DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

197-94

RIN 1018–AB75

Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, and the Vernal Pool Tadpole Shrimp; and Threatened Status for the Vernal Pool Fairy Shrimp

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: The U.S. Fish and Wildlife Service (Service) determines endangered status pursuant to the Endangered Species Act of 1973, as amended (Act) for the Conservancy fairy shrimp (*Branchinecta conservatio*), longhorn fairy shrimp (*Branchinecta longiantenna*), and the vernal pool tadpole shrimp (*Lepidurus packardi*); and threatened status for the vernal pool fairy shrimp (*Branchinecta lynchi*). These four invertebrate species are restricted to vernal pools in the State of California and are in danger of extinction principally as the result of urban development, conversion of native habitats to agriculture, and stochastic (random) extinction by virtue of the small isolated nature of many of the remaining populations. This rule implements Federal protection and recovery provisions afforded by the Act for all of these animals.

One species, the California linderiella (*Linderiella occidentalis*), which had been proposed for listing with the above species, has been withdrawn. Additional information that has become available to the Service since the publication of the proposed rule reveals that this species is more abundant than previously known. The Service has considered the additional information and has determined that the California linderiella is not likely to become either endangered or threatened throughout all or a significant portion of its range in the foreseeable future, and it does not qualify for listing under the Act. A notice withdrawing the proposal is published in the **Federal Register** concurrently with this final rule.

EFFECTIVE DATE: September 19, 1994.

ADDRESSES: The complete file for this final rule is available for public inspection, by appointment, during normal business hours at the Sacramento Field Office, U.S. Fish and Wildlife Service, 2800 Cottage Way Room E–1823, Sacramento, California 95825–1846.

FOR FURTHER INFORMATION CONTACT: Chris Nagano or Jim Browning at the above address or by telephone (916/978–4866).

SUPPLEMENTARY INFORMATION:

Background

The Conservancy fairy shrimp, longhorn fairy shrimp, and the vernal pool fairy shrimp are members of the aquatic crustacean order Anostraca. The vernal pool tadpole shrimp is a member of the aquatic crustacean order Notostraca. They are endemic to vernal pools in the Central Valley, coast ranges, and a limited number of sites in the Transverse Range and Santa Rosa Plateau of California.

The three fairy shrimp and the vernal pool tadpole shrimp live in vernal pools, an ephemeral freshwater habitat. None are known to occur in riverine waters, marine waters, or other permanent bodies of water. They are ecologically dependent on seasonal fluctuations in their habitat, such as absence or presence of water during specific times of the year, duration of inundation, and other environmental factors that include specific salinity, conductivity, dissolved solids, and pH levels. Water chemistry is one of the most important factors in determining the distribution of fairy shrimp and tadpole shrimp (Belk 1977; Jamie King, University of California, *in litt.*, 1992; Marie Simovich, University of San Diego, *in litt.*, 1992). The four species included in this final rule are sporadic in their distribution, often inhabiting only one or a few pools in otherwise more widespread vernal pool complexes (Larry Eng, California Department of Fish and Game, pers. comm., 1990; Jamie King, *in litt.*, 1992; Marie Simovich, *in litt.*, 1992; Richard Brusca, San Diego Museum of Natural History, pers. comm., 1992).

Fairy shrimp have delicate elongate bodies, large stalked compound eyes, no carapace, and 11 pairs of swimming legs. They swim or glide gracefully upside down by means of complex beating movements of the legs that pass in a wave-like anterior to posterior direction. Nearly all fairy shrimp feed on algae, bacteria, protozoa, rotifers, and bits of detritus (Pennak 1989). The second pair of antennae in the adult females are cylindrical and elongate, but in the males are greatly enlarged and specialized for clasping the females during copulation. The females carry the eggs in an oval or elongate ventral brood sac. The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. The "resting" or "summer" eggs are capable of withstanding heat, cold, and prolonged desiccation. When the pools refill in the same or subsequent seasons some, but not all, of the eggs may hatch. The egg bank in the soil may be comprised of the eggs from several years of breeding (Donald 1983). The eggs hatch when the vernal pools fill with rainwater. The early stages of the fairy shrimp develop rapidly into adults. These non-dormant populations often disappear early in the season long before the vernal pools dry up.

Tadpole shrimp have dorsal compound eyes, a large shield-like carapace that covers most of the body, and a pair of long cercopods at the end of the last abdominal segment (Brusca and Brusca 1991; Pennak 1989; Linder 1952; Longhurst 1955a; Lynch 1966, 1972). They are primarily benthic animals that swim with their legs down. Tadpole shrimp climb or scramble over objects, as well as plow along in bottom sediments. Their diet consists of organic detritus and living organisms, such as fairy shrimp and other invertebrates (Pennak 1989; Fryer 1987). Mating in tadpole shrimp is described by Longhurst (1955b). The females deposit their eggs on vegetation and other objects on the bottom. Vernal pool tadpole shrimp populations pass the dry summer months as diapaused eggs in pool sediments. Some of the eggs hatch as the vernal pools are filled with rainwater in the fall and winter of subsequent seasons.

Vernal pools have a discontinuance occurrence in several regions of California. Generally vernal pool habitat is found west of the Sierra Nevada and extends from southern Oregon into northern Baja, California (Holland and Jain 1977, 1988). Vernal pools form in regions with Mediterranean climates where shallow depressions fill with water during fall and winter rains and then evaporate in the spring (Collie and Lathrop 1976; Holland 1976, 1978; Holland and Jain 1977, 1988; Norwick 1992; Thorne 1984). Overbank flooding from intermittent streams may augment the amount of water in some vernal pools (Hanes *et al.* 1990). Downward percolation is prevented by the presence of an impervious subsurface layer, such as a claypan, hardpan, or volcanic stratum (Holland 1976, 1988). Due to local topography and geology, the pools are usually clustered into pool complexes (Holland and Jain 1988). Pools within a complex typically are separated by distances on the order of meters and may form dense, interconnected mosaics of small pools or a more sparse scattering of larger

pools. Temporary inundation makes vernal pools too wet during the wetted period for adjacent upland plant species adapted to drier soil conditions, while rapid drying during late spring makes pool basins unsuitable for typical marsh or aquatic species that require a more permanent source of water. However, many indigenous plant and aquatic invertebrate species have evolved to occupy the extreme environmental conditions found in vernal pool habitats. Fairy shrimp and tadpole shrimp play an important role in the community ecology of many ephemeral water bodies (R. Brusca, pers. comm., 1992; Loring *et al.* 1988). They are fed upon by waterfowl (Ahl 1991; Driver 1981; Krapu 1974; Swanson *et al.* 1974) and other vertebrates, such as western spadefoot toad (*Scaphiopus hammondi*) tadpoles (M. Simovich, pers. comm., 1991).

The genetic characteristics of the three fairy shrimp and the vernal pool tadpole shrimp, as well as ecological conditions, such as watershed contiguity, indicate that populations of these animals are defined by pool complexes rather than by individual vernal pools (Fugate 1992; J. King, unpubl. data). Therefore, the most accurate indication of the distribution and abundance of the four vernal pool crustaceans is the number of inhabited vernal pool complexes. Individual vernal pools occupied by the four species listed herein are most appropriately referred to as subpopulations.

Urban, water, flood control, highway, and utility projects, as well as conversion of wildlands to agricultural use, have eliminated vernal pools in southern California (Riverside and San Diego Counties), the Central Valley, and San Francisco Bay area (Jones and Stokes Associates 1987). Changes in hydrologic pattern, overgrazing, and off-road vehicle use also imperil this aquatic habitat and the four species listed herein. Human activities that alter the watershed of vernal pools indirectly affect these animals. The flora and fauna in vernal pools or swales can change if the hydrologic regime is altered (Bauder 1986, 1987). Anthropogenic activities that reduce the extent of the watershed or that alter runoff patterns (i.e., amounts and seasonal distribution) may eliminate the animals, reduce their population sizes or reproductive success, or shift the location of sites inhabited by these animals.

According to Holland (1978), there were an estimated 1.7 million hectares (4.2 million acres) in the Central Valley that possibly supported vernal pools at the time Europeans arrived in California. Holland estimated that between 67 and 88 percent of this acreage was destroyed by 1973, largely by human activities (Holland 1978). However, both the acreage of historic vernal pool habitat and estimates of loss determined in this study have been disputed by others. Vernal pools in southern California have been highly impacted by human activities (Zedler 1987). The rate of loss of vernal pool habitat in parts of California has been estimated to occur at approximately 2 or 3 percent per year (Holland 1988).

Discussion of the Four Species

The Conservancy fairy shrimp (*Branchinecta conservatio*), a member of the family Branchinetidae, was described from specimens collected at the Jepson Prairie Preserve, located in the Central Valley east of Travis Air Force Base in Solano County (Eng *et al.* 1990). The animal ranges in size from 14 to 27 millimeters (0.6 to 1.1 inches) long and is most similar in appearance to Lindahl's fairy shrimp (*Branchinecta lindahli*). However, the female brood pouch is fusiform and usually ends under abdominal segment 8 in the Conservancy fairy shrimp, whereas the pouch is cylindrical and usually ends under segment 4 in Lindahl's fairy shrimp. The large, oval pulvillus at the proximal end of the basal segment of the male antenna appears similar in both species, however, the terminal end of the distal antennal segments of the Conservancy fairy shrimp are distinctive (Eng *et al.* 1990).

The Conservancy fairy shrimp inhabits vernal pools with highly turbid water. The species is known from six disjunct populations: Vina Plains, Tehama County; south of Chico, Tehama County; Jepson Prairie, Solano County; Sacramento National Wildlife Refuge, Glenn County (Joe Silviera, U.S. Fish and Wildlife Service, pers. comm., 1993), near Haystack Mountain northeast of Merced in Merced County; and the Lockewood Valley of northern Ventura County (Michael Fugate, University of California at Riverside, pers. comm., 1991). The pools inhabited by the Conservancy fairy shrimp are large, such as the 36 hectare (89 acre) Olcott Lake at Jepson Prairie (Eng, pers. comm., 1990). The Conservancy fairy shrimp has been observed from November to early April. The pools at Jepson Prairie and Vina Plains inhabited by this animal have very low conductivity, total dissolved solids (TDS), and alkalinity (Barclay and Knight 1984; Eng *et al.* 1990). The Conservancy fairy shrimp is usually collected at cool temperatures and appears to be relatively long-lived (Simovich *et al.* 1992; Patton 1984).

The longhorn fairy shrimp (*Branchinecta longiantenna*), a member of the family Branchinectidae, was described from specimens collected at Souza Ranch in the Kellogg Creek watershed, about 35 kilometers (22 miles) southeast of the City of Concord, Contra Costa County (Eng *et al.* 1990). It ranges in size from 12.1 to 20.8 mm (0.5 to 0.8 inches). This species differs from other branchinectids in that a portion of the distal segment of its antennae is flattened in the antero-posterior plane rather than the latero-medial plane.

The longhorn fairy shrimp inhabits clear to turbid grass-bottomed vernal pools in grasslands and clear-water pools in sandstone depressions. This species is known only from four disjunct populations along the eastern margin of the central coast range from Concord, Contra Costa County south to Soda Lake in San Luis Obispo County: the Kellogg Creek watershed, the Altamont Pass area, the western and northern boundaries of Soda Lake on the Carrizo Plain (Eng *et al.* 1990), and Kesterson National Wildlife Refuge in the Central Valley (Dennis Woolington, U.S. Fish and Wildlife Service, *in litt.* 1993). All vernal pools inhabited by this species are filled by winter and spring rains and may remain inundated until June. The longhorn fairy shrimp has been observed from late December until late April. The water is grassland pools inhabited by this species has very low conductivity, TDS, and alkalinity (Eng *et al.* 1990).

The vernal pool fairy shrimp (*Branchinecta lynchi*), a member of the family Branchinectidae, was described from specimens collected at Souza Ranch in the Kellogg Creek watershed, Contra Costa County, California (Eng *et al.* 1990). It ranges in size from 10.9 to 25.0 mm (0.4 to 1.0 inches). This species most resembles the Colorado fairy shrimp (*Branchinecta coloradensis*). There are several differences in the antennae of the males of the two species, including the basal segment outgrowth below and posterior to the pulvillus, which is ridge-like in the vernal pool fairy shrimp but is cylindrical and often much larger in the Colorado fairy shrimp. The shorter brood pouch of the vernal pool fairy shrimp is pyriform, whereas the longer one in the Colorado fairy shrimp is fusiform (Eng *et al.* 1990).

Although the vernal pool fairy shrimp has a relatively wide range, the majority of known populations inhabit vernal pools with clear to tea-colored water, most commonly in grass or mud

bottomed swales, or basalt flow depression pools in unplowed grasslands, but one population occurs in sandstone rock outcrops and another population in alkaline vernal pools. The vernal pool fairy shrimp has been collected from early December to early May. The water in pools inhabited by this species has low TDS, conductivity, alkalinity, and chloride (Collie and Lathrop 1976). This species has a sporadic distribution within vernal pool complexes (Jones and Stokes, 1992, 1993; County of Sacramento 1990; Patton 1984; Stromberg 1993; Sugnet and Associates 1993b) wherein the majority of pools in a given complex typically are not inhabited by the species. Simovich *et al.* (1992) reported that the vernal pool fairy shrimp typically is found at low population densities. Only rarely does the vernal pool fairy shrimp co-occur with other fairy shrimp species, but where it does, the vernal pool fairy shrimp is never the numerically dominant one (Eng *et al.* 1990). Although it can mature quickly, allowing populations to persist in short-lived shallow pools, it also persists later into the spring where pools are longer lasting (Simovich *et al.* 1992). Sugnet and Associates (1993b) listed 178 records for the species out of 3092 "discrete locations" containing potential habitat in their report. These 178 records represent the 32 known populations of the vernal pool fairy shrimp, which extend from Stillwater Plain in Shasta County through most of the length of the Central Valley to Pixley in Tulare County, and along the central coast range from northern Solano County to Pinnacles in San Benito County (Eng *et al.* 1990; M. Fugate, pers. comm., 1991; Sugnet & Associates 1993b). Five of these populations are believed to be comprised of a single inhabited pool. Four additional, disjunct populations exist; one near Soda Lake in San Luis Obispo County, one in the mountain grasslands of northern Santa Barbara County, one near the Santa Rosa Plateau in Riverside County, and one near Rancho California in Riverside County. Three of these four isolated populations contain only a single known pool occupied by the vernal pool fairy shrimp.

The vernal pool tadpole shrimp (*Lepidurus packardi*), a member of the family Triopsidae, was described by Eugene Simon in 1866 (Longhurst 1955a). Longhurst (1955a) placed the name in synonymy with *Lepidurus apus*. Subsequently, Lynch (1972) examined the taxa and determined that *Lepidurus packardi* is a valid species. The Service accepts Lynch's taxonomic treatment of the genus *Lepidurus*, which maintains *L. packardi* as a species.

Vernal pool tadpole shrimp adults reach a length of 50 millimeters (2 inches). They have about 35 pairs of legs and two long cercopods. This species superficially resembles the ricefield tadpole shrimp (*Triops longicaudatus*). However, *Lepidurus* possess a flat paddle-shaped supra-anal plate that is entirely lacking in members of the genus *Triops* (Pennak 1989; R. Brusca *in litt.*, 1992; M. Simovich *in litt.*, 1992; J. King *in litt.*, 1992). The vernal pool tadpole shrimp is known from 18 populations in the Central Valley, ranging from east of Redding in Shasta County south through the Central Valley to the San Luis National Wildlife Refuge in Merced County, and from a single vernal pool complex located on the San Francisco Bay National Wildlife Refuge in the City of Fremont, Alameda County.

The vernal pool tadpole shrimp inhabits vernal pools containing clear to highly turbid water, ranging in size from 5 square meters (54 square feet) in the Mather Air Force Base area of Sacramento County, to the 36 hectare (89 acre) Olcott Lake at Jepson Prairie. The pools at Jepson Prairie and Vina Plains have a very low conductivity, TDS, and alkalinity (Barclay and Knight 1984; Eng *et al.* 1990). These pools are located most commonly in grass bottomed swales of grasslands in old alluvial soils underlain by hardpan or in mud-bottomed pools containing highly turbid water.

The life history of the vernal pool tadpole shrimp is linked to the phenology of the vernal pool habitat. After winter rainwater fills the pools, the populations are reestablished from diapaused eggs that lie dormant in the dry pool sediments (Ahl 1991; Lanway 1974). Ahl (1991) found that eggs in one pool hatched within three weeks of inundation and maturated to sexually reproductive adults in another three to four weeks. Simovich *et al.* (1992) reported sexually mature adults occurred in another pool three to four weeks after the pools had been filled. A female surviving to large size may lay up to six clutches of eggs, totaling about 861 eggs in her lifetime (Ahl 1991). The eggs are sticky and readily adhere to plant matter and sediment particles (Simovich *et al.* 1992). A portion of the eggs hatch immediately and the rest enter diapause and remain in the soil to hatch during later rainy seasons (Ahl 1991). The vernal pool tadpole shrimp matures slowly and is a long-lived species (Ahl 1991; Alexander 1976). Adults are often present and reproductive until the pools dry up in the spring (Ahl 1991; Simovich *et al.* 1992).

Previous Federal Actions

Ms. Roxanne Bittman petitioned the Service to list the Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, and California linderiella as endangered species in a letter dated November 19, 1990, which was received by the Service on November 20, 1990. Ms. Bittman submitted additional information on these species in a letter dated November 20, 1990, which was received on November 26, 1990. On March 21, 1991, the Service made a 90-day finding that the petition contained substantial information indicating that the action requested may be warranted. A notice announcing this finding was published in the **Federal Register** on August 30, 1991 (56 FR 426968).

Ms. Dee Warenycia petitioned the Service to list the vernal pool tadpole shrimp as an endangered species in a letter dated April 28, 1991, which was received by the Service on April 30, 1991. On November 21, 1991, the Service determined in the administrative 90-day finding that the petition contained substantial information that the action requested may be warranted. On May 8, 1992, the Service published a proposed rule in the **Federal Register** (57 FR 19856) to list the four fairy shrimp and vernal pool tadpole shrimp as endangered.

Summary of Comments and Recommendations

In the May 8, 1992, proposed rule (57 FR 19856) and associated notifications, all interested parties were requested to submit factual reports or information that might assist the Service in determining whether these taxa warrant listing. Appropriate State agencies, county governments, including affected planning departments, Federal agencies, scientific organizations, and other interested parties were contacted and requested to comment. Notices of this proposal were published in the Santa Rosa Press Democrat, San Francisco Chronicle, Monterey Herald, Chico Enterprise Record, San Luis Obispo Telegram-Tribune, Santa Barbara News-Press, Modesto Bee, Sacramento Bee, and the Fresno Bee on June 5, 1992.

On June 4, 1992, the Service received a written request for a public hearing from Mr. George Robson of the Tehama County Planning Department. Several other requests for a public hearing also were received. As a result, on August 13, 1992, the Service published a notice in the **Federal Register** (57 FR 36380) announcing the public hearing and

reopening the comment period until September 18, 1992. The Service conducted a public hearing on August 31, 1992, at the Radisson Hotel in Sacramento, California. Testimony was taken from 6 p.m. to 8 p.m. Twenty-one persons presented testimony.

On September 18, 1992, the Service attended a public meeting held at the Red Bluff Community Center in Red Bluff, Tehama County, California. Six people presented oral and written comments to the Service.

During the comment periods, the Service received 117 comments (letters and oral testimony). Several people submitted more than one comment to the Service. The Service received two petitions containing 63 signatures of people supporting the listing and one petition containing 190 signatures of people opposed to the listing. The California Department of Parks and Recreation supported a listing of threatened for the four fairy shrimp but did not state a position on the vernal pool tadpole shrimp. The California Department of Fish and Game expressed concern for the fairy shrimp and also did not state a position on the vernal pool tadpole shrimp. Comments supporting the listing were received from 41 private parties, including the Riverside County Planning Department, and nine professional biologists from several institutions, including the Stanford University Center for Conservation Biology, University of California, University of San Diego, and San Diego Museum of Natural History. Comments opposing the listing were received from 34 private parties, organizations, and agencies including seven mosquito abatement districts. Opposition to the listing also was expressed by Congressman Wally Herger and Congressman Vic Fazio. Four commenters did not express an opinion.

In addition, after the comment period closed, six parties, including the California Department of Fish and Game, requested that the Service extend the date of the final determination for the five species by six months pursuant to 16 U.S.C. 1533(b)(6). The Act provides for a six-month extension if the Secretary finds that "* * * there is substantial disagreement regarding the sufficiency or accuracy of the available data relevant to the determination * * * for the purposes of soliciting additional data." One of these commenters submitted a report that summarized collection records and field work conducted in 1993 (Sugnet and Associates 1993b). The California Department of Fish and Game supported the extension but stated that they had no additional information. The California Native Plant Society opposed the six-month extension and urged the Service to immediately list the five species under the Act.

The Service has reviewed all of the written and oral comments described above. Comments updating the data presented in the "Background" or "Summary of Factors Affecting the Species" are incorporated in those sections of this final rule. Opposing comments and other comments concerning the rule have been organized into specific issues. These issues and the Service's response to each are summarized as follows:

Issue 1: A number of commenters stated that a single public hearing was inadequate to obtain full public input on the proposal. They requested that public hearings be held in all of the towns and counties that contain vernal pools and swales inhabited by the five species.

Service Response: The Service is obligated to hold one public hearing on a listing proposal if requested to do so within 45 days of publication of the proposal (16 U.S.C. 1533(b)(5)(E)). In addition to the public hearing held on August 31, 1992, the Service attended a public meeting organized by Congressman Vic Fazio in Red Bluff, on September 18, 1992. The public comment period was extended to September 8, 1992, to allow all interested parties to provide written comments. In making a decision on a listing proposal, written comments are given the same weight as oral comments presented at hearings.

Issue 2: Several respondents stated that the Service's notification of the public on this proposal was inadequate.

Service Response: The Service went through an extensive notification process to make the public aware of this proposal; this process satisfied the requirements of the Act and is described at the beginning of this section.

Issue 3: Many respondents concluded that listing the fairy shrimp and the vernal pool tadpole shrimp would result in adverse economic impacts to thousands of hectares of land and questioned the value of these animals to society. Two commenters requested that an analysis of the economic impact of listing these species be completed. Two commenters noted that these species are restricted to vernal pools but stated that listing would result in adverse economic impacts by eliminating future residential or commercial development in areas containing this habitat. Five commenters claimed the fairy shrimp and the vernal pool tadpole shrimp are "insignificant" species and that listing would interfere with the natural evolutionary process of extinction. On the other hand, a number of respondents asserted that opposition to the listing of the species was based solely on economic interests. They cited the ecological and educational value of vernal pool plants and animals. Four crustacean biologists noted the species can be considered "living fossils" and are of great scientific value to the study of biological evolution, systematics, and ecology.

Service Response: Under section 4(b)(1)(A) of the Act, a listing determination must be based solely on the best scientific and commercial data available. The legislative history of this provision clearly states the intent of Congress to "ensure" that listing decisions are "based solely on biological criteria and to prevent non-biological criteria from effecting such decisions" H.R. Rep. No. 97–835, 97th Cong. 2d Sess. 19 (1982). As further stated in the legislative history, "economic considerations have no relevance to determinations regarding the status of species." Because the Service is specifically precluded from considering economic impacts in a final decision on a proposed listing, the Service has not considered possible economic consequences of listing the three fairy shrimp and the vernal pool tadpole shrimp. There may be many opinions as to a particular species' contribution to society, including their aesthetic, scientific, or other significance, however, this contribution is not among the five factors upon which a listing determination is based.

Issue 4: One commenter recommended that the Service prepare an Environmental Impact Statement (EIS), pursuant to the National Environmental Policy Act (NEPA), on this rule. He stated that a decision to list these five crustaceans is a major Federal action that significantly affects the quality of the human environment.

Service Response: For the reasons set out in the NEPA section of this document, the Service takes the position that rules issued pursuant to section 4(a) of the Act do not require the preparation of an EIS. The courts held in *Pacific Legal Foundation* v. *Andrus*, 657 F2d. 829 (6th Circuit 1981) that an EIS is not required for listing under the Act. The decision noted that preparing EIS's on listing actions does not further the goals of NEPA or the Act.

Issue 5: One commenter requested that the Service conduct a Takings Implications Assessment under Executive Order 12630 for this listing action.

Service Response: The Attorney General has issued guidelines to the

Department of the Interior (Department) regarding implementation of Executive Order 12630.

The Attorney General's guidelines state that Taking Implications Assessments (TIAs), which are used to analyze the potential for Fifth Amendment taking claims are to be prepared after, rather than before, an agency makes a decision upon which its discretion is restricted. In enacting the Endangered Species Act, Congress required the Department to list a species based solely upon scientific and commercial data indicating whether or not the species is in danger of extinction. No discretion is afforded and the Service may not withhold a listing based upon economic concerns. Therefore, even though a TIA is required, a TIA for a listing action is to be finalized only after the final decision whether to list a species is made.

Issue 6: The California Department of parks and Recreation recommended that the four fairy shrimp should be listed as threatened species rather than endangered species.

Service Response: The Service has determined that threatened status is appropriate for the vernal pool fairy shrimp. The proposal to list the California linderiella as an endangered species has been withdrawn. The rationale for these actions and endangered status for the two other fairy shrimp species and the vernal pool tadpole shrimp is described at the conclusion of the "Summary of Factors Affecting the Species" section.

Issue 7: Several commenters expressed concern that it will be difficult or impossible to delist any or all of the crustaceans listed herein.

Service Response: When the recovery goals for a species have been met, the Service may prepare a proposal to delist or reclassify it. The process for delisting or reclassifying a species, allowed for at section 4(b)(3)(A) of the Act, is the same process used for listing the species.

Issue 8: Three respondents stated that compared to other federally listed crustaceans, the fairy shrimp and the vernal pool tadpole shrimp do not warrant listing under the Act.

Service Response: The claim that the status of the fairy shrimp and the vernal pool tadpole shrimp do not warrant listing under the Act when compared with other listed crustaceans does not address the full range of issues and complexities bearing on listing decisions. The multiplicity of factors and relationships that must be considered and interpreted in assigning the appropriate status to listed taxa is sufficiently complex that patterns of consistency may not be necessarily agreed upon by all parties.

Issue 9: Several respondents stated that critical habitat should be designated for the fairy shrimp and the vernal pool tadpole shrimp.

Service Response: The Service believes that the danger posed by designating critical habitat at this time outweighs the potential benefits. As discussed in Factors "A" and "E" under the "Summary of Factors Affecting the Species" section below, all of the species included in this final rule could be adversely affected by acts of vandalism. The Service is aware of vernal pools that contained suitable habitat for these animals that apparently were destroyed to escape regulatory requirements. Designation of critical habitat at this time would increase the degree of threat facing these species.

Issue 10: One commenter stated that there is not enough data on the species listed herein upon which to develop a recovery plan.

Service Response: Section 4(f) of the Act directs the Secretary to develop and implement recovery plans for conservation and survival of listed endangered and threatened species. The Service intends to pursue the development of a recovery plan for the four species as soon as possible. Identification of needed research and acquisition of additional data are key components of most recovery plans.

Issue 11: Several commenters stated that the California linderiella and the vernal pool fairy shrimp do not warrant listing because of their widespread distribution.

Service Response: Species may be listed under the Act if one or more of the five listing criteria imperils the species with extinction or if the species is likely to become endangered in the foreseeable future, throughout all or a significant portion of its range. These criteria apply for narrowly, as well as widely distributed species. As described elsewhere in this final rule, the vernal pool fairy shrimp is imperiled by habitat loss from construction activities and degradation to the extent that 28 of the 32 known populations face one or more of the various threats described elsewhere in this rule. Thus, even though this species has a relatively wide range in California, it is imperiled by one or more of five factors throughout a significant portion of its range.

At the time the proposed rule was published, the California linderiella was known from vernal pools in the Central Valley from central Tehama County to central Madera County and across the valley in the Sacramento area to the central and south coast mountains from Lake County south to Riverside County. Surveys conducted in 1993 and other information that has become available to the Service indicate that the range extends from Shasta County south to Fresno County and across the valley to the Coast and Transverse Ranges from Willits in Mendocino County south to near Sulfur Mountain in Ventura County. Within this area more vernal pools have been found to contain subpopulations of the California linderiella than was known at the time of the proposed rule. The populations in Riverside County have been determined to represent an undescribed species of *Linderiella*. The Service has carefully considered the additional information and has determined that the California linderiella fails to meet the definition of either an endangered or threatened species and has withdrawn it from consideration for endangered or threatened status.

Issue 12: After the comment period closed, six parties requested that the Service extend the date of the final determination for these species pursuant to 16 U.S.C. 1533(b)(6). That section of the Act provides for a six-month extension to solicit additional data if the Secretary finds that "there is substantial disagreement regarding the sufficiency or accuracy of the available data relevant to the determination." The parties asserted that additional information on the range and status of these animals could become available during this time period. One of these commenters submitted a report as the basis for their request that summarized museum, literature, and field records, the majority of which were collected in 1993, for the five species (Sugnet and Associates 1993b). A seventh party, the California Native Plant Society, stated that they were opposed to the six month extension and they urged the Service to immediately list the five species.

Service Response: The report by Sugnet and Associates (1993b) provided a number of records for the California linderiella, vernal pool fairy shrimp, and the vernal pool tadpole shrimp that have been incorporated into this final rule. The report listed 3092 "discrete locations" that contained 703 records of the California linderiella, 178 records of the vernal pool fairy shrimp, and 345 records of the vernal pool tadpole shrimp.

The report by Sugnet and Associates (1993b) presented only township and range information on the locations of the California linderiella, vernal pool fairy shrimp, longhorn fairy shrimp, Conservancy fairy shrimp, and the vernal pool tadpole shrimp. A request by the California Department of Fish

and Game to obtain the precise locations that served as the basis for the report was unsuccessful (letter from California Department of Fish and Game to Sugnet and Associates, dated December 29, 1993; letter from Sugnet and Associates to California Department of Fish and Game, dated January 29, 1994). The report also treated the records of the individual vernal pools inhabited by the California linderiella, vernal pool fairy shrimp, and the vernal pool tadpole shrimp as "discrete locations." However, as described in greater detail in the **Background** section, abundance of inhabited vernal pool complexes most appropriately describes the population status of the five vernal pool crustaceans; animals in individual pools most appropriately are referred to as subpopulations. Accordingly, the study by Sugnet and Associates (1993b) overestimated the number of populations of the California linderiella, vernal pool fairy shrimp, and the vernal pool tadpole shrimp. Statements in Sugnet and Associates (1993b), such as "Results of this effort indicate that *B. lynchi* occurs at a total of 178 discrete locations * * *", should be interpreted in light of the fact that a number of inhabited pools can occur within a single vernal pool complex, and that all of these could be threatened by a single project proposal. For example, the proposed Sunrise-Douglas development in Sacramento County contains over 500 vernal pools (Sugnet and Associates 1993a). An unknown number of these pools contain the vernal pool fairy shrimp, and/or vernal pool tadpole shrimp.

The data in Sugnet and Associates (1993b) and other information available to the Service increased the known ranges and number of populations from that described in the proposed rule for three of the five species and located additional populations for one species. The report identified a geographic range extension for the vernal pool tadpole shrimp and increased the number of populations from fourteen to seventeen; none were from unexpected areas or non-vernal pool habitat. Two additional populations of the Conservancy fairy shrimp were located, one at the Sacramento National Wildlife Refuge and one in northern Ventura County. The geographic distribution of the vernal pool fairy shrimp was not increased but additional pools containing this species were located within the known range and known populations of this animal.

With the exception of the California linderiella, the Service concludes that the report by Sugnet and Associates (1993b) does not provide a basis for significant disagreement regarding the sufficiency or accuracy of the available data relevant to this listing action. Rather, the data presented in the report substantiates the rarity and fragmented distributions of the four species listed herein. Therefore, the Service has determined to issue a final regulation pursuant to 16 U.S.C. 1533(b)(6)(i)(I).

Issue 13: Many commenters, including the California Department of Transportation and Congressman Wally Herger, requested the Service delay or not list the five species because they believed additional distributional and ecological data are needed to determine the "true" status of these animals. Several people contended that the survey work and collection data upon which the proposed rule was based are inadequate. One commenter contended that this perceived lack of information would result in a procedurally inadequate listing. Eight commenters stated that the data utilized by the Service presents only collection places inhabited by the species. They asserted that the Service did not conduct a random field survey and failed to accurately delineate the distributions of the species. These parties contended that the absence of information on locations that are not inhabited by the animals suggests a general lack of extensive collection efforts or knowledge of them. To support the need for further field work, one commenter cited 18 records of the vernal pool fairy shrimp and 30 records of the California linderiella that were not included in this proposed rule. This commenter did not provide any additional records of the Conservancy fairy shrimp, the longhorn fairy shrimp, or the vernal pool tadpole shrimp.

Service Response: Scientifically credible data on the status of the five crustaceans was collected in a random 322 kilometer (200 mile) north-south transect in the Sacramento Valley from Fall River in Shasta County to Jepson Prairie in Solano County (Simovich *et al.* 1992). This study found that distinct segments totaling 35 kilometers (22 miles), or 11 percent of the transect, contain vernal pools and swales. Within the portions of the transect, the vernal pool tadpole shrimp and the vernal pool fairy shrimp were found on 16 kilometers (10 miles), the Conservancy fairy shrimp on 6 kilometers (4 miles), and the California linderiella on 10 kilometers (6 miles). The animals were not found in all pools and swales in suitable habitat areas in this study (J. King, *in litt.*, 1992). King (*in litt.*, 1992) reported that the vernal pool tadpole shrimp was found in only five pools on 8 kilometers (5 miles) of the 16 kilometers (10 miles) of vernal pools where the animal occurred, indicating a sparse distribution within much of the area where it occurs. The fairy shrimp species and the vernal pool tadpole shrimp largely were absent from extensive regions in the Sacramento Valley where degraded vernal pools still remain, such as the Red Bluff and Coyote Creek areas of Tehama County, and the Allendale area of Solano County (R. Brusca, *in litt.*, 1992). The three crustacean biologists who conducted this research concluded that based on this random field survey, these fairy shrimp species and the vernal pool tadpole shrimp are rare throughout their ranges.

A comparison of the maps in Sugnet and Associates (1993b) indicates that the number of occupied pools, and amount of suitable habitat for the 30 populations of the California linderiella are larger than for the 32 populations of the vernal pool fairy shrimp. In addition, the California linderiella is known from the north coast, San Francisco Bay area, western areas in the San Joaquin Valley, and the western foothills of the Sierra Nevada in San Joaquin and Stanislaus Counties where the vernal pool fairy shrimp is not known to be present (Sugnet and Associates 1993b).

The Service concludes, as detailed in the "Summary of Factors" section, that there is sufficient biological evidence that the vernal pool fairy shrimp, Conservancy fairy shrimp, longhorn fairy shrimp, and the vernal pool tadpole shrimp warrant listing. Sampling conducted at various locations and intensities between 1981 and 1993 by biologists familiar with the four fairy shrimp and the vernal pool tadpole shrimp and their habitat provided adequate information on the distribution, habitat requirements, and most importantly, threats to the four species to warrant the present action. All additional data provided by respondents during the comment period, including the report by Sugnet & Associates (1993b) have been incorporated into this final rule; none of this data indicated that these taxa were not threatened or endangered. The Service's decision to propose the four fairy shrimp and the vernal pool tadpole shrimp was based on significant threats associated with habitat loss and fragmentation, rather than solely on the basis of population numbers.

Issue 14: Several commenters, including Congressman Wally Herger, requested the precise locations of the populations of the species be widely disseminated or included in the final rule. One respondent requested that the

Service notify all landowners whose property has been found to contain one or more of the species.

Service Response: For the reasons discussed in the response dealing with critical habitat below, the Service concludes that providing the exact locations would increase the degree of threat facing these species.

Issue 15: Some commenters were concerned that the Service did not give due consideration to the impacts of the six year drought in California. They contended that increased amounts of rainfall would result in greater numbers of the fairy shrimp and the vernal pool tadpole shrimp.

Service Response: The average and above average rainfall levels that occurred in 1992/1993 did not reveal significant new populations of the five species in unexpected areas because most vernal pools held water, at least to some extent, during the drought that extended from 1987 to 1992. Even very small, shallow vernal pools were observed to hold water, allowing reproduction of the four fairy shrimp and vernal pool tadpole shrimp during these drought years (J. King pers. comm. 1992; M. Simovich pers. comm. 1992; Simovich *et al.* 1993). Also, natural vernal pool complexes are expected to have some pools that at least partially pond in drought years even though other pools may fill only during years of average or above average precipitation.

Issue 16: Several commenters concluded that the data on the crustaceans does not demonstrate a historic and consistent decline in populations levels. One commenter stated that the data on the Conservancy fairy shrimp, longhorn fairy shrimp, and the vernal pool fairy shrimp is very limited because they were only recently described.

Service Response: Relatively little information is available to reconstruct the distribution of the four species listed herein prior to the loss of vernal pool habitat that began in the late 1800's. However, the Service is required to evaluate species based on current and likely future threats to their status. As discussed in this final rule, numerous populations of the four species face severe, imminent threats that could result in substantial habitat losses and extirpations in the future. Since at least the mid-1980's, the human population has been growing rapidly throughout the Central Valley and other regions of California. Although three of the five crustaceans were described scientifically in 1990, their distribution and abundance are sufficiently documented relative to current and future threats to their continued existence. Field samples made from vernal pools have contained these three fairy shrimp prior to 1990. The earliest known collections of the Conservancy fairy shrimp were made in 1979, the vernal pool fairy shrimp in 1965, and the longhorn fairy shrimp in 1937.

Issue 17: The Contra Costa Water District reported that neither the Los Vaqueros Reservoir alternative nor the Kellogg Reservoir alternative would impact the single vernal pool complex inhabited by the vernal pool fairy shrimp within the watershed (John Gregg, Los Vaqueros Project, *in litt.*, 1992).

Service Response: The Los Vaqueros Reservoir project likely would result in adverse impacts to the California linderiella, vernal pool fairy shrimp, and the longhorn fairy shrimp based on an analysis of the environmental documents for this project (California Department of Fish and Game 1983; John Gregg, Los Vaqueros Project, *in litt.*, 1992; Jones and Stokes 1986, 1989, 1990, 1991). On September 2, 1993, the Service issued a conference opinion to the Bureau of Reclamation for the effects of the Los Vaqueros Reservoir project on the three fairy shrimp species.

Issue 18: One commenter stated that there are populations of the crustacean species located on nature preserves and for this reason the Service was urged to "slow" the listing process for these animals. Four people noted that portions of three preserves owned by the Nature Conservancy are inhabited by three of the fairy shrimp species and the vernal pool tadpole shrimp. One commenter concluded that this assured the long-term protection of these species. However, the other three commenters stated that the preserves were either not specifically managed for these animals or the sites are imperiled by activities on adjacent properties.

Service Response: The Service recognizes that while some populations of the fairy shrimp and vernal pool tadpole shrimp are found on protected public and private lands, almost all are located in areas that are not secure against adverse impacts to these animals. Please refer to Factor D below, for an expanded discussion on landownership patterns and protection for these species.

Issue 19: One commenter said the scientific articles containing data on the fairy shrimp that were used by the Service are "primitive and unreliable" and the taxonomy of these crustaceans is "confused". However, four recognized crustacean biologists noted that the taxonomy of fairy shrimp found in California had been reviewed recently in a peer-reviewed scientific journal and the taxonomic status of these species is widely accepted by current authorities.

Service Response: Using the best and most recent systematic information from a number of reliable sources, including Eng *et al.* (1990), D. Belk (pers. comm., 192), and M. Fugate (pers. comm., 1992), the Service maintains that the Conservancy fairy shrimp, vernal pool fairy shrimp, and the longhorn fairy shrimp are valid species and no further taxonomic studies are needed.

Issue 20: Several respondents, including Congressman Wally Herger contended that the vernal pool tadpole shrimp is a "taxonomically unstable species". One commenter stated that taxonomic confusion between Lemmon's tadpole shrimp (*Lepidurus lemmoni*) and the vernal pool tadpole shrimp should be resolved prior to any listing decision. Several commenters stated that the taxonomy of tadpole shrimps is unresolved and recommended that the Service not list the animal. Expressing a contrary position, three recognized authorities on crustaceans provided information showing the vernal pool tadpole shrimp is a biologically and taxonomically valid species. They reported that the vernal pool tadpole shrimp is distinct in both morphology and ecology from Lemmon's tadpole shrimp, which is restricted to alkaline lakes is western North America.

Service Response: Using the best and most recent systematic information from a number of reliable sources, including Lynch (1972) and various crustacean biologists) (R. Brusca, *in litt.*, 1992; M. Simovich, *in litt.*, 1992; J. King, *in litt*,. 1992), the Service maintains that the vernal pool tadpole shrimp is a valid species and no further taxonomic studies are needed.

Issue 21: Four respondents expressed concern that the Service was going to list the ricefield tadpole shrimp (*Triops longicaudatus*) a pest in rice fields in the Central Valley. They further stated that protection of this animal would be an "economic disaster" for rice growers of California. Alternatively, three recognized crustacean authorities provided information showing that the rice field tadpole shrimp is only distantly related to the vernal pool tadpool shrimp. They stated that *T. longicaudatus* is known to occur in the Central Valley only in rice fields while *L. packardi* is found only in vernal pools. One of the crustacean biologists stated that based on genetic studies, the two species are separated by genetic distances on the order of those normally found between crustacean orders (J. King, *in litt.*, 1992). In addition, the four

crustacean biologists noted that the two species are morphologically distinct and are easily distinguishable from each other.

Service Response: The findings in this final rule reflect the published taxonomic literature and the expert opinion of recognized crustacean biologists.

Issue 22: A number of commenters stated that Federal, State, and local regulatory processes provide adequate protection for the crustaceans. Two respondents said that listing would directly affect agriculture, industrial, and commercial development in areas that have been meticulously planned and subject to State laws such as the California Environmental Quality Act (CEQA) and California Subdivision Map Act. Some commenters noted the wetlands "no-net-loss" policies of several State and county agencies, while other cited section 404 of the Clean Water Act. On commenter analyzed data for a group of 29 development projects in the Sacramento area and found that 56 percent of the vernal pools at these project sites had been preserved and 0.9 hectare (2.2 acres) of vernal pools provided as mitigation for each acre impacted under Corps permit conditions pursuant to section 404 requirements. The commenter stated that this group of projects is representative of the level of preservation afforded vernal pool habitat in the Sacramento area and further concluded that this level of protection may be equaled or exceeded for projects requiring section 404 permits throughout the range of the five species. Another commenter noted that the Corps recently classified vernal pools at a proposed project site in Sacramento County as "aquatic resources of national importance". According to the commenter, this designation will cause the Corps to more closely evaluate impacts to vernal pools from proposed projects and thus provide significant protection to vernal pool habitat for the five crustacean species during a six-month time extension.

Expressing a contrary position, several other commenters noted that Federal, State, and local laws have been ineffective in providing protection for these species. The Mount Lassen Chapter of the California Native Plant Society provided data on the destruction of two vernal pool complexes known to have been inhabited by the vernal pool tadpole shrimp in the City of Chico. They provided information on two other vernal pool complexes in Chico that are located on properties proposed for residential development. Another commenter stated that vernal pools in Santa Rosa have been eliminated despite the protective provisions of State law (CEQA). A number of respondents noted that destruction of vernal pools commonly is allowed if an attempt is made to create artificial habitat as compensation.

Service Response: While vernal pool habitat has been preserved permanently under special conditions of section 404 permits for a number of projects, significant areas of vernal pool habitat continue to be lost in spite of the Corps jurisdictional authority to regulate these wetlands under the Clean Water Act. Since 1987, the Service has been tracking the Corps' implementation of Nationwide Permit 26 within the area of responsibility of the Service's Sacramento Field Office. A Service report produced in October 1992 showed that the Corps' Sacramento District authorized filling of 189 hectares (467 acres) of wetlands between 1987 and 1992 pursuant to Nationwide Permit 26 (U.S. Fish and Wildlife Service 1992). During this same time period, the Corps' San Francisco District authorized projects under Nationwide Permit 26 that filled a total of 104 hectares (257 acres) of wetlands of which 15.6 hectares (38.6 acres) were in the Santa Rosa Plain. The report notes that these figures are conservative estimates because notification of agencies for projects affecting less than 0.405 hectares (1.0 acre) are not mandatory. The Service estimates that a majority of the wetland losses permitted in the Sacramento District constitute vernal pools. In addition, between December 1, 1992, and June 15, 1993, the Service identified 10 unauthorized projects in Sacramento and Butte Counties that destroyed or damaged between 8.5 and 15 hectares (21 and 37 acres) of vernal pool habitat (D. Strait, pers. comm., 1993). The projects were not authorized because landowners either were not required or failed to comply with the regulatory requirements of the section 404 permitting process. In addition, gravel mines are proposed for significant areas in the Sacramento Valley, including an approximately 404 hectare (1,000 acres) site south of Mather Air Force Base that contains the California linderiella, vernal pool fairy shrimp, and the vernal pool tadpole shrimp. Under recent changes in the Corps of Engineers regulations, some gravel mining activities will be regulated. However, in the past, most of these activities were not subject to the provisions of the Clean Water Act.

In December 1992, the Department of the Interior signed a revised Memorandum of Agreement with the Department of the Army that provides an administrative process for requesting higher level review of District Engineers' decisions on section 404 individual permit applications. One criterion necessary for higher level review under the Memorandum of Agreement is that the wetlands in question must constitute "aquatic resources of national importance." The ultimate determination on whether the criterion is met will be made on a case-by-case basis by the Assistant Secretary of the Army (Civil Works). Requests for higher level review only apply to projects subject to individual permits, not Nationwide permits. Projects determined by the Corp's Sacramento District to quality for authorization under Nationwide Permit 26 are not eligible for higher level review. Department of the Army concurrence with the designation of vernal pools at the project site at issue "as aquatic resources of national importance" does not ensure application of additional protection to vernal pools beyond that site (see discussion under Issue 29 and Factor D, "Summary of Factors Affecting the Species", for a complete discussion on the adequacy of existing regulatory mechanisms for the four species listed herein). Such a designation must be made on a site-specific basis and, by itself, does not necessarily effect any protection of these resources. San Francisco District of the Corps considered possible revocation of Nationwide Permit 26 in the Santa Rosa Plain that would have ensured that all projects affecting wetlands in this area would require authorization on an individual permit basis and potential higher level review. However, the Corps decided instead to impose stricter conditions on the use of Nationwide Permit 26 in this area, including demonstration that no rare or endangered plant or animal species are supported on the wetlands within any proposed project site. The Corps also determined that individual permits would be required on wetlands that support federally proposed or listed threatened or endangered species. Regardless, of the four species listed herein, only the California linderiella is found at the Santa Rosa Plain and this area constitutes a small percentage of the overall geographical range of the species. Therefore, any additional protection afforded vernal pools in this area would not provide rangewide protection of these animals.

Based on this and other information discussed under Factor D below, the Service concludes that proposed and on-going damage or destruction of vernal pools in California caused by urban and agricultural development is prevalent despite existing Federal, State, and local regulations and that existing levels of protection are not adequate to assure the survival of these species.

Issue 23: One commenter completed a literature survey of three reports that addressed trends in overall wetland losses throughout California and the Central Valley, in particular. Essentially, this commenter concluded that the historic trend of wetland losses throughout California subsided in the mid-1980's and that current wetland acreages actually are increasing in the State, apparently as a result of the implementation of Federal wetland regulatory mechanisms.

Service Response: Methodological flaws and ambiguities in the analysis conducted by this commenter invalidate the report's findings. The most serious flaw is the comparison of wetland acreages in various studies that focused on different geographic study areas. For example, the two Service reports reviewed by the commenter cannot be used together to draw conclusions on changes in wetland acreages because data from the Central Valley and the entire State are not comparable.

Issue 24: Several commenters disputed the Service's statement in the proposed rule that 90 percent of the original vernal pool habitat throughout the Central Valley has been lost and that an estimated 2 to 3 percent of vernal pool habitat continues to be lost annually. Several commenters contended that the study referenced by the Service actually showed a 67 to 88 percent historic loss of vernal pool acreage. One commenter further stated that additional interpretation and analysis of the data used in the study revealed that historic losses were 63 percent. Based upon information contained in a separate document prepared by the Service, other commenters asserted that the actual loss more closely approximated 50 percent. After the comment period closed, one respondent commented that preliminary results from a newly-initiated soils data analysis indicate that the original estimates of historic vernal pool losses in the Central Valley may be substantially less than was identified in the proposed rule. Another late commenter noted that U.S. Soil Conservation Service information supported recent conclusions drawn by other soil scientists that 404,700 hectares (1 million acres) of soils suitable for vernal pool habitat remain from 809,400 hectares (2 million acres) determined to have historically existed in the Central Valley, thus implying that historic losses were close to 50 percent.

Service Response: After closer review of the referenced study (Holland 1978), the Service discovered apparent arithmetic errors in the estimates of historic vernal pool habitat (i.e., areas that could have supported pools) losses. Correction of these errors yields estimates of vernal pool habitat losses between 60 and 85 percent. Accordingly, the Service finds that the study's corrected estimates of historic vernal pool habitat loss in the Central Valley are reasonably close to the range of estimates determined by those commenters who criticized the study. Comments concerning a 50 percent habitat reduction based upon a Service publication appear to be derived from the Wetlands of the California Central Valley; Status and Trends 1939 to mid-1980's (Frayer *et al.* 1989), which estimated losses of palustrine emergent wetlands. However, calculation of vernal pool losses cannot be deduced from the numerous wetland types categorized as "palustrine emergent wetlands." The results of the soils data analysis under preparation by the commenter were not available for review at the time of publication of this final rule.

The purpose of addressing historic vernal pool losses in the proposed rule was to provide a historical context to the Central Valley ecosystem inhabited by the four crustacean species. It was not the intention, nor is it appropriate, to conduct an exhaustive analysis of information pertaining to the history of vernal pool habitat losses affecting the five crustacean species. Unverifiable and/or contradictory information on the extent of former and current vernal pool habitat will generate continued debate on this issue throughout the foreseeable future. In a legal context, the extent of historic habitat loss is of academic interest only, since the five factors at 50 CFR 424.11(c) under which species may qualify for listing look prospectively to the future rather than retrospectively on the past. The relevant issues are whether the current extent of fairy and tadpole shrimp habitat is depleted and/or fragmented enough to render the species vulnerable to extinction, or whether foreseeable threats similarly threaten the species.

Issue 25: Eight commenters, including four mosquito abatement districts, reported that vernal pools provided an important breeding source for mosquitoes. They stated that the listing of the fairy shrimp and the vernal pool tadpole shrimp, when coupled with the preservation and creation of vernal pools next to residential areas, will create a serious health risk to people. They were especially concerned about the western encephalitis mosquito (*Culex tarsalis*), a vector of western equine encephalitis and Saint Louis encephalitis. Some of the respondents also expressed concern about mosquito-borne malaria and yellow fever. A number of commenters stated that continued urban development would result in greater numbers of people being affected by mosquitoes and increase the need to control mosquitoes in vernal pools. The four mosquito abatement districts were concerned that listing of the crustaceans would increase the costs and restrictions on their control activities.

Expressing a contrary position, four biologists stated that mosquitoes rarely are found in vernal pools and swales that have not been impacted by humans. They reported this is likely due to the presence of the high abundance of predatory crustaceans and aquatic insects that inhabit this ecosystem. A crustacean specialist noted that mosquitoes were absent or not present in significant numbers in pools inhabited by the fairy shrimp and the tadpole shrimp. Significant numbers of mosquito larvae were found in areas that contain created vernal pools or artificial bodies of water e.g., ditches and stock ponds where the crustaceans are sparse or absent. One biologist reported that no mosquito larvae were found in any of the 27 randomly sampled vernal pools at Beale Air Force Base (Mary Ann Griggs, private biologist, Colusa, California, *in litt.*, 1992). However, mosquitos were found in areas that had augmented water supply from a pressure release valve on a well. The water supply produced a distinctively different flora and fauna than nearby vernal pools. Commenting biologists stated that the use of oil and mosquito fish (*Gambusia affinis*) will adversely affect vernal pool fauna, including the three fairy shrimp and the vernal pool tadpole shrimp, consequently allowing mosquitoes populations to sue vernal pools where they otherwise are controlled or eradicated by the nature pool fauna.

Service Response: The best information available to the Service indicates that non-degraded vernal pools and swales do not provide a significant breeding source for mosquitoes. Mosquitoes do not appear in vernal pools until very late in the season, when they are unlikely to complete their development before the pools dry (Wright 1991; Stan Wright and

Dave Brown, Sacramento-Yolo Mosquito Abatement District, pers. comm., 1993). This pattern likely is due to the ecology of vernal pool invertebrate communities rather than to oviposition timing of female mosquitoes or to water chemistry, since (1) duck ponds in the same area that fill at the same time as many vernal pools produce mosquitoes throughout the wet season while vernal pools do not, and (2) degraded pools and ruts without healthy vernal pool invertebrate communities support mosquito populations while undisturbed vernal pools in close proximity do not (S. Wright, pers. comm., 1993; J. King, pers. comm., 1993; Christopher Rogers, Redding Mosquito Abatement District, pers. comm., 1993).

Female mosquitoes are attracted to gases produced by fermentation that indicate an abundance of decaying organic matter suitable for food for mosquito larvae (S. Wright, pers. comm., 1993). This likely is the cue used by females to select oviposition sites. Healthy vernal pools appear to have tight nutrient cycling and relatively low levels of decaying organic material, which makes them undesirable as oviposition sites for gravid mosquitoes. Only late in the season when the abundance of the invertebrates in vernal pools begins to decline are enough nutrients and organic material available to make the vernal pools attractive oviposition sites. By this time, however, it is often too late for the mosquito larvae to develop before the pools dry. Therefore, protecting vernal pools from disturbance and degradation can prevent vernal pools from becoming mosquito breeding grounds, thereby naturally preempting the need for artificial mosquito control in this habitat.

Quantitative data collected from 64 vernal pools of widely varying types, depths, and locations on a random 322 kilometer (200 mile) north-south transect in the Central Valley from Fall River in Shasta County to Jepson Prairie in Solano County over an entire season indicate that mosquitoes are successful in breeding and developing only in pools that have been disturbed or degraded, or late in the season (J. King, pers. comm., 1993). Only about one third (34 percent) of the 64 pools studied were occupied by mosquito larvae or pupae. Most of these pools had relatively low population densities of mosquitoes, and in all of these pools mosquitoes were only present later in the season. Of the 5 pools (8 percent) that did contain abundant mosquitoes, one was an artificially created pool and another appeared to be degraded by vehicular use and possibly discing.

The Service recognizes that there could be potential conflicts with protection of the three fairy shrimp and the vernal pool tadpole shrimp in implementing mosquito control programs. The Service will be working with Federal, State, and local agencies, and examining additional alternatives, such as the use of *Bacillus thuringiensis* var. *israelensis* (Bti) and methoprene, to allow suppression programs to continue. In this way, the Service is confident that Federal listing will contribute to the survival of the four species and promote the understanding of their vernal pool environment without jeopardizing public health and safety.

Issue 26: Several commenters expressed concern that listing of the crustaceans would curtail or eliminate cattle and livestock grazing in areas containing vernal pools. Two crustacean biologists reported that grazing by cattle and the crustacean species are compatible with each other. They stated that moderate to low levels of grazing likely have no adverse impacts on the fairy shrimp and the vernal pool tadpole shrimp.

Service Response: The Service recognizes and acknowledges that low to moderate levels of livestock grazing likely have no impact or may be beneficial for these crustaceans. However, overgrazing in areas containing the shrimp and their habitat likely is detrimental to these species. High levels of pasture runoff may lead to increased siltation of vernal pool habitat, and high livestock densities may cause changes in pool water chemistry, water quality, and excessive physical disturbances, such as trampling.

Issue 27: Several commenters reported the presence of the fairy shrimp in non-vernal pool habitats, such as irrigation return ditches, stock ponds, a backhoe pit, a gravel pit, and a depression left from scraping. One commenter stated that a historic vernal pool habitat site in southern Sacramento County that was disced, plowed, and farmed with winter wheat still contained inundated depressions inhabited by the vernal pool fairy shrimp and vernal pool tadpole shrimp. This example was used to support the contention that these species can survive and reproduce in degraded habitat. The commenter also noted that "the site was not leveled unlike other properties in the area, and still retained some swale and hillock topography." (Bill Sugnet, Sugnet and Associates, *in litt.*, 1992). Another respondent, based on anecdotal data, concluded that the habitat for the vernal pool fairy shrimp, and the vernal pool tadpole shrimp has been insufficiently described. He reported them from roadside ditches, scrapes, tire track depressions, or similar man-made ephemeral pools from 28 locations in Sacramento County (E.J. Koford, Ebasco Environmental, *in litt.*, 1992). This commenter asserted that herbicides and/or mechanical weed control at sites located along some railroad tracks may have promoted the habitat for these species. One crustacean biologist, based on discussions, examination of photographs of these sites, and personal knowledge of the area concluded that they are remnant or disturbed vernal pools (J. King pers. comm., 1992).

Service Response: The Service has reviewed carefully the assertion that the crustaceans are found in non-vernal pool habitat. A number of the sites that served as the basis for this belief have been examined by Service biologists and were found to represent degraded vernal pool habitat or, in one case, an ephemeral wetland located in a gravel pit that likely was colonized by fairy shrimp washed in from adjacent vernal pools during periods of high rainfall. Based on the best information available, the Service believes that a significant portion of these records most likely represent "unusual" vernal pools (e.g., rock depression pools) or vernal pool habitat that was incorrectly identified. Some of these records, such as roadside ditches, scraped areas, and airport runoff ditches almost certainly represent remnant vernal pool habitat or are part of the swale systems connected to vernal pools. Lack of experience or familiarity with vernal pool ecosystems likely has led some respondents to misinterpret these observations. Most of these disturbed habitats also are imperiled by urban development, gravel mining, and, in the cases of roadside ditches, grading and spraying of herbicides for highway maintenance. In addition, the accurate identification of fairy shrimp is extremely difficult because the morphological characters required to differentiate the various species are often extremely subtle and can be misinterpreted by biologists not specifically trained in fairy shrimp identification. Widespread, common species, such as Lindahl's fairy shrimp, can be mistaken for other fairy shrimp species. Some of the records of the California linderiella and vernal pool fairy shrimp in non-vernal pool habitats may result from such misidentifications.

The potential for a fairy shrimp population to persist after habitat disturbance varies from case to case,

depending upon specific circumstances, such as the nature and intensity of disturbance, how much of the original egg bank was destroyed, and other factors. With the exception of a few extremely rare cases, plowed fields that historically held vernal pool habitat do not support populations of these species. The example provided by the commenter is not typical of agricultural operations, as is pointed out in the commenter's statement that this site was "unlike other properties in the area . . ." (B. Sugnet, *in litt.*, 1992), with respect to the degree of disturbance (i.e., leveling) and adverse modification of the vernal pool habitat.

Issue 28: Many respondents contended that the proposed rule did not reflect accurately the success of vernal pool "creation" efforts. For example, a number of commenters claimed that artificial vernal pools, primarily in Sacramento and Placer Counties, cited in Sugnet and Associates (1992), were successful and were adequate mitigation for adverse impacts to vernal pools resulting from urban development. Other commenters asserted that ongoing creation ratios of 2:1 or greater and the ability to transplant these animals makes it likely that the habitat for these species will increase over time.

One commenter stated that the ability to successfully transplant the eggs of fairy shrimp and tadpole shrimp is well known. One submitted report (Sugnet and Associates 1992) asserted that the four fairy shrimp and vernal pool tadpole shrimp have been shown in the "literature and in field sampling to be extremely hardy and capable of surviving long-term in greatly disturbed conditions and artificial habitats". The report also stated that there are technical papers that demonstrate the ability to rear shrimp in the laboratory. The party submitting this report stated that they have been creating vernal pools as mitigation for development projects and monitoring the fairy shrimp and tadpole shrimp for the past three years from 1989 to 1992. They stated that although the presence of adult fairy shrimp may be due to a certain number of eggs continuing to hatch from the initial inoculum in successive years due to differences in physiochemical parameters, the presence of mating individuals and gravid female fairy shrimp in artificial pools, as well as historically degraded habitat, leads them to conclude that natural reproductive mechanisms are still at work. The report stated that the California linderiella and the vernal pool fairy shrimp can be transplanted successfully from one vernal pool location to another. The supporting data and criteria by which success was determined were not specified in the report. Based partly on the above information, numerous commenters stated that the fairy shrimp and vernal pool tadpole shrimp were not imperiled.

On the other hand, one crustacean biologist stated that the reports of successful vernal pool creation have been "generally poorly controlled, completely lacking in long-term monitoring, and do not appear in the peer reviewed scientific literature * * *" (J. King, *in litt.*, 1992). In addition, this commenter reported that "contrary to common misconception these organisms [vernal pool tadpole shrimp] are not easily raised outside of their natural habitat." This crustacean specialist stated that their efforts to maintain viable reproductive vernal pool tadpole shrimp in the laboratory have been unsuccessful. Another biologist pointed out that long-term studies of the effect of mixing genotypes in created pools likely are adversely impacting the fairy shrimp and the vernal pool tadpole shrimp (M. Simovich, *in litt.*, 1992).

Eight biologists specializing in crustaceans or plants inhabiting vernal pools stated that these habitats are an intricate ecosystem and efforts to recreate them likely will not be successful until they are more fully understood. Furthermore, six fairy shrimp specialists concluded that protection of these animals is best assured via the preservation of extant habitat and its associated community.

Service Response: In a review of 21 vernal pool creation projects dispersed throughout California, Ferren and Gervitz (1990) concluded that no conclusive data exist to substantiate the hypothesis "that vernal pools can be restored or created to provide functional values within the range of variability of natural pools." Though some individuals (Sugnet and Associates *et al.* 1992) have claimed complete or some degree of success, these conclusions generally are based on anecdotal unscientific studies and the persistence of fairy shrimp after only a short period of time, e.g., three years or less. Moreover, the principal pool creation technique (i.e., relocation of soil from excavated pool bottoms versus inoculation of a known quantity of eggs) and lack of scientifically designed monitoring do not allow for collection of the necessary data to determine the long-term population viability of transplanted species.

In a study on the preservation and management of vernal pools (Jones and Stokes Associates 1990), the researchers concluded that the "science of vernal pool creation is still in its infancy and is primarily an experimental mitigation technique." Environmental requirements, not dispersal, is likely the limiting factor in the distribution of the fairy shrimp and the vernal pool tadpole shrimp (D. Belk, pers. comm., 1992). The four species in this final rule require unknown, but more restrictive environmental conditions than more widely distributed taxa (J. King, *in litt.*, 1992; M. Simovich, *in litt.*, 1992; R. Brusca, pers. comm., 1992). There are no demonstrated proven long-term populations of the fairy shrimp or the vernal pool tadpole shrimp in artificial habitats.

Artifically created habitats also may increase the threat of hybridization between the four fairy shrimp and other more widespread species. For example, Lindahl's fairy shrimp is a widespread species found in western North America that inhabits a wide array of conditions, ranging from pools whose salinity is high enough to support brine shrimp (*Artemia* sp.) to snow melt pools. Poorly planned, careless construction, or haphazard placement of the substrate during vernal pool creation may enhance conditions for species like Lindahl's fairy shrimp. Laboratory studies have shown that Lindahl's fairy shrimp and the vernal pool fairy shrimp readily hybridize in the laboratory and produce viable first generation hybrids (Fugate, pers. comm., 1992). There is evidence that hybridization between other fairy shrimp has occurred in the field because of human actions. Belk (1977) reported that the westward dispersal from Texas and New Mexico of a desert fairy shrimp (*Streptocephalus dorothae*) across extensive expanses of arid land into Arizona may be due to the cattle ponds and livestock watering holes that were built after the 1800's in the region. Wiman (1979) reported that viable hybrid offspring are produced by this species and Mackin's desert fairy shrimp (*Streptocephalus mackini*), a resident species in Arizona.

Given these uncertainties associated with vernal pool creation, the Service maintains that transplanting target species (e.g., listed, proposed, and candidate species) into artificial pools cannot be considered adequate replacement for the loss of occupied vernal pool habitat. Even if such transplantation of the fairy shrimp and the vernal pool tadpole shrimp and creation of their habitat were documented to be a proven procedure rather than an evolving problematic venture, artificial pool creation for the species listed herein would not fulfill

the mandates of section 2 of the Act, which require the Service to develop programs that conserve the ecosystems upon which listed species depend. As discussed elsewhere herein, natural habitats throughout the ranges of the four species have been damaged or eliminated. As a result, the Service concludes that the continued survival and recovery of the three fairy shrimp and the vernal pool tadpole shrimp only can be assured, at this time, by the preservation of extant vernal pools and their associated watersheds.

Issue 29: Several comments were received questioning the relationship between the Endangered Species Act and the Fifth Amendment to the U.S. Constitution (e.g., "taking" without just compensation).

Service Response: The mere promulgation of a regulation, such as the enactment of a statute, is rarely sufficient to establish that private property has been taken unless the regulation on its face denies the property owner the economically viable use of his property. Listing pursuant to the Endangered Species Act does not automatically restrict all uses of one's land. A property owner cannot establish that his property has been taken as a result of a regulatory action such as the listing of a species until he has first submitted a proposal to develop the property and has received a determination as to the level of development that will be allowed. The property owner must apply for all available permits and waivers before a taking could potentially be established. With respect to listing, this means that no takings can be established until the property owner complies with section 10(a) of the Act and the Service concludes that no permit to take incidental to an otherwise lawful activity will be issued.

Issue 30: The Service received a comment that requested an explanation of the applicability of *Hoffman Homes Inc.* v. *EPA* to vernal pools.

Service Response: Hoffman Homes Inc. v. *EPA*, 916 F.2d 1310 (7th Cir. 1992) held that an isolated wetland, with no shown effect on interstate commerce, was not within EPA's nor the Corps of Engineers' jurisdiction to regulate. That decision was vacated in the same year (*Hoffman Homes Inc.* v. *EPA*, 975 F.2d 1554) and the issue reheard by the same court in 1993 (*Hoffman Homes Inc.* v. *EPA*, 999 F.2d 256). In its final interpretation of the issues presented in that case, the court held that waters whose use, degradation, or destruction *could* affect interstate commerce, were waters appropriately regulated by EPA and/or the Corps (emphasis added). Based upon the facts as presented in that case, however, the court could not find sufficient evidence to support a conclusion that the wetland in question could potentially affect interstate commerce. As such, the court determined this particular water body to be outside the realm of EPA or Corps jurisdiction.

The Service is not aware how the EPA or Corps view this case relative to vernal pools. Regardless of the interpretation, however, it is the animal (as opposed to habitat) for which the Endangered Species Act will afford protection with this final regulation. Should it be determined that neither the Corps nor EPA have jurisdiction over these wetlands, and that section 7 is not therefore applicable, then the property owner may comply with the Endangered Species Act through section 10 of the Act.

Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that the Conservancy fairy shrimp (*Branchinecta conservatio* Eng *et al.*), longhorn fairy shrimp (*Branchinecta longiantenna* Eng *et al.*), and the vernal pool tadpole shrimp (*Lepidurus packardi* Simon) should be classified as endangered species; and the vernal pool fairy shrimp (*Branchinecta lynchi* Eng *et al.*) should be classified as a threatened species. Procedures found at section 4(a)(1) of the Endangered Species Act (16 U.S.C. 1531 *et seq.*) and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act were followed. A species may be determined to be endangered or threatened due to one or more of the five factors described in section 4(a)(1). These factors and their application to the Conservancy fairy shrimp (*Branchinecta conservatio*), longhorn fairy shrimp (*Branchinecta longiantenna*), vernal pool fairy shrimp (*Branchinecta lynchi*), and the vernal pool tadpole shrimp (*Lepidurus packardi*) are as follows:

A. *The present or threatened destruction, modification, or curtailment of their habitat or range.* All three fairy shrimp and the vernal pool tadpole shrimp are restricted to vernal pools in California. The habitat of these animals is imperiled by a variety of human-caused activities, primarily urban development, water supply/flood control activities, and conversion of land to agricultural use. Habitat loss occurs from direct destruction and modification of pools due to filling, grading, discing, leveling, and other activities, as well as modification of surrounding uplands that alters vernal pool watersheds.

Rapid urbanization of areas containing vernal pools poses a significant threat to the four species included in this final rule. In the Central Valley, at least five pool complexes that were known to contain suitable habitat for the vernal pool fairy shrimp and the vernal pool tadpole shrimp were eliminated by urban development in the late 1980's. Mitigation measures were either lacking or unsuccessful. In general, the growth rate of human populations and associated urban development throughout the Central Valley is equal to or exceeds that of any other region in California. Indicative of this growth rate are proposals to develop several new towns within the ranges of the vernal pool fairy shrimp and the vernal pool tadpole shrimp. As an example, two towns proposed in Placer and San Joaquin Counties would support 80,000 and 44,000 people, respectively, and likely would impact significant amounts of vernal pool habitat for these species (Laver 1991, Wiegand 1991).

Vernal pools in the Redding area that likely provided habitat for the vernal pool fairy shrimp and the vernal pool tadpole shrimp have been impacted significantly by urban development and agricultural conversion. Aerial photographs of an approximately 61-hectare (150 acre) area near the Redding Municipal Airport document that development occurring between 1952 and 1992 resulted in the loss of 62 percent and the degradation of 37 percent of the original vernal pools in this vernal pool complex (Jim Nelson, California Fish & Game, pers. com., 1993). The remaining pools at this site are inhabited by the vernal pool fairy shrimp and the vernal pool tadpole shrimp. Vernal pool areas around the airport have been zoned for enterprise, and sewer lines have been installed in anticipation of development. Several proposed residential development projects in the Redding area (e.g., Argyle West and Eagle Crest projects) also would adversely affect the vernal pool fairy shrimp and the vernal pool tadpole shrimp. A proposed electrical transmission line also threatens several pools in the area. Eucalyptus farms have been established on many historic vernal pool sites around Redding and future groves are planted at the rate of approximately 810 hectares (2,000 acres) per year (J. Nelson, California Department of Fish and Game, pers. comm. 1993).

In the Chico area, certain areas inhabited by the vernal pool tadpole shrimp recently were ditched and drained (Patrick Kelly, Mount Lassen Chapter of the California Native Plant Society, *in litt.*, 1992). In addition, at least four residential developments proposed in Chico, including the Simmons Ranch, Foothill Park, Sierra Technology, and Bidwell Ranch projects are proposed that would eliminate approximately 810 hectares (2,000 acres) of habitat containing vernal pools inhabited by the vernal pool tadpole shrimp. No specific mitigation measures are included in these projects for this animal.

Numerous residential and commercial development projects in the Sacramento area pose a severe threat to vernal pool complexes inhabited by populations of the vernal pool fairy shrimp and vernal pool tadpole shrimp. These proposed and ongoing projects, sponsored by Federal, State and local agencies, private interests, and local governments, include, but are not limited to the closure of Mather Air Force Base, modifications to Strawberry, Elk Grove, and Laguna Creeks, two proposed surface gravel mines, and numerous residential developments including the Elliot Ranch South, Churchill Downs, Elk Ridge Estates, and Sunrise-Douglas projects.

Urban development and agricultural conversion imperil populations of the vernal pool fairy shrimp and vernal pool tadpole shrimp in the San Joaquin Valley. Castle Air Force Base is undergoing closure and the U.S. Bureau of Prisons has proposed to build a prison on vernal pools at this site known to contain the two fairy shrimp. The Corps has proposed the Merced County Streams project that would facilitate urban development in many areas that provide suitable habitat for the vernal pool fairy shrimp and the vernal pool tadpole shrimp. Numerous projects between Stockton and Bakersfield also would adversely impact the three species, including the Mueller Ranch gravel mine in Stanislaus County, a number of residential developments in San Joaquin County (e.g., the Liberty project would affect approximately 2,000 vernal pools), the Yosemite Lake project in Merced County, and the Ball Ranch project in Fresno County.

Areas in the San Francisco Bay area that contain vernal pools also are undergoing substantial urban development. Vernal pools inhabited by the vernal pool fairy shrimp in the Livermore area of Alameda County have been adversely impacted by urban development, agriculture, and alteration of the hydrology of Altamont Creek (Alan Launer, Stanford University Center for Conservation Biology, *in litt.*, 1992). The City of Livermore is evaluating land use options that could result in the conversion of 3,002 hectares (7,420 acres) of natural habitat, including vernal pools that provide suitable habitat for the vernal pool fairy shrimp, to urban use for up to 30,000 people (City of Livermore 1992; Susan Frost, Livermore Planning Department, pers. comm., 1993). The proposed expansion of the municipal airport at Byron Hot Springs in eastern Contra Costa County will eliminate a number of pools inhabited by the vernal pool fairy shrimp.

Other vernal pools located in San Luis Obispo County, including most of the known populations of the longhorn fairy shrimp and at least one population of the vernal pool fairy shrimp, are located in subdivided areas with constructed roads and lots for sale and development (Eng *et al.* 1990; Dave Chipping, Amateur biologist, *in litt.*, 1992). To date, some of the sites have been cleared and continued habitat loss is ongoing or impending. The Coastal Branch Phase II (Coastal Aqueduct) of the State Water Project, proposed by the California Department of Water Resources (Carol Nelson, California Department of Water Resources, *in litt.*, 1993), annually would convey 70,000 acre-feet of water from the Delta region of California to San Luis Obispo and Santa Barbara Counties. It is unclear if this source of water would allow urban development of the Soda Lake area, however, the longhorn fairy shrimp and the vernal pool fairy shrimp may be adversely affected by commercial development made possible by this project.

A 36-hectare (14 acre) vernal pool located at Skunk Hollow in Riverside County containing a population of the vernal pool fairy shrimp likely will be adversely affected by urban development and possibly agricultural conversion (Art Davenport, Fish and Wildlife Service, pers. comm., 1994; Joseph Jolliffe, Riverside County Planning Department, *in litt.*, 1992). The Rancho Bella Vista residential project would impact this vernal pool and, along with other major roadways, also impact the surrounding watershed (Joseph Jolliffe, *in litt.*, 1992). Skunk Hollow also contains a population of the Riverside fairy shrimp (*Streptocephalus woottoni*), an endangered species (58 FR 41384).

Because of rapid urbanization, several highway projects are proposed that may affect the vernal pool fairy shrimp and the vernal pool tadpole shrimp. Vernal pools in the Sacramento area inhabited by the vernal pool fairy shrimp and the vernal pool tadpole shrimp would be affected adversely by the proposed widening of State Highway 16 in Sacramento County. The State of California has proposed to extend State Highway 505 from Vacaville to Collinsville in Solano County; this project directly and/or indirectly would impact vernal pools inhabited by the Conservancy fairy shrimp and the vernal pool tadpole shrimp (C. Goude, pers. comm., 1993). Vernal pools inhabited by the vernal pool tadpole shrimp may be affected by improvements to Highway 70 near Gridley in Butte County (Chris Collison, California Department of Transportation, pers. comm., 1993).

Agricultural conversion poses a widespread threat to remaining vernal pools in the Central Valley. Sites containing fairy shrimp near Pixley in Tulare County and Haystack Mountain in Merced County are pockets of privately owned habitat remnants threatened by surrounding agricultural operations (Eng *et al.* 1990). A 148-hectare (365 acres) site with vernal pools adjacent to State Highway 41 north of Fresno in Fresno County that likely contained the vernal pool fairy shrimp was disced and graded in 1992 (Dames and Moore 1992). Two sites with vernal pools in the Sacramento Valley recently were plowed or disced and seeded with winter wheat, apparently in preparation for future urban development (C. Goude, pers. comm., 1993). Almond and fruit orchards in Stanislaus, Madera, and Fresno Counties continued to be planted in habitat suitable for the vernal pool fairy shrimp and the vernal pool tadpole shrimp (J. King pers. comm. 1993; K. Geer and J. Browning, U.S.F.W.S., pers. obs. 1994).

Water supply/flood control activities also generally present a degree of disturbance to affected pools that would preclude survival of any substantial fraction of the populations. The timing, frequency, and length of inundation of the vernal pool habitat are critical to the three fairy shrimp and the vernal pool tadpole shrimp; any substantial hydrologic change in these factors adversely affect the four species. Diversion of watershed runoff feeding the pools can result in premature pool dry-down before the life cycle of these animals is completed. The three species of fairy shrimp and the vernal pool tadpole shrimp also are intolerant of flowing water that washes away the egg bank. Supplemental water from outside the natural watershed into vernal pools can change the habitat into a marsh-dominated or a permanent aquatic community that is unsuitable for the

four species of vernal pool shrimps. The modification of vernal pool areas to create artificial reservoirs, such as the Modesto Reservoir and Turlock Lake in Stanislaus County, have led to the extirpation of the vernal pool tadpole shrimp population that was known to occur in the vernal pools where these reservoirs now lie (J. King, pers. comm., 1993). Vernal pool watershed areas have been reduced by conversion of uplands to paved or grass-turf surfaces, by damming of swales caused by road construction, or other construction activities. Physical barriers, such as roads and canals, unsuitably deepen a vernal pool upstream of a barrier, and can isolate a fairy shrimp or vernal pool tadpole shrimp population from a portion of its aquatic habitat. Surface runoff, including non-point runoff, is altered by disturbance from trenching, grading, scraping, off-road vehicles, intensive livestock grazing, or other activities that change amounts, patterns, and direction of surface runoff to ephemeral drainages. Presence of summer water also affects the hydrologic pattern. Introduction of water during the summer disrupts the life cycles of the fairy shrimp and the vernal pool tadpole shrimp by subjecting them to greater levels of predation by animals requiring more permanent sources of water. Increased water also converts vernal pools to unsuitable marsh habitat dominated by emergent vegetation (e.g., cattails).

Direct and associated indirect impacts from the proposed Los Vaqueros Project, a water-storage project in the Kellogg Creek watershed of eastern Contra Costa County, would adversely impact two vernal pool complexes that support the highest diversity of fairy shrimp in the State (California Department of Fish and Game 1983). The rock pools in this area are inhabited by the vernal pool fairy shrimp and the longhorn fairy shrimp (John Gregg, Los Vaqueros Project, *in litt.*, 1992). Proposed construction of a major roadway, high-pressure natural gas and petroleum pipelines, and 230,000 kV electrical transmission lines at the Los Vaqueros Reservoir site would adversely affect these species (Jones and Stokes Associates 1986, 1989, 1990, 1991).

Several proposed utility projects have the potential to affect all of the three fairy shrimp and the vernal pool tadpole shrimp. For example, the Pacific Gas Transmission Company—Pacific Gas and Electric natural gas pipeline project extending from the Canadian border along the west side of the Sacramento Valley to Fresno County has adversely impacted a number of vernal pools containing the vernal pool fairy shrimp, Conservancy fairy shrimp, and the vernal pool tadpool shrimp (Federal Regulatory Energy Commission 1991; Arnold 1990; C. Nagano, pers. obs., 1992 and 1993). The Service has issued a conference opinion to the Federal Energy Regulatory Commission on a portion of this project that will adversely impact the vernal pool fairy shrimp; however, the applicant has indicated the mitigation measures will not be implemented if the species is not listed (John Cassady, PGT–PG&E Pipeline Expansion Project, *in litt.*, 1993).

Off-road vehicle (ORV) use also imperils fairy shrimp and the vernal pool tadpole shrimp inhabiting vernal pools (Bauder 1986, 1987). ORVs cut deep ruts, compact soil, destroy native vegetation, and alter pool hydrology. Fire fighting, security patrols, military maneuvers, and recreational activities cumulatively have damaged vernal pool habitats in many areas (Bauder 1986, 1987). In Solano County, an off-road vehicle park adjacent to the Jepson Prairie Reserve owned by the Nature Conservancy could adversely impact populations of the Conservancy fairy shrimp and the vernal pool tadpole shrimp.

Other secondary impacts associated with urbanization include disposal of waste materials into habitat for the four species included in this final rule (Bauder 1986, 1987). Disposal of concrete, tires, refrigerators, sofas, and other trash adversely affects these animals by eliminating habitat, disrupting pool hydrology or, in some cases, through release of toxic substances. Dust and other forms of air or water pollution from commercial development or agriculture projects also may be deleterious to these animals.

Filling of vernal pool wetlands without authorization from the Corps also poses a threat to these species (Tricia Richards, Sacramento County Planning and Community Development Department, *in litt*, 1991: D. Strait, pers. comm., 1993). In Stanislaus County, a site with 61 hectares (150 acres) of vernal pool habitat that was potentially inhabited by the vernal pool fairy shrimp was converted to irrigated pasture in 1990 (Martha Naley, U.S. Fish and Wildlife Service, pers. comm., 1991). A 112 hectare (275 acre) site containing vernal pool and swale habitat for the vernal pool tadpole shrimp in the Jepson Prairie area in Solano County was destroyed by discing in October 1992 (C. Nagano and J. Knight, pers. obs., 1992).

The Service is aware of 10 actions in the last 2 years in the Sacramento Valley, including agricultural conversion and urban development, that have resulted in the damage or destruction of as many as 17 hectares (43 acres) of vernal pools, exclusive of associated watersheds, that likely provided habitat for the vernal pool fairy shrimp and vernal pool tadpole shrimp (Dan Strait, U.S. Fish and Wildlife Service pers. comm., 1993). Some of these activities were undertaken without authority under the Clean Water Act. At least one of these parties likely intended to alter the elevations of the site to eliminate one or more of the parameters used by the Corps to define a wetland according to their 1987 jurisdictional manual. Other similar deliberate activities that are damaging or destroying vernal pools are likely occurring throughout the Central Valley (D. Strait, pers. comm., 1993). The Service is concerned that unless a final rule for the four species is issued and effective immediately upon publication, this may result in landowners knowingly destroying the habitat of these animals. Previously, this has occurred with other endangered species that inhabit vernal pools in the Santa Rosa area of Sonoma County (C. D. Nagano and J. C. Knight, U.S. Fish and Wildlife Service, pers. obs., 1992). Because of the immediate threat posed by these on-going activities, the Service finds that good cause exists for this rule to take effect immediately upon publication in accordance with 5 U.S.C. 553(d)(3).

B. *Overutilization for commercial, recreational, scientific, or educational purposes.* Not known to be applicable.

C. *Disease or predation.* The three fairy shrimp and the vernal pool tadpole shrimp are a food item in the diet of migratory waterfowl and other native animals (Krapu 1974; Swanson *et al.* 1974; J. King, pers. comm., 1992). However, this naturally occurring predation is not considered a threat to the continued existence of these crustaceans.

Introduction of the bullfrog (*Rana catesbeiana*) to areas inhabited by the vernal pool tadpole shrimp appears to increase the threat of predation facing this crustacean. These amphibians are voracious predators on many species of native and exotic animals. Large numbers of vernal pool tadpole shrimp were found in stomach content analysis of bullfrogs captured in vernal pools in the Chico area (Marc Hayes, Oregon State University, pers. comm., 1993; Robert Fisher, University of California, pers. comm., 1993). Although bullfrogs are unable to establish permanent breeding populations in vernal pools, dispersing immature males take up residence in these areas during the rainy

season (Mark Jennings, U.S. National Biological Survey, pers. comm. to Peter Sorensen, 1994). A number of bullfrogs were observed at Jepson Prairie during the winter of 1992/1993 (C. Nagano, pers. obs. 1992/93).

Vernal pool tadpole shrimp were found to have been parasitized by flukes (Trematoda) of an undetermined species at the Vina Plains, Tehama County (Ahl 1991). The gonads of both sexes were greatly reduced in size and their body cavities were filled with many young flukes (metacercariae). Ahl concluded that parasitic castration was the major limiting factor affecting reproduction of the vernal pool tadpole shrimp at the Vina Plains. The range and extent of this parasite is unknown.

There are no known diseases affecting the three fairy shrimp and the vernal pool tadpole shrimp.

D. *The inadequacy of existing regulatory mechanisms.* The primary cause for the decline of these species is loss of habitat from human activities. State and local laws and regulations have not been passed to protect the four species included in this final rule. Other regulatory mechanisms necessary for the conservation of vernal pools have proven inadequate and ineffective.

The environmental review process under the California Environmental Quality Act for projects that result in loss of habitats that support these animals sometimes requires development and implementation of mitigation plans. However, the effectiveness of this statute in protecting vernal pool habitat has not been consistent. As documented above, fairy shrimp and vernal pool tadpole shrimp habitat typically has been eliminated without offsetting mitigation measures. Most mitigation plans that have been required were designed specifically for vernal pool plants. The artificial creation of vernal pools as compensatory mitigation has not been proven scientifically to be successful (Ferren and Gevirtz 1990; Zedler and Black 1988; J. King, *in litt.*, 1992; M. Simovich, *in litt.*, 1992; R. Brusca, *in litt.*, 1992).

Under section 404 of the Clean Water Act, the Corps regulates the discharge of fill material into waters of the United States, which include navigable waters, wetlands (e.g., vernal pools), and other waters. The Clean Eater Act requires project proponents to obtain a permit from the Corps prior to undertaking many activities (grading, discharge of soil or other fill material, etc.) that would result in fill of wetlands. The Corps promulgated Nationwide Permit 26 to address fill of isolated or headwater wetlands totalling less than 4 hectares (10 acres). Under Nationwide Permit 26, proposals that involve fill of wetlands less than one acre are considered authorized. Where fill would aversely modify between 0.4 and 4.0 hectares (one and 10 acres) of wetland, the Corps circulates for comment a predischarge notification to the Service and other interested parties to determine whether or not an individual permit should be required for fill activity and associated impacts.

Individual Corps permits are required for discharge of fill material that would fill or adversely modify greater than 4 hectares (10 acres) of wetlands. The review process for individual permits is more rigorous than for nationwide permits. Unlike nationwide permits, an analysis of cumulative wetland impacts is required for individual permit applications. Resulting permits may include special conditions that require potential avoidance or mitigation for environmental impacts. On nationwide permits, the Corps has discretionary authority to require an individual permit if the Corps believes that resources are sufficiently important, regardless of the wetland's size. In practice, however, the Corps generally does not require an individual permit when a project qualifies for a nationwide permit, unless a threatened or endangered species or other significant resources would be adversely affected by the proposed activity. Most vernal pools and swales within the range of these three species of fairy shrimp and the vernal pool tadpole shrimp encompass less that 4 hectares (10 acres). The discontinuous distribution of these sites has allowed some landowners to divide large projects into several smaller projects. Wetland acreage on these smaller projects is usually under 4 hectares (10 acres), and therefore, most projects qualify for Nationwide Permit 26. Discing and other farming or ranching practices, including overgrazing, can destroy vernal pool habitat without a permit from the Corps because many of these activities are exempt from regulation under the Clean Water Act. The discontinuous configuration of the pools and swales further obscures separation of these wetland losses.

The Sacramento District of the Corps has several thousand vernal pools under its jurisdiction (Coe 1988), which includes most of the geographic range encompassing the four species listed herein. Areas occupied by these animals are undergoing rapid urbanization and current trends indicate 60 to 70 percent of these pools could be destroyed in the next 10 to 20 years (Coe 1988).

The Conservancy fairy shrimp, vernal pool fairy shrimp, and the vernal pool tadpole shrimp are found in vernal pools within the Vina Plains in Tehama County. They likely are found in the vicinity of ephemeral swales and drainages that support *Limnanthes floccosa* ssp. *calfornica* (Butte County meadowfoam). This plant was listed as an endangered species on June 8, 1992 (57 FR 24192). These crustaceans could be protected indirectly by actions taken to conserve the Butte County meadowfoam. A "conservation plan" has been drafted for the City of Chico (Jokerst 1989) that details various actions designed to conserve the plant, such as creation of a preserve system. However, the draft plan does not address plant populations and vernal pool habitat outside city limits. Moreover, the City of Chico has yet to adopt the plan. Meanwhile, typical of other vernal pool areas, the Corps continues to use nationwide permits to authorize numerous residential developments in the Chico area.

The Conservancy fairy shrimp and the longhorn fairy shrimp each have portions of one population on lands under public ownership. Portions of four populations of the vernal pool fairy shrimp are on lands under public ownership. Portions of eight populations of the vernal pool tadpole shrimp are on lands under public ownership. The Nature Conservancy owns or controls portions of vernal pool habitat, including Jepson Prairie in Solano County, Vina Plains in Tehama County, the Carrizo Plain in San Luis Obispo County, and Santa Rosa Plateau area in Riverside County. All three fairy shrimp species and the vernal pool tadpole shrimp occur on Conservancy property. Management plans for some Federal, State, local, and Conservancy properties include provisions to protect vernal pools but none specifically address these species. Surrounding privately owned vernal pool habitat and watershed are not protected.

E. *Other natural or man-made factors affecting their continued existence.* The pools and, in some cases, pool complexes supporting the fairy shrimp species and the vernal pool tadpole shrimp are usually small and unforeseen natural and man-caused catastrophic events threaten the elimination of some sites. Many of the known populations of the four species are comprised of single or less than five pools (e.g., 3 of 6 Conservancy fairy shrimp populations, 1 of 3 longhorn fairy shrimp populations, 20 of 34 vernal pool fairy shrimp populations, 1 of the 18 vernal pool tadpole shrimp populations). In many cases, these

populations are remnants of larger, multi-pool populations that originally existed in historic vernal pool complexes. Such populations are important for their genetic uniqueness, which has been documented for the Conservancy fairy shrimp and the vernal pool tadpole shrimp (Fugate 1993; J. King pers. comm. 1992). However, these important populations are those that have the most tenuous chances for long-term persistence due to population bottlenecks in conjunction with low gene flow between populations (J. King pers. comm. 1993). Additionally, some of the areas with the largest populations (i.e., greatest number of vernal pools remaining in pool complexes) are currently under threat of fragmentation by numerous proposed projects (e.g., Sacramento and Placer Counties).

The four crustaceans in these small habitat patches are vulnerable to random fluctuations or variation (stochasticity) due to annual weather patterns and availability of food and other environmental factors superimposed on the cumulative threats described throughout this rule. The populations of the four species are isolated from other conspecific populations and are distributed in discontinuous vernal pool systems. Such populations are vulnerable to stochastic extinction. The breeding of closely related individuals may cause genetic problems in small populations of the four species, particularly in the expression of deleterious genes (known as inbreeding depression). Individuals and populations possessing deleterious genetic material are less able to cope with environmental conditions and adapt to environmental changes, even relatively minor ones. Further, small populations are subject to the effects of genetic drift (the random loss of genetic variability). The phenomenon also reduces the ability of individuals and populations to respond successfully to environmental stresses. Overall, these genetic factors could influence the survivability of isolated populations of each of the three fairy shrimp and the vernal pool tadpole shrimp.

The Service has carefully assessed the best scientific and commercial information regarding past, present, and future threats faced by these species in determining to issue this final rule. Based on this evaluation, the preferred action is to list the Conservancy fairy shrimp, longhorn fairy shrimp, and the vernal pool tadpole shrimp as endangered; and the vernal pool fairy shrimp as threatened. The three fairy shrimp and the vernal pool tadpole shrimp are imperiled by rapid urbanization, conversion of land to agricultural use, off-road vehicle use, and changes in hydrologic patterns in areas they occupy. Only a small proportion of the pools are permanently protected from these threats. Numerous ongoing and proposed development projects pose an imminent threat to the three fairy shrimp and the vernal pool tadpole shrimp. Extraordinary increases in human populations and associated pressures from urban development have rendered existing regulatory mechanisms inadequate. Stochastic events, which commonly affect small isolated populations, also may result in extirpation of some populations of these species. Four of the six known populations of the Conservancy fairy shrimp are imperiled. There are threats to the four known populations of the longhorn fairy shrimp. Twenty-eight of the 32 known populations of the vernal pool fairy shrimp are under threat. Fourteen of the 18 known populations of the vernal pool tadpole shrimp are imperiled. Because the Conservancy fairy shrimp, longhorn fairy shrimp, and the vernal pool tadpole shrimp are in danger of extinction throughout all or a significant portion of their ranges, these species fit the definition of endangered as defined in the Act. Because the vernal pool fairy shrimp is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, this species fits the definition of threatened as defined in the Act.

The Service considers the change in the listing status from endangered to threatened of the vernal pool fairy shrimp to be warranted based on two factors. Since the proposed rule was published, data gathered by Sugnet and Associates (1993b) and information otherwise available to the Service indicate that the geographic extent and number of populations and subpopulations of this species are larger than was originally known. The distribution of the species is not so fragmented as to reduce the likelihood of recolonization. As mentioned previously in this final rule, recolonization following stochastic local extinctions is probably a determining factor for the long-term persistence of this species.

Taking this information into consideration, as well as the actions discussed under factors A, C, D, and E in the "Summary of Factors Affecting the Species" section of this rule, the Service finds that the vernal pool fairy shrimp is not in imminent danger of extinction but is likely to become so in the foreseeable future throughout all or a significant portion of its range.

Designation of critical habitat for the vernal pool fairy shrimp, longhorn fairy shrimp, Conservancy fairy shrimp, and the vernal pool tadpole shrimp is not prudent at this time for the reasons discussed below.

Critical Habitat

Section 4(a)(3) of the Act, as amended, requires that to the maximum extent prudent and determinable, the Secretary designate critical habitat at the same time the taxa are listed. The Service finds that designation of critical habitat is not prudent for these species at this time. Because the three fairy shrimp and vernal pool tadpole shrimp face numerous anthropogenic threats (see Factor A in "Summary of Factors Affecting the Species"), the publication of precise maps and descriptions of critical habitat in the **Federal Register** would make these species more vulnerable to incidents of vandalism and, therefore, would contribute to the decline of these species. A number of sites inhabited by the four species occur on private land that is undergoing rapid urban and agricultural development. As documented above, some areas have been destroyed to eliminate vernal pool characteristics and escape regulatory jurisdiction by the Corps. The proper agencies have been notified concerning management requirements of these animals. Protection of the habitat of these species will be addressed through the recovery, section 7 consultation, and incidental take permitting processes. Federal involvement in areas where these animals occur can be identified without designation of critical habitat. Therefore, the Service finds that designation of critical habitat for these animals is not prudent at this time, because such designation likely would increase the degree of threat from vandalism or other human activities.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities. Recognition through listing encourages and results in conservation actions by Federal, State, local, and private agencies, groups, and individuals. The Endangered Species Act provides for possible land acquisition and cooperation with the States and requires recovery actions be carried out for all listed species. Such actions are initiated following listing. The protection required of Federal agencies and the

prohibitions against taking are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(2) requires Federal agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

As described above, the U.S. Army Corps of engineers exerts section 404 jurisdiction over habitats supporting these animals. Nationwide permits are not valid where a federally listed endangered or threatened species would be affected by the proposed project. When listed species may be affected, formal consultation is required pursuant to section 7 of the Act before nationwide permits become effective. In addition, the Department of Housing and Urban Development (HUD) may insure housing loans in areas that presently support these animals; HUD actions regarding these loans also would be subject to review by the Service under section 7 of the Act.

Other Federal agencies that possibly could be affected if these animals are listed include the U.S. Air Force, U.S. Department of Agriculture (Farmers Home Administration), Veterans Administration, and the Department of Transportation (Federal Highways Administration). Populations of the longhorn fairy shrimp, vernal pool fairy shrimp, and the vernal pool tadpole shrimp occur on property owned by the Bureau of Land Management at the Carrizo Plain in San Luis Obispo County; and the U.S. Air Force at Castle Air Force Base, Mather Air Force Base, and Beale Air Force Base.

The listing of these fairy shrimp and the vernal pool tadpole shrimp will also bring section 5 and 6 of the Endangered Species Act into effect. Section 5 authorizes acquisition of lands for the purposes of conserving endangered and threatened species. Pursuant to section 6, the Service would be able to grant funds to affected States for management actions aiding in protection and recovery of these animals.

Listing these fairy shrimp and the vernal pool tadpole shrimp as endangered provides for the development of a recovery plan (or plans) for them. Such plan(s) will bring together State and Federal efforts for conservation of the animals. The plan(s) will establish a framework for agencies to coordinate activities and cooperate with each other in conservation efforts. The plan(s) will set recovery priorities and estimate costs of various tasks necessary to accomplish them. They also will describe site-specific management actions necessary to achieve conservation and survival of the fairy shrimp and the vernal pool tadpole shrimp.

The Act and implementing regulations found at 50 CFR 17.21 for endangered species and 17.31 for threatened species set forth a series of prohibitions and exceptions that apply to all endangered wildlife and to threatened wildlife not covered by a special rule. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take, import or export, transport in interstate or foreign commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any such species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that was illegally taken. Certain exceptions can apply to agents of Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered and threatened animal species under certain circumstances. Regulations governing permits are at 50 CFR 17.22, 17.23, and 17.32. For endangered species, such permits are available for scientific purposes, to enhance the propagation or survival of the species, to alleviate economic hardship in certain circumstances, and/or for incidental take in connection with otherwise lawful activities. For threatened species, there are also permits for zoological exhibition, educational purposes or other purposes consistent with the purposes of the Act. Further information regarding regulations and requirements for permits may be obtained from the U.S. Fish and Wildlife Service, Ecological Services, Endangered Species Permits, 911 N.E. 11th Avenue, Portland, Oregon 97232–4181 (503/231–2063; FAX 503/231–6243).

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A complete list of all references cited herein is available, upon request, from the Field Supervisor, Sacramento Field Office, (see **ADDRESSES** section).

Authors

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List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, and Transportation.

Regulations Promulgation

Accordingly, part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, is amended as set forth below:

PART 17—[AMENDED]

1. The authority citation for Part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500, unless otherwise noted.

2. Section 17.11(h) is amended by adding in the table the following in alphabetical order under CRUSTACEANS to the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
•	•	•	•	•	•		•
CRUSTACEANS							
•	•	•	•	•	•		•
Shrimp, Conservancy fairy.	*Branchinecta conservatio.*	U.S.A. (CA)	NA	E	549	NA	NA
•	•	•	•	•	•		•
Shrimp, longhorn fairy.	*Branchinecta longiantenna.*	U.S.A. (CA)	NA	E	549	NA	NA
•	•	•	•	•	•		•
Shrimp, vernal pool fairy.	*Branchinecta lynchi* .	U.S.A. (CA)	NA	T	549	NA	NA
Shrimp, vernal pool tadpole.	*Lepidurus packardi* ..	U.S.A. (CA)	NA	E	549	NA	NA

Dated: August 31, 1994.

Mollie H. Beattie,

Director, U.S. Fish and Wildlife Service.

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