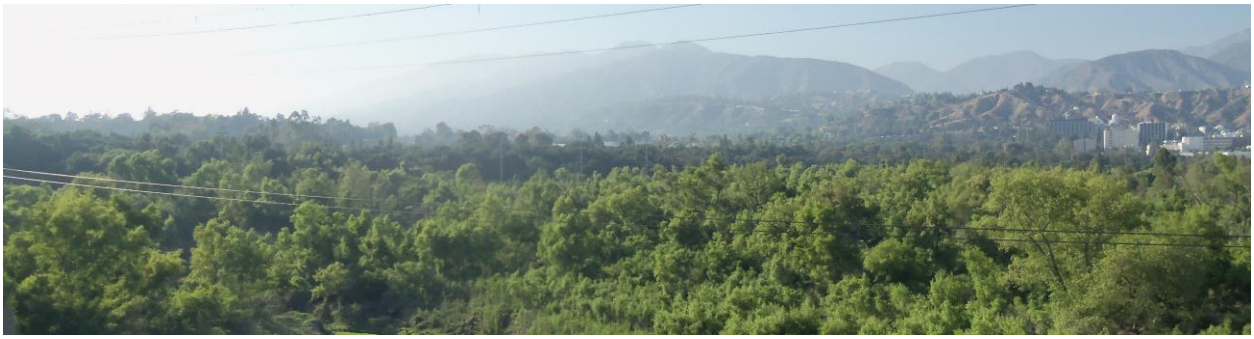


Preliminary Habitat Assessment of Southwest Hahamongna

Arroyo Seco Stream Team
August 23, 2012

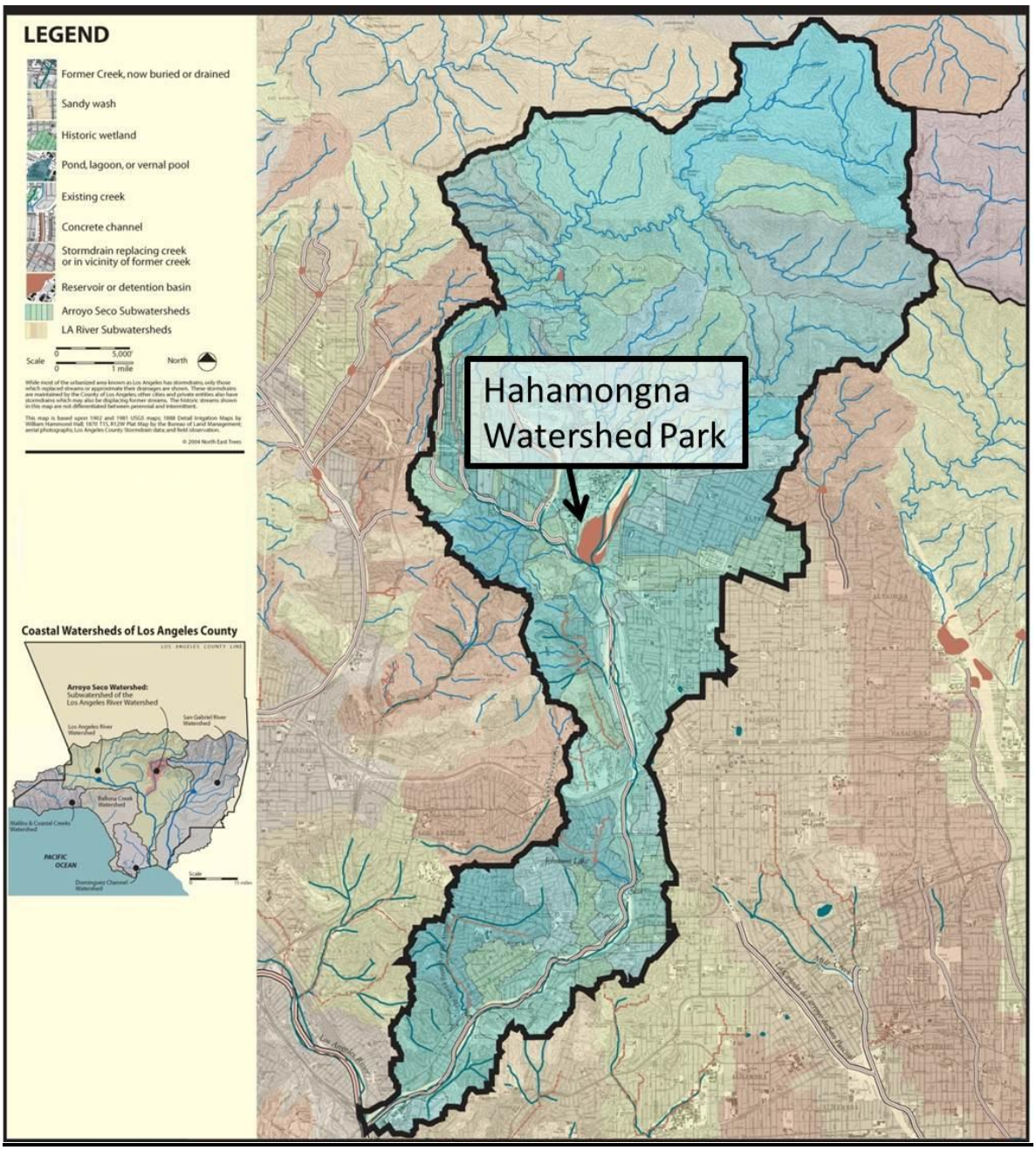
Arroyo Seco Stream Team
570 W Avenue 26
Suite 450
Los Angeles, CA 90065

August 23, 2012

Contributing Authors:

Johnathan Perisho
Austin Kahn
Jonathan Frame
Lin Cher

Abstract
Hahamongna is a key link of the Arroyo Seco between the undeveloped mountains and lower urban channel. This study identified ecologically significant habitat dominated by wetlands throughout the study area in the southwestern basin. Findings indicated current vegetation cover is very similar to 2003 Hahamongna Watershed Park Master Plan terrestrial plant community cover proposed for restoration. Regeneration is notable after extensive site disturbances through 1994, as well as the 2009 Station Fire. Existing hydrology and fluvial processes are likely contributing factors. The preservation of these conditions, restoration in flow restricted conditions, and long-term sediment management planning are recommended.



Arroyo Seco Watershed regional map, referenced through North East Trees

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1.0 Summary

Hahamongna is an important site in Southern California's cultural and ecological heritage, playing a critical role in the region's water resources, flood management, recreation, education, biological diversity, and wildlife corridor. Located at the foot of the San Gabriel Mountains in the center of the Arroyo Seco Watershed, Hahamongna is a key reach of not only the Arroyo Seco River, but also the Los Angeles River Watershed system. Throughout the years, the Hahamongna landscape has been through an enormous amount of changes ranging from natural geological and biological morphology to manmade alterations.

This habitat assessment of the southwest Hahamongna Basin was carried out by the Arroyo Seco Stream Team on behalf of the Arroyo Seco Foundation to better inform future study and planning. Although thorough and comprehensive data collection with systematic random sampling was not conducted due to limited resources, time, and access, this study will provide Hahamongna stakeholders and decision makers with a basic assessment of current conditions of the site. At accessible points through the study area, vegetation cover and distribution were inventoried and identified both during and after fieldwork. Wetland status was then classified using U.S. Army Corps of Engineer standards for hydrophytic vegetation dominance and prevalence indicators.

The majority of the study area was classified as wetland with most points found to have vegetative cover comprising greater than 50% wetland dominance. The current distribution of willow and mulefat cover is similar to that proposed in the 2003 Hahamongna Watershed Park Master Plan addressed in Appendix C. The results are not only significant for identified increasingly rare freshwater riparian wetland habitat and species associations, but also for the integrity of conditions observed. Robust native cover and relative lack of exotic species constitutes notable regeneration after extensive site disturbances through 1994, as well as the 2009 Station Fire. Native dominance and signs of emergent diversity were most pronounced throughout areas with flood indicators. Flood and groundwater access are likely positive influences. Conversely, exotic invasive presence was observed to be greater up slopes and compacted terraces. Accordingly, recommended ecological enhancement measures include preserving existing hydrology, managing exotic species on adjacent slopes and terraces, and long-term planning for complex sediment issues.

2.0 Scope

This preliminary study concerns an inventory of existing conditions for future study and planning purposes. Included are both the results of site observation and reference of related literature. The area of interest for the study was defined by accessibility through portions of the basin presently undergoing project considerations. The area addressed is the southwestern section of the Devil's Gate Basin in Hahamongna, located at the foot of the San Gabriel Mountains northwest of Pasadena. This falls in the center of the Arroyo Seco, a first order tributary of the Los Angeles River. See Figure 1.

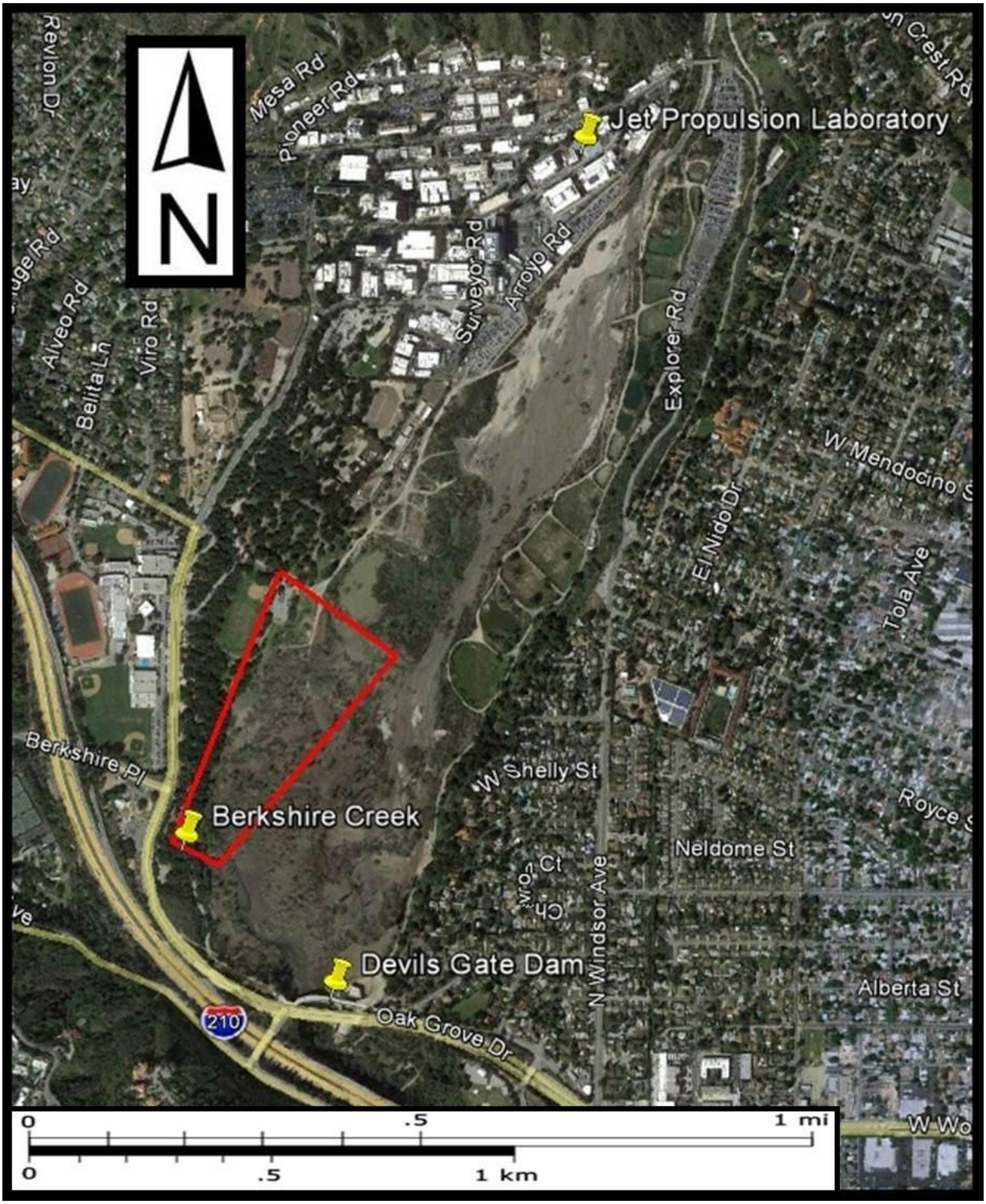

Figure 1. Aerial image of Hahamongna Watershed Park with the Habitat Assessment boundary outlined in red, referenced through GoogleEarth

2.1 Limitations

Field locations were not randomized or systematic. Observations were limited to accessible areas due to thick vegetation cover. Locations for collection were not consistent and observations were limited to April through July of 2012. Additionally, the Flintridge precipitation index for October 2011- August 2012 was 14.02", approximately 64% of average[1] concurrent with record heat. The short observation window over the dry period likely limited identification of wetland indicators and so does not account for seasonal fluctuations.

Field use of professional instruments was limited. Soil probes, survey equipment, and randomized distribution of observation would have enhanced the quality of the data. Some insignificantly represented species were not identified. Additionally, the prevalence and coverage of plant species was not gauged with the accuracy and precision necessary for policy decisions without more complete study.

3.0 Background

3.1 History

Humans are understood to have lived in the San Gabriel Mountains for thousands of years. Historically, the Hahamongna area provided access to important trade routes across the mountains. The development of the California Missions began to change the landscape and cultural characteristics of Hahamongna.

In 1920 the Los Angeles County Flood Control District built Devil's Gate Dam. The dam was built for flood protection and water conservation following 1914 and 1916 heavy rain and flooding. The reservoir extends well into what is now known as Hahamongna Watershed Park.

During early research at Jet Propulsion Laboratory (JPL) liquid and solid waste was disposed of in the Hahamongna Basin. The hazardous waste located at JPL included solvents, solid rocket fuel propellants, cooling tower chemicals, sulfuric acid, Freon, mercury, and chemical laboratory wastes. Due to the resulting volatile organic compounds (VOCs) in the groundwater, several water production wells were closed in the late 1980s and early 1990s.[2] Lawsuits have been filed in response to health issues believed to be caused by contaminated drinking water.[3] NASA started constructing treatment centers to remove toxins. Groundwater is now tested regularly. In March of 2011 NASA completed another treatment system to address the perchlorate contamination in the Pasadena.

Additionally, extensive disturbance has occurred through the site over the last century up to conclusions in 1994. Activities included aggregate mining, soil amendment mixture, dumping, as well as truck and heavy equipment parking; minimal oversight occurred over this period with some unpermitted ongoing operations. No reclamation plans were established, and no remediation took place after 1994.[4] For aerial photography of described conditions see Appendix D.

In 1974 "Steady" Ed Headrick and other flying disc enthusiasts established a course for disc golf using chain linked baskets as targets. The sport has grown in popularity and the course at

[1] Los Angeles County Department of Public Works [LADPW], "Near Real Time Precipitation Map."
[2] U.S. Environmental Protection Agency, "Superfund Site Overview Jet Propulsion Laboratory (NASA), Pacific Southwest, US EPA."
[3] *Vallier v Jet Propulsion Laboratory*.
[4] Brick, "Devil's Gate Basin Private Operations."

Hahamongna known as Oak Grove has gained fame and recognition as the first permanent basket disc golf course.

In October of 1993, in an effort to honor the original people of the Watershed the name was changed from Oak Grove Park to Hahamongna Watershed Park. Vera Rocha, a leader in the Gabrielinos Native American community, was involved in the name change and conducted the ceremony.

In recent years planning efforts concerning Hahamongna have included the 2003 adoption of the Hahamongna Watershed Park Master Plan, 2005 Army Corps of Engineers South Pacific Division feasibility phase of the *Arroyo Seco Watershed Management Study*, and the 2006 *Arroyo Seco Watershed Management and Restoration Plan*. Ongoing planning for management strategies also continue to influence Hahamongna after the 2009 Station Fire and 2009-2010 heavy rainfall depositions.

3.2 Geophysical

The study area is located below the mouth of the San Gabriel Mountains in the lower Hahamongna section of the Arroyo Seco. The Devil's Gate Dam at the bottom of the wash forms a roughly 120 acre basin encompassing the study. This portion has a watershed of 20,416 acres undeveloped in the mountains and developed in adjacent La Cañada-Flintridge and Altadena[5]. The surveyed locations are between 1000 and 1050 feet above sea level[6] in the Southern California coastal transverse foothills characterized by gently rolling topography and semi-arid conditions. This includes upland oak woodland, chaparral, and coastal sage scrub communities with less than 3% riparian habitat cover identified throughout the coastal foothills.[7]

In "The Control of Nature" John McPhee describes the unstoppable force of the eroding San Gabriel Mountains. The massive amount of debris that is transported down the steep slopes of the mountains has historically gone to rest in the Pacific Ocean, or on the coastal plain. These depositions can be seen in almost every outcrop in the Los Angeles area. This pattern is further aggravated by the intermittent heavy wet periods and long dry periods of the region with almost all discharge occurring between November and April,[8] compounded by the locally higher precipitation index of the mountains and foothills.[9]

The highly erosive San Gabriel Mountains in conjunction with variable precipitation patterns produce the alluvial fan. This is characterized by heavy erosion in the steep mountains carried down to the more gradual elevation change of the hills, reducing velocity and carrying capacity for sediment. Resulting depositions periodically fill channels, leading to meandering flows.[10] The Devil's Gate Dam now also impedes peak flow discharge and sediment movement leading to increased sediment buildup. During high velocity flows that are more capable of moving sediment, the lower outlets that would let sediment-laden flow past the dam are closed. Capital

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[5] Los Angeles County Department of Public Works [LADPW], *Devil's Gate Dam and Reservoir Postfire Sediment Removal Short Term Solution Report for Sediment Accumulation Along the Face of the Dam*.

[6] U.S. Geological Survey [USGS], "Pasadena Quadrangle 7.5-minute Series."

[7] Stephenson and Calcarone, *Southern Calfornia Mountains and Foothills Assessment: Habitat and Species Conservation Issues*.

[8] Montgomery Watson Herza, *Hydrology, Hydraulics and Geomorphology Engineering Information and Studies*.

[9] Los Angeles County Department of Public Works [LADPW], "Near Real Time Precipitation Map."

[10] CDM, *Arroyo Seco Watershed Assessment: Arroyo Seco Watershed Sustainability Campaign*.

storm peak flow is limited by 30% and 10-year peak flow by 75% with the dam almost completely holding back sediment movement.[11]

The extreme geophysical characteristics were demonstrated by the fall 2009 Station Fire that burned more than 162,000 acres. This included nearly the entire undeveloped upper watershed in the mountains, approximately 68% of the total catchment area.[12] The fire removed slope stabilizing vegetation and formed hydrophobic soils, contributing to the 2009-2010 storm accumulation of 1,000,000 cubic yards of sediment in Devil's Gate Basin.[13] This drastically altered the landscape with ten times more sediment deposited in this period than all of the previous depositions since the last debris removal in 1994.[14] The Los Angeles County Flood Control District is currently in the environmental review for the Devil's Gate Reservoir Sediment Removal and Management Plan.

3.3 Biophysical

The most recent comprehensive biological resources inventory was conducted over a ten month period between 1998-1999 for the Hahamongna Watershed Park Master Plan,[15] followed by other general assessments.[16] The 1998-1999 Parsons study identified cover as largely ruderal (described as largely bare and non-native cover dominated by forbs), southern willow scrub that gave way to mulefat scrub north, and both landscaped and coast live oak woodland at the western and southwestern peripheries. Over 300 plant and 100 animal species were observed.[17] Reference 1998-1999 survey map from the 2001 report in Appendix C.

Lepidospartum squamatum shrubland alliance (alluvial fan scrub [Holland]) is known to occur north of the site,[18] noted rare as G3 S3 (21-100 viable occurrences or 10-50,000 acres) and some associations G1 S1 (fewer than 6 occurrences state wide or 2000 acres).[19] In addition, *Salix gooddingii*, *S. laevigata*, and *S. lasiolepis* were identified and could comprise the southern willow scrub described. Both black willow woodlands (G4 S3) and red willow woodlands (G3 S3) are rare alliances also associated with cottonwoods. This cover is considered globally threatened by hydrologic alteration and water management[20] and restoration proposals for

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[11] Montgomery Watson Herza, *Hydrology, Hydraulics and Geomorphology Engineering Information and Studies*.

[12] Los Angeles County Department of Public Works [LADPW], Devil's Gate Dam and Reservoir Postfire Sediment Removal Short Term Solution Report for Sediment Accumulation Along the Face of the Dam.

[13] Los Angeles County Department of Public Works [LADPW], *Devil's Gate Dam and Reservoir Postfire Sediment Removal Short Term Solution Report for Sediment Accumulation Along the Face of the Dam*.

[14] Ibid.

[15] Parsons Engineering Science, Inc, Inventory Surveys of Biological Resources and Landscape and Habitat Restoration Plan at Hahamongna Watershed Park.

[16] CDM, Arroyo Seco Watershed Assessment: Arroyo Seco Watershed Sustainability Campaign; North East Trees et al., Arroyo Seco Watershed Management and Restoration Plan; U.S. Army Corps of Engineers, "U.S. Army Corps of Engineers North American Digital Flora: National Wetland Plant List."

[17] Parsons Engineering Science, Inc, Inventory Surveys of Biological Resources and Landscape and Habitat Restoration Plan at Hahamongna Watershed Park.

[18] Ibid.; U.S. Army Corps of Engineers, South Pacific Division, Arroyo Seco Watershed Management Study, Los Angeles, California, Feasibility Phase Project Management Plan.

[19] Sawyer, Keeler-Wolf, and Evans, A Manual of California Vegetation.

[20] Stromberg, "Restoration of Riparian Vegetation in the South-western United States."

willow and cottonwood associations in the region focus on mimicking natural flood patterns.[21] The 2003 Hahamongna Watershed Park Master Plan proposed that the study area include a mosaic of willow and mulefat habitat in the study area.[22] See Appendix C.

More than 225 known avian, mammalian, reptilian, and amphibian species are dependent on wetland habitat throughout California.[23] Many species of concern are associated with this cover, including several with favorable conditions in the study area[24] such as the observed arroyo toad.[25] Arid and semi-arid wet habitat supports the greatest diversity of avian species in the region[26], with most Southern California species of concern occurring in lower elevation riparian wetlands.[27] Accordingly, avian diversity is a strong indicator of wetland integrity and these vegetation alliances and associations are considered most important for species conservation.[28]

Historic and contemporary observations have identified 202 avian species in Hahamongna.[29] Species of concern include the threatened bank swallow, endangered willow flycatcher, and federally endangered least bell's vireo.[30] These species understood to be threatened by lacking habitat and the least bell's vireo in particular is dependent upon willow and mulefat habitat[31] observed in the area.

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[21] Sawyer, Keeler-Wolf, and Evans, *A Manual of California Vegetation*; Shafroth et al., "Establishment of Woody Riparian Vegetation in Relation to Annual Patterns of Streamflow, Bill Williams River, Arizona"; Stromberg et al., "Altered Stream- flow Regimes and Invasive Plant Species"; Stromberg, "Restoration of Riparian Vegetation in the South-western United States."

[22] City of Pasadena, *Hahamongna Watershed Park Master Plan*.

[23] Barbour, Keeler-Wolf, and Schoenherr, *Terrestrial Vegetation of Southern California*.

[24] Parsons Engineering Science, Inc, Inventory Surveys of Biological Resources and Landscape and Habitat Restoration Plan at Hahamongna Watershed Park; U.S. Army Corps of Engineers, South Pacific Division, Arroyo Seco Watershed Management Study, Los Angeles, California, Feasibility Phase Project Management Plan.

[25] U.S. Army Corps of Engineers, South Pacific Division, *Arroyo Seco Watershed Management Study, Los Angeles, California, Feasibility Phase Project Management Plan*.

[26] Barbour, Keeler-Wolf, and Schoenherr, *Terrestrial Vegetation of Southern California*.

[27] Stephenson and Calcarone, *Southern Calfornia Mountains and Foothills Assessment: Habitat and Species Conservation Issues*.

[28] Barbour, Keeler-Wolf, and Schoenherr, *Terrestrial Vegetation of Southern California*.

[29] "eBird Hahamongna Watershed Park [formerly Oak Grove Park]."

[30] Dowell, Garrett, and Benner, "eBird Checklist – Hahamongna Watershed Park [formerly Oak Grove Park], California – Sun Jul 29, 2012 – 55 Species [+2 Other Taxa]."

[31] Stephenson and Calcarone, *Southern Calfornia Mountains and Foothills Assessment: Habitat and Species Conservation Issues*.

4.0 Methods

Work in the field primarily consisted of detailed observation with particular attention to plant abundance, vegetative diversity, soil characteristics, and hydrology indicators. At each geographic location, the prevalence of certain plant species as well as the variety of those species were noted. Soil indicators such as ped structures and particle sizes helped identify areas of water flow. Drainage paths also supported identification of wetland hydrology.

Geographic locations were recorded with a Garmin Etrex GPS unit. Plants were identified in the field with reference to the Arroyo Seco Foundation Wetland Plants of Hahamongna Field Guide. A Kodak Easyshare M532 camera was used for photographic documentation. Photographs were used for post-field identification of plants using the USDA online "Plant Database," the USACE wetland plant list, and other online and textual resources.[32]

Identified plant species were cross-referenced for their wetland indicator status. The USACE classifies plants that are found with a likelihood of 0.99, 0.66, 0.5, 0.33, .01, as OBL, FACW, FAC, FACU, and UPL respectively. Species with common status were grouped together for calculation of indicator ratios and USACE dominance test and prevalence index test. The prevalence index procedure can be found in the Wetland Determination Data Form in the Arid West Region supplement to the USACE Wetland Delineation Manual. The requirement for the dominance test is such that over 50% of the dominant plant species found must be of indicator status FAC, FACW, or OBL. Data were entered into the ESRI ArcView GIS program for visualization and referencing.

A review of related literature was also conducted to frame and describe findings, including review of the most recent biological surveys[33] and subsequent assessments.[34] History of conservation species, significance of community cover, and cross-reference of identified communities and biota made primary reference to *A Manual of California Vegetation, 2nd Edition* and *Terrestrial Vegetation of Southern California, 3rd Edition* supported by other text and online resources. Report findings were expressed using the Sawyer, Keeler-Wolf, and Evans classification system outlined in *A Manual of California Vegetation, 2nd Edition* adopted by California Native Plant Society and the California Department of Fish and Game. Classification of point observations into associations provided a reference for the conditions, characteristics, and other species that may be present or reliant on the habitat observed. The informed observations, both in the field and through literature review, form the basis for evaluation and recommendations.

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[32] County of Ventura Planning Division, "Guide to Native and Invasive Streamside Plants: Restoring Riparian Habitats in Ventura County & Along the Santa Clara River in Los Angeles County"; Southern Calfiornia Coastal Water Research Project, "Riparian Plants Commonly Encountered in Riverine Wetlands Ver. 1: a Field Guide for Practitioners of the California Rapid Assessment Method for Wetlands and Riparian Areas (CRAM)"; Calflora, "Calflora: Information on Wild California Plants for Conservation, Education, and Appreciation"; Regents of the University of California, "UCJEPS: Jepson Manual Treatment Indexes"; Ladybird Johnson Wildflower Center, "Native Plant Database."

[33] Parsons Engineering Science, Inc, *Inventory Surveys of Biological Resources and Landscape and Habitat Restoration Plan at Hahamongna Watershed Park*.

[34] CDM, *Arroyo Seco Watershed Assessment: Arroyo Seco Watershed Sustainability Campaign*; North East Trees et al., *Arroyo Seco Watershed Management and Restoration Plan*; U.S. Army Corps of Engineers, South Pacific Division, *Arroyo Seco Watershed Management Study, Los Angeles, California, Feasibility Phase Project Management Plan*.

5.0 Survey Results

The study area is characterized by dominant wetland indicator vegetation comprising more than 50% of cover surveyed at most locations throughout southwestern Hahamongna. This classifies most of the surveyed area as wetland by U.S. Army Corps of Engineers standards. Species were largely FAC and FACW in dominant black willow thickets with mosaic mulefat thickets in wide open flow areas and smartweed-cocklebur patches in deep meanders and clay soils. Groupings of OBL species were observed in low woodland openings and meanders. Additional FACW perennial pepperweed patch semi-natural stands were found on slopes and in elevated portions of the wash with UPL exotic associations. Upland coast live oak woodland and upland mustard series are found at the western and southwestern periphery of the study area.

Many meanders were noted throughout the study, from wide and shallow to deep and narrow eroded channels sometimes several feet deeper than surrounding topography. Meanders were sometimes characterized by fine clay soils creating ped structures clearly defined by divided points of weakness. Most commonly soils in flow areas were fine to course sand likely more widespread from 2009 Station Fire sedimentation. On raised sites above clear flow indicators soils were often compacted. Cobble and drift wood debris were widespread throughout.

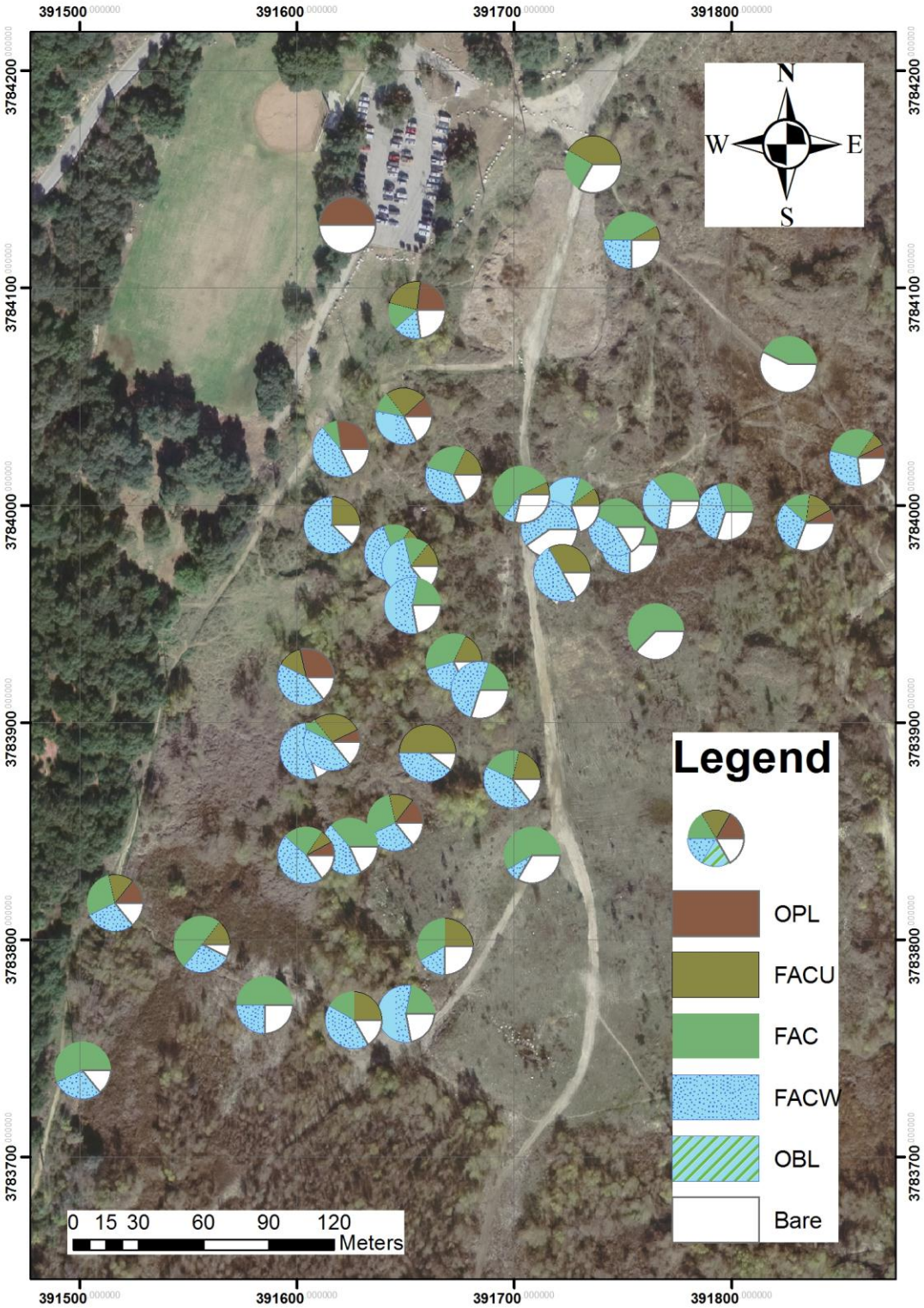

Figure 2. Wetland indicator status survey point inventory

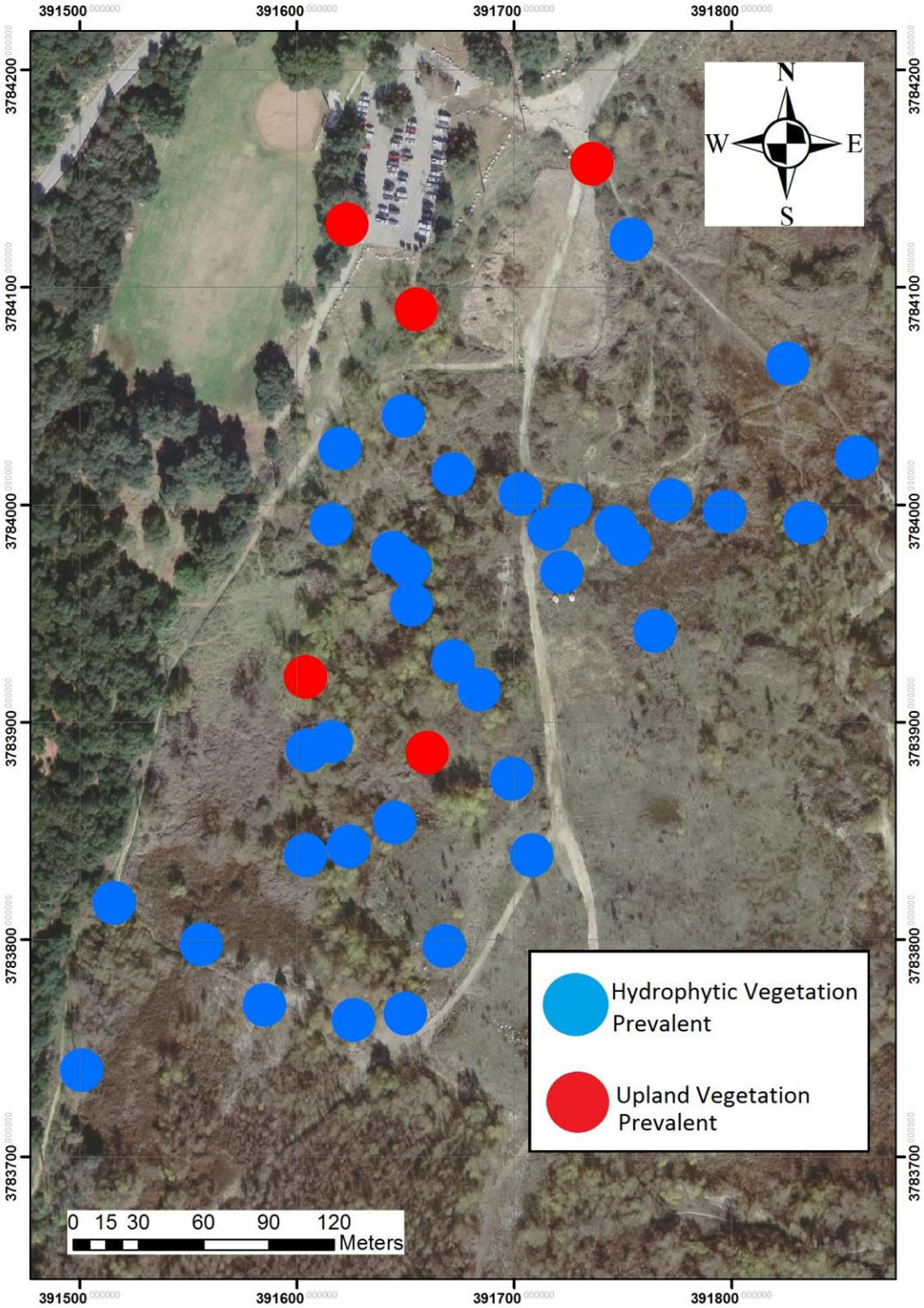

Figure 3 Hydrophytic vegetation prevalence

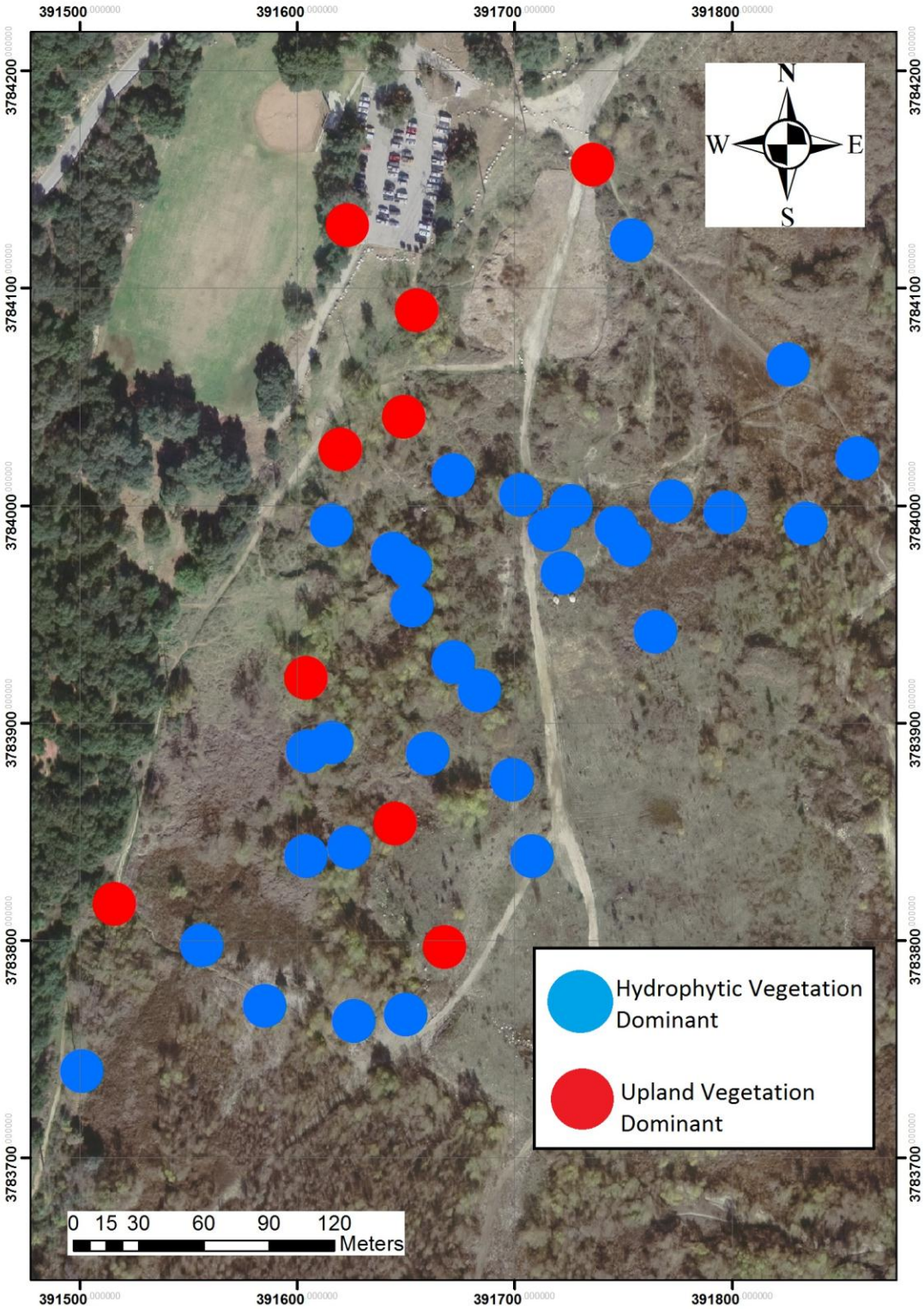

Figure 4. Hydrophytic vegetation dominance

Figure 5. Black willow thicket observed in the SW Hahamongna Basin

5.1 *Salix gooddingii* woodland alliance

Black willow thickets made up the most dominant cover throughout the study area with some stands of tall trees (>30'). Growth was noted both in wide open flow areas with fine course sand soil as well as adjacent and creating canopies over deep meanders, usually opening before clay and compacted soils. Some wide space bare of vegetation is prevalent, especially where deposition seems to indicate strong periodic flows. Exotic species were generally absent or insignificant, with exotic presence observed most significant where slopes and terraces fell under the canopy, particularly adjacent *Lepidium latifolium* semi-natural stands. Black willow species have a tendency to be dominant in more disturbed willow woodland below 1500' in seasonally flooded freshwater conditions with other willows including red willow (*S. laevigata*) and arroyo willow (*S. lasiolepis*) as well as cottonwoods.[35] During the study other willow species were largely found in the wide northern sections adjacent and into mulefat scrub. Sometimes important *Populus fremontii* were found establishing adjacent stands with few *P. balsamifera L ssp trichocarpa* mature individuals observed. Ranked G4 S3 rare statewide, this association is considered globally threatened by altered and encroached riparian habitat[36] with restoration efforts focusing on mimicking natural flood conditions.[37]

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[35] Sawyer, Keeler-Wolf, and Evans, *A Manual of California Vegetation*.

[36] Stromberg, "Restoration of Riparian Vegetation in the South-western United States."

[37] Sawyer, Keeler-Wolf, and Evans, *A Manual of California Vegetation*; Shafroth et al., "Establishment of Woody Riparian Vegetation in Relation to Annual Patterns of Streamflow, Bill Williams River, Arizona"; Stromberg et al., "Altered Stream- flow Regimes and Invasive Plant Species."

Figure 6. Mulefat thicket observed in the SW Hahamongna Basin

5.2 *Baccharis salicifolia* alliance

A mosaic of mulefat thickets was observed with black willow thickets, mulefat predominant in wide open flow areas with fine to very fine sandy soils. Emergent *Populus fremontii* were found in stands, as well as *Salix laevigata* and *S. lasiolepis*. Very minimal exotic species presence was with robust near monocultures in large patches observed at time of study, sometimes with wide space bare of vegetation between growth. This alliance is ranked G5 S4 and found below 4000' in highly disturbed areas with seasonal freshwater flooding. The cover is further known to give way to emergent species associations.[38]

Figure 7. Smartweed-cocklebur patch observed in the SW Hahamongna Basin

5.3 *Persicaria lapathifolia – Xanthium strumarium* provisional alliance

X. strumarium (common cocklebur) often created monocultures in low spots and wide meanders with clay soils, growing with more diversity in narrow meanders. *P. lapathifolia* (smartweed) was not observed as important during the study. This cover is associated with weedy native and exotic species in wetlands and emergent wetlands up to 4500' with *P. lapathifolia* tending to prefer slightly more moist conditions. Often very distinct patches were defined by surrounding native cover and exotic monocultures just up slope. Ranked G4 S4.[39]

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[38] Sawyer, Keeler-Wolf, and Evans, *A Manual of California Vegetation*.

[39] Ibid.

Figure 8. Perennial pepperweed patch observed in the SW Hahamongna basin

5.4 *Lepidium latifolium* semi-natural stands

Exotic invasive perennial pepperweed was found dominant in monoculture stands on terraces and patches on slopes adjacent both *Salix gooddingii* alliance and just above *Persicaria lapathifolia-Xanthium strumarium* provisional alliance. Characterized by exotic invasive species found in moist and semi-moist environments up to 5700' in seasonally flooded fresh and saltwater conditions. *Ailanthus altissima, Carduus pycnocephalus, Eucalyptus globulus,* and *Rubus discolor* were found adjacent. *Lepidium latifolium* is adapted to spread by rhizomes often broken by flooding, and is known to sprout from fragments smaller than 1".[40] These stands have no heritage program rank.[41]

Figure 9. Coast live oak woodland observed at SW periphery of Hahamongna Basin

5.5 Quercus agrifolia alliance

Coast live oak woodland occurs in upland slopes at the west and southwestern periphery of the study area. Found below 3600' in deep organic soils on alluvial terraces, canyon bottoms, flats, often growing on steep slopes, and sometimes along streams with closed tree canopies. Not listed on the National Registry of Wetland Plants. Ranked G5 S4.[42]

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[40] County of Ventura Planning Division, "Guide to Native and Invasive Streamside Plants: Restoring Riparian Habitats in Ventura County & Along the Santa Clara River in Los Angeles County."
[41] Ibid.
[42] Ibid.

Figure 10. Dried mustard patch observed at SW periphery of Hahamongna Basin

5.6 *Brassica nigra* and other mustards semi-natural stands

Exotic invasive upland black mustards were observed at the western and southwestern periphery in disturbed and compacted soils in and adjacent to heavily used park spaces and overflow parking. These semi-natural stands are unranked UPL exotic and invasive species associated with exotic invasive species.[43]

6.0 Assessment

Observed characteristics suggest that the area of interest is predominantly freshwater riparian wetland habitat. The regeneration of this habitat is notable following manifold disturbances up through 1994[44] (Appendix D) and the 2009 Station Fire. The 1998-1999 study previously indicated largely ruderal conditions dominated by exotic weedy species and space bare of vegetation through the study area.[45] The Station Fire then preceded the 2009-2010 deposition of 1,000,000 cubic yards of sediment through the basin.[46] Vegetation cover now closely matches the terrestrial plant community cover proposed in the 2003 Hahamongna Watershed Park Master Plan (refer to Appendix C), excepting compacted soils up slopes and terraces. Given improved integrity to planned restoration standards over the last decade despite heavy disturbance, conditions may be anticipated to continue to improve.

This study took place during a narrow window over dry periods. Further thorough evaluation is needed, and strong emphasis must be placed on a sufficient study period to include cool and wet periods to observe biota through all seasons. The regeneration potential of these conditions would also benefit from ongoing study.

6.1 Hydrology and Fluvial Process

The current distribution of robust native cover may be attributed to uninterrupted periodic flooding, sedimentation, and species movement from undeveloped areas in the upper watershed. Native cover and the lack of exotic presence is particularly notable where there are indicators of flooding in low areas that likely also have greater access to groundwater. Flood

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[43] Ibid.

[44] Brick, "Devil's Gate Basin Private Operations."

[45] Parsons Engineering Science, Inc, *Inventory Surveys of Biological Resources and Landscape and Habitat Restoration Plan at Hahamongna Watershed Park*.

[46] Los Angeles County Department of Public Works [LADPW], *Devil's Gate Dam and Reservoir Postfire Sediment Removal Short Term Solution Report for Sediment Accumulation Along the Face of the Dam*.

regimes following historic patterns and increased access to water have been shown to improve diversity of riparian vegetation,[47] favor native over exotic species,[48] and form the basis for cottonwood willow woodland restoration proposals in the region.[49]

Both the study and research suggests persisting historic water flow patterns occurring above the Devil's Gate Dam are positively influencing regeneration through the study area. Alteration of this hydrology would likely negatively impact the currently self-maintaining willow associations and potentially emergent cottonwood woodland habitat. Similar negative impacts would also be likely in other wetland plant associations, including the *Lepidospartum squamatum* shrubland alliance, or alluvial fan scrub (Holland) to the north. Accordingly, preservation of existing fluvial processes will be important for supporting biotic integrity in the study area and minimizing future restoration costs.

6.2 Sediment

Sedimentation movement out of the San Gabriel Mountains is a complex regional issue largely beyond the scope of this report. The recent 2009 Station Fire in particular is understood to have substantially contributed to sediment buildup in blocked flow channels as seen in the Devil's Gate Basin.[50] These events are ongoing elements of the geomorphological and biophysical characteristics of this region. Flow channels that carry sediment both improve soil and species movement and are important components of strong biotic integrity.[51] However, continued sediment accumulation without historic movement to the ocean and beaches causes exaggerated disturbances and infrastructure concerns. These problems require far-looking, long-term planning for solutions that can be sustained for the foreseeable future.

6.3 Exotic Invasive Species

Lepidium latifolium and *Brassica nigra* semi-natural stands with other exotic invasive associations are dominant on disturbed and compacted terraces and uplands. These conditions unfavorable for native species are important foci for restoration. Regularly disturbed unmitigated spaces, such as the overflow parking, further promote these conditions. Long-term treatment including clearly designated heavy traffic access, establishing appropriate cover for traffic spaces, and appropriate restoration of vegetated spaces limits the prevalence and spread of invasive species. Exotic invasive species removal without improvement will likely result in re-establishment of invasive vegetation. The exotic invasive *Lepidium latifolium* in particular requires careful management as natural spread occurs by rhizomes, known to sprout from fragments smaller than 1".[52] Uncontrolled disturbance would likely create infestation problems throughout the area and downstream.

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[47] Stromberg, "Restoration of Riparian Vegetation in the South-western United States."

[48] Shafroth et al., "Establishment of Woody Riparian Vegetation in Relation to Annual Patterns of Streamflow, Bill Williams River, Arizona"; Stromberg et al., "Altered Stream- flow Regimes and Invasive Plant Species."

[49] Sawyer, Keeler-Wolf, and Evans, *A Manual of California Vegetation*; Shafroth et al., "Establishment of Woody Riparian Vegetation in Relation to Annual Patterns of Streamflow, Bill Williams River, Arizona"; Stromberg et al., "Altered Stream- flow Regimes and Invasive Plant Species."

[50] Los Angeles County Department of Public Works [LADPW], *Devil's Gate Dam and Reservoir Postfire Sediment Removal Short Term Solution Report for Sediment Accumulation Along the Face of the Dam*.

[51] Bunn et al., *California Wildlife Conservation Challenges: California's Wildlife Action Plan*.

[52] County of Ventura Planning Division, "Guide to Native and Invasive Streamside Plants: Restoring Riparian Habitats in Ventura County & Along the Santa Clara River in Los Angeles County."

6.4 Significant Ecology

The observed recovery and self-maintenance of this habitat is significant. Riparian presence is increasingly uncommon in this region with more flood control infrastructure than anywhere in the country[53] and estimated 95% wetland loss in Los Angeles County.[54] None of the native cover alliances identified are considered secure statewide, and the dominant black willow thickets in particular are considered rare with 21-100 total occurrences and/or 10-50,000 acres in the state (S3).[55] Willow and cottonwood woodlands are further considered globally threatened by abating hydrological conditions ___ ongoing viability. These habitats are associated with many species of concern,[56] including contemporary site recordings of federally endangered arroyo toad,[57] threatened bank swallow, endangered willow flycatcher, and federally endangered least bell's vireo.[58]

8.0 References

Los Angeles County Department of Public Works [LADPW]. *Devil's Gate Dam and Reservoir Postfire Sediment Removal Short Term Solution Report for Sediment Accumulation Along the Face of the Dam.* Alhambra, CA: LADPW, March 2011. http://ladpw.org/wrd/removal/DevilGate/BOARD_MOTION_REPORT_A3570_DEVILS_GATE.pdf.

———. "Near Real Time Precipitation Map", August 2012. http://dpw.lacounty.gov/wrd/Precip/.

Los Angeles County of Public Works [LADPW], Water Resources Division. *Hydrology Manual*. Alhambra, CA, January 2006. http://dpw.lacounty.gov/wrd/publication/engineering/2006_Hydrology_Manual/2006%20Hydrology%20Manual-Divided.pdf.

Barbour, Michael, Todd Keeler-Wolf, and Allan A. Schoenherr. *Terrestrial Vegetation of Southern California. 3rd ed*. Berkeley, CA: University of California Press, 2007.

Brick, Timothy F. "Devil's Gate Basin Private Operations", August 16, 2012.

Bunn, David, Andrea Mummert, Marc Hoshovsky, Kirsten Gilardi, and Sandra Shanks. *California Wildlife Conservation Challenges: California's Wildlife Action Plan*. Sacremento, CA: California Department of Fish and Game, 2007. http://www.dfg.ca.gov/wildlife/wap/report.html.

Calflora. "Calflora: Information on Wild California Plants for Conservation, Education, and Appreciation", 2012. http://www.calflora.org/.

California Bird Species of Special Concern: a Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Concern in California. Studies of Western Birds. online: Western Field Ornithologists and California Department of Fish and Game, 2008. http://www.dfg.ca.gov/wildlife/nongame/ssc/.

California Coastal Conservancy [CCC]. *Southern California Wetlands Recovery Project Regional Strategy.* Oakland, CA, 2001. http://www.scwrp.org/regional_strategy.htm.

California Department of Fish and Game. "Nongame Wildlife Program: Special Plant and Animal Lists", 2012. http://www.dfg.ca.gov/wildlife/nongame/list.html.

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[53] Bunn et al., *California Wildlife Conservation Challenges: California's Wildlife Action Plan*.

[54] California Coastal Conservancy [CCC], *Southern California Wetlands Recovery Project Regional Strategy*.

[55] Sawyer, Keeler-Wolf, and Evans, *A Manual of California Vegetation*.

[56] Barbour, Keeler-Wolf, and Schoenherr, *Terrestrial Vegetation of Southern California*; Stephenson and Calcarone, *Southern Calfornia Mountains and Foothills Assessment: Habitat and Species Conservation Issues*; U.S. Army Corps of Engineers, South Pacific Division, *Arroyo Seco Watershed Management Study, Los Angeles, California, Feasibility Phase Project Management Plan*.

[57] U.S. Army Corps of Engineers, South Pacific Division, *Arroyo Seco Watershed Management Study, Los Angeles, California, Feasibility Phase Project Management Plan*.

[58] "eBird Hahamongna Watershed Park [formerly Oak Grove Park]."

———. “Nongame Wildlife Program: Threatened and Endangered Species”, 2012. http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/.

CDM. *Arroyo Seco Watershed Assessment: Arroyo Seco Watershed Sustainability Campaign*. Pasadena, CA: Arroyo Seco Foundation, May 2010.

City of Pasadena. Hahamongna Watershed Park Master Plan. Pasadena, CA, September 2003.

County of Ventura Planning Division. “Guide to Native and Invasive Streamside Plants: Restoring Riparian Habitats in Ventura County & Along the Santa Clara River in Los Angeles County”. County of Ventura Planning Division, May 2006. http://www.santaclarariverparkway.org/wkb/scrbiblio/vcpd2006/attachment_download/file.

Dowell, Darren, John Garrett, and Lance Benner. “eBird Checklist – Hahamongna Watershed Park [formerly Oak Grove Park], California – Sun Jul 29, 2012 – 55 Species [+2 Other Taxa]”, July 2012. http://ebird.org/ebird/view/checklist?subID=S11230677.

“eBird Hahamongna Watershed Park [formerly Oak Grove Park]”, 2012. http://ebird.org/ebird/GuideMe?step=saveChoices&getLocations=hotspots&parentState=US-CA&bMonth=01&bYear=1900&eMonth=12&eYear=2012&reportType=location&continue.x=39&continue.y=7&continue=Continue&hotspots=L198791.

Ladybird Johnson Wildflower Center. “NPIN: Native Plant Database”, 2012. http://www.wildflower.org/plants/.

Lichvar, Robert W., and John T. Kartesz. *North American Digital Flora: National Wetland Plant List, Version 2.4.0*. U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill, NC, 2009. https://wetland_plants.usace.army.mil.

McPhee, John. The Control of Nature. New York, NY: Farrar, Straus, and Giroux, 1989.

Montgomery Watson Herza. *Hydrology, Hydraulics and Geomorphology Engineering Information and Studies*. Technical Report. Arroyo Seco Watershed Restoration Feasibility Study Phase II, May 2001.

Mount, Jeffrey F. *California Rivers and Streams: The Conflict Between Fluvial Process and Land Use.* Berkeley, CA: University of California Press, 1995.

North East Trees, GreenInfo Network, Geosyntec Consultants, and Verna Jigour Associates. *Arroyo Seco Watershed Management and Restoration Plan*. Los Angeles, CA: California State Water Resources Control Board, March 2006.

Parsons Engineering Science, Inc. *Inventory Surveys of Biological Resources and Landscape and Habitat Restoration Plan at Hahamongna Watershed Park.* Pasadena, CA: City of Pasadena Public Works and Transportation Department, July 2001. http://www.ci.pasadena.ca.us/WorkArea/DownloadAsset.aspx?id=6442462850.

Philip Williams and Associates, Ltd. Flood Hazard, *Sediment Management, and Water Feature Analysis-Hahamongna Watershed Park, Pasadena, CA*. Corte Madera, CA: Takata Associates, January 2000.

Regents of the University of California. “UCJEPS: Jepson Manual Treatment Indexes.” Jepson Manual Treatment and Keys from “The Jepson Manual”, 2012. http://ucjeps.berkeley.edu/interchange/I_treat_indexes.html.

Sawyer, John O., Todd Keeler-Wolf, and Julie Evans. A Manual of California Vegetation. 2nd ed. Sacramento, CA: California Native Plant Society Press, 2009.

Shafroth, Patrick B., Gregor T. Auble, Juliet C. Stromberg, and Duncan T. Patten. “Establishment of Woody Riparian Vegetation in Relation to Annual Patterns of Streamflow, Bill Williams River, Arizona.” Wetlands 18, no. 4 (December 1998): 577–590.

Southern Calfiornia Coastal Water Research Project. “Riparian Plants Commonly Encountered in Riverine Wetlands Ver. 1: a Field Guide for Practitioners of the California Rapid Assessment Method for Wetlands and Riparian Areas (CRAM)”, May 2009.

Stephenson, John R., and Gena M. Calcarone. *Southern Calfornia Mountains and Foothills Assessment: Habitat and Species Conservation Issues*. General Technical Report GTR-PSW-175. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, 1999.

Stromberg, Juliet C, Sharon J Lite, Roy Marler, Charles Paradzick, Patrick B Shafroth, Donna Shorrock, Jacqueline M White, and Margaret S White. “Altered Stream- flow Regimes and Invasive Plant Species: The Tamarix Case.” Global Ecology and Biogeography 16, no. 3 (May 1, 2007): 381–393.

Stromberg, Juliet C. “Restoration of Riparian Vegetation in the South-Western United States: Importance of Flow Regimes and Fluvial Dynamism.” Journal of Arid Environments 49, no. 1 (September 2001): 17–34.

U.S. Army Corps of Engineers Environmental Laboratory. *Corps of Engineers Wetlands Delineation Manual*. Technical Report. Wetlands Research Program. Vicksburg, MS, January 1987. http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf.

U.S. Army Corps of Engineers. “U.S. Army Corps of Engineers North American Digital Flora: National Wetland Plant List.” NWPL, 2012. http://rsgisias.crrel.usace.army.mil/apex/f?p=703:1:

U.S. Army Corps of Engineers U.S. Army Engineer Research and Development Center, Environmental Laboratory. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*. Wetlands Regulatory Assistance Program. Vicksburg, MS, September 2008. http://www.nwo.usace.army.mil/html/od-rwy/aridwest.pdf.

U.S. Army Corps of Engineers, South Pacific Division. *Arroyo Seco Watershed Management Study, Los Angeles, California, Feasibility Phase Project Management Plan*. Los Angeles, CA, May 2005.

U.S. Department of Agriculture, Natural Resources Conservation Service. “Plant Database”, 2012. http://plants.usda.gov/java/.

U.S. Environmental Protection Agency. “Superfund Site Overview Jet Propulsion Laboratory (NASA), Pacific Southwest, US EPA”, May 2012. http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/vwsoalphabetic/Jet+Propulsion+Laboratory+(NASA)?OpenDocument.

U.S. Fish and Wildlife Service. “Endangered Species Program”, April 19, 2012. http://www.fws.gov/endangered/.

U.S. Geological Survey [USGS]. “Pasadena Quadrangle 7.5-minute Series”, 2012. http://www.usgs.gov/.

Vallier v Jet Propulsion Laboratory (United States District Court, C.D. California, Western Division 2000).

Appendix A
Definition of Terms

alliance Sawyer, Keeler-Wolf, and Evans terminology similar to plant community or typology (habitat type) semantically differentiated by the assumption that vegetative cover may not be a linear succession; describes only what vegetative cover is dominant at a given point in time and does not necessarily imply what has come before or what may come after
capital storm/ flood the Los Angeles County Department of Public Works Hydrology Manual defines this as: “a 50-year frequency design storm falling on a saturated watershed (soil moisture at field capacity)”
compacted this term refers to the pressurized lack of void space limiting atmosphere and space for growth often found where organisms and heavy objects have moved over soil
disturbed damaged or significantly altered, particularly in ways that create conditions unfavorable to native growth of the area
dominant most prevalent; covering the most space or comprising the most mass
exotic in contrast to native, not historically originating from a defined area, usually in the United States referring to species that have arrived after western colonization; within this report referring to species that historically have originated from outside Southern California; not adapted to the complex species associations of a given area, often posing threats to species diversity and potentially indicating poor conditions for native species
fluvial of or related to rivers and streams
hydrophobic tendency to resist water
hydrophytic descriptive of species most prevalently observed in saturated conditions; tending or adapted to grow in or on water
important meaning similarly dominant, as an ecological term referring to species distribution
invasive particularly aggressive and difficult to manage
monoculture uniform distribution of a species with minimal or absent presence of other species
native in contrast to exotic, historically originating from a defined area, usually in the United States referring to species that have been present before western colonization; within this report referring to species that are historically from Southern California
ped unit of soil structure
random sampling/randomization use of an unpredictable system intended to simulate chance for information collection: objectives generally include minimizing control to reduce bias and relying on probability to more accurately reflect aspects being studied by representative samples
riparian related to river and stream banks; wetlands along rivers and streams
semi-natural stand Sawyer, Keeler-Wolf, and Evans terminology used to describe non-native or exotic stands of vegetation, in contrast to native alliances
watershed the entire area from which surface water flows to the same place
wetland the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency definition as follows: "Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Appendix B
The Nature Conservancy Heritage Program Status Ranks

Global ranks

G1: Fewer than 6 viable occurrences worldwide and/or 2000 acres
G2: 6-20 viable occurrences worldwide and/or 2000-10,000 acres
G3: 21-100 viable occurrences worldwide and/or 10,000-50,000 acres
G4: Greater than 100 viable occurrences worldwide and/or greater than 50,000 acres
G5: Community demonstrably secure due to worldwide abundance

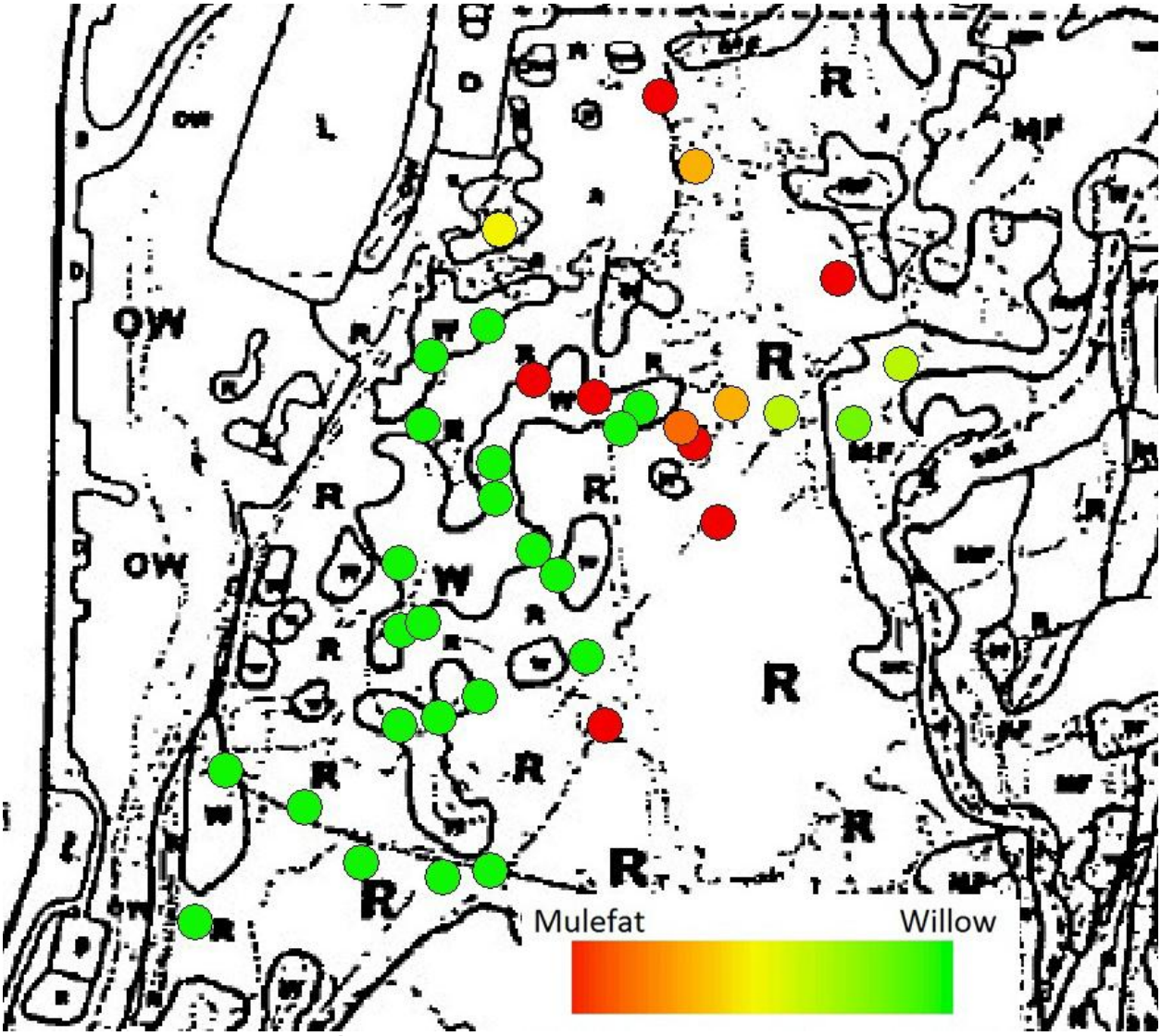
State ranks

S1: Fewer than 6 viable occurrences statewide and/or less than 2000 acres
S2: 6-20 viable occurrences statewide and/or 2000-10,000 acres
S3: 21-100 viable occurrences statewide and/or 10,000-50,000 acres
S4: Greater than 100 viable occurrences statewide and/or greater than 50,000 acres
S5: Community demonstrably secure statewide

Threat ranks

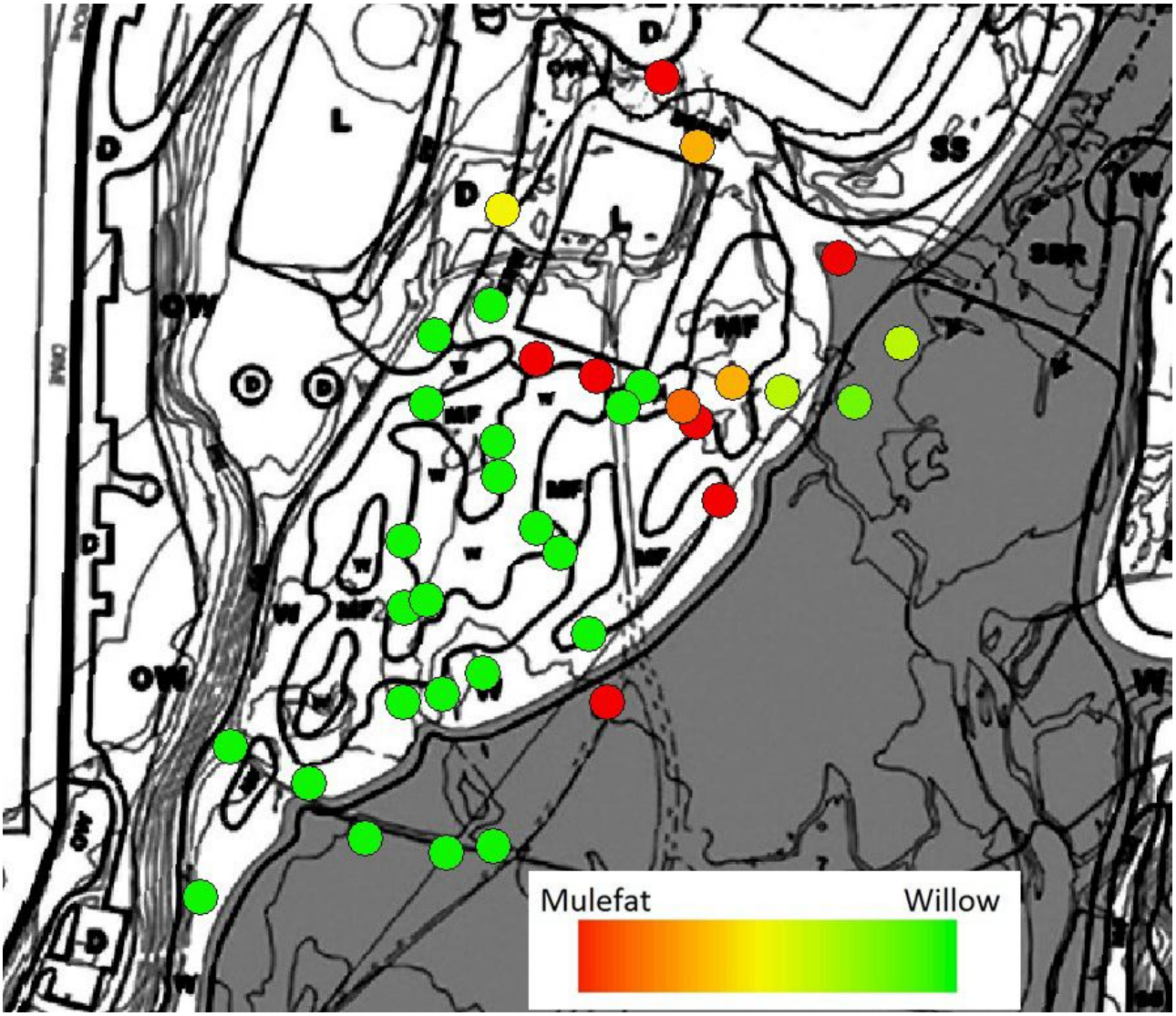
0.1: Very threatened
0.2: Threatened
0.3: No current threats known

Appendix C
Comparison of existing conditions against 1998-1999 survey and 2003 master plan proposed restoration cover



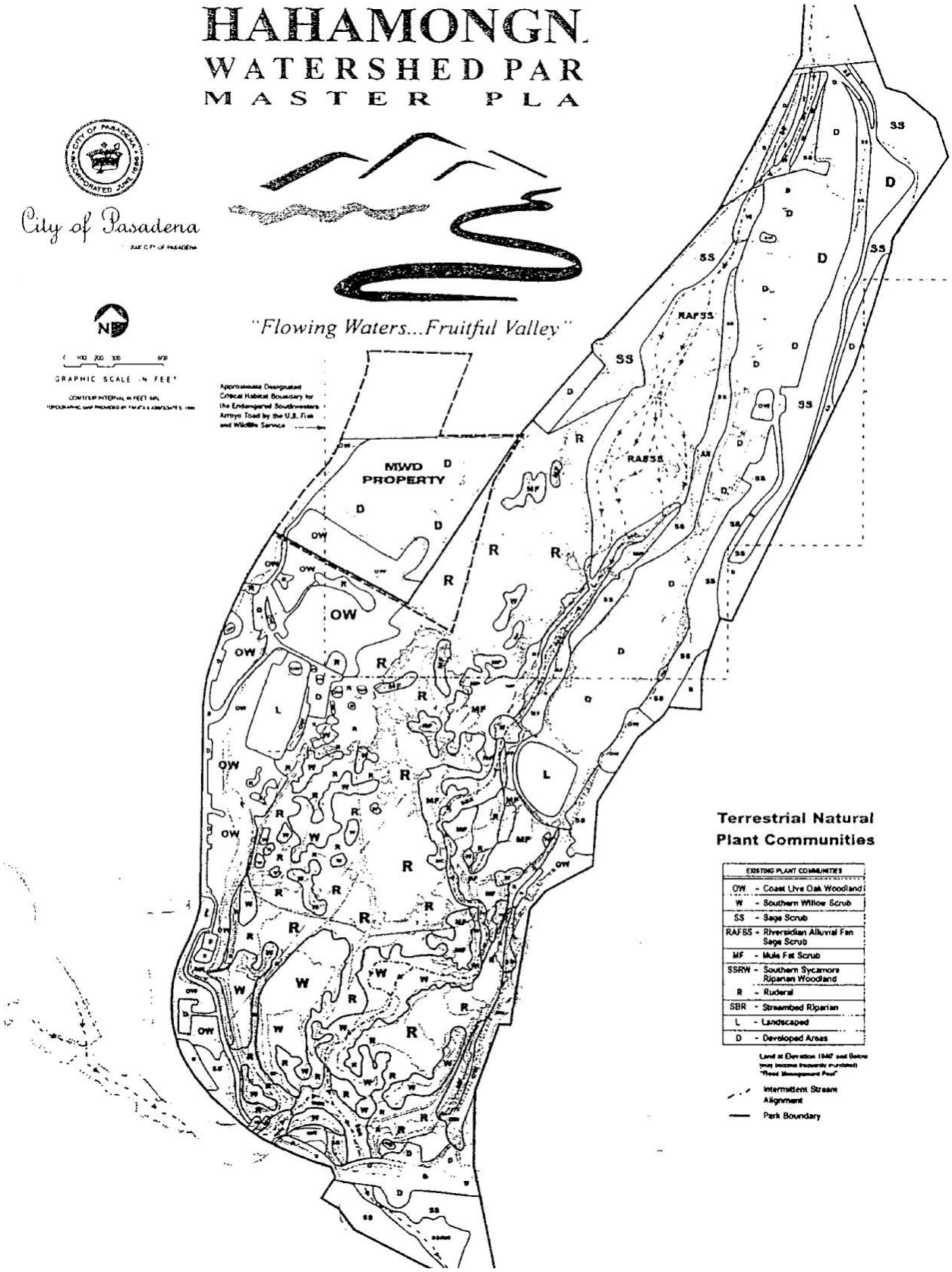
2012 assessment cover overlay over 1998-1999 Parsons survey map

R= ruderal (described as largely bare and non-native cover dominated by forbs)
MF= mulefat
OW= coast live oak woodland
W= southern willow scrub

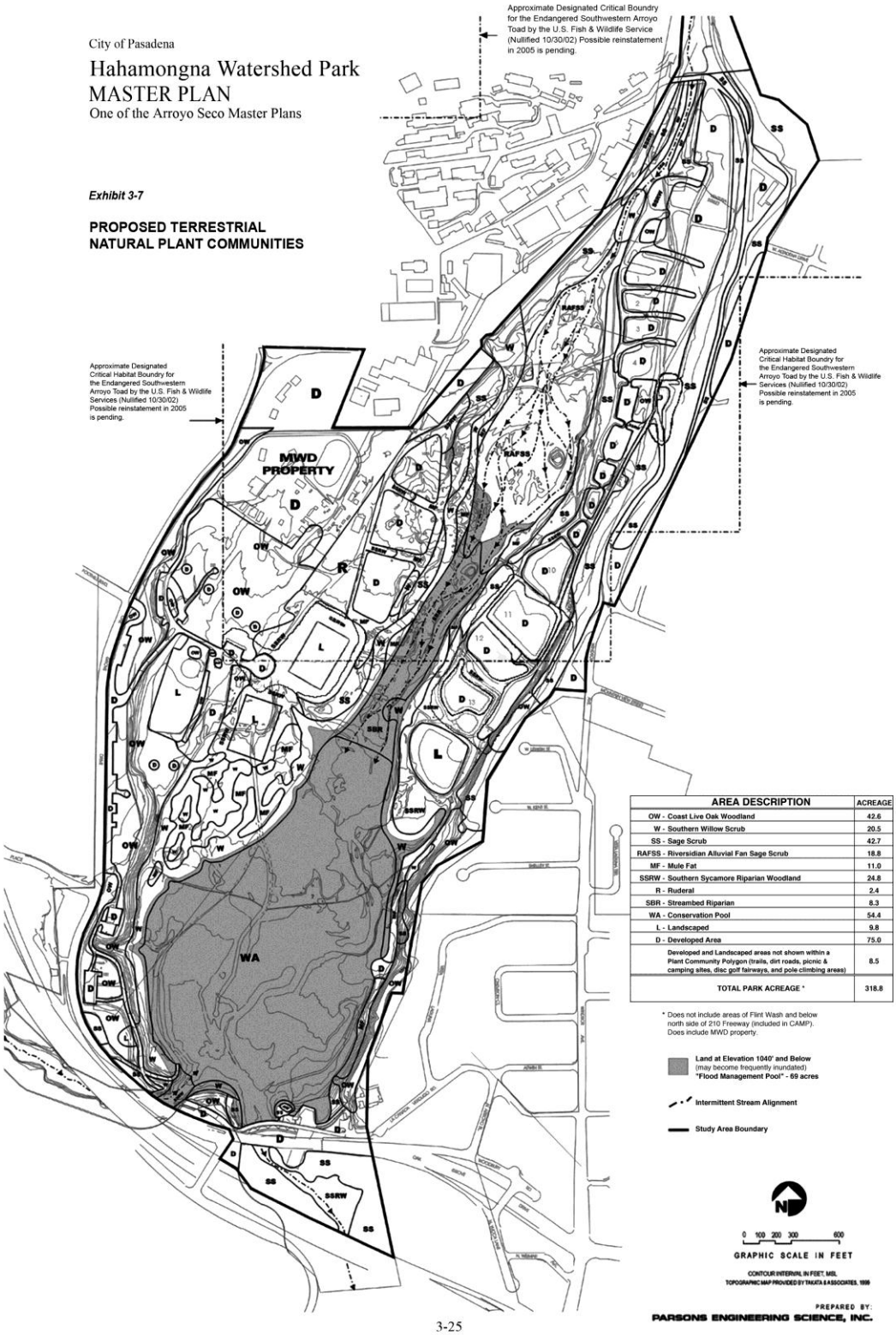


2012 assessment cover overlay over 2003 Hahamongna Watershed Park Master Plan Proposed Terrestrial Natural Plant Communities

MF= mulefat
OW= coast live oak woodland
W= southern willow scrub



1998-1999 existing conditions map of terrestrial plant communities from 2001 Parson's Study

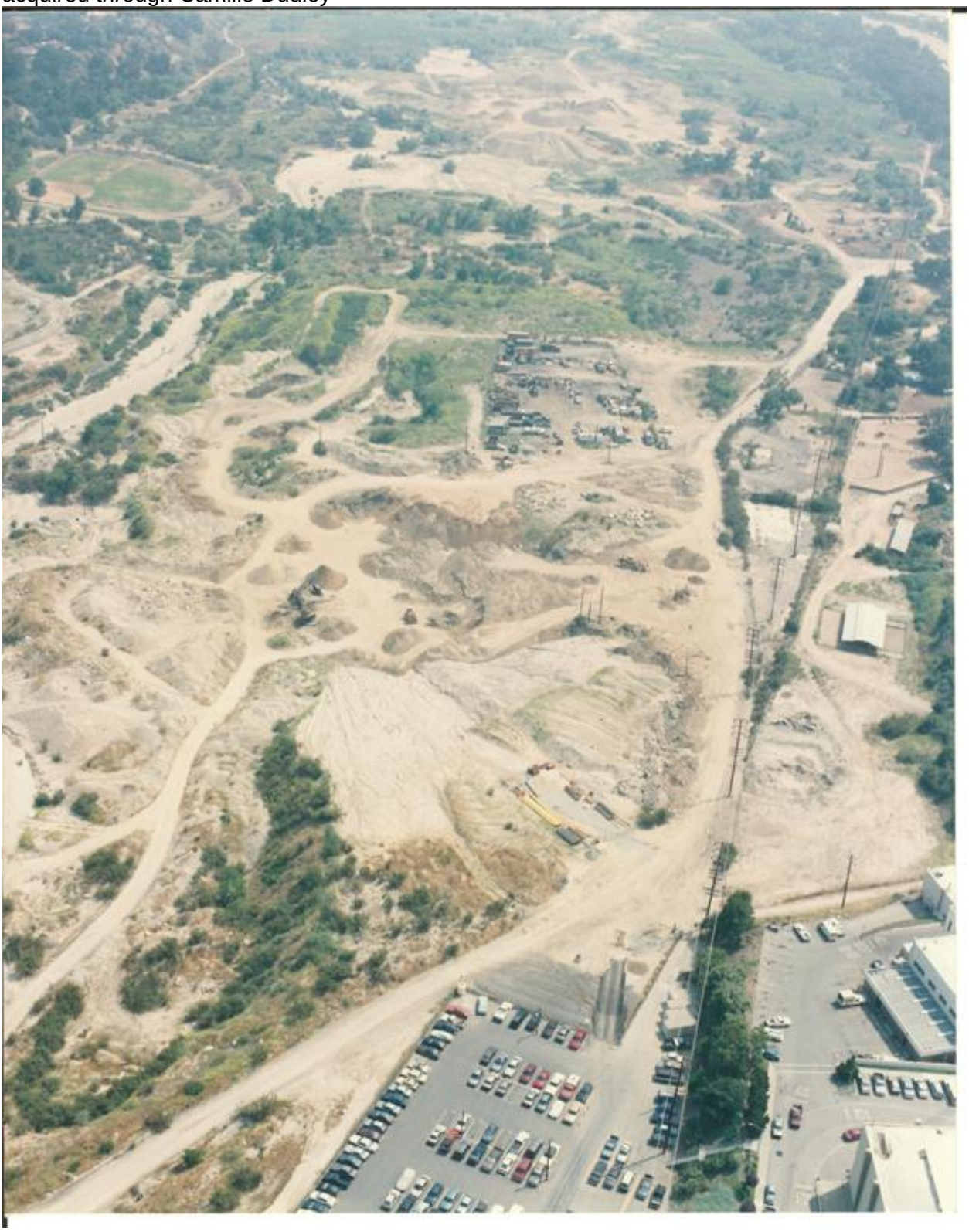


AREA DESCRIPTION	ACREAGE
OW - Coast Live Oak Woodland	42.6
W - Southern Willow Scrub	20.5
SS - Sage Scrub	42.7
RAFSS - Riversidian Alluvial Fan Sage Scrub	18.8
MF - Mule Fat	11.0
SSRW - Southern Sycamore Riparian Woodland	24.8
R - Ruderal	2.4
SBR - Streambed Riparian	8.3
WA - Conservation Pool	54.4
L - Landscaped	9.8
D - Developed Area	75.0
Developed and Landscaped areas not shown within a Plant Community Polygon (trails, dirt roads, picnic & camping sites, disc golf fairways, and pole climbing areas)	8.5
TOTAL PARK ACREAGE *	318.8

* Does not include areas of Flint Wash and below north side of 210 Freeway (included in CAMP). Does include MWD property.

2003 Hahamongna Watershed Park Master Plan proposed terrestrial natural plant communities

Appendix D
Devil's Gate Basin early 1990's aerial photography
acquired through Camille Dudley



facing south over JPL

top and bottom facing south

top right and left over central basin, bottom facing southeast