EXHIBIT J.

SEVEN OAKS DAM
BIOLOGICAL OPINION
DATED
DECEMBER 2002

COPY

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road
Carlsbad, California 92009

In Reply Refer To:
FWS-SB-1000.10

DEC 19 2002

Ruth Villalobos
Chief, Planning Branch
U.S. Army Corps of Engineers
P.O. Box 532711
Los Angeles, California 90053-2325

Attn: Joy Jaiswal and Hayley Lovan

Re: Section 7 Consultation for Operations of Seven Oaks Dam, San Bernardino County, California (1-6-02-F-1000.10)

Dear Ms. Villalobos:

This document transmits our biological opinion on operations for Seven Oaks Dam, San Bernardino County, California, and the possible effects on the federally endangered San Bernardino kangaroo rat (*Dipodomys merriami parvus*, "SBKR") and its designated critical habitat, slender-horned spineflower (*Dodecahema leptoceras*, "spineflower"), and Santa Ana River woolly star (*Eriastrum densifolium* ssp. *sanctorum*, "woolly star"), least Bell's vireo (*Vireo bellii pusillus*, "vireo"), southwestern willow flycatcher (*Empidonax traillii extimus*, "flycatcher"), and arroyo toad (*Bufo californicus*, "toad") and the federally threatened coastal California gnatcatcher (*Polioptila californica californica*, "gnatcatcher"), California red-legged frog (*Rana aurora draytonii*, "frog"), and Santa Ana sucker (*Catostomus santaanae*, "sucker") in accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*). Your request for formal consultation was received on August 14, 2000. We have determined that the proposed operation of Seven Oaks Dam is not likely to adversely affect the vireo, flycatcher, toad, gnatcatcher, frog, or sucker; therefore, these species will not be addressed further in this biological opinion.

This biological opinion is based on the (1) *Biological Assessment Seven Oaks Dam, Santa Ana River Mainstem Project* (BA) dated August 2000 (MEC 2000a); (2) the *Qualitative Assessment; Adequacy of assumptions and first order cost estimates associated with mitigation monitoring Seven Oaks Dam* dated June 2001 (MEC 2001); (3) the *General Design Memorandum No. 1, Phase II on the Santa Ana River Mainstem* (GDM) dated August1988 (U.S. Army Corps of Engineers 1988a); and (4) other correspondence, notes and information compiled during the course of our consultation with your staff. This information and other references cited in this biological opinion constitute the best available scientific information on the status and biology of the species considered. The complete administrative record for this consultation is on file at the Carlsbad Fish and Wildlife Office.

Consultation History

The operation of Seven Oaks Dam is one component of the greater Santa Ana River Mainstem Project ("Mainstem") undertaken by the U.S. Army Corps of Engineers (COE) to address flood control on the Santa Ana River. The U.S. Fish and Wildlife Service (Service) issued a biological opinion (1-1-80-F-75) to COE on October 1, 1980, which assessed effects to listed species including the California least tern (*Sterna antillarum browni*), the light footed clapper rail (*Rallus longirostris levipes*) and California brown pelican (*Pelecanus occidentalus*) from the construction of downstream sections of Mainstem. On June 22, 1989, we issued another biological opinion (1-6-88-F-6) to address effects to the vireo and woolly star from the raising of Prado Dam and Mill Creek Levee and construction of Seven Oaks Dam.

Construction of Seven Oaks Dam began in March of 1994. The SBKR was emergency listed in January 1998, and dam construction was stopped until our issuance of a biological opinion (1-6-98-F-21) dated February 4, 1998, which addressed effects to SBKR from continued use of the Pervious Borrow Site for dam construction. That biological opinion stressed that the operation of the dam was of "utmost importance due to the reliance of the plant and animal community of the Santa Ana Wash on periodic flood events," and that consultation on operation of the dam would be required in the future. The 2000 BA (pg. 15) provides a summary of informal consultation that took place between our agencies from January 1998 and January 2000.

On October 12, 2000, we sent your agency a letter acknowledging initiation of formal consultation on August 14, 2000. Our agencies held a meeting on Oct 31, 2000, to discuss conservation measures and other outstanding issues. On November 16, 2000, the Service sent your agency a letter requesting an extension of formal consultation to February 26, 2001 (erroneously February 26, 2000, in the letter) to allow receipt and analysis of information that had been asked of COE at the meeting on October 31, 2000.

On December 11, 2000, the Service sent a letter to COE commenting on the Final Biological Assessment. On February 9, 2001, we sent COE a letter again requesting information discussed at the meeting on October 31, 2000, and requesting another 60-day extension to April 27, 2001. In that letter we suggested that COE conference on proposed critical habitat for SBKR.

On March 14, 2001, our agencies and the local sponsors met to discuss Mainstem projects including Seven Oaks Dam. On April 17, 2001, we met with your agency to discuss habitat and species monitoring for Seven Oaks Dam. In a letter dated April 20, 2001, the Service sent your agency a letter again requesting information discussed at the meeting on October 31, 2000. We stated that an opinion would be issued 45 days from receipt of the complete information request. Our agencies met to discuss Mainstem projects on May 22, 2001, where we discussed interdependency of the components of Mainstem and conservation measures for Seven Oaks Dam operations impacts. In your letter dated May 29, 2001, which included the information we previously requested, you also requested formal conference on proposed critical habitat for the SBKR.

On June 8, 2001, we received your *Qualitative Assessment* document. On August 2, 2001, our agencies met to further discuss issues associated with mitigation and monitoring. On August 8,

2001, the Service sent a letter to COE requesting an extension of formal consultation for another 90 days to allow completion of the biological opinion for the Prado Basin and Norco Bluffs components of Mainstem and to address monitoring and management issues at Seven Oaks Dam.

On September 4, 2001, the Service sent a letter to COE with comments and information requests based on our review of the *Qualitative Assessment*. On December 5, 2001, the Service issued a biological opinion on the Prado Basin and Norco Bluffs components of Mainstem.

Our agencies met on May 3, 2002, to discuss funding assurances, monitoring plans, statistical analyses, and other issues for Seven Oaks Dam. On July 19, 2002, we received a letter from your agency requesting completion of formal consultation by September 20, 2002. In our meeting on July 23, 2002, we discussed outstanding issues including the multiple species management plan development, management action triggers, water appropriations, and sediment transport. In an electronic mail correspondence to your staff on August 6, 2002, we requested a written response to our comments and information requests on the *Qualitative Assessment*.

On August 19, 2002, we sent a letter to COE stating that the September 20, 2002, biological opinion deadline would not be met due to meetings scheduled for September 10-12, 2002, where it was hoped that resolution on outstanding issues would be achieved. We met on September 10 and 11, 2002, to discuss those outstanding issues. In that meeting, COE committed to responding to our comments on the *Qualitative Assessment* and providing a draft project description. The Service committed to providing a draft biological opinion on November 12, 2002. We received COE's response to our comments on the *Qualitative Assessment* on September 26, 2002, and the draft project description on September 30, 2002. A draft biological opinion was provided on November 12, 2002. We received your comments on the draft biological opinion on November 20, 2002, and a further analysis of effects to listed species from future conservation actions on December 3, 2002. We provided a revised draft biological opinion on December 12, 2002.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Seven Oaks Dam, located on the Santa Ana River near the City of Highland, is a major feature of the Santa Ana River Mainstem Project. This dam is designed to provide flood protection along the Santa Ana River. The Seven Oaks Dam watershed drains an area of about 177 square miles. Seven Oaks Dam is a 550-foot high earthen dam with a gross retention capacity of 145,600 acre-feet at the spillway crest elevation. Specific dam features are described in detail in the 2000 BA. The dam is intended to be operated for flood control purposes by temporarily retaining water and attenuating peak flows until the downstream flood threat has passed. The hydrologic effect of Seven Oaks Dam is to reduce peak flood flows downstream to Prado Dam, which controls floods downstream to the Pacific Ocean. Construction began in March 1994, and the dam became operable in December 1999.

Since its completion, the dam has been operated in accordance with an interim operation plan that was developed in coordination with, and approved by, the Service. The purpose of this

interim plan was to avoid impacts to the SBKR and other species while the long-term operation plan, including conservation measures, was being developed and undergoing consultation. The interim plan involved passing as much inflow as physically possible without risk to public safety and/or the dam itself. The dam was also operated so as not to interfere with downstream water rights. In general, the dam has been operated so that during non-flood conditions, releases match inflows as closely as possible. The plan is fully described in the Interim Water Control Plan (COE 1999a).

The proposed project involves operating the dam fully for flood control, including use of the gated outlet structure, as described in the GDM. COE and local flood control districts of Orange, San Bernardino and Riverside counties (local sponsors) propose to initiate long-term operation of Seven Oaks Dam in a manner consistent with the original flood control objectives described in the 1988 GDM. The GDM, and its supporting environmental documents, also included conservation measures to offset impacts to the woolly star and other species. The 1988 GDM operation plan, however, has been and will continue to be revised to incorporate additional conservation measures that will further avoid, minimize, or offset impacts to listed species. These measures will be further defined and overseen by a collaborative multi-agency committee of environmental experts and agency officials. The plan also may be modified periodically based on species and habitat monitoring.

Therefore, the long-term operation plan will consist of the 1988 GDM flood control operation plan, plus additional operations and conservation measures intended to support affected listed species and their habitats, as directed by the proposed Steering Committee. Presently, additional conservation measures, including the Multi-Species Habitat Management Plan (MSHMP), the structure of its managing Steering Committee, and other necessary documents are not fully refined, completed, or concurred upon by responsible agencies. However, to be able to request Federal funding necessary for further multi-species plan development and finalization, COE requested that the Service complete a biological opinion that addressed full flood control operation of Seven Oaks Dam and the current and proposed additional conservation while those conservation measures, in particular the MSHMP, are finalized.

Based on information provided by your agency in the August 2000 BA, the 1988 Phase II GDM/SEIS, and other project documents, the Service, COE and local sponsors have developed conservation measures for long-term operation and maintenance of Seven Oaks Dam. The conservation measures described in the BA will be further refined in the MSHMP. The Corps and local sponsors have agreed to prepare the MSHMP and appropriate environmental documentation, perform studies, and implement experimental treatments and management measures to protect the species. The MSHMP preparation will be initiated within six months of issuing this biological opinion. It is anticipated that completion of the MSHMP and environmental document may take two years. However, even if the documents are not completed within that time frame, the measures identified in the biological opinion will remain in effect and dam operations as defined in the Phase II GDM will continue. Upon completion of the MSHMP, the Corps may request an amendment to the BO to address any potential effects of the specific conservation measures that were not addressed fully in this biological opinion.

Long-Term Operation Plan for Flood Control

The water control plan for Seven Oaks Dam (based on the 1988 GDM) was originally designed to achieve flood control objectives. When significant flood inflow into the dam reservoir occurs, floodwaters would be temporarily retained, while a small release (500 cubic feet per second [cfs] or less) is made until the reservoir pool level at Prado Dam begins to recede. Water retained at Seven Oaks Dam would then be released at higher rates to evacuate the reservoir pool in a controlled manner to regain retention capacity for subsequent flood events. Storing water for longer periods for the purpose of water conservation is not currently authorized or proposed (Letter from COE to San Bernardino County Flood Control Department dated May 29, 2001).

Long-term flood control operations include the following main elements:

Sediment Pool (2,100 to 2,120 feet National Geodetic Vertical Datum [NGVD]) - At the beginning of each flood season, stop logs will be added to block the lower inlet ports of the intake structure to about 20 to 30 feet above the current invert. This is to be done to minimize the amount of sediment entering the minimum discharge line (MDL). The two lowest rows of ports have already been blocked, so the initial sediment pool will be about 20 feet deep. The stop logs will form a "dead pool," and no operation will be possible other than leakage. As sediment deposition occurs in the future, additional stop logs will be added to maintain the 20-30 foot sediment pool above the sediment deposition level at intake tower.

Debris Pool (2,120 to 2,200 feet NGVD) - At the beginning of each flood season, using inflow in excess of minimum downstream water rights, a debris pool will be formed above the sediment pool. The debris pool is designed to protect outlet facilities from debris damage. Water will be retained in the debris pool until the end of the flood season, when it will be released at a rate of 10 to 20 cfs as agreed upon during the preparation of the GDM. The operation plan for filling and draining the debris pool was negotiated with downstream water users during the preparation of the 1988 GDM to mitigate for the impacts of the flood season operations upon downstream water rights. Water stored in the debris pool should not be considered available for conservation measures.

Intermediate Pool Elevations (2,200 to 2,265 feet NGVD) - The intermediate pool elevations occur between the top of the debris pool and the sill of the main intake. Early in the project life the elevation range of the intermediate pool is between 2,200 and 2,265 feet NGVD. Within this range, the pool will be evacuated at a rate consistent with the 1988 Phase II GDM flood control operation plan, except if water is retained for periodic release in the flood plain for federally listed species conservation. The maximum combined capacities of the MDL and low-flow gate may be used, which are about 400 to 500 cfs at this range.

Main Trash Rack (2,265 to 2,299 feet NGVD) - The trash racks protecting the main intake are located between 2,265 and 2,299 feet NGVD. During rising flood stages, no releases will be made through the main regulation outlet or low-flow gate to avoid drawing floating debris into the trash racks. Instead, releases will be made through the MDL in this elevation range at the maximum safe rate (theoretically on the order of 50 cfs). During falling stages, releases will be

made up to a maximum of 2,000 cfs depending on the potential blockage of the trash rack by floating debris and potential for additional near-term flood inflow.

Main Pool (2,299 to 2,580 feet NGVD) - This is the pool between 2,299 feet and the spillway crest at elevation 2,580 feet NGVD. Between these elevations, water will be released at a rate consistent with the 1988 Phase II GDM flood control operation plan. The maximum flood control release rate is 7,000 cfs.

Spillway Surcharge (2,580 to 2,604 feet NGVD) - Above elevation 2,580 feet NGVD, releases are uncontrolled over the spillway. During rising stages, releases from the outlet works will be adjusted so the total project release equals 7,000 cfs. Above 2,585 feet NGVD, no controlled releases will be made. During falling stages, the outlet works gates will be adjusted to maintain the resulting maximum spillway release rate to assure quick evacuation of the remaining surcharge volume in anticipation of another major storm.

1988 GDM Conservation Measures

Conservation measures were identified in the 1988 Final Supplemental Environmental Impact Statement (FSEIS) and subsequent biological opinions to avoid, minimize or offset direct and indirect impacts associated with construction of Seven Oaks Dam. The 1988 FSEIS conservation commitments and status of each are summarized in Table 1.

Table 1. Status of conservation measures for Seven Oaks Dam construction based on commitments made in 1988 FSEIS (COE 1988b).

Resource Impacted	Commitment	Status
Upland habitat (chaparral); deer migration and general wildlife	Acquire and preserve Section 5 (596 acres); acquire Filaree Flats (139 acres, of which 119 is upland habitat)	Complete. Both Filaree Flats and Section 5 have been purchased.
Aquatic habitat; brown trout	Acquire Filaree Flats; 1 mile of aquatic habitat preserved and 20 acres of the total 139 are riparian	Complete; see above.
Woodland riparian habitat	Acquire and revegetate 60 acres of Santa Ana River Wash	Complete (Note: In lieu of planting 60 acres of riparian habitat, $1.35 million was contributed to an endowment for giant reed (*Arundo donax*) management in the Santa Ana River watershed.)
Santa Ana River woolly star	Acquire 700 acres of wash lands below Greenspot Road. Incorporate endangered species management into the LCA as part of the local sponsors' O&M responsibility	Complete. The 764-acre Woolly Star Preserve Area (WSPA) has been purchased in fee or conservation easement and set aside for wildlife in perpetuity. A Management Plan has been prepared, funded, and implemented by the local sponsors. The Steering Committee reviews work and approves budget and actions.
Alluvial fan sage scrub	Re-seed disturbed areas (borrow areas, haul roads, access roads) with native seed mix	Complete.

Additional Conservation Measures

Operation of Seven Oaks Dam is expected to change the quality of downstream habitat due to a reduction in flood processes of scour and sand deposition that are important to the renewal and succession of the alluvial scrub habitat. The primary objective of both the existing Woolly Star Preserve Area (WSPA) and the additional conservation measures outlined in the BA is to compensate for potential changes in floodplain characteristics and listed species' habitat brought about by construction and operation of Seven Oaks Dam.

It is difficult to predict whether habitat quality associated with succession would proceed to a point beyond suitability for spineflower and SBKR within the 100-year project life of the dam. Estimates of time required for succession to a mature alluvial scrub community differ by an order of magnitude, from a few hundred to thousands of years. Additionally, there are substantial data gaps in knowledge of relationships between habitat characteristics and quality for these species and how that may relate to flood processes. Despite these uncertainties, there is evidence of a relationship between the abundance and distribution of spineflower and SBKR relative to recent and historic flood flows. Operation of the dam will reduce overflows in these areas.

Therefore, in addition to operation for flood control, it is anticipated that water releases will be made to maintain and enhance habitat for listed species under a finalized MSHMP for listed species as outlined in the BA. It is anticipated that the water used for controlled releases, for both experimental treatments and management measures, would come from flood flows stored in the intermediate, main trash rack, and main pools. The objective would be to mimic historic conditions without compromising public safety or dam integrity. If there is no immediate need to release the water for flood control reasons, and if directed by the Steering Committee, releases could be temporarily retained for some period time (up to several weeks) while diversion dikes are constructed. Some or all of the controlled releases could then be diverted onto the WSPA and/or other areas within the historic Santa Ana River floodplain to produce the hydrologic erosion and sediment deposition believed to be necessary to sustain species' habitat. During the period immediately following issuance of the biological opinion, while the MSHMP and appropriate NEPA documentation are being prepared, the dam will be operated for flood control purposes as described in the 1988 Phase II GDM.

Controlled releases are not expected to occur with every storm event or even every year. Flood events that produce sufficient runoff to operate the dam to flood and scour habitat outside of the main channel, but within the historic floodplain, occur with an estimated frequency of every 5-10 years. The actual frequency of controlled releases may depend on a number of factors, including rain events, the results of directed studies and experimental treatments, and direction from the Steering Committee.

The proposed additional conservation measures focus on providing the means to: (1) further evaluate the impacts from dam operation; (2) test and select appropriate management actions; and (3) implement habitat management actions within the WSPA and other historic floodplain areas within the local sponsors' jurisdiction to sustain SBKR, woolly star and spineflower.

The additional conservation measures are described in the 2000 BA and *Qualitative Assessment* and are briefly summarized below. These elements may change and be refined subsequent to discussions between COE, local sponsors, the Service and other resource agencies.

The additional conservation measures have six elements:

(1) A Memorandum of Understanding (MOU) among appropriate stakeholders. The MOU (mistakenly referred to as a "Memorandum of Agreement" in the 2000 BA) will establish the responsibilities of the various stakeholders. It will describe the manner in which the MSHMP will be developed, how the directed studies will be managed, and how the habitat management measures will be funded and directed. It is anticipated that participants (agency staff and technical experts) will serve on a Steering Committee that will semi-annually review and make decisions regarding the MSHMP. It is envisioned that the existing WSPA Steering Committee could serve that management function by expanding its membership and responsibilities to include multi-species management.

(2) Development of a Multi-Species Habitat Management Plan. The MSHMP will detail the habitat management measures, as well as the decision-making process, for implementing management measures or changes in design. The MSHMP will be adaptive and allow flexibility to institute changes in study designs and/or implementation of habitat management measures based on experimental studies and monitoring results and the decisions of the Steering Committee. The MSHMP will be developed by COE and the local sponsors in coordination with resource agencies (including the Service and California Department of Fish and Game [CDFG]) and technical experts. The MSHMP will be reviewed by the resource agencies for their concurrence prior to implementation.

(3) Directed studies of population trends and habitat relationships, threats to the species, and life requirements. These will include studies of habitat succession, spineflower and SBKR population abundance and distribution and will include wash-wide habitat and exotic species mapping. The 2000 BA and *Qualitative Assessment* proposed the number, duration, and types of studies. The Service and COE have not yet agreed on all aspects of the study design; however, the COE has provided information (letter to the Service dated September 25, 2002) to respond to Service concerns (letter to the COE dated September 4, 2001) that will provide a basis for further discussion with technical experts on topics such as detection and significance of percent population change, power, alpha level and other statistical considerations, and cost comparisons. Both agencies anticipate coming to resolution on these points during preparation of the MSHMP. Therefore, the 2000 BA, *Qualitative Assessment*, and subsequent correspondence between our agencies provide a good basis for the MSHMP, which will be finalized to incorporate the comments, concerns, and agreements of all the agencies.

(4) Experimental studies of the effectiveness of different habitat management techniques. The purpose of the experimental studies will be to test the effectiveness of hydraulic renewal and on-ground techniques to slow habitat succession that is due to lack of fluvial processes. The various techniques will be applied to degraded habitat areas, with pre-

and post-monitoring and surveys to document changes in habitat and population dynamics.

a) Operation of Seven Oaks Dam coupled with construction of diversion dikes to provide periodic controlled releases to flood designated areas of the WSPA or other lands within local sponsors' jurisdiction. Temporary dikes will be constructed to confine flooding to an area of approximately 5-10 acres. If necessary, sediment will be placed next to the river to be picked up and conveyed by flood flows. This experiment may include two types of tests:

- Controlled water release only,
- Controlled release with vegetation clearing (to mimic scouring).

b) On-ground habitat renewal experiments using equipment (rather than flood flows from the dam) to clear vegetation and spread sand and/or water. This experiment may include two types of tests:

- Sand spread with light equipment in cleared areas and green waste debris removed;
- Sand placed in a pile and dispersed using water from a water truck. Temporary training dikes will be used to control flooding.

c) Monitoring of experimental trials, as described in the 2000 BA.

(5) Implementation of habitat management on the WSPA and on a larger-scale over the Santa Ana Wash (covering more area) than the experimental treatments. This element, described in the 2000 BA Section 9.1.2 as "Option 1," also includes replenishment of downstream sediment. Habitat management measures will be selected for implementation once their feasibility is determined, potential benefit is understood, and disturbance judged to be acceptable. Proposed habitat management measures (flooding and active manipulation of the floodplain) will be done on the WSPA and other lands within the local sponsors' jurisdiction but may be expanded to other lands if appropriate rights are provided. The proposed MSHMP includes a fund to augment management actions within the WSPA or on other floodplain lands to include benefits for spineflower and SBKR, as directed by the Steering Committee.

COE has agreed to request a single appropriation which, combined with the local sponsor share, will total $5,690,000 (the estimated cost of habitat management measures included in the 2000 BA) and to seek approval to establish an escrow account through a willing third party (i.e., San Bernardino County Flood Control District or The Nature Conservancy). The escrow account will generate interest that could be used as an added contingency fund, should directed studies or management measures prove more expensive than currently anticipated, or should the Steering Committee recommend additional measures.

It is envisioned that with implementation of the MSHMP approximately 25% of the "flow target area" (the total area subject to target flows from the diversion dikes) will be rejuvenated during each controlled flow release (about 10 acres of area with one temporary dike). Flows will follow topography and occupy existing and historic flow paths. It will take several (about 20) controlled releases over the

life of the project to provide flows to the entire area. Flood events that produce sufficient runoff to operate the dam to flood and scour habitat outside of the main channel occur with an estimated frequency of every 5-10 years. More detailed design will be developed during preparation and implementation of the MSHMP. Decisions concerning the release schedule, locations, discharge volumes and sediment volumes will require additional information from the proposed directed studies. In concept, each release could require:

- A 400 foot long, 50 foot wide, 10 foot high temporary diversion dike in the main channel (0.5 acre footprint, 2 acres construction footprint);
- Small training dikes, approximately 0.1-acre footprint each;
- Possibly a protective levee, 25,000 feet long, 40-50 feet wide, 10 feet high, to prevent water from leaving the WSPA, unless hydraulic analysis demonstrates that this is not necessary;
- Avoidance measures, including:
    a) Prior to construction of any dikes and/or controlled releases, surveys will be conducted for target and sensitive species within access routes, construction footprints, and target flow areas, and specific avoidance measures will be recommended and implemented;
    b) Adverse impacts to high-quality habitat will be avoided;
    c) If necessary, and recommended by the Steering Committee, exclusionary fencing will be constructed and individual listed species will be relocated.

The operation plan includes sand recharge into the Santa Ana River below the dam to the confluence of Mill Creek as part of a sediment management plan for the river. The sand could be conveyed to the river by a conveyor belt system running through the dam, excavated from behind the dam and trucked to the river on access roads, or provided from another source. Regardless of the source, the sand that is recharged into the river will have the same physical characteristics as under pre-dam conditions. Sand will be spread over about a 10-acre area in the river channel by bulldozer. Sand will be recharged to the river at a frequency of every 10 to 20 years over the life of the project. During a sediment management year, sand placement will occur over about a six-month period.

Other potential management measures involve use of equipment, instead of dam operations, to simulate the processes of scour and sand deposition. These measures will consist of two different aspects. The first involves scraping away (or "brushing") areas in channels supporting older growths of vegetation or invasive exotic weeds. The second phase will be to deposit new sand in the areas brushed. These management techniques may be considered for applications to maintain suitability of existing habitat and/or to reclaim currently unoccupied habitat.

(6) Expansion of habitat management measures beyond current boundaries, if approved, authorized and funded. This element can also include other measures such as non-native grass control to enhance habitat in the floodplain. COE has agreed to work with the Service to seek conservation or other easements from the Bureau of Land Management to permit habitat management measures, including flooding, on areas currently outside of

the agencies' jurisdiction. This commitment assumes that water appropriations will not be required. This commitment also assumes that funding for such easements or land acquisitions, if required, will be provided by an entity other than COE or local sponsors, and that the local sponsors bear no obligation to implement, fund, acquire lands and easements, obtain water appropriations and/or any other action as may be required for the expansion of habitat management measures beyond current WSPA boundaries. If easements are granted and the assumptions noted above occur, COE has agreed to seek additional approval, authorization, and funding to implement habitat management measures within those areas. This element can also include other measures to enhance listed-species habitat within the WSPA or other areas, potentially improving habitat over existing or pre-dam conditions, as described in Section 10 of the 2000 BA.

STATUS OF THE SPECIES

San Bernardino Kangaroo Rat (SBKR) and its designated critical habitat

The SBKR is one of 19 recognized subspecies of Merriam's kangaroo rat (*Dipodomys merriami*), a widespread species distributed throughout the arid regions of the western United States and northwestern Mexico (Hall 1981, Williams *et al.* 1993*a*). There are three recognized subspecies of Merriam's kangaroo rat within California: *Dipodomys merriami merriami*, *Dipodomys merriami collinus*, and the SBKR. Based on morphological evidence, Lidicker (1960) noted that the SBKR is one of the most highly differentiated subspecies of *Dipodomys merriami*, and stated that "it seems likely that it has achieved nearly species rank." This differentiation may be due to the SBKR's nearly complete isolation from other members of *Dipodomys merriami* (Lidicker 1960). No genetic analyses have been conducted to confirm this apparent differentiation.

The historical range of the SBKR extended from the San Bernardino Valley in San Bernardino County to the Menifee Valley in Riverside County (Lidicker 1960, Hall 1981). Within this range, the SBKR was known from over 25 localities (McKernan 1997). From the early 1880s to the early 1930s, the SBKR was a common resident of the San Bernardino and San Jacinto Valleys (Lidicker 1960). By 1997, however, the SBKR was only known to occupy a total of approximately 3,247 acres (1,299 hectares) in six widely separated sites (McKernan 1997). Three sites (i.e., Etiwanda alluvial fan, Reche Canyon, Jurupa Hills) supported only small, remnant populations, while three sites (Santa Ana River and its tributaries, Lytle and Cajon creeks, San Jacinto River and Bautista Creek) had higher densities of kangaroo rats and were estimated to contain larger blocks of occupied habitat (McKernan 1997). More-recent surveys and research indicate that the SBKR may occupy a greater range of soil and vegetation types, and is more widely distributed, than previously thought (Braden and McKernan 2000, MEC 2000b).

The SBKR appears to have a strong preference for well-drained, sandy substrates where they are able to dig simple, shallow burrows (McKernan 1997, MEC 2000b). Historically, the SBKR was distributed across a mosaic of areas with sandy soils, including dry washes, braided river channels, terraces, and alluvial deposits (McKernan 1997). SBKR also occupy gravelly soils (McKernan 1993) and areas where sandy soils were at least partially deposited by winds (e.g., Jurupa Mountains; McKernan 1997). Areas with silt-clay soils appear to be associated with lower abundance of the SBKR (MEC 2000b).

The SBKR appears to reach its highest densities in areas with low to moderate (30 to 50 percent) perennial vegetative cover and greater than 40 percent bare ground, although this species can occur within areas supporting higher or lower shrub cover. Areas with a dense cover (greater than 60 percent) of nonnative annual plants and/or litter are typically either unoccupied by the SBKR or occupied at low densities. Within otherwise suitable shrub habitat for the SBKR, the percent cover of herbaceous vegetation and sand depth can range from very low to very high (McKernan 1997, MEC 2000b).

Favorable conditions for the SBKR frequently occur in Riversidean alluvial sage scrub. This vegetation type is characterized by low growing shrubs and other perennial species tolerant of a relatively sterile, rapidly draining substrate, and includes elements from chaparral, coastal sage scrub, and desert communities (Holland 1986). Three phases (pioneer, intermediate, and mature) of Riversidean alluvial sage scrub have been described. These phases appear to correlate with factors indicative of fluvial disturbance such as time since last flood with significant overbank flows, elevation and distance from the main river channel, and substrate features such as texture and moisture (Smith 1980, Hanes *et al.* 1989). Under natural conditions, flood waters periodically overtop or "break out" of alluvial river channels in unpredictable spatial and temporal patterns, scouring vegetation and transporting and depositing sands. These geomorphological processes contribute to a braided mosaic of pioneer, intermediate, and mature associations of Riversidean alluvial sage scrub on the flood plain.

High densities of the SBKR have been documented in pioneer and intermediate phases of Riversidean alluvial sage scrub, which generally correlate with areas that have been more-recently disturbed by floods (within the last 40 to 70 years; McKernan 1997; MEC 2000b). The pioneer or earliest phase has sparse vegetation with low diversity and structure. This phase is typically found within and adjacent to active river channels or recently scoured streambeds (Smith 1980, Hanes *et al.* 1989). The intermediate phase, which represents the progressive development of the Riversidean alluvial sage scrub community in terms of density and diversity, is typically found between the active river channel and mature flood plain terraces at higher elevations. Areas with intermediate Riversidean alluvial sage scrub are subject to periodic flooding at longer intervals than the pioneer phase. The mature or latest phase occurs in areas infrequently affected by flooding (e.g., upper alluvial terraces) and, as a result, has the highest structure and densest cover (Smith 1980, MEC 2000b). These areas with mature, dense vegetation are generally occupied at low densities by the SBKR, with animals found in scattered microsites (pockets or patches) with more-open shrub cover and loose, sandy soils (Braden and McKernan 2000). Such areas may be critical to the long-term survival of the species, providing a source of animals for recolonization following catastrophic floods that may drown kangaroo rats inhabiting lower areas of the flood plain.

Due to their shallow burrow systems, the SBKR generally does not persist in highly degraded habitats, such as areas that are frequently disced, graded, or inundated. However, the SBKR can recolonize some degraded areas once disturbance activities cease and the vegetation begins to recover. Also, some SBKR successfully survived translocation to a revegetated reclamation site in the Cajon Creek wash that was restored following sand mining activities and contained a complement of native rodents (O'Farrell 1999).

Few specifics are known about the life history and ecology of the SBKR because few species-specific studies have been conducted. SBKR are primarily nocturnal and active throughout the year. They reside in burrow systems, each of which appears to be occupied by a single adult. The burrow systems of many adults are often clustered in a given area. SBKR typically emerge from their burrows after sunset and may be active at any time during the night.

Though few specifics are known about the diet of the SBKR, they are granivorous and feed primarily on the seeds of grasses and forbs that they harvest from the soil. They often cache seeds in small surface pits for later consumption. This behavior may enable them to endure temporary shortages of food, as has been documented for other species of *Dipodomys* (Williams *et al.* 1993b as cited in Goldingay *et al.* 1997). Green vegetation and insects may be important seasonal food sources. The closely related Merriam's kangaroo rat is known for its ability to live indefinitely without water on a diet consisting entirely of dry seeds (Reichman and Price 1993).

Virtually nothing is known about the spatial requirements of the SBKR. In other species of *Dipodomys*, the sizes of home ranges vary owing to habitat features, season, food availability, population density, and sex. Behrends *et al.* (1986) reported that home ranges for the Merriam's kangaroo rat in Riverside County, California, averaged 0.8 acre (0.33 hectare) for males and 0.8 acre (0.31 hectares) for females. However, the sizes of home ranges for Merriam's kangaroo rats in New Mexico were much larger, averaging 4.1 acres (1.7 hectares) for males and 3.9 acres (1.6 hectares) for females (Blair 1943). Outlying areas of the home ranges of neighboring kangaroo rats may overlap, but adults actively defend small core areas near their burrows (Jones 1993). Overlap between the home ranges of neighboring male kangaroo rats, or between neighboring male and female kangaroo rats, is often extensive. In contrast, overlap between the home ranges of neighboring female kangaroo rats is usually slight (Jones 1993).

Little is known about the mating system of the SBKR. Females are capable of having more than one litter per year, and litter sizes probably average between two and three young (M. O'Farrell, Las Vegas, Nevada, as cited in MEC 2000b). Reproductive activities peak in June and July, although the SBKR appears to have a prolonged breeding season. Pregnant or lactating females have been captured between January and November, while males in scrotal condition have been captured between January and August (McKernan 1997).

No estimates of age-specific survival rates, age structures, sex ratios, or dispersal rates are available from populations of the SBKR. Definitive information on their life span is lacking. Maximum longevity in free-ranging short-nosed kangaroo rats (*Dipodomys nitratoides brevinasus*) is probably 3 to 5 years (Williams *et al.* 1993b cited in Goldingay *et al.* 1997). Free-ranging Stephens' kangaroo rats (*Dipodomys stephensi*) only lived as long as 18 months, however, and the average life span observed at various sites was only 3.7 to 7.5 months (McClenaghan and Taylor 1991). Likewise, most juvenile Fresno kangaroo rats (*Dipodomys nitratoides exilis*) do not survive to breed the following spring (Williams *et al.* 1993b cited in Goldingay *et al.* 1997).

Long-range dispersal and population expansion by the SBKR is likely hampered by the presence of other rodents owing to its small body size relative to other species. Also, it is unlikely that SBKR faced with a catastrophic disturbance such as a large-scale flood or discing activities could

successfully relocate to upland or offsite refugia. Rather, the persistence of the species in such locations is likely dependent upon recolonization by dispersing animals (or their offspring) from adjacent areas that survived the disturbance.

Little is known about factors that cause mortality or adversely affect birth rates in the SBKR. The availability of suitable sites for burrows, free from winter flooding, may limit densities of kangaroo rats in some areas, especially near active river channels. Prolonged droughts of more than 1 year are known to induce rapid population decreases in kangaroo rats once their seed caches are depleted (Williams *et al.* 1993b as cited in Goldingay *et al.* 1997). A number of pathogens and parasites are associated with the genus *Dipodomys,* and these factors could be major threats under the current conditions of small, isolated and, possibly, inbred populations.

Competition and predation could pose major threats to remnant populations of kangaroo rats because they directly affect population growth rates and indirectly affect the structure of the community. Competition occurs when individuals of the same or different species utilize common resources (food, space, burrows) that are in short supply; or, if the resources are not in short supply, competition occurs when organisms seeking the resources nevertheless harm one or other in the process. Many territorial interactions ensued after Tipton kangaroo rats (*Dipodomys nitratoides nitratoides*) were translocated into habitat that was already occupied by this species; to the detriment of the relocated animals (Goldingay *et al.* 1997).

The range of the SBKR is partially overlapped by the distribution of Stephens' kangaroo rats, and is entirely overlapped by the range of the Pacific kangaroo rat (*Dipodomys simulans*). Where these species occur in proximity, competition could occur if one or more resources became limiting. However, differences in habitat selection among these species may minimize the likelihood of competition. The SBKR primarily occurs in sage scrub habitats with open, low shrub cover and sandy soils (McKernan 1997). In contrast, the Stephens' kangaroo rat typically is associated with open, arid, grassland associations (O'Farrell *et al.* 1986, O'Farrell and Uptain 1987, O'Farrell 1990), and occurs on a variety of soil types. The Pacific kangaroo rat typically inhabits denser shrub cover on a variety of soil types.

Specific information on the types and abundances of predators that feed on the SBKR is lacking. However, natural predators of the nearby Stephens' kangaroo rats include the common barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), San Diego gopher snake (*Pituophis melanoleucus annectens*), California king snake (*Lampropeltis getulus californiae*), red diamond rattlesnake (*Crotalus ruber*), southern Pacific rattlesnake (*Crotalus viridis helleri*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), badger (*Taxidea taxus*), long-tailed weasel (*Mustela frenata*), and bobcat (*Felis rufus*). Also, continued urban development and fragmentation of habitat is likely to promote higher levels of predation by urban-associated animals, as the interface between natural habitat and urban areas is increased (Church and Lawton 1987). Domestic or feral cats are known to be predators of native rodents, and predation by cats has been documented for the SBKR (R. McKernan, San Bernardino Natural History Museum, Redlands, California, unpublished data).

Populations of kangaroo rats (*Dipodomys*) are characterized by marked instability in population size, with density often varying 5-fold or more from year to year (McClenaghan and Taylor 1993,

Price and Kelly 1994, Goldingay *et al.* 1997, White and Garrott 1999). A population of *Dipodomys nitratoides* in central California declined 99 percent (from 87 rats per hectare to less than one rat per hectare) in 2½ years (Goldingay *et al.* 1997). High frequency fluctuations in abundance appear to be intrinsic to many populations of kangaroo rats owing to the unpredictable weather of the desert systems they inhabit. Arid regions of California are subject to considerable environmental variation; particularly in year-to-year precipitation that occurs primarily as winter rains (White and Garrott 1999). During droughts, plant production is poor and rodents that subsist on seeds and vegetation often reproduce poorly or not at all once their seed caches are exhausted. Hence, their numbers may decrease substantially (White and Ralls 1993, Cypher and Spencer 1998). Unusually high precipitation may also contribute to catastrophic decreases in rodent populations, although the causal mechanism(s) have not been identified (U.S. Fish and Wildlife Service 1998). These rapid decreases in abundance render small populations even more susceptible to chance extinctions.

McKernan (1997) used mark-recapture sampling on 1-hectare grids to estimate the densities of the SBKR at six locations in the San Bernardino Valley over a 5 year period (1988-1993). Mean density estimates ranged from 2.6 to 31.6 animals per hectare for the six sites, and differences among sites appeared to reflect variations in environmental conditions and the amount, quality, and structure of the habitat. Sites with larger proportions of the pioneer and intermediate phases of Riversidean alluvial sage scrub had higher densities of the SBKR than sites in which fluvial actions were disrupted, Riversidean alluvial sage scrub was mature, or nonnative annual plants comprised a higher proportion of the vegetation cover (McKernan 1997). Similar results were obtained by MEC Analytical Systems (2000b) during sampling along the Santa Ana River.

The SBKR was emergency listed as endangered on January 27, 1998 (62 FR 49401) because its historic range had been reduced by approximately 95 percent. All remaining populations were threatened by habitat loss, degradation, and fragmentation from urban development, sand and gravel mining, flood control projects, groundwater recharge activities, and vandalism. Upon expiration of the emergency rule, we listed the species as endangered on September 24, 1998 (63 FR 51005).

We proposed critical habitat for the SBKR on December 8, 2000 (65 FR 77178). Primary constituent elements for the SBKR consist of those habitat components that are essential for their primary biological needs: foraging, reproducing, rearing of young, intraspecific communication, dispersal, genetic exchange, and/or sheltering. The primary constituent elements occur in areas influenced by historic and/or current geomorphological processes and areas of wind-blown sand that support Riversidean sage scrub or a mosaic of this and other associated vegetation types (coastal sage scrub, chaparral) in San Bernardino and Riverside counties. Primary constituent elements are also found in areas that provide connectivity or linkage between or within larger core areas, including open space and disturbed areas containing introduced plant species.

Loss and fragmentation of habitat for the SBKR continues as the human population increases and urbanization expands in southern California. In the 1950s, the population of Riverside and San Bernardino counties totaled approximately 400,000 people. The current population estimate for this region is approximately 1.8 million, an increase of approximately 60 percent. Forecasts by the Southern California Association of Governments indicate that the population in San

Bernardino County may reach 2.8 million by the year 2020. Approximately 339,900 houses will be built to support this population growth. Further habitat losses resulting from development or alteration of the landscape will likely have a significant adverse effect on the viability of remaining populations of the SBKR.

Sand and aggregate mining continue to destroy or degrade hundreds of acres of habitat occupied by the SBKR along the Santa Ana and San Jacinto rivers, and City, Cajon, and Lytle creeks. Also, flood control and water spreading structures have significantly altered the natural hydrology of all alluvial areas occupied by the SBKR by decreasing the magnitude and distribution of flooding, scouring, and sand transport and deposition. In the absence of flood scouring, sediments and organic matter accumulate over time and contribute to the maturation of Riversidean alluvial sage scrub, increased vegetation cover, and increased density of nonnative grasses. These conditions do not provide the open environment favored by the SBKR and, therefore, reduce the suitability of the habitat for this species. Within channelized areas, confined flood events often scour too frequently to maintain suitable habitat for the SBKR. In addition, many areas that would normally revegetate following flood events and, thereby, provide suitable habitat for the SBKR have been denuded of vegetation by ongoing flood control and maintenance activities within spreading basins and channels. Channelization also predisposes local populations of the SBKR to extirpation during large floods by drowning animals within channelized areas that confine flood waters, and eliminating or isolating upland terraces essential for recolonization. In general, groundwater recharge areas are unsuitable for the SBKR because of the periodic presence of standing water and the degradation of alluvial scrub communities. Hundreds of acres along the Santa Ana and San Jacinto rivers, and San Antonio, Etiwanda, and Lytle creeks are potentially affected by ongoing water percolation and associated activities.

The open structure of Riversidean sage scrub encourages recreational activities within these areas that threaten the survival and recovery of the SBKR. Examples of these activities include off-highway vehicle use, dumping, scavenging, and commercial collection of yucca stalks. Off-highway vehicle use directly damages plant communities, the soil crust, and the burrow systems of kangaroo rats. Trespass by off-highway vehicles continues to destroy and degrade hundreds of acres of Riversidean sage scrub communities occupied by the SBKR in and near the Santa Ana and San Jacinto rivers, and City, Plunge, Lytle, and Cajon creeks.

All remaining populations of the SBKR are at risk due to their small size. Small populations have a higher probability of extinction than larger populations because their low abundance renders them susceptible to stochastic (random, naturally occurring) events such as inbreeding, the loss of genetic variation, demographic problems like skewed variability in age and sex ratios, and catastrophes such as floods, droughts, or disease epidemics (Lande 1988, Frankham and Ralls 1998, Saccheri *et al.* 1998). These chance events can affect small populations with devastating results. Extirpation can even occur when the members of a small population are healthy because whether the population increases or decreases in size is less dependent on the age-specific probabilities of survival and reproduction than on raw chance (sampling probabilities). Due to the probabilistic nature of extinction, some small populations will survive when faced with these demographic, environmental, and genetic stochastic risks; however, many will eventually go extinct (Caughley and Gunn 1996).

Another factor that renders populations of SBKR vulnerable to stochastic events is isolation, which often acts in concert with small population size to increase the probability of extinction for endangered populations. Altered fluvial processes, urbanization, and land conversion have fragmented the historic range of the SBKR such that remaining blocks of occupied habitat now function independently of each other. Isolated populations are more susceptible to extirpation by accidental or natural catastrophes because their recolonization has been precluded. Hence, the extirpation of remnant populations during local catastrophes will continue to become more probable as land development further constricts remaining populations.

Because the status of the SBKR is precarious and declining, remaining occurrences should be secured and managed to increase the distribution and abundance of the species. Populations should be independently viable with stable or increasing numbers (exhibiting demonstrable long-term reproductive success). The natural ecosystem processes necessary to maintain viable, dynamic mosaics of habitat for the SBKR must be maintained in each conservation area. This includes a natural fluvial regime or a managed alternative that periodically results in scouring, sand transport and deposition, and plant community responses similar to those expected under a natural fluvial regime.

Santa Ana River Woolly Star

Woolly star is a short-lived, woody perennial, subshrub of the phlox family (Polemoniaceae). It has a basally branched, generally erect or spreading form, reaching 75 centimeters (30 inches) in height. The entire plant, including the inflorescence, is covered with woolly pubescence, giving it a silvery-white appearance. The inflorescence is dense and spiny bracted with about 20 flowers. The flowers have blue to violet-blue, elongate, funnel shaped corollas that are usually longer than 25 millimeters (1.0 inch), although occasionally as short as 20 millimeters (0.8 inch). The light gray-green leaves generally curve upward. The leavers are irregularly divided to the midrib into two to six narrow lobes, and are up to 50 millimeters (2.0 inches) long.

Woolly star is a pioneer species that colonizes washed sand deposits created by sporadic stream flow action. Between major flood events, these deposits typically exist as terraces above the high water mark of the river and associated braided streams (Zembal 1985). Woolly star grows primarily in Riversidean alluvial fan sage scrub habitat in sandy soils from 378 to 579 meters (1,240 to 1,900 feet) in elevation (Chambers Group 1993, Skinner and Pavlik 1994). It thrives in the nutrient poor sands of early seral stage habitat that have more than 97 percent sand (i.e., 0.5 to 2 millimeters; 0.02 to 0.08 inches) particles. The dominant species on young substrates include California buckwheat (*Erigonum fasciculatum*), scalebroom (*Lepidospartum squamatum*), fastigiate golden aster (*Heterotheca fastigiata*), and California croton (*Croton californica*). Woolly star also remains competitive on intermediate-aged substrates that have between 90 and 97 percent sand particles. The dominant species on intermediate substrates include California buckwheat, scalebroom, California juniper (*Juniperus californica*), valley cholla (*Opuntia californica* var. *parkeri* - formerly *Opuntia parryi*), and coastal prickly pear (*Opuntia littoralis*). In the few locations where woolly star occurs in mature seral stages, stands are relatively small and appear to be declining; probably because competition from shrubs and annual herbs limits the establishment of the subspecies. The dominant species on older substrates include sugar bush, holly-leaved cherry (*Prunus ilicifolia*) and chamise. Total

vegetative cover at sites supporting woolly star ranges from 42 to 48 percent at younger sites and 66 to 88 percent at older sites (Wheeler 1991).

Woolly star is a short-lived perennial species. The average life span of this perennial is 5 years, with a maximum life expectancy of 10 years (Burk *et al.* 1988). Woolly star begins reproduction in the second season of growth. The blooming period is from late May through mid-August; with heaviest blooms occurring in June (Muñoz 1991, Erickson 1993), Stone 1995). Total seasonal rainfall and time of rainfall may have an effect on the time of flowering (Erickson 1993).

Woolly star is primarily an outcrosser, and depends on pollinators for dispersal because seeds typically fall within 10 centimeters (4 inches) of the parent plant (Muñoz 1991, Wheeler 1991, Jones and Burk 1996). The flowers of woolly star mature and release pollen prior to the maturation and receptivity of the stigma. Jones and Burk (1996) documented a "drastic reduction" in fruit an seed set in 1995, corresponding to a reduction in observed pollinator populations that year. Identified pollinators of woolly star are the solitary digger bee (*Micranthophora flavocinta*), giant flower-lover fly (*Rhaphiomidas acton acton*), California bumblebee (*Bombus californicus*), white -lined sphinx moth (*Hyles lineata*), the black-chinned hummingbird (*Arhilochus alexandri*), and Anna's hummingbird (*Calipte anna*) (Muñoz 1992, Erickson 1993, Stone 1995). The digger bee is an important pollinator at early seral stage sites whereas hummingbirds and the giant flower-loving fly are important pollinators at intermediate stage sites (Muñoz 1991, Erickson 1993). Also, Stone (1995) reported that the California bumblebee and giant flower-loving fly were primary pollinators in both the Santa Ana River and Cajon Creek washes; although overall pollinator assemblages differed among sites.

Burk *et al.* (1989) reported that when seeds of woolly star are wetted, the outer seed coat forms a mucilaginous mass that readily attaches the seed to the surrounding soil particles. Hence it is unlikely that woolly star efficiently disperses into new habitats unless floods carry the seeds greater distances (Burk *et al.* 1989) the optimum temperature for germination is about sixty degrees Fahrenheit and no scarification or other treatment of any kind was necessary to stimulate germination (Burk *et al.* 1989). During demographic studies in the late 1980s, seedlings germinated simultaneously with the first major autumn storms (Burk *et al.* 1989). The median survival time of woolly star seedlings was determined to be significantly longer in early seral phase sites than in older sites. Mortality oat early seral sites was not negatively correlated with seedling density, whereas at older sites mortality was density-dependent (Wheeler 1991).

Historically, habitat for woolly star likely occurred in a mosaic pattern shifting in time and space across alluvial floodplains. Woolly star habitat still exists in a mosaic pattern within remaining patches of alluvial fan scrub along the Santa Ana River and Lytle and Cajon Creeks. The pattern of distribution of subpopulations, combined with current knowledge of the genetic diversity and pollinator ecology, suggest that the subspecies functions as a metapopulation.

Wheeler (1991) determined that woolly star has a standing seed bank. Those seeds not immediately shed from the fruits are stored within the capsules. In times of flooding, long distance movement of encapsulated seeds down the floodplain is possible' thereby facilitating some gene flow between subpopulations (Wheeler 1991).

Brunell (1991) used enzyme electrophoresis to investigate genetic diversity and partition of genetic information among woolly star stands across the Santa Ana Wash. Results of this investigation indicated the population is not threatened by inbreeding, and that there was a high rate of pollen migration among subpopulations. Brunell (1991) speculated that pollinators occasionally migrate among subpopulations; thereby dispersing genes and limiting the genetic substructuring of the population . Another possible explanation for the low genetic partitioning exhibited by woolly star subpopulations in the Santa Ana wash could relate to population characteristics. Massive floods, in the past, may have caused widespread seed migration. Over time, woolly star habitat would then recede as a function of succession. Pollen exchange across the range of patches may have been extremely rare. However the genetic variation expected from isolated patches might not exist because the last major flood (population- mixing event) occurred recently on an evolutionary scale (Brunell 1991)

Woolly star was listed as endangered on September 28, 1987 (Service 1987), after we determined the remaining 10 percent of its range was threatened by encroaching developments within the floodplain, sand and gravel, grazing by domestic animals, competition from exotic plants and other factors. We determined that destination of critical habitat was warranted because such an action was unlikely to provide a net benefit to the conservation of the subspecies.

Historically, woolly star occupied about 110 kilometers (60 miles) of habitat along the Santa Ana River from an elevation of about 600 meters (2,000 feet) at the base of the San Bernardino Mountains, through Riverside County to about 150 meters (500 feet) in the vicinity of Santa Ana Canyon in Orange County. Woolly star may have occupied alluvial habitats in Orange County as far downstream as Santiago Canyon (Craig 1934, Mason 1945, Zembal and Kramer 1984). Today, the subspecies is known from one extended, fragmented population in San Bernardino County on alluvial terraces along the Santa Ana River and its tributaries (Chambers Group 1993, Skinner and Pavlik 1994). No individuals have been located Riverside or Orange Counties during recent decades (Zembal 1985).

Since its listing, the status for woolly star "has been one of continuing decline" (CDFG 1990), with land development responsible for a significant portion of the loss of habitat. Current threats include urban development, off-road vehicles, flood control activities, sand and gravel mining operations, and competition from non-native plants.

Slender-horned Spineflower

Spineflower is a diminutive annual herb of the buckwheat (Polygonaceace) family. From its basal rosette of glabrous oblanceolate leaves, spineflower has prostrate to decumbent (reclining, but rising at the growing tips) stems ascending out of a basal rosette. Initial flower stems are erect, out of which the branching stems spread openly (Reveal and Hardham 1989a,b). During its flowering period, the ruddy coloration of the stems and involucres (whorl of leaf-like structures originating below and, in this case, encompassing the flowers) is similar to other seasonal colors in the surrounding landscape. This camouflages the plant from view. During this period, the plant is most readily detected by its distinctive basal rosette, whose leaves exhibit a characteristic shade of green often tinged with red. The leaves frequently become completely

reddish at maturity. Despite the striking appearance, the basal rosette is quite small, ranging form 6 to 25 millimeters (0.3 to 1.0 inch) in diameter (Ferguson *et al.* 1994). Plants are more distinguishable in the field outside the growing period when dried into a dark skeletal form.

Spineflower has broad, flat flower clusters borne on branching stems that are composed of numerous, closely congested, but solitary involucres. These cylindrical involucres are composed of six free or weakly fused lobes, each bearing a terminal and basal awn (Reveal and Hardham 1989a). It is the six hooked basal awns that distinguish spineflower and are used as a key character. Within the characteristic involucres, the minute flowers are composed of six petal-like parts, that are generally pinkish but may grade to white. The nine exerted stamens (male flower parts) bear oblong anthers (pollen-bearing tips), colored deep red to maroon, on glabrous filaments (Reveal and Hardham 1989a). The stigma (female flower part) is a rectangular box-shaped structure with four filamentous projections extending from the corners (N. Ferguson, pers. comm. 1995).

Spineflower is generally restricted to sandy terraces of floodplains and washes within the Riversidean alluvial fan sage scrub natural community. Spineflower is typically associated with the intermediate seral stage, and occurs on relatively flat (0 to 2 percent slopes) silty benches and terraces 100 to 5,000 years old (Barbour and Wirka 1997, Woods and Wells 1997). Spineflower gros primarily in sandy to gravelly soils that are slightly acidic and have low salinities, low nitrogen and phosphorus contents, low percentages of organic matter, low electrical conductivities, and low cation exchange capacities (Allen 1996, Ferguson *et al.* 1996). In the Santa Ana River wash, areas occupied by spineflower have low shrub cover and total forb and grass cover of 15 to 30 percent (Metropolitan Water District 1998). Microhabitats for spineflower are typically basins filled with silty soil and surrounded by rounded cobbles. Associated species include California juniper, California buckwheat, scalebroom, and laurel sumac (*Malosma laurina)*; although there is no consistent indicator species for spineflower. However a t least one population in Riverside County occupies an upland redshank chaparral association (S. Boyd, pers. comm., 1991). This non-typical population exists within close proximity to alluvial fan scrub (V. Jigour, pers. obs., 1994).

Recent surveys have also located spineflower in slight depressions adjacent to braided stream channels in the Santa Ana Wash (Jigour and McKernan 1992). Some of these depressions were created by scouring during the floods of 1938 and 1969. The 1938 storm was a 50-year event (a probability of happening once every 50 years) that had a peak flow approximately 1481 cubic meters per second (52,300 cubic feet per second) at the Santa Ana River near Mentone (COE 1988a). The 1969 storm was a 20-year event that had a peak discharge of 793 cubic meters per second (28,000 cubic feet per second) on the Santa Ana River at E Street near San Bernardino (downstream of Mentone) (COE 1988a). Movement of fine sediment into these depressions, upon which spineflower plants grow, may occur primar8ily by local overland flow during rain events (Wood and Wells 1997). Also, most populations of spineflower occur on microsites where the movement of fine-grained, aeolian (windblown) sediment may contribute to deposition (Woods and Wells 1997).

In some areas, spineflower occurs on or between patches of cryptogamic soils (Jigour and McKernan 1992). Cryptogamic crusts bind surface soil particles together, and are composed of

associations of algae, bryophytes (mosses), lichens, xerophytic liverworts, and cyanobacteria.. These crusts are slow to recover from disturbance, and estimates for time to unaided recovery may be as high as 100 years (Belnap 1993). The reliability of this apparent association appears weak, however, because ground cover of cryptogamic crusts in areas supporting spineflower ranged from zero to 90 percent at sites throughout the distribution of this species (Allen 1996). Also Metropolitan Water District (1998) found only 3 to 17 percent cryptogamic cover in areas occupied by spineflower along the Santa Ana River alignment of the Inland Feeder Project.

Because spineflower is generally associated with undisturbed habitats on older, stabilized alluvium, this species is not resilient when faced with disturbance (Woods and Wells 1997; S. Eliason, pers. comm. 1999). Recovery occasionally occurs, however, as evidenced by a population on the Santa Wash that was destroyed during land clearing by a sand and gravel mining company in 1983. This population persisted in small colonies consisting of as few as two individuals that were dispersed across portions of the graded area (V. Jigour, pers. obs. 1990).

Spineflower is an annual species with a distinctive basal rosette that appears in March. Germination may begin in late February and continues throughout the growing season (Ferguson *et al.* 1996). Although germination does not appear to be influenced by the environment, survivorship to reproduction and subsequent seed rain appear to be strongly influenced by available moisture (Ferguson *et al.* 1996). During rainfall early in the season vegetal growth is favored; later as moisture lessons, plants produce flowering stalks without a rosette (Ferguson *et al.* 1996).

Spineflower appears to be mostly self-incompatible and an outcrosser (Ferguson *et al.* 1996). The level of genetic diversity in this species is higher than that typical for either annuals or endemics. Most of this genetic variation occurs within populations, as opposed to being partitioned among populations (Ferguson *et al.* 1996).

Little is known about the pollinators of this plant. During a late May survey of a Riverside County population, three flying insect species were observed visiting the flowers. The most abundant of these was identified as a wasp (*Plenoculus davisii*) (Ferguson *et al.* 1994). It is not known whether this or any of the other insect species observed functions as a pollinator. Seeds are tightly retained in the involucres, and up to five seeds were found in each involucre. There appears to be a moisture related mechanism for seed release (Ferguson *et al.* 1994). The longevity of spineflower seeds in the soil is unknown, but there is some evidence that it is a t least seven years (V. Jigour, pers. obs., 1990). Dormancy and germination-triggering mechanisms in the greenhouse (Ferguson *et al.* 1996).

Evidence suggest alluvial fan scrub seed banks are characteristic of desert scrub associations. In desert seed banks, "from 80 to 90 percent of soil seeds are in the upper 2 cm of soil... and of these, most are in the litter or top few millimeters of soil" (Kemp 1989). The near-surface desert seed banks commonly exhibit a clumped distribution. The seed banks are dependent on parent plant distribution and are correlated with small topographic variations. Natural depressions and wind shadows have been shown to be major locations of the soil seed bank in the Sonoran Desert near Ajo, Arizona (Kemp 1989). This pattern is similar to the distribution of spineflower populations and individual plants (V. Jigour, pers. obs., 1995).

Spineflower typically forms spatially distinct populations in small isolated areas lacking any evidence of surface disturbance on a stabilized alluvium (Wood and Wells 1997). Some patches appear to be stable in abundance over several years, varying in their density with annual precipitation, while others virtually disappear in dry years. The survivorship and fecundity of spineflower can vary substantially among years, and appear to be significantly and positively correlated with the occurrence of wet conditions (Ferguson *et al.* 1996, Wood and Wells 1997). In other words, the population dynamics of spineflower are most strongly influenced by stochastic factors such as precipitation, rather than seed rain from the previous year, the type of co-occurring species, or percent ground cover (Ferguson *et al.* 1996).

Predation of spineflower leaves has rarely been observed, but predation of floral stems was observed at all 21 sites studied by Ferguson *et al.* (1996). This type of predation occurred early in the season while the stems were still green, and the stems were bitten off close to the ground. The number of stems predated varied widely among sites and years, but generally accounted for a low percentage of the total plants (Ferguson *et al.*1996). Grasshoppers appeared to be responsible for high stem predation during 1994 at Dripping Springs in the Cleveland National Forest near Vail Lake (Ferguson *et al.* 1996). If predation occurred early in the reproductive cycle, plants grew new floral stems; although the reproductive output was undoubtably reduced as stems produced later had fewer involucres (Ferguson *et al.* 1996).

Seed dispersal mechanisms for spineflower are unknown. Patterns of flooding and plant locations observed on the Santa Ana Wash suggest that floods facilitate long range dispersal (Jigour and McKernan, 1992; Woods and Wells 1997). Given that the locations of spineflower populations remain fairly constant from year to year, seed dispersal during climatic periods without major floods is likely within occupied microsites. Wind probably functions to help disperse seeds within the vicinity of the originating population since strong Santa Ana winds generally occur during autumn and winter in this region (Woods and Wells 1997).

Spineflower was listed as endangered on September 28, 1987 (Service 1987), after we determined that the remaining 25 percent of its range was threatened by habitat loss and degradation owing to encroaching developments within the floodplain, sand and gravel mining, grazing by domestic animals, competition from exotic plants, and other factors. We determined that designation of critical habitat was not warranted because such an action was unlikely to provide a net benefit to the conservation of the species.

Spineflower is found from 700 to 2,500 feet in elevation in central and eastern southern California, adjacent to foothills of the Transverse (San Gabriel) and Peninsular (San Bernardino and San Jacinto) Ranges (Allen 1996; Wood and Wells 1997). Historic records indicate that spineflower formerly occupied the following locations:

Los Angeles County: Along the foothills of the San Gabriel Mountains, including Mint Canyon, Newhall, San Fernando Wash, Pacoima Canyon Wash, Limekiln Canyon (San Fernando), Big Tujunga Wash, Rubio Wash (Altadena), Santa Anita Wash, and the West Fork of the San Gabriel River.

Riverside County: Temescal Canyon, Elsinore, Vicinity of Vail Lake, Vicinity of San Jacinto (north of Hemet), vicinity of Sage (South of Hemet), along the San Jacinto River floodplain, and Bautista Canyon in the foothills of the San Jacinto Mountains.

San Bernardino County: Along the foothills of the San Bernardino Mountains, including Cajon Canyon, Arrowhead Springs, Colton, San Bernardino, City Creek, San Bernardino Valley/Santa Ana Wash, and Yucaipa Valley (Reveal and Hardham 1989a, CNDDB 1993; R. McKernan, pers. comm., 1998).

Today, spineflower is restricted eight sites in Los Angeles, Riverside and San Bernardino Counties, including the Bee Canyon tributary to the Santa Clara River, Big Tujunga Wash, the vicinity of Vail Lake, Temescal Canyon, Bautista Canyon, the San Jacinto River floodplain, the Santa Ana Wash, the Lytle Creek wash and Cajon Creek near Devore. The latter population has not been located in the past decade (Rey-Vizgirdas 1994).

Although several previously undocumented populations have been discovered since spineflower was listed as endangered, its extant distribution tin the northern part of its range (Los Angeles County) has declined substantially. Approximately 75 percent of the historical extent of spineflower populations has been extirpated by drainage modification and sand and gravel mining that caused habitat loss and fragmentation (Ferguson *et al.* 1996). Continued threats to spineflower include urban development, off-road vehicles, flood control activities, and sand and gravel mining operations (Allen 1996; Wood and Wells 1997). Another serious concern is the increasing prevalence of Mediterranean annual grasses (e.g., *Bromus* spp.) in alluvial fan scrub communities. Although spineflower can withstand some low level of exotic grass competition, a high percentage cover of non-native grass species appears to limit its presence (Allen 1996).

ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present effects of all Federal, State, or private actions and other human activities in the action area, the anticipated effects of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the effects of State or private actions that are contemporaneous with the consultation in progress (50 CFR § 402.02). According to 50 CFR § 402.02, the "action area" means all areas that will be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area as determined by our agency.

We have described the action area in this consultation to encompass the area of impoundment behind Seven Oaks Dam and areas of historic flow downstream of the dam. The Seven Oaks Dam action area includes three subareas. Subarea 1 includes the area behind the dam and the reservoir pool/inundation area encompassing the 100-year floodplain to an elevation of about 2,580 feet. Subarea 2 extends from the upper Santa Ana River to San Bernardino International Airport (the former Norton Air Force Base). Greenspot Road and the lower reaches of Plunge and City Creeks occur along the northern border of Subarea 2; the creeks are tributaries to the Santa Ana River. Redlands Municipal Airport, the lower reach of Mill Creek, and lands

immediately south of the Santa Ana River occur along the subarea's southern boundary. Subarea 3 extends downstream from San Bernardino International Airport to the eastern or upstream limit of Prado Basin at the 566-foot elevation.

The historical distribution of the three species covered in this biological opinion apparently did not occur in Subarea 1; few occurrences, mostly for SBKR, have been found in Subarea 3. Subarea 2 is the primary area of effects from Seven Oaks Dam operations on SBKR, woolly star and spineflower. The Santa Ana River Wash (Subarea 2) is an alluvial fan formed by gravity-driven transport of sand, gravel, and rocks from the mountain slopes to the valley floors during floods and debris flows that periodically emanated from the principal drainage mouths within the action area (e.g., Santa Ana River and Mill, Plunge, and City creeks). Water percolation structures and sand mining operations have significantly altered the natural hydrology of this area by altering the magnitude and distribution of flooding, scouring, and sand transport and deposition. In the absence of flood scouring, sediments and organic matter accumulate over time and contribute to the maturation of Riversidean alluvial fan sage scrub.

San Bernardino Kangaroo Rat and its designated critical habitat

We estimated the current range of SBKR to include about 6,500 acres on the Santa Ana River alluvial fan, lower fan of Mill Creek, and lower reach of City Creek (Service, unpublished February 1998 GIS map). This range was based on records from the San Bernardino County Museum as communicated by Robert McKernan. Not all habitat within the current range is considered suitable for SBKR. The final rule to list the SBKR as endangered estimated that the Santa Ana River Wash contains about 5,224 acres, of which about 1,363 acres was considered unsuitable for SBKR due to excessive cover or disturbance. Just prior to the emergency listing for the species, the Service estimated that 3,679 acres was suitable (Service, unpublished December 1997 GIS map). Lands considered unsuitable included the active channel of the Santa Ana River, agricultural and residential land, some of the chamise chaparral, and heavily disturbed areas associated with sand and gravel mining, percolation basins, and the pervious borrow site. The areas of unsuitable habitat relative to those land and habitat types were determined by overlaying the unpublished GIS map onto the vegetation habitat base map.

SBKR are expected to occur throughout Subarea 2 west of Greenspot Road in all but the most severely disturbed habitats, including ephemeral use of the active channel (BA 2000). Relative abundance appears to be higher in pioneer and pioneer-intermediate Riversidean alluvial fan sage scrub based on available reports. That habitat generally dates from 1969 to more recent floods. Abundance in areas with intermediate through juniper-dominated Riversidean alluvial fan sage scrub exhibits considerable variability in SBKR abundance. Those habitats date from the 1860s to 1938 floods and, therefore, range from about 60 to 140 years old. Several authors, as well as the 1999 field survey, strongly suggest that non-native grasses may contribute to a lowering of the quality of habitat for SBKR within intermediate and mature Riversidean alluvial fan sage scrub successional phases. The possibility that higher elevation terraces with mature vegetation act as important refugia for the species also should be considered and is under current investigation by R. McKernan and G. Braden of the San Bernardino County Museum. SBKR abundance in chamise chaparral appears to be low based on existing reports. That habitat

typically has dense grass cover (COE 1996, MEC 2000a). Narrow unvegetated channels and dirt paths that cross the chamise chaparral in some areas may contribute to some of the records of occurrence within that habitat. That habitat is thought to pre-date the major floods of the 1860s (MEI 1999).

Potential habitat for SBKR is limited downstream of Subarea 2. The transition from alluvial scrub in the Santa Ana River Wash area to a more defined channel with riparian vegetation is not abrupt, and some potentially suitable habitat extends into the upper portion of Subarea 3. SBKR have been noted at the Tippecanoe Avenue crossing with the Santa Ana River (S. Montgomery, 2000 pers. comm.). Habitat south of Waterman Avenue to 8th Street is unsuitable because of the high levels of disturbance. A small patch of potential low-quality habitat occurs directly surrounding 8th Street, but remaining downstream reaches are unsuitable because of the wet substrate.

Santa Ana River Woolly Star and Slender-horned Spineflower

Current distribution of woolly star is limited to the sand deposits of the Santa Ana River between approximately Tippecanoe Avenue at the west end of San Bernardino International Airport and the base of the San Bernardino Mountains. There also is a population between the southwest limits of the main population and where the Santa Ana River becomes channelized. Management of the WSPA includes population monitoring and experimental treatments of late-successional habitat to determine the best mechanical means of rejuvenating the habitat in the absence of a natural flood regime. A 1999 spring season survey recorded 17 spineflower sub-populations consisting of 2,622 individuals within the action area. The recent survey noted that each spineflower sub-population occupied a relatively small area (COE 1999b). Four data sets from the 1999 survey can be grouped into three general areas: Group 1 that potentially lies within the 1938 floodplain originating from Plunge Creek; Group 2 in the disturbed area within the sand and gravel mining limits; and Group 3 within the area referred to as Section 12 of the U.S. Geological Survey quad map for Redlands, California (T1S, R.3.W.).

The listed species in the action area continue to be threatened by habitat loss, degradation, and fragmentation due to sand and gravel mining operations, water conservation activities, and the alteration of ecosystem processes, particularly scouring, transport, and deposition of sediment materials caused by the dam and interim operations. Suitable habitat conditions were created over thousands of years by water transporting coarse sediments out of the mountains, depositing sediments on the fan, and scouring vegetation to create a patchwork of pioneer, intermediate, and mature conditions. Flood control and water spreading structures have significantly altered the natural hydrology of this area by decreasing the magnitude and distribution of flooding, scouring, sand transport and deposition. In the absence of flood scouring, sediments and organic matter accumulate over time and pioneer phases of Riversidean alluvial fan sage scrub are not often restored. Eventually, these communities tend to mature and become more dense, thereby eliminating the early and intermediate seral stages favored by SBKR and woolly star, while allowing establishment of non-native grasses, which may have a negative effect on spineflower. In addition, many areas that would normally revegetate following flood events, and thereby

provide suitable habitat, have been denuded of vegetation by ongoing activities within spreading basins and channels.

Existing land uses in the Santa Ana River Wash in Subarea 2 include mining, water conservation and supply, flood control, and open space and habitat preserves. In 1993, representatives of numerous agencies, including water, mining, flood control, wildlife and municipal interests, formed a committee to address local mining issues. Subsequently, the role of the committee was expanded to address all the land functions within the wash. The committee began meeting in 1997 to determine how to use the land to accommodate all of these important functions.

The Service has been involved in discussions with the committee to develop a cooperative agreement among these stakeholders for land use compatible with environmental resource needs. The plan based on this cooperative agreement is known as the "Upper Santa Ana River Land Management and Habitat Conservation Plan" or "Plan B," and has not yet undergone review under either the California Environmental Quality Act or the National Environmental Policy Act. Conceptual land use "Plan B" addresses areas owned by private interests, sand and gravel mining operators, water conservation districts, as well as public owned lands, and land set-aside for environmental purposes. Section 12 (U.S. Geological Survey quad map, Redlands, T1S, R.3.W.) contains the primary land available for the plan to create, maintain, or enhance habitat for listed species. The land area addressed in "Plan B" covers approximately 5,200 acres in the Santa Ana River Wash. It is anticipated that, if it is finalized, "Plan B" or some alternate plan will coordinate and accommodate the existing ongoing activities, anticipated future planned activities, and establish habitat preserve areas. These existing and future activities include:

- Water conservation of both native and (when necessary) imported water resources for groundwater basin replenishment to augment public water supplies;
- Flood control;
- Aggregate extraction and processing;
- Protection of sensitive and listed species and habitat;
- Recreation planning of the Santa Ana River trail system.

The "Plan B" process, although it will likely be compatible with Seven Oaks Dam conservation measures, will not be used to establish or implement any of the additional conservation measures or any other measures to offset impacts to federally listed species and their habitats that may be required in this biological opinion, including any measures that might arise out of the MSHMP process.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the proposed action for their justification. Interdependent actions are those that have no independent utility apart from the action under

consideration. Indirect effects are those that are caused by the proposed action and are later in time but are still reasonably certain to occur.

The action area is defined as all those areas subject to direct and indirect effects of the project. Areas subject to direct effects include all those areas within the project footprint, for example, construction vehicle access routes, staging areas, and grading areas. Indirect effects include, for example, degradation of occupied habitat through edge effects, habitat isolation, and fragmentation.

Direct Effects

On-going management actions on the WSPA and future conservation measures over the 200-acre area, as directed by the Steering Committee to enhance habitat for the woolly star could have an immediate direct adverse effect if individual plants or the seed bank are disturbed and/or destroyed during the process. However, effects will likely be of a similar magnitude on the WSPA as that of current management activities which have been covered under previous section 7 consultation; minimal impacts on the 200-acre habitat manipulation area are anticipated since those future conservation activities will be directed to areas of low woolly star density. We anticipate a net beneficial effect for woolly star from such activities in the long term, with habitat renewed to conditions more suitable for the species' persistence. Due to their low incidence of occurrence in the WSPA, and presuming the WSPA Steering Committee will not direct management activities to areas potentially occupied by SBKR and spineflower, direct effects to SBKR and spineflower are not anticipated from on-going WSPA management activities.

Additional conservation measures for spineflower and SBKR include surveys to determine population status and distribution, experimental trials to assess habitat rejuvenation techniques, and larger scale habitat manipulations to be implemented based on the results of the surveys and experimental trials. Surveys and experimental trials are not anticipated to have a significant direct effect on spineflower. While individual plants could be crushed or damaged during surveys, it is anticipated that survey personnel will be experienced with the species and will take the appropriate care during their work to avoid and minimize such damage. Habitat rejuvenation experiments and larger scale habitat manipulations may remove spineflower plants through flooding and/or spreading of sand; however, these activities will generally be undertaken in areas with no or low density of plants so few individuals would be affected.

SBKR will be affected by the additional conservation measures through trapping studies to understand population factors across the wash, during trapping to remove animals from an area where experimental or larger scale habitat manipulations will be conducted, and by dike construction, sediment spreading and/or flooding during the experimental and larger scale habitat manipulations. While animals trapped during the demographic study or for relocation outside of an area to be flooded are anticipated to be released after data on the individuals is collected, some injury or mortality may occur with trapping (e.g., exposure, attack by ants while in the trap, injury from the trap mechanism). However, the incidence of injury or mortality from trapping is anticipated to be very low, because only SBKR experienced biologists approved by the Service will be conducting the studies using Service trapping protocols. It cannot be assured that all

SBKR will be captured for relocation prior to habitat manipulation; those not trapped may be crushed by equipment spreading sediment or building dikes or drowned while in their burrows during flooding. The number of individuals affected by those activities cannot be quantified, but the loss is anticipated to be minimal since these activities will be undertaken in areas of low density of SBKR (anticipated to be 0-5 animals per hectare) and trapping and relocation of animals to an area outside of the flood area will be implemented prior to the manipulation. Thus, only animals remaining within the areas to be manipulated after relocation trapping will be impacted.

The entire 200-acre area of additional conservation measures falls within and will affect designated SBKR critical habitat. Sediment spreading and dike building by heavy equipment may bury or remove alluvial fan sage scrub and compact soils thereby removing shrub cover for SBKR and making soil unsuitable for burrows. Therefore, some constituent elements of SBKR critical habitat will be impacted by habitat manipulations. However, we anticipate that the experimental and larger scale manipulations that require sediment and dikes will replace the natural processes that would have taken place, absent the dam, to periodically rejuvenate habitat to maintain its suitability for SBKR.

Indirect Effects

If the dam was operated in the long term for flood control in the absence of the additional conservation measures, we would anticipate a decline in the quality and quantity of suitable habitat for SBKR, woolly star and spineflower. Such a decline would result from a reduction in the frequency, magnitude, and extent of flood events due to the operation of the dam. These flood events would normally serve to rejuvenate intermediate and late succession alluvial sage scrub; however, the presence of the dam and its operations will prevent flood flows from reaching at least approximately 15 percent of alluvial scrub habitats on the Santa Ana Wash area. The dam will trap sediment and release water that is relatively free of sand and gravel, thus reducing the amount and quality of sediment that is also necessary for fluvial processes. Therefore, in the absence of additional conservation measures over the life of the dam, we would anticipate that succession of habitat would have an adverse effect on SBKR and spineflower by precluding flood and scour processes necessary for rejuvenation of their habitats. In addition, flood control operation may contribute to further downcutting of the main channel of the Santa Ana River, which may limit SBKR from crossing the channel and thus hamper species dispersal.

However, the flood control operations, in the absence of the additional conservation measure of larger-scale habitat manipulations for SBKR and spineflower, will only occur for a short interim period during experimental trials and finalization of the MSHMP. Therefore, we do not anticipate loss of individuals or other significant impacts to these species this interim period.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future

Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The 2000 BA identified 17 cumulative projects in the Santa Ana River Wash, some of which have been completed in the interim. Two bridge projects would span the river at Alabama and Orange streets in the City of Redlands and may affect habitat for woolly star and SBKR. Sand and gravel mining and water conservation operations will continue in the future; these operations may adversely affect habitat for all three species. However, we anticipate that these mining and water conservation operations will be addressed through finalization and implementation of "Plan B" discussed above and, therefore, are not considered in this analysis. The City of Redlands is pursuing the necessary environmental mitigation for the bridge projects separately from the "Plan B" effort.

CONCLUSION

After reviewing the status of the species, the environmental baseline, the effects of the proposed action, and the cumulative effects, it is our biological opinion that implementation of the proposed project is not likely to jeopardize the continued existence of woolly star, spineflower, or SBKR or adversely modify SBKR critical habitat.

We reached these conclusions by considering the following:

Direct effects to woolly star from the proposed flood control operations and additional conservation measures are anticipated to be of similar magnitude as that already occurring from management activities authorized by the WSPA Steering Committee and covered under prior section 7 consultation. Direct effects to woolly star and spineflower are anticipated to be minimal from experimental and larger scale habitat manipulation, as are direct effects to SBKR from trapping for demographic study and relocation and from experimental and larger scale habitat manipulation. The loss of SBKR that are not relocated out of the habitat manipulation areas is anticipated to be low. The indirect effects due to a lack of fluvial processes to rejuvenate intermediate and mature alluvial sage scrub will be for a short period while experimental trials are conducted and MSHMP finalized. Habitat succession is not anticipated to progress in that short a timeframe so as to make areas unsuitable for SBKR or spineflower. Over the long-term, conservation measures will replace habitat impacted and contribute to recovery of these species.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, and Federal regulations issued pursuant to section 4(d) of the Act, prohibit take of endangered and threatened species without a special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that actually kills or injures a listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an action that creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include,

but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), such incidental taking is not considered to be a prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of Federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

The measures described below are non-discretionary and must be implemented by COE in order for the exemption in section 7(o)(2) to apply. COE has a continuing duty to regulate the activity that is covered by this incidental take statement. If COE (1) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

Over the 100-year life of the project, 200 acres of SBKR habitat will be manipulated (10-20 acres every 5-10 years). This includes 169 acres of existing habitat that will lose the natural fluvial processes due to presence of the dam and an additional 31 acres that COE has agreed to include in its management area.

During population research and habitat manipulation activities it is anticipated that SBKR will be trapped or captured and released or relocated within the action area. Take of SBKR during these population studies and habitat manipulation is authorized as follows:

Service-approved biologists conducting SBKR population studies and relocation activities are authorized to capture, handle, and release individuals within the Santa Ana Wash.

We also anticipate that SBKR within the area subject to experimental and larger scale habitat manipulations that are not captured and relocated will be killed or injured during each manipulation over the 100-year life of the project. We are unable to quantify this incidental take of SBKR because not all animals will be captured and finding a dead or impaired animal is unlikely. Therefore, take of SBKR is authorized during each habitat manipulation event within the 200-acre management area for those animals remaining after relocation trapping.

EFFECT OF TAKE

In the accompanying biological opinion, we determined that this level of anticipated take is not likely to result in jeopardy to SBKR or adversely modify its critical habitat.

REASONABLE AND PRUDENT MEASURE

COE and/or local sponsors and their project contractors shall implement the following reasonable and prudent measure.

1. During population studies, relocation trapping and habitat manipulations, impacts to SBKR will be minimized.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, COE is responsible for compliance with the following terms and conditions, which implement the reasonable and prudent measure described above.

1.1 During trapping, individual SBKR may be held for up to 1 hour after removal from the trap, and then shall be released at the capture site provided that:

a. At each survey site, traps must be located in areas that typify SBKR habitat, and placed in sufficient numbers to provide adequate coverage of suitable habitat. Trapping shall continue for a minimum of 5 consecutive trapping nights at each trap station, line, or grid, unless animals are captured, or unless an alternate trapping regime is agreed to during preparation of the MSHMP.

b. Only 12-inch Sherman or wire-mesh live traps shall be used to trap in habitats that are known or suspected to accommodate SBKR. Models 9 inches in length may be used only if they were purchased before March 13, 1990. All trap models shall be modified to eliminate or substantially reduce the risk of injury (e.g., tail lacerations or excisions) to the animals.

c. No batting shall be used in the traps, and traps must be checked at least twice per night, once near midnight and again at sunrise. Trapping shall not be conducted if the nightly low temperature is forecast to be below 50 degrees Fahrenheit or if extended wind, rain, fog, or other inclement weather make (or have made) conditions unsuitable for trapping or would unduly jeopardize the lives of the animals.

d. No mutilation marking scheme (e.g., toe-clipping, ear-clipping) is authorized. No invasive technique (e.g., PIT-tagging) is permitted, unless specifically authorized by the Portland Regional Fish and Wildlife Office. Other marking schemes (e.g., hair clipping, ear-tagging) are permitted with prior approval by the Service.

e. Traps used for trapping small mammals outside of San Bernardino County shall be sterilized before use in San Bernardino County.

f. Plastic bags shall be used only for removing SBKR from the traps (for extraction and processing). Trapped individuals shall be processed as quickly as possible to reduce stress to the animals. Under no circumstances shall the individual be kept in plastic bags beyond 5 minutes. Trapped SBKR that must be kept for longer periods of time shall be transferred into a clean, structurally sound, breathable container with adequate ventilation. At no time shall the individual be allowed to become stressed due to temperature extremes (either hot or cold).

g. Each time the traps are placed, set, and baited, the traps shall be adjusted and set by hand at a sensitivity level appropriate for capturing SBKR. When closing traps, each trap shall be visually inspected and closed by hand.

h. Translocation activities are not authorized, i.e., animals may not be translocated outside of the Santa Ana River Wash.

i. Measures to prevent inadvertently missing traps shall, at a minimum, include:

i. All trap locations shall be identified with a unique identification code.

ii. While checking traps, a log sheet shall be used. Each time the trap is checked, the surveyor shall note the action on the log sheet. Periodically, the surveyor shall review the log sheet to ensure that no traps were inadvertently missed.

iii. The log sheet shall be in addition to (or incorporated into) other field notes or data sheets that are used for noting trap contents. The log sheet and field notes/data sheets (collectively, the "field documentation") shall be formatted to ensure the surveyor, trap (as identified by the unique identification code), and date/time checked are documented. Field documentation shall be available to Service personnel upon request (including during compliance inspections in the field).

iv. In the field, all trap locations shall be marked with flagging, reflective tape, or other technique that allows the surveyor to readily locate the traps under daytime and nighttime conditions. To the maximum extent possible, the markings shall be visible at a distance of at least 5 meters (16.3 feet).

1.2 The number of individuals, of any life stage, allowed to be incidentally injured or killed during performance of SBKR population research and/or relocation trapping activities is zero SBKR in any calendar year. In the event that an individual SBKR is injured or killed, the biologist must:

a. Immediately cease the activity until re-approved by the Carlsbad Fish and Wildlife Office, which may, after analysis of the circumstances of injury or mortality, revoke or amend this approval.

b. Immediately notify the Carlsbad Fish and Wildlife Office. Within 3 working days, the biologist shall follow up such verbal notification in writing. With the written notification, the biologist shall include a report of the circumstances that led to the injury or mortality. A description of the changes in activity protocols that will be implemented to reduce the likelihood of such injury or mortality from happening again shall be included, if appropriate. The incident shall also be discussed in the annual report that is subsequently submitted.

c. Preserve any dead specimens in accordance with standard museum practices. Before expiration of the permit, all preserved specimens shall be properly labeled and deposited with one of the designated depositories. The biologist shall supply the depository with a copy of this biological opinion to validate that the specimens supplied to the museum were taken pursuant to that biological opinion.

d. The biologist is authorized to salvage all SBKR carcasses.

e. Annual reports of activities shall be submitted to the Carlsbad Fish and Wildlife Office by January 31 following each year this approval is in effect. The report shall be in the following format: (a) an introduction section addressing reasons and objectives for taking the species; (b) a methodology section addressing data collection and analysis procedures; c) a results section that summarizes the data collected, including information on any other federally listed species detected while conducting activities authorized under this permit; and (d) a conclusion section that specifically provides recommendations for recovery of the species. If no activities occurred over the course of a year, indication of such shall be submitted as an annual report. The annual report shall include, but not be limited to:

i. Summary presentations and brief discussions of significant research results;

ii. Maps and/or descriptions of locations sampled (1:24000, 1:2000 scale);

iii. The results of all sampling efforts, including estimates of population sizes;

iv. Numbers of individuals incidentally killed, including dates, locations, circumstances, and depository receiving the preserved specimen(s);

v. Other pertinent observations made during sampling efforts regarding the status or ecology of the species; and

vi. Planned future activities if authorized under this permit.

The reasonable and prudent measure, with its implementing terms and conditions, is designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The COE must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measure.

Disposition of Sick, Injured, or Dead Specimens: Upon locating dead, injured, or sick SBKR, initial notification must be made to Jill Terp at (760) 431-9440 within one working day of discovery. Written notification must be made within five calender days and include the date, time, and location of the animal and any other pertinent information. The location where the animal was found should be marked in an appropriate manner and photographed. Care must be taken in handling sick or injured animals to ensure effective treatment and care. Injured animals should be transported to a qualified veterinarian. Should any treated animals survive, we should be contacted regarding the final disposition of the animals. Dead specimens should be sealed in an appropriately sized container and refrigerated to preserve biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's responsibility for this species, pursuant to section 7(a)(1) of the Act.

1. We recommend that COE work with resource agencies, local sponsors, and land owners to obtain permission to manage habitat for listed species on additional lands adjacent to those that will be actively managed in the future under the MSHMP.

2. We recommend that COE work with local landowners to identify habitats that have been degraded by past COE actions or other activities and may have supported listed species and initiate 1135 and/or 206 programs to remediate such habitat.

REINITIATION NOTICE

This concludes formal consultation on the proposed action. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is reached; (2) new information reveals effects of the agency action that may adversely affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or

critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is reached, any operations causing such take must cease pending reinitiation.

We look forward to continuing our cooperation on the development of additional conservation measures. If you have any questions regarding this letter, please contact Supervisory Fish and Wildlife Biologist Jill Terp of this office at (760) 431-9440.

Sincerely,

Karen A. Evans

Karen A. Evans
Assistant Field Supervisor

cc:
Lance Natsuhara and Matthew Blinstrub, Orange County Flood Control District
David Lovell and Jim Borcuk, San Bernardino County Flood Control District
Steve Thomas, Riverside County Flood Control District

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State Water Resources Control Board

Division of Water Rights
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Winston H. Hickox
Secretary for Environmental Protection

Gray Davis
Governor

In Reply Refer
to:332:KDL:266.0

AUG 1 6 2001

Ms. Anne J. Schneider
Ellison, Schneider & Harris, LLP
2015 H Street
Sacramento, CA 95814-3109

Dear Ms. Schneider:

SEVEN OAKS DAM FLOOD CONTROL PROJECT - SANTA ANA RIVER

Thank you for your letter dated July 27, 2001, which provided us with additional information to determine whether a water right is needed for the Seven Oaks Dam Flood Control Project. The project you described is for the attenuation of peak flood flows only, and does not involve diversion of water to storage for later beneficial use or diversion to areas outside the Santa Ana River channel. Based on the information provided, it appears that a water right permit is not needed. However, if the project is modified to facilitate water storage for diversion after the flood season, a water right permit may be required.

If you have any questions please contact Mitchell Moody at (916) 341-5383.

Sincerely,

for David R. Bunger
Edward C. Anton, Chief
Division of Water Rights

"The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web-site at http://www.swrcb.ca.gov"