DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Bay Checkerspot Butterfly (Euphydryas editha bayensis)

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: The Service determines the bay checkerspot butterfly to be a threatened species. This butterfly subspecies occurred historically in isolated colonies, many of which have been eliminated as a result of drought, urban development, highway and road construction, livestock overgrazing, and other land use activities that altered the natural plant communities upon which it depends. Although recorded in the literature from more than 16 separate localities on the San Francisco Peninsula and adjacent outer Coast Range of California, only a few of the largest colonies, perhaps only two, retain habitat extensive enough now to permit survival through drought and other stresses predictable on a time scale of decades. This determination that the bay checkerspot butterfly is threatened implements the protection provided by the Endangered Species Act of 1973, as amended. The Service will defer designation of critical habitat for the bay checkerspot butterfly in order to complete the necessary economic analyses.

DATE: The effective date of this rule is October 19, 1987.

ADDRESS: The complete file for this rule is available for inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Lloyd 500 Building, 500 N.E. Multnomah Street, Suite 1692, Portland, Oregon 97232.

FOR FURTHER INFORMATION CONTACT: Mr. Wayne S. White, Chief, Division of Endangered Species, at the above address (503/231–6131 or FTS 429–6131).

SUPPLEMENTARY INFORMATION:

Background

The bay checkerspot butterfly (*Euphydryas editha bayensis*) was described by Sternitzky (1937) as a race on the basis of its physical characteristics. Dos Passos (1964) and all subsequent published treatments recognize the bay checkerspot as a distinct subspecies. It has been the subject of extensive research by Dr. Paul R. Ehrlich and his associates at Stanford University and colleagues elsewhere since 1959. The butterfly's distribution, behavior, ecology, and population dynamics are relatively well-understood.

Euphydryas editha bayensis is a medium-sized butterfly with a wingspan of between 1½ inches (38 mm) and 2¼ inches (56 mm). The forewings have black bands along all the veins on the upper wing surface, which contrast sharply with bright red and yellow spots. The black basal coloration gives a more decidedly checkered appearance than in other subspecies such as the smaller *E. e. wrighti* of Southern California, or the montane *E. e. editha* (Sternitzky 1937). *E. editha bayensis* is typically darker than *E. e. luestherae* and lacks a relatively uninterrupted red band demarking the outer wing third (Murphy and Ehrlich 1980), but the bay checkerspot is not as dark overall and has brighter red and yellow colors than *E. e. insularis* (Emmel and Emmel 1975).

All habitat of the bay checkerspot butterfly exists as isolated islands of native grassland on shallow serpentine-derived or similar soils that support abundant growth of the butterfly's two larval foodplants, annual plantain (*Plantago erecta*) and the hemiparasitic annual owl's clover (*Orthocarpus densiflorus*). Presence of both foodplants is evidently required for successful completion of the bay checkerspot's life cycle in nature (Singer 1971, Ehrlich et al. 1975).

The bay checkerspot's known and likely habitat is considered here under three general categories. Primary habitat occurs directly on outcrops of serpentine (geologically identified as mesozoic ultrabasic intrusive rock) larger than about 800 acres. Large and topographically diverse areas of habitat appear to insure survival against drought stresses that occur predictably several times in each century. These large areas function as primary population reservoirs. Only four such areas appear on geologic maps within the butterfly's known range, and only two now support colonies of significant size. Secondary, or "satellite," habitat islands are smaller serpentine outcrops with native grassland typically capable of developing robust bay checkerspot colonies in years of favorable climate when the habitat is relatively undisturbed. Wet years often correlate with population declines, and severe drought has been observed to cause local extirpation of such satellite colonies. Extirpation of satellite colonies is likely on a time scale of decades. Following local extirpation, satellite habitat is thought to be recolonized naturally from neighboring "reservoir" colonies, if other surviving colonies exist within a few miles. A third habitat category consists of areas where both foodplants occur on other soil types similar to those derived from serpentine. All such tertiary habitat found has been located on areas mapped geologically as the Franciscan formation. Strong seasonal variation in numbers of individuals characterize populations in this kind of habitat, and they seldom support dense populations, evidence that this habitat category contributes only marginally to long-term survival of the species, providing only temporary recruitment of individuals and possible stepping stones for colonization.

Habitat difficulties faced by the bay checkerspot butterfly can be summarized as: (1) Permanent loss of more than half of its primary habitat, with two out of the four primary habitat sites believed large enough to function as population reservoirs; (2) present extirpation from about 29 of 32 probable and 5 of 8 known secondary habitat areas, with permanent loss through habitat modification of at least half of such secondary habitat areas; and (3) recent probable extirpation from at least 5 of 6 known areas of marginal habitat and more than 9 likely such areas.

Natural recolonization appears to be a very rare event. For example, in 21 years of study with marked populations less than four miles apart at Woodside and Jasper Ridge, translocation of a single individual from one colony to the other was observed only once (Murphy and Ehrlich 1980). Because the number of habitat islands potentially available to the butterfly continues to decline as a result of habitat modification, and the distance between suitable sites is thus increasing, the actual likelihood of natural recolonization is approaching zero.

On October 21, 1980, the Service was petitioned by Drs. Bruce O. Wilcox, Dennis D. Murphy, and Paul R. Ehrlich to list the bay checkerspot butterfly as an endangered species. The petition was later supplemented with a letter and other materials received on December 11, 1980. The Service included the bay checkerspot butterfly in a **Federal Register** Notice of Review on February 13, 1981 (46 FR 43709). A review of its status was made to determine if it should be added to the U.S. List of Endangered and Threatened Wildlife. On October 13, 1983, the Service found the proposed listing to be warranted but precluded by other pending listing actions, and reported this finding in the **Federal Register** on January 20, 1984 (49 FR 2485). On September 11, 1984, the

Service published a proposed rule to list the bay checkerspot butterfly as an endangered species and determine its critical habitat (49 FR 35665), which constituted a final petition finding affirming that the petitioned action was warranted.

A public hearing regarding the proposed rule was held on November 13, 1984, in San Mateo County, California. The comment period had been scheduled to close on November 13, 1984, but was extended on October 26, 1984 (49 FR 43076), until November 23, 1984. It was reopened on March 14, 1985 (50 FR 43076), at the request of lawyers for United Technologies Corp. It was reopened again on August 12, 1985 (50 FR 32455), to avail the Service of complete and current information, and reopened a third time on September 13, 1985 (50 FR 37391), because information and reports prepared by Dr. Richard Arnold and formally submitted to the Service on behalf of United Technologies Corp. indicated a substantial scientific disagreement regarding the sufficiency and accuracy of available data supporting the listing. On July 2, 1986, the comment period was reopened a fourth and final time (51 FR 24178) to meet with Dr. Murphy and representatives of United Technologies Corp. and others, to clarify information on alleged new populations of the bay checkerspot butterfly from San Luis Obispo, and San Benito Counties, California.

The testimony recorded at the public hearing and all written comments received by the close of the comment period on November 13, 1984, and meeting of July 16, 1986, and all written comments received by the close of the last comment period on August 1, 1986, are part of the public record and have been carefully considered in the drafting of this final rule. The Service has also considered the findings of a panel of scientists asked to address the sufficiency and accuracy of available taxonomic information. As a result of this extensive consideration, the Service determines that the bay checkerspot is a threatened species. Pursuant to section 4(b)(6)(C)(ii) of the Endangered Species Act, as amended, the Service determines that critical habitat is not now determinable. The Service is completing its analyses of potential critical habitat in accordance with sections 4(a)(3)(A) and 4(b)(2), and intends to designate critical habitat for the bay checkerspot butterfly when these analyses are complete.

Summary of Comments and Recommendations

In the September 11, 1984, proposed rule (49 FR 35665) and associated notifications, all interested parties were requested to submit factual reports or information that might contribute to the development of a final rule. Appropriate State agencies, county and city governments, Federal agencies, scientific organizations, and other interested parties were contacted and requested to comment.

On July 25, 1984, Mr. Paul Koening, Department of Environmental Services, County of San Mateo, requested a public hearing on the proposal to list the San Mateo thornmint, which was published June 18, 1984 (49 FR 24906). After discussions with the County and other interested agencies and individuals, the Service decided to hold a combined public hearing for the thornmint and bay checkerspot proposals. Notification of the combined public hearing was published in the **Federal Register** on Friday, October 26, 1984 (49 FR 43076). Notifications of the proposed listing of the bay checkerspot butterfly and the public hearing of November 13, 1984, were published in the following local newspapers: *San Jose Mercury News* on October 31, 1984, *San Francisco Chronicle/Examiner* on October 28, 1984, *Palo Alto Times* on October 30, 1984 and the *San Mateo Times and News Leader* on October 30, 1984. Written notifications also were sent to State, local and Federal agencies, and to interested individuals and organizations.

On November 13, 1984, the Service held a public hearing at the Hillsdale Inn in San Mateo County, California, on the proposals to list the San Mateo thronmint and bay checkerspot butterfly as endangered species and to designate critical habitat for the butterfly. Approximately 120 people attended the hearing. The comment period closed on November 23, 1984, but was reopened on March 14, 1985, August 12, 1985, September 13, 1985, and again on July 2, 1986. An open meeting was held in Sacramento on July 16, 1986, during the final open comment period. Approximately 15 people attended the meeting and five presented oral comments. Notification of this meeting was made in the **Federal Register** (51 FR 24178) and by letter to those individuals submitting previous comments. The last comment period closed on August 1, 1986.

Comments from the public hearing of November 13, 1984, and meeting of July 16, 1986, as well as written comments have been carefully considered in preparing this final rule. Public comments were received during the period from September 11, 1984, to August 1, 1986. During that time 37 oral and 95 written comments were received from various individuals, organizations, and government agencies. Of those, 35 were additional comments by persons who had commented at least once before. Among persons who expressed opinions, four opposed what they feared was premature listing, 24 others either opposed listing altogether or at least to the extent that they expected it to interfere with planned or ongoing activities, nine expressed confidence that all apparent conflicts threatening survival of the butterfly could be resolved, 59 expressed belief in a need for Federal listing of the butterfly, and eight gave no clear indication of their opinion in regard to listing. In the following discussion, comments related primarily to habitat of the butterfly are considered only as they relate to threats and the butterfly's status for listing, and not as they relate to possible exclusion or inclusion of certain areas as critical habitat or to possible economic consequences of critical habitat designation. As mentioned, the Service is deferring the critical habitat designation until a later time.

Three principal subject areas of comments that relate to the butterfly's status are; (1) Scientific definition of the subspecies, (2) adequacy of the distribution data, and (3) threats to habitat from various activities and projects. Only a minor threat is believed to exist from overutilization of individuals by collectors, and it was not a subject of significant comment. This section of the rule will summarize and discuss these three subject areas in order, followed by mention of some general comments from agencies and organizations, and end with a summary of comments that criticized the Service's adherence to rulemaking procedures.

Six of the comments questioned the rationale for listing a butterfly only experts could identify. One suggested that the bay checkerspot is one of the most plentiful of all butterflies. Several comments indicated belief that the designation was inappropriate because the bay checkerspot is a subspecies and the Act was designed to protect full species.

The Service replies that the term "species," pursuant to section 3(16) of the Endangered Species Act, includes any species or subspecies of fish, wildlife, or plants, and any distinct population segment of any species of vertebrate fish or wildife that interbreeds when mature. The bay

checkerspot butterfly (*Euphydryas editha* subspecies *bayensis*) qualifies as a "species" under the Act. Its taxonomic status is recognized in all the major treatments in the scientific literature, and the Service has found no alternative taxonomic treatments that controvert this conclusion.

Lawyers for United Technologies Corp., on the basis of analyses prepared for them under contract by the entomologist Dr. Richard A. Arnold, submitted four sets of comments in 1985, all emphasizing a claim that the subspecies *E. e. bayensis* is not defined in a way that would limit it to the geographic range indicated in the proposed rule. Their comments on May 16 and June 26 claimed the Service had failed to demonstrate that a separate subspecies eligible for listing exists. In a November 11 comment letter, they modified that position somewhat, and made it clear that they did not question the separateness of the bay checkerspot subspecies, but rather its "definition." Their comments incorporated a letter from Dr. Arnold dated November 7, 1985, in which he suggested that two checkerspot colonies known from coastal grassland areas of Santa Barbara and San Luis Obispo Counties, as well as other populations of *E. editha* in the outer coast range north of San Francisco Bay, might be more properly classified as *E. e. bayensis*.

In the November 7 letter, and also in previous comments, Dr. Arnold's argument placed strong and selective emphasis on the use by Drs. Ehrlich and Murphy in their original petition and subsequent comments, and by Dr. Murphy in one publication (1982), of genetic (specifically enzyme biochemistry) information, as well as ecotypic (specifically foodplant and habitat type) information to supplement the conventional phenotypic (features of appearance) information. The Service accepted his position as evidence for substantial scientific disagreement in the matter, and asked four of its own scientists to conduct a panel evaluation of *Euphydryas* systematics as they might affect *E. e. bayensis* on these particular claims.

The Service notes that Murphy (1982) used a lack of clear-cut enzymatic differentiation, taken together with consistent habitat ecotype (chaparral), foodplant (typically *Pedicularis densiflora*) and general phenotypic (or phenetic) similarity to reclassify certain populations of checkerspots formerly treated as *E. e. baroni*, assigning them to *E. e. Luestherae*. Dr. Murphy's use is somewhat different from the one advocated by Dr. Arnold for a reported lack of clear-cut enzymatic differentiation between *E. e. bayenis* and isolated grassland checkerspot colonies found in Santa Barbara and San Luis Obispo Counties. Dr. Arnold's usage implies that such a lack of enzymatic differentiation should in effect enlarge the subspecific definition, and outweigh other observable phenotypic or behavioral differences.

Dr. Peter F. Brussard of Montana State University, who conducted much of the enzyme electrophoretic work cited by the petitioners and by Dr. Arnold in this context, provided some specifics and his opinion in a letter of comment dated August 21, 1985. He stated that electrophoretic analysis conducted subsequent to the studies on which statements made in the petition were based show mainly that enzyme variation from year to year is quite large in this genus, effectively masking any normal subspecific variability that may be present. The net effect, he stated, is a severe limitation on the taxonomic utility of enzyme electrophoresis as a basis for any decisions about distinctiveness or nondistinctiveness of any *Euphydryas* populations.

In their original petition, the petitioners suggested that the checkerspot colonies on grassland in Santa Barbara and San Luis Obispo Counties represented isolated intermediates or intergrades between *E. e. bayensis* far to the north and *E. e. wrighti* of southern California. Emmel and Emmel (1975), in describing the subspecies *E. e. insularis*, had characterized coastal *E. editha* found in those counties as "near" *E. e. bayensis*, a common taxonomic usage that implies kinship but does not merge it with a named entity. In a letter of comment dated November 5, 1985, Drs. Ehrlich and Murphy stated that they consider the mainland colonies in question actually assignable to *E. e. insularis*.

Dr. Arnold's comments of November 7, 1985, further stated that Murphy (1982) had left unresolved which subspecific name to apply to Outer Coast Range populations of the species from north of San Francisco. This comment also recalled a 1981 mention by Dr. Raymond White in a letter to the Service of a note by Doudoroff (1935) reporting some seasonal division of the checkerspot butterfly flight period in Napa County near Calistoga. Dr. White interpreted this as possible evidence of a former bay checkerspot colony, subsequently extirpated.

The Service responds that this comment neglected to mention that the only such populations Murphy (1982) considered to still exist, other than those of the redefined *E. e. baroni*, were from the extreme north of Mendocino County. Murphy (1982) did state that he considered their affinities to probably lie with populations in Oregon that use a different larval foodplant than *E. e. bayensis*, and "which may be" referable to *E. e. taylori*. Doudoroff's (1935) note antedated the 1937 description of *E. e. bayensis*, of course, but did not specify anything about morphology or habitat, and mentioned no voucher specimens. Since Dr. Doudoroff's note did not account for another checkerspot butterfly species that was probably present, and because serpentine chaparral rather than grassland predominates in that area, this note must be considered very doubtful as evidence for including Napa County in the former range of the bay checkerspot butterfly.

Drs. Arnold, Ehrlich, and Murphy, using the medium of letters of comment on this rule, engaged in an argumentative exchange in respect to taxonomic philosophy and motives for making various statements. Much of the exchange pertained to Dr. Arnold's published analysis of variation in another butterfly species (one conclusion of his paper was that no one, including himself, had found features to reliably distinguish subspecies in that taxon). Although the discussion is part of the public record, the Service did not find it specifically relevant to the present consideration. One letter of comment from a journal editor also concerned itself primarily with that debate and with the validity of subunits in another species.

Under the second subject of comments stated above, the accuracy of existing distributional data, the County of San Mateo and four individuals commenting on the proposal indicated belief that there has been insufficient effort to locate additional bay checkerspot colonies. The lawyers' comments for United Technologies cited above follow a logical course from the effort to include widely separated populations within the subspecific scope of the bay checkerspot butterfly, to a listing of available reasons for doubt about the completeness of the existing data. Their comments also follow leads established in Dr. Arnold's analyses and discuss a number of other letters of comment. The detailed exposition has as themes the wide and plentiful distribution of serpentine rock outcrops in California, and a claim for recent discovery of six bay checkerspot butterfly populations in the preceding two years, of which the centerpiece is the large colony near Morgan Hill.

The Service responds that except for discovery of the Morgan Hill colony, which exists in a very large area of private property that is mostly to trespass and that was indeed unknown to the petitioners at the time of original petition, a review of several related factors that United Technologies' comments did not address gives an entirely different perspective. First, there is a critical distinction between serpentine rock outcrops that support native grassland and the more numerous ones that support chaparral (and other subspecies of checkerspot butterflies, if any). An article on California serpentine by Kruckeberg (1934), submitted as an exhibit to one of Dr. Arnold's letters, devoted considerable attention to serpentine chaparral, but gave only passing mention to serpentine grassland, citing Jasper Ridge as its primary example. Even at Jasper Ridge there is a considerable amount of chaparral, which does not support the bay checkerspot butterfly (Ehrlich 1965). Second, a significant interruption in Outer Coast Range serpentine outcrops likely to support the required grassland habitat type begins near the line between Santa Clara and Santa Cruz Counties and extends southward along the Outer Coast Range. It figures prominently in the geological maps submitted to illustrate the wide distribution of serpentine occurrences. Third, two others of the six "new bay checkerspot populations" are based on assignment of two previously known and reported colonies of uncertain taxonomic status in southern California to *E. e. bayensis* in accordance with Dr. Arnold's interpretation of the species' taxonomy. The remaining three may or may not be colonies able to persist; one exists on a very small remnant of a formerly extensive habitat near San Mateo, and two were recorded as occurrences on small serpentine outcrops in the vicinity of the largest colony near Morgan Hill.

The Service accepts one implication of the foregoing comments, that undiscovered colonies or stray individuals of the bay checkerspot butterfly may be found in the future at various locations in the bay area, or indeed may establish themselves in the vicinity of the two remaining reservoir populations. Dr. Arnold's explorations in 1985 provided useful additional data, and it was appropriate for him to concentrate his search in areas of serpentine outcrops supporting grassland habitat. His report of overgrazing observed on most of them is discouraging from a viewpoint of long-term protection of butterfly habitat. Most discouraging is the lack of any additional large serpentine outcrops supporting grassland habitat. Even more significant, though, is a lack of any additional serpentine grassland left to search within the known or probable range of the subspecies.

Lawyers for United Technologies raised a number of issues in a letter of comment dated July 31, 1986, which will be treated below. Many of those issues related to information brought forward for the record during the public meeting of July 16, 1986. A primary concern was evidently discovery of two previously unreported checkerspot (*E. editha*) populations well to the south of the Bay area, one in San Luis Obispo County, found by Dr. Richard Arnold, and one in San Benito County, found by Dr. Dennis Murphy.

The July 31 letter restated an earlier claim that the taxonomy of these southern checkerspot populations, and, by extension, the taxonomy of the bay checkerspot, *E. editha bayensis*, is not yet resolved. The Service agrees that subspecific taxonomy of *E. editha* collected from areas south of Santa Clara County needs further elucidation. However, the subspecific name *bayensis* was apparently not applied to such specimens, despite ample opportunities to do so, before the issue of possible listing for this taxon was raised.

The July 31 comment letter claims further that the Service refused to consider the taxonomic status of southern *E. editha* colonies in determining whether the bay checkerspot butterfly is endangered. On the contrary, the Service received and considered information from the area, some of it in published form, but concluded after due consideration that the kind of monographic taxonomic work that is clearly needed to resolve all the existing uncertainties is simply not available now. Some specific examples of facts, ideas, and opinions that the Service considered follow.

A colony of *E. editha* utilizing at least one of the bay checkerspot's two obligate foodplants was mentioned by Singer (1971) and McKechnie *et al.* (1975) to exist in San Luis Obispo County near Madonna Inn, not far from one of Dr. Arnold's newly reported colonies (whose foodplant is unknown). Similarly, Emmel and Emmel (1975) illustrated a specimen they identified as "near *bayensis*" from Monterey County, closer than any other known grassland colony to Dr. Murphy's newly reported colony in San Benito County. Geographically close colonies are apt to be closer phylogenetically than are ones farther apart, other factors being equal.

A different vernacular name, "coastal checkerspot" was applied by Emmel and Emmel (1973) to a number of these southern entities otherwise identified only as "near *bayensis*." Emmel and Emmel (1975), however, did not explore possible relationships of these southern entities to either *E. e. insularis*, a subspecies they described, or to *E. e. bayensis*. Subsequently, colonies mentioned by Emmel and Emmel (1973) from sands in Santa Barbara County were indicated to be ecologically different from *E. e. bayensis* (Ehrlich and Murphy 1981), and a colony near Pozo, San Luis Obispo County, was indicated by Murphy (1982) to represent the serpentine chaparral form, *E. e. luestherae*.

At the July 16, 1986, hearing, Dr. Arnold asserted that the butterflies located in San Luis Obispo County appeared to be bay checkerspots because of the favorable comparison to descriptions in scientific literature and specimens in reference collections. Dr. Arnold also indicated that both essential food plants were present at the San Luis Obispo population sites. (Hearing transcript at 13.) He noted, however, that statistical measurements were not done for butterflies collected from San Luis Obispo County (hearing transcript at 14), and that he had not seen any butterflies from the "near *bayensis*" samples to compare them to bay checkerspot specimens. (Hearing transcript at 22.) Dr. Dennis Murphy, one of the petitioners for this action, professed no knowledge of the existence of bay checkerspots between the Morgan Hill colony and San Luis Obispo County. He noted that serpentine grasslands are rare in the areas between these populations, and that the distance between these checkerspot colonies is several orders of magnitude greater than any recorded movement of bay checkerspot butterflies. Dr. Murphy further noted that the areas in between the Morgan Hill colony and the San Luis Obispo County population generally include unsuitable habitat, and that the populations are effectively isolated by a wall of chaparral. (Hearing transcript at 41.) Noting first that it is generally accepted that the San Benito County populations belong to the subspecies *luestherae*, Dr. Murphy speculated that an assignment of San Luis Obispo County populations to the subspecies *bayensis* would most probably involve a determination that the populations arose independently at habitat locations using the same host plants and involving the same color patterns, features which have yet to be established. (Hearing transcript at 42.) Consequently, a similar

appearance may have arisen between genetically distinct lineages on northern and southern grasslands through parallel or convergent changes instead of through migration and/or colonization from one grassland to another. Thus one or more populations resembling *bayensis* may, in fact, be separately derived. To treat similar but convergent entities as a single entity for convenience is contrary to accepted basic biological principles, and the Service would not knowingly do so. In the present case, evidence is insufficient to determine whether convergent evolution has occurred.

At the July 16, 1986, public hearing Dr. Arnold also raised a question concerning the alternative idea, already mentioned, that some of the southern colonies could represent genetic intermediates between named subspecies, which arose as a result of a previous contiguous or widespread distribution. Dr. Murphy conceded that habitat continuity may have been a possibility in the ecologically recent past. (Hearing transcript at 48.) The Service agrees that intermediate populations or clinal intergrades often are found where the ranges of adjacent subspecies approach one another (when such intermediates are lacking, specific rather than subspecific recognition is usually indicated). However, normal taxonomic usage does not require that any intermediates found must be allocated either to one subspecies or the other, but lets them be recognized simply for what they are. Furthermore, Dr. Murphy made the point that, even if the San Luis Obispo and San Benito County serpentine grassland populations were included within the subspecies *bayensis*, the subspecies as a whole would still be threatened in a significant portion of its range and listing would still be justified. (Hearing transcript at 44–45.) Noting that the taxonomy issue would not resolve the threats posed to the bay Checkerspot butterfly, Dr. Murphy observed that no one had taken the position that the San Luis Obispo populations would support the long-term survival of the bay checkerspot butterfly in a significant portion of its range. (Hearing transcript at 52.) The Service concurs that a listing determination is justified regardless of the taxonomic classification of the San Benito and San Luis Obispo County populations. Noting that the petitioners do not use subspecific classifications in their studies on checkerspot butterflies, Dr. Murphy indicated that their attention had been drawn to discrete populations that were historically referred to as *bayensis*. (Hearing transcript at 52–53.) Dr. Murphy indicated that the petitioners were not taxonomic experts of the checkerspot butterfly, and he reaised the question of whether any such experts really exist. (Hearing transcript at 54.)

Replacing the prevailing uncertain scientific opinions regarding identities of southern colonies with detailed evidence for relationships is a task for skilled biologists using the array of techniques available for phylogenetic investigation. Separation and identification of genetic lineages is time-consuming, tedious research. Acceptance and consensus among scientific peers requires additional review and time. As discussed below in the findings of the bay checkerspot butterfly review panel, the Service concludes on the basis of the best presently available scientific information that the known *E. editha* grassland populations from south of Santa Clara County are not bay checkerspot butterflies.

The July 31 letter of comment from United Technologies Corp. advocates that the Service must take responsibility for filling the existing gap of information about the southern checkerspot colonies and should "define" or commission to be "defined" some distinction between *E. e. bayensis* and "near *bayensis*," based on biological "criteria." The comment presents the standard of acting on "the best available scientific and commercial information" as a primary basis for the action advocated, namely that the Service withdraw the proposed rule to list the bay checkerspot as endangered, and refrain from protecting known colonies of *Euphydryas editha bayensis*. The Service responds that the Endangered Species Act does not redefine either species or subspecies, except to include subspecies within the concept of "species" in respect to its own provisions. Species and subspecies are biological entities, not "defined" by *criteria* but instead representing relationships among organisms, to be identified through a process of research and the reasoned exercise of scientific judgment. Such research seeks to arrive at taxonomic interpretations that best reflect current knowledge of biological relations among populations. To postpone protection for the known remnants of the bay checkerspot butterfly while all issues that may be relevant are researched does not accord with the Service's interpretation of the Endangered Species Act, and could result in elimination of that taxon from a very significant portion of any range ever likely to be established for it. The idea that the standard of "best available scientific or commercial information" could be used as a basis to delay protective actions otherwise needed is unsupportable.

The Service also wishes to acknowledge for the record the intensive search for "stepping stone" populations throughout the range of the species and the State of California reported by McKechnie *et al.* (1975). Those studies were conducted over many years by groups of experienced collectors from Stanford University and elsewhere in connection with projects to study quantitative gene flow and other biological features of this species (Brussard *et al.* 1974, Ehrlich 1965, 1979, Ehrlich *et al.* 1975, Ehrlich *et al.* 1980, Johnson *et al.* 1968, Murphy and Ehrlich 1980, White and Singer 1974). In attempting to actually measure gene flow, these researchers risked error to the extent that they were unable to locate all existing geographic links or stepping-stone colonies. The Service believes that the distribution data for *Euphydryas editha*, of all subspecies, are both generally accurate and reasonbly complete.

The Bay Checkerspot Butterfly Review Panel (1986) examined the relevant literature, and reviewed it in considerable detail. Its members reported unanimous agreement that *Euphydryas editha bayensis* is a valid subspecies whose description meets all the pertinent requirements of the International Code of Zoological Nomenclature, that it has been continuously recognized as a valid subspecies in all major works since its description, that its recognized populations considered together have phenotypic, geographic and ecological integrity, and that its currently recognized range (present and former) is in San Francisco, San Mateo, western Santa Clara, and Alameda Counties, California. They believed no other known populations should be included in the subspecies *E. e. bayensis*. On the basis of the best scientific information presently available, therefore, the Service accepts the recommendation of its scientific review panel.

The remaining subject of comments relating to status for listing (threats to bay checkerspot butterfly habitat from various human activities and projects) attracted by far the most attention and comment.

Three comments indicated that the bay checkerspot butterfly cannot be endangered if it survived farming, construction of an interstate highway, carbon monoxide poisoning from cars using that highway, repeated sprayings of malathion, destruction by off-road

vehicles, and years of intensive livestock grazing. Two comments opposed to the listing of the bay checkerspot butterfly stated that Interstate 280 destroyed hundreds of acres of serpentine outcrops and presumably many bay checkerspot butterflies and their larval host plants. The latter comments also noted that construction of Interstate 280 was vigorously supported by many of those now hoping to block development of a golf course at Edgewood Park.

The Service responds that, except for carbon monoxide, the factors referred to in these comments may have all contributed to the critical situation now faced by the bay checkerspot butterfly. The fact that the butterfly survives despite these many assaults on its habitat and populations cannot be construed as evidence for its immortality. Processes leading up to extinction happen over time, usually resulting from a combination of many factors and events. The butterfly survives now in a much depleted and highly vulnerable condition. Determination of threatened status relates to the application of the five factors identified in section 4(a) of the Endangered Species Act, any one of which may make a species eligible for listing. The five factors and their application to the bay checkerspot butterfly are presented in the section "Summary of Factors Affecting the Species." The elimination of former extensive serpentine grasslands as a result of the construction of Interstate 280 is well known. This is one of the activities contributing to the decline of the bay checkerspot identified in the original proposal.

One comment in opposition to the bay checkerspot listing stated that the Service merely assumes that modification of present bay checkerspot habitat would seriously reduce the size of the colonies and that habitat will be adversely modified by the various proposed projects. Another comment stated that the Service only assumes that a reduction in the size of the butterfly colonies would result from a severe, prolonged drought.

The Service responds that several developments are proposed or underway for the largest remaining habitats of the bay checkerspot butterfly. Many of those plans call for elimination and/or increased fragmentation of portions of the bay checkerspot's habitat. The Service also notes that the past detrimental effects of drought on bay checkerspot populations are well documented in the literature cited (Ehrlich et al. 1980, Ehrlich and Murphy 1981). The Service believes that these various factors and activities have the potential to contribute to significant further declines in an already severely depleted and geographically fragmented subspecies. Without measures to actively manage and enhance colonies of the bay checkerspot butterfly, the likelihood of its extinction will be increased significantly.

Only a few threats to the largest and therefore the most important habitat, near Morgan Hill, California, were described in comments. Lawyers for United Technologies Corp. evidently assumed that controlled burning there in continued conformance with Santa Clara County fire safety codes would pose a threat to the colony and automatically be prevented. They also mentioned a great number of activities involving the Federal Government, national security, and/or national defense that might be involved in threats to the colony at some future time. They criticized the Service for failing to list these aspects of the Morgan Hill proposed critical habitat in the proposed rule.

The Service responds that the comments and other available information regarding habitat on the property owned by United Technology Corp. indicate the colony there is numerically small and scattered on serpentine deposits having suboptimum conditions, but is otherwise in relatively good condition. The Service believes that the past activities conducted on the property, including limited grazing, and controlled burning outside of areas actually occupied by the butterfly, have presented no significant threats to the colony. Consultation with the Santa Clara County and San Jose City Planning Departments indicated that there are no plans for urban or commerical development on United Technologies property that would seriously alter the habitat. At present, all of the serpentine grassland habitat at Morgan Hill is zoned as open space. On that basis no specific threats were identified for United Technologies property actually occupied by the butterfly when the rule was proposed. The situation remains unchanged. Threatened status is appropriate for the bay checkerspot butterfly because, although the Morgan Hill site provides the largest remaining habitat for the butterfly, and a conservation agreement has been developed to help protect the species over about thirty percent of the habitat there, approximately seventy percent of the habitat remains in an uncertain, highly vulnerable status and could later be rezoned for development under the State zoning laws. Moreover, while it is the intent of the conservation agreement to restore habitat damaged by the landfill, through reconstitution of serpentine grassland and enhancement of carrying capacity on undisturbed habitat by intensive grazing controls or other artificial methods, the Service notes that the best-intentioned restoration and management programs for biological systems can and often do inadvertently sustain losses or otherwise fail to fully achieve their intended goals. Appropriate long-term assurances are provided in the Morgan Hill conservation agreement in case the restoration and management programs do not adequately minimize or compensate for adverse impacts from the landfill project.

Former U.S. representative Ed Zschau, the U.S. Air Force, the U.S. Navy, the Bureau of Reclamation, the Western Area Power Administration, the County of Santa Clara, the City of San Jose, United Technologies Corp., Pacific Gas and Electric Company, and Waste Management of California Inc. all expressed concern over the listing of the bay checkerspot butterfly as an endangered species and the proposed designation of critical habitat in the Morgan Hill area. Several expressed the hope that the Service would not list the species prematurely, without benefit of adequate study. Congressional and military concern was general, the correspondents expressing fears that activities at United Technologies Corp. vital to the national interest could conflict with the butterfly and possibly be affected by the listing or designation of critical habitat. The County of Santa Clara and United Technologies Corp. also questioned the inclusion of large areas of non-serpentine habitat in the description of critical habitat at Morgan Hill.

The Service refers these correspondents to its response to United Technologies Corp. above. Although the Service is not directly concerned in this final rule with designation of or exclusions from the proposed critical habitat, it also wants to elaborate to these correspondents the function of its regulations at 50 CFR 424.12, according to which the description in the proposed rule was made. Section 424.12(e) provides that if several sites, each satisfying the requirements for designation as critical habitat, are located in proximity to one another, an inclusive area may be designated. Section 424.12(c) directs the Service to use non-ephemeral reference points in making any designation. The informational function of such

designation is served best if the reference points can be located easily on maps and in the field. Inclusive references inform Federal agencies of critical habitat within, and are easily revised if better data, maps, or landmarks become available. Reports by Harvey and Stanley Associates (1983), Dibblee (1973), Soil Conservation Service (1974), and Dr. Dennis Murphy (pers. comm.) illustrate that the appropriate serpentine habitat near Morgan Hill is patchy and discontinuous in a generally linear band approximately 7,500 feet wide, extending from northwest to southeast between Metcalfe Road and Anderson Dam.

The Bureau of Reclamation, the Western Area Power Administration, the County of Santa Clara, and Pacific Gas and Electric Company were all concerned about a 115 kV transmission line proposed to cross the Morgan Hill habitat area between Metcalfe Substation and a planned Bureau of Reclamation pumping plant at Coyote, part of the San Felipe Project. The Bureau of Reclamation indicated that the Western Area Power Administration would address the impacts of this proposed action in the environmental documents being prepared for the project.

The Service responds that it is aware of this project and has been in communication with the Western Area Power Administration. Adequate planning and some design modifications have been implemented to avoid adverse impacts to the butterfly.

Waste Management of California, Inc. requested that the bay checkerspot butterfly be listed as threatened as opposed to endangered. The company developed and is now implementing a conservation agreement for the butterfly in conjunction with their landfill project in the Morgan Hill habitat area. This agreement is intended to off-set and compensate for the adverse impacts of Waste Management's landfill on the butterfly and its habitat. Waste Management believes that the implementation of this program decreases the threats to the species. Waste Management further requested that if threatened status were determined then special regulations be issued to authorize the incidental taking of butterflies for the landfill. Waste Management's representative also requested that the Service delay the designation of critical habitat in this area until the final habitat conservation program has been submitted to the Service.

The Service acknowledges the conservation agreement for the landfill and encourages such coordination efforts. The decision to change the listing status of the bay checkerspot butterfly from endangered to threatened is, in part, a result of the landfill agreement. However, the agreement *per se*, does not significantly change the status of the species as a whole, or benefit a majority of the species' distribution. The landfill will eliminate an estimated 6–10 percent of the low to moderate quality proposed critical habitat at Morgan Hill. The agreement commits Waste Management, or any of its assigns, responsibility to undertake species conservation activities and funding for 10 years, including managing grazing to enhance population levels and carrying capacity, developing and implementing methods for reestablishing and repopulating serpentine grassland habitat destroyed by the landfill, establishing butterflies in former habitat, and providing for habitat acquisition in the event the other measures prove unsuccessful or inadequate. As a consequence of the above, the Service issued a conference opinion that the conservation agreement was not expected to reduce appreciably the likelihood of survival and recovery of the bay checkerspot butterfly. Although this program does not substantially improve the status of the species as a whole, it does provide a significant legal mechanism that is expected to compensate for the adverse impacts of the landfill project. If further efforts were undertaken to manage the remainder of the Morgan Hill proposed critical habitat, the conservation of the species could be substantially advanced. A further discussion of why threatened status has been determined is provided in the section "Summary of Factors". The delay of critical habitat designation announced in this final rule is not a response to Waste Management's specific request.

With regard to Waste Management's request for special regulations to allow the take of the bay checkerspot butterfly if threatened status is determined, the Service acknowledges the availability of special regulations under section 4(d) of the Endangered Species Act, but finds in this situation special regulations are not necessary. The landfill activity has been covered by the incidental take statement in the Service's conference biological opinion, which will be evaluated for adoption as a final biological opinion after this listing becomes effective, provided there are no significant changes in the facts or the project design since the date of the conference opinion.

Three comments in favor of listing the bay checkerspot as an endangered species stated that the proposed sanitary landfill poses a significant threat to the butterfly. One also expressed concern that excavation at the landfill site would produce crysotile asbestos dust that could extend damage or adverse effects to areas well outside the actual landfill site and excavation area.

The Service concurs with the concerns expressed about asbestos dust, which has been an issue in other areas having the same soil type. The Service also is aware that the landfill itself could eliminate butterfly habitat, which relates more directly to the status of the species. The Service, in coordinating through the section 7 conference process with all parties involved in the development of the landfill site, has determined that careful and attentive implementation of Waste Management's habitat conservation program is not likely to reduce appreciably the survival and recovery of the bay checkerspot butterfly.

Since elimination of the large bay checkerspot butterfly colony at Woodside, the second largest area of primary habitat for the butterfly is in Edgewood Park in San Mateo County. A golf course and recreation facility proposed by the county for the park were identified as posing threats to this habitat in the proposed rule. The greatest number of individual comments, for and against listing this butterfly, related directly to the Edgewood Park habitat area.

An entomologist provided additional data on the bay checkerspot population numbers at Edgewood Park, indicating a dramatic decline since 1981 from more than 100,000 down to between 2,000 and 3,000 in 1984. He attributed the reductions in 1983 and 1984 to adverse weather conditions in 1982 and 1983. In 1985 the population was estimated at fewer than 1,000, in 1986 fewer than 500, and in 1987 the population remained at about 500 to 1,000 (Murphy, pers. comm., July 1987). The Service notes that the Edgewood population may now be considerably smaller than that needed for recovery and long-term population viability at this site.

A geologist who supported the proposed listing discussed the possible transmission of waters through the serpentine body at Edgewood Park. He expressed concern that golf course irrigation could enter the serpentine fracture system and resurface within or near bay checkerspot populations. He noted that this water could carry various chemicals such as insecticides, herbicides, and fertilizers from the nearby golf course and that such transmissions could inadvertently

damage or destroy the bay checkerspot population at Edgewood Park.

A licensed pest control operator, in support of listing the bay checkerspot butterfly, provided information on likely adverse effects of insecticide and herbicide applications for a golf course at Edgewood Park. He warned of that chemical drift could either kill the bay checkerspot outright and/or kill the butterfly's obligate host plants.

The County of San Mateo and 10 individuals expressed concern that listing the bay checkerspot butterfly would block the proposed golf course at Edgewood Park. Most of those commenting in this vein indicated that the Endangered Species Act is being used by local environmentalists to halt San Mateo County's recreation plans for Edgewood Park, specifically, the golf course development.

The Service responds that identifying and listing endangered or threatened species pursuant to the Endangered Species Act, as amended, is a requirement mandated by Congress. Furthermore, as noted by another comment, the Service must look *solely* to the best scientific and commercial information available when making a decision on a proposed listing of an endangered or threatened species under section 4 of the Endangered Species Act. Economic or other non-biological factors can not be considered in the listing decision. (See H.R. Conf. Rep. No. 835, 97th Cong., 2d Sess. 19 (1982).) In making its decision in this issue, the Service has relied solely upon the best available biological and commercial information. The Service recognizes that such listings may affect various State and local entities and planned and approved development proposals through the local planning process, even though Federal listings primarily affect Federal activities that may pose impacts to the bay checkerspot butterfly.

Twelve comments pointed out that the golf course as planned was designed to protect as much of the butterfly's habitat as possible. They further indicated that the golf course would not "wipe out" the butterfly and thus does not pose a threat. One comment stated that there is no basis for inferring that any future single event will cause the demise of the bay checkerspot butterfly. The County of San Mateo submitted a Specific Conservation Program that it believes can accommodate the golf course as well as protection of the butterfly.

The Service responds that the proposed golf course at Edgewood Park is only one of many activities and factors that may adversely affect the bay checkerspot butterfly. San Mateo County's Stage II Final Supplement to the Environmental Impact Report (1984) identified environmental effects of the proposed Master Plan for Edgewood Park, which includes the proposed golf course development and other recreation facilities. This document indicated that 42 to 64 percent of the serpentine grassland habitat at Edgewood Park would be destroyed as a result of Master Plan implementation and that there would be significant adverse effects to the bay checkerspot butterfly and irreversible losses of individuals and colonies. Because local extirpation or further declines of the bay checkerspot are likely even without disturbance, the Service believes that the existing Master Plan (San Mateo County 1984) contains substantial additional threats to the bay checkerspot butterfly. This does not mean, however, that modifications or alternative designs could not alleviate or significantly reduce these threats. The Specific Conservation Program (San Mateo County 1985) provides one alternative design. San Mateo County and one individual opposed to the listing pointed out that not all of the serpentine area within Edgewood Park is occupied by the butterfly. San Mateo County further stated that some of the proposed habitat area at Edgewood Park has not been and could not be viable habitat for the butterfly.

The Service responds that habitat identification in all areas is based on detailed survey information from a variety of sources. In the Edgewood Park area, information sources included Torrey and Torrey Inc. (1982), Reid and Murphy (1983), and Dr. Dennis Murphy (pers. comm.). The situation there is similar to that at Morgan Hill, in that serpentine grassland occupies about 20 percent of the park. It forms a nearly continuous band varying in width from about 250 to 2,500 feet surrounding a central ridge formed by an uplifted core of Franciscan greenstone. The distribution of adult butterflies, larvae, and host plants within the encircling serpentine matrix shows two disjunct areas of high butterfly concentration, one along the western edge of Edgewood Park, and the other near Hillcrest Way. There are several sites of lesser occurrence between these two sites and on the north side of the central ridge. Again, because of the disjunct distribution of host plants, larvae, adults and serpentine soils within the park, the map in the proposed rule outlined an inclusive area with convenient, non-ephemeral boundaries. Such boundaries serve to inform Federal agencies that habitat exists within that may be affected by Federal activities, funding or permits.

One comment stated that the habitats of the bay checkerspot butterfly at Jasper Ridge and San Bruno Mountain are not threatened. The commenter further qualified the statement by noting that the San Bruno colony is protected by the San Bruno Mountain Area Habitat Conservation Plan and the Jasper Ridge colony is protected as a biological preserve.

The Service replies that, indeed, no developments are proposed in these two areas that would adversely affect the bay checkerspot. However, observations of the bay checkerspot at San Bruno Mountain over the last four years indicate the colony is small, declining, and likely to disappear. The habitat is considered marginal as described below under "Summary of Factors." In 1984, fewer than 50 bay checkerspot butterflies were observed at the site. In 1986, a wildfire swept through the site. In 1987, no bay checkerspot butterflies were observed at San Bruno Mountain, and it is possible the population has been extirpated. The San Bruno Mountain Habitat Conservation Plan (County of San Mateo 1982) provides no specific provisions for protecting or managing the bay checkerspot colony other than leaving the habitat as natural open space.

The Jasper Ridge colony occurs within a biological preserve of Stanford University that is used for biological research. Although no developments are proposed for this area, the serpentine outcrop is small, and the grassland habitat is fragmented and interspersed with chaparral non-habitat. Consequently, the attendant small bay checkerspot colony is subject to severe fluctuations in population levels. This colony once consisted of three demographic units (Ehrlich and Murphy 1981), but it now consists of two as a result of drought-induced extirpation of one unit in the mid-1970s. If the drought had continued one more year, it is considered likely that all three units would have succumbed (Ehrlich and Murphy 1981, Ehrlich *et al.* 1980). These factors were emphasized in a letter of comment from the President of Stanford University that supported the listing.

The Service believes that the San Bruno Mountain and Jasper Ridge colonies, although relatively unthreatened by human activities, face a high probability of extirpation from natural factors such as prolonged drought.

The California Department of Fish and Game called attention to the proposed rule's inaccuracy of referring to habitat in Redwood City as the Woodside zone. Although the colony there is or was a

remnant on the edge of the former large butterfly colony in Woodside, the Service agrees with this recommendation and will refer to that area in the future as the Redwood City area or zone.

One comment stated that the Service assumes that because no Federal or State regulations exist to protect the bay checkerspot, no efforts are being made to preserve it. The City of San Jose, the County of San Mateo, and Santa Clara County all indicated that their environmental review process and various regulations help protect and provide measures to mitigate impacts to the butterfly. One comment stated that Federal listing cannot help these local efforts to protect the butterfly. Several comments stated that we should try to refurbish the habitats or move the organisms rather than just declare them to be endangered and then allow them to become extinct.

The Service replies that it recognizes the efforts of local agencies and individuals to protect the butterfly; however, Federal listing is required for any species fitting the definition of a threatened or endangered species after careful consideration of the five criteria outlined in seciton 4(a) of the Act. The Service is required by law to list the bay checkerspot as threatened because it clearly qualifies under these criteria. Whether the listing will assist local efforts to protect the butterfly is not pertinent to listing itself; recognition of threatened status makes a statement about the survival prospects of the species. The Service hopes, however, that Federal listing will help promote the conservation of the bay checkerspot through protective measures otherwise unavailable to local agencies and individuals. For example, Federal listing restricts the taking of the bay checkerspot butterfly pursuant to section 9(a)(1) of the Act. Moreover, Federal listing provides additional opportunities for the management and recovery of the species directly, by developing and implementing a recovery plan, and through cooperation with the State of California via Section 6 of the Act. Further discussion of the benefits of listing can be found below under the heading "Available Conservation Measures".

Agencies whose comments extended general support for listing included the National Park Service (Regional Office and Golden Gate National Recreation Area), which commented that Federal listing is required for the bay checkerspot butterfly to effect needed protection, and the California Department of Fish and Game, which also provided specific information on the occurrence of, and threats to, the butterfly. Their data was in agreement with the information presented in the proposed rule.

The Conservation Monitoring Centre and the Butterfly Specialist Group of the International Union for the Conservation of Nature and Natural Resources (IUCN), and Dr. Thomas W. Davies of California Academy of Sciences (Department of Entomology) also provided opinions and substantive data from other scientists. An IUCN report on this butterfly (Wells et al. 1983) in the Invertebrae Red Data Book affirms significant threats for the San Bruno, Jasper Ridge and Edgewood Park colonies. The letter from the California Academy of Sciences described former habitats and confirmed the loss of bay checkerspot colonies in Alameda County that resulted from home construction, plantings of Monterey pine, and drought.

Twelve chapters representing eight private conservation organizations registered support for the listing in letters and oral comments at the public hearings. A person that testified for one private organization did not support the listing. None of these testimonials added substantive information regarding the butterfly's status or threats not already in the record, but the Service appreciates the interest and concern shown.

With respect to procedures related to the proposed listing, one comment complained about the conditions at the public hearing. The complainant stated that the public address system did not work at first, and then later it played music, making it difficult to hear the speakers. He stated that the Service used too much time explaining the reasons for listing the species; concepts that were previously discussed in the **Federal Register.** He noted equal time was not allowed for each side to present relevant facts; with the specific example that a videotaped presentation prepared by Mr. Robert Trent Jones was delayed until after 10 o'clock and by that time most of the audience had left.

The Service apologizes for any inconvenience to the audience for the public address system, but this did not appear to be a significant problem at the meeting. Several other commenters stated that they thought the procedures and conditions at the public hearing were very good. The court recorder did not report difficulties, and the transcripts are evidently complete. The hearing officer ensured that all those wishing to comment were given adequate time to present relevant facts. No one was denied an opportunity to speak, and the hearing was extended to accommodate all speakers. Mr. Jones' video recording was held until last so that all individuals actually present would be given an opportunity to speak first. The Service considered that presentations on the provisions of the Act and background information in support of the listings were necessary to clarify the proposal and ensure everyone was familiar with the purpose of the public hearing.

United Technologies Corp. and two individuals commented on listing procedures noting that there was insufficient notification of the proposal and the public hearing. A concerned citizen stated that the file information on the listings was not reasonably available to people in the local area. United Technologies further alleged that they were denied due process in this proceeding, that the Service failed to follow the notice requirements specified in the listing regulations, that the newspaper publication was inadequate for the proposed rule, that the Service erred by adding the Morgan Hill critical habitat site to the proposed rule after the petition had been filed with the Service, and that the Service erred in denying United Technologies an opportunity for a second public hearing.

The Service responds that the Act and 50 CFR 424.16(c) require that notifications of the proposal and the public hearing be made public through notices published in the **Federal Register** and in local newspapers (refer to the previous background section for specific newspapers and publication dates). The Service provided all required notices under 50 CFR 424.16(c)(1)(iii). The Service published its proposed rulemaking in the **Federal Register** on September 11, 1984. "Actual notice" of the proposal was given to the California Department of Fish and Game and to each county in which the bay checkerspot butterfly was believed to occur. To the extent the Service had knowledge of the potential impacts proposed by the listing to any Federal agencies, local authorities, or private individuals or organizations, notice was provided to these entities and individuals. It should also be noted, however, that actual notice (by individual letter) is not a regulatory requirement under 50 CFR 424.16(c)(1)(iii) and that only a good faith effort is required on the part of the Service to notify states and counties and to determine the jurisdictions within which the species is believed to occur. "[A]n unintentional and unplanned failure of the notification system shall

not invalidate the proposed regulation." (H.R. Conf. Rep. No. 1804, 95th Cong., 2d Sess. 27 (1978).) With regard to the newspaper publication, United Technologies Corp. fails to point out specific facts concerning why the newspaper publications were inadequate. Given the extensive public record developed by the Service on the proposed rule and the full participation by development interests, the public, environmental groups, and various Federal, State, county, and city officials in the rulemaking process (and in particular the extensive participation by United Technologies), the Service is confident that it has fully complied with the procedural requirements of the regulations. To the extent it is entitled to procedural due process in an Endangered Species Act rulemaking, United Technologies and all other interested parties have been accorded adequate opportunity to comment numerous times on the proposed rulemaking and, along with all other members of the general public, have received all of the public notices that are provided for by the statute and the regulations. No other notice or hearing responsibilities are required to be fulfilled by the Service under the Endangered Species Act or the listing regulations, and United Technologies has failed to point out facts that would entitle it to any special procedural rights.

With respect to the reasonable availability of the file information, the information was available at the Service's Regional Office in Portland, Oregon. A phone number and address were provided in the notifications for those wishing to ask questions or inquire about the file information. The Service's file information was also available through the Freedom of Information Act, and was requested by several parties. The Service considers that all procedural requirements of the Act have been met.

With respect to United Technologies comments regarding inclusion of the proposed Morgan Hill critical habitat after the petition, the site was clearly indicated in the proposed rule. Any failure on the petitioner's part to include the site within the scope of their petition is not fatal to the rulemaking process, since the proposed rule undergoes a complete regulatory review that provides for public notice and comment on the expanded proposal. Moreover, the petitioner was under no duty to address the issue of critical habitat in a listing petition. The Service had complete authority to accept the new information concerning the Morgan Hill critical habitat site and incorporate it into a proposed rule after evaluating the information.

With respect to the requirement for a second hearing, as recommended by United Technologies, although the Service was not required to do so, the Service held a second hearing on July 16, 1986, to resolve differing scientific interpretations of data concerning newly discovered populations of checkerspot butterflies. United Technologies fully participated in the second public hearing, and, therefore, allegations that they have been denied the opportunity to personally appear before the Service during a public hearing no longer have weight. The Service further clarifies that written comments carry equal weight with those presented at public hearings. No special authority or significance is accorded oral statements made at public hearings.

In light of all of the notice and public comment opportunities accorded by the Service in the rulemaking process for the bay checkerspot butterfly listing, it is not necessary that the Service publish a second proposed rule to rectify alleged procedural infirmities. The Service's administrative record is complete for the issuance of a final listing rule.

In its May 16, 1985, comments, United Technologies objected to the listing of the bay checkerspot butterfly and designation of its critical habitat on the grounds that such proposed actions "would constitute a (taking) of [United Technologies] private property for public use without just compensation, in violation to the Fifth Amendment" to the Constitution of the United States. United Technologies also contended that the listing and critical habitat procedures provided for in the Endangered Species Act are unconstitutionally vague.

The Service responds that the constitutional issues raised by United Technologies challenge the fundamental procedural process provided by Congress for the listing of endangered and threatened species and the designation of their critical habitats, if any. As such, these contentions cannot be addressed in the final rule because the Service's determination on whether to list the bay checkerspot butterfly cannot be influenced by non-biological factors. The Service can state, however, that no federal court has determined that the listing procedure provided for in Section 4 of the Endangered Species Act is unconstitutionally vague. Furthermore, the biological standards specified in section 4(a)(1) of the Act are not vague and have been followed by the Service since the Act was first passed in 1973 to determine the appropriateness of listing species under section 4. In regard to the contention that the property of United Technologies has been "taken" by the Service's action, the Service replies that United Technologies failed to indicate how such taking will occur and why this rulemaking process *per se* would effect such a taking. The section 4 listing procedure requires the Service merely to analyze biological factors to determine the scientific appropriateness of classifying wildife or plant species as endangered or threatened. Once that procedure is accomplished, other procedures exist, either through section 7 of section 10 of the Act, to analyze impacts posed by particular development projects on endangered or threatened species. At present, facts have not been presented to show that a taking of United Technologies property would occur as a result of a final listing of the bay checkerspot butterfly. United Technologies has failed to make a showing of actual conflicts between its activities and the regulatory action taken by the Service in listing the bay checkerspot butterfly under Section 4 of the Endangered Species Act. Further, United Technologies has failed to show that the statutory procedures for listing species as endangered or threatened, or the application of such procedures to the bay checkerspot butterfly, are unconstitutionally vague. The Service is under a statutory obligation to follow through with the listing process based on the best available scientific and commercial information.

Further, United Technologies is not entitled to compensation for its expenses incurred in investigating and defending against this proceeding. The section 4 listing process is not an adversary proceeding, but rather is the Service's public involvement process for obtaining the best available information before making a final decision on listing proposals.

Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that the bay checkerspot butterfly *(Euphydryas editha bayensis)* should be classified as a threatened species. Procedures found at section 4(a)(1) of the Endangered Species Act (16 U.S.C. 1531 et seq.) and regulations promulgated to implement the listing provisions of the Act (50 CFR Part 424) were followed. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section

4(a)(1). These factors and their application to the bay checkerspot butterfly *(Euphydryas editha bayensis)* are as follows:

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

Geologic map sheets show four large serpentine outcrops that all probably once constituted primary habitat for the bay checkerspot butterfly. A large outcrop at San Leandro in Alameda County had a historic bay checkerspot population, but apparently no longer supports the butterfly. San Mateo County has two such large outcrops, one at San Mateo, lying northeast of Crystal Springs Reservoir and extending southeast beyond the intersection of Interstate Highway 280 and Highway 92, and a second one extending from what is now Edgewood Park eastward to Woodside Road. Habitat on the San Mateo outcrop was almost eliminated by construction of Interstate Highway 280, although a remnant colony or recolonization is reported near the highway intersection mentioned. Habitat on the second outcrop is fragmented into smaller units by urbanization and road construction. A very significant fraction remains in Edgewood Park, but the portion in Woodside was largely eliminated by housing development, leaving a very small (approximately 26 acre) remnant inside the city limits of Redwood City. The Edgewood Park habitat segment is now the second largest remaining area of bay checkerspot habitat and appears to be vital to the species' continued survival. The fourth and largest serpentine outcrop in the known range occurs in Santa Clara County. It extends in a narrow belt about 16 miles from Hellyer Canyon to near the southeast end of Anderson Lake. The portions of this outcrop northwest of Metcalf Road and southeast of the Coyote Creek outlet from Anderson Lake appear to have been adversely modified by overgrazing. The remaining segment on the east face of Coyote Creek Valley between Metcalf Road and the Anderson Lake outlet supports the largest and most robust remaining colony of these butterflies and also appears to constitute the most vital population reservoir.

Approximately 26 smaller serpentine outcrops are mapped in or close to the known range of the bay checkerspot butterfly in Alameda, San Francisco, San Mateo and Santa Clara Counties. The best-studied bay checkerspot butterfly colony on such an outcrop is in the Jasper Ridge Biological Preserve of Stanford University, located east of Searsville Reservoir. Very detailed studies there revealed the existence of three distinguishable demographic (interbreeding) units within the single colony, but drought extirpated one of those in 1964 and again in 1974, and conservative extrapolations predicted the extirpation of the other two units as well if the 1975–1977 drought had lasted only one year longer.

Satellite colonies similar to the one at Jasper Ridge were observed to become extirpated by habitat modification at Joaquin Miller in Alameda County, and in 1977 by combined drought and habitat modification near Hillsborough in San Mateo County, near Silver Creek and west of Uvas Reservoir in Santa Clara County, and at Morgan Territory Road, in Alameda County. The colony at Morgan Territory Road had previously existed in close proximity to a *Euphydryas editha luestherae* colony on a serpentine formation at nearby Mount Diablo. In 1985, Dr. Richard Arnold found bay checkerspot butterflies at two small outcrop localities in Santa Clara County where they were previously unreported, one west of Calero Reservoir, and one about 2.5 miles west southwest of San Martin. Whether these are recolonizations since 1977 from the Morgan Hill colony about 5 miles away, or survived the last severe drought stress *in situ* cannot be determined, but they are on serpentine grassland habitats smaller than some occupied by colonies that disappeared in 1977. The small portions of former primary habitat in Redwood City and in San Mateo have been fragmented by urbanization, and colonies on them can be expected to act in the future as satellite colonies. The colony in Redwood City may be extirpated, as no butterflies have been observed there in the past four years.

Serpentine grassland sites that have probably supported satellite colonies of *E. e. bayensis* at one time or another are found in San Francisco County in a row of seven sites from Fort Point to Hunter's Point, at two sites in Alameda County, near Albany and near Lexington, and at 15 more sites in Santa Clara County, one south of Saratoga, one east of Lexington Reservoir, four sites between Guadalupe Reservoir and New Almaden, three sites lying north, south and west of Chesbro Reservoir, two sites in Santa Theresa Park, and four sites near Gilroy and along Sargent Fault. Many of these sites were surveyed briefly by Dr. Richard Arnold during the adult butterfly flight season in 1985 without establishing the presence of bay checkerspot butterflies, and his comments note that most of the sites he visited in Santa Clara County appeared to be overgrazed.

Marginal non-serpentine grassland habitat that has supported recorded colonies of the bay checkerspot butterfly occurred in Alameda County at Berkeley (extirpated), San Francisco County at Twin Peaks and Mount Davidson (both extirpated), San Mateo County at Brisbane (extirpated) and San Bruno Mountain (possibly extirpated), and in Santa Clara County near Coyote Reservoir (extirpated). Dr. Arnold has noted the presence of similar possible habitat in the vicinity of San Francisco Jail, on Sweeny Ridge, and in San Pedro Valley in San Mateo County.

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

Although specimens of the bay checkerspot butterfly are valuable to collectors, overcollecting has not been identified as a threat to any colony. To discourage unnecessary collecting, Stanford University offers old specimens from its museum on an exchange basis.

C. Disease or Predation

Ninety to ninety-nine percent of bay checkerspot butterfly larvae die of starvation while in prediapause instars. Three to twenty-four percent of the remaining postdiapause larvae at the Jasper Ridge colony are killed by three species of parasitoids (Ehrlich et al. 1975). Because of high prediapause mortality and because the greatest parasitism only occurs during years of high butterfly numbers, even this high rate of parasitism is not a major factor in determining the size of any bay checkerspot butterfly population. In years of large butterfly numbers, the majority of the butterflies still escape parasitism and provide recruitment in subsequent years.

D. The Inadequacy of Existing Regulatory Mechanisms

The bay checkerspot butterfly is not adequately protected from habitat loss, illegal collection, or harm under State or local regulations. Federal listing would provide additional protection to wild populations of this butterfly.

E. Other Natural or Manmade Factors Affecting its Continued Existence

Habitat damage can reduce the carrying capacity of a habitat or the size of a colony to a level at which natural climatic changes lead to extinction. The drought of 1976 and 1977 in association with overgrazing caused the disappearance of four colonies of the bay checkerspot butterfly (Murphy and Ehrlich 1980), and greatly reduced the

Jasper Ridge population (Ehrlich et al. 1980). This drought also caused the extirpation of some populations of another subspecies of *Euphydryas editha* (Ehrlich et al. 1980). It is likely that a particularly severe or prolonged drought would be disastrous to most of the remaining colonies.

The bay checkerspot butterfly occurs on grasslands of Montara or other serpentine or similar soils that function as habitat islands, disjunct from one another, and surrounded by unsuitable habitat. The five known occupied sites are geographically disjunct, the northernmost site on San Bruno Mountain and the southernmost, a 6000+ acre area located near Morgan Hill. Two of the five disjunct colonies are small enough to be subject to periodic natural extinctions. Threats of continued habitat and population losses, and the already substantially increased distances among the remaining colonies has significantly reduced the likelihood of natural recolonization and survival.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by this species in determining to make this rule final. Based on this evaluation, the preferred action is to list the bay checkerspot butterfly *(Euphydryas editha bayensis)* as a threatened species. The documented loss of many former populations throughout a significant portion of the butterfly's range, the low population levels at all but one of the remaining colonies, and the high potential for continued habitat loss from planned and ongoing urban development, support listing as threatened. The Service finds that the conservation agreement initiated by Waste Management at the Morgan Hill site provides a useful legal mechanism that is expected to compensate for the adverse impacts of the landfill project. The Service also finds that the Waste Management conservation agreement could substantially assist with the conservation of the species at the Morgan Hill site if such efforts were expanded to include the additional habitat outside of the landfill area and leased lands, which encompass the remaining portion (about 70 percent) of the habitat at Morgan Hill. Threats at Edgewood Park are largely potential, depending upon the pending golf course proposal. The Jasper Ridge colony, although in protective ownership, remains susceptible to periodic threats of drought. The two recently extirpated colonies at San Bruno Mountain and Woodside seem to be in secure, protective ownership and, although small and thus more susceptible to periodic environmental stochasticity, remaining habitat at each appears to offer substantial potential for reestablishment. Thus, while the bay checkerspot butterfly is not presently in danger of extinction throughout a significant portion of its range, the Service finds that this subspecies is likely to become an endangered species within the foreseeable future throughout a significant portion of its range, and a "threatened" classification is appropriate.

Critical Habitat

Section 4(a)(3) of the Act requires that critical habitat be designated to the maximum extent prudent and determinable concurrently with the determination that a species is endangered or threatened. The Service believes that prompt determination of threatened status for the bay checkerspot butterfly is essential and warranted by the best scientific information available. However, critical habitat is not determinable at this time and it must be postponed.

Section 4(b)(2) of the Act requires the Service to consider economic and other impacts of designating a particular area as critical habitat. The remaining colony sites for the bay checkerspot butterfly exist in an area with a large human population and competing proposals for land use. The habitat identification process seeks to resolve a complex interdigitation of primary, permanent habitat, habitat having transitory and variable value to survival, and non-habitat. Because of these complexities and the extent of the activities being assessed, the Service has not completed the analyses required by sections 4(a)(3)(A) and 4(b)(2) of the Act in respect to the designation of critical habitat, and, therefore, a final critical habitat designation is not yet determinable.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing encourages and results in conservation actions by other Federal, State, and private agencies, groups, and individuals. The Endangered Species Act provides for possible land acquisition and cooperation with the States and requires initiation of recovery actions by the Service following listing. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat. Regulations implementing this interagency cooperation provisions of the Act are codified at 50 CFR Part 402. Section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service. Federal activities that could affect this species and its habitat in the future include, but are not limited to, the following: the development of the San Bruno or Edgewood Park areas for recreation, the issuance of Federal permits or approvals for roads or transmission lines, or Federal funding or approval to build or construct any structures or facilities that might affect the bay checkerspot butterfly. The Act and implementing regulations found at 50 CFR 17.31 set forth a series of general prohibitions and exceptions that apply to all threatened wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take, import or export, ship in interstate commerce in the course of a commercial activity, or sell or offer for sale in interstate or foreign commerce any endangered or threatened wildlife species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered wildlife species under certain circumstances. Regulations governing permits are at 50 CFR 17.22, 17.23 and 17.32. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities. The permit issued to the County of San Mateo and the Cities of South San Francisco, Brisbane and Daly City under section 10(a) for incidental take of three endangered species pursuant to the San Bruno Mountain Habitat Conservation Plan does not cover the bay checkerspot butterfly. As a result, listing of the bay checkerspot

butterfly may require issuance of a new or amended section 10(a) permit.

National Environmental Policy Act

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

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Author

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List of Subjects in 50 CFR Part 17

Endangered and threatened wildlife, Fish, Marine mammals, Plants (agriculture).

Regulations Promulgation

Accordingly, Part 17, Subchapter B of Chapter I, Title 50 of the Code of Federal Regulations, is amended as set forth below:

PART 17—[AMENDED]

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

Authority: Pub. L. 93–205, 87 Stat. 884; Pub. L. 94–359, 90 Stat. 911; Pub. L. 95–632, 92 Stat. 3751; Pub. L. 96–159, 93 Stat. 1225; Pub. L. 97–304, 96 Stat. 1411 (16 U.S.C. 1531 *et seq.*); Pub. L. 99–625, 100 Stat. 3500 (1986), unless otherwise noted.

2. Amend § 17.11(h) by adding the following, in alphabetical order under "Insects," to the List of Endangered and Threatened Wildlife:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
Insects							
Butterfly, bay checkerspot	*Euphydrayas editha bayensis*	U.S.A. (CA)		T	288	NA	NA

Dated: September 14, 1987.

Susan Recce,

Acting Assistant Secretary for Fish and Wildlife and Parks.

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