Biological Resources Survey and Report for "Baseline Dry Season In-Channel Vegetation Mapping"

Los Angeles River (and selected reference sites)

Los Angeles River through Elysian Valley, showing characteristic mix of terrestrial and aquatic habitats. Photo taken by D.S. Cooper in May 2021 during survey for Mountains Recreation and Conservation Authority

Prepared for:

Watershed Conservation Authority
Azusa, California

and

Mountains Recreation and Conservation Authority
Los Angeles, California

Date: February 28, 2022

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Summary

In late 2021 and early 2022, we surveyed and mapped the entire length of the Los Angeles River channel, from the mid-San Fernando Valley (vic. Canoga Park) to the mouth at Long Beach harbor. We added four coarse-scale habitat types to the four initially identified by Stein et al. (2021a, 2021b; hereafter "Flows Study"), for a total of eight types:

1. Wading shorebird habitat
2. Freshwater marsh habitat
3. Riparian habitat;
4. Warm water habitat;
5. Non-native Trees and Shrubs (this study);
6. Transitional Herbaceous (this study);
7. Bare Channel – Natural (this study); and
8. Bare Channel – Concrete (this study)

Within these categories, we produced fine-scale maps for portions of four natural-floor stretches (i.e., where concrete was not poured onto the bed of the river, allowing natural vegetation to develop). We were not able to access several areas due to safety concerns (illegal encampments) or because they were too time-consuming to safely access. This fine-scale mapping resulted in 133 discrete vegetation communities, based on Manual of California Vegetation criteria (Sawyer et al. 2009), adapted for use in urban areas where non-native herbs and shrubs frequently dominate. We must emphasize that this assessment represents a "snapshot in time" based on the unique characteristics of prior years' rainfall and existing conditions; the Los Angeles River (and its tributaries) is a highly-dynamic system, so current distribution and makeup of particularly vegetation communities is expected to change each season (and each year).

We recorded 243 plant species in the channel, of which at least 98 are considered native and naturally-occurring in the region. Through herbarium research, we found that as many as 43 native plant species have apparently been extirpated along the river channel. By species frequency, Glendale Narrows had the most native-dominated vegetation, while one of our reference sites, Rio Hondo, had the least, presumably owing to the abundance of weedy forbs on the sandy bed and sides of the Rio Hondo. By proportion as well as numerically, Elysian Valley was found to support the highest number of native species, but it also had the highest number of non-native species (and it was the largest natural-floor area surveyed). Structurally, the vegetation in Sepulveda Basin was the most woodland-like (75% of vegetation points >5 meters tall), while Willow St. and Compton Creek and almost no vegetation higher than 5 meters tall, again illustrating the broad variation between sites.

Interestingly, many common native "hillside" plants were apparently *totally absent* from the river channel vegetation (except where planted in pocket parks), including sages (*Salvia* spp.), rushes (*Juncus* spp.), carrots (Apiaceae) mustards (Brassicaceae), buckthorns (Rhamnaceae; e.g., *Ceanothus*), coast live oak (*Quercus agrifolia*)[1], and blue elderberry (*Sambucus caerulea*).

[1] A handful in Sepulveda Basin appear to have been planted.

We found two notable microhabitat communities along the river channel and its reference sites, including a periodically-inundated area of the lower river channel in Long Beach which resembled an alkali vernal pool, and which supported the globally-rare (CNPS Rank 1) southern tarplant (*Centromadia parry* ssp. *australis*) as well as the range-restricted, highly specialized wetsalts tiger beetle (*Cicindela haemorrhagica*), both of which occur on areas of drying mud away from the main flow of the river channel.

We found that the Rio Hondo still supports elements of what had historically been a large area of alluvial fan scrub, located on and just outside the eastern bank of the channel within the Whittier Narrows Recreation area north of the 60 Fwy. This unique habitat is locally present at the base of the San Gabriel Mountains (e.g., Santa Fe Dam) but is otherwise absent downstream. We also found what may be a rare aquatic plant in the Sepulveda Basin stretch near Balboa Blvd., Sanford's arrowleaf (*Sagittaria sanfordii*), but are awaiting positive identification.

In terms of management, we observed that ample opportunities exist for promotion of native flora and control of non-natives both within and outside the channel, in the form of vegetation management and park creation. However, we noted continuing and increasing degradation of the remaining habitat by illegal encampments, resulting in frequent fires and disturbance through noise and human activity, including piles of trash and other waste in some of the most sensitive habitats along the river.

Background

This report was funded jointly by two local agencies, Watershed Conservation Authority (WCA) and Mountains Recreation and Conservation Authority (MRCA) with the support of Rivers and Mountains Conservancy (RMC) and Santa Monica Mountains Conservancy (SMMC)- referred to hereafter as "the Conservancies". MRCA funded the "upper" portion of the study, north of Vernon (including Sepulveda Basin and Elysian Valley); WCA funded the portion of the study from Vernon southward (including Long Beach). With this report, we synthesize prior ecological investigation along the Los Angeles River and associated waterways to devise and implement a simple, replicable vegetation mapping protocol. We then use this protocol to map various sections at appropriate scale suitable for crafting management strategies and approaches, with more complex habitats mapped at a finer scale. We also identify and inventory select areas of greatest botanical interest along the Los Angeles River, as well as two reference sites suggested by WCA/MRCA staff, Rio Hondo and Compton Creek.

Though discussion with the Conservancies, we prioritized stretches of the channel(s) most likely to be impacted by future water level changes for our surveys, in particular the lowermost reach of the Los Angeles River ("Willow Street Estuary", from Willow St. south to Pacific Coast Highway), the near-fully-natural stretch of Rio Hondo north of State Route 60, and the Los Angeles River upstream of Burbank Blvd. in the Sepulveda Basin. These areas have retained the most natural topography and native flora *in situ*, and could serve as reference sites for future restoration.

Specifically, we:

1. Reviewed prior research on vegetation of the "modern" Los Angeles River channel;
2. Fully describe our mapping methodology;
3. Present and analyze results of mapping;
4. Discuss how findings may inform future management decisions regarding base flow management targets;
5. Discuss goals for in channel habitat enhancements in the Los Angeles River;
6. Discuss potential for habitat enhancements in Compton Creek and Rio Hondo to affect or be affected by projected changes in flow levels and other in-channel habitat change in the mainstem Lower Los Angeles River; and
7. Discuss potential for habitat enhancements in Glendale Narrows and elsewhere in the Upper Los Angeles River.

We have drawn on existing studies that have been conducted in and around the study area. In particular, we review and summarize relevant findings from the "Flows Study", which was divided into two separate documents:

1. *Assessment of Aquatic Life use Needs for the LA River*[2]*;* and
2. *Process and Decision Support Tools for Establishing Flow Recommendations to Support Aquatic Life and Recreational Beneficial Uses of the Los Angeles River*[3].

We thoroughly describe the flora and fauna of select reference sites in our study area that appear to represent semi-natural riparian conditions, such as the Rio Hondo in the Whitter Narrows Recreation Area, to support management goals such as species communities to restore more widely in the watershed. These goals and recommendations will be made with reference to proposed reduction in flow levels, such that they may be considered part of mitigation efforts for anticipated impacts to the current river system. Examples of mitigation may include non-native species control and removal (in addition to ongoing efforts to remove giant reed); establishment of vegetated areas of channel sides (where feasible given flood-control needs); native plantings, wetland enhancement and creation, removal of hardscape (e.g., "redundant" fencing and wires), and the addition of interpretive elements. This combination of mapping at various scales, rare species information, management goal setting, and recommendations for impact mitigation should assist the Conservancies in devising policy that results in a more vibrant, sustainable, and biodiverse Los Angeles River watershed.

[2] Stein et al. 2021a. Assessment of aquatic life use needs for the Los Angeles River: Los Angeles River Environmental Flows Project. SCCWRP Tech. Report #1154. January 2021.
[3] Stein et al. 2021b. Process and Decision Support Tools for Establishing Flow Recommendations to Support Aquatic Life and Recreational Beneficial Uses of the Los Angeles River. SCCWRP Tech. Report #1196. April 2021.

Methods

Vegetation Mapping

Prior Efforts

The vegetation of the Los Angeles River channel has never been the subject of comprehensive vegetation mapping, as have other areas of the Los Angeles region[4]. As is the case with any highly-disturbed habitat, it is simply not possible to neatly classify in-channel vegetation as a stable, recognizable community like "chamise chaparral" or "Jeffrey pine forest". The vegetation of the modern Los Angeles River represents a "novel ecosystem[5]", with its most dominant species from various parts of the world, and with no clear analogue in pre-settlement California. It is also constantly changing, depending on water flows (particularly during storms the prior winter) and due to human land-use such as mechanical clearing (using heavy machinery), hand clearing, and herbicide application.

We therefore have based our classification scheme on that proposed by Faber-Langendoen *et al.* 2014[6], which acknowledges a combination of factors – "diagnostic species", "growth forms", "disturbance regime/succession", and "edaphic/hydrology" – as a way to sort out and discuss highly disturbed vegetation. For example, our "Transitional herbaceous" habitat, dominant across large portions of the lower river channel, is a novel habitat consisting of a mix of native and non-native forbs (especially white sweet-clover *Melilotus albus* and western ragweed *Ambrosia psilostachya*) maintained in some areas by discing (running metal plough discs attached to trucks) over the soil in the channel soil south of Willow St. in Long Beach In other areas, large gaps have been opened up on vegetated islands by hand-removal of non-native giant cane (*Arundo donax*). In still other areas, such as Glendale Narrows, the linear river islands may be nearly unrecognizable after heavy scouring along the natural flood channel in the days and even weeks following major events.

Prior efforts to map Los Angeles River channel vegetation have used different various scales. One recent categorization used by Stein et al. (2021)[7] identified four major habitat types extant in a recent assessment of in-channel conditions in the "lower" (i.e., away from the mountains) river:

1. Wading shorebird habitat[8]
2. Freshwater marsh habitat
3. Riparian habitat; and

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[4] AIS and ESRI 2007. USGS-NPS Vegetation mapping program. Santa Monica Mountains National Recreation Area, Photo Interpretation Report (Final). May 23, 2007. Prepared for Santa Monica Mountains NRA, Thousand Oaks, CA, by Aerial Information Systems, Inc. and Environmental Systems Research Institute, Redlands, CA.

[5] Kennedy, P.L. et al. 2018. Do novel ecosystems provide habitat value for wildlife? Revisiting the physiognomy vs. floristics debate. *Ecosphere*. 9(3): e92172.

[6] Faber-Langendoen et al. 2014. EcoVeg: a new approach to vegetation description and classification. *Ecological Monographs* 84(4):533-561. We note that Todd Keeler-Wolf, a co-author of Manual of California Vegetation (Sawyer et al. 2009), was also a co-author on this paper.

[7] "Assessment of Aquatic Life Use Needs for the Los Angeles River"; referred to in the RFP.

[8] This refers to the "biofilm" habitat that forms between rain events along the broad, flat cement channel bottom near the I-5/134 Fwy. interchange in the Glendale Narrows, and from vic. Soto St. south to Willow Street. This is critical stopover habitat for thousands of shorebirds each year (treated previously by Cooper 2006).

4. Warm water habitat

They also identified two additional habitats they considered to be extirpated, "Cold water habitat" and "(fish) Migration habitat".

TNC (2016)[9] identified the following four main in-channel vegetation communities in the Elysian Valley portion of the channel, which conform to the Manual of California Vegetation ("MCV")[10], a commonly-used reference in habitat assessment in the state:

- Giant Reed Stands;
- Black Willow Thickets;
- Mulefat Thickets[11]; and
- Emergent Vegetation/Cattail marshes

The authors of the TNC report based these categories on dominant vegetation present, yet elsewhere in the same study, they (K.L. Garrett) identified nine in-channel "habitat types" and "substrates" for use in avian habitat characterization, including "Riparian", "Marsh", "Slow water", and "Fast water", which are an important reflection of the non-vegetated habitat types on the river (and resemble those of Stein et al. 2021). This combination of vegetation, substrate, and wildlife use makes intuitive sense when characterizing the habitats of the river channel.

Since our work is intended to inform the management decisions that will be referring to the Stein et al. study, **we began with their four major categories to map the entire length of the Los Angeles River**, as well as in two natural-floor (soft-bottomed, or mud-bottomed) portions of Rio Hondo and Compton Creek.

However, we soon discovered that these were insufficient to represent all habitat types (including anthropomorphic vegetation and features) along the entire length of the lower river. Thus, we recognized and mapped four additional (coarse-scale) habitat types (for a total of eight):

- Non-native Trees and Shrubs;
- Transitional Herbaceous;
- Bare Channel – Natural; and
- Bare Channel – Concrete

Our fine-scale mapping scheme is necessarily more data-rich, and particularly useful for understanding vegetation patterns along natural-floor stretches of the river. However, we again found that even the highly comprehensive MCV categories fail to account for the diversity and abundance of the vegetation present in the channel much of the year, particularly the non-native trees and shrubs, whose distribution has profound implications for local wildlife. Based on many

[9] The Nature Conservancy (TNC) 2016. Water Supply and Habitat Resiliency for a Future Los Angeles River: Site-Specific Natural Enhancement Opportunities. Los Feliz to Taylor Yard. December 2016.
[10] Sawyer, J.O, T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society Press, Sacramento.
[11] We found mulefat (*Baccharis salicifolia*) to be fairly uncommon in the channel (all sites) and did not find it to be a dominant species at any scale mapped.

years of observation (in addition to this study), it is well-known that local wildlife populations make heavy use of many non-native habitats along the river (e.g., early-successional weedy areas that may be filled with birds and flying insects in late summer and fall), yet utilize others hardly at all (e.g., thickets of giant cane *Arundo donax*, or dense forests of Shamel ash *Fraxinus udhei*). Based on our observations, these non-native forests resemble, and may even support, *some aspects* of native riparian vegetation, but with many characteristic (native) wildlife and understory plant species often completely absent.

The "minimalist" approach of TNC may be contrasted with the "maximalist" classification scheme used by Stillwater Sciences and URS Corporation (2007)[12] on the Santa Clara River, which identified 58 discrete communities, albeit across a much larger study area. URS Corporation did a much more complete job of treating the various non-native tree and shrub communities common along the Los Angeles River channel, as well as various non-native herbaceous communities; we found these to be strongly dominant vegetation types along the modern Los Angeles River (possibly due to long-term and ongoing disturbance of vegetation here), and thus our categories hopefully capture their importance here.

Mapping Protocol (this study)

Drawing from our years of surveying, monitoring, and observing vegetation along the lower Los Angeles River and associated drainages, we first devised a fine-scale mapping protocol that began by observation of vegetation within a minimum 10-meter by 10-meter block, visually assessing (typically by R.A. Hamilton) the dominant (>25% cover) plant species present. Hamilton then drew polygon boundaries around each "blob" of contiguous vegetation with the same dominant species (resulting in hundreds of small polygons) onto print-outs of Google Earth aerial imagery.

Hamilton also noted (on paper field maps) a) substrate type (either terrestrial or aquatic) underlying the vegetation (or algae community; e.g., cement, cobbles/boulders, sand or fine silt); and b) the presence of certain largest, "structurally-dominant" tree and shrub species (estimated to provide at least 25% aerial cover).

We also used our field visits to record birds and other wildlife, which helped differentiate these communities, similar to the approach used by Jones et al. (2016)[13] to categorize wetland habitat types at the Salton Sea, another warm-water, anthropomorphically-altered southern California wetland system with no clear historical natural analogue. Thus, our effort was synthetic, rather than derivative, recognizing that useful schema must acknowledge "cultural vegetation", and that anthropogenic forces are as-yet poorly understood and not widely used among traditional ecologists.

From these field data, we established a hierarchical habitat categorization (i.e., broadest to most specific), as well as a "cross-walk" of corresponding categories, ultimately settling on 8 coarse-scale habitat categories (based on Stein et al. 2021) and 132 finer-scale vegetation and substrate categories

[12] Stillwater Sciences and URS Corporation. 2007. Riparian Vegetation Mapping and Preliminary Classification for the Lower Santa Clara River and Major Tributaries, Ventura County, California. Volume I. Prepared by Stillwater Sciences and URS Corporation for the California State Coastal Conservancy and the Santa Clara River Trustee Council.
[13] Jones, A., Krieger, K., Salas, L., Elliott, N., and Cooper, D.S. 2016. Quantifying bird habitat at the Salton Sea: Informing the State of California's Salton Sea Management Plan. Audubon California, Point Blue Conservation Science, and Cooper Ecological Monitoring, Inc. Final Technical Report, Nov. 23, 2016.

based on Sawyer et al. (2009) where possible[14] (see **Appendix A**, **Table A1**). We then moved to an Arc-based mapping framework, and mapped these habitats and, where data were obtained, the vegetation communities present (**Table 1**).

Table 1. Mapping scale (this study).

River section	**Mapping Scale**		
	Coarse scale (8 categories)	**Fine scale**	**Special focus/ Rare taxa***
Upper River (MRCA)			
Canoga Park to White Oak Blvd.[15]	X		
White Oak Blvd. to Sepulveda Dam	X	X	X
Sepulveda Dam to Bette Davis Park	X		
Bette Davis Park to Arroyo Seco	X	X	X
Arroyo Seco to Soto St.	X		
Lower River (WCA)			
Soto St. to Willow St.	X		
Willow St. to ocean	X	X	X
Rio Hondo (WCA)			
Lower Azusa Rd. to Rush St.	X		
Rush St. to 60 Fwy.	X		X
60 Fwy. to Rio Hondo Dam	X	X	X
Rio Hondo Dam to L.A. River	X		
Compton Creek (WCA)			
120th St. to Artesia Blvd.	X		
Artesia Blvd. to L.A. River	X		X

* Parentheses indicate potential sites for rare plant searches.

We assessed vegetation type and height along the channel using a simple line-transect methodology (**Figure 1**). Where feasible, a measuring tape was extended from the base/foot of the levee toward the middle of the channel, and recorded the species and height of vegetation intersecting the tape at 5-meter intervals (stopping when we hit water). Again, where feasible, we repeated this measurement at regular intervals (either 100-meter or 500-meter) up and down the natural-floor sections, but in many areas, access issues (including high water at the base of the levee) precluded this methodology, so we switched to measuring vegetation on islands using a 100-foot measuring tape set "laterally" (i.e., in the direction of the flow of water), with readings at 10-foot intervals. The levee-to-channel approach was used at Willow St., Compton Creek, Rio Hondo, and Sepulveda Basin, while the "lateral" approach was used on vegetated islands at Glendale Narrows and Elysian Valley (see

[14] Many of the vegetation communities we observed and mapped along the channel are not treated in the most recent Manual of California Vegetation, either because they are temporary (including several "Transitional Herbaceous" communities) or because they are localized in the state, and represent an unusual combination of native and non-native flora restricted to highly-disturbed urban sites such as the Los Angeles River channel.

[15] The natural-floor stretch of river through Sepulveda Basin extends from just west of White Oak Blvd. (at the Metro busway crossing) east to Sepulveda Dam. We were unable to map the stretch from the Metro busway to Balboa Blvd. due to safety concerns (threats from local homeless residents). The stretch from Burbank Blvd. to the dam was not mapped because the habitat was entirely removed (bulldozed) by the USACOE as we were finishing up the mapping in late fall 2021.

Figure 2 for map of sites where transects were used). For analysis, these points were pooled by site, and the resulting break-down of dominant species and vegetation height was analyzed.

Figure 1. Collecting vegetation data along a line transect, Willow St. (Long Beach), 1 Sept. 2021.

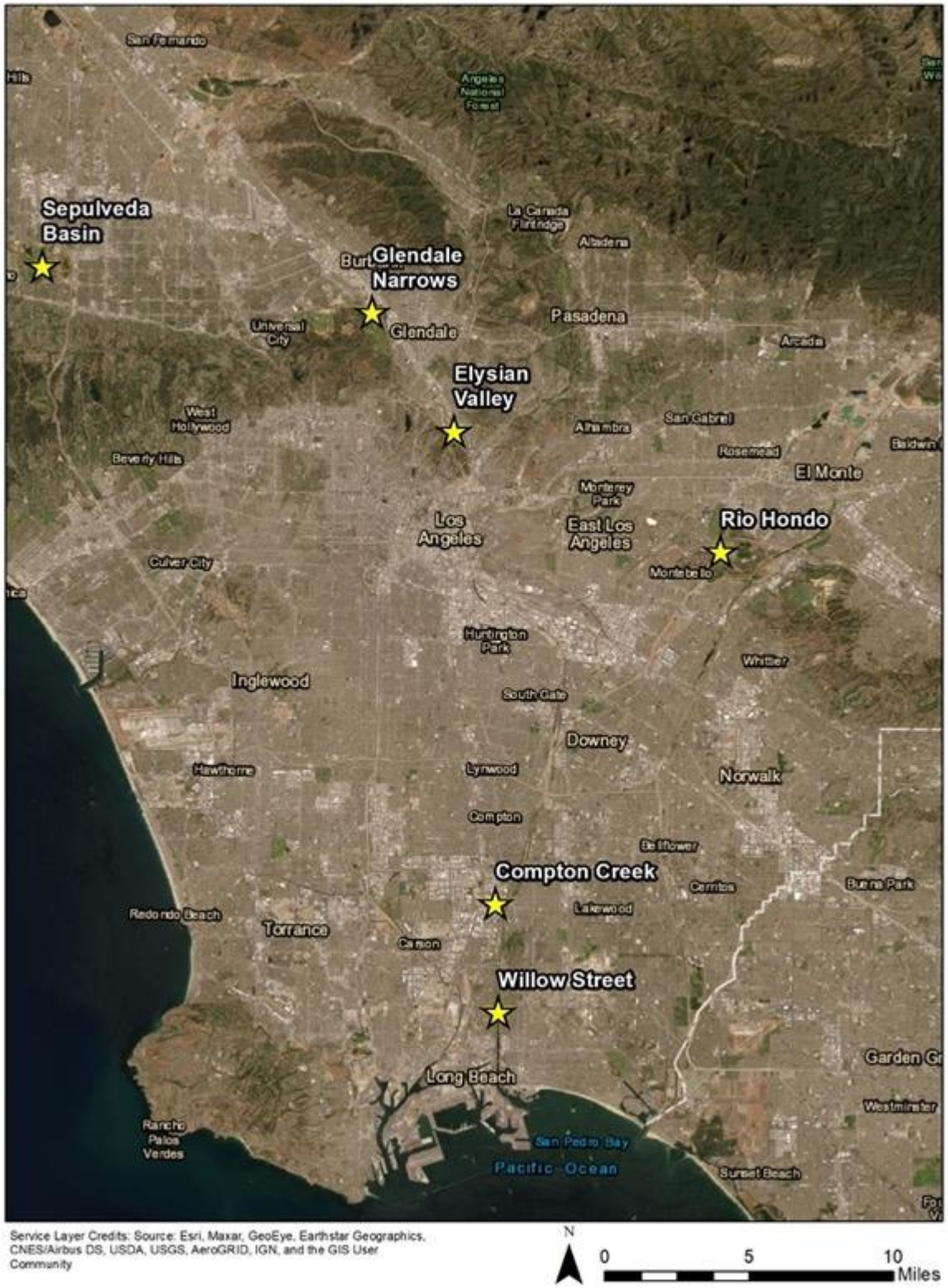

Figure 2. Locations of line transects used in vegetation mapping.

We documented all plant species by opportunistically searching the vegetation at each site visited, paying close attention to areas that appeared little-disturbed and with the potential to support native flora (non-native flora was dominant at most sites, and along the majority of the river, so finding native species – other than the handful of abundant taxa such as black willow – required specialized knowledge and close attention).

We searched for special-status plant species (including those not listed as special-status but believed extirpated from the lower Los Angeles River) by focusing our efforts on areas most likely to support native riparian species. Since we had never searched for rare/relict flora in the river channel, and knew of no prior efforts to do so, we concentrated on areas with high concentrations of native species, including:

1. The "natural bank" area through Sepulveda Basin, roughly between Balboa Blvd. and Burbank Blvd. This area features a steep bank-cut and extensive riparian woodland on either bank, as well as smaller areas of permanently-flooded freshwater marsh.
2. Vegetated islands at Glendale Narrows and Elysian Valley. Many of these proved difficult to access due to high water or safety concerns, but we made an effort to visit as many of these islands as feasible.
3. Less-disturbed edges of the channel at Willow St. and Compton Creek, perhaps where mechanical clearing/discing operations could not easily work (due to rip-rap and other obstacles).
4. Less-weedy sections of Rio Hondo, particularly where standing water supported seasonal wetland vegetation.

Our efforts were far from comprehensive, and conducted only in fall, which while ideal for certain groups (e.g., late-summer-blooming emergent wetland species), were insufficient for spring annuals and other species most visible during other times of year.

We opportunistically noted any uncommon or special-status birds and other taxonomic groups (e.g., reptiles/amphibians, invertebrates), and photographed them when possible.

Safety Concerns

The converging addiction/mental health/homeless crisis currently engulfing the Los Angeles area (and many other areas of the world) was plainly evident along the river, at each site we visited. Extensive, semi-permanent encampments with wood construction, electricity, and motorized vehicles were prevalent at Sepulveda Basin, Elysian Valley, Willow St., and Rio Hondo, and safety concerns precluded our visiting several areas during this study, notably the western side of the channel south of Willow St., the vicinity of Fletcher Ave. in Elysian Valley, and a particularly "woodsy" stretch of channel upstream of Balboa Blvd. through Sepulveda Basin.

Management Recommendations

We considered our mapping effort to be the first part of the study, the second part being the development of habitat management goals for the river, in particular an evaluation of how a drop in

water levels envisioned by upstream water conservation might impact in-channel habitats. To evaluate future water level drops and to help guide future management of the river, we have synthesized findings from our more granular mapping, as well as our rare species surveys, to identify vegetation communities, habitats and species likely most at risk from a drop in water flow. We used online community-science platforms such as eBird (www.ebird.org) and iNaturalist (www.inaturalist.org), as well as prior reports, to determine species most at risk from these declines in water loss, similar to the approach taken by Jones et al. which evaluated threats to waterbirds at the Salton Sea from future water transfers away from the Salton Trough.

Results

Multiscale Habitat Mapping

Our coarse-scale mapping was completed for most of the length of the channel (see **Figure 3)** for a breakdown of how each river section was mapped). We identified eight broad habitat categories, as described below. Within these eight main habitat categories, we recognized 133 discrete vegetation communities based on dominant species, described in detail below, including: 48 categories of "Transitional Herbaceous" vegetation, 44 categories of "Riparian Woodland and Scrub", 18 categories of "Freshwater Marsh", 13 categories of "Non-native Trees and Shrubs", and nine categories of "Bare Channel – Natural". Please refer to **Table A1** for a breakdown of both coarse-scale habitats and fine-scale vegetation communities, **Appendix A** for detailed maps showing the locations of these features. We provide additional habitat photographs in **Appendix B**.

We found that three natural-floor stretches supported *all* of the coarse-scale habitat categories represented during the study: Glendale Narrows, Elysian Valley and Willow St. We did not encounter significant (i.e., >100 m^2) stands of Freshwater Marsh at Sepulveda Basin, though we observed, but did not map, both "Wading Shorebird Habitat" and "Bare Channel – Natural" just upstream of Sepulveda Dam. Compton Creek had just three habitats present: Freshwater Marsh, Warm Water Habitat, and Transition Herbaceous.

We mapped fine-scale vegetation communities at four sites: Sepulveda Basin, Elysian Valley, Willow St. and Rio Hondo. In each case, we could not map the entire extent of the communities here, due either to safety concerns (all sites; we were verbally threatened by local homeless residents at several sites), access issues (deep, flowing water), or because of time constraints. However, we believe that our mapped areas are *strongly representative of the entire extent of the natural/naturalized habitat along the channel*, and thus may serve as a model for future mapping.

We consider many of the fine-scale vegetation communities we mapped to be "novel" habitats, because while the Manual of California Vegetation (MCV) recognizes all of our "Freshwater Marsh" categories, and all but one of those we consider part of "Riparian Woodland and Scrub" (see "crosswalk" in **Table A1**), it recognizes *none* of our "Bare Channel – Natural" communities, and fewer than half of our "Non-native Trees and Shrubs", and just over half of our "Transitional Herbaceous" ones. This emphasizes the importance of our mapping effort toward an understanding of the actual vegetation of the Los Angeles River channel.

Examples of vegetation types not recognized by MCV include sandy patches with sparse patches of creeping saltbush (*Atriplex prostrata*), Australian brass-buttons (*Cotula coronopifolia*), Bermuda grass (*Cynodon dactylon*), castor bean (*Ricinis communis*) and rough cocklebur (*Xanthium strumarium*), which we recognize as part of the "Bare Channel – Natural" community; and stands of non-native trees such as wattle (*Acacia* spp.), Shamel ash (*Fraxinus udhei*), mulberry (*Morus* sp.), and fan palm (*Washingtonia* spp.), which, while sometimes mixed with native willows (*Salix* sp.), are nonetheless strongly non-native-dominated. The lack of MCV-recognized vegetation types dominated by Bermuda grass, annual sunflower (*Helianthus annuus*), white sweet-clover (*Melilotus albus*) and/or rough cocklebur may be an oversight, as large areas of the lower Los Angeles River channel are so dominated.

Figure 3. Major in-channel habitats and focal areas of Los Angeles River, this study. Please see **Appendix A** for detailed/fine-scale mapping of areas listed as "Mapped" (green). As a note, we consider the start of the "Los Angeles River channel" to be the confluence of Bell and Calabasas creeks in the west San Fernando Valley (red arrow). The Rio Hondo reference site is located well to the east, and is not shown here.

Coarse-scale Mapping

Bare Channel – Concrete

These were areas with neither vegetation nor water along the river channel. We also mapped areas with only a narrow flow of water through a lowered central channel through the concrete as "Bare channel – Concrete" since the rest of the channel area here was largely concrete (**Figure 4**).

Figure 4. Bare Channel – Concrete habitat (Reseda Blvd., 27 Nov. 2021).

Bare Channel – Natural

Naturally-forming areas of boulders, cobbles, gravelly/sandy soil, or dried mud along the channel (**Figure 5**), if un-(or sparsely-) vegetated, cannot be easily placed into the other categories, and like many areas of Transitional Herbaceous habitat, are transitory (if important) components of the river channel system. These provide foraging areas for a variety of birds, reptiles, and other wildlife, depending on how wet they are, and essentially re-create what would have been natural open-soil areas of the formerly un-channelized Los Angeles River (most natural rivers are characterized by large areas of sand and/or bare soil). Therefore, we felt it was important to draw attention to these areas. In the study area, most examples were found at Willow St., with Elysian Valley having areas of sandy soil with scattered herbs/forbs. At Rio Hondo, we observed natural river bars and braided-channel/wash areas on the floor of the channel, some of which had drying pools during our visits in October 2021. These ecosystems are strongly reminiscent of natural rivers throughout the West, and have been largely lost along the mainstem of the Los Angeles River.

Figure 5. Bare Channel – Natural habitat, within an opening in riparian vegetation, well away from normal water flows and supporting a largely "upland" vegetation and wildlife community (e.g., scrubland insects and reptiles (Elysian Valley, 29 Sept. 2021).

Freshwater Marsh

While aspects of freshwater marsh vegetation may form at virtually any point along the cement channel where emergent reeds and grasses can gain a foothold, it was observed as extensive only at the southernmost stretch (south of Willow St.) and along Compton Creek (**Figure 6**). Among the vegetation communities we identified as Freshwater Marsh, nine were dominated by cattail (*Typha* spp.), seven were dominated by water-primrose (*Ludwigia* spp.) or smartweed (*Persicaria* spp.), six were dominated by common reed (*Phragmites australis*), and five by creeping saltbush (*Atriplex prostrata*). Giant cane (*Arundo donax*) was associated with just three vegetation types, likely owing to its tendency to form monocultural stands wherever it occurs. Bulrush (*Schoenoplectus* spp.) was a dominant species *only* associated with Freshwater Marsh habitat, and so may be considered an obligate freshwater marsh species. Numerous types of wildlife were also associated primarily with freshwater marsh, such as Red-winged Blackbird (*Agelaius phoeniceus*).

Figure 6. Freshwater Marsh habitat south of Willow St., Long Beach, showing water-primrose (*Ludwigia* sp.) in foreground and a large patch of cattail (*Typha* sp.) in the background and at upper left. 1 Sept. 2021.

Non-native Trees and Shrubs

This catch-all category was reserved for vegetation that had little native cover, and consequently would support limited native wildlife (other than the most widespread taxa). Examples include areas dominated by Shamel ash (*Fraxinus udhei*) with few/no willows or other riparian trees (**Figure 7**), pure or nearly-pure stands of giant cane (*Arundo donax*; **Figure 8**), eucalyptus stands, and thickets of non-native trees and shrubs such as castor bean (*Ricinis communis*), palms and acacia. While some of these habitats are associated with water (such as giant cane), they all essentially take up space that could be occupied by native, naturally-occurring species along the river, and so were separated out for analysis.

Figure 7. Evergreen woodland dominated by non-native Shamel ash (*Fraxinus udhei*), Sepulveda Basin. 15 Oct. 2021. Scattered willows share the canopy with this tree, but, being essentially an upland species, Shamel ash does not contribute appreciably to supporting a native riparian plant and wildlife community.

Figure 8. Another type of Non-native Trees and Shrubs: a massive infestation of giant cane (*Arundo donax*) just south of Lake Balboa (Sepulveda Basin, 4 Oct. 2021).

Riparian Woodland and Scrub

The majority of our identified Riparian Woodland and Scrub communities (34) supported at least one species of willow (*Salix* spp.), with black willow (*S. gooddingii*) being the most frequently encountered. Riparian shrubland (**Figure 9**) was represented by both sandbar willow (*S. exigua*) and (at Sepulveda Basin) by mulefat (*Baccharis salicifolia*), with woodland (**Figure 10**) (co-)dominated in areas by western sycamore (*Platanus racemosa*), Shamel ash (*Fraxinus udhei*), and/or walnut (*Juglans* sp.; likely a hybrid). Black cottonwood (*Populus trichocarpa*) and box-elder (*Acer negundo*) woodland was encountered at Rio Hondo only, and (somewhat surprisingly given its abundance in riparian areas in the southern California region), no significant stands of Fremont cottonwood (*Populus fremontii*) were found, though a small number of seedlings were noted. The only coast live oaks (*Quercus agrifolia*) noted within the channel were several small, apparently planted trees in the Sepulveda Basin. Understory species were similar to those found within the "Transitional herbaceous" community, though elements of alluvial fan scrub were noted at Sepulveda Basin (and may be present elsewhere;

see below), which included large stands of branching phacelia (*Phacelia ramosissima*) and other low shrubs without a significant overstory/canopy layer.

Figure 9. Riparian scrub habitat, Glendale Narrows, showing small black willows (*Salix gooddingii*) no more than a few years old, mixing with Freshwater Marsh and Transitional Herbaceous habitat around the edges. 8 Oct. 2021.

Figure 10. Riparian woodland habitat east of Balboa Blvd. showing high canopy willows (*Salix* spp.), western sycamore (*Platanus racemosa*) and walnut (*Juglans* sp.), and an understory of mulefat (*Baccharis salicifolia*) (Sepulveda Basin, 15 Oct. 2021).

Transitional Herbaceous

This complex habitat is dominated by seasonal growth, typically of winter-dormant, herbaceous species maintained by heavy disturbance (**Figure 11**). At the Willow St. site, it is apparently maintained by regular disking/bulldozing. As water flows over the habitat, either from storm flows, rainfall, or via "sub-irrigation" (near-surface groundwater), these communities quickly develop through the warmest months. Dominant plant species represent a mix of native and non-native taxa, and include western ragweed (*Ambrosia psilostachya*), creeping saltbush (*Atriplex prostrata*), Bermuda grass (*Cynodon dactylon*), rough cocklebur (*Xanthium strumarium*), annual sunflower (*Helianthus annuus*) and white sweet-clover (*Melilotus albus*). Local stands of other native species include western goldenrod (*Euthamia occidentalis*) and western saltmarsh aster (*Symphyotrichum subulatum*) at Willow St., and mugwort (*Artemisia douglasiana*) at Sepulveda Basin. Areas of this habitat, if left undisturbed, would be expected to eventually transition to either Freshwater Marsh (if wet enough) or to Riparian Woodland and Scrub (if slightly drier), but some stands are likely fairly stable.

Figure 11. Transitional Herbaceous habitat, neither a riparian woodland/scrub nor a marsh, here we found it dominated by western goldenrod (*Euthamia occidentalis*) and western ragweed (*Ambrosia psilostachya*), south of Willow St., Long Beach. 8 Sept. 2021.

Wading Shorebird Habitat

This community is characterized by a thin flow of water atop an algal film (**Figure 12**), which develops on the concrete channel through the spring and summer following winter rainfall (see Cooper 2006[16] for description). The width of this habitat varies by both water flow and channel width, but is generally widest in the lowermost portion of the channel in north Long Beach. South of here (i.e., south of Willow St.), the channel is natural-floored and supports lush vegetation rather than an algal film). The northern boundary of this habitat type fluctuates with upstream releases of treated wastewater, but is generally continuous north to the confluence with Compton Creek (vic. Del Amo Blvd.), and irregularly continuous north of here to vic. Washington Blvd. just south of Downtown Los Angeles. Small patches of vegetation may form on mud and sand bars and in cracks in the cement channel of this habitat, typically represented by the most abundant herbaceous/fast-

[16] Cooper, D.S. 2006. Shorebird use of a novel habitat: the lower Los Angeles River channel. *Western Birds* 37:1-6.

growing species such as umbrella-sedge (*Cyperus umbellifera*) and water-primrose (*Ludwigia* spp.). Much of this vegetation washes away each year, and re-forms through the spring and summer.

Figure 12. Wading Shorebird Habitat, showing distinctive shallow water (note concrete channel floor just barely showing through). This habitat supports thousands of shorebirds in summer and fall. Cudahy. 1 Dec. 2021.

Warm Water Habitat

Following its definition in Stein et al. (2021a), we considered warm water habitat to be any flowing (or standing) water deeper than that supporting wading shorebird habitat (**Figure 13**). The substrate under this habitat was, in general, that with a natural floor (in Sepulveda Basin, Glendale Narrows, Elysian Valley and Willow St./Estuary); however, areas, particularly portions of box channel with a concrete floor (e.g., through Sherman Oaks/Studio City) may also considered to have warm water habitat, since the water depth here is typically too low to support shorebirds (and wading shorebirds avoid using habitats like the deep, narrow box channel surrounded by houses and buildings that characterizes this stretch through the San Fernando Valley). We excluded areas of concrete channel

with a narrow (<2 meter) central channel, as may be found in the west San Fernando Valley (e.g., Reseda) and portions of the channel in southeastern Los Angeles County (e.g., Bell, South Gate). These we considered to be "Bare channel – concrete" since the swift water moving through the narrow, concrete central channel would be unlikely to support fish or much other life.

Figure 13. Warm water habitat, showing deeper pools interspersed with small boulders. This habitat type was extremely rich in birdlife and other wildlife, particularly ducks, herons/egrets and other waterbirds. Glendale Narrows. 28 Oct. 2021.

Vegetation Origin and Structure

Native vs. non-native species

We quantified "vegetation origin" at each of the six study sites/references areas by comparing the transect points with native vs. non-native species. Glendale Narrows had the most native species on the transects, where just over 90% of species "hits" on line transect points were natives, followed by Elysian Valley, Sepulveda Basin, and Willow St. (**Table 2a**; **Figure 14**). Interestingly, the "natural" reference used, Rio Hondo, had the *lowest* native cover of any site, with fewer than a third of line-transect points intersecting a native species, while a relatively small fragment of river island habitat, Glendale Narrows, had the highest. Rio Hondo *does* support a great variety of native species – it just also supports many non-natives, and many of the natives present *only* occur above the actual river channel, where we did not quantitatively sample vegetation.

Table 2a. Native/non-native breakdown across study sites. Results derived from line-intercept transect points placed (largely opportunistically) at each site, which accounts for the wide variation in number of points per site. "Native proportion" represents the number of points with natives divided by the total number of points per site.

Site	**Total points**	**Points with native(s)**	**Native proportion**
Sepulveda Basin	85	33	0.388
Glendale Narrows	38	35	0.921
Elysian Valley	255	147	0.576
Willow St.	85	33	0.388
Compton Creek	131	55	0.420
Rio Hondo	140	43	0.307

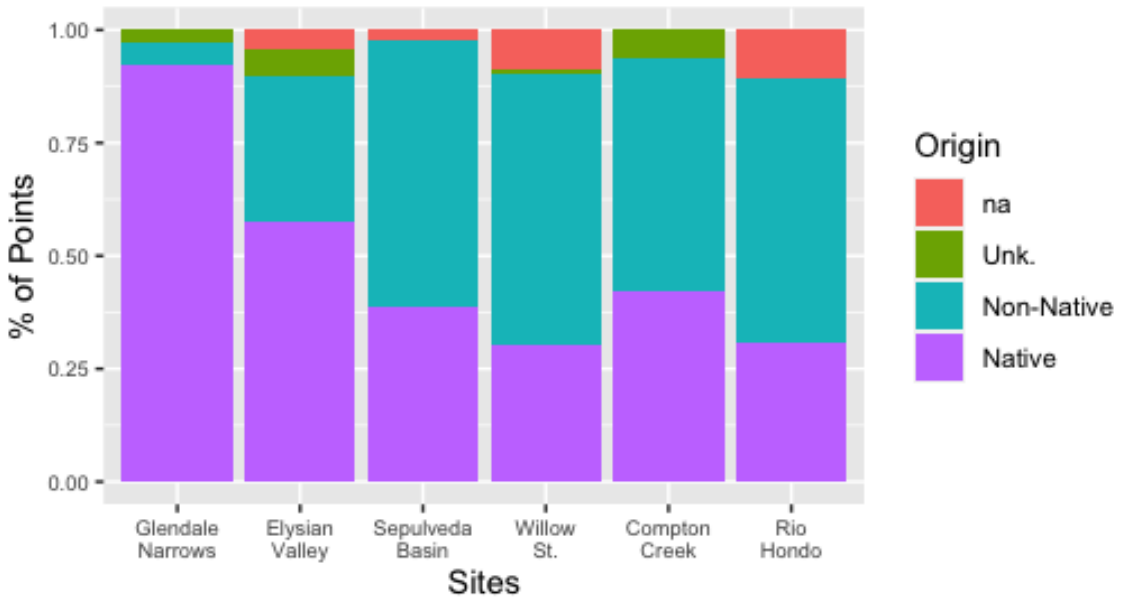

Figure 14. Percentage of line transect points with native (vs. non-native) species. "Na" denotes bare earth or rock (i.e., unvegetated areas); "Unk." denotes taxa where native-ness is still to be determined (e.g. white-flowered nightshade *Solanum* spp.).

Dominant species

Sites varied widely in terms of the type and number of dominant species at each, and we prepared figures showing the breakdown of these metrics based on our vegetation transect results (**Appendix C**). For example, at Sepulveda Basin, just five species comprise nearly half the vegetative cover, including three trees: black willow (*Salix gooddingii*), walnut (*Juglans* sp.), and Shamel ash (*Fraxinus udhei*); a vine (woodbine, *Parthenocissus inserta*), and giant cane (*Arundo donax*). Of these, only black willow is native(!). Even the walnuts at Sepulveda Basin are apparently derived from orchard stock, either as hybrids (including possibly with the native *J. californica*), or as cultivars such as English walnut (*J. regia*).

Glendale Narrows and Elysian Valley, similarly, have black willow as strongly dominant, but with several (native) wetland-associated forbs also frequent, cattail (*Typha* sp.), cocklebur (*Xanthium strumarium*), smartweed (*Persicaria* sp.) and a bulrush (*Schoenoplectus americanus*).

Willow St. is wholly different from these three sites, dominated by a grassland-herbaceous community of Bermuda grass (*Cynodon dactylon*), western ragweed (*Ambrosia psilostachya*) and a twining saltbush known as fat hen (*Atriplex prostrata*). A similar community of herbs, with western ragweed dominant, was also noted at Compton Creek.

The community at Rio Hondo was found to be quite different from each of the study sites, essentially an "overstory" of black willow with a high diversity of non-native forbs (not all of them riparian taxa) forming the understory, including shortpod mustard (*Hirschfeldia incana*) and poison-hemlock (*Conium maculatum*). This in part reflects the fact that the Rio Hondo does not typically flow year-round at this site (in contrast to the "augmented" flows of treated wastewater at each of the

other sites, which might support large expanses of native reeds or willows). Thus, in some ways, the riparian ecosystem that has developed at Rio Hondo approximates the "natural" condition of local waterways better than any of the other sites in that it dries out through the summer, with water reduced to pools (and non-flowing) in most years and large areas of sand. In contrast to, say, Elysian Valley, Rio Hondo – at least the stretch between San Gabriel Ave. and the 60 Fwy. – may be spared from certain highly-invasive weedy species that are associated with standing water, such as giant cane (*Arundo donax*) and thickets of white sweet-clover (*Melilotus albus*), which seem to thrive on moist soils, but nonetheless supports dryland (non-native) weeds (farther downstream, the broad Rio Hondo flood control basin is thoroughly-invaded with giant cane, which burns frequently due to encampment fires). This further illustrates the wide variation between all sites, and again shows how they're not interchangeable (even within the same drainage, such as Rio Hondo).

Vegetation Structure

Structurally, the most densely-wooded site (i.e., the most transect points with vegetation exceeding 5 meters) was Sepulveda Basin (nearly 75%), followed by Elysian Valley (and Rio Hondo) and Glendale Narrows, with c. 30% of points registering vegetation greater than 5 meters (**Figure 15**). Willow St. and Compton Creek had little/no vegetation higher than 5 meters.

The "high shrub" layer (2-5 meters) was particularly well-developed at Glendale Narrows, while the "low shrub" layer (0-2 meters) was most prevalent at Willow St. These differences contribute to the different "feel" of the habitat at each area, with Willow St. consisting of lower, more open vegetation (including large amounts of Upland Herbaceous habitat), and Sepulveda Basin more woodland-like.

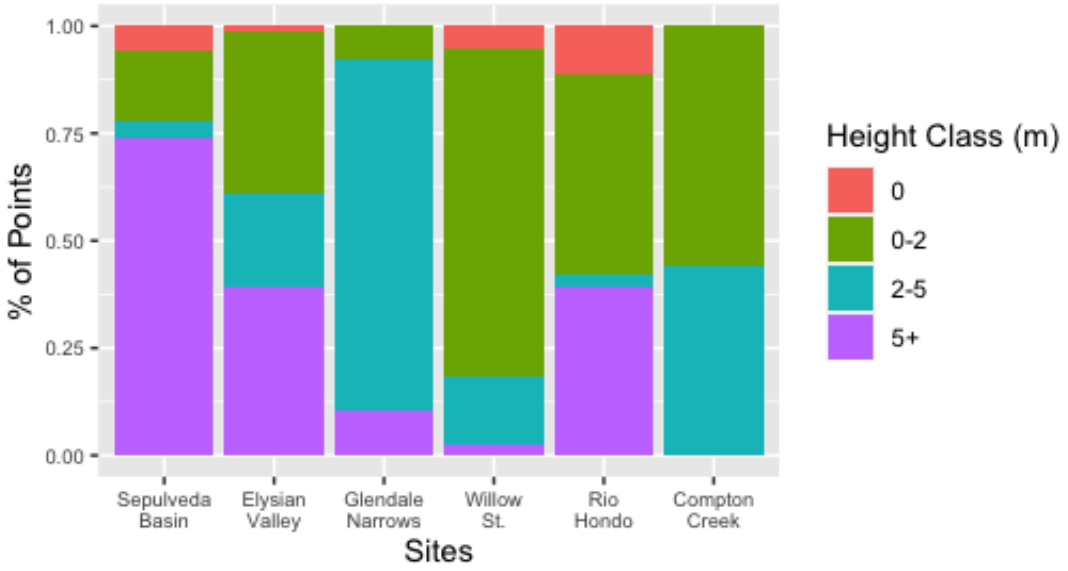

Figure 15. Vegetation height at each survey site and the two reference sites. Height class was determined by line-transect data as the maximum height at each point along the transect.

Storm Events and Vegetation

As with any dynamic riparian system, local areas of vegetation of the Los Angeles River channel may change dramatically from year to year, particularly after serious storm events. Heavy rains in late October 2022, for example, resulted in the vegetation at Glendale Narrows becoming essentially flattened or stripped, and covered with refuse (much of it obviously from encampments, including tents and tent poles, mattresses, luggage, folding chairs, etc.). The figures below depict this area before the rains, on October 20 (**Figure 16a**) and just following the rains on October 27 (**Figure 16b**). Notably, the more herbaceous plants such as smartweed (*Persicaria*) and *Ludwigia* were severely bent or uprooted by the flow of water, and smaller willow (*Salix*) and reeds (including *Typha* and *Schoenoplectus*) were also pushed laterally, where they were covered by refuse deposited by the receding water. These environments then take several months to recover (i.e., through the spring and summer), and may appear in somewhat different forms in terms of dominant species.

Figure 16a. Pre-rain vegetation (Oct. 20, 2022), just downstream of Riverside Dr., Glendale Narrows.

Figure 16b. Same view as in Figure 16a, post-rain vegetation (Oct. 27, 2022), just downstream of Riverside Dr., Glendale Narrows.

Floristic Diversity

Species Richness

Our plant surveys recorded 243 identifiable plant taxa along the Los Angeles River channel, of which at least 98 are considered native to California (see lists in **Appendix D**, including **Table D1**)[17]. We may estimate the acreage of the river channel's natural-floor stretches as follows (very rough calculations):

Balboa Blvd. – West: 17 acres
Balboa Blvd. – East: 40 acres

[17] Of these, 23 (native) species were identified from the vicinity of the channel by photographs uploaded to iNaturalist (www.inaturalist.org) by various users, and while likely correct, could be separated out from the main list until they are conclusively recorded along the channel (location errors in iNaturalist are not infrequent, and certain identifications are best made using living material or specimens). In addition, several individual plants could not be identified beyond genus, and may represent native species (including *Amranthus*, *Chenopodium*, *Ludwigia*, *Solanum*, and *Spergularia*).

Glendale Narrows – West: 14 acres
Elysian Valley – North: 67 acres
Elysian Valley – South: 78 acres
Long Beach: 58 acres
Total: 274 acres

Thus, the river channel supports 0.35 native species per acre. This compares favorably to Ernest Debs Park in Highland Park (282 acres), which supports 88 native plant species, or 0.31 natives/acre (by comparison, 4,200-acre Griffith Park supports 326 natives, representing c. 0.8 native species per acre; obviously, there exists a limit of the total number of species in a given area, so at a certain point, an addition of more acreage does not result in more species!). Table 2b presents the breakdown of native vs. non-native species richness at each site.

A total of 43 species are known solely from collections made along the Los Angeles River and vouchered in herbaria, nearly all prior to 1940[18] (**Table D2**).

Table 2b. Comparison native vs. non-native species at each site. **Note**: these figures refer to the total number of species, not their dominance (which is treated in Table 2 and Figure 14, above).

	Sepulveda Basin	**Glendale Narrows**	**Elysian Valley**	**Willow St.**	**Compton Cr.**	**Rio Hondo**
# Native	61	36	71	34	20	45
# Non-native	81	55	86	51	34	76
Total	142	91	157	85	54	121
% Native	43%	40%	45%	40%	37%	37%

Based on the current list of in-channel flora, the most speciose extant families (those with >10 species) are:

Asteraceae (46 spp.)
Poaceae (27 spp.)
Amaranthaceae (16 spp).
Fabaceae (12 spp.)
Cyperaceae (11 spp.)

By contrast, the most speciose taxa in neighboring Griffith Park (Cooper 2017[19]) are:

Asteraceae (69 spp.)
Poaceae (29 spp.)
Fabaceae (22 spp.)
Boraginaceae (19 spp.)
Brassicaceae (17 spp.)

[18] These are separated from the main list because the configuration of the river was completely different prior to 1940 (i.e., it was not channelized).
[19] Cooper, D.S. 2017. A flora of Griffith Park, Los Angeles, California. Crossosoma 41(1&2):1-86.

Onagraceae (16 spp.)
Polygonaceae (12 spp.)

The lack of large groups of forbs (e.g., Boraginaceae, Brassicaceae) along the river may be reflective of the time of year when the surveys were conducted. However, the diversity of Amaranths (Amaranthaceae) is notable, as these are among the more common members of the Transitional Herbaceous communities along the river channel, and are relatively scarce at upland/hillside sites such as Griffith Park. Grasses are also abundant and diverse along the river; we found just two fewer species than are known from Griffith Park, and surveys in spring would surely reveal more taxa along the river.

Notably, several groups of native species are scarce or entirely absent along the river, and were only found along the channel within the Sepulveda Basin where both sides of the river have natural banks and lack concrete channelization (i.e., south of Woodley Lakes Golf Course), and still others were only found at the Rio Hondo reference site (a total of 39 species; **Table 3**). We did observe a handful of these adjacent to the channel at several survey sites, as noted.

Table 3. Plant species detected only at the Rio Hondo reference site (typically in the alluvial fan scrub micro-habitat north of the 60 Freeway and just east of the main channel).

Family	**Latin**	**English**
Anacardiaceae	*Rhus integrifolia*	Lemonade berry
Apocynaceae	*Asclepias fascicularis*	Narrowleaf milkweed[20]
Cactaceae	*Opuntia littoralis*	Coast prickly-pear
Convolvulaceae	*Calystegia macrostegia*	coast morning glory[21]
Cyperaceae	*Cyperus esculentus*	yellow nutsedge[22]
Euphorbiacae	*Croton californicus*	California spurge
Grossulariaceae	*Ribes aureum*	golden currant
Juglandaceae	*Juglans californica*	Southern California Walnut
Onagraceae	*Epilobium brachycarpum*	panicled willowherb
Poaceae	*Nassella lepida*	foothill needlegrass
Polygonaceae	*Eriogonum gracile*	slender wooly buckwheat
Ranunculaceae	*Clematis ligusticifolia*	western virgin's bower
Salicaceae	*Populus trichocarpa*	black cottonwood
Salicaceae	*Salix lasiandra*	Pacific willow[23]
Scrophulariaceae	*Penstemon spectabilis*	showy penstemon

Most of these "Rio Hondo-specific taxa" are fairly common in the more natural tributaries of the Los Angeles River (including Big Tujunga Wash, Bell Canyon, and others), and could be considered candidates for including in restoration plans.

Interestingly, many common native "hillside" plants were apparently *totally absent* from the river channel vegetation (except where planted in pocket parks), including sages (*Salvia* spp.), rushes

[20] Small patches noted just outside channel at Sepulveda Basin.
[21] Observed growing along chainlink fence of bikepath (outside channel) at Elysian Valley.
[22] A fairly common (native) weed, possibly overlooked at other sites.
[23] Several trees believed to be this species noted at Sepulveda Basin and Elysian Valley await positive identification.

(*Juncus* spp.), carrots (Apiaceae) mustards (Brassicaceae), buckthorns (Rhamnaceae; e.g., *Ceanothus*), coast live oak (*Quercus agrifolia*)[24], and blue elderberry (*Sambucus caerulea*). These, or representatives of these groups, are found commonly in tributaries of the river (and in adjacent natural areas such as Griffith Park). It is likely that the annual scouring of the river islands precludes these long-lived species from establishing along the channel, though one may encounter some of these (e.g., blue elderberry) just outside the levee walls, along rights-of-way or even in yards of houses.

Our study did not include a coastal wetland reference site, which would have been appropriate for the Willow St. site. Examples of these could include the Los Cerritos Wetlands[25] or the Ballona Wetlands (formerly an "alternate mouth" of the Los Angeles River).

Extirpated Species

Looking at the 43 extirpated/historical-only taxa[26] that were presumably along the pre-channelized river (**Table D2**), a few things stand out. First, several are still extant in Griffith Park and other habitats adjacent to, but separated from, the modern river by roads/freeways and other barriers (Cooper 2015), including *Acer macrophyllum, Acmispon strigosus*, *Camissonia* (now *Camissoniopsis*) spp., *Phacelia brachyloba*, and *Rhus aromatica* (none of these are strictly riparian taxa, they may well have been collected on the upper banks of the river, or in native scrub away from main channels). Others are obligate wetland/riparian taxa that were likely eliminated by channelization, including *Equisetum* spp., several *Juncus* spp., *Ranunculus cymbalaria*, *Samolus parviflorus*, and *Sparangium erectum*. The same may be said for several natives that would have been members of the "Transitional herbaceous" community, occupying damp and somewhat disturbed areas, including native *Rumex* spp. and grasses. These have been widely extirpated in the Los Angeles area, and their discovery in the modern channel would be notable, if unlikely.

Rare Species

Our surveys located one CNPS-ranked taxon in the Los Angeles River channel, the southern tarplant (aka southern tarweed), *Centromadia parryi* ssp. *australis* (CNPS Rank 1B.1). A population of several hundred plants were observed growing at the base of the eastern levee, roughly halfway between Willow St. and Pacific Coast Highway (see **Figure 17**). Plants appeared robust and healthy, with many seedlings and mature plants noted (**Figure 18a**, **Figure 18b**), but most plants were smallish, likely the result of recent (2020) discing of the site, visible on Google Earth.

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[24] A handful in Sepulveda Basin appear to have been planted.

[25] See: Cooper, D.S. and R.A. Hamilton. 2015. A Conservation Vision for Los Cerritos Wetlands, Los Angeles/Orange County, California (final draft). Prepared by D.S. Cooper and R.A. Hamilton for Audubon California. Oct. 27, 2015. Available at: https://www.researchgate.net/publication/357285084_A_Conservation_Vision_for_the_Los_Cerritos_Wetlands_Los_Angeles_CountyOrange_County_California

[26] These are listed as they appear in CCH (CCH2 Portal. 2022. https://cch2.org/portal/index.php. Accessed on December 15, 2021); a few may be the result of misidentification or taxonomic uncertainty (e.g., *Solanum umbelliferum*).

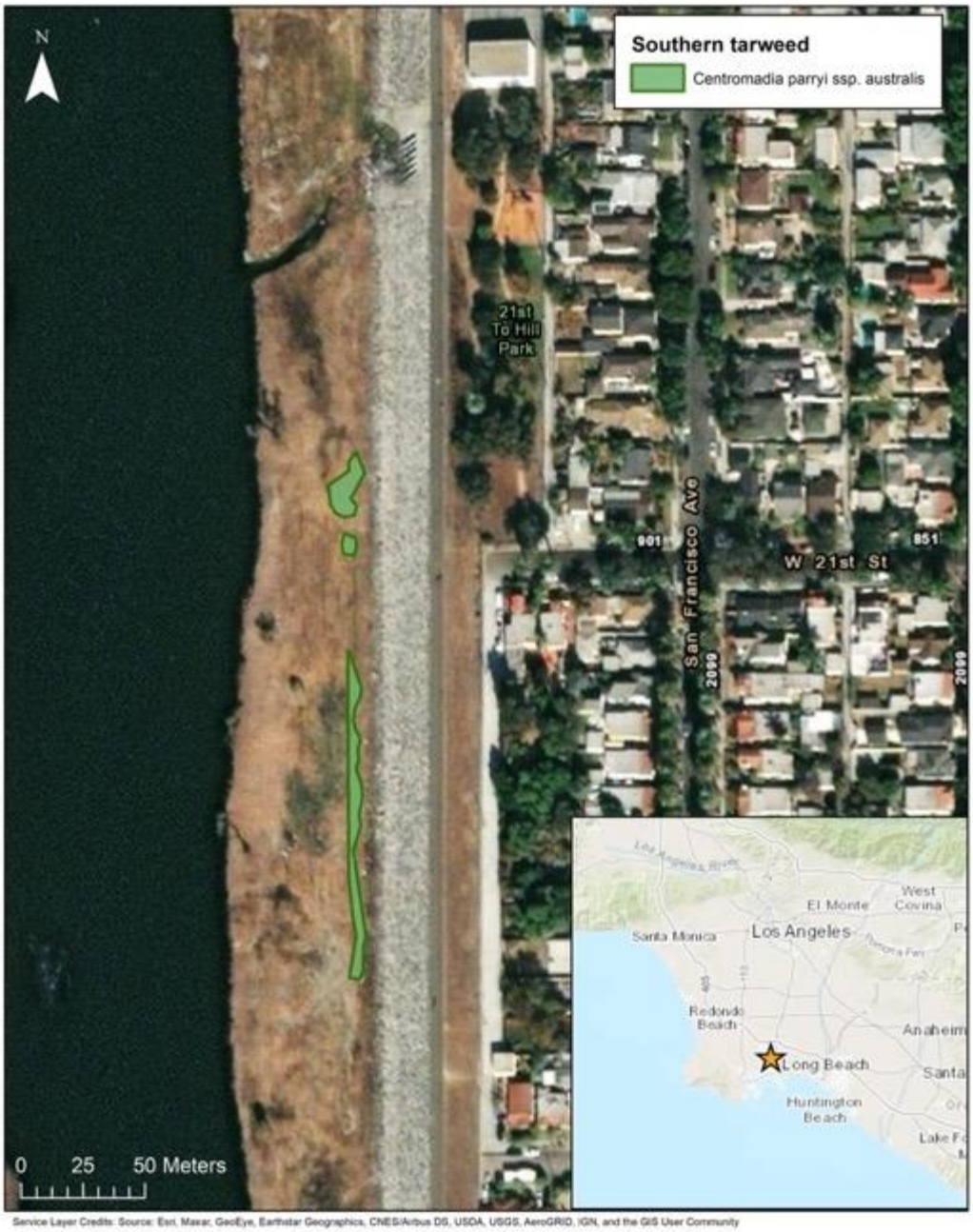

Figure 17. Map of southern tarplant (*Centromadia parryi* ssp. *australis*) population discovered along channel in Long Beach.

Figure 18a. Close-up of flowering southern tarplant.

Figure 18b. Southern tarplant growing *in situ*, growing within the "Transitional Herbaceous" habitat community. Other species in the photo include *Chenopodium* sp. (either *C. album* or *C. berlandieri*), *Atriplex prostrata* (lower left), and an unidentified grass (Poaceae).

Most surprising was a tiny population of what appeared to be Sanford's arrowleaf (*Sagittaria sanfordii*), a CNPS Rank 1B.2 species (**Figure 19**). Fewer than five individuals were growing along the north

side of the river channel roughly 100 meters east of the Balboa Blvd. bridge, in an area with large cobbles/small boulders and an abundance of native marsh and wetland vegetation (**Figure 20a, Figure 20b**). It is possible that the species we found represents a poorly-known, perhaps tropical species that was released from an aquarium, or something else entirely (*fide* A.C. Sanders, UCR Herbarium). Positive identification will hopefully be made soon (material deposited in UCR Herbarium).

Figure 19. An aquatic plant likely Sanford's arrowleaf (*Sagittaria sanfordii*) discovered just east of Balboa Blvd. in the Sepulveda Basin. Smaller floating bits of vegetation are leaves of duckweed (*Lemna* sp).

Figure 20a. Understory of riparian woodland and shallow water south of Lake Balboa, showing diversity of herbaceous understory (including southern cattail *Typha domingensis* at left, and spikerush *Eleocharis* sp. in middle ground). The middle-story here consists of both native willows (esp. black willow *Salix gooddingii*) and Shamel ash (*Fraxinus udhei*). This area is where we located what may be a CNPS-ranked plant, Sanford's arrowleaf (*Sagittaria sanfordii*). 21 Sept. 2021.

Figure 20b. Location of possible Sanford's arrowleaf (*Sagittaria sanfordii*).

We also observed a large number of CNPS-ranked southern California black walnut (*Juglans californica*; Rank 4.2) adjacent to the Rio Hondo reference site, where it occurs with coast live oak *Quercus agrifolia*. Southern California Black walnut is common in the hills within and surrounding the Los Angeles Basin, but does not appear to have persisted in/colonized the Los Angeles River channel. Abundant walnuts (*Juglans* sp.) in the Sepulveda Basin stretch of the river likely pertain to hybrids (see above).

Micro-habitats

The Los Angeles River channel is a dynamic system, subject to major changes in vegetation configuration and composition depending on winter storms the year prior, and in prior cumulative years. Nonetheless, certain small, discrete habitats ("micro-habitats") may be somewhat consistent in terms of where they appear, and our survey yielded insight into certain natural communities that may be significant, based on the plants and animals we encountered there.

Alkali vernal pool

The area that supports the southern tarplant may be described as an alkali vernal pool, in that the soil is alkaline, and water pools here seasonally (**Figure 21**). Nearby Madrona Marsh in Torrance is perhaps the best remaining example of this once-common ecosystem in Los Angeles County[27].

[27] See: Cooper, D.S. and E. Fiesler. 2012. Madrona Marsh Preserve Biological Inventory (Final Report). Prepared for Friends of Madrona Marsh and City of Torrance, January 27, 2012. Available online:

However, we encountered very few of the characteristic alkali vernal pool species along the Los Angeles River channel, other than the tarplant, and sea clubrush (*Bolboschoenus maritimus*), found sparingly here. It is likely that the flooding here is maintained not by rainwater (as at Madrona Marsh) but by stormflows along the Los Angeles River pushing up against the sides of the channel and then retreating quickly, mimicking the way winter storms may quickly fill up vernal pools.

Figure 21. Seasonal wetlands south of Willow St. mimic alkali vernal pools, and were found to support the rare southern tarplant (*Centromadia parryi* ssp. *australis*).

Tidal algal mudflat

Just south of the tarplant area (and perhaps co-occurring with it in some years) we found an area of dried algal mat east of the main channel unlike any other habitat we encountered in the study (**Figure 22a**). We map this area in **Figure 22b**. In it, we found no distinctive vegetation, but did locate a population of tiger beetle called the wetsalts tiger beetle (*Cicindela haemorrhagica*) (**Figure 23**). The wetsalts tiger beetle had been photographed in this same area in 2020 (www.inaturalist.org/observations/53225607). While not "listed" by any resource agency, it is part

https://www.researchgate.net/publication/315779710_Madrona_Marsh_Biological_Inventory_by_DS_Cooper_and_E_Fiesler#fullTextFileContent

of a genus that includes many rare and localized taxa[28], and itself is highly localized in alkali marsh and drying pool habitats on alkaline soil throughout the West; in Los Angeles County, it is currently known elsewhere only from Colorado Lagoon and Los Cerritos Wetlands, both in Long Beach (iNaturalist). Outside the county, it is also known from recent records at Mugu Lagoon, Orange Co. wetlands, Lake Elsinore, San Jacinto Valley, and the Coachella Valley. Its discovery along the Los Angeles River channel was surprising, since we assumed this habitat was highly disturbed nearly every year; presumably, the area where the beetles were found (just south of the southern tarplant area, above) is either relatively lightly disturbed, or is just left un-disced during vegetation modification in the area.

[28] Two other *Cicindela* tiger beetles have been observed recently in the Long Beach area, including S-banded tiger beetle (*C. trifasciata*), also at Colorado Lagoon, and the mudflat tiger beetle (*C. trifasciata* ssp. *sigmoidea*) in larger wetlands (locations obscured in iNaturalist).

Figure 22a. Unusual mudflat habitat south of Willow St., presumably formed by deeper brackish water pooling for an extended period of time. This habitat was found to support the wetsalts tiger-beetle (*Cicindela haemorrhagica*), a native arthropod found in salt marshes and alkali lakes around the West (but unexpected in an active flood control channel in Long Beach!). 8 Sept. 2021.

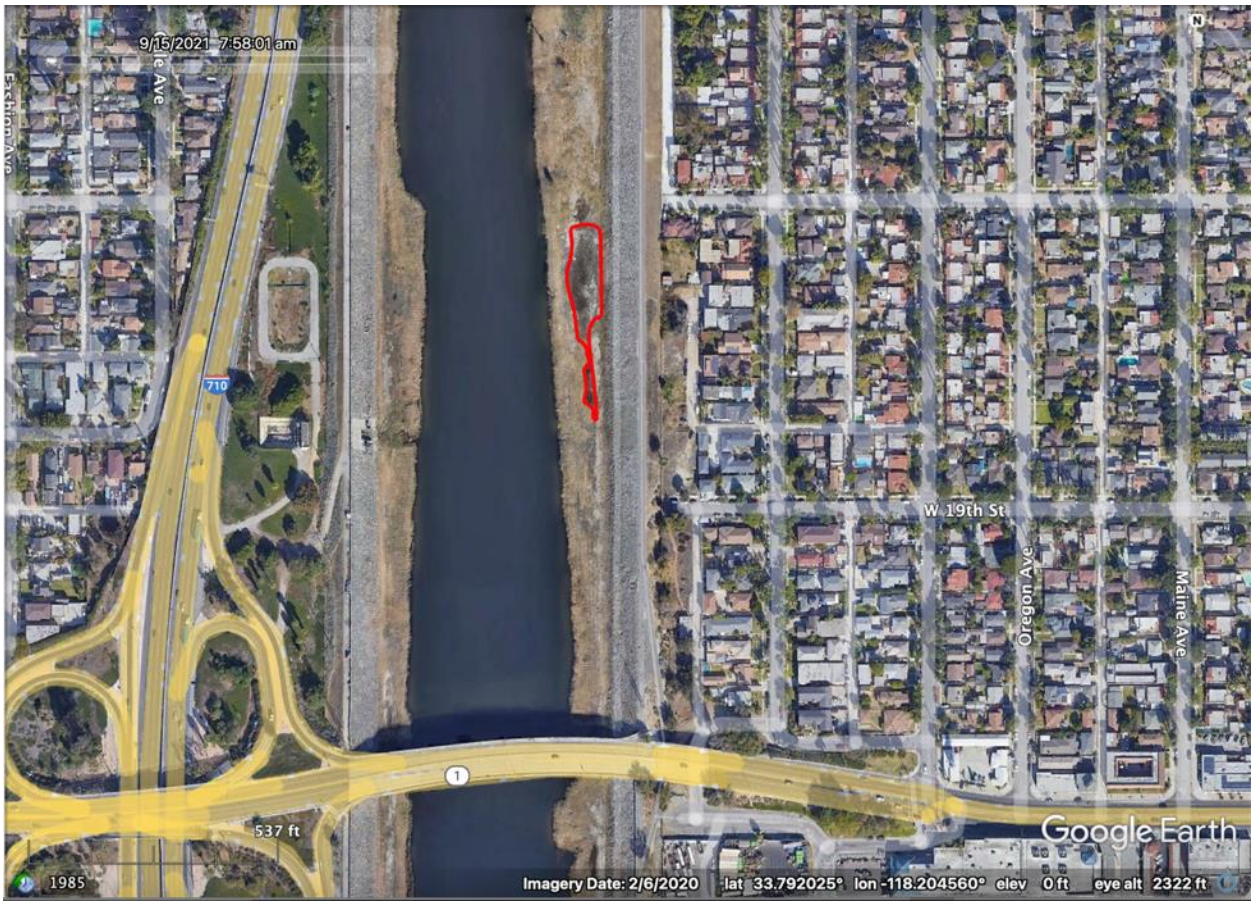

Figure 22b. Location of algal mat habitat where we located wetsalts tiger beetle (red outline).

Figure 23. Wetsalts tiger beetle (*Cicindela haemorrhagica*) on the algal crust shown in **Figure 22**. 8 Sept. 2021.

Sepulveda Basin natural bank

The stretch of the river through Sepulveda Basin (between Balboa Blvd. and Burbank Blvd.) was notable for several reasons, including being the longest portion of the river channel with entirely natural-sided (i.e, earthen) banks. The left/north bank of the river is actively eroding (**Figure 24**), creating a natural meander in the river. These banks supported several plant species that were absent from the other sites, or that were only encountered at Rio Hondo (which has similarly natural banks). Among the 24 taxa (see **Table D1**) we found here that were not at the other survey sites were Pacific poison oak (*Toxicodendron diversilobum*), California aster (*Corethrogyne filaginifolia*), clustered tarplant (*Deinandra fasciculata*), branching phacelia (*Phacelia ramossisima*), both California and canyon dodder (*Cuscuta californica* and *C. subinclusa*), alkali mallow (*Malvella leprosa*), monkeyflowers (*Erythranthe cardinalis* and *E. guttata*), trailing blackberry (*Rubus ursinus*), broad-leaf cattail (*Typha latifolia*) and blue elderberry (*Sambucus caerulea*). Incidentally, many of these same plants were observed recently at a small relict of lowland river habitat in upper Bull Creek in Granada Hills (Bull Creek is a tributary of the Los Angeles River that meets the river in the Sepulveda Basin; **Figure B25**), and most are common in various plant communities in the upper watershed, such as those found at Big Tujunga Wash and Bell Canyon (D.S. Cooper, pers. obs.). This suggests that indeed this stretch is a relict of former riverbottom habitat, and worth studying and protecting for that reason alone.

Figure 24. Natural river cut south of Woodley Golf Course formed by river erosion. This stretch had both natural floor and natural bank, and supported a very high diversity of native plants, including many not found elsewhere along the river channel. 13 Oct. 2021.

Alluvial fan scrub

This rare habitat type is characterized by widely-spaced scrub species and stunted riparian trees on sand or fine gravel soil[29]. Components of this habitat were observed along the channel at Sepulveda Basin (including stands of branching phacelia *Phacelia ramosissima* and patches of California buckwheat *Eriogonum fasciculatum* and California sagebrush *Artemisia californica*), but given the highly modified nature of these communities, and the fact that they are well-integrated into the larger riparian system here, we have elected to treat them as part of the Riparian woodland and scrub mapping category. Perhaps the finest example of little-disturbed river-associated habitat we encountered was located adjacent to our Rio Hondo reference site, within the Whittier Narrows Recreation Area (see **Figure 25**). This area was located off the main channel (to the east), but prior to channelization, would have occurred within the channel itself (which would have been much broader). Here, a patch of alluvial fan scrub on fine sandy soil with a different assortment of plants

[29] Buck-Diaz, J. and J.M. Evens, with A. Montalvo. Alluvial Scrub Vegetation of Southern California, A focus on the Santa Ana River Watershed in Orange, Riverside and San Bernardino Counties, California. September 2011. Available at: https://cnps.org/wp-content/uploads/2018/03/alluvial_scrub-diaz_evans2011.pdf

as was found anywhere else in the study area (including at Sepulveda Basin, at least not in a natural/non-planted state). Here we found lemonadeberry (*Rhus integrifolia*), coastal pricklypear (*Opuntia littoralis*), California spurge (*Croton californica*), golden currant (*Ribes aureum*), and showy penstemon (*Penstemon spectabilis*), as well as a stand of native bunchgrass that appears to be foothill needlegrass (*Nassella lepida*), or some other native bunchgrass. A handful of species in the wet riparian zone were also not found at the other sites (including western virgin's-bower *Clematis ligusticifolia* and black cottonwood *Populus trichocarpa*), but the alluvial scrub was an entirely unique (for the study area) community, and one that has been essentially lost elsewhere in the study area.

Figure 25. Alluvial fan scrub, a rare microhabitat, east of Rio Hondo channel north of 60 Fwy, showing a high diversity of scrub plants with large patches of bare sand (a natural condition). 25 Sept. 2021.

Undetermined taxa

In the course of our research, we treated several observations of plants to the level of genus, rather than species, owing to identification challenges that were beyond the scope of the study. In most cases, positive identification would require a microscope and reference specimens (and far more

time); in other cases, the taxonomic breaks between species are either imperfectly known, or the local populations appear to be hybrids. We describe these below.

Pigweeds (*Amaranthus* spp., *Chenopodium* spp.). Many species in these two genera are reliably identified by fruit/seeds, and they include both native and non-native taxa. They are especially common in the Transition Herbaceous plant community (esp. at Willow St. and Compton Cr.), but representatives were encountered at every study site. All material collected has been deposited at the University of California, Riverside Herbarium for positive identification.

Nightshades (*Solanum* spp.). White-flowered nightshades were encountered at each site except Willow St., and are referable to either *S. nigra*, *S. americana* or *S. douglasii*. As with Amaranthus, fruit and seeds are needed to positively identify them. S. nigra is a non-native, and the others are considered native. Nightshades were not abundant anywhere, but rather were scattered through various communities, and for this reason, were not a high priority for identification. All material collected has been deposited at the University of California, Riverside Herbarium for positive identification.

Water-primrose (*Ludwigia* spp.). At least two taxa are present, as discussed in the Annotated Checklist (see **Appendix D**). Water-primrose is a dominant species in both shallow-water portions of the river (throughout the study area except for Sepulveda Basin and Rio Hondo) and in the weedy Transitional Herbaceous community at Willow St. and Compton Creek. All material collected has been deposited at the University of California, Riverside Herbarium for positive identification.

Cattail (*Typha* spp.). At least two taxa are present, as discussed in the Annotated Checklist (**Appendix D**). Cattails are locally dominant in freshwater marsh vegetation, and were encountered at every site in the study area (except for Rio Hondo). Because of the extreme similarity of the two expected taxa, and the likelihood that wildlife do not utilize each species differently, their separation was not a high priority for the study. We photographed Typha at each site and uploaded our observations to iNaturalist.

Smartweed (*Persicaria* sp.). Two main types of smartweed were encountered, an uncommon pure white flowered taxon (likely *P. punctata*), observed at Elysian Valley and Glendale Narrows, and pink-and-white flowered plants found at every study site and at both Compton Creek and Rio Hondo. The latter plants are likely the native *P. lapathifolia* (*fide* A.C. Sanders, UCR Herbarium), but several other species, including both native and non-native taxa, have been collected from the Los Angeles Basin. Again, because wildlife are unlikely to distinguish between the different (very similar) species, we did not put a high priority on their separation. All material collected has been deposited at the University of California, Riverside Herbarium for positive identification.

Wildlife of the Los Angeles River Channel

While wildlife was not a focal component of our study, we made many incidental observations that may inform future resource conservation along the Los Angeles River channel.

Birds

Birds were particularly visible during our surveys, and we compiled a summary of bird species diversity (and birding effort) based on thousands of recorded visits by birders to the river (**Table 4**, **Figure 26**). We did not find a clear pattern in terms of bird species richness and habitat characteristics; for example, the most bird-species-rich site (Willow St. in Long Beach) did not have an especially high plant species diversity, either for natives or non-natives. However, it did have the most extensive areas of both transitional herbaceous and wading shorebird habitat, so perhaps those two habitat types are important for having a large species list. Obviously, one should not over-interpret avian diversity based on total species counts, as counts include vagrants/one-off sightings, fly-overs, etc., and do not always represent the actual regularly-occurring avifauna at each site.

Table 4. Bird species totals from eBird "Hotspots" along the Los Angeles River channel (as of Jan. 6, 2022; see www.ebird.org). Channel type: NFNB = Natural floor, natural bank; NFCB = Natural floor, cement bank; CFCB = Cement floor, cement bank (trapezoidal/slanted sides); BOX = Box channel (entirely cement, vertical sides).

eBird Hotspot	Channel type	# Spp.	# Checklists
Sepulveda Basin[30]	NFNB	228	934
Whitsett to Coldwater Canyon[31]	BOX	70	38
Riverside Dr. to I-5	NFCB	133	111
Glendale Narrows Riverwalk	NFCB	175	704
134 Fwy.	CFCB	132	264
Los Feliz Golf Course area	NFCB	157	256
Sunnynook Bridge	NFCB	140	177
"Frogtown" (vic. end of Knox St.)	NFCB	190	336
Oros St.	NFCB	120	108
Downtown (Olympic Blvd.)	CFCB	85	22
Downey Rd.	CFCB	73	97
Atlantic – Slauson	CFCB	102	141
Slauson – Imperial	CFCB	131	110
Southern Ave.	CFCB	83	39
Rosecrans Blvd.	CFCB	115	103
Alondra Blvd.	CFCB	135	106
Del Amo Blvd.	CFCB	149	308
Willow St.	NFCB	234	3122
Anaheim St.	CFCB	142	200

[30] Full name: "Los Angeles River – Sepulveda Basin" (separate Hotspots for other subareas within Sepulveda Basin, e.g., Sepulveda Basin Wildlife Area, sports complex, etc.)
[31] Here the river is a narrow, completely cement box channel with limited bird habitat. Most species likely in trees outside channel, but included here for reference.

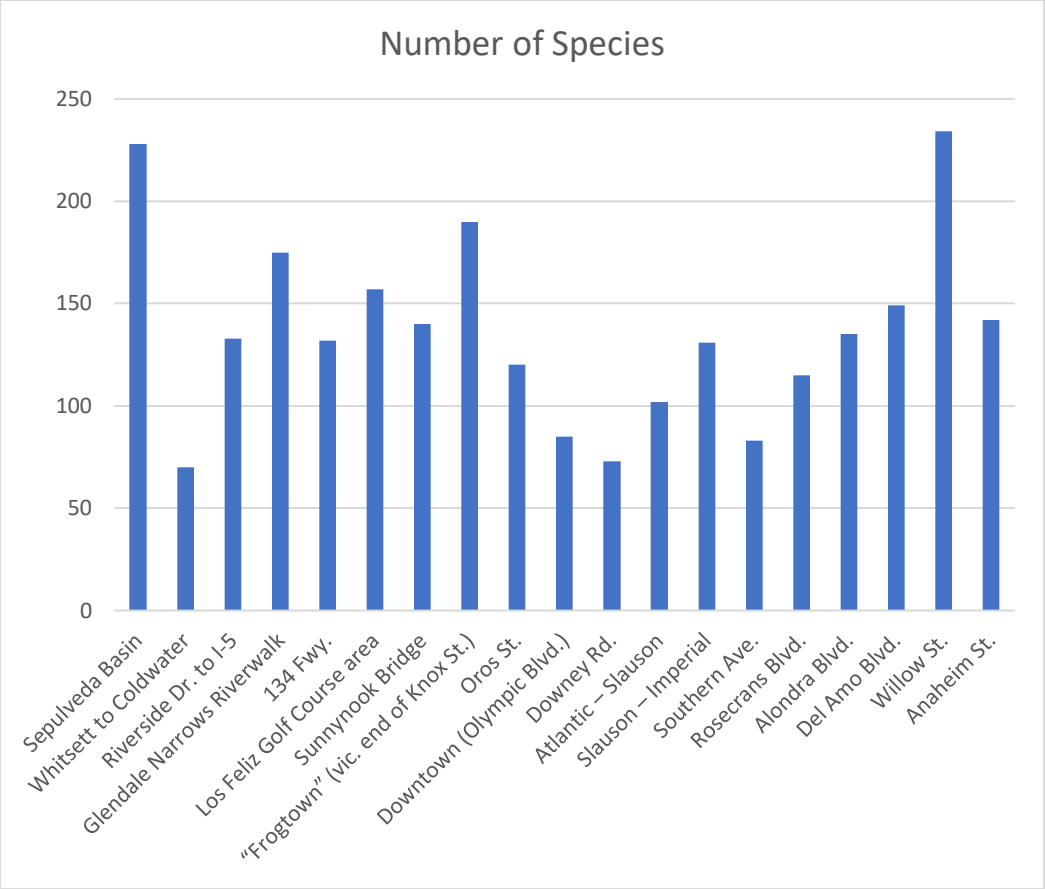

Figure 26. Visual representation of bird species diversity at various points along the lower Los Angeles River channel (see **Table 4**; compiled from eBird; www.ebird.org).

Other Wildlife

We noted an abundance of invertebrate life at every site, but in particular the Transitional Herbaceous habitat at Willow St. which we visited in late August and September. Here we found numerous butterflies, dragonflies/damselflies, native bees and flies, and other insects actively foraging on the lush summer- and fall-blooming vegetation along the channel (in addition to the tiger-beetles described above).

In particular, we noted the native "dark firefly" (*Pyropyga nigricans*), including multiple individuals mating, at Willow St. (**Figure 27**) – alas, this species does not illuminate! Other insects observed at Willow St. include both Pacific and black-tailed forktails (*Ischnura cervula* and *I. denticollis*); *Poecilanthrax arethusa*, a native bee fly (Bombyliidae); the (relatively) giant purple syrphid fly *Copesylum violaceum* (**Figure 28**); eufala skipper (*Lerodea eufala*), a butterfly largely found away from urbanized areas; and native moths such as *Caenurgia togataria*, found mainly in California, in wildland habitats. As these were found incidentally during vegetation surveys, more intensive investigation would surely reveal a wealth of interesting invertebrate information. Please see **Appendix E** for additional wildlife photos.

Figure 27. Dark firefly (*Pyropyga nigricans*), mating at Willow St., Long Beach. 1 Sept. 2021.

Figure 28. Syrphid fly *Copesylum violaceum* at Willow St., Long Beach. 1 Sept. 2021.

Management Recommendations

Stein et al. 2021a and Stein et al. 2021b analyzed future conditions for a handful of indicator species (including black willow *Salix gooddingii*) based on reduced flow rates, but did not set forth management goals for the entire river channel. Several years ago, TNC (2016) identified four main "findings" with respect to management of the Los Angeles River channel, which are still relevant today, and which we summarize below:

- "Multiple Flow Scenarios = Uncertainty", and "Flows Drive Biology"
    - We don't know what future iterations of the river's flow will be, which makes (in-channel) planning difficult.
    - Currently high (year-round) flows encourage non-native and invasive species; a drop in flows would improve natural conditions (at least in the Elysian Valley).
- "Prioritize Complementary Habitats" with respect to "River Adjacent Land Use"
    - Strips of land outside the channel levees are key to restoration of the river system.
    - These should be restored (or landscaped/enhanced) to add value to the riparian and other habitats along the channel.

In general, we concur with the findings of TNC, which acknowledge the importance of working around in-channel flows when envisioning restoration opportunities in the channel. However, as we observed in the field, active management is currently occurring in the channel, which represents a form of habitat restoration and/or modification.

Arundo removal

Most obviously, there has been an ongoing effort to eradicate larger patches of giant cane (*Arundo donax*) from the south Glendale Narrows (i.e., vic. Colorado Blvd. and south) and Elysian Valley, which we observed as resulting in large areas of river islands completed denuded of herbaceous vegetation (**Figure 29**; see also **Appendix F** for additional photos)[32]. This will presumably give the native herbaceous and other plant material an opportunity to germinate on these islands, which were previously a near-monoculture of giant cane. However, and concerningly, in the same area, we also observed numerous large (native) willow tree trunks sawed-off, sometimes leaving other trunks, but often entailing the removal of most of the above-ground portion of the tree (**Figure 30**). Again, we did not investigate the goal of these activity, but we presume that it made removal of giant cane faster and more efficient.

Whether the eradication/control of giant cane is a goal in itself, it may be a means to achieving a greater dominance by native plant species, which, in turn, would support a more diverse and robust native wildlife community in the river channel. Therefore, we do not object to keeping this activity going where giant cane poses a major threat to biodiversity. We would encourage managers to make every effort to avoid harm to other herbaceous species, including the look-along common reed (*Phragmites australis*), bulrushes (*Schoenoplectus* spp.), cattails (*Typha* spp.) and various sensitive

[32] We did not attempt to ascertain the specific methods of removal employed recently or in prior years. Much of the treatment areas appeared to have dead and dried herbaceous vegetation, which suggests chemical treatment, as well as having large "stumps" of giant cane cut down to near ground level or partially dug out.

herbaceous and perennial herbs, such as water-plantain (*Alisma triviale*), which we observed in one treatment area during this study.

Figure 29. Giant cane (*Arundo donax*) removal area south of Fletcher Ave., Elysian Valley. 29 Sept. 2021.

Figure 30. Cut willow stumps (unknown reason) in giant cane removal area, Elysian Valley. 2 Oct. 2021.

Other In-channel Restoration Opportunities

Promotion of native species

We noted several areas rich in native species within the channel, both in terms of where natives dominated non-natives in the total flora (e.g., Glendale Narrows adjacent to Bette Davis Park), and where there was just a high diversity of natives, including those not found elsewhere, such as the natural-floor stretches of Sepulveda Basin and Elysian Valley. We hope that our study highlights the uncommon native species found in these areas, and that future restoration proposals both re-survey them during other times of year (to augment our findings), and take their occurrence into account. Because each species has slightly different needs, it is impossible to generalize the effect of proposed management changes such as reduced flow in the river channel. This might be good for a native forb such as Coulter's lupine (*Lupinus sparsiflorus*, known only from a small area of Elysian Valley, on dry boulder cobble on a river island), but potentially bad for sneezeweed (*Helenium puberulum*), a semi-aquatic taxon nearly extirpated from the entire Los Angeles Basin, but represented by a single

plant discovered on a river island at Glendale Narrows adjacent to Glendale Riverwalk (this study). In other words, what may be bad for the lupine may be very good for the sneezeweed.

Non-native species control

With more than 150 non-native species recorded by our work along the river channel, ample opportunities exist for vegetation management. While giant cane appears to be the current highest priority for removal, we observed several highly-invasive species along the channel that could also be targeted, including tree-of-heaven (*Ailanthus altissima*), Persian silk tree (*Albizia julibrissin*), fivehook bassia (*Bassia hyssopifolia*), grasses in the genus *Cenchrus* (including fountain grass, *Cenchrus setaceus*), Shamel ash (*Fraxinus udhei*), goldenrain tree (*Koelreuteria* spp.), black locust (*Robinia pseudoacacia*), and fan palm (*Washingtonia* spp.). Considerable confusion must persist among agencies and groups, as some of these species, in particular Shamel ash, are virtually never targeted for removal, despite their considerable role in depressing native biodiversity throughout the river system.

We note that several non-natives appear to be acting as "surrogates" for native species, in that they appear to be supporting a diversity of native species, and are ecological similar to native counterparts that have been extirpated from the system. Examples of these include creeping saltbush (*Atriplex prostrata*), common in moist areas in Long Beach/Willow St.; umbrella sedge (*Cyperus involucratus*), grasses in the genera *Echinochloa* and *Sorghum*, and watercress (*Nasturtium officinale*). Each of these have "ecological equivalents" that have been lost along the river (e.g., *Atriplex serenana* var. *davidsonii*, *Nasturtium gambelii*) and while these could be re-introduced here, the odds of their survival would likely be low, given current flows, etc.

Still other common non-natives are herbs that die back in winter, that do not tend to form monocultures or otherwise crowd-out natives, and do not appear to pose a serious threat to native biodiversity. This list could include bur-marigold (*Bidens pilosa*), nettle-leaved goosefoot (*Chenopodium murale*), plantains (*Plantago* spp.), crispy dock (*Rumex crispus*).

A complete analysis of the various non-natives by river segment, and their prioritization for removal/control, was beyond the scope of this study, but would be useful for management going forward. At the very least, removal of non-native trees in the channel should be a high priority (along with continual removal of giant cane).

Encampment remediation

Illegal encampments now occupy every natural-floor (and many cement-floor) stretches of the river channel, with the most impactful concentrations at Sepulveda Basin, where we found no area of riparian habitat out of sight/ear-shot of an encampment, and the habitat riddled with footpaths, bikepaths, piles of trash, tents, wooden structures resembling cabins, lighting, cooking materials (grills, stoves), gas generators, electrical appliances, motorized vehicles parked along the river, pets, and piles of human excrement (**Figure 31**; see also photos in **Appendix F**). These encampments directly intersect some of the most sensitive plant and wildlife we encountered along the river, including known territories of State and Federally Endangered least Bell's vireo (*Vireo bellii pusillus*). These encampments burn regularly (daily, according to staff we spoke to at LAFD Station 88 adjacent to the Sepulveda Basin!), generally during the early morning when residents are trying to

stay warm, and in late afternoon when they are preparing food. These burns clear away large areas of native vegetation, and open up opportunities for non-natives.

Restoration of these areas would need to start with a massive trash removal over a period of weeks, a revamping of the signage/fencing regime near the sites, increased law-enforcement activity, and other actions. Again, it was beyond the scope of this study to complete an analysis of each "problem area", but a complete understanding of the magnitude of the issue by decision-makers is necessary as a first step.

Figure 31. Typical encampment refuse, river island near Sunnynook footbridge, Elysian Valley. Piles of this garbage is washed downstream during each rain event. 2 Oct. 2021.

Levee-bank Restoration Opportunities

We observed native shrub species planted as ornamental landscaping directly onto the levees (outside slope; i.e., away from the river channel) in several areas, but most consistently in the "southeastern cities" of Los Angeles County, such as South Gate, Paramount, and Long Beach, presumably as part of U.S. Army Corps of Engineers "improvement" projects dating to the 1990s (**Figure 32**; see also photos in **Appendix G**). Commonly-observed species included cultivars of

sages (*Salvia*), coyotebush (*Baccharis pilularis*), and buckwheat (*Eriogonum* cf. *fasciculatum*). As our focus for this report was in-channel restoration, we did not investigate the composition of these plantings, nor their use by wildlife. However, it is likely that these plantings support at least some native species, which are then able to move up and down the river more easily (e.g., lizards and small mammals).

Figure 32. Extensive, mostly-native plantings at Ralph Dills Park, city of Paramount (left), adjacent to levee of Los Angeles River channel (right), which is also landscaped in part with native vegetation. 9 Jan. 2022.

Outside-channel Restoration Opportunities

We were surprised (and delighted) by the sheer number of "pocket parks" that have appeared along the Los Angeles River channel since the 1980s, often on formerly highly-disturbed, undeveloped lands with some native flora still extant, but also as plantings of natives within manicured parks (see photos in **Appendix G**). Particularly where they border unvegetated concrete channels, these pocket parks are critical areas of native flora and fauna within urban areas with virtually no native elements, such as in the San Fernando Valley (away from Sepulveda Basin) and in southeastern Los Angeles County (e.g., Southgate, Paramount, etc.). Because only a fraction of river-adjacent lands have been

landscaped with natives, ample opportunities exist to extend these plantings to connect the larger parkland areas along the river, such as Sepulveda Basin and Bette Davis Park, and to better integrate in-channel natural-floor habitat with native plantings just outside the channel (and, where possible, into the surrounding neighborhoods). While this is starting to occur in places like the southeastern San Fernando Valley (e.g., the Valleyheart Greenway area through Studio City), large stretches of river are both concrete-lined and pass through highly urbanized areas with virtually no native vegetation (e.g., Downtown Los Angeles to Maywood-Cudahy). Many of these "high-need" stretches have already been identified for future park and restoration projects to be funded by bond measures (Cooper et al., unpubl. data), but we would also suggest identifying and enhancing existing natural vegetation areas along the river, such as equestrian areas with relict blue elderberry (*Sambucus caerulea*) stands.

Many areas of river-adjacent land, including those many miles from large blocks of native habitat (such as along Compton Creek) still support relict riparian species such as blue elderberry, Fremont cottonwood (*Populus fremontii*), and willows (*Salix* spp.) (**Figure 33**). These areas have never been formally mapped, and yet represent a major source of actually native flora and fauna along the river channel, which must be recognized, protected, and promoted during any development (including restoration).

Encouragingly, we observed native wildlife species using the plantings within (otherwise "manicured") urban parks along the river, such as an Audubon's cottontail (*Sylvilagus audubonii*) at Hollydale Park (**Figure 34**), miles from a large area of natural habitat, and California Towhees (*Melozone crissalis*) using planted (native) scrub species at Ralph Dills Park in Paramount. Ample opportunities exist for much larger, more impactful plantings at existing parks that were landscaped decades ago with turf grass and non-native trees, such as at Reseda Park, which has essentially no native plantings other than perhaps western sycamore (*Platanus racemosa*) and a single valley oak (*Quercus lobata*). Setting aside – and managing – portions of parks like Reseda Park for natives, as has been done at Hollydale Park, North Atwater Park, and many others, would greatly increase opportunities for native flora and fauna to both thrive along the Los Angeles River, and pass through the urban matrix more easily during migration and dispersal events. It would also bring nature directly to communities that are located far from the large natural areas that characterize Los Angeles (e.g., Griffith Park, Santa Monica Mountains), but which are located miles from most peoples' homes.

Flows Reduction

It is generally understood that the modern Los Angeles River has far more year-round water throughout its length than would have occurred historically, including during the height of agricultural development in the early 1900s. The introduction of late spring and summer flows through the river has resulted in the creation and maintenance of many novel vegetation communities, and certain wildlife communities (which were beyond the scope of this study). Given how varied the river channel vegetation is from Sepulveda Basin to the lower river, any change in flow level will surely have a dramatically different impact depending on which area of the river one is evaluating.

Most dramatically, a reduction in flows would severely impact the wildlife (mainly bird) species using "Wading shorebird habitat", which is heavily-used as foraging habitat by a variety of waterbirds (i.e., not just shorebirds), including certain species of waterfowl, gulls and terns, herons and egrets, and swallows (Cooper 2006). It also supports nesting populations of certain species such as Black-necked Stilt (*Himantopus mexicanus*), American Avocet (*Recurvirostra americana*), and Spotted Sandpiper (*Actitis maculatus*). It would also reduce the amount of "Warm water habitat" used by waterfowl, and by large waders such as herons and egrets. Because waterbird habitat is not particularly abundant in the Los Angeles area, and because two areas of both types of aquatic bird habitat are highly-productive areas for migratory, wintering, and a handful of nesting birds, this impact would be significant.

In general, one would expect a reduction in riparian woodland, freshwater marsh, and native transitional herbaceous vegetation, and a relative increase in some types of riparian scrub, some transitional herbaceous vegetation, and non-native trees and shrubs. Tall native riparian woodland such as that dominated by willow and sycamore trees depends on access to freshwater, or a high water table, so loss of this would be most felt in the Sepulveda Basin, Glendale Narrows, and Elysian Valley where this vegetation dominates. Freshwater Marsh habitat could be lost, which would affect Elysian Valley and Willow St., both of which support extensive stands of this habitat (or did, at least prior to *Arundo* removal, in the case of Elysian Valley). Certain types of non-native shrubs and forbs might increase with reduced water flows, such as non-native white sweet-clover and Bermuda grass in areas like Willow St. in Long Beach. In places like Elysian Valley, it is also possible that native scrub species like lupines would colonize newly-exposed areas of cobble and sand, which could see a re-emergence of sandy wash habitat long gone from the lower river channel.

While this study did not assess the existing wildlife communities present along the river channel, nor the potential impacts to these under different flows scenarios, several special-status bird species occur along the river, including in areas we surveyed, such as the Federally and State Endangered Least Bell's Vireo (*Vireo bellii pusillus*). This and other taxa such as the Yellow Warbler (*Setophaga petechia*) and Yellow-breasted Chat (*Icteria virens*), both California Species of Special Concern, would be expected to be affected by a reduction in the amount of spring and summer water through the channel. Obviously, many other native bird and wildlife species – not just special-status taxa – would be negatively impacted by a reduction of riparian and freshwater marsh habitat. It was beyond the scope of this study to assess these impacts, or the potential vegetation change at each site under different flow scenarios, but it is our hope that this report lays the groundwork for such future investigations.

Figure 33. Relict stands of blue elderberry (*Sambucus caerulea*) were observed widely, including these along the fenceline just outside the Compton Creek levee (north of Del Amo Blvd.). These can serve as "keystone species" in an otherwise heavily-urbanized/industrial zones through which the river flows. If these levee-adjacent sites were to be protected and managed (a large encampment was recently cleared here following several publicized murders of unhoused residents), these elderberries could serve to anchor the native plantings here, and provide habitat if the non-natives were removed. A fan palm (*Washingtonia* sp.) is visible, and castor bean (*Ricinis communis*). 15 Sept. 2021.

Figure 34. Young Audubon's cottontail (*Sylvilagus auduboni*) along the native plantings area at Hollydale Park, South Gate. 9 Jan. 2022 (Ph. by Nurit Katz).

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