SPECIAL PUBLIC NOTICE

SANTA ANA RIVER WATERSHED ASSOCIATION OF RESOURCE CONSERVATION DISTRICTS IN-LIEU FEE PROGRAM

LOS ANGELES DISTRICT

Public Notice/Application No.: SPL-2009-00272-YJC
Comment Period: September 3, 2009 through October 2, 2009
Project Manager: Jae Chung; 951-898-6171; Yong.J.Chung@usace.army.mil

Applicant
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Location

The location of the proposed in-lieu fee (ILF) program would generally be within the Santa Ana River Watershed from the San Bernardino Mountains, San Gabriel Mountains, San Jacinto Mountains, Santa Ana Mountains, to the Pacific Ocean including the Santa Ana River and all major and minor tributaries in the California counties of San Bernardino, Riverside, Los Angeles, and Orange.

Activity

The review of a draft prospectus associated with the development of an ILF program for compensatory mitigation for Department of the Army (DA) permits by SAWA. For more information see page 3 of this notice.

Interested parties are hereby notified that an application has been received for a Department of the Army permit for the activity described herein and shown on the attached drawing(s). Interested parties are invited to provide their views on the proposed work, which will become a part of the record and will be considered in the decision. This permit will be issued or denied under . Comments should be mailed to:

LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

Alternatively, comments can be sent electronically to: Yong.J.Chung@usace.army.mil

Evaluation Factors

The decision whether to authorize the proposed ILF program will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof. Factors that will be considered include conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people. In addition, if the proposal would discharge dredged or fill material, the evaluation of the activity will include application of the EPA Guidelines (40 CFR 230) as required by Section 404 (b)(1) of the Clean Water Act.

The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. The District Engineer (DE) will review the comments received in response to this notice and make a written initial evaluation as to the potential of the proposed ILF program to provide compensatory mitigation. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity. In addition, all comments will be distributed to the members of the Inter-Agency Review Team (IR) and the sponsor within 15 days of the close of the comment period. The DE and the IRT members will also have the opportunity to comment to the sponsor. After considering comments from the DE, the IRT, and the public, if SAWA chooses to proceed with establishment of the ILF program, SAWA will prepare a draft instrument and submit it to the DE.

Background

On April 10, 2008, the Corps of Engineers and the Environmental Protection Agency published the Final Rule on Compensatory Mitigation for Losses of Aquatic Resources ("Mitigation Rule"), which went into effect June 9, 2008. The rule replaced most previous guidance concerning compensatory mitigation, including the previous ILF guidance of 2000. The new rule includes requirements that prospective ILF program providers meet substantially the same standards as mitigation banks and undergo the same Interagency Review Team review and approval process as mitigation banks.

SAWA is a 501(c) (3) nonprofit organization formed in 1996 to help facilitate some of the resource and conservation work needed in the watershed, including invasive plant and animal species eradication, habitat restoration, biological monitoring, research and public education. In 2002, SAWA became an authorized ILF program sponsor targeting the eradication of invasive non-natives such as *Arundo donax*. The Mitigation Rule requires existing ILF programs to comply with the new rule by June 9, 2010. Consistent with the requirements of the rule at 33 CFR § 332.8(d), SAWA has submitted a draft prospectus to the Corps for the purpose of establishing and managing an ILF

program consistent with the mitigation rule. The Corps seeks comments from interested parties on the prospectus. The full prospectus is attached. The prospectus is organized to address the information requirements of the mitigation rule including:

(i) The objectives of the proposed ILF program.
(ii) How the ILF program will be established and operated.
(iii) The proposed service area.
(iv) The general need for and technical feasibility of the proposed ILF program.
(v) The proposed ownership arrangements and long-term management strategy for the ILF project sites.
(vi) The qualifications of the sponsor to successfully complete the type(s) of mitigation project(s) proposed, including information describing any past such activities by the sponsor.
(vii) The compensation planning framework consisting of:
  (a) The geographic service area(s), including a watershed-based rationale for the delineation of each service area;
  (b) A description of the threats to aquatic resources in the service area(s), including how the ILF program will help offset impacts resulting from those threats;
  (c) An analysis of historic aquatic resource loss in the service area(s);
  (d) An analysis of current aquatic resource conditions in the service area(s), supported by an appropriate level of field documentation;
  (e) A statement of aquatic resource goals and objectives for each service area, including a description of the general amounts, types and locations of aquatic resources the program will seek to provide;
  (f) A prioritization strategy for selecting and implementing compensatory mitigation activities;
  (g) An explanation of how any preservation objectives satisfy the criteria for use of preservation in § 332.3(h);
  (h) A description of any public and private stakeholder involvement in plan development and implementation, including, where appropriate, coordination with federal, state, tribal and local aquatic resource management and regulatory authorities;
  (i) A description of the long-term protection and management strategies for activities conducted by the ILF program sponsor; and
  (j) A strategy for periodic evaluation and reporting on the progress of the program in achieving the goals and objectives, including a process for revising the planning framework as necessary.
(viii) A description of the in-lieu fee program account.

For additional information please call Jae Chung of my staff at 951-898-6171 or via e-mail at Yong.J.Chung@usace.army.mil. This public notice is issued by the Chief, Regulatory Division.

Draft Prospectus

For the

SANTA ANA RIVER WATERSHED IN-LIEU FEE PROGRAM

Introduction

The Santa Ana Watershed Association (SAWA) was formed in 1996 to help facilitate some of the resource and conservation work needed in the watershed, including invasive plant and animal species eradication, habitat restoration, biological monitoring, research and public education. In early March 2003, SAWA became a 501(c) (3) nonprofit organization, and changed from fiscal year to calendar year. In January 2004, SAWA established an In-Lieu Fee (ILF) Program with the U.S. Army Corps of Engineers (Corps) for invasive species removal and habitat restoration.

One major problematic species, *Arundo donax,* (giant reed) is reported to have taken over approximately 10,000 acres of river bottom, displacing native wetland habitats. Habitat restoration, primarily through giant reed eradication and ongoing monitoring of these areas, is the current central focus of the Watershed Program because most of the funding obtained was earmarked for giant reed eradication and ongoing restoration. The endangered species work and other wildlife monitoring is necessary for compliance with the regulatory permits to do the arundo work.

SAWA engages a multitude of agencies and private citizens living in the watershed. The organization is run by a board of directors currently comprised of one representative from each of four resource conservation districts (RCDs) and the Orange County Water District (OCWD). The four RCDs in the watershed include Inland Empire RCD, Riverside-Corona RCD, San Jacinto Basin RCD, and Elsinore-Murrieta-Anza RCD. The coordinated activities involved in resource management and restoration are organized in an annual work plan with input from partnering agencies and other entities. The day-to-day operations of SAWA are run by an executive director and his administrative assistant. SAWA also employs six biologists, two half-time biologists, a biological technician, six field assistants, a project manager and two assistants, two educators, and staff contracted to the Western Riverside Multiple Species Habitat Conservation Program.

The Santa Ana River (SAR) watershed encompasses about 3,200 square miles, comprising the largest river system in coastal Southern California. The river originates in the San Bernardino and San Gabriel Mountains, flowing more than 100 miles through San Bernardino, Riverside, Orange, and a small portion of Los Angeles counties to the Pacific Ocean between the cities of Newport Beach and Huntington Beach. Human development and activities in the watershed have greatly reduced the size and quality of the floodplain and associated habitats, and deleteriously affected the river's natural function and processes. One of the most challenging agents of deleterious change has been a multitude of non-native, invasive species, primarily, but not exclusively, plants.

Restoring the river requires many partners, agencies and landowners. The Corps has provided major funding through mitigation requirements and permits the mitigation work in the wetlands under Section 404 of the Clean Water Act. EPA receives, administers, and has distributed funds earmarked for this program through the efforts of Congressman Calvert and others. CDFG, which regulates alterations to lakes and streams under Section 1600 et seq. of the Fish and Game Code and the take of threatened and/or endangered species under Section 2081 and 2081.1 of the Fish and Game Code, has directed mitigation funds to SAWA through the streambed alteration and incidental take programs. CDFG also contributes expertise regarding the various aquatic resource issues of the watershed. The U.S. Fish and Wildlife Service (USFWS) oversees and must approve activities that could affect wetland resources and endangered species. The Regional Water Quality Control Board (RWQCB) approves activities that could affect water quality and provides oversight of the recognized beneficial uses of the wetland resources. OCWD, which is responsible for managing water resources and providing water to more than two million Orange County residents, has provided major funding, provides personnel to manage wetlands and endangered species, and manages 2,400 acres near the middle of the river in the Prado Basin, attempting to maximize wildlife resources. The county flood control agencies maintain sections of the river for flood conveyance, cooperate toward achieving mutual goals, and issue entry permits.

A major goal of SAWA is to restore the natural function of the watershed through the enhancement and restoration of the native riparian community. This is accomplished by the removal of exotic species and the management of existing resources, including both habitat and wildlife species. The largest threat to the riparian habitat within the Santa Ana Watershed is arundo. This exotic plant has invaded much of the watershed, out-competing native vegetation and displacing wildlife. The removal of arundo requires multiple treatments and intensive monitoring. Eradication efforts include mapping, initial biomass removal, herbicide treatment, and intensive biological monitoring. SAWA biologists monitor the removal areas long after the arundo is presumed to have been eradicated to ensure that native vegetation and wildlife are recovering.

The Santa Ana River has been transformed by giant reed. Other weedy species also impacting the river include pepperweed (*Lepidium latifolium*), tamarisk (*Tamarix* spp.), castor bean (*Ricinus molle*), and tree of heaven (*Ailanthus* altissima), among others, but giant reed is pervasive. Giant reed provides no redeeming wildlife value; it carries fire; causes obstruction to flood flows and expensive beach clean up; compared to native habitat, it consumes nearly three times the water; and it provides poor stream shading, impacting water quality, and also habitat for juvenile aquatic species, particularly amphibians and fish. Giant reed consumes an estimated 56,200 acre-feet of water annually from the Santa Ana River alone—enough for more than 100,000 households.

1. Objectives

The following are major objectives of the SAWA ILF Program:

1) Restore 8,000 to 10,000 acres of wetlands, primarily riparian woodlands that have been replaced by non-native invasive species.

2) Accomplish Objective #1 mostly by eradicating invasive, exotic plants including, but not limited to, giant reed, *Arundo donax*; tamarisk, *Tamarix* spp.; perennial pepperweed, *Lepidium latifolium*; tree of heaven, *Ailanthus altissima*; castor bean, *Ricinus communis*; various palms, *Phoenix* spp. and *Washingtonia* spp.; pampasgrass, *Cortaderia selloana*; and others. Accomplish the invasive removal from the top of the watershed and tributaries downstream.

3) Rely mostly on natural succession to accomplish regrowth of the native wetlands, planting native species only where greater species diversity is desired in the remaining wetland, source material is lacking and natural re-vegetation would take longer than a decade, or where higher terraces are available that would be less prone to sedimentation or scour.

4) Continually monitor all restoration sites to document and quantify recovery of the wetlands. Map the project areas to display target restoration areas and recovery using GIS.

5) Monitor wildlife in pre-treatment, treatment, and post-treatment areas to document existing conditions and any changes in populations and to avoid potential impacts of the restoration activities on sensitive species and nesting birds.

6) Monitor listed species throughout the watershed, particularly least Bell's vireos, *Vireo bellii pusillus*, and willow flycatchers, *Empidonax trailii extimus* to document their use of restored areas and their population trends.

7) To further maximize habitat suitability, devise and implement management strategies to benefit sensitive and listed species, particularly control of non-native vertebrates that have been shown to impact native species. Non-native species targeted for control include brown-headed cowbirds, *Molothrus ater*; African clawed frog, *Xenopus laevis*; bullfrog, *Rana catesbiana*; crayfish, *Procambarus* sp.; among others.

8) Involve and educate the public in the restoration efforts.

9) Perpetuate the restoration and management activities by building an endowment that is large enough to sustain the program.

The primary objective of the Santa Ana River Watershed ILFP is to restore the functional ability of the Santa Ana River Watershed to establish and maintain native wetland plant communities through natural succession. Most of this restoration will be accomplished by the systematic eradication of non-native invasive plants that reportedly displaced native riparian habitat over approximately half of the floodplain. It was recently estimated giant reed alone dominates 8,000 to 10,000 acres of the Santa Ana River Watershed. The objective of this program is to convert that acreage back to native wetlands. To date, 3,500 acres of formerly giant reed-infested floodplain have been treated and are under ongoing management. About half of this work was accomplished with grant funding, and the other half with mitigation funding.

For a detailed scope of work, please see Appendix A: Scope of Work and Methods Employed by SAWA Under the ILF Program.

For a cost schedule for the ILF Program for different types of mitigation work, please see Appendix B: In Lieu Fee Program Costs Flyer.

2. How the Santa Ana River Watershed ILF Program Will Be Established and Operated.
The Santa Ana River Watershed ILF Program (SARWILFP) will be the updated version of the Santa Ana River Watershed Trust Fund for Arundo Eradication and Habitat Enhancement ILF Mitigation Program established in November 2002. The responsible agency will be the Santa Ana Watershed Association (SAWA), a 501(c) (3) non-profit corporation, which was established for the express purpose of restoring the watershed and managing its natural resources. The program fund is already established with dedicated accounts and fund tracking for each project that is taken on by SAWA. Project proponents negotiate with the Corps on terms and conditions comprising project-appropriate mitigation. When the Corps deems the use of the SARWILFP to be appropriate, the project proponent contacts SAWA to inquire about the availability of mitigation credits. SAWA responds with a letter quoting the cost and location of the desired mitigation work and requesting copies of the permits for the subject project to ensure that the requested mitigation is that specified in the project permits. Once the requested mitigation is found to be mirrored in the permits and the applicant submits the required fees to SAWA, a receipt letter is sent to the applicant and SAWA takes over the mitigation and reporting responsibilities for the subject project. The receipt letter describes the location of the mitigation work, the type of mitigation to be performed, and the amount of acreage to be mitigated. Work on the mitigation project commences immediately, and separate fund tracking is set up. This information will also be published in the annual reports. Annual reports are submitted to the Corps outlining the progress on each project including the location of the mitigation work, the type of mitigation to be performed, the amount of acreage to be mitigated as well as maps and photographs of the project areas at various stages of development. An annual tour is arranged and more frequently as requested, to examine the project mitigation sites with Corps staff. Mitigation sites are managed in perpetuity.

3. Proposed Service Area.
The entire watershed of the Santa Ana River, and adjacent areas as requested by the Corps, will be serviced by the SARWILFP. This is an area of approximately 3,200 square miles encompassing the southern exposures of the San Bernardino, San Gabriel Mountains and San Jacinto Mountains, through portions of San Bernardino, Riverside, Los Angeles, and Orange Counties to the Pacific Ocean between the cities of Huntington Beach and Newport (see the attached map).

4. Need and Technical Feasibility.
The Santa Ana River and major tributaries within the watershed have been significantly altered through the modification of floodplain for human development projects, flood control, recreation, road crossings, water purveyance, and other human uses. It has been estimated that the acreage of natural wetland habitats has been diminished by 90 percent in Southern California. That which remains today is regularly degraded by additional human uses and activities including trespassing, fires, farming, grazing, recreation including paintball games, off-road vehicle use, biking, hiking, horseback riding, and illegal trail construction, along with the effects of non-native invasive species. The constant disturbance and alteration of the remaining habitat

further reduces habitat values, wildlife diversity and abundance. Some of the human-induced impacts on the habitat and wildlife can be reduced or eliminated through restoration to maximize habitat quantity and management to maximize habitat quality. Some of the species that inhabit the wetlands of the Santa Ana River Watershed have become imperiled due to the reduction of habitat and habitat value. However, it has been demonstrated that with restoration and management populations of certain of these endangered and sensitive species can be improved. SAWA will specifically target certain of these species for management in conjunction with habitat restoration.

SAWA and its constituent agencies have been restoring habitat and managing wildlife populations in the Santa Ana River Watershed for many years. Since the formal beginning of SAWA in 1996, more than 3,500 acres of non-native invasive plants (predominantly giant reed and tamarisk) have been removed, the formerly infested acreage has been monitored, and re-treated as needed to eventually eradicate these species. A minimum of 2,000 acres of the floodplain that was formerly dominated by low-value invasive species is covered in native wetlands today. This significant increase in high value habitat has greatly benefited wildlife, particularly neotropical migrant birds in the Santa Ana River Watershed.

Additional benefits have resulted from management done in conjunction with the control of invasive plants. Certain species of non-native vertebrates like the brown-headed cowbird are extremely harmful to native species and are managed in association with endangered species monitoring to ensure no harmful effects to listed species. Approximately 85,000 cowbirds have been removed from the Santa Ana River Watershed since 1986. In 1986 there were only 16 pairs of vireos reported breeding in the Santa Ana River Watershed. With the management and restoration provided by SAWA and its constituent agencies, there were over 1,000 vireo territories in the Santa Ana River Watershed in 2008.

Recovery of native riparian habitat and endangered species is possible on a watershed scale given the continued activities of SAWA.

5. Ownership Arrangements.

It is necessary to control invasive species from the top of the watershed down particularly for those species, such as giant reed, which reproduce vegetatively. If any areas are skipped due to the lack of ownership they become source material for heavy re-infestations downstream following high flow events, ruining some of the prior efforts, wasting major efforts and funding. It will not be possible for SAWA to obtain fee title or easements on the thousands of acres under restoration, management, and monitoring in the Santa Ana River Watershed. Those acres will be set aside to be addressed with the appropriate resource conservation district (RCD). SAWA will work closely with the RCD to develop landowner relationships to ensure future access. Eventually, most landowners have given SAWA permission to control invasive species on their property; slightly fewer have been positive about SAWA growing endangered species populations on their property. However, natural succession has led to re-vegetation of all of the invasive control sites that have been under treatment for a minimum of three years. Once the habitat grows back, the birds move in, including the vireos.

Where willing landowners are encountered, and where feasible, SAWA will attempt to obtain access, conservation or wildlife easements on their properties. Strategically, attempting to obtain conservation easements on private land is not always a preferred strategy because landowners are often leery of creating "permanent" features that may limit the future uses of their land. SAWA will attempt to reach agreement with large landowners such as the Riverside County Water Conservation and Flood Control District. It may be possible to convince them of the benefit of SAWA's efforts where their goals overlap. However, it may also be necessary to offer them a tangible benefit for allowing SAWA to continue working their property. Such an agreement would comprise acknowledgement by the county agency that the habitat and wildlife values resulting from SAWA's work are protected under various laws and statutes that they would be in violation of in the event damage results from their activities.

Information on the impacts of giant reed, other exotic plant life invasion and the importance of natural open space and wildlife is disseminated in regular reports, brochures, newspaper articles, information sheets, fliers and announcements to keep agency personnel and the public informed and involved. Our monthly meetings are open to the general public and the cities, counties, agencies, and interested non-governmental organizations are specifically invited and sent copies of agendas and meeting minutes.

The biological monitoring for the giant reed removal efforts is focused upon listed species but includes other rare and sensitive species as well. Status updates of many sensitive species are provided on handout sheets that are modified as new information is obtained. Examples include status sheets or brochures on the willow flycatcher, cactus wren, orange-throated whiptail and Santa Ana sucker.

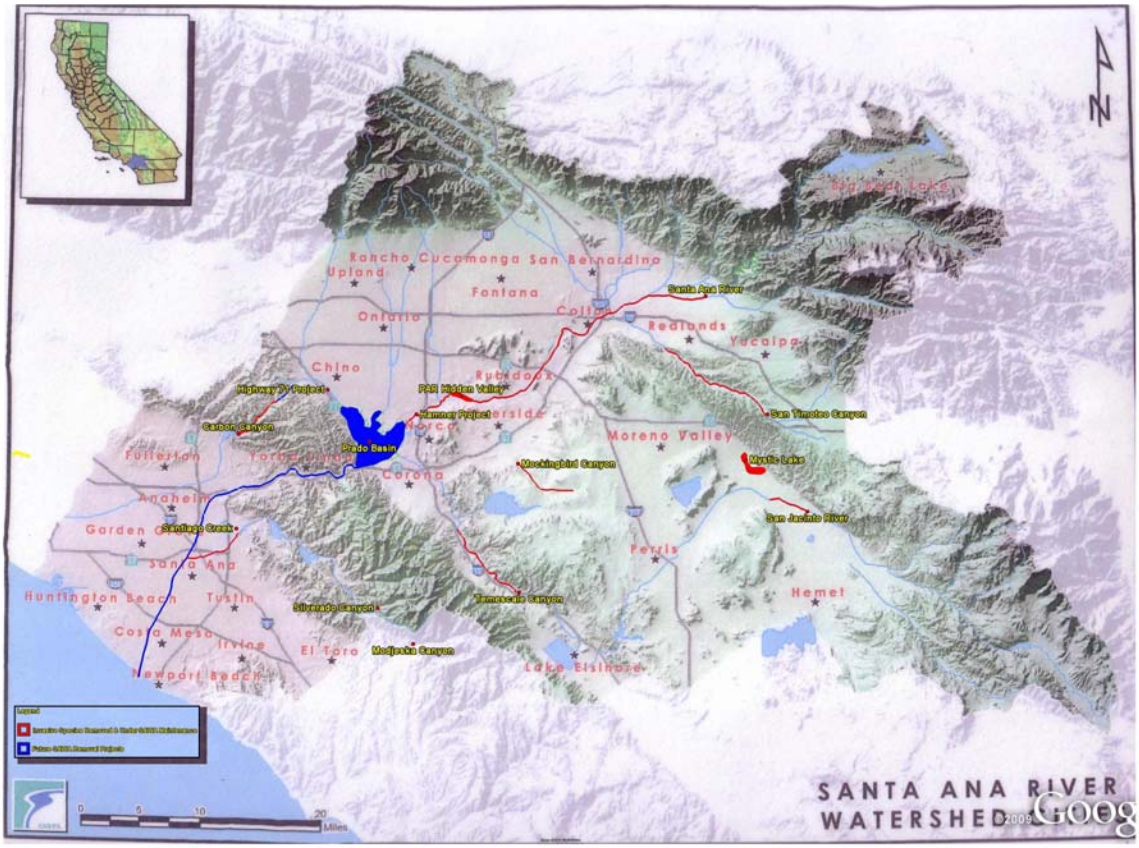
6. Qualifications.

SAWA has been working in the watershed since 1996. The RCDs and OCWD have been engaged in related activities for many prior years. SAWA has raised approximately $35,000,000—half in grant funding and half in mitigation funding—and applied it to resource recovery in the Santa Ana River Watershed. SAWA has invasive species under control on more than 3,500 acres of the Santa Ana River Watershed and is in the process of recovering endangered species, such as the vireo, as a result of our efforts. SAWA has established a reputation as the go-to agency in the Santa Ana River Watershed for restoration, mitigation, wildlife management and monitoring.

7. Geographic Service Area and Summary of Work.

The geographic service area for the Santa Ana River Watershed ILF Program shall include approximately 3,200 square miles of river floodplain, tributaries, and associated areas within the Santa Ana River Watershed from the San Bernardino Mountains, San Gabriel Mountains, San Jacinto Mountains, Santa Ana Mountains, to the Pacific Ocean including the Santa Ana River and all major and minor tributaries in the California counties of San Bernardino, Riverside, Los Angeles, and Orange. Detailed descriptions of these major areas and their conditions may be found in Appendix C: Geographical Areas and Conditions in the Santa Ana River Watershed.

Figure 1: Geographic Service Area for the SARWILFP and Future Project Areas



Primary threats to aquatic resources within the Santa Ana River Watershed include past and ongoing loss and degradation of native habitat; approximately 90 percent of the wetland habitat in the Santa Ana River Watershed has been lost; non-native invasive plants have taken over about half of the remaining wetlands resulting in greatly increased threat of fire, greatly reduced wildlife values, and increased flooding issues, particularly from the giant reed breaking off and forming huge debris dams; non-native vertebrate and invertebrate species are wreaking havoc as competitors and predators of native species; the relative lack of natural resources management to counteract some of the effects of human-induced impacts on the wetlands; lack of public awareness and stewardship of wetland resources; illegal human encroachment into the floodplain; and continued availability and quality of water.

It is SAWA's goal to maximize aquatic resources in the SARW for wildlife and people by controlling invasive species, managing and monitoring native wildlife populations, and by educating and involving the public in our efforts. The major efforts on controlling non-native plants have been undertaken with grant funding, but the necessary follow-up treatment on the removal sites is not covered by the grants. Giant reed in particular takes five years or more to finally eradicate because of the huge root masses that continue to sprout. Funds provided through the SARWILFP are essential for follow-up treatment of areas initially taken on through grants and to continue the giant reed eradication march to the sea. In the process of controlling invasive plants, SAWA monitors wildlife populations to be certain that the effects of the activities are beneficial to wildlife. To further protect native species, SAWA engages in control

of additional non-native species such as the brown-headed cowbird. One of the member agencies of SAWA, OCWD, has a water right to a minimum of 42,000 acre-feet of water annually at Prado Dam in the lower middle of the watershed. When available, that quantity at a minimum will always flow from northern Riverside County through the dam and into the lower river. Along the way the water will continue to support habitat and wildlife. In addition, the removal of giant reed results in a minimum of 3.75 acre-feet of additional water in the river annually for every acre of giant reed removed. SAWA staffs engage the public to gain access to private property for giant reed removal, nesting bird monitoring, and cowbird trap placement. They are vigilant for un-permitted activities that affect habitat or species and notify the appropriate regulatory agencies in an effort to end those activities and repair any damage. There have been many instances of uncooperative landowners becoming advocates, including several landowners in Mockingbird Canyon, who now allow SAWA to place cowbird traps on their properties. We also reach out to the public at our interpretive center at the Inland Empire Utility District's Chino Wetlands and Educational Park with tours and an educational program for school children.

The aquatic resource goals and objectives of the SARWILFP are to continue the restoration of wetland habitats in the watershed primarily through the control of invasive species, to monitor and manage habitat and native species, and to involve the public. The ultimate goal of SAWA is to restore and manage habitat and species on a watershed-wide basis. This will be accomplished from current project sites downstream. The very next acre required for mitigation will be accomplished at the downstream end of the last acre accomplished for mitigation. All of the upper tributaries of the watershed have been cleared, are being monitored for regrowth, and treated as needed. The river has been cleared and is under management down to the vicinity of Hidden Valley in Norco. ILFs that are appropriate for use to continue restoration of areas that were initially cleared with grant funds will be applied to a specific acreage and location on the upper river or tributaries, whichever location is appropriate. ILFs that need to be spent on initial removal of giant reed and long-term maintenance will be applied to the next downstream untreated acre. We have more than 3,500 acres of formerly weed infested floodplain under management for ongoing giant reed control; only the most recent, downstream areas require a lot of effort to maintain. There are an estimated 2,000 acres of giant reed left to be controlled in the watershed. SAWA is planning to convert the entirety of that acreage to native wetlands over time. The vast majority of the restoration will result in willow riparian habitat with a minor component of fresh water marsh dominated by reeds, cattails and bulrushes.

The highest priority restoration areas will be those located just downstream of the most recent restoration project whether it involves initial removal of giant reed or ongoing maintenance in a former removal site. Because the Corps and other Regulatory Agencies are still requiring "creation" of some applicants, the SARWILFP will continue to negotiate with the Corps to offer creation credits in the Prado Basin with the conversion of Eucalyptus forest to native riparian habitat. The applicant will be required to purchase the land from the federal government but the price we are attempting to negotiate with the Corps would be the cost of improvements on the land. So, it would be in-kind and not additional to the cost of the restoration.

The long-term viability of the habitat restored to date through this program is entirely dependent upon enforcement of applicable laws that protect wetlands and provide flood control. The flood-

conveying channels, streams, and rivers of the SARW have been so greatly encroached upon that they are tenaciously scrutinized by the flood control agencies for any new encroachment. The water carrying capacity of the watershed has been so impaired that no additional reduction of the floodplain areas can be tolerated simply from a flood conveyance perspective. There have been minor issues with violations but they are dealt with by wildlife agents, the Corps, and the flood control agencies. Most of the private landowners in the floodplain have no interest in giving or selling wildlife easements. Where a landowner is receptive, we will attempt to get easements to add further protection to the restored areas.

In cases where the private landowners are not cooperative in allowing access to the invasive species on their property, we work with the resource conservation district (RCD) serving the landowner and develop the trust needed to enter and conduct removal efforts on their land. Personnel will work closely with the RCD staff in providing public outreach relating to the impact of invasive species and the potential fire hazards. This direct interaction is effective in developing a trusting relationship which will lead to obtaining permission for access. We have in the past and will continue to offer to replace the invasive species with drought tolerant plants to provide the privacy the landowner is concerned with. In the San Gabriel Mountains and the San Bernardino Mountains, the majority of the land is owned by the U.S. Forest Service, in which they have a National Environmental Policy Act (NEPA) permit in place to remove the invasive species. We will continue to collaborate with U.S. Forest Service staff to abide by the specific methodologies itemized in the NEPA permit to removal the invasives on site. Had we been impaired by the necessity of only working on public lands or easements, we never would have achieved the cleanup of the upper half of the watershed. We are working with county agencies that own land to develop agreements concerning habitat protection on their property which is the largest remaining piece to be treated. However, if the work is to be denied except on land owned or under easement to SAWA, the restoration of an entire watershed, with which we are halfway done, will not be possible.

SAWA came into existence through an agreement signed by the Corps, USFWS, and OCWD. The Corps and USFWS continue to be routinely involved in the watershed restoration activities, as do the CDFG, California State Parks, RWQCB, Riverside County MSHCP (the MSHCP biological monitoring staffs are on SAWA's payroll), and others. SAWA has worked with hundreds of private landowners. In one project area alone in Orange County in the Santiago Creek Watershed, SAWA contacted 179 property owners to inform them of the problems caused by giant reed and gain access to their properties to remove giant reed and restore habitat. Other partners include the counties of Orange, Riverside, and San Bernardino, the Cities of Norco, Corona, Riverside, Brea, San Bernardino, Redlands, Santa Ana, Huntington Beach, the Santa Ana Watershed Project Authority (SAWPA), among many others. SAWPA is a joint powers authority formed by and consisting of representatives from the five water-management agencies in the watershed. SAWA has partnered on projects with Congressman Calvert, the Corps, Bureau of Reclamation, the Municipal Water District (MWD), California Department of Transportation (Caltrans), City of Riverside, Counties of Orange, Riverside, and San Bernardino, City of Irvine, City of Calimesa, Orange County Transportation Authority, Southern California Regional Rail Authority, City of Los Angeles Department of Airports, Nature Conservancy, the Irvine Company, Boy Scouts of America, OCWD, Riverside County Transportation Department, San Bernardino County Association of Governments, Orange County Conservation Corps, and

65 private development and consulting firms. SAWA prides itself on the ability to work well with local people, something that is absolutely essential in dealing with giant reed on thousands of acres of land. The foundational organizations of SAWA, the RCDs, are comprised of individuals who know their neighbors and how to compel them to participate in these restoration efforts. People are drawn to the table with SAWA because of the myriad issues associated with the pervasion of giant reed and associated weeds. Whether their priority is flood control, wildlife, water quality, outdoor recreation, debris issues, or fire threat they see a need to be a SAWA partner. SAWA's partners provide input at monthly meetings, on the Web site, through written or verbal comment on the annual workplan goals and annual reports. Their review helps give SAWA direction.

SAWA intends to survive as a habitat restoration, wildlife management, environmental information-sharing organization in perpetuity. The organization was conceived upon the realization that Southern California's wetland resources cannot survive without proper management. For many years traditional mitigation was practiced in the watershed, hundreds of trees were grown in the floodplain to compensate for wetland losses. All but very few of the mitigation sites restored on the mainstem of the river in the 1980s and 1990s do not exist as native habitat today. They were scoured, became sediment deposit sites, or were taken over by giant reed. It became apparent that the judicious use of mitigation funds in the watershed would be to support long term maintenance of resources by focusing upon preserving and restoring the river's functions on a watershed scale and decadal timeframe. Maximizing wetland resources in the watershed can be achieved most efficiently through natural succession when that process is not hampered by landscape-scale alterations of the environment such as the presence of a super-competitor like giant reed.

The fees collected for mitigation work are structured to fund long-term maintenance. About one-fourth of the $35,000,000 raised by SAWA is still in the bank in interest bearing accounts and investments. SAWA's goal is to build a non-wasting endowment over time. Long-term management fees are determined using a formula based on intensive initial removal and maintenance for a number of years and then a gradual decrease in intensity of the operations over time. See Appendix B.

SAWA biologists deploy throughout the watershed, monitoring restoration sites and wildlife populations, and collaboratively providing oversight of the status and abundance of the watershed wetlands. We have worked cooperatively with CDFG game wardens, FWS law enforcement officers, Streambed Alteration Agreement Program staffs, and various additional agencies with property and other regulatory responsibilities throughout the watershed to safeguard natural resources. SAWA holds annual meetings with agencies that have maintenance responsibilities that could affect wetlands or sensitive species to help them plan for the least damaging techniques and timing. We are vigilant for un-permitted activity in the watershed and seek to help rectify such activities.

SAWA publishes an annual report that documents the activities for that calendar year including income; expenditures; watershed map showing project locations; status of work on each project site; expenditures per project site; before and after pictures of each restoration site; a summary of all of the biological monitoring activities (individual reports are periodically published on the

annual endangered bird monitoring and study, raptor inventories, winter and breeding bird studies, herpetological investigations, and special studies); a summary of the educational program activities and scientific meeting participation and presentations; and a summary of GIS database. In additional to the annual and periodic reports, SAWA tours the regulatory agencies annually or as requested to visually inspect the individual project sites. In the process of annual reporting, review of progress is made in partnership with the Regulatory Agencies and the restoration approach is modified as needed in the next Annual Work Plan.

8. Recordkeeping and Financial Management.

SARWILFP will maintain accurate records of the ILF Program fund expenditures including a spreadsheet identifying monies accepted for each project, Corps file number, impact location and acreage, type of mitigation required, type of habitat and species impacted, required mitigation acreage, ILF amount, date of Corps letter approving acceptance of ILF, and date monies were received. A further breakdown of ILF expenditures including cost of land acquisitions, project planning, construction, monitoring, maintenance, contingencies, and administration will be identified in the annual report. The SARWILFP fund account will be a separate account with individual sub-accounts dedicated to specific project areas. The long-term management portion of the fees will be pooled and invested to maximize return.

SAWA is audited each year by an independent auditing firm and these documents are presented publicly each year the board of directors and are available for review by all interested agencies.

APPENDIX A:
Scope of Work and Methods Employed by SAWA Under the ILF Program

Arundo is a genus of tall perennial grasses that includes six species native to the warmer regions of the Old World. Giant reed is the largest member of the genus and one of the largest living grasses. Giant reed is native to Europe and is found associated with abundant fresh water in the Mediterranean region. It was purposely introduced to California in the 1820s when it was planted along the banks of drainage canals in the Los Angeles area for erosion control. Giant reed was also used as thatching for roofs and fodder for domestic animals. It came to California without the natural controls found in its native land and took over many streams and other areas where water is abundant near the surface. Giant reed reproduces vegetatively, with new stalks sprouting from roots and from pieces of stalk, generally larger than 12 inches, which root and grow new plants. Stalks break under high flows and replant themselves downstream. Giant reed is reported to grow up to 3 inches per day under optimal conditions.

Several techniques and types of tools and equipment have been used to remove giant reed including: removal by hand using loppers, chainsaws, brush cutters, tractor-mounted mulching mowers, arm-mounted tractor/cutter and other approved power equipment. Care is taken to minimize impacts to native habitat that could result from the transport of personnel and equipment and from removal activities. Where removal is by hand, stockpile areas are established in order to chip the stalks after surgical, biologist-supervised removal from sensitive habitat. Small piles of cane no higher than 3 feet can be left in areas where access is poor as long as the piles are above the high water line and dried. In most areas the material is chipped and either scattered onsite or removed to be used as mulch elsewhere.

The methods used for treating giant reed stands are different, depending on the makeup of the stands. Pure stands of invasive plants containing only non-native plants can be tackled with heavy equipment. Impacts to any associated native plants are mitigated because even a few spindly willows, *Salix* spp. will fully leaf and repopulate the site once the competition is removed. Mixed stands of invasive plants occur in or among willows, cottonwoods (*Populus fremontii*), and mule fat (*Baccharis salicifolius*). No removal or spraying of native vegetation is allowed. All native plants and animals are protected from damage by equipment, personnel, and all other giant reed-control activities. Native shrubs and trees may be trimmed to provide access and to protect them from incidental spraying with herbicide but only under close supervision by a qualified field biologist. Hand-removal is the only method allowed in mixed stands or if there are sensitive species in the area.

Giant reed control on the Santa Ana River starts with biomass reduction and removal. The canes are chipped in place, where possible, to pieces smaller than 6 inches. The chips make good mulch and are too small to sprout. The roots are left in place to avoid the major excavation that would be required to remove them. New growth is allowed to get 4 to 6 feet tall, and then is sprayed with a systemic herbicide “Rodeo” (glyphosate is the active ingredient) which is taken in through the herbage to the roots. Over years and re-treatments the huge root masses are eventually dried out and rendered unable to support new plant growth. “Rodeo” that is not taken into a plant degrades to water and other harmless ingredients within 48 hours. Giant reed will re-sprout and the new growth will be treated repeatedly for many years.

Usually the native riparian forest reclaims treated areas over time. The riparian plant species that occur near active channels, such as willow (*Salix* spp) and cottonwood (*Populus* spp), are very flexible and these plants have the ability to resprout after scouring or damage; flexibility helps minimize damage during high flows. Because establishment by seed in riparian areas is difficult, it is advantageous for a broken plant to be able to regenerate and utilize the energy stored in its established root system. If plants are damaged, they must be able to recover quickly to survive subsequent high-flow events. Rapid recovery also ensures that the plant will outcompete new colonizing plants (Fischenich & Copeland 2001). Due to the nature of unstable velocities and scouring of the tributaries, replanting is discouraged as natural succession has proven to be prolific in several riparian project areas.

As re-sprouting of invasives diminishes and giant reed eradication approaches in an area, the need for riparian re-vegetation is assessed. We recommend only local and limited re-vegetation efforts when dictated by special needs, such as in situations where immediate erosion control is needed. The river dynamics have led to the expansion of the riparian forest into areas released from competition with invasives. For example, On San Timoteo Creek, removal efforts began in 1997 and eventually 230 acres of giant reed were removed. On the main stem where areas greater than 5 acres are covered 100 percent in giant reed, it may be beneficial to replant thickets of native riparian trees to aid in faster natural colonization. However, care must be taken as to the location and timing of such efforts or the re-vegetation and eradication efforts could conflict.

Achieving total eradication of giant reed in some parts of the Santa Ana River Watershed will take decades. Giant reed control started in the upper watershed and continues downstream because giant reed invades by pieces washing down and sprouting in moist soil. Giant reed seeds are sterile in our area, so that the spread of giant reed has been entirely by vegetative means in the watershed.

The field biologist responsible for each removal site must approve the equipment to be used at that site. The biologist meets daily and as often each day as required by site conditions with the work crew to coordinate avoidance of sensitive species. Endangered nesting birds are not approached closer than 100 meters. CDFG recommends that the nesting birds not be approached closer than 300 feet. Their territories are avoided and revisited for completion of giant reed removal only after nesting has been completed.

SAWA took on its first major project in 1997 with giant reed removal in San Timoteo Creek, a 14-mile waterway in the upper watershed. The removal effort presented numerous challenges, including 40-foot vertical banks, difficult road access, endangered animals, and a multitude of marginally cooperative landowners. The biomass removal concluded in 2001 but monitoring and treatment continue today to ensure eventual, total eradication. In 2009, more than 95 percent of the treatment area has become native riparian woodland through natural succession. The success of this project demonstrated the ability to deal effectively with giant reed and that removal of the non-native, invasive species results in the regrowth of native habitat.

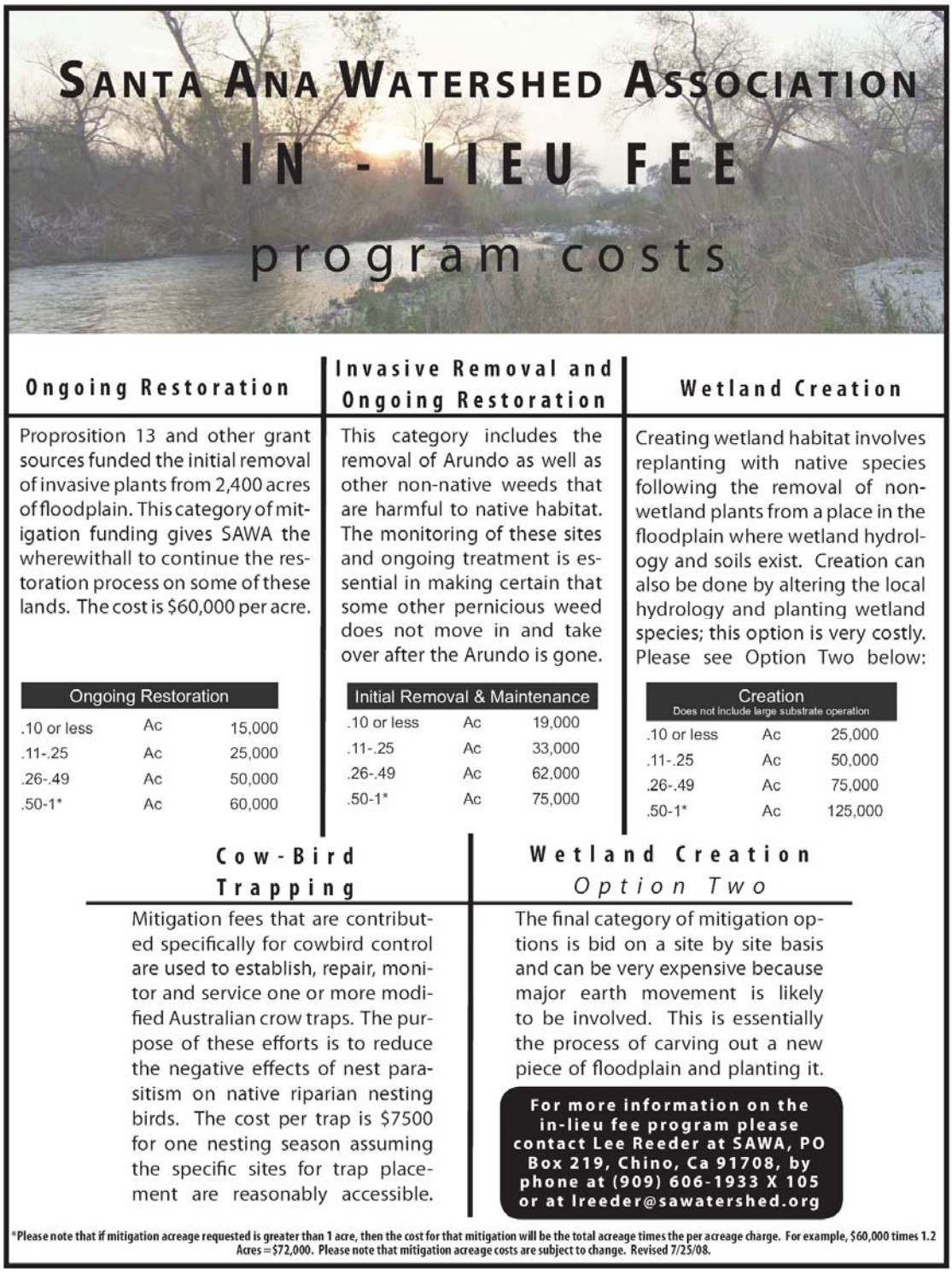
As funding became available, additional projects were started at the top of the watershed and tributaries, working systematically toward the ocean. In 2006, SAWA was working on 42

different removal projects. In 2009, initial phases of most of those projects are completed and 3,500 acres of former giant reed-infested floodplain is under ongoing management.

In addition to invasive plant removal, SAWA biologists monitor, manage and report on wildlife that could be affected by the restoration activities. Annual surveys, studies, and other efforts include watershed-wide monitoring of nesting endangered birds including the least Bell's vireo, *Vireo bellii pusillus*; control of exotic vertebrates, most notably the nest-parasitizing brown-headed cowbird, *Molothrus ater*; winter and breeding bird surveys in pre-treatment, treatment, and post-treatment areas; systematic trapping and inventory of reptiles and amphibians; formalized raptor surveys; native fish work including removal of non-native aquatic species; and inventory and investigation of sensitive species. Cowbird trapping is offered a separate mitigation and as part of ongoing restoration mitigation.

SAWA partnered with the Inland Empire Utilities Agency (IEUA) on a 20-acre wetland park in Chino where SAWA has its main office and educational facility and tracks the progress of the wetland restoration there as well as its colonization by wildlife. The goal of the fledgling education program is to reconnect people with the natural world. Any funds used to facilitate public outreach efforts at this location or any other satellite office are derived from management contracts, grants and donations, separate from this ILF Program.

APPENDIX B:
In Lieu Fee Program Costs Flyer



SANTA ANA WATERSHED ASSOCIATION

IN - LIEU FEE

program costs

Ongoing Restoration

Proprosition 13 and other grant sources funded the initial removal of invasive plants from 2,400 acres of floodplain. This category of mitigation funding gives SAWA the wherewithall to continue the restoration process on some of these lands. The cost is $60,000 per acre.

Ongoing Restoration		
.10 or less	Ac	15,000
.11-.25	Ac	25,000
.26-.49	Ac	50,000
.50-1*	Ac	60,000

Invasive Removal and Ongoing Restoration

This category includes the removal of Arundo as well as other non-native weeds that are harmful to native habitat. The monitoring of these sites and ongoing treatment is essential in making certain that some other pernicious weed does not move in and take over after the Arundo is gone.

Initial Removal & Maintenance		
.10 or less	Ac	19,000
.11-.25	Ac	33,000
.26-.49	Ac	62,000
.50-1*	Ac	75,000

Wetland Creation

Creating wetland habitat involves replanting with native species following the removal of non-wetland plants from a place in the floodplain where wetland hydrology and soils exist. Creation can also be done by altering the local hydrology and planting wetland species; this option is very costly. Please see Option Two below:

Creation Does not include large substrate operation		
.10 or less	Ac	25,000
.11-.25	Ac	50,000
.26-.49	Ac	75,000
.50-1*	Ac	125,000

Cow-Bird Trapping

Mitigation fees that are contributed specifically for cowbird control are used to establish, repair, monitor and service one or more modified Australian crow traps. The purpose of these efforts is to reduce the negative effects of nest parasitism on native riparian nesting birds. The cost per trap is $7500 for one nesting season assuming the specific sites for trap placement are reasonably accessible.

Wetland Creation *Option Two*

The final category of mitigation options is bid on a site by site basis and can be very expensive because major earth movement is likely to be involved. This is essentially the process of carving out a new piece of floodplain and planting it.

For more information on the in-lieu fee program please contact Lee Reeder at SAWA, PO Box 219, Chino, Ca 91708, by phone at (909) 606-1933 X 105 or at lreeder@sawatershed.org

*Please note that if mitigation acreage requested is greater than 1 acre, then the cost for that mitigation will be the total acreage times the per acreage charge. For example, $60,000 times 1.2 Acres = $72,000. Please note that mitigation acreage costs are subject to change. Revised 7/25/08.

APPENDIX C:
Geographical Areas and Conditions in the Santa Ana River Watershed.

Overall Summary
The Santa Ana River and its tributaries have been largely channelized and dammed to provide flood protection for the growing human population. There are many lakes, reservoirs, and dams on the tributaries including Santiago Dam, Villa Park Reservoir, Brea Dam, Fullerton Dam, Prado Dam, Carbon Canyon Dam, San Antonio Dam, Lake Hemet, Railroad Canyon Lake, Lake Elsinore, Lake Mathews, Big Bear Lake, and Baldwin Lake. Seven Oaks Dam is situated on the mainstem, near its emergence from the San Bernardino Mountains and captures about 7.2 percent of the total watershed. Prado Dam is located near the middle of the mainstem, capturing 52 percent of the watershed.

The base flow of the Santa Ana River continues to increase because of continuing urbanization. A minimum base flow of 42,000 acre-feet per year was adjudicated in 1969 as a result of litigation between OCWD and Chino. This flow rate is measured at Prado Dam and was based upon historical averages. However, rapid urbanization has resulted in increasing discharges of high-quality tertiary treated water from the many treatment plants located along the river. In 1999, the base flow had increased to 140,000 acre-feet and is projected to rise to 230,000 acre-feet by 2020.

Upper Santa Ana River/San Bernardino Mountains
Flows in the upper Santa Ana River are perennial in an average year to the diversion for the Edison Power Plant near the canyon mouth. They are generally seasonal to the City of San Bernardino but become perennial again through the City of Riverside and below due to increased urbanization and runoff. Oceanic tidal influence extends about 1.5 miles up the river channel.

Water quality in the mountain portion of the watershed is excellent, with low concentrations of total dissolved solids, nitrates and other pollutants. Although elevated levels of total coliform and silt have been identified with storm flows, water quality exceeds the state standards set for the identified beneficial uses of the water. The water quality generally decreases, and turbidity increases with distance from the mountains. Multiple water reuse becomes a more dominant factor. The river courses through a large dairy preserve. Treated municipal wastewater is discharged into the river at many points between Riverside and the Prado Basin.

Water from the upper tributaries contributes to municipal and domestic supplies, agriculture, groundwater recharge, hydropower generation, water-associated recreation, and wildlife resources. The primary human uses of the water along the entire course of the river are municipal and industrial. Flows that reach Prado Dam are used to recharge the groundwater basin and provide water to more than two million residents along the 30 miles of river below the dam.

The combined average annual discharge in the mainstem at the canyon mouth below Seven Oaks Dam was 83.2 cubic feet per second (cfs), or 60,280 acre-feet for 86 years of record (excluding Warm Springs Canyon). The minimum and maximum records at this upper location were 7.4 cfs (1971) and 53,700 cfs (1891). River flows, near Riverside, were estimated by the U.S. Geological Survey (USGS) at 320,000 cfs during the 1862 flood. On the west side of the upper watershed, the flows in Lytle and Cajon Creeks are intermittent. The combined average discharge of the creek near Fontana (for 79 years of record) was 45 cfs, or 12,600 acre-feet per year. The maximum, recorded flow was 35,900 cfs (1969).

The uppermost tributaries of the watershed cut through chaparral, southern oak woodland, and pine forest. At the higher elevations, the willows are shrubby. The common conifers include white fir (*Abies concolor*), Jeffrey (*Pinus jeffreyi*), sugar (*P. lambertiana*), and lodgepole (*P. contorta*) pines, along with incense cedar (*Calocedrus decurrens*) and bigcone spruce (*Pseudotsuga macrocarpa*). Most of the work associated with the SARWILFP will occur below the pine belt, in the floodplain proper, and within a few miles of the upper tributary canyon mouths to the ocean. However, non-wetland habitat adjacent to wetlands tends to provide an ecological extension for wetland wildlife for foraging, cover, and in some cases nesting. Native cover on the edge of the wetlands is very important as habitat as well as a buffer.

The Santa Ana River has an average gradient of about 240 ft/mile in the mountains, 20 ft/mile near Prado Dam, and 15 ft/mile downstream from Prado. The average gradient of the tributaries is about 700 ft/mile in the mountains and 30 ft/mile in the valleys. The upper river and tributaries course around large boulders and over sand and gravel bars. Riffles and shallow pools to about 6 feet deep occur regularly. The banks are generally vegetated in the upper, narrower portions of the waterways and intermittently so, in the wider, more active channels near the canyon mouths. Common bank cover and overhang in the canyons includes watercress (*Rorippa nasturtium-aquaticum*), bulrushes (*Juncus* spp.), nut-grasses (*Cyperus* spp.), white sweet clover (*Melilotus alba*), mule fat (*Baccharis salicifolia*), and occasional willows (*Salix* spp.), with local stands of white alder (*Alnus rhombifolia*) and cottonwood (both Fremont's, *Populus fremontii* and black, *P. balsamifera*).

Where the waterways emerge from the mountains, the floodplains are broad, boulder-strewn, sand and gravel washes. The low-flow channels are well-defined and the dominant vegetational cover is comprised of low- to medium-density shrubs. This specialized shrubland habitat, known as alluvial scrub, was historically scoured by sheet flows during floods, once every two to 20 years. There is little bank or overhang cover for fish on these huge deposits of alluvium. The scouring action of water and winds kept soil nutrients low and weeds scarce. This unique habitat is home to three endangered species, the San Bernardino kangaroo rat (*Dipodomys merriami parvus*), the Santa Ana River woolly star (*Eriastrum densifolium sanctorum*), and slender-horned spine-flower (*Dodecahema leptoceras*).

The flow through the alluvial scrub is seasonal. Between the cities of San Bernardino and Riverside, the river picks up enough urban discharge to support perennial flow and productive riparian habitat dominated by willows. The quality of the fish habitat also increases greatly and there are recent records for the occurrence of native fishes including the federally listed, threatened Santa Ana River sucker (*Catostomus santaanae*). The other native species recorded

from several, scattered localities are the arroyo chub (*Gila orcutti*) and more rarely, the speckled dace (*Rhinichthys osculus*). The common fish of the river system are nonnative species.

From the vicinity of the City of Riverside to the Prado Basin, there is lush riparian growth, overhanging willows, occasional floating and emergent vegetation along the edges, and perennial flow in an often broad, flat, sandy-bottomed channel. There is fair habitat for warm-water fishes but the plethora of introduced species has taken a heavy toll on the natives. Additionally, holes, overhang, backwater, and riffle have been greatly reduced by sedimentation greatly accelerated by urbanization. Furthermore, giant reed has taken over many thousands of acres of riparian habitat, significantly diminishing bank quality for fish and reducing shade. Removing exotic weed species in this region would restore the ecosystem to its natural state; however, we recommend only local and limited re-vegetation efforts dictated by special needs and would take into consideration the location and timing of such efforts so eradication efforts would not conflict.

Lytle Creek Subwatershed/San Gabriel Mountains

Lytle Creek is 6 square miles of unincorporated community in San Bernardino County. It is approximately 15 miles northwest of the City of San Bernardino and 10 miles from the cities of Fontana and Rialto. This small, remote community is located in a large southeast-trending canyon on the eastern portion of the San Gabriel Mountains completely within the boundaries of the San Bernardino National Forest.

The high winter flows on Lytle Creek keep the riparian habitat in a fairly young successional stage. Habitat persists along side drainages, particularly along two that come into Lytle Creek from the west near the canyon mouth, and the toe of the slope. A white alder stand along 600 feet of the channel was composed of 198 live and 22 dead alders. A slope grove of 49 young sycamores occurred just above the alders. Other plants common in the side canyons included mulefat and willows with a locally dense understory of poison oak. There were a few local seeps on the slopes with dense tangles of wild grape (*Vitis girdiana*).

The Lytle Creek floodplain is open, sandy and boulder-strewn. A few higher floodplain terraces supported shrublands with moderate to extremely dense plant cover, whereas most of the floodplain was quite open. The side slopes were steep and densely vegetated. The open floodplain is periodically disturbed by earth-moving equipment; dikes are maintained for flood control and the watercourse is kept to the west side of the floodplain by an artificially maintained low earthen berm. The plant cover that did occur on the open wash ranged from 1 percent to 5.5 percent with an average cover of about 3 percent (Feldmeth et al. 1985). From 95 percent to 99 percent of the ground along transects was unvegetated; 31 percent to 51 percent was sand, and 48 percent to 64 percent was rock. The common perennials in the broad wash included golden aster, white everlasting, California buckwheat, scale broom, mulefat, brickellia, and tarragon.

A total of 283 species of vascular plants was identified from the eastern side of the watershed along Lytle and Cajon Creeks. Of these, 13 species were cultivated, occurring only near home sites, and 58 species, or 21.5 percent of the flora, are non-native. A total of 117 species (43.3 percent of the flora) was detected in the wash, and 36 (30.8 percent) of these were non-natives; 132 species (48.8 percent of the flora) were observed in the terrace scrub and 19 (14.3percent) of

these were introduced species; 167 species (61.9 percent) were found in coastal sage scrub, of which 32 (19.2 percent) were non-native; 121 species (44.8 percent) were detected in chaparral, of which 17 (14 percent) were introduced species; 57 species (21.1 percent) were found in the slope woodlands, of which 9 (15.8 percent) were naturalized species; 135 species (50 percent) were observed in grassland, of which 30 (22.7 percent) were introduced; and 71 species (26.3 percent) were documented in disturbed areas, of which 27 (38 percent) were non-natives (Feldmeth et al. 1985).

Round-leaved boykinia was also observed in the Lytle Creek canyon, as was the Santa Ana River woolly star. Boykinia was observed in a few seeps along the canyon edge near its emergence from the mountains.

Scour has been infrequent enough to allow the persistence of terrace shrublands on the fringe of the creek low-flow channel. The shrubs on the terraces closest to the canyon mouth were more widely spaced and lower growing with local dominance of species such as California buckwheat, scale broom, yerba mansa, and goldenbush (*Ericameria linearifolia*). These open shrublands gradually transitioned into densely vegetated chaparral further up the canyon. Locally the terrace chaparral consisted of patches of dense chamise. Other dominants included scrub oak, interior live oak, holly-leaved cherry, honeysuckle, and manzanita (*Arctostaphylos glauca*). Silk tassel bush (*Garrya veatchii*) and flannel bush (*Fremontodendron californicum*) were locally conspicuous, as were stands and intermixed arborescent individuals of mountain mahogany. Plant cover in the terrace chaparral averaged 67.2 percent. Open areas occurred amidst the dense shrublands and were heavily vegetated with low-growing grasses and annuals including species of *Bromus, Festuca* (*Vulpia*), *Avena, Camissonia, Chaenactis, Cryptantha, Clarkia, Lotus, Lupinus,* and *Phacelia.*

Disturbed areas, as along the edge of Lytle Creek Road, were characterized by grasslands dominated by introduced weeds, intermixed with native annuals. Common genera of weedy species included *Bromus, Festuca (Vulpia), Avena, Erodium, Brassica, Hypochoeris, Centaurea, Salsola, and Picris.* Natives included *Lupinus, Lotus, Rafinesguia, Phacelia, Mentzelia, Cryptantha, Camissonia, Chaenactis, Clarkia,* and *Amsinckia.*

Most of the vegetation on the slopes of Lytle Creek was dominated by species typical of chaparral. The chaparral varied from less to most dense and tall, from a chamise-dominated type on drier sites, through a lilac-scrub oak type to an oak-dominated form on the most mesic sites. The chamise chaparral varied from nearly pure stands of chamise, to an association with species characteristic of coastal sage scrub, and the occurrence of other chaparral elements including honeysuckle, lilac, silk tassel bush, and poison oak. Total plant cover ranged from 83.5 percent to 94 percent with chamise contributing 33 percent to 62 percent of the cover. As the chaparral became woodier, species diversity increased greatly and local dominance by scrub oak and California lilac became apparent. Scrub oak and lilac associates included poison oak, bush snapdragon, interior live oak, elderberry, mountain mahogany, honeysuckle, buckthorn, coffeeberry (*Rhamnus californica*), bedstraw (*Galium angustifolium*), and wild cucumber (*Marah macrocarpus*). Plant cover in the scrub oak-lilac type chaparral varied from 68 percent to 127 percent. On the most mesic slopes, the chaparral graded to a type locally dominated by interior live oak, and there was an additional increase in species diversity. Common species

included those mentioned above, as well as toyon, holly-leaved cherry, silk tassel bush, virgin's bower (*Clematis lasiantha*), snowberry (*Symphoricarpos mollis*), California walnut (*Juglans californica*), sycamore, and ash trees (*Fraxinus velutina*). Plant cover in this most diverse of the chaparral types varied from 86.8 percent to 103.5 percent, and averages 98.6 percent.

Slope woodlands occurred along Lytle Creek on the most mesic of north-facing slopes. The two dominant species were canyon oak and big-cone spruce. Other associates included California bay (*Umbellularia californica*, a local dominant), big-leaf maple (*Acer macrophyllum*), poison oak, interior live oak, lilac, bush snapdragon, mountain mahogany, brickellia, toyon, holly-leaved cherry, gooseberry (*Ribes amarum*), and bush monkey-flower (*Mimulus longiflorus*). A variety of annuals occurred in the understory. Total plant cover varied only slightly from 105 percent to 105.8 percent.

Species typical of coastal sage scrub were not as abundantly dominant along the edge of Lytle Creek as they were near the mouth of the Santa Ana Canyon. Important species that were present included California buckwheat, California sagebrush, white sage, yerba mansa, and deerweed. Plant cover varied from 80percent to 120percent with an average value of 101.8percent.

San Jacinto Mountains

The San Jacinto River is in Riverside County. The river's headwaters originate in the San Jacinto Mountains and it flows through the San Jacinto Valley. The lower portion of the 765-square-mile watershed is urban and agricultural land and flows about 10 miles from its source to Lake Hemet, which holds 14,000 acre feet of water. Downstream of the dam, the river continues northeast passing though an area filled with citrus orchards and dairy and agricultural farms, until it discharges into Mystic Lake. Overflow from the river then flows southwest to Railroad Canyon Reservoir, or Canyon Lake, which has a capacity of 11,900 acre-feet. Downstream of Railroad Canyon Dam, the river continues flowing roughly southwest for about 3 miles until it drains into Lake Elsinore. The lake has very little outflow, but in rare cases of heavy rain events, it has overflowed into Temescal Creek which drains into the Santa Ana River near Prado.

Significant portions of the San Jacinto Basin are devoted to agricultural cropland and grassland, consisting of predominantly winter annual grasses, forbes, and subshrubs. Foothill vegetation consists mostly of evergreen species well adapted to withstand drought. Chaparral vegetation is dominated by chamise (*Adenostoma fasciculatum*) and scrub oak (*Quercus dumosa*). Coastal sage scrub type vegetation dominates the Santa Ana Mountain Range. Canyons and riparian sites produce oak (*Quercus* spp.), and cottonwood (*Populous fremontii*) trees. Above 5,000-foot elevation, the mountains are dominated by stands of Jeffery (*Pinus jeffreyi*) and Ponderosa pine (*Pinus ponderosa*) trees.

Mystic Lake is a natural, ephemeral lake that is fed mainly by the San Jacinto River. It fills during the rainy season and often dries up in summer. The lake soil is characteristically alkaline and supports many unique and isolated plant species. The most notable plant is the San Jacinto Valley Crown-scale (*Atriplex coronata var. notatior*) that is endemic and federally endangered. This species is also found in the upper Salt Creek vernal pool complex encompassing approximately 1,200 acres above Railroad Canyon Reservoir in the west Hemet area. The community is unique consisting of alkali scrub, playa, annual grasslands, and vernal pools.

Other species known to occur or likely to occur within the Mystic Lake Basin, which have adapted to the alkaline conditions include: navarretia (*Navarretia fossalis*), federally listed as threatened; thread-leaved brodiaea (*Brodiaea filifolia*), federally listed as threatened and state listed as endangered; Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*), identified by the California Native Plant Society (CNPS) as "seriously endangered in California;" Davidson's saltscale (*Atriplex serenana var. davidsonii*), identified by the CNPS as "fairly endangered in California;" Parish's brittlescale (*Atriplex parishii*), identified by the CNPS as "seriously endangered in California;" smooth tarplant (*Centromadia pungens* ssp. *laevis*), identified by the California Native Plant Society as "seriously endangered in California;" mud nama (*Nama stenocarpum*), identified by the CNPS as "fairly endangered in California;" and Wright's trichocoronis (*Trichocoronis wrightii var. wrightii*), identified by the CNPS as "seriously endangered in California." Evidence suggests that the San Jacinto Valley contains the world's largest concentration of Coulter's goldfields, and Mystic Lake has the only known population of mud nama in Riverside County. Parish's brittlescale is the most endangered saltbush in Southern California.

San Timoteo Canyon

San Timoteo Canyon is an ancient river valley that runs from south of Banning, California in San Bernardino County to a point just south of San Bernardino, California. The creek runs through the city of Redlands and Loma Linda where it converges with the Santa Ana River in San Bernardino. The creek runs through many parcels of private property. Access was is difficult due to the steep banks of the creek and endangered species territories such as the least Bell's vireo.

The San Timoteo Subbasin underlies Cherry Valley and the City of Beaumont in southwestern San Bernardino and northwestern Riverside Counties. The surface is drained by Little San Gorgonio Creek and San Timoteo Canyon to the Santa Ana River. Average annual precipitation ranges from 12 to 14 inches in the western part to 16 to 18 inches in the eastern part of the subbasin.

San Timoteo Creek has had 30 percent to 60 percent of the understory and younger trees removed three times now since 1997 by flood flows. As mentioned, this method works in the active channel of the creek. In areas out of the high watermark it has been observed that replanting is necessary. A dominant plant species such as California grape (*vitis californica*) has a tendency to out-compete with other native species, causing a monoculturistic plant community. It has been observed that re-vegetation is necessary in these areas. Inland Empire RCD will conduct revegetation projects in areas where diversity of native species is limited.

Species known to occur in San Timoteo Canyon include arroyo willow (Salix lasiolepis), mulefat (*Baccharis salicifolia*), black willow (*Salix goodingi*), red willow (*Salix laevigata*), mugwort (*Artemisia douglasiana*), elderberry (*Sambucus mexicana*), narrow-leafed willow (*Salix exigua*), Fremont cottonwood (*Populus fremonti*), wild grape (*Vitis girdana*), toyon (*Heteromeles arbutifolia*), mustard (*Brassica sp.*), shining willow (*Salix lucida spp. lasiandra*), Emory baccharis (*Baccharis emoryii*) black mustard (*Brassica nigra*), golden currant (*Ribes aureum*), four-winged saltbrush (*Atriplex candescens*), and box elder (*Acer negundo*).

Prado Basin

The riparian habitat along the Santa Ana River has been examined most intensively near mid-river, in the Prado Basin and environs, including a 7.5-mile reach of the river through the lower canyon, below Prado Dam (Zembal et al. 1985). Water flows through the Prado Basin but is regularly impounded for flood control and water conservation. Prado Dam was built in 1941 at the confluence of the river, Chino, Mill and Temescal Creeks to provide flood protection for Orange County. Prado Dam is located about 31 miles from the Pacific Ocean and the mouth of the river. About half of the flow of the river is diverted into 465 acres of constructed wetlands in the Basin. The wetlands remove nitrates, sediment, and improve the quality of the water.

About 4,400 acres of the 11,000 acres in the Prado Basin were comprised of various, vegetated riparian habitats, mostly willow woodland (Zembal et al. 1985). The quality, age, and coverage of the aerial photos available for analysis allowed only approximations of the extent of each habitat type. Of the approximately 1,800 acres in the canyon below Prado Dam, there was an estimated additional total of 340 acres of riparian habitat, assuming an average width of 400 feet of habitat for 7 miles. Most of the canyon riparian was willow and mixed woodland, with about 40 percent of the acreage in shrubby riparian and more scattered willows.

In examining the vegetation, a total of 311 species, belonging to 65 families of vascular plants, was identified from the project area. Species are listed along with annotations in the plant checklist in Zembal et al. (1985). Approximately 99 species, or 31.8 percent of the observed species, are most typically associated with floodplain and riparian habitats; 200 species, or 64.3 percent, are usually found on slopes and in upland habitats; and the remaining 12 species, or 3.9 percent, are often found in both upland and riparian situations. About 99 species, or 31.8 percent of the total, are introduced members of the flora and a small number of these are obvious escapes from cultivation.

Specimens of rare plants known from the general area (Smith et al. 1980) were examined from collection data at the herbaria at the University of California, Riverside, and the Rancho Santa Ana Botanic Garden. None of the 67 localities obtained from those specimens led to additional sightings of rare species in the project area. One rare species, many-stemmed dudleya (*Dudleya multicaulis*), had already been found in three small and widely separated stands. The first was comprised of about 25 plants, located on the rock and earthen wall just above and to the north of the west end of the dam-top road; the other totaled about 10 plants located on a vertical earthen bank along a foot trail just below the Raadhauge Pheasant Club. Many-stemmed dudleya is an endangered species and was most abundant on the northwest side of the spillway, where several hundred plants were found. The Santa Ana River woolly star was also looked for in the vicinity but was not found; neither was suitable habitat. The species was endemic to the Santa Ana River Canyon (Lathrop and Thorne 1978), but has apparently been extirpated there (Zembal and Kramer 1984).

The vegetated riparian habitat within the reservoir was mostly woodland and almost entirely willow woodland. Black willows (*Salix gooddingii*) were quite dominant, with an occasional stand of arroyo willow (*Salix lasiolepis*) or an infrequent Fremont's cottonwood, mostly along the past reservoir margins or on higher, less frequently inundated ground in the interior of the

basin. The data for the basin woodland are skewed toward a higher occurrence of arroyo willows because the sampling necessarily was accomplished near the basin edge. The percent of bare ground was relatively high for riparian habitat, and most of the low cover in the woodlands was from deadfall and litter. This and the local dominance of pure stands of cocklebur (*Xanthium strumarium* var. *canadense*) were apparently attributable to the periodically prolonged inundation of the habitat. There was only one small stand of sycamores found in the basin proper and but one general locality for coast live oaks (*Quercus agrifolia*). The sycamores, numbering about 30, were along the mid-south margin of the past reservoir and about 50 oaks grew in the draw bottoms above the west shore just north of the dam. The most extensive stand of cottonwoods observed in the basin was located near the oil pumping operation just south of the duck ponds. The low ground cover contributed by living plants increased in these higher elevation mixed woodlands. Like the sycamores and cottonwoods, scattered patches of shrubby riparian growth were widely spaced only along higher ground along the near-shore band. The openings in the woodlands were devoid of vegetation, covered with open water, or densely vegetated with very low-growing herbaceous species, particularly the fast-growing and locally dominant cocklebur. This was in contrast with the habitat along the river and creeks at just slightly higher elevations, where shrubby riparian growth was a regular component. Some of this shrubby riparian habitat was artificially maintained by periodic mowing of certain areas along the river; giant reed was proliferating in such areas. The only other locally extensive habitats in the basin bottom were snag fields and fresh or brackish water marsh. The snag fields usually occurred in low sumps and are open areas of standing dead tree trunks that varied from one to several acres in extent. The marsh habitat was locally dominated by cattails (*Typha* spp.) or reeds (*Scirpus* spp.), with scattered willows that became increasingly abundant locally, toward the nearshore margins and closer to the creek mouths.

Well-developed riparian woodland dominates the major tributaries and rivers of the watershed. There are perhaps 20,000 acres of wetlands in the watershed, most of them willow-dominated except where giant reed control has not yet been done. Lush willow woodland is continuous from below Mt Rubidou in Riverside, through the Prado Basin, and for about 7.5 miles below the dam in the lower canyon. The area below the dam contains some of the largest and oldest cottonwood stands found along the river. Large cottonwood stands can also be found on San Timoteo Creek, Temescal Creek, and scattered elsewhere along the mainstem. Alder groves are typical of the more mountainous sections of the river and tributaries, and oak groves are rare except on the tributaries, particularly at higher elevations because many of the higher terraces that would have supported oaks have been lost.

Lower Santa Ana River

The river runs through the Santa Ana Canyon below Prado Dam. It is partially channelized but supports good riparian habitat for about 7.4 miles. Below this stretch, from about Weir Canyon Road, the river is channelized and heavily manipulated for flood control and to spread and percolate water. Floodplain and bank vegetation is largely herbaceous and ephemeral. Plant cover that develops on deposited sediments at the river mouth regularly includes elements of the coastal salt marsh because of the tidal influence. The higher tides move about 1.5 miles inland and there is at least one record of a marine fish, the striped mullet (*Mugil cephalus*) reaching as far inland as the lower canyon.

A total of 290 species of vascular plants was identified from the upper Santa Ana Canyon and environs during studies of the environmental effects of the Seven Oaks Dam (Feldmeth et al. 1985, Zembal and Kramer 1984 and Zembal 1985, 1989). Of these, four were cultivated species and 48 species, or 16.8 percent of the flora is non-native. A total of 77 species (26.9 percent of the flora) was observed in riparian habitat, 24 of which (31.1 percent) were non-natives; 164 species (57.3 percent of the flora) were found on the floodplain terraces, of which 35 species (21.3 percent) were non-natives; 164 species (57.3 percent) were also found in chaparral, 20 (12.2 percent) were introduced; 145 species (50.7 percent) were found in the coastal sage scrub, 35 (24.1 percent) were introduced; and 61 species (21.3 percent) were present in ruderal habitat, of which 24 species (39.3 percent) were non-natives.

Two species of rare plants were identified from the upper Santa Ana Canyon, Santa Ana River woolly star (*Eriastrum densiflorum sanctorum*) and round-leaved boykinia (*Boykinia rotundifolia*). The woolly star, a California endemic, is on the federal list of endangered species. The current known distribution of Santa Ana River woolly star is along the Santa Ana River in the terrace shrublands of the floodplain in San Bernardino County (Zembal and Kramer 1984). Small stands occur in the Lytle/Cajon drainage area but most of the plants known to exist today occur between the Santa Ana River Canyon mouth and the former Norton Air Force Base. This covers a linear distance of only about 7.5 river miles. The stand nearest the dam was comprised of 25 plants and at 1,900 ft. represents the known upper elevational limit of the species' current distribution.

The round-leaved boykinia is also endemic to California, but is considered common enough now to be in no immediate threat of extinction (Smith 1984). A small stand of the boykinia was found in a seep near Powerhouse No. 2.

The floodplain of the upper Santa Ana Canyon is open and sandy with scattered boulders, the meandering stream course, and a narrow but almost unbroken belt of riparian habitat. Shrubs also grow in the floodplain, comprising an open scrub over much of the area, with vestiges of more densely vegetated shrublands that more closely resemble the slope vegetation on a few small terraces. The side slopes in the canyon are steep and near vertical rock walls are regularly interspersed. In the floodplain scrub, 65 percent to 91 percent of the surface was open ground, of which 33 percent to 42 percent consisted of sand and 30 percent to 49 percent consisted of granite boulders. Total shrub cover varied from 9.8 percent to 25 percent with an average cover of 18.2 percent. The common perennials included California buckwheat (*Eriogonum fasciculatum*), scale broom (*Lepidospartum squamatum*), and sweetbush (*Bebbia juncea*) with conspicuous local abundance of golden-aster (*Heterotheca villosa*), yerba santa (*Eriodictyon trichocalyx*), white everlasting (*Gnaphalium canescens* ssp. *microcephalum*), mullein (*Verbascum thapsus*), brickellia (*Brickellia desertorum*), and western ragweed (*Ambrosia psilostachya*) (vegetational analyses are from Feldmeth et al. 1985, Zembal 1985; plant names were updated from Hickman, ed. 1993). Frequently encountered annuals in the boulder-strewn wash included brome grasses (*Bromus tectorum*, *B. madritensis*, and *B. diandrus*), wild oats (*Avena barbata*), black mustard (*Brassica nigra*), schismus (*Schismus barbatus*), *Vulpia myuros*, pigmy weed (*Crassula connata*), filaree (*Erodium cicutarium*), peppergrass (*Lepidium lasiocarpum*), and several species of *Camissonia* (particularly *Camissonia californica*, *C. bistorta*, and *C. hirtella*).

Riparian thickets in the upper Santa Ana Canyon were comprised mostly of shrubby to subarborescent plants with widely spaced smaller stands of much taller old trees. The habitats varied from herbaceous to sub-shrubby species in and along the immediate watercourse to very small marshy patches and occasional stands of woodland along old side channels. The emergent and near-bank annuals included speedwell (*Veronica anagallis-aguatica*), watercress (*Rorippa palustris* var *occidentalis*), bentgrass (*Agrostis viridis*), rabbits foot grass (*Polypogon monspeliensis*), and white sweet clover; the perennial herbs include white everlasting, scarlet monkeyflower (Mimulus cardinalis), umbrella sedge (*Cyperus eragrostis*), rushes (particularly *Juncus xiphioides* and *Juncus effusus* var. *pacificus*), curly dock (*Rumex crispus*), and very locally, dense cattails (*Typha latifolia*). Overhead canopy was contributed by mulefat and young willows (*Salix laevigata*, *S. lasiolepis*, and *S. gooddingii*, in order of decreasing abundance) over much of the riparian belt. Particularly along old side channels, taller trees were intermixed and included individuals of the willows, scattered cottonwoods (mostly *Populus fremottii* with a few *P. trichocarpa*), white alder, infrequent sycamores (*Platanus racemosa*), and occasional tamarisk (*Tamarix ramosissima*). Total plant cover in the riparian belt varied from 78.5 percent to 108percent with a mean of 95 percent (Feldmeth et al. 1985, and Zembal 1985).

The vegetation of the uplands along the upper Santa Ana River Canyon consisted of plant associations ascribable to coastal sage scrub and chaparral. Coastal sage scrub constitutes a more open shorter statured shrubland that occurred mostly on drier slopes, particularly those with a southern exposure. Common species of the open shrublands included coastal sagebrush (*Artemisia californica*), California buckwheat, brittlebush (*Encelia farinosa*), deerweed (*Lotus scoparius*), croton (*Croton californicus*), and white sage (*Salvia apiana*). Brittlebush occurred locally in nearly monotypic stands on the driest slopes. Where coastal sage scrub graded into chaparral on more mesic slopes, chaparral species, particularly chamise (*Adenostoma fasciculatum*) and chaparral lilac (*Ceanothus crassifolius*), intermixed in the coastal sage scrub. Total plant cover in coastal sage scrub varied from 40.8 percent to 95 percent and averages 64.8 percent (Feldmeth et al. 1985).

Much of the upland vegetation in the Santa Ana Canyon was chaparral. From the driest to the most moist conditions, the chaparral graded from a low shrubby form dominated by chamise through a lilac-dominated (locally either *Ceanothus crassifolius* or *C. leucodermis*) form to a dense, tall tangle dominated by scrub oak (*Quercus dumosa*) and flowering ash (*Fraxinus dipetala*). In the shadier draws and on more north facing slopes the vegetation was particularly tall and scattered. Canyon oaks (*Quercus chrysolepis*) occurred and, locally in such situations, interior live oak (*Quercus wislizenii* var. *frutescens*) was dominant. The common perennials in the chaparral included chaparral lilac, chamise, flowering ash, scrub oak, holly-leaf redberry (*Rhamnus ilicifolia*), bush snapdragon (*Keckiella cordifolia*), honeysuckle (*Lonicera subspicata* var. *denudata*), toyon (*Heteromeles arbutifolia*), poison oak (*Toxicodendron diversilobum*), with local importance of sugar bush (*Rhus ovata*), holly-leaved cherry (*Prunus ilicifolia*), mountain mahogany (*Cercocarpus betuloides*), black sage (*Salvia mellifera*), and yerba mansa (*Anemopsis californica*). A variety of annuals occurred in the chaparral understory and along edges. Total plant cover varied widely in the chaparral from about 83 percent to 130.5 percent with a mean of 98.4 percent (Feldmeth et al. 1985).

Disturbed areas, particularly the road margins, were inhabited by a weedy element dominated by annual grasses and including such species as brome grasses (four species), Vulpia, filaree, Russian thistle (*Salsola tragus*), black mustard, western ragweed, tree tobacco (*Nicotiana glauca*), tarragon (*Artemisia dracunculus*), and horehound (*Marrubium vulgare*).

Alluvial scrub dominated the floodplain from the canyon mouth to about the City of San Bernardino. The shrubs were openly spaced with total cover ranging from 26 percent to 52 percent, and averaging about 35 percent. Much of the cover was low-growing but there were regularly spaced, conspicuous stands and individuals of overstory species including California juniper (*Juniperus californica*), holly-leaved cherry, sumac (*Rhus* spp.), elderberry (*Sambucus mexicana*), scrub oak, and local sycamores. Another endangered plant, slender-horned spineflower (*Centrostegia leptoceras*) is known from a small number of sites along this reach of the river.

References

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