Vegetation Analysis of the San Pedro Creek Lower Riparian Zone and Upper Watershed

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I hereby thank everyone involved in stimulating these baseline surveys and I am pleased that this vegetation analysis will contribute a small part to the several other excellent studies that have already been published concerning the San Pedro Creek Watershed. Collectively, these studies are dramatically increasing our understanding of the San Pedro Creek ecosystem and, as a consequence, are also enabling us to do a better job of managing its natural and cultural complexities.

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I. Introduction

Relative to other watersheds along the central California coast, the San Pedro Creek watershed is remarkable for several reasons. Although small in area (just over 8 square miles), it supports a perennial creek with clear, cool flows that still provide spawning habitat for a run of steelhead fish and populations of sensitive species such as California red-legged frog. The upper and lower slopes of the watershed historically lacked conifer forests that are otherwise characteristic of other places in the Santa Cruz Mountains. Based on historical accounts, the upper San Pedro Creek watershed vegetation was dominated by various assemblages of grassland, coastal scrub and chaparral. Although a large portion of the watershed has been extensively altered due to urban influences, the surrounding slopes still support a rich and varied representation of the original biodiversity found in this area. Finally, San Pedro Valley has one of the longest histories of European settlement in the central coast region. Accordingly, extensive habitat alterations have taken place along San Pedro Creek for over two centuries (summarized in Collins et al. 2001)

The San Pedro Creek Watershed Coalition (SPCWC) was formed to assess the general water quality and ecological condition of the watershed so that its residents could learn about both challenges and potential solutions to retaining a healthy aquatic, riparian and upland watershed environment for the foreseeable future. The goal of the coalition is to identify needed actions to enhance the San Pedro Creek environment both for citizens who live along the creek and for the many native species that depend upon the creek for their existence. Watershed vegetation has a central place in such an assessment because plants (1) provide important habitat structure for fish and wildlife communities in the riparian zone; (2) are the primary producers that drive energy transfer within riparian ecosystems; (3) provide flood control and bank stabilization services that are key to maintaining the geomorphic qualities of the riparian environment; and (4) provide water retention and flow moderating influences in the upper drainages. Generally speaking, indigenous riparian vegetation is best suited to provide these services to the many different kinds of organisms that have co-evolved with these plant species over time. In that regard, the introduction of non-native invasive plant species has the potential for seriously degrading both riparian habitat quality and the essential services provided by native watershed plant species.

From a conceptual perspective, the San Pedro Creek watershed can be divided into an upper and lower watershed system. The upper system consists of slopes and small order drainages that channel runoff and subsurface flows from the crests of the surrounding ridges down to the lower watershed. The lower watershed system consists of large order channels of the creek that dissect alluvial plains and flood basins as the main stem works its way to the mouth of the creek. In conjunction with a number of other inquiries that have been directed towards assessing the status of San Pedro Creek, the purpose of this study is to provide (1) a relatively fine-grained analysis of the vegetation along the main creek reaches in the lower

watershed and (2) a more coarse-grained analysis of vegetation patterns that primarily characterize the upper watershed.

What is the status of the vegetation that lines the riparian environments of the lower watershed of San Pedro Valley and cloaks the slopes of its upper watershed basin? What are the most frequent and abundant species that occur in the lower watershed riparian zone? To what extent have non-native invasive species impacted native species in this riparian zone? Where are native species and non-native invasive species (NIS) most abundant and to what extent does their distribution mirror human impacts along the lower watershed creek forks and main stem? If riparian habitat restoration is to take place, what native plant species should be used for restoration? What non-native invasive species should be the focus of eradication efforts and what strategy should be employed to carry out this stewardship activity? Lastly, given a limited budget, how can this information be generated in a timely and cost-effective manner?

These are the key questions that this study is designed to address. The focus of the study is the riparian vegetation of the lower watershed. A general survey was conducted using a random-systematic sampling approach to evaluate the general frequency and cover of plant species that occur along the main forks and main stem of the creek. A focused survey was conducted simultaneously to record all major non-native invasive species (NIS) infestations. A modified severity index was used to rank levels of infestation for different species evaluated in this survey. Sample sites and NIS infestations were oriented to the geomorphic benchmarks identified in Collins (2001). These are mapped in a GIS and linked to a data matrix for each sample site and NIS infestation site.

Stein et al. (2000) provides a useful discussion concerning vegetation classification. The Nature Conservancy has taken a lead role in forging a national consensus concerning a physiognomic-floristic classification system (Grossman et al. 1998; Anderson et al. 1998). This system is known as the U.S. Vegetation Classification System. In 2001, California signed a Memorandum of Agreement between state and federal agencies to adopt this system for the purpose of inventorying the different kinds of plant assemblages that constitute the rich complexity of habitats that epitomize California's biodiversity. The web site listed above conforms to this system. Based upon this approach, to develop a coarse-grained insight into the vegetation patterns of the upper and, to a lesser degree, the lower watersheds has been divided into polygons representing different subclasses (e.g. evergreen shrubland) and alliances (*Baccharus pilularis* mixed evergreen-deciduous shrubland) of vegetation that reflect canopy dominants in the different subclasses

II. Objectives

The objectives of this analysis are to:

1. Conduct an unbiased survey of riparian plant species, both native and non-native, that occur along San Pedro Creek from the mouth of the creek to the upper forks along the lower watershed before they climb steeply up the slopes of the upper watershed. The goal of this survey is to analyze the frequency of occurrence and approximate cover of all species encountered. The combination of frequency of occurrence and average cover per occurrence can then be used to calculate a Relative Importance Value (RIV) for each species for the whole lower watershed system and also by particular reaches that have been identified by the SPCWC.

2. Map the general riparian survey sample localities on a GIS base-map of the San Pedro Creek lower watershed so that these samples can provide insight into the vegetation associated with the hydro-geomorphic analysis of the creek and the analysis of fish habitat for steelhead. These sample localities ideally will provide a benchmark for future monitoring of riparian vegetation.

3. Conduct a focused assessment of NIS infestations and to map these infestations in relation to the sample localities located in the general vegetation survey.

4. Utilize this data to propose recommendations for NIS management and re-vegetation associated with watershed restoration activities.

5. Conduct a coarse-scale analysis of vegetation patterns along both the lower and upper watershed boundaries so that vegetation assemblages can be identified and mapped at least to the level of alliance (aka series).

III. Methods

Given limited funds, we chose to conduct this analysis using rapid assessment methods. Rapid assessment techniques are under active development. Consequently, this study uses an original approach to accomplish the objectives described above. These methods are derived from rapid assessment protocols advocated by the California Department of Fish and Game and the California Native Plant Society (http://www.cnps.org/vegetation/rapid_assessment_protocol.pdf.). Species richness and relative abundance in sample sites are estimated using standard cover classes. These cover classes are typically used to sample vegetation that occurs in stands that can be mapped as polygons. Ideally, the polygons are sampled so that a number of replicates can robustly describe species that (1) occur with the greatest frequency in each sample and (2) that dominate the vegetative cover of each sample. This information enables vegetation classification of plant alliances and associations that collectively compose the primary units of habitat for the majority of species that occur on any given landscape (U.S. National Vegetation Classification System 1998).

We adapted these methods to analyze the riparian vegetation of the lower watershed. However, we employed a random-systematic sampling of the riparian corridor to provide an unbiased estimate of plant species composition. Sample points are linked to a GIS database that can be correlated to geomorphic features, urban influences, spawning habitat, etc. The database enables calculations of frequency and average cover for each species encountered during the survey. These two parameters were then multiplied to yield an index called Relative Importance Value (RIV). The RIV is a simplistic but convenient parameter that reflects the combined importance of frequency of occurrence and average cover per occurrence in identifying the dominant, common, and rare species found in a given plant assemblage.

We used a different method to record NIS infestations. These were observed as the riparian vegetation survey was being conducted. Invasives often occurred together. For each infestation occurrence, the NIS species was (were) identified and level of infestation was estimated. NIS infestation occurrences are linked to the GIS database in relation to the vegetation sample points and the hydro-geomorphic reference points (Collins 2001).

Since the lower watershed is linked to the upper watershed in all of its significant hydrological processes, we elected to create a "conceptual model" of the vegetation that occurs in the watershed as a whole. This is particularly relevant to understanding larger scale processes that impact the watershed. Using the same cover class system as the riparian vegetation survey, we hiked the watershed with laminated aerial photographs. We identified discrete polygons of different vegetation assemblages. Vegetation assemblages were characterized principally by dominant species in the canopy layer of the vegetation. These polygons have been digitized and are displayed in a vegetation map which provides a preliminary vegetation classification for the watershed.

Unfortunately, in the general riparian survey, we were unable to examine all of the large order drainages in the lower watershed. Some, like the North Fork, are impossible to survey because they are under-ground as part of the storm drain system. Others, like the Sanchez Fork, are partly disrupted by under-grounding but some of the smaller branches and main channels of the forks could (and should) be sampled in the future. In particular, the east branch of Sanchez Fork hosts an exceptional red alder grove that should be included in this analysis at some point. Nonetheless, the survey did cover the majority of the accessible lower watershed and provides a fairly representative picture of general conditions in this riparian system.

The methods used in this analysis are as follows:

1. General riparian vegetation survey

Acting as a team, two field staff conducted the survey during July and August, 1999. A random-systematic sampling approach was selected that would generate enough frequency within the three mile survey area to provide insight into species that most frequently occur in the riparian corridor and the approximate cover they exhibit when encountered. After a random site was selected near the mouth, further sample sites were taken approximately every 100 feet upstream. Each site was labeled and flagged. At each sample site, a meter-stick was laid along the bank and used to visualize a one-meter wide prism transecting the creek from one bank to the other. All plant species in or encroaching into this prism were recorded and the extent of the area covered by each species was estimated based on a rapid assessment cover class recommended by the California Department of Fish and Game (web site). The cover class codes are: 1=<5%; 2=6%-15%; 3=16%-25%; 4=26%-50%; 5=51%-75%; and 6=>76%. Standing in the middle of the stream, we recorded canopy condition: either predominantly open or closed. Sample localities were referenced as much as possible to the hydro-geomorphic reference sites (which mostly had already been flagged along the creek).

Once entered into an Excel spread sheet, this data set allows one to calculate frequency of occurrence (count of occurrences/total number of samples) and average cover class for each occurrence (sum of cover classes for all occurrences/count of all occurrences) from an array of sample data sets. A useful index to evaluate the relative importance value (RIV) of different species in the system is to multiply the frequency of occurrence for the species times the average cover class per occurrence. This way, species that occur with high frequency and high average cover have the highest index values while species that occur either with low frequency and/or low cover have the lowest values. These parameters are calculated for the data set as a whole and also broken down into different reaches so vegetation differences along these reaches can be compared. The data matrix includes scientific name, common name, native vs. non-native status, and life form for each species. Non-native status includes species native to California but not indigenous to the San Pedro Creek watershed.

2. While traveling upstream during the general riparian vegetation survey, infestations of non-native invasive species were noted in relation to the general plant survey sample sites and the Collins (2001) hydro-geomorphic assessment. Infestations were ranked 1 to 6 based upon a subjective estimate of the area covered by the NIS infestation (low to very high - see Table 24). Large, extensive infestations were ranked as 6 while other infestations were ranked progressively smaller depending on their estimated extent of infestation. Non-native tree species (e.g. blue gum, Monterey pine, and Monterey cypress) were not specifically mapped although the general

riparian survey gives an insight into their distribution. Rather, the focus of the NIS survey was on shrubs, vines and large herbs that are amenable to removal. This data set provides a more detailed insight into the level of infestations of NIS in the system as a whole and in different particular reaches.

3. All sample sites (205) and infestation sites (108) were mapped on a GIS base-map in the context of the Collins (2001) reference sites.

4. In 2002, imagery that was needed to conduct the watershed scale mapping activity became available. A GIS technician generated satellite and aerial imagery for the watershed as a whole and map panels were created and laminated for field use. Maps were taken out in the field with a botanical assistant and map polygons of different vegetation alliances was identified and mapped on the laminated maps. These maps were then digitized so that the boundaries of the polygons could be superimposed upon the digital imagery. Special attention has been paid to upland riparian and seasonal wetland environments that have the greatest effect on the upper watershed drainage network. For each polygon, the vegetation class was noted and canopy species identified and classified based upon the CNPS cover class system identified above.

IV. Results

The results of this study are portrayed in three contexts: (1) an over-all analysis of lower watershed riparian vegetation; (2) a reach by reach analysis of 18 reaches identified by the SPCWC and surveyed in the general riparian vegetation study; and (3) a landscape-scale analysis of vegetation of the entire watershed. Table 1 and Figure 1 identify the over-all area of the lower watershed included in the survey. Table 1 identifies the 18 reaches and lists the sample sites, NIS occurrences, and the hydro-geomorphic reference sites that occur within each reach. This will enable a further GIS analysis of the relationship between vegetation, NIS infestations, channel morphology, bed conditions, spawning habitat, and other relationships that apply at a reach scale. Figure 1 displays the distribution of sample sites per reach and the pattern of NIS infestations found along the reaches.

Table 2 displays information on each reach including number of samples, proportion of samples with a closed canopy, numbers and percent of native versus non-native species, the average frequency, cover, and RIV values for natives and non-natives, and the ratio between native/non-native RIV values. Reach 16 is the only reach in which no non-native species were recorded. The RIV ratio tends to be high when native vegetation is more frequent and presents greater average cover than non-native species.

Table 3 lists all 140 species in alphabetical order by scientific name. Table 4 sorts these 140 species by the RIV index in descending order. This table identifies the most common and rare native and non-native species in the over-all system. Tables 5 through 23 displays all species encountered per reach in descending order based upon the RIV index parameter. This provides insight into the general vegetation composition in each reach. Reaches average about 11 sample sites. Frequency, average cover, and RIV parameters for each species are displayed. Figures 2-15 depict (1) native canopy dominants in each reach and (2) the most common non-native invasive species in reach. These figures illustrate the kind of information that can be generated using the GIS. It is possible to display the distribution of any species in the database and to query the sample site database and see the cover class values for each species encountered in the sample.

Table 24 displays an RIV index for all invasive species found in each reach. This gives insight into the invasive species that occur most frequently in the system, and along each particular reach, and that also have the most severe levels of infestation. In viewing this table, one can visualize reaches with the greatest to the least problems with NIS infestations. Table 25 provides this data in detailed form. Appendix 1 provides a guide to the vegetation types covered in the landscape analysis.

Findings

1. Lower watershed riparian vegetation is dominated by native species although the actual number of non-native species in the main drainage (76) exceeds the number of native species (64). "Dominance" refers to higher frequency of occurrence and greater average cover per occurrence for natives versus non-natives. A total of 140 plant species were encountered during the survey. This probably represents the majority of species found along the creek but there are likely to be other infrequent species present not picked up by sampling or species that were not identifiable during the time of year in which the survey took place.

2. Two species (California blackberry and arroyo willow) are both highly frequent and present high cover values compared to all other species sampled (Table 3). These two species generally occur from near the mouth of the creek to the upper reaches of the lower watershed. Relative Importance Value (RIV) for California blackberry (*Rubus ursinus*) is (3.40) and (3.00) for arroyo willow (*Salix lasiolepis*). Eight other species had RIVs ranging from (1.56) to (1.13). In descending order, these include creek dogwood (*Cornus sericeus*), thimbleberry (*Rubus parviflorus*), red alder (*Alnus rubra*), hoary nettle (*Urtica dioica*), giant horsetail (*Equisetum telmateia*), shining willow (*Salix lucida* ssp. *lasiandra*), cape ivy (*Delairea odorata*), and red elderberry (*Sambucus racemosa*). Although these 10 species make up only 7% of the total number of species identified in the vegetation survey, they constitute the bulk of the riparian vegetation along San Pedro Creek. Nine of ten species, except for cape ivy, are native.

3. Another 29 species (13 native and 16 non-native) with RIVs ranging between (.77) to (.10) are moderately frequent with varying cover values. These species are scattered along the entire lower watershed or may be concentrated along different reaches. Many of the most problematic non-native invasive species are among this group (e.g. blue gum (*Eucalyptus globulus*), English ivy (*Hedera helix*), poison hemlock (*Conium maculatum*), radish (*Raphanus sativa*), Monterey pine (*Pinus radiata*), periwinkle (*Vinca major*), Monterey cypress (*Cupressus macrocarpus*), Himalaya berry (*Rubus discolor*), cherry plum (*Prunus cerasifera*), fuchsia (*Fuchsia magellanica*), and Chinese honeysuckle (*Lonicera japanica*). Collectively, these 29 species make up 21% of the riparian species encountered during the survey. **Several native species in this group [California wood mint (*Stachys bullata*), lady fern (*Athyrium felix-femina*), valley manroot (*Marah fabaceous*), California bee plant (*Scrophularia californica*), sword fern (*Polystichum munitum*), panicled bulrush (*Scirpus microcarpus*), sitka willow (*Salix sitchensis*), Pacific oenanthe (*Oenanthe sarmentosa*), cream bush (*Holodiscus discolor*), and cow parsnip (*Heracleum lanatum*)], along with the top nine native**

species identified above, may represent the optimal species for native plant restoration along creek banks or adjacent to the creek bed.

4. The vast majority of riparian species (101, or 72%) encountered during the survey have RIVs less than (.10). This suggests that they were encountered infrequently and/or that they had low average cover when encountered. Again, this underscores the importance of the 39 species with RIVs greater than (.10). However, there are a number of non-native invasive species in this group that could present serious problems for the riparian environment including pampas grass (*Cortaderia jubata*), garden nasturtium (*Tropaeolum majus*), veldt grass (*Ehrharta erecta*), french broom (*Genista monspessulanus*), sweet briar (*Rosa eglanteria*), golden wattle (*Acacia longifolia*), and giant reed (*Arundo donax*). The limited occurrence of these invasive species at present provides the potential for spot eradication now that could prevent widespread occurrence later.

5. The NIS survey, which specifically mapped infestations of invasive non-native species, is generally consistent with the riparian plant survey of the lower watershed; however, there is one important exception. The most abundant and widespread invasive species is cape ivy, occurring in every reach except the upper Middle Fork. The next most abundant and widespread invasive is English ivy, found in 13/18 reaches (72%). These two species also had the two highest RIV indices for non-native species in the general survey. Pampas grass, however, was found in 11/18 reaches (61%). Reach 9 (lower Capistrano) and 11 (lower Linda Mar) present particularly dense infestations. Based on the NIS survey, it is number three in terms of its importance as an invasive. For some reason, however, the general survey did not reveal this level of prominence (RIV=(.06). Periwinkle, poison hemlock, and Himalaya berry were each found in 5 reaches (28%). These three were among the 29 most frequently encountered species in the general survey. Periwinkle has some of the most extensive infestations, particularly along Reach 13. Numerous other species (e.g. Chinese honeysuckle) are heavily impacting habitat where they occur but do not appear to be spreading rapidly throughout the system.

6. Of the 18 reaches surveyed for non-native invasive species, the reach with the highest number of invasive species (10) is Reach 9 (lower Capistrano). Reaches 3, 4, and 5 (upper Highway One through lower Adobe) also have high numbers of invasives (7) with high levels of infestation. Reaches 7 and 8 (mid upper to upper Adobe) also have a large number of invasives with high levels of infestation (6), as does Reach 11 (lower Linda Mar). Most of the garden escapes [fuchsia, glossy privet (*Ligusticum lucidum*), Chinese honeysuckle, passion vine (*Passiflora mollisima*), cherry plum, sweet briar, and garden nasturtium] occur along these main stem reaches. The reaches of the Middle Fork and South Fork have fewer non-native invasive species,

however, cape ivy has extensive infestations in the lower Middle Fork and upper areas of the South Fork. Pampas grass, poison hemlock, Himalya berry, and periwinkle also occur in these reaches which otherwise host a rich native species diversity and high value habitat.

7. The upper watershed of San Pedro Valley is dominated by three different alliances of scrub: the coyote brush scrub alliance, the hazelnut scrub alliance, and the manzanita-chinquapin chaparral alliance. The coyote brush scrub alliance is most widespread and is characterized by a number of associations that sort out based upon slope and aspect. Grassland in San Pedro Valley is quite limited and concentrated on the south facing slopes of the northern divide or on slopes on hills on the north and west sides of Shamrock Ranch. Exotic evergreen forest stands are now more abundant than grassland and these stands occur in the central uplands of San Pedro Valley and around the lower slopes of the entire watershed. Blue gum is the dominant exotic forest species, however, Monterey pine is a close second and Monterey pine appears to be the more invasive species and is rapidly colonizing several areas of scrub and grassland. Monterey cypress is also present in occasional stands but does not appear to be as invasive as Monterey pine.

8. Upland watershed arroyos have seeps, springs, and low flow streams that support stands of wetland scrub. This scrub is most often characterized by arroyo willow. Other riparian vegetation in these perennial to seasonal drainages includes sedges, rushes (e.g. *Juncus effusus* and *J. patens*), creek dogwood, red elderberry, thimbleberry, poison oak (*Toxicodendron diversilobum*), twin berry (*Lonicera conjugialis*), and California wax myrtle (*Myrica californica*), and at least one occurrence of elk clover (*Aralia californica*).

The vegetation map is included in an envelope at the back of this report and summarized in Appendix 1.

Findings by Reach.

Reach 1 (Mouth of Creek to Hwy 1) Samples 1-5 (not covered by Collins)
This is an estuarine reach dominated by arroyo willow and shining willow with natives such as panicled bulrush, giant horsetail, Pacific oenanthe, California blackberry, northern willow herb (*Epilobium ciliatum*), and amphibious smartweed (*Polygonum amphibium*). Most problematic invasive species include cape ivy, radish, poison hemlock, and giant reed. The reach lacks riparian canopy cover. It is currently in the process of being restored for the San Pedro Creek flood control project. The south bank will remain in tact but the north bank will be removed and a one-acre wetland-lagoon will be created that ranges from the highway to the mouth of the creek.

Reach 2 (Hwy One to Rest Home) Samples 6-23, Collins 0 -1800

This was a relatively undisturbed reach with a high cover and frequency of arroyo willow, shining willow, and California blackberry. Under story vegetation is dominated by giant horsetail, thimbleberry, panicled bulrush, creek dogwood, and large monkey flower (*Mimulus guttatus*). Red alder stands are occasional and there is some sitka willow (*Salix sitchensis*). Canopy cover is about two-thirds. Major invasive species are prominent, particularly around back yards along the north bank. These include cape ivy, English ivy, radish, and poison hemlock. This reach has already been disturbed by the Pacifica flood control project. A twelve-acre area adjacent to the south bank has been contoured and planted with native perennial grasses, alder, three species of willow, dogwood, wetland herbaceous species (in created depressions), and box elder (*Acer negundo*), a new introduction to San Pedro Valley. Within a few years, the south bank will be removed and the creek diverted through a channel that bisects this restoration project.

Reach 3 (Rest Home to Peralta Bridge) Samples 24-35, Collins 2100-3000

This reach is characterized by thick vegetative cover and dominated by arroyo willow, California blackberry, and shining willow. Common herbaceous under story species include giant horsetail, thimbleberry, California wood mint, hoary nettle, creek dogwood, and panicled bulrush. Major non-native invasives include cape ivy, radish, fuchsia, English ivy, periwinkle, and a large clump of giant reed. Backyard structures and erosion problems are prevalent.

Reach 4 (Peralta Bridge to Adobe Bridge) Samples 36-47, Collins 3300-4200

This reach is highly disrupted by erosion control structures and backyards approach the creek on both sides along the entire reach. Half the sample sites lacked canopy cover. Dominant species include California blackberry, English ivy, giant horsetail, hoary nettle, and Monterey pine. Arroyo willow, thimbleberry, California wood

mint, and red elderberry are occasional natives. Non-native species that are also prominent include cherry plum, cape ivy, forked nightshade (*Solanum furcatum*), veldt grass, garden nasturtium, poison hemlock, Chinese honeysuckle, and radish. This is one of the major gaps in native riparian vegetation along the length of the lower watershed.

Reach 5 (Adobe Bridge to end of Alma Heights) Samples 48-62, Collins 4500-5700

This reach begins the historic creek channel, whereas the lower reaches described above are the legacy of a drainage channel that was constructed in the late 1800's. It is of interest because a large stand of red alder dominates this lower Adobe reach. However, the red alder is largely over-shadowed by a larger stand of blue gum. California blackberry is frequent and dense. Other native species prominent in the reach include arroyo willow, creek dogwood, shining willow, hoary nettle, thimbleberry, and California wood mint. Besides the blue gum, major non-native infestations include cape ivy, English ivy, sweet fennel (*Foeniculum vulgare*), radish, Monterey pine, French broom, and poison hemlock.

Reach 6 (End Alma Heights to Sanchez Nursery.) Samples 63-73, Collins 6000-69000

This short reach is highly influenced by backyards on both sides of the creek. The canopy cover, as judged by the samples, is very low (less than 10%). Dominant species include California blackberry, hoary nettle, and giant horsetail. Shrubby occurrences of arroyo willow and shining willow are also present, as is thimbleberry, California wood mint, creek dogwood, and lady fern. Non-native invasive infestations include English ivy, cape ivy, poison hemlock, Chinese honeysuckle, and forked nightshade.

Reach 7 (Sanchez Nurse. to Sanchez Art Center) Samples 74-85, Collins 7200-8100

This reach, in contrast to Reach 6, has a dense canopy dominated by arroyo willow with an extensive California blackberry under-story. Other prominent native species include thimbleberry, California wood mint, California bee plant, red elderberry, shining willow, creek dogwood, valley man root, and lady fern. The only non-native invasive that is prominent is cape ivy, with small infestations of English ivy and Himalaya berry also present. The reach is bordered along the north bank by the undeveloped fields behind the former Sanchez elementary school. Sanchez Fork enters the creek in the middle of the reach. Except for the heavy cape ivy infestations, it is prime native habitat.

Reach 8 (Sanchez Art Center to Capistrano Br.) Samples 86-96, Collins 8400-9300
This reach has undergone extensive bank erosion, particularly near the Capistrano Bridge. Back yards and a town home complex have introduced major bank stabilization structures. About half of the reach lacks canopy cover over the stream. California blackberry is the dominant native species along with hoary nettle. Arroyo

willow is the major tree species although there are some large red alder and shining willow stands. Other prominent natives include thimbleberry, California wood mint, creek dogwood, valley man root, and red elderberry. Invasive non-natives include poison hemlock, cape ivy, Himalaya berry, cherry plum, Monterey pine, weeping willow (*Salix babylonica*), Monterey cypress and blue gum. This is a prime staging area for steelhead salmon that need to negotiate the dramatic headcut at the Capistrano Bridge. A restoration project is underway at the Creek side Townhouse complex that runs along most of the south bank. This effort has removed many exotic invasive species and planted numerous native plants along the channel terrace and sloping banks.

Reach 9 (Capistrano Br. through concrete channel) Samples 97-103, C. 9600-10200

This reach is characterized along its length by a concrete channel. Only about half of the samples had canopy cover. Non-native invasive species dominate the reach including English ivy (extensive infestation), cherry plum, cape ivy, Himalaya berry, sweet briar, golden wattle, lemon bottlebrush (*Callistemon citrina*), French broom, poison hemlock, and periwinkle. California blackberry is also common. Other native species include arroyo willow, hoary nettle, giant horsetail, and shining willow, but they are not prominent. This reach has very poor native habitat value.

Reach 10 (concrete ch. to Linda Mar Br.) Samples 104-114, Collins 10500-11100

This reach is surprisingly well vegetated with native species and has an approximate 80% cover. California blackberry, arroyo willow, and shining willow are the most prominent. Other important natives include hoary nettle, thimbleberry, giant horsetail, valley man root, creek dogwood, lady fern, California bee plant, and California wood mint. Non-native invasive species include infestations of cape ivy, poison hemlock, Monterey pine, English ivy, edible fig (*Ficus carica*), and radish. Although houses are along both banks, the banks seem relatively stable and there is a minimum of erosion control structures along the reach. Accordingly, it appears to have relatively high native habitat value.

Reach 11 (Linda Mar Br to N. Fork culvert) Samples 115-121, Collins 11400-11700

Canopy cover is high along this reach; however, this is partly because of old blue gum, Monterey pine, and Monterey cypress trees. In the under-story of this exotic forest, native species are relatively abundant, particularly California blackberry, arroyo willow, thimbleberry, poison oak, red elderberry, creek dogwood, hoary nettle, and giant horsetail. Numerous other invasive species also occur along this reach and in particular pampas grass, cape ivy, English ivy, poison hemlock, and French broom present major infestations. This reach gets the full impact of the North Fork drainage culvert. There is a major stand of exotic forest (mainly blue gum) on the west slope above the reach behind the homes.

Reach 12 (N Fork confluence to Oddstad Br) Samples 122-128, Collins 1200-12300

Arroyo willow, California blackberry, thimbleberry, red alder, hoary nettle, red elderberry, shining willow, and lady fern characterize this reach. Despite the prominence of native species, however, it also has a major infestation of cape ivy and some cover of other non-natives such as Monterey cypress, poison hemlock, giant reed, and Himalaya blackberry. A major infestation of giant reed above the creek bank (somewhat out of the survey zone) has been removed. The canopy of this reach is essentially closed. There is a good deal of bank erosion. The general habitat value of this reach is better than Reach 12 but still highly influenced by non-native invasive species.

Reach 13 (Oddstad Br to confluence of Forks) Samples 129-138, Collins 12600-13500

Red alder is the dominant native tree along this reach with California blackberry spreading widely in the under story. Red elderberry, lady fern, California wood mint, poison oak, and giant horsetail are also prominent native species. Towering above the red alders is an equally impressive stand of non-native blue gum. Heavy invasive infestations of periwinkle, cape ivy, and English ivy are also present. Large Monterey cypresses add to this densely shaded riparian environment.

Reach 14 (Confluence up Middle Fork to first major drainage) Samples 169-173

The major cover along this reach is a dense canopy of red elderberry, arroyo willow, and creek dogwood with some isolated stands of red alder. California blackberry is an omnipresent under-story species. Thimbleberry, lady fern, hoary nettle, cow parsnip, sword fern, and a perennial lily, big fairy bells, cloak the under-story banks and channel flats. The lower end of the reach is influenced by an extension of the blue gum and periwinkle dominated vegetation below the confluence (Reach 13). The general survey did not pick up other non-native invasive species; however, the NIS survey recorded nine heavy infestations of cape ivy and three infestations of poison hemlock. This suggests that these infestations are local rather than being widespread along this reach. With the exception of these infestations, this is prime native habitat.

Reach 15 (First drainage along Middle Fork to bridge) Samples 174-199

This is a very long reach that is densely covered in riparian forest dominated by red alder. Arroyo willow is equally frequent but is a sub-canopy component to the red alder, joining red elderberry and creek dogwood as a dense secondary tree layer. Below this secondary canopy is a shrub layer dominated by California blackberry, thimbleberry, hoary nettle, lady fern, sword fern (*Polystichum munitum*), big fairy bells (*Disporum hookeri*), California wood mint, California bee plant, and cow parsnip. Valley man root occurs frequently as a vine weaving through the canopy. Numerous native herbaceous species are also present but collectively do not rank

however, cape ivy has extensive infestations in the lower Middle Fork and upper areas of the South Fork. Pampas grass, poison hemlock, Himalya berry, and periwinkle also occur in these reaches which otherwise host a rich native species diversity and high value habitat.

7. The upper watershed of San Pedro Valley is dominated by three different alliances of scrub: the coyote brush scrub alliance, the hazelnut scrub alliance, and the manzanita-chinquapin chaparral alliance. The coyote brush scrub alliance is most widespread and is characterized by a number of associations that sort out based upon slope and aspect. Grassland in San Pedro Valley is quite limited and concentrated on the south facing slopes of the northern divide or on slopes on hills on the north and west sides of Shamrock Ranch. Exotic evergreen forest stands are now more abundant than grassland and these stands occur in the central uplands of San Pedro Valley and around the lower slopes of the entire watershed. Blue gum is the dominant exotic forest species, however, Monterey pine is a close second and Monterey pine appears to be the more invasive species and is rapidly colonizing several areas of scrub and grassland. Monterey cypress is also present in occasional stands but does not appear to be as invasive as Monterey pine.

8. Upland watershed arroyos have seeps, springs, and low flow streams that support stands of wetland scrub. This scrub is most often characterized by arroyo willow. Other riparian vegetation in these perennial to seasonal drainages includes sedges, rushes (e.g. *Juncus effusus* and *J. patens*), creek dogwood, red elderberry, thimbleberry, poison oak (*Toxicodendron diversilobum*), twin berry (*Lonicera conjugialis*), and California wax myrtle (*Myrica californica*), and at least one occurrence of elk clover (*Aralia californica*).

The vegetation map is included in an envelope at the back of this report and summarized in Appendix 1.

high in cover value. Cape ivy and poison hemlock occurrence was relatively low and diminishes as one moves up the reach towards the bridge. The NIS survey noted 10 infestations of cape ivy, 2 infestations of poison hemlock, and one infestation of English ivy. These were mostly lower in the reach. Again, this suggests that these infestations are quite local rather than being widespread. The native species rich, multi-storied canopy of this reach, combined with its size and continuity, makes it arguably the best quality riparian habitat of any of the other reaches.

Reach 16 (upper reach of Middle Fork above bridge) Samples 200-205

A low, dense canopy of arroyo willow and creek dogwood characterizes this reach. Red elderberry occasionally joins as a part of this canopy. California blackberry, sword fern, big fairy bells, thimbleberry, poison oak, slim Solomon's seal (*Smilacina stellata*), giant horsetail, and cow parsnip are prominent in the under-story. Valley man root vines are frequent in the canopy. Numerous native herbaceous species are also present. No non-native species were recorded along this reach, either in the general survey or in the NIS survey. Accordingly, although not as rich and varied as the middle reach of the Middle Fork, this reach is virtually a pristine remnant of the indigenous landscape in its vegetation composition.

Reach 17 (confluence up South Fork to blue gum stand) Samples 139-158

This reach presents a rich native species canopy dominated by arroyo willow and creek dogwood, with occasional red alder, red elderberry, and shining willow also being present. California blackberry, thimbleberry, hoary nettle, lady fern, giant horsetail, hoary nettle, sword fern, and California bee plant dominate the under-story. Numerous other native herbaceous species occur in this rich riparian environment. Cape ivy infestations are present, particularly in the upper portion of the reach. Blue gum and periwinkle occur lower, near the confluence, an extension of the vegetation along the Oddstad Reach (13). The NIS survey recorded 7 infestations of cape ivy, 3 infestations of periwinkle, 2 infestations of pampas grass, and 1 infestation of Himalaya berry. Consequently, despite its general quality as rich native habitat, it is vulnerable to the spread of these non-native invasive species.

Reach 18 (South Fork along E. Branch to NCCWD structure) Samples 159-168

This reach is deeply shaded by a tall, dense grove of blue gum. A lower canopy is created by native species dominated by creek dogwood, arroyo willow, and red elderberry. Red alder is also an occasional tree. Under story vegetation is dominated by California blackberry, thimbleberry, lady fern, sword fern, giant horsetail, hoary nettle, and California wood mint. The general survey also picked up some occasional cape ivy, poison hemlock, and Himalaya berry infestations. The NIS survey revealed 3 cape ivy infestions, 1 infestation of pampas grass, 1 infestation of English ivy, and 1 infestation of Himalaya berry. Despite the blue gum over

story, this habitat is rich in native riparian vegetation and is likely good avian habitat.

V. Summary

The lower watershed can be characterized as consisting of three different systems:

From the mouth of the creek to Peralta Bridge, there is good riparian habitat and, because of the City of Pacifica flood control project, this is likely to expand over time. Nonetheless, the transition from established riparian vegetation to future riparian vegetation may be somewhat problematic in the short term. This lower region is partially impacted by private homes and businesses; however, the flood control project should shift the natural riparian system away from these urbanizing influences. This area has high potential for being an excellent steelhead staging area in the future, and also prime habitat for many species that depend upon estuarine-centered ecosystems.

From Peralta Bridge to the Oddstad Bridge, this region is dominated by private residences. Riparian vegetation along these reaches is heavily impacted by flood control structures and bank erosion. Many garden escapes have become invasive species, such as English ivy, periwinkle, Chinese honeysuckle, and fuchsia. Gaps in the canopy have opened habitat for other non-native invasive species such as poison hemlock, fennel, French broom, and pampas grass. Cape ivy also thrives in this region, climbing over native and non-native trees and shrubs wherever it gets established. This region is likely to be the focus of private-public restoration partnerships that are designed to provide flood protection, enhance native riparian habitat, and provide both refugia for wildlife in general and clear passage for steelhead and other aquatic species in particular.

Above Oddstad Bridge up both the South Fork and the Middle Fork, these are reaches with high quality native riparian habitat. Further, as protected parkland, they are very amenable to coordinated resource management that is designed to create excellent wildlife habitat. Fortunately, these reaches are the prime spawning habitat of our local steelhead run and they also provide good habitat for sensitive species such as the California red-legged frog. By enhancing and managing these quality reaches of the lower watershed, there is a good chance of preserving the natural values of these upper systems.

The great majority of the watershed is covered by native shrubland. The coyote brush scrub alliance is the dominant vegetation. The hazelnut deciduous scrub alliance is prominent on north-facing slopes centering on Montara Mountain and extending out in lesser stands to the west and east. The manzanita-chinquapin chaparral alliance dominates the granitic uplands of Montara Mountain and sandstone outcrops on adjacent lower slopes. Wetland scrub is found in seeps, springs, and wet arroyos throughout the watershed but it is most abundant on the

slopes of the southern watershed. There is very little native coast live oak forest alliance and some native pacific reedgrass grassland alliance, particularly on uplands near the coast. Mixed native/exotic grasslands are concentrated on upper ridges over the northern watershed. Exotic evergreen forest is the next most abundant vegetation type in the watershed relative to the overwhelming dominance of different native scrub alliances. Over all, the watershed has good vegetative cover on its uplands and evidence of perennial wetland springs, seeps, and first order streams in all parts of the watershed.

VI. Recommendations

Both the general riparian survey and the NIS survey revealed extensive and widespread infestations of cape ivy, English ivy, poison hemlock, Himalaya berry, pampas grass, and periwinkle. Cape ivy and English ivy occur from near the mouth of the creek up into prime reaches of the Middle Fork and South Fork. Numerous other garden escapes occur along the urbanized middle region of the lower watershed. Some highly invasive species, such as French broom and giant reed, are present but are still not yet widespread. Furthermore, large stands of non-native trees are present along the residential reaches and up into the lower Middle Fork and upper South Fork reaches.

The extensive occurrence of these non-native invasive species poses a threat to the future quality of the riparian vegetation of San Pedro Creek. Furthermore, any future restoration efforts that occur along the creek for erosion control or fish habitat enhancement are likely to open up opportunities for invasion by these species. Consequently, developing and implementing a NIS control strategy should be the top priority for riparian vegetation management along San Pedro Creek.

NIS control is a challenge in riparian environments, and along San Pedro Creek in particular. Herbicides have negative impacts on riparian ecosystems and accordingly are not ideal. Cape ivy, the most pernicious non-native species, is extremely difficult to hand-remove. Contracting for removal of non-natives is generally an expensive option. Furthermore, the middle section of the lower watershed is dominated by private residences. Consequently, there is also difficulty in getting permission from homeowners to go in and remove infestations wherever they occur.

Fortunately, there is an option for addressing this problem that is relatively inexpensive and potentially very productive in the long term. That option involves developing a volunteer-based stewardship program that would (1) strategically remove NIS infestations and (2) strategically plant site-appropriate native plant species to fill riparian gaps and replace removed NIS infestations. The key to the success of this type of program is to hire a watershed stewardship coordinator, ideally in a full time capacity. The coordinator would be responsible for working with landowners, agencies, contractors, educational institutions, and public volunteers to organize and implement a long-term NIS removal and native plant revegetation and hands-on education program. The coordinator would also be responsible for organizing an on-going monitoring effort to (1) assess the outcome of restoration projects and (2) continue to survey for NIS infestations along the creek.

Within the watershed, there are two adult citizen volunteer stewardship organizations (without paid staff support), five elementary schools, and one high school. A watershed stewardship program would ideally tap into these institutions,

and others, to provide hands-on opportunities for NIS removal and revegetation efforts at various places along the creek.

Budget for this program would be for the salary and benefits of the coordinator, equipment and supplies, and funds for contract growing the appropriate native plant species for revegetation and (if needed) hiring specialists to conduct monitoring and other technical work. The San Pedro Creek Watershed Coalition could hire and supervise the watershed stewardship coordinator.

An alternative approach would be to spend about the same amount of money or more per year on contracting for stewardship services with a company like Go Native Nursery. Although this is a good investment as well, and this option has advantages over building a volunteer-based program, it is still likely that a more cost-effective, long term solution will happen if a focused watershed stewardship program is established.

A recommended strategy for NIS control and riparian vegetation enhancement in either event is as follows:

1. Begin a hand-removal NIS project at the new bridge over the Middle Fork working downstream to the confluence with the South Fork. Work in conjunction with the County Park staff and the park volunteer group that already exists. Concentrate on removing cape ivy, English ivy, and poison hemlock. If possible, eradicate these NIS infestations from this upper reach. This is prime steelhead spawning habitat and otherwise excellent native riparian habitat. Removing the threat of exotic species from this reach consequently enhances and preserves excellent native habitat and removes a source of propagules for cape ivy and English ivy spread downstream.

2. Continue hand-removal of cape ivy and other NIS infestations in the South Fork, also in conjunction with the park and park volunteers. Although this habitat is not as high quality for steelhead as the Middle Fork, this effort will remove a source for downstream spread of these species and also enhance high quality riparian habitat for a variety of other wildlife species. Reach 13 is park property and NIS removal efforts of these infestations would be good. Ideally, a concentrated effort should be made to rid the county park of NIS infestations and this will reduce a source for downstream spread of these species. However, I would not attempt to remove the blue gum trees along Reach 13 for reasons mentioned below.

3. Work with the City of Pacifica to conduct NIS removal efforts in the downstream flood control project (both above and below Highway One). Although this area will be subject to infestation from upstream sources, preventative maintenance now and over time will help to enhance the quality of the riparian vegetation that will eventually be established. The City is

funding native plant installation, some maintenance, and some monitoring, but a volunteer stewardship program could provide the kind of attention that this project needs to have a truly optimal outcome. Like the spawning area in the upper region of the lower watershed, this area could also become key to recovering healthy steelhead populations because of its value for improving smolt success in transitioning to the marine environment.

4. Focus NIS removal and native plant revegetation efforts on individual projects along the middle residential-dominated region. In this area, there are certain key reaches that are probably very important for steelhead habitat (particularly pools during the summer and early fall). Hagar (2002) identified the Adobe Reach (Adobe Bridge to Capistrano Bridge) as one key area. A high priority for NIS removal would be the prime areas of riparian habitat along Reach 7 and Reach 5. These reaches have good riparian habitat that just needs to be enhanced. Reach 6 is a canopy gap but it would take the cooperation of property owners to revegetate this area. Reach 8 should also be a high priority because there is already a restoration project underway along the south bank, there is mitigation funding to work along the north bank which includes funds for monitoring, and it is an important staging area for steelhead as they attempt to negotiate the Capistrano falls. Reach 4 (between Peralta and Adobe) is in dire need of NIS removal and revegetation, however, it may become part of an expanded flood control project sometime in the future and a holistic approach might become possible. Otherwise, efforts along this reach would be subject to individual homeowner permission. Reach 9 is perhaps the worst area for NIS infestations. It is the concrete channel owned by the City of Pacifica above Capistrano. Efforts along this reach should be coordinated with future City plans to remove the concrete channel and lay back the banks. NIS removal and revegetation will have to be a major component to this future project. Reach 10 is also an area that could be enhanced with minimum effort and maximum effect. Reaches 11 and 12 will require extensive effort for NIS removal and revegetation.

5. Unless there are obvious opportunities, I do not recommend trying to remove individuals and stands of mature non-native trees. Tree removal is very costly and politically controversial. Most native riparian species seem to do okay under the shade of these exotic trees so I'm not convinced that they threaten native riparian vegetation. I believe that efforts can be better spent concentrating on non-native invasive vines and large shrubs or clumps of giant reed and pampas grass. Many invasive non-native species will be inhibited once a good native riparian cover is established (e.g. fennel, poison hemlock, pampas grass and French broom). Consequently, I recommend that removal efforts be concentrated on cape ivy and English ivy (which thrive in all environments), opportunistic removal of other NIS infestations in project areas, and planting and cultivating native trees and shrubs at every opportunity to re-establish a native canopy. This should eventually shade

out many gap opportunists such as French broom, poison hemlock and pampas grass.

6. The watershed stewardship program should be funded for at least five years. The key to success of this approach is slow but steady progress, building a volunteer network, using hand-removal efforts rather than herbicides, and engaging students and adults in a community building effort. A long-term commitment is a must. Ideally, we can develop a future assessment district in which creek-side home- owners and other residents of the watershed contribute annually to a fund which would support the watershed stewardship program. Consequently, the initial funding will provide the opportunity to demonstrate the value of such a program. However, a key to enabling the success of this pilot project is that it be supported for a minimum of five years so that success can be demonstrated.

Estimated Budget for Watershed Stewardship Program

Year One	**$55,000**	**Year Two**	**$57,500**
Coordinator	$30,000	Coordinator	$32,500
Equipment	$10,000	Equipment	$5,000
Supplies	$5,000	Supplies	$5,000
Contract Plants	$10,000	Contract Plants	$10,000
Year Three	**$50,000**	**Year Four**	**$52,500**
Coordinator	$35,000	Coordinator	$37,500
Supplies	$5,000	Supplies	$5,000
Contract Plants	$10,000	Contract Plants	$10,000
Year Five	**$55,000**	**Total Cost (5 Years)**	**$270,000**
Coordinator	$40,000		
Supplies	$5,000		
Contract Plants	$10,000		

The key threat to riparian habitat quality along San Pedro Creek is disruption of the native species canopy, disturbance, and infestation of a few key non-native invasive species. A watershed stewardship program should be established to focus on a careful strategy of removing these NIS infestations and replacing canopy gaps and disturbed habitat with native riparian vegetation. Contracting for this effort would likely be inordinately expensive and possibly involve the short-term use of herbicides. In the long term, establishing a community supported stewardship program that is tied into education and outreach and which focuses on NIS removal,

re-vegetation, and monitoring will be the best solution to this problem. By promoting native riparian vegetation, numerous other ecological benefits will be realized for the San Pedro Creek ecosystem, including enhancement of the steelhead population.

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Table 1
Index to Reaches and Sample Localities

Reach	Reach Name	Veg Samples	N	NIS Samples	N	Collins
1	Beach	001-005	5	001-003	3	None
2	Lower Hwy 1	006-023	18	004-012	9	00-00-18-00
3	Upper Hwy 1	024-035	12	013-023	11	21-00-30-00
4	Peralta	036-047	12	024-032	9	33-00-42-00
5	Lower Adobe	048-062	15	033-044	12	45-00-57-00
6	Low Mid Adobe	063-073	11	045-055	11	60-00-69-00
7	Upper Mid Adobe	074-085	12	056-063	8	72-00-81-00
8	Upper Adobe	086-096	11	064-071	8	84-00-93-00
9	Lower Capistrano	097-103	7	072-078	7	96-00-102-00
10	Upper Capistrano	104-114	11	079-082	4	105-00-111-00
11	Lower Linda Mar	115-121	7	083-089	7	114-00-117-00
12	Upper Linda Mar	122-128	7	090-094	5	120-00-123-00
13	Oddstad	129-138	10	095-104	10	126-00-135-00
14	Lower Middle Fork	169-173	5	119-130	12	None
15	Mid Middle Fork	174-199	26	131-142	12	None
16	Upper Middle Fork	200-205	6	None	None	None
17	Lower South Fork	139-158	20	105-114	10	None
18	Upper South Fork	159-168	10	115-118	4	None

Table 2
Comparison of Vegetation by Reach

Reach	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Sample Size	5	18	12	12	15	11	12	11	7	11	7	7	10	5	26	6	20	10
Canopy Cover	1.00	0.67	0.92	0.42	0.60	0.09	1.00	0.45	0.57	0.82	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Native #	16	26	17	20	18	17	21	24	9	19	19	14	16	16	33	22	29	23
Non-Native #	10	20	20	30	25	19	19	30	23	27	22	11	6	2	6	0	8	6
Total	26	46	37	50	43	36	40	54	32	46	41	25	22	18	39	22	37	29
Native %	62%	57%	46%	40%	42%	47%	53%	44%	28%	41%	46%	56%	73%	89%	85%	100%	78%	79%
Non-Native %	38%	43%	54%	60%	58%	53%	48%	56%	72%	59%	54%	44%	27%	11%	15%	0%	22%	21%
Native Av Freq	0.45	0.24	0.35	0.22	0.29	0.36	0.32	0.31	0.27	0.36	0.35	0.66	0.36	0.43	0.31	0.40	0.31	0.37
Non-Nat. Av Freq	0.30	0.20	0.21	0.15	0.17	0.23	0.16	0.16	0.23	0.13	0.30	0.16	0.37	0.20	0.09	0.00	0.13	0.27
Native Av Cover	2.67	2.32	2.57	2.53	2.65	2.57	2.60	2.37	2.76	2.46	2.34	2.97	2.81	3.12	1.92	2.13	2.49	2.52
Non-Nat. Av Cov	1.90	1.91	2.14	2.33	2.19	2.95	1.64	2.19	2.22	2.13	2.07	2.74	2.94	5.00	1.71	0.00	2.71	2.77
Nat Avg RIV	1.25	0.72	1.13	0.58	0.86	1.06	1.00	0.85	0.81	1.14	0.83	0.54	1.13	1.59	0.93	1.07	0.93	1.10
Non-Nat Avg RIV	0.56	0.39	0.47	0.36	0.41	0.51	0.32	0.33	0.59	0.28	0.62	0.45	1.35	1.00	0.19	0.00	0.36	0.98
RIV Ratio	2.23	1.85	2.43	1.64	2.11	2.08	3.11	2.57	1.37	4.03	1.33	1.20	0.83	1.59	4.89	NA	2.60	1.11

Table 3
List of Species by Scientific Name

n = 205 Canopy Cover = .78

Taxon	Common Name	Status	Life Form	Fr	Avg	RIV
Acacia longifolia	**golden wattle**	**Non-Native**	**tree**	**0.01**	**3.00**	**0.03**
Acanthus mollis	**bear's breech**	**Non-Native**	**per herb**	**0.00**	**3.00**	**0.01**
Agrostis viridis	**water bent grass**	**Non-Native**	**per herb**	**0.17**	**1.53**	**0.25**
Albizia dystachia	**stink bean**	**Non-Native**	**tree**	**0.00**	**3.00**	**0.01**
Alnus rubra	red alder	Native	tree	0.28	5.00	1.39
Anagallus arvensis	**scarlet pimpernel**	**Non-Native**	**ann herb**	**0.01**	**1.00**	**0.01**
Anthriscus caucalis	**bur chervil**	**Non-Native**	**ann herb**	**0.00**	**2.00**	**0.01**
Artemesia douglasiana	Douglas's mugwort	Native	shrub	0.00	1.00	0.00
Arundo donax	**giant reed**	**Non-Native**	**shrub**	**0.00**	**3.00**	**0.01**
Athyrium filix-femina	lady fern	Native	per herb	0.36	1.85	0.66
Avena barbata	**slender oats**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Bellis perennis	**English daisy**	**Non-Native**	**per herb**	**0.00**	**2.00**	**0.01**
Bromus diandrus	**ripgut brome**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Bromus species	**brome**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Callistemon citrina	**lemon bottlebrush**	**Non-Native**	**shrub**	**0.00**	**3.00**	**0.01**
Calocedrus decurrens	**incense cedar**	**Non-Native**	**tree**	**0.00**	**4.00**	**0.02**
Calystegia purpuratus	purple morning glory	Native	per herb	0.00	1.00	0.00
Carex bolanderi	Bolander's sedge	Native	per herb	0.02	1.25	0.02
Cirsium vulgare	**bull thistle**	**Non-Native**	**ann herb**	**0.05**	**1.50**	**0.07**
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.26**	**1.83**	**0.47**
Coprosma repens	**mirror plant**	**Non-Native**	**shrub**	**0.00**	**1.00**	**0.00**
Cornus sericeus	creek dogwood	Native	shrub	0.39	4.04	1.56
Coronopus didymus	**lesser watercress**	**Non-Native**	**per herb**	**0.02**	**1.25**	**0.02**
Cortaderia jubata	**pampas grass**	**Non-Native**	**per herb**	**0.03**	**2.17**	**0.06**
Corylus cornuta	California hazelnut	Native	shrub	0.02	2.25	0.04
Crocosmia masoniorum	**montbretia**	**Non-Native**	**per herb**	**0.03**	**1.57**	**0.05**
Cupressus macrocarpus	**Monterey cypress**	**Non-Native**	**tree**	**0.06**	**3.15**	**0.20**
Cyperus esculentus	yellow nutgrass	Native	per herb	0.07	1.27	0.09
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.42**	**2.74**	**1.15**
Disporum smithii	big fairy bells	Native	per herb	0.11	1.64	0.18
Ehrharta erecta	**veldt grass**	**Non-Native**	**ann herb**	**0.04**	**2.25**	**0.09**
Elymus glaucus	blue wildrye	Native	per herb	0.00	3.00	0.01
Epilobium cilliatum	northern willow herb	Native	per herb	0.04	1.25	0.05
Epipactis gigantea	stream orchid	Native	per herb	0.02	1.00	0.02
Equisetum telmateia	giant horsetail	Native	per herb	0.56	2.25	1.25
Eucalyptus globulus	**blue gum**	**Non-Native**	**tree**	**0.16**	**4.64**	**0.75**
Euphorbia peplus	**petty spurge**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Ficus carica	**edible fig**	**Non-Native**	**tree**	**0.01**	**2.33**	**0.03**
Foeniculum vulgare	**sweet fennel**	**Non-Native**	**ann herb**	**0.03**	**2.29**	**0.08**
Fuchsia magellanica	**fuschia**	**Non-Native**	**per herb**	**0.05**	**2.91**	**0.16**
Fumaria parviflora	**small flowered fumitory**	**Non-Native**	**per herb**	**0.13**	**1.69**	**0.21**
Genista monspessulanus	**French broom**	**Non-Native**	**shrub**	**0.03**	**2.67**	**0.08**
Gnaphalium chilense	cotton batting plant	Native	per herb	0.02	1.00	0.02
Hedera helix	**English ivy**	**Non-Native**	**vine**	**0.21**	**3.18**	**0.68**
Helenium puberulum	sneezeweed	Native	per herb	0.00	2.00	0.01
Heracleum lanatum	cow parsnip	Native	per herb	0.05	2.10	0.10

Table 3
List of Species by Scientific Name

Heteromeles arbutifolia	toyon	Native	shrub	0.00	2.00	0.01
Hirschfeldia incana	**summer mustard**	**Non-Native**	**ann herb**	**0.03**	**1.83**	**0.05**
Holcus lanatus	**velvet grass**	**Non-Native**	**per herb**	**0.02**	**2.00**	**0.04**
Holodiscus discolor	cream bush	Native	shrub	0.05	2.40	0.12
Hordeum murinum	**farmer's foxtail**	**Non-Native**	**ann herb**	**0.00**	**2.00**	**0.01**
Iris longipetala	coast iris	Native	per herb	0.00	2.00	0.01
Juglans regia	**English walnut**	**Non-Native**	**tree**	**0.00**	**5.00**	**0.02**
Juncus effusus	bog rush	Native	per herb	0.06	1.23	0.08
Juncus leseurii	salt rush	Native	per herb	0.00	3.00	0.01
Juncus patens	common rush	Native	per herb	0.00	1.00	0.00
Juncus phaeocephalus	brown-headed rush	Native	per herb	0.00	1.00	0.00
Lathyrus vestitus	common Pacific pea	Native	vine	0.01	1.50	0.01
Lepidium pinnatifidum	**pepper grass**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Ligusticum lucidum	**glossy privet**	**Non-Native**	**shrub**	**0.01**	**2.33**	**0.03**
Lolium multiflorum	**Italian ryegrass**	**Non-Native**	**ann herb**	**0.04**	**1.75**	**0.07**
Lonicera involucrata	twinberry	Native	vine	0.00	2.00	0.01
Lonicera japanica	**Chinese honeysuckle**	**Non-Native**	**vine**	**0.04**	**2.78**	**0.12**
Lotus corniculatus	***bird's-foot trefoil***	**Non-Native**	**per herb**	**0.02**	**1.25**	**0.02**
Lythrum californicum	California loosestrife	Native	per herb	0.01	1.00	0.01
Malus species	**crabapple**	**Non-Native**	**tree**	**0.00**	**3.00**	**0.01**
Marah fabaceus	valley manroot	Native	vine	0.22	2.63	0.59
Marah oregana	coast manroot	Native	vine	0.00	3.00	0.01
Marchantia sp. (liverwort)	liverwort	Native	per herb	0.03	1.29	0.04
Melica californica	western melica	Native	per herb	0.00	2.00	0.01
Melilotus indica	**Indian melilot**	**Non-Native**	**ann herb**	**0.00**	**2.00**	**0.01**
Mimulus guttatus	large monkey flower	Native	per herb	0.06	1.58	0.09
Myoporum latetum	**myoporum**	**Non-Native**	**shrub**	**0.00**	**3.00**	**0.01**
Myosotis latifolia	**forget me not**	**Non-Native**	**per herb**	**0.01**	**1.00**	**0.01**
Myrica californica	California wax myrtle	Native	shrub	0.00	3.00	0.01
Nandina domestica	**heavenly bamboo**	**Non-Native**	**shrub**	**0.00**	**3.00**	**0.01**
Oemleria cerasiformis	oso berry	Native	shrub	0.00	1.00	0.00
Oenanthe sarmentosa	Pacific oenanthe	Native	per herb	0.08	2.00	0.16
Oenothera elata ssp. hookeri	Hooker's evening primrose	Native	per herb	0.01	2.00	0.02
Passiflora mollisima	**passion vine**	**Non-Native**	**vine**	**0.00**	**2.00**	**0.01**
Phalaris aquatica	**Harding grass**	**Non-Native**	**per herb**	**0.02**	**1.60**	**0.04**
Picris echioides	**bristly ox tongue**	**Non-Native**	**ann herb**	**0.03**	**1.50**	**0.04**
Pinus radiata	**Monterey pine**	**Non-Native**	**tree**	**0.06**	**3.62**	**0.23**
Pittosporum crassifolium	**pittosporum**	**Non-Native**	**shrub**	**0.01**	**3.33**	**0.05**
Plantago cornopus	**cut-leaved plantain**	**Non-Native**	**per herb**	**0.00**	**1.00**	**0.00**
Plantago lanceolata	**English plantain**	**Non-Native**	**per herb**	**0.01**	**1.00**	**0.01**
Plantago subnuda	Mexican plantain	Native	per herb	0.01	1.00	0.01
Poa annua	**annual bluegrass**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Polygonum amphibium	amphibious smartweed	Native	per herb	0.04	1.50	0.06
Polygonum punctatum	water smartweed	Native	per herb	0.00	1.00	0.00
Polypogon monspeliensis	**rabbit's foot grass**	**Non-Native**	**ann herb**	**0.03**	**1.00**	**0.03**
Polystichum munitum	sword fern	Native	per herb	0.24	1.74	0.42
Prunus cerasifera	**cherry plum**	**Non-Native**	**shrub**	**0.04**	**3.67**	**0.16**
Quercus agrifolia	coast live oak	Native	tree	0.00	3.00	0.01
Ranunculus muricatus	**prickle-fruited buttercup**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**

Table 3
List of Species by Scientific Name

Raphanus sativa	**radish**	**Non-Native**	**ann herb**	**0.20**	**1.98**	**0.40**
Rhamnus californica	coffee berry	Native	shrub	0.01	2.00	0.03
Ribes glutinosum	flowering current	Native	shrub	0.01	2.33	0.03
Ribes menziesii	canyon gooseberry	Native	shrub	0.01	1.67	0.02
Rorripa nasturtium-aquaticum	**water cress**	**Non-Native**	**per herb**	**0.11**	**1.18**	**0.13**
Rosa eglanteria	**sweet briar**	**Non-Native**	**vine**	**0.01**	**3.33**	**0.05**
Rubus discolor	**Himalaya berry**	**Non-Native**	**vine**	**0.06**	**2.92**	**0.17**
Rubus parviflora	thimble berry	Native	shrub	0.46	3.12	1.43
Rubus ulmifolius	**blackberry**	**Non-Native**	**vine**	**0.01**	**3.50**	**0.03**
Rubus ursinus	California blackberry	Native	vine	0.85	4.01	3.40
Rumex crispus	**curly dock**	**Non-Native**	**per herb**	**0.09**	**1.26**	**0.12**
Rumex species	**dock**	**Non-Native**	**per herb**	**0.00**	**1.00**	**0.00**
Salix babylonica	**weeping willow**	**Non-Native**	**tree**	**0.01**	**4.00**	**0.06**
Salix laevigata	red willow	Native	tree	0.01	3.33	0.05
Salix lasiolepis	arroyo willow	Native	tree	0.68	4.43	3.00
Salix lucida ssp lasiandra	shining willow	Native	tree	0.29	4.03	1.16
Salix sitchensis	Sitka willow	Native	tree	0.05	3.30	0.16
Sambucus racemosa	red elderberry	Native	shrub	0.33	3.45	1.13
Scirpus microcarpus	panicled bulrush	Native	per herb	0.13	2.35	0.30
Scrophularia californica	California bee plant	Native	per herb	0.21	2.02	0.43
Senecio vulgaris	**common groundsel**	**Non-Native**	**ann herb**	**0.01**	**1.00**	**0.01**
Sequoia sempervirens	**coast redwood**	**Non-Native**	**tree**	**0.02**	**3.20**	**0.08**
Sequoiadendron gigantea	**giant redwood**	**Non-Native**	**tree**	**0.00**	**3.00**	**0.01**
Smilacina racemosa	slim solomon's seal	Native	per herb	0.02	1.00	0.02
Solanum furcatum	**forked nightshade**	**Non-Native**	**per herb**	**0.10**	**2.25**	**0.22**
Soleirolia soleirolii	**baby's tears**	**Non-Native**	**per herb**	**0.01**	**1.00**	**0.01**
Sonchus oleraceus	**common sow thistle**	**Non-Native**	**ann herb**	**0.02**	**1.00**	**0.02**
Stachys bullata	California wood mint	Native	per herb	0.36	2.15	0.77
Symphoricarpos albus	common snowberry	Native	shrub	0.00	1.00	0.00
Taraxicum officionalis	**dandelion**	**Non-Native**	**per herb**	**0.01**	**1.67**	**0.02**
Tellima grandiflora	fringe cups	Native	per herb	0.04	1.13	0.04
Tetragonia tetragonioides	**New Zealand spinach**	**Non-Native**	**per herb**	**0.00**	**1.00**	**0.00**
Thalictrum fendleri	meadow rue	Native	per herb	0.00	1.00	0.00
Toxicodendron diversilobum	poison oak	Native	shrub	0.08	2.59	0.21
Trifolium repens	white clover	Native	per herb	0.00	2.00	0.01
Trillium chloropetalum	giant wake robin	Native	per herb	0.00	1.00	0.00
Tropaeolum majus	**garden nasturtium**	**Non-Native**	**per herb**	**0.03**	**2.57**	**0.09**
Urtica dioica	hoary nettle	Native	per herb	0.46	2.83	1.31
Veronica americana	American brooklime	Native	per herb	0.02	1.25	0.02
Vicia americana	**American vetch**	**Non-Native**	**vine**	**0.00**	**1.00**	**0.00**
Vicia gigantea	giant vetch	Native	vine	0.06	1.92	0.12
Vinca major	**periwinkle**	**Non-Native**	**per herb**	**0.07**	**2.87**	**0.21**
Woodwardia fimbriata	Western chain fern	Native	per herb	0.00	1.00	0.00
Yucca gloriosa	**soft-tip yucca**	**Non-Native**	**per herb**	**0.01**	**2.00**	**0.03**
Zantedeschia aethiopica	**common cala**	**Non-Native**	**per herb**	**0.01**	**1.33**	**0.02**
Indigenous =		**64**	**46%**	**0.09**	**2.06**	**0.26**
Nonindigenous =		**76**	**54%**	**0.06**	**2.12**	**0.15**
Total =		**140**		**Ratio**		**3.40**

Table 3
List of Species by Scientific Name

Fr = Frequency of occurrence per sample for each species
Avg CC = Average cover class for each species per occurrence
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 4
All Sites/All Species Comparison

n = 205 Canopy Cover = .78

Taxon	Common Name	Status	Life Form	Fr	Avg	RIV
Rubus ursinus	California blackberry	Native	vine	0.85	4.01	3.40
Salix lasiolepis	arroyo willow	Native	tree	0.68	4.43	3.00
Cornus sericeus	creek dogwood	Native	shrub	0.39	4.04	1.56
Rubus parviflora	thimble berry	Native	shrub	0.46	3.12	1.43
Alnus rubra	red alder	Native	tree	0.28	5.00	1.39
Urtica dioica	hoary nettle	Native	per herb	0.46	2.83	1.31
Equisetum telmateia	giant horsetail	Native	per herb	0.56	2.25	1.25
Salix lucida ssp lasiandra	shining willow	Native	tree	0.29	4.03	1.16
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.42**	**2.74**	**1.15**
Sambucus racemosa	red elderberry	Native	shrub	0.33	3.45	1.13
10						
Stachys bullata	California wood mint	Native	per herb	0.36	2.15	0.77
Eucalyptus globulus	**blue gum**	**Non-Native**	**tree**	**0.16**	**4.64**	**0.75**
Hedera helix	**English ivy**	**Non-Native**	**vine**	**0.21**	**3.18**	**0.68**
Athyrium filix-femina	lady fern	Native	per herb	0.36	1.85	0.66
Marah fabaceus	valley manroot	Native	vine	0.22	2.63	0.59
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.26**	**1.83**	**0.47**
Scrophularia californica	California bee plant	Native	per herb	0.21	2.02	0.43
Polystichum munitum	sword fern	Native	per herb	0.24	1.74	0.42
Raphanus sativa	**radish**	**Non-Native**	**ann herb**	**0.20**	**1.98**	**0.40**
Scirpus microcarpus	panicled bulrush	Native	per herb	0.13	2.35	0.30
Agrostis viridis	**water bent grass**	**Non-Native**	**per herb**	**0.17**	**1.53**	**0.25**
Pinus radiata	**Monterey pine**	**Non-Native**	**tree**	**0.06**	**3.62**	**0.23**
Solanum furcatum	**forked nightshade**	**Non-Native**	**per herb**	**0.10**	**2.25**	**0.22**
Toxicodendron diversilobum	poison oak	Native	shrub	0.08	2.59	0.21
Fumaria parviflora	**small flowered fumitory**	**Non-Native**	**per herb**	**0.13**	**1.69**	**0.21**
Vinca major	**periwinkle**	**Non-Native**	**per herb**	**0.07**	**2.87**	**0.21**
Cupressus macrocarpus	**Monterey cypress**	**Non-Native**	**tree**	**0.06**	**3.15**	**0.20**
Disporum smithii	big fairy bells	Native	per herb	0.11	1.64	0.18
Rubus discolor	**Himalaya berry**	**Non-Native**	**vine**	**0.06**	**2.92**	**0.17**
Salix sitchensis	Sitka willow	Native	tree	0.05	3.30	0.16
Prunus cerasifera	**cherry plum**	**Non-Native**	**shrub**	**0.04**	**3.67**	**0.16**
Fuchsia magellanica	**fuschia**	**Non-Native**	**per herb**	**0.05**	**2.91**	**0.16**
Oenanthe sarmentosa	Pacific oenanthe	Native	per herb	0.08	2.00	0.16
Rorripa nasturtium-aquaticum	**water cress**	**Non-Native**	**per herb**	**0.11**	**1.18**	**0.13**
Vicia gigantea	giant vetch	Native	vine	0.06	1.92	0.12
Lonicera japanica	**Chinese honeysuckle**	**Non-Native**	**vine**	**0.04**	**2.78**	**0.12**
Holodiscus discolor	cream bush	Native	shrub	0.05	2.40	0.12
Rumex crispus	**curly dock**	**Non-Native**	**per herb**	**0.09**	**1.26**	**0.12**
Heracleum lanatum	cow parsnip	Native	per herb	0.05	2.10	0.10
29						
Mimulus guttatus	large monkey flower	Native	per herb	0.06	1.58	0.09
Cyperus esculentus	yellow nutgrass	Native	per herb	0.07	1.27	0.09
Tropaeolum majus	**garden nasturtium**	**Non-Native**	**per herb**	**0.03**	**2.57**	**0.09**
Ehrharta erecta	**veldt grass**	**Non-Native**	**ann herb**	**0.04**	**2.25**	**0.09**
Sequoia sempervirens	**coast redwood**	**Non-Native**	**tree**	**0.02**	**3.20**	**0.08**
Foeniculum vulgare	**sweet fennel**	**Non-Native**	**ann herb**	**0.03**	**2.29**	**0.08**

Table 3
All Sites/ All Species Comparison

Genista monspessulanus	**French broom**	**Non-Native**	**shrub**	**0.03**	**2.67**	**0.08**
Juncus effusus	bog rush	Native	per herb	0.06	1.23	0.08
Cirsium vulgare	**bull thistle**	**Non-Native**	**ann herb**	**0.05**	**1.50**	**0.07**
Lolium multiflorum	**Italian ryegrass**	**Non-Native**	**ann herb**	**0.04**	**1.75**	**0.07**
Cortaderia jubata	**pampas grass**	**Non-Native**	**per herb**	**0.03**	**2.17**	**0.06**
Salix babylonica	**weeping willow**	**Non-Native**	**tree**	**0.01**	**4.00**	**0.06**
Polygonum amphibium	amphibious smartweed	Native	per herb	0.04	1.50	0.06
Crocosmia masoniorum	**montbretia**	**Non-Native**	**per herb**	**0.03**	**1.57**	**0.05**
Hirschfeldia incana	**summer mustard**	**Non-Native**	**ann herb**	**0.03**	**1.83**	**0.05**
Epilobium cilliatum	northern willow herb	Native	per herb	0.04	1.25	0.05
Pittosporum crassifolium	**pittosporum**	**Non-Native**	**shrub**	**0.01**	**3.33**	**0.05**
Rosa eglanteria	**sweet briar**	**Non-Native**	**vine**	**0.01**	**3.33**	**0.05**
Salix laevigata	red willow	Native	tree	0.01	3.33	0.05
Marchantia sp. (liverwort)	liverwort	Native	per herb	0.03	1.29	0.04
Picris echioides	**bristly ox tongue**	**Non-Native**	**ann herb**	**0.03**	**1.50**	**0.04**
Corylus cornuta	California hazelnut	Native	shrub	0.02	2.25	0.04
Tellima grandiflora	fringe cups	Native	per herb	0.04	1.13	0.04
Phalaris aquatica	**Harding grass**	**Non-Native**	**per herb**	**0.02**	**1.60**	**0.04**
Holcus lanatus	**velvet grass**	**Non-Native**	**per herb**	**0.02**	**2.00**	**0.04**
Ficus carica	**edible fig**	**Non-Native**	**tree**	**0.01**	**2.33**	**0.03**
Ligusticum lucidum	**glossy privet**	**Non-Native**	**shrub**	**0.01**	**2.33**	**0.03**
Polypogon monspeliensis	**rabbit's foot grass**	**Non-Native**	**ann herb**	**0.03**	**1.00**	**0.03**
Ribes glutinosum	flowering current	Native	shrub	0.01	2.33	0.03
Rubus ulmifolius	**blackberry**	**Non-Native**	**vine**	**0.01**	**3.50**	**0.03**
Rhamnus californica	coffee berry	Native	shrub	0.01	2.00	0.03
Yucca gloriosa	**soft-tip yucca**	**Non-Native**	**per herb**	**0.01**	**2.00**	**0.03**
Acacia longifolia	**golden wattle**	**Non-Native**	**tree**	**0.01**	**3.00**	**0.03**
Carex bolanderi	Bolander's sedge	Native	per herb	0.02	1.25	0.02
Coronopus didymus	**lesser watercress**	**Non-Native**	**per herb**	**0.02**	**1.25**	**0.02**
Epipactis gigantea	stream orchid	Native	per herb	0.02	1.00	0.02
Juglans regia	**English walnut**	**Non-Native**	**tree**	**0.00**	**5.00**	**0.02**
Lotus corniculatus	**bird's-foot trefoil**	**Non-Native**	**per herb**	**0.02**	**1.25**	**0.02**
Ribes menziesii	canyon gooseberry	Native	shrub	0.01	1.67	0.02
Sonchus oleraceus	**common sow thistle**	**Non-Native**	**ann herb**	**0.02**	**1.00**	**0.02**
Taraxicum officionalis	**dandelion**	**Non-Native**	**per herb**	**0.01**	**1.67**	**0.02**
Veronica americana	American brooklime	Native	per herb	0.02	1.25	0.02
Calocedrus decurrens	**incense cedar**	**Non-Native**	**tree**	**0.00**	**4.00**	**0.02**
Gnaphalium chilense	cotton batting plant	Native	per herb	0.02	1.00	0.02
Oenothera elata ssp. hookeri	Hooker's evening primrose	Native	per herb	0.01	2.00	0.02
Smilacina racemosa	slim solomon's seal	Native	per herb	0.02	1.00	0.02
Zantedeschia aethiopica	**common cala**	**Non-Native**	**per herb**	**0.01**	**1.33**	**0.02**
Anagallus arvensis	**scarlet pimpernel**	**Non-Native**	**ann herb**	**0.01**	**1.00**	**0.01**
Myosotis latifolia	**forget me not**	**Non-Native**	**per herb**	**0.01**	**1.00**	**0.01**
Senecio vulgaris	**common groundsel**	**Non-Native**	**ann herb**	**0.01**	**1.00**	**0.01**
Soleirolia soleirolii	**baby's tears**	**Non-Native**	**per herb**	**0.01**	**1.00**	**0.01**
Acanthus mollis	**bear's breech**	**Non-Native**	**per herb**	**0.00**	**3.00**	**0.01**
Albizia dystachia	**stink bean**	**Non-Native**	**tree**	**0.00**	**3.00**	**0.01**
Arundo donax	**giant reed**	**Non-Native**	**shrub**	**0.00**	**3.00**	**0.01**
Callistemon citrina	**lemon bottlebrush**	**Non-Native**	**shrub**	**0.00**	**3.00**	**0.01**

Table 3

All Sites/All Species Comparison

Elymus glaucus	blue wildrye	Native	per herb	0.00	3.00	0.01
Juncus leseurii	salt rush	Native	per herb	0.00	3.00	0.01
Lathyrus vestitus	common Pacific pea	Native	vine	0.01	1.50	0.01
Malus species	**crabapple**	**Non-Native**	**tree**	**0.00**	**3.00**	**0.01**
Marah oregana	coast manroot	Native	vine	0.00	3.00	0.01
Myoporum latetum	**myoporum**	**Non-Native**	**shrub**	**0.00**	**3.00**	**0.01**
Myrica californica	California wax myrtle	Native	shrub	0.00	3.00	0.01
Nandina domestica	**heavenly bamboo**	**Non-Native**	**shrub**	**0.00**	**3.00**	**0.01**
Quercus agrifolia	coast live oak	Native	tree	0.00	3.00	0.01
Sequoiadendron gigantea	**giant redwood**	**Non-Native**	**tree**	**0.00**	**3.00**	**0.01**
Anthriscus caucalis	**bur chervil**	**Non-Native**	**ann herb**	**0.00**	**2.00**	**0.01**
Bellis perennis	**English daisy**	**Non-Native**	**per herb**	**0.00**	**2.00**	**0.01**
Helenium puberulum	sneezeweed	Native	per herb	0.00	2.00	0.01
Heteromeles arbutifolia	toyon	Native	shrub	0.00	2.00	0.01
Hordeum murinum	**farmer's foxtail**	**Non-Native**	**ann herb**	**0.00**	**2.00**	**0.01**
Iris longipetala	coast iris	Native	per herb	0.00	2.00	0.01
Lonicera involucrata	twinberry	Native	vine	0.00	2.00	0.01
Lythrum californicum	California loosestrife	Native	per herb	0.01	1.00	0.01
Melica californica	western melica	Native	per herb	0.00	2.00	0.01
Melilotus indica	**Indian melilot**	**Non-Native**	**ann herb**	**0.00**	**2.00**	**0.01**
Passiflora mollisima	**passion vine**	**Non-Native**	**vine**	**0.00**	**2.00**	**0.01**
Plantago lanceolata	**English plantain**	**Non-Native**	**per herb**	**0.01**	**1.00**	**0.01**
Plantago subnuda	Mexican plantain	Native	per herb	0.01	1.00	0.01
Trifolium repens	white clover	Native	per herb	0.00	2.00	0.01
Artemesia douglasiana	Douglas's mugwort	Native	shrub	0.00	1.00	0.00
Avena barbata	**slender oats**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Bromus diandrus	**ripgut brome**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Bromus species	**brome**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Calystegia purpuratus	purple morning glory	Native	per herb	0.00	1.00	0.00
Coprosma repens	**mirror plant**	**Non-Native**	**shrub**	**0.00**	**1.00**	**0.00**
Euphorbia peplus	**petty spurge**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Juncus patens	common rush	Native	per herb	0.00	1.00	0.00
Juncus phaeocephalus	brown-headed rush	Native	per herb	0.00	1.00	0.00
Lepidium pinnatifidum	**pepper grass**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Oemleria cerasiformis	oso berry	Native	shrub	0.00	1.00	0.00
Plantago cornopus	**cut-leaved plantain**	**Non-Native**	**per herb**	**0.00**	**1.00**	**0.00**
Poa annua	**annual bluegrass**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Polygonum punctatum	water smartweed	Native	per herb	0.00	1.00	0.00
Ranunculus muricatus	**prickle-fruited buttercup**	**Non-Native**	**ann herb**	**0.00**	**1.00**	**0.00**
Rumex species	**dock**	**Non-Native**	**per herb**	**0.00**	**1.00**	**0.00**
Symphoricarpos albus	common snowberry	Native	shrub	0.00	1.00	0.00
Tetragonia tetragonioides	**New Zealand spinach**	**Non-Native**	**per herb**	**0.00**	**1.00**	**0.00**
Thalictrum fendleri	meadow rue	Native	per herb	0.00	1.00	0.00
Trillium chloropetalum	giant wake robin	Native	per herb	0.00	1.00	0.00
Vicia americana	**American vetch**	**Non-Native**	**vine**	**0.00**	**1.00**	**0.00**
Woodwardia fimbriata	Western chain fern	Native	per herb	0.00	1.00	0.00
101						
Native =	64	46%		0.01	1.68	0.01
Non-Native* =	76	54%		0.13	2.44	0.36

Table 3

All Sites/ All Species Comparison

Total =	**140**		
Common (RIV: > 1.0)) =	10	7%	*Non-Native includes CA
Frequent (RIV: 1.00 -.10)) =	29	21%	natives not indigenous to
Rare (RIV: < .10) =	101	72%	San Pedro Valley

Table 5
Relative Importance of Vegetation in Reach One

n = 5	Canopy Cover = 0.00	Samples 1-5				
Taxon	**Common Name**	**Status**	**Life Form**	Fr	Avg	RIV
Salix lasiolepis	arroyo willow	Native	tree	1.00	4.20	4.20
Scirpus microcarpus	panicled bulrush	Native	per herb	1.00	3.40	3.40
Equisetum telmateia	giant horsetail	Native	per herb	0.60	3.00	1.80
Oenanthe sarmentosa	Pacific oenanthe	Native	per herb	0.80	2.25	1.80
Raphanus sativa	**radish**	**Non-Native**	**ann herb**	**0.80**	**2.00**	**1.60**
Rubus ursinus	California blackberry	Native	vine	0.40	3.50	1.40
Epilobium cilliatum	northern willow herb	Native	per herb	0.60	1.67	1.00
Polygonum amphibium	amphibious smartweed	Native	per herb	0.60	1.67	1.00
Salix lucida ssp lasiandra	shining willow	Native	tree	0.20	5.00	1.00
Agrostis viridis	**water bent grass**	**Non-Native**	**per herb**	**0.20**	**4.00**	**0.80**
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.40**	**2.00**	**0.80**
Cornus sericeus	creek dogwood	Native	shrub	0.20	4.00	0.80
Mimulus guttatus	large monkey flower	Native	per herb	0.40	2.00	0.80
Scrophularia californica	California bee plant	Native	per herb	0.40	2.00	0.80
Urtica dioica	hoary nettle	Native	per herb	0.20	4.00	0.80
Holcus lanatus	**velvet grass**	**Non-Native**	**per herb**	**0.20**	**3.00**	**0.60**
Juncus leseurii	salt rush	Native	per herb	0.20	3.00	0.60
Lotus corniculatus	**bird's-foot trefoil**	**Non-Native**	**per herb**	**0.20**	**2.00**	**0.40**
Melilotus indica	**Indian melilot**	**Non-Native**	**ann herb**	**0.20**	**2.00**	**0.40**
Picris echioides	**bristly ox tongue**	**Non-Native**	**ann herb**	**0.40**	**1.00**	**0.40**
Anagallus arvensis	**scarlet pimpernel**	**Non-Native**	**ann herb**	**0.20**	**1.00**	**0.20**
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.20**	**1.00**	**0.20**
Polypogon monspeliensis	**rabbit's foot grass**	**Non-Native**	**ann herb**	**0.20**	**1.00**	**0.20**
Gnaphalium chilense	cotton batting plant	Native	per herb	0.20	1.00	0.20
Juncus phaeocephalus	brown-headed rush	Native	per herb	0.20	1.00	0.20
Polygonum punctatum	water smartweed	Native	per herb	0.20	1.00	0.20
Indigenous =		**26**	**57%**	**0.46**	**2.31**	**1.25**
Nonindigenous =		**20**	**43%**	**0.28**	**2.47**	**0.56**
Total		**46**		**Ratio**		**2.23**

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 6
Relative Importance of Vegetation in Reach Two

n = 18	Canopy Cover = .67	Samples 6-23				
Taxon	**Common Name**	**Status**	**Life Form**	Fr	Avg	RIV
Salix lasiolepis	arroyo willow	Native	tree	0.72	4.62	3.33
Rubus ursinus	California blackberry	Native	vine	0.78	4.00	3.11
Salix lucida ssp lasiandra	shining willow	Native	tree	0.56	4.90	2.72
Equisetum telmateia	giant horsetail	Native	per herb	0.83	2.73	2.28
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.56**	**2.20**	**1.22**
Raphanus sativa	**radish**	**Non-Native**	**ann herb**	**0.61**	**2.00**	**1.22**
Rubus parviflora	thimble berry	Native	shrub	0.33	3.50	1.17
Hedera helix	**English ivy**	**Non-Native**	**vine**	**0.33**	**3.33**	**1.11**
Salix sitchensis	Sitka willow	Native	tree	0.22	3.25	0.72
Scirpus microcarpus	panicled bulrush	Native	per herb	0.28	2.40	0.67
Scrophularia californica	California bee plant	Native	per herb	0.28	2.40	0.67
Agrostis viridis	**water bent grass**	**Non-Native**	**per herb**	**0.50**	**1.33**	**0.67**
Cornus sericeus	creek dogwood	Native	shrub	0.17	3.33	0.56
Mimulus guttatus	large monkey flower	Native	per herb	0.33	1.67	0.56
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.28**	**2.00**	**0.56**
Rumex crispus	**curly dock**	**Non-Native**	**per herb**	**0.28**	**1.60**	**0.44**
Alnus rubra	red alder	Native	tree	0.11	4.00	0.44
Oenanthe sarmentosa	Pacific oenanthe	Native	per herb	0.17	2.33	0.39
Solanum furcatum	**forked nightshade**	**Non-Native**	**per herb**	**0.17**	**2.33**	**0.39**
Juncus effusus	bog rush	Native	per herb	0.22	1.50	0.33
Stachys bullata	California wood mint	Native	per herb	0.17	2.00	0.33
Ehrharta erecta	**veldt grass**	**Non-Native**	**ann herb**	**0.17**	**2.00**	**0.33**
Lolium multiflorum	**Italian ryegrass**	**Non-Native**	**ann herb**	**0.11**	**2.50**	**0.28**
Vinca major	**periwinkle**	**Non-Native**	**per herb**	**0.11**	**2.50**	**0.28**
Cyperus esculentus	yellow nutgrass	Native	per herb	0.17	1.33	0.22
Marchantia sp. (liverwort)	liverwort	Native	per herb	0.22	1.00	0.22
Salix laevigata	red willow	Native	tree	0.06	4.00	0.22
Veronica americana	American brooklime	Native	per herb	0.17	1.33	0.22
Fumaria parviflora	**small flowered fumitory**	**Non-Native**	**per herb**	**0.17**	**1.33**	**0.22**
Hirschfeldia incana	**summer mustard**	**Non-Native**	**ann herb**	**0.11**	**2.00**	**0.22**
Lonicera japanica	**Chinese honeysuckle**	**Non-Native**	**vine**	**0.06**	**3.00**	**0.17**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Native**	**per herb**	**0.17**	**1.00**	**0.17**
Rosa eglanteria	**sweet briar**	**Non-Native**	**vine**	**0.06**	**3.00**	**0.17**
Epilobium cilliatum	northern willow herb	Native	per herb	0.11	1.00	0.11
Polygonum amphibium	amphibious smartweed	Native	per herb	0.06	2.00	0.11
Polystichum munitum	sword fern	Native	per herb	0.11	1.00	0.11
Urtica dioica	hoary nettle	Native	per herb	0.06	2.00	0.11
Fuchsia magellanica	**fuschia**	**Non-Native**	**per herb**	**0.06**	**2.00**	**0.11**
Polypogon monspeliensis	**rabbit's foot grass**	**Non-Native**	**ann herb**	**0.11**	**1.00**	**0.11**
Artemesia douglasiana	Douglas's mugwort	Native	shrub	0.06	1.00	0.06
Juncus patens	common rush	Native	per herb	0.06	1.00	0.06
Lythrum californicum	California loosestrife	Native	per herb	0.06	1.00	0.06
Vicia gigantea	giant vetch	Native	vine	0.06	1.00	0.06
Avena barbata	**slender oats**	**Non-Native**	**ann herb**	**0.06**	**1.00**	**0.06**
Lepidium pinnatifidum	**pepper grass**	**Non-Native**	**ann herb**	**0.06**	**1.00**	**0.06**
Tropaeolum majus	**garden nasturtium**	**Non-Native**	**per herb**	**0.06**	**1.00**	**0.06**
Indigenous =		**26**	**57%**	**0.24**	**2.32**	**0.72**

Table 6
Relative Importance of Vegetation in Reach Two

Nonindigenous =	**20**	**43%**	**0.20**	**1.91**	**0.39**
Total	**46**		**Ratio**		**1.85**

Table 7
Relative Importance of Vegetation In Reach Three

n = 12	Canopy Cover = .92	Samples 24-35				
Taxon	**Common Name**	**Status**	**Life Form**	Fr	Avg	RIV
Salix lasiolepis	arroyo willow	Native	tree	0.92	4.55	4.17
Rubus ursinus	California blackberry	Native	vine	0.92	4.27	3.92
Salix lucida ssp lasiandra	shining willow	Native	tree	0.58	4.57	2.67
Equisetum telmateia	giant horsetail	Native	per herb	0.83	2.60	2.17
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.42**	**3.20**	**1.33**
Raphanus sativa	**radish**	**Non-Native**	**ann herb**	**0.67**	**2.00**	**1.33**
Rubus parviflora	thimble berry	Native	shrub	0.33	3.75	1.25
Fuchsia magellanica	**fuschia**	**Non-Native**	**per herb**	**0.42**	**3.00**	**1.25**
Hedera helix	**English ivy**	**Non-Native**	**vine**	**0.33**	**3.75**	**1.25**
Stachys bullata	California wood mint	Native	per herb	0.42	2.60	1.08
Urtica dioica	hoary nettle	Native	per herb	0.33	2.75	0.92
Cornus sericeus	creek dogwood	Native	shrub	0.25	3.33	0.83
Vinca major	**periwinkle**	**Non-Native**	**per herb**	**0.17**	**4.00**	**0.67**
Scirpus microcarpus	panicled bulrush	Native	per herb	0.25	2.00	0.50
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.33**	**1.50**	**0.50**
Phalaris aquatica	**Harding grass**	**Non-Native**	**per herb**	**0.25**	**1.67**	**0.42**
Polygonum amphibium	amphibious smartweed	Native	per herb	0.25	1.33	0.33
Scrophularia californica	California bee plant	Native	per herb	0.17	2.00	0.33
Agrostis viridis	**water bent grass**	**Non-Native**	**per herb**	**0.25**	**1.33**	**0.33**
Cupressus macrocarpus	**Monterey cypress**	**Non-Native**	**tree**	**0.08**	**4.00**	**0.33**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Native**	**per herb**	**0.25**	**1.33**	**0.33**
Alnus rubra	red alder	Native	tree	0.08	3.00	0.25
Cyperus esculentus	yellow nutgrass	Native	per herb	0.17	1.50	0.25
Oenanthe sarmentosa	Pacific oenanthe	Native	per herb	0.17	1.50	0.25
Lonicera japanica	**Chinese honeysuckle**	**Non-Native**	**vine**	**0.08**	**3.00**	**0.25**
Rumex crispus	**curly dock**	**Non-Native**	**per herb**	**0.25**	**1.00**	**0.25**
Marah fabaceus	valley manroot	Native	vine	0.08	2.00	0.17
Ehrharta erecta	**veldt grass**	**Non-Native**	**ann herb**	**0.08**	**2.00**	**0.17**
Fumaria parviflora	**small flowered fumitory**	**Non-Native**	**per herb**	**0.08**	**2.00**	**0.17**
Hirschfeldia incana	**summer mustard**	**Non-Native**	**ann herb**	**0.08**	**2.00**	**0.17**
Holcus lanatus	**velvet grass**	**Non-Native**	**per herb**	**0.08**	**2.00**	**0.17**
Solanum furcatum	**forked nightshade**	**Non-Native**	**per herb**	**0.08**	**2.00**	**0.17**
Epilobium cilliatum	northern willow herb	Native	per herb	0.08	1.00	0.08
Mimulus guttatus	large monkey flower	Native	per herb	0.08	1.00	0.08
Polypogon monspeliensis	**rabbit's foot grass**	**Non-Native**	**ann herb**	**0.08**	**1.00**	**0.08**
Tetragonia tetragonioides	**New Zealand spinach**	**Non-Native**	**per herb**	**0.08**	**1.00**	**0.08**
Tropaeolum majus	**garden nasturtium**	**Non-Native**	**per herb**	**0.08**	**1.00**	**0.08**
Indigenous =		**17**	**46%**	**0.35**	**2.57**	**1.13**
Nonindigenous =		**20**	**54%**	**0.21**	**2.14**	**0.47**
Total		**37**		**Ratio**		**2.43**

Fr = Count of all occurrences/Total number of samples

AvgC = Sum of all cover classes per occurrence/Count of all occurrences

RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 8
Relative Importance of Vegetation In Reach Four

n = 12 | Canopy Cover = .42 | Samples 36-47

Taxon	Common Name	Status	Life Form	Fr	Avg	RIV
Rubus ursinus	California blackberry	Native	vine	0.75	3.33	2.50
Hedera helix	**English ivy**	**Non-Native**	**vine**	**0.50**	**4.17**	**2.08**
Equisetum telmateia	giant horsetail	Native	per herb	0.75	2.44	1.83
Urtica dioica	hoary nettle	Native	per herb	0.58	2.57	1.50
Pinus radiata	**Monterey pine**	**Non-Native**	**tree**	**0.42**	**3.60**	**1.50**
Rubus parviflora	thimble berry	Native	shrub	0.25	3.00	0.75
Salix lasiolepis	arroyo willow	Native	tree	0.17	4.50	0.75
Stachys bullata	California wood mint	Native	per herb	0.25	3.00	0.75
Sambucus racemosa	red elderberry	Native	shrub	0.25	2.67	0.67
Prunus cerasifera	**cherry plum**	**Non-Native**	**shrub**	**0.17**	**4.00**	**0.67**
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.25**	**2.33**	**0.58**
Solanum furcatum	**forked nightshade**	**Non-Native**	**per herb**	**0.25**	**2.33**	**0.58**
Ehrharta erecta	**veldt grass**	**Non-Native**	**ann herb**	**0.17**	**3.50**	**0.58**
Tropaeolum majus	**garden nasturtium**	**Non-Native**	**per herb**	**0.17**	**3.50**	**0.58**
Alnus rubra	red alder	Native	tree	0.08	6.00	0.50
Scirpus microcarpus	panicled bulrush	Native	per herb	0.25	2.00	0.50
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.25**	**2.00**	**0.50**
Lonicera japanica	**Chinese honeysuckle**	**Non-Native**	**vine**	**0.25**	**2.00**	**0.50**
Raphanus sativa	**radish**	**Non-Native**	**ann herb**	**0.25**	**1.67**	**0.42**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Native**	**per herb**	**0.25**	**1.67**	**0.42**
Juglans regia	**English walnut**	**Non-Native**	**tree**	**0.08**	**5.00**	**0.42**
Salix lucida ssp lasiandra	shining willow	Native	tree	0.08	4.00	0.33
Scrophularia californica	California bee plant	Native	per herb	0.17	2.00	0.33
Fumaria parviflora	**small flowered fumitory**	**Non-Native**	**per herb**	**0.25**	**1.33**	**0.33**
Ligusticum lucidum	**glossy privet**	**Non-Native**	**shrub**	**0.17**	**2.00**	**0.33**
Pittosporum crassifolium	**pittosporum**	**Non-Native**	**shrub**	**0.08**	**4.00**	**0.33**
Rubus discolor	**Himalaya berry**	**Non-Native**	**vine**	**0.08**	**4.00**	**0.33**
Vinca major	**periwinkle**	**Non-Native**	**per herb**	**0.17**	**2.00**	**0.33**
Salix laevigata	red willow	Native	tree	0.08	3.00	0.25
Salix sitchensis	Sitka willow	Native	tree	0.08	3.00	0.25
Acanthus mollis	**bear's breech**	**Non-Native**	**per herb**	**0.08**	**3.00**	**0.25**
Cortaderia jubata	**pampas grass**	**Non-Native**	**per herb**	**0.08**	**3.00**	**0.25**
Cupressus macrocarpus	**Monterey cypress**	**Non-Native**	**tree**	**0.08**	**3.00**	**0.25**
Malus species	**crabapple**	**Non-Native**	**tree**	**0.08**	**3.00**	**0.25**
Yucca gloriosa	**soft-tip yucca**	**Non-Native**	**per herb**	**0.08**	**3.00**	**0.25**
Cornus sericeus	creek dogwood	Native	shrub	0.08	2.00	0.17
Oenanthe sarmentosa	Pacific oenanthe	Native	per herb	0.08	2.00	0.17
Agrostis viridis	**water bent grass**	**Non-Native**	**per herb**	**0.08**	**2.00**	**0.17**
Crocosmia masoniorum	**montbretia**	**Non-Native**	**per herb**	**0.17**	**1.00**	**0.17**
Rumex crispus	**curly dock**	**Non-Native**	**per herb**	**0.17**	**1.00**	**0.17**
Cyperus esculentus	yellow nutgrass	Native	per herb	0.08	1.00	0.08
Mimulus guttatus	large monkey flower	Native	per herb	0.08	1.00	0.08
Polygonum amphibium	amphibious smartweed	Native	per herb	0.08	1.00	0.08
Polystichum munitum	sword fern	Native	per herb	0.08	1.00	0.08
Tellima grandiflora	fringe cups	Native	per herb	0.08	1.00	0.08
Coprosma repens	**mirror plant**	**Non-Native**	**shrub**	**0.08**	**1.00**	**0.08**
Ficus carica	**edible fig**	**Non-Native**	**tree**	**0.08**	**1.00**	**0.08**

Table 8

Relative Importance of Vegetation In Reach Four

Foeniculum vulgare	sweet fennel		Non-Native	ann herb	0.08	1.00	0.08
Phalaris aquatica	Harding grass		Non-Native	per herb	0.08	1.00	0.08
Picris echioides	bristly ox tongue		Non-Native	ann herb	0.08	1.00	0.08
Zantedeschia aethiopica	common cala		Non-Native	per herb	0.08	1.00	0.08
Indigenous =		20	40%		0.22	2.53	0.58
Nonindigenous =		30	60%		0.15	2.33	0.36
Total		50			Ratio		1.64

Fr = Count of all occurrences/Total number of samples

AvgC = Sum of all cover classes per occurrence/Count of all occurrences

RIV = Relative Importance Value = Frequency x Average Cover Class

*Non-Native includes California native species not indigenous to San Pedro Valley

Table 9
Relative Importance of Vegetation in Reach Five

n = 15	Canopy Cover = .60	Samples 48-62				
Taxon	**Common Name**	**Status**	**Life Form**	Fr	Avg	RIV
Rubus ursinus	California blackberry	Native	vine	0.87	4.00	3.47
Alnus rubra	red alder	Native	tree	0.47	4.43	2.07
Equisetum telmateia	giant horsetail	Native	per herb	0.67	2.50	1.67
Eucalyptus globulus	**blue gum**	**Non-Native**	**tree**	**0.33**	**4.80**	**1.60**
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.53**	**2.88**	**1.53**
Salix lasiolepis	arroyo willow	Native	tree	0.40	3.17	1.27
Cornus sericeus	creek dogwood	Native	shrub	0.33	3.60	1.20
Salix lucida ssp lasiandra	shining willow	Native	tree	0.27	4.25	1.13
Urtica dioica	hoary nettle	Native	per herb	0.40	2.50	1.00
Hedera helix	**English ivy**	**Non-Native**	**vine**	**0.33**	**3.00**	**1.00**
Rubus parviflora	thimble berry	Native	shrub	0.33	2.60	0.87
Stachys bullata	California wood mint	Native	per herb	0.33	2.60	0.87
Foeniculum vulgare	**sweet fennel**	**Non-Native**	**ann herb**	**0.27**	**2.75**	**0.73**
Fumaria parviflora	**small flowered fumitory**	**Non-Native**	**per herb**	**0.40**	**1.67**	**0.67**
Raphanus sativa	**radish**	**Non-Native**	**ann herb**	**0.33**	**2.00**	**0.67**
Pinus radiata	**Monterey pine**	**Non-Native**	**tree**	**0.13**	**3.50**	**0.47**
Agrostis viridis	**water bent grass**	**Non-Native**	**per herb**	**0.33**	**1.40**	**0.47**
Scrophularia californica	California bee plant	Native	per herb	0.20	2.00	0.40
Genista monspessulanus	**French broom**	**Non-Native**	**shrub**	**0.13**	**3.00**	**0.40**
Solanum furcatum	**forked nightshade**	**Non-Native**	**per herb**	**0.20**	**2.00**	**0.40**
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.27**	**1.25**	**0.33**
Fuchsia magellanica	**fuschia**	**Non-Native**	**per herb**	**0.13**	**2.50**	**0.33**
Sambucus racemosa	red elderberry	Native	shrub	0.07	4.00	0.27
Scirpus microcarpus	panicled bulrush	Native	per herb	0.13	2.00	0.27
Toxicodendron diversilobum	poison oak	Native	shrub	0.07	4.00	0.27
Lonicera japanica	**Chinese honeysuckle**	**Non-Native**	**vine**	**0.07**	**4.00**	**0.27**
Athyrium filix-femina	lady fern	Native	per herb	0.20	1.00	0.20
Cyperus esculentus	yellow nutgrass	Native	per herb	0.20	1.00	0.20
Prunus cerasifera	**cherry plum**	**Non-Native**	**shrub**	**0.07**	**3.00**	**0.20**
Tropaeolum majus	**garden nasturtium**	**Non-Native**	**per herb**	**0.07**	**3.00**	**0.20**
Juncus effusus	bog rush	Native	per herb	0.13	1.00	0.13
Oenanthe sarmentosa	Pacific oenanthe	Native	per herb	0.07	2.00	0.13
Cortaderia jubata	**pampas grass**	**Non-Native**	**per herb**	**0.07**	**2.00**	**0.13**
Crocosmia masoniorum	**montbretia**	**Non-Native**	**per herb**	**0.07**	**2.00**	**0.13**
Ehrharta erecta	**veldt grass**	**Non-Native**	**ann herb**	**0.07**	**2.00**	**0.13**
Passiflora mollisima	**passion vine**	**Non-Native**	**vine**	**0.07**	**2.00**	**0.13**
Polystichum munitum	sword fern	Native	per herb	0.07	1.00	0.07
Picris echioides	**bristly ox tongue**	**Non-Native**	**ann herb**	**0.07**	**1.00**	**0.07**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Native**	**per herb**	**0.07**	**1.00**	**0.07**
Rumex crispus	**curly dock**	**Non-Native**	**per herb**	**0.07**	**1.00**	**0.07**
Sequoia sempervirens	**coast redwood**	**Non-Native**	**tree**	**0.07**	**1.00**	**0.07**
Soleirolia soleirolii	**baby's tears**	**Non-Native**	**per herb**	**0.07**	**1.00**	**0.07**
Vinca major	**periwinkle**	**Non-Native**	**per herb**	**0.07**	**1.00**	**0.07**
Indigenous =		**18**	**42%**	**0.29**	**2.65**	**0.86**
Nonindigenous =		**25**	**58%**	**0.17**	**2.19**	**0.41**
Total		**43**		**Ratio**		**2.11**

Table 9
Relative Importance of Vegetation in Reach Five

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 10
Relative Importance of Vegetation in Reach Six

n = 11 Canopy Cover = .09 Samples 63-73

Taxon	Common Name	Status	Life Form	Fr	Avg	RIV
Rubus ursinus	California blackberry	Native	vine	0.91	4.20	3.82
Urtica dioica	hoary nettle	Native	per herb	0.82	3.11	2.55
Salix lasiolepis	arroyo willow	Native	tree	0.64	4.00	2.55
Salix lucida ssp lasiandra	shining willow	Native	tree	0.73	3.00	2.18
Equisetum telmateia	giant horsetail	Native	per herb	0.82	2.11	1.73
Rubus parviflora	thimble berry	Native	shrub	0.36	3.00	1.09
Stachys bullata	California wood mint	Native	per herb	0.45	2.20	1.00
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.45**	**2.20**	**1.00**
Hedera helix	**English ivy**	**Non-Native**	**vine**	**0.27**	**3.33**	**0.91**
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.55**	**1.50**	**0.82**
Lonicera japanica	**Chinese honeysuckle**	**Non-Native**	**vine**	**0.27**	**3.00**	**0.82**
Fumaria parviflora	**small flowered fumitory**	**Non-Native**	**per herb**	**0.27**	**2.67**	**0.73**
Cornus sericeus	creek dogwood	Native	shrub	0.18	3.50	0.64
Fuchsia magellanica	**fuschia**	**Non-Native**	**per herb**	**0.18**	**3.50**	**0.64**
Solanum furcatum	**forked nightshade**	**Non-Native**	**per herb**	**0.27**	**2.33**	**0.64**
Athyrium filix-femina	lady fern	Native	per herb	0.27	2.00	0.55
Vicia gigantea	giant vetch	Native	vine	0.27	2.00	0.55
Raphanus sativa	**radish**	**Non-Native**	**ann herb**	**0.27**	**2.00**	**0.55**
Calocedrus decurrens	**incense cedar**	**Non-Native**	**tree**	**0.09**	**4.00**	**0.36**
Cupressus macrocarpus	**Monterey cypress**	**Non-Native**	**tree**	**0.09**	**4.00**	**0.36**
Salix babylonica	**weeping willow**	**Non-Native**	**tree**	**0.09**	**4.00**	**0.36**
Sequoia sempervirens	**coast redwood**	**Non-Native**	**tree**	**0.09**	**4.00**	**0.36**
Marah fabaceus	valley manroot	Native	vine	0.09	3.00	0.27
Marah oregana	coast manroot	Native	vine	0.09	3.00	0.27
Oenanthe sarmentosa	Pacific oenanthe	Native	per herb	0.18	1.50	0.27
Eucalyptus globulus	**blue gum**	**Non-Native**	**tree**	**0.09**	**3.00**	**0.27**
Ligusticum lucidum	**glossy privet**	**Non-Native**	**shrub**	**0.09**	**3.00**	**0.27**
Zantedeschia aethiopica	**common cala**	**Non-Native**	**per herb**	**0.18**	**1.50**	**0.27**
Iris longipetala	coast iris	Native	per herb	0.09	2.00	0.18
Scirpus microcarpus	panicled bulrush	Native	per herb	0.09	2.00	0.18
Scrophularia californica	California bee plant	Native	per herb	0.09	2.00	0.18
Cirsium vulgare	**bull thistle**	**Non-Native**	**ann herb**	**0.18**	**1.00**	**0.18**
Crocosmia masoniorum	**montbretia**	**Non-Native**	**per herb**	**0.09**	**2.00**	**0.18**
Hordeum murinum	**farmer's foxtail**	**Non-Native**	**ann herb**	**0.09**	**2.00**	**0.18**
Rumex crispus	**curly dock**	**Non-Native**	**per herb**	**0.18**	**1.00**	**0.18**
Sonchus oleraceus	**common sow thistle**	**Non-Native**	**ann herb**	**0.18**	**1.00**	**0.18**
Sambucus racemosa	red elderberry	Native	shrub	0.09	1.00	0.09
Agrostis viridis	**water bent grass**	**Non-Native**	**per herb**	**0.09**	**1.00**	**0.09**
Bromus species	**brome**	**Non-Native**	**ann herb**	**0.09**	**1.00**	**0.09**
Ranunculus muricatus	**prickle-fruited buttercup**	**Non-Native**	**ann herb**	**0.09**	**1.00**	**0.09**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Native**	**per herb**	**0.09**	**1.00**	**0.09**
Yucca gloriosa	**soft-tip yucca**	**Non-Native**	**per herb**	**0.09**	**1.00**	**0.09**

Indigenous =	**17**	**47%**	**0.36**	**2.57**	**1.06**
Nonindigenous =	**19**	**53%**	**0.23**	**2.95**	**0.51**
Total	**36**		**Ratio**		**2.08**

Table 10
Relative Importance of Vegetation in Reach Six

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 11
Relative Importance of Vegetation in Reach Seven

n = 12	Canopy Cover = 1.00	Samples 74-85				
Taxon	**Common Name**	**Status**	**Life Form**	Fr	Avg	RIV
Salix lasiolepis	arroyo willow	Ind	tree	1.00	4.83	4.83
Rubus ursinus	California blackberry	Ind	vine	0.92	4.18	3.83
Delairea odorata	**cape ivy**	**Non-Ind**	**vine**	**0.83**	**2.80**	**2.33**
Rubus parviflora	thimble berry	Ind	shrub	0.58	3.43	2.00
Stachys bullata	California wood mint	Ind	per herb	0.67	2.50	1.67
Scrophularia californica	California bee plant	Ind	per herb	0.50	2.33	1.17
Sambucus racemosa	red elderberry	Ind	shrub	0.33	3.25	1.08
Salix lucida ssp lasiandra	shining willow	Ind	tree	0.25	4.00	1.00
Cornus sericeus	creek dogwood	Ind	shrub	0.25	3.67	0.92
Marah fabaceus	valley manroot	Ind	vine	0.33	2.50	0.83
Athyrium filix-femina	lady fern	Ind	per herb	0.33	2.00	0.67
Solanum furcatum	**forked nightshade**	**Non-Ind**	**per herb**	**0.25**	**2.33**	**0.58**
Equisetum telmateia	giant horsetail	Ind	per herb	0.25	2.00	0.50
Urtica dioica	hoary nettle	Ind	per herb	0.25	2.00	0.50
Alnus rubra	red alder	Ind	tree	0.08	5.00	0.42
Hedera helix	**English ivy**	**Non-Ind**	**vine**	**0.17**	**2.50**	**0.42**
Rubus discolor	**Himalaya berry**	**Non-Ind**	**vine**	**0.17**	**2.50**	**0.42**
Scirpus microcarpus	panicled bulrush	Ind	per herb	0.17	2.00	0.33
Fumaria parviflora	**small flowered fumitory**	**Non-Ind**	**per herb**	**0.17**	**2.00**	**0.33**
Juncus effusus	bog rush	Ind	per herb	0.17	1.50	0.25
Marchantia sp. (liverwort)	liverwort	Ind	per herb	0.17	1.50	0.25
Salix sitchensis	Sitka willow	Ind	tree	0.08	3.00	0.25
Raphanus sativa	**radish**	**Non-Ind**	**ann herb**	**0.17**	**1.50**	**0.25**
Rumex crispus	**curly dock**	**Non-Ind**	**per herb**	**0.17**	**1.50**	**0.25**
Oenanthe sarmentosa	Pacific oenanthe	Ind	per herb	0.08	2.00	0.17
Agrostis viridis	**water bent grass**	**Non-Ind**	**per herb**	**0.17**	**1.00**	**0.17**
Conium maculatum	**poison hemlock**	**Non-Ind**	**ann herb**	**0.08**	**2.00**	**0.17**
Crocosmia masoniorum	**montbretia**	**Non-Ind**	**per herb**	**0.08**	**2.00**	**0.17**
Phalaris aquatica	**Harding grass**	**Non-Ind**	**per herb**	**0.08**	**2.00**	**0.17**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Ind**	**per herb**	**0.17**	**1.00**	**0.17**
Yucca gloriosa	**soft-tip yucca**	**Non-Ind**	**per herb**	**0.08**	**2.00**	**0.17**
Gnaphalium chilense	cotton batting plant	Ind	per herb	0.08	1.00	0.08
Holodiscus discolor	cream bush	Ind	shrub	0.08	1.00	0.08
Mimulus guttatus	large monkey flower	Ind	per herb	0.08	1.00	0.08
Cirsium vulgare	**bull thistle**	**Non-Ind**	**ann herb**	**0.08**	**1.00**	**0.08**
Coronopus didymus	**lesser watercress**	**Non-Ind**	**per herb**	**0.08**	**1.00**	**0.08**
Hirschfeldia incana	**summer mustard**	**Non-Ind**	**ann herb**	**0.08**	**1.00**	**0.08**
Holcus lanatus	**velvet grass**	**Non-Ind**	**per herb**	**0.08**	**1.00**	**0.08**
Lolium multiflorum	**Italian ryegrass**	**Non-Ind**	**ann herb**	**0.08**	**1.00**	**0.08**
Senecio vulgaris	**common groundsel**	**Non-Ind**	**ann herb**	**0.08**	**1.00**	**0.08**
Indigenous =		**21**	**53%**	**0.32**	**2.60**	**1.00**
Nonindigenous =		**19**	**48%**	**0.16**	**1.64**	**0.32**
Total		**40**		**Ratio**		**3.11**

Fr = Count of all occurrences/Total number of samples

AvgC = Sum of all cover classes per occurrence/Count of all occurrences

Table 11

Relative Importance of Vegetation in Reach Seven

RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 12
Relative Importance of Vegetation In Reach Eight

n = 11 Canopy Cover = .45 Samples 86-96

Taxon	Common Name	Status	Life Form	Fr	Avg	RIV
Rubus ursinus	California blackberry	Ind	vine	0.91	4.20	3.82
Salix lasiolepis	arroyo willow	Ind	tree	0.64	3.71	2.36
Urtica dioica	hoary nettle	Ind	per herb	0.82	2.78	2.27
Equisetum telmateia	giant horsetail	Ind	per herb	0.64	2.71	1.73
Rubus parviflora	thimble berry	Ind	shrub	0.45	2.80	1.27
Stachys bullata	California wood mint	Ind	per herb	0.55	2.33	1.27
Alnus rubra	red alder	Ind	tree	0.18	5.50	1.00
Cornus sericeus	creek dogwood	Ind	shrub	0.36	2.50	0.91
Salix lucida ssp lasiandra	shining willow	Ind	tree	0.27	3.33	0.91
Conium maculatum	**poison hemlock**	**Non-Ind**	**ann herb**	**0.55**	**1.67**	**0.91**
Marah fabaceus	valley manroot	Ind	vine	0.27	3.00	0.82
Agrostis viridis	**water bent grass**	**Non-Ind**	**per herb**	**0.45**	**1.80**	**0.82**
Cyperus esculentus	yellow nutgrass	Ind	per herb	0.45	1.40	0.64
Delairea odorata	**cape ivy**	**Non-Ind**	**vine**	**0.36**	**1.75**	**0.64**
Rubus discolor	**Himalaya berry**	**Non-Ind**	**vine**	**0.18**	**3.50**	**0.64**
Sambucus racemosa	red elderberry	Ind	shrub	0.18	3.00	0.55
Fumaria parviflora	**small flowered fumitory**	**Non-Ind**	**per herb**	**0.27**	**2.00**	**0.55**
Prunus cerasifera	**cherry plum**	**Non-Ind**	**shrub**	**0.18**	**3.00**	**0.55**
Scrophularia californica	California bee plant	Ind	per herb	0.18	2.50	0.45
Vicia gigantea	giant vetch	Ind	vine	0.18	2.50	0.45
Cirsium vulgare	**bull thistle**	**Non-Ind**	**ann herb**	**0.18**	**2.50**	**0.45**
Picris echioides	**bristly ox tongue**	**Non-Ind**	**ann herb**	**0.18**	**2.50**	**0.45**
Scirpus microcarpus	panicled bulrush	Ind	per herb	0.27	1.67	0.45
Oenothera elata ssp. hookeri	Hooker's evening primros	Ind	per herb	0.18	2.00	0.36
Pinus radiata	**Monterey pine**	**Non-Ind**	**tree**	**0.09**	**4.00**	**0.36**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Ind**	**per herb**	**0.36**	**1.00**	**0.36**
Salix babylonica	**weeping willow**	**Non-Ind**	**tree**	**0.09**	**4.00**	**0.36**
Rumex crispus	**curly dock**	**Non-Ind**	**per herb**	**0.27**	**1.33**	**0.36**
Salix sitchensis	Sitka willow	Ind	tree	0.09	3.00	0.27
Crocosmia masoniorum	**montbretia**	**Non-Ind**	**per herb**	**0.18**	**1.50**	**0.27**
Cupressus macrocarpus	**Monterey cypress**	**Non-Ind**	**tree**	**0.09**	**3.00**	**0.27**
Eucalyptus globulus	**blue gum**	**Non-Ind**	**tree**	**0.09**	**3.00**	**0.27**
Foeniculum vulgare	**sweet fennel**	**Non-Ind**	**ann herb**	**0.09**	**3.00**	**0.27**
Hirschfeldia incana	**summer mustard**	**Non-Ind**	**ann herb**	**0.09**	**3.00**	**0.27**
Lolium multiflorum	**Italian ryegrass**	**Non-Ind**	**ann herb**	**0.09**	**3.00**	**0.27**
Myoporum latetum	**myoporum**	**Non-Ind**	**shrub**	**0.09**	**3.00**	**0.27**
Tropaeolum majus	**garden nasturtium**	**Non-Ind**	**per herb**	**0.09**	**3.00**	**0.27**
Athyrium filix-femina	lady fern	Ind	per herb	0.18	1.00	0.18
Oenanthe sarmentosa	Pacific oenanthe	Ind	per herb	0.09	2.00	0.18
Hedera helix	**English ivy**	**Non-Ind**	**vine**	**0.09**	**2.00**	**0.18**
Pittosporum crassifolium	**pittosporum**	**Non-Ind**	**shrub**	**0.09**	**2.00**	**0.18**
Raphanus sativa	**radish**	**Non-Ind**	**ann herb**	**0.09**	**2.00**	**0.18**
Solanum furcatum	**forked nightshade**	**Non-Ind**	**per herb**	**0.09**	**2.00**	**0.18**
Epilobium cilliatum	northern willow herb	Ind	per herb	0.09	1.00	0.09
Gnaphalium chilense	cotton batting plant	Ind	per herb	0.09	1.00	0.09
Juncus effusus	bog rush	Ind	per herb	0.09	1.00	0.09
Lythrum californicum	California loosestrife	Ind	per herb	0.09	1.00	0.09

Table 12
Relative Importance of Vegetation In Reach Eight

Plantago subnuda	Mexican plantain		Ind	per herb	0.09	1.00	0.09
Plantago cornopus	cut-leaved plantain		Non-Ind	per herb	0.09	1.00	0.09
Plantago lanceolata	English plantain		Non-Ind	per herb	0.09	1.00	0.09
Poa annua	annual bluegrass		Non-Ind	ann herb	0.09	1.00	0.09
Polypogon monspeliensis	rabbit's foot grass		Non-Ind	ann herb	0.09	1.00	0.09
Senecio vulgaris	common groundsel		Non-Ind	ann herb	0.09	1.00	0.09
Sonchus oleraceus	common sow thistle		Non-Ind	ann herb	0.09	1.00	0.09
Indigenous =		24	44%		0.31	2.37	0.85
Nonindigenous =		30	56%		0.16	2.19	0.33
Total		54			Ratio		2.57

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

*Non-Native includes California native species not indigenous to San Pedro Valley

Table 13
Relative Importance of Vegetation In Reach Nine

n = 7	Canopy Cover = .57	Samples 97-103				
Taxon	Common Name	Status	Life Form	Fr	Avg	RIV
Hedera helix	**English ivy**	**Non-Ind**	**vine**	**0.86**	**3.17**	**2.71**
Rubus ursinus	California blackberry	Ind	vine	0.57	3.50	2.00
Prunus cerasifera	**cherry plum**	**Non-Ind**	**shrub**	**0.43**	**4.67**	**2.00**
Delairea odorata	**cape ivy**	**Non-Ind**	**vine**	**0.57**	**3.00**	**1.71**
Salix lasiolepis	arroyo willow	Ind	tree	0.29	4.50	1.29
Urtica dioica	hoary nettle	Ind	per herb	0.29	4.50	1.29
Rubus discolor	**Himalaya berry**	**Non-Ind**	**vine**	**0.43**	**2.67**	**1.14**
Equisetum telmateia	giant horsetail	Ind	per herb	0.43	2.33	1.00
Rosa eglanteria	**sweet briar**	**Non-Ind**	**vine**	**0.29**	**3.50**	**1.00**
Salix lucida ssp lasiandra	shining willow	Ind	tree	0.29	2.00	0.57
Elymus glaucus	blue wildrye	Ind	per herb	0.14	3.00	0.43
Salix laevigata	red willow	Ind	tree	0.14	3.00	0.43
Acacia longifolia	**golden wattle**	**Non-Ind**	**tree**	**0.14**	**3.00**	**0.43**
Callistemon citrina	**lemon bottlebrush**	**Non-Ind**	**shrub**	**0.14**	**3.00**	**0.43**
Fuchsia magellanica	**fuschia**	**Non-Ind**	**per herb**	**0.14**	**3.00**	**0.43**
Genista monspessulanus	**French broom**	**Non-Ind**	**shrub**	**0.14**	**3.00**	**0.43**
Raphanus sativa	**radish**	**Non-Ind**	**ann herb**	**0.14**	**3.00**	**0.43**
Solanum furcatum	**forked nightshade**	**Non-Ind**	**per herb**	**0.14**	**3.00**	**0.43**
Cirsium vulgare	**bull thistle**	**Non-Ind**	**ann herb**	**0.14**	**2.00**	**0.29**
Conium maculatum	**poison hemlock**	**Non-Ind**	**ann herb**	**0.14**	**2.00**	**0.29**
Coronopus didymus	**lesser watercress**	**Non-Ind**	**per herb**	**0.14**	**2.00**	**0.29**
Lolium multiflorum	**Italian ryegrass**	**Non-Ind**	**ann herb**	**0.29**	**1.00**	**0.29**
Vinca major	**periwinkle**	**Non-Ind**	**per herb**	**0.14**	**2.00**	**0.29**
Cornus sericeus	creek dogwood	Ind	shrub	0.14	1.00	0.14
Polystichum munitum	sword fern	Ind	per herb	0.14	1.00	0.14
Agrostis viridis	**water bent grass**	**Non-Ind**	**per herb**	**0.14**	**1.00**	**0.14**
Bromus diandrus	**ripgut brome**	**Non-Ind**	**ann herb**	**0.14**	**1.00**	**0.14**
Foeniculum vulgare	**sweet fennel**	**Non-Ind**	**ann herb**	**0.14**	**1.00**	**0.14**
Fumaria parviflora	**small flowered fumitory**	**Non-Ind**	**per herb**	**0.14**	**1.00**	**0.14**
Hirschfeldia incana	**summer mustard**	**Non-Ind**	**ann herb**	**0.14**	**1.00**	**0.14**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Ind**	**per herb**	**0.14**	**1.00**	**0.14**
Sonchus oleraceus	**common sow thistle**	**Non-Ind**	**ann herb**	**0.14**	**1.00**	**0.14**
Indigenous =		**9**	**28%**	**0.27**	**2.76**	**0.81**
Nonindigenous =		**23**	**72%**	**0.23**	**2.22**	**0.59**
Total		**32**				**1.37**

Fr = Count of all occurrences/Total number of samples

AvgC = Sum of all cover classes per occurrence/Count of all occurrences

RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 14
Relative Importance of Vegetation In Reach Ten

n = 11	Canopy Cover = .82	Samples 104-114				
Taxon	Common Name	Status	Life Form	Fr	Avg	RIV
Rubus ursinus	California blackberry	Ind	vine	0.91	4.20	3.82
Salix lasiolepis	arroyo willow	Ind	tree	0.82	4.22	3.45
Salix lucida ssp lasiandra	shining willow	Ind	tree	0.73	4.38	3.18
Urtica dioica	hoary nettle	Ind	per herb	0.91	3.20	2.91
Rubus parviflora	thimble berry	Ind	shrub	0.64	3.57	2.27
Delairea odorata	cape ivy	Non-Ind	vine	0.64	2.57	1.64
Equisetum telmateia	**giant horsetail**	**Ind**	**per herb**	**0.64**	**2.43**	**1.55**
Conium maculatum	**poison hemlock**	**Non-Ind**	**ann herb**	**0.55**	**2.33**	**1.27**
Marah fabaceus	valley manroot	Ind	vine	0.45	2.60	1.18
Pinus radiata	**Monterey pine**	**Non-Ind**	**tree**	**0.18**	**4.50**	**0.82**
Cornus sericeus	creek dogwood	Ind	shrub	0.18	4.00	0.73
Hedera helix	**English ivy**	**Non-Ind**	**vine**	**0.36**	**2.00**	**0.73**
Athyrium filix-femina	lady fern	Ind	per herb	0.45	1.20	0.55
Agrostis viridis	water bent grass	Non-Ind	per herb	0.27	2.00	0.55
Ficus carica	**edible fig**	**Non-Ind**	**tree**	**0.18**	**3.00**	**0.55**
Raphanus sativa	**radish**	**Non-Ind**	**ann herb**	**0.27**	**2.00**	**0.55**
Scrophularia californica	California bee plant	Ind	per herb	0.18	2.00	0.36
Stachys bullata	California wood mint	Ind	per herb	0.18	2.00	0.36
Cupressus macrocarpus	**Monterey cypress**	**Non-Ind**	**tree**	**0.09**	**4.00**	**0.36**
Pittosporum crassifolium	**pittosporum**	**Non-Ind**	**shrub**	**0.09**	**4.00**	**0.36**
Salix babylonica	**weeping willow**	**Non-Ind**	**tree**	**0.09**	**4.00**	**0.36**
Sequoia sempervirens	coast redwood	Non-Ind	tree	0.09	4.00	0.36
Lolium multiflorum	**Italian ryegrass**	**Non-Ind**	**ann herb**	**0.18**	**1.50**	**0.27**
Nandina domestica	**heavenly bamboo**	**Non-Ind**	**shrub**	**0.09**	**3.00**	**0.27**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Ind**	**per herb**	**0.18**	**1.50**	**0.27**
Tropaeolum majus	**garden nasturtium**	**Non-Ind**	**per herb**	**0.09**	**3.00**	**0.27**
Juncus effusus	bog rush	Ind	per herb	0.18	1.00	0.18
Marchantia sp. (liverwort)	liverwort	Ind	per herb	0.09	2.00	0.18
Oenanthe sarmentosa	Pacific oenanthe	Ind	per herb	0.09	2.00	0.18
Sambucus racemosa	red elderberry	Ind	shrub	0.09	2.00	0.18
Trifolium repens	**white clover**	**Ind**	**per herb**	**0.09**	**2.00**	**0.18**
Vicia gigantea	giant vetch	Ind	vine	0.09	2.00	0.18
Bellis perennis	English daisy	Non-Ind	per herb	0.09	2.00	0.18
Cirsium vulgare	bull thistle	Non-Ind	ann herb	0.09	2.00	0.18
Coronopus didymus	**lesser watercress**	**Non-Ind**	**per herb**	**0.18**	**1.00**	**0.18**
Fumaria parviflora	**small flowered fumitory**	**Non-Ind**	**per herb**	**0.09**	**2.00**	**0.18**
Genista monspessulanus	**French broom**	**Non-Ind**	**shrub**	**0.09**	**2.00**	**0.18**
Holcus lanatus	**velvet grass**	**Non-Ind**	**per herb**	**0.09**	**2.00**	**0.18**
Soleirolia soleirolii	**baby's tears**	**Non-Ind**	**per herb**	**0.18**	**1.00**	**0.18**
Cyperus esculentus	yellow nutgrass	Ind	per herb	0.09	1.00	0.09
Gnaphalium chilense	cotton batting plant	Ind	per herb	0.09	1.00	0.09
Anagallus arvensis	scarlet pimpernel	Non-Ind	ann herb	0.09	1.00	0.09
Cortaderia jubata	**pampas grass**	**Non-Ind**	**per herb**	**0.09**	**1.00**	**0.09**
Lotus corniculatus	**bird's-foot trefoil**	**Non-Ind**	**per herb**	**0.09**	**1.00**	**0.09**
Polypogon monspeliensis	**rabbit's foot grass**	**Non-Ind**	**ann herb**	**0.09**	**1.00**	**0.09**
Senecio vulgaris	**common groundsel**	**Non-Ind**	**ann herb**	**0.09**	**1.00**	**0.09**
Sonchus oleraceus	**common sow thistle**	**Non-Ind**	**ann herb**	**0.09**	**1.00**	**0.09**
Vicia americana	American vetch	Non-Ind	vine	0.09	1.00	0.09

Table 14
Relative Importance of Vegetation In Reach Ten

Indigenous =	**19**	**41%**	**0.36**	**2.46**	**1.14**
Nonindigenous =	**27**	**59%**	**0.13**	**2.13**	**0.28**
Total	**46**		**Ratio =**		**4.03**

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

*Non-Native includes California native species not indigenous to San Pedro Valley

Table 15
Relative Importance of Vegetation in Reach Eleven

Canopy Cover = 1.00 | n = 7 | Samples 115-121

Taxon	Common Name	Status	Life Form	Fr	AvgC	RIV
Rubus ursinus	California blackberry	Ind	vine	0.86	3.33	2.86
Salix lucida ssp lasiandra	shining willow	Ind	tree	0.57	4.75	2.71
Hedera helix	**English ivy**	**Non-Ind**	**vine**	**0.71**	**3.00**	**2.14**
Delairea odorata	**cape ivy**	**Non-Ind**	**vine**	**0.71**	**2.80**	**2.00**
Rubus parviflora	thimble berry	Ind	shrub	0.71	2.60	1.86
Toxicodendron diversilobum	poison oak	Ind	shrub	0.57	2.75	1.57
Eucalyptus globulus	**blue gum**	**Non-Ind**	**tree**	**0.43**	**3.67**	**1.57**
Sambucus racemosa	red elderberry	Ind	shrub	0.43	3.33	1.43
Pinus radiata	**Monterey pine**	**Non-Ind**	**tree**	**0.43**	**3.00**	**1.29**
Cornus sericeus	creek dogwood	Ind	shrub	0.43	3.00	1.29
Urtica dioica	hoary nettle	Ind	per herb	0.43	3.00	1.29
Conium maculatum	**poison hemlock**	**Non-Ind**	**ann herb**	**0.43**	**2.67**	**1.14**
Equisetum telmateia	giant horsetail	Ind	per herb	0.57	2.00	1.14
Cortaderia jubata	**pampas grass**	**Non-Ind**	**per herb**	**0.43**	**2.33**	**1.00**
Marah fabaceus	valley manroot	Ind	vine	0.43	2.33	1.00
Stachys bullata	California wood mint	Ind	per herb	0.43	2.33	1.00
Taraxicum officionalis	**dandelion**	**Non-Ind**	**per herb**	**0.43**	**1.67**	**0.71**
Cupressus macrocarpus	**Monterey cypress**	**Non-Ind**	**tree**	**0.29**	**2.50**	**0.71**
Genista monspessulanus	**French broom**	**Non-Ind**	**shrub**	**0.29**	**2.50**	**0.71**
Sequoia sempervirens	**coast redwood**	**Non-Ind**	**tree**	**0.14**	**4.00**	**0.57**
Solanum furcatum	**forked nightshade**	**Non-Ind**	**per herb**	**0.29**	**2.00**	**0.57**
Acacia longifolia	**golden wattle**	**Non-Ind**	**tree**	**0.14**	**3.00**	**0.43**
Sequoiadendron gigantea	**giant redwood**	**Non-Ind**	**tree**	**0.14**	**3.00**	**0.43**
Agrostis viridis	**water bent grass**	**Non-Ind**	**per herb**	**0.29**	**1.50**	**0.43**
Alnus rubra	red alder	Ind	tree	0.14	3.00	0.43
Lotus corniculatus	**bird's-foot trefoil**	**Non-Ind**	**per herb**	**0.29**	**1.00**	**0.29**
Rorripa nasturtium-aquaticum	**water cress**	**Non-Ind**	**per herb**	**0.29**	**1.00**	**0.29**
Heteromeles arbutifolia	toyon	Ind	shrub	0.14	2.00	0.29
Athyrium filix-femina	lady fern	Ind	per herb	0.14	2.00	0.29
Scirpus microcarpus	panicled bulrush	Ind	per herb	0.14	2.00	0.29
Scrophularia californica	California bee plant	Ind	per herb	0.14	2.00	0.29
Fumaria parviflora	**small flowered fumitory**	**Non-Ind**	**per herb**	**0.14**	**1.00**	**0.14**
Plantago lanceolata	**English plantain**	**Non-Ind**	**per herb**	**0.14**	**1.00**	**0.14**
Rumex crispus	**curly dock**	**Non-Ind**	**per herb**	**0.14**	**1.00**	**0.14**
Rumex species	**dock**	**Non-Ind**	**per herb**	**0.14**	**1.00**	**0.14**
Ehrharta erecta	**veldt grass**	**Non-Ind**	**ann herb**	**0.14**	**1.00**	**0.14**
Euphorbia peplus	**petty spurge**	**Non-Ind**	**ann herb**	**0.14**	**1.00**	**0.14**
Salix lasiolepis	arroyo willow	Ind	tree	0.14	1.00	0.14
Calystegia purpuratus	purple morning glory	Ind	per herb	0.14	1.00	0.14
Plantago subnuda	Mexican plantain	Ind	per herb	0.14	1.00	0.14
Veronica americana	American brooklime	Ind	per herb	0.14	1.00	0.14

Indigenous =	**19**	**46%**	**0.35**	**2.34**	**0.83**
Nonindigenous =	**22**	**54%**	**0.30**	**2.07**	**0.62**
Total	**41**		**Ratio =**		**1.33**

Fr = Count of all occurrences/Total number of samples

Table 15
Relative Importance of Vegetation in Reach Eleven

AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 16
Relative Importance of Vegetation in Reach Twelve

n = 7	Canopy Cover = 1.00	Samples 122-128				
Taxon	**Common Name**	**Status**	**Life Form**	**Fr**	**AvgC**	**RIV**
Delairea odorata	**cape ivy**	**Non-Ind**	**vine**	**0.50**	**3.86**	**1.93**
Salix lasiolepis	arroyo willow	Ind	tree	0.29	5.25	1.50
Rubus ursinus	California blackberry	Ind	vine	0.36	3.80	1.36
Rubus parviflora	thimble berry	Ind	shrub	0.29	3.25	0.93
Alnus rubra	red alder	Ind	tree	0.14	5.50	0.79
Urtica dioica	hoary nettle	Ind	per herb	0.29	2.75	0.79
Sambucus racemosa	red elderberry	Ind	shrub	0.21	3.67	0.79
Cupressus macrocarpus	**Monterey cypress**	**Non-Ind**	**tree**	**0.14**	**4.00**	**0.57**
Rubus ulmifolius	**blackberry**	**Non-Ind**	**vine**	**0.14**	**3.50**	**0.50**
Conium maculatum	**poison hemlock**	**Non-Ind**	**ann herb**	**0.21**	**2.00**	**0.43**
Salix lucida ssp lasiandra	shining willow	Ind	tree	0.07	4.00	0.29
Athyrium filix-femina	lady fern	Ind	per herb	0.21	1.33	0.29
Marah fabaceus	valley manroot	Ind	vine	0.07	3.00	0.21
Scirpus microcarpus	panicled bulrush	Ind	per herb	0.07	3.00	0.21
Albizia dystachia	**stink bean**	**Non-Ind**	**tree**	**0.07**	**3.00**	**0.21**
Arundo donax	**giant reed**	**Non-Ind**	**shrub**	**0.07**	**3.00**	**0.21**
Rubus discolor	**Himalaya berry**	**Non-Ind**	**vine**	**0.07**	**3.00**	**0.21**
Equisetum telmateia	giant horsetail	Ind	per herb	0.07	2.00	0.14
Stachys bullata	California wood mint	Ind	per herb	0.07	2.00	0.14
Anthriscus caucalis	**bur chervil**	**Non-Ind**	**ann herb**	**0.07**	**2.00**	**0.14**
Fumaria parviflora	**small flowered fumitory**	**Non-Ind**	**per herb**	**0.14**	**1.00**	**0.14**
Carex bolanderi	Bolander's sedge	Ind	per herb	0.07	1.00	0.07
Epilobium cilliatum	northern willow herb	Ind	per herb	0.07	1.00	0.07
Cirsium vulgare	**bull thistle**	**Non-Ind**	**ann herb**	**0.07**	**1.00**	**0.07**
Polypogon monspeliensis	**rabbit's foot grass**	**Non-Ind**	**ann herb**	**0.07**	**1.00**	**0.07**
Indigenous =		**14**	**56%**	**0.66**	**2.97**	**0.54**
Nonindigenous =		**11**	**44%**	**0.16**	**2.74**	**0.45**
Total		**25**		**Ratio =**		**1.20**

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 17
Relative Importance of Vegetation In Reach Thirteen

n = 10	Canopy Cover = 1.00	Samples 129-138				
Taxon	**Common Name**	**Status**	**Life Form**	Fr	Avg	RIV
Eucalyptus globulus	**blue gum**	**Non-Ind**	**tree**	**0.90**	**5.11**	**4.60**
Alnus rubra	red alder	Ind	tree	0.90	4.89	4.40
Rubus ursinus	California blackberry	Ind	vine	1.00	4.20	4.20
Sambucus racemosa	red elderberry	Ind	shrub	0.90	3.11	2.80
Vinca major	**periwinkle**	**Non-Ind**	**per herb**	**0.30**	**3.67**	**1.10**
Delairea odorata	**cape ivy**	**Non-Ind**	**vine**	**0.40**	**2.50**	**1.00**
Athyrium filix-femina	lady fern	Ind	per herb	0.50	1.80	0.90
Stachys bullata	California wood mint	Ind	per herb	0.40	2.25	0.90
Toxicodendron diversilobum	poison oak	Ind	shrub	0.30	3.00	0.90
Equisetum telmateia	giant horsetail	Ind	per herb	0.40	1.75	0.70
Cupressus macrocarpus	**Monterey cypress**	**Non-Ind**	**tree**	**0.30**	**2.33**	**0.70**
Marah fabaceus	valley manroot	Ind	vine	0.20	3.00	0.60
Urtica dioica	hoary nettle	Ind	per herb	0.20	3.00	0.60
Hedera helix	**English ivy**	**Non-Ind**	**vine**	**0.20**	**3.00**	**0.60**
Salix lasiolepis	arroyo willow	Ind	tree	0.10	4.00	0.40
Salix lucida ssp lasiandra	shining willow	Ind	tree	0.10	4.00	0.40
Cornus sericeus	creek dogwood	Ind	shrub	0.10	3.00	0.30
Rubus parviflora	thimble berry	Ind	shrub	0.10	3.00	0.30
Polystichum munitum	sword fern	Ind	per herb	0.30	1.00	0.30
Scrophularia californica	California bee plant	Ind	per herb	0.10	2.00	0.20
Tellima grandiflora	fringe cups	Ind	per herb	0.10	1.00	0.10
Conium maculatum	**poison hemlock**	**Non-Ind**	**ann herb**	**0.10**	**1.00**	**0.10**
Indigenous =		**16**	**73%**	**0.36**	**2.81**	**1.13**
Nonindigenous =		**6**	**27%**	**0.37**	**2.94**	**1.35**
Total		**22**		**Ratio**		**0.83**

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 18
Relative Importance of Vegetation In Reach Fourteen

n = 5	Canopy Cover = 1.00	Samples 169-173				
Taxon	**Common Name**	**Status**	**Life Form**	**Fr**	**Avg**	**RIV**
Rubus ursinus	California blackberry	Native	vine	1.00	4.60	4.60
Sambucus racemosa	red elderberry	Native	shrub	0.80	4.50	3.60
Salix lasiolepis	arroyo willow	Native	tree	0.60	6.00	3.60
Cornus sericeus	creek dogwood	Native	shrub	0.60	5.33	3.20
Alnus rubra	red alder	Native	tree	0.40	6.00	2.40
Rubus parviflora	thimble berry	Native	shrub	0.60	3.67	2.20
Athyrium filix-femina	lady fern	Native	per herb	0.80	2.25	1.80
Eucalyptus globulus	**blue gum**	**Non-Native**	**tree**	**0.20**	**6.00**	**1.20**
Urtica dioica	hoary nettle	Native	per herb	0.40	2.50	1.00
Vinca major	**periwinkle**	**Non-Native**	**per herb**	**0.20**	**4.00**	**0.80**
Heracleum lanatum	cow parsnip	Native	per herb	0.20	3.00	0.60
Carex bolanderi	Bolander's sedge	Native	per herb	0.20	2.00	0.40
Disporum smithii	big fairy bells	Native	per herb	0.20	2.00	0.40
Polystichum munitum	sword fern	Native	per herb	0.20	2.00	0.40
Salix lucida ssp lasiandra	shining willow	Native	tree	0.20	2.00	0.40
Scrophularia californica	California bee plant	Native	per herb	0.20	2.00	0.40
Equisetum telmateia	giant horsetail	Native	per herb	0.20	1.00	0.20
Stachys bullata	California wood mint	Native	per herb	0.20	1.00	0.20
Indigenous =		**16**	**89%**	**0.43**	**3.12**	**1.59**
Nonindigenous =		**2**	**11%**	**0.20**	**5.00**	**1.00**
Total		**18**		**Ratio**		**1.59**

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 19
Relative Importance of Vegetation in Reach Fifteen

n = 26 n = 1.00 Samples 174-199

Taxon	Common Name	Status	Life Form	Fr	Avg	RIV
Alnus rubra	red alder	Native	tree	0.88	5.13	4.54
Salix lasiolepis	arroyo willow	Native	tree	0.96	4.28	4.12
Rubus ursinus	California blackberry	Native	vine	0.88	4.13	3.65
Sambucus racemosa	red elderberry	Native	shrub	0.81	3.86	3.12
Cornus sericeus	creek dogwood	Native	shrub	0.62	4.25	2.62
Rubus parviflora	thimble berry	Native	shrub	0.77	2.95	2.27
Urtica dioica	hoary nettle	Native	per herb	0.62	2.88	1.77
Marah fabaceus	valley manroot	Native	vine	0.50	2.77	1.38
Athyrium filix-femina	lady fern	Native	per herb	0.69	1.94	1.35
Polystichum munitum	sword fern	Native	per herb	0.65	1.94	1.27
Disporum smithii	big fairy bells	Native	per herb	0.62	1.69	1.04
Stachys bullata	California wood mint	Native	per herb	0.42	1.64	0.69
Scrophularia californica	California bee plant	Native	per herb	0.35	1.89	0.65
Heracleum lanatum	cow parsnip	Native	per herb	0.31	2.00	0.62
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.15**	**3.25**	**0.50**
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.19**	**2.00**	**0.38**
Equisetum telmateia	giant horsetail	Native	per herb	0.31	1.13	0.35
Salix sitchensis	Sitka willow	Native	tree	0.08	4.00	0.31
Toxicodendron diversilobum	poison oak	Native	shrub	0.08	2.00	0.15
Epipactis gigantea	stream orchid	Native	per herb	0.12	1.00	0.12
Holodiscus discolor	cream bush	Native	shrub	0.08	1.50	0.12
Tellima grandiflora	fringe cups	Native	per herb	0.08	1.50	0.12
Helenium puberulum	sneezeweed	Native	per herb	0.04	2.00	0.08
Ribes glutinosum	flowering current	Native	shrub	0.04	2.00	0.08
Ribes menziesii	canyon gooseberry	Native	shrub	0.04	2.00	0.08
Vicia gigantea	giant vetch	Native	vine	0.04	2.00	0.08
Cirsium vulgare	**bull thistle**	**Non-Native**	**ann herb**	**0.08**	**1.00**	**0.08**
Rubus discolor	**Himalaya berry**	**Non-Native**	**vine**	**0.04**	**2.00**	**0.08**
Carex bolanderi	Bolander's sedge	Native	per herb	0.04	1.00	0.04
Juncus effusus	bog rush	Native	per herb	0.04	1.00	0.04
Trillium chloropetalum	giant wake robin	Native	per herb	0.04	1.00	0.04
Agrostis viridis	**water bent grass**	**Non-Native**	**per herb**	**0.04**	**1.00**	**0.04**
Anagallus arvensis	**scarlet pimpernel**	**Non-Native**	**ann herb**	**0.04**	**1.00**	**0.04**
Indigenous =		**33**	**85%**	**0.31**	**1.92**	**0.93**
Nonindigenous =		**6**	**15%**	**0.09**	**1.71**	**0.19**
Total		**39**		**Ratio**		**5.00**

Fr = Count of all occurrences/Total number of samples

AvgC = Sum of all cover classes per occurrence/Count of all occurrences

RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 20
Relative Importance of Vegetation in Reach Sixteen

n = 6	Canopy Cover = 1.00		Samples 200-205			
Taxon	**Common Name**	**Status**	**Life Form**	**Fr**	**Avg**	**RIV**
Salix lasiolepis	arroyo willow	Native	tree	1.00	5.33	5.33
Cornus sericeus	creek dogwood	Native	shrub	1.00	5.00	5.00
Rubus ursinus	California blackberry	Native	vine	0.50	3.67	1.83
Polystichum munitum	sword fern	Native	per herb	0.83	1.80	1.50
Marah fabaceus	valley manroot	Native	vine	0.50	2.67	1.33
Disporum smithii	big fairy bells	Native	per herb	0.83	1.40	1.17
Sambucus racemosa	red elderberry	Native	shrub	0.33	3.50	1.17
Athyrium filix-femina	lady fern	Native	per herb	0.50	2.00	1.00
Rubus parviflora	thimble berry	Native	shrub	0.33	3.00	1.00
Toxicodendron diversilobum	poison oak	Native	shrub	0.33	2.50	0.83
Smilacina racemosa	slim solomon's seal	Native	per herb	0.50	1.00	0.50
Epipactis gigantea	stream orchid	Native	per herb	0.33	1.00	0.33
Equisetum telmateia	giant horsetail	Native	per herb	0.33	1.00	0.33
Heracleum lanatum	cow parsnip	Native	per herb	0.17	2.00	0.33
Holodiscus discolor	cream bush	Native	shrub	0.17	2.00	0.33
Lathyrus vestitus	common Pacific pea	Native	vine	0.17	2.00	0.33
Urtica dioica	hoary nettle	Native	per herb	0.17	2.00	0.33
Carex bolanderi	Bolander's sedge	Native	per herb	0.17	1.00	0.17
Stachys bullata	California wood mint	Native	per herb	0.17	1.00	0.17
Symphoricarpos albus var. laevigatus	common snowberry	Native	shrub	0.17	1.00	0.17
Tellima grandiflora	fringe cups	Native	per herb	0.17	1.00	0.17
Thalictrum fendleri	meadow rue	Native	per herb	0.17	1.00	0.17
Indigenous =		**22**	**100%**	**0.40**	**2.13**	**1.07**
Nonindigenous =		**0**	**0%**	**0.00**	**0.00**	**0.00**
Total		**22**		**Ratio**		**NA**

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 21
Relative Importance of Vegetation in Reach Seventeen

n = 20	Canopy Cover = 1.00	Samples 139-158				
Taxon	**Common Name**	**Status**	**Life Form**	Fr	AvgC	RIV
Salix lasiolepis	arroyo willow	Ind	tree	0.90	4.94	4.45
Rubus ursinus	California blackberry	Ind	vine	0.90	4.06	3.65
Cornus sericeus	creek dogwood	Ind	shrub	0.75	4.53	3.40
Rubus parviflora	thimble berry	Ind	shrub	0.60	3.08	1.85
Urtica dioica	hoary nettle	Ind	per herb	0.60	2.58	1.55
Athyrium filix-femina	lady fern	Ind	per herb	0.75	1.87	1.40
Equisetum telmateia	giant horsetail	Ind	per herb	0.55	2.18	1.20
Alnus rubra	red alder	Ind	tree	0.20	5.75	1.15
Stachys bullata	California wood mint	Ind	per herb	0.50	2.20	1.10
Delairea odorata	**cape ivy**	**Non-Ind**	**vine**	**0.35**	**3.00**	**1.05**
Polystichum munitum	sword fern	Ind	per herb	0.60	1.67	1.00
Marah fabaceus	valley manroot	Ind	vine	0.40	2.38	0.95
Sambucus racemosa	red elderberry	Ind	shrub	0.30	3.00	0.90
Salix lucida ssp lasiandra	shining willow	Ind	tree	0.25	3.40	0.85
Eucalyptus globulus	**blue gum**	**Non-Ind**	**tree**	**0.15**	**4.67**	**0.70**
Holodiscus discolor	cream bush	Ind	shrub	0.20	3.00	0.60
Corylus cornuta	California hazelnut	Ind	shrub	0.20	2.25	0.45
Scrophularia californica	California bee plant	Ind	per herb	0.30	1.50	0.45
Vinca major	**periwinkle**	**Non-Ind**	**per herb**	**0.15**	**2.67**	**0.40**
Vicia gigantea	giant vetch	Ind	vine	0.20	1.75	0.35
Rhamnus californica	coffee berry	Ind	shrub	0.15	2.00	0.30
Toxicodendron diversilobum	poison oak	Ind	shrub	0.15	2.00	0.30
Conium maculatum	**poison hemlock**	**Non-Ind**	**ann herb**	**0.15**	**1.33**	**0.20**
Quercus agrifolia	coast live oak	Ind	tree	0.05	3.00	0.15
Ribes glutinosum	flowering current	Ind	shrub	0.05	3.00	0.15
Cupressus macrocarpus	**Monterey cypress**	**Non-Ind**	**tree**	**0.05**	**3.00**	**0.15**
Rubus discolor	**Himalaya berry**	**Non-Ind**	**vine**	**0.05**	**3.00**	**0.15**
Sequoia sempervirens	**coast redwood**	**Non-Ind**	**tree**	**0.05**	**3.00**	**0.15**
Lonicera involucrata	twinberry	Ind	vine	0.05	2.00	0.10
Melica californica	western melica	Ind	per herb	0.05	2.00	0.10
Mimulus guttatus	large monkey flower	Ind	per herb	0.05	2.00	0.10
Ribes menziesii	canyon gooseberry	Ind	shrub	0.05	2.00	0.10
Tellima grandiflora	fringe cups	Ind	per herb	0.10	1.00	0.10
Juncus effusus	bog rush	Ind	per herb	0.05	1.00	0.05
Smilacina racemosa	slim solomon's seal	Ind	per herb	0.05	1.00	0.05
Woodwardia fimbriata	Western chain fern	Ind	per herb	0.05	1.00	0.05
Myosotis latifolia	**forget me not**	**Non-Ind**	**per herb**	**0.05**	**1.00**	**0.05**
Indigenous =		**29**	**78%**	**0.31**	**2.49**	**0.93**
Nonindigenous =		**8**	**22%**	**0.13**	**2.71**	**0.36**
Total		**37**		**Ratio**		**2.60**

Fr = Count of all occurrences/Total number of samples

AvgC = Sum of all cover classes per occurrence/Count of all occurrences

RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 22
Relative Importance of Vegetation In Reach Eighteen

n = 10	n = 1.00	Samples 159-168				
Taxon	**Common Name**	**Status**	**Life Form**	**Fr**	**Avg**	**RIV**
Eucalyptus globulus	**blue gum**	**Non-Native**	**tree**	**1.00**	**4.60**	**4.60**
Cornus sericeus	creek dogwood	Native	shrub	1.00	4.40	4.40
Rubus ursinus	California blackberry	Native	vine	1.00	3.70	3.70
Salix lasiolepis	arroyo willow	Native	tree	0.70	3.71	2.60
Sambucus racemosa	red elderberry	Native	shrub	0.70	3.43	2.40
Rubus parviflora	thimble berry	Native	shrub	0.60	3.00	1.80
Athyrium filix-femina	lady fern	Native	per herb	0.70	2.43	1.70
Polystichum munitum	sword fern	Native	per herb	0.70	2.14	1.50
Equisetum telmateia	giant horsetail	Native	per herb	0.70	1.86	1.30
Alnus rubra	red alder	Native	tree	0.20	5.00	1.00
Urtica dioica	hoary nettle	Native	per herb	0.30	3.00	0.90
Stachys bullata	California wood mint	Native	per herb	0.50	1.40	0.70
Holodiscus discolor	cream bush	Native	shrub	0.20	3.00	0.60
Marah fabaceus	valley manroot	Native	vine	0.20	2.50	0.50
Toxicodendron diversilobum	poison oak	Native	shrub	0.20	2.50	0.50
Myrica californica	California wax myrtle	Native	shrub	0.10	3.00	0.30
Salix sitchensis	Sitka willow	Native	tree	0.10	3.00	0.30
Conium maculatum	**poison hemlock**	**Non-Native**	**ann herb**	**0.10**	**3.00**	**0.30**
Delairea odorata	**cape ivy**	**Non-Native**	**vine**	**0.10**	**3.00**	**0.30**
Rubus discolor	**Himalaya berry**	**Non-Native**	**vine**	**0.10**	**3.00**	**0.30**
Ribes glutinosum	flowering current	Native	shrub	0.10	2.00	0.20
Scrophularia californica	California bee plant	Native	per herb	0.10	2.00	0.20
Vicia gigantea	giant vetch	Native	vine	0.10	2.00	0.20
Myosotis latifolia	**forget me not**	**Non-Native**	**per herb**	**0.20**	**1.00**	**0.20**
Prunus cerasifera	**cherry plum**	**Non-Native**	**shrub**	**0.10**	**2.00**	**0.20**
Lathyrus vestitus	common Pacific pea	Native	vine	0.10	1.00	0.10
Oemleria cerasiformis	oso berry	Native	shrub	0.10	1.00	0.10
Ribes menziesii	canyon gooseberry	Native	shrub	0.10	1.00	0.10
Tellima grandiflora	fringe cups	Native	per herb	0.10	1.00	0.10
Indigenous =		**23**	**79%**	**0.37**	**2.52**	**1.10**
Nonindigenous =		**6**	**21%**	**0.27**	**2.77**	**0.98**
Total		**29**		**Ratio**		**1.11**

Fr = Count of all occurrences/Total number of samples
AvgC = Sum of all cover classes per occurrence/Count of all occurrences
RIV = Relative Importance Value = Frequency x Average Cover Class

***Non-Native includes California native species not indigenous to San Pedro Valley**

Table 23
RIV Indices for NIS Infestations by Reach

Taxon	Common Name	Life Form	1 RIV	2 RIV	3 RIV	4 RIV	5 RIV	6 RIV	7 RIV	8 RIV	9 RIV
Arundo donax	giant reed	shrub	1.33	*	0.36	0.44	*	*	*	*	*
Conium maculatum	poison hemlock	ann herb	*	*	*	*	*	*	0.50	*	*
Cortaderia jubata	pampas grass	per herb	*	*	0.18	0.56	0.38	0.27	0.63	0.13	1.71
Delairea odorata	cape ivy	vine	2.67	2.11	1.55	0.22	2.19	2.18	3.50	2.00	0.57
Foeniculum vulgare	sweet fennel	ann herb	*	*	*	*	0.42	*	*	0.38	*
Fuchsia magellanica	fuschia	per herb	*	0.67	0.18	*	0.33	*	*	*	0.29
Fumaria parviflora	small flowered fumitory	per herb	*	0.22	*	*	*	*	*	*	*
Genista monspessulanus	French broom	shrub	*	0.11	*	*	0.94	*	*	*	0.43
Hedera helix	English ivy	vine	*	1.89	1.82	3.22	1.56	1.09	0.38	1.13	3.29
Ligusticum lucidum	glossy privet	shrub	*	*	*	0.22	*	*	*	*	*
Lonicera japanica	Chinese honeysuckle	vine	*	*	0.36	0.44	*	0.45	0.38	*	*
Passiflora mollisima	passion vine	vine	*	*	*	*	0.50	*	*	*	0.86
Phalaris aquatica	Harding grass	per herb	*	*	*	*	*	*	*	*	*
Prunus cerasifera	cherry plum	shrub	*	*	*	*	*	*	*	*	0.57
Rosa eglanteria	sweet briar	vine	*	*	*	*	*	*	*	*	1.14
Rubus discolor	Himalaya berry	vine	*	*	*	*	*	*	0.25	0.25	0.43
Tropaeolum majus	garden nasturtium	per herb	*	*	*	0.44	*	0.18	*	0.38	*
Vinca major	periwinkle	per herb	*	0.56	0.27	*	*	*	*	*	0.43

Taxon	Common Name	Life Form	10 RIV	11 RIV	12 RIV	13 RIV	14 RIV	15 RIV	17 RIV	18 RIV
Arundo donax	giant reed	shrub	*	*	0.40	*	*	*	*	*
Conium maculatum	poison hemlock	ann herb	*	0.00	0.60	*	0.83	0.42	*	*
Cortaderia jubata	pampas grass	per herb	0.25	2.81	*	*	*	*	0.30	0.75
Delairea odorata	cape ivy	vine	1.75	1.50	4.00	1.50	3.75	3.50	2.20	2.25
Foeniculum vulgare	sweet fennel	ann herb	*	*	*	*	*	*	*	*
Fuchsia magellanica	fuschia	per herb	*	*	*	*	*	*	*	*
Fumaria parviflora	small flowered fumitory	per herb	*	*	*	*	*	*	*	*
Genista monspessulanus	French broom	shrub	*	0.42	*	*	*	*	*	*
Hedera helix	English ivy	vine	*	2.25	*	1.20	0.08	0.08	*	0.25
Ligusticum lucidum	glossy privet	shrub	*	*	*	*	*	*	*	*
Lonicera japanica	Chinese honeysuckle	vine	*	*	*	*	*	*	*	*
Passiflora mollisima	passion vine	vine	*	*	*	*	*	*	*	*
Phalaris aquatica	Harding grass	per herb	*	*	*	*	0.33	*	*	*
Prunus cerasifera	cherry plum	shrub	*	*	*	*	*	*	*	*
Rosa eglanteria	sweet briar	vine	*	*	*	*	*	*	*	*
Rubus discolor	Himalaya berry	vine	*	*	*	*	*	*	0.20	0.50
Tropaeolum majus	garden nasturtium	per herb	*	*	*	*	*	*	*	*
Vinca major	periwinkle	per herb	*	*	*	1.40	*	*	0.80	*

Table 24
Non-Native Invasive Species Analysis by Reach

Site	Reach	ARDO	COMA	COJU	DEOD	FEVU	FUMA	FUPA	GEMO	HEHE	LILU	LOJA	PAMO	PHAQ	PRCE	ROEG	RUDI	TRMA	VIMA	
1	1				2															1
2	1				3															1
3	1	4			3															2
	RIV	1.33	*	*	2.67	*	*	*	*	*	*	*	*	*	*	*	*	*	*	4
4	2				4															1
5	2				4					1										2
6	2				3				1	5										3
7	2				4					4									2	3
8	2							2												1
9	2						3													1
10	2									4										1
11	2						3												3	2
12	2				4					3										2
	RIV	1.33	*	*	2.67	*	*	*	*	*	*	*	*	*	*	*	*	*	*	4
13	3				3					6										2
14	3									5										1
15	3				4															1
16	3				4															1
17	3																		3	1
18	3				2															1
19	3									5										1
20	3			2			2					4								3
21	3				4															1
22	3	4																		1
23	3									4										1
	RIV	0.36	*	0.18	1.55	*	0.18	*	*	1.82	*	0.36	*	*	*	*	*	*	0.27	14
24	4				2															1
25	4									5		4								2
26	4									3								4		2
27	4									3	2									2
28	4	4								5										2
29	4			2																1
30	4									5										1
31	4									4										1
32	4			3						4										2

Table 24
Non-Native Invasive Species Analysis by Reach

	RIV	0.44	*	0.56	0.22	*	*	*	*	3.22	0.22	0.44	*	*	*	*	*	0.44	*	14
Site	Reach	ARDO	COMA	COJU	DEOD	FEVU	FUMA	FUPA	GEMO	HEHE	LILU	LOJA	PAMO	PHAQ	PRCE	ROEG	RUDI	TRMA	VIMA	
33	5					2														1
34	5				3															1
35	5				4															1
36	5					3	2		2											3
37	5				3					4										2
38	5				3				2											2
39	5			2																1
40	5								4	5										2
41	5				2				1											2
42	5				4								3							2
43	5				4															1
44	5			1						5										2
	RIV	*	*	0.25	1.92	0.42	0.17	*	0.75	1.17	*	*	0.25	*	*	*	*	*	*	20
45	6				4															1
46	6				2															1
47	6				5															1
48	6									4										1
49	6				3															1
50	6				4															1
51	6									4								2		2
52	6			3																1
53	6				3							2								2
54	6											3								1
55	6				3					4										2
	RIV	*	*	0.27	2.18	*	*	*	*	1.09	*	0.45	*	*	*	*	*	0.18	*	14
56	7				4												2			2
57	7		4		2															2
58	7			3	3															2
59	7				4															1
60	7				4							3								2
61	7				3					3										2
62	7				4															1
63	7			2	4															2
	RIV	*	0.50	0.63	3.50	*	*	*	*	0.38	*	0.38	*	*	*	*	0.25	*	*	14

Table 24
Non-Native Invasive Species Analysis by Reach

64	8				3					1									2
65	8			1	4												3		3
Site	Reach	ARDO	COMA	COJU	DEOD	FEVU	FUMA	FUPA	GEMO	HEHE	LILU	LOJA	PAMO	PHAQ	PRCE	ROEG	RUDI	TRMA	VIMA	
66	8				2	3														2
67	8				3												2			2
68	8				1															1
69	8				3					2										2
70	8									2										1
71	8									4										1
	RIV	*	*	0.13	2.00	0.38	*	*	*	1.13	*	*	*	*	*	*	0.25	0.38	*	14
72	9			3	1					5									3	4
73	9						2			5							3			3
74	9			4						6						4				3
75	9			2	1											4				3
76	9									4			6							2
77	9			3					3	3					4					4
78	9				2															1
	RIV	*	*	1.71	0.57	*	0.29	*	0.43	3.29	*	*	0.86	*	0.57	1.14	0.43	*	0.43	20
79	10				2															1
80	10				2															1
81	10			1																1
82	10				3															1
	RIV	*	*	0.25	1.75	*	*	*	*	*	*	*	*	*	*	*	*	*	*	4
83	11		3		3				3	4										4
84	11				2					3										2
85	11			2	5				1											3
86	11				2					5										2
87	11			5						2										2
88	11			5	3				1											3
89	11			3						1										2
	RIV	*	0.43	2.14	2.14	*	*	*	0.71	2.14	*	*	*	*	*	*	*	*	*	18
90	12	2			4															2
91	12		3		4															2
92	12				3															1
93	12				4															1
94	12				5															1

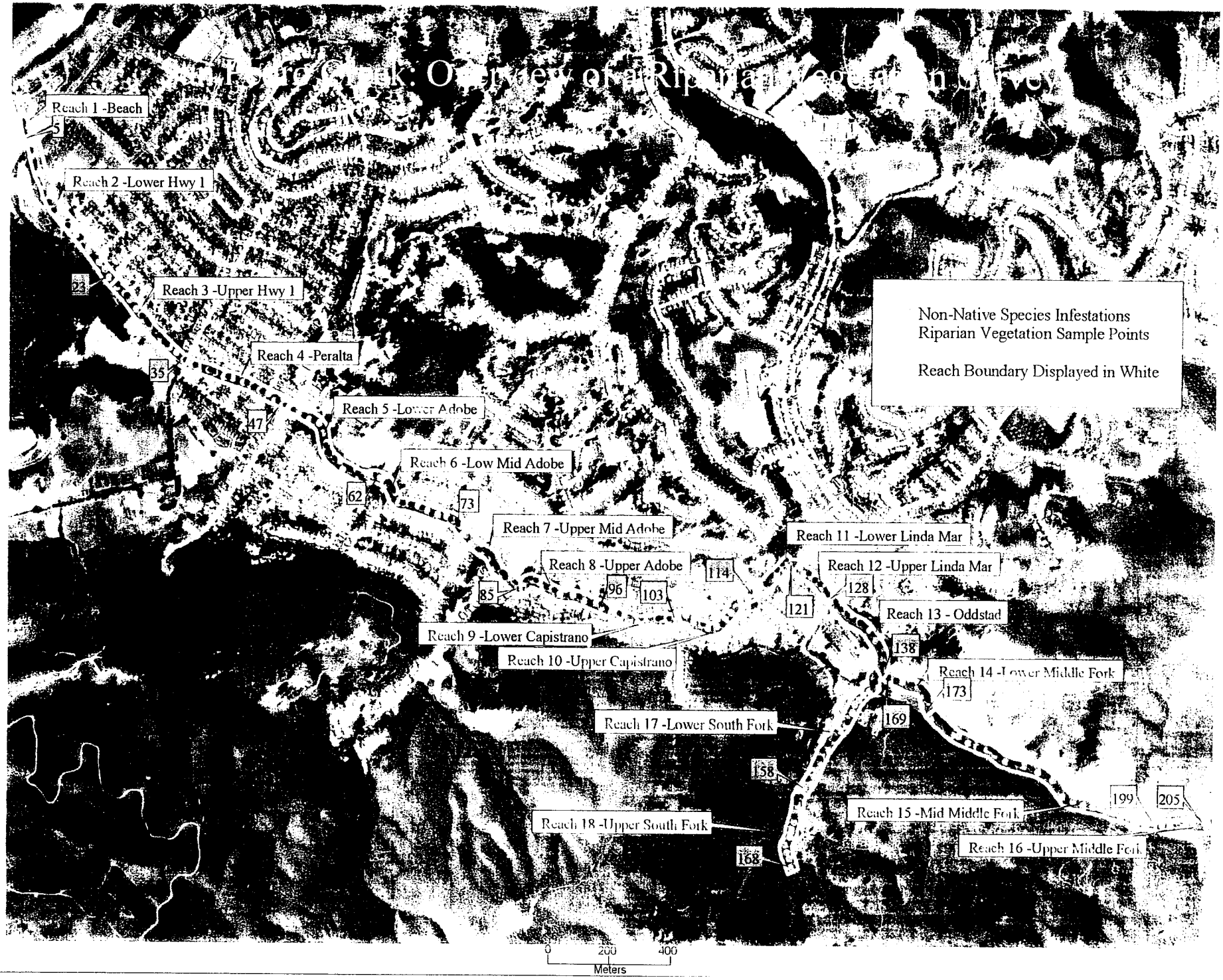
Table 24
Non-Native Invasive Species Analysis by Reach

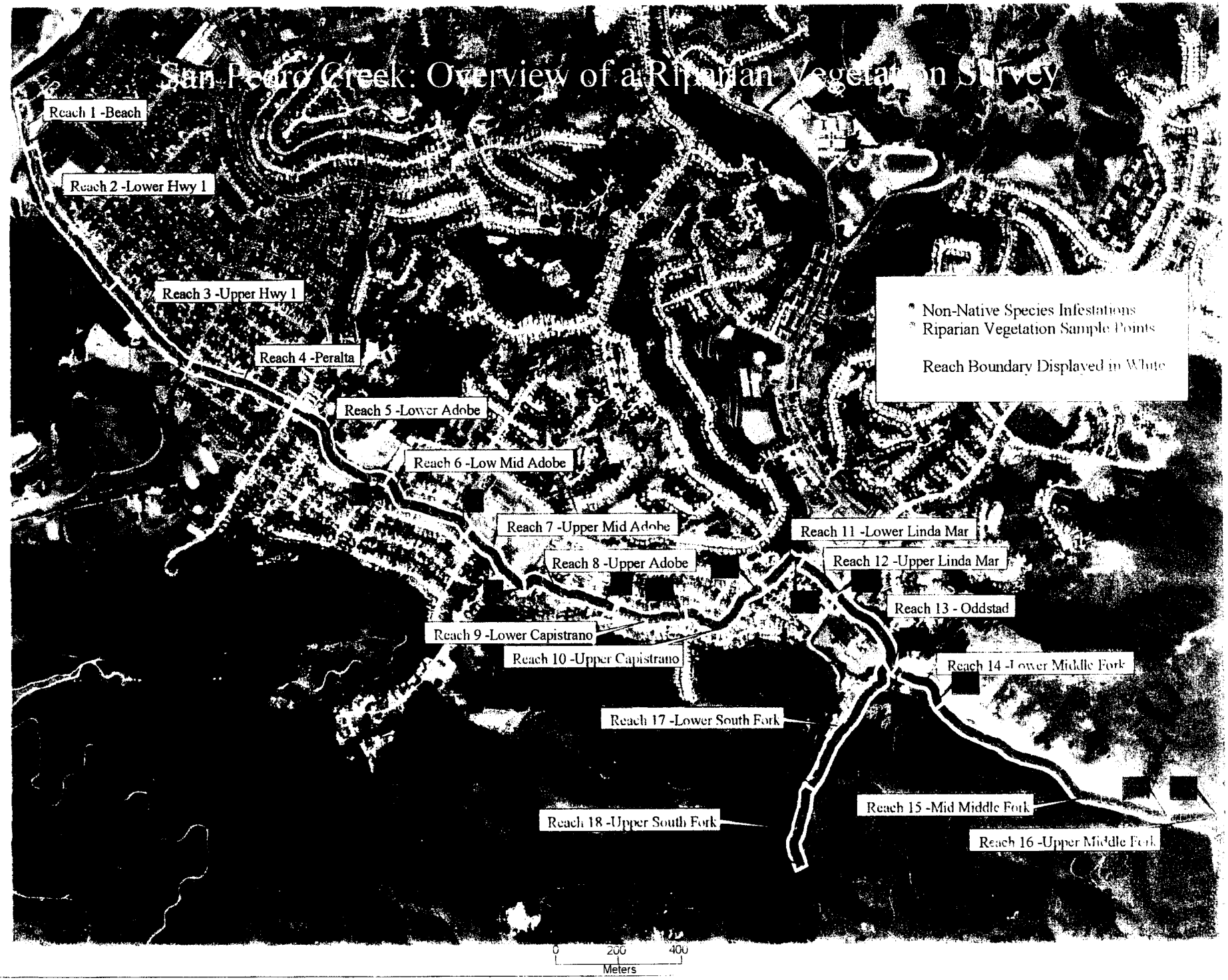
	RIV	0.40	0.60	*	4.00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	7
95	13				6															1
96	13				3															1
Site	Reach	ARDO	COMA	COJU	DEOD	FEVU	FUMA	FUPA	GEMO	HEHE	LILU	LOJA	PAMO	PHAQ	PRCE	ROEG	RUDI	TRMA	VIMA	
97	13				3															1
98	13									3										1
99	13									4										1
100	13									2									3	2
101	13									3									4	2
102	13																		5	1
103	13				1														2	2
104	13				2															1
	RIV	*	*	*	1.50	*	*	*	*	1.20	*	*	*	*	*	*	*	*	1.40	13
119	14		4																	1
120	14				4															1
121	14				6					1										2
122	14				3															1
123	14				5															1
124	14		4											4						2
125	14				6															1
126	14		2																	1
127	14				6															1
128	14				6															1
129	14				3															1
130	14				6															1
	RIV	*	0.83	*	3.75	*	*	*	*	0.08	*	*	*	0.33	*	*	*	*	*	14
131	15				6															1
132	15				4															1
133	15				4															1
134	15				3															1
135	15				5															1
136	15				2															1
137	15				3															1
138	15				3															1
139	15				6															1
140	15		2																	1

Table 24
Non-Native Invasive Species Analysis by Reach

141	15				6					1									2
142	15		3																1
	RIV	*	0.42	*	3.50	*	*	*	*	0.08	*	*	*	*	*	*	*	*	
105	17				3													2	2
Site	Reach	ARDO	COMA	COJU	DEOD	FEVU	FUMA	FUPA	GEMO	HEHE	LILU	LOJA	PAMO	PHAQ	PRCE	ROEG	RUDI	TRMA	VIMA	
106	17			1	2														3	3
107	17				4														1	2
108	17																		2	1
109	17			2																1
110	17																2			1
111	17				1															1
112	17				4															1
113	17				4															1
114	17				4															1
	RIV	*	*	0.30	2.20	*	*	*	*	*	*	*	*	*	*	*	0.20	*	0.80	14
115	18				4															1
116	18				2															1
117	18			3	3															2
118	18									1							2			2
	RIV	*	*	0.75	2.25	*	*	*	*	0.25	*	*	*	*	*	*	0.50	*	*	6
		0.09		0.36	2.14	0.05	0.08	0.01	0.12	1.06	0.01	0.11	0.06	0.03	0.03	0.05	0.07	0.06	0.22	

Levels of Infestation	Key to Codes		
1 - Low	ARDO - *Arundo donax*	GEMO - *Genista monspessulanus*	RUDI - *Rubus discolor*
2 - Moderately Low	COMA - *Conium maculatum*	HEHE - *Hedera helix*	TRMA - *Tropaeolum majus*
3 - Low Moderate	COJU - *Cortaderia jubata*	PAMO - *Passiflora mollisima*	VIMA - *Vinca major*
4 - High Moderate	DEOD - *Delairea odorata*	PHAQ - *Phalaris aquatica*	
5 - High	FEVU - *Foeniculum vulgare*	PRCE- *Prunus cerasifera*	
6 - Very High	FUMA - *Fuchsia magellanica*	ROEG - *Rosa eglanteria*	


Reach 1 -Beach
5
Reach 2 -Lower Hwy 1
23
Reach 3 -Upper Hwy 1
Reach 4 -Peralta
35
47
Reach 5 -Lower Adobe
Reach 6 -Low Mid Adobe
62
73
Reach 7 -Upper Mid Adobe
Reach 8 -Upper Adobe
85
96
103
114
Reach 9 -Lower Capistrano
Reach 10 -Upper Capistrano
Reach 11 -Lower Linda Mar
Reach 12 -Upper Linda Mar
121
128
Reach 13 - Oddstad
138
Reach 14 -Lower Middle Fork
173
169
Reach 17 -Lower South Fork
158
Reach 18 -Upper South Fork
168
199
205
Reach 15 -Mid Middle Fork
Reach 16 -Upper Middle Fork
Non-Native Species Infestations
Riparian Vegetation Sample Points
Reach Boundary Displayed in White
0
200
400
Meters


San Pedro Creek: Overview of a Riparian Vegetation Survey
Reach 1 -Beach
Reach 2 -Lower Hwy 1
Reach 3 -Upper Hwy 1
Reach 4 -Peralta
Reach 5 -Lower Adobe
Reach 6 -Low Mid Adobe
Reach 7 -Upper Mid Adobe
Reach 8 -Upper Adobe
Reach 9 -Lower Capistrano
Reach 10 -Upper Capistrano
Reach 11 -Lower Linda Mar
Reach 12 -Upper Linda Mar
Reach 13 - Oddstad
Reach 14 -Lower Middle Fork
Reach 15 -Mid Middle Fork
Reach 16 -Upper Middle Fork
Reach 17 -Lower South Fork
Reach 18 -Upper South Fork
Non-Native Species Infestations
Riparian Vegetation Sample Points
Reach Boundary Displayed in White
0
200
400
Meters

San Pedro Creek
Reach 1 & 2

San Pedro Creek
Reach 1 & 2

Native Species Occurence

- Shining Willow
- Arroyo Willow
- Creek Dogwood
- Red Alder
- Red Elderberry
- Sitka Willow
- Reach Boundary

0 200 400
Meters

Source: DOQ supplied by USGS at www.ltsd.wr.usgs.gov, image created in ArcView/GIS 3.2, map design and analysis performed by Erika Rean, February 2002

San Pedro Creek
Reach 1 & 2

Non-Native
Species Occurence

- Blue Gum
- Pampas Grass
- Cape Ivy
- English Ivy
- English Ivy & Cape Ivy Co-exist
- Reach Boundary

0 200 400
Meters

Source: DOQ supplied by USGS at www.basil.wr.usgs.gov, image created in ArcViewGIS 3.2, map design and analysis performed by Erika Kraus, February 2002

San Pedro Creek
Reach 3 & 4

Native Species Occurence

- Shining Willow
- Arroyo Willow
- Creek Dogwood
- Red Alder
- Red Elderberry
- Sitka Willow
- Reach Boundary

0 200 400

Meters

Source: DOQ supplied by USGS at www.basd.wr.usgs.gov, image created on ArcView GIS 3.2, map design and analysis performed by Emily Kane, February 2002

FIGURE 4

San Pedro Creek
Reach 3 & 4

Source: DOQ supplied by USGS at www.land.usgs.gov, usage created in ArcView GIS 3.2, map design and analysis performed by Emily Kaiser, February 2002

San Pedro Creek
Reach 5, 6, & 7

Source: DOQ supplied by USGS at www.land.vr.usgs.gov, image created in ArcViewGIS 3.2, map design and analysis conducted by Erika Kear, February 2002

San Pedro Creek
Reach 5, 6, & 7

Source: DOQ supplied by USGS at
www.land.usgs.gov, image created in

San Pedro Creek
Reach 8, 9, & 10

Native Species Occurence

- Shining Willow
- Arroyo Willow
- Creek Dogwood
- Red Alder
- Red Elderberry
- Sitka Willow
- Reach Boundary

0 200 400
Meters

Source: DOQ supplied by USGS at www.basemaps.gov, image created in ArcViewGIS 3.2, map design and analysis performed by Erika Kraus, February 2002

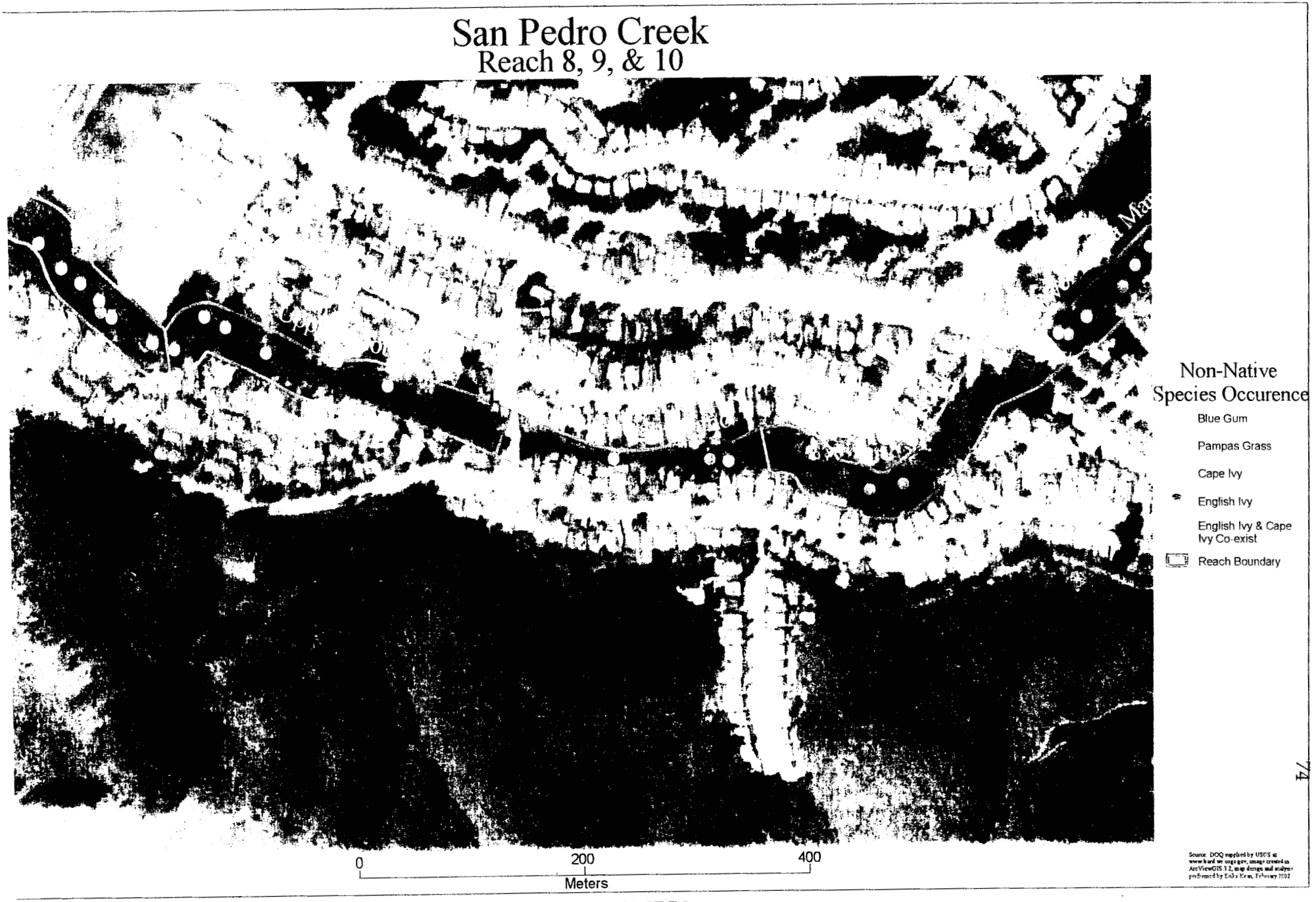

San Pedro Creek
Reach 8, 9, & 10
Non-Native
Species Occurence
Blue Gum
Pampas Grass
Cape Ivy
English Ivy
English Ivy & Cape
Ivy Co-exist
Reach Boundary
0
200
400
Meters

FIGURE 9

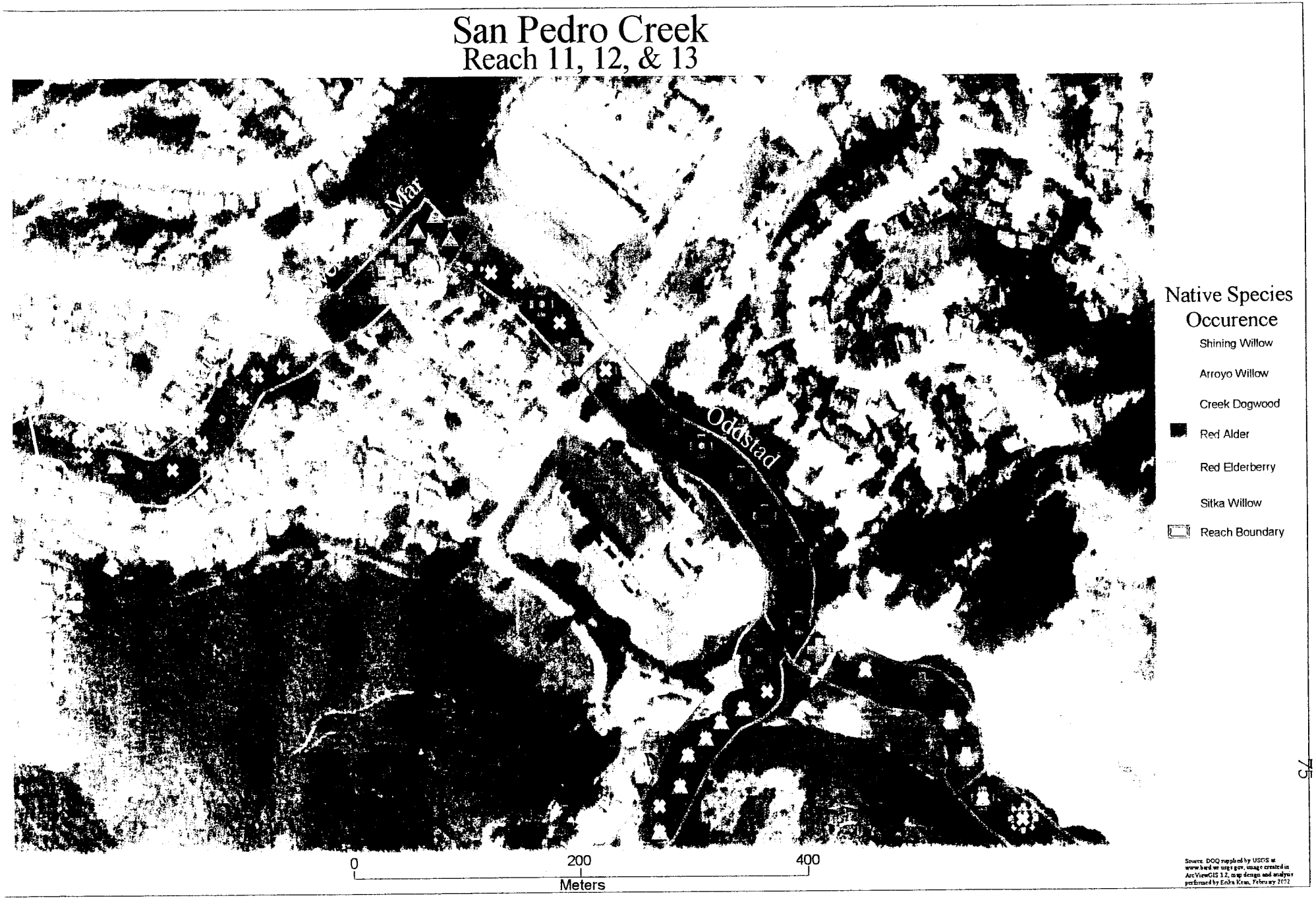
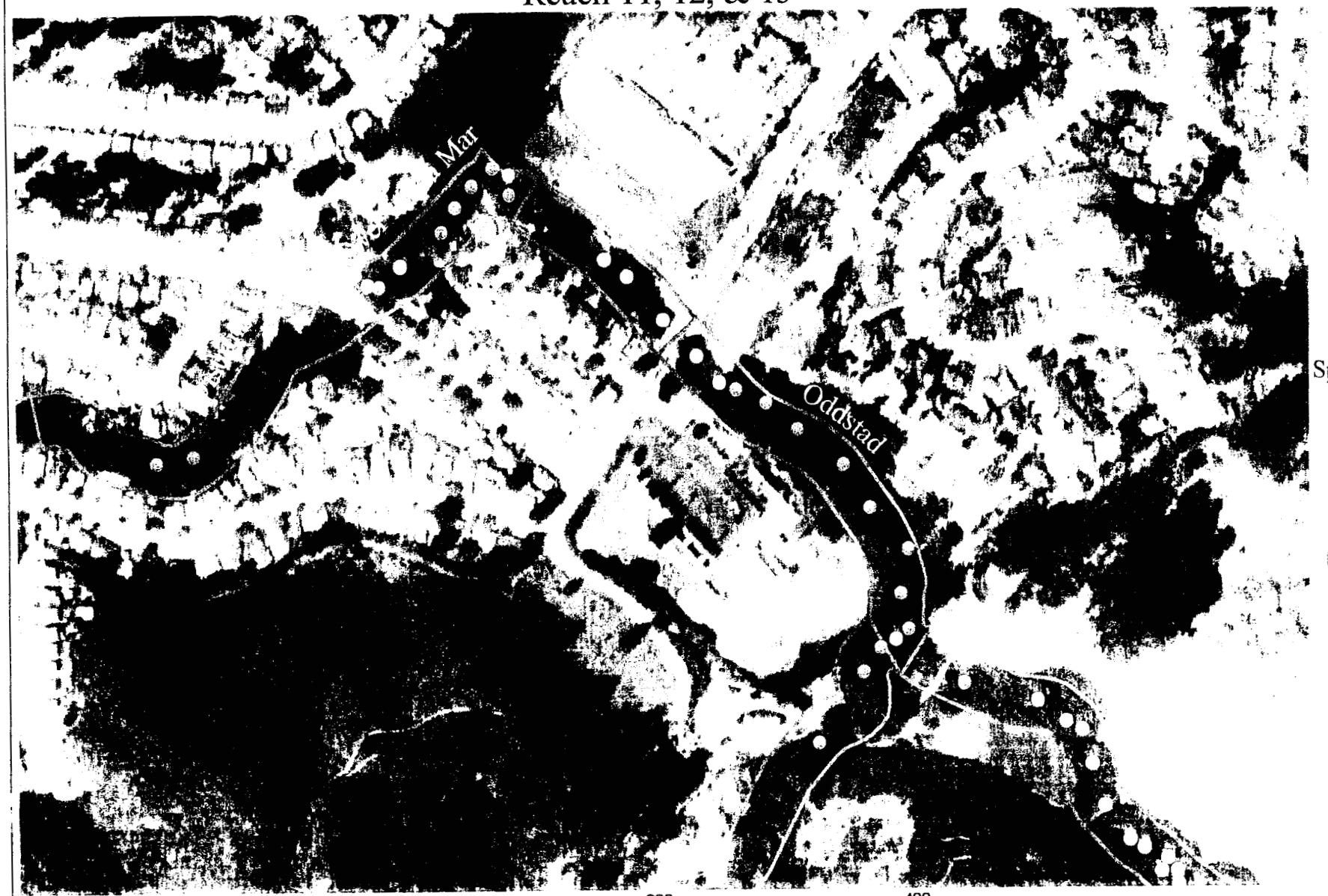

San Pedro Creek
Reach 11, 12, & 13
Mar
Oddstad
Native Species Occurence
Shining Willow
Arroyo Willow
Creek Dogwood
Red Alder
Red Elderberry
Sitka Willow
Reach Boundary
0
200
400
Meters
Source: DOQ supplied by USGS at www.ksrd.wr.usgs.gov, image created in ArcViewGIS 3.2, map design and analysis performed by Erika Kean, February 2002

FIGURE 10

San Pedro Creek
Reach 11, 12, & 13



Non-Native Species Occurence

- Blue Gum
- Pampas Grass
- Cape Ivy
- English Ivy
- English Ivy & Cape Ivy Co-exist
- Reach Boundary

Source: DOQ supplied by USGS at www.terraserver.microsoft.com, image created in ArcView GIS 3.2, map design and analysis performed by Santa Clara Valley Water District

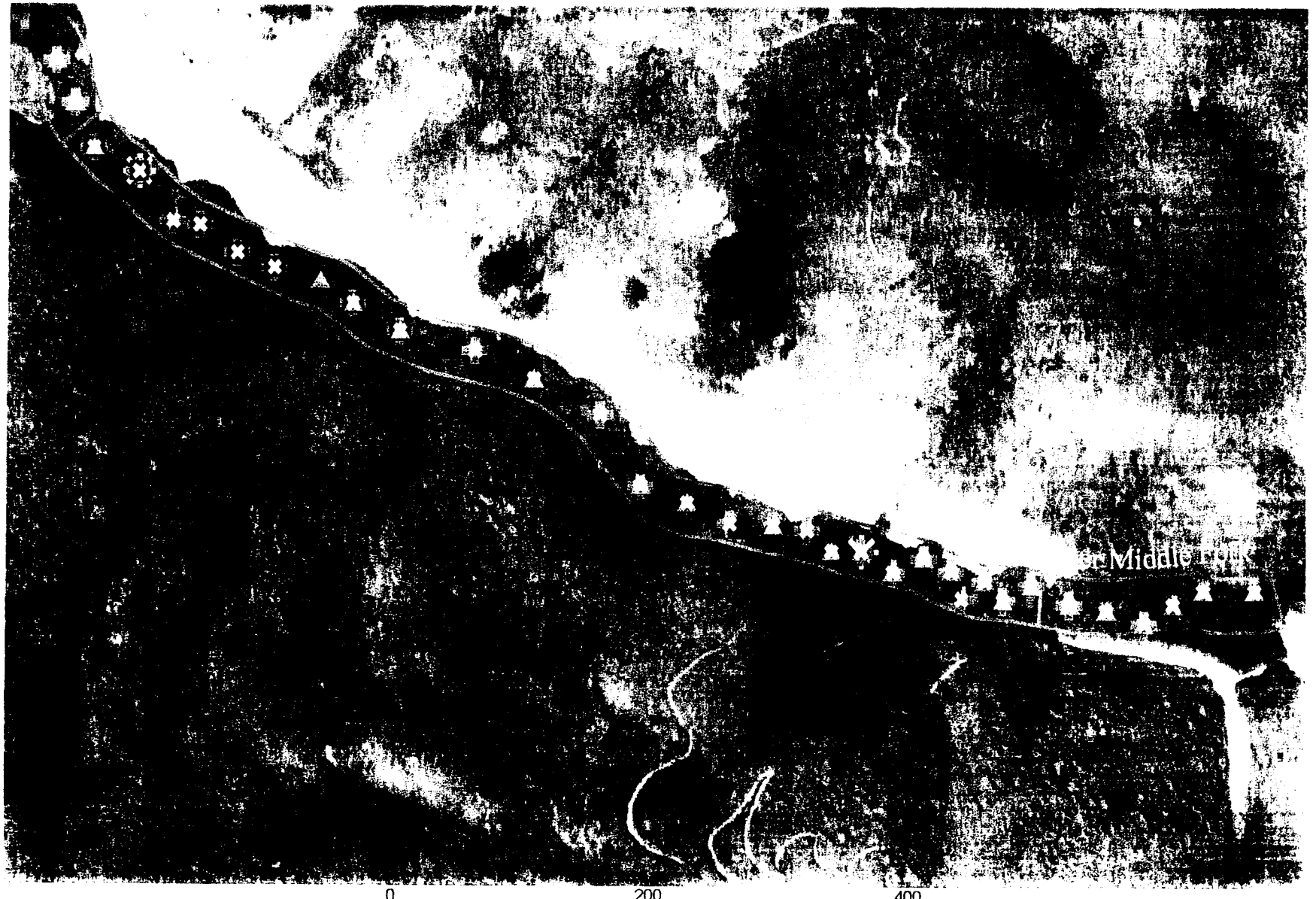
San Pedro Creek
Reach 14, 17, & 18

FIGURE 12

San Pedro Creek
Reach 14, 17, & 18

FIGURE 13

San Pedro Creek
Reach 15 & 16



Native Species Occurence

- Shining Willow
- Arroyo Willow
- Creek Dogwood
- Red Alder
- Red Elderberry
- Sitka Willow
- Reach Boundary

0 200 400

Meters

Source: DOQ supplied by USGS at www.bard.wr.usgs.gov, image created in ArcViewGIS 3.2, map design and analysis performed by Erika Kean, February 2002

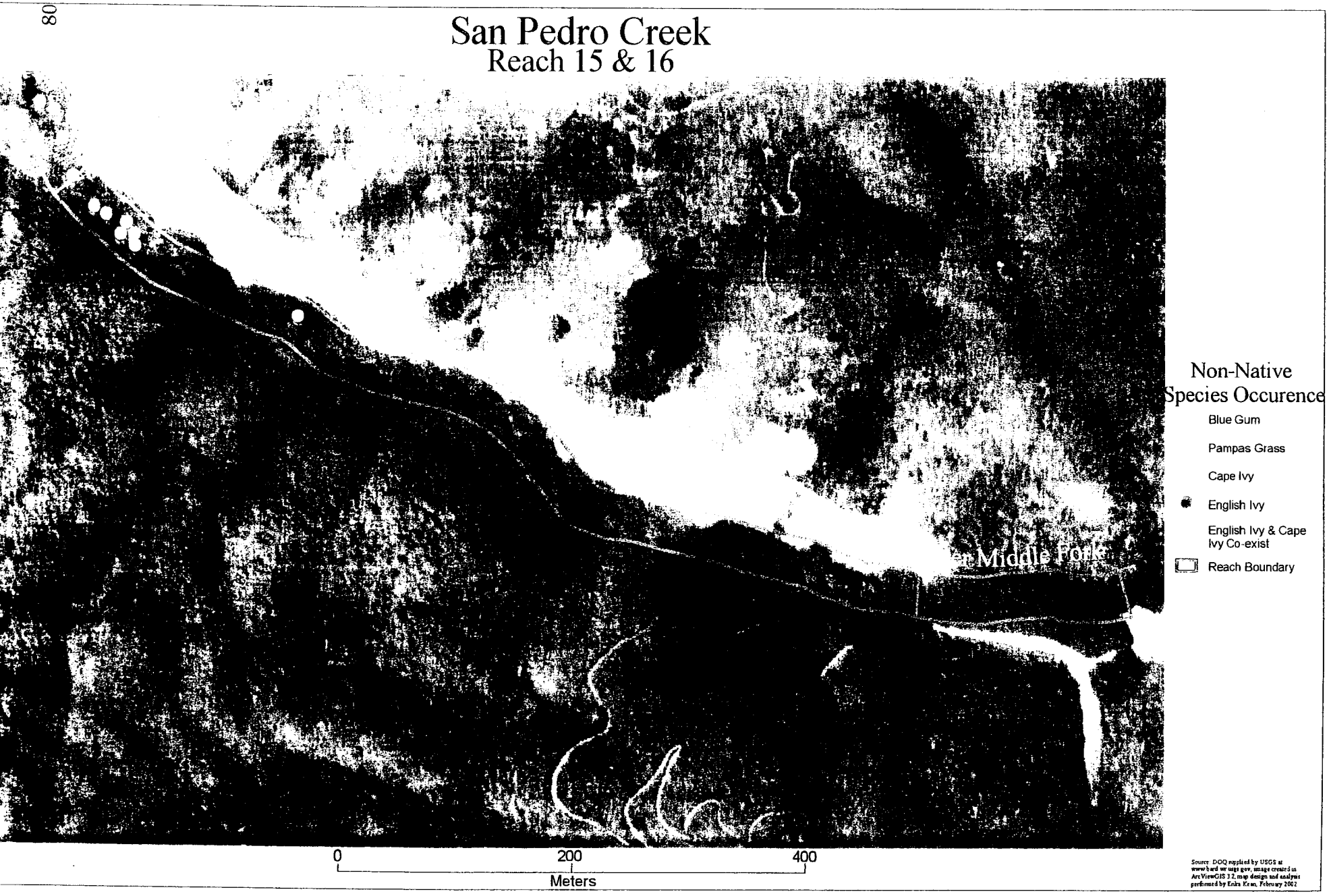

San Pedro Creek
Reach 15 & 16
Middle Fork
Non-Native
Species Occurence
Blue Gum
Pampas Grass
Cape Ivy
English Ivy
English Ivy & Cape
Ivy Co-exist
Reach Boundary
0
200
400
Meters
Source: DOQ supplied by USGS at
www.bard.wr.usgs.gov, image created in
ArcViewGIS 3.2, map design and analysis
performed by Erika Kean, February 2002

FIGURE 15

Appendix 1

Guide to the Vegetation Map of the San Pedro Creek Watershed

Introduction

The vegetation of the San Pedro Creek Watershed was mapped on the basis of vegetation classes (forest, scrub, grassland, and marsh), subclasses (evergreen, deciduous, or mixed evergreen/deciduous), canopy dominant species, and whether or not the canopy dominants are non-native introduced species (exotics) or native species. This resulted in sixteen general vegetation types that provide a relatively digestible visual image of the typical kinds of vegetation that characterize the watershed. Over 270 vegetation polygons were mapped and canopy-dominant data was evaluated for each polygon based upon field surveys.

The canopy-dominant species are identified by codes in each polygon so that "series" (Sawyer and Keeler-Wolf, 1995) or "alliance" classifications under the US Vegetation Classification System (Anderson et al. 1998, Grossman et al. 1998) can be inferred for each polygon. There were far too many alliances (over forty) to depict the watershed in a way that would have produced a coherent map, which is why this vegetation type display design was chosen. Further, there are many more vegetation associations that could conceivably be mapped at finer scales, particularly for vegetation such as the coyote brush (*Baccharus pilularis*) scrub. This kind of detailed mapping would require more rigorous sampling. Ideally, this map will provide a foundation for accomplishing such detailed studies.

We also chose to use common names to depict canopy dominants so that the San Pedro Creek Watershed vegetation map would be easier to interpret by a larger audience. A key to common names and technical names is part of this appendix (see below).

Description of Vegetation Types

The following descriptions are provided for the different vegetation types that are depicted on the San Pedro Creek Watershed vegetation map.

1. Native Evergreen Forest

One of the least common vegetation types in the watershed. There is only one stand dominated by coast live oak near the visitor center in San Pedro Valley County Park. Coast live oak may well have been more common in the valley when it was first settled. There are occasional individuals of madrone (*Arbutus menziesii*) and coast live oak scattered about in the scrub and chaparral but these

do not form forest stands. Chinquapin forms dense stands that can get quite tall but they are so dense and shrubby that they do not constitute true forest.

2. Native Deciduous Riparian Forest

Native riparian forest is limited to the lower watershed along the main forks and the main stem of San Pedro Creek. Three relatively distinct alliances are apparent: red alder, arroyo willow, and arroyo willow-shining willow.

(a) Red alder forest is best represented in a long reach of the Middle Fork. It is also present in the east branch and south branch of the Sanchez Fork. Dense stands of red alder also occur as a sub-canopy dominant in two large blue gum stands along the main stem. Red alder forest has a rich sub-canopy composed of arroyo willow, red elderberry, creek dogwood, thimbleberry, California blackberry, lady fern, man root, and numerous herbaceous species.

(b) Arroyo willow forest dominates the upper portion of the main stem and the lower portions of the Middle and South Forks. It also has a rich sub-canopy of red elderberry, creek dogwood, thimbleberry, California blackberry, lady fern, man root, and numerous herbaceous species. Occasional individuals of sitka willow also occur in this forest. Red alder is an occasional emergent.

(c) Arroyo willow-shining willow forest dominates the lower and middle reaches of the main stem. While arroyo willow is still dominant, shining willow is a clear canopy co-dominant. Red elderberry, creek dogwood, thimbleberry, California blackberry, lady fern, man root, hedge nettle, and numerous herbaceous species are also prominent. This forest is also heavily infested with cape ivy, English ivy, and other non-native invasive species. There are some significant gaps in this forest where backyard erosion control structures and exotic plantings have reduced this cover. Red alder also occurs occasionally as an emergent tree along channels dominated by this vegetation.

3. Native Grassland

There are relatively few stands that are clearly dominated by native grasses and these are more scrub-like than typical grasslands. The dominant species in this assemblage is Pacific reed grass. California fescue is also prominent, particularly on Pedro Point Headland. Coyote brush, poison oak, snowberry (*Symporicarpos rivularis*), and other shrubs are scattered among the large bunchgrass individuals. Numerous native perennial wildflowers occur in this alliance, such as *Calochortus albus, Fritallaria affinis, Zygadenus fremontii, Horkelia californica,* etc. Polygons of this native grassland are concentrated on Pedro Point and western San Pedro

Mountain, however, there is a disjunct stand in the grassland near the entrance to San Pedro Valley County Park.

4. Native Wetland Scrub

Native wetland scrub occurs where seeps, springs, and seasonal or low flow arroyos drain the upland ridges. While comprising a relatively small amount of the total vegetative cover, upland perennial wetlands are distributed widely in all parts of the watershed. However, wetlands scrub stands are most prominent on the north facing slopes of the southern watershed. Most of these wetland scrub assemblages are dominated by deciduous species. Arroyo willow is the most common dominant but red elderberry, thimbleberry, creek dogwood, poison oak, and red flowering current are often mixed together in various co-dominant combinations. There are also occasional dense stands of evergreen wax myrtle, particularly on San Pedro Mountain near the saddle that separates it from Montara Mountain. There are often sedges, rushes, ferns, and other wetland herbaceous species that are prominent in the understory of these wetland scrub assemblages.

5. Native Deciduous Scrub

The San Pedro Creek Watershed hosts large stands of a very unusual scrub dominated by deciduous species, and in particular California hazelnut (*Corylus cornuta var. californica*). Another prominent deciduous shrub, which sometimes co-dominates, is cream bush (*Holodiscus discolor*). Sword fern, huckleberry, poison oak, and blue blossom are also important contributors to the canopy. The understory of this assemblage hosts numerous unusual herbaceous species such as fetid adder's tongue (*Scoliopus bigelovii*), trilliums (*Trillium ovatum, T. albida,* and *T. chloropetalum*), and false solomon's seal (*Smilacina stellata*). This vegetation is prominent on the lower north facing slopes of Montara Mountain and extends west into the lower slopes of San Pedro Mountain and northward on north facing slopes of the eastern watershed.

6. Native Evergreen/Deciduous Scrub

This is the dominant shrubland in the watershed, ranging from Rockaway Head in the northwest corner all the way around the watershed to Pedro Point Headland in the southwest corner of the watershed. The defining species for this assemblage is coyote brush (*Baccharus pilularis*). Wherever coyote brush exceeded 50% of the canopy, we classified the vegetation as coyote brush scrub alliance. There are some widespread and distinctive associations in this alliance that sort themselves out on the basis of slope and aspect. South facing slopes have prominent cover of California sagebrush (*Artemisia californica*), yerba santa

(*Eriodictyon californicum*) and sticky monkey flower (*Mimulus aurantiacus*). North facing slopes have sword fern, toyon, blue blossom, and red elderberry. Poison oak is frequent in patches and sometimes is a co-dominant. Coffee berry (*Rhamnus californicus*) is a prominent, and occasionally co-dominant species in all phases of this scrub. A number of species, such as soap plant (*Chlorogalum pomeridianum*) and yerba buena (*Satureja douglasii*), are prominent in the shady understory of this alliance. It would be difficult but interesting to quantify the many different associations of the coyote brush scrub alliance and determine the environmental variables that sort these associations into the many patterns they display throughout the watershed.

7. Native Evergreen Chaparral

There are two basic alliances of native evergreen chaparral in the watershed, manzanita-chinquapin and blue blossom.

(a) The manzanita-chinquapin alliance is the most common chaparral vegetation in the watershed. It is dominated by two species of manzanitas (*Arctostaphylos montaraensis* and *A. tomentosa* ssp. *crustacea*) and chinquapin (*Chrysolepis chrysophylla*). Other important elements include huckleberry (*Actinium ovatum*) and occasionally blue blossom (*Ceanothus thyrsiflorus*). This vegetation dominates the steep, north facing granitic slopes of Montara Mountain. Stands of this chaparral descend onto sandstone outcrops of lower Montara Mountain and to a lesser degree San Pedro Mountain. There are no stands of this chaparral on the far western or northern slopes of the watershed.

(b) The blue blossom chaparral is much less common. There is one large, dense stand on a northeastern ridge crest above the North Fork of the watershed. This stand is literally pure blue blossom with few other species present in the stand. There are some much smaller and more diverse stands where blue blossom dominates on Pedro Point Headland and San Pedro Mountain. These stands have similar species present as in the coyote brush scrub alliance except that they are dominated by blue blossom.

8. Native Marsh

There is one major vegetation remnant that is likely related to the historic marsh wetland that once dominated lower San Pedro Valley. This marsh stand occurs at the north end of Pacifica State Beach. It is wet all year but floods in the winter. There is a stand of arroyo willow surrounding a shallow pond that is covered in California tule (*Scirpus californicus*) and cat tail (*Typha dominguensis*). The larger, shallow wetland is dominated by rushes (*Juncus effusus* and *J. leseurii*), sedges (*Scirpus maritimus*), and herbaceous species such as primrose (*Oenothera elata* ssp.

hookeri). A second native marsh has been restored at the mouth of San Pedro Creek on the north side between the beach and the highway. This has a rich mixture of rushes, sedges, Pacific reedgrass, surrounding willows, and coastal scrub species around the upland margins. There is very little marsh left in the San Pedro Creek Watershed.

9. Exotic Evergreen Forest

Exotic evergreen forest dominates undeveloped uplands in the central portion of San Pedro Valley and there are several large stands on lower slopes of the entire watershed. These stands are typically dominated by blue gum (*Eucalyptus globulus*), Monterey pine (*Pinus radiata*), mixtures of these two species, and to a lesser degree, Monterey cypress (*Cupressus macrocarpus*). High above the valley, there are also a few small, planted stands of Douglas fir (*Pseudotsuga menziesii*), coast redwood (*Sequoia sempervirens*) and noble fir (*Abies procera*). Of all these species, it appears that the Monterey pine is spreading the most rapidly into adjacent native vegetation. The understory of these former plantations and newly invaded areas is typified by shade-tolerant species that persist after invasion. Species such as sword fern, red elderberry, poison oak, California blackberry, and others may persist for long periods of time. Species such as coyote brush, California sagebrush, and many others appear to not be able to tolerate shady conditions and they consequently disappear from the stands.

10. Exotic Evergreen Riparian Forest

Exotic riparian forest is also dominated by blue gum, and particularly two stands along Reach 5 (Lower Adobe) and Reach 13 (Oddstad). Interestingly, both of these stands host a large number of red alders in the understory. These stands are also both heavily infested with cape ivy, English ivy, and periwinkle. The other exotic riparian forest occurs along Reach 4 (Peralta) where there are a number of Monterey pines and extensive infestations of non-native species.

11. Exotic Grassland

Grasslands that are thoroughly dominated by non-native grass species and that lack a substantial cover of native grasses are considered exotic grassland. Pasture land at Shamrock Ranch is so classified, as are the meadows at San Pedro Valley County Park along the Middle Fork that are dominated by grass perennials such as velvet grass (*Holcus lanatus*) and orchard grass (*Dactylis glomerata*). The upland, mostly ungrazed grasslands dominated by annual grasses host large numbers of native grass species and native herbaceous species. These are classified as "mixed" exotic/native vegetation types (see below).

12. Exotic Wetland Scrub

Some upland seep areas are dominated by exotic species and in particular poison hemlock (*Conium maculatum*) and cape ivy (*Delairea odorata*). These infestations are not particularly heavy at this time, except for on Pedro Point Headland.

13. Exotic Scrub

Where soils have been stripped away or are highly disturbed, a few non-native invasive species are particularly effective at colonizing these sites and these species produce a dominant scrub-like canopy. These include such species as pampas grass (*Cortaderia jubata*), French broom (*Cytisus monspessulanus*) and fennel (*Foeniculum vulgare*).

14. Mixed Woodland

There are a few areas where Monterey pine is rapidly spreading through stands of native coyote brush scrub and grassland. These areas have numerous young and old individual trees but do not create a closed canopy. I have classified these as mixed (exotic and native dominant) woodlands.

15. Mixed Grassland

The majority of grasslands in the San Pedro Creek Watershed occur on formerly grazed uplands, particularly on the south-facing ridges and upper slopes of the northern watershed, and to a lesser degree the eastern watershed. These grasslands are dominated by a mixture of non-native grasses such as rip gut brome (*Bromus diandrus*), soft chess (*Bromus hordaceous*), slender wild oat (*Avena barbata*), wild oat (*Avena fatua*), rattlesnake grass (*Briza maxima*), and hair grass (*Aira caryophillea*) as well as by native grasses, and in particular, purple needlegrass (*Nasella pulchra*). Since the annual grasses were not distinguishable at the time of our survey, I grouped them into an assemblage called "ag" (i.e. annual grasses). Other common perennial native grasses in these grasslands include oatgrass (*Danthonia californica*), California brome (*Bromus carinatus*), and blue rye (*Elymus glaucus*). Numerous native annual and perennial herbaceous species are also prominent in these grasslands, as is the exotic English plantain (*Plantago lanceolata*). Accordingly, I have classified these stands as mixed (exotic and native dominant) grasslands.

16. Mixed Dune Scrub

Pacifica State Beach has an extensive stand of back dunes between Highway One and the beach between the surfer's parking lot and the upland terraces that rise

up towards Rockaway Head at the northern area of the beach. A non-native species of ice plant (*Carprobrotus edulis*) is one of the dominant perennials in this habitat and there are also a number of prostrate native shrubs and perennial herbs that co-occur. Beach bur (*Ambrosia chamisonis*) occupies the majority of the sparse canopy covering these dunes, although other native species such as yellow sand verbena (*Abronia umbellata*), beach morning glory (*Calystegia soldanella*), and dune primrose (*Cammisonia cheiranthifolia*) are also common. The northern portion of these dunes is undergoing active restoration, with removal of the ice plant and planting of native dune species such as beach sagebrush (*Artemesia pycnocephala*) and native dune grass (*Leymus mollis*). Accordingly, I have classified this as a mixed (exotic and native dominant) dune scrub.

Key to the Canopy Dominant Species

ag - annual grasses - *Bromus diandrus, Avena barbata, A. fatua, Briza maxima*
aw - arroyo willow - *Salix lasiolepis*
bb - beach bur - *Ambrosia chamisonis*
bbm - blue blossom - *Ceanothus thyrsiflorus*
bg - blue gum - *Eucalyptus globulus*
c - chinquapin - *Chrysolepis chrysophylla*
Cb - California blackberry - *Rubus ursinus*
cb - coyote brush - *Baccharus pilularis*
cd - creek dogwood - *Cornus sericeus*
cf - California fescue - *Festuca californica*
ci - Cape ivy - *Delairea odorata*
clo - coast live oak - *Quercus agrifolia*
cr - California redwood - *Sequoia sempervirens*
Cs - California sagebrush - *Artemesia californica*
Ct - California tule - *Scirpus californicus*
df - douglas fir - *Pseudotsuga menziesii*
fb - french broom - *Cytisus monspessulanus*
h - hazelnut - *Corylus cornuta var. californica*
hb - huckleberry - *Vaccinium ovatum*
i - iceplant - *Carprobrotus edulis*
m - manzanita - *Arctostaphylos montaraensis, A. tomentosa* ssp. *crustacea*
Mp - Monterey pine - *Pinus radiata*
mt - mustard - *Brassica rapaceous*
nf - noble fir - *Abies procera*
og - orchard grass - *Dactylus glomerata*
pg - pampas grass - *Cortaderia jubata*
ph - poison hemlock - *Conium maculatum*
pn - purple needlegrass - *Nasella pulchra*
pr - pacific reedgrass - *Calamagrostis nutkaensis*

r - radish - *Raphanus sativa*
ra - red alder - *Alnus rubra*
re - red elderberry - *Sambucus racemosa*
sr - salt rush - *Juncus leseurii*
sw - shining willow - *Salix lucida* ssp. *lasiandra*
t - thimbleberry - *Rubus parviflorus*
tb - twinberry - *Lonicera involucrata*
vg - velvet grass - *Holcus lanatus*
wm - wax myrtle - *Myrica californica*