The Los Angeles River
California Environmental Flows Framework

Focal Species Selection Process

TECHNICAL REPORT

Stillwater Sciences
McMillen

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Acronyms and Abbreviations

BMI	Benthic macroinvertebrate
CalTrout	California Trout
CDFW	California Department of Fish and Wildlife
CEFF	California Environment Flows Framework
CWHR	California Wildlife Habitat Relationships
LA	Los Angeles
LA River CEFF Project	Los Angeles River California Environment Flows Framework Project
LOI	Location of Interest
SCCWRP	Southern California Coastal Water Research Project
SG	Spreading grounds
TNC	The Nature Conservancy
TWG	Technical Working Group
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
WRP	Water reclamation plant

1 INTRODUCTION

1.1 Background

As biodiversity movements have accelerated across the State of California through the 30x30 and related State-mandated policies and programs, the Los Angeles (LA) region has been recognized as a biodiversity hotspot on the global stage (City of LA 2015; Conservation International 2017; LASAN 2018; LAC 2019; CNRA 2022, 2024). The City of LA, County of LA, and local communities are focused on expanding and enhancing biodiversity in the LA region, investing in wildlife connectivity, and restoring the LA River (USACE 2015; City of LA 2007, 2019, 2023, 2024; LAC 2020; LAC and LACPW 2022; LASAN 2018, 2022; Stillwater Sciences 2022; County of LA and City of LA 2023; LA County Planning 2024; CNRA 2022, 2024). Revitalizing the LA River has become a key focal point for supporting biodiversity because it is home to a variety of native species and it connects significant ecological areas from the mountains to the Pacific Ocean—intercepting upper river tributaries in the headwaters and urban drainages throughout the basin. Multiple studies have evaluated the range of benefits, including climate resilience, a revitalized LA River could bring to the city and the region through natural habitat diversification (City of LA 2007; USACE 2015; Sanchez and Stein 2019; Stein et al. 2021a,b; FoLAR 2021; Katagi et al. 2022; LAC and LACPW 2022; Stillwater Sciences 2022; Sytsma et al. 2024). Numerous projects are in development, under construction, or completed to restore physical and ecological processes and to improve regional biodiversity along the LA River (Figure 1).

Historical accounts, reports, and data indicated that much of the mainstem LA River flow was historically perennial and the LA River headwaters and tributaries were connected to the Pacific Ocean for at least a portion of the year (Hall 1888, Lippencott 1903, Gumprecht 2001, Ethington et al. 2020, USC 2021). The LA River, its tributaries, and a network of artesian and groundwater wells throughout the watershed were the sole water supply of native communities and early European and American settlements (Gumprecht 2001). Development within the watershed from the late 18th to early 20th century was dependent on water diversions (e.g., the Zanja Madre or "mother ditch") from this perennial flow and groundwater pumping adjacent to the LA River (Hall 1888, Lippencott 1903, Gumprecht 2001). While imported water reached the watershed in the early 20th century, water diversions, water storage, and groundwater pumping that altered flows in the LA River continued to be essential to the LA region's water supply. Discharges from water reclamation plants (WRP) (and, in decades past, agricultural returns), partially made up of water diverted or pumped from the LA River or its adjacent groundwater, helped offset the effects of these diversions, storage, and pumping. However, these actions to utilize local sources as the water supply for the LA region combined with imported water from outside the region, development within the watershed, and channelization of almost all of the river have resulted in substantially modified flows in the LA River to this day (USACE 2015, LAC and LACPW 2022).

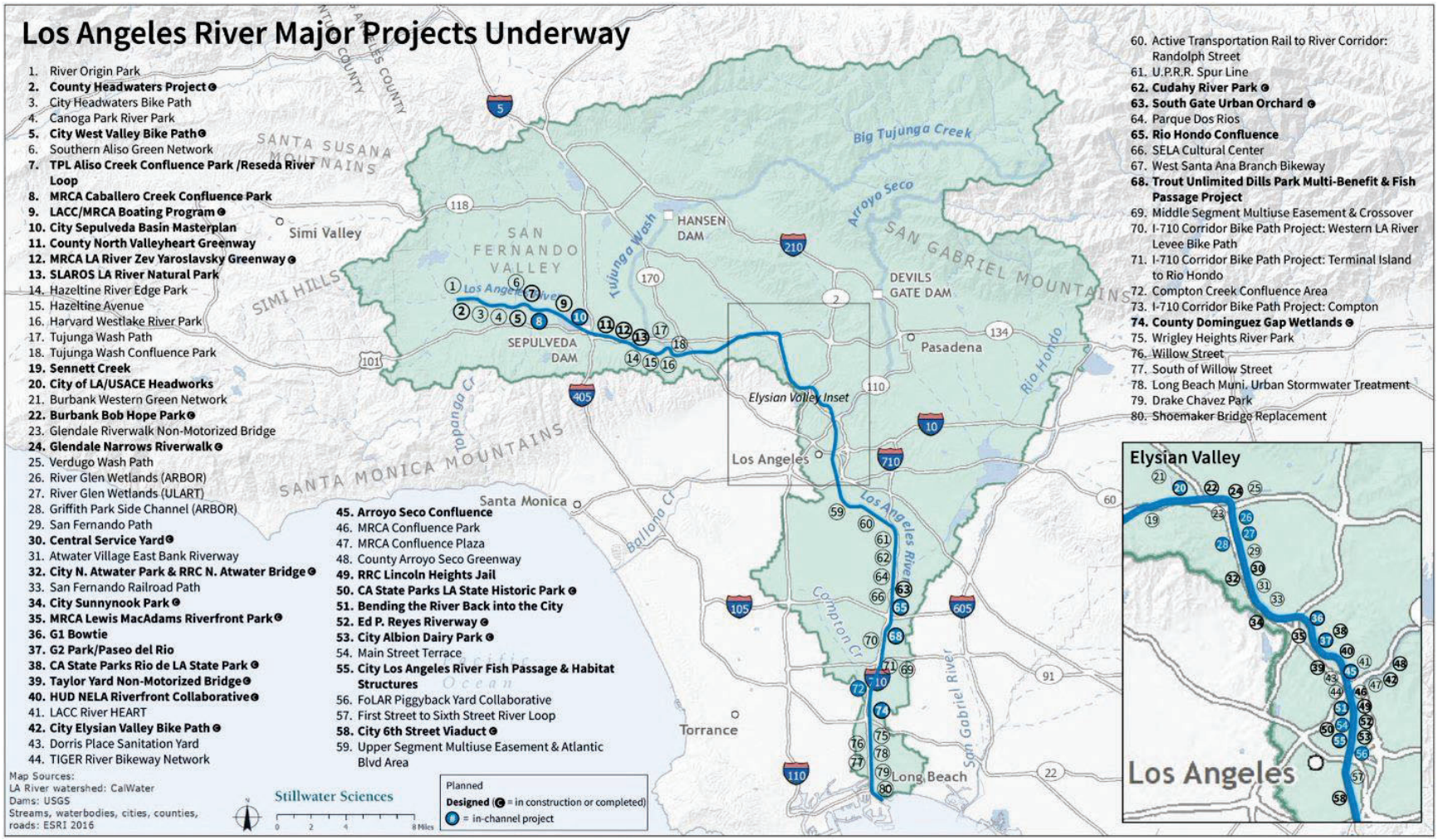

Figure 1. Major projects underway along the mainstem of the Los Angeles River.

The City of LA, U.S. Army Corps of Engineers (USACE), LA County, other regional and local agencies, key stakeholder groups, and communities along the river are working to restore the LA River to a more natural state, and, therefore, balance the needs for revitalizing the river and its regional biodiversity with the local and state initiatives to make the LA region more water independent while meeting regional water supply needs. Exploring the water cycle and the ways it has been altered within the LA River watershed—from groundwater-surface water interactions, natural springs, groundwater dependent ecosystems, urbanization and associated changes in runoff, dam operations, and flow releases along with ongoing climate whiplash—and anticipating continuing changes associated with atmospheric rivers, fire, sediment management, and drought are key to understanding the available water budget of the watershed. Discharges from the Los Angeles-Glendale, Burbank, and Donald C. Tillman Water Reclamation Plants (WRPs), as noted above, along with water from storm drains make up much of the dry-weather flow in the LA River (USACE 2015; LAC and LACPW 2022). Integrating strategies—maximizing natural flows, strategic releases for beneficial uses, increasing recycled water use, and capturing water discharged from storm drains—have been identified as key components to increase the local water supply, reduce reliance on water imports, and improve the reliability of water resources within the watershed (LADWP and LADPW 2012, LADWP 2015, City of LA 2018, LADWP 2020). Consequently, integrating these key strategies will drive study questions relative to the overall flow into the river and the current ecology, biodiversity, and beneficial uses along the LA River.

To better understand the implications of variations in WRP and storm drain discharges on conditions in the LA River, the State Water Resources Control Board, in coordination with the City of LA, LA County Department of Public Works, and LA County Sanitation Districts, initiated the Los Angeles River Environmental Flows Project (Sanchez and Stein 2019; Stein et al. 2021a,b). The Southern California Coastal Water Research Project (SCCWRP) conducted the Los Angeles River Environmental Flows Project studies between 2017 and 2021. The project was initiated with the goal of developing a toolkit to evaluate how flow reduction scenarios would influence the LA River's ecology and beneficial uses for recreation and to inform future management decisions associated with proposed wastewater change petitions and stormwater management programs. The project included assessing the LA River watershed ecology and its contribution to regional biodiversity and compiling data on habitat and species in the LA River watershed using existing databases. Key habitat types that potentially could be supported were also identified for the mainstem LA River and tributary reaches within the project's study area. After the habitat and species data were compiled, a set of focal habitats and focal endmember species (hereafter referred to as *focal species*) were selected to characterize how flow variations in the river would alter ecological conditions along the river. Nine focal species were selected for the six representative habitat types based on the study's set of seven criteria for focal species selection. Focal habitats and focal species were selected to represent a range of tolerances for each habitat, but one of the selection criteria that required species be dependent on aquatic habitats for key life history stages meant that the full range of terrestrial biodiversity supported by LA River flows would not be characterized by the selected focal species.

Flow-ecology relationships were developed for five of the nine focal species to assess how variations in flow would influence the focal species (Table 1). Four focal species were not evaluated further under the project because the habitat requirements for two of the focal species were deemed too similar to the flow-ecology relationship used for other focal species and the habitat tolerances of the other two focal species were deemed too broad to develop useful flow-ecology relationships. After developing the flow-ecology relationships for the five focal species, the project evaluated how the habitat suitability of these five focal species would change in response to flow variations in the mainstem LA River and tributary reaches within the study area

under existing conditions and a range of WRP, stormwater management, and dry-weather storm drain discharge conditions. While the project achieved its goal of providing a toolkit to assess potential effects of some WRP and storm drain discharge variations on its set of focal species and beneficial uses for recreational, its acknowledged limited scope only represented the first step in determining how variations in LA River flows would influence the range of LA River watershed management goals connected to flows in the river (Stein et al. 2021b, Stillwater Sciences 2021).

Table 1. Los Angeles River Environmental Flows Project habitat types and focal species.

Habitat type	Focal species	Flow-ecology relationship developed
Cold-water habitat	Santa Ana Sucker	Yes
	Unarmored threespine stickleback	No
Migration habitat	Steelhead/Rainbow trout	Yes
Wading shorebird habitat	*Cladophora* spp.	Yes
Freshwater marsh habitat	*Typha* spp.	Yes
	Duckweed	No
Riparian habitat	Black willow	Yes
Warm-water habitat	African clawed frog	No
	Mosquitofish	No

Adapted from Stein et al. (2021a).

1.2 Los Angeles River California Environmental Flows Framework Project

In 2022, the Los Angeles River California Environment Flows Framework Project (LA River CEFF Project) was initiated by the Mountains Recreation and Conservation Authority to build on the initial work of the Los Angeles River Environmental Flows Project. The LA River CEFF uses a new approach for developing environmental flow recommendations released in 2021—the California Environment Flows Framework (CEFF)—to further characterize the influence of LA River flows on biodiversity within the watershed and develop environmental flow recommendations for the LA River. The CEFF was developed by a collaborative team of staff from the State Water Resources Control Board and California Department of Fish and Wildlife (CDFW); academic researchers from University of California, Davis, University of California, Berkeley, and Utah State University; and scientists from non-governmental organizations including SCCWRP, The Nature Conservancy (TNC), and California Trout (CalTrout). The CEFF provides an approach to explicitly articulate the range of management goals that need to be incorporated into every management decision and uses a functional flow approach to develop scientifically defensible, easy-to-understand environmental flow recommendations (CEFWG 2021). One of the key features of the CEFF is its collaborative structured decision-making process for stakeholders to specify their goals for the watershed, define the metrics that indicate achievement of those goals, evaluate the tradeoffs associated with different flow recommendations and the range of management actions available, and develop environmental flow recommendations that best support achieving those goals in the watershed. The CEFF was developed to streamline the process for determining environmental flow recommendations that support a broad range of ecosystem functions, preserve the multitude of benefits provided by healthy rivers and streams, and address the distinct sociopolitical demands of flows in rivers and streams (CEFWG 2021). Environmental flow recommendations developed using the CEFF will support achieving biodiversity management goals for the LA River and assist decision-makers in evaluating how planned and potential future restoration projects align with established management goals in the watershed.

The CEFF is composed of three sections. Section A (the first section of the CEFF) entails defining the area of analysis, identifying the existing biodiversity[1] management goals that flow should be supporting within the watershed, estimating the range of natural flows, and assessing whether modifications to the river (e.g., levees or channelization) would limit or prevent natural flows achieving the biodiversity management goals. Section B (the second section of the CEFF) involves analyzing what flows would support the previously identified biodiversity management goals when modifications to the river would prevent natural flows from achieving those biodiversity management goals. Completing the CEFF Section B analysis may not be necessary if the river is relatively unmodified and natural flows would still be able to support the ecological functions necessary to achieve biodiversity management goals. Section C (the third section of the CEFF) includes integrating stakeholder and additional non-biodiversity management goals into the CEFF analysis to ensure all watershed priorities are sufficiently represented, conducting a flow assessment to understand how some management goals for the watershed influence flow in the river and flow in the river influences achievement of some management goals, and determining the environmental flow recommendations that best support achieving the range of management goals for the watershed, through a collaborative structured decision-making process with stakeholders (CEFWG 2021).

The LA River CEFF Project Section A analysis was conducted and the report detailing its conclusions was released in July 2023 (Stillwater Sciences 2023). In Section A, the analysis area was defined as the mainstem LA River from the Sepulveda Basin to the Pacific Ocean with the river subdivided into Location of Interest (LOI) reaches based on the U.S. Geological Survey's National Hydrography Dataset Plus, medium resolution, version 2 (Figure 2). LOIs were assigned a number based on the river mile upstream of the mouth of the LA River at the Pacific Ocean, using the river mile conventions from the LA River Master Plan (LAC and LACPW 2022). Eight biodiversity management goals that characterize key biodiversity goals for the LA River watershed and are applicable to the mainstem LA River were identified by reviewing federal, state, and local policies, programs, and plans. The Section A analysis for the LA River CEFF Project assessed whether the California Natural Flow Database-predicted natural flows for the LA River would support the ecosystem functions necessary to achieve the eight biodiversity management goals given the existing channel conditions. It was concluded that extensive LA River channel modifications have so significantly altered conditions (e.g., relationship between flow, water depth, water velocity, and riverbed shear stress) that natural flows would no longer support the necessary ecosystem functions to achieve biodiversity management goals. Consequently, a CEFF Section B analysis was recommended to determine the appropriate flow criteria in the mainstem LA River to support achieving the LA River biodiversity management goals.

[1] Initially, the CEFF technical guidance document term *ecological management goals* was used during Section A when discussing watershed goals focused on ecology and biodiversity for the LA River CEFF Project, but for the subsequent LA River CEFF Project Section B and Section C analyses, the term *biodiversity management goals* was used instead to better reflect the terminology used in the LA River watershed.

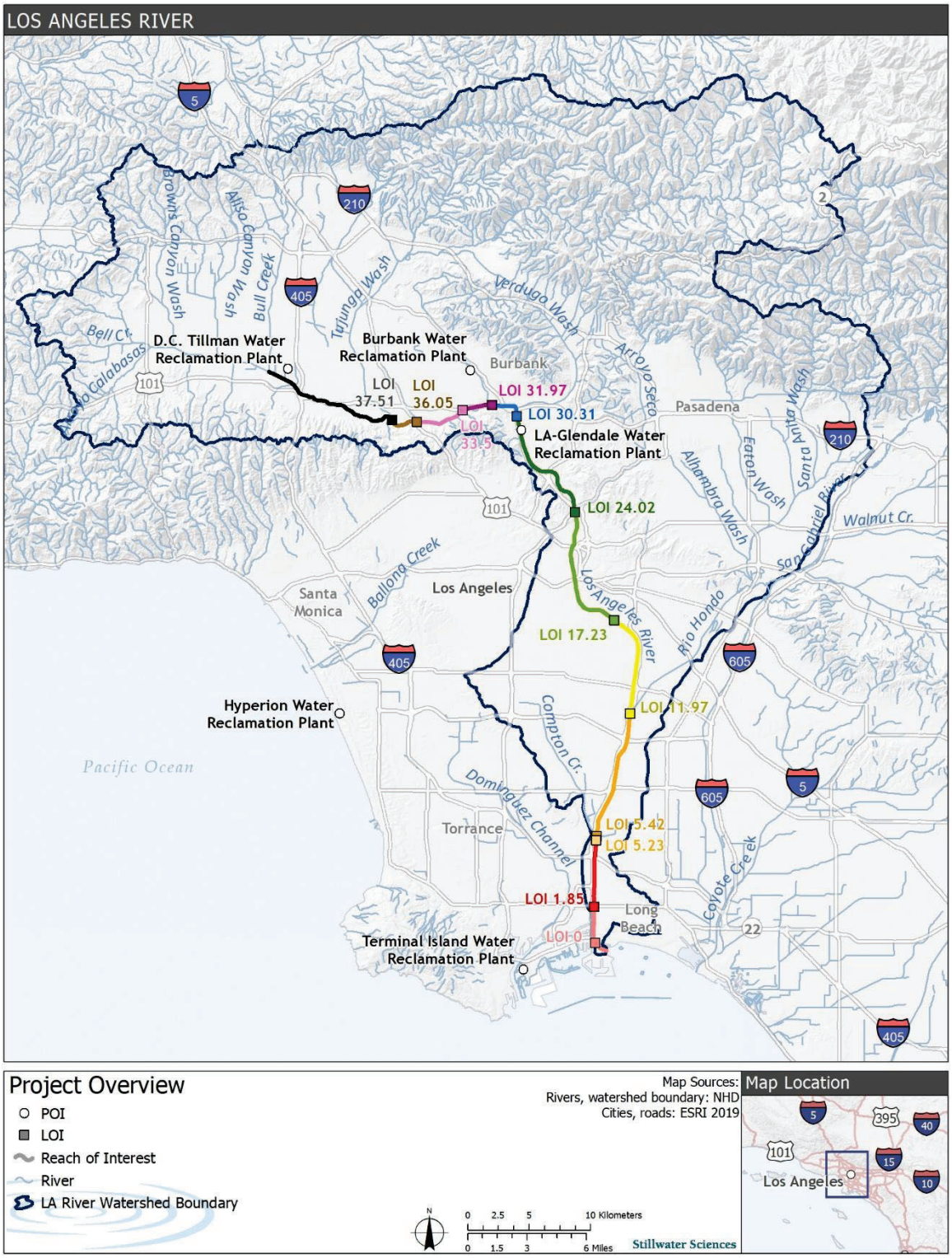

Figure 2. Los Angeles River California Environmental Flow Framework locations of interest (LOIs) and points of interest (POIs) (Stillwater Sciences 2023).

After the LA River CEFF Section A analysis was completed, the Mountains Recreation and Conservation Authority was joined by City of LA, Los Angeles Department of Water and Power, LA Sanitation & Environment, and CDFW to undertake the LA River CEFF Project Section B and Section C analyses. These analyses will advance the understanding of the flow criteria that would achieve biodiversity management goals in the LA River, incorporate other LA River watershed management goals that must be supported by flows in the river along with biodiversity management goals, and ultimately develop flow recommendations that best support achieving the entire range of management goals for the LA River. The Section B and Section C analyses were initiated simultaneously in recognition that a wide range of management goals exist, and often intersect, for an urban river, so a holistic assessment of these goals would better support finding opportunities for goals to coexist. One of the first steps of the Section B and Section C analyses was to develop a comprehensive list of management goals. Management goals were compiled by reviewing federal, tribal, state, regional, and local policies, programs, and plans applicable to the LA River and grouping them into one of seven themes based on the primary focus of the management goal:

- Biodiversity
- Tribal/Cultural
- Flood Risk Management
- Recreation
- Urban Cooling
- Water Supply
- Water Quality

The LA River CEFF Project also convened a collaborative Technical Working Group (TWG) of federal, tribal, state, regional, and local experts in each of the seven themes to review and provide input on the management goals, ensuring the wide range of management goals for the LA River were sufficiently characterized.

The LA River CEFF Project is using a focal species approach to help determine the LA River flows that would best support achieving biodiversity management goals for the LA River. A focal species approach, which builds on the umbrella species concept, defines key environmental attributes required to meet the life history needs of biota in the landscape being considered, then selects multiple focal species to define those key attributes that must be present to support species (such as timing and magnitude of flows during life-stage key periods) (Lambeck 1997, Stillwater Sciences 2007a). A focal species approach is being used for the LA River CEFF Project because it has been successfully used in several conservation efforts, including defining environmental flow targets and implementing conservation and management actions to achieve those targets in support of multiple resource objectives in managed river systems (Stillwater Sciences 2007a, Alexander et al. 2018). Additionally, a focal species approach for the LA River CEFF Project will be compatible with, and will expand on, the focal species selected by the LA River Environmental Flows Project (Stein et al. 2021a,b) to create a set of focal species that best characterize the flow influence on the wide range of biodiversity management goals associated with LA River flows.

For the LA River CEFF Project, the primary goal of the focal species approach is to identify species that would interact with the aquatic, riparian, and transitional habitats along the river and whose environmental flow requirements and sensitivities are representative of (1) flows that other native species depend on, and (2) one or more LA River biodiversity management goals. Once

focal species are selected, performance measures and associated suitability criteria for each life stage of the focal species that interacts with LA River flows will be developed and these performance measures and suitability criteria will be used in the subsequent LA River CEFF Project analysis to estimate how well biodiversity management goals are achieved under existing, potential future, and potential alternative flow conditions. Comparison of how well different potential alternative flow conditions meet the biodiversity management goals will be one of the key factors considered in the eventual selection of the flow recommendations for the LA River CEFF Project.

1.3 Purpose and Objectives

The overall purpose of the focal species selection process for the LA River CEFF Project is to develop a scientifically defensible, easy-to-understand, replicable basis for selecting focal species that can characterize the influence of flow on LA River biodiversity management goals under existing and potential future flow conditions.

In order to accomplish this purpose, the LA River CEFF Project focal species selection process objectives follow:

- Document the TWG expert input on best practices for focal species selection in the LA River watershed,
- Compile a list of candidate focal species for the LA River between Sepulveda Basin and the Pacific Ocean,
- Identify the focal species selection criteria that would characterize whether a species is representative of flows other native species depend upon,
- Explain the methods for evaluating candidate focal species for the LA River using the focal species selection criteria, and
- Specify the focal species that meet the selection criteria and the rationale for their selection.

2 SELECTION METHODS

2.1 Technical Work Group Input

On June 11, 2024, the LA River CEFF Project held the LA River CEFF TWG Meeting #1 (TWG #1) and summarized the Section A analysis results and the initial approach for determining how LA River flow influences achievement of biodiversity management goals in the forthcoming Section B and Section C analyses. Federal, tribal, state, regional, and local experts attending TWG #1, either in person or virtually, provided their input on the best practices for assessing whether flows support biodiversity management goals in the LA River. During TWG #1 and in subsequent follow-up email correspondence and meetings, the U.S. Fish and Wildlife Service (USFWS; J. Avery, USFWS, pers. comm., 2024) strongly recommended using an umbrella species approach for the LA River CEFF Project analysis, rather than a mixture of focal species and species guild approaches, due to the "grayness" and variability of flow needs associated with using species guilds (i.e., it would be easier to develop and justify conceptual models based on single species rather than multiple species in a guild). Guilds, for example, usually include generalist and common species that have flow needs that do not encompass the needs of sensitive and uncommon species. In the experience of USFWS, an umbrella species approach is more likely to yield positive outcomes for the range of species in a landscape, including sensitive or

uncommon species, than a guild approach. The USFWS recommended the following selection criteria:

- Sensitive or uncommon native species;
- Historically present;
- Technologically feasible to be supported in the future by flow in LA River; and
- Representative of flows other native species depend upon.

Furthermore, USFWS indicated that an umbrella species approach should comprise at least **10 species, including at least 2 fish; 1 reptile; 3 birds; 1 amphibian**; and **1 mammal species,** to sufficiently characterize the range of biodiversity supported by the LA River flows. USFWS would consider a smaller set of appropriate umbrella species to be a fatal flaw in the LA River CEFF Project analysis.

After receiving this feedback from USFWS, two additional meetings were held October 2 and October 4, 2024, with federal, state, regional, and local biodiversity experts with knowledge of LA River watershed biodiversity, including representatives from the following groups:

- Resource Conservation District of Santa Monica Mountains
- USACE
- CDFW
- City of LA
- SCCWRP

At both meetings, Stillwater Sciences presented background on the LA River CEFF Project and LA River biodiversity management goals that would be relevant for selecting focal species (Appendix A); summarized several approaches for identifying umbrella, indicator, or focal species; provided a preliminary list of candidate focal species for the LA River watershed (Appendix B, Table B-1); and solicited input from these regional biodiversity experts on the most appropriate selection criteria for focal species for the LA River CEFF Project. Key takeaways are summarized below:

- Suggested sources to review:
    - *Biodiversity Indicator Species: A Guide to the City of Los Angeles' Charismatic Umbrella Species* (LASAN 2021)
    - *Biological Resources Survey and Report for "Baseline Dry Season In-Channel Vegetation Mapping"* (Cooper Ecological Monitoring 2022)
    - *Assessing and Improving the Ecological Function of Linear Parks Along the Lower Los Angeles River Channel, Los Angeles County, California, US* (Cooper Ecological Monitoring 2022)
- Suggested focal species selection criteria:
    - **Charismatic species**: consider species that are important for generating public interest in biodiversity in a community-based audience, instilling excitement
    - **Commonality**: include a mix of sensitive and common species
    - **Species' range**: consider a mix of aquatic and riparian upland species, also species that exist in transitional zones
    - **Functional Flows**: consider how species are representative of one or more key components of the functional flow hydrograph

  - **Ecological needs:** consider whether species cover ecological needs of other species, including habitat types and trophic levels; choose species that encapsulate other species' life history requirements
  - **Plant communities:** factor in plant species/communities at some level[2]
  - **Resilience**: add species that have some level of resilience to future climate-change effects
  - **Connectivity:** consider connectivity for wildlife
- Proposed candidate focal species mentioned during the meeting:
  - Benthic macroinvertebrates (BMI)
  - Belted kingfisher (*Megaceryle alcyon*)
  - Great blue heron (*Ardea herodias*)
  - Black-necked stilt (*Himantopus mexicanus*)
  - Mudflat tiger beetle (*Cicindela trifasciata* ssp. *sigmoidea*)
  - Southern tarplant (*Centromadia parryi* ssp. *australis*)
  - Southwestern pond turtle (*Actinemys pallida*)
  - Least Bell's vireo (*Vireo bellii pusillus*)
  - Santa Ana sucker (*Catostomus santaanae*)
  - Steelhead, southern California Distinct Population Segment (*Oncorhynchus mykiss irideus*)
  - Mountain lion (*Puma concolor*)
  - Osprey (*Pandion haliaetus*)
  - Red-tailed hawk (*Buteo jamaicensis*)
- **Suggested selection approaches:**
  - Consider weighting certain parameters
  - Consider dividing the focal species list into sublists based on different criteria such as species tailored to reach-specific, long-term restoration, and community-based audience goals

2.2 Background Review

Based on feedback from the stakeholders (Section 2.1), the following sources were reviewed for potential candidate focal species as well as information on which species were historically present in the LA River and its watershed:

- *Taylor Yard G2 River Park Project Implementation Feasibility Report*. City of LA, Department of Public Works, Bureau of Engineering (City of LA 2022)
- Biodiversity Indicator Species: A guide to the City of Los Angeles' *Charismatic Umbrella Species* (LASAN 2021)
- *Assessment of Aquatic Life Use Needs for the Los Angeles River: Los Angeles River Environmental Flows Project* (LA River Environmental Flows Project; Stein et al. 2021a)

[2] During the meeting, there was some discussion regarding whether plant species and/or plant communities should be considered as focal species/groups. There was consensus that assessing linkages between candidate fish and wildlife species and key vegetation types (i.e., Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub, and Riverine) was sufficient.

- *The Past and Present Freshwater Fish Fauna of the Los Angeles River: With Particular Reference to the Area of Griffith Park* (Swift and Seigel 1993)
- *Backyard Bats* (Natural History Museum 2024)
- North American Bat Acoustic Monitoring Portal (BatAMP) (Conservation Biology Institute and USFS 2024)
- *Final Fish and Wildlife Coordination Act Report for the Proposed Los Angeles River Ecosystem Restoration Project, Los Angeles County, California* (USFWS 2014)
- The California Natural Diversity Database (CDFW 2025a)[3]
- *Los Angeles Biodiversity Atlas* (UCLA 2023)
- *Newhall Pass Wildlife Crossing Feasibility Study* (Stillwater Sciences 2024)
- *Water Supply and Habitat Resiliency for a Future Los Angeles River: Site-Specific Natural Enhancement Opportunities Informed by River Flow and Watershed-Wide Action* (TNC 2016)
- *Los Angeles River Ecosystem Restoration Feasibility Study* (USACE 2015)
- *iNaturalist* (iNaturalist 2025)

Additionally, literature associated with the recommended focal species' resilience to future climate-change effects and connectivity was reviewed to determine how these topics might be evaluated for candidate focal species. One of the key assumptions about species' resilience is that climate change-driven ecosystem change is occurring (IPCC 2023), and the distribution of suitable habitat for species and species' ranges also will change in the future (Spencer et al. 2010). Resilience to future climate-change effects is often conceptualized as the capacity of ecosystems to resist and recover from disturbances due to climate change and the ability of a landscape to provide space or other important ecological resources for species to adapt to these disturbances (Chambers et al. 2020).

Management actions that preserve and enhance areas with cooler or moister conditions is a common conservation measure recommended for climate-change adaptation to ensure that species adapted to these conditions have refugia under future warmer and dryer conditions (McCrea et al. 2016, Morelli et al. 2016, Gordon et al. 2022, Saunders et al. 2023, Backus et al. 2024, Keppel et al. 2024). Resilience to future climate-change effects (e.g., hotter and/or drier extended droughts) may be incorporated into a focal species selection criteria by identifying the focal species adapted to cooler or moister conditions (e.g., Coast Range newt [*Taricha torosa torosa*] or southern California steelhead) such that analysis of flow conditions that support these focal species would inherently also provide the cooler and moister habitat conditions to support broader ecosystem resilience to future climate-change effects for other species.

Increased habitat connectivity to facilitate range shifts is also a recommended strategy for promoting ecosystem resilience to future climate-change effects in California's complex mix of urban, rural, and wild landscapes (Spencer et al. 2010, McRea et al. 2016, State of California 2025). The LA River will potentially play a critical role in supporting regional habitat connectivity and facilitating range shifts for species across the region in the coming century under future climate-change conditions (Heller and Zaveleta 2009, CDFW 2025b). Restoration and open space projects along the LA River will result in increased connectivity along the river corridor and between adjacent habitat areas. In the absence of assisted migration, the ability of

[3] The database query results were reviewed, and only the fish and wildlife species that came up in this query were added as candidate species if they met the primary selection criteria as described in Section 2.3.

species to move within this network will likely determine their future presence. Additionally, connectivity can have compounding positive impacts such as higher overall biodiversity and improved landscape resilience (LASAN 2022). Movement parameters of species, including the availability of suitable habitat, current presence of the species within the surrounding landscape, and species' mobility characteristics, are important considerations in determining appropriate focal species. Species that have the most available literature on movement parameters and that are representative of the connectivity for multiple other species across the watershed and region (e.g., relevant umbrella planning species for connectivity) will likely be the most appropriate to select as focal species (Allen and Singh 2016, Zellmer and Goto 2022).

2.3 Selection Criteria Comparison

In addition to the selection criteria specified by the Los Angeles River Environmental Flows Project, USFWS, and other regional biodiversity experts, several recent California studies that used focal species to evaluate environmental flow needs were reviewed to identify relevant focal species selection approaches for consideration in the LA River CEFF Project. Although the literature contains various cautions about potential challenges and shortcomings of using focal species, many sources recommended that thoughtful development and a broader suite of focal species can be effective in assessing and managing environmental flows (e.g., Dondina et al. 2020, Xie et al. 2024). It was determined that focal species selection frameworks developed for flow and conservation efforts on the Sacramento and Santa Clara rivers (Stillwater Sciences 2007a, 2007b) were particularly relevant for comparison with the approach used for the Los Angeles River Environmental Flows Project (Stein et al. 2021a) and with USFWS's recommendations (Table 2). The selected Sacramento River focal species were specifically used in a decision support tool to evaluate environmental flows in the Sacramento River (Alexander et al. 2014, Alexander et al. 2018), emphasizing the usefulness of that focal species selection approach for informing environmental flow recommendations and management decisions.

Table 2. Comparison of potential Los Angeles River California Environmental Flows Framework criteria for focal species selection.[1]

Los Angeles River Environmental Flows Project (Stein et al. 2021a)	U.S. Fish and Wildlife Service recommendations (J. Avery, USFWS, pers. comm., 2024)	Sacramento ecological flows (Stillwater Sciences 2007a) and Santa Clara River focal species (Stillwater Sciences 2007b) projects
Present or potentially present in the study area Representative of the range of conditions within the habitat Representative of diversity of species Mix of **sensitive** and more common species **Life history traits fairly well understood** **Dependent on aquatic habitats for key life history stages** Sensitive to changes in flow, temperature, and hydraulics	**Sensitive** or uncommon native species **Historically present** Technologically feasible to be supported in the future by flow in LA River **Representative of flows other native species depend upon** Should have at least 10 species, including at least 2 fish; 1 reptile; 3 birds; 1 amphibian; and 1 mammal species	**Species historically existed or currently exists within watershed** **Species is listed or proposed under the federal or state Endangered Species Act (primary criteria)** Species meets one or more secondary criteria (e.g., **special-status designation**, high economic or public interest value, narrow habitat requirements, weak disperser, **strong interactor in aquatic or riparian communities**, dependent on habitats whose quality and/or quantity has been affected by human activities, suspected of local and/or regional population declines) **Available information for at least a qualitative assessment of life history and habitat requirements, and particularly linkages of those requirements to environmental flows**

[1] Similarities in selection criteria across projects are bolded.

Comparison of the selection criteria from the Los Angeles River Environmental Flows Project, USFWS, and Sacramento River and Santa Clara River projects highlights that although the three approaches are similar and have some overlap in the selected species, they are not equivalent. Importantly, the Los Angeles River Environmental Flows Project and the USFWS selection criteria would produce a different set of focal species. The focal species selection criteria for the Los Angeles River Environmental Flows Project (Stein et al. 2021a) resulted in the selection of the species provided in Table 3. Selection of southern California steelhead, Santa Ana sucker, and unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*) is consistent with the USFWS criterion of "sensitive or uncommon native species." While potentially valuable for characterizing species influenced by flow in the LA River, other Los Angeles River Environmental Flows Project selected focal species would ***not*** be consistent with this USFWS criterion. Additionally, neither of these sets of selection criteria would fully encompass the range of selection criteria that regional biodiversity experts recommended for the LA River CEFF Project during the two October meetings. The Santa Clara River focal species criteria would also produce a different set of focal species than the Los Angeles River Environmental Flows Project and the USFWS selection criteria and not take into account all the recommended biodiversity

selection criteria, but its approach of using primary and secondary criteria provides a potential path for synthesizing the different sets of selection criteria. Selection criteria shared by all approaches that would not be overly restrictive (e.g., species historically existed, currently exist, or potentially present) would be used as primary criteria, while all other selection criteria would be used as secondary criteria.

Table 3. Los Angeles River Environmental Flows Project focal species selected (Stein et al. 2021a).

Common name	Scientific name	Native, naturalized, or non-native status	Status[1] (federal/state)
African clawed frog	*Xenopus laevis*	Non-native	–/–
Cattail	*Typha* spp.	Native	–/–
Duckweed	*Lemna* spp.	Native	–/–
Goodding's black willow	*Salix gooddingii*	Native	–/–
Reticulated algae	*Cladophora* spp.	Naturalized	–/–
Steelhead, southern California Distinct Population Segment	*Oncorhynchus mykiss irideus*	Native	FE/SCE
Santa Ana sucker	*Catostomus santaanae*	Native	FT/SSC
Unarmored threespine stickleback	*Gasterosteus aculeatus williamsoni*	Native	FE/SE, SFP
Western mosquitofish	*Gambusia affinis*	Non-native	–/–

[1] Status codes:

Federal
FE = Listed as endangered under the federal Endangered Species Act
FT = Listed as threatened under the federal Endangered Species Act

State
SE = Listed as endangered under the California Endangered Species Act
SCE = State candidate as endangered under the California Endangered Species Act
SSC = CDFW Species of Special Concern
SFP = CDFW Fully Protected species

2.4 Proposed LA River CEFF Project Focal Species Selection Criteria

The LA River CEFF Project focal species selection criteria were developed based on input from LA River CEFF Project participants (Section 2.1), background review of sources recommended by the LA River CEFF Project participants (Section 2.2), and a comparison of selection criteria from other projects (Section 2.3). Figure 3 provides an overview of selection criteria for the LA River CEFF Project.[4]

[4] A selection criterion addressing climate resiliency was considered; however, available sources (Gardali et al. 2012, Wright et al. 2013, Stewart et al. 2016, Moyle et al. 2012, UCLA 2023) were not comprehensive for all candidate species. While climate resiliency is an important consideration for LA River watershed biodiversity, it was determined that an assessment of candidate species' climate resiliency could not be uniformly applied across all candidate species. Consequently, climate resiliency was not included in the final list of selection criteria. While a selection criterion was not added that focused explicitly on connectivity, a couple of the secondary criteria include consideration of connectivity (i.e., one or more biodiversity management goals supported by the species; and strong interactor in upland riparian communities and/or transitional zones).

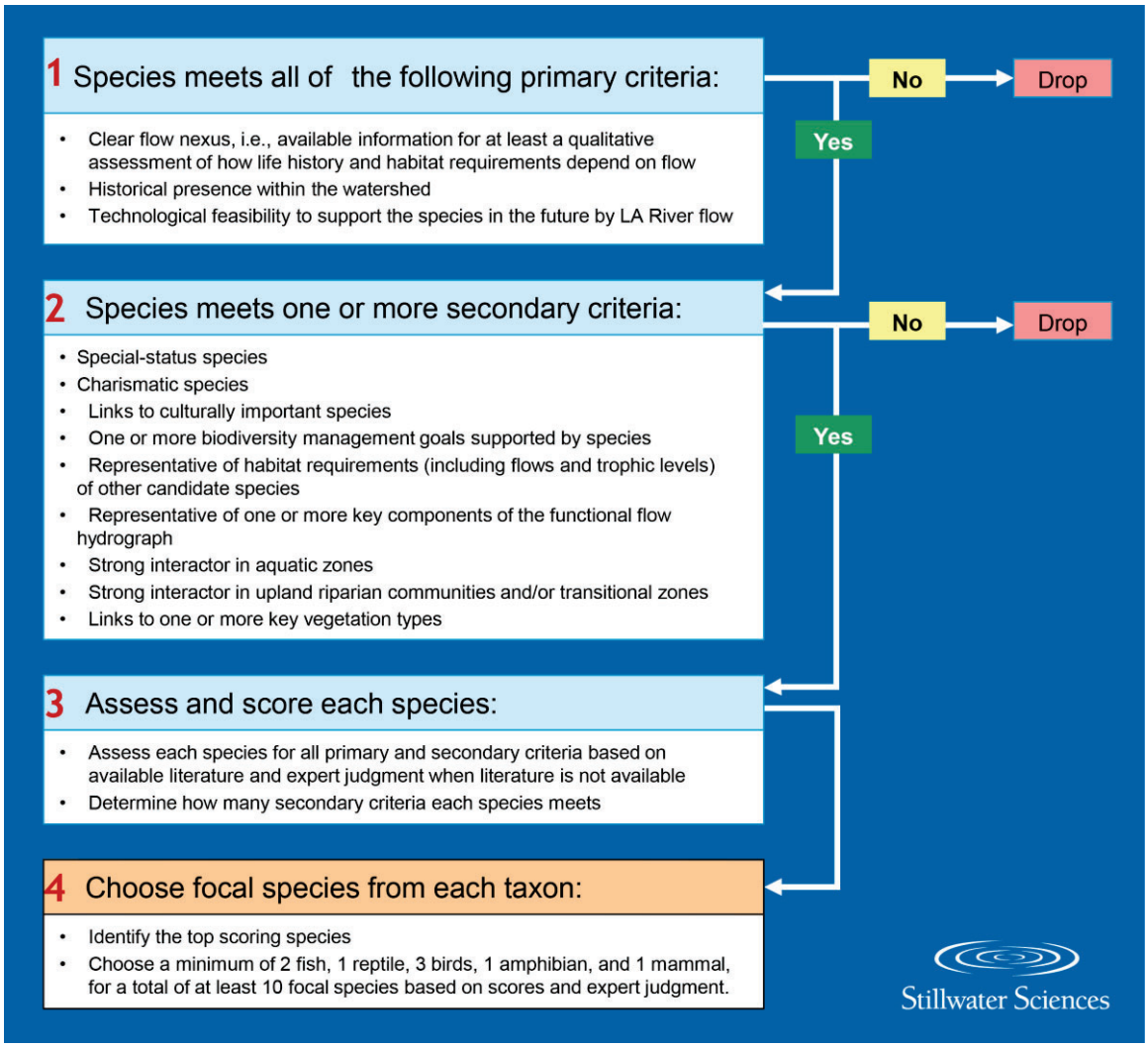

Figure 3. Proposed Los Angeles River California Environmental Flows Framework Project focal species selection criteria.

2.5 Evaluation Methods and Scoring

For each of the selection criteria defined in Section 2.4 an assessment methodology was defined as follows:

Primary Criteria:

- **Clear flow nexus** (i.e., available information for at least a qualitative assessment of how life history and habitat requirements depend on flow):
    - Information on the life history and habitat requirements of candidate focal species was derived from multiple sources that describe their biological requirements and ecological associations in relation to the river flow regime (i.e., flow magnitude, duration, frequency, timing, and rate of change), including information on the

interactions between river flow and the aquatic, riparian, and transitional upland habitat used by the candidate focal species.[5]

- The approach used to more generally characterize relationships between natural or functional flow components of the LA River (e.g., fall pulse flow, winter base flow, winter peak flow, spring recession, and dry season base flow) and the life history and habitat requirements of candidate focal species and associated ecological communities is described in published literature, including
  - *Restoring Native Fish Assemblages to a Regulated California Stream Using the Natural Flow Regime Concept* (Kiernan et al. 2012),
  - *A Functional Flows Approach to Selecting Ecologically Relevant Flow Metrics for Environmental Flow Applications* (Yarnell et al. 2020),
  - *Developing Ecological Flow Needs in a Highly Altered Region: Application of California Environmental Flows Framework in Southern California, USA* (Taniguchi-Quan et al. 2022), and
  - *Functional Flows in Groundwater-Influenced Streams: Application of the California Environmental Flows Framework to Determine Ecological Flow Needs* (Yarnell et al. 2022).
- **Historical[6] presence** within the watershed:
  - This criterion was based on sources containing historical evidence or other rationale indicating the documented or likely occurrence of candidate focal species in the LA River watershed, as described in published literature, including the following:
    - *The Past and Present Freshwater Fish Fauna of the Los Angeles River* (Swift and Siegel 1993);
    - *The Status and Distribution of the Freshwater Fishes of Southern California* (Swift et al. 1993);
    - *Water Supply and Habitat Resiliency for a Future Los Angeles River: Site-Specific Natural Enhancement Opportunities Informed by River Flow and Watershed-Wide Action* (TNC 2016);
    - *Final Fish and Wildlife Coordination Act Report* for *the proposed Los Angeles River Ecosystem Restoration Project* (USFWS 2014);
    - *Historical Ecology and Landscape Change of the San Gabriel River and Floodplain* (Stein et al. 2007);

[5] Example sources for fish species include *Inland Fishes of California* (Moyle 2002), *Fish Species of Special Concern in California*, Third Edition (Moyle et al. 2015), the Southern California Steelhead Recovery Plan (NMFS 2012), and the Recovery Plan for Santa Ana Sucker (USFWS 2017). Example sources for bird and terrestrial wildlife species include California Amphibians and Reptiles (Hansen and Shedd 2025), Biodiversity Indicator Species: A guide to the City of Los Angeles' charismatic umbrella species (LASAN 2021), Peterson Field guide to Western reptiles and amphibians (McGinnis and Stebbins 2018), and California's Wildlife, Vol. I–III (Zeiner et al. 1990).

[6] For the purposes of this report, "historical" existence is defined as preceding the settlement of Europeans (1769) during the roughly 10,000-year period characterized by indigenous cultural influence on the landscape. Although the early faunal and floral records found in the source materials (Swift and Siegel 1993, USFWS 2014, Ethington et al. 2020, Natural History Museum 2024, CDFW 2025a, Ebird 2024) are from later than 1769, it is assumed that these resources still represent an accurate characterization of the period preceding 1769.

- *Historical Ecology of the Los Angeles River Watershed and Environs: Infrastructure for a Comprehensive Analysis* (Ethington et al. 2020);
- *Historical Ecology of the Ballona Creek Watershed* (Dark et al. 2011); and
- *The Biota of the Los Angeles River* (Garrett 1993).

- **Technological feasibility** to support the species in the future by flow in LA River:[7]
  - This criterion was based on the species explicitly noted in the *Final Fish and Wildlife Coordination Act Report for the proposed Los Angeles River Ecosystem Restoration Project* (USFWS 2014) to be "infeasible to restore in the LA River."
  - For species not addressed in this report, professional judgement was used to evaluate habitat suitability and life history requirements for the species in conjunction with, but not limited to, current species' distributional information including from these sources: database queries (e.g., the California Natural Diversity Database [CDFW 2025b]), Backyard Bats (Natural History Museum 2024), and community science databases (e.g., eBird).

Secondary Criteria:

- **Special-status species**:
  - **Special-status** fish and wildlife species were defined as follows:
    - Listed, proposed, or under review as endangered or threatened under the federal Endangered Species Act or the California Endangered Species Act;
    - Designated as a Species of Special Concern by CDFW;
    - Designated as Fully Protected under the California Fish and Game Code (Sections 3511, 4700, 5050, and 5515); or
    - Protected under the federal Bald and Golden Eagle Protection Act;
  - **Charismatic** species:
    - Charismatic species were defined as follows:
      - Included in *Biodiversity Indicator Species: A guide to the City of Los Angeles' charismatic umbrella species* (LASAN 2021); or
      - Not mentioned in the *Biodiversity Indicator Species: A guide to the City of Los Angeles' charismatic umbrella species* (LASAN 2021) but otherwise noted to generate public interest in the Los Angeles region.[8]
  - Links to **culturally important species:**

[7] It is assumed that translocation is an acceptable means of re-establishing a population. Before any actions are taken to translocate individuals to enhance populations of special-status species currently considered to be potentially present, or to reintroduce species thought to have occurred historically in the LA River but now considered extirpated, issues related to the current and future regulatory status of such species in the LA River should be thoroughly addressed. For example, if a species being considered for reintroduction is federally listed, a designation as a "nonessential, experimental" population in the LA River could be sought under Section 10(j) of the ESA to reduce any future regulatory burden.

[8] Candidate focal species given points under this criterion using this definition of charismatic included common green darner, Western tiger swallowtail, steelhead (southern California Distinct Population Segment), arroyo toad, least Bell's vireo, southwestern willow flycatcher, osprey, Cooper's hawk, and yellow billed cuckoo.

- *Common Shrubs of Chaparral and Associated Ecosystems of Southern California* (Conrad 1987) was reviewed for its list of plant species[9] considered to be culturally important species. Local tribal experts will be consulted in the future to expand or refine this list.
- Species were awarded points for having a clear nexus[10] with culturally important plant species as outlined in the "wildlife value" and "cultural value" descriptions of plant species in *Common Shrubs of Chaparral and Associated Ecosystems of Southern California* (Conrad 1987).

- One or more **LA River biodiversity management goals** supported by species:
  - For each species, a tally of the initial list of applicable LA River biodiversity management goals (Appendix A) was compiled.
- **Representative of habitat requirements** (including flows and trophic levels) of other candidate species:
  - Each species was assessed to determine how many other potential candidate species for which it could be considered an umbrella species based on species' habitat requirements and local knowledge concerning patterns of habitat use within the urbanized riverscape (see Appendix C, Table C-2). Subsequently, the scores were converted to categories of *low*, *low/moderate*, *moderate*, *high/moderate*, and *high*.
- **Representative of one or more key components of the functional flow hydrograph** (i.e., fall pulse flow, winter base flow, winter peak flow, spring recession, and dry season base flow):
  - Species were awarded points based on how many of the five key functional flow components, as described in *A Functional Flows Approach to Selecting Ecologically Relevant Flow Metrics for Environmental Flow Applications* (Yarnell et al. 2020), are relevant to supporting its specific life history and habitat needs.
- **Strong interactor in aquatic zones**:
  - Species were awarded points if they require the aquatic zone to support any life stage based on their life history requirements.
- **Strong interactor in upland** riparian communities **and/or transitional zones**:
  - Species were awarded points if they require upland riparian communities and/or transitional zones to support any life stage based on their life history requirements.
- Links to one or more **key vegetation types**:
  - Key vegetation types were identified based primarily on California Wildlife Habitat Relationship types (CWHR; CDFW 2025c): Fresh Emergent Wetland; Valley Foothill Riparian; and Riverine to match the approach used by SCCWRP in the LA River Environmental Flows Project[11] (Stein et al. 2021a). A Holland

[9] Culturally important plant species that are included in Conrad (1987) and at were determined to be relevant for this Project include *Artemisia* sp., *Juncus* sp., *Quercus* sp., *Rosa* sp., *Salix* sp., *Salvia* sp., *Sambucus* sp., and *Schoenoplectus acutus*.

[10] For the purposes of this report, plant and wildlife species have a clear nexus with one another if the plant species is a major component of the wildlife species' diet, nesting substrate, or cover substrate; if the wildlife species is a primary disperser of the plant species; or if the two species have a direct and well-documented relationship not described above.

[11] Habitat types and species (latter in parentheses) identified in Stein et al. (2021a) include wading shorebird habitat (*Cladophora* spp. [algae]) and warm-water habitat (*Xenopus laevis* [African clawed frog],

classification type (Holland 1986)—Riparian Scrub—was also included to distinguish between shrub-dominated and tree-dominated riparian systems. Subsequently, each species was matched with the vegetation types that support the specific life history and habitat needs of that species. One additional Holland type, southern alluvial fan scrub, was not included in the overall selection process but was factored into the assessment of and selection of the Arroyo toad as a focal species.

After assessments were complete (see Appendix C, Table C-1), scoring for each species was determined by matching assessment information with a numerical value for the primary and secondary selection criteria (see Appendix C, Table C-2). All criteria were given a maximum score of 10 points each, with clear *yes* answers receiving 10 points and clear *no* answers receiving zero points. Cases in which the answer was not a clear *yes* or *no* received partial point values (e.g., between 1 and 9 points), and criteria for which the answer inherently had more than two states[12] were scored with maximum values receiving 10 points and minimum values receiving zero points. Two criteria—*strong interactor in aquatic zones* and *strong interactor in upland riparian communities and/or transitional zones*—were given a maximum of 5 points each because they had initially been a single question but were separated to simplify scoring.

Species that did not fully meet one or more primary criteria were eliminated from further consideration as a focal species. In other words, all the primary criteria had to receive the maximum score of 10 points for the species to be considered further. Top scoring species with each taxonomic group were reviewed, then a minimum number of species from each taxonomic group were selected following the guidance from USFWS. Species for each taxonomic group were selected based on their scores and potential niche overlap to ensure that there was minimal niche overlap within a given taxonomic group. For example, the first species selected for a taxonomic group would be the top scoring species, but a second species selected for a taxonomic group would be the top scoring species that did not have significant niche overlap with the first species selected.

3 RESULTS

Each of the candidate species was assessed based on the criteria and methodology as described in Section 2.5. Table C-1 (Appendix C) details the determinations for each of the criteria and species, Table C-2 (Appendix C) summarizes the analyses for the "Representative of habitat requirements" criterion, and Table C-3 (Appendix C) details the application of scores. Table 4 summarizes the final score for each candidate focal species and indicates which species were selected for each taxonomic group. Following the table are the rationales that supported final decisions.

and *Gambusia affinis* [Western mosquito fish]),which translates to CWHR Riverine habitat; freshwater marsh habitat (*Typha* spp. [tules] and *Lemna* spp. [duckweed]), which translates to CWHR Freshwater Emergent Wetland habitat; and riparian habitat *(Salix gooddingii* [black willow]), which translates to CWHR Valley Foothill Riparian habitat.

[12] Criteria that inherently had more than two states included: (1) one or more biodiversity management goals supported by species; (2) representative of habitat requirements (including flows and trophic levels) of other native species; (3) representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak); and (4) links to one or more key vegetation types.

Table 4. Summary of scoring for all Los Angeles River California Environmental Flows Framework Project candidate focal species.

Common name (*Scientific name*)	Eliminated by primary criteria? (Yes/No)	Secondary criteria score	Selected species? (Yes/No)
Invertebrates			
Common green darner (*Anax junius*)	No	45	Yes
Western tiger swallowtail (*Papilio rutulus*)	No	37	Yes
California floater (*Anodonta californiensis*)	No	29	Yes
Mudflat tiger beetle (*Cicindela trifasciata* ssp. *sigmoidea*)	Yes	–	No
Benthic macroinvertebrates (BMI)	Yes	–	No
Crotch's bumble bee (*Bombus crotchii*)	Yes	–	No
El Segundo blue butterfly (*Euphilotes battoides allyni*)	Yes	–	No
Lorquin's admiral (*Limenitis lorquini*)	Yes	–	No
Sara orangetip (*Anthocharis sara*)	Yes	–	No
Fish			
Steelhead, southern California Distinct Population Segment (*Oncorhynchus mykiss irideus*)	No	57	Yes
Pacific lamprey (*Entosphenus tridentata*)	No	43	No
Santa Ana sucker (*Catostomus santaanae*)	No	41	Yes
Western brook lamprey (*Lampetra richardsoni*)	No	41	No
Unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*)	No	41	No
Arroyo chub (*Gila orcuttii*)	No	41	Yes
Santa Ana speckled dace (*Rhinichthys osculus* ssp.)	No	37	No
Amphibians			
Arroyo toad (*Anaxyrus californicus*)	No	52	Yes
Baja California tree frog (*Pseudacris hypochondriaca*)	No	52	Yes
Western toad/California toad (*Anaxyrus boreas halophilus*)	No	44	No
Coast range newt (*Taricha torosa torosa*)	No	44	No
Black-bellied slender salamander *(Batrechoseps nigriventris*)	Yes	–	No

Common name (*Scientific name*)	Eliminated by primary criteria? (Yes/No)	Secondary criteria score	Selected species? (Yes/No)
Reptiles			
Southwestern pond turtle (*Actinemys pallida*)	No	62	Yes
Two-striped garter snake (*Thamnophis hammondii*)	No	52	No
California kingsnake (*Lampropeltis californiae*)	Yes	–	No
Southern California legless lizard (*Anniella stebbinsi*)	Yes	–	No
Side-blotched lizard (*Uta stansburiana*)	Yes	–	No
Birds			
Least Bell's vireo (*Vireo bellii pusillus*)	No	65	Yes
Great blue heron (*Ardea herodias*)	No	54	No
Belted kingfisher (*Megaceryle alcyon*)	No	54	Yes
Yellow warbler (*Setophaga petechia*)	No	51	No
Yellow-breasted chat (*Icteria virens*)	No	49	No
California brown pelican (*Pelecanus occidentalis californicus*)	Yes	–	No
Southwestern willow flycatcher (*Empidonax traillii extimus*)	Yes	–	No
Western yellow-billed cuckoo (*Coccyzus americanus*)	Yes	–	No
Wading Birds			
American avocet (*Recurvirostra americana*)	No	32	No
Western sandpiper (*Calidris mauri*)	No	32	No
Least sandpiper (*Calidris minutilla*)	No	32	No
Long-billed dowitcher (*Limnodromus scolopaceus*)	No	32	No
Black-necked stilt (*Himantopus mexicanus*)	No	32	Yes
Raptors			
Osprey (*Pandion haliaetus*)	No	44	Yes
Cooper's hawk (*Accipiter cooperii*)	No	43	No
American peregrine falcon (*Falco peregrinus anatum*)	No	42	No
Red-tailed hawk (*Buteo jamaicensis*)	No	39	No
American kestrel (*Falco sparverius*)	No	39	No

Common name (*Scientific name*)	Eliminated by primary criteria? (Yes/No)	Secondary criteria score	Selected species? (Yes/No)
Mammals			
Mountain lion (*Puma concolor*)	No	45	Yes
Bobcat *(Lynx rufus*)	No	39	Yes
Dusky-footed woodrat (*Neotoma macrotis*)	No	37	No
Yuma myotis (*Myotis yumanensis*)	No	35	Yes
California myotis (*Myotis californicus*)	No	35	No
Mexican free-tailed bat (*Tadarida brasiliensis*)	No	27	No

Notes: – = Species did not qualify for secondary scoring.

3.1 Rationales

3.1.1 Invertebrates

Among invertebrate candidate focal species, three were selected as focal species: one native mussel that historically occurred in the LA River (the California floater [*Anodonta californiensis*]) along with one dragonfly (the common green darner [*Anax junius*]) and one butterfly (the western tiger swallowtail [*Papilio rutilus*]) that are still observed along the LA River and associated wetland, riparian, and upland habitats. Three invertebrate focal species were selected because they integrate distinctly different (if overlapping) habitats that would support a range of other species, they contribute to different parts of riverine food webs that would support other species, and these were the only invertebrate candidate species that met all of the primary criteria[13]. The California floater is a native freshwater mussel that was once common in many rivers of Southern California[14]. It filters large volumes of water and, when present, is a strong interactor in aquatic ecosystems. The common green darner is a dragonfly species that is widespread in California and elsewhere. Adult females lay eggs in aquatic vegetation and the

[13] Four of the invertebrate species considered had little or no clear nexus to flow; the mudflat tiger beetle (*Cicindela trifasciata* ssp. *sigmoidea*), has a moderately understood nexus with flow but no documented evidence was found that it was historically present in the LA River; and BMI as a whole have a generally well understood relationship with flow, but the level of understanding varies notably among the component taxa. It was determined that BMI would be suitable as a focal taxon only if (1) data on species abundance and richness for the BMI assemblage were converted to metrics that could be directly related to flow (such as those used in aquatic bioassessment protocols), or (2) individual species were identified that met the primary criteria and many of the secondary criteria. Additionally, it is not necessary to consider BMI in the LA River CEFF analyses through a focal species lens since the LA River CEFF analyses will evaluate the relationship between flow and the California Stream Condition Index (CSCI). The CSCI translates data on multiple individual BMIs found living in a stream into an overall measure of stream health, so BMI and their contribution to food webs still will be considered in the LA River CEFF analyses.

[14] Although the California floater is generally considered extirpated in southern California, its current status in the LA River (and other rivers and streams in LA and Ventura counties) should be confirmed within the next year when results become available from ongoing surveys of aquatic eDNA focused on freshwater mussels and their fish host species that are being conducted by University of California, Santa Barbara researchers under contract to the LA Regional Water Quality Control Board.

nymphs prey on other aquatic invertebrates in wetlands and backwaters or slow-moving waters of soft-bottom river reaches. Adults are strong fliers and can be migratory, preying on aerial insects in aquatic, wetland, riparian, and upland habitats. Caterpillars of the western tiger swallowtail feed on a number of tree and shrub species common in riparian habitats (including native species of cottonwood [*Populus* spp.], willow [*Salix* spp.], alder [*Alnus* spp.], ash [*Fraxinus* spp.], and oak [*Quercus* spp.]). Adult western tiger swallowtails visit a variety of flowering plants for nectar and are valuable pollinators in riparian and upland woodlands, as well as urban parks and gardens.

3.1.2 Fish

Among fish candidate focal species, scoring values were highest for southern California steelhead (Table 4), which was selected as the first focal species within the group. The fish with the second highest scoring value was Pacific lamprey (*Entosphenus tridentata*), but it was excluded from selection due to similarities in the habitat requirements and flow associations of migrating Pacific lamprey and steelhead. While it may be possible for larval lamprey (ammocoetes) to rear in the soft-bottom reaches of the LA River under some conditions, it was assumed for this evaluation that the primary use of the LA River by Pacific lamprey would be a migration corridor between the suitable spawning and rearing habitats in tributaries of the LA River and the ocean. Suitable spawning and rearing conditions for both species currently present in portions of major LA River tributaries (e.g., Arroyo Seco) would be unaffected by future changes in LA River flow. Pacific lamprey ammocoetes (i.e., larval lamprey) have very different substrate requirements than young steelhead[15]though, so Pacific lamprey would not be excluded from focal species selection in tributaries or in the LA River mainstem if Pacific lamprey spawning and rearing life stages are anticipated to use the river

The next highest scoring value for candidate fish species was shared (i.e., a four-way tie) by Santa Ana sucker, western brook lamprey (*Lampetra richardsoni*), unarmored threespine stickleback, and arroyo chub (*Gila orcuttii*) (Table 4). Two species were chosen from these four: Santa Ana sucker and arroyo chub. These two species are both year-round residents with some similar habitat requirements and flow associations for certain life stages, but with key differences in habitat and flow associations between the two species including velocity, water temperature, and substrate preference. Together, the habitat requirements and flow associations of these two species represent a variety of aquatic habitat conditions expected to occur in the LA River year-round under a range of flow scenarios. The western brook lamprey was eliminated due to niche redundancy with southern California steelhead, and the unarmored threespine stickleback was eliminated due to niche redundancy with arroyo chub. The Santa Ana speckled dace (*Rhinichthys osculus* ssp.) received the lowest score and was not considered further.

3.1.3 Amphibians

Secondary scoring values were the same for arroyo toad (*Anaxyrus californicus*) and Baja California tree frog (*Pseudacris hypochondriaca*), and both were selected to be focal species (Table 4).

[15]Pacific lamprey ammocoetes are filter feeders. They burrow in fine substrates in low-velocity areas of streams where they remain for 3–7 years as they feed and grow. In contrast, fry and juvenile steelhead rear in streams for one or two years, actively moving and feeding in habitats with a variety of coarser substrates and faster moving water than lamprey ammocoetes.

The arroyo toad occupies high-quality alluvial scrub habitat (Southern Alluvial Fan Scrub in the Holland vegetation classification system), a narrow niche not shared by other candidate focal species or currently found within parts of the channel. Historically, alluvial scrub habitat was a major component of the LA River watershed; however, currently very few pockets remain, such as the Big Tujunga Wash Mitigation Area or the Arroyo Seco upstream of the Hahamongna Watershed Park, with one pocket of habitat located in Big Tujunga Canyon more than 12 miles north of the LA River CEFF analysis area hosting an extant population of the arroyo toad (CDFW 2025a). The only documented observation of the species adjacent to the LA River CEFF analysis area is from 1970, near West Hills (CDFW 2025a), along Bell Creek. No recent occurrences of the arroyo toad have been documented in the mainstem LA River. Arroyo toad has moderate quality habitat modeled within the Sepulveda Basin (in the LA River CEFF analysis area) and low quality habitat modeled where the LA River CEFF analysis area meets both the Santa Monica Mountains and the San Fernando Valley (CDFW 2025c). While this species would require translocation into the LA River CEFF analysis area (a natural re-establishment of the species is highly unlikely), the inclusion of the arroyo toad as a focal species could provide protection for other species that require alluvial scrub habitat. Other species that could potentially benefit from the arroyo toad's inclusion as a focal species include western toad, burrowing owl (*Athene cunicluaria*), cactus wren (*Campylorhynchus brunneicapillus*), California glossy snake (*Arizona elegans occidentalis*), coastal California gnatcatcher (*Polioptila californica californica*), western spadefoot toad (*Spea hammondii*), and slender-horned spineflower (*Dodecahema leptocerus*).

The Baja California treefrog was also selected as a focal species because of its strong and direct tie to fresh emergent wetlands habitats, a significant habitat type for the LA River CEFF Project. Fresh emergent wetlands habitat could be covered under birds (specifically great blue heron), but Baja California treefrog was ultimately selected due to its more direct reliance on both aquatic and terrestrial areas of these habitats; its reduced ability to disperse to alternative aquatic habitats (when compared with the great blue heron) if flows were to affect habitat suitability; and its significant role in the LA River's identity in the public eye.

3.1.4 Reptiles

Southwestern pond turtle was selected as the reptile focal species for the LA River CEFF Project since it scored significantly higher than the other candidate reptile focal species (Table 4). The southwestern pond turtle uses both aquatic and terrestrial habitats for various activities (e.g., nesting, estivation, foraging, or basking) and would provide coverage for the other reptile that was considered for focal species selection, the two-striped garter snake (*Thamnophis hammondii*). While this species is a habitat generalist for aquatic features, they require friable upland soils (with functional connectivity to/from aquatic areas for both adult and juveniles) that are suitable for successful nesting (reproduction), and its inclusion could encourage the restoration or naturalization of stream banks and refugia. Additionally, southwestern pond turtles are usually found in deeper or quieter sections of streams or waterways, areas that are also typically beneficial for piscivorous birds.

3.1.5 Birds

Among bird candidate focal species, least Bell's vireo, belted kingfisher, black-necked stilt, and osprey were selected as focal species (Table 4). Least Bell's vireo had the highest scoring values of the group, based on its status as a special-status species and its representation of other candidate focal species' habitat needs. Additionally, the least Bell's vireo currently occupies portions of the LA River mainstem (Pottinger and Kus 2019, Preston et al. 2021, Seidman 2024).

Yellow warbler (*Setophaga petechia*) and yellow-breasted chat (*Icteria virens*) were also considered but excluded due to niche redundancy with the least Bell's vireo which has a slightly wider niche that includes scrubbier, lower-stature habitats. Belted kingfisher was selected over great blue heron, which had a similar scoring value, because the belted kingfisher was unique in its need for deep, clear water hosting small fish in which to forage. The emergent wetland habitat used by great blue heron for foraging largely overlaps the habitat of Baja California treefrog, one of the selected amphibian focal species. A wading shorebird was included to protect the large avian populations that use the LA River in fall and require running water that is at least 10 centimeters deep. All five lower LA River wading shorebirds evaluated as candidate focal species had identical secondary criteria values; the black-necked stilt was selected because it was the most distinctive and recognizable, along with being present year-round. Lastly, a raptor was included. Osprey had the highest scoring values of the group and was selected as a focal species. Of the raptor species, osprey are most directly tied to the LA River for nesting habitat. Other raptors typically utilize tall nonnative trees (e.g., eucalyptus [*Eucalyptus* sp.], pines [*Pinus* sp.]) or native trees (e.g., oaks) in the surrounding areas or they utilize tall buildings (i.e., in the case of the American peregrine falcon [*Falco peregrinus anatum*]) which are not closely tied to the flow regime of the LA River. Similarly, osprey are also more directly tied to the LA River for foraging whereas other raptors commonly forage in surrounding urban and upland areas (e.g., red-tailed hawk), or in habitats covered by the least Bell's vireo (e.g., Cooper's hawk [*Accipiter cooperi*], American kestrel [*Falco sparverius*]), or in habitats covered by black-necked stilt (e.g., American peregrine falcon). Although osprey showed a slight redundancy with the belted kingfisher in terms of foraging habitat, osprey are more susceptible to the harmful effects from biomagnification because they hunt larger fish species, which accumulate toxins faster than the smaller fish typically hunted by the belted kingfisher.

3.1.6 Mammals

Among the mammals considered as candidate focal species, the mountain lion and the bobcat (*Lynx rufus*) were scored the highest and selected as focal species. Mountain lion was selected because it is well recognized as an umbrella species for biodiversity and it is culturally important to the people of the LA River watershed (Thorne et al. 2006, Dellinger et al. 2020, Riley et al. 2021, Los Angeles Times 2022, Bolas et al. 2025). While mountain lions were selected as a focal species for the LA River CEFF Project and the LA River would support connectivity and habitat for mountain lions, the presence or absence of mountain lions in the system would largely depend on habitat in distant surrounding upland areas that the LA River CEFF Project would have no means of affecting. Mountain lions would likely only visit the river infrequently and only ever use a few reaches that happen to be adjacent to large habitat patches unless there were major modifications to the LA River channel form. Therefore, the bobcat was also selected as a focal species since the bobcat would be more likely to utilize habitat along the entire LA River CEFF Project area. The bobcat requires habitat connectivity over a smaller patch size, and individuals of the species could be able to live within the riparian corridor of the LA River and immediately adjacent upland areas. Numerous accounts and sightings in the immediate vicinity of the LA River suggest that the species likely currently utilizes this habitat (iNaturalist 2025, Padilla-Brill 2019). Additionally, the bobcat is an umbrella species regularly used in southern California for planning and wildlife corridors and landscape linkages (WCCA 2013; Kozakiewicz et al. 2019; Smith et al. 2020). A variety of other species, including long-tailed weasel (*Mustela frenata*), racoon (*Procyon lotor*), and Virginia opossum (*Didelphis virginiana*), were considered but did not become candidate focal species because they did not meet the primary selection criteria.

The Yuma myotis (*Myotis yumanensis*), a bat species, was also selected as an appropriate focal species. Although it had similar scoring values as the California myotis (*Myotis californicus*), the

Yuma myotis was selected primarily because of its slightly higher degree of dependence on caddisflies (Trichoptera), flies (Diptera) including midges, and net-winged insects (Neuroptera) such as lacewings as prey (Ober and Hayes 2008), and its slightly higher reliance on a diverse set of habitat components[16] present near the LA River (H.T. Harvey & Associates 2021). To assess the habitat component ratings provided in *Caltrans Bat Mitigation: A Guide to Developing Feasible and Effective Solutions* (H.T. Harvey & Associates 2021), habitat components (bridges, buildings, and tree cavities) predominantly found along the LA River were used for the three candidate focal species (Yuma myotis, California myotis, and Mexican free-tailed bat [*Tadarida brasiliensis*]).

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[16] Yuma myotis used bridges and buildings "frequently," with tree cavities "sometimes," while California myotis used buildings "frequently" and bridges and trees "sometimes," and Mexican free-tailed bat uses bridges and buildings "frequently" and tree crevices "rarely" (H.T. Harvey & Associates 2021).

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Appendices

Appendix A

Initial Los Angeles River California Environmental Flows Framework Biodiversity Management Goals

Table A-1. Initial Los Angeles River California Environmental Flows Framework biodiversity management goals.[1]

Biodiversity management goal ID	Biodiversity management goal	Applicable LOI	Planning document source
1	Support healthy, connected ecosystems	LOI 0–LOI 37.51	LA River Masterplan (LAC and LACPW 2022)
2	Conserve, enhance, and restore habitat biodiversity, and floodplain functions	LOI 0–LOI 17.23	Lower LA River Revitalization Masterplan (LLARRP Working Group 2017)
3	Restore Valley Foothill riparian strand and freshwater marsh habitat	LOI 17.23–LOI 31.97	LA River Ecosystem Restoration Project IFR (USACE 2015)
4	Increase habitat connectivity	LOI 17.23–LOI 31.97	LA River Ecosystem Restoration Project IFR (USACE 2015)
5	Restore a functional riparian ecosystem	LOI 17.23–LOI 37.51	LA River Revitalization Masterplan (City of LA 2007)
6	Ensure the long-term persistence of a viable, self-sustaining wild Southern California steelhead population	LOI 0–LOI 37.51	NMFS Southern California Steelhead Recovery Plan (NMFS 2012)
8	Expand the current range of the Santa Ana sucker by restoring Santa Ana sucker habitat for all life stages (as appropriate)	LOI 0–LOI 37.51	USFWS Recovery Plan for the Santa Ana Sucker (USFWS 2017)
9	Reclassification of the least Bell's vireo to threatened and, ultimately, delisting through recovery	LOI 0–LOI 37.51	USFWS Draft Recovery Plan for the Least Bell's Vireo (USFWS 1998)

Note: LOI = location of interest

[1] Biodiversity management goals are actively being compiled and this list only encompasses the initial biodiversity management goals identified for the LA River.

Appendix B

Initial List of Candidate Focal Species

Table B-1. Initial list of Los Angeles River California Environmental Flows Framework candidate focal species presented at meetings on October 2 and October 4, 2024.

Potential focal species (scientific names)	Special-status or uncommon species? (federal/state[1])	Biodiversity management goals supported by species[2]	California Water Quality Control Board (2014) beneficial uses associated with species	Habitat preferences	Flow nexus known (qualitative)	Historically present	Technologically feasible to be supported in the future flow in LA River	Representative of flows/habitat other native species depend upon	Identified as potentially restorable in USFWS (2014) Coordination Act Report[3]	Selected as focal species for LA River biodiversity previously[4]
Fish										
Western brook lamprey (*Lampetra richardsoni*)	–/SSC/S3S4	1,2,4	MIGR	Migratory resident. Would use LAR and tributary mainstems primarily for migration. Habitat preferences are similar to steelhead.	Well understood	Y (Swift and Seigel 1993)	Y – mainstem migration habitat; soft-bottom tributary spawning & rearing habitat	Y	N	
Pacific lamprey (*Entosphenus tridentata*)	–/SSC/S3	1,2,4	MIGR	Anadromous. Would use LAR and tributary mainstems primarily for migration. Habitat preferences are similar to steelhead.	Well understood	Y (Swift and Seigel 1993)	Y – mainstem migration habitat; soft-bottom tributary spawning & rearing habitats	Y	C	
Steelhead, southern California Distinct Population Segment (*Oncorhynchus mykiss irideus*)	FE/SE/S1	1,2,4,6,7	MIGR, COLD, RARE	Anadromous. Would use LAR and tributary mainstems primarily for migration. For adult upstream migration, requires unobstructed passage to spawning habitat in upper tributaries; adequate flow to provide upstream passage during winter-spring; deep, low-velocity areas for resting/holding between winter-spring storms	Well understood	Y (Swift and Seigel 1993)	Y – mainstem migration habitat; soft-bottom tributary spawning & rearing habitat (Stillwater Sciences 2020, 2021, 2022)	Y	C	SCCWRP LA River Environmental Flows Project (Stein et al. 2021)
Santa Ana sucker (*Catostomus santaanae*)	FT/SSC/S1	1,2,4,8	COLD, RARE, SPWN	Resident. Habitat generalists; prefer sand-rubble-boulder substrates, cool, clear water, and algae	Well understood	Y (Swift and Seigel 1993)	Y – in soft-bottom tributary habitat; possibly in soft-bottom mainstem habitat	Y	Y	Stein et al. (2021); LA River Master Plan (City of LA 2022)
Arroyo chub (*Gila orcuttii*)	–/SSC/S2	1,2,4	COLD, WARM	Resident. Low-velocity areas of streams and rivers with mud or sand bottoms	Well understood	Y (Swift and Seigel 1993)	Y – in soft-bottom mainstem and tributary habitat	Y	Y	(City of LA 2022)
Unarmored threespine Stickleback (UTS; *Gasterosteus aculeatus williamsoni*)	FE/SE, SFP/S1	1,2,4	COLD, RARE, SPWN	Resident. Low-velocity areas of streams and rivers with abundant cover provided by vegetation or algae; relatively tolerant of low dissolved oxygen and high water temperatures.	Well understood	Y (Swift and Seigel 1993)	Y – in soft-bottom mainstem and tributary habitat	Y	C	Considered but not selected by Stein et al. (2021)
Santa Ana speckled dace (*Rhinichthys osculus ssp.*)	–/SSC/S1	1,2,4	COLD	Resident. Riffles in cool perennial streams with water temperatures < 20°C	Well understood	Y (Swift and Seigel 1993)	Y – in soft-bottom tributary habitat	Y – in tributaries	Y	

Potential focal species (scientific names)	Special-status or uncommon species? (federal/state[1])	Biodiversity management goals supported by species[2]	California Water Quality Control Board (2014) beneficial uses associated with species	Habitat preferences	Flow nexus known (qualitative)	Historically present	Technologically feasible to be supported in the future flow in LA River	Representative of flows/habitat other native species depend upon	Identified as potentially restorable in USFWS (2014) Coordination Act Report[3]	Selected as focal species for LA River biodiversity previously[4]
Amphibians										
Baja California Tree Frog (*Pseudacris hypochondriaca*)	No	1,2,4		Varied riparian areas, woodlands, emergent vegetation along urban waterways. Breeds in aquatic habitat (slow streams, permanent and seasonal ponds). Tadpoles are suspension feeders, adults eat a variety of invertebrates (including a high percentage of flying insects).	Well understood	Y per USFWS (2014)			Y (present; improve habitat)	LASAN (2021)
Western toad/California toad (*Anaxyrus boreas halophilus*)	No	1,2,4		Riparian woodland, urban parks, anywhere with shallow isolated pools for several weeks per year for breeding (but particularly in slow moving or still water seasonal pools, ponds, and streams in the LA region).	Well understood	Y per USFWS (2014) (California toad)			Y (California toad present; improve habitat)	LASAN (2021) (Western toad)
Arroyo Toad (*Anaxyrus californicus*)	FE/SSC/S2	1,2,4		Washes, arroyos, sandy riverbanks, riparian areas with willows, sycamores, oaks, cottonwoods; needs exposed sandy streamsides with stable terraces for burrowing.	Well understood	Yes, per USFWS (2014) currently not present			N	
Coast range newt (*Taricha torosa torosa*)	–/SSC/S4	1,2,4		Riparian woodland, terrestrial habitats, with breeding in ponds, reservoirs and slow-moving streams. Larve typically eat small aquatic invertebrates and decomposing organic matter; adults feed primarily on small invertebrates but also on amphibian eggs and larvae.	Well understood					
Black-bellied slender salamander (*Batrechoseps nigriventris*)	No			Moist microhabitats with leaf litter in riparian woodlands, urban parks, oak woodlands.	Poorly understood	Y per USFWS (2014)			Y (present; improve habitat)	LASAN (2021)

Potential focal species (scientific names)	Special-status or uncommon species? (federal/state[1])	Biodiversity management goals supported by species[2]	California Water Quality Control Board (2014) beneficial uses associated with species	Habitat preferences	Flow nexus known (qualitative)	Historically present	Technologically feasible to be supported in the future flow in LA River	Representative of flows/habitat other native species depend upon	Identified as potentially restorable in USFWS (2014) Coordination Act Report[3]	Selected as focal species for LA River biodiversity previously[4]
Reptiles										
Two-striped Garter snake (*Thamnophis Hammondii*)	–/SSC/S3S4	1,2,4		Riparian woodland, streams with rocky beds; prefers habitat adjacent to permanent or semi-permanent bodies of water; feeds primarily on amphibians and fish.	Well understood	Y per USFWS (2014)			Y (present; improve habitat)	City of LA (2022)
Southwestern pond turtle (*Actinemys marmorata Pallida*)	FPT/SSCSNR	1,2,4		Permanent, slow-moving fresh or brackish water with available basking sites and adjacent open habitats or forest for nesting; a generalist species that hunts in the water and feed on a wide variety of aquatic vegetation and animals.	Well understood	Y per USFWS (2014); currently not present			N	LASAN (2021)
California kingsnake (*Lampropeltis californiae*)	No	1,2,4		Occupies many habitat types, primarily terrestrial but including marshes and riparian woodland.	Poor/no flow nexus	Y per USFWS (2014)			Y (present; improve habitat)	LASAN (2021)
Southern California legless lizard (*Anniella stebbinsi*)	–/SSC/S3	1,2,4		Varied; moist microhabitats within ruderal habitats, city parks, sandy washes; feed on invertebrates in leaf litter or sandy soil	Poor/no flow nexus	Y per USFWS (2014)			Y (present; improve habitat)	
Side-Blotched Lizard (*Uta stansburiana*)	No	1,2,4		Generally in open habitats in coastal scrub, grassland, chaparral, and riparian scrub or woodland; feeds on a wide variety of invertebrates; thought to obtain water from its food (Palermo 2000)	Poor/no flow nexus	Y per USFWS (2014)			Y (present; improve habitat)	City of LA (2022); LASAN (2021)

Potential focal species (scientific names)	Special-status or uncommon species? (federal/state[1])	Biodiversity management goals supported by species[2]	California Water Quality Control Board (2014) beneficial uses associated with species	Habitat preferences	Flow nexus known (qualitative)	Historically present	Technologically feasible to be supported in the future flow in LA River	Representative of flows/habitat other native species depend upon	Identified as potentially restorable in USFWS (2014) Coordination Act Report[3]	Selected as focal species for LA River biodiversity previously[4]
Mammals										
Yuma myotis (*Myotis yumanensis*)	–/–/S4	1,2,4		Commonly associated with rivers, streams, and riparian habitats (Bogan et al. 2005). Forages for insects predominantly over waterways and typically includes moths, beetles, mosquitoes, midges, and flies (National Park Service 2024).	Beneficial nexus where aquatic insects (including BMI) contribute significantly to bat diet	Y – historically and currently present (Natural History Museum 2024)		Y		
California myotis (*Myotis californicus*)	No	1,2,4		Optimal foraging habitats include open forests and woodlands with sources of water over which to feed (Harris n.d.). While foraging low over water and ground, and among shrubs and trees, they forage on midges, moths, beetles, and spiders (Harris n.d.)	Beneficial nexus where insect including BMI quantity & biodiversity increased.	Y – historically and currently present (Natural History Museum 2024)				
Mexican free-tailed bat (*Tadarida brasiliensis*)	No	1,2,4		Forages high over water and surrounding habitats, primarily on moths, while also other flying insects. Commonly found roosting in bridges.	Beneficial nexus where insect including BMI quantity & biodiversity increased.	Y–historically and currently present (Natural History Museum 2024 and Stillwater 2024)			Y (present; improve habitat)	
Dusky Footed Woodrat (*Neotoma macrotis*)	No	1,2,4		Riparian woodlands with dense chaparral, and forest habitats of moderate canopy and moderate to dense understory	Poor/no flow nexus					LASAN (2021)
Birds										
Least Bell's vireo (*Vireo bellii pusillus*)	FE/SE/S3	1,2,4,9		Dense willow and mulefat scrub, stratified canopies	Well understood	Y per USFWS (2014); Y per Stein et al. (2021)			Y (present; improve habitat)	
Yellow warbler (*Setophaga petechia*)	–/SSC/S3	1,2,4		Open canopy, deciduous riparian woodland close to water, along streams or wet meadows	Well understood	Y per USFWS (2014);; Y per Stein et al. (2021)			Y (present; improve habitat)	
Southwestern willow flycatcher (*Empidonax traillii extimus*)	FE/SE/S3	1,2,4		Very dense willow scrub	Well understood	Y per USFWS (2014); currently breeding not present			N	

Potential focal species (scientific names)	Special-status or uncommon species? (federal/state[1])	Biodiversity management goals supported by species[2]	California Water Quality Control Board (2014) beneficial uses associated with species	Habitat preferences	Flow nexus known (qualitative)	Historically present	Technologically feasible to be supported in the future flow in LA River	Representative of flows/habitat other native species depend upon	Identified as potentially restorable in USFWS (2014) Coordination Act Report[3]	Selected as focal species for LA River biodiversity previously[4]
Yellow-breasted chat (*Icteria virens*)	–/SSC/S4	1,2,4		Early-successional riparian habitats with a dense shrub layer and an open canopy	Well understood	Y per USFWS (2014); currently greatly reduced in numbers or extirpated as breeders			Y	City of LA (2022)
Great Blue Heron (*Ardea herodias*)	–/–/S4	1,2,4		Forages in shallow coastal marine waters, coastal mangrove swamps, sea beaches, prairie, pasture and cultivated fields, aquacultural ponds, and developed sites where fish scraps can be found. Nests in trees and bushes near water.	Well understood	Y per USFWS (2014); nonbreeding			Y	LASAN (2021); City of LA (2022)
Yellow-billed cuckoo (*Coccyzus Aamericanus*)	FT/SE/S1	1,2,4		Nests in open woodland with clearings and low, dense, scrubby vegetation	Well understood	Y per USFWS (2014); currently breeding not present			N	
Black-necked stilt (*Himantopus mexicanus*)	No	1,2,4		Forages in lower LA River in fall, shallow water under 10 cm	Well understood					
American avocet (*Recurvirostra americana*)	No	1,2,4		Forages in lower LA River in fall, shallow water under 10 cm	Well understood					
Western sandpiper (*Calidris mauri*)	No	1,2,4		Forages in lower LA River in fall, shallow water under 10 cm	Well understood					
Least sandpiper (*Calidris minutilla*)	No	1,2,4		Forages in lower LA River in fall, shallow water under 10 cm	Well understood	Y per USFWS (2014); nonbreeding			Y	
Long-billed dowitcher (*Limnodromus scolopaceus*)	No	1,2,4		Forages in lower LA River in fall, shallow water under 10 cm	Well understood					
Belted Kingfisher (*Ceryle alcyon*)	No	1,2,4		Needs open bodies of water often near woodlands with vertical exposed soil for digging burrows	Well understood	Y per USFWS (2014); (nonbreeding only)			Y	
California Brown pelican (*Pelecanus occidentalis californicus*)	FD/SD/S3	1,2,4		Nests on low rocky or brushy slopes of undisturbed islands; rarely seen inland or far out at sea; roost habitat includes islands, offshore rocks, beaches, mudflats, wharfs, piers, breakwaters, and jetties	Well understood	Y per Stein et al. (2021)				

Potential focal species (scientific names)	Special-status or uncommon species? (federal/state[1])	Biodiversity management goals supported by species[2]	California Water Quality Control Board (2014) beneficial uses associated with species	Habitat preferences	Flow nexus known (qualitative)	Historically present	Technologically feasible to be supported in the future flow in LA River	Representative of flows/habitat other native species depend upon	Identified as potentially restorable in USFWS (2014) Coordination Act Report[3]	Selected as focal species for LA River biodiversity previously[4]
Invertebrates										
Benthic macroinvertebrates (BMI)	No	1,2,4			Moderately understood	Y				
Crotch's bumble bee (*Bombus crotchii*)	–/SCE/S2	1,2,4			Poor/no flow nexus					LASAN (2021)
El Segundo Blue Butterfly (*Euphilotes battoides allyni*), Lorquin's admiral (*Limenitis lorquini*), Sara Orangetip (*Anthocharis sara*)	Blue: FE/–/S1 Lorquin's: No Orangetip: No	1,2,4			Poor/no flow nexus					
Monarch butterfly (*Danaus plexippus*)	FC/–/S2	1,2,4			Poor/no flow nexus					City of LA (2022)
Riparian Vegetation Communities										
<u>Valley Foothill Riparian Vegetation (CWHR type):</u> • Goodding's willow - red willow riparian woodland and forest (MCV alliance: S3) • Fremont cottonwood forest and woodland (MCV alliance; S3.2) • California sycamore - coast live oak riparian woodlands (MCV alliance; S3) <u>Associated species</u>: • Goodding's Black Willow (*Salix gooddingii*) • Cottonwood (Populus fremontii ssp. fremontii); • Western sycamore (*Platanus racemosa*); • Willows (*Salix* sp.); • White Oak (Quercus agrifolia); • Wild grape (Vitis californica)	Some of the alliances are sensitive natural communities (S1–S3s)	1,2,3,4	Goodding's black willow: WILD, RARE		Moderately to well understood; Goodding's black willow: Stein et al. (2021)	Goodding's black willow: Y per Stein et al. (2021) Cottonwood, Western sycamore, willows, wild grape: Y per USFWS (2014)	Goodding's black willow: Y per Stein et al. (2021)	Goodding's black willow: Y per Stein et al. (2021)		Goodding's black willow: Stein et al. (2021)

Potential focal species (scientific names)	Special-status or uncommon species? (federal/state[1])	Biodiversity management goals supported by species[2]	California Water Quality Control Board (2014) beneficial uses associated with species	Habitat preferences	Flow nexus known (qualitative)	Historically present	Technologically feasible to be supported in the future flow in LA River	Representative of flows/habitat other native species depend upon	Identified as potentially restorable in USFWS (2014) Coordination Act Report[3]	Selected as focal species for LA River biodiversity previously[4]
Coastal & Valley Freshwater Marsh (Holland type): • Cattail marshes (MCV alliance; S5); • Hardstem and California bulrush marshes (MCV alliance; S3S4); Associated species: • Cattail Marsh (*Typha spp.*) • Bulrush (*Scirpus* spp.) • Sedges (*Carex* spp.) • Pennywort (*Hydrocotyle* spp.) • Smartweed (*Polygonum* spp.) • Pondweeds (*Potamogeton* spp.) • Water-parsley (*Oenanthe sarmentosa*)	Some of the alliances are sensitive natural communities (S1–S3s)	1,2,3,4	WILD		Moderately to well understood; Stein et al. (2021)	Coastal & Valley Freshwater Marsh, including Cattail Marsh (*Typha spp.*): Y per Stein et al. (2021); Pennywort, smartweed, pondweeds, water-parsley: Y per USFWS (2014)	Y per Stein et al. (2021)	Y per Stein et al. (2021)		Stein et al. (2021)
Mulefat Scrub (Holland type): • Mulefat thickets (MCV alliance; S4) Associated species include: • Mule fat (*Baccharis salicifolia* ssp. *salicifolia*) • Mugwort (*Artemisia douglasiana*)	No	1,2,3,4			Moderately understood	Mulefat & Artemisia: Y per USFWS (2014)				

Potential focal species (scientific names)	Special-status or uncommon species? (federal/state[1])	Biodiversity management goals supported by species[2]	California Water Quality Control Board (2014) beneficial uses associated with species	Habitat preferences	Flow nexus known (qualitative)	Historically present	Technologically feasible to be supported in the future flow in LA River	Representative of flows/habitat other native species depend upon	Identified as potentially restorable in USFWS (2014) Coordination Act Report[3]	Selected as focal species for LA River biodiversity previously[4]
Riverine (CWHR type): • Aquatic Vegetation Associated species include: • Algae (*Cladophora* spp.)	No	1,2,3,4	Algae: EST, WILD		Moderately to well understood; Algae: Stein et al. (2021)	Algae: Y per Stein et al. (2021)	Algae: Y per Stein et al. (2021)	Algae: Y per Stein et al. (2021)		Algae: Stein et al. (2021)

[1] Status codes:

Federal
FE = Listed as endangered under the federal Endangered Species Act
FT = Listed as threatened under the federal Endangered Species Act
FPT = Federally proposed as threatened
FC = Federal candidate species
FD = Federally delisted

State
SE = Listed as Endangered under the California Endangered Species Act
SCE = State candidate for listing as Endangered under the California Endangered Species Act
SD = State Delisted
SSC = CDFW Species of Special Concern
SFP = CDFW Fully Protected species

NatureServe Conservation Status Ranks
S1 = Critically Imperiled: At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
S2 = Imperiled: At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
S3 = Vulnerable: At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

[2] Appendix A, Table A-1 for Biodiversity Management Goal ID

[3] N: Restoration of species is not likely practicable
C: Restoration of species would be challenging and require substantial riverine, riparian, and watershed modifications.
Y: Restoration of species is likely with considerable riverine and riparian modifications along the river

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Appendix C

Candidate Focal Species Assessment

Table C-1. Los Angeles River California Environmental Flows Framework Project candidate focal species assessment.

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria			Secondary criteria								
		There is a clear flow nexus	Species that historically existed within the watershed	Technologically feasible to be supported in the future flow in LA River[1]	Special-status species (federal/state[2])	Charismatic	Links to culturally important species (to be re-scored after consulting with Tribes)	One or more biodiversity management goals supported by species[3]	Representative of habitat requirements (including flows and trophic levels) of other candidate species	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)	Strong interactor in aquatic zones	Strong interactor in upland riparian communities and/or transitional zones	Links to one or more key vegetation types[4]
Invertebrates													
California floater (*Anodonta californiensis*)	Lakes, slow-moving rivers, and some reservoirs, typically on mud or sand substrate	Well understood	Y; currently presumed extirpated	Y - in natural streambed areas with suitable host fish species	No	No	–	1,2,4	Low/moderate	Fall Pulse Flow, Wet Season Baseflow, Wet Season Peak Flows, Spring Recession Flow, Dry Season Baseflow	Y	N	Y; Riverine
Common green darner (*Anax junius*)	Eggs laid in aquatic vegetation; nymphs in lakes, ponds, wetlands, and backwaters/slow-moving waters of rivers and streams; Adults strong fliers and can be migratory	Well understood	Y; currently present	Y – in backwater and wetland habitat for eggs and nymphs; riparian habitat and adjacent upland habitat for adults//Y (present; improve habitat)	No	Yes	–	1,2,4	Moderate	Fall Pulse Flow, Wet Season Baseflow, Wet Season Peak Flows, Spring Recession Flow, Dry Season Baseflow	Y	N	Y; Riverine, Valley Foothill Riparian, Fresh Emergent Wetland
Mudflat tiger beetle (*Cicindela trifasciata* ssp. *sigmoidea*)	Mudflats along coast and edges of marshes and rivers inland.	Moderately understood	Unknown	Yes, currently present/–	No	No	–	1,2,4	Low/moderate	Wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	N	Y	Y, Riverine, Fresh Emergent Wetland
Western tiger swallowtail (*Papilio rutulus*)	Host plants include many riparian trees (Populus, Salix, Prunus, Fraxinus, Quercus, Alnus);- Adults frequently seen in riparian areas, urban parks and gardens, and rural woodlands; mudpuddling along shorelines	Well understood	Y; currently present	Y – in riparian habitat and adjacent upland habitat/Y (present; improve habitat)	No	Yes	–	1,2,4	Moderate	Wet Season Baseflow, Spring Recession Flow, Dry Season Baseflow	N	Y	Y; Valley Foothill Riparian
El Segundo Blue Butterfly (*Euphilotes battoides allyni*)	Endemic to El Segundo Dunes.	Poor/no flow nexus	Yes, currently present	No/–	FE/–	Yes	–	1,2,4	Low	None	N	Y	N
Lorquin's admiral (*Limenitis lorquini*)	Mountain canyons, urban parks, gardens, deciduous woodlands, cottonwood groves and along forest edges.	Poor/no flow nexus	Yes, currently present	Yes, in riparian habitat and adjacent upland habitat/–	No	Yes	–	1,2,4	Low/moderate	None	N	Y	Y, Valley Foothill Riparian

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Sara Orangetip (*Anthocharis sara*)	Orchards, fields, meadows, canyons, hilly oak woodlands and along stream courses.	Poor/no flow nexus	Yes, currently present	Yes, in riparian habitat and adjacent upland habitat/–	No	Yes	–	1,2,4	Moderate	None	N	Y	Y, Riparian Scrub
Crotch's bumble bee (*Bombus crotchii*)	Open grasslands, shrublands, chaparral, desert margins, and semi-urban settings.	Poor/no flow nexus	Yes (CDFW 2025b)	Yes, in riparian habitat and adjacent upland habitat/–	–/SCE	Yes	–	1,2,4	Low	None	N	Y	Y, Riparian Scrub
Benthic macroinvertebrates (BMI)	Rivers and streams.	Moderately understood	Yes, currently present	Yes/–	No	No	–	1,2,4	High	Wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	Y	N	Y, Riverine
Fish													
Pacific lamprey (*Entosphenus tridentata*)	Habitat preferences similar to Steelhead. Anadromous. Would use the LA River and tributary mainstems primarily for migration.	Well understood	Yes	Yes, mainstem migration habitat; soft-bottom tributary spawning and rearing habitat/ Challenging	–/SSC	No	–	1,2,4	High/moderate	Fall pulse flow, wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	Y	N	Y, Riverine
Western brook lamprey (*Lampetra richardsoni*)	Habitat preferences similar to Steelhead. Migratory resident. Would use the LA River and tributary mainstems primarily for migration.	Well understood	Yes	Yes, mainstem migration habitat; soft-bottom tributary spawning and rearing habitat/No	–/SSC	No	–	1,2,4	Moderate	Fall pulse flow, wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	Y	N	Y, Riverine

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Steelhead, southern California Distinct Population Segment (*Oncorhynchus mykiss irideus*)	Unobstructed passage to spawning habitat in upper tributaries needed for adult upstream migration; adequate flow to provide upstream passage during winter-spring; deep, low-velocity areas for resting/holding between winter-spring storms. Anadromous. Would use LA River and tributary mainstems primarily for migration.	Well understood	Yes (Swift and Seigel 1993)	Yes, mainstem migration habitat; soft-bottom tributary spawning and rearing habitat Stillwater Sciences (2020, 2021, 2022)/ Challenging	FE/SE	Yes	–	1,2,4,6,7	High/moderate	Fall pulse flow, wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	Y	N	Y, Riverine
Arroyo chub (*Gila orcuttii*)	Low-velocity areas of streams and rivers with mud or sand bottoms. Resident.	Well understood	Yes (Swift and Seigel 1993)	Yes, in soft-bottom mainstem and tributary habitat/Yes	–/SSC	No	*Schoenoplectus acutus*	1,2,4	Moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	N	Y, Riverine
Santa Ana speckled dace (*Rhinichthys osculus* ssp.)	Riffles in cool perennial streams with water temperatures <20°C. Resident.	Well understood	Yes (Swift and Seigel 1993)	Yes, in soft-bottom tributary habitat/Yes	–/SSC	No	–	1,2,4	Low/moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	N	Y, Riverine
Santa Ana sucker (*Catostomus santaanae*)	Habitat generalists; prefer sand-rubble-boulder substrates, cool, clear water, and algae. Resident.	Well understood	Yes (Swift and Seigel 1993)	Yes, in soft-bottom tributary habitat; possibly in soft-bottom mainstem habitat/Yes	FT/SSC	No	–	1,2,4,8	Moderate	Wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	Y	N	Y, Riverine
Unarmored threespine Stickleback (UTS; *Gasterosteus aculeatus williamsoni*)	Low-velocity areas of streams and rivers with abundant cover provided by vegetation or algae; relatively tolerant of low dissolved oxygen and high water temperatures. Resident.	Well understood	Yes (Swift and Seigel 1993)	Yes, in soft-bottom mainstem and tributary habitat/ Challenging	FE/SE, SFP	No	*Schoenoplectus acutus*	1,2,4	Moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	N	Y, Riverine

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Amphibians													
Black-bellied slender salamander (*Batrechoseps nigriventris*)	Moist microhabitats with leaf litter in riparian woodlands, urban parks, oak woodlands.	Poorly understood/no flow nexus	Yes, per USFWS (2014)	Yes, in adjacent upland habitats/Yes (present; improve habitat)	No	Yes	*Quercus* sp.	1,2,4	Low/moderate	None	N	Y	Y, Valley Foothill Riparian
Coast range newt (*Taricha torosa torosa*)	Habitat with ample canopy and rocky-bottomed pools (Hansen and Shedd 2025). Riparian woodland, terrestrial habitats, with breeding in ponds, reservoirs and slow-moving streams. Larve typically eat small aquatic invertebrates and decomposing organic matter; adults feed primarily on small invertebrates but also on amphibian eggs and larvae.	Well understood	Yes, currently present	Yes, in reaches of upper tributaries with ample canopy, rocky-bottomed pools/–	–/SSC	No	–	1,2,4	High/moderate	Wet season baseflow, spring recession flow	Y	Y	Y, Valley Foothill Riparian
Western toad/California toad (*Anaxyrus boreas halophilus*)	Riparian woodland, urban parks, anywhere with shallow isolated pools remain wet for several weeks/ year for breeding (but particularly in slow moving or still water seasonal pools, ponds, and streams in the LA region).	Well understood	Yes, per USFWS (2014) (California toad)	Yes/Yes (improve habitat)	No	Yes	–	1,2,4	Low/moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
Arroyo Toad (*Anaxyrus californicus*)	Washes, arroyos, sandy riverbanks, avoids areas with heavy riparian growth. Bordering plant communities include Oak Woodland, Chaparral, and Coastal Sage Scrub (Hansen and Shedd 2025); needs exposed sandy streamsides with stable terraces for burrowing.	Well understood	Yes, per USFWS (2014)	Yes, in soft bottom habitat with significant channel modifications/No	FE/SSC	Yes	–	1,2,4	Moderate	Fall pulse flow, wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	Y	Y	N

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Baja California Tree Frog (*Pseudacris hypochondriaca*)	Varied riparian areas, woodlands, emergent vegetation along urban waterways. Aquatic habitat for breeding (e.g., slow streams, permanent and seasonal ponds). Tadpoles are suspension feeders; adults eat a variety of invertebrates (including a high percentage of flying insects).	Well understood	Yes, per USFWS (2014)	Yes/Yes (present; improve habitat)	No	Yes	*Juncus* sp., *Schoenoplectus acutus*	1,2,5	Low/moderate	Wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	Y	Y	Y, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
Reptiles													
Southwestern pond turtle (*Actinemys pallida*)	Permanent, slow-moving fresh or brackish water with available basking sites and adjacent open habitats or forest for nesting; generalists that hunt in the water and feed on a variety of aquatic vegetation and animals.	Well understood	Yes, per USFWS (2014); Yes per CDFW (2024); currently not present	Yes, in soft bottom habitat and areas with access to upland nesting habitat/No	FPT/SSC	Yes	–	1,2,4	High	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Riverine, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
Southern California legless lizard (*Anniella stebbinsi*)	Coastal Dunes and Coastal Sage Scrub but also Oak Woodland, Joshua Tree Woodland, Colorado Desert Scrub, open Mixed Evergreen-Deciduous Forest, open Pinyon-Juniper/ Coniferous Woodland, and Lowland Riparian, as well as arroyos and ephemeral washes where sandy or loamy soils allow for burrowing. Sometimes found in urban settings if soil has not been disturbed or extensively paved over (Hansen and Shedd 2025).	Poor/no flow nexus	Yes, per USFWS (2014)	Yes, in adjacent upland habitat/Yes (present; improve habitat)	–/SSC	No	–	1,2,4	Low/moderate	None	N	Y	Y, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
Side-Blotched Lizard (*Uta stansburiana*)	Open habitats in coastal scrub, grassland, chaparral, and riparian scrub or woodland; feeds on a wide variety of invertebrates; thought to obtain water from its food (Palermo 2000).	Poor/no flow nexus	Yes, per USFWS (2014)	Yes, in riparian habitat/Yes (present; improve habitat)	No	Yes	–	1,2,4	Low	None	N	Y	Y, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub

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California kingsnake (*Lampropeltis californiae*)	Habitat generalist, primarily terrestrial but including marshes and riparian woodland.	Poor/no flow nexus	Yes, per USFWS (2014)	Yes, in adjacent upland habitat/Yes (present; improve habitat)	No	Yes	–	1,2,4	Low/moderate	None	N	Y	Y, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
Two-striped Garter snake (*Thamnophis hammondii*)	Small streams and creeks with scattered pools and open areas for basking, often bordered by willows or other overhanging vegetation. By summer the smaller streams may be reduced to isolated pools. Also occurs in freshwater marshes and vernal pools. Occasionally found away from water. Present in coastal streams where they meet the ocean and also at high elevation in mountain areas (Hansen and Shedd 2025); feeds primarily on amphibians and fish.	Well understood	Yes, per USFWS (2014)	Yes, in soft bottom habitat/Yes (present; improve habitat)	–/SSC	No	*Salix* sp.	1,2,4	High	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Valley Foothill Riparian, Riparian Scrub
Birds													
Western yellow-billed cuckoo (*Coccyzus americanus*)	Open woodland with clearings and low, dense, scrubby vegetation if nesting.	Well understood	Yes, per USFWS (2014); Yes, per CDFW (2024)	No/No	FT/SE	Yes	*Rosa* sp., *Salix* sp., *Sambucus* sp.	1,2,4	High	Wet season baseflow, spring recession flow, dry season baseflow	N	Y	Y, Valley Foothill Riparian
Black-necked stilt (*Himantopus mexicanus*)	Forages in lower LA River in fall, shallow water under 10 cm.	Well understood	Yes, currently present	Yes/–	No	No	–	1,2,4	Moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Riverine
American avocet (*Recurvirostra americana*)	Forages in lower LA River in fall, shallow water under 10 cm.	Well understood	Yes, currently present	Yes/–	No	No	–	1,2,4	Moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Riverine

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Least sandpiper (*Calidris minutilla*)	Forages in lower LA River in fall, shallow water under 10 cm.	Well understood	Yes, per USFWS (2014); nonbreeding	Yes/Yes	No	No	–	1,2,4	Moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Riverine
Western sandpiper (*Calidris mauri*)	Forages in lower LA River in fall, shallow water under 10 cm.	Well understood	Yes, currently present; nonbreeding	Yes/–	No	No	–	1,2,4	Moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Riverine
Long-billed dowitcher (*Limnodromus scolopaceus*)	Forages in lower LA River in fall, shallow water under 10 cm.	Well understood	Yes, currently present; nonbreeding	Yes/–	No	No	–	1,2,4	Moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Riverine
California Brown pelican (*Pelecanus occidentalis californicus*)	Low rocky or brushy slopes of undisturbed islands if nesting; rarely seen inland or far out at sea; roost habitat includes islands, offshore rocks, beaches, mudflats, wharfs, piers, breakwaters, and jetties.	Well understood	Yes, per Stein et al. (2021)	No/–	FD/SD	No	–	1,2,4	Low	None	Y	N	N
Great Blue Heron (*Ardea herodias*)	Shallow coastal marine waters, coastal mangrove swamps, sea beaches, prairie, pasture and cultivated fields, aquacultural ponds, and developed sites where fish scraps can be found when foraging. Nests in trees and bushes near water.	Well understood	Yes, per USFWS (2014)	Yes/Yes	No	Yes	*Juncus* sp., *Schoenoplectus acutus*	1,2,4	High/moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Riverine, Valley Foothill Riparian, Fresh Emergent Wetland
Osprey (*Pandion haliaetus*)	Near shallow, fish-bearing waters atop trees and cliffs if nesting, but in urban areas they typically use artificial nesting platforms or existing artificial structures.	Well understood	Yes, currently present	Yes/Yes (present; improve habitat)	No	Yes (iNaturalist 2025)	–	1,2,4	Moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Riverine, Valley Foothill Riparian

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Cooper's hawk (*Accipiter cooperii*)	Nest and forages in a variety of wooded habitats within and outside of riparian areas; tolerant of human disturbance and habitat fragmentation in urban habitats. While known locally to nest in oaks, frequently utilizes non-native trees such as eucalyptus or pines in the Los Angeles area.	Well understood	Yes, currently present	Yes/–	No	Yes (iNaturalist 2025)	–	1,2,4	Moderate	Wet Season Baseflow, Spring Recession Flow, Dry Season Baseflow	N	Y	Y; Riverine, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
Red-tailed hawk (*Buteo jamaicensis*)	Habitat generalist; nests in prominent trees or artificial structures in oak woodlands, riparian areas, and urban areas.	Well understood	Yes, currently present	Yes/–	No	Yes	*Quercus* sp., *Salix* sp.	1,2,4	Low	None	N	Y	Y, Riverine, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
Belted Kingfisher (*Megaceryle alcyon*)	Open bodies of water for foraging, nesting populations often near woodlands with vertical exposed soil for digging burrows.	Well understood	Yes, per USFWS (2014); nonbreeding	Yes/Yes	No	No	–	1,2,4	Moderate	Wet season baseflow, spring recession flow, dry season baseflow	Y	Y	Y, Riverine, Valley Foothill Riparian, Fresh Emergent Wetland
American kestrel (*Falco sparverius*)	Nests in cavities; known locally to prefer man-made structures. Forages in both riparian and non-riparian areas.	Well understood	Yes, currently present	Yes/–	No	Yes	–	1,2,4	Moderate	Wet Season Baseflow, Spring Recession Flow, Dry Season Baseflow	N	Y	Y; Riverine, Valley Foothill Riparian
American peregrine falcon (*Falco peregrinus anatum*)	Wetlands, woodlands, cities, agricultural lands, and coastal area with cliffs (and rarely broken-top, predominant trees) for nesting; often forages near water. Typically utilizes man-made structures for nesting in Los Angeles.	Well understood	Yes, currently present	Yes/Yes	FD/SD	Yes	–	1,2,4	Low/Moderate	Wet Season Baseflow, Spring Recession Flow, Dry Season Baseflow	Y	Y	Y; Riverine, Valley Foothill Riparian

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Southwestern willow flycatcher (*Empidonax traillii extimus*)	Very dense willow scrub if nesting.	Well understood	Yes, per USFWS (2014); Yes, per CDFW (2024); present but currently not breeding	No/No	FE/SE	Yes	*Rosa* sp., *Salix* sp., *Sambucus* sp., *Quercus* sp.	1,2,4	High	Wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	N	Y	Y, Valley Foothill Riparian
Least Bell's vireo (*Vireo bellii pusillus*)	Dense willow and Riparian Scrub, stratified canopies if nesting.	Well understood	Yes, per USFWS (2014); Yes, per CDFW (2024), Yes, per Stein et al. (2021)	Yes, in riparian habitat and adjacent upland habitat/Yes (present; improve habitat)	FE/SE	Yes	*Rosa* sp., *Salix* sp., *Sambucus* sp.	1,2,4,9	High	Wet season baseflow, wet season peak flows, spring recession flow, dry season baseflow	N	Y	Y, Valley Foothill Riparian, Riparian Scrub
Yellow-breasted chat (*Icteria virens*)	Successional riparian habitats with a dense shrub layer and an open canopy if nesting.	Well understood	Yes, per USFWS (2014); currently greatly reduced in numbers or extirpated as breeders	Yes/Yes	–/SSC	No	*Rosa* sp., *Salix* sp., *Sambucus* sp.	1,2,4	High/moderate	Wet season baseflow, spring recession flow, dry season baseflow	N	Y	Y, Valley Foothill Riparian, Riparian Scrub
Yellow warbler (*Setophaga petechia*)	Open canopy, deciduous riparian woodland close to water, along streams or wet meadows if nesting.	Well understood	Yes, per USFWS (2014); Yes, per Stein et al. (2021)	Yes, in riparian habitat and adjacent upland habitat/Yes (present; improve habitat)	–/SSC	No	*Rosa* sp., *Salix* sp., *Sambucus* sp., *Quercus* sp.	1,2,4	High/moderate	Wet season baseflow, spring recession flow, dry season baseflow	N	Y	Y, Valley Foothill Riparian
Mammals													
Dusky Footed Woodrat (*Neotoma macrotis*)	Riparian woodlands with dense chaparral, and forest habitats of moderate canopy and moderate to dense understory.	Poorly understood/ may be flow nexus whereby it is beneficial for the woodrat to have a stable flow regime so that middens don't get washed away?	Yes, currently present	Yes, in adjacent upland habitat/–	No	Yes	*Salix* sp., *Sambucus* sp.	1,2,4	Low/moderate	None	N	Y	Y, Valley Foothill Riparian, Riparian Scrub

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Mexican free-tailed bat (*Tadarida brasiliensis*)	Over water and surrounding habitats while foraging, primarily on moths, while also other flying insects. Commonly found roosting in bridges.	Beneficial nexus where insect including BMI quantity & biodiversity increased.	Yes, historically and currently present (Natural History Museum 2024 and Stillwater 2024)	Yes/Yes (present; improve habitat)	No	No	–	1,2,4	Low/moderate	Wet season baseflow, spring recession flow, dry season baseflow	N	Y	Y, Riverine, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
California myotis (*Myotis californicus*)	Over open forests and woodlands with sources of water over which to feed while foraging. While foraging low over water and ground, and among shrubs and trees, they forage on midges, moths, beetles, and spiders (Harris n.d.).	Beneficial nexus where insect including BMI quantity and biodiversity increased.	Yes, historically and currently present (Natural History Museum 2024)	Yes/–	No	No	–	1,2,4	High/moderate	Wet season baseflow, spring recession flow, dry season baseflow	N	Y	Y, Riverine, Valley Foothill Riparian
Yuma myotis (*Myotis yumanensis*)	Rivers, streams, and riparian habitats (Bogan et al. 2005). Forages for insects predominantly over waterways and typically includes moths, beetles, mosquitoes, midges, and flies (National Park Service 2024).	Beneficial nexus where aquatic insects (including BMI) contribute significantly to bat diet	Yes, historically and currently present (Natural History Museum 2024)	Yes/–	No	No	–	1,2,4	High/moderate	Wet season baseflow, spring recession flow, dry season baseflow	N	Y	Y, Riverine, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria			Secondary criteria								
		There is a clear flow nexus	Species that historically existed within the watershed	Technologically feasible to be supported in the future flow in LA River[1]	Special-status species (federal/state[2])	Charismatic	Links to culturally important species (to be re-scored after consulting with Tribes)	One or more biodiversity management goals supported by species[3]	Representative of habitat requirements (including flows and trophic levels) of other candidate species	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)	Strong interactor in aquatic zones	Strong interactor in upland riparian communities and/or transitional zones	Links to one or more key vegetation types[4]
Bobcat (*Lynx rufus*)	Habitat generalist, urbanized areas, forests, wetlands, deserts, mountains, grasslands, woodlands.	Well understood	Yes, per USFWS (2014)	Yes, in riparian habitat and adjacent upland habitat/Yes	No	Yes	–	1,2,4	Low/moderate	Wet season baseflow, spring recession flow, dry season baseflow	N	Y	Y, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
Mountain lion (*Puma concolor*)	Habitat generalist; large home ranges include mountainous areas, forested areas, shrubland, and wetlands.	Well understood	Yes, per USFWS (2014)	Yes, in adjacent upland habitat, in river channel primarily only as an occasional dispersal route and water source. /–	No	Yes	–	1,2,4	High	Wet season baseflow, spring recession flow, dry season baseflow	N	Y	Y, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub

Notes: °C = degrees Celsius
BMI = benthic macroinvertebrate
cm = centimeter
LA = Los Angeles

[1] No: Restoration of species is not likely practicable.
Challenging: Restoration of species would be challenging and require substantial riverine, riparian, and watershed modifications.
Yes: Restoration of species is likely with considerable riverine and riparian modifications along the river

[2] Status codes:

Federal		**State**
FE	= Listed as endangered under the federal Endangered Species Act	SE = Listed as Endangered under the California Endangered Species Act
FT	= Listed as threatened under the federal Endangered Species Act	SCE = State candidate for listing as Endangered under the California Endangered Species Act
FPT	= Federally proposed as threatened	SD = State Delisted
FC	= Federal candidate species	SSC = CDFW Species of Special Concern
FD	= Federally delisted	SFP = CDFW Fully Protected species

[3] See Appendix Table A-1 above for Biodiversity Management Goal ID

[4] Key vegetation types were identified based primarily on California Wildlife Habitat Relationship types (CWHR; CDFW 2025a): Fresh Emergent Wetland; Valley Foothill Riparian; and Riverine to match the approach used in SCCWRP (Stein et al. 2021). A Holland classification type, Riparian Scrub, was also included to distinguish between shrub-dominated and tree-dominated riparian systems.

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Table C-2. Assessment for "Representative of habitat requirements (including flows and trophic levels) of other candidate species" criterion.

Potential Focal Species (common name; scientific name)	**California floater (*Anodonta californiensis*)**	**Common green darner (*Anax junius*)**	**Mudflat tiger beetle (*Cicindela trifasciata* ssp. sigmoidea)**	**Western tiger swallowtail (*Papilio rutulus*)**	**El Segundo Blue Butterfly (*Euphilotes battoides allyni*)**	**Lorquin's admiral (*Limenitis lorquini*)**	**Sara Orangetip (*Anthocharis sara*)**	**Crotch' s bumble bee (*Bombus crotchii*)**	**BMI**	**Pacific lamprey (*Entosphenus tridentata*)**	**Western brook lamprey (*Lampetra richardsoni*)**	**Steelhead, southern California DPS (*Oncorhynchus mykiss irideus*)**	**Arroyo chub (*Gila orcuttii*)**	**Santa Ana speckled dace (*Rhinichthys osculus* ssp.)**	**Santa Ana sucker (*Catostomus santaanae*)**	**Unarmored threespine Stickleback (UTS; *Gasterosteus aculeatus williamsoni*)**	**Black-bellied slender salamander (*Batrachoseps nigriventris*)**	**Coast range newt (*Taricha torosa torosa*)**	**Western toad/California toad (*Anaxyrus boreas halophilus*)**	**Arroyo Toad (*Anaxyrus californicus*)**	**Baja California Tree Frog (*Pseudacris hypochondriaca*)**	**Southwestern pond turtle (*Actinemys pallida*)**	**Southern California legless lizard (*Anniella stebbinsi*)**	**Side-Blotched Lizard (*Uta stansburiana*)**	**California kingsnake (*Lampropeltis californiae*)**	**Two-striped Garter snake (*Thamnophis hammondii*)**	**Yellow-billed cuckoo (*Coccyzus americanus*)**	**Black-necked stilt (*Himantopus mexicanus*)**	**American avocet (*Recurvirostra americana*)**	**Least sandpiper (*Calidris minutilla*)**	**Western sandpiper (*Calidris mauri*)**	**Long-billed dowitcher (*Limnodromus scolopaceus*)**	**California Brown pelican (*Pelecanus occidentalis californicus*)**	**Great Blue Heron (*Ardea herodias*)**	**Osprey (*Pandion haliaetus*)**	**Cooper's hawk (*Accipiter cooperii*)**	**Red-tailed hawk (*Buteo jamaicensis*)**	**Belted Kingfisher (*Megaceryle alcyon*)**	**American kestrel (*Falco sparverius*)**	**American peregrine falcon (*Falco peregrinus anatum*)**	**Southwestern willow flycatcher (*Empidonax traillii extimus*)**	**Least Bell' s vireo (*Vireo bellii pusillus*)**	**Yellow-breasted chat (*Icteria virens*)**	**Yellow warbler (*Setophaga petechia*)**	**Dusky Footed Woodrat (*Neotoma macrotis*)**	**Mexican free-tailed bat (*Tadarida brasiliensis*)**	**California myotis (*Myotis californicus*)**	**Yuma myotis (*Myotis yumanensis*)**	**Bobcat (*Lynx rufus*)**	**Mountain lion (*Puma concolor*)**
California floater (*Anodonta californiensis*)									●	●	●	●	●	●	●	●					●																									●	●	●		
Common green darner (*Anax junius*)												●	●	●	●	●			●		●	●				●	●							●			●	●			●	●	●	●						
Western tiger swallowtail (*Papilio rutulus*)								●											●		●		●	●	●		●							●			●	●			●	●	●	●						
Steelhead, southern California DPS (*Oncorhynchus mykiss irideus*)	●	●							●	●	●		●	●	●	●		●	●		●	●				●								●	●			●		●						●	●	●		
Santa Ana sucker (*Catostomus santaanae*)	●	●							●				●	●		●		●	●		●					●								●	●			●		●						●	●	●		
Arroyo chub (*Gila orcuttii*)	●	●																																																
Arroyo Toad (*Anaxyrus californicus*)							●	●	●				●								●		●	●	●									●		●	●		●					●		●	●	●	●	
Baja California Tree Frog (*Pseudacris hypochondriaca*)	●	●		●		●	●												●				●	●										●		●	●								●	●	●	●		●
Southwestern pond turtle (*Actinemys pallida*)		●				●	●		●				●		●	●	●		●		●		●	●		●								●		●	●	●	●				●	●	●		●	●	●	●
Black-necked stilt (*Himantopus mexicanus*)									●										●		●			●					●	●	●	●		●	●		●	●		●						●	●	●		
Osprey (*Pandion haliaetus*)							●		●										●		●		●	●	●											●	●	●	●	●			●	●		●	●	●		●
Belted Kingfisher (*Megaceryle alcyon*)		●		●			●		●										●		●	●	●	●	●										●	●	●		●	●			●	●	●	●	●	●		
Least Bell's vireo (*Vireo bellii pusillus*)		●		●		●	●		●										●		●	●	●	●	●	●	●							●	●	●	●	●	●		●		●	●	●		●	●	●	●
Yuma myotis (*Myotis yumanensis*)	●					●	●		●															●	●		●							●	●		●	●		●	●	●	●	●	●	●	●		●	●
Bobcat (*Lynx rufus*)						●	●																●	●	●											●			●						●					●
Mountain lion (*Puma concolor*)						●	●	●	●								●	●	●		●	●	●	●	●	●								●	●	●	●	●	●					●	●	●	●	●	●	

Table C-3. Candidate focal species scoring.

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria				Secondary criteria									
		There is a clear flow nexus[1]	Species historically existed in the watershed[1]	Technologically feasible to be supported in the future flow in LA River[1, 2]	Pass/no pass primary criteria	Special-status species (Federal/State)[1, 3]	Charismatic[1]	Links to culturally important species (to be re-scored after consulting with Tribes)[1]	One or more biodiversity management goals supported by species[1, 4]	Representative of habitat requirements (including flows and trophic levels) of other candidate species[1]	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)[1]	Strong interactor in aquatic zones[1]	Strong interactor in upland riparian communities and/or transitional zones[1]	Links to one or more key vegetation types[1, 5]	Total secondary criteria score
Invertebrates															
California floater (Anodonta californiensis)	Lakes slow rivers, and some reservoirs, typically on mud or sand substrate	10	10	10	Pass	0	0	0	6	4	10	5	0	4	**29**
Common green darner (Anax junius)	Eggs laid in aquatic vegetation; nymphs in lakes, ponds, wetland, and backwaters/slow-moving waters of rivers and streams; Adults strong fliers and can be migratory	10	10	10	Pass	0	10	0	6	6	10	5	0	8	**45**
Mudflat tiger beetle (*Cicindela trifasciata* ssp. *sigmoidea*)	Mudflats along coast and edges of marshes and rivers inland.	5	5	10	No pass	0	0	0	6	4	8	0	5	4	–
Western tiger swallowtail (*Papilio rutulus*)	Host plants include many riparian trees (Populus, Salix, Prunus, Fraxinus, Quercus, Alnus); Adults frequently seen in riparian areas, urban parks and gardens, and rural woodlands; mudpuddling along shorelines	10	10	10	Pass	0	10	0	6	6	6	0	5	4	37
El Segundo Blue Butterfly (*Euphilotes battoides allyni*)	Endemic to El Segundo Dunes.	0	10	0	No pass	10	10	0	6	2	0	0	5	0	–
Lorquin's admiral (*Limenitis lorquini*)	Mountain canyons, urban parks, gardens, deciduous woodlands, cottonwood groves and along forest edges.	0	10	10	No pass	0	10	0	6	4	0	0	5	4	–
Sara Orangetip (*Anthocharis sara*)	Orchards, fields, meadows, canyons, hilly oak woodlands and along stream courses.	0	10	10	No pass	0	10	0	6	6	0	0	5	0	–
Crotch's bumble bee (*Bombus crotchii*)	Open grasslands, shrublands, chaparral, desert margins, and semi-urban settings.	0	10	10	No pass	10	10	0	6	2	0	0	5	0	–
Benthic macroinvertebrates	Rivers and streams.	5	10	10	No pass	0	0	0	6	10	8	5	0	4	–

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria				Secondary criteria									
		There is a clear flow nexus[1]	Species historically existed in the watershed[1]	Technologically feasible to be supported in the future flow in LA River[1, 2]	Pass/no pass primary criteria	Special-status species (Federal/State)[1, 3]	Charismatic[1]	Links to culturally important species (to be re-scored after consulting with Tribes)[1]	One or more biodiversity management goals supported by species[1, 4]	Representative of habitat requirements (including flows and trophic levels) of other candidate species[1]	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)[1]	Strong interactor in aquatic zones[1]	Strong interactor in upland riparian communities and/or transitional zones[1]	Links to one or more key vegetation types[1, 5]	Total secondary criteria score
Fish															
Pacific lamprey (*Entosphenus tridentata*)	Habitat preferences similar to Steelhead. Anadromous. Would use the LA River and tributary mainstems primarily for migration.	10	10	10	Pass	10	0	0	6	8	10	5	0	4	**43**
Western brook lamprey (*Lampetra richardsoni*)	Habitat preferences similar to Steelhead. Migratory resident. Would use the LA River and tributary mainstems primarily for migration.	10	10	10	Pass	10	0	0	6	6	10	5	0	4	**41**
Steelhead, southern California DPS (*Oncorhynchus mykiss irideus*)	Unobstructed passage to spawning habitat in upper tributaries needed for adult upstream migration; adequate flow to provide upstream passage during winter-spring; deep, low-velocity areas for resting/holding between winter-spring storms. Anadromous. Would use LA River and tributary mainstems primarily for migration.	10	10	10	Pass	10	10	0	10	8	10	5	0	4	**57**
Arroyo chub (*Gila orcuttii*)	Low-velocity areas of streams and rivers with mud or sand bottoms. Resident.	10	10	10	Pass	10	0	4	6	6	6	5	0	4	**41**
Santa Ana speckled dace (*Rhinichthys osculus* ssp.)	Riffles in cool perennial streams with water temperatures <20°C. Resident.	10	10	10	Pass	10	0	0	6	4	6	5	0	4	**37**
Santa Ana sucker (*Catostomus santaanae*)	Habitat generalists; prefer sand-rubble-boulder substrates, cool, clear water, and algae. Resident.	10	10	10	Pass	10	0	0	8	6	8	5	0	4	**41**
Unarmored threespine Stickleback (UTS; *Gasterosteus aculeatus williamsoni*)	Low-velocity areas of streams and rivers with abundant cover provided by vegetation or algae; relatively tolerant of low dissolved oxygen and high water temperatures. Resident.	10	10	10	Pass	10	0	4	6	6	6	5	0	4	**41**

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria				Secondary criteria									
		There is a clear flow nexus[1]	Species historically existed in the watershed[1]	Technologically feasible to be supported in the future flow in LA River[1, 2]	Pass/no pass primary criteria	Special-status species (Federal/State)[1, 3]	Charismatic[1]	Links to culturally important species (to be re-scored after consulting with Tribes)[1]	One or more biodiversity management goals supported by species[1, 4]	Representative of habitat requirements (including flows and trophic levels) of other candidate species[1]	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)[1]	Strong interactor in aquatic zones[1]	Strong interactor in upland riparian communities and/or transitional zones[1]	Links to one or more key vegetation types[1, 5]	Total secondary criteria score
Amphibians															
Black-bellied slender salamander (*Batrechoseps nigriventris*)	Moist microhabitats with leaf litter in riparian woodlands, urban parks, oak woodlands.	0	10	10	No pass	0	10	4	6	4	0	0	5	4	–
Coast range newt (*Taricha torosa torosa*)	Habitat with ample canopy and rocky-bottomed pools (Hansen and Shedd 2025). Riparian woodland, terrestrial habitats, with breeding in ponds, reservoirs and slow-moving streams. Larve typically eat small aquatic invertebrates and decomposing organic matter; adults feed primarily on small invertebrates but also on amphibian eggs and larvae.	10	10	10	Pass	10	0	0	6	8	4	5	5	4	**44**
Western toad/California toad (*Anaxyrus boreas halophilus*)	Riparian woodland, urban parks, anywhere with shallow isolated pools remain wet for several weeks/ year for breeding (but particularly in slow moving or still water seasonal pools, ponds, and streams in the LA region).	10	10	10	Pass	0	10	0	6	4	6	5	5	8	**44**
Arroyo Toad (*Anaxyrus californicus*)	Washes, arroyos, sandy riverbanks, avoids areas with heavy riparian growth. Bordering plant communities include Oak Woodland, Chaparral, and Coastal Sage Scrub (Hansen and Shedd 2025); needs exposed sandy streamsides with stable terraces for burrowing.	10	10	10	Pass	10	10	0	6	6	10	5	5	0	**52**

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria				Secondary criteria									
		There is a clear flow nexus[1]	Species historically existed in the watershed[1]	Technologically feasible to be supported in the future flow in LA River[1, 2]	Pass/no pass primary criteria	Special-status species (Federal/State)[1, 3]	Charismatic[1]	Links to culturally important species (to be re-scored after consulting with Tribes)[1]	One or more biodiversity management goals supported by species[1, 4]	Representative of habitat requirements (including flows and trophic levels) of other candidate species[1]	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)[1]	Strong interactor in aquatic zones[1]	Strong interactor in upland riparian communities and/or transitional zones[1]	Links to one or more key vegetation types[1, 5]	Total secondary criteria score
Baja California Tree Frog (*Pseudacris hypochondriaca*)	Varied riparian areas, woodlands, emergent vegetation along urban waterways. Aquatic habitat for breeding (e.g., slow streams, permanent and seasonal ponds). Tadpoles are suspension feeders; adults eat a variety of invertebrates (including a high percentage of flying insects).	10	10	10	Pass	0	10	6	6	4	8	5	5	8	**52**
Reptiles															
Southwestern pond turtle (*Actinemys pallida*)	Permanent, slow-moving fresh or brackish water with available basking sites and adjacent open habitats or forest for nesting; generalists that hunt in the water and feed on a variety of aquatic vegetation and animals.	10	10	10	Pass	10	10	0	6	10	6	5	5	10	**62**
Southern California legless lizard (*Anniella stebbinsi*)	Coastal Dunes and Coastal Sage Scrub but also Oak Woodland, Joshua Tree Woodland, Colorado Desert Scrub, open Mixed Evergreen-Deciduous Forest, open Pinyon-Juniper/ Coniferous Woodland, and Lowland Riparian, as well as arroyos and ephemeral washes where sandy or loamy soils allow for burrowing. Sometimes found in urban settings if soil has not been disturbed or extensively paved over (Hansen and Shedd 2025).	0	10	10	No pass	10	0	0	6	4	0	0	5	8	–
Side-Blotched Lizard (*Uta stansburiana*)	Open habitats in coastal scrub, grassland, chaparral, and riparian scrub or woodland; feeds on a wide variety of invertebrates; thought to obtain water from its food (Palermo 2000).	0	10	10	No pass	0	10	0	6	2	0	0	5	8	–

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria				Secondary criteria									
		There is a clear flow nexus[1]	Species historically existed in the watershed[1]	Technologically feasible to be supported in the future flow in LA River[1, 2]	Pass/no pass primary criteria	Special-status species (Federal/State)[1, 3]	Charismatic[1]	Links to culturally important species (to be re-scored after consulting with Tribes)[1]	One or more biodiversity management goals supported by species[1, 4]	Representative of habitat requirements (including flows and trophic levels) of other candidate species[1]	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)[1]	Strong interactor in aquatic zones[1]	Strong interactor in upland riparian communities and/or transitional zones[1]	Links to one or more key vegetation types[1, 5]	Total secondary criteria score
California kingsnake (*Lampropeltis californiae*)	Habitat generalist, primarily terrestrial but including marshes and riparian woodland.	0	10	10	No pass	0	10	0	6	4	0	0	5	8	–
Two-striped Garter snake (*Thamnophis hammondii*)	Small streams and creeks with scattered pools and open areas for basking, often bordered by willows or other overhanging vegetation. By summer the smaller streams may be reduced to isolated pools. Also occurs in freshwater marshes and vernal pools. Occasionally found away from water. Present in coastal streams where they meet the ocean and also at high elevation in mountain areas (Hansen and Shedd 2025); feeds primarily on amphibians and fish.	10	10	10	Pass	10	0	4	6	10	6	5	5	6	**52**
BirdsWestern yellow-billed cuckoo (*Coccyzus americanus*)	Open woodland with clearings and low, dense, scrubby vegetation if nesting.	10	10	0	No pass	10	10	8	6	10	6	0	5	4	–
Black-necked stilt (*Himantopus mexicanus*)	Forages in lower LA River in fall, shallow water under 10 cm.	10	10	10	Pass	0	0	0	6	6	6	5	5	4	**32**
American avocet (*Recurvirostra americana*)	Forages in lower LA River in fall, shallow water under 10 cm.	10	10	10	Pass	0	0	0	6	6	6	5	5	4	**32**
Least sandpiper (*Calidris minutilla*)	Forages in lower LA River in fall, shallow water under 10 cm.	10	10	10	Pass	0	0	0	6	6	6	5	5	4	**32**
Western sandpiper (*Calidris mauri*)	Forages in lower LA River in fall, shallow water under 10 cm.	10	10	10	Pass	0	0	0	6	6	6	5	5	4	**32**
Long-billed dowitcher (*Limnodromus scolopaceus*)	Forages in lower LA River in fall, shallow water under 10 cm.	10	10	10	Pass	0	0	0	6	6	6	5	5	4	**32**
California Brown pelican (*Pelecanus occidentalis californicus*)	Low rocky or brushy slopes of undisturbed islands if nesting; rarely seen inland or far out at sea; roost habitat includes islands, offshore rocks, beaches, mudflats, wharfs, piers, breakwaters, and jetties.	10	10	0	No pass	0	0	0	6	2	0	5	0	0	–

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria				Secondary criteria									
		There is a clear flow nexus[1]	Species historically existed in the watershed[1]	Technologically feasible to be supported in the future flow in LA River[1, 2]	Pass/no pass primary criteria	Special-status species (Federal/State)[1, 3]	Charismatic[1]	Links to culturally important species (to be re-scored after consulting with Tribes)[1]	One or more biodiversity management goals supported by species[1, 4]	Representative of habitat requirements (including flows and trophic levels) of other candidate species[1]	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)[1]	Strong interactor in aquatic zones[1]	Strong interactor in upland riparian communities and/or transitional zones[1]	Links to one or more key vegetation types[1, 5]	Total secondary criteria score
Great Blue Heron (*Ardea herodias*)	Shallow coastal marine waters, coastal mangrove swamps, sea beaches, prairie, pasture and cultivated fields, aquacultural ponds, and developed sites where fish scraps can be found when foraging. Nests in trees and bushes near water.	10	10	10	Pass	0	10	6	6	8	6	5	5	8	**56**
Osprey (*Pandion haliaetus*)	Near shallow, fish-bearing waters atop trees and cliffs if nesting, but in urban areas they typically use artificial nesting platforms or existing artificial structures.	10	10	10	Pass	0	10	0	6	6	6	5	5	6	**44**
Cooper's hawk (*Accipiter cooperii*)	Nest and forages in a variety of wooded habitats within and outside of riparian areas; tolerant of human disturbance and habitat fragmentation in urban habitats. While known locally to nest in oaks, frequently utilizes non-native trees such as eucalyptus or pines in the Los Angeles area.	10	10	10	Pass	0	10	0	6	6	6	5	5	10	**43**
Red-tailed hawk (*Buteo jamaicensis*)	Habitat generalist; nests in prominent trees or artificial structures in oak woodlands, riparian areas, and urban areas.	10	10	10	Pass	0	10	0	6	2	0	0	5	10	**39**
Belted Kingfisher (*Megaceryle alcyon*)	Open bodies of water for foraging, nesting populations often near woodlands with vertical exposed soil for digging burrows.	10	10	10	Pass	0	10	6	6	6	6	5	5	8	**54**
American kestrel (*Falco sparverius*)	Nests in cavities; known locally to prefer man-made structures. Forages in both riparian and non-riparian areas.	10	10	10	Pass	0	10	10	6	6	6	0	5	6	**39**

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria				Secondary criteria									
		There is a clear flow nexus[1]	Species historically existed in the watershed[1]	Technologically feasible to be supported in the future flow in LA River[1, 2]	Pass/no pass primary criteria	Special-status species (Federal/State)[1, 3]	Charismatic[1]	Links to culturally important species (to be re-scored after consulting with Tribes)[1]	One or more biodiversity management goals supported by species[1, 4]	Representative of habitat requirements (including flows and trophic levels) of other candidate species[1]	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)[1]	Strong interactor in aquatic zones[1]	Strong interactor in upland riparian communities and/or transitional zones[1]	Links to one or more key vegetation types[1, 5]	Total secondary criteria score
American peregrine falcon (*Falco peregrinus anatum*)	Wetlands, woodlands, cities, agricultural lands, and coastal area with cliffs (and rarely broken-top, predominant trees) for nesting; often forages near water. Typically utilizes man-made structures for nesting in Los Angeles.	10	10	10	Pass	0	10	10	6	4	6	5	5	6	**42**
Southwestern willow flycatcher (*Empidonax traillii extimus*)	Very dense willow scrub if nesting.	10	10	0	No pass	10	10	10	6	10	8	0	5	4	–
Least Bell's vireo (*Vireo bellii pusillus*)	Dense willow and Riparian Scrub, stratified canopies if nesting.	10	10	10	Pass	10	10	8	8	10	8	0	5	6	**65**
Yellow-breasted chat (*Icteria virens*)	Successional riparian habitats with a dense shrub layer and an open canopy if nesting.	10	10	10	Pass	10	0	8	6	8	6	0	5	6	**49**
Yellow warbler (*Setophaga petechia*)	Open canopy, deciduous riparian woodland close to water, along streams or wet meadows if nesting.	10	10	10	Pass	10	0	10	6	8	6	0	5	4	**51**
Mammals															
Mexican free-tailed bat (*Tadarida brasiliensis*)	Over water and surrounding habitats while foraging, primarily on moths, while also other flying insects. Commonly found roosting in bridges.	10	10	10	Pass	0	0	0	6	4	6	0	5	6	**27**
California myotis (*Myotis californicus*)	Over open forests and woodlands with sources of water over which to feed while foraging. While foraging low over water and ground, and among shrubs and trees, they forage on midges, moths, beetles, and spiders (Harris n.d.).	10	10	10	Pass	0	0	0	6	8	6	0	5	10	**35**

Potential focal species (common name; *scientific name*)	Habitat preferences	Primary criteria				Secondary criteria									
		There is a clear flow nexus[1]	Species historically existed in the watershed[1]	Technologically feasible to be supported in the future flow in LA River[1, 2]	Pass/no pass primary criteria	Special-status species (Federal/State)[1, 3]	Charismatic[1]	Links to culturally important species (to be re-scored after consulting with Tribes)[1]	One or more biodiversity management goals supported by species[1, 4]	Representative of habitat requirements (including flows and trophic levels) of other candidate species[1]	Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)[1]	Strong interactor in aquatic zones[1]	Strong interactor in upland riparian communities and/or transitional zones[1]	Links to one or more key vegetation types[1, 5]	Total secondary criteria score
Yuma myotis (*Myotis yumanensis*)	Rivers, streams, and riparian habitats (Bogan et al. 2005). Forages for insects predominantly over waterways and typically includes moths, beetles, mosquitoes, midges, and flies (National Park Service 2024).	10	10	10	Pass	0	0	0	6	8	6	0	5	10	**35**
Bobcat (*Lynx rufus*)	Habitat generalist, urbanized areas, forests, wetlands, deserts, mountains, grasslands, woodlands.	10	10	10	Pass	0	10	0	6	4	6	0	5	8	**39**
Mountain lion (*Puma concolor*)	Habitat generalist; large home ranges include mountainous areas, forested areas, shrubland, and wetlands.	10	10	10	Pass	0	10	0	6	10	6	0	5	8	**45**

[1] Scoring key:

There is a clear flow nexus
- 10 = Well understood
- 0 = Poorly understood/no flow nexus
- 0 = Poor/no flow nexus
- 10 = Beneficial nexus where aquatic insects (including BMI) contribute significantly to bat diet
- 10 = Beneficial nexus where insect including BMI quantity & biodiversity increased
- 10 = Poorly understood/may be flow nexus whereby it is beneficial for the woodrat to have a stable flow regime so that middens don't get washed away?
- 5 = Moderately understood

Technologically feasible to be supported in the future flow in LA River
- 10 = Yes
- 10 = Yes; mainstem migration habitat; soft-bottom tributary spawning & rearing habitat/No
- 10 = Yes; mainstem migration habitat; soft-bottom tributary spawning & rearing habitat/Challenging
- 10 = Yes; mainstem migration habitat; soft-bottom tributary spawning & rearing habitat Stillwater Sciences (2020, 2021, 2022)/Challenging
- 10 = Yes; in soft-bottom tributary habitat; possibly in soft-bottom mainstem habitat/Yes
- 10 = Yes; in soft-bottom mainstem and tributary habitat/Yes
- 10 = Yes; in soft-bottom mainstem and tributary habitat/Challenging
- 10 = Yes; in soft-bottom tributary habitat/Yes
- 10 = Yes/Yes (present; improve habitat)
- 10 = Yes/Yes (improve habitat)
- 10 = Yes; in soft bottom habitat with significant channel modifications/No
- 10 = Yes; in reaches of upper tributaries with ample canopy, rocky-bottomed pools/–
- 10 = Yes; in adjacent upland habitats/Yes (present; improve habitat)
- 10 = Yes; in soft bottom habitat/Yes (present; improve habitat)

Species historically existed in the watershed
- 10 = Yes
- 10 = Yes (Swift and Seigel 1993)
- 10 = Yes per USFWS (2014)
- 10 = Yes per USFWS (2014) (California toad)
- 10 = Yes per USFWS (2014); Yes per CDFW (2025b); currently not present
- 10 = Yes; historically and currently present (Natural History Museum 2024)
- 10 = Yes; historically and currently present (Natural History Museum 2024 and Stillwater 2024)
- 10 = Yes per USFWS (2014); Yes per CDFW (2025b), Yes per Stein et al. (2021)
- 10 = Yes per USFWS (2014); Yes per Stein et al. (2021)
- 10 = Yes per USFWS (2014); Yes per CDFW (2025b); present but currently not breeding
- 10 = Yes per USFWS (2014); currently greatly reduced in numbers or extirpated as breeders
- 10 = Yes per USFWS (2014); Yes per CDFW (2025b)
- 10 = Yes per USFWS (2014); nonbreeding
- 10 = Yes per Stein et al. (2021)
- 10 = Yes (CDFW 2025b)
- 10 = Yes; currently present; nonbreeding
- 10 = Yes; currently present
- 5 = Unknown
- 0 = No

Special-status species (Federal/State)
- 10 = –/SSC
- 10 = FE /SE
- 10 = FT/SSC
- 10 = FE/SE, SFP

10 = Yes; in soft bottom habitat and areas with access to upland nesting habitat/No
10 = Yes; in adjacent upland habitat/Yes (present; improve habitat)
10 = Yes; in riparian habitat/Yes (present; improve habitat)
10 = Yes; in adjacent upland habitat/–
10 = Yes; in adjacent upland habitat, in river channel primarily only as an occasional dispersal route and water source/–
10 = Yes; in riparian habitat and adjacent upland habitat/Yes
10 = Yes; in riparian habitat and adjacent upland habitat/Yes (present; improve habitat)
10 = Yes; in riparian habitat and adjacent upland habitat/–
10 = Yes; currently present/–
10 = Yes/Yes
0 = No/–
0 = No/No

Charismatic
10 = Yes
0 = No

One or more Biodiversity Management Goals Supported by Species
10 = 1,2,4,6,7
8 = 1,2,4,8
8 = 1,2,4,9
6 = 1,2,4
6 = 1,2,5
0 = 0

Representative of one or more key components of the functional flow hydrograph (i.e., base flow, winter/spring peak)
10 = Fall Pulse Flow, Wet Season Baseflow, Wet Season Peak Flows, Spring Recession Flow, Dry Season Baseflow
8 = Wet Season Baseflow, Wet Season Peak Flows, Spring Recession Flow, Dry Season Baseflow
6 = Wet Season Baseflow, Spring Recession Flow, Dry Season Baseflow
6 = Wet Season Baseflow, Spring Recession Flow, Dry Season Baseflow
4 = Wet Season Baseflow, Spring Recession Flow
0 = none

Strong interactor in upland riparian communities and/or transitional zones
5 = Yes
0 = No

10 = FE/SSC
10 = FPT/SSC
10 = FT/SE
10 = –/SCE
10 = FE/–
0 = FD/SD
0 = None

Links to culturally important species (to be re-scored after consulting with Tribes)
10 = *Rosa* sp., *Salix* sp., *Sambucus* sp., *Quercus* sp.
8 = *Rosa* sp., *Salix* sp., *Sambucus* sp.
6 = *Juncus* sp., *Schoenoplectus acutus*
6 = *Salix* sp., *Sambucus* sp.
6 = *Salix* sp., *Quercus* sp.
4 = *Schoenoplectus acutus*
4 = *Quercus* sp.
4 = *Salix* sp.
0 = –

Representative of habitat requirements (including flows and trophic levels) of other native species
10 = High
8 = High/Moderate
6 = Moderate
4 = Low/Moderate
2 = Low
0 = 0

Strong interactor in aquatic zones
5 = Yes
0 = No

Links to one or more key vegetation types
10 = Yes; Riverine, Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
8 = Yes; Valley Foothill Riparian, Fresh Emergent Wetland, Riparian Scrub
8 = Yes; Riverine, Valley Foothill Riparian, Fresh Emergent Wetland
6 = Yes; Valley Foothill Riparian, Riparian Scrub
6 = Yes; Riverine, Valley Foothill Riparian, Riparian Scrub
6 = Yes; Riverine, Valley Foothill Riparian
4 = Yes; Riverine
4 = Yes; Valley Foothill Riparian
4 = Yes; Riverine, Fresh Emergent Wetland
0 = Yes; Riparian Scrub
0 = No

[2] N: Restoration of species is not likely practicable
C: Restoration of species would be challenging and require substantial riverine, riparian, and watershed modifications.
Y: Restoration of species is likely with considerable riverine and riparian modifications along the river

[3] Status codes:

Federal
FE = Listed as endangered under the federal Endangered Species Act
FT = Listed as threatened under the federal Endangered Species Act
FPT = Federally proposed as threatened
FC = Federal candidate species
FD = Federally delisted

State
SE = Listed as Endangered under the California Endangered Species Act
SCE = State candidate for listing as Endangered under the California Endangered Species Act
SD = State Delisted
SSC = CDFW Species of Special Concern
SFP = CDFW Fully Protected species

[4] See Appendix Table A-1 above for Biodiversity Management Goal ID

[5] Key vegetation types were identified based primarily on California Wildlife Habitat Relationship types (CWHR; CDFW 2025a): Fresh Emergent Wetland; Valley Foothill Riparian; and Riverine to match the approach used in SCCWRP (Stein et al. 2021). A Holland classification type, Riparian Scrub, was also included to distinguish between shrub-dominated and tree-dominated riparian systems.

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