


UC Berkeley Campus Biodiversity Report

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Introduction

The University of California, Berkeley's unique positioning within a biodiversity hotspot and legacy of research and leadership in environmental education closely align with local and global goals of conserving and enhancing biodiversity. A commitment to biodiversity on the UC Berkeley campus will contribute to the campus' overarching goals of fostering a vibrant campus experience, promoting discovery and collaboration, improving campus connectivity, enhancing sustainability and optimizing campus resources (UC Berkeley Campus Master Plan).

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Land Acknowledgement

The following acknowledgement for the UC Berkeley campus was was co-created with the Muwekma Ohlone Tribe and Native American Student Development and is a living document:

> *UC Berkeley sits on the territory of xučyun (Huichin), the ancestral and unceded land of the Chochenyo speaking Ohlone people, the successors of the sovereign Verona Band of Alameda County. This land was and continues to be of great importance to the Muwekma Ohlone Tribe and other familial descendants of the Verona Band.*
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> *We recognize that every member of the Berkeley community has benefitted, and continues to benefit, from the use and occupation of this land since the institution's founding in 1868. Consistent with our values of community, inclusion and diversity, we have a responsibility to acknowledge and make visible the university's relationship to Native peoples. As members of the Berkeley community, it is vitally important that we not only recognize the history of the land on which we stand, but also, we recognize that the Muwekma Ohlone people are alive and flourishing members of the Berkeley and broader Bay Area communities today.*

What is Biodiversity?

Biodiversity refers to the variety of life on Earth, encompassing the diversity of ecosystems, species, and genetic variation within species. It includes the full range of biological or biotic diversity as well as interactions between genes, organisms and the environment. Biodiversity can also encompass evolutionary, ecological and cultural processes as well.

Biodiversity is essential for proper ecosystem functions and provides a wide range of benefits by supporting ecosystem services such as air and water purification, soil fertility, nutrient cycling, and climate regulation. Biodiversity also plays a crucial role in maintaining the stability and resilience of ecosystems in the face of environmental changes including climate change and other ecosystem disturbances.

Biodiversity is integral to human health and well-being by providing important resources including shelter, medicine, food and fiber. Biodiversity contributes to cultural, spiritual, recreational and aesthetic values, enriching human communities and promoting the mental and physical health of individuals. Biodiversity is a critical component of our natural heritage and is central to our sense of identity, sense of place and cultural diversity and knowledge.

Rapid ecosystem change and habitat conversion through human activities has caused massive biodiversity loss around the world. Many species are at risk of extinction and face other threats related to habitat loss and fragmentation, unsustainable resource use and extraction, invasive species, pollution and climate change. By developing a better understanding of biodiversity and threats to biodiversity, we can plan appropriate conservation actions and enact policies to protect and conserve biodiversity.

Biodiversity at Berkeley

The California Floristic Province

Globally, there are 36 recognized biodiversity hotspots. These hotspots represent the most biologically rich and threatened terrestrial regions on Earth. A biodiversity hotspot is defined as containing at least 1,500 endemic species of vascular plants and must have lost at least 70% of its primary native vegetation.

The University of California, Berkeley is situated within the California Floristic Province, one of these biodiversity hotspots and one of the most biologically diverse regions in the world. The California Floristic Province spans most of California as well as small parts of Oregon, Nevada, and Baja California, and is home to a remarkable array of plant and animal species. While it is difficult to determine the exact numbers of species, it is estimated that there are approximately 7,600 plant species and 1,000 animal species. Many of these species are endemic to the California Floristic Province, meaning that they are found nowhere else in the world. An estimated 60% of California's native plant species are endemic to the state as well as numerous animal species. Plant and animal biodiversity within the California Floristic Province faces many ongoing threats including habitat loss, invasive species and climate change.

The UC Berkeley Campus

The UC Berkeley campus is known for its diverse mix of architectural styles, green spaces, and spacious views. Because the campus is situated at the base of the Berkeley Hills, the campus has a unique topography that lends itself to winding paths, scenic vistas and microclimates.

The many green spaces on campus provide students and visitors with peaceful areas to relax, study, or socialize. These green spaces range from formal and manicured areas like the Memorial Glade lawn to more wild sections such as the Grinnell Natural Area. Strawberry Creek flows from the Berkeley Hills through the campus providing aquatic and riparian habitat while also adding ambience and continuity.

Biodiversity at Berkeley

The University of California, Berkeley's position within the California Floristic Province global biodiversity hotspot has provided the university with unique opportunities to study and conserve the region’s natural heritage. Berkeley has a rich legacy in biodiversity

research with a history of scholarship that has contributed significantly to our understanding of the natural world. For example, researchers at UC Berkeley have conducted extensive studies on the ecology and evolution of California's endemic plant and animal species, many of which are found nowhere else in the world. They have also investigated the interactions between these organisms and their environments as well as threats to biodiversity from human activities like urbanization, agriculture and climate change.

In addition to research, UC Berkeley has been instrumental in documenting, conserving and protecting the region’s biodiversity through its world class natural history museums. The University and Jepson Herbaria, UC Botanical Garden, Essig Museum of Entomology and Museum of Vertebrate Zoology house remarkable collections and promote biodiversity conservation.

Furthermore, Berkeley’s commitment to biodiversity research has played a major role in training the next generation of scientists and researchers through both undergraduate and graduate education. Berkeley’s strong academic lineage continues to influence fields such as ecology, evolutionary biology and natural resource management. These contributions help shape our collective understanding of the natural world and inform our efforts to conserve and protect biodiversity in California and beyond.

For the purposes of this report, the term biodiversity will be used to refer to the diversity of plants, animals and a suite of other organisms including insects, aquatic macroinvertebrates, soil microbes, etc. A diverse array of plant species and landscaping styles provide home and habitat for insects, pollinators, birds and other small animals. This report primarily focuses on increasing biodiversity by diversifying plantings and landscaping practices to increase habitat for other organisms.

Campus Biodiversity Goals

The University of California, Berkeley's unique positioning within a biodiversity hotspot and legacy of research and leadership in environmental education closely align with local and global goals of conserving and enhancing biodiversity. A commitment to biodiversity on the UC Berkeley campus will contribute to the campus' overarching goals of fostering a vibrant campus experience, promoting discovery and collaboration, improving campus connectivity, enhancing sustainability and optimizing campus resources (UC Berkeley Campus Master Plan).

This report seeks to communicate and advocate for a better understanding of biodiversity on the Berkeley campus and to organize existing reports into a single reference document. The goal of this report is to identify actionable steps towards increasing biodiversity on the Berkeley campus.

STARS Report

In 2021, UC Berkeley received a 2.0/2.0 score for biodiversity operations (OP-10) for the campus through The Sustainability Tracking, Assessment & Rating System (STARS). STARS is a "transparent, self-reporting framework for colleges and universities to measure their sustainability performance". UC Berkeley currently has an overall sustainability rating of Platinum (85.9) for the campus (valid through April 29, 2024).

In forthcoming guidance, universities will have the opportunity to earn a maximum of one bonus point credit (partial points are available) for conducting a baseline biodiversity assessment that is inclusive of the entire campus and identifies areas of biodiversity importance with a focus on endangered and vulnerable species. This biodiversity assessment must be conducted or supervised by experts and must then be used to protect the important areas or species identified on campus.

Nature Positive Universities

Nature Positive is a global goal to halt and reverse nature and biodiversity loss such that species and ecosystems can recover from the effects of anthropogenic climate change and habitat loss. This agreement and global goal also seeks to link biodiversity with other climate and conservation conventions and agreements.

Berkeley has signed onto a Becoming Nature Positive Pledge through Nature Positive Universities. This program is a partnership between University of Oxford, United Nations Environment Programme Youth & Education Alliance and the UN Decade on Ecosystem Restoration (2021-2030). The Nature Positive pledge is a commitment to restoring species and ecosystems that have been harmed by a university's environmental impacts at all levels, from teaching and research to operations and supply chains. Overall, the goal of Nature Positive is to improve and enhance nature on university campuses, worldwide. The pledge serves as an institutional commitment towards ensuring a livable future by halting and reversing nature loss so that species and ecosystems start to recover.

In order to achieve the goal of Nature Positive, there must be a measured biodiversity baseline, a target goal, timeframe, planned actions and transparent monitoring and reporting. Although metrics for measuring biodiversity and environmental impacts are not comprehensive, the Nature Positive Universities program encourages universities to demonstrate leadership in biodiversity to staff, students and our wider communities.

30 x 30 California

California's 30x30 conservation initiative establishes a state goal of conserving 30% of California's lands and coastal waters by 2030. This goal is intended to accelerate conservation in order to conserve and restore biodiversity, expand access to nature and mitigate climate change impacts. By increasing biodiversity on campus, UC Berkeley will be in alignment with largescale statewide conservation efforts.

Campus Biodiversity Successes

Notable examples of biodiversity on the UC Berkeley campus include designated natural areas, Strawberry Creek, breeding peregrine falcons in the Campanile tower, heritage trees and pollinator gardens. Additionally, UC Berkeley owns and manages conservation lands off the main campus such as Upper Strawberry Creek Watershed and Ecological Study Area, the riparian corridor following Codornices Creek at University Village, and grasslands and tidal marsh of the Richmond Field Station.

Recommendations for Biodiversity at Berkeley

1. Develop a robust biodiversity baseline for the Berkeley campus

Baselines serve as a critical step for assessing change over time. Until an adequate baseline is developed, there is no standardized way that biodiversity can be assessed on the Berkeley campus into the future. Without understanding biodiversity trends, campus staff, planners, researchers and students can not make positive changes or intervene to alter problematic practices. Additionally, the development of a biodiversity baseline is the first step in the Nature Positive Universities framework and a forthcoming component of future STARS reporting for the campus.

A plethora of existing research and data on campus biodiversity already exists, but this information is not in a centralized location or standardized format in addition to other issues with data storage, availability and the fact that historic records may no longer be accurate. Community science initiatives, museums, environmental planning and reporting and campus services also hold important data that can be utilized to help inform targeted biodiversity surveys and future planning.

In addition to organizing and interpreting existing data, a baseline can be assessed by collecting updated observations and leveraging campus expertise, student and community involvement and museum staff. A comprehensive biodiversity survey could take place over the course of a few days in a concentrated effort or over a longer time period. This assessment could also be expanded to other areas beyond the main campus to better understand the distribution of biodiversity and identify potential hotspots. It is also recommended that the baseline be used to quantify the quality of biodiversity on the Berkeley campus, i.e. native diversity, diversity among taxonomic groups, etc.

A biodiversity baseline can be assessed through existing community science tools such as a BioBlitz through iNaturalist or through more systematic approaches like the Convention on Biological Diversity's City Biodiversity Index or recommendations outlined in Campus Biodiversity in the IARU Universities: An OxPOCH Report. A baseline can then be further applied toward other broader biodiversity initiatives such as the Nature Positive Universities program and California's 30 x 30.

A baseline should then be used to set biodiversity targets that are specific, measurable, achievable, relevant and timed (SMART). The baseline can also be used to set future priorities for biodiversity enhancement or development, recommendations for management actions and interventions as stated in forthcoming STARS guidance.

2. Enhance existing natural areas of the campus and environs

By improving and enhancing existing natural areas on campus, these areas can host increased biodiversity of native plants, pollinators, etc. Enhanced natural areas will also increase learning opportunities by using the campus park as an experiential learning lab for both formal and informal education.

This work would ideally be funded by increased investment in campus landscaping, but can also be achieved through consistent program leadership and undergraduate student involvement. Projects can also be catalyzed, planned and implemented by leveraging the expertise of students, faculty and staff, particularly through departments in the College of Environmental Design and Rausser College of Natural Resources. It would also be worthwhile to explore existing and possible fundraising options to restore or maintain significant sections of the campus natural areas and those identified in the UC Berkeley Campus Master Plan.

Targeted areas could also be enhanced by updating the campus' design and landscaping guidelines and standards to include an official planting palette. Improved guidance can expand upon current practices of prioritizing of native and low water plants while avoiding the risk of introducing non-native species or pests.

Areas to consider restoration and biodiversity enhancement include: the Strawberry Creek riparian corridor and existing campus natural areas including the Grinnell Natural Area, Eucalyptus Grove, Observatory Hill, Goodspeed Natural Area and Wickson Natural area. Enhancing the Strawberry Creek watershed is aligned with one of the "Big ideas" or central recommendations of the UC Berkeley Campus Master Plan to "Elevate Strawberry Creek as a resilient ecological and people connector" (UC Berkeley Campus Master Plan).

3. Integrate biodiversity on campus and within the broader community

The Berkeley campus has a remarkable opportunity to utilize biodiversity as a unifying concept that can draw together students, faculty and community members from across disciplines. This concept is well aligned with the principles of UC Berkeley Campus Master Plan to “promote discovery, innovation, and interdisciplinary collaboration”.

The campus can improve community involvement and integration by consulting with local tribes and Indigenous communities, hosting biodiversity walks and events on campus for the general public and by increasing biodiversity interpretation on campus through signage and outreach.

Campus biodiversity offers a potential pathway to integrate STEM and the humanities. While the concepts and study of biodiversity are well established within the sciences, humanities scholars and practitioners can help the campus community to interpret, appreciate and recognize these metrics using creativity and humanist approaches. The opportunity to interpret and translate biodiversity through various forms of art practice and cultural history will add depth and meaning to biodiversity science, communication and education on campus.

4. Explore additional avenues for enhancing biodiversity and student learning

- Conduct an audit of current academic courses that either focus or relate to biodiversity in order to inventory and feature classes that are already using the campus park as a living laboratory, studio or other teaching space. Working with the academic community, new classes and/or added biodiversity teaching in existing courses can be developed to fully assess biodiversity on campus. Additional classes can then be added to further inventory and increase biodiversity on campus or that utilize the campus park as a living laboratory, studio or teaching space.

- Invest in extra-curricular programming that can enhance student learning and experience such as Campus as a Living Laboratory (see STARS report), student organizations, DeCal courses, and events.

- Investigate formation of a formal campus committee of faculty, administrators, planners, landscaping staff and students to coalesce on shared goals and spearhead projects.

- Incentivize, invest and encourage student, faculty and museum research and demonstration on urban/ campus biodiversity to draw attention to both campus research programs and campus biodiversity.

- Develop a protocol or repository for campus biodiversity data. This could be a website or database to list and store available data. Several courses have students collect campus biodiversity data either during demonstrations or through course assignments. By developing a repository and data standards, this data could be made available and useful for campus planners or for research.

- Reframe campus biodiversity and green space as investment in student physical and mental health contributing to positive learning outcomes.

Biodiversity Action Plan

Phase 1 - Developing a biodiversity baseline

1. Gather a core team of students, faculty, and staff to help further define assessment process and priorities
2. Perform additional research on effective models and approaches for assessing biodiversity at the university or institution scale
3. Collect, organize and inventory existing campus biodiversity research and data
4. Engage undergraduate students through existing curricula, a targeted academic course, student groups and/or campus programming
5. Assess current campus biodiversity baseline through a systematic survey and plan for future biodiversity assessments to track changes over time and adaptively reassess targets, goals and management

Phase 2 - Enhancing and increasing campus biodiversity

1. Use baseline to set biodiversity targets, recommend future management actions and track changes over time
2. Develop documentation and a central repository for campus biological data
3. Investigate new approaches and avenues of funding for landscaping services and restoration of campus natural areas
4. Update campus planting palette and landscaping guidelines
5. Create or bolster programming to sustainably engage students and the broader community

Conclusions

The conservation and enhancement of biodiversity on our university campus is a collective responsibility that requires collaboration among students, faculty, administrators and the broader community. By embracing these recommendations and taking action, we can ensure that our campus maintains habitat value for a diversity of species and natural spaces while contributing to larger campus and state goals of higher education and sustainability.

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- Delaney Demro - Sustainability Planning and Institutional Alignment Manager, SUNY College of Environmental Science and Forestry
- Emily Stott - Nature Positive Universities Coordinator, Department of Biology, University of Oxford

Annotated Bibliography of Resources and References

- This report was funded by the International Alliance of Research Universities (IARU) and the Oxford Partnership for Operationalising the Conservation Hierarchy (OxPOCH), a program focused on increasing environmental sustainability at Oxford. The report provides an overview of different approaches that IARU member university campuses can take and have taken to assess and improve biodiversity at their institution. The report also highlights examples of good practice within institutions and includes discussion and direction on establishing biodiversity baselines.
  https://sustainability.berkeley.edu/sites/default/files/oxpoch_iaru_biodiversity_report_13.10.21.pdf

- The upcoming STARS Report guidelines for Buildings and Grounds outlines how universities and other institutions are scored on the sustainability of their buildings and grounds. This document includes guidelines for how an institution can earn a maximum of 1 bonus point through the exemplary practice of conducting a baseline biodiversity assessment of the entire campus. Please note that this document is a draft which has been approved by the STARS Steering Committee, but may be revised prior to official publication and implementation.
  Buildings & Grounds v3.0 FINAL

- This document was created by Delaney Demro (SUNY College of Environmental Science and Forestry) and outlines the staff and resources needed to conduct a campus biodiversity assessment in alignment with the Singapore Cities Biodiversity Index. This includes developing a college profile, selecting biodiversity indicators, identifying ecosystem services of biodiversity and planning for governance and management.
  Resources and Staff for Biodiversity Index

- This webpage from the Sustainability Exchange, provides guidance on creating and conducting a campus biodiversity assessment at the college campus level.
  https://www.sustainabilityexchange.ac.uk/the_biodiversity_survey

- UC Berkeley earned a 2.0/2.0 score for Biodiversity in the latest submitted STARS Report for OP-10 as of March 2021.
  https://reports.aashe.org/institutions/university-of-california-berkeley-ca/report/2021-03-04/OP/grounds/OP-10/documentation/

- This website from Stanford University provides an extensive definition and history of the term “biodiversity”. https://plato.stanford.edu/archives/spr2021/entries/biodiversity/

- Greenmetric is an international ranking of the world’s most sustainable universities. UC Berkeley is not yet included in the rankings but UC Davis is currently ranked at number 1 for the U.S.. https://greenmetric.ui.ac.id/

- The California Biodiversity Network (CBN) seeks to bring together environmental and community leaders to support the implementation of California’s 30x30 initiative to conserve the state’s natural heritage. More information on goals, activities and funding can be found on their website: https://cabiodiversitynetwork.org/

- This 2023 assessment of climate change hazards and impacts to the UC Berkeley campus. UC Resilience_Hazard Overview_Berkeley_v2.pdf