CHAPTER TWO
DESERT TORTOISE
(Gopherus agassizii)

Status: Federal: Threatened California: Threatened
Date of Evaluation: March 12, 17-19, 1998; October 20-22, 1998
Attendees: Bransfield, Black, Hoover, Jones, Thompson, LaRue, LaPre, Haigh, Bell, Boarman, Avery (briefly), Lovich (briefly), Foreman, Egan, Woodman, Karl

Development of a successful conservation strategy for the desert tortoise is the West Mojave Plan's most important task. To this end, the evaluators met repeatedly to assess the effectiveness of current tortoise management, identify management shortfalls, and develop a conservation strategy that blends the most effective components of current management with new solutions to identified threats.

The approach developed by the evaluators, and recommended in this report, categorizes lands within the planning area into one of three desert tortoise management areas, and recommends measures to minimize and mitigate impacts of take in each of these areas. The chapter is organized as follows:

- Part A, *Methodology*, documents the meetings, studies, and discussions that led to the suggested conservation strategy.
- Part B identifies *biological goals and objectives*.
- Part C explains the *conservation strategy*.
- Part D presents ideas for the Supergroup's use when it determines the *take* to be authorized by incidental take permits and biological opinions.
- Part E examines the likely success of the recommended conservation strategy in meeting the biological goals and objectives.
- Part F presents a bibliography of literature cited in this chapter.

In addition, a Desert Tortoise Appendix Volume (available upon request) presents background information concerning management prescriptions and areas.

Part A
Methodology

BACKGROUND INFORMATION

Evaluators kept three factors in mind throughout their deliberations: (1) known threats to the desert tortoise, (2) field survey results, and (3) current and historic tortoise management areas. Each is discussed below.

Threats to the Desert Tortoise

Boarman (1999) summarized the literature and documented 22 threats affecting the desert tortoise. His analysis provides a comprehensive discussion of the most important threats to tortoise recovery. While similar to the discussion given in the *Desert Tortoise (Mojave Population) Recovery Plan* (Recovery Plan) (U.S. Fish and Wildlife Service 1994b), Boarman's study updates it by providing the results of research completed since 1994.

Dr. Boarman assigned each of the threats a rank of high, medium, or low based on the following rationale: (a) percent of known mortalities attributable to a specific factor; (b) geographic extent of the threat factor (localized versus region-wide); (c) temporal pattern of threat (e.g., one-time, seasonal, long-term); (d) acreage affected by the factor; and (e) future expected trends in the threat factor. Using these criteria, threats to tortoise recovery were ranked as follows:

Table 2-1
Desert Tortoise Threats

High	Medium	Low
Construction	Agriculture	Collecting
Disease	Fire	Drought
Urbanization & development	Landfills	Energy & mineral development
	Livestock grazing	Garbage & litter
	Military operations	Handling & manipulation
	Off-road vehicles	Invasive weeds
	Predation	Noise
	Roads & highways	Non off-highway vehicle recreation
	Utility corridors	Vandalism
		Wild horses & burros

Source: Boarman 1999. Threats within a given rank are listed alphabetically

Dr. Boarman added a word of caution:

> The rating of relative importance of different threat factors is a difficult undertaking for several reasons. First, it is difficult to determine the cause of death of animals and it is even harder to determine how much decline is really attributable to the various indirect causes of mortality (e.g., habitat alteration)....Second, not enough is known about several potential threats to evaluate their absolute or relative impact...Third, which mortality factors are functioning is very site specific...Finally, as discussed above, factors that caused the declines (e.g., disease) may not be the same factors that are preventing recovery (e.g., genetic or demographic consequences of small populations, fragmentation, raven predation).

Dr. Boarman's analysis is only one interpretation of the relative importance of threats affecting tortoises; the Recovery Plan is another source. Regulatory agency personnel, the planning team, and the biologists participating in the evaluation (including Dr. Boarman) were very familiar with these and other threats, and applied this knowledge and experience when determining solutions to those threats.

Whereas Dr. Boarman considered fragmentation, degradation, and loss of habitat to constitute a 23rd threat (Boarman 1999), the evaluators viewed them as habitat impacts that *result* from a combination of other threats. For example, roads and utility corridors fragment tortoise habitat; sheep grazing, off-highway vehicles, and some military operations degrade habitat; and urbanization clearly results in habitat loss.

Some threats affect both habitat and tortoises (construction, urbanization, wildland fires), while others affect only tortoises (disease and predation). Appendix DT-6 presents a "threats matrix" that identifies, for each threat, whether it results in fragmentation, degradation, and/or loss of habitat, and whether tortoises would be directly affected.

In many ways the West Mojave tortoise population is more affected by human and non-human threats than any of the other tortoise populations listed as threatened (i.e., those occurring north and west of the Colorado River). In Table 2-2, we list the relative degree of threat for each recovery unit and the associated Desert Wildlife Management Areas.

Additional documentation regarding the relative effects of various threats are given below:

- Although population declines are occurring over large sections of the species' range, the tortoise appears to be faring least well in the Western Mojave desert of California, where, not coincidentally, habitat destruction due to human disturbance is widespread...Our most obvious conclusion is that populations of desert tortoise in the Western Mojave desert are in grave danger (Doak et al. 1994).

Table 2-2 Degree of Threat Recovery Plan DWMAs			
Recovery Unit	**Proposed DWMA**	**Degree of Threat**	**Average Degree of Threat**
Upper Virgin River	Upper Virgin River	5	5.0
Western Mojave[1]	*Fremont-Kramer* *Ord-Rodman* *Superior-Cronese*	*5* *4* *5*	*4.7*
Eastern Colorado	Chuckwalla	4	4.0
Northeastern Mojave	Beaver Dam Slope Coyote Spring Gold Butte - Pakoon Mormon Mesa	5 2 2 3	3.0
Eastern Mojave	Fenner Ivanpah Piute El Dorado	3 3 2	2.7
Northern Colorado	Chemehuvei	1	1.0

Source: Recovery Plan, Table 6; Degree of Threat: 5=High, 1=Low.

- Studies conducted throughout the California deserts indicate that ravens were most abundant in the west Mojave Desert (Knowles and Berry 1990); ravens in the Mojave desert increased by over 1,500%...and this increase is likely much higher in the western Mojave desert...the largest number of [tortoise] shells [with evidence of raven predation] have been found in the western Mojave (Boarman 1992b); tortoise populations experiencing highest raven predation rates are within the western Mojave Desert (Rado 1989).

- On the BLM western Mojave Desert study plots, 14.6% to 28.9% of all desert tortoise carcasses bore evidence of gunshots, whereas carcasses from the less-visited eastern Mojave Desert yielded gunshot frequencies of 0% to 3.1% (Berry 1986); the highest rate of vandalism was recorded in the Fremont Valley, where 40.7% of desert tortoises found dead between 1981 and 1987 showed signs of gunshots and other vandalism (Berry 1990, as amended).

- Tortoise mortality, apparently from the upper respiratory tract disease, has been more severe at the Desert Tortoise Research Natural Area than at most other BLM study plots

[1] The Joshua Tree DWMA, which has a threat level of 1, is excluded from this analysis because it is already being managed by the National Park Service as a reserve and has implemented management prescriptions identified in the Recovery Plan. If Joshua Tree were included, the entire Western Mojave Recovery Unit would have an average threat level of 3.75.

(Berry 1990, Corn 1994).

- Corn (1994) indicates that there was an apparent decline in large tortoises and a marked decline in small tortoises since the latter-1980's and mid-1980's, respectively, in the western Mojave Desert

- Early fires may be particularly damaging in the western parts of the Mojave Desert where [tortoise] growth and breeding are focused on a relatively short time period during the late winter and early summer (Brooks 1998).

Tortoise Field Surveys

1975 to 1982 BLM Tortoise Surveys: Between 1975 and 1982, the BLM funded surveys throughout much of the Mojave Desert to determine relative tortoise densities. A total of 1,678 transects was surveyed throughout the California portion of the Mojave Desert, including 894 in the planning area (Matt Daniels, pers. comm., 12 February 1999). These data were used to develop tortoise density polygons (Berry 1984), and the resulting map (Desert Tortoise Map 2) has been used by regulatory agencies, land managers, and tortoise biologists ever since.

The map depicts areas of tortoise densities segregated into the following categories: 0 to 20, 21 to 50, 51 to 100, 101 to 250, and more than 250 tortoises per square mile. A central area roughly corresponding to current critical habitat contained most of the tortoises, surrounded by peripheral areas of 0 to 20 tortoises per square mile. The outer-most portions of the planning area (foothills in the Sierra Nevada, San Gabriel, and San Bernardino mountains and the northern portions of China Lake and Fort Irwin), according to this map, did not support tortoises.

The highest tortoise densities occurred in four areas. The largest area (approximately 163 square miles) was found entirely within Kern County and roughly consisted of Fremont Valley, northeastern portions of California City (including the Desert Tortoise Research Natural Area), and areas southeast of California City. The next largest area (64 square miles) was found mostly in the Brisbane Valley (between Interstate 15 and National Trails Highway) and in the northwestern portion of the Stoddard Valley Open Area. Two relatively smaller areas (e.g., Water Valley near the Mud Hills and the eastern end of Daggett Ridge along Camp Rock Road) were also identified as having more than 250 tortoises per square mile. Although these areas were considered tortoise “hot spots” in the late 1970's, other extensive areas north, south, and east of Edwards Air Force Base were documented as supporting between 51 and 250 tortoises per square mile.

Local Government Tortoise Surveys: Since the tortoise was listed as threatened in 1990, county and city planning departments have required focused tortoise surveys on undeveloped lands as per Service protocol (U.S. Fish and Wildlife Service 1992). Such sites have been surveyed along transects spaced at 30-foot intervals, effecting a 100 percent presence-absence analysis of tortoise occurrence. During May 1998, the planning

team reviewed the records of approximately 250 focused desert tortoise surveys completed in San Bernardino County. Of these, 234 reported either presence or absence of tortoise sign. That information shows many areas, particularly to the south, where focused surveys failed to locate tortoise sign.

There have been five other, recent programmatic surveys of tortoise occurrence within urban areas, including: (a) 225 square miles of Lancaster (Tierra Madre Consultants, Inc. 1991); (b) 200 square miles encompassing portions of Adelanto, Apple Valley, Hesperia, and Victorville (Tierra Madre Consultants, Inc. 1992); (c) 100 square miles of Palmdale (Feldmuth and Clements 1990); (d) 38 square miles of Ridgecrest and Inyokern (Circle Mountain Biological Consultants 1997a); and (e) 38 square miles of Yucca Valley (Tierra Madre Consultants, Inc. 1993a).

1988 to 1997 Military Surveys: During the past decade, extensive tortoise survey work has been conducted on four of the military bases in the planning area. These surveys included the China Lake Naval Air Weapons Station (1990; 270 transects): Edwards Air Force Base (1992 and 1994; 987 transects): Fort Irwin, including proposed expansion areas (1988, 1989, 1990 and 1992; 1098 transects); and the Marine Corps Air Ground Combat Center at Twentynine Palms (1997; 875 transects).

These surveys revealed one area where tortoise populations were significantly underestimated by the 1984 map. This was an area south and southwest of Fort Irwin, where Woodman in 1988 and other surveyors in 1990 found areas apparently supporting as many as 250 tortoises per square mile (Chambers Group, Inc. 1990).

1998 West Mojave Regional Survey: The Supergroup's intent is to base the West Mojave Plan on the best available scientific data. Until 1998-1999, when much of the planning area was surveyed for tortoises, the 1984 map provided the latest available information regarding tortoise densities and distribution. However, this map is based on 20 year old data (from the late 1970's through early 1980's), and there have been documented declines in tortoise numbers in much of the West Mojave since the data were collected (Berry 1990, as amended; Corn 1994).

In addition, large areas of estimated tortoise densities on the 1984 map are associated with very few transect data points. For example, in the polygon located southeast of California City, encompassing between 60 and 70 square miles with tortoise densities estimated at 51 to 100 per square mile, only two transects were surveyed between 1975 and 1982.

The planning team concluded that a new survey effort was necessary for areas not recently (or ever) surveyed. The 1998 surveys were designed to (a) determine relative tortoise abundance throughout the proposed DWMAs and adjacent areas where tortoises likely occur; (b) quantify observable human impacts in those same areas; and (c) be sufficiently comprehensive to avoid excessive extrapolation onto unsurveyed lands.

The planning team was concerned about the methodology to be used: the prediction of tortoise density on the basis of tortoise "sign" counts (i.e., deriving an estimate of population per square mile from the number of tortoise burrows, scat and shells recorded on a given transect). Predicting tortoise density based on sign counts is problematic because of the wide range of tortoise sign found in areas of known (or suspected) tortoise density.

For example, on the Lucerne Valley permanent study plot where tortoise density was estimated at 82 animals in 1990, surveyors found as few as 6 and as many as 23 pieces of tortoise sign in 1998 (LaRue, pers. obs.). Since, during 15 out of 17 years tortoise densities have been estimated a single piece of sign has equated to 10 tortoises (Woodman, pers. comm.), one would estimate that as few as 60 and as many as 230 tortoises occur on the Lucerne Valley plot. To correct the effects of this variance, Dr. Michael Weinstein (pers. comm., 10 July 1998) indicated that three transects per square mile would be preferable to estimate tortoise densities.

Concerns with the methodology were tested by calculating tortoise densities in several different ways. Statistical techniques applied included the regression analysis traditionally used by Dr. Kristin Berry and the reduced major axis method (McArdle 1987). Variable results were obtained by (a) either "forcing" or "not forcing" the regression line through zero; (b) either considering all tortoise age classes, or adults only; and (c) applying either linear regression analysis or the reduced major axis method.

As a result of this analysis and discussion with several statisticians, it was decided to avoid the uncertainties inherent in these alternative treatments of the data. Instead, we have mapped "patterns of tortoise occurrence" based on normalized sign counts among the surveyors rather than on estimated tortoise densities.

This decision is supported by evidence that the regional sign count patterns more or less correspond to patterns of relative tortoise occurrence. Dr. Anthony Krzysik (1996) wrote that although "the use of surrogate measures to assess or monitor wildlife populations has universally been criticized on issues of relevancy, accuracy, or precision ... statistical modeling revealed that both burrow and scat counts were strongly positively correlated with the occurrence of tortoises on survey transects."

Prior to beginning the surveys, field biologists (Steve Boland, Frank Hoover, Dr. Alice Karl, Ed LaRue, David Silverman, and Peter Woodman) met with Dr. Kristin Berry on 9 July 1998 to discuss the locations of the transects. The 1998 survey transects were positioned, in part, to avoid areas that had been surveyed since 1988. Transect locations were chosen to accomplish the following goals:

- Delineate boundaries of tortoise management areas, particularly: (1) south of Edwards Air Force Base, north of Adelanto, south of Shadow Mountain Road,

north of Silver Lakes, and east of Highway 395; (2) north of Kramer Junction and west of Highway 395 to the Kern-San Bernardino county line; and (3) east of Helendale Road in the Iron Mountain area.

- Confirm areas of expected high tortoise densities, including: Water Valley and Mud Hills; around Iron Mountain north of Silver Lakes; south of Interstate 40; portions of the Brisbane Valley; and the region east of Highway 395, south of Highway 58, west of Helendale Road, and north of Shadow Mountain Road.

- Confirm areas of expected low densities, such as: the Cady Mountain region south of Interstate 15, north of Interstate 40, and west of Broadwell Dry Lake; and the area around California City.

- Consider a potential connecting corridor between Twentynine Palms Marine Corps Base and Joshua Tree National Park.

- Determine general distributions in the Stoddard and Johnson Valley Open Areas.

Surveys were completed between July 13 and September 24, 1998 on approximately 875 square miles of the planning area. Methodologies were the same as those used throughout the desert over the past 20 years (Berry and Nicholson 1984), where one transect was surveyed along a 1.5-mile equilateral triangle on a given square mile. Tortoise "Total Sign" and "Total Corrected Sign" (and other data including observable human disturbances) were recorded and later entered into a geographical information system (GIS) data base. Observable human disturbances included vehicles (paved roads, dirt roads, trails, tracks), garbage, shooting (targets, areas), mining (test pits, markers), campsites, sheep sign, cattle sign, domestic dog sign, fencelines and posts, utility lines, denuded habitat, partially denuded habitat, old buildings, and ordnance.

There was concern that tortoise sign may have deteriorated during the middle and latter parts of August 1998 when uncharacteristic summer storms associated with the *El Niño* weather pattern occurred throughout the area. As a result, calibration transects were re-surveyed. Dr. Boarman confirmed that there was no significant difference in the surveyor's finding abilities before or after the rains.

The survey confirmed tortoise declines through much of the planning area since the late 1970's. Like other post-1984 surveys, the 1998 effort found few new significant populations where fewer than 50 tortoises per square mile were reported in the 1970's. The 1998 surveys indicated that sizable populations remain in the Mud Hills, west of and including Iron Mountain and Kramer Hills, and lands north of Barstow, and documented major declines in tortoise numbers in the California City and Fremont Valley areas since 1990.

1999 West Mojave-Fort Irwin Regional Survey: With money provided by the Department of Army, and with coordination among the BLM, Service, Army, and West Mojave team, eight tortoise surveyors (Ed LaRue, Peter Woodman, Dr. Alice Karl, Steve Boland, Mercy Vaughn, Paul Frank, Denise LaBerteaux, and Gilbert Goodlett) were enlisted to survey for tortoises and human disturbances in various Fort Irwin expansion alternative areas and remaining portions of the planning area, particularly in proposed DWMA areas.

The goals of the survey effort were to (a) determine the approximate number of tortoises in various expansion area alternatives; (b) conduct tortoise surveys in areas not surveyed in 1998; (c) determine the relative disturbance levels inside and outside proposed expansion areas; and with this information, (d) determine the relative effect of a given expansion alternative on tortoises found in the planning area.

Between 19 July and 11 September 1999 the eight biologists surveyed approximately 1,500 transects on approximately 1,200 square miles. They surveyed two transects per square mile throughout the Army's 1999 expansion proposal alternative and one transect per square mile outside that area. These data provide a new look at tortoise occurrence within the various expansion area alternatives and around California City, on lands that were last surveyed between 1990 and 1992.

Summary of Recent Desert Tortoise Surveys: Studies conducted since 1988 (see Desert Tortoise Map 6) include the most recent, available tortoise survey information for approximately 4,775 square miles of the planning area. This is the first time this amount of tortoise distribution information for the West Mojave Desert has been assembled and is available in one place. These survey efforts are summarized in Table 2-3.

Table 2-3
Regional Tortoise Surveys Completed Since 1988

Geographic Area	Date	Transects	Square Miles	Surveyors	Literature Citation
Outside Fort Irwin (west, east, and south)	1988	90	90	P. Woodman	U.S. Fish and Wildlife Service 1988
Fort Irwin and Goldstone	1989	406	406	P. Woodman G. Goodlett A. Krzysik	Woodman and Goodlett 1990, Krzysik 1994
California City, Rand Mountains, Fremont Valley, Spangler Hills	1990	450	150	G. Goodlett G. Goodlett P. Woodman	Berry et al. 1994

Table 2-3 Regional Tortoise Surveys Completed Since 1988					
China Lake Naval Air Weapons Station	1990	270	270	S. Boland T. Shields P. Woodman	Kiva Biological Consulting and McClenahan & Hopkins Associates, Inc. 1990
Fort Irwin (including expansion areas)	1990	468	468	S. Boland J. Kaufmann T. Shields P. Woodman	Chambers Group, Inc. 1990
Fort Irwin (including the North Alvord Slope proposed expansion area)	1992	134	134	S. Rowland R. Lewis P. Potenza T. Cholmondeley B. Leatherman K. Thorne	Chambers Group, Inc. 1994
Edwards Air Force Base	1992	672	224	M. Allaback R. Arnold D. Laabs	Mitchell et al. 1993
Edwards Air Force Base	1994	315	105	M. Allaback D. Laabs E. LaRue	Laabs et al. 1996
Twentynine Palms Marine Corps Base	1997	850	850	G. Goodlett P. Woodman	GIS database provided by Marine Corps, with no associated document
West Mojave Survey	1998	875	875	S. Boland F. Hoover A. Karl E. LaRue D. Silverman M. Vaughn P. Woodman	Reported herein
West Mojave - Fort Irwin Survey	1999	1,500	± 1,200	S. Boland G. Goodlett P. Frank A. Karl D. LaBerteaux E. LaRue M. Vaughn P. Woodman	Reported herein
Totals		**6,030**	**± 4,775**	**23 Surveyors**	

Not all of this information reflects *current* tortoise densities and distribution in the planning area. The 1999 survey effort included approximately 100 square miles in and around the Desert Tortoise Research Natural Area, which was last surveyed in 1990. The 1999 data will be compared with the 1990 data to document tortoise declines in that area, and will be useful in determining the conservation strategy for the planning area. The 1999 surveys, those from 1998, Twentynine Palms Marine Corps Base's 1997 effort, and two surveys at Edwards Air Force Base (1992 and 1994) provide the best, most recent tortoise information for the planning area. Other surveys around Fort Irwin in the late 1980's and early 1990's, between California City and Spangler Hills in 1990, and on China Lake Naval Air Weapons Station in 1990 are useful for comparison's sake, but should not be used to determine current distributions of tortoises in the planning area.

Tortoise Management Areas, Historic and Current

Repeated efforts have been made during the past two decades to identify the areas that are, and are not, important to desert tortoise management. This section discusses the most significant of those attempts, several of which have been adopted as components of land use plans, or formally designated pursuant to FESA. They are summarized in Table 2-4 and discussed in greater detail below.

Table 2-4
Current and Historic Tortoise Management Areas

Name	Date Established	Notes
Crucial Habitat	1980	California Desert Conservation Area Plan Designation
Category I, II, and III	1993	California Desert Conservation Area Plan Designation
Critical Habitat	1994	Designation pursuant to FESA
Recovery Plan	1994	Suggests that DWMAs be established
Desert Tortoise Emphasis Zones	1998	Analytical tool developed to assist BLM route designation

Crucial Habitat: "Crucial habitat" for the desert tortoise was identified by the California Desert Conservation Area (CDCA) Plan (U.S. Bureau of Land Management 1980). The crucial habitat area (CDCA Plan, Map 4) was considered to be "...essential to the continued existence of the species...." In 1987, the BLM described crucial habitat:

> 'Crucial habitat' includes portions of the habitats of officially designated BLM sensitive species that if destroyed or adversely modified could result in their being listed as threatened or endangered pursuant to section 4 of the Endangered Species Act of 1973, as amended.

Within the planning area, the CDCA Plan recognized two areas of tortoise crucial habitat: the Desert Tortoise Research Natural Area (an ACEC) and "Western Mojave Desert Crucial Habitat 1."

Category I, II, and III Habitat: In 1992, the BLM adopted a *California Statewide Desert Tortoise Management Policy*. This policy directed that desert tortoise habitat be categorized into one of three categories. Management goals were assigned to each category. For Category I, the goal is to maintain stable, viable populations and increase populations where possible; for Category II, the goal is to maintain stable, viable populations; for Category III, the goal is to limit declines to the extent possible using mitigation measures. In April 1993, the BLM amended the CDCA plan to delineate these three categories of desert tortoise habitat on public lands.

Critical Habitat: Critical habitat is defined as (a) the specific areas within the geographical area occupied by the species at the time it is listed on which are found those physical or biological features which are essential to the conservation of the species and which may require special management considerations or protection; and (b) specific areas outside the geographic area occupied by the species at the time it is listed upon a determination by the Secretary of the Interior that such areas are essential for the conservation of the species (FESA section 3(5)(A)). In 1994, the Service designated four critical habitat units in the planning area: Fremont-Kramer, Superior-Cronese, Ord-Rodman, and Pinto Mountain units (U.S. Fish and Wildlife Service 1994a).

Public lands designated as critical habitat were generally the same as those earlier delineated by the CDCA Plan as crucial habitat. Boundaries differed in the following respects: (a) the northern half of Brisbane Valley, most of the Stoddard Valley Open Area, and two ± 50-square mile areas in Johnson Valley Open Area were considered crucial habitat but are not designated as critical habitat; and, (b) areas south of Fort Irwin and Edwards Air Force Base, and most of the area east of Highway 247, which are now critical habitat, were never identified as crucial habitat. Similarly, BLM properties designated as critical habitat generally correspond to Category I and II habitat lands.

Desert Tortoise Recovery Plan Recommendations: The Recovery Plan established recovery goals and objectives for six "recovery units." These included the Western Mojave Recovery Unit, which corresponds to the planning area. The Recovery Plan stated that recovery units are "...essential to the long-term recovery, viability, and genetic diversity of the species." The Recovery Plan also recommended that Desert Wildlife Management Areas (DWMAs) be established within each recovery unit. DWMAs were characterized as areas in which "...recovery actions will be implemented to provide for the long-term persistence of viable desert tortoise populations and the ecosystems upon which they depend." The Recovery Plan recommended that DWMAs should include:

- "...somewhere between 200 and 5,000 square miles..." with "...at least 1,000

square miles...recommended as the target size" (page 33).

- "...boundaries ... drawn to include the best examples of desert tortoise habitat in specific vegetation regions...heterogenous terrain, soil types, and vegetation within DWMAs will best provide protection for the entire ecosystem upon which healthy desert tortoise populations depend" (page 48).

- "...the largest possible blocks of good tortoise habitat in an area, containing the most dense desert tortoise populations, should be included within DWMA boundaries" (page 48).

- "...round or square patches of habitat are more likely to retain desert tortoise populations than elliptical or rectangular ones. Long, linear strips are least desirable" (page 49).

The Recovery Plan distinguished the differences between DWMAs and critical habitat as follows:

> Critical habitat does not accomplish the same goals or have as dramatic an effect upon tortoise conservation as does a recovery plan because critical habitat does not apply management prescription to designated areas. However, designation of critical habitat does provide protection of desert tortoise habitat until such time as the Desert Tortoise Recovery Plan is implemented and DWMA management is employed. [page 56]

The Recovery Plan suggested that four DWMAs be established within the Western Mojave Recovery Unit. These included the Fremont-Kramer DWMA, located along both sides of Highway 395 between Adelanto to the south and Red Mountain to the north; the Superior-Cronese Lakes DWMA, located due east of the Fremont-Kramer DWMA, encompassing Superior Valley, areas north of Barstow, and areas south of Fort Irwin, east to Cronese Lakes near Baker; the Ord-Rodman DWMA, bounded by Highway 247 on the west, Interstate 40 on the north, the Twentynine Palms Marine Corps Base on the east, and the Lucerne and Johnson valleys on the south; and the Joshua Tree DWMA, which more or less corresponds to Joshua Tree National Park. These areas were recommended for the following reasons:

> The Western Mojave recovery unit is the largest and most heterogenous of the recovery units in terms of climate, vegetation and topography. It includes three major vegetation types - the Western Mojave, Central Mojave, and Southern Mojave - each of which has significant and distinctive elements...Four DWMAs within the Western Mojave recovery unit represent the diversity. The Fremont-Kramer DWMA represents the Western Mojave region; the Superior-Cronese DWMA represents the Central Mojave region; and the Ord-Rodman DWMA represents the Southern Mojave region. The Joshua Tree DWMA, the fourth within this recovery unit, contains Southern Mojave and Eastern Colorado elements. The tortoises have responded to this habitat heterogeneity with

> different food habits and behavior in each of these areas. *Thus, three DWMAs are essential in this recovery unit to preserve the heterogeneity* [emphasis added]. Secure, large reserves are especially critical because of the severe population declines and heavy human use in these areas. [page F28]

It is important to note that the Recovery Plan's suggestions are advisory, not binding. The actual decision of whether to adopt DWMAs and, if so, where they should be located, is the function of the West Mojave Plan:

> The recovery plan recommends the general areas where DWMAs should be located, but leaves the task of delineating the DWMA boundaries to the land management agencies, in coordination with FWS [U.S. Fish and Wildlife Service], State wildlife agencies, local stakeholders, and other interested parties. The principle agency mechanism for implementing recovery plan tasks is through amendments to existing resource management plans (BLM [Bureau of Land Management]) or general management plans (NPS [National Park Service]) or through the development of broader bioregional plans in conjunction with local government (e.g., the West Mojave Coordinated Management Plan) (Hastey 1996).

Desert Tortoise Emphasis Zones: The Desert Tortoise Emphasis Zone (DTEZ) concept was designed by the BLM to aid the designation of off highway vehicle routes as open or closed in the Ord Mountain area (U.S. Bureau of Land Management 1997). The BLM based DTEZ and Non-DTEZ categories on (a) desert tortoise density; (b) landform type and degree of slope; (c) elevation; and (d) a desert tortoise habitat quality index. Categories included: (a) High DTEZ, (b) Medium DTEZ, (c) Low DTEZ, and (d) Non-DTEZ. High DTEZs in the Ord Mountain area consisted of areas with slopes less than 30 degrees, less than 4,000 feet elevation, and relatively high tortoise densities (mostly greater than 20 animals/square mile). Non-DTEZ habitats were considered to be the least important tortoise habitat (based on slope, elevation, and historic records of tortoise occurrence). In early 1998, the BLM applied the DTEZ concept throughout the West Mojave planning area (See Desert Tortoise Map 1a.).

HOW WAS THE EVALUATION CONDUCTED?

In late February and early March 1998, the Recovery Plan and other documents were reviewed for potential solutions to the 22 discrete threats to the tortoise that were identified by Dr. Boarman. Between March 4 and 6, 1998, the team (Chuck Bell, Dr. Bill Boarman, Wes Chambers, Bill Haigh, and Ed LaRue) and several tortoise biologists (Dr. Hal Avery, Tom Egan, Dr. Larry Foreman, and Dr. Jeff Lovich) met to consider the approaches given in these documents and to identify any additional solutions to counteract threats.

The results of these analyses and meetings were presented by the team (Dr. Bill Boarman, Bill Haigh, Dr. Larry LaPré, and Ed LaRue) to the Service (Ray Bransfield) and Department (Glenn Black, Frank Hoover, Becky Jones, and Rocky Thompson) on March

12 and 17 to 19, 1998. On separate days, Dr. Alice Karl and Pete Woodman, long-time tortoise field biologists, attended the meetings; Larry Morgan, BLM range management specialist, was contacted on the telephone. During the four days, agency personnel considered the materials and adopted, modified, or recommended new solutions to the threats. In this manner, 145 suggested management prescriptions were identified.

The evaluators also recommended that three types of management areas be established. These included the following: (1) Desert Wildlife Management Areas, which would be most intensively managed for tortoise conservation[2]; (2) Managed Use Areas, where impacts to tortoises would be mitigated, but tortoise management would be less intensive and protective than in the DWMAs; and (3) Incidental Take Areas, where most lands are expected to be lost to or severely impacted by continued human development. Each area is discussed in greater detail below in Part D of this chapter, titled Conservation Strategy.

DTEZ category boundaries were used by the evaluators to draw lines that would capture the best current and historic habitat for the tortoise (Desert Tortoise Map 1b). These lines (a) encompassed most of the High DTEZ areas and some Medium and Low DTEZ areas to the east, particularly the southeast; and (b) were drawn with no regard to land ownership or current management. For example, privately-owned areas between Highway 395 and California City were included because they once supported significant densities of tortoises. The general idea was to identify all lands within the planning area with any potential for contributing to the recovery of the tortoise, as background information for the use of the evaluators when they began the work of identifying DWMA boundaries.

Between March and October 1998 the planning team recommended boundaries for four desert tortoise DWMAs, and consulted numerous tortoise biologists concerning all aspects of the recommended prescriptions and management areas (see Appendix DT-4). A highly annotated "long version" of each prescription was prepared. Then, from October 20 to 22, 1998, the planning team (Bill Haigh and Ed LaRue) met for three days in Ventura with Ray Bransfield, Frank Hoover, and Becky Jones to reconsider the "long version" of the management prescriptions in light of the newly proposed management areas. The applicability of each prescription to each management area was discussed.

During the course of the October meeting, the evaluators developed a final list of 120 management prescriptions, and comprise the recommendations of this report (see Section 1.0 of Appendix DT-1).

The *Desert Tortoise Appendix* to this report presents a more detailed and annotated

[2]In the earliest iterations, the DWMAs were divided into two subset management zones that were referred to as "Conserved Habitat Areas" and "Protected Habitat Areas." For reasons given in Appendix DT-1, these designations were dropped from further consideration, resulting in changes to six prescriptions (see Section 3.0 of Appendix DT-1).

discussion of each prescription. The appendix materials include the following:

- *Appendix DT-1*: A 12-page list including 120 final prescriptions, 10 prescriptions that were considered redundant and therefore dropped and 6 prescriptions that changed when the potential core area designations were dropped, and the reasons for not proposing core areas (as per footnote 2, this chapter).

- *Appendix DT-2* ("short version"): A 10-page list with the 120 final prescriptions segregated into six categories.

- *Appendix DT-3* ("tabulated version"): A tabulation of each threat, including rank (high, medium, or low); description of the threat; predominant occurrence and effects of each threat; goal statement by the agencies to address each threat; and the management prescriptions recommended to counteract each threat.

- *Appendix DT-4*: Persons involved in the formulation of the prescriptions.

- *Appendix DT-7* ("long version"): An 80-page document that lists each management prescription, including the associated threat; agency goal statement; rank; applicable management areas; applicable and non-applicable jurisdictions; team interpretations (usually a description of the information considered that resulted in a given prescription); and potential task group activities (listing some of the issues that the public may want to discuss with regards to a given prescription).

The "long version" of the prescriptions (Appendix DT-7) includes an expanded discussion (or interpretation) of the intent of a given prescription (titled "Team Interpretation"). For example, prescriptions 91 through 96 include recommended measures for fighting wildfires in tortoise habitat; the "team interpretations" follow:

> The Bureau of Land Management currently fights wildland fires under prescriptions that were formulated, in part, to minimize impacts to biological resources. If not already, these guidelines should be made available to county and city jurisdictions to ensure consistency, where applicable, in fire suppression activities. Suppression activities in the [DWMA] and [Managed Use] Areas should be somewhat more restrictive and resource protective than those in Incidental Take Areas.
>
> The Bureau of Land Management has already considered means to reduce resource damage during fire fighting activities. The current situation for private fire stations is unknown.

The "Long Version" also includes a discussion of "Potential task group activities" for each prescription. This is a brief, bulleted list of issues that the Supergroup may want to discuss. The information provided for prescriptions 91 through 96 follows:

(A) If necessary, fire management organizations could meet to discuss variable approaches to fighting fire in different management zones. A standard set of guidelines could be developed to minimize impacts to biological resources during and after fire suppression activities. These guidelines would be adopted by all applicable, private and federal fire departments.

(B) Experts on fire suppression (Todd Esque of USGS-BRD, Tim Duck of Arizona Strip District of Bureau of Land Management, Steve Johnson, California Desert District of Bureau of Land Management, etc.) could be asked to review any guidelines that may be developed by such a Task Group.

The 120 management prescriptions are considered "side boards" or indicators of the types of actions which would help recover the desert tortoise within the planning area.

Part B
Measurable Biological Goals and Objectives

Biological Goal 1

Protect sufficient habitat to ensure long-term tortoise population viability.

Objective 1 for Goal 1: Establish a minimum of three, preferably four, Desert Wildlife Management Areas that would be managed for the long-term survival and recovery of the desert tortoise, and which would also benefit other special-status plant and animal species.

Objective 2 for Goal 1: Ensure that at least one DWMA exceeds 1,000 square miles in size.

Objective 3 for Goal 1: Design DWMAs so that they are well distributed across the recovery unit, edge to area ratios are minimized, impediments to the movement of tortoises are avoided, and (where feasible) boundaries are contiguous.

Biological Goal 2

Establish an upward or stationary trend in the tortoise population of the West Mojave Recovery Unit for at least 25 years.

Objective 1 for Goal 2: Achieve population growth rates (lambdas) within DWMAs of at least 1.0.

Objective 2 for Goal 2: Attain a minimum average population density of 10 adult female tortoises per square mile within each DWMA.

Objective 3 for Goal 2: Establish a program for tortoise population monitoring that

would detect an increase, decrease, or stable trend in tortoise population densities, and include an information 'feedback loop' that ensures that necessary changes will be made in management.

Biological Goal 3

Ensure genetic connectivity among desert tortoise populations, both within the Western Mojave Recovery Unit, and between this and other recovery units.

Objective 1 for Goal 3: Delineate and maintain movement corridors between DWMAs, and with the Eastern Mojave Recovery Unit, the Eastern Colorado Recovery Unit, and the Northern Colorado Recovery Unit.

Objective 2 for Goal 3: Ensure a minimum width of two miles for movement corridors, and include provisions for major highway crossings.

Biological Goal 4

Reduce tortoise mortality resulting from interspecific (e.g., raven predation) and intraspecific (e.g., disease) conflicts that likely result from human-induced changes in ecosystem processes.

Objective 1 for Goal 4: Initiate proactive management programs addressing each conflict, to be implemented by each affected agency or jurisdiction.

Objective 2 for Goal 4: Establish an environmental education program to facilitate public understanding and support for proactive management programs necessary to reduce tortoise mortality.

Objective 3 for Goal 4: Continue research programs that assess the relative importance of human activities and natural processes that affect desert tortoise populations.

Part C
Conservation Strategy

The following is a suggested conservation strategy for the desert tortoise. The discussion is divided into five parts:

- First, three types of *management areas.* "Desert Wildlife Management Areas" could protect valuable tortoise habitat while "Managed Use Areas" and "Incidental Take Areas" could provide streamlined permitting and survey procedures.

- Second, *take-avoidance measures*. These measures are intended to minimize or

mitigate the impacts of specific projects that might incidentally take desert tortoises.

- Third, *survey and disposition protocols,* which suggest the type of tortoise surveys that should be conducted in each of the management areas, and recommend standards to guide the handling and disposition of tortoises found during surveys and project construction.

- Fourth, *proactive tortoise management programs*, which cities, counties and agencies are encouraged to undertake on their own initiative (in contrast to the take-avoidance measures, which are reactive in nature).

- Finally, guidance to aid the Supergroup's development of an *adaptive management* program, including ideas for monitoring programs (to measure the success of the Plan in achieving biological goals) and "feedback" procedures that would allow the conservation strategy to be modified by monitoring findings.

For the Supergroup's convenience, each prescription is accompanied by a parenthetical number. These numbers were assigned during the evaluation meetings, and correspond to more detailed discussions of that prescription that can be found in Appendices DT-1, 2, 3 and 7. Prescriptions developed after the evaluation meetings are denoted by "(200)".

MANAGEMENT AREAS

Overview

The evaluators recommended that three types of management areas be established. Management area summaries follow:

- *Desert Wildlife Management Area.* Establish four DWMAs: Fremont-Kramer, Superior-Cronese, Ord-Rodman, and Pinto Mountain (see Desert Tortoise Map 4). These areas consist of habitat that is considered essential to the conservation of tortoises. The evaluators used tortoise survey information, land ownership patterns, and discussion with scientists and agency personnel to determine the location of the boundaries. They concluded that the designation of smaller "core areas" within the DWMAs would not effectively provide for the conservation of tortoises; accordingly, no such "two-tiered" DWMA structure is recommended.

  DWMAs would be managed for tortoise conservation; the most protective of the recommended management prescriptions would apply, as indicated below. Long-term survival and recovery of the tortoise would be the goal. (1)

  The BLM should recognize DWMAs by designating as many as four Areas of Critical Environmental Concern (ACEC), each of which would encompass the

public lands within a given DWMA. (10) All public lands that are within the DWMAs and outside of congressionally-designated wilderness areas should be designated as Class L (Limited Use) under the CDCA Plan. (9)

- *Incidental Take Area.* Identify *Incidental Take Areas* (ITA), which are lands likely to be developed in the foreseeable future. The ITAs should consist of cities and developed unincorporated county lands. (1, 2)

  Recommended ITAs are comprised of all areas within the city limits of Adelanto, Barstow, California City, Hesperia, Lancaster, Palmdale, Ridgecrest, Twentynine Palms, and Victorville and the town limits of Apple Valley and Yucca Valley. Collectively, this area comprises approximately 512,700 acres (801 square miles), or 5.48 percent of the 9,354,670-acre (14,617-square mile) planning area.

  It is recommended that the Supergroup identify private and public lands within the counties that appropriately could be designated as "County ITAs." Like the "City ITAs," the County ITAs would be areas where the incidental take of all resident tortoises would be anticipated. It is suggested that portions of Lucerne Valley, Lake Los Angeles, Rosamond, Mojave, Boron, Inyokern, and Helendale, for example, be considered for ITA designation. The areas not included in ITAs or DWMAs would be designated as Managed Use Areas (see next point).

- *Managed Use Area.* Lands not designated as either a DWMA or an ITA would constitute the *Managed Use Areas* (1). Tortoise management would be less intensive and protective than in the DWMAs. The management goal should be to regulate development through appropriate mitigation rather than tortoise recovery.

When identifying the final boundaries of DWMAs, ITAs, and MUAs, the Supergroup should understand that (1) the exact number and distribution of tortoises in a given area is unknown, and (2) the habitat quality associated with different jurisdictions is unknown. Even where tortoises apparently have been extirpated (such as from large parts of some cities), it is possible that habitat of suitable quality to support tortoises could still occur in some areas, and may be worth protecting.

In addition, the evaluators suggested that military bases be characterized as *Military Management Areas*, wherein each base could, at its option, identify lands as ITAs, MUAs, and DWMAs. Bases are under no obligation to make such designations. (55) The Plan could function, in part, to document conservation measures currently implemented on the bases, and indicate how those measures add to or detract from the overall conservation strategy of the planning area (particularly if "current missions" are altered such that the overall conservation value provided for the area is reduced).

The Supergroup should determine how the dichotomy between Discretionary Permits and Ministerial Permits will be handled. It must decide whether habitats lost under ministerial

permits will be counted towards the total loss of habitat. It must also be decided where the line between a ministerial and a discretionary action lies for purposes of FESA and CESA compliance. (200)

Proposed DWMAs Compared to Current and Historic Tortoise Management Areas

The proposed DWMA boundaries were drawn to capture habitat that has been identified in the past as essential to the conservation of the species, including critical habitat, BLM Category I and II habitats, BLM's desert tortoise emphasis zones, and the approximate boundaries of the Recovery Plan's proposed DWMAs. Table 2-6 compares the relative sizes of these areas. Joshua Tree National Park, which is already managed consistently with the Recovery Plan (National Park Service 1995), is not included in the table.

Table 2-6
Proposed DWMAs
Compared to Current and Historic Tortoise Management Areas

Land Status	Proposed DWMA	Critical Habitat	BLM Category I & II	Tortoise Emphasis Zones
Private	725	696	0	1,248
BLM	1,651	1,533	1,288	1,804
National Park Service	0[3]	27	0	0
Military				
Edwards	102[4]	102	0	102
China Lake	150	150	0	150
Fort Irwin	52	52	0	52
29 Palms	0	0	0	0
NEBO	1	1	0	1
State	40	51	0	55
Total	**2,721**	**2,612**	**1,288**	**3,412**

Note: All figures expressed in square miles.

Proposed DWMAs and Designated Critical Habitat: The proposed DWMAs roughly

[3] Although the Tortoise Emphasis Zone acreage is given as "0" for the National Park Service, the Plan recognizes that all tortoise habitat within Joshua Tree National Park is being managed for tortoise protection and recovery.

[4] The acreages for military bases given in the first column correspond to existing critical habitat, rather than newly proposed DWMAs on military bases. No DWMAs are proposed for military bases, which have their own management plans that, some more some less, benefit conservation efforts within the planning area.

correspond to critical habitat, which was identified as "...essential to the conservation of the species..." by the Service in 1994 (U.S. Fish and Wildlife Service 1994a). They diverged from critical habitat where necessary to reduce private land in-holdings and to capture high tortoise densities. Because the West Mojave tortoise population is more affected by human and non-human threats than most other tortoise populations listed as threatened (see Table 2-2), reducing the area proposed as critical habitat was considered counter-productive to the conservation of tortoises within the planning area.

The boundaries of the proposed DWMAs differ from critical habitat designations in the following ways (see Desert Tortoise Map 5):

- In areas south of Edwards Air Force Base and north of Adelanto, the proposed DWMA does not include some areas of critical habitat that are largely on private lands. It is suggested that these lands be included in the Managed Use Area.

- The proposed DWMA in the vicinity of the Desert Tortoise Research Natural Area is approximately 70 square miles larger than critical habitat. These additional lands are included for the following reasons: (a) to provide for a connection between the northwestern portion of the DWMA and Red Rock Canyon State Park; (b) to include the Desert Tortoise Research Natural Area (not currently critical habitat) in the DWMA; and (c) to provide for better connection and manageability by acquiring approximately 21 square miles east of the Desert Tortoise Research Natural Area and north of the Mojave-Randsburg Road.

- In the Iron Mountain area north of Silver Lakes, the DWMA boundary is farther east than critical habitat to encompass significant numbers of tortoises that were detected during the 1998 regional survey.

There are no recommendations to alter critical habitat lines on Edwards Air Force Base, China Lake Naval Air Weapons Station, or on Fort Irwin. Nor are there any recommended modifications to the Pinto Mountain Critical Habitat Unit, which is mostly managed by the BLM. The current boundaries of that unit will suffice to protect tortoises occurring in the area, and provide essential connectivity between the West Mojave and Northern and Eastern Colorado Desert recovery units.

Boundary modifications of BLM-designated Open Areas (Johnson Valley, Stoddard Valley, El Mirage, Jawbone Canyon, and Rasor open areas) were not recommended by the evaluators. These areas are well established and known to OHV users. Reducing their size may result in more intense use in adjacent areas where tortoise conservation is considered essential.

Conversely, the expansion of the Johnson Valley Open Area into the Cinnamon Hills was considered an unacceptable impact due to (i) the relatively small size and isolation of that portion of the DWMA from larger areas to the north, east, and west; (ii) the relatively

high incidence of tortoises in the area; and (iii) the status of tortoises found there as the southern-most relatively intact population in the West Mojave. Although other habitats occur farther south, particularly between Yucca Valley and Twentynine Palms, many of those lands have been severely impacted.

TAKE-AVOIDANCE MEASURES

Take-avoidance measures are those components of the conservation strategy that would minimize and mitigate the impacts of discrete projects (such as a shopping center or a water pipeline). They should apply to both the construction and operation of a given project. These measures should be included as requirements of permits issued to project proponents by cities, counties, and agencies.

In developing take-avoidance measures, the Supergroup should consider the dichotomy between permanent impacts (solar power plant, facilities development) and intrusive but temporary impacts (pipelines, fiber optic cables). (26)

Generally Applicable Measures

It is recommended that the take-avoidance measures described in this section apply to all lands within the West Mojave Planning Area, including DWMAs, Managed Use Areas and, to a limited extent, Incidental Take Areas. Take-avoidance measures that would be limited in application to a particular management area are described later (e.g., "Take-Avoidance Measures Unique to DWMAs").

It is recommended that prescriptions identified for the DWMAs apply equally to BLM-administered public lands, State of California properties, and private lands; the same would apply for MUA and ITA prescriptions. For example, measure 86, which recommends that pipeline construction right-of-ways be revegetated, should apply to both public and private lands in DWMAs and MUAs, and to neither in ITAs.

Pre-Ground Disturbance Tortoise Surveys: Differing tortoise survey and disposition requirements could apply to each of the management zones. For suggestions as to how this could be done, see the discussion under "Survey and Disposition Protocols."

Agriculture: The Supergroup is asked to consider if the Plan should address the loss of native habitat to new agriculture. For example, should we consider compensation by paying appropriate fees, or implementing other, appropriate measures? (80)

General Construction and Maintenance: It is recommended that the Supergroup develop standard mitigation measures for ground-disturbing construction projects, such as (a) pipelines, (b) parcel development, (c) mines, etc. (28, 56)

Rather than focus on what will and will not be allowed, general development criteria

should be defined: size of development covered by the West Mojave Plan (less than or greater than a certain acreage), permanent versus temporary impacts, single time impacts (e.g., pipeline booster station) versus ongoing impacts (e.g., solar plant employing 100 workers). The Supergroup should discuss the management prescriptions that could apply in each case. (27) The approach should be flexible enough to allow applicants to utilize innovative approaches. (200)

Utility Construction and Maintenance: Pipelines within DWMAs and the MUA should be revegetated where feasible; those in ITAs need not be revegetated. (26) Narrowing the construction right of way is suggested in all management areas. (89)

Recommend that the CDCA Plan's existing network of designated utility corridors and use restrictions be retained (88) (although it is recommended, below, that CDCA Plan *contingent* corridors not be activated within DWMAs (82)).

Routine, non-emergency maintenance of pipelines that requires ground disturbance should occur during the late fall and winter only. (200)

Avoid creating new nest substrates for common ravens in areas where few currently exist. New transmission lines that would provide significant new nesting opportunities should not be erected (112) unless the poles are designed to reduce the potential for raven nesting, as follows:

- Absence of two parallel cross-arms; a single cross-arm is preferred; inverted "V" shape. (83)

- Where possible, solid-bodied transmission towers should be used instead of lattice-bodied towers to minimize raven nesting opportunities. (84)

- It is not necessary to require anti-perch structures on transmission lines. (85)

Highway Construction and Maintenance: Maintenance operators should be aware of tortoises and avoid them. Seasonal restrictions may be appropriate (late fall and winter may be the best time for these activities). Any such measures should consider roads on a case-by-case basis and be dependent on tortoise densities in the area or adjacent management areas. These or other measures to avoid the need for a biological monitor are advisable. (72)

As far as possible, road beds should not be lowered and berms should not exceed 12 inches or a slope of 30°. Helendale Road, Fossil Bed Road, Camp Rock Road, and Copper City Road were identified as particular problems. Consider alternatives to grading, such as chain drag. (73)

Fire Management: Wildland fire management should be allowed in all management

areas. (91) Fire suppression could be a mix of aerial attack with fire retardant; crews using hand tools to create firebreaks; mobile attack engines limited to public roads and designated open routes. (92) The use of earth-moving equipment or vehicle travel off public roads and designated open routes should not be allowed except in critical situations where needed to protect life and property. (93)

Incoming fire crews unfamiliar with tortoise protection should receive a tortoise awareness program to minimize impacts. (94)

Post-suppression mitigation should include rehabilitation of firebreaks and other ground disturbances using methods compatible with management goals. (95)

Mineral Development: Restoration under SMARA or other applicable laws should strive to reclaim lands to constitute tortoise habitat as a goal. (116)

Site-specific withdrawals from mineral entry could be considered by the Supergroup to facilitate tortoise recovery. (118)

Recreation: Suggest that the Supergroup consider the use of speed regulators (speed bumps, signs) to further reduce speeds on some strategic roads lacking tortoise-proof fencing (e.g., Helendale Road north of Silver Lakes). (78)

Recommend that the portion of the Barstow-to-Vegas race course that lies within the West Mojave planning area be deleted from the CDCA Plan. (34) The Supergroup should also consider whether the Stoddard-to-Johnson Valley corridor should be retained. (35)

Dogs off-leash that are accompanied by owners could be allowed in all areas. (108)

Hunting should be allowed and regulated by current legislation. (122)

Research Protocols: At present, scientific manipulation of tortoises is authorized by permits issued under section 10(a)(1)(A) of FESA; take that is incidental to an otherwise lawful activity would be permitted under section 10(a)(1)(B); and projects that are funded, authorized or carried out by a federal agency would be authorized under FESA section 7 consultations. Comparable state permits are authorized by section 2081 of the California Endangered Species Act. (139) Translocation and other science-based studies implied or required by this Plan also require separate authorization under federal and state scientific collection permits. (140)

The timing of scientific studies may need to be modified when persisting drought conditions occur. (145)

Take-Avoidance Measures Unique to DWMAs

Authorized Take and Compensation (DWMA): Recommend that within each DWMA, new ground disturbance not exceeding a cumulative total (over the term of the plan) of 1 percent of the total acreage of that DWMA could be authorized using the streamlined permitting procedures of the Plan (i.e. case-by-case consultations with the Service and Department would be necessary to approve ground disturbance in excess of the 1% threshold). (25) It is advisable that this percentage be tracked separately on BLM and private lands so that development of private lands would not impair the BLM's ability to continue to manage public lands (200). Once this threshold is reached in any given DWMA, all future ground disturbing activities within that DWMA would be considered outside the scope of the Plan. In such a case, a project-specific incidental take permit or biological opinion, as appropriate, would be required.

Recommend that the Supergroup identify a specific compensation ratio for DWMAs. Suggest a compensation ratio of 5:1 within DWMAs (one acre of land disturbed within a DWMA would be compensated for by protecting another five acres within the same DWMA). (25) Consider the ratios that might apply where lands lost from one management area (e.g., MUA) could be compensated by the acquisition of lands in another management area (e.g., DWMA).

Recommend that the Supergroup consider the best means to address the interplay between fees and compensation acreage. Should the proponent have an option to pay fees or buy land? If land values are less than fees, would this option undermine the income from compensation fees? Consider the effect this might have on the ability of the Plan to fully mitigate the impact of the authorized take.

Boundaries and Ranger Patrol (DWMA): DWMA boundaries could be signed or otherwise designated to identify boundaries and facilitate enforcement. (125)

BLM ranger patrols should be increased. (36) The Supergroup should determine the degree of increase that would be necessary to facilitate conservation goals, based on current ranger deployment and other factors. The BLM should determine whether this should be accomplished by diverting rangers from other duties or by increasing the ranger force.

General Construction and Maintenance (DWMA): Invasive weeds should not be used in landscaping within or adjacent to the DWMA (e.g., do not plant African daisies along Highway 395). (126)

Proponents wishing to construct new roads or railroads should be encouraged to locate them outside of DWMAs. (200) Proponents should implement designs and maintenance procedures that are consistent with the terms identified for existing roads; locations of such roads should consider reserve design relative to the DWMAs and other factors. (77)

Develop a maintenance schedule to maintain fence integrity and effectiveness. (71)

No new landfills should be allowed either inside or within five miles of any DWMA because ravens eat juvenile tortoises and research shows that ravens daily travel up to five miles (and farther on occasion) from landfills for food. (47)

Utility Construction and Maintenance (DWMA): Within existing corridors, use areas that are already disturbed rather than disturb new areas within the two to three mile corridor. (90) Suggest that no additional CDCA Plan contingent corridors be activated within the DWMAs. This would apply to currently inactive portions of contingent corridors P, Q, and W. (82)

Maintenance of existing utilities should be allowed. However, impacts to tortoises and habitat should be minimized. Recommend that maintenance crews remain on existing access roads except for the point location of maintenance-related disturbance. (87)

It is not necessary to require anti-perch structures on transmission lines. After obtaining applicable salvage permits, however, a mechanism should be established for the proponent of a transmission line project to implement monitoring and removal of raven nests from the DWMAs in areas where other nesting substrates are uncommon. (85)

Cattle Grazing (DWMA): Current BLM management of livestock grazing under the CDCA Plan and as regulated by various biological opinions could be modified, as necessary, with Supergroup input. The following recommendations resulted from evaluation meetings

- Supplemental feed (hay, alfalfa) and food supplements (nitrogen supplements like molasses) should not be allowed on public lands. (103)

- The rancher shall contact the BLM for range improvements requiring off-road use of equipment; routine maintenance using mechanized equipment should be restricted to existing roads; unreported off-road travel should be authorized to remove cattle carcasses. (104)

- Herding of cattle should be minimized, and cattle allowed to disperse throughout the area of use. (105)

- In the Ord Mountain Allotment, consider placement of water sources in areas that would draw cattle away from tortoise concentrations located to the east, west, and southwest. (200)

The BLM's California State Office range conservationist has suggested that the Supergroup consider and discuss a range of possible measures to govern livestock grazing within tortoise DWMAs. None, one, or several of these measures could be adopted by the

Supergroup. It is recommended that the Supergroup discuss the merits of each when it writes the Plan:

- **Suggestion 1:** Maintain forage biomass of 350 pounds per acre (air dry weight) from March 15 to June 15. Grazing use should not occur, and cattle should be removed from the allotment or area, if above-ground ephemeral forage falls below this value during the March 15 to June 15 period.

- **Suggestion 2:** Rather than establish biomass thresholds, establish a no grazing period from March 15 to June 15.

- **Suggestion 3:** Initiate research into the relationship between winter weather and the amount and attributes of ephemeral forage production. If this research can adequately predict production of ephemeral forage and related attributes, the results of that data would be used to determine turnout of livestock between March 15 and June 15.

- **Suggestion 4:** Allow a lease to be canceled if the holder of base property voluntarily relinquishes the grazing lease and related authorizations. New allotments may be designated from those portions of allotments outside DWMAs.

- **Suggestion 5:** Terminate ephemeral allotments, and terminate ephemeral grazing authorization of an ephemeral/perennial allotment.

- **Suggestion 6:** Terminate grazing authorizations and the area of the allotment within the DWMA. New allotment boundaries would be developed, where feasible, from portions of terminated allotments outside DWMAs.

The Department's Becky Jones (September 1999, pers. comm.) indicated that it is the Department's preference that cattle grazing not be allowed within the DWMAs "to be consistent with the recovery plan." Jones said that if grazing is allowed, current BLM management of grazing under the CDCA Plan could continue provided that additional research is conducted on the effects of cattle in DWMAs, and that the results of this research should be used to modify the plan as needed.

Sheep Grazing (DWMAs): There should be no sheep grazing within DWMAs. (97) Ephemeral and perennial sheep grazing allotments within DWMAs should be eliminated. (200) Consider permanent closure of the Pilot Knob Allotment to future grazing by cattle or sheep. (200) Consider terminating sheep allotments with more than 50% of an allotment is in a DWMA. (200)

Mineral Development (DWMA): Mining operations resulting in ground disturbance exceeding a certain acreage (which should be set by the Supergroup; 80 to 100 acres has been suggested) should be evaluated by the "Implementing Team" (see Part D of this

chapter) to determine if additional compensation and mitigation may be required of the proponent. (117)

Recreation (DWMA): On public lands administered by the BLM, camping should be allowed within 100 feet of vehicle routes designated as "open." (120) Otherwise, no vehicles should be allowed to travel off of designated routes. (38) Limited speed travel on designated, signed routes should be allowed. (41) Travel in washes should be allowed only in those washes that are signed as "open." (45)

General shooting, other than hunting, should not be allowed in DWMAs. (123)

Non-consumptive recreation (e.g., hiking, birdwatching, horseback riding, photography) should be allowed within DWMAs. (124)

No off-highway vehicle speed events should be allowed in DWMAs. (39) Dual Sport events, however, could be allowed seasonally. Consider summer Dual Sport events (although problems with rain in summer should be kept in mind). Agencies should continue to implement the existing biological opinion on dual sport events. (40)

Other Measures (DWMA): Upland game guzzlers in tortoise habitat should be modified to prevent or reduce future tortoise mortality. (121)

Commercial activities (such as filming) that result in ground disturbance or adverse effects should not be allowed in DWMAs. (132) Cross-country vehicle travel should not be allowed for commercial activities. (131)

Take-Avoidance Measures Unique to the Fremont-Kramer DWMA: Suggest that tortoise-proof fencing be installed along Highway 395 from Shadow Mountain Road to Red Mountain. The Supergroup should consider the possibility of fencing Highway 395 north of Red Mountain, as well as parts of Highway 58 not currently fenced. (63) Suggest that tortoise-proof fencing be considered along the National Trails Highway from Helendale to just south of Lenwood. (65)

Recommend fencing west of Helendale to minimize impacts on areas to the west. (8)

Suggest that tortoise-proof fencing be installed on the following unpaved roads should average daily traffic (ADT) levels increase to the point that traffic becomes a problem: Helendale Road and Mojave-Randsburg Road. (69) The Supergroup should identify the ADT threshold that would trigger a need for fencing.

Take-Avoidance Measures Unique to the Superior-Cronese DWMA: Suggest that tortoise-proof fencing be installed along both sides of Irwin Road and Fort Irwin Road. (64)

Take-Avoidance Measures Unique to the Ord-Rodman DWMA: Suggest that tortoise-proof fencing be installed along the south side of Interstate 40 from Barstow to Camp Rock Road. (67) Suggest that Highway 247 from Lucerne to Barstow not be fenced to avoid fragmenting a relatively small population (in any event, ADT levels may not warrant fencing). (66)

The effects of an expanded Barstow Landfill on the adjacent DWMA need to be discussed. (48)

Take-Avoidance Measures Unique to the Pinto Mountain DWMA: No specific measures identified.

Take-Avoidance Measures Unique to the Managed Use Area

Authorized Take and Compensation: Recommend that within the MUA as a whole, new ground disturbance not exceeding 5 percent of the total acreage could be authorized. (25) Once this threshold is reached, subsequent ground disturbing activities within the MUA would be considered outside the scope of the coverage provided by the West Mojave Plan. In such a case, a project-specific incidental take permit or biological opinion, as appropriate, would be required.

The team suggested a compensation ratio of 1:1 within the MUA. (25) The Department (Becky Jones, September 1999, pers. comm.) recommended "...a compensation ratio of 1:1 in the areas currently considered Category III habitat and 3:1 for other habitat." (200) The Supergroup must identify a specific compensation ratio for the MUA and other management areas.

Utility Construction and Maintenance (MUA): Pipeline revegetation could be determined on a case-by-case basis with input from the Implementing Team. Suggest that pipeline revegetation should be required in MUAs unless the Implementing Team determines otherwise. (26) Suggest that narrowing the construction ROW is best. (89)

Sheep Grazing: Pursue a conservation easement with California City, Kern County, and other appropriate jurisdictions to eliminate all sheep grazing from areas east of California City Boulevard and Neuralia Road and southeast of Mojave-Randsburg Road; consider compensating landowners for lost income from sheep grazing fees (if any) and/or reimbursing wool growers for loss of this area to their industry; alternatively, require that wool growers consult independently with the Service under section 10(a)(1)(B) for impacts to tortoises. It is recognized that this would require significant discussions among all involved entities. (200)

Recreation (MUA): Travel in washes should only be allowed in those washes that are signed as "open." (45)

Dual Sport events could be allowed year-round. The BLM would continue to implement the existing biological opinion on dual sport events. (40)

On lands administered by the BLM, camping could be allowed within 300 feet of vehicle routes designated as open. (120)

Other (MUA): Upland game guzzlers in tortoise habitat should be modified to prevent or reduce future tortoise mortality. This should be done in the MUA only after completion of this task in the DWMAs. (121)

Take-Avoidance Measures Unique to Incidental Take Areas

Dual Sport events should be allowed year-round. BLM should continue to implement the existing biological opinion on dual sport events. (40)

On lands administered by the BLM, camping should be allowed within 300 feet of vehicle routes designated as open. (120)

Suggest a compensation ratio of 1:1 within the ITA. (25)

SURVEY AND DISPOSITION PROTOCOLS

DWMA Survey Protocols

Pre-disturbance, removal surveys should be required for tortoises in DWMAs. If tortoise sign is found or there is a reasonable likelihood that tortoises occur, construction activities should either be monitored by a tortoise biologist or a tortoise-proof fence erected to preclude tortoises from the area of impact. (79)

Managed Use Area Survey Protocols

Pre-disturbance, removal surveys should be required. If tortoise sign is found, construction activities should either be monitored by a tortoise biologist or a tortoise-proof fence erected to preclude tortoises from the area of impact. If no tortoise sign is found, monitoring by a tortoise biologist would not be required. Instead, a biologist could be on call should tortoises wander into non-monitored sites. (22)

Incidental Take Area Survey Protocols

Recommend that within the Incidental Take Area, the Supergroup identify tortoise *removal zones* and *exclusion zones*.

- *Removal Zones*: Areas where tortoises are occasionally found. Where tortoise sign is found or there is a reasonable likelihood that tortoises occur, construction

activities should either be monitored or a tortoise-proof fence erected to preclude tortoises from the area of impact. Alternatively, with input from the Implementing Team, a biologist could be on-call to rescue tortoises wandering into harms way.

- *Exclusion Zones*: Areas where tortoises are almost never found. Neither presence-absence surveys nor tortoise removal surveys should be required. (18) A biologist should be on call or another contingency established to rescue a tortoise incidentally found in exclusion zones during construction. (19)

Removal zones and exclusion zones should be identified by the Supergroup with input from the team. Suggest that these zones be determined based on housing density and other factors, such as previous focused tortoise survey information. (23) They should be identified for both County ITAs (for example, small communities such as Helendale and Lake Los Angeles) and City ITAs (that is, lands within incorporated city limits). (21)

Handling and Disposition of Tortoises

The Supergroup should identify scenarios where qualified biologists handle tortoises during removal surveys and environmental monitors fill in afterwards for operations at mines, bases, and other large-scale projects. (141) Biological monitors should handle tortoises as per *Guidelines for Handling Tortoises During Construction Projects* (Desert Tortoise Council 1994 (Revised 1999)). (138)

Tortoises found during drought conditions or summer should be excavated just before sunset and moved to an existing burrow (preferably their own) at night. (144)

The Supergroup, with input from the team, needs to discuss the disposition of tortoises removed from certain areas (for example, city versus county). (24) Alternatives for disposition of tortoises taken during removal surveys could include: (a) euthanasia versus translocation; (b) translocation into the nearest suitable area; (c) placement in a conservation camp (as in Clark County, Nevada) prior to final disposition; (d) use tortoises for coordinated translocation studies; (e) adopt them out. (137)

PROACTIVE TORTOISE MANAGEMENT PROGRAMS

The programs recommended in this section are intended to be undertaken by the participating agencies proactively, on their own initiative, in contrast to take avoidance measures identified above, which are designed to minimize and mitigate the impacts of discrete projects. It is suggested that programs should be specific (e.g., rather than recommend highway fencing, indicate the exact stretches to be fenced), and set implementation priorities (e.g., rather than recommend highway fencing along highways 395 and 58, recommend that Highway 395 be fenced first, followed by Highway 58, and Interstate 40).

Disease Control

Issues relative to desert tortoise diseases (e.g., upper respiratory tract disease, cutaneous dyskeratosis) should be considered at the level of the interagency desert tortoise Management Oversight Group (MOG). (14) Disease research is encouraged, and coordination between the Implementing Team and the appropriate MOG contact should be maintained. (15) Any breakthrough relative to disease management should be incorporated into the West Mojave Plan through adaptive management provisions. (200)

Authorized tortoise handlers should use sterile techniques to avoid spreading the disease (current management). (17)

Education programs should stress that captive tortoises are not to be released. (16)

Translocation studies should be designed to avoid potential transmission of disease. (200)

BLM Route Designation

The BLM should designate a network of open, closed, and limited off-highway vehicle routes within DWMAs. (200) The closure of routes not designated as open or limited should be undertaken by the BLM. (42) The most effective means of implementing the network (e.g., Signs? Restoration?) should be discussed.

Recommend that route closure be concentrated throughout the DWMAs with implementation in the following order: (a) Upper Lucerne Valley, eastern Stoddard Valley, Cinnamon Hills, and other level portions of the Ord-Rodman DWMA; (b) southern portions of the Fremont-Kramer DWMA, east of Highway 395, south of Highway 58, west of Helendale Road, and north of Shadow Mountain Road; (c) eastern portions of the Superior-Cronese DWMA, north of Hinkley, east of Black Mountain, south of the Mojave B Range (China Lake), and west of Irwin Road; (d) western portions of Superior-Cronese and eastern portions of Fremont-Kramer DWMA, east of Highway 395 and west of Black Mountain; and (e) the remaining portions of all DWMAs as funds become available. (200)

Education

Recommend that a curriculum on environmental education be developed, or agencies identified to do this, for presentation to school districts. Counties and cities should ensure that this program is implemented. Education programs should be implemented at the school district level. (7)

Suggest that the Supergroup work with OHV groups (AMA, CORVA) to establish meaningful education brochures and mechanisms to discourage inappropriate off-highway vehicle travel. (44)

The public should be educated about not releasing captive tortoises (16) and about the risks associated with handling or relocating tortoises. (136) Public education should emphasize that tortoises are not to be handled or otherwise harmed. (135) Immigrant communities should be contacted concerning laws against tortoise collection. Suggest working directly with community representatives and groups. (200)

Contract with a proven group to formulate a desert-wide education program; potential groups may include Desert Tortoise Preserve Committee, San Bernardino County Museum, or California Department of Parks and Recreation. A call to (702) 383-TORT will provide a good example of a tortoise outreach effort already in place, as required by the Clark County Desert Conservation Plan (RECON 1995). (200)

Fencing and Culverts

It is recommended that tortoise-proof fencing be placed along the following roadways in the order presented: (a) along both sides of Highway 395 between Shadow Mountain Road and Kramer Junction and along the eastern side of Highway 395 between Kramer Junction and Red Mountain; (b) on unfenced portions of Highway 58 between Kramer Junction and Hinkley (consult Boarman); and (c) along the south side of Interstate 40 between Barstow and approximately Camp Rock Road. (200)

To counteract the effects of Helendale and Silver Lakes on the DWMA to the west, an exclusion fence should be placed along the western boundary of the community from Shadow Mountain Road, north to the westward extension of Smithson Road; at Smithson Road and other appropriate places, install kiosks or other signs to let the public know they are entering a DWMA. (200)

Encourage research concerning the following:

- The use of fencing (other than roads) as a management tool to minimize residential impacts on adjacent areas (e.g., impacts on adjacent areas, west of Silver Lakes).

- The feasibility (cost, use by tortoises, maintenance) of overpasses compared to underpasses. (75)

- The use of culverts, which are necessary where fencing would otherwise permanently fragment tortoise habitat. Studies are encouraged that would determine more about spacing, and design and monitoring should be implemented to see if there is a need to manually translocate tortoises. (74) Culverts should be maintained on a regular basis to facilitate tortoise use. (76)

- Criteria should be developed to determine future needs for fencing; e.g., 500 to 1,000 ADT, dependent on tortoise densities in adjacent areas; insofar as possible, do not fragment DWMAs by running fences through the center of them without

installing culverts. (70)

- Pursue the feasibility of transferring Interstate 15 fencing funds from Caltrans/ Federal Highway Administration to the Implementing Team to fence portions of Highway 395. (200)

Predators: Ravens

A raven control program should be considered. The program should target only those ravens that are preying on tortoises; wholesale eradication without evidence of predation may be possible in specific areas (raven removal zones) and may be seasonal (March to June and September and October). Consider investigating and implementing measures to restrict raven use of water at cattle troughs. (200) Another alternative may be "nest management" including the removal of nests from areas where other nesting substrates are uncommon (200) and replacing real eggs with fake eggs (109).

Investigate and eliminate miscellaneous anthropogenic sources of raven food and water (e.g., spilled grain from trains, sewage ponds). (110) Jurisdictions should enforce removal and proper disposal of dead farm animals (e.g., chickens, cattle) from rearing facilities. "Proper disposal" should not include dumping animals at landfills; animals should be buried, rendered. (111)

Landfill and transfer station management should conform to the standards currently implemented by San Bernardino County at landfills such as Victorville, Phelan, and Barstow, and transfer stations such as at Newberry Springs. (49) Activities at landfills and sewage ponds could be modified by providing more effective cover of materials. The need for installing coyote-proof fences should be discussed. (113)

Refuse containers in residential areas and dumpsters should have self-closing lids. (51, 114) "Do-it-yourself" dumpster centers should be eliminated unless they are well designed and maintained. (50) Ensure that there is regular refuse pickup. (114) Suggest improved maintenance and litter removal from various recreation sites and problem areas. (130)

Suggest creating and/or enforcing ordinances against illegal dumping. (128) Existing, illegal dumps on private and public lands in the DWMAs should be cleaned up. (129) Ensure that landfill operations do not encourage illegal dumping. Consider the following (52): Is free dumping available to local residents? Are receptacles available at landfills to receive after-hours refuse? Can operating hours be extended into the evening to accommodate refuse?

Predators: Feral Dogs and Pets

Feral and free-roaming dogs, when found, should be eliminated by designated individuals (such as BLM rangers) from DWMAs. (107)

Bolstering Tortoise Populations

Consider ways of supplementing existing, wild tortoise populations:

- With input from pertinent experts (Dr. Dave Morafka, Dr. Kristin Berry and Edwards' Environmental Management) consider implementing head-starting programs in areas where tortoises have apparently been extirpated or numbers significantly reduced; e.g., west and south of Fremont Peak, Fremont Valley, Desert Tortoise Research Natural Area, northern portions of Edwards Air Force Base. (200)

- Consider translocation alternatives that would (a) maintain wild tortoises in a given area and (b) not likely result in spread of upper respiratory tract disease; i.e., translocation of clinically healthy tortoises from Barstow and Brisbane Valley development sites to eastern portions of Stoddard Valley, north of West Ord Mountain. (200)

Land Acquisition

In order to consolidate land ownership to enhance tortoise conservation:

- Consider acquiring, or otherwise protect through conservation easements, approximately 11 square miles of private land south of Edwards Air Force Base; 21 square miles of private land north of the Mojave-Randsburg Road and adjacent to the Desert Tortoise Research Natural Area; and 8 square miles of private land north of Silver Lakes, west of Helendale Road. (200)

- BLM is currently implementing a Land Tenure Adjustment Project, through which private land in-holdings (including many within the proposed DWMAs) are being acquired through land trades for public ownership. Suggest conferring with BLM realty specialists to identify lands for priority acquisition. (200)

- Insofar as possible, encourage consolidation of public lands throughout all DWMAs to facilitate natural resource management.

Mining

Within the DWMAs, any entity proposing any mining activity on public lands that is not already approved must submit a mining plan of operation to the BLM, which will consider it for compatibility with the conservation recommendations given in this Plan; the BLM should ensure compatibility with this Plan when it approves, disapproves, or modifies the Plan of operation. (200)

Off-Highway Vehicles

Recommend implementing the following measures to encourage vehicle use consistent with tortoise conservation:

- Strategically place signs along the eastern side of the Stoddard Valley Open Area (i.e., along the eastern side of Highway 247) to reduce cross-country vehicle travel in the Ord-Rodman DWMA; increase ranger patrols to enforce compliance. (200)

- Place signs along the western boundary of the Johnson Valley Open Area (i.e., along the eastern side of Camp Rock Road) encouraging off-highway vehicle use of that area (this as opposed to more signs along the west side prohibiting use of that area). (200)

- Place a fence along pertinent portions of the western boundary of the Johnson Valley Open Area to prevent off-highway vehicle use in the Ord-Rodman DWMA to the west and to minimize use in the Cinnamon Hills; increase ranger patrols to enforce compliance. (200)

ADAPTIVE MANAGEMENT

Adaptive management is used to examine alternative strategies for meeting measurable biological goals and objectives through research and/or monitoring and then, if necessary, to adjust future conservation management actions according to what is learned (U.S. Fish and Wildlife Service 1999). A flexible conservation strategy may be necessary to attain long-term goals (or biological objectives) and to ensure the likelihood of the survival and recovery of the species in the wild (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996).

Adaptive management concepts should be incorporated into HCPs to minimize the uncertainty associated with listed species where there are gaps in the scientific information or their biological requirements (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996). For example, in the discussion presented above concerning fencing and culverts, there is a recommendation to conduct studies that would help determine the ideal design and spacing of culverts along fenced highways. Once determined, the results of such studies could be applied to actual construction of culverts at a later date.

A practical adaptive management strategy within the operating conservation program of a long-term incidental take permit will include milestones that are reviewed at scheduled intervals during the lifetime of the incidental take permit and permitted action. If there is a relatively high degree of risk, milestones and adjustments may need to occur early and often (U.S. Fish and Wildlife Service 1999).

The intent of the following sections is to suggest three monitoring programs which could be incorporated into the adaptive management provisions of the West Mojave Plan.

Tortoise Population Monitoring

One of the biological goals recommended for the desert tortoise is to "establish an upward or stationary trend in the population of the West Mojave Recovery Unit for at least 25 years." To that end, this report identifies, as an objective, the establishment of "a program for tortoise population monitoring that would detect an increase, decrease, or stable trend in tortoise population densities, and include an information 'feedback loop' that ensures that necessary changes will be made in management."

Background: Between the 1970's and the mid-1990's, first the BLM, then the USGS-Biological Resources Division monitored population densities, sex ratios, age structure, mortality rates and survivorship, and other demographics of tortoises on eight different permanent trend plots in the planning area. Most of the square-mile plots were surveyed during a 60-day period in the spring on a four-year rotational schedule. Other plots, usually a square kilometer in size, continue to be monitored at Fort Irwin, Goldstone Deep Space Communications Complex, Twentynine Palms Marine Corps Air Ground Combat Center, and Joshua Tree National Park.

Another form of monitoring has been to survey relative density transects over regional landscapes to provide distribution and density data to which future data may be compared. The 1998-1999 tortoise survey efforts were completed, in part, to compare current relative tortoise occurrence with data collected by the BLM between 1975 and 1982. Recent, base-wide survey efforts at Edwards Air Force Base (Mitchell et al. 1993) and Twentynine Palms Marine Corps Base (Sharon Jones, pers. comm.) were completed, in part, to establish such baseline information to facilitate population monitoring.

The Recovery Plan (Appendix A, U.S. Fish and Wildlife Service 1994b) proposed yet another methodology for estimating regional densities of tortoises, whereby square kilometer study plots would be sampled throughout a given DWMA. According to the Recovery Plan, the advantages of this method were reported to include: (1) it assesses population trends over large areas, not just in single plots; (2) sample areas are selected randomly, allowing comparisons with standard statistical techniques; and (3) it violates no known assumptions of the underlying model. Hastey (1996) stated that this method may be cost prohibitive, and Corn (1994) argued that the sampling methodology was problematic because tortoises could enter and leave the area during monitoring (i.e., it is not a "geographically closed system") and precipitation could also bias capture probabilities.

Distance Sampling Transects: The Desert Tortoise Management Oversight Group (MOG) has officially adopted the "line transect sampling" or "distance sampling" methodology as the best way to estimate tortoise abundance throughout the range of the

Mojave tortoise population (Ed Lorentzen, pers. comm.). The Department has not officially endorsed this method, pending further analysis of on-going surveys (Becky Jones, September 1999, pers. comm.).

This methodology has already been implemented in parts of Nevada (Drs. Phil Medica and Ron Marlow, pers. comm.), in Washington County, Utah (Ann McLuckie, pers. comm.), in Joshua Tree National Park (Gillian Bowser, pers. comm.), and in 1999 was implemented in the Chocolate Mountains Gunnery Range in southeastern California (Peter Woodman, pers. comm.). Several workshops have been conducted by Drs. David Anderson and Kenneth Burnham, of the Colorado Cooperative Fish & Wildlife Research Unit.

Anderson and Burnham (1996) provided an overview of this methodology in a document entitled, *A Monitoring Program for the Desert Tortoise*, which is summarized below. The primary objectives of this sampling methodology are:

- intensive monitoring to detect possible, short-term, drastic declines in population density;

- less intensive, long-term monitoring to detect possible long-term increases in population density due to management alternatives on the reserved lands; and

- a comparison of trends across reserved and surrounding lands.

They recommend two independent teams, one using line transect sampling (Buckland et al. 1993) and the other using radio-telemetry. The first team would be responsible for focused tortoise surveys along transects that can be resurveyed in the future. They expected that a dozen-or-so crews surveying during April and May of a given year could complete sampling efforts in about 40 days. In fact, Woodman (pers. comm., March 1999) and others working on the Chuckwalla Bench, surveyed a total of 30, 4-km transects during a three to four-week period in March and April of 1999. Information would be recorded for each tortoise found, and each tortoise would receive a permanent mark. They indicated that about 100 tortoises need to be found to have an adequate sample size.

The second team would determine the proportion of tortoises above ground during certain environmental conditions (referred to as g_0, or "g-sub-zero"). Team two would make this determination at the same time team one is performing its surveys. Determining tortoise activity above or below ground would be facilitated by affixing radio-telemetry equipment to a dozen-or-so tortoises. By the time this sampling methodology could be implemented in the West Mojave, it is hoped that "g_0" can be predicted based on easily measurable environmental variables, such as temperature, cloud cover and wind velocity, so that only the sampling team would be needed.

Suggested Transect Locations: Anderson and Burnham have indicated that it would be necessary to stratify the sampling area to between 30 and 70 sub-strata. For example, there would be a number of transects in each of the four DWMAs and perhaps on the four military bases, and within each region there would be transects at certain elevations, in certain plant communities, on certain substrates (rocky, upper bajadas versus lower, sandy bajadas), or even within certain management zones (Open Areas versus DWMAs versus MUAs). Whereas the MOG has decided that this methodology should be employed to monitor the Mojave Population of tortoises, it is still necessary to develop a specific approach, including the number of transects and their locations.

This report recommends that the Supergroup consider implementing a "head-starting" program (where hatchling tortoises are reared and released in the wild) at the Desert Tortoise Research Natural Area and areas south and/or west of Fremont Peak. It is appropriate, therefore, that some of the permanent distance sampling transects be located in the vicinity of these areas where tortoise populations would ostensibly be bolstered. If over a period of 10 years, for example, there are no measurable increases in tortoise numbers in these areas, plan managers would want to consider if the head-starting programs should be continued, modified, or discontinued.

In addition, the translocation of clinically healthy tortoises from impact areas into adjacent management areas where tortoise densities may be very low or non-existent is also recommended. One such proposal may be to relocate tortoises out of southern Barstow impact areas into the eastern portions of Stoddard Valley. If this proposal is adopted, transects should be positioned in Stoddard Valley to see if the translocation program is successful, as may be determined if the numbers of disease-free tortoises increase in the area. Because these tortoises would be permanently marked, there would be opportunities in future sampling efforts to determine if the tortoises were persisting following translocation. At the same time, surveyors would be recording information on the incidence of URTD-symptomatic tortoises and carcasses. If monitoring determined that diseased animals were relatively more common in these translocation areas than before, it may be necessary to stop the program and provide better screening for diseased versus non-diseased animals before the program can be resumed.

Use of Monitoring Results: The results of this monitoring effort should be used to adjust management as necessary. The methodology is more sensitive in detecting drastic population declines than a general increase in numbers of tortoises, which fits well with goals of the Recovery Plan and the West Mojave Plan. As part of the West Mojave Plan, the Implementing Team will want to know if drastic declines are occurring so that emergency measures may be considered in the short-term. As identified in the Recovery Plan, it is important to know if the population is remaining stable or increasing in the long-term so that delisting may be considered.

Although distance sampling could detect such declines, biologists, land managers, and the Plan's Implementing Team would still need to determine the cause(s) of those declines. If,

for example, monitoring indicated that tortoises were crashing in the Mud Hills area, the loss of tortoises could be due to drought and/or upper respiratory tract disease, which may be outside our control, or there could be an increase in vehicle impacts or poaching, which could be controlled.

In the absence of the monitoring program, however, a population crash would go undetected, there would be no emergency consultation to consider why this had occurred, and there would be no opportunity for adaptive management to curtail or reverse the decline.

Monitoring of Threats Affecting the Long-term Tortoise Survival and Recovery

The recommended conservation strategy is intended to off-set threats known to affect the tortoise. It is strongly recommended that the Plan set measurable milestones against which the success of Plan implementation can be measured. Rather than say that "highways should be fenced," the Plan should dictate that, for example, "both sides of Highway 395 between Shadow Mountain Road and Kramer Junction will be fenced during the first three years of Plan implementation." Rather than say that "roads designated as 'closed' will be scarified and otherwise camouflaged," the Plan should indicate, for example, that "$100,000 will be provided annually to close routes in the four DWMAs." Monitoring milestones should be identified by the Supergroup once it has developed the specific measures to be implemented.

Becky Jones of the Department (September 1999, pers. comm.) cautions the reader that terms such as "should," "could," and "would" currently associated with the potential management prescriptions will be replaced with "shall" once the Supergroup has agreed to the measures. Hence, "Highway 395 should be fenced," would read, "Highway 395 shall be fenced" in the final Plan and permit authorization from the Department.

Monitoring the Plan's Effectiveness in Mitigating and Minimizing Impacts

FESA requires that a conservation strategy mitigate and minimize the impacts of the authorized take to the maximum extent practicable. CESA requires that the "impacts of authorized take [are] minimized and fully mitigated;" and that measures to minimize and mitigate "shall be *roughly proportional* in extent to the impact of the authorized taking on the species." A credible monitoring plan is necessary to determine if these standards are being met.

The term "minimize" refers to measures that are implemented on-site at the time of construction or immediately thereafter to alleviate the impacts to resident tortoises and occupied habitat. The recommendations to move tortoises from harm's way, monitor construction where tortoise sign is found, and revegetate pipelines within DWMAs and MUAs are measures intended to minimize the impacts of project development. The term "mitigate" generally refers to measures implemented outside the area of impact to off-set

any adverse effects. Designation of DWMAs, closure of routes therein, fencing of highways, and increased ranger patrols are examples of measures implemented within conservation areas to mitigate impacts of take occurring elsewhere.

It is suggested that a process be developed to establish an impartial "watchdog" entity (perhaps the Implementing Team or other appropriate group), charging it to prepare an annual report regarding each jurisdiction's success in implementing minimization and mitigation measures. The purpose of the "watchdog" would be to ensure that all parties fairly and equitably share the responsibility of Plan implementation. If, for example, an independent monitoring team or panel determines that DWMAs were never designated as an amendment to the CDCA Plan, that no roads were closed, that no highways were fenced, and no new rangers employed, then it could report this failure, which would be deemed a violation of the 2081 permit, 10(a) permit, and/or biological opinion.

Part D
Determining Anticipated Take

An incidental take permit exempts the permitee from the take prohibitions of FESA and CESA, allowing the take of species covered by the permit so long as the take is incidental to, but not the purpose of, an otherwise lawful activity, or take that is inadvertent. The permit must identify the level of take that will be allowed.

Accordingly, the Supergroup (with assistance from the Service and Department) must determine the anticipated take level that would occur with Plan implementation. The following information is provided to the Supergroup to help determine take levels:

- In what terms should take be calculated (Acres of habitat modified? Number of animals harmed?)

- What should the level of authorized take be (e.g., How many acres could be modified over the term of the Plan?)

- How should cumulative take be tracked? (By what means could agencies and jurisdictions document the take that actually occurs over the term of the Plan?)

- Useful background information for the Supergroup to consider when it determines anticipated take levels (such as the portions of the planning area where take of tortoises is most likely to occur, and the level of take historically associated with different types of development projects).

IN WHAT TERMS SHOULD TAKE BE CALCULATED?

The Service's *Habitat Conservation Planning Handbook* (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1996) (HCP Handbook) suggests that "...in cases where the specific number of individuals is unknown or indeterminable," incidental take levels can be expressed in an HCP "...in terms of habitat acres ... to be affected generally;" take should be expressed in terms of numbers of animals "...if those numbers are known or can be determined." (HCP Handbook at 3-14.) In any event, "...habitat modification or destruction ... must be detailed in the HCP and authorized by the permit." (HCP Handbook at 3-15.)

The absolute number of tortoises in an area as large as the West Mojave Recovery Unit cannot be determined with precision. Therefore, it is *strongly suggested that anticipated take be expressed in terms of acres of occupied habitat* affected during the term of the West Mojave Plan.

Definitions

Take (FESA): Harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (Section 3 of FESA, as amended). "Harass" is further defined in federal regulations as an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns that include, but are not limited to, breeding, feeding, or sheltering. "Harm" is further defined as an act, which may include significant habitat modification or degradation, where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering.

Take (CESA): Hunt, pursue, catch, capture or kill, or attempt to hunt, pursue, catch, capture or kill. (Cal. Fish & Game Code Section 86.)

Incidental Take: Take that is incidental to, but not the purpose of, the carrying out of an otherwise lawful activity, or take that is inadvertent. Construction of transmission lines and installation of pipelines in occupied desert tortoise habitat are examples of "otherwise lawful activities" that have resulted in the take of tortoises in the planning area.

The Clark County Desert Conservation Plan is an example of a regional HCP that expresses take in terms of acres. This HCP allowed for the loss of 113,900 acres of tortoise habitat over the term of the permit. It does not estimate the number of tortoises that would be displaced (RECON 1995).

The HCP Handbook offers the following suggestions for determining the level of take when take is expressed in terms of habitat modified or destroyed:

> The next aspect [determining anticipated take] depends upon the number of ... habitat units that occur in the ... planning area, and the likelihood that any given activity will result in take. This can be determined by first "overlaying" data on proposed activities — often in the form of maps — with biological data compiled from existing sources and collected in the field.... When this is completed, the effects of particular activities on species ... can be analyzed.

> [HCP Handbook at 3-14] [E]xpected take levels [can be] ... estimated based on a comparison of proposed activities with species distribution in the plan area.... [HCP Handbook at 3-15]

The planning team will provide the Supergroup with both the biological data and GIS map library necessary to make this assessment.

WHAT SHOULD THE LEVEL OF AUTHORIZED TAKE BE?

The conservation strategy presented in Part C recommends the designation of three types of management areas for the desert tortoise: Desert Wildlife Management Areas, Managed Use Areas, and Incidental Take Areas. It suggests that different levels of take be authorized in each area, or that a percentage of the area be subject to new ground disturbance: 1 percent in DWMAs and 5 percent in MUAs. Within the ITA, this report suggests that all tortoises could be taken; no acreage threshold would be applied. These thresholds are suggestions only; the Supergroup could establish different levels, but it is recommended that whatever level of take of habitat is adopted, it should be identified by considering the current rate of growth, and the number of acres currently undisturbed within the West Mojave planning area.

These thresholds conform to the suggestion made above, that take be calculated in terms of acreage of habitat that could be disturbed during the term of the permit.

For each jurisdiction, therefore, this report suggests that authorized take be expressed as a certain number of acres of new habitat disturbance within each DWMA under its jurisdiction. This could correspond to 1 percent of the surface area of the jurisdiction that lies within DWMAs; 5 percent of the surface area of the jurisdiction that lies within the MUA; and an unlimited number of acres of new disturbance within ITAs under its jurisdiction. For example, if a jurisdiction had 100,000 acres of DWMA lands (70,000 in DWMA number 1, 30,000 in DWMA number 2), 100,000 acres of MUA lands and 100,000 acres of ITA lands, the authorized take for that jurisdiction would be as follows: 700 acres within DWMA number 1, 300 acres within DWMA number 2, 5,000 acres in the MUA, and 100,000 acres within the ITA.

If these acreage thresholds are reached, any additional ground disturbing activities within the particular management area would require independent FESA or CESA permits, on a case-by-case basis, from the Service and Department (as at present); that is, those projects would be outside the scope of the streamlined permitting process provided by the Plan. The Service and Department would need to determine on a case-by-case basis if the project would jeopardize the continued existence of the tortoise.

HOW SHOULD CUMULATIVE TAKE BE TRACKED?

The acreage affected by authorized projects within the three management areas should be tracked by a monitoring program. This will require the establishment of a baseline of disturbed acreage, and a mechanism for tracking and auditing the total number of acres disturbed in DWMAs and MUAs during the term of the Plan.

The planning team has digitized all existing urban and rural development within the planning area using 1:24,000 scale aerial photography from 1995. This analysis allows us to determine the undeveloped lands that may ultimately be lost through Plan implementation. Estimated growth trends can be applied to this acreage to determine the loss of potential habitat over time. To keep track of habitat loss, it is recommended that the Supergroup consider the following:

- Lands under the jurisdiction of each agency, city, and county could be separately tracked. For example, within DWMAs the recommended 1 percent acreage threshold would be separately tracked by the BLM, State, and county (for private lands).

- Temporary impacts, such as pipeline right-of-ways, should be factored into this take threshold.

- The restoration of degraded habitats should be considered. For example, if a 100-acre sand and gravel mine site is "successfully restored" such that it can be reoccupied by tortoises (additional success criteria need to be developed), 100 acres could be "credited" to the 1 percent threshold. The Department (Becky Jones, September 1999, pers. comm.) has indicated that "restored habitat...{should be}...equal to or better than undisturbed habitat adjacent to that area and be able to support a minimum of 50 tortoises per square mile."

USEFUL BACKGROUND INFORMATION TO CONSIDER WHEN DETERMINING ANTICIPATED TAKE

Regions Where Take of Tortoises Is Most, and Least, Likely

Activities occurring in certain regions of the planning area are likelier to affect tortoises than in other regions. Most of these habitats once supported tortoises, although some are now considered unsuitable (e.g., urban areas, agricultural fields, etc.). The likelihood of tortoises occurring in a given area can be estimated, in part, by considering the available data collected over the past 10 years, in particular. The following discussion identifies those areas where take of tortoises is likely to be high, moderate, or minimal.

- Take of tortoises is likely to be minimal or absent in Lancaster (Tierra Madre Consultants, Inc. 1991, Brian Hawley, pers. comm.), Palmdale (Feldmuth and

Clements 1990, Laurie Lile, pers. comm.), Hesperia (Tierra Madre Consultants, Inc. 1992, Dave Reno, pers. comm.), the southern portions of Apple Valley and eastern portions of Victorville (Tierra Madre Consultants, Inc. 1992, John Hnatek and Charles LaClaire, respectively, pers. comm.), and areas south of Highway 18, west of Lucerne Valley (Ed LaRue, pers. obs.). In Los Angeles County, there is very little likelihood that tortoises will be found in the vicinity of developed areas, such as Lancaster and Palmdale to the west and Lake Los Angeles to the east. Though marginally possible throughout the southern portions of the county, Inyo County is the least likely of the four participating counties where take would occur during project development.

- Take of tortoises is moderately likely to occur in undeveloped areas peripheral to existing development in Ridgecrest (Circle Mountain Biological Consultants 1997a), Yucca Valley (Tierra Madre Consultants, Inc. 1993a), southeastern parts of Twentynine Palms and peripheral areas of Lucerne Valley (Ed LaRue, pers. obs.), eastern portions of California City (1998-1999 survey results), and northern portions of Apple Valley and southern portions of Adelanto (Tierra Madre Consultants, Inc. 1992, Ed LaRue, pers. obs.). In Los Angeles County, take is relatively more likely as one proceeds from west to east.

- Take of tortoises is very likely to occur in undeveloped areas peripheral to existing development in Barstow (Circle Mountain Biological Consultants 1996), areas between Yucca Valley and Twentynine Palms (Circle Mountain Biological Consultants 1997c), and areas north of Adelanto and Apple Valley (Tierra Madre Consultants, Inc. 1992). Most undeveloped portions of Kern and San Bernardino counties located away from cities and other human development support tortoises where take during project development is likely. Areas in San Bernardino County, particularly between Irwin Road and Harper Dry Lake, and between Highway 395 and the Mojave River north of Shadow Mountain Road, appear to support the highest numbers of tortoises. Projects in such areas are more than likely to encounter tortoises and adversely affect them.

Anticipated Take of Tortoises by Specific Activities

A summary of the relative effects of various activities on desert tortoises can be found in Part A of this chapter, regarding threats to the tortoise. A more detailed treatment of this topic can be found in Boarman (1999).

In 1995, Circle Mountain Biological Consultants (CMBC) prepared an analysis of federal biological opinions for desert tortoises. Its findings area briefly discussed herein.

Between the listing of the tortoise in 1990 and 1995, there were approximately 150 federal biological opinions issued for projects that “may affect” the desert tortoise in California. Approximately 20 of those opinions were for organized off-highway vehicle events,

grazing, and other uses of the desert. CMBC's study focused on the other 126 opinions, which were associated with specific projects that would result in ground disturbance and potential take of tortoises. CMBC consulted about 145 different people affiliated with the projects for which opinions had been issued, and determined that those 126 opinions authorized 123 different projects, 101 of which had been constructed.

CMBC found that 11 different project types were authorized in California by Service biological opinions. Table 2-5 shows the project types and the number of tortoises reportedly handled (i.e., harassed) and accidentally killed by each project type. The project types are presented in descending order of harassment take, with projects resulting in the most take listed first.

Table 2-5
Tortoise Harassment and Mortality by Project Type
California 1990 - 1995

Project Type	Number of Projects	Tortoises Handled	Tortoises Killed
Pipelines	22	583	38
Transmission Lines	15	227	7
Mining	23	59	2
Highways	14	16	1
Miscellaneous Military	8	14	5
Tract and Parcel Development	19	13	0
Programmatic Opinions	12	5	0
Miscellaneous	2	2	0
Hazardous Materials	3	0	0
Flood Control	2	?	?
Landfill	3	0	0
Total	123	919	53

Source: Appendix B, Section 1 in Circle Mountain Biological Consultants 1995

It is clear from this analysis that long, linear projects have resulted in the most prevalent, documented harassment and mortality impacts to tortoises. Whereas CMBC documented more mining projects than any other, only two tortoises were reportedly killed. We suspect that implementation of successful, on-site mitigation measures was responsible for the reduced mortality associated with mining activities.

There is no certain way to predict the types of projects that may occur in the planning area in the future. However, the types listed above and their relative impacts are likely to continue.

Part E
Permit Compliance Summary

EFFECTIVENESS OF CONSERVATION STRATEGY

The conservation strategy recommended by this report will attain the suggested biological goals and objectives if it protects valuable tortoise habitat and allows for the natural (or enhanced) recovery of the tortoise in the West Mojave.

The establishment of DWMAs, and the BLM's designation of these areas as ACECs and Multiple-Use Class L (Limited Use), will help meet those goals and objectives. This report recommends that 2,682 square miles, or 18 percent of the planning area, be designated for DWMA-ACEC status[5]. This compares to the 1,161 square miles, or 22.5 percent, proposed for ACEC status within the BLM's 3.3 million-acre Las Vegas Resource Area to protect tortoises (U.S. Bureau of Land Management 1998). Existing protection is currently provided in some wilderness areas, ACECs, State Parks, and at Goldstone, Edwards Air Force Base and China Lake, although the level of protection on military bases could vary if the current missions at these installations substantially changed. Data show that the proposed DWMAs would encompass lands that recently (since the 1970's) and presently support the largest numbers of tortoises in the planning area. Establishment of the DWMAs and implementation of appropriate conservation measures would predictably result in protection of large, unfragmented regions in which tortoises could persist for many generations.

The DWMA areas compare to 801 square miles, or 5.5 percent of the planning area, that would be within the City Incidental Take Areas and therefore lost from conservation as a result of the Plan. Much of this area, however, is already developed. County Incidental Take Areas would also be impacted, but these are areas that would be predictably lost to or impacted by development with or without the Plan. Through programmatic studies (in Adelanto, Apple Valley, Hesperia, Lancaster, Palmdale, Ridgecrest, and Victorville) and about 250 focused tortoise surveys in San Bernardino County, it is apparent that tortoises are mostly absent from these Incidental Take Areas already.

Designation of conservation and take areas, alone, would not protect habitat and lead to the recovery of the species. What are the conservation measures that would be implemented that would protect tortoises over and above protection currently provided?

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[5](2,017 mi^2 in the Fremont-Kramer and Superior-Cronese DWMAs, 404 mi^2 in the Ord-Rodman DWMA, and 261 mi^2 in the Pinto Mountain DWMA).

Although it is the responsibility of the participating jurisdictions to answer this question, this report identifies a wide range of measures intended to provide this extra protection. Fencing highways, closing unimproved routes in prime tortoise habitat, employing rangers to enforce route closure and apprehend poachers, minimizing impacts of BLM Open Areas on adjacent lands, eliminating the potential for future sheep grazing in DWMAs, and many other measures were identified. It is not expected that *every one* of these measures will need to be implemented to meet with Service and Department approval; it is recognized that the jurisdictions may conclude that some may not be feasible; others may prove too expensive or controversial to win acceptance from all parties. If a representative subset of the protective measures is implemented, however, this should allow the Service and the Department to approve the Plan, regulatory compliance will become streamlined, and tortoise conservation and recovery would be facilitated.

These conclusions presuppose that the Plan provide a funding mechanism to pay for these conservation measures, through a combination of grants, developer's fees, coordinated land acquisition, credits, and appropriated agency funds, the actual nature of which will be determined by the Supergroup. For example, it is expected that federal agencies will commit funds to make the Plan work. In fact agencies are already planning for this: the Management Oversight Group Technical Advisory Committee is pursuing ways to fund and implement distance sampling to monitor tortoise populations in the planning area and elsewhere (Ed Lorentzen, personal communication); and the BLM is seeking funding to implement route closure (Tom Egan, personal communication).

Success of the Plan and recovery of the tortoise (if measured in numbers of tortoises only) will always be hampered by local and regional catastrophic population declines that cannot be controlled. For example, a total of 110 tortoises died since about 1993 from unknown causes at Goldstone (Berry et al. 1998), which is one of the more protected desert regions in the planning area. However, as long as areas are relatively protected and not fragmented, there is a general consensus that tortoises may re-occupy these lands naturally or with human intervention (e.g., through head-starting or translocation), as these techniques are further developed and successes (and failures) documented.

EFFECTIVENESS OF FESA SECTION 10(A) AND SECTION 7

Current management with regards to section 10(a) incidental take of tortoises is not functioning well in the planning area. Since the listing of the tortoise in 1990, only six permits have been issued, implying that only six private projects have affected the tortoise during the last 10 years. Since no established time limit has been identified for issuance of section 10(a) permits, they have taken between six months and three years to process and issue. Thus, the conscientious developer is faced with uncertainties that may undermine or force abandonment of his or her development project (LaRue 1994). Without the streamlined section 10(a) provisions suggested by this report, it is expected that tortoise habitat will continue to be developed or degraded in unpredictable ways and tortoises will continue to be lost with no off-setting conservation measures implemented. With these

provisions, project proponents would obtain a streamline and timely program for compliance with FESA and CESA, and conservation measures would be implemented.

Section 7 consultations, by contrast to incidental take permits, are currently performing well throughout the planning area. Consultations are relatively more timely; they must be completed within 135 days. Terms and conditions of biological opinions are being successfully implemented under section 7, tortoises are being rescued from harm's way, tortoise mortalities are being reduced during construction activities, and practical conservation solutions, such as revegetating pipeline alignments and purchasing lands to be managed for species conservation, are being implemented (Circle Mountain Biological Consultants 1995). Worker education programs, which are typically required in the Service's biological opinions, have been very useful. It is difficult these days to find a construction worker in the desert who has not heard of the desert tortoise or worked side-by-side with a biological monitor. The main contribution of the recommendations of this report to the section 7 process would be to expedite the process and alleviate the regulatory burden of both the Federal Lead Agency (usually the BLM) and the Service (Tom Egan, personal communication), although specific measures are yet to be identified.

Part F
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