

Mexican Wolf Experimental Population Area Initial Release and Translocation Proposal for 2018

This document was developed by the Mexican Wolf Interagency Field Team (IFT) and outlines management options for initial release(s) and translocation(s) of Mexican wolves into the Mexican Wolf Experimental Population Area (MWEPA) in Arizona and New Mexico in 2018. The initial releases and translocations outlined in this document are consistent with:

- (1) *the 2014 Final Environmental Impact Statement (EIS) for the Proposed Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf (Canis lupus baileyi),*
- (2) *the 2015 Record of Decision for the Proposed Revision to the Regulations for the Nonessential Experimental Population of the Mexican Wolf (Canis lupus baileyi),*
- (3) *the 2015 Final Rule - Revisions to the Regulations for the Nonessential Experimental Population of the Mexican Wolf.*

The above documents analyzed the potential environmental and socioeconomic impacts of a Mexican wolf population in the MWEPA, including initial releases and translocations. This document is the initial release and translocation planning proposal for 2018, thus it is not a final agency action but rather an implementation planning document that may be changed during this planning period. From 1998-October of 2017, the IFT has conducted 31 initial release events (108 wolves) and 69 translocations events (121 wolves).

With seven unrelated founders, the Mexican wolf is likely to have a genetic bottleneck necessitating management actions to retain remaining gene diversity. Specifically, the captive population is carefully managed in an effort to maintain or increase gene diversity by establishing breeding pairs through a process that considers mean kinship¹ (MK) and avoidance of inbreeding². Conversely, breeding pairs in the wild population are not prescribed, but typically establish through natural dispersal and pack formation. Thus, to maintain or increase gene diversity in the wild population, it is important to ensure the population as a whole is genetically diverse, increasing the probability that wolves pairing naturally have a low MK.

The wild population's MK is approximately 0.2452. This means that, on average, individuals within the population are as related to one another as full siblings. All current known wild breeding pairs are producing pups related to the Bluestem Pack, specifically breeding female F521 (Figure 1). Of the approximately 73 Mexican wolves in the wild for which individual genetics are known (or highly

¹ Mean kinship (MK) is an individual's degree of relatedness to the population. A wolf with low MK is less genetically represented in the population, and a breeding event by this animal would decrease the overall relatedness of the population. A wolf with higher MK is genetically well represented in the population, and a breeding event by this animal would increase the overall relatedness of the population. Because MK of an individual animal is relative to the current population, it is constantly changing. For example, an individual's MK will increase each time that animal successfully produces and raises offspring in the population.

² Inbreeding is the mating of closely related individuals, which tends to increase the number of individuals in the population that are homozygous for a trait which can reduce adaptive potential.

suspected for 2017 pups of the year), analyses indicate only 5 (M1038, AM1341, M1343, m1471, and fp1578), are not descendants of F521. Thus, there is very little potential for natural pair formation among wild wolves to have a low MK now or in the future which naturally leads to inbreeding accumulation. Release of wolves from the more genetically diverse captive population is necessary to decrease the overall relatedness among wolves in the wild population and to meet the objectives of the Mexican Wolf Recovery Plan, First Revision. In addition, we may need to prevent production of highly inbred wolves or remove wolves from the wild to reduce MK. The following release and translocation actions are proposed in consideration of the current genetic status of the wild population.

The proposed actions within the MWEPA are to:

- (1) Cross-foster pups from captivity into as many as six wild wolf packs throughout the MWEPA (with a maximum of six pups into the Arizona portion). Based on our experience, we estimate a maximum of 12 pups would be cross-fostered throughout the MWEPA during 2018.
- (2) Temporarily remove Alpha Female (AF) 1339 (the Panther Creek Pack) during the helicopter capture in January to prevent a brother/sister mating event. During the temporary period of time in captivity, artificially inseminate AF1339 and/or allow AF1339 to breed naturally with a captive male, M1196. Following a complete estrous cycle (likely mid-February) translocate AF1339 back into the Panther Creek home range to maintain pack dynamics, and potentially produce pups with increased genetic diversity and lower inbreeding coefficients.
- (3) Provide for the translocation of wolves for management purposes as needs rise during 2018 (primarily wolves that disperse outside of the MWEPA or if other packs are determined to be brother/sister pairings).

The ultimate success of an initial release, translocation, or cross-foster occurs when those animals survive and produce pups in the wild.

Background

Initial Release and Translocation Restrictions and Land Use:

Initial release and translocation strategies differ throughout the MWEPA to reflect various state, federal, and tribal agency laws, rules, regulations, and land-use patterns (e.g. higher and more complex land-use areas vs. wilderness). To the extent possible, agency direction and land-use patterns are addressed in these initial release and translocation strategies while still promoting the health of the wolf population by addressing critical genetic issues. The Arizona Game and Fish Commission has directed the Arizona Game and Fish Department to conduct only cross-fostering of captive-born pups into wild wolf dens and translocations of wild-born and raised wolves in Arizona. The combinations of strategies within the MWEPA that are outlined in this plan represent an effort to increase gene diversity in the wild population. Gene diversity can continue to be improved through additional initial release and cross-fostering efforts in future years. However, it is easier to affect the gene diversity of the wild population when it is small, and it will become more difficult as the population increases.

Initial Release and Translocation Strategies:

Translocations: Involve moving a wolf for management purposes from one location to another location within the MWEPA. Mexican wolves that travel outside of the MWEPA or require translocation for management purposes will be considered for translocation onto Federal land within the MWEPA in accordance with the 2015 10(j) Rule. The IFT will assess: (a) the specific reasons for a translocation, (b) previous behavior of the wolf or wolves, and (c) the potential effects of the management action, prior to recommending a translocation. Further, the IFT will consider wolf distribution, breeding vacancies, and genetics associated with the potential translocation candidate(s).

Most translocations will be single animals and can occur anywhere within Zone 1 or Zone 2 as a hard release (i.e., a release from a crate). The IFT may recommend that translocations be conducted at a previously established release site; potential new release sites within the MWEPA are undergoing National Environmental Policy Act (NEPA) analysis by the U.S. Forest Service (USFS). If a previously established release site will be considered, the IFT will recommend the best available site based on site ranking. Translocated wolves may spend a period of time in captivity prior to being released in a new location in the wild. Entering 2018, the USFWS has one preferred translocation candidate (M1336) available in captivity. M1336 was captured during the 2014 helicopter count (January of 2015) to prevent breeding between full siblings. M1336 does not have a depredation or nuisance history. The IFT does not have a translocation recommendation for M1336 during 2018, but the animal is available in captivity should a need arise (e.g., breeding vacancy).

In 2018, the IFT proposes to conduct a management action associated with the Panther Creek Pack. The proposed management action is to remove AF1339 to be impregnated in captivity by artificial insemination and/or breeding with a captive male wolf, and then returned to the same area in the wild as the removal. This action would be considered a translocation. Other wolves may be translocated for management purposes as needs arise in 2018. Options will be evaluated to determine if, where, and how a translocation should proceed based on SOP 6.1 (Wolf Translocations) and a full evaluation by the IFT.

Initial Releases: Involve the release of wolves from captivity without wild experience. Originally, initial releases were necessary to establish a wild population and subsequently augment population growth. Now initial releases are a management option to reduce MK of the wild population (see Figure 1). Captive wolves are selected for release based on their genetic value relative to both the captive and wild Mexican wolf populations, as well as other desirable characteristics (e.g. fear of humans). Artificial insemination may also be utilized to further increase the genetic benefit of release actions. Although not an initial release, the IFT plans to conduct an artificial insemination effort with AF1339 to prevent a wild brother/sister pairing.

Both initial releases and translocations are more successful when young pups are present and when they occur in areas with adequate native prey. For instance, we have documented that 66% ($n = 9$) of the initial released breeding animals with dependent pups in areas of adequate native prey have been successful versus 29% success ($n = 17$) of the initial released breeding-aged animals without dependent pups in similar conditions. The pattern observed for initial released wolf also holds for translocated animals with 77% success ($n = 13$) with pups versus 32% ($n = 38$) without pups under

similar conditions. Success, as we are using this term, means any released wolf that produces pups in the population in the future. Breeding pairs that are considered successful releases tend to persist and produce pups in successional years, continuing to increase gene diversity. Initial released wolves do not have wild experience, typically exhibit some level of naivety towards humans, and can be a nuisance to people living and working in release areas for a period of time following release. Survival of adult Mexican wolves released from captivity has been substantially lower during the first year following a release compared to the average adult survival rate of wild wolves (adult survival rate first year after release of 0.28 [Note: this includes adults released without pups] versus an average adult survival rate of 0.8 using data from 2009 through 2015). Initial release wolves require intensive and prolonged management by IFT staff including supplemental feeding, monitoring, and potential hazing from human occupied areas until the pack has acclimated to wild behavior. In extreme situations, the pack may also need to be removed if nuisance behaviors exceed acceptable thresholds. No initial releases of adults or packs are proposed during 2018. The IFT will instead focus on cross-fostering (considered an initial release) in 2018 because initial efforts have been promising (see below) and present an opportunity to accomplish genetic goals while eliminating nuisance behavior observed during initial release of adult wolves. Initial releases of packs of wolves may still be necessary in the future based on the continued evaluation of cross-fostering.

Cross-fostering (a specific technique of initial releases): Involves placing captive-born pups (<14 days old) into wild dens with similarly aged pups, and is an additional/alternative method to increase gene diversity in the wild population. Cross-fostering can be logistically complicated because it requires synchronicity between captive and wild born litters produced during a short time window and often a considerable distance apart (e.g., we have previously cross-fostered from captive facilities as far away as Missouri and Illinois). Cross-fostering is a relatively new method for the Mexican Wolf Recovery Program, and therefore its overall efficacy as a genetic management tool is not yet fully known. However, recent successes within the Mexican Wolf Recovery Program and the more in-depth experience of the red wolf program in North Carolina suggest that cross-fostering can be an effective management tool. These expectations are tempered by data from the wild population suggesting that from birth to 1 year of age, approximately 50% of pups survive, and average survival for yearlings is 0.673. Thus, we would predict that 0.34 ($0.5 * 0.673$) of cross-fostered pups would survive to breeding age should cross-fostered animals perform similarly to other wild-born pups. This survival rate would likely be considered a minimum estimate because packs that receive cross-fostered pups also are provided a supplemental food cache to increase pup survival.

Initial results from the Mexican Wolf Recovery Program have demonstrated that cross-fostering can be successful in releasing captive wolves that survive to reproductive age. The IFT has conducted cross-fostering on six occasions. In 2014, the IFT fostered two pups from one wild litter to another. Both of the pups (AF1346 and AM1347) survived to breeding age, paired and produced pups with other wolves in the wild. In 2016, the IFT fostered two pups from three captive litters into three wild litters (two pups into each wild litter) and documented that a minimum of two survived (mp1471 and an uncollared pup) to the end of the year. All of the packs into which pups were cross-fostered successfully raised pups (either natal or cross-fostered). Similar results are expected for the four pups cross-fostered in 2017 (one cross-fostered pup has been radio collared (fp1578) and is known alive, however data are still being collected). Collectively, these results indicate that: (1) in all six cross-fostering events (inclusive of 2017), human disturbance at the den site resulted in the adult

wolves moving the den a short distance, but did not result in abandonment of the pups, (2) a minimum of four of the eight cross-fostered pups survived to the end of the year (excluding 2017 since final data are currently unknown), (3) both of the cross-fostered animals that were old enough to disperse and form packs of their own did so during 2016, and (4) both of them have successfully contributed genetically to the population (bred and raised pups) which is the ultimate goal of all release strategies. Collectively, these results are encouraging and suggest that the Mexican Wolf Recovery Program should continue to utilize cross-fostering as a strategy to increase genetic diversity of Mexican wolves in the wild. In addition, the results are consistent with expectations based on Mexican wolf pup survival rates.

Cross-fostering does not appreciably change the distribution of wolves on the landscape, and depends on complex coordination of logistics between captive facilities and the wild population (see SOP 31.0) to succeed. Captive-born pups placed into wild Mexican wolf dens will be of a different genetic profile than existing wolf packs in the MWEPA and, if successfully established, can increase the gene diversity of the wild wolf population. Cross-fostering will occur in April and/or May and will only occur within packs that den on Federal land in accordance with the 2015 10(j) Rule.

Initial Releases and Translocations

The IFT proposes to conduct the following actions.

Action 1 – Cross-foster Mexican Wolf Pups Produced in Captivity into Wild Mexican Wolf Pack Dens in the MWEPA.

The IFT proposes to cross-foster pups into as many as six packs throughout the MWEPA (with a maximum of six pups into the Arizona portion). Based on our experience, the IFT estimates a maximum of 12 pups cross-fostered into the MWEPA in 2018. Cross-fostering will occur within packs that den on Federal land within Zones 1 and 2 of the MWEPA, in accordance with the guidance of Phase 1 (see 2015 10(j) Rule).

Figures 2 and 3 give a general distribution of existing packs where cross-fostering may occur. As many as 21 packs or pairs (10 in Arizona and 11 in New Mexico) are currently potential breeding pairs for cross-fostering in 2018 (Table 1). We have listed below the preferred wild pack candidates for 2018 cross-fostering, based on their past success with pup production/recruitment and our expectation that the same experienced alpha females will reproduce this year. The pack candidates are listed in chronological order by predicted whelp date based on previous years:

- Saffel (AZ) April 5
- Bear Wallow (AZ) April 8 -18
- Elk Horn (AZ) April 16 – 25
- Hoodoo (AZ) April 15 – 22
- San Mateo (NM) April 20 – 24
- *Mangas (NM) April 23
- *Luna (NM) April 23 -25
- SBP (NM) April 26
- Lava (NM) April 28
- Iron Creek (NM) April 24 – May 2

- Prieto (NM) April 23 – May 4
- *Panther Creek (AZ) May 3 – 4

* The IFT would likely not consider a cross-foster into the Panther Creek pack if AF1339 is impregnated in captivity as described by proposed Action 2 in this document. Luna and Mangas packs would be evaluated based on den location and depredations accumulated prior to the cross-fostering effort, since both packs had depredations prior to denning in 2017.

Associated Management Actions

After the 2018 breeding season, the IFT will prepare a cross-fostering priority ranking for all 2018 breeding pairs that will be considered for cross-fostering using predicted whelp dates and parameters (e.g. past reproductive successes, locational logistics, availability of GPS collars on breeders) in an effort to increase success and recruitment of wild and cross-fostered pups. This ranking will guide the IFT in deciding which wild packs to consider when captive pups become available. The IFT will develop specific cross-foster operational plans for the 2018 breeding season after they have identified a match between available captive pups and a wild litter. This management option requires the following circumstances and considerations:

- Wild Mexican wolf packs display denning in Zone 1 and Zone 2 of the MWEPA.
- Donor pack(s) in captivity are identified and produce available pups based on the demographic and genetic needs of the wild and captive population.
- Wild and donor pups are <14 days old.
- Whelping dates of wild pups and donor pups must be within 10 days of one another (with less age difference preferred).
- Donor litter size needs to be large enough to contribute pups to the wild population (i.e. 4 or more) and wild litter size needs to be small enough to accept donor pups (i.e. approximately 6 or fewer, but dependent on other data [e.g., females that have a history of raising large litters may be pushed to 7 or fewer]). The IFT will not know the recipient litter size prior to conducting the operation. Thus, a contingency plan will be developed to return wild born pups to the captive litter in every cross-foster operation if the addition of the captive born pups creates too large of a litter size (i.e. > ~8 pups). In addition, if the captive litter is large enough, the IFT will consider cross-fostering more pups into a wild litter (previously we have limited it to two pups per cross-foster attempt) based on our experience in 2017 of successfully cross-fostering pups from the wild to captivity.
- The primary limiting factor in cross-fostering efforts last year was a lack of synchrony between wild and captive litters. The Service is exploring options (e.g., induced ovulation and/or artificial insemination) to increase availability of pups in captivity to coincide within the expected timing of wild wolf whelp dates where possible.
- The IFT plans to prevent a known sibling mating by temporarily removing a breeding adult from the Panther Creek Pack (see Action 2 below). The IFT may consider a suite of management options if additional sibling pairings are documented, including removing most of the pups from the wild litter to captivity, with cross-fostering from the captive litter. We recognize that these pups may have little value to the captive population; however, these pups could adversely affect the genetic management goals by increasing MK if they remain in the wild.

Favorable Attributes of Action 1:

1. Cross-fostering allows for the integration of genetically different Mexican wolves into areas already occupied by wolves.
2. Cross-fostering allows captive-born wolf pups to be raised in the wild by experienced wolves and reduces the potential for nuisance wolf interactions that are often associated with the release of naïve captive adult wolves.
3. Cross-fostering provides for progress towards the genetic criterion of the Mexican Wolf Recovery Plan, First Revision.

Less Favorable Attributes of Action 1:

1. Cross-fostering requires significant disturbance of the targeted wild pack(s) dens, and may result in packs moving pups to another location. However, data from red wolves and Mexican wolves indicate that den movement does not impact survival of the pups.
2. Cross-fostering requires a series of specific events to occur simultaneously (e.g. packs den in Zones 1 or 2 in the MWEPA, both the donor and wild packs have pups within ten days of each other, the cross-foster event occurs within the first 14 days of life, wild pack den sites are located within 10 days of whelping, it is logistically feasible to transport the donor pups to the wild den, etc.). Thus, we are limited in the number of opportunities to cross-foster within a whelping season, and we cannot specify individual recipient or donor packs until the time that key information is available.

Action 2 – Prevent the Mating of Full Siblings in the Panther Creek Pack.

This action would be the first effort on the Mexican Wolf Recovery Program to artificially inseminate a wild wolf. AF1339 would be temporarily removed in January and artificially inseminated using fresh and/or frozen semen and/or AF1339 would be held in captivity with a captive male and allowed to breed naturally. AF1339 would be released back into the Panther Creek territory (Figure 2) following a completed estrous cycle (~3-4 weeks following capture). The Mexican Wolf Recovery Program has temporarily removed alpha animals during previous helicopter surveys to treat injuries, and subsequently released the wolf back into the territory to maintain the original pairing. Pairs were maintained during this process despite the disturbance. The expectation in this action is that pack dynamics would not change with the temporary removal of AF1339.

Favorable Attributes of Action 2:

1. The action would prevent a known mating of full siblings resulting in the production of highly inbred pups in the wild.
2. Similar to cross-fostering, this action would allow for the integration of genetically different Mexican wolves without having to release naïve adults/packs. Pups that survive 2 years from this action would count towards the genetic criterion in the Mexican Wolf Recovery Plan, First Revision.
3. The action should not alter the distribution of wolves.

Less Favorable Attributes of Action 2:

1. There is a slight chance that AF1339 may be replaced in the Panther Creek Pack while being held in captivity. If this occurred, AF1339 could be released and form a new pair with

another male prior to whelping in May. However, the newly established territory may impact stakeholders depending on the location of the pair.

2. If AF1339 is replaced, there is the potential that AF1339 is released and does not form a new pair with another male, and whelps pups as an individual animal. The IFT would likely need to provide supplemental feeding to assist AF1339 in raising the pups. In addition, if the timing works, the IFT may cross-foster some of AF1339's litter into another wild litter. Staff from USFWS and AGFD will have to be involved in expending resources to manage this scenario.
3. If both alpha animals from the Panther Creek Pack survive the full year, a similar action may need to be performed to prevent the sibling mating in 2019.
4. Removal of AF1339 may cause dispersal of uncollared pups in the Panther Creek Pack that were born in 2017, two of which may be cross-fostered animals, which would make collaring efforts by the IFT more difficult. It may be desired to capture and collar Panther Creek pups during the start of the 2018 helicopter count/capture operations prior to removing AF1339 to captivity.

Action 3 - Translocate Wolves for Management Purposes During 2018 (primarily wolves dispersing outside of the MWEPA).

The IFT will consider translocation onto Federal land inside the MWEPA in accordance with the 2015 10(j) Rule of Mexican wolves that travel outside of the MWEPA or that are removed for other management purposes. The IFT will assess: (a) the specific reasons for a translocation, (b) previous behavior of the wolf or wolves, and (c) the potential effects of the management action, prior to recommending a translocation. In addition, the IFT will consider the distribution of wolves, breeding vacancies, and genetics associated with the potential translocation candidate(s). Most translocations under these scenarios will be single animals and can occur anywhere within Zone 1 or Zone 2 as a hard release. The IFT will recommend the best available site based on site ranking, the USFS decision on new release sites, and current wolf distribution. The IFT will follow SOP 5.1 (Translocations) for communication with permittees and local officials in association with translocation events.

Favorable and Less Favorable Attributes of Action 3:

1. These wolves are maintained inside the MWEPA population as potential breeders.
2. Translocated wolves are radio collared and could pair with an uncollared wolf.
3. Translocated wolves may travel widely and repeat the behavior causal to the translocation (e.g. leaving the MWEPA).

Table 1. Packs that are predicted to produce pups in the wild during 2018. Other animals are likely to pair produce pups in 2018.

| Pack | State | Previous Whelp Dates for Breeding Female | Minimum No. of Pups Produced ¹ | Notes |
|--------------|-----------------|--|---|--|
| Bear Wallow | AZ | 4/8/17, 4/18/16 | 3, 2 | |
| Bluestem | AZ | <4/25/17, 4/19/16, 4/18-4/29/15 | 4, 6, 8 | AF1042 will be 12 in 2018 and AM1341 is fate unknown |
| Copper Creek | NM | 5/5/17 | Unknown/Failed Den | 2017 was AF1444's first litter |
| Dark Canyon | NM | 4/21/17 | Unknown/Failed Den | 2017 was AF1456's first litter |
| Elk Horn | AZ | 4/16/17, 4/23/16, 4/22-4/25/15 | 2, 5, Failed | Successful cross-foster pack in 2016 |
| Frieborn | NM ² | 4/10/17 – 4/17/17 | Unknown/Failed Den | 2017 was AF1443's first litter |
| Hoodoo | AZ | 4/15/17, 4/22/16 | 5, 6 | |
| Iron Creek | NM | 5/1/17, 4/24/16, 5/2/15 | 4, 5, 5 | |
| Lava | NM | 4/28/17 | 3 | 2017 was AF1405's first litter |
| Leopold | NM | Unknown, 5/15/16 | Unknown, 3 | Poor candidate for cross-fostering due to denning in the wilderness and associated logistics |
| Luna | NM | 4/25/17, 4/23/16 | 4, 5 | Potential for depredations post cross-fostering should be considered to determine cross-foster potential |
| Mangas | NM | 4/23/17 | 4 | 2017 was AF1439's first litter. Same depredation concerns as Luna |

| Pack | State | Previous Whelp Dates for Breeding Female | Minimum No. of Pups Produced ¹ | Notes |
|------------------|-------|--|---|--|
| Maverick | AZ | 4/10/17, 4/21/16, 4/19/15 | Failed, 2, 2 | |
| New Pair (f1562) | AZ | N/A | N/A | 2018 will be f1562's first litter |
| Panther Creek | AZ | 5/3/17, 5/4/16, 4/20/15 | 6, 5, Failed | Successful cross-foster pack in 2016 (2017 results pending). Planned for alternative action in 2018. |
| Prieto | NM | 5/4/17, 5/2/16, 4/23/15 | 2, 4, 6 | Near cattle in traditional denning area, but did not depredate in 2017 |
| Prime Canyon | AZ | Non-Breeder in 2017 | N/A | 2018 will be f1488's first litter |
| Saffel | AZ | 4/5/17 | 4 | 2017 was AF1567's first litter |
| San Mateo | NM | 4/24/17, 4/20/16 | 8, 3 | Cross-foster pack in 2017 (results pending) |
| SBP | NM | 4/26/17 | 3 | 2017 was AF1553's first litter |
| Tsay-O-Ah | AZ | * | * | Dependent on White Mountain Apache Tribe's decisions/discussions |

¹Number of pups will likely be refined during the 2017 population count. All data here-in should be considered preliminary. Final numbers will be reflected in the 2017 Annual Report.

²Boundary pack that occurs in both Arizona and New Mexico, but denned just on the New Mexico side of the border in 2017.

*Tribal data are considered proprietary and not displayed.

Table 2. Pairs that are planned to produce pups in captivity during 2018 and are currently being evaluated for their availability to contribute pups to cross-foster to the wild.

| Pair | State | Previous Whelp Dates for Breeding Female | Minimum No. of Pups Documented | Estimated Drive Time to MWEPA ¹ |
|--------------|------------|--|--------------------------------|--|
| M1478xF1539 | Arizona | First time breeder | | 4 h 18 min |
| M1049xF1217 | California | N/A ² | | 9 h 8 min |
| M1139xF1227 | California | 5/8/16, 5/9/17 | 7, 6 | 9 h 8 min |
| M1537xF1128 | Colorado | First time breeder | | 8 h 55 min |
| M1195xF1265* | Illinois | 5/29/15, 4/25/16, 4/22/17 | 4, 5, 5 | 22 h 47 min |
| M968xF1479 | Indiana | First time breeder | | 21 h 7 min |
| M1344xF1530 | Kansas | First time breeder | | 13 h 1 min |
| M1177xF1266 | Missouri | 4/17/15, 4/15/16 | 3, 6 | 17 h 59 min |
| M1249xF1216 | Missouri | First time breeder | | 17 h 59 min |
| M1297xF1300 | Missouri | 5/7/16, 5/13/17 | 4 ³ , 8 | 17 h 59 min |
| M1298xF1374 | Missouri | 5/2/16, 4/2/17 ⁴ | 4, 1 | 17 h 59 min |
| M1229xF1365 | New Mexico | N/A ² | | 3 h 45 min |
| M1336xF1323 | New Mexico | 5/22/17 | 4 ³ | 3 h 52 min |
| M1400xF1431 | New Mexico | First time breeder | | 3 h 52 min |
| M1133xF1226* | New York | 5/25/16, 5/22/17 | 3, 3 | 34 h |
| M1198xF1143 | New York | 5/4/16 | 1 | 34 h |
| M1564xF1505 | New York | First time breeder | | 34 h |
| M1228xF1468 | Ohio | First time breeder | | 23 h 39 min |
| M1396xF1129 | Texas | First time breeder | | 12 h 17 min |
| M1336xF1422* | Washington | 5/11/17 | 4 | 22 h 45 min |

¹Drive time estimated from originating captive facility to Alpine, AZ provided as guidance in determining whether to drive or fly pups to MWEPA

²Pups never observed; unsure of production date or if pups were indeed born in captivity

³Because of early mortality in these litters, they would have been unavailable for cross-fostering efforts

⁴Litter produced through induced ovulation and artificial insemination, thus this whelp date should not be considered when analyzing previous whelp dates

*F1265 and F1226 will be artificially inseminated in 2018, thus their whelp date will likely be in early April based on induced ovulations. F1422 will be artificially inseminated using semen from M1336.

Figure 1. Potential 2018 breeding pairs and their relationship to the Bluestem Pack. All packs are shaded according to the percentage of ancestors in the last three generations that were direct Bluestem Pack descendants. For pups born to these packs in 2017, the percentage represents the proportion of their four maternal and four paternal great-grandparents that were direct offspring of the Bluestem Pack (n=8 great-grandparents; where a past breeder was not confirmed the denominator to calculate percent may be fewer than 8).

2017 potential breeding pairs and their proportion of Bluestem pack heritage

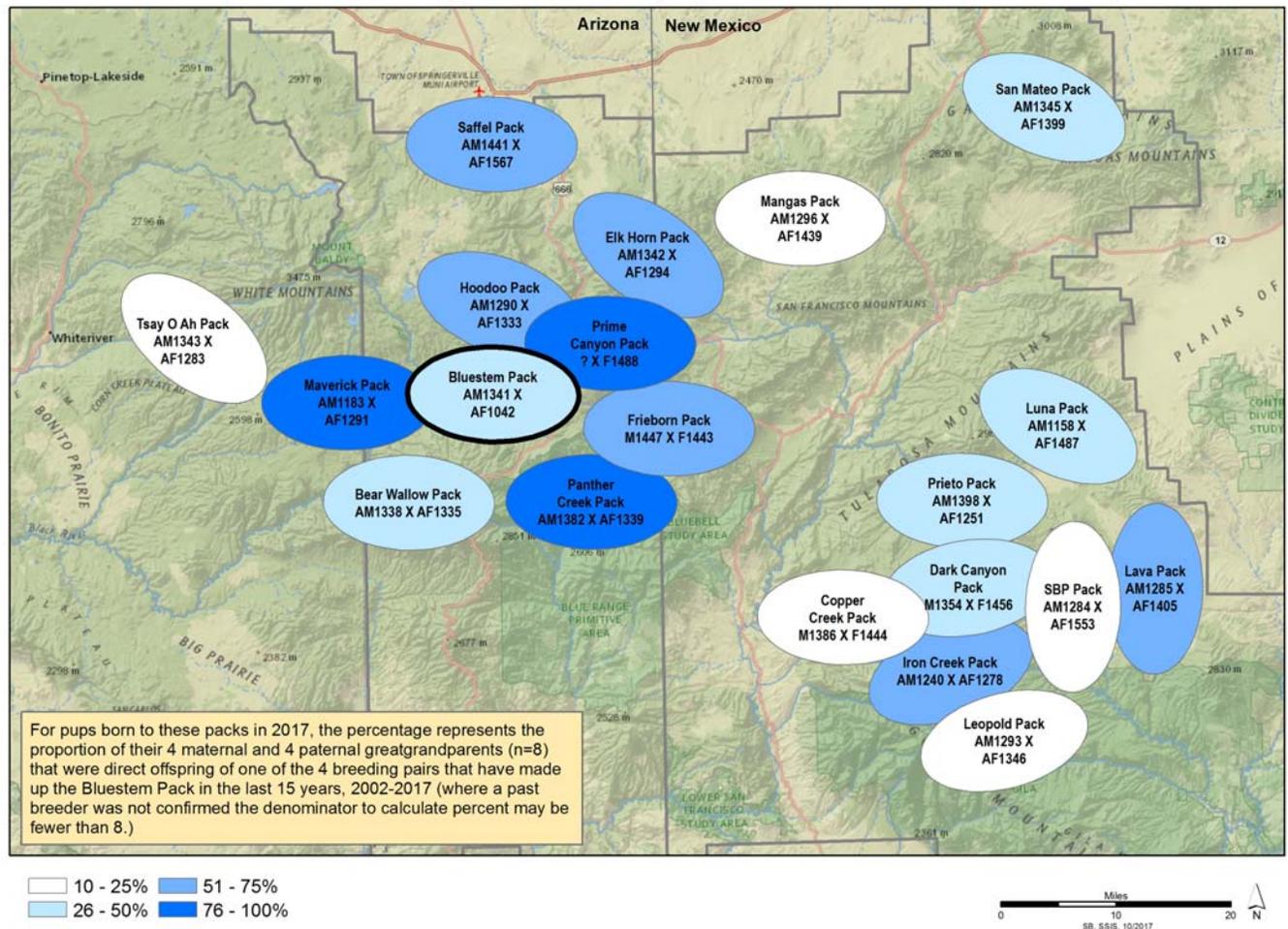


Figure 2. Mexican wolf home ranges for 2016 in Arizona and New Mexico within the Mexican Wolf Experimental Population Area (MWEPA). The shaded polygons on the map represent wolves having a minimum of 20 and a maximum of 466 independent radio locations and exhibiting movement characteristics consistent with a home range during 2016. The Bear Wallow and Maverick packs are represented with dots because there were not enough locations in 2016 to calculate home ranges for these packs.

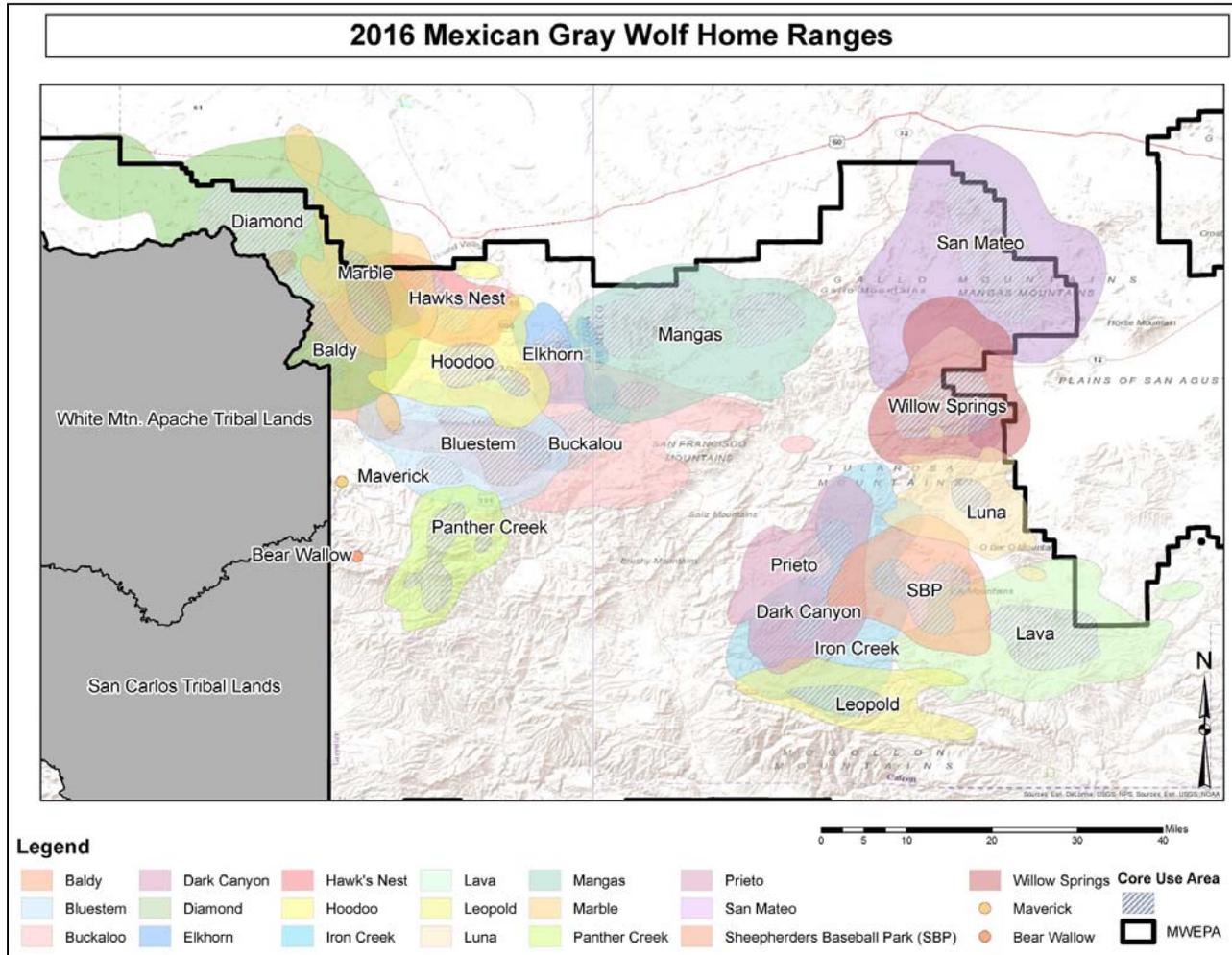


Figure 3. Mexican wolf occupied range in Arizona and New Mexico (2016) within the Mexican Wolf Experimental Population Area (MWEPA).

