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San Diego Collaboration for Conservation: Sustaining the Region's Legacy of Biodiversity Conservation

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San Diego Collaboration for Conservation:

Sustaining the Region's Legacy of Biodiversity Conservation

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REPORT PREPARED BY:

University of San Diego
SCHOOL OF LEADERSHIP AND EDUCATION SCIENCES
The Nonprofit Institute

FOR:

the nat | SAN DIEGO NATURAL HISTORY MUSEUM

SANDAG

Housed in the School of Leadership and Education Sciences, The Nonprofit Institute advances the University of San Diego's commitment to academic excellence, expanding liberal and professional knowledge, creating a diverse and inclusive community, and preparing leaders who are dedicated to ethical conduct and compassionate service. Founded in 2002, The Nonprofit Institute provides education, training and research to strengthen organizations that help meet critical community needs.

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The San Diego Natural History Museum (The Nat) is one of California's oldest and most respected cultural and scientific institutions. Founded in 1874 by a small group of community scientists, the Museum has now become a hub for collaboration and partnerships, public engagement, and conservation science. With a focus on the natural history and unique biodiversity of Southern California and the Baja California Peninsula, The Nat is at the forefront of actionable solutions for environmental issues facing our region. After 150 years of studying and protecting nature, the Museum looks forward to continuing its legacy of environmental stewardship by deepening our understanding of the natural world.

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SANDAG is the San Diego Association of Governments. We are both a metropolitan planning organization and a council of governments, bringing together local decision-makers to develop solutions to regional issues including improving equity, transportation, air quality, clean energy, economic development, goods movement, public health, public safety, housing, the environment and more. SANDAG carefully tackles these regional issues with the communities we serve through a big-picture, coordinated approach. One of the primary ways we plan for the future is through the Regional Plan, a long-term vision for how we will transform the way people and goods move in the 21st century. We're hard at work bringing the plan to life by delivering near-term projects, identifying partnerships, seeking funding opportunities, and deploying pilot programs.

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Foreword

San Diego County is the most biodiverse county in the continental United States. Our region's ecosystems, both on land and in the water, are critical habitats to many endangered and important species and are essential to people's well-being. However, these vital natural systems are at risk.

To conserve the region's unique biodiversity, the first step was to learn from many of the individuals and organizations that work hard to conserve our biodiversity in San Diego. San Diego Natural History Museum (The Nat), in partnership with the San Diego Association of Governments (SANDAG), wanted to begin the process of forging a vision and path forward for conserving the region's biodiversity.

The report outlines the research methodology used to collect data from a diverse cross-sector of stakeholders at the Summit on the needs, gaps, and opportunities in biodiversity conservation in the region. It also identifies some challenges and opportunities related to habitat management and monitoring, ecosystem benefits, economic resilience, education and public awareness, equitable access to natural spaces, research needs, and policy. The report articulates what success would look like to accelerate biodiversity conservation. This is the first step in identifying actions that will support San Diego's long legacy of biodiversity conservation.

The Nat has been dedicated to conservation since its founding in 1874 and aims to continue its commitment to conservation so San Diegans can continue to enjoy nature for the next 150 years. The Nat plays a unique convening role in gathering multiple stakeholders and brings together diverse voices and expertise to foster partnerships that enhance our collective conservation impact. By facilitating dialogue and collaboration, The Nat catalyzes actions and inspires innovative solutions to protect the unique habitats that define our region.

The Nat is celebrating 150 years by looking toward the future with a new strategic vision focused on improving conditions for nature and people in our region. This will be accomplished through three main activities: public engagement, conservation science, and partnerships.

For the past 30 years SANDAG, as the regional Council of Governments, has brought together the local, state, and federal agencies and key stakeholders to advance habitat conservation throughout the region. The adoption of the Multiple Species Conservation Program and Multiple Habitat Conservation Program are examples of the proactive planning efforts aimed at conserving the unique species and their habitats throughout the San Diego region. To support the implementation of these plans, SANDAG has led the TransNet Environmental Mitigation Program, which has allowed for the strategic acquisition of land for mitigation of transportation projects, and regional collaboration of land management and biological monitoring.

In December 2021, the SANDAG Board of Directors adopted San Diego Forward: the 2021 Regional Plan, the blueprint for how we will grow, where we will live and how we will move around the region. The plan outlined a future Regional Habitat Conservation Vision: to protect, connect, and respect species and their natural habitats in order to maintain and preserve the unique biodiversity of San Diego. SANDAG is committed to implement this vision by continuing to find alignment among diverse stakeholder groups and promoting actions that will support San Diego's long legacy of biodiversity conservation.

As we step into an exciting new phase of regional conservation effort, it is with great enthusiasm that we celebrate the continued partnership between SANDAG and The Nat with the release of this report. We will continue to foster coordination through convening, collaboration, and exchange of best practices to enhance regional conservation efforts. By leveraging our collective expertise and resources, we can create a more sustainable future for San Diego.

We invite you to join us on this important journey in conserving our natural heritage and working together to accomplish even greater impacts through our combined efforts.

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SAN DIEGO COLLABORATION FOR CONSERVATION

Sustaining the Region's Legacy of Biodiversity Conservation

We are living through significant environmental, social, political, and economic challenges. These challenges have strained our communities and human-built systems, as well as our interconnected habitats, wildlife, and natural systems. Lack of adequate infrastructure to withstand natural disasters and climate change, as well as historical and present-day inequities in resources across neighborhoods, are examples of the multifaceted and interconnected threats contributing to the accelerated loss of our rich biodiversity. This natural abundance is integral to our region's health, history, and continued prosperity.

Given these interconnected challenges, a united, collaborative approach to generate long-lasting, sustainable solutions is more essential than ever. This report aims to address these concerns holistically.

San Diego is the most biodiverse county in the continental United States and has a long history of collaboratively prioritizing biodiversity conservation. Our approach to regional conservation planning, management, and monitoring has served as an influential blueprint for other parts of the nation.

Our Multiple Species Conservation Program of 1997 paved the way for innovative cross-jurisdictional species management. Public opinion polls have confirmed the high value San Diegans place on nature and the importance of maintaining access to natural lands. Governments across borders, federal and state resource agencies, community-based organizations, academia, and community members are working to protect and restore our local and native fauna and flora in the face of constant—and sometimes catastrophic—change.

As the pressing urgency for broader biodiversity conservation action becomes more apparent, coordinated and collaborative efforts are necessary to create a healthy region in which people, ecosystems, and wildlife thrive.

This report synthesizes data and ideas collected during spring of 2024 from our diverse, multinational community of conservation practitioners with a goal of developing a unified approach for defining success in biodiversity conservation efforts.

Guided by a Habitat Conservation Steering Committee, data was gathered through surveys, a day-long workshop with 261 biodiversity stakeholders, and follow-up interviews. Stakeholders identified five priority areas where significant needs exist and both the cost of inaction and the opportunity for action is great. Below is the list of priorities identified by stakeholders.

PRIORITIES IDENTIFIED BY STAKEHOLDERS

1. **Habitat Monitoring and Management** — Entails maintaining healthy, biodiverse ecosystems by leveraging a robust network of scientists, land managers, and partners who implement and sustain comprehensive, multinational conservation efforts that harmonize with nature.

2. **Ecosystem Benefits and Economic Resilience** — Involves recognizing and quantifying the multiple advantages biodiverse habitats offer to both human and non-human communities, including health, well-being, and economic stability, and developing equitable investment strategies to sustain resilient natural and built systems.

3. **Education and Public Awareness** — Includes supporting processes for scaling education and public engagement efforts that are culturally relevant, enable self-efficacy and empowerment, and are robust and accessible for all of San Diego's diverse communities.

4. **Equitable Access that Supports Biodiversity** — Ensures all San Diegans can responsibly enjoy and preserve local natural environments like beaches, parks, and preserves, through systems of reciprocity, accountability, and stewardship between land management agencies and the public.

5. **Research and Policy** — Focuses on bridging the gap between impacted communities, scientists, and policymakers by fostering inclusive, culturally informed research that incorporates BIPOC perspectives and addresses key areas such as public transit, education, access to outdoor spaces, and environmental protections.

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Across these five topical priority areas, four cross-cutting themes emerged–Connectivity, Collaboration, Climate, and Change. Regarding connectivity, experts spoke to the need of connecting habitats through wildlife corridors, as well as increasing regulated human access and connectivity to healthy environments. Collaboration among organizations, governments, and grassroots community efforts emerged as a promising solution to address the multifaceted threats to the health of our multinational bioregion.

Practitioners also noted the significance of our climate's impact on the environment while also recognizing the impact of human behavior on our climate. With these themes in mind, our experts collectively honed in on the need for change in human behaviors, organizational practices, legislative decisions, and infrastructure. These four cross-cutting themes collectively incite actionable opportunities to advance biodiversity conservation efforts in the region.

Using the gathered data, a guiding framework was developed defining a Theory of Change (ToC) for advancing biodiversity conservation in the San Diego region.

A ToC is a conceptual model, shown in Figure 1, that illustrates the causal pathways through which a set of activities (in this case, Topical Priority Areas) are expected to achieve its desired outcomes (Potential Successes) and broader societal impact. The ToC also depicts Change Triggers that initiate current efforts, the Existing Strengths that underpin the ToC, and key Levers that can facilitate or hinder progress.

WHY IS BIODIVERSITY IMPORTANT?

Insights from Workshop Stakeholders

FIGURE 1: DRAFT THEORY OF CHANGE FOR REGIONAL BIODIVERSITY CONSERVATION

CHANGE TRIGGERS

- Climate change impacts on biodiversity
- Growing social inequality
- Leadership from The Nat and SANDAG
- Potential funding avenues

TOPICAL PRIORITY AREAS

- Habitat Monitoring and Management
- Ecosystem Benefits & Economic Resilience
- Education and Public Awareness
- Equitable Access that Supports Biodiversity
- Research and Policy

LEVERS

- Collaboration
- Funding
- Human Resource Capacity

POTENTIAL SUCCESSES

- Connected and Protected Habitats
- Studies on Biodiversity's Benefits
- Community Engagement in Stewardship
- Equitable Access to Nature
- Improved Knowledge Sharing

IMPACT

A healthy region where humans and wildlife communities thrive

EXISTING STRENGTHS

- Regional conservation plans and monitoring systems
- Biodiversity hotspot
- Community valuing natural assets

LOOKING FORWARD

Within this report, we outline the key needs and institutional challenges that we face when working toward robust biodiversity conservation, and opportunities that leverage the multiple co-benefits of biodiversity conservation efforts, including the economic, social, and cultural benefits that healthy ecosystems enable for our region.

This report serves as an outline for regional decision makers and agencies to pave pathways for actionable change that envisions a region that prioritizes biodiversity conservation. By working together toward a common goal, we can not only sustain, but enhance our region's legacy of biodiversity conservation. We look forward to working together to bring this report's solutions to life.

Introduction & Background

San Diego County is the most biodiverse county in the continental United States. Biologically, our region's ecosystems, both on land and in the water, serve as critical habitats to many endangered and important species, as well as provide refuge for enjoyment and learning for our communities. However, these vital natural systems are at risk, and expanding human development threatens to destroy or critically threaten these essential resources. As the population of Southern California grows, the stakes for wildlife and humans alike have escalated. San Diego County shelters approximately 200 imperiled plants and animals—more than in any other county in the nation–and in order to continue safeguarding these natural resources, we need to have a better collective understanding of the state of biodiversity conservation in the region.

For 150 years, the San Diego Natural History Museum (The Nat) has led the way studying and archiving the natural history and unique biodiversity of San Diego and our binational region. The Nat has not done this work alone and is joined by hundreds of individuals and organizations that work to conserve our natural ecosystems. In celebration of its 150th anniversary, The Nat, in partnership with the San Diego Association of Governments (SANDAG), wanted to begin the process of forging a vision and path forward for conserving the region's biodiversity. They recognized that the first step was to learn from the many individuals and organizations who are on the ground working to conserve our biodiversity every day.

In order to begin this process, The Nat commissioned The Nonprofit Institute at the University of San Diego (NPI) to facilitate a convening of 250 conservation stakeholders to gather together at the museum and spend a day in conversation identifying the strengths, needs, and gaps of biodiversity conservation in the San Diego region. The purpose of this convening was to bring together a diverse group of people representing different sectors and perspectives to collectively reflect on the region's long history of conservation and begin to clearly articulate complex webbing of needs as well as potential pathways that could offer opportunities for how to sustain the unique habitats and ecosystems. This report documents data gathered before, during, and after the convening of conservation stakeholders.

The primary objectives for this report are the following:

- Identify needs, gaps, and opportunities for regional biodiversity conservation from a diverse cross-sector group of stakeholders
- Articulate and define what success would look like to accelerate biodiversity conservation efforts for the San Diego region
- Identify potential pathways for moving the needle on complex regional challenges that pose a threat to biodiversity conservation

This report begins with a summary of San Diego's unique bioregion and its long legacy of biodiversity conservation. Next, it outlines the research methodology used to collect data from stakeholders on the needs, gaps, and opportunities in biodiversity conservation in the region. The next section highlights findings on the key habitat and ecosystem connectivity needs across the San Diego region's natural systems. The remainder of the report presents challenges and opportunities related to the following five biodiversity conservation topics: habitat monitoring and management, ecosystem benefits and economic resilience, education and public awareness, equitable access to natural spaces, and research and policy.

Grounding in Our Bioregion

The San Diego region is defined by its unique and diverse natural environment. It is one of the most ecologically, geologically, and culturally rich regions in California. San Diego has ocean, bays, shoreline, coastal plain, canyons, foothills, mountains, and desert landscape that host habitats such as scrub, woodland, forest, grassland, wetland, agriculture, and urban areas, all in close proximity to each other.

The region is home to 3.3 million people sharing 19 local governments, including 18 cities and the County. Additionally, San Diego County has the most Tribal governments and reservations in the United States, with 18 federally recognized Native American reservations represented by 17 Tribal governments. The region also neighbors Mexico, making it a hub for international trade and travel.

The San Diego region's Mediterranean climate, characterized by dry summers and cool winters with little yearly precipitation, fosters an ideal climate for people, organisms, and ecosystems. San Diego County is recognized as the most biodiverse county in the continental United States with over 520 bird species,[1] over 1,500 native plant species,[2] and 177 threatened or endangered species.[3] As a part of the California Floristic Province, which ranges from the South Oregon coast to northern Baja California, it is part of one of 36 biodiversity hotspots designated by Conservation International.[4]

Although our region is separated politically by an international border, it is important to recognize that our bioregion–the connected ecosystem–reaches far beyond the U.S.-Mexico border. Ecosystems themselves are not bound by jurisdictional boundaries; therefore, conservation efforts must be integrated to adapt at a scale reflective of the ecological boundaries of the system. For instance, the Tijuana River Watershed spans across the U.S.-Mexico border, crossing the border four times. Thus, the watershed faces unique challenges for habitat restoration and species conservation as a result of varying environmental and land use regulations, as well as pollution and conservation policies, from both the U.S. and Mexico.

There are numerous cross-border conservation projects currently active in the region. For example, cross-border, species-specific monitoring and research, such as that of the red-legged frog and California spotted owl, is underway, and research centers such as University of California San Diego's Center on Global Justice have programs to increase connectivity within this bioregion for people and organisms alike. Additionally, community science programs such as the Border BioBlitz–coordinated by Next Generation Sonoran Desert Researchers, Botanical Community Development Initiatives, the San Diego Natural History Museum, and partners in Baja California–allow community members from both the U.S. and Mexico border to participate in species monitoring and documentation. Connecting the bioregion across international borders is also supported through the Binational Resilience Initiative, a grant program by the San Diego Foundation that funds collaborations between U.S. and Mexico nonprofits.

Defining Biodiversity and Conservation

Biodiversity:
The variety and variability of life on Earth. Biodiversity is a measure of variation at the genetic, species, and ecosystem level.

Biodiversity Conservation:
The protection, enhancement, management, and monitoring of biodiversity to ensure sustainable benefits for present and future living beings and ecosystems.

San Diego County is recognized as one of the first in the nation to enact regional habitat conservation plans that streamline the permitting process for developers while preserving large, connected areas of land to protect vulnerable species. There are two approved subregional plans: the Multiple Species Conservation Plan (MSCP), which guides conservation of 11 cities and parts of unincorporated San Diego County or 172,000 acres, and the Multiple Habitat Conservation Plan (MHCP) which guides the preservation of 19,000 acres of habitat. The North County MSCP is currently being developed and is under review, and the East County MSCP is expected to begin after the North County MSCP is adopted. These regional habitat conservation plans are designed to provide an umbrella of protection for multiple species by conserving their habitats and the linkages that allow them to travel between habitats.

In 1987, San Diego County voters approved TransNet, a half-cent sales tax funding regional transportation improvements. Originally set to expire in 2008, voters extended it in 2004 to 2048, raising funds for highways, transit, and other projects. The extension also introduced the TransNet Environmental Mitigation Program (EMP), a unique initiative to San Diego that streamlines mitigation for infrastructure projects. It also provides funding to protect open space and conserve habitats, consistent with the biological goals and objectives of the MSCP and the MHCP regional habitat conservation plans.

The EMP also established the San Diego Management and Monitoring Program (SDMMP) providing a coordinated, scientific approach to management and biological monitoring of conserved lands in San Diego County. The SDMMP and its partners have (1) developed and implemented a regional, science-based adaptive management and monitoring framework, (2) created and maintained a data management system and web portal for species, vegetation communities, and threats, (3) developed metrics for assessing the effectiveness of the regional preserve with an integrated dashboard, and (4) coordinated management through a collaborative network of preserve owners and managers, wildlife agencies, and scientists. This collective management and monitoring program is distinctive among conservation efforts worldwide and fundamental to the San Diego region's conservation success.

San Diego Regional Historical Timeline

The following timeline contains important events in the San Diego region's biodiversity conservation history, as identified by San Diego Region Biodiversity Conservation Summit attendees. While far from exhaustive, the timeline highlights events, both protective and destructive, that have had an indelible impact on the region's unique biodiversity.

San Diego Region Biodiversity Conservation Events:

1542 Spain landed a ship in modern-day Point Loma, San Diego and claimed the territory. The native population at the time was around 20,000 including five distinguishable American Indian groups: Luiseño, Cahuilla, Cupeño, Kumeyaay, and Northern Diegueño.

1780 The permanent occupation of Kumeyaay territory by European missionaries and colonists began.

1848 Treaty of Guadalupe Hidalgo was signed, ending the Mexican-American War, and Mexico ceded 55% of its territory to the United States, including modern-day California. As a result, Kumeyaay territory was divided by two distinct nation-states (modern-day Mexico and the U.S.) which imposed an international boundary on the region, as well as separate political and economic structures, cultures, and languages.

1850 California became the 31st state of the United States of America.

1874 San Diego Society of Natural History (modern-day The Nat) was founded and regional conservation research began.

1908 Cleveland National Forest was established in an effort to stop the destruction of forests and the damage to San Diego's watersheds from mining, ranching, and other human impacts.

1932 Kumeyaay Indians living on ancestral lands on the Capitan Grande Reservation were forced off their lands to make way for the city of San Diego's El Capitan Dam and its reservoir. Their agricultural economy never recovered.

1933 Anza-Borrego Desert and Cuyamaca Rancho State Parks were established.

1970 California Endangered Species Act was enacted, making California the first state in the nation to protect threatened plant and animal species and habitats.

1982 Tijuana River National Estuarine Research Reserve (TRNERR) was established, preserving California's largest coastal wetland.

1992 Natural Community Conservation Planning Act (NCCP) was enacted representing an innovative initiative by the State of California to take a broad-based ecosystem approach to planning for the protection and conservation of biological diversity.

1993 The first San Diego-Tijuana border fence was approved and constructed; it stretches 14 miles.

1993 The California Gnatcatcher, an indicator species of ecosystem health in the region, was listed as a federally threatened species which led to the unprecedented effort by the State of California to move towards broad-based ecosystem planning for the protection and perpetuation of biological diversity.

1996 The San Diego National Wildlife Refuge was established, U.S. Fish & Wildlife's contribution to the San Diego County Multiple Species Conservation Program (MSCP).

1998 Final adoption of the MSCP, one of the first-in-the-nation habitat conservation plans that streamlined the permitting process for developers, while preserving large, connected areas of land to protect vulnerable species.

2003 Adoption of the Multiple Habitat Conservation Program (MHCP), a multiple jurisdictional planning program designed to create, manage, and monitor ecosystems in northwestern San Diego County.

2004 Transnet 1/2 cent sales tax was passed, and the Environmental Mitigation Program was created to support habitat acquisition, management, and monitoring in the region.

2008 The San Diego Managing and Monitoring Program (SDMMP) was created, funded by the Environmental Mitigation Program to provide a coordinated, scientific approach to management and biological monitoring of conserved lands in San Diego County.

2015 ReWild Mission Bay was launched to enhance and restore the wetlands around Mission Bay.

2020 California's 30x30 Program was initiated, in which the state set the goal of conserving 30% of California's lands and coastal waters by 2030.

2022 The Binational Resilience Initiative was launched by the San Diego Foundation to fund cross-border projects aimed at addressing climate change impacts and improving coastal resilience.

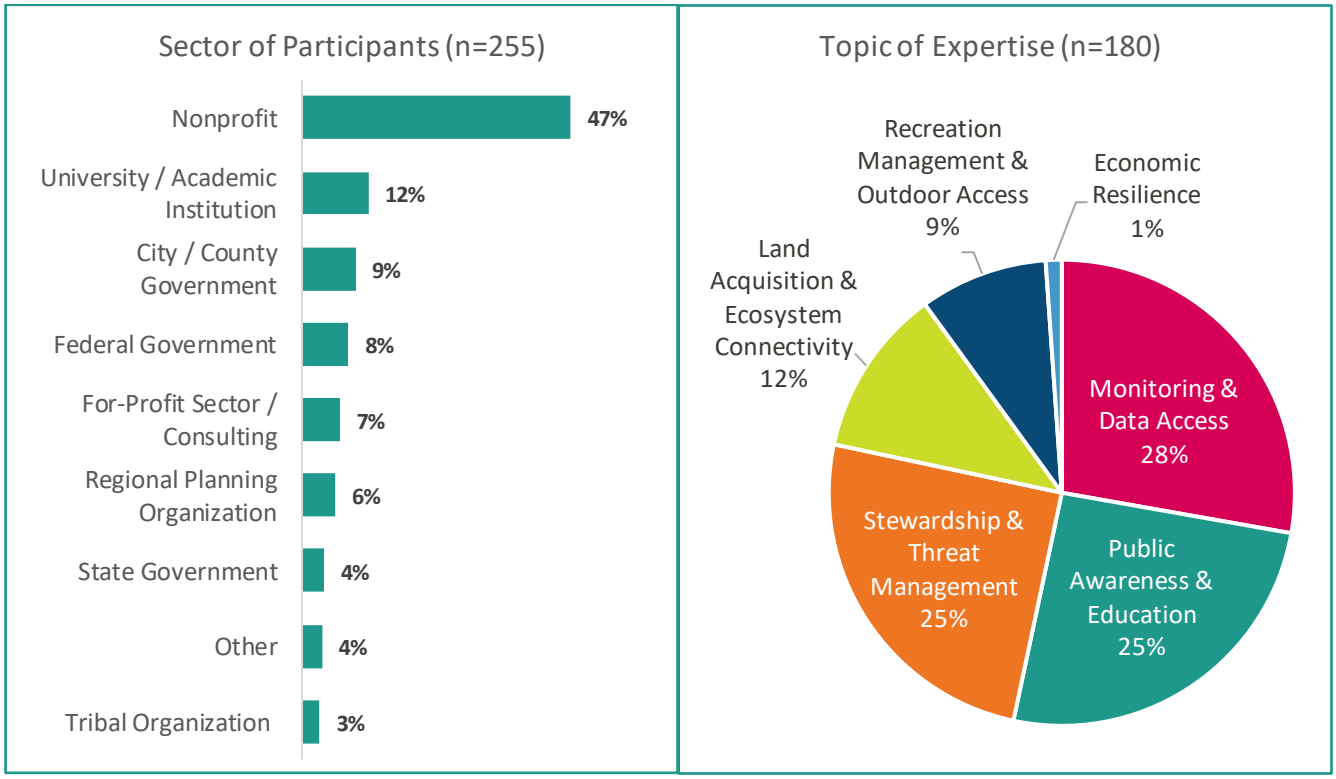
Project Methodology

The findings represented in this report were synthesized from multiple data sources collected between November 2023 and May 2024. These data were collected through a survey of biodiversity conservation professionals, discussion groups and interactive activities at the San Diego Region Biodiversity Conservation Summit (Summit) hosted in February 2024, and ongoing meetings with a steering committee composed of conservation professionals. NPI researchers analyzed the qualitative data collected from these three sources using content analysis, a method in which text is coded and key themes and patterns in the responses are identified.

Biodiversity Pre-Survey (n=119)	The San Diego Biodiversity Conservation Pre-Survey was distributed to biodiversity conservation professionals via a snowball distribution method. This survey was open to responses from November 2023 through January 2024. The survey asked respondents to identify key strengths, benefits, needs, and gaps in knowledge as they related to biodiversity conservation. These results were also used to guide the agenda for the Summit.
San Diego Region Biodiversity Conservation Summit (n= 261)	Biodiversity conservation practitioners and outreach leaders were invited to participate in this feedback-gathering Summit hosted in February 2024 at the San Diego Natural History Museum. The Summit included participants from a broad diversity of sectors, and a detailed breakdown of attendees is displayed in Figure 1. The goal of the Summit was to gather detailed feedback through small breakout discussion sessions and passive, interactive data collection. *Breakout Discussion Session:* Participants were separated into six breakout sessions of 30-40 participants that lasted one hour. Each breakout discussion group focused on a key topical area: 1) Economic Resilience, 2) Land Acquisition, 3) Monitoring & Data Access, 4) Public Awareness & Education, 5) Recreation Management & Outdoor Access, and 6) Stewardship & Threat Management. These topics were selected based on responses collected through the pre-survey, the internal project team, and through a Steering Committee discussion. Participants were asked to discuss, identify, and share areas of need, success, and opportunities for equitable access to the assigned topic. Answers were collected from groups of five to seven people and inputted into a Google Form. *Passport Activity Session:* Data was collected through a series of interactive stations integrated into museum exhibits in the San Diego Natural History Museum. Activity formats included flipchart questions, mapping exercises, and word clouds and spanned across eight topical areas: 1) Envisioning Success, 2) Climate Change & Emerging Threats, 3) Ecosystem Connectivity, 4) Policy & Funding, 5) Education & Community, 6) Aligning on Nomenclature, 7) History & Time, and 8) Binational & Indigenous Context. Activities were developed through internal team and Steering Committee meetings. Participants were asked pointed questions about key gaps and needs related to each topical area.

Post-Summit Dialogue with Tribal Partners (n=2)	Based on feedback and input gathered at the Summit, NPI held additional one-on-one dialogues with attendees who represented a Tribal organization or government at the Summit. These dialogues were optional and conducted with the goal to gain further insight into data around Tribal relations and Indigenous knowledge collected at the Summit. Participants were asked to give input on preliminary findings and needs, gaps in knowledge, and strengths in the region as it related to Tribal involvement with biodiversity conservation.
State of Biodiversity Symposium (n=250 in person, 72 virtual)	NPI presented preliminary findings from the Summit to the public in April 2024.
Habitat Conservation Steering Committee (n=12)	A Steering Committee of 12 practitioners guided NPI in the development of the Summit and provided input throughout the project process.

Figure 1: Breakdown of Summit Participants



Introduction to Core Thematic Areas

For the remainder of the report, the findings are categorized into the following five core topical areas. The topical areas outlined in this report were derived from analysis of the data gathered from the San Diego Region Biodiversity Conservation Summit. Additionally, a draft report was made available for public comment, and feedback was integrated throughout this report. The five topical areas are defined below.

Overview of Five Core Topical Areas

Habitat Monitoring & Management	Maintaining healthy, biodiverse ecosystems and habitats requires a strong, well-supported system of scientists, land managers, agencies, and collaborative partners capable of funding, implementing, and sustaining large-scale, holistic conservation efforts. This includes a diverse system of partners and projects that can transcend structural and systemic borders to conduct necessary research and habitat restoration efforts that work with nature, not against it.
Ecosystem Benefits & Economic Resilience	Beyond their natural beauty, biodiverse ecosystems and habitats provide an endless list of valuable co-benefits to our region's human and non-human communities, such as human health and well-being and economic resilience. A resilient economy needs resilient systems to sustain it–this includes across both our built and natural systems, pathways to quantify the direct and indirect economic benefits of biodiversity conservation efforts, as well as identifying equitable investment strategies.
Education & Public Awareness	A knowledgeable, connected, and empowered community is critical for scaling and supporting biodiversity conservation efforts. This includes supporting processes for scaling education and public engagement efforts that are culturally relevant, enable self-efficacy and empowerment, and are robust and accessible for all of San Diego's diverse communities.
Equitable Access that Supports Biodiversity	To maintain a strong connection with the region's natural environment, all San Diegans must have equitable access to our beaches, parks, and natural preserves–concurrently, to sustain these places as healthy systems, human interaction and impacts must be managed and monitored. This includes supporting a system of reciprocity, accountability, and stewardship between land management agencies and the general public.
Research & Policy	Strong research and policy guidance is integral to understanding and maintaining the complex relationship between our natural and human-built systems, how they interact, and how they evolve. This includes developing more robust, transparent, and proactive connections between policymakers, scientists, and the communities they serve.

Definitions of Cross-Cutting Themes

Across each of the five core topical areas, there were four cross-cutting themes consistent throughout the data and analysis. The cross-cutting themes utilized in this report were derived from the analysis of data gathered from the San Diego Region Biodiversity Conservation Summit. These cross-cutting themes encapsulate the opportunities and pathways forward to move the needle on complex regional challenges that pose a threat to biodiversity conservation efforts.

Connectivity

- Strengthening and restoring connections across diverse and divergent ecosystems and habitat types
- Deeper integration across systems of practice, including policy, program alignment, communities, and places

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Collaboration

- Fostering opportunities for collaboration and community across diverse sectors and scales (government, academia, Tribes, individuals)
- Facilitating stronger linkages for the broader community of practice to accelerate action and enable collaborative leadership

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Climate

- Understanding the impacts of a changing climate temporally and spatially across the bioregion
- Advancing adaptation and resiliency in practice, and evolving knowledge, systems, and communication in response to a changing climate

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Change

- Uplifting holistic, future-forward, and innovative opportunities to meet evolving needs and changing demands
- Creating an enabling an environment to support emerging practices in land management, data acquisition, and ecosystem services

Habitat Monitoring & Management

The Challenge

While major accomplishments have been made over the last 25 years, the challenge to protect and manage a system of interconnected natural land still has not been accomplished. San Diego County has publicly, albeit partially, funded land acquisition, regional management, and biological monitoring through the TransNet Environmental Mitigation Program and federal and state sources. However, there are still gaps and challenges that impact regional progress and biodiversity conservation efforts. SDMMP has served as a strength for the region, providing collaboration of land management and monitoring across a variety of conservation stakeholders within the region. However, without additional long-term funding, it has been very difficult for agencies to implement long-term management and monitoring of the land. Although significant strides have been made in data collection and research, stakeholders identified a need for improved data collection uniformity, streamlined data sharing across agencies and borders, and standardized collection and management protocols for post-data collection.

Additional structural and systemic challenges impact regional habitat monitoring and management efforts including constraints on funding, workforce, and governance. Existing funding resources seldom cover the full cost of biodiversity conservation projects, specifically the challenge of restricted resources that are available for long-term monitoring and data management. Conservation efforts rely heavily on a volunteer workforce to implement projects, and many leading agencies struggle internally with limited staff for habitat restoration and invasive species management. San Diego's geographic location along an international border presents unique challenges to collaboration across sovereign Tribal and international borders for effective species and habitat monitoring and management.

What are the Root Causes?

- Lack of funding for long-term habitat monitoring and management.
- Historically differing perspectives between Tribal and U.S. agencies on approaches to biodiversity conservation and land management has impeded collaboration (e.g., habitat destruction on U.S. military bases).
- Borders (Mexico, jurisdictional, state, federal, county, Tribal) hinder collaboration, data sharing, and ecosystem connectivity.
- The large bioregional scale, spanning across San Diego County, the Baja California Peninsula, and Mexico makes comprehensive monitoring and management difficult.
- Natural resources careers are often low-wage, rely on volunteers and require manual labor; deepening capacity constraints.

What Would Success Look Like?

Connected and protected habitat collaboratively monitored and managed to promote and restore the region's native species and habitats:

- Long-term, sustainable funding and implementation of bioregional (multi-national) management and monitoring efforts with transparency and open communication about financials and monitoring/data
- Data is Findable Accessible Interoperable Reusable (FAIR): Open-access up-to-date data repository where all other databases would feed into
- Databases include historical as well as current data
- Effective wildlife crossings are constructed on highways and roadways that previously obstructed habitat connectivity
- Ongoing coordinated regional programs for invasive species management

Opportunities for Action

Connectivity: Connect Ecosystems and Protect Habitats

Expand research to understand wildlife movement corridors and restore habitat connections where they have been severed by transportation and human development. Both human and non-human migratory patterns are impeded and disrupted by our built environment and physical and political barriers, like the border wall, highways, dams, and human transit corridors. Identify the existing corridors that need to be protected and restored as well as collective efforts that are already underway to support their protection. Additionally, enhance our understanding of which critical areas need to be better connected.

Long-term funding for invasive species management. Currently, invasive species removal efforts typically only fund the initial removal. Often there is a lack of funding to sustain the habitat and maintenance needed, so these species inevitably return.

Improve species monitoring data sharing across agencies and nations. There is a call for standardized species monitoring data collection protocols that cross jurisdictional boundaries, and an accessible data repository that all other databases feed into.

"The importance of connectivity needs to be prioritized. We spend too much time focused on protection of individual species and not enough time on the entire ecosystem and how the species are dependent on each other."

"We fall short on monitoring all wildlife – for example, there are large gaps of data for pollinators and insects, which is the basis of the food chain that supports biodiversity."

Collaboration: Improve Collaboration Across Groups and Systems

Reciprocal collaboration between Tribes, government agencies, and community-based organizations. The most frequently cited need was improved Indigenous engagement and knowledge sharing around Traditional Ecological Knowledge (TEK).

Potential Actions to Support Tribal Collaboration and Leadership:

- **Prioritize trust-building:** Engage in activities that build intentional, trusting relationships. Examples include hosting conferences and workshops specifically focused on trust-building, knowledge-sharing, and collaborative engagement.
- **Engage in reciprocal knowledge sharing:** Create an enabling environment for a two-way exchange where both Indigenous communities and external stakeholders (such as government agencies, community-based organizations, and scientists) share, learn, and respect each other's knowledge, perspectives, and experiences. This approach values the contributions of all parties equally and emphasizes reciprocity, mutual benefit, and co-learning; ensuring that Indigenous wisdom and practices are not just extracted but are integrated in ways that also benefit the Tribal communities themselves.
- **Fund and support capacity building:** Enable the support needed by Tribes to engage and implement strategies of TEK on Tribal and ancestral lands. There is a recognition that TEK practices may hold a lot of promise in conserving the region's biodiversity, but there is very limited funding and capacity for Tribes to be supported to actually do the work. Additional capacity is needed for Tribes to be able to document and to share that knowledge with their communities and with others (as they deem appropriate).
- **Build on existing, successful collaborations:** There are already ongoing partnership efforts that exemplify best practices for elevating relationships and collaboration with Tribes in our region; it is important to find ways to support the capacity of these existing efforts as well as build off their leadership. A few examples that were highlighted in the data include the Climate Science Alliance's Tribal Working Group, San Diego State University's Institute for Ecological Monitoring and Management, and the San Diego Botanic Garden's Medicinal Plants Project.

Increase and improve binational collaboration on species conservation. Acknowledging that non-human species do not recognize political borders, and their historic, native habitats extend and transcend throughout our bioregion. There is a need for increased collaboration between Mexico and the U.S., to both improve conservation efforts as well expand research and data collection efforts to be multi-national.

Potential Actions to Support Binational Collaboration

- **Increase binational conferences between scientists from Mexico and San Diego:** Host convenings, similar to The Nat's Biodiversity Summit, specifically focused on binational conservation efforts. Identify clear pathways and lower barriers for attendees to participate.
- **Mainstream translation and interpretation services:** Increase bilingual resources and translation services for convenings, reports, and data collection to actively lower the barrier to collaboration between the U.S. and Mexico.
- **Make travel stipends available for border colleagues:** Crossing the border is logistically and financially difficult for people on both sides of the border. Allocating and identifying funding opportunities for travel stipends, as well as supporting necessary visa applications is one way to increase collaboration.
- **Identify collaboration opportunities with land managers across the border:** Many of our bioregion's habitats and ecosystem types can be found on both sides of the border. Creating more clear pathways for conservation land managers to share their expertise and best practices will aid and accelerate restoration and conservation activities.
- **More flexible funding to support binational collaboration:** Many funding streams and resources are not set up to allow the dollars to cross the border, creating an additional barrier to continuity in biodiversity conservation efforts. Expanding on successful binational funding programs, like the Binational Resilience Initiative, can accelerate collaboration and progress.

Collaborative access agreements for data collection. To improve species monitoring, streamline the process of accessing properties, obtaining appropriate permits, and promoting clear pathways for conservation land access to accelerate and expand data collection.

Conservation experts build relationships across sectors. There is a call for increased collaboration between the conservation community of practice, specifically with city/county planners and private landowners, to deepen relationships, share best practices, and identify more collaborative pathways.

Opportunities for land managers to come together to share best practices. There is a need for increased convenings with focuses on land management from a regional approach (including binational and Tribal partners). Participants encouraged funding for travel, as well as multi-lingual resources and translations for improved accessibility to these convenings.

Climate: Expand Research on How Climate Change Will Impact Biodiversity

Participants identified many gaps in knowledge about how a changing climate will impact existing biodiversity, and how to best adapt to these climate impacts. Participants want to see more multidisciplinary, cross-community-informed research to address the following knowledge gaps on climate change.

Reveal and address key climate impact data and research gaps: The most frequently identified data gaps included the need for clear historical trend data on species and habitat types to serve as a baseline for assessing potential climate impacts. Additionally, there is an increased need for specific data on key environmental and biological threats, such as: increases in disease and parasites, sea level rise and drought impact on habitats, ecosystem capacities to sequester carbon, and identifications of climate refugia species, range shifts, and distribution changes. Data collection efforts that deploy modern scientific technologies such as geographic information systems, DNA and genome sequencing, assessments of environmental factors, and genetic impacts on local flora and fauna also need to be increased.

Expand the role of Indigenous knowledge systems to address climate impacts: Practices such as prescribed burns were long used by the region's Indigenous communities to combat increased drought and wildfire. Creating clear pathways to learn about land management practices in a changing climate from Tribal partners and expanding the use of these practices is needed.

Update our understanding of restoration in the context of climate change: Climate change has been impacting our region's habitats and sensitive ecosystems in real-time. There is an increased need to think about our restoration practices in the context of climate change and updated data to better understand how species and ecosystems will or will not adapt to these climate impacts.

Deepen the understanding of how biodiversity conservation intersects with socioeconomic and community impacts: Climate change impacts all of our communities, but not equally. These impacts are harder on our region's historically marginalized communities, and this is particularly strong in relationship with housing and food systems. To uplift and support all communities, we need better baseline data of communities being served and communities not being served, along with a clearer understanding of the potential co-benefits of conservation efforts for these communities.

Change: Adapt and Innovate in the Face of Change

Progress requires innovation and the invitation for new approaches and techniques. Summit participants identified opportunity areas that may aid and support habitat monitoring and management practices for a better future.

Scale and deploy emerging and innovative land ownership/management practices: Conservation practices, such as co-stewardship models, land trusts, the return of ancestral lands to Tribes, and flexible conservation easements for private land owners, are gaining traction at the global scale. By exploring and adopting these techniques and practices where available, the goals of regional efforts to scale protection for critical habitats and land can be met.

Utilize nature-based solutions to expand biodiversity conservation efforts: Creating pathways to more holistically define "ecosystem services" and identify projects that utilize innovative resilience techniques, such as nature-based solutions, can help meet regional conservation goals. One specific funding opportunity is to explore the expedited green energy rollout to encourage nature-based solutions and biomimicry in energy infrastructure (e.g., power lines are spaced so wing spans don't touch, place windmills on a horizontal access to reduce bird strikes and bat sonar impacts, put solar infrastructure on developed and disturbed land in a dispersed fashion to avoid using pristine habitat.) Additionally, there was a call for increased research efforts to enhance understanding of the intersectional and inclusive benefits and services of healthy ecosystem.

Increase public engagement in online community science data collection platforms by improving their accessibility for both the public and researchers. Improve and mainstream the use of accessible data collection applications, such as iNaturalist and E-bird to increase data quality and quantity. Introducing iNaturalist in schools offers students the opportunity to participate in biodiversity at a young age and can encourage them to become agents for action.

Ecosystem Benefits & Economic Resilience

The Challenge

One challenge that our region faces when tackling biodiversity conservation is fully prioritizing, understanding, and communicating the importance of biodiversity conservation beyond its inherent value. Many biodiversity conservation efforts have lasting impacts on the economic, cultural, and human health of the region, but these benefits are often overlooked. Quantifying these benefits has been a particular challenge, as many of these ecosystem services are vast, take time to establish, and beneficial outcomes are often indirect services. Additionally, capacity is limited due to restrictive conservation funding and limited workforce training opportunities. Initiating and maintaining biodiversity conservation efforts have become increasingly strained due to numerous factors, including a shortage of qualified personnel and agencies to carry out the work, rising costs of performing the work, and the complexity and constraints of funding resources for biodiversity conservation coming from local, state, and federal entities.

What are the Root Causes?

- No set methodology or existing metrics to quantify ecosystem services and biodiversity benefits across systems throughout the region.
- An unequal distribution of resources throughout the region due to historical injustices such as redlining, colonization, and other systemic factors.
- Barriers to obtaining and managing funding, including communication gaps between funders and recipients around the needs and costs of biodiversity work.
- Agencies charged with leading biodiversity conservation efforts are resource-limited and lack the technical staff capacity needed to sustain the work.
- Pressure to prioritize basic needs before meeting the needs of the natural world.
- Regional plans other than conservation plans (e.g., transportation, housing, energy, recreation, etc.) do not currently require an assessment of ecological impacts and benefits.

What Would Success Look Like?

- Studies and reports that quantify the multiple benefits and costs of biodiversity conservation beyond the dollar value
- Tax dollars that get redirected to biodiversity conservation funds
- San Diego corporations recognize and support the conservation of biodiversity and its contribution to community health and well-being
- A robust conservation workforce with appropriate training and livable compensation

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"San Diego has the nation's finest landscape-level habitat conservation program addressing the need to balance economic development with conservation of the mainland of the United States greatest species diversity. Relationships were established decades ago that persist even to this day and that momentum has helped the program advance."

Opportunities for Action

Connectivity: Connecting Economic Resilience to Biodiversity and Funding

Participants identified a need to connect the health of the economy to how biodiversity conservation can serve the region and make way for new, sustainable funding opportunities. By making the connections clearer between biodiversity conservation and the growth of our economy, community stakeholders are more inclined to participate in these efforts.

Quantify ecosystem services and elevate the multiple benefits of biodiversity. In order to make biodiversity benefits more tangible and connected to societal benefits, many suggested quantifying these benefits so they could be used as mechanisms of communication and data when applying for funding. While many Ecosystem Services Assessments (ESA) are developed in the aftermath of a natural disaster; proactive ESAs may be beneficial to outline the multiple benefits that a healthy ecosystem provides. One way to initiate these efforts would be to require all regional plans across sectors (e.g., housing, transportation, agriculture, etc.) to incorporate ecological impacts and benefits. Another suggestion is for government agencies to prioritize Request for Proposals that ask bidders to submit projects that quantify and integrate ecosystem benefits.

Connect socioeconomic impacts to biodiversity. Many biodiversity conservation efforts have been intertwined with the socioeconomic conditions of communities and the historical inequities that have followed them– examples include a higher density of open space parks and wildlife corridors in more affluent communities and neighborhoods than in historically disadvantaged communities. Biodiversity conservation is necessary for creating a resilient economy; identifying communities that have been disproportionately affected by historic inequities allows us to redirect and prioritize the deployment of resources in these areas.

Publicly promote and systematically update existing initiatives that assess ecological health. SDMMP recently completed an ecological health assessment that includes species and habitat indicators and metrics.[5] This assessment should be periodically repeated and used as a tool to communicate to the public about the health of the place we live.

Elevate funding opportunities with others in the region. Oftentimes, funding opportunities for biodiversity conservation go unnoticed due to multiple channels of communication or lack thereof to announce these programs. Opportunities that fund biodiversity conservation work can be tracked through a shared database or hub to make sure that leaders and organizations from different spaces have the opportunity to apply for them as well as identify collaborators and co-applicants who can strengthen and enhance the efficacy of the work.

Collaboration: Building Better Partnerships with Organizations and the Community

Creating pathways for partnerships between practitioners and the local communities that biodiversity conservation efforts serve is critical for creating an economically resilient region.

Increase public and private partnerships. The private sector plays an important role in supporting the diversity of our regional economy. By collaborating across public and private entities, regional practitioners can strengthen relationships and identify new, synergistic opportunities. These partnerships can catalyze unique pathways for accessing private capital and assets to aid in biodiversity conservation efforts. Additionally, collaboration between smaller community organizations and larger established corporations and entities can strengthen pathways to fund underserved communities and overlooked issues, giving way to more equitable allocation of resources.

Partner with the community to incentivize biodiversity conservation. One way to engage the community in conservation is to make these efforts affordable and financially incentivized. For instance, creating initiatives that make native plants free or affordable, or launching an incentive program for those who install rain barrels or convert their lawns to native plants may be a way to increase community engagement with biodiversity conservation.

Climate: Align Pathways for Funding Biodiversity Conservation Efforts and Climate Resilience

Economic impacts from climate change shocks and stressors ripple across our communities. By taking a proactive approach to addressing climate change impacts, we can ensure our communities are resilient while extending the funding for biodiversity conservation projects.

Understand and define the true cost of inaction in the face of climate change. Inaction on climate change can lead to higher costs in the event of a climate and natural disaster. By conducting local research and assessments that consider and identify the potential impacts and costs of climate change at the forefront, practitioners can more effectively educate the public and make the case for proactive action, funding, and project implementation.

Utilize climate-related funding sources to address biodiversity conservation efforts collaboratively. Expanding partnerships, and building climate resilience and adaptation strategies into existing biodiversity conservation efforts may unlock new funding resources. Additionally, identifying innovative funding and financing pathways for projects, such as deploying a carbon tax, developing a climate resilience district, or community insurance models, can supplement and expand on available funding resources.

"I am concerned about the relatively small amount of funding for weed management and the lack of long-term funding to maintain habitats after the initial weed management work is completed. Once we walk away from the project the sites just get reinvaded with weeds so that the initial money/effort gets wasted."

Change: Innovate Funding Models for Long-Term Change

A resilient economy needs resilient systems to sustain it–this includes across both our built and natural systems. Identifying innovative and less restrictive funding pathways can enable more stable approaches to

implementing necessary projects and build an economy that is more responsive and less reactive to financial and climate-related shocks.

Increase flexible funding opportunities for biodiversity conservation projects. It is becoming increasingly difficult to design conservation and restoration projects alongside an unpredictable climate with changing needs. To combat this, it is crucial that funding opportunities and funding agencies recognize the need for funds that are flexible and expansive. This flexibility will ensure that better, more resilient projects are built and can meet the needs of the region at the project's completion, not the project's beginning.

Equitable allocation of resources and funding. By adopting practices for resource allocation that lean towards a more circular, closed-loop economic model and holistically prioritize biodiversity conservation, it is possible to address community needs through sharing resources while also addressing conservation through affordable conservation programming.

Create a culture of accountability around corporations and their biodiversity impacts. Anthropogenic-driven biodiversity loss due to habitat destruction and urban development is an increasingly pressing issue, and one with few consequences for the offenders. Large public institutions and private corporations need to be more proactively held responsible, both fiscally and socially, for their contributions to negative impacts on our natural systems. By developing an engaged community that prioritizes a shared culture of accountability, we can unlock new resources as well as new partners to lead the way in biodiversity conservation efforts.

Identifying long-term funding pathways. Many large-scale biodiversity conservation projects are enabled through public funding streams such as grants, tax, and bond measures. These pathways, while impactful, can also be politically and economically volatile and can fall victim to annual fiscal budget cuts. There is a need to identify additional funding sources, streams, and mechanisms that are more resilient to shorter-term economic and social shortfalls that can fund the scale of projects needed to support biodiversity conservation efforts.

Education & Public Awareness

The Challenge

One of the primary challenges for the region in advancing biodiversity conservation work is the public's lack of knowledge about the region's biodiversity, its benefits to society, and the threats it faces. In a 2018 poll of San Diego residents, 77% did not know that San Diego County was a biodiversity hotspot, with more threatened plants and animals than any other county in the continental U.S. Moreover, nearly half of the respondents did not feel confident they could make a difference in preventing the loss of our local biodiversity. However, in the same poll, 80% of respondents indicated a high value and care for the environment.[6] The region has an opportunity to build on San Diegan's strong value for the environment by increasing knowledge about the challenges facing our region's biodiversity and instilling a sense of self-efficacy about what we as individuals can do to protect the region we value.

What are the Root Causes?

- There are limited messengers and the messengers that do exist are not typically experts in marketing and communication.
- Biodiversity conservation is complex, which makes simple messaging difficult.
- Schools lack incentives to teach environmental studies and to prioritize cultivating a child's connection to nature.
- Funding does not match the level of resources needed to increase public awareness.
- The professional conservation community is not ethnically or culturally representative of San Diego County, and as a result, there are cultural and linguistic barriers.
- There are many barriers to accessing nature for historically marginalized communities and there has been limited community engagement between conservation experts and historically excluded communities.

What Would Success Look Like?

- Access to high quality environmental and nature education for all
- Public understanding of the value of biodiversity (i.e., ecosystem services)
- Widespread participation in community science
- Community engaged and has a sense of responsibility for environmental stewardship
- Every school teaches the value and importance of nature

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"The conditions for life here are extraordinary, and we are already a hotspot for biodiversity as we have rich and varied types of habitats already. Noticing that and protecting it must be taught to future generations, and the schools are increasingly doing that."

Opportunities for Action

Connectivity: Cultivate a Connection to Nature Early

Connect young children to nature: In a study conducted in 2020 that mapped the outdoor educational programs offered to youth in south San Diego County, it was found that most of the programs occurred during the school day and offered structured formal lessons. While providing these opportunities during school is an effective way to reach large groups of youth, many of the educational programs prioritize structured lessons over free play. Children learn through play, and a developmentally appropriate curriculum should include opportunities to freely explore and play in the outdoors, such as through immersive field trips and access to local nearby greenspaces either in or near schools.[7]

Collaboration: Collaborate More and with New Messengers

Participants identified primary nodes of collaboration that could support an increase in public awareness around biodiversity conservation.

Increase partnerships between schools and nonprofit environmental education organizations. The California State Department of Education's Blueprint for Environmental Literacy[8] outlines how environmental education can be integrated into every subject. However, the blueprint is not mandatory and has no timeline, relegating it to a lower priority for schools to enact. There are a number of nonprofits serving San Diego County youth whose mission is directly tied to increasing knowledge and awareness about environmental issues. While many of these organizations already work with schools, there is a need to increase these partnerships across all school districts serving children from a young age and continuing through to high school graduation.

Initiate collaborations between scientists and marketing/communications experts. Biodiversity conservation and the science behind it is complex and rarely translated for the general public. Scientists and conservation experts recognized a need to partner with marketing and communication experts to make complex information easier to understand.

Increase collaboration between community leaders working in environmentally-burdened communities and the conservation community. To increase public awareness about the importance of biodiversity conservation, there must be a better understanding of the needs of communities most impacted by environmental burdens.

> *"Listen to community partners to better connect conservation to their priorities."*

Identify new and trusted messengers. To truly reach a large swath of the population, participants identified a need to broaden the region's biodiversity champions. This could include more outreach to local businesses, religious leaders, healthcare providers, and libraries to identify mutually beneficial opportunities for community engagement.

Climate: Bridge Climate Change Education with Biodiversity Conservation

The same strategies employed to boost public knowledge about climate change were also deemed essential for conservation education. By using language that links climate change with biodiversity conservation, we can enhance public awareness of how individuals can help protect and conserve the region's human and natural resources.

Blend public awareness of the current climate landscape with education on conservation. Climate education was recognized as a way to directly connect people's everyday lives to the habitats and ecosystems in which we live. Because San Diego County routinely experiences multiple climate impacts such as flooding, wildfires, and heat waves, there is an opportunity to connect these impacts to education about our biodiversity.

"If we can collaborate in efforts to support those in critical need and blend public awareness of the current climate landscape with education on conservation based-solutions for flooding such as bioswales, riparian buffer zones, floodplain restoration, living shorelines. We should be publicly expressing these or similar recommendations to city and county planners."

Change: Develop a Marketing and Communication Plan

Invest in a broad marketing and communication plan to increase public awareness. Innovate communication strategies about biodiversity conservation to respond to the evolving ways in which we access information; utilize social media as well as mainstream media; identify a mascot species and tell stories to support an emotional connection between people and our biodiversity; deploy targeted marketing campaigns that speak to the unique needs of neighborhoods and communities.

Change the narrative around biodiversity conservation to highlight its role in economic resilience. Have common messaging that focuses on the economic and societal benefits of our region's biodiversity and the tangible ways in which the public can engage and conserve our biodiversity.

Change: Build a Future Workforce

Build a diverse, inclusive, and sustainable future workforce in the natural resources field. There was a recognition that many jobs in biodiversity conservation do not provide a living wage and the current workforce is not ethnically and culturally representative of the San Diego population. Some recommendations include:

- Offer paid internships, mentorships, and programs in biodiversity conservation across all career levels that combine compensation with hands-on learning and training.
- Prioritize building career pathways in communities that have been historically excluded in conservation work.
- Host convenings, similar to the Biodiversity Summit, specifically for high school students.

Equitable Access that Supports Biodiversity

The Challenge

An issue closely connected to raising public awareness is increasing equitable access to the outdoors in such a way that biodiversity is protected. For the public to feel a strong connection with the region's natural environment, all San Diegans must have equitable access to our beaches, parks, and natural preserves. This is not currently the reality. In fact, according to the Equinox Quality of Life Dashboard, San Diego's low-income neighborhoods only have 14% of the park space of high-income neighborhoods.[9] At the same time, human activity represents the single greatest threat to the region's biodiversity. Summit participants reported that land managers lack resources (funding and staffing) to frontload information for the public and manage the potential for damage. As one of the summit participants wrote, the challenge is "*how do we balance inclusion and preservation?*"

What are the Root Causes?

- Humans have caused significant environmental harm, making it difficult to enact policies that balance access with protection.
- The region's transportation infrastructure makes travel to outdoor spaces very difficult for anyone without access to a personal vehicle.
- Historically, communities of color were systemically excluded from community, state, and national parks.[10]
- Economic inequalities (having the time to visit, financial means to pay for transportation, entry fees, etc.) disproportionately limit opportunities to visit outdoor spaces.
- Outdoor spaces are often not welcoming. There is a lack of signage translated into languages other than English, park staff often do not represent the communities that the park serves, and parks do not disclose the full cultural history of the park.
- Funding to support access to parks is not equitably distributed.

What Would Success Look Like?

- The general public would feel a personal responsibility to be caretakers of our public lands and open space while not feeling like we are inherently separate from these natural areas
- Improved human and ecological community health and wellbeing
- Better information/monitoring about how recreation impacts species (e.g., appropriate buffers)
- Community ownership at the core of programming and stewardship
- Equitable access for everyone (regardless of zip code, income, etc.) with sufficient and culturally responsive management to ensure protection of wildlife/nature

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"Fantastic green spaces interwoven into urban and suburban areas! The most biodiverse county in the U.S.! A fantastic diversity of landscapes and ecosystems that provide opportunities to connect with nature!"

Opportunities for Action

Connectivity: Connect People to Place

Create recreation opportunities in non-sensitive habitats to educate the public. Acknowledging that certain habitats are fragile and easily damaged by human activity, expand access to recreational opportunities in less sensitive habitats in order to strengthen community members' connection to place and understanding.

Reduce transportation barriers. One of the largest barriers to connecting San Diego residents to our natural spaces is a lack of accessible transportation. Providing mass transit to green spaces would increase equitable access, particularly for low-income communities. Philanthropic and government investment in community-based programs that provide transportation to parks and beaches is another way to reduce transportation barriers.

Increase green spaces in neighborhoods where there are fewer parks and preserves. Prioritize investments in park spaces in communities with less access. This will require allocating funding for park investments based on need and acknowledging historic disinvestment.

Make natural spaces more welcoming for all. Listen to communities to identify what services/programs would lead to a greater sense of safety and belonging in parks. Include a cultural history of outdoor spaces, even when that history is rife with conflict and oppression. Improve and translate signage into multiple languages at parks and preserves. Build Americans with Disabilities Act (ADA) trails for people with disabilities.

Collaboration: Collaborate to Increase Understanding

Improve collaboration among land managers so there is common messaging across parks and preserves. The public visits outdoor spaces with little understanding of which entities manage the land, yet land managers are employed by many different public and private agencies each with their own rules and regulations. Common messaging to the public would help balance the need to preserve delicate habitats while providing rich recreational opportunities.

Partner with law enforcement to increase a sense of safety in parks, canyons, and beaches. Parks and outdoor spaces are often perceived by community members as unsafe for a variety of reasons. Interactions with law enforcement in parks have historically increased a sense of safety for some while decreasing feelings of safety for many. Participants recommended improved collaboration and engagement with law enforcement around park access.

Climate: Expand Access to Natural Climate Mitigation Resources

Prevent the destruction of natural spaces San Diegans enjoy in the face of climate change. Open spaces and natural lands are becoming rarer due to climate-driven destruction and change, such as wildfire, coastal erosion, extreme drought and flooding, and sea level rise. As these spaces slowly start to disappear or become

more fragile, it is important to commit efforts to protecting the spaces that already exist and understand the role that climate change plays in their disappearance, as well as expand these spaces so that they can be made more physically available to all communities.

Identify and prioritize climate vulnerable communities for park access. Many of the neighborhoods most vulnerable to climate impacts are the same neighborhoods with limited access to natural spaces. Natural spaces can often serve as a buffer and provide mitigation services to climate impacts; ensuring vulnerable communities have increased access to these spaces will also support meeting our collective climate resilience goals and safer communities.

Change: Change Who is at the Table

Listen to the needs of environmentally burdened communities and those with less park space and engage local ambassadors in decision-making. Co-design approaches to increase access to the outdoors with local ambassadors and community members and prioritize the implementation of community-led solutions and projects.

Increase funding for systems-change activities such as advocacy. Many philanthropic and government agencies place restrictions on funding specifically for advocacy. Enabling community-based organizations to fund advocacy work would allow greater collaboration on advocating for equitable outdoor access.

Research & Policy

The Challenge

There has been a disconnect between who is most impacted by policy decisions and who traditionally has held a seat at the table when policies are being developed. There is a concern that existing policies are not inclusive of the needs of all of the region's residents, and more specifically the perspectives of Black, Indigenous, and People of Color (BIPOC) have traditionally been excluded. Some of the policy areas most frequently cited as needing change include: public transit, education policies that prioritize nature for all, access to outdoor spaces (both enforcing restrictions to access and opening up access), aquaculture and microplastics, financial incentives for conservation on private property, rainwater collection infrastructure, expanded wildlife protections to plants, and policies to encourage native propagation.

This drive for inclusive policy changes also comes with an increased need for more robust research efforts that support policy development, monitor changes, and document policy impacts on communities. There is a need for the research and research questions themselves that are working to address our region's biodiversity conservation efforts to be more community and culturally informed–this includes uplifting and centering the validity of non-western science and research in policy development, identifying interdisciplinary research opportunities, and supporting large-scale, long-term research projects.

What are the Root Causes?

- Lack of long-term funding to implement the monitoring and management practices that exist in current policies.
- Policies are often reactionary and short-sighted rather than proactive, holistic, and informed by long-term data.
- Policies often become siloed, singular, and inflexible over time.
- Complex relationships between policymakers and the physical spaces they oversee and share borders with (i.e., local, state, federal, Tribal, and international governments).
- Biological monitoring data must adhere to state and federal protocols for species protection, which leads to narrow types of data collection techniques being used to inform policy development, often excluding historical Indigenous knowledge and community lived experiences.
- Lack of diverse community stakeholders in decision-making.

What Would Success Look Like?

- Researchers/scientists would be involved in policy review
- Research and policy would be community-informed
- Research would be accessible to a wide audience
- Research would be holistic focused on equitable and scalable solutions for habitat and biodiversity welfare

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"Coordinated, long-term regional (multinational) monitoring efforts with transparency and open communication about financials and monitoring/data. Monitoring would be backed by an overarching scientific framework."

Opportunities For Action

Connectivity: Connect the Public to Research

Increase accessibility of research. Make research understandable to a wide audience, this includes ensuring results are translated in multiple languages, data is open access, and research is communicated through multiple channels and outreach platforms. Additionally, opportunities like empowering non-traditional and community messengers to share research findings as well as creating research summaries that are free of jargon.

Mainstream and embed community-led and traditional knowledge into policy-making pathways. Often, traditional western scientific research studies are the only source of "valid" information utilized in policy development. This process excludes the validity of and critical resource of Tribal knowledge and community members' lived experiences–leaving the policies that are developed incomplete. By ensuring these perspectives and knowledge resources are utilized in policy development, we can ensure policies are more holistic and reflective of our communities.

Collaboration: Community-Informed Research to Inform Policy

Increase collaboration between scientists and policymakers. Involve scientists throughout the entirety of the policy process in policy writing, review, and advocacy. This also includes ensuring scientists are equipped and trained to help translate research and data into practical policy applications, as well as enable policymakers to be responsive to research inputs.

Research should be community informed. From the outset, researchers should engage partners, stakeholders, and community members so research addresses their needs and priorities before it informs policy. This includes creating space in the research process for research questions and methodologies to be flexible and responsive to community input.

Coordinate ongoing regional planning efforts to include both conservation and climate change considerations. Various local entities, including municipalities, public agencies, and other organizations, are currently involved in initiatives that affect our biodiversity, such as Climate Action Plans, Park Master Plans, and Tree Inventory Assessments. By aligning these regional plans through a focus on biodiversity conservation, we can streamline and improve efforts to preserve biodiversity.

Climate: Research Climate Impacts to Inform Conservation Policy

Approach biodiversity conservation and climate change from an intersectional lens. While biodiversity conservation research may be treated as mutually exclusive from climate change research, it is crucial to recognize the importance that climate change plays in conservation efforts. Understanding how the impacts of climate change may affect restoration efforts, how these efforts may mitigate climate hazards and stressors, and how we may elevate this research in policy can catalyze further biodiversity conservation action. For

example, future climate action and resilience plans could include addressing impacts to biodiversity conservation due to climate change.

Integrate climate change modeling and historical trend data into biodiversity conservation research. Predicting future changes to landscapes due to climate change is important to understand the state of our region's biodiversity. Climate change modeling, including temperature, sea level rise, and erosion models, can be useful to proactively plan conservation and restoration efforts. Additionally, climate change modeling can assist in predicting how climate change hazards will impact existing conserved lands and species. This, in conjunction with historical trend data, can provide practitioners with a robust timeline and scenarios of how our region's species and habitats will react and rebound in the face of climate change and natural disasters.

Change: Conduct New Lines of Research to Influence Policy

Research ecosystem benefits and services. Conduct more research and support better communication of existing research on ecosystem benefits for both nature and human health There is a large body of research suggesting a strong connection between improved physical and mental health with engagement with nature[11]– ensuring this information is up to date and communicated effectively with our communities is critical.

Conduct research that promotes improved land management. Scientists should focus on research that promotes better land management, which could be transformed into better practices and policies. This includes ensuring sustainable funding streams are available for continuous data collection and research to improve management practices in real-time.

Uphold and implement Traditional Ecological Knowledge in policy development. Work with Tribal representatives to promote the inclusion of TEK in policy development and scientific research from the outset. This also includes funding Tribal communities to lead and design the research questions and processes to ensure they are culturally relevant and impactful for their communities.

Structural and Systemic Needs of San Diego County's Major Natural Systems

During the Summit, participants were asked to identify the structural and systemic needs related to each natural system in the region. Systemic and structural needs refer to the overarching policies, practices, mechanisms, and legal frameworks that can influence biodiversity conservation. The following tables list the highest-priority structural/systemic needs for each major natural system. The displayed needs were identified by at least three Summit participants and are ordered by frequency (note: many more needs were identified that are not included on these tables). This was not meant to be an exhaustive analysis of all the diverse natural systems of the region, but rather, an exercise to begin brainstorming how structural and systematic needs compare across our diverse landscape.

Across all natural systems **invasive species management** and **ecosystem connectivity** emerged as central concerns to sustaining the region's biodiversity and protecting against future threats.

Desert: Structural and Systemic Needs

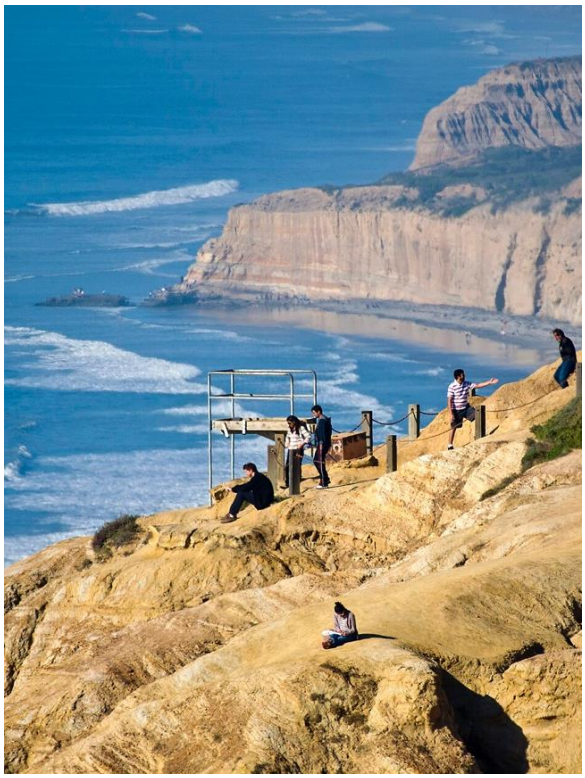
- Increase education and community engagement
- Poaching enforcement
- Off-Highway Vehicle (OHV) management
- Flooding infrastructure (changes to landscape with flooding and sediment buildup)
- Enhance specific habitat protections during superblooms
- More funding
- Protect aeolian processes

Wetlands: Structural and Systemic Needs

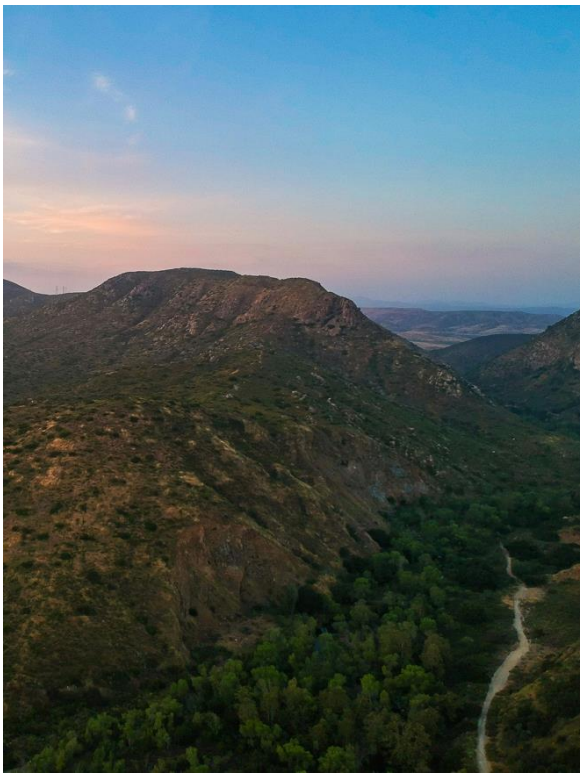
- Long-term planning to account for sea level rise
- Funding for management
- Support invasive plant and animal removal
- Pollution prevention
- Research on changing hydrology
- Comprehensive strategic planning with partners and member agencies
- Address urban runoff from creeks (urban drool)
- Address homeless impacts on riparian zones

Coastal/Ocean: Structural and Systemic Needs

- Policy changes regarding fisheries
- Pollution prevention: Reduce plastics, trash
- Community engagement/education
- Improve stormwater infrastructure
- Enhance connectivity: managed retreat and restoration of streams entering bays
- Support nature-based solutions for cliff erosion and shoreline stabilization
- Address and research sea level rise and coastal resilience
- Protect sea life from overfishing, sonar, boat strikes, entanglement threats, etc.



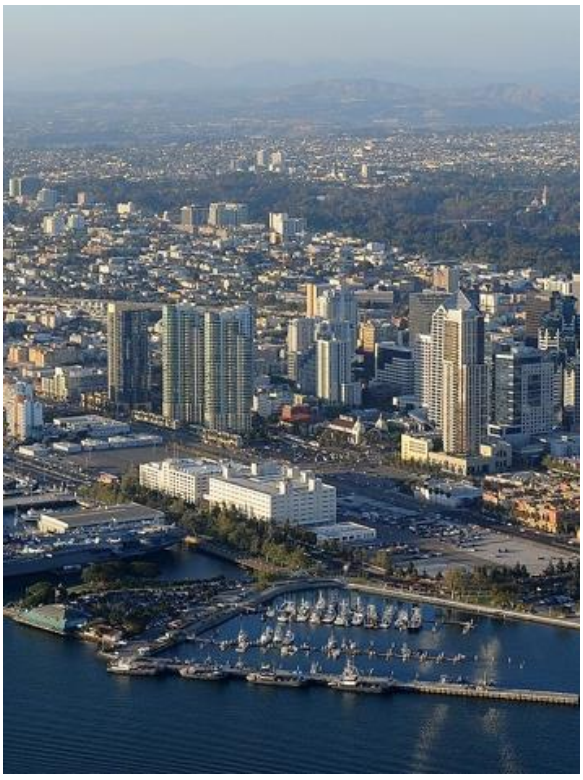
Mountains: Structural and Systemic Needs



- Improve and increase fire management to ensure resilience
- Protect traditional gathering areas for Tribes
- Holistic management
- Increase understanding of climate change impacts/needs for modeling

Urban Areas: Structural and Systemic Needs

- Connect corridors between habitat islands (i.e., wildlife crossings)
- Connect urban space to open space (through canyons)
- Increase fuel management to protect sensitive species
- Provide information and resources to support "backyard stepping stone" habitats for pollinators and wildlife
    - Increased availability of native plant/pollinator gardens



Looking Forward

The purpose of this report is to serve as a guiding document for identifying priorities, finding areas of alignment across diverse stakeholder groups, and uncovering tangible actions that will support San Diego's long legacy of biodiversity conservation at this unique moment in history. While our region's biodiversity faces many real threats, this report captures numerous opportunities to forge a path forward. The conservation community in San Diego is strong and there are many systems and structures already in place to support the work. To sustain this conservation investment into the future, the region must build on this foundation through the following coordinated actions.

- Expand **funding** programs so that they are **long-term, diverse, flexible**, and can adapt to future needs.
- Develop a **comprehensive public awareness** campaign to increase knowledge about the problems facing our biodiversity, the ecosystem benefits of a biodiverse region, and the meaningful actions the public, especially those from marginalized communities, can take to preserve our unique landscape. Some priorities include:
    - Partner with communications and marketing professionals to create accessible messaging
    - Expand messengers beyond scientists and educators and adapt methods of communication to include social media as well as mainstream media
- Prioritize **relationship-building** and **reciprocal learning** across diverse stakeholders, including binational partners, government agencies, Tribal groups, community-based organizations, businesses, and community scientists.
    - Promote collaborations between researchers and citizen scientist volunteers in biodiversity discovery surveys
    - Be intentional about inviting intergenerational collaboration and including groups who have historically been excluded from conservation work
- Invest in **research** and knowledge sharing in the following areas:
    - **Traditional Ecological Knowledge from local tribes**
    - Research and monitor biodiversity at various scales to track responses of species, communities and ecosystems to environmental change
    - Long-term **invasive species** management
    - **Ecosystem benefits** to human health and economic resilience
    - Develop best practices in land management to reduce vulnerability and enhance the adaptive capacity of species and habitats in response to climate change
- Invest in **land acquisition** and **restoration**, and **long-term management** to build out the network of protected, connected, and ecologically diverse lands across social and political borders.
    - Protect core habitat needed to sustain the region's plant and wildlife species
    - Identify and protect wildlife movement corridors between protected areas
    - Identify and prioritize the restoration of barriers (e.g., roads, degraded habitats) to facilitate wildlife movement
- Invest in the future conservation **workforce**. Some priorities include:
    - Support schools/programs that connect children to natural spaces from an early age
    - Advocate for environmental studies to be a K-12 curricular requirement in California

    - Develop partnerships with federal, state, and local agencies to implement workforce development programs that train and place people in natural resource field positions with opportunities for advancement and living wages

- Invest in increasing **equitable access to natural spaces.** Some priorities include:
    - Allocate funding for green spaces based on community need
    - Reduce transportation barriers through both long-term and short-term solutions
    - Make natural spaces welcoming and inclusive

As The Nat and SANDAG consider next steps for advancing this work, there is an opportunity in future cross-sector conversations to build on what was learned in this process and develop more tactical and detailed actions to guide the work of conserving the region's biodiversity.

To build upon actions identified above for land acquisition, restoration, and long-term management, SANDAG will be working with conservation stakeholders to further identify the needs and gaps in funding specifically for regional acquisition, management, and monitoring in order to implement the Regional Habitat Conservation Vision and fulfill the commitments made in the region's habitat conservation plans. SANDAG, as the regional planning agency, will continue to work with its member agencies and stakeholders to promote regional habitat conservation and assess how SANDAG's programs, like the Environmental Mitigation Program, can assist in creating sustainable future for the region. This Regional Needs Assessment will determine what work remains to be done for acquisition, management, and monitoring with an estimate of the cost in current year dollars.

Looking forward, The Nat will continue the role of a convener by bringing together various stakeholders, and uniting voices and expertise to form partnerships through programs such as State of Biodiversity. Additionally, The Nat will enhance public engagement efforts to foster a deeper appreciation for the natural world—cultivating a community that values nature will inspire action to conserve it.

Appendix

Habitat Needs Organized by San Diego County's Natural Systems

In addition to identifying structural and systemic needs related to each natural system in the region, Summit participants were asked to identify habitat and species needs. The following lists identify the highest-priority habitat/species needs for each major natural system. These needs were identified by at least three Summit participants and are ordered by frequency. This is not an exhaustive list of Summit responses, nor is it an exhaustive analysis of all diverse natural systems of the region.

Desert Habitat / Species

- Invasive species: grasses, plants
- Riparian corridors
- Dunes
- Bighorn sheep
- Birds, crows, windmill bird counts
- Low-abundance sensitive species
- Pollinator plants
- Water conservation
- Cactus shrubs

Wetlands Habitat / Species

- Wetland restoration
- Water quality
- Erosion
- Traditional use plants for Tribes
- Shorebirds
- Invasive plants
- Bullfrog removal

Coastal/Ocean Habitat / Species

- Kelp forests
- Intertidal zones
- Dunes
- Vernal pools
- Snowy plovers
- Shorebird breeding and nesting habitat

Mountains Habitat / Species

- Mountain lions
- Owls
- Conifers
- Invasive species: goldspotted oakborer
- Oaks

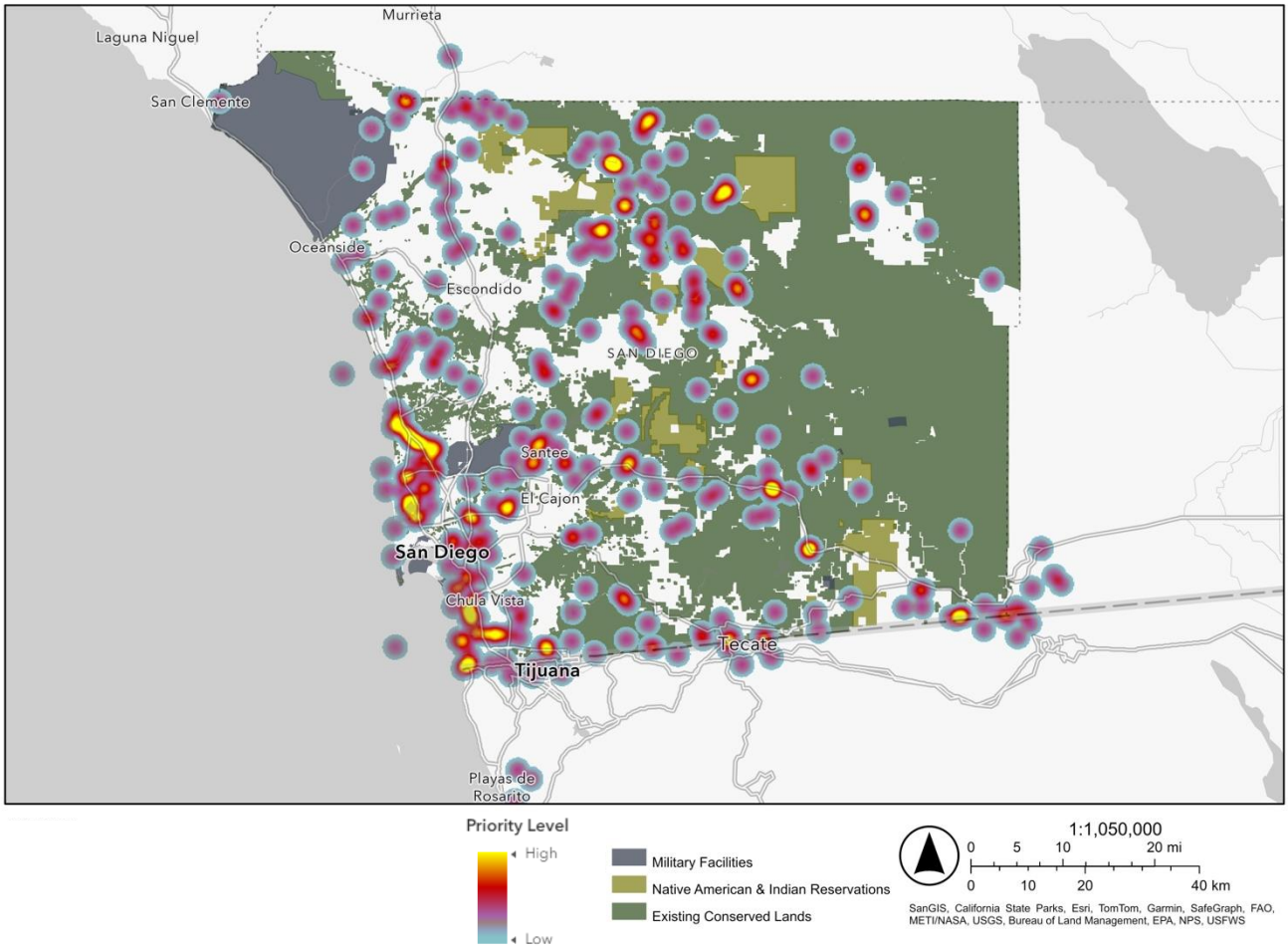
Urban Areas Habitat / Species

- Pollinators
- Native insects
- Monarch butterflies (native milkweed vs. tropical milkweed)

Priority Locations for Biodiversity Connectivity and Conservation

During a mapping exercise at the Summit, participants were instructed to place a pin in the geographic locations that were of highest priority for biodiversity connectivity and conservation. The heat map below displays the geographic locations of the most frequently identified biodiversity conservation and connectivity priorities. For reference, the map also displays the conserved lands, Tribal lands, and military lands.

Heat Map of Priority Areas Identified for Biodiversity Connectivity and Conservation



Endnotes

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