

populations of these animals are defined by pool complexes rather than by individual vernal pools" (Fugate 1992, 1998; King 1996). 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" (59 FR 48136). Our use of vernal pool complexes to define populations of the four listed crustaceans was upheld by the U.S. District Court in post-listing challenge to the listing (*Building Industry Association of Superior California, et al. v. Babbitt et al.*, CIV 95-0726 PLF). The July 25, 1997, court decision stated that the plaintiffs were on notice that the Service would consider vernal pool complexes as a basis for determining fairy shrimp populations. The court also concluded that the use of this methodology was neither arbitrary nor capricious. The Court of Appeals for the D.C. Circuit upheld the district court's decision, and the Supreme Court has declined to hear the case.

Each of the critical habitat units likely includes some areas that are unoccupied by the vernal pool crustaceans and vernal pool plants. "Unoccupied" is defined here as an area that contains no hatched vernal pool crustaceans or observed above-ground vernal pool plants, and that is unlikely to contain a viable cyst or seed bank. Determining the specific areas that the vernal pool crustaceans or vernal pool plants occupy is difficult because, depending on climatic factors and other natural variations in habitat conditions, the size of the localized area in which above-ground plants or hatched crustaceans appear may fluctuate dramatically from one year to another. In some years, individuals may be observed throughout a large area, and in other years they may be observed in a smaller area or not at all. Because it is logistically difficult to determine how extensive the cyst or seed bank is at any particular site, and because hatched vernal pool crustaceans or above-ground vernal pool plants may or may not be present in all vernal pools within a site every year, we cannot quantify in any meaningful way what proportion of each critical habitat unit may actually be occupied by the vernal pool crustaceans or vernal pool plants. Therefore, areas of unoccupied habitat are probably interspersed with areas of occupied habitat in each unit. The inclusion of unoccupied habitat in our critical habitat units reflects the dynamic nature of the habitat and the

life history characteristics of the vernal pool crustaceans and vernal pool plants. Unoccupied areas provide areas into which populations might expand, provide connectivity or linkage between groups of organisms within a unit, and support populations of pollinators and seed dispersal organisms. Both occupied and unoccupied areas that are designated as critical habitat are essential to the conservation of the species.

All of the above described PCEs do not have to occur simultaneously within a unit for the unit to constitute critical habitat for any of the 15 vernal pool species. We determined the PCEs of critical habitat for the 15 species based on studies on their habitat and population biology, including but not limited to Kalin-Arroyo 1973; Elias 1986; Corbin and Schoolcraft 1989; Jokerst 1989; Eng *et al.* 1990; Alexander and Schlising 1997; Helm 1998; Witham 1998; Eriksen and Belk 1999; Grosberg 2002. Additional information on species-specific PCEs are outlined below in Descriptions of Critical Habitat Units for each species.

#### Conservation Criteria Used to Identify Critical Habitat

Based on the best scientific information available, all areas identified as critical habitat for the 15 vernal pool species addressed by this rule are within the historical and current ranges of each of the species and contain the two PCEs identified above. Rather than designate every area containing PCEs, however, we designated only those areas which available evidence clearly demonstrated were essential to the conservation of each species. Areas for which the evidence available at this time was less certain were not included in this designation, although we believe these areas to be important to the species and may include them in future recovery plans. Areas essential to the conservation of the species are those that are necessary to advance at least one of the following conservation criteria:

(1) The conservation of areas representative of the geographic distribution of the species. Species that are protected across their ranges have lower chances of extinction (Soule and Simberloff 1986; Murphy *et al.* 1990; Primack 1993; Given 1994; Hunter 1996; Pavlik 1996; Noss *et al.* 1999; Grosberg 2002). Maintenance of representative occurrences of the species throughout its geographic range helps ensure the conservation of regional adaptive differences and makes the species less susceptible to environmental variation

or negative impacts associated with human disturbances or natural catastrophic events across the species' entire range at any one time (Primack 1993; New 1995; Hunter 1996; Helm 1998; Redford and Richter 1999; Rossum *et al.* 2001; Grosberg 2002). Additionally, the conservation of the geographic distribution of the species is one of the physical and biological features we are required to consider under our regulations (50 CFR 424.13(b)). Accordingly, we considered the number of occupied areas in each vernal pool region (Sawyer and Keeler-Wolf 1995), and determined roughly the extent to which each occupied area would likely be necessary for the conservation of the species in the region or as a whole.

(2) The conservation of areas representative of the ecological distribution of the species. Each of the 15 vernal species is associated with various combinations of soil types, vernal pool chemistry, geomorphic surfaces (landforms), and vegetation community associations. Maintaining the full range of varying habitat types and characteristics for a species is essential because it would include the full extent of the physical and environmental conditions necessary for the species (Zedler and Ebert 1979; Ikeda and Schlising 1990; Fugate 1992; Gonzales *et al.* 1996; Fugate 1998; Platenkamp 1998; Bainbridge 2002; Noss *et al.* 2002a). Vernal pool species are extremely adapted to the physical and chemical characteristics of the habitat in which they occur. Additionally, the conservation of the ecological distribution of the species is one of the physical and biological features we are required to consider under our regulations 50 CFR 424.13(b), and was also strongly endorsed by at least one peer reviewer (*see* Peer Review section). Accordingly, we considered the extent to which habitat types occupied by the species could be expected to be conserved in light of the number of occupied areas and the threats involved.

(3) The conservation of areas necessary to allow movement of cysts, pollen, and seeds between areas representative of the geographic and ecological distribution of the species. As a result of dispersal events within and between vernal pool complexes, and environmental conditions that may prevent the emergence of dormant cysts and seeds for up to several decades, the presence of vernal pool species is dynamic in both space and time (Eriksen and Belk 1999; Noss *et al.* 2002a). We therefore determined that essential habitat for the vernal pool