Billing Code 4310-55

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–HQ–ES–2013–0073]

[FXES11130900000-156–FF09E42000]

RIN 1018–AY00

Endangered and Threatened Wildlife and Plants; Endangered Status for the Mexican Wolf

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), determine endangered status under the Endangered Species Act of 1973, as amended, for the Mexican wolf (*Canis lupus baileyi*). The effect of this regulation will be to revise the List of

Endangered and Threatened Wildlife by making a separate entry for the Mexican wolf. We are separating our determination on the listing of the Mexican wolf as endangered from the determination on our proposal regarding the delisting of the gray wolf in the United States and Mexico. This rule finalizes our determination for the Mexican wolf.

DATES: This rule becomes effective [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: This final rule is available on the internet at *http://www.regulations.gov* and *http://www.fws.gov/southwest/es/mexicanwolf/*. Comments and materials we received, as well as some of the supporting documentation we used in preparing this rule, are available for public inspection at *http://www.regulations.gov*. All of the comments, materials, and documentation that we considered in this rulemaking are available by appointment, during normal business hours at: Mexican Wolf Recovery Program, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, 2105 Osuna Road, NE, Albuquerque, NM 87113; by telephone 505–761–4704; or by facsimile 505–346–2542.

FOR FURTHER INFORMATION CONTACT: Sherry Barrett, Mexican Wolf Recovery Coordinator, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, 2105 Osuna Road, NE, Albuquerque, NM 87113; by telephone 505–761–4704; or by facsimile 505–346–2542. If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800–877–8339.

Further contact information can be found on the Mexican Wolf Recovery Program's website at *http://www.fws.gov/southwest/es/mexicanwolf/*.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Endangered Species Act (Act), a subspecies warrants protection if it is endangered or threatened throughout all or a significant portion of its range. Listing a subspecies as endangered or threatened can only be completed by issuing a rule. We proposed to delist the gray wolf and maintain protections for the Mexican wolf by listing it as an endangered subspecies on June 13, 2013 (78 FR 35664). At this time, we are finalizing the proposal to list the Mexican wolf as an endangered subspecies. Elsewhere in today's **Federal Register**, we are finalizing revisions to the regulations for the nonessential experimental population of the Mexican wolf.

We note that the United States District Court for the District of Columbia recently vacated the final rule at 76 FR 81666 (December 28, 2011) that removed protections of the Act from the gray wolf in the western Great Lakes. *Humane Society v. Jewell*, 2014 U.S. Dist. Lexis 175846 (D.D.C. December 19, 2014). The court's action was based, in part, on its conclusion that the Act does not allow the Service to use its authority to identify distinct population segments (DPSs) as "species" to remove the protections for part of a listed species. We have determined that the decision in *Humane Society* does

not change our conclusions in this final rule. First, the district court's interpretation of the Act is in error, and is in any case not binding on particular matters not at issue in that case. Second, the action here is distinguishable from that in *Humane Society*. Here, the Service is not designating a DPS, but is taking an action with respect to a subspecies of a listed entity. In addition, the Service is not reducing protections for the Mexican wolf or delisting it, but instead is confirming that it is an endangered species.

This rule will finalize the listing of the Mexican wolf as an endangered subspecies.

The basis for our action. Under the Act, a subspecies is determined to be endangered or threatened because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. We have determined the Mexican wolf meets the definition of an endangered subspecies primarily because of illegal killing, inbreeding, loss of heterozygosity, loss of adaptive potential, small population size, and the cumulative effects of the aforementioned threats. Absent protection by the Act, regulatory protection would not be adequate to ensure the survival of the Mexican wolf.

Peer review and public comment. Through the National Center for Ecological Analysis and Synthesis we sought comments from independent specialists to ensure that our designation is based on scientifically sound data, assumptions, and analyses. These peer

reviewers were invited to comment on our listing proposal. We also considered all comments and information received during the public comment period.

Background

Previous Federal Actions for Mexican Wolves

Gray wolves were originally listed as subspecies or as regional populations of subspecies in the contiguous United States and Mexico. We listed the Mexican gray wolf subspecies, *Canus lupus baileyi,* as endangered on April 28, 1976 (41 FR 17736), in the southwestern United States and Mexico.

In 1978, we published a rule (43 FR 9607, March 9, 1978) classifying the gray wolf as an endangered population at the species level (*Canis lupus*) throughout the contiguous United States and Mexico, except for the Minnesota gray wolf population, which was classified as threatened. At that time, we considered the gray wolves in Minnesota to be a listable entity under the Act, and we considered the gray wolves in Mexico and the 48 contiguous United States other than Minnesota to be another listable entity (43 FR 9607 and 9610, respectively, March 9, 1978). The separate subspecies listings thus were subsumed into the listings for the gray wolf in Minnesota and the gray wolf in the rest of the contiguous United States and Mexico.

The 1978 listing of the gray wolf was undertaken to address changes in our understanding of gray wolf taxonomy, and recognize the fact that individual wolves sometimes disperse across subspecific boundaries, resulting in intergradation of neighboring populations. The 1978 rule also stipulated that "biological subspecies would continue to be maintained and dealt with as separate entities" (43 FR 9609), and offered "the firmest assurance that [the Service] will continue to recognize valid biological subspecies for purposes of its research and conservation programs" (43 FR 9610, March 9, 1978).

Accordingly, we implemented three gray wolf recovery programs in the following regions of the country: the Western Great Lakes (Minnesota, Michigan, and Wisconsin, administered by the Service's Great Lakes, Big Rivers Region), the Northern Rocky Mountains (Idaho, Montana, and Wyoming, administered by the Service's Mountain–Prairie Region and Pacific Region), and the Southwest (Arizona, New Mexico, Texas, Oklahoma, Mexico, administered by the Service's Southwest Region). Recovery plans were developed in each of these areas (the northern Rocky Mountains in 1980, revised in 1987; the Great Lakes in 1978, revised in 1992; and the Southwest in 1982) to establish and prioritize recovery criteria and actions appropriate to the unique local circumstances of the gray wolf. A separate recovery effort for gray wolves formerly listed as *Canis lupus monstrabilis* was not undertaken because this subspecies was subsumed with the Mexican wolf, *C. l. baileyi*, and thus addressed as part of the recovery plan for the Southwest.

In the Southwest, on August 11, 2009, we received a petition dated the same day from the Center for Biological Diversity requesting that we list the Mexican wolf as an endangered subspecies or distinct population segment (DPS) and designate critical habitat under the Act. On August 12, 2009, we received a petition dated August 10, 2009, from WildEarth Guardians and The Rewilding Institute requesting that we list the Mexican wolf as an endangered subspecies and designate critical habitat under the Act. On October 9, 2012, we published a 12-month finding in the **Federal Register** stating that, because all individuals that constitute the petitioned entity already receive the protections of the Act, the petitioned action was not warranted at that time (77 FR 61375).

On February 29, 2012, we concluded a 5-year review of the *Canis lupus* listed entity, recommending that the entity currently described on the List of Endangered and Threatened Wildlife should be revised to reflect the distribution and status of *C. lupus* populations in the contiguous United States and Mexico by removing all areas currently included in the Code of Federal Regulations (CFR) range except where there is a valid species, subspecies, or DPS that is threatened or endangered.

On June 13, 2013 (78 FR 35664), we published a proposed rule to delist the gray wolf and maintain protections for the Mexican wolf by listing it as an endangered subspecies. Upon publication of the proposed rule, we opened the public comment period on the proposal. On September 5 and October 2, 2013, we announced public hearings on the proposed rule (78 FR 54614 and 78 FR 60813). The September 5 notice

also extended the public comment period for the proposed rule to October 28, 2013. Following delays caused by the Federal Government lapse in appropriations, the Service announced rescheduled dates for three of the public hearings, scheduled a fifth public hearing, and extended the public comment period for the proposed rule to December 17, 2013 (78 FR 64192, October 28, 2013). On February 10, 2014 (79 FR 7627), we reopened the public comment period on the proposal in conjunction with the submission of the peer review report. The comment period closed on March 27, 2014.

Subspecies Information

Taxonomy

The Mexican wolf subspecies, *Canis lupus baileyi*, was originally described by Nelson and Goldman in 1929 as *Canis nubilus baileyi*, with a distribution of "Southern and western Arizona, southern New Mexico, and the Sierra Madre and adjoining tableland of Mexico as far south, at least, as southern Durango (Nelson and Goldman 1929, pp. 165–166)." Goldman (1944, pp. 389–636) provided the first comprehensive treatment of North American wolves, in which he renamed *C. n. baileyi* as a subspecies of *lupus* (i.e., *C. l. baileyi*) and shifted the subspecies' range farther south in Arizona. His gray wolf classification scheme was subsequently followed by Hall and Kelson (1959, pp. 847–851; Hall 1981, p. 932). Since that time, gray wolf taxonomy has undergone substantial revision, including a major taxonomic revision in which the number of recognized gray wolf subspecies in North America was reduced from 24 to 5,

with the Mexican wolf, *C. l. baileyi*, being recognized as a subspecies ranging throughout most of Mexico to just north of the Gila River in southern Arizona and New Mexico (Nowak 1995, pp. 375–397).

Three published studies of morphometric variation conclude that the Mexican wolf is a morphologically distinct and valid subspecies. Bogan and Mehlhop (1983) analyzed 253 gray wolf skulls from southwestern North America using principal component analysis and discriminant function analysis. They found that the Mexican wolf was one of the most distinct subspecies of southwestern gray wolf (Bogan and Mehlhop 1983, p. 17). Hoffmeister (1986) conducted principal component analysis of 28 skulls, also recognizing the Mexican wolf as a distinct southwestern subspecies (pp. 466–468). Nowak (1995) analyzed 580 skulls using discriminant function analysis. He concluded that the Mexican wolf was one of only five distinct North American gray wolf subspecies that should continue to be recognized (Nowak 1995, pp. 395–396).

Genetic research provides additional validation of the recognition of the Mexican wolf as a subspecies. Studies have demonstrated that the Mexican wolf has unique genetic markers that distinguish the subspecies from other North American gray wolves. Garcia–Moreno *et al.* (1996, p. 384) utilized microsatellite analysis to determine whether two captive populations of Mexican wolves were pure *C. l. baileyi* and should be interbred with the captive certified lineage population that founded the captive breeding program. They confirmed that the two captive populations were pure Mexican wolves and that they and the certified lineage were closely related. Further,

they found that, as a group, the three populations were the most distinct grouping of North American wolves, substantiating the distinction of the Mexican wolf as a subspecies.

Hedrick *et al.* (1997, pp. 64–65) examined data for 20 microsatellite loci from samples of Mexican wolves, northern gray wolves, coyotes, and dogs. They concluded that the Mexican wolf was divergent and distinct from other sampled northern gray wolves, coyotes, and dogs. Leonard *et al.* (2005, p. 10) examined mitochondrial DNA sequence data from 34 wolves collected from 1856 to 1916 from the historical ranges of *Canis lupus baileyi* and *Canis lupus nubilus*. They compared these data with sequence data collected from 96 wolves in North America and 303 wolves from Eurasia. They found that the historical wolves had twice the diversity of modern wolves, and that two-thirds of the haplotypes were unique. They also found that haplotypes associated with the Mexican wolf formed a unique southern clade distinct from that of other North American wolves. A clade is a taxonomic group that includes all individuals that have descended from a common ancestor.

In another study, von Holdt *et al.* (2011, p. 7) analyzed single nucleotide polymorphisms genotyping arrays and found *Canis lupus baileyi* to be the most genetically distinct group of New World gray wolves. Chambers *et al.* (2012, pp. 34–37) reviewed the scientific literature related to classification of the Mexican wolf as a subspecies and concluded that this subspecies' recognition remains well-supported. Most recently, Cronin *et al.* (2014, p. 9) analyzed single nucleotide polymorphism

genotyping arrays and found single nucleotide polymorphisms differentiation of Mexican wolves from other North American wolves. However, Cronin *et al.* (2014, p. 9) challenge the subspecies concept for North American wolves, including the Mexican wolf, based on their interpretation of other authors work (most notably Leonard *et al.* 2005 relative to mtDNA monophyly (see southern clade discussion above)). Maps of the Mexican wolf's historical range are available in the scientific literature (Young and Goldman 1944, p. 414; Hall and Kelson, 1959, p. 849; Hall 1981, p. 932; Bogan and Mehlhop 1983, p. 17; Nowak 1995, p. 395; Parsons 1996, p. 106). The southernmost extent of Mexican wolf's range in Mexico is consistently portrayed as ending near Oaxaca (Hall 1981, p. 932; Nowak 1995, p. 395). Depiction of the northern extent of the Mexican wolf's pre-settlement range among the available descriptions varies depending on the authors' taxonomic treatment of several subspecies that occurred in the Southwest and their related treatment of intergradation zones. Recent research based on historical specimens suggests the Mexican wolf ranged into southern Utah and southern Colorado across zones of intergradation where interbreeding with northern gray wolf subspecies may have occurred (Leonard *et al*. 2005, p. 11 and p. 15, insomuch as haplotype lu47 only had been documented to occur in Mexican wolves and was documented in a specimen in southern Colorado).

Hall's (1981, p. 932, based on Hall and Kelson 1959) map depicted a range for the Mexican wolf that included extreme southern Arizona and New Mexico, with *Canis lupus mogollonensis* occurring throughout most of Arizona, and *C. l. monstrabilis*, *Canis l. youngi*, *C. l. nubilus*, and *C. l. mogollonensis* interspersed in New Mexico.

Bogan and Mehlhop (1983, p. 17) synonymized two previously recognized subspecies of gray wolf, *C. l. mogollonensis* and *C. l. monstrabilis,* with the Mexican wolf, concluding that the Mexican wolf's range included the Mogollon Plateau, southern New Mexico, Arizona, Texas, and Mexico. This extended the Mexican wolf's range northward to central Arizona and central New Mexico through the area that Goldman (1944) had identified as an intergrade zone with an abrupt transition from the Mexican wolf to *C. l. mogollensis*. Bogan and Mehlop's analysis did not indicate a sharp transition zone between the Mexican wolf and *C. l. mogollensis*, rather the wide overlap between the two subspecies led them to synonymize the Mexican wolf and *C. l. mogollensis*.

Hoffmeister (1986, p. 466) suggested that *Canis lupus mogollonensis* should be referred to as *C. l. youngi*, but maintained the Mexican wolf, *C. l. baileyi*, as a subspecies, stating that wolves north of the Mogollon Rim should be considered *C. l. youngi*. Nowak (1995, pp. 384–385) agreed with Hoffmeister's synonymizing of *C. l. mogollonensis* with *C. l. youngi,* and further lumped these into *C. l. nubilus,* resulting in a purported northern historical range for *Mexican wolf* as just to the north of the Gila River in southern Arizona and New Mexico. Nowak (1995) and Bogan and Mehlhop (1983) differed in their interpretation of which subspecies to assign individuals that were intermediate between recognized taxa, thus leading to different depictions of historical range for the Mexican wolf.

Subsequently, Parsons (1996, p. 104) included consideration of dispersal distance when developing a probable historical range for the purpose of reintroducing Mexican wolves in the wild pursuant to the Act, by adding a 200-mi (322-km) northward extension to the most conservative depiction of the Mexican wolf historical range (i.e., Hall and Kelson 1959). This description of historical range was carried forward in the Final Environmental Impact Statement "Reintroduction of the Mexican Wolf within its Historic Range in the Southwestern United States" in the selection of the Blue Range Wolf Recovery Area as a reintroduction location for Mexican wolves (Service 1996).

Recent molecular genetic evidence from limited historical specimens supports morphometric evidence of an intergradation zone between Mexican wolf and northern gray wolves (Leonard *et al.* 2005, pp. 15–16). This research shows that, within the time period that the historical specimens were collected (1856–1916), a northern clade (i.e., group that originated from and includes all descendants from a common ancestor) haplotype was found as far south as Arizona, and individuals with southern clade haplotypes (associated with Mexican wolves) occurred as far north as Utah and Nebraska. Leonard *et al.* (2005, p. 10) interpret this geographic distribution of haplotypes as indicating gene flow was extensive across the subspecies' limits during this historical period, and Chambers *et al*. (2012, p. 37) agree this may be a valid interpretation.

Subspecies Description

The Mexican wolf is the smallest extant gray wolf in North America. Adults weigh 23 to 41 kg (50 to 90 lb) with a length of 1.5 to 1.8 m (5 to 6 ft) and height at shoulder of 63 to 81 cm (25 to 32 in) (Brown 1988, p. 119). Mexican wolves are typically a patchy black, brown to cinnamon, and cream color, with primarily light underparts (Brown 1988, p. 118). Solid black or white coloration, as seen in other North American gray wolves, does not exist in Mexican wolves. Basic life history for Mexican wolves is similar to that of other gray wolves (Mech 1970, entire; Service 1982, p. 11; Service 2010, pp. 32–41).

Historical Distribution and Causes of Decline

Prior to the late 1800s, the Mexican wolf inhabited the southwestern United States and Mexico. In Mexico, Mexican wolves ranged from the northern border of the country southward through the Sierra Madre Oriental and Occidental and the altiplano (high plains) to the Neovolcanic Axis (a volcanic belt that runs east–west across central-southern Mexico) (SEMARNAP 2000, p. 8), although wolf distribution may not have been continuous through this entire region (McBride 1980, pp. 2–7). The Mexican wolf is the only subspecies known to have inhabited Mexico. In the United States, Mexican wolves (and, in some areas, *Canis lupus nubilus* and the previously recognized subspecies *C. l. monstrabilis*, *C. l. mogollonensis,* and *C. l. youngi*) inhabited montane forests and woodlands in portions of New Mexico, Arizona, and Texas (Young and Goldman 1944, p. 471; Brown 1988, pp. 22–23) (see Taxonomy). In southern Arizona, Mexican wolves inhabited the Santa Rita, Tumacacori, Atascosa–Pajarito, Patagonia,

Chiricahua, Huachuca, Pinaleno, and Catalina Mountains, west to the Baboquivaris and east into New Mexico (Brown 1983, pp. 22–23). In central and northern Arizona, the Mexican wolf and other subspecies of gray wolf were interspersed (Brown 1983, pp. 23–24). The Mexican wolf and other subspecies were present throughout New Mexico, with the exception of low desert areas, documented as numerous or persisting in areas including the Mogollon, Elk, Tularosa, Diablo and Pinos Altos Mountains, the Black Range, Datil, Gallinas, San Mateo, Mount Taylor, Animas, and Sacramento Mountains (Brown 1983, pp. 24–25). Gray wolf distribution (of other subspecies) continued eastward into the Trans-Pecos region of Texas and northward up the Rocky Mountains and to the Grand Canyon (Young and Goldman 1944, pp. 23, 50, 404–405), where intergradation between northern and southern wolf clades occurred (Leonard *et al*. 2005, pp. 11–15).

Population estimates of gray wolves, and specifically Mexican wolves, prior to the late 1800s are not available for the southwestern United States or Mexico. Some trapping records and rough population estimates are available from the early 1900s, but do not provide a rigorous estimate of population size of Mexican wolves in the United States or Mexico. For New Mexico, a statewide carrying capacity (potential habitat) of about 1,500 gray wolves was hypothesized by Bednarz, with an estimate of 480 to 1,030 wolves present in 1915 (ibid, pp. 6, 12). Brown summarized historical distribution records for the wolf from McBride (1980, p. 2) and other sources, showing most records in the southwestern United States as being from the Blue Range and the Animas region of New Mexico (Brown 1983, p. 10). In Mexico, Young and Goldman (1944, p. 28) stated that

from 1916 to 1918 the Mexican wolf was fairly numerous in Sonora, Chihuahua, and Coahuila, although McBride comments that Mexican wolves apparently did not inhabit the eastern and northern portions of Coahuila, even in areas with seemingly good habitat (1980, p. 2).

The 1982 Mexican Wolf Recovery Plan cautioned; "It is important … not to accept unquestioningly the accounts of the 1800s and early 1900s that speak of huge numbers of wolves ravaging herds of livestock and game …. The total recorded take indicates a much sparser number of wolves in the treated areas than the complaints of damage state or signify, even when one remembers that these figures do not reflect the additional numbers of wolves taken by ranchers, bounty-seekers and other private individuals (Service 1982, p. 4)."

Mexican wolf populations declined rapidly in the early and mid-1900s, due to government and private efforts across the United States to kill wolves and other predators. By 1925, poisoning, hunting, and trapping efforts drastically reduced Mexican wolf populations in all but a few remote areas of the southwestern United States, and control efforts shifted to wolves in the borderlands between the United States and Mexico (Brown 1983, p. 71). Bednarz (1988, p. 12) estimated that breeding populations of Mexican wolves were extirpated from the United States by 1942. The use of increasingly effective poisons and trapping techniques during the 1950s and 1960s eliminated remaining Mexican wolves north of the United States–Mexico border, although occasional reports of wolves crossing into the United States from Mexico

persisted into the 1960s. Wolf distribution in northern Mexico contracted to encompass the Sierra Madre Occidental in Chihuahua, Sonora, and Durango, as well as a disjunct population in western Coahuila (from the Sierra del Carmen westward). Leopold (1959, p. 402) found conflicting reports on the status of the Coahuila population and stated that wolves were likely less abundant there than in the Sierra Madre Occidental.

When the Mexican wolf was listed as endangered under the Act in 1976, no wild populations were known to remain in the United States or Mexico. McBride (1980, pp. 2–8) conducted a survey to determine the status and distribution of wolves in Mexico in 1977. He mapped 3 general areas where wolves were recorded as still present in the Sierra Madre Occidental: (1) Northern Chihuahua and Sonora border (at least 8 wolves); (2) western Durango (at least 20 wolves in 2 areas); and (3) a small area in southern Zacatecas. Although occasional anecdotal reports have been made during the last three decades that a few wild wolves still inhabit forested areas in Mexico, no publicly available documented verification exists. Several Mexican wolf individuals captured in the wild in Mexico became the basis for the captive-breeding program that has enabled the reintroduction to the wild (see below, Current Distribution—In Captivity).

Current Distribution in the United States

On January 12, 1998, we published a final rule in the **Federal Register** to establish the Mexican Wolf Experimental Population Area (MWEPA) in central Arizona,

New Mexico, and a small portion of northwestern Texas (63 FR 1752). In March of 1998 we released 11 Mexican wolves from the captive-breeding program to the wild. We have conducted additional initial releases or translocations of individuals and family groups into the Blue Range Wolf Recovery Area (BRWRA) within the MWEPA through 2014. At the end of 2013, a single wild population of a minimum of 83 Mexican wolves (December 31, 2013, population count) inhabited the United States in central Arizona and New Mexico. Mexican wolves do not occupy the small portion of northwestern Texas included in the MWEPA. For more information regarding the MWEPA, please see Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf, which published elsewhere in today's **Federal Register**.

Mexican wolves associated with the MWEPA also currently occupy the Fort Apache Indian Reservation of the White Mountain Apache Tribe, adjacent to the western boundary of the BRWRA. Since 2000, an agreement between the Service and the White Mountain Apache Tribe permits the release, dispersal, and establishment of Mexican wolves onto the reservation, providing an additional 2,500 mi^2 (6,475 km^2) of high-quality forested wolf habitat for the reintroduction (Service 2001, p. 4). The White Mountain Apache Tribe does not make information about the number and location of Mexican wolves on the reservation publicly available.

Detailed information on the status of the experimental population and the reintroduction project can be found in the 2001 to 2013 annual reports, the 2010

Mexican Wolf Conservation Assessment (Service 2010), and our online population statistics, available at *http://www.fws.gov/southwest/es/mexicanwolf/*.

Current Distribution in Mexico

In October 2011, Mexico initiated the reestablishment of Mexican wolves to the wild (see Historical Distribution) with the release of five captive-bred Mexican wolves into the San Luis Mountains just south of the U.S.–Mexico border. Mexico has continued to release animals into the wild during the past few years. Through August 2014, Mexico released a total of 14 adult Mexican wolves, of which 11 died or are believed dead, and 1 was removed for veterinary care. Of the 11 Mexican wolves that died or are believed dead, 6 were due to illegal killings (4 from poisoning and 2 were shot), 1 wolf was presumably killed by a mountain lion, 3 causes of mortality are unknown (presumed illegal killings because collars were found, but not the carcasses), and 1 disappeared (neither collar nor carcass has been found). The remaining two adult Mexican wolves were documented with five pups in 2014, marking the first successful reproductive event in Mexico. We expect the number of Mexican wolves in Mexico to fluctuate from zero to several packs in or around Sonora, Durango, and Chihuahua in the near future.

In Captivity

Due to the extirpation of Mexican wolves in the United States and Mexico, the first step in the recovery of the subspecies was the development of a captive-breeding population to ensure the Mexican wolf did not go extinct. Between 1977 and 1980, a binational captive-breeding program between the United States and Mexico, referred to as the Mexican Wolf Species Survival Plan (SSP), was initiated with the capture of the last known Mexican wolves in the wild in Mexico and subsequent addition of wolves from captivity in Mexico and the United States. The individual unrelated seven wolves used to establish the captive-breeding program are considered the "founders" of the breeding population. These pure Mexican wolves represent three distinct lineages (family groups): McBride (also known as the Certified lineage; three individuals), Ghost Ranch (two individuals), and Aragon (two individuals). From the breeding of these 7 Mexican wolves and generations of their offspring, the captive population has expanded to its current size of 248 Mexican wolves in 55 facilities in the United States and Mexico (Siminski and Spevak 2014).

The purpose of the SSP is to reestablish Mexican wolves in the wild through captive breeding, public education, and research. This captive population is the sole source of Mexican wolves available to reestablish the subspecies in the wild and is imperative to the success of the Mexican wolf reintroduction project and any additional efforts to reestablish the subspecies that may be pursued in the future in Mexico by the General del Vida Silvestre or by the Service in the United States.

Captive Mexican wolves are routinely transferred among the zoos and other SSP holding facilities to facilitate genetic exchange (through breeding) and maintain the health and genetic diversity of the captive population. The SSP strives to house a minimum of 240 wolves in captivity at all times to ensure the security of the subspecies in captivity, while still being able to produce surplus animals for reintroduction.

In the United States, Mexican wolves from captive SSP facilities that are identified for potential release are first evaluated for release suitability and undergo an acclimation process. All Mexican wolves selected for release in the United States and Mexico are genetically redundant to the captive population, meaning their genes are already well represented in captivity. This minimizes any adverse effects on the genetic integrity of the remaining captive population in the event that Mexican wolves released to the wild do not survive.

Habitat Description

Historically, Mexican wolves were associated with montane woodlands characterized by sparsely to densely forested mountainous terrain consisting of evergreen oaks (*Quercus* spp.) or pinyon (*Pinus edulus*) and juniper (*Juniperus* spp.) to higher elevation pine (*Pinus* spp.), mixed-conifer forests, and adjacent grasslands at elevations of 4,000 to 5,000 ft (1,219 to 1,524 m) where ungulate prey were numerous. Factors making these vegetation communities attractive to Mexican wolves likely

included the abundance of ungulate prey, availability of water, and the presence of hiding cover and suitable den sites. Early investigators reported that Mexican wolves probably avoided desert scrub and semidesert grasslands that provided little cover, food, or water (Brown 1988, pp. 19–22).

Prior to their extirpation in the wild, Mexican wolves were believed to have preyed upon white-tailed deer (*Odocoileus virginianus*), mule deer (*O. hemionus*), elk (*Cervus elaphus*), collared peccaries (javelina) (*Tayassu tajacu*), pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), jackrabbits (*Lepus spp.*), cottontails (*Sylvilagus spp.*), and small rodents (Parsons and Nicholopoulos 1995, pp. 141–142); white-tailed deer and mule deer were believed to be the primary sources of prey (Brown 1988, p. 132; Bednarz 1988, p. 29).

Today, Mexican wolves in Arizona and New Mexico inhabit evergreen pine–oak woodlands (i.e., Madrean woodlands), pinyon–juniper woodlands (i.e., Great Basin conifer forests), and mixed-conifer montane forests (i.e., Rocky Mountain, or petran, forests) that are inhabited by elk, mule deer, and white-tailed deer (Service 1996, pp. 3–5; AMOC and IFT 2005, p. TC–3). Mexican wolves in Arizona and New Mexico show a strong preference for elk compared to other ungulates (AMOC and IFT 2005, p. TC–14, Reed *et al.* 2006, pp. 56, 61; Merkle *et al.* 2009, p. 482). Other documented sources of prey include deer (*O. virginianus* and *O. hemionus*) and occasionally small mammals and birds (Reed *et al.* 2006, p. 55). Mexican wolves are also known to prey and scavenge on livestock (Reed *et al.* 2006, p. 1129).

Summary of Comments and Recommendations

We requested written comments from the public on the proposed rule to remove the gray wolf from the List of Endangered and Threatened Wildlife and maintaining protections for the Mexican wolf by listing it as endangered during a 6-month comment period from June 13, 2013, to December 17, 2013. Between September 30, 2013, and December 3, 2013, the Service held a series of public hearings on the proposed rule: September 30, 2013, in Washington, District of Columbia; November 19, 2013, in Denver, Colorado; November 20, 2013, in Albuquerque, New Mexico; November 22, 2013, in Sacramento, California; and December 3, 2013, in Pinetop, Arizona. We reopened the public comment period on February 10, 2014, in conjunction with announcing the availability of the independent scientific peer review report on the proposal. This comment period closed on March 27, 2014. We also contacted appropriate Federal, Tribal, State, county, and local agencies, scientific organizations, and other interested parties and invited them to comment on the proposed rule during these comment periods.

All substantive information specifically related to our proposal to list the Mexican wolf as an endangered subspecies provided during the comment periods, including the public hearings, has either been incorporated directly into this final determination or addressed below. Comments from peer reviewers and State agencies are grouped separately. In addition to the comments, some commenters submitted additional reports

and references for our consideration, which were reviewed and incorporated into this final rule as appropriate.

Peer Reviewer Comments

The National Center for Ecological Analysis and Synthesis (NCEAS) was asked to perform an independent scientific review of the proposed rule to remove the gray wolf from the List of Endangered and Threatened Wildlife and maintain protections for the Mexican wolf by listing it as endangered (78 FR 35664, June 13, 2013). In accordance with our peer review policy published on July 1, 1994 (59 FR 34270), NCEAS solicited expert opinions from seven knowledgeable individuals with scientific expertise that included familiarity with the species, the geographic region in which the species occurs, and conservation biology principles. NCEAS received responses from five of the seven peer reviewers they contacted during the public comment period.

Based on their panel discussion in January 2014, peer reviewers came to general consensus that the Mexican wolf is the most differentiated gray wolf in North America. Also, peer reviewers discussed and seemed to reach general concurrence that the historical range of the Mexican wolf was likely larger than described by the Service in the proposed rule based on the presence of genetic markers found in historical wolf specimens described by Leonard *et al.* 2005, and they questioned how this information should be incorporated into decisions about its status. They expressed concern over the Service's reliance on the Chambers *et al.* 2012, manuscript within the Service's proposal

to delist the gray wolf in the United States, which included the identification of, and discussion of the validity of, other gray wolf subspecies, but their concerns did not lead them to conclude that the Mexican wolf was not a valid entity to list under the Act. Rather, they focused on how the Service should "draw a line on a map" to indicate the historical range of the Mexican wolf and the appropriate geographic extent of the listed entity.

We reviewed all comments received from the peer reviewers regarding the proposed listing of the Mexican wolf as an endangered subspecies. As previously noted, the peer reviewers generally concurred with our methods and conclusions that the Mexican wolf is ecologically and morphologically distinct. They also provided additional information, clarifications, and suggestions to improve this final rule. Peer reviewer comments are addressed in the following summary and incorporated into the final rule, as appropriate.

(1) *Comment*: Peer reviewers stated that the Service did not use the best available information related to the exclusive reliance on the concordance method of identifying species/subspecies utilized by Chambers *et al.* 2012. The justification for the exclusive use of this approach is not well defended by the Service.

Our response: As required by section 4(b) of the Act, we used the best scientific and commercial data available in making this final determination for the Mexican wolf. We solicited peer review from knowledgeable individuals with scientific expertise that

included familiarity with the species, the geographic region in which the species occurs, and conservation biology principles to ensure that our listing is based on scientifically sound data, assumptions, and analysis. Additionally, we requested comments or information from other concerned governmental agencies, Native American Tribes, the scientific community, industry, and any other interested parties concerning the proposed rule. The commenters' concerns with the Service's reliance on the Chambers *et al.* 2012, manuscript primarily focused on taxonomic issues associated with gray wolf populations other than the Mexican wolf. Taxonomic issues related to other gray wolf populations are not germane to this final rule to list the Mexican wolf as an endangered subspecies. Specific to the Mexican wolf, the peer reviewers concurred that the Mexican wolf is differentiated from other gray wolves by multiple morphological and genetic markers documented in the scientific literature. The Act is explicit that threatened or endangered subspecies are to be protected.

(2) *Comment*: Peer reviewers noted that genetic markers indicate a larger historical range for Mexican wolf than described by the Service and should be taken into consideration when determining its status and the range within which recovery could occur.

Our response: We have not attempted to define historical range for the Mexican wolf, but rather to describe available historical range information contained in the scientific literature, including the research by Leonard *et al.* 2005 referenced by the peer reviewers. Listing the entire Mexican wolf subspecies means that all members of the

taxon are afforded the protections of the Act regardless of where they are found; therefore, we do not demarcate a specific geographic area in which conservation and recovery efforts may take place. Rather, guidance about the abundance and distribution of the Mexican wolf necessary for delisting will be provided in a revised recovery plan containing recovery (delisting) criteria. Therefore, we recognize that current research such as Leonard *et al.* 2005 suggests a larger historical geographic range for the Mexican wolf than described by prior accounts (Hall 1981, p. 932; Bogan and Mehlhop 1983, p. 17; Nowak 1995, pp. 384–385). However, this information does not lead us to a different conclusion about the endangered status of the Mexican wolf, nor are any recovery options precluded by our discussion of historical range.

Comments from States

(3) *Comment*: One State agency expressed concern that the Service did not articulate reasons for choosing to list the Mexican wolf as a subspecies rather than a DPS, claiming that the Mexican wolf is legally eligible for a DPS listing under the Service's policy, and, therefore, the choice to list it as a subspecies as opposed to a DPS is a discretionary act subject to review under the Administrative Procedure Act.

Our response: Under section 3(16) of the Act, we may consider for listing any species, including subspecies, of fish, wildlife, or plants, or any DPS of vertebrate fish or wildlife that interbreeds when mature. As noted in our Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Act (61 FR 4722, February 7,

1996), Congress has instructed the Secretary to exercise authority to list DPS's sparingly. Because a DPS is typically a subset of a species or subspecies, we first determine whether any negative impacts appear to be affecting the species or subspecies anywhere in its range, and whether any of these impacts rise to the level of threats such that the species or subspecies is endangered or threatened throughout its range. If we determine that a species or subspecies is endangered or threatened throughout its range, then we are not required to conduct a DPS analysis. In other words, we typically first assess whether or not an entity qualifies for listing as a species or subspecies before assessing whether it qualifies as a DPS. Because the Mexican wolf qualifies for listing as a subspecies throughout its range, we are not analyzing whether or not it warrants listing as a DPS.

(4) *Comment*: Among other alternatives, the Service should also be considering listing two DPS's of gray wolf or Mexican wolf (i.e., one in Arizona and New Mexico and the other in Mexico), the range of which is bisected by the International Border between the United States and Mexico.

Our response: See response immediately above regarding listing a DPS of the Mexican wolf.

(5) *Comment*: One State agency expressed concern that, if listed as a subspecies, the Mexican wolf will never be delisted in the United States. The commenter stated that a species or subspecies may be delisted only when it is no longer in danger of extinction throughout all or a significant portion of its range and that approximately 10 percent of

the Mexican wolf's historical range occurs in the United States with the remainder in Mexico. Because the Mexican wolf in the United States will never constitute a significant portion of the subspecies' range, delisting would require substantial wolf recovery in Mexico.

Our response: "Range" as referred to in the phrase "significant portion of its range" refers to the general geographical area within which the species can be found at the time the Service makes a status determination (79 FR 37578, July 1, 2014). Prior to its extirpation in the 1900's, the Mexican wolf inhabited large portions of Mexico. Our colleagues in Mexico are continuing to investigate whether areas that functioned as wolf habitat historically are suitable for wolf reintroduction and recovery efforts today (Araiza *et al.* 2012, entire). Regardless, the Act does not stipulate that a species must inhabit all of its historical range in order to be recovered. Rather, threats to the species must be alleviated such that it is secure in its range at the time of status determination, such as delisting, listing, or reclassification. Therefore, listing the Mexican wolf as a subspecies does not preclude the ability to achieve recovery and delist the subspecies. A recovery strategy, including delisting criteria, will be developed in a revised recovery plan for the Mexican wolf.

(6) *Comment*: One commenter expressed concern that if we have to wait for recovery to occur in Mexico before we can delist the Mexican wolf, States will be faced with unchecked population growth of Mexican wolves with no effective mechanism for

controlling population growth, which will lead to the detriment of livestock and big game wildlife in the United States.

Our response: See response above. The purpose of the Act is to recover species such that they are no longer in danger of extinction now or within the foreseeable future throughout all or a significant portion of their range, at which time they are delisted and management of the species is typically turned over to the State and tribal wildlife agencies. Further, in a separate rule in today's **Federal Register**, we have published the Revision to the Nonessential Experimental Population of the Mexican Wolf, which contains take provisions for Mexican wolves by designated agencies and the public, demonstrating that the Service is cognizant of the need to include such (control) measures as a component of wolf reintroduction and recovery efforts.

(7) *Comment*: One State agency noted that the Service's proposed rule to list the Mexican wolf as an endangered subspecies referenced several important documents to which the public has not had access.

Our response: All of the comments, materials, and documentation that we considered in this rulemaking were available by appointment, during normal business hours at: Mexican Wolf Recovery Program, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, 2105 Osuna Road, NE, Albuquerque, NM 87113; by telephone 505–761–4704; or by facsimile 505–346–2542.

(8) *Comment*: One State agency suggested that the Service should recognize Mexican wolf historical range as extending from central Mexico into Arizona and New Mexico south of Interstate Highway 40.

Our response: We have utilized the best available science to describe historical range for the Mexican wolf in the Background section of this final rule. Maps of the Mexican wolf's historical range are available in the scientific literature (Young and Goldman 1944, p. 414; Hall and Kelson, 1959, p. 849; Hall 1981, p. 932; Bogan and Mehlhop 1983, p. 17; Nowak 1995, p. 395; Parsons 1996, p. 106). Depiction of the northern extent of the Mexican wolf's historical range among the available descriptions varies depending on the authors' taxonomic treatment of several subspecies that occurred in the Southwest and their related treatment of intergradation zones. In any case, there is evidence indicating that the Mexican wolf may have ranged north into southern Utah and southern Colorado within zones of intergradation where interbreeding with other gray wolf subspecies may have occurred (Leonard *et al*. 2005, p. 11 and p. 15).

(9) *Comment*: The Service does not provide cooperators and stakeholders with sufficient time to comprehensively analyze the Service's varied proposals on Mexican wolf listing. The Service expects stakeholders and cooperators, in a matter of months, to review and digest hundreds of pages of material, sort out the interconnected points concerning all the facets of the entirety, review the alternatives, formulate comments, and otherwise meaningfully participate in the review process.

Our response: The Service recognizes that public involvement is an essential part of the rulemaking process, helping to inform both the agency and the affected public. That is why we requested written comments from the public on the proposed rule and contacted appropriate Federal, Tribal, State, county, and local agencies, scientific organizations, and other interested parties and invited them to comment on the proposed rule during the open comment period from June 13, 2013, to December 17, 2013, and the reopened comment period from February 10, 2014, to March 27, 2014. We believe that the nearly 8-month open comment period was sufficient time for cooperators and stakeholders to comprehensively analyze the Service's proposed rule and provide comment.

Comments from Tribes:

(10) *Comment*: Any listing or delisting of the gray wolf or the Mexican wolf must recognize the Tribe's rights and sovereignty in managing wildlife on Tribal lands. The proposed rule fails in this respect.

Our response: The Service recognizes the Tribe's rights and sovereignty in managing wildlife on Tribal lands (see Government to Government Relationships with Tribes section below). Under their sovereign authority Tribes have the option of allowing Mexican wolves to occupy Tribal trust land or to request their removal. Also, elsewhere in today's **Federal Register**, we are finalizing revisions to the nonessential experimental population of the Mexican wolf, which will give Tribes the option to enter

into voluntary agreements with the Service for the management of Mexican wolves on Tribal trust land.

Public Comments

(11) *Comment:* We received numerous requests from diverse interest groups and individuals asking that we subdivide our final determination on listing the Mexican wolf as endangered from the final determination on our proposal regarding the current listing for gray wolf in all or portions of 42 States and Mexico.

Our Response: We are separating our determination on the listing of the Mexican wolf as endangered from the determination on our proposal regarding removing the current listing for gray wolf from the List of Endangered and Threatened Wildlife. This rule finalizes our determination for the Mexican wolf. A subsequent decision will be made for the rest of the United States.

(12) *Comment*: A problematic aspect of the rule is the fact that the Service does not designate the species as endangered over a specific geographic area, but instead designates the subspecies as endangered where found. Genetic analysis of historic Mexican wolves showed that the range of the Mexican wolf likely extended beyond the historic range initially inferred from limited record data.

Our response: Unless we designate a Distinct Population Segment, which has a geographic component to the designation, a species or subspecies listing means that all members of the taxon are afforded the protections of the Act regardless of where they are found. We have described the historical range of the Mexican wolf in the Background section of this rule.

(13) *Comment:* Listing the Mexican wolf as endangered would negatively impact the private landowners and ranchers in the State of Arizona by imposing additional restrictions on those private lands, which is an economic and operational burden on the public.

Our response: This final rule to list the Mexican wolf as an endangered subspecies will not change the protected status of the Mexican wolf as, to date, it has been listed as endangered within the broader gray wolf listing; rather, this final rule creates an independent listed entity for the Mexican wolf on the List of Endangered and Threatened Wildlife, separate from the gray wolf entity. As previously noted, we are finalizing revisions to the nonessential experimental population of the Mexican wolf elsewhere in today's **Federal Register**, which relaxes some of the Act's prohibitions for take of Mexican wolves in certain circumstances. With this final rule to list the Mexican wolf as an endangered subspecies, there are no additional restrictions to private landowners.

(14) *Comment*: Has the Service examined the biological ramifications of the illegal killings? What analyses were used to estimate the level of impact of a 0 to 15 percent annual mortality attributed to illegal killing of wolves? The proposed listing stated 3 Mexican wolves died from disease, 3 from predation, 14 from vehicular collisions, 4 from other reason, 9 for unknown reasons, and 46 from illegal killing. What was the fate of the 13 wolves unaccounted for in this document that died from 1998 to 2012? The Service should show mortality graphically; what is the ratio of illegal kills to population size?

Our response: We recognize that illegal killing is the number one source of mortality to Mexican wolves in the wild; see Factor C. Disease and Predation, for our discussion and assessment of this mortality factor. Known wolf mortality is documented annually and is available on our website at *http://www.fws.gov/southwest/es/mexicanwolf/MWPS.cfm*.

(15) *Comment:* The Mexican wolf experimental population has been unsuccessful due to weak genetics that caused malformed jaws and other deformities, hybridization with dogs after releases into the wild, habituation to humans, dependence on human food including livestock regardless of abundant wild ungulate prey availability, and a variety of other fatal flaws.

Our response: We describe known instances of hybridization in Factor E of this final rule. Based on the low number of occurrences of Mexican wolf–dog hybrids, we do

not consider hybridization to be a threat to the Mexican wolf. We also discuss genetic concerns in Factor E, which, although not specific to physical deformities, we do determine inbreeding and loss of heterozygosity to be threats to the Mexican wolf. We have not documented Mexican wolf dependence on human food, including livestock; while Mexican wolves do occasionally prey on livestock, their primary prey in the Mexican Wolf Experimental Population Area is elk (see Background section).

(16) *Comment*: The Service fails to present the expected outcomes of genetic depression (decreased fitness, negatively biased population growth rate, loss of adaptive potential) on the Mexican wolf. How does the Service quantify loss of adaptive potential? What does the Service propose to do to address their concerns over inbreeding? If the nonessential population is genetically depressed, why does the Service continue to release Mexican wolves that are inbred? Over what timeframe does the Service expect to be able to effect a change in the genetic depression of the Mexican gray population?

Our response: Tracking of the genetic status of the captive and wild Mexican wolf populations is conducted by the Species Survival Plan, which tracks the mean kinship of wolves and other relevant metrics of the captive and wild population. We describe our concerns related to the genetic composition of the Mexican wolf population under Factor E. In a separate rule published in today's **Federal Register**, Revision to the Nonessential Experimental Population of the Mexican Wolf, and our associated Environmental Impact Statement, we address our need to increase the number of initial

releases we conduct in order to improve the genetic composition of the nonessential population. We expect to substantially improve the genetic status of the nonessential population within several Mexican wolf generations, or about 12 to 16 years.

(17) *Comment*: Except in cases of absolute isolation, what we call subspecies are populations with variable rates of gene flow over time and space. It is time for the Service to abandon typological thinking, stop using subspecies for listings, and use the biologically robust concepts of populations with quantifiable rates of gene flow and phylogenetic independence.

Our response: The Act is explicit that threatened or endangered subspecies are to be protected. Our Service regulations require us to rely on standard taxonomic distinctions and the biological expertise of the Department of the Interior and the scientific community concerning the relevant taxonomic group (50 CFR 424.11).

(18) *Comment*: According to the Service, the "nature of the available data does not permit the application of many traditional subspecies criteria", and many experts actually reject the notion of wolf subspecies due to the ease with which wolves move and interbreed. The Service further admits that the taxonomy for wolves is complicated and continuously evolving. These statements clearly show the lack of definitive information supporting the identification of gray wolf subspecies.

Our response: We recognize that wolf taxonomy is complicated and continuously evolving. However, the controversy in the scientific community has focused on wolf populations other than the Mexican wolf (but see Cronin *et al.* 2014, p. 9), which are outside the purview of this final rule. The best available scientific literature, and our Service regulations that require us to rely on standard taxonomic distinctions, support the recognition of the Mexican wolf as a subspecies of gray wolf.

(19) *Comment*: Review of the literature shows that the Mexican wolf does not warrant subspecies status. Data for 170,000 single nucleotide polymorphisms (Cronin *et al.* in preparation) and 48,000 single nucleotide polymorphisms (vonHoldt *et al.* 2011) shows that single nucleotide polymorphisms allele frequency differentiation of Mexican wolves and other North American wolves is relatively high. However, Mexican wolves lack mtDNA monophyly and share haplotypes with wolves in other areas (Leonard *et al.* 2005), and mtDNA haplotypes in Mexican wolves have low sequence divergence from other wolf haplotypes. This sequence divergence is particularly low because it is for the hypervariable control region.

Our response: As required by section 4(b) of the Act, we used the best scientific and commercial data available and continue to recognize the Mexican wolf (*Canis lupus baileyi*) as a distinct gray wolf subspecies. Taxonomic issues related to other gray wolf populations are not germane to this final rule to list the Mexican wolf as an endangered subspecies. Specific to the Mexican wolf, the peer reviewers concurred that the Mexican wolf is differentiated from other gray wolves by multiple morphological and genetic

markers documented in the scientific literature. Further, Leonard *et al*. (2005, p. 10) found that haplotypes associated with the Mexican wolf formed a unique southern clade distinct from that of other North American wolves. A clade is a taxonomic group that includes all individuals that have descended from a common ancestor.

(20) *Comment:* A science-based recovery plan has the potential to reduce conflict over the long term by minimizing litigation, minimizing resources needed by the Service for defending its actions, and speeding the eventual delisting of the Mexican wolf. Because lack of an updated recovery plan seriously hampers efforts to recover the subspecies, we encourage the Service to resume the recovery planning process immediately.

Our response: We intend to resume the recovery planning process to develop a revised recovery plan for the Mexican wolf after completion of this final rule.

(21) *Comment:* Several commenters recommended management of the Mexican wolf be returned to the States. Delisting of the wolf would automatically trigger this return of State control.

Our response: In our final rule, published elsewhere in today's **Federal Register**, Revision to the Nonessential Experimental Population of the Mexican Wolf, we allow for States (or other agencies) to cooperate in the management of Mexican wolves as designated agencies. Due to our determination of endangered status for the Mexican

wolf, we are not delisting the Mexican wolf at this time. When the Mexican wolf has been recovered and delisted, management control will be turned over to State and tribal agencies.

(22) *Comment*: The States of Arizona and New Mexico have sufficient regulations and trained personnel and programs in place to protect Mexican wolves so that a Federal listing is unwarranted under the Act.

Our response: We have no information to suggest that, absent the Act's protections, illegal killing of Mexican wolves in the United States would cease. Rather, illegal killing of Mexican wolves could increase, as State penalties (assuming wolves were granted protected status by the States) would be less severe than current Federal penalties under the Act. Thus, existing State penalties in Arizona and New Mexico would not serve as an adequate deterrent to illegal take. Also, in 2011, the New Mexico Department of Game and Fish withdrew from the Mexican Wolf Recovery Program and has shown no intention of rejoining or further cooperating with the program. We address this issue under Factor D. Adequate Regulatory Mechanisms.

(23) *Comment*: Several commenters stated that local citizens are fearful of Mexican wolves and noted the need to protect themselves when in areas occupied by wolves, psychological impacts on children, pet safety, and related topics. One commenter stated that he would face criminal charges if he defended himself against a

wolf. These commenters stated that the Service has not adequately recognized or addressed these issues.

Our response: There are no historical or recent cases of Mexican wolves attacking humans. If a Mexican wolf were to attack someone, the Act allows a person to take (including kill) a Mexican wolf in self-defense or in defense of another person. Elsewhere in today's **Federal Register**, we have published a final Revision to the Nonessential Experimental Population of the Mexican Wolf, which provides conditional take provisions (in addition to take for self-defense) of Mexican wolves by the Service, designated agencies, and individuals under certain circumstances.

(24) *Comment:* The Service states that the status of Mexican wolves in Mexico is unknown. Mexican wolves should be managed through a coordinated effort internationally according to sound biological principles and with consideration to all other State, national, and international laws that protect the health, safety, and welfare of humans.

Our response: We are fully aware of the status of Mexican wolves in Mexico, as we are in continual communication with the Federal agencies in Mexico that are responsible for the reintroduction of the Mexican wolf. We have clarified language in this final rule regarding the status of wolves in Mexico; see Current Distribution in Mexico. While we may at times coordinate various Mexican wolf management activities with Federal agencies in Mexico (such as sharing equipment or transferring captive

wolves between captive facilities), the reintroduction of Mexican wolves in the United States and Mexico are independent efforts.

(25) *Comment*: The Service should consider the negative impacts to our elk, deer, bighorn sheep, and javelina populations from predation by possible reintroduced Mexican wolves. A decrease in these game animals will create a significant economic and recreational loss to our State.

Our response: While the Act is explicit that our listing determinations must be made solely on the basis of the best scientific and commercial data available, in a separate action published elsewhere in today's **Federal Register** we have considered the impacts to ungulate populations from the experimental population of Mexican wolves in our Environmental Impact Statement, Revision to the Nonessential Experimental Population of the Mexican Wolf, available on our website at *http://www.fws.gov/southwest/es/mexicanwolf/NEPA_713.cfm*.

Summary of Changes from the Proposed Rule

In this final rule, we make one substantive change from the proposal. We are separating our determination on the listing of the Mexican wolf as endangered from the determination on our proposal regarding the delisting of the gray wolf in the United States and Mexico. This rule finalizes our determination for the Mexican wolf. A subsequent decision will be made for the gray wolf.

Summary of Factors Affecting the Mexican Wolf

Several threats analyses have been conducted for the Mexican wolf. In the initial proposal to list the Mexican wolf as endangered in 1975 and in the subsequent listing of the entire gray wolf species in the contiguous United States and Mexico in 1978, the Service found that threats from habitat loss (factor A), sport hunting (factor B), and inadequate regulatory protection from human targeted elimination (factor D) were responsible for the Mexican wolf's decline and near extinction (40 FR 17590, April 21, 1975; 43 FR 9607, March 9, 1978). In the 2003 reclassification of the gray wolf into three distinct population segments, threats identified for the gray wolf in the Southwestern Distinct Population Segment (which included Mexico, Arizona, New Mexico, and portions of Utah, Colorado, Oklahoma, and Texas) included illegal killing and (negative) public attitudes (68 FR 15804, April 1, 2003). The 2010 Mexican Wolf Conservation Assessment (Conservation Assessment) contains the most recent five-factor analysis for the Mexican wolf (Service 2010, p. 60). The purpose of the Conservation Assessment, which was a non-regulatory document, was to evaluate the status of the Mexican wolf reintroduction project within the broader context of the subspecies' recovery. The Conservation Assessment found that the combined threats of illegal shooting, small population size, inbreeding, and inadequate regulatory protection were hindering the ability of the current population to reach the population objective of at least 100 wolves in the BRWRA (Service 2010, p. 60).

The threats we address in this five-factor analysis and our conclusions about a given factor may differ from previous listing actions due to new information, or, in the case of the Conservation Assessment, the difference in perspective necessitated by the listing process compared to that of the Conservation Assessment, which was focused on recovery. For example, in this five-factor analysis we analyze currently occupied habitat, whereas the Conservation Assessment included discussion of unoccupied habitat that may be important in the future for recovery. In this five-factor analysis, we are assessing which factors pose a threat to the existing population of wolves in the BRWRA or would pose a threat to these wolves if the protections of the Act were not in place.

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

As previously discussed, wolves are considered habitat generalists with fairly broad ecological capabilities and flexibility in using different prey and vegetation communities (Peterson and Ciucci 2003, pp. 104–111). Gray wolves hunt in packs, primarily pursuing medium to large hooved mammals. Wolf density is positively correlated to the amount of ungulate biomass available and the vulnerability of ungulates to predation (Fuller *et al.* 2003, pp. 170–175). These characterizations apply to the Mexican wolf and form our basis for defining suitable habitat.

We consider suitable habitat for the Mexican wolf as forested, montane terrain containing adequate wild ungulate populations (elk, white-tailed deer, and mule deer) to

support a wolf population. Suitable habitat has minimal roads and human development, as human access to areas inhabited by wolves can result in wolf mortality. Specifically, roads can serve as a potential source of wolf mortality due to vehicular collision and because they provide humans with access to areas inhabited by wolves, which can facilitate illegal killing of wolves. Although the road itself could be considered a form of habitat modification, the primary threat to wolves related to roads stems from the activities enabled by the presence of roads (i.e., vehicular collision and illegal killing) rather than a direct effect of the road on the wolf such as a boundary to dispersal. We address illegal killing under factor C. Disease or Predation, and vehicular collision under factor E. Other.

For the Mexican wolf, we define habitat destruction, modification, or curtailment as a decrease or modification in the extent or quality of forested, montane terrain in currently occupied habitat, or a decrease in ungulate populations in currently occupied habitat, such that wolves would not persist in that area. In order to assess whether habitat destruction, modification, or curtailment is a threat to Mexican wolves, we consider information related to land status (as a characteristic of quality related to minimal human development) and the effects of catastrophic wildfire on Mexican wolves and ungulates. Our definitions of suitable habitat and of habitat destruction, modification, and curtailment are the same for the United States and Mexico. Implications of climate change are addressed under factor E. Other.

United States—Mexican wolves currently inhabit only the BRWRA as identified in the January 12, 1998, final rule to designate an experimental population (63 FR 1752), as well as the adjacent Fort Apache Indian Reservation as allowed by an agreement between the White Mountain Apache Tribe and the Service. As noted above, we finalize revisions to our regulations for the experimental population of the Mexican wolf, which published elsewhere in today's **Federal Register**. With this MWEPA revision, Mexican wolves will be allowed to inhabit the entire MWEPA, with the exception of any tribal areas where their removal is requested. In the revised MWEPA, there are 32,244 mi^2 (83,512 km^2) of suitable Mexican wolf habitat (Service 2014, p. 25). Of this suitable habitat, 63 percent occurs on federally owned land; of that, the U.S. Forest Service accounts for 91 percent, the Bureau of Land Management, 7 percent, and other Federal land ownership comprises the final 2 percent.

We consider Federal land in the revised MWEPA to be an important characteristic of the quality of the reintroduction area. Federal lands such as National Forests are considered to have the most appropriate conditions for Mexican wolf reintroduction and recovery efforts because they typically have significantly lesser degrees of human development and habitat degradation than other land-ownership types (Fritts and Carbyn 1995, p. 26). We do not have any information or foresee any change in the size, status, ownership, or management of the National Forests in the revised MWEPA in the future. If Mexican wolves were not protected by the Act, we cannot foresee any changes to the status of these National Forests such that suitability for Mexican wolves would significantly diminish.

Current and reasonably foreseeable management practices in all of the Apache, Gila, and Sitgreaves National Forests; the Payson, Pleasant Valley, and Tonto Basin Ranger Districts of the Tonto National Forest; and the Magdalena Ranger District of the Cibola National Forest are expected to support ungulate populations at levels that will sustain a growing Mexican wolf population in the revised MWEPA. Prey populations throughout all of Arizona and New Mexico continue to be monitored by the State wildlife agencies within Game Management Units, the boundaries of which are defined in each State's hunting regulations. We do not predict any significant change to ungulate populations that inhabit the National Forests such that habitat suitability for Mexican wolves would diminish.

On the other hand, wildfire is a type of habitat modification that could affect the Mexican wolf population in two primary ways—by killing of wolves directly or by causing changes in the abundance and distribution of ungulates. Two recent large wildfires, the Wallow Fire and the Whitewater–Baldy Complex Fire, have burned within close proximity to denning wolf packs. Due to their very large size and rapid spread, both of these fires are considered catastrophic wildfires.

On May 29, 2011, the Wallow Fire began in Arizona and spread to over 538,000 ac (217,721 ha) in Arizona (Apache, Navajo, Graham, and Greenlee Counties; San Carlos Apache Indian Reservation, Fort Apache Indian Reservation) and New Mexico (Catron County) by the end of June. The Wallow Fire was human-caused and is the largest fire in

Arizona's recorded history to date. The Wallow Fire burned through approximately 11 percent of the BRWRA. Three known or presumed wolf pack denning locations (Rim pack, Bluestem pack, Hawks Nest pack) were within the fire's boundaries (Service 2011). Although we had initial concern that denning pups (which are not as mobile as adults or may depend on adults to move them from the den) may not survive the fire due to their proximity to the rapidly spreading fire, we did not document any wolf mortalities as a result of the fire.

Telemetry information indicated all radio-collared animals survived, and pups from two of the packs whose den areas burned survived through the year's end to be included in the end-of-year population survey. While denning behavior was observed in the third pack, the presence of pups had not been confirmed prior to the fire, and no pups were documented with this pack at the year's end (Service 2011).

In addition to possible direct negative effects of the Wallow Fire (i.e., mortality of wolves, which we did not document), we also considered whether the fire was likely to result in negative short- or long-term effects to ungulate populations. The Wallow Fire Rapid Assessment Team's postfire assessment hypothesized that elk and deer abundance will respond favorably as vegetation recovers, with ungulate abundance exceeding prefire conditions within 5 years due to decreased competition of forage and browse with fire-killed conifers (Dorum 2011, p. 3). Based on this information, we recognize and will continue to monitor the potential for this fire to result in beneficial (increased prey) effects for Mexican wolves over the next few years.

On May 16, 2012, the Whitewater–Baldy Complex Fire was ignited by lightning strikes in New Mexico. It burned at least 297,845 ac (120,534 ha), including an additional (to the Wallow Fire) 7 percent of the BRWRA. The Whitewater–Baldy Complex Fire was contained 2 mi (3 km) from a denning wolf pack to the north (Dark Canyon pack) and 5 mi (8 km) from a denning wolf pack to the east (Middle Fork pack). We have not documented any adverse effects, including mortality, from the fire to these packs. We similarly hypothesize, as with the Wallow Fire, that elk and deer abundance will respond favorably as vegetation recovers in the burned area, with ungulate abundance exceeding pre-fire conditions within several years.

Given that we have not observed any wolf mortality associated with the Wallow and Whitewater–Baldy Complex fires, these specific fires have not significantly affected the Mexican wolf population. Moreover, although these fires demonstrate the possibility that a catastrophic wildfire within the reintroduction area could result in mortality of less mobile, denning pups, we recognize that adult wolves are highly mobile animals and can move out of even a catastrophic fire's path. While mortality of pups would slow the growth of the population over a year or two, the adult, breeding animals drive the ability of the population to persist. We do not consider even these catastrophic fires to be a significant mortality risk to adult wolves given their mobility and, therefore, do not consider wildfire to be a significant threat to the Mexican wolf. Further, we predict that these fires will result in changes in vegetation communities and prey densities that will be favorable to wolves within a few years. We have no

information to indicate there would be changes to the effects of fire on Mexican wolves if they were not protected by the Act.

Mexico—The Mexican wolf appears to have been extirpated from the wild in Mexico for more than 30 years. Recently, researchers and officials in Mexico identified priority sites for reintroduction of Mexican wolves in the States of Sonora, Durango, Zacatecas, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas based on vegetation type, records of historical wolf occurrence, and risk factors affecting wolf mortality associated with proximity to human development and roads (Araiza *et al.* 2012, pp. 630–637). In October 2011, Mexico initiated a reintroduction program with the release of five captive-bred Mexican wolves into the San Luis Mountains just south of the United States–Mexico border. Through August 2014, Mexico released a total of 14 adult Mexican wolves, of which 11 died or are believed dead, and 1 was removed for veterinary care. The remaining two adult Mexican wolves were documented with five pups in 2014, marking the first successful reproductive event in Mexico. We expect the number of Mexican wolves in Mexico to fluctuate from zero to several wolves or packs of wolves during 2015 and into the future in or around Sonora and Chihuahua or other Mexican States as wolves are released to the wild from captivity by Mexico and subsequently may survive, breed, die of natural causes, or be illegally killed.

We recognize that Mexican wolves are being reintroduced in Mexico to areas identified as priority sites based on recent research (Araiza *et al.* 2012). However, we also note that Araiza *et al.*'s habitat assessment does not include assessment of prey

availability within the six identified areas, which is a critical indicator of habitat suitability. Some information on prey availability is currently being collected and synthesized by Mexico for specific locations, but is not publicly available at this time. We also note that, due to the majority of land in Mexico being held in private ownership, large patches of secure public land are unavailable in Mexico to support reintroduction, which has been an important characteristic of reintroduction sites in the United States. We will continue to observe the status of the wolf reintroduction effort in Mexico. At this time, because our focus in this analysis is on currently occupied range, the absence of a Mexican wolf population in Mexico precludes analysis of habitat threats there.

Summary of Factor A

We have no information indicating that present or threatened habitat destruction, modification, or curtailment is significantly affecting the Mexican wolf or is likely to do so in the future. Zones 1 and 2 of the revised MWEPA provide an adequately sized area containing high-quality forested montane terrain with adequate ungulate populations (deer and elk) to support Mexican wolves in the experimental population. We do not foresee any changes in the status of the area (primarily U.S. Forest Service land). Further, we do not consider wildfire to be resulting in habitat destruction, modification, or curtailment that is threatening the Mexican wolf, although we recognize that future catastrophic wildfires have the potential to slow the growth of the population if pup mortality occurs in several packs.

We have not conducted an analysis of threats under factor A in Mexico due to the lack of a Mexican wolf population there for more than 30 years. Based on the mortality of reintroduced Mexican wolves in Mexico from 2011 to 2013, we do not expect a population to be established there for at least several years.

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

Since the inception of the Mexican wolf reintroduction project in 1998, we have not authorized legal killing or removal of wolves from the wild for commercial, recreational (i.e., hunting), scientific, or educational purposes. We are not aware of any instances of illegal killing of Mexican wolves for their pelts in the Southwest, or of illegal trafficking in Mexican wolf pelts or parts. Mexican wolf pelts and parts from wolves that die in captivity or in the wild may be used for educational or scientific purposes, such as taxidermy mounts for display, when permission is granted from the Service; most wolf parts are sent to a curatorial facility at the University of New Mexico to be preserved, catalogued, and stored. A recreational season for wolf hunting is not currently authorized in the Southwest.

We have authorized, through a section 10(a)(1)(A) research-and-recovery permit under 50 CFR 17.32, as well as in accordance with the Mexican wolf experimental population rule and section 10(j) management rule under 50 CFR 17.84(k), agency

personnel to take any Mexican wolf in the experimental population, as well as to conduct activities related directly to the recovery of reintroduced experimental populations of Mexican wolf within Arizona and New Mexico. While removal of individual Mexican wolves (including lethal take) has occurred by the Service as a result of these measures, these actions are conducted within the purpose of our recovery program to contribute to the conservation of the Mexican gray wolf.

Several Mexican wolf research projects occur in the BRWRA or adjacent tribal lands by independent researchers or project personnel, but these studies have utilized radio-telemetry, scat analysis, and other noninvasive methods that do not entail direct handling of, or impact to, wolves (e.g., Cariappa *et al.* 2008, Breck *et al.* 2011, Rinkevich 2012). Nonlethal research for the purpose of conservation is also conducted on Mexican wolves in the SSP captive-breeding program; projects include research on reproduction, artificial insemination, and gamete collection and preservation (see Service Mexican Wolf Recovery Program annual reports online at *www.fws.gov/southwest/es/mexicanwolf/* for descriptions of past and current research projects). Research on disease and conditioned taste aversion is also being conducted in the SSP captive-breeding program. In all cases, any take authorized by the Service for scientific, educational, and conservation purposes must benefit the Mexican wolf and promote its recovery.

Since reintroductions began in 1998 and have continued through December 31, 2013, we are aware of 25 incidents in which Mexican wolves were captured in nongovernmental (private) traps, at least 7 have been severely injured, and at least 3

have died as a result of injuries or activities associated with being captured in a leg-hold trap. While these seven injuries may have a significant effect on the individual Mexican wolf and may affect that particular animal's pack, they are relatively rare occurrences. We conclude that the 3 mortalities through 2013 have not affected the Mexican wolf's population growth because this accounts for only 3 mortalities in 15 years, and at the end of 2013, the minimum population size was 83 Mexican wolves.

Absent the protection of the Act, Mexican wolves could be protected from overutilization in the United States by State regulations and programs in Arizona and New Mexico and Federal law in Mexico. The Arizona Revised Statutes Title 17 gives the Arizona Game and Fish Commission (Commission) the authority to regulate take of wildlife in the State of Arizona. "Take" (to pursue, shoot, hunt, trap, kill, capture, snare, or net) of wildlife in Arizona on lands under the authority of the Arizona Game and Fish Commission is prohibited, unless a provision (e.g., Commission Order, special rule, permit) is made to allow take. Arizona Game and Fish Commission Rules, Article 4, outlines additional restrictions that would provide further protections from overutilization including regulating and outlining prohibitions on possession and transport of illegally taken wildlife, and regulating and placing restrictions on scientific collection/handling of wildlife. Because Commission Order 14 (Other Birds and Mammals) does not open a hunting season on wolves, all take of Mexican wolf in Arizona is prohibited (except via special permit, as for science and management purposes; permits that in-turn require the permittee to secure all required Federal permits). A hunting season could be opened if the agency documented a harvestable

surplus or identified a need for population reduction in a specific area. The Arizona Game and Fish Department, the administrative, management, and enforcement arm of the Commission, is charged with carrying out the Commission's programs and enforcing its regulations.

Pursuant to the Wildlife Conservation Act of New Mexico, it is unlawful to take, possess, transport, export, process, sell, or offer for sale or ship any State or Federal endangered species or subspecies (17–2–41 New Mexico Statutes Annotated [NMSA]), thus, as a State-listed endangered subspecies, the Mexican wolf would be protected from take related to overutilization.

Similarly, in Mexico, the General Wildlife Law ("Ley General de Vida Silvestre", 2000, as amended) provides regulation against take of species or subspecies identified by the Norma Oficial Mexicana NOM–059–SEMARNAT–2010, "Protección ambiental–Especies nativas de México de flora y fauna silvestres." These regulatory provisions are further discussed under factor D. The Inadequacy of Existing Regulatory Mechanisms.

Summary of Factor B

Based on available information, overutilization for commercial, recreational, scientific, or educational purposes does not occur or is exceedingly rare in the United States. In addition, we have no examples of these forms of take occurring in Mexico since the Mexican reintroduction program began in 2011. Arizona, New Mexico, and

Mexico have regulatory provisions under which Mexican wolves could be protected against overutilization if the subspecies were not protected by the Act. Due to the nonexistent or very low level of overutilization occurring, and the ability of the States and Mexico to regulate overutilization, we do not consider overutilization to be affecting the Mexican wolf now or in the future.

Factor C. Disease or Predation

A number of viral, fungal, and bacterial diseases and endo- and ectoparasites have been documented in gray wolf populations (Kreeger 2003, pp. 202–214). However, little research has been done specific to disease in Mexican wolves, and little documentation exists of disease prevalence in wild wolves in the BRWRA population. We obtain the majority of our information on documented mortalities (from all sources, including disease) in the BRWRA from animals wearing radio collars. We may, therefore, underestimate the number of mortalities resulting from disease (e.g., due to the number of uncollared wolves).

Typically, infectious diseases (such as viruses and bacteria) are transmitted through direct contact (e.g., feces, urine, or saliva) with an infected animal, by aerosol routes, or by physical contact with inanimate objects (fomites). Parasites are infective through water, food sources, or direct contact. Wolves are able to tolerate a number of parasites, such as tapeworms or ticks, although occasionally such organisms can cause significant disease, or even be lethal (Kreeger 2003, p. 202).

Mexican wolves are routinely vaccinated for rabies virus, distemper virus, parvovirus, parainfluenza virus, and adenovirus before release to the wild from captive facilities. In addition, common dewormers and external parasite treatments are administered. Wolves captured in the wild are vaccinated for the same diseases and administered dewormers and external parasite treatments. Kreeger (2003, pp. 208–211) describes the transmission route and effect of these diseases on gray wolves and can be referenced for general information. Recent rules for the Western Great Lakes and Northern Rocky Mountain gray wolf populations contain information from studies of disease occurrences in those geographic regions, and can also serve as a reference for a more comprehensive discussion of these (and other) diseases than that provided below (72 FR 6051, February 8, 2007; 73 FR 10513, February 27, 2008).

Rabies, caused by a rhabdovirus, is an infectious disease of the central nervous system typically transmitted by the bite of an infected animal. Rabies can spread between infected wolves in a population (e.g., among and between packs), or between populations, resulting in severe population declines. Rabies is untreatable and leads to death. A rabies outbreak in and near the BRWRA began in 2006 in eastern Arizona and continued through 2009, with positive rabies diagnoses (fox variant) in both foxes and bobcats. No Mexican wolves in the BRWRA were diagnosed with rabies during this outbreak (Arizona Department of Health Services 2012; New Mexico Department of Health 2011) or throughout the history of the reintroduction.

Canine distemper, caused by a paramyxovirus, is an infectious disease typically transmitted by aerosol routes or direct contact with urine, feces, and nasal exudates. Death from distemper is usually caused by neurological complications (e.g., paralysis, seizures), or pneumonia. Distemper can cause high fatality rates, though survivors are occasionally documented in canine populations. Distemper virus may have been a contributing factor to high levels of pup mortality in Yellowstone National Park during several summers (Smith and Almberg 2007, p. 18). Although wolf populations are known to be exposed to the virus in the wild, mortality from distemper in wild Mexican wolves is uncommon. However, we expect Mexican wolf pups, in general, would be most susceptible to death from distemper virus at a time period prior to when they are captured, collared, and vaccinated. Therefore, our collared sample of pups may not be accurately documenting this source of mortality.

Distemper has been documented in one wild litter of Mexican wolves in the BRWRA. Two sibling Mexican wolf pups brought to a captive-wolf-management facility in 2000 from the wild were diagnosed with distemper (indicating they were exposed to the disease in the wild) and died in captivity (AMOC and IFT 2005, p. TC–12). (Note: these captive deaths are not included in the BRWRA mortality statistics.) These are the only known mortalities due to distemper documented in relation to the current experimental population (AMOC and IFT 2005, p. TC–12).

Canine parvovirus is an infectious disease caused by a parvoviridae virus that results in severe gastrointestinal and myocardial (heart disease) symptoms. Parvovirus

is persistent in the environment and can be spread by direct contact or viral particles in the environment. Symptoms of an infected adult animal may include severe vomiting and diarrhea, resulting in death due to dehydration or electrolyte imbalance. Pups may die from myocardial (heart) disease if infected with canine parvovirus while in utero or soon after birth from cardiac arrhythmias. Although canine parvovirus has been documented in wild wolf populations, documented mortalities due to parvovirus are few; researchers hypothesize that parvovirus is a survivable disease, although less so in pups. Parvovirus is thought to have slowed various stages of colonization and dispersal of wolves in the greater Minnesota population (Mech *et al.* 2008, pp. 832–834).

Parvovirus has been documented in one wild litter of wolves in the BRWRA. Three sibling Mexican wolf pups were documented having, and then dying from, parvovirus in 1999: One pup died in an acclimation release pen in the BRWRA, indicating it had been exposed to the disease in the wild (AMOC and IFT 2005, p. TC–12). The other two pups, which also may have been exposed to the disease in the wild, were transferred to, and died at, a prerelease captive facility and are considered captive mortalities. Mortality from canine parvovirus has otherwise not been documented in the BRWRA population. However, we expect pups, in general, to be most susceptible to death from parvovirus prior to when they are captured, collared, and vaccinated. Therefore, our collared sample of pups may not be accurately documenting this source of mortality.

Three of 100 total documented Mexican wolf deaths in the BRWRA population between 1998 and 2013 have been attributed to disease: 1 to canine parvovirus, 1 to chronic bacterial pleuritis (bacterial infection around the lungs), and 1 to bacterial pneumonia. The pleuritis and pneumonia cases, though bacterial diseases, are likely both secondary to other unknown natural factors, rather than contagious, infectious diseases. Potential pup mortality caused by infectious disease may be poorly documented in the free-ranging population because these pups are too young to radio collar and thus difficult to detect or monitor. In addition, collared animals are vaccinated, which reduces the potential for mortality to occur among collared wolves.

We do not have evidence that disease was a significant factor in the decline of Mexican wolves prior to its protection by the Act in the 1970's. However, we recognize that, in a general sense, disease has the potential to affect the size and growth rate of a wolf population and could have a negative impact on the experimental population if the active vaccination program were not in place. We also recognize that some diseases are more likely to spread as wolf-to-wolf contact increases (Kreeger 2003, pp. 202–214), thus the potential for disease outbreaks to occur may increase as the current population expands in numbers or density, although the effect on the population may be lower because a larger wolf population would be more likely to sustain the epidemic. Absent the protection of the Act, the potential for disease to affect the Mexican wolf population would primarily depend on whether State wildlife agencies or other parties provided a similar level of vaccination to the population as that which we currently provide.

In addition to disease, we must also assess whether predation is affecting the Mexican wolf now or in the future under factor C. In our assessment of predation, we focus on wild predators as well as illegal killing of Mexican wolves.

Wild predators do not regularly prey on wolves (Ballard *et al.* 2003, pp. 259–271). Although large prey may occasionally kill wolves during self-defense (Mech and Peterson 2003, p. 134), this occurrence is rare and not considered predation on the wolf. Between 1998 and December 31, 2013, three documented Mexican wolf mortalities are attributed to predators (wolf, mountain lion, and unknown) (Service 2013, Mexican Wolf Blue Range Reintroduction Population Statistics). This may be an underestimate (e.g., due to the number of uncollared wolves), but we still consider the overall incidence to be low based on the occurrences we have documented. Monitoring of Northern Rocky Mountain wolf populations demonstrates that wolf-to-wolf conflicts may be the biggest source of predation among gray wolves, but this typically occurs from territorial conflicts and has not occurred at a level sufficient to affect the viability of these populations (73 FR 10513; February 27, 2008). As the Mexican wolf population begins to saturate available habitat, wolf mortalities resulting from territorial conflicts may become more prevalent but this type of mortality is not currently a concern. We do not foresee any change in the occurrence of wild predation on Mexican wolves if the subspecies was not protected by the Act and, therefore, do not consider predation from wild predators to be affecting the Mexican wolf.

Illegal mortalities have been the biggest source of Mexican wolf mortalities since the reintroduction began in 1998 (Service 2013: Mexican Wolf Blue Range Reintroduction Project Statistics). Out of 100 wild wolf mortalities documented between 1998 and 2013, 55 deaths are attributed to illegal killing (55 percent of total mortalities). Documented illegal shootings have ranged from zero to seven per year between 1998 and December 2013, with one or more occurring every year with the exception of 1999. Illegal shooting has varied from no impact to the population (e.g., in 1999 when no illegal shootings were documented) to resulting in the known mortality of about 15 percent of the population in a given year (e.g., in 2001). Documented causes of illegal shooting in other gray wolf populations have included intentional killing and mistaken identity as a coyote or dog (Fuller *et al.* 2003, p. 181). We do not know the reason for each instance of illegal shooting of a Mexican wolf.

We recognize that some wolf populations can maintain themselves despite sustained human-caused mortality rates of 17 to 48 percent ([Fuller *et al.* 2003 +/– 8 percent], pp. 184–185; Adams *et al.* 2008 [29 percent], p. 22; Creel and Rotella 2010 [22 percent], p. 5; Sparkman *et al.* 2011 [25 percent], p. 5; Gude *et al.* 2011 [48 percent], pp. 113–116; Vucetich and Carroll In Review [17 percent]) and that human-caused mortality sometimes replaces much of the wolf mortality in a population that would have occurred naturally (e.g., due to intraspecific strife from territorial conflicts occurring in populations that have saturated available habitat) (Fuller *et al.* 2003, p. 186). Regardless, for the Mexican wolf experimental population, we think it is likely that the majority of illegal shootings function as additive mortality (that is, these

mortalities are in addition to other mortalities that occur, rather than compensatory mortality where the deaths from illegal shooting would substitute for deaths that would occur naturally) (Murray *et al.* 2010, pp. 2515, 2522). Illegal mortalities have a negative effect on the size and growth rate of the experimental population at its current small size, but the effect of these mortalities on the population has likely been masked to some degree by the number of captive Mexican wolves released into the wild over the course of the reintroduction effort. Additionally, we are unable to document all Mexican wolf mortalities (i.e., uncollared wolves) and, therefore, may be underestimating the number of mortalities caused by illegal shooting.

We expect that, absent the protection of the Act, killing of Mexican wolves would continue at current levels or, more likely, increase significantly because Federal penalties would not be in place to serve as a deterrent. Mexican wolves could be protected from take by State regulations in Arizona and New Mexico and Federal regulations in Mexico, but State penalties are less severe than Federal penalties (see a description and discussion of this under factor D), and Federal protection in Mexico does not infer protection for Mexican wolves in the United States. Based on the continuous occurrence of illegal shooting taking place while the Mexican wolf is protected by the Act and the likelihood of increased occurrences of wolf shooting absent the protection of the Act, we consider illegal killing of Mexican wolves to be significant to the population. We further consider the threat of illegal shooting to Mexican wolves in "Combination of Factors/Focus on Cumulative Effects," which discusses this and other threats within the context of the small, geographically restricted and isolated experimental population.

In Mexico, illegal killing of Mexican wolves released to the wild in between 2011 and 2013 has already been documented. Through August 2014, Mexico released a total of 14 adult Mexican wolves, of which 11 died or are believed dead, and 1 was removed for veterinary care. Of the 11 Mexican wolves that died or are believed dead, 6 were due to illegal killings (4 from poisoning and 2 were shot), 1 wolf was presumably killed by a mountain lion, 3 causes of mortality are unknown (presumed illegal killings because collars were found, but not the carcasses), and 1 disappeared (neither collar nor carcass has been found). The illegal killing of at least six Mexican wolves has significantly hindered Mexico's initial efforts to establish a population; continued monitoring of the wolves Mexico releases in the future will be necessary to document whether these initial events were by chance or are indicative of a significant, ongoing threat to Mexican wolves in Mexico.

Summary of Factor C

Based on the low incidence of disease and mortality from wild predators, we do not consider these factors to be significantly affecting the Mexican wolf nor do we expect them to in the future. Illegal shooting has been a continuous source of mortality to the experimental population in the United States since its inception, and we expect that if Mexican wolves were not protected by the Act the number of shootings would increase substantially in the United States. Therefore, we consider illegal shooting to be significantly affecting Mexican wolves in the United States. In Mexico, four wolves

released in 2011 were illegally poisoned within months of their release to the wild, significantly hindering their reintroduction efforts. Illegal poisoning may affect the future Mexican wolf population in Mexico significantly if such events continue.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

The Act requires us to examine the adequacy of existing regulatory mechanisms with respect to those existing and foreseeable threats, discussed under the other factors that may affect the Mexican wolf. In this five-factor analysis, we consider illegal shooting (factor C), inbreeding (factor E), and small population size (factor E) to be significantly affecting Mexican wolves. We address regulatory mechanisms related to illegal shooting, as no regulatory mechanisms are available to address inbreeding or small population size beyond the overarching protection of the Act.

As discussed in factor C, illegal killing (or "take," as it is referred to in the Act) of Mexican wolves currently occurs at significant levels in both the United States and Mexico. In the United States, illegal shooting of Mexican wolves has been a continuous source of mortality over the course of the reintroduction project. In Mexico, illegal killing has resulted in a setback to the reestablishment of a population of Mexican wolves in the State of Sonora and the Western Sierra Madre; we are unsure of whether this threat will continue.

The Act provides broad protection of listed subspecies to prohibit and penalize illegal take but has not been sufficient to deter all illegal killing of Mexican wolves in the United States. Section 9 of the Act (Prohibited acts) prohibits the take of any federally-listed species, subspecies, or DPS. Section 11 (Penalties and enforcement) provides civil penalties up to $25,000, and criminal penalties up to $50,000 and/or not more than 1 year in jail for knowing violations of section 9. Experimental populations are treated as if they are listed as threatened, which limits criminal penalties to up to $25,000 and imprisonment for not more than 6 months.

All cases of suspected illegal take of Mexican wolves in the United States are investigated by the Service's Office of Law Enforcement Special Agents. On-the-ground personnel involved in preventing illegal take of a Mexican wolf and apprehending those who commit illegal take include Service Special Agents, Arizona Game and Fish Department (AGFD) Game Wardens, New Mexico Department of Fish and Game Conservation Officers, U.S. Forest Service special agents and Law Enforcement Officers (LEOs), San Carlos Apache Tribe LEOs, and White Mountain Apache Tribe LEOs. Specific actions to reduce illegal take include targeted patrols during high-traffic periods (hunting seasons and holidays); the ability to restrict human activities within a 1-mi (1.6-km) radius of release pens, active dens, and rendezvous sites; proactive removal of road kills to reduce the potential of wolves scavenging, which may result in vehicular collision or illegal take of a Mexican wolf; and monetary rewards for information that leads to a conviction for unlawful take of the subspecies. Of the 55

wolf mortalities classified as illegal mortalities between 1998 and 2013, only 4 individuals have been convicted and 1 individual has paid a civil penalty.

If Mexican wolves were not protected by the Act, they would be protected by State regulations in Arizona and New Mexico, and by Federal law in Mexico. In Arizona, the Mexican wolf is managed as Wildlife of Special Concern (Arizona Game and Fish Commission Rules, Article 4, R12–4–401) and is identified as a Species of Greatest Conservation Need (Tier 1a, endangered) (Species of Greatest Conservation Need 2006, pending). Species with these designations are managed under the AGFD's Nongame and Endangered Wildlife Management program, which seeks to protect, restore, preserve, and maintain such species. These provisions, i.e., the Species of Greatest Conservation Need list and the Wildlife of Special Concern list, are nonregulatory. However, Arizona Revised Statute Title 17 establishes AGFD with authority to regulate take of wildlife in the State of Arizona. "Take" (to pursue, shoot, hunt, trap, kill, capture, snare, or net) of wildlife in Arizona on lands under the authority of the Arizona Game and Fish Commission is prohibited, unless a provision (e.g., Commission Order, special rule, permit) is made to allow take. Penalties for illegal take or possession of wildlife can include revocation of hunting license or civil penalties up to $8,000 depending on its classification as established through annual regulations.

In New Mexico, the Mexican wolf is listed as endangered (Wildlife Conservation Act, pp. 17–2–37 through 17–2–46 NMSA 1978). Pursuant to the Wildlife Conservation Act, it is unlawful to take, possess, transport, export, process, sell or offer for sale, or ship

any State or Federal endangered species or subspecies (17–2–41 NMSA). Penalties for violating the provisions of 17–2–41 may include fines of up to $1,000 or imprisonment.

In Mexico, several legal provisions provide regulatory protection for the Mexican wolf. The Mexican wolf is classified as "E" ("probably extinct in the wild") by the Norma Oficial Mexicana NOM–059–SEMARNAT–2010, "Protección ambiental–Especies nativas de México de flora y fauna silvestres–Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio–Lista de especies en riesgo" (NOM–059–SEMARNAT–2010), which is a list of species and subspecies at risk. This regulation does not directly provide protection of the listed species or subspecies; rather it includes the criteria for downlisting, delisting, or including a species, subspecies, or population on the list. The General Wildlife Law ("Ley General de Vida Silvestre," 2000, as amended), however, has varying restrictions depending on risk status that apply only to species or subspecies that are listed in the NOM–059–SEMARNAT–2010.

Mexico's Federal Penal Law ("Código Penal Federal" published originally in 1931) Article 420 assigns a fine of 300 to 3,000 days of current wage and up to 9 years prison to those who threaten the viability of a species, subspecies, or population, transport a species at risk, or damage a specimen of a species at risk. Administrative fines are imposed by an administrative authority (PROFEPA, "Procuraduria Federal de Proteccion al Ambiente," or the Attorney General for Environmental Protection) and are calculated on the basis of minimum wage in Mexico City ($62.33 daily Mexican pesos). The fines established in the General Wildlife Law range from 1,246.60 to 311,650 Mexican pesos

(approximately U.S. $98 to U.S. $24,400) for the four minor infractions, to a range of 3,116 to 3,116,500 Mexican pesos (approximately U.S. $244 to U.S. $244,400) for the other offenses, including the killing of a wolf. Penal fines are imposed by a judge and are calculated on the basis of the current daily wage of the offender including all their income.

We have no information to suggest that, absent the Act's protections, shooting of Mexican wolves in the United States would cease. Rather, we believe that shooting of Mexican wolves could increase, as State penalties (assuming wolves were granted protected status by the States) would be less severe than current Federal penalties under the Act. Thus, existing State penalties in Arizona and New Mexico would not serve as an adequate deterrent to illegal take. The illegal killing of at least four wolves in Mexico (see factor C) between 2011 and 2014 suggests that Federal penalties in Mexico may not be an adequate deterrent to illegal take there, although Federal fines in Mexico are potentially higher than those available under the Act in the United States. The adequacy of these penalties to address overutilization (factor B) is not an issue, as instances of overutilization do not occur or are exceedingly rare and, therefore, do not significantly affect the Mexican wolf.

Summary of Factor D

Regulatory mechanisms to prohibit and penalize illegal killing exist under the Act, but illegal shooting of wild Mexican wolves in the United States persists. We

conclude that, absent the protection of the Act, killing of wolves in the United States would increase, potentially drastically, because State penalties are less severe than current Federal penalties. In regards to regulatory protection for the Mexican wolf in Mexico, the recent poisoning of several reintroduced wolves suggests that illegal killing may be a challenge for that country's reintroduction efforts as well. Thus, in the absence of the Act, existing regulatory mechanisms will not act as an effective deterrent to the illegal killing of Mexican wolves in the United States, and this inadequacy will significantly affect the Mexican wolf.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

We document sources of mortality in six categories as part of our ongoing monitoring of Mexican wolves in the experimental population: Illegal Killing, Vehicle Collision, Natural, Other, Unknown, and Awaiting Necropsy. In factor C, we assessed illegal shooting in the United States, disease, and predation (our mortality category "Natural" includes disease and predation). In factor E, we assess the impacts to the Mexican wolf from the remaining sources of mortality—Vehicle Collision, Natural, Other, and Unknown. As stated in our discussions of disease, predation, and illegal shooting, we may not be documenting all mortalities to the population because mortality of uncollared wolves is not typically detected; similarly, we may underestimate the number of mortalities attributed to any one cause discussed below. We also assess intolerance of wolves by humans, land-use conflicts, hybridization, inbreeding, climate change, and small population size.

Our category of "Natural" causes of mortality includes a number of mortality sources, such as predation, starvation, interspecific strife, lightning strikes, and disease. Because we have documented three or fewer natural mortalities per year since 1998, we do not consider natural mortalities to be occurring at a level, individually or collectively, that significantly affects the Mexican wolf (and see factor C for additional discussion of disease and predation) (Service 2013: Mexican Wolf Blue Range Reintroduction Project Statistics). Therefore, we do not further discuss these "Natural" causes of mortality. Similarly, mortalities caused by "Other" sources of mortality, which also includes several sources of mortality (capture-related mortalities, public-trap mortality, legal public shooting, etc.) and "Unknown" causes are occurring at very low levels (5 of 100 mortalities, and 8 of 100 mortalities, respectively) and are not occurring at a level that significantly affects the Mexican wolf.

Vehicular collision has accounted for 14 percent of Mexican wolf mortalities from 1998 to December 31, 2013 (14 out of 100 total documented Mexican wolf deaths) (Service 2013: Mexican Wolf Blue Range Reintroduction Project Statistics). Thirteen out of 14 Mexican wolf mortalities attributed to vehicular collision throughout the course of the reintroduction (through December 31, 2013) occurred along paved U.S. or State highways; one wolf died on a Forest Service dirt road as a result of vehicle collision. The number of vehicular-related mortalities, which has ranged from zero to two per year, with the exception of a high of four vehicular-related wolf deaths in 2003, has not shown a trend (increasing or decreasing) over time. Given the occurrence of these mortalities on

highways, it is likely that these collisions were accidental events that occurred from vehicles traveling at relatively high speeds. We are cognizant that different types of roads present different levels of threats to Mexican wolves—paved roads with higher speed limits present more risk of wolf mortality due to vehicular collision than unpaved roads with lower speed limit.

Roads, both paved and unpaved, in currently occupied Mexican wolf range in the Gila and Apache National Forests primarily exist to support forest management, livestock grazing, recreational access, resource protection, and transport of forest products on the National Forests (Service 1996, pp. 3–13). National Forests contain various road types (paved, unpaved, opened, closed, etc.) and trails (motorized, nonmotorized), but are generally considered to be driven at relatively low speeds and have relatively low traffic volume. Non-Forest Service roads (e.g., highways and other paved roads) are limited in currently occupied range, and include portions of U.S Highways 191 and 180, and State Highways 260, 152, 90, 78, 32, and 12. U.S. highway 60 runs immediately to the north of this area.

It has been recommended that areas targeted for wolf recovery have low road density of not more than 1 linear mile of road per square mile of area (1.6 linear km of road per 2.56 square kilometers; Thiel 1985, pp. 406–407), particularly during colonization of an area (Fritts *et al.* 2003, p. 301). Road density in the BRWRA was estimated at 0.8 mi road per mi^2 (1.28 km road per km^2) prior to the reintroduction (Johnson *et al.* 1992, p. 48). The U.S. Forest Service Southwest Region recently

calculated road densities for the Gila and Apache–Sitgreaves National Forests during analysis of alternatives to designate a system of roads, trails, and areas designated for motor vehicle use in compliance with the Travel Management Rule. They did not assess road use in terms of a baseline of traffic volume or projections of traffic volume for the future. Both the Gila and Apache–Sitgreaves National Forests continue to have an appropriately low density of roads for the Mexican wolf reintroduction effort, with no plans to increase road density in either Forest—road density in the Apache portion of the Apache–Sitgreaves National Forest is estimated at 0.94 mi road per mi^2 for all roads (1.5 km road per km^2) (open, closed, decommissioned) and motorized trails, or 0.43 mi road per mi^2 (0.69 km road per km^2) for open roads and motorized trails (USDA 2010a, p. 102); road density in the Gila National Forest is estimated at 1.02 mi per mi^2 (1.64 km per km^2) for open and closed (but not decommissioned) roads and motorized trails (an overall average of 0.99 mi per mi^2 (1.59 km per km^2) (USDA 2010b, p. 149). Therefore, these Forests provided Mexican wolf habitat with appropriately low road density for establishment (colonization) of the experimental population.

The revised MWEPA includes the addition of the Sitgreaves National Forest, Magdalena Ranger District of the Cibola National Forest, and Tonto, Payson, and Pleasant Valley Ranger Districts of the Tonto National Forest to the Gila and Apache National Forests as Zone 1, the area in which we will primarily conduct initial releases; these Forests have appropriately low road densities compared with non-Forest Service land to support these management activities (Service 2014, Ch 3, p. 2). In Zone 2, which comprises a wider matrix of habitat quality than Zone 1, including areas of substantially

higher road density of paved, high-speed roads, we recognize that wolf morality due to vehicular collision may increase. However, we do not have any data to determine the degree to which this may occur or whether it will significantly affect the Mexican wolf.

In summary, Mexican wolf mortalities from vehicular collision show a strong pattern of occurrence on high-speed paved State or U.S. Highways rather than on Forest Service roads, and are currently occurring at relatively low levels (two or fewer mortalities per year, with the exception of 1 year in which four mortalities were attributed to vehicular collision). We consider it possible that wolf mortalities due to vehicular collision may increase in the future as Mexican wolves will be allowed to disperse beyond the Gila and Apache National Forests into areas with higher road density within the MWEPA. We will continue to document wolf mortality due to vehicular collision to determine whether this becomes significant. In absence of Federal protection, we would not expect that incidence rate of wolf–vehicular collision to change, due to the accidental nature of these incidents. Therefore, with or without the protections of the Act, we conclude that vehicular collisions, considered in isolation of other sources of mortality, are not significantly affecting the Mexican wolf. We further consider the significance of these mortalities in Combination of Factors/Focus on Cumulative Effects.

Intolerance by Humans—Human attitudes have long been recognized as a significant factor in the success of gray wolf recovery efforts to the degree that it has been suggested that recovery may depend more on human tolerance than habitat

restoration (see Boitani 2003, p. 339, Fritts *et al.* 2003; Mech 1995). In the Southwest, extremes of public opinion vary between those who strongly support or oppose the recovery effort. Support may stem from such feelings as an appreciation of the Mexican wolf as an important part of nature and an interest in endangered species restoration, while opposition may stem from negative social or economic consequences of wolf reintroduction, general fear and dislike of wolves, or Federal land-use conflicts.

Public polling data in Arizona and New Mexico shows that most respondents have positive feelings about wolves and support the reintroduction of the Mexican wolf to public land (Research and Polling 2008a, p. 6, Research and Polling 2008b, p. 6). These polls targeted people statewide in locations outside of the reintroduction area, and thus provide an indication of regional support.

In any case, there is no direct evidence to indicate that intolerance by humans of Mexican wolves will result in increased illegal killings. Without additional information, we are unable to confirm whether, or the degree to which, disregard for or opposition to the reintroduction project is a causative factor in illegal killings. Similarly, in Mexico, we do not know whether the illegal poisoning of four reintroduced Mexican wolves was purposeful and stemmed from opposition to the reintroduction or rather was targeted more generally at (other) predators. We recognize that humans can be very effective at extirpating wolf populations if human-caused mortality rates continue at high levels over time, as demonstrated by the complete elimination of Mexican wolves across the Southwest and Mexico prior to the protection of the Act. At this time, however, we do

not have enough information to determine whether, or the degree to which, intolerance by humans may pose a threat to the Mexican wolf.

Land-Use Conflicts—Historically, land-use conflict between Mexican wolves and livestock producers was a primary cause of the wolf's endangerment due to human killing of wolves that depredated livestock. At the outset of the reintroduction effort, the amount of permitted grazing in the recovery area was identified as a possible source of public conflict for the project due to the potential for wolves to depredate on livestock (Service 1996, p. 4–4). Since the reintroduction project began in 1998, 73 Mexican wolves have been removed from the wild due to livestock depredation, reaching a high of 16 and 19 removals in 2006 and 2007, respectively (Service 2013 Mexican Wolf Blue Range Project Statistics).

Since 2007, the Service, other State, Federal, and tribal agencies, private parties, and livestock producers have increased proactive efforts (e.g., hazing, fencing, range riders) to minimize depredations, resulting in fewer removals from 2008 to 2013 than in the first 10 years of the program. Since 2007, we removed one Mexican wolf in 2012 and two Mexican wolves in 2013 from the experimental population due to confirmed livestock depredation (Service 2013 Mexican Wolf Blue Range Project Statistics). While recognizing that management removals must be part of an overall management scheme that promotes the growth of the experimental population, the Service is committed to actively managing depredating Mexican wolves to improve human tolerance.

Furthermore, the Service, in cooperation with the National Fish and Wildlife Foundation, established the Mexican Wolf/Livestock Interdiction Trust Fund (Trust Fund), which was founded on September 23, 2009. The objective of the Trust Fund is to generate long-term funding for prolonged financial support to livestock operators with the framework of cooperative conservation and recovery of Mexican wolf populations in the Southwest. Funding is provided for initiatives that address management, monitoring, and proactive conservation needs for Mexican wolves related to livestock protection, measures to avoid and minimize depredation, habitat protection, species protection, scientific research, conflict resolution, compensation for damage, education, and outreach activities. The Trust Fund is overseen by the Mexican Wolf/Livestock Coexistence Council, an 11-member group of ranchers, Tribes, county coalitions, and environmental groups that may identify, recommend, and approve conservation activities, identify recipients, and approve the amount of the direct disbursement of Trust Funds to qualified recipients. It is the current policy of the Coexistence Council to pay 100 percent of the market value of confirmed depredated livestock and 50 percent market value for probable kills.

Based on these efforts, we conclude that land-use conflicts are not significantly affecting the Mexican wolf. As noted above, since 2007 we removed three Mexican wolves from the experimental population due to confirmed livestock depredation (Service 2013 Mexican Wolf Blue Range Project Statistics). Also, when we remove Mexican wolves due to confirmed livestock depredation, many of the wolves are

released back into a different part of the experimental population area where they are less likely to cause livestock depredations. We are able to manage problem Mexican wolves in a manner that does not significantly affect the experimental population. In the absence of protection by the Act, land-use conflicts would still occur in areas where Mexican wolves and livestock coexist. However, because the Mexican wolf is protected by State law in Arizona and New Mexico, we expect that livestock producers and State agencies would continue to employ effective practices of hazing or other active management measures to reduce the likelihood of occurrence of depredation incidents. Therefore, we conclude that land-use conflicts are unlikely to significantly affect the Mexican wolf if it was not protected by the Act.

Hybridization—Hybridization between wolves and other canids can pose a significant challenge to recovery programs (e.g., the red wolf recovery program) (Service 2007, pp. 10–11) because species in the *Canis* genus can interbreed and produce viable offspring. In the Mexican wolf experimental population, hybridization is a rare event. Three confirmed hybridization events between Mexican wolves and dogs have been documented since the reintroduction project began in 1998. In the first two cases, hybrid litters were humanely euthanized (Service 2002, p. 17, Service 2005:16.). In the third case, four of five pups were humanely euthanized; the fifth pup, previously observed by project personnel but not captured, has not been located and its status is unknown (BRWRA Monthly Project Updates, June 24, 2011, *http://www.fws.gov/southwest/es/mexicanwolf/CEBRWRA.cfm*). No hybridization between Mexican wolves and coyotes has been confirmed through our genetic

monitoring of coyotes, wolves, and dogs that are captured in the wild as part of regular management activities of canids in the wild.

Our response to hybridization events has negated potential impacts to the BRWRA population from these events (e.g., effects to the genetic integrity of the population). Moreover, the likelihood of hybrid animals surviving, or having detectable impacts on wolf population genetics or viability, is low due to aspects of wolf sociality and fertility cycles (Mengel 1971, p. 334; Vila and Wayne 1999, pp. 195–199).

We do not foresee any change in the likelihood of hybridization events occurring, or the potential effect of hybridization events, if the Mexican wolf was not protected by the Act; that is, hybridization events and effects would continue to be rare. Therefore, we conclude that hybridization is not significantly affecting the Mexican wolf population now nor is it likely to do so in the future.

Inbreeding, Loss of Heterozygosity, and Loss of Adaptive Potential—Mexican wolves have pronounced genetic challenges resulting from an ongoing and severe genetic bottleneck (that is, a reduction in a population's size to a small number for at least one generation) caused by its near extirpation in the wild and the small number of founders upon which the captive population was established. These challenges include inbreeding (mating of close relatives), loss of heterozygosity (a decrease in the

proportion of individuals in a population that have two different alleles for a specific gene), and loss of adaptive potential, three distinct but interrelated phenomena.

When a population enters a genetic bottleneck, the strength of genetic drift (random changes in gene frequencies in a population) is increased and the effectiveness of natural selection is decreased. As a result, formerly uncommon alleles may drift to higher frequencies and become fixed (the only variant that exists), even if they have deleterious (negative) effects on the individuals that carry them. Conversely, beneficial alleles may become less common and even be lost entirely from the population. In general, rare alleles are lost quickly from populations experiencing bottlenecks. Heterozygosity is lost much more slowly, but the losses may continue until long after the population has grown to large size (Nei *et al.* 1975, entire). The extent of allele and heterozygosity loss is determined by the depth (the degree of population contraction) and duration of a bottleneck. Heterozygosity is important because it provides adaptive potential and can mask (prevent the negative effects of) deleterious alleles.

Inbreeding can occur in any population, but is most likely to occur in small populations due to limited choice of mates. The potential for inbreeding to negatively affect the captive and reintroduced Mexican wolf populations has been a topic of concern for over a decade (Parsons 1996, pp. 113–114; Hedrick *et al.* 1997, pp. 65–68). Inbreeding affects traits that reduce population viability, such as reproduction (Kalinowski *et al.* 1999, pp. 1371–1377; Asa *et al.* 2007, pp. 326–333; Fredrickson *et al.* 2007, pp. 2365–2371), survival (Allendorf and Ryman 2002, pp. 50–85), and disease

resistance (Hedrick *et al.* 2003, pp. 909–913). Inbreeding is significant because it reduces heterozygosity and increases homozygosity (having two of the same alleles) throughout the genome.

Inbreeding depression is thought to be primarily a result of the full expression of deleterious alleles that have become homozygous as a result of inbreeding (Charlesworth and Willis 2009, entire). In other words, rare deleterious alleles, or gene variants that have deleterious effects such as deformities, are more likely to be inherited and expressed in an offspring of two related individuals than of unrelated individuals (that is, the offspring may be homozygous). Theory suggests that, although lethal alleles (those that result in the death of individuals with two copies) may be purged or reduced in frequency in small populations (Hedrick 1994, pp. 363–372), many other mildly and moderately deleterious alleles are likely to become fixed in the population (homozygous in all individuals) with little or no reduction in the overall genetic load (amount of lethal alleles) (Whitlock *et al.* 2000, pp. 452–457). In addition, there is little empirical evidence in the scientific literature that purging reduces the genetic load in small populations.

As previously described, Mexican wolves experienced a rapid population decline during the 1900s, as predator eradication programs sought to eliminate wolves from the landscape. Subsequently, a captive-breeding program was initiated. The McBride lineage was founded with three wolves in 1980. The Ghost Ranch and Aragon lineages were each founded by single pairs in 1961 and around 1976,

respectively. These lineages were managed separately until the mid-1990s, by which time all three lineages had become strongly inbred. Inbreeding coefficients (*f*) (a measure of how closely related two individuals are) for McBride pups born in the mid–1990s averaged about 0.23— similar to inbreeding levels for offspring from outbred full sibling or parent–offspring pairs ($f = 0.25$). Inbreeding coefficients for Aragon and Ghost Ranch lineage pups born in the mid-1990s were higher, averaging 0.33 for Aragon pups and 0.64 for Ghost Ranch pups (Hedrick *et al.* 1997, pp. 47–69).

Of the three lineages, only the McBride lineage was originally managed as a captive-breeding program to aid in the conservation of Mexican wolves. However, out of concern for the low number of founders and rapid inbreeding accumulation in the McBride lineage, the decision was made to merge the Aragon and Ghost Ranch lineages into the McBride lineage after genetic testing confirmed that this approach could improve the gene diversity of the captive population (Garcia–Moreno *et al.* 1996, pp. 376–389). Consequently, pairings (for mating) between McBride wolves and Aragon wolves and between McBride and Ghost Ranch wolves began in 1995 with the first generation (F1) of these pups born in 1997. Although the parents of these first generation wolves were strongly inbred, the offspring were expected to be free of inbreeding and free of the inbreeding depression. Forty-seven F1 wolves were produced from 1997 to 2002. Upon reaching maturity, the F1 wolves were paired among themselves, backcrossed with pure McBride wolves, and paired with the descendants of F1 wolves called “cross-lineage” wolves to maintain gene diversity and reduce inbreeding in the captive population.

Although there was slight statistical evidence of inbreeding depression among captive wolves of the McBride and Ghost Ranch lineages, the outbred F1 wolves proved to have far greater reproductive fitness than contemporary McBride and Ghost Ranch wolves (which were strongly inbred) as well as minimally inbred wolves from early in the McBride and Ghost Ranch pedigrees. Pairings between F1 wolves were 89 percent more likely to produce at least one live pup, and mean litter sizes for F1 × F1 pairs were more than twice as large as contemporary McBride pairings (7.5 vs 3.6 pups per litter; Fredrickson *et al.* 2007, pp. 2365–2371). The large increases in reproductive fitness among F1 wolves suggested that the McBride and Ghost Ranch lineages were suffering from a large fixed genetic load of deleterious alleles. In other words, McBride and Ghost Ranch wolves had accumulated identical copies of gene variants that had negative effects on their health or reproductive success at many locations (loci) throughout their genome. In addition, pups born to cross–lineage dams (mother wolves) had up to 21 percent higher survival rates to 180 days than contemporary McBride lineage pups (Fredrickson *et al*. 2007, pp. 2365–2371).

Although the F1 wolves had high reproductive fitness, strong inbreeding depression among cross-lineage wolves in captivity has been documented. Inbreeding levels of both dams and sires (mother and father wolves, respectively) were found to negatively affect the probability that a pair would produce at least one live pup. For example, the estimated probabilities of a pair producing at least one live pup dropped from 0.96 for F1 × F1 pairs (with no inbreeding in the dam and sire) to 0.40 for pairs

with a mean inbreeding coefficient of 0.15 (Fredrickson *et al.* 2007, pp. 2365–2371). Consistent with the finding that inbreeding levels of sires affected the probability of producing at least one live pup, Asa *et al.* (2007, pp. 326–333) found that two measures of semen quality, sperm cell morphology and motility of sperm cells, declined significantly as inbreeding levels increased. Among pairs that produced at least one live pup, increases of 0.1 in the inbreeding coefficients of both the dam and pups was estimated to reduce litter size by 2.8 pups. Inbreeding levels of the pups were found to have about twice the detrimental effect as inbreeding in the dam, suggesting that inbreeding accumulation in pups was causing pups to die prior to being born (Fredrickson *et al.* 2007, pp. 2365–2371).

As of July 2014, the captive population of Mexican wolves consisted of 258 wolves, of which 33 are reproductively compromised or have very high inbreeding coefficients, leaving 225 wolves as the managed population (Siminski and Spevak 2014). The age structure of the population, however, is heavily skewed, with wolves 7 years old and older comprising about 62 percent of the population—meaning that most of the population is composed of old wolves who will die within a few years. This age structure, which has resulted from the high reproductive output of the F1 wolves and their descendants in captivity, the combination of few releases of captive-born wolves to the wild in recent years, removal of wolves from the wild population to captivity, and limited pen space for pairings, means that additional gene diversity will be lost as the captive population continues to age (R. Fredrickson, pers. comm., 2014).

The SSP strives to minimize and slow the loss of gene diversity of the captive population but (due to the limited number of founders) cannot increase it. As of 2014, the gene diversity of the captive program was 83.36 percent of the founding population, which falls below the average mammal SSP (93 percent) and below the recognized SSP standard to maintain 90 percent of the founding population diversity. Below 90 percent, the SSP states that reproduction may be compromised by low birth weight, smaller litter sizes, and related issues.

Representation of the Aragon and Ghost Range lineages in 2014 was 17.94 percent and 20.07 percent, respectively (Siminski and Spevak 2014, p. 8). More specifically, the representation of the seven founders is very unequal in the captive population, ranging from about 30 percent for the McBride founding female to 4 percent for the Ghost Ranch founding male. Unequal founder contributions lead to faster inbreeding accumulation and loss of founder alleles. The captive population is estimated to retain only 3.00 founder genome equivalents, suggesting that more than half of the alleles (gene variants) from the seven founders have been lost from the population.

With the current gene diversity of 83.36 percent and current space limitations of 300 captive Mexican wolves, retaining 75 percent gene diversity for only 41 years from present is possible with the current generation length of 5.8 years in the captive population, population growth rate of $\lambda = 1.065$, effective population size (*Ne*) of 26.96, and a ratio of effective to census size (*Ne* / *N;* that is, the number of breeding animals as a percentage of the overall population size) of 0.1266 (Siminski and Spevak 2014, p. 7).

The genetically effective population size is defined as the size of an ideal population that would result in the rate of inbreeding accumulation or heterozygosity loss as the population being considered. The effective sizes of populations are almost always smaller than census sizes of populations. A rule of thumb for conservation of small populations holds N_e should be maintained above 50 to prevent substantial inbreeding accumulation, and that small populations should be grown quickly to much larger sizes ($Ne \geq 500$) to maintain evolutionary potential (Franklin 1980, entire). The low ratio of effective to census population sizes in the captive population reflects the limitations on breeding (due to a lack of cage space) over the last several years, while the low effective population size is another indicator of the potential for inbreeding and loss of heterozygosity.

The gene diversity of the experimental population of Mexican wolves can only be as good as the diversity of the captive population from which it is established. Based on information available in July 11, 2014, the genetic diversity of the wild population was 74.52 percent of the founding population (Siminski and Spevak 2014, pp. 9), with 5.36 percent and 14.56 percent representation of Aragon and Ghost Range lineages, respectively. At the end of 2013, the minimum population in the Mexican wolf experimental population was 83 Mexican wolves, but the experimental population is a poor representative of the genetic variation remaining in the captive population. Founder representation in the experimental population is more strongly skewed than in the captive population. Mean inbreeding levels are 65 percent greater, and founder genome equivalents are 35 percent lower than in the captive population.

In addition, the estimated relatedness of the Mexican wolf experimental population is on average 65 percent greater than that in the captive population (population mean kinship: 0.2548 versus 0.1664; Siminski & Spevak 2014, p. 9). Without substantial management action to improve the genetic composition of the population, inbreeding will accumulate and heterozygosity and alleles will be lost much faster than in the captive population.

There is evidence of strong inbreeding depression in the Mexican wolf experimental population. Fredrickson *et al.* (2007, pp. 2365–2371) estimated that the mean observed litter size (4.8 pups for pairs producing pups with no inbreeding) was reduced on average by 0.8 pups for each 0.1 increase in the inbreeding coefficient of the pups. For pairs producing pups with inbreeding coefficients of 0.20, the mean litter size was estimated to be 3.2 pups. Computer simulations of the experimental population incorporating the Mexican wolf pedigree suggest that this level of inbreeding depression may substantially reduce the viability of the experimental population (Carroll *et al.* 2014, p. 82).

The recent history of Mexican wolves can be characterized as a severe genetic bottleneck that began no later than the founding of the Ghost Ranch lineage in 1960. The founding of the three lineages along with their initial isolation likely resulted in the loss of most rare alleles and perhaps even some moderately common alleles. Heterozygosity loss was accelerated as a result of rapid inbreeding accumulation. The merging of the captive lineages likely slowed the loss of alleles and heterozygosity, but

did not end it. The consequences to Mexican wolves of the current genetic bottleneck will be future populations that have reduced fitness (for example, smaller litter sizes, lower pup survival) due to inbreeding accumulation and the full expression of deleterious alleles. The loss of alleles will limit the ability of future Mexican wolf populations to adapt to environmental challenges.

Based on data from the SSP documenting loss of genetic variation, research documenting viability-related inbreeding effects in Mexican wolves, and our awareness that the wild population is at risk of inbreeding due to its small size, we conclude that inbreeding, and loss of heterozygosity, and loss of adaptive potential are significantly affecting Mexican wolves and are likely to continue to do so in the future. If the Mexican wolf was not protected by the Act, these risks would remain, and may increase if States or other parties did not actively promote genetic diversity in the experimental population by releasing wolves with appropriate genetic ancestry to the population.

Small Population Size—Rarity may affect the viability (likelihood of extinction or persistence over a given time period) of a subspecies depending on the subspecies' biological characteristics and threats acting upon it. We consider several types of information to determine whether small population size is affecting the Mexican wolf, including historical conditions, consideration of stochastic (or, chance) events, theoretical recommendations of population viability, and applied population-viability models specific to Mexican wolves. We discuss three types of stochastic events—demographic, environmental, and catastrophic—as the fourth type of stochastic event—genetic—is

addressed under the subheading of Inbreeding. We further discuss the significance of small population size in Combination of Factors/Focus on Cumulative Effects, below.

Historical abundance and distribution serve as a qualitative reference point against which to assess the size of the current population. Prior to European colonization of North America, Mexican wolves were geographically widespread throughout numerous populations across the southwestern United States and Mexico. Although we do not have definitive estimates of historical abundance, we can deduce from gray wolf population estimates (Leonard *et al.* 2005, p. 15), trapping records, and anecdotal information that Mexican wolves numbered in the thousands across its range in the United States and Mexico. We, therefore, recognize that the current size and geographic distribution of the Mexican wolf represents a substantial contraction from its historical (pre-1900s) abundance and distribution.

Scientific theory and practice generally agree that a subspecies represented by a small population faces a higher risk of extinction (or a lower probability of population persistence) than a subspecies that is widely and abundantly distributed (Goodman 1987, pp. 11–31; Pimm *et al.* 1988, p. 757). One of the primary causes of this susceptibility to extinction is the sensitivity of small populations to random demographic events (Shaffer 1987, pp. 69–86, Caughley 1994, p. 217). In small populations, even those that are growing, random changes in average birth or survival rates could cause a population decline that would result in extinction. This phenomenon is referred to as demographic stochasticity. As a population grows larger and individual events tend to average out, the

population becomes less susceptible to extinction from demographic stochasticity and is more likely to persist.

Two Mexican wolf population-viability analyses were initiated subsequent to the development of the 1982 Mexican Wolf Recovery Plan but prior to the reintroduction of Mexican wolves into the experimental population in 1998 (Seal 1990 entire, IUCN 1996 entire, Service 2010, p. 66), although neither was completed. Population-viability modeling will be conducted as part of the development of draft recovery criteria; these results will be available to the public when the draft recovery plan is published. In the meantime, Carroll *et al.* (2014, p. 81) conducted a population viability model for Mexican wolves and found that the risk of extinction varied by both population size and the number of effective migrants per generation. The risk of extinction for population sizes below 200 was affected by the number of migrants, such that populations of 100 had a greater than 5 percent extinction risk, even with 3 effective migrants per generation, while populations of 125 were more secure with 2.5 to 3.0 effective migrants per generation, and populations of 150 were secure with greater than 0.5 effective migrants per generation (Carroll *et al.* 2014, p. 81). Given our understanding of the high extinction risk of the current size of the experimental population and our awareness that this rarity is not the typical abundance and distribution pattern for Mexican wolves, we consider the small population size of the Mexican wolf.

At the end of 2013, the minimum population size was 83 Mexican wolves, meaning the experimental population is, by demographic measures, considered small

and has a low probability of persistence (Shaffer 1987, p. 73; Boyce 1992, p. 487; Mills 2007, p. 101; Service 2010, pp. 63–68). Absent the protection of the Act, the extinction risks associated with small population size would remain, and may increase if Arizona or New Mexico does not actively support the experimental population through appropriate management measures. The vulnerability of a small population to extinction can also be driven by the population's vulnerability to decline or extinction due to stochastic environmental or catastrophic events (Goodman 1987, pp. 11–31; Pimm *et al.* 1988, p. 757). While we consider these types of events to be critically important considerations in our recovery efforts for the subspecies, we have not identified any single environmental event (i.e., disease, climate change (below)) or catastrophic event (wildfire) to be significantly affecting Mexican wolf based on our current information and management practices (e.g., vaccinations, monitoring). However, we reconsider the concept of vulnerability to these events below, in Combination of Factors/Focus on Cumulative Effects.

Climate Change—Our analyses under the Act include consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2013, p. 1450). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether

the change is due to natural variability, human activity, or both (IPCC 2013, p. 1450). Various types of changes in climate can have direct or indirect effects on the Mexican wolf. These effects may be positive, neutral, or negative, and they may change over time, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation). In our analysis, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change. Research to investigate the possible impacts of climate change specifically on the Mexican wolf has not been conducted. Therefore, we base our analysis on pertinent information from the scientific literature related to Mexican wolf habitat and prey.

Throughout their circumpolar distribution, gray wolves persist in a variety of ecosystems with temperatures ranging from -70 to 120 degrees Fahrenheit (-56 to 48 degrees Celsius) with wide-ranging prey type and availability (Mech and Boitani 2003, p. xv). Mexican wolves historically inhabited, and still inhabit, a range of southwestern ecotypes subsisting on large ungulate prey as well as small mammals Mexican wolves did not historically, (nor currently),inhabit extreme desert areas or semi-desert grasslands except potentially during dispersal movements (Service 2010, p. 39). Due to their plasticity and lack of reliance on microhabitat, we generally do not consider Mexican wolves to be highly vulnerable or sensitive to climate change (Dawson *et. al* 2011, p. 53). However, we recognize that climate change is already having detectable impacts on the ecosystems of the Southwest, and future changes could affect Mexican wolves or their prey. For example, warmer temperatures, more frequent and severe drought, and reductions in snowpack, streamflows and water availability are projected across the

southwestern US (Garfin *et al.* 2014, pp. 464-466). To the degree that warmer temperatures and increased aridity or decreased water availability (Dai 2011, p. 58) or any of these other conditions, limit prey abundance, we would also expect decreased Mexican wolf densities. Information suggests that ungulate prey populations in more xeric ecoregions in the Southwest may be impacted more negatively than those in wetter areas due to decreased forage quality and availability (deVoss and McKinney 2012, p. 19). However, Mexican wolves are associated with mid-to high-elevation montane forests and adjacent grasslands rather than areas with more xeric conditions. Reduced water in the system, due to reduced summer base flow in streams, and the earlier onset of summer low-flow conditions, may reduce or localize big game populations in the summer months; such changes have the potential to adversely affect the wolf within the next 50 to 100 years through reductions or distributional shifts in wild ungulate populations. Information also suggests that mule deer may be more susceptible to climate change impacts that alter vegetation patterns than elk (deVoss and McKinney 2012, pp. 16-19), but elk are currently a much more important source of prey for Mexican wolves than mule deer.

Both Mexican wolves and their primary prey (elk) may exhibit reasonable adaptive capacity (Dawson *et al.* 2011, p. 53), such that they could shift habitats in response to changing climatic conditions or potentially persist in place. Elk, which make up approximately 77 to 80 percent of the Mexican wolf's diet in the experimental population, are known to be habitat generalists due to their association with wide variation in environmental conditions (Kuck 1999, p. 1). Both positive and negative impacts to elk from climate change have been hypothesized in the literature, although no

specific regional research has been conducted (deVoss and McKinney 2012, p. 18). For example, if climate change results in decreased winter snow pack in the Colorado Plateau Region (which includes central Arizona and New Mexico), elk populations could expand in number due to milder winters and increased forage availability (National Wildlife Federation 2013, p. 14). Conversely, if migratory elk herds stop migrating in response to milder winters, increased elk densities in some areas could lead to higher levels of disease transmission between elk, which may increase mortality (ibid). With these types of positive and negative considerations in mind, several sources tentatively suggest that overall elk may respond favorably in range and population size to climate change (National Wildlife Federation 2013, p. 14, deVoss and McKinney 2012, p. 19).

In Mexico, elk are not present as a source of prey for Mexican wolves. Therefore, the effects of climate change on deer populations could be important for the establishment and maintenance of a wolf population there. Seasonal decreases in precipitation and resulting changes in vegetation quality and availability could lead to the same type of impacts to ungulates as hypothesized in the United States, such as range contraction or decreasing populations. However, as with Factors A-D and because our focus in this analysis is on currently occupied range, the absence of a Mexican wolf population in Mexico precludes analysis of climate change there.

Therefore, based on the relatively low vulnerability and sensitivity of the Mexican wolf to changes in climate, and the potential for elk to respond favorably to climate change in this region, we conclude that climate change is not substantially affecting the Mexican wolf at the current time nor do we expect it to do so in the future.

Summary of Factor E

Inbreeding, loss of adaptive potential, loss of heterozygosity, and small population size are significantly affecting the Mexican wolf. Inbreeding and loss of heterozygosity have the potential to affect viability-related fitness traits in Mexican wolves and, therefore, to affect the persistence of the subspecies in the wild in the near term; loss of genetic variation (adaptive potential) significantly affects the likelihood of persistence of the Mexican wolf over longer timeframes. Absent the protection of the Act, inbreeding, loss of heterozygosity, and loss of adaptive potential would persist and possibly increase depending on whether the States or other parties undertook active promotion of the maintenance of gene diversity.

The small size of the Mexican wolf experimental population results in a high risk of extinction due to the susceptibility of the population to stochastic demographic events. The minimum estimated population of 83 Mexican wolves at the end of 2013 is not a sufficient size to ensure persistence into the future. Absent the protection of the Act, small population size would continue to significantly affect the Mexican wolf, or may increase if States or other parties did not actively support the experimental population through appropriate management measures. Intolerance by humans, land-use conflicts, hybridization, and climate change are not significantly affecting the Mexican wolf, nor are they expected to do so in the future. Vehicular collision is not significantly affecting the Mexican wolf; however, we expect that this source of mortality may increase in the

future due to wolf dispersal and occupancy in areas of higher road density than currently occupied habitat. We do not have data to estimate how significant this may become.

Combination of Factors/Focus on Cumulative Effects

In the preceding review of the five factors, we found that the Mexican wolf is most significantly affected by illegal killing, inbreeding, loss of heterozygosity, loss of adaptive potential, and small population size. In absence of the Act's protections, these issues would continue to affect the Mexican wolf, and would likely increase in frequency or severity. We also identify several potential sources of mortality or risk (disease, vehicular collision, wildfire, hybridization, etc.) that we do not currently consider to be significantly affecting the Mexican wolf due to their low occurrence, minimal impact on the population, or lack of information. However, we recognize that multiple sources of mortality or risk acting in combination have greater potential to affect the Mexican wolf than each factor alone. Thus, we consider how factors that, by themselves may not have a significant effect on the Mexican wolf, may affect the subspecies when considered in combination.

The small population size of the Mexican wolf exacerbates the potential for all other factors to disproportionately affect the Mexican wolf. The combined effects of demographic, genetic, environmental, and catastrophic events to a small population can create an extinction vortex—an unrecoverable population decline—that results in

extinction. Small population size directly and significantly increases the likelihood of inbreeding depression, which has been documented to decrease individual fitness, hinder population growth, and decrease the population's probability of persistence. Small population size also increases the likelihood that concurrent mortalities from multiple causes that individually may not be resulting in a population decline (e.g., vehicular collisions, natural sources of mortality) could collectively do so, depending on the population's productivity, especially when additive to an already significant source of mortality, such as illegal shooting. Effects from disease, catastrophe, environmental conditions, or loss of heterozygosity that normally could be sustained by a larger, more resilient population have the potential to rapidly affect the size, growth rate, and genetic integrity of the small experimental population when they act in combination. Therefore we consider the combination of factors C, D, and E to be significantly affecting the Mexican wolf.

Summary of Five-Factor Analysis

We do not find habitat destruction, curtailment, or modification to be significantly affecting the Mexican wolf now, nor do we find that these factors are likely to do so in the future regardless of whether the subspecies is protected by the Act. The size and federally protected status of the National Forests in Arizona and New Mexico are adequate and appropriate for the reintroduction project. These National Forests provide secure habitat with an adequate prey base and habitat characteristics to support the current wolf population. The Wallow Fire and the Whitewater–Baldy Complex Fire,

while catastrophic, were not sources of habitat modification, destruction, or curtailment that affected the Mexican wolf because there were no documented wolf mortalities during the fires, and prey populations are expected to increase in response to post-fire positive effects on vegetation.

We do not find overutilization for commercial, recreational, scientific, or educational purposes to be significantly affecting the Mexican wolf because we have no evidence to indicate that legal killing or removal of wolves from the wild for commercial, recreational (i.e., hunting), scientific, or educational purposes is occurring. The killing of wolves for their pelts is not known to occur, and Mexican wolf research-related mortalities are minimal or nonexistent. Incidents of injuries and mortalities from trapping (for other animals) have been low. In absence of Federal protection, State regulations in Arizona and New Mexico, and Federal regulations in Mexico, could provide regulations to protect Mexican wolves from overutilization. Overutilization of Mexican wolves would not likely increase if they were not listed under the Act due to the protected status they would be afforded by the States and Mexico.

Based on known disease occurrences in the current population and the active vaccination program, we do not consider disease to be significantly affecting the Mexican wolf. Absent the protection of the Act, a similar vaccination program would need to be implemented by the States or other parties, or the potential for disease to significantly affect the Mexican wolf could increase.

Predation (by nonhuman predators) is not significantly affecting the Mexican wolf. No wild predator regularly preys on wolves, and only a small number of predator-related wolf mortalities have been documented in the current Mexican wolf experimental population. We do not consider predation likely to significantly affect the Mexican wolf in the future or if the subspecies was not protected by the Act.

Illegal shooting is identified as significantly affecting the Mexican wolf and is a significant threat. Adequate regulatory protections are not available to protect Mexican wolves from illegal shooting without the protection of the Act. We would expect shooting of Mexican wolves to increase if they were not federally protected, as State penalties (assuming Mexican wolves were maintained as State-protected) are less than Federal penalties.

Inbreeding, loss of heterozygosity, loss of adaptive potential, and small population size are significantly affecting the Mexican wolf. We recognize the importance of the captive management program and the active reintroduction project and recovery program in addressing these issues. Absent the protection of the Act, their effects on Mexican wolf would continue, or possibly increase depending on the degree of active management provided by the States or other parties.

Vehicular collisions, intolerance by humans, land-use conflicts, hybridization, and climate change are not significantly affecting the Mexican wolf, nor are they expected to do so in the near future or if the Mexican wolf was not protected by the Act.

Climate change is not significantly affecting the Mexican wolf nor would it do so in the absence of the Act's protections. The effects of climate change may become more pronounced in the future, but as is the case with all stressors that we assess, even if we conclude that a species or subspecies is currently affected or is likely to be affected in a negative way by one or more climate-related impacts, it does not necessarily follow that these effects are significant to the species or subspecies. The habitat generalist characteristics of the wolf and their primary prey, elk, lead us to conclude that climate change will not significantly affect the Mexican wolf in the future.

The cumulative effects of factors that increase mortality and decrease genetic diversity are significantly affecting the Mexican wolf, particularly within the context of its small population size (a characteristic that significantly decreases the probability of a population's persistence). The cumulative effects of these threats are significantly affecting the Mexican wolf at the current time and likely will continue to do so in the future. Absent the protection of the Act, the cumulative effects of these threats may increase due to the potential for more killing of Mexican wolves, increased risk of inbreeding, and other sources of mortality, all exacerbated by the Mexican wolf's small population size.

Determination

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species, subspecies, or DPS based on (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination.

We have carefully assessed the best scientific and commercial data available regarding the past, present, and future threats to the Mexican wolf and have determined that the subspecies warrants listing as endangered throughout its range. As required by the Act, we considered the five potential threat factors to assess whether the Mexican wolf is endangered or threatened throughout its range. Based on our analysis, we find that the Mexican wolf is in danger of extinction throughout all of its range due to small population size, illegal killing, inbreeding, loss of heterozygosity and adaptive potential, and the cumulative effect of all threats. Also, existing regulatory mechanisms are not adequate to ensure the survival of the Mexican wolf.

Our finding that the Mexican wolf is in danger of extinction throughout all of its range is consistent with our administrative approach to determining which subspecies are on the brink of extinction and, therefore, warrant listing as endangered. Prior to the

early 1900s, the Mexican wolf was distributed over a large geographic area that included portions of the Southwest and much of Mexico. The Mexican wolf was nearly eliminated in the wild by the mid-1900's due to predator eradication efforts, which led to its listing as an endangered subspecies in 1976 and again as part of the species-level gray wolf listing in 1978. Therefore, the Mexican wolf is a subspecies that was formerly widespread but was reduced to such critically low numbers and restricted range (i.e., eliminated in the wild) that it is at high risk of extinction due to threats that would not otherwise imperil it.

At the time of its initial listing, no robust populations of Mexican wolves remained in the wild. The establishment and success of the captive-breeding program temporarily prevented immediate absolute extinction of the Mexican wolf and, by producing surplus animals, has enabled us to undertake the reestablishment of Mexican wolves in the wild by releasing captive animals into the experimental population. In the context of our current proposal to list the Mexican wolf as an endangered subspecies, we recognize that, even with these significant improvements in the Mexican wolf's status, its current geographic distribution is a very small portion of its former range. Moreover, within this reduced and restricted range, the Mexican wolf faces significant threats that are intensified by its small population size. The Mexican wolf is highly susceptible to inbreeding, loss of heterozygosity, and loss of adaptive potential due to the bottleneck created during its extreme population decline prior to protection by the Act, the limited number of and relatedness of the founders of the captive population, and the loss of

some genetic material from the founders. The effects of inbreeding have been documented in Mexican wolves and require active, ongoing management to minimize.

Mexican wolf mortality from illegal killing, as well as all other sources of mortality or removal from the wild experimental population, is occurring within the context of a small population. Smaller populations have low probabilities of persistence compared to larger, more geographically widespread populations. Absent the protection of the Act, illegal killing would likely increase dramatically, further reducing the population's size and increasing its vulnerability to genetic and demographic factors, putting the Mexican wolf at imminent risk of extinction. These factors are occurring throughout the Mexican wolf's range in the wild, resulting in our determination that the subspecies warrants listing as endangered throughout its range.

After a thorough review of all available information and an evaluation of the five factors specified in section 4(a)(1) of the Act, as well as consideration of the definitions of "threatened species" and "endangered species" contained in the Act and the reasons for delisting as specified in 50 CFR 424.11(d), we revise the List of Endangered and Threatened Wildlife (50 CFR 17.11) by listing the Mexican wolf subspecies (*Canis lupus baileyi*) as endangered. The Mexican wolf is in danger of extinction throughout all of its range and thus warrants the protections of the Act. Listing the entire Mexican wolf subspecies means that all members of the taxon are afforded the protections of the Act regardless of where they are found.

The Act defines an endangered species as any species that is "in danger of extinction throughout all or a significant portion of its range" and a threatened species as any species "that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future." We find that the Mexican wolf is in danger of extinction throughout all of its range due to illegal killing, inbreeding, loss of heterozygosity, loss of adaptive potential, small population size, and the cumulative effects of factors C, D, and E. Historically, the Mexican wolf was distributed across portions of the southwestern United States and northern and central Mexico. The subspecies may have also ranged north into southern Utah and southern Colorado within zones of intergradation where interbreeding with other gray wolf subspecies may have occurred (Leonard *et al.* 2005, pp. 15–16). The Mexican wolf was near extinction prior to protection by the Act in the 1970's, such that the captive-breeding program was founded with only seven wolves. Although our recovery efforts for the Mexican wolf, which are still under way, have led to the reestablishment of a wild population in the United States, the single, small population of Mexican wolves would face an imminent risk of extinction from the cumulative effects of small population size, inbreeding, and illegal shooting, without the protection of the Act. Absent protection by the Act, regulatory protection, especially against illegal killing, would not be adequate to ensure the survival of the Mexican wolf. Therefore, on the basis of the best available scientific and commercial information, we list the Mexican wolf as endangered in accordance with sections 3(6) and 4(a)(1) of the Act. We find that a threatened subspecies status is not appropriate for the Mexican wolf because of the contracted range, because the threats are

occurring rangewide and are not localized, and because the threats are ongoing and expected to continue into the future.

Under the Act and our implementing regulations, a subspecies may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. The threats to the survival of the Mexican wolf occur throughout its range and are not restricted to any particular significant portion of that range. Accordingly, our assessment and proposed determination applies to the Mexican wolf throughout its entire range.

Effects of the Rule

This final rule lists the Mexican wolf as an endangered subspecies. As a matter of procedure, in a separate but concurrent rulemaking published in today's **Federal Register**, we also finalize the revision to the regulations for the nonessential experimental population of the Mexican wolf to ensure appropriate association of the experimental population with this Mexican wolf subspecies listing.

Required Determinations

National Environmental Policy Act

We determined that an environmental assessment or an environmental impact statement, 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 Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

Paperwork Reduction Act of 1995

Office of Management and Budget (OMB) regulations at 5 CFR part 1320, which implement provisions of the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*), require that Federal agencies obtain approval from OMB before collecting information from the public. This rule does not contain any new collections of information that require approval by OMB under the Paperwork Reduction Act. This rule will not impose recordkeeping or reporting requirements on state or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Government-to-Government Relationship with Tribes

In accordance with the President's memorandum of April 29, 1994, Government-to-Government Relations with Native American Tribal Governments (59 FR 22951), E.O. 13175, and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206

of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes. We have coordinated with affected Tribes through correspondence and meetings in order to both (1) provide them with an understanding of the changes, and (2) to understand their concerns with those changes. We fully considered all of the comments on the proposed rule that were submitted by Tribes and Tribal members during the public comment period, and we addressed those concerns, new data, and new information where appropriate.

References Cited

A complete list of all references cited in this document is posted on *http://www.regulations.gov* at Docket No. FWS–HQ–ES–2013–0073 and available upon request from the New Mexico Ecological Services Field Office, Albuquerque, NM (see **FOR FURTHER INFORMATION CONTACT**).

Data Quality Act

In developing this rule we did not conduct or use a study, experiment, or survey requiring peer review under the Data Quality Act (Pub. L. 106–554).

Authors

The primary authors of this rule are the staff members of the Mexican Wolf Recovery Program (see **FOR FURTHER INFORMATION CONTACT**).

List of Subjects in 50 CFR Part 17

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

Regulation Promulgation

PART 17—[AMENDED]

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

Authority: 16 U.S.C. 1361–1407; 1531–1544; 4201–4245; unless otherwise noted.

2. Amend § 17.11(h) in the List of Endangered and Threatened Wildlife under Mammals by:

a. Revising the entry for “Wolf, gray (*Canis lupus*)”;

b. Removing the entry that set forth experimental population status for “Wolf, gray *(Canis lupus)”* in portions of AZ, NM, and TX; and

c. Adding two entries for “Wolf, Mexican (*Canis lupus baileyi*)” in alphabetic order, to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species							
Common name	Scientific name	Historic Range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Mammals							
*	*	*	*	*	*	*	
Wolf, gray	*Canis lupus*	Holartic	U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, KS, KY, LA, MA, MD, ME, MO, MS, NC, NE, NH, NJ, NV, NY, OK, PA, RI, SC, TN, TX, VA, VT and WV; and portions of AZ, IA, IN, IL, ND, NM, OH, OR, SD, UT, and WA as follows: (1) Northern AZ (that portion north of the centerline of Interstate Highway 40); (2) Southern IA, (that portion south of the centerline of Highway	E	1, 6, 13, 15, 35	NA	NA

Species							
Common name	Scientific name	Historic Range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
			80); (3) Most of IN (that portion south of the centerline of Highway 80); (4) Most of IL (that portion south of the centerline of Highway 80); (5) Western ND (that portion south and west of the Missouri River upstream to Lake Sakakawea and west of the centerline of Highway 83 from Lake Sakakawea to the Canadian border); (6) Northern NM (that portion north of the centerline of Interstate Highway 40); (7) Most of OH (that portion south of the				

Species							
Common name	Scientific name	Historic Range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
			centerline of Highway 80 and east of the Maumee River at Toledo); (8) Western OR (that portion of OR west of the centerline of Highway 395 and Highway 78 north of Burns Junction and that portion of OR west of the centerline of Highway 95 south of Burns Junction); (9) Western SD (that portion south and west of the Missouri River); (10) Most of Utah (that portion of UT south and west of the centerline of Highway 84 and that portion of UT				

Species							
Common name	Scientific name	Historic Range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
			south of Highway 80 from Echo to the UT/WY Stateline); and (11) Western WA (that portion of WA west of the centerline of Highway 97 and Highway 17 north of Mesa and that portion of WA west of the centerline of Highway 395 south of Mesa). Mexico.				
Wolf, Mexican	*Canis lupus baileyi*	Southwestern United States and Mexico	Entire, except where included in an experimental population as set forth in 17.84(k)	E		NA	NA

Species							
Common name	Scientific name	Historic Range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Wolf, Mexican	*Canis lupus baileyi*	Southwestern United States and Mexico	U.S.A. (portions of AZ and NM)—see 17.84(k)	XN		NA	17.84(k)
*	*	*	*	*	*	*	

* * * * *

Dated: 1/7/15

Signed: Stephen Guertin

Director, U.S. Fish and Wildlife Service.

[~~Endangered and Threatened Wildlife and Plants; Endangered Status for the Mexican Wolf~~]