VEGETATION ASSOCIATION: RIPARIAN FOREST/WOODLAND/SCRUB

MAPPED SUBASSOCIATIONS:

Riparian Forest, Arundo/Riparian Forest, Southern Willow Scrub, Mulefat Scrub, Riparian Scrub, Tamarisk Scrub, Southern Cottonwood/ Willow Riparian Forest, Southern Sycamore/Alder Riparian Woodland, Montane Riparian Forest, and Montane Riparian Scrub.

DATA CHARACTERIZATION

Much of the information provided in this section was obtained from published papers, *i.e.,* Holland and Keil (1995), Faber and Keller (1985), Sawyer and Keeler-Wolf (1995) and Grenfell (1988). Distribution data for the vegetation association and subassociations was obtained primarily from the University of California, Riverside GIS database.

BIOGEOGRAPHY

Riparian Habitats generally occur among mid- to large-order streams below 4,000 feet, primarily within the foothills and valleys (Stephenson and Calcarone 1999). The present distributional ranges of riparian Habitat apparently have been influenced more by long-term climatic history than the surrounding upland Habitats. Several million years ago California experienced considerable rain and a warm, humid climate. The flora and fauna that evolved during this period adapted to these conditions. Over the next few millennia, the climate gradually became cooler and drier with summer drought and winter rains. As a result, many plant species that require summer moisture were forced to contract their ranges to riparian zones. Those species not able to persist in the riparian refugia had to adapt to the progressively drier uplands. For these reasons, the dominant riparian tree species in California are not confined to any single floristic region or land form province, or to a single hydrologic or climatic regime (Warner and Hendrix 1984; Faber and Keller 1985).

RANGE AND DISTRIBUTION WITHIN WESTERN RIVERSIDE COUNTY

Riparian vegetation including forest, woodland, and scrub subtypes spatially is distributed in drainages throughout much of Western Riverside County covering approximately 1.1 percent (14,545 acres) of the Plan Area. Southern cottonwood/willow forest makes up the largest proportion of the riparian vegetation in the Plan Area comprising nearly one-half (6,610 acres)

of the acreage. Most of the southern cottonwood/willow forest Habitat occurs along the Santa Ana River drainage from Lake Evans to beyond the Prado basin, along the San Gorgonio River north of Banning and along Temecula Creek east of Vail Lake. Other large stands of southern cottonwood/willow forest are scattered evenly throughout the western portion of the Plan Area co-occurring in drainages with other riparian types.

Large complexes containing several of the riparian forest, woodland and scrub types are located in several portions in the Plan Area. The Santa Ana River basin supports largely southern cottonwood/willow riparian scrub interspersed with smaller patches of riparian scrub, southern willow scrub and mulefat scrub. Drainages flowing toward Highway 91 or Interstate 15, between El Cerrito and eastern Riverside largely support southern willow scrub and riparian scrub with smaller patches of mulefat scrub and southern cottonwood/willow vegetation. Riparian drainages in this area largely are separated by urban and agricultural land uses. Temescal Canyon Wash and its tributaries largely support riparian scrub and mulefat scrub. The stream channels within San Mateo Canyon watershed, within the Cleveland National Forest, generally support riparian forest, southern sycamore/alder riparian woodland and riparian scrub in connected stands. The Temecula area supports a diversity of riparian vegetation types among urban and agricultural land uses along Temecula Creek, Sandia Canyon and portions of Wolf Valley. The riparian system above the Vail Lake area, including Wilson Creek, supports each of the mapped riparian vegetation types.

Montane riparian forest is distributed at higher elevations in the San Bernardino and San Jacinto Mountains. Most of the montane riparian forest is located along the San Gorgonio River north of Banning, within the Indian Creek watershed on the Soboba Indian Reservation, and along the San Jacinto River west of Hemet Lake. This system also supports significant stands of lower elevation riparian Habitats. Montane riparian scrub is mapped at only one location: the hills south of Highway 60 between Jack Rabbit Trail and Gilman Springs Road.

Disturbed riparian vegetation types were mapped in only two locations, *i.e.,* arundo/riparian forest was mapped along the urbanized portions of the Santa Ana River from Riverside to Norco and near Corona and tamarisk scrub was mapped only at Vail Lake.

VEGETATION CHARACTERISTICS

Riparian communities typically consist of one or more deciduous tree species with an assorted understory of shrubs and herbs (Holland and Keil 1995). The transition between riparian Habitats and adjacent non-riparian Habitats often is abrupt, especially in montane areas where the topography is steep (Grenfell 1988). Vegetation height can vary from one to three meters in scrub Habitats to 30 meters in riparian forest Habitats (Grenfell 1988).

Riparian Habitats are successional in nature and undergo a predictable sequence of revegetation following flood events. Succession from exposed alluvial soil to mature riparian forest or woodland may take 50 to 75 years or more (Faber and Keller 1985).

SPECIES COMPOSITION

Riparian Forest. Riparian forest can include any combination of the following species along perennial stream channel banks: box elder (*Acer negundo*), big-leaf maple (*A. macrophyllum*), Valley oak (*Quercus lobata*), coast live oak (*Q. agrifolia*), white alder (*Alnus rhombifolia*), Oregon ash (*Fraxinus latifolia*), California dogwood (*Cornus californica*), California bay (*Umbellularia californica*), sycamore (*Platanus racemosa*), Fremont's cottonwood (*Populus fremontii*), California walnut (*Juglans californica*), and several species of willow (*Salix lasiandra*, *S. lasiolepis*, *S. laevigata*, *S. gooddingii, S. exigua*), Mexican elderberry (*Sambucus mexicana*), wild grape (*Vitis girdiana*) and poison-oak (*Toxicodendron diversilobum*). Where the stream channel receives perennial flows in some years but intermittent flows in other years, alder species drop out of the vegetation. Where the stream channel receives only intermittent flow, the willow and cottonwood species become less common and the sycamore, coast live oak and California bay tend to move down into the channel. Along ephemeral stream channels, coast live oak and California walnut can grow within the channel as a continuum or ecotone from uplands on north-facing slopes (Faber and Keller 1985).

Arundo/Riparian Forest. Arundo/riparian forest is dominated by non-native giant reed (*Arundo donax*) but also may contain emergent shrubs and trees (Sawyer and Keeler-Wolf 1995) such as arroyo willow (*Salix lasiolepis*) and mulefat (*Baccharis salicifolia*).

Riparian Scrub. This Habitat type has the same potential species composition as riparian forest, but at a younger successional stage, either because of a more recent disturbance or more frequent flooding (Faber and Keller 1985). In addition to the species listed in the description of riparian forest, riparian scrub also may include mulefat.

Southern Willow Scrub. Southern willow scrub is dominated by willow trees and shrubs (*Salix* spp.) and also may contain gooseberry (*Ribes* spp.) and elderberry. When disturbance is high within this Habitat type, the dominant species typically is sandbar willow (*Salix exigua*). When disturbance is less, the dominant species typically is Goodding's black willow (*Salix gooddingii*). Willows are fast-growing and can reproduce vegetatively from root sprouts. Red willow (*Salix laevigata*) occupies fast-flowing perennial streams at elevations up to 1,200 m and often occurs with yellow willow.

Yellow willow (*Salix lasiandra*) grows along stream channels and in perennially wet places at elevations of 2,500 m. Sandbar willow occurs along sandbars and riverbeds at elevations below 900 m. Arroyo willow occupies Habitat within perennial and intermittent stream channels at elevations up to 750 m. Goodding's black willow occurs along streambanks and in wet places within drier Habitats at elevations below 450 m (Faber and Keller 1985).

Mulefat Scrub. Mulefat scrub is dominated by mulefat, but also may include willows (*Salix* spp.), sedges (*Carex* spp.) and stinging nettle (*Urtica dioica*) (Holland 1986; Sawyer and Keeler-Wolf 1995).

Tamarisk Scrub. Tamarisk scrub is dominated by tamarisk (*Tamarix* spp.) but also may contain willows (*Salix* spp.), salt bushes (*Atriplex* spp.), catclaw acacia (*Acacia greggii*), and salt grass (*Distichlis spicata*) (Holland 1986; Sawyer and Keeler-Wolf 1995).

Southern Cottonwood/Willow Riparian. Southern cottonwood and willow riparian Habitat is dominated by cottonwood (*Populus* spp.) and willow (*Salix* spp.) trees and shrubs (Faber and Keller 1985). Understory species may include mugwort (*Artemisia douglasiana*), stinging nettle and wild cucumber (*Marah macrocarpus*) (Holland 1986). This riparian Habitat is considered to be an early successional stage as both species are known to germinate almost exclusively on recently deposited or exposed alluvial soils. Like the willow, the cottonwood can reproduce vegetatively from roots. In the absence of disturbance, this Habitat type will transition to include oaks (*Quercus* spp.) and sycamores or, at higher elevations, will include white alder (Faber and Keller 1985).

Southern Sycamore/Alder Riparian Woodland. Below 2,000 m sycamore and alder often occur along seasonally-flooded banks; cottonwoods and willows also are often present (Faber and Keller 1985). Poison-oak, mugwort, elderberry and wild raspberry (*Rubus* spp.) may be present in the understory (Holland 1986). Sycamore and alder are both able to withstand long periods of flooding. The distribution of white alder is restricted to permanent streams and consistent saturation of the root zone by well-aerated, cool water (Faber and Keller 1985).

Montane Riparian Forest. Montane riparian forest consists of cottonwood (*Populus* spp.), sycamore, willows (*Salix* spp.) and alders (*Alnus* spp.) (Faber and Keller 1985; Grenfell 1988; Sawyer and Keeler-Wolf 1995).

Montane Riparian Scrub. Montane riparian scrub consists primarily of shrubby species of willows (*Salix* spp.), dogwood (*Cornus* spp.) and/or alders (*Alnus* spp.) (Holland 1986;

Faber and Keller 1985; Sawyer and Keeler-Wolf 1995). Jeffrey pine (*Pinus jeffreyi*) and incense cedar (*Calocedrus decurrens*) often are found near the edges of these Habitats (Faber and Keller 1985).

PHYSICAL ENVIRONMENT

Riparian communities are not restricted to specific climates or soil types, but they are primarily dependent on a permanent supply of water. Variables that affect the community structure and composition include the nature of the water supply (*i.e.*, the amount of water carried by a stream or present within a lake, and the lateral extent and depth of subterranean aquifers), altitudinal gradients, north-south and east-west axes, historical land uses, and the nature and size of the stream banks and flood plains (Bowler 1988; Holland and Keil 1995). The amount of water carried by a stream or present within a lake is determined by the climate (precipitation patterns) and the size of the watershed (Warner and Hendrix 1984).

Riparian Habitats develop between adjacent mountains and hills and along fault lines. In areas where the geologic forces have upthrust the land into mountain masses, the water flows swiftly and the streams are incised into the underlying rocks. The riparian Habitat is often limited to narrow strips due to the limited soil over the rocks. In areas where the geologic forces have resulted in valleys and gentle slopes, the riparian Habitat is often wider, due to the deposition of eroded soils. Alluvial silt, gravel and sand deposited within the floodplain create a raised terrace which is ideal for bottomland riparian vegetation (Warner and Hendrix 1984).

Because most of the canopy species are deciduous, there is a seasonal light fluctuation within riparian understories. During winter dormancy, direct sunlight reaches the ground in most parts of the community. It is at this time that some herbaceous and shrub species actively grow and flower. As the canopy leafs-out in the spring, conditions at ground-level change sharply, particularly in broad-leaved deciduous forests. The resulting shade reduces the quantity of light energy beneath the canopy and also reduces daytime temperatures by several degrees. Wind velocity also is decreased by the tree canopy. Moisture evaporation from the soils and transpiration from the vegetation result in increased humidity. These characteristics result in a generally more mesic environment than the surrounding environment (Bowler 1988; Warner and Hendrix 1984; Holland and Keil 1995).

Within drier riparian zones bordering small, intermittent watercourses, the riparian communities often consist of scattered trees such as sycamore (*Platanus racemosa*) growing along the stream banks with open areas between the trees. These physical characteristics result in alternating groups of sun-tolerant and shade-tolerant species. The herbaceous species may

temporarily die back as the surface water dries up, but the scattered trees and/or shrubs are able to persist due to ground water (Holland and Keil 1995).

Soils within riparian corridors usually consist of interbedded layers of fine and coarse sediments ranging from clay, silt, sand and gravel to rounded river-rocks and large boulders. The fine-grained particles generally collect in areas where the water movement is slight and the coarse particles generally accumulate where the water flows more quickly. Meandering stream channels within broad floodplains will deposit and redistribute sediments over time, creating a horizontal patchwork and vertical layers. Soils closest to the stream channel are usually relatively young while the seldom-flooded areas within the floodplain are often deep and well-developed (Holland and Keil 1995). Organic materials (*e.g.*, decomposing plant litter) are often present within the soils and nutrient levels are comparatively high. These organic materials are the primary food source for the vegetation within shady headwater situations (Bowler 1988; Holland and Keil 1995).

Riparian communities can be divided into two general groups: Valley and foothill riparian communities and montane riparian communities. The valley and foothill riparian communities include riparian forest, arundo/riparian forest, southern willow scrub, mulefat scrub, riparian scrub, tamarisk scrub, southern cottonwood/willow riparian, southern sycamore/ alder riparian woodland. Montane riparian communities include montane riparian forest, and montane riparian scrub (Holland and Keil 1995).

Valley and foothill riparian communities occur at elevations from near sea level to the lower margins of the montane coniferous forest areas within cismontane California. These communities range from the broad valley flood plains to narrow steep canyons. Within valley and foothill riparian communities, the climate is comparatively warm during the winter with precipitation falling primarily as rain and the summers are dry and long (Holland and Keil 1995).

Montane riparian communities occur in high mountain areas and typically experience lower temperatures than the Valley and foothill riparian communities. Mountainous valleys often serve as drainages for water and cold air. In addition, mountain streams are usually very cold and swiftly flowing. The combined cold air and water temperature limit the types of dominant trees in these communities. Species such as sycamore occur in lower foothill areas but fail to grow at higher elevations. Concurrently, the cold temperatures permit Jeffrey pine and ponderosa pine (*P. ponderosa*) to colonize riparian areas at lower elevations than they can occupy on exposed slopes. This results in a localized inversion of the usual vegetation zones (Holland and Keil 1995).

The understory is generally sparse within riparian communities, while the dense broad-leaved deciduous trees can reach heights up to 30 meters (30 m). At higher elevations, the riparian

communities are usually less than 15 meters (15 m) in height with a greater concentration of shrubs. At very high elevations (2,000 m or more), the riparian community may only occur in the shrub/scrub stage (Faber and Keller 1985; Grenfell 1988).

ECOSYSTEM PROCESSES

Riparian communities are dynamic systems. The stream channels may be swept clean of vegetation during floods as sediments are shifted during erosion flood events. Flood waters may undercut stream banks and, over time, can cut through exposed bedrock, grinding organic debris into small fragments. As a result of channel-cutting and sediment deposition, streams may shift their banks, particularly in areas with gentle topography. Streams in steep areas gradually cut downward, forming canyons or ravines (Holland and Keil 1995).
In southern California, most streams have very low flow during the summer and in many cases surface flow may dry up (Stephenson and Calcarone 1999). Seasonably variable water flows allow herbaceous annuals and perennials to colonize newly exposed and denuded sites such as an exposed stream channel or a sand or gravel bar. These plants may be swept away during the next winter's storm events (Holland and Keil 1995).

Annually variable water flows result in a gradation of environments as well. Some areas of the floodplain may be flooded annually while other areas may be flooded only during years of extremely high waters. Areas that regularly are flooded are often in a condition of perpetual succession. That portion of the riparian community nearest to the stream channel may not advance beyond the pioneer stage, while areas farther from the stream channel may advance through several stages of succession before being swept clean by periodic floods (Holland and Keil 1995).

Many riparian woody and herbaceous species are adapted to periodic flooding. Some have deep root systems that anchor them against the flood waters and some have flexible stems that bend with the flood waters. Many have rhizomes that are protected by layers of sediments and others have no adaptations but are able to persist if they become established at sites that protect them from the full force of the flood waters (*e.g.*, among large rocks) (Holland and Keil 1995). Cottonwood and willow species germinate almost exclusively on recently deposited or exposed alluvial soils (Faber and Keller 1985).

COMMUNITY RELATIONSHIPS

Riparian communities are very important wildlife Habitats. The multiple strata (*e.g.,* canopy, shrubs, herbaceous species) provide a diversity of feeding and nesting sites for mammals and birds. Fish and other aquatic species benefit from important shading and other attributes. (The reader should refer to the species accounts for specific information about sensitive wildlife and plant species and riparian Habitats.) Riparian areas are of particular importance because the moisture of the stream channels is important as a water source in the dry California landscape and are productive during the summer months at times when other plant communities are dormant (Warner and Hendrix 1984; Grenfell 1988; Holland and Keil 1995).

Linear riparian Habitats, by providing shade, cover, water and food, can function as important corridors for faunal species' migration and dispersal (Warner and Hendrix 1984).

THREATS

Riparian Habitats are threatened by cattle grazing, conversion to other land uses and flood control activities. These activities degrade the water quality, instream ecology, reduce the floodplain and/or encourage the colonization of non-native floral species (Bowler 1988).

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