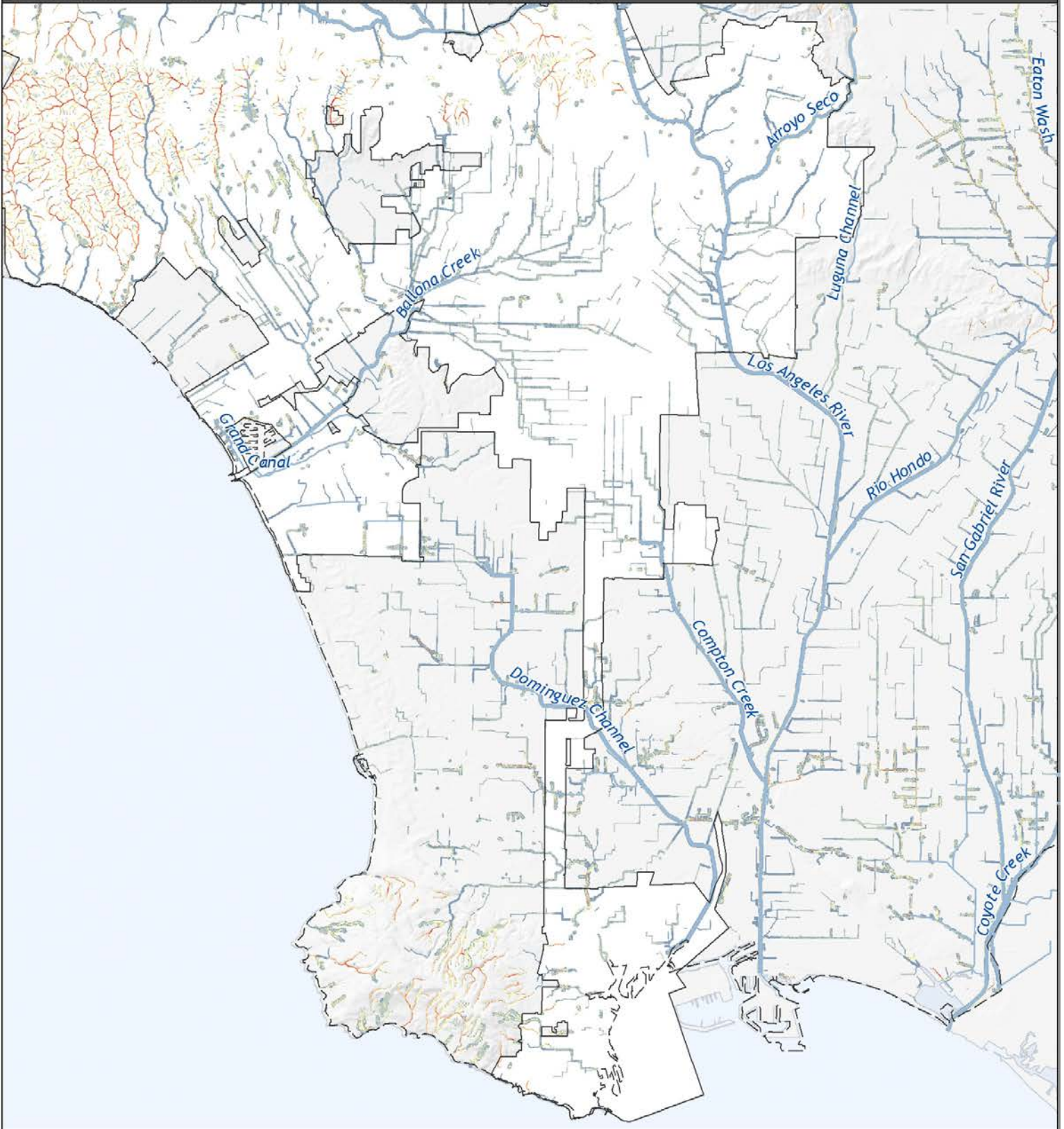
Map Sources:  
 Stream network:  
 USGS 2019, LA DPW 2021  
 Cities, roads: ESRI 2019

## Map Location



Stillwater Sciences

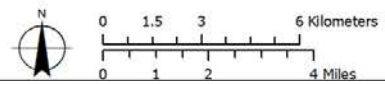
# LOS ANGELES STREAM AND RIPARIAN AREA CONNECTIVITY



## Connectivity Categorization - Southern Los Angeles

- Highly Impermeable (<1.1)
- Intensified (3.5 - 4.9)
- Impeded (1.2 - 2.1)
- Channeled (5 - 7)
- Diffuse (2.2 - 3.4)
- Pinch Points or Highly Channeled (>7.1)

- City of L.A.
- Study Area



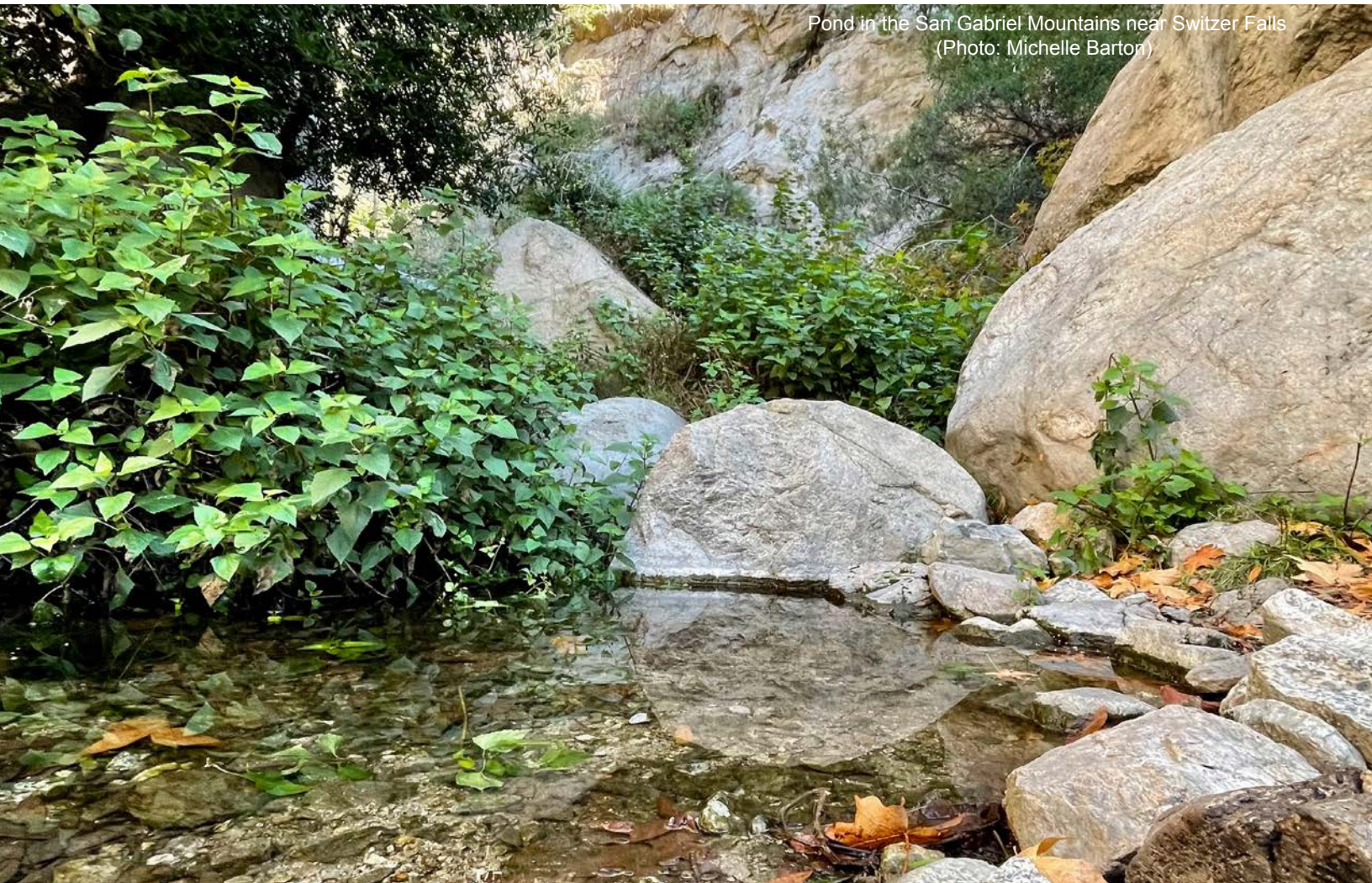
Map Sources:  
 Stream network: USGS 2019, LA DPW 2021  
 Cities, roads: ESRI 2019



Stillwater Sciences

## ***Management Implications:***

- Future assessments/improvements to the methodology for metric 1.1f should consider the habitat and movement needs of different taxa.
- As there are a variety of groups and initiatives working on stream and riparian connectivity issues in the greater LA area, a regional connectivity working group to coordinate connectivity needs, agree upon maps, and identify projects/actions across the region that can be collectively pursued to enhance regional connectivity, will be key to success.
- To the extent feasible, future connectivity assessments should include climate change considerations.
- Unlike other metrics in the LA City Biodiversity Index, metrics 1.1e and 1.1f require intensive computing power and specialized GIS experience. As such, when these metrics are reassessed in ten years, there will be a need for dedicated staff and/or a skilled subcommittee to assist in the creation of the input layers (source and resistance), Omniscape processing, and interpretation of results. Resources may be needed to access cloud computing and/or hire consultants.
- Additional, targeted efforts to interpret the results of this connectivity assessment are needed to analyze results and make recommendations on how this output can contribute to project design, planning considerations, and more.
- Future restoration, conservation, and connectivity planning for riparian areas should hinge on the 1.1f map, or future iterations of the map.
- These baseline results should not be seen as static or final, rather they should serve as a launching point for future evaluations, refinements, and updates as tweaks to scoring and other refinements will help advance strategic planning and implementation projects that broadly improve landscape-level connectivity.
- Updates to scoring, analysis, and interpretation of metric 1.1f should be done in tandem with updates to metric 1.1e. Scoring and refinement on the connectivity output for metrics 1.1e and 1.1f should continue.



Pond in the San Gabriel Mountains near Switzer Falls  
(Photo: Michelle Barton)

# 1.2A % OPEN SPACE WITH CHARISMATIC UMBRELLA SPECIES

**Score: 3 points - 30.1%**  
(28.83 mi<sup>2</sup> / 95.5 mi<sup>2</sup>)

Points	% of Natural Areas with Charismatic Umbrella Indicator Species
0	Charismatic umbrella species present in <10% of natural areas.
1	Charismatic umbrella species present in 10-20% of natural areas.
2	Charismatic umbrella species present in 20-30% of natural areas.
3	<b>Charismatic umbrella species present in 30-50% of natural areas.</b>
4	Charismatic umbrella species present in 50-75% of natural areas.
5	Charismatic umbrella species present in 75%+ of natural areas.

## Background:

This metric assesses the percentage of open space with charismatic umbrella indicator species. In other words, this metric provides a spatially explicit indication of biodiversity status by targeting and monitoring indicator fauna in large natural areas.

### Criteria/Definitions:

- Charismatic species - Species that are iconic, photogenic, or unmistakable. Species that the general public is familiar with or excited to encounter (and photograph).
- Umbrella species - Species whose presence suggests that a broad ecological community of plants and animals is present. Protecting umbrella species will likely result in the protection of other species.

- Natural-area dependent - Species that are typically found in natural areas.
  - Note: while these species can be observed outside of natural areas in parks/suburban areas, by definition they should rely on natural areas for food, breeding, etc.

In order to assess this metric, the first step was to establish a formal list of indicator species for the City of Los Angeles that are simultaneously 1) charismatic, 2) umbrella, and 3) natural-area dependent. In June 2021, LASAN formally released the first list of 37 charismatic umbrella indicator species for the City of Los Angeles (see table below). The list, which was developed in conjunction with the LA Biodiversity Expert Council, provides a focused set of birds, herptiles, mammals, and insects that the City can track over time. While most of the final indicators are species, in four instances, genera or families were used as the taxonomic identification at these higher hierarchical levels because the original specific identifications were not reliable via community science platforms. All selected [indicator species](#) are “avoider” species (i.e., species that don’t venture far from large natural areas), such as mule deer (*Odocoileus hemionus*), California quail (*Callipepla californica*), and mountain lions (*Puma concolor*). Their presence indicates the overall biodiversity status of large, open space areas, suggesting that areas possess a broad suite of habitat quality and connectivity functions, are of sufficient size, and have relatively limited urban edge effects.

LASAN’s Biodiversity Team will track observations of these species made on community science platforms (e.g., iNaturalist and eBird) over time to assess changes in biodiversity and habitat quality and to assess if species are thriving or declining, and what measures should be taken to ensure their continued survival.

Public engagement regarding the official list of indicator species began in earnest in summer 2021 when LASAN partnered with the Los Angeles Public Library to encourage Angelenos to observe, photograph, and map indicator species during the inaugural LA Bioblitz Challenge (see metric 2.3a report for additional information on the LA Bioblitz Challenge). Ultimately, participants observed 29 indicator species including the spotted towhee (*Pipilo maculatus*), bobcat (*Lynx rufus*), and the endangered El Segundo blue butterfly (*Euphilotes battoides allyni*) as part of the project.

Sideblotched lizard (*Uta stansburiana*)  
(Photo: Nurit Katz)



Spotted towhee (*Pipilo maculatus*)  
(Photo: Nurit Katz)

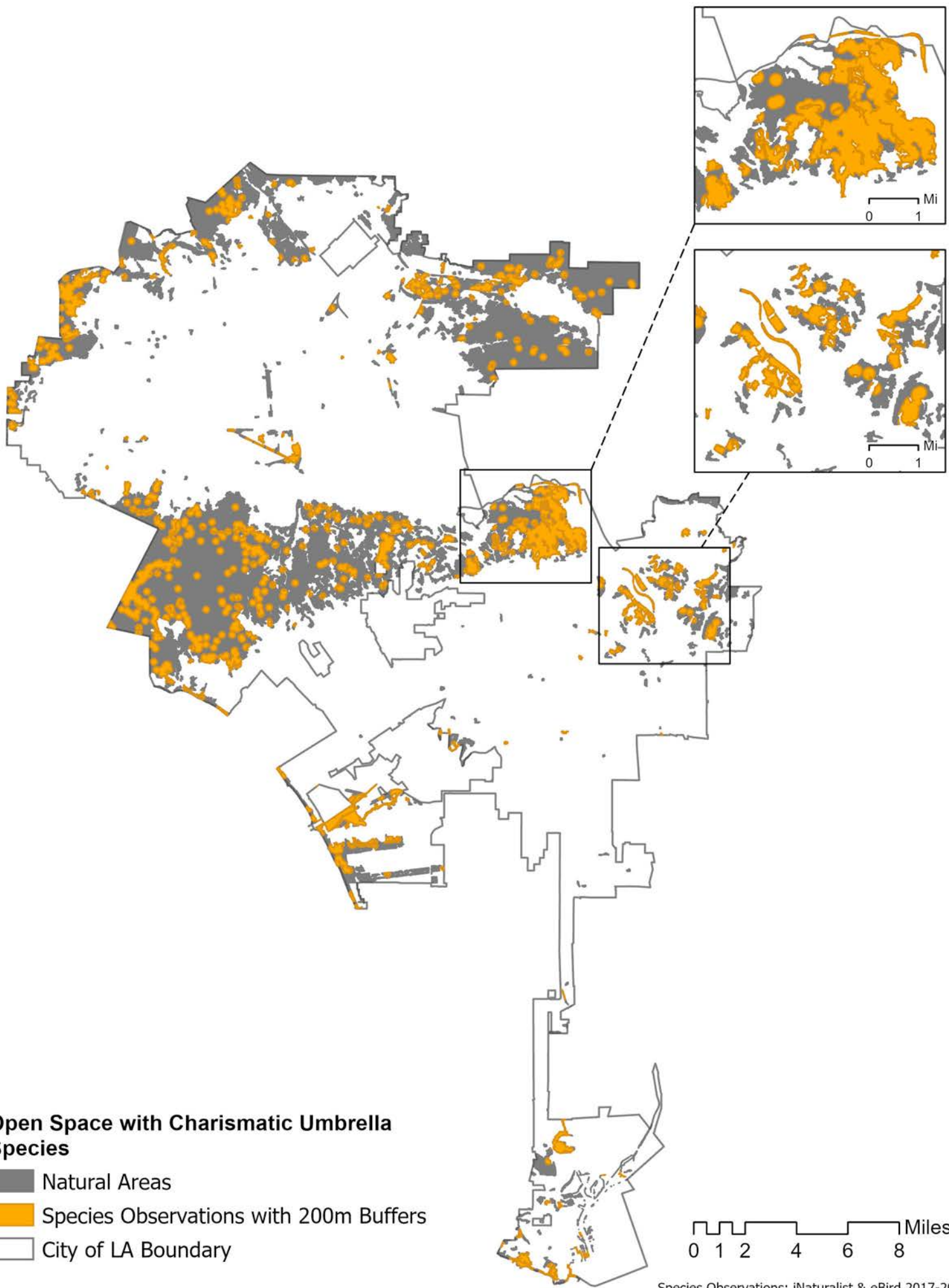


Gopher snake (*Pituophis catenifer*)  
(Photo: Dan Cooper)



Baja California tree frog (*Psuedacris hypochondriaca*)  
(Photo: Dan Cooper)

<b>CHARISMATIC UMBRELLA INDICATOR SPECIES</b>		
<b>Group</b>	<b>Scientific</b>	<b>Common</b>
<b>Amphibians</b>	<i>Anaxyrus boreas</i>	Western toad
	<i>Batrachoseps nigriventris</i>	Black-bellied slender salamander
	<i>Pseudacris hypochondriaca</i>	Baja California tree frog
<b>Birds</b>	<i>Agelaius phoeniceus</i>	Red-winged blackbird
	<i>Ardea herodias</i>	Great blue heron
	<i>Bubo virginianus</i>	Great horned owl
	<i>Buteo jamaicensis</i>	Red-tailed hawk
	<i>Callipepla californica</i>	California quail
	<i>Catherpes mexicanus</i>	Canyon wren
	<i>Circus hudsonius</i>	Northern harrier
	<i>Geococcyx californianus</i>	Greater roadrunner
	<i>Lophodytes cucullatus</i>	Hooded merganser
	<i>Melanerpes formicivorus</i>	Acorn woodpecker
	<i>Pipilo maculatus</i>	Spotted towhee
	<i>Sialia mexicana</i>	Western bluebird
	<i>Spatula cyanoptera</i>	Cinnamon teal
	<i>Sturnella neglecta</i>	Western meadowlark
<b>Invertebrates</b>	<i>Ammopelmatus</i> sp. (Genus)	North American Jerusalem crickets
	<i>Bombus</i> sp. (Genus)	Bumblebees
	<i>Euphilotes battoides allyni</i>	El Segundo blue butterfly
	Mutillidae (Family)	Velvet ants
	<i>Pogonomyrmex</i> (Genus)	Harvester ants
	<i>Anthocharis sara</i>	Sara orangetip
	<i>Apodemia virgulti</i>	Behr's metalmark
	<i>Callophrys dumetorum</i>	Bramble green hairstreak
	<i>Limenitis lorquini</i>	Lorquin's admiral
<b>Mammals</b>	<i>Lynx rufus</i>	Bobcat
	<i>Neotoma fuscipes</i>	Dusky footed woodrat
	<i>Odocoileus hemionus</i>	Mule deer
	<i>Puma concolor</i>	Mountain lion
	<i>Urocyon cinereoargenteus</i>	Gray fox
<b>Reptiles</b>	<i>Actinemys marmorata</i>	Western pond turtle
	<i>Masticophis flagellum</i>	Coachwhip snake
	<i>Crotalus oreganus</i>	Western rattlesnake
	<i>Lampropeltis californiae</i>	California kingsnake
	<i>Pituophis catenifer</i>	Gopher snake
	<i>Uta stansburiana</i>	Sideblotched lizard



**Open Space with Charismatic Umbrella Species**

- Natural Areas
- Species Observations with 200m Buffers
- City of LA Boundary

0 1 2 4 6 8 Miles

Species Observations: iNaturalist & eBird 2017-2020

California quail (*Callipepla californica*)  
(Photo: Nurit Katz)



Western pond turtle (*Actinemys marmorata*)  
(Photo: Nurit Katz)

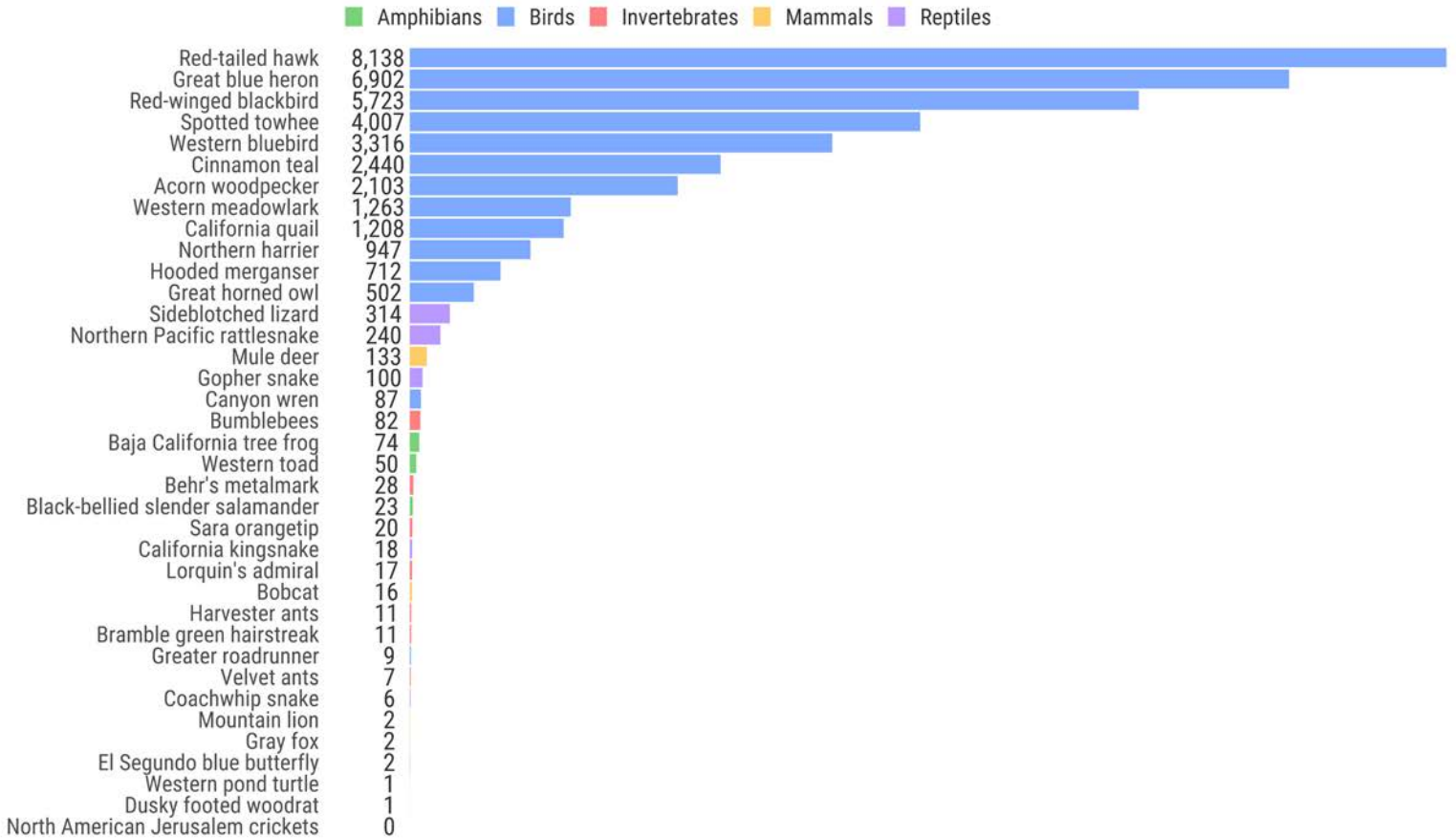


Mule deer (*Odocoileus hemionus*)  
(Photo: Nurit Katz)



Great horned owlets (*Bubo virginianus*)  
(Photo: Nurit Katz)

## Charismatic Umbrella Species Count in Natural Areas of LA City



### Results Discussion:

The first assessment of this metric suggests that indicator species are only present in 30.1% of natural areas, suggesting limited coverage. This limited coverage is likely due to the fact that large swaths of natural areas are rugged, remote, and inaccessible to the general public (e.g., western portions of the Santa Monica Mountains). Still, raising awareness of the 1.2a indicator species and stressing the importance of comprehensively sampling natural areas should drive up both the number of observations of indicator species and the percentage of natural areas that have observations of indicator species.

While the City list of indicator species covers mammals, birds, herptiles, and insects, the number of observations for various bird indicator species vastly outweighs all other taxa (see chart). The red-tailed hawk (*Buteo jamaicensis*) was the most observed species with a total of 8,138 observations in natural areas, followed by the great blue heron (*Ardea herodias*) with 6,902 observations, and the red-winged blackbird (*Agelaius phoeniceus*) with 5,723. The least observed species were the dusky footed woodrat (*Neotoma fuscipes*), with one observation in natural areas, and the North American Jerusalem cricket (*Ammopelmatus* sp.), with zero.

It is interesting to note that while the indicator species tracked for this metric are meant to be natural-area dependent, many of them are regularly observed by community scientists outside of natural areas. The percentage of observations found in natural areas when compared to Citywide observations varies species-by-species, and ranges from 5.7% for the gray fox (*Urocyon cinereoargenteus*) up to 91.7% for the bramble green hairstreak (*Callophrys dumetorum*). With species like the gray fox, where only a fraction of observations were in natural areas, results could either be a product of community science observation biases or evidence of how some wildlife is adapting to and utilizing urban settings in addition to more natural ones, or a combination of both.

While a handful of cities around the world and different U.S. government agency publications (e.g., National Park Service and US Fish & Wildlife Service) refer to tracking charismatic indicator species, published lists of target species are not easily accessible and the lists appear to be used primarily by scientists/researchers. The City of Los Angeles has broken new ground by publishing a [list of charismatic umbrella species](#) in a way that actively engages the public and then using the community-generated data



California Quail



Lorquin's admiral



Bobcat



Western pond turtle



# Biodiversity Indicator Species:

## A Guide to the City of Los Angeles' Charismatic Umbrella Species



Gray fox



Bumblebee



Baja California tree frog



Western bluebird

to track and monitor biodiversity over time. Individual habitat suitability models for all 37 species, seven group-specific models, and a composite habitat suitability model showing suitable habitat for all species have been drafted in partnership with UCLA. While the resulting maps are preliminary, and should continue to be refined, they have incredible value as analytic tools. Comparing habitat suitability models to community science observations can help scientists understand where it would be most beneficial to do on-the-ground monitoring for indicator species or where it would make sense to strategically plan and promote community science observations via planned blitzes. The all-species suitability model can be used to select sites for restoration, enhancement, and or connectivity work.

Changes to charismatic wildlife species are always interesting to the general public and are therefore useful for education and outreach. Additionally, changes to charismatic wildlife species are easier to grasp by laypeople, and thus, are useful for raising awareness and facilitating beneficial change. To further increase public interest in LA's indicator species, a beautiful [booklet](#) with information on all 37 indicator species was created in partnership with UCLA students in a practicum course. The [Biodiversity Indicator Species: A Guide to the City of Los Angeles' Charismatic Umbrella Species](#) booklet includes information on habitat, diet, predators, and behaviors as well as full page photos, observation tips, and fun facts.

## ***Management Implications:***

- The effectiveness of the selected 1.2a indicator species should be evaluated over time in terms of:
  1. Public engagement with individual species,
  2. Species responses to management outcomes or events like wildfires.
- The LASAN Biodiversity Team should continue working with LAPL's Neighborhood Science program to promote educational resources on the City's charismatic umbrella species.
- In the future, habitat suitability models could be refined to better understand how current observation distribution patterns compare with suitable habitat.
- Monitoring and/or management budgets should be established and/or increased to encourage professional, comprehensive surveys of the City for 1.2a indicator species in natural areas and to generally assess ecosystem health.
- Future public engagement efforts should:
  - Aim to drive up observations of non-bird indicator species, and
  - Encourage comprehensive assessment of natural areas for indicator species.
- The LASAN Biodiversity Team should create projects on platforms like [Zooniverse](#) and [Scistarter](#) that focus on indicator species.
- To more formally assess all natural areas for presence of indicator species, a combination of formal surveys, camera traps, and/or eDNA sampling may be needed to supplement community science data



Western meadowlark (*Sturnella neglecta*)  
(Photo: Nurit Katz)

# 1.2B NATIVE SPECIES PRESENCE IN URBAN AREAS

**Score: 2 points - 1.97**

Points	Urban Association Index Score
0	Urban Association Index average score = 0 (urban-tolerant species).
1	Urban Association Index weighted average score = 1.
<b>2</b>	<b>Urban Association Index weighted average score = 2.</b>
3	Urban Association Index weighted average score = 3.
4	Urban Association Index weighted average score = 4.
5	Urban Association Index weighted average score = 5 (natural area-dependent species observed).

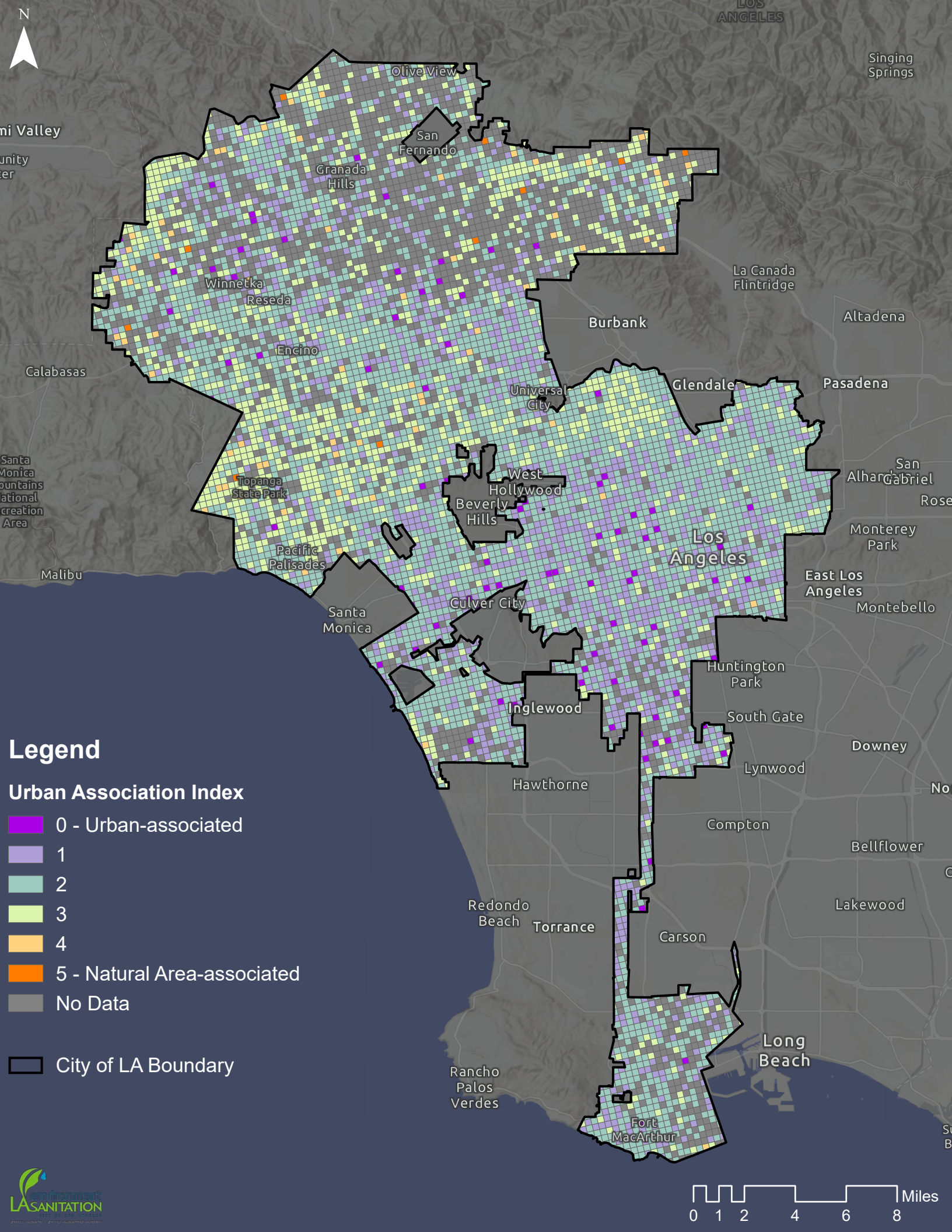
## Background:

Urbanization is a serious threat to biodiversity and a driver of species loss in the City of Los Angeles and across the globe. When natural areas and open space that have traditionally provided habitat to a wide array of plants and animals are urbanized, or developed and converted to other uses, the ecological community will respond and distribution patterns of plants and animals will likely shift. Typically, urbanization is detrimental to native species, and many will respond by avoiding developed, urban areas. However, it is important to note that some bird species, like the Cooper’s hawk (*Accipiter cooperii*), dark-eyed junco (*Junco hyemalis*), and Allen’s hummingbird (*Selasphorus sasin*), have successfully adapted to the urban environment and exploited conditions to establish new ecological niches (Bressler, et al., 2020, Cooper et al., 2020). As cities continue to urbanize, tools are needed to assess how nature responds over time. Additional tools can shape the way in which urbanization and future development/re-development is implemented, so that urban areas become more friendly to native species over time.

This metric has been designed to be sensitive to changes in the distribution of native wildlife species in urban areas over time. As native wildlife exhibit varying levels of urban tolerance, understanding species’ tolerance to urbanization will be key to successful conservation of biodiversity in cities (Cooper et. al., 2020). As species respond differently to the array of environmental factors in developed areas (e.g., light, noise, etc.) a baseline understanding of the urban tolerance of different native species must be established. To do this, an Urban Association Index was developed in partnership with UCLA. To create and assess the index, the following steps were taken (see [Appendix II](#) for additional details and data):

- A native species database was developed.
  - Target taxonomic groups were selected with expert input to represent species groups that are generally well-detected and well-surveyed by community scientists.
- An “urban intensity layer” was developed for southern California by combining three correlated variables that represent different urban effects: noise, nighttime light, and impervious surfaces.
- Each native species in the database was assigned an urban association, or affinity, score based on the correlation of observational data with the urban intensity layer.
- Native species occurrence data for the City of Los Angeles was spatio-temporally thinned and filtered to limit biases, then matched with urban affinities.
- The average urban association score was calculated for individual ¼ mile pixels.
- A Citywide urban association score was calculated by averaging the urban tolerance scores of all pixels across the City.

Tracking how both the distribution of native species across the City of Los Angeles and the urban tolerance of individual species change over time provides important information to biodiversity researchers, indicating changes in habitat quality or availability as well as adaptation to unique urban environments. Further, this metric will help assess whether ecological communities are distributed equally across all areas of the City, or if biodiversity is primarily constricted to some areas of the city, such as large, natural areas.



## Legend

### Urban Association Index

- 0 - Urban-associated
- 1
- 2
- 3
- 4
- 5 - Natural Area-associated
- No Data

City of LA Boundary



## Results Discussion:

The mean of the Urban Association Index created for this metric was 1.97, yielding an overall score of 2. This score suggests that, in general, the City of Los Angeles is home to a diverse set of species with varying levels of urban tolerance, including many which are inhabiting or thriving in urban areas. If the score improves over time, and the overall index goes from a score of 2 to a score of 3, it would indicate a key tipping point where species in aggregate have switched from being urban-associated to urban avoidant. A score of 5, which would suggest that species in aggregate are more natural area associated, would imply that the City has conserved, restored, and enhanced habitat across the entire City in a manner that appropriately supports urban-avoidant species.

In order to perform this assessment, a database of 967 native, terrestrial species (within the target taxa groups shown in the table below) was created and vetted by local experts for the southern California region. Each species with sufficient observational data (n=511) was assigned an urban affinity score. A large number of species (n=456) did not have enough information, but may be able to have scores assigned in the future. Affinity scores are continuous

and can be negative or positive, with 0 indicating no relationship to urban intensity, negative indicating urban avoidance, and positive indicating urban attraction. For reference, the urban-adapted species mentioned above received the following scores:

- Cooper's hawk (*Accipiter cooperii*) → 0.19
- Dark-eyed junco (*Junco hyemalis*) → **-0.03**
- Allen's hummingbird (*Selasphorus sasin*) → 0.29

Conversely, known urban avoiders, like the Western toad (*Anaxyrus boreas*), Sara orangetip (*Anthocharis sara*) both had negative scores of **-0.17** and **-0.35**, respectively.

The overall average urban affinity score for all 511 species assessed was **-0.21**, suggesting that fauna in the Los Angeles region tend to avoid urban areas. The average scores within broad taxonomic groups is detailed in the table below. Snails are the most urban associated group with a score of 0.24, and the only taxa group with an average score above zero. Lepidoptera and Mammals were the most urban-avoidant taxa groups with average group scores of **-0.40** and **-0.39**, respectively.



View of Downtown Los Angeles from Elysian Park  
(Photo: Michelle Barton)

<b>Taxa Group</b>	<b>Average Urban Affinity Score</b>
Bees	-0.16
Beetles	-0.08
Birds	-0.15
Cicadellidae	-0.08
Flies	-0.11
Herptiles	-0.34
Lepidoptera	-0.40
Mammals	-0.39
Odonates	-0.20
Orthoptera	-0.37
Snails	0.24
Spiders	-0.14

While understanding the overall City score is useful for assessment of the metric, visualizing the score in individual quarter mile pixel patterns can discern patterns of urban association of species across the City. As expected, pixels in large, intact natural areas (e.g., the Santa Monica Mountains, Hansen Dam, Santa Susanna foothills, etc.) have high average scores of 3, 4, and 5 as observations are dominated by species that are more natural area associated (i.e., urban avoiders). Overall, the average pixel score for natural areas (i.e., pixels defined as  $\geq 33\%$  natural areas per metric 1.1a) is 2.41, while the average pixel score for non-natural areas is lower at 1.84. Interestingly, patterns across the LA Basin in urban and suburban areas display a high degree of variability, without a strong pattern, suggesting that other local habitat features may be influencing the pattern of native fauna across these areas of the City. However, it is important to note that these patterns may also be due in large part to the inherent biases of community science data.

The City of Los Angeles exhibits incredible species richness in natural areas and open space, but also has areas that are highly developed and devoid of native habitat, resulting in an unequal distribution of biodiversity. This unevenness is important, because it exacerbates existing inequities in access to biodiversity and to natural areas (Cooper et. al., 2021). Given the uneven distribution of biodiversity, one might also speculate that there is a lack of contiguity in habitat patches across the City. Over time, trends in how this metric changes should be carefully examined in conjunction with the results of connectivity (metrics 1.d- 1.1f) and equitable access to nature (metric 2.1a).

Efforts to reverse habitat degradation across the urban matrix, to improve habitat quality in neighborhoods, to preserve existing pockets of native habitat that harbor native species, and to create meaningful corridors and connections that native species can use to traverse the City are vital if the City is to counteract urban species loss and achieve its goal of no-net loss of native biodiversity. These changes will require an immense amount of coordination, resources, and policy support. These efforts will be bolstered as progress is made on governance metrics 3.1a, Biodiversity Vision/Action Plan, and 3.1b, % Departments with Biodiversity Programs & Policies. A future biodiversity action plan, as well as the departmental biodiversity plans prescribed for metric 3.1b, should address the threats and needs of wildlife species across the urban association spectrum, providing protection for urban avoiders and urban-tolerant species alike.

The comprehensive and unique approach piloted by the LASAN Biodiversity Team and UCLA to assess and track the distribution of native wildlife species in urban areas over time can and should be applied to other cities and jurisdictions in the southern California region. This approach can be used for other urban areas across the country and around the world as the global community works to stem biodiversity loss.



Mourning dove (*Zenaida macroura*)  
(Photo: Graham Montgomery)

Bushtit (*Psaltriparus minimus*)  
(Photo: Graham Montgomery)



### ***Management Implications:***

- While community science observation data provides a cost-effective way to monitor and track changes to biodiversity over time, multiple limitations and sampling biases exist. To correct for these issues, the Biodiversity Team and Biodiversity Expert Council should promote more even community science sampling of all native wildlife species throughout neighborhoods and natural areas present across the City as additional data points will yield more precise urban affinity scores and analysis products.
- Urban affinity scores for individual wildlife species should be reassessed approximately once a decade, as benchmark assessments of this metric are performed, as species dynamics and interactions with the urban environment may shift over time.
- The patterns of urban tolerance on the official 1.2b metric map should be correlated with the underlying urbanness layer to map and understand patterns/opportunities for habitat restoration.
- The Interdepartmental Biodiversity Team and the Biodiversity Expert Council should work collectively to pursue projects, initiatives, and policies that lead to a more even distribution of native wildlife species across the entire City, ensuring equitable access to nature, increasing habitat quality, and bolstering connectivity.
- The Biodiversity Team should work in partnership with the Interdepartmental Biodiversity Team and the Biodiversity Expert Council to develop Biodiversity Design Guidelines that will help protect high-quality habitat and rewild degraded/lost habitat across the City.

# 1.2C SPECIES OF CONSERVATION CONCERN GAINED OR LOST

**Score: N/A (Baseline)**

Points	% of Suitable Sensitive Species Still Present
0	0% (No sensitive species remain)
1	1 – 10%
2	10 – 25%
3	25 – 50%
4	50 – 99%
5	100%

## Background:

Due to urbanization, California has the largest number of threatened and endangered species and species of special concern in the contiguous United States. The City of Los Angeles area is believed to be home to 108 species of conservation concern that have protection via State and Federal agencies, like the California Department of Fish and Wildlife (CDFW) and the U.S. Department of Fish and Wildlife (USFWS). These species merit protection under various environmental laws including, but not limited to, the California Endangered Species Act, the Federal Endangered Species Act, the California Environmental Quality Act (CEQA), and the Migratory Bird Treaty Act.

Initially, metric 1.2c was intended to track a subset of threatened and endangered indicator species over time; however, the Biodiversity Expert Council felt strongly that this metric should track the status of all species of conservation concern in the City of LA, rather than a subset. Therefore, a qualified subcommittee of the Biodiversity Expert Council set out to create the City’s first official Inventory of Species of Conservation Concern. The goal was to develop a baseline Inventory of Species of Conservation Concern that includes species that have been confirmed within the City of LA limits. The inventory includes species that have been observed

since 1990 and are therefore thought to currently exist within the City limits.

The [resulting inventory](#) is largely based off of a comprehensive export from the CDFW California Natural Diversity Database (CNDDDB). To be as comprehensive as possible, the definition of “species of conservation concern” for purposes of this metric, and the resulting inventory, includes species that are listed under the Federal and/or State Endangered Species Acts, as well as species that have other special statuses/rarity rankings (e.g., State Rank, Global Rank, Rare Plant Rank, etc.) from State and Federal Agencies (e.g., CDFW Species of Conservation Concern, CDFW Watch List, etc.). After the Citywide baseline inventory was established, efforts were made to develop ecotope-specific inventories of species of conservation concern. However, given the dearth of data available on species of conservation concern in the LA area, it was deemed too complex to determine which species of conservation concern are plausible in each of the 16 ecotopes. Therefore, coarser assignments to the following four ecotope types were made:

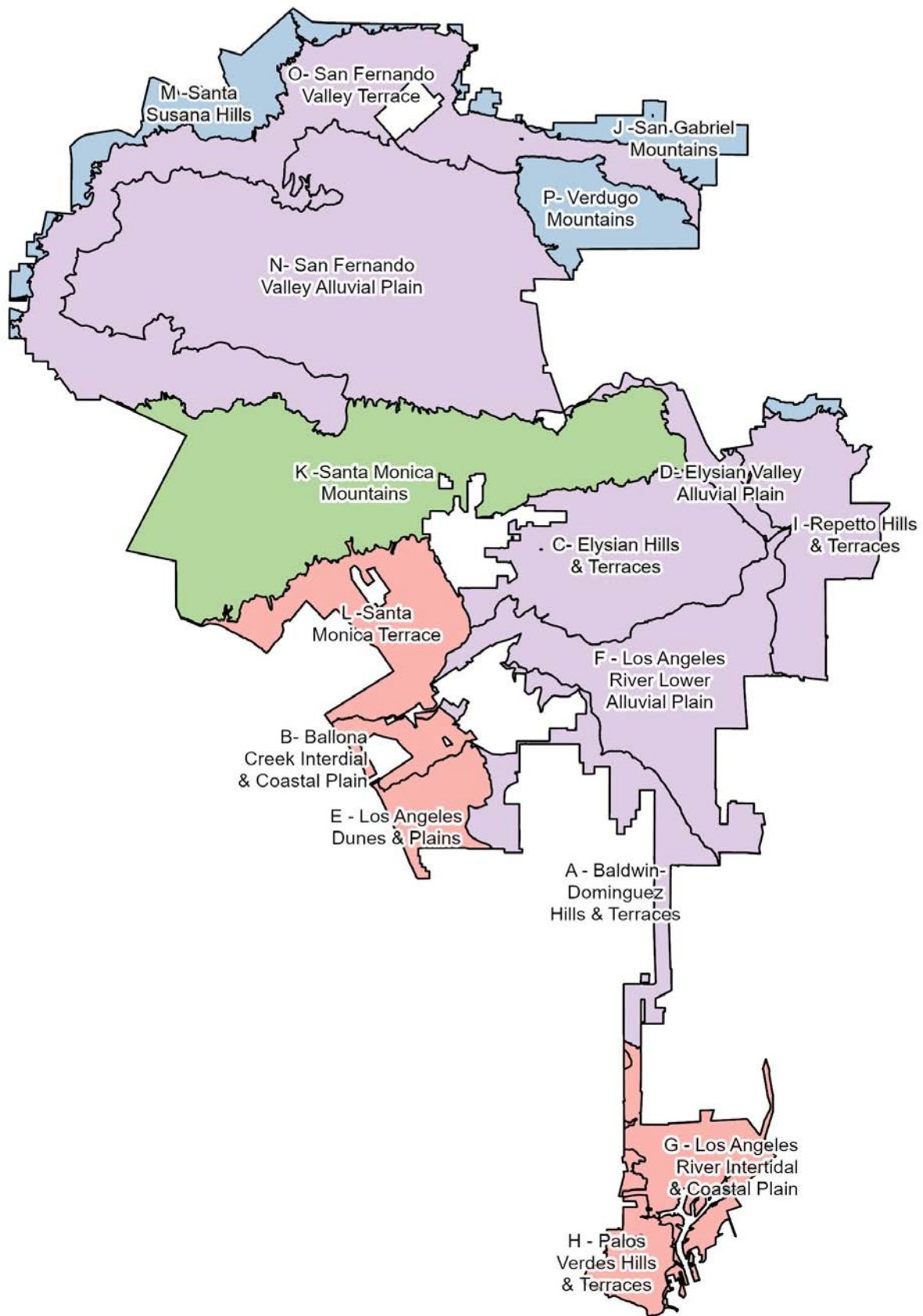
- [Coast](#) (i.e., bluffs, estuaries, dunes, beach),
- [Foothills](#) (i.e., San Gabriel Mountains, Santa Susanas),
- [Hills](#) (i.e., Santa Monica Mountains), and
- [Valleys](#) (i.e., San Fernando Valley, LA Basin).

The Citywide Inventory of Species of Conservation Concern, as well as the sub-inventories for each of the four ecotope types are included in [Appendix II](#).

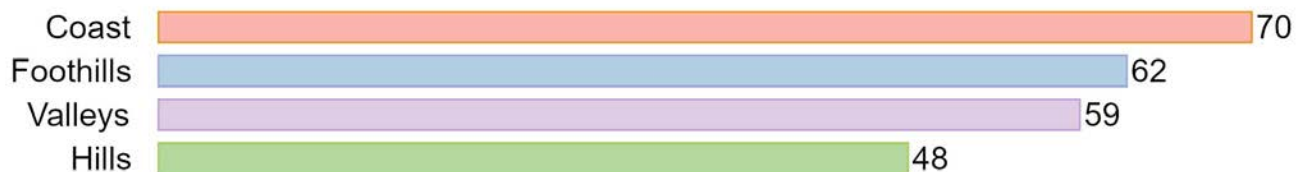
Over time, metric 1.2c will track how the abundance and distribution of all species of conservation concern change in the City of LA and in the four ecotope types. As loss or recovery of protected flora and fauna is a major indicator of alignment with the goals of the Endangered Species Act, this metric will serve as a barometer for how well the City is providing for species of conservation concern over time.

## Results Discussion:

The [Inventory of Species of Conservation Concern](#) that resulted from the baseline assessment of this metric will be a valuable asset to the City of LA. In addition to enabling assessment of this metric, metric 1.2c, the resulting product will serve as the official Inventory of Species of Conservation Concern for the City (see metric 3.2d) and provide a launching point to organize monitoring and management efforts for special-status species.



# of Species of Conservation Concern and Ecotope Type Associations



While establishing a baseline Species of Conservation Concern Inventory for the City is very exciting, it should be acknowledged that this inventory is imperfect, as, unfortunately, comprehensive occurrence data for species of conservation concern is sorely lacking. Community science observations of species of conservation concern are of little help as these species, which are by definition rare, are infrequently observed by the general public, and when they are, the exact coordinates are often obscured. CDFW's CNDDDB is more comprehensive, and a better overall resource, but it also has limitations due to its relatively small user-base and its opportunistic, infrequent data updates.

Further, the effort to categorize species of conservation concern by ecotope type has yielded four sub-inventories that can and should be monitored over time. The sub-inventories, shown in full in [Appendix II](#), have the following:

- Coast Ecotopes: 70 species
- Foothill Ecotopes: 62 species
- Hill Ecotopes: 48 species
- Valley Ecotopes: 59 species

The sub-inventories will be used to gauge progress on this metric when the next benchmark assessment of the LA City Biodiversity Index is made in 2030. It should be noted that the established inventory will need to be refreshed periodically to ensure that both the species included are still confirmed as present or thought to be plausible in the City and that previously excluded species are still implausible in the City. In other words, species that have been assessed, but ultimately left off of the official inventory for various reasons, should be reassessed periodically for inclusion in the inventory as climate-change induced range shifts, management interventions, or other environmental changes may mean that these species could be found within the City limits. In some cases, species left off of the inventory have been extirpated from the City limits. Sightings/reintroductions of species considered extirpated would be a major conservation success for the City and contribute positively to the effort to achieve no-net loss of native biodiversity.

### ***Management Implications:***

- In the future, if data resolution allows, 16 ecotope-specific inventories of species of conservation concern should be created and ecotope-specific monitoring or assessments should be performed.
- Partnerships with State agencies, Federal agencies, and other local entities (e.g., LA County) should be pursued to bolster future monitoring efforts for all species of conservation concern listed on the official City inventory.
- Detailed ecotope type assessments or habitat suitability modeling exercises should be performed to assess potential habitat for species on the inventory.
- As many species on the inventory are climate-sensitive species, occurring near City mountain tops or along coastlines, and are vulnerable to the impacts of climate change, adaptive management approaches should be applied

El Segundo blue butterfly (*Euphilotes battoides allyni*)  
(Photo: Dan Cooper)



# 1.3A URBAN EDGE EFFECTS ON NATURAL AREAS

**Score: 2 points - 29% of Citywide maximum**

Points	Night Lighting % of Score Range
0	Night lighting in buffer areas is > 75% of the highest score observed in the City
1	Night lighting in buffers is 50-75% of the highest score for the City
<b>2</b>	<b>Night lighting in buffers is 25- 49% of the highest score for the City</b>
3	Night lighting in buffers is between 15-24% of the highest score for the City
4	Night lighting in buffers is between 5-14% of the highest score for the City
5	5 points: night lighting in buffer areas is <5% of the highest score for the City

## Background:

This metric assesses urban edge effects, defined as changes in population or community structure that occur at the edge of an intact habitat patch. In the urban environment, these edges are often part of the wildland-urban interface (WUI), where urban development and undeveloped wildland vegetation overlap and intermix (Radeloff et al., 2017).

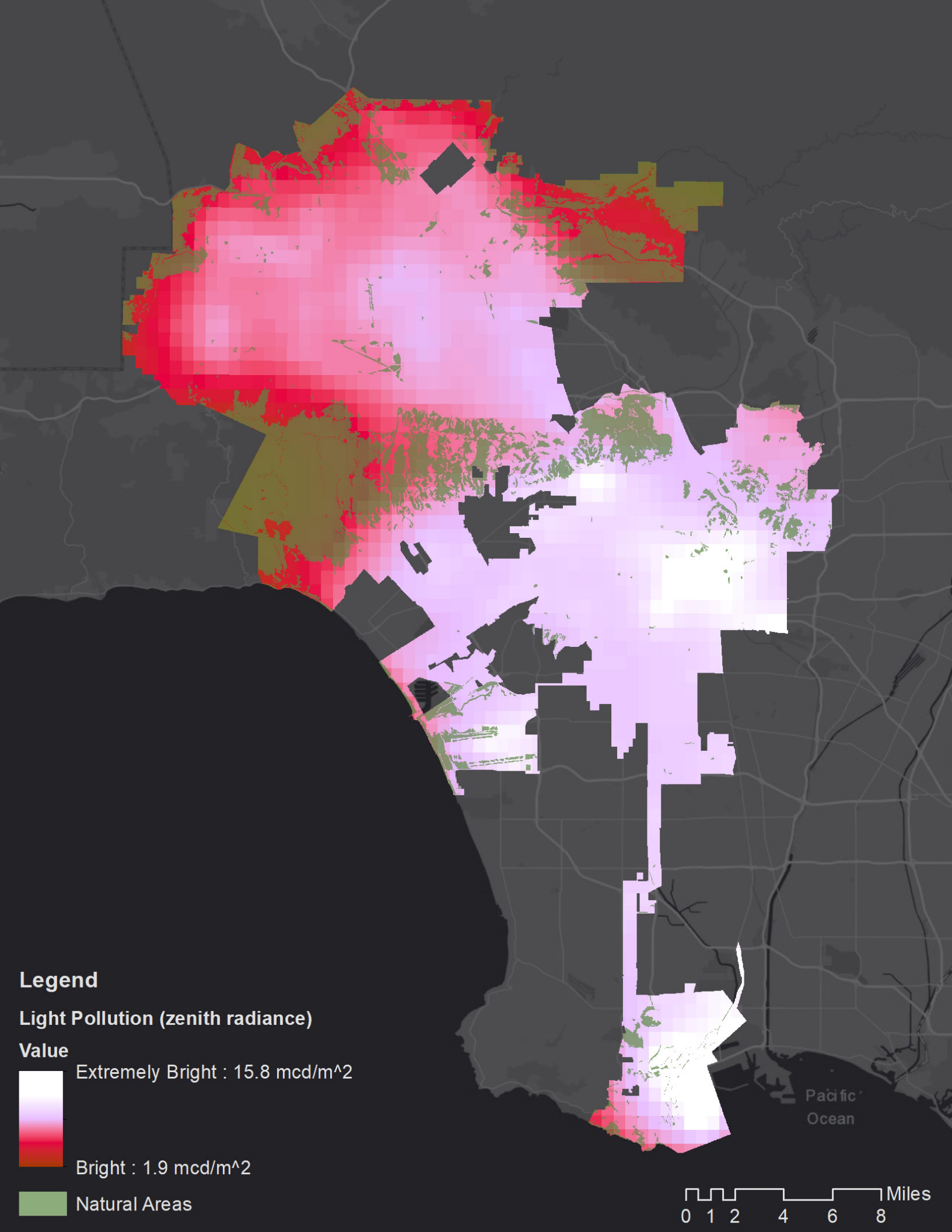
This metric uses artificial night lighting as a proxy to assess the extent of edge effects on natural areas. While an imperfect assessment of edge effects, artificial night lighting is a metric that can easily be monitored. This assessment uses data from the New World Atlas of Artificial Sky Brightness; however for comparisons of the extent of night lighting over time, Visible Infrared Imaging Radiometer Suite (VIIRS) Day-Night Bands (DNBs) could be analyzed.

Artificial night lighting has consequences for non-human species and ecosystems. Ecological light pollution by definition is artificial light pollution that disrupts ecosystems and can alter animal behaviors, such as mating, foraging, and hunting. Ecological light pollution can include glare, increased

illumination, duration and areal coverage of illumination, and fluctuations in lighting. Sources are varied, but can include lighted buildings, security lights, vehicle lights, streetlights, and more. Ecological light pollution can contribute to four major categories of ecological disruption: 1) attraction and disorientation, 2) loss of connectivity, 3) interference with pollination and foraging, and 4) circadian rhythm disruption (Rich & Longcore, 2006).

## Results Discussion:

The score received (2 out of 5) suggests that LA's natural areas are highly impacted by edge effects. Given that the City of Los Angeles is a highly developed urban metropolis with over four million people, this result is not surprising. However, raising awareness of the consequences of habitat fragmentation and edge effects is important so that the City and all Angelenos can take actions to mitigate edge effects and reverse fragmentation trends. There are many meaningful actions, like limiting maximum lumens and better controlling the direction of artificial lighting, that can be taken to mitigate edge effects and reduce ecological light pollution in sensitive areas as outlined in the next section.



**Legend**

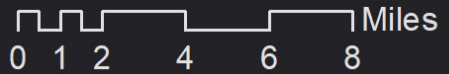
**Light Pollution (zenith radiance)**

**Value**  
Extremely Bright : 15.8 mcd/m<sup>2</sup>

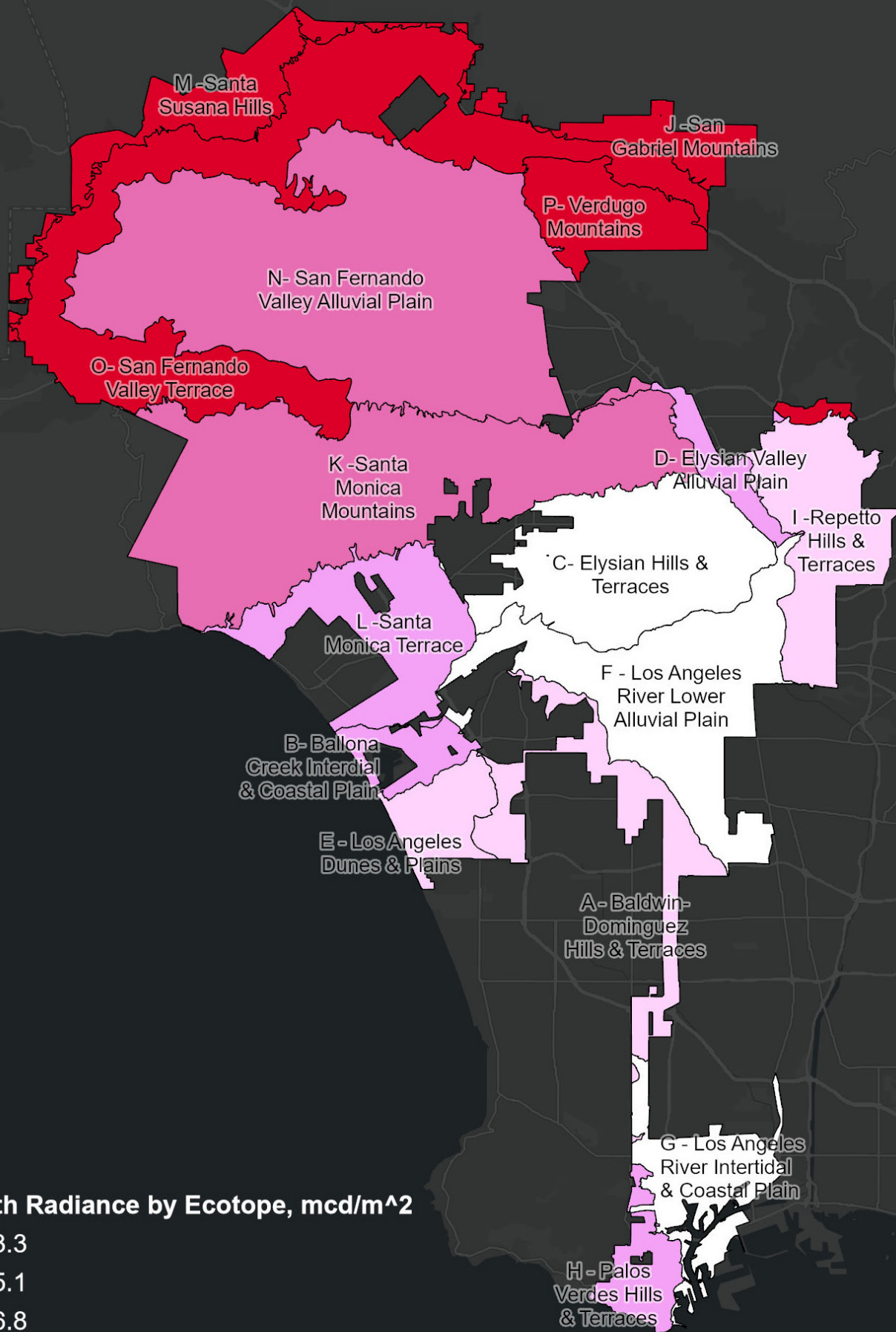


Bright : 1.9 mcd/m<sup>2</sup>

Natural Areas



Pacific Ocean



**Legend**

**Mean Zenith Radiance by Ecotope, mcd/m<sup>2</sup>**

- 2.0 - 3.3
- 3.4 - 5.1
- 5.2 - 6.8
- 6.9 - 8.5
- 8.6 - 10.5



Artificial lights in Los Angeles  
(Photos: Michelle Barton)



## ***Management Implications:***

- Reduce ecological light pollution across the City, particularly in areas buffering natural areas.
  - Encourage expanded application of some of the proposed lighting standards in the Department of [City Planning's Wildlife Ordinance](#), particularly to properties in natural areas or in the Wildland Urban Interface.
  - General lighting recommendations (for public and private property):
    - Limit lumens: Limit maximum lumens in the City by area as recommended by the International Dark-Sky Association (DSA, 2002):
      - Residential = 5,500 lumens for single family residences or 10,000 lumens/acre for larger residential properties,
      - Commercial and industrial = 100,000 lumens/acre.
    - Direction: Shield lights and direct lighting downwards (i.e., avoid unnecessarily reflecting light upward).
    - Color: Encourage the use of warmer lights, particularly "warm-white" or filtered LEDs in outdoor spaces (i.e., not blue-rich LEDs). Discourage use of outdoor lights with a color correlated temperature, or CCT, higher than 3,000 K Citywide or higher than 2,700 K (i.e., the color of an incandescent bulb) in more sensitive areas (e.g., the WUI). Lower CCT (<2200 K) is preferable in environmentally sensitive areas.
    - Duration: Prohibit searchlights and outdoor lighting that flashes near natural areas. Encourage motion-sensitive lighting to limit duration of lighting.
  - Promote the reduction of unnecessary or wasteful night lighting via policy, design guidelines, public education, and outreach.
  - Promote the wealth of information available from the DSA at [darksky.org](#). The DSA has information about outdoor lighting, light pollution, and ways to protect the night skies (including a guide to dark-sky-friendly lighting).
- Encourage the Bureau of Street Lighting (LA Lights) to address the impacts of artificial light pollution on local wildlife in updates to the [LA Lights Strategic Plan](#). The Draft [Salt Lake City Street Lighting Master Plan](#) and [darksky.org](#) are excellent resources. In addition, LA Lights is encouraged to implement the general lighting recommendations listed above.
- Educate the public on the ecological consequences of holiday lighting.
- Address fragmentation and enhance connectivity in and around natural areas to mitigate edge effects.
  - Limit/prevent future fragmentation of natural areas via roads, development, lighting, etc.
  - Heed the recommendations presented on the various connectivity metrics (e.g., 1.1d, 1.1e, and 1.1f) and work to improve connectivity between large, high quality habitat patches (e.g., building or enhancing wildlife crossing structures).
  - Encourage measures and actions that mitigate impacts to natural areas in buffer zones.
- Monitor habitat edges for declines in habitat quality, emerging threats, and potential detriments (e.g., presence of invasive species, wildlife-vehicle collisions).

# 1.3B PRESENCE & SPREAD OF INVASIVE PLANTS

**Score: 2 points - 2.3 / 5**

Points	% of Score Range for Individual Ecotopes
0	> 95%
1	95% – 50%
<b>2</b>	<b>49% – 35%</b>
3	34% – 25%
4	25% – 15%
5	< 15%

## Background:

Non-native and invasive species are a huge problem globally and in the Los Angeles area. Presently, non-native plant species account for 31% of the known vascular plant species in the Santa Monica Mountains National Recreation Area (NPSpecies, 2021). While some non-native plant species have limited impacts on biodiversity, others are invasive and can be detrimental to native ecosystems, displacing native plants and reducing habitat quality. As non-native invasive species often become established in disturbed areas and displace/negatively impact native biota, the frequency and distribution of plant invasions can be a measure of ecosystem health.

Metric 1.3b looks at the presence of invasive plant species and their relative threat to native biodiversity. Initially, this metric was designed to use 7.5 x 7.5 quad data exported from CAL-IPC's CalWeedMapper, but the tool no longer supports spatial download. After conferring with CAL-IPC, the methodology for metric 1.3b was updated to rely on a direct data download from [Calflora's Observation Download Portal](#) based on the invasive species identified in LA County's Regional Prioritization Spreadsheet. Species were assigned specific weights based on CAL-IPC threat rankings (e.g., watch species = 0.5, limited = 1, moderate = 2, high = 3). The weighted count of invasive species was then calculated for each ecotope. Relative scores, compared to the ecotope with the highest species count, were used to assess the individual ecotope scores shown on the 1.3b map.

## Results Discussion:

Raw data indicates that the Santa Monica Mountains ecotope has the greatest number of known invasive species (n=40) and that the Los Angeles River Intertidal & Coastal Plain ecotope has the lowest number of invasive species (n=4). Weighted data that emphasizes the threat level of the observed invasive plants suggests that invasion threats are greatest in the Santa Monica Mountains and in the Repetto Hills & Terraces.

There appears to be a bias towards collecting data on invasive species in natural areas (e.g., the Santa Monica Mountains) where invasive weeds pose the greatest threat. While the results suggest that natural areas have a greater diversity of known weed species, there is significantly more effort expended by scientists and by community scientists to observe and monitor weeds in natural areas. To this point, the dataset downloaded from Calflora had 125 unique observations in the Santa Monica Mountains ecotope and only nine observations in the Los Angeles River Intertidal & Coastal Plain ecotope, the ecotope that performed the best on this metric when assessed individually. However, this difference could also be due to the presence of impervious surfaces. Ecotopes that are largely composed of impervious surfaces (e.g., Los Angeles River Lower Alluvial Plain and Los Angeles River Intertidal & Coastal Plain) have fewer recorded invasive species than more pervious ecotopes (e.g., The Santa Monica Mountains). As more evenly distributed data points would improve the robustness of this metric, ecologists and community scientists should be encouraged to upload observations of invasive species to community science platforms in urban areas to improve knowledge about the presence and spread of invasive species in built environments in the City.

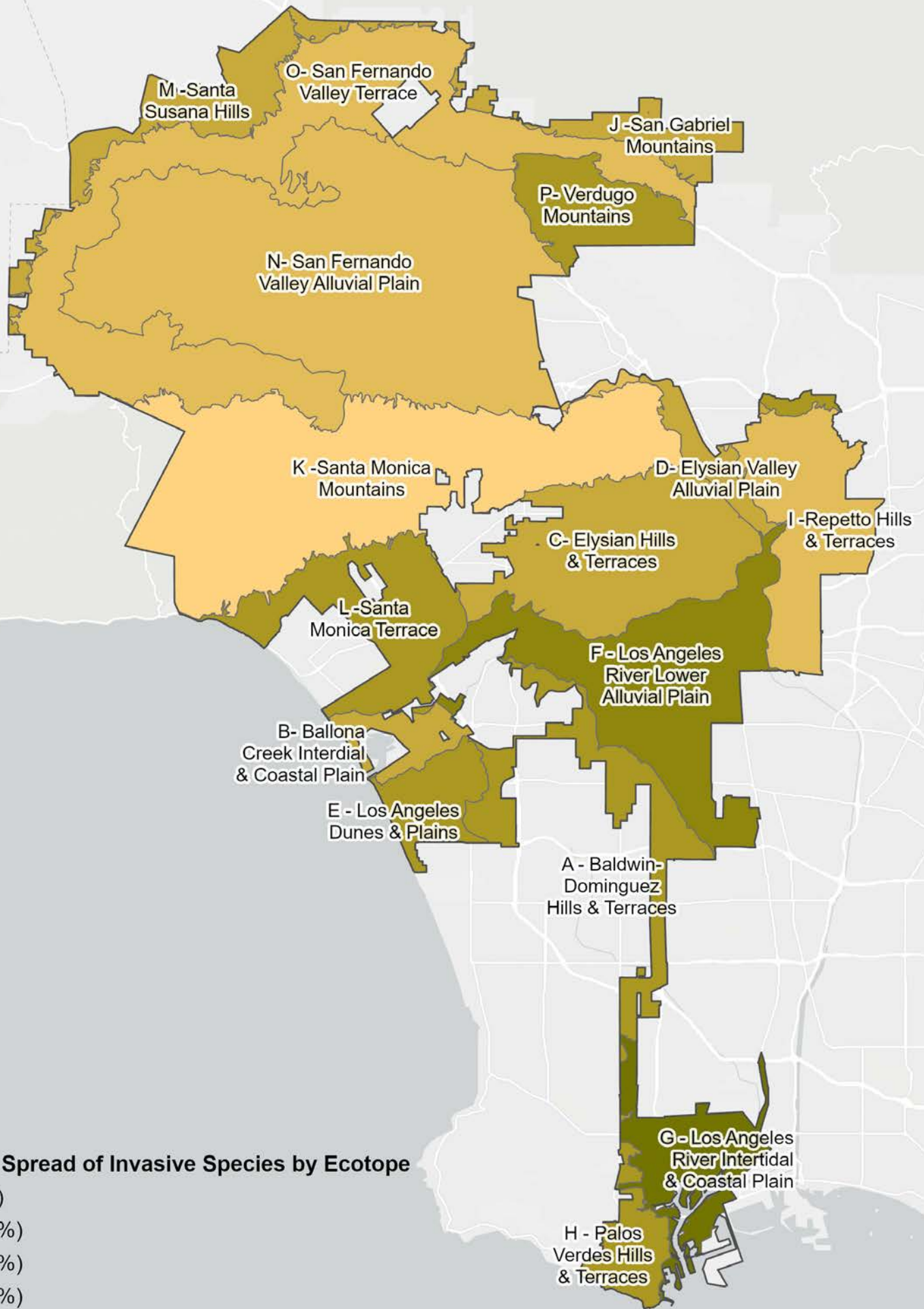
While CAL-IPC is the State's authority on invasive weeds, the species rankings they provide are Statewide. This means that locally, in LA, these rankings are not perfect (i.e., some CAL-IPC high priority species are not top priorities in Los Angeles and vice versa). As an example, the Santa Monica Mountains National Park Service's [Evil 25 list](#) focuses on 25 species that are highly problematic in the Santa Monica Mountains. Of the 24 species that are dual-listed as Evil 25 species and included on the South Coast List, five are considered "limited spread" species, 12 are considered "moderate", and seven are considered "high" threat, demonstrating that local priorities can diverge from high priority CAL-IPC species.



*Delairea odorata*, Los Leones  
(Photo: Nurit Katz)



Invasive mustard  
(Photo: Nurit Katz)



**Legend**  
**Presence and Spread of Invasive Species by Ecotope**

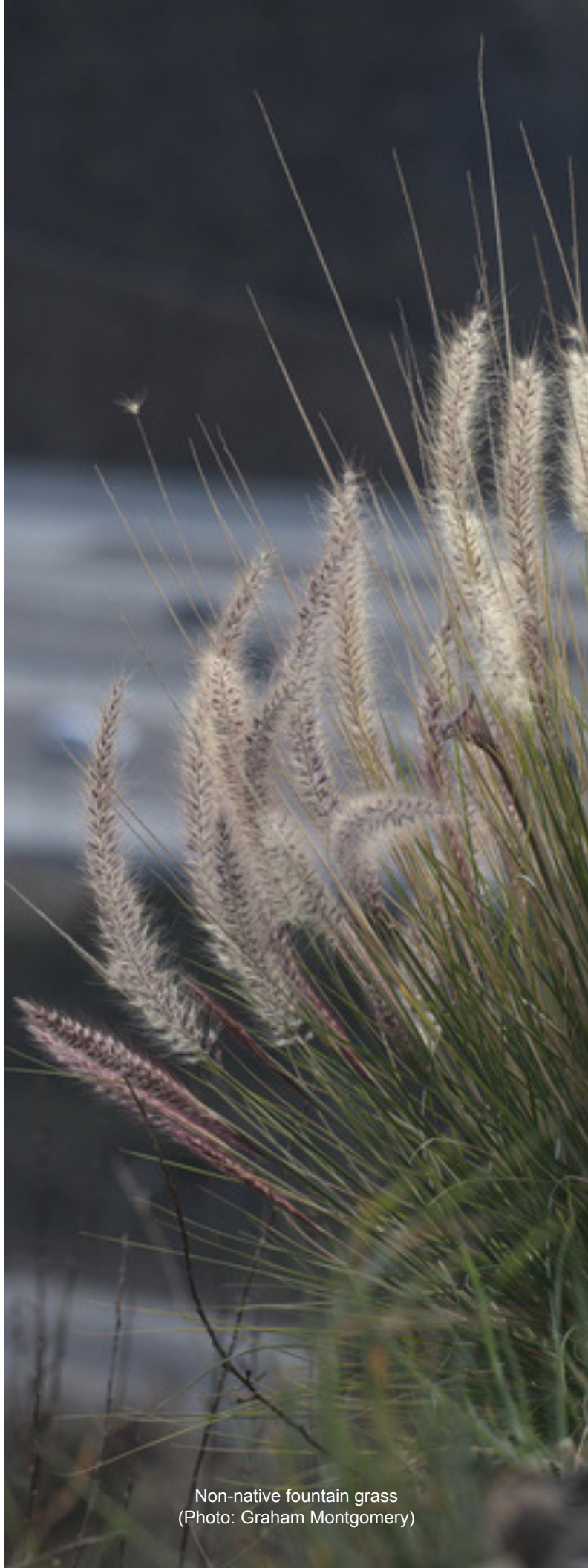
- 0 (95%+)
- 1 (76-95%)
- 2 (36-75%)
- 3 (26-35%)
- 4 (16-25%)
- 5 (<15%)

City of LA Boundary



## ***Management Implications:***

- Continue to work with organizations like Calflora and CAL-IPC to better pinpoint, track, monitor, and manage invasions.
- Train Recreation & Parks staff to identify common and/or highly problematic invasive species (e.g., [Dirty Dozen lists](#), [the Evil 25](#) (used by the National Park Service), etc.).
- Encourage the public and City staff to upload observations of weeds on platforms like Calflora and iNaturalist, particularly in urban areas, to more comprehensively and evenly document weed distributions.
- Educate the public and nursery managers about invasive species and encourage them to stop selling and planting invasive species. [Plantright](#) is a great resource for this.
- Strengthen the ability of the LA County Weed Management Area to work collaboratively across jurisdictional lines.
- Consider software, like [Calflora's Weed Manager](#), to track and record the presence and spread of invasive plant species. This software should be purchased, and utilized, in conjunction with LA County to improve the amount of data available and encourage collaborative efforts across jurisdictions.



# 1.3C WILDFIRE FREQUENCY

**Score: 2 points - Moderate risk**

Points	Assessment of Percent Fire Return Interval Departure (PFRID) Scores and Condition Classes (CCs)
0	Majority of areas (>50%) assessed at severe risk of overburning (CC -3) or underburning (CC 3). Less than 10% of PFRID scores exhibit low departure scores (CC -1 or CC 1).
1	Area assessed at high risk of overburning or underburning. Less than 10% of PFRID scores are considered low departure (CC -1 or CC 1).
2	<b>Area assessed at moderate to high risk of overburning or underburning. Less than 25% of PFRID scores are considered low departure (CC -1 or CC 1).</b>
3	Area assessed at moderate to limited risk of overburning or underburning. More than 50% of PFRID scores are low (CC -1 or CC 1) and less than 10% of PFRID scores are severe (CC -3 or CC 3).
4	Majority of area assessed at limited risk of overburning or underburning. More than 75% of PFRID scores are low (CC -1 or CC 1).
5	Entirety of area assessed at limited risk of overburning or underburning. All PFRID scores are neutral or low (CC -1 or CC 1)

## Background:

Fire is an important natural disturbance process that drives biodiversity change in the City of Los Angeles. In modern times, natural fire frequencies have been disrupted by human activities, fire management policies (i.e., suppression), and climate change (Safford & Kip, 2014). Historically, the types of vegetation present in the City of Los Angeles (e.g., coastal sage scrub), would naturally burn

approximately every 20 years. Invasive plants burn more readily than natives, making degraded southern California landscapes more susceptible to burns. Increasing fire frequency and divergence from the natural fire cycle clearly has significant consequences for biodiversity. Further, invasive plants will regularly [colonize habitats disrupted by wildfire](#), particularly those that have been severely burned, perpetuating the spread of invasive species and further altering regional fire regimes.

Wildfire history is well-monitored in California by scholars and by CAL FIRE and can be tracked over time to understand trends and potential impacts to better protect native ecosystems. While shifting environmental conditions and climate change mean that restoring historical fire conditions may not be feasible, comparing historical and current regimes can be an important exercise in prioritizing natural areas for restoration work/management (Safford & Kip, 2014).

Metric 1.3c uses a dataset from the U.S. Forest Service (USFS) that examines the Fire Return Interval Departure (FRID), which compares the burn frequencies for major vegetation types to historic burn data (USDA, 2020). The FRID dataset uses presettlement fire regime data and CalFIRE's fire perimeter database (FRAP) to compare historical and current fire regimes for different vegetation types (e.g., coastal sage scrub). The resulting data is broken into six condition classes, or CCs, that indicate the direction and magnitude of fire frequency (see the table below), with negative scores indicating overburning and positive scores indicating underburning. FRID data is useful for land and resource planning, such as fuels treatment planning, post-fire restoration, fire management, and assessing the effects of fire on ecosystems. Additionally, it provides context for understanding and comparing the contemporary and historic occurrence of fire in California. FRID data for the South Coast Region from the USFS was used to map the Percent Fire Return Interval Departure (PFRID).

## Results Discussion:

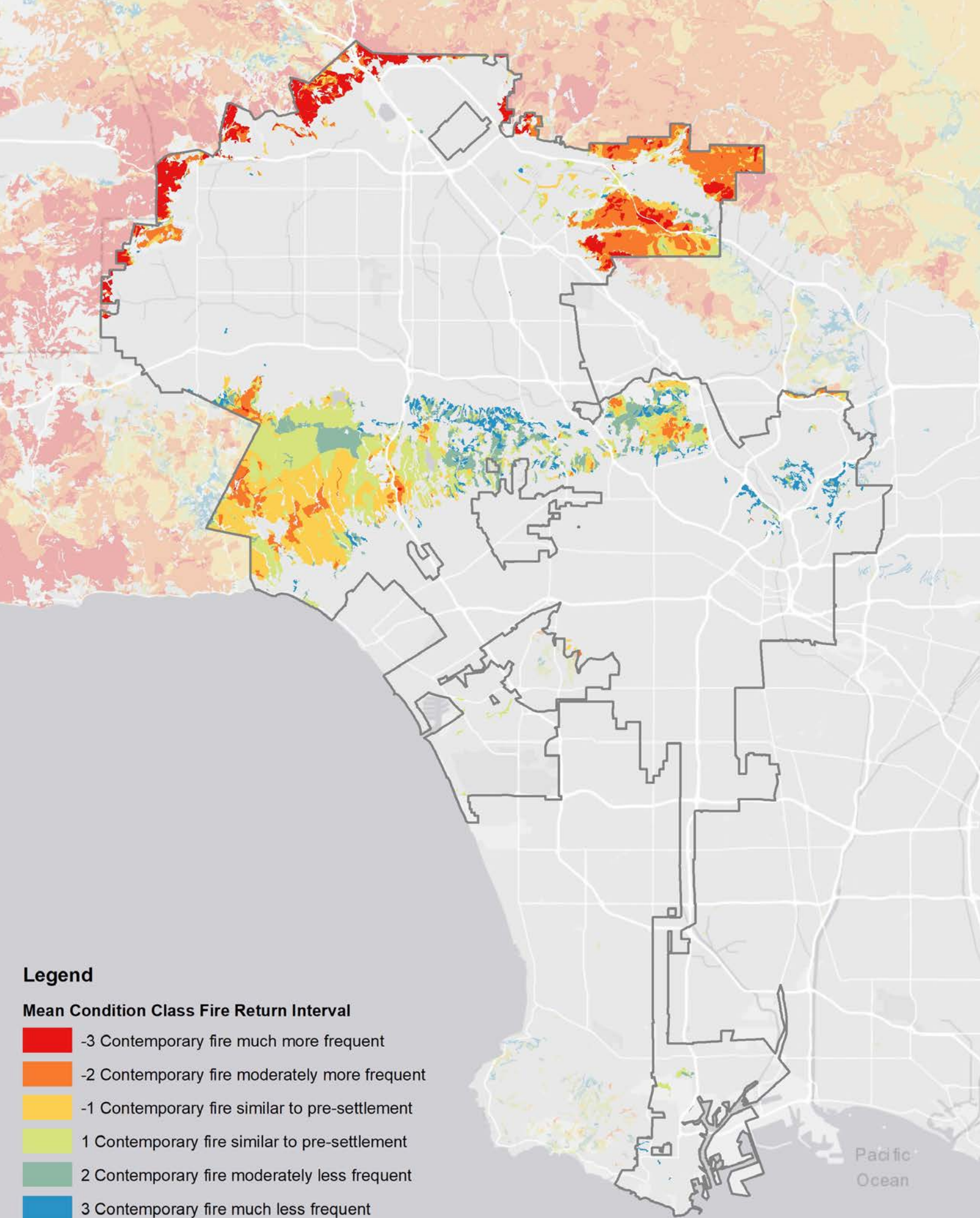
Analysis of this metric indicates that the areas of the City of Los Angeles assessed for this metric are subject to frequent wildfires and are experiencing relatively short fire return intervals (i.e., more frequent burns). This is particularly true for the larger natural areas in the City (e.g., the western Santa Monica Mountains) and areas on the periphery of the City (e.g., the Santa Susana Mountains, the San Gabriel Mountains, etc.). Interestingly, the areas of the City that have experienced less frequent wildfires (the

Santa Monica Mountain foothills, Elysian Park, etc.) are typically more urban and fragmented. Over 50% of PFRID scores are in the lowest condition classes and considered to have low departure (e.g., CC -1 or CC 1) from natural conditions. However, 17% of scores are in the highest condition classes (e.g., CC -3 or CC 3) and significantly diverge from historical fire conditions. The high percentage of severe PFRID scores dictate the assignment of an overall score of 2 for this metric (see full results in table below).

In total, 58% of CC scores are negative, suggesting that the Los Angeles area is subjected to more frequent burns (i.e., shorter fire return intervals) when compared to pre-settlement conditions. This trend is true for Los Angeles County as well (UCLA IoES, 2015). As future climate change is expected to further increase wildfire frequency in LA County, opportunities to mitigate risk and protect ecosystems from wildfire damage should be seized.

<b>Condition Class (CC)</b>	<b>CC Definition</b>	<b>Acres</b>	<b>Percentage</b>
-3	Contemporary fire much more frequent than presumed pre-settlement condition	5,255	11%
-2	Contemporary fire moderately more frequent than presumed pre-settlement condition	10,143	21%
-1	Contemporary fire close to pre-settlement condition	12,124	26%
1	Contemporary fire close to pre-settlement condition	11,754	25%
2	Contemporary fire moderately less frequent than presumed pre-settlement condition	5,353	11%
3	Contemporary fire much less frequent than presumed pre-settlement condition	2,804	6%
		<b>47,432</b>	<b>100%</b>

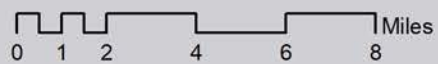
<b>Condition Classes</b>	<b>Burned Area in COLA</b>
CCI -3 and 3	17.0%
CCI -2 and 2	32.7%
CCI -1 and 1	50.3%



**Legend**

**Mean Condition Class Fire Return Interval**

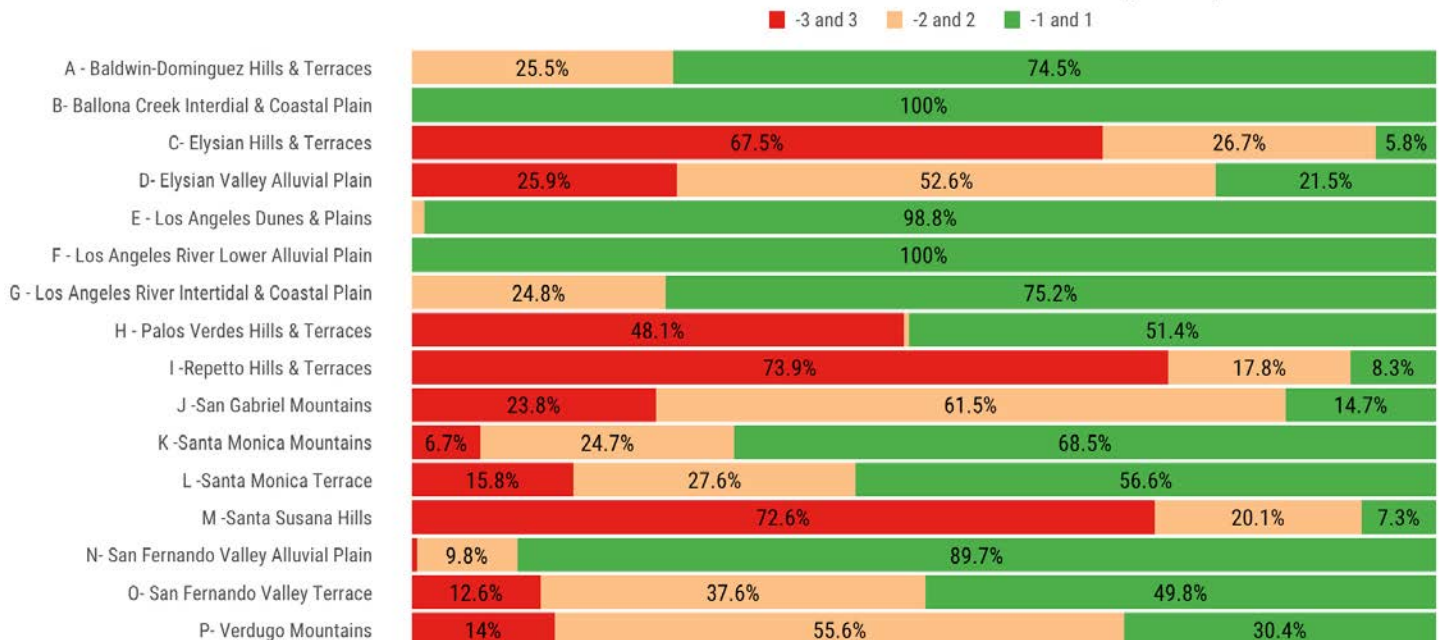
- 3 Contemporary fire much more frequent
- 2 Contemporary fire moderately more frequent
- 1 Contemporary fire similar to pre-settlement
- 1 Contemporary fire similar to pre-settlement
- 2 Contemporary fire moderately less frequent
- 3 Contemporary fire much less frequent
- City of LA Boundary

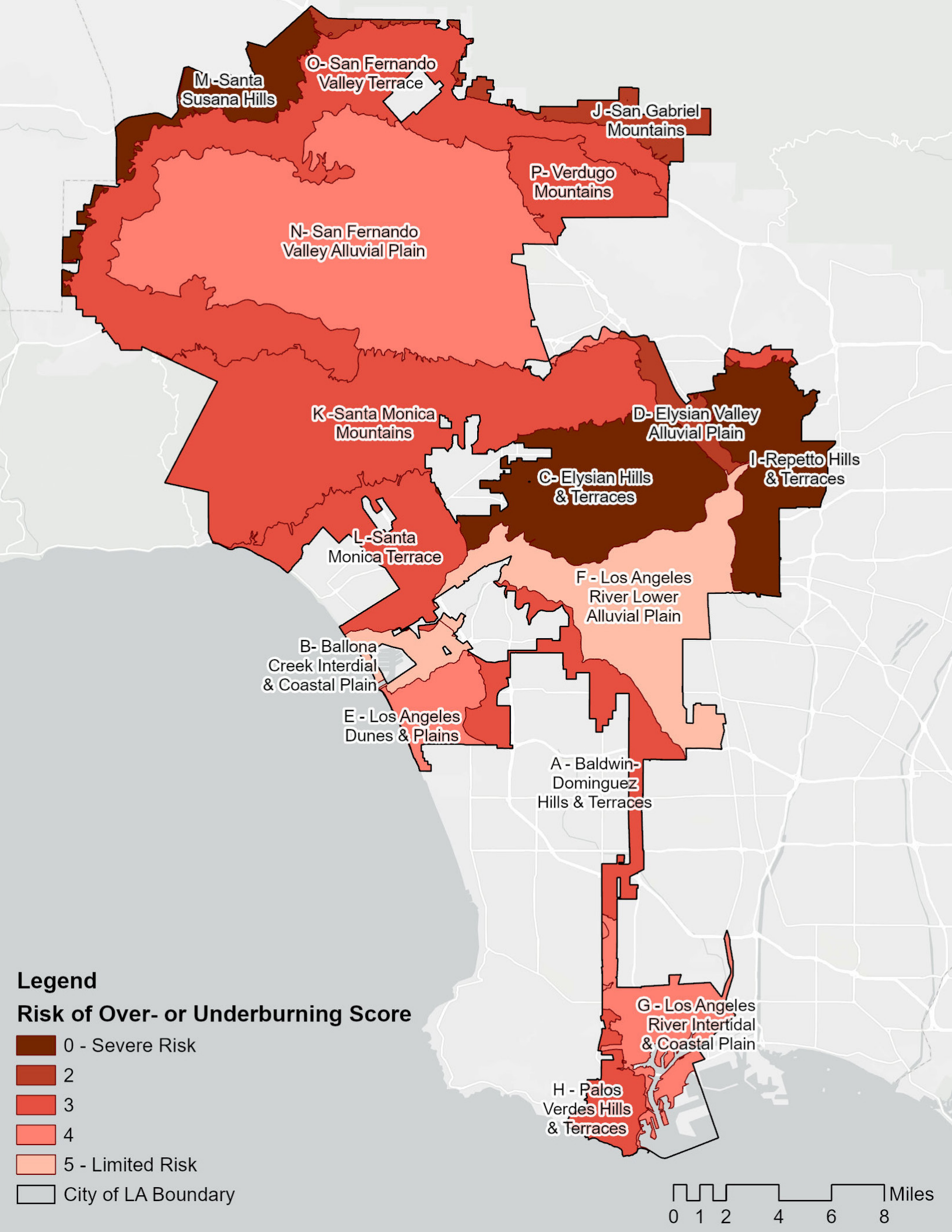


## Ecotopes Results:

This metric was also assessed for each of the City's ecotopes. Individual ecotopes vary significantly in terms of their fire return intervals. Low-lying, coastal ecotopes (e.g., E- Los Angeles Dunes & Plains) tend to have low condition class scores, indicating relatively little departure from natural conditions, whereas hill and mountain ecotopes (e.g., C- Elysian Hills & Terraces and M - Santa Susana Hills) have a majority of high condition class (e.g., 3 and -3) scores (see table below).

Mean Condition Class Fire Return Interval by Ecotope





**Legend**

**Risk of Over- or Underburning Score**

- 0 - Severe Risk
- 2
- 3
- 4
- 5 - Limited Risk
- City of LA Boundary



## ***Management Implications:***

- The City should sustainably monitor, manage, and reduce [hazardous fuels](#). Fuel reduction projects, such as thinning, pruning, and underbrush management, can decrease wildfire hazards and lessen the risk of catastrophic fires. These projects should be undertaken with biodiversity and habitat considerations in mind.
- The City departments involved in wildfire management, climate mitigation, and biodiversity management (e.g., RAP, LAFD, LASAN, etc.) should coordinate efforts to maximize carbon sequestration in healthy wildland habitat, provide habitat for native biodiversity, and safely reduce hazardous fuel loads to achieve mutually beneficial goals in natural areas and in the WUI.
  - Efforts should be made to revise, reduce, or eliminate practices that benefit one of these realms at the expense of others (e.g., denuding hillsides to meet brush clearance requirements).
  - A roundtable discussion between relevant City departments should be held to creatively address the issues at hand. Ideally, the roundtable should result in a set of guidelines that outline best practices for adapting to changing environmental conditions, protecting life and property from fire damage, and ensuring protection of native species and landscape in the name of building a more resilient City.
- Efforts can, and should, be ecotope specific as wildfire stress differs greatly between ecotopes.
- A set of best management practices should be developed to help City departments, utilities, and private property owners simultaneously reduce human-caused fires (e.g., electrical/powerline fires) and sustainably manage their lands to be resilient to wildfires.
- As invasive species continue to fuel extreme wildfires in southern California, better management of invasive plant species will benefit nature in the City (see management implications outlined for metric 3.2c for detailed recommendations).
- LADWP should pilot the creation of pollinator habitats (e.g., native grasses and low-lying shrubs) in areas under power lines that are traditionally cleared to meet fire/brush clearance requirements.
- A list of native plants that are resilient and appropriate in fire-prone areas should be created and distributed with brush clearance notifications.
- The PFRID can be calculated for individual ecotopes to better tailor ecotope-specific mitigation actions and plans.



The La Tuna Fire burning hillside vegetation (September 2017)  
(Photo: Michelle Barton)

# METRIC FINDINGS

## THEME 2: SOCIAL EQUITY CONSIDERATIONS



Birder at the Ballona Wetlands  
(Photo: Michelle Barton)

# 2.1A ACCESS TO NATURAL AREAS

**Score: 3 points - 56.1% of the population has access**

Points	% of Population within ½ Mile of Natural Areas / Open Space
0	< 25%
1	25% – 40%
2	40% – 55%
<b>3</b>	<b>55% – 70%</b>
4	70% – 85%
5	> 85%

## Background:

This metric looks at the percentage of Angelenos that have access to open space and natural areas. Open space and natural landscapes not only support native biodiversity, but provide educational opportunities, afford space for recreational activities, and contribute to the City’s character. Additionally, high-quality, biodiverse landscapes and open space provide a variety of ecosystem services that regulate temperature, mitigate pollution, and contribute to public health, boosting physical and mental well-being. Plus, access to nature, and experiences in nature, increase awareness of local biodiversity. Unfortunately, access to parks, natural areas, and open space is not equitable across the City of Los Angeles. Underserved communities often lack opportunities to connect with nature and derive the benefits described above.

The Trust for Public Land (TPL) has developed a ParkScore index that ranks and compares the park systems of the 100 most populated cities across the U.S. The ParkScore system ranks cities on five metrics:

1. Access
2. Investment
3. Acreage
4. Amenities
5. Equity

In 2021, the [ParkScore index](#) ranked the City of Los Angeles [#71](#) out of 100. Major findings are summarized below:

- **Equity:** In terms of equity, which looks at the distribution of parks and park acres, the City scored 32/100. The Trust for Public Land found that residents in neighborhoods of color have access to 13% less park space per person and individuals in low-income neighborhoods have access to 24% less park space when compared to the Citywide median.
- **Access:** In terms of access, defined as the proportion of residents within a 10-minute walk of a park, the City received a score of 45/100 as 64% of residents currently live within a 10-minute walk of a park.

To address park equity and access disparities, there are many efforts at the City and State level to connect all residents, workers, and visitors to neighborhood green spaces, natural areas, and parks. At the City level, Mayor Garcetti has pledged support to the [10-Minute Walk](#) campaign, which aims to ensure that all City residents have access to a quality park within 10 minutes of their homes by 2050. Mayor Garcetti also issued [Executive Directive #31 - Achieving Park Equity](#), which outlines actions to ensure that the benefits of parks and open space are equitably available to all Angelenos. Execution of the various recommendations will increase and improve park access, increase investments in parks, and increase park acreage and tree canopy in communities that need it most.

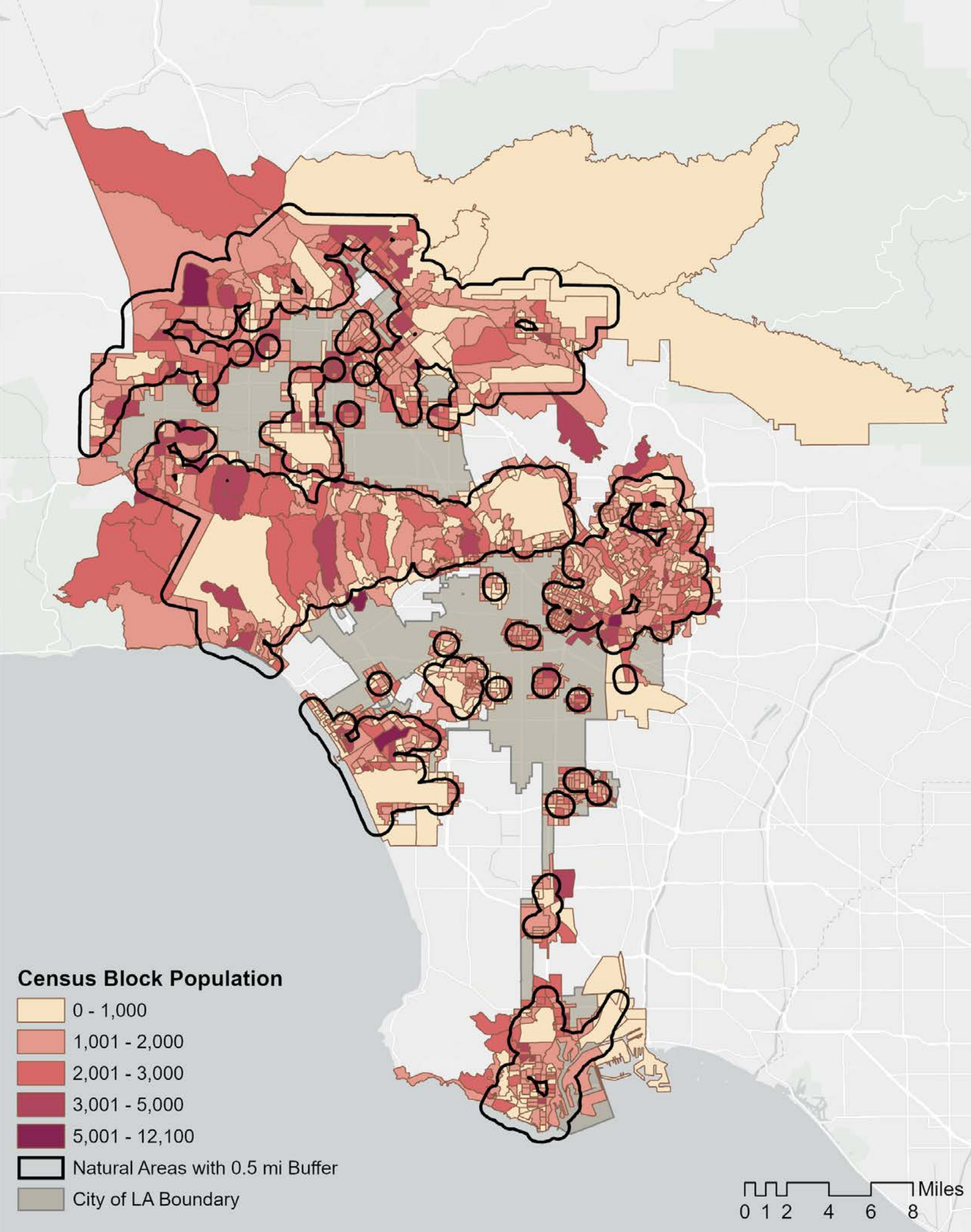
At the State level, the California Natural Resources Agency (CNRA) launched the [Outdoors for All initiative](#) in December 2021 that aims to expand equitable outdoor access to underserved communities across California. In addition to providing \$1 billion in investments to increase equitable access, this initiative will also promote the [State’s 30 x 30 initiative](#) and prioritize the use of [Nature-Based Solutions](#) to achieve climate goals.



## **Results Discussion:**

The percent of the City population within 0.5 mile of natural areas is 56.1% (2,602,700 (population within 0.5 mile) / 4,636,108 (total City population) x 100), yielding a final score of 3 out of 5. However, the default methodology for this metric, which involves capturing the population for all census tracts that intersect with the specified 0.5 mile buffer, potentially overestimates the population living within 0.5 miles from natural areas due to the irregular size and shape of census block groups. In other words, extremely large census tracts that extend miles beyond the natural areas buffer and have minimal overlap are included as accessible. To address this issue, and better represent the number of Angelenos that have access to natural areas, the LASAN Biodiversity Team performed additional spatial analysis to refine the results. Various intersection thresholds (i.e., the overlap of a census block group with the natural areas buffer) were assessed. Ultimately, a 30% threshold (i.e., census block groups must have at least 30% overlap with the buffer), was selected as it most accurately hugged the natural areas buffer and the City of LA boundary, thus limiting overcounting due to large census blocks and due to census blocks that are mostly or totally outside of the City boundaries. The results of the alternative analysis is 44.6% (2,066,945/4,636,108 x 100), yielding a lower score of 2. Maps resulting from the default and alternative methodology are presented here for comparison, and in the future, it may be deemed more appropriate to use the more conservative alternative methodology.

It should be noted that Mayor Garcetti and the Department of Recreation & Parks have opened 37 new parks since 2013, most of which are in underserved areas. Additionally, the City has acquired 164 acres of new parkland and invested tens of millions of dollars in parks and improving services. Collectively, these initiatives have significantly increased access to parks, defined as residents living within ½ mile of a park, from 53% in 2013 to 64% in 2021. These additional strides forward on this initiative are not yet captured in publicly available spatial data and should be captured during the next assessment of this metric.



**Census Block Population**

- 0 - 1,000
- 1,001 - 2,000
- 2,001 - 3,000
- 3,001 - 5,000
- 5,001 - 12,100

□ Natural Areas with 0.5 mi Buffer  
■ City of LA Boundary

0 1 2 4 6 8 Miles

### Census Block Population

- 0 - 1,000
- 1,001 - 2,000
- 2,001 - 3,000
- 3,001 - 5,000
- 5,001 - 12,100

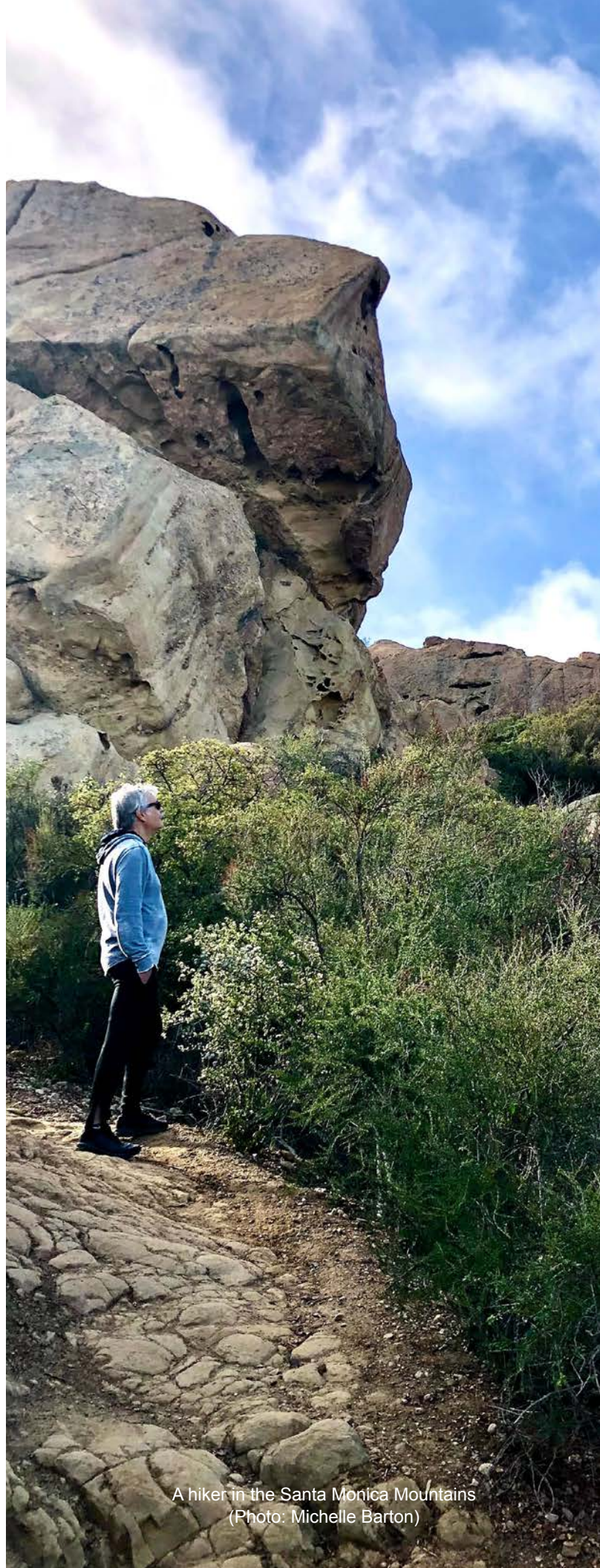
Natural Areas with 0.5 mi Buffer

City of LA Boundary

0 1 2 4 6 8 Miles

## Management Implications:

- Create new parks:
  - The City should continue to open new parks in underserved areas and acquire new parkland to increase the overall size of the park system and increase equitable access.
  - The [TPL ParkServe mapping application](#) can be used as a resource to pinpoint where parks are needed most in the City. The map makes recommendations for ten optimal locations for new parks.
  - Creating new parks or transforming underutilized parks in the communities of greatest need can be propelled by activating local and national partnerships with groups like the:
    - [Trust for Public Land](#),
    - [Santa Monica Mountains Conservancy](#),
    - [Los Angeles Neighborhood Land Trust](#), &
    - [Mountains Recreation and Conservation Authority](#).
  - New parks should be strategically created to simultaneously increase equitable access to green space, increase climate resilience, and boost habitat connectivity. Parks can also utilize and revitalize neglected and/or underutilized areas like [brownfields](#).
- Enhance existing parks:
  - Existing park space should be reimagined and retrofitted as needed to provide biodiversity habitat. Neighborhood parks with native plant palettes that support biodiversity have the potential to expose Angelenos to a more diverse array of native species.
- The City should work independently and in partnership with the County to implement the related recommendations outlined in the 2021 Sustainability Report Card for Los Angeles County on Ecosystem Health (Reid-Wainscoat, et. al., 2021), specifically that:
  - All new parks should incorporate multi-purpose green space that serves both the needs of the community and local biodiversity,
  - Existing parks should be retrofitted to include adequate green space,
  - New parks should not be located within 1,000 feet of a freeway, and
  - Joint-use plans that capitalize on underutilized spaces can be used to increase access to green space in dense neighborhoods.



A hiker in the Santa Monica Mountains  
(Photo: Michelle Barton)

- Transportation:
  - The possibility of increasing service on transit lines that connect Angelenos to open space and natural areas, such as beaches, mountains, and large parks, should be examined.
  - Active transportation (e.g., multimodal paths) should be designed with the goal of connecting all Angelenos to the City's patchwork of open space, parks, and natural assets. The City should strive to better incorporate biodiversity considerations into transportation planning and these paths should double as wildlife corridors to support the movement and dispersal of native species.
- The CNRA has budgeted over \$500 million dollars in grants to local communities to increase park equity, fund park programming, and enhance park infrastructure. City departments involved in outdoor recreation, park-equity, and access to nature (e.g., RAP, LASAN, DCP, etc.) should pursue grant funding from the State's Outdoors for All Initiative to achieve the park equity goals outlined in Executive Directive #31.
- LASAN, RAP, CEMO, and the Civil + Human Rights and Equity Department should form a Biodiversity Equity Group to collaboratively address biodiversity equity and access to nature issues.



Angelenos in Griffith Park  
(Photo: Michelle Barton)

# 2.1B NEIGHBORHOOD LANDSCAPE / TREE CANOPY FOOTPRINT

**Score: 2 points - 36.8%**

Points	% Landscape and Tree Canopy Cover
0	< 15%
1	15% – 25%
<b>2</b>	<b>25% – 40%</b>
3	40% – 50%
4	40% – 50% Citywide & all ecotopes > 30% landscape and tree canopy
5	> 50% Citywide & all ecotopes > 35% landscape and tree canopy

## Background:

Metric 2.1b captures information about urban biodiversity and urban greening across the City. As urban trees, parks, green space, and home gardens provide valuable ecosystem services to Angelenos, this metric serves as a proxy for nature-derived ecosystem services, particularly those related to cooling and carbon capture.

The intent of this metric is to account for large and small scale interventions that add landscape, tree canopy, and greening to the City of LA. New tree plantings, green infrastructure projects, green roof installations, nature-based solutions, and more will be captured over time and improve the score of this metric. On the other hand, tree removals, new roads/parking lots, use of gray infrastructure in lieu of green infrastructure, and densification development will cause this score to decline. To maintain, or ideally improve, the score on this metric, the City must both preserve existing green spaces and create new ones.

Trees, green infrastructure, and nature-based solutions (NbS) are cost-effective solutions to the dual crises of climate change and biodiversity loss, building resilient environments while lessening impacts on biodiversity. Nature-based solutions are defined by the International Union for Conservation of Nature

(IUCN) as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits”. Unlike gray infrastructure, which includes human-engineered infrastructure such as dams and bridges, NbS are designed to deliver important societal benefits while maintaining biodiversity and the ability of natural ecosystems to function over time. Research suggests that NbS are 50% cheaper than gray infrastructure alternatives and deliver up to 28% more value in terms of the suite of benefits they provide (World Economic Forum, 2022).

## Notable City-level Activities:

The City and its nonprofit partners are taking action on a number of fronts to protect and enhance the urban forest and green spaces across Los Angeles. There are four high-level goals in the City’s Green New Deal that guide much of this work:

1. To plant 90,000 trees by 2021.
2. To increase tree canopy by at least 50% by 2028 in areas with the least shade, which tend to be the City’s hottest, low-income communities.
3. To complete a citywide tree inventory by 2021.
4. To complete an Urban Forest Management Plan by 2028.

To date, impressive progress has been made on all four goals: over 65,000 trees have been planted, canopy equity is an important criterion in determining tree planting locations, the Citywide tree inventory is nearly complete, and the Urban Forest Management Plan is in development.

In addition to pursuing these goals, the City is taking a variety of steps to improve financing, data management, and maintenance of public trees. Notably, the City is working to complete a comprehensive inventory of all public trees. Licensed arborists are currently collecting information about the location and health of park and street trees across the City and adding them to a dynamic data management platform called Davey TreeKeeper (see the [public-facing TreeKeeper page](#)). Once complete, the inventory will provide the basis for data-driven planning and decision-making. However, the inventory data alone is not enough. Comprehensive, equity-focused planning, regular maintenance, Citywide management, and sufficient funding are needed to ensure that the City’s urban forest grows, thrives, and is properly and safely managed. To this end, efforts are underway to develop an [Urban Forest Financing Study for Los Angeles](#), which will identify costs, benefits, and funding strategies for a comprehensive urban forestry program, and to create

and implement an [Urban Forest Management Plan](#), which will provide the necessary strategic planning to ensure long-term growth, health, and safety of the urban forest. A comprehensive urban forestry program is one that includes the management of the whole life cycle of LA's urban forest, including tree planting, establishment, maintenance, removal, and beneficial reuse, as well as the enforcement of tree protection and preservation codes. These efforts will build on the valuable findings, proposed steps, and momentum from the [First Step: Developing an Urban Forest Management Plan for the City of Los Angeles](#) report, published in 2018, which identified an estimated \$70-80 million gap to urban forest management aligned with best management practices in Los Angeles.

In 2019, Mayor Garcetti appointed the first City Forest Officer for Los Angeles. The City Forest Officer is spearheading the development of the citywide Urban Forest Management Plan, working to increase tree canopy equity, and in charge of coordinating tree planting activities between City departments and external partners. This role has increased high-level planning and coordination of tree planting activities across the City that will have long-term benefits for the City's canopy.

In 2020, the Department of Recreation and Parks, LA Parks Foundation, City Plants, and the Los Angeles Conservation Corps began working to grow trees and plants from locally sourced seed at the historic [Commonwealth Nursery](#). The Commonwealth Nursery project sets an example for how public-private partnerships can transform Los Angeles into a more livable place for plants, animals, and people. Centrally located in LA, the 11-acre Commonwealth Nursery site in Griffith Park serves as an urban ecological laboratory and training grounds, where plants are grown, people are trained, and transformational seeds are sown. The goal of the nursery is to strengthen the City's partnerships with nonprofits and the public, achieve progress towards the resiliency goals outlined in the City of LA's Green New Deal, the City's Biodiversity Program, and beyond, through local-level seed collection and propagation.

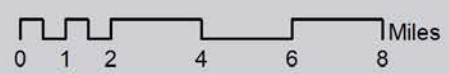
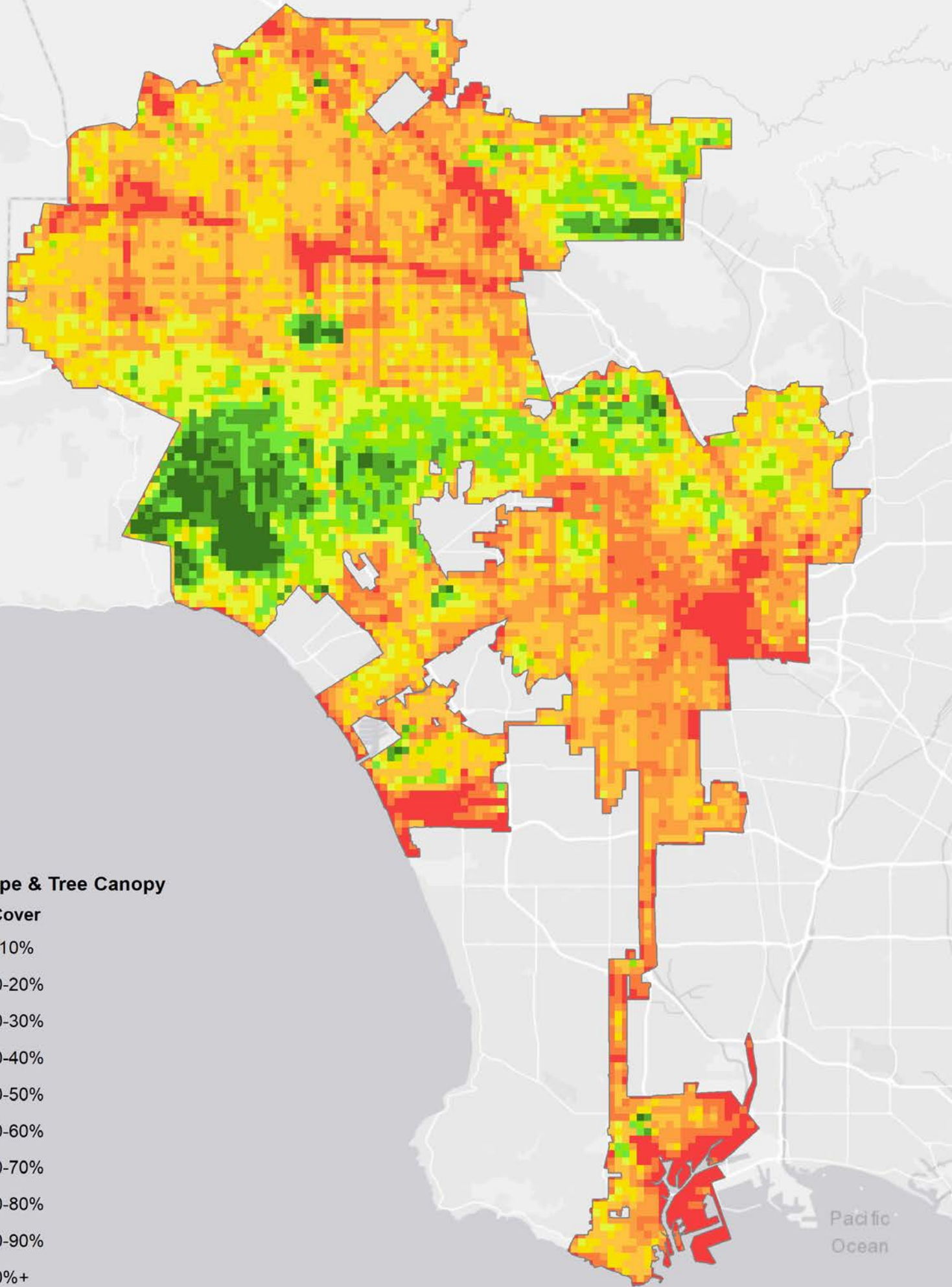


Commonwealth Nursery, Griffith Park  
(Photo: Grown in LA)

**Legend**

**Landscape & Tree Canopy**

**Percent Cover**





Tree delivery for a City Plants community adoption event  
(Photo: City Plants)

### Private Property

While public trees are very valuable greening assets, the aim of this metric is to understand holistic greening patterns across the City. As such, efforts to increase tree canopy and create habitat on private property must also be examined. Efforts on creating habitat for biodiversity are tracked as part of metric 2.3b, # of Certified Biodiversity-Friendly Areas. However, it is understood that the information available on private property activities via certifications is limited. By looking at fine-scale (10-foot) imagery, over time this metric will more comprehensively gauge the success of various City initiatives to increase canopy, green space, and habitat across private property. This is particularly important as it is estimated that over 90% of the urban forest is located on private property. The hope is that this metric will reflect the progress and successes of programs such as:

- [The City Plants Yard Tree Program](#): City Plants offers free yard trees via a home delivery program and community “adoption” events.
- [The Department of City Planning’s Healthy Buildings, Healthy Places Design Guidelines](#): The design guidelines encourage the development of green spaces, green roofs, and urban gardens to promote access to nature, physical activity, and access to healthy food.

## Community Engagement:

Community engagement is key to encouraging activities that enhance and protect green spaces across the City. To celebrate trees, and the multitude of benefits they provide, the City family hosts an annual Arbor Day celebration each spring. The event brings together community members to plant trees, build community, and spread awareness about the benefits of the urban forest and green spaces.

In 2021, City Plants and the LA Department of Water and Power worked with a broad coalition of partners to launch the Tree Ambassador - Promotor Forestal Program, a bilingual pilot program designed to amplify community voices and plant and care for trees across the City. The [Tree Ambassador Program](#) aims to develop invested community leaders to raise awareness on the benefits of trees, particularly in low-canopy, historically redlined communities that are subject to the urban heat island effect. A detailed, ten chapter, Community Action Toolkit is being developed in English and Spanish that will serve as an excellent, publicly available resource for motivated residents to learn about urban forestry and tree planting.



Arbor Day 2022 Celebration  
(Photo: City Plants)

## Results Discussion:

Analysis indicates that 36.8% of the City of Los Angeles is tree canopy and landscape. This footprint demonstrates that the City has a substantial amount of greenery to support biodiversity and provide ecosystem services. While these results are encouraging, data and anecdotal evidence suggests that tree canopy in the City has been declining over time, due primarily to development. [Google's Tree Canopy Insights Tool](#) estimates the average canopy coverage in the City to be a mere 14%. Further, as indicated on the map, trees, landscape, and nature-based solutions, and the biodiversity that they support, are not equitably distributed across neighborhoods (Wood and Esaian, 2020). A supplemental ecotope-based analysis further exemplifies this with landscape and canopy cover ranging from a mere 17% in the Los Angeles River Intertidal & Coastal Plain Ecotope to over 70% in the Santa Monica Mountains Ecotope. These results can be used to support urban design, planning, and other project efforts to maintain adequate and equitable levels of landscape and tree canopy in all Los Angeles neighborhoods.

As part of the City's ongoing effort to increase canopy equity, the City and City Plants worked with Dr. Vivek Shandas, the City's first Urban Forest Equity Visiting Scholar, on research and mechanisms to increase canopy equity. The [Los Angeles Urban Forest Equity Assessment Report](#) and the [Los Angeles Urban Forest Equity Streets Guidebook](#) were published in 2021 as part of this effort. Collectively, these reports provide guidance on how to sustainably and effectively remedy canopy inequities demonstrated by the metric 2.1b analysis. The results of the equity reports are beautifully summarized in this [infographic](#). These resources are crucial to advancing equity goals and providing access to canopy and landscape to all.



Saplings at Commonwealth Nursery  
(Photo: City Plants)

## ***Management Implications:***

- The City should strive to connect all residents, workers, and visitors to nature every day by working to increase opportunities to experience nature near City facilities, promoting opportunities to engage with biodiversity on social media platforms, and doing other types of community engagement.
- Nature should be intensified in natural areas and in neighborhoods across the City to maximize the footprint of green spaces and the associated ecosystem services that these spaces provide.
  - Degraded and/or sub-optimized public and private land across the City should be restored to better integrate nature into the City.
  - Soils should be unsealed and restored to increase habitat, cover, and sources of food for wildlife.
- Nature-based solutions should be promoted as cost-effective solutions to the dual crises of climate change and biodiversity loss. However, the lack of a clear mechanism to accomplish NbS is a critical challenge. Funding mechanisms and revenue streams to support tree planting, green infrastructure, and NbS are sorely needed. A financing study, similar to the one outlined above for urban forestry, should be developed to examine the means of broadly implementing and maintaining NbS across the City.
- Greening projects should be designed to address equity issues and bring trees, shrubs, and other landscape elements to the neighborhoods that would benefit the most from associated ecosystem services, such as cooling and shading.
- Encourage public and private projects to use diverse, native planting palettes to support native biodiversity, e.g., pollinators, and provide ecosystem services.
- Encourage the use of locally collected native seeds in restoration projects to increase diversity in the soil and minimize the introduction of invasive weeds. Support nurseries (e.g., Commonwealth Nursery) and regional seed banking partnerships like [SeedLA](#) that safely collect seeds and propagate stock locally.
- Community Engagement:
  - The materials in the [Tree Ambassador Community Action Toolkit](#) should be promoted and widely distributed to develop knowledgeable, community-based advocates.
- Disseminate relevant resources to determine appropriate native groundcover plants and trees:
  - [Calscape Native Planting Guide](#) and [Advanced Search Tool](#)
  - CalFlora [Planting Guide](#)
  - UC Berkeley [Jepson eFlora](#)
  - Cal Poly [SelectTree Tool](#)
  - National Wildlife Federation [Native Plant Finder](#)
- The Neighborhood Council Sustainability Alliance, Community Forestry Advisory Committee, and other engaged groups should be recruited to help increase tree canopy and green infrastructure across the City.
- The City should pilot a program for site selecting and planting trees on private property, particularly in low canopy, historically disinvested communities, to maximize the social and environmental benefits of its urban tree canopy, close the urban forest equity gap, and aid Angelenos in “right tree, right place” methodology to strengthen the survival of newly planted trees.
- Protected Trees:
  - The City should continue to protect all tree species covered in the [City's Protected Tree Ordinance](#) and work to improve meaningful enforcement efforts.
  - The City should educate developers and homeowners about the value of protecting the species protected by ordinance and the general value of preserving onsite mature trees.
  - The City should continue to develop and explore collaborative and innovative partnerships to insource plant and tree production from locally sourced, genetically diverse, and climate-adapted seeds to meet the demands of urban tree canopy, green infrastructure, and biodiversity policy targets.

# 2.2A SCHOOL (K-12) BIODIVERSITY TOPICS

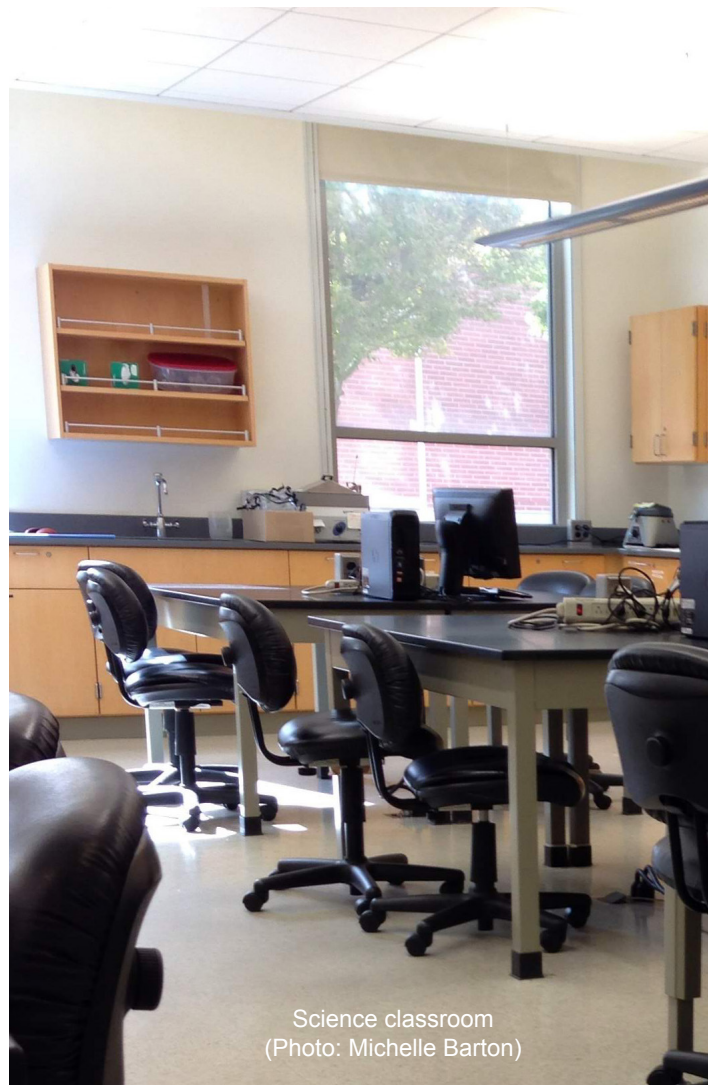
**Score: 2 points - State-compliant**

Points	Level of Compliance with State of California Biodiversity Learning Standards
0	Out of State compliance on biodiversity-related topics at designated grades (classroom instruction at designated grades meets the Performance Expectation)
1	At State compliance on biodiversity-related topics at designated grades (classroom instruction at designated grades meets the Performance Expectation)
<b>2</b>	<b>At State compliance on biodiversity-related topics across a grade-band (classroom instruction at all grades in a grade-band collectively build towards the ability to meet the Performance Expectation)</b>
3	Above State compliance on biodiversity-related topics that involve local biodiversity investigations and explanations
4	Above State compliance on biodiversity-related topics that involve local and advanced biodiversity investigations and explanations by understanding local problems and beginning to plan for action
5	Above State compliance on biodiversity-related topics that involve local and advanced biodiversity investigations and explanations and engaging in action projects (with local organizations when possible) that work to solve local problems (with local-to-global problem solving in high school)

## Background:

Metric 2.2a measures the exposure of students to local and global biodiversity topics through school curricula. In 2013, the State of California adopted the Next Generation Science Standards (NGSS), which are K-12 science standards that integrate crosscutting concepts, science and engineering practices, and disciplinary core ideas. The NGSS standards include performance expectations related to biodiversity, ecosystem, and habitat throughout elementary school (Kindergarten - 5th grade), middle school (6th - 8th grade), and high school (9th - 12th grade). The Los Angeles Unified School District (LAUSD) is required to implement California NGSS.

To supplement the public information available on LAUSD's website about NGSS, in 2020, a survey was sent out to LAUSD Science, Technology, Engineering, Arts, & Math (STEAM) Coordinators and Science Coordinators to collect supplemental information on biodiversity education at LAUSD K-12 schools.



Science classroom  
(Photo: Michelle Barton)

## Results Discussion:

All Los Angeles Unified Schools are in full implementation of the California NGSS. While LAUSD addresses biodiversity topics at all grades, a focus on local biodiversity is not required/built into the standards. However, LAUSD has pages of optional middle school and high school instructional resources, including sample lesson plans (e.g., [Sea Star Ecosystems](#)) that emphasize local biodiversity on its website. In addition to regular science instruction, the LAUSD Office of Outdoor and Environmental Education (LAUSD OOOE) exposes students to local biodiversity and hosts [extended learning resources](#), including [NGSS lesson plans for various grade bands](#) and [learning videos](#) on local tide pools, soil, botany, and more, that serve as valuable biodiversity resources for teachers. In their survey responses, LAUSD STEAM Coordinators and Science Coordinators suggested that there is an interest at district schools regarding local biodiversity topics and that many students engage with local biodiversity first-hand at biodiversity-related field trips (e.g., Outdoor Education, the Cabrillo Marine Aquarium, and the Los Angeles Zoo) and/or through interactions with biodiversity-focused organizations (e.g., the Natural History Museum of LA County and Deb's Park). However, as the emphasis on local biodiversity is not universal at all schools, a score of 2 was assigned for this metric. Enhanced data collection and/or tracking on how biodiversity is taught at LAUSD schools would ease future assessments and enable more specific data collection. To this end, the LASAN Biodiversity Team joined WestEd and UCLA to submit an NSF grant proposal that specifies working with LAUSD to implement NGSS at its schools, possibly involving

biodiversity projects or other environmental sciences issues. Efforts of this nature will lead to future score improvements for this metric.

## Management Implications:

- The LASAN Biodiversity Team should coordinate with LAUSD STEAM Coordinators to better track student engagement with local biodiversity issues.
- The LASAN Biodiversity Team, the Biodiversity Expert Council, the Interdepartmental Team, and stakeholders should work with LAUSD/LAUSD STEAM Coordinators to develop lessons/curriculum that focus on local biodiversity and encourage students to participate in local actions/planning related to biodiversity.
- The LASAN Biodiversity Team and the Los Angeles Public Library's Neighborhood Science (NeiSci) Program should encourage students to participate in bioblitzes, like the [LA Bioblitz Challenge](#). Further, LASAN and LAPL can provide programming and opportunities for students to learn about the City's indicator species and, ideally, upload observations of them to community science platforms, like iNaturalist.
- The Biodiversity Expert Council should lobby for updates to the California NGSS that require education around local biodiversity.
- The Biodiversity Expert Council should work with LAUSD/LAUSD STEAM Coordinators to identify partners/organizations that can create, enhance, or teach biodiversity lessons/curriculum.



Students planting trees in front of a school  
(Photo: City Plants)

# 2.2B OFF-CAMPUS BIODIVERSITY EDUCATIONAL VISITS

**Score: 0 points - 0.21 visits**

Points	Average Formal Education Visits/ Student/Year
0	< 0.25
1	0.25 – 0.5
2	0.5 – 1.0
3	1.0 – 1.5
4	1.5 – 2.0
5	> 2.0

## Background:

Metric 2.2b is designed to measure the first-hand exposure that K-12 students get to local and global biodiversity through visits to natural areas or nature centers. The LAUSD Office of Outdoor and Environmental Education (OOEE), which is part of the Beyond the Bell Branch, provided comprehensive data on district-wide field trips. OOEE reported that its programs are in high demand, and that efforts to increase field trip offerings at no cost to schools or students are underway.

Additional data was collected on informal and non-sponsored field trips (see definitions below) via a survey distributed to education coordinators at organizations that host biodiversity-related field trips. The survey was designed to understand the scope of global and/or local biodiversity topics in the educational programming associated with field trips. Additionally, the survey asked questions to understand opportunities for students and/or schools to develop long-term relationships with sites and/or organizations.

## LAUSD Field Trip Definitions:

**Approved Curricular Field Trip:** A school-sponsored and approved field trip to an approved site on the LAUSD Field Trip List. Curricular excursions, such as non-routine camping or overnight non-athletic trips, and trips involving trails, bodies of water, and visits to state/national parks need the approval of the OOEE and Risk Management.

**Informal Field Trip:** An opportunistic field trip that occurs on a school-by-school or teacher-by-teacher basis. These field trips are not required or institutionalized; however, they do still expose a large swath of students to ecological concepts, natural areas, and LA’s biodiversity. These trips may be led by teachers, informal educators, or community-based organizations.

**Non-Sponsored Trip:** A field trip organized by a school community as a non-school event to sites or activities without LAUSD approval. As such, teachers and parents personally accept liability for injury or misfortune.

## Results Discussion:

### Approved Curricular Field Trips:

LAUSD OOEE provides day-trip and overnight residential science school opportunities for approximately 38,000 students annually throughout LAUSD. This means that roughly 6% of the student body (38,000/652,648) participates in a formal field trip or that a typical student experiences 0.06 formal biodiversity field trips per year. Future investments will increase the capacity for OOEE to offer these field study programs to an additional 10,000 students per year, as well as expand the range of participants to grades K-12.

### Informal Field Trips and Non-Sponsored Trips:

According to our survey (# of respondents = 7), the average number of students who annually engage in programming at participating organizations was 99,000 (as a reference point, the number of LAUSD & charter schools for the 2020-21 school year was 652,648, so this represents ~15% of students). Most trips serve grades 3-8 and are considered to be educational tours. Since none of the participating organizations in our survey are considered to host “approved curricular field trips,” this shows how “informal field trips” are shaping the educational experiences of students. Moving forward, it will be important for OOEE to coordinate with organizations that host existing “informal education visits”. The main challenges survey respondents reported facing are in regards to funding for transportation and the capacity to do outreach. Two respondents represented City Departments/facilities, the Cabrillo Marine Aquarium (Recreation & Parks) and the Environmental Learning Center (LASAN). Collectively, these City Departments engage with an estimated 600 - 750 schools, or 73,000 students annually.



LAUSD Field Trip  
(Photo: LAUSD Office of Outdoor Education)

## Collective results:

Approximately 21%  $((38,000 + 99,000) / 652,648)$  of LAUSD students participate in formal and informal biodiversity field trips annually. In other words, a typical LAUSD student has 0.21 curricular or informal biodiversity field trips per year.

## Management Implications:

- LAUSD OOE should work to increase the number of approved curricular and informal field trip opportunities for students to be exposed to biodiversity. Biodiversity field trips should be frequent and intentionally aligned with classroom instruction to reinforce concepts.
- The City should increase funding for OOE to create more outdoor education facilities, increase OOE staff, and increase the number of field trip partners.
- LAUSD should encourage field trip organizers to have a better understanding of the NGSS standards so that they can reinforce particular concepts.
- Educational programming that provides opportunities for long-term community partnerships that maximizes the educational value for students should be highlighted.
- LAUSD should identify a permanent funding source to decrease or eliminate the barriers presented by transportation to and from field trip sites and to cover entrance fees.
- LAUSD should consider how students with disabilities and learning differences are able to participate in these experiences.
- LASAN and the Department of Recreation and Parks should collaborate to better track student visits and field trips to their respective facilities. Additionally, LAUSD and Recreation & Parks should make an effort to monitor annual formal education visits to parks with natural areas.



LAUSD Field Trip to the Angeles National Forest  
(Photo: LAUSD Office of Outdoor Education)

# 2.2C CAMPUS NATURE EDUCATION GARDENS

**Score: 2 points - 76.7% of LAUSD campuses**

Points	% of Schools with a Living Schoolyard Area
0	< 50%
1	50-75%
<b>2</b>	<b>75%+</b>
3	75%+ and a majority (50%+) have at least ONE programming element*
4	85%+ and a majority (50%+) of gardens have at least TWO programming elements*
5	95%+ and all gardens have at least TWO programming elements*

\*e.g., community partnership, biodiversity curriculum, community access, NWF (or other) certification)

## Background:

Metric 2.2c looks at the presence of campus gardens and biodiversity habitats across the Los Angeles Unified School District. School gardens have the ability to serve as intentional spaces for outdoor learning and exposure to nature. Plus, in communities that lack access to open space and park space, school green space provides access to nature for young people.

This metric also examines the existence of partnerships (e.g., Audubon Society or Enrich LA), community access (via joint-use agreements), and certifications (via the National Wildlife Federation) on LAUSD campuses. Collectively, partnerships, community access, and certifications are referred to as “programming elements”. Although it was originally hoped that this metric would solely track gardens/habitats with a specific focus on biodiversity, this was not possible due to the way the LAUSD Garden Survey was structured. Additionally, the LASAN Biodiversity Team felt it was important to acknowledge the educational value and ecosystem services provided through the presence of any type of schoolyard greening— such as edible vegetable gardens, and opted to broaden the approach.

## LAUSD Background:

LAUSD is the second largest school district in the nation and serves over 600,000 students in kindergarten through twelfth grade at over 1,000 schools. The District also has over 200 independently-operated public charter schools, authorized by the Los Angeles Unified School District Board of Education. These schools cover the City of LA and parts of 31 municipalities and several unincorporated regions of Southern California. In the 2020-2021 academic year, LAUSD had 1,413 campuses and facilities (including 231 charters), and over 652,000 students. Of the 1,413 sites, 785 are K-12 schools and the remaining schools are other types of centers and facilities.

## LAUSD Garden Background:

In February 2021, LAUSD approved the [School Garden Resolution](#) to create new school gardens and school community-shared green spaces. As part of the resolution, a City partnership with the Department of Recreation and Parks has emerged and a Green Space Task Force has been initiated. The Green Space Task Force, which is composed of the Los Angeles Unified School District, United Teachers Los Angeles, and the City of Los Angeles, aims to create new school gardens and school community-shared outdoor spaces. In addition, LAUSD has the following greening/sustainability programs:

- [Sustainable Environment Enhancement Developments for Schools \(SEEDS\)](#)
  - Launches school-initiated projects that provide site improvements and make sites “garden ready”.
- [Nature Explore Outdoor Classrooms](#)
  - Creates outdoor learning spaces for early childhood education centers.
- [Paving and Repair Sustainability Projects](#)
  - Updates LAUSD campuses that are in the greatest need of repairs.
- [Campus-Wide Modernization Projects](#)
  - Creates new, safe, and updated facilities for the 21st century.

In an interview, LAUSD also reported that the district is excited to work with [Green Schoolyards America](#) in hopes to provide outdoor learning solutions for schools within the Los Angeles Unified School District.

An outdoor classroom at Walgrove Elementary School  
(Photo: Michelle Barton)



## LAUSD Facility Assessments:

LAUSD assesses facilities regularly via the Facilities Condition Assessment, which provides granular building and grounds data on facilities, including landscape elements, like gardens. LAUSD also performed a one-time Garden Survey which provided valuable, detailed data on campus green space, garden size, plantings, responsible group assigned, and type of function. This survey was performed in response to a request made by the LAUSD school board.

## Results Discussion:

### LAUSD Data:

Data analysis indicates that 76.7% of LAUSD K-12 schools have some form of educational garden or habitat on campus. Please note that many LAUSD campuses have multiple garden and/or habitat

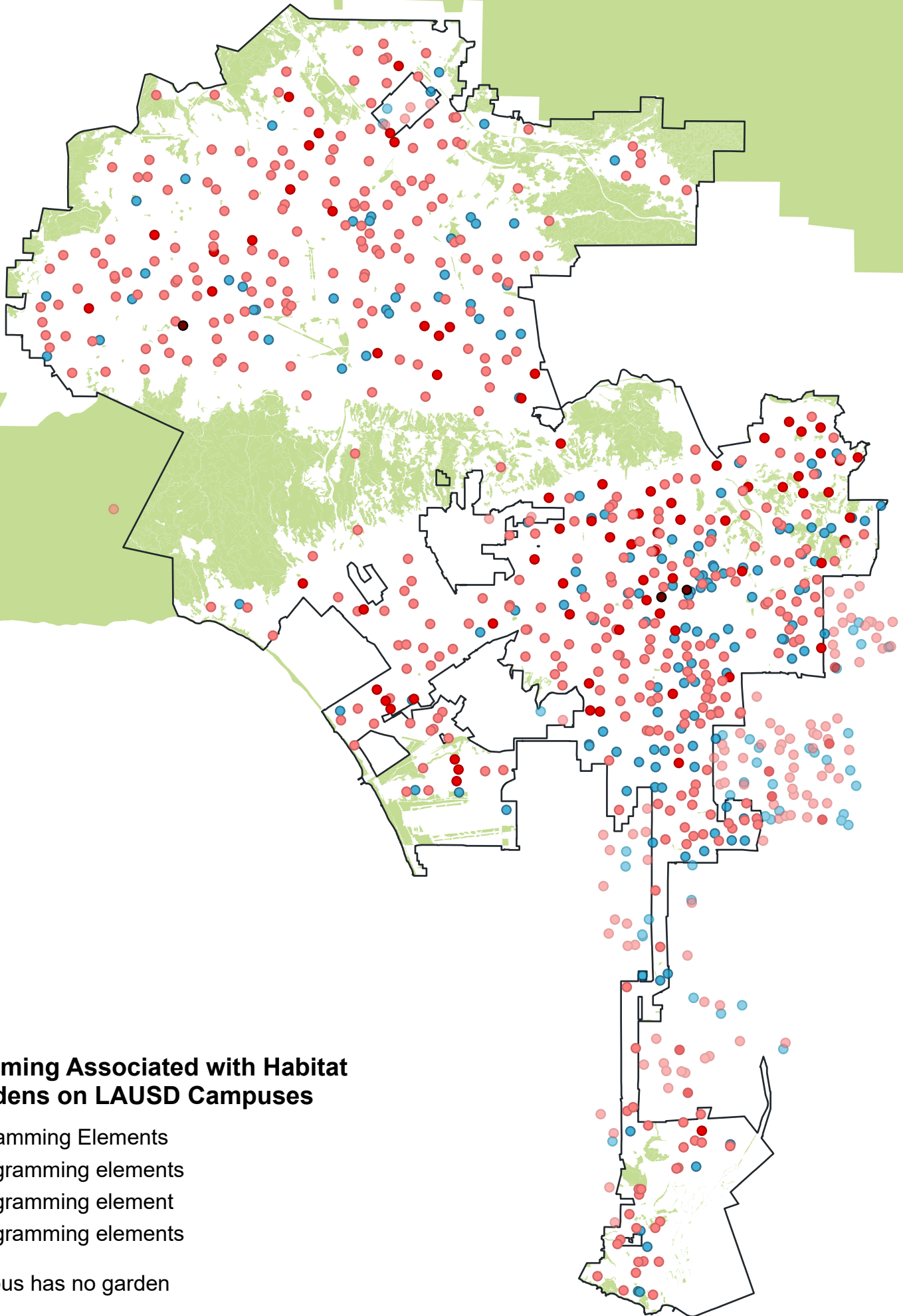
areas, so data was aggregated by school campus prior to this districtwide analysis. Across the entire district, there are 597 gardens on LAUSD campuses (4,787,253 square feet or 109.9 acres of gardens). This means that 76.1% (597/785) of LAUSD schools have gardens or habitats on campus. On average, schools have 0.13 programming elements/school.

### LAUSD Campuses in the City of Los Angeles:

Of the 785 K-12 campuses in the district, 640 are within the City of Los Angeles and 145 fall outside of City boundaries. In the City, there are 491 gardens on LAUSD campuses (4,194,608 square feet or 96.3 acres of gardens). This means that 491/640, or 76.7%, of LAUSD schools in the City of LA have gardens or habitats on campus. In the City, schools have 0.15 programming elements/school.



Students enjoying the wildlife habitat at Esperanza Elementary School with the Downtown LA skyline in the background  
(Photo: Emily Cobar)

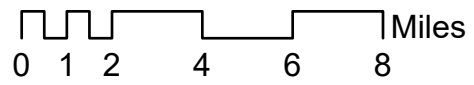


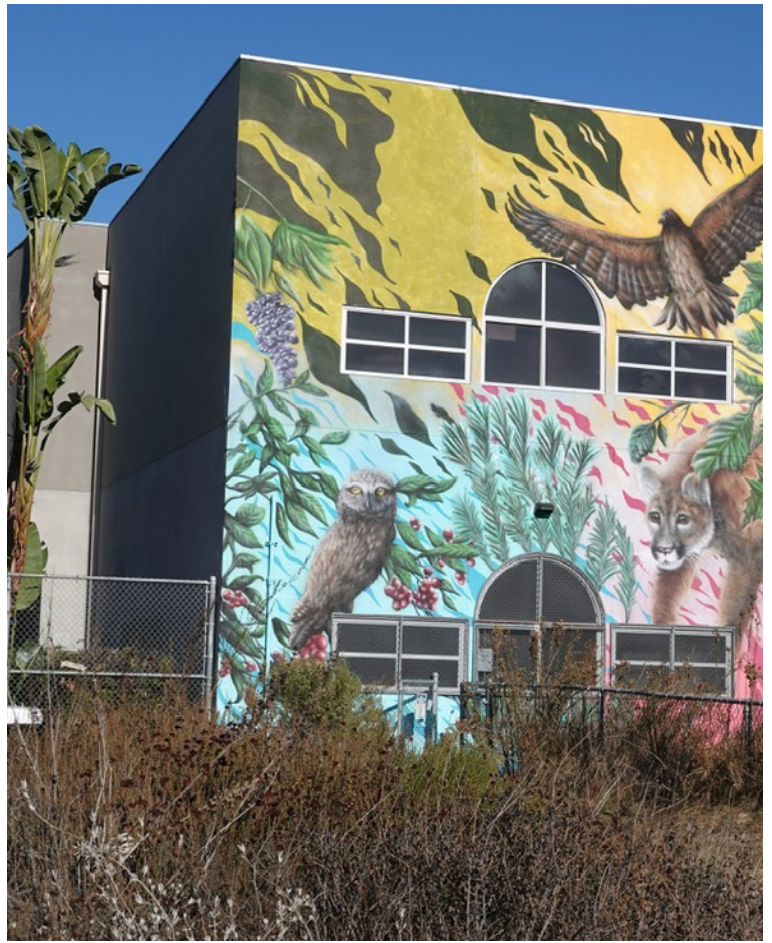
### Programming Associated with Habitat and Gardens on LAUSD Campuses

- # of Programming Elements
  - 0 programming elements
  - 1 programming element
  - 2 programming elements
- Campus has no garden

City of LA Boundary

Natural Areas and Parks





Clockwise from top left: Esperanza habitat before planting in 2016, Esperanza's wildlife mural, Esperanza students at Bird LA Day in 2016, a burrowing owl seen on the Esperanza campus. (Photos: Brad Rumble)

## ***Management Implications:***

- In order to better understand how LAUSD facilities adapt and change over time, the LASAN Biodiversity Team encourages LAUSD to comprehensively refresh facility and garden assessments every decade to better track the progress of the LAUSD Green Space Task Force and other greening initiatives:
  - Facilities Condition Assessment
  - LAUSD Garden Survey
- The LAUSD Green Space Task Force should consider prioritizing the planting of native plant habitats that can serve as learning laboratories, especially in lieu of grass and/or water-intensive non-native ornamental plants.
- Projects that remove asphalt/pavement and create green space should be prioritized in areas that are park poor, have poor access to natural areas, and/or are subject to the urban heat island effect.
- Joint-use agreements with Recreation and Parks and non-profits, like the LA Neighborhood Land Trust, should be pursued to create community-school parks to increase access to green space, especially in areas that are park-poor (see metric 2.1a results).
  - [Mayor Garcetti's Executive Directive #31](#), Achieving Park Equity, has language that directs RAP, the General Services Department (GSD), and the CAO to work with the City Attorney and LAUSD to “examine and resolve the liability and other structural barriers to a master joint-use policy applicable to all schools in the District to establish community school parks, especially those in park-deficient communities.” If enacted, a master joint-use policy would have profound implications for community access to school gardens.
- Advance the Trust for Public Land's Community Schoolyards project, which aims to turn paved public schoolyards into vibrant outdoor spaces that can benefit the entire community.
- Foster partnerships with groups like [Feed Our Soul](#), which installs gardens on school campuses, tends to gardens, teaches a Department of Energy-approved curriculum to students, and provides educational live cooking demonstrations.
- LASAN should partner with LAUSD and non-profit organizations to promote the creation of new school gardens and habitats and support the development of K-12 curriculum/learning modules on local biodiversity, healthy soils, and regenerative agriculture.
- The City and LAUSD should prioritize equity and access in all efforts to expand biodiversity educational programming. For instance, LAUSD could prioritize the creation of new campus gardens in communities with limited tree canopy (see metric 2.1b) and/or limited access to nature/open space (see metric 2.1a). Additionally, an effort to create more intentional ways for students with disabilities to engage with garden programming should be pursued.

# 2.3A COMMUNITY SCIENTIST ACTIVITIES AND APP UTILIZATION

**Score: N/A Baseline = 925,023 observations**

Points	# of Annual Observations (Relative to Baseline & Adjusted for Population Change)
0	< baseline year annual observations
1	<20% above baseline
2	20% - 50% above baseline
3	50% - 100% above baseline
4	100% - 500% above baseline
5	>500% above baseline

### Background:

Community science refers to a data-gathering collaboration between members of the public and the scientific community. The public provides real-time scientific data that is aggregated into a dynamic repository used by researchers and scientists for a variety of research projects.

Metric 2.3a seeks to measure the number of observations made via community science apps (e.g., iNaturalist and eBird) in the City of Los Angeles to better understand the level of public engagement with biodiversity. As many other metrics in the LA City Biodiversity Index, particularly the three on indicator species (e.g., 1.2a, 1.2b, and 1.2c), rely on data generated by community science, significant improvements in the score of this metric can have far-reaching implications for how well biodiversity within the City limits can be tracked and monitored.

There are a number of goals in Mayor Garcetti’s Green New Deal that deal with public participation in community science:

- Goal 51: In partnership with LA County, get LA into the top three cities/counties in the City Nature Challenge by 2025
- Goal 52: Develop strategies to increase community science app users, especially in data-poor areas
- Goal 53: Increase observations of LA’s biodiversity indicator species list
- Goal 54: Host annual bioblitz using community science apps such as iNaturalist or eBird

Clearly, increasing the base of active, engaged community scientists will benefit the LA City Biodiversity Index while also progressing many of the goals in Mayor Garcetti’s Green New Deal.

### Community Science Projects:

The iNaturalist platform allows users to create projects based on parameters of interest (e.g., geographic boundaries, time frame, species of interest, etc.). There are a variety of very large iNaturalist projects focused in or around the LA area (see table below).

iNaturalist Project	Description
<u>RASCals</u> (Reptiles and Amphibians of Southern California)	Aims to improve knowledge of native and non-native reptiles and amphibians in southern California.
<u>The “Evil 25” Invasive Plants</u> of the Santa Monica Mountains	Aims to track observations of 25 invasive plant species across the Santa Monica Mountains National Recreation Area.
<u>Los Angeles (City) Biodiversity Initiative</u>	Compilation of all species observed within the City of Los Angeles limits.

Projects, such as the three highlighted above, are excellent ways to deepen connections to biodiversity in general or special groups (e.g., invasive species, herptiles, etc.), build community around projects, and/or promote observation and identification of specific taxa or species.

## Programming:

In 2021, LASAN partnered with the Los Angeles Public Library (LAPL) to launch the inaugural [LA Bioblitz Challenge](#). LASAN's Biodiversity Team and LAPL's Neighborhood Science Program collaborated to develop, target, promote, and engage residents to participate in a Citywide challenge to inventory biodiversity in the City. The strategy for the distribution of program information involved existing stakeholders groups from both agencies and the use of emails and social media that generated more than 141,000 impressions over the course of the challenge. The partnership effectively combined the missions of protecting public health and the environment with enriching, educating, and empowering City residents. The challenge introduced the interconnectedness of biodiversity and people, framing the public's perception of plant and animal wildlife in a beneficial, essential manner and encouraging public sentiment to reflect and accept the challenge as an important necessity for themselves.

The 2021 LA Bioblitz Challenge coincided with the library's two-month long Summer Reading Challenge. The collaboration engaged participants with fun, interactive activities to observe, photograph, and learn about the wildlife in their neighborhoods, at local parks, and in natural areas to enhance their connection to the City's biodiversity. The main objectives of the challenge were to:

- Document and enumerate the City's existing native biodiversity.
- Increase observations of LASAN's indicator species\*.
- Encourage observations in data cold spots (i.e., areas that lack recent community science data observations).
- Increase awareness and participation in LAPL Neighborhood Science (NeiSci) programs.
- Support Summer Reading Challenge participation with an LA BioBlitz Challenge badge, reading lists, and curated books.
- Encourage Angelenos to learn and read about biodiversity, and the impact of urban environments and other environmental issues for their health and well-being.

\*The 38 indicator species used for the challenge differ slightly from those used in metric 1.2a at the request of the library [Removed (for safety concerns): western rattlesnake and mountain lion. Added: monarch butterfly, toyon, and California rose].

An iNaturalist project was created to track involvement in the program. Over the eight weeks of this first challenge, 14,796 observations of animals

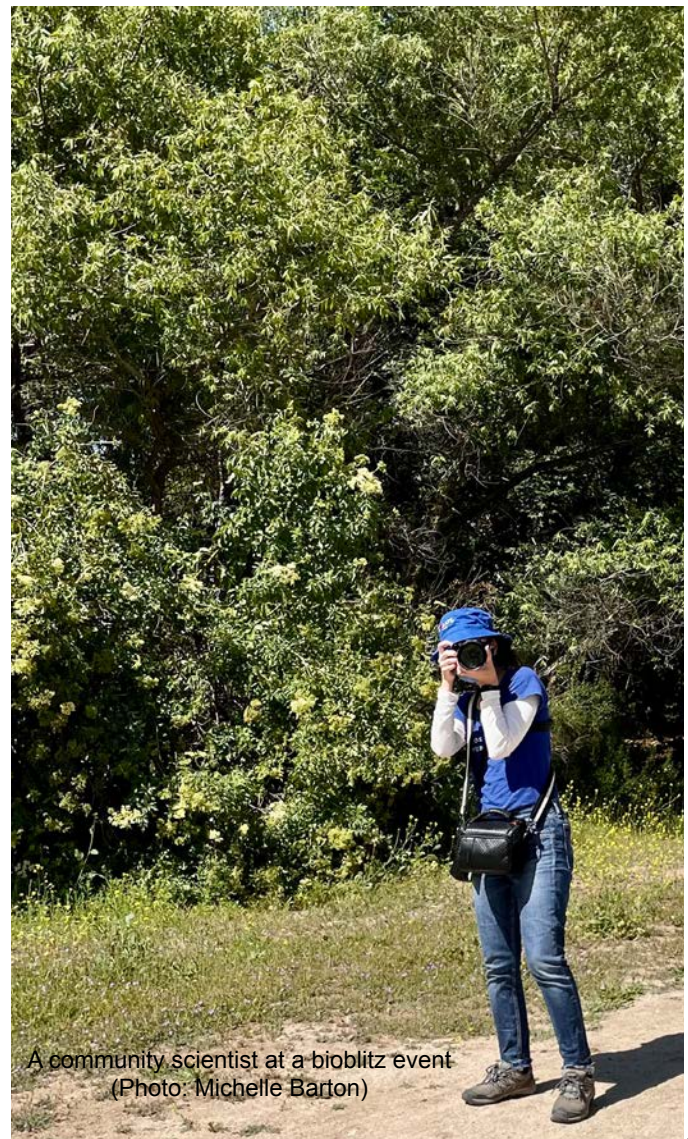
Metric Findings: Theme 2 (Social Equity Considerations)

and plants were recorded and shared to the LA Bioblitz Challenge iNaturalist project. In total, 29 of the 38\* indicator species were observed and identified. Identifications included the spotted towhee (*Pipilo maculatus*), the bobcat (*Lynx rufus*), and the endangered El Segundo blue butterfly (*Euphilotes battoides allyni*). The three most observed indicator species over the course of the challenge were the monarch butterfly (*Danaus plexippus*), red-tailed hawk (*Buteo jamaicensis*), and great blue heron (*Ardea herodias*).

The communications plan for the challenge included:

- Determining campaign position, key messages, and supporting information,
- Hosting webinars, and
- Publishing [five blog posts](#).

The event was such a success that the team decided to make it an annual event because of its critical aim to change human behaviors and increase awareness of native plants and wildlife. The second annual LA Bioblitz Challenge will be held in September 2022.



A community scientist at a bioblitz event  
(Photo: Michelle Barton)

Help support biodiversity and wildlife in L.A. by photographing and mapping animals, insects and plants around your home, neighborhood, parks and other areas.

**It's easy and fun:**

1. Download the iNaturalist app on your mobile device.
2. Watch the video tutorial at [lapl.org/bioblitz](http://lapl.org/bioblitz).
3. Get outside! Explore, observe, record and share the wildlife around you.

# L.A. BioBlitz Challenge

Explore • Observe • Connect  
June 7 - August 7

Scan to learn more and get started!



L.A. BioBlitz Challenge

**Photo Credits:** Daniel S. Cooper; Nurit Katz; Robert Martinez; Jeff Adams Stauffer; Citizens for Los Angeles Wildlife (CLAW); iNaturalist Users: Jesse Rorabaugh, Dario, Photographer, Kyle Nessen, Patrick Alexander and Andre Giraldi.



[lapl.org/bioblitz](http://lapl.org/bioblitz)

@lapubliclibrary

[lapl.org/bioblitz](http://lapl.org/bioblitz)

Observe, photograph & map the listed species

L.A. BioBlitz Challenge



Acorn woodpecker Baja California tree frog Behr's metalmark



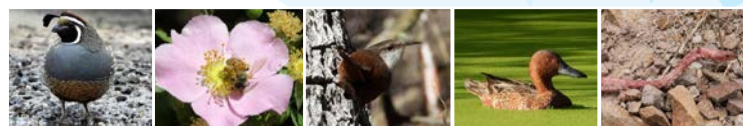
Great blue heron Great horned owl Greater roadrunner Harvester ants Hooded merganser



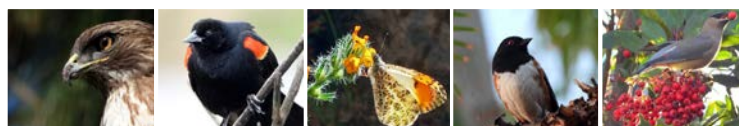
Black-bellied slender salamander Bobcat Bramble green hairstreak Bumblebees California kingsnake



Lorquin's admiral Monarch butterflies Mule deer North American Jerusalem crickets Northern harrier



California quail California wild rose Canyon wren Cinnamon teal Coachwhip snake



Red-tailed hawk Red-winged blackbird Sara orangetip Spotted towhee Toyon



Common side-blotched lizard Dusky footed woodrat El Segundo blue butterfly Gopher snake Gray fox



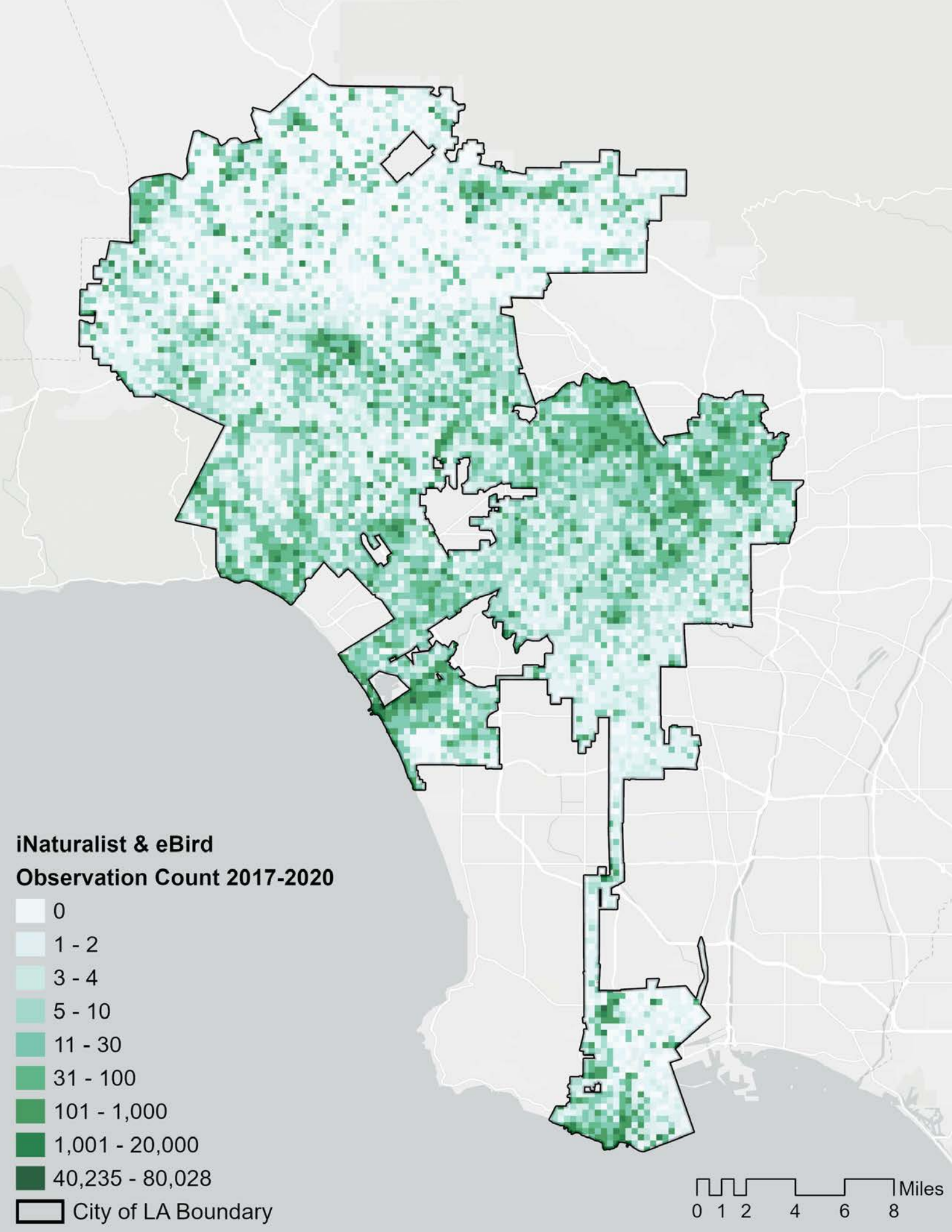
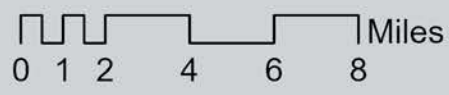
Velvet ants Western bluebird Western meadowlark Western pond turtle Western toad

[lapl.org/bioblitz](http://lapl.org/bioblitz)

LA Bioblitz Challenge postcard (top = front; bottom = back)

**iNaturalist & eBird  
Observation Count 2017-2020**

- 0
- 1 - 2
- 3 - 4
- 5 - 10
- 11 - 30
- 31 - 100
- 101 - 1,000
- 1,001 - 20,000
- 40,235 - 80,028
- City of LA Boundary



## Biodiversity Roundtable:

In June 2021, LASAN, the Natural History Museum of Los Angeles County, and the California Landscape Stewardship Network hosted a half-day roundtable with a number of community-based organizations in the LA area that are engaged in community science. The objective of the Biodiversity Roundtable was to hear about the organizations' needs and perspectives related to environmental/biodiversity issues and community science in our region. Justice, Equity, Diversity, and Inclusion (JEDI) issues related to community science work were discussed with the goal of developing solutions to address shortcomings. The Biodiversity Roundtable deepened and cultivated relationships between groups working on community science and environmental issues in Los Angeles. Overall, the meeting sparked meaningful conversation and helped to inform the direction, range, and reach of future community science program work.

## Results Discussion:

A total of 925,023 research-grade observations were made via iNaturalist and eBird during the time frame of interest (2017-2020). These observations were for 2,884 unique species. As this is the baseline measurement of this metric, an official score cannot be assigned. However, year-over-year changes for the time frame of interest (2017 - 2020) increase annually as shown in the table and chart below.

<b>Year</b>	<b># Observations</b>	<b>Year-over-year % Change</b>
2017	175,061	N/A
2018	231,322	132.1%
2019	253,585	109.6%
2020	265,055	104.5%
<b>Grand Total</b>	<b>925,023</b>	

It is important to note the uneven distribution of community science observations across the City (see the metric 2.3a map). The distribution of community science observations across the City mimics the distribution of natural areas and parks (see metric 1.1a), patterns of habitat quality (see metric 1.1b), and the landscape and tree canopy footprint (see metric 2.1b). In essence, this suggests that participation in community science efforts is concentrated in neighborhoods that have access to parks, ample green space, and leafy tree canopy. Efforts to increase participation in community science across all neighborhoods, particularly those that are park-poor, are vital to remedying disparities. More efforts

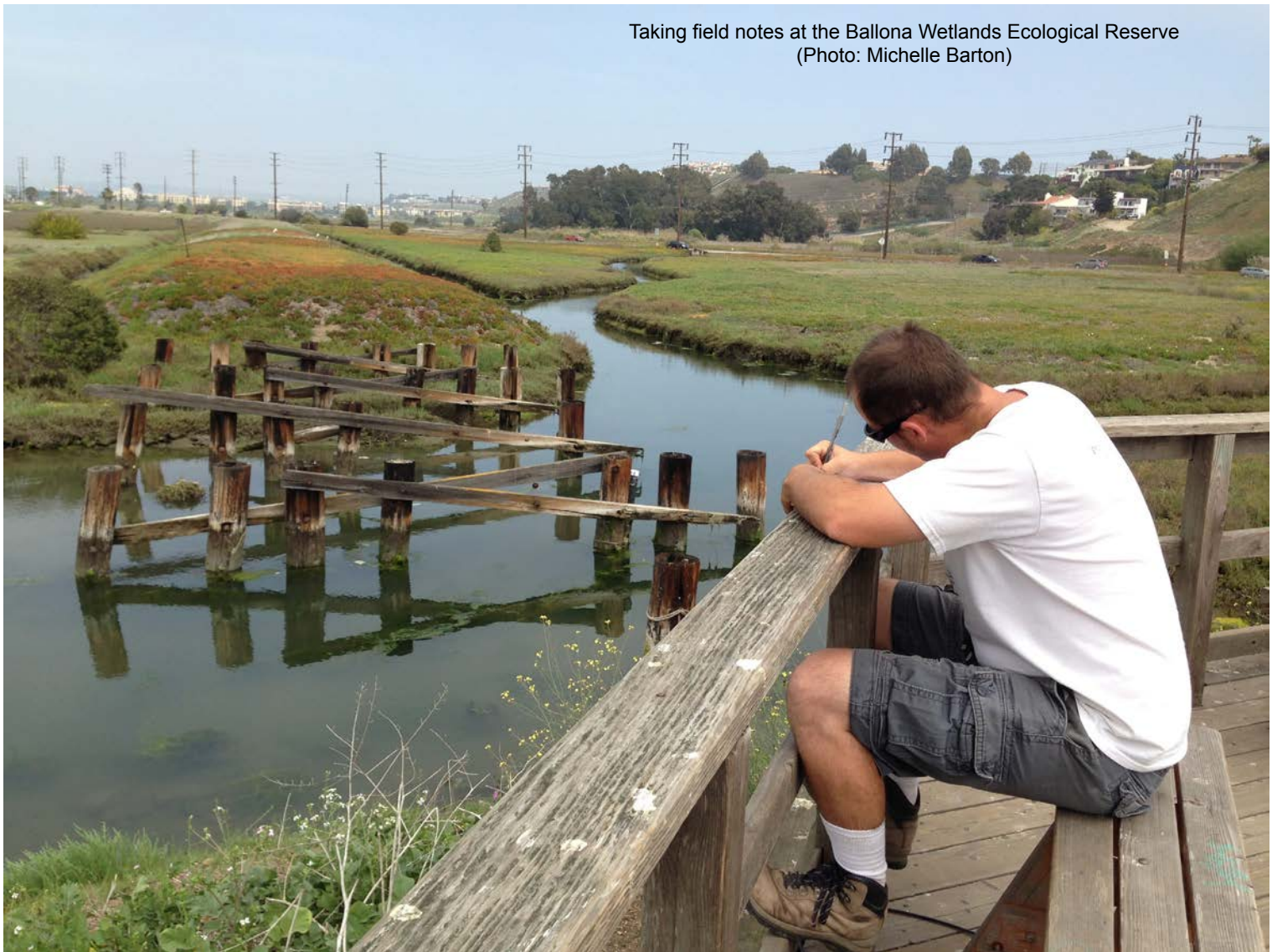
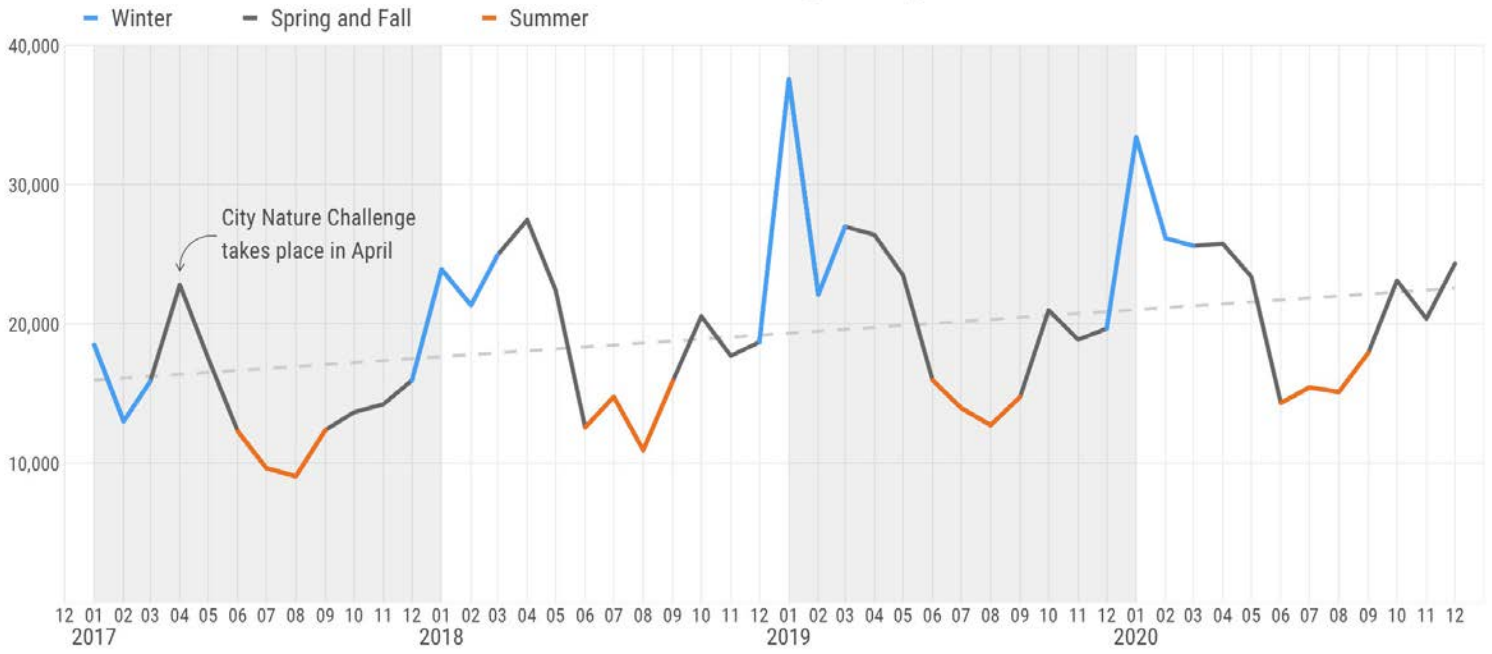
like the June 2021 Biodiversity Roundtable to better understand and overcome barriers to participation in community science programming are needed.

It is also important to note that while this metric is technically only concerned with participation in community science, some of these observations have obscured locations. In other words, some observations have high coordinate uncertainty, diminishing their overall value as data points. Of the nearly one million observations made during the time frame of interest, roughly 1.5% of the coordinates have uncertainty levels that exceed the quarter mile grid size used on the accompanying map. Coordinates can be obscured for two reasons: 1) the community scientist intentionally obscures coordinates (or makes them totally private) for personal reasons or 2) the species observed has special status. While research grade observations with coordinate uncertainty are still valuable, they offer less use to biodiversity researchers than those with precise coordinates.

Notably, the nearly one million research grade observations made from 2017-2020 are almost all to the species or subspecies level. A very small fraction, 0.3%, of identifications were at a higher taxonomic category, e.g., genus or family.

Over time, progress made on this metric will build up a group of dedicated community scientists that will likely also help the City achieve the various goals outlined in the background section above.

### Number of iNaturalist and eBird Observations made in Los Angeles City in 2017-2020



Taking field notes at the Ballona Wetlands Ecological Reserve  
(Photo: Michelle Barton)



A mother and daughter at an  
LASAN bioblitz event  
(Photo: Michelle Barton)

## ***Management Implications:***

- Increase participation:
  - In order to increase the score for this metric, the City should continue to encourage participation in community science, especially in underrepresented areas. This can be done in a variety of ways:
    - Encourage existing community scientists to continue to make observations.
    - Encourage new users to sign up for accounts with iNaturalist or eBird
    - Incorporate exposure to community science platforms and data collection as part of K-12 school science curriculum.
  - Encourage participation in various iNaturalist projects [e.g., Los Angeles (City) Biodiversity Initiative, RASCals].
  - Encourage participation in annual community science programming, specifically the City Nature Challenge and LA Bioblitz Challenge, through public outreach.
  - Develop a campaign and promotional materials (e.g., social media graphics, videos, logs, web materials, etc.) to encourage participation in community science. In particular, the campaign should target new community scientists who could become lifelong contributors (e.g., students/school groups).
  - The City should partner with the Natural History Museum to train new community scientists, hold training and/or bioblitz events, and encourage regular, year-round participation in community science.
- Improve the quality of community science data:
  - In order to improve the quality of community science data, and its potential research and science applications, community scientists uploading observations should be encouraged to provide unobscured geographic coordinates.
  - Reviews of community science-generated datasets suggest that it is important to find a balance between increasing sampling in coldspots and sampling hotspots during less popular (i.e., off-peak) times, days, or seasons to increase data quality (Callaghan et al., 2019).
- Educate the public and increase awareness of local biodiversity:
  - The public should be educated about the City's charismatic umbrella indicator species list (metric 1.2a) and encouraged to upload observations of species on the list.
  - Enhancing public awareness of LA's biodiversity can foster a culture of stewardship where Angelenos are inspired to conserve, protect, and enhance local ecosystems.
  - Work with LAUSD to integrate the use of community science tools into K-12 curricula.

# 2.3B # CERTIFIED BIODIVERSITY-FRIENDLY AREAS

**Score: N/A Baseline**

Points	# of Certified Biodiversity-Friendly Areas
0	< benchmark-year certifications
1	<20% above benchmark-year certifications
2	20% - 50% above benchmark-year certifications
3	50% - 100% above benchmark-year certifications
4	100% - 500% above benchmark-year certifications
5	>500% above benchmark-year certifications

## Background:

Metric 2.3b tracks the number of certifications of public and private parcels as certified biodiversity-friendly habitats. Certification systems administered by non-profits provide a convenient way to evaluate stewardship activities on public and private lands and can be effective promotional tools for biodiversity. The baseline assessment of this metric includes data from the National Wildlife Federation (i.e., Certified Wildlife Habitat data) and the Surfrider Foundation (i.e., Ocean Friendly Gardens). Other programs (e.g., the Audubon Cooperative Sanctuary Program) did not have any certifications within the City limits to report for this assessment, but should be included in future assessments.



NWF signage at TreePeople's Goldwater Canyon Park  
(Photo: Michelle Barton)

<b>Organization</b>	<b>Program</b>	<b>Elements</b>	<b>Cost</b>
<a href="#">National Wildlife Federation</a>	<a href="#">Certified Wildlife Habitat</a>	<ul style="list-style-type: none"> <li>• Food</li> <li>• Water</li> <li>• Shelter</li> <li>• Places to raise young</li> </ul>	\$20 / site
<a href="#">Surfrider Foundation</a>	<a href="#">Ocean Friendly Gardens</a>	<ul style="list-style-type: none"> <li>• Conservation</li> <li>• Permeability</li> <li>• Retention</li> </ul>	Free
<a href="#">Audubon International</a>	<a href="#">Cooperative Sanctuary Program for Golf</a>	<ul style="list-style-type: none"> <li>• Site Assessment/Environmental Planning</li> <li>• Wildlife and Habitat Management</li> <li>• Chemical Use Reduction and Safety</li> <li>• Water Conservation</li> <li>• Water Quality Management</li> <li>• Outreach and Education</li> </ul>	\$400 / golf course

It is also important to note that certified habitats can range widely in terms of their makeup. While some spaces mostly consist of native plants, others are landscaped largely with non-native ornamental species. Typically, native fauna prefer native species for foraging and for their habitat value. However, research is needed to better understand how the mix of native and non-native flora across urban landscapes and gardens in Los Angeles is sustaining native fauna and to determine scientifically-based recommendations for balancing ratios of native and non-native plants in planting palettes.

### Citywide Certification:

On May 3rd, 2021 the City of Los Angeles became the largest City in the USA to be certified by the National Wildlife Federation as Community Wildlife Habitat. This accomplishment is a real testament to the power of collective action by Angelenos, who registered 1,078 residential yards, 34 schools and 140 common areas, mainly at places of work, that cumulatively allowed the City to become certified as a whole.

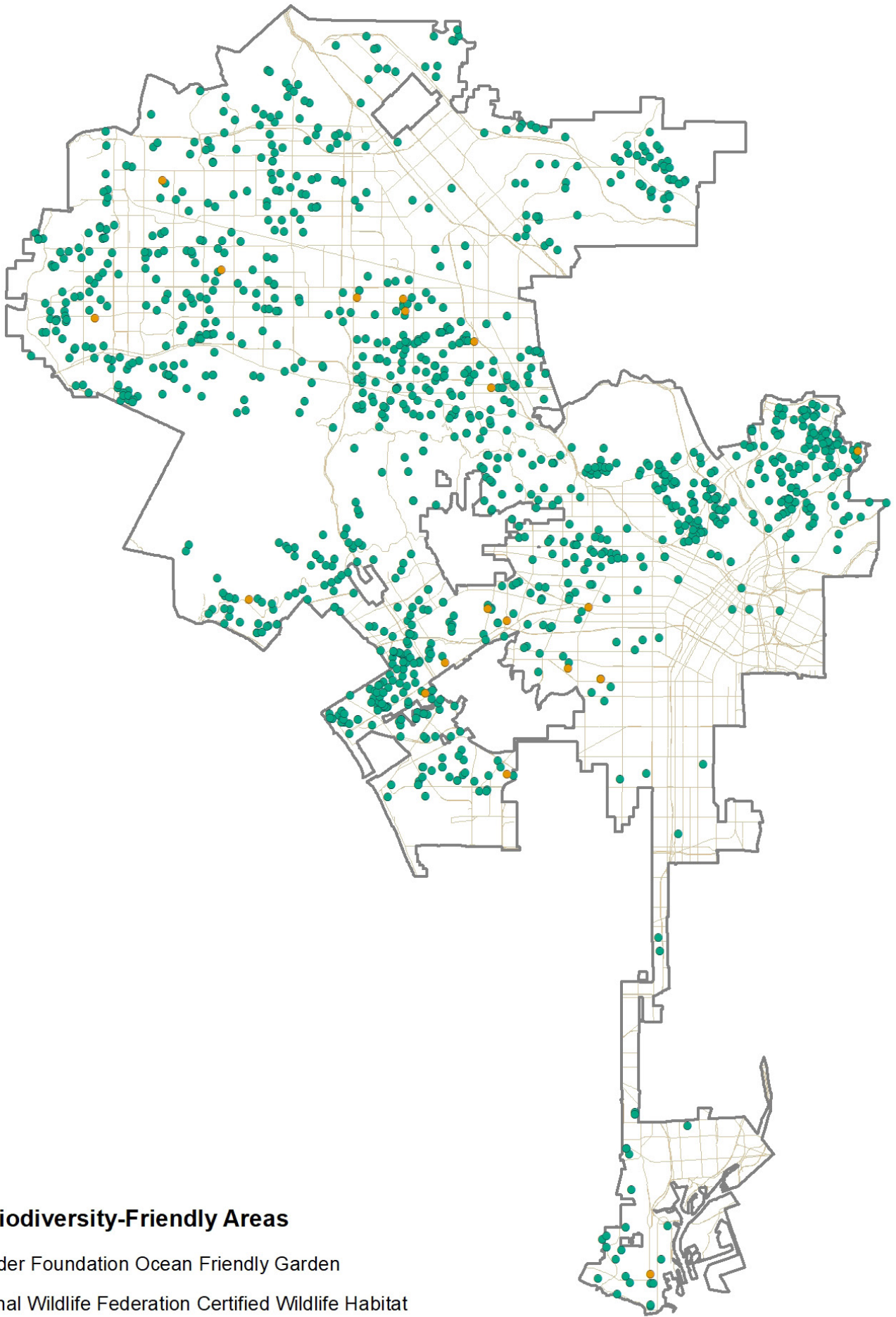
To achieve Citywide certification, the City of Los Angeles encouraged residents, schools and organizations to apply for and achieve their own certification by gardening with wildlife in mind, using native plants and sustainable practices, providing cover and food and water, and reducing or eliminating the use of chemical pesticides and fertilizers. Designing gardens and green spaces following these principles supports wildlife, restores connectivity, and enhances climate resilience. These outreach efforts become apparent. The City registered for the program with the National Wildlife Federation in August 2020. The spike in certifications on the graph below shows the jump in certifications that occurred after the City registered.

### Results Discussion:

The City of Los Angeles has 1,181 unique certified gardens and habitats. This includes 19 Ocean Friendly Gardens and 1,162 National Wildlife Federation habitats. It is important to note that there are actually 1,206 habitats that have been certified by the National Wildlife Federation, but 47 of these had multiple certifications.



NWF-certified coastal habitat  
(Photo: Michelle Barton)



### Certified Biodiversity-Friendly Areas

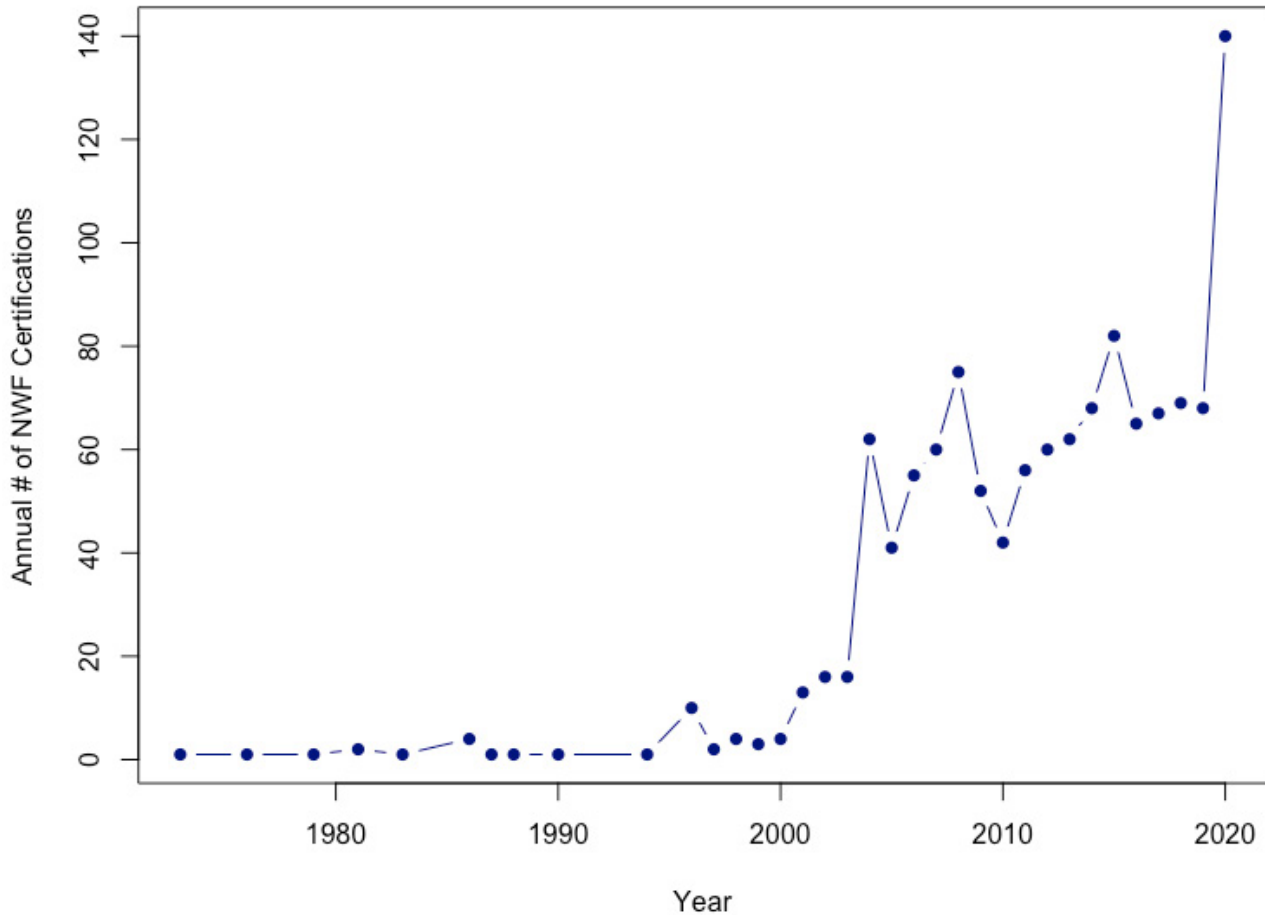
- Surfrider Foundation Ocean Friendly Garden
- National Wildlife Federation Certified Wildlife Habitat

□ City of LA Boundary

— Roads (CAMS)

0 1 2 4 6 8 Miles

## Annual NWF Certifications



### ***Management Implications:***

- Encouraging Angelenos to create habitat and use sustainable, wildlife-friendly practices across the City has immense value. While public spaces can be certified by NWF, the Surfrider Foundation, and Audubon programs, the majority of certified habitats are on private property. As [87% of land in the City of Los Angeles](#) is privately-owned, it is important that these lands are beneficial to native species.
- Policies, like the [Draft Wildlife Ordinance](#), should encourage private landowners to create habitat for wildlife, create wildlife corridors, and enhance connectivity.
- Residents should be encouraged to create habitats on private land that are composed of at least 50% native species to support native insects, birds, and food webs.
- The City, and other major public landowners in the City (e.g., the County, Metro, LAUSD), should also seize opportunities to make public lands more biodiversity-friendly and train staff to manage parklands and open space with organic regenerative management techniques as outlined in the [RegenerateLA Motion](#).
- Many resources exist that provide guidance on incorporating native plants into landscaping. These resources and tools, listed and linked below, should be promoted and shared widely.



- [Native Plant List, LA County Waterworks Districts](#) - This site includes plant lists and resources for designing gardens with drought tolerant native plants.
- [Landscaping Guidelines and Plant Palettes, Los Angeles River Master Plan](#) - This resource includes guidelines and plant palettes for the Los Angeles River and the Tujunga Wash.
- [Emerald Necklace Native Plants Palette, Amigos De Los Rios / Emerald Necklace Group](#) - This site includes plant lists that were developed by a multidisciplinary team for river corridor plantings and restoration work.
- [Native Plant Finder, NWF](#) - This tool provides zip code-specific lists of native plants to users. Additionally, the tool ranks native plants by the number of butterfly and moth species that they support.
- [Native Plants Database, Audubon](#) - This tool provides zip code-specific lists of native plants to use and shows the bird species that each plant species may attract.
- [Pollinator-Friendly Native Plant Lists, Xerces Society](#) - This site provides lists of pollinator plants by state.
- [Planting Guide, Calflora](#) - This site provides a location-specific list of plants.
- [Theodore Payne Foundation](#) - This organization provides a variety of [Plant Guides](#), has an extensive [Native Plant Database](#), and offers a [California Native Plant Landscaper Certificate Program](#).
- [California Native Plant Society \(CNPS\)](#) - CNPS offers a variety of gardening resources and tools. In particular, the [Calscape tool](#) allows users to find plants that have desired plant characteristics.

Beautiful NWF-certified habitat in Venice  
(Photo: Michelle Barton)

# METRIC FINDINGS

## THEME 3: GOVERNANCE & MANGEMENT



# 3.1A BIODIVERSITY VISION/ACTION PLAN

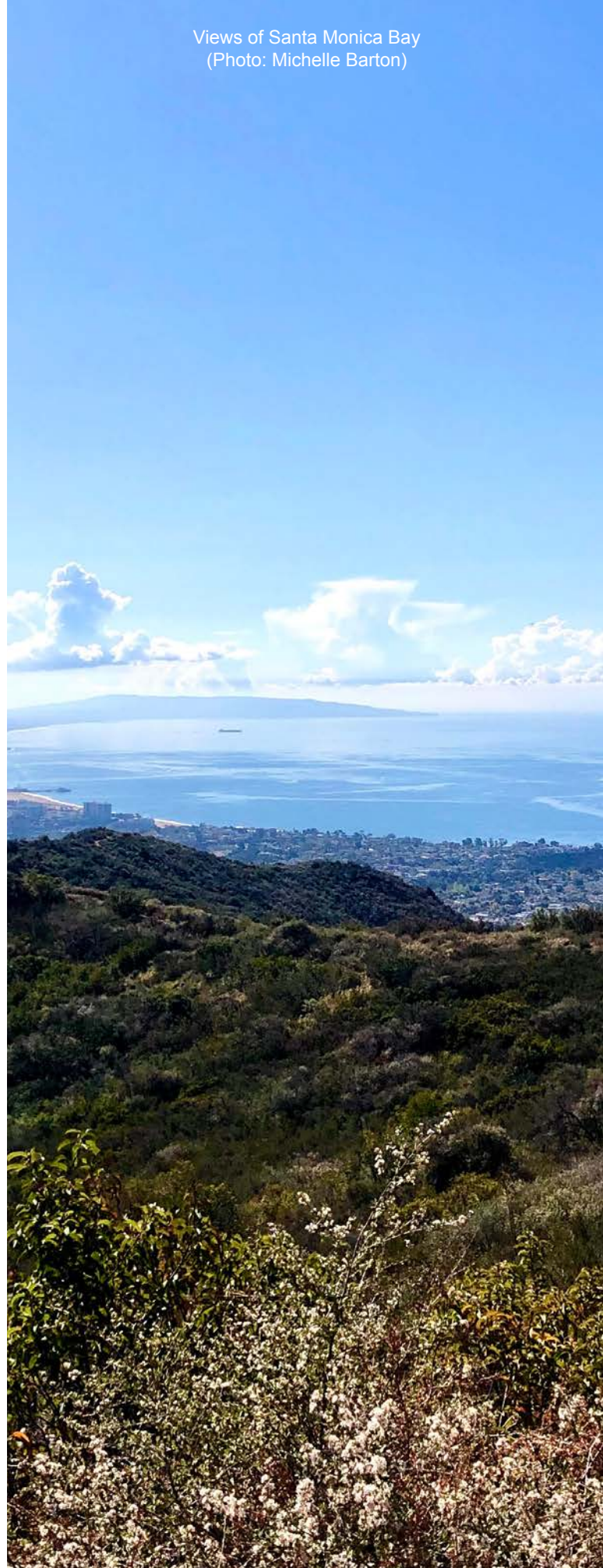
**Score: 0 points - No Plan**

Points	Biodiversity Vision Plan / Action Plan
0	No Plan
1	Biodiversity Vision Plan only
2	Biodiversity Vision Plan and Action Plan
3	Biodiversity Vision Plan and Action Plan plus 1-5 local initiatives that are measurable and achievable
4	Biodiversity Vision Plan and Action Plan plus 5-10 local initiatives that are measurable and achievable
5	Biodiversity Vision Plan and Action Plan plus >10 local initiatives that are measurable and achievable

## Background:

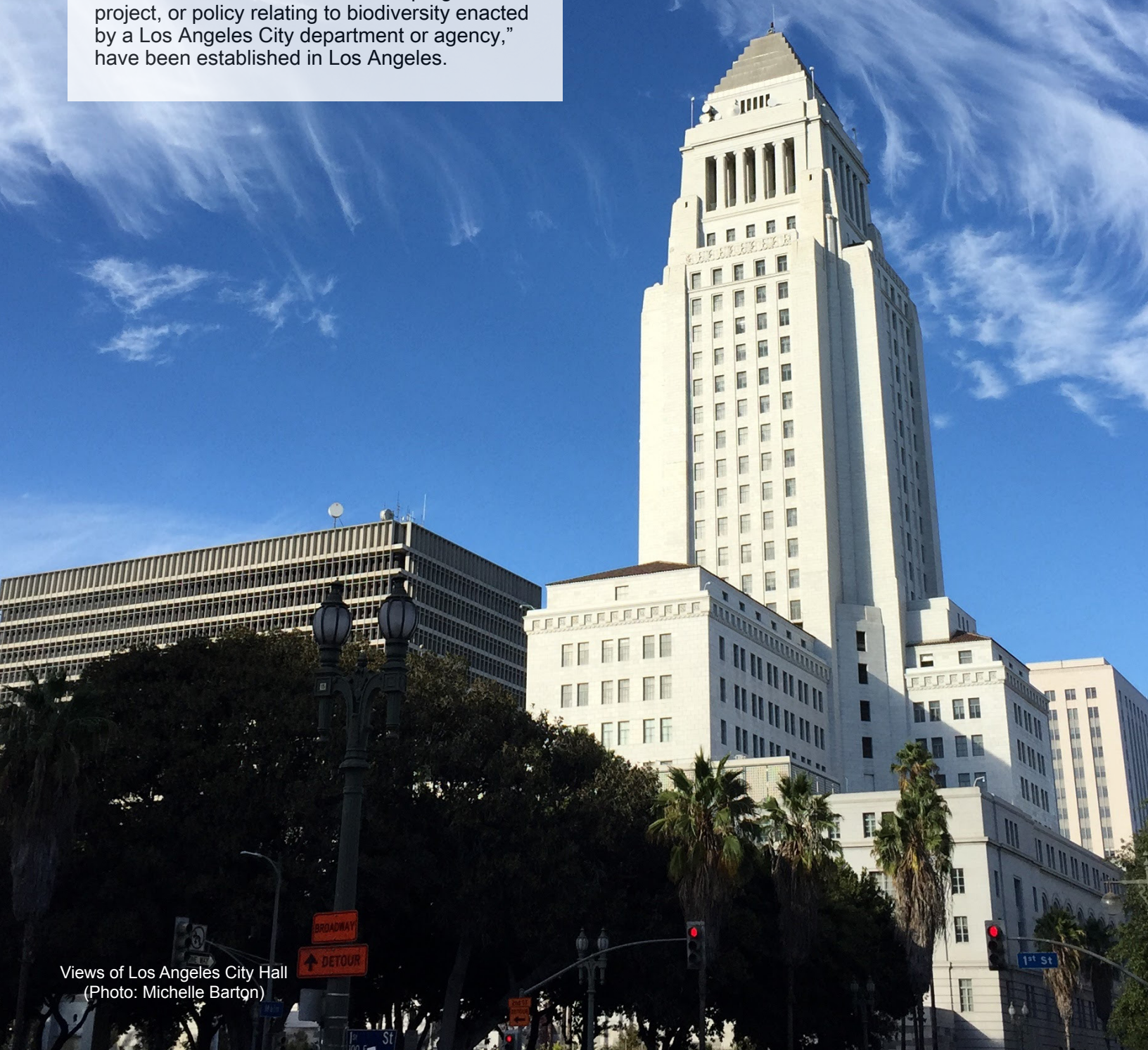
As cities and subnational governments are increasingly seen as playing important roles in biodiversity conservation, policies, rules, and regulations around biodiversity management and conservation must be put into place. Traditionally, issues such as climate change and biodiversity conservation have been seen as national issues, but recent efforts aim to include cities and subnational governments in the process. For example, the Edinburgh Process was created to amplify the roles of subnational governments in regards to the Post-2020 Global Biodiversity Framework.

Metric 3.1a evaluates the presence of a biodiversity vision or action plan and the existence of other local initiatives that supplement the action plan. A formal Local Biodiversity Strategy and Action Plan (LBSAP), is a comprehensive plan designed by the [Convention on Biological Diversity \(CBD\)](#) in order to allow cities, regions, or states to holistically detail how to achieve goals relating to the conservation and enhancement of biodiversity locally. While alignment with the CBD guidelines is not necessarily required for Los Angeles to create a comprehensive biodiversity vision or action plan, available resources and examples could be helpful in framing what needs to be considered by a future plan.



## ***Results Discussion:***

As Los Angeles City does not yet have a comprehensive, City-wide biodiversity vision or action plan, this indicator receives a score of 0. Therefore, it is necessary to establish a vision plan and/or action plan in order to raise the score of this indicator. However, as demonstrated in the table below, a variety of local initiatives, defined here as “a program, project, or policy relating to biodiversity enacted by a Los Angeles City department or agency,” have been established in Los Angeles.



Views of Los Angeles City Hall  
(Photo: Michelle Barton)

This table details local initiatives in the City by department based on research detailed in 3.1b, along with [Convention on Biological Diversity \(CBD\) Aichi targets](#), [CBD Post-2020 targets](#), and [Sustainable Development Goal \(SDG\) targets](#) the City has met. See [Appendix II](#) for additional information on these targets.

<b>City Department</b>	<b>Plans / Guiding Documents / Policies / Procedures / Regulations that Conserve and Enhance Biodiversity</b>	<b>CBD Aichi Targets</b>	<b>CBD Post-2020 Targets</b>	<b>SDG Targets</b>
Los Angeles World Airports	<a href="#">Sustainability Action Plan</a> : Natural Resources Management (2019)	B C E	1 2 3 4 10 13	15.1 15.5 15.8
Department of Animal Services	<a href="#">Wildlife Webpage</a>	B		15.5
City Planning	<a href="#">LA River Planning</a> / <a href="#">Venice Local Coastal Program / Conservation</a> / <a href="#">Wildlife Pilot Study</a>	B C E	1 2 10	15.1
Port of Los Angeles	<a href="#">Biological Baseline Surveys</a> / <a href="#">Biological Mitigation</a> / <a href="#">California Least Tern</a> / <a href="#">Invasive Species</a>	B C E	1 2 3 4 10 13	15.1 15.5 15.8
Recreation & Parks	<a href="#">Urban Forest Program</a>	B C D	1 2 3 10 18	15.2 15.5 15.8
LA Environment & Sanitation	<a href="#">Biodiversity Webpage</a>	A B C D E	13 18 19	15.9 15.A
Street Services Bureau (StreetsLA)	<a href="#">Urban Forestry Division</a>	B C D	1 2 6 10	15.2 15.5
Los Angeles Zoo	<a href="#">Conservation Project Partners</a> / <a href="#">California Condor Recovery Program</a> / <a href="#">Animal Management Programs / Endangered Species</a> / <a href="#">Conservation Strategic Plan</a>	C D	10 18	15.5 15.C
Department of Water and Power	<a href="#">Water Conservation: Encouragement of Native Plants, Water Wise Yard</a>	B E	4 6 9 18	
Bureau of Engineering	Unofficial native plants policy / LA River Master Plan Guidelines for restoration	B C E	1 2 4 13	15.1



A black walnut tree in Elysian Park  
(Photo: Michelle Barton)

## ***Management Implications:***

- LASAN should hold a workshop with the Biodiversity Expert Council and Interdepartmental Biodiversity Team to write a biodiversity vision plan.
- LASAN should work with the Biodiversity Expert Council and Interdepartmental Biodiversity Team to write a biodiversity action plan to accomplish the City's biodiversity vision that utilizes existing Convention on Biological Diversity resources, particularly the [CBD Guidelines to develop and implement national, subnational, and local BSAPs](#). CBD's [list of subnational and local BSAPs](#) should be referenced for inspiration.
- The establishment of a biodiversity vision and action plan for the City of Los Angeles would aid in meeting higher score criteria for multiple metrics in the management and governance theme, including:
  - Metric 3.1b: % Departments with Biodiversity Programs
  - Metric 3.2b: Protected Natural Areas Management & Monitoring
  - Metric 3.2c: Management of Invasive Species & Pests
  - Metric 3.2d: Management of Threatened, Endangered, and Species of Concern
- The five actions described in the Next Steps section at the end of this document can serve as a starting point for a Local Biodiversity Action Plan for the City.



Say's pheobes (*Sayornis saya*)  
(Photo: Graham Montgomery)

# 3.1B % DEPARTMENTS WITH A BIODIVERSITY PROGRAM OR POLICY

**Score: 3 points - 63%**

Points	% of City Departments Expected to Have Biodiversity Programs or Policies
0	< 20%
1	20% – 35%
2	35% – 50%
<b>3</b>	<b>50% – 65%</b>
4	65% – 85%
5	> 85%

## Background:

Metric 3.1b seeks to measure biodiversity programs, policies, and projects within individual City departments in order to understand engagement with biodiversity across various governmental sectors. As a first step, online research was conducted via City department websites, social media, and press releases on all [45 City Departments & Bureaus](#). In addition, a survey sent to Departmental Chief Sustainability Officers (DCSOs) was used in order to gather supplemental information. Collectively, this information was used to populate a comprehensive database with data on all City Departments. The following information was collected: links to departmental websites, links to departmental environmental or biodiversity programs, information about biodiversity programs and policies, and contact information. Based on online research and the DCSO survey, each department was assigned a score from 0-2.

## Scoring Guidelines:

- 0: Department has no environmental or biodiversity programs or policies
- 1: Department has environmental programs or policies, but none directly related to biodiversity
- 2: Department has biodiversity related programs or policies

After individual departments were scored, departments that lack connections to biodiversity were removed from further analysis. To score the metric, the percentage of existing versus expected departmental biodiversity programs and/or policies was calculated. The department-specific information gathered for this metric will be subsequently used to determine which departments should develop and implement biodiversity action plans.

## Results Discussion:

Out of the 45 total Los Angeles City departments, 12 were found to have biodiversity programs, projects, and/or policies, with an additional 10 departments engaging with some aspect of environmental programs or policies (e.g., clean energy, environmental justice, etc.), but without specific reference to biodiversity (see table below).

Score	0	1	2
<b>Number of Departments</b>	23	10	12

While it is important to understand the percentage of City departments with environmental and biodiversity programs, many departments (e.g., 311 Call Center) do not have functions that directly relate to biodiversity. As such, it was deemed beneficial to remove departments from this analysis based on a lack of land or natural resource management jurisdiction (e.g., 311 Call Center, Office of the City Clerk, etc.) and score this metric with only biodiversity-relevant departments. Of the [45 City Departments](#), 19 departments have direct or indirect connections to biodiversity or natural resources in their core activities. This means that 63% of departments (12/19) that should be considering biodiversity actually have biodiversity programs or policies. The remaining seven departments are encouraged to incorporate biodiversity considerations into their operations and practices in the immediate future. LASAN and the other 11 departments that have biodiversity policies and plans can be used as resources. As more than 50% of departments have departmental programming or policies related to biodiversity, a score of 3 is received for this metric.

Score	Have Biodiversity Programs or Policies	Expected to Have Biodiversity Programs or Policies	N/A
Number of Departments	12	7	26
Percentage of Departments	63%	37%	

<b><i>Have Biodiversity Programs or Policies</i></b>	City Planning
	Department of Animal Services
	Department of Water & Power
	Engineering Bureau (Public Works)
	Los Angeles Public Library
	Los Angeles World Airports
	Los Angeles Zoo
	Port of Los Angeles
	Public Works
	Recreation & Parks
	Sanitation Bureau (Public Works)
	Street Services Bureau (StreetsLA)
<b><i>Expected to Have Biodiversity Programs or Policies</i></b>	Building & Safety
	Department of Neighborhood Empowerment
	Economic & Workforce Development
	Fire Department
	General Services Department
	Street Lighting Bureau (Public Works)
	Transportation Department

**Departmental Biodiversity Action Plans:**

In 2021 [City Council requested that a subset of City departments develop department-specific biodiversity action plans](#). Individual plans should outline how each department intersects with native biodiversity issues and how each department is working to protect and enhance biodiversity in their operations. In addition, plans should include recommendations and goals that outline how the department can help achieve the no-net loss of biodiversity goal. Plans should address the threats and needs of wildlife species across the urban association spectrum, providing protection for urban avoiders and urban-tolerant species alike.

Departments that create and submit plans will be requested to share progress annually with LASAN. In total, 14 of the 19 departments and proprietaries (see table below) that have connections to biodiversity are directed to draft biodiversity action plans.

**Biodiversity Considerations:**

Five departments, that have the potential to impact biodiversity, should consider biodiversity in their planning and activities to the extent possible, but will not be required to develop formal biodiversity action plans.

<b><i>Biodiversity Plan Required</i></b>	<b><i>Consideration of Biodiversity Recommended</i></b>	<b><i>No Plan / No Consideration Required</i></b>
Board Offices of Public Works	Building & Safety	311 Call Center
City Planning	Department of Animal Services	Contract Administration Bureau (Public Works)
Department of Water & Power	Department of Neighborhood Empowerment	Convention & Tourism Development
Engineering Bureau (Public Works)	Economic & Workforce Development	Cultural Affairs Department
Fire Department	General Services Department	Department of Aging
Los Angeles Public Library		Department of Cannabis Regulation
Los Angeles World Airports		Department of Disability
Los Angeles Zoo		El Pueblo de Los Angeles Historical Monument Authority
Port of Los Angeles		Emergency Management Department
Recreation & Parks		Fire & Police Pensions Department
Sanitation Bureau (Public Works)		Housing & Community Investment Department
Street Lighting Bureau (Public Works)		Housing Authority
Street Services Bureau (StreetsLA) (Public Works)		Information Technology Agency
Transportation Department		LA Memorial Coliseum
		Los Angeles City Retirement System
		Office of Finance
		Office of the City Administrative Officer
		Office of the City Attorney
		Office of the City Clerk
		Office of the City Controller
		Personnel Department
		Police Department
		Police Inspector General
		Project Restore
		Public Works Office of Accounting
		The Office of (Rate Payer) Public Accountability (OPA)
<b>14</b>	<b>5</b>	<b>26</b>



Clarkia, grindelia, poppies, baby blue eyes, chia, and yarrow in bloom in a Test Plot at Elysian Park  
(Photo: Michelle Barton)

## ***Management Implications:***

- While the scoring for this indicator only counts departments with programs or policies relating directly to biodiversity, the 0-2 system is helpful in understanding the broader environmental commitments being made in the City. Furthermore, a score of 1 in the database shows which departments have taken environmental action, which could indicate departments where biodiversity programs or policies could be more easily initiated in the future. Engagement with these departments on biodiversity topics should be pursued as these departments influence a variety of activities, policies, and procedures across public and private property in the City of LA. Ideally, all 45 City departments should creatively address wildlife and natural resources in their programs and policies.
- Three departments, the LA Fire Department, LA Department of Transportation, and LA Lights, do not appear to have biodiversity policies or programs in place, but are encouraged to develop them in the immediate future as their core functions have the ability to harm, or benefit, native biodiversity.
- Fourteen departments (see full list above) should develop biodiversity action plans and report on progress and activities annually.
- Cross-departmental collaborations are essential to promote biodiversity issues.
- Management of biodiversity should be better integrated across City operations, governance, and major projects.
- The City should develop Biodiversity Design Guidelines that will enable biodiversity considerations for major public and private projects.
- The City of Los Angeles should look to other cities, states, and countries for inspiration on how to better integrate biodiversity into all City Departments and coordinate interdepartmental projects and initiatives. In particular, the City of Los Angeles should look to the City of San Francisco for inspiration. San Francisco has requested that 15 City Departments articulate their commitments to San Francisco's Biodiverse City Vision in [public memos or resolutions](#).

# 3.2A % PROTECTED NATURAL AREAS

Score: 1 point - 61%

Points	% Protected Natural Areas
0	< 60%
1	60% – 65%
2	65% – 70%
3	70% – 80%
4	80% – 90%
5	> 90%

## Background:

Metric 3.2a tracks the proportion of natural areas that are protected and preserved for nature in perpetuity. Protected areas are essential for biodiversity conservation. However, an inadequate fraction of the globe (15% of land and 7.5% of the ocean) is protected to stem the loss of biodiversity at the global scale (Pörtner et. al., 2021). The United States and the State of California are both committed to the 30 x 30 initiative, which aims to protect 30% of land and coastal seas by 2030.

In 2017, Representative Adam B. Schiff introduced the Rim of the Valley Corridor Preservation Act. Shortly thereafter, Senators Feinstein and Padilla introduced a companion bill in the Senate. At this time, the House bill has been approved and the Senate version is under consideration. If passed by the Senate, this important bill would adjust the boundary of the Santa Monica Mountains National Recreation Area to include the Rim of the Valley Unit (see [map](#)), protecting vital lands and corridors in the greater Los Angeles area for biodiversity and wildlife in perpetuity.

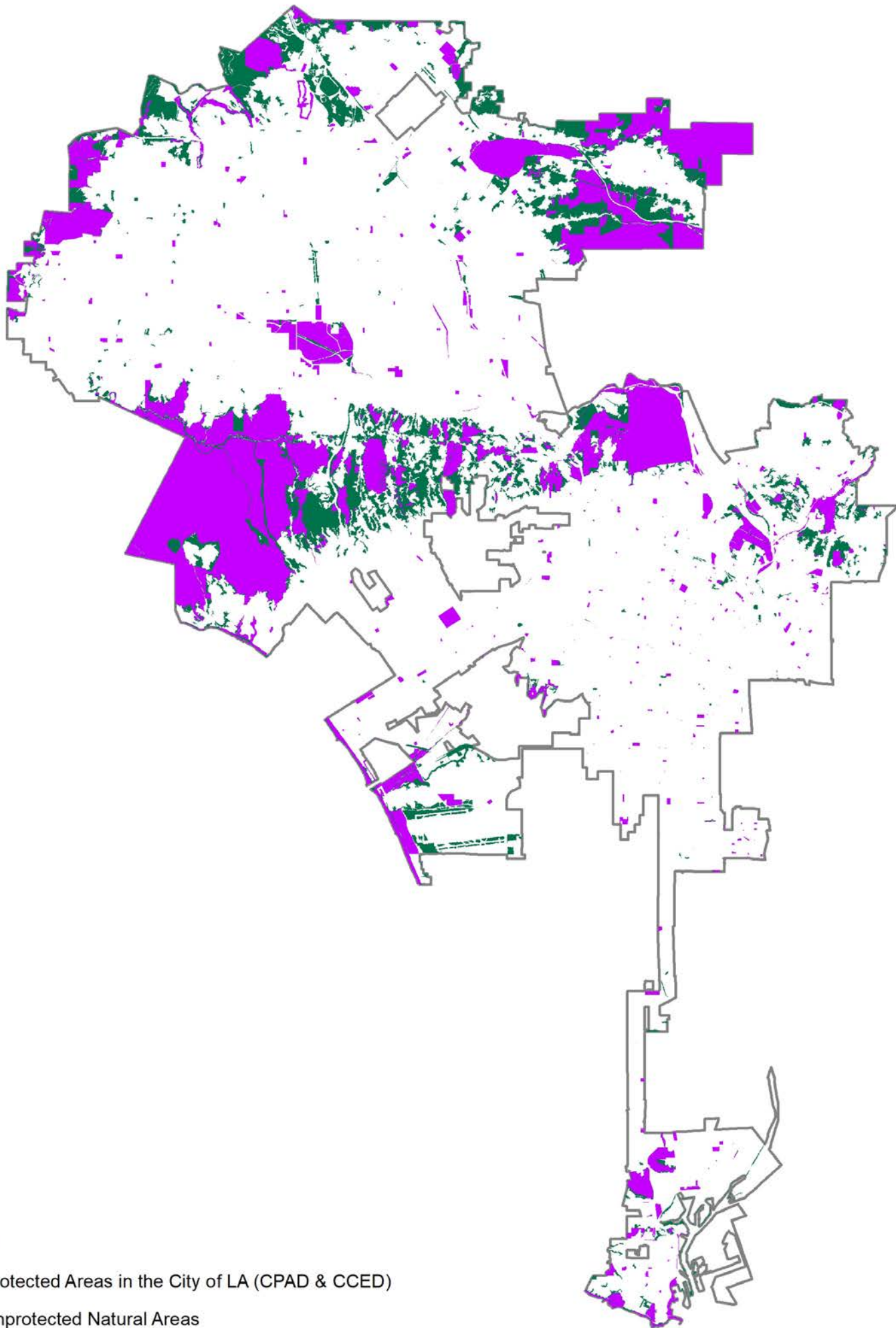
## Results Discussion:

Roughly 20% (95.4 square miles) of the City of Los Angeles is considered to be natural, open space (see metric 1.1a). Of this, 61% (58.3 square miles) is considered protected by the California Protected Areas Database (CPAD) or by the California Conservation Easement Database (CCED). This means that 12.4% of the overall area within the City




limits is legally protected. Given the National and State 30 x 30 goals, the City should work to increase the proportion of open space that is protected for biodiversity and conservation purposes. The City should work to establish an actionable restoration and conservation plan that will allow the Biodiversity Team, the City family, and other biodiversity stakeholders to prioritize locations for future conservation, preservation, or restoration activities across LA. In other words, the Biodiversity Team should lead an effort to create a roadmap to the 30 x 30 initiative for Los Angeles (e.g., the [Bay Area Conservation Lands Network](#)).

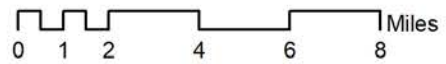
## Management Implications:

- Strategically increase protected areas in the City of Los Angeles (via direct acquisition or acquisitions via local partners) that will augment local wildlife connectivity needs, especially in the face of direct and indirect impacts of climate change.
  - Conduct additional analysis and interpretation of the various connectivity analyses (metrics 1.1c -1.1f) to determine areas of the City that can be protected to support wildlife connectivity.
  - Use the list of management target priorities and a list of acquisition priorities created by the Conservation Ecology Lab at San Diego State University (SDSU) (Jennings et. al., 2019) to make data-driven decisions. In the City of Los Angeles, the Arroyo Seco corridor has been identified as a top management and acquisition priority to ensure regional biodiversity, ecological function, and wildlife connectivity (see [SDSU Story Map](#)).
  - Encourage new research that will develop data resources that will help guide acquisition decisions based on their habitat value, ability to support rare or special-status species, etc.
  - Consider protecting non-natural areas that support biodiversity or connectivity, particularly in urban, environmental justice neighborhoods that are underserved by natural areas and lack access to biodiversity.
  - Research strategic acquisition opportunities (e.g., brownfields or vacant lots) that can augment habitat.
- Assess/account for level of protection since the level of protections offered can vary.
- Evaluate strategies for further protections through zoning, easements and biodiversity design guidelines.



**Legend**

-  Protected Areas in the City of LA (CPAD & CCED)
-  Unprotected Natural Areas
-  City of LA Boundary



# 3.2B PROTECTED NATURAL AREAS MANAGEMENT AND MONITORING

**Score: 1 point - Critical Management**

Points	Level of Management and Monitoring of Protected Natural Areas
0	No management program
<b>1</b>	<b>Critical management activities only</b>
2	Volunteers or equivalent hours to 1 dedicated staff per >100 acres
3	Equivalent hours to 1 dedicated staff per 100 acres
4	Equivalent hours to 1 dedicated staff per 50 acres
5	Equivalent hours to 1 dedicated staff per 25 acres

## Background:

Metric 3.2b builds on metric 3.2a, % Protected Natural Areas, to assess the level of physical-on-the-ground stewardship in natural areas based on person-hours per acre per year.

Recreation & Parks (RAP) takes pride in supporting the City’s urban wilderness and open spaces by maintaining and caring for LA’s vast natural resources, including its urban tree canopy, 13 different lakes, and 92 miles of hiking trails. The department oversees Griffith Park, one of the largest urban parks in North America, and is home to a number of landmarks, such as the world-class Griffith Observatory and the world-famous Hollywood Sign. Recreation & Parks also owns and operates Venice Beach, the Cabrillo Marine Aquarium, and [12 museums](#), which attract millions of residents and visitors from around the world and provide opportunities to educate the public and build a new generation of environmental stewards. Some of these sites, like the White Point Nature Education Center and Preserve located on a beautifully restored 102-acre preserve in San Pedro, are co-managed with non-profit partner organizations, such as the Palos

The natural areas at Runyon Canyon Park are managed by the Department of Recreation & Parks (Photo: Michelle Barton)



Verdes Peninsula Land Conservancy, to restore and steward the land and provide educational opportunities to the public. Similarly, Augustus F. Hawkins Nature Park, a former LADWP pipe yard converted to a nature park with a trail in urban South LA, was funded by SMBRC and City, County, and State bond measures and is managed in partnership with the Mountains Recreation and Conservation Authority (MRCA).

RAP engages with a variety of stewardship partners, some that are focused on specific parks and others that work across the City. A full list of stewardship partners in parks, including park-specific partners, is included below.



#### STEWARDSHIP PARTNERS IN LA CITY PARKS:

- [Biocitizen - Los Angeles](#)
- [California Native Plant Society](#)
- [City Plants](#)
- [Friends of the Los Angeles River \(FOLAR\)](#)
- [Koreatown Youth + Community Center](#)
- [LA Parks Foundation](#)
- [Los Angeles Audubon Society](#)
- [Los Angeles Beautification Team](#)
- [Los Angeles Conservancy](#)
- [Los Angeles Conservation Corps \(LACC\)](#)
- [Los Angeles / Santa Monica Mountains Chapter California Native Plant Society](#)
- [Mountains Recreation & Conservation Authority \(MRCA\)](#)
- [North East Trees](#)
- [Palos Verdes Peninsula Land Conservancy](#)
- [San Fernando Valley Audubon Society](#)
- [TreePeople](#)
- [University of California](#)
- [US Forest Service](#)

#### PARK-SPECIFIC PARTNERS:

##### Griffith Park:

- [Friends of Griffith Park](#)

##### Sepulveda Basin:

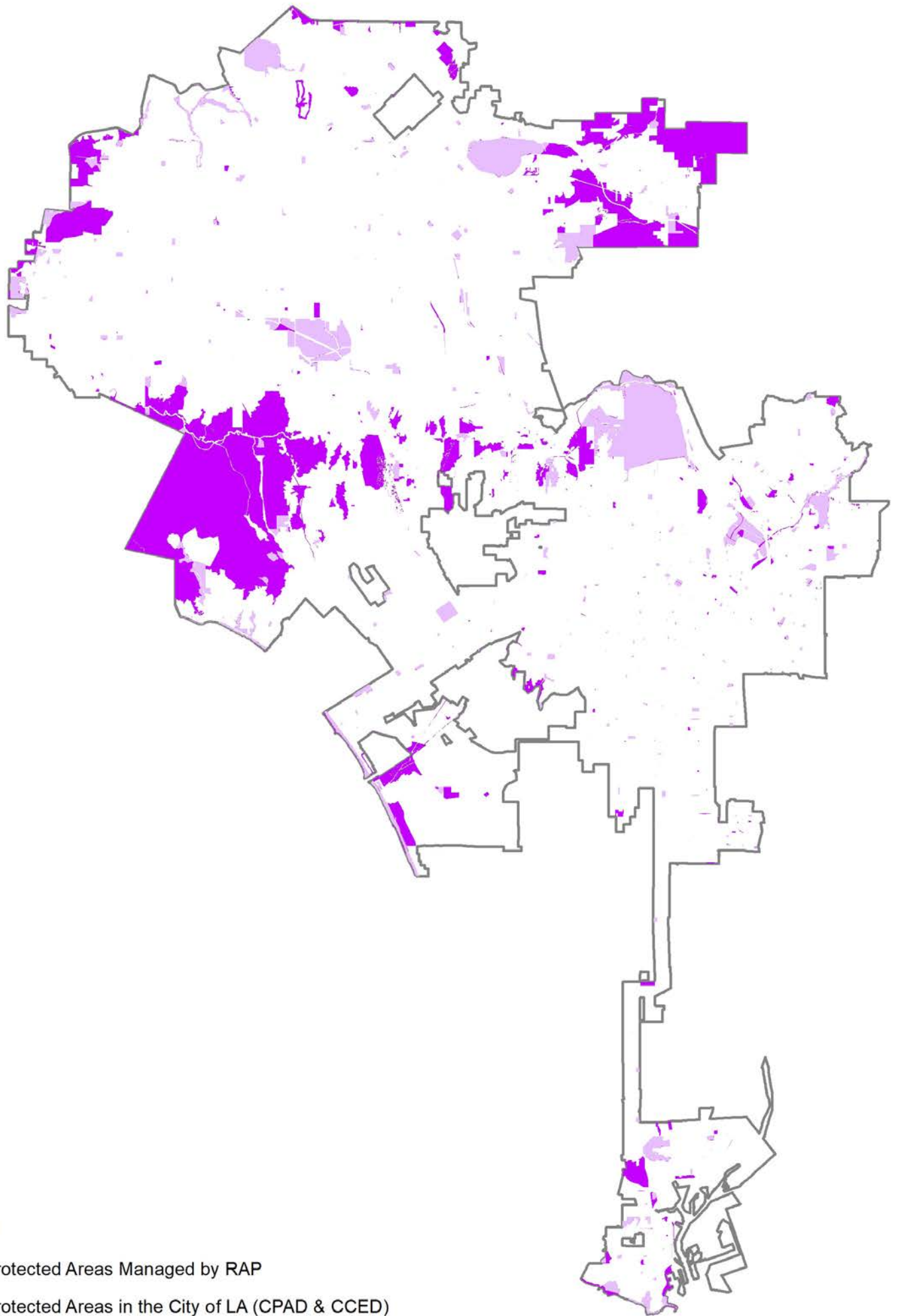
- [Sepulveda Basin Wildlife](#)
- [Sierra Club, Los Angeles Chapter](#)
- [State of California, Department of Parks and Recreation](#)
- [Resource Conservation District of the Santa Monica Mountains](#)
- [The River Project](#)

##### Elysian Park:

- [Echo Park Historical Society](#)
- [Citizens Committee to Save Elysian Park](#)
- [Echo Park Chamber of Commerce](#)
- [Echo Park Neighborhood Council](#)
- [Historic Solano Canyon](#)

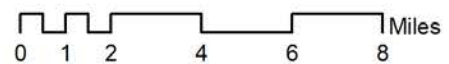
##### Hansen Dam:

- [US Army Corps of Engineers](#)



**Legend**

- Protected Areas Managed by RAP
- Protected Areas in the City of LA (CPAD & CCED)
- City of LA Boundary



The habitat in Griffith Park is managed by the Department of Recreation & Parks  
(Photo: Michelle Barton)



## **Results Discussion:**

The City of Los Angeles Department of Recreation and Parks provides stewardship for more than 17,000 acres of land and offers programming and recreational opportunities at 450+ parks across the City. 27.52 square miles (17,613 acres) or 38% of the 72.35 square miles of protected areas in the City of Los Angeles are managed by the Department of Recreation and Parks. Protected park facilities include important open space and natural areas with hiking trails across the City, such as Griffith Park, Verdugo Mountain Park, the Sepulveda Basin, Hansen Dam, O'Melveny Park, and Ernest E. Debs Regional Park.

In recent years, RAP and other relevant City departments have made great strides in being better stewards of the City's natural habitats. New positions have been created at LASAN, RAP, and the Department of City Planning to better monitor and manage the City's biodiversity, institutionalize wildlife-friendly practices, and raise awareness around biodiversity issues. The most recent position, RAP's Urban Ecologist, will increase the ability of RAP to monitor and manage habitat in the City's parks. Additionally, RAP, LASAN, Kiss the Ground, and LA Compost have created a training course called RegenerateLA that will provide training to RAP staff on how to better steward land and soil to protect the City's biodiversity.

Engaged stewardship partners aid RAP in managing a large portion of the natural areas in the City of LA. While there are a variety of ongoing stewardship initiatives, stewardship efforts are not currently tracked in a comprehensive way that allows an assessment based on the person-hour per acre. Although person-hours of critical management activities (e.g., invasive weed management, trail maintenance, etc.) are not tracked, and readily available, these activities are ongoing. Further, as indicated by the staffing and training developments and stewardship partnerships noted above, there is growing interest and effort in better managing the City's protected natural areas. However, without centralized records that enumerate stewardship activities, a score of 1, critical management activities only, has been assigned for the baseline assessment of this metric.

## Management Implications:

- Recreation & Parks should continue to establish and grow relationships with non-profit partners who can help steward natural lands. [The Los Angeles Stewardship Mapping & Assessment Project \(STEW-MAP\)](#) developed by Loyola Marymount University can serve as a resource to identify stewardship partners for specific projects/ areas of the City.
- Recreation & Parks should investigate ways to use time codes to better track internal stewardship activities/biodiversity-related tasks for future assessments.
- Efforts by RAP stewardship partners should be tracked annually in a comprehensive way that allows an assessment based on the person-hour per acre. Data from listed partners on effort expended and activities engaged in should be collected by RAP annually. The LASAN Biodiversity Team can help develop a database (or other tracking mechanism) to comprehensively track, monitor, and prioritize future stewardship activities on City lands.
- RAP and the LASAN Biodiversity team should collaborate to:
  - Develop a list of Best Management Practices (BMPs) to guide management and stewardship activities.
  - Pilot restoration projects that can demonstrate the impacts of stewardship and management.
- City staff should inventory and analyze the management needs of the City's Parks and Protected Areas for Wildlife (PAWs) and develop a list of management priorities.
- The Biodiversity Team and Recreation & Parks should partner to engage the public about local ecological stewardship volunteer opportunities (e.g., making observations of indicator species, making observations of problematic invasive weeds, applying compost and mulch to urban parks, etc.).
- Members of the community can be called upon to serve as stewards for our natural areas. Resources, such as the [City Plants Tree Ambassador Community Action Toolkit and curriculum](#), should be promoted and shared with the public.



# 3.2C MANAGEMENT OF INVASIVE SPECIES & PESTS

**Score: 0 points - No Inventory**

Points	Level of Practices and Policies Addressing Invasive Species
0	No inventory of invasive species
1	Inventory of invasive species
2	Inventory and monitoring of invasive species
3	Inventory and monitoring of invasive species plus invasive species policy that prohibits the sale of invasive plants and bans second generation rodenticide
4	Inventory and monitoring of invasive species, invasive species policy that prohibits the sale of invasive plants and bans second generation rodenticide, and integrated pest management (IPM) for invasive species
5	Inventory and monitoring of invasive species, invasive species policy that prohibits the sale of invasive plants and bans second generation rodenticide, integrated pest management (IPM) for invasive species, and Management Plan to prevent future invasions

## Background:

Metric 3.2c assesses the level of invasive species and pests management activities currently implemented in the City of Los Angeles. It looks at the existence of an invasive species inventory, various control of spread policies, an integrated pest management plan for invasive species, and managed areas. As stated in the report for metric 1.3b, invasive plant species can be hugely detrimental to native biodiversity, displacing native species and even eliminating host plants that native wildlife species depend on (Cooper & Mathewson, 2009). Similarly, the presence of invasive fauna (e.g., Eastern fox squirrel (*Sciurus niger*), American bullfrog, (*Lithobates catesbeianus*)) and insect pests (e.g., invasive shot-hole borer (*Euwallacea fornicatus*)) is problematic. Invasive

species and pests can alter ecosystem processes (e.g., invasive grasses increase wildfire ignition and reduce the ability of landscapes to sequester carbon). They also lead to displacement, predation, disease and can be detrimental to agriculture and other industries. The impacts of invasive species are so important that the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) lists invasive species as one of five drivers of change in nature. Further, in North America, invasive species and disease are the most common causes of native species extinction (IPBES, 2018). IPBES (2018) points to various impediments in the control of invasive-alien species in the Americas including:

- The lack of information about invasion pathways and mechanisms of successful establishment,
- Low awareness of the risks posed by invasive species by the people involved in major invasion pathways (e.g., shipping industry),
- The lack of infrastructure to intercept and quarantine invasive species, and
- The insufficient funding for monitoring and management.

Globally, and locally, there is much that can be done to improve the monitoring and management of invasive species.



American bullfrog (*Lithobates catesbeianus*) in invasive water lettuce. (Photo: Nurit Katz)

## Results Discussion:

### LA City:

The City of Los Angeles does not have a formal inventory of invasive plant species, nor does the City of LA have a strategy to comprehensively monitor or manage invasive species and pests. The Department of Recreation & Parks, which manages much of the open space in the City, does commit resources to removing invasive species, but the work is opportunistic and done site-by-site or project-by-project as resources permit. However, work done by LA County and non-profit organizations (see below) supplements the work that is formally performed or contracted by the City.

### LA County:

- The Los Angeles County Agricultural Commissioner/Weights & Measures Department has a number of Bureaus and programs that address invasive plant species and pests.
- [The Pest Exclusion and Produce Quality Bureau](#) keeps exotic pests out of the County. County staff has been delegated authority by the State to inspect shipments at USPS, UPS, FedEx, LAX, and nurseries to detect pests.
- The [Weed Hazard/Pest Management Bureau, Weed Hazard Division](#) works with the County Fire Department to deal with and remove brush and invasive weeds to reduce fire risks. The Weed Hazard/Pest Management Bureau, Pest Management Division is responsible for the eradication of all CDFA “A” rated weeds and the control of other invasive weeds in LA County.
- The [Environmental Protection Bureau, Pest Detection Division](#) is in charge of detecting pests in LA County that may have made it past pest exclusion and USDA inspections. The Division sets up traps for fruit flies and other tracked pests. These activities are extremely important as LA is a shipping hub/huge produce market and if there is a pest infestation here, shipping partners may not allow shipments of produce or plants.

Additionally, [LA County](#) has a [Weed Management Area](#) (WMA) that brings together landowners and managers to coordinate efforts and expertise against invasive weeds. Prior to the COVID-19 pandemic, the LA County WMA met quarterly to discuss relevant invasions and has undertaken several projects to more effectively manage the most invasive weeds in the County. Since 2001, the WMA has been surveying selected invasive plants (based on threat levels). The group had specific control projects to manage spotted knapweed, arundo, and perennial pepperweed.



Invasive mustard and other weeds  
(Photo: Nurit Katz)

### Others (Non-profits):

Other non-profit and community-based groups, like Northeast Trees (NET), focus on the preservation and restoration of open space in the LA area. NET pursues grant-funded projects that remove invasive species and restore natural ecosystems in public parks (e.g., Deb’s Park, Ascot Hills Park, Ramona Gardens, etc.). NET reports that the major hurdle to doing this kind of work at a larger scale is funding. Traditionally, there have not been many grant programs that focus on restoration and invasive species control. Grants for fuel management or fire fuel replacement are often available, but the focus of these programs is primarily on wildfire prevention, not ecosystem restoration.

Cities can contribute significantly to biodiversity protection when they manage threats like pollution and invasive species. Despite limited resources, the Department of Recreation & Parks is doing some invasive species management. The Department is also in the process of updating their Integrated Pest Management Plan. In the future, it makes sense to house efforts related to invasive species in RAP. Recommendations on how to shape these efforts are outlined in detail below.

Volunteers removing invasive species  
(Photo: Michelle Barton)



## ***Management Implications:***

- Data
  - An inventory of known invasive species and pests should be established for the City of Los Angeles.
    - An initial list should be jointly drafted by the LASAN Biodiversity Team and Recreation & Parks. Public data on the presence and spread of invasive species across the State of California (e.g., CAL-IPC, Calflora, iNaturalist, CDFG) exists and can be used to build a formal inventory. Data from scientific reports, other departments, and from partners at LA County can help supplement public data.
    - Once drafted, the list should be circulated to the Biodiversity Expert Council for input.
    - Once finalized, this inventory should be adopted by the City and published online via the Recreation & Parks webpage.
    - The inventory should be refreshed and updated every decade.
- Training & Resources:
  - Better train, resource, and equip City staff who manage open space (particularly RAP staff) to identify, monitor, and manage invasive species so that they are positioned to better track and tackle the spread of invasive species.
  - Incorporate invasive species identification, monitoring, and management into Recreation & Parks training.
  - Conduct regional prevention, promote early detection, and expand rapid response training with staff and the public to better monitor and control invasive species.
  - As invasive species are a top threat to local and global biodiversity, there is a need for dedicated Recreation & Parks staff to oversee activities related to the monitoring and management of invasive species and pests, particularly in natural parks (e.g., Griffith Park, Elysian Park, etc.).
- Software:
  - The City should consider purchasing software, like Calflora's Weed Manager, to track and record the presence and spread of invasive plant species. This software should be purchased, and utilized, in conjunction with LA County to improve the amount of data available and encourage collaborative efforts across jurisdictions.
- Collaborations:
  - The City should collaborate across jurisdictions, agencies, and with community groups to better monitor and manage invasive species. The City can learn from the work that is being done by others and partner on initiatives to increase impacts.
  - The City should partner with Los Angeles County to develop an invasive species management plan. This recommendation is also promoted by the [UCLA Ecosystem Health Report Card for Los Angeles County](#), a comprehensive sustainability report card for Los Angeles (Reid-Wainscoat et al., 2021).
  - The City should formally join the Los Angeles County WMA and participate in meetings moving forward.
  - The City should mobilize and collaborate with volunteer groups (e.g., the LADWP Green Team) to help collect data on the presence of invasive species using Calflora and/or iNaturalist.

# 3.2D MANAGEMENT OF SPECIES OF CONSERVATION CONCERN

**Score: 1 - Inventory**

<i>Points</i>	<i>Management of Species of Conservation Concern</i>
0	No inventory of species of concern in the City
<b>1</b>	<b>Inventory of species of conservation concern in the City</b>
2	Inventory and monitoring of species of concern in the City
3	Mitigation plan for impacts species of concern in the City
4	No-net-loss plan for species of concern in the City
5	Adopted recovery plan for species of concern in the City

## **Background:**

Metric 3.2d seeks to measure City engagement with the management, monitoring, and protection of threatened, endangered, and species of conservation concern (“species of conservation concern”). More specifically, this metric seeks to understand the City’s efforts towards the protection and recovery of species considered threatened or endangered by the California Endangered Species Act (CESA) and/or the U.S. Endangered Species Act (ESA) as well as other species of conservation concern.

As described in the report section on metric 1.2c, the City of Los Angeles is thought to provide habitat for over 100 species of conservation concern. Information on policies, projects, and programs related to the management of these 100 species of conservation concern was gathered through online research and the CSO survey described in the report for metric 3.1a, Biodiversity Vision/Action Plan. In particular, respondents were asked to detail projects, programs, and policies relating to the management of species of conservation concern.

Merlin (*Falco columbarius*)  
(Photo: Graham Montgomery)



Additional information on projects, programs, and policies related to T/E/SoC is summarized in the table below. The table includes information on department-specific projects, programs, and/or policies relating to the management of threatened, endangered, and species of concern.

<b>City Department</b>	<b>Projects, Programs, and Policies Relating to Management of Species of Conservation Concern</b>	<b>Sources</b>
Los Angeles World Airports	<ul style="list-style-type: none"> <li>● LAX Dunes: Protection, Monitoring, Management, Stewardship / El Segundo blue butterfly, California coastal gnatcatcher monitoring</li> </ul>	<a href="#">Sustainability Action Plan: Natural Resource Management</a>
Port of Los Angeles	<ul style="list-style-type: none"> <li>● Biological Baseline Surveys: Monitoring, Reporting</li> <li>● Biological Mitigation: Habitat Restoration</li> <li>● California Least Tern: Protection, Monitoring</li> <li>● Vessel Speed Reduction: for air quality with ancillary benefit to blue whales / Eelgrass beds designated as “essential fish habitat”</li> </ul>	<a href="#">Biological Resources Webpage</a> / CSO Survey
Los Angeles Zoo & Botanical Gardens (LA Zoo)	<ul style="list-style-type: none"> <li>● Global Conservation Project Assistance</li> <li>● California Condor Recovery Program</li> <li>● Conservation Strategic Plan</li> <li>● Endangered Species at Zoo / Animal Management (SSPs)</li> <li>● Zoo-based Breeding Program</li> </ul>	<a href="#">Conservation Webpage</a>
Recreation & Parks (RAP)	<ul style="list-style-type: none"> <li>● Endangered Species Conservation Program</li> <li>● Nesting bird surveys</li> <li>● Cabrillo Marine Aquarium: <ul style="list-style-type: none"> <li>○ Tidewater Goby: Husbandry, Education</li> <li>○ Habitat Loss: Education</li> </ul> </li> </ul>	<a href="#">Conservation Webpage / Griffith Park Wildlife Management Plan</a>
LA Sanitation & Environment	<ul style="list-style-type: none"> <li>● Biodiversity Reports: monitoring T/E/SoC and City management practices</li> </ul>	<a href="#">Biodiversity Webpage</a>
City Planning	<ul style="list-style-type: none"> <li>● LA River Ecosystem Restoration: Habitat for various species of concern</li> <li>● Wildlife Pilot Study</li> </ul>	<a href="#">LA River Ecosystem Restoration Webpage / Wildlife Pilot Study</a>
Street Services Bureau (StreetsLA)	<ul style="list-style-type: none"> <li>● Ordinance 177404: Native Protected Tree Ordinance</li> <li>● Compliance with CA Fish and Game Code 3503 and 3503.5 regarding protected birds</li> </ul>	<a href="#">Urban Forestry Division / Ordinance 177404 / CA Fish and Game Code 3503 &amp; 3503.5</a> / CSO Survey
LA Department of Water & Power	<ul style="list-style-type: none"> <li>● Strategic Landholdings Analysis to help identify untapped beneficial uses to support habitat and biodiversity values and engage/ educate customers about ecosystems</li> <li>● Power-in-Pollinators initiative to look at opportunities to consider pollinators in LADWP operations</li> </ul>	CSO Survey

The two-striped gartersnake (*Thamnophis hammondi*)  
(Photo: Graham Montgomery)



The wandering skipper (*Panoquina errans*)  
(Photo: Graham Montgomery)



The activities of three departments, Recreation and Parks, the LA Zoo, and Bureau of Engineering are highlighted and further detailed below:

1. RAP: Parks across the City support plants and animals protected by California and Federal law. In particular, Griffith Park supports 19 known special status species, all of which are detailed in the [Griffith Park Wildlife Management Plan](#). As impacts to species of conservation concern that are regulated by the CESA and ESA need to be regularly evaluated at City parks for activities, including brush clearance, and events, the newly created inventory of special status species will provide a useful starting point. Additional monitoring, mitigation, and better management of special-status species will help focus future surveys, planning, and efforts at park facilities.
2. LA Zoo: In 2021, the LA Zoo launched its Conservation Plan which, amongst other things, details past successes and future goals to support California's native biodiversity. The LA Zoo is committed to rescuing endangered species and has helped save three endangered California species. Additionally, the Zoo is engaged in partnerships and activities, such as captive breeding and release, translocations, etc., that are responsible for saving species locally and around the globe. In the Conservation Plan, the Zoo pledges to expand conservation partnerships and act in a leadership role to accelerate success related to conservation. According to the Conservation Plan, they "pledge to lead efforts to safeguard California's biodiversity, beginning locally in Griffith Park and extending throughout the state."
3. BOE: BOE supports City Departments in CEQA/NEPA environmental review of projects, including assessing potential biological impacts and assists in the development of mitigation measures or integration of biodiversity protection measures into project design.

departments, but spur monitoring, mitigation planning, no-net loss planning, and/or the creation of recovery plans.

Assessment of City activities suggests that eight City departments have projects, programs, and policies related to species of conservation concern, as outlined in the table above. While certain departments perform project-specific monitoring for species of conservation concern, or include mitigation measures related to them, neither monitoring or mitigation is happening comprehensively Citywide. The results of this assessment suggest that there is a strong need for centralized management of species of conservation concern if the City is to achieve the no-net loss of native species goal.



Western pond turtle (*Emys marmorata*)  
(Photo: Nurit Katz)

## Results Discussion:

Via the publication of this report, the City of Los Angeles officially has an Inventory of Species of Conservation Concern and therefore has been given a score of 1 for this metric. Establishing an agreed upon inventory of special-status species for the City of Los Angeles is a very important first step to making progress on how the City approaches threatened, endangered, and species of conservation concern. However, in order for the inventory to be a useful resource that raises awareness and spurs activity, it not only needs to be embedded across relevant City



### ***Management Implications:***

- A centralization monitoring and management of species of conservation concern necessary in order for the scoring on this metric to be improved. The City cannot collectively work towards the important no-net loss of native biodiversity goal until a monitoring plan is established.
- The City should establish a consortium to monitor and manage special-status species and deal with regulatory compliance. At a minimum, this group should include: the Zoo, BOE, RAP, and LASAN, but other members of the Biodiversity Interdepartmental Team should be included as deemed appropriate. The consortium should:
  - Formally adopt the proposed Inventory and maintain an up-to-date Inventory (e.g., refresh/update the Inventory every decade).
  - Establish a web page or other landing space that hosts the official City inventory of special-status species and serves as a hub for up-to-date information on species of conservation concern (e.g., [LASAN's Biodiversity page](#)).
  - Work collectively to establish more comprehensive monitoring for species of conservation concern.
- The proposed consortium should oversee the inventories and monitoring efforts for both 3.2c and 3.2d to maximize efficiency.

Long-billed curlew (*Numenius americanus*)  
(Photo: Graham Montgomery)

# BIODIVERSITY NEXT STEPS



## INTEGRATE

Integrate biodiversity elements and considerations into City Projects.



## DEVELOP GUIDELINES

Develop Biodiversity Guidelines to inform public and private projects to protect and enhance biodiversity.



## STUDY

Continue to study best practices from around the world.



## INTENSIFY NATURE

Encourage Angelenos to creatively use Nature-based Solutions.



## IMPLEMENT

Strategically pursue implementation projects that will conserve, protect, and restore local ecosystems.

## NEXT STEPS:

Now that the baseline assessment of the LA City Biodiversity Index is complete, the LASAN Biodiversity Team will shift its attention to outreach activities and implementation projects that will collectively increase the overall LA City Biodiversity Index score and help the City achieve its broad biodiversity initiatives. Planned next steps can be broadly grouped into five categories:

### ***1. Integrate Biodiversity into City Projects:***

The Biodiversity Team plans to work to better integrate biodiversity elements/considerations into City projects. While this is already starting to happen with LASAN projects like the Slauson Corridor: Making Connections project, which will plant 1,600 new street trees and install thousands of California native and drought-tolerant understory plants, the hope is to better incorporate biodiversity into projects across the City. LASAN's Biodiversity Team will brainstorm with the Interdepartmental Biodiversity Team for the best, most efficient ways to make this happen. The Biodiversity Team will also work with the Expert Council and other City departments (e.g., Bureau of Engineering, Department of Recreation and Parks, the LA Zoo, LA Public Library, and the Department of City Planning) to promote practices, programs, and projects that support biodiversity, improve connectivity, and make Los Angeles more sustainable and resilient.



#BiodiversityLA  
[lacitysan.org/biodiversity](http://lacitysan.org/biodiversity)

## 2. Develop Biodiversity Guidelines:

Another major goal is to develop Biodiversity Guidelines that will help project managers incorporate biodiversity-friendly practices into their designs. Guidelines should be developed to provide guidance to public and private landholders on how to best design projects and sustainability manage properties in order to improve habitat quality and enhance local biodiversity. Official guidelines will help streamline this process, providing straightforward suggestions for how projects can prevent undue stress/damage to biodiversity (e.g., protecting intact habitat, limiting night lighting, etc.) and ways to provide habitat for biodiversity (e.g., planting native plants, creating corridors for wildlife movement, etc.). Guidelines should be designed in a way so that they are applicable to a variety of land uses and scales. Examples from around the world can, and should, be looked to for inspiration.

## 3. Study Best Biodiversity Practices from Around the World:

The City of Los Angeles plans to continue looking to other cities in the state and nation and across the globe for inspiration, especially in regards to policy and models for incorporating biodiversity interests into all municipal projects. The City of San Francisco, which, like Los Angeles, is located in a global biodiversity hotspot, has created the [San Francisco Biodiversity Policy](#) and is working to integrate Biodiversity Guidelines into the Municipal Green Building Code. San Francisco has also incorporated a parcel-specific list of [recommended native plants](#) to the [San Francisco Property Information Map](#), which is similar to NavigateLA or ZIMAS.

## 4. Intensify Nature:

Perform public education and outreach to encourage Angelenos to intensify nature through the use of nature-based solutions across the City. This can be done by creating pollinator gardens, planting native plants, creatively adding green space and green infrastructure to small spaces (e.g., rooftop gardens and vertical gardens), and using sustainable, regenerative practices (e.g., avoiding the use of herbicides, pesticides, and chemical fertilizers).

A connectivity workshop at UCLA's Stunt Ranch  
(Photo: Nurit Katz)



The Pacific Ocean and the Santa Monica Mountains  
(Photo: Michelle Barton)



## 5. Strategically Pursue Implementation Projects:

Lastly, the LASAN Biodiversity Team intends to partner with the Biodiversity Expert Council and Interdepartmental Team to strategically pursue implementation projects that will conserve, restore, or protect local ecosystems. However, the City must first understand where implementation projects will be the most impactful. To this end, LASAN, Recreation & Parks, City Planning, and the Resource Conservation District of the Santa Monica Mountains are hoping to jointly develop a prioritization scheme that will guide City efforts to conserve and protect biodiversity while also increasing access to parks and to nature. The intent is for the scheme to balance

access to nature, restoration, patch size, edge effects, and connectivity. The prioritization exercise should ideally arm City staff with a strategically developed list of priority projects to pursue. Further, the hope is that the output of this project will be an agreed upon prioritization for conservation and restoration projects that City departments, land managers that work in or adjacent to the City could work to collectively realize, increasing effectiveness and cohesion of local conservation efforts. However, staff and resources are needed to support the design, execution, and ongoing maintenance of implementation projects.



Volunteers tend to a TestPlot in Elysian Park.  
(Photo: TestPlot)

# CONCLUSION:

This report provides the first ever assessment of all 25 metrics in the LA City Biodiversity Index. By design, the topics covered in the Index comprehensively assess not only what is happening to habitats and how well connected various habitats are, but how well the City is engaging with students and the larger community on the topic of biodiversity and how the City itself is working to protect endangered species and manage threats, like invasive species.

For the baseline assessment of the Index, the City received a score of 37 out of a possible 110 points (110 = 22 x 5), with an average metric score of 1.7/5 points. Please note that three metrics (1.2c, 2.3a, and 2.3b) assess change over time and so they were

not given official scores for this assessment and will be scored for the next benchmark assessment in 2030. The overall score of the baseline assessment of 37/110 leaves much room for improvement, indicating that substantial work remains to be done if the City aims to effectively protect and enhance biodiversity and take appropriate action to halt biodiversity loss.

A gray fox (*Urocyon cinereoargenteus*) at sunset  
(Photo: Robert Martinez)



# **LA CITY BIODIVERSITY BASELINE ASSESSMENT**

## **INDEX SCORE**



## **AVERAGE METRIC SCORE**



## SCORES BY INDEX THEME

Zooming in on each of the three themes in the LA City Biodiversity Index reveals additional patterns that could, and should, influence how the City prioritizes actions to improve the overall score of the biodiversity index. While work should be done across the board to improve both theme and metric scores, as shown in the table below, the average metric score was the lowest for the third theme, Governance & Management of Biodiversity. To improve scores in this theme, the LASAN Biodiversity Team should work with the Interdepartmental Biodiversity Team to develop a Biodiversity Action Plan, better integrate biodiversity considerations into departmental planning, and take an organized, comprehensive, data-driven approach to management of protected areas, invasive species and pests, and species of conservation concern.

#	THEME	AVERAGE METRIC SCORE (out of 5)
1	Native Species Protection & Enhancement	2
2	Social Equity Considerations	2
3	Governance & Management	1



Anise swallowtail caterpillar (*Papilio zelicaon*)  
(Photo: Graham Montgomery)

Ultimately, the score of the baseline assessment of the LA City Biodiversity Index should serve as a call to action to direct biodiversity stakeholders across the City to push forward bold initiatives, form new partnerships, conceive of innovative implementation projects, and engage in a Citywide fight to protect existing biodiversity and prevent future biodiversity loss in the City of Los Angeles.

Fortunately, due to the way the index was developed, there is already local consensus around the index framework and a collective will to take the steps necessary to not only improve the City's index score, but to meaningfully preserve, conserve, and protect biodiversity in the City of Los Angeles. However, as biodiversity issues are independent of jurisdictional boundaries, a broader coalition is needed to engage in biodiversity protection. The City hopes that in the future, LA County, and neighboring jurisdictions will adopt, or slightly modify, this framework as well so that monitoring, management, and conservation efforts can be conducted and coordinated regionally to better protect the precious biodiversity of the California Floristic Province.

Monumental actions to address the twin crises of climate change and biodiversity collapse will be needed to realize the City's Biodiversity Vision Statement and create "a City where all Angelenos value biodiversity, honor and respect nature, and steward the natural world, ensuring that ecosystems are protected, enhanced, and restored, environmental and public health benefits are maximized and equitably shared by all, and that Los Angeles is a resilient, biophilic City for generations to come."

# CONTRIBUTORS AND DATA SOURCES:

A huge thank you to the individuals and organizations who provided data and contributed their resources and expertise for the creation of this Biodiversity Report! This report would not be possible without your time, expertise, and generosity.

In particular, LASAN would like to recognize Morgan Tingley, who performed the underlying analysis for metric 1.2b, and Stillwater Sciences, who calculated metric 1.1f.

Please note that due to the variability in how individual metrics were measured, some quantitative metrics (e.g., 3.2b) relied exclusively on available data, while others (e.g., 3.2c) were largely based on interviews, so the contributors and data sources were one and the same.

<b>Metric</b>	<b>Contributors and Data Sources</b>	
1.1a	Data Source:	<ul style="list-style-type: none"> <li>● CALVEG Southern Coast Section</li> </ul>
1.1b	Contributor:	<ul style="list-style-type: none"> <li>● Isaac Brown, Stillwater Sciences</li> </ul>
1.1c	Contributors:	<ul style="list-style-type: none"> <li>● Raphael Mazor, and Eric Stein, Southern California Coastal Water Research Project;</li> <li>● Sabrina Drill, University of California Agriculture and Natural Resources</li> </ul>
	Data Source:	<ul style="list-style-type: none"> <li>● Stephanie Bucknam and Shuka Rastegarpour, California State Water Quality Control Board</li> </ul>
1.1d	Contributors:	<ul style="list-style-type: none"> <li>● Irina Koroleva, LASAN</li> </ul>
1.1e	Contributors:	<ul style="list-style-type: none"> <li>● Isaac Brown, Stillwater Sciences;</li> <li>● Peggy Nguyen, LASAN;</li> <li>● Amanda Briones, City Planning; Diana Kitching, Kat Superfisky, and Tom Tran, City Planning;</li> <li>● Snigdha Suvarna, SDG Intern;</li> <li>● National Park Service;</li> <li>● Arroyos &amp; Foothills Conservancy;</li> <li>● Occidental College;</li> </ul>
	Data Source:	<ul style="list-style-type: none"> <li>● 2020 Biodiversity Report;</li> <li>● <a href="#">Isaac Brown's Dissertation</a></li> </ul>
1.1f	Contributors:	<ul style="list-style-type: none"> <li>● Anna Ballasiotes, Derek Booth, Isaac Brown, Wendy Katagi, Bruce Orr, and Karley Rodriguez, Stillwater Sciences</li> </ul>
1.2a	Contributors:	<ul style="list-style-type: none"> <li>● Irina Koroleva, LASAN</li> </ul>
	Data Source:	<ul style="list-style-type: none"> <li>● The Global Biodiversity Information Facility (GBIF)</li> </ul>
1.2b	Contributors:	<ul style="list-style-type: none"> <li>● Joseph Nikko Curti, Alison Lipman, and Morgan Tingley, UCLA;</li> <li>● Rhay Flores, Stephanie Franco, Maren Lechner, Krista Mercado, and Albert Park, UCLA undergraduate students;</li> <li>● Dan Cooper, Resource Conservation District of the Santa Monica Mountains;</li> <li>● Oscar Figueroa, Amber Huu, and Kirstin Rochel, LASAN</li> </ul>
	Data Source:	iNaturalist
1.2c	Contributors:	<ul style="list-style-type: none"> <li>● Dan Cooper, Cooper Ecological;</li> <li>● Robert Fisher, USGS;</li> <li>● Travis Longcore, UCLA;</li> <li>● Isaac Brown, UCLA</li> </ul>
	Data Source:	<ul style="list-style-type: none"> <li>● CNDDDB, iNaturalist</li> </ul>
1.3a	Contributor:	<ul style="list-style-type: none"> <li>● Travis Longcore, UCLA</li> </ul>
	Data Source:	<ul style="list-style-type: none"> <li>● The <a href="#">New World Atlas of Artificial Sky Brightness</a></li> </ul>

<b>Metric</b>	<b>Contributors and Data Sources</b>	
1.3b	Contributors:	<ul style="list-style-type: none"> <li>● Jutta Burger, Doug Johnson, and Nicole Valentine, California Invasive Plant Council;</li> <li>● Joseph Algiers, Jr., National Park Service;</li> <li>● Jim Hartman, Los Angeles County, Agricultural Commissioner, Integrated Pest Management Division</li> </ul>
	Data Sources:	<ul style="list-style-type: none"> <li>● Calflora; Los Angeles County, Agricultural Commissioner, Integrated Pest Management Division</li> </ul>
1.3c	Data Source:	<ul style="list-style-type: none"> <li>● Fire Return Interval Data, USDA, Forest Service (FRID 2019, South Coast, CALVEG Zone 7)</li> </ul>
2.1a	Contributor:	<ul style="list-style-type: none"> <li>● Irina Koroleva, LASAN</li> </ul>
	Data Source:	<ul style="list-style-type: none"> <li>● Census block population data (<a href="#">Total Population Estimate ACS 2019</a>)</li> </ul>
2.1b	Contributors:	<ul style="list-style-type: none"> <li>● Rachel Malarich, City Forest Officer;</li> <li>● Rachel O’Leary and Cindy Chen, City Plants;</li> <li>● Vivek Shandas, Urban Forest Equity Visiting Scholar</li> </ul>
	Data Source:	<ul style="list-style-type: none"> <li>● <a href="#">Los Angeles County Tree Canopy Assessment (2016)</a>, prepared by SavATree Consulting Group, University of Vermont Spatial Analysis Laboratory, TreePeople, and Loyola Marymount University Center for Urban Resilience</li> </ul>
2.2a	Contributor:	<ul style="list-style-type: none"> <li>● Los Angeles Unified School District (LAUSD)</li> </ul>
	Data Sources:	<ul style="list-style-type: none"> <li>● LAUSD <a href="#">page on CA NGSS</a> (relevant standards tracked in this <a href="#">Table</a>); interviews with LAUSD staff; data from a survey sent to LAUSD Science, Technology, Engineering, Arts, &amp; Math (STEAM) Coordinators and Science Coordinators</li> </ul>
2.2b	Contributors:	<ul style="list-style-type: none"> <li>● Gerry Salazar, LAUSD Office of Outdoor and Environmental Education;</li> <li>● Maggie Smart McCabe, SDG Intern</li> </ul>
	Data Sources:	<ul style="list-style-type: none"> <li>● LAUSD Office of Outdoor and Environmental Education; LAUSD science administrators and educators; education and outreach coordinators at organizations that host biodiversity field trips</li> </ul>
2.2c	Contributors:	<ul style="list-style-type: none"> <li>● Lepoldo Munoz, Krisztina Tokes, Christos Chrysiliou, and Jan Ducker (retired), LAUSD Facilities Services Division, Maintenance &amp; Operations;</li> <li>● Maggie Smart McCabe, SDG Intern;</li> <li>● Irina Koroleva, LASAN;</li> <li>● Sharon Cech and Rosa Romano, Urban and Environmental Policy Institute at Occidental College;</li> <li>● Margot Griswold, LandIQ</li> </ul>
	Data Sources:	<ul style="list-style-type: none"> <li>● LAUSD Garden Data; LAUSD joint-use agreements/tenants; Urban and Environmental Policy Institute survey results; school garden community partners, including EnrichLA, Garden School Foundation, Captain Planet, and the National Wildlife Federation</li> </ul>

<b>Metric</b>	<b>Contributors and Data Sources</b>	
2.3a	Contributors:	<ul style="list-style-type: none"> <li>● Lila Higgins, Miguel Ordeñana, and Gregory Pauly, Natural History Museum of Los Angeles County;</li> <li>● Vivienne Byrd, Diane Olivo-Posner, Jimmy Tokeshi, and Margaret Trtryan, Los Angeles Public Library;</li> <li>● McClaran Shirley, SDG Intern;</li> <li>● Irina Koroleva, LASAN</li> </ul>
	Data Sources:	<ul style="list-style-type: none"> <li>● GBIF; U.S. Census Data</li> </ul>
2.3b	Contributors:	<ul style="list-style-type: none"> <li>● The Surfrider Foundation;</li> <li>● The National Wildlife Federation; Audubon;</li> <li>● McClaran Shirley, SDG Intern</li> </ul>
	Data Sources:	<ul style="list-style-type: none"> <li>● The Surfrider Foundation;</li> <li>● The National Wildlife Federation;</li> <li>● Audubon</li> </ul>
3.1a	Contributors:	<ul style="list-style-type: none"> <li>● McClaran Shirley, SDG Intern</li> </ul>
	Data Sources:	<ul style="list-style-type: none"> <li>● <a href="#">Convention on Biological Diversity (CBD) Aichi targets</a>; <a href="#">CBD Post-2020 Targets</a>; <a href="#">Sustainable Development Goal 15 Targets</a></li> </ul>
3.1b	Contributor:	<ul style="list-style-type: none"> <li>● McClaran Shirley, SDG Intern</li> </ul>
	Data Sources:	<ul style="list-style-type: none"> <li>● LA City Departmental web pages;</li> <li>● Survey results from Departmental Chief Sustainability Officers</li> </ul>
3.2a	Data Sources:	<ul style="list-style-type: none"> <li>● California Protected Areas Database 2020b;</li> <li>● California Conservation Easement Database 2020b</li> </ul>
3.2b	Data Sources:	<ul style="list-style-type: none"> <li>● California Protected Areas Database 2020b;</li> <li>● California Conservation Easement Database 2020b;</li> <li>● Department of Recreation and Parks</li> </ul>
3.2c	Contributors:	<ul style="list-style-type: none"> <li>● Jutta Burger, Doug Johnson, and Nicole Valentine, California Invasive Plant Council (CAL-IPC);</li> <li>● Joseph Algiers, Jr., National Park Service;</li> <li>● Jim Hartman, Los Angeles County Agricultural Commissioner Integrated Pest Management Division;</li> <li>● Max Regis, Los Angeles County ACWM-Pest Exclusion/Produce Quality;</li> <li>● Aaron Thomas, Northeast Trees;</li> <li>● Bill Neill, California Native Plant Society;</li> <li>● Drew Ready, Council for Watershed Health;</li> <li>● Recreation and Parks staff</li> </ul>
3.2d	Contributor:	<ul style="list-style-type: none"> <li>● McClaran Shirley, SDG Intern</li> </ul>
	Data Sources:	<ul style="list-style-type: none"> <li>● LA City Departmental web pages;</li> <li>● Survey results from Departmental Chief Sustainability Officers</li> </ul>

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## Contact Us

LASAN is dedicated to protecting public health and the environment for all Angelenos. For more information about the Biodiversity Program, please contact [michelle.barton@lacity.org](mailto:michelle.barton@lacity.org) or visit us at [lacitysan.org/biodiversity](http://lacitysan.org/biodiversity).

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Walnut tree  
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