area of southwestern New South Wales as determined from 1980-1982 aerial surveys. The increase of watering points to aid the pastoral industry has been beneficial to the western gray kangaroo but intensive agriculture has adversely impacted some habitats. Arnold (1990), for example, indicated that the sizes of some populations of western gray kangaroos have declined significantly where habitat fragmentation to favor intensive agriculture has occurred in southwestern Western Australia. Arnold (1990) further believes losses to kangaroo populations will continue in these areas as the remnant native vegetation continues to be degraded. The western gray kangaroo occurs widely through the southern agricultural area of South Australia and extends into the central pastoral areas. This macropod is considered to be basically a dweller of scrublands and woodlands that grazes at the edges of adjacent grasslands. That portion of the gray kangaroo's range in the pastoral zone of South Australia has been favored by management actions beneficial to sheep production. A portion of the gray kangaroo's range in the southern agricultural zone has been degraded or destroyed by extensive habitat destruction caused by the clearing of native vegetation for agricultural and industrial purposes and for urban and suburban developments (SANPWS 1991). The action plan for the conservation of Australasian Marsupials and Monotremes (Kennedy 1992) listed no change to a decline of less than 10 percent in the geographic range of the western kangaroo since European settlement.

The three species of kangaroos occur over a vast region of Australia. Census lines representative of about 2.25 million sq km of habitat are routinely surveyed by air to estimate kangaroo numbers. Kangaroos are abundant in major portions of this habitat. As indicated below, an extensive series of parks and reserves totaling over 400,000 sq km has been and is being established that will contribute directly to the conservation of macropods throughout their natural range. Current kangaroo populations could exceed those present before European man arrived on the continent. This seems possible because kangaroos have a reproductive capability efficiently attuned to the boom-or-bust nature of the usual precipitation-range forage cycle on arid lands and because kangaroos have been an impressive and inadvertent beneficiary of the sheep management system that included the clearing of woodlands, production of watering

points, and the control of predators. Kangaroos that inhabit vast areas of Australia in impressive numbers cannot be considered threatened because of habitat and range conditions even though much native range is severely degraded. Kangaroos do well when habitats are in adequate condition due to sufficient rainfall and more poorly when droughts occur. This cyclic or fluctuating pattern in response to the vegetative condition of rangelands is a normal periodicity in the arid land system and does not in itself comprise a threat to the species.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The intent of kangaroo conservation in Australia is to maintain viable populations of the three species of kangaroos over their existing range and minimize any deleterious effects that high densities of these species could have on agricultural and pastoral products. Management is an art in the arid-zone ecosystems that comprise much of interior Australia where lands normally cycle in productivity in response to a variable rainfall. Viable kangaroo populations need to be maintained when range productivity and carrying capacities are low, but kangaroos can represent an additional range resource when populations and range productivities are increased. The ANČA and the Parks and Wildlife Services of the individual states regularly monitor population trends of red and gray kangaroos. The species are protected on National Parks and Reserves that total about 5 percent of the continental land area (over 400,000 sq km). Some of these lands represent important kangaroo habitats. The species can be legally killed, but not commercially utilized, by permitted actions in many urban, suburban, and agricultural areas for damage mitigation reasons. A major commercial harvest of kangaroos occurs in large designated areas of Queensland, New South Wales, South Australia, and Western Australia. The magnitude and characteristics of this commercial harvest are regulated by the ANCA as a wildlife management strategy. The total commercial harvest is conducted within the framework of a harvest quota system. The commercial quota is the maximum number of kangaroos of a designated species that may enter domestic or international commerce during a specific year after having been taken in accordance with approved State management plans.

The assessment of this factor did not evaluate whether the commercial utilization of kangaroos violates their

protected status as provided by Australian legislation or the legitimacy of the commercial kangaroo industry. Those are Australian domestic issues. The Service assumed that kangaroo products are a legitimate product of the land if kangaroos are managed as a sustainable resource, and if Australian society approves of the harvest. The Service's evaluation in particular focused on whether the commercial enterprise threatened the existence of kangaroos, whether the Commonwealth and State governments adequately manage the kangaroo resource, and how harvest management responds to changes in kangaroo populations, especially during droughts.

Kangaroo population levels are estimated from large-scale aerial and/or ground surveys. These population estimates reflect the effects of all forms of mortality acting on kangaroos. Commercial harvest quotas are determined from estimates of the living population and are intended to regulate the harvest which is the principle human-caused form of mortality. The commercial harvesting of kangaroos is directly controlled through the licensing of shooters and their operations.

The population surveys are accomplished during winter (June-August), annually in South Australia, New South Wales, and Queensland and triennially in Western Australia. The raw data from surveys represent index values that can be compared to develop trends, or they can be expanded by the use of suitable correction factors to provide estimates of kangaroo populations. Correction factors strive to account for differences in the behavior of kangaroo species regarding their sightability and the ability to view kangaroos in different habitats. Research is ongoing to further enhance the quality of surveys and correction factors. In Western Australia, where aerial surveys are only accomplished at 3-year intervals, population status in the intervening years is assessed from monthly reports of the commercial harvest, the intermittent aerial surveys and ground surveys and patrols by appropriate staff (WADCLM 1991a and 1991b).

Harvest quotas are determined on the basis of population information, estimates of habitat quality, and the perceived or estimated requirements for damage mitigation. Conservation interests are considered to drive the establishment of harvest quotas because quotas are usually fixed as conservative proportions of the estimated populations. Individual States could temporarily set quotas at high rates if their stated management goal was to